

Gary Farnell
Royston Lead Ltd
Pogmoor Works
Stocks Lane
Barnsley
S75 2DS

Our Ref: D131266

Your Ref:

Date: 12 May 2010

Dear Mr Gary Farnell,

Pogmoor Works - Contamination Assessment

1.0 Introduction

Scott Wilson was commissioned by Royston Lead Ltd to undertake a review and reassessment of ground condition data from the proposed redevelopment site known as Pogmoor Works in Barnsley, South Yorkshire. The proposed redevelopment of the site is to an industrial end use.

Ground Solutions Group (now part of Scott Wilson) undertook two ground investigations (in 2005 and 2006) and the data from these and a recent site visit have been used for the review and reassessment. The data presented in these two reports was originally assessed for a residential end use using the guidance in place at the time.

2.0 Site Location and History

The site is located off Stocks Lane, approximately 1.5 km to the west of Barnsley town centre and is centred on National Grid Reference SE 333 065 (Figure 1). The site is surrounded on three sides by playing fields to the north, west and south. To the east of the site is residential housing.

The site is occupied by an operational lead reprocessing works. It is approximately 1.1ha in size and consists of two main works buildings and an office building (Figure 2). The site is relatively flat with a gentle slope rising up from the southeast to the north west of the site. The majority of the site is covered with hardstanding (tarmac/concrete) although the northern and western edges of the site comprised soft ground. Photographs are included as Appendix C.

Historical maps included in White Young Greens Geo-environmental Desk Study (2004) indicate the site was previously occupied in part by a colliery, brickworks and the current lead processing works.

3.0 Environmental Setting

3.1 Geology

Reference to the British Geological Survey 1:50,000 Series, Sheet 87, indicates that the site is underlain by north and north-easterly dipping strata of the Middle Coal Measures, dominated by mudstones, sandstones, siltstones and thin coal seams. A sandstone horizon is understood to sub-crop in the east of the site, and mudstone beneath the west of the site. The exact thickness of the sandstone beneath the site is not known.

Geological maps also indicate that there is not likely to be significant drift deposits present on the site.

The investigation carried out for the IPPC licence found that there were some patches of sandy clay and stiff grey clay (completely weathered Mudstone), but most of the site consisted of Made Ground underlain directly by Mudstone. The Made Ground comprised gravel, clay and sand

layers containing some brick and ash. The thickness of the Made Ground varied across the site reaching 5.6 m to 5.7 m (BGL) in the west and between 0.5 m and 2 m (BGL) across the remainder.

3.2 Hydrogeology

Reference to the Environment Agency indicates that the solid strata underlying the site are classified as a Secondary A Aquifer.

Secondary A Aquifers consist of permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

Soils on the site are classified as Soils of High Leaching Potential (U) – Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst-case vulnerability classification (H) is therefore assumed until proven otherwise.

Observations during the initial phase of investigation works recorded groundwater levels at between 2.5 m and 3.5 m below ground level.

The mining and quarrying history in the area is likely to have impacted on groundwater quality in the area.

3.3 Hydrology

The nearest major surface watercourse, the River Dearne is located approximately 3 km from the site in an easterly direction. The closest surface water course is located approximately 120m south and is unnamed drainage ditch flowing east.

4.0 Intrusive Site Investigation Works

4.1 GSG – April 2005

Site works undertaken in April 2005 consisted of the drilling of 4 cable percussive boreholes (to between 3 and 6 m bgl), 16 window sample holes (to between 1.5m and 6m bgl) and a soil gas survey. 45 samples were scheduled for chemical analysis considered appropriate to the past history of the site.

4.2 GSG – April 2006

Site works undertaken in April 2006 consisted of the excavation of 7 trial pits along the sites northern embankment. 18 samples were scheduled for chemical analysis considered appropriate to the past history of the site.

4.3 Identified Ground Conditions

Much of the site is covered with tarmac or hardstanding, below which is Made Ground down to depths of 0.36 m (BGL) at its shallowest to 9.0 m (BGL) at its deepest.

The Made Ground comprised brick, ash, coal and slag in a matrix of sand, clay and/or gravel. The Made Ground was encountered at its greatest depth at the west of the site, in and adjacent to the embankment.

The embankment itself comprised a significant thickness of Made Ground, including both below and above ground level fill. The profile of the embankment area indicated a backfilled quarry with fill material forming a land raise. This is consistent with the sites history. The embankment comprised of much brick and loose ash.

Groundwater was encountered during both phases of investigation and during subsequent monitoring at depths of 2.5 m to 3.5 mbgl depending upon the location of the borehole. Groundwater levels may vary due to seasonal fluctuations in rainfall, but in the shorter term, can be affected by antecedent weather conditions or other causes.

4.4 Japanese knotweed

A extensive area of Japanese knotweed (*Fallopia japonica*) was identified along much of the embankment across the northern area of the site. In additional, Japanese knotweed was noted on the adjacent council land to the south of the site.

Japanese knotweed control was implements and included a number of herbicide application which significantly reduced the area of infestation. The remaining small are knotweed is currently being subject to final eradication.

5.0 Tier 1 Generic Assessment

5.1 Soils

The UKs primary contaminated land guidance is contained within the Contaminated Land Exposure Assessment (CLEA) framework. Within this framework a number of Soil Guideline Values (SGVs) have been published for key contaminants along with toxicological guideline values relating to intake thresholds. The soil guideline values provided by the CLEA model represent intervention values for end uses based upon potential human exposure and soil concentrations of a contaminant above these values might represent an unacceptable risk to the health of the site users.

The Environment Agency has an ongoing programme of SGV publication with associated toxicological information for key contaminants. Where SGVs are available then they should be used as the basis for any Tier 1 human health risk assessment.

Where SGVs, toxicological and physiochemical data is not available under the CLEA framework, the results are screened against (where applicable) Generic Assessment Criteria (GACs) published by LQM/ CIEH (Land Quality Management/ Chartered Institute of Environmental Health) in 2009, Dutch Intervention Values (DIV), DETR guidance, Risk Based Screening Levels (RBSL) and Waste Acceptance Criteria (WAC) for the initial Tier 1 assessment of risk to human health.

Guidance criteria for lead (Pb) were withdrawn by the Environment Agency and no new guidance and toxicological data has yet been published. Therefore, it is our approach that the most suitable criteria to use the withdrawn guidance and SGV's as an interim measure until the new guidance is issued.

The end land use for the site has been categorised as industrial, results have therefore been compared to Commercial / Industrial guidance criteria. Where specific guidance is not available for specific chemicals, appropriate substitute guidance values have been utilised.

In total sixty four (64No.) soil samples were scheduled for chemical analysis, which was undertaken by Chemtest and by I2 Laboratory. The samples were tested for a suite of chemicals including metals, Speciated PAHs (Polycyclic Aromatic Hydrocarbons) and Speciated Hydrocarbons. A summary of the analytical results from the soil samples and Tier 1 Screen are included in Appendix A.

Thirteen samples recorded elevated concentrations of lead when compared to their respective SGV of 750 mg/kg. The highest lead concentration of 16,000 mg/kg was recorded in the sample taken from BH4 at 0.3 m bgl.

Application of the Mean Value Test for all samples analysed, where concentrations exceeded Tier 1 screening values, gave the following true mean soil concentrations:

Analyte	Mean Value (mg/kg)	Maximum Value (mg/kg)	SGV (industrial)
Lead**	2.38	4.20	2.88

Calculated using procedure given in "Assessment of Risks to Human Health from Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research" (CLR7). ** Lead data is log transformed and the Geometric Mean calculated.

The calculated mean values for lead is less than the adopted CLEA SGV and it is therefore not considered to present a significant risk of significant harm to human health in the context of the proposed redevelopment of the site to an industrial end use.

From the speciated PAH analysis two samples recorded elevated concentrations of benzo(a)pyrene with the highest concentration of 45 mg/kg recorded in WS9 at 1.0 m bgl. The mean concentration (calculated using the Mean Value Test) using all data collected from the site was 3.66 mg/kg. The calculated mean values for B(a)P is therefore less than the GACs for an commercial/industrial end use of 14 mg/kg.

No other chemicals were recorded at concentrations above their respective soil guidance criteria.

5.2 Leachates

In the UK a number of water quality standards suitable for the assessment of leachate data have been published including UK Drinking Water Standards (UK DWS) and Environmental Quality Standards (EQS) for Freshwater and for Saltwater. Where UK guidance is not available, recognised European and world guidelines may be used where applicable including EU Drinking Water Standards, Dutch Intervention Values (DIV) Risk Based Corrective Action (RBCA) and World Health Organisation (WHO) Guidelines for Drinking Water Quality.

The leachate data has been screened against EQS Freshwater. Where no EQS Freshwater values are available, UK DWS, RBCA, DIV or WHO guidelines have been used where applicable.

In total eight (8No.) leachate samples were scheduled for chemical analysis, which was undertaken by Chemtest. The samples were tested for a suite of chemicals including metals, sulphate and Speciated PAHs (Polycyclic Aromatic Hydrocarbons). A summary of the analytical results and Tier 1 Screen are included in Appendix A.

The Tier 1 Assessment has recorded four elevated concentrations of lead above the EQS for Freshwater of 20ug/l. The highest concentration of 260 ug/l was recorded in BH1 at 0.5m bgl.

One elevated concentration of copper (82 ug/l) was recorded in WS6 0.8m bgl and one elevated concentration of zinc (170 ug/l) was recorded in BH1 at 0.5m bgl.

No other chemicals were recorded above their respective guidance criteria and all species of PAH were recorded below the laboratories limit of detection.

5.3 Groundwater

In the UK a number of water quality standards suitable for the assessment of groundwater data

have been published including UK Drinking Water Standards (UK DWS) and Environmental Quality Standards (EQS) for Freshwater and for Saltwater. Where UK guidance is not available, recognised European and world guidelines may be used where applicable including EU Drinking Water Standards, Dutch Intervention Values (DIV) Risk Based Corrective Action (RBCA) and World Health Organisation (WHO) Guidelines for Drinking Water Quality.

The groundwater data has been screened against EQS Freshwater. Where no EQS Freshwater values are available, UK DWS, RBCA, DIV or WHO guidelines have been used where applicable.

In total one (1No.) water sample was scheduled for chemical analysis, which was undertaken by Chemtest. The sample was collected from a trial pit in the fill materials (TP1). The sample was tested for a suite of chemicals including metals and a range of Total Petroleum Carbon Bands. A summary of the analytical results and Tier 1 Screen are included in Appendix A.

The Tier 1 Assessment recorded one elevated concentration of copper (48 ug/l) in WS1 all other metals recorded concentrations either below their respective guidance criteria or below the laboratories limits of detection.

No specific guidance criteria is available for the TPH Carbon ranges tested for, however, when compared to the conservative UK DWS value of 10 ug/l the water sample from WS1 recorded elevated concentrations of TPH in Carbon Bands C10 to C20, C20 to C30 and C30 to C40.

6.0 Ground Gases

A number of guidance documents have been published within the UK for the construction industry since the early 1990s, to facilitate accurate measurement of ground gases, guidance on the assessment of the risk and to provide advice on measures that can be adopted to mitigate these risks.

CIRIA C665, 'Assessing risks posed by hazardous ground gases to buildings' published by CIRIA (Construction Industry Research and Information Association) in 2007, is the current industry standard for ground gas risk assessment.

6.1 Ground Gas Results

Two ground gas monitoring rounds were undertaken at the site on 25th April 2005 and 15th May 2005. A summary of ground gas results are presented in the table below and the full results are included in Appendix B.

Table 6.1 Ground Gas Summary

Gas	Concentration Range	Location of Highest Value
CH ₄ *	<0.25 - 0.3	BH2, BH4, WS2, WS15
CO ₂ *	<0.25 - 6.3	BH4
O ₂ *	11.4 – 19.9	BH1 ⁽¹⁾
Flow**	<0.2 – 0.4	BH4, WS15

Notes

* Gas concentration measured in % v/v (% by volume)

** Gas flow measures in l/h (litres per hour)

(1) Lowest oxygen value

6.2 Gas Screening Values

The use of Gas Screening Values (GSV's), is used to assess the risks to humans, buildings and developments posed by methane and carbon dioxide. The assessment also takes into account gas flow rates.

The GSV's are calculated using the following formula and a worse case value is adopted for the site:

$$GSV = \text{Max flow rate (l/hr)} \times \text{max gas concentration (\%)}$$

Table 6.2 Gas Screening values

Gas	Maximum gas Concentration	Maximum Gas Flow	GSV
Methane	0.3	0.4	012
Carbon Dioxide	6.3	0.4	2.52

The resultant GSV is then applied to the following table to establish a site classification:

Table 6.3 Ground Gas Classification (Wilson and Card Classification (CIRIA C665))

Characteristic Situation (CIRIA R149)	Risk Classification	Gas Screening Value (CH4 or CO2) (l/hr) Threshold
1	Very low risk	<0.07
2	Low risk	<0.7
3	Moderate risk	<3.5
4	Moderate to high risk	<15
5	High risk	<70
6	Very high risk	>70

Based on the measured data and calculations, the site is given a preliminary Risk Classification of (2) Low Risk for methane, as the GSV is below the maximum threshold of 0.7 l/hr and (3) Moderate Risk for carbon dioxide, as the GSV is below the maximum threshold of 3.5 l/hr.

Due to the assessed moderate risk, gas protection measures in regards to carbon dioxide and methane, are considered necessary. Typical gas protection measures would include a reinforced concrete cast floor in situ with at least a 1200 g DPM and underfloor venting or beam and block or pre cast concrete with a 2000 g DPM and underfloor venting.

Further details on gas protection measures are available in CIRIA C665.

7.0 Conceptual Site Model and Risk Assessment

7.1 Introduction

This section presents an appraisal of our findings using current legislation to identify the potential risks and contamination issues and consider potential future liabilities specific to the future redevelopment of the site.

Current legislation relating to contaminated land in the UK is contained within Part IIA of the Environmental Protection Act 1990 (as amended), which was enabled by Section 57 of the

Environment Act 1995, and by Section 86 of the Water Act 2003.

The “suitable for use” approach is adopted for the assessment of contaminated land. Remedial measures are only required where unacceptable risks to human health or the environment are identified (taking into account the use (or proposed use) of the land in question and the environmental setting).

Current best practice recommends that the determination of health hazards due to contaminated land is based on the principle of risk assessment, as outlined in Part IIA of the Environmental Protection Act 1990 (as amended).

The risk assessment process for the environmental contaminants is based on a source-pathway-receptor analysis.

7.2 Source – Pathway – Receptor

For a contamination risk to be present at a site Table 7.1 shows the components that must be present for a pollutant linkage to exist:

Table 7.1 Summary of Statutory definitions relating to pollution linkage

Terminology	Definition
Contaminant (Source)	A substance which is in, on or under the land, and which has the potential to cause harm or to cause pollution of controlled waters.
Pathway	One or more routes or means by, or through which a receptor is being exposed to, or affected by, a contaminant, or could be so exposed or affected.
Receptor	A living organism, a group of living organisms, controlled waters, an ecological system or a piece of property, which is being, or could be, harmed by a contaminant.

If all three components are identified then a ‘pollutant linkage’, that is a linkage between a contaminant and a receptor by means of a pathway, potentially exists. Under current legislation and guidance a site will be defined as contaminated land if one or more of the pollutant linkages result in the following:

- significant harm is being caused or there is a significant possibility of such harm being caused to a receptor; or
- pollution of controlled water is being, or is likely to be caused.

7.3 Risk Assessment Principles

Current best practice recommends that the determination of hazards due to contaminated land is based on the principle of risk assessment, as outlined in Part IIA of the Environmental Protection Act 1990 and detailed within the DEFRA document CLR11 which outlines a framework for the management of contamination.

For a risk to be present, there must be a viable pollutant linkage; i.e. a mechanism whereby a source impacts on a sensitive receptor via a pathway.

Using criteria broadly based on those presented in Section 6.3 of the CIRIA Report “Contaminated Land Risk Assessment: A Guide to Good Practice” (CIRIA Report C552) the magnitude of the risk associated with potential contamination at the site has been assessed.

To do this an estimate is made of:

- a) the potential severity of the risk; and
- b) the likelihood of the risk occurring.

The severity of the risk is classified according to the criteria in Table 7.2 below.

Table 7.2 Severity of Risk

Severe	Acute risks to human health likely to result in "significant harm" (e.g. very high concentrations of mobile contaminants/ground gases). Catastrophic damage to buildings/property (e.g. by explosion, sites with high gassing potential, extensive VOC contamination). Major pollution of controlled waters (e.g. surface watercourses or major aquifers/source protection zones). Significant acute and/ or chronic risks to eco-receptors with potential for species/ habitat loss.
Medium	Chronic (long-term) risk to human health likely to result in "significant harm" (e.g. elevated concentration of contaminants/ ground gases). Pollution of sensitive controlled waters (e.g. surface watercourses or major/minor aquifers). Moderate risk of damage to or loss of eco-receptors.
Mild	Non-permanent human health effects (requirement for protective equipment during site works to mitigate health effects). Pollution of non-sensitive waters (e.g. smaller surface watercourses or non-aquifers). Significant damage to crops, buildings, structures or services (e.g. sites with medium gassing potential, elevated concentrations of contaminants).
Minor	Non-permanent human health effects (easily mitigated by the use of personal protective equipment). Short term, minor risks to eco-receptors. Minor (easily repairable) damage to buildings, structures or services (e.g. sites with low gassing potential).

The probability of the risk occurring is classified according to criteria given in Table 7.3 below.

Table 7.3 Probability of Risk Occurring

High likelihood	Pollutant linkage may be present that appears very likely in the short-term and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Pollutant linkage may be present, and it is probable that the risk will occur over the long term.
Low likelihood	Pollutant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Pollutant linkage may be present but the circumstances under which harm would occur even in the long-term are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability (likelihood) of a risk occurring, as shown in Table 7.4 below.

Table 7.4 Risk Evaluation

		Severity			
		Severe	Medium	Mild	Minor
Probability	High likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/ Low Risk
	Likely	High Risk	Moderate Risk	Moderate/ Low Risk	Low Risk
	Low likelihood	Moderate Risk	Moderate/ Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/ Low Risk	Low Risk	Very Low Risk	Very Low Risk

7.4 Conceptual Site Model

Based on the data available the following Conceptual Site Model has been developed based on the current land use. This shows the various components of the potential “source–pathway–receptor” pollutant linkages identified at the site and a preliminary assessment of the associated risks based on the desk study and site observations.

Table 7.5 Potential Sources of Contamination

Location	Source	Contaminant Type
On site	Industrial activities on site; Colliery; Brick Works/ infilled land; Historic buildings	Inorganic chemicals including metals and heavy metals and sulphate; Polycyclic Aromatic Hydrocarbons; Petroleum Hydrocarbons; and Asbestos. Ground gases

Table 7.6 Potential Pathways for Contamination

Dermal contact Inhalation Ingestion Leaching of contaminants Migration of perched groundwater (horizontal, vertical)
--

Table 7.7 Potential Receptors for Contamination

Human health – Site construction Human health – Future users Structures Groundwater
--

7.5 Risk Assessment

There is a potential risk to water resources, although the leachate concentrations and those recorded in the single groundwater sample suggest that this is only low. The nearest groundwater abstraction point is some 600 m to the south east of the site. The main PAH compounds identified in the water sample were naphthalene and acenaphthene, with a combined concentration of 8 µg/l. Both these compounds have a low molecular weight and therefore are susceptible to natural biodegradation which would therefore reduce the concentration over such a distance.

TPH concentrations were also elevated and the major component was the mid range C20 to C30 fraction, although the heavier fraction (C30 – C40) was also present consistent with diesel/gas oil contamination.

Given the local topography, and therefore the likely direction of groundwater flow, and the distance to the nearest abstraction point it is considered likely that even if the groundwater at the site were in hydraulic continuity with the nearest abstraction point that natural breakdown of the PAH and TPH compounds identified would occur and residual concentrations would not impact on abstraction quality.

Furthermore the proposed industrial end use has a significantly increased site cover of hardstanding and buildings (compared to the current layout) which will reduce the amount of water infiltration at the site and therefore similarly reduce the potential mobilisation and percolation of contaminants to groundwater resources. The same hardstanding/buildings will also reduce the already low risks to human health.

Table 7.8 Conceptual Site Model and Risk Assessment

Pollutant Linkage		Potential Hazard	Potential Severity	Likelihood of Occurrence	Assessed Risk	Recommendations(1)
Source	Pathway					
Historical and Current Industrial Activities	Direct contact, ingestion, inhalation	Site Workers and Future Users	Medium	Low	Moderate / Low	Based on the identified contamination and proposed industrial development no further work would be required at this time. However based on the information available health and safety precautions and protective equipment (PPE) should be used at all times during any development works for the site to be classified as suitable for industrial use.
Historical and Current Industrial Activities	Leaching and migration of perched water	Controlled waters (minor aquifer directly beneath the site)	Mild	Low	Low	Based on the identified contamination, the Secondary A aquifer beneath the site and its likely condition from historical mining and disposal activities in the area and the distance to the nearest surface water feature further work would not be required at this time for the site to be classified as suitable for industrial use.
Landfilling activities – Ground Gases	Inhalation	Health and explosive risks	Severe	Likely	High	Ground gas monitoring has indicated that gas concentrations identified on site may pose a significant risk to humans and buildings. Further works would be required in order for the site to be classified as suitable for industrial use.
Asbestos from historical buildings and infilled ground	Inhalation	Asbestos related health conditions including asbestosis	Severe	Unlikely	Moderate/ Low	No asbestos has been identified during the site investigation or site walkover. Further works would not be required before the development site would be classified as suitable for industrial use.

Notes

1 – See Section 8 Conclusions and Recommendations' for further details regarding recommendations.

8.0 Conclusions & Recommendations

The aim of this report is to reassess the potential risks associated with identified ground contamination at the Pogmoor Works site Barnsley and the potential effects on the sites industrial development/expansion.

The site is underlain Sandstone, Mudstone, Siltstone and Coal seams from the middle coal measures and is classified by the Environment Agency as a Secondary A Aquifer with soils of high leaching potential. No superficial deposits have been identified at the site. The closest major surface water feature is the River Dearne 3 km east of the site. Historical maps included in White Young Greens Geo-environmental Desk Study indicate the site was previously occupied primarily by a colliery, brickworks and the current lead processing works.

The ground has been identified, from data obtained during the investigations as comprising Tarmacadam / hard standing underlain by Made Ground comprising a matrix of brick, ash, coal, sand and clay.

Primary on-site sources of contamination have been identified as historical industrial activities on site including a brick works and colliery, potentially infilled land associated with historical activity and potential Asbestos Containing Materials in historical buildings on the site.

Primary receptors of contamination have been identified as construction and future site users, structures and controlled waters.

A small area of Japanese knotweed was noted on site and on the adjacent council parkland to the west of the site. The area of knotweed is being controlled by an eradication programme.

Based on this assessment of the proposed development site, Pogmoor Works, Barnsley, the following recommendations have been made:

Observation		Concern		Recommendation
Contamination arising from historical industrial activities. (Human Health)	→	Elevated concentrations of potential harmful contaminants were recorded in both solid and leachate form across the site and at various depths. Contamination could adversely affect the human health of site workers and future site users.	→	The proposed site development is for industrial use. The development is not likely to open any new direct pathways with the contaminant source (made ground). Any site development is likely to increase the cover of hard standing across the site and therefore increase the barrier between potential receptors and contamination. The risks to human health are considered low and no further assessment is considered necessary for an industrial development.

Observation		Concern		Recommendation
Contamination arising from historical industrial activities. (Controlled Waters)	→	Elevated concentrations of potential harmful contaminants were recorded in the groundwater sample taking during site works and following leachate analysis. Contamination could adversely affect the condition of controlled waters.	→	Groundwater at the site is already in contact with the underlying made ground at the site and historical mine working in the area is likely to have had a negative impact on the quality of controlled waters in the area. The groundwater sample and leachate results indicate the limited presence of elevated contamination and pH conditions are likely to reduce the solubility of the metals identified. Industrial development/expansion is not likely to generate a new pathway for contamination to reach the controlled waters receptors. The extension of hard cover across the site is likely to reduce the amount of water percolation through near surface ground and thereby further reduce the impacts of the proposed redevelopment on controlled waters. No further works are considered necessary for an industrial development.
Ground Gas arising from historical site activities – infilled ground	→	A significant explosive and asphyxiation risk associated with the elevated levels of ground gases.	→	Ground gas monitoring has identified elevated concentrations of methane and carbon dioxide. Calculation of Gas Screening Values (GSVs) indicate the site presents a low to moderate gas risk and would require remedial measures to be implemented as part of the commercial development. Gas mitigation measures should be designed in line with current industry guidance CIRIA C665.
Asbestos arising from historical buildings.	→	A significant health risk to site workers and future site users.	→	No asbestos fibres were detected during the site investigation works or site walkover, however standard PPE should be worn at all times during development works. In the event that potentially Asbestos Containing Materials are identified during development, all work should cease, the material tested and professional advice sought.

We trust it meets with your requirements and should you have any queries, please do not hesitate to contact the undersigned.

Yours sincerely
for **Scott Wilson Ltd**,



Adrian Milton
Associate
Direct Line: +44 (0)113 204 5049
email: Adrian.milton@scottwilson.com

enc: Appendix A – Tier 1 Screen (Soils, Groundwater and Leachates)
Appendix B – Gas Monitoring Results
Appendix C – Photographs

Appendix A - Pogmoor Works, Barnsley - Waters

Substance	Screening Criteria	Number of Analyses	Reported Minimum Value	Reported Maximum Value	Statistical Mean	Standard Deviation	Number of Exceedances	
Metals								
Arsenic*	(µg/l)	50	EQS Freshwater	1	<10	<10	10	0
Cadmium*	(µg/l)	5	EQS Freshwater	1	<5	<5	5	0
Chromium*	(µg/l)	50	EQS Freshwater	1	<10	<10	10	0
Lead*	(µg/l)	20	EQS Freshwater	1	17	17	17	0
Nickel*	(µg/l)	200	EQS Freshwater	1	15	15	15	0
Copper*	(µg/l)	28	EQS Freshwater	1	48	48	48	1
Zinc*	(µg/l)	125	EQS Freshwater	1	51	51	51	0
Mercury*	(µg/l)	1	EQS Freshwater	1	<0.1	<0.1	0.1	0
Selenium*	(µg/l)	10	UK DWS	1	<10	<10	10	0
Total Petroleum Hydrocarbons								
TPH 4 C10 - C20	(µg/l)	10	UK DWS	1	46.1	46.1	46.1	1
TPH 4 C20 - C30	(µg/l)	10	UK DWS	1	140	140	140	1
TPH 4 C30 - C40	(µg/l)	10	UK DWS	1	97.1	97.1	97.1	1

Appendix A - Pogmoor Works, Barnsley - Soils

Substance	Screening Criteria	Number of Analyses	Reported Minimum Value	Reported Maximum Value	Statistical Mean	Standard Deviation	Number of Exceedances
Metals							
Arsenic**	640 CLEA Commercial	63	<2	94	29.1	22.4	0
Cadmium**	230 CLEA Commercial	63	<0.1	8.4	0.48	1.11	0
Chromium**	5000 LQM/CIEH GACs Commercial	63	<2	250	26.8	32.7	10
Lead**	750 CLEA Commercial	63	8.5	16000	885	2671	13
Mercury**	3600 CLEA Commercial	63	<0.1	3.15	0.39	0.54	0
Nickel**	1800 CLEA Commercial	63	9.1	330	43.2	43.6	0
Copper**	71700 LQM/CIEH GACs Commercial	63	20	1700	129	253	0
Zinc**	665000 LQM/CIEH GACs Commercial	63	<10	8600	295	1080	0
Selenium	13000 CLEA Commercial	63	<0.1	<0.5	0.21	0.18	0
Speciated PAHS							
Naphthalene**	200 LQM/CIEH GACs Commercial	18	<0.05	17.5	1.36	4.2	0
Acenaphthylene**	84000 LQM/CIEH GACs Commercial	18	<0.05	1.26	0.32	0.45	0
Acenaphthene**	85000 LQM/CIEH GACs Commercial	18	<0.05	14.1	1.04	3.29	0
Fluorene**	64000 LQM/CIEH GACs Commercial	18	<0.05	16.3	1.33	3.8	0
Phenanthrene**	22000 LQM/CIEH GACs Commercial	18	<0.05	65.7	6.11	15.4	0
Anthracene**	530000 LQM/CIEH GACs Commercial	18	<0.05	22.5	2.09	5.24	0
Fluoranthene**	23000 LQM/CIEH GACs Commercial	18	<0.05	67.6	7.85	16.1	0
Pyrene**	54000 LQM/CIEH GACs Commercial	18	<0.05	52.5	6.24	12.5	0
Benz(a)anthracene**	90 LQM/CIEH GACs Commercial	18	<0.05	32.2	3.78	7.75	0
Chrysene**	140 LQM/CIEH GACs Commercial	18	<0.05	22.7	3.27	5.7	0
Benzo(b)fluoranthene**	100 LQM/CIEH GACs Commercial	18	<0.05	20	2.95	5.15	0
Benzo(k)fluoranthene**	140 LQM/CIEH GACs Commercial	18	<0.05	14.8	1.81	3.52	0
Benzo(a)pyrene**	14 LQM/CIEH GACs Commercial	64	<0.05	45	2.27	6.34	2
Indeno(123-cd)pyrene**	60 LQM/CIEH GACs Commercial	18	<0.05	8.12	1.26	2.06	0
Dibenz(ah)anthracene**	13 LQM/CIEH GACs Commercial	18	<0.05	1.71	0.35	0.48	0
Benzo(ghi)perylene**	650 LQM/CIEH GACs Commercial	18	<0.05	8.3	1.33	2.09	0
TPH Carbon Bands							
C10 to C20	17000 LQM/CIEH GACs Commercial	18	<10	590	83.9	135	0
C20 to C30	28000 LQM/CIEH GACs Commercial	18	<10	1500	292	370	0
C30 to C40	28000 LQM/CIEH GACs Commercial	18	<10	690	186	208	0

Appendix A - Pogmoor Works, Barnsley - Leachates

Substance	Screening Criteria	Number of Analyses	Reported Minimum Value	Reported Maximum Value	Statistical Mean	Standard Deviation	Number of Exceedances
Metals							
Arsenic*	(µg/l)	8	1.3	29	12	9.82	0
Cadmium*	(µg/l)	8	<0.5	<0.5	0.5	0	0
Chromium*	(µg/l)	8	1.4	18	9.63	6.64	0
Lead*	(µg/l)	8	<1	260	59	86.1	4
Nickel*	(µg/l)	8	3.2	12	5.51	2.85	0
Copper*	(µg/l)	8	<1	82	18.5	27	1
Zinc*	(µg/l)	8	13	170	45.8	51.5	1
Mercury*	(µg/l)	8	<0.5	<0.5	0.5	0	0
Selenium*	(µg/l)	8	<1	1.3	1.05	0.11	0
Free Cyanide*	(µg/l)	8	<0.05	<0.05	0.05	7.42E-18	0
Speciated PAHs							
Naphthalene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Acenaphthylene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Acenaphthene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Fluorene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Phenanthrene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Anthracene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Fluoranthene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Pyrene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Benz(a)anthracene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Chrysene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Benzo(b)fluoranthene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Benzo(k)fluoranthene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Benzo(a)pyrene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	8
Indeno(123-cd)pyrene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Dibenz(ah)anthracene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0
Benzo(ghi)perylene	(µg/l)	8	<0.1	<0.1	0.1	1.48E-17	0

SOIL GAS SURVEY

Project: Pogmoor Works Location: Barnsley Job No/JEN D108892		Date: 25/04/2005 Weather: Sunny Temp: 13c	Equipment Used GA2000 PID		(insert serial numbers)					
Monitoring Point No.	CH ₄ (% v/v)	O ₂ (% v/v)	CO ₂ (% v/v)	Flow (l/hr)	H ₂ S	CO	Photo Ionisation Detector (ppm) *	Depth to Ground Water (mbd)	Site Observations	
BH1	<0.25	11.4	6	<0.2				2.3	Time	Barometric Pressure
BH2	<0.25	16.9	2.6	<0.2				2.6	Start	997mb
BH3	<0.25	19.5	0.6	<0.2				1.9		
BH4	<0.25	15.2	3.8	<0.2				N/D	Finish	997mb
WS2	<0.25	18.3	2.3	<0.2				1.6		
WS4	<0.25	17.0	3.5	<0.2				2.1	Datum Description:	
WS6	<0.25	19.9	0.6	<0.2				1.3	Elevation of datum wrt ground level:	
WS9	<0.25	18.4	<0.25	<0.2				1.1	Comments	
WS10	<0.25	17.7	1.3	<0.2				2.5		
WS15	<0.25	17.6	2.1	<0.2				4.1		
Tested by: GL Checked by: AMM									mbd = metres below datum GROUND SOLUTIONS GROUP	

Notes: * For indicative purposes only

Accuracy of Readings:- 0-5% CH₄: the greater of 10% reading or 0.25% CH₄; 5-50% CH₄: the greater of 10% reading or 1% CH₄; 50-100% CH₄: 5% reading

0-30% O₂: 0.5% O₂

0-5% CO₂: the greater of 10% reading or 0.25% CO₂; 5-30% CO₂: the greater of 10% reading or 1% CO₂; 30-100% CO₂: 6% reading

SOIL GAS SURVEY

Project: Pogmoor Works Location: Bamsley Job No/JEN D108892		Date: 13/05/2005 Weather: Sunny Temp: 16c	Equipment Used GA2000 PID	(insert serial numbers)							
Monitoring Point No.	CH ₄ (% v/v)	O ₂ (% v/v)	CO ₂ (% v/v)	Flow (l/hr)	H ₂ S	CO	Photo Ionisation Detector (ppm) *	Depth to Ground Water (mbd)	Site Observations		
BH1	NF	NF	NF	NF				-	Time	Barometric Pressure	
BH2	0.3	17.3	2.3	<0.2				-	Start	1012 mb	
BH3	<0.25	19.5	<0.25	<0.2				-			
BH4	0.3	12.7	6.3	0.4				-	Finish	1012mb	
WS2	0.3	17.3	2.3	<0.2							
WS4	<0.25	17.3	4.1	<0.2				-	Datum Description:		
WS6	<0.25	18.3	0.4	<0.2				-	Elevation of datum wrt ground level:		
WS9	<0.25	18.6	<0.25	<0.2				-	Comments		
WS10	<0.25	18.0	1.4	<0.2				-	NF - BH 1 cover not found		
WS15	0.3	16.6	1.9	0.4				-			
Tested by: GL										mbd = metres below datum	
Checked by: AMM										GROUND SOLUTIONS GROUP	

Notes: * For indicative purposes only

Accuracy of Readings:- 0-5% CH₄: the greater of 10% reading or 0.25% CH₄; 5-50% CH₄: the greater of 10% reading or 1% CH₄; 50-100% CH₄: 5% reading

0-30% O₂: 0.5% O₂

0-5% CO₂: the greater of 10% reading or 0.25% CO₂; 5-30% CO₂: the greater of 10% reading or 1% CO₂; 30-100% CO₂: 6% reading



Photograph 1 – View looking south towards the main building area and proposed area of development.



Photograph 2 – View to the north of the site showing embankment.



Photograph 3 – View of the proposed development area. Hard stand to the fore of the photograph in good condition.



Photograph 4 – Main fuel storage tank, concrete bund in good condition, no evidence of any leaks.



Photograph 5 – View to the southern boundary. Last seasons stand of Japanese knotweed in the centre of the photograph.



Photograph 6 – View to the east across the site showing the main storage areas and range of buildings.



Photograph 7 – Part demolished building to the south of the site.



Photograph 8 – View looking northwest towards the part demolished building. Hard stand is noted as in good condition.



Photograph 9 – View of sites southern boundary following delivery of processing materials. Hard stand is noted as in good condition.