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LAND OFF FULLSHAW LANE,
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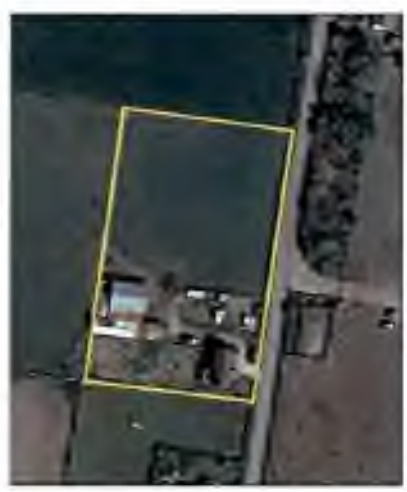

PHASE 1 PRELIMINARY GEO-ENVIRONMENTAL RISK ASSESSMENT

Prepared by

SILKSTONE ENVIRONMENTAL LTD

For

MR M CLYNCH

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EXECUTIVE SUMMARY

Site Location	The site is located off Fullshaw Lane, Langsett, approximately 20km north-west of Sheffield city centre at National Grid Reference 420957, 401276.
Development	The proposed change of use of an agricultural building (barn) to one dwelling house.
Existing Features	The site currently comprises a two-story stone built residential dwelling with several small outbuildings, two large barns and a possible septic tank in the southern half of the site and an open field forming the majority of the site to the north.
History	Historically the area is dominated by agricultural land. By 1891 the existing residential dwelling in the southeast corner of the site (shown as two buildings) had been developed which had been extended by 1964. By 2002 two large barns were built on the western boundary.
Geology	No recorded Artificial Ground, Made Ground or superficial deposits recorded on site, but some Made Ground is anticipated associated with the barns. This overlies bedrock comprising mudstone, siltstone, and sandstone. The Hard Bed (Ganister) coal seam is identified to outcrop beneath the eastern part of the site.
Coal Mining	There is a risk of ground instability / differential settlement from unrecorded shallow workings (<30m) in the Hard Bed (Ganister) coal seam beneath the site. The potential extent of the area that may be affected will depend on the confirmed location of the coal seam outcrop in relation to the proposed development.
	There is a potential for unrecorded mine entries to be present on site. However, this risk would normally be negated on the establishment of foundations for development structures when it is usual practice to undertake a surface scrape.
Hydrogeology	Bedrock Secondary (A) Aquifer with medium groundwater vulnerability but protected at the surface by soils of low leaching class. No groundwater protection zones within 500m and poor chemical quality of groundwater regionally. The sensitivity of groundwater as a receptor to potential contamination is not considered to be highly significant.
Hydrology	Nearest watercourses are small streams approximately 350m east and 380m northwest. There are two surface water abstractions for potable (drinking) water use within 2km which are sensitive receptors. However, the potential risk to these receptors from the site is not considered of high significance.
Flood Risk	The site is located within a Flood Zone 1 (low probability of flooding) and is therefore unlikely to require a flood risk assessment.
Ground Gases	Potential sources of ground or landfill gas (mainly methane and carbon dioxide) have been identified from two recorded landfill sites, areas of Made Ground, surface workings and potential shallow mine workings within 250m of the site which may present a risk to the proposed development.
	The site is not located within a Radon Affected Area and no radon protection measures are required for new development.
Ecology	A potential for roosting bats (protected species) has been identified within both barns which is believed to have been addressed as part of an ecological survey.
Risk Overview	In the context of the proposed development the assessment has derived the overall level of environmental risk to human health and the wider environment from on and off-site sources to be **Low to Moderate.** The risks relate to the following: • To construction workers and future occupants of the development from potential asbestos containing materials within the fabric of the barn buildings, from contaminants within the underlying Made Ground and from ground gas (methane and carbon dioxide) . • Potential explosive damage to the proposed conversion associated with the risk from methane gas. • Ground instability/differential settlement to the building from unrecorded shallow coal mining below the site. Under normal circumstances for new development, a rotary drilling investigation to confirm the location of the coal seam outcrop with respect to the proposed development would be required. However, the proposed development is for the conversion of an existing barn using the existing foundations and if no new significant structures are proposed, this requirement is exempt.
Recommendations	*Phase 2 (intrusive) ground investigation of the proposed development area involving:* • Dynamic (window) to characterise the nature of the underlying soils, to assess contamination status and to establish gas monitoring points. • A programme of gas monitoring from the monitoring points involving 6 no. visits at 2 weekly intervals to enable an assessment of gas risk.
	A refurbishment/demolition survey for asbestos containing materials (ACMs) within both barn structures to identify any ACMs requiring safe removal prior to demolition/ conversion.

This Executive Summary should be read in conjunction with the entire report as it is only a brief account highlighting the key findings of the report.

CONTENTS

APPENDICES

TABLES

KEY REFERENCES

A *Land Contamination Risk Management*, Environment Agency (April 2021)[1].
B Guiding Principles for Land Contamination, Environment Agency (March 2010).
C Town and Country Planning Act 1990.
D National Planning Policy Framework (July 2018).
E Revised Statutory Guidance dated April 2012 implementing the contaminated land provisions under Part 2A of the Environmental Protection Act 1990.
F CIRIA 665 *'Assessing Risks Posed by Hazardous Ground Gases to Buildings'* (2007).
G BR 211 *Radon, Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions, and refurbishment projects)*, BRE, 2015.
H CIRIA Report C758D, Abandoned mine workings manual, CIRIA, 2019.

[1] Replaces Contaminated Land Report (CLR) 11 '*Model Procedures for the Management of Land Contamination*' Environment Agency, September 2004.

1.0 INTRODUCTION

1.1 Brief

Silkstone Environmental Ltd (SEL) have prepared a Phase 1 Preliminary Geo-Environmental Risk Assessment (also known as a Desk Study) for an area of land off Fullshaw Lane, Langsett, Sheffield (the site) following telephone instruction from Mr M Clynch (the Client), dated 7th March 2022.

The site is located off Fullshaw Lane and currently comprises a two-story stone built residential dwelling with several small outbuilding and two large barns at the southern end of the site and an open field occupying the majority of the site to the north.

The report has been prepared in accordance with Condition 4 of the planning permission for the proposed development comprising a change of use of an agricultural building to one dwelling house.

The stated purpose of this work is to carry out a Phase 1 Preliminary Geo-Environmental Risk Assessment which will assess the potential for historic contamination at the site which may adversely impact upon human health and/or the wider environment. Geotechnical issues have also been considered and a review made of the potential for instability at the surface from former coal mining legacy operations. The report has been compiled in general accordance with Refs. A & B as a 'Preliminary Risk Assessment', as defined therein.

This preliminary assessment will highlight the potential requirements for further assessment via an intrusive investigation if considered appropriate. This has been determined based on the following:

- A review of the site history including previous surrounding land uses.
- Determination of the environmental setting by reference to geology, mining / quarrying, hydrology, flood risk, hydrogeology, risks associated with hazardous gases (such as radon, landfill gas, mine gas), proximity to infilled ground, permitted industrial processes and other activities such as Control of Major Accident Hazard (COMAH) and explosive sites.
- A description of the site from a site walkover and inspection.
- An assessment of anticipated ground conditions including potential contaminants.
- An assessment of anticipated foundation and engineering issues associated with the development.
- An inspection of historical and geological maps and information provided by the Local Planning Authority, Environment Agency, British Geological Survey, and the Coal Authority, as appropriate.
- A risk assessment in the context of the site proposals based on an appraisal of the potential contamination sources, pathways, and receptors in an outline conceptual site model.

Conclusions are given alongside any further recommendations. No other site investigations are known, or have been made available to SEL.

1.2 Legislative and Regulatory Context

If land proposed to be developed is suspected of being contaminated either historically or by its current use, an investigation will be requested by the Local Authority under the Town and Country Planning Act (1990) (Ref. C) and the National Planning Policy Framework (Ref. D) to determine the level of risk and if remediation is necessary or whether there may be grounds for the land to be considered contaminated under Part 2A of the Environmental Protection Act 1990 (Ref. E). Under this regime investigations are carried out to determine if the current condition of the site is suitable for its proposed use.

1.3 Guidance and Information Sources Used Within This Report

This report has been produced in line with relevant guidance and best practice and in particular references A, B, C, D, E, F, G and H. This list includes all of the cited references. It is not exhaustive and comprises only the principal references used in conducting this risk assessment.

1.4 Report Limitations

The conclusions reached in this report are necessarily restricted to those which can be determined from available information and may be subject to amendment in the light of additional information becoming available or to changes in relevant legislation.

This report is strictly confidential to the party to whom it is addressed and may only be relied upon by that party or their other professional advisors, for the specific purpose to which it refers. Any third party using this report does so entirely at their own risk and SEL accepts no responsibility or liability for any costs, claims, damages, or expenses (including consequential damages) as a result of this report or any part of its contents being used by any third party.

Except in connection with the specific purpose for which this report has been prepared, neither the whole nor any part of this report, nor any reference thereto, may be included in any published document, circular or statement, nor published in any way, nor disclosed orally to a third party, without the written approval from SEL of the form and context of such publication or disclosure. Such approval is required whether or not SEL are referred to by name and whether or not the report is combined with others.

SEL are unaware of any conflicts of interest in the preparation of this report.

2.0 ENVIRONMENTAL SETTING

2.1 Site Location

The site is located off Fullshaw Lane, Langsett, Sheffield, approximately 20km north-west of Sheffield city centre. A site location plan is presented as Figure 1 in Appendix A and the site boundary is shown outlined red on the existing site layout plan, presented as Figure 2, also included in Appendix A.

The National Grid Reference (NGR) for the centre of the site is 420957, 401276. The site is approximately 0.73ha in area and situated at an approximate height of 297m Above Ordnance Datum (AOD) to 294m AOD, dipping gently from southeast to northwest.

2.2 Historical Land Use

Information relating to the historical uses of the site and surrounding area has been determined from a review of the following:

- The large scale (1:1250 and 1:2500) and small scale (1:10,560 and 1:10,000) historical Ordnance Survey (OS) maps dating from 1854 to 2022 (Appendix B).
- Google Earth aerial imagery dated 2002-2020, and;
- A Groundsure environmental data report for the site (Appendix C).

It is important to note that any date referred to in this section refers to the date a feature appears on the map, not necessarily the date the actual feature was first present. Additionally, the marked site boundary may appear to move with respect to successive editions. This is predominantly due to minor variations in the OS with time.

Within the Site

The earliest mapping (1854) shows the site to be undeveloped, existing as a field with a track extending along the inside of the northern boundary. This remained unchanged until 1891 when two small apparent residential buildings are shown in the southeast corner of the site. In 1893 these buildings were labelled Field House. The buildings remained unchanged until 1964 when they were extended. The site remained unchanged until 2003 when a large building was built along the western boundary, the layout of which is consistent with the existing barns.

Google Earth aerial imagery from 2002 onwards shows this large building to be two large barns. Several small outbuildings are also shown within the southern half of the site. The northern half of the site has remained undeveloped, continuing to exist as a field.

Surrounding Area

The earliest mapping (1854) shows the site to be rural with Lower Paw Hill Farm (337m NE), Bradshaw Farm (233m E), Hoodlands Farm (402m SE), Ganister Pit (123m SE) and sandstone quarries and a coal pit located 500m to the south.

By 1893, a clay pit adjoined the site beyond Fullshaw Lane to the east, identified as the Bradshaw Gannister works by 1905, which included facilities such as a tramway extending to the southeast. By 1964 Bradshaw Gannister Works appears to have ceased operation, with the area of the Gannister pit labelled as adisused mine. The surrounding area has remained largely unchanged to date.

2.3 Site Description

A site walkover was carried out by a SEL representative on 8th March 2022 in dry weather conditions. A photographic record from the visit is presented in Appendix D.

The site comprises of a two-storey stone dwelling house (identified as Field House) (the northern part of which is used as an open fronted stable) with a concrete drive to Fullshaw Lane and a small stone outbuilding at the front. To the south and west of the dwelling are open areas of grass. This land slopes gently northwest. Within the open fronted extension to the house is an oil tank. This was unbunded, but there was no evidence of any significant oil staining on the floor area below the tank.

The concrete drive extends onto the adjoining land north of the dwelling which then turns into a bituminous surfaced access to the large barns at the back of the site.

Within the adjoining area on the eastern side is a dilapidated outbuilding with potential asbestos containing materials in the form of corrugated panels. Further west from this location are three smaller timber outbuildings used to keep small farm animals.

Infront of the small outbuildings is a vent pipe to a possible septic tank. Near the pipe is the location of the suspected septic tank identified by a rectangular shaped slight depression within the ground lined with wood.

To the west of this location are two large barns. The most southern is understood to have previously been used for breeding rabbits and was empty with animal burrows (presumably from the previous rabbits) within the rear of the building. The most northern barn appeared to have been in use for farming activities with the presence of fresh hay and evidence of recent occupation by sheep. Outside and to the eastt of these buildings are two small heaps. One is a soil heap breaching into the field in the northern part of the site and the other is suspected manure mixed with hay, both with animal burrows present.

An unbunded metal tank supported by block walling was noted beneath a roof canopy extending between both barns. This is understood to be a water tank previously used in association with the breeding of rabbits.

The large field to the north forming the majority of the site is grass covered and enclosed by stone walls. This land slopes gently northwest.

Other than the suspected ACMs and the oil tank, no obvious evidence of any other potential sources of contamination were noted on site. There was also no evidence for the presence of invasive non-nature plant species such as Japanese knotweed.

Surrounding Area

The site is located within an active agricultural area with a few sparsely spaced residential dwellings or farm buildings along Fullshaw Lane.

2.4 Geology

An assessment of the artificial ground, superficial and solid (bedrock) geology relating to the site has been gained from British Geological Survey (BGS) and other sources and is summarised in the following Table 1.

Table 1: Geological Summary

Maps / Publications Referenced	BGS 1:50,000 Sheet 86 (Glossop), Bedrock and Superficial dated 2012. BGS Geology of Britain Viewer, BGS lexicon of named rock units and BGS Onshore Geoindex webpages. Groundsure Enviro & Geo Insight Report (Appendix C). CON29M Coal Mining Report (Appendix E) Coal Authority Interactive Viewer website.
Artificial Ground	No artificial or made ground recorded onsite but some Made Ground anticipated from historical uses. One record of artificial deposits within 250m of site, this being an area of infilled ground 39m east.
Superficial Deposits & Landslips	No superficial deposits recorded on or within 500m of site. No landslips recorded within 500m.
Solid Geology (Bedrock)	**Pennine Lower Coal Measures Formation** comprising interbedded grey mudstone, siltstone, and pale grey sandstone with low to moderate fracture type permeability.
Dip of Solid Strata	4° to NE, based on recorded dip on geological map.
Faults	None on site. Normal fault 145m SE.
Coal Seams / Mining / Quarrying Natural Cavities etc	Site within a Coal Mining Reporting Area (see section 2.6 coal mining legacy). Hard Bed (Ganister) coal seam outcrops on site. No natural cavities recorded within 500m. One record on the BritPits database of currently active and closed surface and underground mineral workings within 250m. Seventeen records of surface ground workings within 250m. Two records of underground workings within 250m. One record of a mining cavity within 250m.

According to the Soilscapes on-line viewer from the Cranfield Soil and AgriFood Institute, supported by DEFRA[2], the natural soils within the site are slowly permeable, wet, very acid upland soils with a peaty surface (Soilscape 19).

2.5 Background Soil Contamination

The Groundsure environmental data report records the BGS estimated background soil chemistry with particular reference to concentrations of arsenic, cadmium, chromium, nickel, and lead. Reference has also been made to the on-line BGS maps on '*Contaminant distribution in soil* for arsenic, cadmium, copper, nickel and lead dated 2013.

[2] http://www.landis.org.uk/soilscapes/

SEL have compared the contaminant values from both datasets against levels of concern for human health currently applicable in the UK for Residential for Home Grown Produce (RHGP) to provide an indication of natural background soil contamination levels:

	Estimated On Site	**Max (RHGP)[3]**
Arsenic (As)	15-25.8mg/kg	37mg/kg
Cadmium (Cd)	>0.33-1.8mg/kg	11mg/kg
Copper (Cu)	21.6-35mg/kg	2400mg/kg
Chromium (Cr)	90-120mg/kg	910mg/kg
Nickel (Ni)	13.2-40.1mg/kg	130mg/kg
Lead (Pb)	47.1-100mg/kg	200mg/kg

It should be noted that these are estimated background levels for the area and should not be relied upon as reflecting the actual chemical status of soils on site, which can only be determined by site specific sampling and testing.

2.6 Mining, Coal Mining Legacy Risk and Ground Stability

As the site lies within an identified Coal Mining Reporting Area (also known as CON29M Coal and Brine Consultation area), a Coal Mining Report (CMR) was obtained for the site, a copy of which is presented as Appendix E.

The following comments are made regarding on-site coal mining legacy issues:

- The eastern part of the site is within a Coal Authority designated Development High Risk Area (DHRA) in terms of coal mining legacy issues. This means that this part of the site has one or more recorded coal mining features which have the potential for instability or a degree of risk to the surface.
- The CMR states that *'The property is not within a surface area that could be affected by any past recorded underground coal mining'*. However, *'the property is in an area where the Coal Authority believes there is coal at or close to the surface. This coal may have been worked at some time in the past'*. The area of the site affected is believed to be the eastern part of the site where the conjectured location of the coal outcrop at the surface is indicated.
- *'There are no recorded coal mine entries known to the Coal Authority within, or within 20 metres, of the property'*. However, based on the Coal Authority's experience in the locality, '*there may be unrecorded mine entries in the local area that do not appear on the Coal Authority records*'
- The site is not located within the boundary of any past surface (opencast) site.
- *'Reserves of coal exist in the local area which could be worked at some time in the future'*.

Table 2 summarises the potential risk associated with coal mining legacy issues and has been compiled based on The Coal Authority document entitled '*Risk based approach to development management - Guidance for Developers*' (Version 4, 2017).

[3] Guidance values taken from LQM/CIEM S4ULS 2015 & DEFRA C4SL 2014

Table 2: Summary of Potential Risks Associated with Coal Mining

Coal Mining Issue	Coal Mining Risk		Risk Assessment
	Yes	No	
Past underground coal mining at greater then 30m depth.		✓	
Past shallow recorded underground coal mining (<30m depth).		✓	
Past shallow unrecorded underground coal mining (<30m deep)	✓		Potential workings in the Hard Bed (Ganister) seam at or close to the surface beneath the eastern part of the site.
Present underground coal mining		✓	
Future underground coal mining.		✓	Although The Coal Authority identifies the potential for future underground coal mining, under current economic, environmental, and planning constraints, SEL consider this a negligible risk
Recorded mine entries (shafts/adits)		✓	
Unrecorded mine entries (shafts/adits)	✓		Potential hazard based on past occurrences in the Sheffield area (low risk).
Coal mining geology (fissures etc)		✓	
Past opencast (surface) coal mining		✓	
Present/future opencast coal mining		✓	
Coal mining subsidence		✓	
Record of past mine gas emissions		✓	
Recorded surface hazards related to coal mining		✓	

Information identifying the potential risk from coal mining legacy beneath the eastern half of the site originates from The Coal Authority Interactive Viewer website. The CMR states that '*the Coal Authority believes there is coal at or close to the surface*' which '*may have been worked at some time in the past*'. The CMR also states *'If development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site'.*

The risk relates to potential workings in the 1m thick Hard Bed (Ganister) coal seam outcropping across the eastern part of the site which could affect stability of new development.

The Coal Authority has identified the potential for unrecorded mine entries to be present on site. This is due to the nature of their records, which are extensive but incomplete, and also due to the past occasional incidence of unrecorded shafts/adits in the Sheffield area where coal seams occur on/close to outcrop. SEL recognise this as a valid, but lower risk hazard. However, this risk would normally be negated on the establishment of foundations for development structures when it is usual practice to undertake a surface scrape. Should workers observe any unexpected features such as brickwork, voids or any unidentified or infilled structures, the advice of an appropriately qualified person should be sought. The Coal Authority should be notified if mine entries are encountered.

SEL have considered the potential for the future extraction of coal beneath the site. After consideration of the current economic, planning, and governmental factors that affect coal mining in the UK, SEL consider the risk to be negligible.

Having reviewed coal mining legacy issues relating to the site, SEL consider that ***there is a risk of ground instability / differential settlement from the Hard Bed (Ganister) coal seam outcropping across the eastern part of the site which could have been worked at some time in the past. The potential extent of the area that may be affected will depend on the location of the coal seam outcrop in relation to the proposed development and the actual position of coal seam outcrop may differ from the conjectured position shown on the Coal Authority Interactive Viewer website. Therefore, under normal circumstances the Coal Authority would require a rotary drilling investigation to confirm the location of coal seam outcrop with respect to the proposed development. However, the proposed development is for the conversion of an existing barn and if no new significant structures are proposed, this requirement will be exempt.***

With respect to surface ground workings, there are seventeen records relating to six locations within 250m of the site. The closest is for unspecified ground workings 35m east.

There are two records of underground workings within 250m of the site, both of which relate to an unspecified disused mine 12m east.

The BritPits database of currently active and closed surface and underground mineral workings, records one activity within 250m. This is for Fullshaw Lane Gannister pit at a location 145m south (now ceased).

With regards to non-coal mining activities, the environmental data report shows no records with 500m of the site.

There are no recorded natural cavities within 500m of the site.

There is one record of a mining cavity located 218m south of the site.

With regard to natural ground stability hazards, the Groundsure environmental data report (Appendix C) refers to six BGS defined natural ground stability hazard datasets which provide a hazard rating for ground subsidence arising from natural ground conditions. These are detailed in the following Table.

Table 3: Natural Ground Stability Hazards

Ground Condition	Hazard Potential	Comment
Shrink-Swell Clays	Very Low	
Landslides	Low	For areas of low risk (whole site) slope instability problems may be present or anticipated. Site investigation should consider specifically the slope stability of the site[4].
Ground Dissolution of Soluble Rocks	Negligible	
Compressible Deposits	Negligible	
Collapsible Deposits	Very Low	
Running Sands	Negligible	

[4] No evidence of any slope instability features weas noted during the site walkover.

2.7 Historical Borehole Data

There is one borehole record within 250m of the site for a location 95m north of the site. The geological information is shown in Table 4.

Table 4: Borehole Record

Borehole Record (Ref. SE63SW19)		
Rock Description	**Thickness (m)**	**Depth to Top (m)**
MADE GROUND? Black silty CLAY with shaley mudstone fragments.	0.6	0
Yellow-brown silty fine SAND.	2.4	0.6
Dark grey shaly CLAY.	3	3
Highly weathered grey silty fine SANDSTONE.	1.75	6
Completely weathered MUDSTONE.	4.85	7.75
Black MUDSTONE.	7.4	12.6

2.8 Hydrogeology

The onsite bedrock geology is designated as a Secondary (A) aquifer. Formerly known as minor aquifers, these rocks are 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.

With respect to groundwater vulnerability, the bedrock aquifer is described as having a medium vulnerability with a flow mechanism of well-connected fractures and overlain by soils of low leaching class with an infiltration value 40-70%.

The Environment Agency's (EA's) on-line Catchment Data Explorer map shows the site to be located in the Don and Rother Millstone Grit and Coal Measures operational catchment of the Humber Groundwater Management Area, where the chemical quality of bedrock groundwater between 2013 and 2019 has been classified as 'Poor'. The reason for the poor status is stated as being due to natural mineralisation, mining, and quarrying.

Groundwater protection zones are zones designated in England and Wales by the EA as major groundwater sources (from wells, boreholes, and springs) used for drinking water supply. The site is not located within 500m of a groundwater Source Protection Zone either with respect to potable abstraction sites, or with respect to a confined aquifer.

There three active EA licensed groundwater abstractions recorded within 2km. The closest is located 1633m to the north (abstraction from a borehole for a heat pump).

There are no EA licensed abstractions for potable (drinking) water use recorded within 2km of the site.

Based on the information reviewed above, the sensitivity of groundwater as a receptor to any potential contamination at this location is not considered to be highly significant.

2.9 Hydrology

The nearest surface water feature to the site is a small stream approximately 350m east. This flows in a south-easterly direction towards the Little Don River approximately 1km to the southeast. However, the closest watercourse anticipated to be affected by any surface runoff from the site is approximately 380m to the northwest. This flows north towards the River Don approximately 1.2km to the north.

The EA's on-line Catchment Data Explorer map shows the site to be located within the Don and Rother Management Catchment and Don Upper operational catchment areas. The ecological classification of the nearest classified watercourse within the catchment (Sheaf from Source to River Don) is stated as 'Moderate' and the chemical classification as 'Fail' for 2019[5].

There are two active EA licensed surface water abstractions recorded within 2km of the site, the details of which are summarised in Table 5.

Table 5: Active Licensed Surface Water Abstractions

License Holder (& Licence No.)	Location	Purpose	Point	Expiry Date
Yorkshire Water Services Ltd (2/27/05/032)	909m S	Potable water supply - Direct	Langsett Reservoir	-
Booth Brothers Ltd (NE/027/0005/007)	1340m N	Transfer between sources	River Don – Bullhouse Mill, Penistone	31/03/2029

There are no EA licensed discharge consents to controlled waters within 500m of the site.

There are no EA recorded pollution incidents within 500m of the site which have had an impact on water.

Based on the information reviewed above, the level of sensitivity of surface water resources to any potential contamination that may arise from the site is not considered to be of high significance, because of the distance to the nearest watercourse and because the potable abstraction is not located in the anticipated direction of surface water runoff from the site (which is to the north).

2.10 Flood Risk

Rivers and the Sea

The EA Flood Map for Planning on the Gov.UK website records the site as being within a Flood Zone 1 flood plain with a low probability of flooding. A copy of the EA Flood Map for Planning (Rivers and Sea) is provided in Appendix F[6].

[5] The chemical rating for the years of 2013 and 2016 was 'Good'.
[6] Reproduced under Open Government Licence https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

A review of the EA map of long-term risk of flooding from rivers and the sea available on the Gov.UK website identifies the site to be in an area of 'Very low risk', which means that each year the chance of flooding is <0.1%.

The site is not located within 50m of a Flood Zone 2 or Flood Zone 3 flood plain and there are no records of historic flood events, flood defences, areas benefitting from flood defences or areas benefitting from flood storage within 250m of the site.

Surface Water (Pluvial)

The EA map showing the long-term risk from surface water (pluvial) flooding (also viewed on the Gov.UK website) identifies the majority of site as being at 'Very low risk' which means that each year the chance of flooding is <0.1%.

The environmental data report (Appendix C) identifies the highest risk of surface water flooding on site to be negligible.

It should be noted that flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Groundwater

With respect to groundwater flooding, that is, the potential for the water table to rise to above ground level or within underground structures such as basements or cellars, the environmental data report identifies the highest risk of groundwater flooding on site to be 'Negligible'.

Reservoirs

The EA map showing the flood risk from reservoirs on the Gov.UK website shows that the site is not located in an area of risk should a reservoir fail and release the water it holds.

Flood Risk Assessment

The site is located within a Flood Zone 1 (low probability of flooding). Under normal circumstances, a flood risk assessment would not be required on a site if it is less than 1ha and provided no other flood risk factors affect the location. However, regulators are entitled to require a standalone flood risk assessment for a site in addition to this Phase 1 Preliminary Risk Assessment should they consider it necessary.

2.11 Landfills and Licenced Waste Management Facilities

The influencing distance of a gassing landfill is dependent on a number of variables, including the type of waste, geology, hydrogeology, site engineering etc. Therefore, owing to the specific nature of each of these factors, it is not possible to guarantee that a site is not within the influencing distance of a known landfill site. However, it is normal practice to consider a 250m consultation zone around the property.

The Groundsure environmental data report (Appendix C) identifies one active or recent EA licenced landfill and one historic landfill within 250m of the site (Table 6).

Table 6: Recorded Landfill Sites

Site Name, Address (& Operator)	Location	Accepted Waste Types	Recorded (First)	Last Recorded
Bradshaw Quarry, Fulshaw Lane, Langsett, Sheffield, South Yorkshire, S36 9FD (J G Pears Ltd) (active or recent)	31m E	Non-Biodegradable Wastes	N/A	N/A
Disused Quarry, Hood Lane, Fullshaw Cross, Penistone (P C Hewitt) (historic)	74m E	Inert, Industrial, Commercial, Liquid sludge	08/11/1983	06/01/1994

With respect to other waste sites, the review has identified three records of EA licenced waste treatment, transfer or disposal sites, within 250m (Table 7).

Table 7: EA Licenced & Other Waste Sites

Site Name, Address (& Operator)	Location	Type of Site	Date	Ref. No.
Bradshaw Quarry, Fullshaw Lane, Langsett, Sheffield, South Yorkshire, S36 9FD. (J G Pears Ltd)	212m E	Landfill taking Non-Biodegradable Waste	31/07/1991	YP3490ZQ/A001
Bradshaw Quarry, Fullshaw Lane, Langsett, Sheffield, South Yorkshire, S36 9FD. (J G Pears ltd)	212m E	Inert Landfill site	31/07/1991	YP3490ZQ/V006
Bradshaw Quarry, Fullshaw Lane, Langsett, Sheffield, South Yorkshire, S36 9FD. (J G Pears ltd)	212m E	Landfill taking Non-Biodegradable Waste	31/07/1991	EA/EPR/YP3490 ZQ/V006

The environmental data report identifies no recorded waste exemptions (for activities involving the storage, treatment, use or disposal of waste that are exempt from requiring a permit) within 250m of the site.

2.12 Ground Gases

CIRIA Report C665 (Ref. F) identifies potential sources of hazardous ground gases (principally methane and carbon dioxide) that may be generated from infilled land and other sources and provides guidance on assessing the risks from these features. It is normal practice within the industry that where potentially infilled land occurs within 250m of a site, it should be assessed for risk from ground gas.

The potential gas generation sources that have been identified in the locality are summarised as follows:

- The one active/recent and one historic landfill sites identified 31m and 74m east of the site. One other licenced waste site is located 212m east.
- Unrecorded shallow coal mine workings beneath the eastern part of the site and beyond the site to the southeast (see Section 2.6).
- An area of recorded Artificial Ground (infilled) 39m east of the site.
- Seventeen records of surface ground workings identified from the historical mapping within 250m, with the closest referring to unspecified ground workings 35m to the east.

- Two records of underground workings identified from the historical mapping, relating to an unspecified disused mine at one location, 12m east of the site.

Having reviewed the potential sources of ground gas described above, it is considered that gas monitoring will be required on site to further assess the potential ground gas risk for the proposed development.

Regarding radon gas, reference to the online Public Health England Maps of Radon Affected Areas[7] indicates that the site is not located in a Radon Affected Area. Reference to BRE report BR 211 (Ref. G) indicates that no radon protection measures are required for new buildings in this area.

2.13 Air Quality

Section 82 of the Environment Act 1995 requires every Local Authority to review the air quality within its area and section 83 requires them to designate an Air Quality Management Area (AQMA) where air quality objectives put in place to protect human health and the environment are not being achieved, or are not likely to be achieved, as set out in the Air Quality (England) Regulations 2000.

The revised NPPF (Ref. D) requires AQMAs and Clean Air Zones to be taken into account in planning policies and decisions.

Reference to the online interactive map of Air Quality Management Areas managed by DEFRA[8] shows that the site is in the Barnsley AQMA No.7 in which the declared air pollutant is Nitrogen Dioxide (NO_2).

2.14 Other Potentially Significant Information Relating to the Site

Reference has been made to the Groundsure environmental data report (Appendix C), from which SEL has screened out the historical uses, current industrial uses and permit authorisations within a 250m radius and these are summarised below.

The report identifies *Recent industrial land uses* at two locations within 250m. These include a pylon 208m northeast and a domestic appliance repair shop 248m north of the site.

A review of the database for *Historical industrial land uses* identified from 1:10,000 /10,560 scale mapping identifies thirty-one records relating to eight locations within 250m of the site. These are listed to include an unspecified commercial/industrial use and Gannister Works onsite[9], tramway sidings 6m east, Gannister Works 6m east, unspecified disused mine 12m east, unspecified tank 17m east, unspecified quarry 35m and 103m east, Gannister pits 146m southeast, unspecified pit 150m southeast and tramway sidings 178m northeast.

There are two records of licensed industrial activities (part A (1) relating to the same location 270m east of the site. They were for waste landfilling and associated processes, but their current status is stated as 'refused'.

[7] http://www.ukradon.org/information/ukmaps
[8] https://uk-air.defra.gov.uk/aqma/maps
[9] Cross referencing with the historical maps of the dates stated by Groundsure has been unable to confirm the existence of these features onsite. The Gannister Works was located beyond the road to the east.

The environmental data report does not record any historic military land within 500m of the review area. Inspection of the Zetica unexploded ordnance (UXO) risk map web page identifies the site to be located within a zone of low risk from WWII unexploded ordnance (see Appendix G).

2.15 Environmental Designations

Reference has been made to the environmental data report (Appendix C) which has identified the following environmental designations within 1km of the site.

Table 8: Environmental Designations

Designation	Location	Name
Green Belt	Onsite	South and West Yorkshire

The review area is also located within an SSSI Impact Risk Zone, although the proposals for the site do not require consultation regarding this.

2.16 Habitat Designations

The environmental data report has identified no recorded habitat designations within 250m of the site.

2.17 Visual and Cultural Designations

The environmental data report records no visual/cultural designations within 250m of the site.

2.18 Agricultural Designations

In the environmental data report, the site and wider surrounding area is classified as Grade 4 (poor quality agricultural land).

3.0 CONCEPTUAL SITE MODEL AND PRELIMINARY RISK ASSESSMENT

3.1 Potential Pollutant Linkages

To determine the potential for a pollutant linkage to be present, the preliminary risk assessment process involves the identification of potential sources, pathways, and receptors. A pollutant linkage can only be present if all three of these factors are involved. In this model there must be a **source** of contamination present (normally a contaminant or pollutant), with a **pathway** representing a route for the contaminant to migrate within the environment towards a **receptor** which may be susceptible to impact from the contamination. A receptor can be a natural feature such as surface or groundwater and humans but may also include ecological systems and property.

This approach is in accordance with the contaminated land provisions under Part 2A of the Environmental Protection Act 1990. Under the 2014 revised Statutory Guidance implementing these provisions (Ref. E), land is defined as being contaminated if:

- Significant harm is being caused or there is a significant possibility of such harm being caused to human health, or relevant non-human (ecological or property), receptor; and / or
- Significant pollution of controlled waters is being caused, or there is a significant possibility of significant pollution of controlled waters being caused.

The Conceptual Site Model for this assessment is based on the proposed change of use of an agricultural building (northern barn) to one dwelling house.

3.2 Potential Sources of Contamination

Potential sources of contamination and associated contaminants which may be present on site are shown in Table 9.

Table 9: Potential Sources of Contamination

Potential Sources	Potential Contaminants
On Site	
Vehicular access (concrete and tarmac driveway). Made Ground (historical uses). Demolition of buildings (north of existing house). Oil tank. (adjoining house). Septic tank (suspected). Potential asbestos containing materials (ACMs) in barns. Tank (below canopy between barns, believed to be a water tank). Farm related uses (barns). Unrecorded mine entries. Unrecorded shallow coal mining (dependent on accurate position of coal seam outcrop)..	Asbestos containing materials. Metals / metalloids including As, Cd, Cr, Cu, Ni, Pb, Hg, Zn, Se. Polycyclic aromatic hydrocarbons (PAHs). Petroleum Hydrocarbons (TPHs). Volatile and semi-volatile organic compounds (VOC & SVOCs). Pesticides. Ground / landfill gas (mainly methane and carbon dioxide).
Off Site	
Building demolition (adjacent to the east). Tramway sidings (6m, 18m E, 178m NE). Clay pit / gannister Works (6m E, 145m S, 153m SE). Disused mine (12m E). Unspecified tank (17m E). Unspecified ground workings (35m E). Unspecified quarry (35m, 103m E). Infilled ground (Gannister Works) (39m E). Unspecified pit (64m, 103m E, 145m SE). Historic landfill (74m E) (Inert, industrial, commercial, liquid sludge) Gannister pits (146m SE). Active/recent landfill (31m) (non-biodegradable). Licensed waste site (212m E). Gravel pit (233m S) (small). Domestic appliance repair shop (248m N). Unrecorded mine entries. Unrecorded shallow mine workings.	

3.3 Potential Pathways

The potential pathways representing the routes by which contaminants may migrate or harm be caused are listed as follows:

- Ingestion and inhalation of soil / water / dust.
- Dermal contact with soil / water / dust.
- Emission, migration and / or inhalation of gases and vapours.
- Migration / leaching of contaminants through soil / groundwater.
- Volatisation of contaminants to indoor or outdoor air.
- Surface water runoff.
- Service pipes.
- Physical disturbance.
- Ground instability / differential settlement.

3.4 Receptors

3.4.1 Human Health

Chronic Risks

The chronic risks to human health take into account those risks to end users of the site (future occupants and visitors) and neighbouring occupants.

Acute Risks

Acute risks are considered with respect to construction workers / engineers on site.

NB: During any intrusive ground works appropriate health and safety measures should be adopted to protect site workers from any potential risks associated with contamination in the ground. This should include the use of the appropriate personal protective equipment necessary and a general awareness of any possible risks to safety and human health on site.

3.4.2 Controlled Waters

Groundwater

Groundwater is not considered to be a highly sensitive receptor to potential contamination at this location due to the presence of surface soils of low leaching class overlaying and protecting the secondary A aquifer in which the chemical quality of groundwater regionally is poor. There are no groundwater Source Protection Zones within 500m and an absence of any active licensed groundwater abstractions within 1km of the site.

Surface Water

The level of sensitivity of surface water resources to any potential contamination that may arise from the site is not considered to be highly significant due to the distance to the nearest watercourse and the potable surface water abstraction is located along a different river to the one that would be affected by any surface run off from the site.

3.4.3 Non-Human Receptors

Ecological Systems

Potential ecological receptors include the area of greenbelt in which the site is located and the potential for roosting bats (protected species) within both barns. However, it is understood that the potential for roosting bats has been addressed as part of an ecological survey that was completed for the site by Whitcher Wildlife Ltd.

Property (buildings / structures / crops / livestock)

Property receptors include the existing buildings on site, proposed dwelling onsite, residential property to the south, surrounding agricultural fields and local road infrastructure and utilities.

3.5 Outline Conceptual Site Model

Based on all the information determined from previous sections of this report, the outline Conceptual Site Model (CSM) identifies the potential pollutant linkages which may exist on the site and is presented as Table 10.

Table 10: Outline Conceptual Site Model

Potential Pollutant (Source)	Potential Linkage (Pathway)	Receptor
On Site: Vehicular access (concrete and tarmac driveway). Made Ground (historical uses). Demolition of buildings (north of existing house). Oil tank (adjoining house). Septic tank (suspected). Potential asbestos containing materials (ACMs) within barns. Tank (below canopy between barns, believed to be a water tank). Farm related uses (barns). Unrecorded mine entries. Unrecorded shallow coal mining (dependent on accurate position of coal seam outcrop). ***Off Site***: Building demolition (adjacent to the east). Tramway sidings (6m, 18m E, 178m NE). Clay pit/Gannister Works (6m E, 145m S, 153m SE). Disused mine (12m E). Unspecified tank (17m E). Unspecified ground workings (35m E). Unspecified quarry (35m, 103m E). Infilled ground (Gannister Works) (39m E). Unspecified pit (64m, 103m E, 145m SE). Historic landfill (74m E) (Inert, industrial, commercial, liquid sludge) Gannister pits (146m SE). Active/recent landfill (31m) (non-biodegradable). Licensed waste site (212m E). Gravel pit (233m S). Domestic appliance repair shop (248m N). Unrecorded mine entries. Unrecorded shallow mine workings.	Emission, migration, and inhalation of gases / vapours. Inhalation of soil, water, or dust. Dermal contact with / ingestion of contaminated soil, water, dust. Migration / leaching, runoff and percolation through soils and rock joints. Volatisation of contaminants to indoor or outdoor air. Service pipes. Physical disturbance. Ground instability / differential settlement.	Construction workers. Site end users (residents and visitors). Neighbouring occupants (sporadic residential). Groundwater in Secondary (A) Aquifer (medium vulnerability). Surface watercourse (350m E and 380m NW). Ecological systems. Property (existing and proposed on-site buildings, sporadic nearby residential property, adjacent agricultural fields & road infrastructure).

3.6 Preliminary Environmental Risk Assessment

This section aims to expand the outline CSM to assess the level of risk for each potential pollutant linkage relevant to the proposed development.

Risk is a combination of the 'probability' (likelihood) of an event occurring and the magnitude of its 'consequence' (severity). Therefore, in order to assess risk, both the probability and the consequence of an event must be taken into account. SEL has adopted guidance provided by CIRIA C552[10], for use in the production of risk assessments for contaminated land and a simple guide to this process is provided in Appendix H.

The risk categories that are ultimately determined as the basis for assessing the likelihood of the site being described as contaminated, are provided with their respective definitions in Table 11.

Table 11: Risk Classification Definitions from CIRIA C552

Risk Rating	Definition
	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 and remediation are likely to be required.
High	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 is required, and remedial works may be necessary in the short term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that such harm would be severe, or if any harm were to occur it is more likely that the harm would be mild. Investigation is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
	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	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.

The pollutant linkages from the outline CSM and resulting risks are now considered in Table 12.

[10] CIRIA C552 *Contaminated land risk assessment. A guide to good practice*, CIRIA 2001

Table 12: Preliminary Environmental Risk Assessment

Receptor	Potential Pollutant Linkage	Estimated Degree of Risk to Receptor
Construction Workers	Migration and inhalation of ground gas (methane & carbon dioxide).	Low/Moderate
	Physical disturbance (of UXO).	Low
	Inhalation of soil, water, or dust.	Low/Moderate*
	Dermal contact with/ ingestion of contaminated soil / water / dust.	Low/Moderate*
	Volatisation of contaminants to indoor or outdoor air.	Low
Site End Users & Visitors	Migration and inhalation of ground gas (methane & carbon dioxide).	Moderate
	Inhalation of soil/water or dust.	Low/Moderate
	Dermal contact with/ingestion of contaminated soil/water/dust.	Low/Moderate
	Volatisation of contaminants to indoor or outdoor air.	Low
Neighbouring Occupants / Residents	Migration / leaching / runoff.	Low**
	Inhalation of soil, water, or dust.	Low**
	Dermal contact with/ingestion of contaminated soil/water/dust.	Low**
Surface Water	Migration / leaching / runoff.	Low**
Groundwater	Migration / leaching / runoff.	Low**
Ecological Systems	Migration / leaching / runoff / physical disturbance.	Low**
Property (Land & Buildings)	Migration, accumulation and ignition of methane	Low/Moderate
	Migration / leaching / runoff.	Low**
	Ground instability / differential settlement (from unrecorded shallow coal mining).	Low

* Assumes basic PPE is used.

** Assumes good site construction practice, including relevant reports, control of runoff / spillages and dust control

In this preliminary qualitative risk assessment, an overall **Low to Moderate** risk has been attributed for the site.

4.0 CONCLUSIONS AND RECOMMENDATIONS

This Phase 1 Preliminary Geo-Environmental Risk Assessment report has reviewed the available data for the study area in the context of the proposed change of use of an agricultural building within the southwestern part of the site to one dwelling house. It is understood that this will include the removal of the wooden structures adjoining the barn to be converted.

This Phase 1 Geo-Environmental Risk Assessment has derived the overall level of risk to human health and the wider environment from on and off-site sources to be **Low to Moderate**. The risks mainly relate to following:

- To construction workers and site end users (residential occupants and their visitors) of the proposed development from potential asbestos containing materials within the fabric of the barn buildings, from contaminants within the underlying Made Ground and from ground gas (principally methane and carbon dioxide) from nearby surface and underground workings, surrounding areas of Artificial Ground and nearby landfill sites.
- Potential damage to the proposed conversion associated with the risk from the accumulation and ignition of potentially explosive methane gas.
- Ground instability/differential settlement risk from unrecorded shallow coal mining below the site (dependent on the specific location of the coal seam outcrop in relation to the proposed development).

Whilst the environmental data report has identified the site to be located in a area where slope stability problems may be present or anticipated (see Table 3), no physical evidence of slope failure was identified during the site walkover.

It is recommended that a Phase 2 (intrusive) site investigation is undertaken to further assess the risks associated with the potential for contamination of the shallow soils, to install gas wells for the completion of a gas monitoring programme to assess the potential gas risk to the proposed development.

The objectives of the Phase 2 investigation would be as follows:

- Benchmark the contamination status of the development area including the presence of contaminated Made Ground.
- Assess the risk from ground gas.
- Clarify the outline Conceptual Site Model.
- Clarify the Preliminary Environmental Risk Assessment.
- Provide data for any remedial work that may be required.

Phase 2 Geo-Environmental Site Investigation

The investigation should include the following:

- Dynamic (window) sampling within the area of the proposed development to characterise the nature of the underlying soils, assess contamination status and facilitate the installation of gas monitoring wells.

- Representative soil samples to be recovered and submitted for appropriate contamination analysis. Samples would normally be tested for a range of parameters, including metals / metalloids, speciated polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs), soluble sulphate, pH and the presence of asbestos and any other parameters considered appropriate. Any groundwater encountered should also be sampled and tested for a similar range of contaminants.
- A programme of gas monitoring from the wells established at the window sampling locations, involving six visits at approximately 2 weekly intervals over a period of three months (the minimum required by most Local Authorities).

Coal Mining Legacy Issues

The Coal Authority is a statutory consultee in the planning process and has the right to object to any surface development it considers may be at risk from legacy coal mining issues. The burden of discounting risk is placed on the developer.

There is a risk of ground instability / differential settlement from unrecorded shallow workings in the Hard Bed (Ganister) coal seam which is shown to outcrop across the eastern part of the site. The potential extent of the area that may be affected will depend on the specific location of the coal seam outcrop in relation to the proposed development and the actual position of coal seam outcrop may differ from the conjectured position shown on the Coal Authority Interactive Viewer website. Therefore, under normal circumstances for new development, the Coal Authority would require a rotary drilling investigation to confirm the location of the coal seam outcrop with respect to the proposed development. However, the proposed development is for the conversion of an existing barn using the existing foundations and if no new significant structures are proposed, this requirement would be exempt.

If new development was proposed the following investigation would be required by the Coal Authority to clarify coal mining risk:

- Three rotary open-hole boreholes should be drilled to determine the presence/absence of the Hard Bed (Ganister) coal seam and the depth, thickness and disposition of any associated old workings.
- Boreholes should be drilled to 2m below the coal seam/workings or to a maximum depth of 30m below rockhead if not encountered.
- Gas monitoring apparatus should be installed into the old workings (if encountered) to record the potential presence of mine gases in accordance with CIRIA guidance C665. It is accepted practice to monitor gas levels for six visits over a period of three months as a minimum, in order to assess gas risk for the site upon completion of monitoring.
- The boreholes should be drilled under a Coal Authority licence. The requirement for an air or water flush drilling medium will be determined by the Coal Authority having reviewed the proximity of potential receptors to the site. The Authority normally requires water flush drilling where residences occur within 50m of a site.

The Coal Authority has identified the potential for unrecorded mine entries to be present on site. This is due to the nature of their records, which are extensive but incomplete, and also due to the past occasional incidence of unrecorded shafts/adits in the Sheffield area where coal seams occur on/close to outcrop. SEL recognise this as a valid, but lower risk hazard. However, this risk would normally be negated on the establishment of foundations for development structures when it is usual practice to undertake a surface scrape. Should workers observe any unexpected features such as brickwork, voids or any unidentified or infilled structures, the advice of an appropriately qualified person should be sought. The Coal Authority should be notified if mine entries are encountered.

Asbestos Containing Materials within Buildings

It is recommended that a refurbishment/demolition survey for asbestos containing materials (ACMs) is undertaken within both the existing barns proposed for alteration prior to any work commencing. This is a requirement of the control of Asbestos Regulations 2012.

Radon Gas

The site is not located within a Radon Affected area, therefore no radon protection measures are required for new buildings.

Flood Risk

The site is located within a Flood Zone 1 (low probability of flooding). Under normal circumstances, a flood risk assessment would not be required on a site if it is less than 1ha and provided no other flood risk factors affect the location.

Other Factors

Should the use of plastic pipes or other materials be proposed for underground services as part of the development works, it should be noted that soil sampling requirements can vary between different service providers. For this reason, prior to fully commissioning any ground investigation, it is recommended that the Client agrees any additional sampling requirements that may be required with each service provider.

Prior to intrusive site investigations, records of services should be obtained to accurately locate the existing services on site in order to prevent damage by the use of excavation equipment during intrusive investigations.