Appendix 7.3: Diffusion Tube Monitoring Survey Results

The raw monitoring data from the average of the duplicate diffusion tubes (if available) for each location in the RPS monitoring scheme is presented below in Table 7.3.1.

Table 7.3.1 Raw Diffusion Tube Data

Monitoring Location	Monitored NO_2 Concentration ($\mu g/m^3$)		
	May	June	July
1 (7N)	16.6	19.5	19.4
2 (8N)	6.8	7.0	8.7
3 (9N)	9.2	9.9	12.2
4 (11N)	5.7	5.5	8.1
5 (12N)	5.7	5.4	7.5
6 (18N)	6.0	5.9	8.4
7 (19N)	7.5	8.2	10.5
8 (20N)	18.5	20.3	21.4
9 (22N)	6.8	7.1	9.1

Figure 7.3.1 shows the raw data analytical reports from the Gradko laboratory. A minimum of three months' worth of data is required to perform an annualisation calculation.

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ilac-MRA UKAS TESTING 2187

LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER T04085R
BOOKING IN REFERENCE T04085
DESPATCH NOTE 112773
CUSTOMER RPS - (Brighton) Attn: Georgie Coppin
6-7 Lovers Walk
Preston Park
Brighton
Sussex
BN1 6AH
DATE SAMPLES RECEIVED 20/06/2025

Location	Sample Number	Exposure Data Date On*	Date Off*	Time* (hr.)	µg/m³ *	ppb *	µg NO_2 on tube
7N-A	2654205	13/05/2025	16/06/2025	815.58	16.41	8.57	0.97
7N-B	2654204	13/05/2025	16/06/2025	815.58	16.75	8.74	0.99
8N-A	2654203	13/05/2025	16/06/2025	815.88	6.88	3.59	0.41
8N-B	2654202	13/05/2025	16/06/2025	815.88	6.66	3.48	0.40
9N-A	2654201	13/05/2025	16/06/2025	814.22	8.67	4.52	0.51
9N-B	2654209	13/05/2025	16/06/2025	814.22	9.77	5.10	0.58
11N-A	2654208	13/05/2025	16/06/2025	815.85	5.68	2.97	0.34
12N-A	2654207	13/05/2025	16/06/2025	815.88	5.77	3.01	0.34
12N-B	2654206	13/05/2025	16/06/2025	815.88	5.57	2.90	0.33
18N-A	2654213	13/05/2025	16/06/2025	816.30	5.60	2.92	0.33
18N-B	2654212	13/05/2025	16/06/2025	816.30	6.37	3.33	0.38
19N-A	2654210	13/05/2025	16/06/2025	815.57	7.66	4.00	0.45
19N-B	2654214	13/05/2025	16/06/2025	815.57	7.25	3.79	0.43
20N-A	2654211	13/05/2025	16/06/2025	815.88	17.84	9.31	1.06
20N-B	2668990	13/05/2025	16/06/2025	815.88	19.21	10.03	1.14
22N-A	2668989	13/05/2025	16/06/2025	815.85	6.93	3.62	0.41
22N-B	2668988	13/05/2025	16/06/2025	815.85	6.71	3.50	0.40
Control	2620725			816.30	0.03	0.02	0.00
Laboratory Blank				816.30	0.13	0.07	0.008

Comment: Results are not blank subtracted
Tubes 2668989-90, 2654214, 2654201, 2654204 contained insects. Results may be compromised.
Tubes 2654208 & 2668988 were dirty when received. Results may be compromised.
Results have been corrected to a temperature of 293 K (20°)
Overall M.U. ±9.7% **Limit of Detection** 0.030µgNO_2
The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Tube Preparation: 20% TEA / Water
Analysed on UV CARY3
Analyst Name Mihnea Marmara **Report Checked By** Barbara Perzanowska

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....[redacted]
L. Gates, Laboratory Manager

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LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER T04748R
BOOKING IN REFERENCE T04748
DESPATCH NOTE 115727
CUSTOMER RPS - (Brighton) Attn: Georgie Coppin
6-7 Lovers Walk
Preston Park
Brighton
Sussex
BN1 6AH
DATE SAMPLES RECEIVED 21/07/2025

Location	Sample Number	Exposure Data Date On*	Date Off*	Time* (hr.)	µg/m³ *	ppb *	µg NO_2 on tube
7N - A	2688374	16/06/2025	10/07/2025	575.80	19.33	10.09	0.81
7N - B	2688373	16/06/2025	10/07/2025	575.80	19.71	10.29	0.83
8N - A	2688372	16/06/2025	10/07/2025	575.92	6.81	3.55	0.29
8N - B	2688371	16/06/2025	10/07/2025	575.92	7.21	3.77	0.30
9N - A	2688370	16/06/2025	10/07/2025	575.55	10.33	5.39	0.43
9N - B	2688369	16/06/2025	10/07/2025	575.55	9.56	4.99	0.40
11N - A	2688379	16/06/2025	10/07/2025	576.13	5.13	2.68	0.22
11N - B	2688378	16/06/2025	10/07/2025	576.13	5.78	3.02	0.24
12N - A	2688377	16/06/2025	10/07/2025	575.93	5.61	2.93	0.24
12N - B	2688376	16/06/2025	10/07/2025	575.93	5.26	2.74	0.22
18N - A	2688375	16/06/2025	10/07/2025	575.90	5.76	3.01	0.24
18N - B	2688385	16/06/2025	10/07/2025	575.90	5.95	3.10	0.25
19N - A	2688384	16/06/2025	10/07/2025	575.85	8.27	4.31	0.35
19N - B	2688383	16/06/2025	10/07/2025	575.85	8.12	4.24	0.34
20N - A	2688382	16/06/2025	10/07/2025	575.93	18.44	9.63	0.77
20N - B	2688381	16/06/2025	10/07/2025	575.93	22.12	11.55	0.93
22N - A	2688387	16/06/2025	10/07/2025	575.93	7.26	3.79	0.30
22N - B	2688388	16/06/2025	10/07/2025	575.93	6.95	3.63	0.29
Control	2688380			576.13	0.14	0.07	0.01
	Laboratory Blank			576.13	0.26	0.14	0.011

Comment: Results are not blank subtracted.
Tube 2688376 contained an insect. Result may be compromised.
Tube 2688379 contained a spider. Result may be compromised.
Tube 2688388 contained a web. Result may be compromised.
Results have been corrected to a temperature of 293 K (20°).

Overall M.U. ±9.7% **Limit of Detection** 0.028µgNO_2

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Tube Preparation: 20% TEA / Water Analysed on UV CARY1

Analyst Name Ivelina Paldamova **Report Checked By** Marek Bianga
Date of Analysis 30/07/2025 **Date of Report** 30/07/2025

Analysis carried out in accordance with documented in-house Laboratory Method GLM7.

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed: [redacted]
L. Gates, Laboratory Manager

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LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER T05180R
BOOKING IN REFERENCE T05180
DESPATCH NOTE 115728
CUSTOMER RPS - (Brighton) Attn: Georgie Coppin
6-7 Lovers Walk
Preston Park
Brighton
Sussex
BN1 6AH
DATE SAMPLES RECEIVED 11/08/2025
JOB REFERENCE 794-ENV-AIR-22346

Location	Sample Number	Exposure Data Date On*	Date Off*	Time* (hr.)	µg/m³ *	ppb *	µg NO_2 on tube
7N - A	2711172	10/07/2025	06/08/2025	648.15	13.18	6.88	0.62
7N - B	2711171	10/07/2025	06/08/2025	648.15	19.38	10.12	0.91
8N - A	2711170	10/07/2025	06/08/2025	648.20	8.85	4.62	0.42
8N - B	2711169	10/07/2025	06/08/2025	648.20	8.55	4.46	0.40
9N - A	2711168	10/07/2025	06/08/2025	648.67	11.90	6.21	0.56
9N - B	2711167	10/07/2025	06/08/2025	648.67	12.43	6.49	0.59
11N - A	2711178	10/07/2025	06/08/2025	648.13	7.94	4.14	0.37
11N - B	2711177	10/07/2025	06/08/2025	648.13	8.17	4.27	0.39
12N - A	2711176	10/07/2025	06/08/2025	648.38	7.85	4.10	0.37
12N - B	2711175	10/07/2025	06/08/2025	648.38	7.21	3.77	0.34
18N - A	2711174	10/07/2025	06/08/2025	648.17	8.45	4.41	0.40
18N - B	2711173	10/07/2025	06/08/2025	648.17	8.26	4.31	0.39
19N - A	2711183	10/07/2025	06/08/2025	648.15	11.17	5.83	0.53
19N - B	2711182	10/07/2025	06/08/2025	648.15	9.79	5.11	0.46
20N - A	2711181	10/07/2025	06/08/2025	648.23	21.73	11.34	1.02
20N - B	2711180	10/07/2025	06/08/2025	648.23	21.08	11.00	0.99
22N - A	2711179	10/07/2025	06/08/2025	648.27	8.94	4.66	0.42
22N - B	2711184	10/07/2025	06/08/2025	648.27	9.25	4.83	0.44
Control	2711188			648.67	0.23	0.12	0.01
Laboratory Blank				648.67	0.28	0.14	0.013

Comment: Results are not blank subtracted
Results have been corrected to a temperature of 293 K (20°)

Overall M.U. ±9.7% **Limit of Detection** 0.013µgNO_2
The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Tube Preparation: 20% TEA / Water Analysed on UV CARY4
Analyst Name Alison Wright **Report Checked By** Barbara Perzanowska

Date of Analysis 19/08/2025 **Date of Report** 19/08/2025

Analysis carried out in accordance with documented in-house Laboratory Method GLM7

REPORT OFFICIALLY CHECKED

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Signed [redacted]
L. Gates, Laboratory Manager

The precision of the duplicate diffusion tubes has been calculated using the LAQM Diffusion Tube Precision Accuracy Bias tool. The results of the tool are below. Any set of tubes with a poor precision rating have resulted in the lowest data point been removed from further analysis (on a conservative basis).

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Tubes Precision Check
1	13/05/2025	16/06/2025	16.4	16.8	17	0.2	1	2.1	Good
2	13/05/2025	16/06/2025	6.9	6.7	7	0.2	2	1.4	Good
3	13/05/2025	16/06/2025	8.7	9.8	9	0.8	8	7.0	Good
4	13/05/2025	16/06/2025	5.7	-	-	-		-	-
5	13/05/2025	16/06/2025	5.8	5.6	6	0.1	3	1.3	Good
6	13/05/2025	16/06/2025	5.6	6.4	6	0.5	9	4.9	Good
7	13/05/2025	16/06/2025	7.7	7.3	7	0.3	4	2.6	Good
8	13/05/2025	16/06/2025	17.8	19.2	19	1.0	5	8.7	Good
9	13/05/2025	16/06/2025	6.9	6.7	7	0.2	2	1.4	Good
									Good precision

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Tubes Precision Check
1	16/06/2025	10/07/2025	19.3	19.7	20	0.3	1	2.4	Good
2	16/06/2025	10/07/2025	6.8	7.2	7	0.3	4	2.6	Good
3	16/06/2025	10/07/2025	10.3	9.6	10	0.5	5	4.9	Good
4	16/06/2025	10/07/2025	5.1	5.8	5	0.5	8	4.1	Good
5	16/06/2025	10/07/2025	5.6	5.3	5	0.3	5	2.3	Good
6	16/06/2025	10/07/2025	5.8	5.9	6	0.1	2	1.2	Good
7	16/06/2025	10/07/2025	8.3	8.1	8	0.1	1	0.9	Good
8	16/06/2025	10/07/2025	18.4	22.1	20	2.6	13	23.4	Good
9	16/06/2025	10/07/2025	7.3	7.0	7	0.2	3	2.0	Good
									Good precision

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Tubes Precision Check
1	10/07/2025	10/07/2025	13.2	19.4	16	4.4	27	39.4	Poor Precision
2	10/07/2025	10/07/2025	8.9	8.6	9	0.2	2	1.9	Good
3	10/07/2025	10/07/2025	11.9	12.4	12	0.4	3	3.4	Good
4	10/07/2025	10/07/2025	7.9	8.2	8	0.2	2	1.5	Good
5	10/07/2025	10/07/2025	7.9	7.2	8	0.5	6	4.0	Good
6	10/07/2025	10/07/2025	8.4	8.3	8	0.1	2	1.2	Good
7	10/07/2025	10/07/2025	11.2	9.8	10	1.0	9	8.8	Good
8	10/07/2025	10/07/2025	21.7	21.1	21	0.5	2	4.2	Good
9	10/07/2025	10/07/2025	8.9	9.3	9	0.2	2	2.0	Good
									Good precision

Following precision analysis, the data underwent annualisation, in line with LAQM TG22. Data was collated from the UK Automatic Urban and Rural Network (AURN), a countrywide network of air quality monitoring stations operated on behalf of Defra. Monitoring data for AURN sites was obtained from Automatic Urban and Rural Network (AURN) - DEFRA UK Air - GOV.UK.

As per the requirements of LAQM.TG22, background AURN monitoring sites within 50km of the diffusion tube monitoring positions, and with a minimum data capture of 85%, have been used within the calculation. The following sites have been used: Reading New Town, London Hillingdon and Oxford St Ebbes. The data is shown in Table 7.3.2.

Table 7.3.2 Annualisation of Diffusion Tube Data

Site	London Hillingdon	Reading New Town	Oxford St Ebbes
Year Average (i.e. 06/08/2024 to 06/08/2025)	24.34	12.22	11.20
Period* Average	16.73	6.88	6.92
Ratio	1.45	1.78	1.62
Average Ratio	1.56		
* Corresponding to the monitoring period undertaken for the diffusion tube survey.			

Following the annualisation, a bias adjustment factor of 0.84 is also applied to the data, as outlined in LAQM TG22 to offset the inherent bias associated with diffusion tubes measuring NO_2. This adjustment factor is taken from the most recent national Defra Diffusion Tube Bias Adjustment Factors Spreadsheet (June 2025), which calculates an adjustment factor using 31 studies that utilise Gradko 20% TEA in water tubes. A value of 1.56 has been applied to the data set for annualisation. Table 7.3.3 below displays the adjusted and annualised data.

Table 7.3.3 Adjusted and Annualised Concentrations

Monitoring site	Raw Period Mean Concentration (µg/m^3)	Annualised Mean Concentration (µg/m^3)	Bias Adjusted Annualised Mean Concentration (µg/m^3)
1	18.5	28.9	24.3
2	7.5	11.7	9.8
3	10.4	16.3	13.7
4	6.4	10.0	8.4
5	6.2	9.7	8.2
6	6.7	10.5	8.8
7	8.7	13.6	11.4
8	20.1	31.4	26.4
9	7.7	12.0	10.1