



AMBER VALLEY  
BOROUGH COUNCIL

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## **Environmental Protection Act 1990, Part IIA** **Determination of Crays Hill Recreation Ground, Crays Hill, Leabrooks,** **Derbyshire as contaminated land**

### **1.0 Introduction**

In accordance with the *Environmental Protection Act 1990: Part IIA* and the Statutory Guidance contained in *Circular 02/2000*, Amber Valley Borough Council is required to prepare a written record of any determination that particular land should be classified 'contaminated land' having met certain tests in the definition of 'contaminated land' under this legislation.

It is proposed that the land known as **Crays Hill Recreation Ground, Crays Hill, Leabrooks, Derbyshire (see Fig.1- appendix)** - national grid reference for the centre of the site centre SK417 530 – should be classified as 'contaminated land' in accordance with the *Environmental Protection Act 1990: Part IIA* Contaminated Land legislation. Scaled location and site maps are attached to clearly identify the area of contaminated land subject to this determination.

### **2.0 Site description**

The site, owned by Amber Valley Borough Council (AVBC), forms a roughly rectangular, flat piece of raised grassland, approximately 2.05 hectares in size. An AVBC works depot is located to the southwest of the site; the eastern boundary is formed by a tarmaced footpath used by the public with a small brick changing room, beyond which lies a disused mineral railway and fields; a culverted stream flows northeast to southwest under the site. Residential premises border the northwest, southern, and part of the southwest boundaries. Previously providing cricket and football pitches, the site is currently rough, disturbed grassland, surrounded by semi-mature trees and shrubs.

### **3.0 Site history**

The site was used as a colliery yard and storage facility until 1910, when it became a private disposal site for colliery wastes. Planning records go back to 1965 when an application was approved to land raise the site by the disposal of domestic refuse. This continued until 1989 and the site was thought to contain domestic waste at the southern end, and inert materials, including colliery waste, in the north. Most recently, the site was used as a venue for football and cricket. In 1997, an audit by the Sports Turf Research Institute condemned the pitches on health and safety grounds after concrete and tarmac appeared through the surface soil layers following settlement and weathering.

Having begun to upgrade the surface with imported soil, work was halted pending planning approval. In May 1999, AVBC's Property Services Manager submitted an application for 'engineering operations to repair the reclamation cap, including the importation of soils to increase the depth of the cap' to make good the surface of the sports pitches which it owns and manages.



The Borough Development Board deferred their decision to allow advice to be sought and consultations to take place to address the concerns of local residents, namely for a gas survey to be undertaken to investigate the possibility of methane generation and/or migration off site. In September 1999, AVBC sought advice from Ground Solutions Group Limited, specialising in environmental, geotechnical, surveying and project development with a proven local record, to submit a proposal to assess the possibility of landfill gases and leachate migrating beyond the site boundary. From the 12<sup>th</sup> September 2002 further environmental advice was sought from GeoDyne Limited.

#### **4.0 Summary of the evidence upon which the determination is based, a description of the particular pollutant linkages involved, and a relevant assessment of the evidence**

##### **4.1 Phase I Desk Study/Spike survey (February 2000) - Ground Solutions Group Limited.**

An environmental assessment was conducted to assess geology, groundwater, surface water, radon and landfill gas. As there are no inhabited buildings on site, radon is not considered to pose a significant risk.

The assessment found a high concentration of methane in an area thought to contain inert waste, which required further investigation, as did the lack of gas in the area thought to contain domestic waste. Methane and carbon dioxide can impede plant growth by reducing oxygen levels in the soil; low concentrations of trace landfill gas components can be acutely toxic; and excess metals, such as copper, nickel and boron, as well as oils, coal tars, phenols and sulphate, can affect growth or cause death.

Although no firm evidence of significant contamination was found at this stage, the report concluded with a number of concerns and recommendations for further work.

##### **4.2 Phase II Survey (September 2000) - Ground Solutions Group Limited.**

This survey provided a detailed contamination assessment based on trial pit logs and borehole records, gas monitoring tables, graphs and analytical results for groundwater and loss on ignition tests.

The survey concluded that the main area of concern was elevated levels of **carbon dioxide** and **methane**, along with depressed oxygen concentrations, found at sampling points in the north of the site. Loss on ignition testing to assess the potential for future gassing found that the waste contained up to 40 per cent combustible material. Contaminants measured in perched water in all but two of the sampling points were found to be below the 'example completion criteria' for leachates given in *Waste Management Paper No.26a*. **Phenol** and **manganese** levels at these points were considered not to have a significant detrimental effect on local groundwater resources.

A risk assessment identified and expanded on potential source-pathway-receptor relationships (pollutant linkages); i.e.:-

- (i) The gas monitoring data identified elevated levels of carbon dioxide, with sporadic concentrations of methane in a few locations on the northern part of the site. The results from the laboratory analysis indicated that there is a potential for future generation of gas on the site. The highest concentrations of methane and carbon dioxide were found at the north of the site closest to residential properties;
- (ii) Most of the capping layer covering the site is relatively thin and comprises of soil considered to be permeable to gas migration. Consequently, it is considered that the

majority of landfill gas produced on the site is freely venting to the atmosphere at the surface. Once in contact with the atmosphere, the gas would be quickly diluted, thus reducing the risk it could pose. Potential targets on and within the vicinity of the site are therefore considered to be at low to moderate risk from the landfill gas;

- (iii) The depth of deposited waste and the nature of ground conditions in the northeast of the site has resulted in reduced oxygen influx which in turn has promoted anaerobic decomposition and produced elevated methane levels with the possibility of migration on the northern and part of the western boundaries.

#### 4.3 Phase III Investigation (February 2001) - Ground Solutions Group Limited.

A targeted assessment, following on from Phase II, went on to compare the results with the *ICRCL* guideline values for 'parks, playing fields, and open space'. Elevated results for **arsenic** and the phytotoxic metals - **boron, copper, nickel** and **zinc** were found to be typical of soils in the area, being derived from underlying coal measures; i.e. part of the natural geochemistry of the area.

#### 4.4 Site Characterisation, (March 2004) - GeoDyne Limited.

The report included a detailed review of earlier site investigations, advanced additional exploratory works (including perimeter boreholes), investigated the coal seams beneath the site and collected gas samples for gas chromatography.

From the review and additional information gathered the report concluded that:

##### (i) Source (Contaminant)

Landfill gas is still present at the site, with significantly elevated levels of methane, exceeding the Lower Explosive Limit, encountered towards the northeast area of the site.

The principal source of the methane at the site is a result of the anaerobic degradation of land-filled waste at the site. The shallow coal seams beneath the site are a secondary source of methane, which is typical of areas underlain by coal seams.

##### (ii) Pathway

The made ground was identified as the key potential migration pathway for the elevated methane at the site to potentially affect residential properties adjacent to the northern and western boundaries. A culverted watercourse and the intact coal seams are considered to have a low potential for the migration of significant amounts of methane.

##### (iii) Receptor

As per previous investigations the critical receptor was found to be the existing dwellings (including occupants) along the northern and western boundaries. Future site users would constitute a secondary receptor.

#### 4.5 Landfill Gas Detailed Quantitative Risk Assessment (August 2004) - GeoDyne Limited.

The report undertook a DQRA, of landfill gas at the site, to assess the risk to off-site receptors. The DQRA was based on the Construction Industry Research and Information Association (CIRIA) Report 152 "*Risk assessment for methane and other gases from the ground*", 1995.

The DQRA found the annual frequency of an unacceptable event (fire or explosion) occurring as 3.84E-04, this equates to an unacceptable event once every 2604.17 years.

A level of acceptable risk has been set at 1 unacceptable event in 1000000 years (1E-06).

The results of the DQRA for the site proves an unacceptable risk to receptors from the migration of methane gas from the site.

## 5.0 Conclusion

Having carried out an appropriate scientific and technical assessment of all relevant and available evidence, Amber Valley Borough Council makes this determination on the grounds that there is a *significant possibility of significant harm* in terms of *human health effects, particularly by way of explosion or fire*; as set out in Table B of the *Statutory Guidance*.

There is evidence that a pollutant linkage exists due to the contamination of the site by methanogenic material, and that methane is being generated on site close to residential properties. The depth of the deposited waste in this area and the ground conditions have promoted anaerobic decomposition and produced elevated methane levels which, together with the presence of un-compacted made ground has given rise to the significant possibility of methane migration on the northern and western boundaries of the site.

The DQRA, using CIRIA R152, has identified an unacceptable event frequency, which satisfies the conditions of identifying a *significant possibility of significant harm*, as set out in Table B, for *human health effects, particularly by way of explosion or fire*, of the *Statutory Guidance*. The identification of a *significant possibility of significant harm* requires the pollutant linkage to become the *significant pollutant linkage* (Table 1).

AVBC now considers it has satisfied the requirements of B.45 of the *Statutory Guidance* and as such the aforementioned land is therefore determined to be 'contaminated land' in accordance with section 78A(2) of the *Environmental Protection Act 1990*.

**Table 1. Components of the Significant Pollutant Linkage**

The Significant Pollutant linkage (Relevant section of <i>Statutory Guidance</i> )		
Contaminant (A.12)	Pathway (A.14b)	Receptor (A.13a)
Methane	Migration of methane through made ground resulting in fire or explosion in nearby dwellings (confined spaces)	Human

Signed: \_\_\_\_\_  
Julian Townsend.  
Director of Environmental Services

Date: 02<sup>nd</sup> November 2004

## Appendix

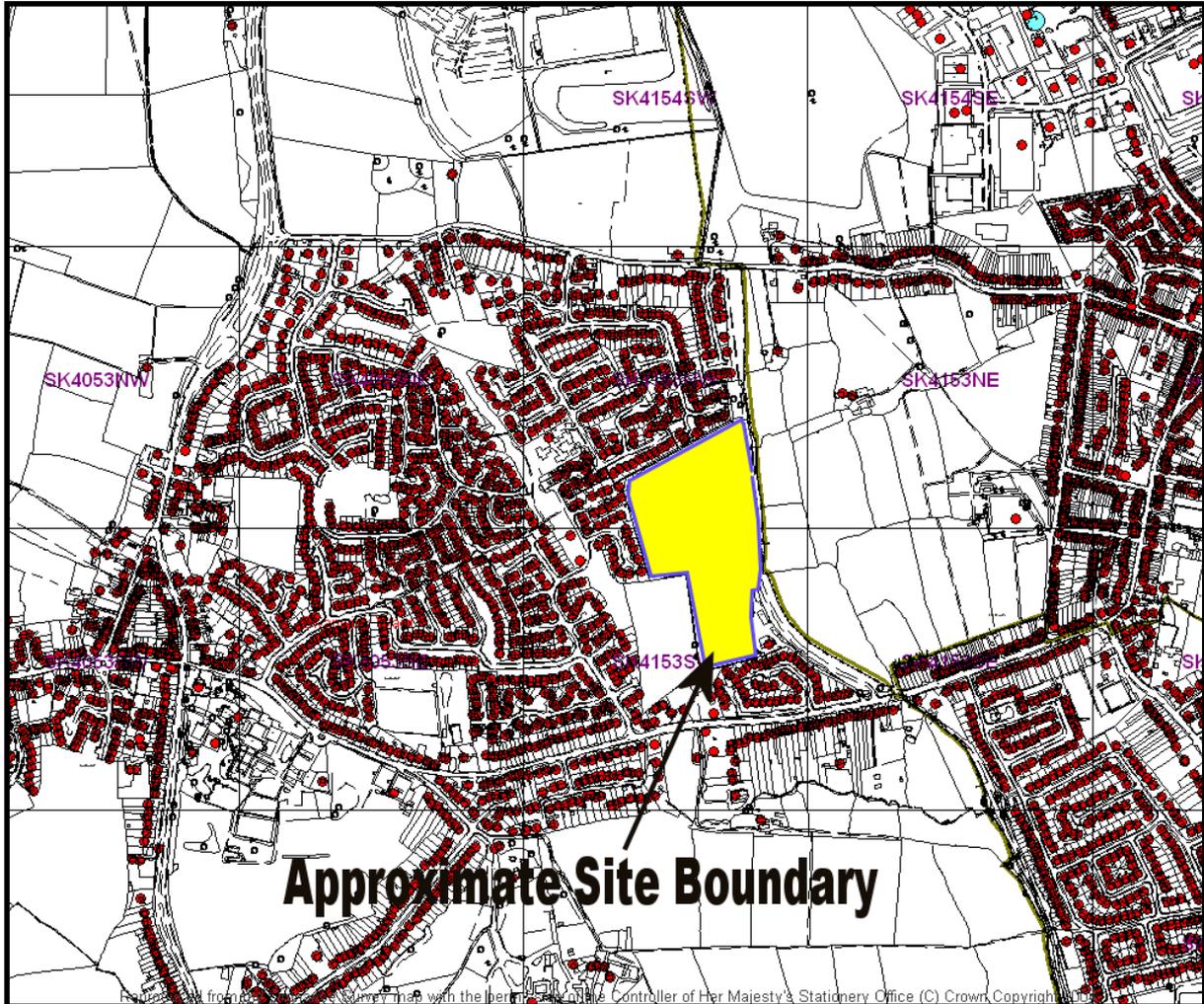


Figure 1. Site Location Plan