

Phase 1 Desk Study / Preliminary Risk Assessment Report

**For the proposed residential
development
of land at the**

**Former Hayes Farm
Halewood
Merseyside**

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Contract:

Phase 1 / Desk Study Report
for the
proposed residential development
of at the Former Hayes Farm,
Halewood
Merseyside.

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Appendix A

Geo-Ventures (UK) Limited

EXECUTIVE SUMMARY

<u>OBJECTIVE</u>	Phase 1 Desk Study / Preliminary Risk Assessment
<u>THE SITE</u>	Land at former Hayes Farm, Halewood, Merseyside.
<u>THE PROPOSAL</u>	Residential housing
<u>SITE HISTORY</u>	Within curtilage of former Hayes Farm
<u>GEOLOGY</u>	Glacial till overlying sandstone bedrock with potentially contaminated made ground in parts formerly occupied by old farm buildings
<u>CONCEPTUAL</u>	Potential problems only envisaged in those parts of the site previously occupied by old farm buildings
<u>HAZARD RATING</u>	Low risk
<u>RECOMMENDATIONS</u>	Phase 2 Intrusive investigation required to assess potential environmental risks and obtain geotechnical data for foundation design.

1.0 INTRODUCTION

1.1 Assignment and Scope of Work

On the instructions of Charles Attard a Phase 1 Desk Study / Preliminary Risk Assessment report has been prepared by Geo-Ventures (UK) Limited for the proposed development known as Lakeside View Phase 2 on land on the northeast side of Lower Road, Halewood, Merseyside for residential housing.

This report includes a review of existing geo-environmental information together with a study of former potentially contaminative land uses to allow the production of a Conceptual Site Model and Preliminary Risk Assessment in relation to the land and its proposed re-development.

1.2 Background

The overall development known as Lakeside View initially comprised Phase 1 involving the refurbishment of an existing former barn at Hayes Farm which was the subject of a Phase 1 Desk Study report produced by Geo-Ventures (UK) Limited dated August 2015.

Phase 2 of the scheme involves the construction of twelve new residential units and in support of this application the initial Phase 1 Desk Study was submitted.

However, in comments received from the Planning Authority it was noted that the original desk study did not include any information on ground contamination in the area and that this issue would need to be addressed in a revised Phase 1 Desk Study / Preliminary Risk Assessment report.

2.0 Methodology

This has been achieved by a detailed study of available information on:

- Soil and groundwater conditions within the general area of the site.
- Possible ground related geotechnical and contamination hazards within the site boundaries that may affect the proposed re-development.

The report also provides preliminary development recommendations and advice on further works required for a cost effective reduction of risks to the development and procedures likely to satisfy regulators.

Whilst every effort has been made to pre-empt the likely requirements of the Local Authority and the Environment Agency, they are likely to have specific requirements that will need to be discussed at a later date.

The report has been compiled with reference to the following guidance:

- Land contamination : risk management published by the Environment Agency October 2020.
- ISO 21365:2019 “ Soil quality – Conceptual site model for potentially contaminated sites”.

It should be noted that the Planning Authority when dealing with applications involving the re-development of land that may have a past history of former potentially contaminated land uses will require a series of reports as listed below:

- Phase 1 Desk Study / Preliminary Risk Assessment.
- Phase 2 Intrusive Investigation and revised Preliminary Risk Assessment.
- Phase 3 Remediation Strategy
- Phase 4 Verification Report

2.1 Site Location

The land is situated on the north east side of Lower Road in Halewood Village on the north side of the Liverpool to Widnes railway line.

The whole site is irregular in shape including the existing lake area but the proposed two works are in two areas.

- To the southwest of the refurbished barn.
- On land adjacent to northwest side of the existing lake.

A more detailed review of site conditions is provided in section 2.1 of this report.

2.2 Proposed Development

It is understood the proposed residential development will comprise twelve units with a block of four town terraced houses to the rear of the refurbished barn and the remainder around the edge of the lake.

3.0 SITE CHARACTERISATION

3.1 Walkover Survey

The site occupies a sensibly level area of land on the northeast side of Lower Road to the north of the existing railway line.

It may be sub-divided into two parts.

- Adjacent to the refurbished former barn which is currently used as a temporary car park.
- Alongside the lake which is grassland.

Significant factors identified at this stage

Possible ground contamination in the area adjacent to the refurbished barn

3.2 Historical Summary

In order to establish a history of land uses at and adjacent to the site a full set of historical plans of the area from 1849 to the present day was obtained from the Landmark Information Group dated 24th July 2015

This report includes a full set of historical plans of the area from 1850 to the present day at various scales and a summary of this information is presented on the following table.

It should be noted that the historical maps do not provide a comprehensive site history but only a series of snapshots in time and that between map dates there could have been transient land uses which have not been recorded.

In addition, not all of the uses are recorded on the maps for example small unmarked buildings.

Anecdotal information can often be a source of useful detail and if more specific particulars are needed, reference may be made to relevant trade directories.

MAP	SCALE	THE SITE	ADJACENT AREAS
Lancashire and Furness Published 1849	1:10560	A number of individual farm buildings are shown	These are apparently open fields and at this time the railway line to the south had not been constructed
Lancashire and Furness Published 1893	1:2500	This comprises three large individual structures set within an orchard and labelled "The Heyes"	The area is still predominantly open farmland although the railway line directly to the south site has now been built.
Lancashire and Furness Published 1907	1:2500	No significant change	No significant change
Lancashire and Furness Published 1927	1:2500	No significant change	No significant change
Lancashire and Furness Published 1958	1:2500	No significant change	No significant change
Ordnance Survey Published 1988	1:1250	No significant change	The surrounding area is still predominantly farmland although some residential housing has been built on the south west side of Lower Road opposite the site
Ordnance Survey Published 1993	1:1250	No significant change	No significant change
Ordnance Survey Published 2006	1:10000	No significant change	The large lake to the north east of the site is now shown
Present Day		No significant change other than refurbishment of the old barn has been completed	New housing to the north of the refurbished barn

In summary, Hayes Farm was established prior to 1849 and was set within open fields.

Although, this usage would not normally be considered to be potentially contaminative, where recent clearance of works have taken place around the refurbished former barn, demolition materials should be anticipated.

With respect to the lake, it is understood that this was formed by excavation into the existing ground to create a water feature for fishing purposes.

Significant factors identified on historical plans

No specific problems anticipated other than in the area around the refurbished barn, where it appears other old buildings have been demolished resulting in the likely presence of demolition materials and the possibility of obstructions such as former foundations still in the ground.

3.3 Geology and Anticipated Ground Conditions

Based on information published by the British Geological Survey the site is underlain by rocks of the Sherwood Sandstones of Triassic age.

The sandstones have a covering or recent superficial drift deposits comprising glacial till commonly referred to as “Boulder Clay” of the Devensian period of Pleistocene age.

Significant factors identified from geological data

The choice of foundation type will principally be governed by the thickness of any made ground at the site in that if only relatively thin, footings should be possible within the superficial soils without the need to pile to greater depth.

3.4 Ground Stability

The site is not within an area affected by underground coal or other mineral workings and is not categorised as subject to any other ground stability problems for example running sands or compressible ground.

Significant ground stability risks

None

3.5 Hydrology

The nearest surface water feature to the site is the large lake to the east, although this is manmade and not of natural origin.

Further to the north east of the site is Ditton Brook with its adjacent land classified as at risk from flooding although this is some considerable distance from the proposed new residential development.

Significant factors from hydrological / flood risk factors

None

3.6 Hydrogeology

The overall hydrogeology of the site and the general area is shown on a series of maps provided by the Environment Agency which indicate:

- The natural superficial deposits of Boulder Clay are classified as “Unproductive Strata”.
- Beneath the superficial soils the Sherwood Sandstones as a Principal Aquifer.
- As such the site is within a “Source Protection Zone”
- In terms groundwater vulnerability the site is classified as of “Low vulnerability”, due to the presence at the surface of “Unproductive low permeability strata”

In this situation, even in the unlikely event that the site is underlain in parts by contaminated made ground the underlying impermeable glacial till will act as a barrier to the downward percolation of any polluted water thereby protecting the quality of groundwater in the sandstone aquifer at depth.

In addition, there are no licenced abstractions or pollution incidents that could have had any detrimental effects on the quality of groundwater in the vicinity of the site.

Significant factors from hydrogeological data

No adverse effects on the quality of groundwater envisaged at this stage.

3.7 Hazardous Ground Gases

Radon is a gas formed by the radioactive decay of small amounts of uranium that occur naturally in all soils and rocks

However, significant volumes of this gas are only produced in areas underlain by particular rock types not present in this area.

As a consequence, the site is not classified as in an area requiring protection against radon and any new buildings will not require the inclusion of any specific protective measures.

Other harmful gases may occur due to anthropogenic activities such as disposing of biodegradable wastes by landfilling.

Methane and carbon dioxide, which are potentially explosive and an asphyxiant respectively, in particular are generated due to the biodegradation of such wastes and in certain conditions can migrate laterally to affect land well beyond the actual landfill itself.

In this particular case there are no nearby records of nearby former or active landfill sites or backfilled mineral workings.

However, although no potential on or off site sources of hazardous gases have been identified, due to the sensitive end use of the site it may be considered prudent to install and monitor gas wells.

Significant risks identified

Potential off site source of hazardous gases identified.

3.8 Unexploded ordnance

A Preliminary Unexploded Ordnance (UXO) Threat Assessment report has not been obtained at this stage.

Significant risk from UXO

A report could be obtained if considered necessary at this site.

3.9 Other

The following topics have not been researched at this stage

- Archaeology
- Invasive Plants
- Ecology

4.0 Conceptual Site Model and Preliminary Risk Assessment

Using the information gathered to allow compilation of this report and discussed in Section 3.0 above, a Conceptual Site Model has been prepared using the Source – Pathway – Receptor methodology as shown on the following table.

This methodology applies to potential contaminants in all three phases namely solid, liquid or gaseous.

As a starting point, there must be an identifiable SOURCE of contamination.

In this particular case it is possible that parts of the site may be underlain by potentially contaminated made ground which:

- In its solid form could cause problems to human health.
- If subject to leaching could potentially result in contaminated groundwater.
- If containing a proportion of biodegradable materials could result in the production of hazardous gases.

On the assumption that a source has been identified there must be a credible PATHWAY for the contamination to affect any designated RECEPTOR.

In this particular case the following potential pathways and receptors have been identified.

- Construction workers could be exposed to potentially contaminated made ground by dermal contact, inhalation or ingestion.
- Contaminants within the made ground could be mobilised by leaching and potentially affect the quality of both surface and underground waters.
- If any hazardous gases are present in the ground these would need appropriate control in the construction of any new buildings with the incorporation of precautionary measures to protect site users from possible explosions and / or asphyxiation,

The concept of this methodology is that there must be an identified physical source of contamination, a realistic receptor and a credible means or pathway through which the contamination can reach and affect the receptor.

For a potential risk to be identified and subsequently quantified the source – pathway – receptor linkage must be sustainable and if for whatever reason the chain is broken then per se there is no risk.

The Preliminary Conceptual Model is presented on the following table:

In terms of the potential ground contaminants that may affect the site this includes a common range of substances including metals, phenols, cyanide, pH, water soluble sulphate and polycyclic aromatic hydrocarbons together with asbestos screen.

In this particular case, in the area adjacent to the refurbished former barn there could be made ground including demolition materials which may be contaminated by total petroleum hydrocarbons and the presence of asbestos.

Source	Pathway	Receptor	Risk Assessment	Linkage
Contaminants in made ground including metals, PAHs and TPHs	Ingestion / dermal contact / inhalation	Current site users	As significant contamination is not anticipated at the site any risks are considered to be minimal	Not viable
		Construction workers	At this stage it must be assumed that only made ground at the site is potentially contaminated thereby posing attendant risks.	Viable
		Site users after re-development	Assuming appropriate attention is paid to required cover in garden areas any potential risks are considered to be minimal	Not viable
		Adjacent Land users	Assuming appropriate practices such as wheel washing of vehicles in / off site and dust control are taken any significant risks are considered to be minimal.	Not viable
	Uptake in root zone	Plants	If contaminated made ground is encountered in rear garden areas appropriate clean cover will need to be provided	Only potentially viable
Mobile contaminants in made ground including metals, PAHs and TPHs.	Leaching from made ground	Groundwater	As impermeable glacial till overlies the sandstone aquifer this will act as a protective barrier negating any risks to the quality of groundwater.	Not viable
	Off site migration in groundwater	Surface Water	No nearby adjacent surface water courses	Not viable
Hazardous vapours from volatile contaminants	Inhalation of vapours	Current site users	No reason to anticipate any problems from this source	Not viable
		Construction workers		
		Site Users after re-development		
		Adjacent users		
Landfill gases from the made ground	Emissions from the ground collecting in excavations / confined spaces on / off site.	Current site users	No potential on or off site source of hazardous gases has been identified.	Not viable
		Construction workers		
		Site Users after re-development		
		Adjacent land users		
Radon	Emissions from the ground	Construction workers	The site is in an area where no specific radon protective measures are required in the construction of new buildings.	Not viable
		Site users after re-development		
Ground conditions aggressive to buried concrete	Direct contact	Underground structures	Buried concrete will need appropriate protection from aggressive ground conditions	Viable
Ground instability	Differential settlements	Structures	No problems anticipated from this source.	Not viable

From a study of the Conceptual Site Model it appears that the principal risks that need to be addressed relate to:

- Potential risk to site construction workers if contaminated made ground is identified at the site.
- Need to provide sufficient clean cover in gardens.
- Aggressive ground conditions with respect to buried concrete at the site.

5.0 FURTHER INVESTIGATION

A Phase 2 Intrusive Investigation will be required to gather information on:

- The degree of contamination of the made ground.
- Geotechnical properties of the underlying superficial deposits.

This will be accomplished by:

- 1) Sinking a number of window sampler boreholes across the site.
- 2) Standard Penetration Tests to be carried out at 1.00m depth intervals accompanied by disturbed soil samples for geotechnical logging and subsequent laboratory testing.
- 3) With respect to the made ground samples to be subject to laboratory chemical testing to establish the concentrations of metals, polycyclic aromatic hydrocarbons and total petroleum hydrocarbons together with asbestos screen.
- 4) Geotechnical laboratory testing to include pH / Sulphate tests on samples of both the made ground and natural superficial soils.
- 5) Due to the sensitive end use of the land it may be considered prudent to install a number of gaswells.

6.0 SUMMARY AND RECOMMENDATIONS

This report has established that the area adjacent to the refurbished former barn was originally part of a larger complex of farm buildings occupied by Hayes Farm whereas the parts alongside the lake were originally open agricultural land.

A Phase 2 Investigation is required to provide information on potential problems due to ground contamination and the presence of hazardous gases together with information for foundation design.

As noted previously a Phase 3 Remediation Strategy and Phase 4 Verification Report will be produced at the appropriate time.

The content of this report is based on a study of available documented information from a variety of sources and including information provided by the client.

The opinions contained within this report have been derived by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned.

The report should not be considered to be exhaustive, and any opinions only relate to the purpose for which the report was commissioned.

It should be noted any risks identified in this Phase 1 Report are and must be regarded as perceived risks and based purely on the information reviewed, and it must also be noted that the actual risks at the site can only be assigned after the completion of the Phase 2 Intrusive Investigation report has been completed.



Dr John Crook

Geo-Ventures (UK) Limited
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