



# Northumberland County Council

2019 Air Quality Annual Status Report (ASR)

## *Northumberland County Council*

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

Date November 2019

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## Executive Summary: Air Quality in Our Area

This is the local air quality Annual Status Report for Northumberland County Council in 2019. The report fulfils this part of the Council's commitment to the continuing Local Air Quality Management (LAQM) process. The report provides an annual update for air quality issues in Northumberland during 2018, including monitoring results for the calendar year.

The main findings for 2018 are:

- The Council is involved in a number of projects which have the aim of improving air quality either directly or indirectly (ie promoting alternative modes of transport, economic, fuel economy, health benefits etc.)
- The Council has continued to monitor air quality at two monitoring stations in Blyth with three real-time, automatic analysers. The results of which have met the national air quality objectives for 2018.
- The Council maintains a network of nitrogen dioxide diffusion tubes across the county which have indicated that none of the monitored locations require more detailed monitoring or investigation.
- PM<sub>2.5</sub> meets the unofficial cap limit (and also meets the stricter objective set in Scotland) at both monitoring stations. One of the monitoring stations is sited next to one of the busiest urban roads in Northumberland, with relevant receptors present.
- Previous feedback from DEFRA on the Annual Status Reports have suggested that where diffusion tube locations did not indicate an issue with nitrogen dioxide, then they should be moved to other locations. Tubes are moved around on a risk based approach to reflect this feedback; however we do have some long-term monitoring location in key locations which are unlikely to ever move. Other tubes are moved on a regular basis.
- The national air quality objectives have been met for annual means and daily exceedances for particulates (PM<sub>10</sub>) and annual mean and hourly exceedances for nitrogen dioxide (NO<sub>2</sub>).

- No further detailed assessment is required for any of the monitored pollutants within Northumberland.
- Northumberland County Council will progress to an LAQM Annual Status Report in 2020 reporting the data collected in 2019.

## **Air Quality in Northumberland County**

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas<sup>1,2</sup>.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion<sup>3</sup>.

For a number of years in succession, the air quality in Northumberland has continued to meet the national air quality objectives and there appears to be a downward trend in both particulates and nitrogen dioxide at the Cowpen Road site and particulates at the Blyth Library site.

Monitoring from 2007 has indicated a trend of decreasing nitrogen dioxide and particulate levels at our monitoring stations. Nitrogen dioxide monitoring ceased at Blyth Library in 2013.

Air quality objectives for NO<sub>2</sub> and PM<sub>10</sub> continue to be met in Northumberland and potential locations with high traffic volumes and relevant receptors are kept under review as future locations for diffusion tubes.

Air quality impacts are routinely addressed through engagement with the planning process, particularly where property developments involve significant changes in road traffic numbers or layout. Generally, compliance with a DMRB air quality screening assessment is required as part of any such application submission.

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<sup>1</sup> Environmental equity, air quality, socioeconomic status and respiratory health, 2010

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

<sup>3</sup> Defra. Abatement cost guidance for valuing changes in air quality, May 2013

The deployment of diffusion tubes (NO<sub>2</sub> and BTEX) has been successively reduced since local government reorganisation in 2009, due to long-term compliance. We no longer employ any BTEX tubes in any location.

The Blyth Air Quality Management Area (AQMA) declared for particulates (PM<sub>10</sub>) was revoked in 2012, as detailed in our 2012 Updating and Screening Assessment. Northumberland currently has no declared Air Quality Management Areas (AQMAs) and based upon monitoring result, there is no indication that any other will be required.

Northumberland County Council's Environmental Protection Team participated in a Local Air Quality Partnership with Rio Tinto (and formerly Alcan) who were operators of the only remaining coal-fired power station in Northumberland. The power station was sold to Energetický a Průmyslový Holding (EPH), a Czech-based company and has been converted biomass with fuel deliveries to the plant commencing in March 2018. The Environment agency are Regulators for the site, but it is hoped that a new air quality partnership will be formed.

The Morpeth Northern Bypass was completed and opened in April 2017. Baseline diffusion tube assessments prior to the bypass opening and a subsequent assessment in Year 1 (2017) have been completed and a further assessment in Year 5 (2021) will be carried out to confirm the prediction model and demonstrate a positive impact for residents within Morpeth. The results of these assessments will be reported in subsequent air quality reports.

Dualling of the A1 north of Morpeth is planned to start in 2020, this is to be carried out by Highways England who manage this road and is likely to take place in two stages; the first being Morpeth to Felton then Alnwick to Brownieside. Air quality is to be addressed in the development, however it is likely that this dualling, once completed, will not result in an increase in traffic but provide a better flow of traffic which is presently restricted by slower vehicles (HGVs, farm vehicles etc.).

Northumberland has no other individual, major commercial air pollution sources other than those controlled through the Environmental Permitting legislation (ie quarries, surface coal mines, painting/coating etc.).

The main impact upon air quality within Northumberland is road traffic which will continue to be monitored at several locations using either automatic or non-automatic methods.

## Actions to Improve Air Quality

Below is a summary of our actions/projects. These are described in more detail in Section 2 of this report and a full list is contained in Table 2.1.

- **Taxi Fleets** - all new taxis in Northumberland to be emission standard Euro 5 (passenger cars) and Euro 4 (light commercial) from 2017 onwards.
- **Biomass Appliances** – to identify commercial biomass appliances through the planning process and require additional information about them.
- **Planning Process** - requirement for an air quality assessment for larger applications where the LAQM trigger vehicle numbers are exceeded.
- **Council Fleet Vehicles** - driver management systems installed to improve overall fuel consumption and emissions, this has now been extended to more fleet vehicles, including “pool cars”. All new fleet vehicles over 3.5 tonne to be either Euro 5 or 6.
- **Agile/Home Working at Northumberland County Council** - enabling staff to work from alternative locations and reduce travel and therefore reduce emissions.
- **Transforming Cities Fund (TCF)** - a bid to central government for up to £377M for the north east to include; £99m earmarked to help restore passenger trains to the railway line running between Newcastle and Northumberland, via Ashington and Blyth and a cycle route between Newcastle Airport, Callerton and Ponteland.
- **Traffic Regulation Orders for Moving Traffic (TROM)** – there is an ongoing programme of introducing urban speed reduction areas in Northumberland with a consequential improvement in emissions from road vehicles.
- **Ongoing Traffic Projects** - a number of other traffic related actions which will improve air quality.
- **The Northumberland Line** – the current administration of Northumberland County Council are pushing ahead longstanding plans to reinstate a passenger

rail service from Newcastle through the south-east of Northumberland with potential stations at Seaton Delaval, Newsham, Bebside, Bedlington and Ashington and a seventh in North Tyneside. The progress of this will be reported in next years' Annual Status Report.

- **Dualling of the A1** – currently two sections of the A1 north of Morpeth; Fairmoor to Felton and Alnwick to Brownside. The progress of this will be reported in next years' Annual Status Report.

## **Conclusions, Local Priorities and Challenges**

No exceedances for any objective for NO<sub>2</sub>, PM<sub>10</sub> or the unofficial “cap” limit for PM<sub>2.5</sub> were identified in Northumberland during 2018.

Northumberland has consistently met national Air Quality Objective (AQO) limits and as such there has been no impetus to develop any air quality action plans or strategies. Momentum now seems to be growing (in conjunction with other regional Authorities and Agencies), towards improving air quality above and beyond AQS limits. It is envisaged that the Environmental Protection Team will play a pivotal role in future co-ordination of projects which have a positive improvement in air quality such as attending the North East Combined Authority (NECA) air quality strategy meeting with Environmental Health professionals and transport planners.

Within our Service plan, there is a priority to proactively engage with internal and external partners to raise awareness of LAQM. Engagement with the Director of Public Health for Northumberland, other council departments, agencies and groups continues to inform and influence decisions where air quality is a consideration.

Areas where further information may be needed are:

- Assessing the impact of small biomass appliances including wood burning stoves within the more populated towns in the county.
- Further engagement with the Director of Public Health, to raise awareness of air quality in relation to the Public Health Outcomes Framework.
- Engaging with other council departments to feed into projects or programmes which have any aspect relating to air quality.

- Raising public awareness of air quality issues through members of the public being able to contact the Environmental Protection Team for information and advice on air quality included on the Council website:

<http://www.northumberland.gov.uk/Protection/Pollution/Air.aspx>

The Public Health Protection Unit webpage content will be reviewed and updated again in 2019.

## **Local Engagement and How to Get Involved**

Members of the public can contact the Public Health Protection Unit for information and advice on air quality using the contact details in the frontispiece of this report and further information is included on the Council website:

<http://www.northumberland.gov.uk/Protection/Pollution/Air.aspx>

Previous annual air quality reports can be found under the “Useful air quality documents” section. There is also a link on the website to live data from the two automatic particulate monitors at Blyth Library and on Cowpen Road, Blyth.



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# 1. Local Air Quality Management

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

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether 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 to document and report the strategies employed by Northumberland County Council to improve air quality and any progress that has been made in the year.

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**

Northumberland County Council does not have any Air Quality Management Areas and there is no current expectation that any would need to be declared in the county.

### **2.2 Progress and Impact of Measures to Address Air Quality in Northumberland County Council**

Northumberland County Council has taken forward a number of measures during 2018 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.2.

Northumberland County Council's priorities for the coming year are to proactively engage with & influence local decisions where air quality impacts may be relevant.

Within the Public Health Protection Unit Service Delivery plan 2019/20, three key priorities are directly related to air improving air quality:

1. Protect and improve public health by proactively ensuring air quality within Northumberland meets national standards through the regulation of permitted industrial premises and the investigation of air pollution incidents.
2. To proactively engage with internal and external partners to raise awareness of Local Air Quality Management. Work in partnership with internal and external bodies to positively influence compliance with National Air Quality Objectives in Northumberland.
3. Respond to planning consultations by the provision of expert technical advice on noise, air quality, land contamination, lighting & private water supplies and attend planning committees as required.

Below is a summary of some of the main actions and projects which improve air quality in Northumberland.

## **Taxis**

Northumberland County Council's Licensing Team currently require that taxis are upgraded to Euro 5 emission standards.

From 1st April 2017 all new vehicles licensed by the Council had to meet the following requirements:

- The Euro 5 Technology standard in respect of passenger cars.
- The Euro 6 Technology standard in respect of light commercial vehicles

The Euro 5 standard now includes an emission limit for particulates.

One of the larger taxi companies in Blyth (Phoenix) have voluntarily moved to a mostly LPG fleet with some electric vehicles.

The North East Strategic Licensing Group (NESLG) have proposed stricter standards to be adopted regionally with the following measures to be adopted:

- 2019 – Euro 6 for new taxis and Euro 4, 5 & 6 and Euro 5 (diesel) allowed to remain in fleet and all pre-Euro 5 (diesel) removed.
- 2020 - Euro 6 for all new taxis and Euro 5 & 6 and Euro 6 (diesel) allowed to remain in fleet and Euro 5 and Euro Petrol 4 (added) removed.
- 2021 – Euro 6 for all new taxis and Euro 5 & 6 and Euro 6 (diesel) allowed to remain in fleet.
- 2022 – Euro 6 & 7 for all new taxis and Euro 5 & 6 and Euro 6 (diesel) allowed to remain in fleet.

It appears that this was agreed by all eleven licensing authorities in the region in June 2018 and adopted to progress with this.

Further details of this will be reported in subsequent Annual Status Reports.

## **Planning Process**

Air quality assessments for larger developments usually include some assessment of air quality impacts, related to any short-term construction and long-term operational phases. These are were previously assessed using the Design Manual for Roads

and Bridges (DMRB) methodology until its withdrawal. Consultants have come in with similar desk top assessments which have been acceptable.

The trigger for requiring an air quality assessment is contained in:

*“Land-Use Planning & Development Control: Planning For Air Quality - Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes. Environmental Protection UK & IAQM, January 2017 (v1.2)”*

### **Biomass Appliances**

The Environmental Protection Team, through their engagement with the planning process, identify planning applications which indicate a biomass combustion component (The Clean Air Act 1993). For such application, an informative is recommended to the Local Planning Authority which indicates the applicant should submit a biomass boiler information form to ensure compliance with the Act.

The Environmental Protection Team, recommend the following biomass informative for all relevant planning applications:

*“For solid fuel biomass appliances with a rated output of greater than 50kW, notification, approval of arrestment and chimney height approval is required under Section 14 of The Clean Air Act 1993 with the Public Protection service at Northumberland County Council. Operation of such an appliance, without agreement may be an offence under the Act. An information form is available to download, complete and return from:*

[http://www.northumberland.gov.uk/Protection/Pollution/Pollution.aspx#pollutioncontro  
l-cleanairactapproval](http://www.northumberland.gov.uk/Protection/Pollution/Pollution.aspx#pollutioncontro<br/>l-cleanairactapproval).

***Please note that this biomass boiler information and requirement does not form part of your application or the decision for your planning permission.”***

This is an ongoing process and will continue to form part of any relevant planning consultation.

## **Fleet Vehicles**

Northumberland County Council undertook a review and major investment in 2018 of the fleet vehicles which were equipped with driver management system and extended the systems used to the entire range of fleet vehicles.

The Council employs three internal driver management systems (Ashwood's Lightfoot, Masternaut and CMS's SupaTrak), which are intended to reduce air emissions by attempting to modify driving styles in their fleet vehicles. These can give voice warnings to the driver where inappropriate driving has occurred (poor gear choices, excessive acceleration etc.) and delivers reports to management where a violation occurs and/or tracks vehicles movements.

The Council's vehicle fleet replacement program also requires all new vehicles over 3.5 tonne to conform to either Euro 5 or Euro 6 emission standard.

## **Agile / Mobile Working at Northumberland County Council**

Northumberland County Council is promoting alternative ways of delivering its services and one of the fundamental changes it is adopting is to allow its staff to work in non-traditional ways. It issued a new Policy in January 2017.

The background to agile working is:

*“Agile working is a way of working in which an organisation empowers its people to work where, when and how they choose – with maximum flexibility and minimum constraints – to optimise their performance and deliver value and customer service.*

*It uses communications and information technology to enable people to work in ways, which best suit their needs without the traditional limitations of where and when tasks must be performed.*

*It is based on the concept that work is an activity we do, rather than a place we go. With the technology available to modern business, there are numerous tools to help us work in new and different ways, to meet customer needs, reduce costs, increase productivity and improve sustainability.*

*Agile working is a transformational tool to allow organisations to work smarter by eliminating all barriers to working efficiently.”*

This is being enabled by providing computer hardware and software which enables access to software and systems to allow normal work to be carried out onsite (ie on inspections, visits) and/or at alternative work locations or even at home.

This has the potential of reducing the distances that staff are required to travel and with a result in reducing fuel consumption and emissions to air.

This is an ongoing project and at the moment, there is no measurable performance indicator for this.

### **The Northumberland County Council Local Transport Plan (2011-2026)**

This is available at:

<http://www.northumberland.gov.uk/Highways/Transport-policy/Transport-plan.aspx>

Among other air quality related issues, the LTP commits Northumberland County Council to:

*“...reducing carbon emissions by 2020, however CO2 emissions from road transport in the North East are forecast to increase. The need to maintain the current good air quality in the county and ensure it is not put at risk by transport emissions”.*

### **Traffic Regulation Orders for Moving Traffic (TROM)**

Northumberland has imposed a number of speed restrictions and one-way traffic controls in 2018 which should all benefit air quality. These include:

- Four one-way traffic schemes.
- Three access restriction schemes.
- Fourteen five new 20 mph speed restrictions (many in relation to school locations).
- Five new 30 mph speed restrictions.
- Two new 40 mph speed restrictions, and;
- Twelve multiple speed restriction schemes.

Details can be found on the following web page:

<http://www.northumberland.gov.uk/Highways/Roads/Traffic.aspx>



## **Ongoing Traffic Projects**

These include:

- Specified HGV routing for quarries / surface mines and timber haulage routes.
- Replacement taxis to meet Euro 5 emissions limits (mandatory from 1st April 2017).
- Promotion and support of homeworking and agile working for staff in council departments.
- Parking enforcement in town centres including rural market towns.
- Fleet vehicles fitted with driving style modifiers / reporting systems (Lightfoot, Masternaut, SupaTrak etc.).
- Offering MOT Vehicles emission testing for Council employees and non-employees.

## **Forecast of Progress**

Northumberland County Council will continue with its established network of air quality monitoring and anticipates compliance with the national air quality objectives across the County in 2019.

## **Funding Sources**

No external sources of funding are used in the management of the Council's local air quality management function.

Table 2.2 – Progress on Measures to Improve Air Quality

| Measure No. | Measure  | EU Category                         | EU Classification  | Organisations involved and Funding Source | Planning Phase | Implementation Phase | Key Performance Indicator | Reduction in Pollutant / Emission from Measure | Progress to Date  | Estimated / Actual Completion Date | Comments / Barriers to Implementation   |
|-------------|--|-------------------------------------|--|---|----------------|----------------------|---------------------------|--|---|------------------------------------|---|
| 1           | For special events (Morpeth Gathering & Fair Day, Tall Ships at Blyth)                                 | Alternatives to private vehicle use | Bus based Park & Ride  | NCC                                       | Various        | Various              | N/A                       | Reduced vehicle emissions                      | N/A   | On going                           | /   |
| 2           | HGV routing used by the LPA for some quarries / surface mine schemes                                   | Freight and Delivery Management     | Route Management Plans/ Strategic routing strategy for HGV's | NCC                                       | Various        | Various              | N/A                       | Reduced vehicle emissions                      | N/A   | On going                           | /   |
| 3           | Informal anti-idling policy through taxi licensing   | Traffic Management                  | Anti-idling enforcement                                      | NCC                                       | /              | /                    | /                         | Reduced vehicle emissions                      | /   | On going                           | /   |
| 4           | Consultation on regional scheme to reduce taxi emissions   | Promoting Low Emission Transport    | Taxi Licensing conditions                                    | NEPPP / NESLG                             | N/A            | TBD                  | N/A                       | Reduced vehicle emissions                      | Agreement reached with all regional Licensing Authorities | TBD                                | <a href="http://committeedocs.northumberland.gov.uk/MeetingDocs/45494_M9539.pdf">http://committeedocs.northumberland.gov.uk/MeetingDocs/45494_M9539.pdf</a> |
| 5           | Home working   | Promoting Travel Alternatives       | Promoting Travel Alternatives                                | NCC                                       | /              | /                    | /                         | Reduced vehicle emissions                      | /   | On going                           | /   |
| 6           | Agile working for NCC staff  | Promoting Travel Alternatives       | Encourage / Facilitate home-working                          | NCC                                       | /              | /                    | N/A                       | Reduced vehicle emissions                      | /   | On going                           | /   |
| 7           | Go Smarter, Cyclescheme offering VAT free cycles with up to 50% of prices with salary sacrifice scheme | Promoting Travel Alternatives       | Promotion of cycling   | NCC                                       | /              | /                    | /                         | Reduced vehicle emissions                      | /   | On going                           | <a href="http://gosmarter.co.uk/">http://gosmarter.co.uk/</a>   |
| 8           | Go Smarter promoting Modeshift STARS   | Promoting Travel Alternatives       | School Travel Plans  | NCC                                       | /              | /                    | /                         | Reduced vehicle emissions                      | /   | On going                           | <a href="http://modeshiftstars.org/">http://modeshiftstars.org/</a>   |
| 9           | Travel planner and cycle routes  | Public Information                  | Via the Internet   | NCC                                       | /              | /                    | /                         | Reduced vehicle emissions                      | /   | On going                           | <a href="http://www.northumberland.gov.uk/Highways/Cycling.aspx">http://www.northumberland.gov.uk/Highways/Cycling.aspx</a>                                 |

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|----|---|---------------------------------------|--|------|-----|-----|---|---------------------------|--|----------|---|
| 10 | 20mph zones imposed in many residential areas especially surrounding schools  | Traffic Management                    | Reduction of speed limits, 20mph zones                 | NCC  | /   | /   | /   | Reduced vehicle emissions | /  | On going | <a href="http://www.northumberland.gov.uk/Highways/Roads/Traffic.aspx#4trafficregulationorderrepaired">http://www.northumberland.gov.uk/Highways/Roads/Traffic.aspx#4trafficregulationorderrepaired</a> |
| 11 | Parking enforcement on highways carried out by Council  | Traffic Management                    | Workplace Parking Levy, Parking Enforcement on highway | NCC  | /   | /   | /   | /                         | N/A  | On going | <a href="http://www.northumberland.gov.uk/Highways/Parking.aspx#civilparking enforcement">http://www.northumberland.gov.uk/Highways/Parking.aspx#civilparking enforcement</a>                           |
| 12 | Several cycle networks, including; Coast & Castles, Pennine Cycleway, Reivers Route and Hadrian's Cycleway. Several others which aren't part of the Sustrans network. | Transport Planning and Infrastructure | Cycle network  | NCC  | /   | /   | /   | /                         | /  | On going | <a href="http://www.northumberland.gov.uk/Highways/Cycling.aspx">http://www.northumberland.gov.uk/Highways/Cycling.aspx</a>   |
| 13 | All fleet vehicles fitted with Lightfoot, Masternaut and SupaTrak systems to encourage more efficient driving styles.   | Vehicle Fleet Efficiency              | Driver training and ECO driving aids                   | NCC  | N/A | /   | N/A                                       | Reduced vehicle emissions | Estimated 7% saving in fuel costs from use of system | On going | <a href="https://www.lightfoot.co.uk/case-study/northumberland-county-council">https://www.lightfoot.co.uk/case-study/northumberland-county-council</a>   |
| 14 | Over 800 fleet vehicles fitted with Masternaut vehicle tracking   | Vehicle Fleet Efficiency              | Driver training and ECO driving aids                   | NCC  | N/A | /   | N/A                                       | Reduced vehicle emissions | /  | On going | <a href="http://www.masternaut.com/">http://www.masternaut.com/</a>   |
| 15 | Bid for Euro 6 buses  | Vehicle Fleet Efficiency              | Promoting Low Emission Public Transport                | NECA | /   | /   | /   | /                         | /  | On going | <a href="http://www.simplygo.com/news/greener-cleaner-buses-for-go-north-east/">http://www.simplygo.com/news/greener-cleaner-buses-for-go-north-east/</a>   |
| 16 | Vehicle emission testing as part of fleet MOT testing, all taxis and service to public  | Vehicle Fleet Efficiency              | Testing Vehicle Emissions                              | NCC  | N/A | N/A | N/A                                       | /                         | /  | On going | <a href="http://www.northumberland.gov.uk/Highways/Roads/Commercial.aspx#mottesting">http://www.northumberland.gov.uk/Highways/Roads/Commercial.aspx#mottesting</a>                                     |
| 17 | Proactively engage with internal and external partners to raise awareness of Local Air Quality Management   | Public Information                    | Via other mechanisms                                   | NCC  | /   | /   | Internal KPI / Stakeholder Engagement Day | /                         | /  | Annual   | /   |

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|    |  |   |  |      |     |            |  |                           |     |           |   |
|----|--|---|--|------|-----|------------|--|---------------------------|-----|-----------|---|
| 18 | Agile working for NCC staff  | Promoting Travel Alternatives           | Encourage / Facilitate home-working  | NCC  | /   | /          | N/A  | Reduced vehicle emissions | /   | On going  | /   |
| 19 | Planning Consultations - requirement for AQ assessments  | Other                                   | Other  | NCC  | /   | /          | Internal KPI for planning consultations      | /                         | N/A | Ongoing   | /   |
| 20 | Liaise with the Director for Public Health for Northumberland on issues and measures to improve AQ | Other Policy                            | Policy Guidance and Development Control  | NCC  | N/A | N/A        | N/A  | /                         | /   | On going  | <a href="https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Health-and-social-care/Public%20Health/2018-Director-of-Public-Health-Annual-Report-Mental-Wealth.pdf">https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Health-and-social-care/Public%20Health/2018-Director-of-Public-Health-Annual-Report-Mental-Wealth.pdf</a> |
| 21 | Bids for funding to improve bus fleet vehicles   | Policy Guidance and Development Control | Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality | NECA | /   | /          | /  | Reduced vehicle emissions | /   | Completed | Bid by Newcastle and Sunderland city councils – however bus fleet enters Northumberland   |
| 22 | Go Smarter   | Promoting Travel Alternatives           | Personalised Travel Planning   | NCC  | /   | 2012       | /  | Reduced vehicle emissions | /   | Completed | From LSTF funding.<br><a href="http://gosmarter.co.uk/">http://gosmarter.co.uk/</a>   |
| 23 | All taxis to be EURO 5   | Promoting Low Emission Transport        | Taxi emission incentives   | NCC  | N/A | Up to 2017 | Complete conversion of taxi fleets to Euro 5 | Reduced vehicle emissions | /   | Completed | <a href="http://www.northumberland.gov.uk/Business/Licences/Taxi.aspx">http://www.northumberland.gov.uk/Business/Licences/Taxi.aspx</a>   |

## 2.3 PM<sub>2.5</sub> – 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<sub>2.5</sub> (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that PM<sub>2.5</sub> has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Within the Northumberland County Council area the annual “cap” limit of 25 µg/m<sup>3</sup> at the roadside of one of the county’s busiest urban roads (A193 - Cowpen Road, Blyth) is comfortably met.

The Authority invested in new monitoring equipment in 2013 in anticipation that monitoring of PM<sub>2.5</sub> was to become a mandatory requirement of LAQM. However, as TG16 states:

*“...PM<sub>2.5</sub> is still not incorporated into LAQM Regulations, and therefore there is no statutory requirement to review and assess PM<sub>2.5</sub> for LAQM purposes (except now in Scotland). Whilst an increase in PM<sub>2.5</sub> monitoring across the UK is desirable given the links to the Public Health Outcomes Frameworks, it is also recognised that the costs involved can be prohibitive.”*

Northumberland County Council is taking the following measures to address PM<sub>2.5</sub>:

- Continuing to monitor PM<sub>2.5</sub> at specific locations in Northumberland
- Reporting the levels of PM<sub>2.5</sub> at these locations on an annual basis.
- Monitoring for any exceedance of the “cap” limit of 25 µg/m<sup>3</sup>.
- Continuing to instigate and support initiatives which directly or indirectly improve air quality within Northumberland.
- Initiate better engagement with the Director of Public Health in Northumberland and look towards better integration of air quality and the Public Health Outcomes Framework.

Five years of PM<sub>2.5</sub> monitoring data adjacent to Cowpen Road and Blyth Library has shown compliance with the “cap” limit of 25 µg/m<sup>3</sup> and also compliance with the stricter 10 µg/m<sup>3</sup> objective imposed in Scotland.

Key indicators of the state of public health have been developed through the Public Health Outcomes Framework (PHOF) following the Health and Social Care Act 2012. The Public Health Outcomes Framework data tool, compiled by Public Health England, includes an indicator applicable to air pollution. Indicator 3.01: Fraction of mortality attributable to particulate air pollution; provides data on the mortality burden of PM<sub>2.5</sub> within England and on a region and county/local authority scale. The fraction of mortality attributable to PM<sub>2.5</sub> pollution across England is 5.1 per cent (2017 data), the fraction within the North East region is 3.7 per cent and the fraction within Northumberland County is 3.2 per cent. The North East region has the lowest level within England and Northumberland has the lowest within the North East Region.

DEFRA background maps for PM<sub>2.5</sub> (2018) provide a useful tool for looking at the rest of the County as a whole, which correlates with the approach that there are no modelled levels of PM<sub>2.5</sub> above 10 µg/m<sup>3</sup> in Northumberland.

This position may be revised if the reviewing and assessing of PM<sub>2.5</sub> become a statutory requirement.

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

### **3.1 Summary of Monitoring Undertaken**

#### **3.1.1 Automatic Monitoring Sites**

Northumberland County Council continues to operate two automatic (realtime) monitoring stations at two sites during 2018. Table A.1 in Appendix A shows the details of the sites.

The Authority also act as LSOs on behalf of DEFRA for a poly-aromatic hydrocarbon (PAH) Digitel (solid phase) monitor on the AURN network at Lynemouth. National monitoring results for this PAH sampler is available at:

[https://uk-air.defra.gov.uk/networks/site-info?uka\\_id=UKA00556](https://uk-air.defra.gov.uk/networks/site-info?uka_id=UKA00556)

Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

Maps showing the location of all monitoring sites are provided in Appendix D.

#### **3.1.2 Non-Automatic Monitoring Sites**

Northumberland County Council deployed passive diffusion tube monitoring for NO<sub>2</sub> at 19 sites during 2018.

Table A.2 in Appendix A shows the details of these non-automatic sites.

Maps showing the location of all monitoring sites are provided in Appendix D.

Results of the annual average nitrogen dioxide levels have been bias adjusted (using national bias factors), annualised (where required) and distance corrected to the nearest receptors using the guidance document NO<sub>2</sub> Concentrations and Distance from Roads, Air Quality Consultants (ref 504/1/F1 Issue No. 3 dated 18<sup>th</sup> July 2008). Details of this are shown in Appendix C.

Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

## 3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, “annualised” and/or adjusted for bias. Further details on these adjustments are provided in Appendix G.

### 3.2.1 Nitrogen Dioxide (NO<sub>2</sub>)

Northumberland County Council maintains one automatic nitrogen dioxide monitor at the Cowpen Road site. No service contract is in place for this instrument and it is the intention to decommission this instrument should it malfunction in the future. Data capture for this instrument in 2018 was 93.9 per cent.

The measured annual mean for this instrument in 2018 was 27.7  $\mu\text{g}/\text{m}^3$ , the annual mean objective for this pollutant is 40  $\mu\text{g}/\text{m}^3$ .

The number of measured exceedances of the 1-hour mean objective (200  $\mu\text{g}/\text{m}^3$ ) limit in 2018 was zero.

For NO<sub>2</sub> diffusion tubes, the highest bias-adjusted NO<sub>2</sub> annual mean was 30.8  $\mu\text{g}/\text{m}^3$  of all the monitoring sites which falls well below the 60  $\mu\text{g}/\text{m}^3$  annual mean which would indicate an exceedance of the 1-hour mean objective for NO<sub>2</sub>. The highest bias-adjusted and distance corrected annual mean was 30.0  $\mu\text{g}/\text{m}^3$ .

Table A.3 in Appendix A compares the monitored NO<sub>2</sub> annual mean concentrations for the past five years with the air quality objective of 40  $\mu\text{g}/\text{m}^3$ .

Table A.4 in Appendix A compares the monitored NO<sub>2</sub> hourly mean concentrations from the automatic monitor for the past five years with the hourly mean objective of 200  $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 18 times per year.

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in Appendix B.



Figure A.1 in Appendix A shows the trend of automatically monitored NO<sub>2</sub> annual averages over the past thirteen years including a linear regression line for the two stations over that time.

Figure A.2 in Appendix A shows the trend of diffusion tube monitored NO<sub>2</sub> annual averages over the past thirteen years including a linear regression line for annual average over that time.

Figure A.3 in Appendix A shows the trend of diffusion tube monitored NO<sub>2</sub> annual minimum, average and maxima over the past thirteen years including a linear regression line for the annual average over that time.

Only data from sixteen of the longest running diffusion tube sites have been used for Figures A.2 and A.3. Prior to Local Government Reorganisation in 2009, the former Blyth Valley Borough Council employed a great number of diffusion tubes with a proportion of them being “urban background” tubes and this inclusion of these in the statistical descriptors and the linear regression affects the overall pattern of a reduction in the measured NO<sub>2</sub>. Indeed, most of the tubes are now stationed at affected sites close to main roads and none of the tubes are placed in background locations. These tubes were gradually phased out of the monitoring programme and the tubes now deployed are targeted to roadside locations to monitor air quality impacts from road traffic.

For background levels, DEFRA’s air quality background maps are referred to.

### **3.2.2 Particulate Matter (PM<sub>10</sub>)**

Northumberland County Council maintains two automatic particulate monitors at the Cowpen Road and Blyth Library sites, both instruments have comprehensive service contracts in place and are returned to Turnkey Instruments for service and calibration annually. Data capture for the Cowpen Road and Blyth Library sites in 2018 was 87.9 and 30.6 per cent, respectively. The data capture for the Library site was impacted by continuing failure of the circuit breaker on the electrical connection to the unit which required external contractors to fault find and repair.

These are indicative monitors and were, in part, purchased to replace older equipment specifically when it was indicated that monitoring of PM<sub>2.5</sub> was to become

a requirement in England. Additionally, changes at one monitoring site specifically required a post-mounted solution which none of the alternatives could achieve.

The Osiris monitors are not “accredited” and were not considered as candidate instruments in the DEFRA UK equivalence program, however the DEFRA equivalence scheme is now over 12 years old and not relevant to many particulate monitors commercially available now. Osiris monitors from unit TNO2296 onwards are MCerts certified in the measurement range of 0 to 100  $\mu\text{g}/\text{m}^3$  (Sira MC090157/05).

Turnkey have carried out their own demonstration of equivalence of the Osiris monitors for PM<sub>10</sub> in accordance with CEN EN 12341:

<http://www.turnkey-instruments.com/images/documents/Osiris-PM10-Equivalence.pdf>

This has shown that “...*the expanded relative uncertainty of the OSIRIS instruments when compared to the CEN reference method is 15.7%. This is much better than the 25% maximum measurement uncertainty required to meet the performance requirements of the EU Air Quality Directive 2008/50/EC*”.

The annual mean for the Cowpen Road Osiris in 2018 was 15.6  $\mu\text{g}/\text{m}^3$ . The annual mean for the Blyth Library Osiris in 2018 was 15.5  $\mu\text{g}/\text{m}^3$  (annualised to 13.9  $\mu\text{g}/\text{m}^3$ ). The annual mean objective for this pollutant is 40  $\mu\text{g}/\text{m}^3$ .

The number of measured exceedances of the 24-hour mean objective (50  $\mu\text{g}/\text{m}^3$ ) for the Cowpen Road Osiris in 2018 was one (the objective being 35 or less exceeds of the 50  $\mu\text{g}/\text{m}^3$  limit).

The number of measured exceedances of the 24-hour mean objective (50  $\mu\text{g}/\text{m}^3$ ) for the Blyth Library Osiris in 2018 was one (the objective being 35 or less exceeds of the 50  $\mu\text{g}/\text{m}^3$  limit). Since data capture was below 85 per cent, the 90.4th percentile was calculated as 31.2, well below the 50  $\mu\text{g}/\text{m}^3$  limit.

Table A.5 in Appendix A compares the monitored PM<sub>10</sub> annual mean concentrations for the past five years with the annual mean objective of 40  $\mu\text{g}/\text{m}^3$ .

Table A.6 in Appendix A compares the monitored PM<sub>10</sub> daily mean concentrations for the past five years with the daily mean objective of 50 µg/m<sup>3</sup>, not to be exceeded more than 35 times per year.

### **3.2.3 Fine Particulate Matter (PM<sub>2.5</sub>)**

Table A.7 in Appendix A presents the monitored PM<sub>2.5</sub> annual mean concentrations for the past four years.

The annual mean for the Cowpen Road Osiris in 2018 was 6.7 µg/m<sup>3</sup>. The annual mean for the Blyth Library Osiris in 2018 was 7.3 µg/m<sup>3</sup> (annualised to 6.7 µg/m<sup>3</sup>). The unofficial “cap” annual mean objective for PM<sub>2.5</sub> is 25 µg/m<sup>3</sup>.

These results are very similar to previous years and substantially below the “cap” limit of 25 µg/m<sup>3</sup> and below the limit set in Scotland for PM<sub>2.5</sub>.

### **3.2.4 Sulphur Dioxide (SO<sub>2</sub>)**

Northumberland County Council no longer monitors for sulphur dioxide.

## Appendix A: Monitoring Results

**Table A.1 – Details of Automatic Monitoring Sites**

| Site ID | Site Name     | Site Type    | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored   | In AQMA? | Monitoring Technique              | Distance to Relevant Exposure (m) <sup>(1)</sup> | Distance to kerb of nearest road (m) <sup>(2)</sup> | Inlet Height (m) |
|---------|---------------|--------------|---------------|---------------|------------------------|----------|-----------------------------------|--|---|------------------|
| BL      | Blyth Library | Urban Centre | 431536        | 581531        | PM10;<br>PM2.5         | NO       | Nephelometer                      | 3  | 3   | 3                |
| CR      | Cowpen Road   | Roadside     | 428817        | 581815        | PM10;<br>PM2.5;<br>NO2 | NO       | Nephelometer;<br>Chemiluminescent | 3  | 3   | 3                |

**Notes:**

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

(2) N/A if not applicable.

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

| Site ID | Site Name                          | Site Type    | X OS Grid Ref | Y OS Grid Ref | Pollutants Monitored | In AQMA? | Distance to Relevant Exposure (m) <sup>(1)</sup> | Distance to kerb of nearest road (m) <sup>(2)</sup> | Tube collocated with a Continuous Analyser? | Height (m) |
|---------|------------------------------------|--------------|---------------|---------------|----------------------|----------|--|---|---|------------|
| 8N      | Bondgate Without, Alnwick          | Roadside     | 419025        | 613070        | NO <sub>2</sub>      | NO       | 2  | 2   | NO  | 3          |
| B1      | Waterloo Road, Blyth               | Urban Centre | 431537        | 581537        | NO <sub>2</sub>      | NO       | 28   | 1   | NO  | 3          |
| B3      | Cowpen Rd. West, Blyth             | Roadside     | 428815        | 581813        | NO <sub>2</sub>      | NO       | 13.5   | 2   | YES   | 3          |
| BER1    | 32 Castlegate, Berwick             | Roadside     | 399596        | 653213        | NO <sub>2</sub>      | NO       | 1  | 2   | NO  | 1.5        |
| B11     | Blyth YCMA, Blyth                  | Urban Centre | 431160        | 581415        | NO <sub>2</sub>      | NO       | 2  | 1   | NO  | 3          |
| CM8     | Entrance to Cecil Court, Ponteland | Urban Centre | 416820        | 572840        | NO <sub>2</sub>      | NO       | 21   | 1.5   | NO  | 3          |
| B15     | South Newsham Road, Blyth          | Roadside     | 430552        | 578950        | NO <sub>2</sub>      | NO       | 8  | 1.7   | NO  | 3          |
| C1      | High Pit Road, Cramlington         | Roadside     | 427593        | 576555        | NO <sub>2</sub>      | NO       | 4  | 1.7   | NO  | 3          |
| BER2    | Prince Edward Road, Tweedmouth     | Roadside     | 399345        | 625512        | NO <sub>2</sub>      | NO       | 11   | 1   | NO  | 2.5        |
| HEX1    | 4 Haugh Lane, Hexham               | Roadside     | 393684        | 564214        | NO <sub>2</sub>      | NO       | 1  | 1.5   | NO  | 2          |
| C11     | Storey Street (B1505), Cramlington | Roadside     | 427523        | 576136        | NO <sub>2</sub>      | NO       | 8  | 1.7   | NO  | 3          |
| CM2     | Newgate St, Morpeth                | Roadside     | 419525        | 586380        | NO <sub>2</sub>      | NO       | 1  | 1   | NO  | 1.5        |
| CM4     | Bridge St, Morpeth                 | Roadside     | 419947        | 585937        | NO <sub>2</sub>      | NO       | 70   | 3   | NO  | 3          |
| CM5     | Thorpe Ave, Morpeth                | Roadside     | 420134        | 586329        | NO <sub>2</sub>      | NO       | 9  | 1.7   | NO  | 2          |
| HALT1   | Westgate Road, Haltwhistle         | Roadside     | 370647        | 564060        | NO <sub>2</sub>      | NO       | 17   | 1   | NO  | 1.5        |
| B16     | 24 Cowpen Road                     | Roadside     | 430666        | 581604        | NO <sub>2</sub>      | NO       | 7  | 2   | NO  | 2          |
| W17     | Front Street East, Bedlington      | Urban Centre | 426014        | 581879        | NO <sub>2</sub>      | NO       | 20   | 1   | NO  | 3          |
| W21     | Newbiggin Road, Ashington          | Roadside     | 427939        | 586210        | NO <sub>2</sub>      | NO       | 5  | 1   | NO  | 2.5        |
| SD1     | Salvation Army, Seaton Delaval     | Roadside     | 430387        | 575433        | NO <sub>2</sub>      | NO       | 6  | 1.7   | NO  | 3          |

**Notes:**

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO<sub>2</sub> Monitoring Results

| Site ID | Site Type    | Monitoring Type | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2018 (%) <sup>(2)</sup> | NO <sub>2</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup> |            |            |                       |      |
|---------|--------------|-----------------|---|--|---|------------|------------|-----------------------|------|
|         |              |                 |   |  | 2014  | 2015       | 2016       | 2017                  | 2018 |
| CR      | Roadside     | Automatic       | 100   | 93.9                                       | 22  | 25         | 18         | <b><u>17 (18)</u></b> | 28   |
| 8N      | Roadside     | Diffusion Tube  | 92  | 92   | 30  | 30         | 31         | 31                    | 27   |
| B1      | Urban Centre | Diffusion Tube  | 75  | 100  | 27  | 29         | 31         | 31                    | 30   |
| B3      | Roadside     | Diffusion Tube  | 100   | 100  | 32  | 32         | 23         | 22                    | 31   |
| BER1    | Roadside     | Diffusion Tube  | 100   | 75   | <u>N/A</u>  | <u>N/A</u> | <u>N/A</u> | <u>N/A</u>            | 18   |
| B11     | Urban Centre | Diffusion Tube  | 100   | 100  | 26  | 26         | 27         | 27                    | 22   |
| CM8     | Urban Centre | Diffusion Tube  | 100   | 83   | 24  | 24         | 21         | 18                    | 20   |
| B15     | Roadside     | Diffusion Tube  | 100   | 100  | 20  | 19         | 24         | 22                    | 18   |
| C1      | Roadside     | Diffusion Tube  | 92  | 92   | 25  | 23         | 20         | 23                    | 24   |
| BER2    | Roadside     | Diffusion Tube  | 100   | 75   | <u>N/A</u>  | <u>N/A</u> | <u>N/A</u> | <u>N/A</u>            | 14   |
| HEX1    | Roadside     | Diffusion Tube  | 100   | 75   | <u>N/A</u>  | <u>N/A</u> | <u>N/A</u> | <u>N/A</u>            | 29   |
| C11     | Roadside     | Diffusion Tube  | 100   | 100  | 22  | 19         | 20         | 16                    | 19   |
| CM2     | Roadside     | Diffusion Tube  | 100   | 100  | 23  | 19         | 24         | 25                    | 16   |
| CM4     | Roadside     | Diffusion Tube  | 100   | 100  | 26  | 22         | 21         | 26                    | 21   |
| CM5     | Roadside     | Diffusion Tube  | 100   | 100  | <u>N/A</u>  | 21         | 26         | 22                    | 17   |
| HALT1   | Roadside     | Diffusion Tube  | 100   | 67   | <u>N/A</u>  | <u>N/A</u> | <u>N/A</u> | <u>N/A</u>            | 13   |
| B16     | Roadside     | Diffusion Tube  | 100   | 67   | <u>N/A</u>  | <u>N/A</u> | <u>N/A</u> | <u>N/A</u>            | 24   |
| W17     | Urban Centre | Diffusion Tube  | 92  | 92   | 28  | 20         | 23         | 24                    | 23   |
| W21     | Roadside     | Diffusion Tube  | 100   | 100  | 19  | 24         | 25         | 24                    | 20   |
| SD1     | Roadside     | Diffusion Tube  | 92  | 92   | 25  | 25         | 27         | 23                    | 23   |

Diffusion tube data has been bias corrected.

Annualisation has been conducted where data capture is <75%.

**Notes:**

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

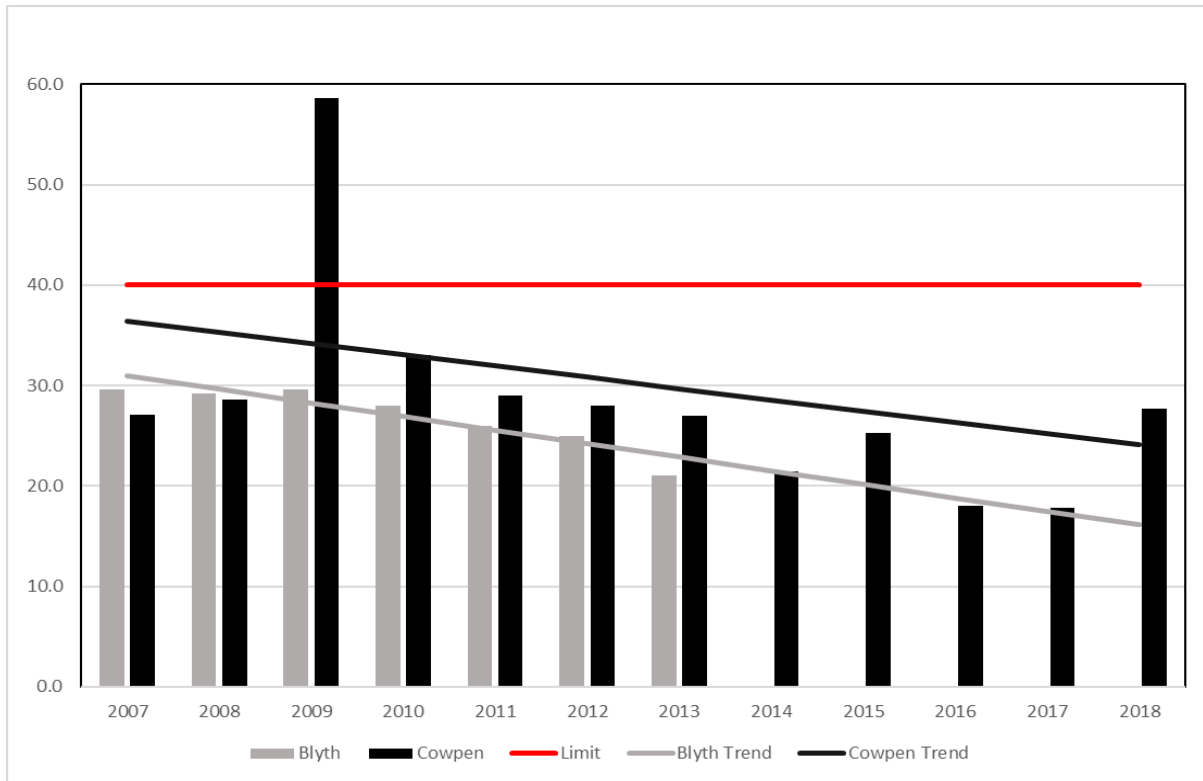
NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

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

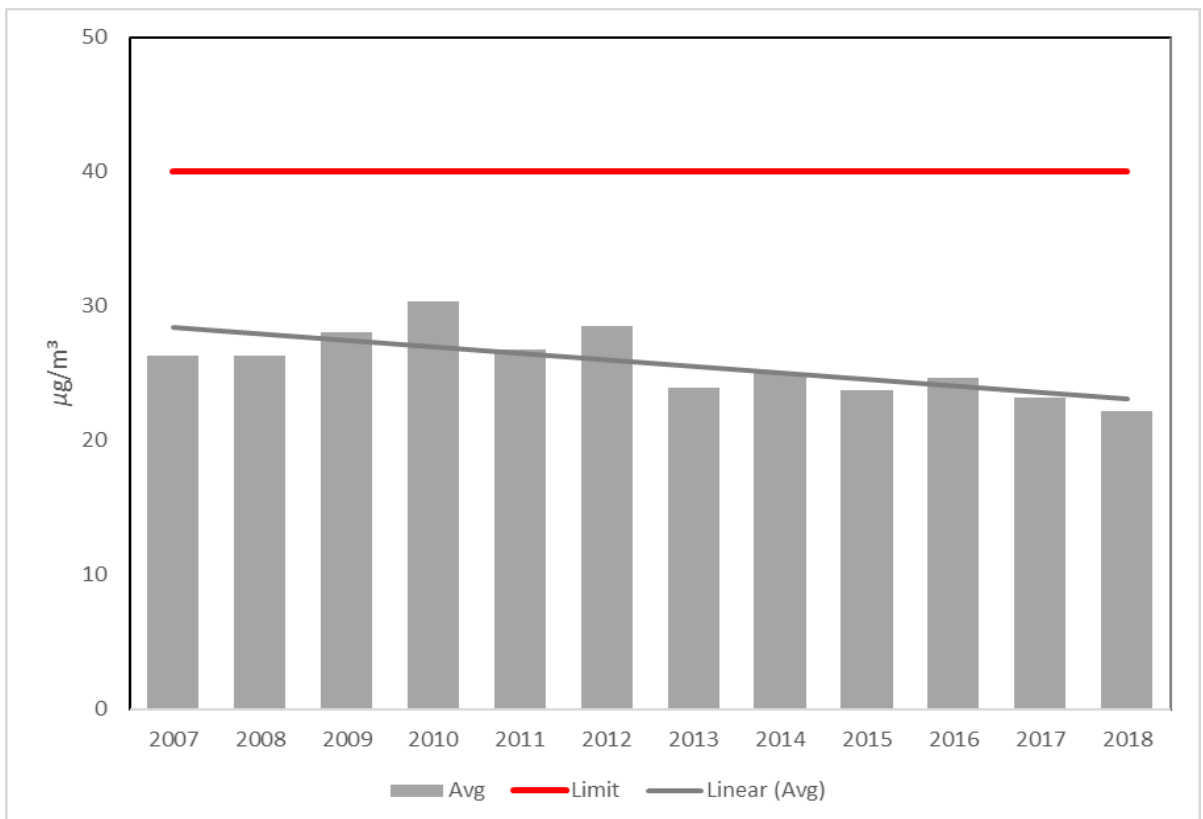
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

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

**Figure A.1 – Trends in Annual Mean NO<sub>2</sub> Concentrations (automatic monitors)**

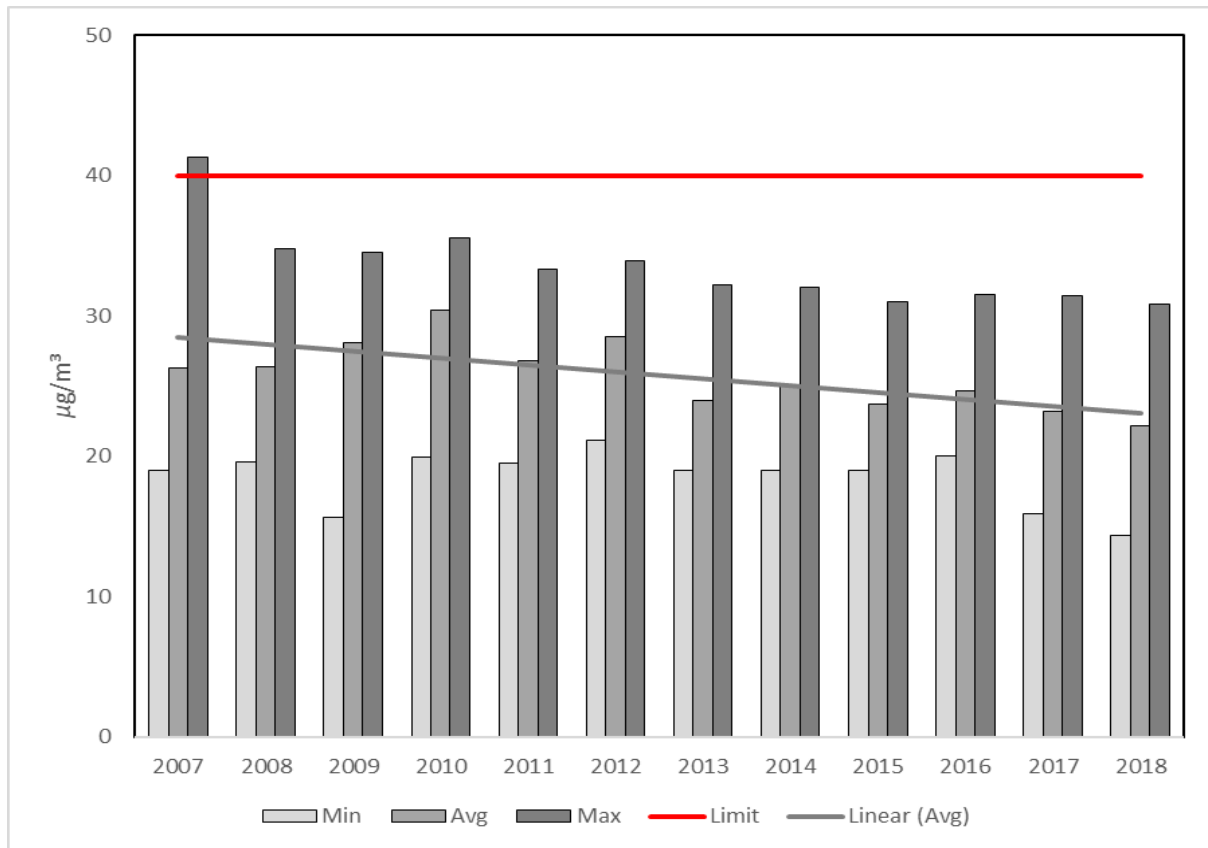


**Figure A.2 – Trends in Annual Mean NO<sub>2</sub> Concentrations (diffusion tubes) \***



\* Using data from the sixteen of the longest running diffusion tube sites.

**Figure A.3 – Trends in Annual Minimum Mean and Maximum NO<sub>2</sub> Concentrations (diffusion tubes) \***



\* Using data from the sixteen of the longest running diffusion tube sites.

**Table A.4 – 1-Hour Mean NO<sub>2</sub> Monitoring Results**

| Site ID | Site Type | Monitoring Type | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2018 (%) <sup>(2)</sup> | NO <sub>2</sub> 1-Hour Means > 200µg/m <sup>3</sup> <sup>(3)</sup> |      |      |               |      |
|---------|-----------|-----------------|---|--|--|------|------|---------------|------|
|         |           |                 |   |  | 2014   | 2015 | 2016 | 2017          | 2018 |
| CR      | Roadside  | Automatic       | N/A   | 93.9                                       | <b>0 (107)</b>   | 0    | 0    | <b>0 (87)</b> | 0    |

**Notes:**

Exceedances of the NO<sub>2</sub> 1-hour mean objective (200µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in **bold**.

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

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

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

**Table A.5 – Annual Mean PM<sub>10</sub> Monitoring Results**

| Site ID | Site Type    | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2018 (%) <sup>(2)</sup> | PM <sub>10</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup> |         |             |             |             |
|---------|--------------|---|--|--|---------|-------------|-------------|-------------|
|         |              |   |  | 2014   | 2015    | 2016        | 2017        | 2018        |
| BL      | Urban Centre | N/A   | 30.6                                       | 15   | 13      | 17.9 (17.6) | 13.4 (14.8) | 15.5 (16.5) |
| CR      | Roadside     | N/A   | 87.9                                       | 14 (14)  | 14 (13) | 15          | 13.5 (15.3) | 15.6        |

Annualisation has been conducted where data capture is <75%.

**Notes:**

Exceedances of the PM<sub>10</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

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

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

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

**Table A.6 – 24-Hour Mean PM<sub>10</sub> Monitoring Results**

| Site ID | Site Type    | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2018 (%) <sup>(2)</sup> | PM <sub>10</sub> 24-Hour Means > 50µg/m <sup>3</sup> <sup>(3)</sup> |       |       |        |        |
|---------|--------------|---|--|---|-------|-------|--------|--------|
|         |              |   |  | 2014  | 2015  | 2016  | 2017   | 2018   |
| BL      | Urban Centre | N/A   | 30.6                                       | 6   | 2     | 8(32) | 4 (30) | 1 (28) |
| CR      | Roadside     | N/A   | 87.9                                       | 2(22)   | 2(22) | 0     | 0 (30) | 1      |

**Notes:**

Exceedances of the PM<sub>10</sub> 24-hour mean objective (50µg/m<sup>3</sup> not to be exceeded more than 35 times/year) are shown in **bold**.

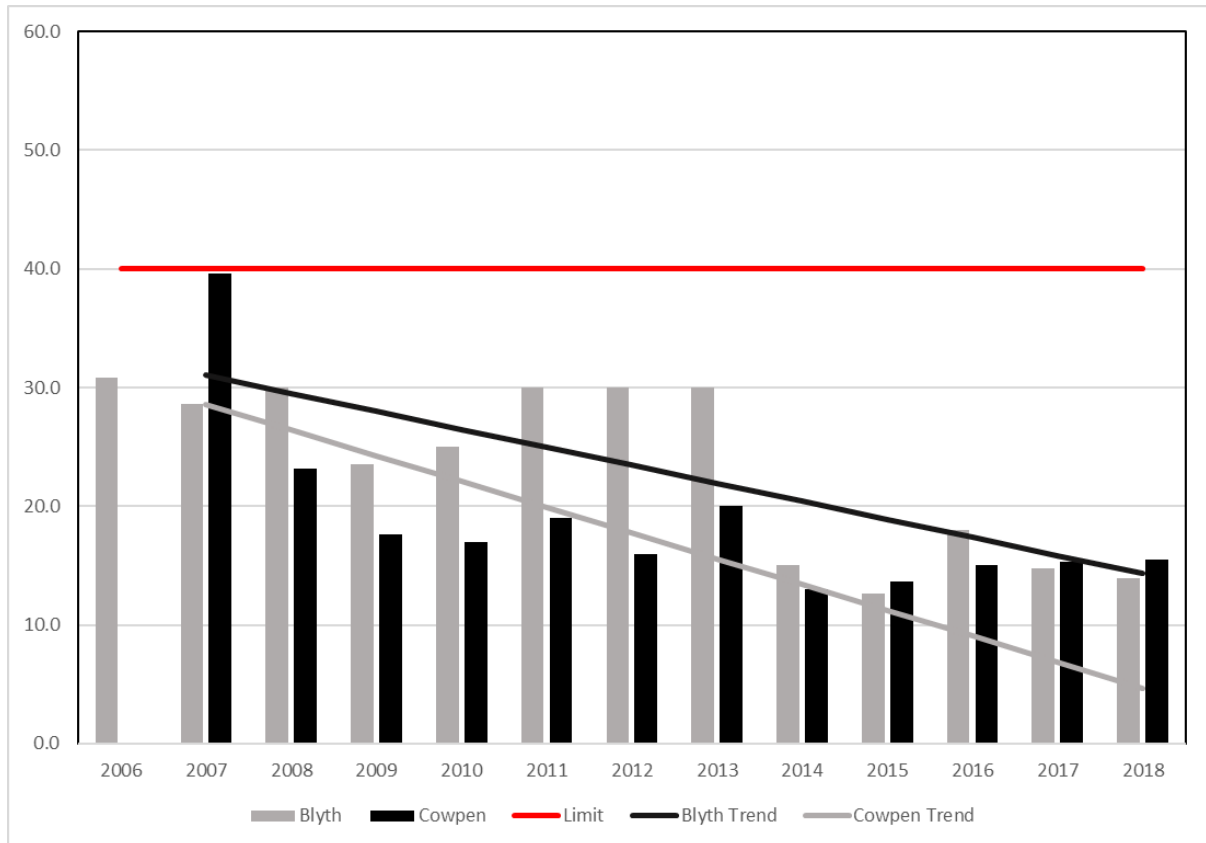
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

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

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



**Figure A.4 – Trends in Annual Mean PM<sub>10</sub> Concentrations**



**Table A.7 – PM<sub>2.5</sub> Monitoring Results**

| Site ID | Site Type    | Valid Data Capture for Monitoring Period (%) <sup>(1)</sup> | Valid Data Capture 2018 (%) <sup>(2)</sup> | PM <sub>2.5</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup> |      |      |           |           |
|---------|--------------|---|--|---|------|------|-----------|-----------|
|         |              |   |  | 2014  | 2015 | 2016 | 2017      | 2018      |
| BL      | Urban Centre | N/A   | 30.6                                       | 6.5   | 6    | 7.1  | 6.2 (6.8) | 7.3 (6.7) |
| CR      | Roadside     | N/A   | 87.9                                       | 6.5   | 6.1  | 5.8  | 5.5 (6.0) | 6.7       |

Annualisation has been conducted where data capture is <75%.

**Notes:**

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

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

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

# Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO<sub>2</sub> Monthly Diffusion Tube Results - 2018

| Site ID | NO <sub>2</sub> Mean Concentrations (µg/m <sup>3</sup> ) |      |      |      |      |      |      |      |      |      |      |      | Annual Mean |  |   |
|---------|--|------|------|------|------|------|------|------|------|------|------|------|-------------|--|---|
|         | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Raw Data    | Bias Adjusted (factor) and Annualised <sup>(1)</sup> | Distance Corrected to Nearest Exposure <sup>(2)</sup> |
|         |  |      |      |      |      |      |      |      |      |      |      |      |             |  |   |
| 8N      | 39.0   | 48.3 | 33.7 | 35.6 | 29.7 | 22.9 | 26.2 | 33.4 | 36.9 | 40.6 | /    | 46.1 | 35.7        | 27.1   | 27.1  |
| B1      | 49.4   | 45.4 | 36.5 | 36.8 | 36.3 | 27.7 | 32.7 | 34.4 | 40.7 | 37.7 | 42.4 | 47.1 | 38.9        | 29.6   | 24.1  |
| B3      | 43.0   | 53.4 | 44.1 | 42.2 | 28.5 | 31.9 | 39.2 | 34.1 | 34.7 | 45.4 | 44.9 | 45.5 | 40.6        | 30.8   | 27.4  |
| BER1    | /  | /    | /    | 25.9 | 28.6 | 27.0 | 25.8 | 19.2 | 12.1 | 21.8 | 27.3 | 21.6 | 23.3        | 17.7   | 18.3  |
| B11     | 34.7   | 32.7 | 23.9 | 31.3 | 28.9 | 24.9 | 24.0 | 28.3 | 26.6 | 29.7 | 32.3 | 33.2 | 29.2        | 22.2   | 21.5  |
| CM8     | /  | /    | 24.1 | 26.7 | 24.6 | 23.9 | 24.0 | 21.9 | 18.1 | 28.6 | 32.8 | 36.0 | 26.1        | 19.8   | 17.0  |
| B15     | 23.4   | 36.6 | 26.1 | 22.3 | 17.3 | 14.5 | 19.0 | 19.7 | 18.1 | 24.4 | 32.1 | 31.6 | 23.8        | 18.1   | 16.8  |
| C1      | 30.3   | 33.1 | 31.5 | /    | 37.7 | 30.8 | 32.7 | 21.0 | 19.0 | 31.1 | 47.5 | 37.3 | 32.0        | 24.3   | 23.3  |
| BER2    | /  | /    | /    | 18.9 | 19.2 | 18.2 | 18.0 | 16.6 | 15.1 | 21.2 | 19.6 | 23.1 | 18.9        | 14.3   | 13.2  |
| HEX1    | /  | /    | /    | 38.4 | 34.5 | 32.8 | 37.9 | 36.1 | 31.4 | 42.8 | 48.0 | 44.2 | 38.5        | 29.2   | 30.0  |
| C11     | 18.7   | 31.3 | 33.9 | 26.5 | 28.1 | 22.9 | 26.2 | 16.6 | 11.8 | 23.5 | 41.0 | 24.6 | 25.4        | 19.3   | 18.2  |
| CM2     | 24.2   | 25.6 | 20.9 | 20.4 | 17.0 | 13.9 | 16.8 | 14.0 | 13.5 | 19.7 | 30.3 | 28.8 | 20.4        | 15.5   | 15.5  |
| CM4     | 29.5   | 34.6 | 28.5 | 33.0 | 29.4 | 27.2 | 24.4 | 20.0 | 16.6 | 22.7 | 34.1 | 26.0 | 27.2        | 20.6   | 16.8  |
| CM5     | 2/5.7  | 27.5 | 22.2 | 19.0 | 19.7 | 16.6 | 20.4 | 16.2 | 13.8 | 23.1 | 32.6 | 31.0 | 22.3        | 17.0   | 15.5  |
| HALT1   | /  | /    | /    | /    | 13.2 | 14.0 | 15.5 | 13.8 | 13.7 | 19.0 | 22.0 | 23.3 | 16.8        | 12.8   | 10.9  |
| B16     | /  | /    | /    | /    | 31.7 | 26.1 | 26.9 | 26.8 | 24.9 | 33.8 | 42.0 | 39.8 | 31.5        | 23.9   | 22.3  |
| W17     | 39.0   | 24.3 | 26.7 | 28.4 | 24.6 | /    | 27.0 | 24.6 | 23.5 | 31.0 | 43.1 | 33.7 | 29.6        | 22.5   | 18.8  |
| W21     | 31.9   | 31.8 | 27.0 | 24.9 | 19.1 | 16.8 | 22.7 | 22.0 | 22.3 | 27.0 | 38.3 | 38.4 | 26.9        | 20.4   | 18.8  |
| SD1     | 34.1   | 39.2 | 29.0 | 28.5 | 27.1 | 21.7 | 25.1 | 24.8 | /    | 31.5 | 36.3 | 40.4 | 30.7        | 23.3   | 21.9  |

Local bias adjustment factor used.

National bias adjustment factor used.

Annualisation has been conducted where data capture is <75%.

Where applicable, data has been distance corrected for relevant exposure (see Appendix ?).

**Notes:**

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

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

(2) Distance corrected to nearest relevant public exposure.

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

### **Factor from Local Co-location Studies**

Northumberland County Council did not carry out any co-location studies in 2018.

### **Processing of Automatic Monitor Data**

Data from the Teledyne API 200E is uniformly scaled, with the lowest recorded measurement up to zero. The long-term data is then adjusted with a linear regression from the last service/calibration (when the response of the analyser was reset) to current responses to span and calibration values.

Results from the Turnkey Osiris units require no data processing and are serviced and calibrated annually by Turnkey Instruments.

### **Diffusion Tube Bias Adjustment Factors**

The tubes are prepared and analysed by Environmental Scientifics Group Didcot. The method used involves the reaction of gaseous nitrogen dioxide with 50% triethanolamine (TEA) contained on grids within the diffusion tubes prepared with 50% acetone. This is then reacted with reagents to produce a stable coloured complex, which can then be compared to standards prepared from sodium nitrite and analysed using visible spectroscopy.

The ESG laboratory follows the procedures set out in the Harmonisation Practical Guidance.

Northumberland County Council has not compared the diffusion tubes with the reference method in a co-location study.

The bias factor is calculated by the using data from the DEFRA Website:

<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

National Diffusion Tube Bias Adjustment Spreadsheet Version Number: 06/19. The bias factor was calculated to be 0.76 for SOCOTEC (Didcot).

The results of the laboratory performance scheme (AIR PT) are included below; the Environmental Scientifics Group received a 100 percent performance for the whole of 2018.

Figure C.1 – National Diffusion Tube Bias Adjustment Spreadsheet for 06/19 showing results for SOCOTEC (Didcot) using 50% TEA in acetone.

| National Diffusion Tube Bias Adjustment Factor Spreadsheet  |   | Spreadsheet Version Number: 06/19  |   |   |          |                |                                    |      |
|---|---|--|---|---|----------|----------------|------------------------------------|------|
| <p>Follow the steps below in the correct order to show the results of relevant co-location studies</p> <p>Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods</p> <p>Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet</p> <p>This spreadsheet will be updated every few months; the factors may therefore be subject to change. This should not discourage their immediate use.</p> <p>The LAQM Help desk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.</p> |   | <p>Spreadsheet will be updated at the end of September</p> <p>LAQM Historical Database</p>   |   |   |          |                |                                    |      |
| Step 1:   | Step 2:   | Step 3:  | Step 4:   |   |          |                |                                    |      |
| <p>Select the Laboratory that Analyses Your Tubes from the Drop-Down List</p> <p>If a laboratory is not shown, we have no data for this laboratory.</p>   | <p>Select a Preparation Method from the Drop-Down List</p> <p>If a preparation method is not shown, we have no data for this method at this laboratory.</p> | <p>Select a Year from the Drop-Down List</p> <p>If a year is not shown, we have no data.</p> | <p>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 shown in blue at the foot of the final column.</p> <p>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 LAQM-Helpdesk@uk.bureauveritas.com or 0800 0327953</p> |   |          |                |                                    |      |
| Analysed By 1   | Method  | F5   | F6  |   |          |                |                                    |      |
| To copy your selection, choose (M) from the pop-up list.  | To copy your selection, choose (M) from the pop-up list.  | To undo your selection, choose (All)   | To undo your selection, choose (All)  |   |          |                |                                    |      |
| Site Type   | Local Authority   | Length of Study (months)   | Diffusion Tube Mean Conc. (Dm) (ng/m3)  | Automatic Monitor Mean Conc. (Cm) (ng/m3) | Bias (B) | Tube Precision | Bias Adjustment Factor (A) (Cm/Dm) |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 42  | 30  | 40.2%    | G              | 0.71                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 11  | 38  | 35.8%    | G              | 0.74                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 18  | 36.3%    | G              | 0.73                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 21  | 20.8%    | G              | 0.83                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 34  | 20.4%    | G              | 0.83                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 41  | 54.2%    | G              | 0.65                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 11  | 22  | 52.0%    | G              | 0.66                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 34  | 30.8%    | G              | 0.76                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 11  | 30  | 32.9%    | G              | 0.75                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 36  | 19.7%    | G              | 0.84                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 47  | 28.5%    | G              | 0.79                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 11  | 44  | 32.4%    | G              | 0.76                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 10  | 26  | 21       | 25.4%          | G                                  | 0.80 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 11  | 33  | 42.2%    | G              | 0.70                               |      |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 11  | 33  | 29       | 17.2%          | G                                  | 0.85 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 33  | 29       | 16.1%          | G                                  | 0.86 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 10  | 38  | 31       | 25.6%          | G                                  | 0.80 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 11  | 32  | 22       | 46.7%          | G                                  | 0.68 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 11  | 39  | 32       | 22.5%          | G                                  | 0.82 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 39  | 25       | 57.8%          | G                                  | 0.63 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 95  | 85       | 11.3%          | G                                  | 0.90 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 37  | 30       | 22.1%          | G                                  | 0.82 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 28  | 24       | 18.8%          | G                                  | 0.84 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 24  | 16       | 53.5%          | G                                  | 0.65 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 33  | 24       | 39.0%          | G                                  | 0.72 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 10  | 19  | 16       | 23.4%          | G                                  | 0.81 |
| Socotec Didcot  | 50% TEA in acetone  | 2018   | 12  | 34  | 25       | 34.8%          | G                                  | 0.74 |
| Socotec Didcot  | 50% TEA in Acetone  | 2018   | 11  | 21  | 18       | 16.1%          | G                                  | 0.86 |
| Overall Factors (28 studies)  |   |  |   |   |          |                | Use                                | 0.76 |

## LAQM Helpdesk – March 2018 - Summary of Laboratory Performance in AIR NO<sub>2</sub> Proficiency Testing Scheme (September 2017 – August 2019).

### LAQM Helpdesk – August 2019

#### Summary of Laboratory Performance in AIR NO<sub>2</sub> Proficiency Testing Scheme (September 2017 – August 2019).

*Reports are prepared by LGC for BV/NPL on behalf of Defra and the Devolved Administrations.*

#### Background

AIR is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combined two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme.

AIR offers a number of test samples designed to test the proficiency of laboratories undertaking analysis of chemical pollutants in ambient indoor, stack and workplace air. One such sample is the AIR NO<sub>2</sub> test sample type that is distributed to participants in a quarterly basis.

AIR NO<sub>2</sub> PT forms an integral part of the UK NO<sub>2</sub> Network's QA/QC, and is a useful tool in assessing the analytical performance of those laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). With consent from the participating laboratories, LGC Standards provides summary proficiency testing data to the LAQM Helpdesk for hosting on the web-pages at <http://laqm.defra.gov.uk/diffusion-tubes/ga-qc-framework.html>. This information will be updated on a quarterly basis following completion of each AIR PT round.

Defra and the Devolved Administrations advise that diffusion tubes used for Local Air Quality Management should be obtained from laboratories that have demonstrated satisfactory performance in the AIR PT scheme. Laboratory performance in AIR PT is also assessed, by the National Physical Laboratory (NPL), alongside laboratory data from the monthly NPL Field Intercomparison Exercise carried out at Marylebone Road, central London.

The information is used to help the laboratories to identify if they have problems and may assist devising measures to improve their performance and forms part of work for Defra and the Devolved Administrations under the Local Air Quality Management Services Contract.

#### AIR NO<sub>2</sub> PT Scheme overview

##### Purpose of scheme

The AIR PT scheme uses laboratory spiked Palmes type diffusion tubes to test each participating laboratory's analytical performance on a quarterly basis and continues the format used in the preceding WASP PT scheme. Such tubes are not designed to test other parts of the measurement system e.g. sampling. Every quarter, roughly January, April, July and October each year, each laboratory receives four diffusion tubes doped with an amount of nitrite, known to LGC Standards, but not the participants. At least two of the tubes are usually duplicates, which enables precision, as well as accuracy, to be assessed. The masses of nitrite on the spiked tubes are different each quarter, and reflect the typical analytical range encountered in actual NO<sub>2</sub> ambient monitoring in the UK.

## LAQM Helpdesk – August 2019

### Preparation of test samples

Diffusion tubes are spiked using a working nitrite solution prepared from a stock solution. The concentration of this stock solution is initially assayed using a titrimetric procedure. All steps in the subsequent test sample production process, involving gravimetric and volumetric considerations, are undertaken using calibrated instruments employing traceable standards. As an additional cross check, 12 spiked Palmes tubes are picked at random from each spike loading level and submitted to a third party laboratory which is accredited to ISO 17025 to undertake this analysis using an ion chromatographic procedure.

In summary, the tube spiking precision is calculated to be better than 0.5 %, expressed as a standard deviation, and this is derived from repeat gravimetric checking of the pipette device used to spike the test samples. The calculated spike values, derived from titrimetric, gravimetric and volumetric considerations, are found to be typically within  $\pm 3$  % of results obtained by the third party laboratory using an ion chromatographic analytical procedure.

### Scheme operation

The participants analyse the test samples and report the results to LGC Standards via their on-line PORTAL data management system. LGC Standards assign a performance score to each laboratory's result, based on how far their results deviate from the assigned values for each test samples. The assigned values are best estimates of the levels of nitrite doped onto the test sample tubes and are calculated from the median of participant results, after the removal of test results that are inappropriate for statistical evaluation, e.g. miscalculations, transpositions and other gross errors. At the completion of the round, laboratories receive a report detailing how they have performed and how their results relate to those of their peers.

### Performance scoring

The z-score system is used by LGC to assess the performance of laboratories participating in the AIR PT NO<sub>2</sub> scheme.

The  $Z_{score}$ , may be defined as:

$$Z_{score} = \frac{(x_{lab} - \bar{x}_{assigned})}{\sigma_{SDPA}}$$

Where:

- $x_{lab}$  = participant result from a laboratory
- $\bar{x}_{assigned}$  = assigned value
- $\sigma_{SDPA}$  = standard deviation for performance assessment (currently set at 7.5 % of  $\bar{x}_{assigned}$ )

## LAQM Helpdesk – August 2019

### Performance score interpretation

A  $Z_{score}$  is interpreted as described below:

$|Z_{score}| \leq 2$  indicates satisfactory laboratory performance

$2.0 < |Z_{score}| < 3$  indicates questionable (warning) laboratory performance

$|Z_{score}| \geq 3$  indicates unsatisfactory (action) laboratory performance

As a general rule of thumb, provided that a laboratory does not have systematic sources of bias in their laboratory measurement system, then on average, 19 out of every 20 z-scores should be  $\leq \pm 2$ . In this scheme each laboratory receives 4 test samples per round and therefore submits 4 z-scores per round. Hence over 5 rounds laboratories would receive 20 test samples and report 20 z-scores.

### Assessing the performance of a laboratory

End users that avail of analytical services from laboratories should satisfy themselves that such laboratories meet their requirements. A number of factors ideally need to be considered including

- Expertise and skills of staff within the laboratory?
- Does the laboratory follow accepted measurement standards, guidance?
- Does the laboratory operate a robust internal quality control system?
- Is the laboratory third party accredited to relevant standards such as ISO 17025?
- Does the laboratory successfully participate in relevant external proficiency testing schemes?
- How good is their customer care (communication, turnaround times, pricing etc)?

Participation therefore, in an external proficiency-testing scheme such as AIR PT, represents but one factor in such considerations.

Participation in a single round of an external proficiency-testing scheme represents a “snap-shot” in time of a laboratory’s analytical quality. It is more informative therefore to consider performance over a number of rounds.

Following on from above, therefore over a rolling five round AIR PT window, one would expect that 95 % of laboratory results should be  $\leq \pm 2$ . If this percentage is substantially lower than 95 % for a particular laboratory, within this five round window, then one can conclude that the laboratory in question has significant sources of error within their analytical procedure.

A summary of the performance, for each laboratory participating in the AIR PT scheme, is provided in Table 1. This table shows the percentage of results where the absolute z-score, for each laboratory, was less than or equal to 2, i.e. those results which have been assessed as satisfactory.

**LAQM Helpdesk – August 2019**

**Contacts**

Further **specific** information on the LGC AIR NO<sub>2</sub> PT scheme is available from LGC proficiency testing on 0161 7622500 or by email at [customerservices@lgcgroup.com](mailto:customerservices@lgcgroup.com).

For **general** questions about the scheme within the context of wider LAQM activities please contact Nick Martin at NPL on 0208 943 7088 or [nick.martin@npl.co.uk](mailto:nick.martin@npl.co.uk).



Table 1: Laboratory summary performance for AIR NO<sub>2</sub> PT rounds AR0022, 24, 25, 27, 28, 30, 31 and 33

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO<sub>2</sub> PT rounds and the percentage (%) of results submitted which were subsequently determined to be satisfactory based upon a z-score of  $\leq \pm 2$  as defined above.

| AIR PT Round                                     | AIR PT AR022 | AIR PT AR024 | AIR PT AR025 | AIR PT AR027 | AIR PT AR028 | AIR PT AR030 | AIR PT AR031 | AIR PT AR033 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Aberdeen Scientific Services                     | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        | 75 %         | 100 %        | 100 %        |
| Cardiff Scientific Services                      | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       |
| Edinburgh Scientific Services                    | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        | NR [2]       | 100 %        |
| SOCOTEC  | 100 % [1]    | 100 % [1]    | 100 % [1]    | 100 % [1]    | 100 % [1]    | 87.5 % [1]   | 100 % [1]    | 100 % [1]    |
| Exova (formerly Clyde Analytical)                | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       |
| Glasgow Scientific Services                      | 100 %        | 100 %        | 100 %        | 50 %         | 100 %        | 100 %        | 100 %        | 100 %        |
| Gradko International [1]                         | 100 % [1]    | 100 % [1]    | 100 %        | 100 %        | 100 %        | 75 %         | 100 %        | 100 %        |
| Kent Scientific Services                         | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       |
| Kirklees MBC                                     | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       |
| Lambeth Scientific Services                      | 100 %        | NR [2]       | NR [2]       | NR [2]       | 25 %         | 50 %         | 100 %        | 50 %         |
| Milton Keynes Council                            | 75 %         | 100 %        | 75 %         | 100 %        | 100 %        | 100 %        | 100 %        | 50 %         |
| Northampton Borough Council                      | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       | NR [3]       |
| Somerset Scientific Services                     | 75 %         | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        |
| South Yorkshire Air Quality Samplers             | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        |
| Staffordshire County Council                     | 100 %        | 50 %         | 100 %        | 100 %        | 100 %        | 100 %        | 75 %         | 75 %         |
| Tayside Scientific Services (formerly Dundee CC) | NR [2]       | 100 %        | NR [2]       | 100 %        | NR [2]       | 100 %        | NR [2]       | 100 %        |
| West Yorkshire Analytical Services               | 100 %        | 50 %         | 75 %         | 100 %        | 100 %        | 100 %        | 100 %        | 100 %        |

[1] Participant subscribed to two sets of test results (2 x 4 test samples) in each AIR PT round.

[2] NR No results reported

[3] Northampton Borough Council, Kent Scientific Services, Cardiff Scientific Services, Kirklees MBC and Exova (formerly Clyde Analytical) no longer carry out NO<sub>2</sub> diffusion tube monitoring and therefore did not submit results.

NO<sub>2</sub> PT Summary – AIR PT Rounds AR022, 24, 25, 27, 28, 30, 31 and 33

## Diffusion Tube NO<sub>2</sub> Fall Off with Distance to Receptor

Results of the annual average nitrogen dioxide levels have been distance corrected to the nearest receptors using the guidance document NO<sub>2</sub> Concentrations and Distance from Roads, Air Quality Consultants (ref 504/1/F1 Issue No. 3 dated 18<sup>th</sup> July 2008).

This uses the equation:

$$C_z = ((C_y - C_b) / (-0.5476 \times \ln(D_y) + 2.7171)) \times (-0.5476 \times \ln(D_z) + 2.7171) + C_b$$

Where:

C<sub>y</sub> is the total measured concentration (µg/m<sup>3</sup>) at distance D<sub>y</sub>;

D<sub>y</sub> is the distance from the kerb at which concentrations were measured;

C<sub>z</sub> is the total predicted concentration (µg/m<sup>3</sup>) at distance D<sub>z</sub>

D<sub>z</sub> is the distance from the kerb (m) at which concentrations are to be predicted;

C<sub>b</sub> is the background concentration (µg/m<sup>3</sup>)\*

Ln(D) is the natural log of the number D

\* **The background concentrations are obtained from the DEFRA LAQM background maps available from:**

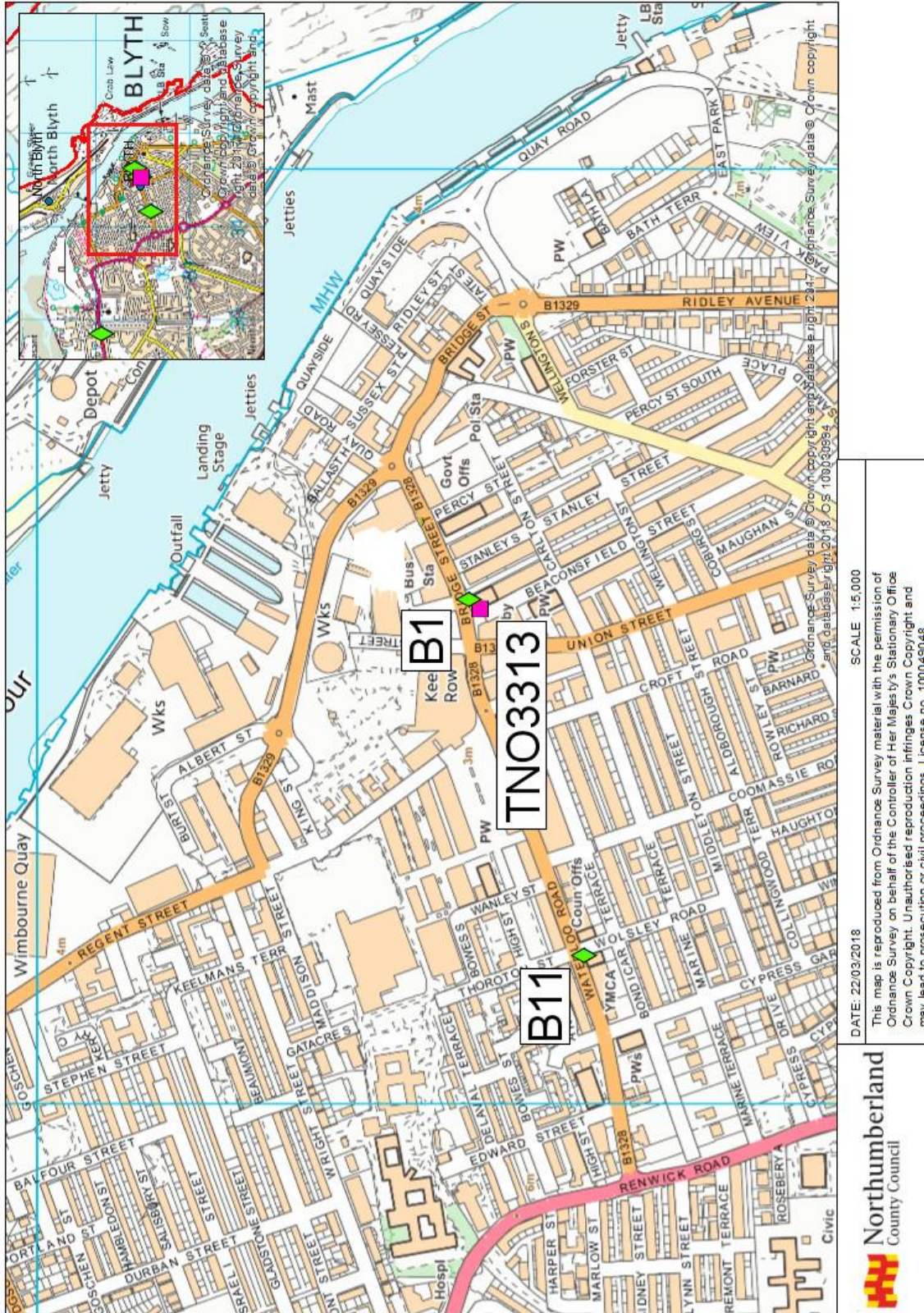
<https://uk-air.defra.gov.uk/data/laqm-background-home>

For the resulting calculation for the 2018 are as follows:

| Site ID | Annual Average (Bias Adjusted and Annualised) | Background Concentration (ug/m <sup>3</sup> ) | Distance from Kerb to Diffusion Tube (m) | Distance from Kerb to Receptor (m) | Logn Kerb-Tube | Logn Kerb-Receptor | Distance Corrected to Nearest Exposure (ug/m <sup>3</sup> ) |
|---------|---|---|--|------------------------------------|----------------|--------------------|---|
| 8N      | 27.1  | 6.7   | 2  | 2                                  | 0.30103        | 0.30103            | 27.1  |
| B1      | 29.6  | 10.7  | 1  | 28                                 | 0.00000        | 1.44716            | 24.1  |
| B3      | 30.8  | 11.8  | 2  | 13.5                               | 0.30103        | 1.13033            | 27.4  |
| BER1    | 17.7  | 8.4   | 2  | 1                                  | 0.30103        | 0.00000            | 18.3  |
| B11     | 22.2  | 10.7  | 1  | 2                                  | 0.00000        | 0.30103            | 21.5  |
| CM8     | 19.8  | 8.1   | 1.5                                      | 21                                 | 0.17609        | 1.32222            | 17.0  |
| B15     | 18.1  | 8.8   | 1.7                                      | 8                                  | 0.23045        | 0.90309            | 16.8  |
| C1      | 24.3  | 11.4  | 1.7                                      | 4                                  | 0.23045        | 0.60206            | 23.3  |
| BER2    | 14.3  | 8.9   | 1  | 11                                 | 0.00000        | 1.04139            | 13.2  |
| HEX1    | 29.2  | 7.2   | 1.5                                      | 1                                  | 0.17609        | 0.00000            | 30.0  |
| C11     | 19.3  | 11.4  | 1.7                                      | 8                                  | 0.23045        | 0.90309            | 18.2  |
| CM2     | 15.5  | 7.7   | 1  | 1                                  | 0.00000        | 0.00000            | 15.5  |
| CM4     | 20.6  | 8.1   | 3  | 70                                 | 0.47712        | 1.84510            | 16.8  |
| CM5     | 17.0  | 7.5   | 1.7                                      | 9                                  | 0.23045        | 0.95424            | 15.5  |
| HALT1   | 12.8  | 5.2   | 1  | 17                                 | 0.00000        | 1.23045            | 10.9  |
| B16     | 23.9  | 10.6  | 2  | 7                                  | 0.30103        | 0.84510            | 22.4  |
| W17     | 22.5  | 8.4   | 1  | 20                                 | 0.00000        | 1.30103            | 18.8  |
| W21     | 20.4  | 9.2   | 1  | 5                                  | 0.00000        | 0.69897            | 18.8  |
| SD1     | 23.3  | 11.6  | 1.7                                      | 6                                  | 0.23045        | 0.77815            | 21.9  |

# Appendix D: Maps of Monitoring Locations

Figure D.1 – Blyth Automatic and NO<sub>2</sub> Diffusion Tube Monitoring Locations



DATE: 22/03/2018  
 SCALE: 1:5,000  
 This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationary Office. Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. License no. 100045048.



Figure D.2 – Cowpen Automatic and NO<sub>2</sub> Diffusion Tube Monitoring Locations

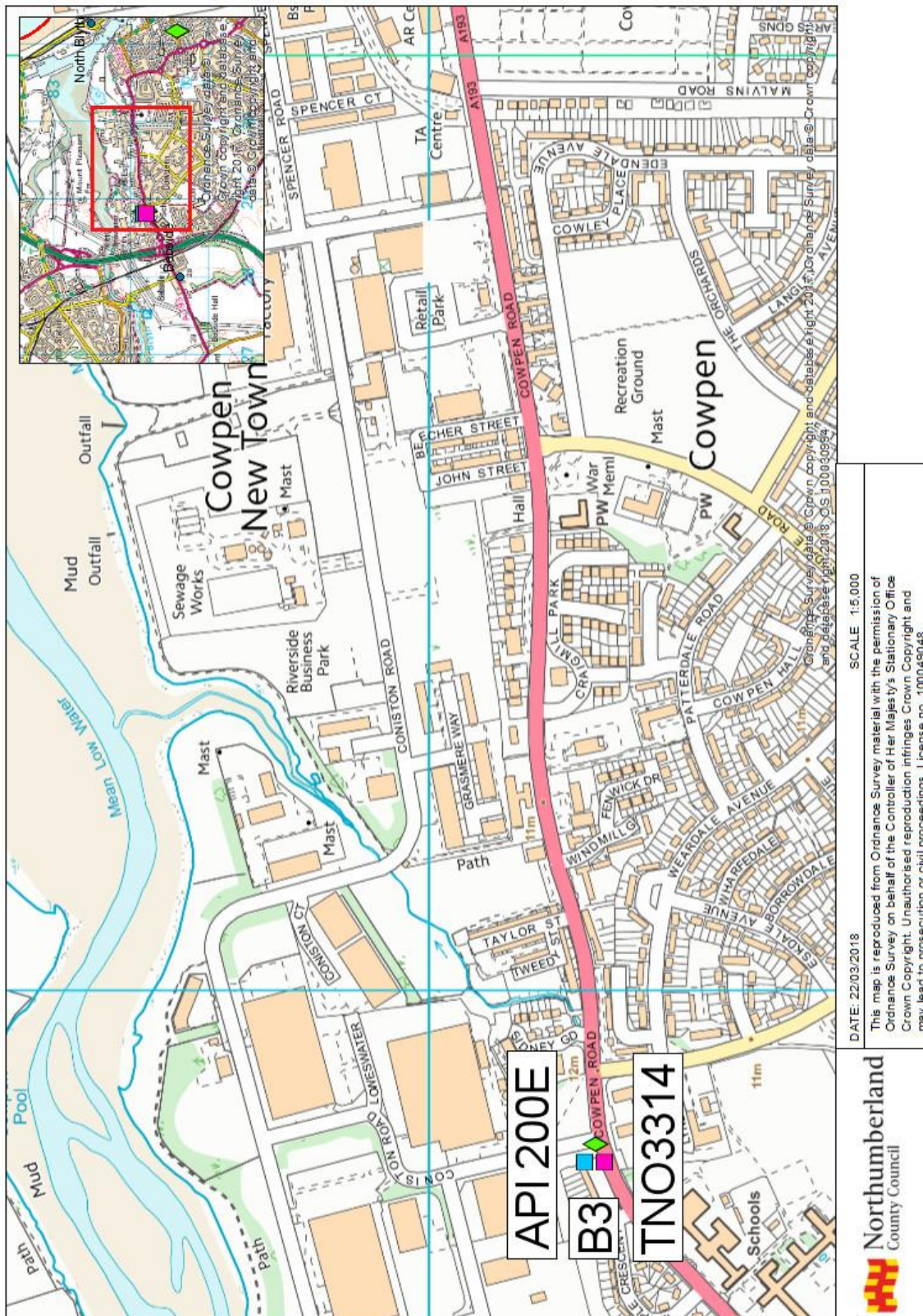


Figure D.3 – Alnwick NO<sub>2</sub> Diffusion Tube Monitoring Locations

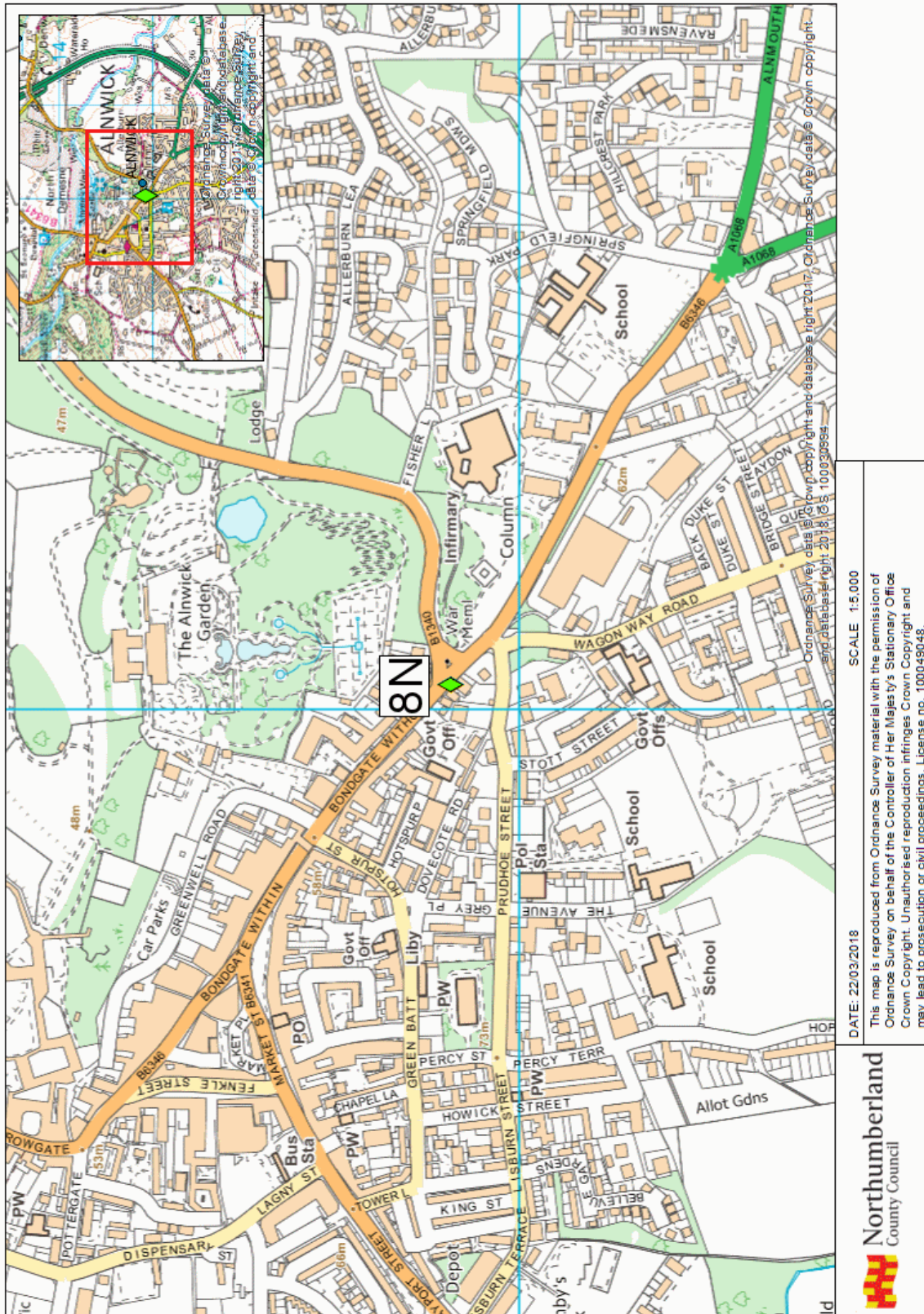


Figure D.4 – Morpeth NO<sub>2</sub> Diffusion Tube Monitoring Locations

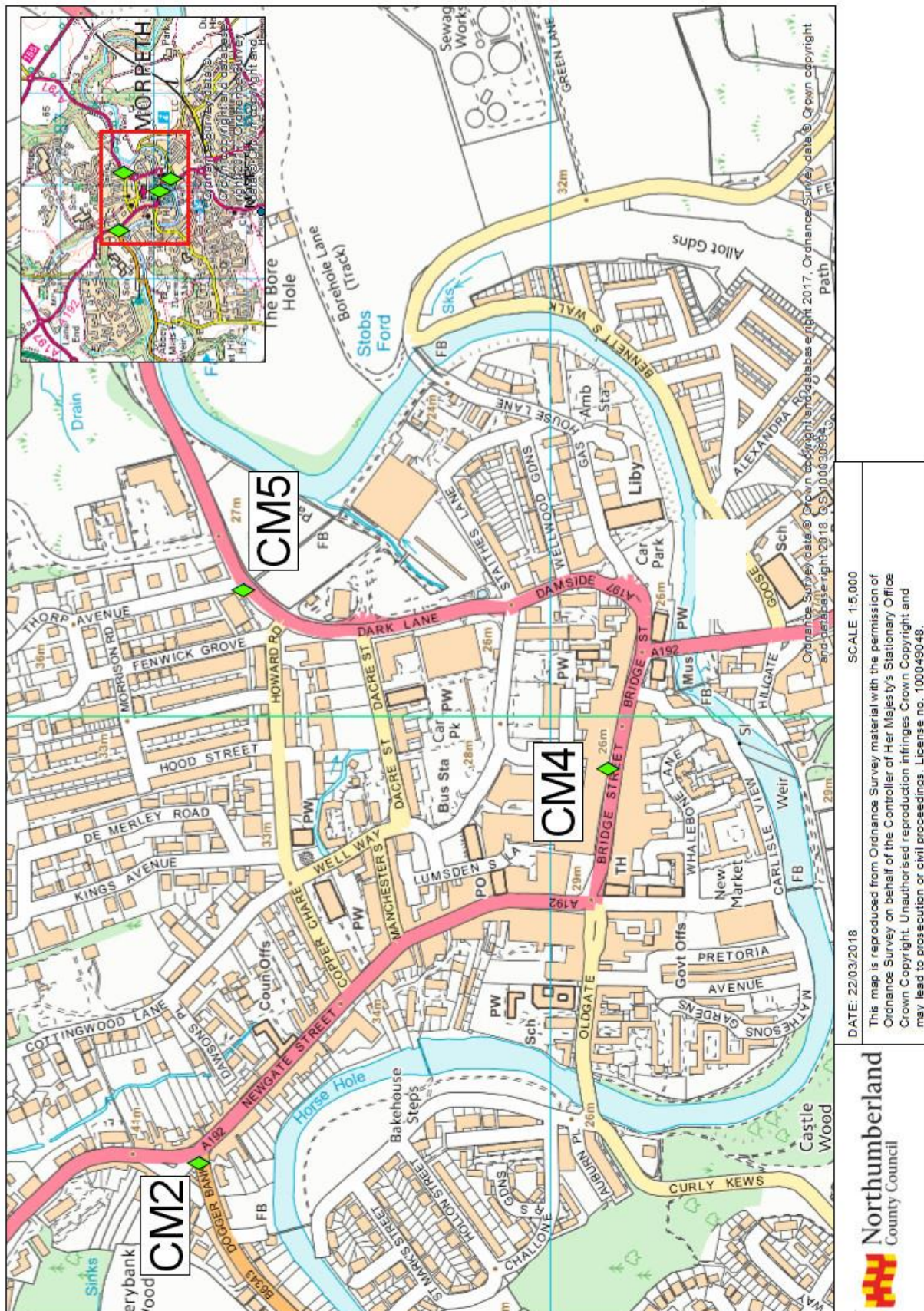


Figure D.5 – Ponteland NO<sub>2</sub> Diffusion Tube Monitoring Location

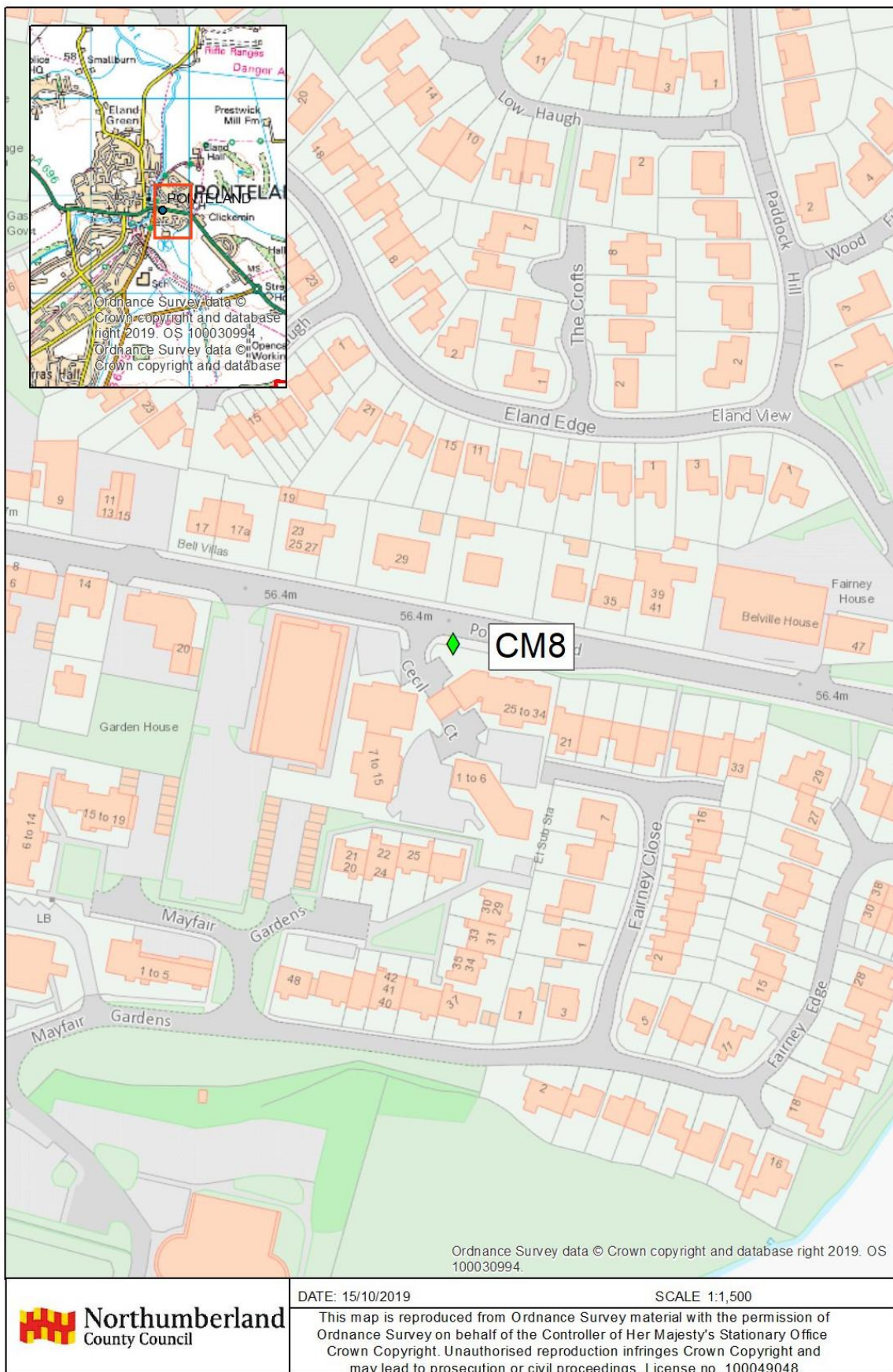
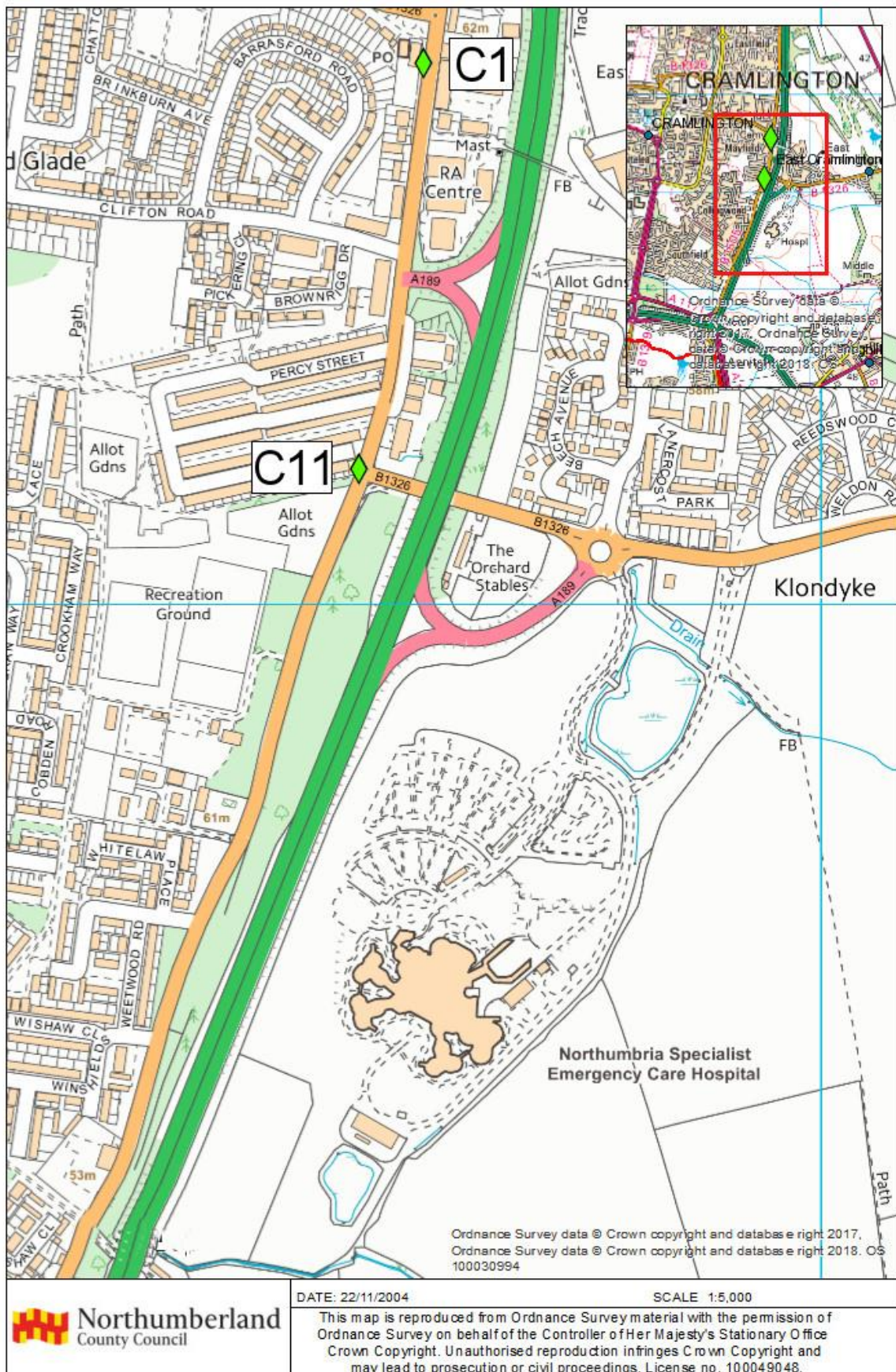


Figure D.6 – East Cramlington NO<sub>2</sub> Diffusion Tube Monitoring Locations





**Figure D.7 – Berwick and Tweedmouth NO<sub>2</sub> Diffusion Tube Monitoring Locations**



Figure D.8 – Ashington NO<sub>2</sub> Diffusion Tube Monitoring Locations



Figure D.9 – Bedlington NO<sub>2</sub> Diffusion Tube Monitoring Locations

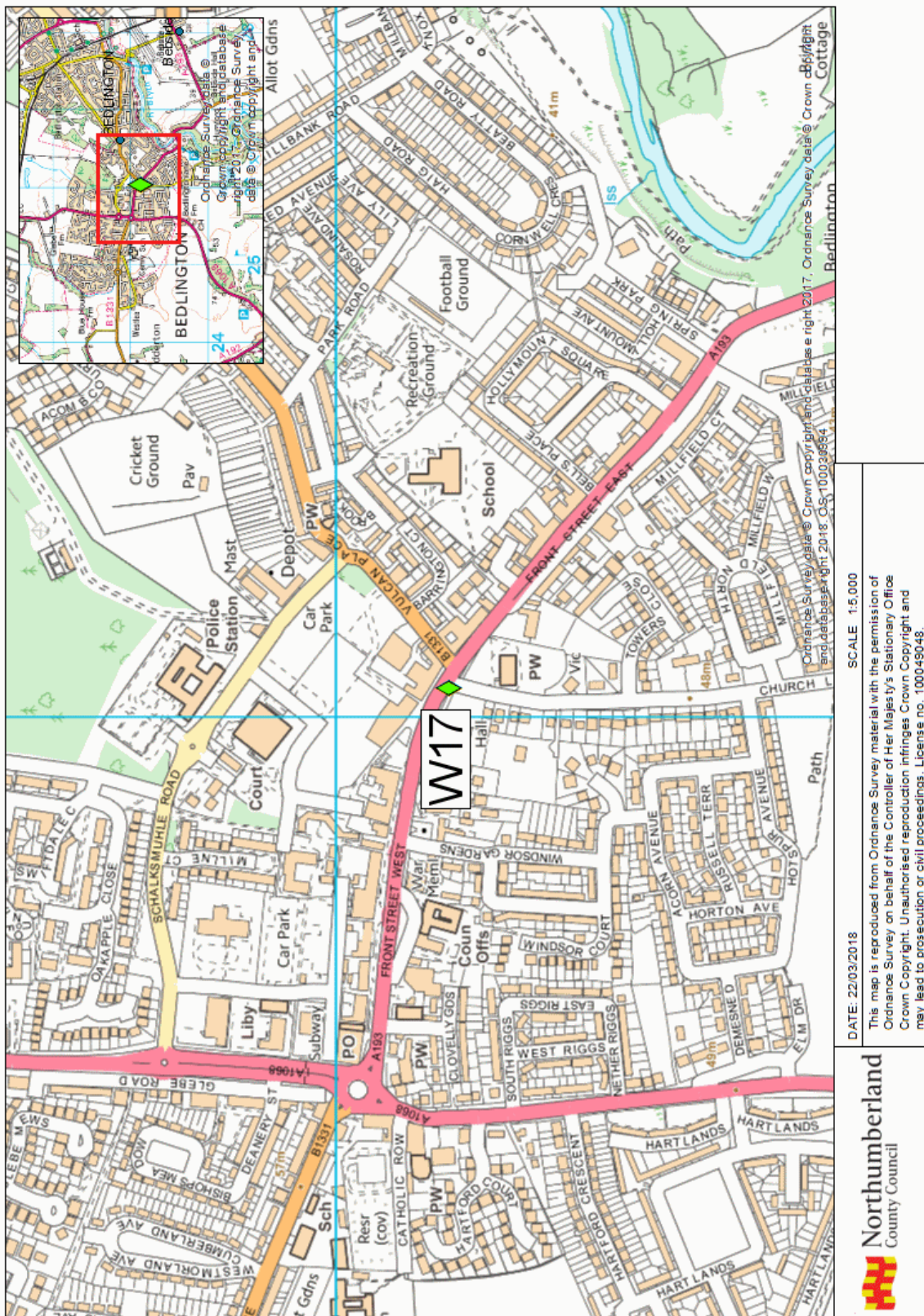
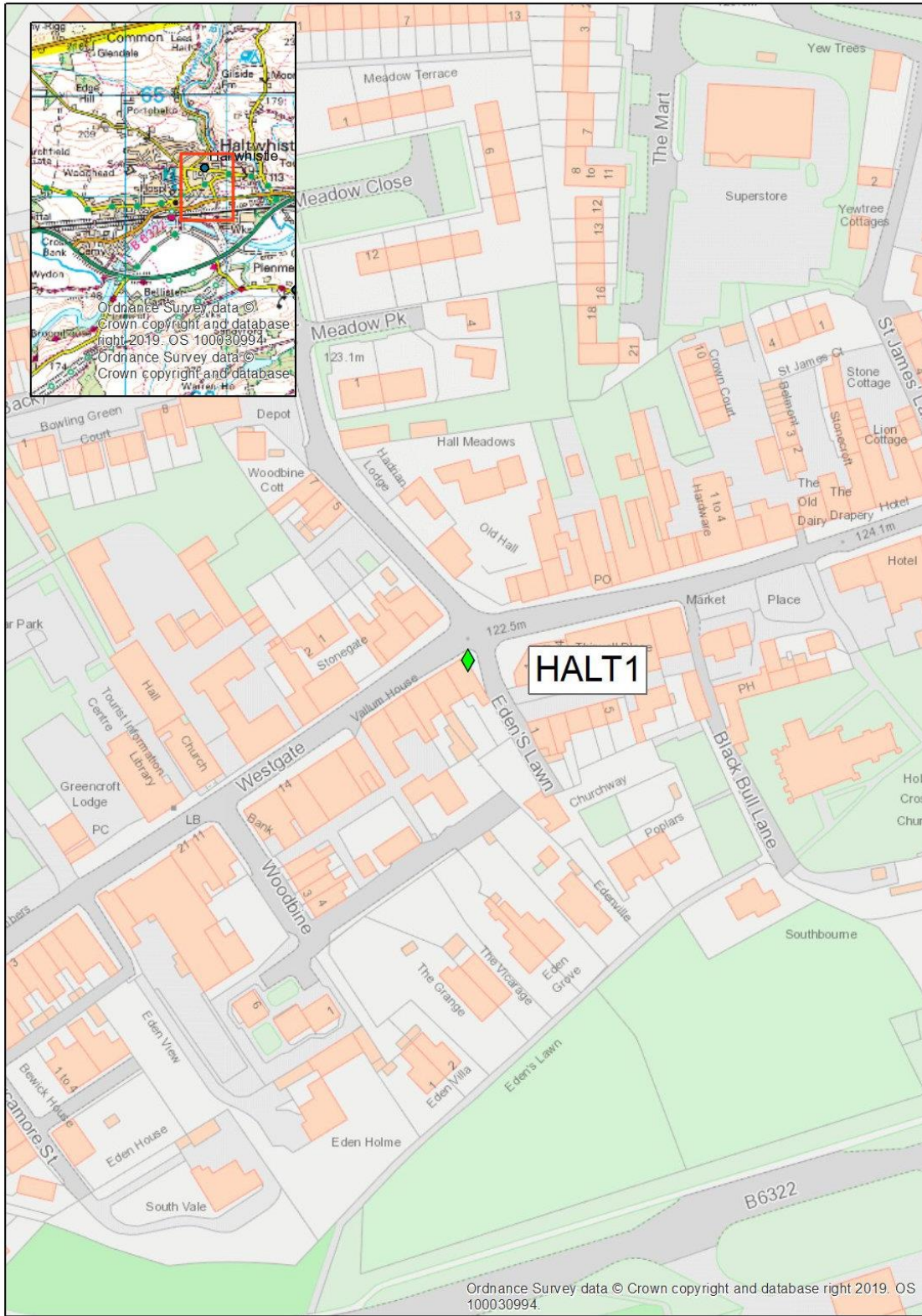


Figure D.10 – Hexham NO<sub>2</sub> Diffusion Tube Monitoring Location



Figure D.11 – Haltwhistle NO<sub>2</sub> Diffusion Tube Monitoring Location



## Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

| Pollutant                              | Air Quality Objective <sup>4</sup>                                   |                |
|--|--|----------------|
|  | Concentration  | Measured as    |
| Nitrogen Dioxide (NO <sub>2</sub> )    | 200 µg/m <sup>3</sup> not to be exceeded more than 18 times a year   | 1-hour mean    |
|  | 40 µg/m <sup>3</sup>   | Annual mean    |
| Particulate Matter (PM <sub>10</sub> ) | 50 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year  | 24-hour mean   |
|  | 40 µg/m <sup>3</sup>   | Annual mean    |
| Sulphur Dioxide (SO <sub>2</sub> )     | 350 µg/m <sup>3</sup> , not to be exceeded more than 24 times a year | 1-hour mean    |
|  | 125 µg/m <sup>3</sup> , not to be exceeded more than 3 times a year  | 24-hour mean   |
|  | 266 µg/m <sup>3</sup> , not to be exceeded more than 35 times a year | 15-minute mean |

<sup>4</sup> The units are in microgrammes of pollutant per cubic metre of air (µg/m<sup>3</sup>).

## Appendix F: Data Summaries and Time Series Plots

**Table F.1 – Cowpen Road AQ Monitoring Station - Air Quality Data Summary**

|                                  | PM2.5                  | PM10                    | NO                      | NO2                     | NOx                      |
|----------------------------------|------------------------|-------------------------|-------------------------|-------------------------|--------------------------|
| Number Very High                 | 0                      | 0                       | 0                       | 0                       | 0                        |
| Number High                      | 0                      | 1                       | 0                       | 6                       | 3                        |
| Number Moderate                  | 0                      | 8                       | 0                       | 146                     | 51                       |
| Number Low                       | 319                    | 310                     | 8597                    | 8443                    | 8540                     |
| Maximum 15-minute Mean           | 75.7 $\mu\text{g m}^3$ | 614.6 $\mu\text{g m}^3$ | 472.9 $\mu\text{g m}^3$ | 580.9 $\mu\text{g m}^3$ | 1053.8 $\mu\text{g m}^3$ |
| Maximum Hourly Mean              | 69.3 $\mu\text{g m}^3$ | 181.8 $\mu\text{g m}^3$ | 434.8 $\mu\text{g m}^3$ | 92.9 $\mu\text{g m}^3$  | 489.2 $\mu\text{g m}^3$  |
| Maximum running 8-hour Mean      | 41.6 $\mu\text{g m}^3$ | 74.5 $\mu\text{g m}^3$  | 278.3 $\mu\text{g m}^3$ | 73.8 $\mu\text{g m}^3$  | 327.0 $\mu\text{g m}^3$  |
| Maximum running 24-hour Mean     | 30.4 $\mu\text{g m}^3$ | 58.5 $\mu\text{g m}^3$  | 166.1 $\mu\text{g m}^3$ | 48.2 $\mu\text{g m}^3$  | 200.8 $\mu\text{g m}^3$  |
| Maximum Daily Mean               | 30.4 $\mu\text{g m}^3$ | 54.1 $\mu\text{g m}^3$  | 172.2 $\mu\text{g m}^3$ | 50.1 $\mu\text{g m}^3$  | 207.5 $\mu\text{g m}^3$  |
| 90.4th Percentile (PM) - Daily   | -                      | -                       | -                       | -                       | -                        |
| 99.8th Percentile (NO2) - Hourly | -                      | -                       | -                       | -                       | -                        |
| Average                          | 6.7 $\mu\text{g m}^3$  | 15.6 $\mu\text{g m}^3$  | 33.0 $\mu\text{g m}^3$  | 17.8 $\mu\text{g m}^3$  | 49.3 $\mu\text{g m}^3$   |
| Data Capture                     | 87.9 %                 | 87.9 %                  | 93.9 %                  | 93.9 %                  | 93.9 %                   |

### Hourly Time Series Plots

**Figure F.1 – Cowpen Road Nitrogen Dioxide (NO<sub>2</sub>) Time Series Plot**

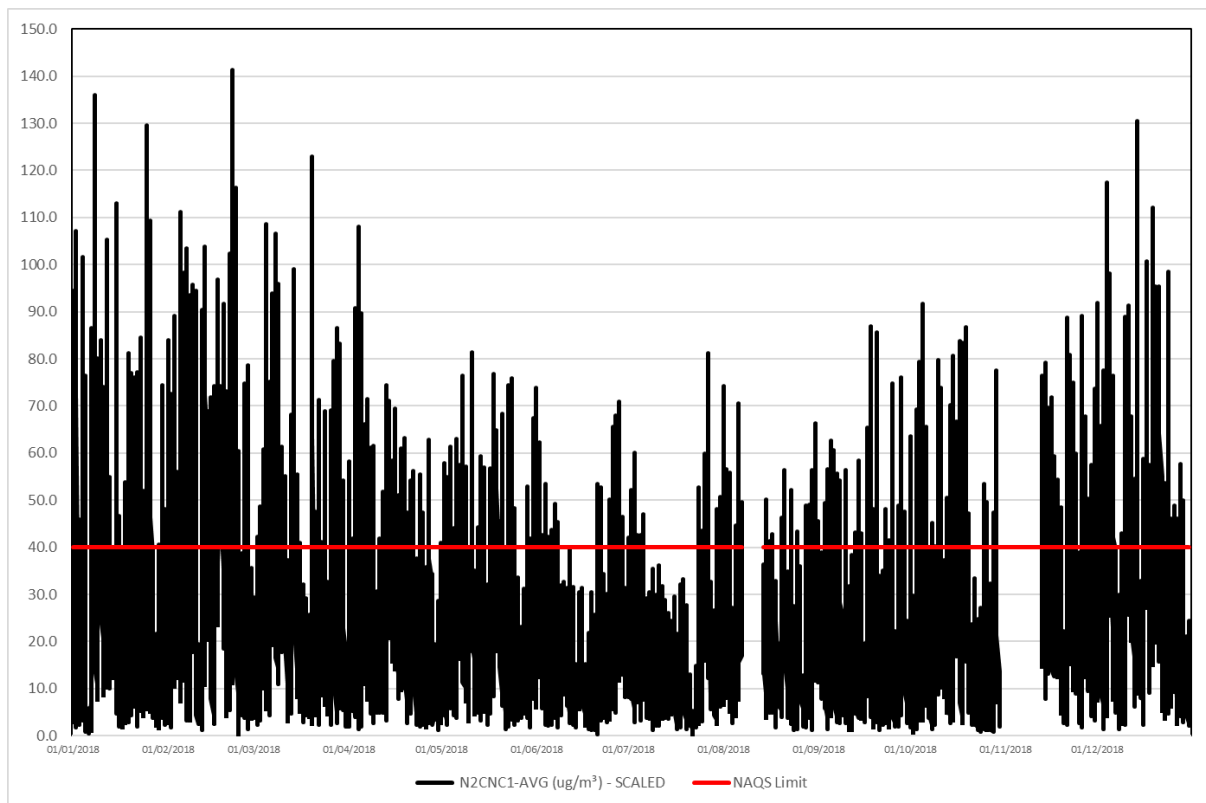


Figure F.2 – Cowpen Road Particulates (PM<sub>10</sub>) Time Series Plot

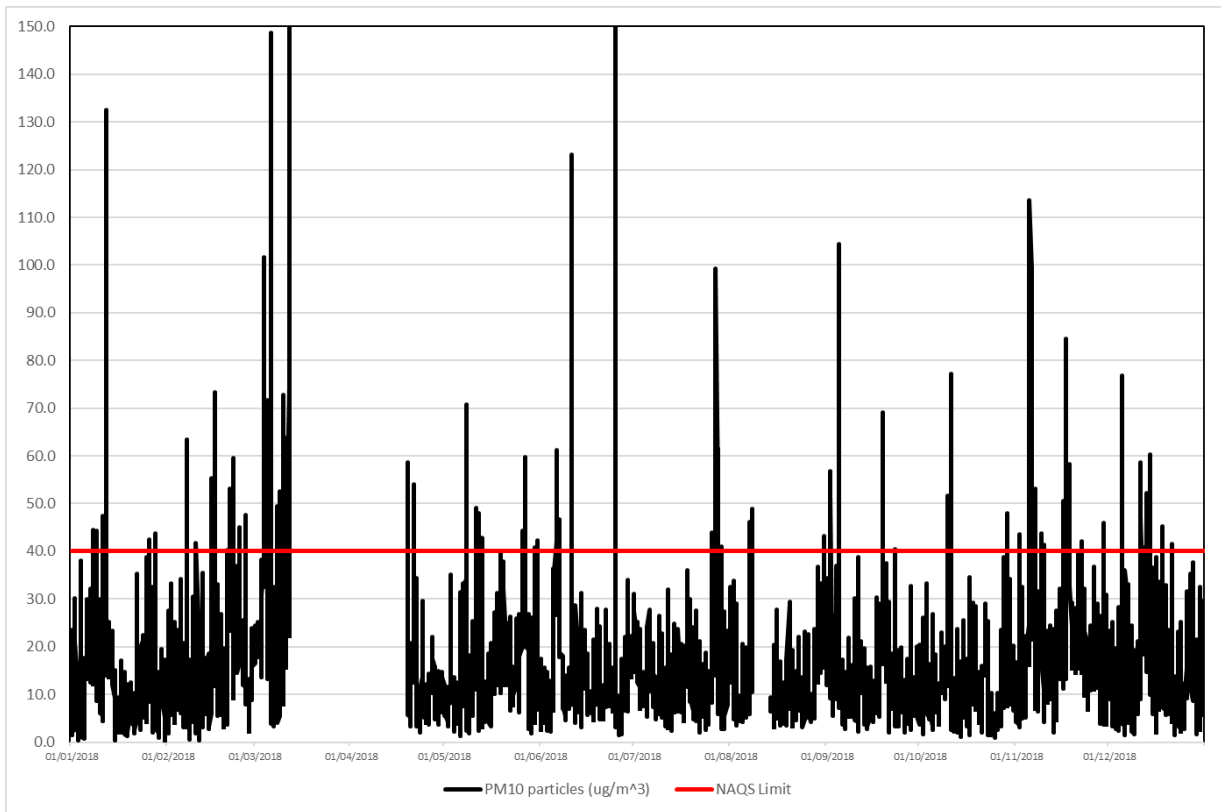
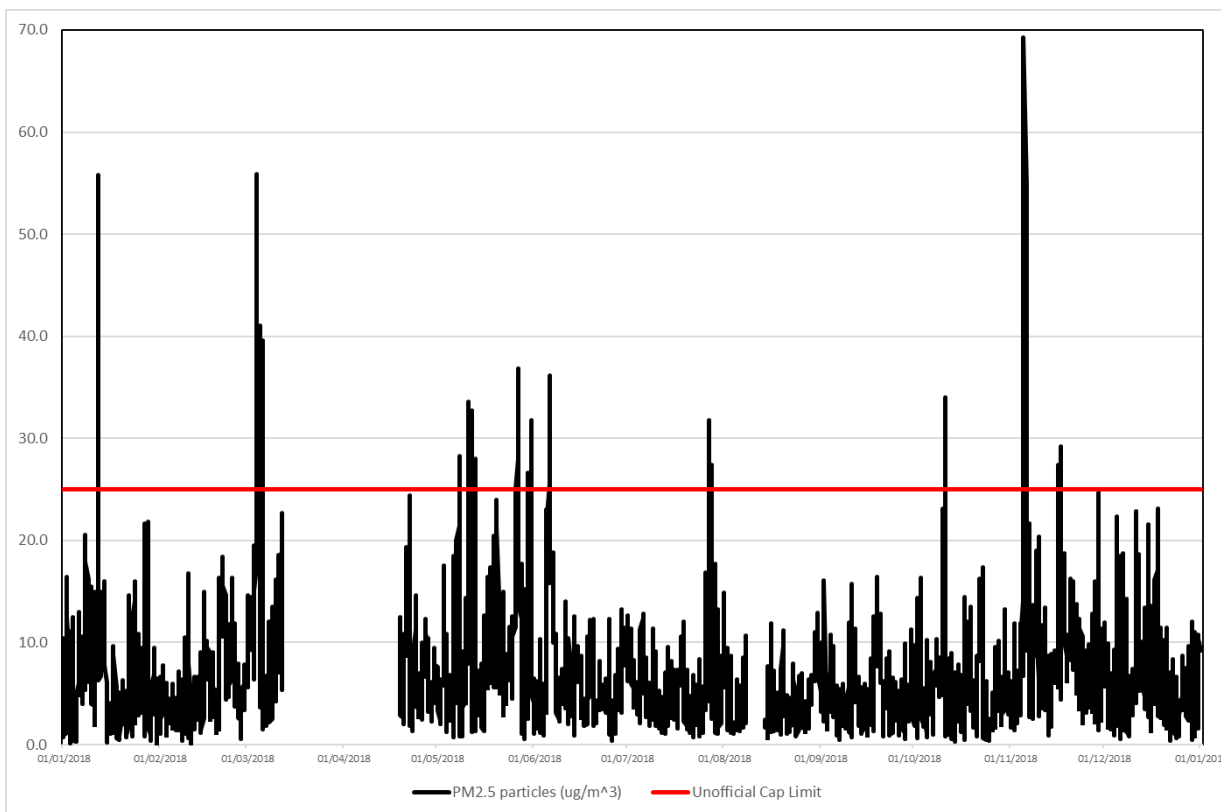


Figure F.3 – Cowpen Road Particulates (PM<sub>2.5</sub>) Time Series Plot





**Table F.2 – Blyth Library / Town Centre AQ Monitoring Station - Air Quality Data Summary**

|                                  | PM2.5                  | PM10                    |
|----------------------------------|------------------------|-------------------------|
| Number Very High                 | 0                      | 0                       |
| Number High                      | 0                      | 0                       |
| Number Moderate                  | 0                      | 0                       |
| Number Low                       | 0                      | 109                     |
| Maximum 15-minute Mean           | 64.3 $\mu\text{g m}^3$ | 193.4 $\mu\text{g m}^3$ |
| Maximum Hourly Mean              | 45.9 $\mu\text{g m}^3$ | 126.9 $\mu\text{g m}^3$ |
| Maximum running 8-hour Mean      | 0.0 $\mu\text{g m}^3$  | 0.0 $\mu\text{g m}^3$   |
| Maximum running 24-hour Mean     | 0.0 $\mu\text{g m}^3$  | 0.0 $\mu\text{g m}^3$   |
| Maximum Daily Mean               | 26.6 $\mu\text{g m}^3$ | 54.3 $\mu\text{g m}^3$  |
| 90.4th Percentile (PM) - Daily   | -                      | 27.5 $\mu\text{g m}^3$  |
| 99.8th Percentile (NO2) - Hourly | -                      | -                       |
| Average                          | 7.3 $\mu\text{g m}^3$  | 15.5 $\mu\text{g m}^3$  |
| Data Capture                     | 30.6 %                 | 30.6 %                  |

**Hourly Time Series Plots**

**Figure F.4 – Blyth Library Particulates (PM<sub>10</sub>) Time Series Plot**

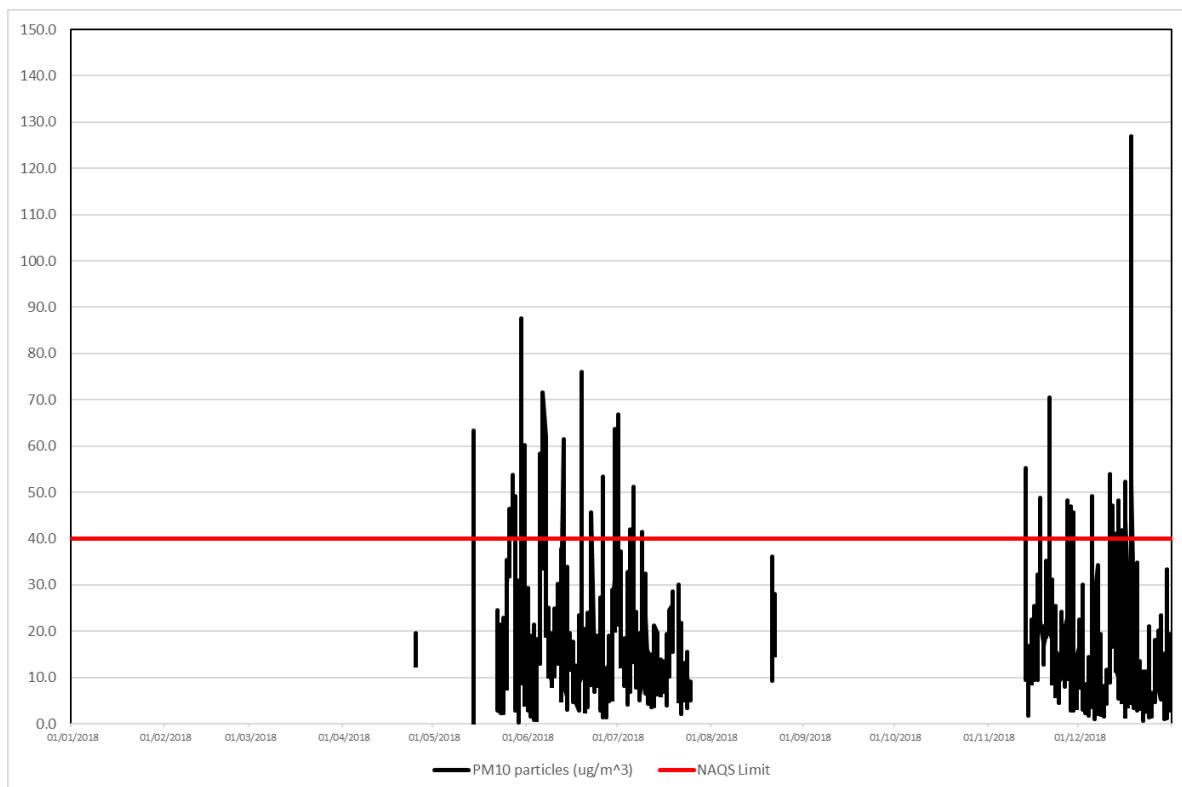
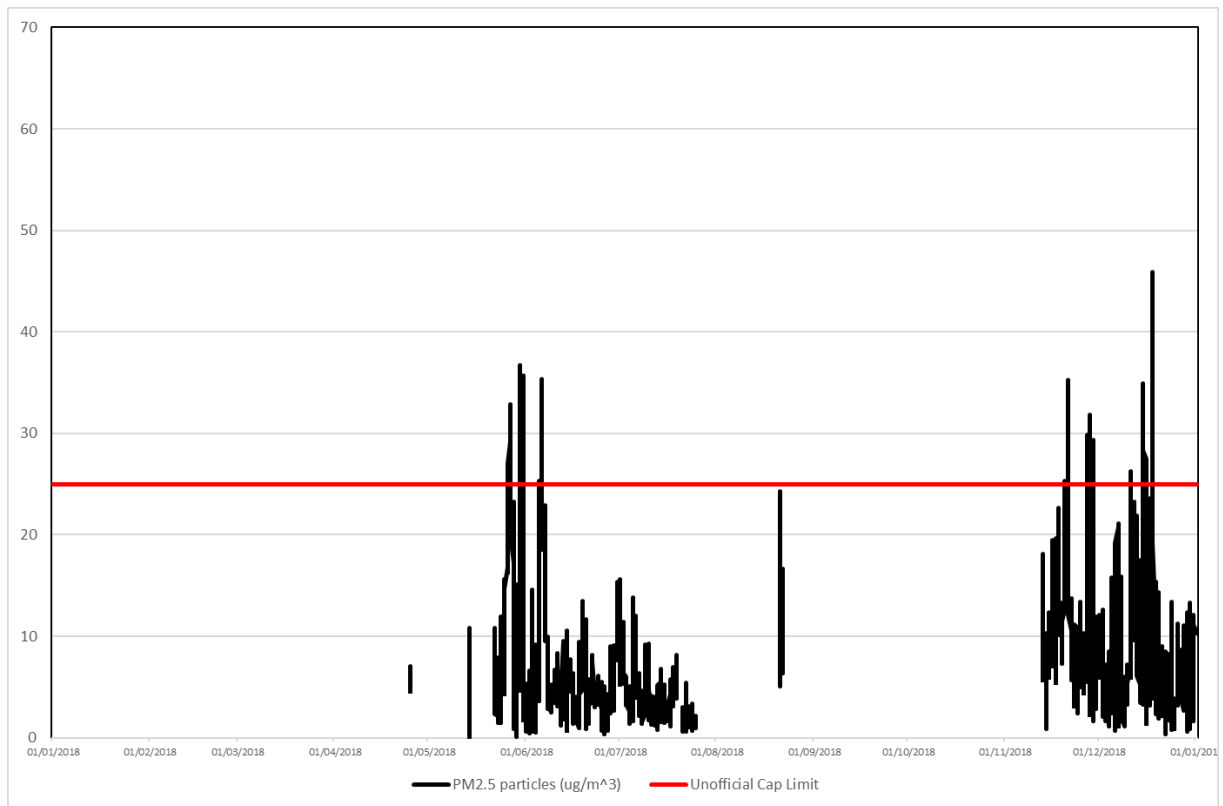


Figure F.5 – Blyth Library Particulates (PM<sub>2.5</sub>) Time Series Plot



## Appendix G: Annualising Data

### Particulates (PM<sub>10</sub> and PM<sub>2.5</sub>) - TNO3313 - Blyth Library

The data capture for the Blyth Library Osiris particulate monitor was 30.6 per cent in 2018, being less than the accepted 85 per cent data, this requires annualising under the guidance and the 90.4th percentile calculated for the one hour mean. Data was “missing” in two main blocks from 01 January to 22 May and from 25 July to 13 November, because of an intermittent power supply issue.

Particulate (PM monitors on the AURN network within 50 miles of the Blyth Library site include Newcastle City Centre (11.1 miles), Newcastle Cradlewell (10.1 miles) Middlesbrough (40.2 miles), Sunderland Silksworth (18.2) and Middlesbrough (40.2 miles). The three stations collected 97.2, 95.4 and 97.3 per cent data in 2018, respectively.

**Table G.2 – Blyth Library PM<sub>10</sub> Annualising Calculation**

|                       | <i>Data Capture (%)</i> | <i>Annual Mean 2018 (AM)</i> | <i>Period Mean 2018 (PM)</i> | <i>Annualised Value</i> |
|-----------------------|-------------------------|------------------------------|------------------------------|-------------------------|
| Blyth Library Osiris  | 30.6                    | 15.5                         | /                            | <b>16.5</b>             |
| Long Term Sites       | <i>Data Capture (%)</i> | <i>Annual Mean 2018 (AM)</i> | <i>Period Mean 2018 (PM)</i> | <i>Ratio (AM/PM)</i>    |
| Newcastle City Centre | 93.4                    | 12.3                         | 13.8                         | 0.89                    |
| Newcastle Cradlewell  | 94.4                    | 14.7                         | 10.5                         | 1.40                    |
| Middlesbrough         | 93.9                    | 15.6                         | 17.2                         | 0.91                    |
|                       |                         |                              | Average (Ra)                 | 1.07                    |

Given the lack of choice over available monitors on the AURN network within a 50 mile radius, some of the monitoring sites could not be chosen for being urban background sites.

Newcastle Cradlewell is an “Urban Traffic” site, Middlesborough is an “Urban Industrial”, however both Sunderland Silksworth and Newcastle City Centre are “Urban Background” sites.

For PM<sub>10</sub>, the ratio of the annual mean and period mean for three of the sites was 1.07, the ratio varies little between 0.89 to 1.40 at the three sites.

For PM<sub>10</sub>, the ratio of the annual mean and period mean was substantially affected by the Newcastle Cradlewell ratio (the period mean being lower than the annual

mean). However, the exclusion of this monitoring site in the calculation would only reduce the annualised mean to  $13.9 \mu\text{g}/\text{m}^3$ .

The result is that the annualised value for the Blyth Library Osiris PM<sub>10</sub> annual mean is increased from  $15.5 \mu\text{g}/\text{m}^3$  to  $16.5 \mu\text{g}/\text{m}^3$ .

**Table G.3 – Blyth Library PM<sub>2.5</sub> Annualising Calculation**

|                       | <i>Data Capture (%)</i> | <i>Annual Mean 2018 (AM)</i> | <i>Period Mean 2018 (PM)</i> | <i>Annualised Value</i> |
|-----------------------|-------------------------|------------------------------|------------------------------|-------------------------|
| Cowpen Road Osiris    | 30.6                    | 7.3                          | /                            | <b>6.7</b>              |
| Long Term Sites       | <i>Data Capture (%)</i> | <i>Annual Mean 2018 (AM)</i> | <i>Period Mean 2018 (PM)</i> | <i>Ratio (AM/PM)</i>    |
| Newcastle City Centre | 91.5                    | 9                            | 10.3                         | 0.87                    |
| Sunderland Silksworth | 90.1                    | 8.4                          | 8.8                          | 0.95                    |
| Middlesbrough         | 92.9                    | 8.9                          | 9.8                          | 0.91                    |
|                       |                         |                              | Average (Ra)                 | 0.91                    |

For PM<sub>2.5</sub>, the ratio of the annual mean and period mean for three of the sites was 0.91, the ratio varies little between 1.09 to 1.11 at the three sites.

The result is that the annualised value for the Blyth Library Osiris PM<sub>2.5</sub> annual mean is decreased from  $7.3 \mu\text{g}/\text{m}^3$  to  $6.7 \mu\text{g}/\text{m}^3$ .

### **Nitrogen Dioxide Diffusion Tubes – Haltwhistle 1 (HALT1) and 24 Cowpen Road, Blyth (B16)**

Two diffusion tubes were relocated at the beginning of May which resulted in only eight months of results being collected at their new locations, both resulting in less than 75 per cent data collection. The tubes had been at locations under a contract and couldn't be moved until that contract had ended.

**Table G.4 – Diffusion Tube Annualising Calculation**

|                           | <i>Data Capture (%)</i> | <i>Annual Mean 2018 (AM)</i> | <i>Period Mean 2018 (PM)</i> | <i>Annualised Value</i> |
|---------------------------|-------------------------|------------------------------|------------------------------|-------------------------|
| HALT1                     | 67.0                    | 16.8                         | /                            | <b>18.3</b>             |
| B16                       | 67.0                    | 31.5                         | /                            | <b>34.3</b>             |
| Long Term Sites           | <i>Data Capture (%)</i> | <i>Annual Mean 2018 (AM)</i> | <i>Period Mean 2018 (PM)</i> | <i>Ratio (AM/PM)</i>    |
| Newcastle City Centre     | 100.0                   | 28.7                         | 26.4                         | 1.09                    |
| Newcastle Cradlewell      | 100.0                   | 39.2                         | 37.1                         | 1.06                    |
| Sunderland Silksworth     | 100.0                   | 14.1                         | 13.6                         | 1.04                    |
| Sunderland Wessington Way | 92.0                    | 20.6                         | 17.6                         | 1.17                    |
|                           |                         |                              | Average (Ra)                 | 1.09                    |

## Glossary of Terms

| Abbreviation      | Description   |
|-------------------|---|
| AM                | Annual Mean   |
| 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 |
| AQO               | Air Quality Objectives, sometimes referred to as the Air Quality Standards (AQS)  |
| ASR               | Annual Status Report (for air quality)  |
| AURN              | Automatic Urban Rural Network   |
| BAM               | Beta Attenuation Monitor  |
| BTEX              | Benzene, Toluene, Ethylbenzene and Xylene   |
| DEFRA             | Department for Environment, Food and Rural Affairs  |
| DMRB              | Design Manual for Roads and Bridges – includes an air quality screening tool produced by Highways England   |
| EU                | European Union  |
| FDMS              | Filter Dynamics Measurement System  |
| IAQM              | Institute of Air Quality Management   |
| LAQM              | Local Air Quality Management  |
| LGR               | Local Government Reorganisation   |
| LSO               | Local Site Operatives   |
| LTP               | Local Transport Plan  |
| NO                | Nitrous Oxide   |
| NO <sub>2</sub>   | Nitrogen Dioxide  |
| NO <sub>x</sub>   | Nitrogen Oxides   |
| PAH               | Poly-Aromatic Hydrocarbons  |
| PM                | Period Mean   |
| PM <sub>10</sub>  | Airborne particulate matter with an aerodynamic diameter of 10 $\mu\text{m}$ (micrometres or microns) or less   |
| PM <sub>2.5</sub> | Airborne particulate matter with an aerodynamic diameter of 2.5 $\mu\text{m}$ or less   |
| QA/QC             | Quality Assurance / Quality Control   |
| SO <sub>2</sub>   | Sulphur Dioxide   |
| ...               | ...   |

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