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Nantycaws Landfill

Landfill Gas Surface Emissions Survey 2014

402.00610.00026

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Version: Rev 2

EXECUTIVE SUMMARY

CWM Environmental Ltd instructed SLR Consulting Ltd to complete a phased Landfill Gas Surface Emissions Survey at Nantycaws Landfill in 2014.

The Stage 1 landfill gas surface emissions walkover survey was undertaken on 30th April 2014, with the site being divided into 2 internal zones to reflect the various specifications of capping and restoration within the landfilled area.

All measurements of surface emissions from the cap were compliant with the Environment Agency guidance standards, with the exception of four areas. The majority of the point source emissions recorded compliant levels against industry and Environment Agency guidance standards with 8 minor defects identified during the survey. These were investigated and remediated prior to instigating the flux survey. These features were re-surveyed prior to the flux survey and were found to be compliant.

A quantitative (flux box) surface emissions monitoring survey was undertaken on the 19th and 20th August 2014. The zones surveyed were found to be compliant with Environment Agency Emission Standards for permanent capping.

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DRAWINGS

1.0 INTRODUCTION

SLR Consulting Limited (SLR) has been commissioned by CWM Environmental Limited (CWM) to undertake a survey of landfill gas surface emissions at Nantycaws Landfill Site, Carmarthenshire.

Methane emissions through the cap of a landfill need to be monitored as an integral part of demonstrating compliance with the Landfill Directive, and in particular to:

- identify faults in the gas management system at a site and prioritise any remediation required; and
- quantify the total emissions of this important greenhouse gas from the site as a whole.

The Environment Agency produced the Guidance for Monitoring Landfill Gas Surface Emissions[1] (LFTGN07). The purpose of the guidance is to provide a standard set of monitoring methods for determining the emission of methane from the surface of a landfill. A two stage approach is required by the guidance. The first stage involves a walkover survey to locate any significant emission sources and to identify any failures in the gas collection system. The second stage of the survey, which aims to quantify the surface emissions from the site, can only take place once any required remediation work has been completed. This report represents the Stage 1 annual walkover survey and Stage 2 Flux survey. This report describes the techniques and methodology used in the first and second stage of assessment, followed by analysis of the results of these surveys.

1.1 Survey Methodology

The site has been divided into a number of zones with similar characteristics with respect to the factors that will affect surface emissions (e.g. nature of capping). The main characteristic used for zoning of the landfill is the nature of the capping, which are described below.

- permanent capping: filled and restored phases of an operational or closed landfill with a permanent cap, where no more waste will be accepted; and
- temporarily capped zones of an operational landfill not currently accepting wastes and not expected to do so within 3 months.

The capping layer is the primary containment of surface emissions from a landfill. Therefore, where the characteristics or age of the cap differ, surface emissions may vary. Boundaries between different areas of differing characteristics may also be areas of higher emissions.

The walkover survey was undertaken on all permanent and temporary capped areas of the landfill, with the exception of any areas which were operationally active or were inaccessible due to gradient. Methane emissions were monitored using a hand-held flame ionisation detector (FID) held close to the ground (< 5cm). Monitoring was undertaken on a 25m and 50m grid on temporary and permanently capped areas, respectively. Where high concentrations of methane were detected and when it was appropriate, the survey deviated to locate the source. A written record of methane levels was recorded at each location.

Features were inspected closely, with measurement of methane emissions taken around the feature and landfill surface. A separate reading was taken from the actual feature and associated pipe works if it protruded above the landfill surface.

[1] Guidance on Monitoring Landfill Gas Surface Emissions V2 2010. Environment Agency

The Geographic Positioning System (GPS) equipment used during the survey was a Thales Mobile Mapper. The instrument used to measure methane concentration was a Gastec

1.2 Previous Assessments

This report presents the 2014 surface emissions survey for Nantycaws Landfill. The most recent surface emission surveys undertaken prior to this report was the Stage 1 walkover survey undertaken in 2013[2]. Prior to this previous were undertaken in 2012[3], 2008[4,5] and 2006[6].

[2] SLR Consulting Ltd 2013, Surface Emissions Stage 1 Walkover Survey 402.000610.00023
[3] SLR Consulting Ltd. 2012. Surface Emissions Survey Stage 1 +Stage 2. March 2012 402.00610.00020/21
[4] SLR Consulting Ltd 2008 Landfill Gas Surface Emissions Walkover Survey. November 2008 402.00610.00015
[5] SLR Consulting Ltd 2009 Landfill Gas Surface Emissions Flux Survey. April 2009 402.00610.00015
[6] SLR Consulting Ltd. Stage 1 Gas Surface Emissions Walkover Survey. October 2006 402.00610.00013

2.0 DEFINITION OF ZONES

Nantycaws Landfill is located approximately 8km to the east of Carmarthen and 1.5km to the south-east of the small village of Nantycaws, to the immediate south of the A48. The area surrounding Nantycaws Landfill is agricultural, with open fields to the north and east.

For the purposes of this assessment, Nantycaws landfill has been divided into two zones according to the type of capping in place as shown in Drawing AQ1. Zone 1 represents the permanently capped areas of the landfill and Zone 2 represents the areas of the landfill with temporary capping in place.

Since the survey undertaken in 2013, a number of changes to the capping have occurred including additional restoration soils. The zones are as described below and illustrated in Drawing AQ1.

2.1 Description of Zone 1

Zone 1 comprises all the permanently capped areas of Nantycaws Landfill; this zone has been subdivided into five separate subzones due to the date or type of capping in place as described below.

2.1.1 Zone 1A

Zone 1A comprises the majority of Cell 1, this zone has been permanently capped with 300mm of clay soils, 1.0mm HDPE geomembrane and completed with restoration soils. The zone is fully restored and is covered with short vegetation. This area was capped in 1999 (see Appendix B, Photo 1) and was last subject to flux survey in 2008.

2.1.2 Zone 1B

Zone 1B comprises of a large grassed area which includes the plateau of Cells 2, 4 and 5, the grassed flank of Cells 4, 5 and Cell 6. The permanent capping installed within this area includes 1.0mm LLDPE geomembrane cap followed by 1m of restoration soils (see Appendix B, Photo 2) and was last subject to a flux survey in February 2012.

2.1.3 Zone 1C

Zone 1C comprises permanent areas of capping which have yet to receive restoration soils. This zone incorporates the western flanks of Cells 3 and 4. The zone area has decreased as the south western flank of Cell 3 which was previously within this zone, has now received restoration soils and is now designated as Zone 1E.

2.1.4 Zone 1D

Zone 1D comprises permanent capping installed in October 2012, on the western corner of Cell 2 and western edge of Cell 6. This is capped with 1.0 LLDPE geomembrane cap (see Appendix B, Photo 3) and covered with 1m of restoration soils. A flux survey is required on this zone.

2.1.5 Zone 1E

Zone 1E comprises permanent capping characterised by 1mm LLDPE geomembrane cap and 1m restorations soils. This area previously comprised part of Zone 1C, but restoration

soils were placed in 2013 and therefore has been characterised as a new zone. A flux survey is required on this zone (See Appendix B Photo 4).

2.2 Description of Zone 2

Zone 2 comprises of all temporarily capped areas of Nantycaws Landfill; this zone has been subdivided into two subzones due to either the date or type of capping in place. These separate zones are described below.

2.2.1 Zone 2A

Zone 2A is a small area of temporary cap within Cell 1. This area is capped with a minimum of 250-300mm of clay and is covered in dense grass vegetation (see Appendix B, Photo 1).

2.2.2 Zone 2B

Zone 2B comprises all of remaining temporarily capped areas of Nantycaws Landfill, this zone includes the northern flank of Cell 3 and Cell 6. The capping in Zone 2B comprises of 1mm LLDPE geomembrane (see Appendix B, Photo 3).

3.0 WALKOVER SURVEY

3.1 Climatic Conditions

The walkover was completed on the 30th April 2014. Data quality from a walkover survey can be directly influenced by the meteorological conditions prevailing before and during the monitoring period. Nantycaws Landfill site does not have an onsite weather station. Weather data from the weather station at Pembrey Sands, 20km south west of the site has been used. Results are presented in the Table 3-1.

Table 3-1: Weather Conditions during the Walkover Survey: 30th April 2014

Time	Pressure (pa)	Temperature (˚C)	Wind Speed (mph)	Wind Direction
08:00	1013	9.3	8	N
09:00	1013	9.9	8	N
10:00	1013	9.7	7	N
11:00	1013	10.7	11	N
12:00	1013	10.5	15	N
13:00	1013	11.9	11	N
14:00	1013	13.0	15	N
15:00	1012	13.0	10	N
16:00	1012	11.8	9	N
17:00	1011	11.9	11	N
18:00	1011	11.3	11	N

For landfill surface emission surveys, the EA Guidance Note LFTGN 07 suggests wind speeds of Beaufort scale 2 or below (equal to 7 mph or below). From the data presented in Tables 3.1, it can be seen from the wind speeds recorded on site these were elevated during the survey. The weather station is located on the coast and therefore recorded windspeeds are likely to be greater than those experienced onsite. Additionally a wind protection device was used to reduce speeds in the immediate vicinity.

3.2 Gas Management System Conditions

The site currently has in operation two engines and one flare. Gas abstraction data for the settings of the gas system during April are presented in Appendix D.

3.3 Walkover Survey Results

The results of the walkover survey have been presented in Appendix A and Drawing AQ2, which show the monitoring locations and corresponding concentrations. The results are summarised in the following subsections.

The Geographic Positioning System (GPS) equipment used during the survey was a Thales Mobile Mapper. The instrument used to measure methane concentration was a Gastec Flame Ionisation Detector (FID). The Gastec FID has a range of 0 – 10,000ppm with a minimum detectable limit of 0.1ppm. The instrument used at Nantycaws landfill site had been calibrated on 17th April 2014 (Serial Number; 6335). The calibration certificate is presented in Appendix E.

According to LFTGN07, a quantitative flux survey will be of little value until the concentration of methane in the air is:

- less than 100 parts per million by volume (ppmv) immediately above the surface on the main zones of the cap; and
- less than 1,000 ppmv close to any discrete feature.

3.3.1 Zone 1

Zone 1A

The walkover survey of Zone 1A found no locations where methane concentrations exceeded the guidance criteria of 100ppm. All concentrations recorded were less than 10ppm.

Zone 1B

Observations of methane levels across the cap of Zone 1B found no locations where methane concentrations exceeded the guidance criteria of 100ppm set by the EA. All concentrations recorded were less than 10ppm.

Zone 1C

The walkover of Zone 1C found two locations where methane concentrations exceeded the 100ppm criteria. A concentration of >5000ppm was recorded from a hole in the plastic capping located halfway up the southwest flank (See Appendix B Photo 14). A second area of exceedance was to the east of the zone on the boundary with Zone 1E where a concentration of >5000ppm was recorded (See Appendix B Photo 15).

Zone 1D

The walkover of Zone 1D found one location where methane concentrations exceeded the 100ppm criteria. A concentration of 200ppm was recorded in an area approximately 1m x 1m towards the centre of the zone adjacent to feature NYCW1001 where there was an area of distressed or no vegetation (See Appendix B Photo 12).

Zone 1E

Observations of methane levels across the cap of Zone 1E found no locations which exceeded the criteria of 100ppm set by the EA. All concentrations recorded were less than 10ppm.

3.3.2 Zone 2

Zone 2A

Measured concentrations of methane across the cap of Zone 2A recorded no locations where concentrations were in excess of the 100ppm criteria. All concentrations were less than 10ppm.

Zone 2B

Measured concentrations of methane levels across the accessible areas of the cap of Zone 2B found one area which exceeded the criteria of 100ppm set by the Environment Agency. The area included a number of points where concentrations reached a maximum concentration of 500ppm. The feature was linear and occurred between on the flank between the caps of Zone 2B and 1C on the north west corner of Cell 3. A number of exceedances occurred on the grassed area, with one location on the plastic capping. The

exceedance on the plastic capping was a location where the welding had broken (See Appendix B Photo 13).

3.3.3 Features

Observations of methane levels from features across the surface of the landfill found eight features recording methane levels above the guidance criteria of 1000ppm, these are shown below in Table 3-2.

Table 3-2: Features where Methane Levels >1000ppm

	Reference	Concentration (ppm)		Comments / Location	Grid Reference	Photograph (Appendix B)
		At Ground Level	Around Associated Pipe-work			
F1	NYCW901	>5000	<10	Top of Boot	SN 46960 17555	Photo 7
F2	NYW1004	>5000	<10	Base of Feature	SN46929 17482	
F3	NYCR1005	>5000	<10	Base of Feature and top of boot	SN46910 17512	Photo 5
F4	NYCW1203	>5000	<10	Top of Boot	SN 46884 17495	Photo 10
F5	NYCW1201	>5000	<10	Base of Feature	SN 46915 17438	Photo 11
F6	NYCW906	>5000	<10	Base of Feature	SN 46950 17410	Photo 6
F7	NYCL06	>5000	<10	Base of Feature	SN 46945 17397	Photo 8
F8	SN 46905 17196	2000	<10	Base of Feature	SN 46905 17196	Photo 9

3.4 Conclusions from Walkover Survey

The 2014 walkover survey has demonstrated ongoing compliance across the majority of the cap. Four areas of cap within Zone 1C, 1D and 2B require investigation and remediation. Exceedences were also recorded at 8 discrete features. These areas require investigation and remediation prior to re-monitoring and the commencement of a flux survey.

4.0 REMEDIATION & RE-MONITORING

4.1 Remediation Summary

Following the findings of the Stage 1 walkover survey detailed previously, eight features and four areas of cap were identified as requiring further investigation and possibly remediation. A summary of the further investigation and remediation undertaken by Infinis and CWM Environmental Ltd is presented in Table 4-1 below.

Table 4-1
Summary of Applied Remediation

Reference	Feature/Area ID	Grid reference	Method of remediation
F1	NYCW901	SN 46960 17555	Re-sealed with tape
F2	NYW1004	SN46929 17482	
F3	NYCR1005	SN46910 17512	Re-sealed with tape
F4	NYCW1203	SN 46884 17495	Re-sealed with tape
F5	NYCW1201	SN 46915 17438	Sealed with bentonite and additional clay
F6	NYCW906	SN 46950 17410	Clay remediation around base
F7	NYCL06	SN 46945 17397	Bentonite Base
F8	SN 46905 17196	SN 46905 17196	Re-welded and sealed
E1	Zone 1D	SN 46942 17450	Clay
E2-E5	Zone 2B	SN 46774 17317	Re-welded areas of seam. Covered with soil
E6	Zone 1C	SN 46878 17212	Patched and welded
E7	Zone 1C	SN 46922 17201	Patched and welded

4.2 Results of Re-monitoring

Following the remediation work (as summarised in Table 4-1) the features were re-monitored, with the results presented in Table 4-2 below. Re-monitoring was undertaken by SLR on the 19th August 2014.

Table 4-2
Results of Re-monitoring

Reference	Feature/Area ID	Measured Methane Concentration Base/ground level(ppm)	Measured Methane Concentration Top (ppm)	Compliant (Y/N)
F1	NYCW901	<10	<10	Y
F2	NYW1004	500	<10	Y
F3	NYCR1005	800	<10	Y
F4	NYCW1203	<10	<10	Y
F5	NYCW1201	800	<10	Y
F6	NYCW906	200	<10	Y
F7	NYCL06	100	<10	Y
F8	SN 46905 17196	<10	<10	Y
E1	Zone 1D	850	N/A	Y
E2-E5	Zone 2B	900	N/A	Y
E6	Zone 1C	<10	N/A	Y
E7	Zone 1C	<10	N/A	Y

All features were found to be below the Environment Agency criteria prior to the flux survey and therefore all zones from the walkover survey were found to be compliant.

5.0 FLUX SURVEY

5.1 Applicability of Previous Flux Survey Results

According to LFTGN07:

'if a capped zone has previously shown compliance with the emission limits and there has been no significant physical changes in the gas management during the year, a detailed annual walkover survey to demonstrate that the surface emissions are compliant can be used.'If these surveys show no change in the pattern of methane emissions, the values for the flux and total methane emissions measured in the initial survey may be reported and a fresh flux box survey is not necessary.'

At Nantycaws landfill Zone 1A, 1B and 2A has previously had a flux survey and the capping of the area has not changed. Therefore the results from the previous quantitative flux survey can be applied to these zones and are summarised in Table 5-1 below.

Zone 1C and 2B due to the nature of the material and gradient could not be fluxed due to health and safety reasons.

Table 5-1:
Previous Quantitative Flux Emissions

Zone	Date of Flux Survey	Average Flux ($mg/m^2/s$)	Surface Area (m^2)	Mass Emission Rate (mg/s)
1A	October 2008	0.00045	16,525	7.39
1B	February 2012	0.00051	40,971	20.8
2A	February 2012	0.00069	993	0.7
Zone 1A mass emission rate adjusted to the revised size of the zones				

The annual walkover survey has demonstrated compliance for all zones. A flux survey is required on Zone 1D and 1E which has not yet been subject to a flux survey; with the addition of restoration soils safe access is now possible.

5.2 Flux Survey Requirements

The number of monitoring locations is determined on the basis of the zone size. The number of flux box monitoring locations and spacing required is presented in Table 5-2.

The number of flux box locations is calculated using the formula from LFTGN07:

$$N = 6 + 0.15 \sqrt{Z}$$

The spacing between flux box monitoring points is calculated using formula:

$$S = \sqrt{Z}/N$$

Where:

S = average spacing between monitoring points
Z = area of zone (m^2)
N = number of locations

Table 5-2: Flux Survey Requirements

Zone	Surface Area (m^2)	No. Flux Locations	Spacing (m)

Zone	Surface Area (m^2)	No. Flux Locations	Spacing (m)
1D	5,171	17	17
1E	6,465	18	19

5.3 Flux Measurement

The design of this flux monitoring survey was based on guidance recommended in LFTGN07. Prior to commencement of the flux survey a Geographical Positioning System was used to plot each point to be sampled and assigned it with an individual identification number (see Drawing AQ2). The GPS equipment used during the survey was a Thales Mobile Mapper. Gastec FIDs were also used; serial numbers 800 and 6335. Calibration certificates are presented in Appendix D.

The site of each plotted grid point was assessed for an appropriate location to place the flux box (a gas tight reciprocal of known volume and basal area (flux hood) adapted from a plaster's bath) and any areas of vegetation were cut down to enable a more effective seal with the ground. The flux box was placed on the ground with the open face downwards. The FID was then allowed to stabilise while an appropriate seal was ensured along the bottom edge of the flux box if it was needed. A carbon filter was then attached to the inlet valve to ensure that air entering through the inlet valve is purified before it enters the flux box. Finally the FID was attached to the outlet valve and the timer started. The concentration of methane in the flux box was recorded at time intervals of 60 seconds over a period of time between 20 and 30 minutes. The sampling duration is determined by results obtained; if little methane is detected after 20-minutes, further monitoring is not undertaken.

The data recorded is used to determine the flux of gas through the surface using the following equation:

$$Q = V/A \times (dC/dt)$$

Where:

Q = Flux ($mg/m^2/s$)
V = Volume of reciprocal (m^3)
A = Area of footprint (m^2)
dC = Change in methane concentration (mg/m^3)
dt = Change in time (s)

5.3.1 Interpretation of Results

The measured methane concentrations are displayed on the FID in ppmv. These concentrations were then converted into mg/m^3 using the formula below:

$$\text{Concentration (c) } [mg/m^3] = \frac{c\ [ppmv] \times \text{Molecular weight of methane}}{\text{Molecular volume of methane}}$$

$$= \frac{c\ [ppmv] \times 16 \times 10^3\ [mg/mole]}{22.4 \times 10^3\ [mole/m^3]}$$

$$= c\ [ppmv] \times 0.7143$$

The concentrations were then plotted onto a graph with a trend line, and the correlation coefficient (R^2). In accordance with LFTGN07, the data are considered acceptable if the following criteria are achieved:

- $R^2 > 0.8$;

- graph has more than 5 data points; and
- change in concentration is > 0 (i.e. positive trend lines).

If these criteria are not satisfied, the methane flux must be reported as being at the lower detection limit of the method (i.e. $5*10^{-5}$ mg/m^2/second or limit of detection of the flux box used).

As mentioned in LFTGN 07, monitoring data towards the end of the dataset can be affected by factors such as methane saturation whilst monitoring in the first few minutes can be affected by wind effects or the effects of the gas abstraction system.

"To eliminate these effects, individual data points are removed from the ends of the dataset – first from the last data collected and then the initial readings, until a correlation coefficient > 0.8 is obtained".

To enable a consistent approach for the elimination of data points, the following approach has been adopted;

- a spreadsheet has been used to identify all suitable possibilities within the dataset where a correlation coefficient of 0.8 and above is achievable; and
- where a correlation coefficient of 0.8 or above is achievable, this selection of data points (providing there were more than 5 recordings) has been used as the final result.

Those recordings that have been eliminated from the flux calculations are highlighted in grey for each point in Appendix E. All points that are not highlighted have been used to calculate the flux rate.

5.4 Flux Survey Results

The flux survey (Stage 2) of Zones 1D and 1E was carried out on the 19th and 20th August 2014. A summary of the survey results are presented in Table 5-3 below, the full results can be found in Appendix E.

Table 5-3
Surface Gas Emissions

Zone	Surface Area (m^2)	Average Flux (mg/m^2/s)	Environment Agency Criteria (mg/m^2/s)	Mass Emission Rate (mg/second)
1D	5,171	0.00082	0.001	4.3
1E	6,465	0.00020	0.001	1.3

Zone 1D was found to be compliant with respect to the emission standard for permanent capping. An average flux of 0.00082mg/m^2/s was recorded across the cap with the mass emission rate for Zone 1D being 4.3mg/s over an area of 5,171m^2. Seven flux locations were found to individually exceed the emission limit which were locations 7-8 and 11-15 bringing the average flux to 82% of the limit for permanent capping.

The average surface methane flux of Zone 1E was found to be 0.00020 mg/m^2/s, below the Environment Agency's emission standard of 0.001mg/m^2/s for permanent capping, and therefore considered to be compliant. The mass emission rate from Zone 1E is 1.3mg/s over an area of 6,465m^2. Location 28 was found to individually exceed the emission limit bringing the average flux to 20% of the limit for permanent capping.

6.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of CWM Environmental Limited, no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

APPENDIX A: STAGE 1 WALKOVER SURVEY RESULTS

Monitoring Results across Cap

All points which exceeded the guidance criteria of 100ppm are highlighted in grey.

Point	Grid Reference	Methane Concentration (ppm)
1	SN 46911 17506	<10
2	SN 46929 17519	<10
3	SN 46884 17495	<10
4	SN 46895 17503	10
5	SN 46892 17483	40
6	SN 46906 17466	<10
7	SN 46913 17444	<10
8	SN 46920 17451	20
9	SN 4622 17460	0
10	SN 46927 17465	<10
11	SN 46920 17474	20
12	SN 46924 17477	10
13	SN 46938 17468	<10
14	SN 46940 17454	10
15	SN 46942 17450	200
16	SN 46942 17448	50
17	SN 46954 17444	10
18	SN 46955 17429	10
19	SN 46951 17419	<10
20	SN 46935 17410	<10
21	SN 46995 17441	10
22	SN 47120 17463	<10
23	SN 47065 17438	<10
24	SN 46978 17401	<10
25	SN 46928 17328	<10
26	SN 46944 17314	<10
27	SN 47629 17340	<10
28	SN 46883 17295	<10
29	SN 46825 17319	<10
30	SN 46802 17314	80
31	SN 46797 17316	<10
32	SN 46774 17316	200
33	SN 46774 17317	500
34	SN 46769 17317	20
35	SN 46761 17319	20
36	SN 46756 17317	100
37	SN 46736 17315	500
38	SN 46953 17191	<10
39	SN 46878 17212	>5000
40	SN 46923 17209	20
41	SN 46924 17197	50
42	SN 46922 17201	>5000

Monitoring Results of Features

All features which exceeded the guidance criteria of 1000ppm are highlighted in grey.

Feature	Methane Concentration (ppm)	
	Base / Boot Cover	Top and Pipe-work
KOP 2	<10	<10
NYCW0035	<10	<10
NYCW056	<10	<10
NYCW1019	<10	<10
NYCS0036	<10	<10
SN 47095 17544	<10	<10
NYCS1021	<10	<10
NYCW0003	<10	<10
NYCW0053	<10	<10
NYCL013	<10	<10
NYCL004	<10	<10
NYCW903	<10	<10
NYCW302	<10	<10
NYCW901	>5000	<10
NYC1006	<10	<10
SN 46947 17505	<10	<10
NYCW1003	<10	<10
NYCW1002	<10	<10
SN46986 17400	<10	<10
NYCR 0905	<10	<10
NYCR1001	<10	<10
NYW1004	>5000	<10
NYCR1005	>5000	<10
NYCW 1203	>5000	<10
NYCW 1201	>5000	<10
NYCW900	>5000	<10
NYCW06	>5000	<10
NYCS0904	<10	<10
NYCS1101	20	<10
NYCS037	<10	<10
KOP5	<10	<10
SN47035 17426	<10	<10
NYCW102	<10	<10
NYCW1104	<10	<10
NYCW 912	<10	<10
NYCW0910	<10	<10
NYCW0711	<10	<10
NYCW1009	<10	<10
NYCW911	<10	<10
NYCW0710	<10	<10
NYCW0709	<10	<10
NYCW913	<10	<10
SN 46994 17354	<10	<10
NYCW1103	300	<10
NYCW703	<10	<10
NYCW704	<10	<10
NYCW1010	<10	<10
NYCW1011	<10	<10

Feature	Methane Concentration (ppm)	
NYCW1012	<10	<10
NYCW911	<10	<10
KOP7	<10	<10
NYCW1014	<10	<10
NYCW909	<10	<10
NYCW1016	<10	<10
SN46721 17324	900	<10
SN 46753 17349	<10	<10
NYCW1209	<10	<10
NYCW1008	<10	<10
NYCW1007	<10	<10
SN 47065 17358	<10	<10
SN 47064 17325	<10	<10
MANIFOLD 13	<10	<10
KOP4	<10	<10
SN 47014 17264	<10	<10
SN 47000 17249	<10	<10
SN 46988 17236	<10	<10
SPO7	<10	<10
SN 46905 17196	2000	<10
SP09	<10	<10
SP10	<10	<10
SN 46879 17218	80	<10
SP11	<10	<10
SP12	<10	<10
SP13	<10	<10
NYCW0708	<10	<10
M3B	<10	<10
NYCW1017	<10	<10
KOP8	<10	<10
NYC509	<10	<10
NYCW1018	<10	<10
LW9	<10	<10
SN 46881 17259	<10	<10
NYCW511	30	<10
NYCW512	<10	<10
SN 46906 17270	<10	<10
NYCS 1013	<10	<10
SN 46928 17265	<10	<10
NYCW 513	<10	<10

APPENDIX B: STAGE 1 WALKOVER – SITE RECORDS

Site Photographs

Photo 1: View of Zone 1A, 1B (permanent cap) and 2A (temporary cap)

Photo 2: Zone 1B and 2A looking east

Photo 3: View of (temporary capped) Zone 2B facing west

Photo 4: Restored section of Zone 1C, now Zone 1E

Photo 5: Exceeding Feature NYCW1005

Photo 6: Exceeding Feature NYCW906

Photo 7: Exceeding Feature NYCW901

Photo 8: Exceeding Feature NYCL06

Photo 9: Exceeding Feature SN 46905 17196

Photo 10: Exceeding Feature NYCW1203

Photo 11: Exceeding Feature NYCW1201

Photo 12: Exceeding Cap P1

Photo 13: Exceeding Cap P2

Photo 14: Exceeding Cap P3

Photo 15: Exceeding Cap P4

Stage 1 Walkover: Gas Abstraction Data

Readings undertaken during April 2014

Asset ID	CH4	CO2	O2	Balance Gas	Vacuum	Atm Pressure	Original Valve	Depart valve
	(%)	(%)	(%)	(%)	(mbar)	(mbar)	(%)	(%)
NYCW0035	70.8	7.9	3.6	17.7	0.95	987	紆	10
NYCW0035	68.6	7.7	3.9	19.8	0.83	986	10	0
NYCW0056	52.7	18.5	0.1	28.7	0.64	986	10	20
NYCW0056	48.6	19.4	0.1	31.9	-1.67	985	20	20
NYCW1019	54.6	17	0.1	28.3	-0.43	985	0	10
NYCW1019	54.5	17.1	0.1	28.3	0.21	986	10	10
NYCW0055	65.4	15.6	0.1	18.9	0.51	986	5	10
NYCW0055	61.2	16.7	0	22.1	-1.14	985	10	10
NYCW1020	44.2	16.7	0.1	39	0.24	985	0	10
NYCW1020	43.9	16.9	0	39.2	0.05	986	10	10
NYCW1021	25.1	13.1	1.2	60.6	0	986	0	0
NYCW0053	34.2	14.8	7.2	43.8	-1.05	986	0	0
NYCW0054	65.2	26.6	0.1	8.1	-0.8	985	10	15
NYCW0054	62.3	25.3	0.1	12.3	-0.13	985	15	15
NYCL0003	47.4	19.5	1.9	31.2	-0.37	985	0	10
NYCL0003	52.1	21.3	0.1	26.5	-2.34	985	10	10
NYCW0036	10.8	2.3	15.5	71.4	-0.34	985	0	0
NYCW0037	51	20.5	0.5	28	-11.17	985	10	20
NYCW0037	51.9	20.8	0.4	26.9	-35.43	986	20	20
NYCW0904	56.2	30.8	0.1	12.9	-6.47	986	10	20
NYCW0904	57.4	31	0	11.6	-14.89	984	20	20
NYCR0905	54.7	36.5	0	8.8	-55.84	984	100	100
NYCW1104	42.5	33.3	0.1	24.1	-57.16	984	100	100
NYCW1103	62	41.2	0.1	0	-57.33	984	0	100
NYCW1102	44.8	31.8	0.3	23.1	-18.08	984	20	25
NYCW1102	44.8	31.8	0.2	23.2	-27.61	985	25	25
NYCW1101	38.9	22.9	0.1	38.1	-14.92	985	10	5
NYCW1101	38.8	22.9	0	38.3	-10.82	985	5	5
NYCL0004	49.9	30.3	0.1	19.7	-23.01	984	40	45
NYCL0004	48.8	30	0.1	21.1	-24.19	984	45	45
NYCL0013	53.9	35.9	0.1	10.1	0.03	984	30	35
NYCL0013	52.9	35.5	0	11.6	-0.37	985	35	35
NYCW0901	47.8	34.2	0.1	17.9	-17.89	985	20	25
NYCW0901	47.5	34.2	0.1	18.2	-28.62	984	25	255
NYCW0902	64.3	41.6	0.1	0	2.43	984	0	10
NYCW0902	63.4	42.1	0	0	-19.87	984	10	10
NYCW0903	62.6	41.5	0.1	0	-51.82	984	100	100
NYCW1002	62	39.5	0.5	0	-51.81	985	100	100

Asset ID	CH4	CO2	O2	Balance Gas	Vacuum	Atm Pressure	Original Valve	Depart valve
NYCW1003	57.5	38.1	0	4.4	-32.21	985	100	100
NYCW1006	54.8	38.8	0.1	6.3	-1.08	985	20	25
NYCW1006	51.1	36.9	0.2	11.8	-3.34	985	25	25
NYCW1007	59.3	39.7	0	1	-1.43	985	20	25
NYCW1007	58.8	39.6	0	1.6	-5.88	986	25	25
NYCW1008	48.4	36.4	0.1	15.1	-44.47	986	20	25
NYCW1008	50.5	36.9	0	12.6	-49.47	986	25	25
NYCW1005	52.8	37.5	0	9.7	-49.37	986	100	100
NYCW1004	61.8	41.7	0	0	-50.47	985	100	100
NYCR1001	62.8	42.1	0	0	-50.41	985	100	100
NYCW0906	64.5	39.9	0	0	-49.93	985	100	100
NYCL0006	63.2	40.5	0	0	-49.79	985	100	100
NYCW1203	74.4	40.5	0	0	-32.24	985	20	20
NYCW1209	10.5	8.1	18.8	62.6	0.11	985	0	0
NYCW1210	48.9	29.9	5	16.2	-0.32	986	0	10
NYCW1210	52.2	32.2	3.5	12.1	-32.29	986	10	10
NYCW1206	67.1	40.9	0.1	0	-10.5	986	20	30
NYCW1206	66.6	40.9	0.1	0	-25.56	985	30	30
NYCW0907	64.4	41	0	0	14.41	985	0	15
NYCW0907	63.5	41.2	0.1	0	-24.67	985	15	15
NYCW0712	60.9	44.3	0.1	0	-47.84	985	100	100
NYCW0908	55	36.6	0.1	8.3	-30.34	985	55	60
NYCW0908	55.1	36.9	0.1	7.9	-36.66	985	60	60
NYCW0909	63.9	41.3	0.1	0	-1.91	985	0	10
NYCW0909	64.2	41.3	0	0	-1.14	985	10	10
NYCL0007	42.5	31.7	5.8	20	-61.29	1006	100	50
NYCL0007	60.6	42.6	0.2	0	-58.95	1004	50	75
NYCW0911	54	38.9	0.1	7	-62.02	1004	100	100
NYCW1009	39.4	31.6	0.1	28.9	-54.4	1004	30	20
NYCW1009	38.4	31.2	0.1	30.3	-47.47	1004	20	20
NYCW0711	61.5	42.4	0.1	0	-67.6	1004	100	100
NYCW0710	56.3	39.3	0.1	4.3	-12.48	1004	5	10
NYCW0710	54.4	38.2	0.1	7.3	-18.88	1005	10	10
NYCW0709	35.6	30.6	1.1	32.7	-62.3	1005	40	25
NYCW0709	34.2	29.6	1.3	34.9	-41.07	1005	25	25
NYCW0910	41.9	30.7	6.3	21.1	-4.14	1005	0	0
NYCW0912	42.3	33.8	0.3	23.6	-1.01	1004	0	10
NYCW0912	41.9	33.6	0.3	24.2	-1.18	1004	10	10
NYCW0913	50.1	37.9	0.4	11.6	-56.03	1004	75	75
NYCW1010	13.5	9.8	18	58.7	-8.21	1005	0	0
NYCW1011	35.5	30.5	0.1	33.9	-25.89	1005	50	20
NYCW1011	39.6	32.3	0.1	28	-19.45	1005	20	20

Asset ID	CH4	CO2	O2	Balance Gas	Vacuum	Atm Pressure	Original Valve	Depart valve
NYCW1012	53.1	36.4	0.1	10.4	-41.85	1005	45	50
NYCW1012	52.9	36.5	0.1	10.5	-44.06	1005	50	50
NYCL0010	59.2	42.4	0.5	0	-65.19	1005	75	100
NYCL0010	58	41.6	0.8	0	-65.7	1005	100	100
NYCW0512	-	-	-	-	-	-	-	-
NYCW0513	-	-	-	-	-	-	-	-
NYCW1013	59.6	43.9	0.2	0	-1.35	1005	0	5
NYCW1013	59.8	43.8	0.1	0	-1.4	1005	5	5
NYCW1014	54.9	33.9	0	11.2	-67.13	1005	40	50
NYCW1014	54.5	34	0.1	11.4	-70.99	1004	50	50
NYCW1015	56.4	36.8	1.9	4.9	-1.12	1005	0	10
NYCW1015	60.5	38.9	0.8	0	-0.13	1004	10	10
NYCW1016	70.6	32.7	0.1	0	0.38	1004	0	10
NYCW1016	70.4	32.8	0.1	0	0	1004	10	10
NYCW0508	68.3	34.4	0.1	0	0.41	1004	0	10
NYCW0508	68.3	34.4	0.1	0	-0.17	1005	10	10
NYCL0008	66.4	33.9	0.1	0	0.15	1005	0	5
NYCL0008	64.6	33.4	0.6	1.4	-0.12	1005	5	5
NYCW1017	68.2	31.5	0.1	0.2	-1.45	1005	0	10
NYCW1017	68.3	31.5	0.1	0.1	-0.43	1005	10	10
NYCW0509	67.3	32	0.1	0.6	0.1	1005	10	15
NYCW0509	67.3	32.1	0.1	0.5	-0.15	1005	15	15
NYCW1018	61.1	41.1	0.1	0	-0.47	1005	0	10
NYCW1018	60	40.9	0.3	0	1.36	1005	10	10
NYCL0009	61.8	40.9	0.1	0	1.84	1005	0	15
NYCL0009	62.1	41	0.1	0	0.7	1005	15	15
NYCP0012	49.3	25.6	0	25.1	-7.54	1005	15	15
NYCP0011	43.8	25.3	0.1	30.8	0.53	1006	15	15
NYCP0010	22.8	22	1.3	53.9	-4.2	1006	15	0
NYCP0009	24.6	19.7	4.5	51.2	-1.39	1006	15	0
NYCP0007	53.8	23.2	0.3	22.7	0.53	1005	0	10
NYCP0007	54	23.2	0.3	22.5	-0.93	1005	10	10
NYCW0511	47.2	33.1	0.1	19.6	-2.66	1005	10	10
NYCL0001	47.8	30.4	0.2	21.6	-10.83	1005	30	25
NYCL0001	47.7	30.3	0.2	21.8	-5.58	1008	25	25
NYCL0002	41.7	28.2	0.1	30	-2.69	1008	20	20
NYCW0704	48.5	33.3	0.3	17.9	-76.86	1008	100	100
NYCW0703	50.6	35.4	0.1	13.9	-76.21	1008	50	60
NYCW0703	50.7	35.3	0.1	13.9	-76.82	1007	60	60
NYCW0605	54.2	35.1	0.1	10.6	-75.75	1007	50	60
NYCW0605	54.2	35.3	0.1	10.4	-76.39	1007	60	60
NYCW0016	26	20.7	3.8	49.5	-1.85	1011	0	0

Asset ID	CH4	CO2	O2	Balance Gas	Vacuum	Atm Pressure	Original Valve	Depart valve
NYCW0013	17.3	18.7	5.3	58.7	-2.09	1012	10	0
NYCW0014	0	0	20.9	78.8	-3.24	1012	0	0
NYCW0018	35	24.9	0.5	39.6	-33.64	1012	40	40
NYCW0017	33.1	22.1	2.2	42.6	0.55	1012	10	0
NYCW0019	0	0	20.6	79.4	-2.22	1013	0	0
NYCW0011	1.1	2	18	78.9	-0.78	1013	0	0
NYCW0005	0	0.8	20.1	79.1	-4.31	1013	0	0
NYCW0012	14.3	8	15.4	62.3	-4.4	1013	0	0
NYCW0006	22.6	12.5	10.6	54.3	-5.16	1013	0	0
NYCW0007	43.9	21.8	1.7	32.6	-55.65	1013	30	30
NYCW0004	43.1	24.9	0.2	31.8	-20.67	1013	40	40
NYCW0003	40.4	23.4	4.1	32.1	-9.71	1013	0	2
NYCW0002	1.3	6.5	14.9	77.3	-0.3	1014	0	0
NYCW0008	65.9	28.9	1.3	3.9	-51.75	1014	60	70
NYCW0008	64.3	28.4	1.6	5.7	-50.04	1014	70	70
NYCW0010	70.6	19	1.4	9	-53.93	1014	15	25
NYCW0010	70.8	19	1.4	8.8	-56.31	1014	25	25
NYCW0009	48.1	27.3	0.7	23.9	-48.48	1015	45	45
NYCW0022	46.2	27.8	0.2	25.8	-3.28	1014	10	10
NYCW0021	0	0.1	20.9	78.8	-1.02	1013	0	0
NYCW0023	53.6	29.6	0.2	16.6	-2.84	1013	0	10
NYCW0023	54.1	29.1	0.1	16.7	-4.66	1013	10	10
NYCW0025	74	21.8	0.2	4	-2.27	1013	0	15
NYCW0025	71.1	22.1	0.1	6.7	-3.23	1013	15	15
NYCW0024	19.6	6.4	10.4	63.6	-2.26	1013	0	0
NYCW0027	42.5	15.8	1.2	40.5	-3	1013	25	25
NYCW0029	40.2	27.9	0.1	31.8	-11.69	1014	25	25
NYCW0031	0	1.5	19.8	78.7	-1.63	1014	0	0
NYCW0033	37	24.6	1.5	36.9	-12.27	1013	15	15
NYCW1021	0.1	0.1	19.9	79.9	-1.42	991	0	0
NYCW1021	0.1	0.1	20.1	79.7	-1.4	990	0	0
NYCW1019	13.2	16.4	0.2	70.2	-0.97	995	10	0
NYCW1020	12.5	15.5	0.1	71.9	-1.04	996	10	0
NYCW0055	38.2	19.2	0.4	42.2	-2.57	996	10	5
NYCW0055	0.2	2	19.1	78.7	-2.03	995	5	0
NYCW0054	14.7	15.1	0.5	69.7	-2.24	995	15	0
NYCL0003	18.5	16.7	0.1	64.7	-5.56	995	10	0

Stage 1 Walkover: Calibration Certificate

GES

Gas & Environmental Services Ltd

British Gas approved test house *Repair and maintenance of electronic equipment*

Unit 1, Little Ridge Industrial Estate
WELWYN GARDEN CITY
Hertfordshire, AL7 2BH

Telephone: 01707 373751
Fax: 01707 373752
E-mail: Katie@gesuk.com
Website: www.gesuk.com

Certificate of test and calibration

Calibration date 17th April 2014

Instrument details Gastec

Serial number 6335

Customer SLR Consulting Ltd

The above instrument has been serviced in accordance with the manufacturers and British Gas recommended procedures for recalibration and checking of Gastec mk4 gas detectors.

The instrument was calibrated using gas standards that are traceable to national standards.

The instrument meets the requirements of British Gas standards, provided it is used and maintained in accordance with the manufacturers instructions

Recalibration is recommended to be carried out at six months from the date on this certificate.

Methane Gas standard	Range	Readings	Cylinder number
80 ppm	One	80ppm	APLA003683
500 ppm	One	520ppm	APLPT04308
800 ppm	One	800ppm	APE576028
80 ppm	Two	80ppm	APLA003683
500 ppm	Two	520ppm	APLPT04308
800 ppm	Two	800ppm	APE576028
8000 ppm	Two	8000ppm	FA003847

Cliff Smith
Gas & Environmental Services Ltd

Registered in England No. 3018793 VAT Number: 640 1570 72
Registered Office: Unit 3 - Little Ridge Industrial Estate - Welwyn Garden City - Hertfordshire - AL7 2BH

APPENDIX C: SITE CHARACTERISATION SUMMARY

Site Name / Address: Nantycaws Landfill
Llanddarog Road
Nantycaws
Carmarthen
Carmarthenshire
SA32 8BG

Licence/permit no: CP3735PB

Licence/permit holder: CWM Environmental Ltd

Site Characterisation Summary			
Basic Site Characteristics	Waste disposal area	Net site area	Approx. 80,000 m^2 (capped area)
		Permitted volume	970,000m^3 (net waste void)
		Planned life	Expected completion in 2018
	Primary engineering measures / designs	Liner design	Single Clay
		Permanent capping design	Geomembrane cap / restored grassland
		Final surface side slope characteristics	Geomembrane cap / restored grassland
Current Site Status	Waste / Capping and Filling	Permanently capped zone and number of gas wells / other extraction methods	Permanent Cap; Zones 1A, 1B, 1C, 1D + 1E
		Temporarily capped zone and number of gas wells / other extraction methods	Temporary Cap; Zones 2A, 2B
		Current filling area and nature of gas extraction	Currently filling in Cell 7A Only permanent gas extraction on permanently and temporary capped areas.
		Period since commencement of cell filling	Since January 2011
Waste Inputs	Permitted	Rate of infill	Non-hazardous waste:150,000 tonnes/year
	Actual	Waste composition (if different)	N/A
Active Environmental Controls	Gas management system(s)	Permanent controls	2 Engines (Jenbacher 420 & 320)
			1 Flare
	Normal condition of System	Normal gas abstraction rate	1,132m^3/hr
		Settings on the gas balancing system	Provided in Appendix D
		Normal oxygen content of gas	Provided in Appendix D

APPENDIX D: STAGE 2 FLUX MONITORING – SITE MONITORING DATA

Site Records

Weather	Temperature (ºC)	Wind Speed (m/s) (onsite readings)	Wind Direction	Pressure (mbar)
18th August 2014	15.8	8.6	NNW	1013
19th August 2014	15.1	2.5[(a)]	NW	1015
20th August 2014	15.3	1.6[(a)]	NW	1019

Table Note: Data from Pembrey Sands weather station
(a) Onsite readings taken using handheld wind vain anemometer

Site Conditions		
Current gas abstraction rate		See gas balancing survey
Current suction of the field		See gas balancing survey
Settings on gas balancing system		See gas balancing survey
Methane content of extracted gas		See gas balancing survey
Current oxygen content of extracted gas		See gas balancing survey
General nature of cap	Zone 1A	Permanent cap, grassed restoration
	Zone 1B	Permanent cap, grassed restoration
	Zone 1C	Permanent cap, LLDPE, unvegetated
	Zone 1D	Permanent cap, grassed restoration
	Zone 1E	Permanent cap, grassed restoration
	Zone 2A	Temporary Cap, vegetated
	Zone 2B	Temporary Cap, LLDPE, unvegetated

Zone	Surface Area (m^2)	No. Flux Locations	Ref. No. Raw Data Monitoring Sheet
1D	5,171	17	Appendix E L1-L17
1E	6,465	18	Appendix E L18-L34

Stage 2 Flux Survey- Site Photographs

Photo 16: Remediated NWYC901

Photo 17: Remedaited SN 46905 17196

Photo 18: Remediated NWYC 1203

Photo 19: Remediated NYWC906

Photo 20: Remediated E2-E5

Photo 21: Remedaited E6

Stage 2 Site Data - Gas Balancing Survey

Gas Data Recorded during August

Engines: 2 Flares: 1

Well No	Date	CH4	CO2	O2	Balance Gas	Vacuum	Atmos. Pressure	Original Valve Position	New Valve Position
		%	%	%	%	mb	mb	%	% Open
NYCW0035	04/08/2014	16.1	4.2	14	65.7	0.14	998	0	0
NYCW0056	04/08/2014	51.6	20.1	0.1	28.2	0.06	998	10	15
NYCW0056	04/08/2014	49.9	21.5	0.1	28.5	-0.48	998	15	15
NYCW1019	04/08/2014	63.6	14.9	1.3	20.2	0.28	998	15	20
NYCW1019	04/08/2014	67	16.4	0.3	16.3	-0.04	998	0	20
NYCW0055	04/08/2014	22	6.4	12.5	59.1	-0.24	998	0	0
NYCW1020	04/08/2014	38.4	17.4	0.2	44	-0.38	998	0	0
NYCW1021	04/08/2014	23.8	13.9	4.8	57.5	0	998	0	0
NYCW0054	04/08/2014	-	-	-	-	-	-	-	-
NYCL0003	04/08/2014	44.1	18.3	0.2	37.4	-1.77	998	10	10
NYCW0036	04/08/2014	0.1	1.7	20.4	77.8	-0.64	998	0	0
NYCW0037	04/08/2014	40.7	19.4	0.3	39.6	-22.12	998	20	10
NYCW0037	04/08/2014	39.8	21	0.2	39	-13.82	999	10	10
NYCW0053	04/08/2014	47.1	18.7	6.5	27.7	-1.08	999	0	0
NYCL0004	04/08/2014	53.3	28.6	1.4	16.7	-9.33	998	40	50
NYCL0004	04/08/2014	53.1	29.7	1.3	15.9	-9.83	998	50	50
NYCL0003	04/08/2014	35.5	28.7	0.3	35.5	0.01	998	35	20
NYCL0003	04/08/2014	37.2	29	0.3	33.5	0.34	998	20	20
NYCL0013	04/08/2014	37.2	29	0.3	33.5	0.34	998	20	20
NYCW0901	04/08/2014	54.6	34.6	0.1	10.7	-11.79	998	25	30
NYCW0901	04/08/2014	54.1	34.8	0.1	11	-18.7	998	30	30
NYCW0902	04/08/2014	55.9	36.2	1.3	6.6	-21.08	998	25	25
NYCW0903	04/08/2014	58.4	40	0.2	1.4	-25.42	998	100	100
NYCW1002	04/08/2014	60.4	38.6	0.1	0.9	-25.43	998	100	100
NYCW1003	04/08/2014	60.1	39	0.1	0.8	-14.22	998	100	100
NYCW1006	04/08/2014	51	35.6	0.1	13.3	-7.52	998	25	30
NYCW1006	04/08/2014	50.7	36	0.1	13.2	-9.98	998	30	30
NYCW1007	04/08/2014	50	35.9	0.1	14	-2.71	998	25	30
NYCW1007	04/08/2014	50	36.1	0.1	13.8	-5.16	998	30	30
NYCW1008	04/08/2014	0.2	2	20.3	77.5	-9.87	998	25	0
NYCW1005	04/08/2014	55	35.8	0.2	9	-25.01	998	100	100
NYCW1004	04/08/2014	48.5	35.6	2.8	13.1	-24.01	998	10	10
NYCR1001	04/08/2014	54.9	37.4	1.4	6.3	-24.88	997	100	100
NYCR0905	04/08/2014	61.4	37.7	0.1	0.8	-24.26	997	100	100
NYCW0906	04/08/2014	61.7	38.2	0.1	0	-21.48	998	100	100
NYCL0006	04/08/2014	61.2	38	0.1	0.7	-24.02	997	100	100
NYCL0007	04/08/2014	61.2	38	0.1	0.7	-24.02	997	100	100
NYCW1201	04/08/2014	4.4	6.9	12.4	76.3	-17.47	998	0	0
NYCW1202	04/08/2014	55.6	42.2	0.2	2	53.05	998	0	0
NYCW1203	04/08/2014	61.1	39.3	0.2	0	-26.04	998	40	40
NYCW1209	04/08/2014	25.7	30.6	5	38.7	0.05	998	0	0
NYCW1210	04/08/2014	6.7	16.4	14.2	62.7	0.08	999	0	0
NYCW1206	04/08/2014	61	40.4	0.1	0	-25.81	998	55	25
NYCW1206	04/08/2014	60.9	40.3	0.1	0	12.17	998	5	25

Well No	Date	CH4	CO2	O2	Balance Gas	Vacuum	Atmos. Pressure	Original Valve Position	New Valve Position
NYCW0907	04/08/2014	60.9	38.6	0.1	0.4	-10.82	998	10	20
NYCW0907	04/08/2014	59.9	39.4	0.1	0.6	-15.77	998	20	20
NYCW0712	04/08/2014	57.4	42.7	0.1	0	-26.71	998	100	100
NYCW0908	04/08/2014	61.4	39	0.1	0	-19.95	998	60	65
NYCW0908	04/08/2014	61.5	39.1	0.1	0	-21.17	998	65	65
NYCW0909	04/08/2014	61.5	39.2	0.1	0	-2.41	998	10	10
NYCW1101	04/08/2014	49.8	22.7	0.2	27.3	-16.15	998	10	15
NYCW1101	04/08/2014	49.3	23	0.2	27.5	-20.5	999	15	15
NYCW0904	04/08/2014	65.6	33.8	0.1	0.5	-18.67	999	25	30
NYCW0904	04/08/2014	64.9	34.1	0.1	0.9	-22.33	999	30	30
NYCW1102	04/08/2014	54.6	34.9	0.1	10.4	-16.03	999	25	30
NYCW1102	04/08/2014	54.2	35.3	0.1	10.4	-21.34	999	30	30
NYCW1103	04/08/2014	60.5	39.9	0.1	0	-27.73	999	100	100
NYCW1104	04/08/2014	58.6	36.4	0.1	4.9	-27.34	999	100	100
NYCW0912	04/08/2014	58.5	41.4	0.1	0	-2.96	999	20	25
NYCW0912	04/08/2014	58.4	41.9	0.1	0	-3.46	999	25	25
NYCW0913	04/08/2014	57.6	40.3	0.1	2	-26.73	999	100	100
NYCW0709	04/08/2014	49.1	35.5	0.1	15.3	-13.19	999	10	10
NYCW0910	04/08/2014	58.5	41.3	0.1	0.1	-1.37	999	10	15
NYCW0910	04/08/2014	57.2	42	0.2	0.6	-2.7	999	15	15
NYCW0710	04/08/2014	47	32.5	0.1	20.4	-9.89	999	10	10
NYCW0711	04/08/2014	58.7	41	0.1	0.2	-26.82	999	100	100
NYCW1009	04/08/2014	59.2	36.8	0.1	3.9	-22.8	999	25	30
NYCW1009	04/08/2014	59.4	36.5	0.1	4	-24.79	999	30	30
NYCW0911	04/08/2014	58.1	38.4	0.1	3.4	-26.58	999	100	100
NYCL0007	04/08/2014	37.5	26.9	7.2	28.4	-25.58	999	100	50
NYCL0007	04/08/2014	40	28.6	6.3	25.1	-26.26	999	50	50
NYCW1013	05/08/2014	45.8	35.5	0.8	17.9	-2.91	999	25	25
NYCW1014	05/08/2014	48.4	32.9	0.4	18.3	-21.87	997	50	50
NYCW1015	05/08/2014	57.1	33.2	0.1	9.6	-0.7	997	20	25
NYCW1015	05/08/2014	56.7	33.7	0.1	9.5	-1.65	997	25	25
NYCW1016	05/08/2014	44.7	28.6	0.2	26.5	-0.09	997	15	15
NYCW0508	05/08/2014	54	29.8	0.5	15.7	-2.04	997	10	10
NYCL0008	05/08/2014	20.3	11.2	12.2	56.3	-0.41	997	15	0
NYCW1017	05/08/2014	47.6	26.7	0.2	25.5	-0.69	997	10	10
NYCW0509	05/08/2014	46.9	24.5	0.1	28.5	-0.41	997	10	10
NYCW1018	05/08/2014	56	33.8	0.1	10.1	-0.74	997	5	10
NYCW1018	05/08/2014	55.9	34.2	0.1	9.8	-1.04	997	10	10
NYCL0009	05/08/2014	53.9	37.9	0.1	8.1	-0.03	997	15	20
NYCL0009	05/08/2014	52	37.9	0.1	10	-0.65	997	20	20
NYCP0012	05/08/2014	68.1	26.9	0.1	4.9	0.72	997	5	10
NYCP0012	05/08/2014	67.3	27.3	0.1	5.3	0.56	997	0	10
NYCP0011	05/08/2014	75	20	0.2	4.8	0.82	997	5	10
NYCP0011	05/08/2014	74.2	20.5	0.2	5.1	0.66	997	10	10
NYCP0010	05/08/2014	44.2	30.1	0.1	25.6	-0.56	998	5	5
NYCP0009	05/08/2014	62	31.3	1.1	5.6	0.69	997	5	10
NYCP0009	05/08/2014	56.4	29.7	2	11.9	0.55	997	10	10
NYCP0007	05/08/2014	65.6	24.9	0.3	9.2	0.78	998	3	10
NYCP0007	05/08/2014	65.7	25.1	0.3	8.9	0.35	998	10	10
NYCW0511	05/08/2014	45	32.7	0	22.3	-2.69	998	20	20
NYCW0512	05/08/2014	-	-	-	-	-	-	-	-
NYCW0513	05/08/2014	62.5	39.3	0.1	0	2.04	998	0	0

Well No	Date	CH4	CO2	O2	Balance Gas	Vacuum	Atmos. Pressure	Original Valve Position	New Valve Position
NYCL0010	05/08/2014	58.3	41.9	0.3	0	-21.54	997	100	100
NYCW1012	05/08/2014	57.7	38.8	0.1	3.4	-22.73	998	65	70
NYCW1012	05/08/2014	57.8	38.7	0.1	3.4	-23.92	998	70	70
NYCW1011	05/08/2014	57.3	37.8	0.1	4.8	-8.63	998	30	40
NYCW1011	05/08/2014	57.2	37.8	0.1	4.9	-10.15	998	40	40
NYCW1010	05/08/2014	41.8	30.1	5.9	22.2	-0.09	998	0	0
NYCL0001	05/08/2014	53.5	31.1	0.1	15.3	-4.55	1000	30	35
NYCL0001	05/08/2014	53.2	31	0.1	15.7	-7.3	1000	35	35
NYCL0002	05/08/2014	47	29.6	0.1	23.3	-3.9	1000	25	30
NYCL0002	05/08/2014	47.1	29.5	0.1	23.3	-5.44	1000	30	30
NYCW0704	05/08/2014	58.1	37.6	0.1	4.2	-24.73	1000	100	100
NYCW0703	05/08/2014	57.9	39.6	0.1	2.4	-24.84	1000	60	70
NYCW0703	05/08/2014	58.1	39.6	0	2.3	-24.9	1000	70	70
NYCW0605	05/08/2014	59.8	36.1	0	4.1	-24.49	1000	60	70
NYCW0016	05/08/2014	64.8	28.3	1	5.9	-0.23	1001	0	5
NYCW0013	05/08/2014	20.2	16.2	2.8	60.8	-0.41	1001	0	0
NYCW0014	05/08/2014	0.3	4.3	13.1	82.3	0.21	1001	0	0
NYCW0018	05/08/2014	49.8	24.4	1.6	24.2	-5.78	1001	30	30
NYCW0011	05/08/2014	1.6	1.8	17	79.6	0	1001	0	0
NYCW0005	05/08/2014	0.3	0.9	18.9	79.9	-1.61	1001	0	0
NYCW0012	05/08/2014	43	25.2	2.9	28.9	-1.11	1001	0	0
NYCW0006	05/08/2014	33.6	20.7	3.4	42.3	-1.49	1001	0	0
NYCW0007	05/08/2014	48.3	24.6	0.1	27	-25.28	1001	40	40
NYCW0004	05/08/2014	42.6	24.1	0.1	33.2	-10.03	1002	40	40
NYCW0003	05/08/2014	52.7	27.9	0.9	18.5	-2.41	1002	0	10
NYCW0002	05/08/2014	67.2	32.4	0.1	0.3	-0.03	1002	5	5
NYCW0008	05/08/2014	66.3	32.3	0.5	0.9	-23.64	1002	70	80
NYCW0010	05/08/2014	82.9	15.9	0.1	1.1	-25.33	1002	50	60
NYCW0009	05/08/2014	59.5	29.8	0.2	10.5	-24.98	1002	45	55
NYCW0022	05/08/2014	44	26.1	0	29.9	-1.17	1001	10	10
NYCW0021	05/08/2014	39.9	23.9	0.1	36.1	-0.56	1001	5	5
NYCW0023	05/08/2014	50.6	28.6	0.2	20.6	-17.28	1001	20	20
NYCW0025	05/08/2014	46.8	22.8	0.1	30.3	-0.41	1001	15	15
NYCW0024	05/08/2014	17	10.2	6.8	66	-0.46	1000	0	0
NYCW0027	05/08/2014	51	26.2	0.1	22.7	-0.85	1000	25	25
NYCW0029	05/08/2014	52.8	28.8	0.1	18.3	-0.87	1001	25	25
NYCW0031	05/08/2014	0.2	0.4	19.8	79.6	-0.16	1001	0	0
NYCW0033	05/08/2014	48.2	27.6	0.6	23.6	-4.77	1000	15	15
NYCW1201	19/08/2014	32.7	5.9	0.9	60.5	1.27	998	0	0
NYCW1202	19/08/2014	54	42	0.1	3.9	110.55	995	0	0
NYCW1206	19/08/2014	61.1	39.9	0.1	0	13.84	995	25	25
NYCW1202	27/08/2014	51	44.8	0	4.2	106.68	995	0	0
NYCW1201	27/08/2014	39.2	7.7	1.4	51.7	5.35	994	0	0

Stage 2 Site Data and Re-survey- GasTec Calibration Certifications

GES

Gas & Environmental Services Ltd

British Gas approved test house *Repair and maintenance of electronic equipment*

Unit 1, Little Ridge Industrial Estate
WELWYN GARDEN CITY
Hertfordshire, AL7 2BH

Telephone: 01707 373751
Fax: 01707 373752
E-mail: Katie@gesuk.com
Website: www.gesuk.com

Certificate of test and calibration

Calibration date 1st April 2014

Instrument details Gastec

Serial number 800

Customer SLR Consulting Ltd

The above instrument has been serviced in accordance with the manufacturers and British Gas recommended procedures for recalibration and checking of Gastec mk4 gas detectors.

The instrument was calibrated using gas standards that are traceable to national standards.

The instrument meets the requirements of British Gas standards, provided it is used and maintained in accordance with the manufacturers instructions

Recalibration is recommended to be carried out at six months from the date on this certificate.

Methane Gas standard	Range	Readings	Cylinder number
80 ppm	One	80ppm	APLA003683
500 ppm	One	500ppm	APLPT04308
800 ppm	One	780ppm	APE576028
80 ppm	Two	80ppm	APLA003683
500 ppm	Two	500ppm	APLPT04308
800 ppm	Two	800ppm	APE576028
8000 ppm	Two	7700ppm	FA003847

Cliff Smith
Gas & Environmental Services Ltd

Registered in England No. 3018793 VAT Number: 640 1570 72
Registered Office: Unit 3 - Little Ridge Industrial Estate - Welwyn Garden City - Hertfordshire - AL7 2BH

GES

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British Gas approved test house *Repair and maintenance of electronic equipment*

Unit 1, Little Ridge Industrial Estate
WELWYN GARDEN CITY
Hertfordshire, AL7 2BH

Telephone: 01707 373751
Fax: 01707 373752
E-mail: Katie@gesuk.com
Website: www.gesuk.com

Certificate of test and calibration

Calibration date 17th April 2014

Instrument details Gastec

Serial number 6335

Customer SLR Consulting Ltd

The above instrument has been serviced in accordance with the manufacturers and British Gas recommended procedures for recalibration and checking of Gastec mk4 gas detectors.

The instrument was calibrated using gas standards that are traceable to national standards.

The instrument meets the requirements of British Gas standards, provided it is used and maintained in accordance with the manufacturers instructions

Recalibration is recommended to be carried out at six months from the date on this certificate.

Methane Gas standard	Range	Readings	Cylinder number
80 ppm	One	80ppm	APLA003683
500 ppm	One	520ppm	APLPT04308
800 ppm	One	800ppm	APE576028
80 ppm	Two	80ppm	APLA003683
500 ppm	Two	520ppm	APLPT04308
800 ppm	Two	800ppm	APE576028
8000 ppm	Two	8000ppm	FA003847

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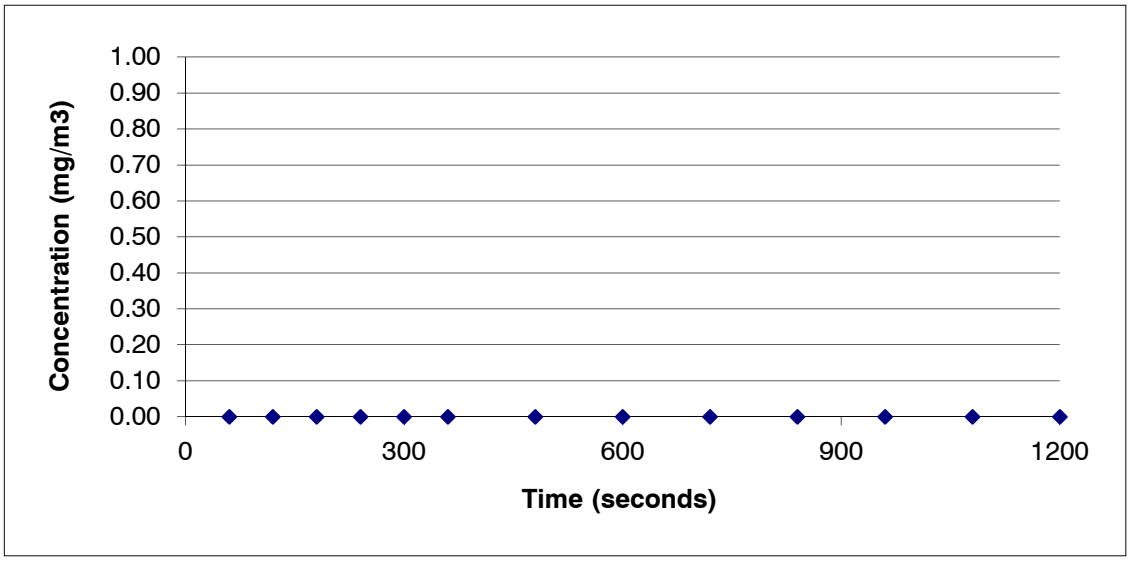
Registered Office: Unit 3 - Little Ridge Industrial Estate - Welwyn Garden City - Hertfordshire - AL7 2BH

APPENDIX E: FLUX SURVEY RESULTS

Location No. 1



Survey Details

Date	19.8.14
Start Time	13:40
Location (OS *X* m)	246887
Location (OS *Y* m)	217494

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.9
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	N/A
dC/dT	0.000000

Result ($mg/m^2/sec$)

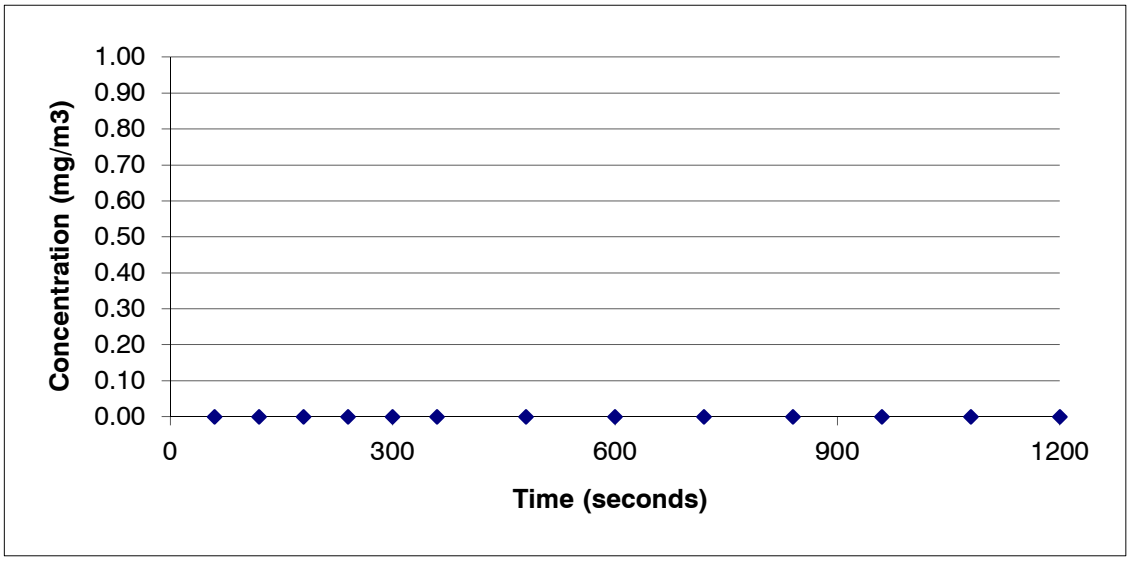
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 2



Survey Details

Date	19.8.14
Start Time	13:10
Location (OS *X* m)	246903
Location (OS *Y* m)	217505

Meteorological Conditions

Temperature (˚c)	16.0
Wind Speed (m/s)	1.9
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	N/A
dC/dT	0.000000

Result ($mg/m^2/sec$)

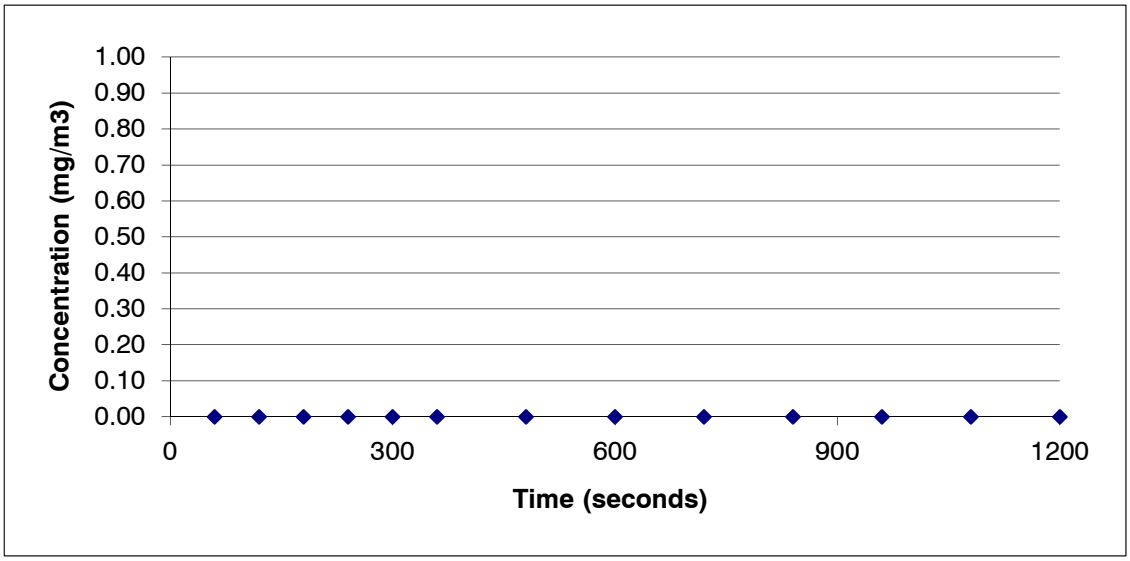
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 3



Survey Details

Date	19.8.14
Start Time	14:35
Location (OS *X* m)	246920
Location (OS *Y* m)	217512

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.9
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	N/A
dC/dT	0.000000

Result ($mg/m^2/sec$)

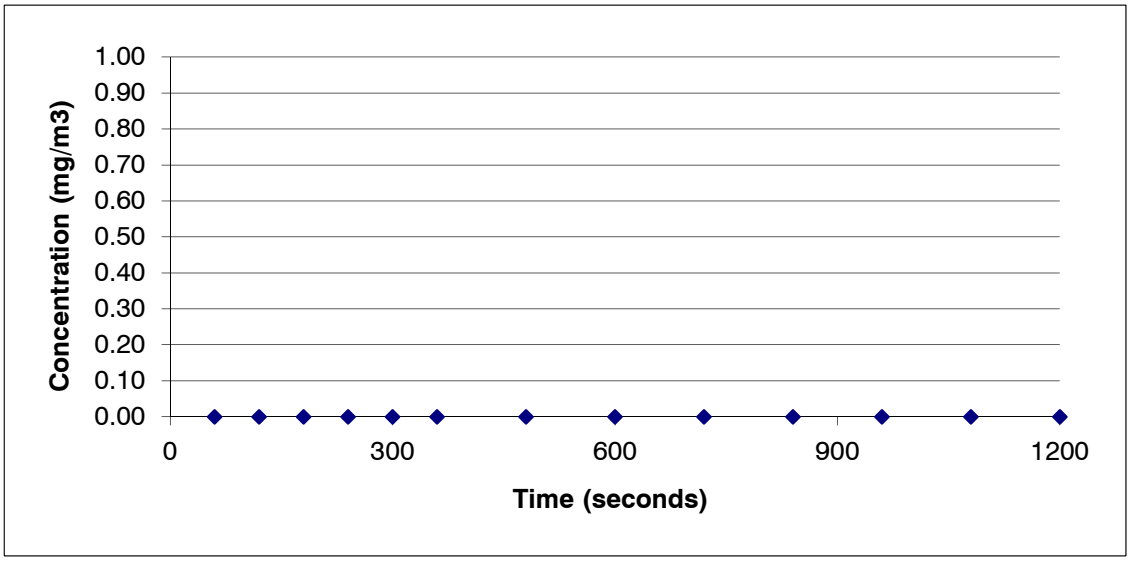
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 4



Survey Details

Date	19.8.14
Start Time	11:55
Location (OS *X* m)	246895
Location (OS *Y* m)	217478

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	2.7
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	N/A
dC/dT	0.000000

Result ($mg/m^2/sec$)

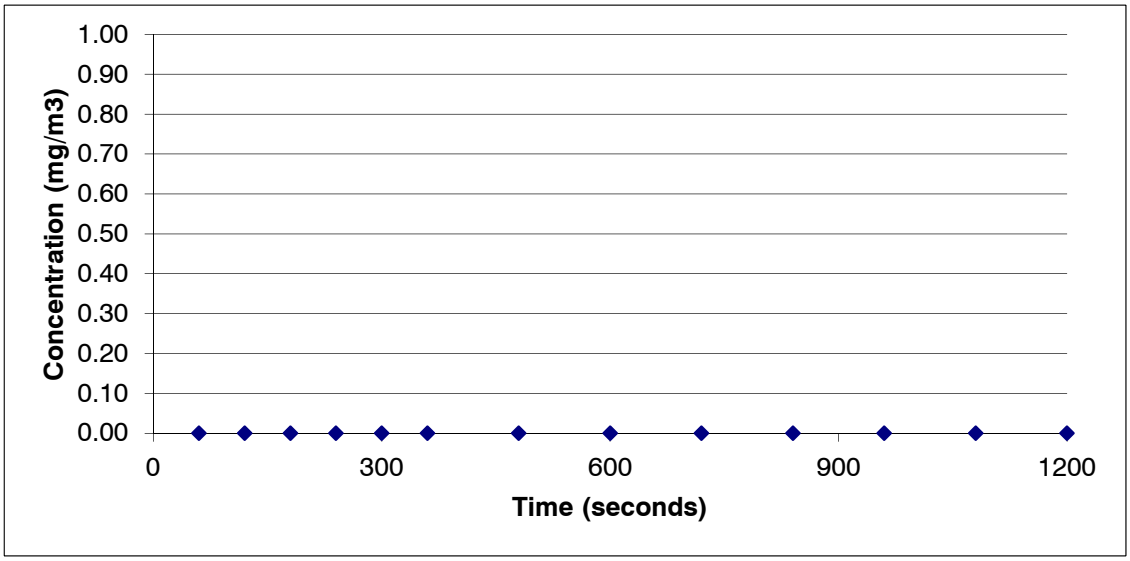
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 5



Survey Details

Date	19.8.14
Start Time	12:25
Location (OS *X* m)	246910
Location (OS *Y* m)	217487

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	2.7
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	N/A
dC/dT	0.000000

Result ($mg/m^2/sec$)

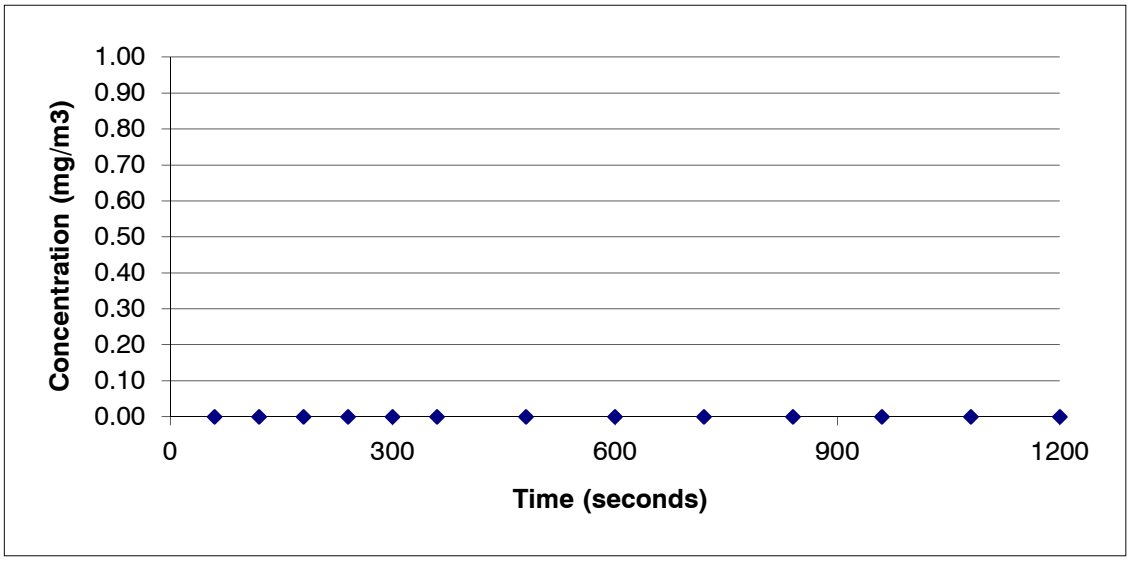
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 6



Survey Details

Date	19.8.14
Start Time	13:00
Location (OS *X* m)	246928
Location (OS *Y* m)	217500

Meteorological Conditions

Temperature (˚c)	16.0
Wind Speed (m/s)	1.9
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	N/A
dC/dT	0.000000

Result ($mg/m^2/sec$)

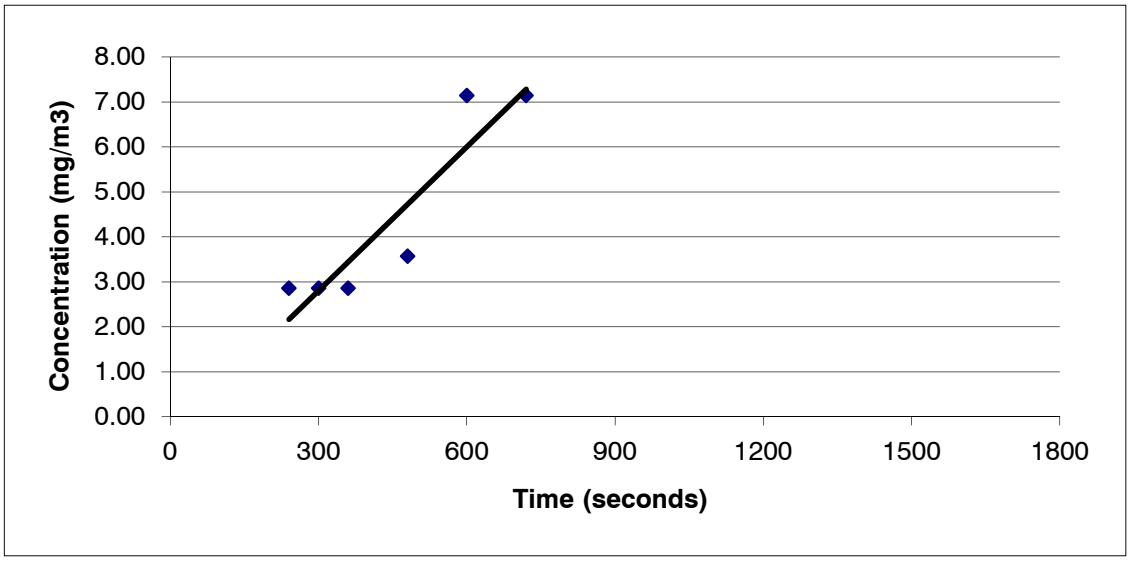
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 7



Survey Details

Date	19.8.14
Start Time	16:05
Location (OS *X* m)	246904
Location (OS *Y* m)	217462

Meteorological Conditions

Temperature (˚c)	16.0
Wind Speed (m/s)	2.8
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	0.848
dC/dT	0.011

Result ($mg/m^2/sec$)

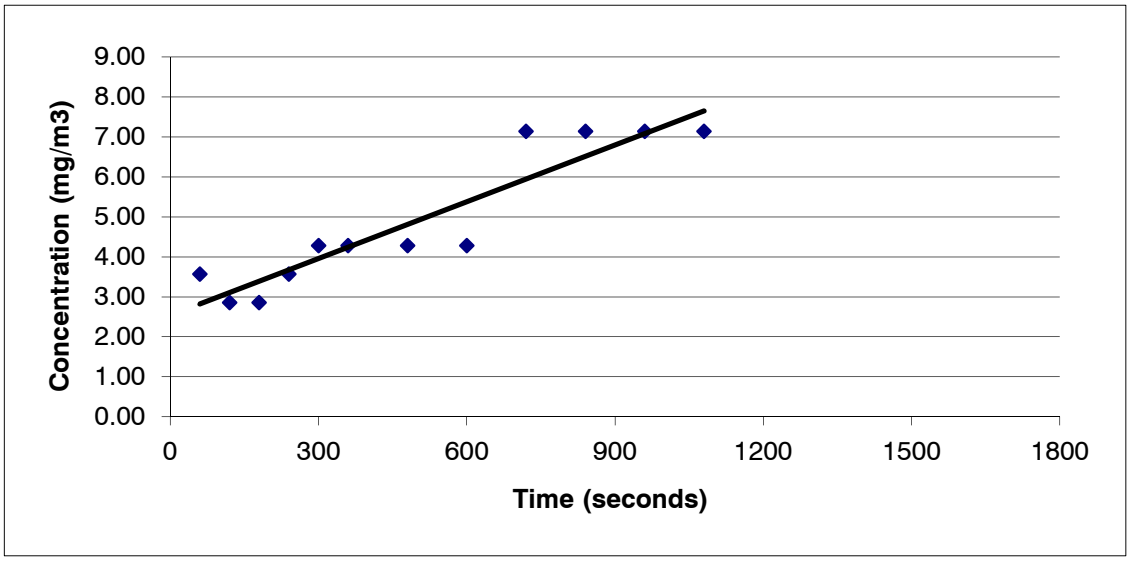
CH_4 Flux	0.0026

Action required?	**YES**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	3.57
120	3.57
180	3.57
240	2.86
300	2.86
360	2.86
480	3.57
600	7.14
720	7.14
840	5.71
960	3.57
1080	7.14
1200	7.14
1320	7.14
1440	7.14
1560	7.14
1680	7.14
1800	3.57

Location No. 8



Survey Details

Date	19.8.14
Start Time	15:30
Location (OS *X* m)	246918
Location (OS *Y* m)	217472

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.5
Wind Direction	NNW
Pressure (Mb)	1016.0

Data Analysis

R^2	0.863
dC/dT	0.004735

Result ($mg/m^2/sec$)

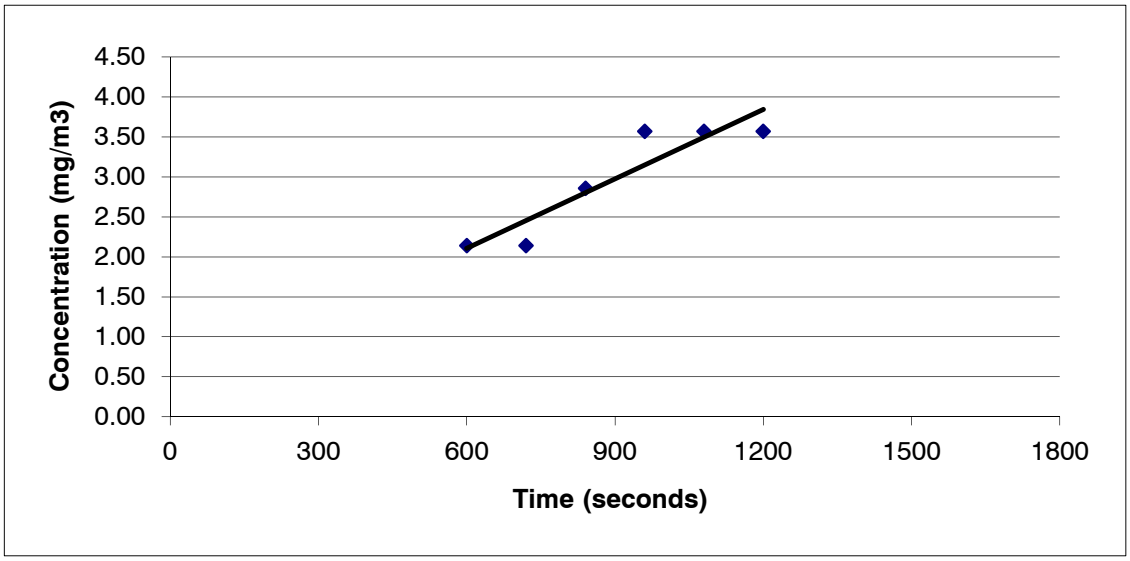
CH_4 Flux	0.001134

Action required?	**YES**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	3.57
120	2.86
180	2.86
240	3.57
300	4.29
360	4.29
480	4.29
600	4.29
720	7.14
840	7.14
960	7.14
1080	7.14
1200	5.71
1320	5.71
1440	7.14
1560	7.14
1680	5.71
1800	5.71

Location No. 9



Survey Details

Date	19.8.14
Start Time	15:00
Location (OS *X* m)	246934
Location (OS *Y* m)	217480

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.5
Wind Direction	NNW
Pressure (Mb)	1016.0

Data Analysis

R^2	0.854
dC/dT	0.002891

Result (mg/m^2/sec)

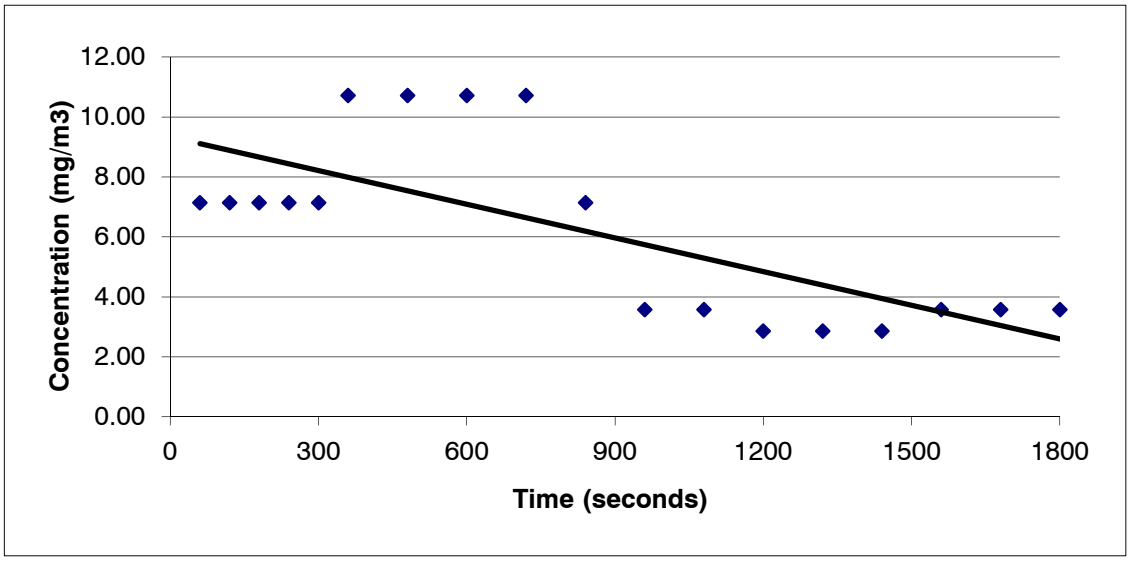
CH_4 Flux	0.000692

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	2.86
120	2.86
180	2.86
240	3.57
300	3.57
360	3.57
480	2.86
600	2.14
720	2.14
840	2.86
960	3.57
1080	3.57
1200	3.57
1320	2.86
1440	3.57
1560	2.86
1680	2.14
1800	2.14

Location No. 10



Survey Details

Date	19.8.14
Start Time	14:30
Location (OS *X* m)	246918
Location (OS *Y* m)	217448

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.9
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	0.806
dC/dT	-0.008334

Result ($mg/m^2/sec$)

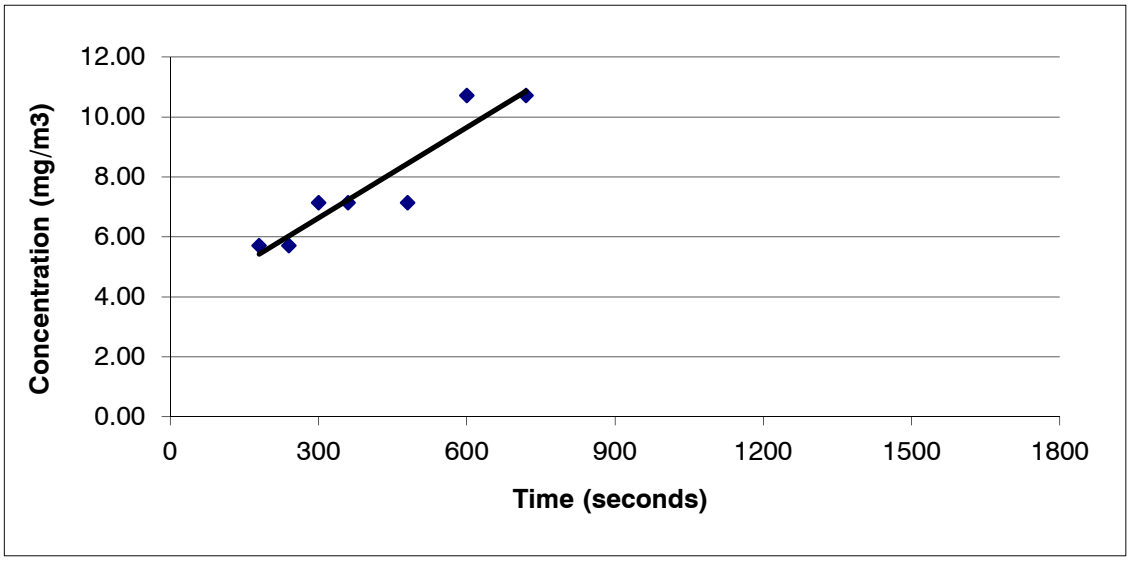
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	7.14
120	7.14
180	7.14
240	7.14
300	7.14
360	10.71
480	10.71
600	10.71
720	10.71
840	7.14
960	3.57
1080	3.57
1200	2.86
1320	2.86
1440	2.86
1560	3.57
1680	3.57
1800	3.57

Location No. 11



Survey Details

Date	19.8.14
Start Time	13:55
Location (OS *X* m)	246936
Location (OS *Y* m)	217460

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.9
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	0.878
dC/dT	0.010069

Result ($mg/m^2/sec$)

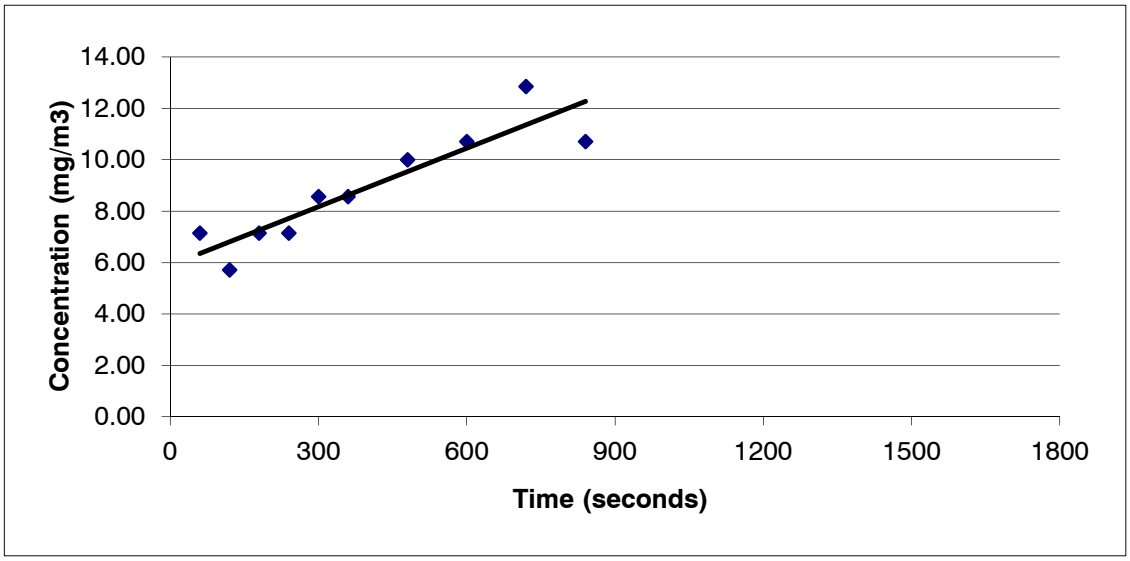
CH_4 Flux	0.002411

Action required?	**YES**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	9.29
120	7.14
180	5.71
240	5.71
300	7.14
360	7.14
480	7.14
600	10.71
720	10.71
840	7.14
960	10.71
1080	10.71
1200	7.14
1320	10.71
1440	8.57
1560	10.71
1680	10.71
1800	7.14

Location No. 12



Survey Details

Date	19.8.14
Start Time	12:30
Location (OS *X* m)	246919
Location (OS *Y* m)	217420

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	2.7
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	0.831
dC/dT	0.007592

Result (mg/m^2/sec)

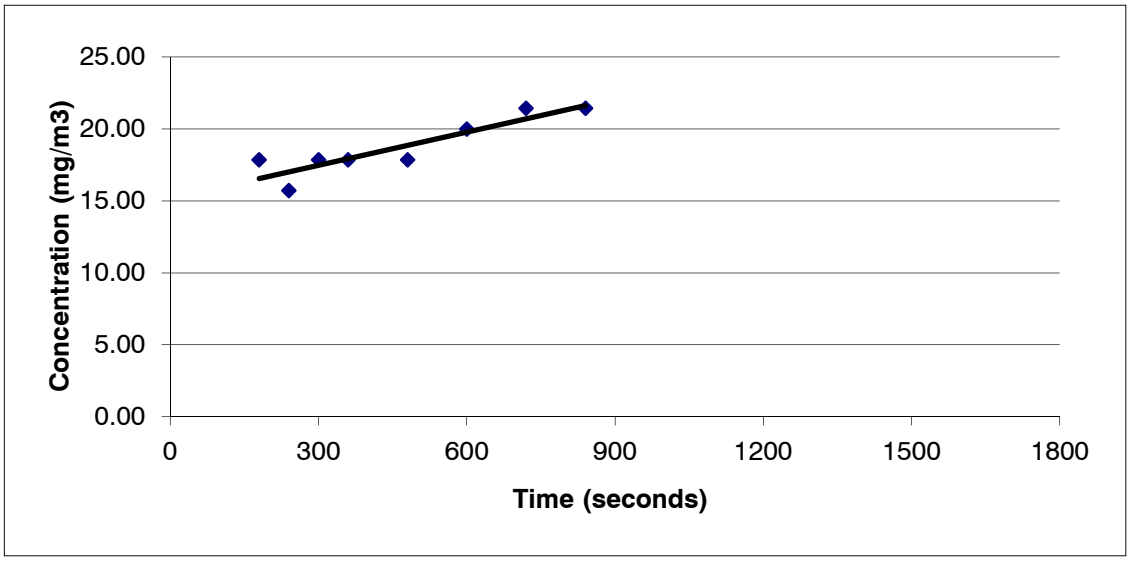
CH_4 Flux	0.001818

Action required?	**YES**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	7.14
120	5.71
180	7.14
240	7.14
300	8.57
360	8.57
480	10.00
600	10.71
720	12.86
840	10.71
960	10.71
1080	9.29
1200	9.29
1320	7.14
1440	5.71
1560	3.57
1680	7.14
1800	5.71

Location No. 13



Survey Details

Date	19.8.14
Start Time	13:05
Location (OS *X* m)	246934
Location (OS *Y* m)	217433

Meteorological Conditions

Temperature (˚c)	16.0
Wind Speed (m/s)	1.9
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	0.818
dC/dT	0.007665

Result ($mg/m^2/sec$)

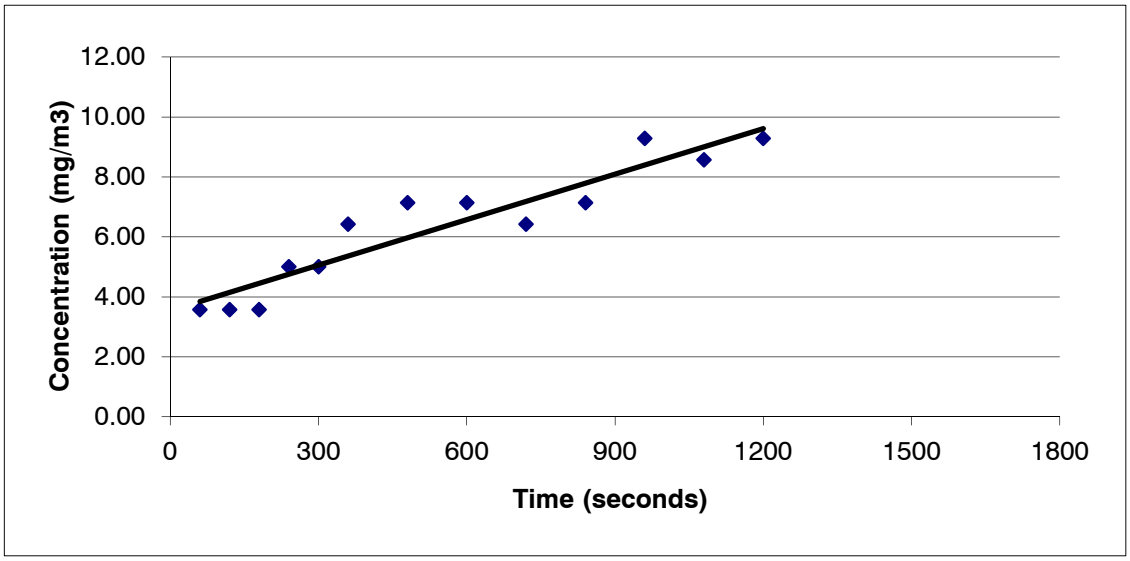
CH_4 Flux	0.001836

Action required?	**YES**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	17.86
120	17.86
180	17.86
240	15.71
300	17.86
360	17.86
480	17.86
600	20.00
720	21.43
840	21.43
960	20.00
1080	21.43
1200	21.43
1320	21.43
1440	21.43
1560	17.86
1680	17.86
1800	17.86

Location No. 14



Survey Details

Date	19.8.14
Start Time	13:30
Location (OS *X* m)	246946
Location (OS *Y* m)	217442

Meteorological Conditions

Temperature (˚c)	16.0
Wind Speed (m/s)	1.9
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	0.879
dC/dT	0.005057

Result ($mg/m^2/sec$)

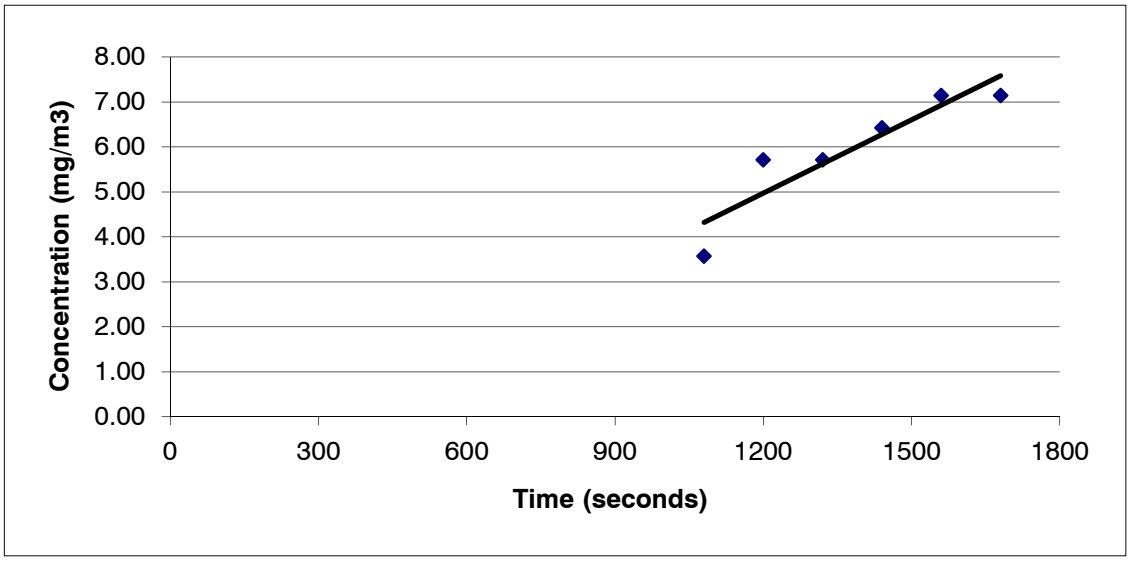
CH_4 Flux	0.001211

Action required?	**YES**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	3.57
120	3.57
180	3.57
240	5.00
300	5.00
360	6.43
480	7.14
600	7.14
720	6.43
840	7.14
960	9.29
1080	8.57
1200	9.29
1320	7.14
1440	7.14
1560	6.43
1680	7.14
1800	5.71

Location No. 15



Survey Details

Date	19.8.14
Start Time	10:55
Location (OS *X* m)	246934
Location (OS *Y* m)	217397

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	2.1
Wind Direction	NNW
Pressure (Mb)	1015.0

Data Analysis

R^2	0.844
dC/dT	0.005442

Result ($mg/m^2/sec$)

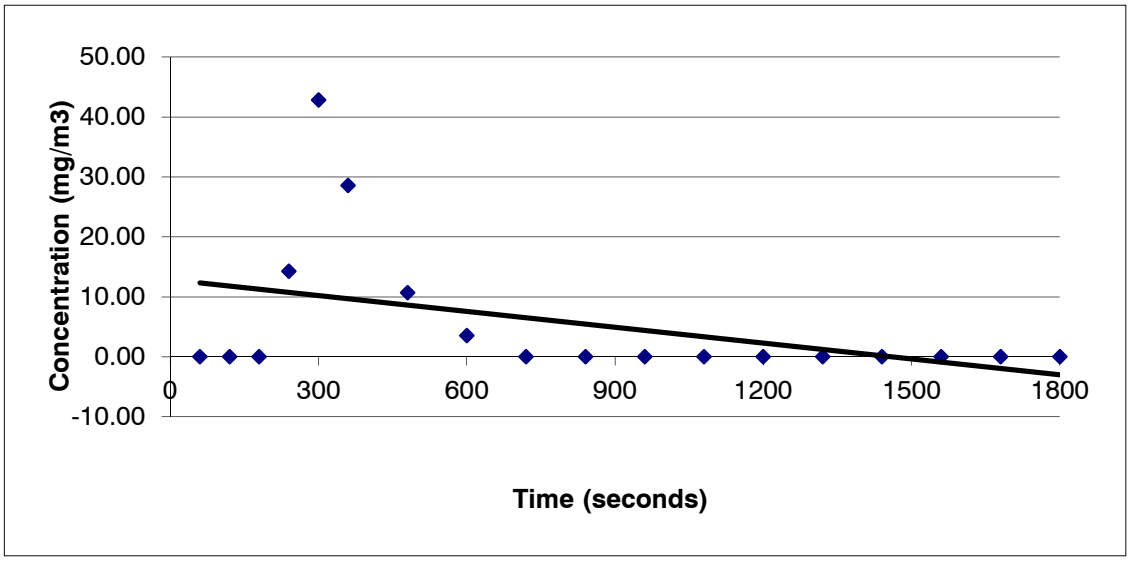
CH_4 Flux	0.001303

Action required?	**YES**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	14.29
120	14.29
180	14.29
240	14.29
300	14.29
360	10.71
480	8.57
600	7.14
720	7.14
840	7.14
960	7.14
1080	3.57
1200	5.71
1320	5.71
1440	6.43
1560	7.14
1680	7.14
1800	5.00

Location No. 16



Survey Details

Date	19.8.14
Start Time	11:25
Location (OS *X* m)	246944
Location (OS *Y* m)	217411

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	2.1
Wind Direction	NNW
Pressure (Mb)	1015.0

Data Analysis

R^2	0.820
dC/dT	-0.076322

Result (mg/m^2/sec)

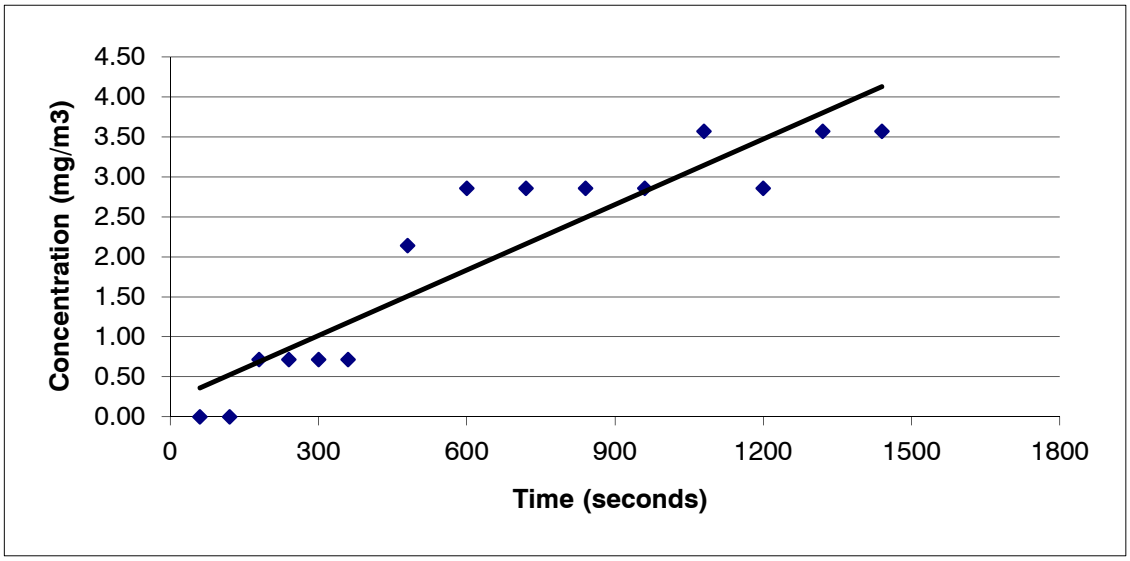
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	14.29
300	42.86
360	28.57
480	10.71
600	3.57
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00
1320	0.00
1440	0.00
1560	0.00
1680	0.00
1800	0.00

Location No. 17



Survey Details

Date	19.8.14
Start Time	12:00
Location (OS *X* m)	246955
Location (OS *Y* m)	217424

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	2.7
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	0.855
dC/dT	0.002729

Result ($mg/m^2/sec$)

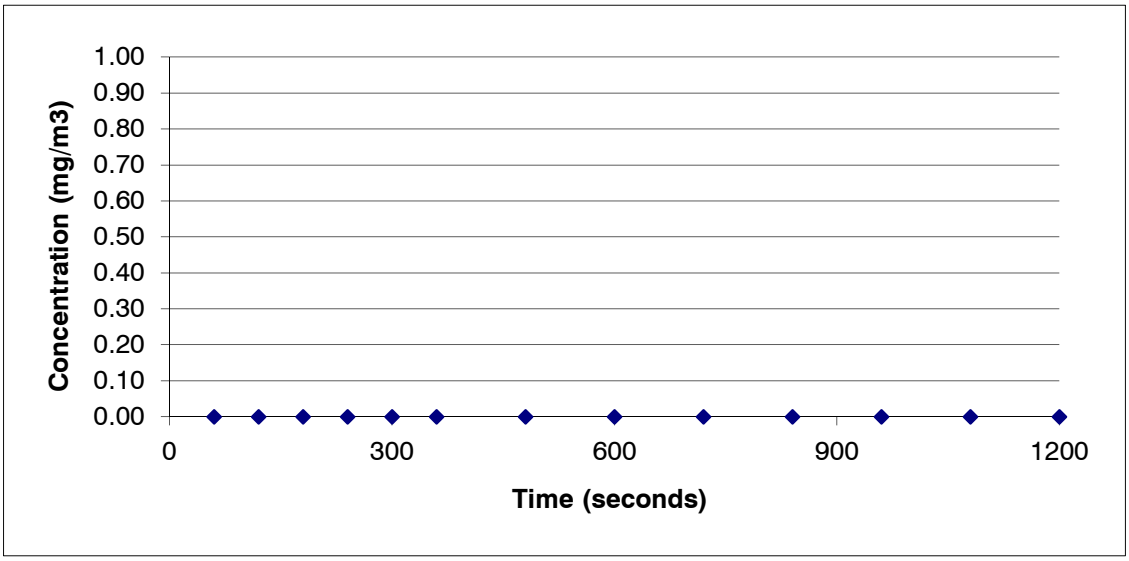
CH_4 Flux	0.000654

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.71
240	0.71
300	0.71
360	0.71
480	2.14
600	2.86
720	2.86
840	2.86
960	2.86
1080	3.57
1200	2.86
1320	3.57
1440	3.57
1560	2.86
1680	3.57
1800	2.86

Location No. 18



Survey Details

Date	19.8.14
Start Time	14:10
Location (OS *X* m)	247021
Location (OS *Y* m)	217342

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.9
Wind Direction	NW
Pressure (Mb)	1016.0

Data Analysis

R^2	N/A
dC/dT	0.000000

Result ($mg/m^2/sec$)

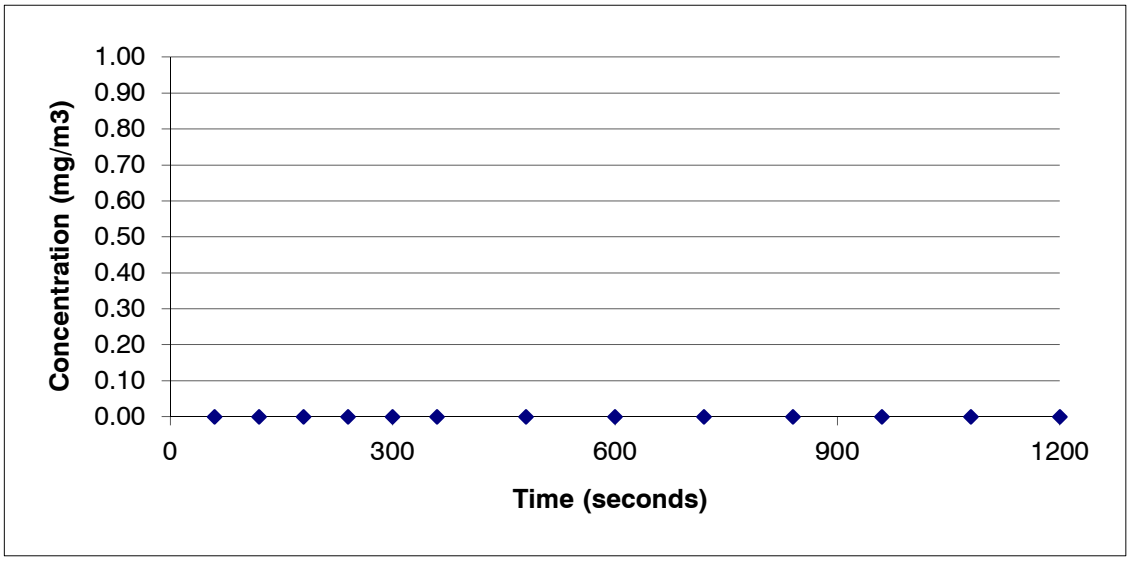
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 19



Survey Details

Date	19.8.14
Start Time	14:45
Location (OS *X* m)	247039
Location (OS *Y* m)	217354

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.5
Wind Direction	NNW
Pressure (Mb)	1016.0

Data Analysis

R^2	N/A
dC/dT	0.000000

Result ($mg/m^2/sec$)

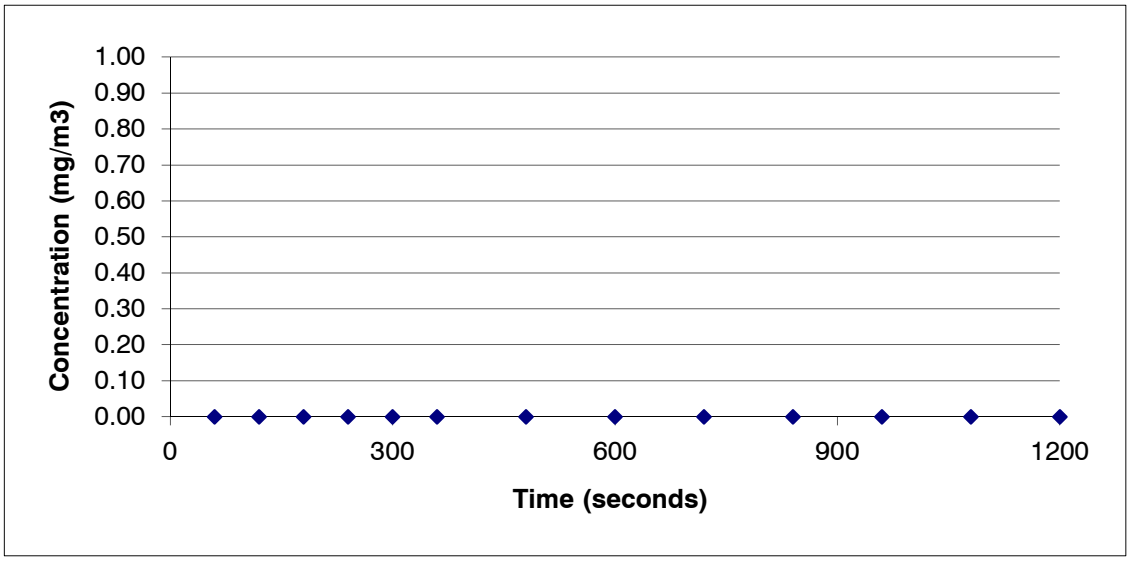
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 20



Survey Details

Date	20.8.14
Start Time	10:20
Location (OS *X* m)	257058
Location (OS *Y* m)	217371

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	1.5
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	N/A
dC/dT	0.000000

Result ($mg/m^2/sec$)

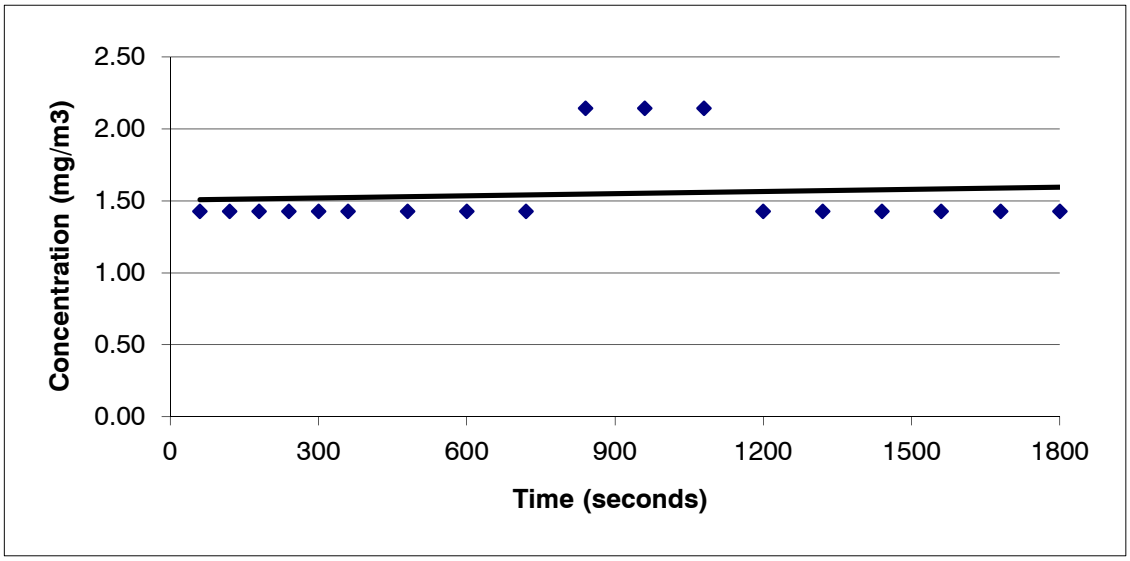
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 21



Survey Details

Date	20.8.14
Start Time	10:45
Location (OS *X* m)	247069
Location (OS *Y* m)	217354

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	1.5
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.011
dC/dT	0.000050

Result ($mg/m^2/sec$)

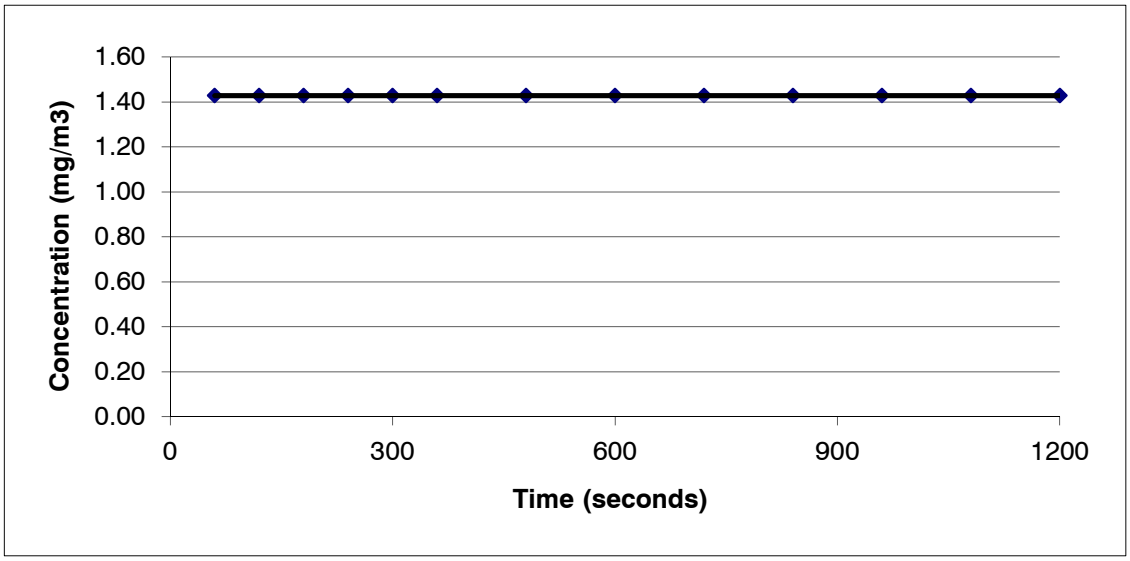
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	1.43
120	1.43
180	1.43
240	1.43
300	1.43
360	1.43
480	1.43
600	1.43
720	1.43
840	2.14
960	2.14
1080	2.14
1200	1.43
1320	1.43
1440	1.43
1560	1.43
1680	1.43
1800	1.43

Location No. 22



Survey Details

Date	20.8.14
Start Time	11:15
Location (OS *X* m)	247054
Location (OS *Y* m)	217342

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	1.2
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.000
dC/dT	0.000000

Result ($mg/m^2/sec$)

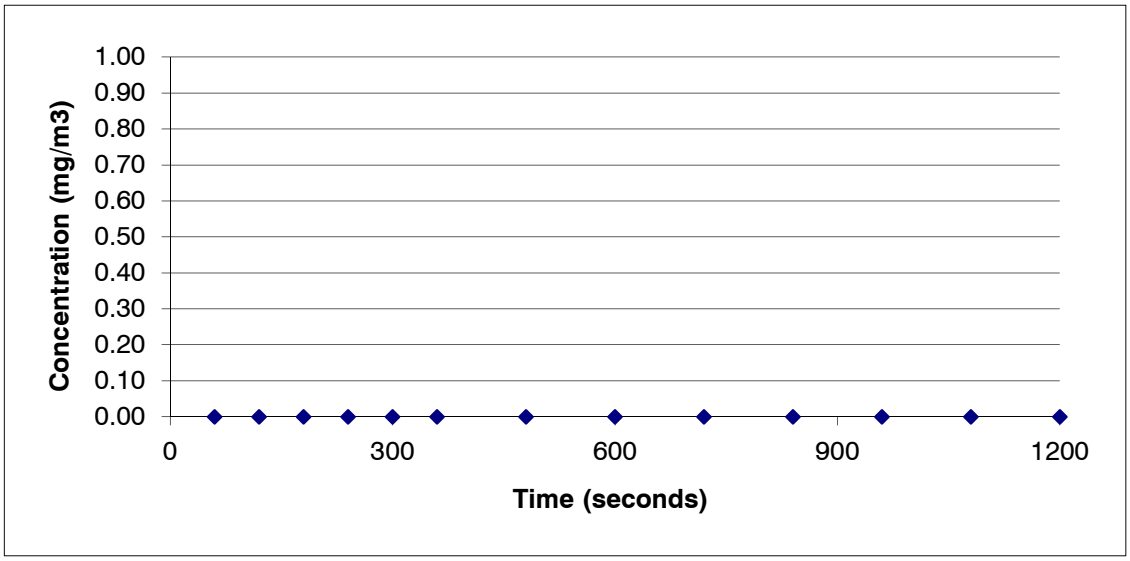
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	1.43
120	1.43
180	1.43
240	1.43
300	1.43
360	1.43
480	1.43
600	1.43
720	1.43
840	1.43
960	1.43
1080	1.43
1200	1.43

Location No. 23



Survey Details

Date	20.8.14
Start Time	10:25
Location (OS *X* m)	247040
Location (OS *Y* m)	217327

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	1.5
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	#DIV/0!
dC/dT	0.000000

Result ($mg/m^2/sec$)

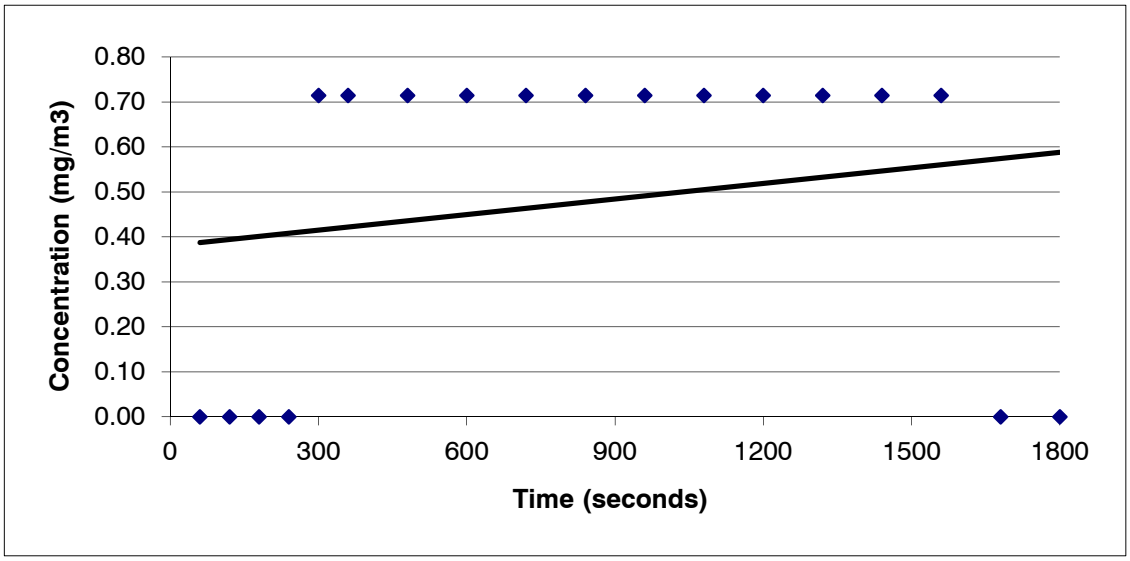
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.00
840	0.00
960	0.00
1080	0.00
1200	0.00

Location No. 24



Survey Details

Date	20.8.14
Start Time	11:40
Location (OS *X* m)	247073
Location (OS *Y* m)	217330

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.2
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.036
dC/dT	0.000115

Result ($mg/m^2/sec$)

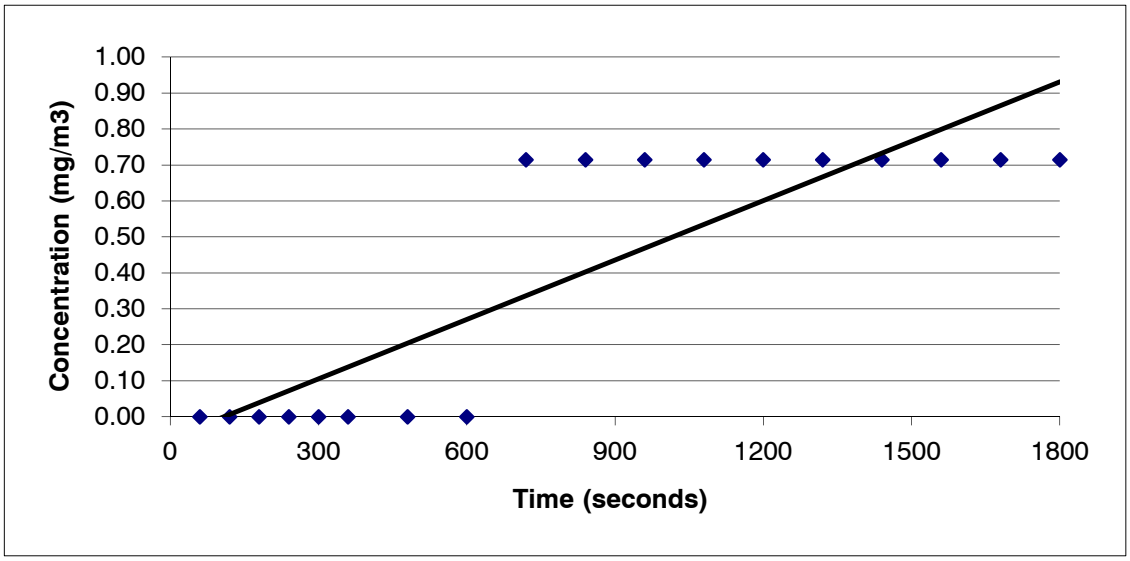
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.71
360	0.71
480	0.71
600	0.71
720	0.71
840	0.71
960	0.71
1080	0.71
1200	0.71
1320	0.71
1440	0.71
1560	0.71
1680	0.00
1800	0.00

Location No. 25



Survey Details

Date	20.8.14
Start Time	13:20
Location (OS *X* m)	247057
Location (OS *Y* m)	217316

Meteorological Conditions

Temperature (˚c)	17.0
Wind Speed (m/s)	1.8
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.745
dC/dT	0.000550

Result ($mg/m^2/sec$)

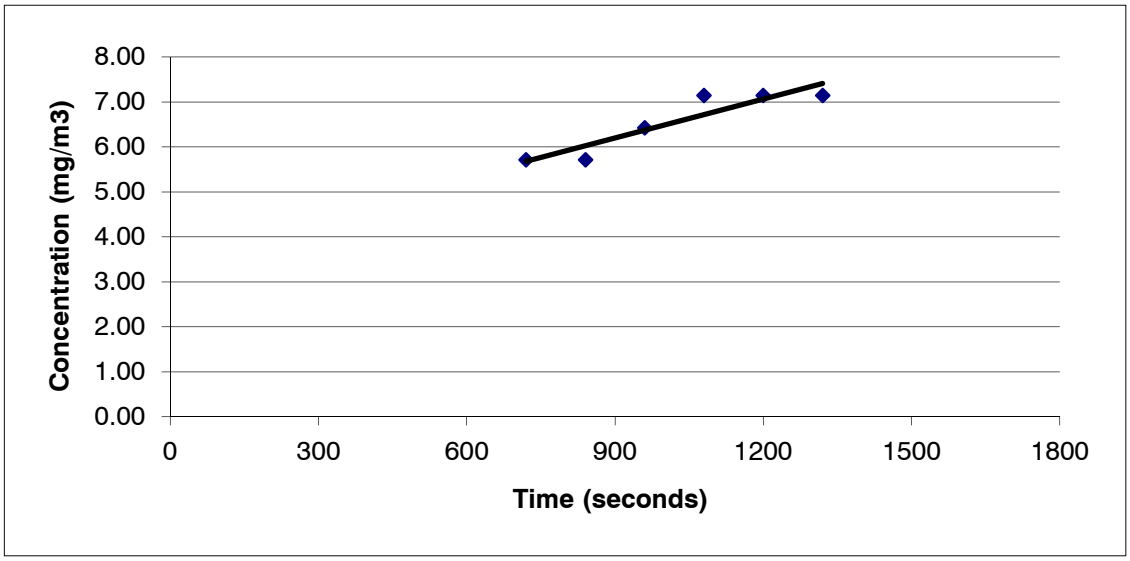
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.00
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.71
840	0.71
960	0.71
1080	0.71
1200	0.71
1320	0.71
1440	0.71
1560	0.71
1680	0.71
1800	0.71

Location No. 26



Survey Details

Date	20.8.14
Start Time	12:40
Location (OS *X* m)	246926
Location (OS *Y* m)	217274

Meteorological Conditions

Temperature (˚c)	17.0
Wind Speed (m/s)	1.8
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.854
dC/dT	0.002891

Result ($mg/m^2/sec$)

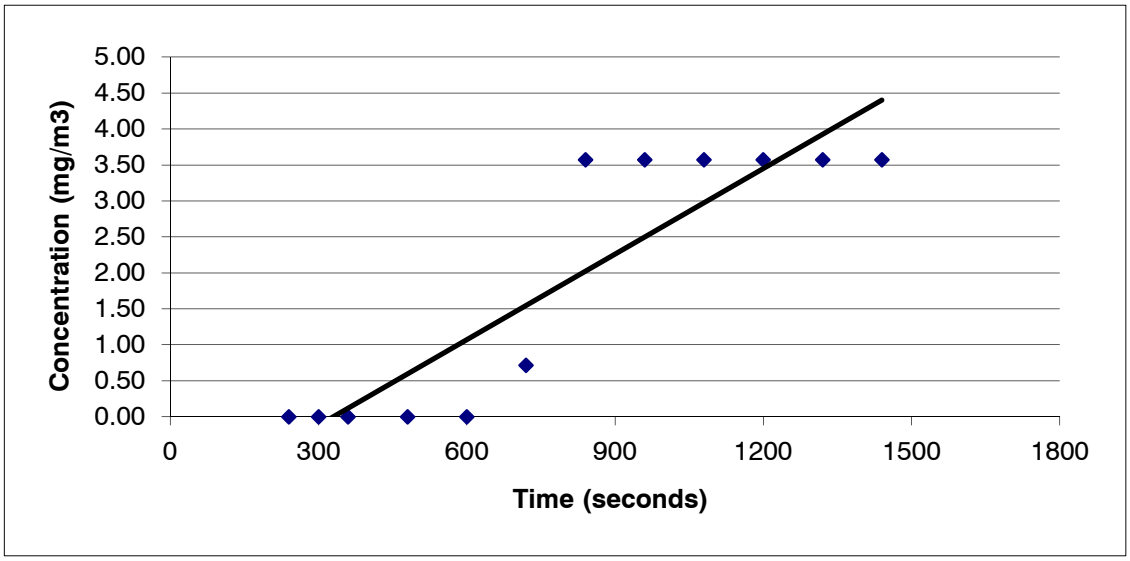
CH_4 Flux	0.000692

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	2.14
120	2.14
180	2.14
240	2.14
300	10.71
360	10.71
480	7.14
600	7.14
720	5.71
840	5.71
960	6.43
1080	7.14
1200	7.14
1320	7.14
1440	7.14
1560	7.14
1680	7.14
1800	7.14

Location No. 27



Survey Details

Date	20.8.14
Start Time	12:05
Location (OS *X* m)	246941
Location (OS *Y* m)	217256

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.2
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.804
dC/dT	0.003964

Result ($mg/m^2/sec$)

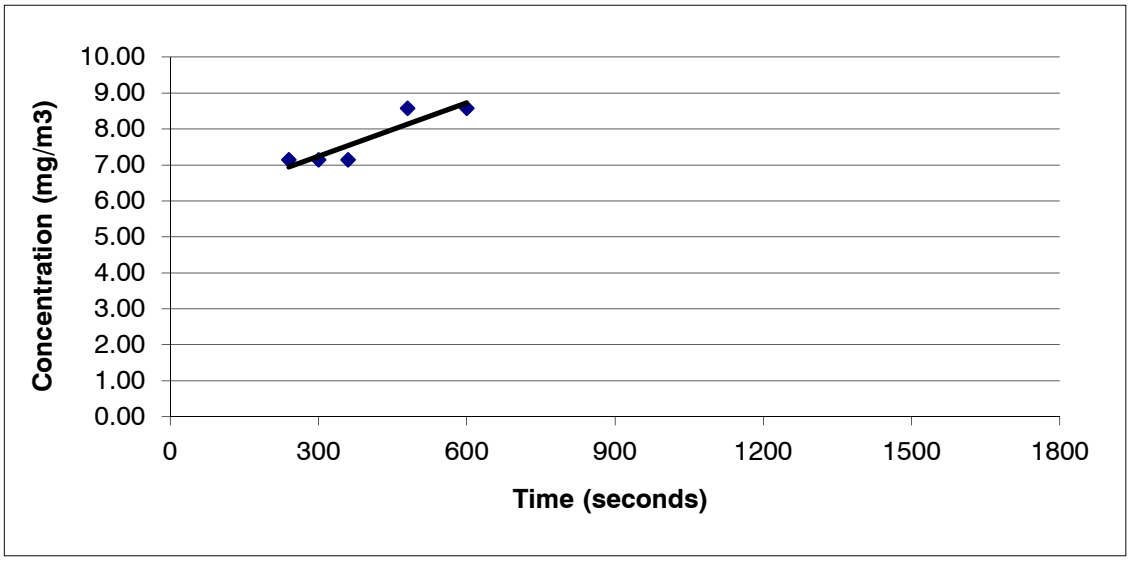
CH_4 Flux	0.000949

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	0.00
120	0.00
180	0.71
240	0.00
300	0.00
360	0.00
480	0.00
600	0.00
720	0.71
840	3.57
960	3.57
1080	3.57
1200	3.57
1320	3.57
1440	3.57
1560	3.57
1680	3.57
1800	3.57

Location No. 28



Survey Details

Date	20.8.14
Start Time	11:35
Location (OS *X* m)	246956
Location (OS *Y* m)	217236

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	1.2
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.828
dC/dT	0.004926

Result ($mg/m^2/sec$)

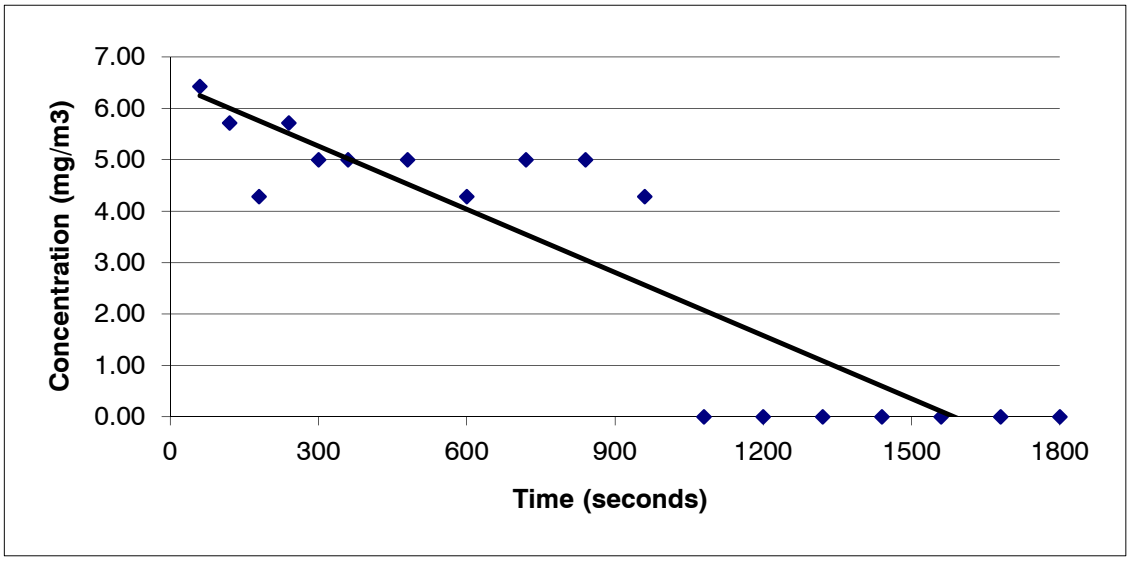
CH_4 Flux	0.001180

Action required?	**YES**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	10.71
120	10.71
180	10.71
240	7.14
300	7.14
360	7.14
480	8.57
600	8.57
720	7.14
840	7.14
960	7.14
1080	7.14
1200	7.14
1320	7.14
1440	7.14
1560	7.14
1680	7.14
1800	7.14

Location No. 29



Survey Details

Date	20.8.14
Start Time	11:00
Location (OS *X* m)	246968
Location (OS *Y* m)	217219

Meteorological Conditions

Temperature (˚c)	14.0
Wind Speed (m/s)	1.2
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.818
dC/dT	-0.004092

Result ($mg/m^2/sec$)

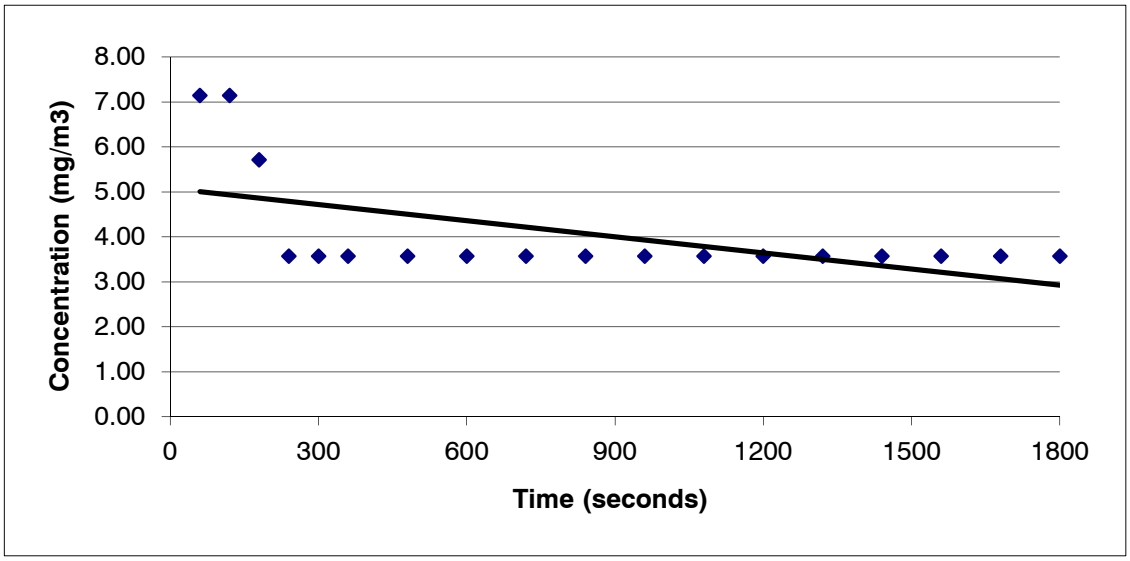
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	6.43
120	5.71
180	4.29
240	5.71
300	5.00
360	5.00
480	5.00
600	4.29
720	5.00
840	5.00
960	4.29
1080	0.00
1200	0.00
1320	0.00
1440	0.00
1560	0.00
1680	0.00
1800	0.00

Location No. 30



Survey Details

Date	20.8.14
Start Time	12:10
Location (OS *X* m)	246954
Location (OS *Y* m)	217197

Meteorological Conditions

Temperature (˚c)	15.0
Wind Speed (m/s)	2.2
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.857
dC/dT	-0.014626

Result ($mg/m^2/sec$)

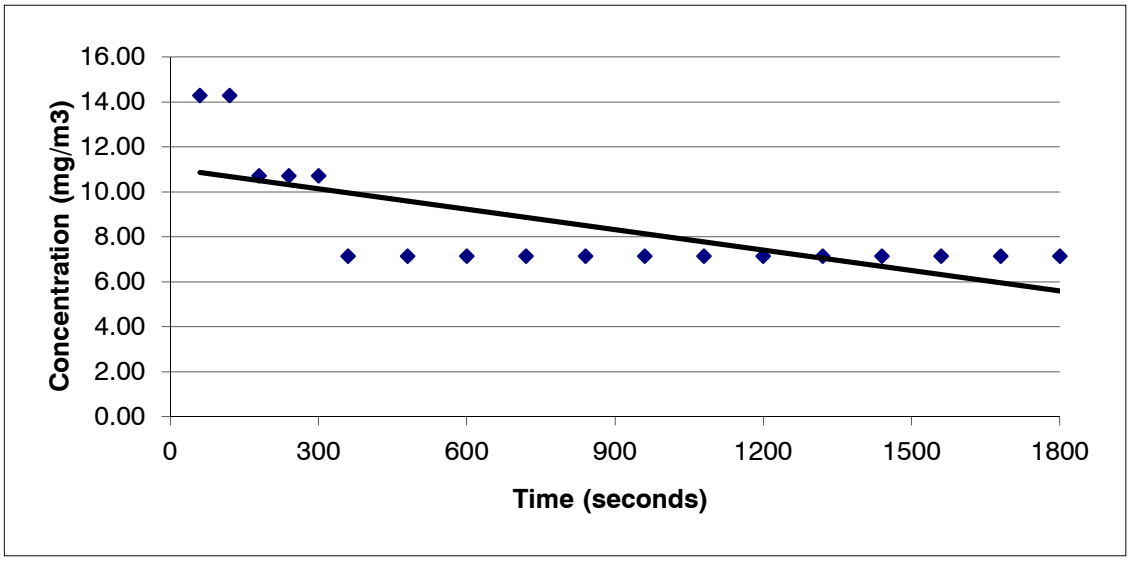
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	7.14
120	7.14
180	5.71
240	3.57
300	3.57
360	3.57
480	3.57
600	3.57
720	3.57
840	3.57
960	3.57
1080	3.57
1200	3.57
1320	3.57
1440	3.57
1560	3.57
1680	3.57
1800	3.57

Location No. 31



Survey Details

Date	20.8.14
Start Time	12:40
Location (OS *X* m)	246942
Location (OS *Y* m)	217217

Meteorological Conditions

Temperature (˚c)	17.0
Wind Speed (m/s)	1.8
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.822
dC/dT	-0.014795

Result ($mg/m^2/sec$)

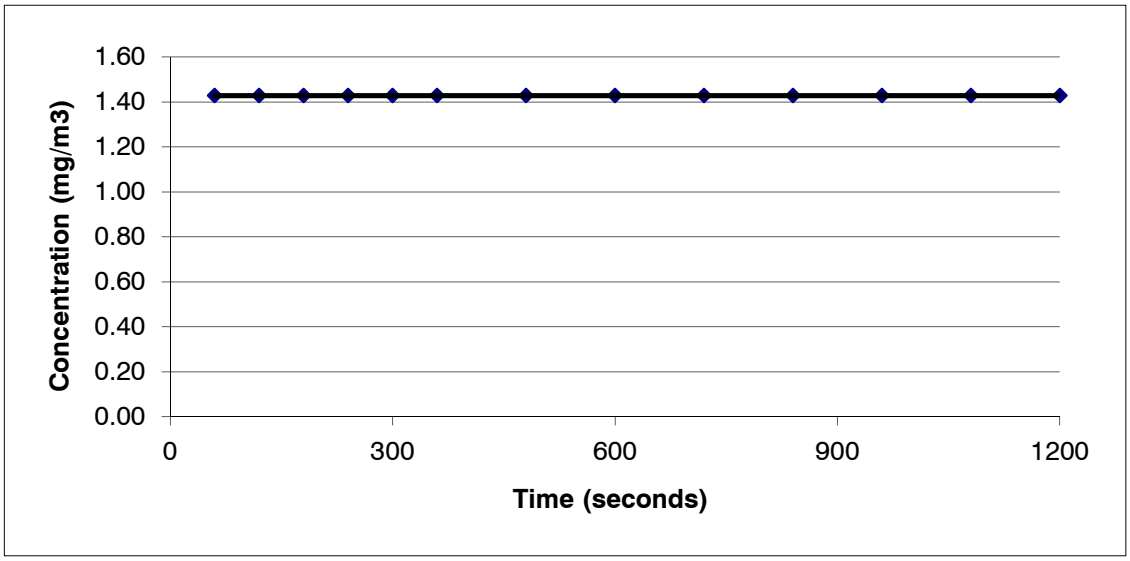
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	14.29
120	14.29
180	10.71
240	10.71
300	10.71
360	7.14
480	7.14
600	7.14
720	7.14
840	7.14
960	7.14
1080	7.14
1200	7.14
1320	7.14
1440	7.14
1560	7.14
1680	7.14
1800	7.14

Location No. 32



Survey Details

Date	20.8.14
Start Time	13:15
Location (OS *X* m)	246930
Location (OS *Y* m)	217237

Meteorological Conditions

Temperature (˚c)	17.0
Wind Speed (m/s)	1.8
Wind Direction	NW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.000
dC/dT	0.000000

Result ($mg/m^2/sec$)

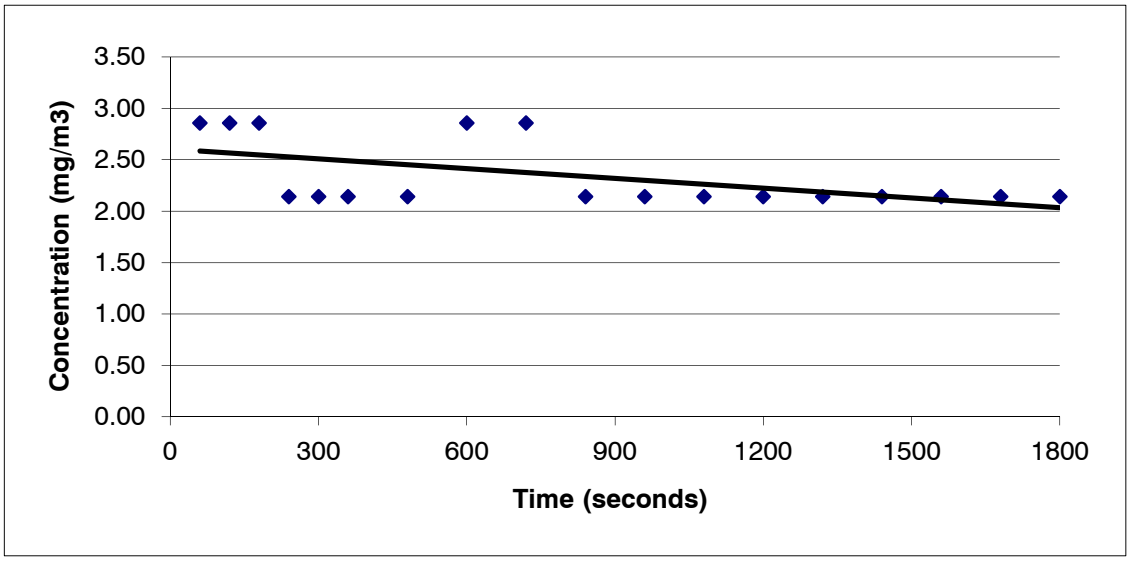
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	1.43
120	1.43
180	1.43
240	1.43
300	1.43
360	1.43
480	1.43
600	1.43
720	1.43
840	1.43
960	1.43
1080	1.43
1200	1.43

Location No. 33



Survey Details

Date	20.8.14
Start Time	14:50
Location (OS *X* m)	246922
Location (OS *Y* m)	219213

Meteorological Conditions

Temperature (˚c)	16.0
Wind Speed (m/s)	1.5
Wind Direction	NNW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.303
dC/dT	-0.000316

Result ($mg/m^2/sec$)

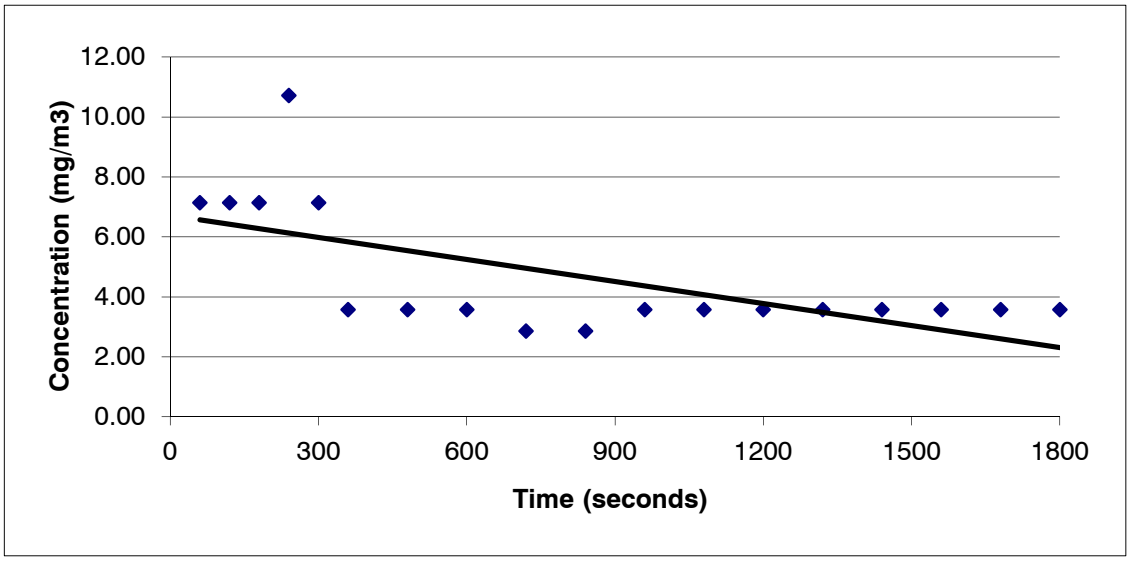
CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	2.86
120	2.86
180	2.86
240	2.14
300	2.14
360	2.14
480	2.14
600	2.86
720	2.86
840	2.14
960	2.14
1080	2.14
1200	2.14
1320	2.14
1440	2.14
1560	2.14
1680	2.14
1800	2.14

Location No. 34



Survey Details

Date	20.8.14
Start Time	14:20
Location (OS *X* m)	246932
Location (OS *Y* m)	217194

Meteorological Conditions

Temperature (˚c)	16.0
Wind Speed (m/s)	1.5
Wind Direction	NNW
Pressure (Mb)	1019.0

Data Analysis

R^2	0.412
dC/dT	-0.002444

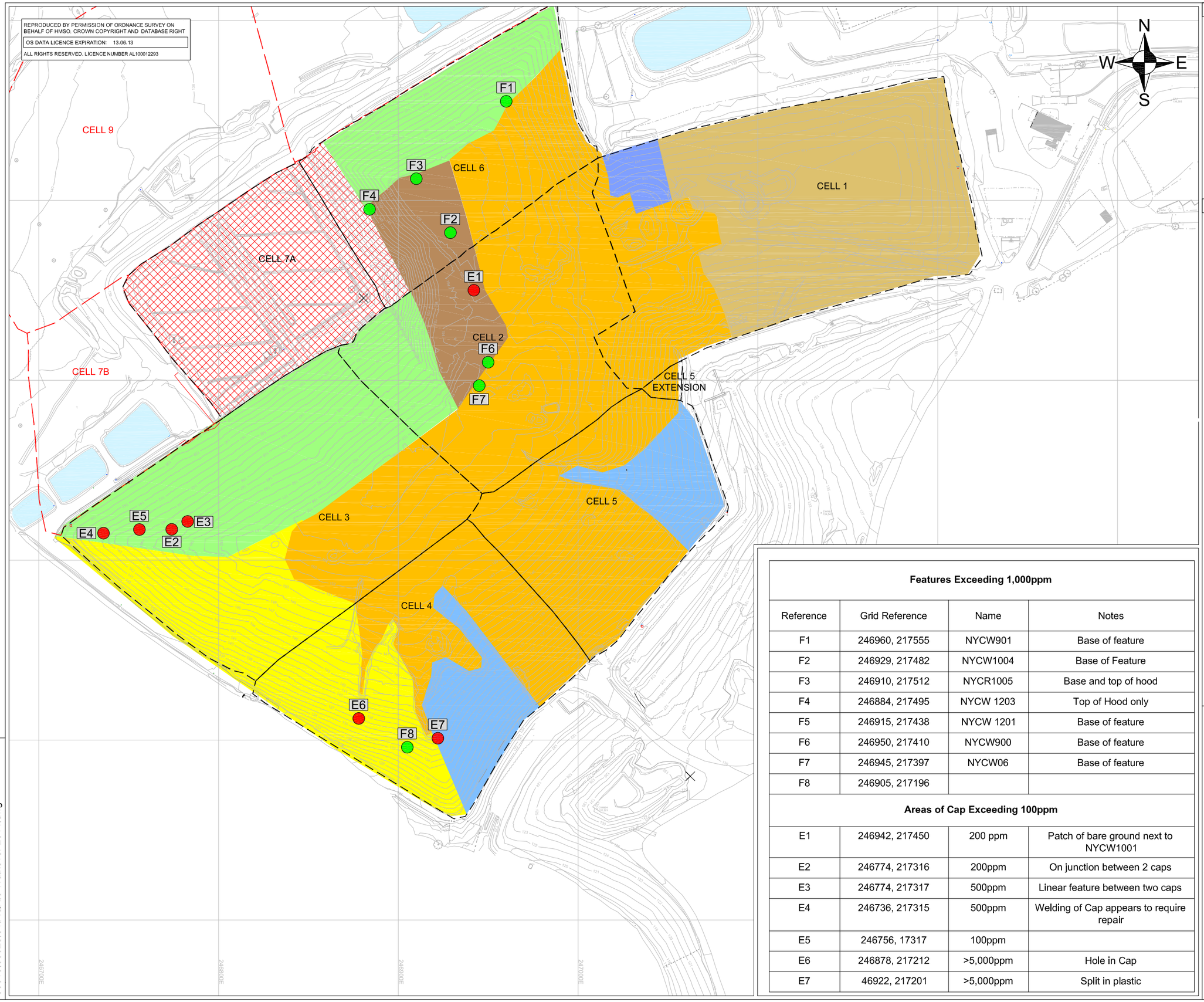
Result ($mg/m^2/sec$)

CH_4 Flux	0.000050

Action required?	**NO**

Raw Data

Time (secs)	Concentration (mg/m^3)
60	7.14
120	7.14
180	7.14
240	10.71
300	7.14
360	3.57
480	3.57
600	3.57
720	2.86
840	2.86
960	3.57
1080	3.57
1200	3.57
1320	3.57
1440	3.57
1560	3.57
1680	3.57
1800	3.57



00610.00023.01.AQX.0 Walkover 2014.dwg

Features Exceeding 1,000ppm

Reference	Grid Reference	Name	Notes
F1	246960, 217555	NYCW901	Base of feature
F2	246929, 217482	NYCW1004	Base of Feature
F3	246910, 217512	NYCR1005	Base and top of hood
F4	246884, 217495	NYCW 1203	Top of Hood only
F5	246915, 217438	NYCW 1201	Base of feature
F6	246950, 217410	NYCW900	Base of feature
F7	246945, 217397	NYCW06	Base of feature
F8	246905, 217196		
Areas of Cap Exceeding 100ppm			
E1	246942, 217450	200 ppm	Patch of bare ground next to NYCW1001
E2	246774, 217316	200ppm	On junction between 2 caps
E3	246774, 217317	500ppm	Linear feature between two caps
E4	246736, 217315	500ppm	Welding of Cap appears to require repair
E5	246756, 17317	100ppm	
E6	246878, 217212	>5,000ppm	Hole in Cap
E7	46922, 217201	>5,000ppm	Split in plastic

NOTES

LEGEND

- EXISTING CELLS
- ZONE 1A PERMANENT CAP
- ZONE 1B PERMAMENT CAP
- ZONE 1C PERMANENT CAP
- ZONE 1D PERMANENT CAP
- ZONE 1E PERMANENT CAP
- ZONE 2A TEMPORARY CAP
- ZONE 2B TEMPORARY CAP
- ACTIVE AREA
- E1 EXCEEDANCES OF THE CAP
- F1 EXCEEDENCES OF A FEATURE

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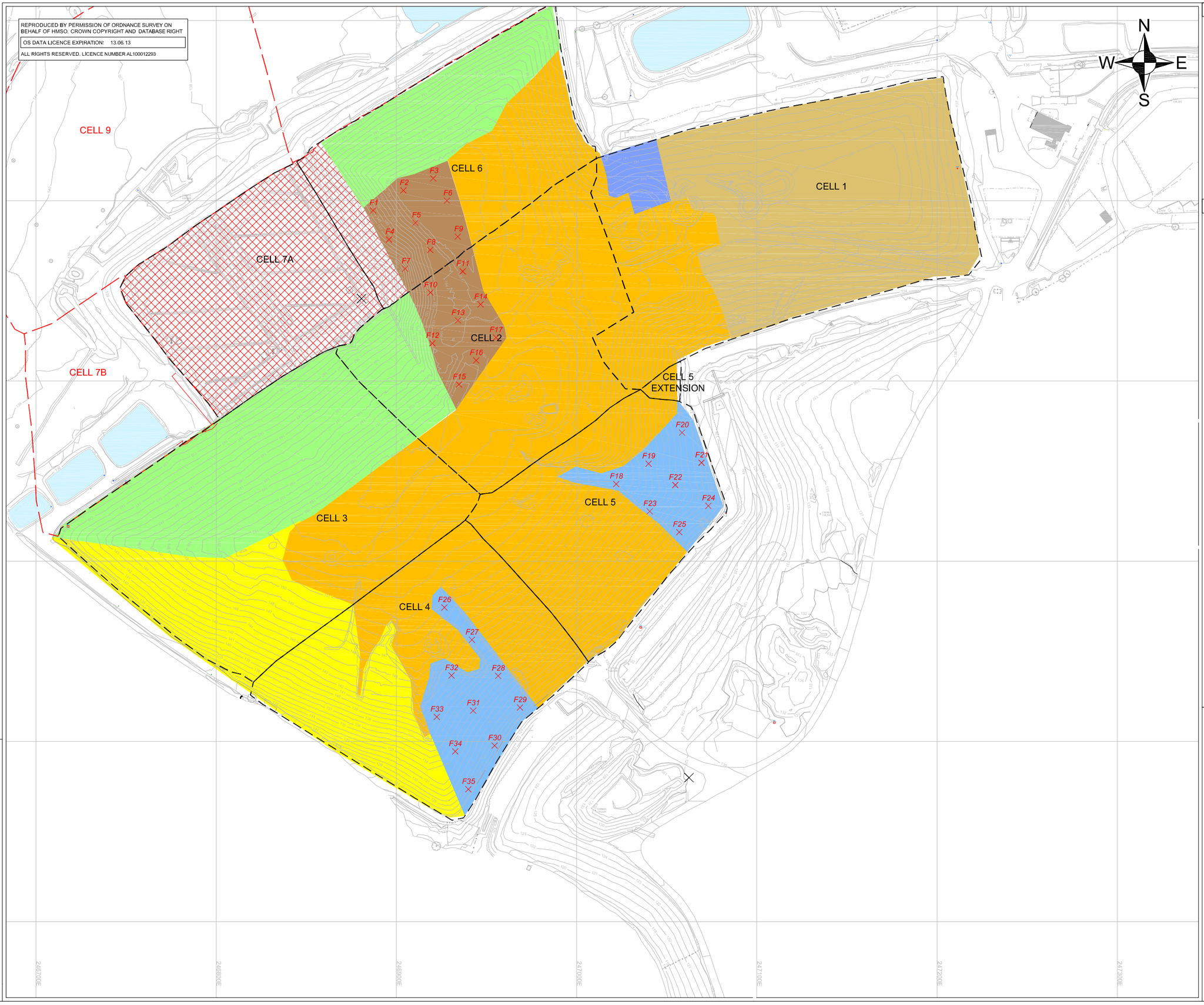
SURFACE EMISSIONS FLUX SURVEY

WALKOVER SURVEY EXCEEDENCES

AQ1

Scale 1:2000 @ A3

Date MAY 2014



NOTES

LEGEND

- EXISTING CELLS
- ZONE 1A PERMANENT CAP
- ZONE 1B PERMAMENT CAP
- ZONE 1C PERMANENT CAP
- F5 — ZONE 1D PERMANENT CAP
- F31 — ZONE 1E PERMANENT CAP
- ZONE 2A TEMPORARY CAP
- ZONE 2B TEMPORARY CAP
- ACTIVE AREA

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NANTYCAWS LANDFILL

SURFACE EMISSIONS FLUX SURVEY

FLUX SURVEY LOCATIONS

AQ2

Scale 1:2000 @ A3

Date AUGUST 2014

00610 00023 01 AQX 0 Flux 2014.dwg