NANTYCAWS LANDFILL

Landfill Surface Emissions Survey 2020
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 2020 Surface Emissions Survey at Nantycaws Landfill.

The Stage 1 landfill gas surface emissions walkover survey was undertaken on 8th September 2020, with the site being divided into 2 zones to reflect the various specifications and restoration within the landfill area.

The walkover survey undertaken in September 2020 demonstrated ongoing compliance across the majority of the cap within the surveyed area. However, the September 2020 survey found there were two distinct areas of cap and five features which required further investigation and remediation. Following remediation, the identified areas of cap and features were re-surveyed on 7th October 2020 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 2020 annual survey, with monitoring undertaken on the 8th September.

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 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. 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 surveys.

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 is the primary cause 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 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 2020 surface emissions survey for Nantycaws Landfill. The most recent surface emission survey for Nantycaws prior to this report was the survey undertaken in 2019[2].

[2] SLR Consulting Ltd. 2019 Surface Emissions Survey Stage 1 Walkover 402.00610.00032.

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. Deposition of waste into the landfill has not been undertaken since December 2016, with no changes to the capped areas since the 2019 surface emissions survey.

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 of 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. This area comprises of long grass vegetation.

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 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 8th September 2020. Data from a walkover survey can be directly influenced by the meteorological conditions prevailing before and during the monitoring period. Weather data using on-site observations and local meteorological station data are presented in Table 3-1, covering the date of the Stage 1 walkover survey and 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)
5th September 2020 AM	5.6	SW	12	998.5
5th September 2020 PM	9.9	SW	15	999
6th September 2020 AM	3.7	SW	14	996.5
6th September 2020 PM	5.6	W	16	998.5
7th September 2020 AM	9.3	NW	12	999.4
7th September 2020 PM	12.4	SW	15	999.5
8th September 2020 AM	6.2	SW	15.5	1001
8th September 2020 PM	5.6	SW	15	1001.5

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 8th September that wind speeds were less than 7mph.

3.2 Gas Management System Conditions

The site currently has two engines and one flare in operation. Gas abstraction system data between September and October 2020 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, illustrating the monitoring locations and corresponding methane concentrations. 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 18th August 2020 (Serial Number 8067). 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 found two locations and five 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	x246831, y217492	100	Hole in cap adjacent to NYCW1210
C2	x246814, y217423	150	Leak between membrane connection

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

Ref	Grid Reference (NGR) (m)	Maximum Methane Concentration (ppm)	Exceedance Information
F1	x246874, y217418	>5,000	NYCW1411 – Collar of the well
F2	x246791, y217458	>5,000	NYCW1402 – Hole in the seal of the cap around the base of the well
F3	x246793, y217457	>5,000	Unlabelled well next to NYCW1402 – Collar of the well connection
F4	x246825, y217415	>5,000	NYCLW017 – Tear in the cap around the base of the well
F5	x246802, y217419	>5,000	NYCW1405 – Tear in the cap around the base of the well

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, two areas of cap and five features were identified as requiring further investigation and possible remediation. CWM investigated both areas and remediation was undertaken. Re-monitoring of the areas identified was undertaken on 7th October 2020, the results of which are detailed below in Table 4-1.

Table 4-1
Re-Monitoring Results 7th October 2020

Reference	Remediation undertaken	Maximum Methane Concentration (ppm)
C1	New geomembrane around opening, held with extrusion wield	50
C2	Extrusion wield	<10
F1	Collar tightly filled with bentonite	<10
F2	Extrusion wield	150
F3	Collar tightly filled with bentonite with new tape around opening	<10
F4	New geomembrane around base of well, held with extrusion wield. Bentonite under new capping	500
F5	Extrusion wield	<10

Concentrations recorded at all exceedence locations were shown to have been remediated sufficiently so that they were no longer exceeding 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

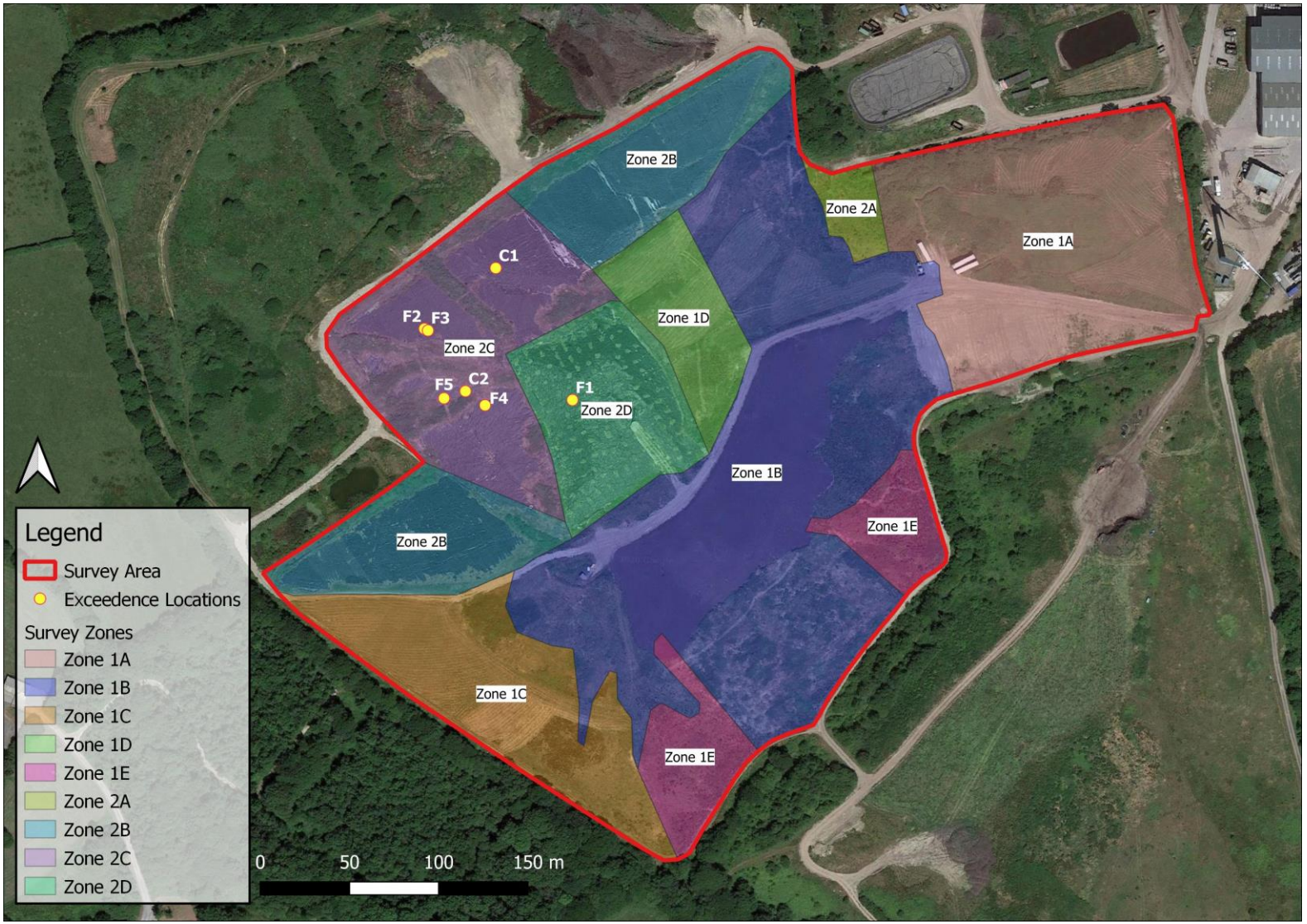
Nantycaws Landfill has not received any additional waste into the landfill since 2016. Since the 2019 surface emissions survey, no additional areas of landfill have been capped and completed that would require a Stage 2 flux survey. Equally, no existing areas of the landfill have changed the nature of 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 2020 Surface Emissions Survey.

5.0 CONCLUSIONS

The 2020 landfill gas surface emissions walkover survey has demonstrated ongoing compliance across the majority of the cap, with two areas of cap and four features within Zone 2C needing remediation and one feature within Zone 2D 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 since the previous surface emissions survey undertaken in 2019. As such, there is no requirement at present for a Stage 2 flux survey to be undertaken.

DRAWINGS



AQ1 – Survey Zones and Exceedence Locations

APPENDIX A

Stage 1 Walkover Results

Table A-1 – Walkover Survey Results

Feature ID	Flux Measurement (ppm methane)
KOP2	<10
NYCW0056	0
NYCW0035	0
NYCW1019	0
NYCW0055	0
NYCW1020	0
NYCW0035	0
NYCL0003	0
NYCW0054	0
NYCW0053	0
NYCL0004	0
NYCW0037	0
NYCW1101	0
NYCW0904	0
NYCW0903	0
NYCW0902	0
NYCW0901	0
NYCL0013	0
NYCW1006	0
NOID1	0
NYCW1003	0
NYCW1002	0
NYCR1001	0
NYCL0014	5
NYCR1202	5
NYCW0908	0
NYCW1008	0
NYCW1209	0
NYCW1210	0
NYCW1203	5
NYCW1005	50
NYCW1410	0
NYCLW15	0
NYCLW16	0
NYCR1201	100
NYCW1411	>5,000

Feature ID	Flux Measurement (ppm methane)
NYCP1201	0
NYCP1202	0
NYCW0906	0
NYCR0905	0
NYCW1102	0
NYCW1104	0
NYCW1103	0
NYCW0913	0
NYCW0709	0
NYCW0912	0
NYCL0006	0
NYCW1910	0
NYCW0710	0
NYCW0911	0
NYCW0711	0
NYCW1009	0
KOP1	0
NYCW1402	>5,000
WELL NEXT TO 1402	>5,000
NYCW1403	0a
KOP07	0
NYCW1406	0
NYCLW017	>5,000
NYCW 1405	>5,000
NYCW1404	0
SUMP2	0
NYCW1407	0
UNLABELLED BETWEEN 1407 1412	900
NYCW1412	0
UNLABELLED WELL NEXT TO 1411	100
UNLABELLED WELL 2 NEXT TO 1411	50
UNLABELLED WELL 3 NEXT TO 1411	10
UNLABELLED WELL 4 NEXT TO 1411	0
NYCW1206	0
NYCW0907	0
NYCW0909	0
NYCL0010	0

Feature ID	Flux Measurement (ppm methane)
NYCW1012	0
NYCW1011	0
NYCW1010	0
NYCW0704	0
NYCW0703	0
NYCW0605	not found
NYCW1103 (2)	0
KOP04	0
MANIFOLD 13	0
NCL0001	0
NYCL00012	0
NYCL0011	0
NYCW511	0
NYCW513	0
NYCW0512	0
NYCL0009	0
NYCW1018	0
KOP6	0
NYCW0509	0
NYCW1017	0
NYCL0008	0
NYCW0508	0
NYCW1016	0
NYCW1015	0
NYCL0007	0
NYCW1014	0
NYCW0509	0
NYCW1013	0
KOP5	0

APPENDIX B

Stage 1 Walkover Photos

Cap Exceedence 1

Cap Exceedence 2

Feature Exceedence 1

Feature Exceedence 2

Feature Exceedence 3

Feature Exceedence 4

Feature Exceedence 5

APPENDIX C

Gas Management Abstraction System Data (04.09.20, 09.09.20, 01.10.20 & 07.10.20)

Table C-1 – Gas Management Abstraction System Data

Reference	Reading Taken On	CH_4 (%)	CO_2 (%)	O_2 (%)	Depart valve (%)
NYCSITE1	04/09/2020 08:42	40.6	26.8	0.9	-
NYCSMN13	04/09/2020 09:07	41.2	26.9	0.9	100
NYCSMN7S	04/09/2020 09:09	37.8	28.8	1.3	100
NYCSOLDS	04/09/2020 09:13	42.5	24.5	0.4	20
NYCW0035	04/09/2020 09:20	1.5	2.5	20.8	0
NYCW0055	04/09/2020 09:23	0.3	0.9	20.9	0
NYCW0056	04/09/2020 09:26	30.2	7.4	10.8	15
NYCW1019	04/09/2020 09:28	45.6	19.1	0.4	5
NYCW1020	04/09/2020 09:32	10	19.3	0.2	0
NYCW1021	04/09/2020 09:36	-	-	-	-
NYCW0054	04/09/2020 09:42	-	-	-	-
NYCW0036	04/09/2020 09:53	51.3	20.9	4.9	7
NYCW0037	04/09/2020 09:57	48.3	21.1	0.6	15
NYCW0053	04/09/2020 10:00	8.2	4.5	18.6	0
NYCSC601	04/09/2020 10:15	-	-	-	-
NYCSC602	04/09/2020 10:18	-	-	-	-
NYCSC603	04/09/2020 10:20	-	-	-	-
NYCW0901	04/09/2020 10:32	39.8	27.1	0.3	7
NYCW0902	04/09/2020 10:35	35.3	27.6	0.3	28
NYCW0903	04/09/2020 10:38	62.3	37.2	0.3	100
NYCW1002	04/09/2020 10:41	63.2	34.4	0.2	100
NYCW1003	04/09/2020 10:43	34.4	29	0.2	20
NYCW1006	04/09/2020 10:46	45.5	34.1	0.2	30
NYCW1007	04/09/2020 10:48	53.6	31.9	0.2	7
NYCW1008	04/09/2020 10:51	33.5	28.4	0.4	5
NYCW1005	04/09/2020 10:53	25.5	26.1	0.2	10
NYCW1004	04/09/2020 11:03	60.6	40.1	0.2	100
NYCR1001	04/09/2020 11:06	59.1	38.3	0.3	100
NYCR0905	04/09/2020 11:09	23.2	9.3	14.4	0
NYCW0906	04/09/2020 11:13	63.1	37.6	0.3	100
NYCR1201	04/09/2020 11:19	56.6	39.5	0.2	100
NYCR1202	04/09/2020 11:24	50.6	36.5	0.6	100
NYCW1206	04/09/2020 13:13	58.4	42.9	0.3	100

Reference	Reading Taken On	CH_4 (%)	CO_2 (%)	O_2 (%)	Depart valve (%)
NYCW1412	04/09/2020 13:16	31.6	29.4	0.3	10
NYCW1411	04/09/2020 13:18	58.5	42.7	0.2	100
NYCW1410	04/09/2020 13:21	38.3	31.8	0.2	10
NYCW1203	04/09/2020 13:26	37.7	29.6	0.2	21
NYCW1209	04/09/2020 13:28	35.3	27	1.1	5
NYCW1210	04/09/2020 13:31	72.2	28.6	0.3	10
NYCW1402	04/09/2020 13:34	29.7	27	0.2	20
NYCW1403	04/09/2020 13:36	32.6	22.2	0.4	5
NYCW1404	04/09/2020 13:39	35.4	29.6	0.2	7
NYCW1405	04/09/2020 13:41	36.7	30.1	0.3	5
NYCW1406	04/09/2020 13:44	54.8	38.6	0.2	7
NYCW1407	04/09/2020 13:48	41.2	24.9	7.2	5
NYCW0909	04/09/2020 13:54	49.9	28.3	0.2	7
NYCSITE1	04/09/2020 14:39	40.6	26.2	1	-
NYCW1013	09/09/2020 10:45	0.2	4.3	16.8	0
NYCW1014	09/09/2020 10:47	37.5	25.9	0.3	12
NYCW1015	09/09/2020 10:50	37.6	24.2	0.3	5
NYCW1016	09/09/2020 10:53	41	19.8	0.3	10
NYCW0508	09/09/2020 10:55	37.6	18.9	0.3	10
NYCW1017	09/09/2020 10:57	39.7	18.4	0.3	12
NYCW0509	09/09/2020 11:00	47	20	0.3	15
NYCW1018	09/09/2020 11:03	16.7	18.1	0.2	0
NYCW0512	09/09/2020 11:10	38.1	19.9	0.4	10
NYCW0513	09/09/2020 11:12	68.7	32.7	0.2	12
NYCW0911	09/09/2020 11:17	39.6	29.5	0.3	80
NYCW0711	09/09/2020 11:21	61.5	39.4	0.2	100
NYCW1009	09/09/2020 11:23	40.9	28.5	0.3	43
NYCW0910	09/09/2020 11:25	34.7	23.5	7.2	10
NYCW0709	09/09/2020 11:28	47.2	35	0.3	80
NYCW0710	09/09/2020 11:30	28.1	24.6	0.3	2
NYCW1012	09/09/2020 11:33	39.3	31.4	0.3	20
NYCW1011	09/09/2020 11:36	39.3	32.4	0.3	22
NYCW1010	09/09/2020 11:38	38.8	30.9	0.3	15
NYCW0913	09/09/2020 11:41	63.7	37	0.3	100

Reference	Reading Taken On	CH_4 (%)	CO_2 (%)	O_2 (%)	Depart valve (%)
NYCW0912	09/09/2020 11:44	45	30.1	0.3	12
NYCW1104	09/09/2020 11:53	47.1	26.4	4	12
NYCW1103	09/09/2020 11:57	40.3	29.1	0.4	80
NYCW1102	09/09/2020 11:59	-	-	-	-
NYCW0904	09/09/2020 12:03	41.4	20.7	0.4	28
NYCW1101	09/09/2020 12:09	24.1	15.3	0.4	0
NYCW0704	09/09/2020 13:11	25.3	23.1	1.2	7
NYCW0703	09/09/2020 13:17	38.8	29	0.2	80
NYCW0605	09/09/2020 13:19	37	23.2	0.3	10
NYCW0033	09/09/2020 13:28	40.9	26.6	0.8	20
NYCW0027	09/09/2020 13:33	45.2	23.8	0.3	30
NYCW0029	09/09/2020 13:36	1.1	9.1	12.8	0
NYCW0025	09/09/2020 13:39	51.5	16.7	0.4	7
NYCW0023	09/09/2020 13:42	34.8	22.7	0.5	20
NYCW0013	09/09/2020 13:46	35	23.6	0.2	7
NYCW0018	09/09/2020 13:50	34.8	24.5	0.2	12
NYCW0002	09/09/2020 14:07	27.3	18.4	1.9	5
NYCW0003	09/09/2020 14:15	50.4	23.1	4.6	5
NYCW0004	09/09/2020 14:18	41.8	23.2	0.4	32
NYCW0012	09/09/2020 14:21	41.7	24	0.3	20
NYCW0006	09/09/2020 14:23	38.3	20.8	0.4	30
NYCW0007	09/09/2020 14:26	49.4	25	0.4	32
NYCW0008	09/09/2020 14:28	61.4	29.6	0.4	100
NYCW0010	09/09/2020 14:31	58.5	29.3	0.3	100
NYCW0022	09/09/2020 14:34	37.8	26.6	0.3	10
NYCSITE1	09/09/2020 14:45	40	26.3	1	-
NYCSITE1	01/10/2020 08:56	41.3	30.1	0.5	-
NYCSMN13	01/10/2020 09:07	43.3	30.4	0.5	100
NYCSMN7S	01/10/2020 09:09	40.4	32.2	0.8	100
NYCSOLDS	01/10/2020 09:14	41.1	27.5	0.1	20
NYCW0035	01/10/2020 09:40	3.8	0.6	20.2	0
NYCW0055	01/10/2020 09:44	50.8	15.9	0.2	2
NYCW0055	01/10/2020 09:46	50.4	15.9	0.1	2
NYCW0056	01/10/2020 09:50	60.8	17.6	0.8	17

Reference	Reading Taken On	CH_4 (%)	CO_2 (%)	O_2 (%)	Depart valve (%)
NYCW0056	01/10/2020 09:53	61.9	17.9	0.5	17
NYCW1019	01/10/2020 09:56	32.4	20.9	0	3
NYCW1019	01/10/2020 09:58	32.4	20.9	0	3
NYCW1020	01/10/2020 10:02	7.5	19.5	0	0
NYCW1021	01/10/2020 10:06	-	-	-	-
NYCW0054	01/10/2020 10:11	26.2	18.4	0.2	0
NYCW0036	01/10/2020 10:20	58.1	27.6	0.1	10
NYCW0036	01/10/2020 10:23	58.2	27.8	0	10
NYCW0037	01/10/2020 10:26	41.1	24.9	0	12
NYCW0037	01/10/2020 10:28	41	24.9	0	12
NYCW0053	01/10/2020 10:32	33	11.5	11.9	0
NYCSC601	01/10/2020 10:46	58	41.7	0	100
NYCSC602	01/10/2020 10:48	43.1	35.1	0.1	100
NYCSC603	01/10/2020 10:51	39.5	31.2	1.4	100
NYCW0901	01/10/2020 11:12	51.5	35.2	0	7
NYCW0902	01/10/2020 11:17	39.6	31.7	0	28
NYCW0903	01/10/2020 11:20	54.9	36.5	1.7	100
NYCW1002	01/10/2020 11:23	61.6	37.5	0	100
NYCW1003	01/10/2020 11:26	38.7	33.2	0	20
NYCW1006	01/10/2020 11:30	57.9	41.9	0	32
NYCW1006	01/10/2020 11:32	53	38.4	0	32
NYCW1007	01/10/2020 11:35	52.4	31.8	0	7
NYCW1008	01/10/2020 11:37	39.1	32.4	0.1	5
NYCW1005	01/10/2020 11:41	43.9	35.8	0	12
NYCW1004	01/10/2020 11:45	59.1	42.3	0	100
NYCR1001	01/10/2020 11:49	58.5	41.8	0	100
NYCR0905	01/10/2020 11:52	71	25.8	0	5
NYCW0906	01/10/2020 13:02	60.3	40.7	0	100
NYCR1201	01/10/2020 13:09	56.1	42.3	0	100
NYCR1202	01/10/2020 13:12	52.5	39.4	0.5	100
NYCW1206	01/10/2020 13:19	56.3	45.5	0	100
NYCW1412	01/10/2020 13:23	52.5	41.8	0	10
NYCW1411	01/10/2020 13:27	56.9	45.6	0	100
NYCW1410	01/10/2020 13:30	40.8	34.1	0	10

Reference	Reading Taken On	CH_4 (%)	CO_2 (%)	O_2 (%)	Depart valve (%)
NYCW1203	01/10/2020 13:35	42.8	33.3	0	21
NYCW1209	01/10/2020 13:38	36.4	29.3	0.7	5
NYCW1210	01/10/2020 13:41	20.1	22.5	0	0
NYCW1402	01/10/2020 13:47	35.8	29.2	0	20
NYCW1403	01/10/2020 13:53	34	24.4	0	5
NYCW1404	01/10/2020 13:58	47.9	36.9	0	7
NYCW1405	01/10/2020 14:03	42.9	35.7	0	5
NYCW1406	01/10/2020 14:07	57.5	43.6	0	10
NYCW0909	01/10/2020 14:34	57.6	33.3	0	7
NYCSITE1	01/10/2020 14:59	42.5	30.9	0.7	-
NYCW1013	07/10/2020 08:42	0.1	3.8	17.7	0
NYCW1014	07/10/2020 08:45	38.2	28.9	0.1	12
NYCW1015	07/10/2020 08:47	31.7	23.3	0	5
NYCW1016	07/10/2020 08:50	37.9	21.7	0	8
NYCW0508	07/10/2020 08:52	38.1	20.8	0	10
NYCW1017	07/10/2020 08:54	46.2	20.4	0	12
NYCW0509	07/10/2020 08:57	43	22.2	0	15
NYCW1018	07/10/2020 09:00	9.8	19.2	0	0
NYCW0512	07/10/2020 09:07	35.3	22.8	0	8
NYCW0513	07/10/2020 09:09	45.3	23.7	0	12
NYCW0911	07/10/2020 09:14	45.8	33.4	0	85
NYCW0711	07/10/2020 09:21	61.1	41.5	0	100
NYCW1009	07/10/2020 09:24	49.2	32.8	0	45
NYCW0910	07/10/2020 09:26	51.7	38.9	2.2	12
NYCW0710	07/10/2020 09:29	59.6	41.9	0	5
NYCW0709	07/10/2020 09:31	50.3	39	0	85
NYCW0912	07/10/2020 09:34	51.4	35.6	0	14
NYCW0913	07/10/2020 09:36	63.3	38.4	0	100
NYCW1010	07/10/2020 09:40	45.5	34.7	0	15
NYCW1011	07/10/2020 09:42	54.5	37.9	0	24
NYCW1012	07/10/2020 09:44	53	36.5	0	22
NYCW0904	07/10/2020 09:59	44.8	25.1	0	28
NYCW1101	07/10/2020 10:01	34.8	17.3	0	5
NYCW1102	07/10/2020 10:06	74.1	26.9	0	5

Reference	Reading Taken On	CH_4 (%)	CO_2 (%)	O_2 (%)	Depart valve (%)
NYCW1103	07/10/2020 10:08	44.1	32.6	0	80
NYCW1104	07/10/2020 10:11	39.8	26	4.9	6
NYCW0704	07/10/2020 11:47	38.5	26.6	1.2	7
NYCW0703	07/10/2020 11:55	41.6	32	0	80
NYCW0605	07/10/2020 11:57	40.3	26.1	0	10
NYCW0033	07/10/2020 12:04	41.6	30	0.4	20
NYCW0027	07/10/2020 12:08	46	26.7	0	30
NYCW0029	07/10/2020 12:11	45	25.9	0.9	10
NYCW0025	07/10/2020 12:14	54.8	18.2	0	10
NYCW0023	07/10/2020 12:16	35.6	26.5	0	20
NYCW0013	07/10/2020 12:19	50.5	27.4	0	10
NYCW0018	07/10/2020 12:22	48.5	9.1	0	12
NYCW0002	07/10/2020 12:35	66.8	20.1	1.2	5
NYCW0003	07/10/2020 12:44	28.5	18.7	9.9	0
NYCW0004	07/10/2020 12:47	39	26.1	0	30
NYCW0012	07/10/2020 12:50	43.7	26.9	0	20
NYCW0006	07/10/2020 12:53	33	23.5	0	25
NYCW0007	07/10/2020 12:55	49.2	28.6	0	32
NYCW0008	07/10/2020 12:58	59.2	33.2	0	100
NYCW0010	07/10/2020 13:00	54.6	32.6	0	100
NYCW0022	07/10/2020 13:05	39.5	29.8	0	10
NYCW1407	07/10/2020 14:31	51.3	35.4	1	5

APPENDIX D

Gastec Flame Ionisation Detector (FID) Calibration Certificate

GES

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	18th August 2020
Instrument Details	Gastec MK 4
Serial Number	8067
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	APE1170631
500 ppm	One	550ppm	AGA184231
800 ppm	One	850ppm	APL608817
80 ppm	Two	78ppm	APE1170631
500 ppm	Two	550ppm	AGA184231
800 ppm	Two	850ppm	APL608817
8000 ppm	Two	8500ppm	APL 223439

Terry Evans
Gas & Environmental Services Ltd

GES

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

Certificate of Test and Calibration

Calibration Date	18th August 2020
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	APE1170631
500 ppm	One	550ppm	AGA184231
800 ppm	One	850ppm	APL608817
80 ppm	Two	82ppm	APE1170631
500 ppm	Two	550ppm	AGA184231
800 ppm	Two	850ppm	APL608817
8000 ppm	Two	8200ppm	APL 223439

Terry Evans
Gas & Environmental Services Ltd

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