2021 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: June, 2021

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Executive Summary: Air Quality in Our Area

Air Quality in North Norfolk

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 ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

Air pollution, specifically Nitrogen Dioxide, within the North Norfolk District continues to show that levels remain below national limit values. This outcome is applicable to all those areas currently monitored within the district and on this basis there are no areas of concern in association with this specific pollutant. However we consider the previous 12 months as anomalous on the basis that the Covid 19 Pandemic created unique traffic conditions not considered to be representative of normal conditions. Our current results do show the impacts of the restrictions from the point of view that emissions of Nitrogen Dioxide were notably lower than results gathered from previous years.

Although we feel that our Nitrogen Dioxide coverage and data quality is comprehensive, there is still some debate and desire to improve our understanding and impacts of particulate matter, specifically $PM_{2.5}$ within both our urban and rural settings, especially given the likelihood of targets being adopted as part of the up and coming Environment Bill (in this case we assume that the WHO levels will be adopted).

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[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 2020

[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

On the basis of the information given above, there are no AQMA's within the District, the Council considers its priorities to be maintaining a comprehensive monitoring regime to observe changing trends and demonstrate the quality of the air in North Norfolk.

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[5] sets out the case for action, with goals even more ambitious than EU requirements to reduce exposure to harmful pollutants. The Road to Zero[6] 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.

The past reporting year has been unique in many respects, the Covid pandemic with its restrictions proved an opportunity to compare traffic impacts at many of our monitoring sites with business as usual and restrictions in place. Although there are no notable achievements the continuation of the monitoring process through the period of restrictions together with the impacts from the redeployment of supporting staff, should be seen as a success. Other than the continuation of the monitoring regime in North Norfolk there are no addional proposals for the coming year, other than the co-deployment of our Zephyr monitors with diffusion tubes to examine particulate pollution in hot spot areas.

Conclusions and Priorities

The notable conclusion for the ASR regarding the monitoring during 2020 is that the Pandemic restrictions impacted emission levels of Nitrogen Dioxide at all monitoring locations, both urban and rural. For example, at our documented Hotspot at Hoveton, the annual average concentration of Nitrogen Dioxide showed a clear reduction in levels from

[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

31.3 µg/m^3 in 2019 to 26 µg/m3 in 2020. Although a unique opportunity to conduct experimentation, caution must be exercised in viewing these results given that they do not represent business as usual, and ultimately mask other variables that may be at play.

The main priorities for the coming year include the following objectives:

- Continuation of the diffusion tube (Nitrogen dioxide) network within north Norfolk
- Co-locate Zephyr monitors at each diffusion tube location to determine particulate emissions.

On the basis of our findings over the previous year there is no justification to enable or create an AQAP.

Local Engagement and How to get involved

North Norfolk District Council has good local engagement in regards to publishing the ASR for public viewing and maintaining local member contact. In the wider context the Authority gets involved with cooperative publicity events with other local Councils in Norfolk.

Table of Contents

Executive Summary: Air Quality in Our Area i

Air Quality in North Norfolk i

Actions to Improve Air Quality ii

Conclusions and Priorities ii

Local Engagement and How to get involved iii

1 Local Air Quality Management 1

2 Actions to Improve Air Quality 2

Air Quality Management Areas 2

Progress and Impact of Measures to address Air Quality in North Norfolk 2

$PM_{2.5}$ –Local Authority Approach to Reducing Emissions and/or Concentrations 4

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance 7

Summary of Monitoring Undertaken 7

3.1.1 Automatic Monitoring Sites 7

3.1.2 Non-Automatic Monitoring Sites 7

Individual Pollutants 7

3.1.3 Nitrogen Dioxide (NO_2) 7

3.1.4 Particulate Matter (PM_{10}) 8

3.1.5 Particulate Matter ($PM_{2.5}$) 8

Appendix B: Full Monthly Diffusion Tube Results for 2020 12

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC 13

New or Changed Sources Identified Within North Norfolk During 2020 13

Additional Air Quality Works Undertaken by North Norfolk During 2020 13

QA/QC of Diffusion Tube Monitoring 13

Diffusion Tube Annualisation 14

Diffusion Tube Bias Adjustment Factors 14

NO_2 Fall-off with Distance from the Road 15

Appendix D: Map(s) of Monitoring Locations and AQMAs 16

Appendix E: Summary of Air Quality Objectives in England 20

Appendix F: Impact of COVID-19 upon LAQM 21

Impacts of COVID-19 on Air Quality within North Norfolk 22

Opportunities Presented by COVID-19 upon LAQM within North Norfolk 23

Challenges and Constraints Imposed by COVID-19 upon LAQM within North Norfolk 23

Glossary of Terms 25

References 26

Figures

Figure A.1 – Trends in Annual Mean NO_2 Concentrations.....11

Figure A.2 - Impact of Covid Lockdown on peak emissions……27

Figure D.1 – Map of Non-Automatic Monitoring Site.....16

Tables

Table A.2 – Details of Non-Automatic Monitoring Sites 9

Table A.4 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3) 10

Table B.1 – NO_2 2020 Diffusion Tube Results (µg/m^3) 12

Table C.1 – Bias Adjustment Factor 15

Table E.1 – Air Quality Objectives in England 20

Table F 1 – Impact Matrix FFFI her her life from.....24

1 Local Air Quality Management

This report provides an overview of air quality in North Norfolk during 2020. 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 Norfolk 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

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 place in pursuit of compliance with the objectives.

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

Progress and Impact of Measures to address Air Quality in North Norfolk

Defra's appraisal of last year's ASR concluded that monitoring results for 2019 have shown continued compliance with the annual mean NO2 objective at all 16 sites within the District. As such there is no indication that any AQMAs need to be declared.

Included in last year's recommendations, other than a few suggestions to improve aspects of the report, there were recommendations to discuss the district in relation to Public Health Outcomes and explore the standing of the district in relation to $PM_{2.5}$ Concentrations locally and regionally.

Overall North Norfolk expects the following measures to be completed over the course of the next reporting year:

- Continuation of the diffusion tube (Nitrogen dioxide) network within North Norfolk
- Co-locate Zephyr monitors at each diffusion tube location to determine particulate emissions.

The principal challenges and barriers to implementation that North Norfolk anticipates facing are the potential uncertainties posed by the new Environment Bill and the delays and issues associated with equipment repairs (specifically continuous monitors) and deployment infrastructure (electrical connections etc.)

Progress on the co-location deployment has been slower than expected due to the impacts of Covid Restrictions during 2020 and staff support shortages due to covid redeployment.

$PM_{2.5}$ –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.

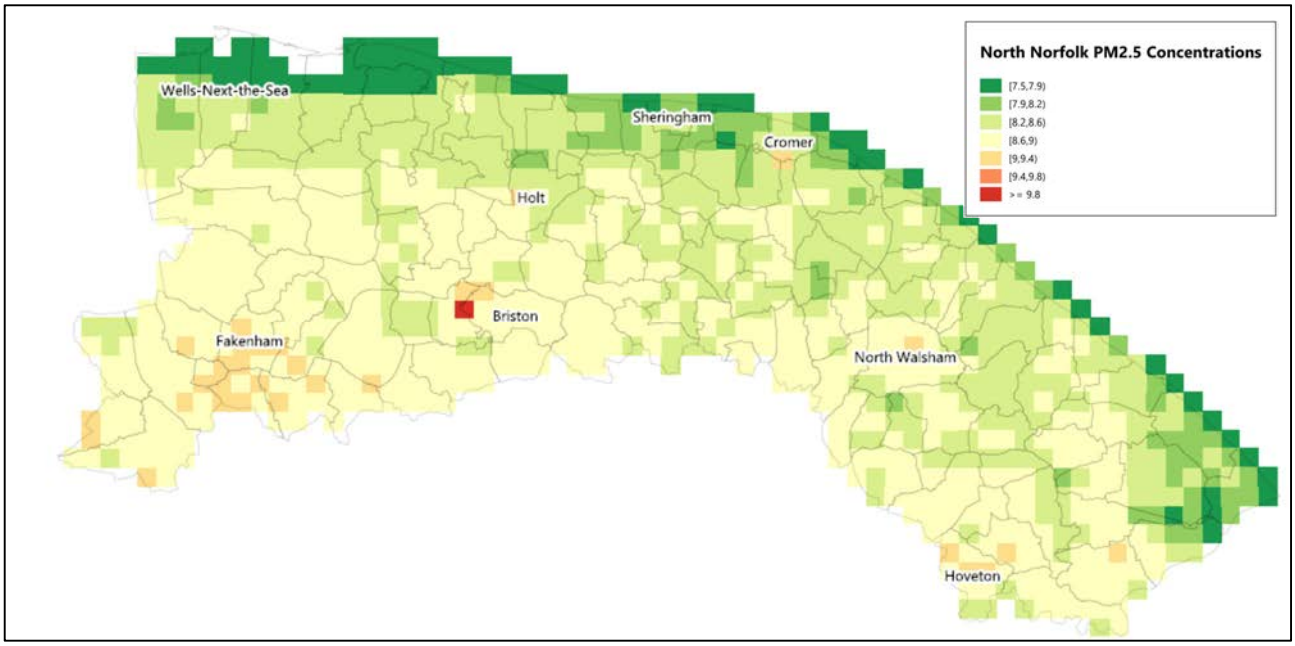
In the first instance North Norfolk is taking the following measures to address $PM_{2.5}$:

- Deploying continuous monitors co-located with Nitrogen Dioxide diffusion tubes to determine $PM_{2.5}$ concentrations.
- Assess $PM_{2.5}$ emissions using Background modelling data from UK-Air

Data Comparisons & Background Modelling

Background map data provided by UK-Air for the modelling period of 2020 provides an

Figure 1. UK Air Data: North Norfolk $PM_{2.5}$ Concentrations

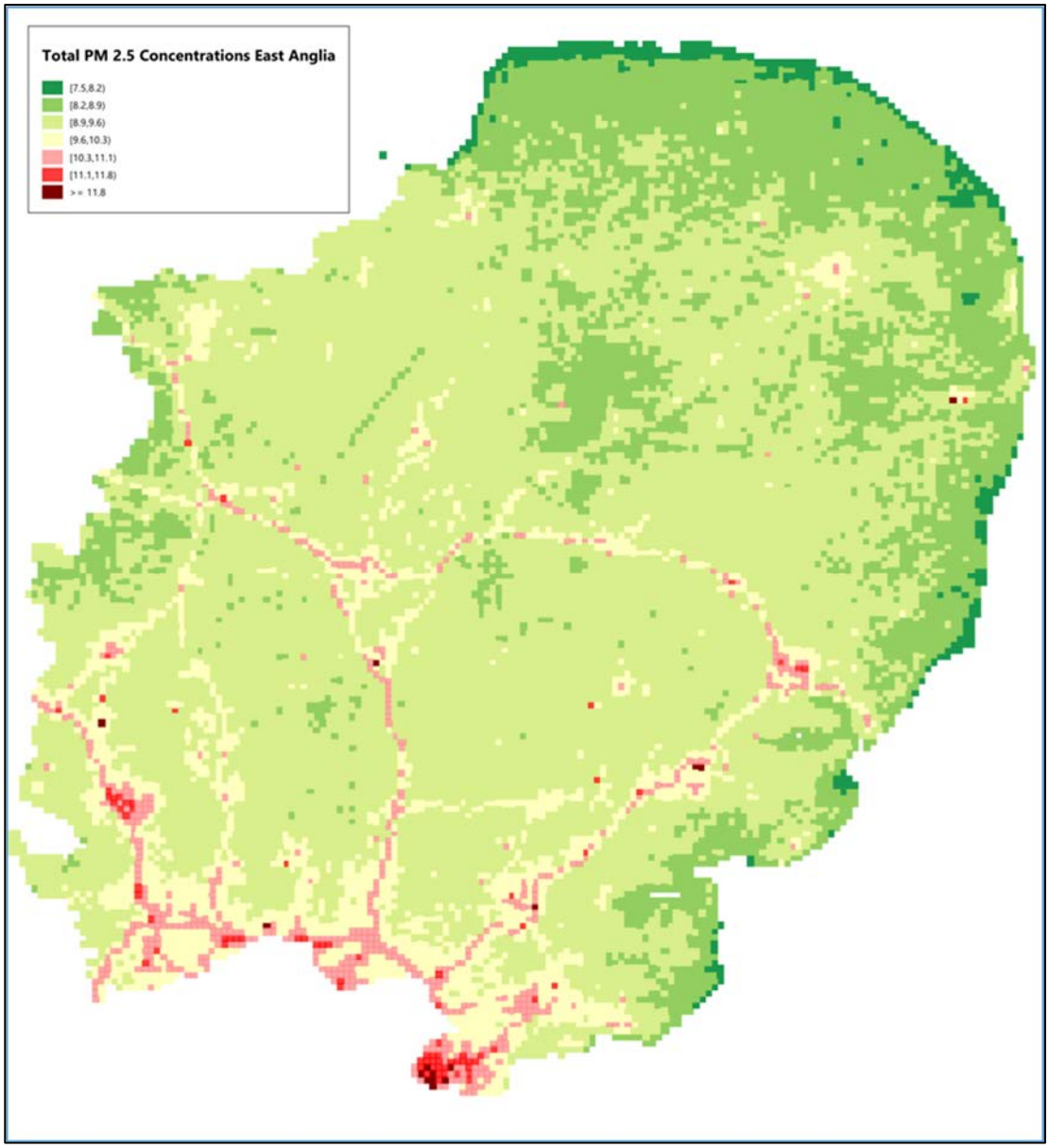


overview of estimated concentrations for $PM_{2.5}$ within the North Norfolk District (Figure 1). Values show that in general there are no exceedances of WHO limit value for $PM_{2.5}$ (10µg/m^3) which is anticipated to be in the new Environment Bill, with the urban centres showing the greatest concentrations in line with expectations. The highest concentrations

(although not above WHO guidlines) were identified in the Briston Parish, which is most likely attributed to the intensive poultry farming and aggregate extraction undertaken in that area.

In comparison, the UK Air data for the East Anglian region were obtained (Figure 2) to provide a degree of comparison with the local area. In contrast North Norfolk and other adjoining authority areas have notably lower $PM_{2.5}$ emissions than those areas closer to the London area and major transport routes, such as the A14 and Northern section of M25.

Figure 2. UK Air Data: East Anglian Region $PM_{2.5}$ Concentrations



This comparison suggests that North Norfolk District is well placed in the event that a $PM_{2.5}$ limit is introduced. The comparatively lower concentrations are most likely attributed to its geographical location and absence of large urban centres. It is important to note that no

concentration is found below 7µg/m^3 and in reality any level of particulate exposure is likely to contribute to a deleterious impact on health, so even with the levels being below WHO guidelines there is a duty monitor the situation. As stated in previous reports North Norfolk District Council is now in a position to directly monitor $PM_{2.5}$ concentrations at our passive monitoring locations in conjunction with diffusion tube measurements, which is hoped will enable the authority to compare concentrations with the modelled background data in coming years and identify hotspots that background modelling has been unable to capture.

Public Health Outcomes

In additon to background modelling the Public health outcome for North Norfolk in relation to the fraction of mortality attributed to $PM_{2.5}$ exposure was examined. Comparitivly North Norfolk compares favouably with the national value of 5.13%, being below this at 4.99%. On a more local level compared against those local authorities with know air quality breaches and AQMAs in places (Figure 3) North Norfolk again compares more favorably.

Figure 3 Public Health Outcomes: Fraction of Mortality Attributed to $PM_{2.5}$ Pollution

North Norfolk Distict Council

Indicator	Age	Sex	Period	Value	Value (Region)	Value (England)	Unit	Recent trend	Change from previous
D01 - Fraction of mortality attributable to particulate air pollution	30+ yrs	Persons	2019	4.99	5.50	5.13	%	-	-

Borough Council of Kings Lynn & West Norfolk

Indicator	Age	Sex	Period	Value	Value (Region)	Value (England)	Unit	Recent trend	Change from previous
D01 - Fraction of mortality attributable to particulate air pollution	30+ yrs	Persons	2019	5.21	5.50	5.13	%	-	-

Norwich City

Indicator	Age	Sex	Period	Value	Value (Region)	Value (England)	Unit	Recent trend	Change from previous
D01 - Fraction of mortality attributable to particulate air pollution	30+ yrs	Persons	2019	5.48	5.50	5.13	%	-	-

Gt Yarmouth Borough Council

Indicator	Age	Sex	Period	Value	Value (Region)	Value (England)	Unit	Recent trend	Change from previous
D01 - Fraction of mortality attributable to particulate air pollution	30+ yrs	Persons	2019	5.28	5.50	5.13	%	-	-

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

This section sets out the monitoring undertaken within 2020 by North Norfolk District Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2016 and 2020 to allow monitoring trends to be identified and discussed.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

North Norfolk District Council undertook automatic (continuous) monitoring at 2 sites during 2020. Data currently recorded does not meet the criteria of UKAS accreditation, as such the results are indicative only and are not recorded in this document.

3.1.2 Non-Automatic Monitoring Sites

North Norfolk District Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 16 sites during 2020. 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.

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.

3.1.3 Nitrogen Dioxide (NO_2)

Error! Reference source not found. and Table A.2 in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. 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 2020 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.

In regards to our diffusion tube network, there have been no exceedances of any of the national objectives for Nitrogen dioxide. The deployment of our continuous monitors, although indicative only confirm the same results in relevant areas.

3.1.4 Particulate Matter (PM_{10})

North Norfolk District Council are now currently monitoring indicative levels of PM_{10} at our Hoveton site, this has been achieved with the upgrade of the existing monitor, however we do not have a comprehensive data coverage at this time, as such, this information will not be published until this has been assessed over the appropriate time frame.

3.1.5 Particulate Matter ($PM_{2.5}$)

North Norfolk District Council are now currently monitoring indicative levels of $PM_{2.5}$ at our Hoveton site, this has been achieved with the upgrade of the existing monitor, however we do not have a comprehensive data coverage at this time, as such, this information will not be published until this has been assessed over the appropriate time frame.

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)
1	Hoveton (Opposite Toy Store)	Roadside	318172	630393	NO2	NO	0	1.5	NO	2.5
2	Waveney Close Hoveton	Roadside	318624	631131	NO2	NO	0	1	NO	2.5
3	Grammar School Rd, North Walsham	Roadside	330190	628400	NO2	NO	0	1	NO	2.5
4	Norwich Road North Walsham	Roadside	329754	628056	NO2	NO	0	1	NO	2.5
5	Cliff Drive, Cromer	Roadside	341984	622477	NO2	NO	0	2	NO	2.5
6	Hamilton Road, Cromer	Roadside	342187	621836	NO2	NO	0	2	NO	2.5
7	Norwich Road Holt	Roadside	338451	607760	NO2	NO	0	2	NO	2.5
8	Woodfield Road, Holt	Roadside	339384	608327	NO2	NO	0	1.5	NO	2.5
9	Queens Rd, Fakenham	Roadside	329690	592131	NO2	NO	0	2	NO	2.5
10	Barons Hall Rd, Fakenham	Roadside	329654	592605	NO2	NO	0	1.5	NO	2.5
11	Corbett Road, North Walsham	Roadside	330906	592605	NO2	NO	0	1	NO	2.5
12	High Street, Holt	Roadside	338736	607795	NO2	NO	0	1.5	NO	2.5
13	Hoveton, Roy's Shop Front	Roadside	318212	630442	NO2	NO	0	1.2	NO	2.5
14	Hoveton, Roy's Car Park	Roadside	318239	630477	NO2	NO	0	2	NO	2.5
15	Trinity Road, Fakenham	Roadside	330780	593277	NO2	NO	0	3	NO	2.5
16	Rudham Stile Lane	Roadside	330698	592394	NO2	NO	0	1	NO	2.5

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_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3)

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 2020 (%) [2]	2016	2017	2018	2019	2020
1	630385	318171	Roadside		100.0	35.33	30.7	32.5	31.3	26.0
2	631132	318631	Roadside		100.0	7.79	12	10.2	10.9	9.1
3	628289	330057	Roadside		100.0	20.15	24.7	22.3	22.9	19.0
4	628074	329783	Roadside		91.6		20.7	21.3	19.3	16.0
5	622448	342001	Roadside		91.6	8.3	10.8	9	8.7	7.2
6	621845	342188	Roadside		91.6	22.15	26.2	22.9	23.7	19.7
7	607748	338478	Roadside		100.0		17.7	19.9	19.2	15.9
8	608316	339398	Roadside		100.0	7.69	10	9.5	8.8	7.3
9	592126	329693	Roadside		100.0	21.6	21.7	19.9	20.3	16.9
10	592611	329646	Roadside		100.0	7.49	10	8.9	8.6	7.1
11	628292	330908	Roadside		100.0	9.84	11.5	11.5	13.1	10.9
12	607821	338740	Roadside		91.6	19.3	21.9	21.2	19.2	15.9
13	630444	318218	Roadside		100.0		27.4	26.5	24.9	20.7
14	630498	318250	Roadside		100.0		24.6	23	22.9	19.0
15	593309	330773	Roadside		100.0		12.5	14.6	14.6	12.1
16	592397	330717	Roadside		100.0		10.3	9.3	10.3	8.6

☒ **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 µg/m^3.

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**.

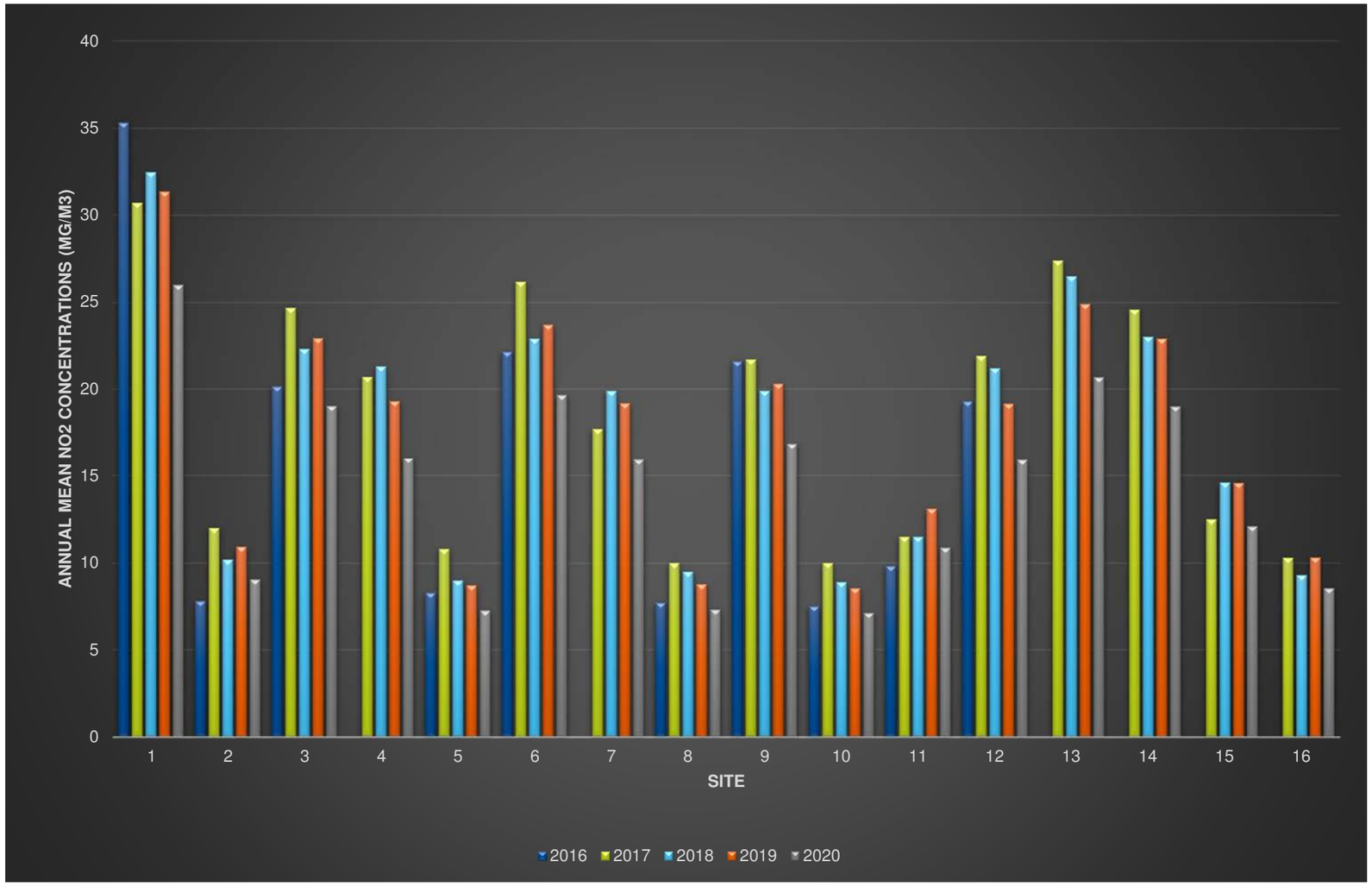
Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

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_2 Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO_2 2020 Diffusion Tube Results ($\mu g/m^3$)

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
1	630385	318171	33.51	31.09	25.51	20.20	17.70	22.08	26.53	34.87	32.55	25.06	26.02	25.12	26.7	22.2	N/A	
2	631132	318631	14.33	17.26	11.68	9.07	6.06	6.21	6.71	7.96	7.29	10.70	13.57	13.15	10.3	8.6	N/A	
3	628289	330057	32.88	32.40	29.22	20.81	15.80	17.18	19.30	22.39	23.88	31.01	27.49	20.18	24.4	20.2	N/A	
4	628074	329783		23.72	22.22	17.25	12.12	14.70	14.40	18.14	19.23	27.16	25.37	22.59	19.7	16.4	N/A	
5	622448	342001	13.25		9.17	8.50	5.33	6.58	6.42	7.60	8.54	7.34	15.59	12.11	9.1	7.6	N/A	
6	621845	342188	30.83	28.89	24.03		14.77	20.19	20.48	30.13	24.31	23.06	27.83	25.52	24.6	20.4	N/A	
7	607748	338478	17.94	17.03	11.56	13.28	10.27	15.39	12.96	19.22	16.99	14.28	21.37	15.75	15.5	12.9	N/A	
8	608316	339398	12.15	12.80	8.46	8.17	4.93	6.15	5.01	5.46	6.97	7.21	16.97	13.52	9.0	7.5	N/A	
9	592126	329693	25.82	26.91	22.20	15.44	12.75	13.77	15.61	17.79	17.57	20.46	26.46	22.31	19.8	16.4	N/A	
10	592611	329646	12.09	11.49	7.09	7.9	5.02	5.67	5.55	5.27	7.06	8.08	12.55	12.81	8.4	7.0	N/A	
11	628292	330908	17.49	16.17	11.99	10.51	6.98	8.69	7.76	7.96	9.24	15.54	16.72	15.85	12.1	10.0	N/A	
12	607821	338740	23.31	23.22	18.71	14.23	9.78	13.23		18.40	20.61	15.11	26.32	21.51	18.6	15.4	N/A	
13	630444	318218	26.54	24.47	23.53	17.27	14.89	18.96	19.92	27.66	32.01	25.72	25.65	24.32	23.4	19.4	N/A	
14	630498	318250	26.59	28.28	21.41	17.03	13.75	15.65	17.79	22.55	20.40	22.89	20.89	22.46	20.8	17.3	N/A	
15	593309	330773	26.77	15.73	13.08	12.09	9.59	11.66	9.14	11.02	11.14	13.50	22.76	19.24	14.6	12.2	N/A	
16	592397	330717	13.30	14.09	8.75	8.05	5.28	7.74	6.48	6.43	8.23	7.70	18.61	11.14	9.6	8.0	N/A	

☒ **All erroneous data has been removed from the NO_2 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 Norfolk District Council confirm that all 2020 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System**.

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**.

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 Norfolk During 2020

North Norfolk District Council has not identified any new sources relating to air quality within the reporting year of 2020

Additional Air Quality Works Undertaken by North Norfolk During 2020

North Norfolk District Council has not completed any additional works within the reporting year of 2020

QA/QC of Diffusion Tube Monitoring

Diffusion Tubes for the 2020 monitoring period were supplied by Gradko International Ltd. Method of preparation chosen was 50% TEA in water and tube deployment followed the 2020 Diffusion Tube Monitoring Calendar. Gradko are UKAS accredited, which ensures conformance with the requirements of ISO/IEC 17025. The latest AIR-PT Rounds 30 to 42 (Jan 2019 to March 2021) regarding Gradko Analysis Performance are specified below:

Table 1: Laboratory summary performance for AIR NO_2 PT rounds AR0030, 31, 33, 34, 36. 37, 39, 40 and 42

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO_2 PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of ≤ ± 2 as defined above.

AIR PT Round	AIR PT AR030	AIR PT AR031	AIR PT AR033	AIR PT AR034	AIR PT AR036	AIR PT AR037	AIR PT AR039	AIR PT AR040	AIR PT AR042
Round conducted in the period	January – February 2019	April – May 2019	July – August 2019	September – November 2019	January – February 2020	May – June 2020	July – August 2020	September – October 2020	January – March 2021
Aberdeen Scientific Services	75 %	100 %	100 %	100 %	100 %	NR [3]	NR [3]	100 %	100 %
Edinburgh Scientific Services	100 %	NR [2]	100 %	25 %	50 %	NR [3]	NR [3]	100 %	25 %
SOCOTEC	87.5 % [1]	100 % [1]	100 % [1]	100 % [1]	100 % [1]	NR [3]	NR [3]	100 % [1]	100 % [1]
Glasgow Scientific Services	100 %	100 %	100 %	50 %	100 %	NR [3]	NR [3]	100 %	50 %
Gradko International	75 %	100 %	100 %	100 %	75 %	NR [3]	NR [3]	75 %	25 %
Lambeth Scientific Services	50 %	100 %	50 %	100 %	100 %	NR [3]	NR [3]	100 %	100 %
Milton Keynes Council	100 %	100 %	50 %	100 %	100 %	NR [3]	NR [3]	25 %	0 %
Somerset Scientific Services	100 %	100 %	100 %	100 %	100 %	NR [3]	NR [3]	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	100 %	75 %	100 %	NR [3]	NR [3]	100 %	100 %
Staffordshire County Council	100 %	75 %	75 %	75 %	100 %	NR [3]	NR [3]	50 %	100 %
Tayside Scientific Services (formerly Dundee CC)	100 %	NR [2]	100 %	NR [2]	100 %	NR [3]	NR [3]	100 %	NR [2]
West Yorkshire Analytical Services	100 %	100 %	100 %	50 %	100 %	NR [3]	NR [3]	NR [2]	NR [2]

Diffusion Tube Annualisation

All diffusion tube monitoring locations within North Norfolk 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.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2020 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/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

North Norfolk District Council have applied a national bias adjustment factor 0.83 to the 2020 monitoring data. A summary of bias adjustment factors used by North Norfolk District Council over the past five years is presented in Table C.1.

The national bias factor used was obtained from the latest version spreadsheet (06/21) based upon 50% TEA in water and current tube provider (Gradko Labs). The bias figure was based upon and average from 21 studies (Figure 4).

Figure 4

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 06/21

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
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 spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of Sept 2021
LAQM Helpdesk Website

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: Select the Laboratory that Analyses Your Tubes from the Drop-Down List. If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List. If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List. If a year is not shown, we have no data.

Step 4: 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[3] shown in blue at the foot of the final column.

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 (To see your selection, choose (All) from the pop-up list)	Year[2] (To see your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	50% TEA in Acetone	2020	UC	Falkirk Council	10	33	26	24.3%	G	**0.80**
Gradko	50% TEA in Acetone	2020	UB	Falkirk Council	11	16	12	33.6%	G	**0.75**
Gradko	50% TEA in acetone	2020	UB	Middlesbrough Council	9	17	12	45.6%	G	**0.69**
Gradko	50% TEA in acetone	2020	R	Royal Borough of Windsor and Maidenhead	12	29	25	17.3%	G	**0.85**
Gradko	50% TEA in acetone	2020	R	Royal Borough of Windsor and Maidenhead	12	24	22	11.7%	G	**0.90**
Gradko	50% TEA in acetone	2020	SU	Redcar & Cleveland Borough Council	11	16	13	23.4%	P	**0.81**
Gradko	50% TEA in acetone	2020	R	Newham	10	29	24	18.2%	G	**0.85**
Gradko	50% TEA in acetone	2020	R	Sandwell MBC	12	34	27	26.9%	G	**0.79**
Gradko	50% TEA in acetone	2020	B	Sandwell MBC	9	14	11	23.0%	S	**0.81**
Gradko	50% TEA in acetone	2020	R	Sandwell MBC	11	25	23	9.4%	S	**0.91**
Gradko	50% TEA in acetone	2020	UB	Sandwell Metropolitan Borough Council	11	21	19	9.4%	G	**0.91**
Gradko	50% TEA in acetone	2020	KS	Marylebone Road Intercomparison	12	57	43	33.0%	G	**0.75**
Gradko	50% TEA in acetone	2020	R	London Borough of Richmond upon Thames	12	22	20	9.4%	G	**0.91**
Gradko	50% TEA in acetone	2020	B	London Borough of Richmond upon Thames	9	19	16	20.3%	G	**0.83**
Gradko	50% TEA in acetone	2020	UB	Reading Borough Council	12	14	15	-7.7%	G	**1.08**
Gradko	50% TEA in acetone	2020	R	Reading Borough Council	12	30	25	20.2%	G	**0.83**
Gradko	50% TEA in acetone	2020	UB	Norwich City Council	10	12	10	14.4%	G	**0.87**
Gradko	50% TEA in acetone	2020	SU	Reigate and Banstead BC (RG1)	10	19	14	33.3%	G	**0.75**
Gradko	50% Tea in Acetone	2020	KS	Slough Borough Council	12	34	27	23.5%	G	**0.81**
Gradko	50% TEA in Acetone	2020	SU	Slough Borough Council	11	21	17	29.2%	G	**0.77**
Gradko	50% TEA in Acetone	2020	KS	Slough Borough Council	12	29	25	17.9%	G	**0.85**
Gradko	50% TEA in acetone	2020		**Overall Factor[3] (21 studies)**				**Use**		**0.83**

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	National	06/21	0.83
2019	National	09/20	0.89
2018	National	06/19	0.89
2017	National	09/18	0.96
2016	National	06/17	1.01

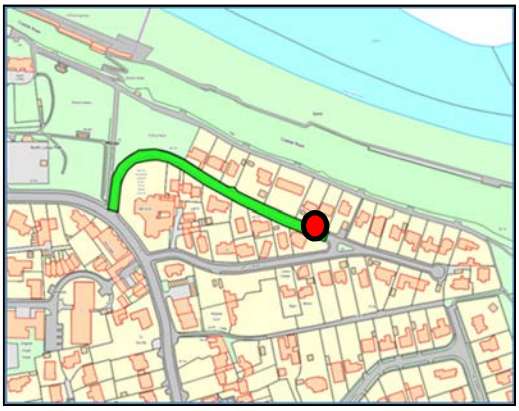
NO_2 Fall-off with Distance from the Road

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 Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

No diffusion tube NO_2 monitoring locations within North Norfolk required distance correction during 2020.

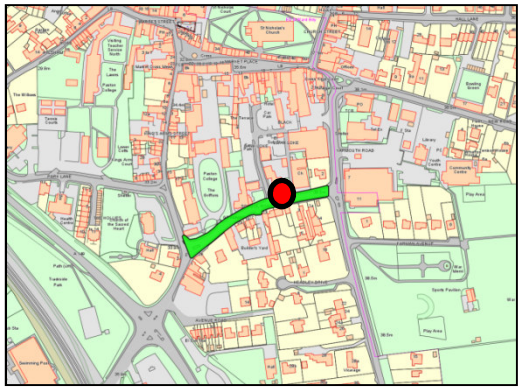
Appendix D: Map(s) of Monitoring Locations and AQMAs

Figure D.1 – Map of Non-Automatic Monitoring Site



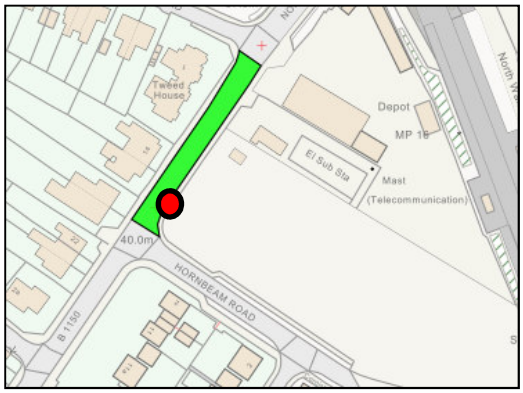
Cliff Drive, Cromer

Site 5



Grammar School Road, North Walsham

Site 3

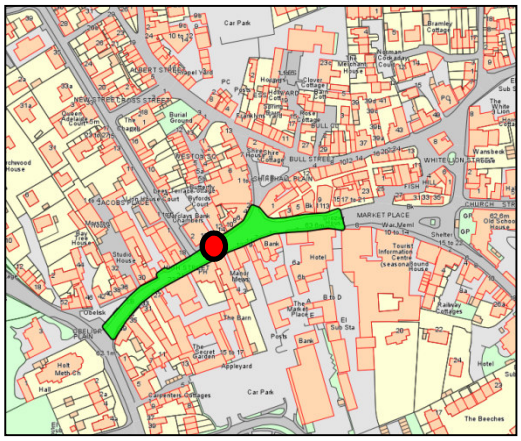


Norwich Road, North Walsham

Site 4

Corbett Road, North Walsham

Site 11

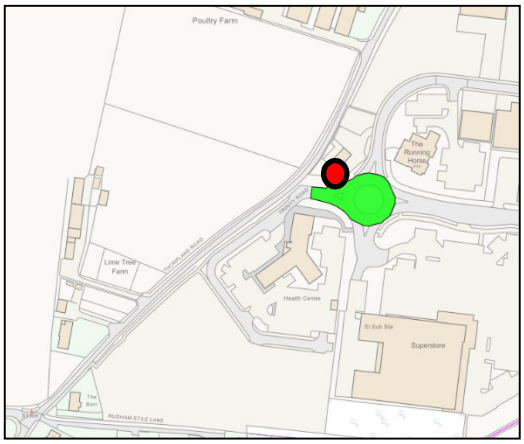


High Street, Holt

Site 12

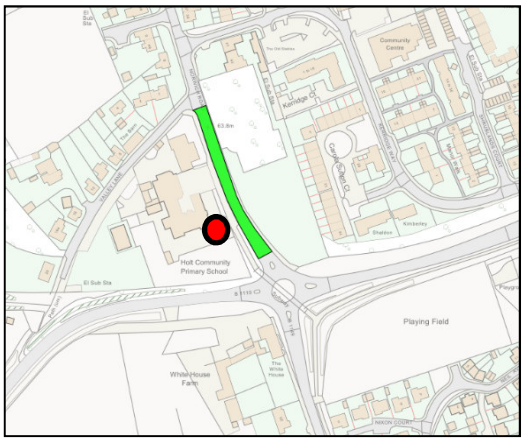
Woodfield Road, Holt

Site 8



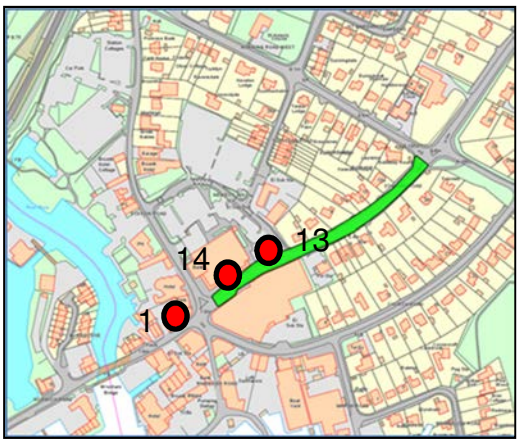
Trinity Road, Fakenham

Site 15



Norwich Road, Holt

Site 7



Stalham Road, Hoveton

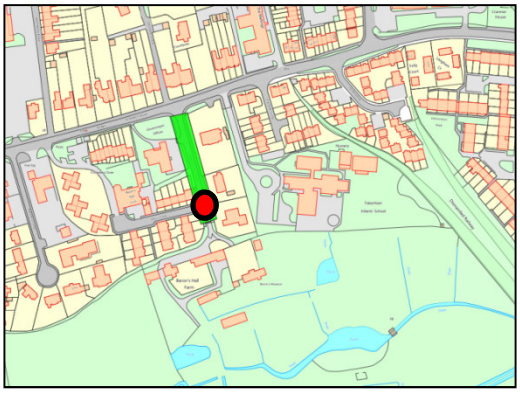
Site 1, 13, 14

Waveney Close, Hoveton

Site 2

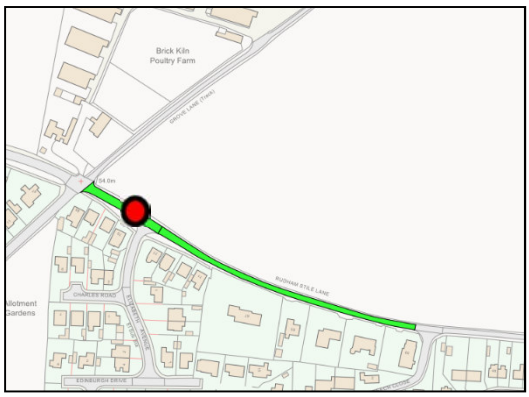
Queens Road, Fakenham

Site 9



Barons Hall Lane, Fakenham

Site 10

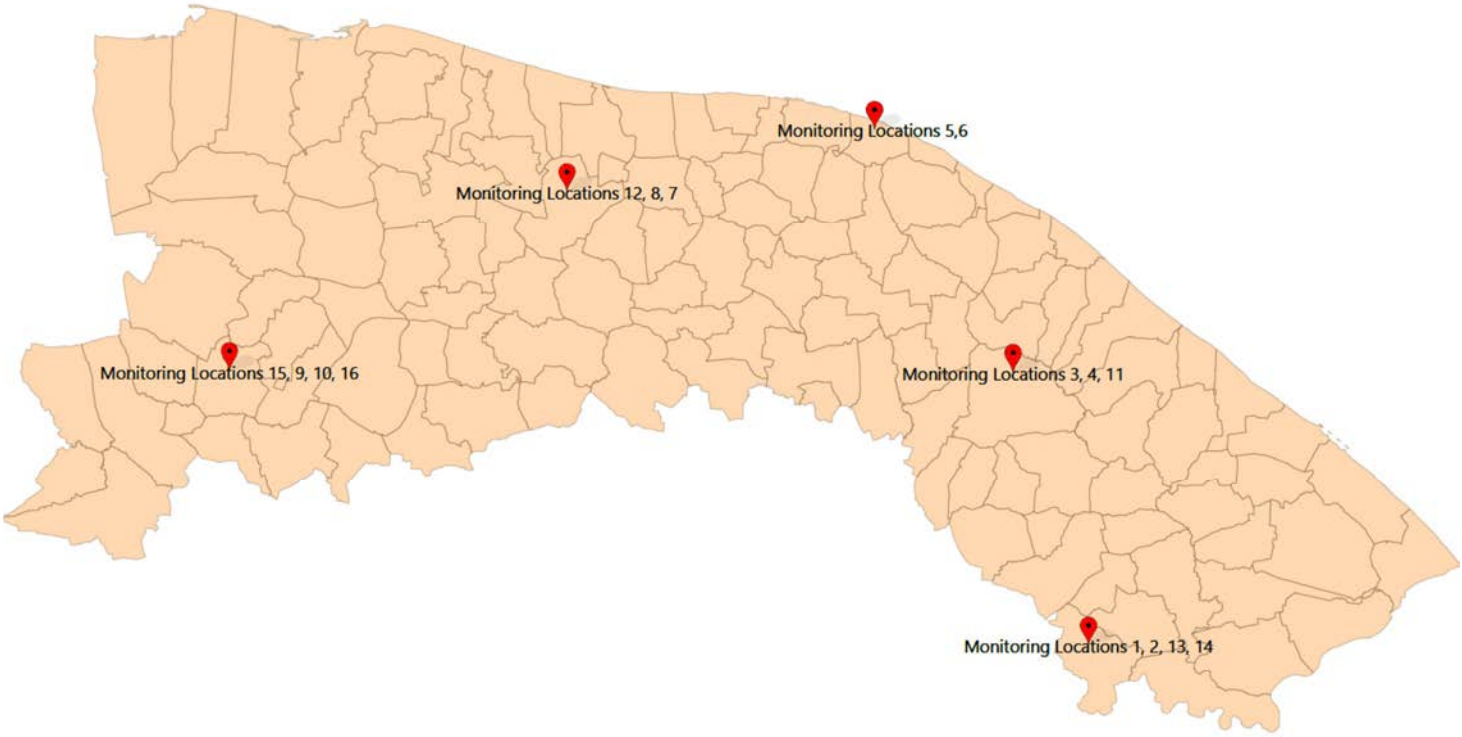


Rudham Stile Lane, Fakenham

Site 16

Hamilton Road, Cromer

Site 6



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

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/m^3).

Appendix F: Impact of COVID-19 upon LAQM

COVID-19 has had a significant impact on society. Inevitably, COVID-19 has also had an impact on the environment, with implications to air quality at local, regional and national scales.

COVID-19 has presented various challenges for Local Authorities with respect to undertaking their statutory LAQM duties in the 2021 reporting year. Recognising this, Defra provided various advice updates throughout 2020 to English authorities, particularly concerning the potential disruption to air quality monitoring programmes, implementation of Air Quality Action Plans (AQAPs) and LAQM statutory reporting requirements. Defra has also issued supplementary guidance for LAQM reporting in 2021 to assist local authorities in preparing their 2021 ASR. Where applicable, this advice has been followed.

Despite the challenges that the pandemic has given rise to, the events of 2020 have also provided Local Authorities with an opportunity to quantify the air quality impacts associated with wide-scale and extreme intervention, most notably in relation to emissions of air pollutants arising from road traffic. The vast majority (>95%) of AQMAs declared within the UK are related to road traffic emissions, where attainment of the annual mean objective for nitrogen dioxide (NO_2) is considered unlikely. On 23rd March 2020, the UK Government released official guidance advising all members of public to stay at home, with work-related travel only permitted when absolutely necessary. During this initial national lockdown (and to a lesser extent other national and regional lockdowns that followed), marked reductions in vehicle traffic were observed; Department for Transport (DfT) data[8] suggests reductions in vehicle traffic of up to 70% were experienced across the UK by mid-April, relative to pre COVID-19 levels.

This reduction in travel in turn gave rise to a change of air pollutant emissions associated with road traffic, i.e. nitrous oxides (NO_x), and exhaust and non-exhaust particulates (PM). The Air Quality Expert Group (AQEG)[9] has estimated that during the initial lockdown period in 2020, within urbanised areas of the UK reductions in NO_2 annual mean concentrations were between 20 and 30% relative to pre-pandemic levels, which represents an absolute

[8] Prime Minister's Office, COVID-19 briefing on the 31st of May 2020

[9] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, June 2020

reduction of between 10 to 20µg/m^3 if expressed relative to annual mean averages. During this period, changes in $PM_{2.5}$ concentrations were less marked than those of NO_2. $PM_{2.5}$ concentrations are affected by both local sources and the transport of pollution from wider regions, often from well beyond the UK. Through analysis of AURN monitoring data for 2018-2020, AQEG have detailed that $PM_{2.5}$ concentrations during the initial lockdown period are of the order 2 to 5µg/m^3 lower relative to those that would be expected under business-as-usual conditions.

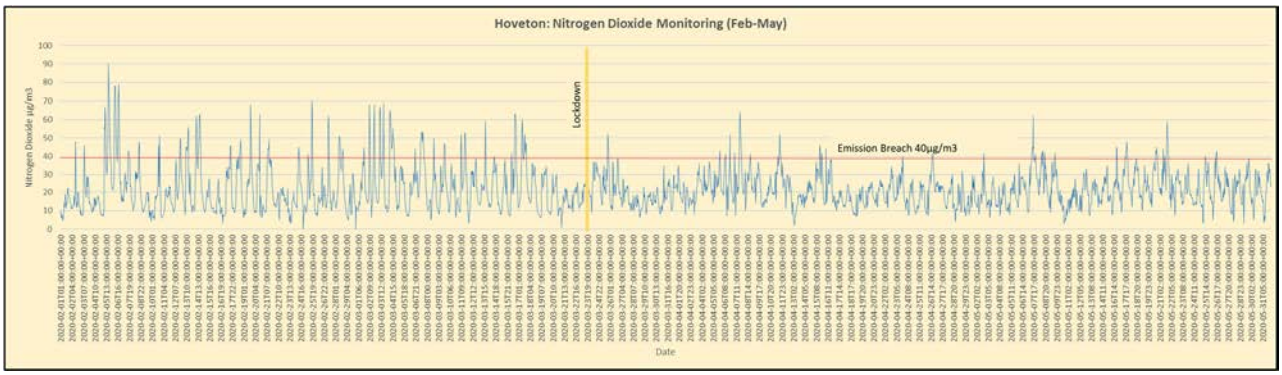
As restrictions are gradually lifted, the challenge is to understand how these air quality improvements can benefit the long-term health of the population.

Impacts of COVID-19 on Air Quality within North Norfolk

As alluded to in earlier sections of this document, there were some distinct and observable effects on traffic numbers and subsequent impacts of Nitrogen Dioxide emissions during the Covid 19 Lockdown period. According to our data, on average there was a 17% reduction of Nitrogen Dioxide emissions across all of our urban and rural monitoring locations.

Although indicative, real time data recorded from one of our continuous monitors at our Hoveton Hotspot within the 2019 ASR also demonstrated a significant fall in Nitrogen emissions. Data from Zephyr 168 has been obtained for the first half of 2020 (see Figure 4). These results over the lockdown period show an observed decline in recorded peaks during the lock down period.

Figure 4



Opportunities Presented by COVID-19 upon LAQM within North Norfolk

No LAQM related opportunities have arisen as a consequence of COVID-19 within North Norfolk.

Challenges and Constraints Imposed by COVID-19 upon LAQM within North Norfolk

No notable challenges or constraints relating to LAQM have arisen during 2020 as a consequence of COVID-19 within North Norfolk.

Table F 1 – Impact Matrix

Category	Impact Rating: None	Impact Rating: Small	Impact Rating: Medium	Impact Rating: Large
Automatic Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Automatic Monitoring – QA/QC Regime	Adherence to requirements as defined in LAQM.TG16	Routine calibrations taken place frequently but not to normal regime. Audits undertaken alongside service and maintenance programmes	Routine calibrations taken place infrequently and service and maintenance regimes adhered to. No audit achieved	Routine calibrations not undertaken within extended period (e.g. 3 to 4 months). Interruption to service and maintenance regime and no audit achieved
Passive Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Passive Monitoring – Bias Adjustment Factor	Bias adjustment undertaken as normal	<25% impact on normal number of available bias adjustment colocation studies (2020 vs 2019)	25-50% impact on normal number of available bias adjustment studies (2020 vs 2019)	>50% impact on normal number of available bias adjustment studies (2020 vs 2019) and/or applied bias adjustment factor studies not considered representative of local regime
Passive Monitoring – Adherence to Changeover Dates	Defra diffusion tube exposure calendar adhered to	Tubes left out for two exposure periods	Tubes left out for three exposure periods	Tubes left out for more than three exposure periods
Passive Monitoring – Storage of Tubes	Tubes stored in accordance with laboratory guidance and analysed promptly.	Tubes stored for longer than normal but adhering to laboratory guidance	Tubes unable to be stored according to be laboratory guidance but analysed prior to expiry date	Tubes stored for so long that they were unable to be analysed prior to expiry date. Data unable to be used
AQAP – Measure Implementation	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP
AQAP – New AQAP Development	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP

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 Highways England
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.