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GEOENVIRONMENTAL REPORT
For land at
BANK END ROAD, WORSBROUGH BRIDGE, BARNSLEY.



Prepared for
Erris Homes Ltd

Prepared by

G & M Consulting Ltd

TABLE OF CONTENTS

1.0 INTRODUCTION. 3
1.1 Instructions. 3
1.2 Project Brief. 3
1.3 Previous Reports. 3
1.4 Limitations. 4
2.0 PROPOSED DEVELOPMENT. 4
3.0 GROUND INVESTIGATION. 5
3.1 Design and Strategy 5
3.2 Scope of Works. 5
3.3 Strata Description. 6
3.4 Sampling and In-situ Testing 6
3.5 Laboratory Testing 6
4.0 PHYSICAL GROUND CONDITIONS 7
4.1 General Succession of Strata 7
4.2 Groundwater 9
5.0 GROUND CONTAMINATION CONDITIONS 9
5.1 General 9
5.2 Current Guidance and the Interpretation of Analytical Data 11
5.3 Results 12
5.4 Reassessment of Site Conceptual Model 12
6.0 HAZARDOUS GAS MONITORING 14
6.1 General 14
6.2 Monitoring Procedure 14
6.3 Monitoring Results 15
6.4 Discussion 15
7.0 CONCLUSIONS AND RECOMMENDATIONS. 15
7.1 General. 15
7.2 Mining and Quarrying 16
7.3 Foundations. 17
7.4 Excavations/Retaining Structures. 18
7.5 Contaminated Land 19
7.6 Hazardous Gas. 19
7.7 Road Pavement Design. 19
7.8 Further Works. 20
7.9 Development Issues. 20

TABLES AND FIGURES

Table 1 - Summary of Total Soil Concentrations and Generic Quantitative Risk Assessment

APPENDICES

APPENDIX A - DRAWINGS

Drawing No	Title
C036/01/01	Proposed Development Layout.
C036/01/02	Proposed Cut/Fill Earthworks.
C036/01/03	Exploratory Hole Locations and Cross Sections.
C036/01/04	Conceptual Site Model

APPENDIX B - COAL AUTHORITY PERMIT

APPENDIX C - EXPLORATORY HOLE RECORDS

APPENDIX D - LABORATORY TEST RESULTS

APPENDIX E - GAS MONITORING SHEETS

GEOENVIRONMENTAL REPORT

For land at

BANK END ROAD, WORSBROUGH BRIDGE, BARNSLEY

1.0 INTRODUCTION.

1.1 Instructions.

On the instructions of Erris Homes Ltd (Erris) G&M Consulting Ltd (G&M) has carried out a site investigation of land at Bank End Road, Worsbrough Bridge near Barnsley. The work was commissioned to obtain and collate geoenvironmental and geotechnical information in connection with the proposed development of the site comprising residential properties with associated private gardens and estate roads. The proposed development is shown on Drawing No C036/01/01, presented in Appendix A of this report, taken from Drawing No 1613-102 dated April 2009, produced by KPP Architects

1.2 Project Brief.

The objectives of this investigation were as follows;

- To determine the shallow ground and groundwater conditions beneath the site;
- To determine whether past mining has an influence on the site;
- To determine the nature and degree of near surface ground contamination;
- To determine the risks posed to the site from hazardous gas, and;
- To provide foundation recommendations and advice on measures to deal with any proven contamination.

Fieldwork was undertaken on the 15th and 16th October 2009 and 20th November 2009 and comprised the drilling of ten rotary open-hole boreholes and the excavation of seven trial pits. Combined gas/groundwater monitoring wells were subsequently installed in three of the rotary open-holes.

Following completion of the fieldwork selected soil samples were scheduled for a range of chemical laboratory tests. The gas and groundwater wells have been monitored for hazardous gases on three occasions to date, and six more visits are programmed.

The rotary open-hole drilling works were carried out under the terms of reference of the Coal Authority (CA) permit No 4508, dated 16th September 2009. A copy of the permit is presented in Appendix B of this report.

1.3 Previous Reports.

The geoenvironmental appraisal has been undertaken in two phases. The initial phase was a preliminary investigation (desk study) which was reported in May 2009 under cover of G&M report ref. C036.

As part of this desk study information was sourced from Groundsure Ltd, the South Yorkshire Mining Advisory Service (SYMAS) and the British Geological Survey (BGS).

Based on the results of the preliminary investigation an intrusive investigation was developed and undertaken. This report details the results of the intrusive investigation and makes recommendations relating to the proposed development and should be read in conjunction with the desk study, the latter of which contains the site description, historical development associated with the site and environmental setting.

Prior to the current work the site has been subject to a previous site investigation carried out by Michael D Joyce Associates (MJA) in 1992. A copy of this report was made available to G&M, which has been reviewed and summarised in the above referenced desk study.

1.4 Limitations.

The comments and opinions presented in this report are based on the findings of a review of available information and ground conditions encountered during the intrusive investigation work. There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation. Any diagram or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

The information contained within this report is limited to land within the site boundary, as indicated on Drawing No C036/01/01, presented in Appendix A of this report, and to areas accessible during the ground investigation. As a consequence of the steep nature of the site profile, access to some parts of the site was restricted.

During the course of the works G&M did not notice the presence of any Japanese Knotweed. However, it should be noted that G&M are not qualified ecologists and as such cannot guarantee the absence of knotweed or other invasive vegetation. The possible presence of such vegetation should be confirmed by a qualified ecologist if necessary.

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2.0 PROPOSED DEVELOPMENT.

Erris Homes Ltd is proposing to develop the site for residential purposes. The proposed development is shown on Drawing No C036/01/01, presented in Appendix A of this report, taken from Drawing No 1613-102 dated April 2009, produced by KPP Architects. It is noted that retaining structures (primarily timber cribwall) are proposed by the Architect to the northern and western boundaries of the development.

From a review of the proposed development levels shown on Drawing C036/01/01, it is apparent that in order to achieve proposed development levels compared to current existing site levels a significant amount of cut earthworks is required, particularly in the northern and central parts of the site. This is evidenced by Drawing C036/01/02, presented in Appendix A of this report, taken from Drawing 1340/002 dated 15 October 2009, produced by Stamford Geomatics Ltd.

It is assumed in the preparation of this report that the final levels will not alter significantly from those shown on the drawings referenced above. If this is not the case then significant amendments to the conclusions and recommendations presented in the following sections may be required.

3.0 GROUND INVESTIGATION.

3.1 Design and Strategy

The findings of the desk study, referenced in Section 1.3 of this report, were used as the basis for the design of an appropriate intrusive ground investigation, the scope of which is detailed below;

Exploratory Holes	Purpose
Trial Pits	To determine the general nature of shallow soils underlying the site, including the; • Nature, distribution and thickness of made ground. • Nature, degree and extent of ground contamination. • Suitability of the ground for founding structures and highways
Boreholes	• Determine the general nature of deep geology underlying the site to assess the possible risk from past mining activity. • Installation of monitoring wells for the assessment of hazardous gas and groundwater regime beneath the site.

Proposed exploratory hole locations were selected to provide a representative view of the strata beneath the site and target areas of interest identified by the desk study.

3.2 Scope of Works.

Fieldwork was undertaken on the 15th and 16th October and 20th November 2009, and comprised;

- Ten rotary open-holes, referenced R1 to R10, to depths of between 9.0 and 27.0m
- Seven machine excavated trial pits, referenced TP1 to TP7, to depths of between 1.8 and 3.8m;
- Three gas/groundwater monitoring wells (50mm diameter) installed in selected rotary open holes.

The open-hole boreholes were 115mm in diameter and drilled with a Casagrande C6 rotary drilling rig. Water was used as the flushing medium and temporary steel casing was employed to support the borehole sides where appropriate.

The boreholes were logged by the lead driller who recorded the nature of the drill cuttings returned to surface in the water flush together with other key drilling characteristics (e.g. ease of drilling, loss of water return etc.).

Combined gas/groundwater monitoring wells were installed in three of the boreholes (R3, R4 and R6). The wells consisted of a lower slotted section of pipe surrounded by single size non calcareous gravel. The upper section of each well comprised plain pipe surrounded by a bentonite seal. A lockable security cover completed each of the wells.

The remaining boreholes were backfilled with a mixture of arisings and bentonite/cement.

The trial pits were excavated using a 360° tracked excavator with a 0.8m wide bucket. On completion, the trial pits were backfilled with arisings in the approximate reverse order to which they were excavated.

The exploratory hole positions were set out and the fieldwork supervised by a G&M engineering geologist. The locations of the exploratory holes are shown on Drawing No C036/01/03, presented in Appendix A of this report.

A complete set of the exploratory hole records are presented in Appendix C of this report

3.3 Strata Description.

Depths and descriptions of strata encountered together with details of the samples recovered are presented on the exploratory hole record sheets presented in Appendix C of this report. Procedures and principals contained in BS5930 (1999) and BS EN ISO 1997 (Eurocode 7) have been followed.

The depths of strata on the record sheets are recorded from current ground levels at each location.

It must be noted that rotary open hole techniques only recover small chip samples, brought to surface by flush returns. Consequently the strata descriptions and depth to strata boundaries recorded on the rotary logs should only be used as a guide to ground conditions.

3.4 Sampling and In-situ Testing

Samples were selected by a representative of G&M during the fieldworks. Disturbed samples of soil for geotechnical and/or chemical analysis were placed in 1 litre plastic containers or large plastic bulk bags as appropriate.

Where cohesive soils were encountered, undrained shear strengths were assessed by means of hand shear vane testing in the sidewalls and base of the trial pits and on materials excavated to surface. The use of the shear vane was carried out in general accordance with BS1377 (1990).

3.5 Laboratory Testing

Selected soil samples were tested for a range of potential contaminants, under a sub-contract with Derwentside Environmental Testing Services Ltd (DETS), a UKAS/MCERTS accredited laboratory.

The analytes tested are listed in Section 5.1 of this report. The results, as received from the laboratory, are presented in Appendix D of this report, and discussed in Section 5.4 of this report.

4.0 PHYSICAL GROUND CONDITIONS

4.1 General Succession of Strata

A review of the geological maps of the area (BGS 1:50,000 Scale, Sheet 87 (Barnsley), BGS 1:10,000 Scale SE 30 SE) was undertaken as part of the preliminary investigation. These indicate that the site is underlain by strata of the Middle Coal Measures. This is noted to comprise, siltstones, mudstones likely to be present in the southern part of the site and the Woolley Edge Sandstone likely to be present in the northern part of the site. The Meltonfield coal seam (also referred to as the Woodmoor coal) is conjectured to outcrop through the site. The findings of the G&M investigation broadly concur with the published geology.

The intrusive investigation revealed the site to be underlain by made ground, particularly to the northern and western parts of the site, above Middle Coal Measures bedrock. Natural ground was not encountered in one of the trial pits which was terminated at a depth of 3.0m (TP5). The coal measures strata were recorded in the rotary open-holes as mudstones, sandstones and coal, proved to a maximum depth of 27.0m.

A complete record of all the strata encountered is provided in each individual exploratory hole log, and associated field drilling logs, presented in Appendix C of this report.

Made Ground

A variable thickness of made ground was encountered particularly in the northern and western parts of the site to depths of between 1.7m (TP4) to in excess of 3.0m (TP5). The base of the made ground was not established in TP5 due to ground instability preventing deeper excavation. Evidence from the boreholes indicates that the made ground locally extends up to 7.8m below existing ground level.

The made ground generally comprised gravels, cobbles and boulders of sandstone in a sandy matrix, and is considered to represent backfill/infill to the quarry which is likely to have encroached onto the western part of the site.

Stability of excavations in the made ground materials was generally found to be very poor.

Middle Coal Measures

Trial pits TP1 to TP4 excavated in the southern part of the site encountered a weathered profile which typically comprised a stiff grey and orange brown mottled clay with gravel sized lithorelicts of mudstone to depths of between 0.6m (TP2) and in excess of 3.0m (TP4). This clay is considered to represent completely weathered mudstone bedrock. With the exception of TP3 this clay was found to overlay a poor quality shaley coal of between 0.2m and 0.3m in thickness. Based on the stratigraphic column it is likely that this coal represents the Meltonfield seam.

Where cohesive soils were encountered undrained shear strengths were measured by hand shear vanes, which recorded results of between 77kPa and 95kPa.

Generally weak cream brown mudstone bedrock was encountered at depths of between 1.0m (TP2) and 3.2m (TP1).

In the northern part of the site trial pits TP6 and TP7 encountered gravel and cobble sized fragments of sandstone, which is considered to represent a highly weathered sandstone. Moderately weathered brown sandstone bedrock was encountered at depths of between 2.3m (TP6) and 3.2m (TP7).

The records of the open-hole drilling indicate the bedrock comprised an alternating succession of sandstone and mudstone with two seams of coal. Based on the stratigraphic column and depth between the seams it is likely these represent the Meltonfield and Two Foot coals.

The Meltonfield coal was encountered at depths between 0.7m (TP2) and 12.1m (R10).

In boreholes R4, R7, R8 and R9 the driller recorded beds of dark mudstone/traces of coal, up to 1.7m in thickness, where coal was expected. It should be noted that the MJA report reviewed as part of this investigation records that this seam was observed intact during the reconstruction of a retaining wall at the cross road with Upper Sheffield Road, approximately 250m to the west of the site and that a middle dirt band was present in the section. The presence of a 'dirt band' within this coal may explain why the driller noted fragments of both mudstone and coal in the drilling flush at this depth.

The deeper Two Foot coal, was typically recorded as between 0.4 to 0.7m in thickness and was encountered at depths of between 11.5m (R2) and 26.1m (R10). The MJA report notes that *'This seam was not as viable as other coals in this area, although it has been worked in places.'*

A summary of the key data provided by the boreholes is presented below;

BH No	Depth to Rockhead (m)	Depth and thickness of Meltonfield Coal Seam (m)	Depth and thickness of Two Foot Coal Seam (m)	Broken Ground
R1	**1.4**	-	**13.7-14.2 (0.5)**	-
R2	**1.3**	-	**11.5-12.2 (0.7)**	-
R3	**3.8**	-	**13.5-14.1 (0.6)**	-
R4	**2.8**	**Dark mudstone/coal traces noted between 2.8-4.5m. (Meltonfield?)**	**19.0-19.5 (0.5)**	-
R5	**5.0**	**9.9-10.3 (0.4)**	**23.4-23.8 (0.4)**	-
R6	5.7 (Hole terminated at 9.0m)	-	-	-
R7	**7.8**	**Dark mudstone/coal traces noted between 11.8-12.8m. (Meltonfield?)**	**26.0-26.4 (0.4)**	-

BH No	Depth to Rockhead (m)	Depth and thickness of Meltonfield Coal Seam (m)	Depth and thickness of Two Foot Coal Seam (m)	Broken Ground
R8	6.8	Dark mudstone/coal traces noted between 10.2-11.1m. (Meltonfield?)	23.5-23.9 (0.4)	-
R9	2.1	Dark mudstone/coal traces noted between 10.8-11.7m. (Meltonfield?)	24.6-25.0 (0.4)	-
R10	2.7	12.1-13.0 (0.9)	26.1-26.5 (0.4)	-

No evidence of voids or broken ground was encountered within any of the rotary boreholes.

A complete record of all the strata encountered is provided in each individual exploratory hole log contained in Appendix C of this report. A copy of the driller's field logs are also presented in this appendix for completeness.

4.2 Groundwater.

Assessment of groundwater within the rotary open-hole boreholes was not possible during the fieldwork, as a consequence of using water as the flushing medium.

No groundwater was encountered in the trial pits during this investigation.

A summary of the groundwater levels recorded during the three monitoring visits undertaken to date are detailed below;

Borehole No	Depth to base of monitoring pipe (m bgl)	Groundwater Level (m bgl) 18.10.09	Groundwater Level (m bgl) 21.11.09	Groundwater Level (m bgl) 19.12.09
R3	7.5	3.45	4.15	3.52
R4	12.0	9.05	Dry	Dry
R6	9.0	7.20	7.20	7.14

It should be borne in mind that water levels are likely to fluctuate with season/rainfall and may therefore be substantially higher at wetter times of year than those found during this investigation.

5.0 GROUND CONTAMINATION CONDITIONS

5.1 General

A review of available information undertaken as part of the desk study indicates the site to have been occupied by a vicarage from pre 1890 until the 1970s, when the building was demolished. Prior to this it appears as through a sandstone quarry encroached into the western boundary of the site. The remainder of

the site appears to have been undeveloped. With the exception of the backfilled quarry such a past land use is considered unlikely to give rise to any significant ground contamination.

The site investigation revealed possible quarry backfill in the western and north western part of the site, which comprised typically cobbles and boulders of sandstone in a sandy matrix. Across the remainder of the site the investigation encountered ground conditions typical of a Coal Measures strata sequence.

During the course of the fieldwork no visual or olfactory evidence of any contamination was noted.

Localised areas of fly tipped household waste were noted particularly along the back slopes of the site adjacent to the back gardens of the residences along the northern site boundary.

To determine the possible contaminants that could be found on this site reference was made to DEFRA R&D Publication CLR8.

The site is considered to lie within a setting of **low/moderate** environmental sensitivity. Facts that are considered pertinent to this conclusion are:

- The site is underlain by a minor aquifer;
- The site does not lie within an indicative floodplain area;
- There are no surface water features within 250m of the site;
- There are no groundwater or surface water abstractions within 1km of the site.

Consideration is being given to the development of the site for residential purposes. This is considered a **high** sensitivity end use as occupiers could be exposed to ground contamination for a significant period of their lifetime.

A preliminary conceptual site model was presented in the desk study report, detailed in Section 1.3 of this report. A copy of this model is shown as Drawing No C036/01/04, presented in Appendix A of this report.

Based on the above assessment, G&M submitted a test schedule, detailed below, to an accredited laboratory. This schedule also took into account visual evidence recorded during the previous and current site investigations.

Type of Sample	No of Samples	Determinands
Made Ground	1	Arsenic, cadmium, chromium, copper, lead, nickel, selenium, zinc, total sulphate, water soluble sulphate, pH, phenol, speciated PAH
	1	Speciated TPH
Natural Ground	2	Arsenic, cadmium, chromium, copper, lead, nickel, selenium, zinc, total sulphate, water soluble sulphate, pH, phenol, speciated PAH
	2	Speciated TPH

The results received from the laboratory are presented in Appendix D of this report.

5.2 Current Guidance and the Interpretation of Analytical Data

Contaminated land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995. This supports a 'suitable for use' based approach to the risk assessment of contaminated land. The site specific risk assessment is based upon an assessment of plausible pollutant linkages, referred to as the contaminant → pathway → receptor model, based upon the current or proposed use of the site.

One of the objectives of this investigation was to provide information on land contamination at the site, required for assessing relevant pollutant linkages, to undertake a risk assessment and where necessary determine remedial options. These works are carried out in accordance with the risk assessment and options appraisal section of the Model Procedures for the Management of Land Contamination (CLR11)

The first stage usually comprises the development of a preliminary conceptual site model (CSM), usually based on desk top study data. This is undertaken in order to identify potential contaminants, pathways and targets. This preliminary model can then be used to scope an effective/targeted intrusive ground investigation.

Following completion of the investigation, the findings are used to refine the initial CSM, in order that a suitable cost effective remediation strategy can be devised or further investigation and risk assessment undertaken.

The process of refining the CSM from the preliminary model, involves semi quantitative risk assessment, which is split into two parts:

a) The comparison of the soil analysis results against generic soil screening values, to establish sources of contamination (Generic Quantitative Risk Assessment); and,

b) A qualitative risk assessment to identify any plausible pathways from contaminant to receptor.

A preliminary conceptual site model is shown in Drawing No C036/01/04, presented in Appendix A of this report.

If the screening levels are exceeded and the qualitative risk assessment identifies a plausible pollutant linkage, then assessment could move onto another stage, which includes more sophisticated Detailed Quantitative Risk Assessment (DQRA), or remedial action taken to break the pollutant linkages. The benefits of undertaking a DQRA must be weighed against the likelihood that it will bring about cost savings in the proposed remediation.

The majority of initial screening levels used in the production of this assessment have been taken from the guidelines introduced by DEFRA, in the Contaminated Land Exposure Assessment (CLEA) Model, March 2002 and 2009 (where applicable), and by the Joint Land Quality Management Ltd (LQM) and Chartered Institute of Environmental Health (CIEH), Generic Assessment Criteria for Human Health Risk Assessment. 2nd Edition, 2009. Full details of the screening levels used are shown on Table 1 in this report.

The generic quantitative risk assessment carried out as part of this report assumes a **residential with plant uptake** end use.

5.3 Results

The 'as received' results of the soils analysis are presented in Appendix D of this report, and are summarised in Table 1 presented in Appendix A of this report. The concentrations of the analytes tested were all below the relevant screening levels.

5.4 Reassessment of Site Conceptual Model

With respect to the proposed future land use, site layout and analytical results obtained, the identified contaminant sources, pathways and receptors can be defined as follows;

Identified Contaminants of Concern

- No contaminants of concern recorded in any of the samples tested.

Pathways

- Direct contact.
- Direct and indirect ingestion.
- Inhalation.
- Leaching to controlled waters.
- Potential plant uptake of contamination in soil.

Targets/Receptors

- End users/landscaping.
- Controlled waters (the underlying groundwater)
- Construction and maintenance workers.
- Built development.

In assessing risk, the following categorisation has been developed:

Term	Description
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
Moderate Risk	It is possible that without appropriate remedial 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 Risk	It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst if any harm was realised any effects would be mild.
Negligible Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The above is intended to be an aid in assessing the degree of risk. It should be noted that in terms of the Environmental Protection Act 1990, there is no differing degree of risk, i.e. it is either significant or not.

The site has previously been subject to uses that are deemed to pose a **low/moderate** potential for significant contamination.

The environmental sensitivity of the site is considered to be **low/moderate** with respect of controlled waters.

The proposed end use of the site as residential is regarded as a **high** sensitivity target.

End Users

Based on the contaminant>pathway>target philosophy, the chemical results obtained as part of this investigation, it is considered that there is currently a **low** risk to end users from the identified contamination.

It should be noted that the majority of the made ground (quarry backfill comprising gravels, cobbles and boulders of sandstone in a sandy matrix) encountered in the west and north west of the site will be removed from site in order to achieve the proposed development levels, discussed in Section 2.0 of this report. As a consequence of this reprofiling work the majority of these development levels will be located on the underlying natural subsoils or bedrock.

Any areas of gardens and or soft landscaping should be capped with subsoil/topsoil to provide a suitable growing medium for shallow rooted plants.

It is recommended that a watching brief is maintained on excavations and if any areas of noxious, odorous, fibrous or liquid etc. contamination are encountered, then works should stop immediately and further advice sought from a suitably experienced and qualified consultant.

Statutory service providers should be consulted to determine if service pipes require upgrading to protect against chemical attack.

Construction and Maintenance Workers

In moving or excavating the made ground materials, it is considered that there is a **low** risk to construction and maintenance workers associated with exposure to contamination during the redevelopment works. It is recommended that normal health and safety procedures should be adopted by groundworkers including no eating, drinking or smoking on-site, provision of washing facilities and wearing gloves and overalls. It is also recommended that procedures outlined in the HSE document "Protection of Workers and the General Public during Redevelopment of Contaminated Land" be followed.

This report should be forwarded to the construction company undertaking the groundworks in order for them to assess risk to their personnel.

If groundworks are undertaken in dry weather conditions, dust suppression will be required.

Built Development

Chemical results indicate a design sulphate class of DS-1 and an ACEC class of AC-1s, in accordance with BRE Special Digest 1 (2005) for the design of buried concrete, based on brownfield site designation and static groundwater conditions, should be used.

Chemical results should be forwarded to the appropriate utility companies in order to determine the necessity for service protection.

6.0 HAZARDOUS GAS MONITORING

6.1 General

Approved Document C to the Department of the Environment's Building Regulations 2004, requires that a gas risk assessment is undertaken, which may require investigation and monitoring. Notwithstanding the requirements for a risk assessment Approved Document C, states that ground gas monitoring is required for the following ground conditions:

- There is a landfill within 250m of the site;
- There is wide scale deposition of biodegradable substances;
- The site has been subject to widespread spillages of petrol, oil, or solvents;
- The site is in an area of naturally occurring methane or carbon dioxide.

As a consequence of the potential for mine gases from the underlying Coal Measures strata to affect the site, and the presence of historically backfilled quarries, monitoring wells were installed in three of the rotary open-hole boreholes. The monitoring installations have been sealed into the deeper natural strata to establish peak and steady state ground gas conditions beneath the site.

Where there may be gaseous contamination of the ground, Approved Document C cross references Construction Industry and Information Association (CIRIA) report 149 for advice on remedial measures.

The most recent published guidance on the assessment of hazardous soils gases is CIRIA Report C665.

6.2 Monitoring Procedure

The gas monitoring wells have been monitored for flow, methane, carbon dioxide and oxygen using a Gas Data GFM 430 gas analyser.

The gas monitoring was undertaken in accordance with the guidance given in CIRIA Report 151 'Interpreting Measurements of Gas in the Ground' (1995).

The gas monitoring is currently on going, however three visits have been made so far. It is proposed to undertake a total of nine visits over a six month monitoring period. The installations have been monitored on 18th October 2009, 21st November 2009 and 19th December 2009.

The results of the gas monitoring are presented within Appendix E of this report.

6.3 Monitoring Results

Well	Range of Methane Concentrations (% v/v)	Range of Carbon Dioxide Concentrations (% v/v)	Range of Positive Flow Rates (litre/hour)
R3	Not Detected	0.8-1.2	Not Detected-0.3
R4	Not Detected	0.4-1.2	Not Detected
R6	Not Detected	0.5-0.9	Not Detected

Note: Atmospheric pressures varied between 994mb and 1007mb.

6.4 Discussion

In accordance with CIRIA Report C665 'Assessing Risks Posed by Hazardous Ground Gas to Buildings' the proposed end use dictates that the site be assessed under Situation B 'Low Rise Housing with a Ventilated Underfloor Void (min 150mm)

Since no methane has been detected, then based on a steady state concentration of 1.2% v/v for carbon dioxide, the calculated Gas Screening Value (GSV) in accordance with CIRIA 665 is detailed below;

GSV (l/hr)	Gas Source Risk	Traffic Light System for 150mm void (Situation B)
0.0036	Carbon dioxide	Green

In accordance with CIRIA 665, with presently detected carbon dioxide concentrations coupled with low flow rates the site is classified as 'Green'. As such no special precautions are required.

Radon protective measures are not currently required for the site.

Six further monitoring visits are due to be undertaken, with the results updated accordingly to fully assess the level of ground gas protection measures required at the site. These results will be forwarded under separate cover when compete, together with a final assessment of the risk from ground gas.

7.0 CONCLUSIONS AND RECOMMENDATIONS.

7.1 General.

On the instructions of Erris Homes Ltd, G&M Consulting Ltd has undertaken a site investigation of land at Bank End Road, Worsbrough Bridge near Barnsley. It is understood that consideration is being given to development of the site for a residential end use.

A review of available information carried out during the desk study phase for the work shows a quarry (Yew Lane Quarry) to have encroached onto the western part of the site on the OS map dated 1854 (presented in the SYMAS report contained in the desk study report). By 1890 this quarry is shown approximately 100m to the west of the site with the western part of the site now shown as being wooded. Further development of the site appears to be limited to a vicarage, which was located to the rear of the site. This building was demolished by 1977.

Based on a review of the drawings presented in Appendix A of this report, in order to achieve proposed development levels compared to current existing site levels a significant amount of cut earthworks is required, particularly in the northern and central parts of the site. Therefore the following recommendations are subject to refinement should further changes to proposed development levels are made.

7.2 Mining and Quarrying

The investigation has revealed two seams of coal to underlie the site, based on the stratigraphic column these are considered to represent the Meltonfield and Two Foot coal seams. Rotary open-hole drilling carried out on the site at ten locations showed no evidence of broken or worked ground to 27m.

The Meltonfield was encountered at depths between 0.7m and 12.1m, up to 1.7m in thickness, which in certain locations this is considered to include a 'dirt band', refer to Section 4.1 of this report. The deeper Two Foot coal, was typically recorded as between 0.4 to 0.7m in thickness and was encountered at depths of between 11.5m and 26.1m.

The depth and thickness of the Two Foot coal seam is such that any unrecorded pillar and stall workings within them would be unlikely to influence the surface stability. The general rule of thumb to determine the zone of influence of workings is to assume a cover of rock equal to or greater than 10 x the seam thickness. This however should be used as a guide only as the zone of influence is also a function of geology, topography, method of working, the effect of deeper workings etc. The MJA report reviewed as part of this investigation notes that the Two Foot coal was not as viable as other coals in this area, although it has been worked in places.

Based on the findings of the report, it is considered that the possibility of the surface stability of the site being affected by unrecorded workings in both seams is low, although the depth and thickness of the Meltonfield seam is such that localised crop workings cannot be wholly discounted, particularly in the area of the former quarry in the north western part of the site, where this seam may have been locally robbed out. Therefore a watching brief should be maintained during the earthworks reprofiling of the site, and during all foundation/service excavations. Where this seam is exposed during these works further examination should be undertaken and recorded. If any evidence of coal mine workings is encountered, further advice from a suitably qualified engineer should be sought.

Review of the available information indicates that a quarry (Yew Lane Quarry) extended onto the western part of the site. Boreholes drilled in the vicinity of this encountered probable backfill up to 7.8m from existing ground level. According to the proposed development levels a significant portion if not all of the backfill in this area is likely to be removed to achieve these levels.

7.3 Foundations.

Following earthworks re-profiling of the site to achieve the proposed development levels, surfaces across a significant part of the site will be onto or close to the underlying natural strata.

Where any made ground remains in-situ following the re-profiling works, due to the highly variable nature of these materials (granular deposits with predominantly oversized cobbles and boulders of sandstone) it is not considered a suitable founding stratum in its current form.

For preliminary design purposes the natural soils beneath the made ground are considered to have the following allowable bearing capacities;

- Highly/completely weathered Coal Measures (i.e. stiff clays, and gravels and cobbles of sandstone) – 100kN/m^2.
- Weak Coal Measures (i.e. mudstones and sandstone) – 150kN/m^2. Greater bearing capacities are likely to be achievable in the rock subject to confirmatory field testing, if required.

Where foundations encounter rock they should be placed wholly in rock and not partly in rock and partly in highly/completely weathered deposits. Inspections of foundation excavation should be carried out to ensure that the footings are taken through any weathered profile.

It is recommended that foundation excavations bearing upon clay be immediately blinded following excavation in order to prevent deterioration of the founding stratum as a consequence of inclement weather or localised seepage.

Where trees lie in close proximity to the site boundary, or where it is proposed to plant trees, then guidance should be sought from the NHBC Standards, Chapter 4.2.

Foundations will be required to be placed below a line drawn up at 45° from the base of any service or similar excavation.

Where any foundation excavations come into contact with in-situ coal, the foundation should be taken through, into underlying natural strata of adequate bearing capacity. The full thickness of coal should then be sealed with concrete to create a trench fill foundation and also exclude air from the coal to avoid the possibility of spontaneous combustion.

Based on a review of the proposed cut/fill earthworks, shown on Drawing No C036/01/02, presented in Appendix A of this report, indicates localised areas of infilling, particularly to the southern boundary of the site to achieve proposed development levels. In these areas made ground is likely to exceed 2.5m in thickness, in which case shallow footings will prove both uneconomic and technically difficult to achieve. In this case a piled solution may be incorporated or alternatively a rafted solution, provided that placed fill in these areas is engineered to an appropriate standard. The design of the piles should be undertaken by a specialist contractor.

If piles are the preferred solution then areas of the site will require the provision of piling mats and further advice should be sought from the appointed specialist piling contractor regarding proposed plant loadings and resultant pressures.

According to the report prepared by SYMAS *'weak ground conditions may be associated with the sandstone bedrock present on site. Sandstone bedrock may be fractured both naturally and mining induced'*. **As a consequence of this reinforcement of the footings is recommended.** Reinforcement should be detailed by a suitably qualified structural engineer.

Based on the samples tested, and in accordance with BRE Special Digest 1 and the results of soluble sulphate testing, a Design Sulphate Class of DS-1 and an ACEC Class of AC-1s should be used for buried concrete structures which are placed in contact with the underlying strata.

7.4 Earthworks

Proposed development levels across much of the site are significantly below existing levels, which will necessitate a significant amount of cut earthworks particularly to the northern and central parts of the site. Near vertical faces will be required particularly along the northern and western boundaries of the site, to allow the construction of the proposed retaining structures.

Hydraulic or pneumatic breakers may be required to assist excavations where they extend into the underlying bedrock.

As a consequence of the above it is advisable to undertake a structural assessment to all boundary walls, particularly those located on the western and southern boundaries of the site.

The design of the retaining structures should be undertaken by a specialist contractor, using information obtained during a further proposed phase of site investigation, refer to Section 7.8 of this report.

The stability of a rock face, in competent rock, is primarily a function of the frequency and orientation of the discontinuities. To determine the orientation of these discontinuities test excavations are required, ideally in the area of the proposed cut, to allow in-situ measurement of joint dip, strike and openness.

Where areas of infilling are proposed to achieve development levels, any materials which are used for this purpose should be classified and placed in accordance with Series 600 (Earthworks) of the Department of Transport (DoT) 'Specification for Highway Works' 1998.

Excavations through any areas of made ground or quarry backfill should be assumed to be unstable and an allowance should be made for appropriate shoring. No man entry into unsupported excavations should be allowed without an appropriate risk assessment. Reference to CIRIA 97 Trenching Practice should be made to establish suitable means of support or battering of excavation sides during construction.

Shallow excavations, less than 2m in depth, are generally expected to remain dry. Seepages or minor flows could occur locally. It should be possible to deal with these by pumping from sumps.

It is recommended that an adequate drainage system for surface water be installed by a competent contractor in order to prevent surface water ponding or collection during construction which may lead to deterioration of the founding stratum.

Where coal is exposed in excavations it should be blinded with lean mix concrete to avoid the possibility of spontaneous combustion.

7.5 Contaminated Land

Where encountered, made ground generally comprised gravels, cobbles and boulders of sandstone, which it is considered forms backfill/infill to the former quarry which historically encroached onto the western part of the site.

No elevated contaminants were identified in any of the samples tested. Following reprofiling of the site to achieve proposed development levels, a significant portion of the site will be cut onto the underlying natural ground. These surfaces are likely to be texturally unsuitable for plant growth. Therefore it is recommended that areas of proposed soft landscaping and gardens are covered by a suitable thickness of subsoil/topsoil, subject to agreement with the local authority.

To achieve proposed development levels from current levels will require removal from site of both made ground and natural soils. Materials arising from these excavations at the site are likely to be classified as follows;

Soil Type	Waste	Remarks
Granular Made Ground	Non-hazardous/Inert	Former quarry infill/backfill
Natural Soils	Non-hazardous/Inert	Clays/sands,gravels/Mudstone and sandstones

Localised areas of fly tipped household waste was noted particularly along the back slopes of the site adjacent to the back gardens of the residences along the northern site boundary which should be removed from site to a suitably licensed landfill facility during the development works.

Any materials removed from site should be removed in accordance with the Duty of care Regulations and the Landfill Directive.

It is possible that areas of more significant contamination may be encountered during the development works. If any areas of noxious, odorous, fibrous or liquid etc. contamination are encountered, then works should stop immediately and further advice sought from a suitably experienced and qualified consultant.

7.6 Hazardous Gas.

Based on the findings of this investigation to date, the site has been categorised, with guidance from CIRIA C665, as Situation B 'Low Rise Housing with a Ventilated Underfloor Void (min 150mm)' requiring no gas protection measures.

Radon protective measures are not currently required for the site.

Gas monitoring is still ongoing, with the results to be reported in due course, once finalised.

7.7 Road Pavement Design.

Where any area of made ground remains insitu, based on a visual inspection, a CBR design value of less than 2% is considered appropriate.

It is recommended that where natural ground is encountered CBRs for the finished sub grade be determined by laboratory testing or on site testing once development levels have been achieved following earthworks reprofiling of the site.

7.8 Further Works.

Considering the amount of cut earthworks required and the extent of the proposed retaining structures it is recommended that further site investigation is carried out to provide the following information;

- Geotechnical data to allow the design of the retaining structures. (The design work should be undertaken by a specialist contractor);
- Assessment of the excavation characteristics of the underlying natural strata;
- Geotechnical characteristics of the founding and excavation surfaces, to determine the depth of footing below proposed finished development level.

It is recommended this further work comprises trial pits and if necessary boreholes, with associated geotechnical laboratory testing. The scope of works should be developed in association with the specialist contractor responsible for the design of the retaining structures.

The findings and recommendations contained within this report are subject to further refinement if appropriate following the further site investigation.

7.9 Development Issues.

The report has presented options with respect to various geotechnical and geoenvironmental issues associated with the site, which are considered technically feasible and in line with current good practice. Consequently G&M would expect regulatory approval for whichever option or recommendation is adopted, although this cannot be guaranteed. Copies of this report should be forwarded to the relevant regulatory authorities for their comment/approval.

G & M Consulting Ltd

TABLES AND FIGURES

TABLE 1

Summary of Total Soil Concentrations and Generic Quantitative Risk Assessment

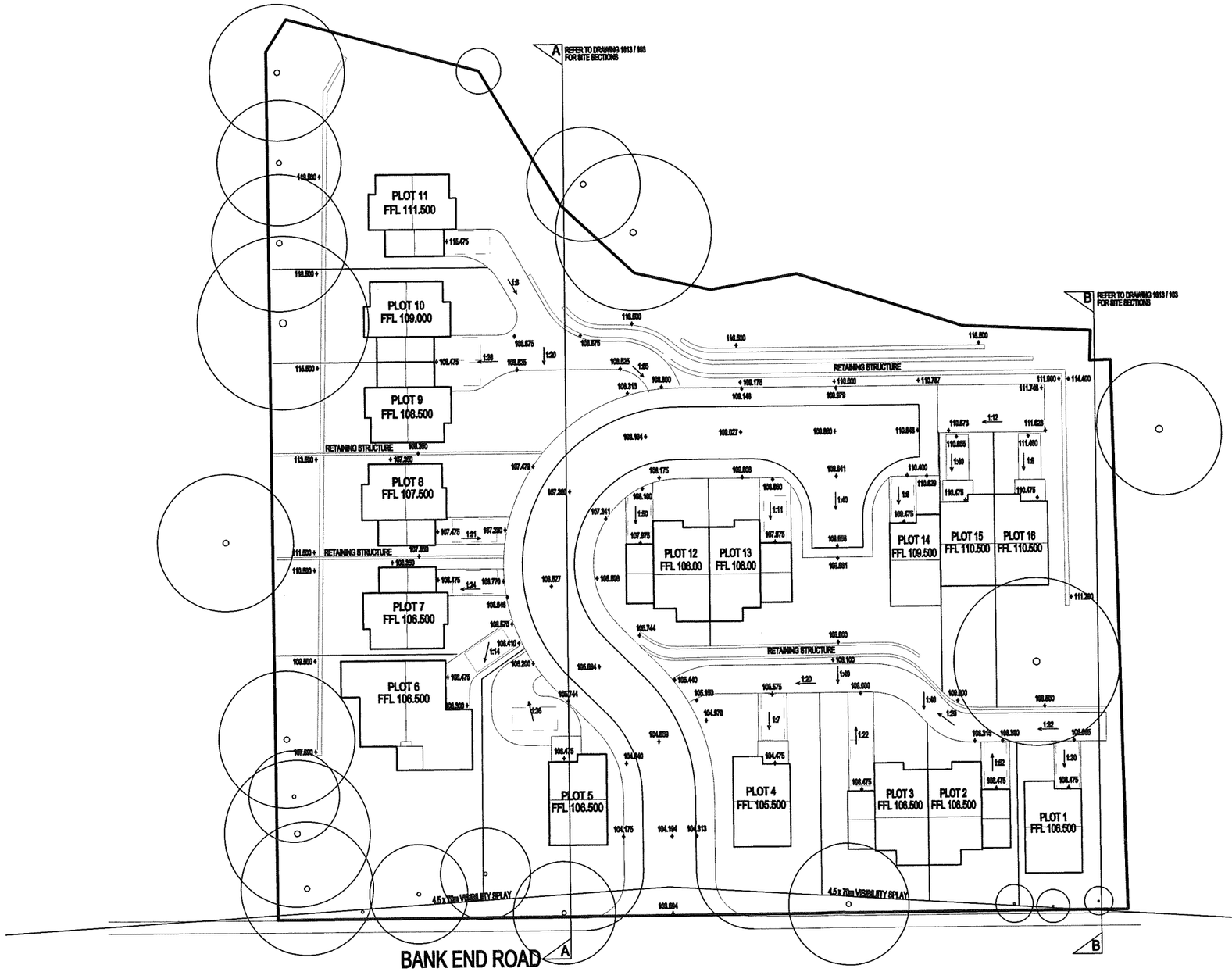
Parameter	Screening value (mg/kg, unless otherwise stated)	No. of samples above screening value	No. of samples tested	Maximum concentration above Screening Value (mg/kg, unless otherwise stated)
Metals/Metalloids				
Arsenic	32 [1]	0	3	
Cadmium	10[1]	0	3	
Chromium (Total)	130 [1]	0	3	
Lead	450 [1]	0	3	
Mercury	170 [1]	0	3	
Selenium	350 [1]	0	3	
Copper	111 [2]	0	3	
Nickel	130 [1]	0	3	
Zinc	330 [2]	0	3	
Inorganics				
pH	<5	0	3	
Water Soluble Sulphate	0.5 g/l [3]	0	3	
Organics				
PAHs				
Acenaphthene	195[2]	0	3	
Anthracene	2200[2]	0	3	
Acenaphthylene	162[2]	0	3	
Benzo(a)anthracene	3.3[2]	0	3	
Benzo(b)fluoranthene	5.6[2]	0	3	
Benzo(k)fluoranthene	8.5[2]	0	3	
Benzo(g,h,i)perylene	44[2]	0	3	
Benzo(a)pyrene	0.83[2]	0	3	
Chrysene	6.1[2]	0	3	
Dibenz(a,h)anthracene	0.77[2]	0	3	
Fluoranthene	260[2]	0	3	
Fluorene	160[2]	0	3	
Indeno(1,2,3-cd)pyrene	3.2[2]	0	3	
Naphthalene	0.68[2]	0	3	
Pyrene	564[2]	0	3	
Phenanthrene	92[2]	0	3	
TPH				
Aliphatic EC 5-6	17[2]	0	3	
Aliphatic EC >6-8	36[2]	0	3	
Aliphatic EC >8-10	8.8[2]	0	3	
Aliphatic EC >10-12	43[2]	0	3	
Aliphatic EC >12-16	350[2]	0	3	
Aliphatic EC >16-35	29,000[2]	0	3	
Aromatic EC 5-7	0.054[2]	0	3	
Aromatic EC >7-8	92[2]	0	3	
Aromatic EC >8-10	14[2]	0	3	
Aromatic EC >10-12	54[2]	0	3	
Aromatic EC >12-16	140[2]	0	3	
Aromatic EC >16-21	250[2]	0	3	
Aromatic EC >21-35	890[2]	0	3	
Organics				
Monohydric Phenol	180[1]	0	3	

[1] DEFRA (2002 and 2009), Soil Guideline Values – for residential with plant uptake
[2] LQM/CIEH (2009) Generic Assessment Criteria for Human Health Risk Assessment. 2nd Ed. (for a sandy soil with 1% SOM and pH 7.0)
[3] BRE (2005) Special Digest 1, 3rd Edition, Concrete in aggressive ground. Upper limits for DS-1 Design Sulphate Class concrete.

G & M Consulting Ltd

APPENDIX A

DRAWINGS



Rev	Description of revision	Date

G & M Consulting Ltd

The Chestnuts,
Brackenhill Road,
East Lound,Haxey,
Doncaster,
DN9 2LR.

Client:

Erris Homes.

Site Name:

Bank End Road,
Worsbourgh Bridge,
South Yorkshire.

Status:	Drawn:	Checked:
	CSm	CSm

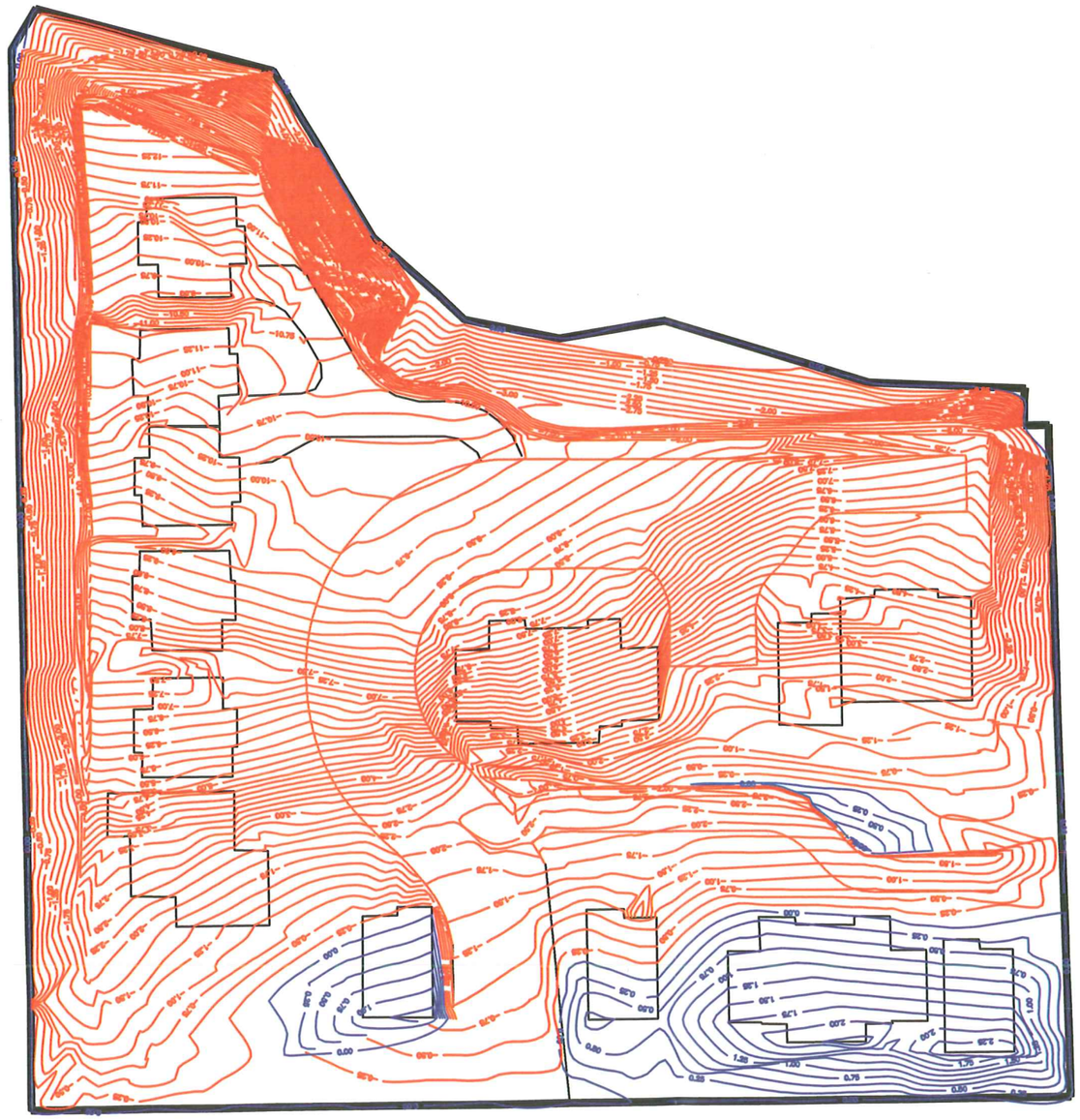
Title

Proposed
Development
Layout.

Plotted Scale:	Date:	Sheet Size:
1:500	12 Jan 10	A3

Drawing No.	Revision
C036/01/01	-

RED (−ve) Contours Denote "CUT"
BLUE(+ve) Contours Denote "FILL"



Contours denote depth between existing levels and proposed levels less 500mm as shown on plan 1613−101.

Rev	Description of revision	Date

G & M Consulting Ltd
The Chestnuts,
Brackenhill Road,
East Lound,Haxey,
Doncaster,
DN9 2LR.

Client:
Erris Homes.

Site Name:
Bank End Road,
Worsbourgh Bridge,
South Yorkshire.

Status:	Drawn: CSm	Checked: CSm

Title
Proposed
Cut/Fill
Earthworks.

Plotted Scale:	Date:	Sheet Size:
1:500	12 Jan 10	A3

Drawing No.	Revision
C036/01/02	-

100mm 90mm 80mm 70mm 60mm 50mm 40mm 30mm 20mm 10mm

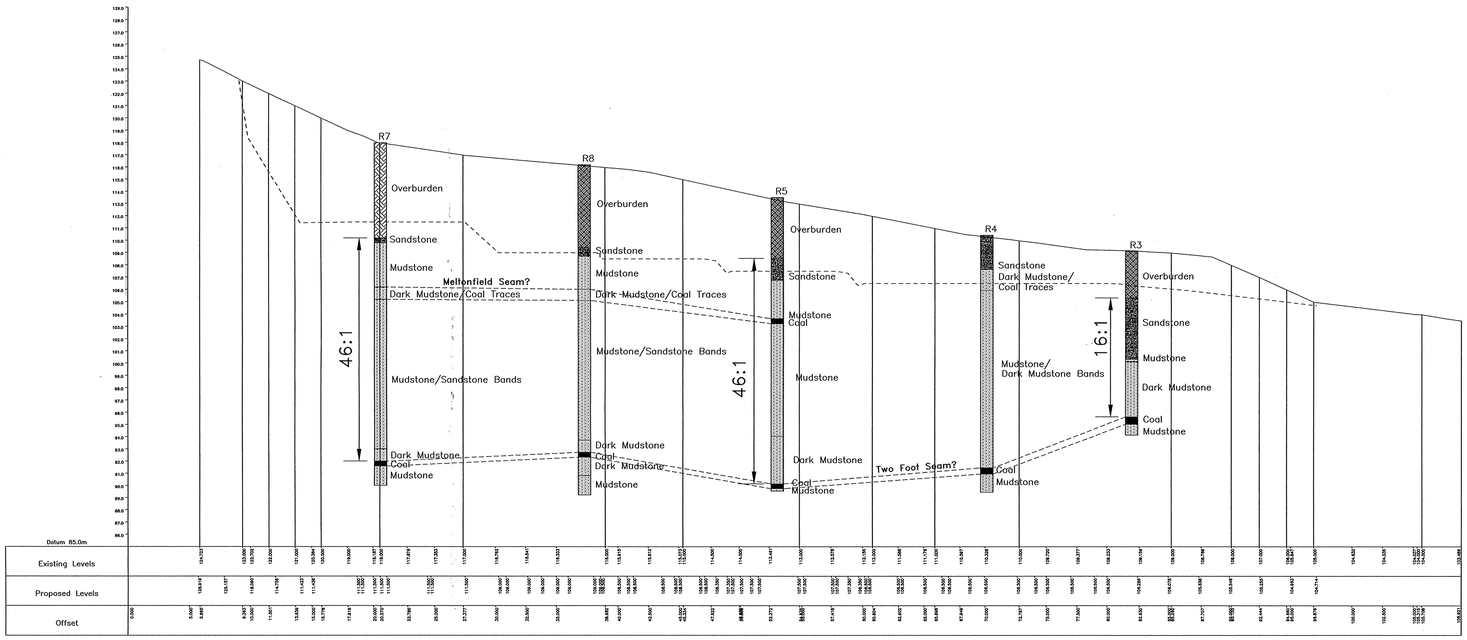
© Stamford Geomatics Ltd 2009

Notes:

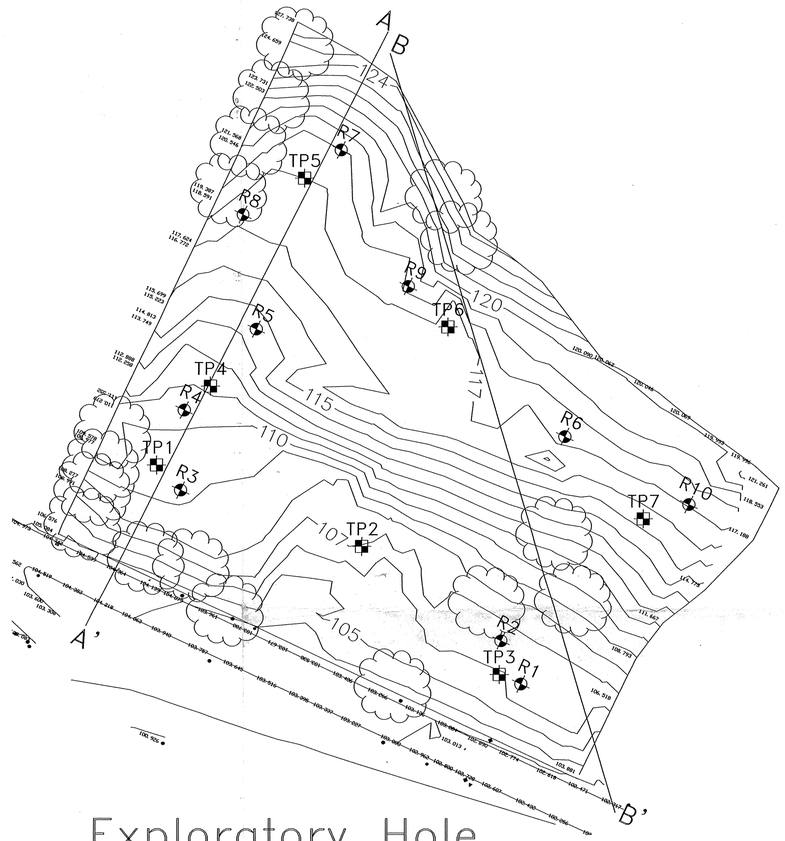
1. The accuracy and content of this drawing are dependent on the surveyed scale and survey specification, care should be taken when working with other plotted scales or from CAD.

2. Existing site survey details provided by Erris Homes.

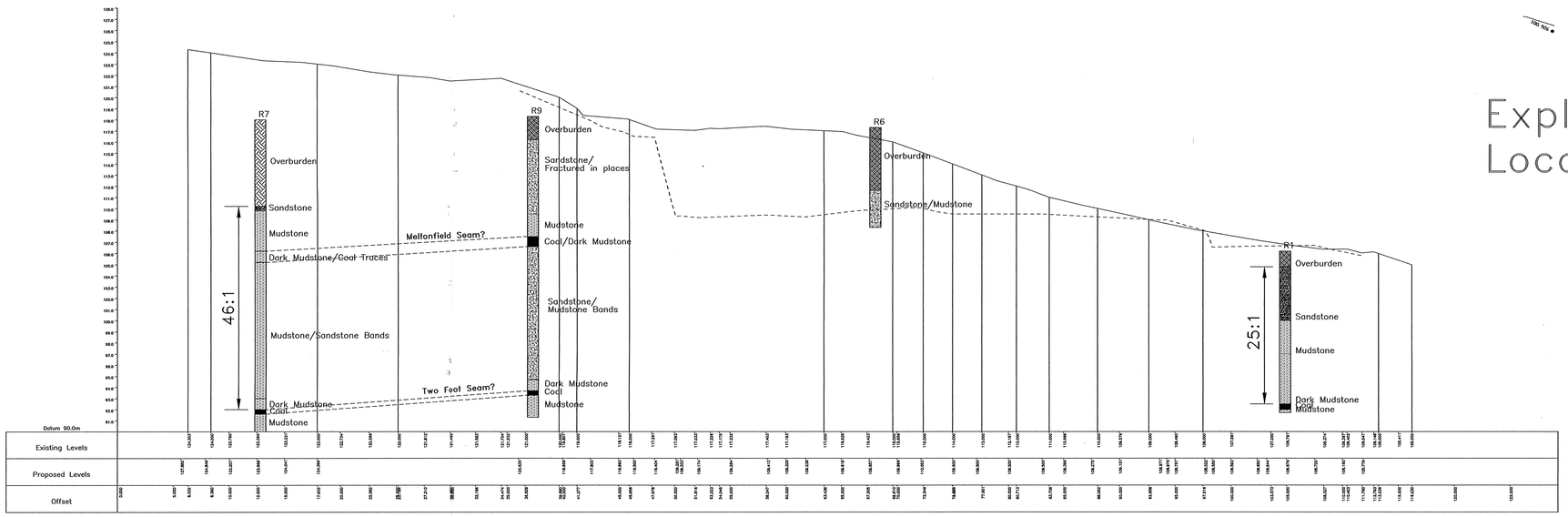
3. X:1 Seam thickness ratio.



Section A



Exploratory Hole Locations 1:500



Section B

Geological Sections 1:250

Rev	Description of revision	Date

G & M Consulting Ltd

The Chestnuts,
Brackenhill Road,
East Lound,Haxey,
Doncaster,
DN9 2LR.

Site Name:
Erris Homes,
Bank End Road,
Worsbrough Bridge,
South Yorkshire.

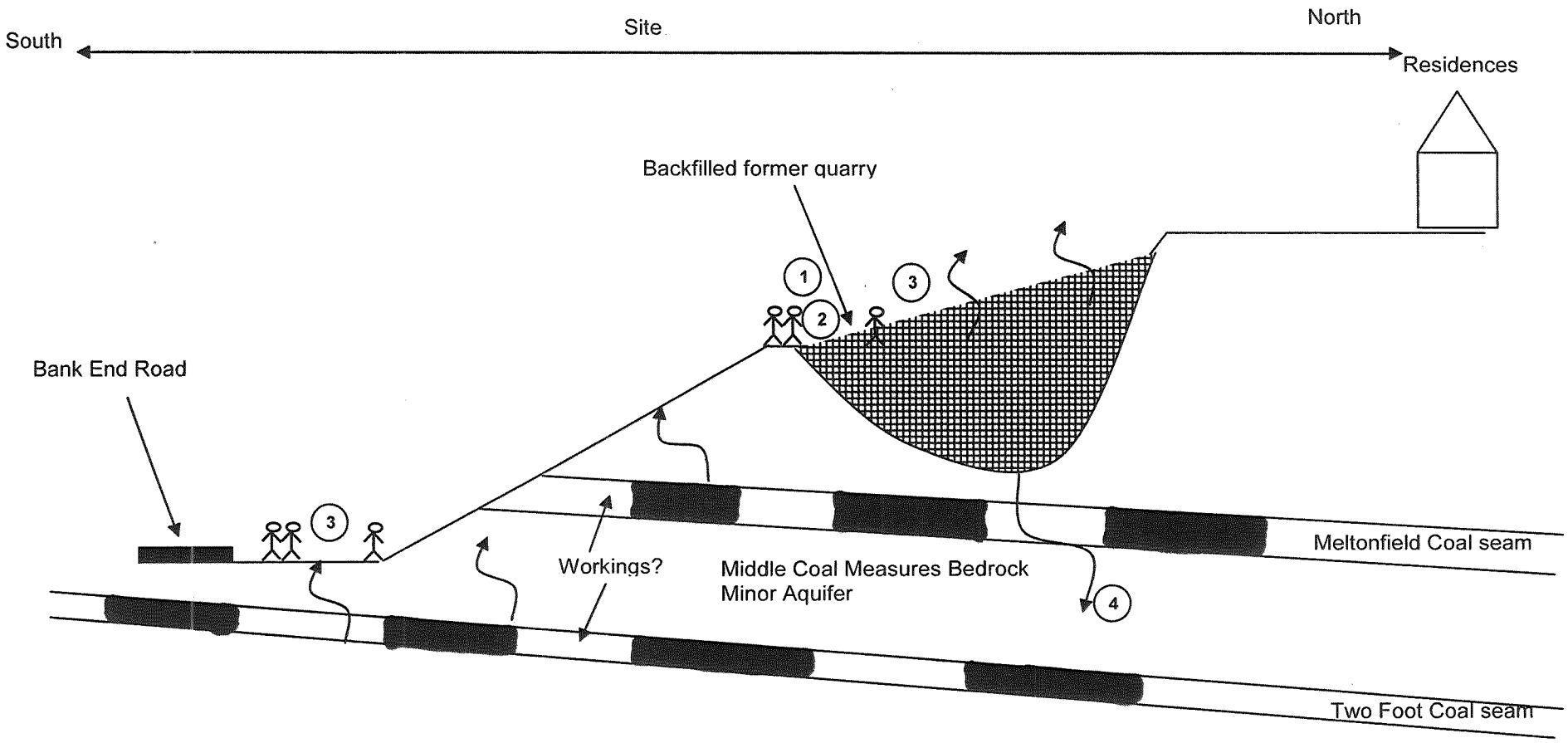
Surveyed:	Drawn:	Checked:
-	CSm	GS

Title
Exploratory Hole Locations and Geological Sections.

Plotted Scale:	Date:	Sheet Size:
1:500	22 Dec 09	A1

Drawing No.	Revision
C036/01/03	-

G & M Consulting Ltd



Potential Pathways

1. Direct Contact
2. Direct and indirect ingestion
3. Inhalation
4. Leaching to controlled waters

Contract Number	C036	**Scale**	NTS
Contract	Bank End Road, Worsbrough Bridge	**Drawn by** GS	**Approved** GS
		Drawing Number	C036/01/04
Client	Erris Homes Ltd		

Preliminary Conceptual Site Model

G & M Consulting Ltd

APPENDIX B

COAL AUTHORITY PERMIT

The COAL AUTHORITY

INVESTOR IN PEOPLE

200 Lichfield Lane
Berry Hill
Mansfield
Nottinghamshire
NG18 4RG

Tel: 01623 637320
Fax:01623 620363
E-mail: keithbanton@coal.gov.uk

Our Ref: 4508
Your Ref: IMW 5551

16th September 2009

DCE Limited
Unit 3A Wentworth Way
Wentworth Industrial Estate
Tankersley
Barnsley
S75 3DH

For the attention of Ian Wicks

Dear Sir

Investigation of Shallow Mine Workings at Bank End Road, Worsbrough Bridge, Barnsley

"Permission to Enter or Disturb Coal Authority Mining Interests"

Please find attached to this letter the **permit** and supporting documentation which, subject to the terms and conditions contained therein, allows you to carry out the works within 'the Site' (as shown on the plan attached to the appended mining report) to the specification provided.

In carrying out this work you should be aware that unrecorded mine workings (and possibly associated unrecorded mine entries) are believed to exist within this area at shallow depth. Whilst mine water levels have generally recovered in this region, any mine workings encountered will sit above this level and will probably contain mine gases (primarily oxygen deficient air with elevated levels of carbon dioxide along with methane and possibly hydrogen sulphide) within the voids / broken ground and possibly any overlying permeable strata.

Whilst it is noted that it is your intention to drill using water flush techniques, you should be aware that exposure of coal to large quantities of air (for example when boreholes are left open to air for long periods) can, under certain circumstances, cause it to spontaneously combust; the resultant fire producing, amongst other things, large quantities of carbon monoxide. Care should be given to ensure that any boreholes are effectively sealed at the earliest opportunity.

In light of the above information and the proximity of occupied buildings it is imperative that the proposed drilling methodology is adopted and regular monitoring for mine gas is carried out especially at times of falling barometric pressure. If gas is encountered, would you please ensure that such occurrences are documented, and if necessary, the appropriate actions taken as outlined in the attached *Terms & Conditions* document. Furthermore any construction must take account of the risks associated with building on land that may be susceptible to surface emissions of mine gases.

Would you please ensure that the content of the permit and supporting documentation are passed on to all interested parties, especially the drilling contractor and be available for inspection on a site visit by the Authority or the HSE. You should also note that the NHBC may require a copy of this permit if they are insuring any future development.

Under no circumstances should any investigation/treatment works be carried out, other than those specified, without the prior written permission of the Authority. Should any unrecorded mine entries be encountered you will contact the Authority for an additional permit, including the results of your investigations and proposed specification for treatment.

Please note that a completion/validation report must be supplied to the Authority when the works are finished as per clause 11 of the terms and conditions document. In the meantime, should you wish to discuss this or any other matter, please do not hesitate to contact me.

Yours faithfully

Keith Banton
Mining Property Manager

THE COAL AUTHORITY

Permit Reference Number 4508

Permission to Enter or Disturb Coal Authority Mining Interests

Name and Address of Applicant:

Michael Howard
Erris Homes Ltd
Unit D Copley Hill Industrial Estate
Whitehall Road
Leeds
LS12 1HE

Site Location:

Land off Bank End Road
Worsbrough Bridge
Barnsley

This certificate hereby grants the above named Applicant permission to carry out *Investigation of Shallow Mine Workings* within the Authority's mining interests at the identified site location for the period of 12 months from the effective date shown below. The granting of this Permission does not constitute advice given by the Authority in relation to the proposed operations. It is the Applicant's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.

Signed: K. R. Banton Effective Date: 16th September 2009

For and on behalf of The Director of Mining Projects and Property at the Coal Authority

Nominated Representative: Mr Keith Banton, Mining Property Manager;
The Coal Authority, Licensing & Permits Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG
Tel: 01623 637320; e-mail keithbanton@coal.gov.uk

THE COAL AUTHORITY

Terms and Conditions for Entering or Disturbing Coal Authority Mining Interests

Before permission can be given to enter or disturb Coal Authority mining interests, each applicant must agree with the following terms and conditions in support of their application and return a signed copy to the Coal Authority along with the original application and supporting documentation.

1) The Applicant will take all steps, including the erection and maintenance of fences and warning notices, necessary to prevent any person from accidentally entering, falling into, or interfering with any mine entry, mine working, mining collapse, excavation or borehole during the works and as a consequence of the work.

2) The Applicant will ensure that nothing is deposited, falls or flows into any mine entry, mine working, mining collapse, excavation or borehole which by itself, or in combination with anything else which may be or which might reasonably be expected to be, in or adjacent to any such mine entry, mine working, mining collapse, excavation or borehole, could block or weaken any underground excavations within or beyond the Site, or could cause or aggravate pollution of underground water, or could cause any nuisance or harm to persons or property on the surface or underground, including any mining operations.

3) The Applicant will ensure that appropriate equipment is available on the Site and that procedures are adopted to detect the emission of any flammable or noxious gas from any part of the Site, and will take appropriate action to protect members of the public and workmen. Furthermore, the Applicant will take all appropriate measures to prevent mine gasses migrating into neighbouring properties as a result of the works and where it is necessary to ensure public safety extend his gas monitoring regime to include offsite properties

4) The Applicant will notify the Authority's Surface Hazards Office, using the **24 hour Emergency Call Out Service** on **01623-646333**, immediately there is evidence of spontaneous combustion of coal, uncontrolled emissions of mine gas or water or other hazard directly or indirectly caused by or related to the above mentioned activities both during and following completion of works. Furthermore, the Applicant will seek proper advice and take all necessary steps for the purpose of controlling, extinguishing and making safe any of the above mentioned hazards.

5) The Applicant will comply with all reasonable directions given by the Authority which the Authority in its absolute discretion believes is necessary to safeguard coal, mine workings, mine entries, the environment or public safety.

6) The Applicant will provide to the Authority and it's representatives all necessary facilities at all reasonable times to inspect the Site, and ensure that all permissions, consents and private or other rights are adequate to entitle the Authority or those authorised by it to gain access to the Site for any purpose connected with the carrying out of its statutory duties, powers and obligations. The Applicant will notify the Authority's Licensing & Permits Office at least **48 hours** prior to starting intrusive work on the Site and supply contact details of a nominated Site supervisor.

7) Should it be found necessary to significantly change the method of treatment, design or specification of the works from that contained in the application to the Authority, the prior permission of the Authority must be obtained before proceeding (such permission not to be unreasonably withheld).

8) The Applicant will take account of the possibility of unrecorded mine workings and unrecorded disused mine entries within the site.

9) The Applicant should be conversant with all current applicable legislation and will adopt appropriate practices and procedures for working and drilling in hazardous conditions associated with mine workings and mine entries and seek advice as necessary from suitably qualified persons. The Applicant should ensure that contractors are competent and have the necessary experience to enter mine workings.

G & M Consulting Ltd

APPENDIX C

EXPLORATORY HOLE RECORDS

G & M Consulting Ltd	TRIAL PIT RECORD		TP No	1
			Contract No	C036
Method 360° tracked excavator	Site	Bank End Road, Worsbrough Bridge	Date	15/10/09
			Scale	01:25
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
B	1.0 to 1.5		MADE GROUND comprising predominantly COBBLES and BOULDERS of medium to coarse grained sandstone in a sandy matrix (Probably quarry waste)	2.6		
D	2.7	78,90,79	Stiff friable high strength orange brown Clay	2.9		
			Black shaley weathered COAL (Meltonfield?)	3.2		
			Brown very closely bedded? MUDSTONE; weak. Ironstaining to many surfaces. Highly weathered			
			Trial pit ends at 3.8m			

Remarks
No groundwater encountered
Faces unstable in made ground

Sample Types
D - Disturbed
U - Undisturbed
W - Water

Fig No

G & M Consulting Ltd	TRIAL PIT RECORD		TP No	3
			Contract No	C036
Method 360° tracked excavator	Site	Bank End Road, Worsbrough Bridge	Date	15/10/09
			Scale	01:25
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
			MADE GROUND comprising orange brown fine to coarse generally sub-angular GRAVEL of sandstone, with many cobbles and boulders of medium to coarse grained sandstone (Probably quarry waste)	1.9		
		77,82,80	Stiff friable mottled grey brown CLAY with frequent gravel sized lithorelicts of mudstone	2.1		
			Black shaley weathered COAL (Meltonfield?)	2.4		
			Cream brown gravel sized generally sub-angular to angular lithorelicts of MUDSTONE in a clay matrix. Lithorelicts weak and moderately weak. (weathered bedrock)			
			Trial pit ends at 3.0m			

Remarks
No groundwater encountered
Faces unstable in made ground

Sample Types
D - Disturbed
U - Undisturbed
W - Water

Fig No

G & M Consulting Ltd	TRIAL PIT RECORD		TP No	4
			Contract No	C036
Method 360° tracked excavator	Site	Bank End Road, Worsbrough Bridge	Date	15/10/09
			Scale	01:25
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
B	0.4		MADE GROUND? comprising brown and orange brown generally sub-angular GRAVEL and occasional cobbles of sandstone in a clayey matrix. Occasional gravel sized fragments of coal	0.7		
B	1.0		MADE GROUND? Comprising orange brown very sandy generally sub-angular GRAVEL and COBBLES of highly weathered sandstone, with an occasional clayey matrix	1.7		
		82, 95, 89	Stiff friable high strength grey and orange brown mottled CLAY. Frequent gravel sized lithorelicts of mudstone throughout. In parts poorly very closely fissured (Completely weathered mudstone)			
		85, 94, 88				
			Trial pit ends at 3.0m			

Remarks
No groundwater encountered
All faces unstable in made ground
Vane tests undertaken on material recovered to surface

Sample Types
D - Disturbed
U - Undisturbed
W - Water

Fig No

G & M Consulting Ltd	TRIAL PIT RECORD		TP No	5
			Contract No	C036
Method 360° tracked excavator	Site	Bank End Road, Worsbrough Bridge	Date	15/10/09
			Scale	01:25
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
B	0.5		MADE GROUND comprising generally sub-angular COBBLES and BOULDERS of orange brown sandstone in a sandy matrix. (Probably quarry waste)			
B	1.5					
B	2.5					
			Trial pit ends at 3.0m			

Remarks
No groundwater encountered
All faces unstable
Trial pit abandoned due to instability

Sample Types
D - Disturbed
U - Undisturbed
W - Water

Fig No

G & M Consulting Ltd	TRIAL PIT RECORD		TP No	6
			Contract No	C036
Method 360° tracked excavator	Site	Bank End Road, Worsbrough Bridge	Date	15/10/09
			Scale	01:25
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
B	1.0		Light brown generally sub-angular GRAVEL and COBBLE sized fragments of weathered medium to coarse sandstone in a sandy clayey matrix. (Probably highly weathered sandstone). Sandstone generally weak.			
				2.3		
			Brown fine to medium moderately weathered SANDSTONE; generally weak.			
			Trial pit ends at 2.5m			

Remarks
No groundwater encountered
All faces stable
Trial pit terminated on impenetrable sandstone

Sample Types
D - Disturbed
U - Undisturbed
W - Water

Fig No

G & M Consulting Ltd	TRIAL PIT RECORD		TP No	7
			Contract No	C036
Method 360° tracked excavator	Site	Bank End Road, Worsbrough Bridge	Date	15/10/09
			Scale	01:25
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Vane kN/m²				
D	0.5		Light brown generally sub-angular GRAVEL and COBBLE sized fragments of weathered generally medium sandstone in a sandy clayey matrix. (Probably highly weathered sandstone). Sandstone weak.			
D	1.0					
D	1.5		Rootlets noted to 1.2m			
D	2.0					
				3.2		
			Brown fine to medium moderately weathered SANDSTONE; generally weak.			
			Trial pit ends at 3.4m			

Remarks
No groundwater encountered
All faces stable
Trial pit terminated on impenetrable sandstone

Sample Types
D - Disturbed
U - Undisturbed
W - Water

Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R1
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	15/10/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	Driller

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Overburden	1.00		
			Sandstone	2.00 3.00 4.00 5.00 6.00		
			Mudstone	7.00 8.00 9.00		
			Dark Mudstone	10.00 11.00 12.00 13.00		
			Coal (13.7m to 14.2m)	14.00		
			Mudstone	15.00		
			Borehole ends at 15.0m	16.00 17.00 18.00 19.00 20.00 21.00 22.00 23.00 24.00 25.00		

Remarks

1.No groundwater noted
2.Hole backfilled with arisings/bentonite/cement mixture
3. Borehole descriptions based on drillers records

Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R2
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	15/10/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	Driller

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Overburden	1.00		
			Sandstone	2.00 3.00 4.00 5.00 6.00		
			Mudstone	7.00		
			Dark Mudstone	8.00 9.00 10.00 11.00		
			Coal/Dark Mudstone (11.5m to 12.2m)	12.00		
			Mudstone	13.00 14.00 15.00		
			Borehole ends at 15.00m	16.00 17.00 18.00 19.00 20.00 21.00 22.00 23.00 24.00 25.00		

Remarks

1.No groundwater noted
2.Hole backfilled with arisings/bentonite/cement mixture
3. Borehole descriptions based on drillers records

Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R4
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	16/10/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
	Bentonite seal to 1.5m		Sandstone	1.00		
				2.00		
	Plain pipe to 3.0m		Dark Mudstone/Coal Traces (2.8m to 4.5m)	3.00		
				4.00		
				5.00		
				6.00		
	Single size gravel from 1.5m to base			7.00		
				8.00		
				9.00		
				10.00		
	Slotted pipe 3.0 to 12.0m		Mudstone/Dark Mudstone Bands	11.00		
				12.00		
				13.00		
				14.00		
				15.00		
				16.00		
				17.00		
				18.00		
				19.00		
			Coal (19.5m to 20.0m)			
			Mudstone	20.00		
				21.00		
			Borehole ends at 21.0m	22.00		
				23.00		
				24.00		
				25.00		

Remarks
1.No groundwater noted
2.Gas/groundwater monitoring well installed on completion
3. Borehole descriptions based on drillers records

Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R5
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	15/10/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Overburden	1.00		
				2.00		
				3.00		
				4.00		
				5.00		
			Sandstone	6.00		
				7.00		
			Mudstone	8.00		
				9.00		
				10.00		
			Coal (9.9m to 10.3m)	11.00		
			Mudstone	12.00		
				13.00		
				14.00		
				15.00		
				16.00		
				17.00		
				18.00		
				19.00		
			Dark Mudstone	20.00		
				21.00		
				22.00		
				23.00		
			Coal (23.4 to 23.8m)	24.00		
			Borehole ends at 24.0m (in Mudstone)	25.00		

Remarks

1.No groundwater noted
2.Hole backfilled with arisings/bentonite/cement mixture
3. Borehole descriptions based on drillers records

Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R7
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	20/11/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Overburden	1.00 2.00 3.00 4.00 5.00 6.00 7.00		
			Sandstone	8.00		
			Mudstone	9.00 10.00 11.00		
			Dark Mudstone/Coal Traces (11.8m to 12.8m)	12.00 13.00		
			Mudstone/Sandstone Bands	14.00 15.00 16.00 17.00 18.00 19.00 20.00 21.00 22.00 23.00 24.00 25.00		

Remarks

1. No groundwater noted
2. Hole backfilled with arisings/bentonite/cement mixture
3. Borehole descriptions based on drillers records

Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R7
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	20/11/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description			
Type	Depth To-from (m)	Well (m)		Depth (m)	Level (mAOD)	Legend
			Dark Mudstone	26.00		
			Coal (26.0 to 26.4m)			
			Mudstone	27.00		
				28.00		
			Borehole ends at 28.0m	29.00		
				30.00		
				31.00		
				32.00		
				33.00		
				34.00		
				35.00		
				36.00		
				37.00		
				38.00		
				39.00		
				40.00		
				41.00		
				42.00		
				43.00		
				44.00		
				45.00		
				46.00		
				47.00		
				48.00		
				49.00		
				50.00		

Remarks	Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R8
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	20/11/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Overburden	1.00 2.00 3.00 4.00 5.00 6.00		
			Sandstone	7.00		
			Mudstone	8.00 9.00 10.00		
			Dark Mudstone/Coal Traces (10.2m to 11.1m)	11.00		
			Sandstone/Mudstone Bands	12.00 13.00 14.00 15.00 16.00 17.00 18.00 19.00 20.00 21.00 22.00		
			Dark Mudstone	23.00		
			Coal (23.5m to 23.9m)	24.00		
			Dark Mudstone	25.00		

Remarks

1.No groundwater noted
2.Hole backfilled with arisings/bentonite/cement mixture
3. Borehole descriptions based on drillers records

Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R8
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	20/11/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Dark Mudstone			
			Mudstone	26.00		
				27.00		
			Borehole ends at 27.0m	28.00		
				29.00		
				30.00		
				31.00		
				32.00		
				33.00		
				34.00		
				35.00		
				36.00		
				37.00		
				38.00		
				39.00		
				40.00		
				41.00		
				42.00		
				43.00		
				44.00		
				45.00		
				46.00		
				47.00		
				48.00		
				49.00		
				50.00		

Remarks	Fig No

G & M Consulting Ltd

BOREHOLE RECORD

BH No			R9
Contract No			C036
Site	Bank End Road, Worsbrough Bridge	Date	20/11/09
		Scale	1:100
Client	Erris Homes Ltd	Logged By	GS

Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Overburden	1.00		
				2.00		
			Sandstone (Fractured in places)	3.00		
				4.00		
				5.00		
				6.00		
				7.00		
				8.00		
			Mudstone	9.00		
				10.00		
			Coal/Dark Mudstone (10.8m to 11.7m)	11.00		
				12.00		
			Sandstone/Mudstone Bands	13.00		
				14.00		
				15.00		
				16.00		
				17.00		
				18.00		
				19.00		
				20.00		
				21.00		
				22.00		
				23.00		
				24.00		
			Dark Mudstone			
			Coal (24.6m to 25.0m)	25.00		

Remarks

1.No groundwater noted
2.Hole backfilled with arisings/bentonite/cement mixture
3. Borehole descriptions based on drillers records

Fig No

G & M Consulting Ltd	BOREHOLE RECORDS		BH No	R9
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	20/11/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Mudstone	26.00		
				27.00		
			Borehole ends at 27.0m	28.00		
				29.00		
				30.00		
				31.00		
				32.00		
				33.00		
				34.00		
				35.00		
				36.00		
				37.00		
				38.00		
				39.00		
				40.00		
				41.00		
				42.00		
				43.00		
				44.00		
				45.00		
				46.00		
				47.00		
				48.00		
				49.00		
				50.00		

Remarks	Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R10
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	20/11/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Overburden	1.00		
				2.00		
				3.00		
			Sandstone	4.00		
				5.00		
				6.00		
				7.00		
				8.00		
				9.00		
				10.00		
				11.00		
			Dark Mudstone	12.00		
			Coal (Meltonfield) (12.1m to 13.0m)	13.00		
				14.00		
				15.00		
				16.00		
				17.00		
			Sandstone/Mudstone Bands	18.00		
				19.00		
				20.00		
				21.00		
				22.00		
				23.00		
			Dark Mudstone	24.00		
				25.00		

Remarks

1.No groundwater noted
2.Hole backfilled with arisings/bentonite/cement mixture
3. Borehole descriptions based on drillers records

Fig No

G & M Consulting Ltd	BOREHOLE RECORD		BH No	R10
			Contract No	C036
Method: Open hole drilling 115mm dia Casagrande C6 rig with water flush	Site	Bank End Road, Worsbrough Bridge	Date	20/11/09
			Scale	1:100
	Client	Erris Homes Ltd	Logged By	GS

Sample Details			Description	Depth (m)	Level (mAOD)	Legend
Type	Depth To-from (m)	Well (m)				
			Dark Mudstone	26.00		
			Coal (26.1m to 26.5m)	27.00		
			Borehole ends at 27.0m (in mudstone)	28.00		
				29.00		
				30.00		
				31.00		
				32.00		
				33.00		
				34.00		
				35.00		
				36.00		
				37.00		
				38.00		
				39.00		
				40.00		
				41.00		
				42.00		
				43.00		
				44.00		
				45.00		
				46.00		
				47.00		
				48.00		
				49.00		
				50.00		

Remarks	Fig No

DAILY RETURN
(Drilling)

SHEET 1 OF 1

Date THURS 15-10-09 Working Day No. 1

Contract Name BANK END ROAD - WORSBROUGH

Contract No. 5551

Dayworks Were Executed Today

Daywork No.

Drilling Contracting & Environmental Limited

Hole No.	Depth	Casing	Dia	Angle	From	To	Description
							MOBILISED TO SITE :-
							1N° CASAGRANDE R.G
							1N° WATER PUMP
							2N° 1000Ltr WATER TANKS
	SET UP WATER HOSE AND TANKS						
	BOREHOLE POSITIONS MARKED OUT BY CLIENT - COMMENCED DRILLING						
R1	14.50	-	4½"	V	00	1.40	OVERBURDEN
					1.40	6.20	SANDSTONE
					6.20	9.20	MUDSTONE
					9.20	13.70	DARK MUDSTONE
					13.70	14.20	COAL
					14.20	14.50	MUDSTONE.
R2	15.00	-	4½"	V	00	1.30	OVERBURDEN
					1.30	6.00	SANDSTONE
					6.00	7.80	MUDSTONE
					7.80	11.50	DARK MUDSTONE
					11.50	12.70	COAL/DARK MUDSTONE
					12.70	15.00	MUDSTONE

2	29.50	-	SHEET TOTAL	CREW	PLANT
-	-	-	PREVIOUS SHEET TOTAL	D. EDWARDS	CASAGRANDE R.G
2	29.50	-	CUMULATIVE TOTAL	M. GREEN	WATER PUMP
					WATER TANKS (2)

Signed by D.C.E. N. Lell Date 16-10-09

Signed by CLIENT Date

CLIENT COPY - WHITE
Q.S. COPY - YELLOW
SITE COPY - PINK

NO CLAIM CAN BE ACCEPTED UNLESS REPORTED IN WRITING WITHIN 14 DAYS OF THIS RETURN

DAILY RETURN
(Drilling) SHEET 1 of 2

Drilling Contracting & Environmental Limited

Date FRI 16-10-09 Working Day No. 2

Contract Name BANK END ROAD - WORSBROUGH

Contract No. 5551

Dayworks Were Executed Today .....

Daywork No. .....

Hole No.	Depth	Casing	Dia	Angle	From	To	Description
R3	15.00	4.50	4½"	V	00	3.80	OVERBURDEN
					3.80	8.80	SANDSTONE
					8.80	9.00	MUDSTONE
					9.00	13.50	DARK MUDSTONE
					13.50	14.10	COAL
					14.10	15.00	MUDSTONE
END CAP FITTED TO LEAD LENGTH - INSERTED 6.00 METRES SLOTTED 63mm PIPE + 1.50 METRES PLAIN 63mm PIPE - GRAVEL PLACED UP TO 1.50 METRES - BENTONITE SEAL TO SURFACE - GAS BUNG/VALVE FITTED - LOCKABLE COVER FITTED (SUPPLIED BY CLIENT) - CONCRETED INTO PLACE.							
R4	21.00	~~0.00~~	4½"	V	00	2.80	SANDSTONE
					2.80	4.50	DARK MUDSTONE/COAL TRACES
					4.50	19.00	MUDSTONE / DARK MUDSTONE BANDS
					19.00	19.50	COAL
					19.50	21.00	MUDSTONE
END CAP FITTED TO LEAD LENGTH - INSERTED 9.00 METRES SLOTTED 63mm PIPE + 3.00 METRES PLAIN 63mm PIPE - GRAVEL PACKED UP TO 1.50 METRES - BENTONITE SEAL TO SURFACE - GAS BUNG/VALVE FITTED - LOCKABLE COVER FITTED (SUPPLIED BY CLIENT) CONCRETED INTO PLACE.							

2	36.00	4.50	SHEET TOTAL	CREW	PLANT
2	29.50	–	PREVIOUS SHEET TOTAL	D. EDWARDS M. GREEN D. GAYLOR	CASAGRANDE RIG WATER PUMP WATER TANKS (2)
4	65.50	4.50	CUMULATIVE TOTAL		

Signed by D.C.E. N. Lell Date 17-10-09

Signed by CLIENT ..... Date .....

CLIENT COPY - WHITE
Q.S. COPY - YELLOW
SITE COPY - PINK

NO CLAIM CAN BE ACCEPTED UNLESS REPORTED IN WRITING WITHIN 14 DAYS OF THIS RETURN

DAILY RETURN
(Drilling) SHEET 2 OF 4

Date FRI 16-10-09 Working Day No. 2

Contract Name BANK END ROAD - WORSBROUGH

Contract No. 5551

Dayworks Were Executed Today

Daywork No.

Drilling Contracting & Environmental Limited

Hole No.	Depth	Casing	Dia	Angle	From	To	Description
R5	24.00	6.00	4½"	V	00	5.00	OVERBURDEN
					5.00	6.80	SANDSTONE
					6.80	9.90	MUDSTONE
					9.90	10.30	COAL
					10.30	19.50	MUDSTONE
					19.50	23.40	DARK MUDSTONE
					23.40	23.80	COAL
					23.80	24.00	MUDSTONE
R6	9.00	6.00	4½"	V	00	5.70	OVERBURDEN
					5.70	9.00	SANDSTONE / MUDSTONE
END CAP FITTED TO LEAD LENGTH - INSERTED 6.00 METRES SLOTTED 63mm PIPE +							
3.00 METRES PLAIN 63mm PIPE - GRAVEL PACKED UP TO 1.50 METRES - BENTONITE SEAL							
TO SURFACE - GAS BUNG/VALVE FITTED - LOCKABLE COVER (SUPPLIED BY CLIENT)							
CONCRETED INTO PLACE.							
							COMMENCED DEMOBILISATION

2	33.00	12.00	SHEET TOTAL	CREW	PLANT
4	65.50	4.50	PREVIOUS SHEET TOTAL	D. GAYLOR M. GREEN	CASAGRANDE RIG WATER PUMP WATER TANKS (2)
6	98.50	16.50	CUMULATIVE TOTAL		

Signed by D.C.E. J. Hall Date 17-10-09

Signed by CLIENT ..... Date .....

CLIENT COPY - WHITE
Q.S. COPY - YELLOW
SITE COPY - PINK

NO CLAIM CAN BE ACCEPTED UNLESS REPORTED IN WRITING WITHIN 14 DAYS OF THIS RETURN

DAILY RETURN
(Drilling) SHEET 3 of 4

Date FRI 20-11-09 Working Day No. 3

Contract Name BANK END ROAD - WORSBROUGH

Contract No. 5551

Dayworks Were Executed Today

Daywork No.

Drilling Contracting & Environmental Limited

Hole No.	Depth	Casing	Dia	Angle	From	To	Description
							MOBILISED TO SITE!
		BOREHOLE POSITIONS SET OUT					1 No CASAGRANDE RIG
							C/W WATER PUMP.
B/H8	27.00	8.00	4½"	V	00	6.80	OVERBURDEN
					6.80	7.50	SANDSTONE
					7.50	10.20	MUDSTONE
					10.20	11.10	DARK MUDSTONE / COAL TRACES
					11.10	22.50	SANDSTONE / MUDSTONE BANDS
	NO GAS DETECTED				22.50	23.50	DARK MUDSTONE
					23.50	23.90	COAL
BOREHOLE BACKFILLED USING					23.90	25.40	DARK MUDSTONE
DRILLING ARISINGS - BENTONITE SEAL					25.40	27.00	MUDSTONE
B/H7	28.00	8.00	4½"	V	00	7.80	OVERBURDEN
					7.80	8.20	SANDSTONE
					8.20	11.80	MUDSTONE
	NO GAS DETECTED				11.80	12.80	DARK MUDSTONE / COAL TRACES
					12.80	25.00	MUDSTONE / SANDSTONE BANDS
BOREHOLE BACKFILLED USING					25.00	26.00	DARK MUDSTONE
DRILLING ARISINGS - BENTONITE / O.P.C					26.00	26.40	COAL
SEAL AT SURFACE.					26.40	28.00	MUDSTONE

2	55.00	16.00	SHEET TOTAL	CREW	PLANT
6	98.50	16.50	PREVIOUS SHEET TOTAL	CASAGRANDE RIG C/W WATER PUMP	D. EDWARDS M. GREEN
8	153.50	32.50	CUMULATIVE TOTAL		

Signed by D.C.E. N. Lell Date 20-11-09

Signed by CLIENT Date

CLIENT COPY - WHITE
Q.S. COPY - YELLOW
SITE COPY - PINK

NO CLAIM CAN BE ACCEPTED UNLESS REPORTED IN WRITING WITHIN 14 DAYS OF THIS RETURN

DAILY RETURN
(Drilling) SHEET 4 OF 4

Date FRI 20-11-09 Working Day No. 3

Contract Name BANK END ROAD - WORSBROUGH

Contract No. 5551

Dayworks Were Executed Today

Daywork No.

Drilling Contracting & Environmental Limited

Hole No.	Depth	Casing	Dia	Angle	From	To	Description
B/H 10	27.00	3.00	4½"	V	00	2.70	OVERBURDEN
					2.70	11.50	SANDSTONE
					11.50	12.10	DARK MUDSTONE
NO GAS DETECTED					12.10	13.00	COAL
					13.00	23.50	SANDSTONE / MUDSTONE BANDS
BOREHOLE BACKFILLED USING DRILLING					23.50	26.10	DARK MUDSTONE
ARISINGS - BENTONITE/O.P.C SEAL					26.10	26.50	COAL
		TO SURFACE.			26.50	27.00	MUDSTONE
B/H 9	27.00	3.00	4½"	V	00	2.10	OVERBURDEN
					2.10	8.80	SANDSTONE / FRACTURED IN PLACES
					8.80	10.80	MUDSTONE
NO GAS DETECTED					10.80	11.70	COAL / DARK MUDSTONE
					11.70	23.60	SANDSTONE / MUDSTONE BANDS
BOREHOLE BACKFILLED USING DRILLING					23.60	24.60	DARK MUDSTONE
ARISINGS - BENTONITE / O.P.C SEAL					24.60	25.00	COAL
	AT SURFACE.				25.00	27.00	MUDSTONE.
SUMMARY OF MATERIALS USED ON VISITS 1+2							
							NO FURTHER DRILLING
BENTONYTE		4 x 25kG BAGS					REQUIRED - CONTRACT
10mm GRAVEL		1 TONNE BULK BAG.					COMPLETED TO ENGINEERS
							SPECIFIC REQUIREMENTS.

2	54.00	6.00	SHEET TOTAL	CREW	PLANT
8	153.50	32.50	PREVIOUS SHEET TOTAL	D. EDWARDS M. GREEN	CASAGRANDE RIG C&W WATER PUMP.
10	207.50	38.50	CUMULATIVE TOTAL		

Signed by D.C.E. J. Lello Date 20-11-09

Signed by CLIENT Date

CLIENT COPY - WHITE
Q.S. COPY - YELLOW
SITE COPY - PINK

NO CLAIM CAN BE ACCEPTED UNLESS REPORTED IN WRITING WITHIN 14 DAYS OF THIS RETURN

G & M Consulting Ltd

APPENDIX D

LABORATORY TEST RESULTS

Derwentside Environmental Testing Services

2139

Certificate of Analysis

Certificate Number: 09-32458

Date: 12/11/2009

Client:

G & M Consulting
The Chestnuts
Brackenhill Road
Doncaster
South Yorkshire
DN9 2LR

Our Reference:	09-32458
Client Reference:	C036
Contract Title:	Worsbrough Bridge
Description:	3 soil samples
Date Received:	30/10/2009
Date Started:	30/10/2009
Date Completed:	12/11/2009
Test Procedures:	Identified by prefix DETSn, details available upon request.

Notes:

Observations and interpretations are outside the scope of UKAS accreditation
* denotes test not included in laboratory scope of accreditation
# denotes test that holds MCERT accreditation
$ denotes tests completed by an approved subcontractor
I/S denotes insufficient sample to carry out test
N/S denotes that the sample is not suitable for testing
DETSM denotes tests carried out by DETS Midlands laboratory
Solid samples will be disposed 1 month and liquids 2 weeks
after the date of issue of this test certificate
Asbestos subsamples will be kept for 6 months

Approved By:

Authorised Signatories: Rob Brown
Business Manager

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Our Ref: 09-32458
Client Ref: C036
Contract Title: Worsbrough Bridge

Sample Details

Sample ID	Depth	DETS Ref	Matrix Description	Date Sampled	Time Sampled	Preservation	Analysis Complete
TP2	0.50	223320	light brown gravelly SAND	Not Provided	Not Provided	None	12/11/2009
TP7	1.00	223321	light brown gravelly SAND	Not Provided	Not Provided	None	12/11/2009
TP5	1.50	223322	brown gravelly SAND	Not Provided	Not Provided	None	12/11/2009

Summary of Chemical Analysis
Soil Samples

Our Ref: 09-32458
Client Ref: C036
Contract Title: Worsbrough Bridge

		Lab No.	223320	223321	223322
		Sample Ref	TP2	TP7	TP5
		Depth	0.50	1.00	1.50
		Other Ref			
		Sample Type	D	D	D
Test	**Units**	**DETSxx**			
Arsenic	mg/kg	DETS 042#	4	4	5
Cadmium	mg/kg	DETS 042#	0.4	0.5	0.6
Chromium	mg/kg	DETS 042#	14	12	14
Copper	mg/kg	DETS 042#	13	8	15
Lead	mg/kg	DETS 042#	13	12	15
Mercury	mg/kg	DETS 081#	< 0.05	< 0.05	< 0.05
Nickel	mg/kg	DETS 042#	17	17	27
Selenium	mg/kg	DETS 042#	< 0.5	< 0.5	< 0.5
Zinc	mg/kg	DETS 042#	32	46	63
Sulphate Aqueous Extract as SO4	mg/l	DETS 076#	60	25	25
pH		DETS 008#	8.6	8.5	8.7
Acenaphthene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	DETS 050	< 0.1	0.2	< 0.1
Fluorene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Naphthalene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	DETS 050	< 0.1	< 0.1	< 0.1
Pyrene	mg/kg	DETS 050	< 0.1	0.2	< 0.1
PAH	mg/kg	DETS 050	< 1.6	< 1.6	< 1.6
Phenol - Monohydric	mg/kg	DETS 067#	0.5	0.8	< 0.3
Aliphatic C5-C6	mg/kg	DETS 072*	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	mg/kg	DETS 072*	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	mg/kg	DETS 072*	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	mg/kg	DETS 072*	<0.1	<0.1	<0.1
Aliphatic C12-C16	mg/kg	DETS 072*	<0.1	<0.1	<0.1
Aliphatic C16-C21	mg/kg	DETS 072*	<0.1	<0.1	<0.1
Aliphatic C21-C35	mg/kg	DETS 072*	<0.1	<0.1	<0.1
Aromatic C5-C7	mg/kg	DETS 072*	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	mg/kg	DETS 072*	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	mg/kg	DETS 072*	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	mg/kg	DETS 072*	<0.1	<0.1	<0.1
Aromatic C12-C16	mg/kg	DETS 072*	< 0.1	< 0.1	< 0.1
Aromatic C16-C21	mg/kg	DETS 072*	<0.1	<0.1	<0.1
Aromatic C21-C35	mg/kg	DETS 072*	<0.1	<0.1	<0.1
Aliphatic C5-C35	mg/kg	DETS 072*	<10	<10	<10
Aromatic C5-C35	mg/kg	DETS 072*	<10	<10	<10

Summary of Chemical Analysis
Soil Samples

Our Ref: 09-32458
Client Ref: C036
Contract Title: Worsbrough Bridge

		Lab No.	223320	223321	223322
		Sample Ref	TP2	TP7	TP5
		Depth	0.50	1.00	1.50
		Other Ref			
		Sample Type	D	D	D
Test	**Units**	**DETSxx**			
TPH Ali/Aro	mg/kg	DETS 072*	<10	<10	<10

Appendix A - Details of Analysis

Method details are shown only for those determinants listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery
Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETS 002	Organic Matter	%	0.01	Air Dried	No	Yes	Yes
DETS 003	Loss on Ignition	%	0.01	Air Dried	No	Yes	Yes
DETS 004	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETS 075	Total Sulphate	%	0.01	Air Dried	No	Yes	Yes
DETS 004	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETS 076	Water Soluble Sulphate	mg/l	10.00	Air Dried	No	Yes	Yes
DETS 006	Chloride	mg/kg	0.01	Air Dried	No	Yes	Yes
DETS 008	pH	pH Units	0.10	Air Dried	No	Yes	Yes
DETS 042	Selenium	mg/kg	0.50	Air Dried	No	Yes	Yes
DETS 019	Ammonia	mg/kg	0.02	Air Dried	No	Yes	Yes
DETS 020	Boron (Water Soluble)	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 024	Sulphide	mg/kg	10.00	Air Dried	No	Yes	Yes
DETS 042	Antimony	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Arsenic	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Barium	mg/kg	1.50	Air Dried	No	Yes	Yes
DET S 042	Beryllium	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Cadmium	mg/kg	0.10	Air Dried	No	Yes	Yes

Appendix A - Details of Analysis

Method details are shown only for those determinants listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS.
No Recovery Factors are used in the determination of results. Results reported assume 100% recovery
Full method statements are available on request.

Method	Name of Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETS 042	Cobalt	mg/kg	0.70	Air Dried	No	Yes	Yes
DETS 042	Copper	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETS 042	Iron	mg/kg	1.00	Air Dried	No	Yes	No
DETS 042	Lead	mg/kg	0.30	Air Dried	No	Yes	Yes
DETS 042	Manganese	mg/kg	20.00	Air Dried	No	Yes	Yes
DETS 081	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETS 042	Molybdenum	mg/kg	0.40	Air Dried	No	Yes	Yes
DETS 042	Nickel	mg/kg	0.20	Air Dried	No	Yes	Yes
DETS 042	Thallium	mg/kg	1.00	Air Dried	No	No	No
DETS 042	Vanadium	mg/kg	0.80	Air Dried	No	Yes	Yes
DETS 042	Zinc	mg/kg	1.00	Air Dried	No	Yes	Yes
DETS 049	Sulphur (Free)	mg/kg	0.50	As Received	No	Yes	Yes
DETS 050	PAH	mg/kg	0.10	As Received	No	Yes	No
DETS 051	TPH (C10 - C40)	mg/kg	20.00	As Received	No	Yes	Yes
DETS 052	PCB	mg/kg	0.01	As Received	No	Yes	Yes

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APPENDIX E

GAS MONITORING SHEETS

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Erris Homes Ltd **Job No:** C036
Site: Bank End Road, Worsbrough Bridge **Visit No:** 1 **of**
Date: 18/10/2009 **Operator:** GS **Project Manager:** GS

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			Peak	Steady								
R3	ND	ND	ND	ND	1.2	1.2					19.3	1.93	NR		0.3	0.3			3.45	7.5				
R4	ND	ND	ND	ND	1.2	1.2					19.1	19.1	NR		ND	ND			9.05	12.0				
R6	ND	ND	ND	ND	0.5	0.5					20.0	20.0	NR		ND	ND			7.20	9.0				
Max	0	0	0	0	1.2	1.2	0	0	0	0	20	20	0	0	0.3	0.3	0	0	9.05	12	0	0.00		
Min	0	0	0	0	0.5	0.5	0	0	0	0	19.1	1.93	0	0	0.3	0.3	0	0	3.45	7.5	0	0.00		
GSV (l/hr)	0				0.0036																			

METEOROLOGICAL AND SITE INFORMATION: (Select correct box with X or enter data, as applicable)

State of ground:		Dry	X	Moist		Wet		Snow		Frozen
Wind:	X	Calm		Light		Moderate		Strong		
Cloud cover:	X	None		Slight		Cloudy		Overcast		
Preciptation:	X	None		Slight		Moderate		Heavy		
Barometric pressure (mbar):			1007	Before			1005	After		
Pressure trend:				Falling	X	Steady		Rising		
Air Temperature (Deg. C):				Before				After		

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM 430
Gas concentration: **CH_4** 0.2%@5%, 1.0@30%, 3.0@100% **CO_2** 0.1%@10%, 3.0%@30%,3.0%@100% **O_2**
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 12/12/2008
Date of next calibration: 12/12/2009

G & M Consulting Ltd

PID:
Calbrated range:
Calibration gas:
Response time:
Accuracy:
Date of last calibration:

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client: Erris Homes Ltd **Job No:** C036
Site: Bank End Road, Worsbrough Bridge **Visit No:** 2 **of**
Date: 21/11/2009 **Operator:** GS **Project Manager:** GS

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m)	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			Peak	Steady								
R3	ND	ND	ND	ND	0.8	0.8					16.1	16.1	NR		ND	ND			4.15	7.5				
R4	ND	ND	ND	ND	0.4	0.4					16.5	16.5	NR		-6	-3			Dry	12.0				
R6	ND	ND	ND	ND	0.9	0.9					16.2	16.2	NR		-0.3	-0.3			7.20	9.0				
Max	**0**	**0**	**0**	**0**	**0.9**	**0.9**	**0**	**0**	**0**	**0**	**16.5**	**16.5**	**0**	**0**	**-0.3**	**-0.3**	**0**	**0**	**7.2**	**12**	**0**	**0.00**		
Min	**0**	**0**	**0**	**0**	**0.4**	**0.4**	**0**	**0**	**0**	**0**	**16.1**	**16.1**	**0**	**0**	**-6**	**-3**	**0**	**0**	**4.15**	**7.5**	**0**	**0.00**		
GSV (l/hr)	0				-0.0027																			

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:		Dry		Moist	X	Wet		Snow		Frozen
Wind:		Calm		Light	X	Moderate		Strong		
Cloud cover:		None		Slight	X	Cloudy		Overcast		
Preciptation:		None		Slight	X	Moderate		Heavy		
Barometric pressure (mbar):			996	Before			994	After		
Pressure trend:			X	Falling		Steady		Rising		
Air Temperature (Deg. C):				Before				After		

G & M Consulting Ltd

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM 430
Gas concentration: **CH_4** 0.2%@5%, 1.0@30%, 3.0@100% **CO_2** 0.1%@10%, 3.0%@30%,3.0%@100% **O_2**
Gas Range: **CH_4** 0 - 100% **CO_2** 0 - 100% **O_2** 0 - 25%
Gas Flow range: +100/-50 l/hour
Differential Pressure: (+/-) 1000 Pa
Date of last calibration: 12/12/2008
Date of next calibration: 12/12/2009

PID:
Calbrated range:
Calibration gas:
Response time:
Accuracy:
Date of last calibration:
Date of next calibration:

Ground Gas and Groundwater Monitoring Record Sheet

JOB DETAILS:

Client:	Erris Homes Ltd	**Job No:**	C036		
Site:	Bank End Road, Worsbrough Bridge	**Visit No:**	3	of	
Date:	19/12/2009	**Operator:**	ATS	**Project Manager:**	GS

Monitoring Point	GAS CONCENTRATIONS												VOLATILES		FLOW DATA				WELL AND WATER DATA					Comments
	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Carbon monoxide (ppmv)		Hydrogen sulphide (ppmv)		Oxygen (%v/v)		PID Peak (ppm)	Product thickness (mm)	Flow rate (l/hr)		Differential borehole Pressure (Pa	Time for flow to equalise (secs)	Water level (mbgl)	Depth of well (m	Reduced level (mAOD)	Water level (mAOD)	Response Zone	
	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady			Peak	Steady								
R3	ND	ND	ND	ND	1.0	1.0					19.0	19.0	NR		ND	ND			3.52	7.5				
R4	ND	ND	ND	ND	1.2	1.2					19.5	19.5	NR		ND	ND			Dry	12.0				
R6	ND	ND	ND	ND	0.6	0.6					20.1	20.1	NR		ND	ND			7.14	9.0				
Max	0	0	0	0	1.2	1.2	0	0	0	0	20.1	20.1	0	0	0	0	0	0	7.14	12	0	0.00		
Min	0	0	0	0	0.6	0.6	0	0	0	0	19	19	0	0	0	0	0	0	3.52	7.5	0	0.00		
GSV (l/hr)	0				0.0012																			

METEOROLOGICAL AND SITE INFORMATION:

(Select correct box with X or enter data, as applicable)

State of ground:		Dry	X	Moist		Wet		Snow		Frozen
Wind:		Calm	X	Light		Moderate		Strong		
Cloud cover:		None	X	Slight		Cloudy		Overcast		
Preciptation:	X	None		Slight		Moderate		Heavy		
Barometric pressure (mbar):			1002	Before			1001	After		
Pressure trend:			X	Falling		Steady		Rising		
Air Temperature (Deg. C):				Before				After		

G & M Consulting Ltd

INSTRUMENTATION TECHNICAL SPECIFICATIONS:

Ground gas meter: GFM 430

Gas concentration: CH_4 0.2%@5%, 1.0@30%, 3.0@100% CO_2 0.1%@10%, 3.0%@30%,3.0%@100% O_2

Gas Range: CH_4 0 - 100% CO_2 0 - 100% O_2 0 - 25%

Gas Flow range: +100/-50 l/hour

Differential Pressure: (+/-) 1000 Pa

Date of last calibration: 13/12/2009

Date of next calibration: 13/12/2010

PID:

Calbrated range:

Calibration gas:

Response time:

Accuracy:

Date of last calibration:

Date of next calibration: