Development at Land to South of South View

Phase I Desk Study Report

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Document Control

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Disclaimer

This report was produced by RB Geotechnical for Mr J. Hughes (The client) for the specific purposes of a Phase I Desk Study for the proposed residential development on the land to the South of South View in Darfield, South Yorkshire. This report may not be used by anyone else other than the client without their express permission. In any event, RB Geotechnical accepts no liability for any costs, liabilities or losses arising from the use of reliance upon the contents of this report by anyone other than the client.

1.0 Introduction

RB Geotechnical was commissioned by the client to carry out a Phase I Desk Study for the proposed residential development at the Land to the South of South View in Darfield, for a new potential planning application.

1.1 Aims and Scope

The principal aims of this Phase I Desk Study is to interpret information pertaining to the site, obtained during a desk-based review of available data and recent photos of the site.

The scope of this study is as follows:

- To provide general information on the site such as location and description;
- To discuss the geology, hydrogeology, and hydrology at, and in the vicinity of, the site;
- To summarise the environmental setting of the site; e.g. landfills, permits and sensitive land uses;
- To summarise potential geotechnical risks associated with the site;
- To provide a preliminary summary of potential coal mining risks to the site;
- To discuss and summarise any historical development that have occurred at the site and in the surrounding area;
- To assess potential contamination issues pertaining to the site with consideration of the site's historic use;
- To develop an initial conceptual model linking sources of potential contamination with pathways and receptors; and
- To provide a preliminary risk assessment for the current and proposed end use of the site.

Please note that this Phase I Desk Study excludes an assessment of risks arising from asbestos, unexploded ordnance, and/or invasive species.

1.2 Terms and Conditions

This report has been prepared for the client to help support a planning application for the proposed residential development at Land to South of South View in Darfield, South Yorkshire.

1.3 Sources of information

Information on the site layout and current land use of the site is mainly based on information collected from online sources and photos from other sources.

An environmental database search was undertaken by GroundSure to provide supplementary Environmental information for the site and surrounding area. This was collated into an Insight Report by Ground Sure and as such the potential for further data to exist cannot be ruled out.

The existing database and other sources of which this study is based comprise:

- GroundSure Report, Land to South of South View, 16th July 2020 – Appendix A
- GroundSure 1:10,000 Historical Maps, Land to South of South View, 16th July 2020 - Appendix B
- GroundSure 1:2,500 Historical Maps, Land to South of South View, 16th July 2020 - Appendix B
- Environment Agency website (www.environment-agency.gov.uk);
- British Geological Survey (BGS) Geoindex website (www.bgs.ac.uk/geoindex)
- Coal Authority Interactive Viewer (www.mapapps2.bgs.ac.uk/coalauthority/home.html)

Although every effort has been made to ensure the accuracy of the information contained herein, no checks have been carried out to ensure the accuracy of information obtained from third parties and no liability can be accepted for any errors or misinterpretation of the third party information where it has been incorporated into this report.

2.0 Site Details

2.1 Site Location and Description

The 1.39ha sized site, is occupied mainly by grass, with trees around the boundary and the remainder of occasional wooden barns and sheds. An old caravan is also present in the East of the site. The Southern third of the site is currently occupied by a gravelled driveway, and a lawned garden area. The National Grid Reference for the centre of the site is 441195, 404294.

2.2 Proposed Development

The client plans to construct up to 54 new residential dwellings across the site, each with private back gardens and driveways. The proposed development plan is shown in Appendix C. T

3.0 Site History

3.1 History of site and surrounding area

Information relating to the historical development of the site and the surrounding area has been obtained from Historical Ordnance Survey Maps (1:10,000 and 1:2,500). These are presented in Appendix B.

The site was shown to be undeveloped grassland up until the early 1890s when a road of houses was constructed in the Southern third. The site remained unchanged up until the 1930s when the Northern extent was labelled as allotments, and by the 1960s the Northern two thirds of the site were allotments. By the early 1970s the site is no longer labelled as allotments, and the terraced houses in the Southern third are no longer shown. The site remains largely unchanged beyond the 1970s.

The surrounding area has undergone steady residential development through the years. Additionally, an old quarry once mapped to the North West of the site was shown to be backfilled by the 1970s.

Table 3.1 Summary of on-site and surrounding area history

Map	On-Site Features	Surrounding Area
1854	The site is shown to be an undeveloped area of grassland.	A large old sandstone quarry is shown from approximately 50m to the North West of the site. The main village of Darfield is shown from approximately 500m to the East. The rest of the surrounding area is

Map	On-Site Features	Surrounding Area
		mainly open fields.
1854 – 1893	A footpath is now shown running across the North West of the site. The Southern third of the site is occupied by a row of terraced houses. The site is labelled as Snape Hill.	Houses are now shown adjacent to the North Western site boundary.
1893 – 1904	The site remains unchanged.	Further development in Darfield.
1904 – 1931	The site remains unchanged, apart from allotment gardens are mapped in the North of the site.	Largescale development, mainly residential, adjacent to the North and South of the site.
1931 – 1955	The site remains unchanged.	The surrounding area remains largely unchanged.
1955 – 1961	The Northern two thirds of the site are labelled as Allotment Gardens, whilst the Southern third still has a row of houses, with a road 'Hill Street'	Further residential development in all directions.
1961 – 1967	The site remains unchanged.	The surrounding area remains largely unchanged.
1967 – 1970	The vast majority of terraced houses once situated in the Southern third of the site are no longer present. The Northern two thirds of the site are no longer labelled as allotments.	The old quarry once mapped from approximately 70m to the North West of the site, is now mainly backfilled and constructed upon.
1970 – 1982	Earthworks are shown to have taken place across the Northern and middle of the site.	No further changes in surrounding area.
1982 – 2010	The site remains unchanged.	The surrounding area remains largely unchanged
2010 – 2020	During this period the road 'Hill Street' which was once shown splitting the bottom third of the site from the top two thirds, is no longer shown.	The surrounding area remains unchanged.

4.0 Geology, Hydrogeology and Hydrology

4.1 Geology

Information relating to the geology of the site has primarily been sourced from the GroundSure Report and the BGS Geoindex website.

4.1.1 Made Ground

According to the published geological maps and information on the BGS GeoIndex website, no Made Ground is mapped beneath the site.

4.1.2 Superficial Deposits

Superficial deposits are not mapped on site; however, a highly weathered bedrock is likely above the intact bedrock.

4.1.3 Solid Geology

Geological maps indicate that the Southern half of the site is underlain by bedrock of the Pennine Middle Coal Measures Formation, Mudstone, Siltstone and Sandstone, and the Northern half by Mexborough Rock Sandstone

4.1.4 BGS Boreholes

No historical BGS boreholes are shown within 100m of the site boundary.

4.1.5 Faults and Seams

No coal seams are mapped within 250m of the site boundary. A fault is mapped running across the site in a North West to South East direction.

4.1.6 Radon

The GroundSure Report indicates that the property is not within a Radon Affected Area, as less than 1% of properties are above the Action Level. No radon protective measures are deemed necessary.

4.2 Hydrogeology

4.2.1 Aquifers

The underlying bedrock is classified as being a Secondary A Aquifer, whereby permeable layers capable of supporting water supplies at a local scale may be possible in the underlying bedrock. The underlying soils are classified as having a High Leaching Potential.

4.2.2 Groundwater, Surface Water and Potable Water Abstraction Licences

The GroundSure Report indicates that there are no Groundwater, Surface Water or Potable Water Abstraction Licences within 250m of the site boundary.

4.2.3 Discharge Consents

There are Recorded Licensed Discharges within 500m of the site boundary, situated 402m to the South as a Sewage Discharge and from 476m to the South, also as a Sewage Discharge.

4.2.4 Pollution Incidents to Controlled Waters

The Groundsure Report shows no significant pollution incidents to controlled water within 250m of the site boundary.

4.3 Hydrology

Water networks mapped within 250m have been identified as an inland river situated 242m to the South of the site. m to the South of the site.

4.3.1 Flood Risk

The GroundSure Report states that the site is at a **Very Low** Risk of flooding from Rivers and Sea and is not situated within either a Zone 2 Fluvial/Tidal Model or Zone 3 Fluvial Model floodplain. The site is classified as having a **Negligible** risk of Groundwater flooding.

4.3.2 Source Protection Zones

There are no source protection zones mapped within 500m of the site boundary.

5.0 Environmental Setting

5.1 Waste Treatment and Disposal

5.1.1 Landfill Sites

There are no active/recent or historical landfill sites mapped within 250m of the site boundary.

5.1.2 Waste Management, Waste Treatment, Waste Transfer Facilities or Disposal Sites

There are no other waste sites mapped within 250m of the site boundary.

5.2 Regulatory Permits, Incidents and Registers

5.2.1 Control of Major Hazard Sites /Notification of Installations Handling Substances

The GroundSure Report indicates that the site is not within 500m of a Control of Major Hazard site (COMAH) or Notification of Installations Handling Substances (NIHHS).

5.2.2 Planning Hazardous Substance Consents

There are no records of Planning Hazardous Substance Consents within 500m of the site.

5.2.3 Recorded Pollution Incidents

There is one recorded pollution incident mapped within 250m of the site boundary, located from 177m to the East with the pollutant being described as Inert Materials and Wastes.

5.3 Potentially Infilled Land

The Groundsure Report identifies a number potentially infilled land/worked ground within 250m of the site boundary, as unspecified quarries from 52m to the North West, Ground Workings and Voids from 73m to the South.

5.4 Sensitive Land Uses

An area of green belt land is mapped from 198m to the South East of the site, and the site itself is noted to be with a Nitrate Vulnerable Zone. No other classified sensitive land uses are mapped either on or within 1000m of the site.

6.0 Potentially Contaminative Sites

6.1 Potentially Contaminative Land Uses

Potentially contaminative historic land uses mapped within 250m of the site boundary mainly comprise old quarries and ground workings. Current potentially contaminative land uses situated within 250m of the site boundary include a MOT centre and an electricity substation.

7.0 Geotechnical Assessment

7.1 Natural Hazards

The GroundSure Report states that the site has a **Negligible** risk of Running Sands, Compressible Deposits and Dissolution of Soluble Rocks, a **Very Low** risk of Shrink-Swell Clays and Collapsible Deposits and a **Low** risk of Landslides.

8.0 Mining

The site is noted by the Groundsure Report as being within a Coal Mining area. Upon inspecting the Coal Interactive Viewer, the site is not located within a Development High Risk Area, therefore no further assessment of mining risks is necessary.

The site is noted to be within a Non-Coal Mining Area, where the Vein Mineral of Iron Ore is noted as the commodity, however the potential for difficult ground conditions are unlikely.

9.0 Conceptual Site Model

9.1 Introduction

A preliminary **Conceptual Site Model** (CSM) has been developed for the site, to assess any constraints on the proposed development arising from contamination which may be present. The CSM describes the relationship between contamination which may be present from past and current activities, both on and off site, along with potential receptors of that contamination.

The site has been assessed in line with current UK guidelines, namely the Contaminated Land (England) Regulations 2000 and Part IIA of the Environmental Protection Act 1990 and follows the procedures set out in the Environmental Agency 'Model Procedures for the Management of Land Contamination – Contamination Land Report (CLR).11'.

CLR.11 provides the technical framework for structured decision making about land contamination and builds on previous work carried out under the Contaminated Land Research Programme of the former Department of the Environment. CLR 11 has adopted and refined the methodology and terminology that has been used in contaminated land risk assessment for a number of years.

CLR.11 defines the three essential elements to any risk:

- **A contaminant source** - a substance that is in, on or under land and has the potential to cause harm or to cause pollution of controlled waters;
- **A receptor** – in general terms, something that could be adversely affected by a contaminant, such as people, an ecological system, property, or a water body; and
- **A pathway** - a route or means by which a receptor can be exposed to or affected by a contaminant.

Each of these elements can exist independently, but they create a risk only where they are linked together, so that a particular contaminant affects a particular receptor through a particular pathway. This kind of linked combination of source-pathway-receptor is described as a **Potential Pollutant Linkage (PPL)**.

It should be noted that at this preliminary stage, the assessment is based only on a desk-based study. A quantitative assessment of the potential risk is not possible at this stage of the assessment.

This report presents a Preliminary Conceptual Site Model and Preliminary Risk Assessments for the site, based on the proposed **Residential** end use.

9.2 Potential Contamination Sources

9.2.1 On Site Sources

Potential on-site sources of contamination have been identified as possibly contaminated Made Ground mainly in the Southern third, resulting from demolition of the old houses. Additionally, contaminated soils may exist in the Northern two thirds, from it's historical use as allotments.

9.2.2 Off Site Sources

Off-site sources of contamination have been identified as possible source of ground gas from nearby infilled land features such as quarries and voids within 250m of the site boundary.

9.3 Potential Receptors

9.3.1 Human Receptors

Based on the proposed use of the site, on-site receptors include:

- New Residents;
- Construction workers involved in the proposed development. Note that potential contamination risks to construction workers will be mitigated by appropriate risk assessments and mitigation measures required by Control of Substances Hazardous to Health (COSHH) and Construction, Design and Management (CDM) regulations.

9.3.2 Controlled Waters Receptors

The following on-site controlled waters receptors include:

- Groundwater within the underlying Aquifers.

9.3.3 Buildings Receptors

The proposed new buildings are a potential receptor.

9.4 Potential Pathways

9.4.1 On-Site Human Receptors

Potential pathways to future human receptors on site include:

- Dermal contact or ingestion with contaminated soils;
- Inhalation of contaminants in soil derived dust;
- Migration and inhalation of gases and vapours outdoors or indoors;
- Contamination of drinking water pipes by contaminated soils/water leading to the ingestion of contaminated drinking water.

9.4.2 Controlled Waters

Potential pathways to on-site controlled water receptors (groundwater) include:

- Leaching of contaminants and/or migration of contaminants from the unsaturated zone of soils to groundwater (Secondary A Aquifer) in natural strata;
- Vertical migration of contaminants in shallow groundwater to deeper strata and aquifers;
- Lateral migration of impacted water through service conduits, drainage systems and possible perched groundwater pathways to surface water receptors.

9.4.3 Buildings

Potential pathways from off-site sources to the on-site property receptor include:

- Migration and accumulation of ground gas or vapours in buildings or structures.

9.5 Preliminary Risk Assessment

Based on the stated potential sources of contaminants identified and the receptors and pathways described, an assessment of the environmental risks has been made with reference to the significance and

degree of risk. This assessment is based on consideration of whether the source contamination can reach a receptor and hence whether it is of a major or minor significance.

A preliminary Conceptual Site Model (CSM) of the Potential Pollutant Linkages (PPL) has been developed based on the information derived from this desk study for the site. This CSM has been used to identify potentially Relevant PPL's for the current and proposed end uses which have been assessed qualitatively using CIRIA 552 guidance, as described in Table 9.1 and Table 9.2.

Table 9.1 Classification of Consequence

Consequence	Criteria
Severe	Short term (acute) risk to Human Health likely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIa. Short term risk of pollution of sensitive water resource. Catastrophic damage to buildings / property
Moderate	Chronic damage to Human Health likely, over a long term, to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIa. Pollution of sensitive water resources
Mild	Health effects to Human Health that are unlikely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIa. Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures, and services. Damage to sensitive buildings / structures / services or the environment
Negligible	Non-permanent health effects to Human Health that are unlikely to result in "significant harm" as defined by the Environmental Protection Act 1990, Part IIa. Those that are easily prevented by means such as personal protective clothing. Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve.

Table 9.2 Classification of Probability

Probability	Criteria
Almost Certain	Circumstances are such that an event either appears very likely in the short term and almost inevitable over the long term or there is evidence of currently harm occurring
Likely	Circumstances are such that an event, whilst not inevitable, is possible in the short term and is likely to occur over the long term
Unlikely	Circumstances are such that it is possible an event could occur, but it is by no means certain to occur even over a longer period, and it is less likely in the shorter term
Very Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are improbable even in the medium to long term
Extremely Unlikely	Pollutant linkage may be present, but the circumstances under which harm would occur are highly improbable even in the long term

Once the consequence and probability have been classified, these can then be compared to produce a risk category (using Table 9.3), ranging from **Very High Risk** to **Very Low Risk,** with the definitions summarised in Table 9.4.

Table 9.3 Comparison of Consequence against Probability

Consequence / Probability	Severe	Moderate	Mild	Negligible
Almost Certain	Very High Risk	High Risk	Moderate Risk	Low Risk
Likely	High Risk	Moderate Risk	Moderate/ Low Risk	Low Risk
Unlikely	Moderate Risk	Moderate/ Low Risk	Low Risk	Very Low Risk
Very Unlikely	Low Risk	Low Risk	Very Low Risk	Very Low Risk
Extremely Unlikely	Very Low Risk	Very Low Risk	Very Low Risk	Very Low Risk

Table 9.4 Description of the Classified Risks and Likely Action Required

Risk	Criteria
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action
High	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action.
Moderate	It is possible that without appropriate remediation action, harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild
Low	It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at works, if any harm were to be realised, any such effects would be mild.
Very Low	There is very low possibility that harm could arise to the receptor, but it is likely that this harm, if realised, would be mild at worst

In accordance with CLR11, professional judgement has been employed to evaluate the risk on a qualitative basis using available information.

A summary of the pollution linkages identified during the desk study are provided in Table 9.5.

Table 9.5 Conceptual Site Model of Potential Pollutant Linkages

Source	Receptor	Pathway	Risk
Contaminants in soil, soil derived dust, surface water run-off, groundwater, and as vapours/ground gas	New Residents	• Dermal contact or ingestion contaminants in soil-derived dust and entrained surface water run-off from areas where soil is exposed at the surface or where excavation takes place and in shallow groundwater in the natural strata if excavation takes place below the water table. • Inhalation of contaminants in soil derived dust from areas where soil is exposed at the surface of where excavation takes place. • Inhalation of soil and water derived vapours and ground gas outdoors • Inhalation of soil derived, and water derived vapours and ground gas indoors where it may have accumulated in buildings and enclosed spaces.	Moderate
	Construction Workers	• Dermal contact or ingestion contaminants in soil-derived dust and entrained surface water run-off from areas where soil is exposed at the surface or where excavation takes place and in shallow groundwater in the natural strata if excavation takes place below the water table. • Inhalation of contaminants in soil derived dust from areas where soil is exposed at the surface of where excavation takes place.	Low
Contaminants in Soil	Groundwater within the underlying soils and bedrock (Secondary A Aquifer)	• Leaching of contaminants and/or migration of free phase contaminants from the unsaturated zone soils to groundwater in the natural strata • Vertical migration of contaminants in shallow groundwater to deeper strata and aquifer	Low
Contaminants in soil, surface water runoff, groundwater and as vapours/ground gas	Surface Water	• Lateral migration of contaminants and/or migration of free phase contaminants present in the Made Ground via groundwater to surface water discharge • Lateral migration of contaminants and/or migration of free phase contaminants present in the Made Ground and entrained in surface water runoff	Low
Contaminants in soil, groundwater and as vapours/ground gas	Building	• Accumulation of soil and water derived vapours/and or ground gas in enclosed spaces	Moderate/Low

10.0 Conclusions

The site is to be developed with a number of residential properties, each with private gardens and driveways, including new roads.

Potential on-site sources of contamination have been identified as possibly contaminated Made Ground soils in areas of the old houses (in Southern third of site). There is also the potential for soil contamination across the Northern two thirds of the site, due to its past use as allotments.

Off-site sources of contamination have been identified as possible ground gases, accumulating from nearby infilled land features situated within 250m of the site boundary.

In summary, on the basis of the above listed contaminant sources it is concluded that:

- Contaminants are likely to be present in, on or under the land at the site from on-site sources; and
- Future on site receptors to any form of contamination have been identified as the construction workers, residents, employees, the new buildings, surface water and the groundwater.

A qualitative risk assessment of the identified potential pathways of contamination to the site have been summarised in Table 9.5. The following risks have been designated:

- Future Human Receptors –Moderate Risk
- Construction Workers –Low Risk
- Groundwater –Low Risk
- Surface Water –Low Risk
- New Buildings – Moderate/Low Risk

Based on the review of all available historical data, it has been established that overall a **MODERATE** risk of potential pollutant linkage to the site exists. This risk has been identified due to the potential for contaminated Made Ground in South of site, contaminated soils across the rest of the site and the potential for ground gases from nearby infilled land features.

11.0 Recommendations

A Phase II Intrusive Investigation is recommended to obtain shallow soil samples from across the site, to assess the soils for a range of contaminants. Additionally, a ground gas risk assessment is required, due to the potential for off-site sources of ground gas.

It is generally recommended that any Phase II investigation also incorporates an assessment of the geotechnical site parameters.

It is likely that Windowless Sampling drilling, allowing collection of shallow soil samples and installation of ground gas monitoring standpipe will be suitable for the Phase II works.

References

- BS 5930: (2015) Code of Practice for Site Investigations. British Standards Institution.
- BS 10175: (2011) Code of Practice for the Investigation of Potentially Contaminated Sites. British Standard Institution.
- CIRIA 552: (2001) Contaminated Land Risk Assessment, A guide to good practice.