



Marlpool Drive, Redditch Remediation of Part 2A Contaminated Land

REMEDICATION VERIFICATION REPORT
NO. 62 MARLPOOL DRIVE

- V1
- June 2012



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SKM EnviroS
10 Ty-Nant Court,
Morganstown,
Cardiff
CF15 8LW
Tel: +44 (0) 29 20 814 200
Fax: +44 (0) 29 20 814 222
Web: www.skmenviros.com

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Summary of Remediation and Verification Works

1.1. Introduction

This report describes the remediation works carried out at No.62 Marlpool Drive and provides verification information to demonstrate that the works are successful in eliminating the risks associated with the presence of landfill gas (which is comprised predominantly of methane and carbon dioxide). Further more detailed information is provided in the following report:

- Remediation of Part 2A Contaminated Land. Marlpool Drive Verification Report. SKM Enviros. June 2012.

1.2. Background and Requirement for Remediation

Following several phases of investigation and assessment between 2009 and 2011, a number of residential properties at Marlpool Drive in Redditch had been identified by Redditch Borough Council as potentially being affected by the ingress and accumulation of landfill gas.

Following the local authority determination of 16 properties at Marlpool Drive as Contaminated Land under Part 2A of the Environmental Protection Act 1990, SKM Enviros was commissioned to carry out a remedial options appraisal. This considered a number of options which would ensure safety of premises and occupants. The remediation scheme which was chosen as being the most feasible, comprised installation of positive ventilation to create a clean air blanket system. This would maintain a zone of positive air pressure beneath the properties, and dilute and disperse any ground gas under buildings emanating from the underlying landfill waste materials.

The remedial design was agreed with Worcestershire Regulatory Services on behalf of Redditch Borough Council. SKM Enviros then prepared a tender specification and procured Prestige Air Technology to carry out the design and installation work.

1.3. Remediation Works

The remediation works carried out at No.62 Marlpool Drive were undertaken between the 10th and 14th October 2011.

Overview

The remediation works comprised the retrofit of positive ventilation beneath the property. Previous investigations have demonstrated that the existing ventilation system below the property (gas dispersion layer) is suitable for use and capable of maintaining a clean air blanket below the structure. Activation of the gas dispersion layer was achieved by the retrospective installation of a single 110mm outlet Positive Pressurisation Unit (PPU). The PPU operates by taking clean fresh air and introducing it below the floor slab, into the gas dispersion layer. This acts to dilute and disperse any accumulating ground gas and by maintaining a net positive pressure and a clean air blanket below the structure.

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A brief description of the installation of the remedial system is presented below, with the contractor's report, including location of all pipework and PPU, included as Appendix 1.

Installation Works

The two existing vents on the right side wall of the property were selected as the air input points, with the PPU fixed to the wall between the two vents.

At the location of the air input point, shallow excavations were formed between the vent and the PPU to depths of up to approximately 0.3m, to enable the 110mm diameter plastic pipework to be installed below ground level.

Small excavations were also made at the remaining vents to enable all vents to be cleared of any blockages or debris. This was carried out by the use of hand augers. A camera probe was also used to confirm that vent pipes were free of debris, which could impede air flow.

The PPU comprises an electric fan delivering fresh air, protected by two filters. A control panel contains a pressure sensor, safety valve and fan speed controller. The PPU also contains a GSM telemetry system to alert the 24 hour call out and maintenance service in the event of power outage. The entire unit is enclosed in a weatherproof external enclosure, which also contains sound insulation on the inside of the unit cover.

Each PPU was connected to the house electricity supply via a fused spur outlet, installed by approved electricians Wallis Electrical Services Ltd. Installation works certificates for each PPU are included with the contractor's report in Appendix 1.

System Commissioning

As part of the commissioning of the system, tracer gas (sulphur hexafluoride) was introduced into the air inlet via the PPU, and monitoring was performed both inside of the property and at the remaining external vents. This was carried out to ensure that the air flow from the PPU was reaching all areas of the underfloor slab.

The results of the zone of influence tests are included within the Contractors Report for each property, included as Appendix 1. The results demonstrate that the air flow generated by the PPU extends beneath the floor slabs of No.62.

Commissioning Monitoring

A permanent gas monitoring probe was installed into the vent located at the left side wall of the property (accessed via No.64), to enable monitoring of the underfloor gas dispersion layer. The monitoring probe comprised approximately 1m length of 10mm diameter tubing with a push fit gas monitoring tap on the end.

The contractor undertook gas monitoring within each of the underfloor vents prior to and during commissioning and following commission, to confirm the correct installation and operation of the system. Monitoring was carried out using a GA2000 infrared gas analyser.

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Results of this monitoring are included within the Contractors Report included as Appendix 1 and summarised below. For comparative purposes, the table also includes the maximum historic concentration recorded within the vents.

Table 1: Commission Monitoring

	Historic ¹	Before ¹	Commission ¹	Following ²
Methane %	16.0	0.0	8.9	0.0
Carbon Dioxide %	6.4	0.0	9.1	1.2

1. Maximum concentration from all vents
2. Concentration from monitoring point

The results demonstrate that on initial commission of the system, gas concentrations within the gas dispersion layer peaked then slowly decreased as air flow purged soil gas from the gas dispersion layer.

1.4. Verification Monitoring

The verification process was managed by SKM EnviroS and utilised a continuous monitoring device, GasClam, which is an infrared gas analyser. The GasClams were supplied and installed by Ground Gas Solutions (GGS).

Remediation Criteria

The aim of the remediation was to reduce concentrations of methane and carbon dioxide beneath the properties to acceptable levels. Specifically concentrations of landfill gas beneath properties must not exceed 1% methane and 1.5% carbon dioxide, over a two week continuous monitoring period, comprising at least one low and falling atmospheric pressure event (which represents conditions most favourable for landfill gas migration).

Methodology

Following installation, commissioning and testing of the PPU, one GasClam was connected into the dedicated monitoring point set into the underfloor venting layer. In order to protect the GasClam, a secure plastic box (pelicase) was used to contain the GasClam, fixed to the wall of the property using drilled holes and screws. The GasClam was connected to the monitoring point by small diameter plastic tubing.

The GasClam was set to record concentrations of methane and carbon dioxide and atmospheric pressure at one hour intervals for a period of two weeks.

Results

The verification monitoring results for No.62 is provided as Appendix 2 and summarised in Table 2 below.

Table 2: Summary of Verification Monitoring

Property No.	Remediation Completed	Date of Verification Monitoring	Details of Atmospheric pressure drops (mb) during monitoring	Maximum Concentrations	
				Methane %	Carbon Dioxide %
62	14/10/11	21/2/12 – 6/3/12	Pressure drop 1010 to 998 over 20hrs	0.052	0.341

Historic monitoring of the vents to the underfloor gas dispersion layer, identified elevated concentrations of methane and carbon dioxide during low pressure (<1000mb) events and steep drops in atmospheric pressure. Therefore it was essential to capture low and falling atmospheric pressure events during the verification monitoring.

During the clearing of the vents it was noted that the debris being removed was wet. Further investigation identified that surface water from the front drive was flowing towards the house and into one of the front gas vents. In addition, rainwater from a neighbours' temporary shelter was flowing onto the path and entering a side vent. The neighbour subsequently removed the shelter and the vent at the front of the property was blocked off as part of the remediation works.

The first verification monitoring was carried out between 1st and 15th November 2011. For the majority of the monitoring period, concentrations of carbon dioxide were below the threshold value of 1.5%. However, there was a short duration (approximately 24hrs), when concentrations exceeded 1.5% with a maximum concentration of 2%. The maximum concentrations did not relate to low or falling atmospheric pressures. All concentrations of methane were low and below thresholds (<0.1%).

The reason for the exceedance of threshold values could be the localised increase in moisture content from rainwater ingress which may increase microbial activity (and hence gas generation), and may also have increased dissolved carbon dioxide concentrations. The application of the positive pressure system will have a drying effect and which could have led to subsequent liberation of carbon dioxide in the short term.

No. 62 was re-verified between 21st February and 6th March 2012 (Table 2), some four months after installation of the active remediation system. There was one significant pressure drop during the monitoring period. Despite this pressure drop and other low atmospheric pressure events, the concentrations of methane and carbon dioxide remained well below the verification threshold concentrations of 1% methane and 1.5% carbon dioxide.

Therefore it is concluded that the remediation criteria have been achieved, and the system is operating satisfactorily

1.5. Residual Hazards

Overview

The residual hazards associated with the project can be placed into two categories:

- Hazards associated with the presence of the remediation system apparatus; and
- Hazards associated with the functioning of the remediation system.

Each of these is described below.

Hazards Associated with the Remediation System Apparatus

The installation of the PPU units has required the installation of internal and external wiring to the properties. All PPUs are powered by a mains electricity supply connected by means of a fused spur. It should be noted that whilst the overall remedial design is generic the differing nature of the properties means that the installation details are bespoke. Installation details are included in Appendix 1.

The remediation system contains no hazardous materials.

Hazards Associated with the Functioning of the Remediation System

Soil gas concentrations may remain elevated beneath the influence of the remediation systems. As the source of landfill gas remains within the area of the properties, the remediation system requires that the on-going functioning of the PPU and the power supply should not be disrupted. Minor disruptions to power supplies will not give rise to an unacceptable risk to house occupiers, more lengthy disruption could do.

Vents to the subfloor void should not be obstructed and pipework must not be damaged. Any damage should be reported to the Redditch BC to be assessed and repaired if necessary.

Correct functioning of the PPUs can be monitored remotely via GSM telemetry and a call-off contract has been placed to allow this monitoring to take place and for any necessary repair of the system to be undertaken.

Any future construction work at the properties, including extensions and alterations to the footprint of the structure must take account of both the on-going functioning of the system and include consideration of amendments to ensure continued functioning.



Appendix 1 Contractors Installation Report