

Lewis Homes Wales Limited

HIGHFIELDS, COEDEL, TONYREFAIL

Desk Study Report

12242/LP/18/DS

CLIENT: Lewis Homes Wales Limited

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1.0 INTRODUCTION

1.1 GENERAL

Lewis Homes Wales Limited are exploring the potential for an extension to their existing residential development at Highfields in Coedely for residential end-use.

Intégral Géotechnique (Wales) Limited have been appointed as the Geotechnical Engineers to undertake a geoenvironmental and geotechnical desk study of the site.

The objectives of the geoenvironmental and geotechnical appraisal are to:

- Assess the degree, nature and extent of possible contamination and its implications for ownership and site development;
- Identify any geotechnical constraints on development; and
- Provide recommendations for physical site investigation works.

This report presents the findings of the desk study and provides guidance on the scope of the geoenvironmental and geotechnical investigation.

The opinions and preliminary assessments presented are based on desk based research and should be reviewed after intrusive investigation, if required.

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1.2 PROPOSED DEVELOPMENT

The proposed development will provide an additional 76 No dwellings as a potential extension to the existing The Meadows/Highfields development to the southwest of the site. The development will include associated infrastructure such as access roads, car parking areas and private drives. Areas of landscaping and private gardens will also be provided as part of the development.

1.3 SCOPE OF WORKS

The work instructed included a desk study of available information, together with an initial conceptual site model. The desk study comprised a review of:

- An Envirocheck Report obtained for the site;
- Available old Ordnance Survey maps covering the site;
- A Radon Report obtained from the British Geological Survey;
- A Coal Authority Mining Report;
- Geological maps of the area provided by the British Geological Survey;
- The Environment Agency groundwater vulnerability map and aquifer database for the area
- Existing site investigation data

1.4 LIMITATIONS

This document is intended to be a working document for further development in discussion with all concerned including the Local Planning Authority, Natural Resources Wales, and the NHBC as appropriate.

“Contamination” is taken throughout the report to mean the “presence of one or more potentially harmful substances as a result of human activity”. The use of the term in this way does not imply that harm is being or might be caused by the contamination. It should be noted that “contamination” can have different meanings under different regulatory regimes, for example, planning, building control and Part IIA of the Environmental Protection Act 1990. Naturally elevated concentrations of potentially harmful substances may also be of concern and the significance of any that have been found is also evaluated in this report.

2.0 THE SITE

2.1 SITE LOCATION AND DESCRIPTION

The site is located near Coedely approximately 1.5km southeast of Tonyrefail, at a National Grid Reference of 302010, 186810, see Figure 1.

The site is irregular in shape and occupies an area of approximately 3.27 hectares. The boundaries of the site are defined by undeveloped fields to the northeast, northwest and southeast and an existing new residential development area to the southwest. A site plan is presented in Figure 2.

The site is situated on sloping ground falling from an approximate elevation of 157m AOD in the northern corner, to an approximate elevation of 138m AOD in the southern corner. The surrounding areas generally slope downwards to the south and southwest towards the Ely River which flows approximately 400m southwest of the site.

The site currently comprises two fields with the field boundaries lined with mature hedgerows. The fields are grass covered and have been harvested for hay in past seasons. An existing footpath runs along the northeast boundary of the site.

2.2 SITE OPERATIONS

The site is currently undeveloped and used as agricultural land.

2.3 SURROUNDING LAND USE

The majority of the surrounding areas are undeveloped farmland. The area to the southwest has been developed for residential use.

2.4 AVAILABLE SITE INVESTIGATION DATA

There is no available site investigation data for the site area to our knowledge.

2.5 CONSULTATIONS WITH REGULATORS

The regulators have not been contacted at this stage.

3.0 SITE HISTORY

The recent history of the site has been traced with the aid of available historical maps included in the Envirocheck Report dated from 1884 to 2018. We have also utilised Google Earth images for the more recent site history, see Figure 3.

The earliest edition of the historical maps dated 1884 shows the site and the surrounding area were undeveloped fields. The southeast field, which formed approximately half of the site, was rough pasture. A track formed the northeast boundary of the site. Nant Melin was approximately 60m to the east of the site and flowed around the site to the southeast. The area alongside Nant Melin was heavily wooded. Two coal levels were located approximately 100m southwest of the site with a quarry/excavated area adjacent to the levels.

The 1899-1900 edition of the map shows that the site and the surrounding area had remained as undeveloped fields. The coal levels to the southwest were now indicated to be old coal levels. There was now a small building in between the quarry area and the old coal levels and an old tramway was indicated which accessed the area. Nant Melyn still flowed to the east and southeast of the site.

The 1919 edition of the map shows that the site and the immediate surrounding area had remained unchanged. The old coal levels to the southwest of the site were now called the Tylcha-fach Level, which was accessed via a new tramway and had an associated engine house. This suggests that mining activity had recommenced by this time. Terraces of residential properties had been constructed approximately 300m southwest of the site by this time. The Tyla-fach Level is understood to have been finally closed in 1927.

The site and the surrounding areas remained relatively unchanged over the subsequent years.

Residential developments to the southwest of the site have continued to expand up the hillside towards the site since the 1990's and have now reached the southern boundary of the site, see Figure 3.

The site itself has remained undeveloped up until the present day.

4.0 SITE ENVIRONMENTAL SETTING

4.1 PHYSICAL SETTING

The site and the surrounding area generally slopes down towards the River Ely. The site itself is situated on sloping ground falling from an approximate elevation of 157m AOD in the northern corner, to an approximate elevation of 138m AOD in the southern corner. Nant Melyn flows to the east and southeast of the site boundary.

4.2 GEOLOGY

The 1:50,000 scale geological map of the area indicates that the site is underlain by Hughes Member Sandstone which is part of the Upper Coal Measures strata of the Carboniferous Period. These rocks comprise green-grey Pennant sandstones, with thin mudstones/siltstones and seatearth interbeds, and mainly thin coals. The strata in this area are conjectured to dip to the north. The geological map does not indicate any significant faults in the vicinity of the site.

The geological maps conjectures that the Cefn Glas coal seam outcrops adjacent to the southern corner of the site, so could potentially underlie this part of the site at shallow depths. The Generalized Vertical Section of the geological map indicates that the next seam below the Cefn Glas is an unnamed thin seam, approximately 70m further below. Due to the topography of the site and the dip of the strata, the depth to these seams is likely to deepen in a northerly direction.

The Generalized Vertical Section also indicates that the next coal seam above the Cefn Glas seam is the Darren-Ddu seam which typically lies some 50m higher up in the sequence of strata and is conjectured to outcrop at least 350m to the north of the site.

Superficial Devensian Till Deposits of the Quaternary Period are indicated to overlie the solid strata within the southeast area of the site. These deposits generally comprise poorly sorted and variable sands, clays and gravels. These deposits could be present across the entire site but could be thin or in areas absent.

Due to the site remaining undeveloped over the years it is not anticipated that made ground would be present.

A summary of the anticipated geological succession is given below in Table 1.

4.2 GEOLOGY (CONTINUED)

Geological unit	Horizon	Description
Recent	Topsoil	Various materials
Quaternary	Devensian Till	Poorly sorted and variable sands, clays and gravels
Carboniferous	Hughes Member Sandstone	Green-grey Pennant sandstones, with thin mudstones/siltstones and seatearth interbeds, and mainly thin coals

4.3 RADON

Information with regard to Radon Protective Measures is provided within the Envirocheck Report and the BGS Report as presented in Appendix B. It states that the site is within a lower probability area, as less than 1% of properties are above action level, and that therefore no radon protective measures would be necessary in the construction of new buildings within the site.

4.4 MINING

A Coal Mining Report for the site has been obtained from the Coal Authority and a copy is included in Appendix C.

The Coal Authority states that the property is in a surface area that could be affected by underground mining in 10 seams of coal at 50m to 740m depth, and last worked in 1976. In addition, the property is in an area where the Coal Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past.

The Coal Authority mining report confirms that there are no known coal mine entries within, or within 20 metres of, the site boundary. However, there may be mine entries in the local area which the Coal Authority has no knowledge of.

The Coal Authority states that it is not aware of any damage due to geological faults or other lines of weakness affected by coal mining.

4.4 MINING (CONTINUED)

The geological maps conjectures that the Cefn Glas coal seam outcrops adjacent to the southern corner of the site. Therefore, depending on the depth of the superficial deposits, this seam could potentially underlie the site at shallow depths in this part of the site. The Generalized Vertical Section indicates the next seam below the Cefn Glas to be an unnamed thin seam, approximately 70m below. Due to the topography of the site and the dip of the strata, the depth to these seams would deepen in a northerly direction.

An abandonment plan, 10581/1, which covers the site and the surrounding area, indicates extensive workings in the Cefn Glas seam to the north and west of the site, see Figure 4. Some of these workings also encroach beneath the northwest area of the site. This mining plan and the historical maps indicate that these workings were accessed from mine entries located over 100m to the southwest and downslope of the site.

Given the recorded presence of extensive workings in the underlying Cefn Glas coal seam, there is a potential risk of associated ground subsidence affecting the north western area of the site. However, the mining plan shows some spot levels within the workings which indicate that the workings are likely to be at least 40m below the site. The workings are therefore likely to be too deep to affect the site.

Shallow unrecorded workings in the Cefn Glas seam, beneath the south eastern area of the site cannot however be discounted.

It is recommended that a series of rotary probeholes are drilled within the site in order to establish the general geology and to assess the mining risk further.

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK

The Envirocheck report records the nearest water feature to be located 7m southeast of the site boundary. The OS Water Network Data map indicates this to be an unnamed surface water feature. The nearest named feature is the Nant Melyn located 64m east and 84m southeast of the site boundary. The next named feature is the River Ely which is located 434m southwest of the site.

The Environment Agency groundwater vulnerability map and aquifer database classifies the bedrock beneath the site as a Secondary 'A' Aquifer. Secondary 'A' Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK (CONTINUED)

The Environment Agency groundwater vulnerability map and aquifer database classifies the superficial deposits beneath the southeast area of the site as Unproductive Strata. Unproductive strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Vertical migration of groundwater is likely to be limited by the high clay content of the Devensian Till.

There is one discharge consent recorded within 500m of the site boundary. It is an unspecified discharge received by the River Ely and located 429m west of the site boundary. This consent has now expired. The nearest effective discharge consent is recorded 548m southwest of the site boundary and is a sewage discharge received by the River Ely.

The Envirocheck Report states that there are no groundwater abstractions within 1km of the site.

Tables 2 and 3 present a summary of the hydrological features and key hydrogeological nature of the site.

Feature	Distance from site	Flow	Classification	Abstraction	Discharge
Unnamed surface water feature	7m southeast	Not known	Not known	No	Nant Melyn
Nant Melyn	64m east and 84m southeast	Not known	Not known	No	River Ely
River Ely	434m southwest	Not known	Not known	No	Cardiff Bay
Surface run-off	On site	Flows into the ground	N/A	No	Not known

4.5 HYDROLOGY, HYDROGEOLOGY AND FLOOD RISK (CONTINUED)

Geological Unit	Aquifer Classification	Aquifer Characteristics	Source Protection Zone	Groundwater Abstractions
Topsoil	Not classified	Highly variable permeability and porosity.	No	None
Devensian Till	Unproductive Strata	Variable low permeability and porosity with intergranular flow possible. High clay content likely to restrict flow.	No	None
Hughes Beds	Secondary A Aquifer	Variable moderate permeability sandstones, with thin mudstones/siltstones and thin coals	No	None

The soils have been classified as having a High Leaching Potential (H3). These are coarse textured or moderately shallow soils which readily transmit non-absorbed pollutants and liquid discharges but which have some ability to attenuate absorbed pollutants because of their large clay or organic matter contents.

The Environment Agency Flood Risk Map as presented within the Envirocheck Report indicates that the site is not at risk from extreme flooding from rivers or sea without defences. The BGS Flood GFS Data map indicates that the site and the surrounding area has limited potential for groundwater flooding to occur at the surface.

4.6 LANDFILL SITES

The Envirocheck Report indicates that there is one historical landfill site located within 500m of the site boundary. It was located 352m southeast of the site and deposited waste included industrial, commercial and household waste and liquid sludge. The last input date was 31st August 1972.

There are records of potentially infilled land (non-water) within 500m of the site and these are at the location of former quarries and coal levels. The nearest is located 121m west of the site.

There are no current landfill sites or licenced waste management facilities within 250m of the site boundary.

4.7 POTENTIAL CONTAMINATION

Previous Uses

The various activities in the vicinity of the site which may have resulted in ground or water resource contamination on this site are listed below in Tables 4 and 5.

Table 4: Potential Contaminants		
Land Use: Undeveloped fields until the present day		
Material/Process	Contamination/Hazard	Evidence
Agricultural land	No potential contaminants	Historical maps

Existing Uses

The site is currently used as agricultural land.

Adjacent Site Uses

Table 5: Potential Contaminants: Adjacent Site Uses		
Potential Contamination Source	Boundary	Associated Contaminants and Hazards
Residential	South western	No Potential Contaminants
Undeveloped land	North western, north eastern and south eastern	No Potential Contaminants

4.8 OTHER ENVIRONMENTAL ISSUES

Rhos Tonyrefail, which the Envirocheck Report indicates is a Site of Special Scientific Interest, is located 216m north of the site. There are also areas of Ancient Woodland within 250m of the site boundary, located 64m east, 73m south and 192m west of the site.

The Envirocheck Report indicates that there have been no pollution incidents to controlled waters recorded on site but two recorded within 500m of the site boundary. The nearest was recorded 28m west of the site and was a Category 3-Minor Incident involving chemicals-pesticides. Another minor incident involving an unknown pollutant was recorded 387m southwest of the site.

4.8 OTHER ENVIRONMENTAL ISSUES (CONTINUED)

There have been no substantiated pollution incidents registered on site or within 500m of the site boundary.

There have been no recorded prosecutions related to authorised processes or controlled waters recorded on site or within 1km of the site boundary.

It is not known if any invasive plants are present on site, although none were noted in adjacent fields during former investigations. A full plant survey may be required prior to development.

5.0 PRELIMINARY CONCEPTUAL SITE MODEL

5.1 RISK ASSESSMENT FRAMEWORK

In order to be consistent with current UK government policies and legislation, it is necessary to identify, make decisions on, and take appropriate action to deal with land contamination, in accordance with the procedures specified in the Environment Agency document 'Model Procedures for the Management of Land Contamination CLR-11' (Environment Agency 2004).

The risk assessment process is designed to provide a reasoned, structured and pragmatic mechanism for the identification of any potential human health and controlled waters risks associated with land contamination and where necessary to develop a robust remediation strategy to ensure protection of the sensitive receptors (human health of future residents, controlled waters, etc).

In accordance with the CLR-11 framework, risk is defined as:

'a combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequence of the occurrence'.

The three essential elements to any risk are defined by CLR-11 as follows:

- A contaminant, or hazard, which is in, on, or under the land and has the potential to cause harm (Source)
- A means by which a receptor can be exposed to, or affected by a contaminant or hazard (Pathway)
- A receptor, i.e. something which could be adversely affected by a contaminant or hazard, such as human health or groundwater (Receptor).

In order for there to be a potential risk, all three of the above elements must be present. If there is a source of contamination and a receptor (for example a resident or site user), then there is only a potential risk if there is a pathway linking the two. Such an active pathway is known as a relevant pollutant linkage. It is possible for the same contaminant to be linked to a receptor via a number of pathways, and hence it is important that all relevant pollutant linkages, to both human health and controlled waters, are separately identified on a site in order that a comprehensive conceptual model can be formed and ultimately a robust remediation strategy designed.

5.1 RISK ASSESSMENT FRAMEWORK (CONTINUED)

Current practice during Generic Quantitative Risk Assessment of land affected by contamination is to use generic soil screening values based on the appropriate proposed end use. These usually comprise risk based Soil Guideline values (SGVs) or Generic Assessment Criteria (GACs) derived by the Environment Agency's Contaminated Land Exposure Assessment Model (CLEA). The SGVs and the supporting technical guidance were developed in order to assist in the assessment of long term risk to human health from the exposure to contaminated soils.

Revised Statutory Guidance, published in 2012, to support Part 2A of the Environmental Protection Act 1990, introduced a new four category system for classifying land under Part 2A. Category 1 includes land where the level of risk is clearly unacceptable and Category 4 includes land where the level of risk posed is considered to be acceptably low. Under Part 2A, land would be determined as contaminated if it falls within Categories 1 or 2.

The revised Part 2A Statutory Guidance was accompanied by an Impact Assessment that identified a role for new 'Category 4 Screening Levels' (C4SLs) that would provide a simple test for determining when land is suitable for use and definitely not contaminated land. A Policy Companion Document including the C4SLs was published in March 2014 (England) and May 2014 (Wales).

The C4SLs have been based on the CLEA methodology and derived using the CLEA model, with modified toxicological and exposure parameters. To date, C4SLs have been released for six substances (arsenic, cadmium, chromium (VI), lead, benzo(a)pyrene and benzene).

The C4SLs have been derived on the assumption that where they exist, they will be used as generic screening criteria within generic quantitative risk assessment.

Following publication of the C4SLs, Land Quality Management (LQM), in conjunction with the Chartered Institute for Environmental Health (CIEH) released Suitable 4 Use Levels (S4ULs) in January 2015.

The S4ULs have been derived in accordance with UK legislation, and using a modified version of the Environment Agency's CLEA software. As such, the S4ULs are based on the concept of minimal or tolerable risk as described in Human Health Toxicological Assessment of Contaminants in Soil (Science Report SR2, Environment Agency 2009a).

S4ULs have been derived for a wider number of substances.

5.1 RISK ASSESSMENT FRAMEWORK (CONTINUED)

In addition to the existing SGVs, C4SLs and S4ULs, Atkins ATRISK^{soil} also provide a set of Soil Screening Values. These are currently intended to be used in conjunction with SGVs, although they intend to update these values in line with the C4SLs in due course.

We have reviewed all sets of values and intend to use the most appropriate assessment criteria as Tier 1 screening values in the first instance. Where a published C4SL is available, and considered appropriate, this will be used in the first instance.

5.2 CONCEPTUAL MODEL FRAMEWORK

The preliminary stage of the risk assessment process is to develop and define a conceptual site model, based on the desk study and any existing site investigation data. This is used to establish any potential contaminant sources, identify existing and future receptors and assess if there are any potentially active pathways by which a potential risk may be present.

The preliminary conceptual site model will be developed and refined as site specific data is gathered, such as actual ground conditions and chemical data, resulting in a more robust conceptual understanding of the site.

5.3 CRITICAL SENSITIVE RECEPTOR – HUMAN HEALTH

The proposed development of the site is for a residential end use. Therefore, the critical sensitive receptor from a human health perspective is an on-site residential receptor.

In accordance with C4SL and CLEA guidance for a standard residential scenario, the critical sensitive receptor for a residential end use risk assessment is a female child, with exposure from 0 to 6 years.

The standard residential end use conceptual model defined by C4SL and CLEA is assumed to be suitable for the purposes of this assessment.

5.4 CRITICAL SENSITIVE RECEPTOR – CONTROLLED WATERS

Based on the proposed redevelopment of the site for a residential end use, and the findings of the desk study, the critical sensitive receptor from a controlled water perspective is groundwater within the Secondary 'A' Aquifer of the Hughes Member Sandstone.

5.4 CRITICAL SENSITIVE RECEPTOR – CONTROLLED WATERS (CONTINUED)

By considering groundwater as the critical sensitive receptor for controlled waters, the groundwater/hydrogeological risk assessment will also be protective of the Nant Melyn to the east and southeast of the site and any other surface water features in close proximity of the site.

5.5 POTENTIAL CONTAMINANT SOURCES

As identified in the desk study, the site has remained undeveloped over the years and significant thicknesses of made ground are not anticipated within the site. If made ground was encountered, the potential types of contaminants of concern are listed below:

- Metals, semi-metals, and inorganics within the shallow made ground;
- Polycyclic aromatic hydrocarbons (PAH) within the shallow made ground; and
- Asbestos within the shallow made ground.

5.6 POTENTIAL EXPOSURE PATHWAYS

Potential exposure pathways for the critical receptors (both human health and controlled waters) are listed below:

- Dermal contact with soil and/or soil derived dust;
- Ingestion of soil and/or soil attached to home-grown produce;
- Ingestion of home-grown produce;
- Inhalation of soil derived dust;
- Inhalation of vapours – indoor and outdoor air;
- Leaching of contaminants from made ground to groundwater; and
- Transportation of contaminants within groundwater.

In addition, the following exposure pathways have also been considered:

- Ground gas generation and migration
- Building materials durability.

5.7 SUMMARY OF CONCEPTUAL EXPOSURE MODEL

A preliminary conceptual exposure model has been developed for the site. This is based on the findings of the desk study and historical review and includes all potential sources, pathways and receptors that may be present on site. Those that have been identified as being potentially active require further investigation in the form of sampling and testing of soils and groundwater, followed by appropriate risk assessment.

The preliminary conceptual exposure model will be reviewed and refined following the completion of the site works and laboratory testing.

The preliminary conceptual exposure model is presented below in Table 6.

Source		Receptor	Pathway	Potentially Active Pathway?
Origin	Contaminant			
Made Ground of unknown origin and historical land uses, although not anticipated within the site	Metals, semi-metals, non-metals, PAH, asbestos	Resident – human health	Dermal Contact with made ground/dust	✓
			Ingestion of soil and/or soil attached to home-grown produce	✓
			Ingestion of home-grown produce	✓
			Inhalation of dust	✓
			Inhalation of vapours – indoor/outdoor	✓
	Metals, semi-metals, inorganics, PAH	Groundwater quality	Leaching from made ground	✓
Metals, semi-metals, inorganics, PAH	Surface water quality	Transportation within groundwater	✓	
Made Ground of unknown origin and natural ground	pH and water soluble sulphate	Building Materials Durability	Direct contact	✓
Ground Gas – organic, gas producing materials present within site or adjacent to the site	Methane, carbon dioxide	Human health	Accumulation of gases in confined spaces, and/or migration off site, leading to asphyxiation, or risk of explosion	X Significant thickness of gas producing materials are not anticipated, no radon protective measures are required

6.0 ANTICIPATED GROUND CONDITIONS

Based on the geological map data, historical records and available site investigation data, the following general succession of superficial deposits and underlying solid geology beneath the site is anticipated:

Recent	Topsoil comprising a variable composition of materials
Quaternary	Devensian Till deposits comprising a variable and poorly sorted combination of sands, clays, gravels and cobbles
Carboniferous	Hughes Member Sandstone predominantly comprising sandstones but with thin mudstones/siltstones and thin coals

The superficial deposits are likely to be thicker across the southeast area of the site and they may thin, or even be absent, across other parts of the site.

7.0 SITE ASSESSMENT

7.1 ENVIRONMENTAL RISK ASSESSMENT

This assessment takes due regard of Contaminated Land Guidance issued by DEFRA and RICS. The methods used follow a risk based approach with the potential environmental risk assessed qualitatively using the 'source-pathway-receptor' pollutant linkage concept set out in the Environment Protection Act 1990.

Although the risk presented in the following tables and above is descriptive, it is correlated to a numerical chance of occurrence. Therefore, the range and percentage chance of occurrence is given in order that the reader may assess the datum for the risk level. Although the percentage chance is quoted, this is still a subjective evaluation and is not prepared by probabilistic determination. Therefore, the chance of occurrence is a value judgement and not a numerical calculation. The evaluation is a simple qualitative risk assessment, which cannot make a judgement on the probability of occurrence or level of contamination. The latter two aspects require site specific information.

Reference to risk classifications is made according to the following definitions.

Low Risk	It is unlikely that the issue will arise as a liability/cost.
Medium Risk	It is possible that the issue could arise as a liability/cost. Further work is needed to clarify the risk and consequences.
High Risk	It is likely that the issue will arise as a liability/cost.

In consideration of the information gathered and presented in this report the following risk appraisal is considered appropriate.

Table 7: Environmental Risk Assessment		
Issue	Risk Category	Comments
Site sensitivity		
Sensitivity of site location	Low	<ul style="list-style-type: none"> Site is not within a 'groundwater source protection zone' a 'nitrate vulnerable zone', or an 'area of outstanding natural beauty'.
Environmental sensitivity of adjacent land uses	Low	<ul style="list-style-type: none"> Site situated in a mainly undeveloped area or within new residential development to the southwest

7.1 ENVIRONMENTAL RISK ASSESSMENT (CONTINUED)

<i>Contamination potential</i>		
Potential for significant on-site contamination	Low	<ul style="list-style-type: none"> • Site historically and currently undeveloped • Significant made ground is not anticipated on site
Potential for contaminants migrating off from the site	Low	
Potential for contaminants migrating onto the site	Low	
Potential for other environmental issues to give rise to liabilities	Low	
<i>Environmental Consequences</i>		
Risk of pollution of controlled waters	Low	<ul style="list-style-type: none"> • Any made ground encountered beneath the site is not anticipated to be significant and if encountered likely to be very localised
Risk of damage to future property	Low	
Risk of harm to human health	Low	
<i>Business Consequences</i>		
Risk of liability for owner	Low	<ul style="list-style-type: none"> • Previous and current land use not likely to produce significant contaminants
Likelihood of designation as Contaminated Land under EPA 1990	Low	
Risk of site value and/or saleability being affected	Low	
<i>Overall Risk</i>	Low	

7.2 GEOTECHNICAL HAZARDS AND CONSTRAINTS

A summary of commonly occurring geotechnical hazards is given in Table 8, together with an assessment of whether the site may be affected by each of the stated hazards. This information may be required should any future construction works or further building expansion be proposed.

7.2 GEOTECHNICAL HAZARDS AND CONSTRAINTS (CONTINUED)

Table 8: Summary of Potential Geotechnical Hazards					
Issue (excluding contamination issues)	Hazard Status			Engineering considerations	
	Likely to be present on site	Could be present on site	Unlikely to be present and/or affect the site		
Shrinkable clays	✓			Special requirements for foundation and floor design	
Filled and made ground			✓	Likely to affect ground engineering and foundation design and construction.	
Highly compressible and low bearing capacity soils including peat and soft clay		✓			
Silt rich soils susceptible to rapid loss of strength in wet conditions		✓			
Adverse ground chemistry (including expansive slags, weathering of sulphides to sulphates)			✓		
Combustibility potential			✓		
Solution features			✓		
Evaporite dissolution features and subsidence			✓		
Ground subject to peri-glacial valley cambering with gulls present			✓		
Sudden lateral changes in ground conditions			✓		
Existing sub structures (e.g. foundations and pits)			✓		
Ground subject to vibration			✓		
Underground mining (shallow)		✓			Shallow workings could be present beneath the site based on the information from the Coal Authority
Mine entries (shafts and adits, bell pits)		✓			Unrecorded mine entries could be present on site

7.2 GEOTECHNICAL HAZARDS AND CONSTRAINTS (CONTINUED)

Table 8: Summary of Potential Geotechnical Hazards				
Issue (excluding contamination issues)	Hazard Status			Engineering considerations
	Likely to be present on site	Could be present on site	Unlikely to be present and/or affect the site	
Ground subject to or at risk of coastal or river erosion			✓	
Ground subject to, or at risk from landslips			✓	
High water table (including waterlogged ground)		✓		Envirocheck Report stated that the site could have limited potential for groundwater flooding to occur across the site
Rising groundwater table due to diminishing abstraction in urban areas or cessation of deep mining			✓	
Culverted water courses			✓	

8.0 SITE INVESTIGATION PROPOSALS

Prior to development of the site, a comprehensive intrusive site investigation would be required, over the entire site, in order to facilitate a detailed technical and financial appraisal. This would enable the foundation and hardstanding design for any proposed development to be developed using specific data on the ground conditions and enable more accurate costings to be made.

Investigation works should give consideration to the following:

- Foundation design
- Excavation stability design
- Remediation requirements
- Groundwater control

In particular, the principal geoenvironmental and geotechnical issues to be addressed are:

- Foundation strata - level, strength, compressibility, and chemical characteristics;
- Presence or absence of shrinkable clays;
- The extent of any ground contamination, including potential asbestos in the ground;
- Presence of shallow mine workings; and
- The potential for ground gas to be present beneath the site.

Investigation techniques to be adopted should include:

- Trial pits could be used to examine the shallow ground conditions;
- Rotary probeholes would be used to examine deeper ground conditions to investigate the possible presence of shallow underground mine workings;
- Laboratory chemical testing to determine soil chemistry to include a range of organic and inorganic contaminants, and also screening for asbestos if made ground is encountered; and
- Laboratory geotechnical testing to determine soil plasticities.

If significant areas of made ground are encountered, supplementary works in the form of gas monitoring would be required. A requirement for a programme of gas monitoring is considered unlikely at this stage.

APPENDIX A

ENVIROCHECK REPORT

APPENDIX B

BGS RADON REPORT

APPENDIX C

COAL AUTHORITY MINING REPORT

FIGURES