2022 Air Quality Annual Status Report (ASR)

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

Date: 30 June 2022

Information	Richmondshire District Council Details
Local Authority Officer	Amanda Fuller
Department	Environmental Health
Address	Richmondshire District Council Mercury House Station Road Richmond North Yorkshire DL10 4JX
Telephone	01748 829100
E-mail	environment@richmondshire.gov.uk
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Executive Summary: Air Quality in Our Area

Air pollution is the contamination of air due to the presence of substances in the atmosphere that are harmful to the health of humans and other living beings and is associated with several adverse health impacts. Air pollution can increase the risk of respiratory infections, heart disease and lung cancer. Additionally, air pollution particularly affects the most vulnerable in society including children, the elderly, and those with existing health conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas[1,2].

Air quality is compromised when it contains particulate matter, which can include dust, dirt, soot, smoke, and liquid droplets. These sources of emissions are typically emitted from Transport, Waste Management, Industrial Process, and Agricultural soils. Particles less than 10 micrometres in diameter (PM_{10}) pose a health concern, particles less than 2.5 micrometres ($PM_{2.5}$) in diameter are referred to as 'fine' and pose the greatest health risks because their small size can be inhaled deeply into the lungs. Air pollution can negatively affect human health through short term (days to weeks) transitory exposure and long-term accumulated exposure (over years to decades) with the latter considered to cause the greater harm.

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4]. Whilst the coronavirus pandemic led to a significant drop in pollution levels during 2020, returning to levels last measured in 2006 which were 17% lower than the normal levels, some studies have suggested that long term exposure to air pollution

[1] Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

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

[3] Defra. Air quality appraisal: damage cost guidance, July 2021

[4] Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

before the pandemic is associated with severe symptoms from COVID-19 and therefore a greater risk of death[5].

Air Quality in Richmondshire, North Yorkshire

Richmondshire is principally a rural district, with a population estimate of 51,965 (Census 2011), covering a large area of the Yorkshire Dales, incorporating the towns of Richmond, Leyburn, and the military town of Catterick Garrison, the largest British Army Garrison in the world.

The key sectors that broadly dominate employment and commercial activity in Richmondshire are Agriculture, Distribution, Hotels and Restaurants and Public Admin, Education and Health. The district offers the benefits of a beautiful rural setting, excellent quality of life and low crime, with easy access to the main national road network of the A1 and A66 to the East and the M6 to the West.

Very few areas within the district are of concern in relation to air quality.

 Nitrogen dioxide levels are the principal focus of monitoring by Richmondshire District Council (RDC) and concentrations of nitrogen dioxide tend to reflect local road traffic conditions, and layout of the roads in relation to the surrounding buildings. An area of narrow congested streets, road junctions and properties close to the kerb in Richmond (around the main approaches to the town centre from the northeast), have been identified as an area of potential concern in relation to air quality. However, the results of monitoring in 2021 for this area, together with all the other sites in Richmondshire, indicate that the concentrations of nitrogen dioxide measured, lie below the objective set by legislation (see Appendix E, Table E.1.). There has also been an overall downward trend displayed by data gathered at the various monitored locations over the last five years.

There are currently no Air Quality Management Areas (AQMAs) in the district of Richmondshire. If an AQMA were to be declared in the future, then RDC and North

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[5] Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

[5]ONS: Air Pollution and COVID-19 mortality Rates in England, revised August 2020

Yorkshire County Council (NYCC) would work together to develop an Air Quality Action Plan which would include measures to address air pollution.

Locations of AQMAs in other parts of the country can be found on the Defra UK AIR website here: Air Quality Management Areas (AQMAs) - Defra, UK.

Actions to Improve Air Quality

Whilst air quality in England has improved significantly in recent decades and will continue to improve due to national policy decisions, there may be some areas in Richmondshire where local action could be taken to improve air quality further, if required.

The 2019 Clean Air Strategy[6] sets out the case for action, with goals to reduce exposure to harmful pollutants. The Road to Zero[7] sets out the approach to reduce exhaust emissions from road transport through several mechanisms; this is extremely important given that most of the Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

Richmondshire' s main action involves monitoring at 15 sample stations across the council district. The current air quality monitoring regime includes <u>1 sample station change for 2021</u> – a move of the sample station at Scotch Corner on the A1/A66 interchange to 16 Catterick Road, Catterick Garrison; this was due to low concentrations of (NO_2) reported at Scotch Corner, due to the spatial nature of the testing site and an area of potential concern raised in the Catterick Garrison area.

The air quality in Richmondshire is generally good. Monitoring will continue at the same sites as monitored in 2021. If the results of monitoring indicate an upward trend with exceedance(s) of the air-quality objective, then Richmondshire District Council will take steps required by the Local Air Quality Management (LAQM) Policy Guidance.[8]

[6] Defra. Clean Air Strategy, 2019

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

[8] Defra Local Air Quality Management Policy Guidance (PG16), April 2016

Conclusions and Priorities

This report provides the results of the monitoring of nitrogen dioxide (NO_2) concentrations over the past 5 years. The NO_2 annual mean concentrations are compared to the annual air quality objective of 40µg/m^3 for England.

In Richmondshire the air quality objective of 40µg/m^3 for England was not exceeded in 2021. Whilst there was an increase in the annual mean concentrations from the previous year, which was particularly low due to limited traffic activity during the COVID-19 period, data over the last 5-year period displays an overall downward trend.

In Richmondshire the priorities with regards to air quality are therefore to focus on continued monitoring of nitrogen dioxide. In addition, the council will continue to work in tandem with local partnerships, with action groups, forums, and in line with government strategy to further improve air quality and tackle the continued challenges ahead.

North Yorkshire is still currently a two-tier authority, with North Yorkshire County Council (NYCC) being responsible for highways. In April 2023 the current county, district and borough councils will be replaced by a unitary council for North Yorkshire.

Richmondshire District Council set the strategy for new development in the eastern area of Richmondshire (outside the Yorkshire Dales National Park). The Richmondshire Local Plan[9] is published on the RDC website and is currently under review to accommodate additional military growth anticipated in Catterick Garrison and civilian growth across the Plan Area. This review will include a transport assessment with consideration of potential air quality issues: Local Plan 2012 - 2028 (richmondshire.gov.uk)

Yorkshire Dales National Park Authority (YDNP) set the strategy for new development in the western area of Richmondshire within the National Park. The YDNP Local Plan[10] is published on the YDNP website: Local Plan 2023-40 - Yorkshire Dales National Park : Yorkshire Dales National Park

The Local Planning Authorities covering Richmondshire (RDC and YDNP) and NYCC (currently as the Local Highway Authority) will continue to consider planning applications and seek to ensure they do not cause undue traffic congestion on the highway network.

[9] Richmondshire District Council, Richmondshire Local Plan 2012-2028 Core Strategy, adopted 2014.

[10] Yorkshire Dales National Park, Local Plan 2015-2030, adopted 2016.

NYCC Traffic Engineering monitor traffic signals and make technological improvements with the aim of reducing congestion, improving traffic flows, and thus allowing the efficient use of the highway. NYCC also have many other roles such as those that relate to promoting active travel (like cycling and walking). NYCC have drafted an Air Quality Strategy which has undergone an extended consultation and is awaiting approval, however work on many of the actions contained in the plan has already started.

A summary of all the measures taken by the various authorities to improve air quality are included in Table 2.2 of this report.

Local Engagement and How to Get Involved

Richmondshire District Council (RDC) currently has no specific schemes running to help improve air quality, although RDC encourages the General Public to reduce idling at traffic lights and traffic pinch points to benefit local communities and neighbourhood areas. North Yorkshire County Council also works with schools in the district to improve road safety, promote cycling, and travel alternatives and travel awareness and offer cycle training to primary school pupils.

Members of the public can help by reducing the number of car-driver trips, car sharing, increasing use of public transport and increasing active travel (cycling and walking). RDC provides information about Clean Air Day via our website and using social media to engage.

Going forward during 2022/23, EVCPs (electric vehicle charge points) are due to be installed in district council-run car parks across Richmondshire as part of our 2030 net-zero plans. The members of the council's corporate board agreed to a £215,000.00 scheme to place 18-20 EVCPs 22kW capacity chargers in a series of locations throughout the district.

Additionally, RDC are working to place a bid into the **Local Electric Vehicle Infrastructure Fund** (LEVI) which is a £450m scheme announced by the UK government in March 2022 as part of their electric vehicle (EV) Infrastructure Strategy. This project would also involve engagement with the Northern PowerGrid electrical infrastructure provider as points will be integrated into lamp posts.

Local Responsibilities and Commitment

This ASR was prepared by the Environmental Health Department of Richmondshire District Council with the support and agreement of the following:

Nicole Holland, Ardent Consulting Engineers Ltd.

Jo Kirk, Ardent Consulting Engineers Ltd.

NYCC Strategy Groups have provided updated Project status information.

This ASR has been approved by: Dr Kevin Carr. Environmental Health, Richmondshire District Council.

This ASR has not been signed off by a Director of Public Health.

If you have any comments on this ASR, please send them to:

Amanda Fuller at Richmondshire District Council

Mercury House, Station Road, Richmond DL10 4JX

Telephone: 01748 829100

Email: amanda.fuller@richmondshire.gov.uk

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1 Local Air Quality Management

This report provides an overview of air quality in Richmondshire District Council during 2021. 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 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.

As a two-tier authority Richmondshire District Council and North Yorkshire County Council would work together to develop an AQAP (which would include measures to address air pollution).

This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Richmondshire District Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.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.

Richmondshire District Council currently does not have any declared AQMAs.

For reference, a map of Richmondshire District Council monitoring locations is available in Appendix D.

2.2 Progress and Impact of Measures to Address Air Quality in Richmondshire District

'Defra's appraisal of last year's ASR concluded Richmondshire District Council (RDC) does not have any Air Quality Management Areas (AQMAs) within the district as there have been no exceedances of the air quality objective (AQO). Therefore, there is no requirement to produce an Air Quality Action Plan (AQAP). RDC have reported actions that are being taken to improve and maintain the good air quality in the district, which include measures reported in Local Plans and other measures related to the traffic management and promoting alternative travel. This is welcomed as it highlights RDC's commitment to good air quality in the district.

RDC have reported a Public Health Outcome Framework's indicator for 'Fraction of mortality attributable to particulate air pollution' of 4%, which is lower than the regional and national average. No specific actions to tackle $PM_{2.5}$ have been reported.

RDC did not carry out any automatic monitoring of NO_2 or particulate matter in 2021. Non-automatic (passive) monitoring of NO_2 was undertaken at 15 sites across the district. There were no changes to the monitoring network up to 2020. But RDC proposed a change at one location from Scotch Corner (N7) to Catterick Road in Catterick Garrison (N20) which was implemented for 2021 following comments in last year's Appraisal Report.

Monitored NO_2 was well below the annual mean AQO for NO_2 at all sites.

Data capture was good at all sites (>90%) and no sites required annualisation. QA/QC of monitoring was presented in detail. RDC provided clear reasoning and evidence for the chosen bias adjustment factor, applying a national factor due to no co-location of diffusion tubes with automatic sites.

In 2020 there was an approximate 23% reduction in annual mean NO_2 from 2019 levels, and the Council have acknowledged that this is a larger reduction than expected due to COVID-19. RDC report that information was shared with the public highlighting the impact of COVID-19 on improving air quality to encourage the public to consider ways they can help improve air quality in future.

Based on the evidence provided by the local authority the conclusions reached are accepted for all sources and pollutants. The next step is to submit an Annual Status Report in 2022.'

Richmondshire District Council (RDC) has taken forward several direct measures during the current reporting year of 2021 in pursuit of improving local air quality. RDC has a Local Plan Core Strategy[11] and Yorkshire Dales National Park Authority has a Local Plan[12]. Core Policy 3 of the RDC Strategy seeks to align development and provision of services to minimise the need for travel. NYCC as local highway authority, has objectives which relate to transport as detailed in their Local Transport Plan four (LTP4)[13]. NYCC have drafted an Air Quality Strategy which has undergone an extended consultation and is awaiting final approval during 2022, however work on many of the actions contained in the plan has already started.

Details of all measures completed, in progress or planned are set out in Table 2.1 over the following four pages. Measures are included within Table 2.1, with the type of measure and the progress Richmondshire District Council have made during the reporting year of 2021. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.1.

Key completed measures in 2021 are as follows:

- *Measure 6 'Management and Optimisation of Traffic Signals in Leyburn'*
- *Measure 7 'Traffic Signal Improvements at Spennithorne Bridge'; and*
- *Measure 12 'Installation of EV charging points at YDNPA car parks – Hawes & Aysgarth'.*

Richmondshire District Council expects the following measures to be completed or significantly underway over the course of the next reporting year:

- *Measure 11 'Provision of Walking and Cycling Routes'.*
- *Measure 13 'Installation of EV charging points at certain RDC Car Parks'.*

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[11] Richmondshire District Council, Richmondshire Local Plan 2012-2028 Core Strategy

[12] Yorkshire Dales National Park, Local Plan 2015-2030

[13] North Yorkshire County Council, Local Transport Plan four, 2016-2045

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Local Plan 2012-2028 Core Strategy (including Core Policy CP3 Achieving Sustainable Development) - RDC Local Planning Authority area	Policy Guidance and Development Control	Other policy	2012	On-going	Richmondshire District Council (RDC) as Local Planning Authority (LPA) & Ministry of Defence (MoD) in consultation with North Yorkshire County Council (NYCC) as Local Highway / Education Authority	As per organisations involved	NO	Fully funded	Not Known	Implementation	n/a	n/a	On-going & under review to include masterplan for Catterick Garrison to accommodate additional military and civilian growth. Will include transport and air quality assessment Ongoing and preparation of a revised Local Plan (2018-2035) Underway.	The strategy seeks to align development and provision of services to minimise the need for travel.
2	Local Transport Plan 4 (LTP4) 2016-2045	Policy Guidance and Development Control	Other policy	2016	On-going	NYCC	NYCC capitol allocation on transport & bids through the Local Enterprise Partnership (LEP)	NO	Funded	Not Provided	Implementation	Reduced vehicle emissions	Two of the objectives: • 'Environment and Climate Change' - managing the adverse impact of transport on the environment • 'Healthier Travel' - promoting healthier travel opportunities	Air Quality Strategy expected to be approved Q2 20/21.Active Travel Strategy to re-start following release of new Government guidance on cycle infrastructure design /details of Government funding for walking and cycling infrastructure	Uptake of initiatives to achieve objectives
3	Air Quality Strategy - Protecting North Yorkshire's Air Quality 2020-2045 (DRAFT)	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2020	On-going	NYCC working with all 9 local planning authorities to develop this project.	NYCC and look to external funding	NO	Partially Funded	£50k - £100k	Planning	Reduced vehicle emissions	n/a	Draft - consultation closed 30 April 2020. Expected to be approved Q2 22/23. NYCC has a £100k p.a. countywide allocation to identify and deliver measures to improve traffic related air quality. NYCC / LEP funded a project to identify and make the business case for a countywide network of EV charge points which has developed into an EV Rollout Strategy - anticipated completion summer 2022 and adopted in autumn 2022.	Key objectives: • Raise the profile of improving air quality in the context of North Yorkshire • Work in partnership with borough and district councils and other organisations to protect and, where appropriate, improve air quality • Ensure that improving or maintaining good air quality is a key consideration when planning and delivering County Council services. Support the use of Ultra Low Emission Vehicles (ULEVs) in North Yorkshire

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
4	Local Plan Review 2018-2035 Policy on EV charging point provision in new developments	Policy Guidance and Development Control	Other policy	2018	2035	RDC / Development Industry	RDC / Development Industry	NO	Partially Funded	Not Provided	Planning	Reduced vehicle emissions	n/a	Policy drafted & to be included in Preferred Options Consultation Autumn 2022	Subject to economic viability and approval at examination and adoption by Members
5	Management and optimisation of traffic signals - whole district	Traffic Management	UTC, Congestion management, traffic reduction	On-going	On-going	NYCC	NYCC	NO	Funded	Not Provided	Implementation	n/a	n/a	Traffic Engineering monitor the condition / operation of traffic signals through prog. of inspection, fault reporting and network management. Technological improvements installed when available to improve efficiency of the junction, reliability and reduce power consumption	Aim to reduce congestion & improve perceived and actual road safety risk
6	Management and optimisation of traffic signals Leyburn	Traffic Management	Strategic highway improvements, Re-prioritising Road space away from cars, including Access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2020	2021	NYCC & Dept. for Transport (DfT)	Governments Safer Roads Fund	NO	Funded	Not Provided	Completed	n/a	n/a	Pedestrian crossing Improvements. Works continuing the delivery of a package of measures in Leyburn	Aim to reduce congestion & improve perceived and actual road safety risk.
7	Traffic signal Improvements Spennithorne Bridge	Traffic Management	Strategic highway improvements, Re-prioritising Road space away from cars, incl. access management, Selective vehicle priority, bus priority, high vehicle occupancy lane	2018	2021	NYCC & Department for Transport (DfT)	DfT's Safer Roads Fund	No	Funded	Not Provided	Completed	Reduction in congestion and idling traffic	n/a	Traffic signal improvements to reduce delay and improve safety of all users. Project at tender with delivery planned for 2020/21.	Aim to improve traffic flow and road safety
8	Road safety and travel awareness	Promoting Travel Alternatives	Intensive active travel campaign & infrastructure	On-going	On-going	NYCC, 95-Alive	NYCC / DfT grant	NO	Partially Funded	Not Provided	Implementation	Reduction in emissions	n/a	On-going as part of LTP4 Social media posts. Engagement with schools, businesses and communities. Promotion of active/sustainable travel	No Barriers.
9	Countywide Civil Parking Enforcement	Traffic Management	Workplace Parking Levy, Parking Enforcement on highway	2011	On-going	NYCC	NYCC	NO	Funded	Not Provided	Implementation	Reduction in emissions and Congestion	n/a	On-going as part of LTP4. CPE now a fundamental part of delivering traffic and parking	To address parking related traffic congestion / disruption

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
														management improving safety and accessibility of the network for all users	
10	Road safety and travel awareness	Promoting Travel Alternatives	Promotion of cycling	On-going	On-going	NYCC (with partners as appropriate)	NYCC/DfT Grant	NO	Funded	Not Provided	Implementation	Reduction in emissions and Congestion	number of pupils signed up and trained.	Ongoing and part of LTP4. Bikeability cycle training to primary school pupils. Engagement with clubs and event organisers. Safety information. Face-to-face engagement with cyclists/	Barrier only relates to limited uptake.
11	Provision of walking and cycling routes	Transport Planning and Infrastructure	Cycle network	2021	2022	NYCC & Local Planning Authority (LPA)	NYCC / LEP NYCC awaiting further details of recently announced (spring 2020) Government funding for provision of walking and cycling facilities	NO	Funded	Not Provided	Implementation	Reduction in emissions and Congestion	Not provided	NYCC work with the LPA to ensure that any improvement(s) whether cycle or general Non-Motorised Users (NMU) are accommodated where appropriate. Catterick Garrison Masterplan - existing bid to the LEP for funding to undertake a feasibility study to identify improvements / projects to enhance and expand the existing green infrastructure corridor network for walking / cycling as part of the additional development programme. NYCC producing Local Cycling and Walking Infrastructure Plans (LCWIP's) of the main towns in each district in North Yorkshire. Catterick Garrison to commence 21/22	Very limited resources. Success of bid to LEP to allow implementation.
12	Installation of EV charging points at YDNPA car parks - Hawes & Aysgarth	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2019	2021	Yorkshire Dales National Park Authority (YDNPA)	YDNPA	NO	Funded	Not Provided	Completed	Encouraging low emission transport in the district.	n/a	Completed	Completed.
13	Installation of EV charging points at certain RDC car parks	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to	2022	2023	RDC	RDC Capital Project	NO	Funded	£50k - £100k Estimate/under review	Planning	Encouraging low emission transport in the district.	TBA	On-going	Subject to Budget Approval

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
			promote Low Emission Vehicles, EV recharging, Gas fuel recharging												
14	Information about air quality monitoring and reporting	Public Information	Via the Internet	2022	2022	RDC	RDC	NO	Funded	n/a	Completed	n/a	Positive feedback/ no AQMA's	On-going	Available on RDC website & news on RDC Facebook
15	Information about domestic solid fuel burning	Public Information	Via the Internet	2018	On-going	RDC/Defra	RDC	NO	n/a	n/a	Completed	Low	Positive Feedback	Completed	Available on RDC website & news on RDC Facebook

2.3 PM$_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

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

Richmondshire District Council have been issued with no specific targets and no specific monitoring is currently undertaken.

Defra background mapping resource (2018 data) has however been used to identify a maximum background annual mean PM$_{2.5}$ concentration within Richmondshire of 8.4 μg/m^3 which is below the annual objective for PM$_{2.5}$ which is 20 μg/m^3. This resource (2018 data) has also been used to identify a maximum background annual mean PM$_{10}$ concentration, at the same location, of 15.0 μg/m^3 which is also 'well below' the annual objective for PM$_{10}$ which is 40μg/m^3 (as set out in table E.1). Defra background mapping resource.

There are no smoke control areas in Richmondshire.

Public Health England (PHE) produce figures, as part of the Public Health Outcomes Framework (PHOF), in relation to certain health indicators. These can be found on the PHE website at: Public Health Profiles - PHE .

The indicator of relevance, within the context of this ASR, is 'Fraction of mortality attributable to particulate air pollution'. The values currently available from PHE for this indicator are for 2019. The value for this indicator for North Yorkshire is 4.0%. The value for the same indicator for the whole of the Yorkshire and Humber region is 4.8%, with the value for England given as 5.1%.

It is expected that Local authorities review any existing measures already being implemented and assess whether they are already taking positive action to reduce PM$_{2.5}$ emissions. The development of any such measures would form part of an Action Plan to tackle a problem with any Air Quality Management Area (AQMA). As RDC does not have an AQMA, and therefore no Action Plan, no change has been necessary.

[13] Defra Local Air Quality Management Policy Guidance (PG16), April 2016

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

This section sets out the monitoring undertaken within 2021 by Richmondshire District Council and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

3.1   Summary of Monitoring Undertaken

3.1.1   Automatic Monitoring Sites

Richmondshire District Council does not undertake automatic (continuous) monitoring.

Further information about monitoring networks and other resources about air pollution are available on the Defra UK AIR website found here Home - Defra, UK

3.1.2   Non-Automatic Monitoring Sites

Richmondshire District Council undertook non-automatic (i.e., passive) monitoring of Nitrogen Dioxide (NO_2) using diffusion tubes at 15 sites during 2021. Table A.1 in Appendix A presents the details of the non-automatic sites.

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

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 correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO$_2$)

Table A.2. in Appendix A compares the ratified and adjusted monitored NO$_2$ annual mean concentrations for the past five 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 2021 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

The annual air-quality objective of 40µg/m^3 was not exceeded at any of the monitoring sites in Richmondshire in 2021.

In addition, as there were no annual mean values greater than 60µg/m^3, this indicates that the 1-hour mean objective of 200µg/m^3, not to be exceeded more than 18 times per year, is unlikely to be exceeded at these sites.

There is an overall downward trend displayed by measured concentrations for all monitoring sites (with the exception of site R20, for which insufficient data is currently available to determine a trend) over the five-year period 2017 to 2021.

Appendix A: Monitoring Results

Table A.1 – 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)
R2	Queens Road Roundabout	Roadside	417180	501125	NO2	No	8.0	1.8	No	2.5
R3	Darlington Road	Roadside	418066	501490	NO2	No	22.0	1.4	No	2.6
R4	White Rose Crescent	Urban Background	418504	501455	NO2	No	11.0	1.7	No	2.5
R6	Gatherley Moor Farm	Roadside	419207	506509	NO2	No	0.0	8.0	No	2.0
R8	15 Queens Road	Roadside	417179	501127	NO2	No	7.0	2.4	No	2.8
R10	Oglethorpe	Roadside	417381	501281	NO2	No	1.7	1.7	No	2.7
R11	7 Gallowgate	Roadside	417377	501317	NO2	No	0.0	3.3	No	2.7
R12	1 Anchorage Hill	Roadside	417542	501275	NO2	No	3.5	1.8	No	2.7
R13	3 Maison Dieu	Roadside	417536	501258	NO2	No	0.0	1.4	No	2.7
R15	2 Maison Dieu	Roadside	417500	501263	NO2	No	0.0	1.6	No	2.8

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)
R16	74 Frenchgate	Roadside	417451	501269	NO2	No	0.0	1.5	No	2.7
R17	95 Frenchgate	Roadside	417370	501262	NO2	No	2.0	1.5	No	3.0
R18	26 Darlington Road	Roadside	417661	501297	NO2	No	3.5	1.7	No	2.7
R19	43 Frenchgate	Roadside	417312	501037	NO2	No	0.0	1.8	No	2.7
R20	16 Catterick Road Catterick Garrison	Roadside	420754	498280	NO2	No	0.0	1.8	No	2.7

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 – Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring (μg/m³)

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2021 (%) [2]	2017	2018	2019	2020	2021
R2	417180	501125	Roadside	100.0	100.0	25.5	23.4	22.5	18.4	18.9
R3	418066	501490	Roadside	100.0	100.0	16.7	18.6	14.8	11.4	11.6
R4	418504	501455	Urban Background	100.0	100.0	7.6	7.5	7.4	5.8	5.6
R6	419207	506509	Roadside	100.0	100.0	21.3	20.4	20.6	15.7	17.3
R8	417179	501127	Roadside	100.0	100.0	29.9	28.6	27.7	19.8	21.4
R10	417381	501281	Roadside	100.0	100.0	34.7	33.2	28.6	23.5	24.3
R11	417377	501317	Roadside	100.0	100.0	35.4	33.6	32.7	26.4	27.5
R12	417542	501275	Roadside	100.0	100.0	23.5	21.9	21.0	16.1	17.4
R13	417536	501258	Roadside	100.0	100.0	24.4	22.8	19.3	15.4	17.3
R15	417500	501263	Roadside	100.0	100.0	25.1	23.5	21.9	16.0	18.5
R16	417451	501269	Roadside	100.0	100.0	35.2	31.5	30.3	22.7	23.8
R17	417370	501262	Roadside	100.0	100.0	25.7	25.6	23.4	17.1	18.2
R18	417661	501297	Roadside	100.0	100.0	24.3	20.4	21.8	16.9	18.4

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 2021 (%) [2]	2017	2018	2019	2020	2021
R19	417312	501037	Roadside	100.0	100.0	27.9	22.3	21.1	15.5	17.3
R20	420754	498280	Roadside	100.0	100.0					20.8

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

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

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

Notes:

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

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

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

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

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

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

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

Figure A.1 – Trends in Annual Mean NO₂ Concentrations
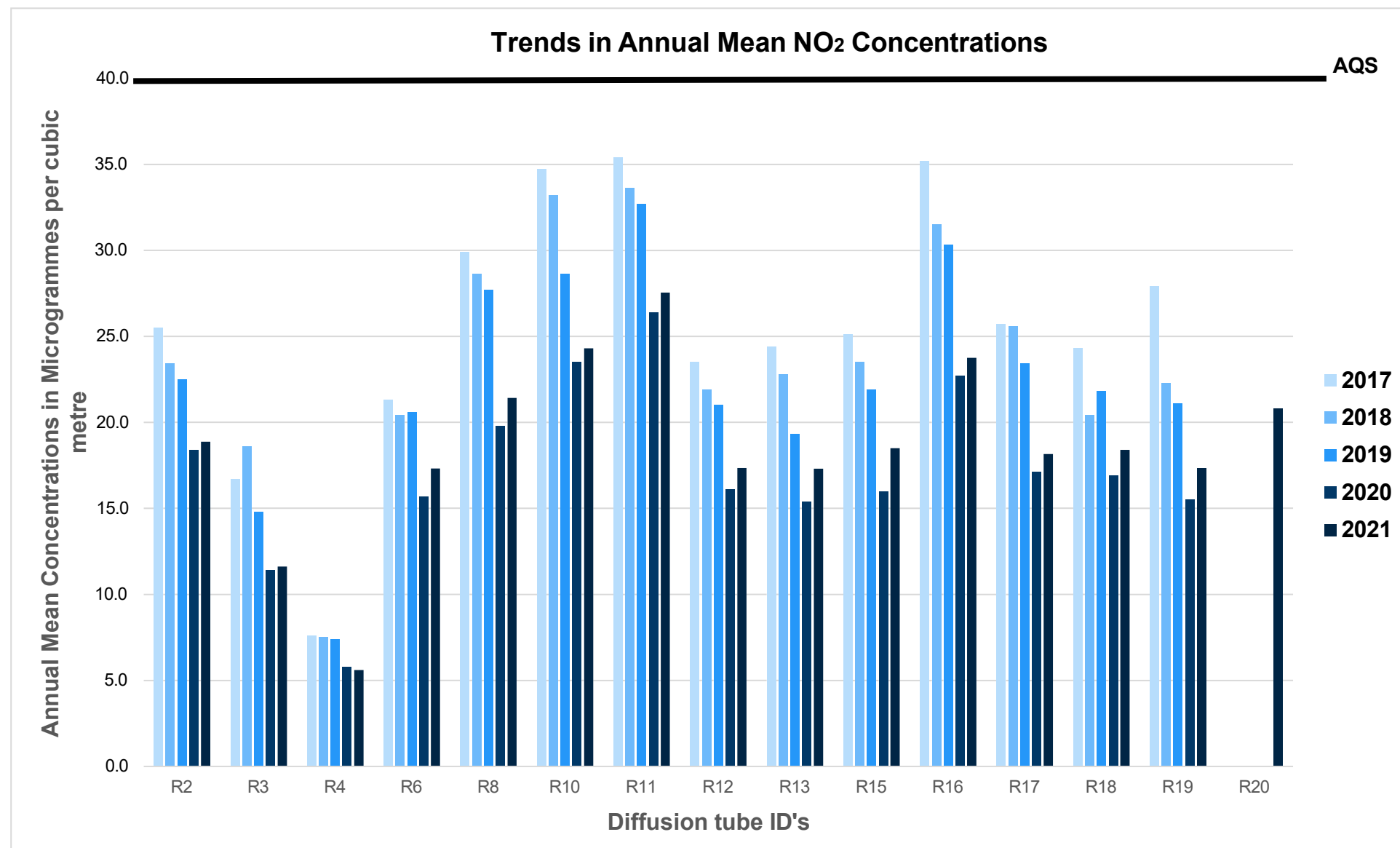
Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO₂ 2021 Diffusion Tube Results (µg/m³)

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted 0.78	Annual Mean: Distance Corrected to Nearest Exposure	Comment
R2	417180	501125	26.1	22.8	19.6	23.9	20.7	21.3	23.4	22.4	27.7	27.4	25.7	29.5	24.2	18.9		
R3	418066	501490	18.8	18.4	11.3	14.2	12.0	11.8	12.5	11.2	17.4	15.9	14.6	20.7	14.9	11.6		
R4	418504	501455	10.5	12.0	5.5	6.0	5.5	3.6	4.4	4.3	6.1	7.3	7.6	13.5	7.2	5.6		
R6	419207	506509	26.2	24.2	20.2	25.9	18.4	17.2	21.6	20.0	25.7	18.5	18.2	30.4	22.2	17.3		
R8	417179	501127	29.4	29.5	24.7	26.5	23.7	23.6	24.6	20.0	29.9	29.6	32.2	35.9	27.5	21.4		
R10	417381	501281	36.6	31.6	29.4	22.0	32.0	28.1	28.6	25.0	34.4	31.4	36.1	38.8	31.2	24.3		
R11	417377	501317	38.9	33.6	27.1	32.2	33.4	33.3	34.9	35.7	41.7	36.3	37.7	39.0	35.3	27.5		
R12	417542	501275	26.5	21.8	18.5	20.9	21.1	18.0	16.4	17.8	26.2	25.2	23.5	31.1	22.3	17.4		
R13	417536	501258	27.5	23.6	20.1	22.0	19.6	18.5	21.0	16.0	24.2	23.1	20.5	30.1	22.2	17.3		
R15	417500	501263	26.9	29.6	18.1	23.7	26.4	18.8	18.8	20.0	27.1	20.4	24.5	30.4	23.7	18.5		
R16	417451	501269	33.8	35.2	25.0	29.9	33.6	25.5	28.1	23.6	35.5	31.4	27.5	36.4	30.5	23.8		
R17	417370	501262	25.8	27.0	18.1	25.9	20.8	20.9	23.5	22.3	29.6	19.1	15.5	30.9	23.3	18.2		
R18	417661	501297	25.6	25.5	16.8	23.1	23.4	20.9	20.4	19.4	29.7	24.7	24.5	29.1	23.6	18.4		
R19	417312	501037	24.3	21.5	22.1	18.6	19.8	19.5	18.8	18.2	22.8	24.3	26.6	29.8	22.2	17.3		
R20	420754	498280	37.9	33.1	26.0	24.4	22.9	19.7	21.4	21.2	26.8	27.8	25.9	33.4	26.7	20.8		

☒ **All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table B.1.**

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

☐ **Local bias adjustment factor used.**

☒ **National bias adjustment factor used.**

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

☒ **Richmondshire District Council confirm that all 2021 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

Notes:

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

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

See Appendix C for details on bias adjustment and annualisation.

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

New or Changed Sources Identified Within Richmondshire District During 2021

Richmondshire District Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Richmondshire District Council During 2021

Richmondshire District Council has not completed any additional works within the reporting year of 2021.

QA/QC of Diffusion Tube Monitoring

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Richmondshire District Council recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance about the application of a bias adjustment factor to correct diffusion tube monitoring. Richmondshire District Council does not undertake automatic monitoring and therefore has not conducted a triplicate co-location study which can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from 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.

Richmondshire District Council have applied a national bias adjustment factor of 0.78 to the 2021 monitoring data. A summary of bias adjustment factors used by Richmondshire District Council over the past five years is presented in Table C.1.

There are systematic differences in the performance of different laboratories and preparation methods of diffusion tubes, therefore the national bias adjustment factor applied for a particular year comes from studies at other local authorities (where diffusion tubes are co-located with automatic monitors), and which use the same:

(i) Tube Supplier

The diffusion tubes used by Richmondshire in 2021 were supplied and analysed by SOCOTEC, Didcot, Oxfordshire.

(ii) Tube Type

The tubes used contain a mesh which is doped with 50% v/v triethanolamine (TEA) and acetone.

A spreadsheet (version Number: 03/22) provided by Defra which contains this information has been used to identify the figure which is relevant for use in the Richmondshire 2021 monitoring data. As such, a national bias adjustment factor of 0.78 has been applied. A copy of the relevant section of the table used to obtain the figure is shown in Table C.2 below.

The diffusion tube samples have been analysed in accordance with SOCOTEC's standard operating procedure ANU/SOP/1015 which meets the guidelines set out in Defra's 'Diffusion Tubes for Ambient NO2 Monitoring: Practical Guidance'. The analysis of the diffusion tube samples to determine the amount of nitrogen dioxide present is within the scope of SOCOTEC's United Kingdom Accreditation Service (UKAS) schedule. In the AIR PT intercomparison scheme for comparing spiked nitrogen dioxide diffusion tubes, SOCOTEC currently holds the highest rank of a 'Satisfactory' laboratory.

Monitoring has been completed in adherence with the 2021 LAQM Diffusion Tube Monitoring Calendar.

Table C.1 – Bias Adjustment Factor

Monitoring Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	National	03/22 (23 Studies)	0.78
2020	National	03/21 (22 studies)	0.77
2019	National	03/20 (24 studies)	0.75
2018	National	03/19 (21 studies)	0.76
2017	National	03/18 (27 studies)	0.77

NO_2 Fall-off with Distance from the Road

Wherever possible, monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure has been 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.

No diffusion tube NO_2 monitoring locations within Richmondshire District Council required distance correction during 2021.

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Table C.2 – Copy of National Diffusion Tube Bias Adjustment Factor Calculation – Version 03/22

National Diffusion Tube Bias Adjustment Factor Spreadsheet										Spreadsheet Version Number: 03/22

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2022
LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data or this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@bureauveritas.com or 0800 0327953

Analysed By[1]	Method	Year[5]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Socotec Didcot	50% TEA in acetone	2021	UB	Gravesham Borough Council	12	23	21	7.9%	G	0.93
Socotec Didcot	50% TEA in acetone	2021	UB	Gravesham Borough Council	11	27	23	18.2%	G	0.85
Socotec Didcot	50% TEA in acetone	2021	R	Horsham District Council	12	27	20	34.5%	G	0.74
Socotec Didcot	50% TEA in acetone	2021	R	Ipswich Borough Council	12	29	23	23.8%	G	0.81
Socotec Didcot	50% TEA in acetone	2021	R	Ipswich Borough Council	12	38	29	33.3%	G	0.75
Socotec Didcot	50% TEA in acetone	2021	UB	Kingston upon Hull City Council	11	24	17	39.7%	G	0.72
Socotec Didcot	50% TEA in acetone	2021	R	Kingston upon Hull City Council	12	30	25	22.9%	G	0.81
SOCOTEC Didcot	50% TEA in acetone	2021	UB	City of York Council	11	17	13	38.2%	G	0.72
SOCOTEC Didcot	50% TEA in acetone	2021	R	City of York Council	12	25	20	27.0%	G	0.79
SOCOTEC Didcot	50% TEA in acetone	2021	R	City of York Council	12	22	17	29.0%	G	0.77
SOCOTEC Didcot	50% TEA in acetone	2021	R	City of York Council	12	37	25	45.5%	G	0.69
SOCOTEC Didcot	50% TEA in acetone	2021	UI	North Lincolnshire Council	12	17	14	19.9%	G	0.83
Socotec Didcot	50% TEA in acetone	2021	R	Bridgend Borough County Council / Shared R	12	36	25	42.9%	G	0.70
Socotec Didcot	50% TEA in acetone	2021	UB	Derry City and Strabane District Council	12	11	9	28.4%	G	0.78
Socotec Didcot	50% TEA in acetone	2021	R	Derry City and Strabane District Council	12	30	30	2.4%	G	0.98
Socotec Didcot	50% TEA in acetone	2021	R	East Suffolk Council	11	30	25	22.3%	P	0.82
Socotec Didcot	50% TEA in acetone	2021	KS	Marylebone Road Intercomparison	10	56	42	32.9%	P	0.75
Socotec Didcot	50% TEA in acetone	2021	R	North East Lincolnshire Council	10	27	29	-7.6%	G	1.08
Socotec Didcot	50% TEA in acetone	2021	R	North East Lincolnshire Council	9	45	33	34.5%	P	0.74
Socotec Didcot	50% TEA in acetone	2021	R	Leeds City Council	13	40	29	35.5%	G	0.74
Socotec Didcot	50% TEA in acetone	2021	KS	Leeds City Council	12	34	25	37.9%	G	0.73
Socotec Didcot	50% TEA in acetone	2021	R	Leeds City Council	9	43	31	40.8%	G	0.71
Socotec Didcot	50% TEA in acetone	2021	UC	Leeds City Council	12	31	23	37.4%	G	0.73
SOCOTEC Didcot	50% TEA in acetone	2021		**Overall Factor[3] (23 studies)**					**Use**	**0.78**

Appendix D: Map(s) of Monitoring Locations

Figure D.1 – Map 1 of Non-Automatic Monitoring Site

Location of diffusion tubes in Richmond (1)
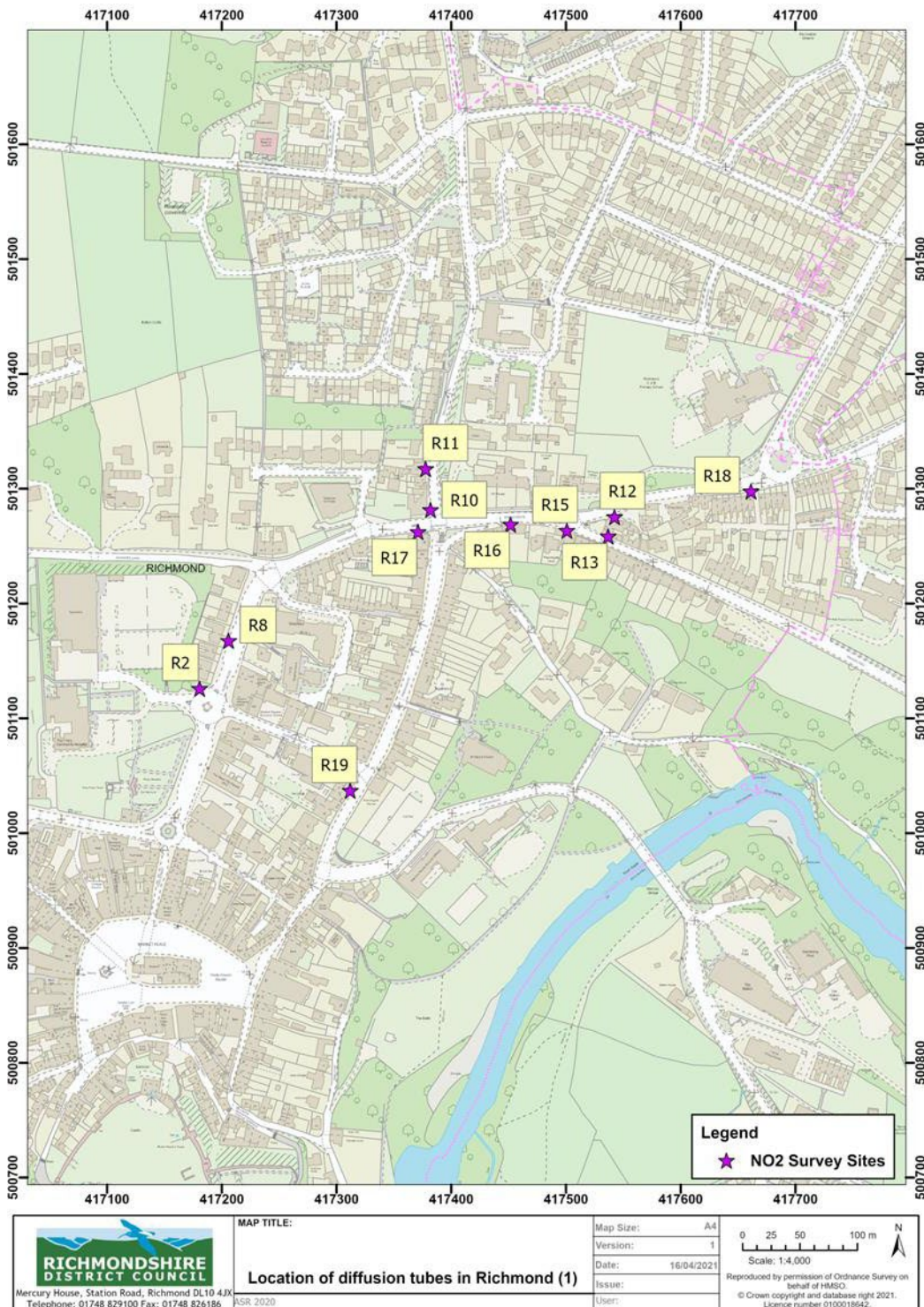
Figure D.2 – Map 2 of Non-Automatic Monitoring Sites
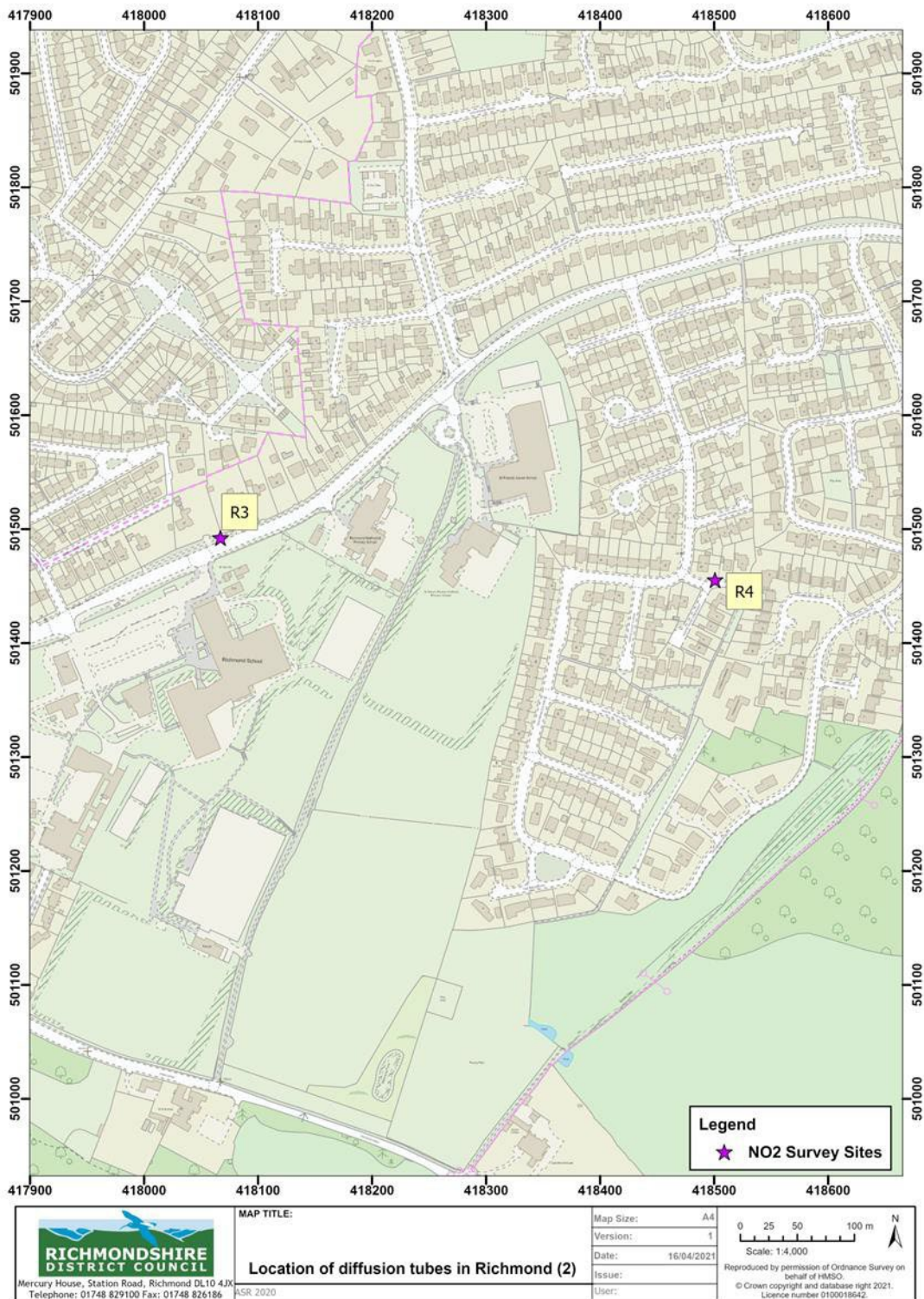
Figure D.3. Map 3 of Non-Automatic Monitoring Site

MAP TITLE:
Location of Diffusion Tube R6

Figure D.4. Map 4 of Non-Automatic Monitoring Site

Location of Diffusion Tube R20
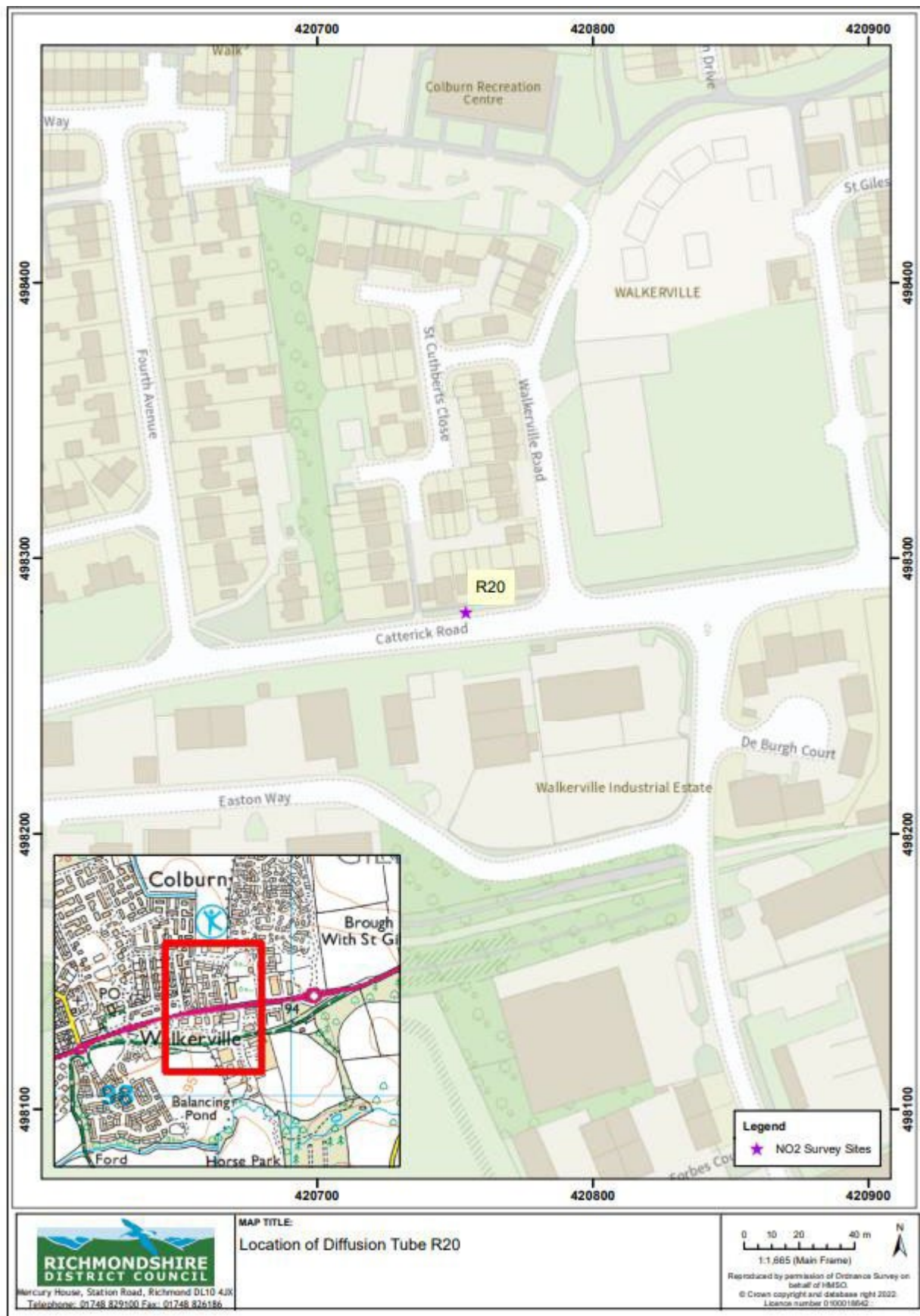
Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[14]

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO$_2$)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO$_2$)	40µg/m^3	Annual mean
Particulate Matter (PM$_{10}$)	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM$_{10}$)	40µg/m^3	Annual mean
Sulphur Dioxide (SO$_2$)	350µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO$_2$)	125µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO$_2$)	266µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[14] 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	Annual Status Report
CPE	Civil Parking Enforcement
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
ERDF	European Regional Development Fund
EU	European Union
EV	Electric Vehicle
LAQM	Local Air Quality Management
LCWIP	Local Cycling and Walking Infrastructure Plans
LEP	Local Enterprise Partnership
LPA	Local Planning Authority
LTP4	Local Transport Plan 4
MoD	Ministry of Defence
NMU	Non-motorised Users
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NYCC / NY	North Yorkshire County Council / North Yorkshire
PHE	Public Health England
PHOF	Public Health Outcomes Framework
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10μm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5μm or less

Abbreviation	Description
QA/QC	Quality Assurance and Quality Control
RDC	Richmondshire District Council
SO_2	Sulphur Dioxide
TBC	To Be Confirmed
TEA	Triethanolamine
UKAS	United Kingdom Accreditation Service
ULEV	Ultra-Low Emission Vehicle
UTC	Urban Traffic Control
YDNP	Yorkshire Dales National Park

References

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

- Defra. Abatement cost guidance for valuing changes in air quality, May 2013.

- Environmental equity, air quality, socioeconomic status, and respiratory health, 2010.

- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.

- North Yorkshire County Council, Local Transport Plan four (LTP4), 2016-2045.

- Richmondshire District Council, Richmondshire Local Plan 2012-2028 Core Strategy, adopted 9 December 2014.

- Yorkshire Dales National Park, Local Plan 2015-2030.