

The Gate House, Former Ainsworth Nursing Home

Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy

Job Number: LKC251059

Date: March 2025

Client: CH Construction Services (UK) Ltd



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EXECUTIVE SUMMARY

Site Details

Location	Northern end of Knowsley Road, in the Ainsworth area of Bury. Centred at National Grid Reference 376420E 410900N.
Area	3,100m ² .
Topography	160 metres Above Ordnance Datum (AOD). Site is approximately level.
Current Site Use	Vacant former residential building in the south-east of the site with rough ground across the remainder of the site.
Proposed Development	Residential housing with gardens / soft landscaping.

Site Setting

Main Historical Features	Onsite: Part of Broom Field, Part of Ainsworth Hospital (Infectious Diseases), Field Boundary, 2no. Buildings. Surrounding Area: Broom Field, Ainsworth Hospital (Infectious Diseases), 3no. Ponds, Windpump, Tank, Well, Pump.
Geology / Hydrogeology	Artificial: No BGS recorded artificial. Superficial: Till (Diamicton) recorded in the south-west corner of the site. Secondary Undifferentiated Aquifer. Remainder of the site – no BGS recorded superficial. No Aquifers recorded over the remainder of the site. Bedrock: Pennine Lower Coal Measures (sandstone) in the north. Secondary A Aquifer. Pennine Lower Coal Measures (mudstone, siltstone and sandstone) in the south. Secondary A Aquifer.
Landfills / Infilled Ground	No recorded landfills. Potentially infilled ground identified.
Site Reconnaissance	1no. vacant building in the south-east corner of the site, remainder overgrown shrubs.
Recommendations	Site Investigation was recommended to further assess geo-environmental risk.

Ground Investigation Work Undertaken

Date of Investigation:	26 th February 2025
Intrusive Investigation Work Undertaken:	2no. window sample boreholes. 1no. mechanically excavated trial pits. 5no. hand excavated pits. Contamination and geotechnical testing.

Ground Conditions

Made Ground	Encountered across the site, except at HDP103 and HDP104 to depths of 0.50-1.20mbgl, comprising horizons of sand and clay with anthropogenic material including brick, coal, ceramic, glass and ash.
Superficial	Soft to very stiff clay, sand and soft to very stiff silt encountered across the site. Gravel / sandstone cobbles encountered from 2.31-3.40mbgl. within TP101, WS101 and WS102.
Bedrock	Possible sandstone bedrock encountered from 2.31-3.40mbgl.
Groundwater	Encountered at 1.00mbgl and 2.90mbgl in HDP103, HDP104, TP101 and WS102.
Obstructions	Possible shallow bedrock encountered in the vicinity of the proposed dwelling.

Geotechnical Assessment

Allowable Bearing Pressure	2000kN/m², based upon BS8004:1986 which is considered more than adequate to support the structure. Standard Penetration Tests undertaken at the base of the window sample holes all recorded in excess of 50 blows (N >50) before completion of the test, indicating a bearing capacity in excess of 434kN/m². The installation of a structure and basement will require the excavation of c.3m of overburden, which when the structure is constructed will result in a negligible increase, if any, of any loading acting on the basement level.
Anticipated Foundation Type	Basement will form the foundation to the structure.
Other Considerations	Temporary supports of excavations may be required. 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 clays and deeper weathered sandstone) 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. Detailed design should be carried out by structural engineer. Concrete Requirements DS1-AC-3z.

Contamination Risk Assessment

PL	Contaminant	Risk	Recommendations
1	Metals Asbestos PAHs Petroleum hydrocarbons	Low	Nominal layer of imported topsoil required in soft garden areas.
2	Naphthalene Light end petroleum hydrocarbons	Low	No remediation required.
3	Carbon dioxide / Methane	Moderate / Low	No remediation required.
3	Radon	Moderate / Low	In-situ radon monitoring within existing dwelling and basic radon protection required.
4	Groundwater (mobile contaminants)	Low	No remediation required.
5	Organic contaminants.	Low	Utility provider risk assessment to be completed.

Recommendations

PL	Recommendation
1	Nominal 150mm layer of site won or imported topsoil required in garden areas.
2	No remediation required.
3	In-situ radon monitoring within the existing dwelling and basic radon protection measures required.
4	No remediation required.
5	Potable water pipe assessment required.

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Figure 2 – Proposed Development Plan

Figure 3 – Site Investigation Location Plan

APPENDICES

Appendix A – Risk Matrix

Appendix B – Profile Logs

Appendix C – Certificates of Analysis (Soil)

Appendix D – Certificates of Analysis (Geotechnical)

Appendix E – Generic Assessment Criteria Values

Appendix F – BGS Radon Report

Appendix G – References

1. Introduction

1.1. Background

LK Consult Ltd (LKC) has been commissioned to carry out a Phase 2 Geo-Environmental Investigation, Risk Assessment for The Gate House, Former Ainsworth Nursing Home. The investigation was undertaken in support of planning application no. 68661 to develop the site for residential use.

The following work has previously been undertaken:

- Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: LKC 21 1335 Ainsworth Nursing Home PRA R1, dated 3rd August 2021).

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

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

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

Location	Northern end of Knowsley Road, in the Ainsworth area of Bury. National Grid Reference 376420E 410900N.
Area	3,100m ² .
Topography	160 metres above ordnance datum (AOD). Site is approximately level.
Current Site Use	Vacant former residential building in the south-east of the site with rough ground across the remainder of the site.
Proposed Development	1no. Residential dwelling with basement, conversion of existing building to guest house with gardens, soft landscaping and landscape buffer.

Table 1-1: Summary of site details.

2. Summary of Preliminary Risk Assessment (PRA)

2.1. Phase 1 Preliminary Risk Assessment (PRA)

Pertinent information has been summarised from the PRA in Table 2-1.

Main Historical Features	Onsite: Part of Broom Field, Part of Ainsworth Hospital (Infectious Diseases), Field Boundary, 2no. Buildings. Surrounding Area: Broom Field, Ainsworth Hospital (Infectious Diseases), 3no. Ponds, Windpump, Tank, Well, Pump.
Geology / Hydrogeology	Artificial: No BGS recorded artificial. Superficial: Till (Diamicton) recorded in the south-west corner of the site. Secondary Undifferentiated Aquifer. Remainder of the site – no BGS recorded superficial. No Aquifers recorded over the remainder of the site. Bedrock: Pennine Lower Coal Measures (sandstone) in the north. Secondary A Aquifer. Pennine Lower Coal Measures (mudstone, siltstone and sandstone) in the south. Secondary A Aquifer.
Landfills / Infilled Ground	No recorded landfills. Potentially infilled ground identified.
Site Reconnaissance	1no. vacant building in the south-east corner of the site, remainder overgrown shrubs.

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

Table 2-2 summarises the geotechnical constraints. This has been updated to consider the previous site investigation work.

Coal Mining	Site is not within a Development High Risk Area. No further assessment required.
Slope Stability	Site is relatively flat. No significant slope stability risk anticipated. 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 and road design should be calculated.

Table 2-2: Summary of geotechnical constraints.

2.2. Conceptual Model

The preliminary contamination conceptual model using contaminant-pathway-receptor linkages based on guidance in LCRM² has been summarised in Table 2-3.

Each pollutant linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552³. The risk matrix is provided in Appendix A.

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

Up to date radon data has been obtained from the UKHSA website.

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 most sites will be very low to low. here 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.

PL	Contaminants of Concern (source)	Pathway	Receptor	Probability	Consequence	Risk
1	ACM, heavy metals, PAHs (made ground)	Dermal contact. Inhalation of soil, fibres, and dust.	Future site users. Offsite receptors.	Low Likelihood	Medium	Moderate (assumed until ground conditions confirmed)
	Petroleum hydrocarbons	Ingestion of soils, dust, home-grown produce, soil attached to home-grown produce. Windblown dust.				Moderate / Low (significant source not anticipated)
2	Volatile contaminants (naphthalene, light end petroleum hydrocarbons)	Inhalation of vapours. Migration via permeable strata and preferential pathways.	Future site users. Offsite receptors.	Low Likelihood	Medium	Moderate / Low (significant volatile source not anticipated).
3	Hazardous gas: methane, carbon dioxide	Migration via permeable strata and preferential pathways.	Future site users. Buildings. Offsite receptors.	Unlikely	Severe	Moderate / Low (no significant source or pathway anticipated)
3	Radon	Inhalation of gas. Explosion in confined spaces. Exposure to radon		Low Likelihood (3-5% of homes above action level)	Medium	Moderate / Low Basic radon protection required.
4	Mobile contaminants such as metals, PAHs, hydrocarbons	Surface run-off. Migration via permeable strata and preferential pathways. Perched waters migration.	Groundwater (Secondary A and Undifferentiated Aquifers)	Unlikely	Medium	Low (only minimal mobile contamination anticipated with limited pathway)
5	Organic contaminants such as petroleum hydrocarbons, naphthalene	Ingestion of tainted water supply.	Future site users. Water pipes.	Low Likelihood	Medium	Moderate / Low (only shallow made ground anticipated)

Table 2-3: Preliminary Contamination Conceptual Model.

3. Ground Investigation

3.1. Site Investigation Scope

The scope of the contaminated land investigation was agreed with the local authority prior to undertaking the work (reference CL-602-LKC 21 1335-01, dated August 2021).

This investigation was generally in line with the agreed scope, although 1no. additional trial pit was undertaken.

3.2. Site Investigation Design and Methodology

The investigation was carried out on 26th February 2025 and comprised the following:

- 2no. window sample boreholes drilled to 2.31-3.40 metres below ground level (mbgl) (ref. WS101 to WS102).
- 1no. trial pit (8t tracked machine) excavated to 3.00mbgl (ref. TP101).
- 5no. hand pits (using hand auger / spade) excavated to 1.00-1.20mbgl (ref. HDP101 to HDP105).

All site investigation locations are shown in Figure 3.

The locations were chosen to allow adequate assessment of ground conditions across the site, . Table 3-1 details the site investigation locations.

Site Investigation Locations	Rationale
HDP101-HDP105 & TP101	General site coverage.
WS101-WS102	Target proposed building footprint.

Table 3-1: Summary of Sampling Locations.

WS102 had to be re-positioned due to fallen trees on site.

The number of site investigation points corresponds to approximately one location per 21m square centres. This is considered to be a conservative sampling density and is in line with BS10175⁴ for a 'detailed investigation'.

The number of site investigation location points corresponds to approximately one location per 21m square centres. This is considered to be a conservative sampling density and is in line with BS10175⁵ for an 'exploratory investigation'. Further investigation work is anticipated to be required to assess the ground conditions further and to be in line with BS10175⁶ for a 'detailed investigation'.

All profile logs are provided in Appendix B and are in line with BS14688-1⁷ and BS5930⁸.

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 investigation⁹.

Soil was collected for onsite testing for total volatile organic compounds (TVOCs) using a photoionisation detector (PID) fitted with a 10.6eV lamp and moisture trap. 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. Results of the PID readings are

presented on the profile logs (Appendix B). The onsite monitoring was carried out in line CIRIA C665¹⁰ to aid in screening samples for volatile analysis.

Soil samples of approximately 500g were recovered in amber jars and plastic tubs. All the samples were sent to DETS laboratory for chemical testing.

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.

Testing	No. Samples	Justification
Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.	3	A basic suite with a broad selection of contaminants where no significant evidence of contamination was identified (except for occasional ash and coal).

Table 3-2: Summary of Soil Testing.

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.

3.3.2. Soil Sampling (Geotechnical)

Soil samples taken during the investigation were collected in tubs, bulk bags and sealed U100 tubes and sent to Murray Rix Laboratories for geotechnical testing.

Further details are given in the laboratory report presented in Appendix D. Table 3-3 shows the geotechnical testing undertaken.

Testing	No. Samples
pH and water-soluble sulphate	4
Atterberg Limits (plasticity testing)	1

Table 3-3: Summary of Geotechnical Testing Undertaken.

3.3.3. Water Sampling / Leaching Testing

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

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

3.4. In-situ Testing

3.4.1. 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.
- Pocket penetrometer tests (giving undrained shear strength) were performed in the window sample boreholes and trial pits within cohesive strata.

Pocket penetrometer tests were not always possible due to the softness or gravel rich nature of some of the clay deposits.

The results are provided within Appendix B.

3.5. Gas Monitoring

Gas monitoring was not carried out as part of this investigation.

A 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.

4. Ground Conditions

4.1. Geology

The ground conditions beneath the site are summarised below. Logs are provided in Appendix B.

4.1.1. Made Ground

Made ground was recorded in all locations (except HDP103 and HDP104) to depths of 0.50-1.20mbgl. The made ground comprised horizons of sand and clay with rare inclusions of anthropogenic material including brick, coal, ceramic, glass and ash.

4.1.2. Natural Strata

Topsoil was encountered within the proposed landscape buffer at HDP103 and the south of the site at HDP104 from ground level to 0.50mbgl.

Superficial strata comprised horizons of soft to very stiff clay, sand and soft to very stiff silt to 2.31-3.40mbgl. A horizon of gravel was encountered from 2.80mbgl within TP101, and boreholes terminated in a horizon of sandstone cobbles was encountered from 2.31-3.40mbgl; this is interpreted as shallow weathered bedrock.

4.1.3. Contamination

There was no visual / olfactory evidence of hydrocarbons or volatile contaminants in any locations. The PID recorded a maximum of 1.1ppm TVOC in the samples.

4.1.4. Obstructions

The following obstructions were encountered:

- TP101: Terminated in sandstone cobbles at 3.00mbgl.
- WS101: SPT refusal in sandstone cobbles at 2.31mbgl.
- WS102: SPT refusal in sandstone cobbles at 3.40mbgl.

4.2. Groundwater

4.2.1. Groundwater Levels

Groundwater strikes were recorded during the investigation in trial pits, hand dug pits and boreholes. This data is provided in the profile logs (Appendix B). Groundwater strikes were recorded between 1.00mbgl and 2.90mbgl in HDP103, HDP104, TP101 and WS102.

No groundwater strikes were recorded in HDP101, HDP102, HDP105 and WS101.

4.2.2. Contamination

No evidence of contamination was identified in the groundwater during investigation work or monitoring. No free phase hydrocarbons were detected.

5. Geotechnical Assessment

5.1. Proposed Development

It is understood that the proposed development will comprise 1no. Residential dwelling with basement, conversion of existing building to guest house with gardens, soft landscaping and landscape buffer. Details of the proposed loadings are not known and therefore a line loading of 75kN/m has been assumed for preliminary assessment purposes only.

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 considered in the following assessment. Any such works should be designed so as not to influence, or compromise, proposed or existing foundations or ground stability.

Given the nature of the proposed development the structure meets the criteria of Geotechnical Category 2 of Eurocode 7¹¹.

5.2. Summary of Ground Conditions

Ground conditions identified at the site are detailed in Section 4.1 and typically comprises made ground up to 1.20mbgl over natural granular and cohesive superficial deposits of sand and clay. Sandstone bedrock is encountered from depths of between 2.31m and 3.40mbgl.

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 Works¹². 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 can be anticipated on site. These should be excavated from below the proposed development footprint 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.

5.4. Foundation Conditions and Bearing Capacity

5.4.1. General

The proposed development comprises a low rise residential structure with basement. Weathered sandstone bedrock was recorded at depths of between 2.31m and 3.40mbgl and it is therefore considered that the structure will be seated upon the sandstone bedrock. The estimated safe bearing capacity for a weak sandstone is 2000kN/m², based upon BS8004:1986 which is considered more than adequate to support the structure.

Standard Penetration Tests undertaken at the base of the window sample holes all recorded in excess of 50 blows ($N > 50$) before completion of the test, indicating a bearing capacity in excess of 434kN/m².

The installation of a structure and basement will require the excavation of c.3m of overburden, which when the structure is constructed will result in a negligible increase, if any, of any loading acting on the basement level.

5.4.2. Plasticity

One clay sample recovered from WS102 at 1.00-2.00mbgl was tested for Atterberg Limits (plasticity) and Moisture Content testing. Results are provided in Appendix D.

The clay is classified as low plasticity.

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%) characterises the clay as having a low volume change potential.

The clay is of low plasticity and the sides of the basement structure are unlikely to require protection using clay board or similar.

5.4.3. Foundations

The placing of the basement will require excavation of the shallow soils and weathered sandstone which should be possible using normal plant such as hydraulic excavators with breaker attachment. At the base of the excavation the rock may be more competent but it is considered that it will be classed as easy to moderate rippability.

5.5. Basement

It is understood that the proposed development will include a basement. No information has been provided on the depth or type of construction of the basement and the material used.

Whilst this report is not a Basement Impact Assessment (BIA), the following comments are applicable. The proposed development is to be located near to existing structures and it is unknown if these buildings have basements. As such, a BIA may become necessary, however it is considered that the existing buildings are a suitable distance from the development not to require a BIA. In order to construct the basement, excavation of the soils adjacent to existing foundations may be required.

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 clays and deeper weathered sandstone) 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.

If any structural cracks appear in the main loadbearing walls of the nearby structures then the structural engineer should be immediately informed and those cracks should be monitored using the Demec system (or similar). 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

It is considered that the basement structure will incorporate a ground bearing floor slab as part of the design and should be suitably designed in order to prevent water ingress and any issues with structural stability.

A key requirement in the construction of a basement is to ensure the design and construction work is carried out by a suitably qualified and experienced contractor. Warranty providers, such as LABC or NHBC should be consulted to ensure that the design meets the requirements of their warranty.

5.7. Pavement Construction

Topsoil is not suitable for use as a sub-grade. Untreated made ground is considered unsuitable as a sub-grade due to its potential variability and potentially low strength/high compressibility. It should be removed to a depth of 0.5m below formation level and sorted to remove any unsuitable or deleterious materials. The sub formation should be rolled, and suitable excavated material can then be replaced, up to formation level, in fully compacted thin layers. Any deficit should be made up with suitable imported fill compacted as above. Following this treatment an overall design CBR of 2-5% should be available, although this will require confirmation through in-situ CBR tests.

Based on the plasticity index the soils are not considered frost susceptible.

5.8. Drainage

The presence of upto 1.20m depth 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.

5.9. Concrete Durability

Based upon the results of the chemical analyses (Appendix D), and observations of groundwater during the advancing of the exploratory holes, it is considered that any groundwater will be mobile, especially at the interface of the basement wall and the surrounding soil. Subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-3z in accordance with the recommendations provided in BRE Special Digest 1 (2005).

5.10. Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant, however bedrock is identified at depths of below 2.31 – 2.80mbgl and is considered to be easy to moderately rippable.

Groundwater seepage was recorded in several of the trial holes, evident of isolated perched water. Generally trial pits were stable.

Due to the variability of the made ground and presence of groundwater pockets, all excavations should be supported or battered back in accordance with guidance contained in CIRIA R97¹⁸.

5.11. Construction Activity and Inspection

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

- Due to the variability of the soils at the site it is recommended that sufficient allowance is made for the inspection of formation and sub formations to foundations and pavement construction.
- Excavations where access is required should be subject to a risk assessment from a competent person and where appropriate mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97²⁰ utilised.

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

6. Generic Risk Assessment

6.1. Introduction

Current good practice requires that the findings from a site investigation should be evaluated on a site-specific basis, using a risk-based approach. Risk assessment involves identification and evaluation of the hazards presented by the concentrations of contaminants measured followed by an evaluation of the risks which are associated with these hazards (LCRM²¹). Information gathered from the risk assessment has been collated in the revised contamination conceptual model in Section 6.6.

6.2. Soil Risk Assessment

6.2.1. Methodology

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

- Category 4 Screening Levels (C4SLs) ^{22, 23}.
- LQM Suitable 4 Use Levels (S4ULs) ^{24, 25, 26, 27}.

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

All criteria have been generated using the CLEA V1.06 model²⁹ based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

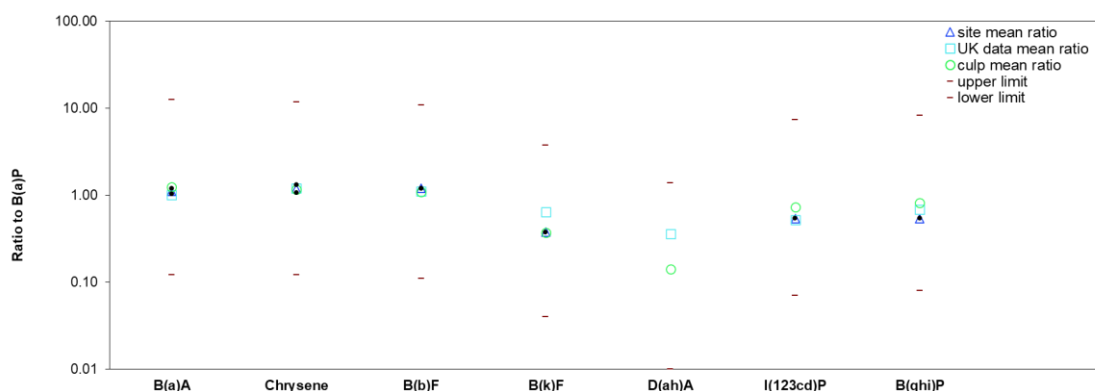
A summary of the generic assessment criteria used in this assessment is provided in Appendix E.

B(a)P as Surrogate Marker

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 PAHs^{30,31} and naphthalene the most volatile and soluble³². The 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 negligible³³. For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)³⁴ and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

LKC undertook an assessment of the PAH 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 2no. 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.

All the data points that could be used to calculate ratios fall inside the upper or lower limits. Based on this distribution of data LKC considers B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

6.2.2. Soil Results Comparison against Assessment Criteria

All analysis sheets are presented in Appendix C. Results have been compared to the relevant assessment criteria and no elevated contaminants were identified. No asbestos was identified in any of the soil samples analysed.

6.2.3. Direct Contact Risk – Pollutant Linkage 1

No asbestos, PAHs or heavy metals, or olfactory / visual evidence of petroleum hydrocarbons were identified in any of the samples; therefore, the probability of these contaminants posing a risk to site users is considered to be unlikely. With a medium consequence, the risk is low.

No specific remediation is recommended, but due to anthropogenic material present in the made ground, albeit at 'rare' amounts, a nominal layer of topsoil is recommended in garden areas for use as a growing medium.

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 significant TVOCs.

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.

6.3. Gas Risk Assessment

Gas monitoring was not carried out as part of this assessment. The PRA identified a moderate / low and recommended gas monitoring or forensic TOC analysis only if a significant depth of organic / putrescible material was identified.

No organic / putrescible material was encountered on site. Made ground comprised a <1.20m thickness of sand or clay with only rare inclusions of anthropogenic material comprising brick, coal, ceramic, glass and ash only. In line with CL:AIRE Research Bulletin

17⁴¹ where made ground is 1m or less and no significant organic / putrescible material is present, the site can be classified as Characteristic Situation (CS1) 1 and no gas protection measures are required. Furthermore, a basement is proposed in the new dwelling, which will be tanked and waterproofed, which will provide protection to CS2.

Given the ground conditions encountered, LKC considers the probability of gas posing a risk to site users as unlikely. The consequence is severe, which gives a moderate / low risk. Given the known ground conditions, LKC considers that no further action is required with respect to Pollutant Linkage 3.

The site is located in an area where 3-5% of properties are above the action level. There is a low likelihood of radon affecting site users. With a moderate consequence, the risk is moderate / low. A site specific radon report the BGS has been obtained (Appendix F). The report confirms that the site is within an area where 3-5% of properties are above the action level. Radon monitoring and basic radon protection required.

6.4. Controlled Water Assessment

A Secondary Undifferentiated and Secondary A Aquifers are present below the site, no abstractions have been identified within influencing distance and the site is not located in a Source Protection Zone. The PRA identified a low risk with respect to controlled waters as no significant source of mobile contamination was anticipated. Furthermore, although

No evidence of significant mobile contamination was identified on the site. Perched groundwater was encountered above the sandstone gravel.

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. 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 contamination. Only contaminants of concern, based on the preliminary conceptual model and ground conditions encountered, were analysed.

No elevated contaminants were identified above PE pipe criteria. Given the depth of made ground, new water pipes are likely to be laid in natural strata. The probability of organic contaminants affecting potable water pipes is therefore anticipated to be a unlikely. Given the consequence is considered to be medium, the risk (Pollutant Linkage 5) is low. A Water Pipe Risk Assessment in line with the utility provider should also be undertaken.

Once details of the pipeline location and depths are known a Water Pipe Risk Assessment in line with the utility provider should be undertaken to confirm the most appropriate pipework for potable water.

6.6. Revised Contamination Conceptual Model

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

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

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

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

PL	Contaminants of Concern (source)	Pathway	Receptor	Probability	Consequence	Risk	Discussion & Recommendations
1	ACM, heavy metals, PAHs, Petroleum Hydrocarbons (made ground)	Dermal contact. Inhalation of soil, fibres, and dust. Ingestion of soils, dust, home-grown produce, soil attached to home-grown produce. Windblown dust.	Future site users. Offsite receptors.	Unlikely	Medium	Low	Concentrations below screening values. No olfactory / visual evidence of hydrocarbons. Nominal layer of imported or site-won topsoil required in garden areas.
2	Volatile contaminants (naphthalene, light end petroleum hydrocarbons)	Inhalation of vapours. Migration via permeable strata and preferential pathways.	Future site users. Offsite receptors.	Unlikely	Medium	Low	Low PID levels. No olfactory / visual evidence of petroleum hydrocarbons. Naphthalene concentrations below detection limits. No remediation required
3	Hazardous gas: (methane, carbon dioxide)	Migration via permeable strata and preferential pathways.	Future site users.	Unlikely	Severe	Moderate / Low	No viable gas source encountered. No remediation required.
3	Radon	Inhalation of gas. Explosion in confined spaces. Exposure to radon	Buildings. Offsite receptors.	Low Likelihood	Medium	Moderate / Low	3-5% of homes above action level. In-situ radon monitoring within existing dwelling and basic radon protection measures required.
4	Mobile contaminants (metals, PAHs, hydrocarbons)	Surface run-off. Migration via permeable strata and preferential pathways. Perched waters migration.	Groundwater (Secondary A and Undifferentiated Aquifers)	Unlikely	Medium	Low	Unlikely probability as no mobile contamination anticipated with limited pathway. No remediation required
5	Organic contaminants	Ingestion of tainted water supply.	Future site users. Water pipes.	Unlikely	Medium	Low	Contamination not expected at pipeline depth. Pipes likely to be installed in natural strata. Water provider risk assessment required.

Table 6-1: Revised Contamination Conceptual Model.

7. Summary Conclusions

7.1. Ground Conditions

Ground conditions are summarised in Table 7-1 below.

Made Ground	Encountered across the site (except HDP103 and HDP104) to depths of 0.50-1.20mbgl, comprising horizons of sand and clay with anthropogenic material including rare brick, coal, ceramic, glass and ash.
Superficial	Soft to very stiff clay, sand and soft to very stiff silt encountered across the site. Gravel / sandstone cobbles encountered from 2.31-3.40mbgl. within TP101, WS101 and WS102.
Bedrock	Possible sandstone bedrock encountered from 2.31-3.40mbgl.
Groundwater	Encountered between 1.00mbgl and 2.90mbgl in HDP103, HDP104, TP101 and WS102.
Obstructions	Possible shallow bedrock encountered in the vicinity of the proposed dwelling.

Table 7-1: Summary of Ground Conditions

7.2. Geotechnical

Geotechnical observations and conclusions are contained in Table 7-2 below, more detailed discussions are contained within Section 5.

Allowable Bearing Pressure	2000kN/m², based upon BS8004:1986 which is considered more than adequate to support the structure. Standard Penetration Tests undertaken at the base of the window sample holes all recorded in excess of 50 blows (N >50) before completion of the test, indicating a bearing capacity in excess of 434kN/m². The installation of a structure and basement will require the excavation of c.3m of overburden, which when the structure is constructed will result in a negligible increase, if any, of any loading acting on the basement level.
Foundation Type	Basement will form the foundation to the structure.
Shallow Groundwater	Shallow groundwater identified on the site which may present a constraint to the development however groundwater is considered to be representative of perched water withing the cohesive glacial till and not the water table.
Concrete Requirements	Based on BRE Digest 2005 ⁶⁷ – DS-1 AC-3z recommended.
Services	Services – consideration to the presence of services running through the site. Services may need to be re-routed.

Table 7-2: Geotechnical Conclusions Table.

Temporary support of excavation	May be required; however, trial pits were generally recorded as stable. 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 clays and deeper weathered sandstone) 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.
Plasticity	A low volume change potential has been calculated for the site.

Table 7-2 (continued): Geotechnical Conclusions Table.

7.3. Contamination Assessment

A revised contamination conceptual model has been produced by LKC which is summarised in Table 7-3 below (more detailed model provided in Section 6).

PL	Contaminant	Risk	Recommendations
1	Metals Asbestos PAHs Petroleum hydrocarbons	Low	Nominal layer of imported topsoil required in soft garden areas.
2	Naphthalene Light end petroleum hydrocarbons	Low	No remediation required.
3	Carbon dioxide / Methane	Moderate / Low	No remediation required.
3	Radon	Moderate / Low	In-situ radon monitoring within existing dwelling and basic radon protection required.
4	Groundwater (mobile contaminants)	Low	No remediation required.
5	Organic contaminants.	Low	Utility provider risk assessment to be completed.

Table 7-3: Summary Risk Table.

PL=Pollutant Linkage, see Table 6-1 for details.

8. Recommendation and Remediation Strategy

8.1. Recommendations

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.

A summary of remediation requirements is included in Table 8-1.

PL	Recommendation
1	Nominal 150mm layer of site won or imported topsoil required in garden areas.
2	No remediation required.
3	Site specific BGS radon report recommended. In-situ radon monitoring within the existing dwelling and basic radon protection measures required.
4	No remediation required.
5	Potable water pipe assessment required.

Table 8-1: Remediation Summary.

All the remediation and validation work should be documented in a Site Completion Report. The Completion Report will be provided to satisfy the outstanding contaminated land planning condition.

8.2. Remediation and Validation Recommendations

8.2.1. Environmental Cover System (PL1)

While no specific environmental cover system is required, however, due to the anthropogenic inclusions present in the made ground LKC recommend that a nominal 150mm of imported or site won topsoil is placed within garden areas. This may be reduced where root protection zones exist.

Chemical validation of imported soils is required, details are included in Section 7.3.

8.2.2. Radon Protection(PL3)

A site specific BGS radon report has been obtained for the site, which confirms that in-situ radon monitoring of the existing building and basic radon protection measures are required, in line with BRE211⁷⁰.

Depending on the type of building and foundation design the protection measures can vary. The radon protection measures should be detailed as part of a verification plan once the design has been confirmed and provided to the Local Authority for approval.

Validation of radon protection measures will be required and should be in line with CIRIA 735⁷¹ including, as a minimum, photographic evidence of ventilation and suitably sealed radon membrane.

8.2.3. Potable Water Pipe Remediation (PL5)

It is recommended that a Water Pipeline Assessment⁷² is undertaken once the location and depth of potable water pipes are known.

Validation of pipeline installation should include delivery notes of pipe materials, photographs of installed pipe and confirmation of connections.

8.3. Other Considerations

8.3.1. Unexpected Contamination

The relevant contractors should be briefed that during development works at the site should any unusual ground conditions and / or visual or olfactory evidence of contamination (including asbestos containing material) be encountered at the site, LKC and the Local Authority should be informed, and further assessment of the material may be required.

8.3.2. Re-use of Site Generated Material

To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following to be used onsite or brought in for use onsite (refer to guidance for types of waste that can be used⁷³):

- 5,000 tonnes (c. 2,500m³) treatment of crushed concrete / stone.
- 1,000 tonnes (c. 500m³) use of non-hazardous soil.
- 5,000 tonnes (c. 2,500m³) use of clays, sand, gravel, brick, concrete, stone etc.
- 50,000 tonnes (c. 25,000m³) use of bituminous material to be used in roadways.

A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice⁷⁴ 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 8-2.

8.4. Validation of Imported / Site Won Soils

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

A summary of the required imported material sampling requirements is presented in Table 8-2 and is based on the slightly modified YALPAG guidance (2021)⁷⁵ based on a general worst case scenario. Ideally, the material should be sampled at source to prevent double handling if soil fails, with confirmatory sampling undertaken on importation to site. Where this is not possible then material designated for re-use should be segregated based on source and soil type. Validation samples should be taken prior to placement in gardens to ensure suitability for use.

Material Type	Source	Suite of Analysis	Sampling Rate
Topsoil / Subsoil	Greenfield / manufactured / natural site-won soil	Suite A*	^A 1 sample per 50m ³
	Brownfield / Screened Soils / site won made ground	Suite B**	^B 1 sample per 50m ³

Table 8-2: Sampling Requirements for Imported and Site Won Soils.

Notes:

Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

*Minimum sampling rate of 3 samples per source.

** Minimum sampling rate of 6 samples per source.

^A YAPALG states Between 1 sample per 50m³ and 1 sample per 250m³. Worst case assumed.

^B YAPALG states Between 1 sample per 50m³ and 1 sample per 100m³. Worst case assumed.

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

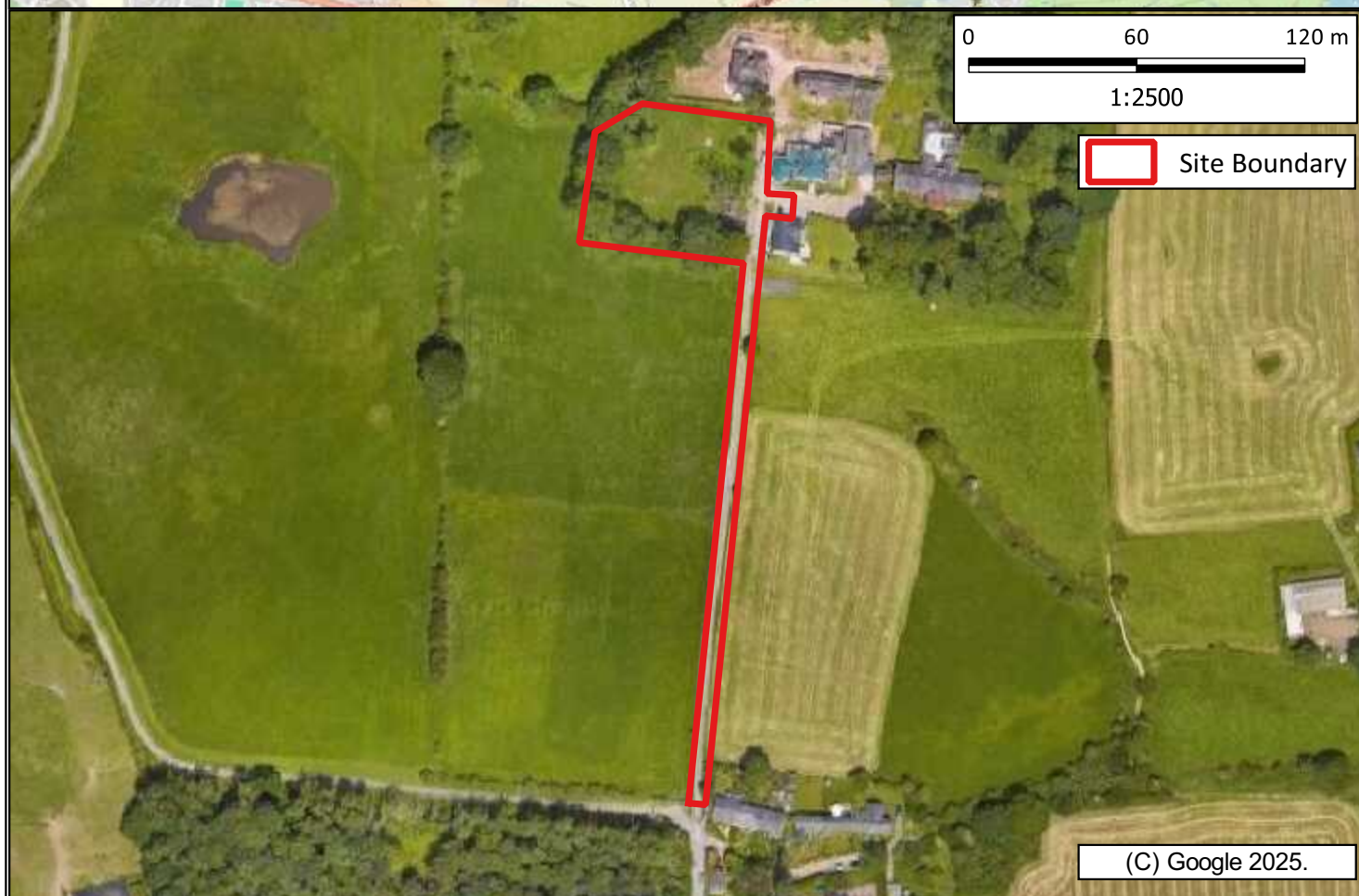
The matrix of imported topsoil should be suitable as a growing medium in line with BS3882⁷⁶. Topsoil soil shall be free of weeds, roots or perennial weeds, pests, diseases, debris, tree roots, sticks, subsoil and foreign matter and shall be capable of being broken down to a fine tilth. LKC advise this information is provided by the supplier before material is imported onto site.

Imported or site won material to be used in gardens will be compared against residential with plant uptake criteria (as used in the contamination risk assessment in Section 6).

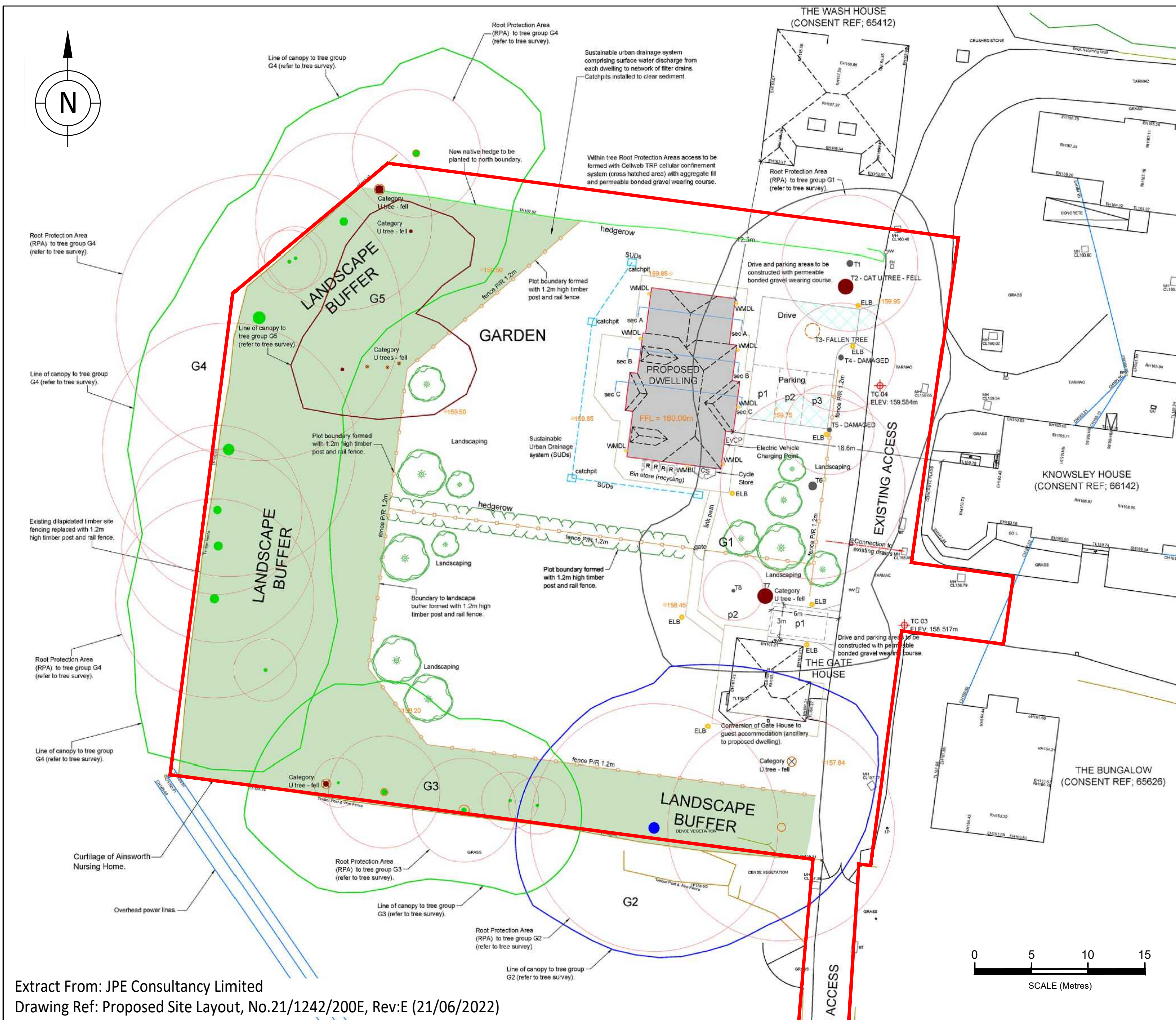
8.5. Site Completion Report

All remediation and validation work should be documented in a Site Completion Report. The Site Completion Report will allow discharge of relevant planning conditions.

Figures



Client: CH Construction Services (UK) Ltd				Title: Site Location & Boundary Plan		 LK CONSULT		
Site: The Gates House, Former Ainsworth Nursing Home								
Job No.: LKC251059		Drawn By: EH	Checked By: EK	Drawn: Mar 2025	Scale (see scale bar): 1:25,000 & 1:2500 @ A4			Figure: 1



KEY



KEY TO EXISTING & PROPOSED LEVELS:

+75.400	Existing levels from topographical survey
-75.400	Proposed design level
 TC 00 ELEV. 135.517m	Levels relate to national datum (OSGB35 (15)) using GNS5 data.

KEY TO EXTERNAL BOUNDARIES & EQUIPMENT

Rear garden to dwelling to have an area of amenity grass, and a path. Perimeter paths & patios to dwellings to be resin bound gravel (pale colour). Refer to landscaping design for hard & soft landscaping details.

Dwelling to have three parking spaces. Drives and parking areas to be surfaced with permeable resin bound gravel.

Bin storage area and used within close boarded timber screen fence 1.5metres high (waste containers for general waste, plastic bottles, paper, & garden waste).

Dwelling to be provided with a single Mode 3 compliant Electric Vehicle Charging Point (EVCP) to be installed to the external wall of dwelling adjacent to the parking space. The specification for the EVCPs are: Roltek Wallpod E1c Type 2 Mode 3 charging socket.

 **Electric Vehicle Charging Point**

Dwelling to be provided with a cycle store (capable of accommodating cycles). To be metal storage unit for 2 bikes (colour - grey) by Aggar similar & approved, galvanneal steel, 3-point locking system, unit is bolted to the ground. Width: 810mm, depth: 190cm, height: 120cm.

EXTERNAL LIGHTING SPECIFICATION
To minimise indirect impacts from lighting it is proposed that artificial light is only directed where necessary for safe use of amenity areas. Non-external lighting installed will be greater than 1,800 lumens (15 Watts) and only LED lights will be installed; they do not emit on the UV spectrum, are more easily controllable in terms of directionality and can be turned on/off instantly. Lighting to be fitted as low as practical to external walls.

W.M.D.L. - Wall Mounted Down Light
Use Saucy Odyssey 7W - wall down lights or similar (530 lumens)

W.M.B.L. - Wall Mounted Bulkhead Light
Use Panchester Hood 15W - LED Bulkhead or similar (1,790 lumens)

ILL **E.L.B. External Lighting Bollard**
Use Westminster 10W - LED bollard or similar (1,320 lumens)

TREE WORK/LANDSCAPING

Refer to tree survey and arboricultural method statement for details of trees to be retained, trees to be felled (category U trees only).

Category LI tree - full

Category U tree - left

Category A & B trees - retained

Node Protected on Axis (NPA): its free group (refer to free sun eye)

Plot boundary fence with 1.2m high timber post and rail fence.

Sampling Locations and features
and are based upon observed m

scale from this drawing and work
and features should be confirmed
includes information provided to

no warranty, representation or as

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11

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Proposed D

b No.:	Scale
LKC251059	

Drawn By: AC	Checked By: EH	Drawn By: AC
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[illegible]

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 552⁷⁷. 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 result 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.

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



Trial Pit Log

Location Number:
HDP101

Project: The Gate House, Former Ainsworth Nursing Home

Client: Nationwide Building & Civils Ltd

Date: 26/02/2025

Project No. : LKC251059

Contractor: D & I Drilling Ltd

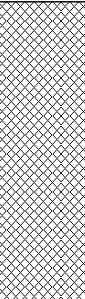
Equipment: Hand Excavation Tools

Level

Logged By
EH

Scale
1:25

Page Number
Sheet 1 of 1

Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description	Level (m)
0.00 - 1.00 0.00 - 1.00 0.00 - 1.00	D ES PID=0.3ppm			MADE GROUND: Very soft consistency very low strength brown very gravelly very sandy CLAY with frequent rootlets, brick fragments, coal fragments, rare roots, ceramic fragments and glass fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.	0.5
0.50	PP=12.3kPa				
1.00 - 1.20 1.00 - 1.20 1.00 - 1.20	D ES PID=0.0ppm	1.00			Orangish brown gravelly clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.
		1.20		End of Trial Pit at 1.20m	1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0



Pit Dimensions			Pit Stability
Length (m)	Width (m)	Depth (m)	Stable
0.25	0.25	1.20	

Remarks:
Hand excavated pit to 1.20mbgl.
No groundwater encountered.



Trial Pit Log

Location Number:
HDP102

Project: The Gate House, Former Ainsworth Nursing Home

Client: Nationwide Building & Civils Ltd

Date: 26/02/2025

Project No. : LKC251059

Contractor: D & I Drilling Ltd

Equipment: Hand Excavation Tools

Level

Logged By
EH

Scale
1:25

Page Number
Sheet 1 of 1

Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description	Level (m)
0.00 - 1.00 0.00 - 1.00 0.00 - 1.00	D ES PID=0.8ppm			MADE GROUND: Brown gravelly silty SAND with frequent rootlets, rare brick fragments, ceramic fragments, glass fragments, and coal fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.	0.5
1.10 - 1.20 1.10 - 1.20 1.10 - 1.20	D ES PID=1.0ppm	1.10 1.20		Orangish brown slightly gravelly silty SAND. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded comprising sandstone	1.0
				End of Trial Pit at 1.20m	1.5
					2.0
					2.5
					3.0
					3.5
					4.0
					4.5
					5.0



Pit Dimensions

Length (m)	Width (m)	Depth (m)
0.25	0.25	1.20

Pit Stability

Stable

Remarks:

Hand excavated pit to 1.20mbgl.

No groundwater encountered.



Trial Pit Log

Location Number:
HDP103

Project: The Gate House, Former Ainsworth Nursing Home

Client: Nationwide Building & Civils Ltd

Date: 26/02/2025

Project No. : LKC251059

Contractor: D & I Drilling Ltd

Equipment: Hand Excavation Tools

Level

Logged By
EH

Scale
1:25

Page Number
Sheet 1 of 1

Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description		Level (m)	Water Strikes
0.00 - 0.50 0.00 - 0.50 0.00 - 0.50	D ES PID=0.4ppm			TOPSOIL: Brown gravelly clayey SAND with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.			
0.50 - 1.00 0.50 - 1.00 0.50 - 1.00	D ES PID=1.1ppm	0.50		Soft consistency low strength orangish brown gravelly very sandy SILT. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.	0.5		
0.80	PP=24.5kPa	1.00		End of Trial Pit at 1.00m	1.0		▼
					1.5		
					2.0		
					2.5		
					3.0		
					3.5		
					4.0		
					4.5		
					5.0		



Pit Dimensions			Pit Stability
Length (m)	Width (m)	Depth (m)	Stable
0.25	0.25	1.00	

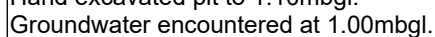
Remarks:

Hand excavated pit to 1.00mbgl.

Groundwater encountered at 1.00mbgl.

Date: 26/02/2025

Contractor: D & I Drilling Ltd

Page Number
Sheet 1 of 1

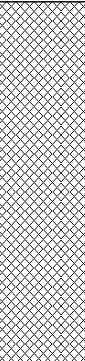
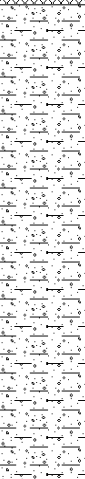
Date: 26/02/2025

Contractor: D & I Drilling Ltd

Page Number
Sheet 1 of 1

Remarks:
Hand excavated pit to 1.20mbgl. No groundwater encountered.

		Trial Pit Log					Location Number: TP101	
Project: The Gate House, Former Ainsworth Nursing Home			Client: Nationwide Building & Civils Ltd			Date: 26/02/2025		
Project No. : LKC251059			Contractor: Client Provided					
Equipment: Excavator: 9 Tonne Tracked			Level		Logged By EH		Scale 1:25	Page Number Sheet 1 of 1

Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description		Level (m)	Water Strikes
1.50 - 2.50 1.50 - 2.50 1.50 1.50 - 2.50	D ES PP=49.0kPa PID=0.3ppm	1.20		MADE GROUND: Brown gravelly silty SAND with frequent rootlets and rare brick fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.		0.5 1.0	
				Soft consistency medium strength orangish brown gravelly very sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.		1.5 2.0 2.5	
2.80 - 3.00 2.80 - 3.00	B ES	2.80		Reddish brown sandy GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular comprising sandstone and sandstone cobbles.		3.0	▼
		3.00		End of Trial Pit at 3.00m		3.5 4.0 4.5 5.0	

	Pit Dimensions			Pit Stability
	Length (m)	Width (m)	Depth (m)	Stable
	2.00	0.40	3.00	
	Remarks: Machine excavated trial pit to 3.00mbgl. Moderate inflow of groundwater at 2.90mbgl.			

		Window Sample Borehole Log			Location Number: WS101	
Project Name: The Gate House, Former Ainsworth Nursing Home		Client: Nationwide Building & Civils Ltd		Date: 26/02/2025		
Project No. : LKC251059		Contractor: D & I Drilling Ltd				
Equipment: Window Sample Rig: Competitor Dart		Level	Logged By EH	Scale 1:50	Page Number Sheet 1 of 1	

Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description		Level (m)
0.00 - 0.90	D			MADE GROUND: Firm consistency high strength brown gravelly sandy CLAY with frequent rootlets, brick fragments, coal fragments and ash. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.		
0.00 - 0.90	ES			0.30m to 0.50mbgl - Pocket of gravel.		
0.00 - 0.90	PID=0.6ppm					
0.30	PP=80.0kPa					
0.90 - 1.40	D	0.90		Very soft consistency orangish brown gravelly sandy SILT. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded comprising sandstone.	1	
0.90 - 1.40	ES					
0.90 - 1.40	PID=0.7ppm					
1.20 - 1.65	SPT	1.40		Very stiff consistency very high strength reddish brown gravelly sandy CLAY. Sand is fine to coarse. Gravel is fine to medium, subangular to subrounded comprising sandstone.		
1.20	PP=0.0kPa					
1.20 - 1.65	N=16 (2,3/4,4,4,4)					
1.40 - 2.00	D					
1.70	PP=196.2kPa				2	
2.00 - 2.31	SPT					
2.00 - 2.31	50 (25 for 140mm/50 for 165mm)	2.31		End of Borehole at 2.31m		
					3	
					4	
					5	
					6	
					7	
					8	
					9	
					10	

Remarks:
 Borehole stable.
 No groundwater strike.
 Borehole refused at 2.31mbgl on sandstone rock.
 No pocket penetrometer at 0.90-1.40mbgl due to softness of strata.

Appendix C – Certificates of Analysis (Soil)

Emma Khadun
LK Consult Limited
Unit 29 Eton Business Park
Eton Hill Road
Manchester
M26 2ZS

Normec DETS Limited
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 25-02254

Site Reference: The Gate House, Former Ainsworth Nursing Home

Project / Job Ref: LKC251059

Order No: PO-C000994

Sample Receipt Date: 28/02/2025

Sample Scheduled Date: 28/02/2025

Report Issue Number: 1

Reporting Date: 06/03/2025

Authorised by:

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

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.

Soil Analysis Certificate						
DETS Report No: 25-02254	~Date Sampled	26/02/25	26/02/25	26/02/25	26/02/25	26/02/25
LK Consult Limited	~Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
~Site Reference: The Gate House, Former Ainsworth Nursing Home	~TP / BH No	HDP102	HDP103	HDP105	TP101	TP101
~Project / Job Ref: LKC251059	~Additional Refs	ES	ES	ES	ES	ES
~Order No: PO-C000994	~Depth (m)	0.00 - 1.00	0.50 - 1.00	0.00 - 0.50	1.50 - 2.50	2.80 - 3.00
Reporting Date: 06/03/2025	DETS Sample No	766536	766537	766538	766539	766540

Determinand	Unit	RL	Accreditation					
Asbestos Screen ⁽⁵⁾	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected		
pH	pH Units	N/a	MCERTS	7.2	6.8	6.3	6.3	6.9
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	< 10	< 10	< 10	13	< 10
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Organic Matter (SOM)	%	< 0.1	MCERTS	4.4	0.9	6.5		
Arsenic (As)	mg/kg	< 2	MCERTS	13	5	21		
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	0.4		
Chromium (Cr)	mg/kg	< 2	MCERTS	43	35	23		
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2		
Copper (Cu)	mg/kg	< 4	MCERTS	28	7	45		
Lead (Pb)	mg/kg	< 3	MCERTS	75	10	106		
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
Nickel (Ni)	mg/kg	< 3	MCERTS	19	12	17		
Selenium (Se)	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Vanadium (V)	mg/kg	< 1	MCERTS	23	17	32		
Zinc (Zn)	mg/kg	< 3	MCERTS	50	19	75		

Soil Analysis Certificate						
DETS Report No: 25-02254	~Date Sampled	26/02/25	26/02/25			
LK Consult Limited	~Time Sampled	None Supplied	None Supplied			
~Site Reference: The Gate House, Former Ainsworth Nursing Home	~TP / BH No	WS101	WS102			
~Project / Job Ref: LKC251059	~Additional Refs	ES	ES			
~Order No: PO-C000994	~Depth (m)	0.00 - 0.90	0.50 - 1.00			
Reporting Date: 06/03/2025	DETS Sample No	766541	766542			

Determinand	Unit	RL	Accreditation					
Asbestos Screen ⁽⁵⁾	N/a	N/a	ISO17025					
pH	pH Units	N/a	MCERTS	7.4	5.5			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	< 10	14			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	< 0.01	0.01			
Organic Matter (SOM)	%	< 0.1	MCERTS					
Arsenic (As)	mg/kg	< 2	MCERTS					
Cadmium (Cd)	mg/kg	< 0.2	MCERTS					
Chromium (Cr)	mg/kg	< 2	MCERTS					
Chromium (hexavalent)	mg/kg	< 2	NONE					
Copper (Cu)	mg/kg	< 4	MCERTS					
Lead (Pb)	mg/kg	< 3	MCERTS					
Mercury (Hg)	mg/kg	< 1	MCERTS					
Nickel (Ni)	mg/kg	< 3	MCERTS					
Selenium (Se)	mg/kg	< 2	MCERTS					
Vanadium (V)	mg/kg	< 1	MCERTS					
Zinc (Zn)	mg/kg	< 3	MCERTS					

Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 25-02254	~Date Sampled	26/02/25	26/02/25	26/02/25		
LK Consult Limited	~Time Sampled	None Supplied	None Supplied	None Supplied		
~Site Reference: The Gate House, Former Ainsworth Nursing Home	~TP / BH No	HDP102	HDP103	HDP105		
~Project / Job Ref: LKC251059	~Additional Refs	ES	ES	ES		
~Order No: PO-C000994	~Depth (m)	0.00 - 1.00	0.50 - 1.00	0.00 - 0.50		
Reporting Date: 06/03/2025	DETS Sample No	766536	766537	766538		

Determinand	Unit	RL	Accreditation				
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	0.13	< 0.1	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	1.03	< 0.1	0.32	
Anthracene	mg/kg	< 0.1	MCERTS	0.22	< 0.1	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	1.42	< 0.1	0.85	
Pyrene	mg/kg	< 0.1	MCERTS	1.36	< 0.1	0.74	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.58	< 0.1	0.26	
Chrysene	mg/kg	< 0.1	MCERTS	0.59	< 0.1	0.29	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.67	< 0.1	0.26	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.21	< 0.1	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.56	< 0.1	0.22	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.30	< 0.1	< 0.1	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.30	< 0.1	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	7.4	< 1.6	2.9	

Soil Analysis Certificate - Sample Descriptions

DETS Report No: 25-02254	
LK Consult Limited	
~Site Reference: The Gate House, Former Ainsworth Nursing Home	
~Project / Job Ref: LKC251059	
~Order No: PO-C000994	
Reporting Date: 06/03/2025	

DETS Sample No	~TP / BH No	~Additional Refs	~Depth (m)	Moisture Content (%)	Sample Matrix Description
766536	HDP102	ES	0.00 - 1.00	12.6	Brown sandy clay with stones and vegetation
766537	HDP103	ES	0.50 - 1.00	17.2	Light brown sandy clay
766538	HDP105	ES	0.00 - 0.50	24	Brown sandy clay
766539	TP101	ES	1.50 - 2.50	13.9	Light brown sandy clay with stones
766540	TP101	ES	2.80 - 3.00	12	Light brown sandy clay with stones
766541	WS101	ES	0.00 - 0.90	17.4	Brown sandy clay with stones and brick
766542	WS102	ES	0.50 - 1.00	17	Light brown sandy clay with stones

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

Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 25-02254
LK Consult Limited
~Site Reference: The Gate House, Former Ainsworth Nursing Home
~Project / Job Ref: LKC251059
~Order No: PO-C000994
Reporting Date: 06/03/2025

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 diphenylcarbazide 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 @ 450oC	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 (ali: 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 (ali: 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

List of HWOL Acronyms and Operators
DETS Report No: 25-02254
LK Consult Limited
~Site Reference: The Gate House, Former Ainsworth Nursing Home
~Project / Job Ref: LKC251059
~Order No: PO-C000994
Reporting Date: 06/03/2025

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
~	Sample details provided by customer and can affect the validity of results

Det - Acronym

Certificate Key

<u>Symbol</u>	<u>Description</u>
F	Filtered sample
UF	Unfiltered sample
D	Dried sample
AR	As received sample
RL	Reporting limit
~	Sample details provided by customer and can affect the validity of results
M/S	Missing Sample
S	Subcontracted analysis
M	MCERTS accredited test
U	UKAS accredited test

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 25 1059 -
The Gate House, Former Ainsworth Nursing Home, Bury

Job Number MRN 25007/27
Date of Issue 11 March 2025
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.



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TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

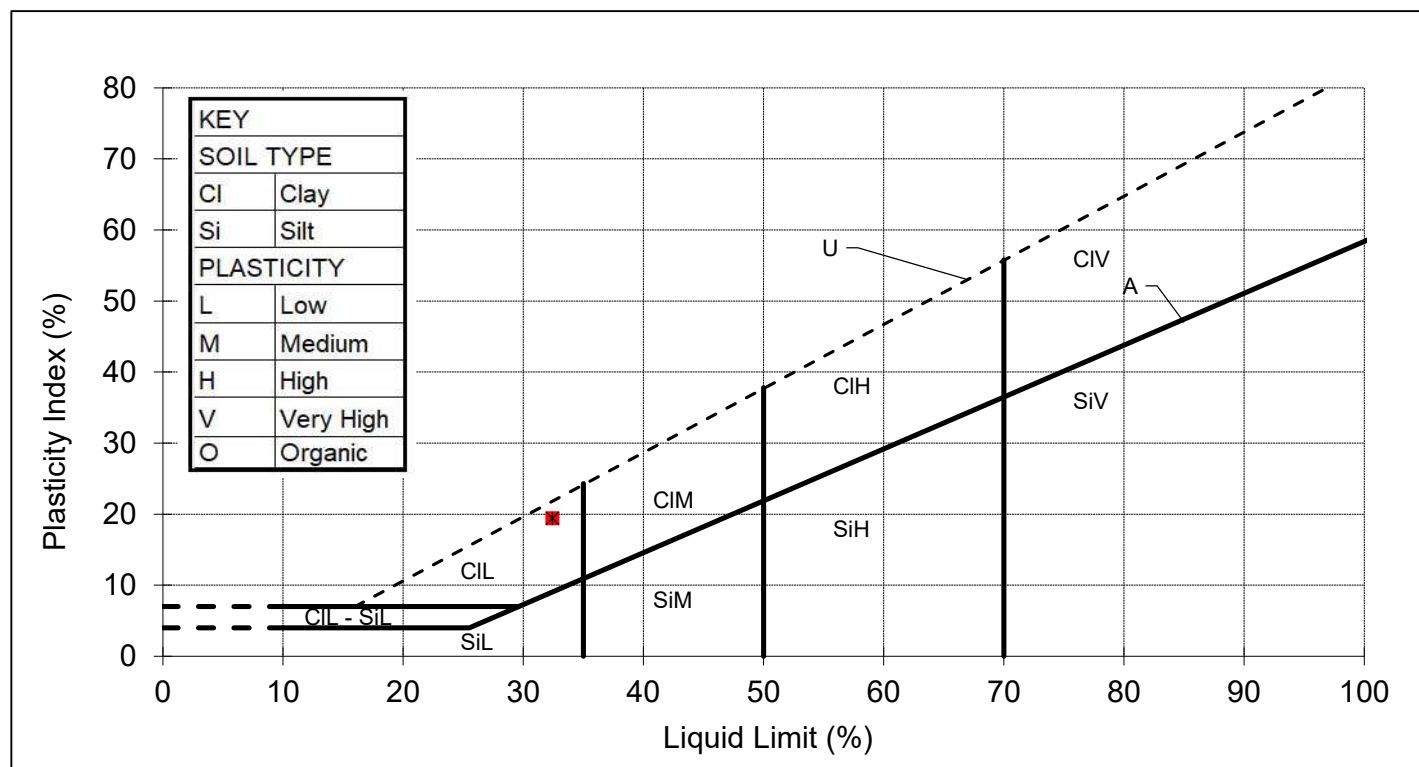
CLIENT	LK Consult Ltd
SITE	LKC 25 1059 - The Gate House, Former Ainsworth Nursing Home, Bury
JOB NUMBER	MRN 25007/27

SAMPLE LABEL	WS102 / 1.00-2.00	DATE SAMPLED	Not advised
SAMPLE No.	5029901	DATE RECEIVED	17-Feb-25
DATE TESTED	20-Feb-25	SAMPLED BY	Client

MATERIAL	Orange 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)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	16.9	31.2	1.045	
Determination 2 (avg)	16.6	30.9		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
10.2	32	13	19	81



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

11-Mar-25

Appendix E – Generic Assessment Criteria Values

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS ^{resi}	POS ^{park}	Source
Metals	Inorganic Arsenic	N/A	37	40	49	640	79	168	DEFRA C4SL
	Beryllium	N/A	1.7	1.7	35	12	2.2	63	LQM S4UL
	Boron	N/A	290	11,000	45	240,000	21,000	46,000	LQM S4UL
	Cadmium	N/A	26	149	4.9	410	220	880	DEFRA C4SL
	Chromium (III)	N/A	910	910	18,000	8,600	1,500	33,000	LQM S4UL
	Chromium (VI)	N/A	21.0	21.0	170.0	49	23.0	250	DEFRA C4SL
	Copper	N/A	2,400	7,100	520	68,000	12,000	44,000	LQM S4UL
	Lead	N/A	200	310	80	2,330	630	1,300	DEFRA C4SL
	Elemental Mercury	N/A	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}	LQM S4UL
	Inorganic Mercury	N/A	40	56	19	1,100	120	240	LQM S4UL
	Methylmercury	N/A	11	15	6.0	320	40	68	LQM S4UL
	Nickel (2015 update)	N/A	130	180	53	980	230	800	LQM S4UL
	Selenium	N/A	250	430	88	12,000	1,100	1,800	LQM S4UL
	Vanadium	N/A	410	1,200	91	9,000	2,000	5,000	LQM S4UL
Zinc	N/A	3,700	40,000	620	730,000	81,000	170,000	LQM S4UL	
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000	LQM S4UL
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000	LQM S4UL
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000	LQM S4UL
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000	LQM S4UL
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000	LQM S4UL
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000	LQM S4UL
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000	LQM S4UL
		2.5%	5,400	35,000	950	540,000	74,000	150,000	LQM S4UL
		6%	11,000	37,000	2,200	540,000	74,000	150,000	LQM S4UL
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49	LQM S4UL
		2.5%	11	14	6.5	170	29	56	LQM S4UL
		6%	13	15	13	180	29	62	LQM S4UL
	Benzo(a)pyrene (only)	1%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
		2.5%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
		6%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
	Benzo(a)pyrene (surrogate marker Coal Tar)	1%	0.8	1.2	0.32	15	2.2	4	LQM S4UL
		2.5%	1.0	1.2	0.67	15	2.2	5	LQM S4UL
		6%	1.1	1.2	1.20	15	2.2	5	LQM S4UL
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13	LQM S4UL
		2.5%	3.3	4.0	2.1	44	7.2	15	LQM S4UL
		6%	3.7	4.0	3.9	45	7.2	16	LQM S4UL
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400	LQM S4UL
		2.5%	340	360	470	4,000	640	1,500	LQM S4UL
		6%	350	360	640	4,000	640	1,600	LQM S4UL
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370	LQM S4UL
		2.5%	93	110	75	1,200	190	410	LQM S4UL
		6%	100	110	130	1,200	190	440	LQM S4UL
	Chrysene	1%	15	30	4.1	350	57	93	LQM S4UL
		2.5%	22	31	9.4	350	57	110	LQM S4UL
		6%	27	32	19	350	57	120	LQM S4UL
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1	LQM S4UL
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3	LQM S4UL
		6%	0.3	0.32	0.43	3.6	0.58	1.4	LQM S4UL
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300	LQM S4UL
		2.5%	560	1,600	130	23,000	3,100	6,300	LQM S4UL
		6%	890	1,600	290	23,000	3,100	6,400	LQM S4UL
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000	LQM S4UL
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000	LQM S4UL
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000	LQM S4UL
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150	LQM S4UL
		2.5%	36	46	21	510	82	170	LQM S4UL
		6%	41	46	39	510	82	180	LQM S4UL
	Naphthalene	1%	15	15	65	1,600*	11,000*	8,400*	DEFRA C4SL
		2.5%	36	36	130	3,700*	15,000*	17,00*	DEFRA C4SL
		6%	85	85	200	8,400*	1,200*	1,900*	DEFRA C4SL
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200	LQM S4UL
		2.5%	220	1,500	38	22,000	3,100	6,200	LQM S4UL
		6%	440	1,500	90	22,000	3,100	6,300	LQM S4UL
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000	LQM S4UL
		2.5%	1,200	3,800	270	54,000	7,400	15,000	LQM S4UL
		6%	2,000	3,800	620	54,000	7,400	15,000	LQM S4UL
	Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4	LQM S4UL
		2.5%	0.98	1.2	0.67	15	2.2	4.7	LQM S4UL
		6%	1.1	1.2	1.2	15	2.2	4.8	LQM S4UL

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS ^{res} i	POS ^{park}	Source
BTEX Compounds	Benzene	1%	0.87	0.38	0.017	27	72	90	LQM S4UL
		2.5%	0.17	0.70	0.034	47	72	100	LQM S4UL
		6%	0.37	1.4	0.075	90	73	110	LQM S4UL
	Toluene	1%	130	880 (869) vap	22	56,000 (869) vap	56,000	87,000 (869) vap	LQM S4UL
		2.5%	290	1,900	51	110,000 (1,920) vap	56,000	95,000 (1,920) vap	LQM S4UL
		6%	660	3,900	120	180,000 (4,360) vap	56,000	100,000 (4,360) vap	LQM S4UL
	Ethylbenzene	1%	47	83	16	5,700 (518) vap	24,000	17,000 (518) vap	LQM S4UL
		2.5%	110	190	39	13,000 (1,220) vap	24,000	22,000 (1,220) vap	LQM S4UL
		6%	260	440	91	27,000 (2,840) vap	25,000	27,000 (2,840) vap	LQM S4UL
	o-xylene	1%	60	88	28	6,600 (478) sol	41,000	17,000 (478) sol	LQM S4UL
		2.5%	140	210	67	15,000 (1,120) sol	42,000	24,000 (1,120) sol	LQM S4UL
		6%	330	480	160	33,000 (2,620) sol	43,000	33,000 (2,620) sol	LQM S4UL
	m-xylene	1%	59	82	31	6,200 (625) vap	41,000	17,000 (625) vap	LQM S4UL
		2.5%	140	190	74	14,000 (1,470) vap	42,000	24,000 (1,470) vap	LQM S4UL
		6%	320	450	170	31,000 (3,460) vap	43,000	32,000 (3,460) vap	LQM S4UL
	p-xylene	1%	56	79	29	5,900 (576) sol	41,000	17,000 (576) sol	LQM S4UL
		2.5%	130	180	69	14,000 (1,350) sol	42,000	23,000 (1,350) sol	LQM S4UL
		6%	310	430	160	30,000 (3,170) sol	43,000	31,000 (3,170) sol	LQM S4UL
Petroleum Hydroc	Aliphatic								
	EC 5-6	1%	42	42	730	3,200 (304) sol	570,000(304)sol	95,000 (304) sol	LQM S4UL
	EC>6-8	1%	100	100	2,300	7,800 (144) sol	600,000	150,000 (144) sol	LQM S4UL
	EC>8-10	1%	27	27	320	2,000 (78) sol	13,000	14,000 (78) vap	LQM S4UL
	EC>10-12	1%	130 (48) vap	130 (48) vap	2,200	9,700 (48) sol	13,000	21,000 (48) vap	LQM S4UL
	EC>12-16	1%	1,100 (24) sol	1,100 (24) sol	11,000	59,000 (24) sol	13,000	25,000 (24) sol	LQM S4UL
	EC>16-35	1%	65,000 (8.48)	65,000 (8.48) f, sol	260,000 f	160,000 f	250,000 f	450,000 f	LQM S4UL
	EC>35-44	1%	65,000 (8.48)	65,000 (8.48) f, sol	260,000 f	160,000 f	250,000 f	450,000 f	LQM S4UL
	Aliphatic								
	EC 5-6	2.5%	78	78	1,700	5,900 (558) sol	590,000	130,000 (558) sol	LQM S4UL
	EC>6-8	2.5%	230	230	5,600	17,000 (322) sol	610,000	220,000 (322) sol	LQM S4UL
	EC>8-10	2.5%	65	65	770	4,800 (190) vap	13,000	18,000 (190) vap	LQM S4UL
	EC>10-12	2.5%	330 (118) vap	330 (118) vap	4,400	23,000 (118) vap	13,000	23,000 (118) vap	LQM S4UL
	EC>12-16	2.5%	2,400 (59) sol	2,400 (59) sol	13,000	82,000 (59) sol	13,000	25,000 (59) sol	LQM S4UL
	EC>16-35	2.5%	92,000 (21)	92,000 (21) f, sol	270,000 f	1,700,000 f	250,000 f	480,000 f	LQM S4UL
	EC>35-44	2.5%	92,000 (21)	92,000 (21) f, sol	270,000 f	1,700,000 f	250,000 f	480,000 f	LQM S4UL
	Aliphatic								
	EC 5-6	6%	160	160	3,900	12,000 (1,150) sol	600,000	180,000 (1,150)	LQM S4UL
	EC>6-8	6%	530	530	13,000	40,000 (736) sol	620,000	320,000 (736) sol	LQM S4UL
	EC>8-10	6%	150	150	1,700	11,000 (451) vap	13,000	21,000 (451) vap	LQM S4UL
	EC>10-12	6%	760 (283) vap	760 (283) vap	7,300	47,000 (283) vap	13,000	24,000 (283) vap	LQM S4UL
	EC>12-16	6%	4,300 (142) sol	4,400 (142) sol	13,000	90,000 (142) sol	13,000	26,000 (142) sol	LQM S4UL
	EC>16-35	6%	110,000 f	110,000 f	270,000 f	1,800,000 f	250,000 f	490,000 f	LQM S4UL
	EC>35-44	6%	110,000 f	110,000 f	270,000 f	1,800,000 f	250,000 f	490,000 f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	1%	70	370	13	26,000 (1,220) sol	56,000	76,000 (1,220) sol	LQM S4UL
	EC>7-8(toluene)	1%	130	860	22	56,000 (869) vap	56,000	87,000 (869) vap	LQM S4UL
	EC>8-10	1%	34	47	8.6	3,500 (613) vap	5,000	7,200 (613) vap	LQM S4UL
	EC>10-12	1%	74	250	13	16,000 (364) sol	5,000	9,200 (364) sol	LQM S4UL
	EC>12-16	1%	140	1,800	23	36,000 (169) sol	5,100	10,000	LQM S4UL
	EC>16-21	1%	260 f	1,900 f	46 f	28,000 f	3,800 f	7,600 f	LQM S4UL
	EC>21-35	1%	1,100 f	1,900 f	370 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	EC>35-44	1%	1,100 f	1,900 f	370 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	2.5%	140	690	27	46,000 (2,260) sol	56,000	84,000 (2,260) sol	LQM S4UL
	EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) sol	56,000	95,000 (1,920) sol	LQM S4UL
	EC>8-10	2.5%	83	110	21	8,100 (1,500) vap	5,000	8,500 (1,500) vap	LQM S4UL
	EC>10-12	2.5%	180	590	31	28,000 (899) sol	5,000	9,700 (899) sol	LQM S4UL
	EC>12-16	2.5%	330	2,300 (419) sol	57	37,000	5,100	10,000	LQM S4UL
	EC>16-21	2.5%	540 f	1,900 f	110 f	28,000 f	3,800 f	7,700 f	LQM S4UL
	EC>21-35	2.5%	1,500 f	1,900 f	820 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	EC>35-44	2.5%	1,500 f	1,900 f	820 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	6%	300	1,400	57	86,000 (4,710) sol	56,000	92,000 (4,710) sol	LQM S4UL
	EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) vap	56,000	100,000 (4,360)	LQM S4UL
	EC>8-10	6%	190	270	51	17,000 (3,580) vap	5,000	9,300 (3,580) vap	LQM S4UL
	EC>10-12	6%	380	1,200	4	34,000 (2,150) sol	5,000	10,000	LQM S4UL
	EC>12-16	6%	660	2,500	130	38,000	5,100	10,000	LQM S4UL
	EC>16-21	6%	930 f	1,900 f	260 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	EC>21-35	6%	1,700 f	1,900 f	1,600 f	28,000 f	3,800 f	7,900 f	LQM S4UL
	EC>35-44	6%	1,700 f	1,900 f	1,600 f	28,000 f	3,800 f	7,900 f	LQM S4UL
	Aliphatic +Aromatic >EC44	1%	1,600 f	1,900 f	1,200 f	28,000 f	3,800 f	7,800 f	LQM S4UL
		2.5%	1,800 f	1,900 f	2,100 f	28,000 f	3,800 f	7,800 f	LQM S4UL
		6%	1,900 f	1,900 f	3,000 f	28,000 f	3,800 f	7,900 f	LQM S4UL

Generic Assessment Criteria Values

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

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	^{POS} resi	^{POS} park	Source
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^B	94	0.13 ^B	3,500	620	1,100	LQM S4UL
		2.5%	2.0	150	0.30	4,000	620	1,100	LQM S4UL
		6%	4.5	210	0.70	4,300	620	1,100	LQM S4UL
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110	LQM S4UL
		2.5%	0.52	29	8.0E-02	400	60	120	LQM S4UL
		6%	1.2	31	0.19	400	60	120	LQM S4UL
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300	LQM S4UL
		2.5%	0.29	0.29	10	22	11,000	1,900	LQM S4UL
		6%	0.62	0.62	23	47	11,000	2,700	LQM S4UL
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48	LQM S4UL
		2.5%	0.7	0.78	0.61	66	25	50	LQM S4UL
		6%	1.6	1.8	1.4	120	25	51	LQM S4UL
	Phenol	1%	120	440 (460)	23	440 ^{dir} (26,000)	440 ^{dir} (10,000)	440 ^{dir} (7,600)	LQM S4UL
		2.5%	200	690	42	690 ^{dir} (30,000)	690 ^{dir} (10,000)	690 ^{dir} (8,300)	LQM S4UL
		6%	380	1,200	83	1,300 ^{dir} (34,000)	1,300 ^{dir} (10,000)	1,300 ^{dir} (9,300)	LQM S4UL

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

*=naphthalene C4SL exceeds the CLEA calculated soil saturation concentration (76 mg kg-1 for 1% SOM, 183 mg kg-1 for 2.5% SOM and 432 mg kg-1 for 6% SOM)

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

dir = S4ULs based on threshold protective of direct skin contact with phenol)brackets long term exposure for illustration purposes)

g = derived based on 2,3,4-tetrachlorophenol

Appendix G – BGS Radon Report

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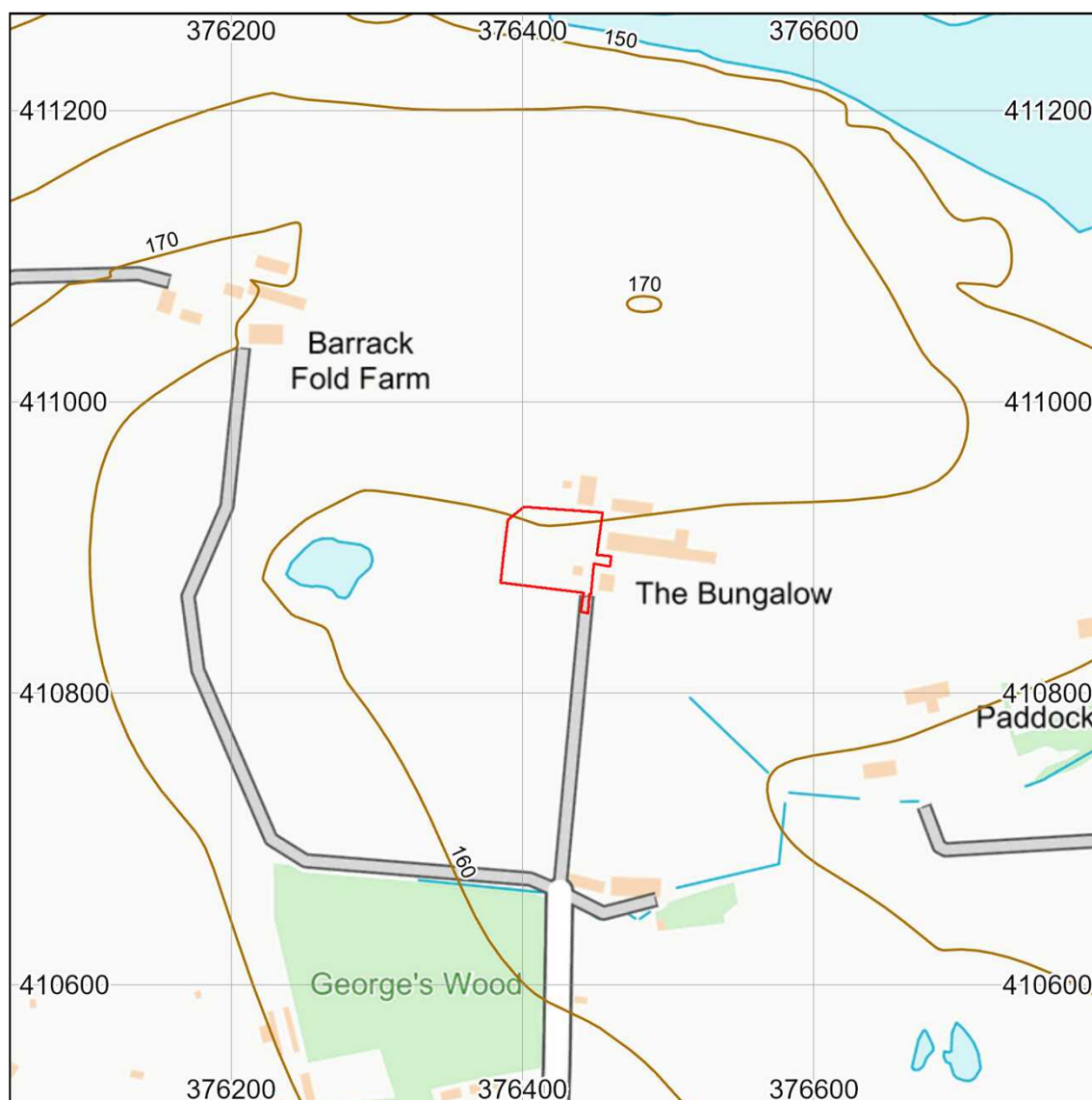
Radon Report

Advisory report on the requirement for radon protective measures in new buildings, conversions and extensions to existing buildings. The report also indicates whether a site is located within a radon Affected Area

Report Id: *BGS_342136/59518*

Client reference: PO-C001063

Search location



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Search location indicated in red

*This report describes a site located at National Grid Reference 376423, 410892.
Note that for sites of irregular shape, this point may lie outside the site boundary.
Where the client has submitted a site plan the assessment will be based on the area given.*

Radon Report: UK

When extensions are made to existing buildings in high radon areas, or new buildings are constructed in these areas, the Building Regulations for England, Wales, Scotland and Northern Ireland require that protective measures are taken against radon entering the building.

This report provides information on whether radon protective measures are required. Depending on the probability of buildings having high radon levels, the Regulations may require either:

1. No protective measures
2. Basic protective measures
3. Full protective measures

This is an advisory report on the requirement for radon protective measures in new buildings, conversions and extensions. The report also indicates whether a site is located within a radon Affected Area

Requirement for radon protective measures

The determination below follows advice in *BR211 Radon: Guidance on protective measures for new buildings (2023 edition)*, which also provides guidance on what to do if the result indicates that protective measures are required.

Is the property in an area where radon protective measures are required for new buildings or extensions to existing ones as described in publication BR211 (2023 edition) Radon: Guidance on protective measures for new buildings?

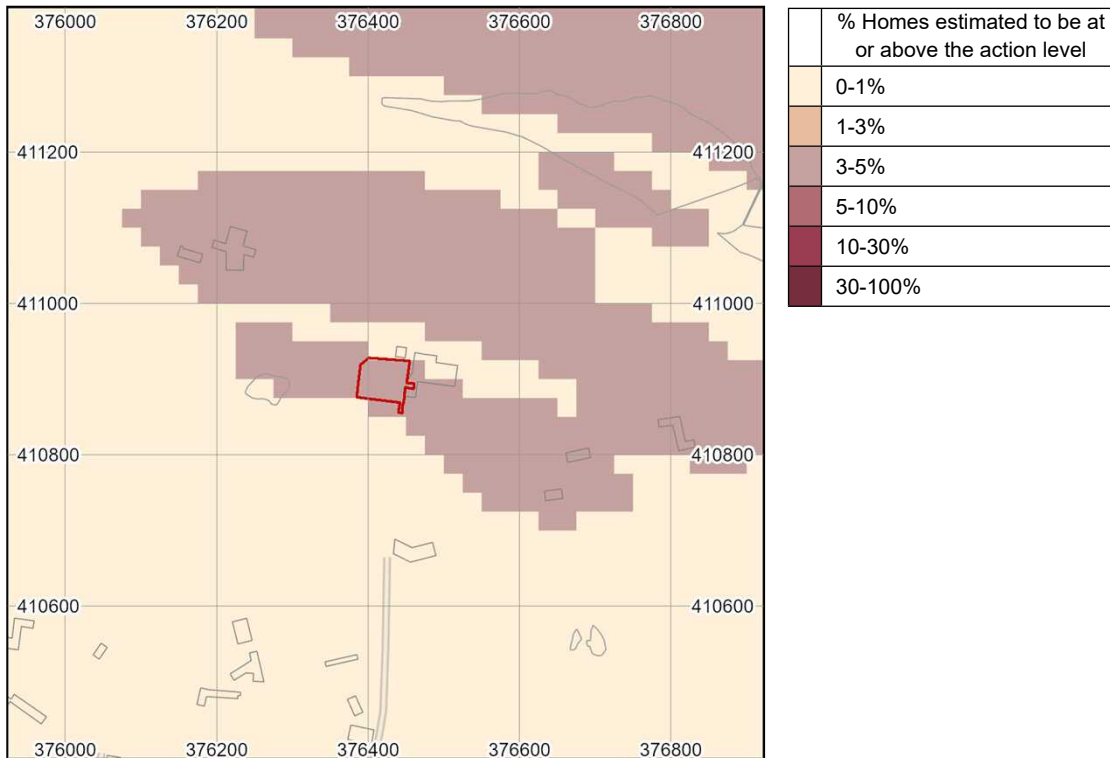
BASIC RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

More details of the protective measures required are available in *BR211 Radon: Guidance on protective measures for new buildings (2023 Edition)*.

Whether or not the radon level in a building is above or below the radon Action Level can only be established by having the building tested. The UKHSA provides a radon testing service which can be accessed at www.ukradon.org or by telephone (01235 822622).

If you require further information or guidance, you should contact your local authority building control officer or approved inspector.

Radon Affected Area



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Scale: 1:10 000 (1cm = 100 m)

Search area indicated in red

Is the property in a radon Affected Area as defined by the UK Health Security Agency (UKHSA) and if so what percentage of homes are estimated to be at or above the Action Level? YES

Additional Information

THE PROPERTY IS IN A RADON AFFECTED AREA WHERE 3 TO 5% OF HOMES ARE ESTIMATED TO BE AT OR ABOVE THE ACTION LEVEL.

The UKHSA recommends a radon 'Action Level' of 200 Becquerels per cubic metre of air (Bq m^{-3}) for the annual average of the radon gas concentration in a home. Where 1% or more of homes are estimated to be at or above the Action Level the area should be regarded as a radon Affected Area.

This report informs you whether the property is in a radon Affected Area and the percentage of homes that are estimated to be at or above the radon Action Level at this location. Being in an Affected Area does not necessarily mean there is a high radon level within the property; the only way to determine the radon level is to carry out a radon measurement.

The UKHSA advises that radon gas should be measured in all properties within radon Affected Areas and that homes with radon levels at or above the Action Level (200 Bq m⁻³) should be remediated. Householders with levels between the Target Level (100 Bq m⁻³) and Action Level should seriously consider reducing their radon level, especially if they are at greater risk, such as if they are current or ex smokers. Whether or not a home is in fact above or below the Action Level or Target Level can only be established by having the building tested. The UKHSA provides a validated radon testing service which can be accessed at www.ukradon.org.

The information in this report provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as Law Society CON29 Enquiries of the Local Authority (2016); 3.14 Radon Gas: Do records indicate that the property is in a “Radon Affected Area” as identified by the UKHSA. The data can also be used to advise house buyers and sellers in Scotland and Northern Ireland.

If you are buying a new build property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

If you are buying a currently occupied property in a radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were at or above the radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and if the results of re-testing confirmed the effectiveness of the measures.

Further information on radon is available from the UKHSA at www.ukradon.org.

What is radon?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters enclosed spaces such as some buildings (particularly basements), caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level is at or above the Action Level, measures should be taken to reduce the concentration.

Radon in workplaces

The Ionising Radiation Regulations 2017 require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace**. BRE publications may be obtained from the BRE Bookshop, Tel: 01923 664262, email: bookshop@bre.co.uk website: www.brebookshop.com

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