

Report No. 30357/1
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**PRELIMINARY GEOENVIRONMENTAL APPRAISAL
OF LAND OFF
THE BLOSSOMS
POULTON-LE-FYLDE**

**Prepared for
BAXTER HOMES LIMITED**



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SUMMARY OF GEOENVIRONMENTAL ISSUES

The site exists as a roughly square parcel of undeveloped land covering a total area of approximately 1 hectare. The site is accessed from The Blossoms, which is off Garstang Road East, Poulton-le-Fylde, approximately 1km east of Poulton-le-Fylde town centre (OS Grid Ref: 335778E, 439351N).

Ground levels are generally level across the northern and eastern portions of the site, though a slight depression is present in the northeast corner. Ground levels in the west fall moderately to the southwest corner. Residential development borders the site on all sides. An industrial estate is present approximately 130m to the south. Relevant natural features in the local area include Main Dyke watercourse approximately 470m to the northeast and a tributary of Main Dyke 200m to the north.

The site is under consideration for residential development of 21No. dwellings, with private gardens and associated infrastructure. Proposed dwellings are understood to comprise a mix of mews, semi-detached and detached 2-storey homes. Proposals include retention of an on-site pond in the east, and provision of public open space along the west banks of the pond.

ALM have been commissioned by Baxter Homes Limited to carry out a preliminary geoenvironmental appraisal of the site. A summary of salient geoenvironmental issues is provided in the Table below.

Issue	Remarks
Made Ground	<ul style="list-style-type: none"> - Significant volumes of made ground are not anticipated to be present at the site, although small localised volumes cannot be ruled out.
Natural Ground	<ul style="list-style-type: none"> - A veneer of naturally occurring topsoil is likely to be present across the site. - Geological maps indicate that superficial deposits of glacial till underlie the site, which may comprise clay, silt, sand and gravels with variable cobble and boulder content. It is likely that cohesive deposits will be the dominant soil type. This is supported by the historical presence of a clay pit 90m to the northwest. - Peat deposits may be present beneath areas of the site prone to significant waterlogging. Such areas were identified in the southwest and northeast of the site during a walkover.
Groundwater	<ul style="list-style-type: none"> - Shallow groundwater is not anticipated to be present below much of the site, though may be present close to the on-site pond and as isolated perched pockets. - Surface soils are likely to be seasonally saturated, particularly in the southwest and northeast parts of the site.
Mining & Quarrying	<ul style="list-style-type: none"> - The study site is not located in a coal mining reporting area. - There are no brine affected areas within 75m of the study site. - The closest mineral extraction site is a historical clay pit 90m to the northwest.
Hazardous Gas and Radon	<ul style="list-style-type: none"> - In line with current guidance, a number of off-site features have been discounted as potential gas sources, due to the small scale of the features and the significant age of potential infill. - BGS radon maps (2022) indicate that the site is in the lowest band for radon potential, with less than 1% of homes at or above the Action Level. Basic radon protective measures are not required for new buildings.
Preliminary Risk Assessment	<ul style="list-style-type: none"> - There is a low likelihood of elevated contaminant concentrations being present in near surface soils at the site, and in any made ground that might be present. - Potential human health receptors that may be exposed to potential contamination sources include residential end-users, construction works personnel, transient users of the site, and recreational users of the on-site pond. The risk to such receptors is generally considered moderate. - Controlled waters receptors that may be exposed to potential contamination sources include the on-site pond and aquifers (superficial and bedrock) underlying the site. The risk to such receptors is generally considered low. - No credible off-site sources of contamination/ground gas have been identified.
Surface Water and Flooding	<ul style="list-style-type: none"> - The site is located in a Flood Zone 1 and is considered to be at low risk of flooding.

A phase 2 intrusive investigation of the site is recommended. The investigation should seek to confirm the chemical and physical nature of site soils, to inform an updated risk assessment, clarify the suitability of site soils for re-use in the proposed development, and inform geotechnical design of proposed buildings.

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02	Ground Investigation Fieldwork
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05	Hazardous Gas

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Drawing No.	Title
30357/1	Site Location Plan
FD206_01_A	Proposed Amended Site Layout (Fylde Design Associates Ltd)
30357/2	Site Features & Photograph Location Plan
30357/3	Indicative Ground levels
30357/4	Conceptual Site Model

Appendix C - Commission

Appendix D – Selected Photographs

Appendix E – Historical Ordnance Survey Maps

Appendix F – Search Responses

From	To	Date	Content
Landmark Information Group	ALM Consult Ltd	12/03/2024	Envirocheck Report

FOREWORD

This report has been prepared for the sole internal use and reliance of the Client and any of their nominated third parties. This report shall not be relied upon or transferred to any other parties without the express authorisation of the Client or ALM Consult Ltd (ALM); such authorisation not to be unreasonably withheld. If any unauthorised third party comes into possession of this report, they rely on it at their peril and the authors owe them no duty of care and skill.

The report presents observations and factual data obtained during ground investigation works that have been specified, designed and undertaken by others, and provides an assessment of geoenvironmental issues with respect to information provided by the Client regarding the proposed development. Further advice should be sought from ALM prior to significant revision of the development proposals.

The report should be read in its entirety, including all associated drawings and appendices. ALM cannot be held responsible for any misinterpretations arising from the use of extracts that are taken out of context.

The findings and opinions conveyed in this report (including review of any third party reports) are based on information obtained from a variety of sources as detailed within this report, and which ALM believes are reliable. All reasonable care and skill has been applied in examining the information obtained. Nevertheless, ALM cannot and does not guarantee the authenticity or reliability of the information it has relied upon and ALM shall not be held liable for the scope and appropriateness of investigations undertaken by others, the information from which has been utilised in preparing this report.

The report represents the findings and opinions of experienced geo-environmental consultants. ALM does not provide legal advice and the advice of lawyers may also be required.

Intrusive investigation can only investigate shallow ground beneath a small proportion of the total site area. It is possible therefore that the intrusive investigation undertaken at the site by others, whilst fully appropriate, may not have encountered all significant subsurface conditions. Consequently, no liability can be accepted for conditions not revealed by the exploratory holes. Any opinion expressed as to the possible configuration of strata between or below exploratory holes is for guidance only and no responsibility is accepted as to its accuracy

It should be borne in mind that the timescale over which the investigation works were undertaken may not allow the establishment of equilibrium groundwater levels. Particularly relevant in this context is that groundwater levels are susceptible to seasonal and other variations and may be higher during wetter periods than those encountered during this commission.

Where the report refers to the potential presence of invasive weeds such as Japanese Knotweed, or the presence of asbestos containing materials, it should be noted that the observations are for information only and should be verified by a suitably qualified expert.

This report assumes that ground levels will not change significantly from those existing at present and that houses will be of two-three storey construction. If this is not to be the case, then some modification to this report may be required.

ALM cannot be responsible for the consequences of changing practices, revisions to waste management legislation etc. that may affect the viability of proposed Remediation options.

ALM reserves the right to amend their conclusions and recommendations in the light of further information that may become available.

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1 INTRODUCTION

1.1 The Commission and Brief

1.1.1 ALM Consult Ltd (ALM), were commissioned by Baxter Homes Ltd to carry out a preliminary geoenvironmental appraisal ('Phase 1' Desk Study) of land located off The Blossoms, Poulton-le-Fylde.

1.1.2 Correspondence regarding ALM's appointment, including the brief for this investigation, is included in Appendix C. The agreed scope of works includes:

- A site walkover and inspection;
- An assessment of the site's land use history;
- Determination of the site's environmental setting;
- A preliminary assessment of anticipated ground conditions and development of a conceptual site model outlining potential contamination sources, relevant environmental receptors and likely pollution pathways.
- A preliminary assessment of potential engineering issues associated with redevelopment for the proposed residential end-use;
- Provision of recommendations for any appropriate 'Phase 2' intrusive site investigation works.

1.1.3 ALM have received the following drawings relating to the study site:

- *Fylde Design Drawing No.FD2406_01 Rev A: 'Proposed Amended Site Layout'*, dated 1st February 2024 (hereon referred to as 'The Site Layout Drawing')

1.1.4 It is understood that the site is under consideration for residential development of 21No. dwellings with private gardens and associated infrastructure, as shown on 'The Site Layout Drawing'. Proposed dwellings are to comprise a mixture of mews, semi-detached and detached homes, presumably of 2-storey construction.

1.1.5 'The Site Layout Drawing' indicates that the proposals include retention of an existing surface water pond in the southeast of the site, and provision of public open space to the west of the pond.

1.2 Report Format and Limitations

1.2.1 Standard definitions, procedures and guidance are contained within Appendix A, which includes generic information on assessment of the site's environmental setting.

1.2.2 This investigation comprised an inspection of historical and geological maps obtained from the British Geological Society (BGS) and Landmark Information Group (which includes information provided by the Environment Agency and local authority).

1.2.3 General notes and limitations relevant to all ALM Investigations are described in the Foreword and should be read in conjunction with this report. The text of the report draws specific attention to any modification to these procedures and to any other special techniques employed.

1.2.4 The primary aims of this of investigation were to identify salient geoenvironmental issues affecting the site to support a Planning Application for residential re-development, and to assist the design and costing of foundations any other abnormal development costs.

2 SITE DESCRIPTION

2.1 General

- 2.1.1 The site location is shown on Drawing No. 30357/1 presented in Appendix B to this report. Site details are summarised in the Table 1 below.

Table 1 - General Site Details

Detail	Remarks
Location	The site is accessed from The Blossoms via Poulton Drive, Poulton-le-Fylde, approximately 1km east of Poulton-le-Fylde town centre.
OSGR	335778E, 439351N
Approximate Area	1ha (Total)

2.2 Site Features

- 2.2.1 Existing salient features at the time of the site walkover are presented on Drawing No. 30357/2 in Appendix B.
- 2.2.2 A series of photographs taken during the site inspection and walkover survey are presented in Appendix D, the locations/orientations of which are illustrated on Drawing No.30357/2 in Appendix B.
- 2.2.3 The site exists as a roughly square parcel of open land. Ground levels are relatively uniform across the north and east area of the site, with a slight depression in the northeast. In the western site area, ground levels decrease moderately towards the southwest corner (see ALM Drawing No.30357/3 in Appendix B).
- 2.2.4 Access to the site is from The Blossoms in the south. A wooden slatted fence is present at the access point, with a section of Heras fencing acting as a gate (Plate 1 in Appendix D).
- 2.2.5 Thick low lying grassy vegetation is present across much of the surface of the site (Plate 2). Reed like vegetation indicative of waterlogged/marsh conditions is present along the western boundary and in the northeast corner of the site (Plate 3). Surface water pooling was observed in these locations and was particularly prominent in the northeast corner (Plate 4). Patches of dense woody brambles are sporadically present across the site.
- 2.2.6 A number of mature and semi-mature deciduous trees are present in the northwest corner of the site, and along the north boundary (Plate 5). Satellite imagery (google earth) indicates the trees have dense seasonal foliage. A dilapidated caravan is present close to the north boundary (Plate 6). A collapsed timber shed is present to the north of the caravan (Plate 7).
- 2.2.7 A surface water pond is present in the southeast of the site. A thick ribbon of brambles are present along the west bank of the pond, in addition to a number of semi mature deciduous trees (Plate 8). A very shallow gully extends along the northern portion of the west boundary, and was observed to contain standing water (Plate 9).
- 2.2.8 A number of concrete filled trenches were observed in the south-central part of the site (Plate 10). It is understood that these are strip foundations established as part of a previous residential planning application (between 2005 and 2007). The top of the concrete is roughly level with surrounding ground levels, and it is understood that no above-ground structures were ever erected as part of the works.

2.3 Surrounding Landuse

- 2.3.1 Land immediately surrounding the site to the north, east, south and west is residential. A number of surface water ponds are visible on satellite imagery to the east of the site, the nearest of which are approximately 30m and 50m from the site boundary. Residential development in the area to the east appears to be ongoing.
- 2.3.2 An industrial estate is located to the south of the site, southwards of Garstang Road East. The closest industrial unit is at a distance of approximately 200m from the site.

3 SITE HISTORY

- 3.1.1 In order to investigate the development history and previous land uses at the site and surrounding land, site centred extracts from Ordnance Survey (OS) plans dating back to 1847 were examined.
- 3.1.2 Table 2 below provides a summary of the salient points relating to the history of the site with respect to the proposed end use.

Table 2 - Site History

Date(s)	Site	Surrounding Land
1847 - 1960	The site is undeveloped and is part of a wider open pasture. A surface water pond is present in the southeast of the site.	<p>North: Land immediately north of the site is open pasture. The hamlet of Little Poulton is present ca.100m from the site. By 1930, residential dwellings are within 70m of the site boundary. A clay pit is present at a distance of approximately 90m northeast. The pit is labelled as 'old' by 1892, indicating extraction has ceased. The pit is no longer shown by 1937, indicating potential infilling.</p> <p>East: The surrounding area is open pasture with a number of small surface water ponds, the nearest of which are 55m and 135m from the site boundary. Main Dyke watercourse is visible ca.480m from the site.</p> <p>South: The surrounding area is open pasture with a number of small surface water ponds, the closest of which are 95m south and 210m southeast of the site boundary.</p> <p>West: Open pasture immediately borders the site. Small surface water ponds are present at distances of 85m and 130m from the site boundary. A set of railway tracks are present at a distance of approximately 200m from the site boundary. By 1930, a tennis court is present within 35m of the site boundary.</p>
1960 - Present	By 1960, an overhead electricity cable appears to pass over the southeast portion of the site, in a NE-SW direction. An electricity pylon is positioned within 10m of the site's east boundary. The cable and pylons are no longer shown by 1970.	<p>North: By 1960, a number of small outbuildings are present on adjacent land, the nearest being within 10m of the northwest site corner. By 2009, residential dwellings come within 15m of the northwest corner.</p> <p>East: Little change in the nearby area until after 2016, when residential development began commencement in the area located between 50m and 500m east.</p> <p>South: By 1970, a number of industrial units are shown in the area between ca.130m and 500m from the site. A shoe factory, 'garage' and knitwear factory are all within 140m distance of the site boundary. A building materials works is ca.225m distance. By 2009, dwellings are present next to the southwest boundary of the site.</p> <p>West: By 1970, a recreational park is present around the ponds to the west. An electric substation is shown ca.190m from the site boundary. A number of residential dwellings appear over the park area by 2001, and by 2006 the nearer pond (ca.85m) appears to have been infilled. By 2009, the local area has undergone more extensive residential development, including along the site's west boundary.</p>

3.1.3 In summary, the site appears to have remained undeveloped from the mid-19th century and has existed as part of a larger pasture. An overhead electricity cable briefly passed over the site between 1960 and 1970, after which, it was presumably re-routed below ground. Immediate surrounding land largely remained as undeveloped pasture with a series of surface water ponds until the 21st century, with a spike of residential development occurring from 2009. A nearby surface water pond to the west appears to have been infilled by 2006.

3.1.4 In the wider area:

- An industrial estate became established in the area beyond 130m south of the site by 1970;
- A clay pit was present approximately 90m northwest of the site boundary between 1847 and 1937, when it is presumed to have been infilled;
- A recreational park was present approximately 40m west of the site by 1970, centred around existing surface water ponds. Railway lines were/are situated further west (ca.200m).
- The area to the east remained undeveloped until after 2016, when residential development occurred.

4 ENVIRONMENTAL SETTING

4.1 General

- 4.1.1 Notes describing how the site’s environmental setting has been assessed are included in Appendix A to this report.
- 4.1.2 Information obtained from the British Geological Survey and Landmark Information Group in the form of an ‘Envirocheck Report’ (including information from the Environment Agency and others) are presented in Appendix F. This information is summarised below.

4.2 Geology

- 4.2.1 The British Geological Survey (BGS) 1:50,000 Sheet 66 (Blackpool) indicates that the site is underlain by glacial deposits of Till, which are likely to comprise cohesive soils with variable silt, sand, gravel, cobble and boulder content. Solid strata underlying the site are indicated to comprise Mudstone of the Singleton Mudstone Member.
- 4.2.2 There are no non-confidential BGS boreholes located within or close to the site.
- 4.2.3 Data in the Envirocheck Report provided by the BGS and National Geoscience Information Service provides a qualitative hazard potential rating for a range of ground stability categories at the site. These are summarised in Table 3 below.

Table 3 – Indicative Hazard Potential for Ground Stability Categories

Ground Stability Category	Inferred Hazard Potential
Potential for Collapsible Ground Stability Hazard	Very Low
Potential for Compressible Ground Stability Hazard	No Hazard
Potential for Ground Dissolution Stability Hazard	No Hazard
Potential for Landslide Ground Stability Hazard	Very Low
Potential for Running Sand Ground Stability Hazard	Very Low
Potential for Shrinking or Swelling Clay Ground Stability Hazard	Very Low

4.3 Hydrogeology

- 4.3.1 Superficial deposits below the site are designated as ‘Secondary Undifferentiated Aquifer’. This designation indicates that superficial deposits possess limited potential value for water supply or river baseflow.
- 4.3.2 Solid strata beneath the site are designated as ‘Secondary B’ Aquifer. This designation indicates a limited potential for water storage within fissures and fractures, and generally a low value for water supply or river baseflow.
- 4.3.3 The Environment Agency Groundwater Vulnerability Map (MAGIC Maps, 2024) indicates that groundwater below the site is classified as ‘Medium Vulnerability’. This indicates the potential risk to any strategic groundwater supplies is low, but there is a potential for contamination sources to impact on any private water supplies or groundwater fed rivers and ecosystems. In this regard, the site is not located within, or near to a groundwater Source Protection Zone (SPZ), and there are no recorded groundwater abstractions within 1km of the site.

4.3.4 Site sensitivity maps indicate that the potential for groundwater flooding to occur is limited across much of the site, but that groundwater flooding may occur in property situated below ground level in the southwest of the site (shown as a topographical low point on ALM Drawing No.30357/3).

4.4 Hydrology

4.4.1 A surface water pond is present in the southeast of the site, extending partly along (and beyond) the south and east boundaries. A number of other surface water ponds are present in the local area to the east and west of the site. The nearest are located approximately 30m and 50m to the east.

4.4.2 An unnamed 'inland river' is present to the north, flowing within 200m distance of the study site. The watercourse is not shown as a statutory main river on the Environment Agency [Statutory Main River Map](#). Historical maps show the watercourse as being a tributary of Main Dyke (designated as a statutory main river) which flows in a northerly direction within 468m northeast of the site.

4.4.3 The Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) Map indicates there is a very low probability of flooding from rivers or the sea occurring at the site.

4.4.4 There are no pollution incidents to controlled waters associated with the study site.

4.4.5 There are 5No. pollution incidents to controlled waters within 500m of the study site. Given the distances and direction of the incidents, the majority appear associated with the industrial estate to the south, and occurred during the 1990's. The nearest of these (189m SW) is a Category 1 – Major Incident in 1993, involving entry of fuel oils into an unspecified receiving water. There is also 1No. pollution incident positioned 275m to the north, involving entry of horse manure to an unspecified freshwater stream/river in 1998.

4.4.6 There are no recorded discharge consents relating to the study site, or any within 500m of the site.

4.4.7 There is 1No. surface water abstraction recorded within 1km of the site. This is positioned 761m to the southeast and relates to extraction of water from Main Dyke for the purpose of suppressing dust in refuse and recycling operations.

4.5 Mining and Quarrying

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

4.5.2 There are 2No. BGS recorded mineral sites within 500m of the study site. These were both opencast clay extraction pits located 472m to the northwest (The Breck Clay Pit) and 480m to the west (Poulton-le-Fylde Brick Works).

4.5.3 However, a closer historical clay pit was identified approximately 90m northwest of the study site boundary on historic maps dated between 1847 and 1937.

4.5.4 There are no brine affected areas within 75m of the study site.

4.6 Radon

4.6.1 BGS radon maps (2022) indicate that the site is in the lowest band for radon potential, with less than 1% of homes at or above the Action Level. Basic radon protective measures are **not** required for new buildings.

4.7 Designated Sites

- 4.7.1 There are no nearby statutory designated ecological sites. The nearest is the Wyre Estuary SSSI and Morecambe Bay Ramsar, approximately 1.8km to the northeast.
- 4.7.2 The study site is not within, or near to a Drinking Water Protected Area and there are no nearby Drinking Water Safeguard Zones for surface waters or groundwater.
- 4.7.3 The site is not located within a nitrate vulnerable zone.

4.8 Landfill and Waste Sites

- 4.8.1 There is 1No. recorded historical landfill site located within 500m, positioned 318m to the west of the site (Poulton Railway Cutting). Deposited waste is indicated to have included 'Inert Waste', and the last recorded waste input was December 1989.
- 4.8.2 There are 3No. licensed waste management facilities within 500m of the site, 2No. of which are potentially active. The nearest two are positioned 330m and 336m southeast of the study site, and are categorised as 'Household, Commercial And Industrial Transfer Stations'. The other is positioned 345m to the southeast and is categorised as a vehicle depollution facility.

4.9 Potentially Infilled Ground

- 4.9.1 There are 7No. areas of potentially infilled land (water features) within 250m of the site, 2No. of which are within 100m. The closest is positioned 8m to the east, and likely relates to minor infilling at the north of the existing site pond during construction/decommissioning of an electricity pylon between 1960 and 1970. The next nearest is positioned 97m to the southeast, and relates to infilling of a small pond during construction of Poulton Road East (now Garstang Road East) prior to 1930. Other features identifiable on historic maps are 2No. small ponds infilled prior to 1930, in the area between 140m and 190m south/southeast.
- 4.9.2 There is one area of potentially infilled land (non-water) within 250m of the site, which is positioned 88m to the west. The location correlates with an old clay pit that was likely infilled around 1937.

4.10 Other Issues

- 4.10.1 There are 2No. fuel station entries within 500m of the site, positioned 254m southeast and 310m southwest. Both are listed as obsolete.
- 4.10.2 There are no recorded sites associated with hazardous substances within 1km of the site (e.g. COMAH, NIHHS, explosive sites).
- 4.10.3 A review of contemporary trade directories has not identified any directories near to the site which are considered relevant to the preliminary risk assessment.

5 PRELIMINARY RISK ASSESSMENT

5.1 Introduction and Legislative Background

5.1.1 The principal legal framework for dealing with contaminated land in England is set out in Part 2A of the Environmental Protection Act 1990, as amended ('Part 2A'). Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment. Under Part 2A the starting point should be that land is not contaminated land unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with Statutory Guidance, should be considered as meeting the Part 2A definition of contaminated land.

5.1.2 The over-arching objectives of the Government's policy on contaminated land and the Part 2A regime are:

- To identify and remove unacceptable risks to human health and the environment;
- To seek to ensure that contaminated land is made suitable for use; and
- To ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development.

5.1.3 [Land Contamination Risk Management guidelines](#) outline a structured process for managing potential land contamination, including its identification, assessment of potential risk to relevant receptors, and remediation of contamination where appropriate. The process must always start with a preliminary risk assessment, which includes development of a conceptual site model (CSM). This outlines potential contaminant linkages which comprise:

- 'Contaminant' - A substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters;
- 'Receptor' - Something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters; and
- 'Pathway' - A route by which a receptor is or might be affected by a contaminant.

5.1.4 For a risk to exist there must be contaminants present in, on, or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters.

5.1.5 All three elements of a contaminant linkage must exist for a significant risk to be present, and before land can be considered as potentially contaminated land under Part 2A, including evidence of the actual presence of contaminants. The term 'significant contaminant linkage' means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. The term 'significant contaminant' means the contaminant which forms part of a significant contaminant linkage.

5.1.6 The aim of the conceptual model is to provide a preliminary assessment of the likelihood of a '*contaminant linkage*' for each potential combination of contaminant source, pathway and receptor.

5.2 Anticipated Ground Conditions & Potential Issues

5.2.1 Based on the data reviewed in Section 3 (Site History) and Section 4 (Environmental Setting), Table 4 summarises the anticipated ground conditions.

Table 4 - Anticipated Ground Conditions

Anticipated Condition	Remarks
Made Ground	<p>There has been no visual or olfactory evidence of the following:</p> <ul style="list-style-type: none"> • Storage tanks • Raw material or chemical use • Solid, hazardous or industrial wastes • Spills or releases <p>A shallow layer of naturally occurring topsoil (<0.5m) is likely to be present across the site. If found to contain significant amounts of anthropogenic materials such as brick or glass, the topsoil will be considered made ground. However, this is not considered likely. Localised granular made ground maybe present in the south of the site, associated with previous development works that comprised localised construction of strip foundations.</p>
Natural Soils	<p>Naturally occurring topsoil is anticipated to be present across the site. BGS mapping indicates that topsoil is likely to be underlain by glacial till deposits. Glacial till is anticipated to comprise cohesive strata with variable amounts of silt, sand and gravel content. Localised areas of peat may be present in the northeast and southwest, where waterlogged conditions are observed at the surface.</p>
Bedrock	<p>Solid strata beneath the site is indicated to comprise Mudstone of the Singleton Mudstone Member.</p>
Mine workings	<p>The site is not located in a coal mining reporting area. There are no recorded brine affected areas within 75m of the site.</p>
Groundwater	<p>Groundwater may be present as non-continuous perched pockets within glacial till deposits. Near surface soils in the northeast and southwest of the site are expected to be saturated. Slight waterlogging in other areas of the site indicates poor natural drainage. Relatively shallow groundwater may be present close to the site pond in the east of the site (≥1m). The surface of the pond is approximately 1m below surrounding ground levels.</p>
Vegetation	<p>A number of mature and semi-mature deciduous trees are present in the northwest corner of the site, along the north boundary, and down sections of the east boundary. Patches of dense woody brambles are sporadically present across the site. Reed like vegetation is present in the northeast corner of the site and partly along the west boundary, where waterlogged/marshy ground conditions are most prominent. Low lying grassy vegetation covers much of the site surface, presumably growing in a naturally occurring topsoil.</p>

5.2.2 Based on the data above and that in Section 2 (Site Features) and Section 3 (Site History), Table 5 summarises potential ground-related issues associated with this site.

Table 5 - Anticipated Ground-Related Issues

Type of Issue	Specific Issue to be Assessed	Remarks
Potential on-site contamination sources	<ol style="list-style-type: none"> 1. Elevated concentrations of organic and/or inorganic contaminants. 	<ol style="list-style-type: none"> 1. There is a low potential for elevated concentrations of organic/inorganic contaminants to be present in topsoil and/or made ground at the site.
Potential off-site contamination sources	<ol style="list-style-type: none"> 1. Infilled ponds in the local area 2. Historical Landfill Site 	<ol style="list-style-type: none"> 1. Backfill soils may contain elevated concentrations of organic contaminants. Gas generating potential should be considered. 2. There is a historical landfill located 318m to the west. Gas generating potential should be considered.

Table 5 continued...

Type of Issue	Specific Issue to be Assessed	Remarks
Potential Geotechnical Hazards	<ol style="list-style-type: none"> 1. Aggressive ground (Sulphates) 2. Compressible Ground 3. Volume change potential of cohesive soils 	<ol style="list-style-type: none"> 1. Natural strata may comprise elevated levels of soluble sulphates which can influence foundation design 2. Potential presence of peat beneath sections of the site prone to significant waterlogging. 3. Shrinkage or swelling in natural soils may present geotechnical hazard.

5.3 Conceptual Site Model

5.3.1 Based on the desk study information, this section identifies potential contamination sources, environmental pathways and potential environmental receptors.

5.4 Potential On-site Sources

Topsoil/Made Ground

5.4.1 It is anticipated that a veneer of topsoil will be present across the site. Topsoil may have been potentially been reworked through historical agriculture, and may have been locally impacted by the presence of construction plant during previous works at the site. Although the presence of such contaminants is initially considered low likelihood, contaminants that could be present include:

- Heavy metals – Associated with wear and tear of agricultural/construction machinery;
- Polycyclic Aromatic Hydrocarbons (PAH's) and Total Petroleum Hydrocarbons (TPH's) – Associated with potential spillages of fuel/lubricant/engine oils.

5.4.2 Although not anticipated, the potential presence of localised made ground deposits cannot be ruled out. Made ground can contain a wide range of organic and inorganic contaminants, including those outlined above.

5.5 Potential Off-site Sources

Potentially Infilled Land

5.5.1 There are a number of potentially infilled land features in the local area, 3No. of which are within 100m of the site. The closest is 8m east and appears to be a very small area of potential infill associated with the construction/demolition of an electricity pylon between 1960 and 1970. The other 2No. features relate to infilling of a pond 97m southeast prior to 1930, and infilling of an old clay pit 88m to the west prior to 1937.

5.5.2 Current guidance¹ states that small features infilled a long time ago are unlikely to be significant gas sources due to the limited volume and age of infill. In consideration of the age and scale of the identified features, they are not considered as credible gas sources. Additionally, the inferred geological and hydrogeological characteristics of the local area indicate a very limited potential for migration to the site.

Potential Off-Site Source – Landfill

5.5.3 A historical landfill site is recorded 318m to the west. The landfill is noted to be a former railway cutting that has been infilled with deposited waste that includes inert waste. There is no mention of potentially gas generating wastes in the site details. In consideration of available information, and the distance between the study site and landfill, it is not considered as a credible off-site source of ground gas or contamination.

5.6 Potential Receptors

Human Health

5.6.1 The proposed end-use of the site is classified as 'residential'. The site is not located near agricultural land or land grazed by livestock. There are no nearby potable water abstractions.

5.6.2 The primary human health receptors are:

- Residential end-users of the proposed development;
- Transient users of the site;
- Recreational users of the on-site pond;
- Construction works personnel.

Controlled Waters

5.6.3 The following controlled waters features have been identified as potentially relevant receptors in the local area:

- Superficial and bedrock aquifers – Both are considered as low sensitivity and unlikely to meet the definition of a 'Groundwater Body', as defined by 'The UK Technical Advisory Group on the Water Framework Directive' (UK TAG). There are no licensed water abstractions within 1km of the site, and the future resource potential of the aquifers is considered to be low value;
- On-site pond – Considered to be of local importance due to ecological and recreational value;
- Main Dyke - A statutory Main River, located 468m northeast of the site;
- Unnamed surface drain – A tributary of Main Dyke, located 200m north of the site;

5.7 Potential Pathways

5.7.1 Human health receptors may potentially be exposed to potential contaminant sources via the following pathways:

- Inhalation of dust/vapours;
- Direct dermal contact with contaminated soils;
- Ingestion of contaminated soils/groundwater/homegrown produce;
- Ingestion of impacted freshwater (pond) through recreational activities;
- Consumption of impacted fish species from on-site pond (bioaccumulation).

5.7.2 Controlled waters receptors may potentially be exposed to potential contaminant sources via the following pathways:

- Leaching of dissolved phase contaminants to groundwater;
- Groundwater migration of contaminants to the on-site pond;
- Overland surface flow of contaminants to on-site pond.

5.7.3 There are no visible surface waters connecting the on-site pond to Main Dyke or its tributary to the north of the site. The inferred hydrogeological setting indicates a limited potential for groundwater transport of dissolved phase contaminants over significant distances.

¹NHBC NF94 'Hazardous Ground Gas – An Essential Guide For Housebuilders' (section 1.4.5)

5.8 Risk Classification

5.8.1 A risk matrix (Table 6) has been used to qualitatively classify risk, by assessing the probability of occurrence against the severity of impacts.

Table 6 - Categorization of Risk (Based on Table 1.8 of R&D66)

Probability (Likelihood)	Consequence			
	Severe	Moderate	Mild	Minor
High Likelihood	Very High Risk	High Risk	Moderate Risk	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

5.8.2 The criteria used to determine the probability of occurrence and the severity of impacts are presented in Table 7 and 8 below.

Table 7 – Assessment criteria for severity of impacts

Term	Description
Severe	There is an acute risk to human health and/or potential for significant pollution of controlled waters, and/or a potential for significant damage to buildings or property.
Moderate	There is a long-term risk to human health and/or the potential for pollution of sensitive controlled waters receptors, with significant adverse impacts on sensitive ecosystems and fauna.
Mild	It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst if any harm was realised any effects would be mild.
Minor	A hazard may exist but does not give rise to the potential to cause harm to a designated receptor.

Table 8 – Assessment criteria for probability of impact occurrence

Term	Description
High Likelihood	All aspects of the pollutant linkage may be present and there is existing evidence of impacts to a receptor, or near certainty of impacts to occur in the long-term.
Likely	All aspects of the pollutant linkage may be present, and it is probable impacts to a receptor will occur in the long-term.
Low Likelihood	The sources, pathways and receptors may be present, but there are limitations on a pollutant linkage being present.
Unlikely	The sources, pathways and receptors may be present, but it is unlikely a pollutant linkage will be present.

5.8.3 The risk classifications for each identified contaminant linkage are summarised in Table 9. Contaminant linkages are also illustrated on a Conceptual Site Model, presented as Drawing No.30357/4 in Appendix B to this report.

5.8.4 The conceptual site model would be subject to modification and refinement in light of data arising from any intrusive ground investigation undertaken at the study site.

Table 9 – Potential Source-Pathway-Receptors derived from desk study information

Potential Source	Potential Pathways	Likely Receptors	Severity of Impact	Probability of Occurrence	Risk Classification	Remarks
On-site Topsoil/Made Ground	Dermal contact, inhalation of dust/vapours. Ingestion of soils/groundwater/homegrown produce	Human Health – residential end-users	Severe	Low likelihood	Moderate/Low	Potential re-use of topsoil in private gardens could result in end-user exposure. However, the presence of contamination is not considered likely. Exposure to groundwater is considered very unlikely and a low risk scenario.
		Dermal contact, inhalation of dust	Human Health – construction personnel	Severe	Low likelihood	Moderate
	Ingestion of impacted freshwater/freshwater ecology	Human health - Recreational users of on-site pond	Moderate	Low likelihood	Moderate/Low	Low sensitivity receptor. May act as pathway to underlying bedrock aquifer. However, the presence of contamination is considered low likelihood.
		Leaching of dissolved phase contaminants and vertical migration to groundwater	Controlled Waters – Secondary Undifferentiated superficial aquifer	Mild	Low likelihood	Low
	Controlled Waters – Secondary B bedrock aquifer		Mild	Low likelihood	Low	Watercourse is important at very localised scale. Existing site is heavily vegetated and unlikely to have significant soil erosion rates. Only eastern portion of the site draining towards pond area. Topsoil likely to be stripped and placed away from pond prior to proposed works.
	Surface overland flow of contaminants	Controlled Waters - On-site Pond	Mild	Low likelihood	Low	Shallow groundwater likely to exist as non-continuous perched pockets in glacial till, with limited lateral movement through cohesive strata. Considered low likelihood but not unlikely due to proximity of pond.
			Mild	Low likelihood	Low	As above. Pathway considered unlikely due to significant distance to watercourses.
	Groundwater transport of contaminants	Controlled Waters - Main Dyke/Tributary	Moderate/Mild	Unlikely	Very low	No apparent surface waters connecting on-site pond with Main Dyke or its tributary.
			Moderate/Mild	Unlikely	Very low	
	Surface water transport of contaminants	Controlled Waters - Main Dyke/Tributary	Moderate/Mild	Moderate/Mild	Unlikely	Very low

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 General

- 6.1.1 It is understood that consideration is being given for development of the site for residential use. *Fylde Design Drawing No.FD2406_01 Rev A* indicates the development will comprise 21No. residential dwellings, with a mix of mews, semi-detached and 2-storey homes. Development plans also comprise retention of an existing surface water pond in the southeast of the site, and provision of public open space along the west boundary of the pond.
- 6.1.2 This report presents a review of historical data and environmental search information, to provide an initial assessment of likely ground conditions and soil/groundwater contamination to establish a conceptual site model, which will form the basis of future ground investigation at the site.

6.2 Historical Development

- 6.2.1 The study site has remained undeveloped since at least the late 19th century, with the on-site pond existing since at least this time. A planning permission for residential development of the site was granted in 2005. Subsequent works were limited to localised construction of strip footings in the south-central part of the site. The footings, were noted to still be present during the site walkover, along with a collapsed timber shed and dilapidated caravan at the north end of the site.
- 6.2.2 Land parcels bordering the site generally remained as undeveloped pasture through the 19th century and much of the 20th century, though a clay pit was noted 90m to the northwest between 1847 and 1937. By 1970, a recreational park was located 40m to the west and an industrial estate was developed 130m south.
- 6.2.3 By 2009, the area to the west of the site underwent residential development, with dwellings along the site's west boundary. By 2016, the area to the east underwent residential development.

6.3 Ground and Groundwater Conditions

- 6.3.1 In consideration of the site's undeveloped nature, it is considered unlikely that significant made ground deposits will be present. However, the presence of small volumes of made ground on the site cannot be ruled out.
- 6.3.2 A narrow veneer of naturally occurring topsoil is likely to be present below the surface. Published geological maps indicate that topsoil is likely to be underlain by superficial deposits of glacial till. Glacial till may comprise clays, silts, sands and gravels with varying cobble and boulder content. However, cohesive deposits are anticipated to be the primary soil type. Solid strata beneath the site is indicated to comprise Mudstone of the Singleton Mudstone Member.
- 6.3.3 Superficial deposits are designated as 'Secondary Undifferentiated' aquifer, whilst bedrock is designated as 'Secondary B' aquifer. The site is not located in a groundwater Source Protection Zone, and there no recorded groundwater abstractions in the immediate vicinity of the site.
- 6.3.4 The nearest watercourse is the on-site surface pond, which does not appear have a significant inflow/outflow linking it to other surface water features in the local area. Main Dyke (Statutory Main River) is located 468m to the east, and a tributary is located 200m north.
- 6.3.5 Shallow groundwater may be present as non-continuous perched pockets within the glacial till. However a consistent shall water table (<2m) is not expected below the site.

6.4 Mining and Quarrying

6.4.1 The site is not located in a coal mining area and does not appear to have been affected by mining or quarrying. The nearest mineral extraction site identified is a historical clay pit 90m to the northwest which was likely infilled by 1937. Other clay pits were noted further to the west and northwest (approximately 480m distance).

6.5 Hazardous Gas

6.5.1 No significant potential sources of hazardous gas have been identified in this desk study.

6.5.2 BGS radon maps (2022) indicate that the site is in the lowest band for radon potential, with less than 1% of homes at or above the Action Level. Basic radon protective measures are **not** required for new buildings.

6.6 Preliminary Contamination Risk Assessment

6.6.1 A preliminary risk assessment has been undertaken utilising the available sources of information in line with prevailing guidance.

6.6.2 The potential for on-site contamination is considered as low likelihood, in consideration of the largely undeveloped nature of the site. However, the potential for contamination to be present in on-site reworked topsoil, and in any made ground that may be present, cannot be ruled out.

6.6.3 The primary receptors for human health risk identified through the preliminary risk assessment are residential end users, construction workers, transient users of the site, and recreational users of the on-site pond.

6.6.4 The primary controlled waters receptors identified through the preliminary risk assessment are underlying aquifers and the on-site surface water pond.

6.6.5 The overall risk to human health receptors is generally considered as low to moderate. The overall risk to controlled waters receptors is generally considered low. The risk classifications take the likely absence of contamination into consideration, alongside the severity of potential impacts and probability of occurrence.

6.7 Flooding

6.7.1 The site is located in a Flood Zone 1, indicating that there is a low risk of flooding.

6.8 Recommendations

6.7.1 A phase 2 intrusive investigation of the site is recommended, and should achieve the following objectives:

- Confirm the chemical characteristics of near surface soils beneath the site to inform an updated risk assessment and clarify the suitability of site soils for reuse in the proposed development;
- Confirm the physical nature of shallow deposits beneath the site, including the shear strengths of cohesive strata to inform foundation design of proposed plots, and the potential presence of peat in waterlogged areas.