
# 2018 Air Quality Annual Status Report (ASR)

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

June 2018

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# Executive Summary: Air Quality in Our Area

## Air Quality in Darlington

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 society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3]. It is estimated that air pollution nationally contributes to nearly 28,000 deaths per year with an associated loss to the population of 340,000 life years[4].

Darlington Borough Council has formally reviewed and assessed air quality since year 2000, and has produced statutory annual reports to the UK Government. It has done this in co-operation with neighbouring Tees Valley Councils and the Environment Agency to give as broad a picture of air quality as possible, continuing a long history of joint co-operation between councils which recognised that air pollution transcended local authority boundaries.

Consistently, the annual report has concluded that air quality in areas in the Darlington Borough where the public may be exposed is generally good when compared with Government objectives, and there has been no need to declare any Air Quality Management Areas in which adverse health effects may exist. There is no complacency in this; Darlington Council is committed to improving air quality as policy, but the economic options are limited against this background.

Darlington Borough, in contrast with the four neighbouring Tees Valley Councils, does not have large industrial areas and is not close to those industrial areas nearer the coast. It has a densely populated central area, with main arterial roads radiating out to the rural surround, and as such has always provided a measure of air pollution from traffic sources, which with its primary emissions at ground level, is now the greatest concern for public health. A significant portion of traffic flow has always been through-traffic and this has dictated major road improvements over the years. In the 1960s, the A1 Darlington bypass to the west of the town was completed, and in the 1970s, the Darlington inner ring road was completed which gave protection to the town centre. The A66 Southern bypass was completed in 1985. More recently in 2008, the eastern transport corridor was opened, which besides providing access to new development land also alleviated traffic congestion on two of the busiest road corridors in the town, Haughton Road and Yarm Road.

[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] Defra. Abatement cost guidance for valuing changes in air quality, May 2013
[4] The Committee on the Medical Effects of Air Pollutants. The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom in December 2010

# Actions to Improve Air Quality

Road traffic across the UK has increased dramatically this century, most noticeably in respect of car ownership. This is also true within Darlington and neighbouring councils. For Darlington, most through traffic has been channelled onto bypasses; the main impact on public health is along commuter roads, and it is in this area that most action needs to be targeted to alleviate air pollution. Fortunately, most housing along these roads is low rise, and set back from kerbside so that there is good dispersion of air pollutants compared with older UK cities and towns. On the downside, it is recognised that public transport limitations have contributed to a higher level of commuter traffic for work purposes than in other large conurbations. In 2004, Darlington was one of three towns selected by the Department for Transport to participate in a national sustainable travel project ('Sustainable Travel Demonstration Towns'), looking at ways to tackle traffic congestion. In 2007, pedestrianisation of a large part of the town centre was completed.

National action in terms of reducing emissions from vehicles is a crucial factor in reducing air pollution alongside roads. While significant strides have been made in vehicle engine technology, and on reducing harmful emissions from large diesels engines in buses and HGV's, Government policy has tended to concentrate in recent years on reducing carbon emissions, and this has filtered down into local authority policies. There has been a major shift away from petrol engines in small vehicles to diesel, which, while contributing to lower carbon emissions per mile, has inadvertently escalated those pollutants judged to be most harmful to public health, fine particulates and nitrogen dioxide ($NO_2$), which cannot easily be reduced as with larger diesel vehicles. This has been compounded by inadequate emission testing regulations, so that actual emissions from small diesel engines in practice can be significantly higher than test. This has meant that the expected benefit of cleaner vehicle technology has not translated into significantly lower air pollution levels, and this has been confirmed by local monitoring. It will now take time for alternative low carbon / low emission technologies such as electric/hydrogen/hybrid vehicles to become economically viable alternatives. Much of the necessary infrastructure at a nationwide scale to facilitate these emerging technologies is currently unavailable.

Darlington Borough Council's Third Local Transport Plan (LTP) (2011-2026) states that a specific outcome it seeks to achieve is that "everyone can play their part in reducing the impact of transport on the environment……" The Council's Fourth LTP is currently being drafted and sets out a transport strategy to 2036. The LTP supports the emerging Local Plan, the Economic Strategy and also the Tees Valley Strategic Transport Plan and will aim to provide transport infrastructure and travel options for the forecast growth in jobs and new houses. The plan proposes to consult on key measures to achieve certain ambitions, one of which is to monitor the impact of traffic and seek to improve air quality. It is due to be published in 2019 along with the Tees Valley Combined Authority Strategic Transport Plan.

Local actions to reduce the impact of vehicle emissions within Darlington are principally taken in conjunction with neighbouring councils through the TVCA concentrating on the following areas, with further detail in the Local Transport Plan:

- Reducing traffic congestion at peak times through improved network management and road improvements.
- Encouraging local bus companies to review services with particular emphasis on access to new and emerging employment opportunities, and to renew their fleet on an on-going basis.
- Encouraging wider transport choices by improving pedestrian, cycling and public transport, including rail.
- Encouraging the provision of a low emission vehicle infrastructure through the planning regime.

Over time, these improvements will all contribute to further reduction in air pollution within Darlington.

In relation to other sources of air pollution the Department for Environment Food and Rural Affairs (Defra's) draft Clean Air Strategy 2018 is currently out for consultation seeking views on actions being proposed to improve air quality by reducing pollution from a wide range of sources. The draft highlights that while road transport and industrial level burning of fossil fuels are two of the central sources of pollution, a recent rise in the popularity of wood burning stoves and open fires is making a significant contribution to particulate matter (especially $PM_{2.5}$) and the government are proposing new goals to cut exposure to particulate matter pollution, as suggested by the World Health Organisation.[5]

# Conclusions and Priorities

For measured pollutants, this year's Annual Status Report (ASR) concludes that there have been no exceedances of the annual mean objective (40µg/m³) for nitrogen dioxide in any area of relevant public exposure. Previous continuous monitoring results have also consistently shown compliance with the 1 hour mean air quality objective for nitrogen dioxide (200µg/m³ not to be exceeded more than 18 times a year). The annual mean objective and 24 hour (daily) mean objective for $PM_{10}$ has also been met in areas of relevant public exposure.

Although not currently a statutory requirement of the National Air Quality Strategy, Local Air Quality Management Policy Guidance expects local authorities to work towards reducing emissions and/or concentrations of particulate $PM_{2.5}$. The Public Health Outcomes Framework includes particulate $PM_{2.5}$ as an air pollution indicator under domain 3.1 – 'Fraction of mortality attributed to particulate air pollution'. Monitoring of particulate $PM_{2.5}$ is carried out within neighbouring Middlesbrough and Stockton-on-Tees Councils through the national network and it is also possible to determine likely levels in all Tees Valley Council areas, including Darlington. Government objectives are easily met where relevant public exposure exists and this is expected to continue. Even so, Darlington Borough Council will continue to co-operate with the four other Tees Valley Councils in trying to identify in more detail sources of fine particles, and see if any local action can cost effectively reduce emissions / concentrations.

[5] Defra Air quality: draft Clean Air Strategy 2018 https://consult.defra.gov.uk/environmental-quality/clean-air-strategy-consultation/

# Local Engagement and How to get Involved

Let's Go Tees Valley (previously known as Local Motion) promotes and provides information on travelling sustainably in Darlington and the rest of the Tees Valley. Let's Go Tees Valley engages with people across Darlington, Hartlepool, Middlesbrough, Redcar & Cleveland and Stockton to encourage walking, cycling, and using any public transport that builds a greener, healthier community.

For schools the Let's Go Tees Valley website includes travel maps showing walking times, cycle routes and bus stops near schools. For workplaces to promote 'greener' commuting Let's Go Tees Valley has worked with Arriva Travel club to provide offers to workplaces to make sustainable ways of commuting more accessible and appealing.

For more information visit the Let's Go Tees Valley webpage at:
http://www.letsgoteesvalley.co.uk/lets-go-tees-valley/

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# 1 Local Air Quality Management

This report provides an overview of air quality in Darlington Borough Council during 2017. 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 Darlington Borough 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.

Darlington Borough Council currently does not have any AQMAs, and can see no requirement for one. Air quality has been shown, since LAQM started in year 2000, to be consistently and generally good and this has been accepted by Defra.

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

Defra's appraisal of last year's 2017 ASR concluded that on the basis of the evidence provided the conclusions reached were acceptable for all sources and pollutants. It was highlighted in the comments received that Darlington Borough Council's decision to relocate three of the tubes in 2016 was supported, especially for St Cuthbert's (D10) which showed an annual mean $NO_2$ value of 35µg/m³. Suggestions were made in relation to reporting going forward including indicating where locations were new (Table A.3) and inclusion of trend graphs (with more than 5 years data) and larger scale maps of diffusion tube locations. These have been incorporated into this report.

Darlington Borough Council has had no requirement to declare an AQMA, and cannot economically justify a formal action plan to address air quality issues. However, the Council is committed to improving air quality in general, and does that through joint co-operation with the four neighbouring Tees Valley Councils through the Tees Valley Combined Authority (TVCA) (April 2016, which includes Tees Valley Unlimited), and at the environmental health level through the Tees Valley Environmental Protection Group (TVEPG), which also includes the Environment Agency. The Council also encourages standalone measures that may have a beneficial impact on air quality.

Measures generally impact on vehicle emission reductions, improving the transport network, changing transport attitudes through encouraging cycling and walking, and improving public transport. Examples are:

- In relation to Arriva, who operates the vast majority of bus services in Darlington: Of 89 buses in total, 59 are Euro 5 compliant (14 of which are gas buses) and 15 are Euro 6 compliant fitted with stop-start technology. This means lower levels of harmful exhaust emissions such as nitrogen oxides (NOx), carbon monoxide (CO), hydrocarbons (THC and NMHC) and particulate matter (PM). The knock-on effects of reducing these can also mean better fuel economy and lower emissions of $CO_2$.

64 No. buses have an automatic engine cut off time of between 4 and 5 minutes. Timetables do not allow for idling time in the town centre, they are scheduled to leave at particular times, which are registered with the Traffic Commissioner and the time they arrive and depart from the town centre stops is regularly monitored for punctuality and network planning purposes. Punctuality data for 2017/18 shows that 86% of bus services run on time.

- A Licensing Policy which offers a 25% reduction in licensing fees for vehicles that are fuelled by liquid petroleum gas (LPG), electric, petrol-electric and compressed natural gas (NGV).
- Promotion of electric vehicle charging points for any commercial development and public facilities that creates a car parking area with 50 or more spaces. The new Feethams Multi Storey Car Park on Beaumont Street which opened in February 2016 has 4 electric charging spaces. The Planning Policy Section are considering including a policy in the new Local Plan to require commercial developments over a certain threshold to provide vehicle charging points to a percentage of the car parking spaces and for a requirement for every residential property with a garage or off road parking space to provide a single phase point to allow vehicle charging.
- Promoting travel alternatives by encouraging use of sustainable transport via Let's Go Tees Valley (www.letsgoteesvalley.co.uk). The on-going promotion of workplace travel planning, use of public transport, car sharing; and walking and cycling schemes. Let's Go Tees Valley continues to encourage the use and expansion of cycle ways, including the 2017 opening of the John Street cycle path which completed the cycle route from Darlington town centre to Harrowgate Hill and beyond to Newton Aycliffe. During 2017/18 Let's Go Tees Valley secured Access Funding to assist with the continued expansion of walking and cycling activities at the Active Travel hubs across the Tees Valley including Bike Stop in Darlington. This includes delivery of volunteer led walks, managed by Groundwork. Personalised Travel Planning took place across the Tees Valley with a focus on working with people in job centres, businesses, hospitals and colleges, and featured workplace challenges to use sustainable transport to commute to work. In addition marketing was carried out across the year including active travel campaigns, including Love to Ride, Big Summer, Walk to School and Shining Example.
- The Council's Building Services Department has recently invested in 8 all-electric vehicles (which equates to 1/7 of the Building Services fleet). There are now four double electric charging points at the depot on Allington Way, with the infrastructure in place to accommodate more. The gardener at South Park also has an electric vehicle.

Most of these schemes have been implemented in part, and the work will continue. The schemes do not address specific air quality issues, but all will have a bearing on improving air quality.

Darlington Borough Council's Public Health team support the work done in relation to air quality and will continue to work alongside Environmental Health and other colleagues across the Council.

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

As detailed in Policy Guidance LAQM.PG16 (Reference 1 - 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.

**Overview**

Particulates $PM_{2.5}$ are very fine particulates which are now considered to be a more significant health risk than the larger particulates $PM_{10}$, as they penetrate further into the respiratory system and are less easily dislodged. Recognising this, the UK Public Health Outcomes Framework (Healthy Lives: Healthy People) includes an indicator relating to fine particulate matter ($PM_{2.5}$). This indicator is 3.01 in Health Protection Domain 3 – 'Fraction of mortality attributed to particulate air pollution' – with the latest factors (2015 and 2016) across the Tees Valley as follows:

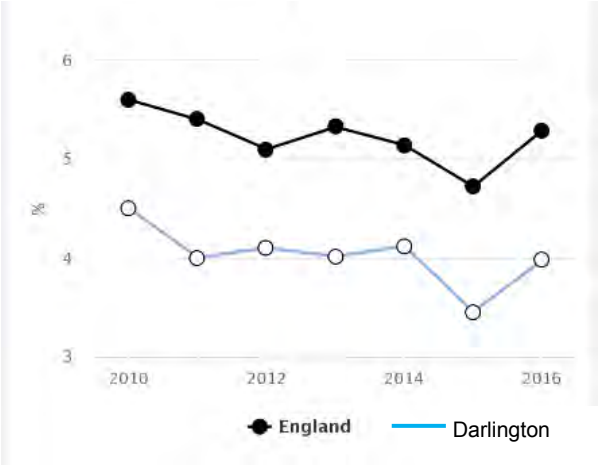
2015 -

| Fraction (%) | England | North East | Darlington | Hartlepool | Middlesbrough | Redcar & Cleveland | Stockton-on-Tees |
|---|---|---|---|---|---|---|---|
| 2015 | 4.7 | 3.5 | **3.5** | 3.5 | 3.7 | 3.5 | 3.5 |
| 2016 | 5.3 | 3.9 | **4.0** | 4.0 | 4.3 | 4.1 | 4.1 |

For Darlington it is estimated there are 47 deaths per year attributable to particulate air pollution ($PM_{2.5}$) with an associated 481 life-years lost in the population[6].

These are estimates of the percentage of mortality attributable to long term exposure to particulate air pollution. The general range for the UK is between 2.5 and 4.0 for rural areas, up to 8 and higher in certain city areas. The trend in the proportion of adult mortality attributable to particulate air pollution has gone up since 2015 nationally (in England) and in Darlington (see Figure 1 below).

Figure 1. Fraction of mortality attributable to particulate air pollution - Darlington [7]




[6] Public Health England. Estimating Local Mortality Burdens associated with Particulate Air Pollution A M Gowers, B G Miller and JR Steadman, 2014

[7] Public Health England. Public Health Outcomes Framework. Fraction of Mortality attributable to particulate air pollution – Darlington. Available at: https://fingertips.phe.org.uk/search/particulate#page/4/gid/1/pat/126/par/E47000006/ati/101/are/E06000005/iid/30101/age/230/sex/4

Particulate $PM_{2.5}$ is not yet incorporated into LAQM regulation within England. As such there is no statutory requirement on local authorities to review and assess $PM_{2.5}$ for LAQM purposes, and while $PM_{2.5}$ monitoring across the UK is desirable given the links to the Public Health Outcomes Framework, it is recognised that monitoring costs can be prohibitive on local authorities. The latest 2016 Technical Guidance (Reference 2) suggests local authorities use results from the national network of $PM_{2.5}$ monitors to assess levels, and also provides a nationally derived factor of 0.7 that can be used to estimate $PM_{2.5}$ levels from any particulate $PM_{10}$ monitors that local authorities may have installed.

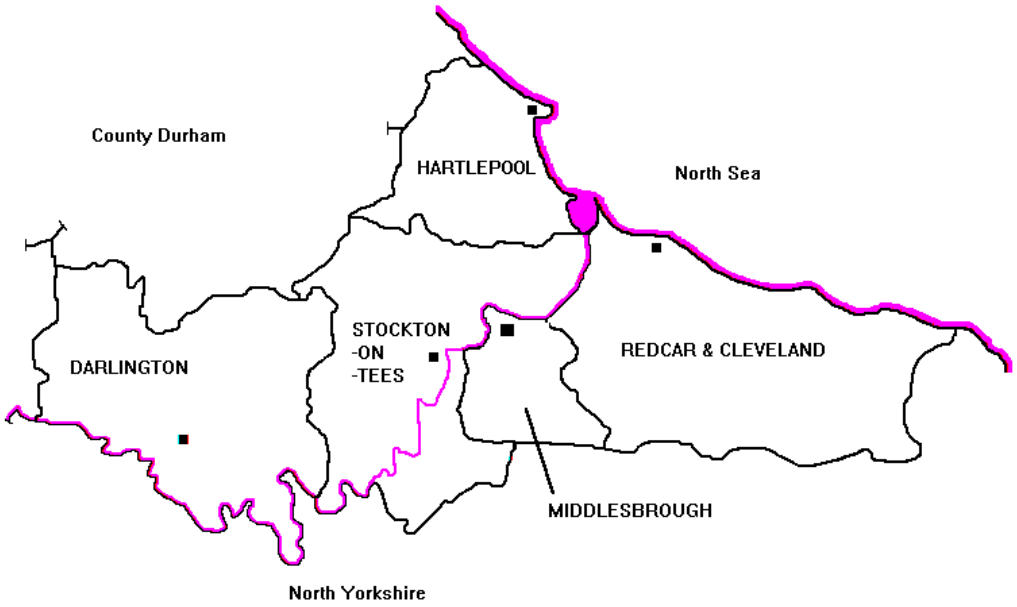
Within the Tees Valley, there are three $PM_{2.5}$ monitors as part of the national network, Middlesbrough Breckon Hill (urban background); Stockton Eaglescliffe (roadside); and Stockton A1035 Nelson Terrace (roadside), all giving direct $PM_{2.5}$ annual means. The Breckon Hill and Eaglescliffe stations have $PM_{10}$ monitors alongside so that a locally derived factor of $PM_{2.5}$ to $PM_{10}$ can be calculated and compared with the national factor and used at local $PM_{10}$ monitors with a similar location. Annual means for $PM_{2.5}$ for within the Tees Valley (Middlesbrough Breckon Hill and Stockton Eaglescliffe, Stockton A1305 Nelson Terrace) for the last five years have ranged between 9.2 and 13.1µg/$m^3$, with variations year on year likely to be due to weather variations.

The UK target objective for $PM_{2.5}$ was first introduced in 2008 as an annual mean of 25µg/$m^3$ (gravimetric) with no exceedances and a target 15% reduction at urban background sites between 2010 and 2020. This has been consistently met across the Tees Valley. The 2016 Technical Guidance has revised this objective to give local authorities in England a new flexible role in working towards reducing emissions and concentrations of $PM_{2.5}$. This will require local authorities to better understand local $PM_{2.5}$ sources and emission levels, data which is currently only available through national estimates.

Technical Guidance recognises that due to its extremely small size, $PM_{2.5}$ can travel for long distances in the air and it is estimated that as much as 40% to 50% of the levels found in any given area can be from sources outside a local authority's direct boundary. Around a quarter of concentrations are thought to be secondary sourced, i.e. reactions between other pollutants in the atmosphere. In addition, coastal and rural areas can have higher proportions of natural sources such as salt, fine sand and pollens, the extent of which will be weather dependent. This means that locally emitted $PM_{2.5}$ will tend to be significantly less than 50% of the total burden, with road traffic, industry and domestic solid fuel burning (wood and coal) the principle sources.

**Darlington $PM_{2.5}$**

Darlington Borough Council is one of five unitary Councils forming the general area known as the Tees Valley. As shown below, it is the most westerly of these Councils and third largest in area, at 198.4 sq. km.




Darlington Borough has a densely populated central area, but is otherwise largely rural. It is a major shopping and commercial centre, and is the main railway centre for the Tees Valley. There is very little heavy industry compared with other Tees Valley Councils, and although some quarrying and other industrial processes lie just outside its boundary, they do not significantly impact on Darlington air quality.

The main A1 motorway (North – South), and the A66 trunk route (East – West) run through the Borough, but are mainly in rural areas, with no areas of relevant exposure. Within the urban area, there are some congested commuter routes, and in the absence of a northern by-pass, some heavy through traffic on the northern outskirts of the town. A major road change, completed in 2008, was the eastern transport corridor, formerly known as the cross-town route (eastern section). The main purpose of this scheme was to provide access to development land to the west of the A66 by-pass, but it has also contributed to significant reductions in traffic on two of the busiest road corridors in the town, Haughton Road and Yarm Road.

The majority of the Darlington urban area is subject to Smoke Control Orders, and natural gas is the main source of hearing in all but a few rural villages. This means that air pollution from domestic and commercial sources are low. Industrial emissions are also low, leaving road transport as the most significant air pollution source.

The principle source of fine particulate pollution is likely to be from road transport, but even this is limited. Other than along the main commuter routes into the town centre, road traffic is generally light as the significant through routes are in their own transport corridors. This general view of sources is reflected in the national 1 sq km sector model data maps for Darlington based on 2015 emission source estimates (Reference 3). Typical background levels are shown as 6.5 – 8.6µg/$m^3$/sq. km. The average $PM_{2.5}$ loading per sq. km in 2015 is shown as 7.2µg/$m^3$, reducing to 6.8µg/$m^3$ in 2020 as a result of planned Government / EU measures.

Therefore, at this stage of understanding of local fine particulate emissions, it is difficult to see what positive action can be economically taken by Darlington Borough Council to reduce $PM_{2.5}$ levels over the coming years, other than those actions already identified in section 2.2 of this report. A more significant impact is likely to be made by changes in Government policy with regard to diesel engines in cars and small vans. Since 1995, the proportion of diesel engine cars has risen from below 10% to over 40% today due to concentration on reducing carbon emissions. Diesel engines emit more fine particulates than petrol engines, and it is difficult to fit effective abatement measures. Of as much concern is the higher levels of nitrogen oxides emitted by diesel engines, which are a key factor in secondary fine particulate formation.

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

## 3.1 Summary of Monitoring Undertaken

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

### 3.1.1 Automatic Monitoring Sites

Until recently, Darlington Borough Council had two continuous monitoring stations both sites are now closed.

**St Cuthbert's Way** was a Local station monitoring nitrogen oxides and particulate $PM_{10}$ from traffic, owned and operated by Darlington Council between 2000 and 2014, when the equipment fell into disrepair. The unit was a kerbside site on a busy inner ring road roundabout, on the edge of the main shopping centre, where traffic is generally slow moving. The unit was in an area of relevant public exposure only for the 1 hour nitrogen dioxide objective, and represented a worst case kerbside site for the whole of the Tees Valley.

The second continuous Local monitoring station for nitrogen oxides and particulate $PM_{10}$ operated at **Cockerton Bridge** from 2004 to early April 2012, when the monitors became unserviceable and could not be economically repaired. The unit was a roadside site on one of the main radial routes into the town centre, with heavy, but relatively free flowing traffic. The monitor location was between kerbside and the nearest building façades, and was a worst-case site for all objectives relating to nitrogen oxides and particulate $PM_{10}$ from traffic. It is noted here that a non-continuous nitrogen dioxide diffusion tube (D5 on the map Appendix D) continues to be operated at a nearby roadside location on Woodland Road to provide an on-going measure of nitrogen dioxide trends.

The locations of the two monitoring sites are shown on the map, Appendix D. Further details on how the monitors were calibrated and how the data has been adjusted are included in Appendix C.

### 3.1.2 Non-Automatic Monitoring Sites

Darlington Borough Council undertook non-automatic (passive) monitoring of $NO_2$ at 10 sites during 2017. Table A.2 in Appendix A shows the details of the sites. One of the tube positions has been relocated since the 2017 ASR (D3 Swinburne Road moved to Platform 1 (Public House) Middleton St George (MSG)). The Swinburne Road site was used as a background site, Middleton St George is a roadside site and was introduced given the development proposals in this area in the future.

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. These diffusion tubes are 50% TEA in acetone, supplied and analysed by Gradko International Ltd. The results are adjusted for bias using factors from the laboratory (Gradko) overall bias factor, as there is no triple tube location study.

## 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.

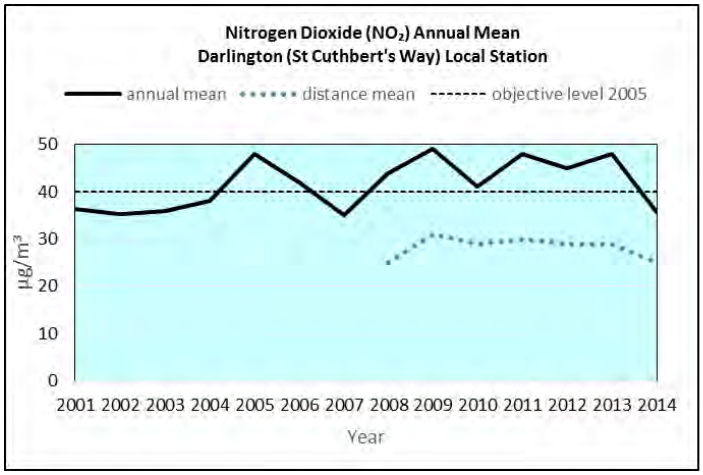
### 3.2.1 Nitrogen Dioxide ($NO_2$)

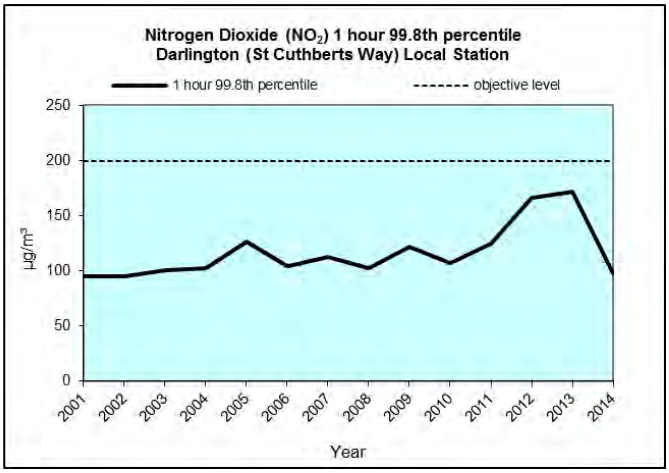
There have been no exceedances of the annual mean (in areas of relevant exposure) or 1 hour mean objectives at any monitoring location.

Table A.3 in Appendix A compares the ratified and adjusted monitored $NO_2$ annual mean concentrations (for diffusion tubes and continuous monitors (when in operation)) for the past 5 years with the air quality objective of 40µg/$m^3$. Table A.4 in Appendix A compares the ratified continuous monitored $NO_2$ 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. For diffusion tubes (annual mean), supplementary trend graphs are also provided where more than 5 years' worth of data is available (at same location) and the full 2017 dataset of monthly mean values is provided in Appendix B.

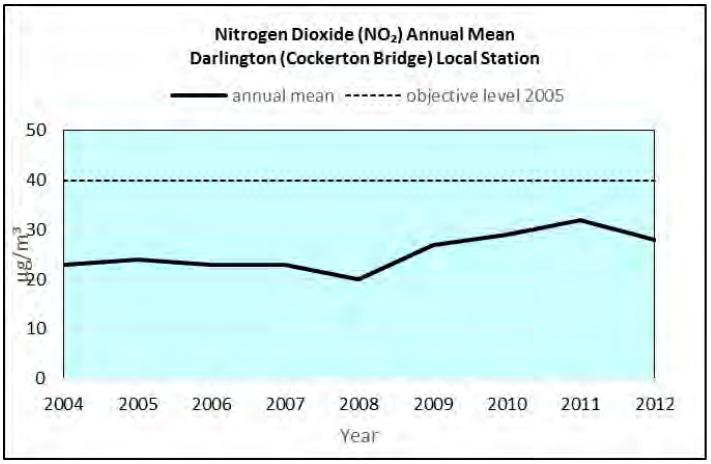
Historical nitrogen dioxide trend graphs at the Darlington St Cuthbert's Way and Cockerton Bridge continuous monitoring stations (when operational) are shown below, along with the nitrogen dioxide diffusion tube trends. The blue trend line shown on the St Cuthbert's Way graph (annual mean) is the expected concentration at the nearest point of relevant public exposure 20 metres away, using the fall off with distance method given in the Technical Guidance (Reference 2).

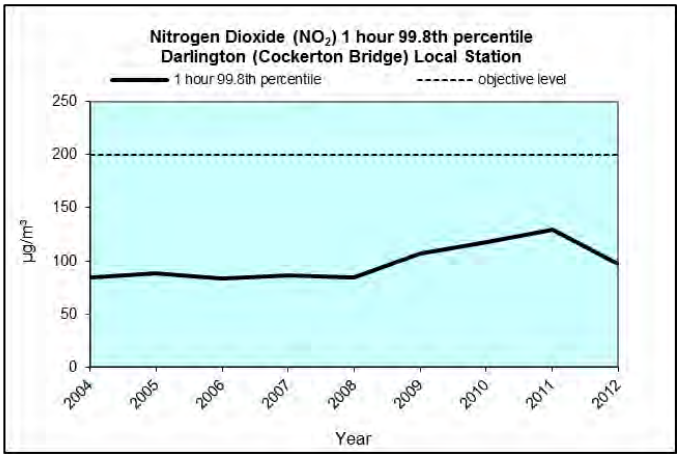
St Cuthbert's Way (no relevant exposure for the annual mean) Closed December 2014



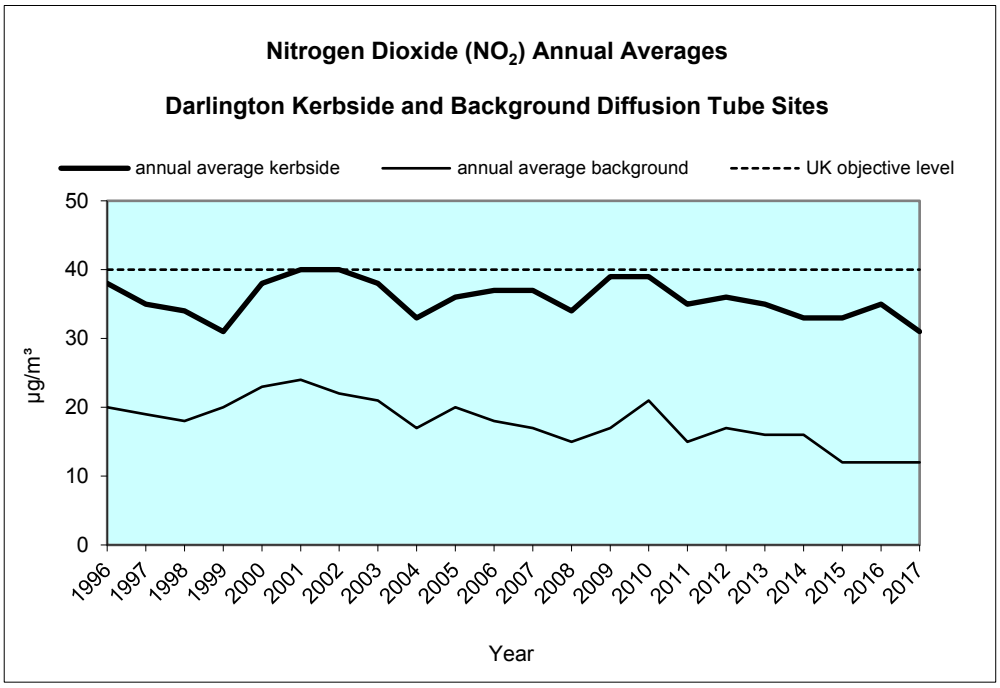




Cockerton Bridge (Closed April 2012)



Diffusion Tube Annual Average Trends



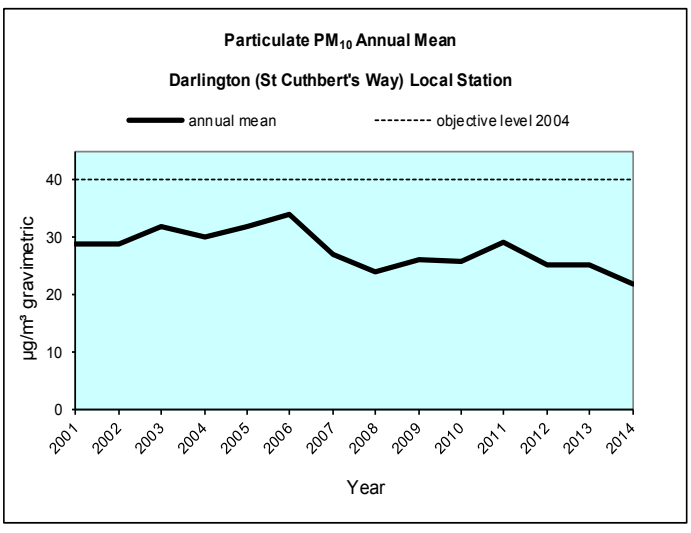

### 3.2.2 Particulate Matter ($PM_{10}$)

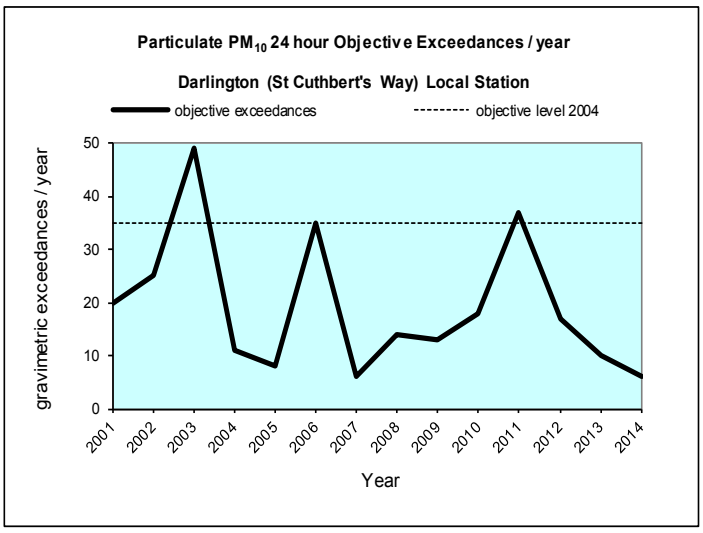
Table A.5 in Appendix A compares the ratified and adjusted continuously monitored $PM_{10}$ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m$^3$.

Table A.6 in Appendix A compares the ratified continuous monitored $PM_{10}$ daily mean concentrations for the past 5 years with the air quality objective of 50µg/m$^3$, not to be exceeded more than 35 times per year.

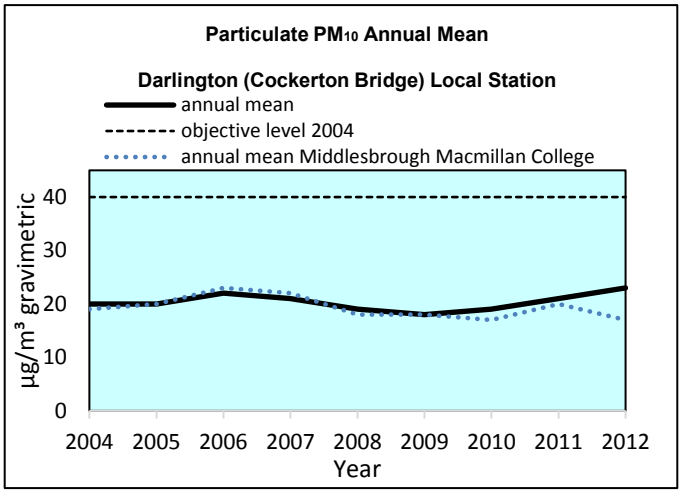
There have been no exceedances of the annual mean or daily mean objective in areas of relevant public exposure. The exceedance variations year on year at the St Cuthbert's Way site are due to weather conditions, with high pressure episodes in winter months causing rapid particulate build-up. Particulate $PM_{10}$ trend graphs at the Darlington St Cuthbert's Way and Cockerton Bridge continuous monitoring stations are shown below and overleaf.

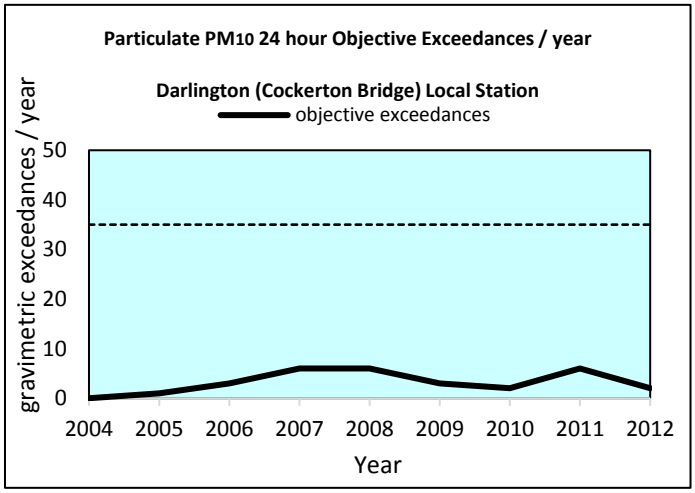
St Cuthbert's Way (no relevant public exposure for the annual mean or daily mean) (Closed December 2014)



Cockerton Bridge (Closed April 2012)




(Middlesbrough MacMillan College data added to indicate probable trend)

### 3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A presents the derived $PM_{2.5}$ annual mean concentrations as available for the past 5 years using the nationally derived factor of 0.7 applied to the particulate $PM_{10}$ results at the St Cuthbert's and Cockerton Bridge sites. Also shown are the annual means recorded at the Middlesbrough and Stockton AURN sites, which are located in areas of relevant public exposure, and indicative of Darlington locations. This data has been obtained from the DEFRA UK Air data selector resource (Reference 4).

The derived annual mean for St Cuthbert's has fallen from 20.5µg/m$^3$ in 2011 to 15.6µg/m$^3$ in 2014. This site is a kerbside site, and fully reflects road traffic emissions. There is insufficient data at the Cockerton Bridge site. The actual monitored levels at the Middlesbrough and Stockton sites range between 10.1µg/m$^3$ and 13.1µg/m$^3$ over the same period (2011-2014) and more recently from 2015-2017 ranged between 7.5µg/m$^3$ and 10.7µg/m$^3$. These stations are more representative of urban traffic and relevant public exposure locations. Weather conditions are thought to be the major influence on year by year variations.

### 3.2.4 Sulphur Dioxide ($SO_2$)

Darlington Borough Council no longer monitors sulphur dioxide concentrations, and there is no requirement in the absence of industrial sources or significant domestic coal burning. For many years, Darlington did monitor sulphur dioxide concentrations in the town centre using an 8 port sampler, but this site was closed in 2004 when sulphur dioxide concentrations fell below the limit of detection.

Sulphur dioxide monitoring results from other Tees Valley Councils with significant emissions from the chemical and steel industries, consistently show the objectives being met, and this will be the case within the Darlington Council area.

# 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| StC (closed December 2014) | St Cuthbert's Way (Local) | Kerbside | 429032 | 514818 | $NO_2$, $PM_{10}$ | N | $NO_2$ - Chemiluminescence<br>$PM_{10}$ - TEOM (vcm correction) | 20 | 0.5 | $NO_x$ 1.9<br>TEOM 2.0 |
| Co (closed April 2012) | Cockerton Bridge (Local) | Urban Centre | 427528 | 515309 | $NO_2$, $PM_{10}$ | N | $NO_2$ - Chemiluminescence<br>$PM_{10}$ - TEOM (vcm correction) | 20 | 10 | 2.9 |

**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) |
|---|---|---|---|---|---|---|---|---|---|---|
| D1 | Northgate | Kerbside | 429026 | 514898 | $NO_2$ | NO | N/A | <1 (0.6) | NO | 2.6 |
| D2 | Haughton Road | Roadside | 429351 | 514819 | $NO_2$ | NO | 1 | 2.2 | NO | 2.5 |
| D3 | Platform 1 - Middleton St George | Roadside | 434205 | 514165 | $NO_2$ | NO | 4 | 2.2 | NO | 2.4 |
| D4 | Salters Lane | Roadside | 429478 | 517375 | $NO_2$ | NO | 5 | 1 | NO | 2.8 |
| D5 | Woodland Rd | Roadside | 428152 | 514966 | $NO_2$ | NO | 20 | 1.6 | NO | 2.9 |
| D6 | Blackwell Bridge | Roadside | 427734 | 512591 | $NO_2$ | NO | 10 | 2.5 | NO | 2.6 |
| D7 | North Road Station | Roadside | 429007 | 515504 | $NO_2$ | NO | 3 | 1.6 | NO | 3.0 |
| D8 | Haughton Green | Kerbside | 430905 | 515918 | $NO_2$ | NO | 20 | <1 (0.79) | NO | 2.5 |
| D9 | Yarm Road | Roadside | 431299 | 514137 | $NO_2$ | NO | 20 | 1 | NO | 2.6 |
| D10 | St Cuthbert's | Kerbside | 429170 | 514534 | $NO_2$ | NO | N/A | <1 (0.73) | NO | 2.4 |

**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). Distance to relevant exposure from monitoring position.

(2) N/A if not applicable. Distance to kerb of nearest road from monitoring position.

## Table A.3 – Annual Mean $NO_2$ Monitoring Results

| Site ID | Site Type | Monitoring Type | Valid Data Capture for Monitoring Period (%) (1) | Valid Data Capture 2017 (%) (2) | $NO_2$ Annual Mean Concentration (µg/m³) (3) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2013 | 2014 | 2015 | 2016 | 2017 |
| StC (closed December 2014) | Kerbside | Automatic | 100 | N/A | **48.4**(28.8) [a] | 35.7(24.8) [a] | - | - | - |
| Co (closed April 2012) | Urban Centre | Automatic | 100 | N/A | - | - | - | - | - |
| | | | | Bias factor | 1.01 | 0.98 | 0.96 | 1.01 | 0.97 |
| D1 | Kerbside | Diffusion Tube | 100 | 58 | 36.3 | 34.4 | 32.8 | 35.7 | 27.9 |
| D2 (new January 2016) | Roadside | Diffusion Tube | 100 | 83 | 18.3 | 17.5 | 12.9 | 30.1 | 29.9 |
| D3 (new January 2017) | Roadside | Diffusion Tube | 100 | 75 | 14.2 | 13.6 | 10.8 | 12.0 | 12.1 |
| D4 | Roadside | Diffusion Tube | 100 | 83 | 34.2 | 30.6 | 29.8 | 34.8 | 29.4 |
| D5 | Roadside | Diffusion Tube | 100 | 92 | 29.1 | 29.5 | 24.9 | 23.0 | 25.1 |
| D6 | Roadside | Diffusion Tube | 100 | 92 | 36.9 | 37.7 | 38.0 | 33.7 | 34.8 |
| D7 | Roadside | Diffusion Tube | 100 | 92 | 33.4 | 31.0 | 35.4 | 37.6 | **41.9** |
| D8 | Kerbside | Diffusion Tube | 100 | 83 | 36.3 | 35.8 | 33.2 | 34.0 | 33.2 |
| D9 | Roadside | Diffusion Tube | 100 | 92 | 26.2 | 27.0 | 24.2 | 26.2 | 27.7 |
| D10 (new January 2016) | Kerbside | Diffusion Tube | 100 | 83 | 10.3 | 9.3 | 8.3 | 35.0 | 31.0 |

*(Figures in brackets for St Cuthbert's Way automatic monitor are the projected public exposure concentration annual means derived from the $NO_2$ fall off with distance calculator at 20 metres, the nearest point of relevant public exposure.)*

☒ **Diffusion tube data has been bias corrected**

☒ **Annualisation has been conducted where data capture is <75%**

**Notes:**

Exceedances of the $NO_2$ annual mean objective of 40µg/m³ are shown in **bold**.

$NO_2$ annual means exceeding 60µg/m³, indicating a potential exceedance of the $NO_2$ 1-hour mean objective are shown in **bold and underlined.**

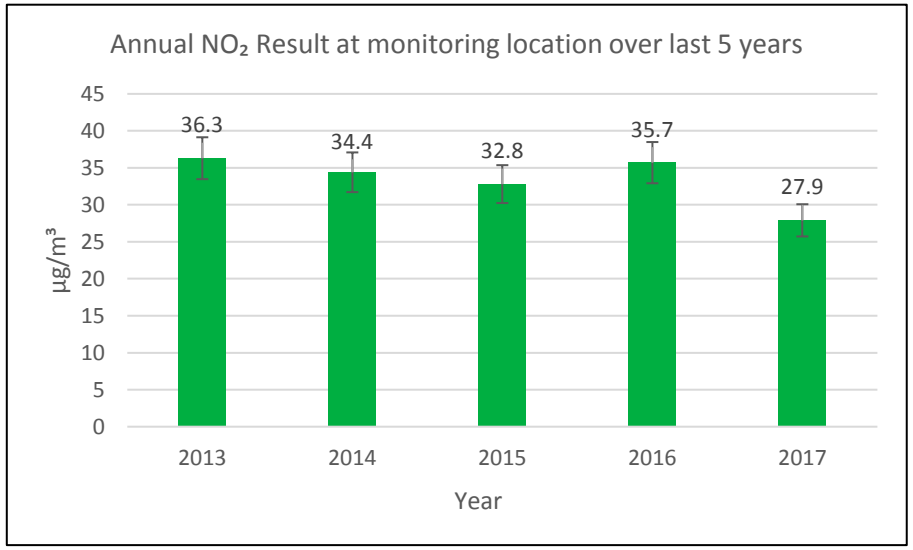
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% - monitoring was carried out for full year)

(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%).

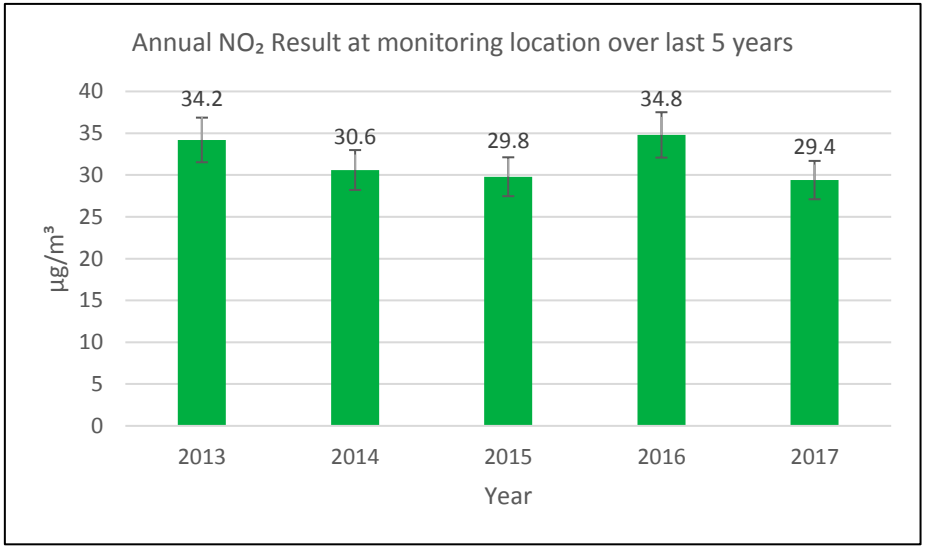
(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

**Diffusion tube trend graphs (locations where 5 years' worth of monitoring data)**

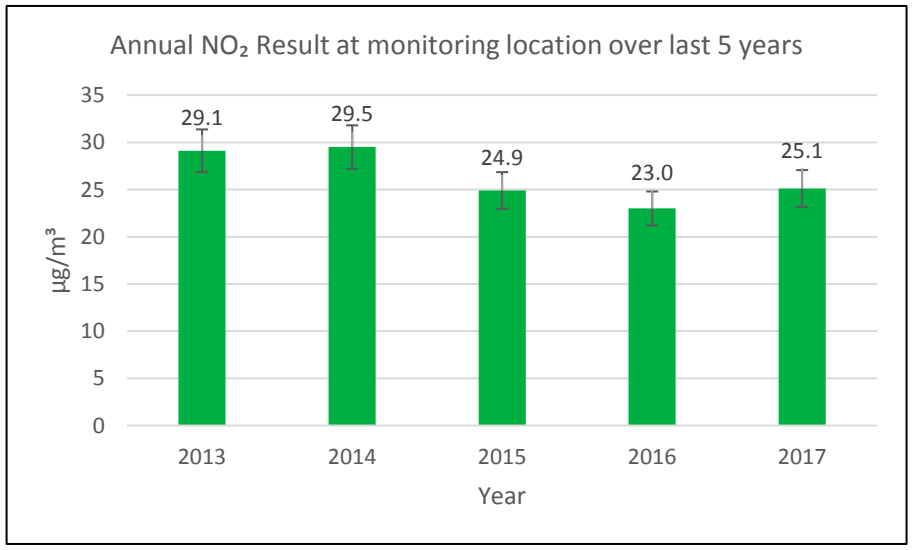
D1 Northgate



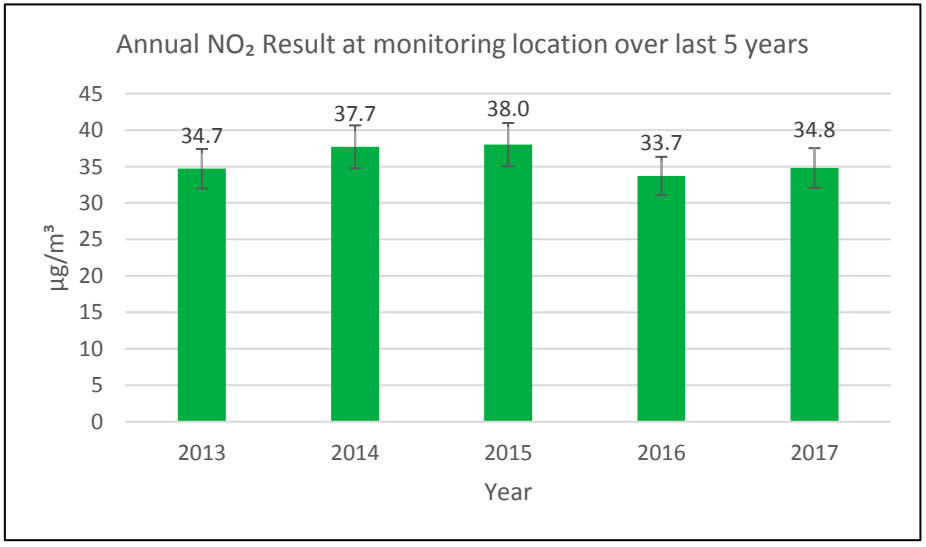

D4 Salters Lane



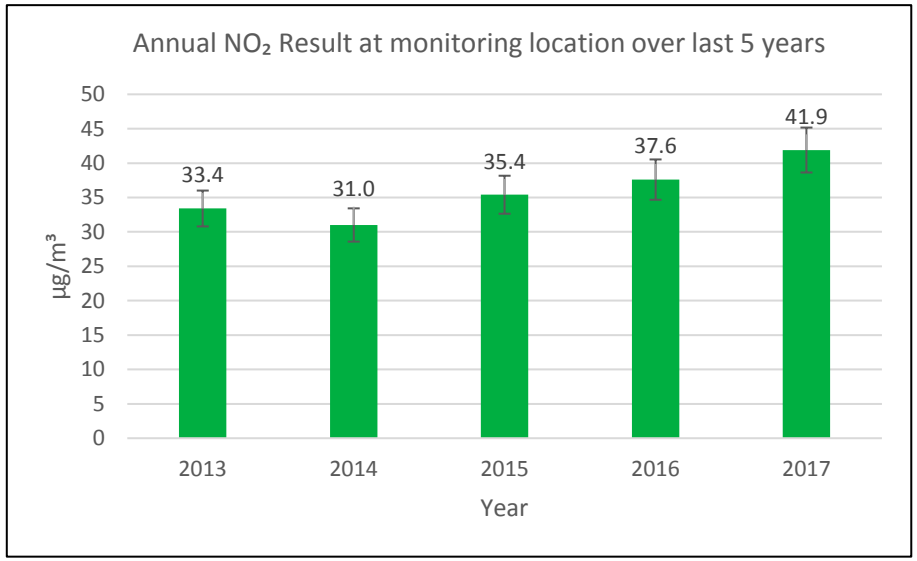

D5 Woodland Road



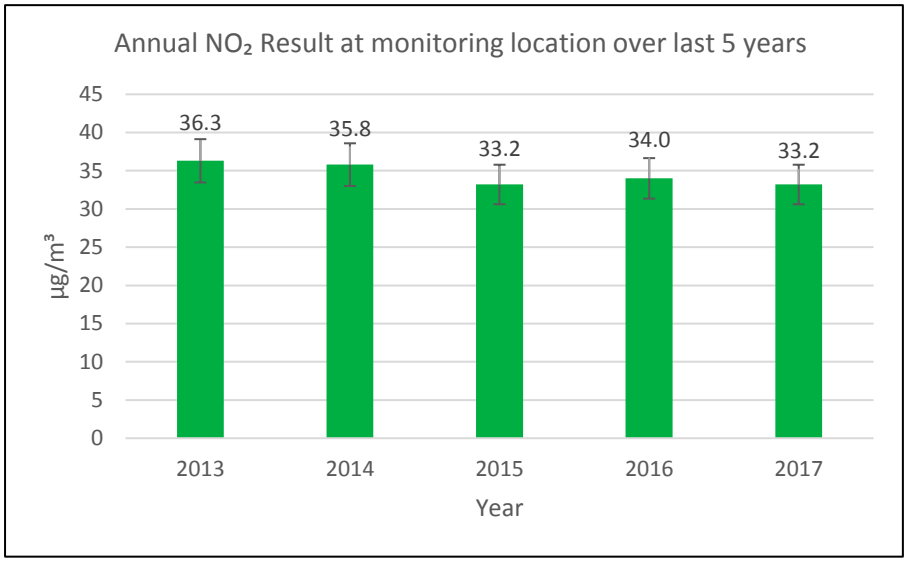

D6 Blackwell



D7 North Road Station




D8 Haughton Green




D9 Yarm Road

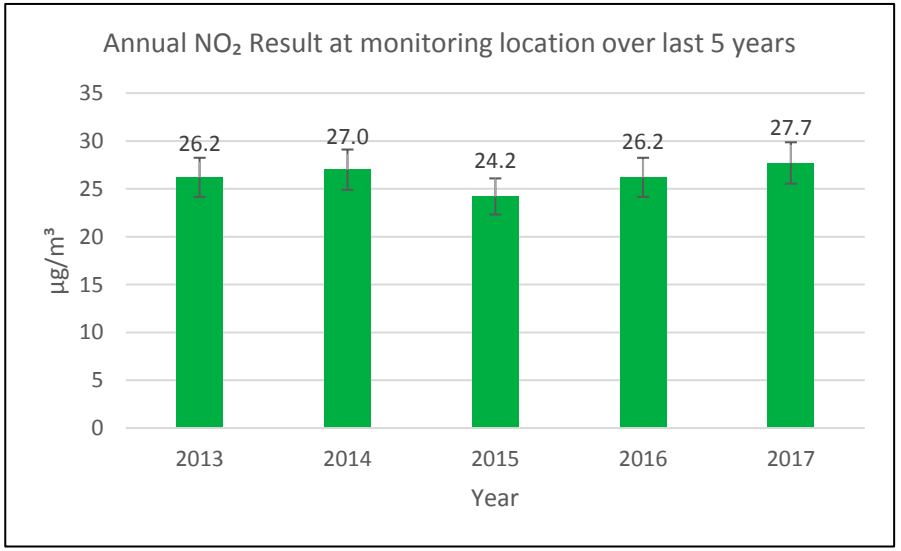



Figure quoted is actual result

Error bars show overall measurement uncertainty (M.U.) as detailed on laboratory analysis report provided by Gradko International (±7.8%)

## Table A.4 – 1-Hour Mean $NO_2$ Monitoring Results

| Site ID | Site Type | Monitoring Type | Valid Data Capture for Monitoring Period (%) (1) | Valid Data Capture 2017 (%) (2) | $NO_2$ 1-Hour Means > 200µg/m$^3$ (3) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2013 | 2014 | 2015 | 2016 | 2017 |
| StC (closed December 2014) | Kerbside | Automatic | 100 | N/A | 4 (172) | 0 (98) | - | - | - |
| Co (closed April 2012) | Urban Centre | Automatic | 100 | N/A | - | - | - | - | - |

**Notes:**

Exceedances of the $NO_2$ 1-hour mean objective (200µg/m$^3$ not to be exceeded more than 18 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% - monitoring was carried out for full 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 99.8$^{th}$ percentile of 1-hour means is provided in brackets.

## Table A.5 – Annual Mean $PM_{10}$ Monitoring Results

| Site ID | Site Type | Valid Data Capture for Monitoring Period (%) (1) | Valid Data Capture 2017 (%) (2) | $PM_{10}$ Annual Mean Concentration ($\mu g/m^3$) (3) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2013 | 2014 | 2015 | 2016 | 2017 |
| StC (closed December 2014) | Kerbside | 100 | N/A | 25.3 | 22.8 | - | - | - |
| Co (closed April 2012) | Urban Centre | 100 | N/A | - | - | - | - | - |

☒ **Annualisation has been conducted where data capture is <75%**

**Notes:**

Exceedances of the $PM_{10}$ annual mean objective of 40$\mu g/m^3$ are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% - monitoring was carried out for full 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.

## Table A.6 – 24-Hour Mean $PM_{10}$ Monitoring Results

| Site ID | Site Type | Valid Data Capture for Monitoring Period (%) (1) | Valid Data Capture 2017 (%) (2) | $PM_{10}$ 24-Hour Means > 50µg/m³ (3) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2013 | 2014 | 2015 | 2016 | 2017 |
| StC (closed December 2014) | Kerbside | 100 | N/A | 10 (40) | 6 (37) | - | - | - |
| Co (closed April 2012) | Urban Centre | 100 | N/A | - | - | - | - | - |

**Notes:**

Exceedances of the $PM_{10}$ 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% - monitoring was carried out for full 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.

## Table A.7 – $PM_{2.5}$ Monitoring Results

| Site ID | Site Type | Valid Data Capture for Monitoring Period (%) (1) | Valid Data Capture 2017 (%) (2) | $PM_{2.5}$ Annual Mean Concentration (µg/m$^3$) (3) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 2013 | 2014 | 2015 | 2016 | 2017 |
| StC (closed December 2014) | Kerbside | 100 | N/A | 17.7 | 16.0 | - | - | - |
| Co (closed April 2012) | Urban Centre | 100 | N/A | - | - | - | - | - |
| | | | | | | | | |
| Stockton-on-Tees Eaglescliffe | Roadside | 100 | 97 | 10.1 | 10.9 | 10.7 | 9.2 | 8.5 |
| Stockton-on-Tees A1305 Nelson Terrace | Roadside | 100 | 98 | N/A | N/A | N/A | 9.5 | 8.1 |
| Middlesbrough Breckon Hill | Urban Background | 100 | 93 | 10.8 | 13.1 | 10.5 | 10.2 | 7.5 |

The Stockton-on-Tees Eaglescliffe and Middlesbrough Breckon Hill sites are national network AURN stations within Tees Valley council areas. The stations are at locations of relevant public exposure and will be representative of such locations in Darlington.

☒ **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. (100% - monitoring was carried out for full 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.

*NB. Data for Stockton and Middlesbrough (2017) from UK AIR data selection csv files downloaded on 06/06/2018

# Appendix B: Full Monthly Diffusion Tube Results for 2017

## Table B.1 – $NO_2$ Monthly Diffusion Tube Results - 2017

| 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 (0.97) and Annualised (1) | Distance Corrected to Nearest Exposure (2) |
| D1 | - | 39.8 | 36.5 | - | 33.4 | 27.9 | 27.9 | - | 32.5 | - | 34.8 | **40.6** | 34.2 | 27.9 | N/A |
| D2 | 39.8 | 38.6 | - | - | 27.0 | 22.7 | 26.2 | 21.3 | 26.8 | 24.9 | 38.6 | **42.3** | 30.8 | 29.9 | 28.3 |
| D3 | - | - | 14.2 | 8.1 | 12.4 | 9.1 | 8.7 | 9.2 | 14.0 | 11.6 | 16.9 | 20.5 | 12.5 | 12.1 | 12.1 |
| D4 | - | 36.7 | 27.8 | 25.7 | 23.8 | 29.5 | 25.3 | 27.1 | 28.8 | 32.4 | 40.0 | 36.5 | 30.3 | 29.4 | 23.1 |
| D5 | 36.9 | 28.6 | 32.3 | 24.5 | 17.4 | 15.0 | 14.5 | - | 22.3 | 21.3 | 36.8 | 34.7 | 25.8 | 25.1 | 17.5 |
| D6 | **44.8** | 37.9 | 32.0 | 32.2 | 27.4 | 32.5 | - | 31.0 | 37.2 | 33.0 | **45.1** | **41.7** | 35.9 | 34.8 | 25.7 |
| D7 | **67.1*** | - | **42.5** | **41.9** | 31.2 | 33.4 | 32.6 | 38.8 | **40.7** | **40.8** | **57.8*** | **48.3** | **43.2** | **41.9** | 34.9 |
| D8 | - | 32.8 | **43.3** | 31.1 | 28.0 | 32.1 | 28.1 | 28.2 | 32.4 | 31.6 | **44.2** | **44.5** | 34.2 | 33.2 | 19.9 |
| D9 | 38.5 | 35.4 | 27.0 | 23.9 | 26.4 | 25.3 | - | 24.6 | 25.2 | 23.6 | 31.3 | 32.4 | 28.5 | 27.7 | 18.1 |
| D10 | - | **40.2** | 37.2 | 23.6 | 32.2 | 27.3 | 28.9 | 27.7 | 31.6 | 26.7 | 34.2 | **41.8** | 31.9 | 31.0 | N/A |

☒ **National bias adjustment factor used**

☒ **Annualisation has been conducted where data capture is <75%**

☒ **If applicable, data has been distance corrected for relevant exposure**

**Notes:**

Exceedances of the $NO_2$ annual mean objective of 40µg/m$^3$ are shown in **bold**.

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

(-) indicates where tube has been missing from location or results may have been compromised

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

(2) Distance corrected to nearest relevant public exposure.

(*) indicates results marked with a note on laboratory analysis report (diluted to read within UKAS accredited calibration range)

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

## Air Quality Monitoring Data QA/QC

**Diffusion Tube Bias Adjustment Factors**

Gradko International Ltd supply and analyse nitrogen dioxide diffusion tubes for Darlington Borough Council. Tube preparation is 50% TEA in acetone. The bias adjustment factor for 2017 has been obtained from the Diffusion Tube Bias Adjustment Factors Spreadsheet collated by DEFRA, and in March 2018, was 0.97 (Reference 5). Darlington does not have a co-location study.

**PM Monitoring Adjustment**

All measurements for $PM_{10}$ at the Local stations are TEOM based. Results since 2008 have been adjusted by the vcm method to provide gravimetric equivalence.

**Short-term to Long-term Data adjustment**

The St Cuthbert's continuous monitoring station had 10 months data only in 2014 (the last monitoring year). The nitrogen dioxide and particulate PM10 annual means were annualised using three Tees Valley continuous monitor datasets. Calculations were included within the Darlington 2015 Updating and Screening report.

Only one of the ten diffusion tubes (D1) had less than 75% data capture (less than 9 months' worth of data). The data has been annualised using the results at three Tees Valley continuous monitoring sites. Calculations are shown below in table C1.

**QA/QC of automatic monitoring**

The two Darlington fixed continuous Local monitoring stations (both $NO_x$ and $PM_{10}$), were modern installations, operated under a comprehensive service contract with the supplier, in both cases Enviro Technology. Operators of the site received supplier training.

The Council is committed to achieving accuracy, precision, data capture, traceability and long term consistency to ensure that data is representative of ambient air quality. In common with other Tees Valley Councils, Darlington had a documented quality assurance and control programme, which includes an established schedule of regular site calibrations, validation of data, and documentation of all procedures. Details are summarised as follows:

| | |
|---|---|
| Calibration | daily 'automatic' calibration with frequent (usually fortnightly) manual checks. |
| | Calibration gas obtained from approved gas standard suppliers. |
| Equipment | a comprehensive service agreement with the supplier. |
| Data capture | site operators were experienced and trained personnel, monitoring data capture on a daily basis where possible to ensure that faults are detected and corrected quickly. |
| Ratification | data was screened, where possible on a daily basis, to check for unusual measurements. Suspicious data was investigated fully, and if found to be faulty, was deleted from the records. Particular attention is paid to possible environmental changes in the vicinity of the analyser. |
| | Data was recorded monthly and compared with earlier results. |

**QA/QC of diffusion tube monitoring**

The Darlington Borough Council nitrogen dioxide diffusion tube programme is operated through an approved laboratory (Gradko International Ltd) with formal accreditation to BS standards, and one that participates in the AIR-PT programme. Particular attention is paid to proper installation of the tubes at the site, and reliable exposure duration.

Tube precision for this laboratory is shown as good (except for two results which were shown as poor) for 2017 for tube preparation 50% TEA in acetone (Reference 6). Gradko International Ltd also demonstrated 100% satisfactory performance in the AIR-PT scheme for 2017 (Reference 7).

**Tables C1 & C2 - Data Adjustment for $NO_2$ Diffusion Tubes**

***Darlington Diffusion Tube Annualisation 2017***

*C1. Data from continuous monitors Stockton, Redcar & Cleveland and Middlesbrough*

| Month | Stockton Eaglescliffe | R&C Dormanstown | Middlesbrough Breckon Hill |
|---|---|---|---|
| | Monthly averages (µg/m³) | | |
| Jan | 24.4 | 20.5 | 25.6 |
| Feb | 16.0 | 14.3 | 15.0 |
| Mar | 14.9 | 14.8 | 15.9 |
| Apr | 10.2 | 12.1 | 11.6 |
| May | 12.7 | 6.6 | 11.3 |
| Jun | 6.7 | 12.3 | 6.8 |
| Jul | 7.5 | 6.2 | 7.5 |
| Aug | 5.4 | 6.9 | 5.7 |
| Sep | 11.3 | 12.3 | 9.1 |
| Oct | 6.4 | 10.8 | 9.7 |
| Nov | 13.0 | 15.9 | 18.0 |
| Dec | 14.8 | 18.9 | 20.4 |
| | | | |
| Annual mean (µg/m³) | 11.9 | 12.6 | 13.1 |

*C2. Darlington diffusion tubes requiring annualisation*

| Tube reference | Period means | Ratios | Average Ratio |
|---|---|---|---|
| | = an average of the months with data for specific Darlington tubes | = annual mean/period mean | =average of the ratios |
| D1 (8 mths) | 22.8; 12.7; 13.0 | 0.522; 0.992; 1.008 | **0.841** |

**Table C3 - Distance correction for $NO_2$**

| Tube reference | Distance of measurement position from kerb (m) | Distance of receptor from measurement position (m) | Distance of receptor from kerb (m) | Local annual mean background $NO_2$ concentration (µg/m³) (measured) | Measured annual mean $NO_2$ concentration (µg/m³)* | Predicted annual mean $NO_2$ concentration at receptor (µg/m³) |
|---|---|---|---|---|---|---|
| D1 | <1 (0.6) | N/A | N/A | 12.0 | 27.9 | N/A |
| D2 | *2.2* | 1 | *3.2* | *12.0* | *29.9* | 28.3 |
| D3 | *2.2* | 4 | *6.2* | *12.0* | *12.1* | 12.1 |
| D4 | *1* | 5 | *6* | *12.0* | *29.4* | 23.1 |
| D5 | *1.6* | 20 | *21.6* | *12.0* | *25.1* | 17.5 |
| D6 | *2.5* | 10 | *12.5* | *12.0* | *34.8* | 25.7 |
| D7 | *1.6* | 3 | *4.6* | *12.0* | *41.9* | 34.9 |
| D8 | *<1 (0.79)* | 20 | *20.79* | *12.0* | *33.2* | 19.9 |
| D9 | *1* | 20 | *21* | *12.0* | *27.7* | 18.1 |
| D10 | <1 (0.73) | N/A | N/A | 12.0 | 31.0 | N/A |

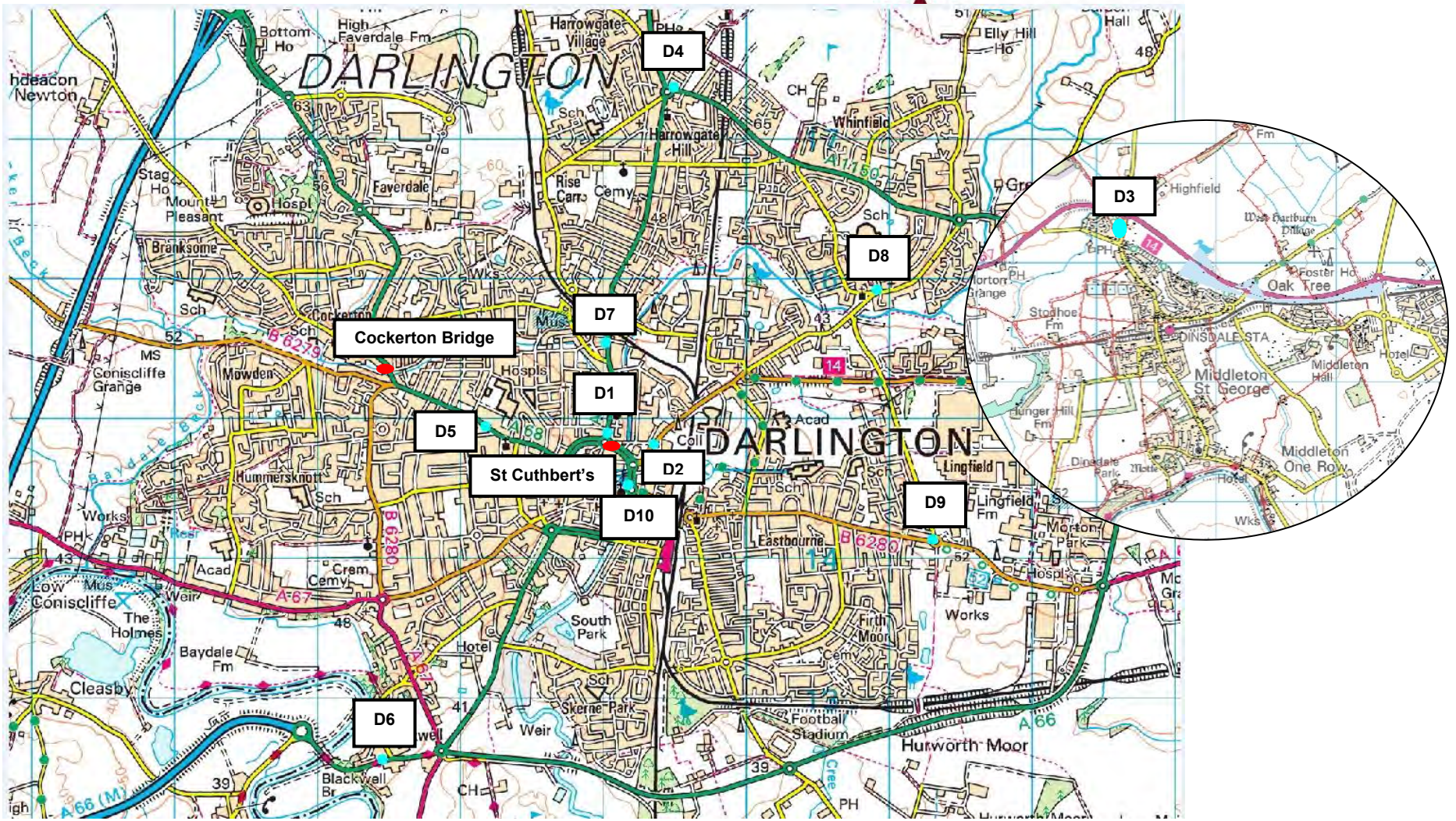
* Figures take into account annualisation (where appropriate) and bias adjustment

The predicated annual mean concentration at the receptor was calculated using the Nitrogen Dioxide fall off with distance calculator provided by DEFRA (Reference 8). *Data inputted is shown in green and italics.*

Previous Swinburne Road site data (2016) used as background.

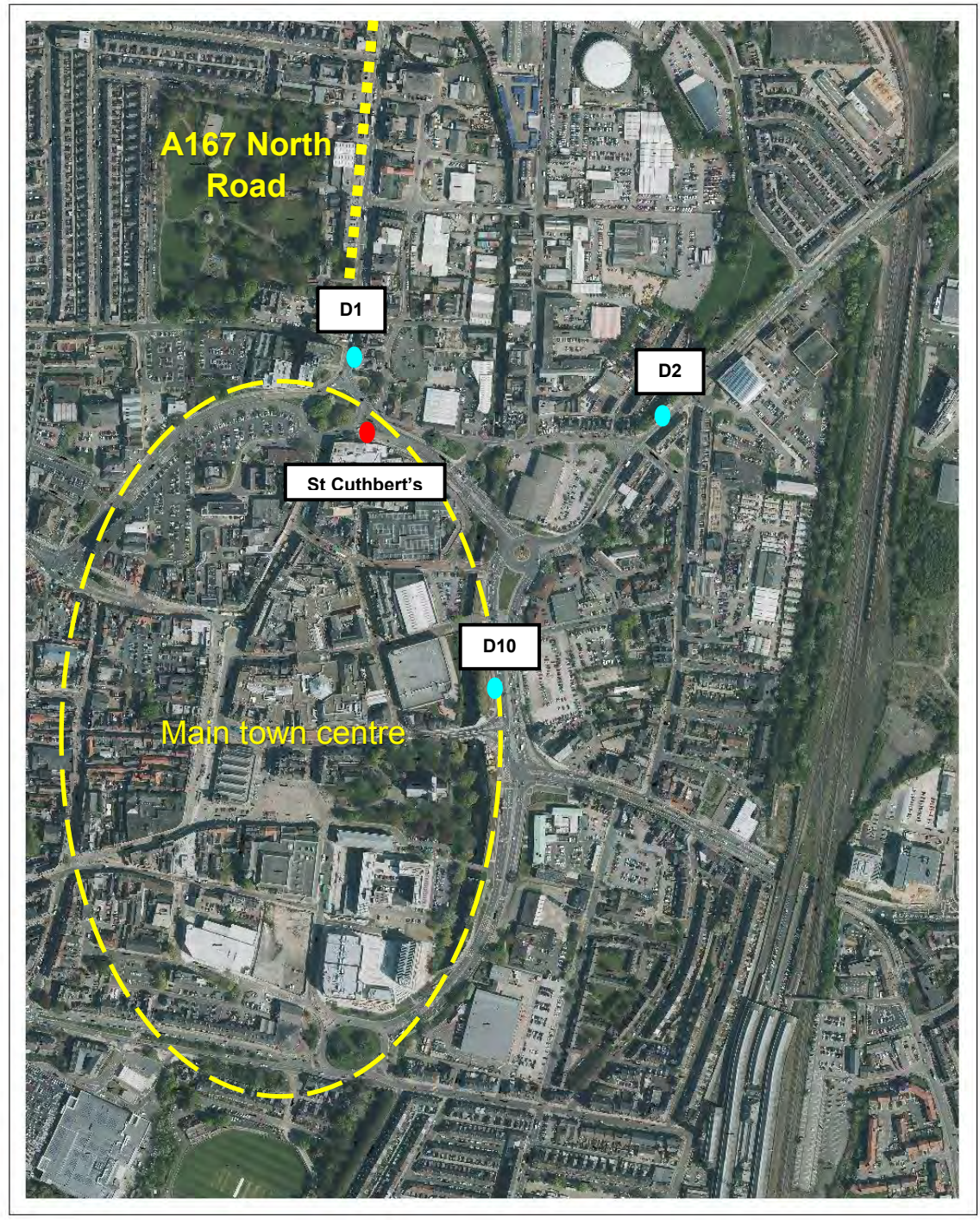
# Appendix D: Map(s) of Monitoring Locations and AQMAs

**Figure D.1 Map of Automatic ● and Non-Automatic ● Monitoring Sites in Darlington Borough Council Area**



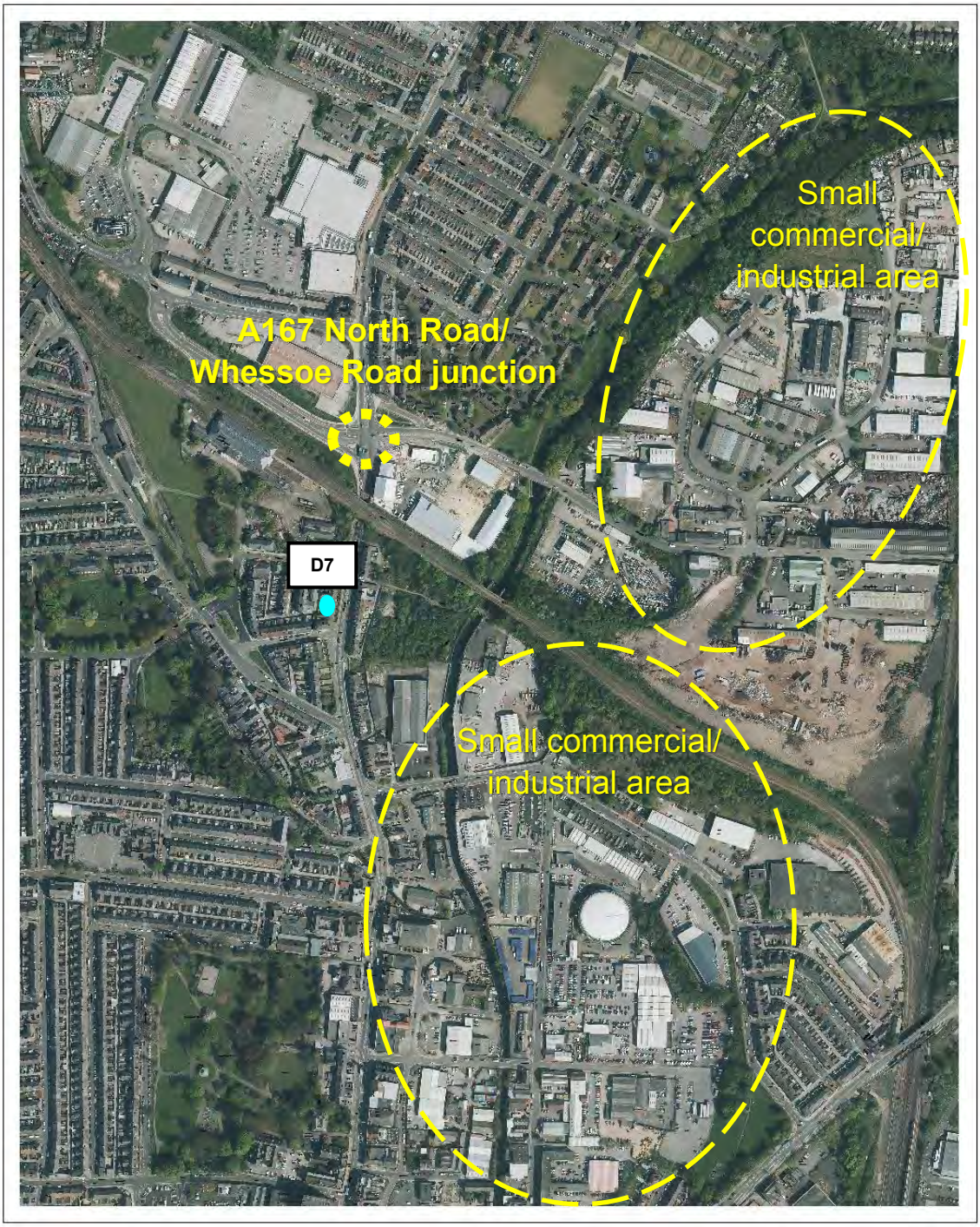

Title – Location of Automatic & Non-Automatic Monitoring Sites
Scale – 1:24,000

**Larger scale maps showing diffusion tube locations**
**D1 Northgate, D2 Haughton Road, D10 St Cuthbert's, St Cuthbert's (automatic)**



**D7 North Road Station**

0 105 210 420 Meters



**D4 Salters Lane North**

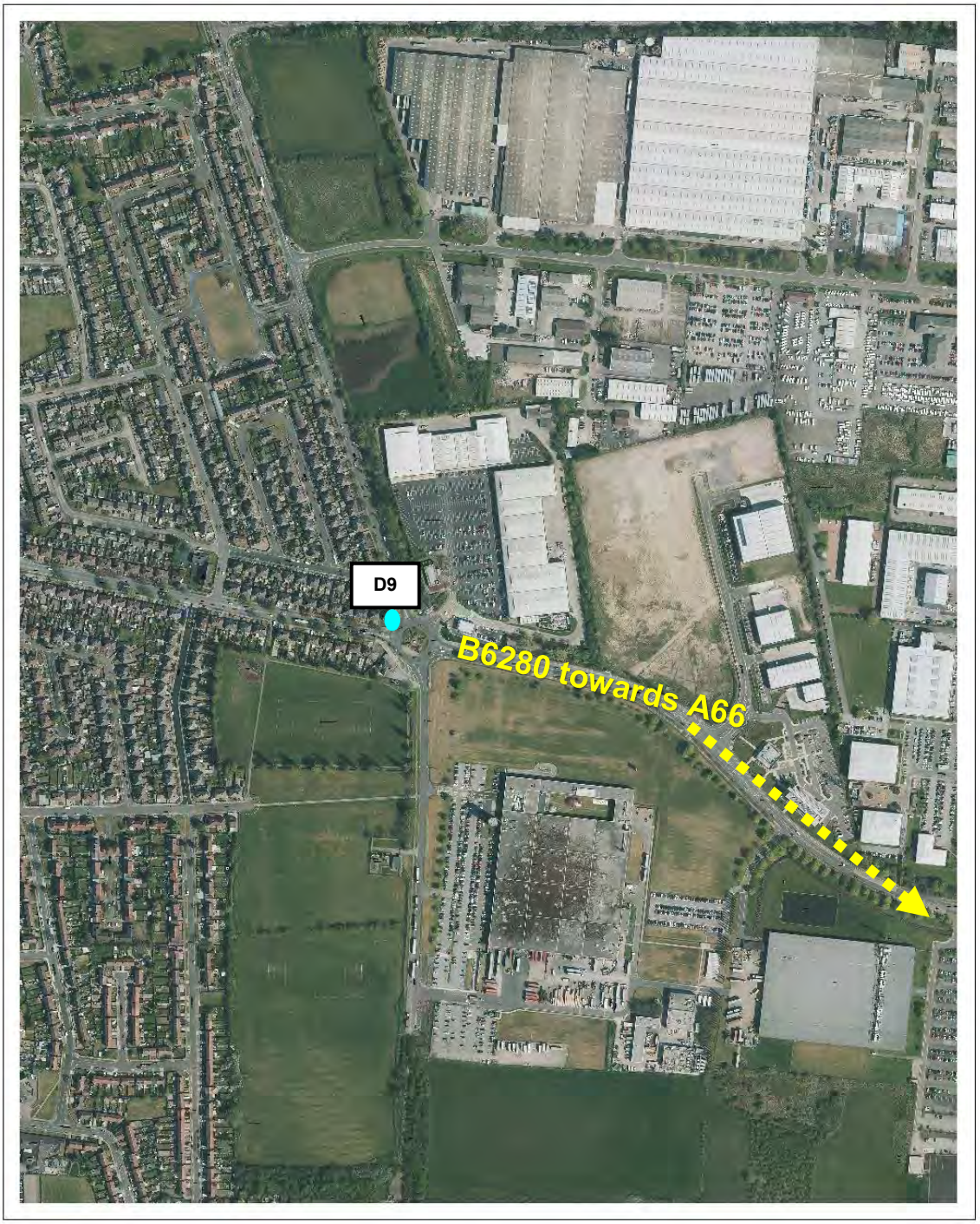
**D8 Haughton Green**

0 105 210 420 Meters


N

**D9 Yarm Road**

0 105 210 420 Meters



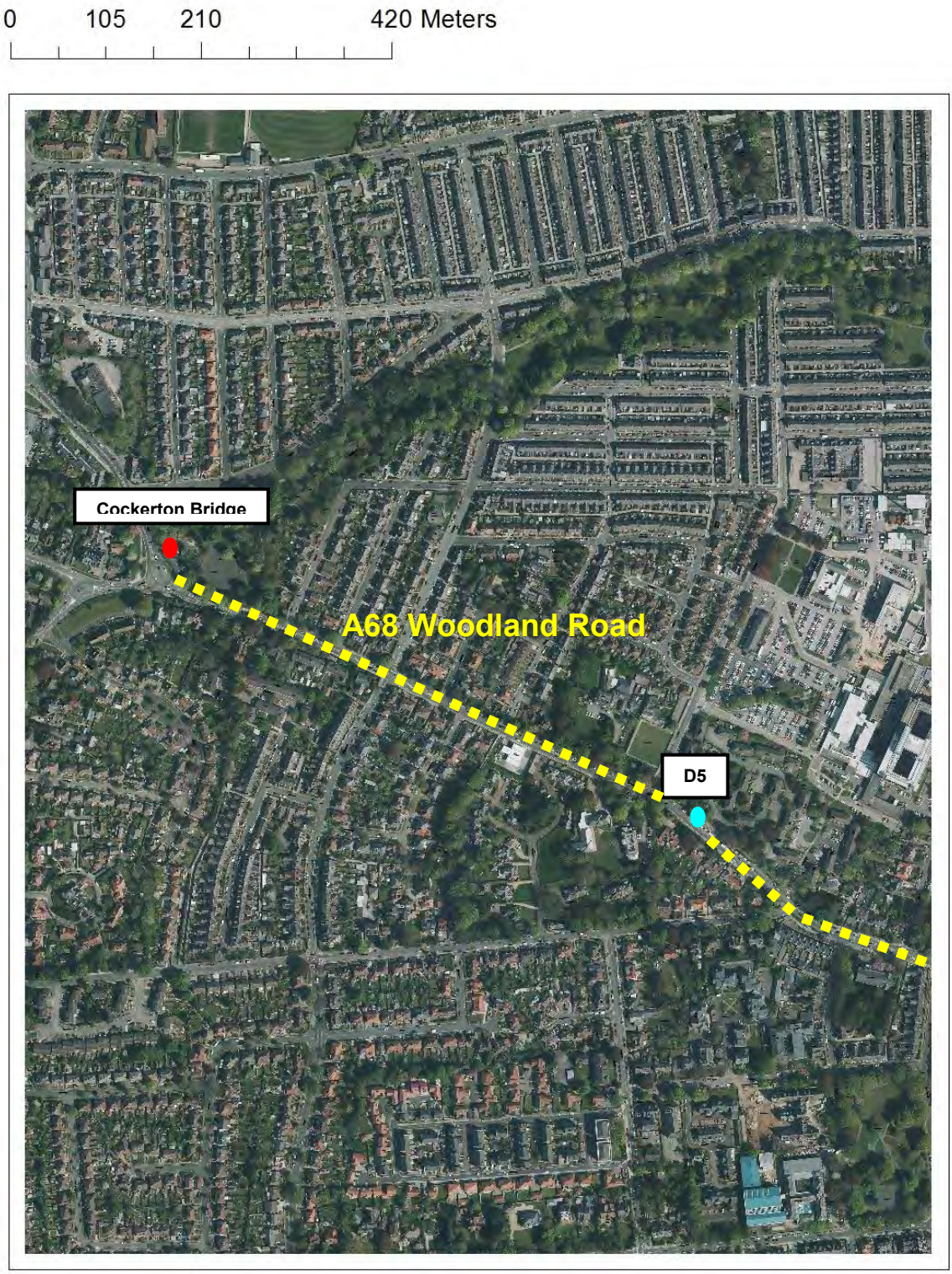

N

**D6 Blackwell**

0 105 210 420 Meters


N

**D5 Woodland Road, Cockerton Bridge (automatic)**



**D3 Platform 1 Middleton St George**

# Appendix E: Summary of Air Quality Objectives in England

## Table E.1 – Air Quality Objectives in England

| Pollutant | Air Quality Objective[8] | |
|---|---|---|
| | 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 |

[8] The units are in microgrammes of pollutant per cubic metre of air (µg/m$^3$).

# 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 |
| CO | Carbon Monoxide |
| Defra | Department for Environment, Food and Rural Affairs |
| DMRB | Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England |
| EU | European Union |
| FDMS | Filter Dynamics Measurement System |
| LAQM | Local Air Quality Management |
| LPG | Liquid Petroleum Gas |
| LTP | Local Transport Plan |
| $NO_2$ | Nitrogen Dioxide |
| $NO_x$ | Nitrogen Oxides |
| PM | Particulate Matter |
| $PM_{10}$ | 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 |
| QA/QC | Quality Assurance and Quality Control |
| $SO_2$ | Sulphur Dioxide |
| TVCA | Tees Valley Combined Authority |
| TVEPG | Tees Valley Environmental Protection Group |

# References


1. LAQM Policy Guidance 2016

   Published by the Department for Environment, Food and Rural Affairs, April 2016

   Available at: https://consult.defra.gov.uk/communications/laqm_changes/supporting_documents/LAQM%20Policy%20Guidance%202016.pdf

2. LAQM Technical Guidance 2016

   Published by the Department for Environment, Food and Rural Affairs, April 2016

   Available at: https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf

3. Particulate PM2.5 Background Data for Darlington (2015)

   Department for Environment, Food and Rural Affairs, Data Archive

   Available at: https://uk-air.defra.gov.uk/data/laqm-background-home

4. UK Air Data Selector

   Department for Environment, Food and Rural Affairs

   Available at: https://uk-air.defra.gov.uk/data/data_selector

5. National bias adjustment factors (Diffusion Tube Bias Adjustment Factors spreadsheet)

   Department for Environment, Food and Rural Affairs

   Available at: https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

6. LAQM Precision and Accuracy (Precision Summary Results – Summary of Diffusion Tube Precision 2008-2017)

   Department for Environment, Food and Rural Affairs

   Available at: https://laqm.defra.gov.uk/diffusion-tubes/precision.html

7. LAQM QA QC Framework AIR-PT Rounds 13 to 24 (April 2016 – Feb 2018)

   Department for Environment, Food and Rural Affairs

   Available at: https://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

8. LAQM Nitrogen Dioxide fall off with distance calculator

   Department for Environment, Food and Rural Affairs

   Available at: https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html