Northumberland County Council

2014 Air Quality Progress Report for

Northumberland County Council

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

April 2014

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Executive Summary

This is the local air quality Progress Report for 2013 Northumberland County Council. The report fulfils this part of the Council's commitment to the continuing Local Air Quality Management (LAQM) process. This report provides an annual update for recent air quality issues in Northumberland, including an update on recent air quality in the area, obtained from its monitoring results.

The main findings for 2013 are:

- The Council has continued to monitor air quality at three real-time continuous monitoring stations; two in Blyth and one at Newbiggin and maintain a network of nitrogen dioxide diffusion tubes across the district.
- The National Air Quality Objectives have not been exceeded.
- Due to down time and instrument failures data capture from the real-time, continuous monitors fell below 90 per cent in 2013, which required "annualised" data to be presented for the annual mean objective and per centiles.
- Redevelopment of the Blyth library site has necessitated the removal of the enclosure which has monitored nitrogen dioxide and particulates (as PM_{10}) since 2006.
- There has been some investment in new equipment to measure some pollutants.
- No further detailed assessment is required for any of the monitored pollutants within Northumberland.

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1 Introduction

1.1 Description of Local Authority Area

Northumberland County Council was vested as a unitary authority on the 1 April 2009 and was the amalgamation of the exiting county council and five district and borough councils; Berwick-upon-Tweed Borough Council, Alnwick District Council, Castle Morpeth Borough Council, Wansbeck District Council, Blyth Valley Borough Council and Tynedale District Council.

Northumberland covers an area of England from the Tyne Valley and Tyneside to the Scottish borders in the North and North-West and to Cumbria in the West. It is the largest county in England by size at 5025 square kilometres and yet is one of the smallest by population (316,000 persons in the 2011 Census).

The county border with Scotland cuts through the Cheviot Hills to the west at a maximum height of 815 metres, several streams and rivers drain these hills and the moors of the Tyne Valley and enter the North Sea at the coast.

Forty-six per cent of the population live in the former districts of Blyth Valley and Wansbeck and together these cover only three per cent of the area of Northumberland. These areas form and urban conurbation in the south east area of the County.

The principal towns of Northumberland are; Alnwick, Ashington, Berwick, Blyth, Cramlington, Hexham and Morpeth.

Each town has commercial / industrial areas which contribute to localised air quality generating emissions from processes, combustion & transport.

The Cramlington and Blyth areas contain large industrial/ commercial areas which include a number of permitted processes including two of the district's four, Part A2 LA-IPPC permitted installations. Blyth still has an active port which is a centre of coal shipping. Hexham, in the rural west, has the only other active A2 LA-IPPC process, which lies to the north of the town on the banks of the River Tyne. Morpeth and Alnwick, have smaller industrial/ commercial estates and Berwick / Tweedmouth has a few commercial businesses and a small port.

The only crematoria in Blyth is installing mercury abatement in 2014 at a cost of £1.5 million.

At present, Northumberland has one co-fuelled coal / biomass power station on the coast at Lynemouth. However, there are plans for this to become 100% biomass by the end of 2014.

There are a number of surface coal mines within the county, mostly situated in the south east of the County. Currently, the active sites are : Shotton, Delhi/Brenkley, Potland Burn, Butterwell and Well Hill.

Below is a map showing the Northumberland county area and the location of continuous and non-continuous monitoring sites within the county which are mentioned in the report.

Figure 1.1. Map of Northumberland County Showing Principal Air Quality Monitoring Locations

1.2 Purpose of Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then 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.

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the LAQM process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM **in England** are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre $\mu g/m^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in England

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	5.00 $\mu g/m^3$	Annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particulate Matter (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu g/m^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

This is the fourth Progress Report produced by the unitary Northumberland County Council (formed in April 2009). There has been one previous Updating and Screening Assessment in 2010, three previous Progress Reports (2010, 2011 and 2013) and a Detailed Assessment (2011). The latter was produced because the 2010 Progress Report identified an exceedance of the annual mean objective for NO_2 at the Cowpen Road AQ station. The detailed assessment concluded that this was anomalous and was not substantiated by previous data at the site or the co-located diffusion tubes. As such, no further action was planned although the site would continue to be monitored. The Detailed Assessment also identified that the AQMA declared by the former Blyth Valley Borough Council should be revoked because of a lack of substantive data, this was done after consultation with DEFRA (Local Air Quality Management: Detailed Assessment of Air Quality letter dated 26 July 2012).

Table 1.2 Previous Air Quality Reports for Northumberland

Progress Report 2013	Date Produced	Outcomes
Northumberland County Council	April 2013	National Air Quality Objectives continue to be met and are likely to be met in the future
USA 2012	**Date Produced**	**Outcomes**
Northumberland County Council	April 2012	National Air Quality Objectives continue to be met and are likely to be met in the future. AQMA revoked.
Progress Report 2011	**Date Produced**	**Outcomes**
Northumberland County Council	April 2011	National Air Quality Objectives continue to be met and are likely to be met in the future. Blyth AQMA should be revoked after consultation.
Detailed Assessment 2011	**Date Produced**	**Outcomes**
Northumberland County Council	April 2011	Previous NO_2 annual mean exceedance at Cowpen appears to be anomalous and that no further action is needed at this site.
Progress Report 2010	**Date Produced**	**Outcomes**
Northumberland County Council	April 2010	Exceedance of the annual mean objective at the Cowpen NO_2 station. No other exceedance or issues with either passive or active monitoring. Detailed assessment required for Blyth AQMA to review status and exceedance in Cowpen Road area
USA 2009	**Date Produced**	**Outcomes**
Alnwick DC	21 August 2009	National Air Quality Objectives continue to be met in and are likely to be met in the future
Berwick DC	2 October 2009	National Air Quality Objectives continue to be met in and are likely to be met in the future
Blyth Valley BC	September 2009	National Air Quality Objectives continue to be met. Review of AQMA
Castle Morpeth BC	June 2009	Report does not show any exceedance of National Air Quality Objectives
Tynedale DC	July 2009	Results do not show exceedance of National Air Quality Objectives
Wansbeck DC	July 2009	National Air Quality Objectives continue to be met in and are likely to be met in the future

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Neither of the monitoring stations in Blyth town centre (library site) and Cowpen Road have shown an exceedance of the 1 hour mean or annual mean on either Nitrogen dioxide (NO_2) or the 24 hour mean or annual mean exceedance limits for 10 micron particulate matter (PM_{10}) for 2013.

The Newbiggin sulphur dioxide (SO_2) monitor has also not shown any exceedance of the air quality objectives for this pollutant.

Council officers (as local site operators) have carried out calibration checks at monthly intervals on all real-time, continuous monitors during 2013.

Data processing and ratification has been carried out by Air Quality Data Management (AQDM) of Oxford.

2013 was a particularly poor year for data capture from all our instruments due to a degree of down time and instrument failures.

Servicing, calibration and maintenance of the real-time, continuous monitors was provided by SupportingU of Hertfordshire.

Due to the age and increasing unreliability of the continuous, real-time monitors, an investment has been made in some new equipment. This was expedited by the issues surrounding the enclosure at the Blyth Library site which had to be removed because of improvement works to transformation of the approaches to the library façade. This was highlighted in the June 2013 Progress Report, although the station itself was left operational until the end of October 2013.

Two Turnkey Osiris particulate monitors were purchased in March 2013 with one unit being installed at the Blyth Library site at the end of September 2013, so as to give a month’s overlap with the existing enclosure before it was removed. The other was installed at the Cowpen Road station on the 10 July 2013 but removed in response to a Fire incident, between the 24 September until the 24 December 2013. Therefore data from both units has not been included in this report as they represent relatively

short-term commissioning and site comparison with the existing monitors. Both Osiris units will be reported for the full year of 2014 in the next round of LAQM reporting.

NO_2 will continue to be monitored through the siting of a co located diffusion tube At the Blyth Library site. The Turnkey Osiris will then routinely monitor particulates at this location.

At the Cowpen Road station, the API/Teledyne 200E will continue to be used to monitor NO_2 together with a co located diffusion tube. Once the present stock of BAM tapes have been used, this instrument will be decommissioned and the co-located Turnkey Osiris will continue to monitor particulates at this site.

Sulphur dioxide will no longer be monitored by the authority due to instrument issues. The continuing objective for SO_2 is being met and the move to biomass fuel this year at the Lynemouth power station will further reduce the need for close monitoring.

Figure 2.1a Blyth and Cowpen Automatic Monitoring Station Locations

Figure 2.1b Newbiggin Automatic Monitoring Station Locations

Location maps of the automatic monitoring locations are shown in Appendix B.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Newbiggin Sports Centre	Urban background	X588085	Y430864	SO_2	CL	N	Y (10m)	30m	Y
Blyth Town Centre	Urban Centre / Roadside	X431536	Y581531	NO_2, PM_{10}	CL, BAM	N	Y(3m)	3m	Y
Cowpen Road	Roadside	X428817	Y581815	NO_2, PM_{10}	CL, BAM	N	Y(3m)	3m	Y

CL = chemiluminescent
BAM = beta attenuation monitor

All monitors were maintained by SupportingU with a six-monthly service, all are calibrated either automatically or manually at least fortnightly. Data download/capture is done remotely using a mix of Windows HyperTerminal, Teledyne's APIComm and Enview 2000. Data processing and ratification for this period of data was carried out by Air Quality Data Management.

2.1.2 Non-Automatic Monitoring Sites

The Council operated 18 NO_2 diffusion tubes at locations across the district. The tube at the Police Station, Ponteland was removed at the end of March 2013.

None of the diffusion tubes measuring NO_2 have shown any monthly exceedance (after bias adjustment) or an annual mean above the air quality objective.

All diffusion tubes are prepared and analysed by Environmental Scientifics Group (ESG Didcot). The details of the laboratory, preparation methods, procedures followed, bias factors, laboratory precision, quality assurance and quality control information (including WASP ratings of the laboratories used) etc. are specified in Appendix A.

A further review of NO_2 diffusion tubes will be carried out in 2014.

It is proposed that the two tubes located at Berwick-upon-Tweed are decommissioned at the end of beginning of April 2014 as they have continued to show compliance with air quality objectives and the location entails a significant amount of time and expense to maintain.

It is proposed that one tube will be relocated to a site in Ashington that has not been monitored before and will represent a location which has relevant receptors and heavy traffic loads including a higher contribution from HGVs.

The following location maps of the non-automatic monitoring locations are shown in Appendix B :

Figure 2.2a Alnwick NO_2 Diffusion Tube Monitoring Locations

Figure 2.2b Berwick NO_2 Diffusion Tube Monitoring Locations

Figure 2.2c Blyth NO_2 Diffusion Tube Monitoring Locations

Figure 2.2d Morpeth and Ponteland NO_2 Diffusion Tube Monitoring Locations

Figure 2.2e Cramlington NO_2 Diffusion Tube Monitoring Locations

Figure 2.2f Wansbeck NO_2 Diffusion Tube Monitoring Locations

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
8N – Bondgate Without, Alnwick	Roadside	X 419025	Y 613074	NO_2	N	N – (20m)	1m	Y
Ber5 - Main Street, Tweedmouth	Roadside	X 399437	Y 652022	NO_2	N	Y – (1m)	4m	Y
Ber7 - Castlegate, Berwick	Roadside	X 399595	Y 653170	NO_2	N	Y – (1m)	2m	Y
B1 - Waterloo Road, Blyth	Urban Centre	X431537	Y581537	NO_2	N	Y – (5m)	1m	Y
B3 - Cowpen Rd. West, Blyth	Roadside(1m)	X428815	Y581813	NO_2	N	Y – (6m)	1m	Y
B5 - Cowpen Rd. East, Blyth	Roadside(1m)	X429850	Y581947	NO_2	N	Y – (25m)	1m	Y
B11 - Blyth YMCA, Blyth	Urban Centre	X431160	Y581415	NO_2	N	Y - (2m)	1m	Y
B12 - Bridge St, Blyth	Urban Centre	X431612	Y581586	NO2	N	Y - (1m)	1m	Y
B15 - South Newsham Road	Roadside(1m)	X430552	Y578950	NO2	N	Y (6m)	2m	N
C1 - High Pit Road, Cramlington	Roadside(1m)	X427593	Y576555	NO2	N	Y – (1m)	1m	Y
C9 - Trebor, Cramlington	Roadside(1m)	X424456	Y577173	NO_2	N	Y - (30m)	3m	Y
C10 – Bay Horse (B1505)	Roadside	X427527	Y576145	NO_2	N	Y – (13m)	1m	N
C11 – Storey Street (B1505)	Roadside	X427214	Y575361	NO_2	N	Y – (10m)	1m	N
2 - Newgate St, Morpeth	Roadside	X 419525	Y 586380	NO_2	N	Y – (2m)	2m	Y
3 - Ponteland Rd, Morpeth	Roadside	X 416724	Y 572853	NO_2	N	Y – (2m)	2m	Y
4 - Bridge St, Morpeth	Roadside	X 419947	Y 585937	NO_2	N	Y – (2m)	2m	Y
S17 - Front Street, Bedlington	Urban Centre	X581879	Y426014	NO_2	N	N – (25m)	1m	Y
SD1 - Salvation Army, Seaton Delaval	Roadside(1m)	X430387	Y575433	NO_2	N	Y – (1m)	1m	Y

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year. Measured means shown in parentheses.
*Annual mean concentrations for previous years are optional.
In bold, exceedance of the NO_2 annual mean AQS objective of 40μg/m^3
Underlined, annual mean > 60μg/m^3, indicating a potential exceedance of the NO_2 hourly mean AQS objective
[a] Means should be "annualised" as in Box 3.2 of TG(09)(http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38), if full calendar year data capture is less than 75%
[b] If an exceedance is measured at a monitoring site not representative of public exposure, NO_2 concentration at the nearest relevant exposure should be estimated based on the "NO_2 fall-off with distance" calculator (http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html), and results should be discussed in a specific section. The procedure is also explained in Box 2.3 of Technical Guidance LAQM.TG(09) (http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=30).

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide (NO_2)

Automatic Monitoring Data

Neither of the automatic monitors indicated any breach of the national air quality objectives for NO_2. Measured annual means were well within the objective and no measured exceedance was recorded. Percentiles for both monitors were well within the 200 $\mu g/m^3$ hourly mean objective.

Both monitors had less than 90 per cent data capture so averages have been "annualised" (*in parentheses*) and the 90.8th per centiles are presented.

Both the Blyth and Cowpen air quality stations are sited where they would represent "worst case scenario" being nearer to the pollution sources than receptors. Relevant public exposure, in terms of the proximity of permanent residential occupants is minimal. However, bus stops are located close to both stations and the Blyth site has constant pedestrian traffic in this town centre location.

Details of the annualising the data are included in Appendix A. Percentiles were calculated by AQDM.

Table 2.3 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2013 [b] %	Annual mean concentrations ($\mu g/m^3$)		
					2011 [c, d]	2012 [c]	2013
	Blyth Library Site	No	N/A	76.3	26 (27)	25	21 (22[c])
	Cowpen Road Site	No	N/A	82.3	29	28	27 (28[c])

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year. Displayed in parentheses.
*Annual mean concentrations for previous years are optional.

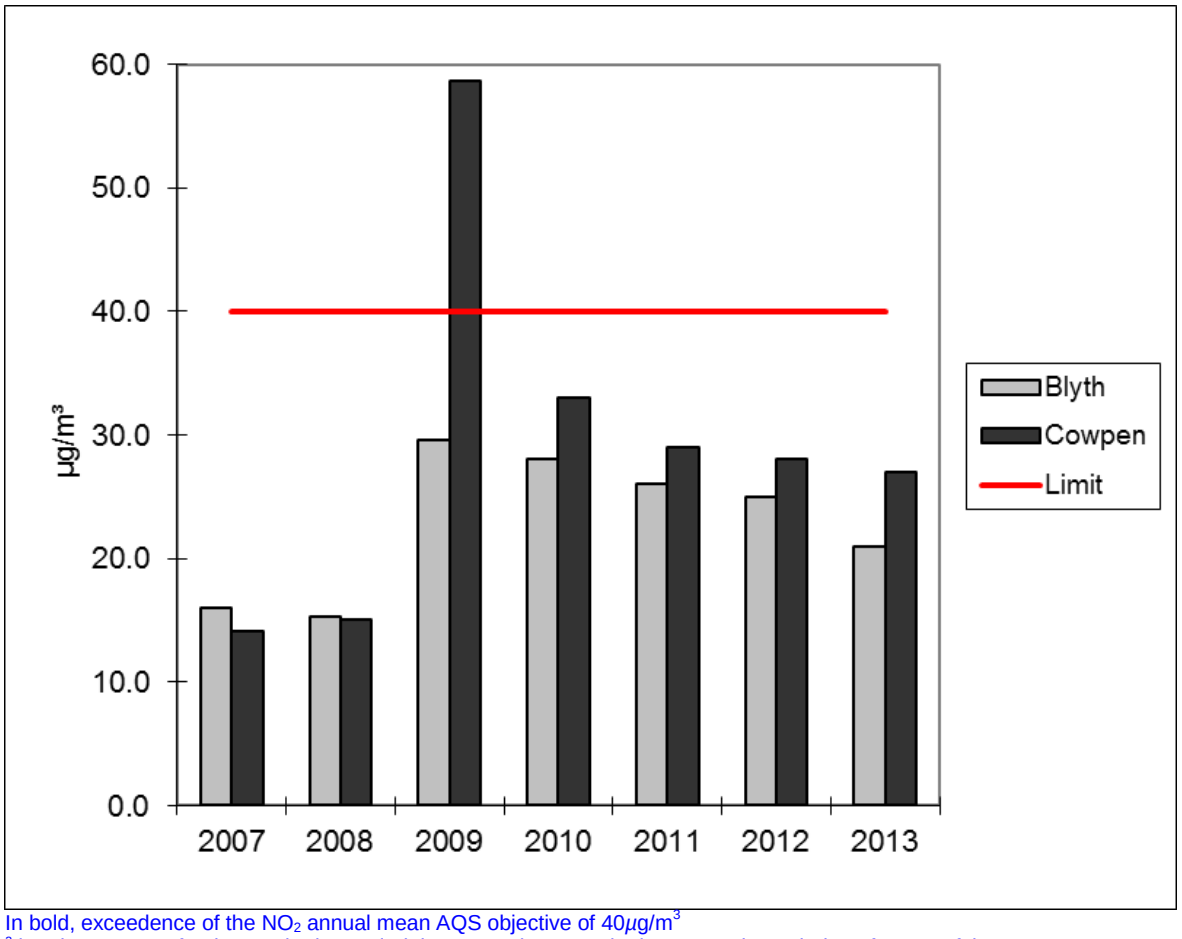
Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2013 [b] %	Number of Exceedence of hourly mean (200 $\mu g/m^3$) If the period of valid data is less than 90% of a full year, include the 99.8th per centile of hourly means in brackets.		
					2011 [c]	2012 [c]	2013
	Blyth Library Site	No	N/A	76.3	0 (90*)	0	0 (80*)
	Cowpen Road Site	No	N/A	82.3	0	3	0 (113*)

* Below the 90% data capture therefore 99.8th Per centile = 90 $\mu g/m^3$ (below the 200 $\mu g/m^3$ guideline value) Percentile displayed in parentheses.
[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Numbers of exceedences for previous years are optional.

Figure 2.3 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Automatic Monitoring Sites 2007 to 2013

NO_2 levels continue to be met at the two automatic stations and seem to indicate a continuing decrease at both stations in the last five year.



In bold, exceedence of the NO_2 annual mean AQS objective of 40μg/m^3
[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] Means should be "annualised" as in Box 3.2 of TG(09) (http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38), if valid data capture is less than 75%
* Annual mean concentrations for previous years are optional

Diffusion Tube Monitoring Data

Results for all 18 nitrogen dioxide diffusion tubes show the annual average objective for 2013 are being met for NO_2 (after bias adjustment). Also, none of the monthly measured values exceeded the annual average objective of 40 μg/m^3 for NO_2 (after bias adjustment).

Table 2.5 Results of NO_2 Diffusion Tubes 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2013 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.80) 2013 ($\mu g/m^3$)
8N	Bondgate Without, Alnwick	Road/Urban	N		91.7	N	N	28
Ber5	Main Street, Tweedmouth	Road/Urban	N		100	N	N	25
Ber7	Castlegate	Road/Urban	N		100	N	N	26
B1	Waterloo Road, opp bus station LP	Road/Urban	N		100	N	N	29
B3	Cowpen Road, west end monitoring station LP	Road/Urban	N		100	N	N	33
B5	Cowpen Road, east end nr Lord Tool Hire LP	Road/Urban	N		91.7	N	N	24
B11	Blyth YMCA LP	Road/Urban	N		100	N	N	25
B12	Bridge Street, opp Job Centre LP	Road/Urban	N		91.7	N	N	25
B15	South Newsham Road	Road/Arterial	N		100	N	N	21
C1	High Pit Road, Burton House car park LP	Road/Urban	N		91.7	N	N	24
C9	Trebor,A1172 Station Road, Cramlington	Road/Arterial	N		100	N	N	21
C10	Bay Horse, Cramlington	Road/Urban	N		100	N	N	28
C11	Storey Street, Cramlington	Road/Urban	N		83.3	N	N	19
2	Newgate Street/Bullers Green, Morpeth	Road/Urban	N		100	N	N	22
3	Police Station, Ponteland	Road/Urban	N		25	Y	N	30 (32)
4	Northern Rock, Bridge Street, Morpeth	Road/Urban	N		100	N	N	28
17	Front Street East, Bedlington (LP next to shelter at junction of Church Ave)	Road/Urban	N		100	N	N	27
SD1	Seaton Delaval, Salvation Army LP	Road/Urban	N		100	N	N	26

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year. Measured means shown in parentheses.
*Annual mean concentrations for previous years are optional.
In bold, exceedance of the NO_2 annual mean AQS objective of 40$\mu g/m^3$
Underlined, annual mean > 60$\mu g/m^3$, indicating a potential exceedance of the NO_2 hourly mean AQS objective
[a] Means should be "annualised" as in Box 3.2 of TG(09)(http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38), if full calendar year data capture is less than 75%
[b] If an exceedance is measured at a monitoring site not representative of public exposure, NO_2 concentration at the nearest relevant exposure should be estimated based on the "NO_2 fall-off with distance" calculator (http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html), and results should be discussed in a specific section. The procedure is also explained in Box 2.3 of Technical Guidance LAQM.TG(09) (http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=30).

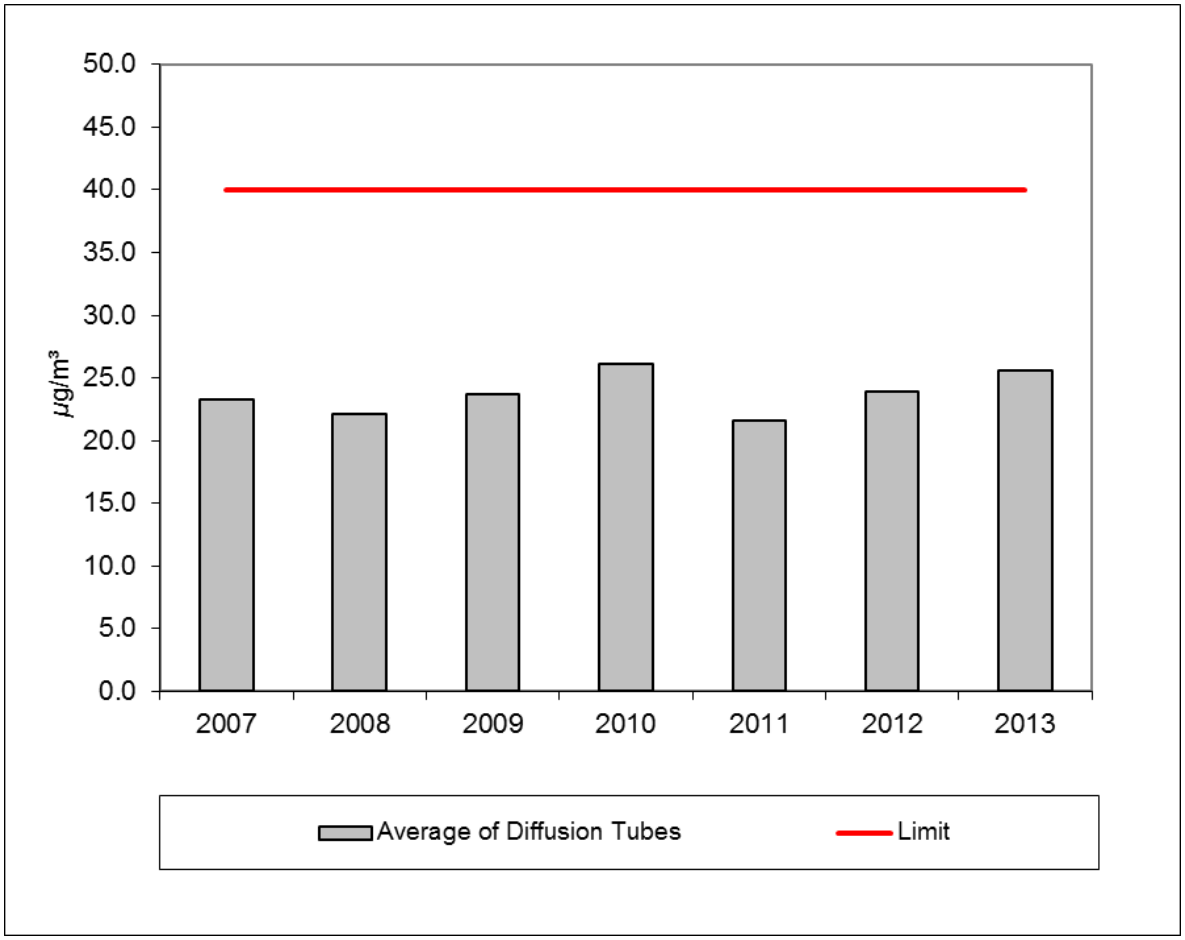
Table 2.6 Results of NO_2 Diffusion Tubes (2010 to 2013)

Site ID	Location	Type	Within AQMA?	Data Capture for monitoring period[a] %	Data Capture for full calendar year 2013[b] %	Annual mean concentrations (mg/m^3)			
						2010 (bias adjustment factor = 1.08)	2011 (bias adjustment factor = 0.84)	2012 (bias adjustment factor = 0.79)	2013 (bias adjustment factor = 0.80)
8N	Bondgate Without, Alnwick	Road/Urban	N		91.7	36	33	30	28
Ber5	Main Street, Tweedmouth	Road/Urban	N		100	30	27	24	25
Ber7	Castlegate	Road/Urban	N		100	29	26	25	26
B1	Waterloo Road, opp bus station LP (X2)	Road/Urban	N		100	35	30	31	29
B3	Cowpen Road, west end monitoring station LP	Road/Urban	N		100	35	28	28	33
B5	Cowpen Road, east end nr Lord Tool Hire LP	Road/Urban	N		91.7	23	21	20	24
B11	Blyth YMCA LP	Road/Urban	N		100	30	26	27	25
B12	Bridge Street, opp Job Centre LP	Road/Urban	N		91.7	32	26	27	25
B15	South Newsham Road	Road/Arterial	N		100	N/A	19	20	21
C1	High Pit Road, Burton House car park LP	Road/Urban	N		91.7	32	25	25	24
C9	Trebor,A1172 Station Road, Cramlington	Road/Arterial	N		100	N/A	27	21	21
C10	Bay Horse, Cramlington	Road/Urban	N		100	N/A	N/A	20 (23)	28
C11	Storey Street, Cramlington	Road/Urban	N		83.3	N/A	N/A	18 (21)	19
2	Newgate Street/Bullers Green, Morpeth	Road/Urban	N		100	20	19	22	22
3	Police Station, Ponteland	Road/Urban	N	100	25	25	28	27	30 (32)
4	Northern Rock, Bridge Street, Morpeth	Road/Urban	N		100	40	25	28	28
17	Front Street East, Bedlington (LP next to shelter at junction of Church Ave)	Road/Urban	N		100	30	27	24	27
SD1	Seaton Delaval, Salvation Army LP	Road/Urban	N		100	32	33	34	26

‡ Diffusion tubes were being analysed by two different companies (Lambeth Scientific Services Ltd = 1.03 and Harwell Scientifics = 0.81)
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year. Measured means shown in parentheses.
In bold, exceedance of the NO_2 annual mean AQS objective of 40μg/m^3
Underlined, annual mean > 60μg/m^3, indicating a potential exceedance of the NO_2 hourly mean AQS objective
[a] Means should be "annualised" as in Box 3.2 of TG(09) (http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38), if full calendar year data capture is less than 75%

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites 2007 - 2013

Even accounting for several reductions in the diffusion tube programme in Northumberland, where tubes which have been removed have tended to be from areas of lesser concern of reaching the national Air Quality Objectives, still show little inter-annual variation and are within the objective for NO_2.



2.2.2 Particulate Matter (PM_{10})

Neither of the automatic monitors indicated any breach of the national air quality objectives for PM_{10}. Measured annual means were well within the objective. Both monitors have shown a measured exceedance of the daily mean objective of 50 $\mu g/m^3$, however, both are well within the limit of 35 exceeds in a year. Percentiles for both monitors were just within the 50 $\mu g/m^3$ daily mean objective.

Both monitors had less than 90 per cent data capture so the annual averages have been "annualised" and the 90.4th per centiles are presented.

Details of the annualising the data are included in Appendix A. Percentiles were calculated by AQDM.

Table 2.7 Results of Automatic Monitoring of PM_{10}: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2013 [b] %	Annual mean concentrations ($\mu g/m^3$)		
					2011 [c]	2012	2013
	Blyth Library Site	No	N/A	64.5	30 (30)	30	36 (35*)
	Cowpen Road Site	No	N/A	83.0	19 (19)	16	25 (24*)

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year. Displayed in parentheses.
* Optional
In bold, exceedance of the PM_{10} annual mean AQS objective of 40$\mu g/m^3$
[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] Means should be "annualised" as in Box 3.2 of TG(09) (http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38), if valid data capture is less than 75%
* Annual mean concentrations for previous years are optional

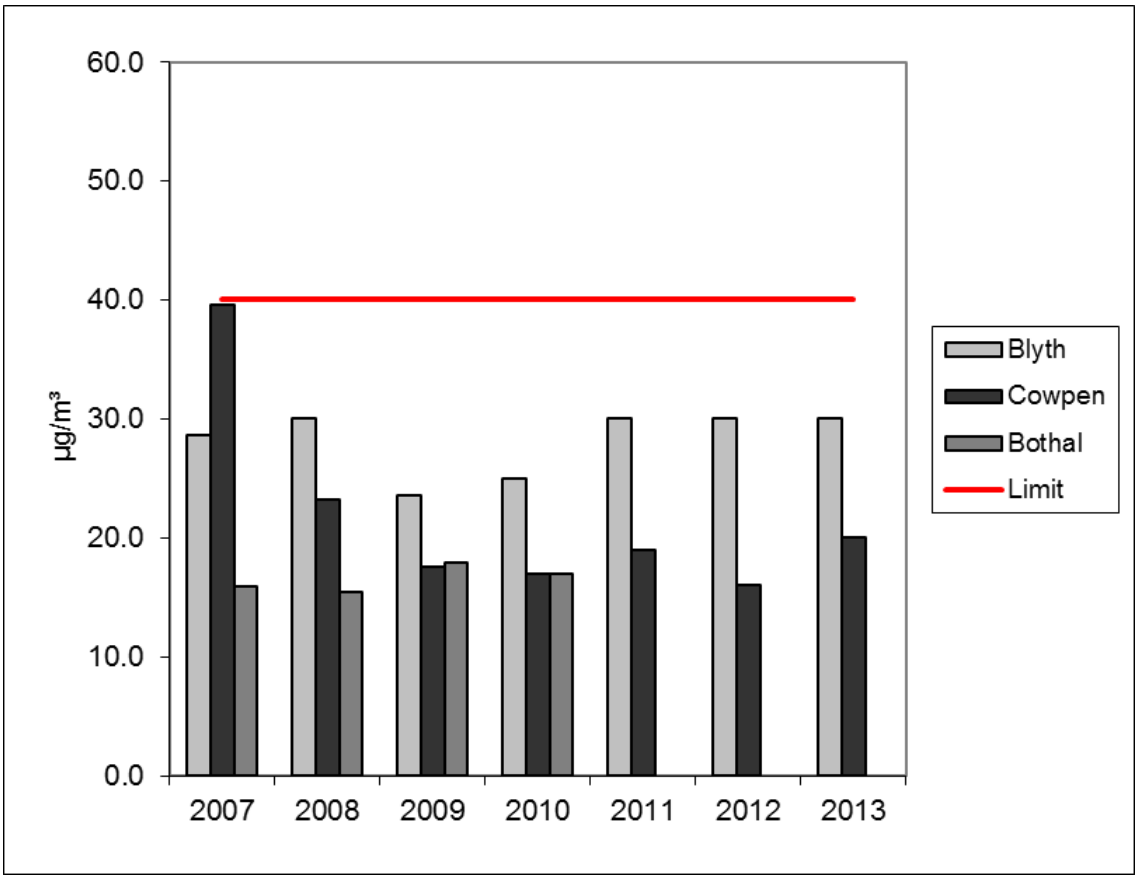
Table 2.8 Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture 2013 [b] %	Number of Exceedence of daily mean objective (50 $\mu g/m^3$) If data capture < 90%, include the 90th per centile of daily means in brackets.		
					2011 [c]	2012 [c]	2013
	Blyth Library Site	No	N/A	64.5	24 (49[c])	22	11 (42[c])
	Cowpen Road Site	No	N/A	83.0	4 (32[c])	0	9 (36[c])

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] if data capture is less than 90%, include the 90th per centile of 24-hour means in brackets
* Optional
In bold, exceedance of the PM_{10} daily mean AQS objective (50$\mu g/m^3$ – not to be exceeded more than 35 times per year)
[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] if data capture for full calendar year is less than 90%, include the 90.4th percentile of 24-hour means in brackets
* Number of exceedances for previous years is optional

Figure 2.5 Trends in Annual Mean PM_{10} Concentrations 2007 - 2013

PM_{10} levels continue to be met at the two automatic stations and have remained relatively constant for the last three years.



2.2.3 Sulphur Dioxide (SO_2)

The automatic monitor indicated no breach of the national air quality objective for SO_2. The measured annual mean was well within the objective and no measured exceedance of the 15 minute, 1 hour or 24 hour objectives recorded. The 99.9th (15 minute), 99.7th (1 hour) and 99.2nd (24 hour) per centiles were also well within the objectives.

Data capture for the Newbiggin SO_2 real-time, continuous monitor fell below 90 per cent in 2013. Therefore, an annualised average has been calculated for this and the following per centiles have been calculated; 99.9th = 15 minute mean, 99.7th = 1 hour mean & 99.2nd = 24 hour mean

Unfortunately, because of the size of Northumberland and the nearest AURN sulphur dioxide monitor with which to annualise the data is at Middlesborough (70 kilometre distant), the robustness of any such annualised data has to be questioned. However, since the values measured have been so low in 2013 (and in previous years), it is felt that the impact of this correction would not have presented any value which would have approached any exceed of the annual mean objective.

Details of the annualising the data are included in Appendix A. Per centiles were calculated by AQDM.

Table 2.9 Results of Automatic Monitoring of SO_2: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period [a] %	Data Capture for full calendar year 2013 [b] %	Annual mean concentrations ($\mu g/m^3$)[C]		
					2011 [c, d]	2012 [c]	2013[c]
	Newbiggin Sports Centre	No	N/A	68.8	5 (5)	3 (3)	6 (5)

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.)
[c] Means should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year. Displayed in parentheses.
* Optional

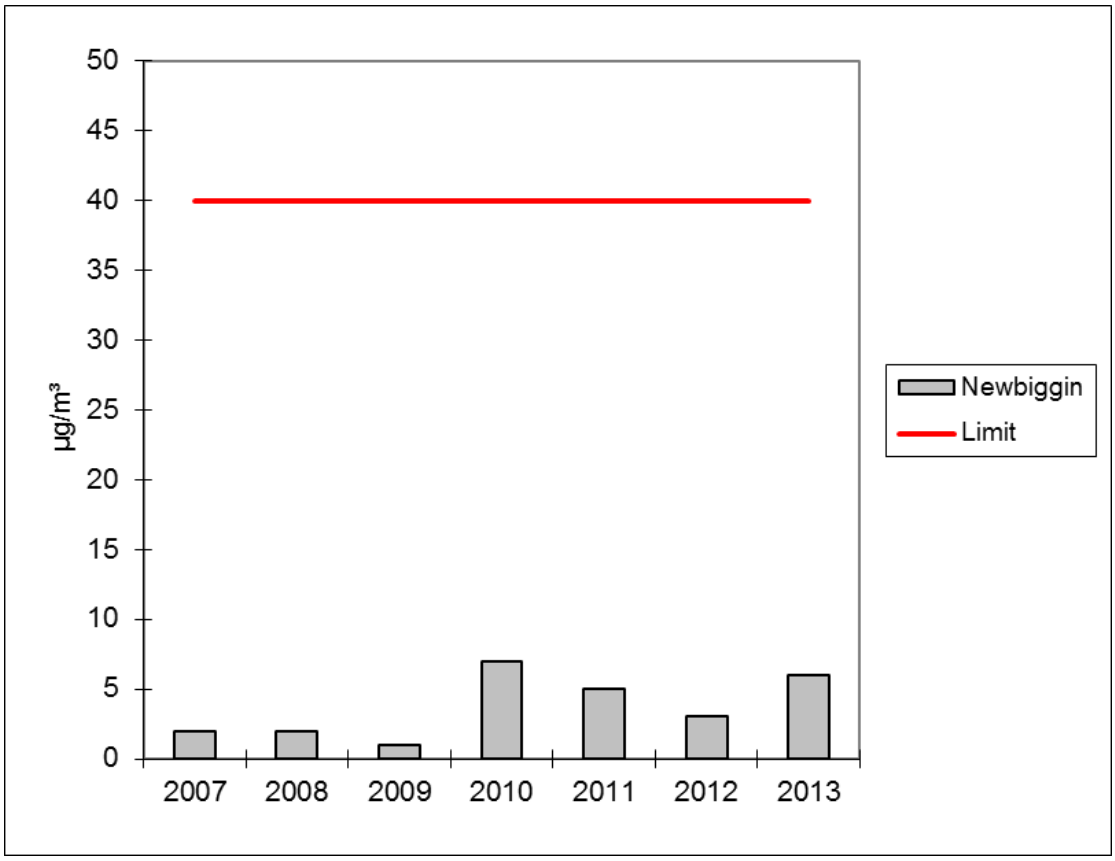
Table 2.10 Results of SO_2 Automatic Monitoring: Comparison with 15-minute, 1-hour & 24-hour Objectives

Site	Location	Within AQMA	Data Capture for monitoring period [a] %	Data Capture 2013 [b] %	Number of Exceedences of: ($\mu g/m^3$)[C]		
					15-minute Objective (266 $\mu g/m^3$)	1-hour Objective (350 $\mu g/m^3$)	24-hour Objective (125 $\mu g/m^3$)
	Newbiggin Sports Centre	No	N/A	68.8	0 (51)	0 (35)	0 (17)

[a] ie. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.
[b] This column shows data capture for the full calendar year – e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%.
NB Relevant per centiles are in parentheses.
In bold, exceedance of the relevant AQS objective (15-min mean = 35 allowed/year; 1-hour mean = 24 allowed/year; 24-hour mean = 3 allowed/year)
[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
[c] if data capture for full calendar year is less than 90%, include the relevant percentile in bracket (in $\mu g/m^3$): 15-min mean = 99.9^{th} ; 1-hour mean = 99.7^{th} ; 24-hour mean = 99.2^{th} percentile. Displayed in parentheses.

Figure 2.6 Trends in SO_2 Concentrations 2007 - 2013

SO_2 levels at Newbiggin continue to be well below the national Air Quality Objectives.



2.2.4 Benzene

Benzene is no longer monitored by this authority after several year of monitoring which indicated no air quality issue with this pollutant at the monitoring sites.

2.2.5 Other Pollutants Monitored

This authority does not routinely monitor any other pollutants.

2.2.6 Summary of Compliance with AQS Objectives

Northumberland County Council has examined the results from monitoring in the Northumberland. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

3.1 Road Traffic Sources

The Morpeth Northern Bypass will be determined by the Secretary of State for Communities and Local Government in January 2015. This major road development will be considered in future LAQM reports. However, air quality has been assessed as part of the application process and there is predicted to be a net benefit to receptors from diverting traffic from Morpeth town centre. Detailed documentation on the scheme is available at:

http://www.northumberland.gov.uk/default.aspx?page=4558

The specific chapter relating to air quality in the draft Environmental Statement can be found at:

http://www.northumberland.gov.uk/idoc.ashx?docid=7816f0ca-c754-4355-b794-0c50ca49ea1f&version=-1

The supporting documentation for this proposed road suggests a positive impact upon the nearest receptors of the present road network in terms of noise and air quality.

No further road traffic sources meeting the criteria have been identified.

3.2 Other Transport Sources

Newcastle Internal Airport (NIA) has expansion plans and are predicting an increase in passenger numbers in excess of 5 million between the present and 2021. The site straddles the Northumberland boundary and will be continually monitored for when this threshold screening criteria is reached.

3.3 Industrial Sources

Akzo-Nobel paint manufacturing plant at Oakwood Way, Ashwood Business Park, Ashington (Planning Ref: 11/03008/FULES) has been constructed and was mentioned in the 2012 Updating and Screening Assessment as a planning application. The installation has an LA-PPC Part B permit for the Manufacture of Coating Materials (Process Guidance note PG6/44(11)) to control emissions from the

installation (permit ref EPSE12/144). The site is not expected to be operational until 2015, although various commissioning works will commence in 2014.

The Blyth Crematorium is carrying out a programme of improvement work at the crematorium, which will run from Autumn 2013 to Summer 2014. The £1.5million project includes the installation of mercury abatement. The crematorium is a Part B LA-PPC permitted process.

It has been reported that the conversion of the Lynemouth Power Station from coal to biomass is due to be completed in 2015. This installation is a Part A1 permitted process and regulated by the Environment Agency.

A major tank farm is to be built under a local development order (LDO) at Blyth to store up to 2000 cubic metres of marine gas. The site will be subject to Environment Agency controls.

3.4 Commercial and Domestic Sources

Several biomass plants have been installed in Northumberland. Where these are located in smoke control areas, the appliance has been specified as an exempt appliance. Many of these have been above the 50kW limit for consideration under chimney height agreement through Approved Document J and so were considered under Section 14 of The Clean Air Act 1993.

In all cases where we were aware of such developments for biomass boilers, chimney height approval forms have been sent to the applicant. The distribution of installations are completely random and many are in very rural locations for example, Northumberland County Council instituted a programme of improvement works during the year at several schools throughout the county which included the installation of biomass boilers at Ashington (x2), Amble and Wooler.

3.5 New Developments with Fugitive or Uncontrolled Sources

A new opencast coal site began operation at the middle of 2013 and will start coaling in autumn 2014. Well Hill Surface Mine Scheme is located to the south west of Morpeth near Stannington village and covers an area of about 0.3 km². It is expected to yield about 130k tonnes of coal and be restored by the end of 2015. The site has a

simplified LA-PPC permit for Coal, Coke, Coal Product and Petroleum Coke handling and processing (process guidance note PG3/05(12)). The site falls into the new, simplified process system as the site is not expected to extract more than 250,000 tonnes of coal per annum.

Northumberland County Council has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area.

Well Hill Surface Mine near Stannington– LA-PPC
Domestic/Commercial Biomass

These will be taken into consideration in the next Updating and Screening Assessment although the control of emissions from the identified developments are adequately covered by environmental permits where they fall under the environmental permitting regime.

4 Local / Regional Air Quality Strategy

A period of sustained restructuring has prevented the development of a council wide strategy on air quality. Work has however begun on a number of policy documents related to environmental issues and it is hoped that work may be progressed on those related to air quality within the next reporting period. The intention is that such documents be adopted by the Council as policy documents for developments within the county.

5 Planning Applications

Work on the proposal for a 100MW renewable energy project (wood-based biomass) at North Blyth which has previously been reported in the LAQM reports has been suspended. This was a National Infrastructure Project and although granted approval from the DECC toward the end of 2013, a key project partner has withdrawn from the project. At this time, it seems unlikely that the project will progress. A report of the project can be found at :

http://www.northblythproject.co.uk/news/announcement.aspx

Details of the project including documentation on the impacts to air quality and their mitigation can be found at:

http://infrastructure.planningportal.gov.uk/projects/north-east/port-blyth-new-biomass-plant/?ipcsection=lir

The Morpeth Northern Bypass road development is discussed in Section 3.1.

Construction of the specialist emergency care hospital at "Land East Of A189 And South Of Lanercost Park", A189 Spine Road Moor Farm To Kitty Brewster Bridge, Cramlington, Northumberland; Planning Ref: 11/00129/CCMEIA began at the end of 2012. Construction is continuing and the hospital is expected to open in 2015. The applicant carried out an assessment of air quality as part of the application submission for a 450kW biomass plant. This was assessed against the national air quality objectives within the context of the national air quality strategy. Two NO_2 diffusion tubes have been sited on nearby access road to assess the traffic impacts on air quality from the development.

6 Air Quality Planning Policies

Although the County is now a single administrative area, it is currently being covered by a combination of existing county and district planning policy stemming from a mixture of Core Strategy and saved Local Plan policies adopted before unification. The Core Strategy is the principal document in the Northumberland Local Development Plan (or 'Local Plan'). The document is currently being finalised having completed the consultation stage. It will set out a vision and strategy for development in Northumberland over the next 15 years. It will be used to assess planning applications for new developments and help protect Northumberland's environment.

The current air quality planning policies from the various planning documents are listed below:

Former Northumberland County Council:
Northumberland Minerals Local Plan (March 2000) – Saved Policies
Policy S6 – Good working practices
Policy EP17 – Encouraging alternatives to road transport and mitigating impacts
Policy EP18 - Encouraging alternatives to road transport and mitigating impacts
Policy EP19 – Protection of local communities
Policy EP20 – Minimising cumulative impact
Policy SM1 – Ensuring good site management
Northumberland Waste Local Plan (December 2001) – Saved Policies
Policy S3 – Protecting communities and the environment
Policy EP2 – Protecting local communities
Policy EP21 - Encouraging alternatives to road transport and mitigating impacts
Policy RE1 – Mini recycling centres
Policy RE2 – Civic amenity sites
Policy RE3 – Material recycling facilities
Policy RE4 – Recycling industrial and commercial waste
Policy RE5 – Recycling construction and demolition waste
Policy RE6 – Composting
Policy DP5 – Transfer stations
Policy SM1 – Ensuring good site management

Former Alnwick District:
Alnwick Local Development Framework Core Strategy Development Plan Document (October 2007)
Policy S3 – Sustainability criteria
Policy S11 – Locating development to maximise accessibility and minimise impact from travel
Alnwick District Wide Local Plan, April 1997 – Saved Policies
Policy CD32 – Bad neighbour uses and the environment

Former Berwick Borough:
No saved policies relevant

Former Blyth Valley Borough:

Blyth Valley Borough Local Development Framework Core Strategy Development Plan Document (July 2007)
Policy SS3 – Sustainability criteria
Policy A1 – Traffic Management
Blyth Valley Borough Local Development Framework Development Control Development Plan Document (September 2007
Policy DC1 – General Development
Policy DC11 – Planning for Sustainable Travel
Policy DC21 – Pollution Control
Blyth Valley District Local Plan (May 1999) – Saved Policies
Policy G10 – Development criteria in the countryside generally

Former Castle Morpeth Borough:
Castle Morpeth District Local Plan (February 2003) – Saved Policies
Policy RE7 – Development affecting sites authorised under Part 1 of the Environment Protection Act

Former Tynedale District:
Tynedale Local Development Framework Core Strategy Development Control Document (October 2007)
Policy GD4 – Principles for transport and accessibility
Tynedale District Local Plan (April 2000) – Saved Policies
Policy CS 19 – Location of development either causing or adjacent to pollution sources

Former Wansbeck District:
Wansbeck District Local Plan (July 2007)
Policy GP4 – Accessibility
Policy GP23 – Pollution and nuisance
Policy GP24 – Pollution and nuisance
Policy T6 – Traffic implications for new development
Policy T10 – Traffic management

There are some general policies covering sustainability criteria brought together into a 'Consolidated Planning Policy Framework' and this is available in an interactive online version in order that prospective applicants, developers and other interested parties can access all the relevant planning policy documents for Northumberland - these can be accessed via the following link - http://www.northumberland.gov.uk/Default.aspx?page=1579. To access the Core Strategy and saved Local Plan policies, go to Annex B, Section A of the Consolidated Planning Policy Framework document and then click on the relevant Core Strategy or Local Plan documents

The associated information about the core strategy and related documentation can be found at: http://www.northumberland.gov.uk/default.aspx?page=3443.

7 Local Transport Plans and Strategies

The Council's third Local Transport Plan (LTP) covers the period from April 2011 to 2026. It explains the 15-year Transport Strategy for the County, the problems faced and proposals on how to tackle these problems.

The associated information about the LTP and related documentation can be found at: http://www.northumberland.gov.uk/default.aspx?page=7846.

8 Climate Change Strategies

Northumberland County Council Action on Climate Change

Northumberland County Council signed the Nottingham Declaration on Climate Change in December 2005. The Climate Change Action Plan was adopted in July 2008. At LGR, the Northumberland County Council Climate Change Action Plan, combined with the action plans prepared by the former districts.

The County Council was involved in the production of the Regional Climate Change Adaptation Study. The Northumberland Strategic Partnership (NSP) published The Heat is On - a Strategic Framework for Climate Change Planning in Northumberland in 2008.

Northumberland County Council is committed to reducing the greenhouse gas emissions from both its own operations and the local community. This will be done by a range of measures on transport, waste, procurement, education, planning and finance as well as by having a robust policy on sustainable energy including initiatives to improve efficiency and reduce waste and by a commitment to generating renewable energy within the county.

For more details : http://www.northumberland.gov.uk/Default.aspx?page=727.

9 Conclusions and Proposed Actions

9.1 Conclusions from New Monitoring Data

Monitoring from the three real-time, continuous stations show continued compliance with the national Air Quality Objectives. Diffusion tube data also continues to show that the Air Quality Objectives for those pollutants are being met in Northumberland.

There are no obvious trends indicating a deterioration of any of the monitored air pollutants in Northumberland. In fact, continuous monitoring of NO_2 seems to suggest a year-on-year improvement. PM_{10} monitoring, at worst, seems to indicate a plateau of levels for the most recent years.

Changes to automatic monitoring in Northumberland will be presented in the next round of air quality reporting.

9.2 Conclusions relating to New Local Developments

There are a number of reported developments which may affect local air quality which are due for completion in 2014/15. These will be reported on in future reports. Also, the cessation of works associated with the North Blyth Biomass power station will, in the short term, remove the proposed potential impact. It is not however envisaged that any of these developments will warrant detailed assessment.

9.3 Proposed Actions

The Progress Report has not identified any need to proceed to a Detailed Assessment for any pollutant monitored in Northumberland.

This Progress Report has identified a need for changes to the existing monitoring programme; re-evaluation of automatic monitoring stations for both location and parameters at Blyth and Cowpen Road. Two new Turnkey Osiris monitors have been installed at Blyth and Cowpen at the end of 2013 to replace existing equipment.

Additionally, changes to the frontage of Blyth Library necessitated the removal of the existing air quality enclosure and the Turnkey Osiris replacement has been mounted on a dedicated lamp-post for particulate monitoring and nitrogen dioxide monitoring will continue to be fulfilled by diffusion tubes at this location.

A further review of NO_2 diffusion tubes will take place in 2014/15 to look at compliance, location and relevant receptors.

Northumberland County Council will look to submit a Updating and Screening Assessment in 2015.

10 References

AEA Energy & Environment Document "Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users." Ref: ED48673043, Issue 1a, February 2008. Available: http://laqm.defra.gov.uk/documents/0802141004_NO2_WG_PracticalGuidance_Issue1a.pdf

"Local Air Quality Management," Technical Guidance LAQM.TG(09), Defra, February 2009. Available: http://www.defra.gov.uk/publications/files/pb13081-tech-guidance-laqm-tg-09-090218.pdf

The Diffusion Tube Bias Adjustment Factors Spreadsheet (v.03/13). Available: http://laqm.defra.gov.uk/documents/Database_Diffusion_Tube_Bias_Factors-v03_14-Final-v2.xls

Last accessed 08/04/2013

Summary of Laboratory Performance in WASP NO_2 Proficiency Testing Scheme for Rounds 117-124 (April 2012 – March 2014). Available: http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

Last accessed 15/04/2014

Appendices

Appendix A: Quality Assurance / Quality Control (QA/QC) Data

Appendix B: Location Maps of Air Quality Monitoring Locations

Appendix C: Full Monthly NO_2 Diffusion Tube Dataset 2013

Appendix D: Ratified Data Summaries and Time Series Plots from AQDM

Appendix A: QA:QC Data

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% triethanoline (TEA) contained on grids within the diffusion tubes. 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: 03/13. The bias factor was calculated to be 0.80 for ESG.

The Results of laboratory precision and WASP scheme are included below; the Environmental Scientifics Group showing a 100 per cent performance for 2012/13.

Figure A.1 National Diffusion Tube Bias Adjustment Spreadsheet ver 03/13 showing results for ESG (Didcot) using 50% TEA in acetone.

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 03/14

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

This spreadsheet will be updated at the end of June 2014

LAQM Helpdesk Website

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

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

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

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

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

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

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

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

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

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

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ($\mu g/m^3$)	Automatic Monitor Mean Conc. (Cm) ($\mu g/m^3$)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
ESG Didcot	50% TEA in acetone	2013	B	Gravesham Borough Council	11	33	32	4.8%	G	0.95
ESG Didcot	50% TEA in acetone	2013	B	Gravesham Borough Council	12	44	32	39.8%	G	0.72
ESG Didcot	50% TEA in acetone	2013	R	Falkirk Council	12	35	31	14.2%	G	0.88
ESG Didcot	50% TEA in acetone	2013	UB	Falkirk Council	12	25	20	22.7%	G	0.81
ESG Didcot	50% TEA in acetone	2013	B	Pembrokeshire Council	12	7	6	17.3%	P	0.85
ESG Didcot	50% TEA in acetone	2013	UB	Medway	12	24	25	-3.5%	G	1.04
ESG Didcot	50% TEA in acetone	2013	R	Medway Council	10	36	27	36.5%	G	0.73
ESG Didcot	50% TEA in acetone	2013	B	Medway	11	26	14	84.9%	P	0.54
ESG Didcot	50% TEA in acetone	2013	R	Wrexham County Borough Council	12	23	22	8.3%	G	0.92
ESG Didcot	50% TEA in acetone	2013	UI	Stockton on Tees	12	27	20	38.0%	G	0.72
ESG Didcot	50% TEA in acetone	2013	R	Stockton on Tees	12	21	16	30.5%	G	0.77
ESG Didcot	50% TEA in acetone	2013	SU	Thanet District Council	11	21	16	29.5%	P	0.77
ESG Didcot	50% TEA in acetone	2013	R	Thanet District Council	11	29	24	17.9%	P	0.85
ESG Didcot	50% TEA in acetone	2013	R	Cambridge City Council	12	46	35	33.3%	G	0.75
ESG Didcot	50% TEA in acetone	2013	R	Swale Borough Council	10	45	41	9.3%	G	0.91
ESG Didcot	50% TEA in acetone	2013	R	Swale Borough Council	12	40	34	16.0%	P	0.86
ESG Didcot	50% TEA in acetone	2013	R	Swale Borough Council	12	41	40	4.0%	G	0.96
ESG Didcot	50% TEA in acetone	2013	R	Swale Borough Council	11	53	34	54.8%	G	0.65
ESG Didcot	50% TEA in acetone	2013	R	North East Lincolnshire Council	11	59	49	19.5%	G	0.84
ESG Didcot	50% TEA in acetone	2013	R	North East Lincolnshire Council	11	34	30	12.3%	G	0.89
ESG Didcot	50% TEA in acetone	2013	R	North East Lincolnshire Council	11	40	31	26.9%	G	0.79
ESG Didcot	50% TEA in acetone	2013	R	Rugby Borough Council	12	26	22	16.6%	P	0.86
ESG Didcot	50% TEA in acetone	2013	KS	Marylebone Road Intercomparison	12	109	81	34.8%	G	0.74
ESG Didcot	50% TEA in acetone	2013	UB	City of York Council	11	25	19	29.7%	G	0.77
ESG Didcot	50% TEA in acetone	2013	R	City of York Council	12	40	28	41.2%	G	0.71
ESG Didcot	50% TEA in acetone	2013	R	City of York Council	12	34	24	38.0%	G	0.72
ESG Didcot	50% TEA in acetone	2013	R	City of York Council	10	40	31	28.3%	G	0.78
ESG Didcot	50% TEA in acetone	2013	KS	Suffolk Coastal District Council	11	46	41	11.8%	G	0.89
ESG Didcot	50% TEA in acetone	2013		**Overall Factor[3] (28 studies)**					Use	0.80

Factor from Local Co-location Studies (if available)

Northumberland did not carry out any co-location studies in 2013.

Discussion of Choice of Factor to Use

Northumberland County Council no longer maintains co-located diffusion tubes which number more than one at co-location sites, therefore national factors were used. Local factors produced in previous report rounds were marginally different to national factors and for data presented as integers had no impact at all upon the reported values.

PM Monitoring Adjustment

PM10 measurements by the BAM units had a factor of 0.83˙ applied to give gravimetric equivalent concentrations, this was done by AQDM when ratifying the data.

Short-term to Long-term Data adjustment

Estimation of annual mean concentrations for short-term monitoring data was calculated following the methodology in Box 3.2 of LAQM.TG(09), the following sites with short-term monitoring data had their annual mean estimated using data from the three nearest monitoring sites in the AURN network (Newcastle City, Newcastle Cradlewell, Sunderland Silksworth and Middlesborough).

The impact of the "annualising" the data from the automatic monitors has been insignificant with no more than a 1 μg/m^3 change in the measured to annualised value and a 2 μg/m^3 change in the one diffusion tube which was discontinued after March.

Table A.1 Period Mean Dates

	Blyth Library API NO_2	Blyth Library BAM PM10	Cowpen Road API NO_2	Cowpen Road BAM PM10	Newbiggin ML SO2	Ponteland Police Station NO_2 Diffusion Tube
Start - End	01/01/13 – 17/06/13	01/01/13 – 24/01/13	01/01/13 - 28/10/13	01./01/13 – 04/01/13	01/01/13 – 11/09/13	Jan - March
Start - End	20/06/13 – 28/10/13	06/02/13 – 21/03/13		07/01/13 – 27/02/13		
Start - End		24/03/13 – 01/05/13		04/03/13 – 19/03/13		
Start - End		03/03/13 – 17/06/13		25/03/13 – 31/03/13		
Start - End		19/06/13 – 15/09/13		02/04/13 – 09/05/13		
Start - End				14/05/13 – 15/08/13		
Start - End				04/09/13 – 11/09/13		
Start - End				19/09/13 – 07/10/13		
Start - End				10/10/13 – 15/11/13		
Start - End				18/11/13 – 31/12/13		
Approx Number of Days	279	235	300	303	251	90

Table A.2 Short-Term to Long-Term Monitoring Data Adjustment

Blyth Library Site – NO_2 (API)			
Long Term Site	Annual Mean 2013 (AM) (μg/m3)	Period Mean 2013 (PM) (μg/m3)	Ratio (AM/PM)
Newcastle Centre	29.07	27.43	1.06
Sunderland Silksworth	15.61	14.79	1.06
Middlesborough	16.23	15.40	1.05
		Average (Ra)	**1.06**
Cowpen Road Site – NO_2 (API)			
Long Term Site	Annual Mean 2013 (AM) (μg/m3)	Period Mean 2013 (PM) (μg/m3)	Ratio (AM/PM)
Newcastle Centre	29.07	27.85	1.04
Sunderland Silksworth	15.61	14.80	1.05
Middlesborough	16.23	15.46	1.05
		Average (Ra)	**1.05**
Blyth Library Site – PM10 (BAM)			
Long Term Site	Annual Mean 2013 (AM) (μg/m3)	Period Mean 2013 (PM) (μg/m3)	Ratio (AM/PM)
Newcastle Centre	12.67	13.49	0.94
Middlesborough	19.67	20.12	0.98
		Average (Ra)	**0.96**
Cowpen Road Site – PM10 (BAM)			
Long Term Site	Annual Mean 2013 (AM) (μg/m3)	Period Mean 2013 (PM) (μg/m3)	Ratio (AM/PM)
Newcastle Centre	12.67	12.92	0.98
Middlesborough	19.67	20.00	0.98
		Average (Ra)	**0.98**
Newbiggin Site – SO2 (ML)			
Long Term Site	Annual Mean 2013 (AM) (μg/m3)	Period Mean 2013 (PM) (μg/m3)	Ratio (AM/PM)
Middlesborough	3.47	3.91	0.89
		Average (Ra)	**0.89**
Diffusion Tubes – Ponteland Police Station			
Long Term Site	Annual Mean 2013 (AM) (μg/m3)	Period Mean 2013 (PM) (μg/m3)	Ratio (AM/PM)
Newcastle Centre	29.07	27.85	1.04
Sunderland Silksworth	15.61	14.80	1.05
Middlesborough	16.23	15.46	1.05
		Average (Ra)	**1.05**

QA/QC of Automatic Monitoring

It is recognised that any monitoring survey must be subject to quality assurance and quality control (QA/QC) to ensure the integrity of the data and to guarantee that the measurements fully comply with the requirements of the air quality review and assessment and are, therefore, fit for purpose. Therefore:

- data should be representative of ambient concentrations existing in the area under investigation.
- measurements need to be sufficiently accurate and precise to meet the defined monitoring requirements. Data must be inter-comparable and reproducible. Results from multi-site networks need to be internally consistent and comparable with national, international of other acceptable standards.

- measurements should be consistent over time, particularly if long-term trend analysis is to be undertaken.

QA/QC procedures were applied to both passive samplers and automatic monitoring data throughout the monitoring period. QA/QC procedures are involved in all aspects of the monitoring exercise from purchase of equipment to the data presentation. The following information summarizes the QA/QC practice applied for the purpose of this report.

Routine Site Visits

Regular site visits are carried out to:

- carry out site checks on equipment, sampling systems, safety and security.
- perform manual calibrations.

The following operations are carried out on site to maximise data integrity and capture rate:

- ensuring the proper running of equipment.
- performing instrument calibrations and diagnostic checks.
- minimising instruments down-time as much as possible, by anticipating problems prior to them becoming serious or fatal.
- carrying out essential routine functions such as particle filter changes and BAM tape replacement
- performing checks of the automatic calibration systems
- ensuring that initial siting criteria are still fulfilled i.e. that the surrounding environment has not changed in any way that prejudices the monitoring objectives.

Calibration Procedure

Proper calibration of automatic monitoring equipment is essential for obtaining accurate and reproducible air quality data. Electrical response signals are generated by the M200E analyser that corresponds to the concentrations of NOx and NO in the air. In order to correctly scale the analyser response, it is necessary to calibrate it using a gas mixture of known concentration from a gas cylinder.

Calibrations are conducted at a number of levels

- daily automatic calibration by the analyser
- frequent (fortnightly) manual calibration (performed by qualified Northumberland County Council staff)
- periodic (6 monthly) reference calibrations (performed by SupportingU engineers)

The fortnightly calibrations are carried out according to procedures contained in the Site Manual and blank forms are provided to assist in performing and documenting the calibrations. Copies of the completed forms during the monitoring period are available on request.

Equipment Service Maintenance

An on-going service and maintenance contract is in place with SupportingU for the mobile unit. The contract provides the following cover:

- routine six monthly service visits in accordance with the manufacturer's and warranty conditions
- guaranteed breakdown call out response of forty eight hours (normal working time)
- written reports showing work carried out and status of instrumentation
- all work and documentation carried out in accordance with BS ISO 9002 accredited system
- dedicated telephone support (Technical Support Engineer) in normal working hours

Data Capture

The following methods are employed to maximise data capture rates.

- regular and frequent site visits
- automatic daily data collection using dedicated software
- M200E and BAM in-built data storage capability
- rapid, service, maintenance and repair
- comprehensive and documented site operational protocols
- experienced site operator

Data Processing

The data stored on each of the analyser's in-built loggers is then downloaded via a modem and mobile telephone line to a computer at the Council Offices or by direct download from data loggers.

The raw values are then converted using calibration factors obtained from manual calibrations performed every fortnight. There is always a gradual decline in the sensitivity of the analyser between each full 6-monthly service. It is this decline in sensitivity that the manual calibration conversation factors are intended to scale against.

The conversion is achieved using zero and span "calibration factors" achieved from the fortnightly calibrations. The two-point calibration will quantify the analysers "zero" and "span" response.

The zero response, Vz, is the response in measurements units of the analyser when the pollutant species being measured is not present in the sample air stream.

The span response, Vs, is the response of the analyser to an accurate known concentration, c, of the pollutant species. Instrument zero and span factors are then calculated using these data as follows:

Instrument zero = Vz

Instrument span, F = c/(Vs-Vz)

Ambient pollution data are then calculated by applying these factors to logged output signals as follows:

Pollutant concentration (ppb) = F(Vs-Vz)

Where Va is the recorded signal from the analyser sampling ambient air.

Data Validation and Ratification

All data collected was thoroughly scrutinised by visual examination to ensure that there was no spurious and unusual measurements. The dedicated software used for handling the data allows data to be edited but ensures that a raw data set is always maintained.

Through ratification of the data was carried out at the end, and during, the monitoring period. Steps in the ratification process included:

- examination of the calibration records to ensure correct application of calibration factors
- examination of simultaneously monitored pollutants PM10 and NO_2 data monitored at the MAQU is scrutinised to ensure that there are no anomalies in either of the measured concentrations.

The data for 2011 from the automatic monitors was ratified by AEA. The automatic monitors were QA/QC audited by AEA during 2010/11 to the AURN standard.

Ratified Data Summaries and Time Series Plots from the automatic monitors were undertaken by Air Quality Data Management as shown in Appendix D.

QA/QC of Diffusion Tube Monitoring

Precision and Accuracy

The spreadsheet of diffusion tube co-location results, made available by the Local Air Quality Management Helpdesk to allow annual mean diffusion tube results to be bias adjusted, also contains information on the precision of the diffusion tubes, in those cases where duplicate or triplicate tubes were exposed. At the request of a number of Local Authorities, the precision data for each laboratory have been brought together in a summary form.

Precision vs Accuracy (Bias)

Precision should not be confused with accuracy. Diffusion tube precision can be described as the ability of a measurement to be consistently reproduced, i.e. how similar the results of duplicate or triplicate tubes are to each other. Accuracy represents the ability of the measurement to represent the ‘true’ value, which, in this case, is defined as the result from the automatic analyser. When averaged over a number of sets of results bias can be evident. This represents the overall tendency of the diffusion tubes to depart from the ‘true’ value, i.e. to systematically over-or under-read when compared against the reference method.

Once identified, bias can be adjusted for to improve the accuracy of diffusion tube results. This is done using **bias adjustment factors**, which have been found to be specific to a laboratory and tube preparation method.

A spreadsheet database of bias adjustment factors obtained from Local Authority co-location studies has been compiled by the Local Air Quality Management Helpdesk **and can be downlowded here**.

Unlike bias, poor precision cannot be adjusted for. It can only be improved by careful handling of the tubes in both the laboratory and the field. The two Figures below illustrate the difference between bias and precision. Both sets of results have the same calculated negative bias, shown by the vertical red line, compared with the true value. However, those in the top part of the Figure have poor precision, whereas those in the lower part have good precision (the vertical spread is just a way of displaying the large number of individual results).

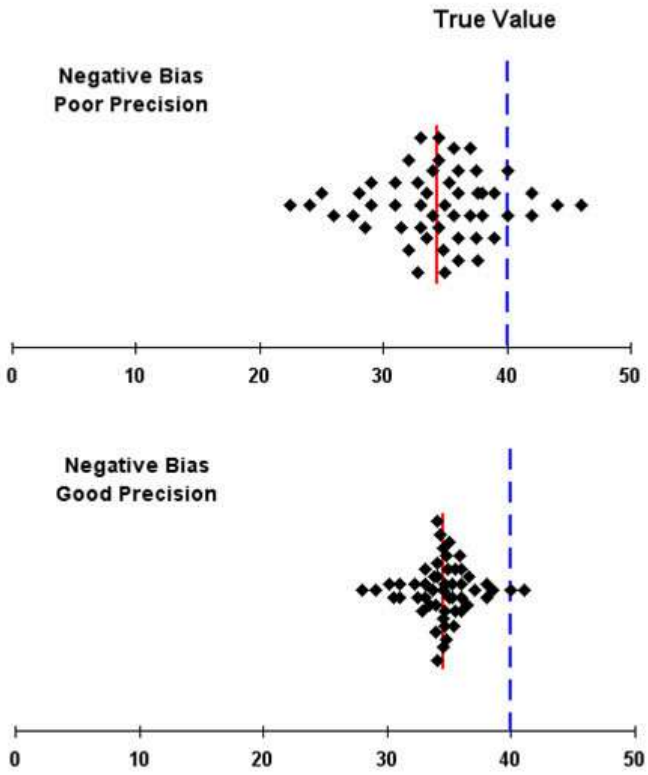


Figure A.2 Good vs Poor Precision

For the purposes of Local Air Quality Management, tube precision is separated into two categories, "Good" or "Poor", as follows: tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%, and the average CV of all monitoring periods is less than 10%. Tubes are considered to have "poor" precision where the CV of four or more periods is greater than 20% and/or the average CV is greater than 10%.

A spreadsheet tool has been developed to calculate the overall precision of a particular co-location study or any sets of duplicate or triplicate results. The tool can be downloaded on the **Local Bias Adjustment Factors page.**

The distinction between "good" and "poor" precision is an indicator of how well the same measurement can be reproduced. This precision will reflect the laboratory's performance/consistency in preparing and analysing the tubes, as well as the subsequent handling of the tubes in the field. Any laboratory can show "poor" precision for a particular period/co-location study, if this is due to poor handling of the tubes in the field.

A summary of precision results for the individual laboratories can be downloaded here as a PDF:

Download Summary of Diffusion Tube Precision 2008-2012 (PDF 15KB) [Updated Version March 2013]

Please note that the performance of a laboratory may change from one year to another. Therefore, when assessing the performance of a laboratory using the findings in the above Summary, account should be taken of the proportion of "poor" precision co-location results, not just the presence or absence of poor precision co-location results. Given this, particular care should be exercised when interpreting the results for a laboratory with only a few precision results. Some laboratories in the co-location spreadsheet are not represented in the Summary, because there were no duplicate or triplicate co-location results for that laboratory (some co-location studies are carried out using tubes exposed singly).

What to do with poor precision results

Where results show "poor" precision, then they should be treated with caution, and may not be suitable for their intended purpose. If a particular authority has "Poor" precision from most or all of its duplicate or triplicate data sets then it should look at its own tube handling procedures.

If these are judged to be good then it will be appropriate to look at the precision results for its laboratory to see if this may be the explanation. The aim should be to use results from tubes that are giving "good" precision, as this will improve the overall reliability of the annual mean concentrations derived from diffusion tubes.

Summary of Laboratory Performance in WASP NO_2 Proficiency Testing Scheme for Rounds 117-124.

April 2014

LAQM Helpdesk – April 2014

Summary of Laboratory Performance in WASP NO_2 Proficiency Testing Scheme for Rounds 117-124.

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

Background

The Workplace Analysis Scheme for Proficiency (WASP) is an independent analytical proficiency-testing (PT) scheme, operated by the Health and Safety Laboratory (HSL). WASP offers a number of test samples designed to test the proficiency of laboratories undertaking analysis of chemical pollutants in workplace and ambient air. One such sample is the WASP NO_2 test sample type that is distributed to participants in a quarterly basis.

WASP NO_2 PT forms an integral part of the UK NO_2 Network's QA/QC, and is a useful tool in assessing the analytical performance of laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). With consent from the participating laboratories, HSL provides summary proficiency testing data to the LAQM Helpdesk for hosting on the web-pages at http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

The WASP scheme is operated independently by HSL. The cost of operating the WASP is borne by the laboratories, which pay an annual fee to HSL.

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 WASP scheme.

For this reason, although WASP remains an independent proficiency-testing scheme, laboratory performance in WASP is also assessed by NPL in conjunction with separate data from the 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. This forms part of work for Defra and the Devolved Administrations under the Local Air Quality Management Services Contract.

This information will be updated on a quarterly basis following completion of each WASP PT round. The posting of reports to schedule is dependent on the laboratories sending their results promptly to HSL.

WASP NO_2 PT Scheme overview

Purpose of scheme

The WASP performance testing scheme uses artificially spiked Palmes type diffusion tubes to test each participating laboratory's analytical performance on a quarterly basis. 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 HSL, 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_2 ambient monitoring in the UK when using such diffusion tubes.

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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 ± 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 HSL. HSL assign a performance score to each laboratory's result, based on how far their results deviate from the reference values for each test samples. The reference values are best estimates of the levels of nitrite doped onto the test sample tubes. 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

Changes to Scoring System as reported on the LAQM website

The z-score system is used by HSL to assess the performance of laboratories participating in the WASP NO_2 scheme. Information on the interpretation of the z score is provided below.

It was proposed however that HSL would migrate to an alternative scoring scheme, which is commonly used elsewhere in their WASP scheme for other PT services. In anticipation of this proposed migration, laboratory summary performance, previously reported on the LAQM website, has been based upon this WASP scoring system.

HSL has decided, upon review, to maintain the z-score system, primarily due to the fact that it is a more readily understandable scoring system when viewed by a wider audience. Hence, going forward, laboratory summary performance, to be reported on the LAQM website, will be based upon this z-score system.

Key changes to the scoring system include:

- All monthly performance scores are reported and the previous WASP scoring system, which allowed the lowest performing round result (best 4 out of 5) to be dropped, is no longer used.

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- The use of the z-score allows new entrants or those leaving the WASP scheme to be assessed as the score is not based on a rolling performance indicator.
- All results from UK laboratories participating in the WASP scheme are now reported (previously laboratories that did not demonstrate satisfactory performance were not included).

Z-Score performance

Performance scores are currently based upon the z-score statistic, a widely used scoring system employed in chemical proficiency testing. More detailed information is available at http://www.hsl.gov.uk/centres-of-excellence/proficiency-testing-schemes/wasp.aspx where the latest version of the WASP participant handbook can be downloaded.

The z-score, z_{score}, may be defined as:

$$z_{score} = \frac{(x_{lab} - \bar{x}_{ref})}{\sigma_{ref}}$$

where;

x_{lab} = participant result from a laboratory

$\bar{x}_{ref}$ = reference result (here it is the calculated nitrite spike value)

σ_{ref} = reference standard deviation (currently set at 7.5 % of $\bar{x}_{ref}$)

Performance score interpretation

A z_{score} may be interpreted as:

$z_{score} \leq \pm 2$ – satisfactory laboratory result

$z_{score} > \pm 2$ and $\leq \pm 3$ – questionable (warning) laboratory result

$z_{score} > \pm 3$ – unsatisfactory laboratory result

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.

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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 participation 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 WASP represents but one factor in such considerations.

Participation in a single round of an external proficiency-testing scheme represents but a "snap-shot" in time of the analytical quality that a laboratory can produce. It is more intuitive therefore to consider performance over a number of rounds.

Following on from above, therefore over a rolling five round WASP 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 may have significant systematic sources of bias in their assay.

A summary of the WASP performance for each laboratory participating in the scheme is provided in Table 1. This table provides the percentage of results where the z-score was between -2 and +2 which is deemed to be a satisfactory z-score.

Contacts for HSL WASP scheme

Further **specific** information on the WASP NO_2 PT scheme is available from HSL by contacting the proficiency testing team at proficiency.testing@hsl.gsi.gov.uk or at 01246 218553.

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.

Table 1: Laboratory summary performance for WASP NO_2 PT rounds 117 - 124

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent HSL WASP NO_2 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.

WASP Round	WASP R117	WASP R118	WASP R119	WASP R120	WASP R121	WASP R122	WASP R123	WASP R124
Round conducted in the period	April – June 2012	July – September 2012	October – December 2012	January – March 2013	April – June 2013	July – September 2013	October – December 2013	January – March 2014
Aberdeen Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	NR [2]	75 %
Cardiff Scientific Services	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Edinburgh Scientific Services	100 %	100 %	100 %	100 %	100 %	75 %	100 %	100 %
Environmental Services Group, Didcot [1]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	
Exova (formerly Clyde Analytical)	0 %	100 %	25 %	75 %	NR [2]	NR [2]	NR [2]	50 %
Glasgow Scientific Services	50 %	100 %	100 %	50 %	25 %	100 %	100 %	100 %
Gradko International [1]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Kent Scientific Services	100 %	75 %	100 %	50 %	75 %	100 %	100 %	100 %
Kirklees MBC	100 %	75 %	100 %	100 %	100 %	100 %	100 %	100 %
Lambeth Scientific Services	100 %	0 %	100 %	100 %	0 %	50 %	75 %	25 %
Milton Keynes Council	100 %	75 %	100 %	50 %	100 %	75 %	75 %	75 %
Northampton Borough Council	100 %	100 %	100 %	0 %	100 %	100 %	100 %	100 %
Somerset Scientific Services	100 %	100 %	100 %	100 %	100 %	75 %	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Staffordshire County Council	100 %	75 %	100 %	50 %	100 %	100 %	100 %	100 %
Tayside Scientific Services (formerly Dundee CC)	100 %	100 %	100 %	75 %	100 %	100 %	100 %	100 %
West Yorkshire Analytical Services	75 %	50 %	100 %	100 %	100 %	50 %	100 %	75 %

[1] Participant subscribes to two sets of test samples (2 x 4 test samples) in each WASP PT round.
[2] NR Not reported

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Appendix B: Location Maps of Air Quality Monitoring Locations

Figure 2.1a Blyth and Cowpen Automatic Monitoring Station Locations

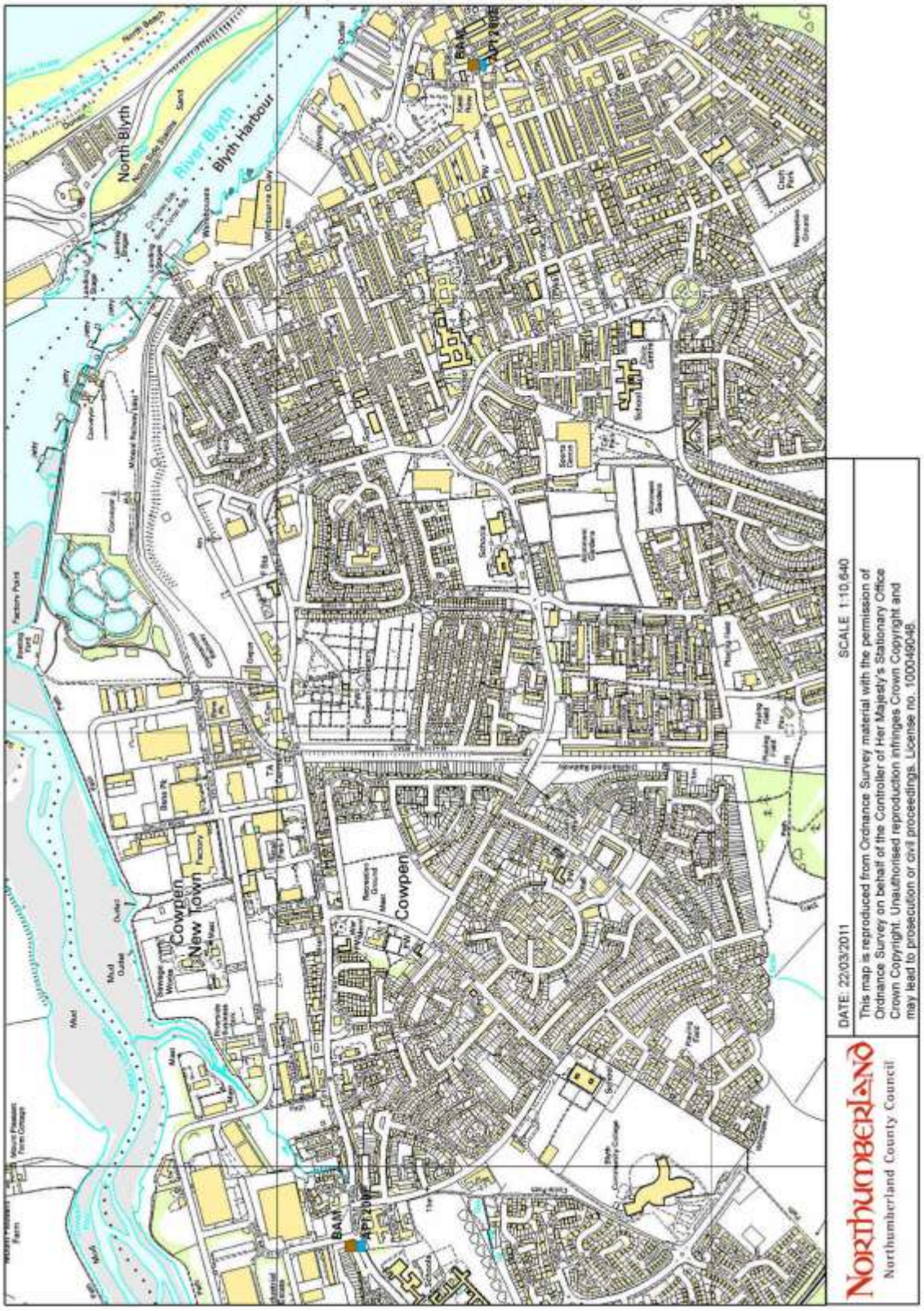


Figure 2.1b Newbiggin Automatic Monitoring Station Locations

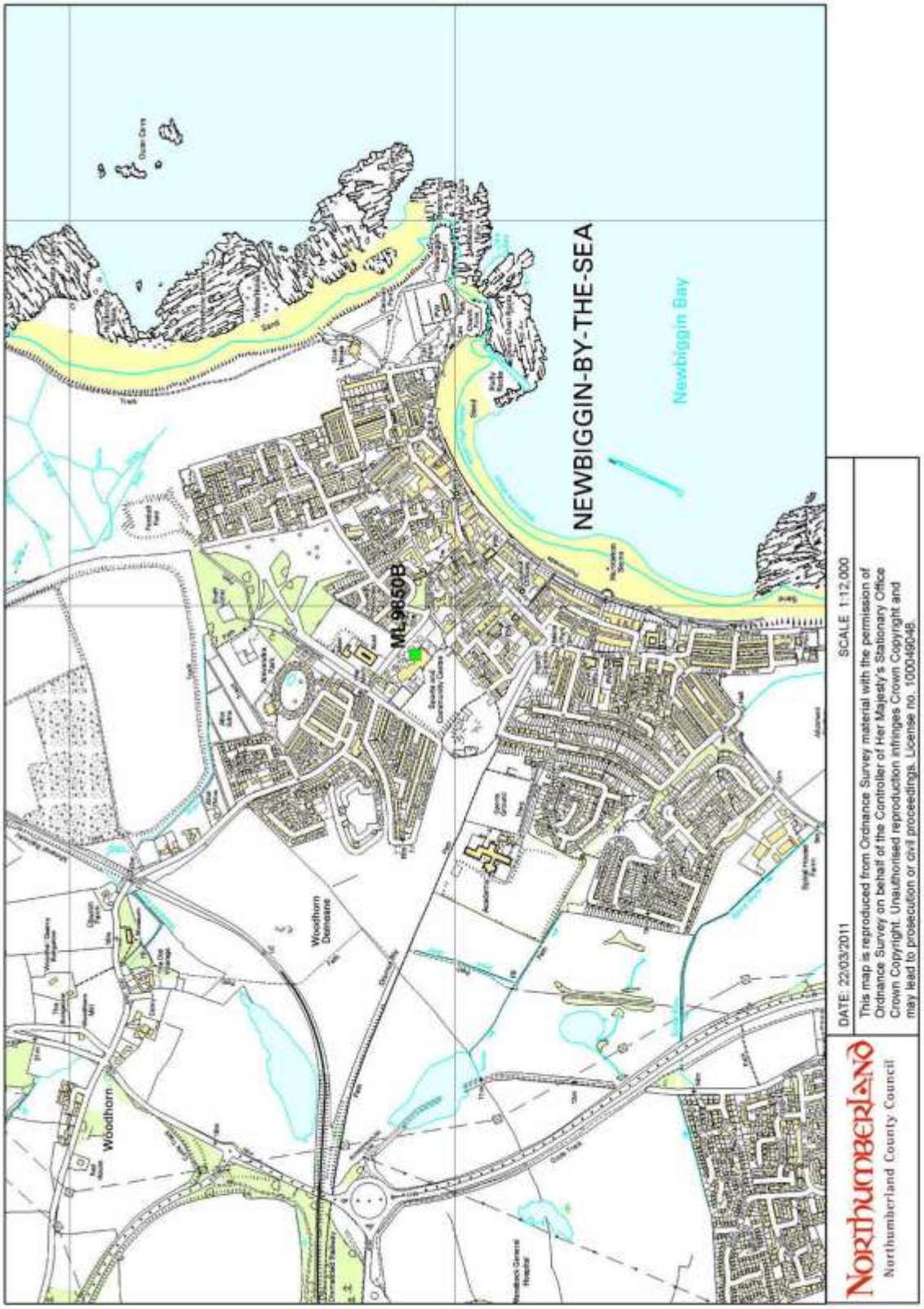


Figure 2.2a Alnwick NO_2 Diffusion Tube Monitoring Locations

Figure 2.2b Berwick NO_2 Diffusion Tube Monitoring Locations

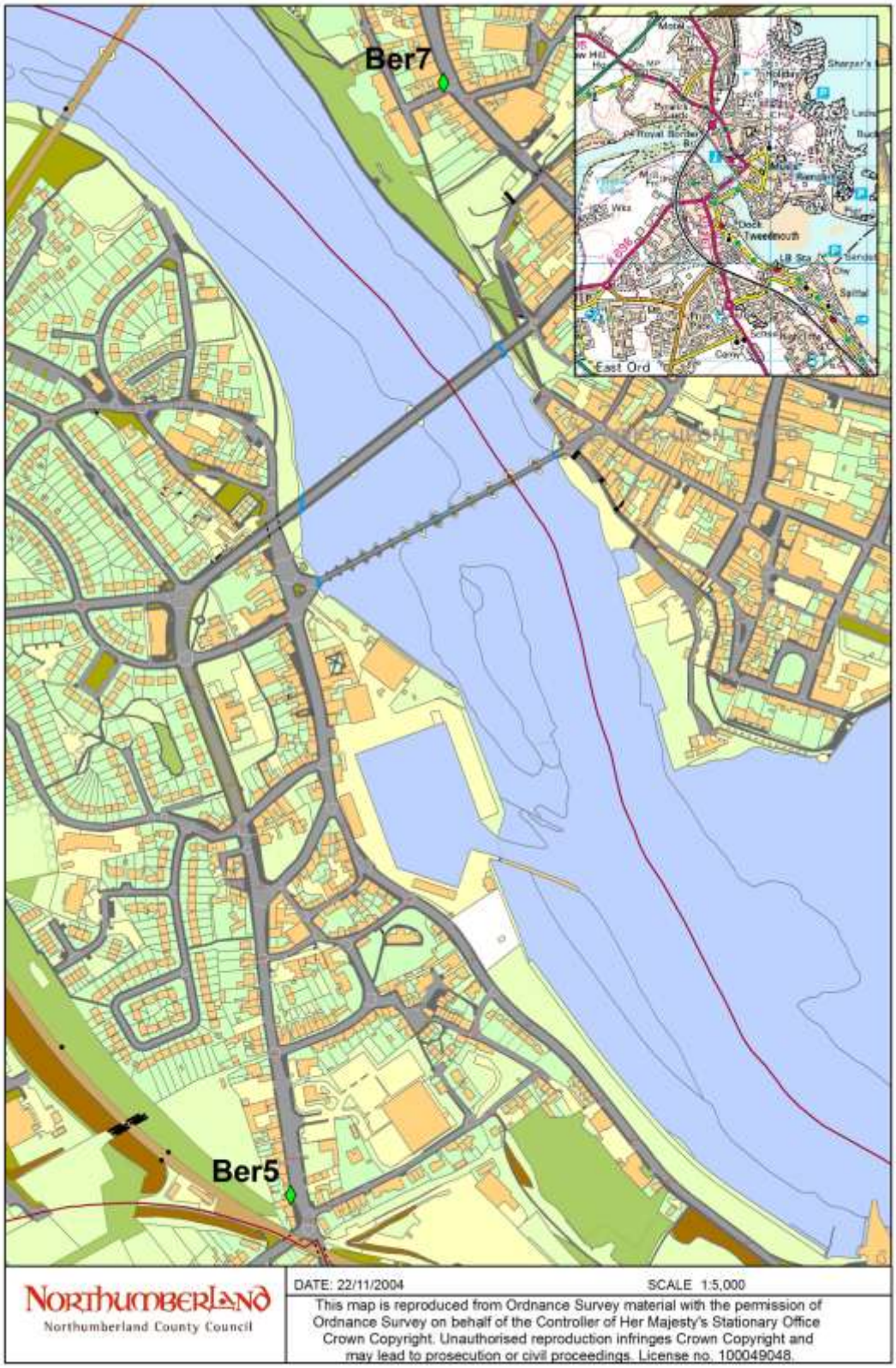


Figure 2.2c Blyth NO_2 Diffusion Tube Monitoring Locations

Figure 2.2d Morpeth and Ponteland NO_2 Diffusion Tube Monitoring Locations

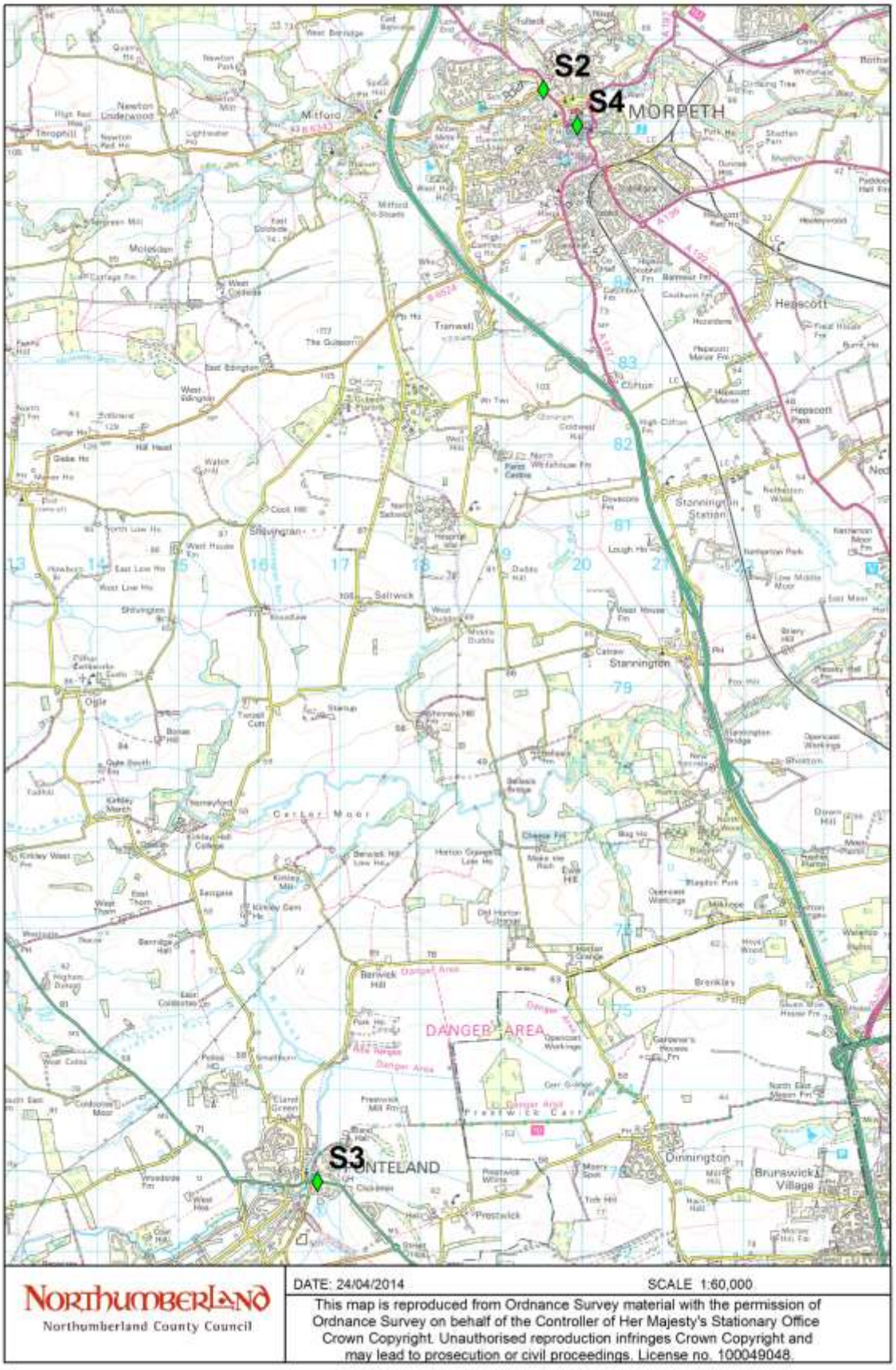


Figure 2.2e Cramlington NO_2 Diffusion Tube Monitoring Locations

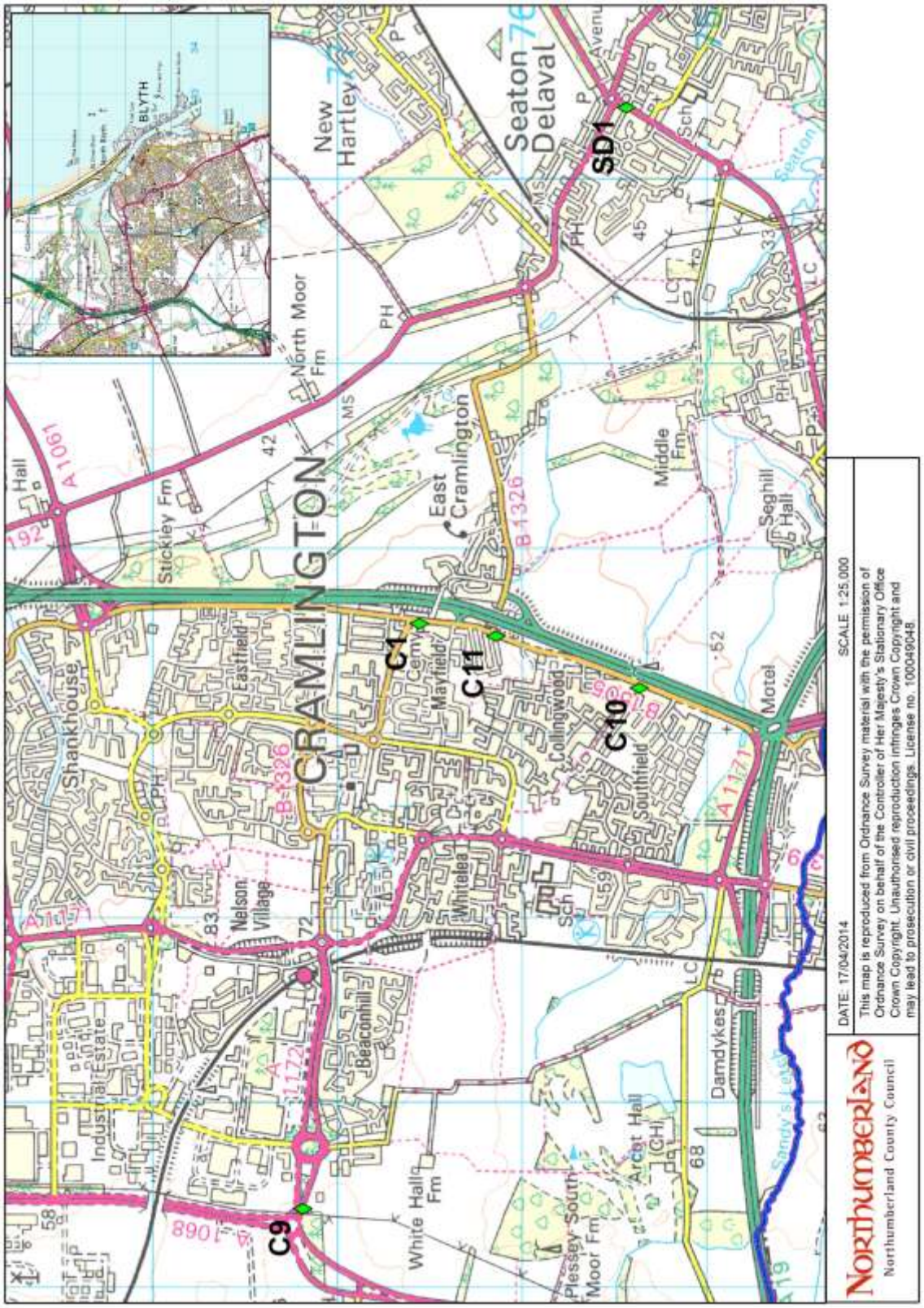
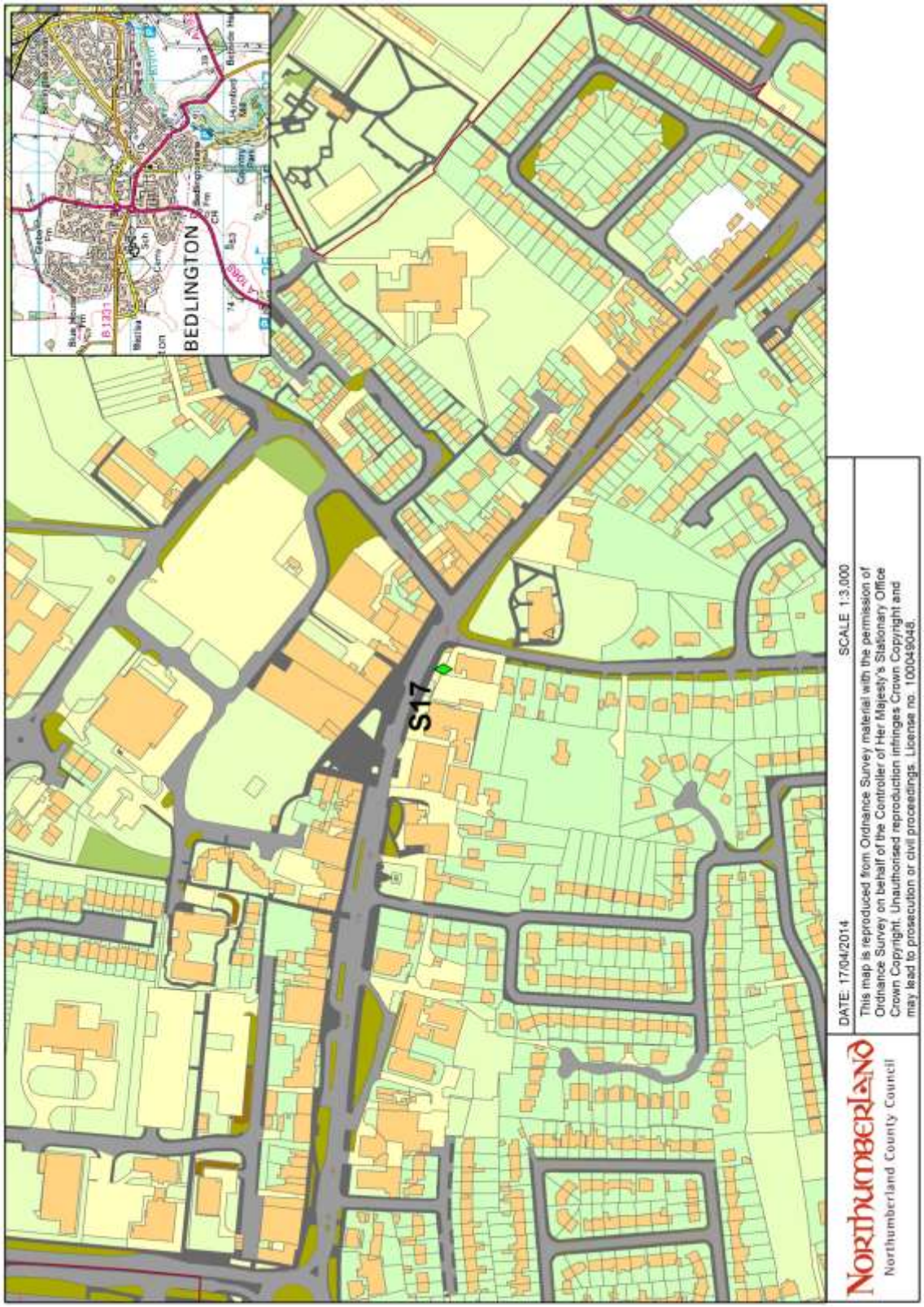


Figure 2.2f Wansbeck NO_2 Diffusion Tube Monitoring Locations



Appendix C

Table A.3 Full Monthly NO_2 Diffusion Tube Dataset 2013

Site ID	Location	Type	x	y	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average	Bias Factor	Bias Adjusted Average	Data Capture
8N	Bondgate Without, Alnwick	Roadside	419025	613070	20.6	27.4	37.1	34.5	31.6	33.7	36.4	32.7		43.1	39.5	41.7	34	0.8	28	91.7
Ber5	Main Street, Tweedmouth	Roadside	399437	652022	38	28.2	26.7	25.3	25.9	22	27	31.2	26.7	40.1	43.1	36.1	31	0.8	25	100.0
Ber7	Castlegate	Roadside	399595	653170	37.9	43	34	29	27.6	29.8	27.3	33.8	30	33.9	33.9	31.4	33	0.8	26	100.0
B1	Waterloo Road, opp bus station LP	Roadside	431537	581537	33.8	50.5	26.8	34.7	33.9	27	26.2	34.4	31.2	42.2	45.3	44.4	36	0.8	29	100.0
B3	Cowpen Road, west ent monitoring station LP	Roadside	428815	581813	60.9	41.1	44.3	32.9	32.3	30	34.6	36.5	37.8	52.9	45.6	51.3	42	0.8	33	100.0
B5	Cowpen Road, east ent nr Lord Tool Hire LP	Roadside	429850	581947	38	29.9	33.6	24.6	23.9		22.2	24.8	24.4	36.3	40	36.9	30	0.8	24	91.7
B11	Blyth YMCA LP	Roadside	431160	581415	38.3	38.7	14.3	29.9	29.7	21.3	26.7	29.9	29	41.2	42.4	38.6	32	0.8	25	100.0
B12	Bridge Street, opp Job Centre LP	Roadside	431612	581586	34.5	34.5	29.5		28.6	20.8	25.8	30.5	27	35	41	40.4	32	0.8	25	91.7
B15	South Newsham Road	Roadside	430552	578950	31.5	27.5	27.9	23	20.9	19.6	22.5	25	25	35.4	28	29.2	26	0.8	21	100.0
C1	High Pit Road, Burton House car park LP (X2)	Roadside	427593	576555	43.9	35.4	41.3	30	27.1		27.4	26	28.9	32.7	16.3	23.9	30	0.8	24	91.7
C9	Trebor	Roadside	424456	577173	35.5	33.4	33	25.6		23.8	22.8	19.7	26.6	32.8	36.6	27.4	29	0.8	23	91.7
C10	Bay Horse	Roadside	427243	575362	50.2	44.4	46	33.6	23.7	25.1	30.6	26.4	29.9	40.6	29.8	37	35	0.8	28	100.0
C11	Storey Street	Roadside	427523	576136			35.5	26.2	22.5	19.9	22.2	20.4	24.6	22.1	22.7	24.8	24	0.8	19	83.3
2	Newgate Street/Bullers Green, Mopeth	Roadside	419525	586380	37.4	32.6	35.5	27.3	21.9	20.6	22.2	22	25.1	26.7	27.8	30.9	28	0.8	22	100.0
3	Police Station, Ponteland	Roadside	416724	572853	37.4	36.3	37.8										37	0.8	30	25.0
4	Northern Rock, Bridge Street, Morpeth	Roadside	419947	585937	44.4	43	54.4	36.3	31.2	25.7	29.3	27.4	31	29.9	28.7	31.2	34	0.8	28	100.0
17	Front Street East, Bedlington (LP shelter at Church Ave)	Roadside	426014	581879	41.9	39.1	36.9	28.1	27	25.6	29.1	28.4	32.7	40.7	41.4	38.1	34	0.8	27	100.0
SD1	Seaton Delaval, Salvation Army LP	Roadside	430387	575433	46.4	33.6	32.4	24.3	24.7	24.3	26.4	28.1	28.4	41.1	42.8	37.1	32	0.8	26	100.0

Appendix D: Ratified Data Summaries and Time Series Plots from AQDM

Blyth Library AQ Monitoring Station

Air Quality Report

Produced by AQDM on behalf of Northumberland

BLYTH TOWN CENTRE 2013

These data have been fully ratified by AQDM to LAQM TG(09) standards

Site Description

Bridge Street, Blyth

Air Quality Statistics

Pollutant	PM_{10}*	PM_{10}*	NO_2	NO	NO_X
Number Very High #	1	-	0	-	-
Number High #	1	-	0	-	-
Number Moderate #	9	-	0	-	-
Number Low #	217	-	6681	-	-
Maximum 15-minute mean	-	-	298 µg m^{-3}	473 µg m^{-3}	905 µg m^{-3}
Maximum hourly mean	764 µg m^{-3}	917 µg m^{-3}	111 µg m^{-3}	244 µg m^{-3}	464 µg m^{-3}
Maximum running 8-hour mean	243 µg m^{-3}	292 µg m^{-3}	77 µg m^{-3}	160 µg m^{-3}	318 µg m^{-3}
Maximum running 24-hour mean	110 µg m^{-3}	132 µg m^{-3}	67 µg m^{-3}	97 µg m^{-3}	213 µg m^{-3}
Maximum daily mean	105 µg m^{-3}	126 µg m^{-3}	58 µg m^{-3}	93 µg m^{-3}	199 µg m^{-3}
99.8th percentile of hourly means†	-	-	80 µg m^{-3}	-	-
90.4th percentile of daily means†	42 µg m^{-3}	-	-	-	-
Average	30 µg m^{-3}	36 µg m^{-3}	21 µg m^{-3}	18 µg m^{-3}	48 µg m^{-3}
Data capture	64.5 %	64.5 %	76.3 %	76.3 %	76.3 %

Daily Air Quality Index (DAQI) as defined by COMEAP January 2012 and revised April 2013
† Percentile required for data capture < 90%
* PM_{10} as measured by a BAM using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent
* PM_{10} as measured by a BAM
Mass units for the gases are at 20'C and 1013mb
NO_X mass units are NO_X as NO_2 µg m^{-3}

Air Quality Exceedences

Pollutant	Air Quality (England) Regulations 2000 & (Amendment) Regulations 2002	Max Conc	Number	Days	Allowed	Exceeded
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	105 µg m^{-3}	11	11	35 days	No
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	30 µg m^{-3}	0	-	-	No
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	21 µg m^{-3}	0	-	-	No
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	111 µg m^{-3}	0	0	18 hours	No

AQDM
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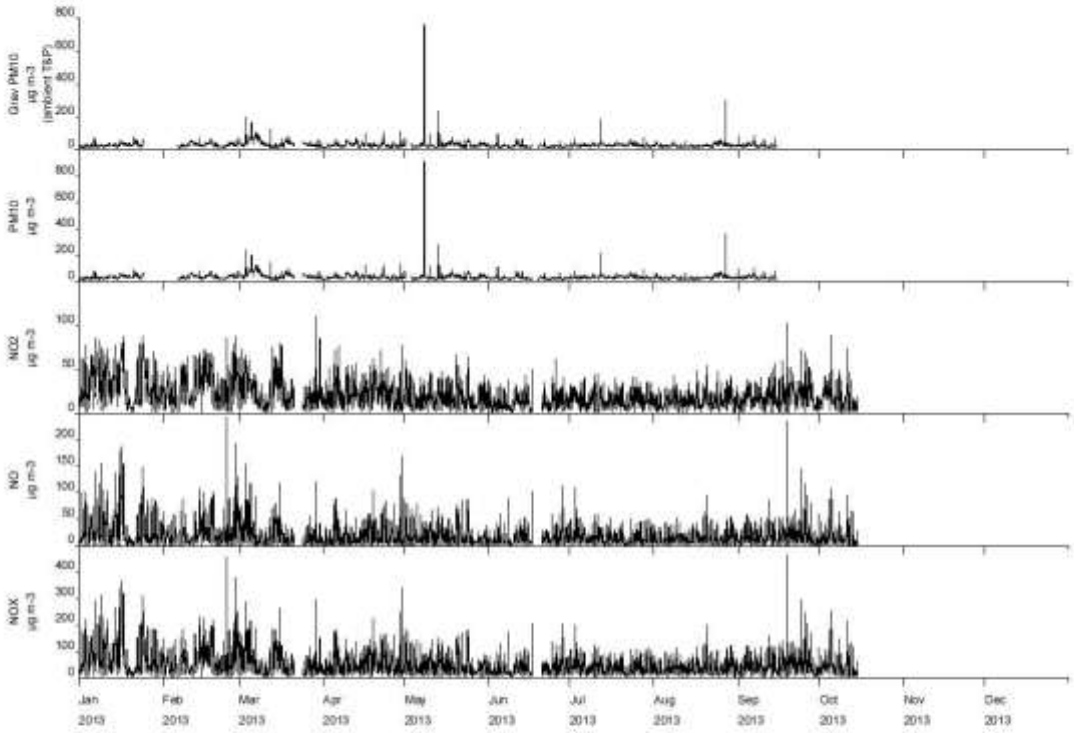
Air Quality Report

BLYTH TOWN CENTRE 2013
Hourly Mean Timeseries



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Air Quality Data Management

Cowpen Road AQ Monitoring Station

Air Quality Report

Produced by AQDM on behalf of Northumberland

BLYTH COWPEN ROAD 2013

These data have been fully ratified by AQDM to LAQM TG(09) standards

Air Quality Statistics

Pollutant	PM_{10}*	PM_{10}*	NO_2	NO	NO_x
Number Very High #	0	-	0	-	-
Number High #	0	-	0	-	-
Number Moderate #	9	-	0	-	-
Number Low #	285	-	7211	-	-
Maximum 15-minute mean	-	-	225 µg m^{-3}	436 µg m^{-3}	856 µg m^{-3}
Maximum hourly mean	470 µg m^{-3}	564 µg m^{-3}	153 µg m^{-3}	375 µg m^{-3}	726 µg m^{-3}
Maximum running 8-hour mean	101 µg m^{-3}	121 µg m^{-3}	115 µg m^{-3}	235 µg m^{-3}	474 µg m^{-3}
Maximum running 24-hour mean	74 µg m^{-3}	89 µg m^{-3}	88 µg m^{-3}	132 µg m^{-3}	289 µg m^{-3}
Maximum daily mean	69 µg m^{-3}	83 µg m^{-3}	73 µg m^{-3}	123 µg m^{-3}	261 µg m^{-3}
99.8th percentile of hourly means†	-	-	113 µg m^{-3}	-	-
90.4th percentile of daily means†	36 µg m^{-3}	-	-	-	-
Average	20 µg m^{-3}	25 µg m^{-3}	27 µg m^{-3}	25 µg m^{-3}	64 µg m^{-3}
Data capture	83.0 %	83.0 %	82.3 %	82.3 %	82.3 %

Daily Air Quality Index (DAQI) as defined by COMEAP January 2012 and revised April 2013
† Percentile required for data capture < 90%
* PM_{10} as measured by a BAM using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent
* PM_{10} as measured by a BAM
Mass units for the gases are at 20'C and 1013mb
NO_X mass units are NO_X as NO_2 µg m^{-3}

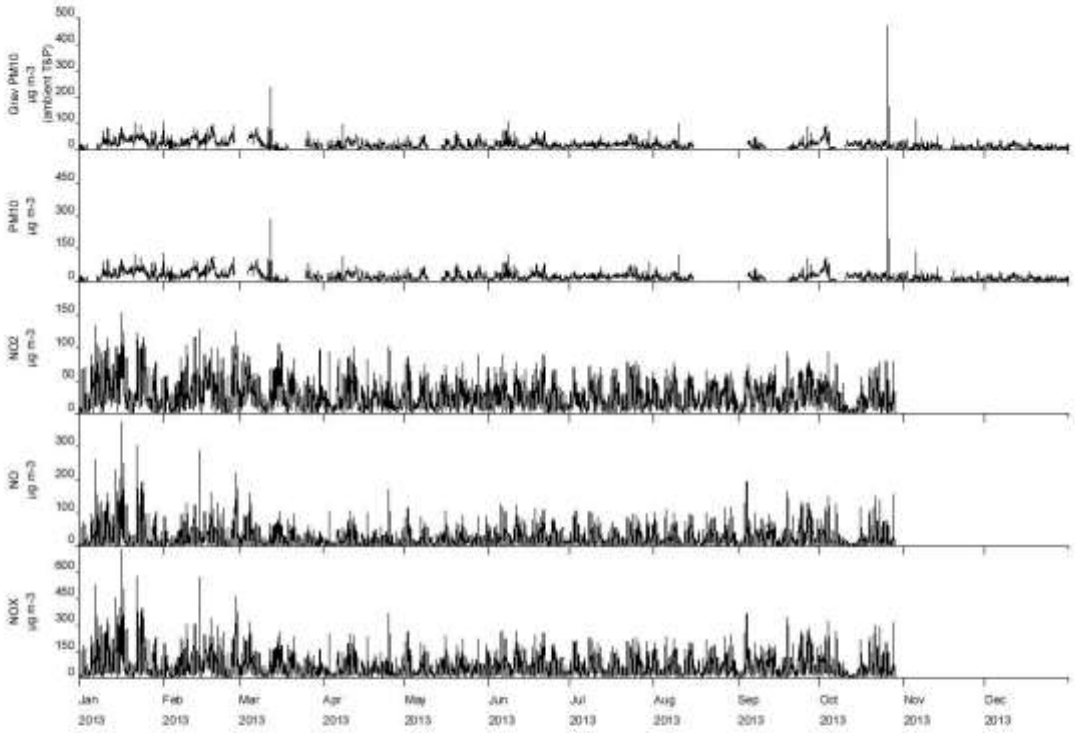
Air Quality Exceedences

Pollutant	Air Quality (England) Regulations 2000 & (Amendment) Regulations 2002	Max Conc	Number	Days	Allowed	Exceeded
PM_{10} Particulate Matter (Gravimetric)	Daily mean > 50 µg m^{-3}	69 µg m^{-3}	9	9	35 days	No
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 40 µg m^{-3}	20 µg m^{-3}	0	-	-	No
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	27 µg m^{-3}	0	-	-	No
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	153 µg m^{-3}	0	0	18 hours	No

AQDM
Air Quality Data Management

Air Quality Report

BLYTH COWPEN ROAD 2013
Hourly Mean Timeseries



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Newbiggin AQ Monitoring Station

Air Quality Report

Produced by AQDM on behalf of Northumberland

NEWB GG N SPORTS CENTRE 2013

These data have been fully ratified by AQDM to LAQM TG(09) standards

Site Description

Newbiggin Sports Centre

Air Quality Statistics

Pollutant	SO_2
Number Very High #	0
Number High #	0
Number Moderate #	0
Number Low #	23541
Maximum 15-minute mean	184 µg m^{-3}
Maximum hourly mean	106 µg m^{-3}
Maximum running 8-hour mean	35 µg m^{-3}
Maximum running 24-hour mean	19 µg m^{-3}
Maximum daily mean	18 µg m^{-3}
99.9th percentile of 15-minute means†	51 µg m^{-3}
99.7th percentile of hourly means†	35 µg m^{-3}
99.2nd percentile of daily means†	17 µg m^{-3}
Average	6 µg m^{-3}
Data capture	68.8 %

Daily Air Quality Index (DAQI) as defined by COMEAP January 2012 and revised April 2013
† Percentile required for data capture < 90%
Mass units for the gases are at 20'C and 1013mb

Air Quality Exceedences

Pollutant	Air Quality (England) Regulations 2000 & (Amendment) Regulations 2002	Max Conc	Number	Days	Allowed	Exceeded
Sulphur Dioxide	15-minute mean > 266 µg m^{-3}	184 µg m^{-3}	0	0	35 15 mins	No
Sulphur Dioxide	Hourly mean > 350 µg m^{-3}	106 µg m^{-3}	0	0	24 hours	No
Sulphur Dioxide	Daily mean > 125 µg m^{-3}	18 µg m^{-3}	0	0	3 days	No
Sulphur Dioxide	Annual mean > 20 µg m^{-3}	6 µg m^{-3}	0	-	-	No

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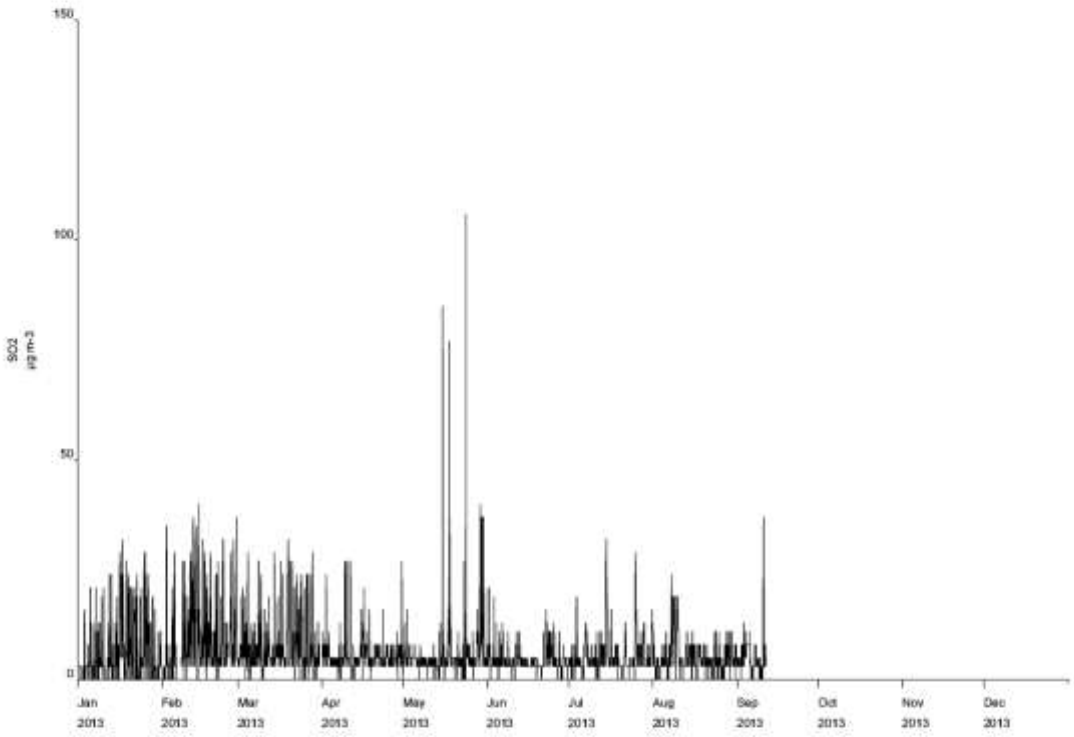
Air Quality Data Management

Air Quality Report

NEWB GG N SPORTS CENTRE 2013
Hourly Mean Timeseries



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http://www.UKAirQuality.net

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Add as many appendices as required.