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**SURFACE EMISSIONS/2011/1 LANDFILL GAS SURFACE EMISSIONS SURVEY AT
CARRIGEEN, CLANE, CO. KILDARE**

PERFORMED BY ODOUR MONITORING IRELAND ON BEHALF OF KILDARE COUNTY COUNCIL

PREPARED BY:	Dr. John Casey
ATTENTION:	Ms. Ciara Corrigan
LOCATION:	Vicinity of Carrigeen Refuse Depot
DATE OF MONITORING VISIT:	28 th Jul. 2011
NAME AND ADDRESS OF CLIENT ORGANISATION:	Kildare County Council, Aras Chill Dara, Devoy Park, Naas, Co. Kildare
NAME AND ADDRESS OF MONITORING ORGANISATION:	Odour Monitoring Ireland, Unit 32 DeGranville Court, Dublin Road, Trim, Co. Meath
DATE OF REPORTING:	09 th August 2011
NAME AND THE FUNCTION OF THE PERSON APPROVING THE REPORT:	Dr. Brian Sheridan, Managing Partner, Odour Monitoring Ireland
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1.1 Introduction

Odour Monitoring Ireland was commissioned by Kildare County Council to perform a specified independent Volatile organic compound surface emissions survey in the vicinity of Carrigeen Refuse Depot. The assessment involved a Volatile organic compound (VOC) surface emissions survey of part of the old refuse depot which in the vicinity of a dwelling in order to ascertain the VOC emission points. This report presents a summary of the findings of a VOC surface emissions survey at Carrigeen Refuse Depot, Carrigeen, Clane, Co. Kildare. The report is based on scientific measurements and observations made during a site visit conducted on the 28th July 2011.

1.2 Techniques used

The "FID/PID" (i.e. Version 2, with less than 3.5 second response time for the FID) VOC analyser is a portable, intrinsically safe, survey VOC dual monitor, which provides fast and accurate readings of organic and inorganic vapours. A Photo ionisation detector (PID) uses an Ultraviolet (UV) light source (*photo*) to ionise a gas sample and detect its concentration. Ionisation occurs when a molecule absorbs the high energy UV light, ejecting a negatively charged electron and forming of positively charged molecular ion. The gas becomes electrically charged. These charged particles produce a current that is easily measured at the sensor electrodes. Only a small fraction of the VOC molecules are ionised. A PID does not respond to methane. A FID is similar to a flame thermocouple detector, but measures the ions from the flame instead of the heat generated. The FID detects the methane fraction, which provides greater sensitivity in terms of methane surface emissions detection but not necessarily odour hence why the PID data is also interpreted. The FID/PID analyser was calibrated with certified reference material isobutylene and methane before commencement of the survey, see calibration certificates for gases used in Appendix II.

The entire area around the dwelling was surveyed at approximately 1 meter intervals (See Appendix I Figure 1.0). In addition readings were taken inside the dwelling in the Kitchen and utility area.

1.3 Results

Figure 3.1 and Table 1.0 illustrates the results obtained for the capping surface emissions survey.

Table 1.0. Capping VOC surface emissions locations results with source identities correlating with *Figure 3.1*

Location ID	Easting (m)	Northing (m)	Max VOC conc. (ppm)	Comment
C1	287777	226733	2,512	Emissions from the top of GS03
C2	287765	226679	12.10	Surface area in the field

A total of 2 individual surface emissions zones were identified (see *Figure 3.1* and *Table 1.0*). Surface emissions location C1 appeared to be present as a result of landfill gas flux from a monitoring well GS03 (See *Figure 3.1*). Surface emissions location C2 appeared to be present as a result of landfill gas surface emissions from an open area (see *Figure 3.1*).

In addition readings of between 5.50 to 7.30 ppm of VOC were recorded from behind the skirting board in the corner of the Kitchen inside the house. Readings of between 3.20 to 5 ppm of VOC were recorded from behind the skirting board in the corner of the Utility room inside the house. It is not possible to disseminate the constituents of the VOC without performing speciated VOC analysis. Concentrations at these locations were low.

2. Conclusions and recommendations

The following conclusions were drawn from the survey in the vicinity of Carrigeen Refuse Depot:

- The surface emissions contour map generated from the Volatile organic compound (VOC) survey illustrated surface areas of landfill gas surface emissions.
- Two surface emissions locations were identified in the vicinity of the paddock beside the dwelling at Carrigeen, Clane, Co. Kildare.
- Given the proximity of the dwelling to the old refuse depot and the surface emissions identified, an appropriate gas relief trench should be placed between the waste body and the dwelling to allow any landfill gas buildup to diffuse to atmosphere before reaching the dwelling location.

3. *Appendix I- Volatile organic compound surface emissions* contour map & survey outline

Figure 3.0. Survey outline (Approximate area surveyed on the 28th July 2011)

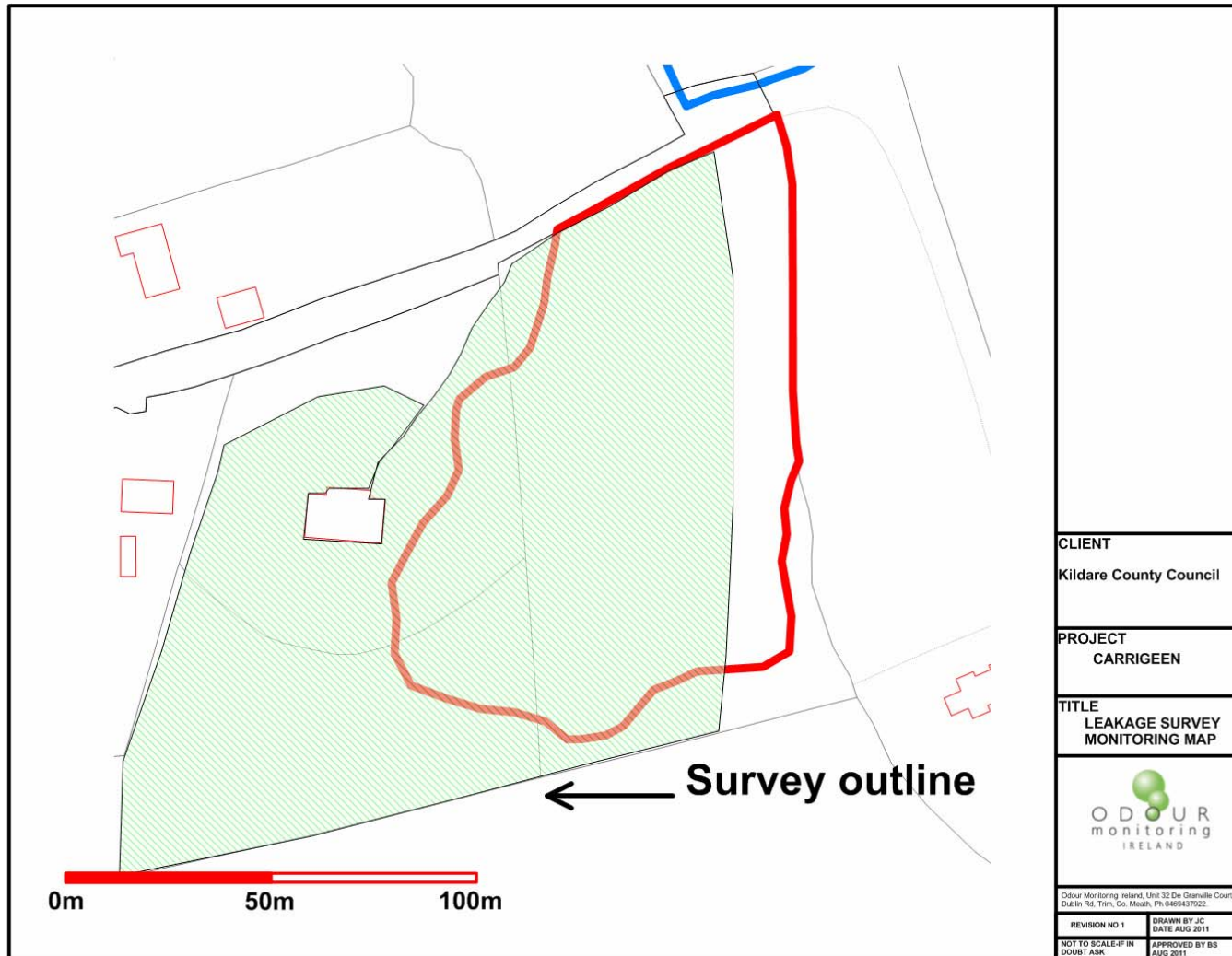
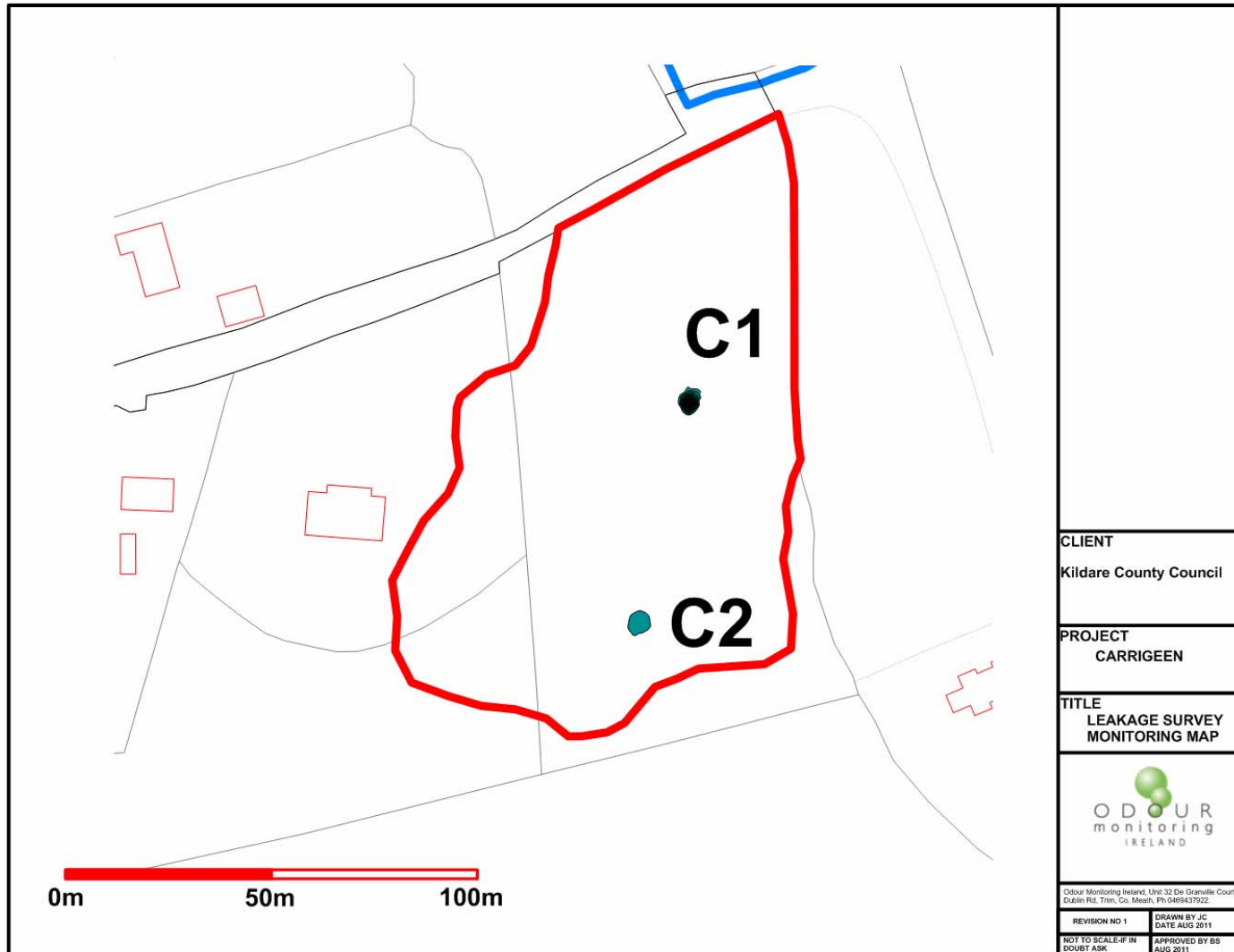


Figure 3.1. Landfill gas surface emissions monitoring within the surveyed area on Figure 3.0.



4. Appendix II-Calibration certificates and procedures.

4.1 Span & Calibration procedure

Necessary Calibration gases: Zero gas (0ppm), 100ppm and 500ppm methane (Calibration certificates below).

Calibration is carried out in accordance with manufacturers guidelines.

Location: Zero span instrument onsite.

Frequency: Before, midway through, and after the surface emissions survey, typically therefore at 3-4 hour intervals. If the survey only last 2 to 3 hours the instrument is checked before and after the event.

Instrument settling: The FID is switched on and left to settle for a period of 30 minutes minimum.

Span Procedure: The zero and span gases shall be introduced under the same flow and pressure conditions using the sample probe at the end of the sample line. The adjustment procedure shall be as follows:

- a) Feed the zero gas (0ppm) into the FID and set the zero;
- b) Feed the span gas (100ppm) and adjust the instrument accordingly;
- c) Feed the zero gas into the FID once more and check that the reading returns to zero; if not repeat steps a) to c).
- d) repeat procedure A to C to verify

Equipment is maintained and operated as specified by the manufacturer.

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Kildare County Council
Carrigeen Refuse Depot

Scientific & Technical
██████ Gases Ltd ██████

Certificate of Composition 29485-6-1

Order No E-MAIL Cylinder No Customer ODOUR MONITORING I
Cylinder Valve C10 Our Ref 29485 Cylinder Size 112DA Nett Wt
(Kg) 0.12 Gross Wt (Kg) 1.2

Component Requested Value Certified Value

METHANE 500PPM 500PPM AIR (ZERO GRADE) BALANCE BALANCE

Pressure 1000PSI Volume 112LTR Valid Until *February 2013*

Please note all units are in *MOL%* and accuracy is $\pm 2\%$. Relative mixtures traceable to standards calibrated at the National Physics Laboratory, Teddington, Middlesex, England

Certified by S. Banks UN NO 1956 Date 10/02/2010

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Kildare County Council
Carrigeen Refuse Depot

Scientific & Technical Gases Ltd

Certificate of Composition 29485-1-1

Order No E-MAIL Cylinder No Customer ODOUR MONITORING I
Cylinder Valve C10 Our Ref 29485 Cylinder Size 112DA Nett Wt
(Kg) 0.12 Gross Wt (Kg) 1.2

Component Requested Value Certified Value

AIR ZERO GRADE ZERO GRADE

Pressure 1000PSI Volume 1000PSI Valid Until *February 2013*

Please note all units are in *MOL%* and accuracy is $\pm 2\%$. Relative mixtures traceable to standards calibrated at the National Physics Laboratory, Teddington, Middlesex, England

Certified by S. Banks UN NO 1002 Date 10/02/2010

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Year: 2011

Kildare County Council
Carrigeen Refuse Depot

Scientific & Technical
██████ Gases Ltd ██████

Certificate of Composition 29485-5-1

Order No E-MAIL Cylinder No Customer ODOUR MONITORING I
Cylinder Valve C10 Our Ref 29485 Cylinder Size 112DA Nett Wt
(Kg) 0.12 Gross Wt (Kg) 1.2

Component Requested Value Certified Value

METHANE 100PPM 100PPM AIR (ZERO GRADE) BALANCE BALANCE

Pressure 1000PSI Volume 112LTR Valid Until *February 2013*

Please note all units are in *MOL%* and accuracy is $\pm 2\%$. Relative mixtures traceable to standards calibrated at the National Physics Laboratory, Teddington, Middlesex, England

Certified by S. Banks UN NO 1956 Date 10/02/2010