

North Lincolnshire Council

2021 Air Quality Annual Status Report (ASR)

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

June 2021

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Executive Summary: Air Quality in Our Area

Air Quality in North Lincolnshire

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

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

The principal town within North Lincolnshire, Scunthorpe, is home to an Integrated Iron and Steel Works, employing over 3,000 people directly and supports over 20,000 jobs in the supply chain. The site covers over 2,400 acres and is located directly to the east of Scunthorpe. Emissions of PM10 (particulate matter with a diameter of 10 microns or less) from this site and neighbouring operators have contributed to the exceedance of legal air quality targets, leading to the declaration of Air Quality Management Areas (AQMA). There are a number of different operators on the site and particulate matter arises from a variety of sources, including point source emissions, for example: stacks,

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

vents and chimneys and fugitive emissions from roads, stockpiles, and material handling operations.

The Council has been working with Industry, Health Professionals, and the Environment Agency for a number of years to implement actions on the Integrated Steelworks Site.

North Lincolnshire Council continues to monitor air pollution across the area, including within the Air Quality Management Area (AQMA) and on behalf of the National Networks. This includes pollutants such as Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂), PM₁₀ (Particulate Matter with a diameter of 10 microns or less), PM_{2.5} (Particulate Matter with a diameter of 2.5 microns or less), Heavy Metals (HM), PAH (Benzo(a)pyrene (B[a]P)) and Benzene.

Recent improvements in the level of PM₁₀ are analysed in detail in the Detailed Assessment of the Scunthorpe PM₁₀ Air Quality Management Area 2016 Report. This led to the revocation of the Low Santon Air Quality Management Area (declared for exceedances of Annual PM₁₀ objective) and the amendment of the Scunthorpe Town Air Quality Management Area (declared for exceedances of the 24 hour mean PM₁₀ objective) in March 2018. The reduction of the Scunthorpe Town AQMA boundary resulted in the removal of approximately 5,000 residential properties from within the AQMA. Details of the past and present AQMAs in North Lincolnshire can be found at the following links: <http://www.nlincsair.info/home/text/336> and <https://uk-air.defra.gov.uk/aqma/list>

For the year 2020, both the Annual Mean PM₁₀ Air Quality Objective and the 24 Hour Mean Air Quality Objective were complied with at all monitoring locations across North Lincolnshire. In addition, all Air Quality Objectives relating to SO₂, NO₂ and PM_{2.5} were also complied with at all monitoring locations across North Lincolnshire.

For the year 2020, whilst the concentrations have reduced at both sites for the year 2020, the levels of PAH (Benzo(a)pyrene (B[a]P) in ambient air) remain elevated at both the Scunthorpe Town and Low Santon monitoring sites. The current levels at Low Santon and Scunthorpe Town are compliant with the European Community Air Quality Target value within the Fourth Air Quality Daughter Directive of 1ng/m³ but in breach of the National Air Quality Objective of 0.25ng/m³.

Compliance with PAH (Benzo(a)pyrene (B[a]P)) Air Quality requirements is not the responsibility of the local authority; this is overseen by DEFRA (Department of Environment, Food and Rural Affairs). Further information can be found at <https://uk-air.defra.gov.uk/networks/network-info?view=pah> North Lincolnshire Council continues to support further improvement in regards to PAH (Benzo(a)pyrene (B[a]P)) concentrations and will support action to improve concentrations for local residents as part of the National Network.

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.

Clean Air Strategy

The 2019 Clean Air Strategy⁵ sets out the case for action, with goals even more ambitious than EU requirements, to reduce exposure to harmful pollutants. The Road to Zero⁶ sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated

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

concentrations heavily influenced by transport emissions. This, however, is not the case within North Lincolnshire.

The main pollutant of concern within North Lincolnshire is PM10. Although, the PM10 24 hour mean objective was not breached within North Lincolnshire during 2020, concentrations at monitoring sites within the Scunthorpe Town Air Quality Management Area (AQMA) remain elevated. In addition to PM10, North Lincolnshire Council continually strives to improve air quality across the district in relation to all pollutants, some of these measures are outlined below.

Grant Funding

The Council applied for DEFRA Air Quality Grant Funding in November 2020. The Council's bid included the provision to upgrade existing air quality monitoring equipment at a monitoring location within the Scunthorpe Town AQMA. Unfortunately, the grant bid was unsuccessful, however the Council will consider applying for future bids when these become available.

Air Quality Website

During Spring 2021, North Lincolnshire Councils air quality website contract was retendered and awarded to the current provider to ensure sufficient data management, ratification, and reporting services in line with LAQM (TG16). The website also provides an essential source of public information and real time data. In addition to this, the service and maintenance contract for the air quality monitoring equipment was retendered and awarded to the current provider to ensure the continued operation and maintenance of the network.

The North Lincolnshire Council website will be continuously updated to include more information on air quality. This includes information on idling of vehicles, how to report smoky vehicles and the requirements of living within a Smoke Control Area. In addition, previous Annual Status Reports are uploaded onto the website to provide up

to date information to the Public. Further information can be found at the following website: <https://www.northlincs.gov.uk/planning-and-environment/pollution/>

Publicising air quality

North Lincolnshire Council is now a supporter of the Clean Air Day initiative. Clean Air Day is the UK's largest annual air pollution campaign, with a day of public engagement, enabling the public to improve air quality and their health. This campaign involves groups from NHS Trusts, Local Authorities, Health Charities and Universities. Within North Lincolnshire Council the event is organised in collaboration with the council's Public Health Department.

During 2019, North Lincolnshire Council and the Environment Agency started to produce monthly reports regarding air quality within the Scunthorpe Town AQMA. The intention of providing a monthly report is to make local industry aware of the current air quality and to seek their continued cooperation in bringing about improvements. The production of this report continues and is circulated to relevant operators.

Environmental Protection Team

Other measures to improve air quality relate to the Environmental Protection Teams role within Development Management. Traffic congestion is directly linked to air pollution with the most polluting vehicles being those with older diesel engines. This contributes to increased NO₂ emissions. The Climate Change Act 2008, committed the UK to reducing greenhouse gas emissions by at least 80% by 2050. In order to meet this target, the Government has committed for nearly every car and van in the UK to be zero emissions by 2050, as set out in their Road to Zero Strategy 2018. The strategy sets out how this will be achieved:

- The UK will end the sale of all new conventional petrol and diesel cars/vans in 2040.
- The UK will 'develop one of the best Electric Vehicle Charging Point (EVCP) networks in the World.

More recently, in November 2020, the UK Government announced the phase out date for the sale of new petrol and diesel cars and vans will be brought forward to 2030. Furthermore all new cars and vans will be fully zero emission at the tailpipe from 2035.

With this in mind, it is essential that new development should seek to deliver high standards of sustainability in accordance with Local and National Planning Policy. The Environmental Protection Team act as consultees for planning applications and require developers within North Lincolnshire to demonstrate that they are making all reasonable efforts to minimise total emissions from development sites, during both construction and operational phases. This will include the requirement to promote and incentivise the use of low emission vehicles, to reduce the overall emission impact of development related traffic.

The Local Plan

In addition to the above measure, North Lincolnshire Council are currently in the process of updating their Local Plan. A Local Plan sets out the vision and objectives for the future development of the area, addressing needs and opportunities in relation to housing, the economy, community facilities and infrastructure. It will outline the policies and proposals that will be used to guide planning decisions and investment on regeneration up to 2036. The Environmental Protection Team reviewed the proposed land allocations for the Local Plan and provided feedback in relation to the suitability of the proposed land use. This included feedback in relation to air quality generally and more specifically development within the Air Quality Management Area. This feedback discouraged residential development within the Scunthorpe Town AQMA and identified that developments that are likely to contribute to local air quality (i.e. B2 General Industrial) would be subject to further investigation.

The Environmental Protection Team have provided useful feedback to enable North Lincolnshire Council to draft a Preferred Options Local Plan that has taken into account the health implications of air quality and land use. The Environmental Protection Team have also assisted in reviewing the current Local Plan Policies and provided updates and amendments where these are considered necessary; some of these Policies relate specifically to air quality.

Complaints

Dust and smoke complaints across North Lincolnshire are investigated and those within the AQMA are investigated as a priority due to increased emissions of PM10. It is an offence under Section 2 of the Clean Air Act 1993 for dark smoke to be emitted from any industrial or trade premises. It is also an offence under Section 33 (1C) of the Environmental Protection Act 1990 to treat, keep or dispose of controlled waste in a manner likely to cause pollution or harm to human health. The burning of waste produces pollutants that are both harmful to human health and the environment, this includes particulate matter, heavy metals, and polycyclic aromatic hydrocarbons (PAHs). North Lincolnshire Council investigate a significant number of incidents reported by officers of the Council and members of public. During 2020, over 50 commercial bonfire complaints were investigated. The burning of controlled waste at commercial premises has resulted in five prosecutions and several cautions in recent years. It is the intention of North Lincolnshire Council to continue to pursue commercial offenders, in line with our enforcement policy, to protect human health and improve local air quality.

Action Plan

The Air Quality Action Plan (AQAP) for the Scunthorpe Town AQMA is currently being drafted. It is intended that this will be circulated for consultation in the near future. The timing of this AQAP has been delayed as a result of the COVID-19 pandemic and ongoing negotiations over the future of the Scunthorpe Steelworks during 2019-2020. The AQAP will outline in detail the Council's objectives to improve local air quality.

Working with partners

In 2020 the Council continued to work closely with Industry, Health Professionals, and the Environment Agency to initiate improvements and to share best practice. This included the distribution of reports detailing pollutant exceedances of air quality objectives on a weekly basis and for individual events. It also included the distribution of air quality warnings on days where concentrations are particularly high. This is a proactive method of advising industry in the area to take preventative action to avoid exceedances of air quality objectives.

Conclusions and Priorities

North Lincolnshire Council has continued to operate an extensive air quality monitoring network. This has identified that all Air Quality Objectives have been met with the exceptions of the following:

- National Air Quality Objective for PAH (Benzo(a)pyrene (B[a]P)) at Low Santon and Scunthorpe Town

All other air quality objectives were complied with during 2020.

Although significant improvements have been made on the annual concentrations of PAH (Benzo(a)pyrene (B[a]P)) in recent years, North Lincolnshire continues to record some of the highest levels of this pollutant in the United Kingdom. The improvements are partly due to the closure of the Dawes Lane Coke Ovens in March 2016 and improvements to the Appleby Coke Ovens. Despite a downward trajectory in concentrations over recent years, both Low Santon and Scunthorpe Town breach the National Air Quality Objective of 0.25ng/m³. It is anticipated that continued liaison with Industry, Health Professionals and the Environment Agency will see further improvements.

The air quality monitoring instrument at Low Santon (FDMS Filter Dynamics Measurement System) has not recorded a breach of the PM₁₀ annual mean objective since it was sited. The other air quality monitoring equipment (TEOM Tapered Element Oscillating Microbalance) has not recorded a breach of this objective since 2008. The Low Santon AQMA was therefore revoked in March 2018.

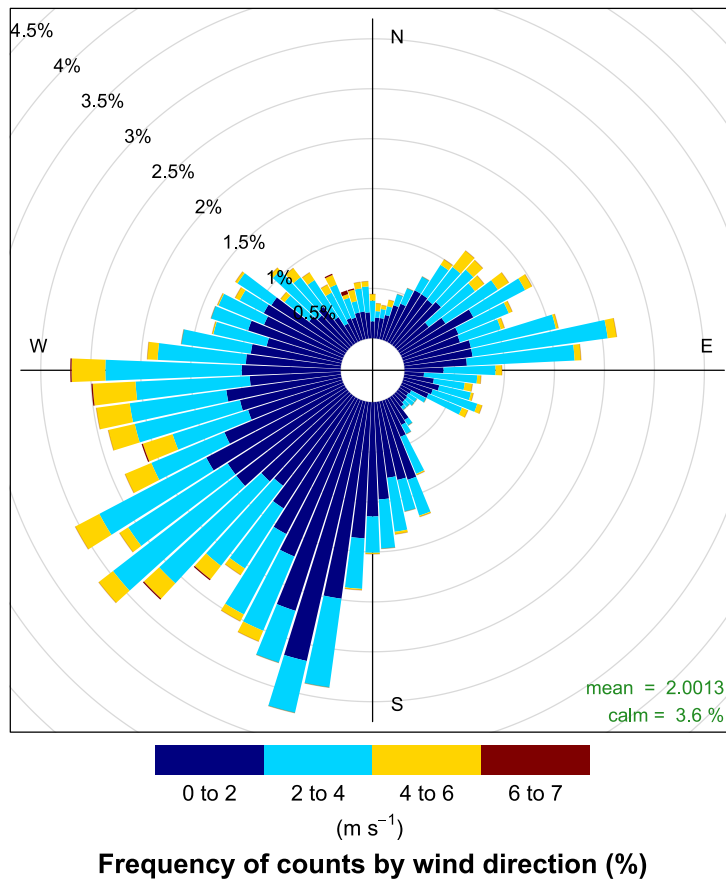
Despite the PM₁₀ 24-hour mean objective not being exceeded at any sites during 2020, some areas still experience high concentrations of this pollutant. This includes the area immediately around the Scunthorpe Integrated Steelworks site including Low Santon and the East Common Lane area to the west of the site.

The PM2.5 levels recorded by the air quality monitors did not breach the European Union (EU) Annual Mean objective of 25 µg/m³. It would be beneficial in the future for more locations within North Lincolnshire to monitor for this pollutant, to provide a more detailed understanding of concentrations in the area.

There are a number of challenges the Council faces in achieving improvements in air quality:

- Within Scunthorpe and the Integrated Steel Works site there are a number of companies which contribute towards emissions of PM10. Some of these companies are regulated for emissions to air by North Lincolnshire Council and others by the Environment Agency. Air pollutants from multiple sources create a greater challenge than if it was from a single source and therefore collaborative working between the Environment Agency, North Lincolnshire Council, local industry, and other relevant parties is vital to bring about continued improvements.
- The majority of the Integrated Steelworks site is regulated by the Environment Agency rather than the Council. The Council therefore has minimal regulatory control of emissions into the atmosphere. As stated above, collaborative working helps towards addressing this constraint.
- The Council has no regulatory control over the monitoring and reduction at source of PAH (Benzo(a)pyrene (B[a]P)) emissions. They are not part of the Local Air Quality Management regime and the operations largely responsible for them, the Coke Ovens, are not regulated by the Council. The closure of the Dawes Lane Coke Ovens and improvements to Appleby Coke Ovens has however seen a significant reduction of PAH (Benzo(a)pyrene (B[a]P)) emissions in recent years.
- In North Lincolnshire the prevailing wind is from the south west direction, as shown in Figure 1. These winds impact directly upon local residents in Santon as the Integrated Steel Works is located upwind of these south westerly winds. In cooperation with local industry the Council has, and continues to encourage operators to predict in advance the weather conditions, so that alterations can be made to their operational practices. This reduces the impact upon local residents, but relies to some extent upon management practices which can be difficult to control and monitor.

Figure 1 – Wind direction and velocity for 2020



In 2021 North Lincolnshire Council aims to:

- Continue operation of the air quality network and website, with associated data analysis and ratification
- Two additional diffusion tubes were installed during January 2021 to monitor NO₂ concentrations
- Work closely with Industry, Stakeholders, and the Environment Agency to obtain continued air quality improvements for local residents
- Complete the Air Quality Action Plan to include new initiatives which will bring about these continued improvements
- Improve the existing mechanisms in place to influence and control on-site management practices to control dust emissions via the Air Quality Action Plan

- Evaluate the potential costs and benefits of source apportionment work within the AQMA
- Evaluate the potential costs and benefits of upgrading some monitors within the air quality network
- Apply for Grant Funding if suitable bids become available
- Put in place a public engagement strategy that will deliver key messages about ongoing improvements to air quality within North Lincolnshire
- To continue to provide planning consultation responses which takes into consideration local air quality such as the implementation of electric vehicle charging infrastructure
- Act as a consultee in relation to updates to North Lincolnshire Council's Local Plan to ensure the impact of development on air quality is considered
- Continue our regulatory functions in respect of emissions to air through the Environmental Permitting Regulations (2016) and complaint investigation

Local Engagement and How to get Involved

North Lincolnshire Council continues to engage with a variety of different parties, including for example, developers and businesses in relation to air quality and actions they can take to help bring about improvements.

North Lincolnshire Council operate a dedicated website with real-time air quality data which is available to the general public and can be found at the following link: <http://www.nlincsair.info>. In addition to this, North Lincolnshire Council's main website has a section on air quality, which can be found at the following link: <https://www.northlincs.gov.uk/planning-and-environment/environmental-health/>

Figure 2 – Air Quality in North Lincolnshire Website

The screenshot displays the website's header with the title "Air Quality in North Lincolnshire" and navigation links: Home, About air quality, Monitoring data, FAQs, Reports, Reports and Guidance, Links, About the website, and a Login button. Below the header, the main heading is "Latest air quality levels in North Lincolnshire".

On the left side, there is a "Current Air Quality Index" section featuring a circular gauge with numbers 1 through 10. The needle points to the number 3, which is labeled "Low". Below the gauge are links for "Find out more & get health advice >>", "Monitoring Site Summary", "Current levels", and "24 hour summary".

In the center is a map of North Lincolnshire with several green location markers indicating monitoring sites. The map includes a search bar, "Map" and "Satellite" options, and a "View Full Screen" button.

At the bottom left, there are two buttons for mobile apps: "ANDROID APP ON Google Play" and "Available on the App Store".

On the right side, there are two paragraphs of text. The first paragraph states: "This website provides information about air quality in North Lincolnshire. It aims to inform you about the causes of poor air quality and what is being done about it. You can also use the site to see local air quality, current levels, 24 hour summary and monitoring site summary." The second paragraph states: "There are a number of air quality monitoring sites in North Lincolnshire. Select a site from the map above to view the latest data, graphs, photographs and site information."

Members of the public are welcomed to contact the Council regarding Local Air Quality Management in North Lincolnshire using the contact details below:

Email: environmental.health@northlincs.gov.uk

Telephone: 01724 297000

There are several things that the general public can do to help improve air quality within North Lincolnshire, some of these are listed below:

Transportation

- Where possible, members of the public are encouraged to use public transport, such as local bus services. If the individual is able to, they are also encouraged to cycle or walk, giving a boost to both air quality and the health of the individual.
- The type of vehicle that is driven also has an impact on air quality; low emission or electric vehicles contribute less pollution than older petrol or diesel vehicles.
- Vehicle idling also contributes to air pollution. The public are advised to avoid idling to warm up their engine and if it is safe to do so, switch off their engine in traffic that is likely to be stationary for long periods.
- Poor driving habits also contribute to increased air pollution. Smooth acceleration and deceleration is recommended to reduce fuel consumption and air pollution.

While at Home

- Domestic burning is a major source of air pollution. Replicated below is information provided from the Department for Environment, Food & Rural Affairs (DEFRA) in relation to a practical guide for minimising the impact of smoke from wood burning stoves on the environment and human health.
 - Consider burning less
 - Buy 'Ready to Burn' fuel
 - Season freshly chopped wood before burning (wet wood contains moisture which creates smoke and harmful particulates when burned).
 - If you use house coal, use approved solid fuels instead

- Do not burn treated waste wood (e.g., old furniture, pallets, or fence panels) or household rubbish
- Regularly maintain and service your stove (e.g annually)
- Get your chimney swept regularly (up to twice a year)

The above list is not exhaustive and is provided for information purposes. Further information can be found at the following link: [https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1901291307 Ready to Burn Web.pdf](https://uk-air.defra.gov.uk/assets/documents/reports/cat09/1901291307_Ready_to_Burn_Web.pdf)

Table of Contents

Executive Summary: Air Quality in Our Area	ii
Air Quality in North Lincolnshire	ii
Actions to Improve Air Quality	iv
Conclusions and Priorities	ix
Local Engagement and How to get Involved	xii
Table of Contents	xvi
Local Air Quality Management	1
Actions to Improve Air Quality	2
Air Quality Management Areas	2
Progress and Impact of Measures to address Air Quality in North Lincolnshire	4
PM _{2.5} – Local Authority Approach to Reducing Emissions and/or Concentrations	16
Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance	18
Summary of Monitoring Undertaken	18
Automatic Monitoring Sites	18
Non-Automatic Monitoring Sites	18
Individual Pollutants	19
Nitrogen Dioxide (NO ₂)	19
Particulate Matter (PM ₁₀)	19
Particulate Matter (PM _{2.5})	22
Sulphur Dioxide (SO ₂)	23
Appendix A: Monitoring Results	27
Appendix B: Full Monthly Diffusion Tube Results for 2020	50
Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC	53
QA/QC of Diffusion Tube Monitoring	58
Diffusion Tube Annualisation	58
Diffusion Tube Bias Adjustment Factors	59
NO ₂ Fall-off with Distance from the Road	60
QA/QC of Automatic Monitoring	60
PM ₁₀ and PM _{2.5} Monitoring Adjustment	63
Automatic Monitoring Annualisation	63
Appendix D: Map(s) of Monitoring Locations and AQMAs	65
Appendix E: Summary of Air Quality Objectives in England	69
Appendix F: Impact of COVID-19 upon LAQM	70
Impacts of COVID-19 on Air Quality within North Lincolnshire	71

Opportunities Presented by COVID-19 upon LAQM within North Lincolnshire	71
Challenges and Constraints Imposed by COVID-19 upon LAQM within North Lincolnshire	71
Glossary of Terms	74
References	75

Figures

Figure 1 – Wind direction and velocity for 2020.....	xi
Figure 2 – Air Quality in North Lincolnshire Website	xiii
Figure A.1– Trends in Annual Mean NO ₂ Concentrations: Automatic Monitoring (µg/m ³).....	31
Figure A.2 – Trends in Annual Mean NO ₂ Concentrations: Diffusion Tubes (µg/m ³)	35
Figure A.3 – Trends in Annual Mean PM ₁₀ Concentrations	38
Figure A.4 – Trends in Number of 24-Hour Mean PM ₁₀ Results > 50µg/m ³	40
Figure A.5 – Trends in Annual Mean PM _{2.5} Concentrations	42
Figure A.6 – Trends in Annual Mean Benzene Concentrations	45
Figure A.7 – Trends in PAH (Benzo(a)pyrene (B[a]P)) Concentrations	47
Figure D.1 – Monitoring locations within the Scunthorpe Town AQMA.....	65
Figure D.2 – Monitoring locations within North Lincolnshire	66
Figure D.3 – Diffusion tube monitoring locations within North Lincolnshire.....	68

Tables

Table 2.1 – Declared Air Quality Management Areas.....	3
Table 2.2 – Progress on Measures to Improve Air Quality	8
Table 3.1 – PHOF Indicator	22
Table A.1 – Details of Automatic Monitoring Sites.....	27
Table A.2 – Details of Non-Automatic Monitoring Sites	28
Table A.3 – Annual Mean NO ₂ Monitoring Results: Automatic Monitoring (µg/m ³)	30
Table A.4 – Annual Mean NO ₂ Monitoring Results: Non-Automatic Monitoring (µg/m ³).....	32
Table A.5 – 1-Hour Mean NO ₂ Monitoring Results, Number of 1-Hour Means > 200µg/m ³	36
Table A.6 – Annual Mean PM ₁₀ Monitoring Results (µg/m ³).....	37
Table A.7 – 24-Hour Mean PM ₁₀ Monitoring Results, Number of PM ₁₀ 24-Hour Means > 50µg/m ³	39
Table A.8 – Annual Mean PM _{2.5} Monitoring Results (µg/m ³).....	41
Table A.9 – SO ₂ 2020 Monitoring Results, Number of Relevant Instances.....	43
Table A.10 - Benzene Monitoring Results	44
Table A.11 – PAH (Benzo(a)pyrene (B[a]P)) Monitoring Results.....	46
Table A.12 – Heavy Metals Monitoring Results.....	48
Table B.1 – NO ₂ 2020 Diffusion Tube Results (µg/m ³)	50
Table C.1 – Bias Adjustment Factor.....	60
Table C.2 – Annualisation Summary (concentrations presented in µg/m ³)	64
Table C.3 – Local Bias Adjustment Calculation.....	64
Table E.1 – Air Quality Objectives in England	69
Table F.1 – Impact Matrix	73

Local Air Quality Management

This report provides an overview of air quality in North Lincolnshire 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 Lincolnshire 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.

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 in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by North Lincolnshire Council can be found in Table 2.1. The table presents a description of the AQMA that is currently designated within North Lincolnshire Council. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of the AQMA and also the air quality monitoring locations in relation to the AQMA. The air quality objectives pertinent to the current AQMA designation is as follows:

- PM₁₀ 24-hour mean;

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance: Declaration	Level of Exceedance: Current Year	Name and Date of AQAP Publication	Web Link to AQAP
Scunthorpe Town Air Quality Management Area	Declared 01/11/05, Amended 19/03/18	PM10 24 Hour Mean	An area encompassing the integrated steelworks site and a number of properties to the east of Scunthorpe	NO	95	30	Action Plan for the Scunthorpe Town AQMA – 2012	http://www.nlincsair.info/home/text/358

North Lincolnshire Council confirm the information on UK-Air regarding their AQMA(s) is up to date

North Lincolnshire Council confirm that all current AQAPs have been submitted to Defra

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

Defra's appraisal of last year's ASR concluded the report is well structured, detailed, and provides the information specified in the Guidance. Furthermore, the appraisal states that *"Overall the report is detailed, concise and satisfies the criteria of relevant standards. The Council should continue their good work."*

North Lincolnshire Council has taken forward a number of direct measures during the current reporting year of 2020 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2. Over 40 measures are included within Table 2.2, with the type of measure and the progress North Lincolnshire Council have made during the reporting year of 2020 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.2.

More detail on these measures can be found in their respective Action Plans. The current Air Quality Action Plan (AQAP) for the Scunthorpe Town AQMA is currently being updated to include new initiatives, some of which are detailed below and to take into account the amendment to the AQMA boundary in March 2018. The AQAP relies on the input from many different stakeholders including local industry. The process of updating the Action Plan is underway. It is anticipated that the updated AQAP will be published for consultation in the near future. The timing of this AQAP has been delayed as a result of uncertainty over the future of the Scunthorpe Steelworks during 2019-2020 and the COVID-19 pandemic.

Key completed measures are:

- The SIM cards have recently been replaced (March 2019) for all continuous monitoring sites to ensure the reliability of service in line with the North Lincolnshire Council Policy
- An application was made to DEFRA for grant funding to replace monitors at a site within the Scunthorpe Town AQMA
- The Air Quality Website contract has been retendered and extended to ensure

sufficient data management, ratification, and reporting services

- The service and maintenance contract has been retendered and extended to ensure continued operation of the air quality monitoring network
- Air pollution forecasting and exceedance reporting continues to be used to inform the activities of the operators on the Integrated Steel Works site
- Regular liaison with stakeholders and other interested bodies
- The Council continue to investigate complaints relating to emissions including dust and smoke and enforce as appropriate
- Environmental Permits will continue to be enforced and reviewed as required
- Development within the AQMA or affecting the AQMA continues to be reviewed
- The Environmental Protection Team continues to act as a consultee in relation to updates to North Lincolnshire Councils Local Plan and planning applications
- North Lincolnshire Council and the Environment Agency continue to produce monthly reports regarding air quality within the Scunthorpe Town AQMA

North Lincolnshire Council expects the following measures to be completed over the course of the next reporting year:

- Continued operation of the air quality monitoring network, making up to date data available for the public, regulators, and industry for information purposes
- Analyse the data and target areas where improvements are needed
- Actively engage with regulators and industry to seek improvements in air quality
- Produce monthly air quality reports in collaboration with the Environment Agency and distribute them to relevant stakeholders.
- Provide comments and input in relation to air quality and proposed development for the revised Local Plan
- Provide comments and input in relation to air quality and proposed development for planning consultations

- Undertake a cost benefit analysis of source apportionment and on-site monitoring of fugitive dust emissions in relation to the Scunthorpe Steelworks
- Apply for DEFRA Grant funding where appropriate
- Complete the Air Quality Action Plan for the Scunthorpe Town AQMA

These measures will ensure monitoring of air quality objectives is ongoing, with opportunities for improvements continually reviewed.

Any future Action Plan will use the format provided by DEFRA. Previous measures have not been assigned Key Performance Indicators or targets for a predicted pollution reduction; therefore, these are not reported in this report. In contrast to traffic related emissions, due to the sheer variety of sources, coupled with the unpredictable effect of meteorological conditions, it is extremely difficult to quantify the effectiveness of single proposed measures. Experience shows that it takes the coordinated impact of a number of actions to produce demonstrable improvements.

The principal challenges and barriers to implementation that North Lincolnshire Council anticipates facing are:

- The prevailing wind is predominantly from the south west direction as shown in Figure 1 of the Executive Summary. These winds impact directly upon local residents in Santon, as the Integrated Steel Works is located upwind of these south westerly winds. In cooperation with local industry the Council has, and continues to, encourage operators to predict in advance the weather conditions so that alterations can be made to their operational practices. This reduces the impact upon local residents, however this method relies to some extent upon management practices which are difficult to control.
- There are a number of emission sources and a number of different companies operating on the Integrated Steelworks Site rather than one single source. This requires collaboration on the part of local businesses and the Council.
- The majority of the Integrated Steel Works Site is regulated by the Environment Agency and therefore the Council has minimal regulatory control over these local businesses.

- The Council have no regulatory control over the monitoring and reduction of PAH (Benzo(a)pyrene (B[a]P)) emissions. They are not part of the Local Air Quality Management regime and the operations largely responsible for them (the Coke Ovens) are not regulated by the Council.

North Lincolnshire Council anticipates that the measures stated above and in Table 2.2 will achieve compliance in the Scunthorpe Town AQMA.

Whilst the measures stated above and in Table 2.2 will help to contribute towards compliance, North Lincolnshire Council anticipates that further additional measures not yet prescribed, will be required in subsequent years to achieve compliance and enable the revocation of the Scunthorpe Town AQMA.

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated/ Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated cost of Measure	Measure Status	Reduction in Pollutant/ Emissions from Measure	Key Performance Indicator	Progress to Date	Comments/ Barriers to Implementation
A1	Maintain network of PM10 analysers	Other	Other	2004 - present	To Continue	NLC	NLC, British Steel	NO	Not Funded	£10k - 50k	Completed			Ongoing	The network maintains focus on AQ issues and enables the Council to measure the effectiveness of any schemes.
A2	Boundary monitoring of PM10, PM2.5, PM1 and Total Suspended Particles at Permitted sites AQMA	Other	Other	2010	2015	NLC	NLC	NO	Not Funded	< £10k	Completed			Complete	This monitoring, completed in 2015, allowed greater analysis and identification of sources. Subsequent improvements in the level of PM10 at Santon are largely due to actions taken as a result of this monitoring exercise.
A3	Traffic count and visual observations at Santon to assess likely contribution from re-suspended road dust.	Traffic Management	Other	2008	Complete	NLC	NLC	NO	Not Funded	< £10k	Completed			Complete	
A4	Environmental Permit Improvement Programme. British Steel to undertake an investigation to monitor and quantify point source and fugitive particulate matter including PM10 and PM2.5 emissions from the BOS Plant, Sinter Plant, Blast Furnaces, Appleby/ Dawes Lane Coke Ovens point source emissions and associated activities.	Environmental Permits	Other measure through permit systems and economic instruments	2008	Complete	British Steel, EA	British Steel	NO	Not Funded	£10k - 50k	Completed			Complete	
A5	Study into a local TEOM to Partisol correction factor. Consideration of alternative measurements techniques or correction factors as developed.	Other	Other	2008 - 2014	Complete	NLC	NLC	NO	Not Funded	£10k - 50k	Completed			Complete	The Partisol monitor was removed in December 2014. There are no current plans to use this monitor again

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated/ Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated cost of Measure	Measure Status	Reduction in Pollutant/ Emissions from Measure	Key Performance Indicator	Progress to Date	Comments/ Barriers to Implementation
A6	Environmental Permit Improvement Programme. British Steel shall assess the monitoring data to identify process areas/outside influences making significant contribution (short and/or long term) to the pollutant levels measured.	Environmental Permits	Other measure through permit systems and economic instruments	2008	Complete	British Steel, EA	N/A	NO	Not Funded	< £10k	Completed			Complete	
A7	Environmental Permit Improvement Programme. British Steel to review annually the emissions to air impact assessment and amend as necessary following progressive completion of relevant improvement programme requirements.	Environmental Permits	Other measure through permit systems and economic instruments	2008	Complete	British Steel, EA	N/A	NO	Not Funded	< £10k	Completed			Complete	
A8	Environmental Permit Improvement Programme. British Steel to formulate an air quality management plan for the installation aimed at reducing the impact of pollutants emitted from the installation and ensuring it does not significantly contribute to breaches of the national Air Quality Strategy standards/objectives or EU Directive Limits.	Environmental Permits	Other measure through permit systems and economic instruments	2009	Complete	British Steel, EA	N/A	NO	Not Funded	< £10k	Completed			Complete	
B1	Maintain North Lincolnshire air quality website with: <ul style="list-style-type: none"> • Access to real time & historical data. • Production of graphs and pollution roses. • Access to air quality reports and latest news updates. • General information. 	Public Information	Via the Internet	2008 - present	To continue	NLC	NLC	NO	Not Funded	£10k - 50k	Completed			Ongoing	The council has operated a dedicated air quality website since 2008, a new contract has recently been retendered to ensure it continues

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated/ Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated cost of Measure	Measure Status	Reduction in Pollutant/ Emissions from Measure	Key Performance Indicator	Progress to Date	Comments/ Barriers to Implementation
B2	Review existing methods of communication of real time data to the public and consider alternatives to internet access.	Public Information	Other	2008 - present	Complete	NLC		NO	Not Funded	< £10k	Completed			Complete	Internet remains the preferred communication method for air quality information
B3	Investigate the potential for air pollution forecasting in Scunthorpe	Environmental Permits	Other measure through permit systems and economic instruments	2009 - present	2022	NLC	NLC	NO	Not Funded	£10k - 50k	Planning			This will be reviewed as part of any future upgrades to the website.	Pollution forecasting is undertaken by operators on the integrated steelworks site.
B4	Provide information to the public through publicity campaigns about how they can improve air quality from domestic situation e.g., bonfires and heating fuels	Public Information	Other	2008 - present	2022	NLC	NLC	NO	Not Funded	< £10k	Implementation			Further campaigns will be developed as appropriate.	Issue-specific campaigns have previously been undertaken using the internet, local press, and council publications.
C1	Raise profile & encourage attendance at organised community bonfire celebrations rather than individual bonfires	Public Information	Other	2008	To continue	NLC	NLC	NO	Not Funded	< £10k	Implementation			Ongoing	
C2	Conduct a publicity campaign advising commercial organisations about their legal obligations in relation to their waste, with particular reference to burning of trade waste	Public Information	Via leaflets	2008 - present	Complete	NLC	NLC	NO	Not Funded	< £10k	Completed			These leaflets are still distributed to companies during complaint investigations.	The Council has produced a leaflet and delivered it to businesses, including all within the Scunthorpe AQMA. .
C3	Complaints in respect of dust and smoke from commercial premises (not regulated under the Environmental Permitting regime) will be investigated as a priority and enforcement action taken in accordance with the enforcement policy.	Other	Other policy	Ongoing	To continue	NLC	N/A	NO	Not Funded	< £10k	Implementation			Ongoing	Enforcement action is taken against those contravening the Environmental Protection Act 1990 and Clean Air Act 1993

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated/ Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated cost of Measure	Measure Status	Reduction in Pollutant/ Emissions from Measure	Key Performance Indicator	Progress to Date	Comments/ Barriers to Implementation
C4	Identify current road sweeping schedules within the Scunthorpe AQMA and realign schedules as appropriate to minimise re-suspended dust emissions from areas such as Brigg Road.	Transport Planning and Infrastructure	Other	2009	Complete	NLC	NLC	NO	Not Funded	< £10k	Completed			Complete	
C5	Conduct a publicity campaign advising local residents the implications of living in a domestic smoke control area and encourage people to complain if they are affected by smoke from domestic chimneys.	Public Information	Via the internet	2008	To continue	NLC	NLC	NO	Not Funded	< £10k	Completed			Complete	A publicity campaign was launched authority-wide in 2008. This information is currently available on the council's website and residents are advised as required
C6	Complaints in respect of domestic smoke control will be investigated as a priority and enforcement action taken in accordance with the enforcement policy.	Other	Other policy	Ongoing	To continue	NLC	N/A	NO	Not Funded	< £10k	Implementation			Ongoing	Enforcement action is taken against those contravening legislation
D1	The Council will organise strategic air quality management meeting with other relevant organisations with an interest in air quality issues, including the Health Protection Agency, Primary Care Trust, and the Environment Agency. The purpose of the group will be to identify key air quality issues and agree measures for reduction.	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2008	To continue	NLC, HPA, PCT, EA	N/A	NO	Not Funded	< £10k	Implementation			Ongoing	
D2	Set up a Local Industry Forum involving the Environment Agency, North Lincolnshire Council and Local Industry representatives with the potential to emit PM10. The purpose of the group is to identify key issues, agree measures for reduction of PM10	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2007 - present	To continue	NLC, Local Industry	N/A	NO	Not Funded	< £10k	Implementation			Complete	

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated/ Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated cost of Measure	Measure Status	Reduction in Pollutant/ Emissions from Measure	Key Performance Indicator	Progress to Date	Comments/ Barriers to Implementation
D3	Formulate an industry overview for the integrated steelworks site. Identifying process areas, haul routes, vehicle flows and operating hours to consider in conjunction with monitoring data. Identify areas of responsibility within general areas of the steelworks site, areas outside the permit regime and regulatory responsibility for the same.	Environmental Permits	Other	2010	Complete	NLC		NO	Not Funded	< £10k	Completed			Complete	
D4	Continue to lobby central government in relation to permitting of mobile plants and look to identify improved mechanisms of regulation and enforcement.	Environmental Permits	Other measure through permit systems and economic instruments	2008	Complete	NLC		NO	Not Funded	< £10k	Completed			Complete	
D5	Ensure that the requirements of the Environmental Permitting regime are appropriately enforced with inspections prioritised on a risk basis taking account of PM10 emissions.	Environmental Permits	Other measure through permit systems and economic instruments	2008 - present	To continue	NLC		NO	Not Funded	< £10k	Implementation			Ongoing	
D6	Ensure permits issued under the Environmental Permitting Regulations are reviewed in accordance with guidance, with particular attention to processes within the AQMA with the potential to emit PM10.	Environmental Permits	Other measure through permit systems and economic instruments	2008 - present	To continue	NLC		NO	Not Funded	< £10k	Implementation			Ongoing	
D7	Work with local industry and EA towards the development of relevant measurable indicators of changes in significant emissions of PM10.	Environmental Permits	Other	2009	To continue	NLC, EA, Industry		NO	Not Funded	< £10k	Implementation			Ongoing	Daily pollution episodes are identified and action is taken to review the cause and analyse the process contribution.

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated/ Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated cost of Measure	Measure Status	Reduction in Pollutant/ Emissions from Measure	Key Performance Indicator	Progress to Date	Comments/ Barriers to Implementation
D8	Work with local industry and EA to develop targets for the reduction of the area covered by the AQMA so that the number of properties affected will be reduced.	Other	Other	2008	2018	NLC, EA, Industry		NO	Not Funded	< £10k	Completed			Complete	The Low Santon AQMA (PM10 annual mean) was revoked in 2018. The Scunthorpe Town AQMA was reduced in size in 2018. This was as a result of the 2016 Detailed Assessment.
E1	The impact of development within the Air Quality Management Area shall be considered in relation to air quality. Exposure of new receptors or the introduction of significant new sources of PM10 will need to be appropriately addressed until such time as action E2 has been completed.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Ongoing	To continue	NLC		NO	Not Funded	< £10k	Implementation			Ongoing	The Environmental Protection Team reviews all planning applications. Advice is given to applicants and Development Control colleagues based on current air quality data.
E2	Develop a Supplementary Planning Document (SPD), which identifies the constraints and mitigation to development within the Air Quality Management Area	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2017	2023	NLC		NO	Not Funded	< £10k	Planning			Ongoing	A draft SPD has been prepared, however this will need reviewing to reflect the proposed AQMA changes. It is likely that the SPD will be completed following the Action Plan review.
F1	Review new and existing development sites, to monitor the impact of road, rail, air and water traffic and their emission levels.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	Ongoing	To continue	NLC		NO	Not Funded	< £10k	Implementation			Ongoing	The Environmental Protection Team reviews all planning applications. These are looked at on a case by case basis and impact upon local air quality and residential amenity are examined.
F2	Implementing bus priority measures as appropriate at new residential developments to help ensure that public transport is a quicker and more direct transport than the car	Traffic Management	Strategic highway improvements	2012	N/A	NLC		NO	Not Funded	< £10k	Aborted			Stopped	This requirement is considered by other departments within the Council as part of the Planning regime.

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated/ Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated cost of Measure	Measure Status	Reduction in Pollutant/ Emissions from Measure	Key Performance Indicator	Progress to Date	Comments/ Barriers to Implementation
F3	Improving facilities for pedestrians and cyclists, school and workplace travel planning, implementation of school safety zones, bus and infrastructure enhancements and simplification of the network, ticketing in Scunthorpe and the main rural routes and managing our car parks and tariff structure.	Traffic Management	Strategic highway improvements	2011-2026	To continue	NLC		NO	Not Funded	< £10k	Aborted			Stopped, incorporated in other Strategy	The implementation of this action is incorporated within the Council's current Local Transport Plan. Full details are available at the following website: https://www.northlincs.gov.uk/transport-and-streets/roads-highways-and-pavements/local-transport-plan-2011-2026/
F4	Implementation of an urban traffic control (UTC) system to assist the traffic manager in delivering a smoother flow of traffic in the urban area of Scunthorpe and reduce levels of congestion.	Traffic Management	UTC, Congestion management, traffic reduction	2012	N/A	NLC	NLC	NO	Not Funded	£100k - £500k	Aborted			Stopped	This scheme is not currently being pursued.
F5	Reducing incidents of dangerous driving and enforcing compliance with speed limits to maintain a smooth flow of traffic and minimise sudden braking acceleration	Traffic Management	Other	2012	To continue	NLC		NO	Not Funded	< £10k	Implementation			Ongoing	The North Lincolnshire Road Safety Partnership was established to; Significantly reduce the numbers of people killed and seriously injured on roads in North Lincolnshire, raise public awareness of road safety issues, encourage safer driving behaviour.
F6	Continued enforcement of speed limits and driving standards	Traffic Management	Other	Ongoing	To continue	NLC		NO	Not Funded	< £10k	Implementation			Ongoing	
F7	Working with operators to encourage the replacement of vehicles to the latest European emission standards wherever possible	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	Ongoing	To continue	NLC	NLC, Operators	NO	Not Funded	< £10k	Implementation			Ongoing	North Lincolnshire Council and local bus operators are part of a Quality Partnership. Operators are encouraged to use vehicles that meet these standards. The two largest operators in the Authority area currently use vehicles that meet the latest standards and it is also a contractual obligation for school bus routes.

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated/ Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated cost of Measure	Measure Status	Reduction in Pollutant/ Emissions from Measure	Key Performance Indicator	Progress to Date	Comments/ Barriers to Implementation
F8	Reduce traffic flows through promotion of sustainable travel and demand management measures	Traffic Management	UTC, Congestion management, traffic reduction	Ongoing	To continue	NLC		NO	Not Funded	< £10k	Aborted			Stopped, incorporated in other Strategy	The implementation of this action is incorporated within the Council's current Local Transport Plan.
Draft AQAP additional measure	Improve PM analysers where funding is available	Other	Other	2021	2023	NLC	NLC, grant funding if available	NO	Not Funded	£100k - £500k	Planning				Significant financial implications
Draft AQAP additional measure	Assess the feasibility and benefits of undertaking an assessment for source apportionment of emissions from local industry	Environmental Permits	Measures to reduce pollution through IPPC Permits going beyond BAT	2019	2023	NLC, EA		NO	Not Funded	£50k - £100k	Planning				Reviewed a similar scheme at a different steelworks within the UK. In discussions with the Environment Agency in relation to feasibility.
Draft AQAP additional measure	Continue to circulate air quality exceedance episode information including concentration levels, data capture rates and other relevant information to regulators and operators	Other	Other	2016	To continue	NLC	NLC	NO	Not Funded	< £10k	Completed				Joint working between local industry and regulators to share information pertinent to air quality impacts.
Draft AQAP additional measure	Encourage the inclusion of electric vehicle infrastructure in new developments	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2017	To continue	NLC	N/A	NO	Not Funded	< £10k	Completed				Ongoing consultee for planning applications
Draft AQAP additional measure	Ensure robust Local Plan Policies in relation to air quality are implemented	Policy Guidance and Development Control	Other policy	2018	2022	NLC	N/A	NO	Not Funded	< £10k	Implementation				North Lincolnshire Council's Local Plan is to be updated in the near future. Air quality policies will be incorporated as part of this update.
Draft AQAP additional measure	North Lincolnshire Council Fleet Improvement	Promoting Low Emission Transport	Other	Ongoing	To continue	NLC	NLC	NO	Not Funded	£50k - £100k	Planning			Increased number of low emission vehicles in Councils fleet	Dependant on feasibility
Draft AQAP additional measure	Upgrade modems at monitoring stations to 3G/4G or better	Other	Other	2021	2023	NLC	NLC	NO	Not Funded	< £10k	Planning				To improve data capture rates further. Reduce the number of officer visits to site to reset modems.

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.

Due to the proportion of PM_{2.5} contained within the PM₁₀ suspension, a reduction in PM₁₀ should see a reduction in PM_{2.5}. In addition, North Lincolnshire Council is taking the following measures to address PM_{2.5}:

- Maintaining a network of particulate analysers, including monitoring of PM_{2.5} at two locations across North Lincolnshire during 2020 including South Ferriby, and East Common Lane which is within the Scunthorpe AQMA.
- Environmental Permit improvement programmes.
- Campaigns to discourage waste burning and bonfires.
- Liaison with Industry, Health Professionals, and the Environment Agency to initiate improvements and share good practice.
- Transport improvement schemes.
- Public transport and fleet improvements, such as encouraging uptake of electric vehicles to replace older more polluting vehicles.

Operators on the Integrated Steelworks site actively participate in a number of measures that would reduce particulate emissions, including PM_{2.5} including the following:

- Reduction of speed limits.
- A targeted road sweeping scheme.
- Improved dust mitigation methods, such as dampening down of roadways and the

closure of external doors when not in use.

- Road surfacing and landscaping improvements.
- Improvements in manual handling and storage methods.
- Email notification to site operators when a high particulate emission day is predicted to allow changes in activities.

North Lincolnshire Council applied to DEFRA for Grant Funding for the Air Quality Grant 2017-18. The application included a public engagement campaign for the 16 Smoke Control Orders in North Lincolnshire declared between 1959 – 1981. The following areas are assigned as Smoke Control Areas and are home to approximately 35,000 residential properties: Scunthorpe, Bottesford, Burringham, Flixborough and Gunness. The aim of the campaign was to provide information to over 35,000 residents living within the Smoke Control Areas. The campaign will highlight the methods of reducing the environmental impact whilst using wood burning stoves with reference to DEFRA's recently published information leaflet entitled 'Open fires and Wood Burning Stoves – A practical guide.' It will also include information relating to the legal duty of using authorised fuels in an exempt appliance and where information on what fulfils this requirement can be found.

Unfortunately, the grant bid was unsuccessful and current financial constraints are likely to prevent progression of this scheme. However, North Lincolnshire Council has provided up to date advice on our website, in relation to wood burning stoves, Smoke Control Areas and air pollution. In addition, information has been circulated to residents in a local publication (News Direct), to raise awareness in relation to the use of wood burning stoves and how best practice, such as burning dry wood and having chimneys swept can reduce air pollution.

The updated Air Quality Action Plan will target reductions in PM₁₀ concentrations within the Scunthorpe Town AQMA. This will therefore also incorporate measures to reduce PM_{2.5} within the area.

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

This section sets out the monitoring undertaken within 2020 by North Lincolnshire 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

Automatic Monitoring Sites

North Lincolnshire Council undertook automatic (continuous) monitoring at 7 sites during 2020. Table A.1 in Appendix A shows the details of the automatic monitoring sites. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. The <https://nlincsair.info/> page presents automatic monitoring results for North Lincolnshire Council with automatic monitoring results also available through the UK-Air website.

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

Non-Automatic Monitoring Sites

North Lincolnshire Council undertook non- automatic (i.e. passive) monitoring of NO₂ at 22 sites during 2020. Table A.2 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.

Nitrogen Dioxide (NO₂)

Table A.3 and Table A.4 in Appendix A compare the ratified and adjusted monitored NO₂ annual mean concentrations for the past five years with the air quality objective of 40µg/m³. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 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.

Table A.5 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past five years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year.

For 2020, there were no exceedances of the air quality objective for the annual mean (>40µg/m³), or of the hourly mean (200µg/m³, not to be exceeded more than 18 times per year) for nitrogen dioxide.

Particulate Matter (PM₁₀)

Particulate Matter (PM₁₀) is fine particles measuring 10 microns in diameter. These particles are from varying sources, these include:

- Combustion from industry and road traffic emissions.
- Secondary sources of the pollutant such as chemical reactions in the atmosphere.

- Coarser particles from tertiary sources, such as, suspended dusts, natural salts, biological particles, and construction work.

PM₁₀ is known to have varied health effects. The size of the particles allow them to enter the lungs and be carried around in the blood to the rest of body. When in the lungs the particles can cause irritation and inflammation, particularly of those with underlying conditions and vulnerable groups. There is also evidence that these fine particles may cause dementia and could carry cancer causing compounds into the body.

A large contributor of PM₁₀ emissions in Scunthorpe is from the Integrated Steel Works site. These are both fugitive and diffuse emission sources which are both defined in the Iron and Steelmaking BREF document as follows:

- Diffuse emissions occur during regular operation such as coal and coke handling, transport of coal and coke, coal blending beds, ascension pipes, coke pushing, coke quenching; if not captured they can be released by the roof, roof hatch, window or from stored material.
- Fugitive emissions happen during irregular operation from leakages at the battery, e.g. because of leakage of vessels, oven doors, flanges etc. or at the by product plant.

In 2020 the Council monitored PM₁₀ at 7 sites. At two of these sites, Scunthorpe Town AURN (site ID: CM1) and Low Santon (site ID: CM3) a BAM/FDMS monitor was co-located with a TEOM.

The FDMS monitoring system is a more accurate method of measuring PM₁₀, the results for these are reported uncorrected. The Standard TEOM data is required to be corrected to compensate for volatile particulate loss from the higher operating temperatures of the equipment. Details on the correction method are found in Appendix C.

The continued operation of the TEOM monitors at Scunthorpe Town and Low Santon is to allow for data trends at sites with FDMS/BAM monitors.

PM₁₀ data for Osiris monitors located at South Ferriby (site ID: CM7) is included within this report, however Osiris monitors do not meet the standard for the European reference method for particulate monitoring within the UK and the results should be treated with caution. The Council deploys Osiris monitors to monitor PM₁₀ for a specific project: the South Ferriby Monitor has been located at the request of a Local Environmental Liaison Committee to monitor emissions from a cement plant which local residents believe is responsible for spikes of PM₁₀. The South Ferriby Osiris monitor was removed in December 2020 due to the closure of the cement plant. There have been no breaches of air quality objectives to date at this location.

In relation to the Amvale TEOM, this site is within the boundary of a commercial premises and is therefore not relevant to public exposure. An Osiris instrument was installed on site in October 2010 as an indicative tool to establish concentrations of PM₁₀ and PM_{2.5} and to help inform the decision making process as a planning application for a large housing development in close proximity to site had been made. Following a review of the initial findings it was agreed that a TEOM instrument should be installed on site for measuring PM₁₀ concentrations. During 2020 this site recorded elevated PM₁₀ concentrations with 30 exceedance days recorded, the data capture was below 85% and a 90.4th percentile of 24 hour means has been provided as 51ug/m³. This is a sharp increase from previous years and may be, in part, due to construction activities in relation to the development of retail units in close proximity to the site. North Lincolnshire Council will continue to monitor at this location and monitor trends in concentrations.

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past five years with the air quality objective of 40µg/m³.

Table A.7 in Appendix A compares the ratified continuous monitored PM₁₀ daily mean concentrations for the past five years with the air quality objective of 50µg/m³, not to be exceeded more than 35 times per year.

In 2020 there were no recorded exceedances of the annual mean ($40\mu\text{g}/\text{m}^3$) and the 24 hour mean ($50\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times a year) air quality objectives for PM_{10} .

Particulate Matter ($\text{PM}_{2.5}$)

$\text{PM}_{2.5}$ is particulate matter that is less than 2.5 microns in diameter. The sources for this are similar for the PM_{10} pollutant as listed above.

This pollutant was measured using Osiris monitors at East Common Lane (CM2) and South Ferriby.

The Council recognises that Osiris monitors do not meet the standard for the European reference method for particulate monitoring within the UK, however data from the Osiris monitors is included within this report as no other $\text{PM}_{2.5}$ monitoring method is available to the Council at this time.

The Public Health Outcomes Framework (PHOF) is a Department of Health data tool for England; it is intended to focus public health action on increasing healthy life expectancy and reducing the difference in life expectancy between communities. The tool uses indicators to assess improvements. The PHOF includes an indicator, based on the effect of particulate matter ($\text{PM}_{2.5}$) on mortality. This is replicated in Table 3.1 below:

Table 3.1 – PHOF Indicator

3.01 Fraction of mortality attributable to particulate air pollution	
Rationale	<p>Poor air quality is a significant public health issue. The burden of particulate air pollution in the UK was estimated to be equivalent to nearly 29,000 deaths in 2008 at typical ages and associated loss of population life of 340,000 life years lost.</p> <p>Inclusion of this indicator in the Public Health Outcomes Framework will enable Directors of</p>

	Public Health to prioritise action on air quality in their local area to help reduce the health burden from air pollution.
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Further information in relation to this indicator can be found at the following link: [Public Health Outcomes Framework - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/public-health-outcomes-framework)

For North Lincolnshire, the fraction of mortality attributable to particulate air pollution is 4.9%. The main objective of the PHOF is to raise awareness of the effect of air pollution on public health. It is intended to encourage promotion of the need for local, regional, and national actions to reduce air pollution and to help form a partnership between all delivery partners in pursuit of this goal.

Table A.8 in Appendix A and Figure A.5 presents the ratified and adjusted monitored PM_{2.5} annual mean concentrations for the past five years.

In 2020 there were no recorded exceedances of the annual mean (25µg/m³) air quality target value for PM_{2.5}.

Sulphur Dioxide (SO₂)

UK emissions of SO₂ are dominated by combustion of fuels containing sulphur, such as coal and heavy oils. SO₂, even in smaller concentrations is known to cause reduced lung function in asthmatics and higher concentrations can cause asthma sufferers to require hospital treatment.

Monitoring of SO₂ was undertaken at the following three sites in North Lincolnshire during 2020:

- Scunthorpe Town AURN (CM1)
- Low Santon (CM3)
- Killingholme School (CM6)

Table A.9 in Appendix A compares the ratified continuous monitored SO₂ concentrations for 2020 with the air quality objectives for SO₂.

In 2020 there were no recorded exceedances of the 15 minute mean (266µg/m³ not to be exceeded more than 35 times a year), 1 hour mean (350µg/m³ not to be exceeded more than 24 times a year) and 24 hour mean (125µg/m³ not to be exceeded more than 3 times a year) air quality objectives for sulphur dioxide.

Benzene

Benzene is an elementary petrochemical, mainly sourced from the combustion of petrol with industrial combustion also contributing. Benzene exposure has been linked to increases in the risks of cancer, liver diseases and other conditions.

The annual mean objective for Benzene is 5µg/m³. This was not exceeded in 2020 as the annual mean recorded at Scunthorpe Town AURN in 2020 was 0.87µg/m³.

Monitoring results are displayed in Table A.10 in Appendix A and Figure A.6.

In 2020 there were no recorded exceedances of the annual mean (5µg/m³) air quality objective for benzene.

PAH (Benzo(a)pyrene (B[a]P))

The local monitoring network is to provide PAH (Benzo(a)pyrene (B[a]P)) concentration information at Scunthorpe Town and Low Santon. Measurement of Solid Phase PAH (Benzo(a)pyrene (B[a]P)) samples are of the PM₁₀ fraction of ambient air. These concentrations are measured over a period of 24 hours on a filter using Digitel DHA-80 samplers with automatic filter changes. The collection of this data enable the assessment of current concentrations of PAH (Benzo(a)pyrene (B[a]P)) for assessment against the National Air Quality Objective for PAH (annual mean of 0.25 ngm⁻³ Benzo(a)pyrene (B[a]P) in ambient air) published in the UK Air Quality Strategy. Also to enable demonstration of the UK's compliance with the Fourth Air Quality Daughter Directive (target value of 1 ngm⁻³ for the annual mean concentration of B[a]P), the OSPAR convention and the UNECE Convention on Long Range Transboundary Air Pollutants.

Polycyclic Aromatic Hydrocarbons (PAHs) are persistent organic compounds some of which are proven carcinogens or toxic. These arise due to the incomplete combustions of fossil fuels from vehicles, industry, and residential sources.

Historically North Lincolnshire recorded some of the highest levels of PAH (Benzo(a)pyrene (B[a]P)) in the United Kingdom. This was principally due to the two coke ovens on the Integrated Steelworks Site. However, the closure of the Dawes Lane Coke Ovens and improvements at the Appleby Coke Ovens has seen a reduction of PAH (Benzo(a)pyrene (B[a]P)) emissions in recent years. This downward trajectory in PAH (Benzo(a)pyrene (B[a]P)) concentrations has continued for Low Santon and reduced significantly at Scunthorpe Town for the year 2020 compared to 2019. PAH (Benzo(a)pyrene (B[a]P)) emissions are not part of the Local Air Quality Management regime and the operations largely responsible for them – the coke ovens – are not regulated by the Council.

The European Community's fourth Air Quality Daughter Directive (2005/107/EC) specifies a target value of 1 ng/m³ for the annual mean concentration of benzo[a]pyrene as a representative PAH (Benzo(a)pyrene (B[a]P)), to be achieved by 2012. The National Air Quality Objective for PAH (Benzo(a)pyrene (B[a]P)) levels is 0.25ng/m³.

In 2020 the annual average for Scunthorpe Town AURN was 0.64ng/m³, and for Low Santon it was 0.84 ng/m³. With this in mind, the EU Target Value was complied with at both sites and the National Air Quality Objective was exceeded at both sites. Overall, however, there has been a significant decline in the emissions at these monitoring sites in recent years.

Table A.11 in Appendix A presents the monthly PAH (Benzo(a)pyrene (B[a]P)) data for the year 2020 at Scunthorpe Town and Low Santon.

Figure A.7 in Appendix A shows the trend in PAH (Benzo(a)pyrene (B[a]P)) annual mean concentrations from 2016 to 2020 at Scunthorpe Town and Low Santon.

Heavy Metals

The Heavy Metals network records concentrations of heavy metals in air near industrial sources and areas of population. The Heavy Metals network now forms the basis of the UK's compliance monitoring for:

- The Air Quality Directive (2008/50/EC) which provides a Limit Value for lead concentration in air of $0.5 \mu\text{g}/\text{m}^3$, expressed as an annual mean.
- The 4th Air Quality Daughter Directive (2004/107/EC), which sets target values for arsenic, cadmium, nickel (and polycyclic aromatic hydrocarbons) in the PM_{10} particulate fraction of ambient air.

Table A.12 in Appendix A presents the heavy metals data for the year 2020 at Scunthorpe Town and Low Santon.

In 2020 there were no exceedances of the target or limit values for heavy metals.

Appendix A: Monitoring Results

Table A.1 – Details of 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?	Monitoring Technique	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Inlet Height (m)
CM1	Scunthorpe Town AURN	Industrial	490320	410831	SO ₂ , NO ₂ , PM ₁₀	YES, Scunthorpe Town AQMA	Chemiluminescent, Fluorescent, BAM & TEOM	21	7	2
CM2	East Common Lane	Urban background	490663	409789	PM ₁₀ , PM _{2.5}	YES, Scunthorpe Town AQMA	TEOM & Osiris	3	28	1.5
CM3	Low Santon	Industrial	492945	411931	SO ₂ , NO ₂ , PM ₁₀	YES, Scunthorpe Town AQMA	Chemiluminescent, Fluorescent, FDMS & TEOM	41	5	2
CM4	Amvale	Industrial	491343	408782	PM ₁₀	YES, Scunthorpe Town AQMA	TEOM	150	100	1.5
CM5	High Street East	Industrial	490224	411301	PM ₁₀	YES, Scunthorpe Town AQMA	TEOM	18	10	1.5
CM6	Killingholme School	Other	514880	416133	SO ₂ , NO ₂ , PM ₁₀	NO	Chemiluminescent & TEOM	9	N/A	2
CM7	South Ferriby	Other	497931	420993	PM ₁₀ , PM _{2.5}	NO	Osiris	10	45	1.5

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 – 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	Frodingham Road	Urban Background	489099	411723	NO2	NO	3.0	1.0	No	2
2	Scotter Road (North side of roundabout)	Roadside	487239	411259	NO2	NO	9.0	2.0	No	2
3	B & Q	Roadside	486699	411110	NO2	NO	2.0	15.0	No	2
4	Hilton Ave	Roadside	486928	411156	NO2	NO	12.0	3.0	No	2
5	Britannia Corner	Urban Background	489190	411285	NO2	NO	4.0	2.0	No	2
6	Oswald Road	Urban Background	489209	411118	NO2	NO	4.0	3.0	No	2
7	Queensway Pub	Roadside	489172	409926	NO2	NO	20.0	2.0	No	2
8	Ashby Road	Roadside	489112	409463	NO2	NO	15.0	1.0	No	2
9	Queensway	Roadside	491628	408658	NO2	NO	16.0	2.0	No	2
10	Mortal Ash Hill	Roadside	491838	408641	NO2	YES, Scunthorpe Town AQMA	15.0	9.0	No	1.5
11	Front of Ashby Lodge Pub	Roadside	491859	408645	NO2	YES, Scunthorpe Town AQMA	1.0	9.0	No	2
12	Barnard Avenue Brigg	Roadside	499975	407421	NO2	NO	30.0	3.0	No	2

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)
13	Ulceby Road Killingholme	Roadside	514573	415901	NO2	NO	15.0	1.0	No	2
14	School Road Killingholme	Roadside	514782	415971	NO2	NO	15.0	1.0	No	2
15	Humber Rd Chip shop	Urban Background	515452	416107	NO2	NO	2.0	15.0	No	2
16	Humber Rd	Roadside	515279	416085	NO2	NO	5.0	2.0	No	2
17	Holydyke Barton	Suburban	503048	421907	NO2	NO	15.0	1.0	No	2
18	Rowland Road AQ station	Industrial	490316	410837	NO2	YES, Scunthorpe Town AQMA	21.0	6.0	Yes	2
19	Rowland Road AQ station	Industrial	490316	410837	NO2	YES, Scunthorpe Town AQMA	21.0	6.0	Yes	2
20	Rowland Road AQ station	Industrial	490316	410837	NO2	YES, Scunthorpe Town AQMA	21.0	6.0	Yes	2
21	ASDA Carlton Street	Roadside	490080	411258	NO2	YES, Scunthorpe Town AQMA	20.0	1.0	No	2
22	East Halton Road Killingholme	Roadside	514141	417483	NO2	NO	4.0	1.0	No	2

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.3 – Annual Mean NO₂ Monitoring Results: Automatic Monitoring (µg/m³)

Site 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
CM1	490320	410831	Industrial	N/A	96.0%	17	16	18	15	13
CM3	492945	411931	Industrial	N/A	98.9%	19	18	20	19	20
CM6	514880	416133	Other	N/A	95.0%	17	17	18	15	13

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

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

Notes:

The annual mean concentrations are presented as µg/m³.

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

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

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

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

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

Figure A.1– Trends in Annual Mean NO2 Concentrations: Automatic Monitoring (µg/m3)

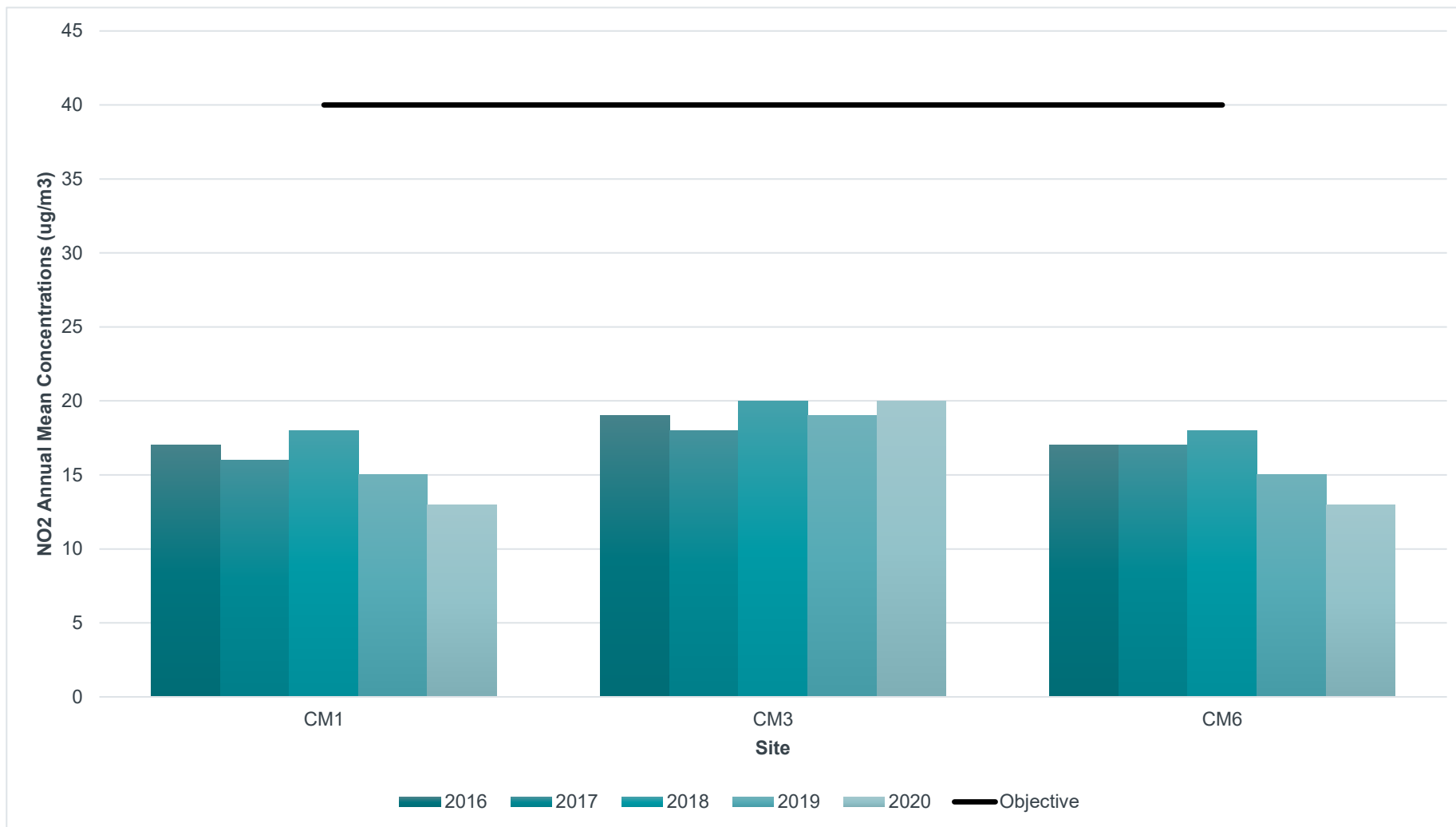


Table A.4 – Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring (µg/m³)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2020 (%) ⁽²⁾	2016	2017	2018	2019	2020
1	489099	411723	Urban Background	N/A	49.9	25	21	19	21	23.8
2	487239	411259	Roadside	N/A	100.0	28	24	24	24	21.5
3	486699	411110	Roadside	N/A	100.0	20	22	19	18	17.5
4	486928	411156	Roadside	N/A	100.0	24	22	20	20	19.0
5	489190	411285	Urban Background	N/A	100.0	25	26	24	24	21.5
6	489209	411118	Urban Background	N/A	100.0	27	24	23	24	21.5
7	489172	409926	Roadside	N/A	100.0	27	25	24	22	21.2
8	489112	409463	Roadside	N/A	100.0	29	27	25	26	22.5
9	491628	408658	Roadside	N/A	100.0	21	19	19	20	17.8
10	491838	408641	Roadside	N/A	100.0	38	35	34	34	28.5
11	491859	408645	Roadside	N/A	100.0	20	22	20	20	20.7
12	499975	407421	Roadside	N/A	92.1	26	26	20	20	17.1
13	514573	415901	Roadside	N/A	84.9	31	20	17	17	18.2

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
14	514782	415971	Roadside	N/A	100.0	31	27	28	29	26.4
15	515452	416107	Urban Background	N/A	100.0	21	19	20	18	16.6
16	515279	416085	Roadside	N/A	100.0	26	25	26	25	23.4
17	503048	421907	Suburban	N/A	100.0	23	22	20	21	17.6
18	490316	410837	Industrial	N/A	92.1	17	16	16	15	13.7
19	490316	410837	Industrial	N/A	100.0	17	15	16	15	13.4
20	490316	410837	Industrial	N/A	75.1	17	15	15	15	13.7
21	490080	411258	Roadside	N/A	100.0	23	22	21	22	19.4
22	514141	417483	Roadside	N/A	100.0			21	21	22.0

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 NO₂ annual mean objective of 40 $\mu\text{g}/\text{m}^3$ are shown in **bold**.

NO₂ annual means exceeding 60 $\mu\text{g}/\text{m}^3$, indicating a potential exceedance of the NO₂ 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.2 – Trends in Annual Mean NO2 Concentrations: Diffusion Tubes (µg/m3)

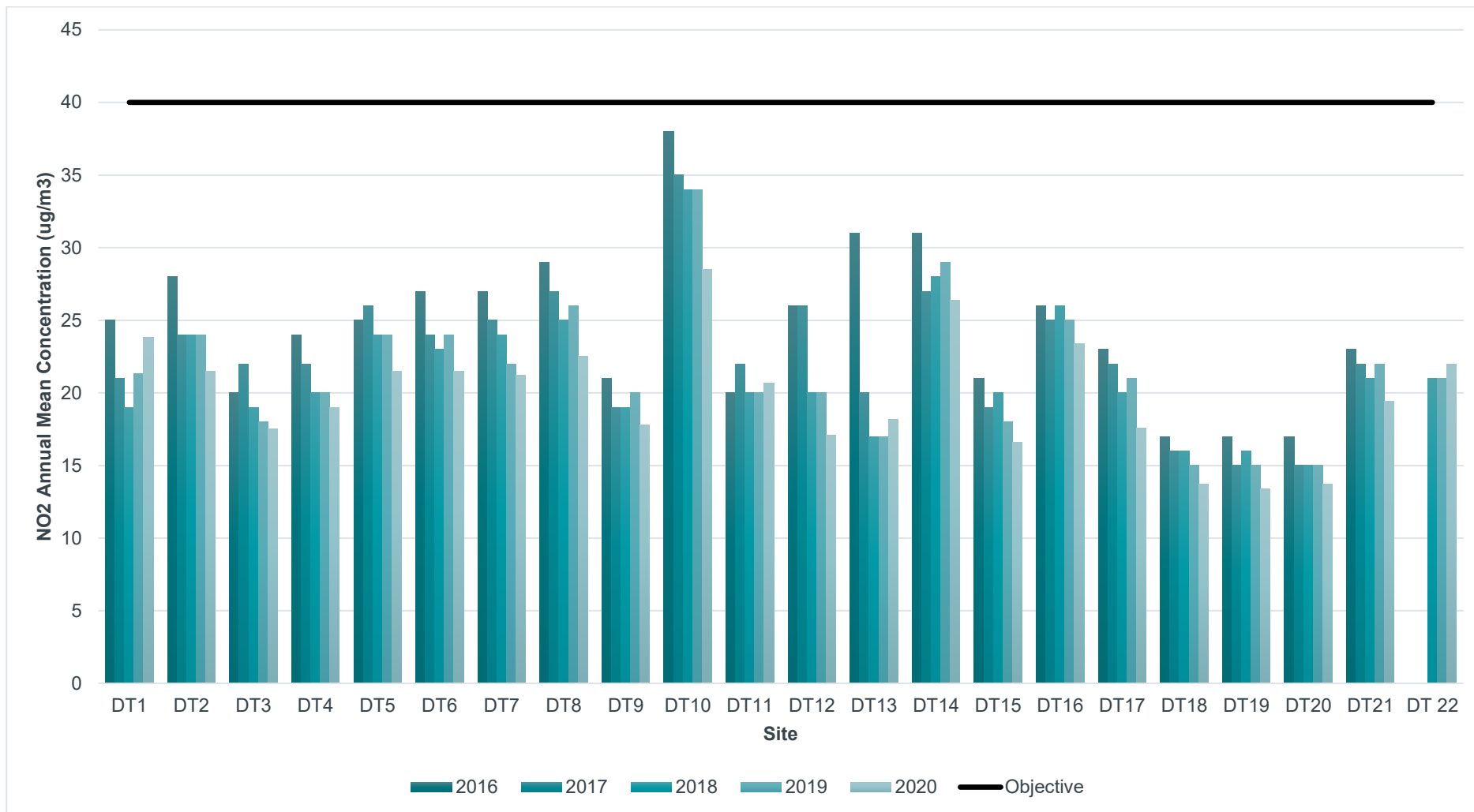


Table A.5 – 1-Hour Mean NO₂ Monitoring Results, Number of 1-Hour Means > 200µg/m³

Site 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
CM1	490320	410831	Industrial	N/A	96.0%	0	0	0	0	0
CM3	492945	411931	Industrial	N/A	98.9%	0	0	0	0	0
CM6	514880	416133	Other	N/A	95.0%	0	0	0	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m³ have been recorded.

Exceedances of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

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

(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%).

Table A.6 – Annual Mean PM₁₀ Monitoring Results (µg/m³)

Site 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
CM1 BAM	490320	410831	Industrial	N/A	92.0%	17	16	18	20	17
CM1 TEOM	490320	410831	Industrial	N/A	88.1%	17	17	20	22	17
CM2	490663	409789	Urban Background	N/A	87.4%	20	18	21	22	19
CM3 FDMS	492945	411931	Industrial	N/A	94.8%	22	23	25	22	21
CM3 TEOM	492945	411931	Industrial	N/A	98.4%	26	30	31	29	29
CM4	491343	408782	Industrial	N/A	82.5%	17	16	20 (18)	21	22
CM5	490224	411301	Industrial	N/A	98.5%	21	19	22 (20)	21	18
CM6	514880	416133	Other	N/A	92.8%	18	18	19	19	15
CM7	497931	420993	Other	N/A	82.0%	21	18	16	18	14

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

Notes:

The annual mean concentrations are presented as µg/m³.

Exceedances of the PM₁₀ annual mean objective of 40µg/m³ are shown in **bold**.

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.

(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.3 – Trends in Annual Mean PM₁₀ Concentrations

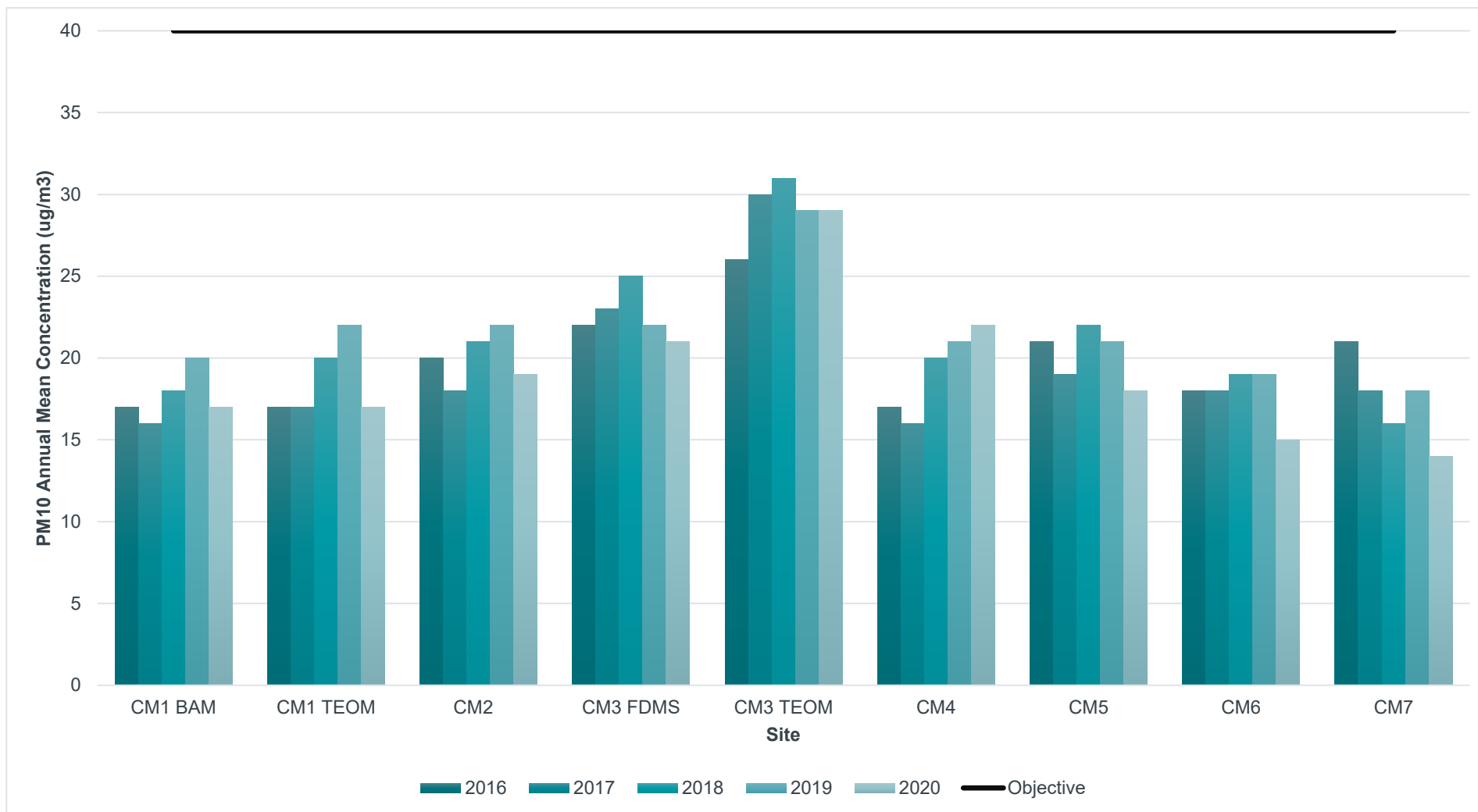


Table A.7 – 24-Hour Mean PM₁₀ Monitoring Results, Number of PM₁₀ 24-Hour Means > 50µg/m³

Site 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
CM1 BAM	490320	410831	Industrial	N/A	92.0%	6	5 (29)	9	18	3
CM1 TEOM	490320	410831	Industrial	N/A	88.1%	8	5	6	22	3
CM2	490663	409789	Urban Background	N/A	87.4%	18	9	16	22	24
CM3 FDMS	492945	411931	Industrial	N/A	94.8%	11	11	22	7	2
CM3 TEOM	492945	411931	Industrial	N/A	98.4%	25	40	40	35	30
CM4	491343	408782	Industrial	N/A	82.5%	15	6	16	15	30 (51)
CM5	490224	411301	Industrial	N/A	98.5%	4	5	2	14	1
CM6	514880	416133	Other	N/A	92.8%	1	4	3	5	0
CM7	497931	420993	Other	N/A	82.0%	6	4	4	10	1 (22)

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m³ have been recorded.

Exceedances of the PM₁₀ 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times/year) are shown in **bold**.

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

(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.4 – Trends in Number of 24-Hour Mean PM₁₀ Results > 50µg/m³

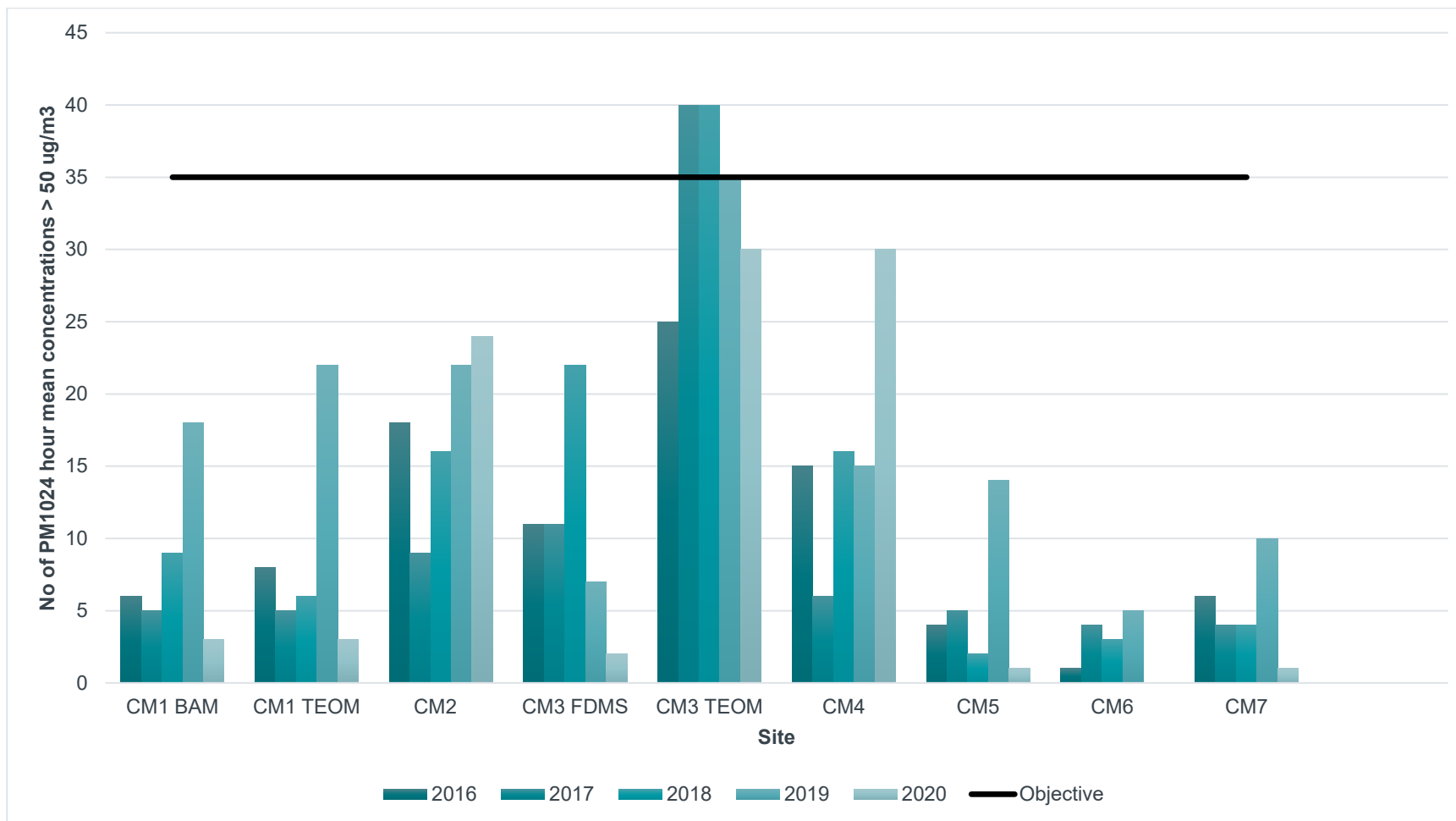


Table A.8 – Annual Mean PM_{2.5} Monitoring Results (µg/m³)

Site 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
CM2	490663	409789	Urban Background	N/A	80.5%	7	6	10	7	7
CM7	497931	420993	Other	N/A	82.0%	7	6	7	9	7

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

Notes:

The annual mean concentrations are presented as µg/m³.

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.

(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.5 – Trends in Annual Mean PM_{2.5} Concentrations

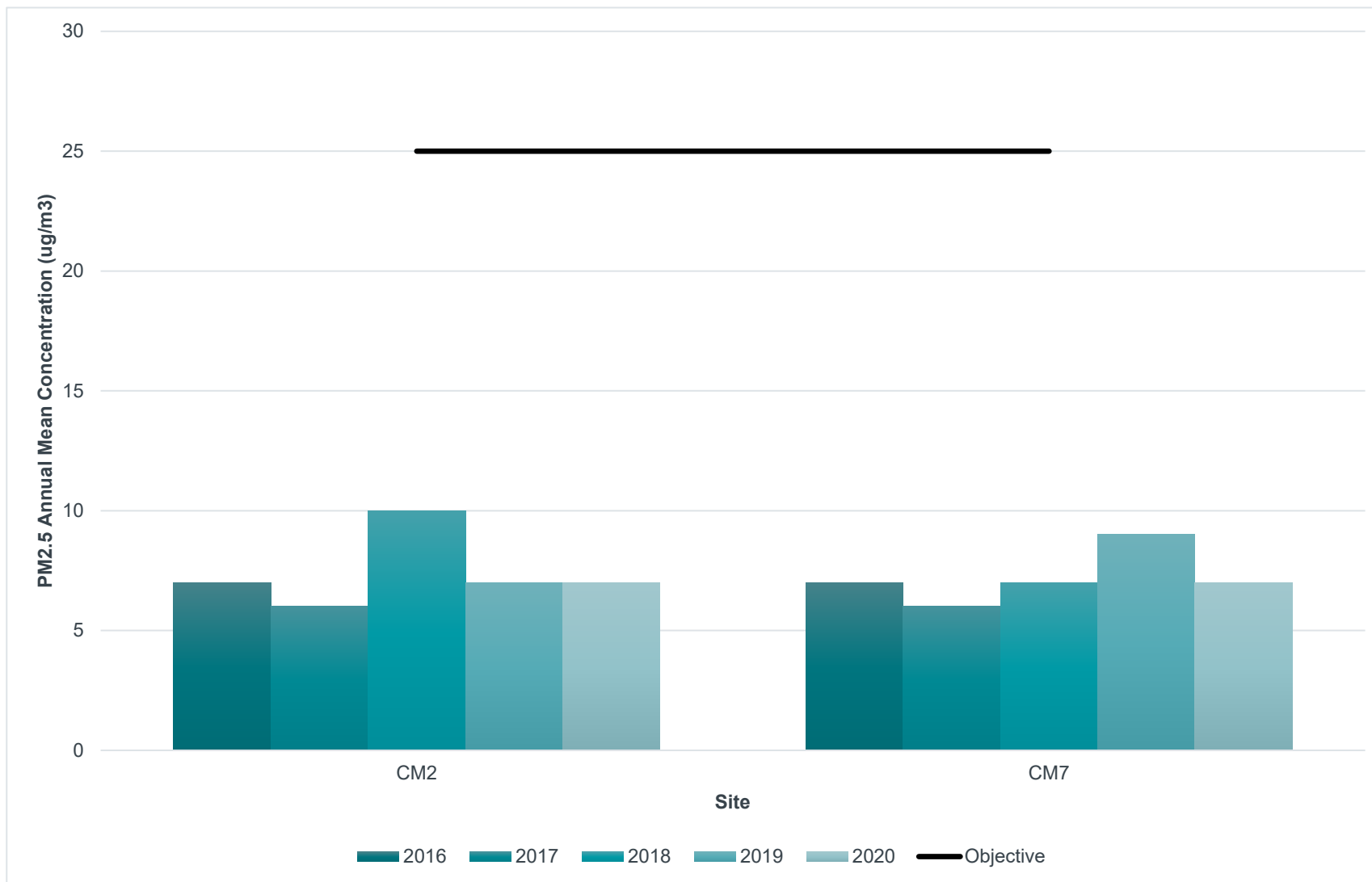


Table A.9 – SO₂ 2020 Monitoring Results, Number of Relevant Instances

Site 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⁾	Number of 15-minute Means > 266µg/m ³	Number of 1-hour Means > 350µg/m ³	Number of 24-hour Means > 125µg/m ³
CM1	490320	410831	Industrial	N/A	87.0%	0	0	0
CM3	492945	411931	Industrial	N/A	83.6%	0 (8)	0 (8)	0 (6)
CM6	514880	416133	Other	N/A	93.6%	0	0	0

Notes:

Results are presented as the number of instances where monitored concentrations are greater than the objective concentration.

Exceedances of the SO₂ objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year).

If the period of valid data is less than 85%, the relevant percentiles are provided in brackets.

(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%).

Table A.10 - Benzene Monitoring Results

Start Date	End Date	Scunthorpe Town AURN (CM1) Concentrations (ug/m ³)
09/01/2020	29/01/2020	0.74
29/01/2020	12/02/2020	0.68
12/02/2020	26/02/2020	0.38
26/02/2020	11/03/2020	0.55
11/03/2020	25/03/2020	0.97
25/03/2020	08/04/2020	0.5
08/04/2020	06/05/2020	0.62
06/05/2020	20/05/2020	0.62
20/05/2020	03/06/2020	2.22
03/06/2020	17/06/2020	0.88
17/06/2020	01/07/2020	0.93
01/07/2020	29/07/2020	1.01
29/07/2020	12/08/2020	1.07
12/08/2020	26/08/2020	0.6
26/08/2020	23/09/2020	0.95
23/09/2020	07/10/2020	1.17
07/10/2020	21/10/2020	0.85
21/10/2020	04/11/2020	0.51
04/11/2020	18/11/2020	
18/11/2020	02/12/2020	1.21
02/12/2020	16/12/2020	0.93
16/12/2020	30/12/2020	0.65
30/12/2020	13/01/2021	1.08
Annual Average		0.87

Note: The Benzene annual mean objective is 5ug/m³

Figure A.6 – Trends in Annual Mean Benzene Concentrations

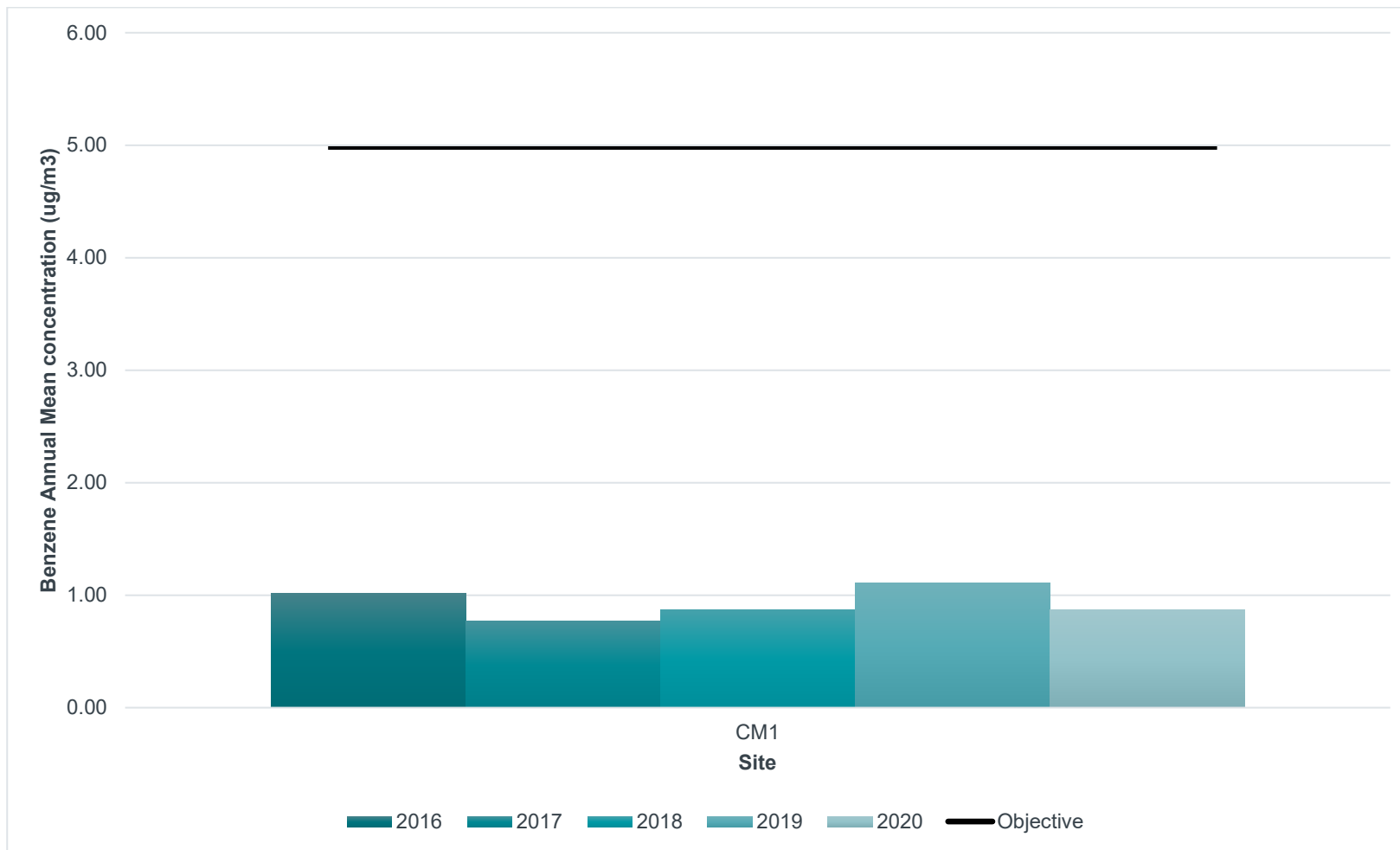


Table A.11 – PAH (Benzo(a)pyrene (B[a]P)) Monitoring Results

Concentration ng/m ³	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Time Weighted Average
Scunthorpe Town (CM1)	0.52	0.22	0.72	1	1.4	0.65	0.67	0.21	0.25	0.49	0.94	0.66	0.64
Low Santon (CM3)	1.6	2.8	1	0.32	0.33	0.45	0.56	0.32	0.91	0.7	0.82	0.33	0.84

Notes:

Exceedances of the National Air Quality Objective of 0.25 ng/m³

Exceedances of the European Community Air Quality Target value of 1ng/m³.

Figure A.7 – Trends in PAH (Benzo(a)pyrene (B[a]P)) Concentrations

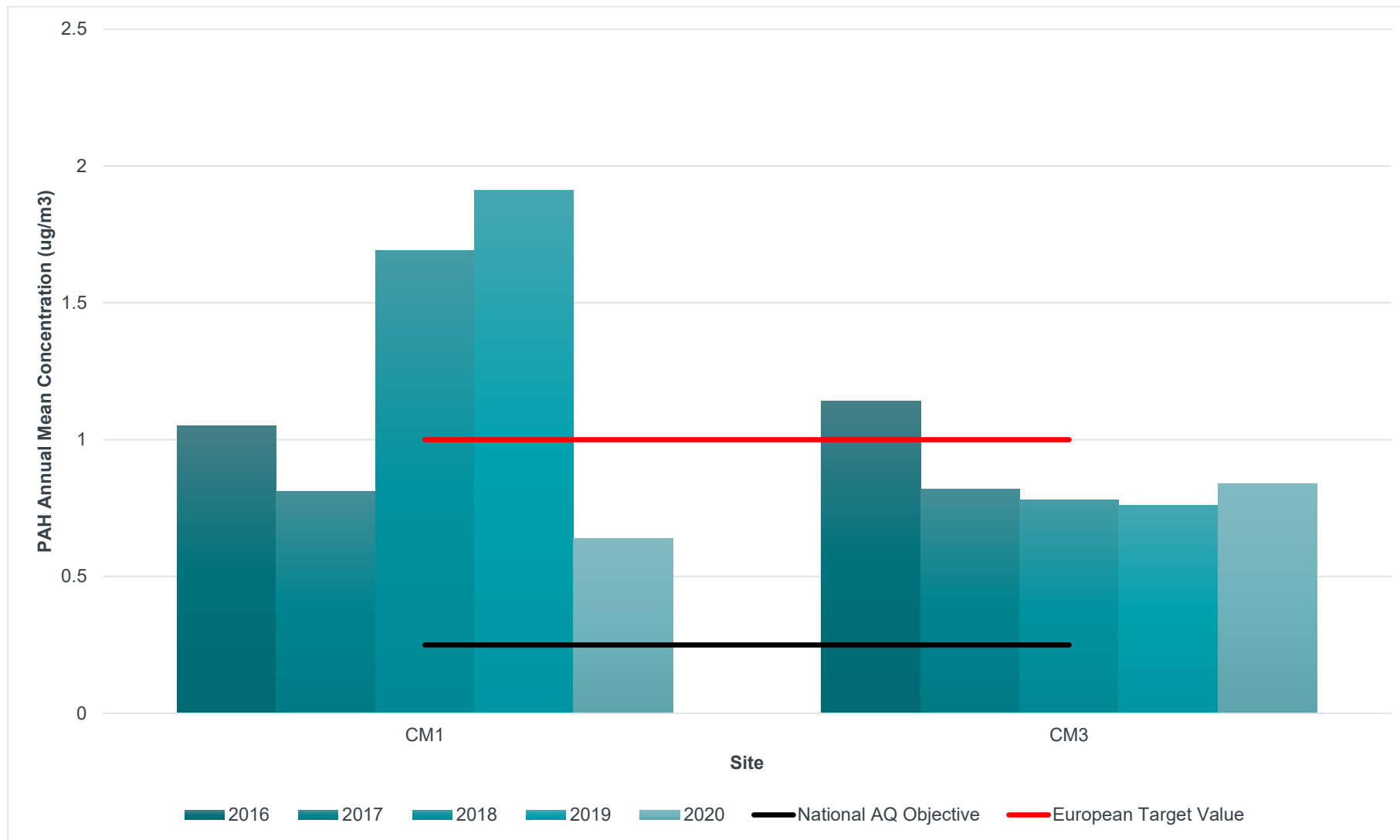


Table A.12 – Heavy Metals Monitoring Results

Heavy Metal	Scunthorpe Town AURN (CM1) Annual Mean Concentration ng/m3	Low Santon (CM3) Annual Mean Concentration ng/m3	Target Value ng/m3
Arsenic (As)	0.792	0.848	6
Cadmium (Cd)	0.320	0.725	5
Cobalt (Co)	0.097	0.210	
Chromium (Cr)	1.56	3.46	
Copper (Cu)	4.41	4.36	
Iron (Fe)	478	2157	
Manganese (Mn)	16	87	
Nickel (Ni)	0.84	1.143	20
Lead (Pb)	10.9	17.2	500
Selenium (Se)	0.80	1	

Heavy Metal	Scunthorpe Town AURN (CM1) Annual Mean Concentration ng/m ³	Low Santon (CM3) Annual Mean Concentration ng/m ³	Target Value ng/m ³
Vanadium (V)	1.27	9.11	
Zinc (Zn)	22.4	38.28	

Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO₂ 2020 Diffusion Tube Results (µg/m³)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.78)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
1	489099	411723	46.5		25.3	22.0	20.1	23.8				42.0			30.0	23.8	-	
2	487239	411259	47.4	29.8	23.2	17.8	22.6	27.1	23.0	25.6	30.1	30.9	35.9	18.0	27.6	21.5	-	
3	486699	411110	42.9	31.2	16.5	14.0	17.4	18.3	17.2	18.0	23.6	26.2	26.8	16.5	22.4	17.5	-	
4	486928	411156	38.7	27.1	20.6	18.3	19.3	21.8	18.1	21.4	25.8	27.0	36.6	17.0	24.3	19.0	-	
5	489190	411285	41.9	36.2	19.6	20.1	22.0	22.7	21.8	25.8	29.2	34.0	39.7	18.4	27.6	21.5	-	
6	489209	411118	40.6	26.4	25.4	22.3	21.3	25.1	20.4	28.1	31.0	31.5	37.6	21.1	27.6	21.5	-	
7	489172	409926	44.3	31.9	22.6	19.1	20.2	22.5	21.3	23.5	28.6	33.0	38.5	20.0	27.1	21.2	-	
8	489112	409463	47.7	35.1	19.0	23.5	25.6	26.2	24.0	26.4	30.9	33.3	37.6	16.2	28.8	22.5	-	
9	491628	408658	36.5	26.5	17.5	16.2	18.5	20.8	13.9	18.3	23.3	27.9	37.3	17.1	22.8	17.8	-	
10	491838	408641	58.5	50.6	30.1	29.3	33.5	38.0	35.0	40.7	43.3	24.4	32.8	22.7	36.6	28.5	-	
11	491859	408645	37.4	26.5	19.0	18.8	21.2	21.7	19.2	23.5	25.5	44.6	47.0	14.6	26.6	20.7	-	

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 (0.78)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
12	499975	407421	35.2	30.0	11.5	16.0	17.4	21.1	19.7	20.6		24.4	30.4	14.5	21.9	17.1	-	
13	514573	415901	39.8	27.5	15.1	22.4	18.0			18.2	21.8	21.5	34.8	14.0	23.3	18.2	-	
14	514782	415971	56.2	32.8	26.2	36.8	32.1	38.7	28.2	32.7	31.5	30.7	40.2	20.5	33.9	26.4	-	
15	515452	416107	25.1	17.9	20.2	25.5	20.3	26.4	15.9	21.8	22.7	24.3	23.2	12.0	21.3	16.6	-	
16	515279	416085	44.1	24.5	23.8	30.7	28.7	31.9	28.6	28.9	32.9	36.0	35.6	14.0	30.0	23.4	-	
17	503048	421907	31.8	25.3	19.4	18.2	18.6	20.9	20.4	22.7	23.7	25.4	33.2	10.8	22.5	17.6	-	
18	490316	410837	29.3	20.5	10.1	15.2	15.8	16.7	12.0	15.1		18.7	27.4	12.3	17.6	13.7	-	
19	490316	410837	29.3	21.1	11.4	14.9	14.7	15.1	11.6	14.1	17.2	18.3	25.0	13.4	17.2	13.4	-	
20	490316	410837	26.2			17.2		10.2	12.5	14.9	16.8	20.9	26.0	13.2	17.5	13.7	-	
21	490080	411258	38.5	28.3	20.4	21.9	19.7	23.0	19.5	23.7	24.7	26.3	33.7	18.3	24.8	19.4	-	
22	514141	417483	41.8	24.9	15.9	25.1	28.4	26.4	24.4	29.1	31.3	29.9	42.9	18.2	28.2	22.0	-	

- All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1
- Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16
- Local bias adjustment factor used
- Where applicable, data has been distance corrected for relevant exposure in the final column

North Lincolnshire Council confirm that all 2020 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System

Notes:

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

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

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within North Lincolnshire During 2020

The below table provides a list of planning applications that have been approved or are yet to be determined that have been identified as having a potential impact on air quality. The sources include a range of transport related and point sources such as biomass boilers or industrial installations. As a consultee, the Environmental Protection Team has provided appropriate comments to the Development Management Team.

Planning Reference	Application	Location	Decision	AQ Relevance
PA/2019/235	Planning permission for an extension to Hibaldstow Quarry	Land to the west of Hibaldstow Quarry, Mill Road, Hibaldstow, DN20 9NN	Granted with EIA subject to conditions	Accompanied with dust and air quality assessment. Relevant comments provided.
PA/2019/664	Planning permission to erect biomass plant room	Holme Farm Care Home, 9 Church Street, Elsham, DN20 0RG	Full Planning Permission with conditions	Accompanied with emissions certificate and further information. Relevant comments provided.
PA/2019/697	Planning permission to install biomass boiler, convert stable to office, extend roof to form covered store and associated alterations	Holme Tree Farm, Access Road To Holme Tree Farm, Haxey, DN9 2NP	Full Planning Permission with conditions	Accompanied with emissions certificate and further information. Relevant comments provided
PA/2019/830	Planning permission to vary condition 5 of planning permission PA/2011/1050 namely to allow for the unloading of trains beyond the approved operating hours	Roxby Landfill Site, Winterton Road, Roxby, DN15 0BJ	Full Planning Permission with conditions	Accompanied by dust assessment. Relevant comments provided.
PA/2019/1088	Planning permission to erect 88 dwellings with associated access, drainage, and landscaping	Land west of Turnstone Drive, Scunthorpe	Full Planning Permission with conditions	Accompanied by AQ assessment. Relevant comments provided.

Planning Reference	Application	Location	Decision	AQ Relevance
PA/2019/1107	Planning permission to erect 122 dwellings with associated access, drainage, and landscaping	land west of Dunlin Drive, Scunthorpe	Full Planning Permission with conditions	Accompanied by AQ assessment. Relevant comments provided.
PA/2019/1147	Planning permission to erect an industrial building (B2 Use Class) with new vehicular access from Barrow Road (A1077) and associated parking, emissions abatement plant, surface water drainage attenuation ponds and landscaping	land east of The Nest, Falkland Way, Barton upon Humber	Full Planning Permission with conditions	Accompanied by AQ assessment. Relevant comments provided.
PA/2019/1545	Planning permission to retain 8 Biomass Boilers, 8 Boiler Flues, 5 Storage Silos and associated equipment	Dawson Poultry, Killingholme Airfield, Crook Mill Lane, Immingham South, East Halton, Doncaster, DN40 3JY	Full Planning Permission with conditions	Accompanied with emissions certificate and further information. Relevant comments provided.
PA/2019/1607	Planning permission to erect 88 dwellings with associated roads, drainage, service infrastructure and public open space (including demolition of existing agricultural buildings)	land south of Silica Lodge Garden Centre, Scotter Road South, Scunthorpe, DN17 2BN	Full Planning Permission with conditions	Accompanied by AQ assessment. Relevant comments provided.
PA/2019/1661	Planning permission to install a 230kw biomass boiler including stainless steel flue	Northlands Farm, Northlands Road, Winterton, DN15 9UP	Full Planning Permission with conditions	Accompanied with emissions certificate and further information. Relevant comments provided.
Development Consent Order. VPI Immingham 2021 No 581.	Development Consent Order (DCO) application for the construction, operation, and maintenance of the proposed gas-fired power station with a gross electrical output of up to 299 Megawatts (MW).	Rosper Road, South Killingholme, North Lincolnshire	The Secretary of State has granted development consent for this application	Accompanied by AQ assessment. Relevant comments provided.
PA/2020/175	Retrospective planning permission for a biomass boiler, loading plant and enclosure	Arbor Forest Products, Barrow Road, New Holland, DN19 7RR	Full Planning Permission with conditions	Accompanied with emissions certificate and further information. Relevant comments provided.

Planning Reference	Application	Location	Decision	AQ Relevance
PA/2020/588	Outline planning permission for residential development, open space, and associated infrastructure (appearance, landscaping, layout, and scale reserved for subsequent consideration)	Land north of Ings Road, Kirton in Lindsey	Appeal Allowed	Accompanied by AQ assessment. Relevant comments provided.
PA/2020/660	Planning permission for mixed use development: hotel (Class C1), gym (Class D2), retail units (Class A1), food and drink and drive-thru restaurants (Class A3/A5), with access, car parking, landscaping, and associated works	land off Jack Brownsword Way, Scunthorpe	Full Planning Permission with conditions	Accompanied by AQ assessment. Relevant comments provided.
PA/2020/699	Planning permission for 990kW biomass boiler and associated flue	Mickleholme Farm, Access Road To Mickleholme Farm, Appleby, DN15 0AD	Full Planning Permission with conditions	Accompanied with emissions certificate and further information. Relevant comments provided.
PA/2020/1483	Planning permission to construct additional vehicle storage area with associated on-site infrastructure to include access bridge	Clough Lane, Killingholme, DN40 3JP	Not yet determined	Accompanied with emissions certificate and further information. Relevant comments provided.
PA/2020/1706	Planning permission to erect an emergency care extension to the existing hospital, alterations and enhancements to existing ambulance drop-off and demolition of existing administration building adjacent to the Cliff Gardens site, erection of new sub-station and erection of new car park deck above existing public parking spaces adjacent to the Church Lane entrance, installation of staff cycle parking facility	Scunthorpe General Hospital, Cliff Gardens, Scunthorpe, DN15 7BH	Full Planning Permission with conditions	Accompanied by AQ assessment. Relevant comments provided.

Planning Reference	Application	Location	Decision	AQ Relevance
PA/2020/1740	Planning application to erect an agricultural feed mill with ancillary offices and associated infrastructure including silos, ground works, hardstanding, parking, and landscaping.	land at Mannaberg Way, Scunthorpe	Not yet determined	Accompanied by AQ assessment. Relevant comments provided.
PA/2020/1748	Planning permission for the change of use to B2 and B8 to allow the operation of a wood processing facility, minor amendments to the existing buildings to facilitate the new operation, the installation of a weighbridge, the installation of two drying floors to dry biomass and grain; and the installation of four 600kW biomass boilers to provide heat to the drying floors	Holmes Lane Stores, Winterton, DN15 9QX	Full Planning Permission with conditions	Accompanied by AQ assessment. Relevant comments provided. Also requires an Environmental Permit.
PA/2020/2049	Planning permission for the construction of 163 two, three and four bedroomed, 2 storey traditional residential homes with associated garages and access infrastructure. [Amendment]: Reduction in number of dwellings to 158 dwellings and alterations to the layout including new footpath links. [Amendment]: alterations to the pedestrian link on the southern boundary	Land to the south of Phoenix Parkway, Scunthorpe, DN15 8NH	Not yet determined	Accompanied by AQ assessment. Relevant comments provided.
Non-Material Change to Development Consent Order	Application to make a non-material change to the North Killingholme (generating station) order 2014 (s.i. 2014/2434, as amended by s.i. 2015/1829)	North Killingholme Power Project, North Killingholme, North Lincolnshire	Granted	Accompanied by Environmental Report. Relevant comments provided.

Planning Reference	Application	Location	Decision	AQ Relevance
Stage 2 Consultation in connection with a proposed application for a Development Consent Order (DCO) for the Keadby 3 Low Carbon Combined Cycle Gas Turbine (CCGT) Power Station Project	The Proposed Development comprises a low carbon CCGT power station with a capacity of up to 910MW electrical output. An initial (Stage 1) consultation period was undertaken in May 2020. This second (Stage 2) consultation is being undertaken in advance of the proposed submission of an application for development consent in early 2021.	Keadby Power Station, Trent Side, Keadby	Awaiting submission of DCO	Comments on Environmental Statement to be provided once DCO submitted.

QA/QC of Diffusion Tube Monitoring

North Lincolnshire Council currently uses SOCOTEC (Didcot) for both supply and analysis of its Nitrogen Dioxide Diffusion Tubes. The samples have been analysed in accordance with SOCOTEC's standard operating procedure ANU/SOP/1015. This method meets the guidelines set out in DEFRA's 'Diffusion Tubes For Ambient NO₂ Monitoring: Practical Guidance'. The tubes were prepared by spiking acetone:triethanolamine (50:50) onto the grids prior to the tubes being assembled. The tubes were desorbed with distilled water and the extract analysed using a segmented flow autoanalyser with ultraviolet detection.

SOCOTEC are UKAS accredited for the analysis of diffusion tube samples to determine the amount of nitrogen dioxide present on the tube. SOCOTEC also holds the highest rank of a "satisfactory laboratory" in the AIR PT intercomparison scheme for comparing spiked Nitrogen Dioxide diffusion tubes.

The 2020 Diffusion Tube Monitoring Calendar was mostly adhered to except for a one day variation during some months, this was largely due to staffing and logistical constraints with the tube collection.

Diffusion Tube Annualisation

Diffusion Tube 1 (DT1), Frodingham Road, recorded 49.9% data capture for 2020. This is below the 75% data capture threshold and therefore the data was annualised. The tube had been removed from the lamp post on several occasions during 2020. The method to undertake this procedure is presented in LAQM Technical Guidance TG16. The reason for annualisation is that the concentration varies throughout the year, and the instrument may have been operational for a period of above or below average concentrations.

The Diffusion Tube Data Processing Tool was used to annualise DT1 using continuous background monitoring data from Scunthorpe Town AURN, Low Santon and Hull Freetown AURN. These sites were selected based on the criteria in LAQM TG(16). All three sites had data capture rates above 85% and were therefore suitable for annualisation purposes.

The results of the processing tool are presented in Table C.2.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2021 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO₂ continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

North Lincolnshire Council have applied a local bias adjustment factor of 0.78 to the 2020 monitoring data. A summary of bias adjustment factors used by North Lincolnshire Council over the past five years is presented in Table C.1.

North Lincolnshire Council had one co location study site in 2020, at CM1: Scunthorpe Town an industrial site. Diffusion tubes 18,19 and 20 were co located at this location.

The decision to use a Bias Adjustment Factor generated from our own co location study was reached due to the complexity of the issues within North Lincolnshire. As the AQMA's declared within North Lincolnshire are predominantly industry related, it was felt that using an average of other authority figures would be unsuitable. Although the tube network is spread over a wide area of North Lincolnshire, the tubes are situated in relatively similar situations, all at the same height and if the tubes are not co-located most are held on roadside lamp posts. This study has been ongoing since 2006 and has presented different adjustment factors each year. We have confidence within our AURN continuous monitor at this location due to its strict calibration programme and ratification procedures undertaken by Ricardo.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	Local	-	0.78
2019	Local	-	0.68
2018	Local	-	0.65
2017	Local	-	0.71
2016	Local	-	0.73

NO₂ 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 NO₂ concentration at the nearest location relevant for exposure should be estimated using the Diffusion Tube Data Processing Tool/NO₂ fall-off with distance calculator available on the LAQM Support website. Distance correction should be considered at any monitoring site where the annual mean concentration is greater than 36µg/m³ and the monitoring site is not located at a point of relevant exposure (taking the limitations of the calculator into account).

No diffusion tube NO₂ monitoring locations within North Lincolnshire required distance correction during 2020.

QA/QC of Automatic Monitoring

Air Quality Data Management (AQDM) performed the QA/QC on the measurements. Each of the gas analysers is calibrated every 2 weeks. The TEOMs were visited at the same frequency, with the filter changed whenever required. All the instruments are audited every 6-months by NPL who are UKAS accredited to AURN standards and serviced every 6 months by Enviro Technology Services Ltd.

Below are the details of the QA/QC procedures which has been provided by AQDM:

QA/QC of Automatic Air Quality Instruments Use

Air quality measurements from automatic instruments are validated and ratified to the standards described in the Local Air Quality Management – Technical Guidance LAQM TG(16): <http://laqm.defra.gov.uk/documents/LAQM-PG16-April-16-v1.pdf> by Air Quality Data Management (AQDM) <http://www.aqdm.co.uk>

Staff at North Lincolnshire Council attend the site at frequent intervals and follow procedures as set out by the manufacturers in the instrument operating manuals.

Validation

This process operates on data during the data collection stage. All data is continually screened algorithmically and manually for anomalies. There are several techniques designed to discover spurious and unusual measurements within a very large dataset.

These anomalies may be due to equipment failure, human error, power failures, interference or other disturbances. Automatic screening can only safely identify spurious results that need further manual investigation.

Raw data from the gaseous instruments (e.g. NO_x, O₃, SO₂ and CO) are scaled into concentrations using the latest values derived from the manual and automatic calibrations. These instruments are not absolute and suffer drifts. Both the zero baseline (background) and the sensitivity change with time. Regular calibrations with certified gas standards are used to measure the zero and sensitivity. However, these are only valid for the moment of the calibration since the instrument will continue to drift. Raw measurements from particulate instruments (e.g. PM₁₀ and PM_{2.5}) generally do not require scaling into concentrations. The original raw data are always preserved intact while the processed data are dynamically scaled and edited.

Ratification

This is the process that finalises the data to produce the measurements suitable for reporting. All available information is critically assessed so that the best data scaling is applied and all anomalies are appropriately edited. Generally, this operates at three, six or twelve month intervals. However, unexpected faults can be identified during the

instrument routine services or independent audits which are often at 6-monthly intervals. In practice, therefore, the data can only be fully ratified in 12-month or annual periods. The data processing performed during the three and six monthly cycles helps build a reliable dataset that is finalised at the end of the year.

There is a diverse range of additional information that can be essential to the correct understanding and editing of data anomalies. These may include:

- the correct scaling of data
- ignoring calibrations that were poor e.g. a spent zero scrubber
- closely tracking rapid drifts or eliminating the data
- comparing the measurements with other pollutants and nearby sites
- corrections due to span cylinder drift
- corrections due to flow drifts for the particulate instruments
- corrections for ozone instrument sensitivity drifts
- eliminating measurements for NO₂ conversion inefficiencies
- eliminating periods where calibration gas is in the ambient dataset
- identifying periods where instruments are warming-up after a power cut and identification of anomalies due to mains power spikes
- correcting problems with the date and time stamp
- observations made during the sites visits and services

The identification of data anomalies, the proper understanding of the effects and the application of appropriate corrections requires expertise gained over many years of operational experience. Instruments and infrastructure can fail in numerous ways that significantly and visually affect the quality of the measurements. There are rarely simple faults that can be discovered by computer algorithms or can be understood without previous experience.

Further information about air quality data management, expert data ratification and examples of bad practices are given on the Air Quality Data Management (AQDM) website <http://www.aqdm.co.uk>.

PM₁₀ and PM_{2.5} Monitoring Adjustment

The PM₁₀ and PM_{2.5} concentrations may require scaling into Gravimetric Equivalent concentration units by use of the Volatile Correction Model (VCM) <http://www.volatile-correction-model.info> or by corrections published by Defra <https://uk-air.defra.gov.uk/networks/monitoring-methods?view=mcerts-scheme> depending in the measurement technique.

Automatic Monitoring Annualisation

All automatic monitoring locations within North Lincolnshire recorded data capture of greater than 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.

Table C.2 – Annualisation Summary (concentrations presented in $\mu\text{g}/\text{m}^3$)

Site ID	Annualisation Factor Scunthorpe Town AURN	Annualisation Factor Low Santon	Annualisation Factor Hull Freetown AURN	Annualisation Factor Site 4 Name	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
1	1.0456	0.9466	1.0578	-	1.0167	30.0	30.4	

Table C.3 – Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1
Periods used to calculate bias	10
Bias Factor A	0.78 (0.66 - 0.96)
Bias Factor B	28% (5% - 51%)
Diffusion Tube Mean ($\mu\text{g}/\text{m}^3$)	16.7
Mean CV (Precision)	5.1%
Automatic Mean ($\mu\text{g}/\text{m}^3$)	13.0
Data Capture	98%
Adjusted Tube Mean ($\mu\text{g}/\text{m}^3$)	13 (11 - 16)

Notes:

A single local bias adjustment factor has been used to bias adjust the 2020 diffusion tube results.

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

Figure D.1 – Monitoring locations within the Scunthorpe Town AQMA

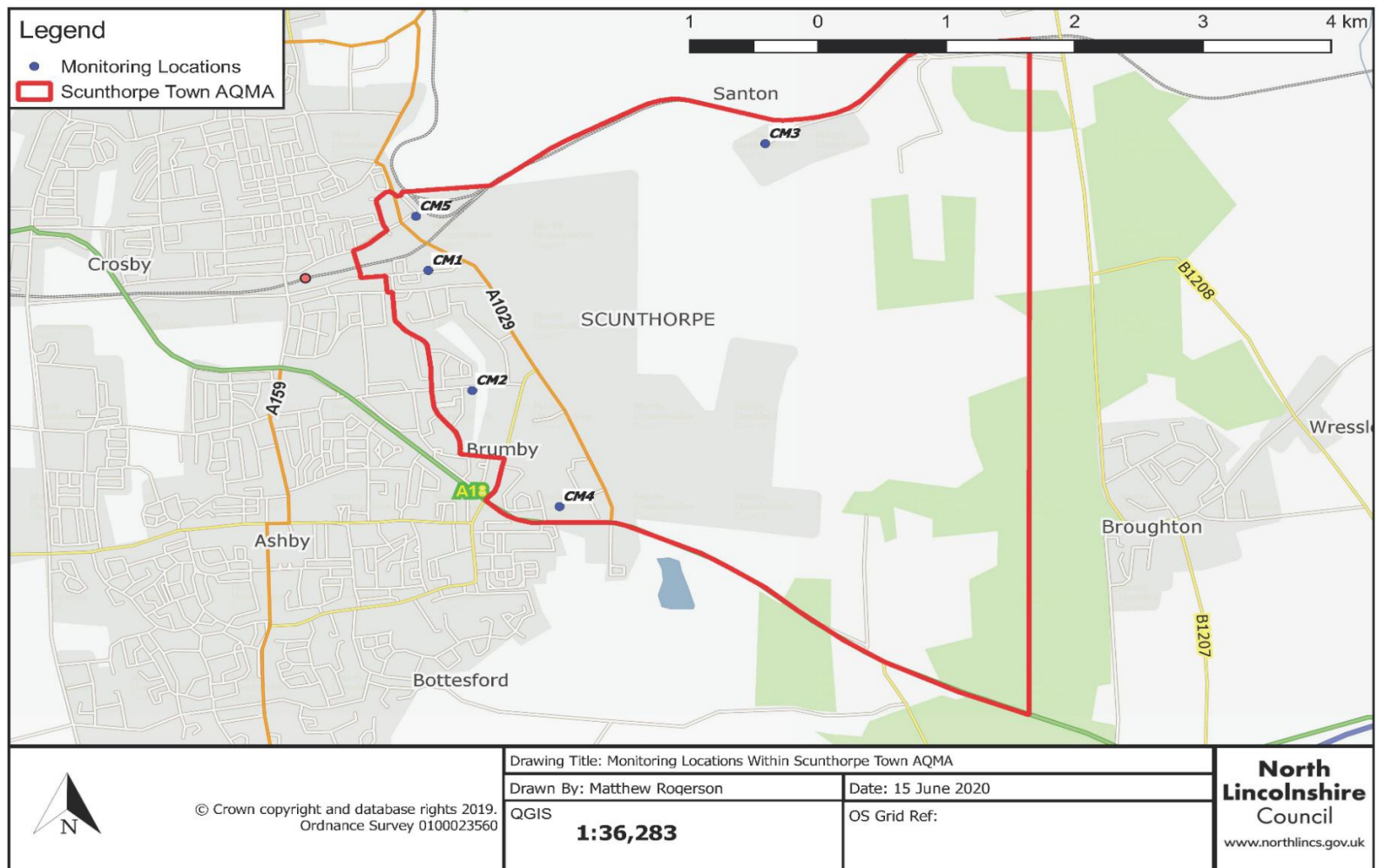


Figure D.2 – Monitoring locations within North Lincolnshire

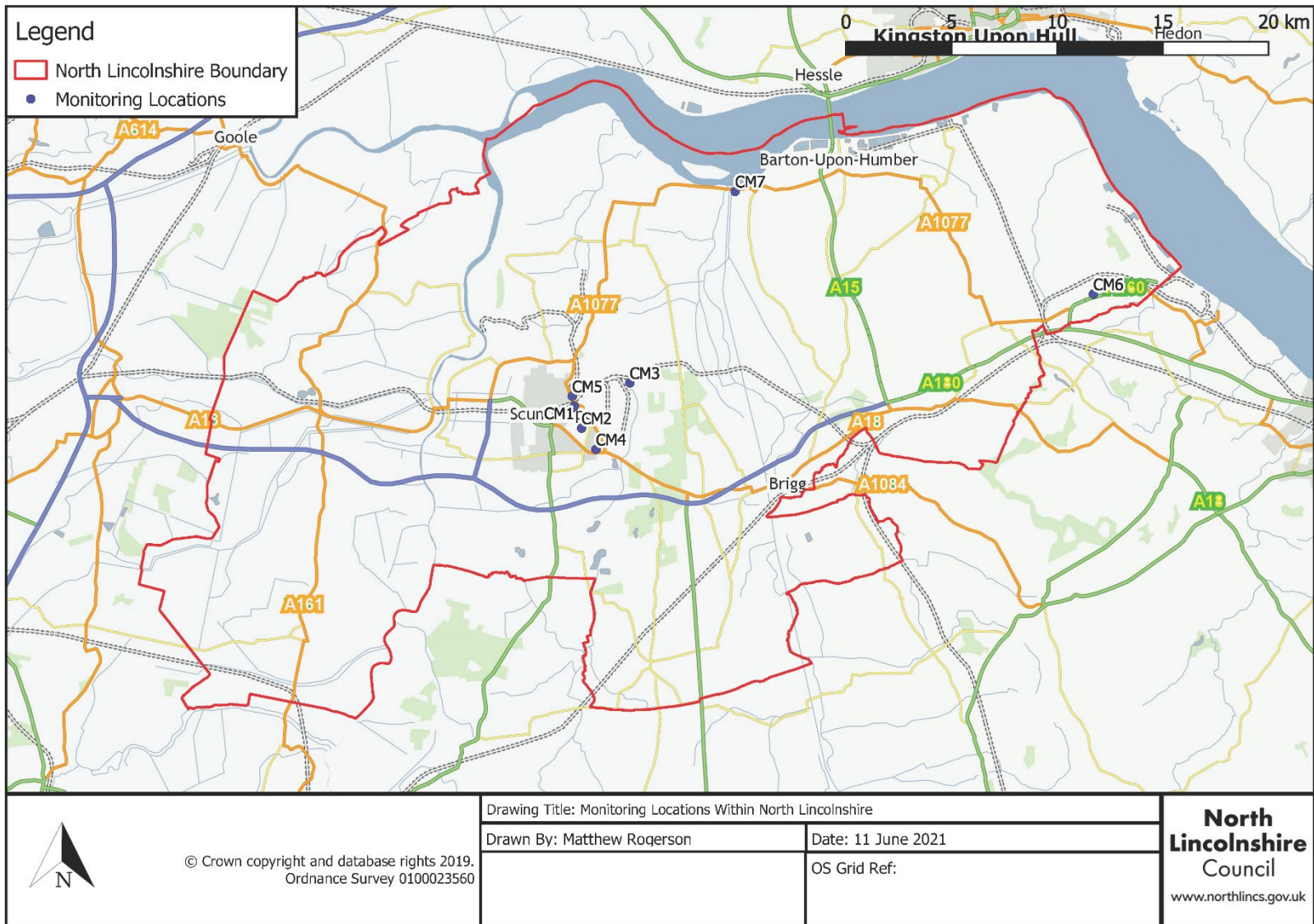
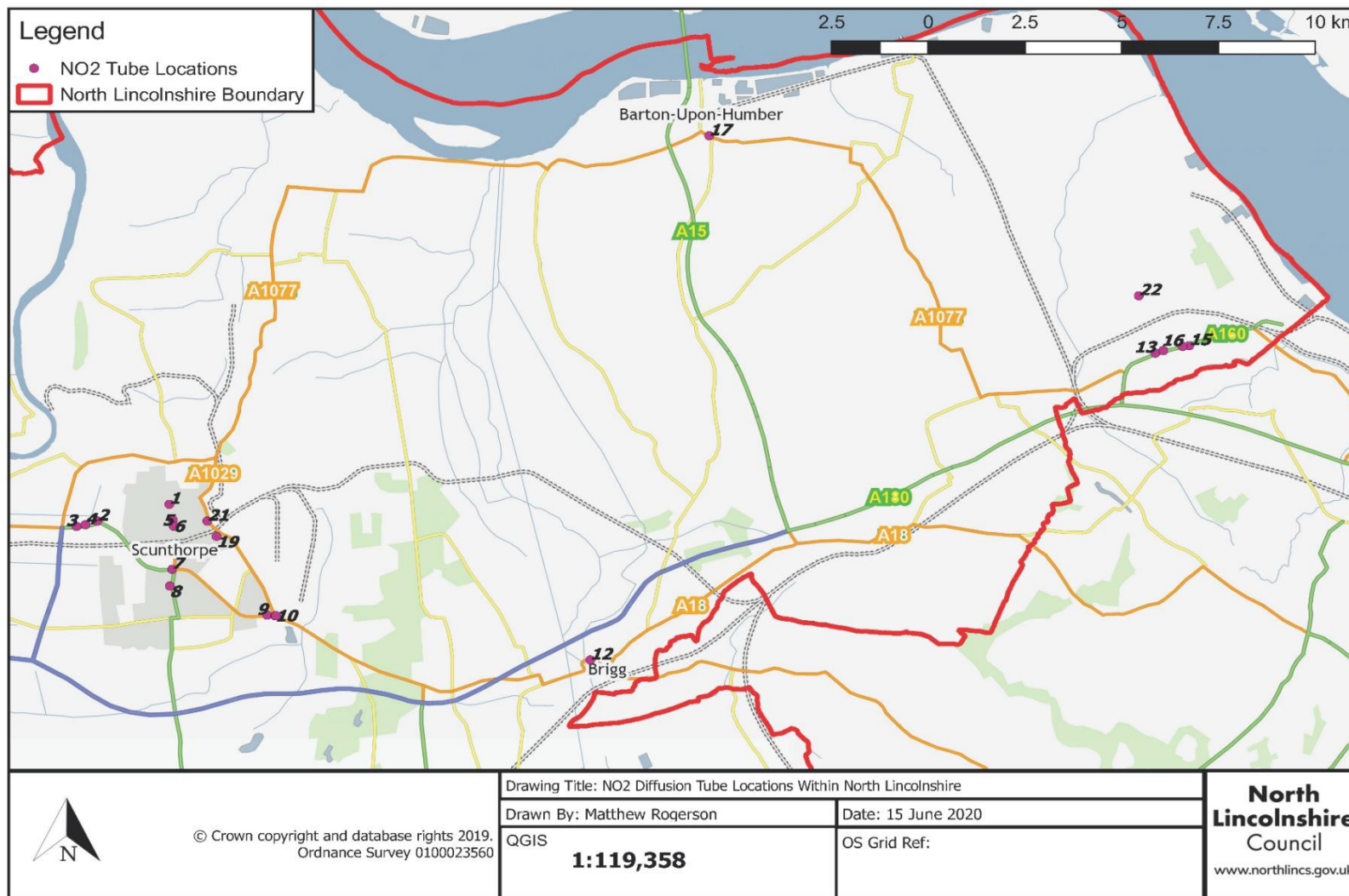


Figure D.3 – Diffusion tube monitoring locations within North Lincolnshire



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England⁷

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

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

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 (NO₂) 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) data⁸ 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,

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

within urbanised areas of the UK reductions in NO₂ annual mean concentrations were between 20 and 30% relative to pre-pandemic levels, which represents an absolute reduction of between 10 to 20µg/m³ if expressed relative to annual mean averages. During this period, changes in PM_{2.5} concentrations were less marked than those of NO₂. 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/m³ 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 Lincolnshire

There were no identifiable impacts as a consequence of COVID-19 upon air quality within North Lincolnshire. The Scunthorpe Town AQMA was declared for industrial related emissions of particulate matter which remained largely unchanged during 2020. It is also difficult to extrapolate the impacts of meteorological conditions for instance February 2020 was the wettest on record in England and spring was the sunniest.

Opportunities Presented by COVID-19 upon LAQM within North Lincolnshire

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

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

- The operation of North Lincolnshire Councils air quality monitoring network including calibration, filter changes and diffusion tube changeovers remained largely unaffected by the pandemic. No impact.
- Unplanned visits to monitoring stations, for example; to re-set modems, change filters or attend due to data capture disruption have, however, been more challenging whilst

LSO's have been working at home and in some cases significant distances from the monitoring stations. Small impact.

- A revised AQAP is being developed for Scunthorpe Town AQMA. However, owing to the reallocation of Council resources during 2020, the development and implementation of the AQAP has been delayed. Current estimates are that the revised AQAP will be prepared in and sent out for draft consultation in the near future.

Medium Impact

The impacts as presented above are aligned with the criteria as defined in Table F.1, with professional judgement considered as part of their application.

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.