



**NORTH AYRSHIRE**  
COUNCIL



# 2012 Air Quality Updating & Screening Assessment and Detailed Assessment for **North Ayrshire Council**

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

**Date (April 2012)**

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**Cover Photo:** View Seafront at Ardrossan (Award Winning Beach)

## Executive Summary

The Environment Act 1995 makes a requirement for Local Authorities to review and assess air quality in their areas. The Air Quality Regulations 1997 provided National Air Quality objectives for 7 key pollutants and local authorities must assess whether these objectives are liable to be met. If any area is identified where air quality objectives are not met, Then the Local Authority must declare an Air Quality Management Area (AQMA).

This report was prepared in accordance with the Local Air Quality Management, Technical Guidance LAQM, TG(09) and sets out the air quality monitoring carried out in North Ayrshire, with results and conclusions.

The 2011 annual mean for nitrogen dioxide (NO<sub>2</sub>) diffusion tube locations in Dalry continue to be below the 40 µg/m<sup>3</sup> air quality objective with the exception of one tube that exceeded the level at 42 µg/m<sup>3</sup>. Extrapolating the data back to the closest relevant receptor gave a value of 38 µg/m<sup>3</sup>, illustrating that the local air quality objectives are still being maintained in this location.

This location will continue to be closely monitored until there is significant confidence that NO<sub>2</sub> levels will remain below the objective limits and long term trends are established. Additional monitoring for particulate matter (PM<sub>10</sub>) will be initiated in 2012 to further assess traffic pollution impact on the area.

With regard to NO<sub>2</sub>, it was predicted that a localised area of High Street, Irvine would continue to be subject to elevated levels bordering on or exceeding the NO<sub>2</sub> air quality annual mean objective of 40µg/m<sup>3</sup>. Currently 11 of the total 21 district wide NO<sub>2</sub> diffusion tubes are situated in High Street, Irvine and nearby area.

This year there have been 2 exceedences in the air quality objective for NO<sub>2</sub> annual mean concentration of 40 µg/m<sup>3</sup>. The relevant diffusion tubes are both located in High Street, Irvine, and only affect a very localised area around 10m diameter. The High Street in Irvine is used as a bus terminus and adjacent tubes in the same street, 10 metres away, were well within the objective level at 34 µg/m<sup>3</sup>.

The automatic roadside monitoring (ROMON) unit is located nearby and recorded an NO<sub>2</sub> annual mean concentration of 31 µg/m<sup>3</sup>, confirming that compliance with the objective for NO<sub>2</sub> in High Street, Irvine is being achieved.

The automated monitoring site also tests for airborne particulate matter (PM<sub>10</sub>) and the annual mean was 18µg/m<sup>3</sup> in High Street, Irvine. The Scottish annual mean air quality objective for PM<sub>10</sub> is set at 18µg/m<sup>3</sup>. The European objective (40µg/m<sup>3</sup>) was not exceeded for PM<sub>10</sub>.

The 2011 results (2012 Report) are an improvement on the 2010 results (2011 Report), however the 2011 Progress Report concluded that a Detailed Assessment would be conducted for High Street, Irvine to consider the situation and offer an explanation for the occurrence of this distinctive hot spot, and provide options to remedy the problem.

As a result of this, a number of issues and developments have come to light and it is clear that High Street, Irvine will be subject to considerable change at the vicinity of the hot spot.

Firstly, there are proposals to have a new leisure centre built adjacent to this area, but no car parking provisions for the additional 150 vehicles per day predicted to be associated with patron use of the new facility. This is currently being given very careful consideration to identify problems and ensure the best transport solutions are employed to minimise impact on local air quality.

There are also plans to have the streets refurbished in High Street and Bridgegate which will have a positive impact on the long term hot spot in High Street. These will include the widening of the pavement where the hot spot is located, which will not only move the source of pollution away from the receptor, but will also allow better dilution and dispersion of pollutants.

High Street, Irvine will continue to be closely monitored to observe any impacts these changes have on local air quality

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# **1 Introduction**

## **1.1 Description of Local Authority Area**

North Ayrshire can be divided roughly into four main regional character classifications based on landscape and topography. Isle of Arran represents a landscape distinct from the mainland, whilst at the same time offering a variety of landscape types which have caused it to be referred to as 'Scotland in Miniature'. The Inner Firth of Clyde is another distinctive character area which includes the northern coastal fringe and the Cumbrae Islands. Inland from this, the topography is dominated by the Renfrew heights, which cover the northern part of North Ayrshire. These hills narrow towards a point near Ardrossan and are largely unsettled. The final area comprises the northern part of the Ayr Basin which is heavily populated in comparison with the neighbouring areas, with a dense network of roads and settlements.

The major trunk road network within North Ayrshire consists of the A78 coastal route running from Irvine, to Largs and the A737 Garnock Valley link to the M8 and Glasgow conurbation. Other major routes are the A736 to Barrhead; and the A71 to Kilmarnock road. North Ayrshire is also well served by the rail network and there are stations on the main Glasgow Central to Ayr line at Dalry, Glengarnock, Kilwinning and Irvine; served by a frequent passenger service. In addition the Largs line continues on from Kilwinning and serves the towns of Stevenston, Saltcoats, Ardrossan, West Kilbride, Fairlie and Largs.

North Ayrshire has commercial ports at Ardrossan and Hunterston; which has a deep sea terminal, and leisure facilities are also available at Largs, Irvine, Saltcoats and Millport. Ferry services connect Ardrossan to Brodick (Arran), Largs to Millport (Cumbrae), and Lochranza to Claonaig in Argyll.

Main sources of relevant pollutant exposures are from road traffic vehicles. Areas particularly affected are High Street, Irvine and Townhead Street/New Street, Dalry. Key focus of this and previous reports has been on these areas.



## 1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management 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.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

## 1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in **Scotland** are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre  $\mu\text{g}/\text{m}^3$  (milligrammes per cubic metre,  $\text{mg}/\text{m}^3$  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 Scotland

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
<b>Benzene</b>	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
<b>1,3-Butadiene</b>	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
<b>Carbon monoxide</b>	10.0 $\text{mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
<b>Lead</b>	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
<b>Nitrogen dioxide</b>	<b>200 <math>\mu\text{g}/\text{m}^3</math></b> not to be exceeded more than <b>18 times</b> a year	<b>1-hour mean</b>	31.12.2005
	<b>40 <math>\mu\text{g}/\text{m}^3</math></b>	<b>Annual mean</b>	31.12.2005
<b>Particles (PM<sub>10</sub>) (gravimetric)</b>	<b>50 <math>\mu\text{g}/\text{m}^3</math></b> , not to be exceeded more than <b>7 times</b> a year	<b>24-hour mean</b>	31.12.2010
	<b>18 <math>\mu\text{g}/\text{m}^3</math></b>	<b>Annual mean</b>	31.12.2010
<b>Sulphur dioxide</b>	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

## 1.4 Summary of Previous Review and Assessments

Report	Summary
Stage 1 Review and Assessment (1998)	It is recommended that a second stage review and assessment be undertaken for nitrogen dioxide and that the current air quality monitoring work in North Ayrshire be continued. This will provide data to indicate compliance with the objectives and will be useful in the next review and assessment to be undertaken before 2005.
Stage 2 Review and Assessment (2000)	The air quality objective for nitrogen dioxide is likely to be met by the end of 2005. It will therefore not be necessary to proceed to a stage three review and assessment.
<b>2003</b> Updating and Screening Assessment	<p>DMRB screening shows that there are no areas within North Ayrshire likely to fail the objective due to Road Traffic. The annual mean nitrogen dioxide levels over a short length of High Street, Irvine, however, are marginally in excess of the annual mean objective in 2002. When the “year correction factors” are applied, as allowed in the guidance, all Annual Mean levels for 2005 should meet the Air Quality Objective. It is believed also that the traffic management scheme, already proposed by North Ayrshire Council, will minimise the risk of any further increase.</p> <p>Passive monitoring for nitrogen dioxide should continue in High Street, Irvine to assess the effect of the proposed traffic management scheme.</p> <p>There are no significant industrial sources of nitrogen dioxide within North Ayrshire.</p> <p>There is no requirement to proceed to a detailed assessment for nitrogen dioxide.</p>
<b>2004</b> Progress Report	<p>With the exception of nitrogen dioxide all guideline limits for the National Air Quality Standards shall be met for 2004.</p> <p>With regard to nitrogen dioxide, it is predicted that a highly localised area of High Street, Irvine shall continue to be subject to concentration levels in excess of the guideline limit for the annual mean (<math>40\mu\text{g}/\text{m}^3</math>) national air quality standard at the end of 2005.</p> <p>With regard to <math>\text{PM}_{10}</math>, whilst the predicted estimated annual mean concentration for 2004 (<math>21.39\mu\text{g}/\text{m}^3</math>) shall be well below the U.K. Air Quality Objective, for 2010 it is predicted to be <math>19.75\mu\text{g}/\text{m}^3</math>, marginally exceeding the much reduced Scottish Air Quality Objective of <math>18\mu\text{g}/\text{m}^3</math>.</p>

Report	Summary
<p><b>2004</b> Progress Report (cont.)</p>	<p>Passive sampling shall continue in the area to monitor ambient levels of nitrogen dioxide. Additionally, the TEOM particulate monitor is due to be re-sited in the area from May 2005 for twelve months. At the end of that period the effects of the traffic management scheme can be further assessed.</p>
<p><b>2005</b> Progress Report</p>	<p>With the exception of nitrogen dioxide all guideline limits for the National Air Quality Standards shall be met for 2004.</p> <p>With regard to nitrogen dioxide, a highly localised area of High Street, Irvine continues to be subject to concentration levels in excess of the guideline limit for the annual mean (<math>40\mu\text{g}/\text{m}^3</math>) national air quality standard at the end of 2005. However, this is not an area of relevant public exposure. Consequently, a detailed assessment for nitrogen dioxide remains unnecessary.</p> <p>There is no need to proceed to a detailed assessment for any of the seven air pollutants.</p>
<p><b>2006</b> Updating and Screening Assessment Report</p>	<p>The Annual Mean Objective for nitrogen dioxide is now being complied with throughout North Ayrshire as demonstrated by passive monitoring. However, monitoring should continue, especially in High Street, Irvine, to ensure the improvement in air quality is maintained.</p> <p>DMRB screening shows that there are no areas within North Ayrshire, which are likely to fail the objective due to road traffic.</p> <p>There are no significant industrial sources of nitrogen dioxide within, either North Ayrshire or neighbouring areas that would adversely affect local air quality in North Ayrshire.</p>
<p><b>2007</b> Progress Report</p>	<p>All guideline limits for the National Air Quality Standards should be met for 2010.</p> <p>With regard to nitrogen dioxide, it is predicted that a highly localised area of High Street, Irvine <b>may</b> have concentrations levels in excess of the guideline limit for the annual mean (<math>40\mu\text{g}/\text{m}^3</math>) national air quality standard. However it is expected that a new updated traffic management scheme will see these figures fall. On the advice of the Scottish Government and the Scottish Environment Protection Agency, a detailed assessment for nitrogen dioxide will be carried out for this area.</p>

Report	Summary
<p><b>2008</b> Progress Report &amp; Detailed Assessment</p>	<p>NO<sub>2</sub> monitoring results for <b>Townhead Street, Dalry</b> and <b>New Street, Dalry</b> show consistent exceedences for the <b>40 µg/m<sup>3</sup></b> level limit. Previous modelling of this area suggested there would be no breaches, however the modelling did not fully account for stationary traffic on an incline at traffic lights.</p> <p>A highly localised area at the façade of <b>75 High Street, Irvine</b> may continue to be subject to concentration levels in excess of the guideline limit for the annual mean (40µg/m<sup>3</sup>) national air quality standard.</p> <p>With regard to PM<sub>10</sub>, whilst the predicted estimated annual mean concentration for 2004 (21.39µg/m<sup>3</sup>) shall be well below the U.K. Air Quality Objective, for 2010 it is predicted to be 19.75µg/m<sup>3</sup>, marginally exceeding the much reduced Scottish Air Quality Objective of 18µg/m<sup>3</sup>.</p> <p>With regards to Townhead Street/New Street, Dalry North Ayrshire Council shall progress to a detailed assessment of NO<sub>2</sub> once a full calendar year of data is available. However the narrowness of the street and the level of traffic flow will limit the options for carrying out more detailed monitoring in the area.</p>
<p><b>2009</b> Air Quality Updating and Screening Assessment</p>	<p>High Street, Irvine continues to have erratic results bordering on the 40 µg/m<sup>3</sup> limit. The results do not warrant declaration of an AQMA. However all sampling locations, old and new, will remain within the monitoring programme to establish a more accurate picture of nitrogen dioxide levels in this locality.</p> <p>High Street, Irvine will continue to be closely monitored using nitrogen dioxide diffusion tubes and the automatic monitoring site (ROMON) located in High Street, Irvine which will also be operational for 2009. The ROMON contains a BAM and NO<sub>2</sub> analyser and will allow better analysis of NO<sub>2</sub> daily trends to identify keys sources affecting the higher readings at tubes in this location.</p> <p>The ROMON will also be the site used in 2009 for a co-location study for nitrogen dioxide diffusion tubes.</p> <p>Nitrogen dioxide levels in Townhead Street/New Street, Dalry continue to exceed 40µg/m<sup>3</sup> at two relevant locations and are consistent in suggesting a strong correlation with previous traffic congestion in the area. Since 2009 monitoring has shown a reduction in levels as a result of the new traffic management system put in place.</p>

Report	Summary
<p><b>2010</b> Progress Report</p>	<p>With regard to nitrogen dioxide (NO<sub>2</sub>), it was predicted that a localised area of High Street, Irvine would continue to be subject to elevated levels bordering or exceeding the guideline limit for the annual mean (40µg/m<sup>3</sup>) national air quality standard. There has been increased focus and sampling in this area with additional diffusion tube monitoring sites established to better define the extent of any possible exceedences. Of the total 37 diffusion tubes in North Ayrshire Council, 17 are located in High Street, Irvine within a 50m stretch of road.</p> <p>This year there have been no annual mean exceedences for High Street, Irvine, however this area will continue to be intensely monitored until long term trends are established.</p> <p>Previous NO<sub>2</sub> monitoring results (2007 &amp; 2008) for Townhead Street, Dalry and New Street, Dalry showed consistent exceedences for the 40 µg/m<sup>3</sup> level limit.</p> <p>The 2009 report concluded that a full calendar year of data for 2009 would be required to assess the impact of the traffic management system.</p> <p>The 2009 annual mean concentrations for NO<sub>2</sub> diffusion tube locations in Dalry were all below the 40 µg/m<sup>3</sup> level limit, suggesting the newly implemented traffic management system has been successful. These locations will be continued to be closely monitored until long term trends are established and there is significant confidence that the levels will remain below the objective limits.</p>
<p><b>2011</b> Progress Report &amp; Detailed Assessment</p>	<p>Monitoring data for 2010 has shown that 3 very localised NO<sub>2</sub> diffusion tubes, out of a total of 37, failed to meet the air quality objective. All other NO<sub>2</sub> diffusion tube sites and automatic monitoring complied with the 40 µg/m<sup>3</sup> NO<sub>2</sub> air quality objective set out in the directive.</p> <p>The 3 tubes that failed the objective are located in High Street, Irvine, adjacent to a major bus route in the town. Diffusion tube monitoring has shown that the area is highly localised and only covers an area approximately 10m wide. The next nearest tubes are about 10m away and had NO<sub>2</sub> annual mean concentrations of 31 µg/m<sup>3</sup> and 33 µg/m<sup>3</sup>. All the remaining tubes in the same vicinity ranged between 25 µg/m<sup>3</sup> and 32 µg/m<sup>3</sup> confirming that the majority of the street used by the buses complies with the air quality objective and the exceedences are concentrated in a very focused spot.</p> <p>The Scottish air quality objective of 18 µg/m<sup>3</sup> for PM<sub>10</sub>, was exceeded by 1 µg/m<sup>3</sup> in High Street, Irvine. The European Directive air quality directive (40 µg/m<sup>3</sup>) was not exceeded.</p>

Report	Summary
<p><b>2011</b> Progress Report &amp; Detailed Assessment (cont)</p>	<p>For the second year running, annual mean concentration of NO<sub>2</sub> in Townhead Street/New Street continues to meet the air quality objective. However the results are borderline and this are will continue to be closely monitored.</p> <p>A review of NO<sub>2</sub> diffusion tube sampling locations was undertaken to identify areas where sampling could confidently be reduced. The results of this and any changes will be included in the 2012 Report. The co-location NO<sub>2</sub> diffusion tubes will continue to be used to provide locally derived bias adjustment factors.</p>

## **2 New Monitoring Data**

### **2.1 Summary of Monitoring Undertaken**

#### **2.1.1 Automatic Monitoring Sites**

The Groundhog mobile monitoring unit was replaced by a fixed ROMON unit containing NO<sub>2</sub> analyser and Beta Attenuation Monitor for PM<sub>10</sub>. This monitoring station has been operational since early 2009 and is the site being used for the co-location tubes. The unit is permanently located here and unlike previous monitoring using the Groundhog is not part of a shared scheme, which will allow for full calendar year data to be collected.

There have been operational problems with data collection ever since the unit was commissioned with gaps in data being sent via the modem. Funding has been granted for 2012 to allow the purchase of a web logger which is expected to resolve this problem. There were additional technical problems with the NO<sub>x</sub> analyser in the middle of the year which required a replacement circuit board and subsequently led to a reduction in data being captured.

Calibration checks are conducted every 2 weeks on site by Local Authority Officers and collected data is forwarded to AEA Technologies who validate and ratify the data. The unit is calibrated by AEA Technologies every 6 months. AEA reports are included in Appendix 2.

All collected data is available on the Scottish Air Quality website [www.scottishairquality.co.uk](http://www.scottishairquality.co.uk).

#### **Map(s) of Automatic Monitoring Sites**

The location of the ROMON is detailed in the Irvine High Street maps in Appendices 9-14 at the rear of the report.



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?
		X	Y						
GroundHog	Kerbside	232188	638861	NO <sub>2</sub> , PM <sub>10</sub> , CO	Permanently replaced by ROMON beginning of 2009				
ROMON	Kerbside	232188	638861	NO <sub>2</sub> , PM <sub>10</sub>	NO <sub>x</sub> & BAM	No	Y 20m	2.5m	Y

### **2.1.2 Non-Automatic Monitoring Sites**

Monitoring of nitrogen dioxide was undertaken at 22 sites using passive diffusion tubes. Tubes were previously relocated during 2008 from long term sites to more important positions within Detailed Assessment areas (High Street, Irvine and Townhead/New Street, Dalry). Due to resource implications, the 2011 sampling programme for NO<sub>2</sub> diffusion tubes was revised. Sampling was ceased at selected sites where there were either low levels of NO<sub>2</sub> or there was dense sampling and other tubes were located nearby.

Maps of Non-Automatic Monitoring Sites and surrounding areas are included in Appendices 8-19

Table 2.2 Details of Non-Automatic Monitoring Sites

No.	Site ID		Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Is monitoring collocated with a Continuous Analyser (Y/N)	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?
	Unique Ref No. (URN)	Name									
1	199802	35 East Road Irvine	K	232323	638892	NO <sub>2</sub>	N	N	N	5m	N
2	200801	18 Bank St, Irvine	K	232202	638952	NO <sub>2</sub>	N	N	Y (1m)	3m	Y
3	200101	147 High Street, Irvine	K	232077	638990	NO <sub>2</sub>	N	N	Y	3m	Y
4	200805	85 High St, Irvine	K	232158	638882	NO <sub>2</sub>	N	N	Y (1m)	3m	Y
5	199807	79 High St, Irvine	K	232169	638878	NO <sub>2</sub>	N	N	N	3m	Y
6	200806	75 High St, Irvine HIGH	K	232170	638871	NO <sub>2</sub>	N	N	Y (1m)	3m	Y
7	200807	71 High St, Irvine	K	232174	638868	NO <sub>2</sub>	N	N	Y (1m)	1m	Y
8	199901	65a High Street, Irvine, (ROMON)	K	232188	638861	NO <sub>2</sub>	N	Y	N	2.5m	Y
9	200701	65 High Street, Irvine, (ROMON)	K	232188	638861	NO <sub>2</sub>	N	Y	N	2.5m	Y
10	200702	63 High Street, Irvine, (ROMON)	K	232188	638861	NO <sub>2</sub>	N	Y	N	2.5m	Y
11	199809	34 Kirkgate Irvine	UB	232085	638774	NO <sub>2</sub>	N	N	N	N/A	N
12	199902	25 Main Rd, Springside	K	236813	638659	NO <sub>2</sub>	N	N	N	N/A	N
13	200001	Auchengate (Bridge)	SP	233332	635558	NO <sub>2</sub>	N	N	N	N/A	N
14	199811	Dalry Rd , Kilwinning	K	229928	643400	NO <sub>2</sub>	N	N	N	N/A	N

# North Ayrshire Council

No.	Site ID		Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Is monitoring collocated with a Continuous Analyser (Y/N)	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?
	Unique Ref No. (URN)	Name									
15	201101	Vernon St, Saltcoats	K	224697	641366	NO <sub>2</sub>	N	N	N	1m	Y
16	200703	12 Garnock St, Dalry	UB	229326	649250	NO <sub>2</sub>	N	N	Y (1m)	1.5	N
17	200808	67 New St, Dalry	K	229338	649337	NO <sub>2</sub>	N	N	Y (1m)	2m	Y
18	200705	45 New St Dalry	K	229286	649365	NO <sub>2</sub>	N	N	Y (1m)	1.5m	Y
19	200708	2 Townhead St, Dalry	K	229230	649338	NO <sub>2</sub>	N	N	Y (1m)	2m	Y
20	199907	Highfield Hamlet , Dalry	K	230943	650280	NO <sub>2</sub>	N	N	N	N/A	N
21	199812	85 Main Street , Largs	K	220333	659322	NO <sub>2</sub>	N	N	N	N/A	N
22	200007	Hunterston Road	SP	219582	650020	NO <sub>2</sub>	N	N	N	N/A	N

Potential AQMA Locations

New Sampling Site for 2011

## **2.2 Comparison of Monitoring Results with AQ Objectives**

### **2.2.1 Nitrogen Dioxide**

Nitrogen dioxide continues to be the primary pollutant of concern in the North Ayrshire district. Key affected areas are Townhead Street/New Street, Dalry and High Street, Irvine. There were exceedences for the Annual Mean objective in both locations and this is discussed in greater detail in the Conclusions.

#### **Automatic Monitoring Data**

North Ayrshire Council had its first official co-location study start in 2009 which has been continued for each report since then. The sampling point for the co-location is at the ROMON site, High Street, Irvine, where NO<sub>2</sub> diffusion tubes are located ~20cm away from the ROMON sampling inlet.

The corresponding data was entered in the “Checking Precision and Accuracy of Triplicate Tubes” spreadsheet provided by AEA Energy & Environment (Appendix 5). The resulting Bias Correction Factor is **0.79**.

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

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2011 %	Annual Mean Concentration $\mu\text{g}/\text{m}^3$				
					2007	2008	2009	2010	2011
ROMON	Kerbside	N	89.0	89.0			26	34	31

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

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2011 %	Number of Exceedences of Hourly Mean ( $200 \mu\text{g}/\text{m}^3$ )				
					2007	2008	2009	2010	2011
ROMON	Kerbside	N	89.0	89.0			0	1	0*

\*99.8<sup>th</sup> percentile of hourly means  $118 \mu\text{g}/\text{m}^3$

### **Diffusion Tube Monitoring Data**

The diffusion tube locations were reviewed for 2011 resulting in sampling ceasing at a number of sites. Most of the long term background sites have been retained to allow comparison when selecting the most appropriate bias factor. A table containing the last 10 years historical data for NO<sub>2</sub> diffusion tube monitoring annual mean results is included in Appendix 20. The table also reflects all the changes in sampling locations throughout this period.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2011

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Months)	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 = 0.79)
								2011 ( $\mu\text{g}/\text{m}^3$ )
1	35 East Road Irvine	K	N	N	12	n/a	N	23
2	18 Bank St, Irvine	K	N	N	12	n/a	N	26
3	147 High Street, Irvine	K	N	N	12	n/a	N	30
4	85 High St, Irvine	K	N	N	12	n/a	N	34
5	79 High St, Irvine	K	N	N	12	n/a	N	54
6	75 High St, Irvine HIGH	K	N	N	12	n/a	N	46
7	71 High St, Irvine	K	N	N	12	n/a	N	34



Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Months)	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 = 0.79)
								2011 ( $\mu\text{g}/\text{m}^3$ )
8	65a High Street, Irvine, (ROMON)	K	N	Triplicate & Collocated	12	n/a	N	30
9	65 High Street, Irvine, (ROMON)	K	N	Triplicate & Collocated	12	n/a	N	31
10	63 High Street, Irvine, (ROMON)	K	N	Triplicate & Collocated	12	n/a	N	31
11	34 Kirkgate Irvine	UB	N	N	12	n/a	N	14
12	25 Main Rd, Springside	K	N	N	12	n/a	N	16
13	Auchengate (Bridge)	SP	N	N	12	n/a	N	12
14	Dalry Rd , Kilwinning	K	N	N	12	n/a	N	23
15	Vernon St, Saltcoats	K	N	N	12	n/a	N	23

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Months)	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 = 0.79)
								2011 ( $\mu\text{g}/\text{m}^3$ )
16	12 Garnock St, Dalry	UB	N	N	12	n/a	N	11
17	67 New St, Dalry	K	N	N	12	n/a	N	32
18	45 New St Dalry	K	N	N	12	n/a	N	42
19	2 Townhead St, Dalry	K	N	N	12	n/a	N	30
20	Highfield Hamlet , Dalry	K	N	N	11	n/a	N	20
21	85 Main Street, Largs	K	N	N	8	n/a	N	19
22	Hunterston Road	SP	N	N	12	n/a	N	6

**Potential AQMA Locations**

**New Site for 2012**

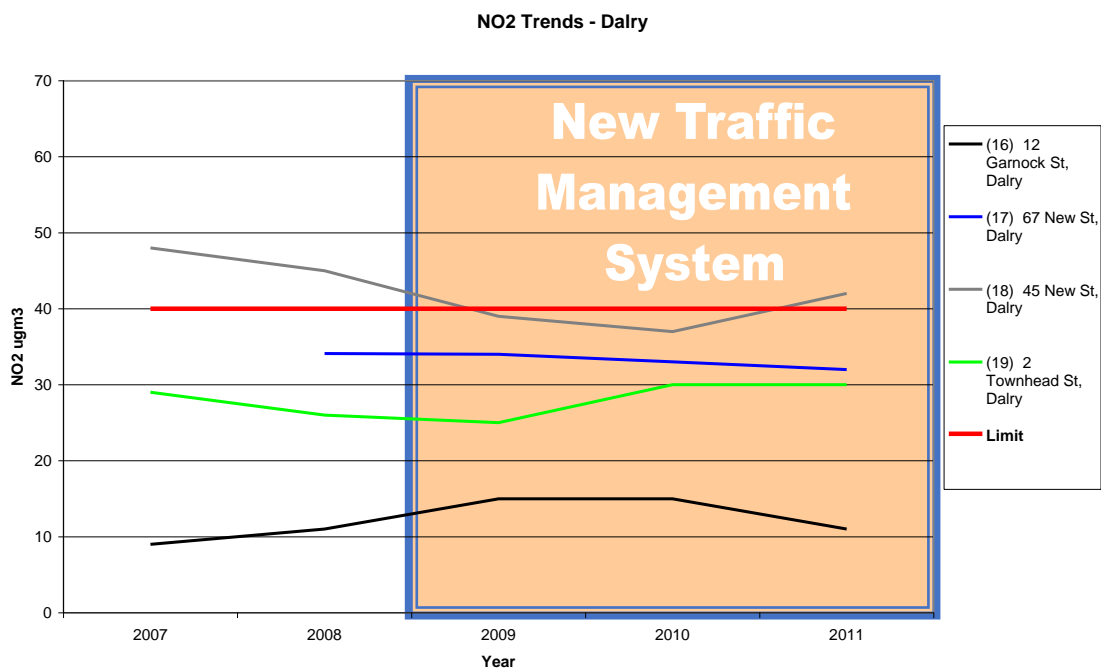
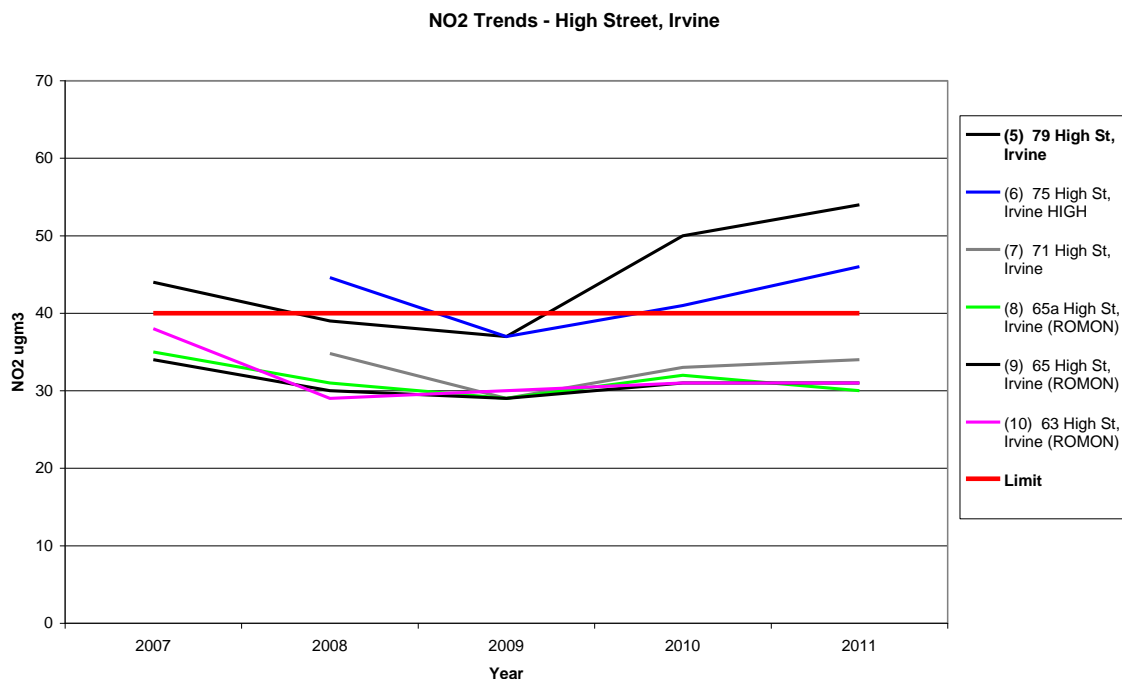
Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)

Site ID		Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
				2007 (Bias Adjustment Factor = 0.83)	2008 (Bias Adjustment Factor = 0.87)	2009 (Bias Adjustment Factor = 0.96)	2010 (Bias Adjustment Factor = 0.93)	2011 (Bias Adjustment Factor = 0.79)
1	35 East Road Irvine	K	N	26	24	25	27	23
2	18 Bank St, Irvine	K	N		33	26	27	26
3	147 High Street, Irvine	K	N	29	34	29	26	30
4	85 High St, Irvine	K	N		34	27	31	34
5	79 High St, Irvine		N	44	39	37	50	54
6	75 High St, Irvine HIGH	K	N	48	47	37	41	46
7	71 High St, Irvine	K	N		35	29	33	34

Site ID		Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
				2007 (Bias Adjustment Factor = 0.83)	2008 (Bias Adjustment Factor = 0.87)	2009 (Bias Adjustment Factor = 0.96)	2010 (Bias Adjustment Factor = 0.93)	2011 (Bias Adjustment Factor = 0.79)
8	65a High Street, Irvine, (ROMON)	K	N	35	31	27	32	30
9	65 High Street, Irvine, (ROMON)	K	N	34	30	29	31	31
10	63 High Street, Irvine, (ROMON)	K	N	38	29	30	31	31
11	34 Kirkgate Irvine	UB	N	11	8	16	14	14
12	25 Main Rd, Springside	K	N	17	16	17	17	16
13	Auchengate (Bridge)	SP	N	14	12	15	13	12
14	Dalry Rd , Kilwinning	K	N	25	19	21	21	23
15	Vernon St, Saltcoats	K	N					23

Site ID		Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$				
				2007 (Bias Adjustment Factor = 0.83)	2008 (Bias Adjustment Factor = 0.87)	2009 (Bias Adjustment Factor = 0.96)	2010 (Bias Adjustment Factor = 0.93)	2011 (Bias Adjustment Factor = 0.79)
16	12 Garnock St, Dalry	UB	N	9	11	15	15	11
17	67 New St, Dalry	K	N		34	34	33	32
18	45 New St Dalry	K	N	<b>48</b>	<b>45</b>	39	37	<b>42</b>
19	2 Townhead St, Dalry	K	N	29	26	25	30	30
20	Highfield Hamlet , Dalry	K	N	15	15	21	19	20
21	85 Main Street, Largs	K	N	26	22	19	23	19
22	Hunterston Road	SP	N	4	5	8	6	6

**Figure 2.1 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites**



### 2.2.2 PM<sub>10</sub>

The automatic monitoring site (ROMON) also houses a Met-One Beta Attenuation Monitor (BAM) which has been monitoring PM<sub>10</sub> since the ROMON was commissioned in February 2009. The monitor is checked every 2 weeks during calibration of the NO<sub>2</sub> monitor and the filter tape is replaced every 8 weeks. This unit continues to be a permanent installation and will allow data collection for each full year.

The Air Quality objective of “ $50\mu\text{g}/\text{m}^3$ , not to be exceeded more than 7 times a year” has not been exceeded during any monitoring. However, the Scottish annual mean concentration limit of  $18\mu\text{g}/\text{m}^3$  was borderline in 2009 and was marginally exceeded in 2010 by  $1\mu\text{g}/\text{m}^3$ . The European Air Quality objective of  $40\mu\text{g}/\text{m}^3$  has never been exceeded at this location.

The annual mean concentration for 2011 was lower than the previous year’s data and borderline at  $18\mu\text{g}/\text{m}^3$ . There have been discussions regarding the matter with North Ayrshire Roads Department, Strathclyde Partnership for Transport (SPT) and Stagecoach as part of the detailed assessment.

Table 2.7 Results of Automatic Monitoring of PM<sub>10</sub>: **Comparison with Annual Mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %	Valid Data Capture 2011 %	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m <sup>3</sup>				
						2007	2008	2009	2010	2011
ROMON	Kerbside	N	93.6	93.6				18	19	18

Table 2.8 Results of Automatic Monitoring for PM<sub>10</sub>: **Comparison with 24-hour mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period % <sup>a</sup>	Valid Data Capture 2011 % <sup>b</sup>	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 µg/m <sup>3</sup> )				
						2007*	2008*	2009*	2010*	2011
ROMON	Kerbside	N	93.6	93.6				1	0	0



### **2.2.3 Sulphur Dioxide**

Monitoring for sulphur dioxide and smoke has been discontinued in North Ayrshire since 2004. Historical monitoring data is available for nearly every town in the area and there is no indication from these results that the air quality standard is likely to be breached even around local industrial sources.

Previous reviews concluded that:

1. The extensive smoke control programme undertaken by Cunninghame District Council has improved sulphur dioxide levels in the area due to the shift to natural gas and electricity.
2. The extensive historical monitoring programmes for sulphur dioxide in North Ayrshire covered every urban area.
3. There is no need to progress to a detailed assessment for sulphur dioxide.
4. The rail link serving North Ayrshire is electrified therefore there are very few diesel-powered passenger trains each day. Goods trains on the network are diesel-powered. There are no major stockyards apart from those serving Hunterston coal terminal. These, however, are not within 15 metres of a relevant location, nor are there any stations or signal junctions where diesel locomotives are likely to be stationary for 15 minutes or more within 15 metres of a relevant exposure.

There has been no evidence of any change to sulphur dioxide production or release in North Ayrshire. Similarly, there has been no development likely to result in any increase in sulphur dioxide levels at locations where there could be relevant public exposure.

### **2.2.4 Benzene**

No recent monitoring of benzene has been undertaken. However, previous reviews have concluded that:

1. There was no significant industrial source of benzene located either within North Ayrshire or neighbouring areas likely to adversely affect air quality within North Ayrshire.
2. There was no need to proceed to a detailed assessment for benzene.

Since the last report there has been no evidence of any change to benzene production or release in North Ayrshire. Similarly, there has been no development likely to result in any increase in benzene levels at locations where there could be relevant public exposure.

## **2.2.5 Other pollutants monitored**

### **Radiation Monitoring**

North Ayrshire Council previously had a Radiation – Food and Environment Programme which involved collecting monthly samples of foods, soils, seawater, etc for analysis by Glasgow Scientific Services, for the purpose of monitoring background levels of radiation in the environment. This sampling programme was terminated in 2010.

Additional environmental monitoring continues to be conducted by officers on a monthly basis using a portable Mini 680 monitor to measure background levels of radiation at 7 sites located throughout the district.

### **Dust Deposition**

Three dust deposit gauges located in Fairlie specifically to monitor dust from the coal stockyard at Clydeport Hunterston were reduced to two in 2011. The dust deposit gauges are checked every month in conjunction with the NO<sub>2</sub> diffusion tubes being changed. The samples are sent to Glasgow Scientific Services and analysed for total rainfall, pH, Total Dissolved Solids (TDS), Total Dried Undissolved Matter (TDUM), Combustible Matter and ash. Reports will include breakdown of additional parameters (metals etc) if detected at significant levels.

There are no British Standards with which to compare results. Assessment is based on any significant changes in the amount of particulates, etc which are present in the samples.

## Summary of Compliance with AQS Objectives

North Ayrshire Council has examined the results from monitoring in the North Ayrshire District. Concentrations are all below the objectives\*, therefore there is no need to proceed to a Detailed Assessment.

\*There were 3 failures for NO<sub>2</sub> diffusion tubes within North Ayrshire which were located in:

- **High Street, Irvine**

This is a known hot spot anomaly and well documented in previous reports. All other tubes in this street were all below the local air quality objectives.

- **Townhead Street/New Street, Dalry**

There is further discussion on this matter contained in the Conclusions.

### **3 Road Traffic Sources**

#### **3.1 Narrow Congested Streets with Residential Properties Close to the Kerb**

North Ayrshire Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

#### **3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic**

North Ayrshire Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

#### **3.3 Roads with a High Flow of Buses and/or HGVs.**

North Ayrshire Council confirms that there are no new/newly identified roads with high flows of buses/HGVs.

The 2011 report proposed that a Detailed Assessment would be conducted for High Street, Irvine with particular attention to specific bus routes and the number of vehicles now on each route.

Previous detailed assessments revealed buses occasionally “laying up” time at South High Street, Irvine which may have led to increases in the annual mean concentration of NO<sub>2</sub>. Strathclyde Partnership for Transport (SPT) had additional monitoring carried out in the North Ayrshire Area which revealed some buses exceeding stoppage times with their engines running.

For the 2012 Detailed Assessment a fact finding mission was conducted with a view to establishing the conditions and extent of use by public transport in High Street, Irvine. For a number of years, traffic restrictions have been in place preventing access by private vehicles into this area, hence the focus was primarily on the bus network. In addition, plans were revealed in 2011 for a new leisure centre to be built on a plot adjacent to this location, and furthermore there are no provisions for designated parking for the facility. The historical traffic restrictions on High Street have raised some logistical problems for private coaches accessing the drop off lay-by serving the new centre.

Various meetings involving the Leisure Centre Design Team, North Ayrshire Transportation, Stagecoach and Strathclyde Partnership for Transport (SPT) revealed the following information regarding High Street, Irvine.

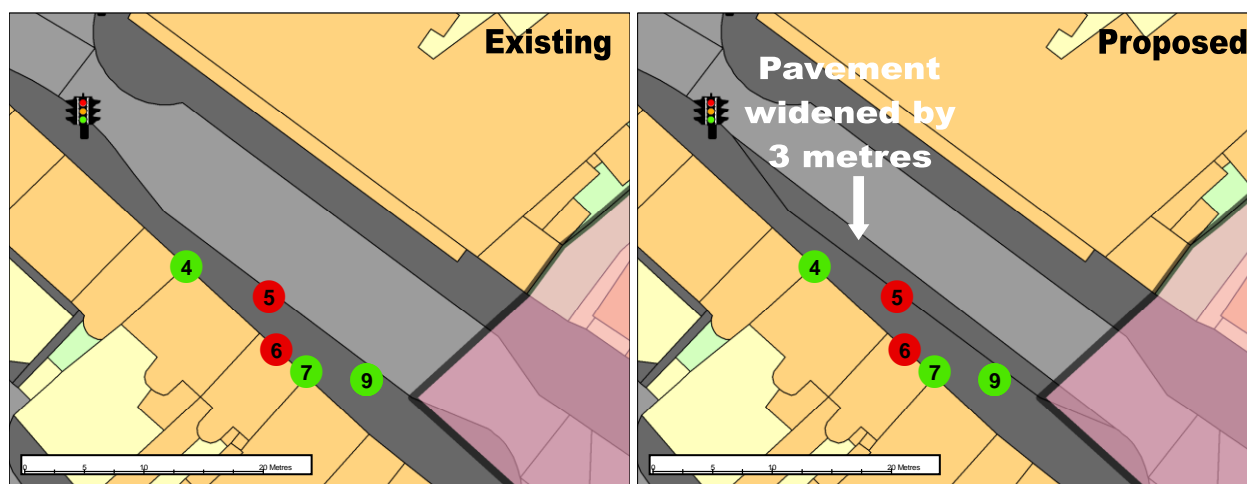
- **All Stagecoach fleet buses are Euro 4 or 5 classification**
- **All Stagecoach fleet buses are now fitted with auto shut off systems which turn off the engines after 3 minutes of idling**
- **All of the Stagecoach fleet buses run on B5 fuel with 70% of the Irvine fleet running on B30 for the last 6 months**
- **There has been no increase in the number of buses using this route in the last 3 years**
- **Leisure centre scheduled to be completed by May 2014. Transport issues relating to local air quality are being carefully considered**
- **There are plans for major improvements in High Street which will include significantly widening the pavement immediately adjacent to the highest NO<sub>2</sub> readings (Appendix 14 and Figure 3.1).**

The fleet being a high standard of Euro class ensures optimal reductions in levels of pollution at source which coupled with the idling cut-off switches suggests that the best practicable means are being adopted to minimise pollution from the buses.

Although planning permission has not yet been granted for the proposed leisure centre, it seemed prudent to include details of the development in this report. The centre is expected to attract a further 150 cars each day into the town centre, however there is no dedicated parking available to accommodate this increase. Primary concerns are increased traffic levels and potential for congestion leading to deterioration in local air quality. These matters have been raised with the project design team and are being given careful consideration.

The most significant finding from the meetings was that the pavement adjacent to the main traffic route in High Street, Irvine where the hot spot is located, will be extended out into the road. This will result in the pavement nearly doubling in width and displacing the stationary buses a further 3 meters away from the building façade.

**Figure 3.1 Proposed Pavement Alterations (High St, Irvine)**



It is anticipated this will have a significant impact on reducing the NO<sub>2</sub> levels at this location by allowing better dilution and dispersal of pollutants. The drop-off with distance calculator was used to predict reductions and is discussed in the Conclusions.

### **3.4 Junctions**

North Ayrshire Council confirms that there are no new/newly identified busy junctions/busy roads.

### **3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment**

North Ayrshire Council confirms that there are no new/proposed roads.

### **3.6 Roads with Significantly Changed Traffic Flows**

North Ayrshire Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

### **3.7 Bus and Coach Stations**

North Ayrshire Council confirms that there are no relevant bus stations in the Local Authority area.

Irvine town centre is the administrative hub of the district and the absence of an official bus station has resulted in heavy use of the High Street by public transport. Currently 60 buses per hour travel along high street which runs through the middle of the town. As discussed earlier in the report, this is the main area of concern for Local Air Quality in North Ayrshire. Traffic restrictions have been in force here for some time preventing private vehicles entering the area during office hours so the primary source of pollution is public transport.

## **4 Other Transport Sources**

### **4.1 Airports**

North Ayrshire Council confirms that there are no airports in the Local Authority area.

### **4.2 Railways (Diesel and Steam Trains)**

#### **4.2.1 Stationary Trains**

North Ayrshire Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

#### **4.2.2 Moving Trains**

North Ayrshire Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

### **4.3 Ports (Shipping)**

North Ayrshire Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.



## **5 Industrial Sources**

### **5.1 Industrial Installations**

#### **5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out**

North Ayrshire Council has assessed new/proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

There are proposals to have a coal fired power station located at Hunterston, Clydeport, Fairlie. Given the nature and size of the development, the application is being handled by the Scottish Government. The planning approval process is still ongoing and the applicants have been made aware of the Local Air Quality concerns. An Environmental Impact Assessment & Statement was submitted in support of the application which covered air quality issues and concluded that there would be no detrimental impact on the Local Air Quality Objectives.

#### **5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced**

North Ayrshire Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

#### **5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment**

North Ayrshire Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

## **5.2 Major Fuel (Petrol) Storage Depots**

There are no major fuel (petrol) storage depots within the Local Authority area.

## **5.3 Petrol Stations**

North Ayrshire Council confirms that there are no petrol stations meeting the specified criteria.

## **5.4 Poultry Farms**

North Ayrshire Council confirms that there are no poultry farms meeting the specified criteria.

## **6 Commercial and Domestic Sources**

### **6.1 Biomass Combustion – Individual Installations**

North Ayrshire Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

### **6.2 Biomass Combustion – Combined Impacts**

North Ayrshire Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

### **6.3 Domestic Solid-Fuel Burning**

North Ayrshire Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

## **7 Fugitive or Uncontrolled Sources**

North Ayrshire Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

## 8 Conclusions and Proposed Actions

### 8.1 Conclusions from New Monitoring Data

NO<sub>2</sub> diffusion tube monitoring data for 2011 has shown exceedences for High street Irvine and New Street, Dalry. All other NO<sub>2</sub> diffusion tube sites and automatic monitoring complied with the 40 µg/m<sup>3</sup> NO<sub>2</sub> air quality objective set out in the directive.

The two tubes that failed the objective located in High Street, Irvine are adjacent to a major bus route through the town. As outlined earlier in the report, this street is the hub of the public transport (buses) serving North Ayrshire.

Diffusion tube monitoring has shown that the exceedence area is highly localised and only covers an area approximately 10m wide. The two nearest tubes are about 10m away and both revealed NO<sub>2</sub> annual mean concentrations of 34 µg/m<sup>3</sup>. All the remaining tubes in the vicinity ranged between 25 µg/m<sup>3</sup> and 34 µg/m<sup>3</sup>, confirming that the street overall complies with the air quality objective and the exceedences are concentrated in one spot.

In addition, the “drop off with distance” calculator was used to more accurately quantify the NO<sub>2</sub> level at the receptors for 2011 results and also to predict the likely levels when the new widening of the pavement is in place at this location. The results are detailed in the Table 8.1. It is anticipated that the amended pavement layout will have a significant impact on dispersion and dilution of the pollutants from buses and will result in significantly lower annual mean levels.

Annual mean concentration of NO<sub>2</sub> in Townhead Street/New Street, generally met the air quality objective, however there was one tube that exceeded the 40 µg/m<sup>3</sup> objective with a measurement of 42 µg/m<sup>3</sup>. Extrapolating the data back to the receptor would suggest that the actual annual mean would be 38.2 µg/m<sup>3</sup>, as detailed in Table 8.1.

**Table 8.1: Drop-off with Distance for NO<sub>2</sub> Tube Exceedences**

Location	Distance from Kerb		Annual Mean NO <sub>2</sub>		Predicted NO <sub>2</sub> at Receptor
	Site	Receptor	Background	Site	
79 High Street, Irvine <i>(Actual)</i>	0.7m	5.2m	6 ug/m <sup>3</sup>	54 ug/m <sup>3</sup>	35.9 ug/m <sup>3</sup>
<i>NEW widened pavement (predicted)</i>	<i>0.7m</i>	<i>8.2m</i>	6 ug/m <sup>3</sup>	54 ug/m <sup>3</sup>	31.8 ug/m <sup>3</sup>
75 High Street, Irvine <i>(Actual)</i>	5.7m	5.7m	6 ug/m <sup>3</sup>	46 ug/m <sup>3</sup>	46 ug/m <sup>3</sup>
<i>NEW widened pavement (predicted)</i>	<i>5.7m</i>	<i>8.8m</i>	6 ug/m <sup>3</sup>	46 ug/m <sup>3</sup>	40.6 ug/m <sup>3</sup>
45 New Street, Dalry	1.2m	2m	6 ug/m <sup>3</sup>	42 ug/m <sup>3</sup>	38.2 ug/m <sup>3</sup>

The Scottish air quality objective of 18 µg/m<sup>3</sup> for PM<sub>10</sub>, was borderline with the annual mean measured at 18 µg/m<sup>3</sup> in High Street, Irvine. The European Directive air quality directive (40 µg/m<sup>3</sup>) was not exceeded. Automated monitoring at this site will continue for 2012.

## 8.2 Proposed Actions

### Irvine

In view of the monitoring data and planned alterations at High Street, Irvine, it is expected that the layout changes will have the desired impact on reducing NO<sub>2</sub> levels at the localised hot spot. It is proposed that NO<sub>2</sub> sampling continues in this area with close supervision of future developments.

### Dalry

It is proposed that monitoring is continued in this area and, in addition to the existing NO<sub>2</sub> diffusion tubes, funding has been granted to have an Osiris (PM<sub>10</sub> monitor) and web logger located on site which will allow more robust data to be collated on an hourly basis.

## 9 References

1. Local Air Quality Management, Technical Guidance LAQM.TG (09), February 2009.
2. Checking Precision and Accuracy of Triplicate Tubes (Version 05 - Feb 2012) . (Appendix 5)
3. [www.scottishairquality.co.uk](http://www.scottishairquality.co.uk) – Download CSV Format Background Map Data for 2010 to 2030 (Appendix \*\*\*\*\*)
4. [www.laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html](http://www.laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html) – Distance from Roads Calculator (Appendix \*\*\*\*\*)

# Appendices



## Appendix 1: QA:QC Data

### Factor from Local Co-location Studies (if available)

The automatic monitoring station (ROMON) has been operational since early 2009 and is the site being used for 3 co-location tubes. The unit is permanently located here and allows for full “calendar year” data to be collected.

The ROMON has fortnightly checks carried out in accordance with the prescribed methodology as issued by AEA Technologies. The unit is audited every 6 months by AEA Technologies and is serviced every 6 months under contract to another company.

Corresponding data was entered in the “Checking Precision and Accuracy of Triplicate Tubes” spreadsheet provided by AEA Energy & Environment (Appendix 5). The resulting Bias factor for 2011 data is **0.79**.

### Diffusion Tube Bias Adjustment Factors

Diffusion tubes (20% TEA/Water) used in the sampling period for 2011 were supplied and analysed by



St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH  
tel.: 01962 860331 fax: 01962 841339 e-mail: [diffusion@gradko.co.uk](mailto:diffusion@gradko.co.uk)



Diffusion Tube Bias Adjustment Factors for tubes provided by Gradko Environmental are listed in Appendix 4. The resultant bias for Gradko Environmental is **0.89** based on 26 studies with 2 poor precision.

### **Discussion of Choice of Factor to Use**

The co-location study for North Ayrshire Council has “good” precision and high quality results from the ROMON, although there has been poor data capture for 2 months of the year due to technical breakdowns on site.

Use of the local co-location bias factor reflects more accurately on the true values of air quality when considered over the entire district. This is particularly noticeable for the long term background results where there are no significant sources of pollution; using the local bias factor reflects a more realistic trend for NO<sub>2</sub> pollution levels.

### **PM Monitoring Adjustment**

The automatic monitoring station (ROMON – BAM) is visually checked every 2 weeks during the NO<sub>x</sub> calibration check. The inlet head and tape carrier are inspected and cleaned each time the filter tape is replaced. The PM<sub>10</sub> data collected by the ROMON is processed and ratified by AEA Technologies. The Air Pollution Report for North Ayrshire, Irvine High Street for 1<sup>st</sup> January 2011 to 31<sup>st</sup> December 2011 is included in Appendix 2.

### **QA/QC of automatic monitoring**

The automatic monitoring station (ROMON – NO<sub>x</sub>) has an onsite calibration check conducted every 2 weeks by Local Authority Officers. All checks are carried out in accordance with procedures laid out by AEA Technologies and calibration check sheets are forwarded to them after each visit. The site is visited by AEA engineers every 6 months to carry out calibration tests and the unit is serviced twice yearly.

### **QA/QC of diffusion tube monitoring**

Workplace Analysis Scheme for Proficiency (WASP) for the diffusion tube provider is provided in Appendix 3

## Appendix 2: AEA Air Pollution Report

# Air Pollution Report

Produced by AEA on behalf of the Scottish Government

## NORTH AYRSHIRE IRVINE HIGH ST 1<sup>st</sup> January to 31<sup>st</sup> December 2011

These data have been fully ratified by AEA

POLLUTANT	PM <sub>10</sub> +	NO <sub>2</sub>	NO <sub>x</sub>
Maximum hourly mean	70 µg m <sup>-3</sup>	151 µg m <sup>-3</sup>	588 µg m <sup>-3</sup>
Maximum running 24-hour mean	49 µg m <sup>-3</sup>	74 µg m <sup>-3</sup>	204 µg m <sup>-3</sup>
Maximum daily mean	47 µg m <sup>-3</sup>	69 µg m <sup>-3</sup>	196 µg m <sup>-3</sup>
99.8 <sup>th</sup> percentile of hourly means	-	118 µg m <sup>-3</sup>	-
Average	18 µg m <sup>-3</sup>	31 µg m <sup>-3</sup>	75 µg m <sup>-3</sup>
Data capture	93.6 %	89.0 %	89.0 %

+ PM<sub>10</sub> instruments:

BAM using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent

All pollutant mass units are at 20°C and 1013 mb.

NO<sub>x</sub> mass units are NO<sub>x</sub> as NO<sub>2</sub> µg m<sup>-3</sup>

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM <sub>10</sub> Particulate Matter (Gravimetric)	Daily mean > 50 µg m <sup>-3</sup>	0	0
PM <sub>10</sub> Particulate Matter (Gravimetric)	Annual mean > 18 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Annual mean > 40 µg m <sup>-3</sup>	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m <sup>-3</sup>	0	0

Note: For a strict comparison against the objectives there must be a data capture of >90% throughout the calendar year

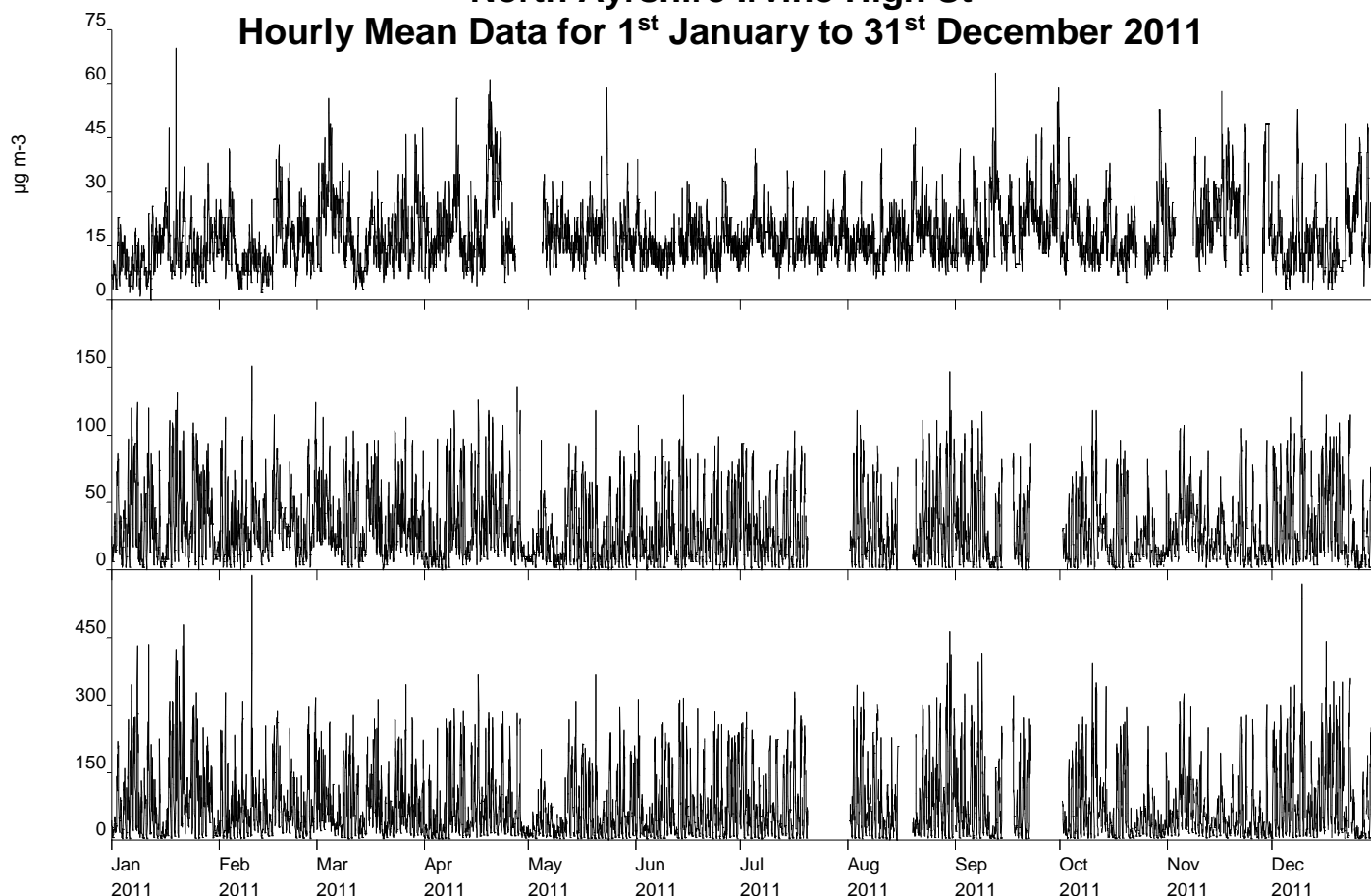
## Appendix 2: AEA Air Pollution Report(cont)

# Air Pollution Report

Produced by AEA on behalf of the Scottish Government

### North Ayrshire Irvine High St

#### Hourly Mean Data for 1<sup>st</sup> January to 31<sup>st</sup> December 2011



Date Created: 30/03/2012

Stephen Stratton  
Ambient Air Quality Monitoring  
AEA Group PLC  
Glengarnock Technology Centre  
Caledonian Road  
Lochshore Business Park  
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## Appendix 3: Tube Precision & WASP Results

Table 1: Laboratory summary performance for WASP NO<sub>2</sub> PT rounds 108 - 115

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

WASP Round	WASP R108	WASP R109	WASP R110	WASP R111	WASP R112	WASP R113	WASP R114	WASP R115
Round conducted in the period	Jan – March 2010	April – June 2010	June – August 2010	Oct – Dec 2010	Jan -March 2011	April - June 2011	July - Sept 2011	October - December 2011
Aberdeen Public Analysts	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Bristol City Council	75 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Cardiff Scientific Services	100 %	50 %	100 %	75 %	100 %	100 %	100 %	75 %
Edinburgh City Council	100 %	100 %	75 %	100 %	100 %	100 %	100 %	0 %
Environmental Services Group, Didcot (formerly Bureau Veritas Laboratories, Glasgow and Harwell Scientifics) [1] [2]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Exova (formerly Clyde Analytical)	100 %	50 %	50 %	100 %	100 %	100 %	0 %	75 %
Glasgow Scientific Services	50 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Gradko International [2]	100 %	87.5 %	100 %	100 %	100 %	100 %	100 %	37.5 %
Kent Scientific Services	100 %	100 %	100 %	100 %	50 %	100 %	100 %	75 %
Kirklees MBC	100 %	100 %	100 %	0 %	100 %	0 %	0 %	50 %
Lambeth Scientific Services	50 %	100 %	100 %	100 %	50 %	25 %	100 %	25 %
Lancashire County Analysts [3]	100 %	75 %	50 %	100 %	75 %	-	-	-
Milton Keynes Council	100 %	25 %	50 %	100 %	100 %	75 %	100 %	100 %
Northampton Borough Council	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Somerset Council [4]	-	-	-	-	-	-	-	100 %
South Yorkshire Council Laboratory [5]	25 %	-	-	-	-	-	-	-
South Yorkshire Air Quality Samplers [6]	-	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Staffordshire County Council	100 %	100 %	50 %	100 %	100 %	100 %	100 %	100 %
Tayside (formerly Dundee CC)	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Walsall MBC [7]	-	100 %	100 %	100 %	-	-	-	-
West Yorkshire Analytical Services	100 %	100 %	100 %	100 %	75 %	75 %	100 %	100 %

[1] Bureau Veritas laboratory and Harwell Scientific now part of ESG Group.

[2] Participant subscribes to two sets of test samples (2 x 4 test samples) in each WASP PT round.

[3] No longer involved in NO<sub>2</sub> diffusion tube measurements from R113.

[4] New participant from R115.

[5] No longer involved in NO<sub>2</sub> diffusion tube measurements from R109.

[6] New participant from R109.

[7] Results for WASP R107, R108 and R112 not submitted. No longer involved in NO<sub>2</sub> diffusion tube measurements from R113.

## Appendix 4: Bias Factor Spreadsheet (Gradko)

National Diffusion Tube Bias Adjustment Factor Spreadsheet						Spreadsheet Version Number: 03/12				
<p>Follow the steps below <b>in the correct order</b> to show the results of <b>relevant</b> co-location studies</p> <p>Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods</p> <p>Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet</p> <p>This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.</p>										<p>This spreadsheet will be updated at the end of September 2012</p> <p><a href="#">LAQM Helpdesk Website</a></p>
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:	Step 2:	Step 3:	Step 4:							
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	<p>Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution.</p> <p>Where there is more than one study, use the overall factor<sup>3</sup> shown in <b>blue</b> at the foot of the final column.</p>							
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data <sup>2</sup>	If you have your own co-location study then see footnote <sup>4</sup> . If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953							
Analysed By <sup>1</sup>	Method To undo your selection, choose (All) from the pop-up list	Year <sup>5</sup> To undo your selection, choose (All)	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision <sup>6</sup>	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in water	2011	R	Scarborough Borough Council	12	35	37	-4.7%	G	1.05
Gradko	20% TEA in Water	2011	R	Dudley MBC	12	35	28	23.3%	G	0.81
Gradko	20% TEA in Water	2011	UB	Dudley MBC	12	28	25	10.0%	G	0.91
Gradko	20% TEA in Water	2011	R	Dudley MBC	11	45	40	11.8%	G	0.89
Gradko	20% TEA in water	2011	K	South Lakeland District Council	10	41	38	8.3%	G	0.92
Gradko	20% TEA in water	2011	R	Gedling Borough Council	11	43	35	24.5%	G	0.80
Gradko	20% TEA in water	2011	R	Gateshead	12	39	37	4.9%	P	0.95
Gradko	20% TEA in water	2011	R	Gateshead	12	37	36	1.8%	G	0.98
Gradko	20% TEA in water	2011	R	Gateshead	10	33	31	5.1%	G	0.95
Gradko	20% TEA in water	2011	R	Gosport Borough Council	10	28	25	11.1%	G	0.90
Gradko	20% TEA in water	2011	UC	Southampton City Council	12	31	35	-10.8%	G	1.12
Gradko	20% TEA in Water	2011	R	Dudley MBC	9	50	51	-1.5%	G	1.02
Gradko	20% TEA in water	2011	K	Marylebone Road Intercomparison	12	111	100	11.4%	G	0.90
Gradko	20% TEA in water	2011	R	Boston Borough Council	11	57	36	59.6%	P	0.63
Gradko	20% TEA in water	2011	UB	Luton Borough Council	11	39	35	11.1%	G	0.90
Gradko	20% TEA in water	2011	R	Exeter City Council	11	37	33	15.1%	S	0.87
Gradko	20% TEA in water	2011	UB	Belfast City Council	12	36	29	23.5%	G	0.81
Gradko	20% TEA in water	2011	R	Bromsgrove District Council (Worcester)	10	56	53	6.0%	G	0.94
Gradko	20% TEA in water	2011	R	Monmouthshire County Council	11	47	40	17.9%	S	0.85
Gradko	20% TEA in water	2011	K	New Forest District Council	10	49	42	16.7%	G	0.86
Gradko	20% TEA in water	2011	R	New Forest District Council	12	34	26	29.9%	G	0.77
Gradko	20% TEA in water	2011	R	Fareham Borough Council	12	39	33	17.4%	G	0.85
Gradko	20% TEA in water	2011	R	Rushcliffe BC	11	35	39	-9.5%	G	1.10
Gradko	20% TEA in Water	2011	R	Carlisle City Council	12	35	28	24.8%	G	0.80
Gradko	20% TEA in Water	2011	O	North Warwickshire Borough Council	12	48	39	23.0%	G	0.81
Gradko	20% TEA in water	2011	R	Wokingham Borough Council	11	41	38	8.6%	G	0.92
Gradko	20% TEA in water	2011		Overall Factor <sup>3</sup> (26 studies)					Use	0.89

## Appendix 5: Diffusion Tube Accuracy NAC

## Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{gm}^{-3}$	Tube 2 $\mu\text{gm}^{-3}$	Tube 3 $\mu\text{gm}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	05/01/2011	02/02/2011	46.0	48.3	41.8	45	3.3	7	8.2
2	02/02/2011	02/03/2011	40.1	27.5	38.2	35	6.8	19	16.9
3	02/03/2011	30/03/2011	36.0	38.6	39.6	38	1.9	5	4.6
4	30/03/2011	27/04/2011	39.6	44.3	44.7	43	2.8	7	7.0
5	27/04/2011	01/06/2011	33.1	35.3	34.2	34	1.1	3	2.7
6	01/06/2011	29/06/2011	43.4	39.1	37.8	40	2.9	7	7.3
7	29/06/2011	03/08/2011	39.2	37.5	37.1	38	1.1	3	2.8
8	03/08/2011	31/08/2011	39.5	41.6	39.5	40	1.2	3	3.0
9	31/08/2011	28/09/2011	33.0	33.2	34.5	34	0.8	2	2.0
10	28/09/2011	02/11/2011	33.9	35.0	44.3	38	5.7	15	14.2
11	02/11/2011	29/11/2011	32.8	31.3	33.4	33	1.1	3	2.7
12	29/11/2011	04/01/2012	32.8	53.9	47.8	45	10.9	24	27.0
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
37	99	Good	Good
34	100	Good	Good
35	99	Good	Good
32	99	Good	Good
23	98	Good	Good
28	99	Good	Good
30	61	Good	or Data Capture
32	81	Good	Good
29	59	Good	or Data Capture
25	90	Good	Good
27	92	Good	Good
35	94	Poor Precision	Good
Overall survey -->		Good precision	Poor Overall DC

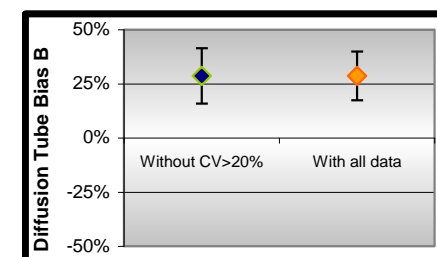
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	High Street, Irvine
----------------	---------------------

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 9 periods of data	
Bias factor A	0.79 (0.72 - 0.88)
Bias B	27% (14% - 40%)
Diffusion Tubes Mean:	38 $\mu\text{gm}^{-3}$
Mean CV (Precision):	8
Automatic Mean:	30 $\mu\text{gm}^{-3}$
Data Capture for periods used:	95%
Adjusted Tubes Mean:	30 (28 - 34) $\mu\text{gm}^{-3}$

Precision	11 out of 12 periods have a CV smaller than 20%
-----------	---

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 10 periods of data	
Bias factor A	0.79 (0.72 - 0.86)
Bias B	27% (16% - 38%)
Diffusion Tubes Mean:	39 $\mu\text{gm}^{-3}$
Mean CV (Precision):	9
Automatic Mean:	31 $\mu\text{gm}^{-3}$
Data Capture for periods used:	95%
Adjusted Tubes Mean:	31 (28 - 34) $\mu\text{gm}^{-3}$



Jaume Targa, for AEA  
Version 04 - February 2011



## Appendix 5: Diffusion Tube Accuracy NAC (cont)

## Adjustment of SINGLE Tubes



Diffusion Tube Measurements															
Site Name/ID	Periods													Raw Mean	Valid periods
	1	2	3	4	5	6	7	8	9	10	11	12	13		
1. 35 East Road Irvine	37.4	33.8	38.7	25.6	24.2	28.7	21.8	25.6	25.1	25.8	29.2	34.3		29.2	12
2. 18 Bank St, Irvine (Pitchers)	45.8	38.6	39.8	35.7	27.5	26.2	21.8	24.9	23.4	33.9	40.4	34.4		32.7	12
3. 147 High Street, Irvine	57.1	37.9	43.5	45.6	30.8	33.9	29.1	31.1	32.1	43.0	40.0	38.8		38.6	12
4. 85 High St, Irvine	47.7	43.7	46.6	62.3	35.7	36.0	35.6		41.2	40.9	39.3	38.8		42.5	11
5. 79 High St, Irvine	77.1	59.3	80.0	88.3	70.2	79.7	35.6	58.7	78.5	69.8	58.2	70.8		68.8	12
6. 75 High St, Irvine (HIGH)	62.8	60.9	64.2	74.9	68.8	67.9	69.3	35.4	59.2	52.1	36.7	47.8		58.3	12
7. 71 High St, Irvine	50.8	25.4	53.4	54.9	41.1	46.3	39.8	46.8	43.0	39.0	34.1	39.0		42.8	12
8. 65a High Street, Irvine	46.0	40.1	36.0	39.6	33.1	43.4	39.2	39.5	33.0	33.9	32.8	32.8		37.4	12
9. 65 High Street, Irvine	48.3	27.5	38.6	44.3	35.3	39.1	37.5	41.6	33.2	35.1	31.3	53.8		38.8	12
10. 63 High Street, Irvine	41.8	38.2	39.6	44.7	34.2	37.8	37.1	39.5	34.5	44.3	33.4	47.8		39.4	12
11. 34 Kirkgate Irvine	24.5	22.0	20.2	13.3	10.0	11.2	37.0	10.7	9.5	13.3	19.8	16.9		17.4	12
12. 25 Main Rd, Springside	26.6	23.1	24.5	21.0	14.2	18.0	16.1	17.8	15.2	21.1	27.0	23.4		20.7	12
13. Auchengate (Bridge)	22.0	10.7	20.0	17.1	11.3	13.3	11.6	11.9	10.5	15.9	19.4	13.2		14.7	12
14. Dalry Rd , Kilwinning	30.5	31.7	31.5	29.6	21.4	24.4	20.6	22.0		42.5	36.5	28.9		29.1	11
15. Vernon St, Saltcoats	35.4	31.4	36.2	33.4	24.2	30.1	27.7	24.5	24.4	35.9	30.0	18.5		29.3	12
16. 12 Garnock St, Dalry	23.6	21.1	16.9	15.6	10.1	8.7	7.7	10.0	7.7	11.1	20.2	11.8		13.7	12
17. 67 New St, Dalry	54.0	34.6	48.9	44.1	34.2	38.5		35.0	34.2	38.7	38.3	41.9		40.2	11
18. 45 New St Dalry	59.4	54.5	62.3	59.0	41.2	49.8	39.7	45.0	49.9	70.7	52.1	48.5		52.7	12
19. 2 Townhead, St, Dalry	41.3	33.4	44.6	36.0	33.7	34.5	36.5	21.7	31.2	51.8	38.1	50.0		37.7	12
20. Highfield Hamlet , Dalry	26.5	43.8	26.6	23.6	21.7	19.9	17.2		17.3	21.3	33.7			25.2	10
21. 85 Main Street , Largs	35.9	17.4				29.7	26.9		19.6	22.2	24.4	19.3		24.4	8
22. Hunterston Road	9.9	12.1	8.1	7.0	6.1	6.3	7.1	6.4	3.9	6.0	11.2	5.8		7.5	12

Adjusted measurement (95% confidence interval)	
with all the data	
10 periods used in this calculations	
Bias Factor A 0.79 (0.72 - 0.86)	
Bias B 27% (16% - 38%)	
Tube Precision: 9	Automatic DC: 95%
Adjusted with 95% CI	23 ( 21 - 25 )
Adjusted with 95% CI	26 ( 24 - 28 )
Adjusted with 95% CI	30 ( 28 - 33 )
Adjusted with 95% CI	34 ( 31 - 37 )
Adjusted with 95% CI	54 ( 50 - 59 )
Adjusted with 95% CI	46 ( 42 - 50 )
Adjusted with 95% CI	34 ( 31 - 37 )
Adjusted with 95% CI	30 ( 27 - 32 )
Adjusted with 95% CI	31 ( 28 - 33 )
Adjusted with 95% CI	31 ( 28 - 34 )
Adjusted with 95% CI	14 ( 13 - 15 )
Adjusted with 95% CI	16 ( 15 - 18 )
Adjusted with 95% CI	12 ( 11 - 13 )
Adjusted with 95% CI	23 ( 21 - 25 )
Adjusted with 95% CI	23 ( 21 - 25 )
Adjusted with 95% CI	11 ( 10 - 12 )
Adjusted with 95% CI	32 ( 29 - 35 )
Adjusted with 95% CI	42 ( 38 - 45 )
Adjusted with 95% CI	30 ( 27 - 32 )
Adjusted with 95% CI	20 ( 18 - 22 )
Adjusted with 95% CI	19 ( 18 - 21 )
Adjusted with 95% CI	6 ( 5 - 6 )

*The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.*



## Appendix 6: NO<sub>2</sub> Levels – Distance from road calculator (79 High St)

This calculator allows you to predict the annual mean NO<sub>2</sub> concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.



**Enter data into the yellow cells**

<b>Step 1</b>	<b>How far from the KERB was your measurement made (in metres)?</b>	(Note 1)	<b>0.7</b>	metres
<b>Step 2</b>	<b>How far from the KERB is your receptor (in metres)?</b>	(Note 1)	<b>5.2</b>	metres
<b>Step 3</b>	<b>What is the local annual mean background NO<sub>2</sub> concentration (in µg/m<sup>3</sup>)?</b>	(Note 2)	<b>6</b>	µg/m <sup>3</sup>
<b>Step 4</b>	<b>What is your measured annual mean NO<sub>2</sub> concentration (in µg/m<sup>3</sup>)?</b>	(Note 2)	<b>54</b>	µg/m <sup>3</sup>
<b>Result</b>	<b>The predicted annual mean NO<sub>2</sub> concentration (in µg/m<sup>3</sup>) at your receptor</b>	(Note 3)	<b>35.9</b>	µg/m <sup>3</sup>

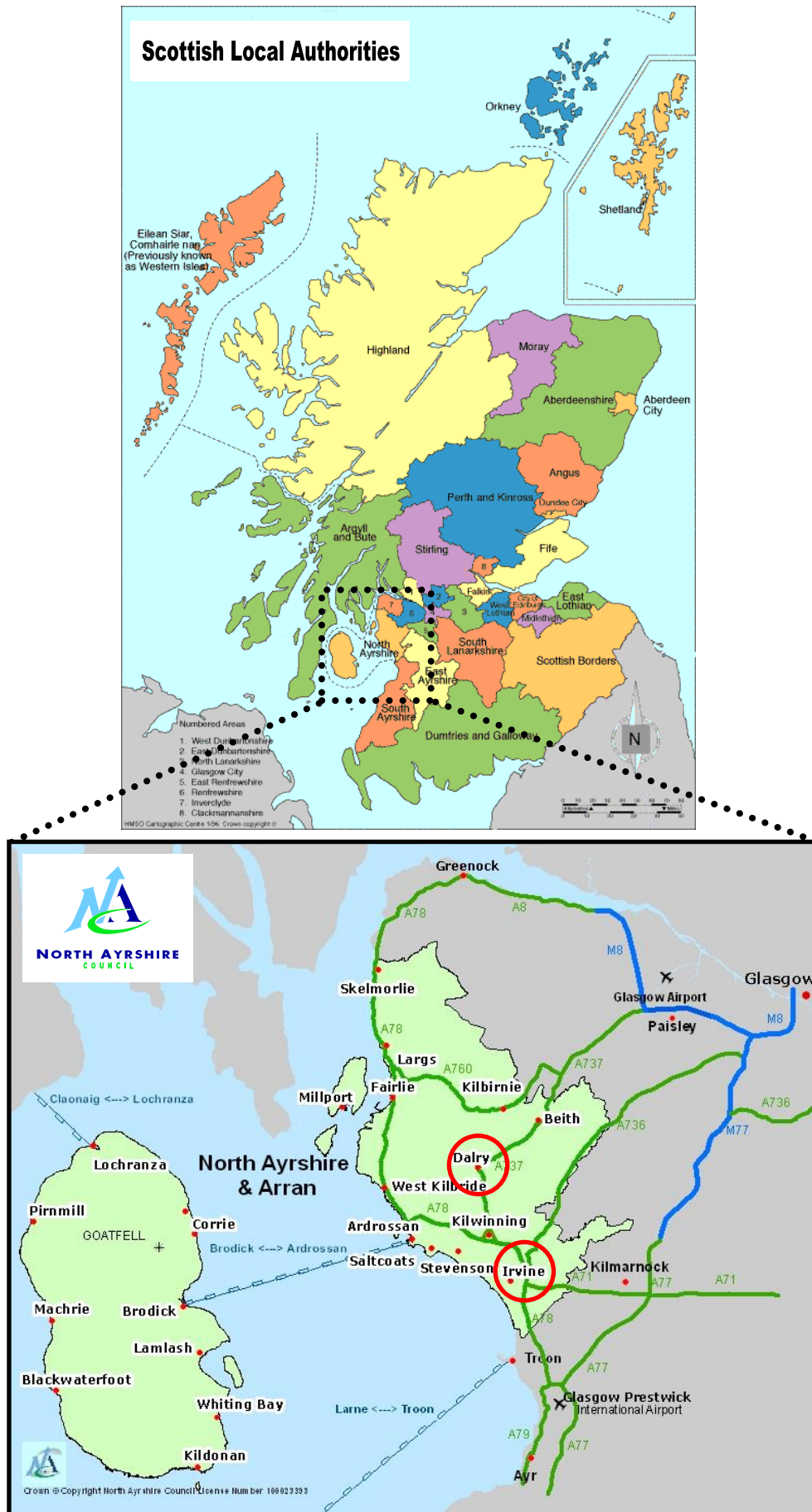
Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at <http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm> for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at [www.airquality.co.uk](http://www.airquality.co.uk), or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

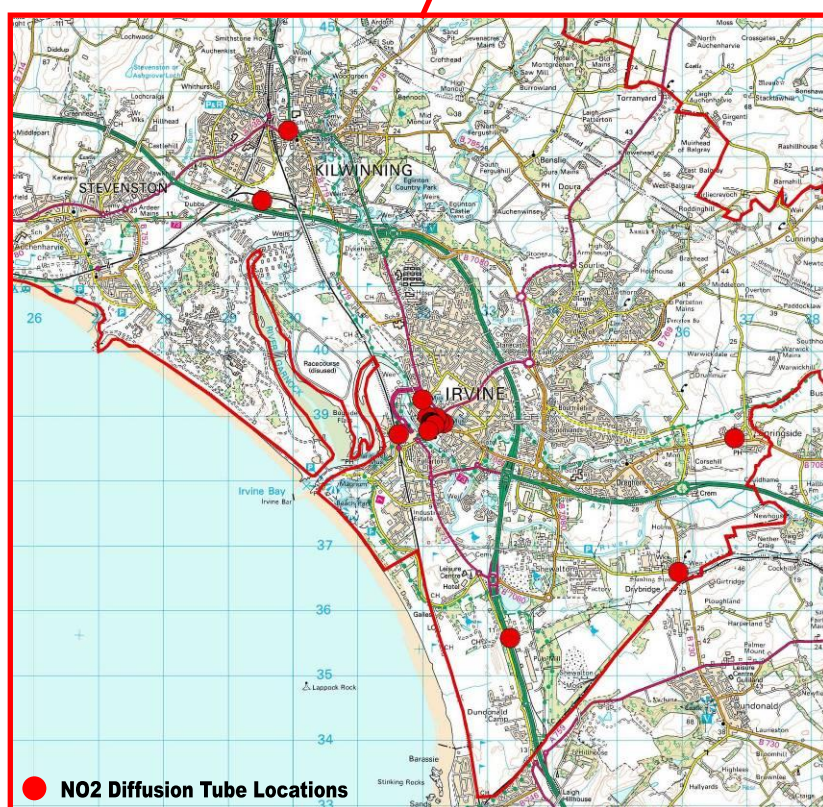
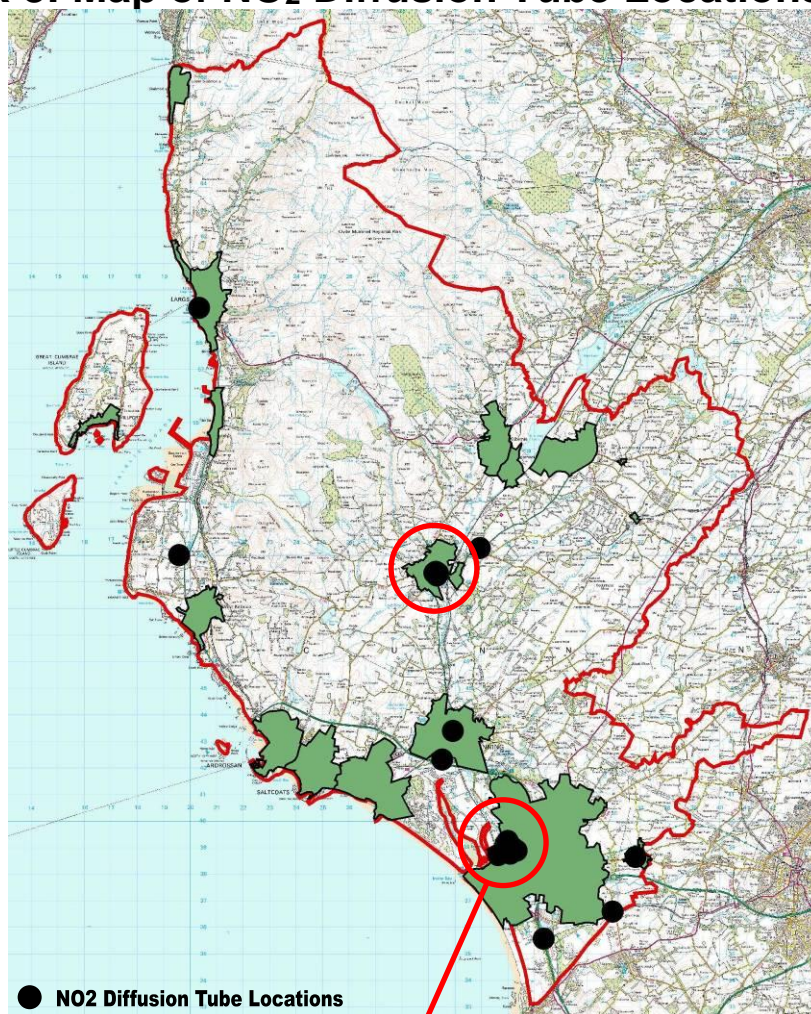
Issue 4: 25/01/11. Created by Dr Ben Marner; Approved by Prof Duncan Laxen. Contact: [benmarner@aqconsultants.co.uk](mailto:benmarner@aqconsultants.co.uk)

## Appendix 7: District Map of Locality & Surrounding Area





## Appendix 8: Map of NO<sub>2</sub> Diffusion Tube Locations

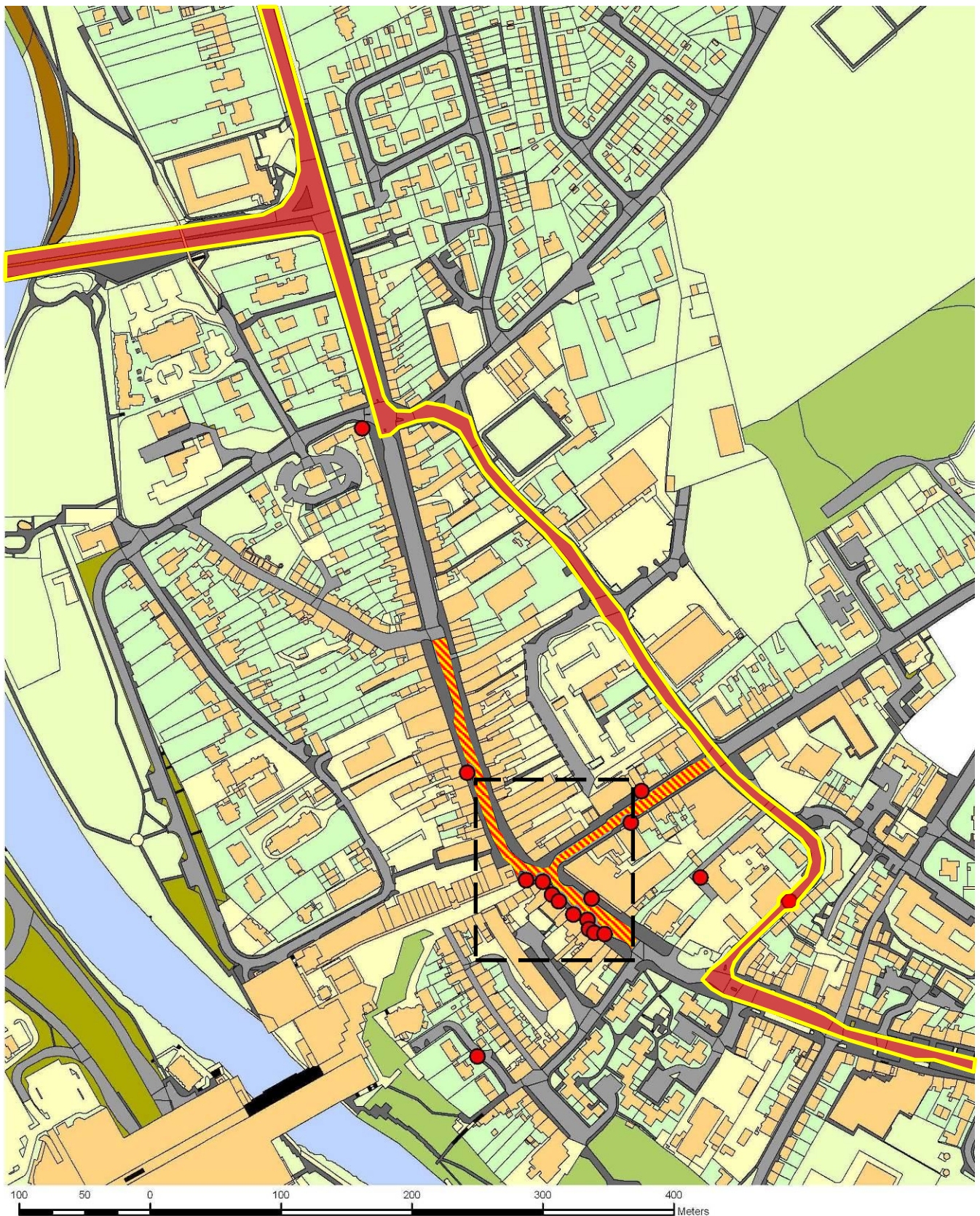


# **Irvine Area**

## **Appendices 9 to 14**



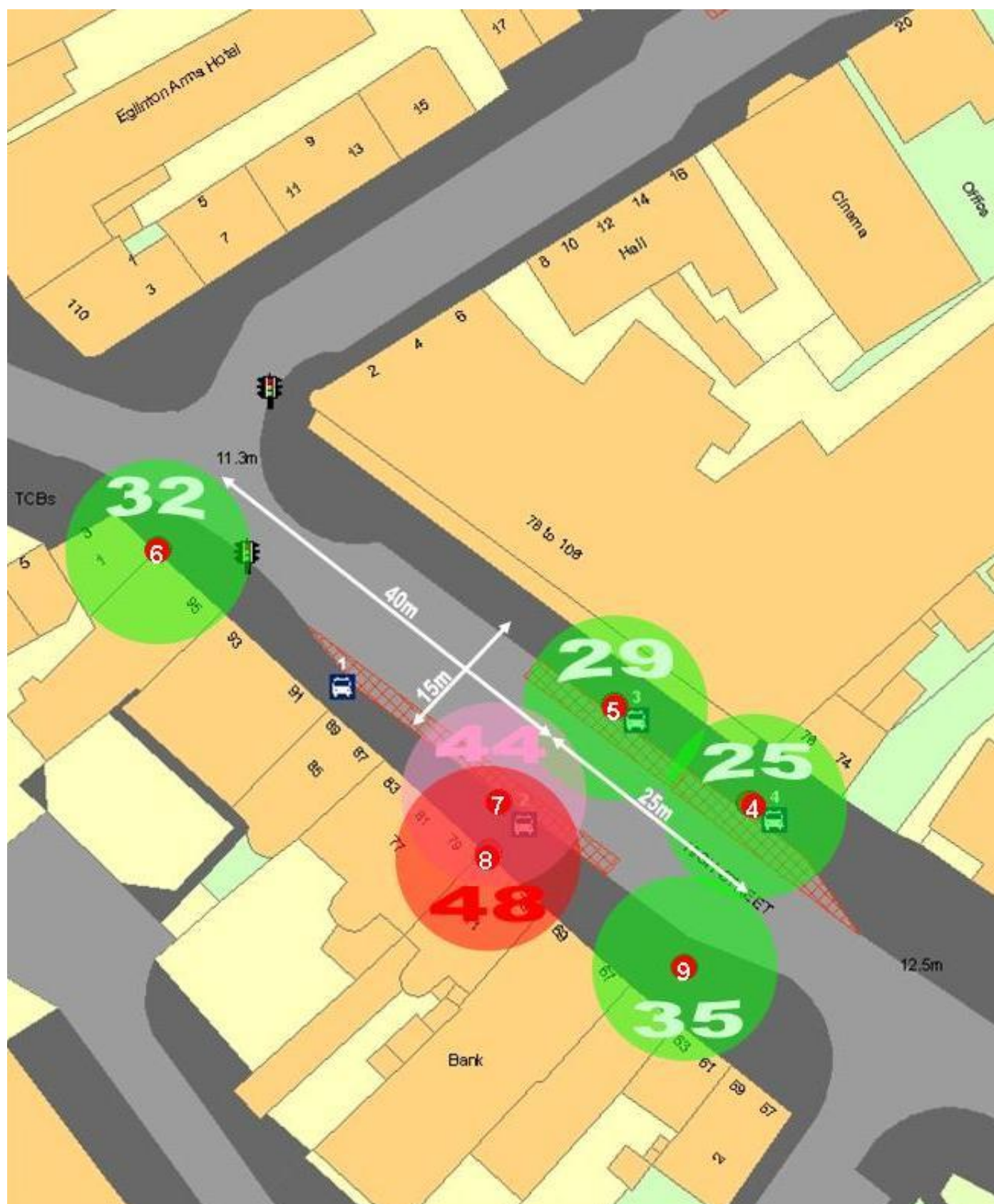
## Appendix 9 Irvine Town Centre



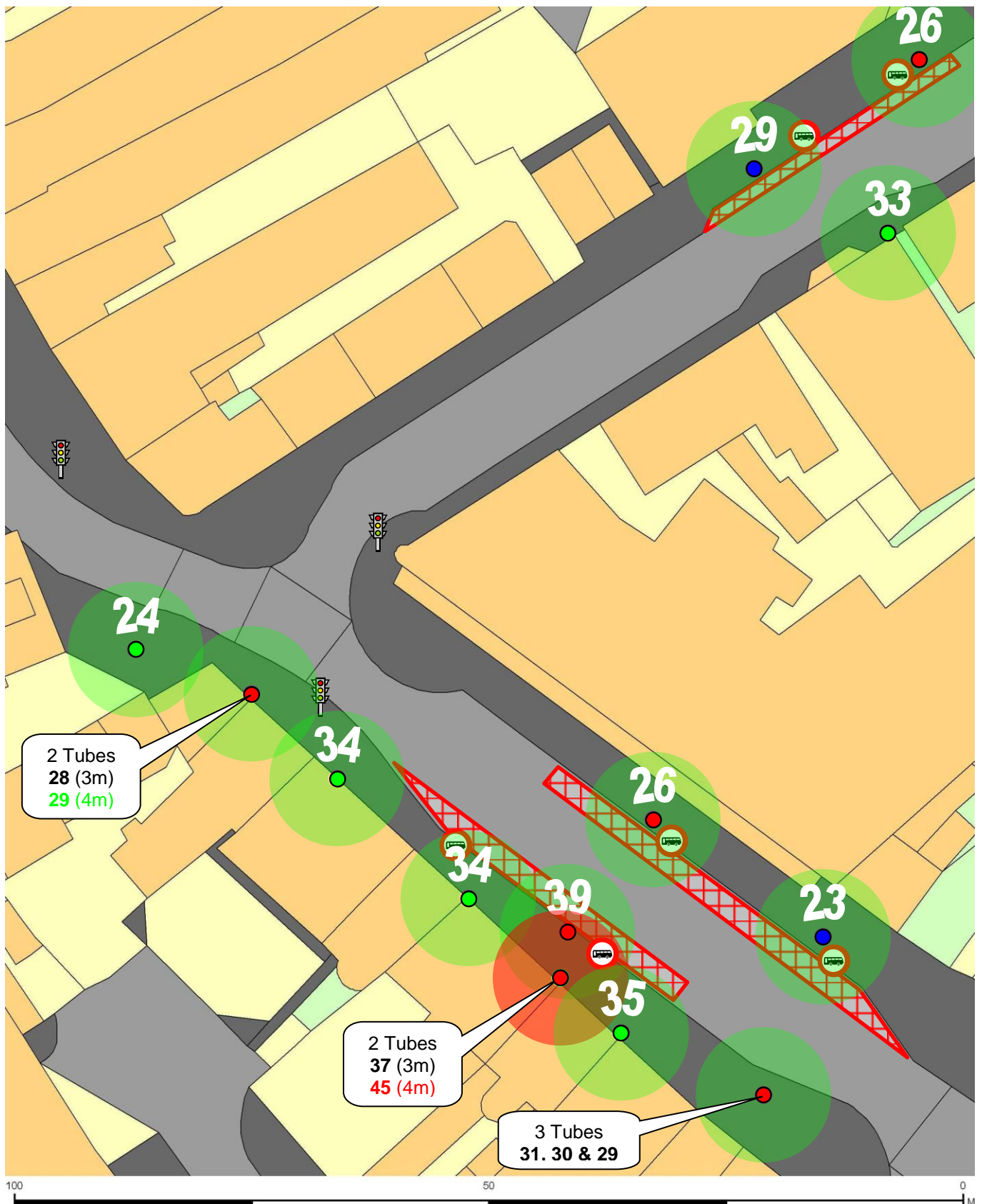
- **Main traffic route**
- ▨ **Restricted Area (buses, taxis & loading only)**
- **NO2 diffusion tubes (Including Historic Sites)**



# Appendix 10: Irvine, High St (2007) NO<sub>2</sub> µg/m<sup>3</sup>



# Appendix 11: Irvine, High St (2008) NO<sub>2</sub> µg/m<sup>3</sup>

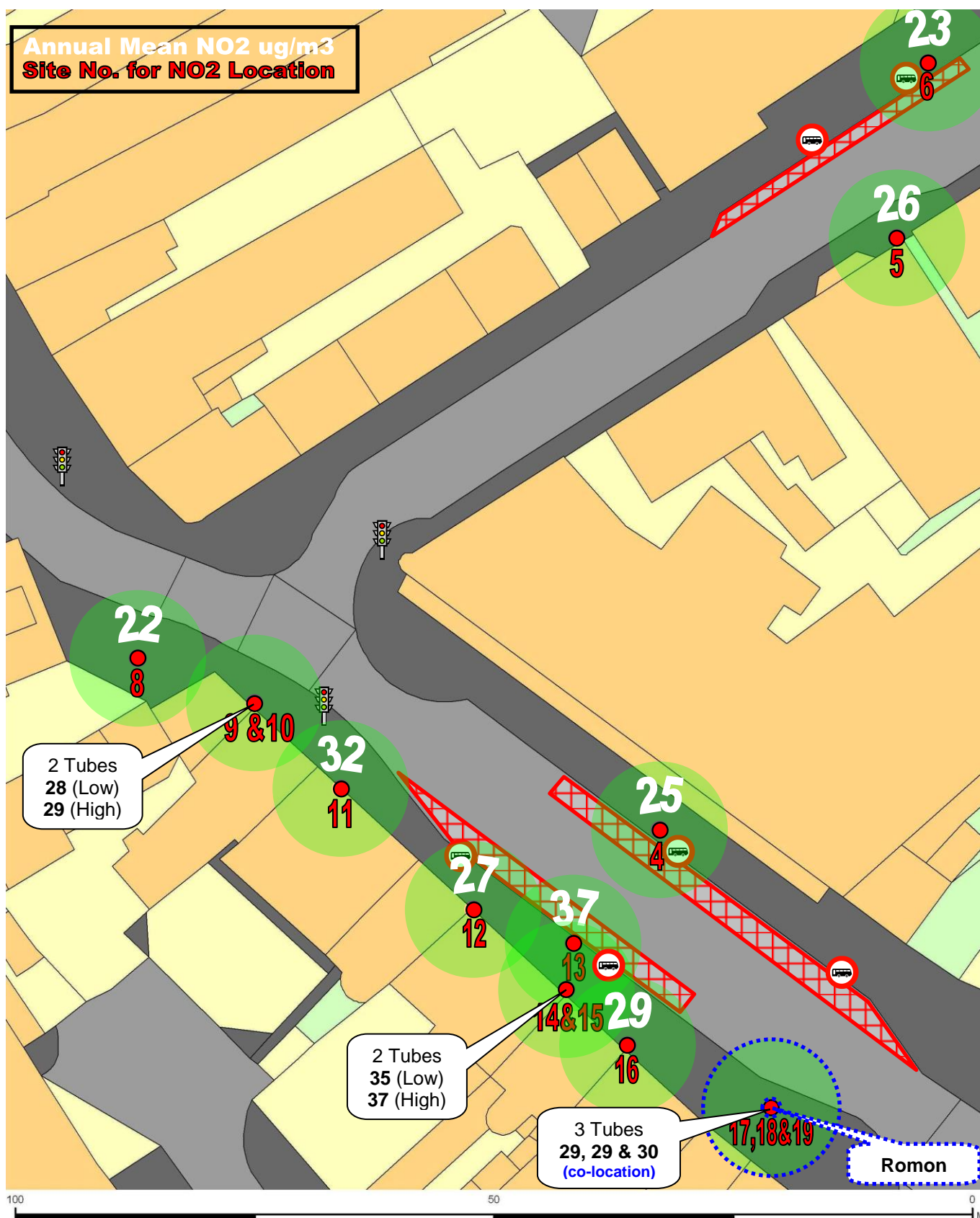


## NO<sub>2</sub> diffusion tubes

- Existing
- New
- Removed

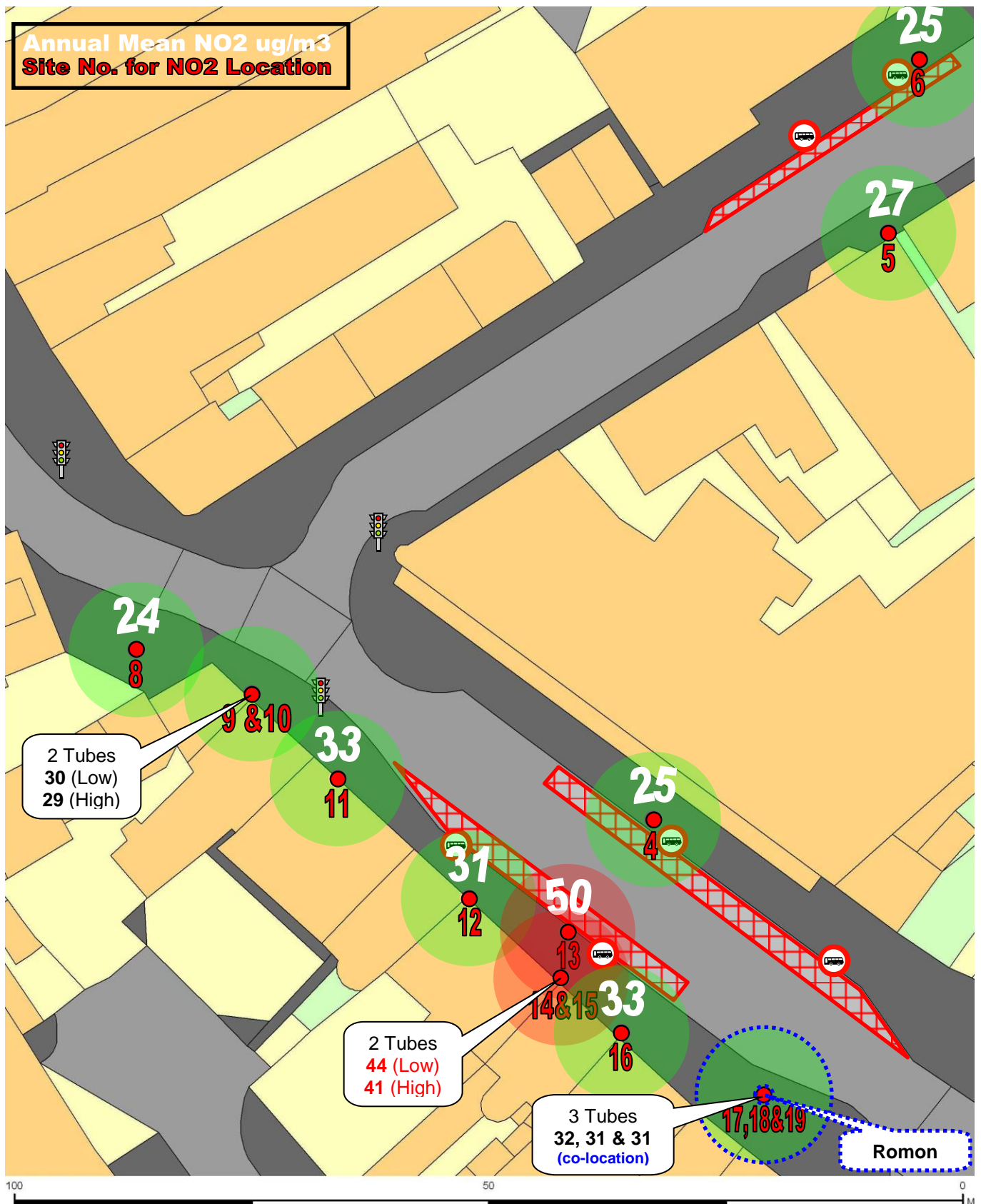


# Appendix 12: Irvine, High St (2009) NO<sub>2</sub> µg/m<sup>3</sup>

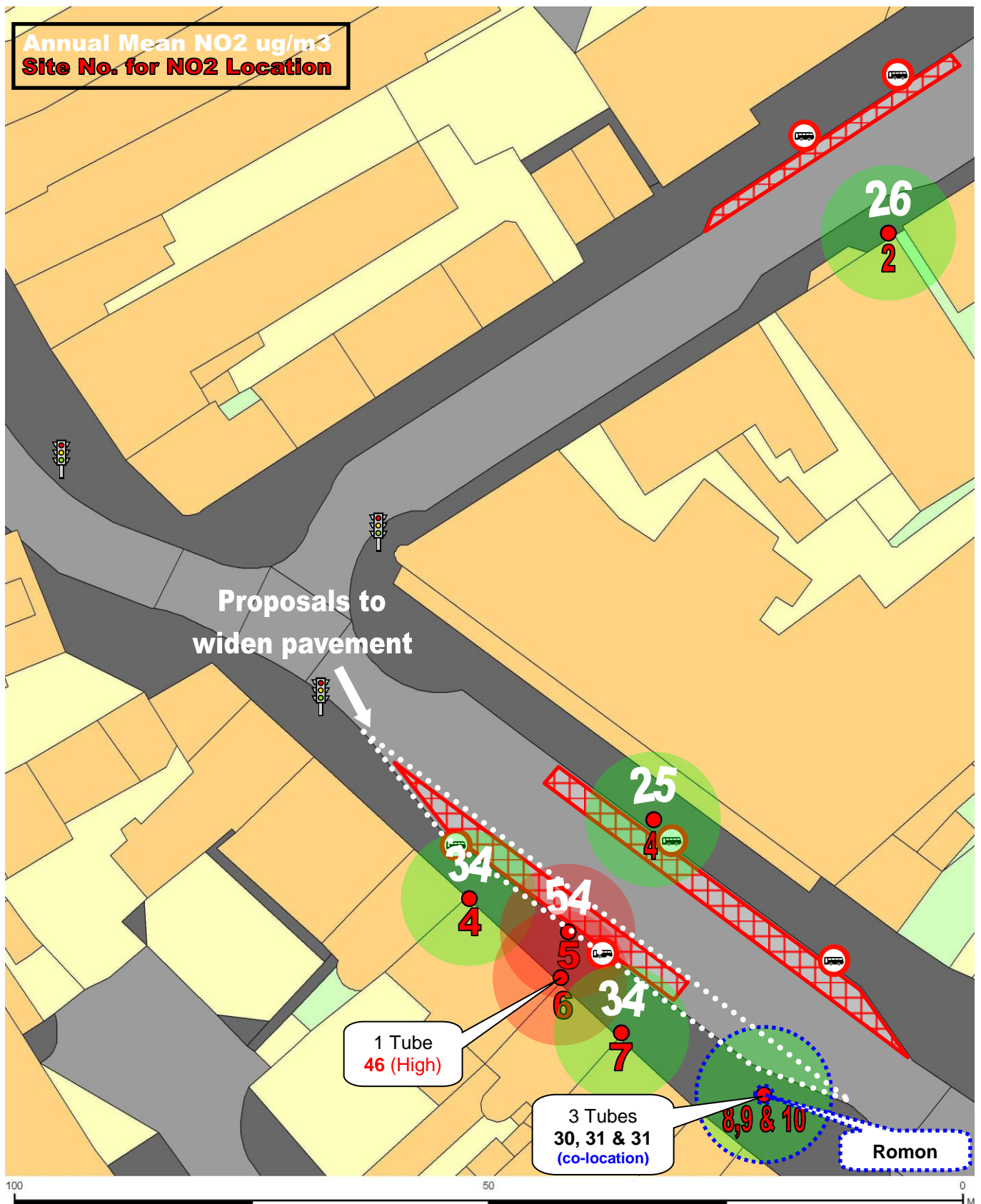




# Appendix 13: Irvine, High St (2010) NO<sub>2</sub> µg/m<sup>3</sup>



# Appendix 14: Irvine, High St (2011) NO<sub>2</sub> µg/m<sup>3</sup>

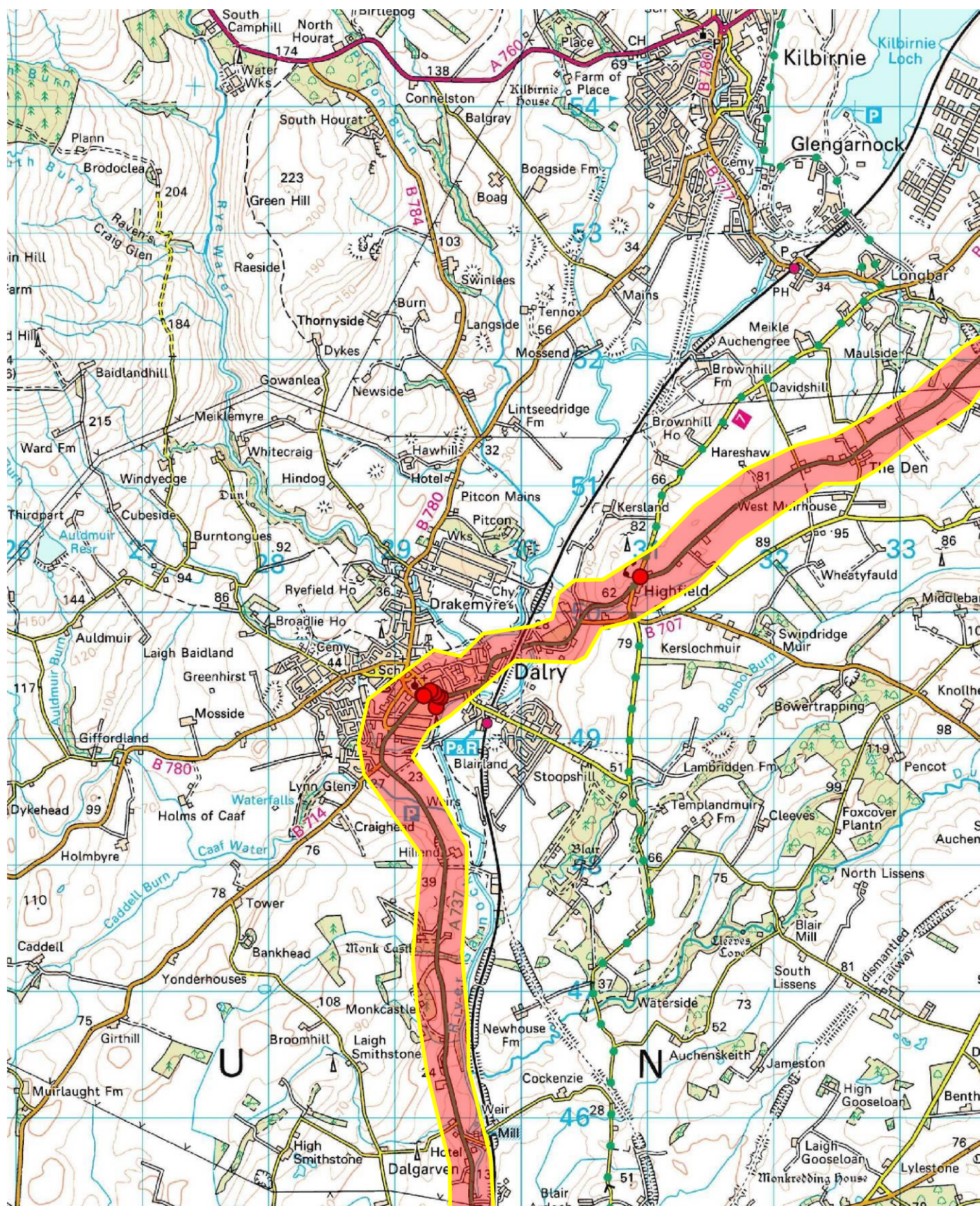


# **Dalry Area**

## **Appendices 15 to 19**



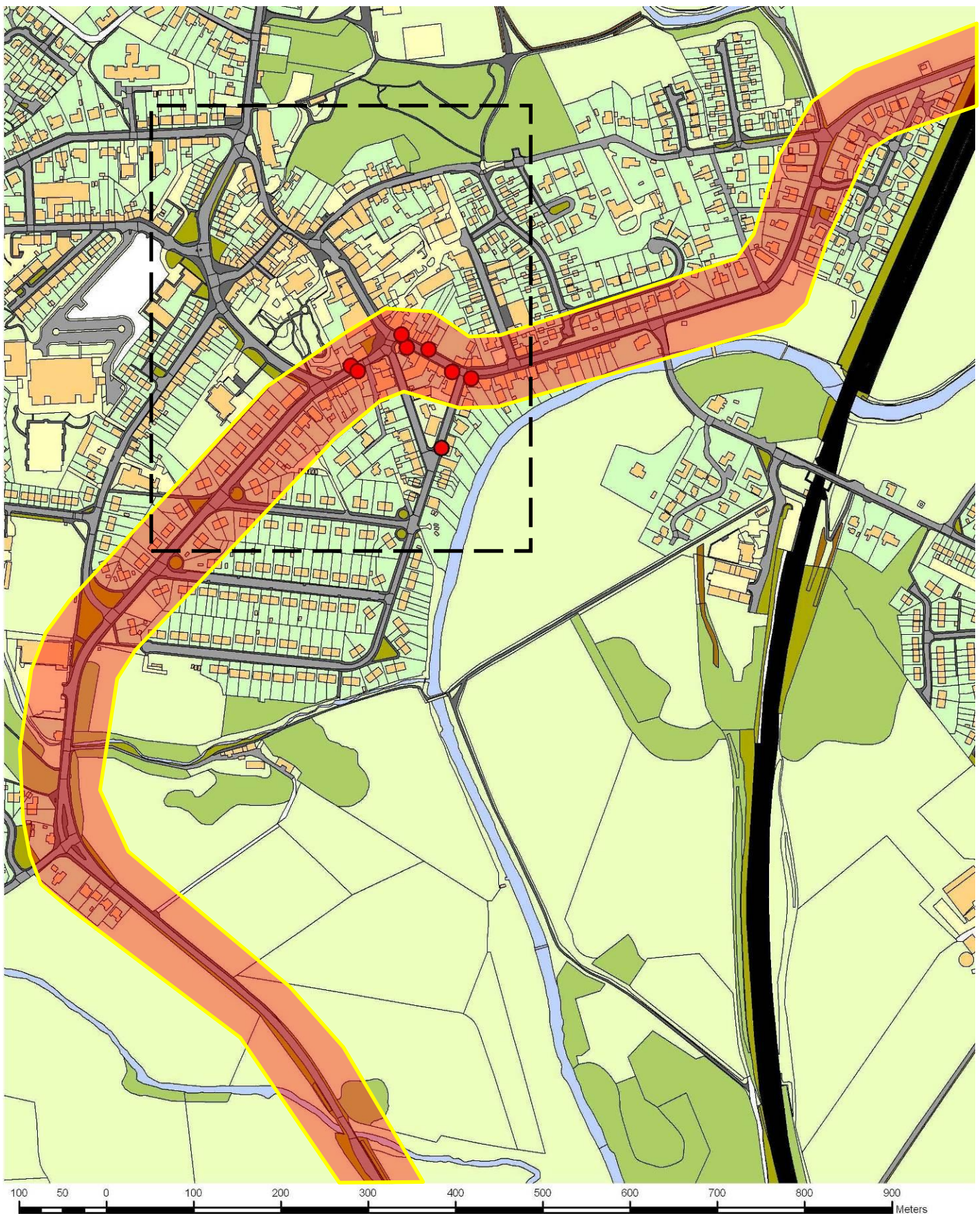
## Appendix 15: Dalry (Ordnance Survey)



- Irvine - Glasgow corridor
- NO2 diffusion tubes



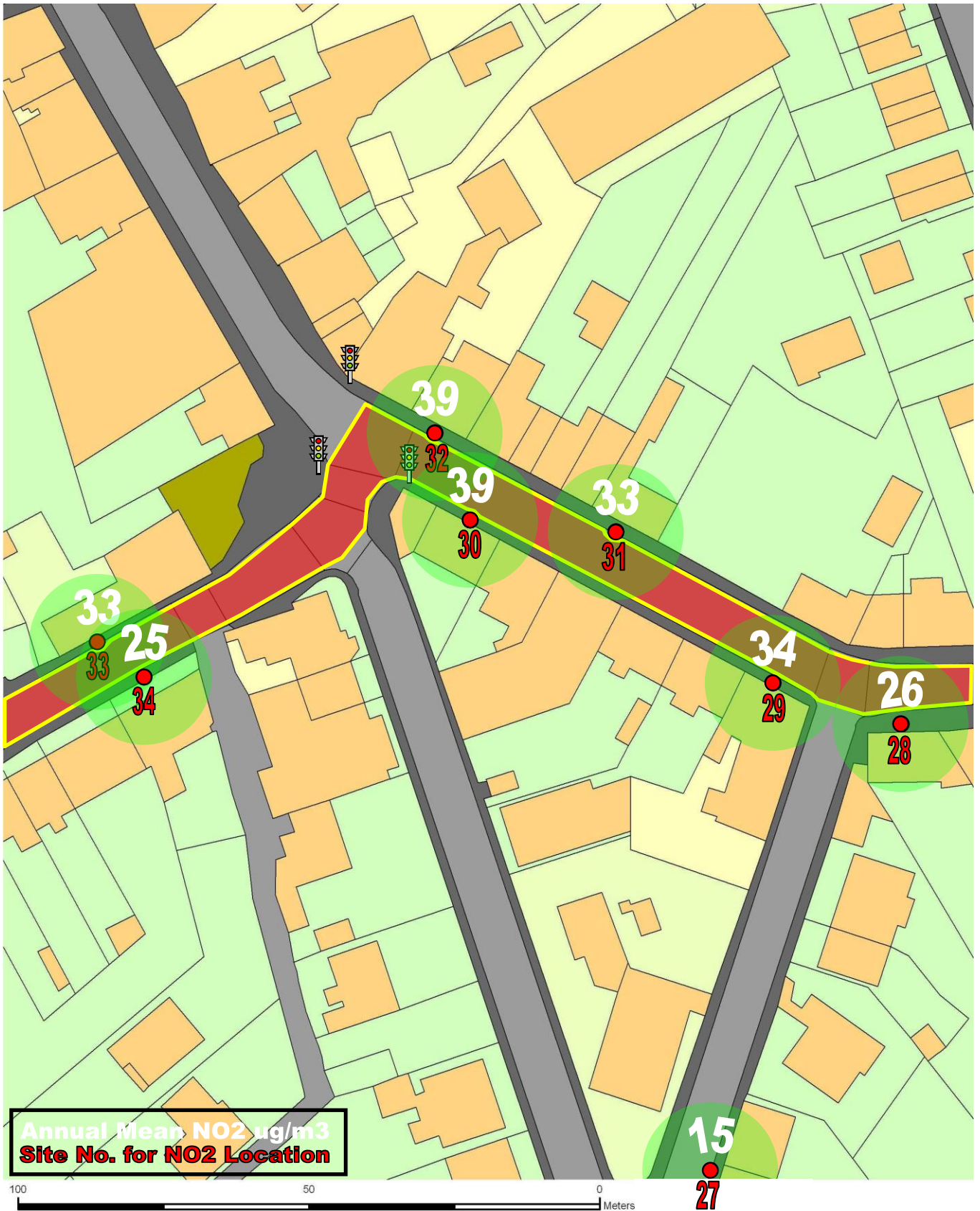
## Appendix 16: Dalry - Town Centre



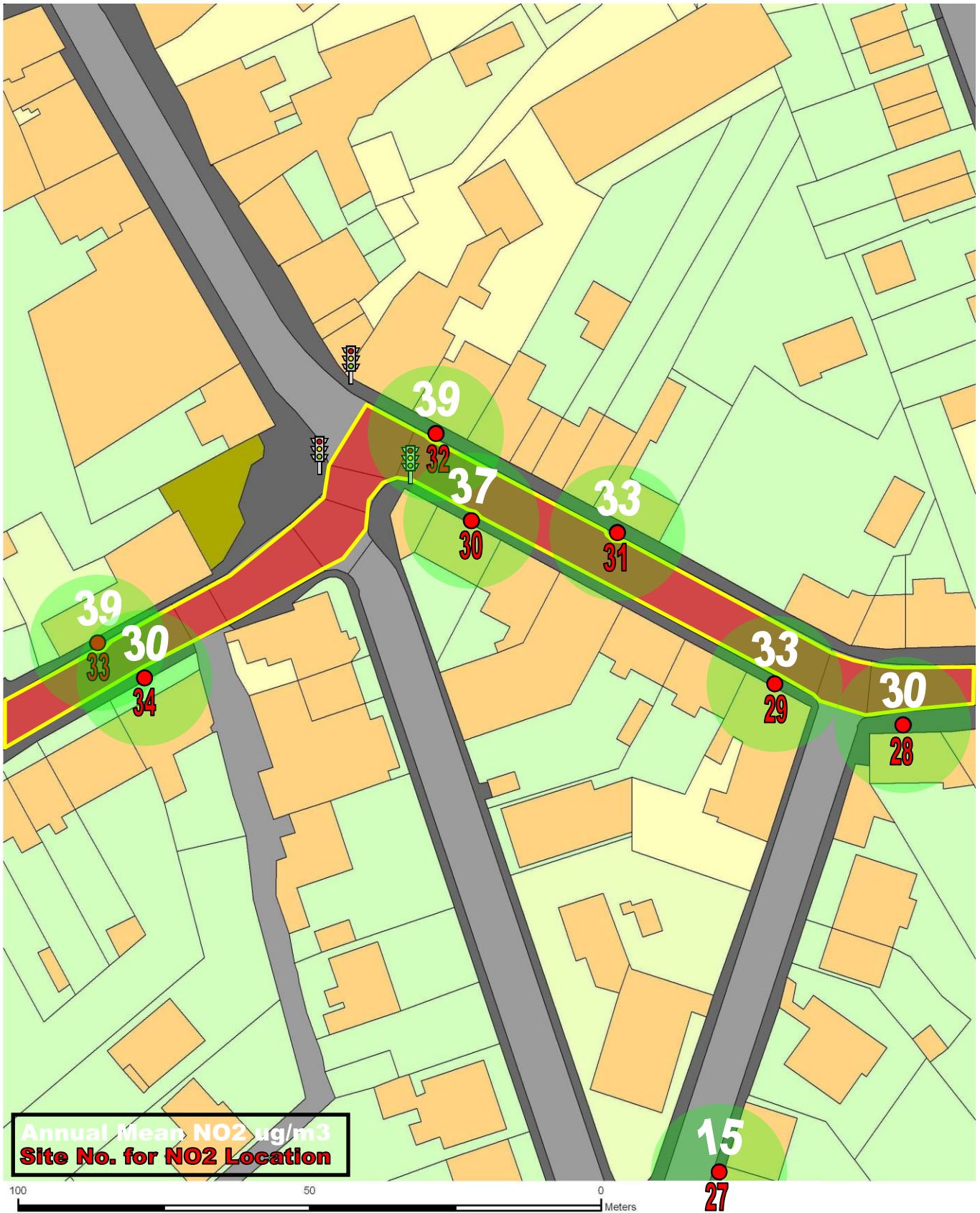
- Irvine - Glasgow corridor
- NO2 diffusion tubes (Including Historic Sites)



Appendix 17: Dalry – Townhead St/New St (2009) NO<sub>2</sub> µg/m<sup>3</sup>

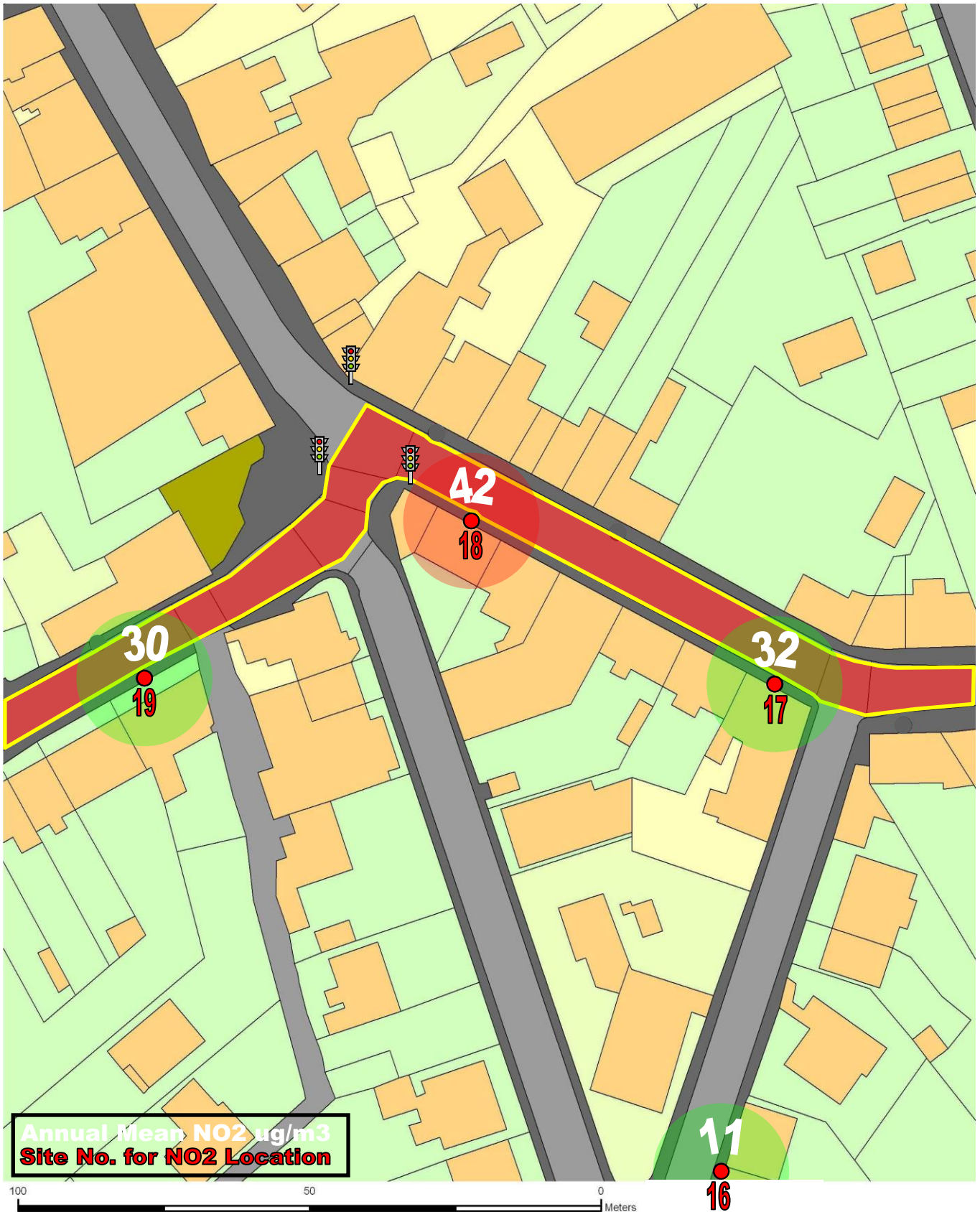


Appendix 18: Dalry – Townhead St/New St (2010) NO<sub>2</sub> µg/m<sup>3</sup>





Appendix 19: Dalry – Townhead St/New St (2011) NO<sub>2</sub> µg/m<sup>3</sup>





Appendix 20: Historical NO<sub>2</sub> Diffusion Tube Results (2001 – 2011)

URN	Tube No.s in Report	RESULTS IN UG/M3	EAST INGS	NORTH INGS	2001	2002	2003	2004	2005	2006	2007 Bias 0.83	2008 Bias 0.87	2009 Bias 0.96	2010 Bias 0.93	2011 Bias 0.79
199801		Cunninghame House, Irvine	231627	638718	10.1	13.7	15.7	11.9	11.8	14	12	10	12	13	
199802	1	35 East Road Irvine	232323	638892	20.1	30	31.4	26.2	22.9	33.2	26	24	25	27	23
199803		Irvine Police Station	232255	638910	9.9	14.9	15.1	12.6	11.8	15	12	12	13	15	
199804		74 High Street, Irvine	232195	638878	18	21.3	28.5	23.7	19.2	25	25	23.6			
199805		70 High Street Irvine	232172	638894	25.1	31.3	32.7	27.9	22.5	31	29	26	25	33	
200801	2	18 Bank St, Irvine	232202	638952								32.5	26	27	26
200401		19 Bank St, Irvine	232182	638960				22.9	22.6	28	24	28.5			
200402		19 Bank St Irvine	232210	638976				24.4	22.1	31	28	26	23	25	
200101	3	147 High Street, Irvine	232077	638990	19.1	30.2	31.5	27.8	23.3	31	29	34	29	26	30
200802		3 Bridgegate,	232122	638908								23.9	22	24	
199806		97 High St, Irvine	232142	638897	21.9	32.7	37.1	33.3	26.9	38	32	28	28	30	
200803		97 High St, Irvine HIGH	232142	638897								29.4	29	29	
200804		91 High St, Irvine LOW	232147	638892								34.1	32	33	
200805	4	85 High St, Irvine	232158	638882								34.1	27	31	34
199807	5	79 High St, Irvine	232169	638878	30.7	40.8	49.6	45.6	31.2	43	44	39	37	50	54
199808		75 High St, Irvine LOW	232170	638871	25.8	36.2	41.9	36.3	30.5	43	48	37	35	44	
200806	6	75 High St, Irvine HIGH	232170	638871								44.6	37	41	46
200807	7	71 High St, Irvine	232174	638868								34.8	29	33	34
199901	8	65a High St, Irvine, (ROMON)	232182	638867	8.5	30.9	33.1	37	28.9	37	35	31	27	32	30
200701	9	65 High St, Irvine, (ROMON)	232182	638867							34	30	29	31	31
200702	10	63 High St, Irvine, (ROMON)	232182	638867							38	29	30	31	31
199809	11	34 Kirkgate Irvine	232085	638774	8.5	13.9	15.9	11	11.5	14	11	8	16	14	14
199810		Eglinton Street Irvine	231997	639252	17.4	23.4	25.2	21.8	19.4	26	22	27	26	27	
199902	12	25 Main Rd, Springside	236813	638659	10.3	14.5	16.8	15.8	15.5	19.2	17	16	17	17	16
199903		Greenwood Academy	234409	637921	12.3	14.8	17.71	16.6	14.7	21.5	17	15.8			
199904		Main St, Drybridge	235946	636597	7.5	9.6	12.1	9.8	9.3	11.3	9	6	12	14	
199905		Shewalton Moss Estate	235751	636637	6.9	10	11.8	10.3	8	10.1	8	7.3			
199906		Dreghorn Primary School	235547	638410	11.3	15.9	18.19	14.9	15.2	18	13	13.1			
200001	13	Auchengate (Bridge)	233332	635558	10.1	13.3	15.8	14.8	13.5	15	14	12	15	13	12
200002		Auchengate (House)	233700	634078	8.5	11.5	13.1	12.1	11.8	15	13	11.6			
200003		Auchengate (Road)	233731	634067	7.6	10.2	12	10.7	10.5	12	11	11.3			
199811	14	Dalry Rd , Kilwinning	229928	643400	15.3	21.4	25	22.7	20.9	30	25	19	21	21	23
200004		Byrehill , Kilwinning	229520	642319	8.8	12	17	10.9	12.2	13	10	8	13	16	
201101	15	Vernon Street, Saltcoats	224697	641366											23
200703	16	12 Garnock St, Dalry	229326	649250							9	11	15	15	11
200704		69 New St Dalry	229360	649330							28	29	26	30	
200808	17	67 New St, Dalry	229338	649337								34.1	34	33	32
200705	18	45 New St Dalry	229286	649365							48	45	39	37	42
200809		60 New St Dalry	229311	649363								36.1	33	33	
200706		44 New St Dalry	229280	649380							47	45	39	39	
200707		3 Townhead St, Dalry	229222	649344							47	42	33	39	
200708	19	2 Townhead St, Dalry	329230	649338							29	26	25	30	30
199907	20	Highfield Hamlet , Dalry	230943	650280	10.4	15.9	18.9	14	13.6	19	15	15	21	19	20
199812	21	85 Main Street , Largs	220333	659322	13.1	18.7	22.1	22.2	20.2	26	26	22	19	23	19
200005		Goldenberry Farm Road	219199	651163	9.9	4.8	4.4	2.8	4.2	6	5	7.9			
200006		Seamill/ Hunterston Road	220017	650320	4.8	7.7	7.9	5.4	6.9	9	6	5.7			
200007	22	Hunterston Road/Cycle Track	219582	650020	2.8	4.7	4.8	3.3	4.2	6	4	5	8	6	6

New Sampling Site
  Sampling Ceased
  Exceedence Result
  Potential AQMA's

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