Darlington Borough Council

2021 Air Quality Annual Status Report (ASR)

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

June 2021

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Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.

The 2019 Clean Air Strategy[5] sets out the case for action, with goals even more ambitious than EU requirements to reduce exposure to harmful pollutants. The Road to Zero[6] sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

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 has long been understood that action needs to be targeted in this area 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. 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. Notwithstanding this there are plans to deal with this, as highlighted in the Road to Zero strategy (published July 2018) and acknowledged in the new Clean Air Strategy 2019 which sets out plans to end the sale of new conventional petrol and diesel cars and vans by 2040. By this date it is expected that the majority of new cars and vans sold will be 100% zero emission and all new cars

[5] Defra. Clean Air Strategy, 2019
[6] Department for Transport. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

and vans will have significant zero emission capability, with the transition expected to be industry and consumer led, supported by Government measures[7].

Tees Valley Combined Authority (TVCA) have produced a Strategic Transport Plan (STP) which is the first for the region, for the period up to 2030. The Strategic Transport Plan will act as a Local Transport Plan for all five Tees Valley authorities with each Local Authority producing their own Local Implementation Plan (LIP).

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) Clean Air Strategy 2019 (Reference 1) 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 $PM_{2.5}$) with new goals proposed by the government to cut exposure to particulate matter pollution, as suggested by the World Health Organisation.[8]

Following a specific article on wood burning stoves/smoke control area requirements in 2018 which was included in the 2019 ASR, in 2019 Environmental Health produced a transport related article/poster on air quality which featured in the One Darlington Magazine in 2019 (September issue). The purpose of the article was to raise awareness of the dangers of air pollution and ways to contribute to improving it. A copy was included in last years' 2020 report.

In addition to this, a message on idling of engines when vehicles are parked was shared on the Council's social media pages to raise awareness of idling. The timing of this coincided with the colder weather when people might idle more to keep a vehicle heated up when stationary and the message was targeting people doing school drop offs and pick-ups in particular. This was also included in the 2020 ASR.

[7] Department for Transport. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

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

Unfortunately, no specific interventions were carried out by Environmental Health during 2020 due to involvement in the response to the COVID-19 pandemic and increases in reactive complaint work likely due to people spending more time at home.

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. 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 3.01 – '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.

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 Council areas 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: https://www.letsgoteesvalley.co.uk/

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1 Local Air Quality Management

This report provides an overview of air quality in Darlington Borough Council during 2020. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by 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 should prepare an Air Quality Action Plan (AQAP) within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Darlington Borough Council currently does not have any AQMAs. 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 ASR concluded that on the basis of the evidence provided the conclusions reached were acceptable for all sources and pollutants. Reference to the Public Health Outcomes Framework was encouraged and the inclusion of trend graphs welcomed. It was highlighted in the feedback that as automatic monitoring has not taken place in the Borough in the last 5 years, while a small amount of detail is helpful, it is not necessary to provide the data in such detail in future reports. In addition, the comments suggest that it is not necessary to include the automatic monitoring done outside of the Borough in the excel template. These comments, as well as those made following the appraisal of Darlington's earlier ASRs, have been taken on board in this report and will be going forward.

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 85 buses in total, 57 are Euro 5 compliant (14 of which are gas buses) and 13 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.

- 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). At the time of writing 93% of the taxi fleet in Darlington were Euro 5 emission standard compliant or better (212 out of 229 in total). Euro 5 saw the introduction of particulate filters (DPFs) for diesel vehicles and tightening of NOx limits as well as, for the first time, a particulates limit for petrol engines (direct injection engines only)[9]. Darlington Borough Council's new taxi licensing policy which was implemented from 1 January 2021 introduced a requirement for all vehicles to be Euro 6 compliant by 1 April 2023 with a maximum vehicle age policy being introduced of 8 years. Euro 6 introduced a further, significant reduction in NOx emissions from diesel engines and established similar standards for petrol and diesel vehicles[9]. Currently 148 of 229 vehicles (65%) already meet the Euro 6 requirement. The taxi licensing policy, as well as the commitment to tougher emission standards, also mentions consideration of longer-term plans aimed at promoting 'cleaner' vehicles, expanding the electric charging infrastructure to encourage uptake of electric vehicles amongst the taxi trade, as well as educational interventions particularly around vehicle idling at taxi ranks.
- 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 Feethams Multi Storey Car Park on Beaumont Street which opened in February 2016 has 4 electric charging spaces and there are also 4 electric car charging points at East Street Car Park. The Council's draft Local Plan 2016 – 2036 is proposing to require non-residential development creating over 50 parking spaces to provide at least one double electric vehicle charge point (2 spaces) and a requirement for every new residential property with a garage or dedicated marked out car parking space within its curtilage to include an electric socket suitable for charging electric vehicles. The Plan was submitted to the Secretary of State for formal public examination on 22 December 2020.
- Tees Valley Combined Authority is currently working on an Electric Vehicle Charging Infrastructure Project which is aimed at coordinating and improving the Electric Vehicle Charging Point provision across the Tees Valley. While there is already electric charging infrastructure in place, some issues have been identified with the current level of provision, including with regard to consistency in the type of provision and interoperability, outdated infrastructure that has been poorly maintained and may not even be functional, as well as varying degrees of coverage across local authority areas within the Tees Valley and focus up to now being on infrastructure provision as opposed to a holistic approach to increasing the

[9] The AA: Limits to improve air quality and health https://www.theaa.com/driving-advice/fuels-environment/euro-emissions-standards

uptake of electric vehicles. With funding of up to £2,000,000, the latest project aims to develop the infrastructure and encourage more people to switch to electric vehicles.

- The Council's Building Services Department has 8 all-electric vehicles (which equates to 1/7 of the Building Services fleet). There are facilities in place to charge 16 vehicles in the Council's own depot (Lingfield/Allington Way), as well as 4 charging points for visitors/staff. The gardener at South Park also has an electric vehicle.
- Environmental Health did some awareness raising in 2019 including with a transport related article/poster which featured in the One Darlington magazine and with messages on social media platforms including on Clean Air Day (20 June 2019), as well as a message on idling in December 2019. Details were included in last year's report (ASR 2020). No specific interventions were carried out by Environmental Health during 2020 in relation to air quality due to involvement in responding to the COVID-19 pandemic and increases in reactive complaint work likely due to people spending more time at home. Future educational work is however intended, including further interventions around engine idling and domestic burning.

Most of these schemes have been implemented in part, and the work will continue. The schemes do not all 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 2 - 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

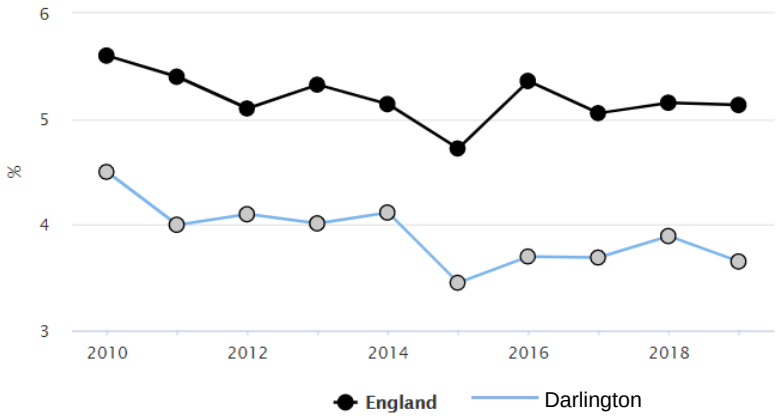
Particulates $PM_{2.5}$ are very fine particulates which are now considered to be a more significant health risk than the larger particulates PM_{10}, as they penetrate further into the respiratory system and are less easily dislodged. Recognising this, the UK Public Health Outcomes Framework (Healthy 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 (2017, 2018 and 2019) across the Tees Valley as follows:

Fraction (%)	England	North East	Darlington	Hartlepool	Middlesbrough	Redcar & Cleveland	Stockton-on-Tees
2017	5.1	3.7	**3.7**	3.8	4.2	4.0	4.0
2018	5.2	3.8	**3.9**	4.0	4.4	4.0	4.1
2019	5.1	3.6	**3.7**	3.9	4.4	4.1	4.0

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[10].

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, both nationally (in England) and in Darlington, until 2019 where the factors have gone down (see Figure 1 below).

Figure 1 – Fraction of mortality attributable to particulate air pollution - Darlington[11]



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 Technical Guidance (TG16, updated April 2021) (Reference 3) 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 (urban background); 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 them 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 (2016 – 2020) have ranged between 7.5 and 10.3µg/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

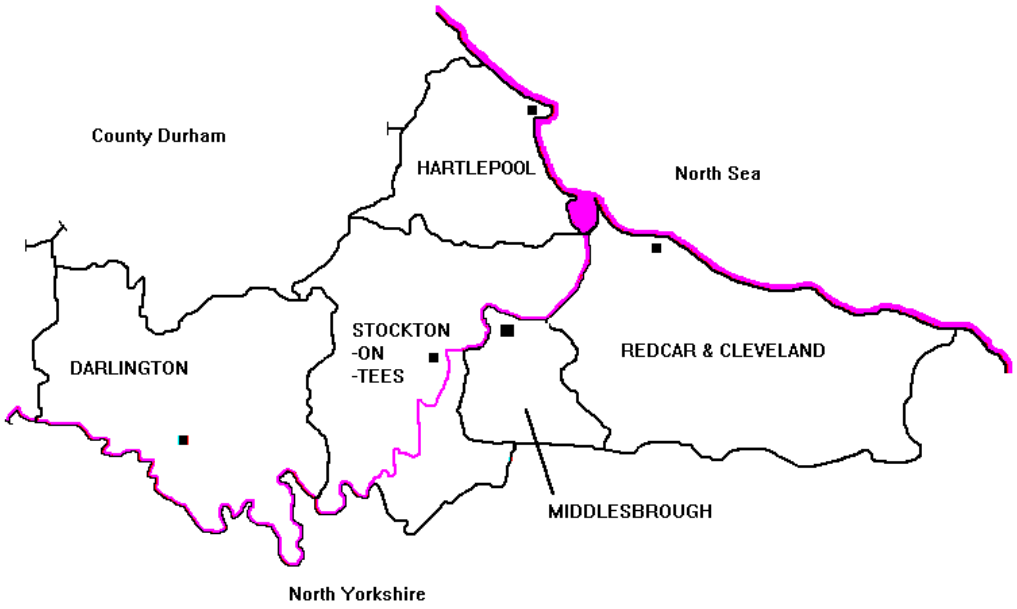
[10] Public Health England. Estimating Local Mortality Burdens associated with Particulate Air Pollution A M Gowers, B G Miller and JR Steadman, 2014
[11] Public Health England. Public Health Outcomes Framework. Fraction of Mortality attributable to particulate air pollution – Darlington. Available at: https://fingertips.phe.org.uk/search/fine%20particulate#page/4/gid/1/pat/6/par/E12000001/ati/102/are/E06000005/iid/30101/age/230/sex/4

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 heating in all but a few rural villages. As highlighted in the ASR 2019, Environmental Health did some work in 2018 to raise awareness and educate people more on the use of wood burning stoves and remind them of the Smoke Control Area requirements. A map showing the extent of the Smoke Control Area in Darlington can be found in Appendix G. Further educational/awareness raising work is intended including in relation to areas not subject to Smoke Control Area requirements, to remind people of responsibilities when it comes to buying/burning the correct fuel, to ensure efficient burning and reduce pollution impacts. This will follow the new Air Quality (Domestic Solid Fuels Standards) (England) Regulations 2020, relating to the sale/certification of domestic solid fuels and the phasing out of certain solid fuels (bituminous coal and wet wood) for use in domestic properties. This legislation places a duty on suppliers of the fuels and further interventions would also look to target householders/owners of appliances (wood burners etc) themselves.

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 produced by DEFRA and the Devolved Administrations based on 2018[12] emission source estimates (Reference 4). Typical background levels ($PM_{2.5}$) are shown as 6.2 – 7.9µg/m³/sq. km. The average $PM_{2.5}$ loading per sq. km in 2018 is shown as 6.9µg/m^3, which is projected to reduce to 6.1µg/m^3 in 2030.

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 efforts/commitments which can already be seen in the Clean Air Strategy 2019 and The Road to Zero 2018.

[12] Projections in the 2018 reference year background maps are based on assumptions which were current before the Covid-19 outbreak in the UK

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

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

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Darlington Borough Council previously had two continuous monitoring stations, however 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.

3.1.2 Non-Automatic Monitoring Sites

Darlington Borough Council undertook non-automatic (i.e. passive) monitoring of NO_2 with diffusion tubes at 17 No. sites during the whole of 2020. Tubes D12 (North Road (2)), D13 (106 High Northgate), D14 (Eldon Street Corner) and D15 (Blackwell (2)) which were put in place for six months at the end of 2018, have remained in place since then. Two new locations were also introduced at the start of the 2020 monitoring period (D16 (Hill House Lane) and D17 (West Auckland Road)). Table A.2 in Appendix A presents the details of the non-automatic sites. A full review of the measurement distances (i.e. distance to relevant exposure, distance to kerb of nearest road and height) was also conducted at the start of the 2020 monitoring year.

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 (where the annual mean data capture is below 75% and greater than 25%), and distance corrected to the nearest point of relevant public exposure. 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 and Table A.4 in Appendix A compare 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/$m^{3.}$. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2020 dataset of monthly mean values is provided in Appendix B. Graphs have also been included where there are now two diffusion tubes at the same site (two locations/duplicate). Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Table A.5 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years (when operational) with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. No new data is being included/reported on due to operation of the continuous monitoring stations ceasing in 2012 and 2014.

3.2.2 Particulate Matter (PM_{10})

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted continuously monitored PM_{10} annual mean concentrations for the past 5 years (when operational) with the air quality objective of 40µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years (when operational) 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 peaks/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.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.8 in Appendix A presents the derived $PM_{2.5}$ annual mean concentrations as available for the past 5 years (when operational) using the nationally derived factor of 0.7 applied to the PM_{10} results at the St Cuthbert's and Cockerton Bridge sites.

The derived annual mean for St Cuthbert's has fallen from 20.4µg/m^3 in 2011 to 16.0µg/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 Middlesbrough and Stockton AURN sites (which are located in areas of relevant public exposure and are indicative of Darlington locations) range between 10.1µg/m^3 and 13.1µg/m^3 over the same period (2011-2014) and more recently from 2015-2020 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. This data has been obtained from the DEFRA UK Air data selector resource (Reference 5).

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 (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
StC (closed December 2014)	St Cuthbert's Way (Local)	Kerbside	429032	514818	NO_2, PM_{10}	NO	NO_2 - Chemiluminescence PM_{10} - TEOM (vcm correction)	20	0.5	NO_x 1.9 TEOM 2.0
Co (closed April 2012)	Cockerton Bridge (Local)	Urban Centre	427528	515309	NO_2, PM_{10}	NO	NO_2 - Chemiluminescence 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

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube co-located with a Continuous Analyser?	Tube Height (m)
D1	Northgate	Kerbside	429026	514898	NO_2	NO	N/A	1	NO	2.5
D2	Haughton Road	Roadside	429351	514819	NO_2	NO	1.7	2.3	NO	2.5
D3	Platform 1 - Middleton St George	Roadside	434205	514165	NO_2	NO	4.6	1.5	NO	2.5
D4	Salters Lane	Roadside	429478	517375	NO_2	NO	4.5	1.4	NO	2.5
D5	Woodland Rd	Roadside	428152	514966	NO_2	NO	20.0	1.6	NO	2.6
D6	Blackwell Bridge	Roadside	427734	512591	NO_2	NO	10.0	2.0	NO	2.6
D7	North Road Station	Roadside	429007	515504	NO_2	NO	4.0	1.5	NO	2.3
D8	Haughton Green	Kerbside	430905	515918	NO_2	NO	19.0	0.6	NO	2.6
D9	Yarm Road	Roadside	431299	514137	NO_2	NO	9.0	2.0	NO	2.4
D10	St Cuthbert's	Kerbside	429170	514534	NO_2	NO	N/A	0.8	NO	2.4
D11	Whinfield Road	Roadside	430981	516584	NO_2	NO	7.6	1.9	NO	2.4
D12	North Road Station (2)	Roadside	429007	515504	NO_2	NO	4.0	1.5	NO	2.3
D13	106 High Northgate	Kerbside	429028	515523	NO_2	NO	2.7	0.4	NO	2.4
D14	Eldon Street Corner	Kerbside	429183	516223	NO_2	NO	8.5	0.6	NO	2.8
D15	Blackwell Bridge (2)	Roadside	427734	512591	NO_2	NO	10.0	2.0	NO	2.6
D16	Hill House Lane	Kerbside	434227	516944	NO_2	NO	4.8	0.7	NO	2.4
D17	West Auckland Road	Roadside	427201	516597	NO_2	NO	11.0	1.8	NO	2.4

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property). N/A if no near relevant exposure. Distance to relevant exposure from monitoring position.

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

Table A.3 – Annual Mean NO_2 Monitoring Results: Automatic Monitoring (µg/m³)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	NO_2 Annual Mean Concentration (µg/m³)				
						2010	2011	2012	2013	2014
StC (closed Dec 2014)	429032	514818	Kerbside	100	81	**41.1** (29.3)	**48.0** (30.2)	**44.6** (28.8)	**48.4** (28.8)	35.7(24.8)
						2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	53	19	20.2	26.6	29.3	33.4	27.8

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.)

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

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required)**

Notes:

The annual mean concentrations are presented as µg/m³

For Darlington automatic sites data is from last 5 years where monitoring data is available i.e. when sites were operational

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) For last year monitored. Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

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

Table A.4 – Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m³)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	NO_2 Annual Mean Concentration (µg/m³)				
						2016	2017	2018	2019	2020
					Bias factor	1.01	0.97	0.92	0.87	0.82
D1	429026	514898	Kerbside	100	65.4	35.7	27.9	38.7	35.8	30.0
D2 (new loc Jan 2016)	429351	514819	Roadside	100	65.4	30.1	29.9	30.9	27.8	21.5
D3 (new loc Jan 2017)	434205	514165	Roadside	100	65.4	12.0	12.1	15.3	14.2	11.1
D4	429478	517375	Roadside	100	65.4	34.8	29.4	34.0	31.4	26.0
D5	428152	514966	Roadside	100	57.7	23.0	25.1	23.9	24.9	16.9
D6	427734	512591	Roadside	100	55.8	33.7	34.8	35.3	30.8	25.5
D7	429007	515504	Roadside	100	65.4	37.6	**41.9**	**41.5**	36.3	29.6
D8	430905	515918	Kerbside	100	65.4	34.0	33.2	33.8	31.1	26.3
D9	431299	514137	Roadside	100	65.4	26.2	27.7	28.6	25.0	19.9
D10 (new loc Jan 2016)	429170	514534	Kerbside	100	65.4	35.0	31.0	34.1	31.6	27.4
D11 (new site Jan 2018)	430981	516584	Roadside	100	65.4	-	-	24.0	18.8	18.9
D12 (duplicate June 2018)	429007	515504	Roadside	100	65.4	-	-	**40.0**	33.2	27.0
D13 (new site June 2018)	429028	515523	Kerbside	100	48.1	-	-	32.5	28.8	23.2
D14 (new site June 2018)	429183	516223	Kerbside	100	30.8	-	-	29.4	24.8	19.0
D15 (duplicate June 2018)	427734	512591	Roadside	100	65.4	-	-	35.7	32.1	26.4
D16 (new site Jan 2020)	434227	516944	Kerbside	100	65.4	-	-	-	-	17.3
D17 (new site Jan 2020)	427201	516597	Roadside	100	65.4	-	-	-	-	15.6

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

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

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

Notes:

The annual mean concentrations are presented as µg/m³

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

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

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

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

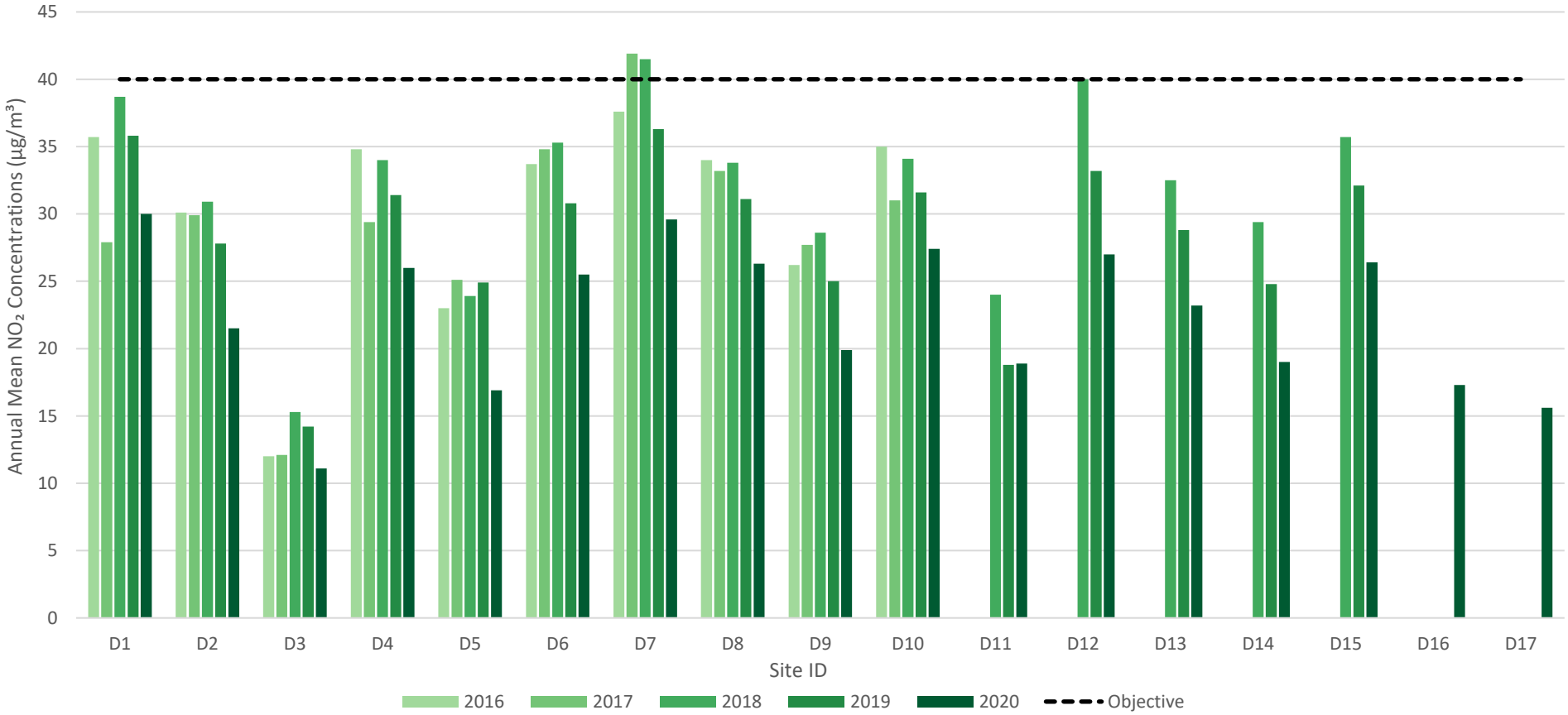
(1) For last year monitored. Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year. (100% indicates all data obtained (as per note 2) was valid)

(2) For last year monitored. 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%). Auto populated from the Diffusion Tube Data Processing Tool.

New location – indicates when tube has moved location but the same tube reference has been used from previous years and in similar/representative area

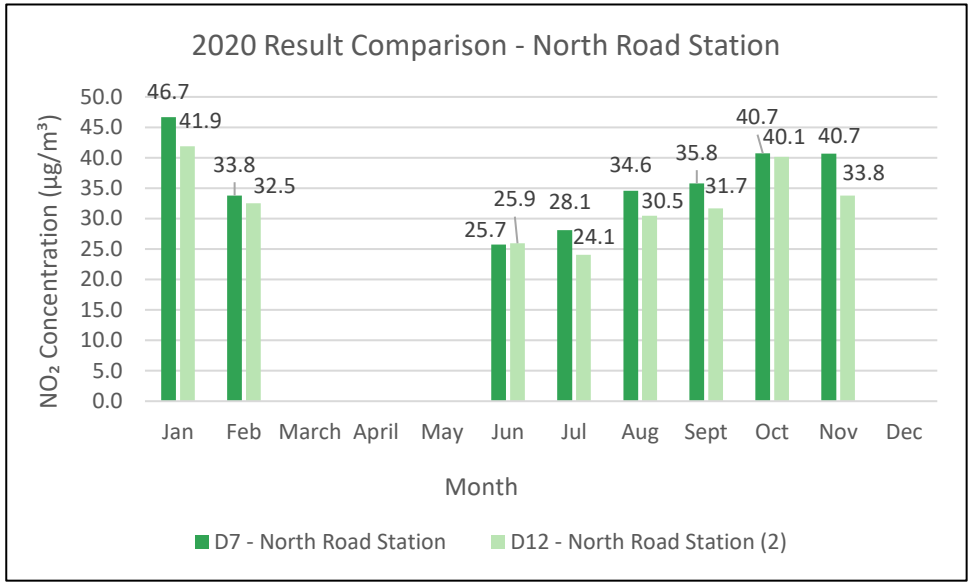
New site – indicates completely new monitoring location/new reference assigned

Figure A.1 – Trends in Annual Mean NO_2 Concentrations



This trend graph shows annual mean nitrogen dioxide results for all diffusion tube sites over the past 5 years, against the air quality objective of 40µg/m³, as per the information in Table A.4. Concentrations across sites have decreased since 2018, with the lowest concentrations across all sites in 2020. D7 shows annual concentrations slightly above the objective level in 2017 and 2018 but this is prior to distance correction to nearest exposure. Once distance corrected to nearest exposure the levels were below the objective (discussed in earlier versions of Darlington's ASR).

Supplementary Diffusion tube trend graphs (locations where two tubes)



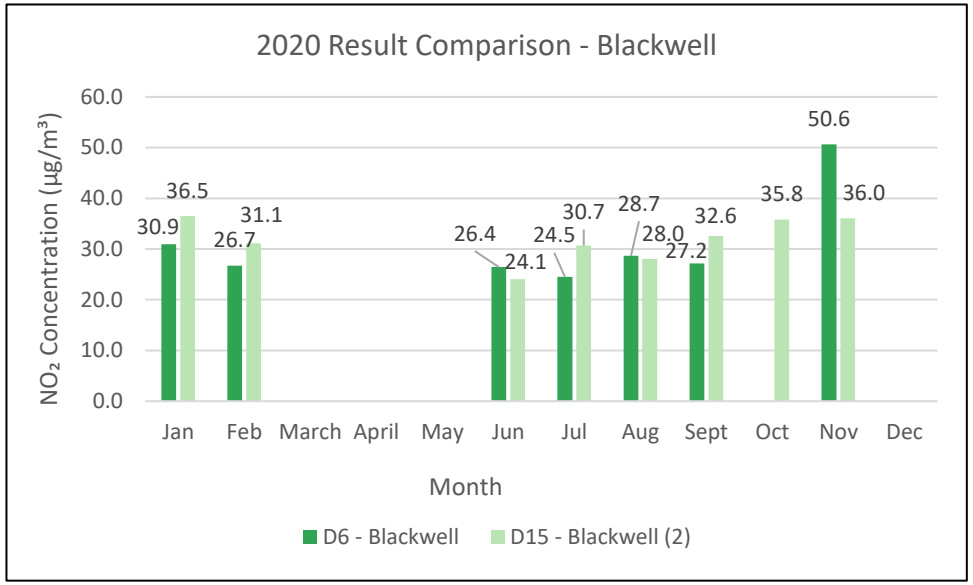


Figure quoted is actual result from laboratory analysis sheet

These trend graphs show a comparison between monthly nitrogen dioxide diffusion tube results in 2020 where there are two tubes at the same location (North Road Station and Blackwell). The results show the concentrations are not the same. This is likely due to the use of diffusion tubes which is an indicative monitoring method and does not have the same level of precision and accuracy as automatic monitors. Laboratory analysis sheet indicates overall measurement uncertainty of ±9.7%.

Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-hour Means > 200µg/m³

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	NO_2 1-hour Means > 200µg/m³ (µg/m³)				
						2010	2011	2012	2013	2014
StC (closed December 2014)	429032	514818	Kerbside	100	81	0 (107)	1 (125)	1 (166)	4 (172)	0 (98)
						2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	53	19	0 (84)	0 (107)	0 (118)	1 (129)	0 (97)

Notes:

Data is from last 5 years where monitoring data is available i.e. when sites were operational

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

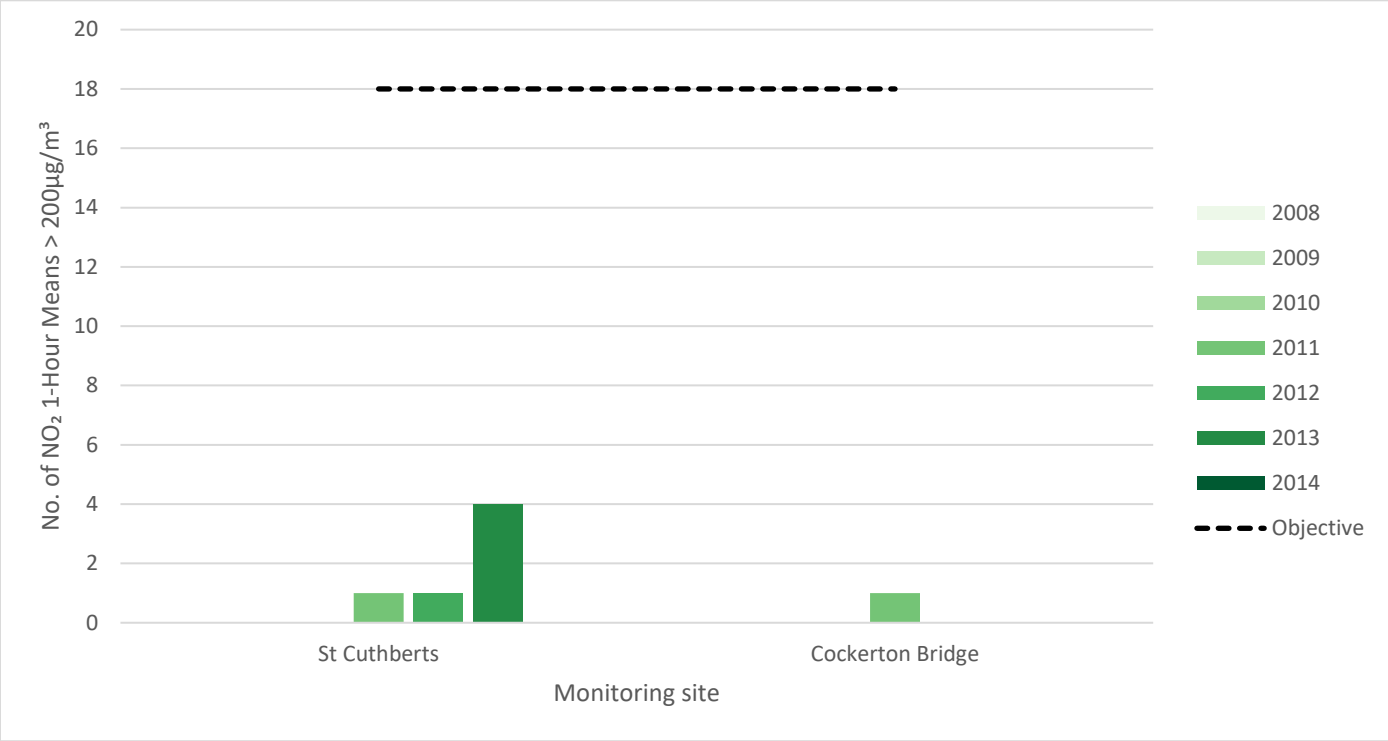
Exceedances of the NO_2 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold.**

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

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

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

Figure A.2 – Trends in Number of NO_2 1-Hour Means > 200µg/m³



This trend graph shows the number of exceedances of the 1-hour mean nitrogen dioxide air quality objective (200µg/m³ not to be exceeded more than 18 times a year) for automatic monitoring sites for the last 5 years when operational, as per the information in Table A.5. There have been no exceedances of this objective.

Table A.6 – Annual Mean PM_{10} Monitoring Results (µg/m³)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	PM_{10} Annual Means (µg/m³)				
						2010	2011	2012	2013	2014
StC (closed December 2014)	429032	514818	Kerbside	100	82	25.8	29.2	25.2	25.3	22.8
						2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	66	18	18.5	18.1	18.5	21.4	22.8

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

Notes:

The annual mean concentrations are presented as µg/m³.

Data is from last 5 years where monitoring data is available i.e. when sites were operational

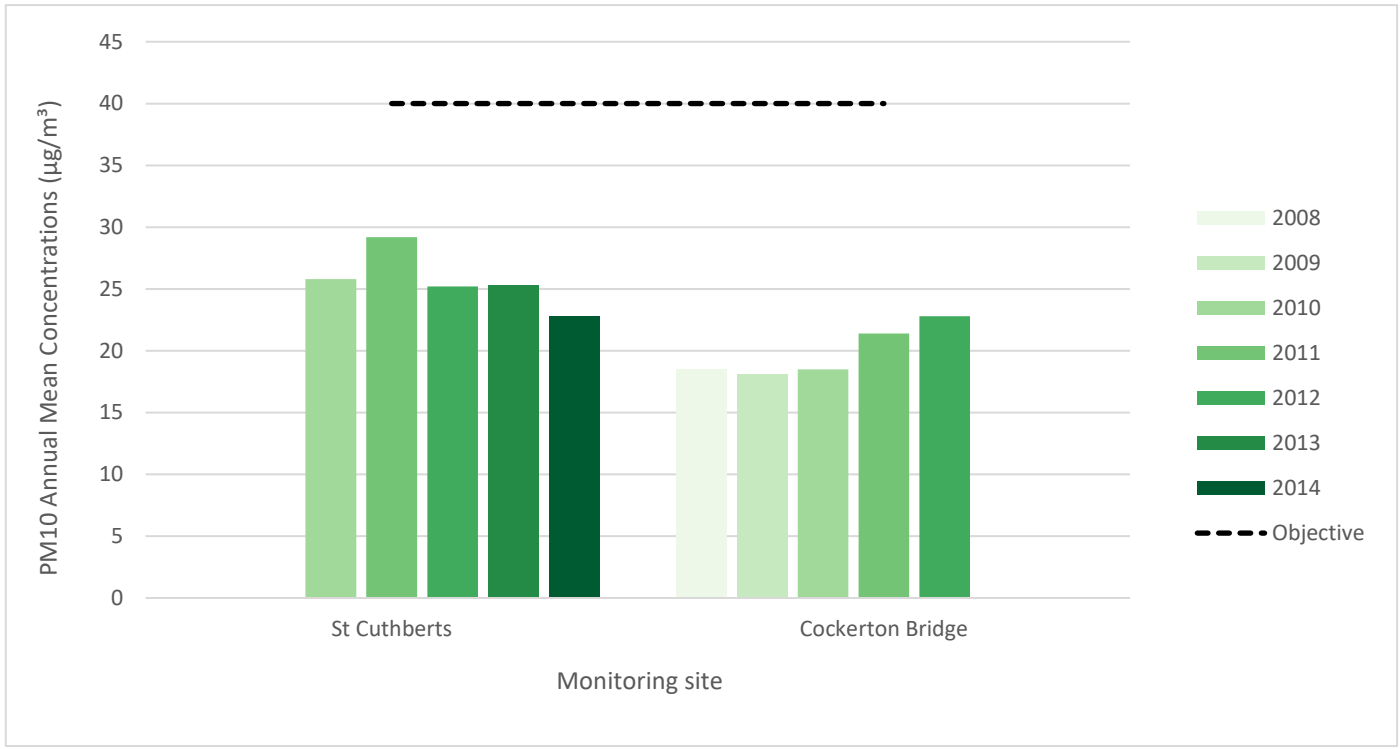
Exceedances of the PM_{10} annual mean objective of 40µg/m³ are shown in **bold.**

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

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

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

Figure A.3 – Trends in Annual Mean PM_{10} Concentrations



This trend graph shows annual mean PM_{10} results for automatic monitoring sites over the past 5 years when operational, against the air quality objective of 40µg/m³, as per the information in Table A.6. All results are below the objective level and results at the Cockerton Bridge site are generally lower than for St Cuthberts.

Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m³

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	PM_{10} 24-Hour Means > 50µg/m³ (µg/m³)				
						2010	2011	2012	2013	2014
StC (closed December 2014)	429032	514818	Kerbside	100	82	18 (42)	37 (51)	17 (43)	10 (40)	6 (37)
						2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	66	18	6 (32)	3 (29)	2 (33)	6 (38)	2 (39)

Notes:

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

Data is from last 5 years where monitoring data is available i.e. when sites were operational

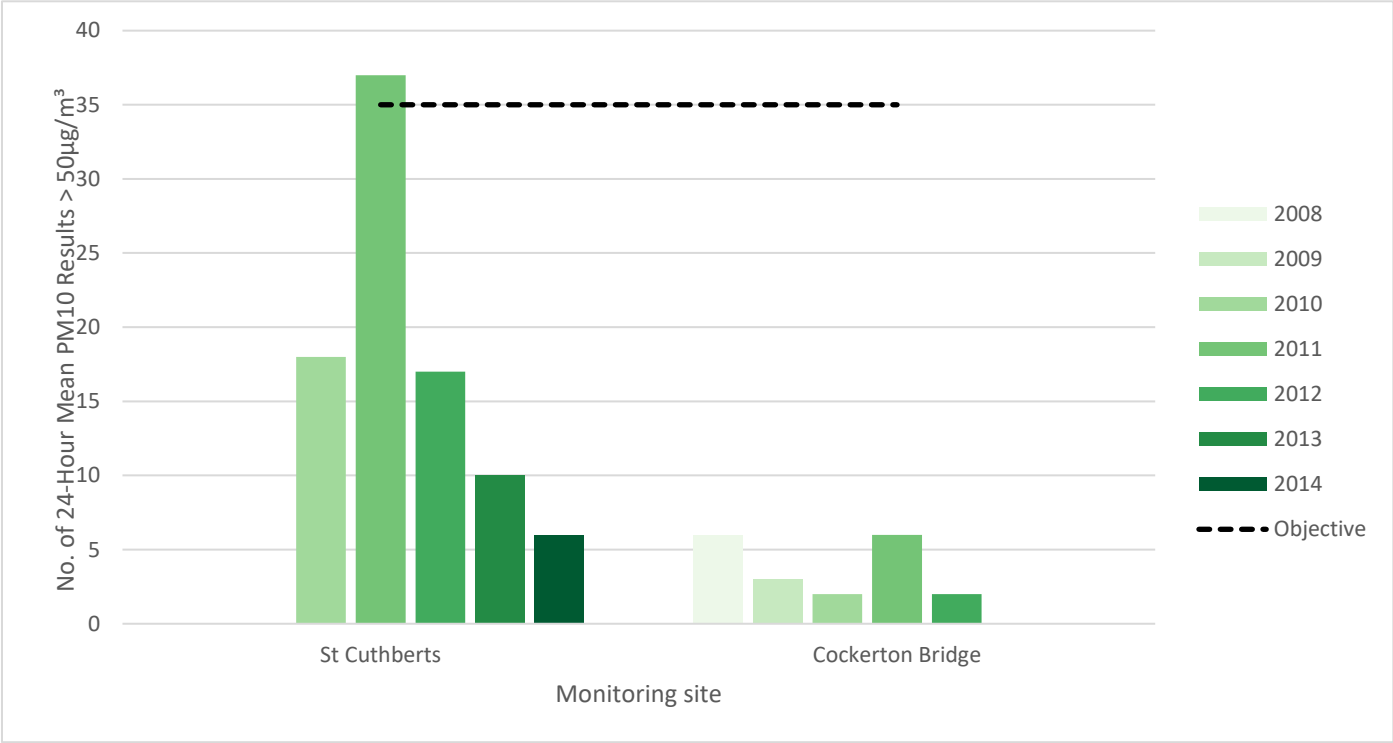
Exceedances of the PM_{10} 24-hour mean objective (50µg/m³ not to be exceeded more than 35 times/year) are shown in **bold.**

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

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

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

Figure A.4 – Trends in Number of 24-Hour Mean PM_{10} Results > 50µg/m³



This trend graph shows the number of exceedances of the 24-hour mean PM_{10} air quality objective (50µg/m³ not to be exceeded more than 35 times per year) for automatic monitoring sites for the last 5 years when operational, as per the information in Table A.7. The graph shows the St Cuthberts site exceeded the objective in 2011. This was discussed in Darlington's earlier reports and was considered to be due to a particulate episode in March 2011 that affected the whole Tees Valley area, and the UK. This was as a result of extended high-pressure conditions over the UK limiting dispersal, and trans boundary pollution from the continent.

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m³)				
						2010	2011	2012	2013	2014
StC (closed December 2014)	429032	514818	Kerbside	100	82	18.1	20.4	17.6	17.7	16.0
						2008	2009	2010	2011	2012
Co (closed April 2012)	427528	515309	Urban Centre	66	18	13.0	12.7	13.0	15.0	16.0

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

Notes:

The annual mean concentrations are presented as µg/m³.

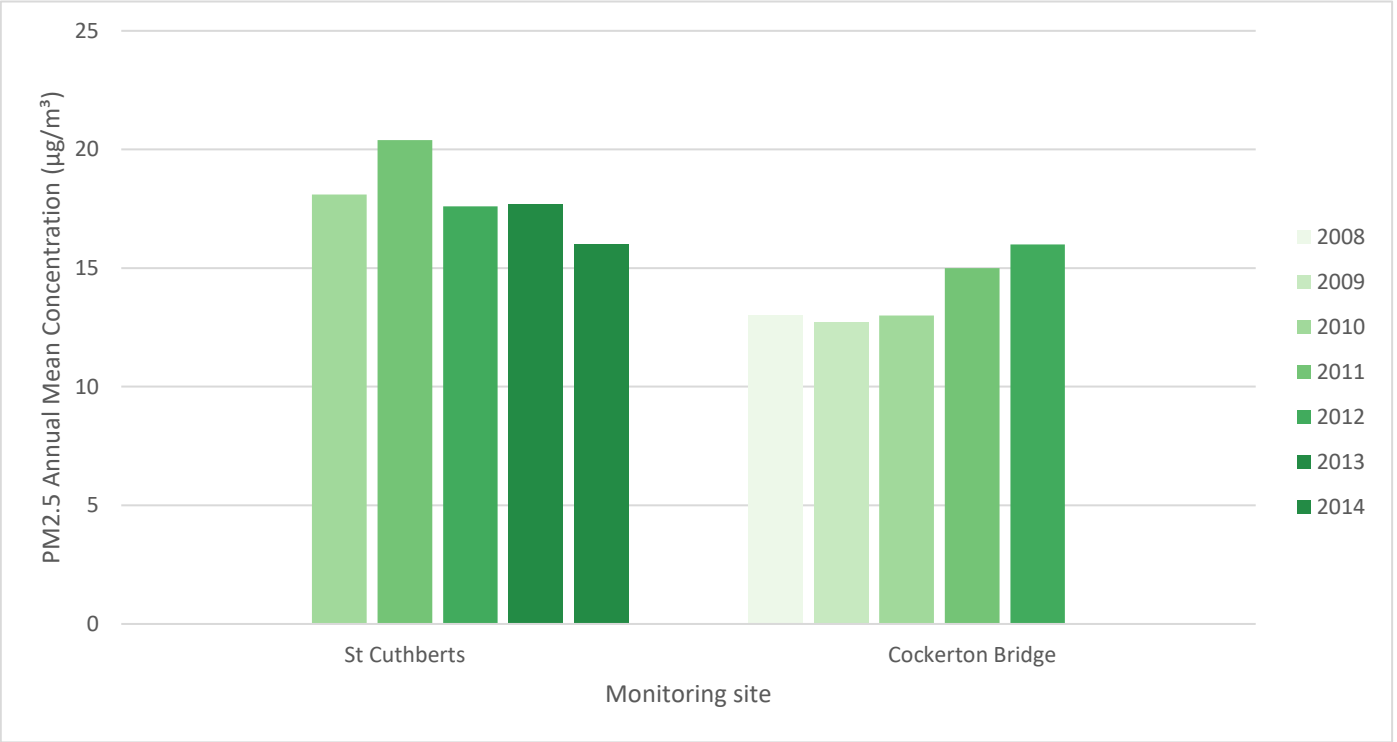
Data is from last 5 years where monitoring data is available i.e. when sites were operational.

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

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

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

Figure A.5 – Trends in Annual Mean $PM_{2.5}$ Concentrations



This trend graph shows annual mean $PM_{2.5}$ results for automatic monitoring sites over the past 5 years when operational, as per the information in Table A.8. $PM_{2.5}$ annual mean concentrations have been calculated using the nationally derived factor of 0.7 applied to the PM_{10} results at the St Cuthbert's and Cockerton Bridge sites. Results for the St Cuthberts site are reducing, and while the levels at the Cockerton Bridge site were increasing, concentrations are still lower than the St Cuthberts site.

Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO_2 2020 Diffusion Tube Results (µg/m³)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (0.82) and Annualised	Distance Corrected to Nearest Exposure
D1	429026	514898	39.4	31.1				34.0	25.8	38.2	37.2	39.1	**44.5**		36.2	30.0	N/A
D2	429351	514819	36.7	24.1				21.6	17.7	22.5	24.1	27.8	32.6		25.9	21.5	N/A
D3	434205	514165	20.7	12.0				10.4	7.4	11.0	11.5	14.4	19.6		13.4	11.1	N/A
D4	429478	517375	**43.4**	35.5				22.5	21.6	25.3	29.3	32.3	**41.5**		31.4	26.0	N/A
D5	428152	514966	30.7	-				14.0	12.3	13.6	17.2	22.5	31.9		20.3	16.9	N/A
D6	427734	512591	30.9	26.7				26.4	24.5	28.7	27.2	-	**50.6**		30.7	25.5	N/A
D7	429007	515504	**46.7**	33.8				25.7	28.1	34.6	35.8	**40.7**	**40.7**		35.8	29.6	N/A
D8	430905	515918	**44.2**	30.8				23.3	24.0	26.9	30.5	36.4	37.3		31.7	26.3	N/A
D9	431299	514137	28.2	22.5				21.2	17.4	20.1	24.7	29.2	29.1		24.1	19.9	N/A
D10	429170	514534	35.6	29.1				29.5	26.7	36.1	32.8	**41.5**	33.2		33.1	27.4	N/A
D11	430981	516584	28.1	23.6				18.2	14.1	19.2	20.7	26.2	32.7		22.9	18.9	N/A
D12	429007	515504	**41.9**	32.5				25.9	24.1	30.5	31.7	**40.1**	33.8		32.6	27.0	N/A
D13	429028	515523	31.4	24.0				-	18.7	32.1	26.0	-	37.3		28.3	23.2	N/A
D14	429183	516223	32.0	25.4				-	12.8	-	-	-	30.9		25.3	19.0	N/A
D15	427734	512591	36.5	31.1				24.1	30.7	28.0	32.6	35.8	36.0		31.9	26.4	N/A
D16	434227	516944	28.2	26.5				15.6	12.7	17.2	18.4	22.1	25.9		20.8	17.3	N/A
D17	427201	516597	28.2	16.0				13.5	12.5	15.7	17.3	20.6	26.6		18.8	15.6	N/A

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1**

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

☒ **National bias adjustment factor used**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column. N/A due to concentrations all being below 36µg/m³, in line with LAQM.TG16**

☒ **Darlington Borough Council confirm that all 2020 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System**

Notes:

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

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

Grey shading indicates where data was not obtained/analysis was not carried out due to COVID-19

Red shading indicates missed collection due to adverse weather with tubes only being able to be collected within +/- 2 days in line with the Diffusion Tube Monitoring Calender

(-) indicates where tube has been missing from location on collection

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified within Darlington During 2020

In March 2020 Darlington Borough Council Local Planning Authority granted planning permission for the refurbishment of the existing crematorium in the Town, including proposals to replace the three existing cremators with two new cremators including mercury abatement. It is considered this will bring about improvements to air quality in the area given the age of the existing cremators. The process is currently covered by a Part B Environmental Permit relating to the control of emissions to air which is regulated by the Local Authority/Environmental Health. A variation application will be required to be submitted to update the current permit in light of the changes to the installation which will continue to be subject to routine inspections to check compliance with permit conditions under the provisions of the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

Planning permission was also granted in March 2020 for an outline application for the erection of up to 58,529 sqm (630,000 sq. ft.) of B1 and/or B2 and/or B8 uses comprising an office/industrial development; ancillary development including restaurants/cafe (A3/A5), Public House (A4), Hotel (C1), and Petrol Filling Station (Sui Generis); together with other associated works. As part of the original proposal a Framework Travel Plan was produced relating to introducing a package of measures to encourage employees of the development to use alternatives to the private car and to increase the awareness of the advantages and potential for travel by more environmentally friendly modes, with examples of measures including promotion of car sharing, cycling and walking schemes, and provision of electric vehicle charging points. A condition was attached to the permission requiring a detailed Travel Plan to be submitted for approval by the Local Planning Authority. The application was also submitted with an Air Quality Assessment which considered the impact of the development at nearby sensitive receptors and concluded that the proposed development would have a negligible impact on air quality in accordance with relevant guidance (Environmental Protection UK and Institute of Air Quality Management, Land-Use Planning & Development Control: Planning for Air Quality, January 2017).

Additional Air Quality Works Undertaken by Darlington Borough Council During 2020

Darlington Borough Council has not completed any additional works within the reporting year of 2020.

QA/QC of Diffusion Tube Monitoring

Gradko International Ltd supply and analyse nitrogen dioxide diffusion tubes for Darlington Borough Council. Tube preparation is 50% TEA in acetone.

Gradko International Ltd is an approved laboratory, 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 for 2020 (except for one poor result) for tube preparation 50% TEA in acetone (Reference 7). Gradko International Ltd demonstrated 75% satisfactory performance in the AIR-PT scheme for January – February 2020 (AIR PT AR036) and September – October 2020 (AIR PT AR040), with no results reported between May and August 2020 (AIR PT AR037 and AIR PT AR039) (Reference 8).

Monitoring during 2020 was impacted by COVID-19 and for three months (March, April, May) no results were obtained due to closure of the analysis laboratory. Where monitoring was carried out, it was in adherence with the 2020 Diffusion Tube Monitoring Calendar. Results for December 2020 were not obtained due to adverse weather conditions and difficulties collecting the diffusion tubes.

Diffusion Tube Annualisation

All diffusion tube data for 2020 required annualisation, due to the impact on collection and analysis of the tubes during the COVID-19 pandemic (See Appendix F for more detail).
The data has been annualised using the results at three Tees Valley continuous monitoring sites, all of which are background sites (two urban background and one suburban) in accordance with LAQM.TG16 box 7.9. The annualisation is performed using data from the continuous monitors (as included in the Diffusion Tube Data Processing Tool), obtained from the DEFRA UK Air data selector resource (Reference 5). See Table C.2.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2020 ASR has been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from the NO_x/NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

Darlington Borough Council have applied a national bias adjustment factor of 0.82 based on 14 studies (March 2021, Reference 6) to the 2020 monitoring data. A summary of bias adjustment factors used by Darlington Borough Council over the past five years is presented in Table C.1.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	National	03/21	0.82
2019	National	03/20	0.87
2018	National	03/19	0.92
2017	National	03/18	0.97
2016	National	06/17	1.01

NO_2 Fall-off with Distance from the Road

Wherever possible, local authorities should ensure that monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure should be estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

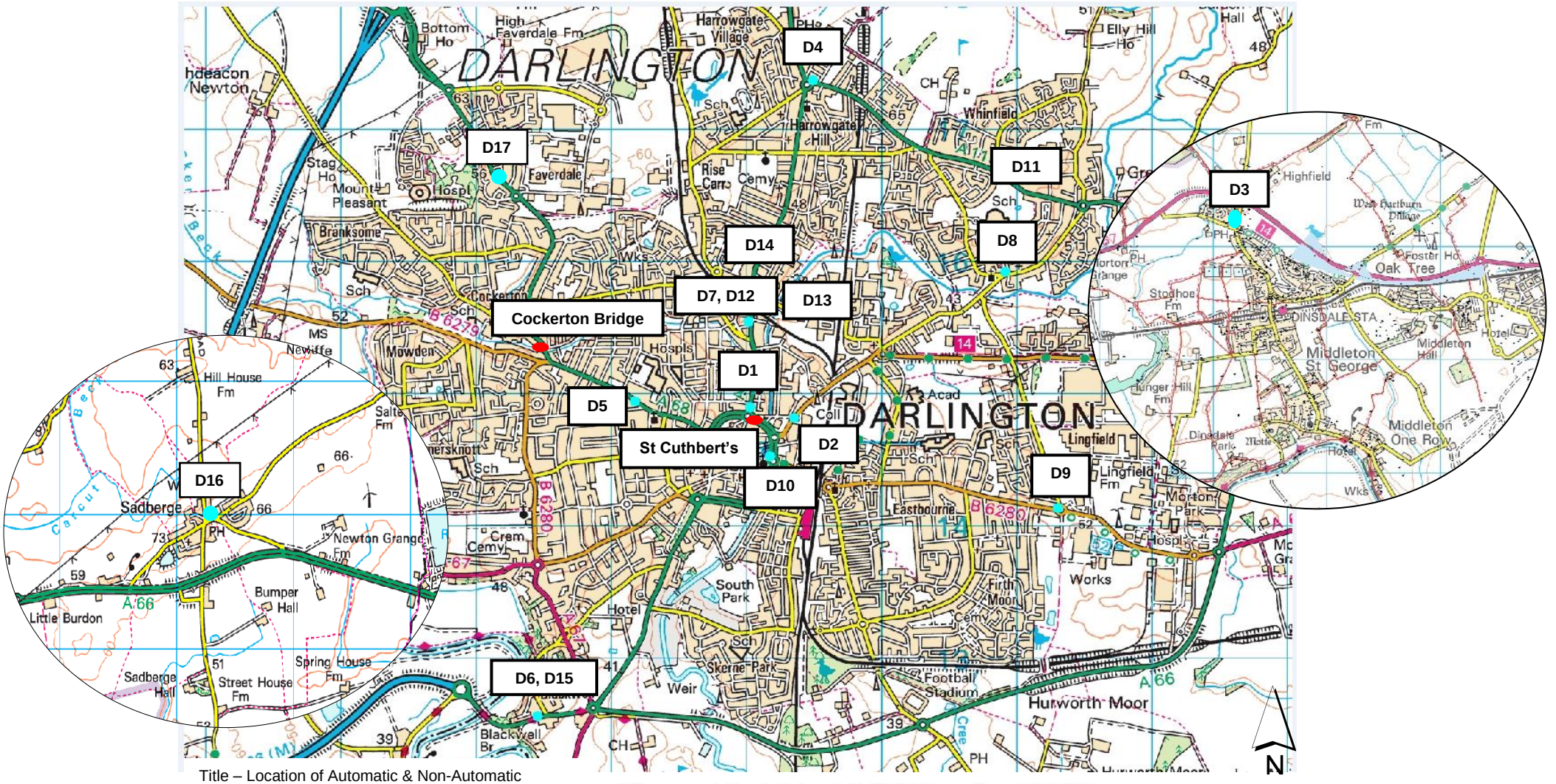
The associated Diffusion Tube Data Processing Tool advises distance correction is not required for any of the Darlington diffusion tube sites for 2020 based on the annual results summary. In accordance with LAQM TG.16, distance correction is only required for sites where the concentration is above 36µg/m³ (i.e. within 10% of the NO_2 annual objective of 40µg/m³) which was not the case for any of the Darlington sites during 2020.

Table C.2 – Annualisation Summary (concentrations presented in µg/m³)

Diffusion Tube ID	Annualisation Factor Redcar & Cleveland Dormanstown	Annualisation Factor Middlesbrough Breckon Hill	Annualisation Factor Stockton Eaglescliffe	Average Annualisation Factor	Raw Data Annual Mean (µg/m³)	Annualised Annual Mean (µg/m³)
D1	0.9741	1.0145	1.0441	1.0109	36.2	36.6
D2	0.9741	1.0145	1.0441	1.0109	25.9	26.2
D3	0.9741	1.0145	1.0441	1.0109	13.4	13.5
D4	0.9741	1.0145	1.0441	1.0109	31.4	31.8
D5	0.9957	1.0141	1.0249	1.0116	20.3	20.5
D6	0.9653	1.0239	1.0539	1.0144	30.7	31.2
D7	0.9741	1.0145	1.0441	1.0109	35.8	36.2
D8	0.9741	1.0145	1.0441	1.0109	31.7	32.0
D9	0.9741	1.0145	1.0441	1.0109	24.1	24.3
D10	0.9741	1.0145	1.0441	1.0109	33.1	33.4
D11	0.9741	1.0145	1.0441	1.0109	22.9	23.1
D12	0.9741	1.0145	1.0441	1.0109	32.6	32.9
D13	0.9027	1.0163	1.0814	1.0001	28.3	28.3
D14	0.7699	0.9094	1.0742	0.9178	25.3	23.2
D15	0.9741	1.0145	1.0441	1.0109	31.9	32.2
D16	0.9741	1.0145	1.0441	1.0109	20.8	21.1
D17	0.9741	1.0145	1.0441	1.0109	18.8	19.0

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

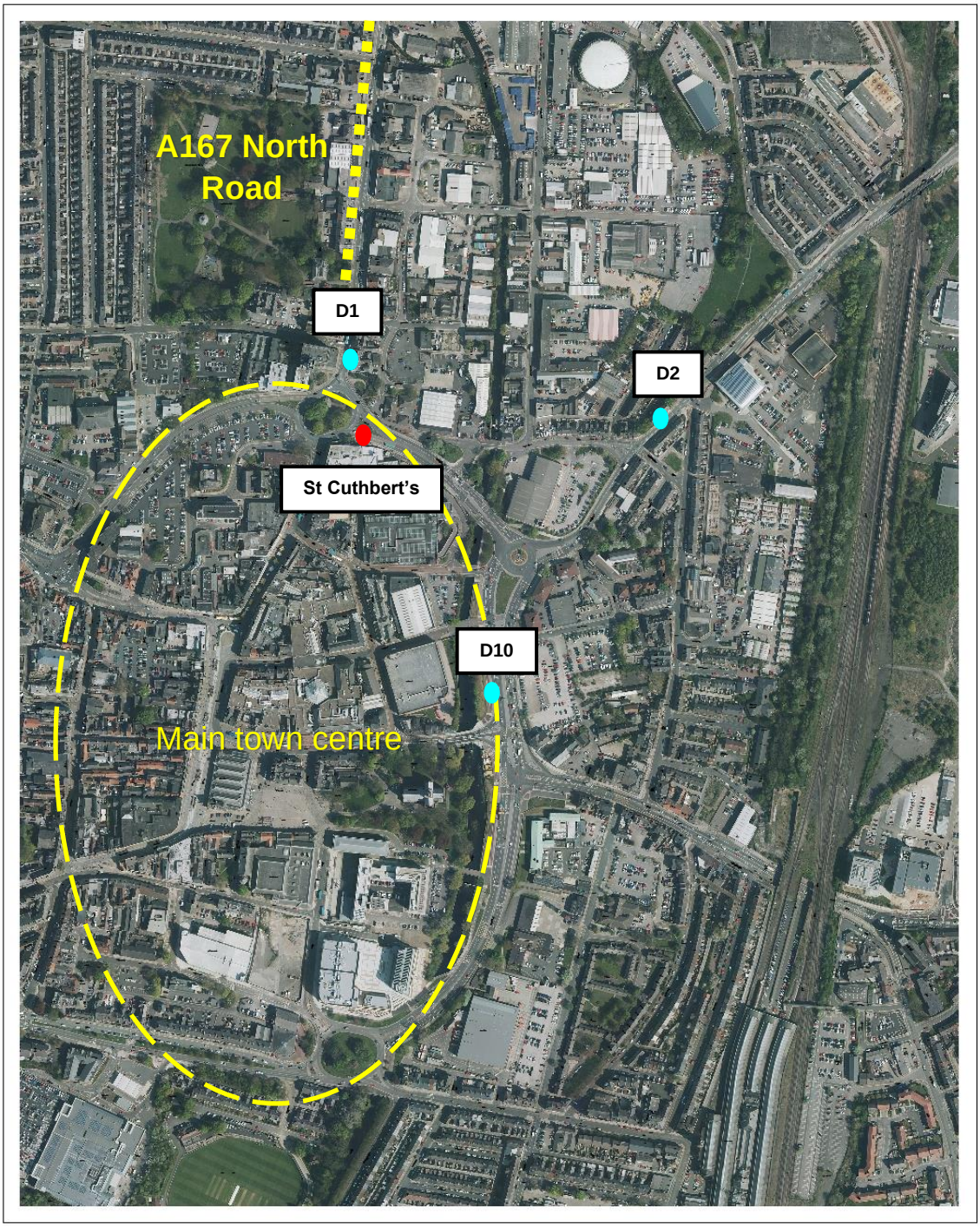


Title – Location of Automatic & Non-Automatic Monitoring Sites
Scale – 1:24,000

Darlington Borough Council

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

0 105 210 420 Meters

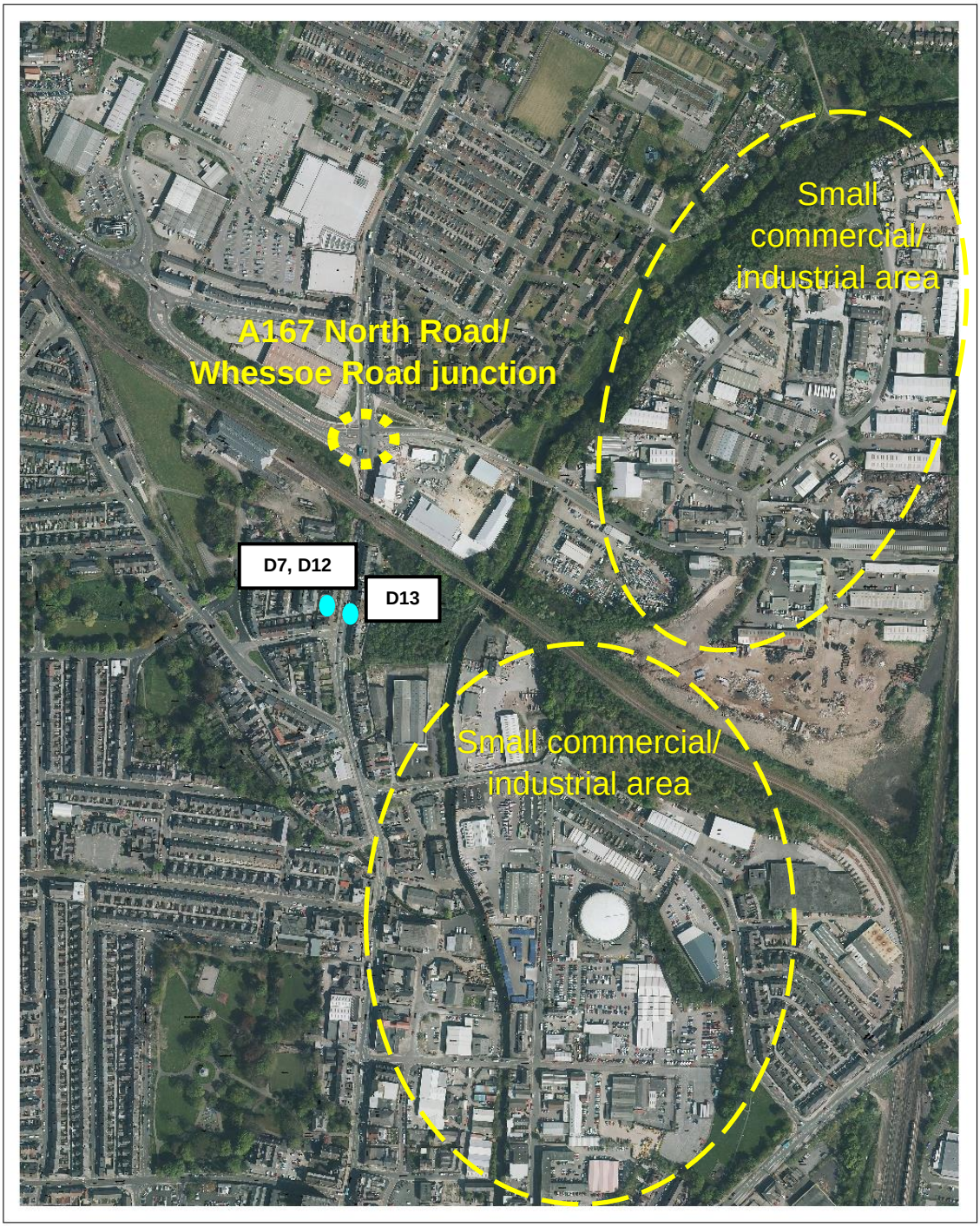


N

Darlington Borough Council

D7, D12 North Road Station and D13 106 High Northgate

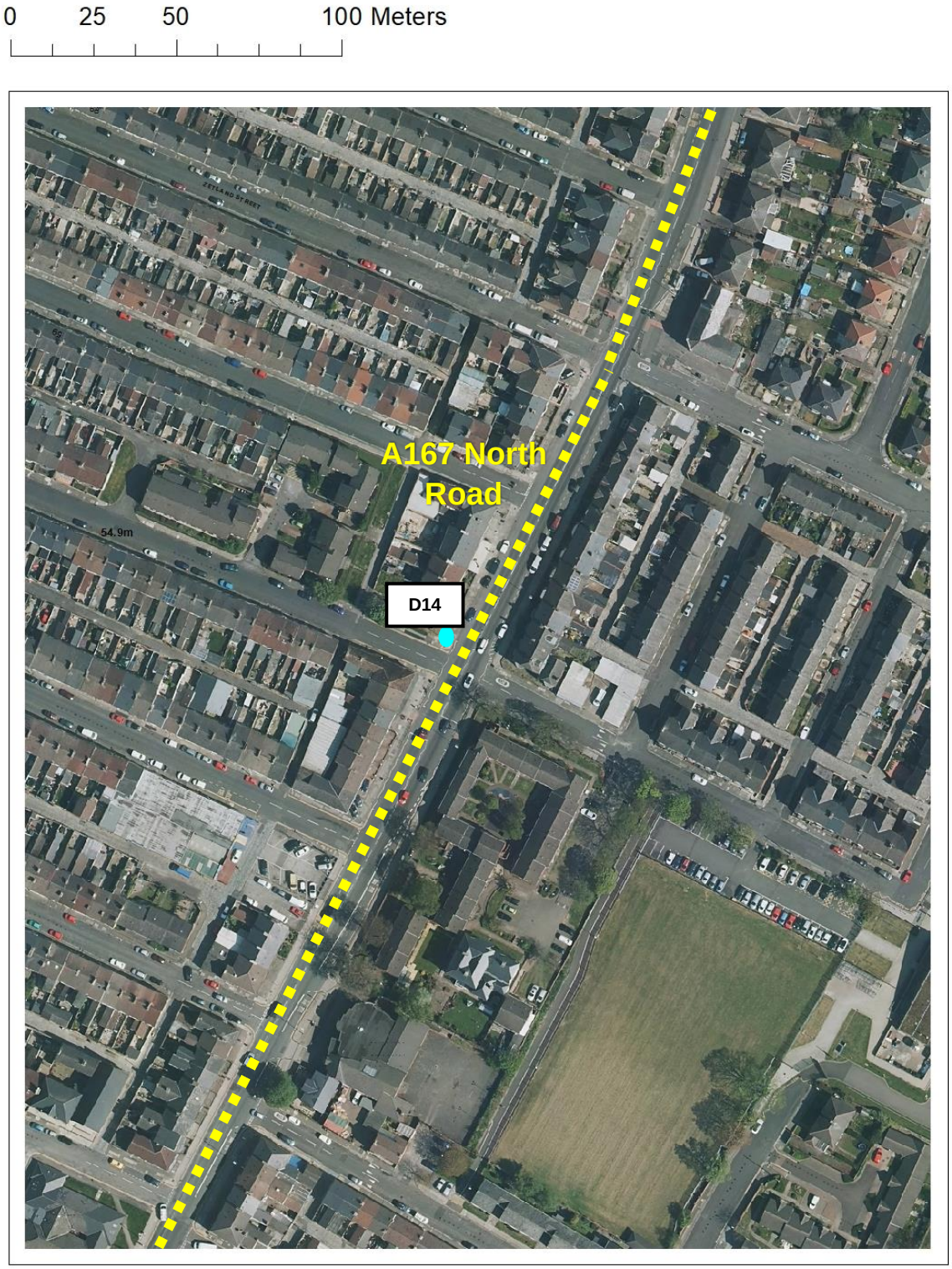
0 105 210 420 Meters



N

Darlington Borough Council

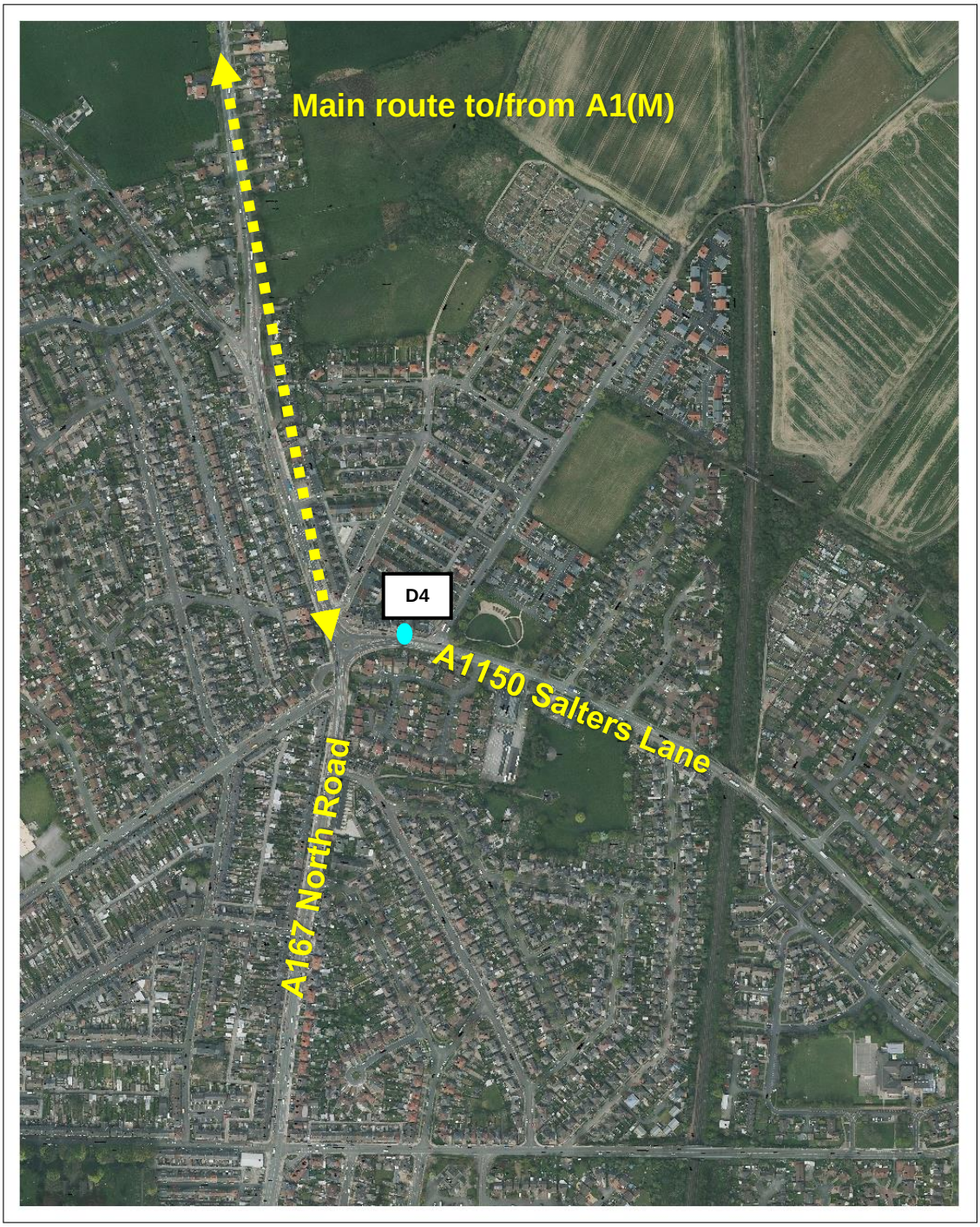
D14 Eldon Street Corner



Darlington Borough Council

D4 Salters Lane North

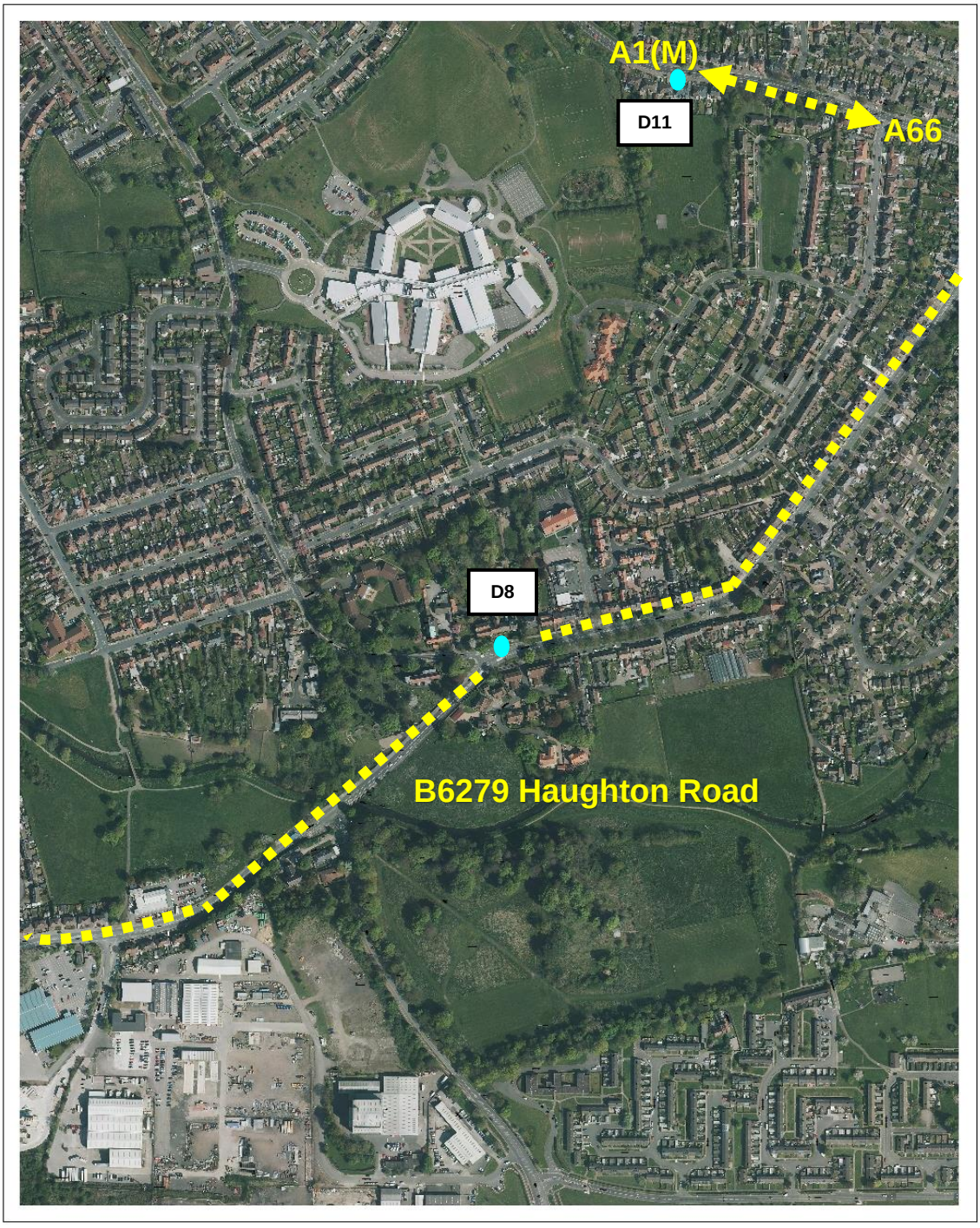
0 105 210 420 Meters



Darlington Borough Council

D8 Haughton Green and D11 Whinfield Road

0 105 210 420 Meters

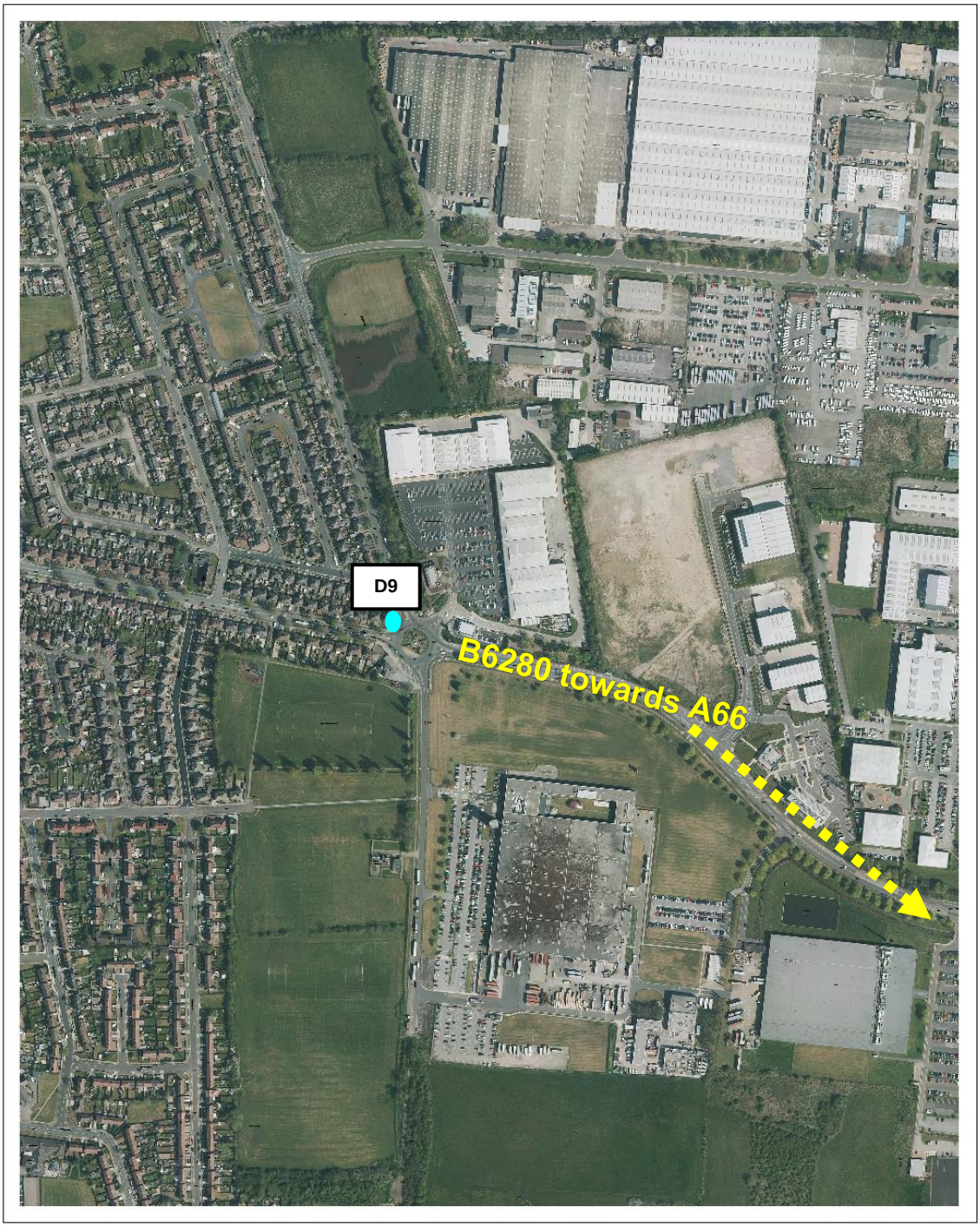


N

Darlington Borough Council

D9 Yarm Road

0 105 210 420 Meters



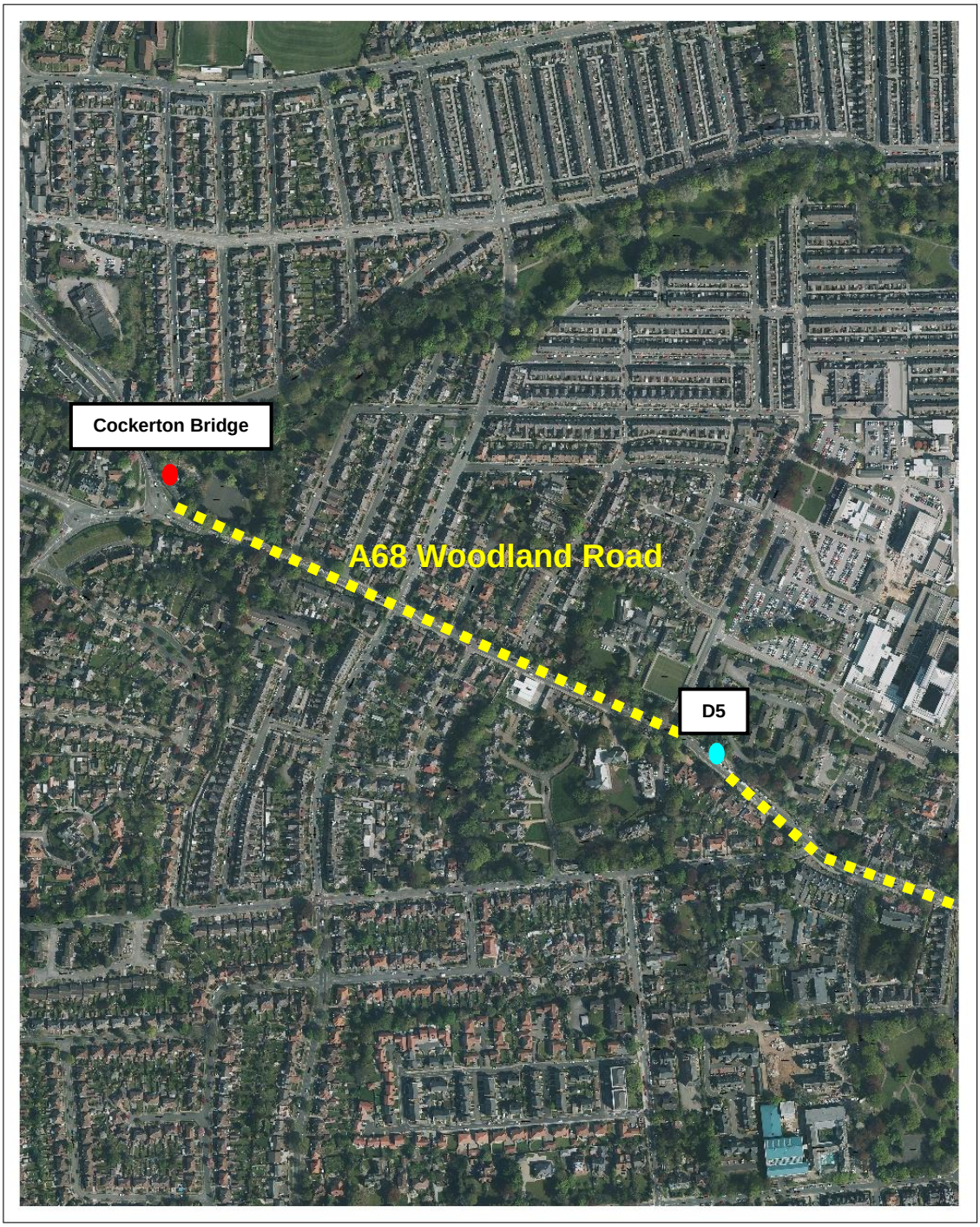
N

D6, D15 Blackwell Bridge

Darlington Borough Council

D5 Woodland Road, Cockerton Bridge (automatic)

0 105 210 420 Meters

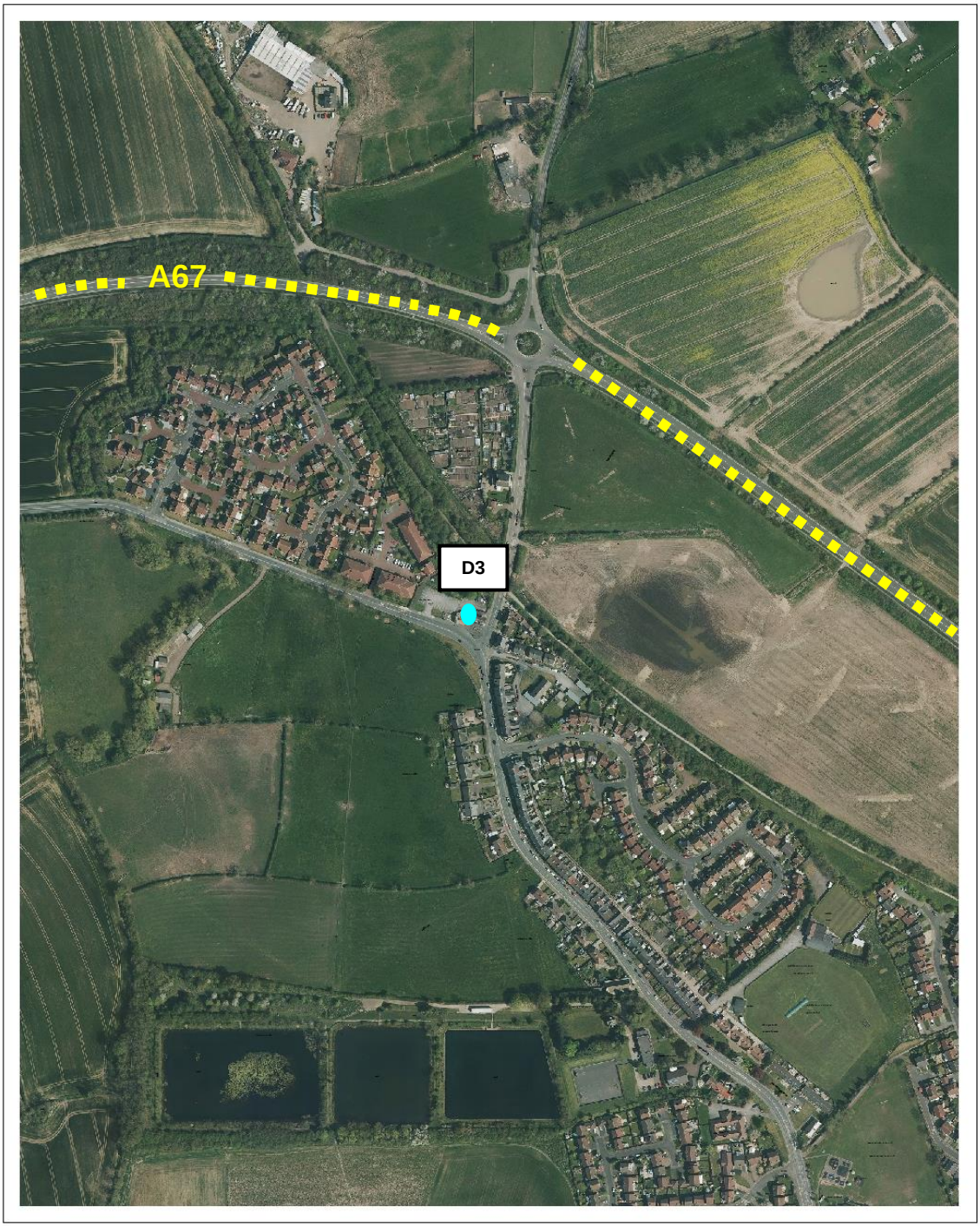


N

Darlington Borough Council

D3 Platform 1 Middleton St George

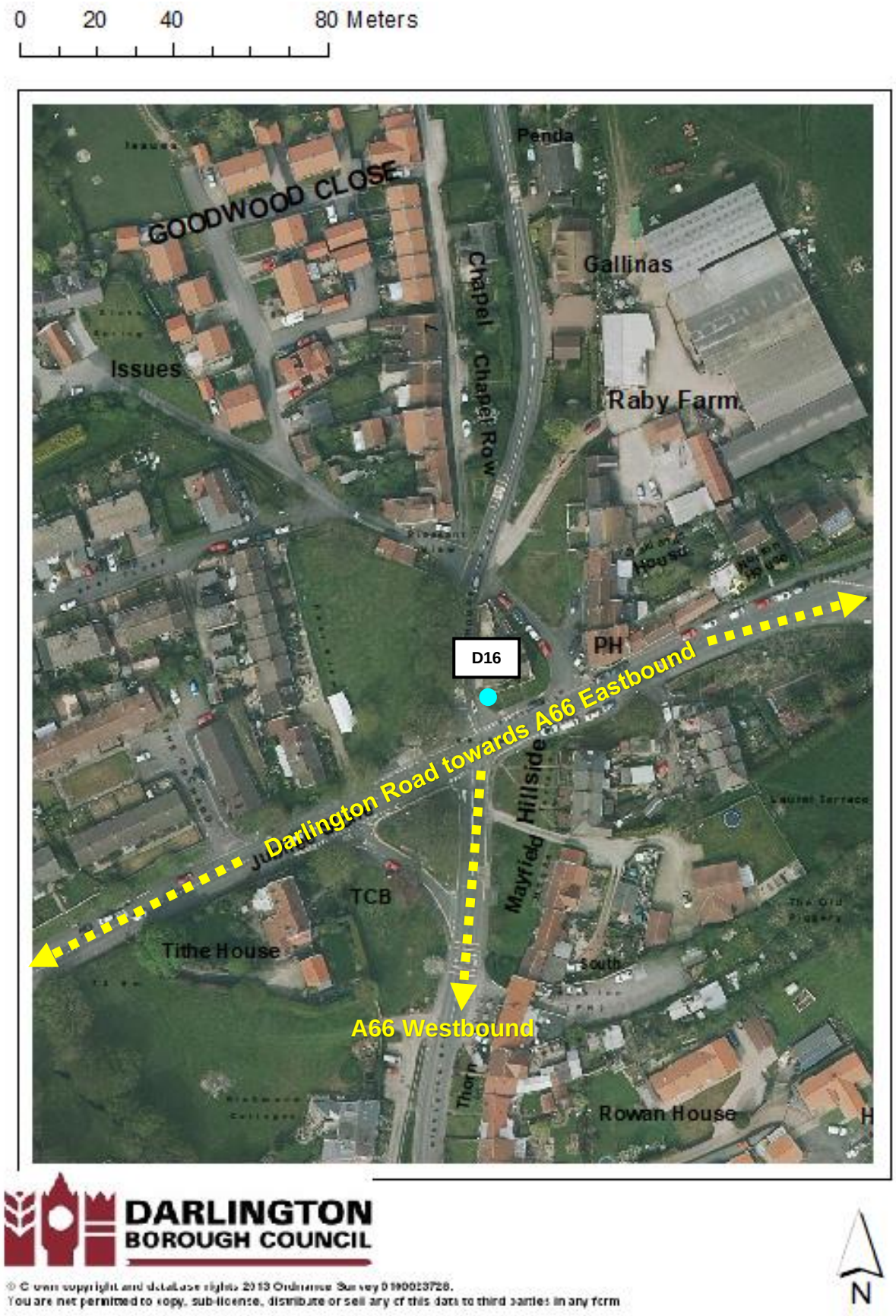
0 87.5 175 350 Meters



N

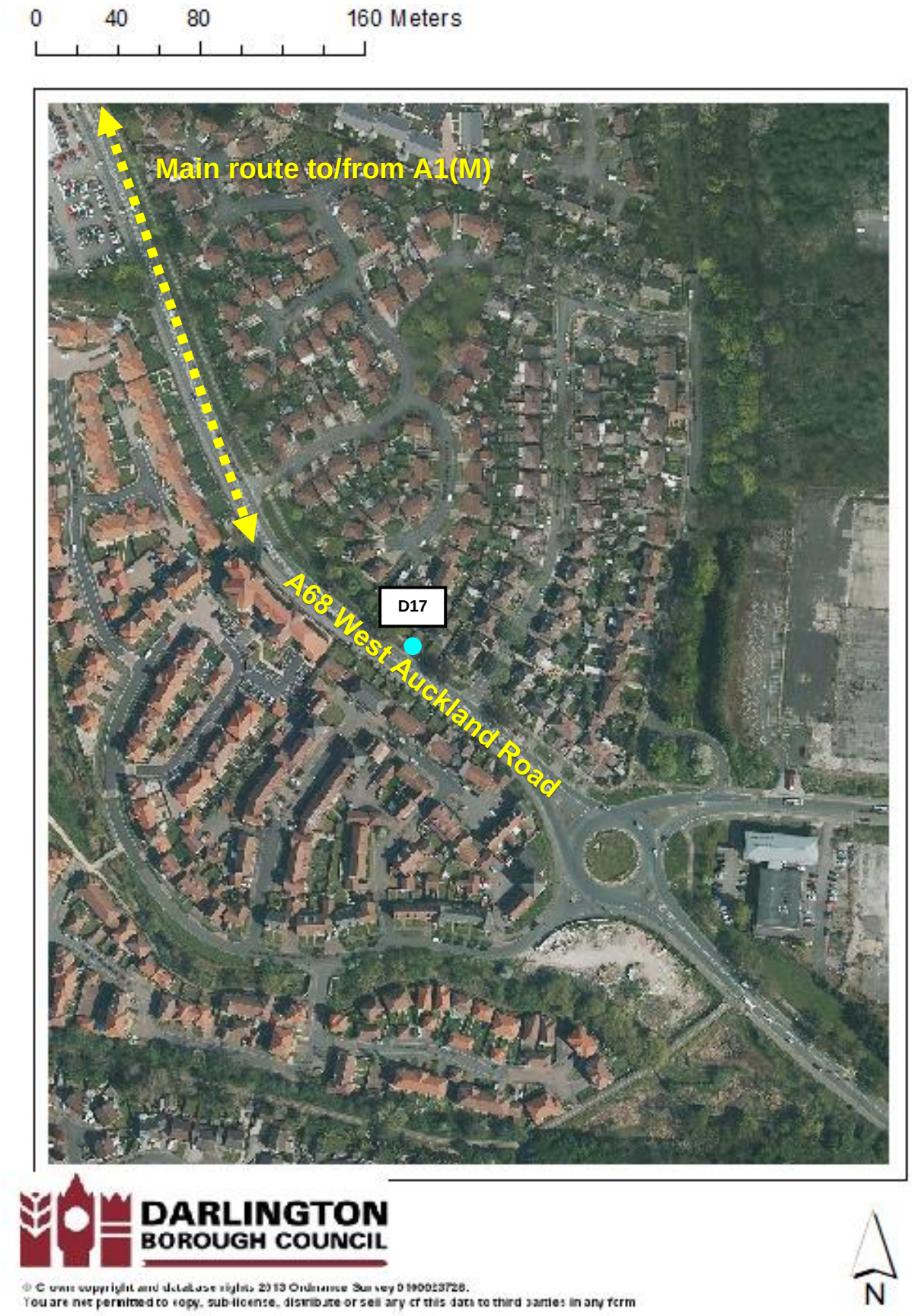
Darlington Borough Council

D16 Hill House Lane Sadberge



Darlington Borough Council

D17 West Auckland Road



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[13]	
	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

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

Appendix F: Impact of COVID-19 upon LAQM

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

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

Despite the challenges that the pandemic has given rise to, the events of 2020 have also provided Local Authorities with an opportunity to quantify the air quality impacts associated with wide-scale and extreme intervention, most notably in relation to emissions of air pollutants arising from road traffic. The vast majority (>95%) of AQMAs declared within the UK are related to road traffic emissions, where attainment of the annual mean objective for nitrogen dioxide (NO_2) is considered unlikely. On 23rd March 2020, the UK Government released official guidance advising all members of public to stay at home, with work-related travel only permitted when absolutely necessary. During this initial national lockdown (and to a lesser extent other national and regional lockdowns that followed), marked reductions in vehicle traffic were observed; Department for Transport (DfT) data[14] suggests reductions in vehicle traffic of up to 70% were experienced across the UK by mid-April, relative to pre COVID-19 levels.

This reduction in travel in turn gave rise to a change of air pollutant emissions associated with road traffic, i.e. nitrous oxides (NO_x), and exhaust and non-exhaust particulates (PM). The Air Quality Expert Group (AQEG)[15] has estimated that during the initial lockdown period in 2020, within urbanised areas of the UK reductions in NO_2 annual mean concentrations were between 20 and 30% relative to pre-pandemic levels, which represents an absolute reduction of between 10 to 20µg/m^3 if expressed relative to annual mean averages. During this period, changes in $PM_{2.5}$ concentrations were less marked than those of NO_2. $PM_{2.5}$ concentrations are affected by both local sources and the transport of pollution from wider regions, often from well beyond the UK. Through analysis of AURN monitoring data for 2018-2020, AQEG have detailed that $PM_{2.5}$ concentrations during the initial lockdown period are of the order 2 to 5µg/m^3 lower relative to those that would be expected under business-as-usual conditions.

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

[14] Prime Minister's Office, COVID-19 briefing on the 31st of May 2020
[15] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, June 2020

Impacts of COVID-19 on Air Quality within Darlington

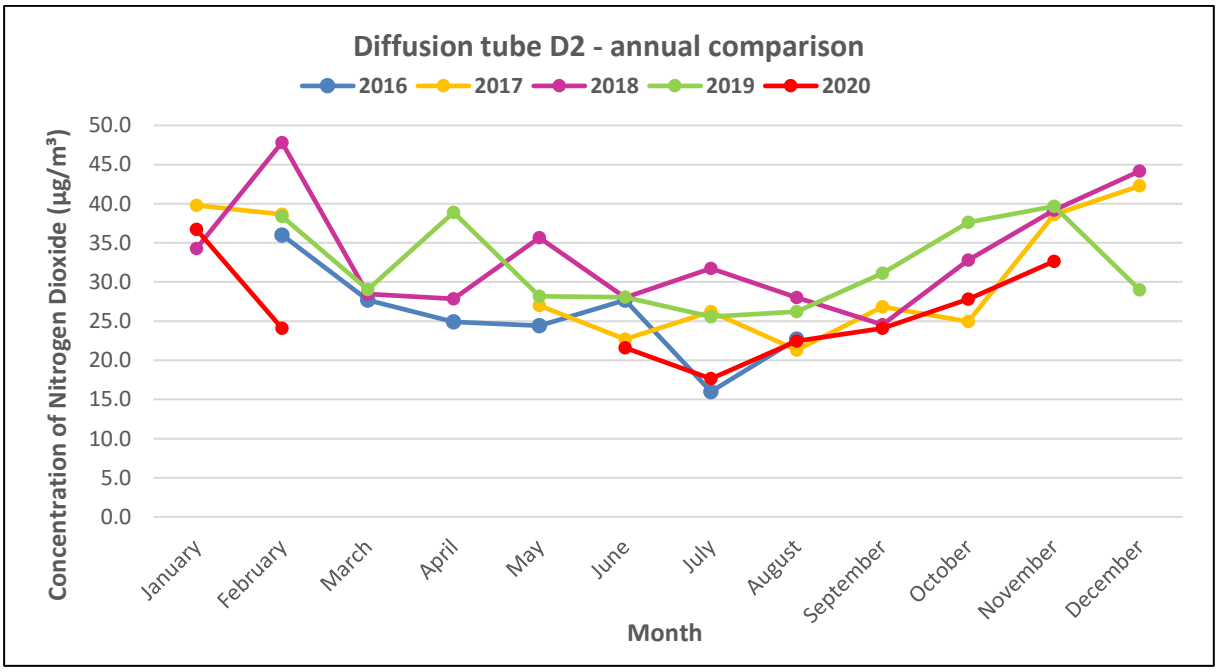
Diffusion tube results

In relation to results of monitoring undertaken, where there is more than one year's worth of data for diffusion tube sites, a comparison of annual mean NO_2 levels highlights concentrations (annualised and bias adjusted) are lower in 2020 than for previous years (going back up to 5 years (from 2016)), for all but two sites (D1 lower in 2017 and D11 lower in 2019). This is likely to have been influenced by reductions in traffic numbers as a result of the COVID-19 pandemic. The average reduction in the annual mean (annualised and bias adjusted) across diffusion tubes sites between 2019 and 2020 was 5.6µg/m³.

Unfortunately, there is no diffusion tube data available over the period which coincided with the imposition of the first national lockdown in March 2020, where any influences on concentrations are likely to have been most noticeable. Later in the year, from July 2020 onwards trends in concentrations started to increase again across sites. This is supported by automatic monitoring data from other Tees Valley Local Authorities.

Comparing 2020 monthly diffusion tube results for corresponding months in the previous year (2019), concentrations are also generally lower in 2020. A graph showing results from one of the sites is shown below as an example.

Figure F.1 – Trends in Diffusion Tube Results (NO_2)



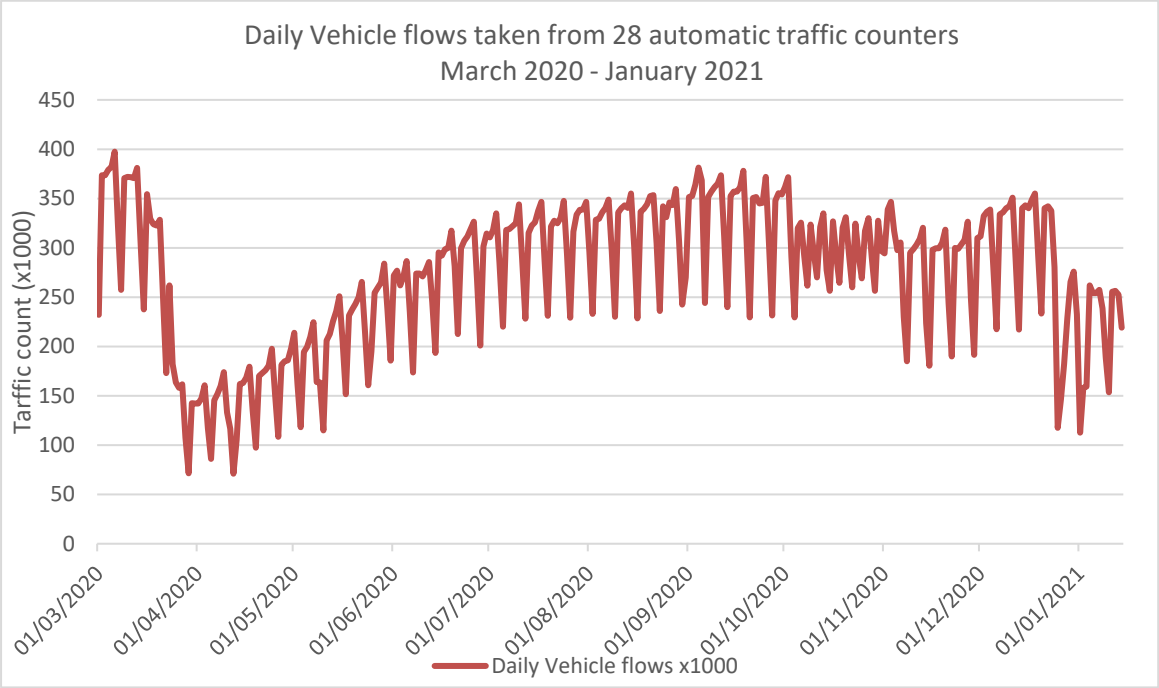
This trend graph shows the monthly diffusion tube results (prior to bias adjustment and annualisation), for site D2 (Haughton Road) over the past 5 years.

While it can be expected that where there are reductions in traffic numbers, pollutant concentrations associated with road traffic will also be lower, caution must be applied when considering any impacts purely based on diffusion tube data, given that they are an indicative monitoring method and their suitability is predominantly for looking at longer term trends in pollution levels, as opposed to short term trends. In addition, it is worthwhile acknowledging that although commuter traffic was much reduced as a result of COVID-19 and the associated lockdowns, there were likely differences in usual traffic count make up with potential increases in other vehicle types (i.e. higher proportions of HGVs, LGVs) due to rises in home delivery demand/supply of products to supermarkets etc.

Traffic numbers

A review of traffic count data for Darlington has shown following the announcement of the first national lockdown on 23 March 2021, traffic counts decreased by 80,000 across the Borough from 262,000 on 23 March to 182,000 on 24 March (figures to the nearest 500). The month with the lowest recorded average daily traffic count (between March 2020 and January 2021) was April 2020, with an average of 150,800 vehicles daily. Average daily traffic counts for other months ranged between 210, 800 and 337, 400. A trend graph showing the daily traffic counts between March 2020 and January 2021 is shown in Figure F.2 below.

Figure F.2 – Trends in Daily Traffic Count Data



Opportunities Presented by COVID-19 upon LAQM within Darlington

No LAQM related opportunities have arisen as a consequence of COVID-19 within Darlington Borough Council.

Challenges and Constraints Imposed by COVID-19 upon LAQM within Darlington

During 2020, results for diffusion tubes were not obtained for March, April or May due to impacts of COVID-19 on the analysis laboratory (i.e. suspension of services). Therefore, it was not possible to obtain diffusion tube results for all sites for these months in line with the national exposure monitoring calendar. This has affected data capture within 2020, resulting in data for all monitoring sites having to be annualised. In accordance with the impact matrix (Table F.1) the impact for the most part can be classed as **Small** (only two locations had 25 to 50% data capture i.e. Medium impact). Under normal circumstances i.e. without COVID-19, annualisation would still usually be required for some diffusion tube sites due to other influences, such as missing tubes on collection. This was true for 2020 in that December's results were not obtained due to adverse weather around the time of the exposure end date meaning the diffusion tubes could not be collected/sent for analysis. In addition, diffusion tubes were also sometimes missing from the location on collection meaning there was no data to analyse for certain sites/months.

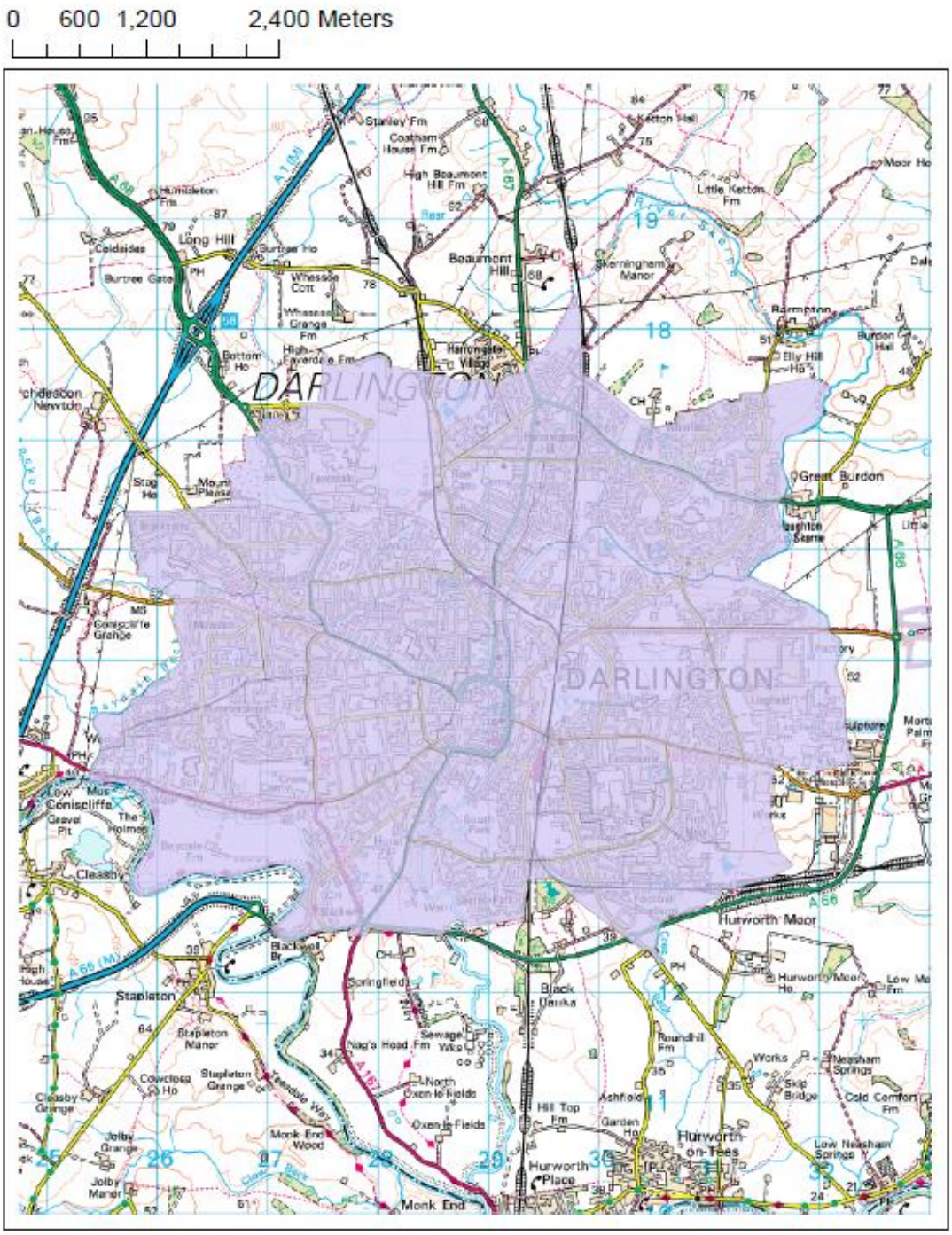
As with previous years, a national bias adjustment factor has been utilised to adjust the diffusion tube results for 2020. Within 2019 there were 8 co-location studies that were utilised to calculate the bias factor for the laboratory and preparation method used (March 2020 factor used). For 2020, this number has increased to 14 studies (March 2021). There is therefore the potential for there to be a lesser degree of uncertainty associated with the resultant annual mean NO_2 concentrations in 2020 than in previous years. However, it is acknowledged that for the later bias adjustment figure for 2019 there were 29 studies, however this was not released until September 2020 after the report submission deadline. Notwithstanding this the difference in the factor between March (0.87) and September (0.89) was only 0.02. Usually there is not a great difference in the factors and therefore the impact on the results is unlikely to be significant.

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

Table F.1 – Impact Matrix

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

Appendix G: Darlington Smoke Control Area



Title: The area marked in pale purple shows the area within the Borough of Darlington, which is in a smoke control area.

Scale: 1:45,000

DARLINGTON BOROUGH COUNCIL

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
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
DPF	Diesel Particulate Filter
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
LGTV	Let's Go Tees Valley
LIP	Local Implementation Plan
LPG	Liquid Petroleum Gas
LTP	Local Transport Plan
NGV	Natural Gas Vehicle
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
SOV	Single Occupancy Vehicle
STP	Strategic Transport Plan
TVCA	Tees Valley Combined Authority
TVEPG	Tees Valley Environmental Protection Group

References

1. Clean Air Strategy 2019
   Department for Environmental, Food and Rural Affairs
   Available at: https://www.gov.uk/government/publications/clean-air-strategy-2019

2. LAQM Policy Guidance 2016
   Published by the Department for Environment, Food and Rural Affairs, April 2016
   Available at: https://laqm.defra.gov.uk/documents/LAQM-PG16-April-16-v1.pdf

3. LAQM Technical Guidance 2016 (Revised April 2021)
   Published by the Department for Environment, Food and Rural Affairs, April 2021
   Available at: https://laqm.defra.gov.uk/technical-guidance/

4. Particulate PM2.5 and NO_2 Background Data for Darlington (2018)
   Department for Environment, Food and Rural Affairs, Data Archive
   Available at: https://uk-air.defra.gov.uk/data/laqm-background-home

5. UK Air Data Selector
   Department for Environment, Food and Rural Affairs
   Available at: https://uk-air.defra.gov.uk/data/data_selector

6. 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

7. LAQM Precision and Accuracy (Precision Summary Results – Summary of Diffusion Tube Precision 2008-2020)
   Department for Environment, Food and Rural Affairs
   Available at: https://laqm.defra.gov.uk/diffusion-tubes/precision.html

8. LAQM QA QC Framework AIR-PT Rounds 30 to 40 (January 2019 – October 2020)
   Department for Environment, Food and Rural Affairs
   Available at: https://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

9. 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