



West Lindsey District Council

Annual Progress Report 2022

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2022 Air Quality Annual Status Report (ASR)

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

Date: June, 2022

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Executive Summary: Air Quality in Our Area

Air Quality in West Lindsey 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, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas^{1,2}.

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages³, with a total estimated healthcare cost to the NHS and social care of £157 million in 2017⁴.

The district of West Lindsey is primarily rural in nature. The main source of pollution is vehicle emissions from the existing road network, most notably the A15, A46 and A631, which connect the district to the cities of Hull to the north, Sheffield to the west, and Lincoln to the south. In 2021, the annual mean nitrogen dioxide (NO₂) concentrations reported in West Lindsey continue to remain well below the Air Quality Strategy (AQS) objectives and there has been no reported exceedance of any AQS objective within West Lindsey for the past five years.

Three power stations, operated by EDF Energy, are located outside the district (within the bordering county of Nottinghamshire), and are in close proximity to one-another. Two of these, Cottam and West Burton A, are coal fired, whereas West Burton B is a gas fired combined cycle gas turbine power station. These industries are regulated through environmental permits.

¹ Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

² Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

³ Defra. Air quality appraisal: damage cost guidance, July 2021

⁴ Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

Whilst there are currently no Air Quality Management Areas (AQMAs) within the Council's designation, the current monitoring network will remain in place and will be updated where required. These locations are constantly reviewed with regard to any hotspot area(s) of pollution being identified.

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.

The 2019 Clean Air Strategy⁵ sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero⁶ sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of AQMAs are designated due to elevated concentrations heavily influenced by transport emissions.

There are currently no designated AQMAs within the District and therefore an Air Quality Action Plan (AQAP) is not required. The air quality across West Lindsey is generally considered to be good, and as such there are no specific measures related to the control and mitigation of sources of local air pollution currently in place.

West Lindsey will continue to monitor and assess the results for the coming year within the NO₂ diffusion tube network.

In addition, the adopted [Central Lincolnshire Local Plan](#) contains objectives and policies designed to minimise the impact of new developments upon local air quality.

Conclusions and Priorities

During 2021 no exceedances of the NO₂ annual mean objective were recorded within the district of West Lindsey. Being a predominantly rural district without any substantial

⁵ Defra. Clean Air Strategy, 2019

⁶ DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

urbanised areas, the pollution concentrations continue to be relatively low and monitoring will continue to ensure that any concentration trends can be identified.

West Lindsey will continue to assess new developments submitted through the planning department so as to ensure that any proposed developments are not detrimental to local air quality. In addition, any new industrial processes will be regulated in line with The Environmental Permitting (England and Wales) Regulations 2016 (as amended).

Local Engagement and How to get Involved

A number of initiatives can be completed by everyone to help reduce air pollution concentrations on a local scale, these include:

- Using alternative modes of transport rather than the car, walking, cycling or using public transport;
- Changes in transport modes can bring added health benefits through walking and cycling exercise; and
- Asking your employer, school or college about the possibility of developing a green travel plan.

Further information on local air quality can be found on [Defra's air quality management website](#).

Local Responsibilities and Commitment

This ASR was prepared by the Housing and Environmental Enforcement Service area of West Lindsey District Council with the support and agreement of the following officers and departments:

- [REDACTED] – Senior Environmental Health Practitioner

This ASR has been approved by:

- Ian Knowles, Chief Executive of West Lindsey District Council.

This ASR has not been signed off by a Director of Public Health.

If you have any comments on this ASR please send them to Andy Gray at: West Lindsey District Council, Guildhall, Marshall's Yard, Gainsborough, DN21 2NA. 01427 676676 - andy.gray@west-lindsey.gov.uk

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1 Local Air Quality Management

This report provides an overview of air quality in West Lindsey District Council during 2022. 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 West Lindsey District Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E. 1.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

AQMAs are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an AQAP within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

West Lindsey District Council currently does not have any declared AQMAs.

2.2 Progress and Impact of Measures to address Air Quality in West Lindsey District Council

Defra's appraisal of last year's ASR concluded that:

The report is well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports.

- 1. The Council continue to present pollutant trends clearly and provide a detailed discussion of trends. Furthermore, a robust comparison with air quality objectives is provided.*
- 2. The Council have included a section which outlines any new or changed sources within West Lindsey during the reporting year. This is useful and the Council are encouraged to continue including this in future ASRs.*
- 3. The diffusion tube mapping is comprehensive and clearly demonstrates the monitoring network.*
- 4. Comments from the previous appraisal are included and responded to.*
- 5. A detailed discussion on the impacts of COVID-19 have been provided and its impacts have been assessed against the COVID-19 Impact matrix.*
- 6. The Council's use of two national bias adjustment factors is supported and provides the best representation of the monitoring data. Furthermore, the Council have continued to use the national factor over the local factor. Monitoring data from the co-located tubes at the Gainsborough Cemetery continue to report concentrations much lower than that of the continuous monitor. Furthermore, the location is in an industrial setting and would not well represent the road site setting of West Lindsey.*

As West Lindsey is a predominantly rural district without any substantial urbanised areas, pollution concentrations across the district continue to be relatively low and few measures have been required to control this.

Several industries with the potential to pollute remain in the district and are controlled by environmental permits. These industries have their emissions controlled by a range of legally enforceable conditions. Whilst Part A1 processes are subject to regulation by the Environment Agency, Part A2 and Part B processes are subject to regular routine inspection by the Council. The Environmental Protection team also responds to complaints

regarding other air pollution issues, such as smoke nuisance from bonfires, emissions of dark smoke and offensive odours.

Monitoring of pollutants continues to ensure that any increase in concentration trends can be identified, as well as facilitating the review of areas believed to be at most risk of exceeding the AQS objectives.

West Lindsey continues to assess new developments submitted through the planning department ensuring that any proposed developments are not detrimental to local air quality. In addition, any new industrial processes will be regulated in line with the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

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.

Whilst during 2021/22 the Council have provided support to the Environment Agency and Defra in their ongoing process to site new PM_{2.5} rural background sites within the East Midlands Zone, there is not currently any monitoring of PM_{2.5} or PM₁₀ completed within the district. Therefore no concentration values can be reported or estimated using the method as described in Box 7.7 of LAQM.TG(16), which provides a method for estimating PM_{2.5} concentrations from PM₁₀ measurements.

The current [Defra background maps](#) for West Lindsey (2018 reference year) show that all 2021 background concentrations of PM_{2.5} are far below the recommended annual mean AQS objective for PM_{2.5} of 25µg/m³. The highest concentration is predicted to be 9.4µg/m³ within the 1km x 1km grid square with the centroid grid reference of 497500, 374500. This is an area to the north of Lincoln close to the A46 and A15.

There is currently one designated [smoke control zone](#) within West Lindsey, the Lincoln Fringe (the area between the boundary of the West Lindsey District and Lincoln bypass). Smoke control zones are a defined geographical region within which smoke cannot be legally emitted from a chimney, unless using authorised fuels or using exempt appliances.

The [Public Health Outcomes Framework](#) data tool compiled by Public Health England quantifies the mortality burden of PM_{2.5} within England on a county and local authority scale. The 2020 fraction of mortality attributable to PM_{2.5} pollution within West Lindsey is 4.4%. This remains lower than average for England as a whole and the East Midlands region, which are 5.6% and 5.2% respectively.

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

This section sets out the monitoring undertaken within 2021 by West Lindsey District Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

In previous years, the Council has included results from the one automatic (continuous) monitoring site that is located within the district (Gainsborough Cemetery). This site has been operated by EDF Energy as part of a monitoring network to assess emissions from the 'North Trent' group of power stations.

As per LAQM.TG(16), annualisation is required for any site which has a data capture of less than 75%, but greater than 25%. Unfortunately, the 2021 data capture from the Gainsborough Cemetery site was less than 25%. Therefore, annualisation was unable to be undertaken and the Council were unable to include the 2021 annual results within this year's ASR. The low data capture was due to EDF's service provider experiencing ongoing data logging and download issues. However (as demonstrated within the 2021 ASR), NO₂ and SO₂ concentrations recorded at the site have been well below the relevant AQOs over the past five years, and have been trending downwards. EDF are due to decommission the site in December 2022.

3.1.2 Non-Automatic Monitoring Sites

West Lindsey District Council undertook non- automatic (i.e. passive) monitoring of NO₂ at 12 locations during 2022, one of which was a triplicate site. Table A. 1 in Appendix A presents the details of the non-automatic 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 and any other adjustments applied (e.g. annualisation and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

Table A. 2 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past five years with the air quality objective of 40µg/m³. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B. 1 includes distance corrected values, only where relevant.

All monitoring locations within West Lindsey continue to report annual mean NO₂ concentrations well below the AQS objective. Fall-off with distance correction was not required due to the low monitored concentrations. Following bias adjustment and annualisation where required, the maximum reported concentration in 2021 is 26.2µg/m³ at diffusion tube monitoring location WL14, located along the A631 Queen Street in Market Rasen. This monitoring location also reported the maximum concentration (24.4µg/m³) in the 2020 report.

Figure A. 1 presents the 2021 annual mean NO₂ concentrations at West Lindsey District Council's monitoring sites. Concentrations at sites WL3, triplicate WL5/6/7, WL8, WL9, WL10 and WL14 all decreased slightly during 2021 in comparison to 2020. Concentrations at all other locations increased during 2021 in comparison to 2020. This is most likely due to a return to business as usual following the COVID-19 pandemic, whereby the UK Government issued advice to stay at home where possible, alongside strict lockdowns. This resulted in decreased levels of traffic observed across the UK, and therefore significantly reduced NO₂ concentrations recorded during 2020.

It is possible to infer the risk of exceedances of the 1-hour mean NO₂ AQS objective at diffusion tube monitoring sites. LAQM.TG(16) provides an empirical relationship that states exceedances of the 1-hour objective are unlikely when the annual mean concentration is below 60µg/m³. Given that the highest recorded annual mean concentration at any of the diffusion tube monitoring sites is 26.2µg/m³, it is possible to conclude that there have been no exceedances of the hourly mean NO₂ objective in the last five years at all monitoring locations.

Appendix A: Monitoring Results

Table A. 1 – Details of Non-Automatic Monitoring Sites

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube Co-located with a Continuous Analyser?	Tube Height (m)
WL1	3 Lea Road, Gainsborough	Roadside	481526	389077	NO ₂	No	0.0	8.6	No	2.8
WL2	58 Etherington Street, Gainsborough	Roadside	481688	389770	NO ₂	No	20.1	1.6	No	2.8
WL3	19 Spring Gardens, Gainsborough	Roadside	481721	389935	NO ₂	No	7.8	2.9	No	2.8
WL4	Heaton Street	Roadside	481555	389891	NO ₂	No	5.9	2.2	No	2.8
WL5, WL6, WL7	Gainsborough Cemetery, Gainsborough	Industrial	482021	389974	NO ₂	No	N/A	13.8	Yes	3.0
WL8	Cherry Tree Road, Gainsborough	Kerbside	481500	390400	NO ₂	No	1.7	0.2	No	2.8
WL9	Walkerith Road	Rural	479811	392738	NO ₂	No	51.0	2.0	No	2.8
WL10	Marshall Way, Gainsborough	Roadside	483062	389224	NO ₂	No	11.2	15.9	No	2.8
WL11	53 Caistor Rd/ Galamore Lane, Market Rasen	Roadside	510681	389675	NO ₂	No	15.1	1.7	No	2.8
WL12	Lammas Leas Lane, Market Rasen	Roadside	510840	388610	NO ₂	No	32.4	10.2	No	2.8

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube Co-located with a Continuous Analyser?	Tube Height (m)
WL13	Beechers Way, Market Rasen	Roadside	510851	388475	NO ₂	No	1.2	6.9	No	2.8
WL14	Queen Street	Roadside	510866	389106	NO ₂	No	2.0	2.0	No	2.8

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 – Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring (µg/m³)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2021 (%) ⁽²⁾	2017	2018	2019	2020	2021
WL1	481526	389077	Roadside	65.0	65.0	32.7	24.6	22.8	16.3	20.6
WL2	481688	389770	Roadside	92.3	92.3	20.9	18.6	19.0	14.4	15.0
WL3	481721	389935	Roadside	100.0	100.0	25.3	20.6	17.3	14.2	13.8
WL4	481555	389891	Roadside	92.3	92.3	26.5	21.4	20.7	15.2	16.7
WL5, WL6, WL7	482021	389974	Industrial	100.0	100.0	14.6	11.5	11.3	9.1	8.7
WL8	481500	390400	Kerbside	100.0	100.0	17.6	15.0	14.7	11.9	11.3
WL9	479811	392738	Rural	100.0	100.0	13.2	11.7	11.5	9.5	8.5
WL10	483062	389224	Roadside	100.0	100.0	19.5	16.8	15.0	12.0	11.7
WL11	510681	389675	Roadside	92.3	92.3	23.0	17.1	16.3	11.2	12.1
WL12	510840	388610	Roadside	92.3	92.3	20.0	17.2	14.8	12.0	13.1
WL13	510851	388475	Roadside	100.0	100.0	15.5	12.8	12.3	9.9	10.1
WL14	510866	389106	Roadside	92.3	92.3	-	-	28.8	24.4	26.2

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.

Diffusion tube data has been bias adjusted.

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance correction.**

Notes:

The annual mean concentrations are presented as $\mu\text{g}/\text{m}^3$.

Exceedances of the NO_2 annual mean objective of $40\mu\text{g}/\text{m}^3$ are shown in **bold**.

NO_2 annual means exceeding $60\mu\text{g}/\text{m}^3$, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

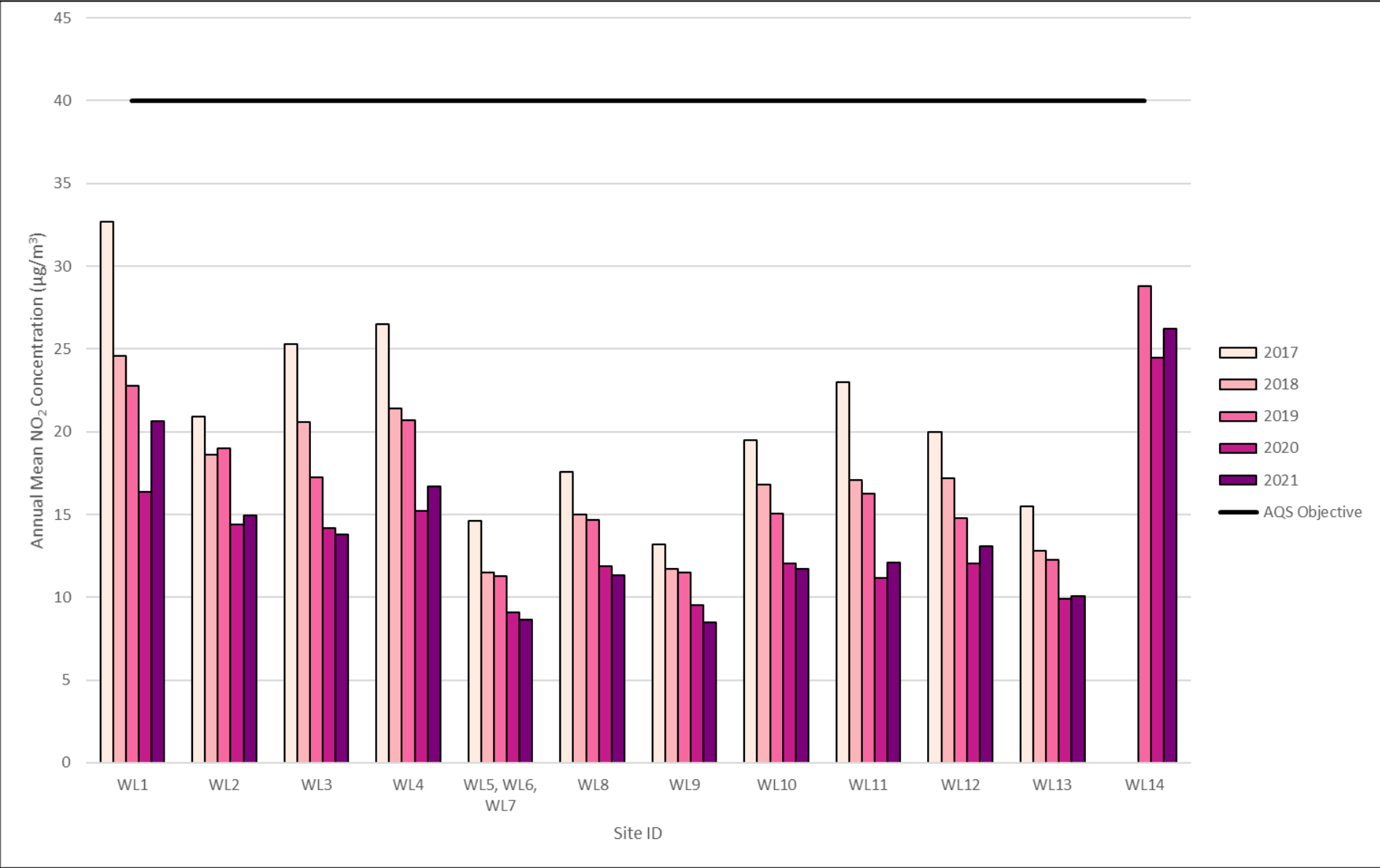
Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(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%).

Figure A. 1 – Trends in Annual Mean NO₂ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B. 1 – NO₂ 2021 Diffusion Tube Results (µg/m³)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.83)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
WL1	481526	389077	34.4	25.6	20.1	24.0	21.5	19.6	21.3	21.5					23.5	20.6		
WL2	481688	389770	27.2	18.6	17.0	14.9	14.2	12.6	13.8		14.4	19.4	23.2	23.2	18.0	15.0		
WL3	481721	389935	26.5	14.1	16.6	13.5	12.5	12.8	14.9	11.4	15.0	17.3	22.6	22.5	16.6	13.8		
WL4	481555	389891	31.4	24.2	22.1	16.4	15.6	14.3	13.5		16.2	19.3	25.7	22.5	20.1	16.7		
WL5	482021	389974	15.6	13.1	10.7	7.9	6.7	7.2	7.5	6.0	8.7	10.7	14.8	13.5	-	-		Triplicate Site with WL5, WL6 and WL7 - Annual data provided for WL7 only
WL6	482021	389974	19.0	11.9	11.6	7.6	7.6	7.5	7.6	7.3	9.8	11.1	15.4	14.6	-	-		Triplicate Site with WL5, WL6 and WL7 - Annual data provided for WL7 only
WL7	482021	389974	15.8	10.3	9.7	7.1	7.3	6.9	7.3	6.8	8.7	10.8	15.2	16.8	10.4	8.7		Triplicate Site with WL5, WL6 and WL7 - Annual data provided for WL7 only
WL8	481500	390400	23.0	16.7	14.5	9.6	9.9	8.1	8.3	8.7	11.3	15.0	20.6	17.8	13.6	11.3		
WL9	479811	392738	14.4	11.0	9.0	8.0	7.0	6.9	6.6	6.0	8.9	16.1	13.7	14.8	10.2	8.5		
WL10	483062	389224	24.6	13.2	14.2	9.4	11.2	10.6	10.7	11.9	13.2	11.1	20.4	18.7	14.1	11.7		
WL11	510681	389675	19.7	11.4		17.4	9.3	12.0	13.5	14.4	14.6	14.6	19.0	14.4	14.6	12.1		
WL12	510840	388610	23.7	15.9	15.3	14.5	12.5	13.0	11.7		13.2	14.9	18.5	20.1	15.7	13.1		
WL13	510851	388475	18.2	10.7	9.8	9.6	9.7	9.4	8.6	9.7	10.4	12.0	20.3	17.2	12.1	10.1		
WL14	510866	389106	38.7	31.5	30.3	38.1	31.9		33.3	26.7	30.6	27.6	29.4	29.0	31.5	26.2		

- All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1.
- Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.
- Local bias adjustment factor used.
- National bias adjustment factor used.
- Where applicable, data has been distance corrected for relevant exposure in the final column.
- West Lindsey District Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified by West Lindsey District Council During 2021

West Lindsey District Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by West Lindsey District Council During 2021

West Lindsey District Council has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes for the year 2021 were supplied and analysed by Gradko International Ltd, the tubes were prepared using the 50% TEA in water preparation method.

Gradko is a UKAS accredited laboratory and participates in the AIR-PT Scheme for NO₂ tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO₂ concentrations reported are of a high calibre. The latest available AIR-PT result is AIR-PT AR042 (January – March 2021), in which Gradko scored 25%. The percentage score reflects the results deemed to be satisfactory based upon the z-score of $< \pm 2$. Data from April 2021 onwards has not yet been made available.

The precision of the current 14 local authority co-location studies in 2021 detailed within the national bias adjustment factor spreadsheet (version 03/22) was rated as 'good' (tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%).

Further information on the precision summary results can be found on the [LAQM website](#).

Diffusion tube monitoring during 2021 was undertaken in line with the Diffusion Tube Monitoring Calendar and recommended exposure period (5 weeks (+/- 4 days)).

A number of tubes were found with insects inside on collection (WL8 in July, WL11 in June and November, and WL13 in March). In addition, WL12 reported results below the detection limit for the month of August. The advice within LAQM.TG(16) has been followed when determining whether these results should be included or excluded from calculations of the annual averages. Any erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1.

Diffusion Tube Annualisation

As per LAQM.TG(16), annualisation is required for any site which has a data capture of less than 75%, but greater than 25%. Annualisation was therefore required to be completed for one site, WL1, due to there being a 65.0% data capture for 2021. This was completed by using version 2 (March 2022) of the [Diffusion Tube Data Processing Tool](#). The three closest continuous monitoring background locations which were selected to annualise the data were:

- Hull Freetown;
- Immingham Woodlands Avenue; and
- Sheffield Tinsley

All of these sites have a data capture of >85% and therefore could be used for annualisation. Table C. 1 presents the annualisation summary and is taken directly from the Diffusion Tube Data Processing Tool.

Table C. 1 – Annualisation Summary (concentrations presented in $\mu\text{g}/\text{m}^3$)

Site ID	Annualisation Factor Hull Freetown	Annualisation Factor Immingham Woodlands Avenue	Annualisation Factor Sheffield Tinsley	Average Annualisation Factor	Raw Data Simple Annual Mean ($\mu\text{g}/\text{m}^3$)	Annualised Data Simple Annual Mean ($\mu\text{g}/\text{m}^3$)	Comments
WL1	1.0962	0.9990	1.0681	1.0544	23.5	24.8	

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube 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/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Diffusion tubes for West Lindsey District Council are supplied and analysed by Gradko International Ltd. The tubes were prepared using the 50% TEA in water preparation method. The national bias adjustment factor for Gradko 50% TEA in water is 0.83 for the year 2021 (based on 14 studies) as derived from the [National Bias Adjustment Factor Spreadsheet](#) (version 03/22).

National Diffusion Tube Bias Adjustment Factor Spreadsheet						Spreadsheet Version Number: 03/22				
Follow the steps below in the correct order to show the results of relevant co-location studies						This spreadsheet will be updated at the end of June 2022 LAQM Helpdesk Website				
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods										
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet										
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.										
The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.						Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.				
Step 1:		Step 2:		Step 3:		Step 4:				
Select the Laboratory that Analyses Your Tubes from the Drop-Down List		Select a Preparation Method from the Drop-Down List		Select a Year from the Drop-Down List		Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor ² shown in blue at the foot of the final column.				
If a laboratory is not shown, we have no data for this laboratory.		If a preparation method is not shown, we have no data for this method at this laboratory.		If a year is not shown, we have no data ²		If you have your own co-location study then see footnote ⁴ . If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMhelpdesk@bureauveritas.com or 0800 0327953				
Analysed By ¹	Method ³	Year ³	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m ³)	Automatic Monitor Mean Conc. (Cm) (µg/m ³)	Bias (B)	Tube Precision ⁵	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	50% TEA in acetone	2021	UC	Falkirk Council	12	35	34	3.5%	G	0.97
Gradko	50% TEA in acetone	2021	UB	Falkirk Council	12	16	13	22.5%	G	0.82
Gradko	50% TEA in acetone	2021	SU	Redcar & Cleveland Borough Council	11	14	11	23.2%	G	0.77
Gradko	50% TEA in acetone	2021	R	Royal Borough of Windsor and Maidenhead	12	23	26	9.3%	G	0.91
Gradko	50% TEA in acetone	2021	R	Royal Borough of Windsor and Maidenhead	11	26	25	7.2%	G	0.93
Gradko	50% TEA in Acetone	2021	R	Sandwell MBC	12	37	28	31.4%	G	0.76
Gradko	50% TEA in Acetone	2021	UB	Sandwell Metropolitan Borough Council	11	23	19	22.2%	G	0.82
Gradko	50% TEA in acetone	2021	UB	Middlesbrough	12	18	14	32.6%	G	0.75
Gradko	50% TEA in acetone	2021	R	London Borough of Richmond upon Thames	12	24	21	15.1%	G	0.87
Gradko	50% TEA in acetone	2021	B	London Borough of Richmond upon Thames	9	16	13	21.5%	G	0.82
Gradko	50% TEA in acetone	2021	KS	Marylebone Road Intercomparison	10	52	41	24.2%	G	0.81
Gradko	50% TEA in acetone	2021	R	Reading Borough Council	12	30	26	15.9%	G	0.86
Gradko	50% TEA in acetone	2021	R	Merton Council	9	50	32	55.4%	G	0.64
Gradko	50% TEA in acetone	2021	UB	Wandsworth Council	11	23	26	9.8%	G	0.91
Gradko	50% TEA in acetone	2021	Overall Factor² (14 studies)						Use	0.83

During 2021 there was no available co-location study within West Lindsey, therefore a local bias adjustment factor could not be derived. As a result, the national factor has been applied to all 2021 monitoring results.

A summary of bias adjustment factors used by West Lindsey District Council over the past five years is presented in Table C. 2. During 2020, the SOCOTEC Didcot laboratory was used to supply and analyse the May tubes whilst the Gradko labs were closed as a result

of the COVID-19 pandemic. However, during 2021 West Lindsey's diffusion tubes have all been supplied and analysed by Gradko International Ltd as normal.

Table C. 2 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	National	03/22	0.83
2020	National	03/21	Gradko – 0.82 SOCOTEC Didcot – 0.77 (applied to May only)
2019	National	03/20	0.87
2018	National	03/19	0.92
2017	Local	N/A	1.22

NO₂ Fall-off with Distance from the Road

No diffusion tube NO₂ monitoring locations within West Lindsey District Council required distance correction during 2022.

Appendix D: Maps of Monitoring Locations

Figure D. 1 – Monitoring Locations: Gainsborough

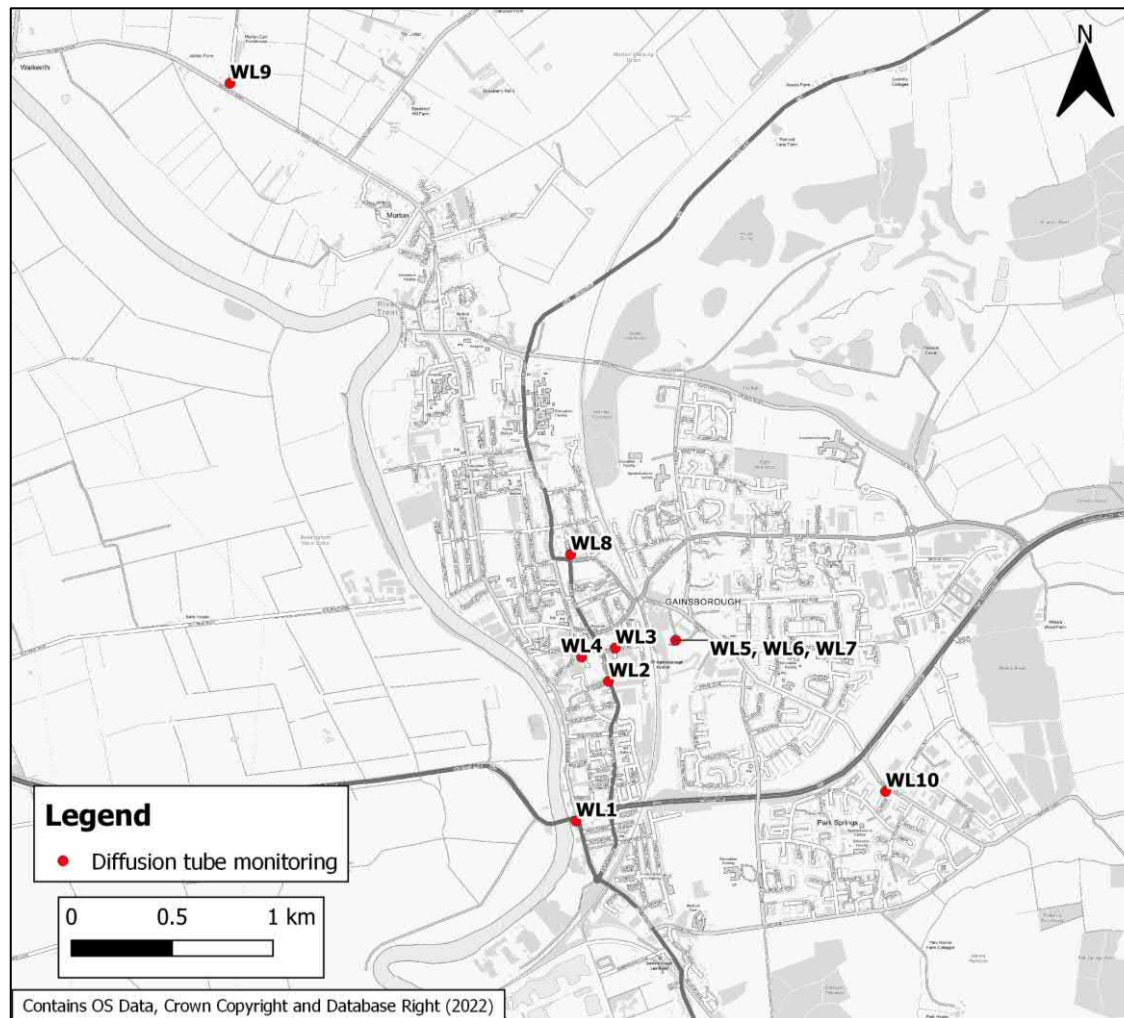
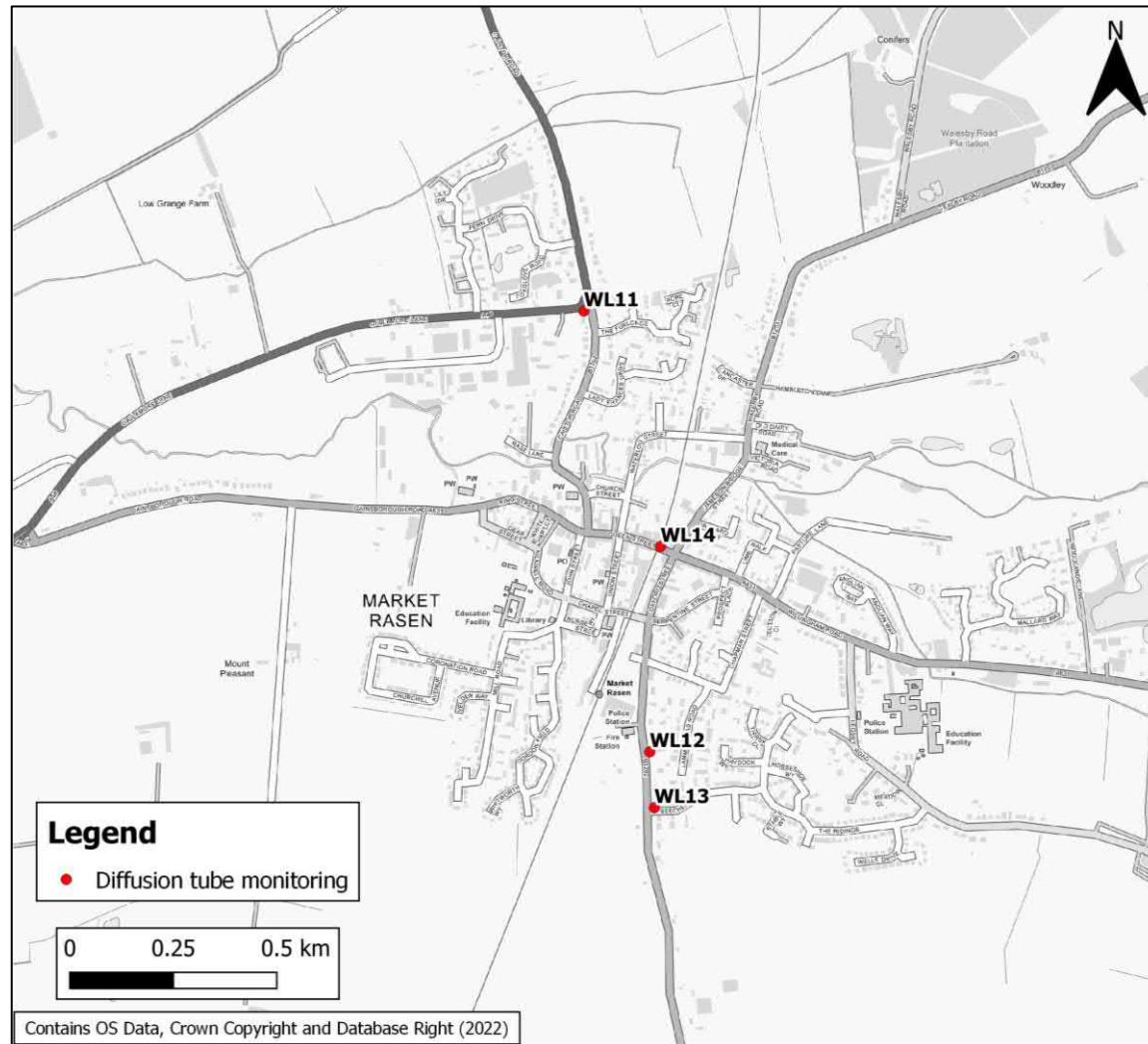


Figure D. 2 - Monitoring Locations: Market Rasen



Appendix E: Summary of Air Quality Objectives in England

Table E. 1 – Air Quality Objectives in England⁷

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO ₂)	200µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO ₂)	40µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM ₁₀)	40µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO ₂)	125µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO ₂)	266µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

⁷ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

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
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm 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

References

- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- West Lindsey District Council 2021 Annual Status Report.
- National Diffusion Tube Bias Adjustment Factor Spreadsheet, published March 2022.
- Diffusion Tube Data Processing Tool version 2.0, published March 2022, Defra.