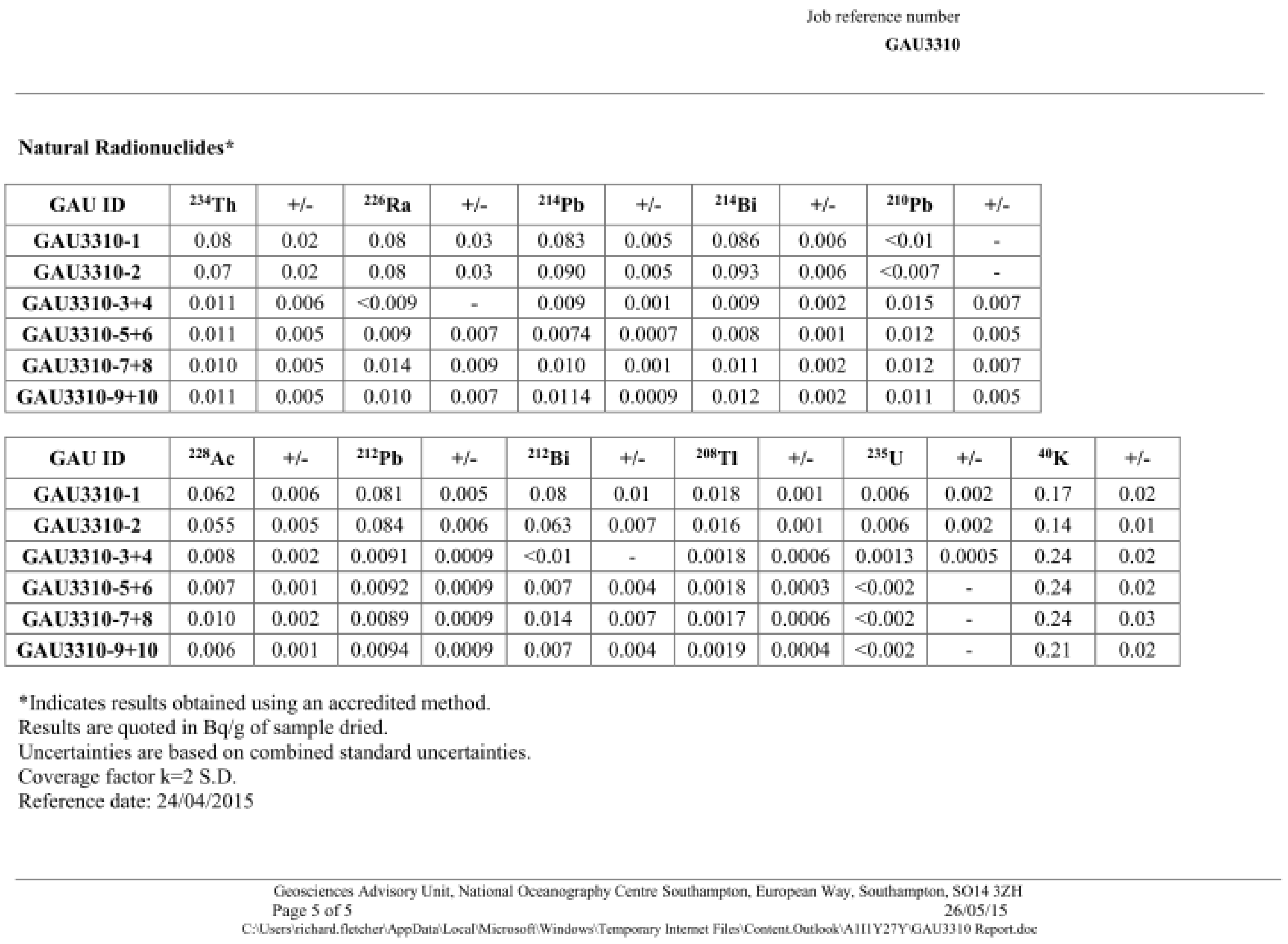


Job reference number
GAU3310

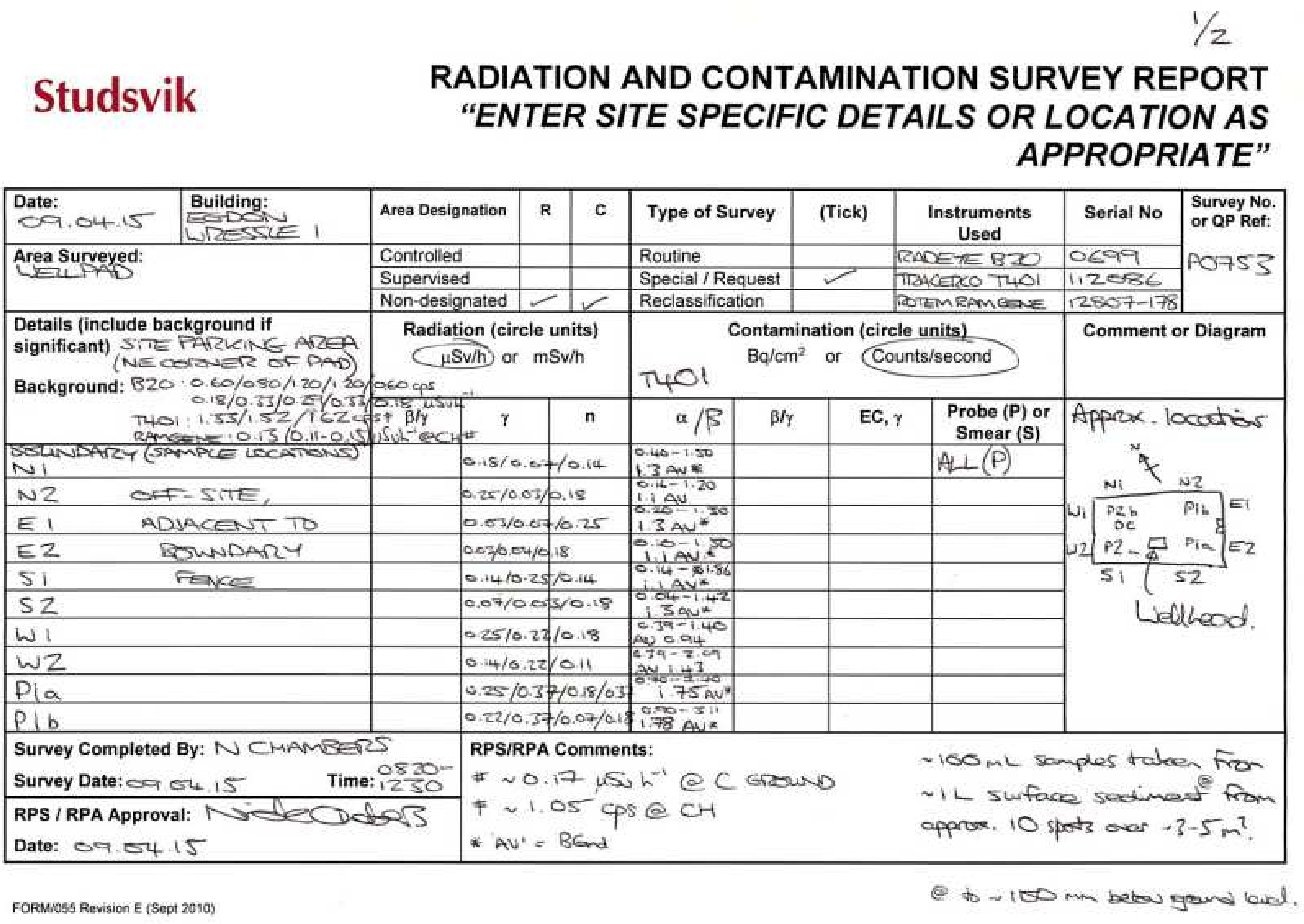
Natural Radionuclides*

GAU ID	^{234}Th	+/-	^{226}Ra	+/-	^{214}Pb	+/-	^{214}Bi	+/-	^{210}Pb	+/-
GAU3310-1	0.08	0.02	0.08	0.03	0.083	0.005	0.086	0.006	<0.01	-
GAU3310-2	0.07	0.02	0.08	0.03	0.090	0.005	0.093	0.006	<0.007	-
GAU3310-3+4	0.011	0.006	<0.009	-	0.009	0.001	0.009	0.002	0.015	0.007
GAU3310-5+6	0.011	0.005	0.009	0.007	0.0074	0.0007	0.008	0.001	0.012	0.005
GAU3310-7+8	0.010	0.005	0.014	0.009	0.010	0.001	0.011	0.002	0.012	0.007
GAU3310-9+10	0.011	0.005	0.010	0.007	0.0114	0.0009	0.012	0.002	0.011	0.005

GAU ID	^{228}Ac	+/-	^{212}Pb	+/-	^{212}Bi	+/-	^{208}Tl	+/-	^{235}U	+/-	^{40}K	+/-
GAU3310-1	0.062	0.006	0.081	0.005	0.08	0.01	0.018	0.001	0.006	0.002	0.17	0.02
GAU3310-2	0.055	0.005	0.084	0.006	0.063	0.007	0.016	0.001	0.006	0.002	0.14	0.01
GAU3310-3+4	0.008	0.002	0.0091	0.0009	<0.01	-	0.0018	0.0006	0.0013	0.0005	0.24	0.02
GAU3310-5+6	0.007	0.001	0.0092	0.0009	0.007	0.004	0.0018	0.0003	<0.002	-	0.24	0.02
GAU3310-7+8	0.010	0.002	0.0089	0.0009	0.014	0.007	0.0017	0.0006	<0.002	-	0.24	0.03
GAU3310-9+10	0.006	0.001	0.0094	0.0009	0.007	0.004	0.0019	0.0004	<0.002	-	0.21	0.02

*Indicates results obtained using an accredited method.
Results are quoted in Bq/g of sample dried.
Uncertainties are based on combined standard uncertainties.
Coverage factor k=2 S.D.
Reference date: 24/04/2015

APPENDIX B – CONTAMINATION SURVEY



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Studsvik

RADIATION AND CONTAMINATION SURVEY REPORT
"ENTER SITE SPECIFIC DETAILS OR LOCATION AS APPROPRIATE"

Date: 09.04.15	**Building:** EGDON WRESSLE 1	**Area Designation**	**R**	**C**	**Type of Survey**	**(Tick)**	**Instruments Used**	**Serial No**	**Survey No. or QP Ref:**
Area Surveyed: WELLPAD		Controlled			Routine		RADEYE B20	0699	P0753
		Supervised			Special / Request	✓	TRACERCO T401	112586	
		Non-designated	✓	✓	Reclassification		ROTEM RAMGENE	12807-178	

Details (include background if significant) SITE PARKING AREA (NE CORNER OF PAD)

Background: B20 : 0.60/0.80/1.20/1.20/0.60 cps
0.18/0.33/0.25/0.33/0.18 µSvh⁻¹
T401 : 1.53/1.52/1.62 cps† β/γ
RAMGENE : 0.13 (0.11-0.15) µSvh⁻¹ @CH#

Radiation (circle units) [✓ µSv/h] or mSv/h

Contamination (circle units) Bq/cm² or [✓ Counts/second] T401

BOUNDARY (SAMPLE LOCATIONS)	γ	n	α / β	β/γ	EC, γ	Probe (P) or Smear (S)
N1	0.15/0.07/0.14		0.40-1.30 1.3 AV*			ALL (P)
N2 OFF-SITE,	0.25/0.03/0.15		0.14-1.20 1.1 AV			
E1 ADJACENT TO	0.03/0.07/0.25		0.20-1.30 1.3 AV*			
E2 BOUNDARY	0.03/0.04/0.18		0.10-1.30 1.1 AV*			
S1 FENCE	0.14/0.25/0.14		0.14-1.86 1.1 AV*			
S2	0.07/0.03/0.18		0.04-1.42 1.3 AV*			
W1	0.25/0.22/0.18		0.39-1.40 AV 0.94			
W2	0.14/0.22/0.11		0.79-2.09 AV 1.43			
P1a	0.25/0.37/0.18/0.37		0.90-3.20 1.75 AV*			
P1b	0.22/0.37/0.07/0.18		0.90-3.11 1.78 AV*			

Comment or Diagram

Approx. locations

Survey Completed By: N CHAMBERS

Survey Date: 09.04.15 **Time:** 0820-1230

RPS / RPA Approval: Nick Ordens

Date: 09.04.15

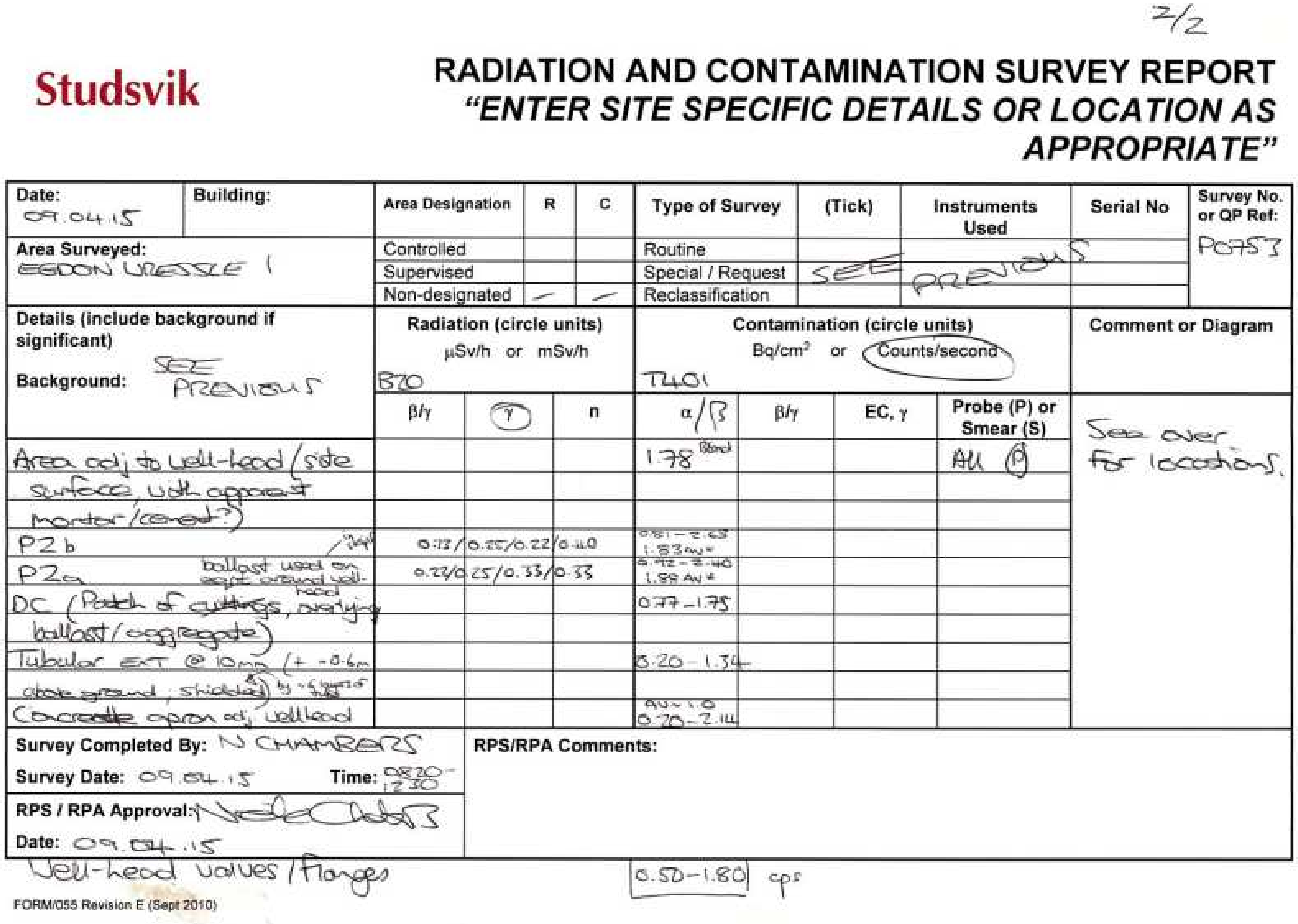
RPS/RPA Comments:

~0.17 µSv h⁻¹ @ C GROUND
† ~1.05 cps @ CH
* 'AV' = BGnd

~100 mL samples taken from ~1L surface sediment@ from approx. 10 spots over ~3-5 m².

@ to ~150 mm below ground level.

FORM/055 Revision E (Sept 2010)



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Studsvik

RADIATION AND CONTAMINATION SURVEY REPORT
"ENTER SITE SPECIFIC DETAILS OR LOCATION AS APPROPRIATE"

Date: 09.04.15	**Building:**	**Area Designation**	**R**	**C**	**Type of Survey**	**(Tick)**	**Instruments Used**	**Serial No**	**Survey No. or QP Ref:** P0753
Area Surveyed: EGDON WRESSLE 1		Controlled			Routine				
		Supervised			Special / Request	SEE	PREVIOUS		
		Non-designated	✓	✓	Reclassification				

Details (include background if significant) **Background:** SEE PREVIOUS	**Radiation (circle units)** µSv/h or mSv/h B70			**Contamination (circle units)** Bq/cm² or [✓ Counts/second] T401				**Comment or Diagram**
	β/γ	[✓ **γ**]	**n**	**α/β**	**β/γ**	**EC, γ**	**Probe (P) or Smear (S)**	See over for locations.
Area adj to well-head (site surface, with apparent mortar/cement?)				1.78 Bkgd			All (P)	
P2b [illegible]	0.13/0.25/0.22/0.40			0.81 – 2.63 1.83 av*				
P2a ballast used on eqpt around well-head	0.22/0.25/0.33/0.33			0.72 – 2.40 1.89 Av*				
DC (Patch of cuttings, overlying ballast/aggregate)				0.77 – 1.75				
Tubular EXT @ 10mm (+ ~0.6m above ground, shielded by ~6 layers of tube)				0.20 – 1.34				
Concrete apron adj wellhead				Av ~ 1.0 0.70 – 2.14				
Well-head valves / flanges				0.50 – 1.80 cps				

Survey Completed By: N CHAMBERS

Survey Date: 09.04.15 **Time:** 0820 – 1230

RPS / RPA Approval: Nicole Childs

Date: 09.04.15

RPS/RPA Comments:

FORM/055 Revision E (Sept 2010)

APPENDIX 6 – AIR QUALITY MONITORING RESULTS

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May 2016

WRESSLE 1 - LODGE FARM

Environmental Monitoring

Submitted to:
Mr Martin Brooks
Egdon Resources UK Ltd
The Wheat House
98 High Street
Odiham
Hampshire
RG29 1LP

REPORT

Report **Number** 14514260347.560/B.0

Distribution:

Egdon Resources UK Ltd - 1 copy (pdf)
Golder Associates (UK) Ltd - 1 copy

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1.0 INTRODUCTION

Egdon Resources U.K. Ltd (Egdon) is the operator of the Wressle 1 Well Site, Lodge Farm, Clapp Gate, Broughton and Appleby, Scunthorpe, DN15 0DB (the 'Site').

The Environment Agency (EA) has issued an Environmental Permit (EP) for the Site (EPR/AB3609XX) dated 1 December 2014. Table S1.1 of the EP allows the following activities to be undertaken:

- A1 – Borehole Drilling Operation – A mining waste operation for the management of hazardous and non-hazardous extractive solid and liquid waste and gas, from prospecting for mineral resources not including a waste facility resulting from borehole drilling operation. The management of extractive waste generated by well abandonment;
- A2 – Production Testing - 'A mining waste operation for the management of non-hazardous extractive liquid waste and gas, from prospecting for mineral resources not including a waste facility resulting from production testing operation'.

There are a number of limits which are important to note attached to Activity A2 as follows:

- Waste shall be stored for no more than three months in secure storage containers at site;
- Flaring of waste gas using an enclosed ground flare. No more than 10 tonnes of gas shall be flared per day: and
- There shall be no reinjection of produced waters.

During the production testing stage it is necessary to manage waste gas by flaring the gas. The flaring of this natural gas results in an emission to air. To establish the environmental impact of the flaring of this gas it is necessary to undertake air quality monitoring both prior to flaring (to establish a baseline) and during flaring (to understand any measurable emissions).

Air quality monitoring commenced on the 14 December 2014 to obtain baseline data and flaring commenced on 3 February 2015. The aim of this report is to compare the monitoring data for the baseline and during flaring with the Defra published background data (http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011) available for the Site location of 12.7 µg/m^3 for NO_2 and 17.31 µg/m^3 for NO_x. This assessment will identify if the Defra background values are representative of the site. A Site Layout Plan is presented in Appendix A.

2.0 AIR QUALITY MONITORING

2.1 Substances to be Monitored

The aim of the first stage of ambient air quality monitoring was to confirm the baseline conditions. The monitoring during flaring was required by the Environment Agency due to a calculation approach agreed for the estimation of flare emissions.

The flare emissions are being calculated, as per Table S3.2 in the EP, for the substances of Total Volatile Organic Compounds (VOCs), Oxides of Nitrogen (NOx) and Carbon Monoxide (CO). Ambient air quality measurements were undertaken for these same emissions substances, with the exception of CO, the reasoning for which is detailed below.

It is acknowledged that CO is also an air quality species within the UK and EU standards. However, CO is assessed over a maximum daily running 8 hour mean and has a high objective of 10,000 µg/m^3. The background concentrations of CO are very low in comparison to other substances, often less than 1% of the standard. As such there is significant headroom for additional emissions and 'it is unlikely that any local authorities will need to monitor CO as part of their LAQM duties' – A1.20 (DEFRA LAQM – Local Air Quality Management Technical Guidance Note TG09).

Methods are available to measure CO for personal exposure and spot checks, however portable electro-chemical CO analysers are generally of low sensitivity (so do not pick up the background concentrations and are not accredited for this use) and not suitable for routine ambient monitoring. Only in areas of very high concentrations may they give an indicative reading.

There is a CEN standard for CO monitoring and a continuous analyser would be required such as deployed in an AURN site. These analysers are a considerable expense and the risk associated with the emissions, from a flare for CO does not warrant such an investment. Indeed the H1 risk assessment (undertaken as part of the EP application) showed that the likely emissions are in the order of 200 $\mu g/m^3$, again an order of magnitude less than the generous objective of 10,000 $\mu g/m^3$.

2.2 Monitoring Methodology

Passive sampling methods have been undertaken at the Site as agreed with the local Environment Agency officer. These are simple, cost effective methods, and no power supply is needed. The instrumentation is single use and the devices absorb the pollutant directly from the ambient air (DEFRA LAQM – Local Air Quality Management Technical Guidance Note TG09). The equipment can be exposed at locations for periods of weeks before being analysed by a laboratory. Passive sampling gives indicative results of average air pollution concentrations which are particularly good for longer term averages; shorter term averages can be used by invoking the correction factors detailed in the H1 guidance (Annex F – Air Emissions, H1 Environment Agency 2011).

NOx diffusion tubes consist of glass tubes with an impregnated gauze inside. Removal of the base cap (where necessary) allows exposure of the tubes and the pollutant to be absorbed onto the gauze. The exposure period is usually several weeks. The concentrations of Nitrite ions, and hence NO_2, chemically adsorbed are quantitatively determined by UV / Visible Spectrophotometry with reference to a calibration curve derived from the analysis of standard Nitrite solutions (UKAS Accredited Methods). When analysed, both tubes (NO and NO_2) are measured for weight (µg) of nitrate collected on each tube, using the standard formula the concentration NO_2 is calculated. The difference between the two concentrations is reported as Nitric oxide (NOx). The uncertainty of diffusion tube measurements is typically quoted as around +/- 25%. The limit of detection for the NOx tubes is less than 3 μgm^3 over a four-week exposure period. Further information on tube deployment and technical datasheets are included in Appendix B.

NOx is one of the key air quality species of concern in the protection of human health and habitats (UK Air Quality (Standards) Regulations 2010). This transposes into English law the Requirements of EU Directive 2008/50/EC and 2004/107/EC on ambient air quality (WHO 2005, IFC 2007). Both hourly (EAL of 200 $\mu g/m^3$) and annual concentrations (EAL of 40 $\mu g/m^3$) require consideration for the protection of human health. Daily (75 $\mu g/m^3$) and annual concentrations (40 $\mu g/m^3$) are required for consideration of habitats (Annex F – Air Emissions, H1 Environment Agency 2011).

There is no ambient air quality standard for generic VOCs; however, there are individual standards for some VOC compounds. The top 10 VOCs are being monitored at each location.

VOC tubes consist of metal tubes, packed with a suitable absorbent and fitted at both ends with brass Swagelok fittings. A separate diffusion tube cap is supplied for covering the exposed end on deployment. The exposure period is usually 2 weeks or longer. The tube is then sent to a laboratory for analysis. The analysis process desorbs the organic compounds from the material inside the tube which are then analysed using gas chromatography. The ambient concentrations of the 4 VOCs is calculated from the amount of pollutant absorbed. Typical accuracy for measurement of benzene using this method is +/- 30% with a limit of detection typically quoted as 0.2 $\mu g/m^3$.

Due to the uncertainty in the measurements when using diffusion tubes it is best practice to include a triplicate tube deployment to better define the variability in the method (or where appropriate a co-location study with an AURN station if high confidence is required in any correction factors). Diffusion tubes were deployed in triplicate in one monitoring location as part of the monitoring campaign.

The laboratory chosen to provide the appropriate monitoring equipment is Gradko Environmental (Gradko). Gradko are market leaders in the supply and analysis of ambient air pollution monitoring products specialising in providing low cost, easy to use products for air sampling for a wide range of applications. Gradko is based in Winchester, UK, providing manufacturing and global distribution of air monitoring products and has a dedicated laboratory that is UKAS accredited (ISO: 17025) providing accurate and timely analysis of customers samples. Gradko were pioneers in the development of passive diffusion tubes in conjunction with the UK Government Department of Trade and Industry. Nitrogen dioxide and NOx diffusion tubes are analysed by UKAS accredited in-house method GLM 7 and GLM 9, and VOC tubes are analysed by in-house method GLM 13 with UKAS flexible scope accreditation.

The methodologies regarding the measurement equipment used and its deployment follow the methodology identified within the following document:

- 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users (DEFRA 2008)'

2.3 Monitoring Locations

The area surrounding the Site is an operational farm with farm operatives seen to be active around the site boundary. Recreational shooting has also been observed in the area to the south east of the site. No significant traffic or air quality monitoring equipment was observed in the neighbouring village of Broughton.

A representative wind rose for the Site was used to identify the monitoring location most likely to be affected by concentrations downwind of the Site activities at which to establish the diffusion tubes in triplicate (Figure 1).

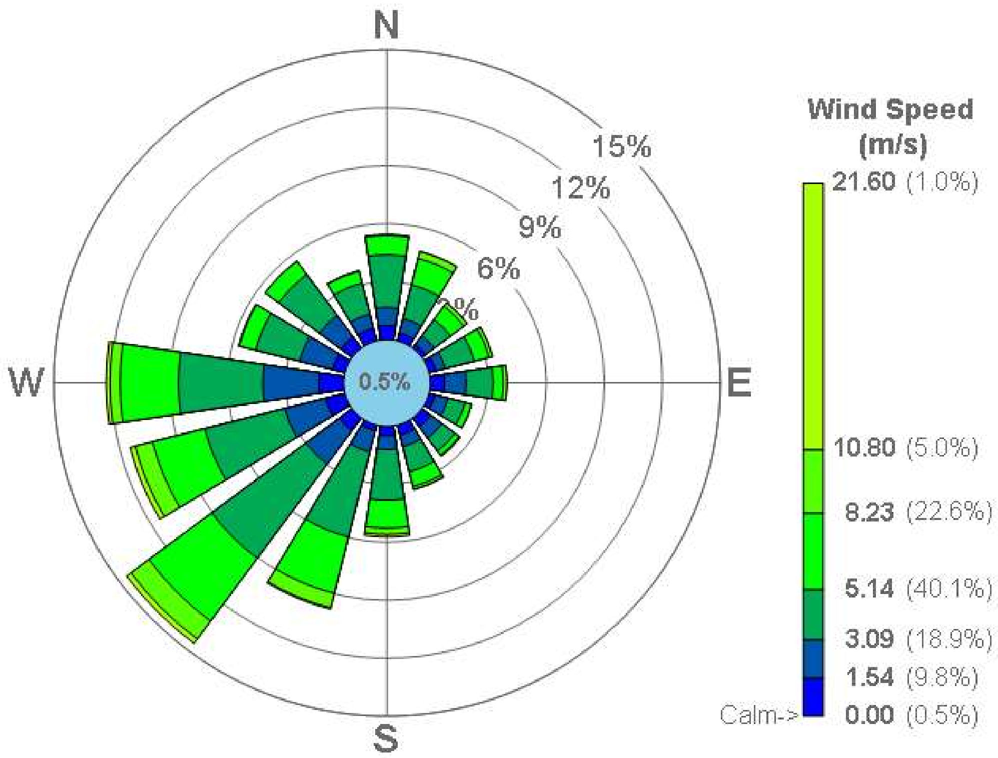

Figure 1: Wind Rose for Waddington RAF Meteorological Station, 2007.

Initially, triplicate tubes were only located on the downwind North East corner location (Figure 1 and Appendix C); the location expected to experience the greatest impacts from a nearby upwind emission source. Tubes were situated on the Site boundary where there is open sky, no overhanging vegetation or buildings and free circulation of air around the tubes. An appropriate spacing block was utilised between the fixing surface and the tube.

Diffusion tubes were deployed at a height of approximately 2 metres (m) as recommended in the above guidance document and to ensure that their fixings were unable to slide down the fence. Ideally, samplers would be placed at breathing height, but in order to reduce theft of tubes, guidance recommends that tubes are placed at a height of 2-4 m.

Following discussion with the local Environment Agency Officer (11 December 2014), it was requested that single diffusion tubes for each substance were also located on each of the other 3 corners (North-West, South-East and South-West) of the compound (Appendix A).

3.0 MONITORING REGIME

The ambient air quality monitoring periods as well as the number of tubes deployed on each occasion are presented in Table 1. Table 1 also details on how many days within the monitoring period flaring occurred and the volume of gas flared over the monitoring period. Flaring dates and volumes are also presented in summary Table 2 and Appendix N.

Table 1: Monitoring Periods with and without Flaring

No. of Diffusion Tubes	Start	End	Number of Days Flaring During Monitoring Period	Amount of Flaring during Monitoring Period (m^3)
1*	09/12/2014	05/01/2015	0	n/a
2*	09/12/2014	19/12/2014	0	n/a
6**	19/12/2014	05/01/2015	0	n/a
6**	05/01/2015	15/01/2015	0	n/a
6**	15/01/2015	16/02/2015	5	13,732
6**	16/02/2015	17/03/2015	6	39,968
6**	17/03/2015	15/04/2015	0	n/a
6**	15/04/2015	20/05/2015	0	n/a
6**	20/05/2015	12/06/2015	0	n/a
6**	12/06/2015	15/07/2015	8	44,084
6**	15/07/2015	13/08/2015	3	34,323
6**	13/08/2015	15/09/2015	0	n/a

Note:

**Initially diffusion tubes were employed in the North East corner only.*

***Following discussions with the EA triplicate diffusion tubes were employed in the North East corner as well as one diffusion tube in the South East corner, South West corner and North West corner each.*

Table 2: Flaring Dates - February to July 2015

Date	Zone	Total gas/day scf	m^3/Day	Notes
3 February 2015	Ashover Grit	7510	-	No value provided.
5 February 2015	Ashover Grit	18,900	535	
6 February 2015	Ashover Grit	3,630	103	
14 February 2015	Wingfield Flags	222,860	6,311	
15February 2015	Wingfield Flags	232,020	6,570	
16 February 2015	Wingfield Flags	176, 330	4,993	
23 February 2015	Penistone Flags	17,260	489	
24 February 2015	Penistone Flags	422,930	11,976	
25 February 2015	Penistone Flags	416,360	11,790	
26 February 2015	Penistone Flags	239,790	6,790	
27 February 2015	Penistone Flags	138,770	3,930	
20 March 2015	Penistone Flags	0	0	Attempted to extract flow from the Penistone Flags formation section. There were no production flows but entries included for completeness
21 March 2015	Penistone Flags	0	0	
22 March 2015	Penistone Flags	0	0	
23 March 2015	Penistone Flags	0	0	
6 July 2015	Penistone Flags	6,463	183	
7 July 2015	Penistone Flags	0	0	Attempted to flow from formation section, no production flows but entries included for completeness
8 July 2015	Penistone Flags	54,971	1,557	
9 July 2015	Penistone Flags	115,830	3,280	
10 July 2015	Penistone Flags	224,995	6,371	
11 July 2015	Penistone Flags	325,004	9,203	
12 July 2015	Penistone Flags	154,019	4,361	
13 July 2015	Penistone Flags	280,164	7,934	
14 July 2015	Penistone Flags	395,344	11,195	
15 July 2015	Penistone Flags	455,564	12,900	
16 July 2015	Penistone Flags	496,569	14,062	
17 July 2015	Penistone Flags	259,954	7,361	

3.1 Data Results

Tubes provided by Gradko (Accredited to ISO/IEC 17025:2005, UKAS number 2187) were collected and returned to the laboratory for analysis in accordance with the diffusion tubes shelf life of approximately 6 weeks.

All results as received from Gradko are provided in Appendix D to Appendix N based on monitoring period. The monitoring results (excluding the top 10 VOCs) are also presented in tabular format with analysis including minimum, maximum, average and standard deviation based on all diffusion tubes employed at the Site during the monitoring period. Where triplicate data is available the mean, standard deviation and coefficient variance is further included as an indicator of precision and accuracy of the monitoring.

3.2 Data Presentation

3.2.1 Monitoring without Flaring (Baseline)

Results for the NO_2 monitoring undertaken at the Site for time periods in which no flaring occurred are presented in Table 3. These time periods are assumed to represent baseline conditions for the Site.

Table 3: NO_2 Baseline Monitoring Results

Monitoring Period	Average (µg/m³)	Standard Deviation (µg/m³)
09/12/2014 - 19/12/2014	30.98	2.03
09/12/2014 - 05/01/2015*	19.27	2.03
05/01/2015 - 15/01/2015	27.12	2.03
17/03/2015 - 15/04/2015	18.82	4.49
15/04/2015 - 20/05/2015	10.16	0.74
20/05/2015 - 12/06/2015	10.42	1.31
13/08/2015 - 15/09/2015	10.86	2.40

*Note: *This monitoring period includes results from the single diffusion tube employed from 09/12/2014 – 05/01/2015.*

It is shown that baseline measurements for NO_2 range from 10.16 – 30.98 µg/m³. The average NO_2 baseline concentration was 16.95 µg/m³ with a standard deviation of 8.21 µg/m³.

The highest concentration of VOCs (including compounds not covered by the UKAS accredited flexible scope and those outside of the UKAS calibration range) recorded in the baseline monitoring period was 1512.10 µg/m³ for Diethyl Phthalate. When the compounds not within the UKAS accreditation scope were removed along with those in excess of the calibration range, the maximum concentration is 28.26 µg/m³ for Hexane, 3-methyl recorded at one of the triplicate tube locations, although similar concentrations were not monitored in the other co-located tubes. The majority of VOC concentrations recorded during the baseline period, had a concentration of less than 10 µg/m³.

3.2.2 Monitoring with Flaring

Results for the NO_2 monitoring undertaken at the Site for time periods in which flaring did occur are presented in Table 4.

Table 4: NO_2 Baseline Monitoring Results

Monitoring Period	Average (µg/m³)	Standard Deviation (µg/m³)
15/01/2015 - 16/02/2015	26.89	2.96
16/02/2015 - 17/03/2015	27.67	6.41
12/06/2015 - 15/07/2015	14.12	3.34
15/07/2015 - 13/08/2015	13.67	3.27

It is shown that baseline measurements for NO_2 range from 13.67– 27.67 µg/m³. The average NO_2 concentration with flaring was 20.59 µg/m³ with a standard deviation of 7.90 µg/m³.

The highest concentration of VOCs (including compounds not covered by the UKAS accredited flexible scope and those outside of the UKAS calibration range) recorded in the baseline monitoring period was 329.0 µg/m³ for 2,5-Cyclohexadiene-1,4-dione, 2,5-diphenyl. When the compounds not within the UKAS accreditation scope were removed along with those in excess of the calibration range, the maximum concentration is 47.38 µg/m³ for 2-Ethylhexyl salicylate recorded at one of the triplicate tube locations, although similar concentrations were not monitored in the other co-located tubes. The majority of VOC concentrations recorded during flaring, had a concentration of less than 10 µg/m³.

4.0 DISCUSSION

Figure 1 shows the average NO_2 concentrations for each monitoring period and the applicable standard deviation for both, time periods without flaring (baseline) and time periods with flaring. The average concentrations across the entire time periods with flaring and without flaring are also presented. As shown in Figure 1 NO_2 concentrations tended to be generally higher from December to April and lower from April to September whether flaring was occurring or not. This may reflect differences in large-scale weather systems and associated pollutant flux into the UK dominating during these months.

Overall the average NO_2 concentration is slightly higher for the time periods in which flaring occurred compared to baseline. However the variation in data as indicated by the standard deviation is high and the mean of both averages is not significantly different. The time of monitoring appears to have a much larger impact than whether flaring was undertaken or not (e.g. comparing the time period 09/12/2014 – 05/01/2015 vs 15/07/2015 – 13/08/2015). Also there appears no correlation between the measured NO_2 concentration and the amount of days of flaring or the flaring volume. The maximum amount of days of flaring within any monitoring period (8) and the maximum volume of flaring (approximately 44,000 m^3) occurred during the monitoring period of 12/06/2015 – 15/07/2015. However NO_2 concentration during this time period were less than in January and February. The fact that amount of flaring and NO_2 monitoring concentration do not correlate is another indicator that the impact of flaring on the background NO_2 concentration is limited.

One VOC compound, 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester, is monitored in the Top 10 during all 4 of the periods when flaring is occurring but not during any of the baseline. During each of these monitoring periods it is recorded in a different monitoring location and when it is present in the north east corner, it is not recorded in all of the triplicate tubes. Hexadecanoic acid, methyl ester and Isopropyl mysristate are recorded in the top 10 VOCs during 2 of the flaring monitoring periods and none of the baseline, although these are only recorded in 1 of the triplicate tubes. There are a number of compounds recorded during 1 of the flaring monitoring periods only but Top 10 concentrations are not recorded in all of the triplicate tubes, when in the north east corner monitoring location.

The average NO_2 concentration during the baseline period (without flaring) and during flaring is slightly higher than the Defra backgrounds but when the standard deviation of the monitoring data is considered the Defra background is within this range and therefore the Defra background is representative of the background of the Site during baseline and during flaring. The average monitored background data are below the Annual Average Air Quality Standards for NO_2, NO_x and VOCs, where EALs exist (Appendix D).

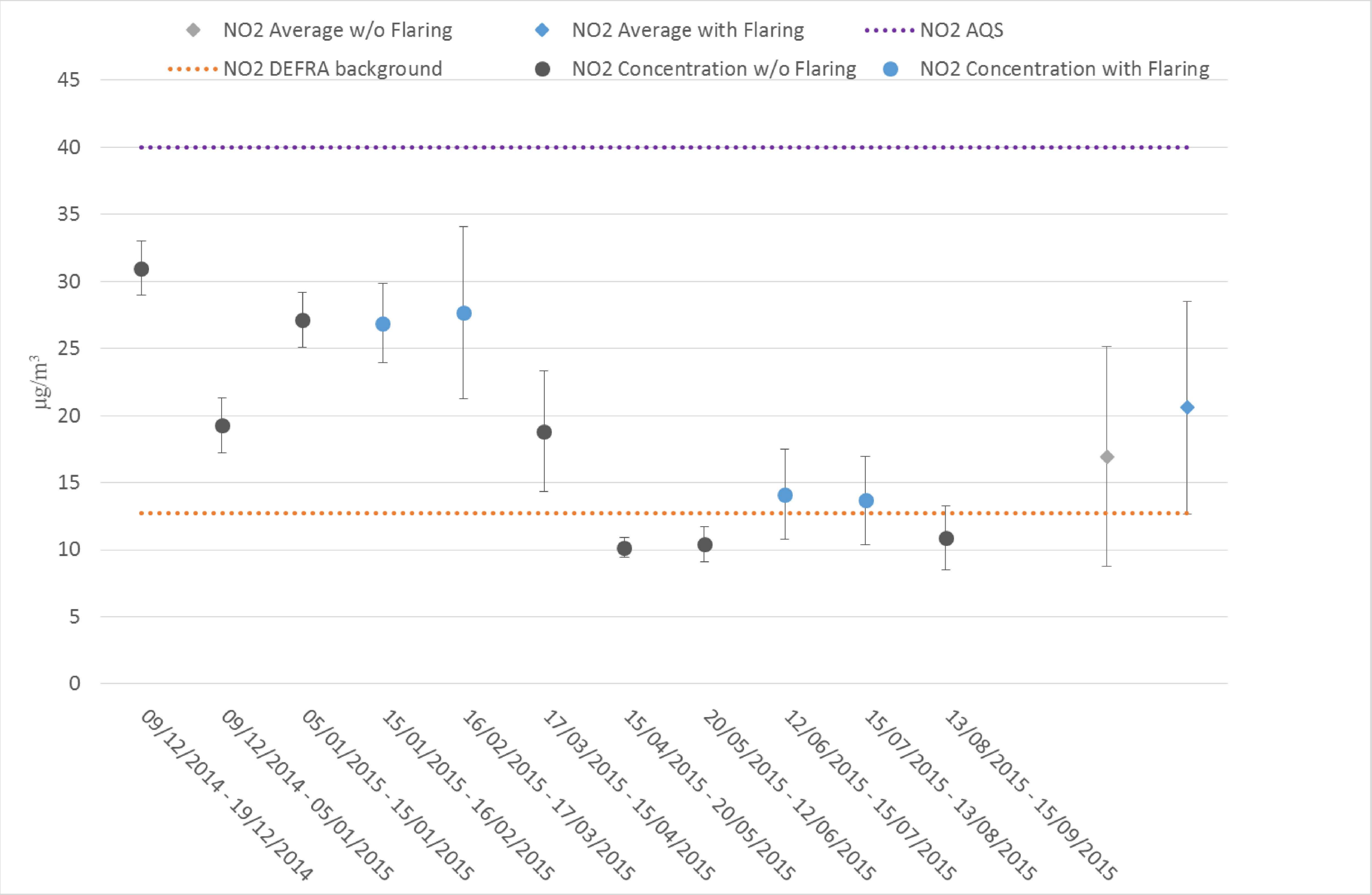

Figure 2: Average NO_2 Concentrations with and without Flaring

5.0 SUMMARY

A baseline and during flaring study of ambient air quality has been undertaken. NO_x, NO_2 and VOC's have been monitored and the baseline and flaring periods have been compared to identify if there are any noticeable changes during the flaring period. A comparison has also been undertaken against the Defra background data to see if the Defra backgrounds are representative of the Site.

The average NO_2 concentration during the baseline period (without flaring) and during flaring is slightly higher than the Defra backgrounds but when the standard deviation of the monitoring data is considered the Defra background is within this range and therefore the Defra background is representative of the background of the Site during baseline and during flaring. The average monitored background data are below the Annual Average Air Quality Standards for NO_2, NO_x and VOCs, where EALs exist (Appendix D).

Report Signature Page

GOLDER ASSOCIATES (UK) LTD

Samantha Arnold Senior Atmospheric Scientist	Dale Haigh Principal

Date: 25 May 2016

SA/DH/ab

Company Registered in England No. 1125149
At Attenborough House, Browns Lane Business Park, Stanton-on-the-Wolds, Nottinghamshire NG12 5BL
VAT No. 209 0084 92
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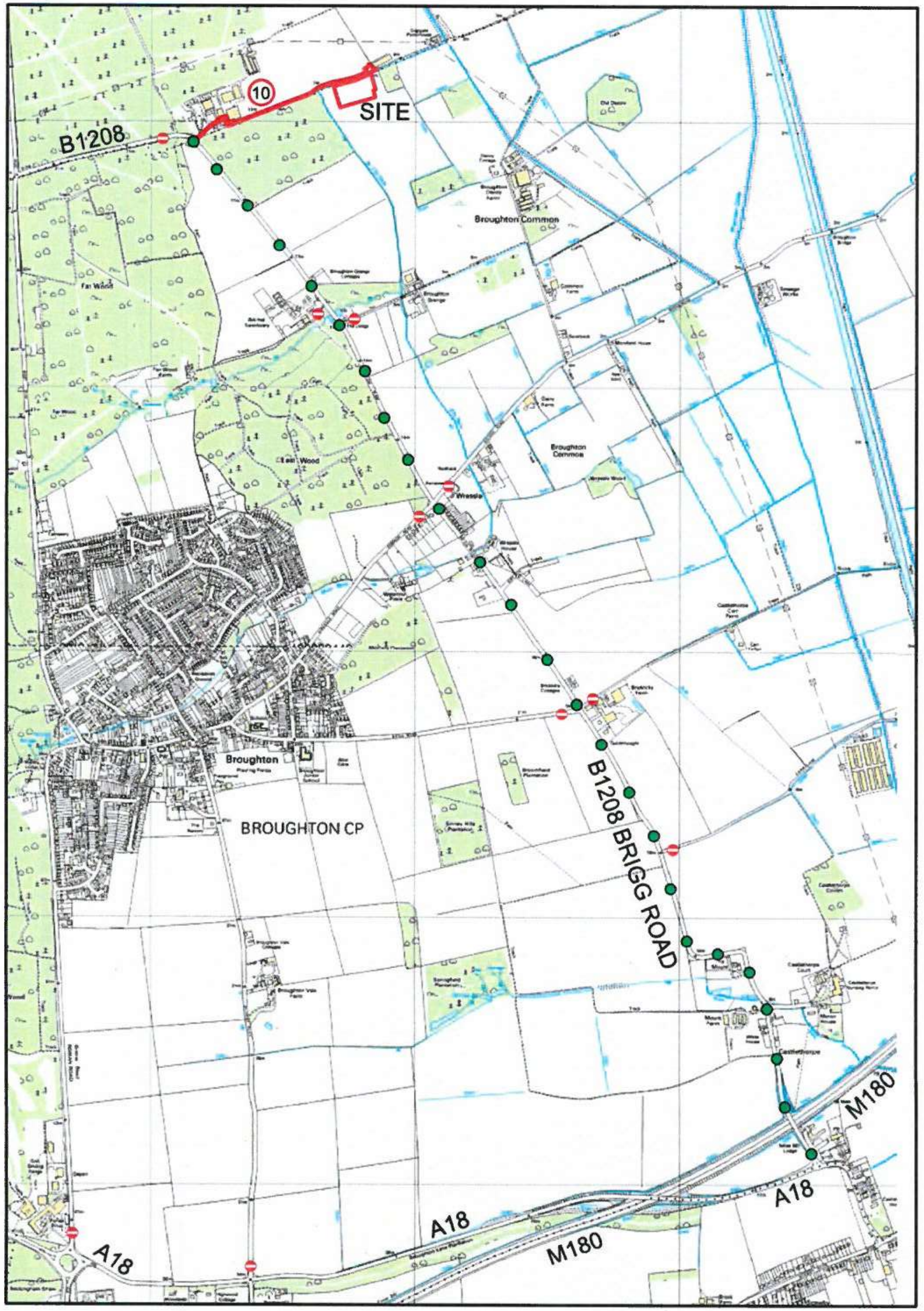
APPENDIX A

Site Layout Plan



HGV CONTROL

1. The approved HGV traffic route to and from site will be the A18, with access from the M180.
2. From the A18, all traffic shall use the B1208 Brigg Road north to Site only.
3. Access through Broughton (i.e. via the B1207) is **PROHIBITED**.
4. No Site traffic is to approach from the north, or leave to the north. Traffic leaving Site must turn left.
5. Particular care should be taken when driving through Castlethorpe (accident blackspot) and the yard at Lodge Farm (residents and farm workers)
6. When using the stone track to site, HGV traffic shall observe the 10mph limit for dust limitation.
7. No deliveries outside site delivery times.
8. All vehicles shall obey the speed limits

ENVIRONMENTAL CONTROL

Delivery Hours - 0700 to 1730 hrs Monday to Friday
0700 to 1300 hrs Saturday
No deliveries Sundays or Bank Holidays

No Litter - Make sure any rubbish, food waste, etc, is disposed of appropriately. Ensure waste can't blow away in the wind.

Exhaust Emissions - All engines are to be turned off when vehicles are waiting for unloading/loading

● Proposed Route
⊖ No entry to HGV vehicles

For more information contact:

Egdon Production & HSE Manager	07914 603786
Egdon Office	01256 702292

Site Address:
Lodge Farm
Clapp Gate
Scunthorpe
DN15 0DB

APPENDIX B

Diffusion Tube Specification

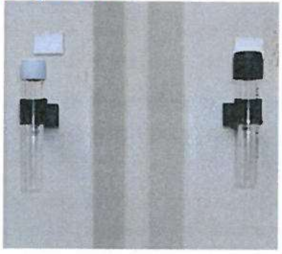
Nitrogen Oxides Instructions

Shelf life: This pack has a shelf life of 6 weeks. Tubes must be exposed and returned for analysis within this period.

Tube storage: Tubes should be refrigerated before exposure and should not be subject to large variations in ambient temperature. Do not exceed the shelf life. If using blank tubes, do not remove the tube from the packaging. Store both tubes in the same conditions as the sampling tubes.

Fixing tubes: It is important that the end of the tube is in an area with a free circulation of air. Certain surfaces may act as absorbers leading to reduced atmospheric concentrations immediately adjacent to the tube. For this reason tubes should not be mounted directly onto a surface. Ideally a spacer of at least 5cm should be used between the surface and the tube. The spacer should not be placed in any form of recess (to avoid the possibility of sampling stagnant air). To avoid sampling in an area of higher than usual turbulence, tubes should not be located on the corner of a building.

Exposure:



1. Both tubes should be exposed in the same location simultaneously.
2. Remove tube from screw top container. Remove WHITE cap from both tubes. Keep caps and container in a safe place.
3. Position each tube vertically with the open end facing downwards during required sampling period (2-4 weeks).

4. **Label the tube and the exposure sheet clearly with the supplied barcode labels (see below).** After sampling, replace the WHITE caps on both tubes. Put the tube with the BLACK cap back into the screw top container.

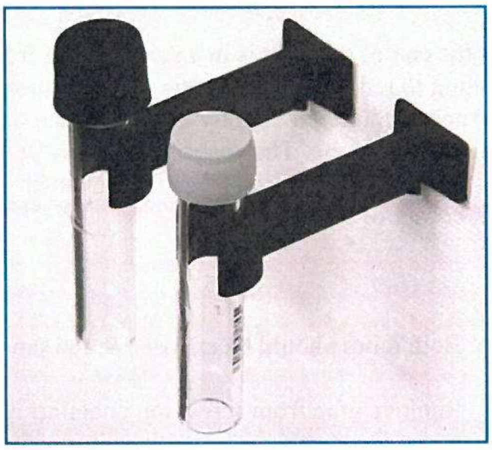
Returning tubes: Tubes should be returned as soon as possible after exposure. Fill in exposure sheet including **exposure time**. Tubes should be returned in a sealed container, such as the plastic bag that they are received in.

Return address:
Gradko International Ltd, St Martins House, 77 Wales Street, Winchester, Hampshire, SO23 0RH.
Tel: +44 (0) 1962 860 331
Email: diffusion@gradko.com or enquiries@gradkolab.com

Technical Data Sheet: TDS 2

DIF 150 RTU - NITRIC OXIDE (NO), NITROGEN DIOXIDE (NO_2) AND NO_x

This two-tube pack is designed for passively monitoring gaseous airborne Nitric oxide, Nitrogen dioxide and total NO_x.



Description: The NO_x diffusion tube system consists of a two-tube pack:

1. A conventional Nitrogen dioxide tube containing the absorbent in a closed grey cap.
2. A Nitrogen oxide tube where the absorbent grid is fitted into a grey open cap. Placed onto this open cap is a black plastic cap containing a secondary absorbent.

Both tubes are exposed in parallel by removing the white plastic cap. During exposure, Nitrogen oxides (NO /NO_2) are taken up into the tube, the NO passes through into the black cap and the NO_2 is absorbed in the grey cap. The NO is oxidised to NO_2 and is back diffused into to the grey cap. The conventional tube just absorbs NO_2.

The concentrations of Nitrite ions and hence NO_2 chemically adsorbed are quantitatively determined by UV / Visible Spectrophotometry with reference to a calibration curve derived from the analysis of standard Nitrite solutions (UKAS Accredited Methods). When analysed, both tubes are measured for weight (ug) of nitrate collected on each tube, using the standard formula the concentration NO_2 is calculated. The difference between the two concentrations is reported as Nitric oxide.

NOTE: When the values of NO_2 and NO_x are very close, a negative NO result may be achieved.

Clips and straps are not included and must be ordered separately.

Tube Dimensions: 71.0mm length x 11.0mm internal diameter.

Recommended Exposure Period: 2 -4 weeks.

Air Velocity: Influence of wind speed <10% between 1.0 and 4.5 $msec^{-1}$ (based on original data).

Storage: Store in a dark, cool environment preferably between 5-10°C.

Shelf Life: 6 weeks from preparation date.

Desorption Efficiency: d = 0.98 (determined using N.I.S.T. Standard Analytes).

Limit of detection: Total NOx: Less than 3 ugm^{-3} over a four-week exposure period. Specific value available on request.

Analytical Expanded Measurement Uncertainty: available upon request.

Relevant Standards: BS EN 13528 Parts 1-3 : 2002/3.

Special Factors: Potential interference from nitrous acid, peroxy acetyl nitrate, which could increase levels of nitrate.

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VOC Instructions - Passive Sampling Only

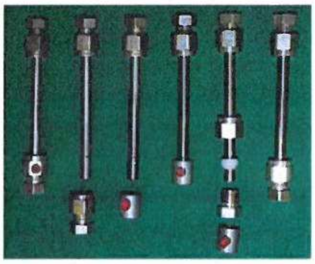
Shelf life: This tube has a shelf life of 10 weeks. Tubes must be exposed and returned for analysis within this period. If tubes are not used they must be returned within 56 days and marked clearly that analysis is not required.

Tube storage and preparation: Tubes should be stored in a dark place away from a heat source before exposure. A desk drawer is ideal. Tubes should always be stored and handled in clean environments, for example a well-ventilated office, well away from laboratory solvents or major emission sources like photocopiers or laser printers. Brief exposure of the tubes to moderately contaminated air (such as would be typical of laboratory, factory or clinical environments) is inevitable when preparing for sample collection and analysis. However, contamination accumulated during these brief periods should not be significant and can be corrected with the appropriate use of blanks. Once sampling or analysis is completed, tubes should be recapped with the brass end caps as soon as possible and returned to the clean environment for storage. If using a blank tube, do not remove the end caps from the tube. Store in the same conditions as the sampling tubes.

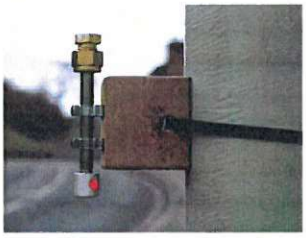
Fixing tubes: It is important that the end of the tube is in an area with a free circulation of air. Certain surfaces may act as absorbers leading to reduced atmospheric concentrations immediately adjacent to the tube. For this reason tubes should not be mounted directly onto a surface. Ideally a spacer of at least 5cm should be used between the surface and the tube. The spacer should not be placed in any form of recess (to avoid the possibility of sampling stagnant air). To avoid sampling in an area of higher than usual turbulence, tubes should not be located on the corner of a building.

It is very important that moisture does not enter the tube – if the environment is humid, please contact us for advice.

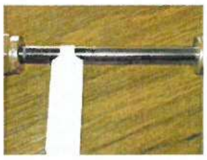
Exposure:



1. Identify the end of the tube with the groove (usually the end with the coloured spot on the cap) (A).
2. Use Tubelock tool to remove the cap nearest the GROOVED end of the tube (B).
3. Push the diffuser cap on the open end of the tube (C)



4. Position the tube vertically with the diffuser cap end (coloured spot) facing downwards during sampling. Leave in place for the required period (between 2 and 4 weeks) (D).
5. After exposing the tube for the required period of time, remove the diffuser cap. Use the Tubelock tool to place the brass end cap on to the tube. DO NOT OVER TIGHTEN, DO NOT USE SPANNERS. Test the tightness of the caps by gently pulling them (E and F)



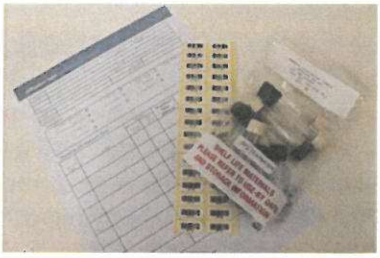
6. **Label the tube with the labels provided, stick the smallest area to the tube as possible, do not cover the whole tube with a label. Do not cover tubes with sticky tape. If you want to provide additional protection to the tube, please wrap in tin foil – this is optional.**

Returning tubes: Tubes should be returned as soon as possible after exposure. Fill in exposure sheet including **exposure time**. Tubes should be returned in a sealed container, such as the plastic bag that they are received in. Tubelock tools should also be returned if hired.

Return address:
Gradko International Ltd, St Martins House, 77 Wales Street, Winchester, Hampshire, SO23 0RH.
Tel: +44 (0) 1962 860 331 **Email:** diffusion@gradko.com or enquiries@gradkolab.com

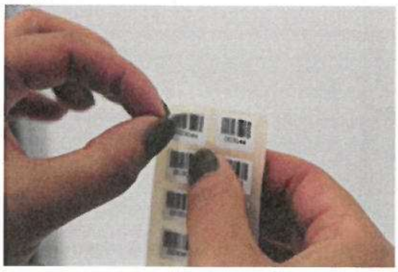
New Barcoding for Tubes

On receiving your delivery, you should find enclosed
A copy of an exposure sheet
A strip of bar codes
Your tubes

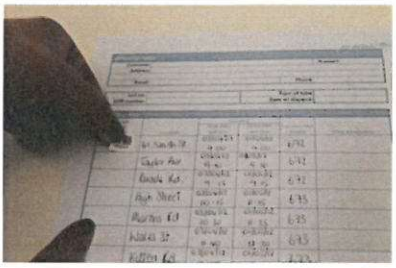


We recommend that you label your tubes (and sheets) at the point of placing the tubes on site.

Simply take the 1st of the duplicate labels (1.) and stick it to the appropriate location on the exposure sheet (2.).



1.

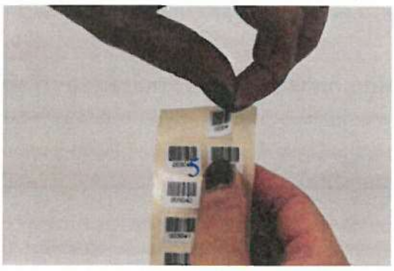


2.

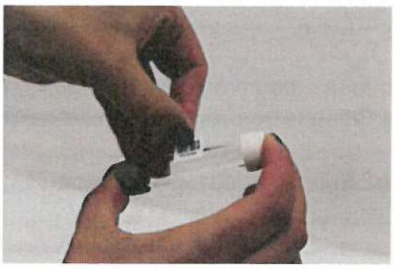
Then take the 2nd matching label (3.) and stick it to the tube exposed at the same location (4.).

Please take care to make sure the label is securely fixed to the tube (5.).
These labels are treated to deal with the weather conditions.

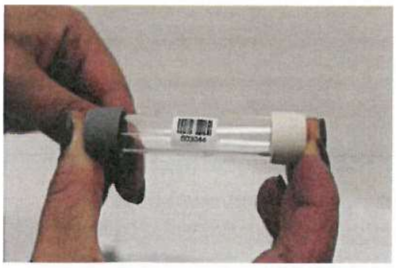
3.



4.



5.



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Technical Data Sheet: TDS 8
VOLATILE ORGANIC COMPOUNDS

These tubes are designed for passive (time weighted average concentrations) and active monitoring of volatile and semi-volatile organic compounds in the range C2 – C28. The tubes can be used passively for time weighted average concentrations or pumped (active) for workplace monitoring and comparison to health and safety workplace exposure limits.

Description: Stainless steel tube filled with a solid polymer absorbent, two brass swagelock caps. An appropriate sorbent is selected to suit the application required – several tubes may be required to measure all compounds required.

For passive sampling an aluminium air diffuser is supplied which is fitted to the sampling end of the tube (groove end) during exposure.

For active sampling, an air pump set to 50 ml/min (other flow rates available on request) is connected to the non-sampling end of the tube and run for a preset period.

Concentrations absorbed by the tube are measured by thermal desorption and analysis by GC/FID or GC/MS (UKAS Accredited Methods).

Suitable for carrying out spatial or localised assessments of volatile and semi-volatile organics in ambient air, soil, workplace, or industrial monitoring. Used for tracking VOC / SVOC in soil using soil probe (please see TDS 11).

Benefits of passive monitoring:

- No power supply required
- Can be used over a wide area
- Long-term monitoring

Benefits of active sampling:

- Faster sample collection so results are received sooner
- Controlled sample volume
- Effective sampling of low concentrations – ppb levels
- Very volatile compounds are retained
- Low cost pump hire from Gradko

TDS 8:V1 March 2012

Tube Dimensions: 6.3mm OD x 5.0mm ID x 90mm length.

Clips and straps are not included and must be ordered separately.

Recommended Exposure Periods:
Passive Sampling: 1 –4 weeks.
Active Sampling: The safe sampling volumes for each type of compound to be monitored should be considered (published figures).

Suggested Guide Lines for Pumped Samples

	Recommended Exposure Times
High (you can smell it)	5 minutes
If you suspect it's high	5 – 10 minutes
No Idea	50 minutes
Low	60 – 100 minutes
Expected Clean Air	100 minutes

Based on pump rate of 50-100 mL/min

It is very important that moisture does not enter the tube – if the environment is humid, please contact us for advice.

Air Velocity: Tube fitted with filter therefore negligible influence.

Storage: Store in a dark, cool environment free from residual airborne VOC. After sampling, tubes can be wrapped in tin foil if required – do not use any other form of wrapping.

Shelf Life: 12 weeks from conditioning date (dependant on type of solid sorbent used).

Analytical Expanded Measurement Uncertainty: Available upon request.

Limit of Detection: Specific values available upon request.
Toluene is used as the non-specific standard for most identification & estomation analysis – general limits of detection are given as a guide below:

For passive samples results are reported in ppb, for pumped samples results are reported in ugm^{-3} unless otherwise requested.

Applications:

- Ambient air monitoring of traffic systems, factory outputs ie. paint shops and petrochemical boundaries.
- Stack monitoring.
- Workplace monitoring: Measuring levels of airborne solvent vapours.
- Personal monitoring.
- Soil monitoring.
- Measurement of occupational exposure levels.
- Biological monitoring i.e. non-invasive measuring of levels of VOCs taken into the body by skin adsorption, ingestion and inhalation. This method provides vital information on the potentially harmful build-up of chemicals in the body after prolonged low-level exposure.

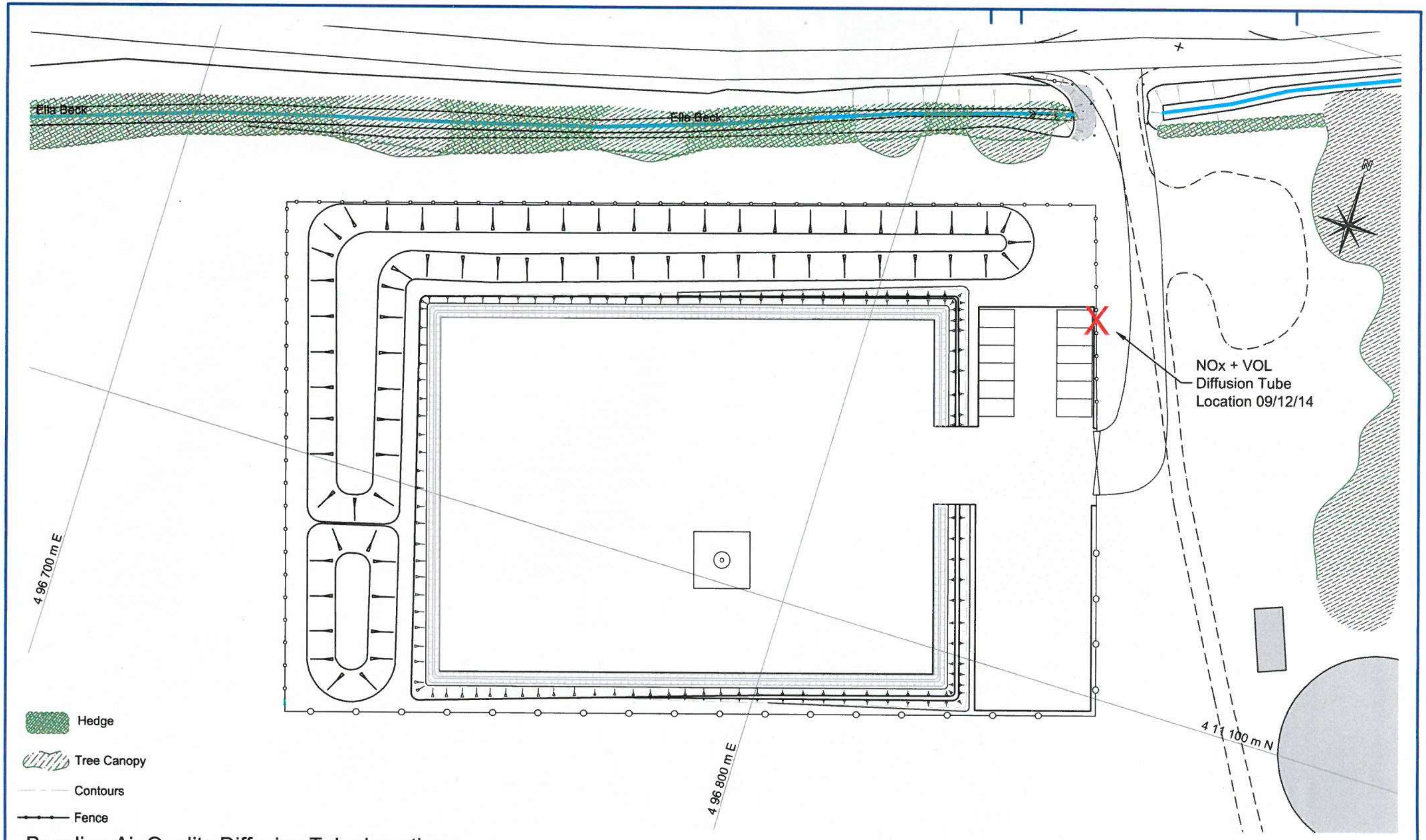
Relevant Standards: ISO16017 : EN14662 : EN13528: MDHS 72 : MDHS 80: EPA T0-17

Packaging of Sorbents: Each type of sorbent is packed into the thermal desorption tube under strict quality control and under laboratory environment conditions. The weight of the sorbent packed is controlled to within +/- 5%.

Selection of Absorbents: The choice of absorbent depends on the volatility of the analyte concerned. Sorbents or series of sorbents selected must quantitatively retain the compounds from the volume of air/gas sampled and then be released as efficiently as possible when the tube is desorbed. A general rule is to use the boiling point of the component as a guide to its volatility. Gradko International Ltd Technical Services can advise users on the correct sorbent to be used.

APPENDIX C

Diffusion Tube Monitoring Locations



Baseline Air Quality Diffusion Tube Location

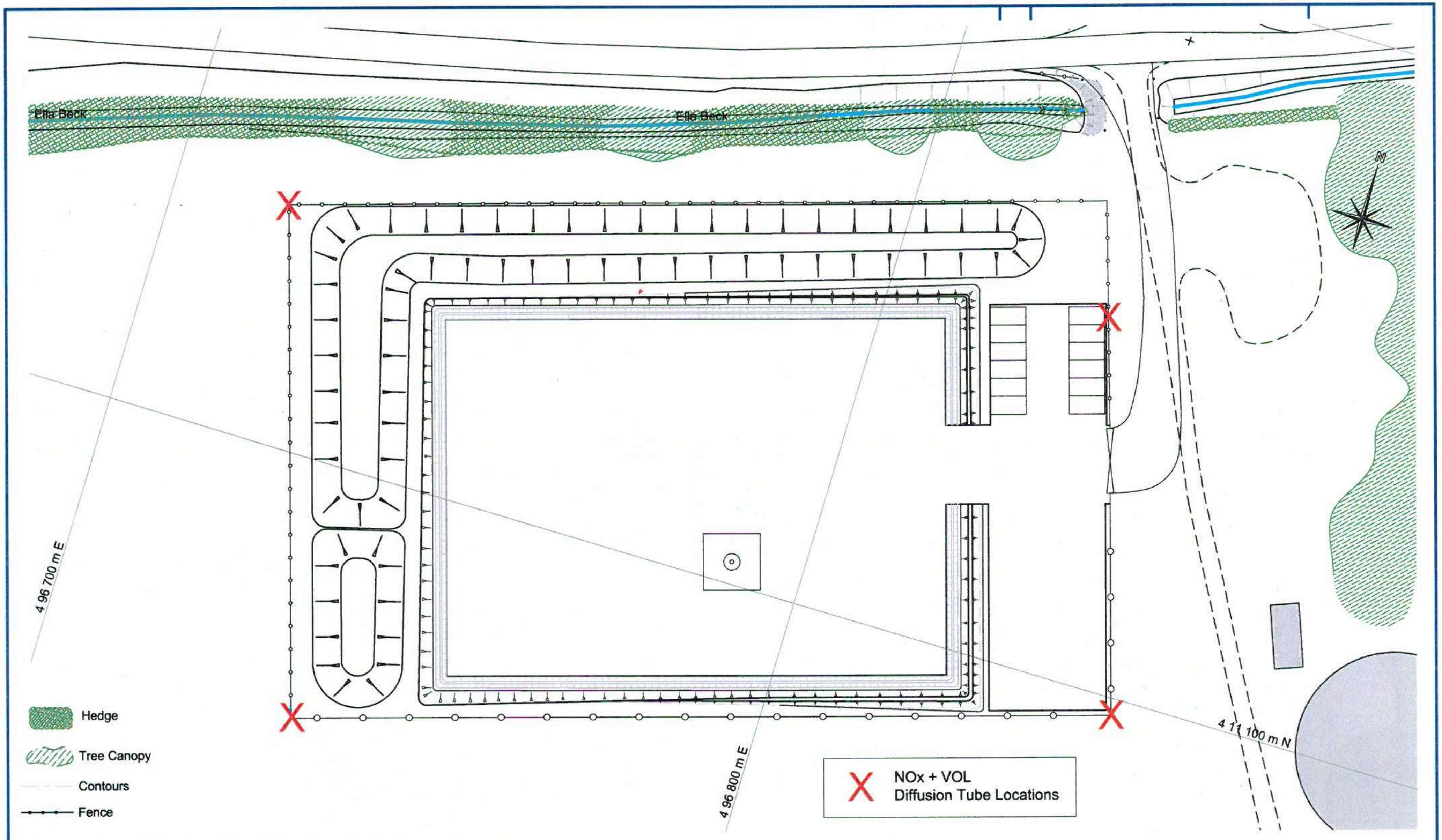
Scale 1:500

R ELLIOTT ASSOCIATES LTD
CONSULTING STRUCTURAL & CIVIL ENGINEERS

t: (01590) 683176 f: (01590) 683533 info@rea-ltd.co.uk www.rea-ltd.co.uk

Dennett House
Brighton Road
Sway
Lymington
Hampshire
SO41 6EB

Client	Egdon Resources UK Ltd Wressle Brigg Lincolnshire
Job Title	Wressle Site
Drawn By	AJNE
Date	December 2014
Sheet Size	A3
Drawing Title	Baseline Air Quality Diffusion Tube Location (1:500)
Drawing Number	3334 T 04
Revision	



Operational Air Quality Diffusion Tube Locations

Scale 1:500

R ELLIOTT ASSOCIATES LTD
CONSULTING STRUCTURAL & CIVIL ENGINEERS
t: (01590) 683176 f: (01590) 683533 info@rea-ltd.co.uk www.rea-ltd.co.uk

Dennett House
Brighton Road
Sway
Lymington
Hampshire
SO41 6EB

Client	Egdon Resources UK Ltd Wressle Brigg Lincolnshire
Job Title	Wressle Site
Drawn By	AJNE
Date	December 2014
Sheet Size	A3
Drawing Title	Operational Air Quality Diffusion Tube Locations (1:500)
Drawing Number	3334 T 05
Revision	

APPENDIX D

Air Quality Standards

Applicable Air Quality Standards and Environmental Assessment Limits (EALs)

Determinand	Statutory Air Quality limit values, target values and objectives (ug/m^3)	AQS For protection of vegetation and Ecosystems (ug/m^3)	EAL (For the protection of human health) (ug/m^3)
NO_2	40	-	-
NOx	-	30	
1,2,4-Trimethylbenzene	-	-	1,100
Acetic acid	-	-	250
Acetone	-	-	18,100
Ethylbenzene	-	-	4,410
Naphthalene	-	-	530
Phenol	-	-	200
Toluene	-	-	1,910

Source: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#environmental-standards-for-air-emissions

A significant number of the VOCs identified in the monitoring do not have EALs associated with them. All compounds with a relevant EAL are included in the table above.

APPENDIX E

Monitoring Period 9 to 12 December 2014

gradko environmental
(A division of Gradko International Ltd.)

St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331   fax: 01962 841339   e-mail:diffusion@gradko.co.uk

UKAS TESTING
2187

LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER X2648R

BOOKING REFERENCE No X2648

DESPATCH NOTE No SOR017550

CUSTOMER Golder Associates UK Ltd
Attenborough House
Browns Lane, Business Park, Stanton-on-the Wolds
Nottinghamshire, NG12 5BL

DATE SAMPLES RECEIVED 23/12/2014
JOB REFERENCE Fast Track

			Exposure Data			NO_2	NO_X	NO	NO_2	NO_X	NO	TOTAL	TOTAL
NO_2	Tube Number	NO_x	Date On	Date Off	Time (hr.)	ppb *	ppb *	ppb * +	µg/m^3	µg/m^3	µg/m^3 +	µG NO_2	µG NOx
457970	North East (2)	457974	09/12/2014	19/12/2014	239.63	19.45	17.38		37.26	33.30		0.65	0.58
457971	North East (3)	457975	09/12/2014	19/12/2014	239.63	12.89	23.88	11.00	24.69	45.76	21.07	0.43	0.80

The Diffusion Tubes have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures calculations and assessments involving the exposure procedures and periods provided by the client are not within the scope of our UKAS accreditation. Those results obtained using exposure data shall be indicated by an asterisk. Any queries concerning the data in this report should be directed to the Laboratory Manager Gradko International Ltd. This report is not to be reproduced, except in full, without the written permission of Gradko International Ltd.

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed..
L. Gates, Laboratory Supervisor

gradko environmental
(A division of Gradko International Ltd.)

St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

UKAS TESTING 2187

LABORATORY ANALYSIS REPORT

Lab Blanks	239.63	0.15	0.33	0.18	0.29	0.63	0.34	0.005	0.011

Comment: Results are not blank subtracted

Where nitric oxide (NO) results have not been calculated result for NOx was lower than result for NO_2.

$^+$NO results are derived by subtracting NO2 from NOx.

Results have been corrected to a temperature of 293K (20C)

Overall M.O.U. 7.3% +/- **Limit of Detection** 0.071ug NOx, 0.017ug NO2 on tube

Tube Preparation: 20%TEA/Water Analysed on UVS04 Camspec M550

Analyst Name C. Gemmell

Date of Analysis 06/01/2015 **Date of Report** 08/01/2015

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

The Diffusion Tubes have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures calculations and assessments involving the exposure procedures and periods provided by the client are not within the scope of our UKAS accreditation. Those results obtained using exposure data shall be indicated by an asterisk. Any queries concerning the data in this report should be directed to the Laboratory Manager Gradko International Ltd. This report is not to be reproduced, except in full, without the written permission of Gradko International Ltd.

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed..
L. Gates, Laboratory Supervisor

Concentrations in µg/m^3			All Tubes		
Sample Location	North East 2	North East 3	Min	Max	Average
Exposed from	09/12/2014	09/12/2014			
Exposed to	19/12/2014	19/12/2014			
Date samples received	23/12/2014	23/12/2014			
NO_2	37.26	24.69	24.69	37.26	30.98
NOx	33.30	45.76	33.30	45.76	39.53
NO	-	21.07	21.07	21.07	21.07

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2187

St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

LABORATORY ANALYSIS REPORT

REPORT NUMBER	**X2646R**
CUSTOMER	**Golder Associates UK Ltd** **Attenborough House** **Browns Lane Business Park** **Stanton-On-The-Wolds** **Nottinghamshire NG12 5BL**
GRADKO LAB REFERENCE	**GHSJ0001-0002**
DESPATCH NOTE No.	**SOR017550**
DATE SAMPLES RECEIVED	**23.12.2014**
BOOKING IN REF.	**X2646**

IDENTIFICATION AND ESTIMATION (SEMI-QUANTITATIVE ANALYSIS) OF TOP 10 VOC ON TENAX DIFFUSION TUBES BY GC/MS

Analysis has been carried out in accordance with in-house method GLM 13

Tube Number	**GRA 07538**
Exposure Time(mins)	**14393**
Sample ID	**Triplicate Two North East**

Top 10 VOC	**ng on tube**	**ppb in air***	**μgm^{-3}***
Squalene **+**	91.02	3.16	51.85
1,2-Benzenedicarboxylic acid, mono(2-ethylhexyl) ester **+**	88.14	3.06	34.05
Heptane, 2,2,4,6,6-pentamethyl- **+**	81.27	2.82	19.20
Benzophenone **+**	67.38	2.34	17.04
Toluene	37.04	1.29	4.74
Decanal** **+**	34.39	1.19	7.45
Pentane, 2-methyl- **+**	27.47	0.95	3.28
Octadecanal **+**	27.41	0.95	10.21
2,5-Cyclohexadiene-1,4-dione, 2,5-diphenyl- **+**	25.22	0.88	9.11
Cyclotetradecane **+**	22.64	0.79	6.17

Tube Number	**GRA 11814**
Exposure Time(mins)	**14370**
Sample ID	**Triplicate Three NE**

Top 10 VOC	**ng on tube**	**ppb in air***	**μgm^{-3}***
Di-n-octyl phthalate **+**	90.62	3.15	49.19
Benzoic acid pentyl ester **+**	25.74	0.90	6.88
Benzoic acid cyclohexyl ester **+**	23.78	0.83	6.75
Cyclotetradecane **+**	22.65	0.79	6.18
Benzoic acid octyl ester **+**	21.32	0.74	6.94

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LABORATORY ANALYSIS REPORT

2,5-Cyclohexadiene-1,4-dione, 2,5-diphenyl- **+**	17.33	0.60	6.27
Heptane, 2,2,4,6,6-pentamethyl- **+**	13.55	0.47	3.21
Decanal** **+**	13.13	0.46	2.85
Benzaldehyde**	11.67	0.41	1.72
Diethyl Phthalate **+**	10.85	0.38	3.35

Identification and estimation results for ng on tube are calculated by reference to toluene and toluene-d8 Internal standard.

+ This compound is not covered by our UKAS accredited flexible scope.
****Compounds may be an artifact due to reaction of ozone with the Tenax sorbent.**

		Date of Analysis	**06.01.2015**
Analysts Name	**Mariella Angelova**	**Date of Report**	**07.01.2015**

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APPENDIX F

Monitoring Period 19 December to 5 January 2015

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LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER X2686R

BOOKING REFERENCE No X2686

DESPATCH NOTE No SOR017647

CUSTOMER Golder Associates UK Ltd
Attenborough House
Browns Lane, Business Park, Stanton-on-the Wolds
Nottinghamshire, NG12 5BL

DATE SAMPLES RECEIVED 06/01/2015
JOB REFERENCE Fast Track

			Exposure Data			NO_2	NO_X	NO	NO_2	NO_X	NO	TOTAL	TOTAL
NO_2	Tube Number	NO_x	Date On	Date Off	Time (hr.)	ppb *	ppb *	ppb * +	µg/m³	µg/m³	µg/m³ +	µG NO_2	µG NOx
469611	N/E corner new (1)	469624	19/12/2014	05/01/2015	407.73	8.52	10.46	1.94	16.33	20.04	3.71	0.48	0.59
469610	N/E corner new (2)	469623	19/12/2014	05/01/2015	407.73	9.72	10.43	0.70	18.63	19.98	1.35	0.55	0.59
469609	N/E corner new (3)	469622	19/12/2014	05/01/2015	407.73	9.58	10.85	1.27	18.36	20.79	2.43	0.54	0.62

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469608	S/E corner	469621	19/12/2014	05/01/2015	408.47	10.55	11.85	1.30	20.21	22.70	2.49	0.60	0.67
469607	S/W corner	469620	19/12/2014	05/01/2015	408.37	11.91	10.39		22.81	19.91		0.68	0.59
469606	N/W corner	469619	19/12/2014	05/01/2015	408.30	9.62	11.29	1.67	18.43	21.63	3.20	0.55	0.64
469612	N/E corner old (1)	469625	09/12/2014	05/01/2015	647.22	10.51	11.61	1.10	20.13	22.24	2.10	0.95	1.05
	Lab Blanks				647.22	0.08	0.17	0.09	0.15	0.32	0.17	0.007	0.015

Comment: Results are not blank subtracted

Where nitric oxide (NO) results have not been calculated result for NOx was lower than result for NO_2.

$^+$NO results are derived by subtracting NO2 from NOx.

Results have been corrected to a temperature of 293K (20C)

Overall M.O.U. 7.3% +/- **Limit of Detection** 0.071ug NOx, 0.017ug NO2 on tube

Tube Preparation: 20%TEA/Water Analysed on UVS04 Camspec M550

Analyst Name C. Gemmell

Date of Analysis 06/01/2015 **Date of Report** 08/01/2015

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

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LABORATORY ANALYSIS REPORT

REPORT NUMBER	**X2685R**
CUSTOMER	**Golder Associates UK Ltd** **Attenborough House** **Browns Lane Business Park** **Stanton-on-the-Wolds** **Nottinghamshire** **NG12 5BL**
GRADKO LAB REFERENCE	**GMSJ0011-0017**
DESPATCH NOTE No.	**SOR017647**
JOB REFERENCE	**GAUK107244**
DATE SAMPLES RECEIVED	**05/01/2015**
BOOKING IN REF.	**X2685**

IDENTIFICATION AND ESTIMATION (SEMI-QUANTITATIVE ANALYSIS) OF TOP 10 VOC ON TENAX DIFFUSION TUBES BY GC/MS

Analysis has been carried out in accordance with in-house method GLM 13

Tube Number	**GRA 11801**
Exposure Time(mins)	**24497**
Sample ID	**SW Corner**

Top 10 VOC	**ng on tube**	**µgm^{-3*}**	**ppb in air***
Diethyl Phthalate **+**	516.35	93.59	10.54
Cyclotetradecane **+**	285.63	45.71	5.83
2,5-Cyclohexadiene-1,4-dione, 2,5-diphenyl- **+**	213.33	45.28	4.35
Compound A	147.08		3.00
1,2-Benzenedicarboxylic acid, diisooctyl ester **+**	115.82	36.88	2.36
Benzoic acid, tridecyl ester **+**	97.69	24.24	1.99
Benzoic acid, octyl ester **+**	86.56	16.54	1.77
Benzoic acid, tetradecyl ester **+**	71.75	18.63	1.46
Benzoic acid, pentadecyl ester **+**	51.13	13.86	1.04
Hexadecane	36.92	6.81	0.75

Tube Number	**GRA 11848**
Exposure Time(mins)	**24448**
Sample ID	**NE Corner New 1**

Top 10 VOC	**ng on tube**	**µgm^{-3*}**	**ppb in air***
2,5-Cyclohexadiene-1,4-dione, 2,5-diphenyl- **+**	668.25	142.14	13.67
Benzoic acid **+**	208.30	20.79	4.26
2-Phenacyl-3-quinoxaline **+**	76.86	15.59	1.57

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Benzaldehyde**	43.48	3.77	0.89
Cyclohexadecane **+**	38.37	7.03	0.78
Phenylmaleic anhydride **+**	30.51	4.34	0.62
Acetophenone**	24.38	2.39	0.50
Naphthalene	24.10	2.52	0.49
2-Ethyl-1-hexanol	18.66	1.98	0.38
Benzoyl isothiocyanate **+**	16.83	2.24	0.34

Tube Number	**GRA 09472**
Exposure Time(mins)	**24446**
Sample ID	**NE Corner New 2**

Top 10 VOC	**ng on tube**	**μgm^{-3*}**	**ppb in air***
Diethyl Phthalate	944.48	174.63	19.32
2,5-Cyclohexadiene-1,4-dione, 2,5-diphenyl- **+**	319.40	67.94	6.53
1,2-Benzenedicarboxylic acid, mono(2-ethylhexyl) ester **+**	193.73	44.06	3.96
Pentane, 3-methyl-	100.10	7.04	2.05
Pentane, 2-methyl-	99.54	7.00	2.04
Hexane	50.76	3.57	1.04
Toluene	47.85	3.60	0.98
Benzaldehyde**	44.61	3.87	0.91
Cyclopentane, methyl- **+**	27.97	1.92	0.57
Acetophenone**	25.28	2.48	0.52

Tube Number	**GRA 07297**
Exposure Time(mins)	**24497**
Sample ID	**NW Corner**

Top 10 VOC	**ng on tube**	**μgm^{-3*}**	**ppb in air***
2,5-Cyclohexadiene-1,4-dione, 2,5-diphenyl- **+**	194.48	41.28	3.97
Benzaldehyde**	32.68	2.83	0.67
Benzoic acid **+**	29.71	2.96	0.61
Naphthalene	27.05	2.83	0.55
Pentane, 2-methyl-	23.84	1.67	0.49
Cyclohexadecane **+**	21.15	3.87	0.43
Diethyl Phthalate **+**	20.72	3.76	0.42
Acetophenone**	19.10	1.87	0.39
Pentane, 3-methyl-	16.74	1.18	0.34
Toluene	16.14	1.21	0.33

LABORATORY ANALYSIS REPORT

Tube Number	**GRA 08717**
Exposure Time(mins)	**24501**
Sample ID	**SE Corner**

Top 10 VOC	ng on tube	µgm^{-3*}	ppb in air*
Benzaldehyde**	34.75	3.01	0.71
Pentane, 2-methyl-	32.45	2.28	0.66
Pentane, 3-methyl-	31.61	2.22	0.65
Naphthalene	23.66	2.47	0.48
Hexane	20.55	1.44	0.42
Toluene	19.90	1.49	0.41
Acetone **+**	17.03	0.81	0.35
Benzene	14.38	0.92	0.29
2-Undecene, 4-methyl- **+**	11.29	1.55	0.23
Undecane	11.15	1.42	0.23

Tube Number	**GRA 08283**
Exposure Time(mins)	**24447**
Sample ID	**NE Corner New 3**

Top 10 VOC	ng on tube	µgm^{-3*}	ppb in air*
2,5-Cyclohexadiene-1,4-dione, 2,5-diphenyl- **+**	188.35	40.06	3.85
Diethyl Phthalate **+**	44.96	8.17	0.92
Tetradecane, 1-chloro- **+**	36.01	6.83	0.74
Benzaldehyde**	34.82	3.02	0.71
Naphthalene	24.77	2.59	0.51
2-Butene, 2,3-dimethyl- **+**	24.03	1.65	0.49
Acetophenone**	23.74	2.33	0.49
Dodecane, 1-chloro- **+**	21.84	3.65	0.45
Nonanal** **+**	20.63	2.40	0.42
Cyclotetradecane **+**	17.56	2.82	0.36

Tube Number	**GRA 09490**
Exposure Time(mins)	**38842**
Sample ID	**NE Corner Old one**

Top 10 VOC	ng on tube	µgm^{-3*}	ppb in air*
2,5-Cyclohexadiene-1,4-dione, 2,5-diphenyl- **+**	863.37	115.58	11.11
Benzaldehyde**	31.64	1.73	0.41
Benzoic acid **+**	26.11	1.64	0.34
Diethyl Phthalate **+**	25.52	2.92	0.33

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Naphthalene	22.73	1.50	0.29
Toluene	21.45	1.02	0.28
Acetophenone**	18.91	1.17	0.24
Benzene	15.97	0.64	0.21
Acetic acid	12.35	0.38	0.16
Nonanal** **+**	11.57	0.85	0.15

Uptake Rates:

All compounds: 2.00 ng.ppm^{-1}.min^{-1}.

Identification and estimation results for ng on tube are calculated by reference to toluene and toluene-d8 Internal standard.

$^{+}$These compounds are not covered by our UKAS accredited flexible scope.
****Compounds may be an artifact due to reaction of ozone with the Tenax sorbent.**
Acetic Acid may be an artifact due to the breakdown of Tenax sorbent.
Acetone was detected however Tenax is not the recommended sorbent.
Unable to identify compound A. Library did not contain matches for mass spectrum.
Exposure times were calculated from start and finish times given on the exposure sheet.

		Date of Analysis	**07.01.15**
Analysts Name	**Mariella Angelova**	**Date of Report**	**12.01.15**

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Concentrations in µg/m^3								All Tubes			Triplicate Tubes		
Sample Location	North East 1 (old)	North East 1 (new)	North East 2 (new)	North East 3 (new)	South East	South West	North West	Min	Max	Average	Mean	Standard Deviation	CV
Exposed from	09/12/2014	19/12/2014	19/12/2014	19/12/2014	19/12/2014	19/12/2014	19/12/2014						
Exposed to	05/01/2015	05/01/2015	05/01/2015	05/01/2015	05/01/2015	05/01/2015	05/01/2015						
Date samples received	06/01/2015	06/01/2015	06/01/2015	06/01/2015	06/01/2015	06/01/2015	06/01/2015						
NO_2	20.13	16.33	18.63	18.36	20.21	22.81	18.43	16.33	22.81	19.27	17.77	1.26	7.07
NOx	22.24	20.04	19.98	20.79	22.70	19.91	21.63	19.91	22.70	21.04	20.27	0.45	2.23
NO	2.10	3.71	1.35	2.43	2.49	-	3.20	1.35	3.71	2.55	2.50	1.18	47.32

Concentrations in µg/m^3								All Tubes			Triplicate Tubes		
Sample Location	North East 1 (old)	North East 1 (new)	North East 2 (new)	North East 3 (new)	South East	South West	North West	Min	Max	Average	Mean	Standard Deviation	CV
Exposed from	09/12/2014	19/12/2014	09/12/2014	09/12/2014	09/12/2014	09/12/2014	09/12/2014						
Exposed to	05/01/2015	05/01/2015	05/01/2015	05/01/2015	05/01/2015	05/01/2015	05/01/2015						
Date samples received	06/01/2015	06/01/2015	06/01/2015	06/01/2015	06/01/2015	06/01/2015	06/01/2015						
NO_2	20.13	16.33	18.63	18.36	20.21	22.81	18.43	16.33	22.81	19.27	17.77	1.26	7.07
NOx	22.24	20.04	19.98	20.79	22.70	19.91	21.63	19.91	22.70	21.04	20.27	0.45	2.23
NO	2.10	3.71	1.35	2.43	2.49	-	3.20	1.35	3.71	2.55	2.50	1.18	47.32

APPENDIX G

Monitoring Period 5 to 15 Jan 2015

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LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER X2771R

BOOKING REFERENCE No X2771

DESPATCH NOTE No SOR017647

CUSTOMER Golder Associates UK Ltd
Attenborough House
Browns Lane, Business Park, Stanton-on-the Wolds
Nottinghamshire, NG12 5BL

DATE SAMPLES RECEIVED 16-Jan

			Exposure Data			NO_2	NO_X	NO	NO_2	NO_X	NO	TOTAL	TOTAL
NO_2	Tube Number	NO_x	Date On	Date Off	Time (hr.)	ppb *	ppb *	ppb * +	µg/m^3	µg/m^3	µg/m^3 +	µG NO_2	µG NOx
469627	N/E one	469614	05/01/2015	15/01/2015	237.18	16.47	20.80	4.33	31.56	39.85	8.30	0.54	0.69
469626	N/E two	469613	05/01/2015	15/01/2015	237.18	18.65	28.07	9.42	35.73	53.78	18.04	0.62	0.93
469618	N/E three	469605	05/01/2015	15/01/2015	237.18	15.35	28.37	13.02	29.41	54.36	24.94	0.51	0.94
469617	S/E corner	469604	05/01/2015	15/01/2015	237.42	18.69	19.06	0.36	35.81	36.51	0.70	0.62	0.63

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