

NANTYCAWS LANDFILL

Landfill Surface Emissions Survey 2022
Prepared for: CWM Environmental Limited

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Executive Summary

SLR Consulting Ltd (SLR) have been commissioned by CWM Environmental Ltd (CWM) to undertake the 2022 Surface Emissions Survey at Nantycaws Landfill.

The Stage 1 landfill gas surface emissions walkover survey was undertaken on 11th October 2022, with the site being divided into 2 zones to reflect the various specifications of restoration within the landfill area.

The walkover survey demonstrated ongoing compliance across the majority of the cap within the surveyed area. The survey identified three distinct areas of cap and six features which required further investigation and remediation. Following remediation, the identified areas were re-surveyed on 13th January 2023 and found to be compliant. There are currently no new areas of capping; as such there is no requirement for a Stage 2 flux survey.

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1.0 INTRODUCTION

SLR Consulting Ltd (SLR) has been commissioned by CWM Environmental Ltd (CWM) to undertake an annual survey of landfill gas surface emissions at Nantycaws Landfill Site, Carmarthenshire. This report provides the results of the 2022 annual survey, with monitoring undertaken on the 11th October 2022.

1.1 Background

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.

To comply with the Landfill Directive, methane emissions through the cap of a landfill need to be monitored and any need for remediation must be prioritised as well as quantifying the total emissions of methane from the whole site area.

The Environment Agency (EA), supported by National Resources Wales (NRW), produced the Guidance for Monitoring Landfill Gas Surface Emissions¹ (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 infrastructure. The second stage of the survey, which aims to quantify the surface emissions from the site, can only take place once any remediation work required as an outcome of the first stage has been completed. This report represents the surface emissions survey. This report describes the techniques and methodology used in the assessment, followed by analysis of the results of the survey.

1.2 Survey Methodology – Walkover

The site has been divided into zones with similar characteristics with respect to the factors that will affect surface emissions. 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.

Faults in the capping layer of a landfill are the primary cause of surface emissions. 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 inaccessible due to gradient and surface material. Methane concentrations 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, or smaller transects where required, such as on side slopes and edges of the cap. Where high concentrations of methane were detected and when it was appropriate, the survey deviated to locate the source. A written record of methane concentration was recorded at each location.

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

Gas wells, leachate wells and pipework were inspected closely, with measurement of methane concentrations taken around the well and landfill surface. A separate reading was taken from the actual gas well and associated pipework if it protruded above the landfill surface.

1.3 Previous Assessments

This report presents the 2022 surface emissions survey for Nantycaws Landfill. The most recent surface emission survey for Nantycaws prior to this report was the survey undertaken in 2021².

² SLR Consulting Ltd. 2021 Surface Emissions Survey Stage 1 Walkover 402.00610.00038. January 2022.

2.0 DEFINITION OF ZONES

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. There has been no deposition of waste into the landfill since December 2016, with no changes to the capped areas since the 2021 surface emissions survey².

2.1 Description of Zone 1

Zone 1 comprises all the permanently capped areas of Nantycaws Landfill; this zone has been subdivided into five subzones (1A – 1E) 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 dense vegetation to the north of the access track and short vegetation to the south of the track. This area was capped in 1999.

2.1.2 Zone 1B

Zone 1B comprises a large, grassed area which includes the grassed plateau of Cells 2, 4 and 5 and the densely vegetated flank of Cells 4, 5 and 6. The permanent capping installed within this area includes 1.0mm LLDPE geomembrane cap followed by 1m of restoration soils.

2.1.3 Zone 1C

Zone 1C comprises permanent areas of capping incorporating the western flanks of Cells 3 and 4. Restoration soils have been placed on Zone 1C in September 2014. Long grass vegetation dominates Zone 1C.

2.1.4 Zone 1D

Zone 1D comprises permanent capping installed in October 2012, covering the western corner of Cell 2 and western edge of Cell 6. This area is defined by short grasses and small shrubbery. This is capped with 1.0 LLDPE geomembrane cap and covered with 1m of restoration soils.

2.1.5 Zone 1E

Zone 1E comprises permanent capping characterised by 1mm LLDPE geomembrane cap and 1m restoration soils. This area comprises of long grasses and dense, inaccessible vegetation.

2.2 Description of Zone 2

Zone 2 comprises of all temporarily capped areas of Nantycaws Landfill; this zone has been subdivided into four subzones (2A – 2D) due to either the date or type of capping in place. The 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 vegetation.

2.2.2 Zone 2B

Zone 2B comprises temporarily capped areas of the northern flank of Cell 3 and Cell 6. The capping in Zone 2B comprises of 1mm LLDPE geomembrane.

2.2.3 Zone 2C

Zone 2C comprises temporarily capped area of the northern and western slope of Cell 7A. This is capped with 1mm LLDPE geomembrane in February 2015.

2.2.4 Zone 2D

Zone 2D comprises of a temporary capped area of the north-eastern slope of Cell 3 and north-western slope of Cell 2. It also comprises a small area in the southern extent of Cell 7A. This was capped with 1mm LLDPE geomembrane in December 2016.

3.0 WALKOVER SURVEY

3.1 Climatic Conditions

The Stage 1 walkover was completed on the 11th October 2022. Data from a walkover survey can be directly influenced by the meteorological conditions prevailing before and during the monitoring period. Weather data using local meteorological station data is presented in Table 3-1, covering the date of the Stage 1 walkover survey and the preceding 3-days.

Table 3-1
Weather Conditions prior and during the Walkover Survey

Date	Weather Conditions (Daytime)			
	Average Wind (mph)	Wind Direction	Avg. Temperature (°C)	Pressure (bar)
8 th October 2022 AM	1.9	WNW	9.1	1,014.3
8 th October 2022 PM	2.3	S	10.6	1,014.7
9 th October 2022 AM	2.7	S	10.0	1,008.9
9 th October 2022 PM	5.4	SSW	13.6	1,002.0
10 th October 2022 AM	8.6	SE	9.8	1,006.7
10 th October 2022 PM	1.9	E	9.5	1,006.7
11 th October 2022 AM	0.4	N	5.2	1,019.5
11 th October 2022 PM	1.9	S	10.8	1,015.8

For landfill surface emissions surveys, the EA Guidance Note LFTGN07 suggests wind speeds of Beaufort scale 2 or below (equal to 7mph or below). From the data presented in Table 3-1, it can be seen during the walkover on the 11th October that wind speeds were consistently less than 7mph and that atmospheric pressures were stable.

3.2 Gas Management System Conditions

The site currently has two engines and one flare in operation. Gas abstraction system data between 12th September and 7th October 2022 was provided by Nantycaws landfill management and is presented in Appendix C.

3.3 Walkover Survey Results

The results of the Stage 1 walkover survey are presented in Appendix A. The results are summarised in the following subsections.

The instrument used to measure methane concentration was a Gastec FID. The Gastec FID has a range of 0 – 10,000ppm with a minimum detectable limit of 1ppm. The instrument used had been calibrated on 26th July 2022 (Serial Number 6335). The calibration certificate is presented in Appendix D.

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.

Observations of methane levels from the surface of the cap identified three distinct areas of cap and six features recording concentrations above the guidance criteria of 100ppm and 1000ppm, respectively. These locations are annotated on Drawing AQ1. Results are shown in Table 3-2 and Table 3-3 below and photos of the areas / features requiring investigation are presented in Appendix B.

Table 3-2
Stage 1 Survey Results: Cap

Ref.	Grid Reference (NGR) (m)	Maximum Methane Concentration (ppm)	Exceedance Information
C1	x246897, y217420	250	Hole in membrane, ~10m west of NYCW1201
C2	x246895, y217394	1,000	Small hole in membrane, ~2m north of NYCW1206
C3	x246850, y217386	10,000	South-east of NYCW1407

Table 3-3
Stage 1 Survey Results – Gas / Leachate Infrastructure

Ref.	Grid Reference (NGR) (m)	Maximum Methane Concentration (ppm)	Exceedance Information
F1	x246987, y217497	>5,000	NYCW0903 – base of well
F2	x246874, y217457	>5,000	NYCLW016 – base of well
F3	x246830, y217420	5,000	NYCLW017 – cracks around old sealant
F4	x246804, y217424	2,000	NYCW1405 – base of well
F5	x246775, y217424	>5,000	SUMP2 - gap between membrane and base of well
F6	x246987, y217456	1,000	NYCL0005 – cap of well dislodged

4.0 PHASE 2 SURFACE EMISSIONS SURVEY – RE-MONITORING AND FLUX REQUIREMENTS

4.1 Re-monitoring Results

Following the findings of the Stage 1 walkover survey, three distinct areas of cap and six features were identified as requiring further investigation and possible remediation. CWM investigated these areas and remediation was undertaken. Re-monitoring of the areas identified was undertaken on 13th January 2023, the results of which are detailed below in Table 4-1.

Table 4-1
Re-Monitoring Results 13th January 2023

Reference	Remediation undertaken	Maximum Methane Concentration (ppm)
C1	Extrusion wield	0
C2	Extrusion wield	0
C3	Extrusion wield	0
F1	Removal of soil to uncover gas infrastructure beneath to allow repair works	10
F2	New collar and extrusion wield at base of well	100
F3	Extrusion wield at base of well	0
F4	Extrusion wield at base of well	0
F5	Extrusion wield at base of well	0
F6	New collar	50

Concentrations recorded at all exceedance locations were shown to have been remediated sufficiently so that there were no exceedances of the relevant criteria. Any areas where concentrations remained elevated are to be investigated further by CWM to ensure they don't deteriorate further and remain below the relevant criteria.

4.2 Flux Requirements

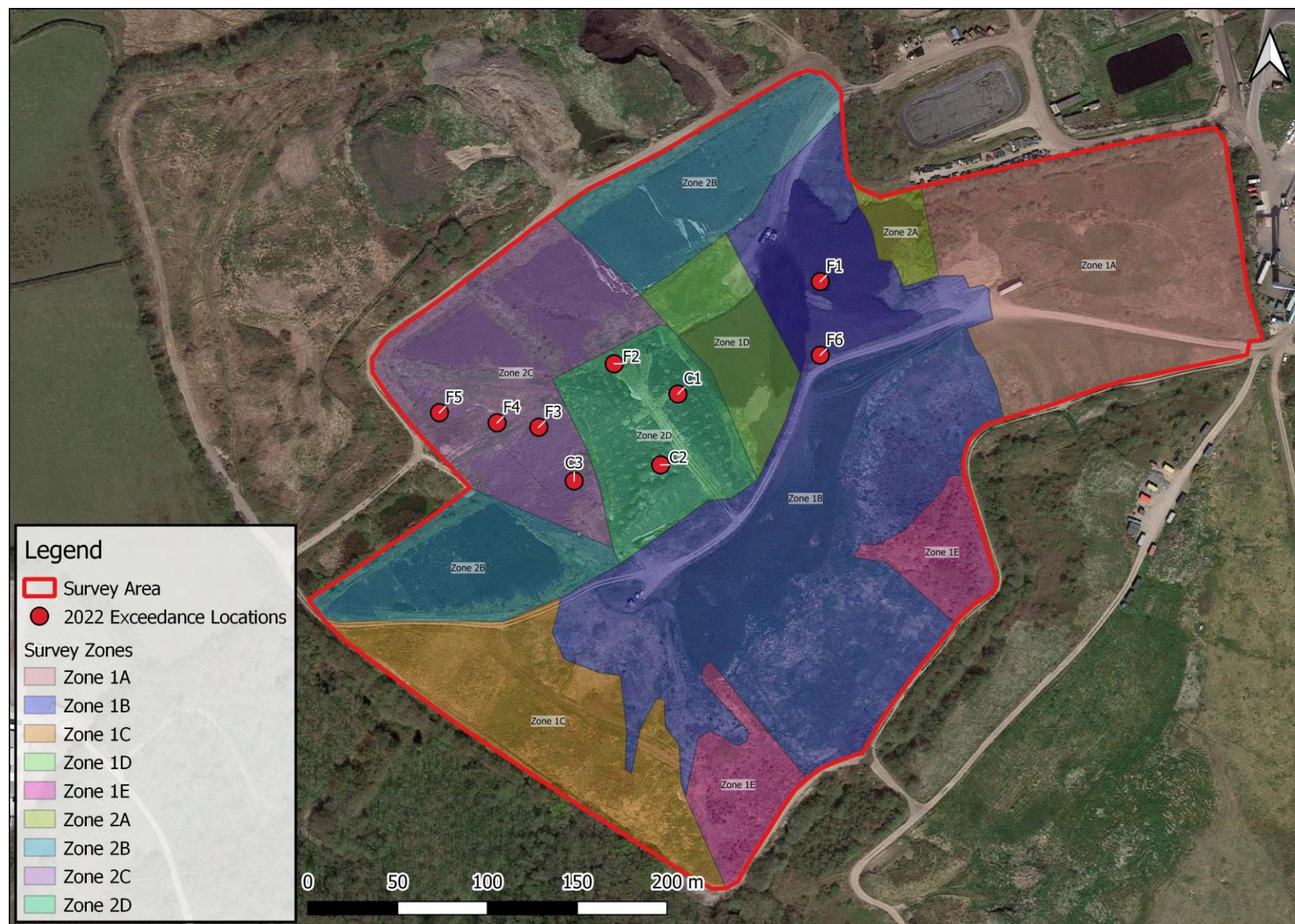
Nantycaws Landfill has not received any waste into the landfill since 2016. Since the 2021 surface emissions survey, no additional areas of landfill have been capped and completed that would require a Stage 2 flux survey. Equally, no existing areas of the landfill have changed the nature of the cap that would require a Stage 2 flux survey. As such, there is no requirement for a flux survey to be undertaken as part of the 2022 Surface Emissions Survey.

5.0 CONCLUSIONS

The 2022 landfill gas surface emissions walkover survey has demonstrated ongoing compliance across the majority of the cap, with three areas of cap and six features needing remediation. Following remediation, the identified areas of cap and features were re-monitored and found to be compliant. As such, it can be concluded that Nantycaws Landfill continues to be in compliance with the Landfill Directive.

Nantycaws Landfill has not received any additional waste into the landfill since 2016. There have been no new areas of cap installed or amended since the previous surface emissions survey undertaken in 2021. As such, there is no requirement at present for a Stage 2 flux survey to be undertaken.

DRAWINGS



AQ1 – Survey Zones and Exceedance Locations

APPENDIX A

Stage 1 Walkover Results

Table A-1 – Walkover Survey Results

Feature ID	Measured Concentration (ppm methane)
NYCW0056	0
NYCW0035	0
NYCW1020	0
NYCW0036	0
NYCW0054	0
NYCW2021	0
NYCW0053	0
NYCL0003	0
NYCL0004	0
NYCW0903	>5,000
NYCW0902	0
NYCW1006	0
NYCW1003	0
NYCW1002	900
NYCW0905	0
NYCR1001	400
NYCW1004	0
NYCW0901	80
NYCW0908/NWCY1007	0
NYCW1008	0
NYCW1209	0
NYCW1210	0
NYCW1203	0
NYCW1005	10
NYCP1206	0
NYCLW016	>5,000
NYCLW015	0
NYCL1202	0
NYCR1202	0
NYCW1201	10
NYCL0006	0
NYCP1201	0
NYCP1202	0
NYCW1411	0
Unlabelled by NYCW1411 1	0
Unlabelled by NYCW1411 2	300
NYCW1206	0

Feature ID	Measured Concentration (ppm methane)
NYCW1412	0
NYCW1407	0
NYCW1406	0
NYCLW017	5,000
NYCW1405	2,000
NYCW1404	0
SUMP2	>5,000
NYCW1402	0
Unlabelled next to NYCW1402	300
NYCW1403	0
KOP7	0
NYCW1016	0
NYCW0508	0
NYCL0008	0
NYCW1017	0
KOP6	0
NYCW0509	0
NYCW1018	0
NYCL0009	0
NYCW0511	0
NYCW0512	0
NYCW0513	0
NYCW1013	0
NYCW1014	0
NYCW1015	0
NYCW0909	0
NYCL0007	0
NYCW0502	0
NYCW0911	0
NYCW1012	0
NYCW1011	0
NYCW1010	0
NYCW0704	0
NYCW0913	0
NYCW0709	0
NYCW0710	0
NYCW0711	0
NYCW1009	0

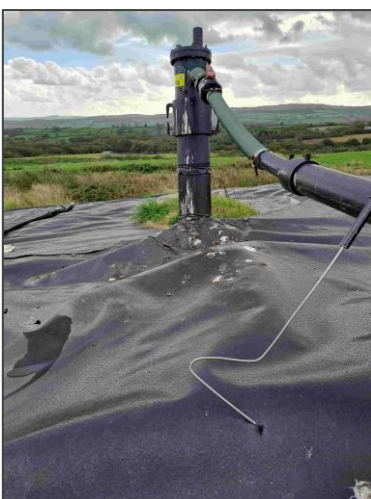
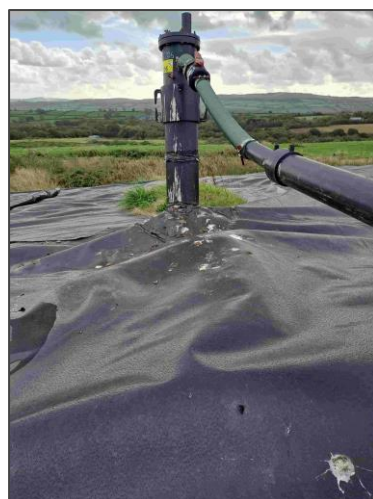
Feature ID	Measured Concentration (ppm methane)
NYCW0910	0
NYCW0912	0
NYCW0907	0
NYCW1104	0
NYCW1103	0
NYCW0905	0
NYCW0906	10
NYCL0005	1,000
NYCW0904	0
NYCW1102	0
NYCW1101	0
NYCW0037	0
KOP5	0
KOP4	0
MANIFOLD13	0
NYCL0001	0
NYCL0012	0
KOP1	0

APPENDIX B

Stage 1 Walkover Photos



C1



C2



C3



F1



F2



F3



F4



F5



F6

APPENDIX C

Gas Management Abstraction System Data

Table C-1 – Gas Management Abstraction System Data

Reference	Reading Taken On	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Depart valve (%)
NYCSITE1	07/10/2022 08:24	38.3	26.5	0.8	-
NYCW0508	07/10/2022 08:54	33.3	22.5	1	20
NYCW1017	07/10/2022 08:56	31	22.3	1.3	18
NYCW0509	07/10/2022 08:58	30.9	22.4	1.3	10
NYCW1018	07/10/2022 09:01	31.3	21.9	1.3	10
NYCW0512	07/10/2022 09:06	-	-	-	-
NYCW0513	07/10/2022 09:08	-	-	-	-
NYCW0911	07/10/2022 09:13	55.7	33.4	0.2	100
NYCW0711	07/10/2022 09:16	63.1	39.2	0.2	100
NYCW1009	07/10/2022 09:18	56.6	35.3	0.1	37
NYCW0910	07/10/2022 09:20	37.8	31.1	0.1	10
NYCW0709	07/10/2022 09:23	49.1	36.7	0.1	40
NYCW0710	07/10/2022 09:26	33	28.6	0.1	10
NYCW1012	07/10/2022 09:28	32.2	29.8	0.1	22
NYCW1011	07/10/2022 09:30	28.9	29.5	0.2	15
NYCW1010	07/10/2022 09:33	35.9	30.3	0.1	5
NYCW0913	07/10/2022 09:36	68.4	20.1	1.3	100
NYCW0912	07/10/2022 09:40	57.8	35.8	1.2	5
NYCW1104	07/10/2022 09:57	65.3	35.4	0.2	5
NYCW0904	07/10/2022 10:01	51.8	22.9	0.2	14
NYCW1101	07/10/2022 10:03	36.4	18.5	0.1	10
NYCW1102	07/10/2022 10:06	79	23.3	0.1	5
NYCW1103	07/10/2022 10:09	39.7	29.6	0.1	60
NYCW0704	07/10/2022 10:31	8.4	5.1	18.7	0
NYCW0703	07/10/2022 10:37	39	28.6	0.2	25
NYCW0605	07/10/2022 10:39	34.5	23.9	0.2	7
NYCW0033	07/10/2022 10:50	57.1	28.5	2	10
NYCW0027	07/10/2022 10:55	56.7	25.1	0.2	22
NYCW0029	07/10/2022 10:57	3.2	1.7	20	0
NYCW0025	07/10/2022 11:01	47.6	25.1	0.2	15
NYCW0023	07/10/2022 11:03	-	-	-	-
NYCW0013	07/10/2022 11:05	-	-	-	-
NYCW0018	07/10/2022 11:08	-	-	-	-
NYCW0002	07/10/2022 11:18	46.2	20.4	0.7	5

Reference	Reading Taken On	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Depart valve (%)
NYCW0003	07/10/2022 11:22	51.8	25.2	0.5	25
NYCW0004	07/10/2022 11:25	39.1	24.2	0.1	20
NYCW0012	07/10/2022 11:28	47.2	25.3	0.1	14
NYCW0006	07/10/2022 11:31	43	22.3	0.1	15
NYCW0007	07/10/2022 11:34	56.1	26.9	0.1	60
NYCW0008	07/10/2022 11:40	68.5	32.6	0.2	100
NYCW0010	07/10/2022 11:43	53.8	26.6	0.1	70
NYCW0022	07/10/2022 11:48	44.6	28.9	0.1	15
NYCSITE1	07/10/2022 13:03	38.9	26.8	0.9	-

APPENDIX D

Gastec Flame Ionisation Detector (FID) Calibration Certificate



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

Gas & Environmental Services Ltd

Units 1 & 3, Little Ridge Industrial Estate
Welwyn Garden City
Herts, AL7 2BH

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

Certificate of Test and Calibration

Calibration Date 26th July 2022
Instrument Details Gastec MK 4
Serial Number 6335
Customer SLR Consulting

The above instrument has been serviced in accordance with the manufacturers and British Gas recommended procedures for recalibration and checking of Gastec 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	P28627/2288
500 ppm	One	525ppm	AGA184231
800 ppm	One	850ppm	CTCO7135426
80 ppm	Two	82ppm	P28627/2288
500 ppm	Two	550ppm	AGA184231
800 ppm	Two	850ppm	CTCO7135426
8000 ppm	Two	8500ppm	APL12/073701

Terry Evans
Gas & Environmental Services Ltd



AWARDS
APPROVED CENTRE



UTILITIES PREQUALIFICATION SCHEME



The Council of Gas Detection and
Environmental Monitoring



534899



ISO 9001:2015



F824808

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EUROPEAN OFFICES

United Kingdom

AYLESBURY

T: +44 (0)1844 337380

BELFAST

belfast@slrconsulting.com

BRADFORD-ON-AVON

T: +44 (0)1225 309400

BRISTOL

T: +44 (0)117 906 4280

CARDIFF

T: +44 (0)29 2049 1010

CHELMSFORD

T: +44 (0)1245 392170

EDINBURGH

T: +44 (0)131 335 6830

EXETER

T: + 44 (0)1392 490152

GLASGOW

T: +44 (0)141 353 5037

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T: +44 (0)1483 889800

LONDON

T: +44 (0)203 805 6418

MAIDSTONE

T: +44 (0)1622 609242

MANCHESTER (Denton)

T: +44 (0)161 549 8410

MANCHESTER (Media City)

T: +44 (0)161 872 7564

NEWCASTLE UPON TYNE

T: +44 (0)191 261 1966

NOTTINGHAM

T: +44 (0)115 964 7280

SHEFFIELD

T: +44 (0)114 2455153

SHREWSBURY

T: +44 (0)1743 23 9250

STIRLING

T: +44 (0)1786 239900

WORCESTER

T: +44 (0)1905 751310

Ireland

DUBLIN

T: + 353 (0)1 296 4667

France

GRENOBLE

T: +33 (0)6 23 37 14 14