



North Ayrshire Council
Comhairle Siorrachd Àir a Tuath



2014 Air Quality Progress Report for North Ayrshire Council

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

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Local Authority Officer	William McNish
Department	Environmental Health Economy and Communities
Address	Cunninghame House, Friars Croft, Irvine, Ayrshire, KA12 8EE
Telephone	01294 324300
e-mail	wmcnish@north-ayrshire.gcsx.gov.uk
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Cover Photo: Main picture view of Island of Arran from Ardrossan; Photo collage.

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 for 2013.

It was predicted that a localised area of south High Street, Irvine would continue to be subject to elevated levels exceeding the NO₂ air quality annual mean objective of 40µg/m³

This year there have been two exceedances again in the air quality objective for NO₂ annual mean concentration of 40µg/m³. The relevant diffusion tubes are both located in the southern area of the High Street and only effect a small localised hotspot around 10m diameter. This area of the High Street in Irvine is used as a bus terminus and adjacent tubes in the same street, 10 metres away, are well within the objective level at 36µg/m³.

Plans approved in June 2013 for a new leisure centre in the vicinity of High Street, Irvine has provided an opportunity to review traffic and pedestrian movements in the town centre with a view to remove the localised hotspot without the need to declare an AQMA. Greater detail is provided within a 2013 Detailed Assessment Report.

The automatic roadside monitoring (ROMON) unit is located nearby and recorded an NO₂ annual mean concentration of 31µg/m³, confirming that compliance with the objective for NO₂ in the majority of High Street, Irvine is being achieved.

The automated monitoring site also tests for airborne particulate matter (PM₁₀) and the annual mean was 21µg/m³ in High Street, Irvine which is an increase from last year (2012). The Scottish annual mean air quality objective for PM₁₀ set at 18µg/m³ was exceeded. European objective of 40µg/m³ was not exceeded for PM₁₀.

To date (June 2014) North Ayrshire has presented the monitoring data from the High Street, Irvine to Strathclyde Passenger Transport and local bus operator Stagecoach and facilitated meetings to achieve a resolution to resolve the elevated levels in the High Street.

Traffic and pedestrian counting and flows have been undertaken together with modelling. The results have been analysed and options discussed with the relevant stakeholders on what is the best action to take to resolve the hotspot issue.

Funds have been applied for from the Local Air Quality Award Scheme and the Council to replace the BAM1020 for a Fidas 200 or TEOM FDMS PM₁₀ analyser and AQ Mesh NO₂ analysers to capture data more frequently and accurately to support better decision making.

The 2013 annual mean for nitrogen dioxide (NO₂) diffusion tube locations in Dalry continue to be below the 40µg/m³ air quality objective with the exception of one tube that exceeded the level at 45µg/m³. Extrapolating the data back to the closest relevant receptor gave a value of 40.8µg/m³, illustrating that the local air quality objectives are borderline in this location. Draft Orders for the A737 Dalry Bypass scheme were published in Spring 2013 and subject to completion of the necessary statutory procedures, construction will start in 2014. The construction of the new bypass will resolve this matter.

NO₂ diffusion tube monitoring will continue in Dalry until after the completion of the new bypass to allow a comparison to be made.

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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 Skelmorlie 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. The installation of Biomass boilers is becoming popular in commercial, educational and leisure facilities.

A map of the area is shown in Figure 1(Appendix 1).

1.2 Purpose of Progress 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 exceedances are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the 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 exceedance of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in **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. This table shows the objectives in units of microgrammes per cubic metre ($\mu\text{g}/\text{m}^3$) and milligrammes per cubic metre (mg/m^3) for carbon monoxide with the number of exceedances in each year that are permitted (where applicable).

Table 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	
Benzene	16.25µg/m ³	Running annual mean	31.12.2003
	3.25µg/m ³	Running annual mean	31.12.2010
1,3-Butadiene	2.25µg/m ³	Running annual mean	31.12.2003
Carbon monoxide	10mg/m ³	Running 8-hour mean	31.12.2003
Lead	0.50µg/m ³	Annual mean	31.12.2004
	0.25µg/m ³	Annual mean	31.12.2008
Nitrogen dioxide	200µg/m³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40µg/m³	Annual mean	31.12.2005
Particulate Matter (PM₁₀) (gravimetric)	50µg/m³ , not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18µg/m³	Annual mean	31.12.2010
Sulphur dioxide	350µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266µg/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.
2003 Updating and Screening Assessment	<p>DMRB screening shows that there were 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>
2004 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 ($40\mu\text{g}/\text{m}^3$) national air quality standard at the end of 2005.</p> <p>With regard to PM_{10}, whilst the predicted estimated annual mean concentration for 2004 ($21.39\mu\text{g}/\text{m}^3$) shall be well below the U.K. Air Quality Objective, for 2010 it is predicted to be $19.75\mu\text{g}/\text{m}^3$, marginally exceeding the much reduced Scottish Air Quality Objective of $18\mu\text{g}/\text{m}^3$.</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>

Report	Summary
<p>2005 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 ($40\mu\text{g}/\text{m}^3$) 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>2006 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 further 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>2007 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 may have concentrations levels in excess of the guideline limit for the annual mean ($40\mu\text{g}/\text{m}^3$) 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>
<p>2008 Progress Report & Detailed Assessment</p>	<p>NO₂ monitoring results for Townhead Street, Dalry and New Street, Dalry show exceedances for the $40\mu\text{g}/\text{m}^3$ 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 75 High Street, Irvine may continue to be subject to concentration levels in excess of the guideline limit for the annual mean ($40\mu\text{g}/\text{m}^3$) national air quality standard.</p> <p>With regard to PM₁₀, whilst the predicted estimated annual mean concentration for 2004 ($21.39\mu\text{g}/\text{m}^3$) shall be well below the U.K. Air Quality Objective, for 2010 it is predicted to be $19.75\mu\text{g}/\text{m}^3$, marginally exceeding the much reduced Scottish Air Quality Objective of $18\mu\text{g}/\text{m}^3$.</p>

Report	Summary
<p>2008 Progress Report & Detailed Assessment (cont)</p>	<p>With regards to Townhead Street/New Street, Dalry North Ayrshire Council shall progress to a detailed assessment of NO₂ 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>2009 Air Quality Updating and Screening Assessment</p>	<p>High Street, Irvine continues to have erratic results bordering on the 40 µg/m³ 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 NO₂ analyser and will allow better analysis of NO₂ 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/m³ at two relevant locations and are consistent in suggesting a strong correlation with previous traffic congestion in the area. At the time of the report, 2009 monitoring had shown a reduction in levels as a result of the new traffic management system put in place.</p>
<p>2010 Progress Report</p>	<p>With regard to nitrogen dioxide (NO₂), 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/m³) 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 exceedances. 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 exceedances for High Street, Irvine, however this area will continue to be intensely monitored until long term trends are established.</p> <p>Previous NO₂ monitoring results (2007 & 2008) for Townhead Street, Dalry and New Street, Dalry showed consistent exceedances for the 40 µg/m³ 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>

Report	Summary
<p>2010 Progress Report (cont)</p>	<p>The 2009 annual mean concentrations for NO₂ diffusion tube locations in Dalry were all below the 40µg/m³ 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>2011 Progress Report & Detailed Assessment</p>	<p>Monitoring data for 2010 has shown that 3 very localised NO₂ diffusion tubes, out of a total of 37, failed to meet the air quality objective. All other NO₂ diffusion tube sites and automatic monitoring complied with the 40µg/m³ NO₂ 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 NO₂ annual mean concentrations of 31µg/m³ and 33µg/m³. All the remaining tubes in the same vicinity ranged between 25µg/m³ and 32µg/m³ confirming that the majority of the street used by the buses complies with the air quality objective and the exceedances are concentrated in a very focused spot.</p> <p>The Scottish air quality objective of 18µg/m³ for PM₁₀, was exceeded by 1µg/m³ in High Street, Irvine. The European Directive air quality directive (40µg/m³) was not exceeded.</p> <p>For the second year running, annual mean concentration of NO₂ 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 NO₂ 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 NO₂ diffusion tubes will continue to be used to provide locally derived bias adjustment factors.</p>

Report	Summary
<p>2012 Progress Report & Detailed Assessment</p>	<p>NO₂ diffusion tube monitoring data for 2011 has shown exceedances for High street Irvine and New Street, Dalry. All other NO₂ diffusion tube sites and automatic monitoring complied with the 40µg/m³ NO₂ air quality objective set out in the directive.</p> <p>The two tubes that failed the objective located in High Street, Irvine are adjacent to a major bus route through the town. This street is the hub of the public transport (buses) serving North Ayrshire.</p> <p>Diffusion tube monitoring has shown that the exceedance area is highly localised and only covers an area approximately 10m wide. The two nearest tubes are about 10m away and both revealed NO₂ annual mean concentrations of 34µg/m³. All the remaining tubes in the vicinity ranged between 25µg/m³ and 34µg/m³, confirming that the street overall complies with the air quality objective and the exceedances are concentrated in one spot.</p> <p>Annual mean concentration of NO₂ in Townhead Street/New Street, generally met the air quality objective, however there was one tube that exceeded the 40µg/m³ objective with a measurement of 42µg/m³. Extrapolating the data back to the receptor would suggest that the actual annual mean would be 38.2µg/m³.</p>
<p>2013 Progress Report & Detailed Assessment</p>	<p>Monitoring results for 2012 indicated that NO₂ diffusion tube data continue to show exceedance of the objective for High street Irvine and New Street, Dalry. All other NO₂ diffusion tube sites and automatic monitoring complied with the 40µg/m³ NO₂ air quality objective.</p> <p>The two tubes located in High Street, Irvine that are adjacent to a major bus route through the town continued to fail the objective. Both the Progress Report and the Detailed assessment showed that the exceedance area only covers an area approximately 10m wide.</p> <p>Plans approved for a new leisure centre in the vicinity of High Street, Irvine has provided an opportunity to move the bus terminus from its present location and to remove the localised hotspot without the need to declare an AQMA.</p> <p>One diffusion tube in New Street, Dalry that failed the 40µg/m³ objective with a measurement of 44µg/m³. Extrapolating the data back to the receptor would suggest that the actual annual mean would be 39.9µg/m³.</p> <p>On 8 February 2012 Ministers announced that preparation work for the A737 Dalry Bypass would commence, with Draft Orders for the scheme in place and subject to completion of the necessary statutory procedures, construction is anticipated to start in 2014. The construction of the new bypass will resolve this matter. This location will continue to be monitored until after the completion of the project..</p>

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

The Groundhog mobile monitoring unit, which was part of a shared monitoring scheme with Inverclyde Council, was replaced by a fixed ROMON unit containing NO₂ analyser and Beta Attenuation Monitor for PM₁₀ in 2009. The ROMON is also the site being used for the co-location tubes.

Occasionally, there had been operational problems with data collection due to gaps in the data being sent via the communication modem. Funding granted in 2012 for the purchase of a web logger has resolved this problem and has ensured better data capture over 2013.

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.

Detail of the automatic monitoring sites is shown in Table 2 overleaf.

All collected data is available on the Scottish Air Quality website www.scottishairquality.co.uk.

Figure 2 Map(s) of Automatic Monitoring Sites

The location of the ROMON is shown on the Irvine High Street maps in Appendix 3.

Table 2 Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
	GroundHog	Roadside	232188	638861		NO2, PM10, CO	Permanently replaced by ROMON beginning of 2009				
CM1	ROMON	Roadside	232188	638861	2.0m	NO2, PM10	No	Chemiluminescence, & Unheated BAM1020	Y ~25m	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 previous Detailed Assessment areas (High Street, Irvine and Townhead/New Street, Dalry).

Figure 3 Map(s) of Non-Automatic Monitoring Sites

Maps of Non-Automatic Monitoring Sites and surrounding areas are included in Appendix 4 whilst their details are shown in table 3 below.

Table 3 Details of Non- Automatic Monitoring Sites

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

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No.	Site ID		Site Type	X OS Grid Ref	Y OS Grid Ref	Site Height (m)	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										
14	201101	Vernon St, Saltcoats	K	224697	641366		NO ₂	N	N	N	1m	Y
15	200703	12 Garnock St, Dalry	UB	229326	649250		NO ₂	N	N	Y (1m)	1.5	N
16	200808	67 New St, Dalry	K	229338	649337		NO ₂	N	N	Y (1m)	2m	Y
17	200705	45 New St Dalry	K	229286	649365		NO ₂	N	N	Y (1m)	1.5m	Y
18	200708	2 Townhead St, Dalry	K	229230	649338		NO ₂	N	N	Y (1m)	2m	Y
19	199907	Highfield Hamlet , Dalry	K	230943	650280		NO ₂	N	N	N	N/A	N
20	199812	85 Main Street , Largs	K	220333	659322		NO ₂	N	N	N	N/A	N
21	200007	Hunterston Road	SP	219582	650020		NO ₂	N	N	N	N/A	N
22	201201	Princes St/Glasgow St, Ardrossan	K	219582	650020		NO ₂	N	N	N	2m	Y

Potential AQMA Locations

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide (NO₂)

Nitrogen dioxide continues to be the primary pollutant of concern in the North Ayrshire district. Key affected areas are High Street, Irvine and Townhead Street/New Street, Dalry. There were exceedances 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 NO₂ diffusion tubes are located ~20cm away from the ROMON sampling inlet. Results are shown in Tables 4 and 5 below.

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 **1.0**.

Table 4 Results of Automatic Monitoring for NO₂: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Annual Mean Concentration (µg/m ³)				
					2009	2010	2011	2012	2013
ROMON	Roadside	N	90	90	26	34	31	31	32

Table 5 Results of Automatic Monitoring for NO₂: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2013 %	Number of Exceedances of Hourly Mean (200 µg/m ³)				
					2009	2010	2011	2012 ^c	2013
ROMON	Roadside	N	90	90	0	1	0	0(117)	0

In **bold**, exceedance of the NO₂ hourly mean AQS objective (200µg/m³ – not to be exceeded more than 18 times per year)

^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

^c If the data capture for full calendar year is less than 90%, include the 99.8th percentile of hourly means in brackets

* Number of exceedences for previous years is optional

Diffusion Tube Monitoring Data

The most recent review of diffusion tube locations was in 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 13 years historical data for NO₂ diffusion tube monitoring annual mean results is included in Appendix 6. The table also reflects all the changes in sampling locations throughout this period.

Results of NO₂ Diffusion Tubes are shown in Tables 6, 7 and 8 below.

Table 6 Results of NO₂ Diffusion Tubes 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2013 (Number of Months or %) ^a	2013 Annual Mean Concentration (µg/m ³) - Bias Adjustment factor = 1
1	35 East Road Irvine	K	N	N	58%	27
2	18 Bank St, Irvine	K	N	N	100%	28
3	147 High Street, Irvine	K	N	N	100%	31
4	85 High St, Irvine	K	N	N	100%	36
5	79 High St, Irvine	K	N	N	100%	59
6	75 High St, Irvine HIGH	K	N	N	100%	48
7	65a High Street, Irvine, (ROMON)	K	N	Triplicate & Collocated	100%	32

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2013 (Number of Months or %) ^a	2013 Annual Mean Concentration ($\mu\text{g}/\text{m}^3$) - Bias Adjustment factor = 1
8	65 High Street, Irvine, (ROMON)	K	N	Triplicate & Collocated	100%	32
9	63 High Street, Irvine, (ROMON)	K	N	Triplicate & Collocated	100%	33
10	34 Kirkgate Irvine	UB	N	N	100%	13
11	25 Main Rd, Springside	K	N	N	100%	17
12	Auchengate (Bridge)	SP	N	N	100%	12
13	Dalry Rd , Kilwinning	K	N	N	100%	23
14	Vernon St, Saltcoats	K	N	N	100%	26
15	Princes St/Glasgow St, Ardrossan	K	N	N	100%	23
16	12 Garnock St, Dalry	UB	N	N	75%	14

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Full Calendar Year Data Capture 2013 (Number of Months or %) ^a	2013 Annual Mean Concentration ($\mu\text{g}/\text{m}^3$) - Bias Adjustment factor = 1
17	67 New St, Dalry	K	N	N	100%	33
18	45 New St Dalry	K	N	N	100%	45
19	2 Townhead St, Dalry	K	N	N	100%	33
20	Highfield Hamlet, Dalry	K	N	N	100%	22
21	85 Main Street, Largs	K	N	N	75%	25
22	Hunterston Road	SP	N	N	100%	7

Potential AQMA Locations

Table 7 Results of NO₂ Diffusion Tubes (2009 to 2013)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m ³					
			2009 (Bias Adjustment Factor = 0.96)	2010 (Bias Adjustment Factor = 0.93)	2011 (Bias Adjustment Factor = 0.79)	2012 (Bias Adjustment Factor = 0.91)	2013 (Bias Adjustment Factor = 1)	
1	35 East Road Irvine	K	N	25	27	23	27	27
2	18 Bank St, Irvine	K	N	26	27	26	28	28
3	147 High Street, Irvine	K	N	29	26	30	31	31
4	85 High St, Irvine	K	N	27	31	34	34	36
5	79 High St, Irvine	K	N	37	50	54	59	59
6	75 High St, Irvine HIGH	K	N	37	41	46	46	48
7	65a High Street, Irvine, (ROMON)	K	N	27	32	30	32	32
8	65 High Street, Irvine, (ROMON)	K	N	29	31	31	31	32

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$					
			2009 (Bias Adjustment Factor = 0.96)	2010 (Bias Adjustment Factor = 0.93)	2011 (Bias Adjustment Factor = 0.79)	2012 (Bias Adjustment Factor = 0.91)	2013 (Bias Adjustment Factor = 1)	
9	63 High Street, Irvine, (ROMON)	K	N	30	31	31	33	33
10	34 Kirkgate Irvine	UB	N	16	14	14	14	13
11	25 Main Rd, Springside	K	N	17	17	16	19	17
12	Auchengate (Bridge)	SP	N	15	13	12	13	12
13	Dalry Rd , Kilwinning	K	N	21	21	23	26	23
14	Vernon St, Saltcoats	K	N				25	26
15	Princes St/Glasgow St Ardrossan	K	N				19.7 (Annualised) (7 months)	23
16	12 Garnock St, Dalry	UB	N	15	15	11	14	14

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$					
			2009 (Bias Adjustment Factor = 0.96)	2010 (Bias Adjustment Factor = 0.93)	2011 (Bias Adjustment Factor = 0.79)	2012 (Bias Adjustment Factor = 0.91)	2013 (Bias Adjustment Factor = 1)	
17	67 New St, Dalry	K	N	34	33	32	36	33
18	45 New St Dalry	K	N	39	37	42	44	45
19	2 Townhead St, Dalry	K	N	25	30	30	33	33
20	Highfield Hamlet, Dalry	K	N	21	19	20	21	22
21	85 Main Street, Largs	K	N	19	23	19	24	25
22	Hunterston Road	SP	N	8	6	6	7	7

In **bold**, exceedance of the NO₂ annual mean AQS objective of 40 $\mu\text{g}/\text{m}^3$

Table 8 Annualised Data

Site: **35 East Road, Irvine** (6 months)

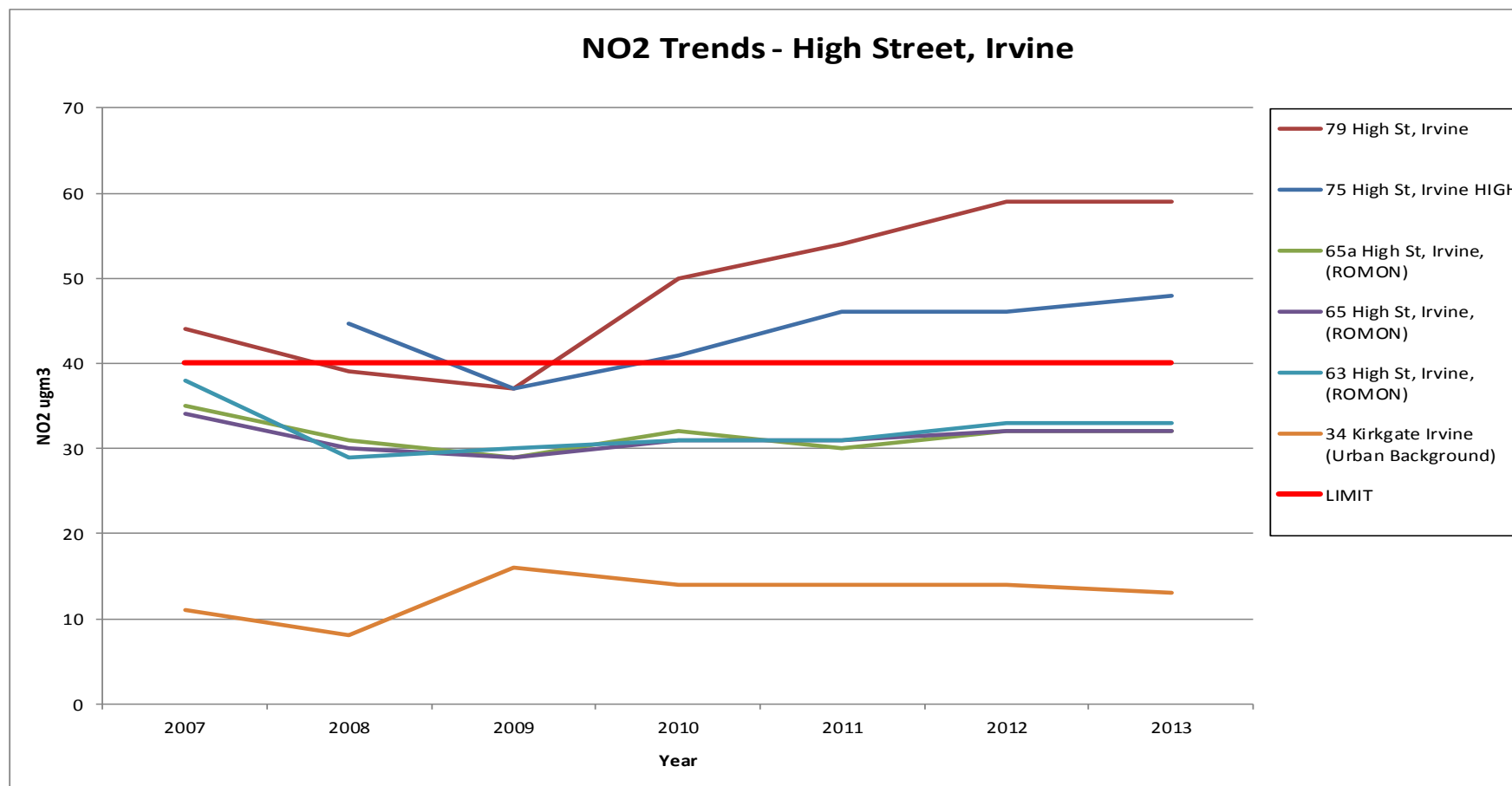
Long Term Site	Annual Mean 2013 (Am)	Period Mean 2013 (Pm)	Ratio (Am/Pm)
Glasgow Anderston	28µg/m ³	28µg/m ³	1
Grangemouth Moray	17µg/m ³	16µg/m ³	1.063
Falkirk Grangemouth MC	20µg/m ³	21µg/m ³	0.952
Average (R_a)			1.005

Data Sources:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Glasgow Anderston	38 99%	42 100%	41 100%	28 85%	25 100%	23 80%	13 93%	13 99%	19 98%	24 99%	55 100%	19 98%
Grangemouth Moray	23 99%	25 100%	28 100%	15 100%	12 100%	11 98%	13 98%	9 100%	13 100%	14 100%	25 100%	11 100%
Falkirk Grangemouth MC	31 99%	31 97%	29 100%	17 99%	16 100%	13 100%	14 94%	13 100%	17 100%	18 100%	30 100%	16 100%

Estimated Annual Mean = Mean Concentration (M) x Average Ratio (R_a) = 58µg/m³ x 1.005 = **58.29µg/m³**

Figure 4 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites



NO₂ annual mean results over the past 6 years at the automatic monitoring station for High Street, Irvine illustrate compliance with the air quality objectives whilst those diffusion tubes located nearby are showing an increase. Comparison with the urban background NO₂ diffusion tube in Kirkgate, Irvine, which has remained steady over the last 3 years, would suggest an actual increase in NO₂ levels for High Street, Irvine.

2.2.2 Particulate Matter (PM₁₀)

The automatic monitoring site (ROMON) also houses a Met-One unheated Beta Attenuation Monitor (BAM) which has been monitoring PM₁₀ since the ROMON was commissioned in February 2009. The monitor is checked every 2 weeks during calibration of the NO₂ 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 Short Term Air Quality objective of “*50µg/m³ (24 Hour Mean) not to be exceeded more than 7 times a year*” has not been exceeded during any monitoring. In 2013 the annual mean objective for PM₁₀ averaged 21µg/m³. Only 9 months data was captured and when annualised gives a result of 20.35µg/m³, confirming non-compliance with the objective of 18µg/m³

The European Air Quality objective of 40µg/m³ has never been exceeded at this location.

The unheated BAM1020 is suspected of over-reading concentrations due moisture and is discussed in greater detail in the Conclusion to this report.

Quality Assurance & Quality Control details are included in Appendix 7.

Table 9 Results of Automatic Monitoring for PM₁₀: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %	Valid Data Capture 2013 %	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m ³				
						2009	2010	2011	2012	2013
ROMON	Roadside	N	69	69	Y (Factor 0.83333)	18	19	18	17	21

In bold, exceedance of the PM₁₀ annual mean AQS objective of 18µg/m³

Table 10 Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %	Valid Data Capture 2013 %	Confirm Gravimetric Equivalent	Number of Exceedances of 24-Hour Mean (50 µg/m ³)				
						2009	2010	2011	2012	2013
ROMON	Roadside	N	69	69	Y (Factor 0.83333)	1	0	0	2	1

In bold, exceedance of the PM₁₀ daily mean AQS objective (50µg/m³ – not to be exceeded more than 7 times per year)

Table 8 Annualised DataSite: **High St., Irvine – BAM1020** (9 months)

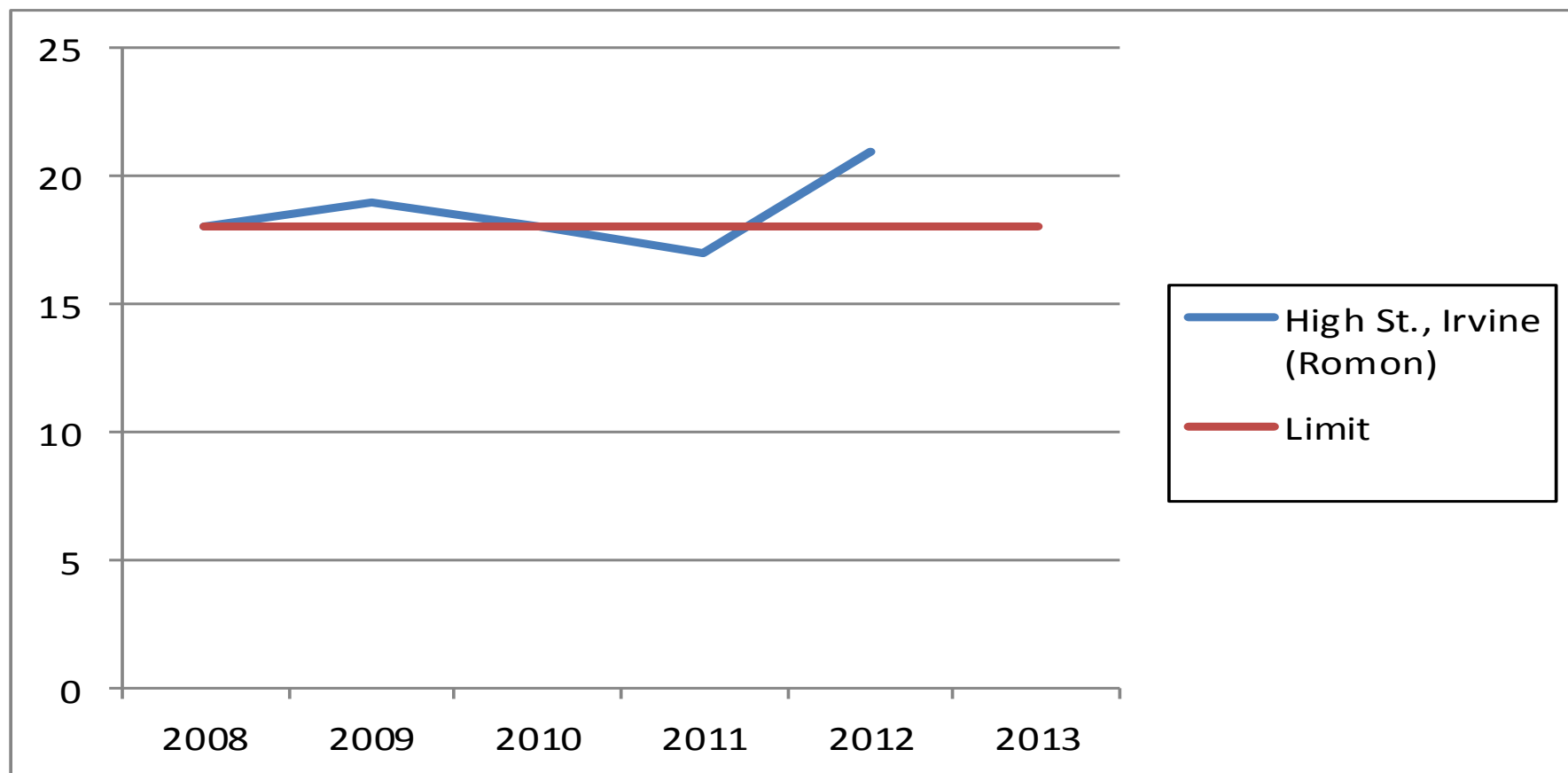
Long Term Site	Annual Mean 2013 (Am)	Period Mean 2013 (Pm)	Ratio (Am/Pm)
Glasgow Anderston	16µg/m ³	16.4µg/m ³	0.976
Glasgow Waulkmillglen	12µg/m ³	12.4µg/m ³	0.978
North Lan. Cumbernauld	14µg/m ³	14.7µg/m ³	0.952
Average (R_a)			0.969

Data Sources:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Glasgow Anderston	17	20	22	18	15	14	16	12	14	13	19	14
	99%	100%	100%	85%	98%	44%	87%	100%	96%	99%	98%	98%
Glasgow Waulkmillglen	11	13	15	14	12	11	14	11	11	12	10	11
	94%	95%	99%	95%	91%	88%	99%	95%	98%	96%	99%	96%
North Lan. Cumbernauld	13	17	18	15	12	13	16	16	13	14	14	12
	94%	92%	100%	100%	94%	82%	85%	41%	98%	85%	93%	100%

Estimated Annual Mean = Mean Concentration (M) x Average Ratio (R_a) = 21µg/m³ x 0.969 = **20.35µg/m³**

Figure 5 Trends in Annual Mean PM10 Concentrations Measured at Automatic Monitoring Station (ROMON)



PM10 annual mean results illustrate a fluctuation around the air quality objectives for High Street, Irvine, between 2008 and 2011 however there has been a steady increase since then.

2.2.3 Sulphur Dioxide (SO₂)

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 NO₂ 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. Following a review of staff resources and analysis of the long term sampling results were no significant changes were noted therefore sampling ceased in September 2013.

2.2.6 Summary of Compliance with AQS Objectives

North Ayrshire Council has measured concentrations of **Nitrogen Dioxide** above the **annual** mean objective at relevant locations. However, as a Detailed Assessment was carried out in 2013 and discussions are on-going with Strathclyde Passenger Transport, the local bus operator and NAC Roads Dept to address the issues and there is no further information to present, therefore North Ayrshire Council **will not need to proceed to a Detailed Assessment***, for **High Street, Irvine at this time.**

*There were 3 failures for NO₂ diffusion tubes within North Ayrshire which were located in:

- **High Street, Irvine – *Detailed assessment available (2013 report)**
This is a known hot spot anomaly at a bus stance and is well documented in previous reports. All other tubes in this street were all below the local air quality objectives.
- **New Leisure Centre Proposals, Townhead Street, Irvine**
These proposals have presented the opportunity to review the whole traffic system within the town centre area.
- **Townhead Street/New Street, Dalry**
The proposed bypass to serve Dalry will remove the bulk of the traffic affecting this area. The scheme is now progressing through its advanced preparatory stages at this time.

There is a separate Detailed Assessment Report (2013) which has considered the exceedances at the High Street, Irvine and is available at

<http://www.north-ayrshire.gov.uk/Documents/CorporateServices/LegalProtective/EnvironmentalHealth/detailed-assessment-of-nitrogen-dioxide-concentrations-high-street-irvine.pdf>

3 New Local Developments

3.1 Road Traffic Sources

North Ayrshire Council confirms that there are no new road traffic sources.

3.2 Other Transport Sources

North Ayrshire Council confirms that there are no new sources from other transport.

3.3 Industrial Sources

North Ayrshire Council confirms that there are no new industrial sources.

3.4 Commercial and Domestic Sources

North Ayrshire Council confirms that there are two new sources in the Local Authority area:

1. Hoval BioLyt 130kW wood pellet biomass boiler installed at Irvine East Primary School under Planning Application 12/00228/PPM. The necessary emission calculations demonstrated that there would be no detrimental effect on local air quality.
2. Hertz Energietechnik Biofire 800kW wood chip biomass boiler installed at Auchrannie House Hotel, Brodick, Island of Arran under Planning Application 13/00665/PP. The necessary emission calculations demonstrated that there would be no detrimental effect on local air quality.

New Developments with Fugitive or Uncontrolled Sources

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

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

North Ayrshire Council confirms that all the following have been considered:

- **Road traffic sources**
- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

4 Planning Applications

The proposal for a new leisure centre in High Street, Irvine was approved in June 2013 and ground clearance and preparation works have commenced.

Planning permission was granted to install a new long stay car park in East Road, Irvine to ease pressure on existing car parking within the town centre area and to accommodate visitors who will visit the new leisure centre which is to be constructed.

The streetscaping within Brigdegate of Irvine town centre is underway and the next phase will include High Street, in due course.

As part of the town centre regeneration the roads and street infrastructure and bus routes are currently under review. Environmental Health is continuing to liaising with Development Planning (Roads), local bus operator and Strathclyde Passenger Transport regarding the pollution hotspot in High Street, Irvine with a view to resolving the issue.

North Ayrshire Council has proposed to install biomass boilers within twelve of its schools to supplement their existing boiler system. Discussions are at an early stage. If this project progresses it is anticipated that further information will be presented in the 2015 Updating & Screening Assessment as necessary.

5 Conclusions and Proposed Actions

5.1 Conclusions from New Monitoring Data

NO₂ diffusion tube monitoring data for 2013 has shown exceedances for High street Irvine and New Street, Dalry. All other NO₂ diffusion tube sites and automatic monitoring complied with the 40µg/m³ NO₂ air quality objective set out in the directive. See Appendices 11-16 for Irvine and Appendices 17-23 for Dalry.

The two tubes that continue to fail the objective are located in the southern area of High Street, Irvine and are adjacent to a major bus route through the town which has been well documented and has been the main focus of the 2013 Detailed Assessment.

Diffusion tube monitoring has shown that the exceedance area continues to be highly localised and only covers an area approximately 10m wide. The two next immediate tubes are about 10m away and both revealed NO₂ annual mean concentrations of 36µg/m³, or less, which is consistent with all other NO₂ monitoring locations in the town centre.

The objective continues to be exceeded for one NO₂ diffusion tube in New Street, Dalry

PM10 monitoring data from the roadside automatic monitoring station (ROMON) has shown exceedances for High Street, Irvine. The instrument used in this location is an unheated BAM1020 and the data capture was 69% (Jan-Sep) as a fault developed in the instrument. During the monitoring period street works within the High Street and Bridegate area often occurred in close proximity to the BAM1020. Street works included building façade cleaning and pavement excavation for services upgrading. Due to the restrictive area the contractor's compound was also located nearby and construction materials and equipment were transported past the monitoring location. Therefore the BAM1020 may have been exposed to elevated levels of local construction dust. There is a growing awareness amongst practitioners that unheated BAM1020 may also be sensitive to moisture and therefore, considering the coastal location of Irvine, higher concentrations are being recorded. Early results of a colocation study with an unheated BAM1020 and TEOM FDMS in the nearby East Ayrshire town of Kilmarnock would suggest that this is the case as TEOM FDMS results show a close, but much lower, correlation to the BAM1020 results.

5.2 Conclusions relating to New Local Developments

Irvine

Ground and preparatory works have started for the new town centre leisure centre. The significant regeneration of the town centre area will act as a catalyst to facilitate changes which are expected to address the pollution hotspot in High Street, Irvine.

The existence of a small localised hotspot in High Street is well documented in previous Progress Reports and was examined in the recent 2013 Detailed Assessment. All information indicates that the main contributor to the problem are the buses which use High Street.

As part of the complete regeneration of the town centre, the bus routes and bus stops will be reviewed and subject to change with the primary objective of addressing the excess numbers of buses clustering in the south end of the High Street. NO₂ monitoring data will be presented to Development Plans (Roads), Strathclyde Passenger Transport and local bus operator Stagecoach and meetings will take place between these groups to discuss the elevated levels and devise options to resolve the matter.

The 129 long stay car park on East Road was assessed to have no detrimental effect on local air quality.

Dalry

The objective continues to be exceeded for one NO₂ diffusion tube in New Street, Dalry however in 2012 Ministers announced that the A737 Dalry Bypass would commence. According to Transport Scotland the scheme is progressing through its advanced preparatory stages at this time and subject to completion of the necessary statutory procedures, construction is expected to start in 2014.

Biomass

The biomass boilers installed at Auchrannie House Hotel on the Island of Arran and the new East Irvine Primary School were assessed to have no detrimental effect on local air quality.

5.3 Proposed Actions

Irvine

Air quality in North Ayrshire continues to comply with the air quality objectives laid out in the directives with the exception of a very unique and abnormal hotspot located in southern area of High Street, Irvine. All other sections of High Street easily comply with the air quality objective of $40\mu\text{g}/\text{m}^3$ with annual levels of NO_2 for 2013 as low as $31\mu\text{g}/\text{m}^3$ and not exceeding $36\mu\text{g}/\text{m}^3$. In other parts of the town the levels are as low as $27\mu\text{g}/\text{m}^3$ (East Road) down to $13\mu\text{g}/\text{m}^3$ (Kirkgate).

The guidance suggests that where there are exceedances in air quality objectives then an Air Quality Management Area (AQMA) should be declared and subsequent action plans prepared to address the problems. Considering the scale of the single hotspot in High Street, Irvine, together with total compliance of the NO_2 objective elsewhere in the whole street and the rest of the town, it is still felt this may be a disproportionate course of action to remedy the situation.

Declaring an AQMA can be a long and protracted process and can place significant demands on resources. The town centre regeneration works are well underway and discussions are already taking place to consider how the bus routes serve the town centre and the roads that they will utilise.

In order to achieve a speedy resolution, North Ayrshire is capitalising on the fortuitous timing of the regeneration of the town centre to utilise this opportunity to make the necessary changes to achieve the required reduction in NO_2 at the High Street, Irvine hotspot, thereby achieving the same objectives and outcome as an AQMA without the need to declare.

Actions to date (June 2014) include: Environmental Health has presented the monitoring data for High Street, Irvine bus operator Stagecoach and Strathclyde Passenger Transport. The results of additional bus and passenger movement studies that have been undertaken have also been presented to Stagecoach together with proposed options to relocate various bus stops. S-Paramic modelling has been undertaken by SIAS Transport Planners for the whole of the town centre area and feeder junctions; there has been renewed focus on enforcement of an existing Traffic Management Order by Police Scotland; maintenance and adjustment of traffic light signals to ensure efficient operation and priority given to High Street South and funding has been confirmed for the purchase of new monitoring equipment.

Environmental Health will continue to facilitate stakeholder meetings to achieve a resolution to resolve this matter.

Traffic and pedestrian counting and flows will be undertaken together with modelling. The results will be analysed and options discussed with the relevant stakeholders on what is the best action to take to resolve the hotspot issue.

Funds will be applied for from the Local Air Quality Award Scheme and the Council to replace the BAM1020 with a Fidas 200 or TEOM FDMS PM₁₀ analyser and AQ Mesh NO₂ analysers to capture data more frequently and accurately to support better decision making.

No additional Detailed Assessment is proposed for 2013 at this time.

Dalry

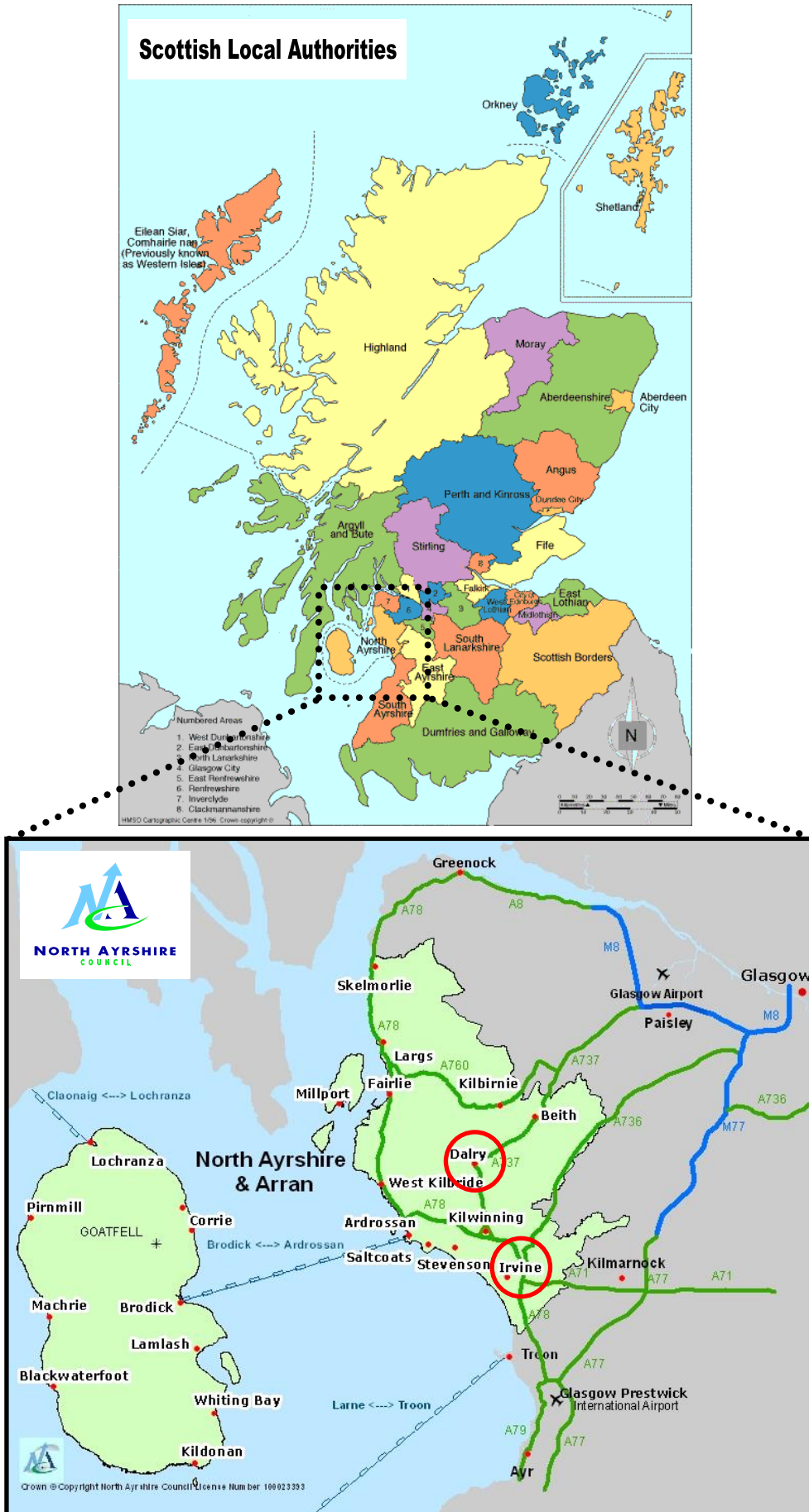
NO₂ diffusion tube monitoring will continue until after the completion of the new bypass to allow a comparison to be made.

6 References

1. Local Air Quality Management, Technical Guidance LAQM.TG (09), February 2009.
2. Checking Precision and Accuracy of Triplicate Tubes (Version 04 - Feb 2011). (Appendix 5)
3. WASP Summary – PT 117-124 - Summary of Laboratory Performance in WASP NO₂ Proficiency Testing Scheme for Rounds 117-124. (LAQM Helpdesk – April 2014)
4. Detailed Assessment of Nitrogen Dioxide Concentrations in High Street, Irvine for North Ayrshire Council – Feb 2013 (TSI Scotland)

Appendices

Appendix 1: Figure 1. District Map of Locality & Surrounding Area



Appendix 2: AEA Air Pollution Report

Air Pollution Report

Produced by RICARDO-AEA on behalf of the Scottish Government

NORTH AYRSHIRE IRVINE HIGH ST 1st January to 31st December 2013

These data have been fully ratified by RICARDO-AEA

POLLUTANT	PM ₁₀₊	NO ₂	NO _x
Maximum hourly mean	98 µg m ⁻³	174 µg m ⁻³	478 µg m ⁻³
Maximum daily mean	51 µg m ⁻³	119 µg m ⁻³	258 µg m ⁻³
99.8th percentile of hourly means	-	147 µg m ⁻³	363 µg m ⁻³
98.08th percentile of daily means	34 µg m ⁻³	-	-
Average	21 µg m ⁻³	32 µg m ⁻³	70 µg m ⁻³
Data capture	69.0 %	90.4 %	90.4 %

* PM₁₀ Indicative Gravimetric Equivalent µg m⁻³+ PM₁₀ instruments:BAM using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent from 1st January 2013

All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.

NO_x mass units are NO_x as NO₂ µg m⁻³

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
PM ₁₀ Particulate Matter (Gravimetric)	Daily mean > 50 µg m ⁻³	1	1
PM ₁₀ Particulate Matter (Gravimetric)	Annual mean > 18 µg m ⁻³	1	-
Nitrogen Dioxide	Annual mean > 40 µg m ⁻³	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m ⁻³	0	0

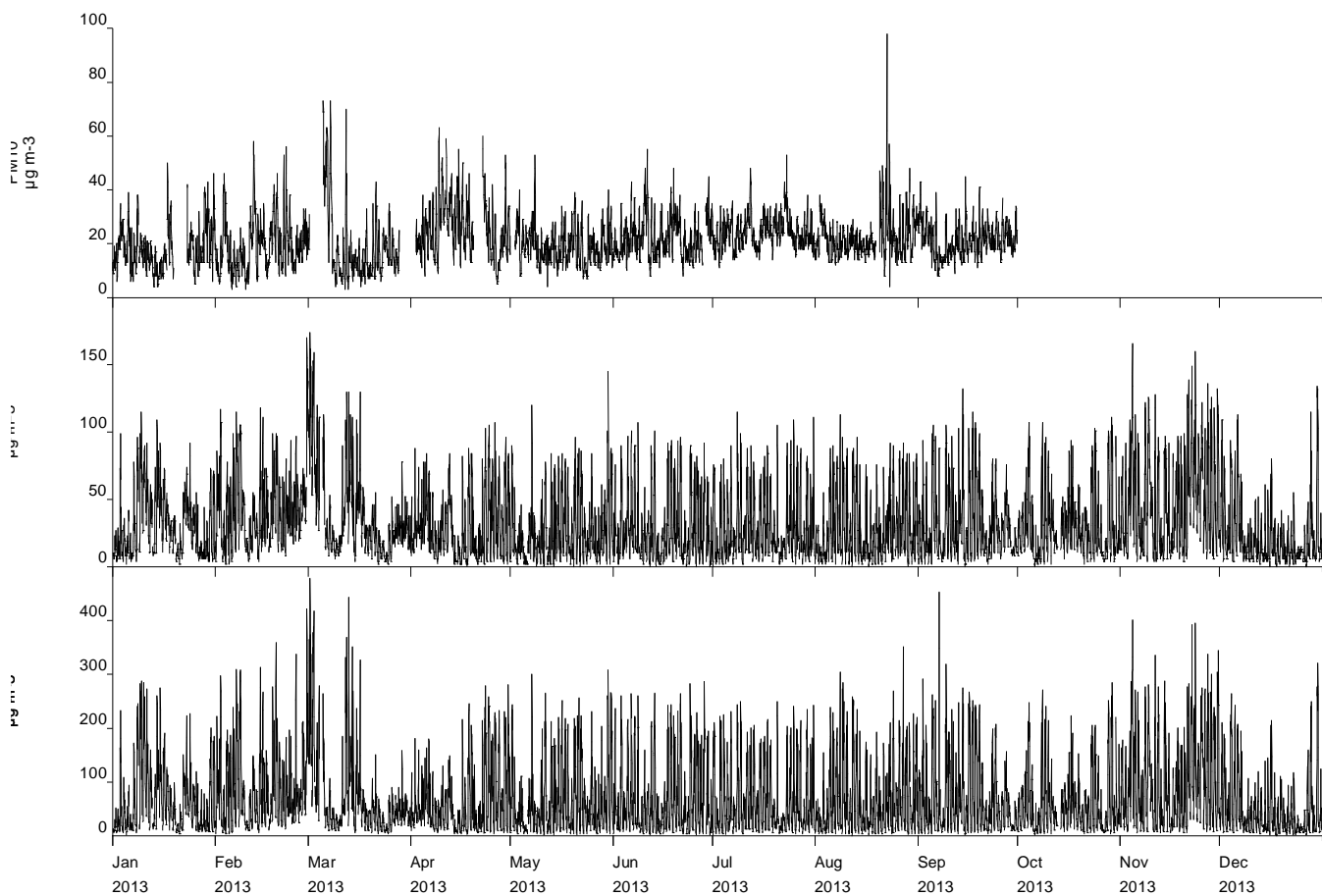
Note: For a strict comparison against the objectives there must be a data capture of >90% throughout the calendar year

Appendix 2: AEA Air Pollution Report (cont)

Air Pollution Report

Produced by Ricardo-AEA on behalf of the Scottish Government

North Ayrshire Irvine High St
Hourly Mean Data for 1st January to 31st December 2013



Date Created: 08/04/2014



SERVICE REPORT



Customer: <input type="text" value="NorthAyrshire"/>	Job No: <input type="text" value="RJM30310513"/>	Start Date: <input type="text" value="30 May 13"/>
Site Name: <input type="text" value="High St., Irvine"/>	Time Start: <input type="text" value="10:00"/>	End Date: <input type="text" value="31-May-13"/>
	Time End: <input type="text" value="10:30"/>	

Reason for visit:

Action Taken:
 Nox monitor serviced and re calibrated with new bottle of gas, Cell cleaned and restrictors blown out, orings replaced and sinterd filter replaced also, fan checked, pump rebuilt, zero and span calibration performed all ok.

Bam service head cleaned, nozzle cleaned and self test passed flow checked and calibrated ok, tape test passed, count pre and post ok.

New gasbottle deliverd to site and installed.

Parts Used

Part No:	Description:	Qty	Invoice
	Consumables	1	
	gas bottle no gas	1	
	restrictor o rings	4	
	sinter filters	2	

Engineer:

Visit Type:

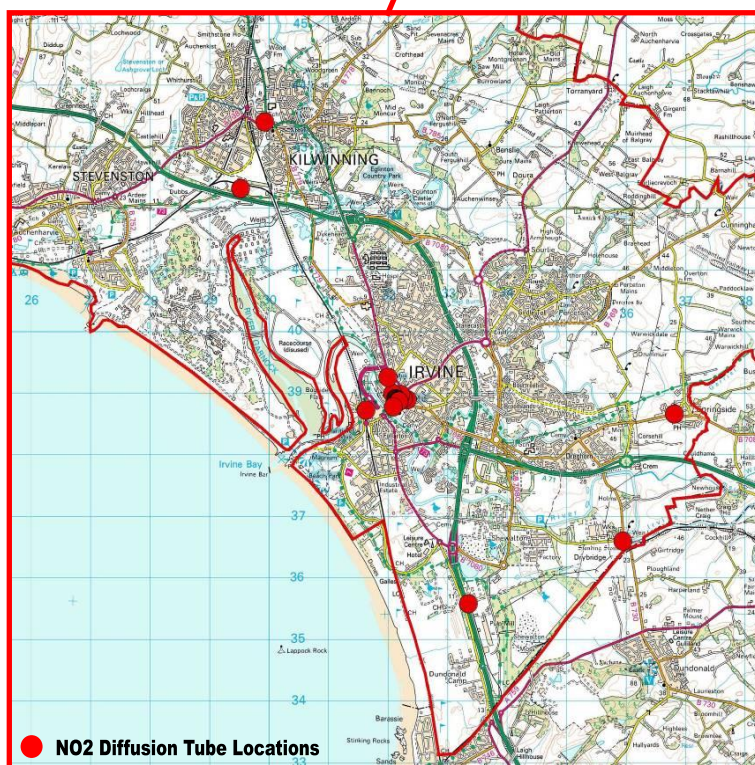
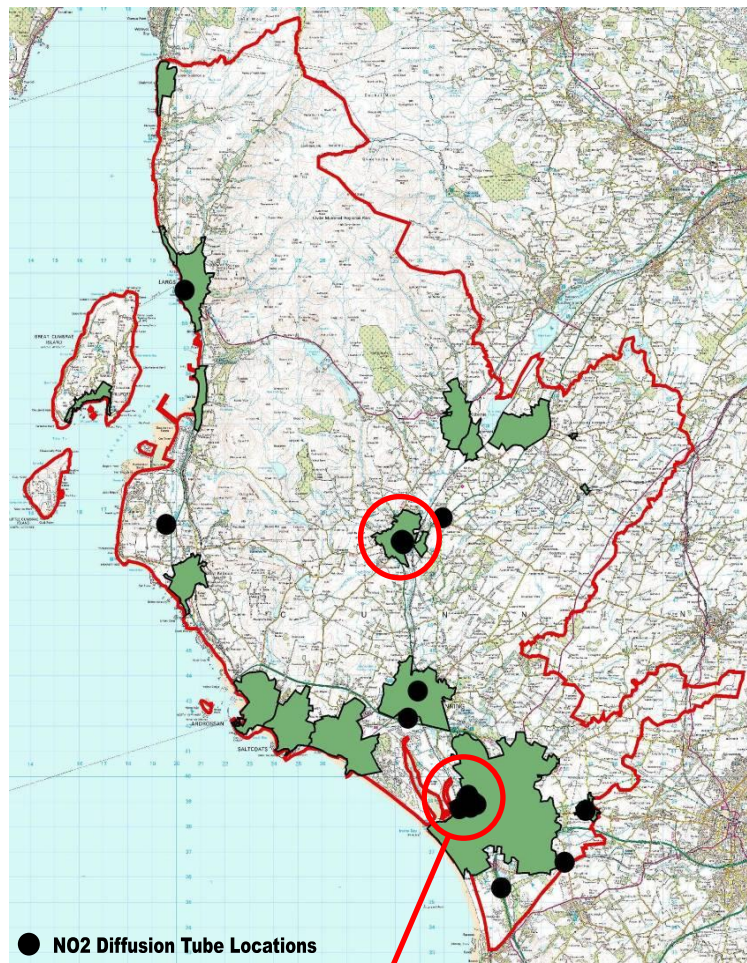
Complete site inventory

Appendix 3: Figure 2 Automatic Monitoring Site Location



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Appendix 4: Figure 3 Map of Non Automatic Monitoring Sites



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 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	07/01/2013	30/01/2013	34.7	36.0	34.9	35	0.7	2	1.7
2	30/01/2013	28/02/2013	35.1	35.0	36.1	35	0.6	2	1.5
3	28/02/2013	28/03/2012	26.2	27.2	28.3	27	1.1	4	2.7
4	28/03/2012	24/04/2012	25.7	28.0	26.0	27	1.2	5	3.0
5	24/04/2012	29/05/2012	31.7	32.1	34.7	33	1.6	5	4.0
6	29/05/2012	26/06/2012	38.1	39.1	36.8	38	1.1	3	2.8
7	26/06/2012	31/07/2013	35.0	34.2	36.5	35	1.2	3	3.0
8	31/07/2013	28/08/2013	31.9	28.3	30.4	30	1.8	6	4.5
9	28/08/2012	02/10/2013	31.9	32.4	28.6	31	2.0	7	5.1
10	02/10/2013	30/10/2013	32.8	31.3	33.5	33	1.1	4	2.8
11	30/10/2013	04/12/2013	36.5	39.1	40.9	39	2.2	6	5.4
12	04/12/2013	08/01/2014	23.0	23.3	24.4	24	0.7	3	1.8
13									

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
34	90.2	Good	Good
40	91.2	Good	Good
41	88.1	Good	Good
27	91.1	Good	Good
28	90.6	Good	Good
30	90.5	Good	Good
29	90.4	Good	Good
28	90.5	Good	Good
31	90.5	Good	Good
32	86.9	Good	Good
47	91.2	Good	Good
20	91.6	Good	Good

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

Overall survey -->

Good precision Good Overall DC

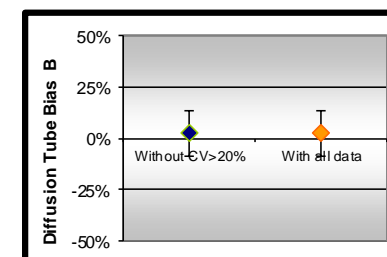
Site Name/ ID: High Street, Irvine

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

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	1 (0.9 - 1.13)
Bias B	0% (-11% - 11%)
Diffusion Tubes Mean:	32 μgm^{-3}
Mean CV (Precision):	4
Automatic Mean:	32 μgm^{-3}
Data Capture for periods used:	90%
Adjusted Tubes Mean:	32 (29 - 36) μgm^{-3}

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	1 (0.9 - 1.13)
Bias B	0% (-11% - 11%)
Diffusion Tubes Mean:	32 μgm^{-3}
Mean CV (Precision):	4
Automatic Mean:	32 μgm^{-3}
Data Capture for periods used:	90%
Adjusted Tubes Mean:	32 (29 - 36) μgm^{-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	33.5			25.2				22.9	25.9	26.6	31.9	23.6		27.1	7
2. 18 Bank St, Irvine (Pitchers)	41.6	33.5	29.4	30.9	23.1	21.6	24.0	22.2	22.3	28.1	30.0	30.8		28.1	12
3. 147 High Street, Irvine	40.5	34.0	28.2	32.0	23.9	27.4	32.1	29.7	24.3	32.8	34.1	33.1		31.0	12
4. 85 High St, Irvine	33.9	37.8	27.9	32.8	35.9	37.2	37.7	38.4	32.2	33.5	42.9	39.9		35.8	12
5. 79 High St, Irvine	58.0	34.8	37.1	46.3	59.9	82.4	90.5	70.6	59.5	48.4	66.3	48.5		58.5	12
6. 75 High St, Irvine (HIGH)	42.4	45.3	29.9	37.6	57.6	57.3	66.1	50.5	41.7	48.3	58.8	35.4		47.6	12
7. 65a High Street, Irvine	34.7	35.1	26.2	25.7	31.7	38.1	35.0	31.9	31.9	32.8	36.5	23.0		31.9	12
8. 65 High Street, Irvine	36.0	35.0	27.2	28.0	32.1	39.6	34.2	28.3	32.4	31.3	39.1	23.3		32.2	12
9. 63 High Street, Irvine	34.9	36.1	28.3	26.0	34.7	36.8	36.5	30.4	28.6	33.5	40.9	24.4		32.6	12
10. 34 Kirkgate Irvine	22.8	20.3	17.1	12.3	7.4	9.5	9.6	7.9	10.8	12.7	17.8	10.1		13.2	12
11. 25 Main Rd, Springside	25.8	24.4	17.5	15.4	12.7	15.0	15.5	13.6	9.2	17.6	26.1	13.4		17.2	12
12. Auchengate (Bridge)	17.5	17.4	14.3	10.7	9.8	12.1	9.8	9.1	9.4	11.7	14.9	9.1		12.2	12
13. Dalry Rd , Kilwinning	23.8	29.3	23.3	25.8	10.9	23.5	19.0	17.5	20.8	25.3	27.2	24.6		22.6	12
14. Vernon St, Saltcoats	29.8	31.2	25.1	24.5	23.6	28.5	28.0	25.1	23.0	26.0	27.8	17.5		25.8	12
15. Princes St/Glasgow St	29.8	28.3	27.1	28.4	17.2	22.5	22.1	16.4	20.8	23.6	21.5	13.1		22.6	12
16. 12 Garnock St, Dalry	29.4	21.5	18.4	15.2	8.2	9.8		7.9	7.4	12.4	15.6	8.8		14.1	11
17. 67 New St Dalry	37.7	49.1	27.0	26.9	30.0	36.0	32.8	34.2	36.1	34.0	28.0	21.6		32.8	12
18. 45 New St, Dalry	49.1	46.7	32.1	35.9	39.2	50.5	47.4	47.0	41.0	46.2	61.5	41.5		44.8	12
19. 2 Townhead St, Dalry	43.4	39.3	29.9	32.9	29.7	31.6	32.0	29.6	30.0	31.2	41.1	26.8		33.1	12
20. Highfield Hamlet	35.4	28.9	26.4	23.8	16.4	19.0	20.9	17.8	20.6	21.3	23.7	12.9		22.3	12
21. 85 Main St, Largs	26.4	34.1	26.5	26.4	23.9	32.0		22.0	24.1	21.4	29.2	13.2		25.4	11
22. HunterstonRd/Cycle track	13.2	10.8	9.7	7.4	5.1	6.4	6.2	5.3	7.3	8.3	6.9	1.9		7.4	12

Adjusted measurement (95% confidence interval) with all the data
12 periods used in this calculations

Bias Factor A 1 (0.9 - 1.13)
Bias B 0% (-11% - 11%)

Tube Precision: 4 Automatic DC: 90%

Adjusted with 95% CI	27 (24 - 31)
Adjusted with 95% CI	28 (25 - 32)
Adjusted with 95% CI	31 (28 - 35)
Adjusted with 95% CI	36 (32 - 41)
Adjusted with 95% CI	59 (53 - 66)
Adjusted with 95% CI	48 (43 - 54)
Adjusted with 95% CI	32 (29 - 36)
Adjusted with 95% CI	32 (29 - 36)
Adjusted with 95% CI	33 (29 - 37)
Adjusted with 95% CI	13 (12 - 15)
Adjusted with 95% CI	17 (15 - 19)
Adjusted with 95% CI	12 (11 - 14)
Adjusted with 95% CI	23 (20 - 26)
Adjusted with 95% CI	26 (23 - 29)
Adjusted with 95% CI	23 (20 - 25)
Adjusted with 95% CI	14 (13 - 16)
Adjusted with 95% CI	33 (30 - 37)
Adjusted with 95% CI	45 (40 - 51)
Adjusted with 95% CI	33 (30 - 37)
Adjusted with 95% CI	22 (20 - 25)
Adjusted with 95% CI	25 (23 - 29)
Adjusted with 95% CI	7 (7 - 8)

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: Historical NO₂ Diffusion Tube Results (2001 – 2013)

URN	Tube No.s in Report	RESULTS IN UG/M3	EAST INGS	NORTH INGS	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
											Bias 0.83	Bias 0.87	Bias 0.96	Bias 0.93	Bias 0.79	Bias 0.91	Bias 1
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	27	27
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	28	28
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	31	31
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	34	36
199807	5	79 High St, Irvine	232169	638878	30.7	40.8	49.6	45.6	31.2	43	44	39	37	50	54	59	59
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	46	48
200807	7	71 High St, Irvine	232174	638868								34.8	29	33	34	42	
199901	8	65a High St, Irvine, (ROMON)	232182	638867	8.5	30.9	33.1	37	28.9	37	35	31	27	32	30	32	32
200701	9	65 High St, Irvine, (ROMON)	232182	638867							34	30	29	31	31	32	32
200702	10	63 High St, Irvine, (ROMON)	232182	638867							38	29	30	31	31	33	33
199809	11	34 Kirkgate Irvine	232085	638774	8.5	13.9	15.9	11	11.5	14	11	8	16	14	14	14	13
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	19	17
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	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	26	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	25	26
200703	16	12 Garnock St, Dalry	229326	649250							9	11	15	15	11	14	14
200704		69 New St Dalry	229360	649330							28	29	26	30			
200808	17	67 New St, Dalry	229338	649337								34.1	34	33	32	36	33
199705	18	45 New St Dalry	229286	649365							48	45	39	37	42	44	45
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	33	33
199907	20	Highfield Hamlet , Dalry	230943	650280	10.4	15.9	18.9	14	13.6	19	15	15	21	19	20	21	22
199812	21	85 Main Street , Largs	220333	659322	13.1	18.7	22.1	22.2	20.2	26	26	22	19	23	19	24	25
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	7	7
201201	7a	Princes St/Glasgow St														20	23

Exceedence Result

Potential AQMA's

Appendix 7: QA:QC Data

Diffusion Tube Bias Adjustment Factors

Diffusion tubes (20% TEA/Water) used in the sampling period for 2013 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



National Diffusion Tube Bias Adjustment Factors (Version No. 03/14) for tubes provided by Gradko Environmental are listed in Appendix 8. The resultant bias for Gradko Environmental is **0.95** based on 24 studies.

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 at this site 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.

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 2013 data is **1**.

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.

The NO_x analyser inlet and all 3 triplicate tubes are located inside the cage on top of the ROMON cabinet in very close proximity to each other ensuring accurate comparison. Good robust QA/QC for the analyser in terms of fortnightly checks and

routine contracted maintenance along with data validated and ratified by AEA allows for strong confidence in selecting the local bias factor for the data contained in this report.

PM Monitoring Adjustment

The automatic monitoring station (ROMON – BAM) is visually checked every 2 weeks during the NO_x calibration check. The inlet head and tape carrier are inspected and cleaned each time the filter tape is replaced. The PM₁₀ data collected by the ROMON is processed and ratified by AEA Technologies. The Air Pollution Report for North Ayrshire, Irvine High Street for 1st January 2012 to 31st December 2013 is included in Appendix 2.

QA/QC of Automatic Monitoring

The automatic monitoring station (ROMON – NO_x) 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. Reports from these visits are included in Appendix 2.

QA/QC of Diffusion Tube Monitoring

Workplace Analysis Scheme for Proficiency (WASP) for the diffusion tube provider is provided in Appendix 9.

Appendix 8: Bias Factor Spreadsheet (Gradko)

National Diffusion Tube Bias Adjustment Factor Spreadsheet							Spreadsheet Version Number: 03/14				
Follow the steps below in the correct order to show the results of relevant co-location studies										This spreadsheet will be updated at the end of June 2014 LAQM Helpdesk Website	
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods											
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet											
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.											
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	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor ³ shown in blue at the foot of the final column.								
If 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 ²	If you have your own co-location study then see footnote ⁴ . If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953								
Analysed By ¹	Method <small>To undo your selection, choose (All) from the pop-up list</small>	Year ² <small>To undo your selection, choose (All)</small>	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m ³)	Automatic Monitor Mean Conc. (Cm) (µg/m ³)	Bias (B)	Tube Precision ⁵	Bias Adjustment Factor (A) (Cm/Dm)	
Gradko	20% TEA in w ater	2013	R	Cheshire West and Chester	12	39	41	-4.4%	G	1.05	
Gradko	20% TEA in Water	2013	R	Dudley MBC	12	38	31	23.1%	G	0.81	
Gradko	20% TEA in Water	2013	UB	Dudley MBC	10	25	25	-1.7%	G	1.02	
Gradko	20% TEA in Water	2013	R	Dudley MBC	11	41	39	5.4%	G	0.95	
Gradko	20% TEA in w ater	2013	R	East Herts Council	10	35	30	19.4%	G	0.84	
Gradko	20% TEA in w ater	2013	R	Fareham Borough Council	9	34	34	2.0%	G	0.98	
Gradko	20% TEA in w ater	2013	R	Fareham Borough Council	12	42	45	-6.2%	G	1.07	
Gradko	20% TEA in w ater	2013	R	Gateshead Council	11	34	37	-8.7%	G	1.10	
Gradko	20% TEA in w ater	2013	R	Gateshead Council	11	35	33	6.3%	G	0.94	
Gradko	20% TEA in w ater	2013	R	Gateshead Council	10	33	32	2.1%	G	0.98	
Gradko	20% TEA in w ater	2013	R	Borough Council of King's Lynn & West Norfolk	12	29	26	12.5%	G	0.89	
Gradko	20% TEA in w ater	2013	R	Gedling Borough Council	10	37	35	7.2%	G	0.93	
Gradko	20% TEA in w ater	2013	R	The Highland Council	12	24	21	14.1%	G	0.88	
Gradko	20% TEA in Water	2013	R	Dudley MBC	12	52	59	-12.0%	P	1.14	
Gradko	20% TEA in w ater	2013	R	NOTTINGHAM CITY COUNCIL	12	43	44	-2.2%	G	1.02	
Gradko	20% TEA in w ater	2013	R	NOTTINGHAM CITY COUNCIL	10	41	39	6.4%	G	0.94	
Gradko	20% TEA in w ater	2013	R	NOTTINGHAM CITY COUNCIL	11	43	42	1.9%	G	0.98	
Gradko	20% TEA in w ater	2013	R	Brighton & Hove City Council	11	62	60	1.9%	G	0.98	
Gradko	20% TEA in w ater	2013	R	Brighton & Hove City Council	11	41	30	37.5%	G	0.73	
Gradko	20% TEA in w ater	2013	KS	Marylebone Road Intercomparison	12	101	81	25.8%	G	0.80	
Gradko	20% TEA in Water	2013	R	Brighton & Hove City Council	9	54	45	19.6%	G	0.84	
Gradko	20% TEA in w ater	2013	R	Wiltshire Council	12	40	36	10.1%	G	0.91	
Gradko	20% TEA in w ater	2013	R	Wiltshire Council	11	41	37	11.6%	G	0.90	
Gradko	20% TEA in w ater	2013	R	Wiltshire Council	12	39	49	-20.0%	G	1.25	
Gradko	20% TEA in w ater	2013		Overall Factor³ (24 studies)					Use	0.95	

Appendix 9: Tube Precision & WASP Results

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent HSL WASP NO₂ PT rounds and the percentage (%) of results submitted which were subsequently determined to be satisfactory based upon a z-score of $\leq \pm 2$ as defined above.

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

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

[2] NR Not reported

Appendix 10: NO₂ Levels – Distance from road calculator (45 New St)

This calculator allows you to predict the annual mean NO₂ 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

Step 1	How far from the KERB was your measurement made (in metres)? (Note 1)	1.2	metres
Step 2	How far from the KERB is your receptor (in metres)? (Note 1)	2	metres
Step 3	What is the local annual mean background NO₂ concentration (in µg/m³)? (Note 2)	6	µg/m ³
Step 4	What is your measured annual mean NO₂ concentration (in µg/m³)? (Note 2)	45	µg/m ³
Result	The predicted annual mean NO₂ concentration (in µg/m³) at your receptor (Note 3)	40.8	µg/m ³

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, or alternatively from a nearby monitor in a background location.

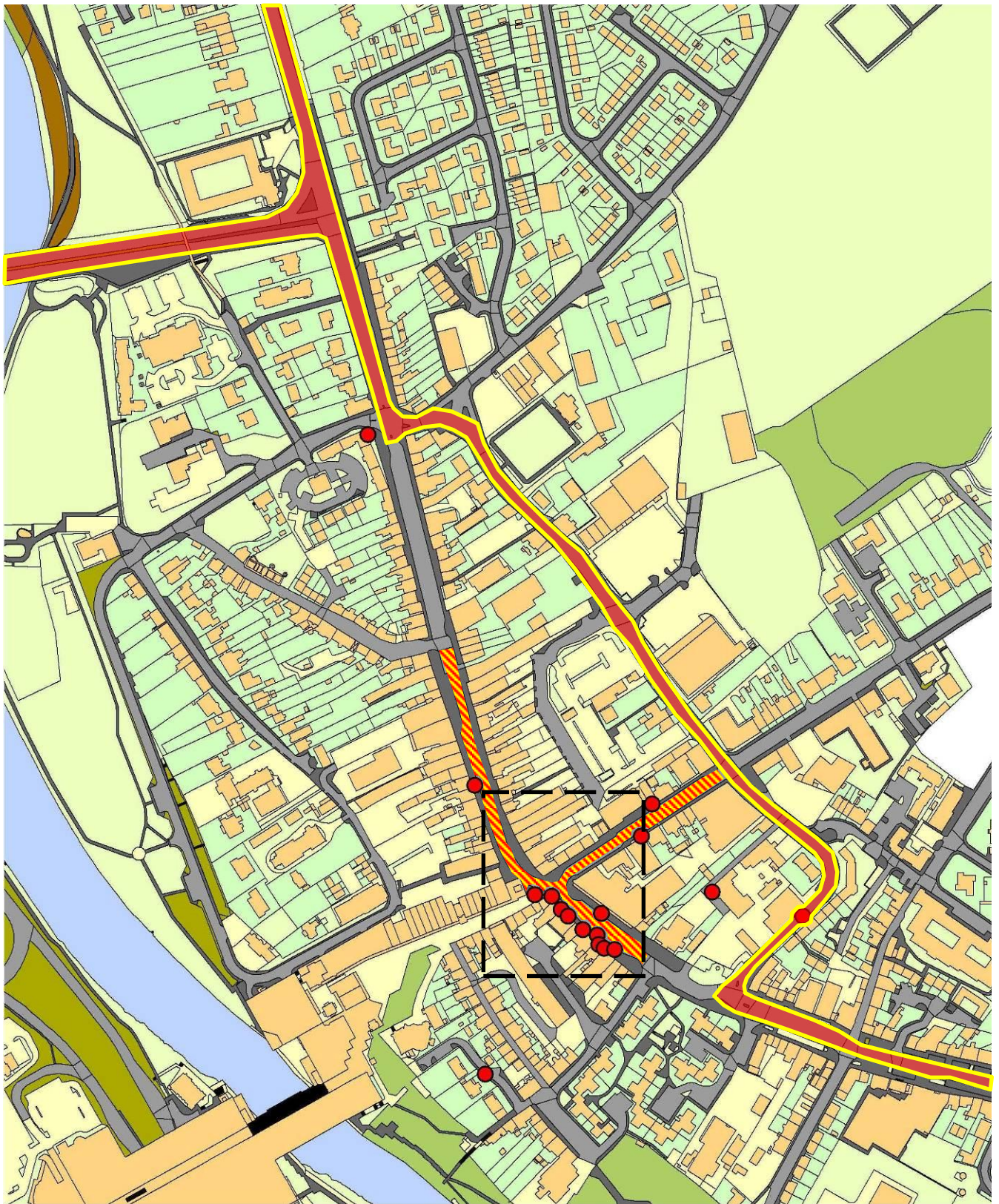
Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.




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

Irvine Area

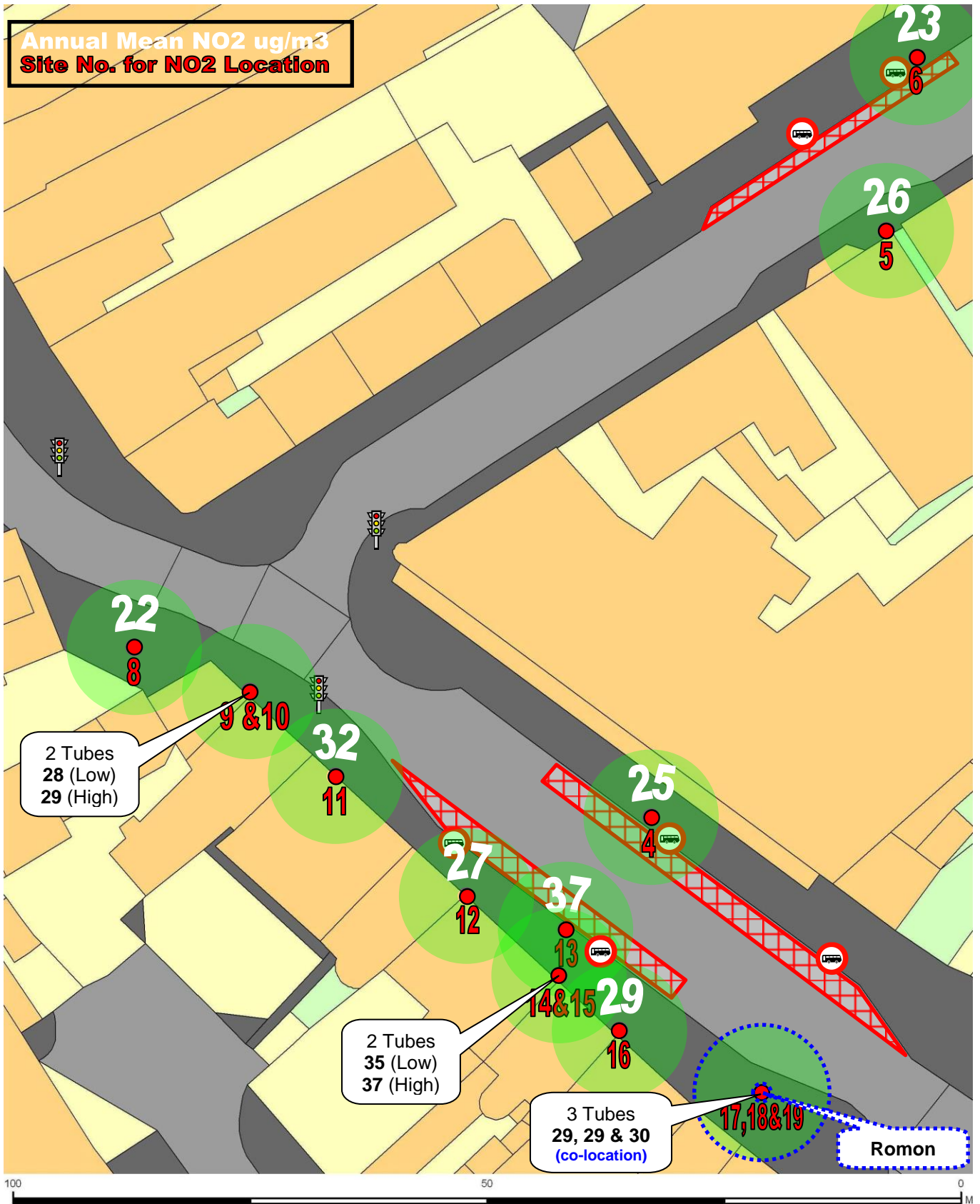
Appendices 11 to 16

Appendix 11 Irvine Town Centre

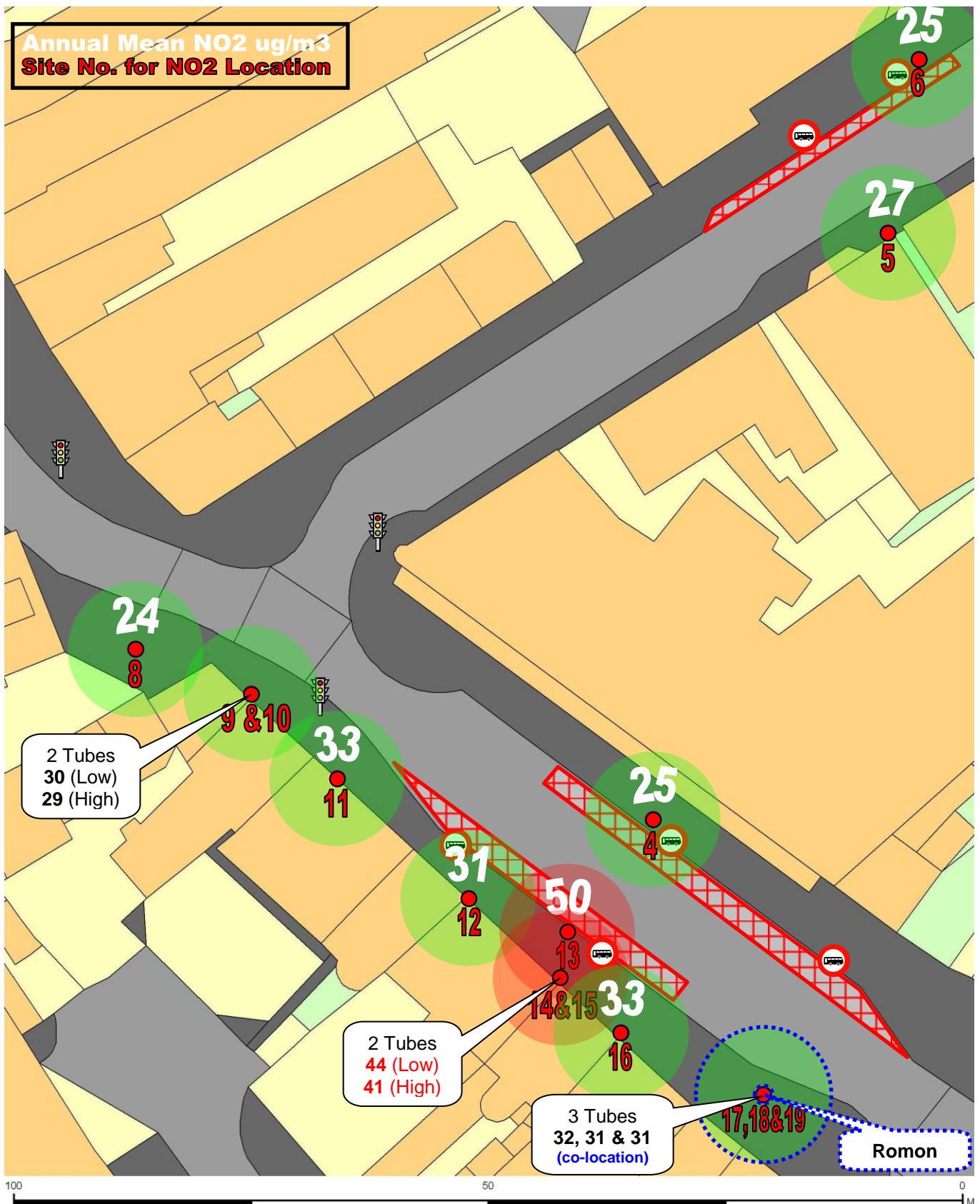


-  **Main traffic route**
-  **Restricted Area (buses, taxis & loading only)**
-  **NO2 diffusion tubes (Including Historic Sites)**

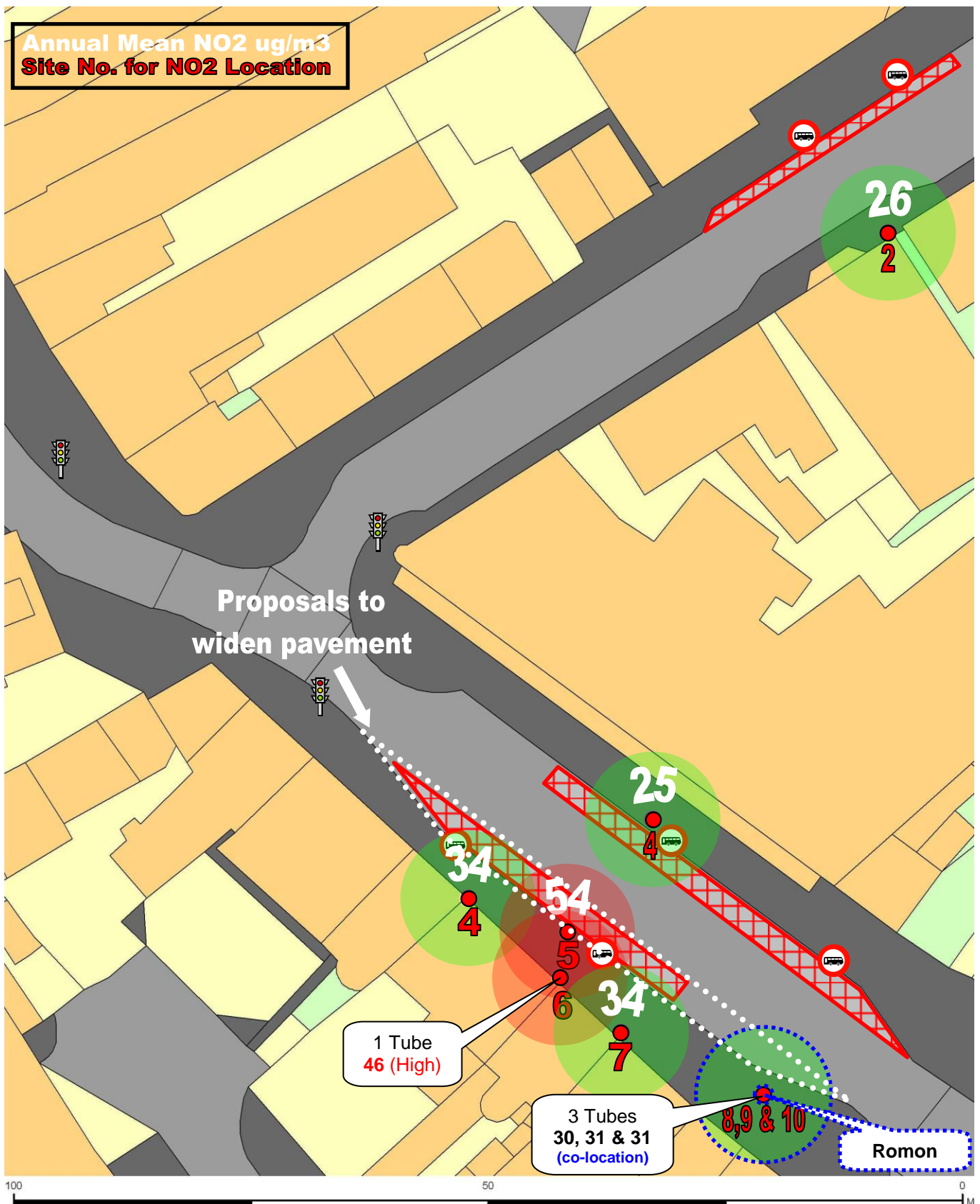
Appendix 12 Irvine, High St (2009) NO₂ µg/m³



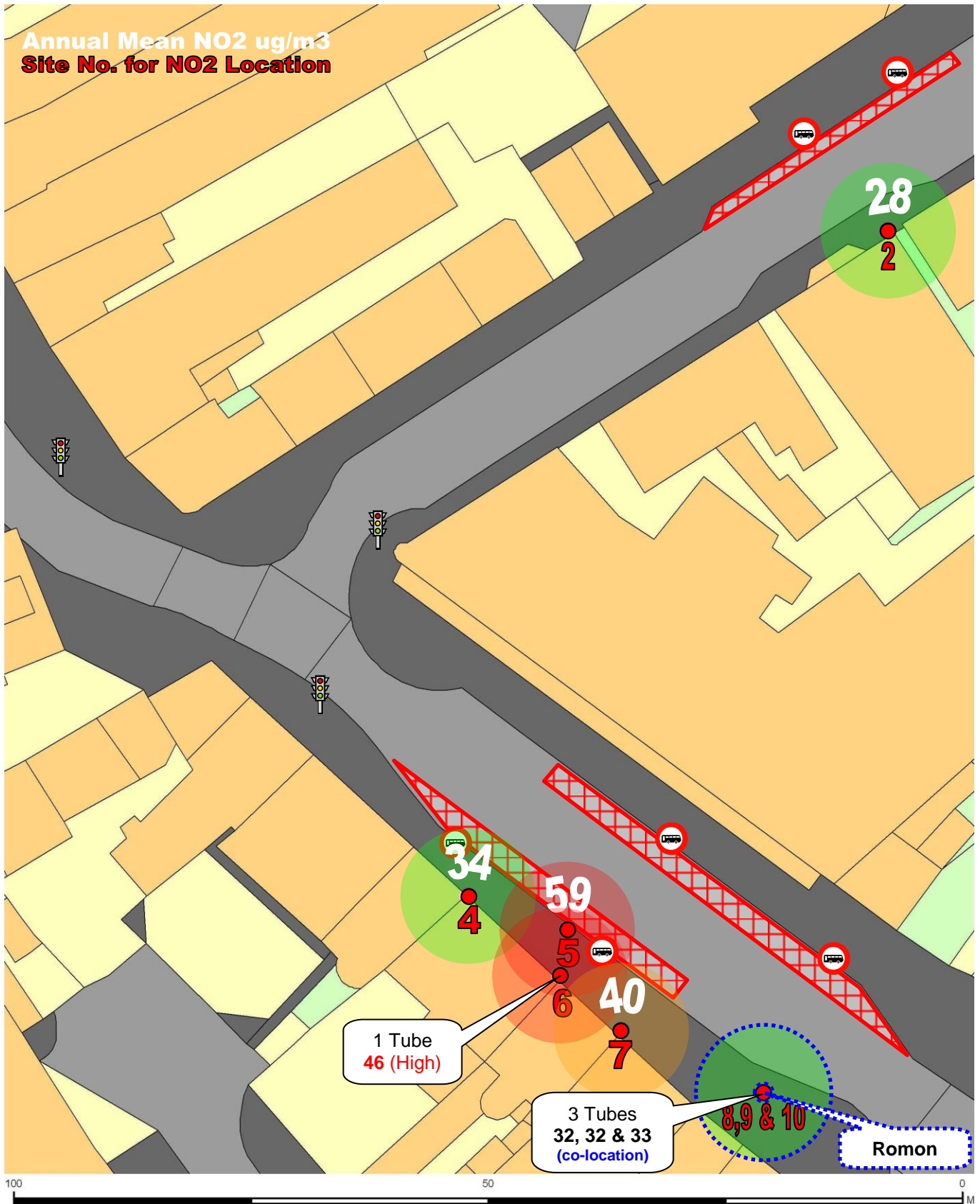
Appendix 13: Irvine, High St (2010) NO₂ µg/m³



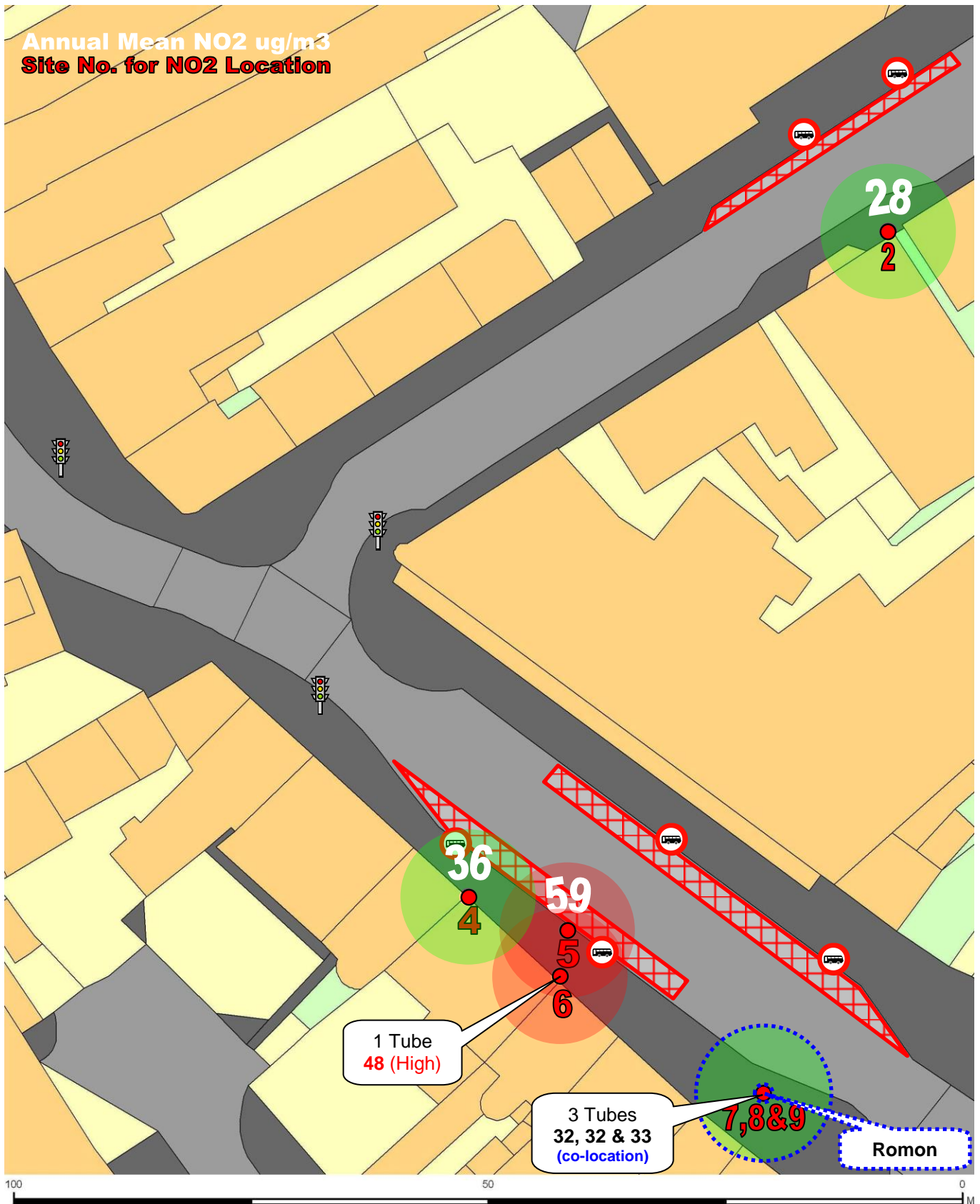
Appendix 14: Irvine, High St (2011) NO₂ µg/m³



Appendix 15: Irvine, High St (2012) NO₂ µg/m³



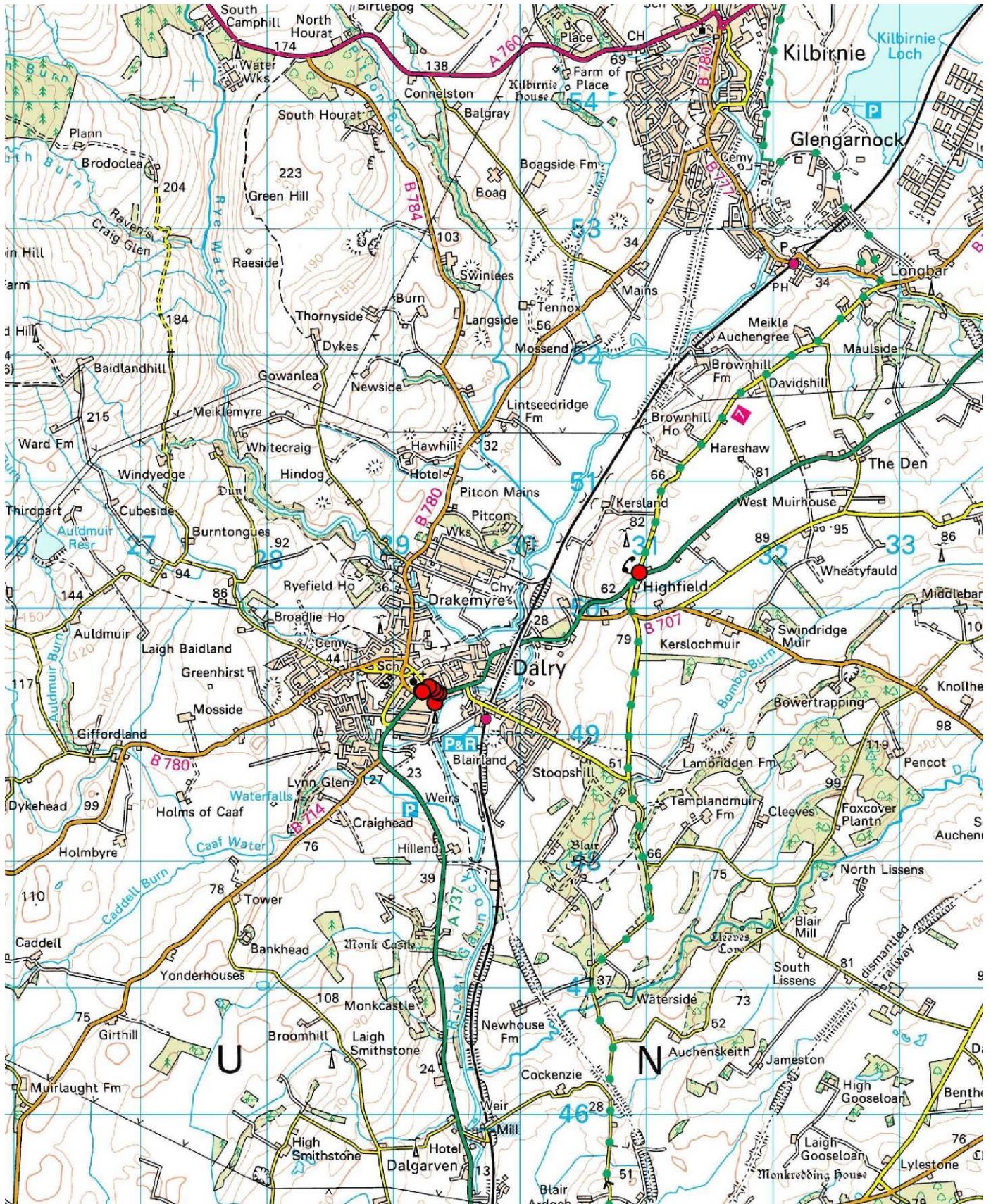
Appendix 16: Irvine, High St (2013) NO₂ µg/m³



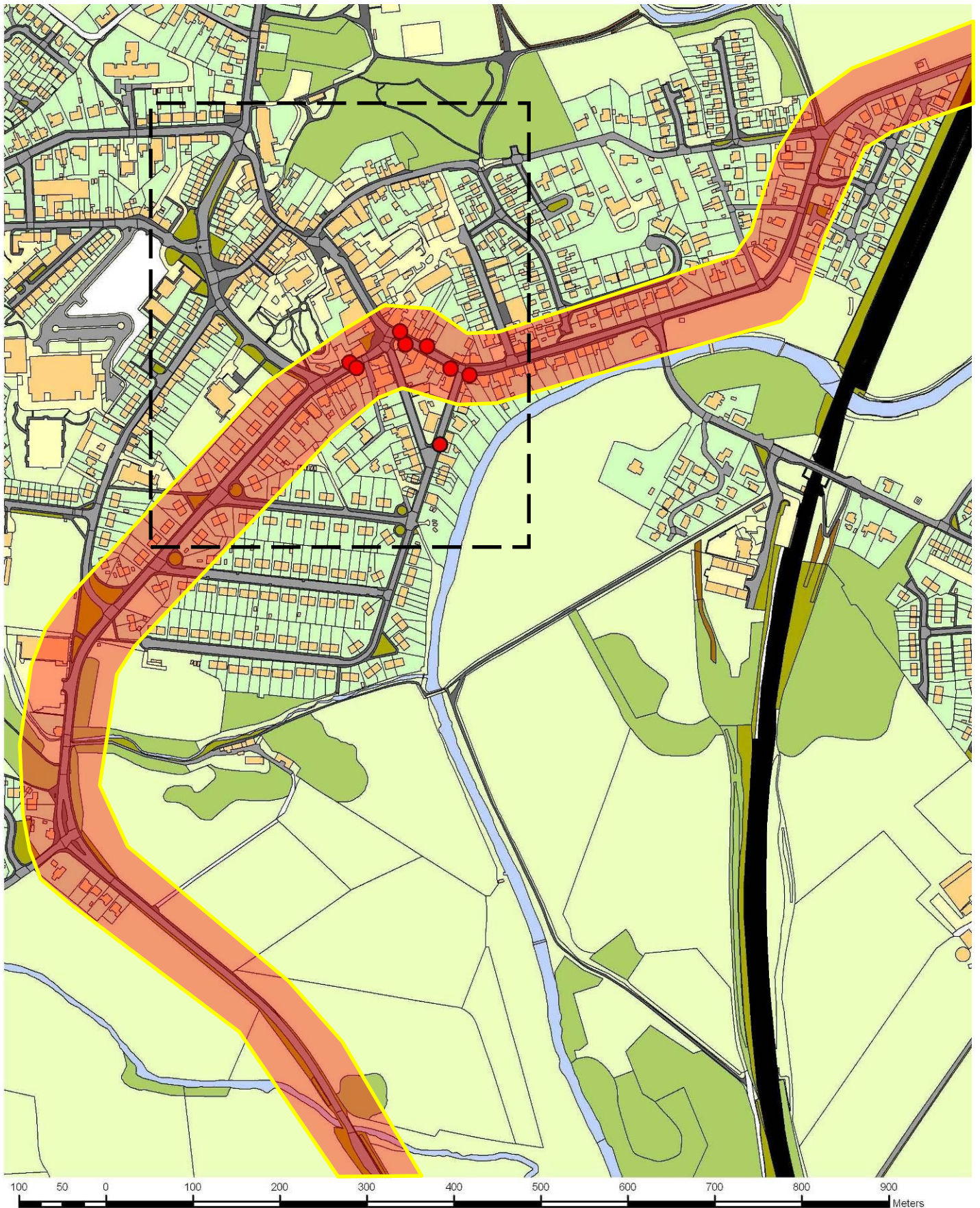
Dalry Area

Appendices 17 to 23

Appendix 17: Dalry (Ordnance Survey)

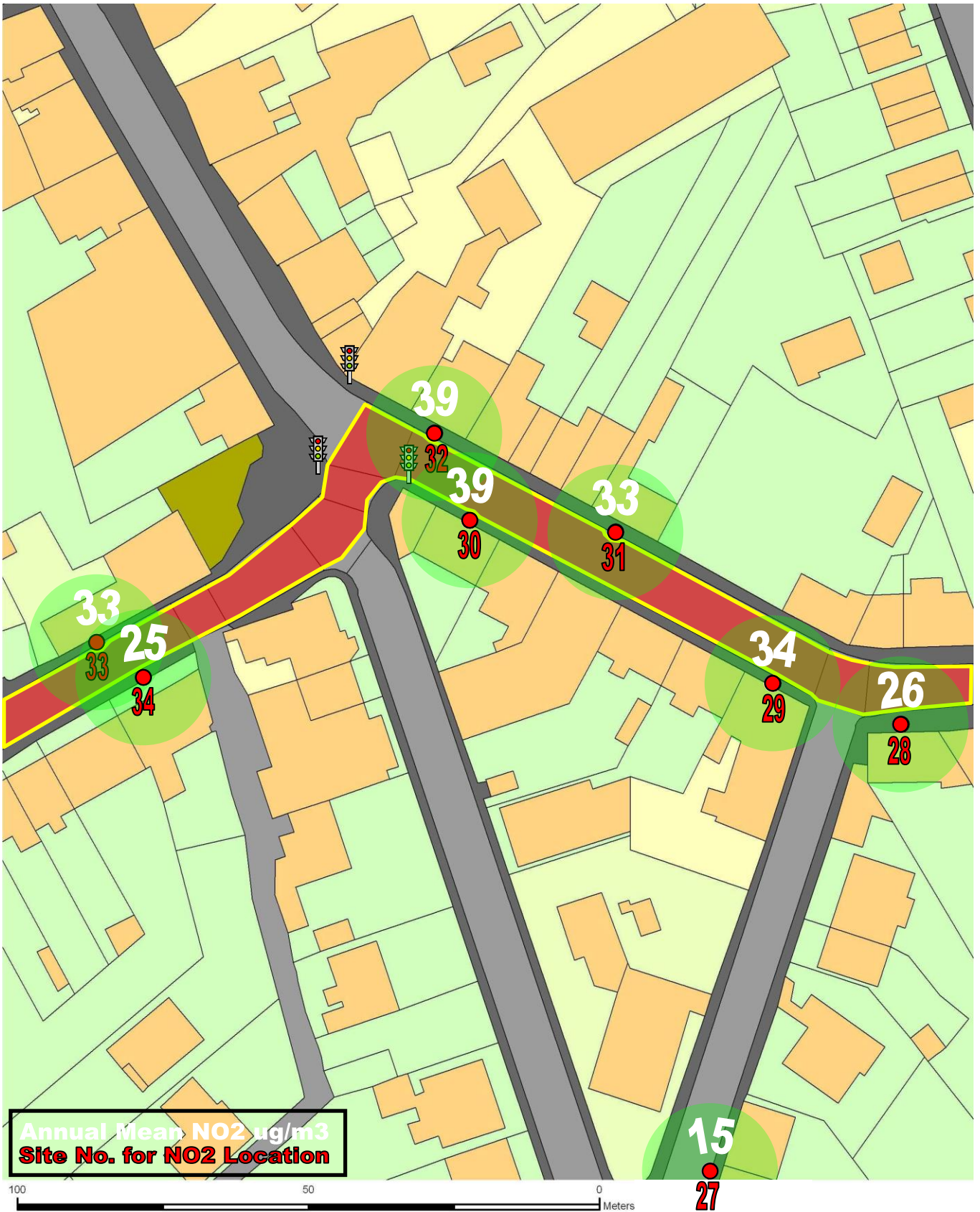


Appendix 18: Dalry - Town Centre

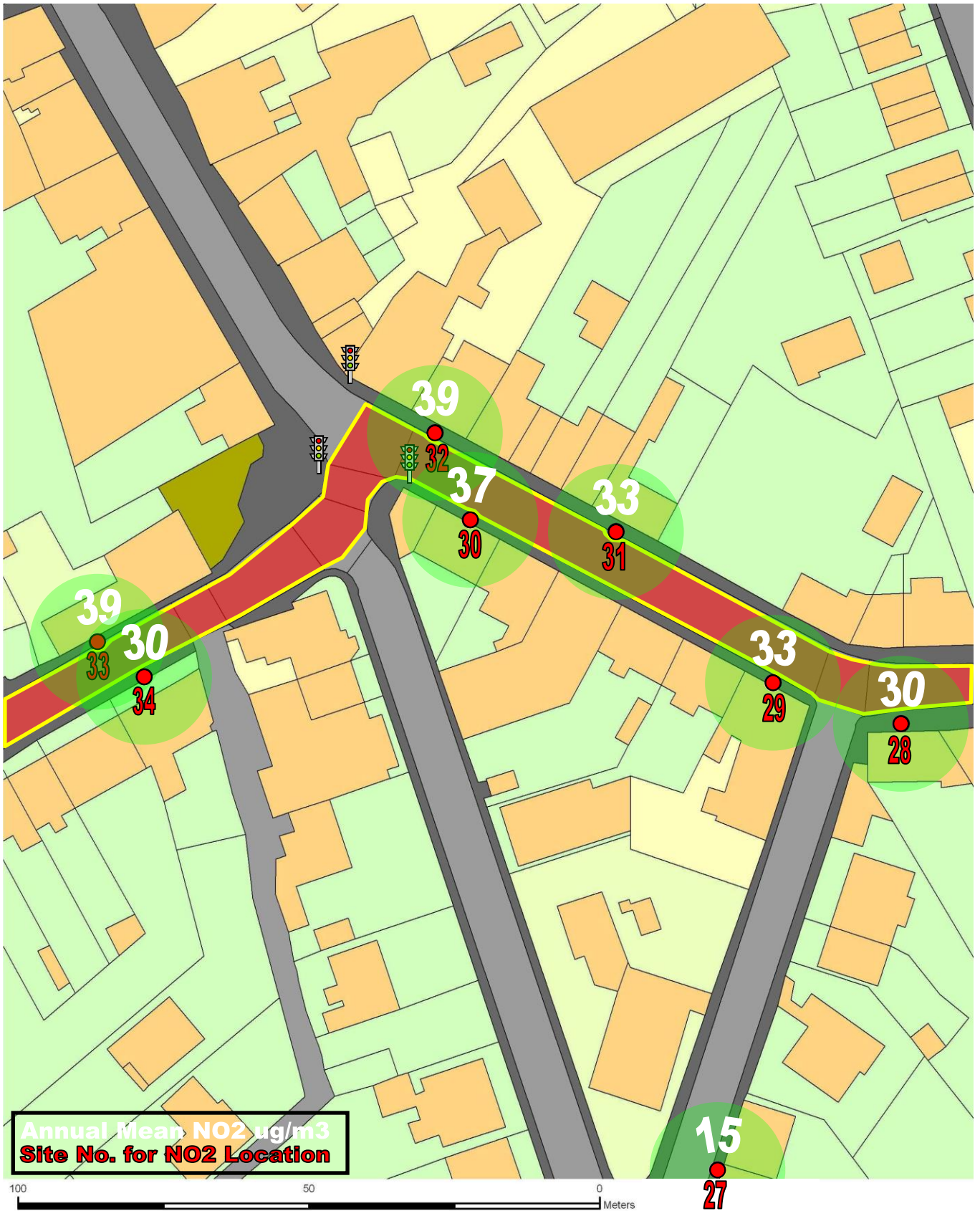


- Irvine - Glasgow corridor
- NO2 diffusion tubes (Including Historic Sites)

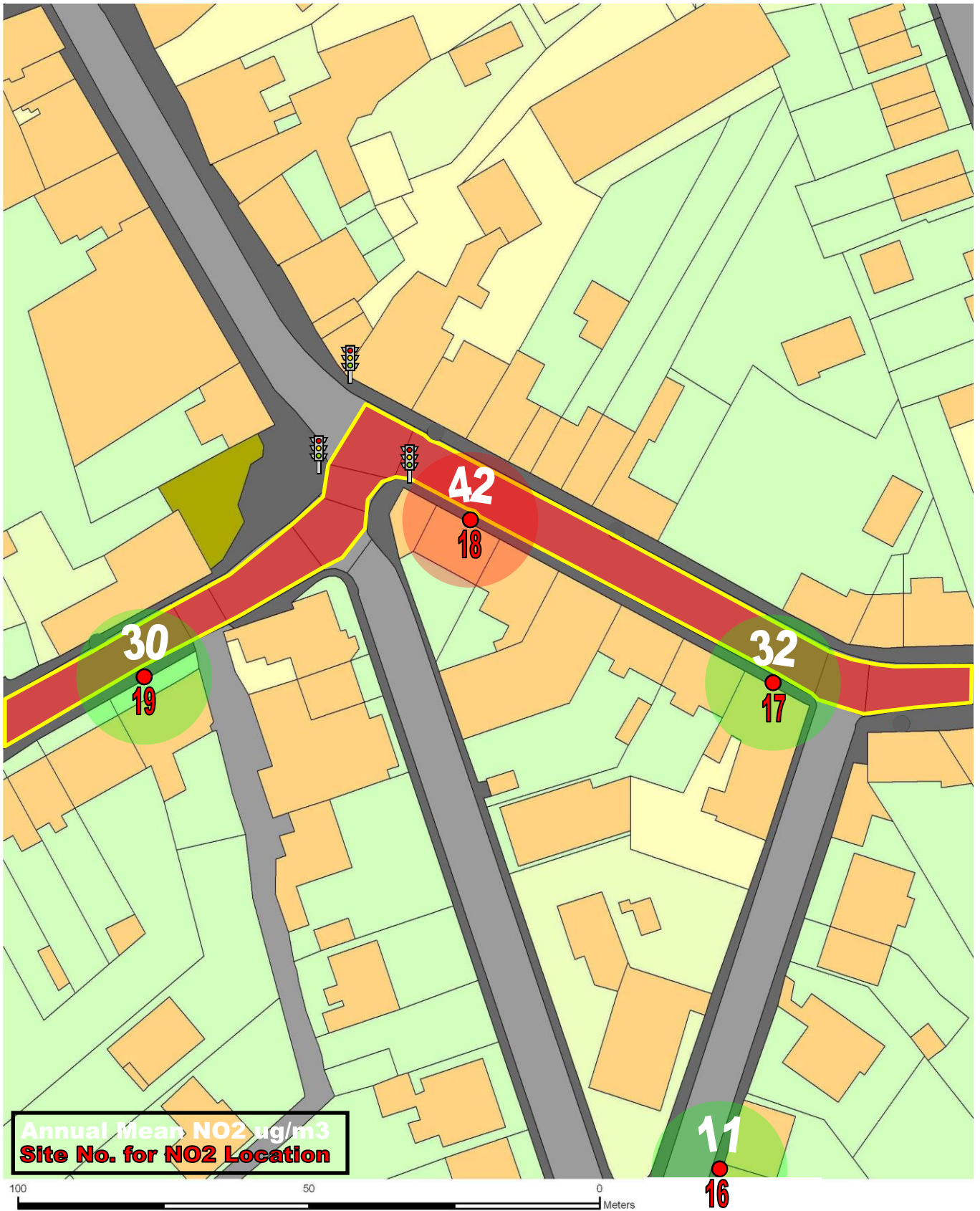
Appendix 19: Dalry – Townhead St/New St (2009) NO₂ µg/m³



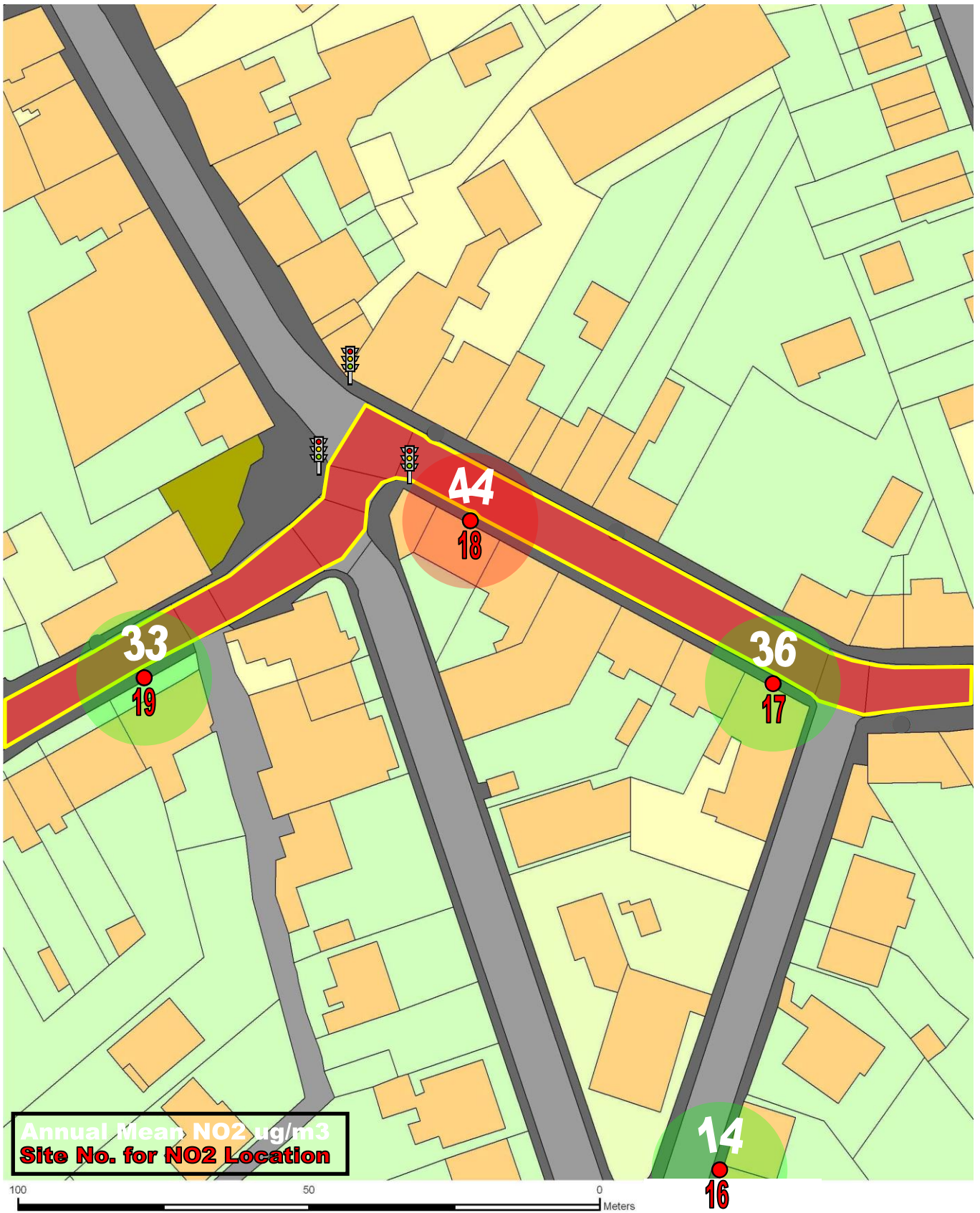
Appendix 20: Dalry – Townhead St/New St (2010) NO₂ µg/m³



Appendix 21: Dalry – Townhead St/New St (2011) NO₂ µg/m³



Appendix 22: Dalry – Townhead St/New St (2012) NO₂ µg/m³



Appendix 23: Dalry – Townhead St/New St (2013) NO₂ µg/m³

