South Holland District Council
Annual Status Report 2018

Bureau Veritas

June 2018

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Document Control Sheet

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2018 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the
Environment Act 1995
Local Air Quality Management

June 2018

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Executive Summary: Air Quality in Our Area

Air Quality in South Holland District Council

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

The main source of air pollution in the district is road traffic emissions from major roads, notably the A16, A17 and A151 which connect South Holland with North Lincolnshire, the Humber estuary and South West Lincolnshire. There are currently no Air Quality Management Areas (AQMAs) declared in South Holland.

During 2017, annual mean NO_2 concentrations have been recorded as under 12µg/m^3 at both automatic monitoring sites and below 30µg/m^3 at all non-automatic monitoring sites, except SH13 at Pinchbeck Road, where the annual mean concentration was reported to be 34.9µg/m^3. A decrease in the NO_2 annual mean concentration was observed in 2017 at most monitoring sites (SH5 remained stable and SH8/9/10, SH11, SH13 & SH16 saw a slight increase on 2016 outputs).

At both automatic monitoring sites, the annual mean PM_{10} concentrations are well below the annual mean PM_{10} AQS objective and the number of exceedances of the daily mean objective is considerably lower than the permitted 35 with one exceedence at the Westmere School and no exceedances at Spalding Monkhouse School.

ADMS screening assessments were carried out for ten biomass boilers in the 2017 ASR. There are no significant impacts from NO_2 and PM_{10} emissions from the biomass boilers at all farms except Luttongate Farm. The NO_2 emissions from the biomass boiler at Luttongate Farm cannot be screened out and a detailed assessment was

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

proposed in 2017 to determine the impact of emissions from the biomass boiler proposed.

Actions to Improve Air Quality

There are no designated AQMAs within South Holland District Council, therefore the Council has not produced any Air Quality Action Plans (AQAPs) and as such the Council has not published any specific measures related to control and mitigation of sources of local air quality issues.

Conclusions and Priorities

In 2017, the annual mean NO_2 concentrations at all monitoring locations in South Holland District were below the 40µg/m^3 air quality objective. Annual mean NO_2 concentrations were recorded below 12µg/m^3 at both automatic monitoring sites and below 30µg/m^3 at all non-automatic monitoring sites, except SH13, where an annual mean concentration of 34.9µg/m^3 was recorded.

As the annual mean concentrations at all the sites are well below 60µg/m^3, this indicates that an exceedance of the 1-hour mean objective is unlikely at these sites.

South District Council's priorities for the coming year include:

- Continuing with the current NO_2 diffusion tube monitoring network to identify any exceedances of the annual mean air quality objective;
- Ensure new developments meet the requirements of planning policies and guidance in relation to air quality; and
- Proceed to the 2019 Annual Status Report.

Local Engagement and How to get Involved

A variety of actions can be undertaken by everyone to help keep air pollution low, and protect their health when levels rise:

- Don't light a bonfire when pollution levels are high.
- Try to use your car less often - walk, cycle or use public transport.
- Cycling or walking is healthier for both the environment, and for you.
- Ask your employer, school or college about developing a green travel plan.

- Do not drive your car when there are warnings of high air pollution. You will normally receive pollution warnings on your local regional news and weather forecast.

The South Holland air quality webpages can be found at http://shollandair.aeat.com/.

The website allows users to find out what the latest pollution levels in South Holland area are, find out more about air pollution, and view data for individual automatic monitoring stations in the local authority area.

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1 Local Air Quality Management

This report provides an overview of air quality in South Holland District Council during 2017. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by South Holland District Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

South Holland District Council currently does not have any AQMAs. For reference, a map of South District Council's monitoring locations is available in Appendix D.

2.2 Progress and Impact of Measures to address Air Quality in South Holland District Council

Defra's appraisal of last year's ASR concluded the District Council may wish to consider reviewing the current monitoring programme in light of the 2016 results to determine whether there may be any further locations with relevant exposure above objective levels elsewhere in the District; in response to this the monitoring network was reviewed in December 2017 and one tube relocated. Further reviews of the network are scheduled for 2019, responding to the key findings outlined in this report. The 2017 monitoring data shows there were no exceedances of NO_2 and PM_{10} AQS objectives.

Defra requested that the roadside automatic monitoring site is used for bias adjustment due to the assumption that data levels characteristically are anticipated to be higher than a background site. The SHDC Urban Background site has been used once again for this year's local bias adjustment due to the site reporting slightly higher values than the other automatic monitoring site..

Defra have further requested that the final results are corrected for distance using the NO_2 fall off with distance calculator, despite the results reporting significantly below objective levels. The 2017 NO_2 annual mean concentrations, reported at all sites, are some of the lowest reported concentrations within the past five years and therefore distance correction was not deemed to be necessary for all but one result. SH13 has been distance corrected as it is the highest measured value of NO_2, measuring a concentration of 34.9µg/m³ before distance correction and 19.3 µg/m³ after.

The proposed detailed assessment following the ADMS screening assessment for Luttongate Farm was also requested to be submitted to Defra for review on completion. The detailed assessment for Luttongate Farm has not yet been progressed due to lack of funding and a change of personnel within the Public Protection Service.

Both NO_2 and PM_{10} AQS objectives have been met within South Holland District in the last five years. Regardless, the Council is committed to improving air quality. The South East Lincolnshire Local Plan is currently at the final consultation stage. Once the new Local Plan is in place air quality mitigation measures will be required as part of new developments that have an impact on air quality.

Across South East Lincolnshire, the focus of the Air Quality actions will centre on the understanding that:

- Due to a strong base of scientific evidence stating that particulates from traffic pollution are a contributor to premature death (29,000 in the UK in 2008, 25,000 of these in England), with Nitrogen Dioxide also strongly linked, there is a requirement to avoid increasing traffic pollution at other locations that fall below the threshold for a declared AQMA, but which could potentially reach this threshold in the future if unchecked;
- Councils have a duty to ensure that the national air quality objectives are met in their area;
- National air quality objectives will evolve over time to further reduce negative impacts on human health and the environment.

With this in mind it is important that the Council is able to require further assessment by developers and apply conditions to applications / permissions, with air quality as a material consideration. It may be necessary to agree a threshold for the number of properties being developed, or the scale of non-housing developments, at which point further assessment of air quality impacts by the developer will take effect and the areas where such further assessment will be relevant. This might be one large scale development, or potentially a number of smaller developments where there is the potential for a negative impact on air quality in a defined location. This might be where there could be impact on a particular street, or combination of streets, where the air quality objective for a particular pollutant either isn't being met, or could fail to be met in the future. Such considerations may vary to reflect changes in the levels of pollutants and the pollutants themselves, as published from time to time as national air quality objectives.

South East Lincolnshire are at a point where a large scale housing development would require an air quality assessment and proposed mitigation to be offered by the developer such as the installation of electric vehicle charge points, provision of cycle / safe pedestrian routes, bus interchanges, contributions to road improvement schemes, or combinations of these, to ensure the Council can keep control of air quality in the future.

We understand that a policy needs to exist under the local plan before such measures can be required. The local plan is currently under “examination” and is expected to be published later in the year.

Transport measures would be addressed County-wide by Lincolnshire County Council, and may include:

- Company Vehicle Procurement -Prioritising uptake of low emission vehicles;
- Priority parking for LEV's;
- Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging;
- Public Vehicle Procurement -Prioritising uptake of low emission vehicles;
- Taxi emission incentives; and
- Taxi Licensing conditions.

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

The Public Health Outcomes Framework indicator for the fraction of deaths attributable to $PM_{2.5}$ in South Holland District is 5.2% during 2016, which is below the regional average of 5.7% and the national average of 5.3%, and lower than a number of other authorities in the East Midlands region.

There is currently no ongoing monitoring of $PM_{2.5}$ within the District, and no specific measures in place to address $PM_{2.5}$ concentrations, as the air quality across the District is considered good. Traffic emissions are the main cause of particulate emissions within the District, and as such, the implementation of the transport measures given in Section 2.2 will continue to contribute to the reduction of $PM_{2.5}$ concentrations experienced across the District.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

South Holland District Council undertook automatic (continuous) monitoring at 2 sites during 2017. Table A.1 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

South Holland District Council undertook non- automatic (passive) monitoring of NO_2 at 15 sites during 2017; 14 single diffusion tube sites and one triplicate site. Table A.2 in Appendix A shows the full details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments are included in Appendix C. The data capture for all 17 tubes are 75% or more, and as such there was no need to annualise any of the results.

3.2 Individual Pollutants

The air quality monitoring results provided in this section are adjusted for bias. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2017 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. For the last five years, the number of exceedences for the hourly mean NO_2 objective has remained at zero.

At both automatic monitoring sites, there have been no exceedances of the hourly mean and the annual mean NO_2 objectives.

Figure A.1 shows the trends of the annual mean NO_2 concentrations recorded at both automatic and non-automatic monitoring sites during 2013 to 2017. In the last five years, the annual mean NO_2 concentrations have been below 13µg/m^3 at both automatic monitoring sites and below 30µg/m^3 at all non-automatic monitoring sites, except one instance in 2013 for SH15 (31.6 µg/m^3) and SH13, which has consistently reported annual mean concentrations below 35µg/m^3. SH13 measured an annual mean of 34.9µg/m^3 in 2017, the highest of all monitoring sites. SH13 is situated >20m from the nearest receptor, and as such, after distance correciton this concentration decreases to 19.3µg/m^3. South Holland will continue to be vigilant of this site, however currently it is not a concern.

Following the peak concentrations recorded in 2016; 2017 has reported a decrease in concentrations across all sites, with the exception of SH8/9/10, SH11 and SH16, which saw a slight increase, and SH5 remained stable when compared to 2016 levels.

Both automatic and non-automatic monitoring results are well below 60µg/m^3, which indicates that an exceedance of the 1-hour mean objective is unlikely at these sites.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

Figure A.2 show the trends of the annual mean PM_{10} concentrations recorded at both automatic monitoring sites during 2013 to 2017. At both automatic monitoring sites, the annual mean PM_{10} concentrations have been well below the annual mean

PM_{10} AQS objective in last five years. The peak PM_{10} annual mean concentrations were recorded in 2013. Since then, the PM_{10} annual mean concentrations decreased over the subsequent four years, with one instance of a slight increase in 2017 for the Westmere School urban background site..

Figure A.3 shows the trends of the number of exceedances of PM_{10} 24-hour mean AQS objective recorded at both automatic monitoring sites during 2013 to 2017. At both sites, the number of exceedances of the daily mean objective is considerably lower than the permitted 35.

3.2.3 Other Pollutants

In addition to monitoring NO_2 and PM_{10}, the automatic analyser located at Westmere School also monitors Ozone (O_3) concentrations. There is no requirement to report these data for LAQM purposes; however, the results are discussed herein for completeness.

O_3 is a trans-boundary pollutant; its sources can be frequently spatially distant from the measured site of the concentration. This pollutant is not prescribed an air quality objective for the purposes of LAQM and therefore the results presented are for information only.

The AQS objective for ground level O_3 (to be met by 2005) states that the maximum daily concentration (measured as an 8-hour running mean) of 100 µg/m^3 should not be exceeded more than 10 times per year.

Table A.7 in Appendix A summarises the number of exceedances over the last 5 years. The number of exceedances of maximum daily concentration (measured as an 8-hour running mean) of 100 µg/m^3 is lower than permitted 10.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Spalding Monkhouse School	Urban Background	523168	322454	NO_2, PM_{10}	N	Chemiluminescence, TEOM/BAM	1	25	3
CM2	Westmere School	Urban Background	547264	321709	NO_2, O_3, PM_{10}	N	Chemiluminescence, UV Absorption,TEOM	14	190	3

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
SH 1	21 Millfield Gardens	UB	524388	310520	NO_2	N	6.8	2.9	N	2.2
SH 2	Nutten Stoven	UB	535595	325453	NO_2	N	5.6	21.8	N	2.2
SH 3	Priory Road	UB	524734	322403	NO_2	N	38.4	80	N	2.2
SH 4	46 The Hollies	UB	536523	325078	NO_2	N	8.4	0.2	N	2.2
SH 5	Station Road	R	526585	328726	NO_2	N	24.9	1.5	N	2.2
SH 6	103 Boston Road	R	535525	325589	NO_2	N	25.7	9.5	N	2.2
SH 7	Field End	R	541013	324393	NO_2	N	5.9	<2	N	2.2
SH8/9/10	Westmere (Triplicate)	UB	547264	321709	NO_2	N	69.4	61.2	Y	3
SH 11	Metalair Site	R	547957	321013	NO_2	N	N/A	<2	N	2.2
SH 13	Pinchbeck Road	K	524595	323793	NO_2	N	20.7	0.7	N	2.2
SH 14	Springfields Roundabout	K	526309	323820	NO_2	N	54.2	0.5	N	2.2
SH 15	Church Street, Pinchbeck	R	524182	325804	NO_2	N	0	1.5	N	2.2
SH 16	Bicker Road, Donington	R	520917	336064	NO_2	N	7.5	16.5	N	2.2
SH 17	High Road, Spalding	R	524892	322571	NO_2	N	0	1.5	N	2.2
SH 18	Hawthorn Bank, Spalding	R	524191	321328	NO_2	N	1.5	3	N	2.2

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

K – Kerbside, R – Roadside, UB – Urban Background

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2013	2014	2015	2016	2017
CM1	Urban Background	Automatic	99.8	99.8	11.3	10.4	10.5	12.7	10.8
CM2	Urban Background	Automatic	97.8	97.8	12.7	12.1	9	11.3	11.2
SH 1	Urban Background	Diffusion Tube	91.6	91.6	14.9	13.13	10.5	12.9	10.7
SH 2	Urban Background	Diffusion Tube	91.6	91.6	15	12.19	10.5	12.0	10.6
SH 3	Urban Background	Diffusion Tube	100	100	19.4	18.86	16.5	19.4	17.9
SH 4	Urban Background	Diffusion Tube	100	100	13.9	12.22	10.7	14.0	12.1
SH 5	Roadside	Diffusion Tube	100	100	17.9	16.2	14.6	16.2	16.2
SH 6	Near-Road	Diffusion Tube	91.6	91.6	25.4	22.77	19.7	25.9	19.9
SH 7	Roadside	Diffusion Tube	100	100	21	19.12	17.8	20.3	19.7
SH8/9/10	Urban Background	Diffusion Tube	100	100	13.5	12.11	10.1	11.0	11.2
SH 11	Roadside	Diffusion Tube	75	75	21.9	20.77	17.7	19.5	20.1
SH 13	Kerbside	Diffusion Tube	75	75	32.3	30.13	29.8	34.8	34.9
SH 14	Kerbside	Diffusion Tube	100	100	27.3	25.42	21.3	24.9	23.9
SH 15	Roadside	Diffusion Tube	91.6	91.6	31.6	28.32	23.6	28.6	25.1

SH 16	Near-Road	Diffusion Tube	100	100	16.1	14.32	12.5	13.9	14.0
SH 17	Roadside	Diffusion Tube	100	100	28.3	28.21	24.3	27.5	24.2
SH 18	Roadside	Diffusion Tube	91.6	91.6	25.4	24.12	22.5	26.5	23.4

☒ **Diffusion tube data has been bias corrected**

☐ **Annualisation has been conducted where data capture is <75%**

☐ **If applicable, all data has been distance corrected for relevant exposure**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

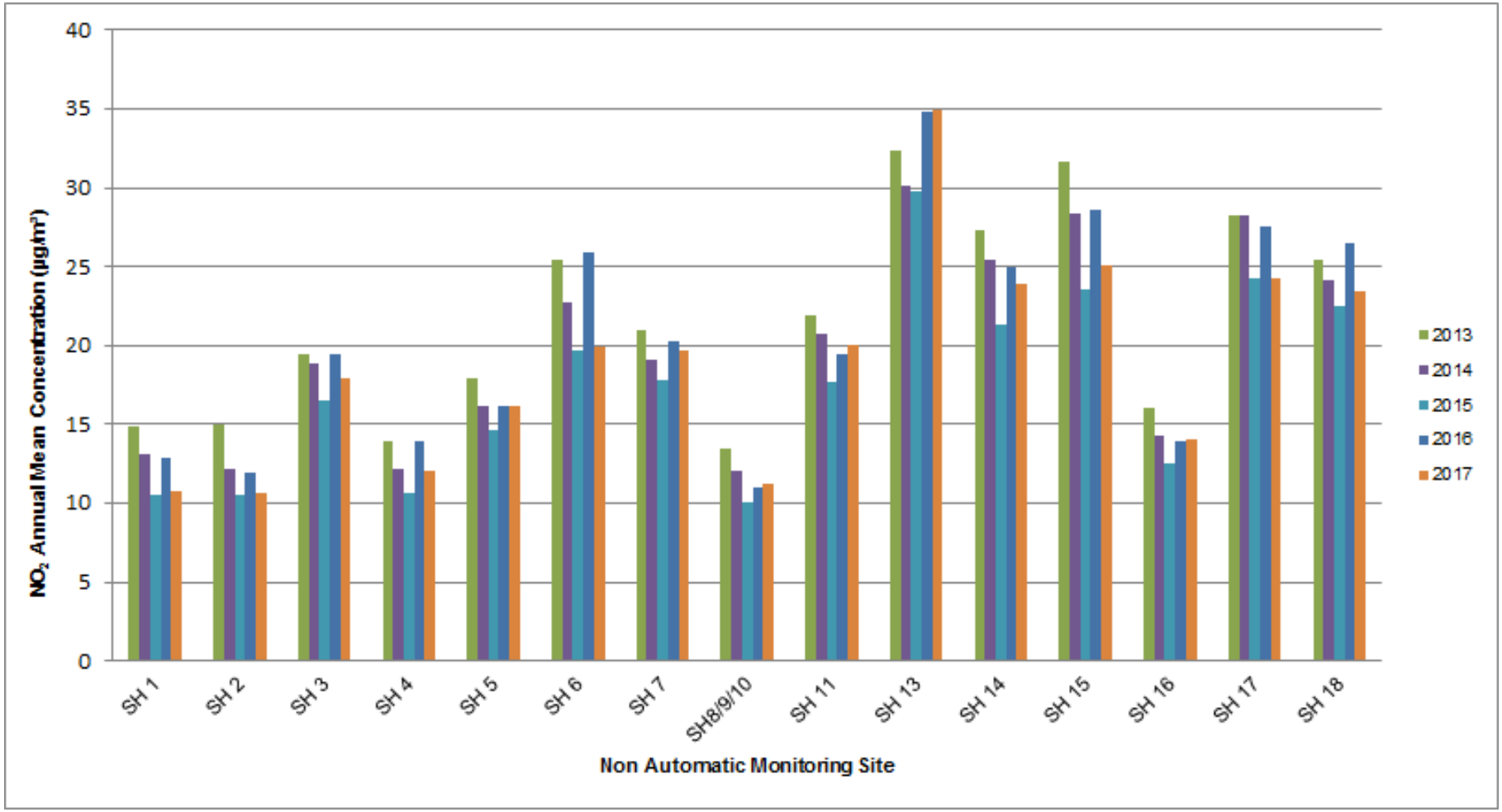


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2013	2014	2015	2016	2017
CM1	Urban Background	Automatic	97.4	97.4	0	0	0	0	0
CM2	Urban Background	Automatic	95.5	95.5	0	0	0	0	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2013	2014	2015	2016	2017
CM1	Urban Background	99.2	99.2	18.9	17.9	15.4	13.5	11.8
CM2	Urban Background	97.8	97.8	17.9	17.2	14.8	14	14.5

☐ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the PM_{10} annual mean objective of 40$\mu g/m^3$ are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.2 – Trends in Annual Mean PM_{10} Concentrations

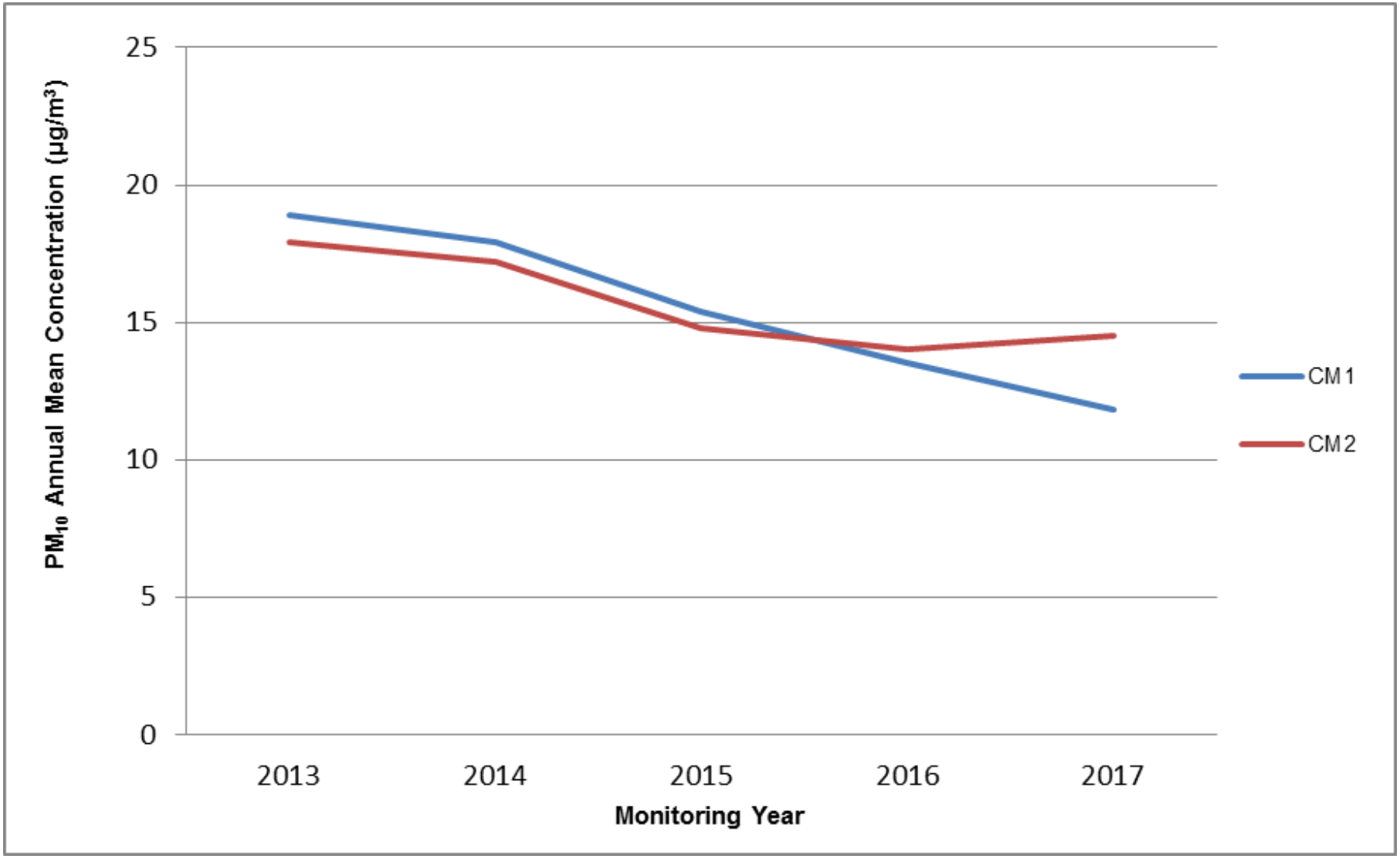


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2013	2014	2015	2016	2017
CM1	Urban Background	99.2	99.2	5	4	1	2	0
CM2	Urban Background	97.8	97.8	4	4	1	1	1

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Figure A.3 – Trends in Number of 24-Hour Mean PM_{10} Results >50µg/m^3

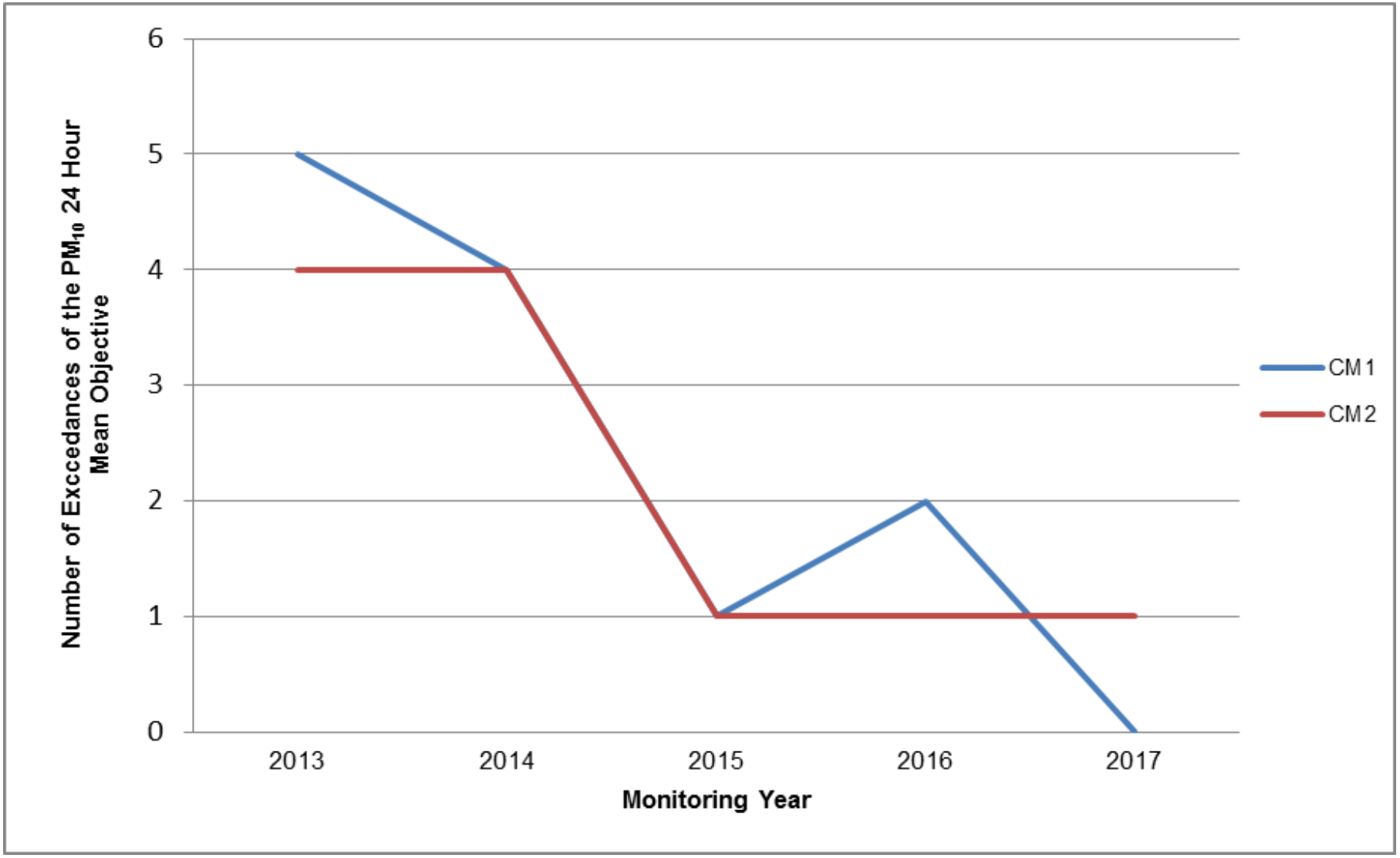


Table A.7 – Results of Westmere School Automatic Ozone Monitoring

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2017 (%) (2)	Number of Exceedances of Maximum Daily Concentration (8-hour running mean)				
				2013	2014	2015	2016	2017
CM2	Urban Background	100	100	55	8	10	3	0

Notes:

Exceedance of the O_3 objective: 8-hour mean of 100 µg/m^3, 10 exceedances allowed per year.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Appendix B: Full Monthly Diffusion Tube Results for 2017

Table B. 1 – NO_2 Monthly Diffusion Tube Results - 2017

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1.02) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
SH 1		14.5	10.9	7.6	8.1	6.6	6.8	8.9	8.1	10.6	17.7	15.9	10.5	10.7	
SH 2		14.2	10.5	9.5	8.7	6.2	7.3	7.6	10.5	11.2	16.1	13.1	10.4	10.6	
SH 3	28.2	20.1	19.2	14.2	13.3	12.4	13.1	11.8	14.3	17.9	23.8	22.5	17.6	17.9	
SH 4	23.3	13.1	12.1	7.8	8.3	5.9	7.9	7.7	10.1	11.2	17.4	17.0	11.8	12.1	
SH 5	22.2	17.0	16.0	14.9	12.4	10.9	12.7	15.1	14.2	14.6	21.7	18.5	15.9	16.2	
SH 6	35.3	19.9	18.8	16.7	21.9	12.9	17.0	14.1	16.8	17.3	24.0		19.5	19.9	
SH 7	26.6	20.3	19.6	16.6	14.9	17.3	16.8	18.7	17.5	18.9	22.5	22.4	19.3	19.7	
SH8/9/10	21.7	12.3	10.5	7.6	7.7	6.2	8.7	7.3	8.6	9.9	16.2	15.5	11.0	11.2	
SH 11	29.8	22.6	16.8	15.2	21.0			14.5	16.9	17.6	22.8		19.7	20.1	
SH 13	48.6	31.8	29.7		23.6		29.9		30.0	31.4	43.4	39.8	34.2	34.9	
SH 14	35.2	25.1	25.1	23.0	23.8	17.6	18.4	16.4	21.9	21.6	27.3	26.2	23.5	23.9	
SH 15	40.2	25.9	19.6	21.2	22.1	21.1	21.4	20.2	23.5		28.6	26.5	24.6	25.1	
SH 16	25.6	15.1	13.6	10.3	10.5	8.9	11.3	10.9	12.2	12.0	16.8	18.0	13.8	14.1	
SH 17	39.7	27.8	23.9	18.5	21.5	18.1	18.8	17.6	21.4	20.3	30.8	26.7	23.8	24.2	
SH 18		25.3	25.8	20.7	17.9	19.0	19.4	16.9	23.9	23.4	31.1	28.9	22.9	23.4	

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

☐ **Annualisation has been conducted where data capture is <75%**

Water droplets present contaminating tube **Diffusion Tube missing**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

QA/QC of Automatic Monitoring

South Holland District Council contracts data management for their continuous analysers to Ricardo-AEA. The Quality Assurance/Quality Control (AQ/QC) procedures employed by Ricardo-AEA are equivalent to the UK Automatic Urban and Rural Network (AURN) procedures. The PM_{10} results have been corrected by Ricardo-EE who undertake the data management for the two automatic continuous monitoring sites. TEOM data were VCM corrected and unheated BAM data have been corrected by multiplying by 0.833.

All monitoring locations recorded data capture of 75% or more, therefore it was not required to annualise any monitoring data.

Diffusion Tube Monitoring Data

The diffusion tube data has been corrected using a bias adjustment factor, which is an estimate of the difference between diffusion tube concentration and continuous monitoring, the latter assumed to be a more accurate method of monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method. With regard to the application of a bias adjustment factor for diffusion tubes, the Defra Technical Guidance LAQM.TG(16) and the LAQM Helpdesk recommend the use of a local bias adjustment factor where available and relevant to diffusion tube sites.

The national bias adjustment factor is 0.97 (based on 22 studies) as derived from the national bias adjustment calculator (Spreadsheet Version Number: 03/2018).

There is a co-located triplicate diffusion tube monitoring site (SH 8/9/10) installed at the urban background Westmere School automatic monitoring site. The local bias correction factor is calculated to be 1.02 using the Diffusion Tube Bias Adjustment Factor Spreadsheet (AEA_DifTPAB_v04.xlsx (Figure C.1)). For completeness and as both 2015 and 2016 data used a local bias, it was decided to present the local bias

adjustment factor (1.02) for the reporting year 2017. In addition, both data capture and tube precision are found to be good.

Figure C.1 – Local Diffusion Tube Correction Factor Calculation

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	04/01/2017	31/01/2017	22.4	20.3	22.4	22	1.2	6	3.1
2	31/01/2017	28/02/2017	10.8	13.0	12.9	12	1.2	10	3.1
3	28/02/2017	28/03/2017	10.5	10.0	10.9	10	0.4	4	1.1
4	28/03/2017	27/04/2017	7.4	7.5	7.8	8	0.2	3	0.5
5	27/04/2017	27/05/2017	8.7	8.1	6.1	8	1.4	18	3.4
6	30/05/2017	28/06/2017	6.3	6.6	5.7	6	0.5	8	1.2
7	28/06/2017	01/08/2017	8.3	9.3	8.4	9	0.6	7	1.5
8	01/08/2017	30/08/2017	6.3	7.9	7.7	7	0.9	12	2.1
9	30/08/2017	28/09/2017	8.9	8.8	8.0	9	0.5	6	1.2
10	28/09/2017	02/11/2017	9.5	10.3	9.8	10	0.4	4	0.9
11	02/11/2017	06/12/2017	17.2	16.2	15.2	16	1.0	6	2.5
12	06/12/2017	03/01/2018	16.0	14.9	15.6	16	0.5	4	1.3
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
24	100	Good	Good
15.1	99.7	Good	Good
12.6	100	Good	Good
10.2	99.9	Good	Good
8.7	100	Good	Good
5.6	99.4	Good	Good
5.7	99.4	Good	Good
6.2	99.9	Good	Good
8.1	100	Good	Good
9.4	99.9	Good	Good
15	99.9	Good	Good
13.6	99.6	Good	Good
Overall survey -->		Good precision	Good Overall

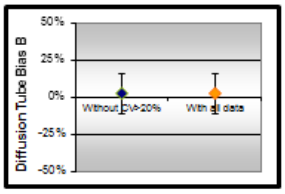
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A 1.02 (0.89 - 1.18)
Bias B -2% (-15% - 12%)
Diffusion Tubes Mean: 11 µgm^{-3}
Mean CV (Precision): 7
Automatic Mean: 11 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 11 (10 - 13) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 1.02 (0.89 - 1.18)
Bias B -2% (-15% - 12%)
Diffusion Tubes Mean: 11 µgm^{-3}
Mean CV (Precision): 7
Automatic Mean: 11 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 11 (10 - 13) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied and analysed by Gradko International Limited utilising the 50% Triethanolamine (TEA) in acetone preparation method.

Gradko International Ltd is a UKAS accredited laboratory and participates in laboratory performance and proficiency testing schemes. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The laboratory follows the procedures set out in the Harmonisation Practical Guidance and participates in the AIR proficiency-testing (AIR-PT) scheme. Defra and the Devolved Administrations advise that diffusion tubes used for LAQM should be obtained from laboratories that have demonstrated satisfactory performance in the AIR-PT scheme. Laboratory performance in the AIR-PT is also assessed by the National Physical Laboratory (NPL), alongside laboratory data from the monthly NPL Field Inter-Comparison Exercise.

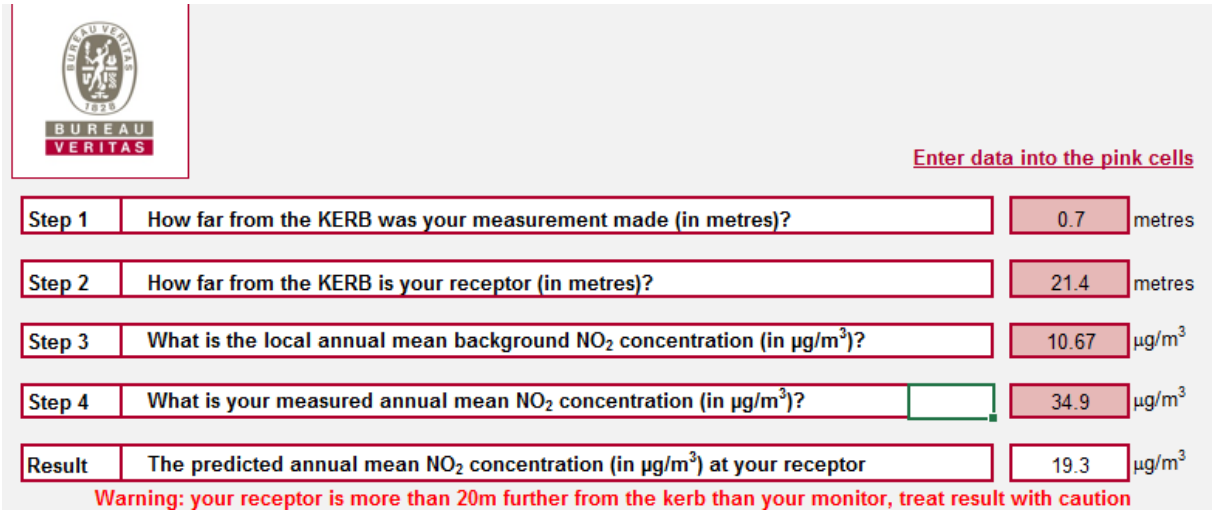
In the 2017 AIR-PT results, AIR-PT AR018 (January to February 2017), AIR-PT AR019 (April to May 2017), AR021 (July to August 2017) and AR022 (September to October 2017), Gradko scored 100% for all periods. The percentage score reflects the results deemed to be satisfactory based upon the z-score of < ±2.

NO_2 Fall-off with distance from the road

Wherever possible, local authorities should ensure that monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure should be estimated, using the NO_2 fall-off with distance calculator available on the LAQM Support website.

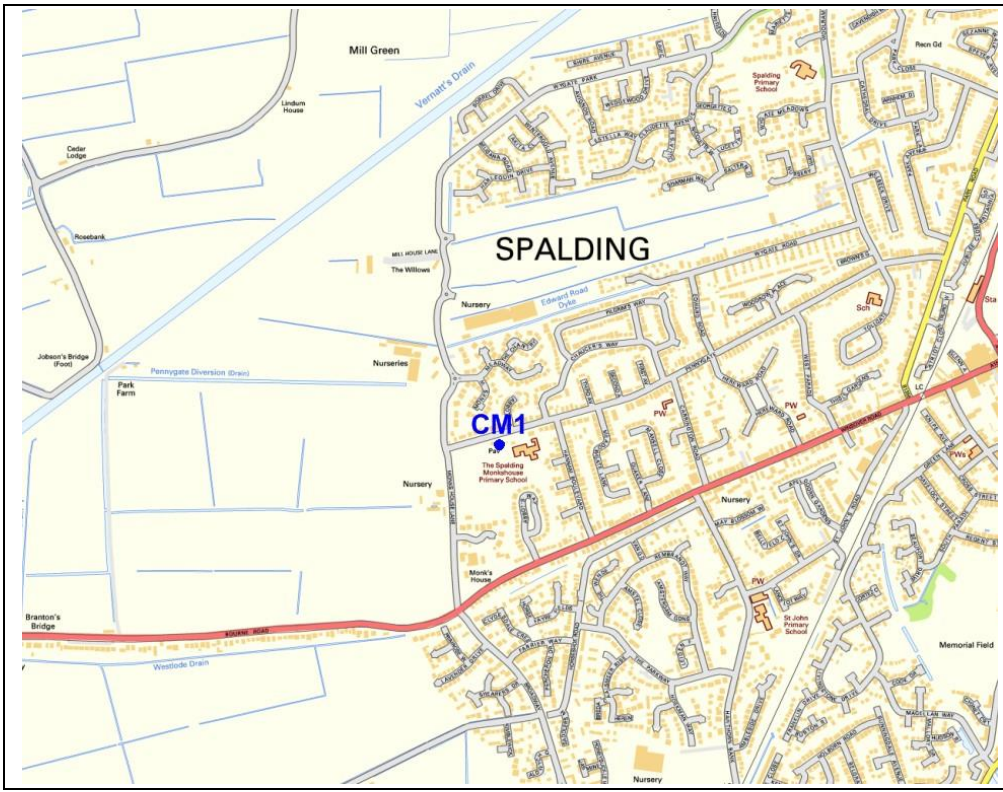
This has been done for one location where the monitoring site is not strictly representative of exposure, and the concentration is the highest measured value, to identify whether elevated monitored concentrations constitute an exceedances of the annual mean NO_2 AQS objective. The summaries of the adjustments undertaken using the tool are presented in Figure C.2. Background concentrations are taken from the Defra 2013-based background maps, also available on the LAQM website.

Figure C.2 W38 NO_2 fall-off with distance from the road



Appendix D: Map(s) of Monitoring Locations and AQMAs

Figure D.1 – Map of Automatic Monitoring Site: Spalding



Legend

● Automatic Monitoring Loation

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	Spalding
Title	**Diffusion Tube Locations**
By	FL
Approved	HS
Scale	Not To Scale
Job Ref	6443719
Date	June 2018
Figure No.	D.1

Figure D. 2 – Map of Automatic Monitoring Site: Sutton Bridge

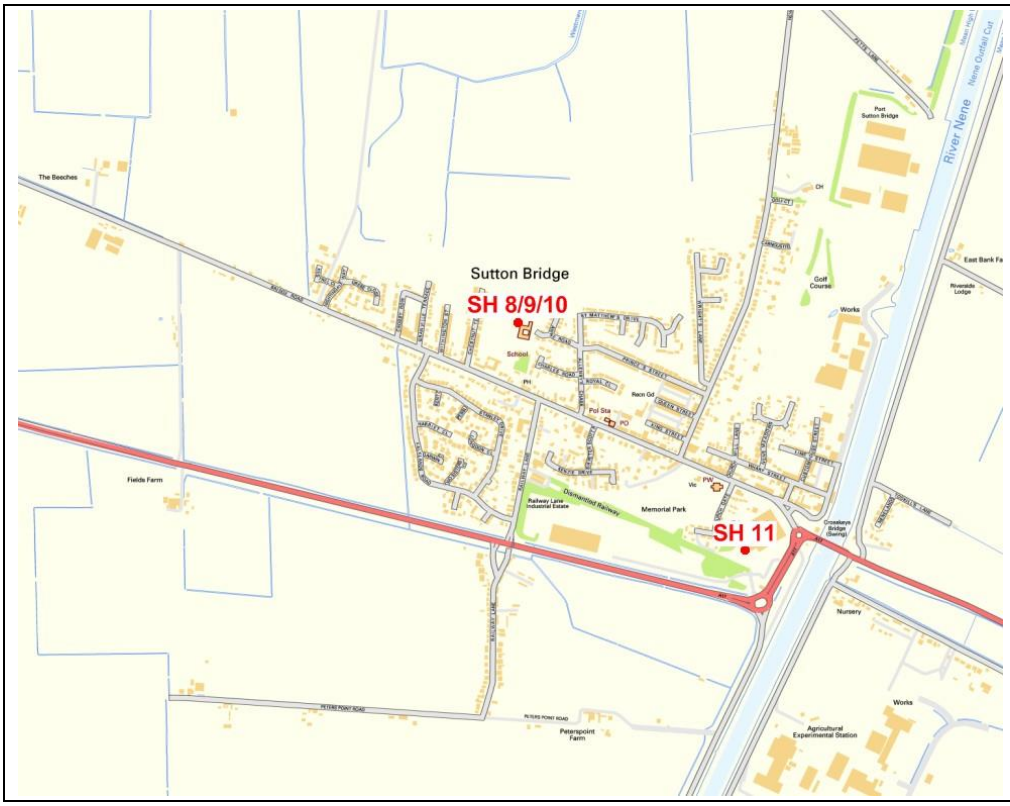
Legend

● Automatic Monitoring Loation

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Sutton Bridge**
Title	**Diffusion Tube Locations**
By	FL
Approved	HS
Scale	Not To Scale
Job Ref	6443719
Date	June 2018
Figure No.	D.2

Figure D. 3 – Map of Non-Automatic Monitoring Site: Sutton Bridge



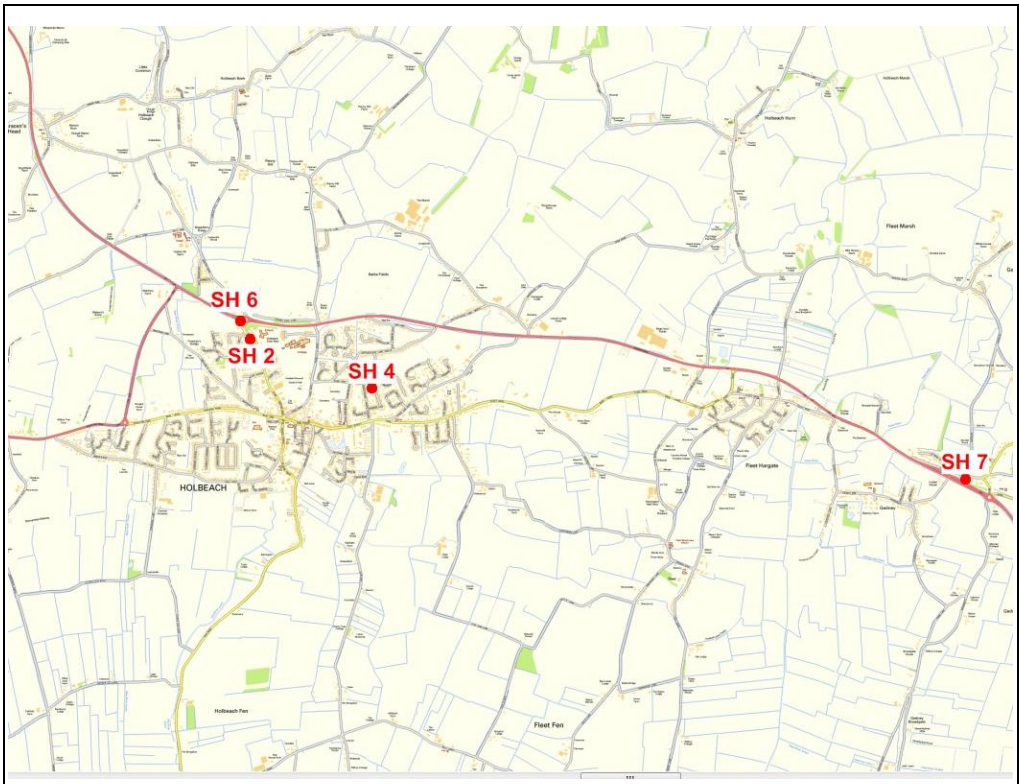
Legend

Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Sutton Bridge**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date June 2018	**Figure No.** D.3

Figure D. 4– Map of Non-Automatic Monitoring Sites: Holbeach and Gedney



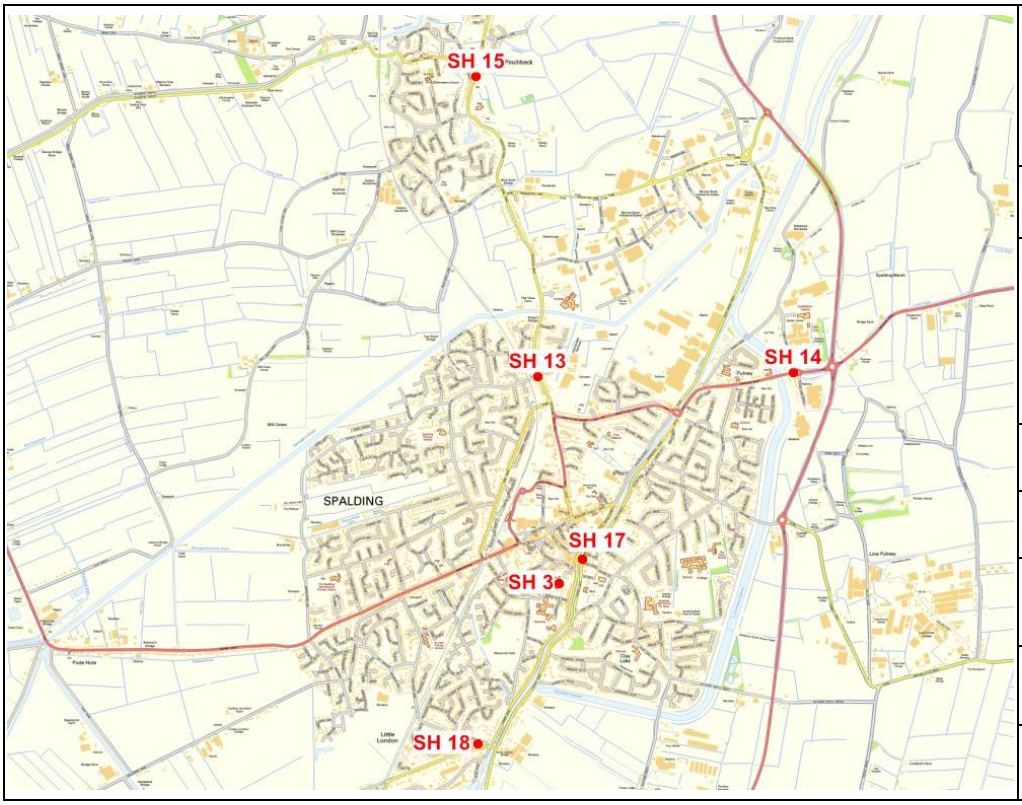
Legend

Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Holbeach and Gedney**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date June 2018	**Figure No.** D.4

Figure D. 5 – Map of Non-Automatic Monitoring Sites: Spalding and Pinchbeck



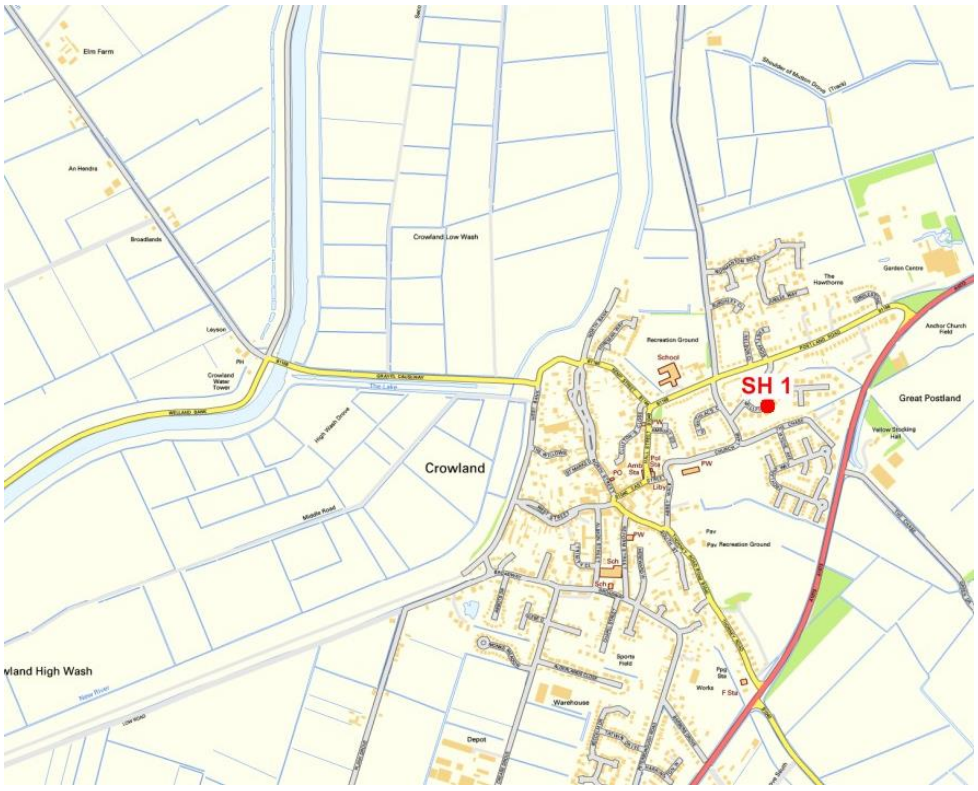
Legend

Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Spalding and Pinchbeck**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date June 2018	**Figure No.** D.5

Figure D. 6 – Map of Non-Automatic Monitoring Site: Crowland



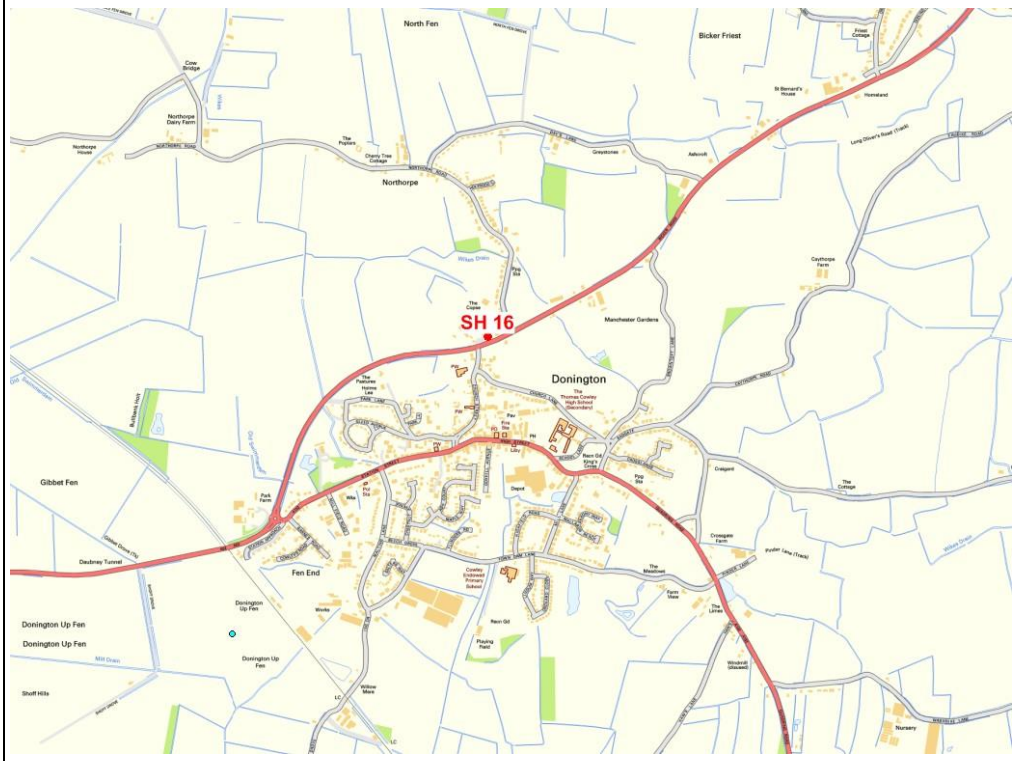
Legend

Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Crowland**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date June 2018	**Figure No.** D.6

Figure D. 7 – Map of Non-Automatic Monitoring Sites: Donington



Legend

Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Donington**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date June 2018	**Figure No.** D.7

Figure D. 8 – Map of Non-Automatic Monitoring Sites: Surfleet

Legend

Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Surfleet**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date June 2018	**Figure No.** D.8

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[4] The units are in micrograms of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
AQS	Air Quality Standard
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
AQMAU	Air Quality Modelling and Assessment Unit

References

- Draft South East Lincolnshire Local Plan 2011-2036
- Local Air Quality Management; Technical Guidance LAQM.TG(16) Available at: http://laqm.defra.gov.uk/technical-guidance/
- AEA Energy and Environment (2011) AEA_DifTPAB_v04.xls, Available at: www.uk-air.com
- http://shollandair.aeat.com/
- National Diffusion Tube Bias Adjustment Factor Spreadsheet, version 03/18 published in March 2018
- South Holland District Council 2017 Annual Status Report