



**Castledine
Environmental**

LAND CONTAMINATION SURVEYS

Phase 1 Land Contamination Risk Assessment

for

Proposed Demolition of Existing Dwelling and Outbuildings and Erection of a Replacement Dwelling and Detached Garage

on the site of

**Little Moat, Newbold Road,
Kirkby Mallory, Leicester
LE9 7QG**

Date: August 2022

Status:

Final Report

Reference:

3338D P1 Hall – Kirkby Mallory

Date:

03/08/2022

Tel: 01509 880399 Mob: 07779 305682 Email: kevin@castledineenvironmental.co.uk

4 Wymeswold Road, Hoton, Loughborough, Leicestershire, LE12 5SN

EXECUTIVE SUMMARY

The site currently comprises an open plot of land that is largely unoccupied save for a redundant stables and a concrete base. The site ground conditions comprise both anthropogenic and natural gravels, including some road planings and what appear to be demolition rubbles. Historically, the site remained unoccupied from circa.1885 through until circa.1958 when a dwelling was located in the north western extent of site. Following this, the site is developed with outbuildings and a barn by circa.1959 to 2003, following which the site buildings were demolished, leaving only the stables. The various developments and demolitions of buildings on site, along with the noted ground conditions and onsite and nearby heaps are considered potential sources of soil contamination.

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **MODERATE** level of risk with respect to the proposed development.

It is recommended that further investigation inline with Section 11.0 is planned and carried out on site.

This report should be submitted to your Local Planning Authority for agreement to allow the Phase 2 intrusive testing to be undertaken.

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1.0 QUALITY ASSURANCE

Castledine Environmental confirm that all reasonable efforts have been made to ensure that the information outlined within this report is accurate.

Castledine Environmental would further confirm that due care, attention and technical skill were used in the creation of this report.

For and on behalf of Castledine Environmental

Kevin Castledine

(Director)

2.0 LIMITATIONS

The conclusions and recommendations made in this report are limited to those based on the findings of the investigation. Where comments are made based on information obtained from third parties, Castledine Environmental assumes that all third-party information is true and correct. No independent action has been undertaken to validate the findings of third parties. The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at the time.

This survey has not included asbestos within existing structures, invasive plant species, geotechnical considerations or any elements unconnected with potential ground contamination at the site. If required, such surveys should be undertaken by suitably accredited organisations.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

3.0 INTRODUCTION

Castledine Environmental have been appointed by Mr. T. J. Hall to undertake a Phase 1 Desk study on land at Little Moat (12 Newbold Road), Newbold Road, Kirkby Mallory, Leicester LE9 7QG.

4.0 SCOPE

Castledine Environmental have prepared this report for the sole use and reliance of Mr. T. J. Hall and his appointees for the purpose of ensuring compliance with:

- Paragraph(s) 174, 179, 183 & 184 of the National Planning Policy Framework 2021
- Part C1 of the building regulations
- Condition No.5 of the Hinckley and Bosworth planning approval reference 18/00914/FUL

5. No development shall commence on the foundations of the dwelling hereby approved until a scheme for the investigation of any potential land contamination on the site has first been submitted to and agreed in writing by the local planning authority which shall include details of how any contamination shall be dealt with and a period of implementation. The approved scheme shall be implemented in accordance with the agreed details and any remediation works so approved shall be carried out in accordance with the agreed implementation period prior to any works commencing on the foundations.

Reason: To ensure that risks from land contamination to future users of the site are minimised thus ensuring that the land is fit for purpose and to accord with Policy DM7 of the SADMP.

This report may not be used or relied upon by any unauthorised third party, or for any other proposed use than that specified above, without the explicit written agreement of Castledine Environmental

The report consists of a preliminary risk assessment in accordance with BS10175:2011+A2:2017, CLR11 “Model Procedures for the Management of Land Contamination” and LCRM “Land Contamination Risk Management”.

The objectives of the report are:-

- To assess historical activities at the site with respect to their potential impact on the site environment.
- To characterise the environmental setting of the site, identify migration pathways and vulnerable receptors for contamination originating at the site, focusing on potential soil and groundwater liabilities.
- To assess historical and current surrounding land use in relation to known or potential off-site contamination issues that may impact on the subject site and
- To develop a preliminary conceptual site model (CSM).

5.0 SITE DESCRIPTION

The site is located in Kirkby Mallory, Leicestershire at National Grid Reference: 445349,301639 and is approximately 0.51ha in area.

The site is rectangular in shape and is orientated north east to south west and connected to Newbold Road to the west via a connecting access spur. The site is located in a predominantly rural area and is directly bounded by a small fielded area with an associated dwelling and grounds beyond to the north, field beyond a hedgerow to the east, further field south and west with Newbold Road to the west and a small lake beyond this.

The site interior comprises an open plot of largely unoccupied land, save for a single, centrally located former stables. A tarmac and gravel access track leads east off Newbold Road to the main site area, terminating an expanse of gravels. Also noted here was a large heap of timber and cut vegetation. A stables were seen to be located centrally on site and orientated slightly north east to south west and constructed of timber with

tilled roofing and concrete flooring. The stables possessed a central unit which appeared to be a former refrigeration unit, with traditional stabling to either side of this. To the north east of the stables lies a concrete base, likely associated with equestrian purposes; and east of the main site area a large, vegetated mound was noted. The remainder of site is occupied by grassed and gravelled areas, with a sandy area located in the north west of site and extending west offsite, which resembled a former ménage. The remaining ground conditions comprised mixed natural and anthropogenic gravels in low lying vegetation.

The evident areas of demolition on site and areas of road chippings as gravel-access routes or parking are considered potential sources of contamination. Topographically, the site is level.

Photos of the site are present in Appendix D

6.0 REGULATORY AUTHORITY AND OTHER ENVIRONMENTAL DATA

An environmental search listing historical and environmental factors likely to affect the property has been reviewed.

The most pertinent information is summarised in the following sections.

A copy is presented in Appendix A.

Additional geological and hydrological data was obtained from the British Geological Survey.

6.1 HYDROLOGICAL**6.1.1 AQUIFER****6.1.1.1 SUPERFICIAL GEOLOGY**

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	62	NE	Secondary (Undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and nonaquifer in different locations due to the variable characteristics of the rock type
3	199	S	Secondary (Undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and nonaquifer in different locations due to the variable characteristics of the rock type

6.1.1.2 BEDROCK GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary B	Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers

6.1.2 ABSTRACTIONS AND PRIVATE WATER SUPPLIES

None recorded within 250m of site.

6.1.3 SOURCE PROTECTION ZONE

Site is not in a source protection zone.

6.1.4 GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one-kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

ID	Location	Summary	Soil / Surface	Superficial geology	Bedrock geology
1	On site	Summary Classification: Secondary superficial aquifer - High Vulnerability Combined classification: Productive Bedrock Aquifer, Productive Superficial Aquifer	Leaching class: High Infiltration value: >70% Dilution value: 300-550mm/year	Vulnerability: High Aquifer type: Secondary Thickness: 3-10m Patchiness value: <90% Recharge potential: Low	Vulnerability: High Aquifer type: Secondary Flow mechanism: Well connected fractures

6.1.5 POTENTIAL SURFACE WATER

The Groundsure report records a large pond located 130m north and an unnamed, surface level watercourses located 133m north and 155m, 170m and 217m west of site. Evidence noted on the walkover and from satellite imagery also shows a lake located approximately 17m west of site, beyond Newbold Road.

6.1.6 DISCHARGE CONSENTS

None recorded within 250m of site.

6.2 PERMITTED PROCESSES

None recorded within 250m of site.

6.3 POLLUTION INCIDENTS

None recorded within 250m of site.

6.4 RADIOACTIVE SUBSTANCES REGISTRATIONS

None recorded within 250m of site.

6.5 WASTE**6.5.1 LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)**

None recorded within 250m of site.

6.5.2 LANDFILL SITES

The Groundsure report records a historical landfill located 149m south west of site, with the site accepting inert, industrial and liquid sludge wastes. The site was in effect from 31/12/1951 and last recorded on 31/12/1974.

6.6 HAZARDOUS SUBSTANCES

None recorded within 250m of site.

6.7 ECOLOGICAL RECEPTORS

The Groundsure report records the site as being located within the Soar River surface waters Nitrate Vulnerable Zone (NVZ). No further sensitive land usages are recorded within 1000m of site.

6.8 SOILS AND GEOLOGY

"Contains British Geological Survey materials © NERC 2022" obtained from <http://www.bgs.ac.uk/data/mapViewers/home.html> under the [Open Government Licence](#)

6.8.1 SUPERFICIAL DEPOSITS

Both BGS geological mapping and the Groundsure report record superficial geological deposits of Glaciofluvial Deposits on site, comprising mostly coarse-grained sediments (i.e. sands and gravels) with some finer-grained layers (i.e. clays and silts) with possible lenses of silt, clay or organic materials (peat), which were deposited by glacial meltwater streams.

Records of the Oadby Member, comprising sands and gravels, clays and silts with chalk and flint fragments are located 63m north east and 199m south of site.

6.8.2 SUPERFICIAL DEPOSITS PERMEABILITY

The Groundsure report records the site as being within an area where the maximum permeability of superficial deposits is recorded as 'very high' and the minimum permeability as 'high', facilitated by intragranular flow mechanisms.

This is a qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

6.8.3 BEDROCK DEPOSITS

Both BGS geological mapping Groundsure report record bedrock geology of the Gunthorpe Member underlying site, comprising a red-brown mudstone with subordinate dolomitic siltstone and fine-grained sandstone with common gypsum veins and nodules.

6.8.4 BEDROCK PERMEABILITY

The Groundsure report records the site as being within an area where the maximum permeability of bedrock geology is recorded as 'low' and the minimum permeability as 'low' and facilitated by fracture flow mechanisms.

6.8.5 ARTIFICIAL GROUND

BGS geological mapping and the Groundsure report record an area of worked ground (undivided) described as a 'void' located 17m west of site. No further artificial deposits are located within 250m of site.

6.8.6 BGS ESTIMATED BACKGROUND SOIL CHEMISTRY

The Groundsure report records BGS background soil chemistry for the site. This is estimated values providing the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km². In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km²; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

The Groundsure report records arsenic, lead & bioaccessible lead, cadmium, chromium and nickel at background concentrations of 15mg/kg, 100mg/kg & 60mg/kg, 1.8mg/kg, 20-40mg/kg and 15mg/kg, respectively.

Assuming a worst-case generic acceptance threshold (GAC) of 1% soil organic matter (SOM), none of the recordings are above the generic acceptance thresholds of 37mg/kg, 200mg/kg (both lead and bioaccessible lead), 11mg/kg, 910mg/kg and 180mg/kg, respectively.

6.8.7 COAL MINING

The site is not located in a coal mining reporting area.

6.8.8 NON-COAL MINING

The Groundsure report records a ceased operations sand and gravel pit formerly located 138m south west of site.

6.8.9 SURFACE WORKINGS

ID	Distance [m]	Direction	Land Usage	Year of Mapping
A	17	W	Pond	1980
A	18	W	Water body	1950
A	18	W	Water body	1966
B	127	SW	Refuse heap	1966

6.8.10 RADON

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level. No radon protective measures are necessary as described in publication BR211:2015 by the Building Research Establishment.

6.9 AERIAL PHOTOGRAPHY

Aerial photography shows the following:

6.9.1 GOOGLE MAPS

The site is shown as occupied by a number of buildings not seen on the site walkover, along with the stables, which remained present on site for the walkover. The stables are located centrally on site and the concrete base is located immediately north east of this. A large ménage is located north west of the stables and extends north and offsite from here. A dwelling is located west again of the ménage and 3 No. barns are located south of this and the ménage. The southern-most barn on site is the largest of the three and potentially possesses potentially asbestos containing materials as roofing. A small heap of debris is located on the eastern face of the barn and a larger heap of indiscernible debris is located just south east of site.

6.9.2 GOOGLE EARTH

11 No. images are held in the historic imagery dataset, as follows:

Date	Description
December 1999	The site is shown as occupied by the dwelling in the NW of site, an adjacent ménage east of this, outbuildings located south of the ménage and a barn in the south of site. The eastern extent of site is occupied by open field.
December 2000	No discernible change on site nor site relevant change to the surrounding areas.
July 2006	The dwelling has had an extension erected on the northern face, extending the dwelling slightly north. The ménage to the east of this has been enlarged and covered entirely in what appears to be sand.
December 2010	An addition barn or small outbuilding has been erected immediately east of the southern barn on site. A large heap of unknown materials is located approx.30m SE of site.
September 2011	The centrally located stables have now been erected on site with the circular feature located immediately NE of this (present-day circular concrete base). The heap to the SE of site has almost doubled in size and resembles manure or hay and soils. Further heaps are now located approx.73m east of site.
April 2015	No discernible change on site. The heap to the SE of site now appears largely removed, however pooling water and some remnants of the heap remain.
April 2016	The heap is now located in the SE corner of site. The site now appears slightly disused with vegetation growing atop the ménage and circular feature NE of the stables.
April 2018	The metalwork atop the circular concrete base NE of the stables has now been removed, further evidencing a disuse of the site or parts of the site. The heap in the SE corner of site remains.
April 2020	No discernible change on site nor site relevant change to the surrounding areas.
June 2021	Site now appears fully disused with vegetation overgrowing areas of site, the barn appearing dilapidated and a heap of debris adjacent to the eastern face of the barn, where a small outbuilding has been removed. The refrigeration door on the stables appears to be laid on the ground adjacent to the stables. The heap remains in the east of site; however, it now appears to be partially comprised of debris and refuse.
February 2022	Site appears to remain disused; a circular area of standing water is located atop the southern extent of the ménage.

6.10 GOOGLE STREET VIEW

Google Street View imagery is dated September of 2021 with the site viewed off Newbold Road and facing north east along the site access track. A number of structures not seen on the site walkover can be made out, with a single-storey dwelling seen in the present-day sandy area of site and a series of stables and a large barn can be seen atop the present-day gravelled area, at the termination of the access track. The barn appears to possess PACM materials for roofing and the site buildings appear in a dilapidated state.

6.11 HISTORIC MAPPING

The following historic maps have been reviewed as part of this assessment, found in the appendices.

Map	Onsite	Offsite
OS County Series: 1885, 1:10,560	The site is shown as open field with a track leading from the present-day site access area NE across site.	The surrounding areas are predominantly open field with 2 No. areas of woodland located approx.30m north and named Kirkby Moats and a second located to approx.160m NW of site and named Fox Covert (persistent until the present-day). A large pond is located approx.130m north of site (persistent until the present-day) and an old gravel pit is located approx.348m SW of site.
OS County Series: 1886, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1903, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1901-1904, 1:10,560	No discernible change on site.	The old gravel pit to the SW of site is no longer marked on mapping.
OS County Series: 1916, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1914-1919, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
OS County Series: 1938, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.

Map	Onsite	Offsite
Provisional: 1950-1955, 1:10,560	A structure is now marked in the SW of site.	The lake seen to the west of site is now present.
National Grid: 1958, 1:2,500	The site is now marked as 'Little Moat' and a dwelling is located in the NW of site.	The woodland located north of site has been removed and replaced with the Kirkby Moats farmyard, with a number of new buildings erected, silos. The pond in the woodland remains (persistent until the present-day).
National Grid: 1959, 1:2,500	The dwelling in the NW of site appears to have been removed or is not marked on mapping. The barn seen on satellite imagery is the south of site is now present along with smaller, unknown usage outbuildings.	A refuse heap is now located approx.127m SW of site on the opposite side of the lake. A large amount of ponds or 'moats' have been excavated approx.90m north of site, in what appears to be a concentric ring pattern (possibly a fishery).
Provisional: 1966, 1:10,560	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 1980, 1:10,000	The dwelling appears to be located in the NW of site once again.	The moats or concentric ponds to the north of site have been removed, leaving only a single linear pond in an 'L' shape and the original woodland pond. The refuse heap to the SW of site is also no longer marked on mapping.
National Grid: 1994, 1:2,500	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 2001, 1:10,000	No discernible change on site.	The 'L' shape pond to the north of site has been removed.
Landline: 2003, 1:10,000	Higher resolution imagery now shows the dwelling in the NW of site, the central outbuildings and the southern barn on site, the stables are not present.	Surrounding areas see little site relevant change.
National Grid: 2010, 1:10,000	No discernible change on site.	Surrounding areas see little site relevant change.
National Grid: 2022, 1:10,000	The stables are now marked on site, leaving the site as occupied on historical satellite imagery.	The pond remaining from the original woodland located approx.130m north of site has increased in size slightly.

6.12 CURRENT LAND USE DATA

The Groundsure report records a workshop located 223m north east of site. No further current or recent industrial land usages are located within 250m of site.

6.13 PETROL AND FUEL SITES

None recorded within 250m of site.

6.14 HISTORICAL PETROL AND FUEL SITE DATABASE

None recorded within 250m of site.

6.15 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING

The Groundsure report records a refuse heap located 127m south west of site an identified from historical mapping dated circa.1966; and unspecified tanks located 135m north east of site and identified from historical mapping dated circa.1980. No further potentially contaminative land usages are recorded within 250m of site.

6.16 HISTORICAL TANK DATABASE

The Groundsure report records unspecified tanks located 135m north east of site and identified from historical mapping dated circa.1980.

6.17 HISTORICAL ENERGY FACILITIES

None recorded within 250m of site.

6.18 HISTORICAL GARAGE DATABASE

None recorded within 250m of site.

7.0 POLLUTANT LINKAGE ASSESSMENT

The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined as a substance that has the potential to cause harm, while a risk is considered to exist if such a substance is present in sufficient

concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.

The following sections discuss all the identified potential on and off-site sources, pathways and receptors in the context of the proposed development and plausible pollutant linkages which may represent a risk to identified receptors from the data gained from the desk study. At this stage the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

Three impact potentials exist for any given site, these are:

- The site impacting upon itself;
- The site impacting on its surroundings; and
- The surroundings impacting on the site.

All three impacts need to be considered in a risk assessment.

7.1 SOURCES

The following potential sources of contamination have been identified.

7.1.1 ONSITE

- Made ground across site and tarmac chippings in the western extent
- PACM materials on demolished buildings / demolition rubbles
- Large, indiscernible material heap in the east of site

7.1.2 OFFSITE

- Large heap of indiscernible materials (approx.30m, circa.2010-present)
- Large, backfilled moats approx.90m north (circa.1959-80)
- Remaining backfilled moat approx.90m north (circa.1959-2001)
- Historical landfill accepting inert, industrial and liquid sludge wastes, approx.149m SW (circa.1951-74)

7.2 PATHWAYS

A pathway is defined as a mechanism or route by which a contaminant comes into contact with, or otherwise affects a receptor. Pathways by which the identified receptors may be impacted upon in the context of the proposed development are identified as follows:

- Ingestion;
- Skin contact;
- Inhalation;
- Plant uptake,
- Direct contact by buried structures;
- Leaching of soluble contamination into groundwater

7.3 RECEPTORS

Receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by contaminant(s).

- Human Health
 - Current users of the site;
 - Future users of the site;
 - Users of neighbouring sites;
 - Construction workers; and
 - Services personnel working in trenches.
- Construction Materials
- Buried concrete, which may be affected by high concentrations of sulphate and/or low pH, in the soils and groundwater underlying the site; and
- Buried water pipes.
- Controlled Waters
- Ecological Receptors
- Flora and fauna using the proposed development

8.0 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) is a hypothesis of the nature and sources of contamination, potential receptors that may be the recipient of contamination arising from those sources and any pathways that may exist. It creates a plausible source-pathway-receptor pollutant linkage (hazard), set within the context of the ground and proposed end use of the site.

8.1 PRELIMINARY CONCEPTUAL SITE MODEL**8.1.1 SOIL CONTAMINATION**

The site currently comprises an open plot of land that is largely unoccupied save for a redundant stables and a concrete base. The site ground conditions comprise both anthropogenic and natural gravels, including some road planings and what appear to be demolition rubbles. Historically, the site remained unoccupied from circa.1885 through until circa.1958 when a dwelling was located in the north western extent of site. Following this, the site is developed with outbuildings and a barn by circa.1959 to 2003, following which the site buildings were demolished, leaving only the stables. The various developments and demolitions of buildings on site, along with the noted ground conditions and onsite and nearby heaps are considered potential sources of soil contamination, with the potential to have impacted site soils with various substances including:

- Metals and metalloids / made ground
- Polycyclic aromatic hydrocarbons (PAH's)
- Asbestos

8.1.2 HAZARDOUS GROUND GAS AND VAPOURS

Potentially significant sources of ground gas generation have been identified in proximity to site, including a number of large moats or ponds located approximately 85-90m north (present from circa.1959 to circa.1980 and 2001); and a historical, unlicensed landfill located 149m south west of site and accepting inert, industrial and liquid sludge wastes (in effect from 1951-74). As the site is located in a predominantly high permeability superficial geological formation, and the moats and potentially the historical landfill are likely to be relatively shallow and located within superficial deposits, these features are considered potential sources of ground gas. Furthermore, the age since infill of the moats or ponds would indicate that, should these features be producing hazardous ground gases, the generational peak has likely not been passed at this stage.

TABLE 1. SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Probability of Pollutant Linkage	Consequence	Risk	Possible Mitigation
Contaminated Soils (<i>made ground / road chippings, demolitions and evidence of demolitions / PACMs, unspecified heap</i>)	Direct Ingestion & Direct Contact	Site Workers	Li	Md	M	Site workers to wear appropriate PPE for health and safety reasons, considered usage would mitigate this risk to LOW.
Contaminated Soils (<i>made ground / road chippings, demolitions and evidence of demolitions / PACMs, unspecified heap</i>)	Inhalation of Dust	Site Workers	Li	Md	M	
Contaminated Soils (<i>made ground / road chippings, demolitions and evidence of demolitions / PACMs, unspecified heap</i>)	Direct Ingestion & Direct Contact	End Users	Li	Md	M	Potential sources of soil contamination identified in the form of made ground deposits (road chippings, rubbles), a number of developments and subsequent demolitions and a large, unspecified heap on site. Recommend a Phase 2 Intrusive Site Investigation be planned and carried out on site, with areas of proposed soft-landscaping and made ground deposits targeted along with the area of unspecified heap in the east of site.
Contaminated Soils (<i>made ground / road chippings, demolitions and evidence of demolitions / PACMs, unspecified heap</i>)	Inhalation of Dust	End Users	Li	Md	M	
Contaminated Soils (<i>made ground / road chippings, demolitions and evidence of demolitions / PACMs, unspecified heap</i>)	Direct Ingestion	Flora and Fauna	Li	Md	M	
Contaminated Soils (<i>made ground / road chippings, demolitions and evidence of demolitions / PACMs, unspecified heap</i>)	Vertical and lateral migration	Controlled Waters	Lw	Md	M/L	
Contaminated Soils (<i>made ground / road chippings, demolitions and evidence of demolitions / PACMs, unspecified heap</i>)	Direct contact (<i>road chippings / made ground, impacted soil</i>)	Services (<i>pipe degradation and leaching</i>)	Lw	Md	M/L	
Ground Gases (Methane and CO ₂) (<i>historical landfill approx.149m SW & large, backfilled ponds approx.90m N</i>)	Vertical and lateral migration (<i>high permeability superficial deposits – potential pathway</i>)	End Users & Building Envelope	UI	Sv	M/L	Potential sources of ground gas generation identified and site is located in predominantly high superficial geology – recommend a Phase 2 Intrusive Investigation be carried out with integrated gas monitoring)
Volatile and Semi-volatile Organic Compounds (<i>no significant potential sources identified, investigated as part of Phase 2</i>)	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	No significant potential sources identified during report, ground conditions and potential contamination investigated as part of Phase 2 Works)
Radon	Vertical and lateral migration	End Users & Building Envelope	UI	Md	L	The site is not located in a Radon Affected Area.

KEY: Probability of pollutant linkage Hi = Highly likely, Li = Likely, Lw = Low Likelihood, UI = Unlikely
Consequence Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor,
Overall Risk VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

Based on the preliminary CSM for the site, an environmental risk assessment has been undertaken. A simple matrix can provide a consistent basis for decision making. It should be used with caution, recognising the over-simplification that it will normally represent. The probability and consequences are defined according to parameters relevant to the situation; the boundaries of risk acceptability (and tolerability, where relevant) indicated on the matrix provided in Table 2, can be tailored to the factors influencing the significance of the risk. Individual situations are mapped onto the matrix to provide a ready and consistent indication of their acceptability or tolerability.

TABLE 2. RISK CLASSIFICATION MATRIX

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High (Hi)	Very high risk	High risk	Moderate Risk	Moderate/Low Risk
	Likely (Li)	High risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood (Lw)	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely (UI)	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring. The risk evaluations for each plausible pollutant linkage are given in the last three columns of Table 1.

TABLE 3. CLASSIFICATION OF RISK

Very high risk (Vh)	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 undertaken already) and remediation are likely to be required.
High risk (Hi)	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 (Md)	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 (Lw)	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 (VI)	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.

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

9.0 ENVIRONMENTAL RISK ASSESSMENT

Based on the information contained in this report, it is the opinion of Castledine Environmental that the site represents a **MODERATE** level of risk with respect to the proposed development.

It is recommended that further investigation inline with Section 11.0 is planned and carried out on site.

This report should be submitted to your Local Planning Authority for agreement to allow the Phase 2 intrusive testing to be undertaken.

10.0 SUMMARY OF RISKS**10.1.1 SOIL CONTAMINATION**

The site currently comprises an open plot of land that is largely unoccupied save for a redundant stables and a concrete base. The site ground conditions comprise both anthropogenic and natural gravels, including some road planings and what appear to be demolition rubbles. Historically, the site remained unoccupied from circa.1885 through until circa.1958 when a dwelling was located in the north western extent of site. Following this, the site is developed with outbuildings and a barn by circa.1959 to 2003, following which the site buildings were demolished, leaving only the stables. The various developments and demolitions of buildings on site, along with the noted ground conditions and onsite and nearby heaps are considered potential sources of soil contamination.

10.1.2 GROUND GASSES AND VAPOURS

Potentially significant sources of ground gas generation have been identified in proximity to site, including a number of large moats or ponds located approximately 85-90m north (present from circa.1959 to circa.1980 and 2001); and a historical, unlicensed landfill located 149m south west of site and accepting inert, industrial and liquid sludge wastes (in effect from 1951-74). As the site is located in a predominantly high permeability superficial geological formation, and the moats and potentially the historical landfill are likely to be relatively shallow and located within superficial deposits, these features are considered potential sources of ground gas. Furthermore, the age since infill of the moats or ponds would indicate that - should these features be producing hazardous ground gases - the generational peak has likely not been passed at this stage.

11.0 RECOMMENDATIONS

It is recommended that a Phase 2 Intrusive Site Investigation is planned and carried out on site. This should take the form of either or both trial pitting and borehole formation, to facilitate the assessment of ground conditions on site (i.e. made ground, natural or reworked natural deposits, their nature, extent and composition) and the taking of environmental samples, for laboratory analysis. Provision should also be made to form ground gas monitoring installations, with a subsequent regime of ground gas monitoring planned and carried out on site.

12.0 REFERENCES**12.1 LEGISLATION AND REGULATIONS****12.1.1 ACTS**

- [1] Environmental Protection Act 1990, Part IIA: inserted by Environment Act 1995, Section 57. See Environment Act 1995 for text of Part IIA.

12.1.2 PLANNING REGULATIONS

- [2] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI1999/No.293
- [3] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2000 SI2000/No.2867

12.1.3 CONTAMINATED LAND REGULATIONS

- [4] The Contaminated Land (England) Regulations 2000. SI2000/No.227
- [5] The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663
- [6] The Contaminated Land (England) Regulations 2006 SI2006/No.1380

12.2 STATUTORY GUIDANCE

- [7] Department of Environment, Food and Rural Affairs. 2012. *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*. Department of Environment, Food and Rural Affairs
- [8] Communities and local Government, 2018: National Planning Policy Framework.

12.3 BRITISH STANDARDS

- [9] BS 5930:2015 Code of practice for site investigations
- [10] BS 10175:2011+A2:2017 Investigation of potentially contaminated sites - Code of practice
- [11] BS 8485:2015+A1:2019 BS 8485 - 2015 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings
- [12] BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

12.4 NON STATUTORY TECHNICAL GUIDANCE**12.4.1 ENVIRONMENT AGENCY**

- [13] Cassella Stranger, 2002. Model Procedures for the Management of Contaminated Land, Contaminated Land Report (CLR) 11, Department for Environment, Food, and Rural Affairs.

12.4.2 CIRIA PUBLICATIONS

- [14] Wilson, S., Oliver, S., Mallett, H., Hutchings, H., and Card, G.. 2007, *C 665 Assessing risks posed by hazardous ground gases to buildings* London: Construction Industry Research and Information Association
- [15] Mallett, H., Cox, L., Wilson, S. and ,Corban M... 2014, *C 735 Good practice on the testing and verification of protection systems for buildings against hazardous ground gases* London: Construction Industry Research and Information Association

12.4.3 CL:AIRE

- [16] Card G, Wilson S, Mortimer S. 2012. *A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17*. CL:AIRE, London, UK. ISSN 2047- 6450 (Online)

13.0 APPENDICES

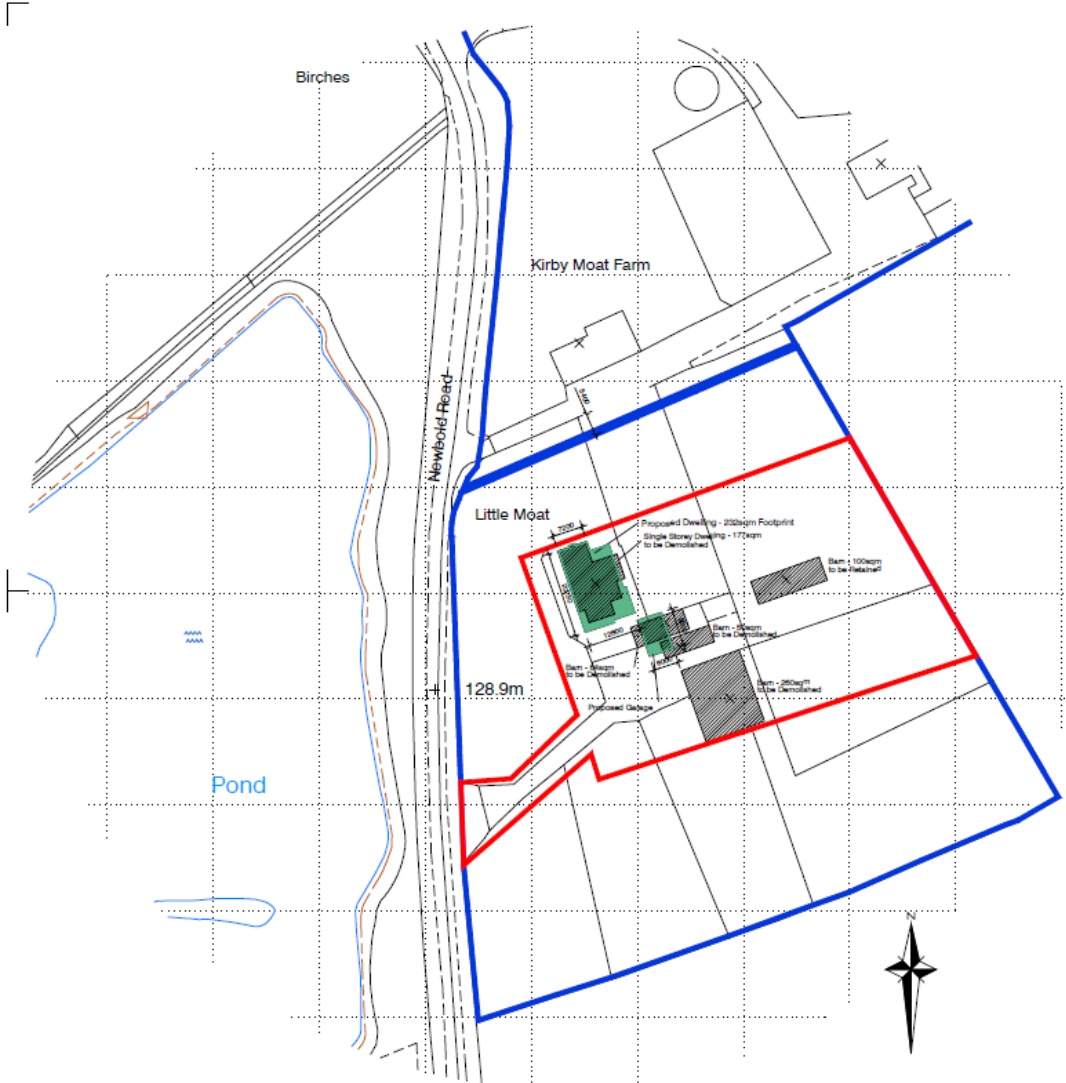
APPENDIX A ENVIRONMENTAL SEARCH

Separate Groundsure Report

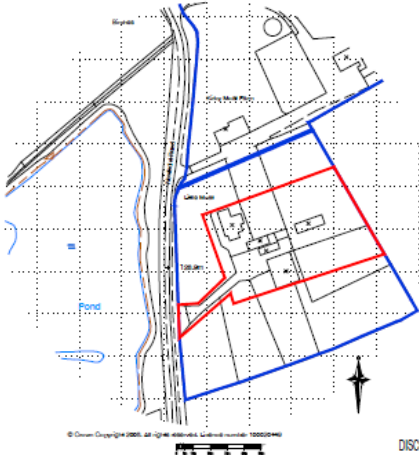
APPENDIX B HISTORICAL MAPPING

Separate Map Packs (2 No. files)

APPENDIX C PROPOSED AND CURRENT SITE PLANS



BLOCK PLAN 1:500



LOCATION PLAN 1:1250

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A	22-02-2018	PL	PROPOSED DWELLING
B	22-02-2018	PL	DEMOLITION DWELLING
C	22-02-2018	PL	DEMOLITION DWELLING

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AXONArchitects
+ Masterplanners

105 The Quadrant, 88, David St.
Leeds, LS1 4JL, England
Tel: 0114 276 0000
Email: info@axonarchitects.co.uk
www.axonarchitects.co.uk

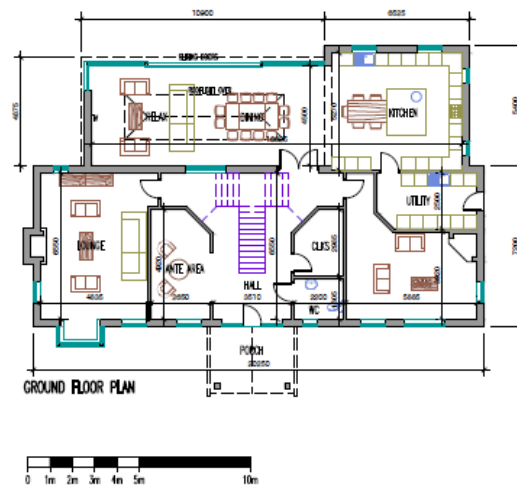
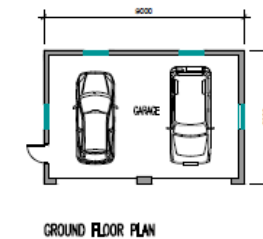
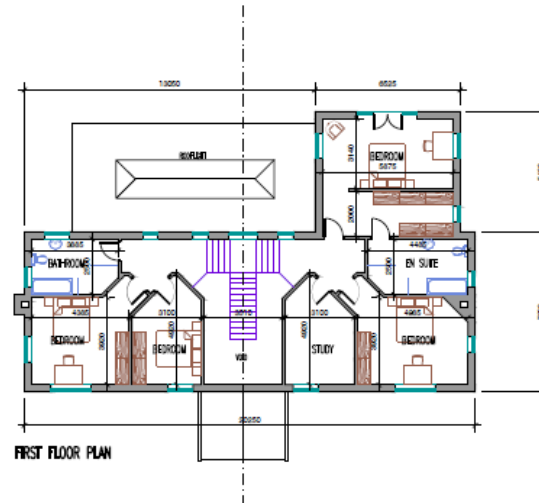
RIBA
Chartered Institute of Architects

Mr & Mrs Mout
Proposed Replacement Dwelling
Little Moat
Newbold Road, Kirkby Mallory

DATE: 22-02-2018
DRAWN: rja
CHECKED: rja
SCALE: 1:500/1:250

Site & Location Plan
171339-PL01
C

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AXONArchitects
 + Masterplanners

100 The Quadrant, 88 Chiswick Rd,
 Uxbridge, Middlesex, UB8 3PH
 Tel: 01895 833333
 Email: info@axonarchitects.com
 Website: www.axonarchitects.com

RIBA
 Chartered Institute of Building

Mr & Mrs Mout

PROPOSED:
 Proposed Replacement Dwelling
 Little Moat
 Newbold Road, Kirkby Mallory

DATE: 22-02-2018
 DRAWN: rja
 CHECKED: rja
 SCALE: 1:100

Proposed Ground & First Floor Plans

171339-PL02 A

APPENDIX D

SITE PHOTOS AND LOCATIONS



Site Walkover Photos

Photo No.1: Facing NE off Newbold Road showing the gated site access



Address: Little Moat, Newbold Rd, Kirkby Mallory
Client: Mr. T. J. Hall

Photo No.2: Facing NE showing the site access track leading to the main site area





Site Walkover Photos

Photo No.3: Facing slightly NE from the western extent of the main site area showing a timber heap and the stables (left)



Address: Little Moat, Newbold Rd, Kirkby Mallory
Client: Mr. T. J. Hall

Photo No.4: Facing north showing the northern extent of site





Site Walkover Photos

Photo No.5: Facing west from the central southern extent of site back towards the site access and Newbold Road



Address: Little Moat, Newbold Rd, Kirkby Mallory

Client: Mr. T. J. Hall

Photo No.6: Facing north from south of the centrally located former stables showing stables with central refrigeration unit





Site Walkover Photos

Photo No.7: Example shot of concrete flooring in central, formerly refrigerated unit of the stables



Address: Little Moat, Newbold Rd, Kirkby Mallory
Client: Mr. T. J. Hall

Photo No.8: Example shot of the concrete flooring in the stables to either side of the central refrigerated unit





Site Walkover Photos

Photo No.11: Facing south showing the northern face of the stables from the northern boundary of site



Address: Little Moat, Newbold Rd, Kirkby Mallory

Client: Mr. T. J. Hall

Photo No.12: Facing slightly SW from the NW extent of site back towards the site access showing proposed dwelling area



APPENDIX E**WATCHING BRIEF**

It remains possible that previously unexpected soil conditions may be encountered during the construction process. Examples may include oily pockets within the soil, potential for asbestos containing materials, black ashy materials, soils exhibiting strong odours, brightly coloured materials, and former demolition materials.

Should previously undiscovered contamination be encountered during the demolition/construction of the new buildings the following course of action should be adhered to:

1. The ground workers should report any suspected contamination immediately to the Client's site supervisor. The supervisor should contact the Client or their appointed agent who will in turn contact Castledine Environmental to request an engineer to visit the site to assess the extent of the 'contamination'.
2. Castledine Environmental shall make records of their inspection, and pass details of these to the Local Authority.
3. Where the conditions revealed differ from those previously anticipated, the Castledine Environmental shall take samples as deemed appropriate to be dispatched for appropriate chemical testing.
4. Depending on the results of the testing either:
 - a. no further work will be required;
 - b. a further detailed risk assessment will be required; and/or
 - c. Localised specific remedial measures will be necessary.
Appraisal criteria will vary depending on the nature of the assessment.
5. The results of any such testing will be sent to the Local Authority Pollution Control Section, Local Authority development control section, and the appointed building inspector. If remediation is required, the LA/Building inspector will be informed of the date and time of the proposed works.

6. Remediation will be undertaken in accordance with a method statement submitted for approval. The works shall be supervised where necessary by Castledine Environmental who shall provide a Verification Report for the Local Authorities.
7. A copy of the discovery strategy should be lodged on site and provisions made to ensure that all workers are made aware of their responsibility to observe, report and act on any potentially suspicious or contaminated materials they may encounter.

APPENDIX F

DISCOVERY STRATEGY

