

North Lincolnshire Council

2019 Air Quality Annual Status Report (ASR)

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

Dated: June 2019

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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 the less affluent areas^{1,2}.

The annual health cost to the NHS from the impacts of particulate matter (PM_{2.5}) alone in the UK is estimated to be around £42.88 million for 2017, rising to an estimated £157 million when diseases are included that have less existing evidence for an association³.

The principle town within North Lincolnshire, Scunthorpe, is home to an Integrated Iron and Steel Works, employing over 3000 people directly and supports over 20,000 jobs in the supply chain. The site covers over 2400 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 Environmental equity, air quality, socioeconomic status and respiratory health, 2010

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

³ Public Health England, Estimation of costs to the NHS and social care due to the health impacts of air pollution, May 2017.

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) and the amendment of the Scunthorpe Town Air Quality Management Area (declared for exceedances of Daily PM₁₀) in March 2018. 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 <http://uk-air.defra.gov.uk/aqma/list>.

For the year 2018, the levels of Polycyclic Aromatic Hydrocarbons (PAH) have increased for Scunthorpe Town (CM1), contrary to a significant decline in concentrations since the closure of the Dawes Lane coke ovens in 2016. The current levels at this site breach both the UK objectives of 0.25ng/m³ and the European Community Target Value 1ng/m³. PAH concentrations at Low Santon currently exceeds the UK Objective, however there has been a significant decline in the emissions at this monitoring site.

Compliance with PAH objectives 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 concentrations and will support action to improve concentrations for local residents as part of the National Network for monitoring PAH's.

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), Polycyclic Aromatic Hydrocarbons (PAH) and Benzene.

Actions to Improve Air Quality

The main pollutant of concern within North Lincolnshire is PM₁₀. The PM₁₀ 24 hour mean objective is not being breached in all the areas within the Scunthorpe Air Quality Management Area (AQMA) boundary. In March 2018, the boundary of this AQMA was formally amended in geographical area which resulted in the removal of approximately 5,000 residential properties from within the AQMA.

The PM₁₀ annual mean objective is no longer being breached at Low Santon and this AQMA was formally revoked in March 2018.

The Council applied for DEFRA Air Quality Grant Funding in 2017-18. The Council's bid included the provision to upgrade existing air quality monitoring equipment, a public engagement campaign for PM_{2.5} reduction and a tree planting scheme along Brigg Road, Scunthorpe. Unfortunately the grant bid was unsuccessful, however the Council will consider applying for future bids when these become available. It is intended that North Lincolnshire Council will apply jointly with the Environment Agency for DEFRA funding at the end of 2019.

The Council actively communicates air quality improvements with the public via a local free publication produced by North Lincolnshire Council (News Direct). An article that was produced at the end of 2018 was titled To Burn or Not to Burn. The aim was to educate on the consequences of domestic burning and relevant legislation.

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. Further information can be found at the following website:
<https://www.northlincs.gov.uk/planning-and-environment/environmental-crime/smoke-control/smoke-control-guidance/#1536232941547-44290cfe-a96b>

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

The Air Quality Action Plan (AQAP) for the Scunthorpe Town AQMA is currently being drafted. It is intended that this will be circulated for consultation towards the end of Summer 2019. This will outline in detail the Councils objectives to improve local air quality.

North Lincolnshire Council has recently started to produce monthly collaborative reports with the Environment Agency, 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.

In 2018 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 UK objective for PAHs at Low Santon, the UK Objective and the European Community Target Value for PAH's at Scunthorpe Town and the PM₁₀ 24 hour mean at Low Santon. Low Santon is inside the AQMA declared for exceedances of the PM₁₀ 24 hour mean air quality objective. All other air quality objectives were complied with.

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

Despite there being only one exceedance of the PM₁₀ 24-hour mean objective in 2018, some areas still experience high concentrations of this pollutant. This includes the area immediately around the Scunthorpe Integrated Steelworks site including Low Santon and the East Common Lane area to the West of the site. There has been an increase in the number of exceedance days for the PM₁₀ 24-hour mean for 2018. This may be as a result of meteorological conditions during 2018 which recorded higher than average temperatures (0.6C higher than the yearly average), with May, June, July and December having significantly higher temperatures than average. The summer was also dominated by high pressure and was recorded as being the driest summer since 2003.

The PM_{2.5} 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.

North Lincolnshire continues to record some of the highest levels of PAH's in the United Kingdom, although significant improvements have been made on the annual concentrations of this pollutant. This is partly due to the closure of the Dawes Lane Coke Ovens in March 2016 and improvements to the Appleby Coke Ovens. Having said this, despite a downward trajectory in concentrations over recent years, the current levels at Scunthorpe Town breach both the UK objective of 0.25ng/m³ and the European Community Target Value 1ng/m³. PAH concentrations have decreased further at the Low Santon Site (CM3) and currently comply with the European Community Target Value. It is anticipated that continued liaison with Industry, Health Professionals and the Environment Agency will see further improvements.

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 will contribute towards emissions of PM₁₀. Some of these companies are regulated for emissions to atmosphere by North Lincolnshire Council, and the Environment Agency. Air pollutants from multiple sources, create a greater challenge than if it was from a single source and therefore collaborative working between the Environment Agency, North Lincolnshire Council, local industry and other relevant parties is vital to bring about continued improvements.
- The majority of the Integrated Steelworks site is regulated by the Environment Agency rather than the Council. The Council therefore has minimal regulatory control of emissions to 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 emissions. They are not part of the Local Air Quality Management regime and the operations largely responsible for them – the British Steel 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 emissions in recent years.

- In North Lincolnshire the wind direction is predominantly from the South West direction, as shown in Figure 1. These winds impact directly upon local residents in Santon as the Integrated Steel Works is located up wind 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. This relies to some extent upon management practices which can be difficult to control and monitor.

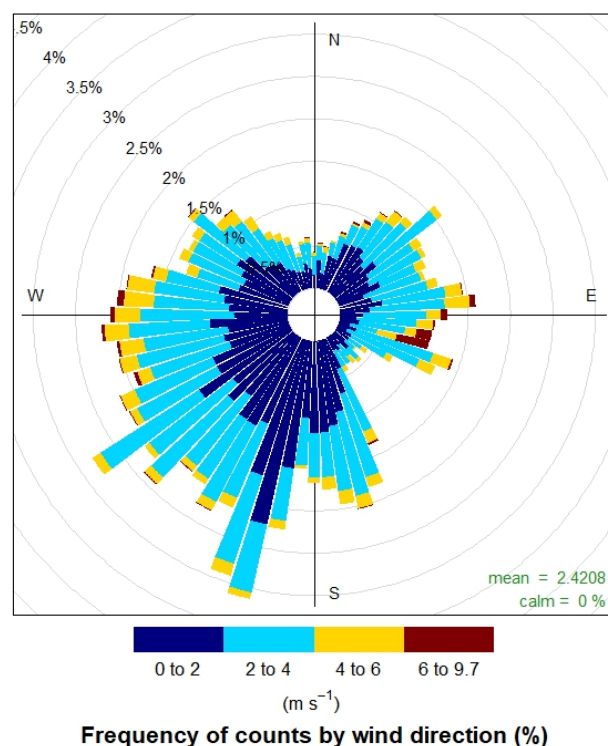


Figure 1 – Wind direction and velocity for 2018

In 2019 North Lincolnshire Council aims to:

- Continue operation of the air quality network and website, with associated data analysis and ratification
- Working closely with Industry, Stakeholders and the Environment Agency to obtain continued air quality improvements for local residents

- Complete the Air Quality Action Plan to include new initiatives which will bring about these continued improvements
- Improve the existing mechanisms in place to influence and control on site management practices to control dust emissions via the Air Quality Action Plan.
- Evaluate the potential costs and benefits of source apportionment work within the AQMA
- Apply for Grant Funding if suitable bids become available
- Put in place a public engagement strategy that will deliver key messages about ongoing improvements to air quality within North Lincolnshire
- To continue to provide planning consultation responses which takes into consideration local air quality such as the implementation of electric vehicle charging infrastructure
- Act as a consultee in relation to updates to North Lincolnshire Councils Local Plan to ensure the impact of development on air quality is considered

Local Engagement

North Lincolnshire Council continues to engage with a variety of different parties including for example, local schools 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 Councils 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/>

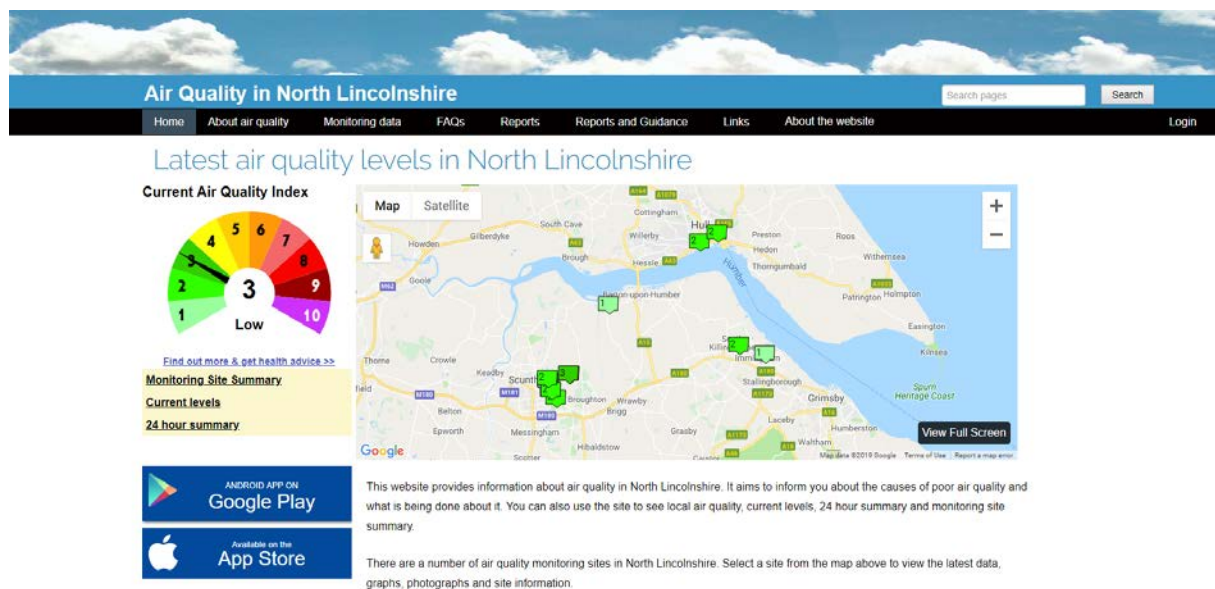


Figure 2. Air Quality in North Lincolnshire Website

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, it is encouraged that members of the public 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. Avoid idling to warm up your engine and if it is safe to do so, switch off your 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. Residents should look to minimise the use of fire pits, log burners and other polluting activities
- Changing to LED or low energy lightbulbs within the home and fully insulating the home to reduce fuel needed for heating, can also help to improve local air quality.

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1 Local Air Quality Management

This report provides an overview of air quality in North Lincolnshire during 2018. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by North Lincolnshire Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

A summary of AQMAs declared by North Lincolnshire Council can be found in Table 2.1. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=178 see full list at <http://uk-air.defra.gov.uk/aqma/list>

The Council revoked the Low Santon AQMA for PM₁₀ annual mean in March 2018, this was due to continued compliance with the air quality objective. The Council amended the boundary of the Scunthorpe Town AQMA for PM₁₀ 24 hour mean in March 2018, this was due to continued compliance with the air quality objective. Further information in relation to this can be found in the Detailed Assessment of the Scunthorpe PM₁₀ Air Quality Management Area 2016 report. In addition, during March/April 2018 several sites were removed due to continued compliance, this included CM4 Redbourn Club, CM5 Lakeside and CM8 Appleby.

Alternatively, see Appendix D: Map(s) of Monitoring Locations and AQMAs, which provides a map of air quality monitoring locations in relation to the AQMA.

Table 2.1 – Declared Air Quality Management Areas

AQMA Name	Date of Declaration	Pollutants and Air Quality Objectives	City / Town	One Line Description	Is air quality in the AQMA influenced by roads controlled by Highways England?	Level of Exceedance (maximum monitored/modelled concentration at a location of relevant exposure)				Action Plan		
						At Declaration		Now		Name	Date of Publication	Link
Scunthorpe Town AQMA	Declared 01/11/05, Amended 19/03/18	PM ₁₀ 24 Hour Mean	Scunthorpe	An area encompassing the integrated steelworks site and a number of properties to the east of Scunthorpe	NO	95	Exceedances	40	Exceedances	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

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

DEFRA's appraisal of last year's ASR concluded that in general the report was well structured, detailed and provided the information specified in the Guidance. In addition, DEFRA concluded that the council should continue their hard work mitigating air quality issues, alongside communicating to the public the success they have had with their strategy to date.

North Lincolnshire Council has taken forward a number of direct measures during the current reporting year of 2018 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in [Table 2.2](#).

The current Air Quality Action Plan (AQAP) for the Scunthorpe Town AQMA is currently being updated to include new initiatives some of which are detailed below and to take into account the amendment to the AQMA boundary in March 2018. The AQAP relies on the input from many different stakeholders including local industry. The process of updating the Action Plan is underway and internal and external Steering Groups met in early June 2018. It is anticipated that the updated AQAP will be published for consultation towards the end of Summer 2019.

To date, key completed measures are:

- Some air quality monitoring sites have been upgraded, along with provision made for future network expansion. In October 2018, the FDMS at Scunthorpe Town AURN site was upgraded to a BAM (Beta –Attenuation Monitor) on behalf of the Department of Environment and Rural Affairs (DEFRA) for the Automatic Urban and Rural Network (AURN).
- The SIM cards have recently been replaced (March 2019) for all continuous monitoring sites to ensure the reliability of service in line with the North Lincolnshire Council Policy.

- The Air Quality Website contract has been extended to ensure sufficient data management, ratification and reporting services
- A review was completed of road and gully sweeping for public highways within the AQMA, this found that the schedule of cleaning is adequate under the current circumstances, but will be reviewed as needed.
- Air pollution forecasting and exceedance reporting continues to be used to inform the activities of the operators on the Integrated Steel Works site.
- Local Industry Forum meetings continue to be held, with participation from stakeholders and other interested bodies.
- The Council continue to investigate complaints relating to emissions including dust and smoke and enforce as appropriate
- Environmental Permits will continue to be enforced and reviewed as required.
- Development within the AQMA or affecting the AQMA continues to be reviewed.
- The Environmental Protection Team continues to act as a consultee in relation to updates to North Lincolnshire Councils Local Plan

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; these are therefore 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.

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

- The 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.

- To actively engage with regulators and industry to seek improvements in air quality.
- To produce monthly air quality reports in collaboration with the Environment Agency and distribute them to relevant stakeholders.
- Provide comments and input in relation to air quality and proposed development for the revised Local Plan
- Undertake a cost benefit analysis of source apportionment and on site monitoring of fugitive dust emissions in relation to the Scunthorpe Steelworks
- Apply for DEFRA Grant funding where appropriate

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

North Lincolnshire Council's priority for the coming year is to complete the AQAP with targets for air quality improvements. It is anticipated that the AQAP will be circulated for consultation towards the end of Summer 2019.

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

- The wind direction is predominantly from the South West direction as shown in Figure 1 of the Executive Summary, these winds impact directly upon local residents in Santon as the Integrated Steel Works is located upwind of these South Westerly winds. In cooperation with local industry the Council has, and continues to, encourage operators to predict in advance the weather conditions so that alterations can be made to their operational practices. This reduces the impact upon local residents, however this method relies to some extent upon management practices which are difficult to control.

- There are a number of emission sources and a number of different companies operating on the Integrated Steelworks Site rather than one single source. This requires collaboration on the part of local businesses and the Council.
- The majority of the Integrated Steel Works Site is regulated by the Environment Agency and therefore the Council has minimal regulatory control over these local businesses.
- The Council no regulatory control over the monitoring and reduction of PAH 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.

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

Table 2.2 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
A1	Maintain network of PM ₁₀ analysers	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	NLC	Implemented	Implemented			Ongoing	To Continue	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 PM ₁₀ , PM _{2.5} , PM ₁ and Total Suspended Particles at Permitted sites AQMA	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	NLC EA	Implemented	Implemented			Complete	Complete	This monitoring, completed in 2015, allowed greater analysis and identification of sources. Subsequent improvements in the level of PM ₁₀ 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	NLC	Implemented	Implemented			Complete	Complete	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
A4	Environmental Permit Improvement Programme. British Steel to undertake an investigation to monitor and quantify point source and fugitive particulate matter including PM ₁₀ and PM _{2.5} 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	British Steel EA	Implemented	Implemented			Complete	Complete	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion 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	NLC	Implemented	Implemented			Complete	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	British Steel EA	Implemented	Implemented			Complete	Complete	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
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	British Steel EA	Implemented	Implemented			Complete	Complete	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion 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	British Steel EA	Implemented	Implemented			Complete	Complete	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
B1	<p>Launch and maintain North Lincolnshire air quality website with:</p> <ul style="list-style-type: none"> • Access to real time & historical data, • Production of graphs and pollution roses • Access to air quality reports and latest news updates • General information 	Public Information	Via the Internet	NLC	Implemented	Implemented			Ongoing	To continue	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	NLC	Implemented	Implemented			Complete	Complete	Internet remains the preferred communication method for air quality information

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion 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	NLC	Implemented	Implemented			Ongoing	To continue	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	NLC	Implemented	Implemented			Ongoing	To continue	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	NLC	Implemented	Implemented			Ongoing	To continue	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
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	NLC	Implemented	Implemented			Complete	Complete	The Council has produced a leaflet and delivered it to businesses, including all within the Scunthorpe AQMA.
C3	Complaints in respect of dust and smoke from commercial premises (not regulated under the Environmental Permitting regime) will be investigated as a priority and enforcement action taken in accordance with the enforcement policy.	Policy Guidance and Development Control	Other policy	NLC	Implemented	Implemented			Ongoing	To continue	Enforcement action is taken against those contravening legislation

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
C4	Identify current road sweeping schedules within the Scunthorpe AQMA and realign schedules as appropriate to minimise re-suspended dust emissions from areas such as Brigg Road.	Transport Planning and Infrastructure	Other	NLC	Implemented	Implemented			Complete	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	NLC	Implemented	Implemented			Ongoing	To continue	A publicity campaign was launched authority-wide in 2008. This information is currently available on the council's internet site and residents are advised as required

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion 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	NLC	Implemented	Implemented			Ongoing	To continue	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	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	NLC HPA PCT EA	Implemented	Implemented			Ongoing	To continue	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	and agree measures for reduction.										

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
D2	Set up a Local Industry Forum involving the Environment Agency, North Lincolnshire Council and Local Industry representatives with the potential to emit PM ₁₀ . The purpose of the group is to identify key issues, agree measures for reduction of PM ₁₀	Policy Guidance and Development Control	Regional Groups Coordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	NLC	Implemented	Implemented			Complete Ongoing	To continue	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion 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	NLC	Implemented	Implemented			Complete	Complete	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
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	NLC	Implemented	Implemented			Complete	Complete	
D5	Ensure that the requirements of the Environmental Permitting regime are appropriately enforced with inspections prioritised on a risk basis taking account of PM ₁₀ emissions.	Environmental Permits	Other measure through permit systems and economic instruments	NLC	Implemented	Implemented			Ongoing	To continue	

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion 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 PM ₁₀ .	Environmental Permits	Other measure through permit systems and economic instruments	NLC	Implemented	Implemented			Ongoing	To continue	
D7	Work with local industry and EA towards the development of relevant measurable indicators of changes in significant emissions of PM ₁₀ .	Environmental Permits	Other	NLC EA Industry	Implemented	Implemented			Ongoing	To continue	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.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
D8	Work with local industry and EA to develop targets for the reduction of the area covered by the AQMA so that the number of properties affected will be reduced.	Environmental Permits	Other	NLC EA Industry	Implemented	Implemented			Ongoing	To continue	The recent Detailed Assessment report recommends that, due to improvements in the level of PM ₁₀ , the Santon AQMA can be revoked and the Scunthorpe AQMA reduced in size
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 PM ₁₀ 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	NLC	Implemented	Implemented			Ongoing	To continue	The Environmental Health (Commercial) Team reviews all planning applications. For air quality purposes, geographical zones have been identified within the Scunthorpe Town AQMA. Advice is given to applicants and Development Control colleagues based on current air quality data.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
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	NLC	Implemented	Implemented			Ongoing	2017	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	NLC	Implemented	Implemented			Ongoing	To continue	The Environmental Health (Commercial) 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.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
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	NLC	Implemented	Implemented			Stopped	N/A	Implementing bus priority measures in new developments has been extremely difficult to achieve. However, we do encourage existing and potential bus services to be considered as an integral part of new developments, particularly at the planning application stage.
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	Traffic Management	Strategic highway improvements	NLC	Implemented	Implemented			Ongoing	To continue	The implementation of this action is incorporated within the Council's current Local Transport Plan. Full details are available at the following website: http://www.northlincs.gov.uk/transport-and-streets/roads-highways-and-pavements/highway-documents/local-transport-plan/

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
	parks and tariff structure.										
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	NLC	Implemented	Implemented			Stopped	N/A	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	NLC	Implemented	Implemented			Ongoing	To continue	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.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
F6	Continued enforcement of speed limits and driving standards	Traffic Management	Other	NLC	Implemented	Implemented			Ongoing	To continue	
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	MLC	Implemented	Implemented			Ongoing	To continue	North Lincolnshire Council and local bus operators are part of a Quality Partnership. Operators are encouraged to use vehicles that meet these standards. The two largest operators in the Authority area currently use vehicles that meet the latest standards and it is also a contractual obligation for school bus routes.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
F8	A fleet of vehicles that are powered by LPG already operates (predominantly in waste management), we will continue to update and operate our fleet vehicles to use more environmentally friendly forms of fuel. Particulate traps on our vehicles are also used and we will continue to promote their use to reduce particulate matter	Vehicle Fleet Efficiency	Fleet efficiency and recognition schemes	NLC	N/A	Not Implemented			Stopped	N/A	NLC does not operate any LPG fuelled vehicles and there are no plans to introduce any. Particulate traps are also now not required given the advances made in engine technology and the current Euro class engines. The Council used to retrospectively fit these to large goods vehicles when the exhaust PM ₁₀ emissions were at 0.15 - 0.1 g/kWh Since the introduction of EURO IV PM ₁₀ emissions have been reduced to 0.02 g/kWh on the production line. This information will be added to the final report.

Measure No.	Measure	EU Category	EU Classification	Organisations involved and Funding Source	Planning Phase	Implementation Phase	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion Date	Comments / Barriers to implementation
F9	<p>The council will aim to:</p> <ul style="list-style-type: none"> • 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	NLC	Implemented	Implemented			Ongoing	To continue	The implementation of this action is incorporated within the Council's current Local Transport Plan.

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

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of PM_{2.5} (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM_{2.5} has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

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}. 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 three locations across North Lincolnshire during 2018 including South Ferriby, Killingholme and East Common Lane which is within the Scunthorpe AQMA.
- Environmental Permit improvement programmes.
- Campaigns to discourage waste burning and bonfires.
- Liaison with Industry, Health Professionals and the Environment Agency to initiate improvements and share good practice.
- Transport improvement schemes.
- Public transport and fleet improvements, such as encouraging uptake of electric vehicles to replace older more polluting vehicles.

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

- 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, 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 titled 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 fulfills 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 in relation to wood burning stoves, Smoke Control Areas and air pollution on our website. 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 for 2019 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.

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with air quality objectives.

North Lincolnshire Council undertook automatic (continuous) monitoring at 11 sites during 2018. Table A.1 in Appendix A shows the details of these 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. National monitoring results are available at <https://uk-air.defra.gov.uk/networks/>

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 is included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

North Lincolnshire Council undertook non- automatic (passive) monitoring of NO₂ at 22 sites during 2018. Table A.2 in Appendix A shows the details of these sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, “annualisation” and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

The main sources of Nitrogen Dioxide (NO₂) are the burning of fossil fuels from industry and internal combustion of vehicles. Prolonged exposure to nitrogen dioxide can cause lung irritation and lower resistance to upper respiratory diseases. Exposure to excess nitrogen dioxide may cause a higher number of cases of respiratory conditions in vulnerable groups, such as young, elderly or infirm.

For the year 2018 North Lincolnshire Council undertook continuous monitoring for NO₂ at three sites:

- Scunthorpe Town AURN (CM1)
- Low Santon (CM3)
- Killingholme School (CM9)

North Lincolnshire Council removed the Killingholme Roadside monitoring site on 03 January 2018 due to continued compliance with the air quality objective. This site was

originally installed in 2013 specifically to measure NO₂ from the nearby A160 after diffusion tube data suggested that this area had elevated concentrations of NO₂.

Table A.3 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³. Figure A.1 in Appendix A, shows compliance with this objective for years 2014 to 2018 at the three continuous monitoring sites (Site ID's CM1, CM3, CM9).

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in Appendix B. The diffusion tubes did not identify an exceedance of the NO₂ annual mean objective.

Table A.4 in Appendix A compares the ratified continuous monitored NO₂ hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year. There were no breaches of this objective.

For 2018, 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.

3.2.2 Particulate Matter (PM₁₀)

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

- Combustion from industry and road traffic emissions.
- Secondary sources of the pollutant such as chemical reactions in the atmosphere.
- Coarser particles from tertiary sources, such as, suspended dusts, natural salts, biological particles and construction work.

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

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

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

In 2018 the Council monitored PM₁₀ at 11 sites. At two of these sites, Scunthorpe Town AURN (site ID: CM1) and Low Santon (site ID: CM3) an FDMS monitor was co-located with a TEOM. In October 2018 however, the FDMS at Scunthorpe Town AURN site was upgraded for a BAM (Beta –Attenuation Monitor) on behalf of the Department of Environment and Rural Affairs (DEFRA) for the Automatic Urban and Rural Network (AURN).

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

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

PM₁₀ data for Osiris monitors located at South Ferriby (site ID: CM10) and Killingholme East Halton Road (site ID: CM11) is included within this report, however Osiris monitors do not meet the standard for the European reference method for particulate monitoring within the UK and the results should be treated with caution. The Council deploys Osiris monitors to monitor PM₁₀ for a specific project: the South Ferriby Monitor has been located at the request of a Local Environmental Liaison Committee to monitor emissions from a cement plant which local residents believe is responsible for spikes of PM₁₀. Similarly the Osiris monitor at Killingholme East Halton Road was deployed to monitor emissions from a local industrial estate due to concerns from local residents. There have been no breaches of air quality objectives to date.

Table A.5 **Error! Reference source not found.** in Appendix A compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³. Figure A.2 in Appendix A, shows compliance with this objective at the continuous monitoring sites for 2018.

Table A.6 in Appendix A compares the ratified continuous monitored PM₁₀ 24 hour mean concentrations for the past 5 years with the air quality objective of 50µg/m³, not to be exceeded more than 35 times per year. Figure A.3 in Appendix A shows compliance with this objective all sites except for Low Santon (TEOM), Site ID CM3 for 2018.

In 2018 there were no recorded exceedances of the annual mean (40µg/m³) and the 24 hour mean (50 µg/m³ not to be exceeded more than 35 times a year) air quality objective for PM₁₀ was exceeded at one site, Low Santon (TEOM).

3.2.3 Particulate Matter (PM_{2.5})

PM_{2.5} is particulate matter that is under 2.5 microns in diameter. The sources for this are similar for the PM₁₀ pollutant as listed above.

This pollutant was measured using Osiris monitors at East Common Lane (CM2), South Ferriby (CM10) and Killingholme East Halton Road.

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

The Public Health Outcomes Framework (PHOF)⁴ 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 (PM_{2.5}) on mortality. This is replicated in the table below:

Table 3.1: PHOF Indicator

PHOF Indicator 3.1 Health Protection	
Fraction of all-cause adult mortality attributable to anthropogenic particulate air pollution (measured as fine particulate matter, PM _{2.5}) ¹⁹ .	The estimates of mortality burden are based on modelled annual average concentrations of fine particulate matter (PM _{2.5}) in each local authority area originating from human activities. Local data on the adult population and adult mortality rates is also used. Central estimates of the fraction of mortality attributable to long-term exposure to current levels of human-made particulate air pollution range from approx. 2.5% to 5% in some local authorities in rural areas, to over 8% in some London boroughs ²⁰ .

⁴ <https://fingertips.phe.org.uk/profile/public-health-outcomes-framework>

For North Lincolnshire the fraction of mortality attributable to long term exposure to current levels of human made particulate air pollution is 4.3%. 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.7 in Appendix A presents the ratified and adjusted monitored PM_{2.5} annual mean concentrations for the past 5 years. Figure A.4 in Appendix A shows compliance with the objective at the three monitoring locations for 2018.

In 2018 there were no recorded exceedances of the annual mean (25µg/m³) air quality target value for PM_{2.5}.

3.2.4 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 2018:

- Scunthorpe Town AURN (CM1)
- Low Santon (CM3)
- Killingholme School (CM9)

Table A.8 in Appendix A compares the ratified continuous monitored SO₂ concentrations for 2018 with the air quality objectives for SO₂.

In 2018 there were no recorded exceedances of the 15 minute mean ($266\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times a year), 1 hour mean ($350\mu\text{g}/\text{m}^3$ 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.

3.2.5 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 2018 as the annual mean recorded at Scunthorpe Town AURN in 2018 was $0.87\mu\text{g}/\text{m}^3$.

Monitoring results are displayed in Table A.9 in Appendix A.

In 2018 there were no recorded exceedances of the annual mean ($25\mu\text{g}/\text{m}^3$) air quality objectives for benzene.

3.2.6 Polycyclic Aromatic Hydrocarbon (PAH)

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

Historically North Lincolnshire recorded some of the highest levels of PAH's in the United Kingdom. This was principally due to the two coke ovens on the Integrated Steelworks Site. However the closure of the Dawes Lane Coke Ovens and improvements at the Appleby Coke Ovens has seen a reduction of PAH emissions in recent years. This downward trajectory in PAH concentrations has continued for Low Santon, however during 2018 the concentrations of PAH emissions at Scunthorpe Town has increased. It is currently unclear as to why this is the case and North Lincolnshire Council will look to investigate this further. PAH emissions are not part of the Local Air Quality Management regime and the operations largely responsible for them – the coke ovens – are not regulated by the Council.

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

In 2018 the annual average for Scunthorpe Town AURN was 1.69 ng/m³, and for Low Santon it was 0.78 ng/m³. This is an exceedance of both the UK Objective and EU target Value for Scunthorpe Town. PAH concentrations at Low Santon currently exceeds the UK Objective, however there has been a significant decline in the emissions at this monitoring site.

Table A.10 in Appendix A presents the monthly PAH data for the year 2018 at Scunthorpe Town and Low Santon.

Figure A.5 in Appendix A shows the PAH annual mean concentration for 2018 at Scunthorpe Town and Low Santon.

Figure A.6 in Appendix A shows the trend in PAH annual mean concentrations from 2015 to 2018 at Scunthorpe Town and Low Santon.

3.2.7 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.11 in Appendix A presents the heavy metals data for the year 2018 at Scunthorpe Town and Low Santon.

In 2018 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	Y OS Grid Ref	Pollutants Monitored	In 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	Chemiluminescent; Fluorescent, BAM & TEOM	21	7	2
CM2	East Common Lane	Urban background	490663	409789	PM ₁₀ , PM _{2.5}	YES	TEOM & Osiris	3	28	1.5
CM3	Low Santon	Industrial	492945	411931	SO ₂ , NO ₂ , PM ₁₀	YES	Fluorescent, FDMS & TEOM	41	5	2
CM4	Redbourn Club	Urban background	490002	410069	PM ₁₀	NO	TEOM	15	N/A	1.5
CM5	Lakeside	Urban background	491750	408127	PM ₁₀	NO	TEOM	4	8	1.5
CM6	Amvale	Industrial	491343	408782	PM ₁₀	YES	TEOM	150	100	1.5
CM7	High Street East	Industrial	490224	411301	PM ₁₀	YES	TEOM	18	10	1.5
CM8	Appleby	Rural	495075	414767	PM ₁₀	NO	TEOM	17	N/A	1.5
CM9	Killingholme School	Other	514880	416133	SO ₂ , NO ₂ , PM ₁₀	NO	Chemiluminescent & TEOM	9	N/A	2
CM10	South Ferriby	Other	497931	420993	PM ₁₀ , PM _{2.5}	NO	Osiris	10	45	1.5
CM11	Killingholme East Halton Road	Other	514148	417514	PM ₁₀ , PM _{2.5}	NO	Osiris	10	14	1.5

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
DT1	Frodingham Road	Urban Background	489099	411723	NO ₂	NO	3	1	NO	2
DT2	Scotter Road (North side of roundabout)	Roadside	487239	411259	NO ₂	NO	9	2	NO	2
DT3	B & Q	Roadside	486699	411110	NO ₂	NO	2	15	NO	2
DT4	Hilton Avenue	Roadside	486928	411156	NO ₂	NO	12	3	NO	2
DT5	Britannia Corner	Urban Background	489190	411285	NO ₂	NO	4	2	NO	2
DT6	Oswald Road	Urban Background	489209	411118	NO ₂	NO	4	3	NO	2
DT7	Queensway Pub	Roadside	489172	409926	NO ₂	NO	20	2	NO	2
DT8	Ashby Road	Roadside	489112	409463	NO ₂	NO	15	1	NO	2
DT9	Queensway	Roadside	491628	408658	NO ₂	YES	80	2	NO	2
DT10	Mortal Ash Hill	Roadside	491838	408641	NO ₂	YES	15	9	NO	1.5
DT11	Front of Ashby Lodge Pub	Roadside	491859	408645	NO ₂	YES	1	9	NO	2
DT12	Barnard Avenue, Brigg	Roadside	499975	407421	NO ₂	NO	30	3	NO	2
DT13	Ulceby Road, Killingholme	Roadside	514573	415901	NO ₂	NO	15	1	NO	2

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
DT14	School Road, Killingholme	Roadside	514782	415971	NO ₂	NO	15	1	NO	2
DT15	Humber Road Chip Shop	Urban Background	515452	416107	NO ₂	NO	2	15	NO	2
DT16	Humber Road, LP 695	Roadside	515279	416085	NO ₂	NO	5	2	NO	2
DT17	Holydyke, Barton	Suburban	503048	421907	NO ₂	NO	15	1	NO	2
DT18	Rowland Road AQ Station	Industrial	490316	410837	NO ₂	YES	21	6	YES	2
DT19	Rowland Road AQ Station	Industrial	490316	410837	NO ₂	YES	21	6	YES	2
DT20	Rowland Road AQ Station	Industrial	490316	410837	NO ₂	YES	21	6	YES	2
DT21	ASDA, Station Road	Roadside	490080	411258	NO ₂	NO	20	1	NO	2
DT22	East Halton Road Killingholme	Roadside	514141	417483	NO ₂	NO	4	1	NO	2

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2014	2015	2016	2017	2018
CM1	Industrial	Automatic	N/A	93.4	25.2	17.6	17	16	18
CM3	Industrial	Automatic	N/A	94.3	16.3	27.1	19	18	20
CM9	Other	Automatic	N/A	97	22.1	20.4	17	17	18
DT1	Urban Background	Diffusion Tube	N/A	83.3	31.1	24.5	25	21	20
DT2	Roadside	Diffusion Tube	N/A	100	33.2	26.3	28	24	24
DT3	Roadside	Diffusion Tube	N/A	100	N/A	N/A	20	22	19
DT4	Roadside	Diffusion Tube	N/A	100	29.5	22.1	24	22	20
DT5	Urban Background	Diffusion Tube	N/A	100	32.2	25.2	25	26	24
DT6	Urban Background	Diffusion Tube	N/A	100	31.4	24.2	27	24	23
DT7	Roadside	Diffusion Tube	N/A	100	32.1	25.8	27	25	24
DT8	Roadside	Diffusion Tube	N/A	100	32.2	26.3	29	27	25
DT9	Roadside	Diffusion Tube	N/A	100	24.4	19.4	21	19	19
DT10	Roadside	Diffusion Tube	N/A	100	45.4	36.3	38	35	34
DT11	Roadside	Diffusion Tube	N/A	100	27.3	22.9	20	22	20
DT12	Roadside	Diffusion Tube	N/A	100	30.8	26.1	26	26	20

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2014	2015	2016	2017	2018
DT13	Roadside	Diffusion Tube	N/A	100	42.9	26.2	31	20	17
DT14	Roadside	Diffusion Tube	N/A	100	46.7	33.7	31	27	28
DT15	Urban Background	Diffusion Tube	N/A	100	27.3	19.4	21	19	20
DT16	Roadside	Diffusion Tube	N/A	91.6	35.1	27.0	26	25	26
DT17	Suburban	Diffusion Tube	N/A	83.3	25.6	22.4	23	22	20
DT18	Industrial	Diffusion Tube	N/A	100	21.5	18.2	17	16	16
DT19	Industrial	Diffusion Tube	N/A	100	20.3	17.0	17	15	16
DT20	Industrial	Diffusion Tube	N/A	100	21.5	16.5	17	15	15
DT21	Roadside	Diffusion Tube	N/A	91.6	27.9	22.7	23	22	21
DT 22	Roadside	Diffusion Tube	N/A	100	N/A	N/A	N/A	N/A	21

Diffusion tube data has been bias corrected

Annualisation has been conducted where data capture is <75%

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective.

(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%).

(3) Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO₂ Concentrations

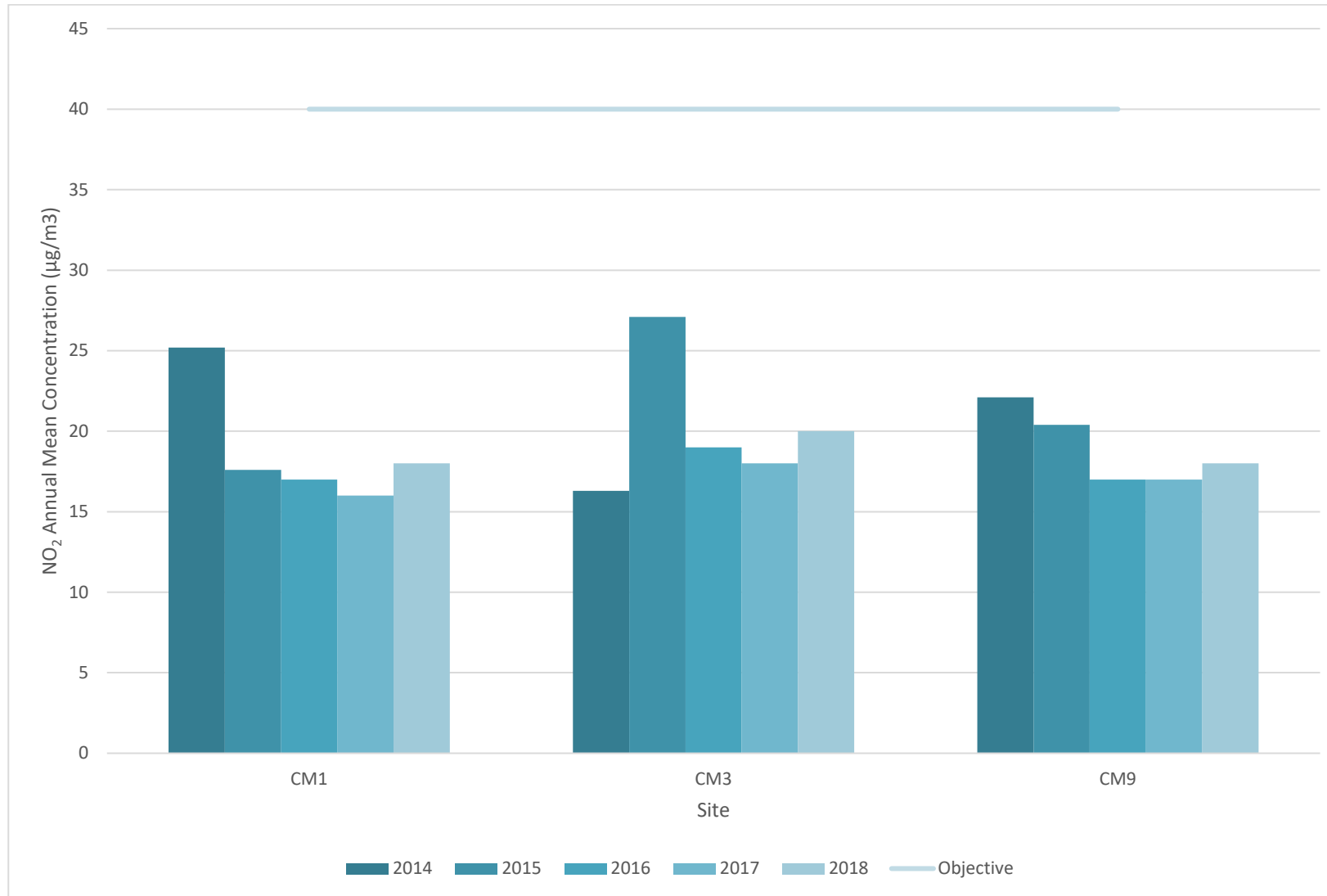


Table A.4 – 1-Hour Mean NO₂ Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	NO ₂ 1-Hour Means > 200µg/m ³ ⁽³⁾				
					2014	2015	2016	2017	2018
CM1	Industrial	Automatic	N/A	93.4	9	0	0	0	0
CM3	Industrial	Automatic	N/A	94.3	0	0 (80.3)	0	0	0
CM9	Other	Automatic	N/A	97	0	0	0	0	0

Notes:

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

(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%).

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

Table A.5 – PM₁₀ Annual Mean Concentration

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	PM ₁₀ Annual Mean Concentration (µg/m ³) ⁽³⁾				
				2014	2015	2016	2017	2018
CM1 BAM	Industrial	N/A	97	21.2	21.4	17	16	18
CM1 TEOM	Industrial	N/A	97.1	21.5	19.1	17	17	20
CM2	Urban Background	N/A	93.6	22.9	19.3	20	18	21
CM3 FDMS	Industrial	N/A	92.5	25.1	27.7	22	23	25
CM3 TEOM	Industrial	N/A	97.2	29.6	27.8	26	30	31
CM4	Urban Background	99.3	21.3	21.3	18.6	17	16	20 (18)
CM5	Urban Centre	99.6	24.9	21.6	19.7	21	19	22 (20)
CM6	Industrial	N/A	98	20.6	19.7	20	17	21
CM7	Industrial	N/A	99.1	21.4	22.0	20	19	20
CM8	Rural	97.5	25.1	16.0	18.5	16	17	17 (15)
CM9	Other	N/A	98.8	19.1	18.0	18	18	19
CM10	Other	N/A	98.3	15.8	23.4	21	18	16
CM11	Other	93.1	85.7	N/A	N/A	N/A	N/A	20

Annualisation has been conducted where data capture is <75%

Notes:

Exceedances of the PM₁₀ annual mean objective of 40µg/m³.

(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%).

(3) All means have been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.2 – Trends in Annual Mean PM₁₀ Concentrations

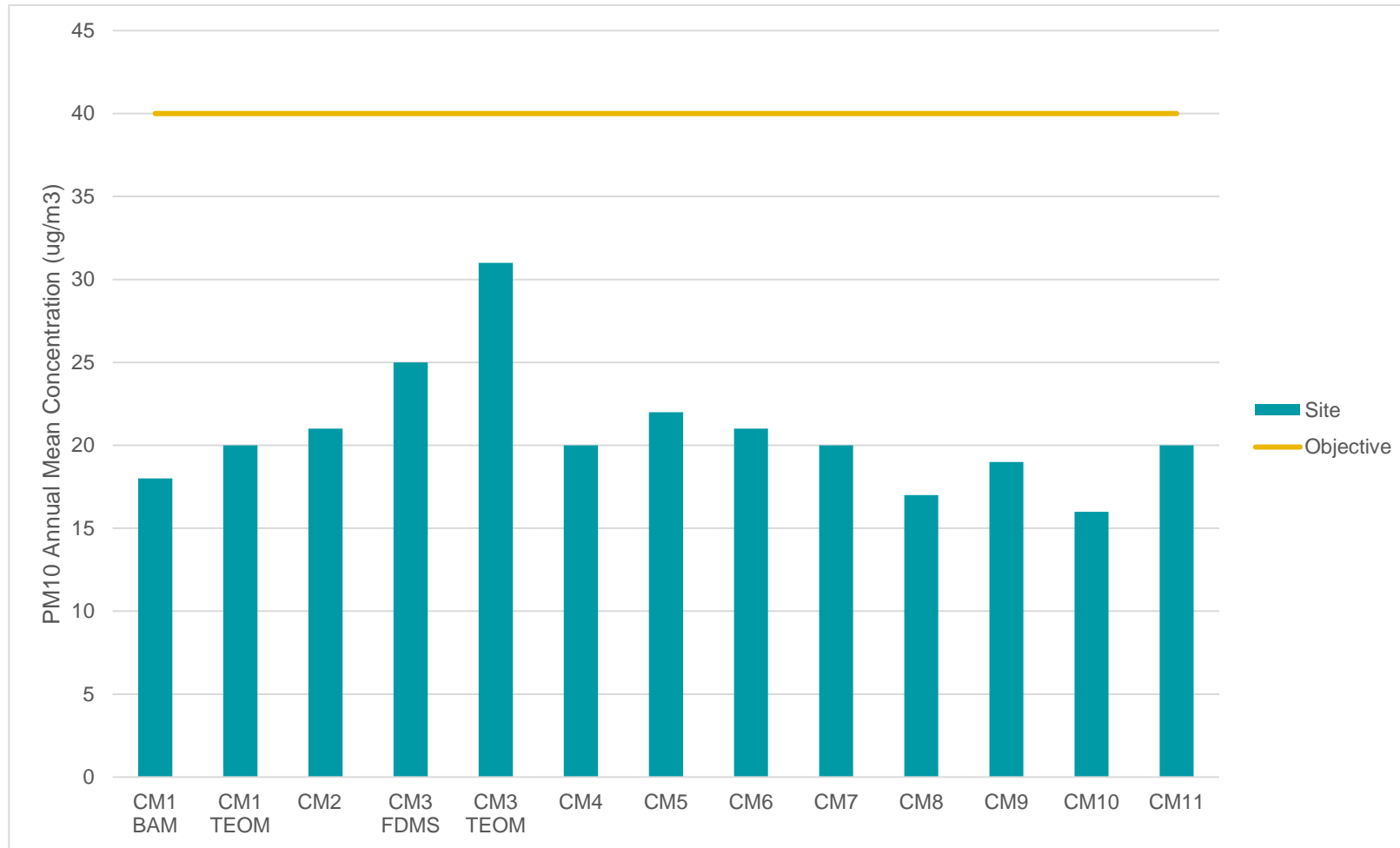


Table A.6 – 24-Hour Mean PM₁₀ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	PM ₁₀ 24-Hour Means > 50µg/m ³ ⁽³⁾				
				2014	2015	2016	2017	2018
CM1 BAM	Industrial	N/A	97	17	15	6	5 (29)	9
CM1 TEOM	Industrial	N/A	97.1	18	7	8	5	6
CM2	Urban Background	N/A	93.6	27	9	18	9	16
CM3 FDMS	Industrial	N/A	92.5	18 (47)	21	11	11	22
CM3 TEOM	Industrial	N/A	97.2	32	42 (68)	25	40	40
CM4	Urban Background	25.6	99.3	18	6	11	5	5 (32)
CM5	Urban Centre	24.6	99.6	10	12	11	6	2 (32)
CM6	Industrial	N/A	98	13	9	15	6	16
CM7	Industrial	N/A	99.1	5 (41)	12	4	5	2
CM8	Rural	25.1	97.5	4	2	1	3	1 (25)
CM9	Other	N/A	98.8	6	2	1	4	3
CM10	Other	N/A	98.3	4 (30)	8	6	4	4
CM11	Other	93.1	85.7	N/A	N/A	N/A	N/A	7

Notes:

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

(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%).

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

Figure A.3 – Trends in Number of 24-Hour Mean PM₁₀ Results >50µg/m³

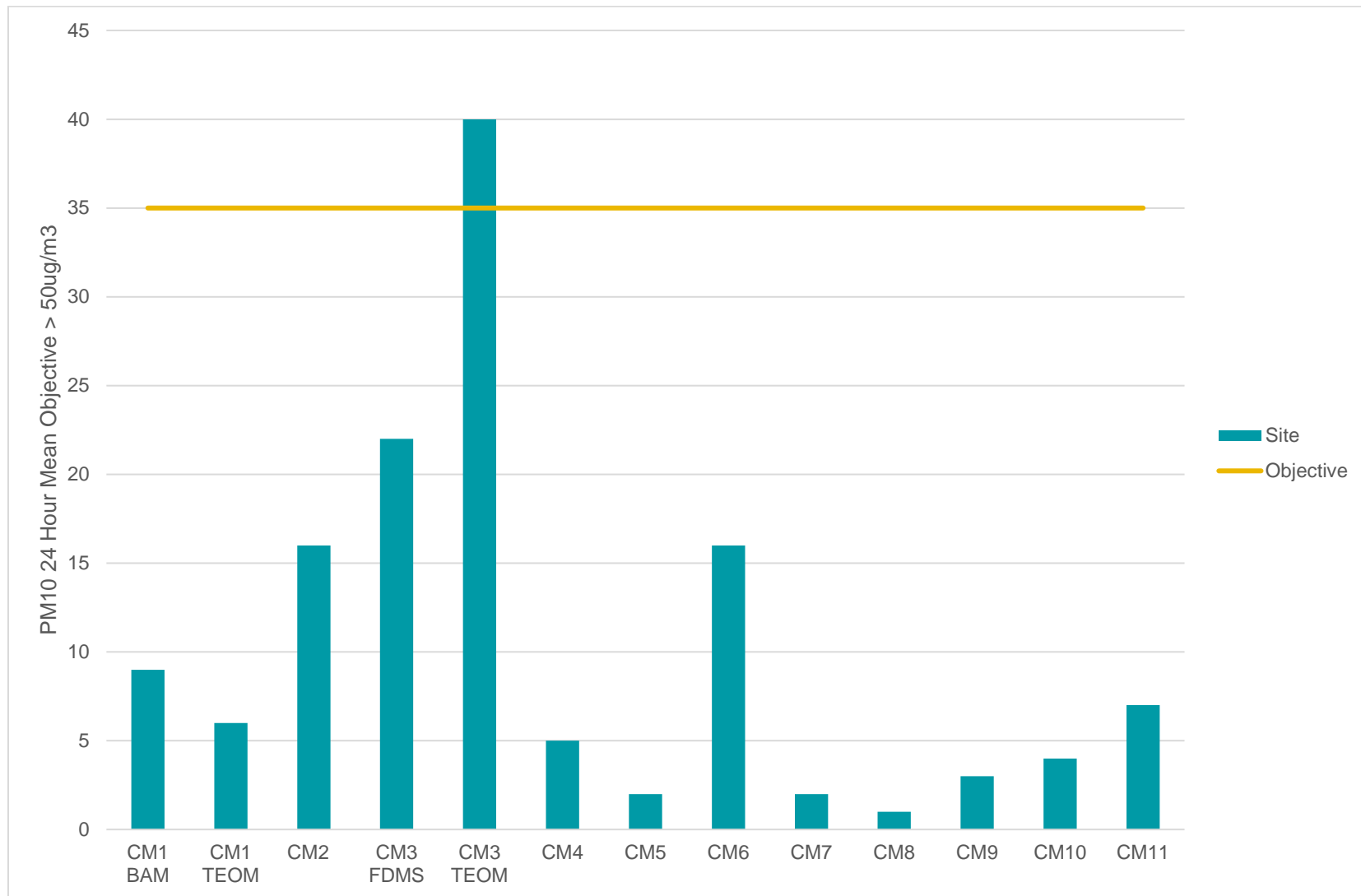


Table A.7 – PM_{2.5} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	PM _{2.5} Annual Mean Concentration (µg/m ³) ⁽³⁾				
				2014	2015	2016	2017	2018
CM2	Urban Background	N/A	94.5	N/A	N/A	7	6	10
CM10	Other	N/A	98.2	5.8	6.8	7	6	7
CM11	Other	93.1	85.7	N/A	N/A	N/A	N/A	7

Annualisation has been conducted where data capture is <75%

Notes:

(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%).

(3) All means have been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.4 – Trends in Annual Mean PM_{2.5} Concentrations

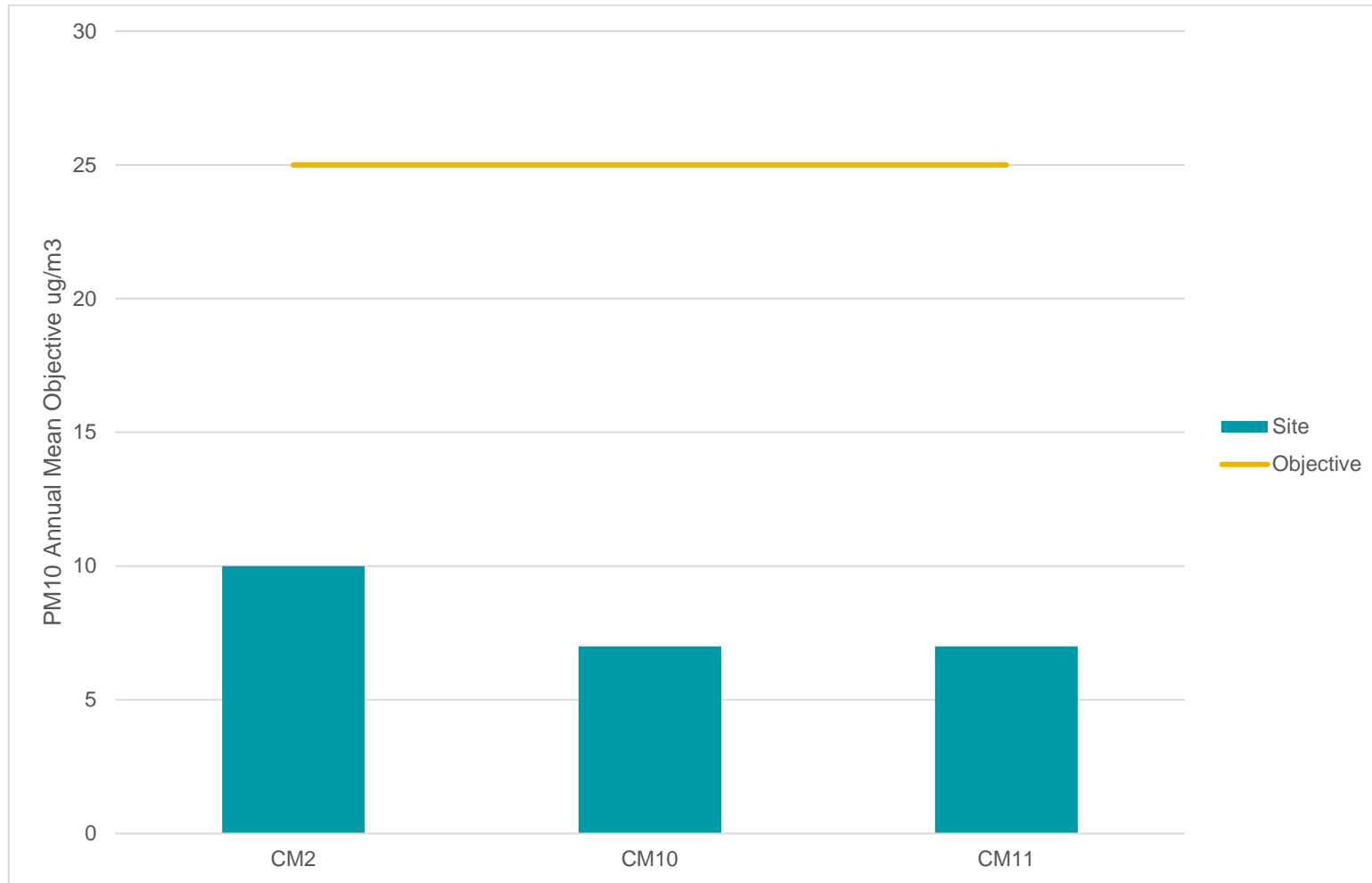


Table A.8 – SO₂ Monitoring Results

Site ID	Site Type	Valid Data Capture for monitoring Period (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	Number of Exceedances 2018 (percentile in bracket) ⁽³⁾		
				15-minute Objective (266 µg/m ³)	1-hour Objective (350 µg/m ³)	24-hour Objective (125 µg/m ³)
CM1	Industrial	N/A	98.7	0	0	0
CM3	Industrial	N/A	99.3	0	0	0
CM9	Other	N/A	96.7	0	0	0

Notes:

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)

(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%).

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

Table A.9 – Benzene Monitoring Results

Start Date	End Date	Scunthorpe Town AURN (CM1) Concentration $\mu\text{g}/\text{m}^3$
27/12/2017	10/01/2018	0.84
10/01/2018	24/01/2018	0.3
24/01/2018	07/02/2018	0.43
07/02/2018	21/02/2018	0.63
21/02/2018	07/03/2018	3.35
07/03/2018	21/03/2018	1.8
21/03/2018	04/04/2018	0.84
04/04/2018	18/04/2018	0.83
18/04/2018	02/05/2018	0.51
02/05/2018	16/05/2018	0.44
16/05/2018	30/05/2018	0.81
30/05/2018	13/06/2018	1.02
13/06/2018	27/06/2018	0.47
27/06/2018	11/07/2018	1.36
11/07/2018	25/07/2018	0.3
25/07/2018	08/08/2018	0.69

Start Date	End Date	Scunthorpe Town AURN (CM1) Concentration $\mu\text{g}/\text{m}^3$
08/08/2018	22/08/2018	0.16
22/08/2018	05/09/2018	0.47
05/09/2018	19/09/2018	0.34
19/09/2018	03/10/2018	0.4
03/10/2018	17/10/2018	0.54
17/10/2018	31/10/2018	1.07
31/10/2018	14/11/2018	0.72
14/11/2018	28/11/2018	3.21
28/11/2018	12/12/2018	0.58
12/12/2018	24/12/2018	0.76
24/12/2018	09/01/2019	0.68
Annual Average		0.87

Note: The Benzene annual mean objective is $5\mu\text{g}/\text{m}^3$

Table A.10 - PAH Monitoring Results

Concentration ng/m ³	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Time Weighted Average
Scunthorpe Town (CM1)	2.9	3.2	4.8	0.76	1.6	1.9	0.19	0.36	0.18	0.32	3.4	0.67	1.69
Low Santon (CM3)	1.1	0.78	0.52	0.45	0.33	0.93	0.71	1.2	1	0.35	0.68	1.3	0.78

Notes: Exceedances of the UK PAH annual mean objective of 0.25 ng/m³
Exceedances of the EU Target Value of 1ng/m³.

Figure A.5 – Annual Mean PAH Concentrations

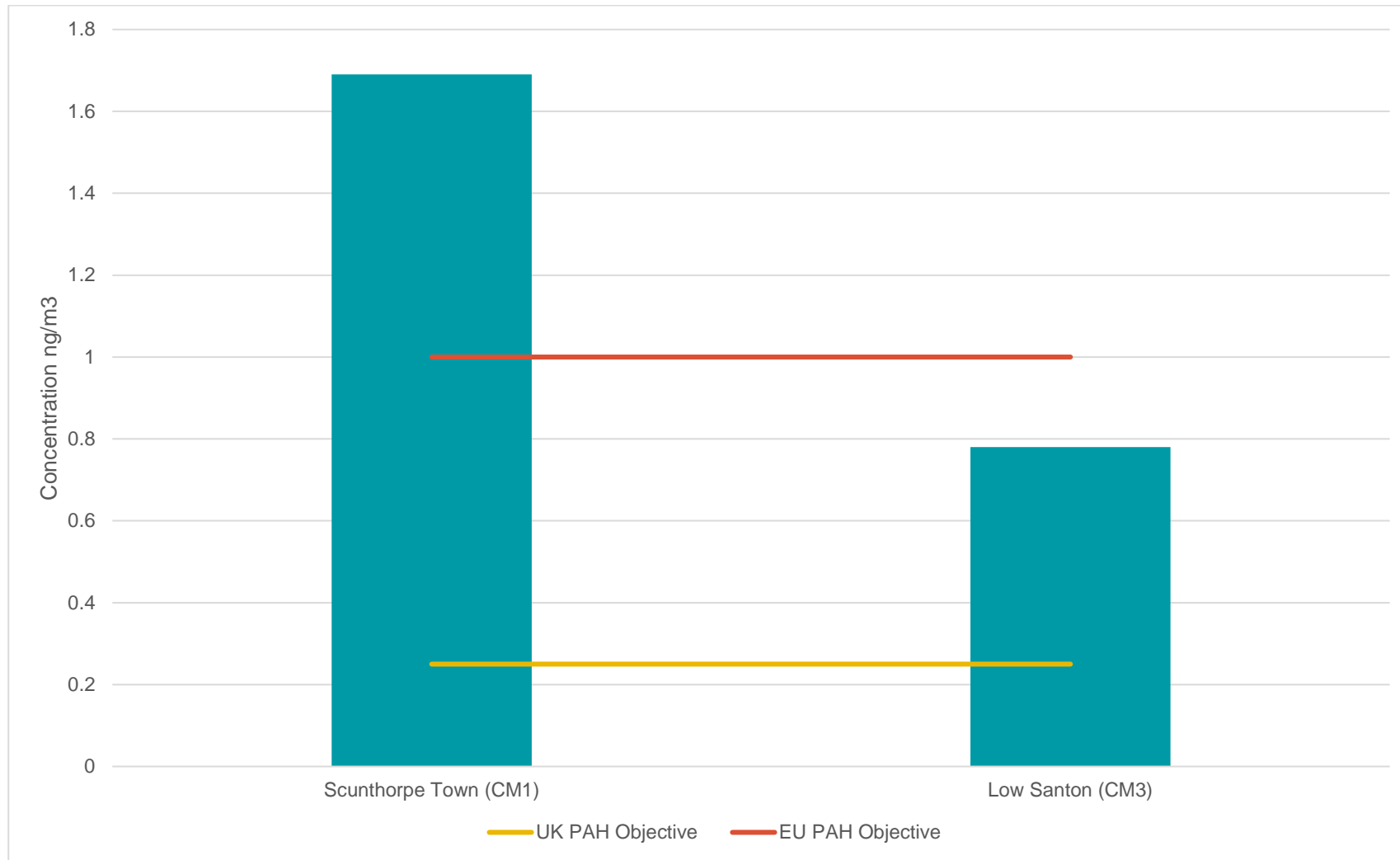


Figure A.6 – Trends in Annual Mean PAH Concentrations

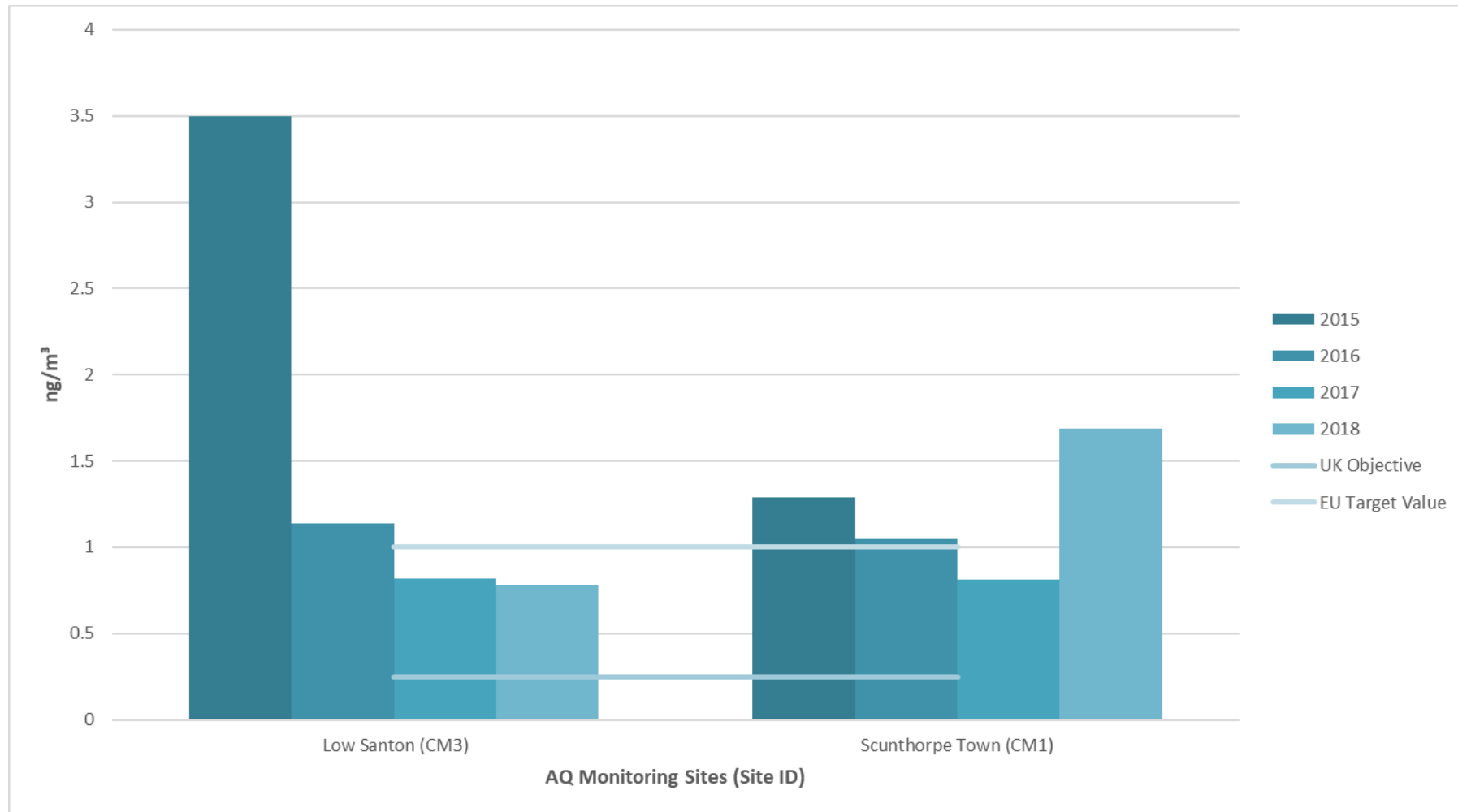


Table A.11 – Heavy Metals Monitoring Results

Heavy Metal	Scunthorpe Town AURN	Low Santon	Target Value
	(CM1) Annual Mean Concentration ng/m3	(CM3) Annual Mean Concentration ng/m3	ng/m3
Arsenic (As)	0.7686	0.7502	6
Cadmium (Cd)	0.3517	0.6298	5
Cobalt (Co)	0.1325	0.2073	
Chromium (Cr)	2.8113	4.3193	
Copper (Cu)	6.1284	5.6541	
Nickel (Ni)	1.1596	1.2533	20

Heavy Metal	Scunthorpe Town AURN (CM1) Annual Mean Concentration ng/m3	Low Santon (CM3) Annual Mean Concentration ng/m3	Target Value ng/m3
Lead (Pb)	16.7651	18.9285	500
Selenium (Se)	0.9589	1.0983	
Vanadium (V)	1.1656	9.5087	
Zinc (Zn)	28.3913	29.5432	

Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO₂ Monthly Diffusion Tube Results - 2018

Site ID	NO ₂ Mean Concentrations (µg/m ³)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.65) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
DT1		33.5	45.7	19.0	5.2	25.5	32.0	31.7	18.9		42.0	42.1	29.6	19.2	18.5
DT2	48.1	34.0	51.6	32.6	30.5	28.5	34.5	32.6	35.5	36.5	40.1	39.4	37.0	24.1	20.3
DT3	36.3	31.4	35.9	22.4	19.7	21.8	25.4	24.7	29.9	27.2	33.4	39.2	28.9	18.8	23.7
DT4	34.9	36.9	44.6	28.7	23.8	22.0	28.2	24.6	27.2	29.9	36.5	34.5	31.0	20.2	17.6
DT5	41.7	37.9	47.7	33.6	30.7	23.2	34.2	29.4	36.5	37.8	43.1	36.9	36.9	24.0	22.7
DT6	39.0	41.3	45.6	33.5	32.3	28.8	29.6	24.7	31.0	38.2	44.0	38.0	35.5	23.1	22.6
DT7	38.3	44.1	55.7	33.3	35.6	24.1	24.4	29.3	33.6	38.5	38.1	46.4	37.0	24.1	18.6
DT8	43.5	43.2	54.3	35.0	33.6	31.4	33.1	29.9	34.7	38.9	41.6	47.4	38.9	25.3	19.1
DT9	27.1	29.6	45.0	26.6	22.5	19.7	21.5	21.4	24.3	3.0	37.2	41.6	28.9	18.8	15.5
DT10	48.0	58.2	54.0	54.5	57.8	44.1	55.2	45.1	50.2	51.0	52.7	49.6	51.7	33.6	30.1
DT11	32.3	41.6	37.6	30.7	28.5	23.4	29.7	27.4	31.2	31.1	29.1	31.9	31.2	20.3	25.0
DT12	43.1	27.8	34.6	28.3	26.7	25.1	27.8	25.0	28.0	28.3	33.4	37.4	30.5	19.8	17.0
DT13	29.1	25.0	37.6	28.5	22.9	19.4	19.6	21.7	23.0	24.5	31.9	31.3	26.2	17.0	14.5
DT14	49.0	42.2	56.1	40.2	43.8	39.0	39.1	39.7	41.0	41.2	43.3	43.9	43.2	28.1	20.0
DT15	31.4	31.2	41.8	26.7	31.4	26.4	32.5	20.5	25.3	32.5	29.6	32.0	30.1	19.6	25.8
DT16		42.8	49.9	38.7	42.3	38.4	34.2	33.4	6.8	38.2	36.2	40.4	39.5	25.7	23.1
DT17	32.5		34.9	27.7	30.6	27.4	29.2	25.1		34.8	30.2	31.5	30.4	19.8	15.7

Site ID	NO ₂ Mean Concentrations (µg/m ³)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.65) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
DT18	26.0	31.5	32.2	19.2	17.0	16.4	17.1	15.0	20.5	26.4	32.8	32.2	23.9	15.5	15.5
DT19	29.3	34.0	35.8	20.1	16.3	14.3	16.4	15.1	19.0	26.7	32.1	37.7	24.7	16.1	16.1
DT20	19.6	26.8	35.5	21.6	15.0	15.8	15.9	13.6	17.6	24.9	32.6	34.8	22.8	14.8	14.8
DT21	41.0	37.8	41.5	30.7	27.2	28.4	31.2	21.3	13.5		44.9	37.7	32.3	21.0	20.3
DT22	41.8	37.0	42.2	31.7	26.7	24.9	29.8	30.6	18.2	28.2	32.5	40.4	32.0	20.8	18.2

- Local bias adjustment factor used
- National bias adjustment factor used
- Annualisation has been conducted where data capture is <75%
- Where applicable, data has been distance corrected for relevant exposure

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective.

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion Tube Bias Adjustment Factors

North Lincolnshire Council currently uses Socotec (previously ESG) for both supply and analysis of its Nitrogen Dioxide Diffusion Tubes. The Bias Adjustment factor for 2018 was 0.65.

All diffusion tube data capture rates exceeded the 75% threshold and therefore no annualisation was required.

Factor from Local Co-location Studies

North Lincolnshire Council had one co location study site in 2018, at CM1: Scunthorpe Town an industrial site:

Site	Analyser Annual Mean	Tube Annual Means	Bias Adjustment Factor
CM1: Scunthorpe Town AURN	22	21	0.65

Discussion of Choice of Factor to Use

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.

Adjustment of DUPLICATE or TRIPLICATE Tubes											AEA Energy & Environment From the AEA group	
Diffusion Tubes Measurements											Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{g m}^{-3}$	Tube 2 $\mu\text{g m}^{-3}$	Tube 3 $\mu\text{g m}^{-3}$	Tripl e Average	Standard Deviation	CV	95% CI mean		Diffusion Tubes Precision Check	
1	02.01.2018	30.01.2018	26.0	29.3	19.6	25.0	4.93	19.75	12.25		Good	
2	30.01.2018	27.02.2018	31.5	34.0	26.8	30.8	3.66	11.88	9.08		Good	
3	27.02.2018	27.03.2018	32.2	35.8	35.5	34.5	2.00	5.79	4.96		Good	
4	27.03.2018	01.05.2018	19.2	20.1	21.6	20.3	1.21	5.97	3.01		Good	
5	01.05.2018	05.06.2018	17.0	16.3	15.0	16.1	1.01	6.30	2.52		Good	
6	05.06.2018	04.07.2018	16.4	14.3	15.8	15.5	1.08	6.98	2.69		Good	
7	04.07.2018	31.07.2018	17.1	16.4	15.9	16.5	0.60	3.66	1.50		Good	
8	31.07.2018	04.09.2018	15.0	15.1	13.6	14.6	0.84	5.76	2.08		Good	
9	04.09.2018	02.10.2018	20.5	19.0	17.6	19.0	1.45	7.62	3.60		Good	
10	02.10.2018	06.11.2018	26.4	26.7	24.9	26.0	0.96	3.71	2.40		Good	
11	06.11.2018	04.12.2018	32.8	32.1	32.6	32.5	0.36	1.11	0.90		Good	
12	04.12.2018	10.01.2019	32.3	37.7	34.8	34.9	2.70	7.74	6.71		Good	
13												

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Site Name/ ID:	Scunthorpe Town
Adjusted measurement (95% confidence level) Without periods with CV larger than 20%	Adjusted measurement (95% confidence level) with all data
Bias calculated using 11 periods of data Tube Precision: 6 Automatic DC: 97%	Bias calculated using 12 periods of data Tube Precision: 7 Automatic DC: 97%
Bias factor A: 0.64 (0.6 - 0.68) Bias B: 56% (46% - 66%)	Bias factor A: 0.65 (0.61 - 0.7) Bias B: 53% (43% - 64%)
Information about tubes to be adjusted Diffusion Tube average: 24 $\mu\text{g m}^{-3}$ Average Precision (CV): 7 Adjusted Tube average: 15 +/- 1 $\mu\text{g m}^{-3}$	Information about tubes to be adjusted Diffusion Tube average: 24 $\mu\text{g m}^{-3}$ Average Precision (CV): 7 Adjusted Tube average: 15 +/- 1 $\mu\text{g m}^{-3}$

Jaume Targa, for AEA
Version 04 - February 2011

PM₁₀ Monitoring Adjustment

PM₁₀ measurements from the TEOM instruments are corrected by the Volatile Correction Model (VCM) <http://www.volatile-correction-model.info> as required by the Technical Guidance LAQM (TG16). This corrects for the loss of volatile components of particulate matter that occur due to the high sampling temperatures employed by this instrument. The resulting corrected measurements have been demonstrated as equivalent to the gravimetric reference equivalent. The VCM works by using the volatile particulate matter measurements provided by nearby FDMS instruments (within 130 km) to assess the loss of PM₁₀ from the TEOM; this value is then added back onto the TEOM measurements. The VCM model used measurements from nearby FDMS instruments (e.g. Scunthorpe Town AURN, Hull Holderness Road AURN and Santon) and other sites within range.

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.

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

QA/QC of Automatic Air Quality Instruments Use

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

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

Validation

This process operates on data during the data collection stage. All data is continually screened algorithmically and manually for anomalies. There are several techniques designed to discover spurious and unusual measurements within a very large dataset. These anomalies may be due to equipment failure, human error, power failures, interference or other disturbances Automatic screening can only safely identify spurious results that need further manual investigation.

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

Ratification

This is the process that finalises the data to produce the measurements suitable for reporting. All available information is critically assessed so that the best data scaling

is applied and all anomalies are appropriately edited. Generally this operates at three, six or twelve month intervals. However, unexpected faults can be identified during the instrument routine services or independent audits which are often at 6-monthly intervals. In practice, therefore, the data can only be fully ratified in 12-month or annual periods. The data processing performed during the three and six monthly cycles helps build a reliable dataset that is finalised at the end of the year.

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

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

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.

The table below sets out the PM₁₀ instrumentation Used by North Lincolnshire Council and the requirement for the VCM Correction Model

Instrument	VCM Correction Required
TEOM-FDMS	No
BAM	No
TEOM	Yes
OSIRIS	Yes

Annualising of PM₁₀ Data for sites CM4, CM5, CM8

PM₁₀ Annual Mean Objective

Sites CM4, CM5 and CM8 were removed during Spring 2018 due to continued compliance with Air Quality Objectives and financial constraints on the local authority. The period of valid data capture was therefore less than the desired 85%.

The data was therefore annualised in accordance with the methodology outlined in LAQM TG-16. Two continuous monitoring sites with data collection over 85% were used, these are detailed in the table below. These were used to work out the average ratio between the two. Using the ratio of the annual mean to the period mean (January – March). Then the average ratio of these were used to annualise the data for the annual PM₁₀ results.

Site	Annual Mean (Am)	Period Mean (Pm)	Ratio (Am/Pm)
Scunthorpe Town AURN	18.00	19.80	0.909
Hull Holderness Road AURN	20.46	22.91	0.893
Average Ratio (Ra)			0.901

With this in mind the following annualisation was applied to sites CM4, CM5 and CM8.

$$\text{CM4: } M^* \times Ra^{**}$$

$$= 20 \times 0.901 = 18\text{ug/m}^3$$

$$\text{CM5: } M^* \times Ra^{**}$$

$$= 22 \times 0.901 = 20\text{ug/m}^3$$

$$\text{CM8: } M^* \times Ra^{**}$$

$$= 17 \times 0.901 = 15\text{ug/m}^3$$

M* The mean concentration for the measurement period

Ra** Average ratio

PM₁₀ 24-Hour Mean Objective

Sites CM4, CM5 and CM8 were removed during Spring 2018 due to continued compliance with Air Quality Objectives and financial constraints on the local authority. The period of valid data capture was therefore less than the desired 85%.

To annualise the data the method outlined in LAQM TG-16 was used. The data capture for these sites was under the required 85% as mentioned above. The 90.4th percentile should be reported. This was calculated using the following method, the available 24 hour mean data was in Column B of an Excel spreadsheet, then the Excel formula =PERCENTILE(B:B,0.904) was used to produce the 24-Hour Mean >50mg/m³ result. This was then used to produce the below table:

Site	90.4 th percentile
CM4	32.28
CM5	32
CM8	25

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

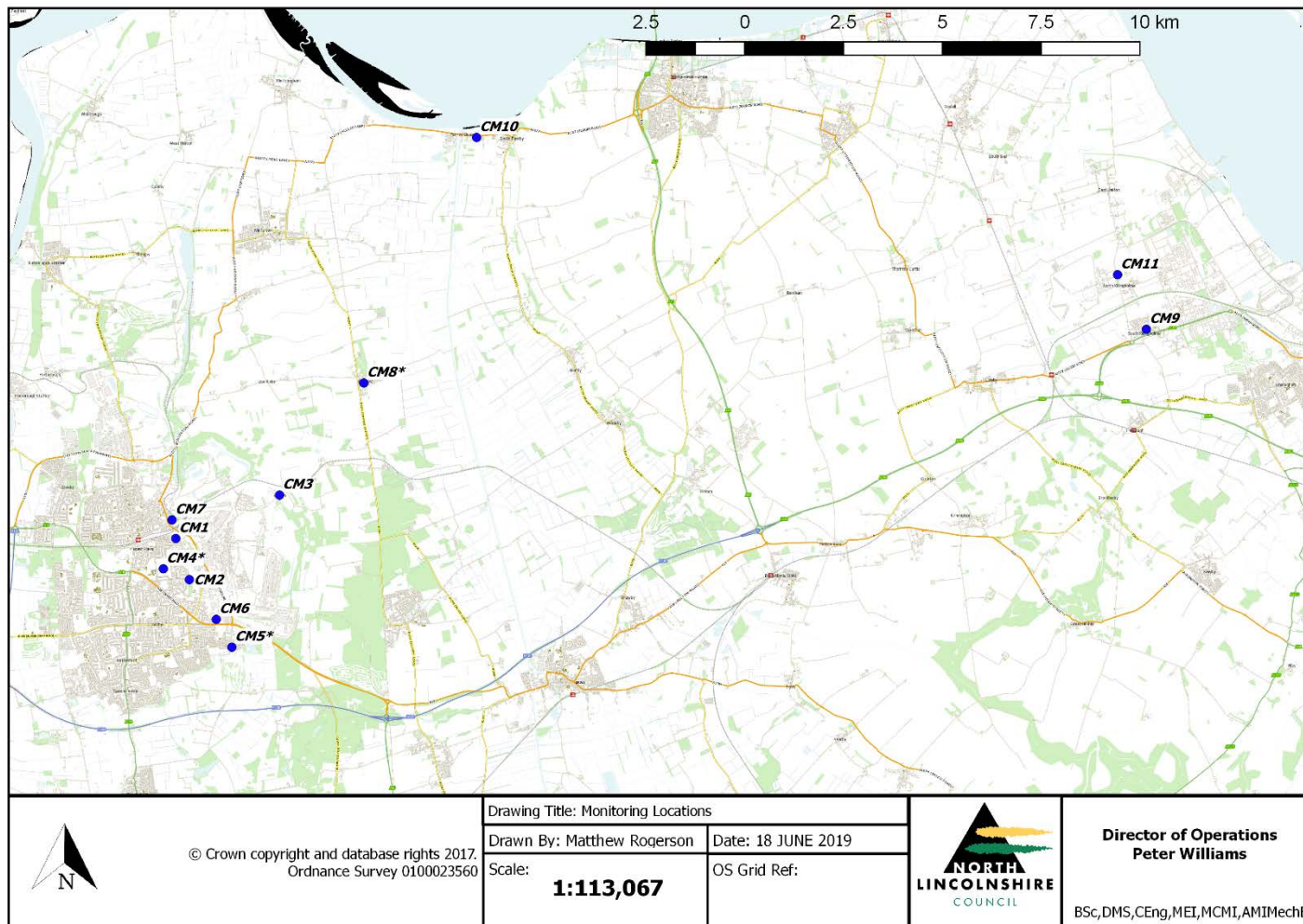


Figure D.1 – Continuous Monitoring Sites in North Lincolnshire

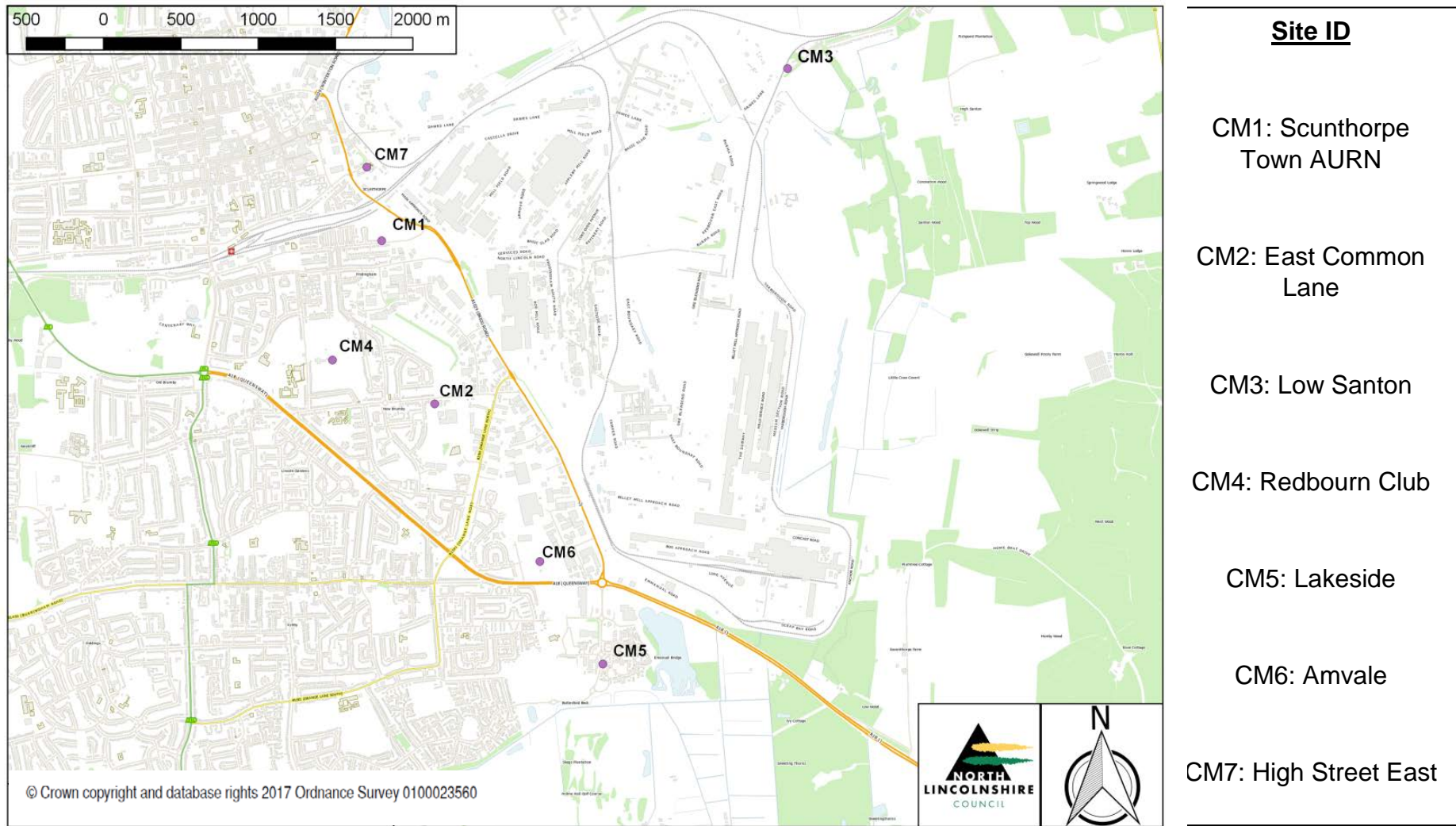


Figure D.2: Location of continuous monitoring sites in Scunthorpe

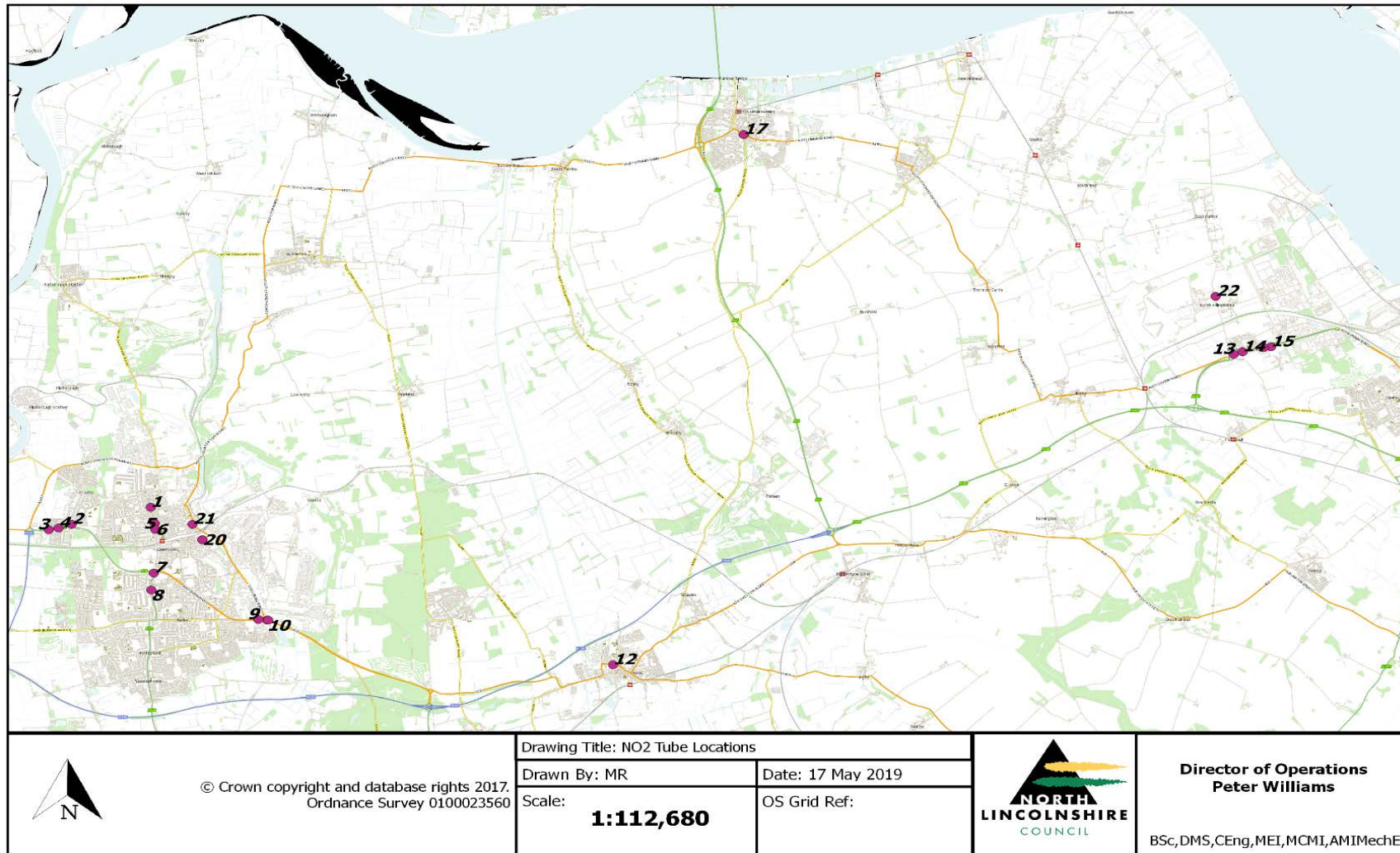


Figure D.3 – Location of diffusion tubes in North Lincolnshire

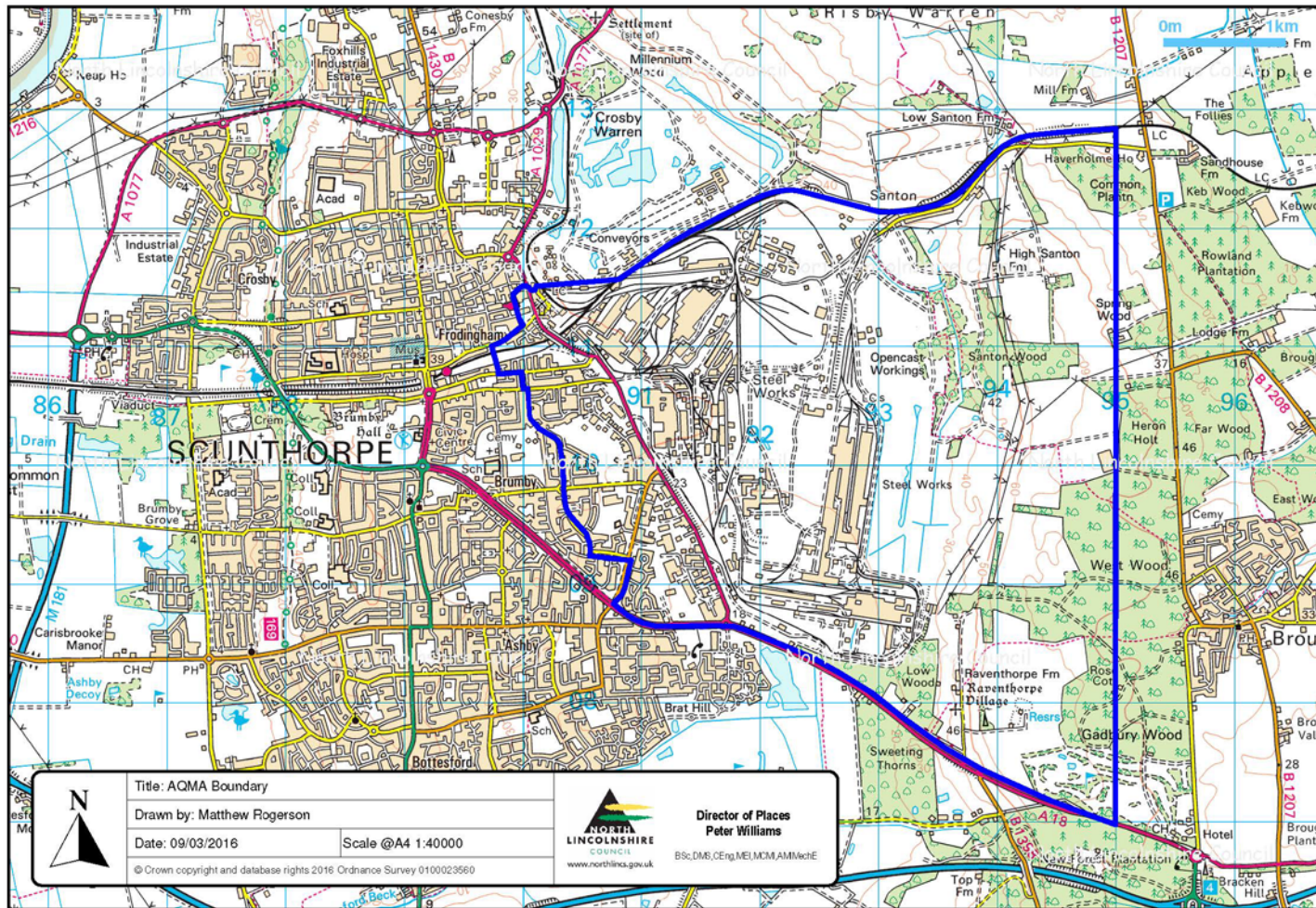


Figure D.4 – Scunthorpe Town AQMA

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective ⁵	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

⁵ The units are in micrograms of pollutant per cubic metre of air (µg/m³).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
AURN	Automatic Urban and Rural Network - the main network used for compliance reporting against the Ambient Air Quality Directives
BAM	Beta attenuation monitoring
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EA	The Environment Agency
EU	The European Union
FDMS	Filter Dynamics Measurement System
HPA	The Health Protection Agency
LAQM	Local Air Quality Management
NLC	North Lincolnshire Council
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PCT	Primary Care Trust
PHE	Public Health England
PHOF	Public Health Outcomes Framework
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less

Abbreviation	Description
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide
TEOM	Tapered Element Oscillating Microbalance
UK	The United Kingdom
VCM	Volatile Correction Model – A method used to correct TEOM PM ₁₀ monitoring data

References

- DEFRA Local Air Quality Management Technical Guidance (TG16)
- DEFRA Local Air Quality Management Policy Guidance (PG16)