

Meadstead Drive, Royston, Barnsley

Desk Study Report

Yorkshire Housing

Solmek Report Number S90716

August 2009

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SECTION		PAGE
1.0	Introduction and Scope of Works	2
2.0	Regulatory and Planning Context	2
3.0	Site Description	3
4.0	Site History	3
5.0	Environmental Context	4
6.0	Geology, Groundwater and Surface Water	5
7.0	Preliminary Geotechnical Assessment	6
8.0	Preliminary Contamination Assessment	6
9.0	Phase II – Intrusive Investigation Work	8
10.0	Preliminary Conceptual Model and Risk Assessment	9
11.0	Conclusions & Recommendations	10

TABLES

1	Summary of Site History	3
2	Potential Priority Contaminants	7
3	Potential Linkages – Ground Gas	7
4	Preliminary Conceptual Model and Risk Assessment	9

APPENDICES

1	Figures and Plates
2	Historical Map Extracts
3	Ground Sure EnviroInsight Report
4	Ground Sure GeoInsight Report
5	Mining Report
6	Notes On Limitations

Status	Date	Prepared by	Checked by
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Meadstead Drive, Royston, Barnsley

Desk Study Report

1 INTRODUCTION AND SCOPE OF WORKS

- 1.1 Solmek were instructed by Acanthus WSM Architects on behalf of Yorkshire Housing to undertake a desk study on a parcel of land to the south of Meadstead Drive, Royston, Barnsley.
- 1.2 The following steps may be required in the investigation and remediation of potentially contaminated land:
- Phase 1: Desk Study
 - Phase 2: Intrusive Investigation
 - Phase 3: Remediation Statement
 - Phase 4: Validation Reports
- 1.3 Phases 1 and 2 are generally required in the redevelopment of most sites. Phases 3 and 4 are subject to the findings of the initial stages. This report represents Phase 1 of the site investigation.
- 1.4 The purpose of this desk study is to evaluate the ground conditions of the site based on existing information and to plan the scope of the subsequent investigation. The objectives and planned outcomes of the desk study are:
- to assess the impact of local authority guidance on the investigation
 - to identify existing features on and near the site
 - to evaluate the historical and environmental setting of the site
 - to assess the likelihood of finding contamination, its nature and extent
 - to identify associated key contaminants
 - to identify sensitive receptors and define source – pathway – receptor relationships (conceptual model)
 - to identify relevant geotechnical parameters
 - to assess any potential sources of ground gas
 - to assess potential risk of shallow mining
 - to refine the design and scope of the proposed intrusive investigation (if necessary)
 - to identify constraints to the investigation, i.e. site access and health and safety considerations
- 1.5 This assessment has been undertaken with due regard to contaminated land guidance, issued by the Royal Institution of Chartered Surveyors (RICS) and BS 10175: 2001, “Code of Practice for the Investigation of Potentially Contaminated Land”. Selected elements of BS 5930: 1999, “Code of Practice for Site Investigations” has also been included.

2 REGULATORY AND PLANNING CONTEXT

- 2.1 The Town and Country Planning Regime is the principal means by which contamination is dealt with by the Local Authority. Contaminated land is a material planning consideration and contamination assessments are required on land that may be potentially contaminated.
- 2.2 The Buildings Regulations (2000) also state that “precautions shall be taken to avoid danger to health and safety caused by substances found on or in the ground covered by the building”. A site investigation is frequently required to satisfy the requirements of building control.

3 SITE DESCRIPTION

- 3.1 The preliminary site inspection, as recommended in BS 5930 and BS 10175, was undertaken on Tuesday 4th August 2009. Location maps and selected plates are presented in Appendix 1. The site is centred at the approximate Ordnance Survey Co-ordinates 435575E, 411291N.
- 3.2 The site is roughly rectangular in shape and slopes slightly down from north to south. The ground cover comprises a mixture of bare earth and earth mounds (north west of site) with rutted concrete along the south. No permanent structures are present on site; however a number of temporary site cabins are located along the southern boundary and central area. A number of stockpiles of building materials are present around the site.
- 3.3 The site is bounded to the north and east by a metal fence, approximately 2.5m in height, with barbed wire top. The southern and western boundaries are marked by a 2m high metal paling fence. The surrounding land use comprises residential properties. A mature silver birch tree is located to the north east corner of the site.
- 3.4 Access to the site was gained via the east of site through metal gates.
- 3.5 No obvious signs of surface contamination were noted on site.

4 SITE HISTORY

- 4.1 In order to determine the history of the site, previous editions of Historical Maps and Ordnance Survey Plans were inspected. Selected map extracts are presented in Appendix 2.
- 4.2 Table 1 presents a summary of the history of the site from 1893 to 2008. The summary focuses on the historical land uses and changes relevant to the site and the proposed end use. Measurements are taken from the centre of the site and all distances quoted are approximate.

OS MAP	ON SITE FEATURES	OFF SITE FEATURES
1893 (1:2,500)	The site lies in an open undeveloped field, likely used for agriculture.	Immediate surrounding land lies undeveloped. A number of small dwellings can be seen along High Street approx. 200m north of the site. Brick pond noted approx. 200m north west of site.
1904 (1:10,560)	No changes noted to the site.	Immediate surrounding land remains undeveloped.
1913 (1:2,500)	No apparent changes noted to the site.	Immediate surrounding land remains undeveloped.
1938 (1:10,560)	No significant changes.	New housing shown to the north west and east. A cricket ground is depicted to the south east. Allotment gardens are present to the west and south east.
1951 (1:10,560)	Site remains undeveloped.	Immediate surrounding land remains undeveloped. Further housing development to far south east.
1960 (1:2,500)	The site itself remains undeveloped.	Semi detached properties have been constructed to the immediate east and south of the site.
1970 (1:2,500)	The site now comprises three semi-detached properties along Meadstead Drive with garages to the	Housing now present to all immediate surrounding areas. Factory or works located to the east.

	central south and south west, accessed from the east of the site.	
1978 (1:10,000)	No apparent changes.	A school has been built approx. 120m east of the site.
1981-1986 (1:1,250)	No apparent changes.	No significant changes noted to the immediate surrounding area.
1989-1990 (1:10,000)	The site appears to remain unchanged.	No significant changes noted to the immediate surrounding area.
2008 (1:2,500)	The three semi-detached dwellings have been removed, with only the garages to the south west remaining.	Housing to the immediate east has also been demolished.

TABLE 1: SUMMARY OF THE SITE HISTORY

- 4.3 The site has seen limited change over the period covered by the historical maps. The site was unoccupied until semi-detached housing and garages were built around 1960-1970. These remained until 2008 when demolition of the housing and some of the garages took place.
- 4.4 The surrounding areas were initially agricultural, with a general increase in housing and road networks from 1960 onwards. No heavy industry was noted within 250m of the site. Due to the age of some of the historical map extracts, not all previous land uses may have been identified.

5 ENVIRONMENTAL CONTEXT

- 5.1 The services of Ground Sure were used to establish the pertinent environmental records relating to the site. This information, which is presented in Appendices 3 (Enviro Insight) and 4 (Geo Insight), replaces much of the information traditionally provided by the Environment Agency. Selected relevant information is summarised as follows. Measurements are taken from the centre of the site and all distances quoted are approximate.

Landfill and Waste

- 5.2 Records of sites dealing with waste within 1km of the site have been examined. Records indicate two such facilities within 1km; however none are located within 700m. The nearest of these is a historical landfill site 741m north east.

Regulated Industries

- 5.3 No entries are included under the headings of Control of Major Accident Hazards Sites (COMAH), Explosive Sites, Notification of Installations Handling Hazardous Substances (NIHHS) or Planning Hazardous Substance Consents, Integrated Pollution Controls Local Authority Pollution Prevention and Control Enforcement, Prosecutions Relating to Authorised Processes or Local Authority Pollution Prevention and Controls.

Industrial Land Use

- 5.4 The Ground Sure Report identifies current industrial land use. Located within 250m of the site are two depots, two electricity sub stations, and a pharmacy. For full details see the Ground Sure Report (Appendix 3).
- 5.5 No underground high pressure oil or gas pipelines are shown within 500m of the site.

Environmentally Sensitive Areas

- 5.6 There are no environmentally sensitive areas within 500m of the site.
- 5.7 The site lies on a Nitrate Vulnerable Zone according to the Ground Sure report.

6 GEOLOGY, GROUNDWATER & SURFACE WATER

Geology

- 6.1 Inspection of British Geological Survey Sheet 87 Barnsley (1:50,000 Series: Solid and Drift Edition) was undertaken. The site lies on a drift deposit boundary with boulder clay or no drift depicted on the map. The solid geology is expected to consist of Middle Coal Measures: mudstone, sandstone and siltstone. A coal seam is inferred to outcrop through or just to the north of the site.
- 6.2 The site lies between two geological faults to the north west (170m) and south east (420m). The site is shown on the down thrown side of each fault.

Geological Hazards

- 6.3 The Ground Sure Report states that a negligible risk is posed by ground dissolution, compressible ground, collapsible ground and running sand subsidence. A very low risk is shown for shrinking/swelling ground and landslide stability hazard. For full details see the Ground Sure Report (Appendix 4).
- 6.4 The Ground Sure Report states that there is a low to moderate risk posed by shallow mining hazards.

Radon Risk

- 6.5 The site is within a Radon affected area in which between 1% and 3% of homes are above the action level. However, the Ground Sure report states that no radon protective measures are necessary in the construction of new dwellings or extensions.

Mining Situation

- 6.6 The Ground Sure Report states that the site is in an area that may be affected by coal mining. A coal mining report was sourced from the David Bellis Consulting Surveyors dated 5th August 2009 and is presented in Appendix 5. The report states the property is in the likely zone of influence of four known worked coal seams between 305mbgl and 547mbgl. The shallowest seam is the Barnsley and has a section of 1.8m.
- 6.7 There are no shafts or adits within 20m of the property. There is no evidence of coal mining related subsidence claims in relation to the property in the past 10 years. The report concludes old workings are present but all settlement is likely to have completed long ago.
- 6.8 The outcropping coal seam noted during inspection of the geological map is not referred to in the coal mining report. Therefore, it is inferred that the seam dips away (northwards) from the site.

Ground and Surface Water

- 6.9 The Ground Sure report shows that the underlying solid geology beneath the site is classified as a minor aquifer, with soils of a high leaching potential.
- 6.10 A surface water feature is highlighted within the Ground Sure report between 51-250m of the site. This is likely to be a drainage ditch located approximately 200m south of the site.
- 6.11 There are two water discharge consents listed in the Ground Sure Report. The nearest is located 441m east of site. The effluent type is shown as sewage discharge from a pumping station. The receiving water is listed as Boulderbridge Dyke.
- 6.12 There are no water abstraction licences listed within 1km of the site.

Flooding

- 6.13 The does not lie within 250m of an Environment Agency Zone 2 or Zone 3 flood plain area. It is stated that the site is not located within an area benefiting from flood defences.

7 PRELIMINARY GEOTECHNICAL ASSESSMENT

Relict Foundations and Made Ground

- 7.1 Given the site history shallow made ground is likely to be encountered. Made ground is likely to consist of demolition waste from the structure recently demolished on the site. Additional made ground materials are likely to be present as a sub base beneath the hardstanding around the site. A Phase 2 investigation would determine the type and extent of made ground.
- 7.2 Apart from the recently demolished buildings on the site; relict foundations are unlikely to be encountered. As these structures were demolished recently, foundations should have been taken out as part of the demolition contract. The client is advised to obtain full utility drawings for the site before commencing any ground works.

Preliminary Foundation Assessment

- 7.3 Foundations are likely to comprise traditional strip or deep strip footings (possibly stepped), depending on the depth of made ground and nature of the underlying natural strata. However, a full assessment cannot be made until a Phase 2 Site Investigation has been carried out.

Excavations and Groundwater

- 7.4 The site is likely to be underlain by drift deposits of boulder clay or thin sandy clay. It is considered likely that excavations above rock head should be easily achievable by means of a normal excavator; however a breaker will be required if relict foundations are proven.
- 7.5 There is no evidence to suggest that groundwater will be encountered at shallow depths; however ground water levels vary with season and rainfall influences.

Mining

- 7.6 A coal mining report obtained for the site states the property is in the likely zone of influence of four known worked coal seams between 305mbgl and 547mbgl. The shallowest seam is the Barnsley and has a worked section of 1.8m. There is no evidence of coal mining related subsidence claims in relation to the property in the past 10 years. The report concludes old workings are present but all settlement is likely to have completed long ago.

8 PRELIMINARY CONTAMINATION ASSESSMENT

- 8.1 The desk study has revealed that the site has **potentially** been exposed to minimal contamination given its history. There is a possibility of contamination from demolition materials such as brick rubble and concrete. Ash may also be present as a sub base beneath areas of hardstanding as well as potential asbestos in the former housing and garages.

Development Proposals

- 8.2 The proposal is for the development of five semi-detached properties. The site will incorporate hardstanding as car parking, along with residential gardens as soft landscaping.

Potential Priority Contaminants

- 8.3 The sites former history includes residential land use, with demolition works having taken place recently. Therefore, it is recommended that a screen of potential priority contaminants should be tested for during a site investigation to confirm whether there is any contamination that may affect human health, given there will be a pathway for contaminants via soft landscaping. The testing should be based on guidance in CLR Report 8 "*Potential Contaminants for the assessment of Land*". The potential priority contaminants based on the sites history includes:

Inorganic Contaminants	Organic Contaminants
Arsenic, Boron, Cadmium, Chromium, Lead, Mercury, Nickel, Zinc, Selenium, Cyanide, Soluble Sulphate.	Phenol, TPH (aromatic/aliphatic), Speciated PAH.

TABLE 2: POTENTIAL PRIORITY CONTAMINANTS

- 8.4 In addition, pH and asbestos testing is recommended in accordance with CLR8.

Proposed Qualitative Risk Assessment

- 8.5 As part of this Phase 1 desk study, a preliminary conceptual model and risk assessment is outlined in Section 10. This assessment should be revised following the Phase 2 intrusive investigation outlining a qualitative risk assessment. Should there be unacceptable risks to the various receptors/end-users following the Phase 2 intrusive investigation, then a remediation strategy may be required to outline measures to satisfy Part 2A of the Environmental Protection Act (1990). The above measures are inline with CLR11 – Model Procedures.
- 8.6 The results of the chemical contamination testing as part of the Phase 2 investigation should be compared to a series of Generic Assessment Criteria (GAC) for a residential development with plant up-take based on the newest CLEA model V1.04.

Potential Hazards from Ground Gases

- 8.7 Ground gases such as carbon dioxide and methane can be classed as a form of contamination. Potential sources of ground gases include:
- Made Ground
 - Quarries & Infilled Ponds
 - Underlying Natural Strata (alluvium, peat and chalk)
 - Petrol re-fuelling sites (which also includes Volatile Organic Compounds)
 - Landfill (on and off-site)
 - Coal measures
- 8.8 Based on historical map evidence and consideration of the sites environmental setting, a preliminary comparison of *consequence* against *probability* has been made where ground gas is considered a potential threat to human health.

PRELIMINARY GROUND GAS ASSESSMENT		
Potential Sources	Potential Pathway	Receptor
Coal Measures (CO ₂ , CO and CH ₄)	Ingress and Accumulation into buildings from vertical and horizontal migration	Future end users – adult and infant receptors. Construction Workers (in particular utility workers).
Alluvium deposits (CH ₄ and CO ₂)		
Landfill Site (CO ₂ and CH ₄)	Ingress and Accumulation into buildings from vertical and horizontal migration	

Made Ground (CO ₂ and CH ₄)	Ingress and Accumulation into buildings from vertical and horizontal migration	
Petrol Refilling Station (CH ₄ and VOC)	Inhalation of vapours	
Preliminary Comparison of Consequence verses Probability		
	Classification	Justification
Probability (Based on Table 8.1, CIRIA C665, 2007)	LOW LIKEIHOOD	No registered waste facilities within 500m. Shallow made ground expected. Shallowest known worked coal seam 305mbgl.
Consequence (Based on Table 8.2, CIRIA C665, 2007)	MEDIUM	Construction of residential housing with infant and adult receptors.
	Risk	Details
Consequence vs. Probability (Based on Table 8.3, CIRIA C665, 2007)	LOW/MODERATE RISK	Investigation is normally required to clarify the risks and determine the potential liability. (Based on Table 8.4, CIRIA C665, 2007)
TABLE 3: POLLUTION LINKAGES - GROUND GAS		

- 8.9 Given the pollution linkages outlined above, it would be prudent to carry out full intrusive works for the new development to the south to justify the above risk assumption; this would give the site a risk classification based on the recommendations given in CIRIA Report C665.

Proposed Ground Gas Risk Assessment Procedure

- 8.10 A low to moderate gas hazard has been identified for the site based on CIRIA C665. The sensitivity of the proposed end use can be considered as moderate. In accordance with Wilson et al, 2005, the initial nominal spacing of gas monitoring wells should be between 25 and 50m.
- 8.11 Given the size of the site a minimum of three gas monitoring visits would be required in accordance with CIRIA C665. Based on the information collated within this desk study, the likely ground gas response zone has been identified as the made ground from recent demolition of houses and garages on site.

9 PHASE TWO – INTRUSIVE INVESTIGATION WORK

- 9.1 Based on the information collated in this desk study a Phase Two intrusive investigation is recommended. The investigation should comprise a series of small percussive boreholes to identify ground conditions beneath the footprint of the proposed new buildings. Boreholes may need to be extended if poor ground conditions are encountered. Given that new car parking is also proposed, it would be prudent to undertake some shallow hand dug trial pits in order to carry out insitu CBR testing.
- 9.2 Samples from the boreholes should be subject to geotechnical and contamination testing. Testing requirements may vary depending on the thickness of the made ground encountered, the nature of the natural soils and the depth to rock head if encountered.

- 9.3 Due to the possible presence of fill materials beneath the site gas/groundwater monitoring pipes should be installed in minimum of three selected boreholes (in accordance with C665) to assess the shallow ground gas and water levels beneath the site. A minimum of three visits should be made initially. However, if high or variable concentrations of ground gases are recorded, an extended period of monitoring maybe necessary.
- 9.4 Site investigations are designed according to the type of development, the requirements of the client, and recommendations in BS 5930 and BS 10175.

10 PRELIMINARY CONCEPTUAL MODEL AND RISK ASSESSMENT

- 10.1 The conceptual model (Table 4) collates the salient aspects of the site to form a model which should enable comparison after fieldwork and testing. This model identifies the **potential** pollution linkages that may influence the proposed development and geotechnical considerations. The risk ratings are based on the current potential liabilities and likely potential future liabilities. This should not be used as a guide to the cost of addressing site specific ground issues. The risks posed by the geotechnical and contamination aspects of the site will be revised following site works, and any mitigating action required added.

PRELIMINARY CONTAMINATION ASSESSMENT					
SOURCES	DETAILS	RECEPTORS	PATHWAYS	DETAILS	RISK RATING
Potential contamination in the made ground	Possible sources include: Possible construction and demolition waste such as brick rubble and concrete. Potential ash rich sub base beneath the hardstanding along south of the site. Possible asbestos.	Users of site (once development is complete)	Dermal absorption	The proposed development is expected to include soft landscaping as garden areas.	LOW-MOD
			Inhalation of soil/volatilised compounds		
			Ingestion of soil		
			Contact with contaminated groundwater		
		Construction workers and users of site during construction	Ground gas from vertical and horizontal migration	Ingress and Accumulation into structure.	LOW-MOD (C665)
			Dermal absorption	Contact with made ground and groundwater during ground works	LOW-MOD
			Inhalation of soil/volatilised compounds		
			Ingestion of soil		
			Contact with contaminated groundwater	Contact with dust during construction	
		Users of surrounding sites	Dermal absorption	Contact with wind blown dust during construction	LOW-MOD
			Inhalation of soil/volatilised compounds		
			Ingestion of soil		
		Vegetation	Uptake via roots and leaf surfaces	The proposed development to include residential gardens.	LOW-MOD
		Groundwater	Slow seepage or leaching of contaminants	Minor Aquifer.	LOW
		Surface Water	Slow seepage or leaching of contaminants	Within 51-250m of site according to Ground Sure; however none noted on historical maps	LOW
			Accumulation of contaminated sediments		
		Construction	Direct contact	Relict foundations	LOW-MOD

		Materials		possible from recently demolished buildings, buried services are present on site.	
PRELIMINARY GEOTECHNICAL ASSESSMENT					
FACTOR		ON SITE DESCRIPTION			RISK RATING
MADE GROUND		Made ground is expected to include brick rubble, and concrete along with possible ash rich sub base beneath areas of hardstanding.			LOW-MOD
NATURAL SOILS		Boulder clay or thin drift of sandy clay.			LOW
SOLID GEOLOGY		Middle Coal Measures.			LOW
MINING		Site underlain by four known worked seams, shallowest of which Barnsley at 305mbgl with 1.8m section. Mining report concludes old workings are present but all settlement is likely to have completed long ago.			LOW
GROUND GAS		No radon protection measures required. Ground gas assessment is recommended.			LOW-MOD
SUBSIDENCE /GROUND STABILITY		Ground instability is not expected to pose a hazard.			LOW
TABLE 4: PRELIMINARY CONCEPTUAL MODEL AND RISK ASSESSMENT					

11 CONCLUSIONS & RECOMMENDATIONS

- 11.1 The results of the desk study are presented in this report and Solmek can comment as follows:

Existing Features on and Near the Site

- 11.2 The site is roughly rectangular in shape and slopes slightly down from north to south. The ground cover comprises a mixture of bare earth and earth mounds (north west of site) with rutted concrete along the south. No permanent structures are present on site; however a number of temporary site cabins are located along the southern boundary and central area. A number of stockpiles of building materials are present around the site.

Historical and Environmental Setting

- 11.3 The site has seen limited change over the period covered by the historical maps. The site was unoccupied until semi-detached housing and garages were built around 1960-1970. These remained until 2008 when demolition of the housing and some of the garages took place.
- 11.4 The surrounding areas were initially agricultural, with a general increase in housing and road networks from 1960 onwards. No heavy industry was noted within 250m of the site. Due to the age of some of the historical map extracts, not all previous land uses may have been identified.
- 11.5 The site lies on a drift deposit boundary with boulder clay or no drift depicted on the map. The solid geology is expected to consist of Middle Coal Measures: mudstone, sandstone and siltstone.
- 11.6 The solid geology beneath the site is designated as a Minor Aquifer.
- 11.7 The Ground Sure Report states that the site is within a Radon affected area in which between 1% and 3% of homes are above the action level. No radon protective measures are necessary in the construction of new dwellings or extensions.

Impact of Local Authority Guidance

- 11.8 Although the site is unlikely to be considered contaminated with regards to Part IIA of the Environmental Protection Act (1990) and the local authorities contaminated land strategy, the contamination status of the site will be considered as part of the planning process to ensure the site is suitable for use.

Likelihood of Finding Contamination, its Nature and Extent and Key Contaminants

- 11.9 Based on the site walkover, and evidence compiled from the historic maps and Groundsure Report, contamination is possible due to the development on site. Made ground is expected to contain construction debris such as brick rubble, concrete, along with possible ash and asbestos.

Source – Pathway – Receptor Relationships

- 11.10 Pathways (as detailed in the conceptual model) may exist between the potential contamination in the made ground and human health, construction materials, vegetation and water. The site investigation will provide information to assess these pathways and the risks posed.

Proposed Development

- 11.11 The proposal is for the development of five semi-detached properties. The site will incorporate hardstanding as car parking, along with residential gardens as soft landscaping.

Geotechnical Considerations

- 11.12 Given the site history shallow made ground is likely to be encountered on site. Made ground is likely to consist of construction/demolition waste. Additional made ground materials are likely to be present as a sub base beneath the hardstanding around the site. A Phase 2 investigation would determine the type and extent of made ground.
- 11.13 Apart from the recently demolished buildings; relict foundations are unlikely to be encountered. As these structures were recently demolished, foundations should have been taken out as part of the contract. The client is advised to obtain full utility drawings for the site before commencing any ground works.

Preliminary Foundation Assessment

- 11.14 Foundations are likely to comprise traditional strip or deep strip footings (possibly stepped), depending on the depth of made ground. However, a full assessment cannot be made until a Phase 2 Site Investigation has been carried out.

Intrusive Investigation

- 11.15 Based on the information collated in this desk study a Phase Two intrusive investigation is recommended. The investigation should comprise a series of small percussive boreholes to identify ground conditions beneath the footprint of the proposed new buildings. Boreholes may need to be extended if poor ground conditions are encountered. Given that new car parking is also proposed, it would be prudent to undertake some shallow hand dug trial pits in order to carry out insitu CBR testing.
- 11.16 Samples from the boreholes should be subject to geotechnical and contamination testing. Testing requirements may vary depending on the thickness of the made ground encountered, the nature of the natural soils and the depth to rock head if encountered.
- 11.17 Due to the possible presence of fill materials beneath the site gas/groundwater monitoring pipes should be installed in minimum of three selected boreholes (in accordance with C665)

to assess the shallow ground gas and water levels beneath the site. A minimum of three visits should be made initially. However, if high or variable concentrations of ground gases are recorded, an extended period of monitoring may be necessary.

Mining

- 11.18 The coal mining report obtained for the site states the property is in the likely zone of influence of four known worked coal seams between 305mbgl and 547mbgl. The shallowest seam is the Barnsley and has a worked section of 1.8m.
- 11.19 There are no shafts or adits within 20m of the property. There is no evidence of coal mining related subsidence claims in relation to the property in the past 10 years. The report concludes old workings are present but all settlement is likely to have completed long ago.
- 11.20 The outcropping coal seam noted during inspection of the geological map is not referred to in the coal mining report. Therefore, it is inferred that the seam dips away (northwards) from the site.

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