



Sunderland City Council

Local Air Quality Management

Progress Report 2013

In fulfillment of Part IV of the Environment Act 1995

Date April 2013

| | |
|--------------------------------|---------------|
| Local Authority Officer | Joanne Dodson |
|--------------------------------|---------------|

| | |
|-------------------|---------------------------------------------------|
| Department | Public Protection & Regulatory Services |
| Address | Civic Centre, PO Box 107, Sunderland, SR2 7DN. |
| Telephone | 0191 5611696 |
| e-mail | Public.health@sunderland.gov.uk |

| | |
|--------------------------------|------------|
| Report Reference number | PR 2013 |
| Date | April 2013 |

Executive Summary

The Air Quality Strategy establishes the framework for air quality improvements. Measures agreed at the national and international level are the foundations on which the strategy is based. It is recognised, however, that despite these measures, areas of poor air quality will remain, and these will best be dealt with using local measures implemented by the LAQM regime. The role of the local authority review and assessment process is to identify those areas where the air quality objectives are being or are likely to be exceeded. Experience has shown that such areas may range from single residential properties to whole town centres.

Sunderland City Council have been assessing the air quality in their area for over 10 years through the Review and Assessment framework and this Progress report follows on from last year's report which concluded that there was a need to proceed to a Detailed Assessment for Nitrogen Dioxide. The new format of the USA which carries out an assessment on a source-by-source basis, rather than considering each pollutant in turn has been followed for this Progress Report. Progress Reports are intended to maintain continuity in the LAQM process, and fill in the gap between the three-yearly cycle of Review and Assessment. Progress Reports are required in all years when the authority is not completing an Updating and Screening Assessment.

Sunderland City Council takes a pro-active stance on LAQM and although we have not had to declare an Air Quality Management Area within our boundaries, considerable effort and funding has been put into monitoring the air quality in Sunderland. We were also very pleased to have one of our automatic monitoring stations adopted into the National Automatic Urban Network in 2004. The station which is situated at the Tennis centre on the Silksworth Sports Complex now monitors NO_x, Ozone, and PM_{2.5} for the AUN along with PM₁₀ for the purposes of LAQM.

The Updating and Screening Assessment 2012 has identified the need to proceed to a Detailed Assessment. This decision has been supported by the data collected and presented in this Progress Report 2013. The objective that is likely to be breached is the Annual Nitrogen Dioxide Objective of 40µg/m³. The location of the exceedence is at Dunn House which is located at the Northern end of North Bridge Street the A1018 near to the Wheatsheaf Gyratory.

Sunderland's next course of action will be to proceed to a Detailed Assessment for Nitrogen Dioxide for the Annual Objective but propose that the start of monitoring for this Assessment be delayed until September 2013 to allow major road works nearby to be completed.

Table of contents

| | | |
|-----------|--------------------------------------------------------------|-----------|
| 1 | Introduction | 6 |
| 1.1 | Description of Local Authority Area | 6 |
| 1.2 | Purpose of Progress Report | 6 |
| 1.2 | Air Quality Objectives | 7 |
| 1.3 | Summary of Previous Review and Assessments | 9 |
| 2 | New Monitoring Data | 11 |
| 2.1 | Summary of Monitoring Undertaken | 11 |
| 2.2 | Comparison of Monitoring Results with Air Quality Objectives | 16 |
| 3.1 | Road Traffic Sources | 23 |
| 3.2 | Other Transport Sources | 23 |
| 3.3 | Industrial Sources | 23 |
| 3.4 | Commercial and Domestic Sources | 24 |
| 3.5 | New Developments with Fugitive or Uncontrolled Sources | 24 |
| 4. | Planning Applications | 25 |
| 5. | Air Quality Planning Policies | 26 |
| 6. | Local Transport Plans and Strategies | 27 |
| 7. | Climate Change Strategies | 29 |
| 8. | Conclusions and Proposed Actions | 31 |
| 8.1 | Conclusions from New Monitoring Data | 31 |
| 8.2 | Conclusions relating to New Local Developments | 31 |
| 8.3 | Proposed Actions | 32 |
| 9. | References | 33 |
| | Nitrogen Dioxide Diffusion Tube Procedure | 37 |

Appendices

Appendix A: QA:QC Data

1 Introduction

1.1 Description of Local Authority Area

Sunderland is one of five Local Authorities making up the conurbation of Tyne & Wear that covers an area of 54,006 hectares, with a population of 1.134 million. The conurbation centres around two major rivers with a mixture of large urban and rural areas.

A substantial rail and road network covers the region, which includes a number of motorways and trunk roads, primary roads, principal roads and other classified and non-classified routes. A comprehensive network of bus services operates in Tyne & Wear, as well as a Metro light rail network. Both regional and national rail systems and freight also operate. Passenger ferries and freight shipping services operate from the Port of Tyne and cargo traffic enters and leaves the Port of Sunderland.

Cars form the bulk of traffic on the roads - car ownership in Tyne & Wear increased by about 44% between 1980 and 1996, broadly in line with national trends. If existing trends continue, further substantial increases in car ownership can be anticipated. This, together with the expected increase in commercial traffic will lead to greater pressure on the road system. As car ownership grows congestion becomes worse. Businesses are especially concerned about rising expenses caused by traffic jams. Regions remote from London, like the North-East, are particularly affected. As a result, large urban areas – including Tyne and Wear – have been instructed by the Department of Transport to set congestion targets. The target for Tyne and Wear is to limit congestion so that, by 2011, travellers experience a maximum 7% increase in average journey time per person mile on 16 key corridors throughout Tyne and Wear. This compares with an expected 12% growth in traffic on these roads during this period.¹

Air quality in Tyne & Wear may also be influenced by sources external to the region, notably power generation and metal refining activities. The region is bounded to the east by the North Sea, which is considered to be a source of natural particulates - sea salt- that contribute to the overall particulate level in the region.

1.2 Purpose of Progress Report

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 Local Air Quality Management 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.

1.2 Air Quality Objectives

The air quality objectives applicable to Local Air Quality Management (LAQM) in **England** are set out in the Air Quality (England) Regulations 2000 (SI 928), and the Air Quality (England) (Amendment) Regulations 2002 (SI 3043). They are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (for carbon monoxide the units used are milligram's per cubic metre, mg/m^3). Table 1.1. includes the number of permitted exceedences in any given year (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England.

| Pollutant | Concentration | Measured as | Date to be achieved by |
|--------------------------------------------------|-----------------------------------------------------------------------------|---------------------|-------------------------------|
| Benzene | 16.25 $\mu\text{g}/\text{m}^3$ | Running annual mean | 31.12.2003 |
| | 5.00 $\mu\text{g}/\text{m}^3$ | Running annual mean | 31.12.2010 |
| 1,3-Butadiene | 2.25 $\mu\text{g}/\text{m}^3$ | Running annual mean | 31.12.2003 |
| Carbon monoxide | 10.0 mg/m^3 | Running 8-hour mean | 31.12.2003 |
| Lead | 0.5 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2004 |
| | 0.25 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2008 |
| Nitrogen dioxide | 200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year | 1-hour mean | 31.12.2005 |
| | 40 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2005 |
| Particles (PM₁₀) (gravimetric) | 50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year | 24-hour mean | 31.12.2004 |
| | 40 $\mu\text{g}/\text{m}^3$ | Annual mean | 31.12.2004 |
| Sulphur dioxide | 350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year | 1-hour mean | 31.12.2004 |
| | 125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year | 24-hour mean | 31.12.2004 |
| | 266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year | 15-minute mean | 31.12.2005 |

1.3 Summary of Previous Review and Assessments

| Name of Report | Date Produced | Brief Outcome |
|---------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| First Stage Air Quality Review & Assessment for Tyne & Wear (<i>jointly with the Tyne & Wear authorities</i>) | 1998 | Identified that 6 of the 7 pollutants with Air Quality Objectives needed further investigation. 1, 3 Butadiene was eliminated. |
| Final Stage Review and Assessment (<i>stages 2 & 3 jointly with South Tyneside Council</i>) | 2000 | Undertook an Urban Emissions Inventory and a computer model using ADMS- Urban. Concluded all objectives will be met by the specified dates. |
| Updating & Screening Assessment 2003 (<i>Sunderland only</i>) | 2003 | Proceeded to a detailed assessment for NO ₂ based on NO ₂ diffusion tubes and DMRB screening model. |
| Detailed Assessment of Air Quality (All Tyne & Wear Authorities) | Jan 2005 | Concluded that AQMA's should be declared at two sites in Sunderland. |
| Supplementary Detailed Assessment of Air Quality (<i>Sunderland only</i>) | June 2005 | Reversed findings of DA and concluded the AQMA's were not required due to new continuous analyser data and removal of a receptor due to redevelopment. |
| Updating & Screening Assessment 2006 (<i>Sunderland only</i>) | 2006 | Concluded not necessary to proceed to a DA for any pollutants but monitoring will continue. |
| Progress Report (<i>Sunderland only</i>) | 2007 | Concluded not necessary to proceed to a DA for any pollutants but monitoring will continue. |
| Progress Report (<i>Sunderland only</i>) | 2008 | Concluded not necessary to proceed to a DA for any pollutants but monitoring will continue. |
| Updating & Screening Assessment 2009 (<i>Sunderland only</i>) | 2009 | Concluded not necessary to proceed to a DA for any pollutants but monitoring will continue. |
| Progress Report (<i>Sunderland only</i>) | 2010 | Concluded not necessary to proceed to a DA for any pollutants but monitoring will continue. |

The Updating and Screening Assessments (USA) carried out as part of the second round of Review and Assessment of air quality in the Sunderland region identified a number of locations where the UK Air Quality Objectives were at risk of being exceeded. In 2005, a Detailed Assessment (DA) was carried out to determine whether it was likely that the objectives will be exceeded at these locations, in order to determine the need for any Air Quality Management Areas (AQMA's).

The DA concluded that there was a risk of the annual mean objective for nitrogen dioxide to be exceeded at two locations, Trimdon Street Roundabout and Chester Road/Ormonde Street, and that Air Quality Management Areas (AQMA's) should be declared. Since publication of the Detailed Assessment report, additional information on measured nitrogen dioxide concentrations at the Chester Road/Ormonde Street junction was made available. The results from three months continuous monitoring at this location, along with the full 12 months data from a diffusion tube monitoring site indicated that the annual mean nitrogen dioxide objective would be achieved by a reasonable margin in 2005.

In addition, further information was obtained relating to the second potential area of exceedence of the annual mean nitrogen dioxide objective at Trimdon Street Roundabout. The area of potential exceedence covered one receptor known as Embassy House. The property was purchased by the City of Sunderland as part of a large development plan and was demolished soon after. Since there were no receptors in the area of potential exceedence there was no requirement for the declaration of an Air Quality Management Area.

The 2012 USA identified that there was a risk of the UK Air Quality Objectives being exceeded in one location. Sunderland City Council have therefore proceeded to a Detailed Assessment for the relevant locations and are currently working towards completing this assessment.

This Progress Report will provide an interim report and present data collected since the last USA.

Currently Sunderland City Council has no AQMA's within its boundary.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Pollutants are automatically monitored at 2 sites within Sunderland. Details of the two stations are shown below in table 2.1. Maps of the 2 locations have also been provided as Fig 2.1-2.2. These stations were running at the time of the previous Updating and Screening report and no new stations have been commissioned. QA/QC procedures for these sites are detailed in Appendix 1 of this report. PM₁₀ is measured at two locations using Tapered Element Oscillating Microbalances (TEOM's).

Table 2.1 Details of Automatic Monitoring Sites

| Site Name | Site Type | OS Grid Ref | Pollutants Monitored | In AQM A? | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road (N/A if not applicable) | Worst-case Location? |
|----------------|------------------|--------------------|-------------------------------------------------------------------------|-----------|-----------------------------------------------------------------|----------------------------------------------------------|----------------------|
| Trimdon Street | Kerbside | X438928 Y557151 | NO _x , PM ₁₀ | N | Yes 3m | 0.5m | Y |
| Puma Centre | Urban Background | X438116 Y554462 | NO _x , SO ₂ O ₃ PM ₁₀ | N | No | 0.5m but approx 10m to nearest 'busy' road | N |

Figure 2.1 Location of Trimdon St Automatic Monitoring Station

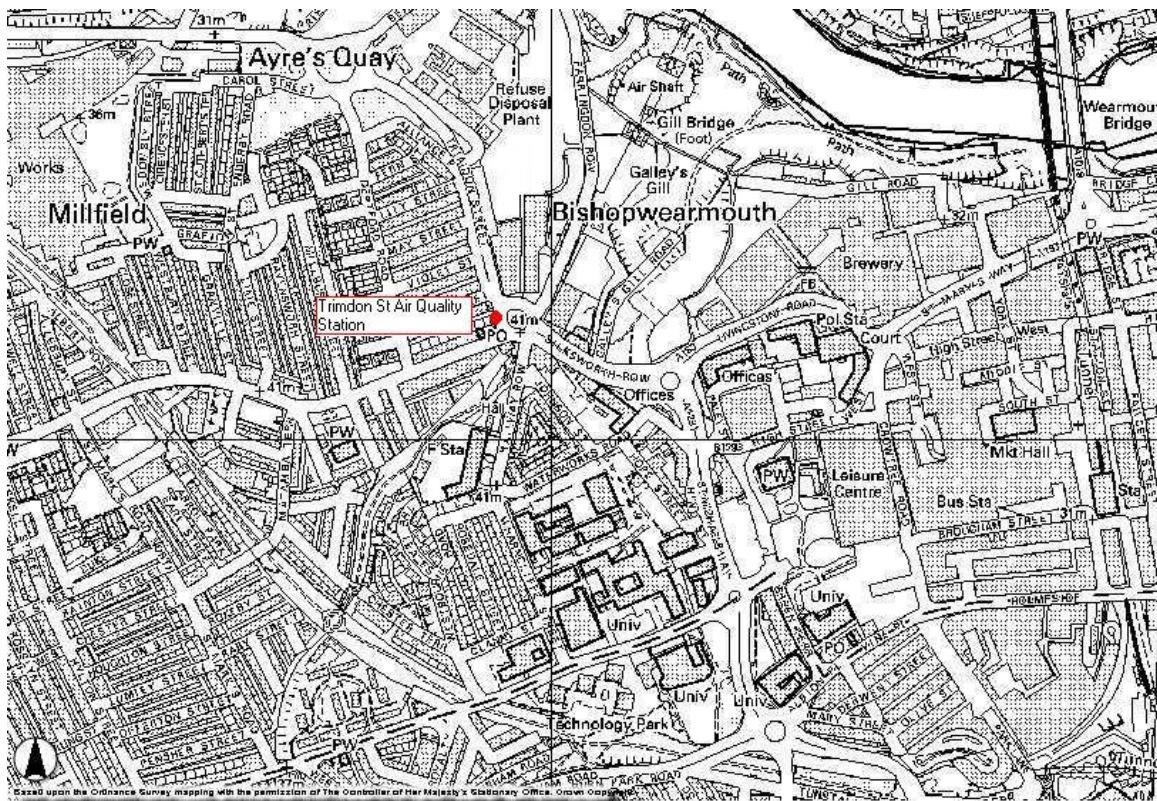
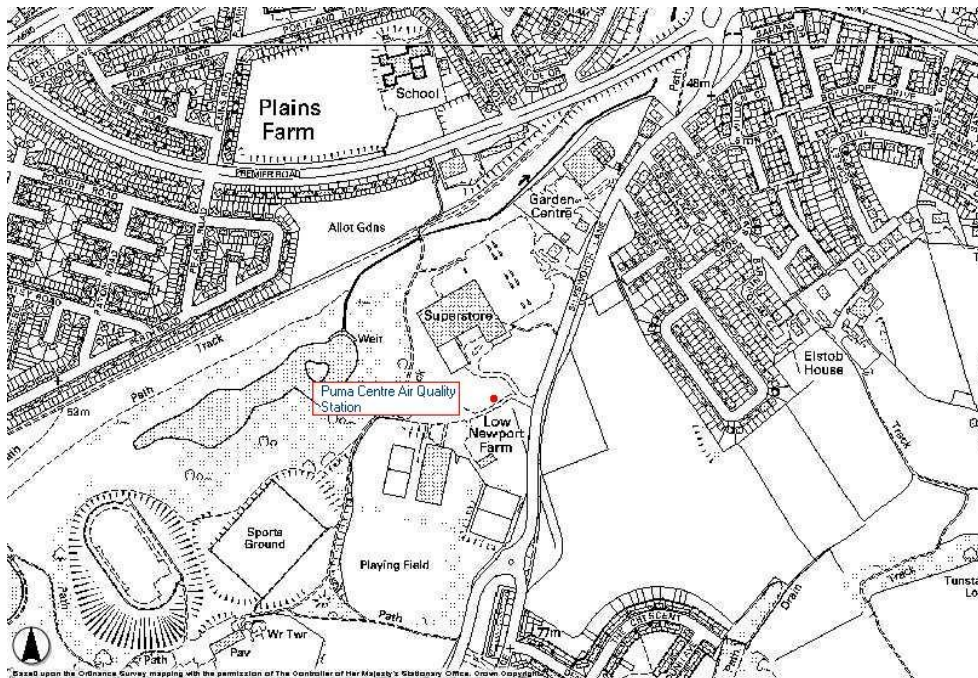


Figure 2.2 Location of Puma Centre Automatic Monitoring Station.



2.1.2 Non-Automatic Monitoring

Nitrogen Dioxide has been measured using passive diffusion tubes for several years throughout Sunderland and the number of sites is currently 37. The vast majority of the tubes are located on busy roads and there are two co-located sites where diffusion tubes in triplicate are sited at automatic stations. These are at Trimdon Street and the Puma Centre. Wherever possible the tubes are located on the façade of buildings that are relevant receptors such as residential properties.

The monitoring of Benzene concentrations has ceased due to continually insignificant results

Details of the QA/QC procedures and the laboratory used to analyse the tubes are contained in Appendix 1.

Sunderland City Council has calculated the precision and bias of the NO₂ diffusion tubes to evaluate their performance. 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 are to each other. Bias represents the overall tendency of the diffusion tubes to depart from the true value, i.e., to under or over-read relative to the reference method (the chemiluminescence analyser).

A database of bias adjustment factors determined from Local Authority co-location studies throughout the UK has been collated by the Local Air Quality Management Helpdesk. Using orthogonal regression, combined bias adjustment factors have been calculated for each laboratory, year and preparation method combination for which data are available.

The National Bias adjustment database was used to calculate a bias adjustment factor.

The correct laboratory, preparation method and year of study were selected from the data base to produce an adjustment factor of 0.96.

| Site Number | Site Name | Site Type | OS Grid Ref | Pollutants Monitored | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road (N/A if not applicable) | Worst-case Location? |
|-------------|--------------------------------|------------------|--------------------|----------------------|-----------------------------------------------------------------|----------------------------------------------------------|----------------------|
| 29 | Arndale House, St Mary's Way | Roadside | X439508 Y557151 | NO ₂ | No | 0.5m | Y |
| 38 | 17 Parkside Sth, E. Herrington | Roadside | X435714 Y552473 | NO ₂ | Yes 0m | 10m | Y |
| 39 | 15 John Street | Urban Centre | X439835 Y556978 | NO ₂ | No | 3m | N |
| 53 | 166 Chester Road | Roadside | X438568 Y556566 | NO ₂ | Yes 0m | 4m | Y |
| 55 | 25 Eden Vale | Roadside | X438690 Y556135 | NO ₂ | Yes 0m | 2m | Y |
| 56 | 101 Southwick Road | Roadside | X439101 Y553282 | NO ₂ | Yes 0m | 2m | Y |
| 57 | 5/6 Nbridge St, Monkwearmouth | Kerbside | X439664 Y557829 | NO ₂ | Yes 0m | 1m | Y |
| 58 | 6 Beatrice Tce, Shiney Row | Kerbside | X432634 Y552616 | NO ₂ | Yes 0m | 1m | Y |
| 86 | 2 Alice Street | Roadside | X439466 Y556484 | NO ₂ | Yes 0m | 2m | Y |
| 88 | Hinds Street | Roadside | X439160 Y556995 | NO ₂ | No | 1m | Y |
| 94 | Chaplin's PH, Mary St. | Kerbside | X439423 Y556738 | NO ₂ | Yes 0m | 0.5m | Y |
| 100 | Trimdon St AQ Station | Kerbside | X438927 Y557151 | NO ₂ | Yes 3m | 0.5m | Y |
| 101 | Puma Centre, Silksworth Ln | Urban Background | X438116 Y554462 | NO ₂ | No | 0.5m | N |
| 103 | Trimdon St AQ Station | Kerbside | X438927 Y557151 | NO ₂ | Yes 3m | 0.5m | Y |
| 104 | Trimdon St AQ Station | Kerbside | X438927 Y557151 | NO ₂ | Yes 3m | 0.5m | Y |
| 105 | Puma Centre, Silksworth Ln | Urban Background | X438116 Y554462 | NO ₂ | No | 0.5m | N |
| 106 | Puma Centre, Silksworth Ln | Urban Background | X438116 Y554462 | NO ₂ | No | 0.5m | N |
| 109 | 23 Newcastle Rd | Roadside | X439648 Y558120 | NO ₂ | Yes 0m | 2m | Y |
| 111 | 237 Queen Alexandra Rd, | Roadside | X438453 Y555507 | NO ₂ | Yes 0m | 5m | Y |
| 113 | 181 Durham Road | Roadside | X437446 Y554989 | NO ₂ | Yes 0m | 5m | Y |
| 116 | 9 Derwent St | Urban Centre | X439451 Y556718 | NO ₂ | Yes 0m | 1m | Y |
| 117 | 3, Holmeside | Roadside | X439495 Y556795 | NO ₂ | No | 1m | N |
| 118 | 27 Bridge St | Roadside | X439696 Y557205 | NO ₂ | Yes 0m | 2m | Y |
| 119 | 4 Athenaeum St | Roadside | X439792 Y556921 | NO ₂ | Yes 0m | 2m | Y |
| 120 | Gillespie's PH | Roadside | X439806 Y557063 | NO ₂ | No | 2m | N |

| Site No | Site Name | Site Type | OS Grid Ref | Pollutants Monitored | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road (N/A if not applicable) | Worst-case Location |
|---------|-----------------------------------|-----------|--------------------|----------------------|-----------------------------------------------------------------|----------------------------------------------------------|---------------------|
| 121 | 16 Windsor Tce, Grngetwn | Roadside | X440702 Y554722 | NO ₂ | Yes 0m | 3m | Y |
| 123 | 263 Chester Rd | Roadside | X437943 Y556341 | NO ₂ | Yes 0m | 4m | N |
| 125 | 45 Station Rd | Roadside | X435417 Y547025 | NO ₂ | Yes 0m | 1m | Y |
| 128 | Echo Building | Roadside | X439707 Y557312 | NO ₂ | Yes 10m | 10m | Y |
| 129 | West Sunnyside | Roadside | X439938 Y557089 | NO ₂ | Yes 5m | 1m | Y |
| 130 | St Mary's Car Park | Roadside | X439538 Y557292 | NO ₂ | No | 1m | Y |
| 131 | Chaplin's PH 2 nd Tube | Kerbside | X439397 Y556666 | NO ₂ | Yes 3m | 0.5m | Y |
| 132 | Dunn House, N Bridge St. | Kerbside | X439661 Y557901 | NO ₂ | Yes 3m | 1m | Y |
| 133 | 26 Northern Way | Roadside | X438153 Y558344 | NO ₂ | Yes 3m | 2m | Y |
| 134 | Southwick Road /Thompson | Roadside | X438563 Y558517 | NO ₂ | Yes 3m | 2m | Y |
| 135 | Merle Terrace | Roadside | X437561 Y557538 | NO ₂ | Yes 3m | 2m | Y |
| 136 | 1 Morningside Rickleton | Roadside | X428269 Y553809 | NO ₂ | Yes 5 m | 0.5m | Y |

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Automatic Monitoring Data

Nitrogen dioxide was monitored at two locations across the city. The annual mean objective was met at both sites (table 2.3a). There were no exceedences of the hourly NO₂ objectives at either site.

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

| Location | Within AQMA? | Proportion of year with valid data 2012 % | Annual mean concentrations ($\mu\text{g}/\text{m}^3$) 2012 |
|----------------|--------------|-------------------------------------------|--------------------------------------------------------------|
| Puma Centre | N | 89.9 | 18 |
| Trimdon Street | N | 93.4 | 35.3 |

Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

| Location | Within AQMA? | Data Capture 2012 % | Number of Exceedences of hourly mean ($200 \mu\text{g}/\text{m}^3$) <i>If the period of valid data is less than 90% of a full year, include the 99.8th %ile of hourly means in brackets.</i> 2012 |
|----------------|--------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Puma Centre | N | 89.9 | 0 |
| Trimdon Street | N | 93.4 | 0 |

2.2.2 Diffusion Tube Monitoring Data

The results of the diffusion tube data for NO₂ were that the annual objective of $40 \mu\text{g}/\text{m}^3$ was met at the majority of locations. However, there were three locations where it was exceeded. Tube 117 at 3 Holmeside where an annual average of $41.1 \mu\text{g}/\text{m}^3$ was recorded. However there is no longer a receptor at this location and therefore there was no exceedence of the air quality objective. Tubes 100, 103 and 104 are all located at Trimdon Street Air Quality Station. However, the results from the automatic analyser at this site show that the annual mean was not exceeded and as these results are more accurate there is no need to proceed to a Detailed Assessment. Tube 132 also showed an exceedence of $46.2 \mu\text{g}/\text{m}^3$. This area is currently subject to a Detailed Assessment and the results of this assessment will be provided once it has been completed.

Chart 2.1 below shows the annual averages for tubes from various locations across the city. These have been plotted for the last 5 years to investigate trends in NO₂ within Sunderland. The 5 sites show a strong visible correlation even though some are road

side and some are classed as background sites. The annual averages can also be seen to generally increase apart from 2009 which would indicate that NO₂ levels are being affected by additional factors apart from traffic for which there should have been only a steady increase in the averages as the number of vehicles across the region increases.

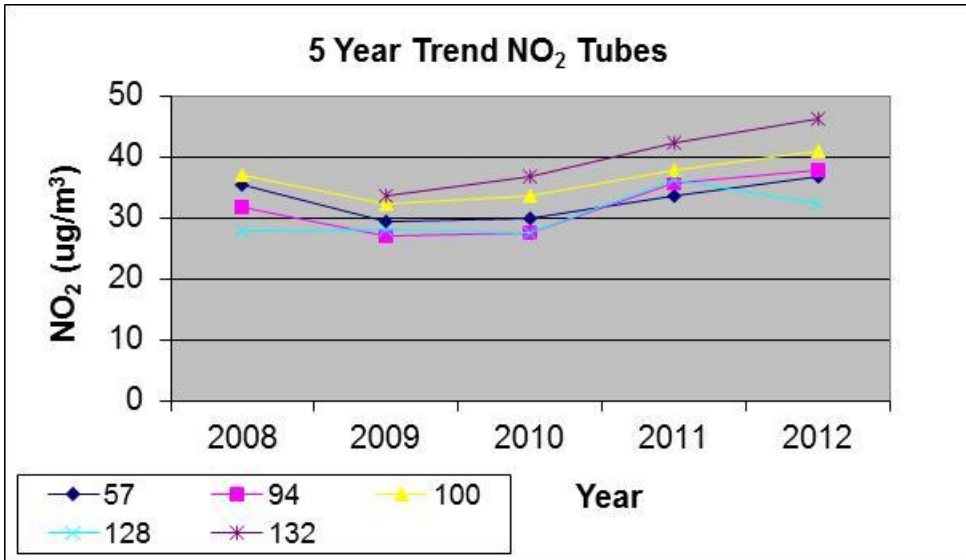


Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

| Site ID | Location | Within AQMA? | Data Capture 2012 % | Annual mean concentration 2012 ($\mu\text{g}/\text{m}^3$) Adjusted for bias (0.96) |
|---------|--------------------------------|--------------|---------------------|--------------------------------------------------------------------------------------|
| 29 | Arndale House, St Mary's Way | N | 100 | 34.9 |
| 38 | 17 Parkside Sth, E. Herrington | N | 100 | 32.4 |
| 39 | 15 John Street | N | 100 | 25.5 |
| 53 | 166 Chester Road | N | 92 | 33.3 |
| 55 | 25 Eden Vale | N | 100 | 37.8 |
| 56 | 101 Southwick Road | N | 92 | 32.4 |
| 57 | 5/6 Nbridge St, Monkwearmouth | N | 100 | 36.8 |
| 58 | 6 Beatrice Tce, Shiney Row | N | 100 | 35.8 |
| 86 | 2 Alice Street | N | 92 | 22.9 |
| 88 | Hinds Street | N | 75 | 34.4 |
| 94 | Chaplin's PH, Mary St. | N | 92 | 37.8 |
| 100 | Trimdon St AQ Station | N | 100 | 40.8 |
| 103 | Trimdon St AQ Station | N | 100 | 40.0 |
| 104 | Trimdon St AQ Station | N | 92 | 40.1 |
| 101 | Puma Centre, Silksworth Ln | N | 100 | 19.1 |
| 105 | Puma Centre, Silksworth Ln | N | 100 | 18.8 |
| 106 | Puma Centre, Silksworth Ln | N | 100 | 18.9 |
| 109 | 23 Newcastle Rd | N | 92 | 34.4 |
| 111 | 237 Queen Alexandra Rd, | N | 75 | 23.7 |
| 113 | 181 Durham Road | N | 92 | 33.2 |
| 116 | 9 Derwent St | N | 100 | 27.7 |
| 117 | 3, Holmeside | N | 92 | 41.1 (no receptor) |
| 118 | 27 Bridge St | N | 100 | 30.4 |
| 119 | 4 Athenaeum St | N | 100 | 33.5 |
| 120 | Gillespie's PH | N | 100 | 30.0 |
| 121 | 16 Windsor Tce, Grngetwn | N | 58 | 21.4 |
| 123 | 263 Chester Rd | N | 92 | 39.4 |

| | | | | |
|-----|--------------------------------------|---|-----|------|
| 125 | 45 Station Rd | N | 83 | 29.5 |
| 128 | Echo Building | N | 100 | 32.2 |
| 129 | West Sunnyside | N | 92 | 27.1 |
| 130 | St Mary's Car Park | N | 100 | 27.9 |
| 131 | Chaplin's PH 2 nd Tube | N | 92 | 39.3 |
| 132 | Dunn House, N Bridge St. | N | 83 | 46.2 |
| 133 | 26 Northern Way | N | 75 | 32.2 |
| 134 | Southwick Road/Thompson | N | 50 | 35.2 |
| 135 | Merle Terrace | N | 75 | 25.1 |
| 136 | 1 Morningside Rickleton | N | 58 | 24.7 |

PM₁₀

PM₁₀ is measured at two locations in Sunderland at present. Both sites use a TEOM to collect these measurements. The data has been corrected for both sites using the Volatile Correction Model. Data Capture at both sites was relatively good and was over 80%. Both sites met the annual objective of 40 µg/m³ and the 24-hour mean of less than 35 exceedences of 50 µg/m³ per year.

Table 2.7 Results of Automatic Monitoring of PM₁₀: Comparison with Annual Mean Objective

| Site ID | Site Type | Within AQMA? | Valid Data Capture for monitoring Period % ^a | Valid Data Capture 2012 % ^b | Confirm Gravimetric Equivalent (Y or NA) | Annual Mean Concentration µg/m ³ | | | | |
|----------------|------------------|--------------|---------------------------------------------------------|----------------------------------------|------------------------------------------|---------------------------------------------|--------------------|--------------------|-------------------|------|
| | | | | | | 2008* ^c | 2009* ^c | 2010* ^c | 2011 ^c | 2012 |
| Trimdon Street | Kerbside | N | | 81.1% | Y | 21 | 18 | 18 | 20 | 22.1 |
| Puma Centre | Urban Background | N | | 83.7% | Y | 13 | 12 | 15 | 15 | 15.6 |

^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.

* Optional

Table 2.8 Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour mean Objective

| Site ID | Site Type | Within AQMA? | Valid Data Capture for monitoring Period % ^a | Valid Data Capture 2012 % ^b | Confirm Gravimetric Equivalent | Number of Exceedences of 24-Hour Mean (50 µg/m ³) | | | | |
|----------------|------------------|--------------|---------------------------------------------------------|----------------------------------------|--------------------------------|---------------------------------------------------------------|-------|-------|------|------|
| | | | | | | 2008* | 2009* | 2010* | 2011 | 2012 |
| Trimdon Street | Kerbside | N | | 81.1% | Y | 5 | 4 | 0 | 16 | 10 |
| Puma Centre | Urban Background | N | | 83.7% | Y | 0 | 0 | 0 | 0 | 2 |

2.2.3 Sulphur Dioxide

Table 2.6 Results of SO₂ Automatic Monitoring: Comparison with objectives.

| Location | Within AQMA? | Data Capture 2012 % | No. of exceedences of 15-min mean (266µg/m ³) | No. of exceedences of one-hour mean (350 µg/m ³) | No. of exceedences of 24-hour mean (125µg/m ³) |
|-------------|--------------|---------------------|-----------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------|
| Puma Centre | N | 72.3 | 0 | 0 | 0 |

Sulphur dioxide has been monitored for many years within Sunderland and the results have shown ambient concentrations have declined. A major factor in this decline has been a reduction of the use of coal due to implementation of Smoke Control Orders within the City. An AURN site measuring SO₂ was located in John Street in the City Centre for 15 years but this site was decommissioned in 2007.

Sulphur Dioxide is measured at the Puma Centre site and has been adopted for SO₂ as an AURN site since 2004.

Data capture for 2012 for the Puma Centre site was 72.3%. There were no exceedences of the 15-minute, one-hour or 24-hour mean. Therefore all of the objectives were met at this location.

2.2.4 Benzene

Due to consistently low levels in previous years Benzene monitoring is no longer undertaken.

2.2.5 Carbon Monoxide

Due to consistently low levels in previous years Carbon Monoxide monitoring is no longer undertaken.

Summary of Compliance with AQS Objectives

Sunderland has measured concentrations of Nitrogen Dioxide above the annual mean objective at relevant locations and **will need to proceed to a Detailed Assessment**, for the North Bridge Street/ Roker Avenue junction also known as the Wheatsheaf Gyratory.

3. New Local Developments

This section of the Progress Report deals with changes that have taken place that may affect air quality. The types of developments that were considered are

- New industrial processes, i.e. Part A, A2 or B
- New developments with an impact on air quality, especially those that will significantly change traffic flows. Only developments that have been granted planning permission are included
- New landfill sites, quarries that have been granted planning permission, and which have nearby relevant exposure.

This Progress Report will log these changes so that they can be considered more thoroughly during the next full round of review and assessment.

3.1 Road Traffic Sources

Sunderland confirms that there are no new/newly identified road traffic sources which may have an impact on air quality within the Local Authority area.

3.2 Other Transport Sources

Sunderland confirms that there are no new/newly identified transport sources which may have an impact on air quality within the Local Authority area.

3.3 Industrial Sources

There were 2 new Part B processes that were permitted between Jan and Dec 2012. The table below summarises these processes and they will be more fully considered at the 2015 USA.

| Development | Description | Source of information |
|-----------------------------------------------------------|-----------------------------------------------------|-------------------------|
| New Part B process Wilden Contracts Ltd | Mobile Crusher | Sunderland City Council |
| New Part B process Sunderland Tyre & Exhaust Centre | Waste Oil Burner | Sunderland City Council |
| New Part B process JC Atkinson & Son Ltd | Manufacture of timber and wood based products | Sunderland City Council |

3.4 Commercial and Domestic Sources

Sunderland confirms that there are no new or newly identified commercial and domestic sources which may have an impact on air quality within the Local Authority area.

3.5 New Developments with Fugitive or Uncontrolled Sources

Sunderland confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

4.Planning Applications

During 2012, Sunderland City Council submitted a planning application for the realignment of St Mary's Way which is the major road west through the city centre.

An air quality assessment was submitted in support of the application. The assessment used DMRB to assess existing conditions and to predict future concentrations of pollutants with the scheme in place.

The conclusions were that the impact of the proposed development would not have a significant impact on air quality.

The former Vaux site that lies to the North of St Mary's Way which has been discussed during previous Review and Assessment reports has yet to be developed. It is planned that as the site is developed that air quality assessments will be submitted going forward. These will of course be discussed during future Progress Reports.

5. Air Quality Planning Policies

The air quality steering group of the five Tyne & Wear Local Authorities are currently in discussion with the aim of producing a supplementary planning guidance document to address air quality issues. Due to time constraints this is still ongoing. Further updates will be provided within the 2015 USA.

6. Local Transport Plans and Strategies

The **Tyne and Wear Air Quality Delivery Plan** has been completed by the Tyne and Wear Local Transport Plan Core Team as a response to air quality issues and problems. The overall aim is to outline air quality conditions across Tyne and Wear, to show where potential problems lie and finally to outline what can be done to improve air quality and thus the quality of life for the people of Tyne and Wear. In doing so, the plan sets out:

- The background to air quality issues and air quality objectives in Tyne and Wear
- Governance and monitoring arrangements to drive improvement forward
- Current air quality levels and measures in the region
- New air quality indicators and targets for Tyne and Wear
- Challenges to our proposed objectives and solutions, and how these can be overcome
- Examples of national and regional best practice which can be used to improve Tyne and Wear air quality levels
- Proposed actions to improve area specific and overall Tyne and Wear air quality levels which affects us all

The key issues raised by the plan are an emphasis on action and a clear commitment that we must, wherever possible, prevent further areas in Tyne and Wear from becoming AQMAs – areas where air quality had been recognised as being especially poor. Current air quality action plans produced subsequent to an area being declared an AQMA do not propose tangible actions, ownership of problems, budgets or timelines. This indicates that the problem does not lie in insufficient monitoring, but in what this information is subsequently utilised for; signifying a need for the proposed actions and for clear ownership of these, as presented in the plan.

The plan therefore presents realistic, efficient and reliable air quality solutions which need to incorporate the promotion of alternative modes, management of the existing highway network, planning, emissions management, information and education. This will be based around a combination of policy implementation and interventions. However, the task of implementing such actions to improve air quality in a specific area can be challenging due to a lack of standardised processes and the varying conditions and sources in each area. Two ‘sets’ of actions are hence needed; one aimed at area-specific interventions, and one dealing with measures which will improve Tyne and Wear air quality levels as a whole.

In order to achieve these ambitions, the plan recognises the need for a clear commitment from stakeholders, along with a better working relationship between planning departments and environmental health officers and more pooling of knowledge. It is also important to note that the Air Quality Delivery Plan is a living document and will hence be regularly updated to reflect changes in AQMA boundaries and to take into account results of on-going detailed assessments.

The LTP is now going into its third round (LTP3) and will be a 10 year strategy with 3 year delivery plans.

The **Tyne and Wear Air Quality Delivery Plan** has recently been completed by the Tyne and Wear Local Transport Plan Core Team as a response to these issues and problems. The overall aim is to outline air quality conditions across Tyne and Wear, to show where potential problems lie and finally to outline what can be done to improve air quality and thus the quality of life for the people of Tyne and Wear. In doing so, the plan sets out:

- The background to air quality issues and air quality objectives in Tyne and Wear
- Governance and monitoring arrangements to drive improvement forward
- Current air quality levels and measures in the region
- New air quality indicators and targets for Tyne and Wear
- Challenges to our proposed objectives and solutions, and how these can be overcome
- Examples of national and regional best practice which can be used to improve Tyne and Wear air quality levels
- Proposed actions to improve area specific and overall Tyne and Wear air quality levels which affects us all

The key issues raised by the plan are an emphasis on action and a clear commitment that we must, wherever possible, prevent further areas in Tyne and Wear from becoming AQMAs – areas where air quality had been recognised as being especially poor. Current air quality action plans produced subsequent to an area being declared an AQMA do not propose tangible actions, ownership of problems, budgets or timelines. This indicates that the problem does not lie in insufficient monitoring, but in what this information is subsequently utilised for; signifying a need for the proposed actions and for clear ownership of these, as presented in the plan.

The plan therefore presents realistic, efficient and reliable air quality solutions which need to incorporate the promotion of alternative modes, management of the existing highway network, planning, emissions management, information and education. This will be based around a combination of policy implementation and interventions. However, the task of implementing such actions to improve air quality in a specific area can be challenging due to a lack of standardised processes and the varying conditions and sources in each area. Two ‘sets’ of actions are hence needed; one aimed at area-specific interventions, and one dealing with measures which will improve Tyne and Wear air quality levels as a whole.

In order to achieve these ambitions, the plan recognises the need for a clear commitment from stakeholders, along with a better working relationship between planning departments and environmental health officers and more pooling of knowledge. It is also important to note that the Air Quality Delivery Plan is a living document and will hence be regularly updated to reflect changes in AQMA boundaries and to take into account results of on-going detailed assessments.

A copy of the Air Quality Delivery Plan can be accessed at <http://www.tyneandwearltp.gov.uk/documents/air-quality-delivery-plan/> .

7. Climate Change Strategies

Sunderland's Climate Change Action Plan was adopted in November 2008, and is the framework through which Sunderland will work to reduce the city's carbon emissions.

Sunderland is now aiming to cut carbon emissions by at least 34% by 2020 (compared to 2005), to align itself with the new UK Low Carbon Transition Plan (July 2009). This is an increase from the 26% target agreed previously.

In 2007, Sunderland's carbon emissions were 1,864,300 tonnes CO₂. This is 4.5% lower than the previous year (2006), and 5.6% below the baseline year of 2005. Of these emissions, 34% were produced by housing, 40% from employers (public and commercial) and 26% from road transport.

With initiatives known to have been implemented to from April 2008 to January 2010, an estimated 54,500 tonnes CO₂ will be saved, taking total emissions in 2009 to 8% below 2005 levels. The following summarises key areas of progress, between April 2008 – January 2010:

Housing initiatives have saved 8,200 tonnes of carbon emissions

Carbon savings are expected from:

- Insulation measures were installed in 4014 homes, by the Council, Gentoo and Warmfront combined.
- 3231 new boilers were installed by Gentoo and Warmfront

Other progress includes:

- The Council has secured £3M of CERT funding, to fund energy efficiency improvements up to March 2012.

Employer actions have saved 27,300 tonnes of carbon emissions

Carbon savings are expected from:

- Nissan installed 2 more 660kW wind turbines, taking the total to 10 turbines.
- Employers continued to install carbon saving measures. For example, City Hospital Sunderland installed new CHP boilers, and the University of Sunderland installed Sunderland's first ground source heating system in their new Chester Rd campus building.
- The Council installed 1.7MW of wood burning boilers, in 6 new schools.
- Emissions saved from closure of Sunderland Glassworks in Sept 2007, will manifest in 2008 emissions data.

- Low Carbon City campaign was launched in March 2009, with 20 major employers committing to cut their carbon emissions by 10% or more. This already will save 28,000 tonnes CO₂ by 2020.

- The Council continued to develop plans for 250kW of wind energy to power its own buildings
- Planning approval was granted for a 9MW biomass power station at the Port of Sunderland

Transport initiatives have saved 20,800 tonnes of carbon emissions

Carbon savings are expected from:

- A 1% reduction in traffic levels from 2007 to 2008
- Introduction of 2.5% biofuels into all road fuels
- Continued expected increases in vehicle efficiency.

Other progress includes:

- Sunderland was included in the UK's first Low Carbon Economic Area, to support electric vehicle manufacturing and deployment.
- The Smarter Choices campaign was launched across Tyne and Wear, to help individuals make sustainable travel choices

Awareness and recognition

- Capitalising on its expertise in carbon management, the Council was commissioned to conduct a carbon emissions study for all 5 Tyne and Wear local authorities.
- In Feb 2009, Sunderland City Council won the national Sustainable Communities Award, for "Tackling Climate Change"

Outlook from 2010 to 2020

Future actions and opportunities identified in this progress report could cut Sunderland's carbon emissions by a further 404,000 tonnes CO₂. This will reduce total emissions to 29% below 2005 levels, with future revisions to this action plan needing to identify how the further 5% reduction could be achieved, to meet the 34% target. New initiatives to support these more ambitious targets include the following:

1. Sunderland is developing a new Economic Masterplan, with a vision that Sunderland is to become "**An entrepreneurial University City at the heart of a low carbon regional economy**"

Action plans that demonstrate how Sunderland will develop a Low Carbon Economy –will be developed during 2010. These will both support low-carbon business sectors, such as electric vehicles and offshore wind, and develop Sunderland as a centre of low carbon business infrastructure, buildings and transport.

2. Sunderland City Council and housing partners will continue efforts to work towards insulating every possible home in Sunderland. From 2010, this will now include the first trials of solid wall insulation for private homes, which is where the greatest potential exists for making carbon savings in Sunderland's housing stock.

Sunderland is also relying on the UK Government to successfully deliver renewable energy targets for heat and electricity, along with national sustainable construction policies for homes and all other buildings.

8. Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

The results from the automatic NO₂ monitoring data were that both the annual and hourly mean was met at both sites. The results from the non-automatic monitoring were that the annual mean was met at all sites apart from one.

The site where an exceedence was recorded was tube no. 132 located on a lamp post in North Bridge Street adjacent to Dunn House which is a large block of apartments approximately 5 storeys high. North Bridge Street is a four-laned road that leads from the Wearmouth Bridge, 3 lanes flow northwards away from the city centre and one lane carries buses and taxis towards the city. Tube 132 had an annual average of 46.2 µg/m³ after bias adjustment. The tube is positioned on a lamp post on the path adjacent to the building and adjacent to Northbridge Street. The residents do not live on the ground floor of the premises and the first level is at approximately 3 metres above street level.

Sunderland City Council will proceed to a Detailed Assessment for this location.

However, there are some additional factors to take into account when assessing this area. Directly to the North of Tube 132's location is a large junction known as the Wheatsheaf Gyratory. This is the junction between 4 busy roads:

1. Northbridge Street A1018
2. Southwick Road B1289
3. Newcastle Road A1018
4. Roker Avenue A1018.

Major road works have been undertaken on the Wheatsheaf Gyratory to change the layout of the junction and the improvements should relieve congestion. In addition to this a large retail development of a new Tesco Supermarket is being constructed close by See Fig 8.1 below.

Originally Sunderland City Council had planned to begin the monitoring of this location immediately after the roadworks had been completed. However, during discussions with the Traffic section of the council it was advised that the junction would need time to "settle" as motorists became used to the new arrangements and found the best way to reach their destinations. The decision was taken to delay monitoring for a further 6 months.

It is therefore proposed to begin one year's monitoring of NO_x at the receptor location at the start of September 2013. After a year's data has been collected Sunderland City Council believe they will have a much clearer picture of the air quality at this location and be able to come to a decision on whether an AQMA should be declared.

8.2 Conclusions relating to New Local Developments

There were three new industrial processes identified that could have a potential impact on Local air quality. These have been logged for further assessment during the next USA.

8.3 Proposed Actions

The Updating and Screening Assessment 2012 has identified the need to proceed to a Detailed Assessment. This decision has been supported by the data collected and presented in this Progress Report 2013. The objective that is likely to be breached is the Annual Nitrogen Dioxide Objective of $40\mu\text{g}/\text{m}^3$. The location of the exceedence is at Dunn House which is located at the Northern end of North Bridge Street the A1018 near to the Wheatsheaf Gyrotory.

Sunderland's next course of action will be to proceed to a Detailed Assessment for Nitrogen Dioxide for the Annual Objective but propose that the start of monitoring for this Assessment be delayed until September 2013 to allow major road works nearby to be completed.

9. References

Department for Environment, Food and Rural Affairs, 2009, *Local Air Quality Management Technical Guidance LAQM.TG (09)*.

Appendices

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors,

Sunderland City Council diffusion tubes are supplied and analysed by Gradko International Ltd, Winchester, Hampshire. The preparation method used is 50% TEA and acetone.

Sunderland City Council has calculated the precision and bias of the NO₂ diffusion tubes to evaluate their performance. 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 are to each other. Bias represents the overall tendency of the diffusion tubes to depart from the true value, i.e., to under or over-read relative to the reference method (the chemiluminescence analyser).

The precision and bias have been calculated for the Trimdon Street station using the excel spreadsheet provided on the UK air quality archive website. The results of the precision analysis were good with 12 out of 12 periods having a confidence interval smaller than 20%. The bias was calculated to be 0.79 at this site. Data capture for the co located analyser was very good (98.7%) at the site. The Puma Centre Station also has tubes in triplicate co located but unfortunately due to power problems at the site the data capture was poor (66%) for 2009. It was therefore decided not to use this site to calculate a bias adjustment factor.

The combined bias adjustment factor was also obtained from the national database of co-location studies and the result from this spreadsheet was a bias factor of 0.92 for comparison.

The two bias factors were considered and it was decided that the factor from the Trimdon Street site would be used. The rationale for this decision was based on advice from Box 3.3 in LAQM.TG (09) and for the following reasons. The data capture from Trimdon Street was greater than 90% for the period. It is classed as a kerbside site and therefore it is a good representation of the majority of the sites in our survey being mostly roadside locations.

PM Monitoring Adjustment

PM₁₀ is monitored at two locations using TEOM instruments. The data has been adjusted using the volatile correction model (VCM) accessed at <http://www.volatile-correction-model.info/>.

QA/QC of automatic monitoring

The QA/QC procedures of Sunderland are based on the AUN Site Operator's manual along with training received from our equipment suppliers, Casella Measurement.

The fundamental aims of a quality assurance/ control programme are:

- The data obtained from measurement systems should be representative of ambient concentrations existing in each area.
- Measurements must be accurate, precise and traceable.
- Data must be comparable and reproducible.
- Results must be consistent over time.

An appropriate level of data capture is required throughout the year.

Equipment Maintenance

- Automatic analysers are serviced every 6 months by a qualified engineer under a contract with Casella Measurement.
- Local Authority staff visits the air quality sites at least once every 2 weeks during which a check of the equipment is made to ensure it is all working within normal parameters. Filters are also changed during this visit.
- If a problem occurs then a call-out is instigated to the service centre and an engineer will normally visit site within 48-hours to correct the fault.

Calibration

- Each day a calibration response check is undertaken by the logger, this check does not re-calibrate the instrument. The calibration system uses certified gas cylinders of a known concentration, to produce an expected response from the analyser.
- Calibration reports stored in the logger will retain expected zero and span gas responses and the actual measured zero and span gas responses.
- Computer software collects and stores these calibration reports and also calculates a zero correction and span response scaling factor which can be applied to the data if required.
- At the 6-month service the instruments are re-calibrated to the site cylinder certificated value.
- Gas cylinder pressures are regularly checked at routine visits to ensure they are replaced before they run out completely.

When a cylinder is replaced the new certified values are entered into the logger.

Data Validation

Data from all of Sunderland City Council's automatic monitoring sites are collected via modem by Sunderland University. The University are under contract with Sunderland City Council to validate and ratify the data. Quarterly and annual reports regarding the data are produced by the University and disseminated to the five local authorities of Tyne & Wear. The data is also displayed on a website that members of the public can freely access. The website address is <http://enviweb.sunderland.ac.uk/> The University review data daily to ensure that

- Telecommunications to the station are operational
- The air quality station is operational
- Individual analysers are operational
- Air quality exceedences are identified
- Operational information such as TEOM filter loading, does not invalidate data
- Obvious data errors are identified

Data Ratification

In addition to the initial data screening process (validation), data are further scrutinised in monthly blocks in order to provide a final ratified data set.

The software that collects the data is used to rescale the data using the factor calculated from the fortnightly calibration check. Data is then reviewed for erroneous data such as:

- Daily calibration spikes
- Routine or service visit errors
- Analyser faults
- Site faults, such as power outages

When data is satisfactory, it is compared to other local sites. This provides a check to ensure data is realistic.

QA/QC of diffusion tube monitoring

Gradko has full U.K.A.S. accreditation for compliance with ISO-IEC 17025 for laboratory management system. Its accuracy and consistency of analytical methods is regularly monitored using external proficiency schemes such as

- Workplace analysis scheme for proficiency (W.A.S.P.)
- Laboratory Environmental Analysis Proficiency (L.E.A.P.)

In addition regular cross-checks are carried out with other U.K.A.S. accredited labs using certified standard solutions.

According to the WASP – Annual Performance Criteria for NO₂ Diffusion Tubes used in Local Air Quality Management (LAQM), 2008 onwards, and Summary of Laboratory Performance in Rounds 97-101, Gradko International were deemed to have a good performance. Gradko International also follows the procedures set out in the Harmonisation Practical Guidance

Details of the tube precision are provided in the section on Diffusion Tube Bias Adjustment Factors at the beginning of this section.

Nitrogen Dioxide Diffusion Tube Procedure

This procedure used in Sunderland is identical to the UK NO₂ Diffusion Tube Network procedure produced by AEA Technology for DEFRA.

- The calendar year is divided into 12 ‘pollution months’, which contain either 4 or 5 weeks for which the tubes will be exposed.
- Change over occurs on a Tuesday to avoid bank holidays. Every effort is made to change tubes on the specified date but if this is not possible then tubes are changed ± 2 days.
- Tubes are stored in airtight bags in a refrigerator until used.
- A ‘blank’ control tube is left in the refrigerator during the exposure period and not exposed.
- Tubes are labelled with a unique ID number.
- Tubes are transported to site in snap seal bags.
- At each site the date and time of start of the exposure period is recorded and with the absorbent end cap uppermost, the bottom cap is removed and the tube is clipped into the holder.
- The tube is mounted vertically with its open end downwards.
- At the end of the exposure period tubes are removed and end cap replaced. The date and time are recorded.
- The tubes are then transported back to the office and refrigerated in an airtight bag until they are sent to the lab for analysis which is as soon as possible.

Benzene Diffusion Tube Procedure

- Tubes are exposed for the same periods as nitrogen dioxide tubes.
- Tubes are stored in airtight bags at room temperature in a clean environment.
- A ‘travel blank’ is left at the office and not exposed.
- Tubes are not labelled directly but put into individually labelled snap seal bags and transported to site.
- Caps (marked with a red spot) are removed using a spanner and a diffuser cap is placed on the tube in its place.
- The tube is mounted vertically with diffuser cap facing downwards and the date and time recorded.
- At the end of the exposure period the diffuser cap is removed and the brass cap is put back onto the tube making sure the bottom of the PTFE seal is in-line with the groove on the tube.
- The cap is tightened with a spanner and tube placed in labelled snap seal bag. The date and time are recorded.
- Caps should be retightened with spanner in case of temperature change when returning to the office.

Tubes are sent to lab for analysis as soon as possible.