

North Lincolnshire Council

2023 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management, as amended by the
Environment Act 2021

Date: June 2023

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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 29,000 to 43,000 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, 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.

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, January 2023

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

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>

The main pollutant of concern within North Lincolnshire is PM₁₀. For the year 2022, the PM₁₀ 24 hour mean objective was breached at one location within the Scunthorpe Air Quality Management Area (AQMA) boundary, all other sites remain compliant. The Annual Mean PM₁₀ Air Quality Objective was 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 2022, whilst the concentrations have reduced at both sites, 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.

The Environmental Improvement Plan⁵ sets out actions that will drive continued improvements to air quality and to meet the new national interim and long-term PM_{2.5} targets. The National Air Quality Strategy, due to be published in 2023, will provide more information on local authorities' responsibilities to work towards these new targets and reduce PM_{2.5} in their areas. The Road to Zero⁶ details the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Air Quality Monitoring Network Upgrade

North Lincolnshire Council have invested in the upgrade of TEOM and FDMS monitoring equipment used for measuring PM₁₀ within Scunthorpe. The current instruments have been installed and operated within the network for a number of years. They are considered old technology when compared with newer more effective real time air quality monitoring equipment. It is also recognised that due to this fact there are increasing levels of uncertainty in some of the results being obtained. Due to its high operating temperature, a correction using a volatile correction model is applied to TEOM data to give gravimetric equivalence. DEFRA have advised the following in relation to this correction:

⁵ Defra. Environmental Improvement Plan 2023, January 2023

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

“It should be noted, however, that due to the gradual withdrawal of TEOM-FDMS instruments and phased replacement with new compliant PM monitoring equipment on the AURN, the extent of data available to maintain the VCM has significantly reduced in recent years. As such, the extent of geographical coverage for the applicability and future viability of the VCM has become limited. Local authorities who have been reliant on the VCM are therefore advised to consider replacing these instruments for others that have been shown to be equivalent to the reference method.”⁷

This further supports the need to upgrade to instruments that do not rely upon the application of a VCM correction.

The upgrade of these instruments has allowed for more accurate real time recording of the PM10 concentrations and additional measurement of PM2.5 at Low Santon. This will facilitate a better understanding of the influence of weather, background contributions and operational activities at the Steelworks upon PM concentrations.

The equipment that has been purchased is Smart Heated BAM 1020s used for measuring PM10 or PM2.5. This equipment is deemed equivalent by Defra⁸, Certified to MCERTS for UK Particulate Matter and Certified to MCERTS for Continuous Ambient Measurement Systems (CAMS).

The following equipment has been replaced during the Summer of 2022:

- Low Santon FDMS and TEOM
- East Common Lane TEOM
- High Street East TEOM
- Amvale TEOM

⁷ <https://laqm.defra.gov.uk/technical-guidance/>

⁸ <https://uk-air.defra.gov.uk/networks/monitoring-methods?view=mcerts-scheme>

This investment demonstrates the Council's continued commitment to the review and assessment of local air quality.

Air Quality Website

During Spring 2021, North Lincolnshire Council's 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 (TG22). 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

Since 2019, North Lincolnshire Council and the Environment Agency have produced 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 Team's 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 the public. The burning of controlled waste at commercial premises has resulted in five prosecutions and several cautions in recent years. Complaints in relation to domestic bonfires and domestic chimneys are also investigated taking into account the recent changes introduced by the Environment Act 2021 in relation to Smoke Control Areas.

It is the intention of North Lincolnshire Council to continue to pursue offenders, in line with our enforcement policy, to protect human health and improve local air quality.

Air Quality Action Plan

Where a Local Authority has declared an AQMA, they must develop and publish an Air Quality Action Plan (AQAP). The AQAP must set out measures the local authority will take to secure the achievement, and maintenance, of air quality standards and objectives in the area of the AQMA and must specify a date by which each measure will be carried out. North Lincolnshire Council produced its first AQAP in 2008, this was later updated in January 2012. The AQAP has not been updated since this time.

As a result of this, in February 2023, North Lincolnshire Council instructed Environmental Consultants Ricardo Energy & Environment to undertake a review and update of the AQAP.

Ricardo support Local Authorities to deliver improvements in air quality and provide expert evidence and analysis needed to develop robust policy and actions, with a proven track record. During this time, a Steering Group has been formed which is made up of representatives from the Council including: Environmental Protection, Development Management, Public Health and Highways as well as the Environment Agency and several local operators. The Steering Group has met on two occasions to produce a list of measures to improve local air quality.

It is intended that the AQAP will be submitted to DEFRA for their appraisal during the Summer of 2023 before being formally adopted.

Working with partners

In 2022 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:

- PM10 24 Hour Mean Air Quality Objective at Low Santon
- 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 2022.

Despite there being only one exceedance of the PM10 24-hour mean objective in 2022, other 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. Some locations have seen an increase in the number of exceedance days for the PM10 24-hour mean for 2022 including Scunthorpe Town, High Street East and Low Santon. This may be as a result of meteorological conditions during 2022 with the average annual temperature exceeding 10C for the first time.⁹ A spell of heatwaves in June 2022 led to the UK experiencing its fourth warmest summer on record with temperatures exceeding 40C for the first time, leading the Met Office to issue its first-ever red warning for extreme heat. This warm and dry weather experienced during 2022 is likely to have resulted in elevated fugitive emissions from surfaces including roads and stockpiles.

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. However, further reductions are expected due to the anticipated closure of the Appleby Coke Ovens, the only remaining coke oven on site, in Summer 2023.

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. This matter has been addressed by the introduction of a Smart Heated BAM 1020 at Low Santon during Summer 2022.

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

⁹ <https://www.bbc.co.uk/news/uk-64173485>

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. Further reductions are expected due to the anticipated closure of the Appleby Coke Ovens, the only remaining coke oven on site, in Summer 2023.
- In North Lincolnshire the prevailing wind is from the southwest 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.

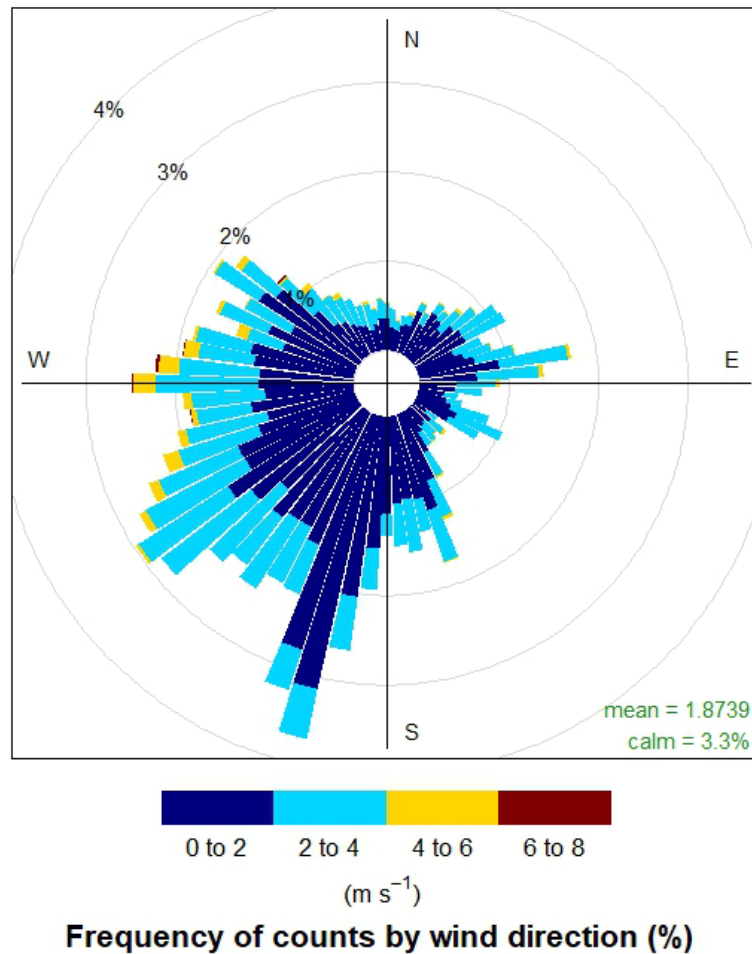


Figure 1 - Wind Direction and Speed 2022

In 2023/24 North Lincolnshire Council aims to:

- Continue operation of the air quality network and website, with associated data analysis and ratification
- 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 continued improvements to local air quality
- Improve the existing mechanisms in place to influence and control on-site management practices to control dust emissions via the Air Quality Action Plan

- 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
- 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/>

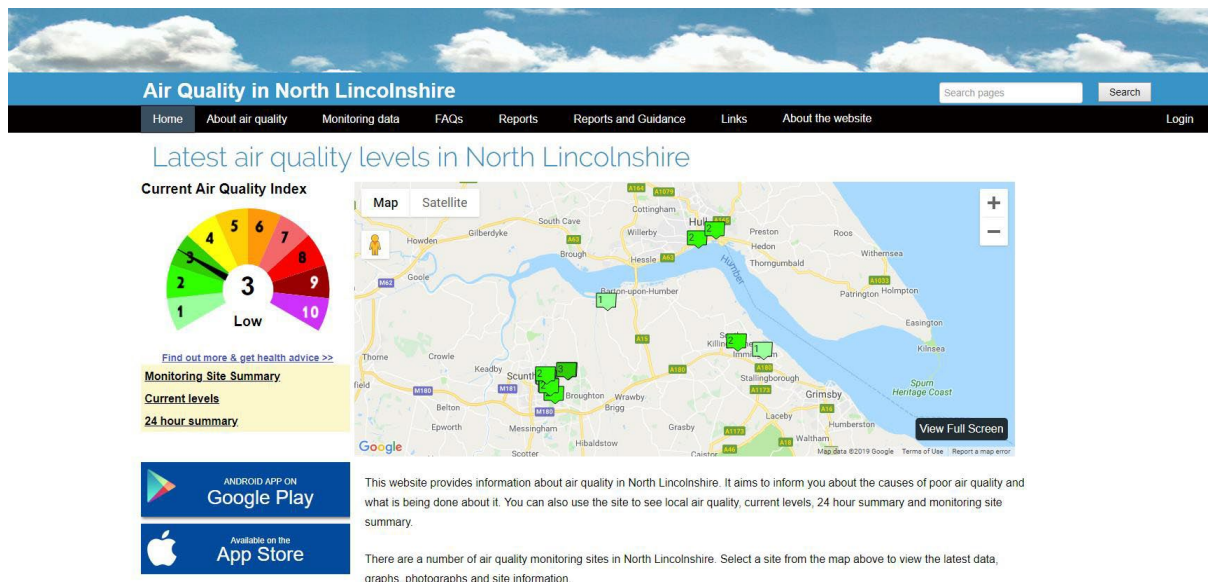


Figure 2 - Air Quality in North Lincolnshire Website

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

Local Responsibilities and Commitment

This ASR was prepared by the Environmental Protection Team of North Lincolnshire Council.

This ASR will be approved and signed off by the relevant Heads of Service and Director of Public Health prior to consultation

If you have any comments on this ASR please send them to Environmental Protection Team at:

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Local Air Quality Management

This report provides an overview of air quality in North Lincolnshire during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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 replicated below:

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

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 18 months. The AQAP should specify how air quality targets will be achieved, maintained and provide dates by which measures will be completed.

A summary of AQMAs declared by North Lincolnshire Council can be found in Table 1. The table presents a description of the AQMA that is currently designated within North Lincolnshire. Appendix D: Map(s) of Monitoring Locations and AQMAs provides maps of the AQMA and 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 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	Number of Years Compliant with Air Quality Objective	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	42	0 years	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 that the report is well structured, detailed, and provides the information specified in the Guidance.

North Lincolnshire Council has taken forward a number of direct measures during the current reporting year of 2022 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2. Over 40 measures are included within Table 2, with the type of measure and the progress North Lincolnshire Council have made during the reporting year of 2022 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.

More detail on these measures can be found in their respective Action Plans. In February 2023, North Lincolnshire Council instructed Environmental Consultants Ricardo Energy & Environment to undertake a review and update of the current AQAP. Ricardo support Local Authorities to deliver improvements in air quality and provide expert evidence and analysis needed to develop robust policy and actions, with a proven track record. During this time, a Steering Group has been formed which is made up of representatives from the Council including: Environmental Protection, Development Management, Public Health and Highways as well as the Environment Agency and several local operators. The Steering Group has met on two occasions to produce a list of measures to improve local air quality. 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:

- Instruct Ricardo AEA to undertake a review of the Scunthorpe Town Air Quality Action Plan
- The successful implementation of new air quality monitoring equipment for measuring PM10 and PM2.5 within Scunthorpe.
- 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 Council's 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:

- Consultation and adoption of the updated AQAP for the Scunthorpe Town AQMA
- 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 planning consultations
- Apply for DEFRA Grant funding where appropriate

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 southwest 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 addition, recent summers have been dry and warm which leads to an increase in fugitive emissions from stockpiles and roads. 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 will achieve compliance in the Scunthorpe Town AQMA.

Whilst the measures stated above and in Table 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 - Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
A1	Maintain network of PM10 analysers	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	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. Sites are located and upgraded as appropriate.
A2	Boundary monitoring of PM10, PM2.5, PM1 and Total Suspended Particles at Permitted sites AQMA	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2008 - 2015	Complete	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		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		NO	Not Funded	£10k - 50k	Completed			Complete	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
A5	Study into a local TEOM to Partisol correction factor. Consideration of alternative measurements techniques or correction factors as developed.	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2008 - 2014	Complete	NLC	NLC	NO	Not Funded	< £10k	Completed			Complete	The Partisol monitor was removed in December 2014. There are no current plans to use this monitor again
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		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		NO	Not Funded	< £10k	Completed			Complete	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
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		NO	Not Funded	< £10k	Completed			Complete	
B1	Launch and maintain North Lincolnshire air quality website with: - 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 been awarded to ensure it continues
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

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
B3	Investigate the potential for air pollution forecasting in Scunthorpe	Environmental Permits	Other measure through permit systems and economic instruments	2009 - present	To continue	NLC		NO	Not Funded	< £10k	Implementation			Ongoing	Pollution forecasting is undertaken by operators on the integrated steelworks site. Currently there are no plans for this to be extended for the public to utilise.
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	To continue	NLC	NLC	NO	Not Funded	< £10k	Implementation			Ongoing	Issue-specific campaigns have previously been undertaken using the internet, local press and council publications. Further campaigns will be developed as appropriate.
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			Complete	The Council has produced a leaflet and delivered it to businesses, including all within the Scunthorpe AQMA. These leaflets are still used on an ad hoc basis.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
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.	Policy Guidance and Development Control	Other policy	Ongoing	To continue	NLC		NO	Not Funded	< £10k	Implementation			Ongoing	Enforcement action is taken against those contravening the Environmental Protection Act 1990 and Clean Air Act 1993
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		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	Implementation			Ongoing	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

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
C6	Complaints in respect of domestic smoke control will be investigated as a priority and enforcement action taken in accordance with the enforcement policy.	Policy Guidance and Development Control	Other policy	Ongoing	To continue	NLC		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		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		NO	Not Funded	< £10k	Implementation			Complete	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission 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	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
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	Data is reviewed by the Technical Working Group to analyse trends and determine areas for improvement. Daily pollution episodes are identified and action is taken to review the cause and analyse the process contribution.
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.	Environmental Permits	Other	2008 - present	To continue	NLC, EA, Industry		NO	Not Funded	< £10k	Implementation			Ongoing	The Low Santon AQMA (PM10 annual mean) was revoked in 2018. The Scunthorpe Tpown AQMA was reduced in size in 2018. This was as a result of the 2016 Detailed Assessment.

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
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		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 in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission 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	Implementation			Ongoing	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	

Measure No.	Measure	Category	Classification	Year Measure Introduced in AQAP	Estimated / Actual Completion Date	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
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.
F8	The council will aim to: - Reduce traffic flows through promotion of sustainable travel and demand management measures. - Reduce transport related emissions by reducing traffic flows and making more efficient use of the network	Traffic Management	UTC, Congestion management, traffic reduction	Ongoing	To continue	NLC		NO	Not Funded	< £10k	Implementation			Ongoing	The implementation of this action is incorporated within the Council's current Local Transport Plan.

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

As detailed in Policy Guidance LAQM.PG22 (Chapter 8), 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 East Common Lane which is within the Scunthorpe AQMA.
- The addition of PM_{2.5} monitoring at Low Santon following the installation of new monitoring equipment (Smart Heated BAM 1020) during Summer 2022
- 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 2022 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 2018 and 2022 to allow monitoring trends to be identified and discussed.

Summary of Monitoring Undertaken

Automatic Monitoring Sites

North Lincolnshire Council undertook automatic (continuous) monitoring at 6 sites during 2022. 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 24 sites during 2022. 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 2022 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 2022, 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 allows 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 relation to Amvale, 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 PM2.5 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. North Lincolnshire Council will continue to monitor at this location and monitor trends in concentrations.

Within the Scunthorpe AQMA, the following instruments were replaced by Smart Heated BAM 1020's in August 2022:

- Low Santon FDMS and TEOM

- East Common Lane TEOM
- High Street East TEOM
- Amvale TEOM

The TEOM/FDMS's were considered old technology when compared with newer more effective real time air quality monitoring equipment. The Smart Heated BAM 1020's are deemed equivalent by Defra¹⁰, Certified to MCERTS for UK Particulate Matter and Certified to MCERTS for Continuous Ambient Measurement Systems (CAMS).

As a result of this change in equipment, the monitoring results have been combined. For example, at the Amvale TEOM, the data collected from January to August has been added to the data collected from August to December by the BAM following discussions with or data ratification providers, AQDM.

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 2022 there were no recorded exceedances of the annual mean air quality objective for PM₁₀ (40µg/m³). The 24 hour mean air quality objective (50 µg/m³ not to be exceeded more than 35 times a year) was exceeded at one monitoring location (Low Santon, CM3). This may be linked to the warm and dry meteorological conditions that existed during 2022.

¹⁰ <https://uk-air.defra.gov.uk/networks/monitoring-methods?view=mcerts-scheme>

Particulate Matter (PM2.5)

PM2.5 is particulate matter that is less than 2.5 microns in diameter. The sources for this are similar for the PM10 pollutant as listed above.

This pollutant was measured using an Osiris monitor at East Common Lane (CM2). 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 there are limited PM2.5 monitoring methods available to the Council at this time. A Smart Heated BAM 1020 was installed at Low Santon (CM3) during Summer 2022 to increase the monitoring distribution of PM2.5 within the district. The results at Low Santon have been annualised as a result of this.

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 (PM2.5) on mortality. This is replicated in Table 3 below:

Table 3 - PHOF Indicator

D01: Fraction of mortality attributable to particulate air pollution	
Rationale	<p>Poor air quality is a significant public health issue. The burden of air pollution in the UK in 2013 was estimated to be equivalent to approximately 28,000-36,000 deaths at typical ages and an associated loss of population life of 328,000-416,000 life years lost (COMEAP, 2018a).</p> <p>Inclusion of this indicator in the Public Health Outcomes Framework will enable Directors of Public Health to prioritise action on air quality in their local area to help reduce the health burden from air pollution.</p>

Further information in relation to this indicator can be found at the following link:

<https://fingertips.phe.org.uk/>

For North Lincolnshire, the fraction of mortality attributable to particulate air pollution is 4.8% (most recent data set, 2021). This is lower than the England average of 5.5%. 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 presents the ratified and adjusted monitored PM_{2.5} annual mean concentrations for the past five years.

In 2022 there were no recorded exceedances of the annual mean (25µg/m³) air quality target value for PM2.5.

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 2022:

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

Table A. 9 in Appendix A compares the ratified continuous monitored SO₂ concentrations for 2022 with the air quality objectives for SO₂.

In 2022 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 ($125\mu\text{g}/\text{m}^3$ 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 $5\mu\text{g}/\text{m}^3$. This was not exceeded in 2022 as the annual mean recorded at Scunthorpe Town AURN in 2022 was $0.78\mu\text{g}/\text{m}^3$.

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

In 2022 there were no recorded exceedances of the annual mean ($5\mu\text{g}/\text{m}^3$) 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 enables 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.

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/m^3 . However, further reductions are expected due to the anticipated closure of the Appleby Coke Ovens, the only remaining coke oven on site, in Summer 2023. 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/m^3 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/m^3 .

In 2022 the annual average for Scunthorpe Town AURN was 0.61ng/m^3 , and for Low Santon it was 0.51 ng/m^3 , this is a reduction at both sites. 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 2022 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 for the last 5 years 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 2022 at Scunthorpe Town and Low Santon.

In 2022 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, Flourescent, BAM & TEOM	21	7	2
CM2	East Common Lane	Urban background	490663	409789	PM ₁₀ , PM _{2.5}	YES, Scunthorpe Town AQMA	Osiris TEOM (Jan-Aug) BAM (Aug-Dec)	3	28	1.5
CM3	Low Santon	Industrial	492945	411931	SO ₂ , NO ₂ , PM ₁₀ , PM _{2.5}	YES, Scunthorpe Town AQMA	Chemiluminescent, Flourescent, FDMS (Jan - Aug) TEOM (Jan - Aug), BAM (Aug - Dec)	41	5	2
CM4	Amvale	Industrial	491343	408782	PM ₁₀	YES, Scunthorpe Town AQMA	TEOM (Jan-Aug) BAM (Aug-Dec)	150	100	1.5
CM5	High Street East	Industrial	490224	411301	PM ₁₀	YES, Scunthorpe Town AQMA	TEOM (Jan-Aug) BAM (Aug-Dec)	18	10	1.5
CM6	Killingholme School	Other	514880	416133	SO ₂ , NO ₂ , PM ₁₀	NO	Chemiluminescent & TEOM	9	N/A	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. 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	2.0
2	Scotter Road (North side of roundabout)	Roadside	487239	411259	NO2	NO	9.0	2.0	No	2.0
3	B & Q	Roadside	486699	411110	NO2	NO	2.0	15.0	No	2.0
4	Hilton Ave	Roadside	486928	411156	NO2	NO	12.0	3.0	No	2.0
5	Britannia Corner	Urban Background	489190	411285	NO2	NO	4.0	2.0	No	2.0
6	Oswald Road	Urban Background	489209	411118	NO2	NO	4.0	3.0	No	2.0
7	Queensway Pub	Roadside	489172	409926	NO2	NO	20.0	2.0	No	2.0
8	Ashby Road	Roadside	489112	409463	NO2	NO	15.0	1.0	No	2.0
9	Queensway	Roadside	491628	408658	NO2	NO	16.0	2.0	No	2.0
10	Mortal Ash Hill	Roadside	491901	408626	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	2.0
12	Barnard Avenue Brigg	Suburban	499975	407421	NO2	NO	30.0	3.0	No	2.0

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	2.0
14	School Road Killingholme	Roadside	514782	415971	NO2	NO	15.0	1.0	No	2.0
15	Humber Rd Chip shop	Urban Background	515452	416107	NO2	NO	2.0	15.0	No	2.0
16	Humber Rd	Roadside	515279	416085	NO2	NO	5.0	2.0	No	2.0
17	Holydyke Barton	Suburban	503025	421942	NO2	NO	15.0	1.0	No	2.0
18	Rowland Road AQ station	Industrial	490316	410837	NO2	YES, Scunthorpe Town AQMA	21.0	6.0	Yes	2.0
19	Rowland Road AQ station	Industrial	490316	410837	NO2	YES, Scunthorpe Town AQMA	21.0	6.0	Yes	2.0
20	Rowland Road AQ station	Industrial	490316	410837	NO2	YES, Scunthorpe Town AQMA	21.0	6.0	Yes	2.0
21	ASDA Carlton Street	Roadside	490080	411258	NO2	YES, Scunthorpe Town AQMA	20.0	1.0	No	2.0
22	East Halton Road Killingholme	Roadside	514141	417483	NO2	NO	4.0	1.0	No	2.0
23	Phoenix Park Care Village	Roadside	488645	412891	NO2	No	85.0	1.0	No	2.0
24	Burringham Road/ Woodside Drive	Roadside	487203	408372	NO2	No	5.0	1.0	No	2.0

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 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
CM1	490320	410831	Industrial	N/A	98.0	18	15	13	13	13
CM3	492945	411931	Industrial	N/A	99.1	20	19	20	13	13
CM6	514880	416133	Other	N/A	91.9	18	15	13	14	14

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22

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.TG22 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 ($\mu\text{g}/\text{m}^3$)

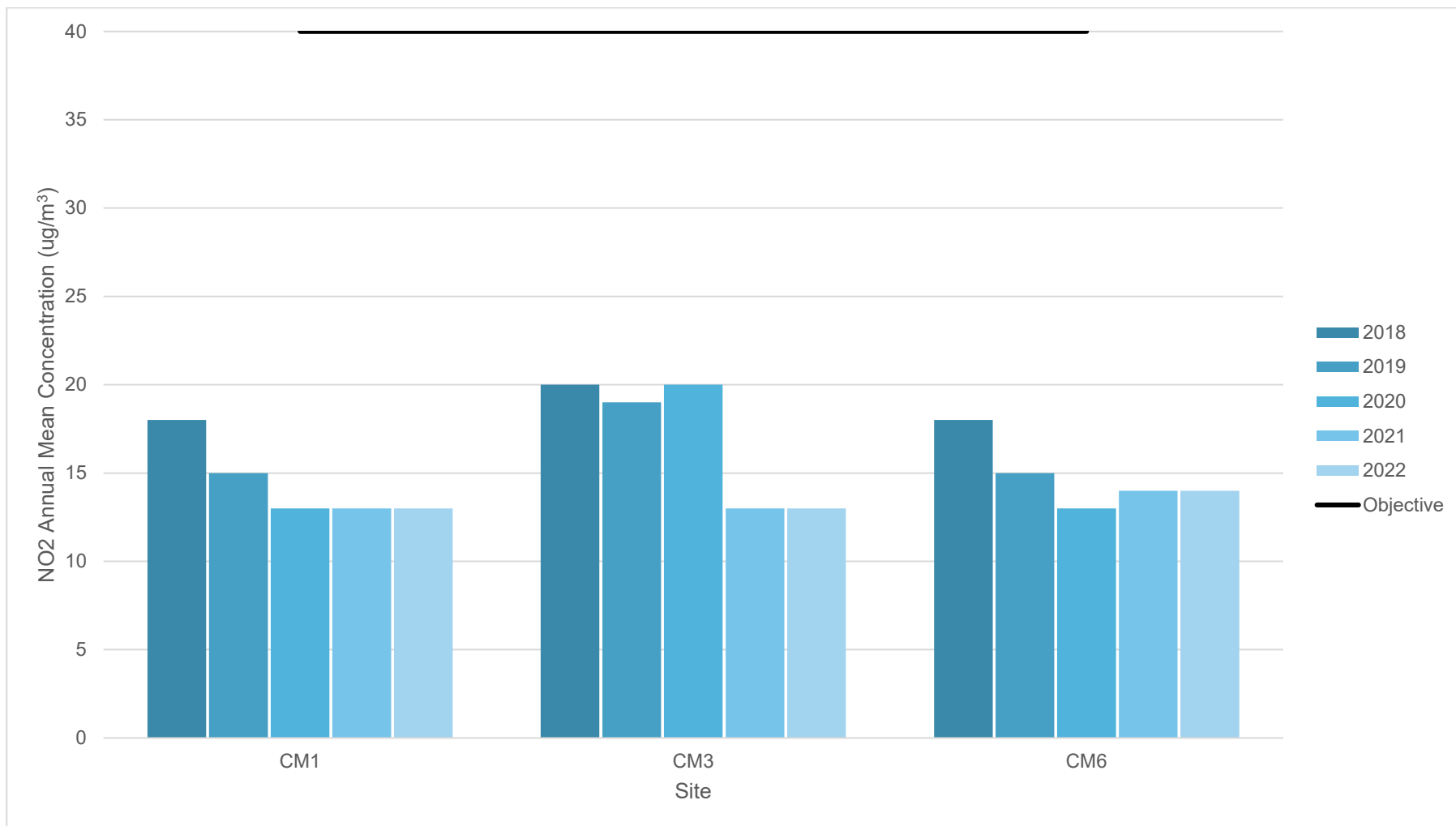


Table A. 4 - Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring (µg/m³)

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 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
1	489099	411723	Urban Background	N/A	92.3	19.0	21.3	23.8	24.0	28.4
2	487239	411259	Roadside	N/A	92.3	24.0	24.0	21.5	24.6	24.3
3	486699	411110	Roadside	N/A	80.8	19.0	18.0	17.5	17.2	19.8
4	486928	411156	Roadside	N/A	100.0	20.0	20.0	19.0	21.0	20.7
5	489190	411285	Urban Background	N/A	100.0	24.0	24.0	21.5	24.8	24.0
6	489209	411118	Urban Background	N/A	100.0	23.0	24.0	21.5	23.3	22.7
7	489172	409926	Roadside	N/A	100.0	24.0	22.0	21.2	26.3	22.9
8	489112	409463	Roadside	N/A	82.7	25.0	26.0	22.5	25.3	25.3
9	491628	408658	Roadside	N/A	100.0	19.0	20.0	17.8	17.5	19.1
10	491901	408626	Roadside	N/A	92.3	34.0	34.0	28.5	34.4	30.2
11	491859	408645	Roadside	N/A	90.4	20.0	20.0	20.7	20.4	19.6
12	499975	407421	Suburban	N/A	100.0	20.0	20.0	17.1	18.8	19.6
13	514573	415901	Roadside	N/A	100.0	17.0	17.0	18.2	17.4	16.8

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 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
14	514782	415971	Roadside	N/A	100.0	28.0	29.0	26.4	28.4	27.1
15	515452	416107	Urban Background	N/A	100.0	20.0	18.0	16.6	17.9	16.7
16	515279	416085	Roadside	N/A	100.0	26.0	25.0	23.4	22.0	23.8
17	503025	421942	Suburban	N/A	51.9	20.0	21.0	17.6	20.9	22.3
18	490316	410837	Industrial	N/A	100.0	16.0	15.0	13.7	13.4	13.9
19	490316	410837	Industrial	N/A	100.0	16.0	15.0	13.4	13.5	13.3
20	490316	410837	Industrial	N/A	100.0	15.0	15.0	13.7	14.1	13.1
21	490080	411258	Roadside	N/A	92.3	21.0	22.0	19.4	19.9	20.2
22	514141	417483	Roadside	N/A	92.3	21.0	21.0	22.0	25.6	24.4
23	488645	412891	Roadside	N/A	92.3	N/A	N/A	N/A	21.2	24.3
24	487203	408372	Roadside	N/A	100.0	N/A	N/A	N/A	17.3	15.9

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22

Diffusion tube data has been bias adjusted

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

Notes:

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

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

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

Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG22 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 ($\mu\text{g}/\text{m}^3$)

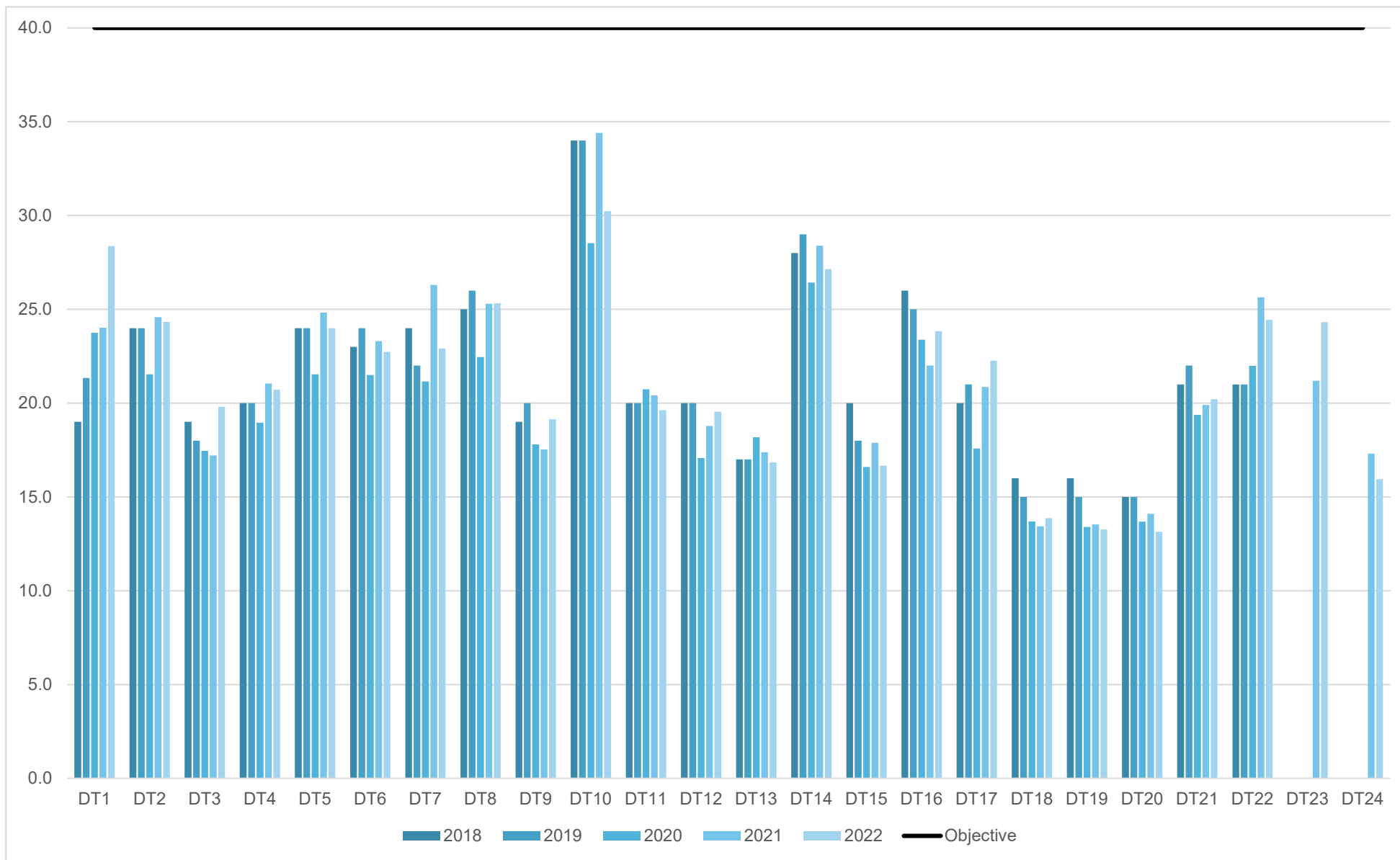


Table A. 5 - 1-Hour Mean NO₂ Monitoring Results, Number of 1-Hour Means >200µg/m³

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
CM1	490320	410831	Industrial	N/A	98.0	0	0	0	0	0
CM3	492945	411931	Industrial	N/A	99.1	0	0	0	0	0
CM6	514880	416133	Other	N/A	91.9	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 ($\mu\text{g}/\text{m}^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
CM1 BAM	490320	410831	Industrial	N/A	79.0	18	20	17	17	19
CM1 TEOM	490320	410831	Industrial	N/A	94.2	20	22	17	17	19
CM2	490663	409789	Urban Background	N/A	98.5	21	22	19	22	22
CM3 FDMS/BAM	492945	411931	Industrial	N/A	94.2	25	22	21	23	29
CM3 TEOM/BAM	492945	411931	Industrial	N/A	95.3	31	29	29	27	31
CM4	491343	408782	Industrial	N/A	98.2	20 (18)	21	22	21	20
CM5	490224	411301	Industrial	N/A	97.9	22 (20)	21	18	19	22
CM6	514880	416133	Other	N/A	89.6	19	19	15	11	18

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22

Notes:

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

Exceedances of the PM₁₀ annual mean objective of 40 $\mu\text{g}/\text{m}^3$ are shown in **bold**.

All means have been “annualised” as per LAQM.TG22 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

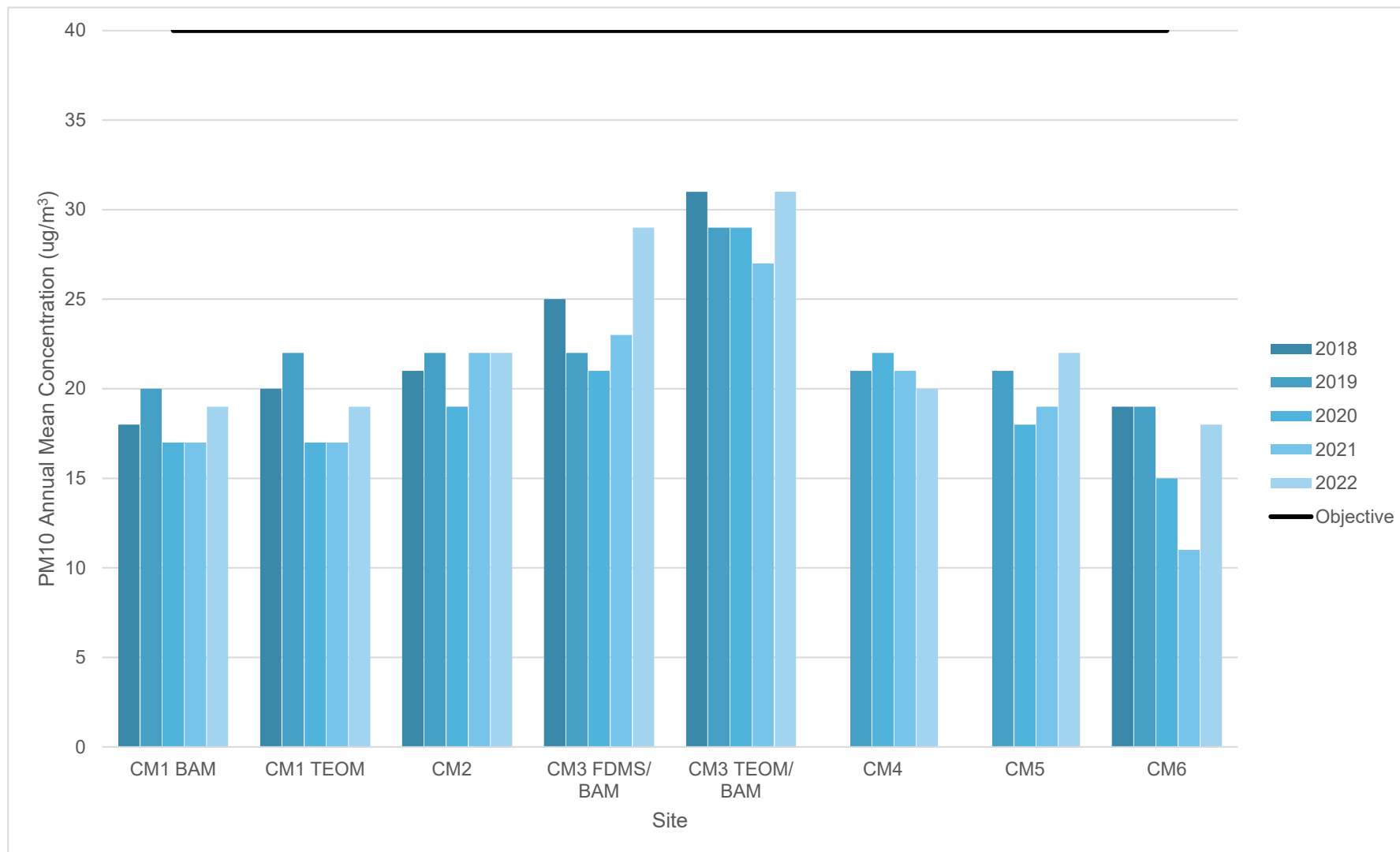


Table A. 7 - 24 Hour Mean PM10 Monitoring Results, Number of PM10 24-Hour Means > 50µg/m³

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽²⁾	2018	2019	2020	2021	2022
CM1 BAM	490320	410831	Industrial	N/A	79.0	9	18	3	4	15 (33)
CM1 TEOM	490320	410831	Industrial	N/A	94.2	6	22	3	4	11
CM2	490663	409789	Urban Background	N/A	98.5	16	22	24	30	26
CM3 FDMS/ BAM	492945	411931	Industrial	N/A	94.2	22	7	2	11	30
CM3 TEOM/ BAM	492945	411931	Industrial	N/A	95.3	40	35	30	30	42
CM4	491343	408782	Industrial	N/A	98.2	16	15	30 (51)	23	20
CM5	490224	411301	Industrial	N/A	97.9	2	14	1	3	10
CM6	514880	416133	Other	N/A	89.6	3	5	0	0	3

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

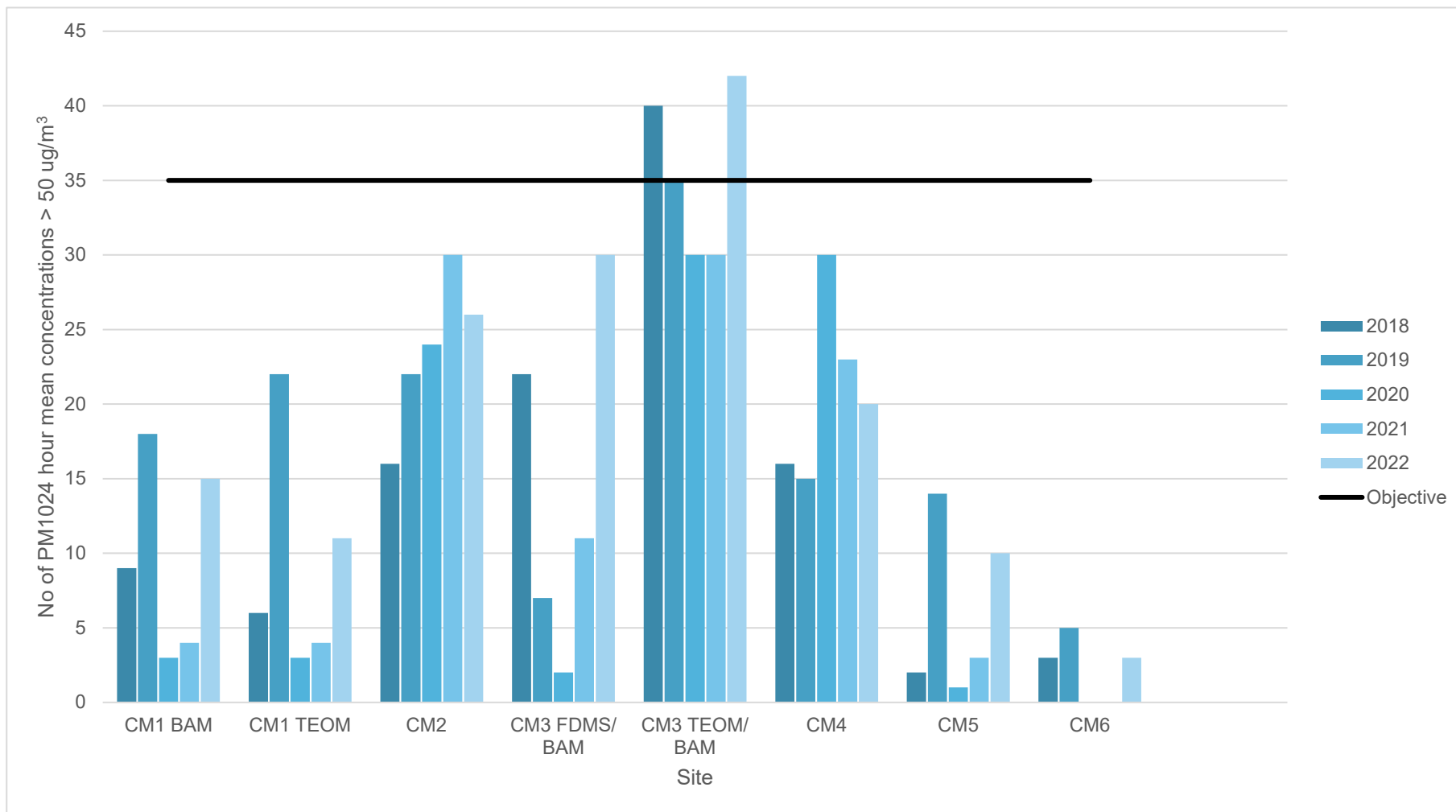


Table A. 8 - Annual Mean PM2.5 Monitoring Results ($\mu\text{g}/\text{m}^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2022 (%) (2)	2018	2019	2020	2021	2022
CM2	490663	409789	Urban Background	N/A	81.4	10	7	7	6	8
CM3	492945	411931	Industrial	99.8	39.1	N/A	N/A	N/A	N/A	13

Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22

Notes:

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

All means have been “annualised” as per LAQM.TG22 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 PM2.5 Concentrations

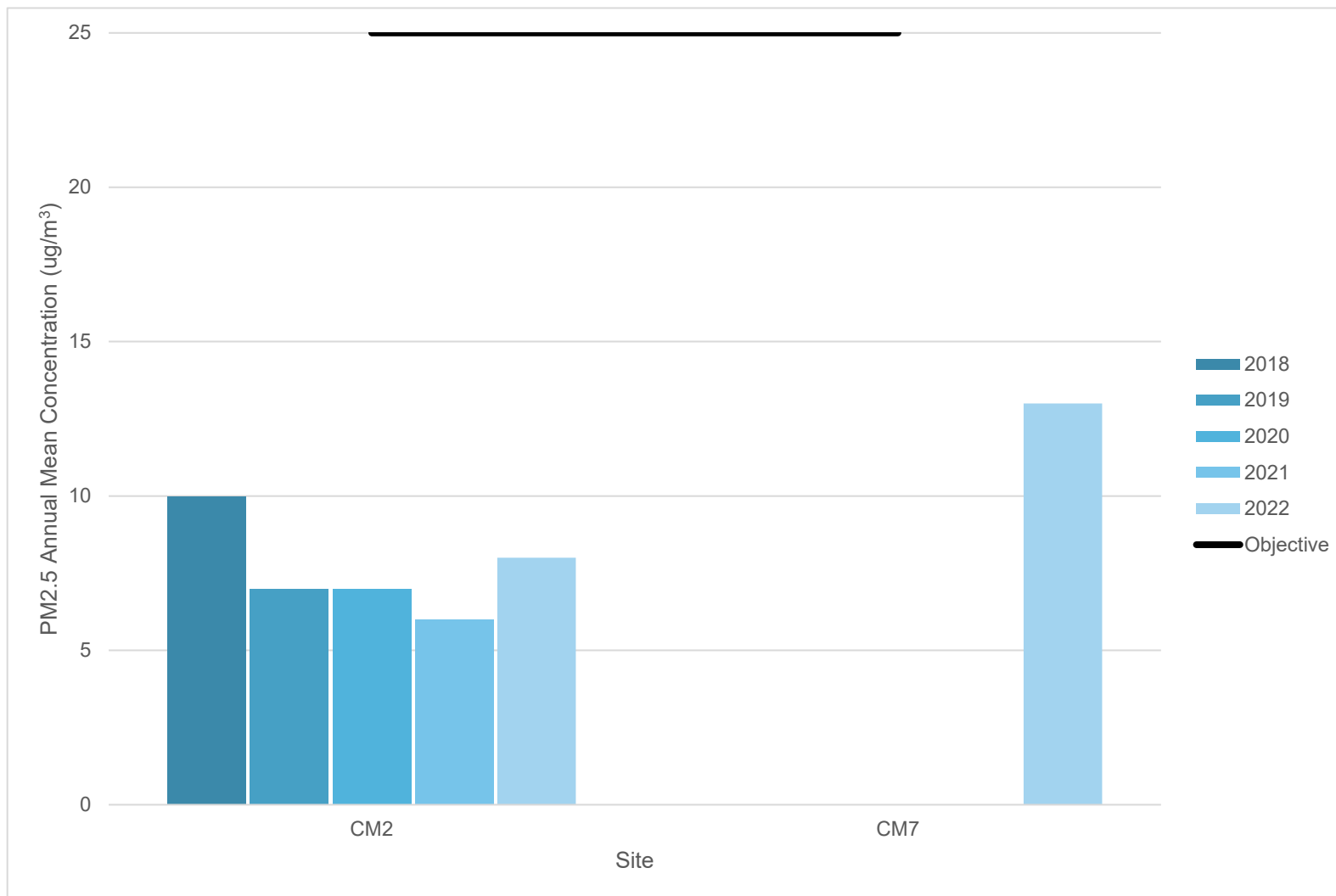


Table A. 9 - SO₂ Monitoring Results, Number of Relevant Instances

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2022 (%) ⁽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	95.0	0	0	0
CM3	492945	411931	Industrial	N/A	96.3	0	0	0
CM6	514880	416133	Other	N/A	91.5	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/m3)
12/01/2022	26/01/2022	0.97
26/01/2022	09/02/2022	0.45
09/02/2022	23/02/2022	0.49
23/02/2022	09/03/2022	1.07
09/03/2022	23/03/2022	1.91
23/03/2022	06/04/2022	1.35
06/04/2022	20/04/2022	0.78
20/04/2022	04/05/2022	0.51
04/05/2022	18/05/2022	0.37
18/05/2022	01/06/2022	0.13
01/06/2022	15/06/2022	0.34
15/06/2022	29/06/2022	0.81
29/06/2022	13/07/2022	0.17
13/07/2022	03/08/2022	0.38
03/08/2022	10/08/2022	0.45
10/08/2022	24/08/2022	0.88
24/08/2022	07/09/2022	1.15
07/09/2022	21/09/2022	1.19
21/09/2022	05/10/2022	0.85
05/10/2022	19/10/2022	0.82
19/10/2022	02/11/2022	0.86
02/11/2022	16/11/2022	0.81
16/11/2022	30/11/2022	0.92
30/11/2022	21/12/2022	1.21
21/12/2022	28/12/2022	1.16
28/12/2022	18/01/2023	0.46
Annual Average		0.79

Figure A. 6 - Trends in Annual Mean Benzene Concentrations

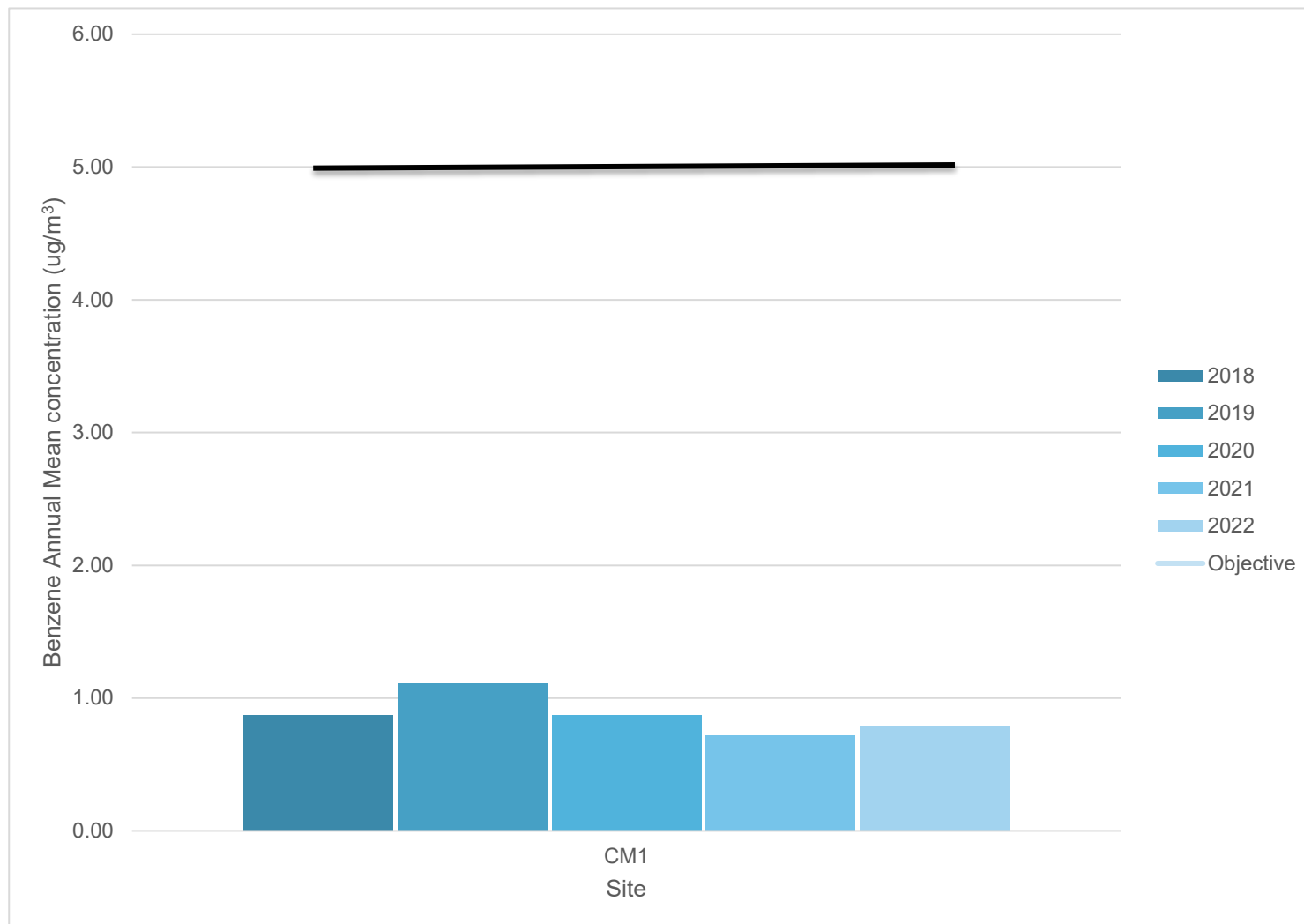


Table A. 11 - PAH (Benzo(a)pyrene (B[a]P)) Monitoring Results

Concentration ng/m ³	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Time Weighted Average
Scunthorpe Town (CM1)	0.84	0.25	1.5	0.3	0.21	0.3	0.22	0.55	0.58	0.97	0.66	0.96	0.61
Low Santon (CM3)	0.74	0.82	0.28	0.4	0.4	0.34	0.29	0.36	0.23	0.83	0.57	0.91	0.51

Notes:

Exceedances of the National Air Quality Objective of 0.25 ng/m³ shown in bold.

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

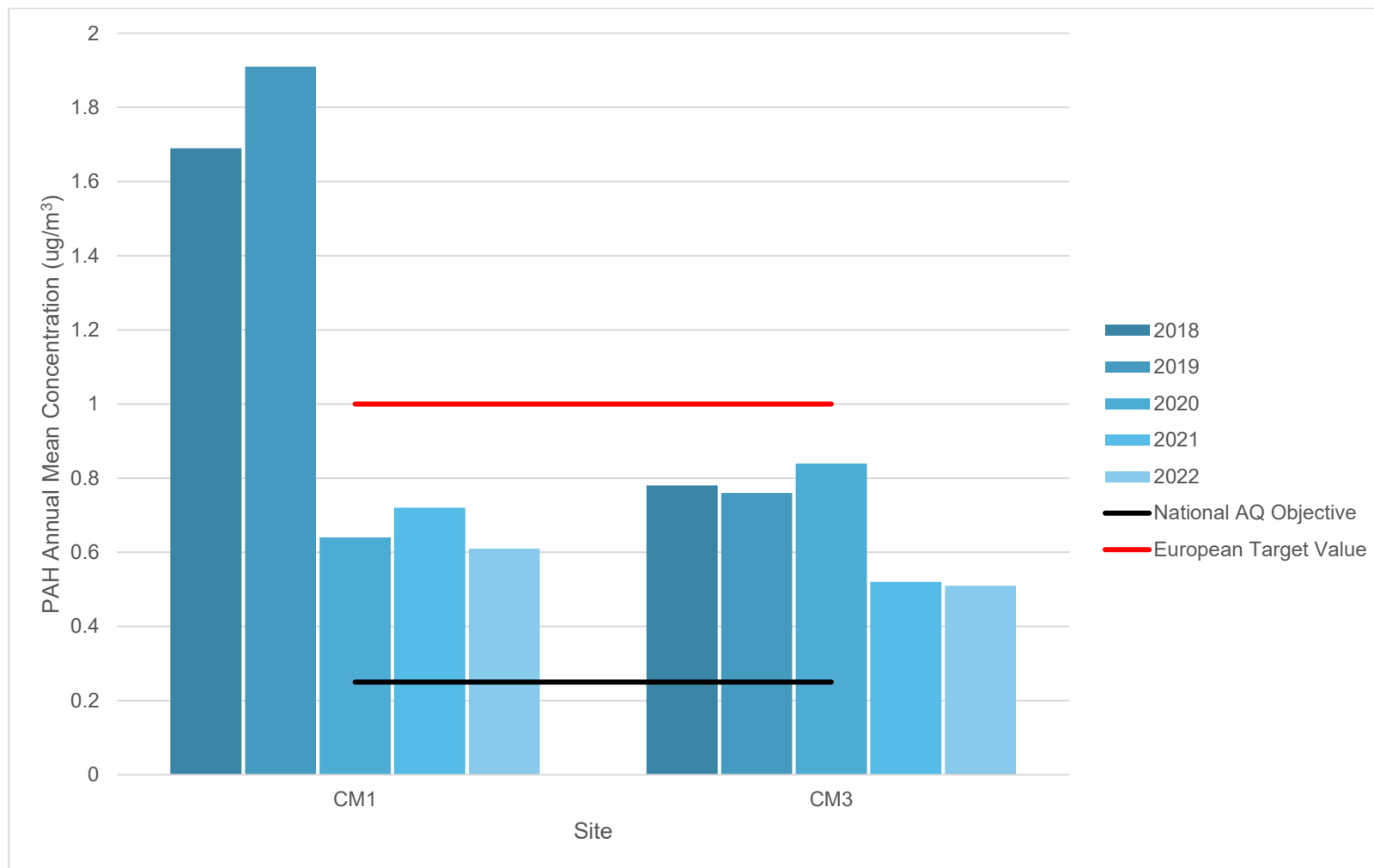


Table A. 12 - Heavy Metal Monitoring Results - Annual Mean Concentration ng/m³

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
Arsenic (As)	0.8	0.9	6
Cadmium (Cd)	0.3	0.6	5
Cobalt (Co)	0.1	0.3	
Chromium (Cr)	1.9	4.4	
Copper (Cu)	4.6	10.4	
Iron (Fe)	764.7	2238.5	
Manganese (Mn)	24.4	101.1	
Nickel (Ni)	1.0	1.4	20
Lead (Pb)	10.4	22.2	500
Selenium (Se)	1.0	1.3	
Vanadium (V)	1.9	12.3	
Zinc (Zn)	22.0	33.2	

Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B. 1 - NO₂ 2022 Diffusion Tube Results (µg/m³)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.76)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
1	489099	411723	54.1	42.5	40.8	29.6	31.2		30.4	29.1	26.4	37.8	43.7	45.1	37.3	28.4	-	
2	487239	411259	43.9	30.5		31.0	27.3	29.9	30.5	30.3	28.9	33.5	32.2	34.1	32.0	24.3	-	
3	486699	411110	37.8	36.2	27.4			20.1	20.7	19.7	16.0	24.4	28.3	29.9	26.1	19.8	-	
4	486928	411156	35.9	28.1	35.4	22.5	21.5	21.2	24.0	23.5	22.0	28.4	32.3	32.3	27.3	20.7	-	
5	489190	411285	42.8	32.7	38.8	29.3	26.6	26.5	26.4	29.2	29.3	27.2	36.1	33.9	31.6	24.0	-	
6	489209	411118	38.3	26.0	38.5	31.4	24.5	22.8	24.1	30.1	26.9	27.6	33.9	34.7	29.9	22.7	-	
7	489172	409926	38.8	31.9	33.6	28.8	25.0	26.1	23.9	25.7	30.6	23.7	35.3	38.4	30.2	22.9	-	
8	489112	409463	46.2		36.3	29.6	27.6	28.9	27.2	30.3	29.6		36.6	40.9	33.3	25.3	-	
9	491628	408658	36.2	26.5	35.8	19.9	17.7	17.2	18.1	19.4	19.9	28.7	31.7	31.2	25.2	19.1	-	
10	491901	408626		12.1	40.2	37.2	41.8	42.3	44.4	43.0	41.5	44.9	45.0	45.2	39.8	30.2	-	
11	491859	408645	33.3	24.8	27.8		22.8	23.8	23.5	23.6	24.2	24.8	27.7	27.7	25.8	19.6	-	
12	499975	407421	36.3	27.0	30.2	21.8	23.1	22.0	23.2	19.2	22.4	25.0	30.7	27.8	25.7	19.6	-	
13	514573	415901	39.2	25.1	28.6	21.5	19.3	17.4	16.1	16.6	16.9	20.2	23.0	22.1	22.2	16.8	-	
14	514782	415971	46.9	30.9	49.7	37.3	34.8	29.8	32.7	33.1	33.3	26.9	38.8	34.4	35.7	27.1	-	
15	515452	416107	29.6	21.1	26.9	30.5	19.7	15.7	16.5	23.7	21.2	14.9	19.4	24.1	21.9	16.7	-	
16	515279	416085	42.8	36.1	30.7	36.7	30.4	26.0	23.2	31.2	30.3	25.7	28.8	34.5	31.4	23.8	-	
17	503025	421942			42.6	28.6	21.5		24.1	28.8				34.2	30.0	22.3	-	
18	490316	410837	29.0	17.9	27.3	15.7	12.9	12.1	14.1	13.6	14.2	16.2	21.9	24.1	18.3	13.9	-	

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.76)	Annual Mean: Distance Corrected to Nearest Exposure	Comment
19	490316	410837	27.7	18.0	26.6	14.5	12.0	11.3	12.3	13.3	14.3	15.8	21.9	21.8	17.5	13.3	-	
20	490316	410837	24.6	16.7	24.8	16.3	11.9	10.8	11.5	14.8	14.4	17.0	22.0	22.8	17.3	13.1	-	
21	490080	411258		23.6	37.8	23.8	20.9	21.1	22.7	26.2	23.0	26.9	33.7	32.8	26.6	20.2	-	
22	514141	417483	45.3	6.9		30.2	33.8	35.0	33.4	31.1	29.1	33.9	39.9	35.1	32.2	24.4	-	
23	488645	412891		28.5	47.5	55.6	65.1	17.2	16.1	23.6	23.5	21.2	25.4	28.3	32.0	24.3	-	
24	487203	408372	27.5	20.2	25.8	22.4	16.9	14.5	15.5	21.7	17.9	18.0	23.0	28.3	21.0	15.9	-	

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.TG22

Local bias adjustment factor used

National bias adjustment factor used

Where applicable, data has been distance corrected for relevant exposure in the final column

North Lincolnshire Council confirm that all 2022 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 2022

The below table provides a list of planning applications or Environmental Permits that have been granted 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.

Reference	Application	Location	Decision	AQ Relevance
PA/2021/1525	Planning permission to erect a monopole manufacturing facility	Land at Able Marine Energy Park, south of Station Road, South Humber Bank, South Killingholme	Granted with conditions	Accompanied by AQ assessment. Relevant comments provided.
PA/2021/1607	Hybrid application encompassing, in full (1): a new workshop, body shop, associated office, HGV sales, service areas and car parking ; and (2) in outline: up to 3,000 sq.m of E(g)/B2/B8 workspace in 2-5 commercial units (all matters reserved except for access).	Suite 17, Normanby Gateway, Lysaghts Way, Normanby Enterprise Park, Scunthorpe, DN15 9YG	Not yet determined	Accompanied by AQ assessment. Relevant comments provided.
PA/2021/2273	Outline planning permission to construct a lorry park with up to 200	Land to the south of M180 Barnetby Top Interchange	Not yet determined	Accompanied by AQ assessment. Relevant comments provided.

Reference	Application	Location	Decision	AQ Relevance
	parking bays; erection of an amenity building; provision of a fuel filling station including the erection of a canopy and sales building comprising ancillary retail floor space; provision of electric vehicle forecourt and charging points; erection of up to two drive-thru restaurant units including associated car parking and access/exit from the A18 with scale, appearance, layout and landscaping reserved for subsequent consideration	(Junction 5) and to the north and west of the A18, Barnetby		
PA/2022/520	Planning permission to erect a fenced energy generation plant and associated new gas meter enclosure	Phase 7, Celsius Parc, Park Farm Road, Foxhills Industrial Estate, Scunthorpe, DN15 8QP	Granted with conditions	Accompanied by AQ assessment. Relevant comments provided.
PA/2022/946	Planning permission for change of use of piggery buildings to storage and distribution	Sandhouse Farm, Broughton Road, Appleby, DN15 0DA	Not yet determined	Accompanied by AQ assessment. Relevant comments provided.

Reference	Application	Location	Decision	AQ Relevance
PA/2022/1139	Planning permission for the temporary change of use of offices and warehouse to a school for a period of 6 years	Roxburgh House, Clayfield Road, Scunthorpe, DN15 8RA	Refused	Accompanied by AQ assessment. Relevant comments provided.
PA/2022/1548	Planning permission to construct and operate a temporary pilot post-combustion carbon capture plant and associated infrastructure	Vpi Power Station, Rosper Road, South Killingholme, DN40 3DZ	Granted with conditions	Accompanied by AQ assessment. Relevant comments provided.
PA/2022/1223	Hybrid application comprising full planning permission for the construction of a hardstanding area for external level storage with landscaping, drainage, access and associated works, and outline planning permission to erect 26,096m ² floor space for industrial/storage and distribution, (Use Class B2/Use Class B8) including ancillary offices (Use Class E) with appearance, landscaping, layout and scale reserved for subsequent consideration	Land To The North, Humber Road, South Killingholme	Not yet determined	Accompanied by AQ assessment. Relevant comments provided.

Reference	Application	Location	Decision	AQ Relevance
CON/2021/1178	PEIR relating to an application by North Lincolnshire Green Energy Park Ltd (the Applicant) for an Order granting Development Consent for the North Lincolnshire Green Energy Park (the Proposed Development)	Land at Flixborough Port, adjacent to Flixborough Industrial Estate, Stather Road/First Avenue, Flixborough DN15 8SF	Not yet determined	Accompanied by AQ assessment. Relevant comments provided.
CON/2021/1232	Consultation on a variation of an environmental permit EPR/RP3206BE/V004	Scunthorpe Integrated Iron and Steelworks, Brigg Road, Scunthorpe, DN16 1NP	Granted	Accompanied by AQ assessment. Relevant comments provided.
CON/2020/647	Consultation on a variation of an A1 Environmental Permit - EPR/YP3133LL/V010	Keadby II Power Station, Keadby, North Lincolnshire	Granted	Accompanied by AQ assessment. Relevant comments provided.
P314/6.23/22	Application for an Environmental Permit for: Spraying and re-spraying of metal container units with solvent-based paints as prescribed in the Environmental Permitting (England and Wales) Regulations 2016 (as amended) Schedule 1, Part 2, Chapter 6, Section 6.4, Part B (a) (iv).	Algeco UK Limited, Scotter Road South, Bottesford, Scunthorpe, North Lincolnshire, DN17 2BW	Granted with conditions	Accompanied by AQ assessment.

Reference	Application	Location	Decision	AQ Relevance
P316/6.33/22	Application for an Environmental Permit for: Wood Coating as prescribed in the Environmental Permitting (England and Wales) Regulations 2016 (as amended) Schedule 1, Part 2, Section 6.4, Part B and The Industrial Emissions Directive Annex VII Parts 1 and 2, and the Manufacture of Timber Based Products as prescribed in the Environmental Permitting (England and Wales) Regulations 2016 (as amended) Schedule 1, Part 2, Section 6.6, Part B.	Wren Kitchens Limited, Parrott Street, Barton-Upon-Humber, North Lincolnshire, DN18 6BP	Granted with conditions	Accompanied by AQ assessment.
P314/3.5/22	Application for an Environmental Permit for the loading, unloading, storage and handling of petroleum coke, coal, coke and coal products as prescribed in the Environmental Permitting (England and Wales) Regulations 2016 (as amended) Schedule 1, Part 2, Section 3.5(b)(iii).	Goxhill Airfield, Chapelfield Road, Goxhill, North Lincolnshire, DN19 7NF.	Granted with conditions	Appropriate controls included to minimise dust emissions.

Reference	Application	Location	Decision	AQ Relevance
P317/4.12/22	Application for an Environmental Permit for the polymerisation or co-polymerisation of any pre-formulated resin or pre-formulated gel coat which contains any unsaturated hydrocarbon as prescribed in the Environmental Permitting (England and Wales) Regulations 2016 (as amended) Schedule 1, Part 2, Chapter 3, Section 4.1, Part B (c).	EMJ Plastics Limited, Unit 8 Sterling Business Park, Park Farm Road, Scunthorpe, North Lincolnshire, DN15 8QP	Not yet determined	

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 2022 Diffusion Tube Monitoring Calendar was adhered to throughout this calendar year.

Diffusion Tube Annualisation

Annualisation is required for any site with data capture less than 75% but greater than 25%. Diffusion Tube 17 (DT17) achieved a 50% data capture rate for 2022 and therefore requires annualisation. This was as a result of the tube being missing during collection or damaged.

The details of the annualisation calculation for this site are contained within Table C. 1 below:

Table C. 1 - Annualisation Summary (concentrations presented in µg/m³)

Site ID	Annualisation Factor Scunthorpe Town AURN	Annualisation Factor Low Santon	Annualisation Factor Immingham Woodland Avenue	Annualisation Factor	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean
17	0.9948	1.0617	0.8764	-	0.9776	30.0	29.3

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2023 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.TG22 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 0.76 to the 2022 monitoring data. A summary of bias adjustment factors used by North Lincolnshire Council over the past five years is presented in Table C. 2.

Table C. 2 - Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	Local	-	0.76
2021	Local	-	0.79
2020	Local	-	0.78
2019	Local	-	0.68
2018	Local	-	0.65

North Lincolnshire Council had one co-location study site in 2022, 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.

The calculation of the local bias adjustment is provided within Table C. 3 below.

Table C. 3 - Local Bias Adjustment Calculation

	Local Bias Adjustment Input 1	Local Bias Adjustment Input 2	Local Bias Adjustment Input 3	Local Bias Adjustment Input 4	Local Bias Adjustment Input 5
Periods used to calculate bias	12				
Bias Factor A	0.76 (0.71-0.81)				
Bias Factor B	32% (24-40%)				
Diffusion Tube Mean ($\mu\text{g}/\text{m}^3$)	17.7				
Mean CV (Precision)	5.0%				
Automatic Mean ($\mu\text{g}/\text{m}^3$)	13.4				
Data Capture	98%				
Adjusted Tube Mean ($\mu\text{g}/\text{m}^3$)	13 (13-14)				

Notes:

A single local bias adjustment factor has been used to bias adjust the 2022 diffusion tube results.

NO₂ Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO₂ concentration at the nearest location relevant for exposure has been estimated using the Diffusion Tube Data Processing Tool/NO₂ fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO₂ concentrations corrected for distance are presented in Table B. 1.

No diffusion tube NO₂ monitoring locations within North Lincolnshire required distance correction during 2022.

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(22): <https://laqm.defra.gov.uk/wp-content/uploads/2022/08/LAQM-TG22-August-22-v1.0.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 PM2.5 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

Annualisation is required for any site with data capture less than 75% but greater than 25%. At Low Santon (CM3), for the Smart Heated BAM 1020, the data capture for the PM2.5 annual mean was 39.1% as the instrument was installed in August. The data therefore requires annualisation. This is presented in Table C. 4 below.

Table C. 4 - Annualisation Summary (concentrations presented in $\mu\text{g}/\text{m}^3$)

Site ID	Annualisation Factor East Common Lane	Annualisation Factor Hull Freetown	Annualisation Factor York Gillygate	Annualisation Factor Site 4 Name	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
CM3	1.33	1.00	1.00	-	1.11	12	13.3	

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

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

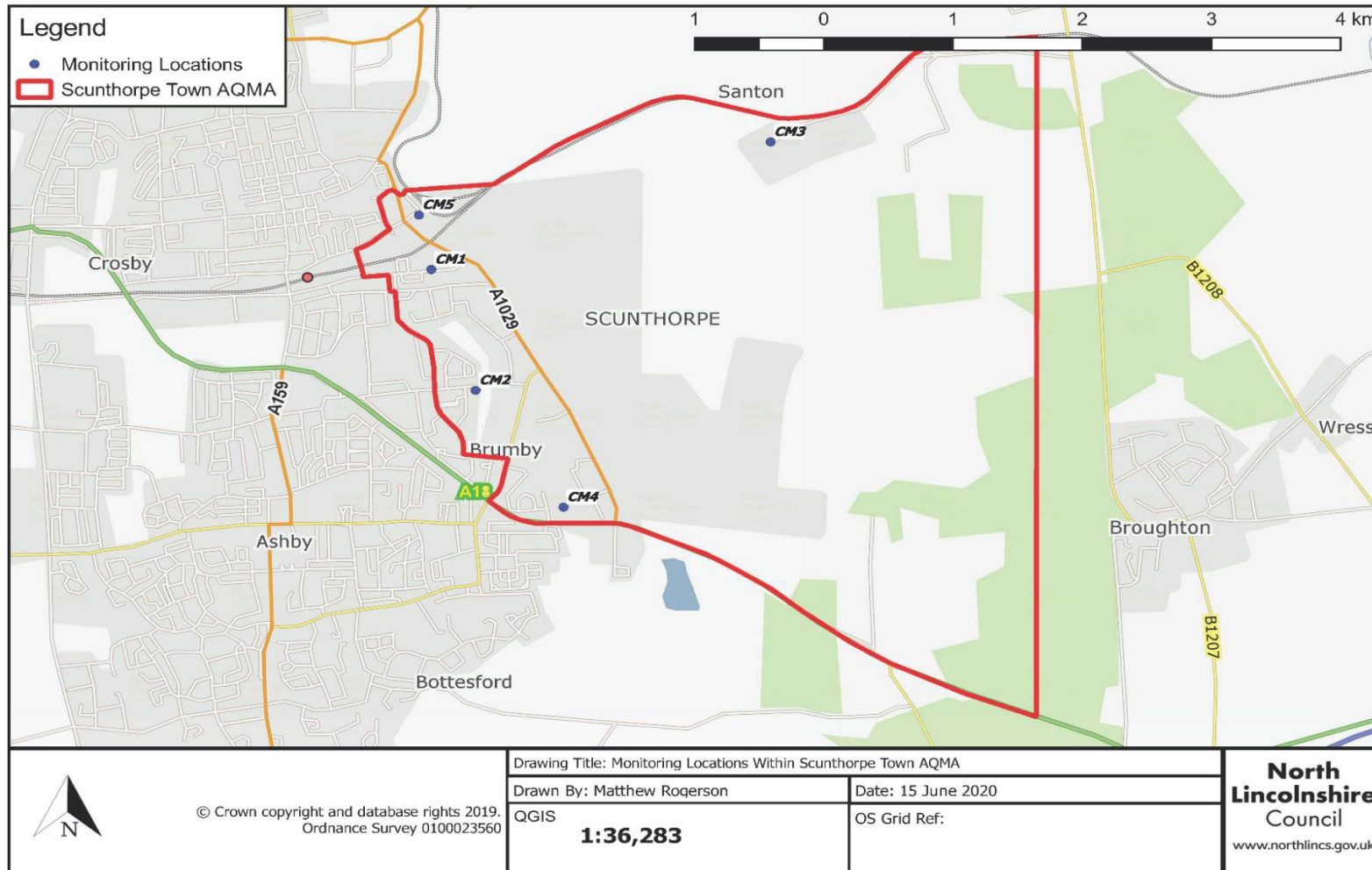


Figure D. 2 - Monitoring locations within North Lincolnshire

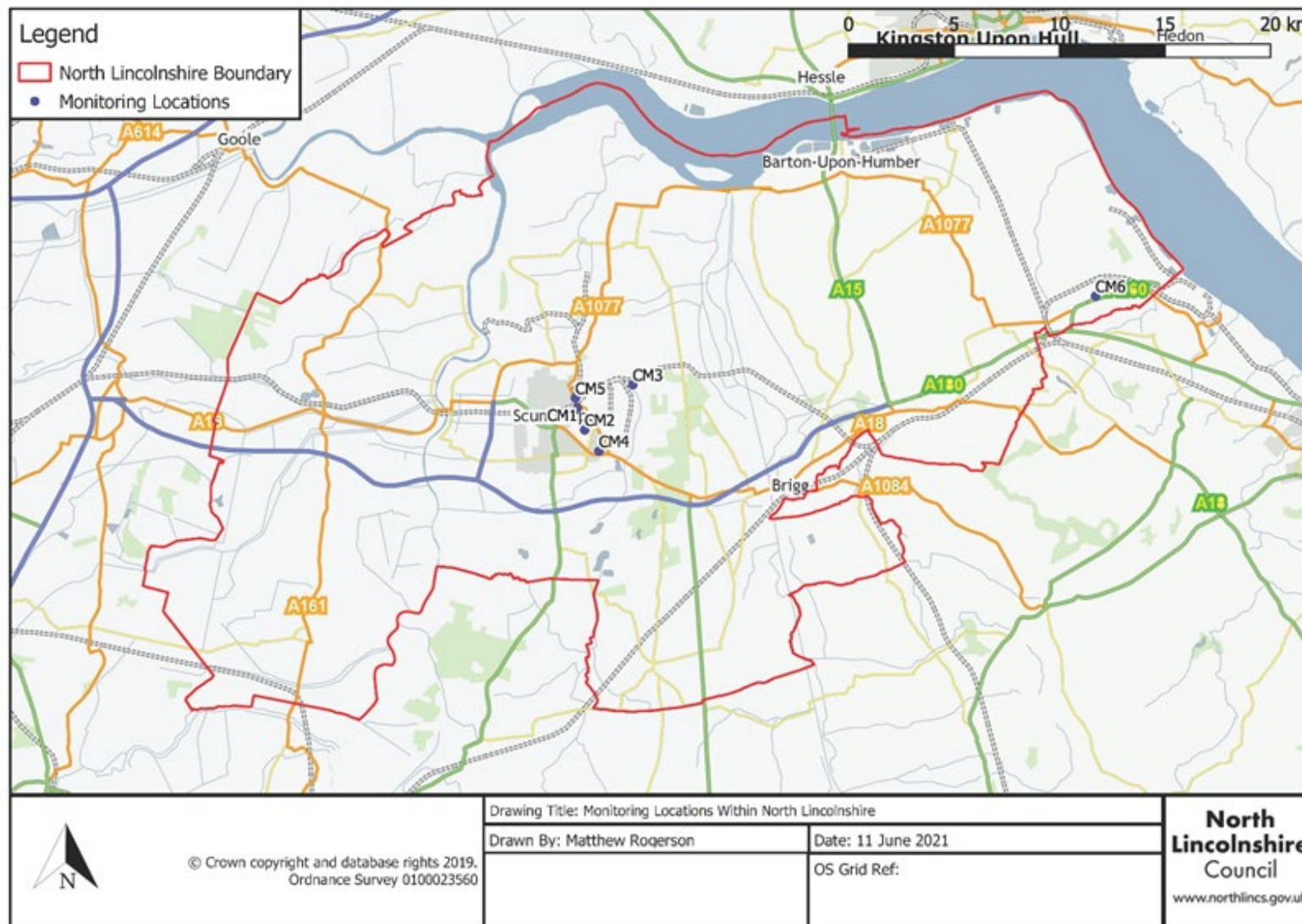
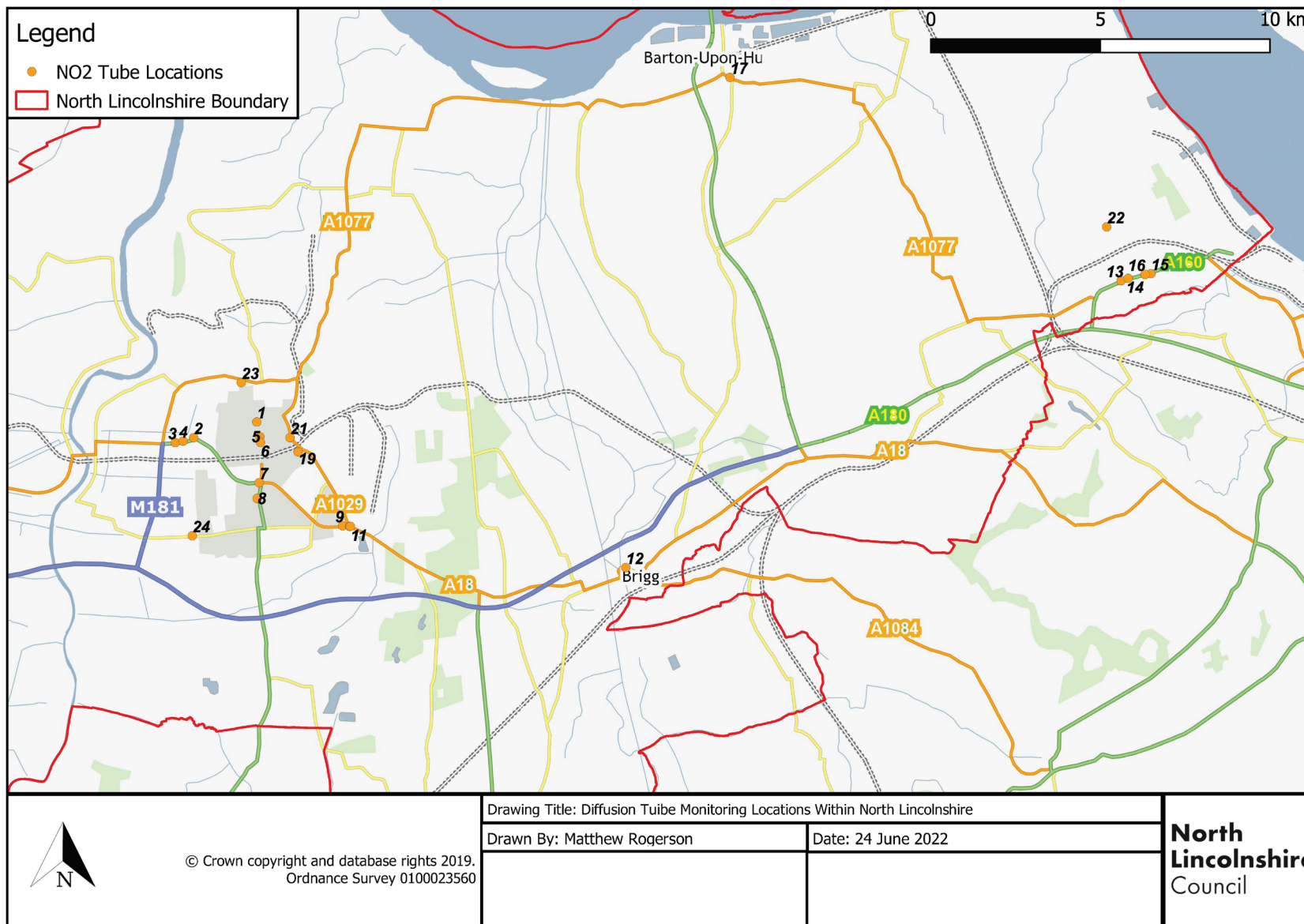


Figure D. 3 - Diffusion tube monitoring locations within North Lincolnshire



Appendix E: Summary of Air Quality Objectives in England

Table E. 1 - Air Quality Objectives in England

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

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by National Highways
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG22. August 2022.
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.PG22. August 2022.
Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.