



# North Kesteven District Council

Annual Status Report 2022

Bureau Veritas

June 2022

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# **North Kesteven**

## DISTRICT COUNCIL

### 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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<b>Date</b>	June 2022

# Executive Summary: Air Quality in Our Area

## Air Quality in North Kesteven

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<sup>1,2</sup>.

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages<sup>3</sup>, with a total estimated healthcare cost to the NHS and social care of £157 million in 2017<sup>4</sup>.

In North Kesteven, the air quality is generally good, owing to the large amount of rural land. For example, across the entire diffusion tube network, the average NO<sub>2</sub> annual mean concentration in 2021 was 14.5 µg/m<sup>3</sup>, with the maximum concentration recorded at a single diffusion tube site being 24.9 µg/m<sup>3</sup>. The average NO<sub>2</sub> annual mean concentration is similar to that recorded in 2020 (14.3 µg/m<sup>3</sup>), indicating that there has been no significant increase in the NO<sub>2</sub> concentration within North Kesteven during 2021. The main source of pollution is from road traffic emissions from the expansive road network that spans across the district – in particular the A15, A17 and the A46. In addition, there are over 40 industrial processes located within North Kesteven that are permitted under the Environmental Permitting (England and Wales) Regulations 2010<sup>5</sup>.

Historically, air quality within North Kesteven has complied with the Air Quality Standard (AQS) objectives, with no exceedances of the NO<sub>2</sub> annual mean objective being recorded in the last five years. Therefore, no Air Quality Management Areas have been declared

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<sup>1</sup> Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

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

<sup>3</sup> Defra. Air quality appraisal: damage cost guidance, July 2021

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

<sup>5</sup> <https://www.gov.uk/government/publications/environmental-permitting-guidance-core-guidance--2>

within North Kesteven, and an Air Quality Action Plan has not needed to be published. However, North Kesteven District Council continues to review the annual NK-Plan, including introducing the Our Environment corporate policy in 2018, declaring a climate emergency in 2019, and formally adopting the Climate Emergency Strategy and Action Plan in 2020 so that greenhouse gas emission reductions remains a key priority within the district. Therefore, North Kesteven District Council are committed to ensuring the measured concentrations of NO<sub>2</sub> continue to comply with the AQS objective, to maintain the trend of the last five years.

## 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 Strategy<sup>6</sup> sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero<sup>7</sup> 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 Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Historically, air quality within North Kesteven has complied with the AQS objectives, with no exceedances of the NO<sub>2</sub> annual mean reported in the last five years. Therefore, due to this consistent compliance, no AQMAs have been declared and no AQAP has been published. However, North Kesteven District Council are committed to taking actions that improve air quality to further reduce the pollutant concentration and, importantly, ensure that no exceedances arise at locations in the future. For example, Clean Air Day has been advertised on social media sites to promote strategies of how the public can get involved with improving air quality, such as less idling of stationary vehicles. The impact of vehicle emissions is reduced by North Kesteven District Council's hybrid working, with members of staff encouraged to work from home at least three days a week. This strategy aims to limit the number of unnecessary commutes to the work place and the overall emissions from staff vehicles. In order to reduce the impact of vehicle emissions beyond the staff of North

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<sup>6</sup> Defra. Clean Air Strategy, 2019

<sup>7</sup> DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

Kesteven District Council, electrical vehicle charging points are promoted via the planning process in new residential developments, as well as encouraging active modes of travel.

## Conclusions and Priorities

During 2021, the maximum NO<sub>2</sub> annual mean concentration recorded at a single diffusion tube site was 24.9 µg/m<sup>3</sup> – a decrease from the maximum NO<sub>2</sub> concentration in the previous reporting year (28.5 µg/m<sup>3</sup>). Monitoring continues to report compliance with the NO<sub>2</sub> annual mean AQS objective. North Kesteven District Council continue to seek opportunities to further reduce the recorded pollutant levels and, more importantly, ensure there are not likely to be any areas of exceedance in the future. The focus continues to be on NO<sub>2</sub>, with no planned monitoring of PM<sub>10</sub> or PM<sub>2.5</sub> within the district.

A key priority for North Kesteven District Council during the current year is to launch the Schools Air Quality project, which is an educational campaign with younger people to discourage idling and use of private vehicles. This priority has arisen off the back of the success of the poster campaign delivered last year, where pupils at schools across the district were invited by North Kesteven District Council to create their own poster designs aimed at making people think twice about their impact on the environment.

## Local Engagement and How to get Involved

North Kesteven District Council have 'Our Environment' as a corporate policy, with a climate emergency being declared. The Climate Emergency Strategy and Action Plan which was subsequently formed is being delivered. North Kesteven District Council's approach to environmental damage follows the doughnut economics model, recognising that air pollution is one of the earth's boundaries that must not be breached.

As a result of North Kesteven District Council's dedication to ensure continued compliance with the AQS objectives, multiple actions have been taken. For example, 100% renewable energy has been purchased for all council controlled buildings, diesel waste/recycling vehicles have telemetric systems to monitor fuel efficiency and idling, and an air pollution monitor is active to provide detailed air quality measurements in real time to identify pollution hot spots. North Kesteven District Council's Climate Emergency Action Plan has resulted in a net-zero carbon housing standard being approved for inclusion in the new building programme. Following the formal adoption of the Cycling Strategy, officers have consulted with Town and Parish Council's to identify any potential infrastructure project that could

potentially encourage residents to cycle more. Overall, the range of actions being taken by North Kesteven District Council aim to reduce air pollution from its key sources, helping to achieve the target to be a net-zero carbon emission district by 2030.

The public can get involved with improving air quality in North Kesteven through numerous educational projects. For example, the Schools Air Quality Project builds on last year's poster competition. Continuous air quality monitoring is to be conducted outside of a school in Sleaford. The data that is obtained will be used to demonstrate the impact of vehicle emissions during the morning drop-off and evening pick-up; it is hoped that individuals will be actively motivated to reducing their individual impact. This includes strategies such as using public transport, active travel (i.e. walking/cycling), car sharing, and less idling of stationary vehicles. If successful, the project is to be rolled out to other schools in the district.

## Local Responsibilities and Commitment

This ASR was prepared by the Bureau Veritas on behalf of North Kesteven District Council with the support and agreement of the following officers and departments:

- Environmental Health
- Planning

This ASR has been approved by:

David Steels – Assistant Director of Environment and Public Protection



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# 1 Local Air Quality Management

This report provides an overview of air quality in North Kesteven during 2021. 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 North Kesteven 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 Appendix E: Summary of Air Quality Objectives in England (Table E.1).

## 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 should prepare an Air Quality Action Plan (AQAP) within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

North Kesteven District Council currently does not have any declared AQMAs.

Based on the latest monitoring data continuing the trend seen in the last five years of NO<sub>2</sub> concentrations being below the AQS objective, North Kesteven District Council do not intend to declare an AQMA during the current reporting year.

## 2.2 Progress and Impact of Measures to address Air Quality in North Kesteven

Defra's appraisal of last year's ASR concluded that the report is well structured, detailed and provides most of the information specified in the guidance following the latest reporting template. Additionally, the following comments were made:

*"Trends in air quality are presented and the report includes a discussion on the observed trends, identifying a general decrease in NO<sub>2</sub> since 2019 except at sites B and Canwick".*

- Trends have been discussed in the 2022 ASR in relation to the previous five years, making reference to the overall change across the diffusion tube network from the previous reporting year.

*"The Local Engagement section of the executive summary includes details on actions being taken by the Council to tackle air quality. This commitment to improving the already good air quality is commended, but further details on local engagement and ways the public can get involved with improving air quality could be included".*

- Ways in which the public can get involved with measures to improve air quality has been highlighted within the 2022 ASR. This includes participation in Clean Air Day activities that have been promoted and the Schools Air Quality Project.

*"The QA/QC procedure applied to calculating a national bias adjustment factor has been clearly justified and presented with appropriate detail. This should continue in future reports".*

- Two bias adjustment factors have been applied to the 2021 data, owing to the use of two different laboratories for the supply and analysis of the diffusion tubes. These two factors were combined to create a weighted bias adjustment factor, in accordance with the process outlined in Box 7.14 of LAQM TG(16).

*"The monitoring network maps clearly show the location of monitoring sites across the network with clear labels and background mapping".*

- Maps of the monitoring network are provided in the 2022 as a general overview to see the spread of diffusion tubes across the district as well as a zoomed in version of each location to identify the exact positioning of each site.

Air quality measures are inextricably linked to measures contained within North Kesteven District Council's Climate Emergency Strategy and Action Plan, which was approved and

adopted in 2020. Although the primary focus is on reducing CO<sub>2</sub> emissions, many of the measures within the plan are also expected to have a positive impact on improving air quality within the district by reducing emissions from the combustion of fossil fuels.

Over the course of the next reporting year, North Kesteven District Council expects the following measures to be completed:

- **Schools Air Quality Project:** The educative campaign with younger people to promote less use of and discourage the idling of private vehicles was launched (16<sup>th</sup> June 2022). Following the launch, if successful, North Kesteven District Council hope to expand the project across more schools.

## 2.3 PM<sub>2.5</sub> – 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<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

There is currently no ongoing monitoring of PM<sub>10</sub> or PM<sub>2.5</sub> within North Kesteven, and no specific measures in place to address PM<sub>2.5</sub> concentrations. However, with the use of the Defra background maps (2018 reference year), the background concentration of PM<sub>2.5</sub> is shown to be low. For example, the highest concentration of PM<sub>2.5</sub> within the 2021 dataset was recorded as 10.1 µg/m<sup>3</sup>, which is well below the annual mean objective of 25 µg/m<sup>3</sup>. This PM<sub>2.5</sub> concentration is reported to be within the 1km grid square which encompasses Doddington and the A46 (X: 491500, Y: 370500).

The Public Health Outcomes Framework data tool compiled by Public Health England quantifies the mortality burden of PM<sub>2.5</sub> within England on a country and local authority scale. The fraction of mortality attributable to PM<sub>2.5</sub> in North Kesteven (5.2%) is comparable to that seen across England at 5.1%. As is the case for NO<sub>2</sub> emissions, traffic emissions are also the primary source of anthropogenic particulates (both PM<sub>10</sub> and PM<sub>2.5</sub>) emissions within North Kesteven. As such, the implementation of the transport measures associated to the Climate Emergency and Strategy Action Plan should help reduce the concentration of PM<sub>2.5</sub>.

There are currently two Smoke Control Areas designated by North Kesteven District Council, both located in North Hykeham. Further information, alongside maps of these designations, is accessible on North Kesteven District Council's website. It is an offence to burn unauthorised fuels within these areas, with failure to comply resulting in a fine. North Kesteven District Council continues to respond to any odour or smoke complaints.

For new development dust and bonfires are managed through appropriate conditions and where necessary enforcement action. North Kesteven District Council currently authorises 33 installations where conditions control air pollution through the Environmental Permitting Regulations 2016.

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

This section sets out the monitoring undertaken within 2021 by North Kesteven 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

North Kesteven District Council did not carry out any automatic (continuous) monitoring for any pollutants during 2021.

#### 3.1.2 Non-Automatic Monitoring Sites

North Kesteven District Council undertook non-automatic (i.e. passive) monitoring of NO<sub>2</sub> at 22 sites during 2021. Of these monitoring sites, one is a triplicate (BH1, BH2, BH3) diffusion tube site, resulting in a total of 24 diffusion tubes being deployed each month. 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: Maps of Monitoring Locations. 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 (NO<sub>2</sub>)

Table A.2 in Appendix A compares the ratified and adjusted monitored NO<sub>2</sub> annual mean concentrations for the past five years with the air quality objective of 40µg/m<sup>3</sup>. 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). The diffusion tube network remained at 22 sites in 2021, providing an accurate comparison to 2020.

During 2021, the average NO<sub>2</sub> annual mean concentration across the entire diffusion tube network was 14.5 µg/m<sup>3</sup>, with recordings ranging from a minimum of 9.2 µg/m<sup>3</sup> at Site ID 'Witham St Hughs' to a maximum of 24.9 µg/m<sup>3</sup> at Site ID 'A (Newark Road/Station Road)'. Therefore, all sites reported NO<sub>2</sub> annual mean concentrations well below the AQS objective of 40 µg/m<sup>3</sup>. The average NO<sub>2</sub> annual mean across the diffusion tube network is comparable to that recorded in 2020 (14.3 µg/m<sup>3</sup>), indicating that there has been no major increase in the concentration of NO<sub>2</sub> within North Kesteven during the reporting year of 2021. As a result of the continued compliance with the AQS objective, North Kesteven District Council are not intending to declare an AQMA for NO<sub>2</sub> annual mean. In addition, no single diffusion tube site recorded an annual mean NO<sub>2</sub> concentration above 60 µg/m<sup>3</sup> therefore, in accordance with LAQM TG(16), there is not likely to be any exceedances of the 1-hour mean objective.

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.

## Appendix A: Monitoring Results

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

Site 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) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Inlet Height (m)
A	Newark Road / Station Road, North Hykeham	Roadside	493845	366567	NO <sub>2</sub>	No	7.5	4.0	No	2.5
B	Asda / Newark Road, North Hykeham	Roadside	493485	366402	NO <sub>2</sub>	No	14.9	0.6	No	2.1
C	9 Dore Avenue, North Hykeham	Roadside	494829	366698	NO <sub>2</sub>	No	7.8	2.7	No	2.2
D	St Hughs Drive, North Hykeham	Roadside	494159	367115	NO <sub>2</sub>	No	6.3	22.6	No	2.3
Ruskington	Winchelsea Road	Roadside	508316	350447	NO <sub>2</sub>	No	0.0	1.0	No	2.5
Canwick	Heighington Road	Roadside	498561	369494	NO <sub>2</sub>	No	39.0	0.0	No	2.5
BH1, BH2, BH3	Bracebridge Heath, Sleaford Road	Roadside	498000	367544	NO <sub>2</sub>	No	7.0	1.0	No	2.5
Waddington	A607 Grantham Road	Roadside	497718	363898	NO <sub>2</sub>	No	7.0	1.0	No	2.5
Sleaford	Southgate, Sleaford	Roadside	506835	345684	NO <sub>2</sub>	No	1.4	1.4	No	2.3
Holdingham 1	Walnut Cottage	Urban Background	505704	347269	NO <sub>2</sub>	No	64.4	1.5	No	1.9

Site 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) <sup>(1)</sup>	Distance to kerb of nearest road (m) <sup>(2)</sup>	Tube Co-located with a Continuous Analyser?	Inlet Height (m)
Holdingham 2	A15 (South) Junction	Urban Background	505985	347343	NO <sub>2</sub>	No	1.8	6.1	No	1.8
Westbanks	Westbanks, Sleaford	Roadside	506507	345744	NO <sub>2</sub>	No	0.0	1.0	No	2.5
Grantham Road	12 - 14 Grantham Road, Sleaford	Roadside	506601	345300	NO <sub>2</sub>	No	0.0	1.0	No	2.2
Sleaford 1	Pedestrian Area of Town	Urban Background	506648	345757	NO <sub>2</sub>	No	0.0	46.2	No	2.0
Waddington 1	A607 Grantham Road	Roadside	496425	365685	NO <sub>2</sub>	No	7.5	1.0	No	2.5
Branston	251 / 253 Lincoln Road	Rural	502358	367322	NO <sub>2</sub>	No	0.0	2.9	No	2.6
Auborn	Auborn	Kerbside	492360	362640	NO <sub>2</sub>	No	4.2	1.8	No	1.8
Witham St Hughs	Witham St Hughs	Kerbside	489199	361790	NO <sub>2</sub>	No	0.9	1.8	No	1.8
Harmston	Harmston	Kerbside	497006	362368	NO <sub>2</sub>	No	6.2	1.2	No	1.8
Metheringham	Metheringham	Urban Background	506126	361636	NO <sub>2</sub>	No	66.5	1.2	No	1.8
Navenby	Navenby	Kerbside	498841	357758	NO <sub>2</sub>	No	7.0	1.6	No	1.8
Heckington	Heckington	Kerbside	514514	343906	NO <sub>2</sub>	No	2.9	1.5	No	1.8

**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 NO<sub>2</sub> Monitoring Results: Non-Automatic Monitoring (µg/m<sup>3</sup>)**

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2021 (%) <sup>(2)</sup>	2017	2018	2019	2020	2021
A	493845	366567	Roadside	92.3	92.3	33.4	33.0	32.2	25.8	24.9
B	493485	366402	Roadside	90.4	90.4	21.7	25.0	14.1	18.2	19.6
C	494829	366698	Roadside	100	100	14.7	15.3	15.4	11.7	11.3
D	494159	367115	Roadside	100	100	16.6	11.9	16.1	9.3	10.5
Ruskington	508316	350447	Roadside	100	100	10.6	14.7	13.3	10.7	11.5
Canwick	498561	369494	Roadside	90.4	90.4	34.4	34.0	19.8	28.5	21.2
BH1, BH2, BH3	498000	367544	Roadside	100	100	27.2	32.0	27.9	21.5	20.5
Waddington	497718	363898	Roadside	92.3	92.3	10.6	15.2	11.9	10.7	10.8
Sleaford	506835	345684	Roadside	82.7	82.7	24.0	27.3	24.2	17.9	19.7
Holdingham 1	505704	347269	Urban Background	100	100	-	22.0	19.0	14.1	14.0
Holdingham 2	505985	347343	Urban Background	100	100	-	19.0	18.0	12.5	15.0
Westbanks	506507	345744	Roadside	100	100	-	18.6	17.0	13.1	13.1
Grantham Road	506601	345300	Roadside	82.7	82.7	-	17.5	17.5	13.6	13.2
Sleaford 1	506648	345757	Urban Background	100	100	11.9	16.1	13.9	10.6	11.3
Waddington 1	496425	365685	Roadside	80.8	80.8	10.6	15.2	11.9	9.8	9.5
Branston	502358	367322	Rural	100	100	15.1	18.8	20.6	17.2	19.5
Auborn	492360	362640	Kerbside	100	100	-	-	13.9	10.9	11.8

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2021 (%) <sup>(2)</sup>	2017	2018	2019	2020	2021
Witham St Hughs	489199	361790	Kerbside	100	100	-	-	11.2	9.2	9.2
Harmston	497006	362368	Kerbside	100	100	-	-	15.0	12.5	12.1
Metheringham	506126	361636	Urban Background	100	100	-	-	11.3	9.8	10.2
Navenby	498841	357758	Kerbside	100	100	-	-	22.0	13.1	14.0
Heckington	514514	343906	Kerbside	100	100	-	-	17.3	14.6	15.8

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.

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<sub>2</sub> annual mean objective of  $40\mu\text{g}/\text{m}^3$  are shown in **bold**.

NO<sub>2</sub> annual means exceeding  $60\mu\text{g}/\text{m}^3$ , indicating a potential exceedance of the NO<sub>2</sub> 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 NO<sub>2</sub> Concentrations (1)

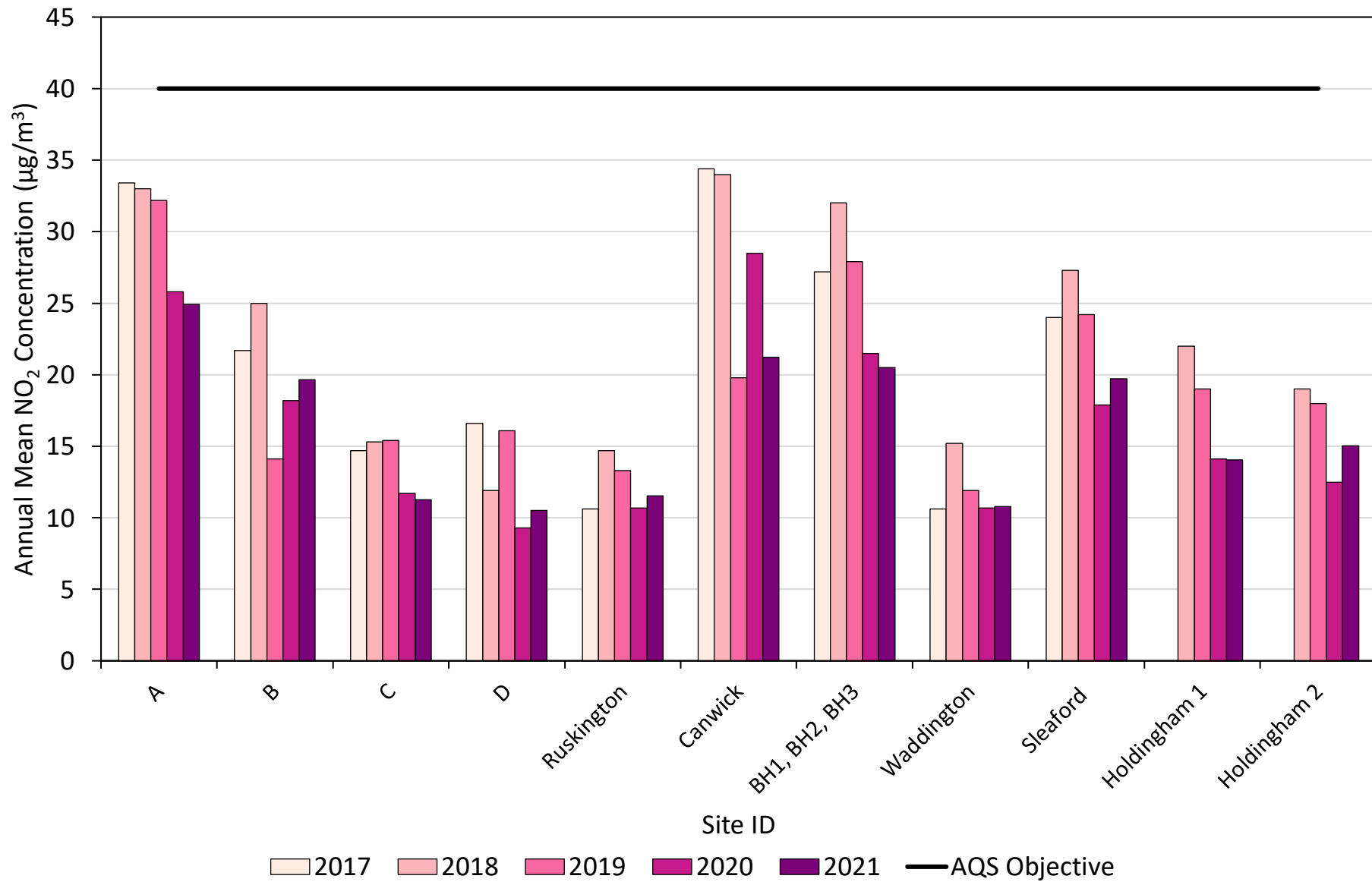
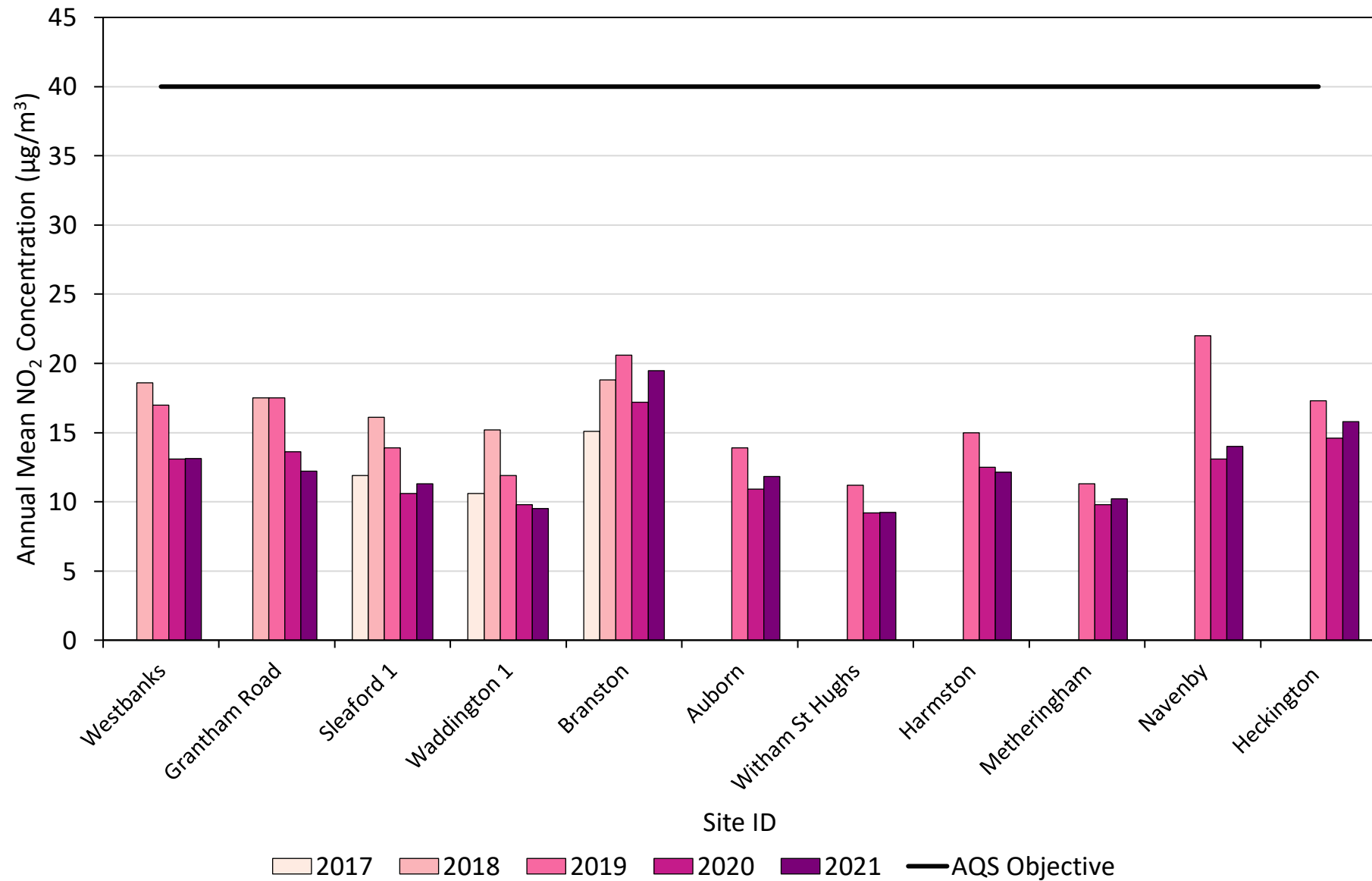


Figure A.2 – Trends in Annual Mean NO<sub>2</sub> Concentrations (2)



## Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO<sub>2</sub> 2021 Diffusion Tube Results (µg/m<sup>3</sup>)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (Gradko 0.83 Jan – Mar, SOCOTEC 0.78 Apr – Dec)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
A	493845	366567	-	35.3	32.9	35.5	24.7	29.3	26.7	20.9	30.2	37.7	41.9	32.0	31.6	24.9	-	
B	493485	366402	39.2	20.3	23.8	-	18.0	19.2	20.4	20.2	28.4	23.1	27.2	31.8	24.7	19.6	-	
C	494829	366698	21.9	13.3	15.1	12.5	9.5	9.6	9.9	6.8	16.4	14.9	19.0	21.1	14.2	11.3	-	
D	494159	367115	19.0	15.2	14.4	10.3	9.7	7.0	8.0	8.3	13.3	15.2	17.5	20.9	13.2	10.5	-	
Ruskington	508316	350447	19.9	16.9	13.9	14.3	12.8	10.0	9.9	8.8	15.4	15.1	16.3	20.7	14.5	11.5	-	
Canwick	498561	369494	31.5	23.2	25.6	25.0	27.0	19.2	21.9	16.1	31.4	-	34.5	38.5	26.7	21.2	-	
BH1	498000	367544	30.9	25.4	21.0	27.5	25.3	23.1	23.5	21.9	34.4	21.5	27.8	-	-	-	-	Triplicate Site with BH1, BH2 and BH3 - Annual data provided for BH3 only
BH2	498000	367544	33.7	20.8	23.1	24.8	24.7	25.5	26.8	16.0	33.2	22.7	28.2	30.8	-	-	-	Triplicate Site with BH1, BH2 and BH3 - Annual data provided for BH3 only
BH3	498000	367544	27.6	27.1	23.3	21.1	25.6	23.4	26.8	19.9	31.3	25.3	29.6	28.0	25.9	20.5	-	Triplicate Site with BH1, BH2 and BH3 - Annual data provided for BH3 only
Waddington	497718	363898	14.3	15.6	12.9	14.8	-	9.9	9.8	7.7	16.9	13.7	16.8	16.9	13.6	10.8	-	
Sleaford	506835	345684	26.8	29.3	24.5	-	24.1	23.6	19.9	17.8	-	25.3	26.8	29.6	24.8	19.7	-	
Holdingham 1	505704	347269	21.6	21.3	19.9	22.7	14.2	18.4	9.0	5.9	22.2	15.9	19.9	20.9	17.7	14.0	-	
Holdingham 2	505985	347343	20.4	20.2	18.6	23.7	18.0	17.0	15.4	13.9	21.6	18.0	19.2	21.6	19.0	15.0	-	



DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (Gradko 0.83 Jan – Mar, SOCOTEC 0.78 Apr – Dec)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
Westbanks	506507	345744	21.8	15.0	16.8	15.6	12.1	12.2	9.7	11.3	19.5	17.8	24.0	22.5	16.5	13.1	-	
Grantham Road	506601	345300	21.8	15.7	18.1	16.1	10.5	12.6	12.9	10.7	-	-	22.9	24.1	16.5	13.2	-	
Sleaford 1	506648	345757	22.5	16.9	14.9	12.0	10.5	9.8	8.5	7.4	18.5	15.1	16.6	17.9	14.2	11.3	-	
Waddington 1	496425	365685	18.3	12.0	12.5	-	7.1	6.8	-	6.5	11.8	12.6	12.7	18.9	11.9	9.5	-	
Branston	502358	367322	26.2	22.9	24.4	24.2	21.8	18.1	18.4	15.4	31.7	23.7	35.6	32.8	24.6	19.5	-	
Auborn	492360	362640	20.8	15.7	12.5	13.6	11.6	12.0	10.9	9.8	18.9	13.7	18.6	20.7	14.9	11.8	-	
Witham St Hughs	489199	361790	17.1	12.3	11.8	10.7	5.3	8.6	8.0	7.7	13.0	12.4	15.6	17.0	11.6	9.2	-	
Harmston	497006	362368	17.9	13.2	13.7	17.4	13.7	15.5	13.4	13.8	20.0	13.4	15.2	16.6	15.3	12.1	-	
Metheringham	506126	361636	18.5	13.1	15.7	10.3	9.8	8.1	7.1	7.0	13.3	15.3	16.0	19.8	12.8	10.2	-	
Navenby	498841	357758	19.2	19.9	15.2	19.6	16.6	14.0	13.5	12.5	20.8	16.6	21.0	22.9	17.7	14.0	-	
Heckington	514514	343906	24.5	18.8	19.2	18.6	19.6	15.1	16.2	13.6	23.5	19.9	25.4	24.5	19.9	15.8	-	

All erroneous data has been removed from the NO<sub>2</sub> 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.

North Kesteven District Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

**Notes:**

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 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 Within North Kesteven District Council During 2021

North Kesteven District Council has not identified any new major sources relating to air quality within the reporting year of 2021. However, the following planning applications were granted, which may impact air quality through the design of new road layouts/access routes:

- **20/0029/FUL**: Erection of 329 buildings, formulation of new access points from Sleaford Road/Dunston Road, and provision of new internal access roads.
- **21/0049/RESM**: Erection of 315 dwellings with access on land to the east of CL1013, Poplar Farm, south of the A17.
- **21/0669/RESM**: Erection of 270 dwellings and associated infrastructure on land to the east of London Road/Stumpcross Hill and West of Southshields Sleaford.
- **20/1659/RESM**: Erection of 148 dwellings, pursuant to outline planning application 15/1347/OUT – erection of 1,100 dwellings and 150 retirement units, to formation of a roundabout to Camp Road and A46 junction improvement works.
- **19/0018/RESM**: Erection of 120 dwellings on the land off Canwick Avenue and Westminster Drive.

In terms of commercial planning applications, the following were granted in 2021:

- **20/1475/FUL**: Hybrid planning application for the construction of an employment park comprising of up to 35,851 sq. m of general industrial and warehouse distribution floorspace, plus 1,394 sq. m of trade showroom floorspace. The applications includes the construction of site-wide infrastructure works comprising access, earthworks and strategic landscaping.
- **21/0419/RESM**: Reserved matters application for the erection of a building of 5 units for office, light industrial, general industrial and storage uses together with associated parking and loading areas.
- **20/1523/FUL**: Hybrid planning application consisting of full planning permission for Phase 4 – erection of 4 units (comprising uses E, B2 and B8) with associated access, car parking and landscaping.

## **Additional Air Quality Works Undertaken by North Kesteven District Council During 2021**

North Kesteven 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 SOCOTEC Didcot for the majority of the year (9 months), with Gradko International being responsible supplying diffusion tubes in the first three months of the year (January, February and March). Despite using two different laboratories, all tubes were prepared using the 50% TEA in acetone preparation method. Both SOCOTEC Didcot and Gradko International are UKAS accredited laboratories and participate in the AIR-PT scheme for NO<sub>2</sub> tube analysis and the Annual Field-Intercomparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO<sub>2</sub> concentrations reported are of a high calibre. During the latest round of results from January – March 2021 (AIR-PT AR042), scores of 100% and 25% were awarded to SOCOTEC Didcot and Gradko International, respectively. The percentage score reflects the results deemed to be satisfactory based upon the z-score of  $\pm 2$ . At the time of writing this report, the AIR-PT results for the remainder of 2021 were not available. Additionally, the precision of NO<sub>2</sub> diffusion tubes supplied by SOCOTEC Didcot were classified as 'good' for all by three observations, whilst all observations during 2021 of Gradko International were classified as 'good'. The precision reflects the laboratories performance and consistency in preparing and analysing the diffusion tubes.

During 2021, all diffusion tubes were exposed and changed in adherence ( $\pm 2$  days) with the 2021 diffusion tube monitoring calendar. Therefore, no single diffusion tube was exposed for longer than the 4-5 week recommendation.

### **Diffusion Tube Annualisation**

All diffusion tube monitoring locations within North Kesteven recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

During 2021, the data capture ranged from a minimum of 80% to a maximum of 100%. Indeed, 15 of the 22 sites recorded a data capture of 100%.

## 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<sub>x</sub>/NO<sub>2</sub> continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

North Kesteven District Council have applied a national bias adjustment factor to the 2021 monitoring data. As the laboratory used for the supply and analysis of diffusion tubes changed during 2021, a weighted bias adjustment factor combining the SOCOTEC Didcot and Gradko International national bias adjustment factors has been utilised. A national bias adjustment factor of 0.83 (Gradko – based on 14 studies) has been applied to the first three months data (January – March), whilst an adjustment factor of 0.78 (SOCOTEC Didcot – based on 23 studies) has been applied to the remaining nine months (April – December) of data (see Figure C.1). The application of two bias adjustment factors is followed in accordance with Box 7.14 of LAQM TG(16). A summary of bias adjustment factors used by North Kesteven District Council over the past five years is presented in Table C.1.

It is important to note that both SOCOTEC Didcot and Gradko International co-location studies include several urban sites alongside some more rural/background sites, whereas North Kesteven is a predominantly rural district. Therefore, the national bias adjustment factors may not be entirely representative of the conditions within North Kesteven. Despite this, as no local co-location studies are carried out within North Kesteven, a local bias adjustment factor cannot be derived and the national factor therefore has to be applied.

**Figure C.1 – National Bias Adjustment Factor Spreadsheet 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				
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.						<a href="#">LAQM Helpdesk Website</a>				
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.				
<b>Step 1:</b>		<b>Step 2:</b>		<b>Step 3:</b>		<b>Step 4:</b>				
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 <sup>3</sup> 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.		If you have your own co-location study then see footnote <sup>1</sup> . If uncertain what to do then contact the Local Air Quality Management Helpdesk at <a href="mailto:LAQMhelpdesk@bureauveritas.com">LAQMhelpdesk@bureauveritas.com</a> or 0800 0327953				
Analysed By <sup>1</sup>	Method <sup>2</sup>	Year <sup>2</sup>	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m <sup>3</sup> )	Automatic Monitor Mean Conc. (Cm) (µg/m <sup>3</sup> )	Bias (B)	Tube Precision <sup>3</sup>	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	50% TEA in acetone	2021		Overall Factor <sup>3</sup> (14 studies)				Use	0.83	
SOCOTEC Didcot	50% TEA in acetone	2021		Overall Factor <sup>3</sup> (23 studies)				Use	0.78	

**Table C.1 – Bias Adjustment Factor**

Monitoring Year	Local or National	Version of National Spreadsheet	Adjustment Factor
2021	National	03/22	0.83 (Gradko, applied to January – March) & 0.78 (SOCOTEC Didcot, applied to April – December)
2020	National	03/21	0.82 (Gradko) & 0.77 (SOCOTEC Didcot, applied to May only)
2019	National	03/20	0.87
2018	National	03/19	0.92
2017	National	03/18	0.97

**NO<sub>2</sub> Fall-off with Distance from the Road**

No diffusion tube NO<sub>2</sub> monitoring locations within North Kesteven required distance correction during 2021.

## Appendix D: Maps of Monitoring Locations

Figure D.1 – Map of Non-Automatic Monitoring Sites in North Kesteven (Overview)

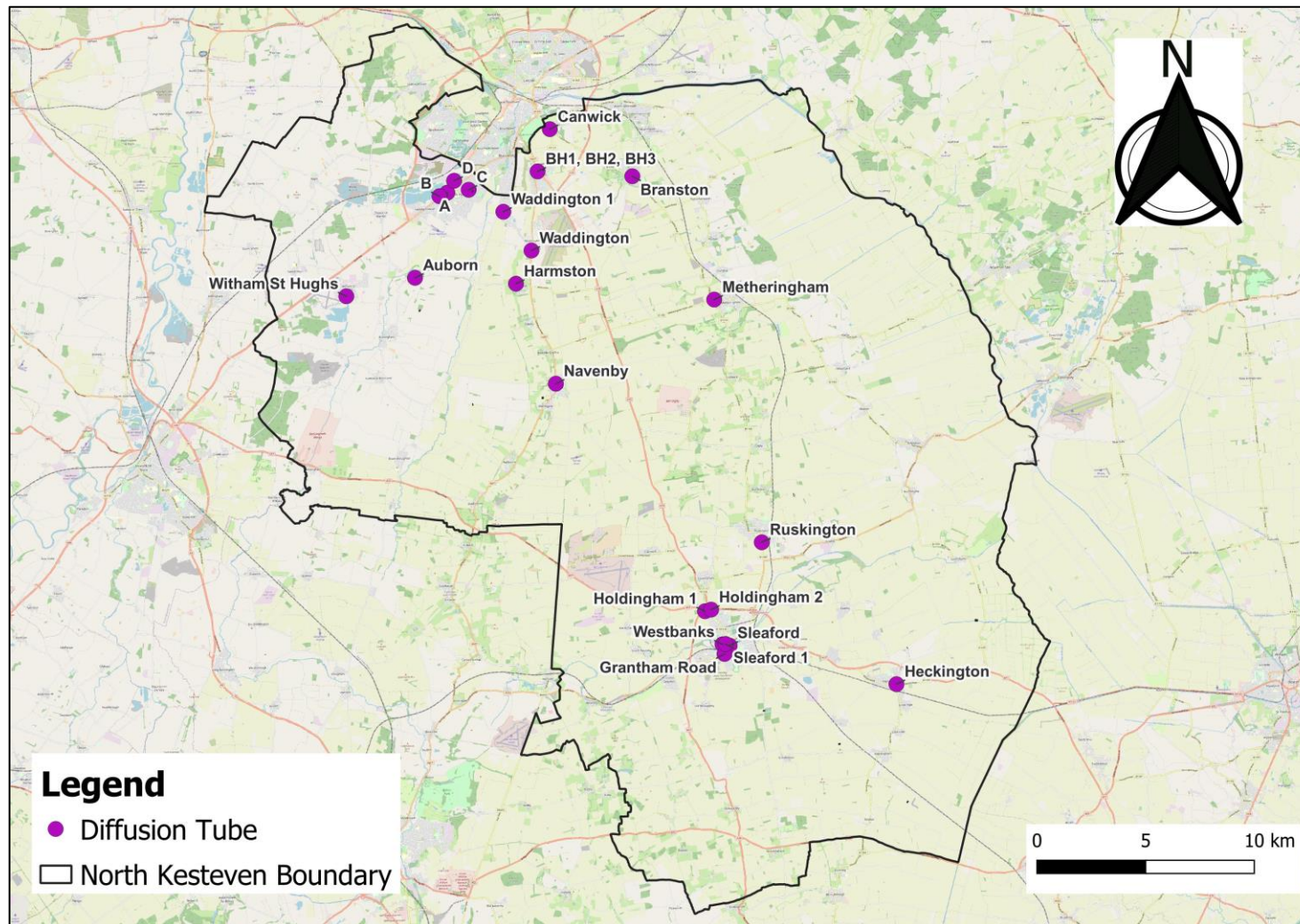


Figure D.2 – Map of Non-Automatic Monitoring Sites in Sleaford & Holdingham

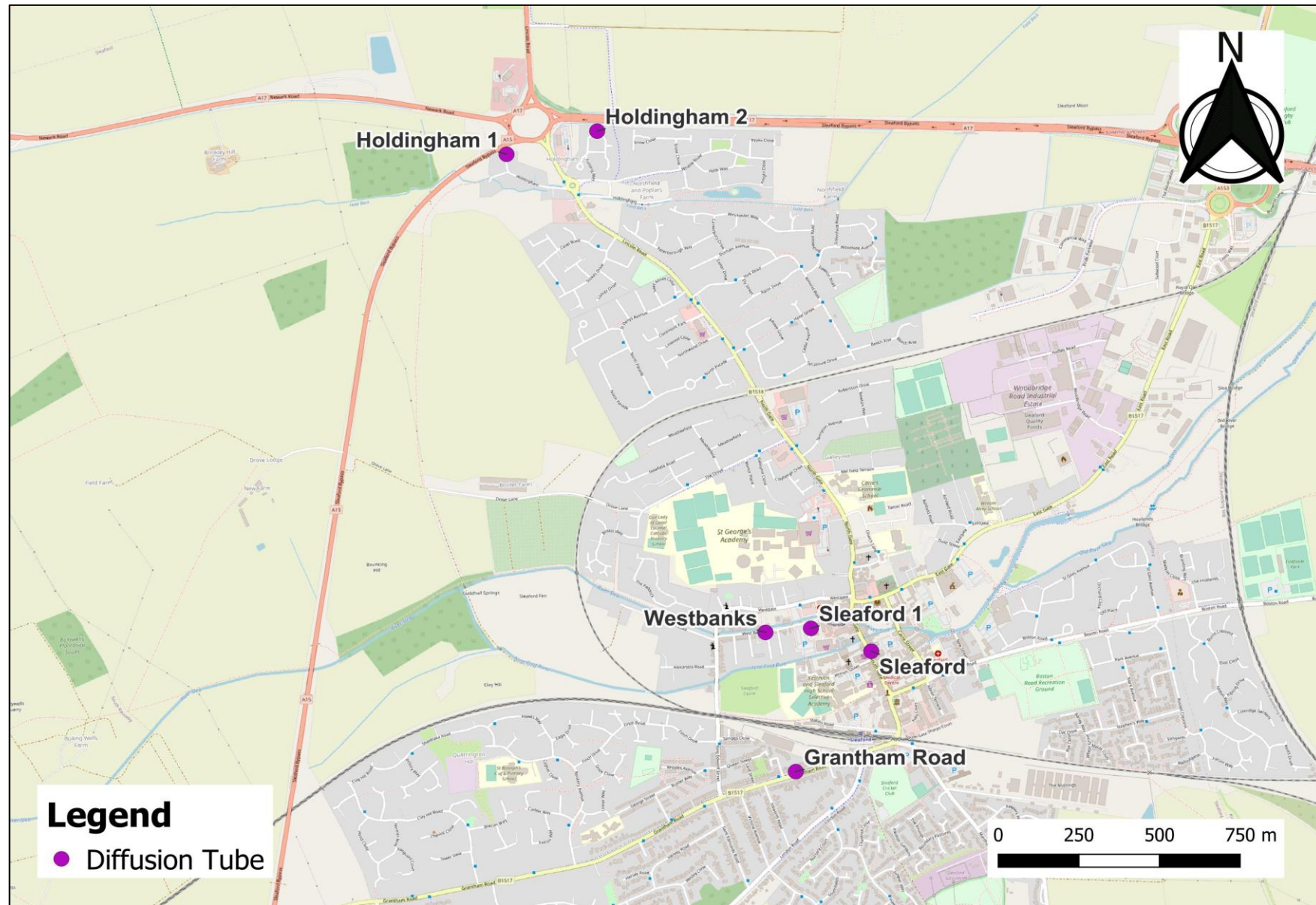


Figure D.3 – Map of Non-Automatic Monitoring Sites in Heckington

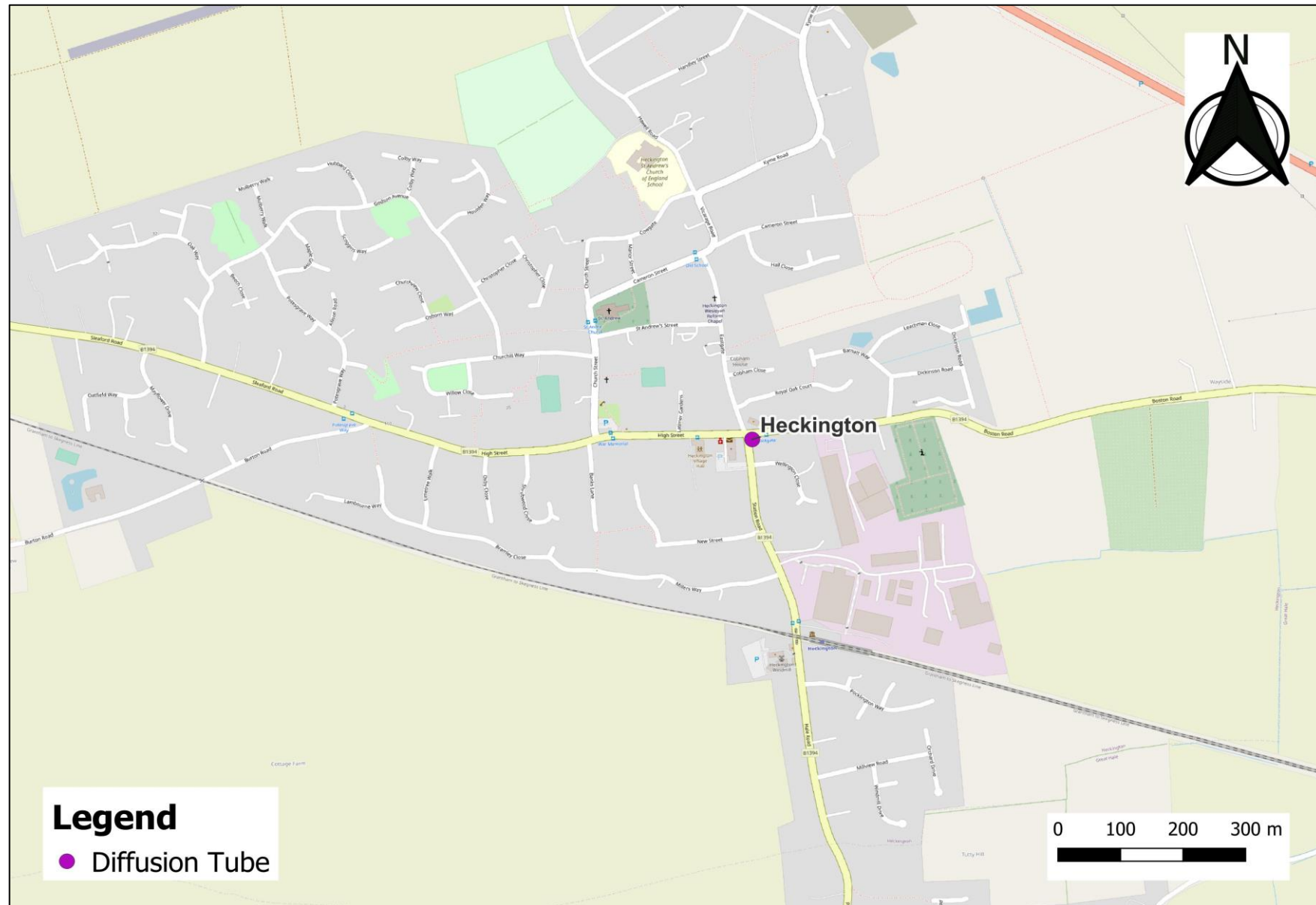




Figure D.4 – Map of Non-Automatic Monitoring Sites in Ruskington

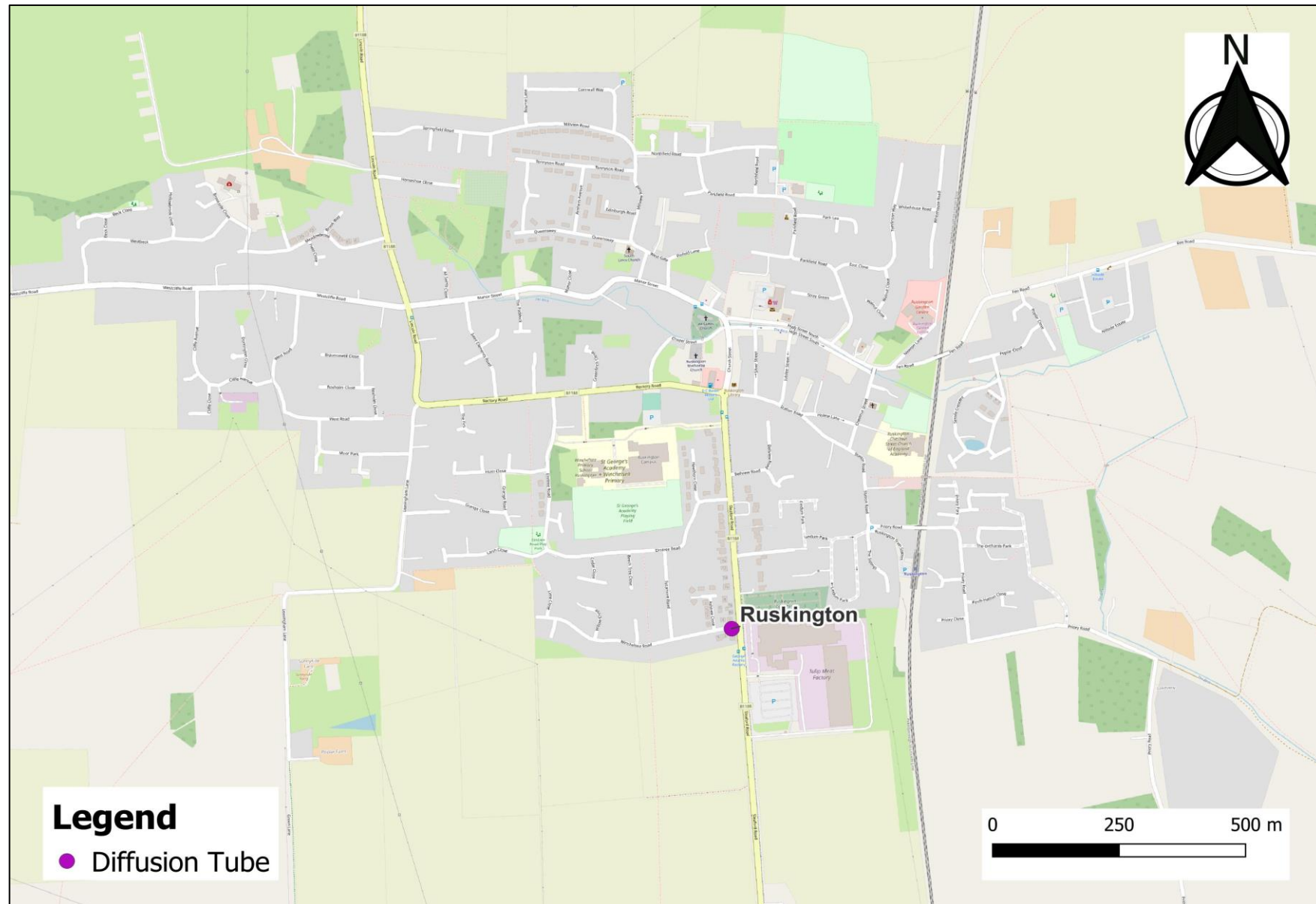


Figure D.5 – Map of Non-Automatic Monitoring Sites in North Hykeham

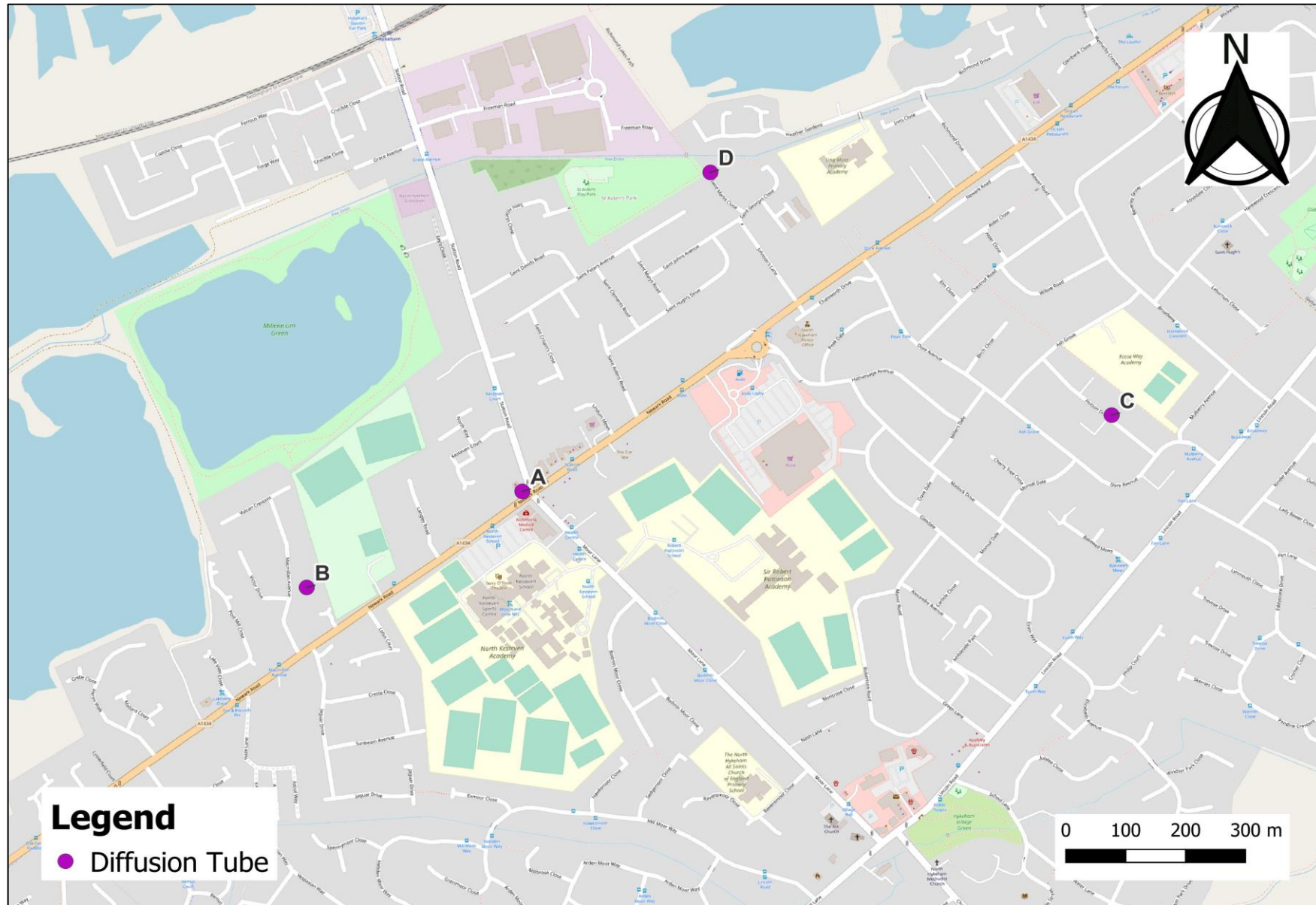


Figure D.6 – Map of Non-Automatic Monitoring Sites in Witham St Hughs & Auborn



Figure D.7 – Map of Non-Automatic Monitoring Sites in Canwick, Bracebridge Heath & Branston

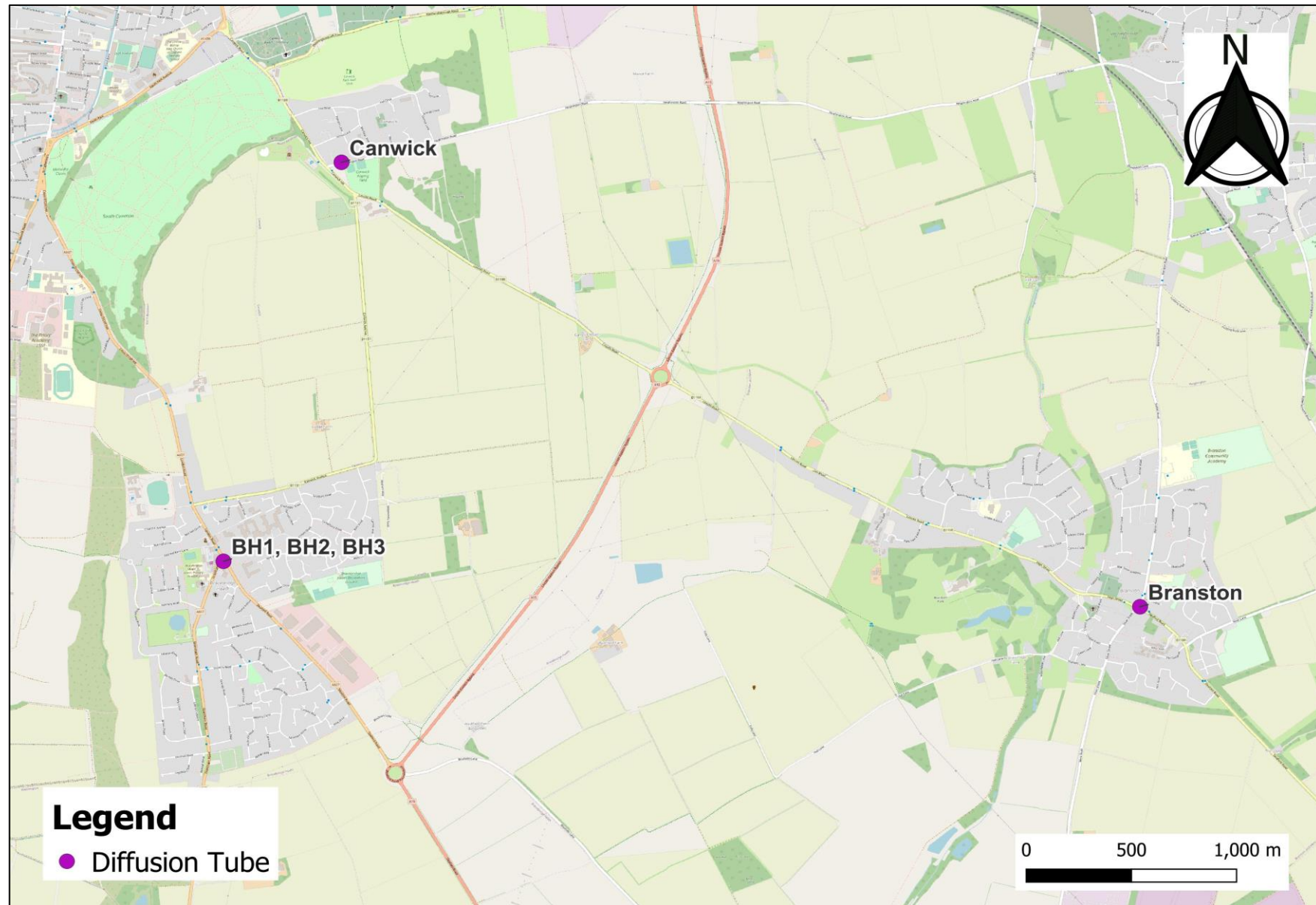


Figure D.8 – Map of Non-Automatic Monitoring Sites in Waddington & Harmston



Figure D.9 – Map of Non-Automatic Monitoring Sites in Metheringham

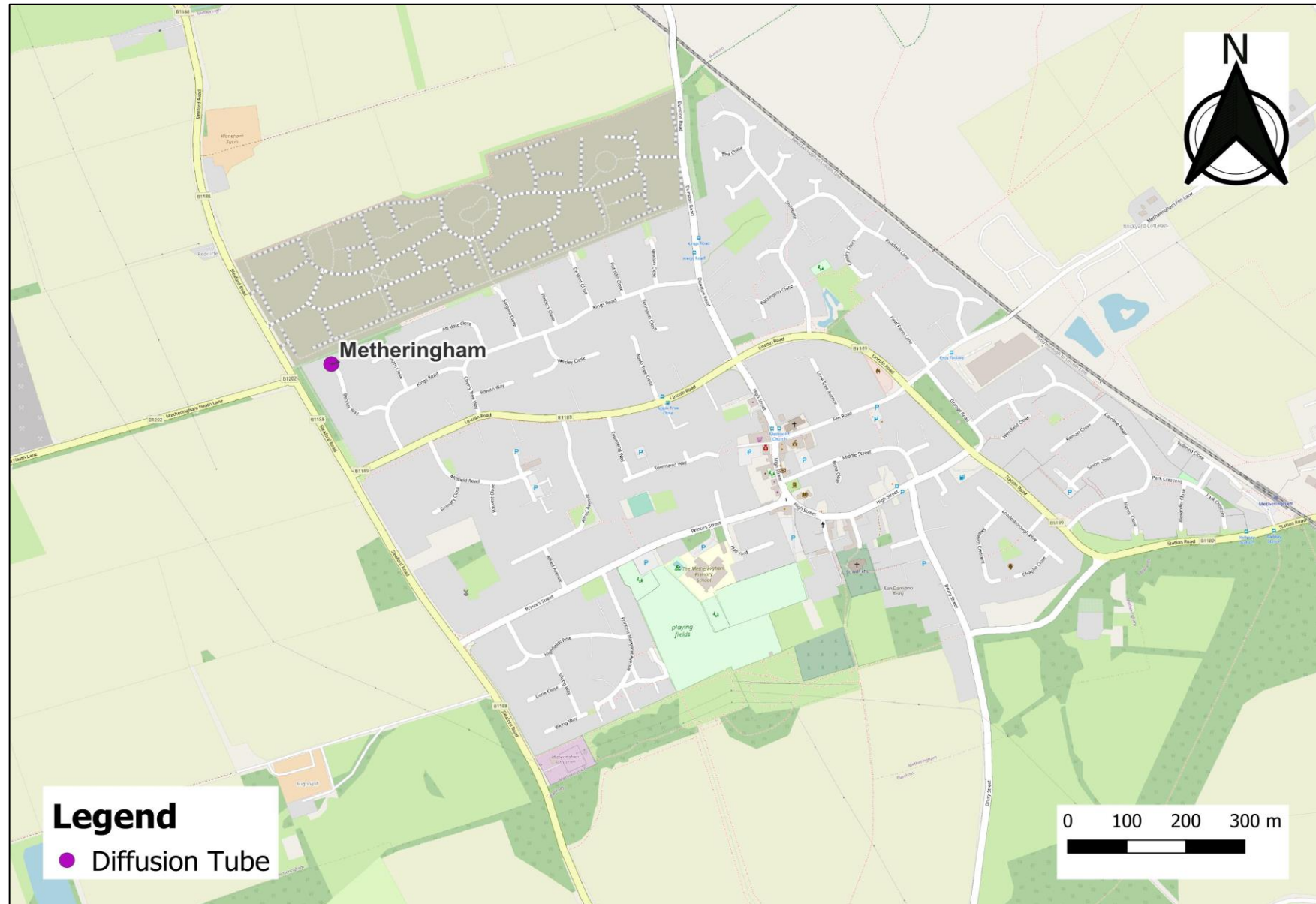


Figure D.10 – Map of Non-Automatic Monitoring Sites in Navenby



## Appendix E: Summary of Air Quality Objectives in England

**Table E.1 – Air Quality Objectives in England<sup>8</sup>**

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

<sup>8</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).



## 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 <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide

## References

- Background Mapping Data for Local Authorities – 2018-Based Background Maps for NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>. Defra. 2022.
- Climate Emergency Strategy Action Plan. 2020. North Kesteven District Council.
- 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.