2014 Air Quality Progress Report for EAST AYRSHIRE COUNCIL

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

December 2014

East Ayrshire COUNCIL

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Executive Summary

East Ayrshire Council has carried out a review of air quality within East Ayrshire, which fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995) and the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007. The Report follows Technical Guidance LAQM.TG(09) (Reference 1), issued by the Scottish Government to assist local authorities in their Review and Assessment of air quality.

The report forms the 2014 Progress Report (PR) of the fifth round of the Review and Assessment process and includes the latest available data up to the end of 2013. It also considers the conclusions of the previous rounds of Review and Assessment and any changes that have occurred since then which would have an effect on local air quality.

The report sets out the results of air quality monitoring carried out by East Ayrshire Council and considers the potential impacts from a range of sources such as road traffic and other transport emissions, industrial processes, commercial and domestic fuel use and fugitive emission sources which may have changed since the 2012 Updating and Screening Assessment and the 2013 Progress Report.

The Progress Report concluded that concentrations of the Air Quality Objectives outlined in Table 1.1 are unlikely to be exceeded for the following pollutants. On the basis of this assessment, no further action is required in respect of the pollutants:

Carbon Monoxide
Benzene
1,3-Butadiene
Lead
Sulphur Dioxide

Nitrogen Dioxide and PM_{10}

All monitoring locations where both automatic and passive monitoring was carried out for NO_2 resulted in measured concentration below the Annual Mean Air Quality Objective (40µg/m^3) (Table2.3 and 2.5). No exceedences of the 1-hour mean (Table 2.4) were recorded at John Finne Street with one exceedence of the 1-hour mean recorded at St. Marnock Street (99.8th percentile of hourly means at 124µg/m^3).

Automatic annualised monitoring results of PM_{10} recorded at the John Finnie St. monitoring location, Kilmarnock (Table 2.7) during 2013 indicated that PM_{10} levels, at 15µg/m^3, were below the Annual Mean Air Quality Objective (18 µg/m^3). We can conclude that measured levels of PM_{10} in John Finnie St. have dropped considerably since 2010 and 2011 (Table 2.6), although further monitoring is necessary to ascertain whether this drop is a short term or a long term trend. The recorded results at the St. Marnock St. site, at 19µg/m^3, would infer exceedence. A difference of 4µg/m^3 between both monitoring locations does seem particularly high as both

monitors are located within the town centre one way system. The major part of the difference is due to the technology used in the monitors. BAM 1020 monitors use a correction factor to obtain the final result. Since BAM 1020's are known to absorb moisture onto the filter paper and also the particles themselves absorb moisture they tend to over read since the beta radiation is absorbed by this moisture and read as particulates. With funding from the Scottish Government East Ayrshire Council, in conjunction with Ricardo AEA, have set up a collocation study comprising of two adjacent monitors, a BAM 1020 and a TEOM FDMS. Initial results (provisional) for 2014 suggest the BAM 1020, at 20µg/m^3, is indicating exceedence, and the TEOM FDMS, at 12 µg/m^3 indicating compliance. Environmental Health are inclined to use the results from the TEOM FDMS monitors due to the characteristic of the BAM 1020 to read moisture as particulates and also the fact the FDMS is the monitor of choice on the National Network (further explanation in Section 2). We can therefore conclude that the levels of PM_{10} within Kilmarnock Town Centre are in compliance with the annual mean Scottish Air Quality Objective.

No exceedences of the PM_{10} 24-hour objective occurred at the John Finnie St. monitoring site (98.08th percentile of 35µg/m^3). 2 exceedences of the 24-hour objective occurred at the St. Marnock St. monitoring site (98.08th percentile of 46µg/m^3).

Since the BAM 1020 is indicating exceedence of the annual mean PM_{10} Objective East Ayrshire Council will proceed to an update of the 2013 Kilmarnock Town Centre Detailed Assessment (Reference 26). Results from the updated collocation study will also be discussed within the document.

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1 Introduction

1.1 Description of Local Authority Area

East Ayrshire is one of 32 unitary authority council areas in Scotland. It borders onto North Ayrshire, East Renfrewshire, South Lanarkshire, South Ayrshire and Dumfries and Galloway. With South Ayrshire and the mainland areas of North Ayrshire, it formed the former county of Ayrshire. The area was formed in 1996, from the former Kilmarnock and Loudoun and Cumnock and Doon Valley Districts.

East Ayrshire has an area of 1,262 Km^2 (97% rural) and a population of 124,700 (Scotland's Census 2011), giving a population density of 99/Km^2. East Ayrshire has 22 localities with populations over 500. Kilmarnock is the largest town with a population of around 43,000. There are three other towns with populations over 5,000, namely Cumnock (9,400), Stewarton (6,600) and Galston (5,000).

Agriculture is the dominant land use, with pastoral farming the main type, along with small areas of arable crops grown mainly for animal feed. 22% of the land area is covered in woodland. Significant areas of land are used for open cast coal mining, stretching north and east from Dalmellington in the south west of the district, through Cumnock and New Cumnock to Muirkirk and into South Lanarkshire. In 2013 two large operators, Scottish Coal and ATH Resources, went into liquidation cutting operational mines by over fifty percent to four at present.

East Ayrshire, in common with the rest of Scotland, has seen the decline of traditional heavy industry and manufacturing along with the closure of deep-mine collieries. Employment is now provided by service industries, light industry, smaller-scale manufacturing, retail and the public sector, with deep mining being replaced by open-cast mining. The Diageo Johnnie Walker whisky bottling plant, Kilmarnock's largest private employer, closed in March 2012 with the loss of over 700 jobs. A significant proportion of the population now work outside the district, with significant areas of new housing developments reflecting this. New housing on the north side of Kilmarnock is one example of this, with many of the new residents heading north towards Glasgow and beyond on the M77.

The main transportation route within East Ayrshire is the A77/M77, which runs from the port of Stranraer in Dumfries and Galloway, passing through South Ayrshire and East Ayrshire, before heading north to Glasgow. Although the most heavily trafficked route by far within East Ayrshire, with daily traffic flows in excess of 40,000 vehicles (Source: Transport Scotland), the road bypasses all centres of populations and built-up areas.

East Ayrshire is also served by six railway stations, with Kilmarnock being the largest, with an annual passenger usage of 421,000.

Previous monitoring and modelling has indicated that road traffic is the major localised source of PM_{10} and NO_2 within East Ayrshire. Where traffic levels are high, combined with congestion (due to traffic lights, frequent junctions etc.) and relatively

narrow streets with tall buildings on either side of the road, has resulted in annual mean PM_{10} exceedences (2010 and 2011, Table 2.7) and annual mean NO_2 exceedences (2010, Table 2.3 and Table2.6) in Kilmarnock Town Centre. Similar combinations in Newmilns and Mauchline have led to NO_2 being close to the annual mean (diffusion tube monitoring, Table 2.6).

Kilmarnock Town Centre
John Finnie Street is part of the one way system in the centre of Kilmarnock and has three lanes of traffic with parking bays on either side of the street. Most of the street has tall buildings on both sides of the road close to the kerb. Annual average daily traffic flows, although in excess of 17,000 vehicles per day during 2006 have dropped to just below 14,000 during 2013 (source, Traffic Section, East Ayrshire Council); there are several feeder roads and several sets of traffic lights along the street, with the resultant stationary traffic. All these factors combine to give raised levels of nitrogen dioxide and PM_{10}.

Newmilns
Daily traffic flows through Newmilns (A71) are in the region of 10-11,000 vehicles (source, Traffic Section, East Ayrshire Council), and that combined with the relatively narrow streets and high buildings on either side of the street (canyon effect), combined with pedestrian lights has resulted in levels of nitrogen dioxide around the annual mean Air Quality Objective of 40 $\mu g/m^3$ (Table 2.6) in previous years along the A71.

Mauchline
The A76 Kilmarnock to Dumfries Trunk Road runs through Mauchline and daily traffic flows are in the region of 12-13,000 vehicles (source, Transport Scotland). This combined with relatively narrow streets and high buildings (canyon effect) with traffic lights both at the intersection of the A76 and the B743 (Mauchline/Ayr Road) in conjunction with pedestrian lights, has resulted in levels of nitrogen dioxide around the annual mean Air Quality Objective (diffusion tube monitoring, Table 2.6) in recent years along the A76.

New Cumnock
New Cumnock was chosen as an automatic monitoring site in previous years as it lies in an area of extensive open cast coal mining. Concern had been raised about the level of PM_{10} emanating from coal extraction. Castle was chosen as an area which was representative of a typical residential area within the town. Monitoring was discontinued in New Cumnock at the end of 2011 due to levels of NO_2 and PM_{10} being well below the Scottish Air Quality Objectives (Table 2.3, 2, 4, 2.7 and 2.8).

A map of the area is included in Figure 1.

1.2 Purpose of Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and

Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

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

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

The Progress Report presented in this document was carried out in accordance with the most recent technical guidance document, Local Air Quality Management Technical Guidance LAQM.TG(09) (Reference 1).

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 micrograms per cubic metre µg/m^3 (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m^3	Running annual mean	31.12.2003
	3.25 µg/m^3	Running annual mean	31.12.2011
1,3-Butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m^3	Annual mean	31.12.2004
	0.25 µg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m^3	Annual mean	31.12.2005
Particulate Matter (PM_{10}) (gravimetric)	50 µg/m^3, not to be exceeded more than 7 times a year	24-hour mean	31.12.2011
	18 µg/m^3	Annual mean	31.12.2011
Sulphur dioxide	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/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

LQMA Activity	Date	Outcome
First Round of Review and Assessment	1998-2001	No exceedences of Air Quality Objectives were found or predicted.
Updating and Screening Assessment	2003	No exceedences of Air Quality Objectives were found or predicted.
Progress Report	2004	Although some exceedences of the Air Quality Objective for benzene were predicted for 2010 levels, this was as a result of problems associated with the analytical laboratory. No other exceedences were found or predicted.
Progress Report	2005	No exceedences of the Air Quality Objectives were found or predicted.
Updating and Screening Assessment	2006	No exceedences of the Air Quality Objectives were found or predicted. Although future levels of nitrogen dioxide and PM_{10} were predicted to be within future Air Quality Objective limits, the levels found suggested more detailed monitoring was required.
Progress Report	2007	No exceedences of Air Quality Objectives were found or predicted.
Progress Report	2008	No exceedences of Air Quality Objectives were found or predicted for all pollutants. However, due to nitrogen dioxide levels being close to the annual mean objective within John Finnie Street, Kilmarnock, it was decided to commission a Detailed Assessment.
Detailed Assessment	2008	An atmospheric dispersion modelling of road traffic emissions was undertaken to determine nitrogen dioxide pollutant concentrations at locations of relevant public exposure, within John Finnie Street, Kilmarnock. No exceedences of both the annual mean and the 1-hour objective for nitrogen dioxide were predicted at areas of relevant public exposure. It was therefore not necessary to declare an Air Quality Management area at this time. Extra monitoring was recommended using both diffusion tubes (underway August 2009) and automatic monitoring (nearing installation).
Updating and Screening Assessment	2009	No exceedences of Air Quality Objectives were found or predicted for all pollutants at locations of relevant public exposure. Further monitoring was deemed necessary particularly in Kilmarnock, Newmilns and Mauchline as levels of NO_2 were just below the Air Quality Objectives.

Progress Report	2010	No exceedences of Air Quality Objectives were found or predicted for all pollutants at locations of relevant public exposure. Further monitoring was deemed necessary particularly in Kilmarnock, Newmilns and Mauchline as levels of NO_2 were just below the Air Quality Objectives.
Progress Report	2011	Exceedences of Air Quality Objectives were found for both annual mean PM_{10} and annual mean NO_2 within Kilmarnock. Due to the exceptional weather conditions associated with 2010 further monitoring was deemed necessary and if either PM_{10} or NO_2 levels exceeded the Air Quality Objectives for a second year East Ayrshire Council would proceed to a Detailed Assessment.
Updating and Screening Assessment	2012	In 2011 exceedence of Air Quality Objective were found for the annual mean PM_{10} within John Finnie Street, Kilmarnock with no exceedence of the 24-hour mean PM_{10} Objective. No exceedences were found for NO_2 Air Quality Objectives within East Ayrshire in 2011. Due to two consecutive years with PM_{10} annual mean exceedence East Ayrshire Council has proceeded to a Detailed Assessment centred around John Finnie Street. NO_2 has also been included in the Detailed Assessment due to past exceedences (Table 2.6).
Detailed Assessment	2013	Source apportionment analysis indicates that road traffic emissions appear to be the main contributor to NO_x concentrations at all specified receptors whereas for PM_{10} the main contributor is from background sources with road traffic emissions being responsible for the next highest contribution. Detailed atmospheric dispersion modelling of pollutant emissions, PM_{10} and NO_x, from road traffic was conducted around Kilmarnock Town Centre focused on John Finnie Street to investigate the potential for exceeding the NO_2 and PM_{10} annual mean objectives at relevant receptor locations. Predicted NO_2 concentrations were compared against the 2011 measured concentrations from the Council's passive and automatic monitoring network. The modelling predictions were shown to significantly over predict and following the guidance provided in Technical Guidance TG (09) an appropriate adjustment factor was calculated and applied. Following adjustment the modelling predictions indicated that the NO_2 annual mean objective was being met at all specified receptors in 2011 and therefore no requirement for an AQMA. Predicted PM_{10} concentrations were also compared against the 2011 measured concentrations from the Council's monitoring site. The modelling predictions were shown to significantly under predict

		and following the guidance provided in TG (09) an appropriate adjustment factor was calculated and applied. After adjustment the modelling predictions indicated that the PM_{10} annual mean objective was being exceeded at all locations adjacent to all modelled roads in 2011. However, the 2012 PM_{10} monitoring undertaken by the Council indicates that there has been a substantial reduction in PM_{10} in John Finnie Street. Measured PM_{10} concentrations reduced by 8 $\mu g/m^3$ between 2011 and 2012. The monitoring results also indicate 5 $\mu g/m^3$ difference in measured concentrations at John Finnie Street and St. Marnock Street, which seems to be an unusually high difference given the proximity of these two sites. The modelling predictions based on current traffic flows would indicate a difference of approximately 0.3 $\mu g/m^3$ between the two monitoring sites where unadjusted concentrations are considered. If the modelling predictions for 2011 are verified against 2012 monitoring data the results indicate that in 2012 the PM_{10} annual mean is currently being met at all specified receptors. On the basis of both the results of the modelling study and the 2012 measured annual mean concentrations of PM_{10} the Council has delayed consideration of the declaration of an AQMA in respect of PM_{10} annual mean until 12 months of ratified data with the recommended >90% data capture is obtained. If a successful funding bid is obtained from the Scottish Government and following completion of a full twelve months of representative monitoring data, an Addendum to this report will be undertaken which will update the modelling study with additional monitoring data and, if required, population exposure calculations will also be undertaken at that time.
Progress Report	2013	No exceedences of Air Quality Objectives were found or predicted for all pollutants at locations of relevant public exposure during 2012. Further monitoring was deemed necessary, particularly in Kilmarnock, Newmilns and Mauchline, as levels of NO_2 were just below the Air Quality Objectives during 2012 at certain locations in all three towns and PM_{10} levels were just below the Air Quality Objectives during 2012 in Kilmarnock Town Centre, in addition to previous exceedences of both NO_2 and PM_{10} which have occurred.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

East Ayrshire Council carried out automatic monitoring for NO_2 and PM_{10} and non-automatic monitoring for NO_2 during 2013.

Automatic Monitoring for NO_2 and PM_{10} was carried out at two locations within East Ayrshire during 2013, using two API Chemiluminescent $NO/NO_2/NO_x$ Analysers and one Met One Instruments BETA Attenuation Mass Monitor (BAM 1020) and one TEOM FDMS 1405 Monitor. All monitors are fitted with web logger functionality.

Automatic monitoring commenced for NO_2 and PM_{10} in John Finnie Street, Kilmarnock (Figure 4) in February 2010 and continued during 2011, 2012 and 2013. John Finnie Street was chosen for NO_2 monitoring since previous monitoring using diffusion tubes has indicated that NO_2 levels are just below the National Air Quality Objective (Table 2.3 and 2.6) and it is a heavily trafficked town centre road, with several feeder roads, several sets of traffic lights and tall buildings on either side of the road. Although earlier modelling suggested 2010 PM_{10} levels would be under 18 $\mu g/m^3$, the fact that levels of NO_2 were close to the Air Quality Objective due to high levels of road traffic (and experience suggests PM_{10} levels would also be close to the Air Quality Objective in these circumstances), monitoring to check actual PM_{10} levels was sensible. In fact monitoring during 2010 and 2011 indicated that PM_{10} levels, at 21 and 20$\mu g/m^3$ respectively, were in fact above the annual mean Air Quality Objective (Table 1.1 and Table 2.7). Further monitoring was therefore deemed necessary and the BAM1020 in John Finnie Street was replaced by a TEOM FDMS PM_{10} monitor in the early part of 2012 and the BAM1020 and API Chemiluminescent analyser moved from New Cumnock to St. Marnock Street, Kilmarnock (Figure 4), part of the one-way system. This was deemed sensible for two reasons, firstly, two years monitoring at New Cumnock confirmed that both NO_2 and PM_{10} are consistently well below Air Quality Objectives (Table 2.3, 2.4, 2.7 and 2.8) and as no major change was predicted the analysers were moved to St. Marnock Street, Kilmarnock. This second site within the heavily trafficked Kilmarnock one way system will give us additional robust monitoring data which will allow more accurate modelling if any detailed or further assessments are required in the future.

Further details of all two monitoring stations are provided in Table 2.1. The locations of both Kilmarnock sites are shown in Figure 4.

Table 2.1 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?
A2	Kilmarnock, John Finnie Street	Roadside	242691	638095	1.77	NO_2	N	Chemiluminescent	Y (<1m)	2.79	Y
					2.11	PM_{10}	N	FDMS	Y (<1m)	2.73	Y
A3	Kilmarnock, St. Marnock Street	Roadside	242742	637705	1.67	NO_2	N	Chemiluminescent	Y (<1m)	3.25	Y
					1.77	PM_{10}	N	BAM 1020	Y (<1m)	3.50	Y

QA/QC of the Automatic Monitoring

The maintenance of the two monitoring sites at Kilmarnock is carried out by Air Monitors. This involves routine servicing and provision for emergency callouts as required. Automatic calibration, zero and span checks are carried out daily. The automatic span check consists of a gas of known concentration being passed through the NOx analyser and the measured concentration being recorded automatically for rescaling. Both Kilmarnock sites are part of the Scottish Air Quality Network and are audited twice yearly by Ricardo AEA on behalf of the Scottish Government. AEA also carry out the data management for these two sites. Since the installation of web loggers, the data is checked daily by East Ayrshire Council Environmental Health staff to ensure that it is being recorded properly and there are no faults showing with any of the analysers, as well as checking the zero and span recordings. AEA and Air Monitors also check the data at regular intervals and e-mail or telephone Environmental Health if any problems occur. An officer from Environmental Health will attend the site to rectify any problems found, often in consultation with an engineer from Air Monitors. If the problem cannot be rectified by Environmental Health staff, Air Monitors attend the site and rectify the faults found. An officer from Environmental Health also carries out any routine filter changes, inlet cleaning etc. as recommended in the equipment instruction manual. At the request of AEA Technology East Ayrshire Council is now carrying out manual calibration checks due to some technical issues with automatic calibrations. Regular visits to the monitoring sites are also good practice as any other faults which may arise from time to time can be picked up and quickly rectified.

AEA undertake quality control of the automatic data for both the Kilmarnock sites. The QA/QC procedures follow the requirements of the Local Air Quality Management Technical Guidance LAQM.TG(09) (Reference 1) and are equivalent to those used at UK National Network (AURN) monitoring sites. This gives a high degree of confidence in the data obtained for reliable concentrations at the automatic sites. Once the calibration factors have been applied AEA carry out monthly Data Validation. In essence the data is screened by visual examination to determine if it contains spurious and unusual measurements. Any suspicious data, such as large spikes or high concentrations are “flagged” or marked to be investigated more fully. At six monthly intervals (quarterly from 2013) AEA carry out Data Ratification. This involves thorough checking of the data to ensure it is reliable and consistent. Essentially the data ratification procedure involves a critical review of all information relating to a particular data set, in order to verify, amend or reject the data. When the data has been ratified, AEA present the final data set to be used in Review and Assessment Process. BAM PM_{10} data was corrected for slope using a factor of 0.83333 to give an Indicative Gravimetric Equivalent (Reference 9). The Air Pollution Reports produced by AEA on behalf of the Scottish Government can be found in Appendix C.

2.1.2 Non-Automatic Monitoring Sites

Non-automatic monitoring of nitrogen dioxide using passive diffusion tubes was undertaken at 26 separate locations in East Ayrshire during 2013 (Figures 5a-5n). (Reference 22, Air Quality Progress Reports East Ayrshire Council and Table 2.2, 2.5 and 2.6). Monitoring commenced at six new sites in January 2013 including five new sites in Kilmarnock and one new site in Newmilns (Table 2.2 and Figures 5a – 5n). Diffusion tube monitoring was discontinued at five sites at the beginning of 2013 due to levels of NO_2 being well below the annual mean Air Quality Objective at these locations (Table 2.6). Of the five sites two were in Newmilns, one in Cumnock, one in Muirkirk and one in Mauchline.

The diffusion tube locations are described in Table 2.2. All diffusion tubes are located at a height of 2.95m. A lower height would be preferred but a compromise of 2.95m was necessary to minimise vandalism but still be representative of the air people breathe at street level.

Table 2.2 Details of Non- Automatic Monitoring Sites

Site ID / Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to annual mean relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
1. Fowlds Street/King Street Junction, Kilmarnock	Kerbside	242805	637620	2.95	NO_2	N	N	Y(35m)*	< 1m	Y
2. 28 John Finnie Street, Kilmarnock	Roadside	242701	638083	2.95	NO_2	N	N	Y(3 – 4m)	2-3m	Y
3. 19 Lainshaw Street, Stewarton	Kerbside	241907	645820	2.95	NO_2	N	N	Y(2 – 3m)	< 1m	Y
4. 40 Main Street, Newmilns	Roadside	253601	637310	2.95	NO_2	N	N	Y(< 1m)	2-3m	Y
6. 8A Kilmarnock Road, Mauchline	Roadside	249826	627335	2.95	NO_2	N	N	Y(2 – 3m)	2-3m	Y
7. Junction at Main Street & A70 Ochiltree	Roadside	250712	621166	2.95	NO_2	N	N	Y(15m)*	1-2m	Y
9.Townhead/Glaisnock Street Junction, Cumnock	Roadside	256889	620133	2.95	NO_2	N	N	Y 9m)*	1-2m	Y

Site ID / Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to annual mean relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
11. 96 John Finnie Street, Kilmarnock	Roadside	242657	637883	2.95	NO_2	N	N	Y(3-4m)	2-3m	Y
12. 62 John Finnie Street, Kilmarnock	Roadside	242673	637955	2.95	NO_2	N	N	Y(3 – 4m)	2-3m	Y
14. 95/97 John Finnie Street, Kilmarnock	Roadside	242619	637773	2.95	NO_2	N	N	Y(100m)*	3m	Y
15. 16 West George Street, Kilmarnock	Roadside	242766	638160	2.95	NO_2	N	N	Y(35m)*	1-2m	Y
17. 23/25 Loudoun Road, Newmilns	Roadside	253204	637237	2.95	NO_2	N	N	Y(<1m)	2-3m	Y
18. 100 Main Street, Newmilns	Roadside	253784	637336	2.95	NO_2	N	N	Y(3-4m)	2-3m	Y
19. 57/59 Townhead Street, Cumnock	Roadside	257059	620157	2.95	NO_2	N	N	Y(<1m)	1-2m	Y
20. 66 Main Street, Muirkirk	Roadside	269706	627355	2.95	NO_2	N	N	Y(5m)	2-3m	Y
22. The Cross, Mauchline	Roadside	249863	627257	2.95	NO_2	N	N	Y(5-6m)*	2-3m	Y
23. 3/5 Loudoun Street, Mauchline	Roadside	249867	627232	2.95	NO_2	N	N	Y(<1m)	3-4m	Y

Site ID / Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to annual mean relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
24. 5/7 Earl Grey Street, Mauchline	Roadside	249894	627233	2.95	NO_2	N	N	Y(<1m)	2m	Y
25. John Finnie Street Monitor, Kilmarnock	Roadside	242691	638095	2.95	NO_2	N	Y	Y(17m)*	2-3m	Y
26. 76 Loudoun Road, Newmilns	Roadside	253015	637232	2.95	NO_2	N	N	Y(9-10m)*	1-2m	Y
27. Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	242771	637714	2.95	NO_2	N	N	Y(44m)*	<1m	Y
28. 2A Welbeck Street, Kilmarnock	Roadside	243212	637338	2.95	NO_2	N	N	Y(29m)*	2-3m	Y
29. Junction McLelland Drive/Dundonald Road, Kilmarnock	Roadside	242192	637249	2.95	NO_2	N	N	Y(5m)	2-3m	Y
30. 16 Cumnock Road, Mauchline.	Roadside	249943	627024	2.95	NO_2	N	N	Y(7m)*	1-2m	Y
31. Wellington Street, Kilmarnock	Kerbside	242965	638555	2.95	NO_2	N	N	Y(8m)*	<1m	Y

Site ID / Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to annual mean relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
32. Kay Park, Kilmarnock	Urban Background	243302	638259	2.95	NO_2	N	N	Y(>50m)	N/A	N
33. Howard Park, Kilmarnock	Urban Background	242581	637409	2.95	NO_2	N	N	Y(>50m)	N/A	N
34. 39 Loudoun Road, Newmilns	Kerbside	253156	637223	2.95	NO_2	N	N	Y(1-2m)	<1m	Y
35. Nelson Street, Kilmarnock	Roadside	242589	637870	2.95	NO_2	N	N	Y(<1m)	2-3m	Y
36. 17 Portland Road, Kilmarnock	Roadside	242514	637769	2.95	NO_2	N	N	Y(<1m)	5-6m	Y
37. Sturrock Street, Kilmarnock	Roadside	242918	637841	2.95	NO_2	N	N	N	2-3m	N

*Although these sites are greater than 5m from relevant exposure (annual mean), they are representative of such exposure. These locations were chosen because of the suitability of mounting the NO_2 diffusion tubes at equivalent representative points to annual mean relevant exposure. Although diffusion tubes can only be used to measure annual mean levels of NO_2 they do give an indication of whether the hourly mean objective is likely to be breached (Reference 6). It is therefore reasonable to conclude that all of the above sites, with the exception of Sturrock Street, have relevant exposure as members of the public might reasonably be expected to spend one hour or longer at these locations.

Nitrogen Dioxide Diffusion Tube Monitoring Procedure

The nitrogen dioxide diffusion tubes are placed at each location by East Ayrshire Council to give 12 periods within the calendar year. On a monthly basis the exposed tubes are replaced and sent to the laboratory for analysis. All exposure times and dates are recorded and sent to the laboratory with the exposed tubes. East Ayrshire Council also sends one unexposed tube with each batch to check that there has been no contamination while in transit or storage. Selection of diffusion tube sites and instructions for exposing diffusing tubes were carried out using the latest guidance issued by AEA from the work completed by the Working Group on Harmonisation of Diffusion Tubes (Reference 3). The supply of the tubes and analysis is undertaken by Glasgow Scientific Services (GSS) – part of Glasgow City Council. The laboratory is UKAS accredited for the analysis and also participates in two centralised QA/QC schemes; the Workplace Analysis Scheme for Proficiency (WASP scheme)(Reference 4) and a monthly field inter-comparison exercise managed by Bureau Veritas, in which diffusion tubes are co-located with an automatic analyser. The WASP scheme is an independent analytical proficiency-testing scheme (PT), operated by the Health and Safety laboratory (HSL). For the 5 quarters from January 2013 to March 2014 GSS obtained 3 rounds at 100%, one round with a score of 50% and one round at 25% giving a combined score of 75% which were subsequently determined to be **satisfactory** based on the z-score system (Reference 4). Over a rolling five round WASP window one would expect that 95% of laboratory results should be within the criteria set within the scheme. If this percentage is substantially lower than 95% for a particular laboratory, within this 5 round window, then one can conclude that the laboratory in question may have significant systemic sources of bias in their assay.

GSS follow the procedures set out in the Harmonisation Practical Guidance and prepares the Palmes-Type diffusion tubes using the 20% Triethanolamine (TEA) in water.

The diffusion tube method is open to a degree of uncertainty inherent in the method. To partially correct for this uncertainty, a bias adjustment factor is applied. To calculate bias adjustment, triplicate tubes from Glasgow Scientific Services are co-located with chemiluminecence automatic analysers at various locations throughout West Central Scotland. The tubes are placed within 1m of the analyser inlet and 10cm apart. The co-located tubes are prepared, handled and analysed in exactly the same way as those from the other (non co-located) monitoring sites in the survey. Co-location data questionnaires are completed and sent to The National Physical Laboratory, Teddington, London. GSS also participate in the Bureau Veritas Marylebone laboratory inter-comparison study (Reference 23). At the time of writing 5 sites, including the Marylebone Road site in London were present on the spreadsheet. A resultant bias adjustment is then computed for each site. A combined bias adjustment is then calculated from these 5 sites using orthogonal regression to allow for both the uncertainty in both the automatic monitor and the diffusion tubes. The uncertainty of the diffusion tube has been assumed to be double that of the automatic monitor. For 2013 the overall bias adjustment factor was computed at **0.99**. The bias adjustment factor applied to the raw annual means of the diffusion tubes was therefore **0.99** for 2013 data. Precision and Bias Adjustment Data (Reference 20) are shown in Appendix A.

2.2 Comparison of Monitoring Results with Air Quality Objectives

This section sets out the results of all monitoring carried out by East Ayrshire Council in 2013 and where relevant, provides results from previous years to identify any trends.

2.2.1 Nitrogen Dioxide (NO_2)

Automatic Monitoring Data

The results of automatic monitoring for nitrogen dioxide carried out in 2013 at St. Marnock Street and John Finnie Street, Kilmarnock are displayed in Table 2.3 and 2.4 and the full report produced by Ricardo-AEA on behalf of the Scottish Government in Appendix C.

Table 2.3 Results of Automatic Monitoring for NO_2: Comparison with Annual Mean Objective

Site ID/Location	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 % [b]	Annual Mean Concentration (µg/m^3)				
					2009	2010	2011	2012	2013
A2/John Finnie Street, Kilmarnock	Roadside	N		95.7		**43**	35	30	39
A3/St. Marnock Street, Kilmarnock	Roadside	N		71.1				29 (36 annualised)	32 (30 annualised)

Annual Mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for Nitrogen Dioxide - 40 µg/m^3.

In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

NO_x monitoring in Kilmarnock was carried out from 1st January until 31st December 2013 but due to technical and servicing problems with the NO_x monitor, and also disruption due to sewer replacement works at St. Marnock St., valid data was reduced to 71.1% at this site.

Short-term to Long-term Data adjustment

Where only short-term periods of monitoring data are available, the results may be adjusted to estimate an annual mean concentration using the approach set out in Technical Guidance LAQM.TG(09) Box 3.2 (Reference 1).

Adjustment to estimate annual mean (Appendix D)

The adjustment is based on the fact that patterns in pollutant concentrations usually affect a wide region. Thus if a six month average is above average at one place it will almost certainly be above average at other locations in the region. The adjustment procedure is as follows:-

1. Five nearby long term, continuous monitoring sites, from the Scottish Automatic Urban and Rural Network, within 50 miles were identified: East Dumbartonshire Milngavie, Dumfries and Galloway Eskdalemuir, Glasgow Waulkmillglen, North Lanarkshire Coatbridge Whifflet and South Lanarkshire Lanark.
2. The results of the annual mean, **Am,** for these sites in 2013 were obtained.
3. The period means, **Pm,** for 2013 were obtained for the months of the short term monitoring in East Ayrshire.
4. The Ratio, **R,** of the annual mean/period mean (**Am/Pm)** for each of the sites was then calculated.
5. The average of these ratios, $\mathbf{R_a}$**,** was then calculated to give an adjustment factor.
6. The measured period mean **M** was multiplied by the adjustment factor $\mathbf{R_a}$ to give the estimate of the annual mean for 2013 (Table 2.3 and 2.7).

Table 2.4 Results of Automatic Monitoring for NO_2: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2013 %	Number of Hourly Means > 200µg/m^3				
					2009	2010	2011	2012	2013
A2/John Finnie Street, Kilmarnock	Roadside	N		95.7		16(197 µg/m^3)	1(159 µg/m$^{3)}$	0(109µg/m$^{3)}$	0
A3/St. Marnock Street, Kilmarnock	Roadside	N		71.1				0(122 µg/m^3)	1(124 µg/m^3)

Annual 1-hour mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for Nitrogen Dioxide - 200 µg/m^3, not to be exceeded more than 18 times a year.

In bold, exceedence of the NO_2 hourly mean AQS objective (200µg/m^3-not to be exceeded more than 18 times per year).Where the period of valid data was less than 90% of the full year, the 99.8th percentile of hourly means are included in brackets.

Kilmarnock

As a result of high levels of nitrogen dioxide found in John Finnie Street from long term monitoring a Detailed Assessment was carried out by BMT Cordah in 2008 (Reference 5) and by Golder Associates in 2013 (Reference 26). The modelling studies concluded that although the annual mean NO_2 objective would be exceeded along the centre of the road, no exceedences of the annual mean were predicted at locations of relevant public exposure. Furthermore, no exceedences of the 1-hour mean objective were predicted at areas of relevant public exposure. It was therefore not considered necessary to declare an Air Quality Management Area for NO_2 at this time. The 2007 report also recommended that the location of the diffusion tube monitoring sites be reviewed and an additional location on the south west of John Finnie Street be considered. This has been carried out (Figure 5c), along with one tube sited on West George Street (Figure 5c). The 2008 report also recommended that an automatic monitoring unit be installed on John Finnie Street. This commenced in John Finnie Street in February 2010 (Figure 4).

Annual mean levels of nitrogen dioxide in John Finnie Street and St. Marnock Street Kilmarnock during 2013 were at 39 µg/m^3 and 30 µg/m^3 respectively (Table 2.3, automatic monitoring sites) under the annual mean Air Quality Objective. 2010 levels at John Finnie Street, at 43 µg/m^3, were raised due to long periods of cold still weather and were higher than any year since monitoring started. 2011 levels recorded a substantial drop from 2010 at around 35 µg/m^3 with 2012 levels monitored levels at 30 µg/m^3. Levels at locations where members of the public might be regularly exposed such as building facades of residential property, schools, hospitals, care homes etc. would be less than the levels found at the roadside as NO_2 levels drop off with distance from the roadside. Although the actual site of the automatic monitoring stations have no actual relevant exposure as regards the annual mean they can be regarded as representative of an area of relevant exposure as they are located at a similar distances from the road as other properties along the length of the road. As they are located near a busy shopping area relevant exposure is applicable to the 1-hour mean. 1-hour mean levels apply to all locations where the annual mean applies, as well as gardens of residential properties, kerbside sites (for example, pavements of busy shopping streets), hotels etc., in essence all locations where members of the public might reasonably be expected to spend one hour or more. There were no exceedences of the 1-hour mean (200 µg/m^3) recorded in John Finnie St. with one exceedence recorded in St. Marnock St. during 2013. The Air Quality Regulations state that 1-hour mean of 200 µg/m^3 nitrogen dioxide levels should not be exceeded more than 18 times per year. Since data capture at St Marnock St. was below 90% the 99.8th percentile of hourly means was included and at 124 µg/m^3 (Table 2.4) was significantly below the objective 200 µg/m^3 limit (Table 1.1)

Nitrogen dioxide levels were predicted to fall steadily within Kilmarnock from 2008 (Detailed Report, Reference 5) to follow predicted national trends. Although the sharp rise in 2010 may be due to the exceptionally long cold weather in that year, the accepted evidence of a levelling-off in the reduction in concentrations in recent years (AQEG 2007, Reference 21) may be due to:

1/ An increase in the proportion of the total NO_x emitted directly to the atmosphere as NO_2 . This in turn is due to the increased penetration of diesel cars and the retrofitting of pollution control devices, such as catalytically regenerative traps to buses.

2/ Increasing background concentrations of O_3, which promotes the oxidation of emitted NO to NO_2.

3/ Recent research has also indicated that actual emissions from vehicles are higher in real driving conditions than when the vehicles were tested under European Emissions Standards using a test completed under a standardised test cycle. The expected reductions in emissions from more modern vehicles have been much more limited than predicted.

The actual trend is more likely to, at best, allow levels of nitrogen dioxide from road transport to remain static until increasing numbers of Euro 6/VI diesels are present on our roads, although initial research suggests patchy results when vehicles were tested under real world driving conditions.

The International Council on Clean Transportation (ICCT) - real world emissions study- diesel cars

• The average on-road emissions levels of NOx were estimated at **7 times** the certified emission limit for Euro 6 vehicles. The best performing vehicle complied (just) with the limits, the worst performing exceeded limits by 25 times.
• Most of the cars tested also exceeded the Euro 5 limits
• This supports the idea that the technology exists to comply with Euro 6 under real world conditions and manufacturers should focus on those technologies

http://www.theicct.org/sites/default/files/publications/ICCT_PEMS-study_diesel-cars_20141010.pdf (Reference 24)

In summary

• The Scottish fleet in 2014 is still quite mixed (Euro3, 4 & 5 mainly)
• A steady increase in Euro VI and Euro 6 vehicles in the next 10 years is forecast
• Euro VI/6 should be dominant by 2020 and almost all vehicles will be of this standard by 2025
• The new Euro standards bring with them important changes to type testing regimes, but at the moment the testing requirements for light and heavy vehicles are not consistent
• Most problems (in terms of exceeding limits) are with NOx
• Real world driving emissions of NOx and PM10 from early studies suggest Euro VI heavy vehicles are meeting the standards, though NOx is still quite high in extreme urban conditions. Euro V heavies are still problematic.
• Real world driving emissions from Euro 6 light vehicles are still exceeding the NOx limit, by some margin in some cases. Euro 5 vehicles similar.
• The testing regime for heavy vehicles, as it stands, is more rigorous for heavy vehicles- though changes are expected at the European level in 2017/18 to bring light vehicles into line

Further automatic monitoring in Kilmarnock is therefore essential to verify actual levels of nitrogen dioxide and likely future trends.

Nitrogen Dioxide Diffusion Tube Monitoring Data

The diffusion tube method is open to a degree of uncertainty inherent in the method and as such the results of the survey should be treated with caution and used as indicators of nitrogen dioxide levels only. That said it is a useful screening method which can be used to cover multiple sites at low cost. They are also easily located, where it may not be practical to site bulky automatic monitoring equipment.

The diffusion tube monitoring data for nitrogen dioxide is presented below in Table 2.5 and the full monthly dataset is displayed in Appendix B. Diffusion tube locations are shown in Figure. 5a-5n.

Table 2.5 Results of NO_2 Diffusion Tubes 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months)[a]	2013 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.99
1	Fowlds Street/King Street Junction, Kilmarnock	Kerbside	N	N	12	32.4
2	28 John Finnie Street, Kilmarnock	Roadside	N	N	12	34.0
3	19 Lainshaw Street, Stewarton	Kerbside	N	N	12	31.7
4	40 Main Street, Newmilns	Roadside	N	N	12	30.8
6	8A Kilmarnock Road, Mauchline	Roadside	N	N	12	29.7
7	Junction at Main Street & A70 Ochiltree	Roadside	N	N	12	20.9
9	Townhead/Glaisnock Street Junction, Cumnock	Roadside	N	N	10	15.4
11	96 John Finnie Street, Kilmarnock	Roadside	N	N	12	32.1
12	62 John Finnie Street, Kilmarnock	Roadside	N	N	11	33.1
14	95/97 John Finnie Street, Kilmarnock	Roadside	N	N	11	35.4
15	16 West George Street, Kilmarnock	Roadside	N	N	12	36.9

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months)[a]	2013 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.99
17	23/25 Loudoun Road, Newmilns	Roadside	N	N	11	34.7
22	The Cross, Mauchline	Roadside	N	N	12	29.6
23	3/5 Loudoun Street, Mauchline	Roadside	N	N	12	27.3
24	5/7 Earl Grey Street, Mauchline	Roadside	N	N	12	39.5
25	John Finnie Street, Kilmarnock	Roadside	N	Collocated	12	32.5
27	Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	N	N	12	30.8
28	2A Welbeck Street, Kilmarnock	Roadside	N	N	12	25.0
29	Junction McLelland Drive/Dundonald Road, Kilmarnock	Roadside	N	N	12	26.4
31	Wellington Street, Kilmarnock	Kerbside	N	N	12	26.7
32	Kay Park, Kilmarnock	Urban Background	N	N	12	12.1
33	Howard Park, Kilmarnock	Urban Background	N	N	12	12.6
34	39 Loudoun Road, Newmilns	Roadside	N	N	11	28.9
35	Nelson Street, Kilmarnock	Roadside	N	N	9	19.6
36	17 Portland Road, Kilmarnock	Roadside	N	N	12	19.6

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months)[a]	2013 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.99
37	Sturrock Street, Kilmarnock	Roadside	N	N	12	21.9

Annual mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for Nitrogen Dioxide - 40 µg/m^3.

In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

Table 2.6 Results of NO_2 Diffusion Tubes (2009 to 2013)

Site ID	Location	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) μg/m^3				
				2009 (Bias Adjustment Factor = 1.23	**2010 (Bias Adjustment Factor = 1.12)**	**2011 (Bias Adjustment Factor = 0.94)**	**2012 (Bias Adjustment Factor = 0.96)**	**2013 (Bias Adjustment Factor = 0.99)**
1.	Fowlds Street/King Street Junction, Kilmarnock	Kerbside	N	32.3	39.1	25.0	27.4	32.4
2.	28 John Finnie Street, Kilmarnock	Roadside	N	32.8	**40.2**	32.1	26.4	34.0
3.	19 Lainshaw Street, Stewarton	Kerbside	N	31.2	35.8	27.0	28.7	31.7
4.	40 Main Street, Newmilns	Roadside	N	29.9	33.0	25.9	26.5	30.8
6.	8A Kilmarnock Road, Mauchline	Roadside	N	30.7	31.6	27.9	23.5	29.7
7.	Junction at Main Street & A70 Ochiltree	Roadside	N	23.2	26.2	19.9	20.3	20.9
9.	Townhead/Glaisnock Street Junction, Cumnock	Roadside	N	18.5	17.4	15.6	13.8	15.4
11.	96 John Finnie Street, Kilmarnock	Roadside	N	33.3	34.8	27.9	28.4	32.1
12.	62 John Finnie Street, Kilmarnock	Roadside	N	38.3	**40.0**	33.3	31.1	33.1
14.	95/97 John Finnie Street, Kilmarnock	Roadside	N	**43.7***	**43.8**	34.2	33.7	35.4
15.	16 West George Street, Kilmarnock	Roadside	N	39.9*	**43.2**	35.8	34.8	26.9

17.	23/25 Loudoun Road, Newmilns	Roadside	N	39.8*	**40.6**	30.4	31.8	34.7
18.	100 Main Street, Newmilns	Roadside	N	24.4*	26.4	22.1	19.9	
19.	57/59 Townhead Street, Cumnock	Roadside	N	19.6*	22.6	19.0	17.5	
20.	66 Main Street, Muirkirk	Roadside	N	15.1*	17.8	14.2	12.9	
22.	The Cross, Mauchline	Roadside	N	28.7*	29.5	29.6	24.7	29.6
23.	3/5 Loudoun Street, Mauchline	Roadside	N	31.2*	31.4	28.4	26.0	27.3
24.	5/7 Earl Grey Street, Mauchline	Roadside	N	**41.3***	39.5	34.2	33.5	39.5
25A.	John Finnie Street, Kilmarnock	Roadside***	N		35.2	28.2	28.9	
25B.	John Finnie Street, Kilmarnock	Roadside***	N		39.8	28.0	29.5	
25C	John Finnie Street, Kilmarnock	Roadside***	N		37.8	30.6	28.9	
Mean 25A-25C	John Finnie Street, Kilmarnock	Roadside***	N		37.7	29.0	29.1	
25	John Finnie Street Monitor, Kilmarnock	Roadside	N					32.5
26	76 Loudoun Road, Newmilns	Roadside	N			21.4	18.8	
27	Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	N			30.8	29.9	30.8
28	2A Welbeck Street, Kilmarnock	Roadside	N			25.6	24.9	25.0

29	Junction McLelland Drive/Dundonald Road, Kilmarnock	Roadside	N			25.2	25.2	26.4
30	16 Cumnock Road, Mauchline.	Roadside	N			19.1	20.0	
31	Wellington Street, Kilmarnock	Kerbside	N			21.8	26.2	26.7
32	Kay Park, Kilmarnock	Urban Background	N					12.1
33	Howard Park, Kilmarnock	Urban Background	N					12.6
34	39 Loudoun Road, Newmilns	Roadside	N					28.9
35	Nelson Street, Kilmarnock	Roadside	N					19.6
36	17 Portland Road, Kilmarnock	Roadside	N					19.6
37	Sturrock Street, Kilmarnock	Roadside	N					21.9

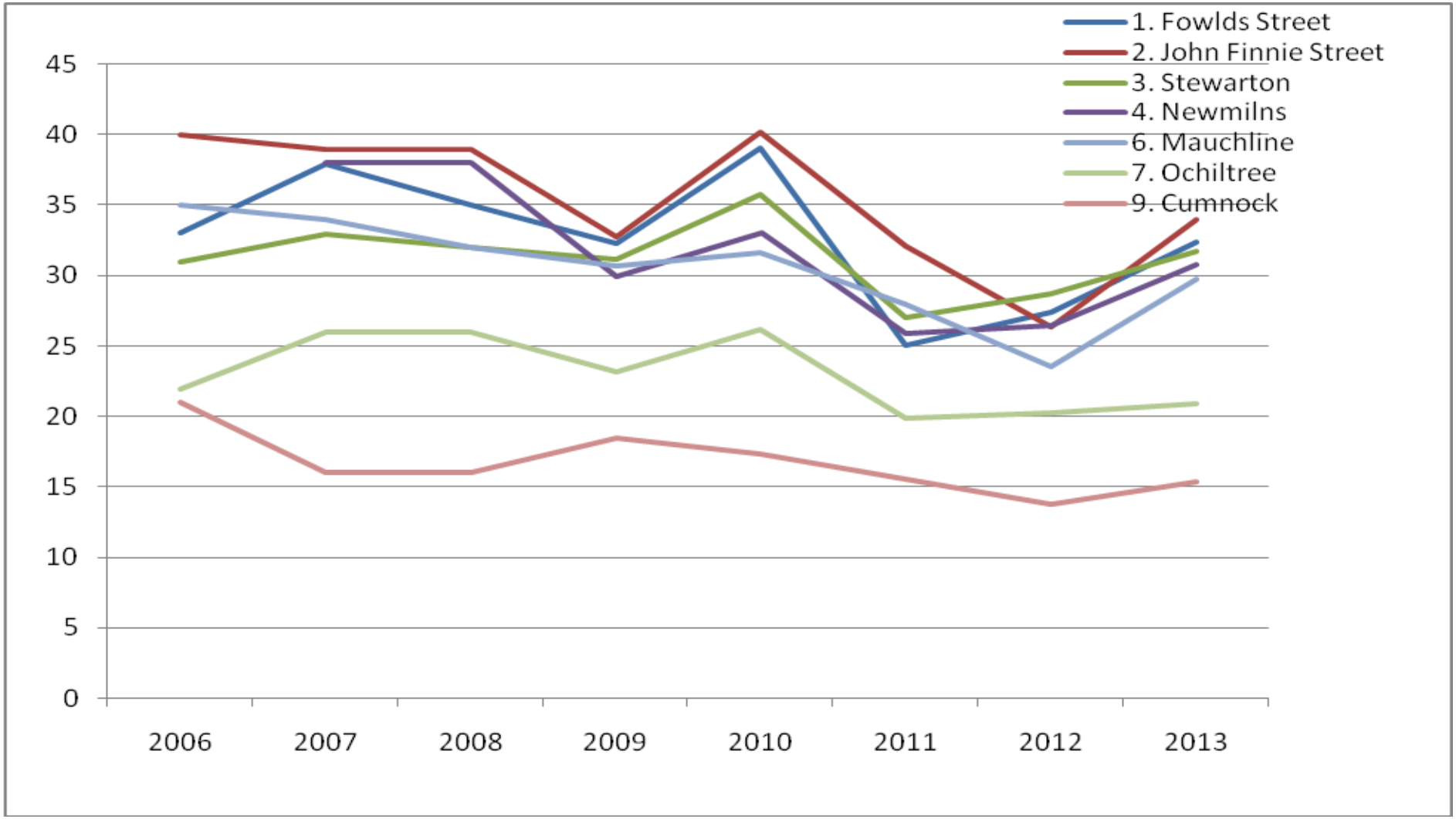
Annual mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for Nitrogen Dioxide - 40 µg/m^3.

*2009 Short term data annualised (2010 Air Quality Progress Report East Ayrshire Council, Reference 22).

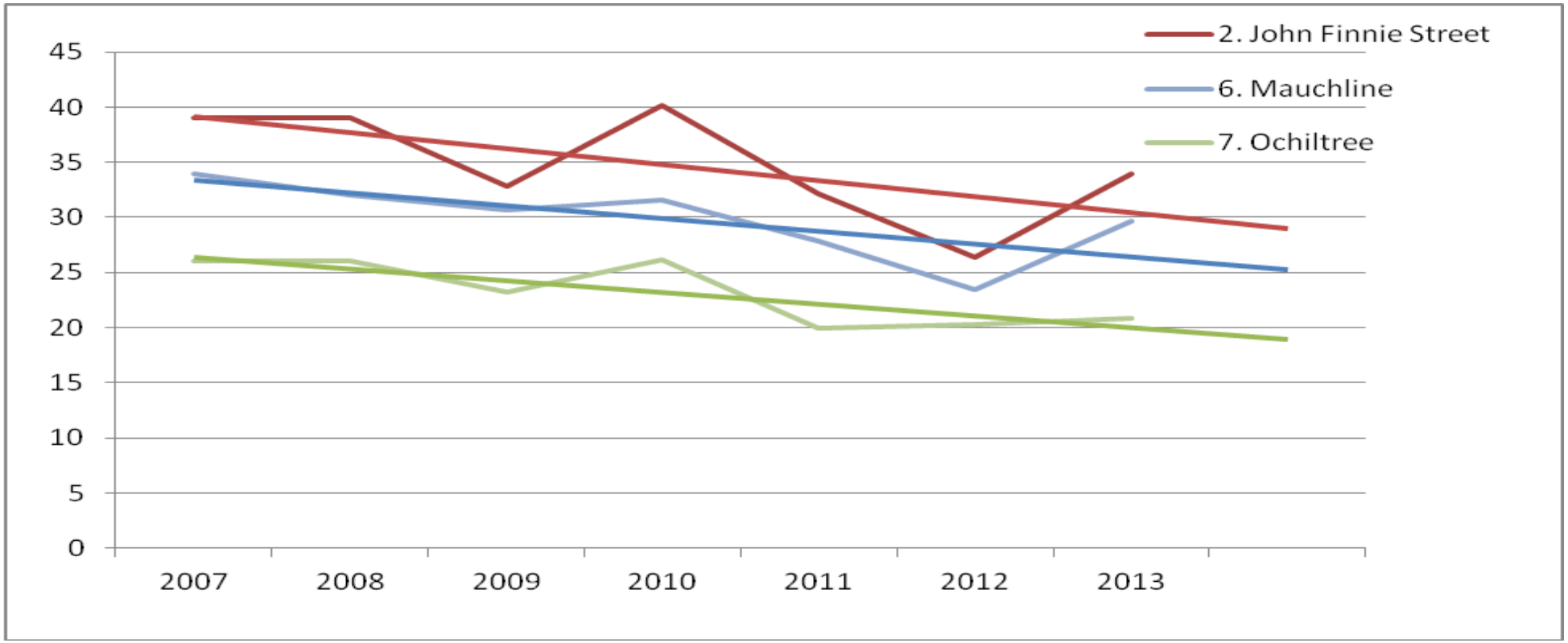
In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

*** Triplicate and co-located tubes

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



Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites - Linear



Annual mean nitrogen dioxide levels in µg/m^3 (y-axis) were plotted against the year of measurement 2006-20013 (x-axis) for the long term diffusion tube monitoring sites. From the data available the overall trend from seven long term monitoring sites within East Ayrshire over the last eight years would appear to be marginally downwards from years 2006 -2009 with a sharp rise in 2010, with a significant fall in 2011 and a levelling off in 2012 and again a noticeable rise in 2013.The sharp rise in 2010 was almost certainly due to the prevailing period of very cold weather experienced during that year. The overall trend would appear to be generally downwards.

2013

All locations where nitrogen dioxide tubes were located within East Ayrshire displayed levels of nitrogen dioxide below the 40 µg/m^3 annual mean Air Quality Objective (Table 2.5 and 2.6).

Kilmarnock

Five new locations were added in Kilmarnock (Table 4 and Figures 5h-n) in January 2013. Diffusion tubes were located in the Kay Park and Howard Park to provide urban background measurements. One additional site was added in Sturrock Street, which although part of the one-way system is located where the road opens out due to adjacent car parks and grass areas with wide pavements. Two extra tubes were also added just off the one way system, one in Nelson Street and one in Portland Road to provide an indication of NO_2 levels outwith the one way system which will provide robust data if any future modelling is required. During 2013 all sites were below the annual mean Air Quality Objective (Table 2.5)

It should be noted that Kilmarnock Town Centre Regeneration works are ongoing and are expected to continue for a considerable period of time. The works are producing particulates from building and ground works as well as the use of generators and traffic disruption which are producing increased NO_x emissions. The main detrimental effect on air quality from the town centre works is likely to result from disruption to traffic flow. This was evidenced from October through to December 2010 and during periods in 2011 where one lane was closed off at the northern end of John Finnie Street and West George Street resulting in a build up of slow-moving traffic and the associated increase of accelerations, decelerations and braking. Major sewer replacement works were also being carried out during 2012 and 2013 in the centre of Kilmarnock resulting in, as previously mentioned, disruption to monitoring at St. Marnock Street. Similar to the regeneration works being carried out the replacement sewer works were increasing the pollutant levels within the town centre, particularly PM_{10} levels as the temporary material handling yard lies in the vicinity of the St. Marnock St. automatic monitor.

In summary the diffusion tube results for the one way system in Kilmarnock followed the national trend for 2012/2013(Reference 13, Air Pollution in Scotland 2012/13) with a significant increase in nitrogen dioxide levels. Further monitoring will be carried out to establish whether levels of NO_2 will remain consistently below the annual mean Air Quality Objective (Table 2.6).

Newmilns

All sites were below the annual mean Air Quality Objective during 2013 (Table 2.5). This showed a substantial fall on 2010 where prolonged very cold weather patterns were experienced which led to raised levels of NO_2 (Table 2.4). One additional diffusion tube was added in Newmilns, in January 2012, at the western end of Loudoun Road (Figure 5c, 76 Loudoun Rd.) to ascertain the spread of NO_2 levels along the A71 running through Newmilns. This tube site was discontinued in January 2013 as levels at 21 µg/m^3 in 2011 and19 µg/m^3 in 2012 (Table 2.6) were well below the annual mean Air Quality Objective (40 µg/m^3). The tube site at the western end of Newmilns, 100 Main Street, was also discontinued since measured levels had dropped below 20 µg/m^3 during 2012 (Table 2.6). One additional tube was added in January 2013 at 39 Loudoun Road (Figure 5n). This site is just along the road from 23/25 Loudoun Road and this will give additional data for this part of the A71 where high buildings lie adjacent to the road creating a canyon effect. The tube indicated a NO_2 level of 28.9 µg/m^3, several micrograms below the tube located at 23/25 Loudoun Road. Since levels in previous years have been around the of 40 µg/m^3 annual mean objective at 23/25 Loudoun Road (Table 2.6) further monitoring is necessary to establish if levels will remain consistently below the annual mean Air Quality Objective.

Mauchline

All sites were below the annual mean Air Quality Objective during 2013 (Table 2.5). One additional diffusion tube was added in Mauchline, in January 2011, at the southern end of the town to ascertain the spread of NO_2 levels along the A76 running through Mauchline (Figure 5d). This tube site, 16 Cumnock Road, was discontinued in January 2013 as levels at 19 µg/m^3 during 2011 and 20 µg/m^3 during 2012 (Table 2.6) were well below the annual mean Air Quality Objective (40 µg/m^3).

Since levels in previous years have been around the of 40 µg/m^3 annual mean objective in Earl Grey Street (Table 2.6), further monitoring is necessary to establish if levels will remain consistently below the annual mean Air Quality Objective.

Cumnock

The NO_2 diffusion tube monitoring site at 57/59 Townhead Street was discontinued in January 2013 since measured levels of NO_2 have dropped below 20 µg/m^3 since 2011. The long time monitoring location at Townhead/Glaisnock Street Junction indicated a level of 15.4 µg/m^3,

Muirkirk

The NO_2 diffusion tube monitoring site at 66 Main Street was discontinued in January 2013 since measured levels of NO_2 have been consistently below 20 µg/m^3 since 2009.

Summary

In summary diffusion tube monitoring is open to a degree of uncertainty and although levels of nitrogen dioxide in Kilmarnock, Newmilns and Mauchline are below the annual mean Air Quality Objective, the raised levels indicate the need to carry out further monitoring.

Relevant Exposure

Diffusion tube monitoring can only give an annual mean level of NO_2, therefore objectives should only apply at locations where members of the public might be regularly exposed such as building facades of residential properties, schools, hospitals, care homes etc. Tube locations are often limited by practical implications such as a suitable mounting point (e.g. lamp post etc.) and often they are nearer the kerb than would be ideal. In the past where levels have exceeded the annual Air Quality Objectives the extrapolated NO_2 levels from the kerbside and roadside data were computed using The NO_2 With Distance From Roads Calculator (Reference 8):-

Cz = ((Cy - Cb) / (-0.5476 x Ln(Dy) + 2.7171)) x (-0.5476*Ln(Dz) + 2.7171) + Cb

Where:

Cz is the total predicted concentration (µg/m^3)at distance Dz;
Cy is the total measured concentration (µg/m^3) at distance Dy;
Cb is the background concentration (µg/m^3);
Dy is the distance from the kerb at which concentrations were measured; and
Dz is the distance from the kerb at which concentrations are to be predicted.
Ln(D) is the natural log of the number D.

Since all monitoring locations during 2013 recorded levels below the annual mean objective this calculation has not been necessary for this report.

1-Hour Mean

Diffusion tubes can only be used to measure the annual mean NO_2 level. Previous research carried out on behalf of DEFRA and the Devolved Administration (Reference 6, Laxen D and Marener B (2003)) identified a relationship between the annual mean and the 1-hour objective, such that exceedences of the latter were considered unlikely where the annual mean was below 60 µg/m^3. An updated analysis (Reference 7, Cook A (2008)) has been carried out taking into account new monitoring data collected over the period 2003-2007. This new analysis has identified a number of exceedences of the 1-hour mean objective where annual mean were below 60 µg/m^3. The majority of these occurrences were recorded at kerbside and roadside sites, and were at sites within South-East England (and in particular within Greater London), but not exclusively so. A large number of these exceedences were associated with a regional pollution event that occurred over several days in December 2007. If these latter exceedences are excluded the number of exceedences of the 1-hour mean where annual mean are below 60 µg/m^3, is extremely limited. On the basis of this new evidence, the guidance remains

unchanged and authorities may assume that exceedences of the 1-hour mean objective are only likely to occur at locations where annual mean concentrations are 60 µg/m^3 and above. Annual mean levels of NO_2 are well below 60 µg/m^3 throughout all monitoring sites within East Ayrshire (Table 2.5 and 2.6) and we can therefore conclude no exceedences of the one hour mean objective are likely at locations of relevant public exposure (any outdoor location where members of the public might reasonably be expected to spend one hour or more e.g. pavements of busy shopping streets etc).

2.2.1 Particulate Matter (PM_{10})

The results of the automatic monitoring carried out at both Kilmarnock are set out in Table 2.7 and Table 2.8 and the full monthly dataset in Appendix C. The BAM 1020 data was corrected using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent (Appendix C) (Reference 9).

PM Monitoring Adjustment

The UK objectives for particulate matter (and the EU limit values) are based upon measurement carried out using the European reference sampler; this is a gravimetric device, where the particle mass is collected onto a filter and subsequently weighed. This type of sampler has significant disadvantages, in that only 24-hour mean concentrations are recorded, the data cannot be disseminated to the public in real time, and the operation is labour intensive. East Ayrshire Council therefore used two Beta Attenuation Monitor (with unheated inlets) (BAM 1020) continuous analysers during 2009 – 2011 and one BAM 1020 and one TEOM FDMS 1405 during 2012 and 2013.

Unheated BAMs tend to over-read PM_{10} with respect to the gravimetric method since they can also read absorbed moisture as particulate matter. In 2006, the UK Government and the Devolved Administrations published a report on the outcome of detailed equivalence tests for various PM_{10} samplers when compared with the European reference sampler. The tests carried out were based on the Guidance for the Demonstration of Equivalence of Ambient Air Monitoring Methods issued by an EC Working Group. In simple terms, the guidance sets out an approach whereby it is possible to test whether an instrument is able to comply with the Data Quality Objective for overall uncertainty as defined within the relevant Air Quality Directive – in the case of PM_{10} this is 25%. The tests were conducted at four sites within the UK, over both summer and winter seasons. The full report can be downloaded from the web (Harrison D (2006) Reference 9).

The Met-One BAM (with unheated inlet) meets the equivalence criteria for PM10 monitoring provided the results are corrected for slope. A correction for slope of 0.83333 was therefore used (Appendix C) (Reference 9).

Table 2.7 Results of Automatic Monitoring for PM_{10}: 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 N/A)	Annual Mean Concentration (µg/m^3)				
						2009	2010	2011	2012	2013
A2 Kilmarnock, John Finnie Street	Roadside	N		63.4	Y		**21**	**20**	13(12 annualised)	16(15 annualised)
A3 Kilmarnock, Saint Marnock Street	Roadside	N		87.9	Y				**19**(17 annualised)	**19**

Annual mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for PM_{10} - 18 µg/m^3.

In bold, exceedence of the PM_{10} annual mean AQS objective of 18µg/m^3

Means were "annualised" as in Box 3.2 of TG(09) (http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38) (Appendices)

PM_{10} monitoring in Kilmarnock was carried out from 1st January until 31st December 2013 but due to technical and servicing problems data capture was below 90%.

Table 2.8 Results of Automatic Monitoring for PM_{10}: 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 (Y or N/A)	Number of Daily Means > 50µg/m^3				
						2009	2010	2011	2012	2013
A2 Kilmarnock, John Finnie Street	Roadside	N		63.8	Y		0(40µg/m^3)	1(38µg/m^3	0(21µg/m^3)	0(35µg/m^3)
A3 Kilmarnock, Saint Marnock Street	Roadside	N		87.9	Y				3(44µg/m^3)	2(46µg/m^3)

24- hour mean Air Quality Objective (included in Regulations for the purpose of LAQM in Scotland) for PM_{10} - 50 µg/m^3, not to be exceeded more than 7 times a year.

In bold, exceedence of the PM_{10} daily mean AQS objective (50µg/m^3 – not to be exceeded more than 7 times per year)

Kilmarnock John Finnie Street and St. Marnock Street (Table 2.7 and 2.8)

An estimated annualised PM_{10} annual mean for 2013 of 15 µg/m^3 (Appendix E) was computed for John Finnie Street (Appendices), lower than the annual mean objective of 18 µg/m^3. No exceedences of the 24-hour objective occurred during 2013 within John Finnie Street. The 98.08th percentile of daily means was 35 µg/m^3 (included since data capture was below 90%).

An annual mean of 19 µg/m^3 was measured for St. Marnock Street (Appendices) for 2013 using BAM technology. This is higher than the annual mean objective of 18 µg/m^3. With funding from the Scottish Government East Ayrshire Council commissioned a collocation study in conjunction with Ricardo AEA to compare the BAM 1020 and TEOM FDMS particulate monitors over a twelve month period. With just under 11 months of the trial completed (December 2014) the BAM 1020 recorded 20 µg/m^3 and the collocated TEOM FDMS recorded 12µg/m^3 (both provisional unratified data obtained from Ricardo AEA). It is suggested the BAM 1020 is over estimating PM_{10} by some margin in higher rainfall/humidity areas particularly when PM levels are raised. This is backed up by East Ayrshire's collocation study which suggests that when PM_{10} is higher the margin between the two instruments is also greater suggesting absorbed moisture by the tape and the particulates is the likely cause. Since the TEOM FDMS is the particulate monitor of choice on the national network and evidence from trial work (reinforced by the 2014 readings from John Finnie St. at 15 – 16 µg/m^3) Environmental Health is satisfied that East Ayrshire PM_{10} levels are in compliance with annual LAQM Air Quality Objectives. 2 exceedences of the 24-hour objective occurred during 2013 within St. Marnock Street. The 98.08th percentile of daily means was 46 µg/m^3 (included since data capture was below 90%).

As in the previous discussion regarding NO_2 the main source of localised PM_{10} in John Finnie Street is due to road traffic. As previously discussed Town Centre Regeneration construction works are directly increasing PM_{10} levels, and indirectly through associated traffic flow changes.

PM_{10} Summary

Annual mean PM_{10} levels recorded at both town centre locations varied by 4 µg/m^3. This is unusually high as both monitors are located within the one way system and traffic levels are similar. Data capture was below 90% for both monitors due to technical and servicing issues, therefore caution should be used when interpreting the results. The conclusion that can be drawn from this difference is that it is in the main due to the difference in measurement method between the BAM 1020 and the TEOM FDMS. As mentioned earlier the BAM 1020 requires correction since the BAM measures particulate mass indirectly and has a propensity to read particle bound water and filter bound water as particulate mass. We are therefore inclined towards using the data from the FDMS monitor (instrument of choice on the national network) as being nearer the true particulate mass reading. Therefore we can conclude that PM_{10} levels in Kilmarnock Town Centre are in compliance with the annual mean and hourly LAQM Scottish Objectives.

2.2.2 Sulphur Dioxide (SO_2)

No Sulphur Dioxide monitoring was carried out in East Ayrshire in 2013. Monitoring was discontinued in 2005 due to the very low levels recorded.

Previous monitoring of sulphur dioxide showed no exceedences of Air Quality Objectives were found or predicted.

Previous assessment of sources of sulphur dioxide concluded that no exceedences of Air Quality Objectives were likely due to the reduction in domestic coal usage and industrial sources.

2.2.3 Benzene

No benzene monitoring was carried out in East Ayrshire in 2013. Monitoring of Benzene was discontinued in January 2008 due to the very low levels of benzene recorded.

Previous monitoring of benzene showed no exceedences of Air Quality Objectives were found or predicted.

Previous assessment of sources of Benzene concluded that no exceedences of Air Quality Objectives were predicted.

2.2.4 Other Pollutants Monitored

No other pollutants, included in the Regulations for the purpose of Local Air Quality Management in Scotland, were monitored by East Ayrshire Council in 2013.

2.2.5 Summary of Compliance with AQS Objectives

East Ayrshire Council has examined the results from the 2013 monitoring stations within East Ayrshire. Concentrations are all below the objectives with the proviso that the BAM 1020 technology is indicating PM_{10} exceedence. With the updated data for 2014 comparative trial East Ayrshire Council will submit an update to the Detailed Assessment submitted in 2013.

3 New Local Developments

3.1 Road Traffic Sources

In order to provide an assessment of road traffic sources for this report, the most up to date information on traffic flows on several roads within East Ayrshire was obtained from the Traffic Section, East Ayrshire Council and Transport Scotland.

The following sources were considered:-

- Narrow congested streets with residential properties close to the kerb.
- Busy streets where people may spend one hour or more close to traffic.
- Roads with a high flow of buses and/or HGVs.
- Junctions.
- New roads constructed or proposed since the last Updating and Screening Assessment.
- Roads with significantly changed traffic flows.
- Bus or coach stations.

East Ayrshire Council confirms that there are no new or newly identified **Road Traffic Sources** which may have an impact on air quality within the Local Authority area.

3.2 Other Transport Sources

The following transport sources were considered:-

- Airports.
- Locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.
- Locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.
- Ports for shipping.

East Ayrshire Council confirms that there are no new or newly identified **Other Transport Sources** which may have an impact on air quality within the Local Authority area.

3.3 Industrial Sources

East Ayrshire Council considered the following industrial sources which are new since the last Updating and Screening Assessment.

- **Industrial installations:** new or proposed installations for which an air quality assessment has been carried out.
- **Industrial installations:** existing installations where emissions have increased substantially or new relevant exposure has been introduced.
- **Industrial installations:** new or significantly changed installations with no previous air quality assessment.
- Major fuel storage depots storing petrol.
- Petrol stations.
- Poultry farms.

East Ayrshire Council confirms that there are no new or newly identified **Other Transport Sources** which may have an impact on air quality within the Local Authority area.

3.4 Commercial and Domestic Sources

East Ayrshire Council considered the following commercial and industrial sources which are new since the last Updating and Screening Assessment.

- Biomass combustion plant – individual installations.
- Areas where the combined impact of several biomass combustion sources may be relevant.
- Areas where domestic solid fuel burning may be relevant..

East Ayrshire Council confirms that there are no new or newly identified biomass combustion plants or areas where domestic solid fuel burning which may have an impact on air quality within the Local Authority area.

3.5 New Developments with Fugitive or Uncontrolled Sources

East Ayrshire Council considered the following new development with fugitive or uncontrolled sources which are new since the last Updating and Screening Assessment.

- Landfill sites.
- Quarries.
- Open Cast Coal Mines.
- Unmade haulage roads on industrial sites.
- Waste transfer stations, etc.
- Other potential sources of fugitive particulate matter emissions.

East Ayrshire Council confirms that there are no new or newly identified fugitive or uncontrolled sources which may have an impact on air quality within the Local Authority area.

In summary, East 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.

East 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

Planning applications for new developments which have not yet been approved but which could impact upon air quality.

1/ Torrance Lodge Care Home, Hurlford, Kilmarnock – 5 single 60Kw Biomass Boilers. Gas boiler replacements.
2/ Glennie House, Auchinleck, Cumnock – 2 single 90Kw Biomass Boilers. Gas boiler replacements.
3/ Campbell Fuels, Kilmarnock – Four 200Kw Biomass Boilers for drying woodchip for retail sale.
4/ Greenock Mains Quarry, Sorn Road, Muirkirk – quarry operation and transport dust.
5/ Kilmarnock Learning Campus, Sutherland Drive, Kilmarnock – possible biomass installation which will replace older gas boilers from merged schools.

5 Air Quality Planning Policies

The local plan currently in force within the East Ayrshire unitary authority is the **East Ayrshire Council local Plan (2010)** (Reference 14). It contains the following policy which is used to assess planning applications:-

Policy ENV25

The Council will require all developers to ensure that their proposals have minimal adverse impact on air quality and will require air quality assessments to be undertaken in respect of any proposed developments which it considers may significantly impact on air quality. The Council will also ensure that any new development will have minimum adverse effects on the physical environment and the amenity of an area as a result of light and noise pollution. Appropriate conditions and Section 75 Agreements will be attached to individual planning consents to ensure that environmental impacts caused by air, light and noise pollution are minimised wherever possible.

6 Local Transport Plans and Strategies

During 2010 East Ayrshire Council published its second Local Transport Strategy (LTS) which sets out the Council's vision for transportation in the area. It replaced the first LTS published in 2000 and builds upon the progress to date, and outlines a vision to carry transport forward over the period 2009 to 2014, and beyond. The key issues to be addressed by the LTS include:

1. Access to education, employment and health care;
2. Access for users of all abilities;
3. Transport and access to job market areas;
4. Managing traffic levels;
5. Road safety measures; and
6. Protecting the environment.

The principle of climate change is now generally accepted. To begin to address this issue, the Scottish Government has set a target to reduce "greenhouse" gas emissions by 50% by 2030. It is therefore an underlying principle of the LTS to pursue policies and actions to enhance the environment and contribute to a reduction in emissions.

LTS Objectives

The LTS is a holistic document and includes measures to reduce emissions to the air by reducing car dependency. The LTS has established five strategic objectives to address stress points in the transport network, promote integrated and sustainable transport and remove barriers to social inclusion. These objectives are intended to be consistent with the Governments national objectives for transport, SPT's Regional Transport Strategy, and support East Ayrshire's Community Plan.

Objective 1 Economic Growth
Objective 2 Accessibility and Social Inclusion
Objective 3 Environment: to improve, conserve and enhance the natural, historic and built environment, and contribute to a healthier lifestyle by facilitating the provision and use of sustainable modes of transport and reduce emissions to air by reducing car dependency, particularly in urban areas.
Objective 4 Safety and Personal Security
Objective 5 Sustainability and Integration: to encourage the integration of transport modes and promote greater use of public transport and other sustainable modes of transport.

Objective 3 and objective 5 contain measures to improve air quality by facilitating the provision and use of sustainable modes of transport and reduce emissions to air by reducing car dependency, particularly in urban areas. East Ayrshire Council is committed to promoting sustainable transport including cycling, walking, use of public transport and car sharing to minimise emissions of carbon dioxide and pollutants and therefore reduce detrimental economic, social and environmental effects. Similarly sustainable freight transport is encouraged by maximising the use of rail.

Key Action Area for Objective 3 and objective 5 include:-

Bus and rail network and service improvements
Parking management
Walking and cycling networks and facilities
Travel plans
East Ayrshire Core Paths Plan
Landscape Maintenance
Quality Bus Corridors
Use of new technology
Sustainable freight transport
Travel awareness
Interchanges
Park and Ride
Timetabling, ticketing and information

Linkage between the LTS Objectives, National and Regional Transport Objectives, Community Plan (Reference 17), and National Outcomes are summarised in Table E.1 of the LTS document (Reference 15).

The East Ayrshire Local Transport Strategy 2009-2014 can be found on the East Ayrshire Council Website (Reference 15).

7 Climate Change Strategies

East Ayrshire Council has policies and strategies in place which promotes sustainable development and carbon reduction.

The principle of climate change is now generally accepted. To begin to address this issue, the Scottish Government has set a target to reduce "greenhouse" gas emissions by 50% by 2030. It is an underlying principle of the LTS to pursue policies and actions to enhance the environment and contribute to a reduction in emissions (summarised in section 6).

East Ayrshire Council also has carbon management programme in place. East Ayrshire Carbon Management Programme, **Strategy and Implementation Plan (SIP), October 2007** (Reference 16)**.**

Improving the environment is a key priority theme within the **East Ayrshire Community Plan.** Protecting the environment now and for future generations is a strategic priority. Climate change is of international, national, regional and individual concern and responsibility. As a community leader and provider, East Ayrshire Council is committed to, act, lead by example and support the increasing challenge of reducing greenhouse gases.

Participation in the Carbon Trust Local Authority Carbon Management Programme (Reference 19) has enabled the council to quantify its carbon emissions and develop a clear plan of action. The plan outlines the Council focus on four themes:

1. Reducing the environmental impact of the council's energy consumption.
2. Reducing the environmental impact of the council's vehicle fleet.
3. Reducing the environmental impact of landfill by reducing and recycling of the council's waste.
4. Reducing the environmental impact of street lighting.

An action plan has been developed ranging from short term, low cost measures to projects requiring significant investment and implementation time.

The Carbon Management Programme will be taken forward as an integral part of the Council's broader Sustainability Strategy (Reference 18).

The Carbon Management Programme Strategy and Implementation Plan (SIP) will raise issues that when carried out will result in benefit to the Council and could be used as a springboard to influence change in the wider community. The Council recognises the need to be visionary and proactive with regard to carbon reduction.

"A commitment to lasting development will help us make the right decisions, with the knowledge that we have taken full account of the social, economic and environmental consequences."
East Ayrshire Community Plan – Improving the Environment

East Ayrshire Council

East Ayrshire Council (EAC) objectives in pursuing the Local Authority Carbon Management (LACM) programme are:

To quantify the carbon emissions associated with running the council.
To identify and implement schemes to reduce carbon emission, by reducing energy consumption, minimising waste and lowering environmental impact of transport.
To progress towards the integration of sustainable energy generation.

The purpose of the implementation plan is

1. To establish a baseline of the Council's carbon emissions by looking at the main energy consumers including (but not exclusively) buildings, transport, street lighting, and waste management.
2. To calculate the value of the real challenges that the Council faces and the implications if no action is taken to reduce our carbon emissions.
3. To highlight the financial and environmental benefit which can arise from resourceful ideas and the implementation of carbon reduction measures.

The implementation of the energy savings programme has been ongoing since September 2005.The plan encompasses actions ranging from simple short term work to longer-term projects and renewable initiatives. One of the outcomes has been confirmation that the works carried out since 2005 have resulted in significant reduction in carbon emissions. This demonstrates that if continued the Council is in a realistic position to achieve the reduction target of 10% and that investment in projects that reduce energy consumption have the additional positive effect on reducing carbon emissions.

Table 6 within the Carbon Management implementation Plan lists nominated actions and emissions reduction opportunities and Table 7 includes an implementation summary plan (Reference 16)

Air quality will also be included in East Ayrshire Councils Community Plan 2015-2030 Strategic Environmental Assessment. This document is currently in draft form and will be referred to in future reports.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Both automatic and passive monitoring for NO_2 carried out during 2013 resulted in no exceedences of both the Annual Mean and the Hourly Mean Air Quality Objectives at all monitoring locations within East Ayrshire (Figures 2.3, 2.4, 2.5 and 2.6).

Automatic monitoring of PM_{10} at the John Finnie Street monitoring site indicated (part year measurements annualised at 15 µg/m^3) an annual mean level below the Air Quality Objective (18 µg/m^3) (Figures 2.7). An Annual Mean level of 19µg/m^3 was recorded at St. Marnock St. using the BAM 1020 and was therefore in exceedence of the Annual Mean Air Quality Objective. Referring to the earlier discussion preferred TEOM FDMS technology indicates compliance with the annual mean Air Quality Objective within the one way system in Kilmarnock. East Ayrshire Council will proceed with an update to the 2013 Kilmarnock Town Centre Detailed Assessment bringing together recent monitoring data from both monitoring technologies.

No exceedences of the 24-hour Mean Objective occurred at the John Finne St. site during 2013 (98.08th percentile of 35 µg/m^3). 2 exceedences of the 24-hour Mean Objective occurred at St. Marnock St. during 2013 (98.08th percentile of 46 µg/m^3).

There has been a slight downward trend in both diffusion tube measured NO_2 annual mean (Figure 2.4) since 2006 and a general downward trend in measured PM_{10} annual mean at the John Finnie St. monitoring site since 2010 (Table 2.7), although the latter is certainly partly due to the previously discussed differences in monitoring technology.

Since PM_{10} and NO_2 annual mean levels have exceeded the objective levels in past years, further monitoring is necessary to determine whether the downward trend is consistent and air quality objectives are being met.

8.2 Conclusions relating to New Local Developments

There are no new or newly identified local developments (since the submission of the 2012 USA and 2013 PR) which may have a significant impact on air quality within the Local Authority area.

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.**

Possible future developments which may have a significant impact on local air quality have been listed in **Section 4 Planning Applications**. These will first of all be screened using appropriate guidance including TG (09) or EPUK guidance and if this indicates significant potential air quality issues the applicant will be asked to submit a detailed assessment.

8.3 Other Conclusions

Large reductions were recorded for PM_{10} within John Finnie Street during 2012. The estimated 2012 annual mean PM_{10} at 12 µg/m^3 indicated an 8 µg/m^3 drop on 2011. This is a substantial drop and seems surprisingly large. It must be noted that the unheated BAM1020 monitor was replaced by a FDMS monitor in early 2012. The difference between the two sites was around 5 µg/m^3 in 2012 and 4 µg/m^3 in 2013 (Table 2.7), again unusually high given the proximity of the two sites, both adjacent to the main one way system which runs through Kilmarnock Town Centre. To this end East Ayrshire have applied successfully for funding from the Scottish Government and has now two collocated PM monitors at the St. Marnock St. site (BAM1020 and FDMS).This should enable us to determine how much of the substantial fall is due to the difference in the level recorded by the different types of monitors used in different years and also hopefully determine if any of the reduction is actually due to a real reduction in PM_{10} within Kilmarnock Town Centre, and also, hopefully determine which monitor is likely to be best reflecting the actual PM_{10} levels.

New Planning Applications

Of particular concern for local air quality within East Ayrshire is the rise in the number of biomass installations. The smaller log burners bypass the planning system and it is therefore difficult to ascertain the cumulative effect they will have on air quality. What

we do know is that Environmental Health is now receiving more smoke related complaints from these log burners and they are often replacing cleaner burning gas fires. The larger installations are also of concern, particularly planned installations within Kilmarnock where levels of NO_2 and PM_{10} are already raised due mainly to vehicular traffic. Research recently published in the Scottish Farmer (Reference 25) is also suggesting that the efficiency levels quoted by manufacturers at over 90% are very optimistic and actual levels are nearer 55 – 75%.

8.4 Proposed Actions

Further automatic monitoring for both PM_{10} and NO_2 will be carried out at the two monitoring sites within Kilmarnock Town Centre to ascertain whether the downward trend in PM_{10} and NO_2 is for the long term and air quality objectives continue to be met. Diffusion tube monitoring for NO_2 will also continue throughout East Ayrshire where it is deemed likely that levels are sufficiently high to warrant this (Table 2.5 and 2.6). In this respect monitoring is likely to be concentrated within Kilmarnock Town Centre, Loudoun Road Newmilns, Mauchline Cross and possibly Stewarton Town Centre. Other sites are likely to be de-commissioned as several years monitoring has indicated levels of NO_2 are well below Air Quality Objectives. As previously discussed a comparative trial is being carried out for 12 months with the co-location of a BAM1020 and a TEOM FDMS PM_{10} monitor with a possible further 12 months extension of the trial if a funding bid to the Scottish Government is successful.

As PM_{10} levels exceeded the Annual Air Quality Objective using the BAM 1020 monitoring technology East Ayrshire Council will proceed to an update of the 2013 Kilmarnock Town Centre Detailed Assessment.

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Appendices

Appendix A:

QA/QC Data: Defra and The Devolved Administrations, Spreadsheet of Bias Adjustment Factors, Version Number 09/13. Accessed at www.uwe.ac.uk/agm/review/index.html

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 09/14

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods

Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet

This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of March 2015

LAQM Helpdesk Website

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

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

Step 1:	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 (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m^3)	Automatic Monitor Mean Conc. (Cm) (µg/m^3)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Glasgow Scientific Services	20% TEA in water	2013	R	East Dunbartonshire Council	12	29	31	-4.1%	P	1.04
Glasgow Scientific Services	20% TEA in water	2013	R	East Dunbartonshire Council	12	40	36	9.1%	G	0.92
Glasgow Scientific Services	20% TEA in water	2013	R	East Dunbartonshire Council	10	33	36	-8.9%	P	1.10
Glasgow Scientific Services	20% TEA in water	2013	R	East Dunbartonshire Council	11	25	27	-4.7%	G	1.05
Glasgow Scientific Services	20% TEA in water	2013	KS	Marylebone Road Intercomparison	12	95	81	17.6%	G	0.85
Glasgow Scientific Services	20% TEA in water	2013		Overall Factor[3] (5 studies)				Use		0.99

Appendix B: Monthly NO_2 Diffusion Tube Data

East Ayrshire Monthly NO_2 Diffusion Tube Data 2013 ($\mu g/m^3$)

Site Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Mean	Corrected Mean (Bias Factor 0.99)
1. Fowlds Street/King Street Junction, Kilmarnock	41.6	47.2	25.3	26.3	28.4	31.0	26.6	23.1	28.5	41.2	46.3	26.9	32.700	32.4
2. 28 John Finnie Street, Kilmarnock	46.9	50.8	31.5	33.2	26.1	29.9	23.6	24.4	28.6	45.2	41.1	31.2	34.375	34.0
3. 19 Lainshaw Street, Stewarton	41.4	37.2	25.2	26.3	29.6	30.1	24.7	26.8	30.1	28.9	58.6	25.5	32.033	31.7
4. 40 Main Street, Newmilns	34.1	43.1	19.3	29.9	24.2	36.1	27.7	24.6	29.4	34.4	44.2	26.2	31.100	30.8
6. 8A Kilmarnock Road, Mauchline	37.9	40.6	23.8	28.0	26.0	30.9	22.7	19.8	30.1	41.9	35.1	23.8	30.050	29.7
7. Junction at Main Street &A70, Ochiltree	27.0	28.1	17.1	16.4	17.7	21.2	13.1	18.3	18.0	25.5	31.0	19.4	21.067	20.9
9. Townhead/ Glaisnock Street Junction, Cumnock	17.7	20.2	10.2			14.1	9.2	11.9	12.9	19.1	23.1	16.9	15.530	15.4
11. 96 John Finnie Street, Kilmarnock	39.9	43.5	23.0	28.8	20.9	32.0	23.4	25.0	30.5	45.9	43.9	31.7	32.375	32.1
12. 62 John Finnie Street Kilmarnock	44.3	48.8	27.2	29.7	29.1	32.6	28.1	25.8	25.8		44.1	32.3	33.436	33.1
14. 95/97 John Finnie Street, Kilmarnock	38.8	50.1	21.8	26.8	36.8	40.8	30.0	32.9	27.9		50.2	37.1	35.745	35.4
15. 16 West George Street, Kilmarnock	46.4	49.6	21.8	27.4	26.9	35.7	38.7	32.6	39.4	43.3	54.8	30.4	37.250	36.9
17. 22/25 Loudoun Road, Newmilns	40.4	45.6	34.8	29.3	26.7	33.2	30.9	28.7	31.3	35.7	49.5		35.100	34.7
22. The Cross, Mauchline	34.9	38.1	23.9	19.6	27.7	30.3	20.3	25.2	28.4	35.2	47.8	27.1	29.875	29.6
23. 3/5 Loudoun Street, Mauchline	35.3	38.8	23.2	14.5	23.1	31.4	23.2	22.8	24.4	25.4	37.6	30.8	27.542	27.3
24. 5/7 Earl Gray Street,	56.3	55.7	37.3	36.2	29.9	40.8	33.8	23.3	36.4	43.8	53.7	31.3	39.875	39.5

Mauchline														
25. John Finnie Street Monitor	32.8	41.7	29.5	22.8	32.5	35.6	31.5	27.0	34.1	31.4	42.5	32.2	32.800	32.5
27. Junction King St./St. Marnock St., Kilmarnock	43.0	48.3	24.7	31.4	31.1	38.6	24.4	11.3	14.3	28.5	46.2	31.3	31.092	30.8
28. 2A Welbeck, Street, Kilmarnock	30.0	39.3	16.5	18.1	24.3	24.8	23.4	23.7	14.4	30.6	35.7	22.5	25.275	25.0
29. JCT McLelland Drive/Dundonald Road, Kilmarnock	39.2	35.9	21.2	24.0	20.9	23.1	22.7	18.5	22.0	30.1	38.1	24.6	26.692	26.4
31. Wellington Street, Kilmarnock	36.6	39.7	23.2	22.8	20.2	23.5	22.2	16.1	25.0	36.9	30.8	27.1	27.008	26.7
32. Kay Park**,** Kilmarnock	22.5	19.7	7.9	8.1	8.7	8.6	6.3	6.1	11.0	14.1	21.0	13.1	12.258	12.1
33. Howard Park, Kilmarnock	18.2	23.6	12.0	13.0	9.0	9.7	7.7	5.7	10.4	16.1	16.1	11.0	12.708	12.6
34. 39 Loudoun Road, Newmilns	41.0	43.2	20.3	22.9	24.8		20.3	19.7	27.7	33.2	38.7	29.6	29.218	28.9
35. Nelson Street, Kilmarnock	29.7	31.9	13.9	13.9	12.6	15.2				20.8	24.5	15.9	19.822	19.6
36. 17 Portland Road, Kilmarnock	28.5	34.7	19.4	18.3	13.6	16.8	11.8	9.8	17.2	24.7	27.6	14.6	19.750	19.6
37. Sturrock Street, Kilmarnock	35.9	36.8	16.8	15.1	17.5	19.1	15.3	12.4	11.2	28.5	32.6	24.5	22.142	21.9

Appendix C: Results of Automatic Monitoring for NO_2 and PM_{10}
Produced by Ricardo-AEA on behalf of the Scottish Government

EAST AYRSHIRE KILMARNOCK JOHN FINNIE 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	126 µg m^{-3}	197 µg m^{-3}	657 µg m^{-3}
Maximum daily mean	48 µg m^{-3}	79 µg m^{-3}	213 µg m^{-3}
98.08th percentile of daily means	35 µg m^{-3}	-	-
Average	16 µg m^{-3}	39 µg m^{-3}	85 µg m^{-3}
Data capture	63.4 %	95.7 %	95.7 %

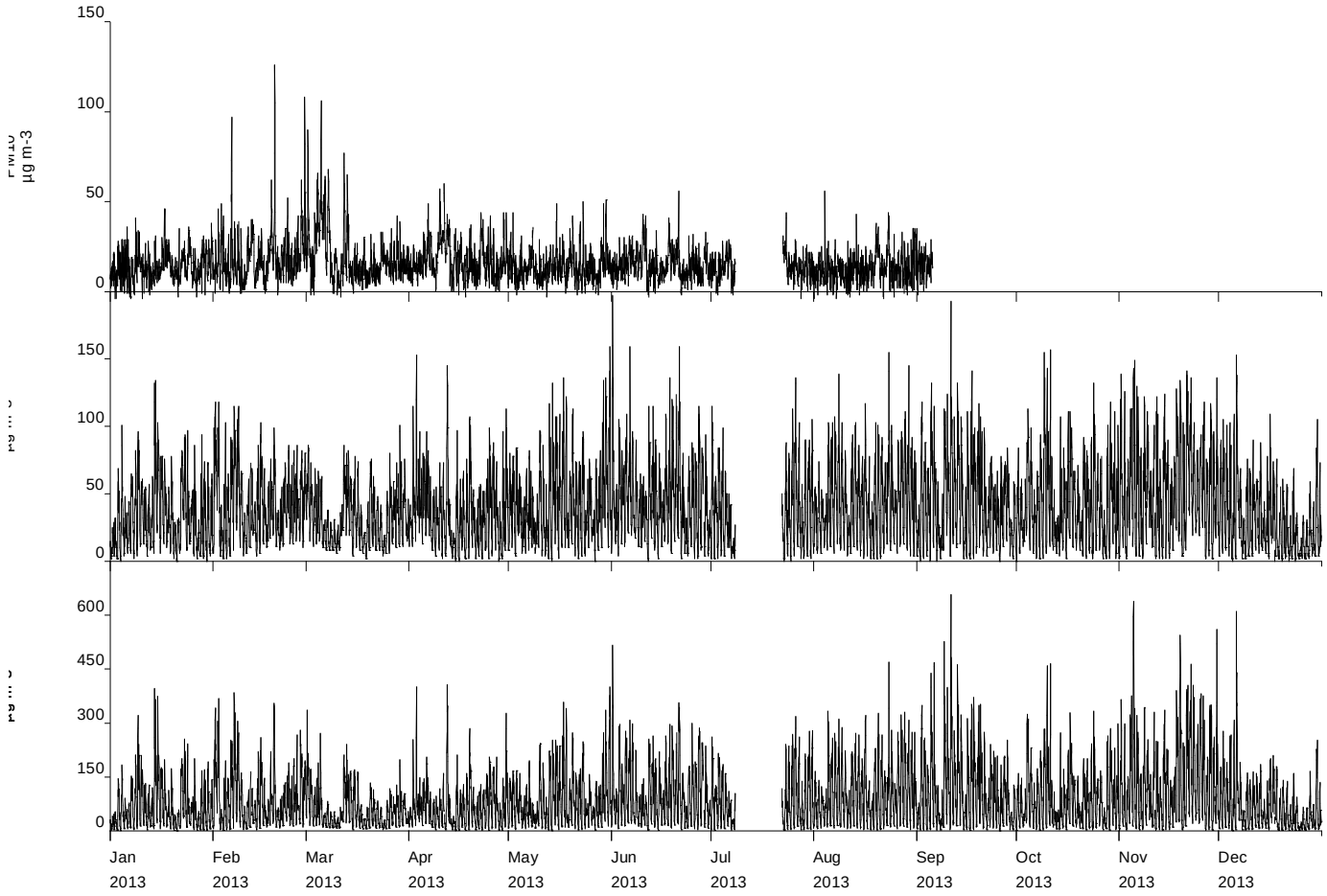
* PM_{10} as measured by a FDMS using a gravimetric factor of 1
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.
NO_X mass units are NO_X as NO_2 µg m^{-3}

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}	0	0
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	0	-
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

Produced by Ricardo-AEA on behalf of the Scottish Government

East Ayrshire Kilmarnock John Finnie St
Hourly Mean Data for 1st January to 31st December 2013



Date Created: 08/04/2014

Produced by Ricardo-AEA on behalf of the Scottish Government

EAST AYRSHIRE KILMARNOCK ST MARNOCK 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	147 µg m^{-3}	220 µg m^{-3}	613 µg m^{-3}
Maximum daily mean	55 µg m^{-3}	73 µg m^{-3}	204 µg m^{-3}
99.8th percentile of hourly means	-	124 µg m^{-3}	468 µg m^{-3}
98.08th percentile of daily means	46 µg m^{-3}	-	-
Average	19 µg m^{-3}	32 µg m^{-3}	72 µg m^{-3}
Data capture	87.9 %	71.1 %	71.1 %

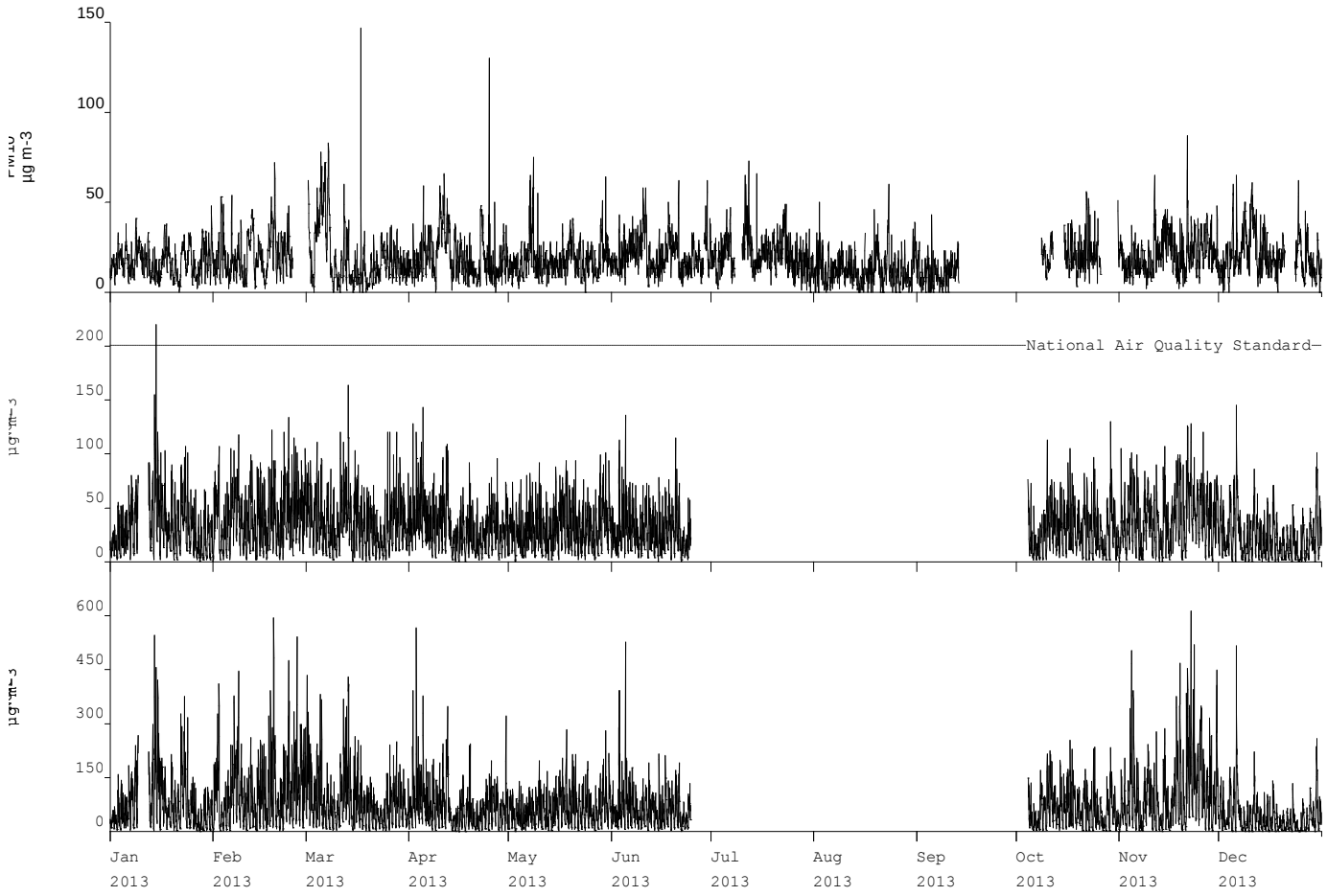
* PM_{10} instruments:
BAM using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent from 1 January 2013
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.
NO_X mass units are NO_X as NO_2 µg 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}	2	2
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}	1	1

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

Produced by Ricardo-AEA on behalf of the Scottish Government

East Ayrshire Kilmarnock St Marnock St
Hourly Mean Data for 1st January to 31st December 2013



Date Created: 08/04/2014

Appendix D: Industrial Premises Regulated by SEPA under the Pollution Prevention and Control (Scotland) Regulations 2000

Part A

PPC/W/20040	Egger	East Ayrshire
PPC/A/1079002	Auldhouseburn Farm	East Ayrshire
PPC/A/1082048	Thomarston Poultry Farm	East Ayrshire
PPC/A/1088432	Hillhead Farm, Kilmaurs,	East Ayrshire
PPC/A/20019	Garlaff Landfill, Skares	East Ayrshire
PPC/A/1017028	Dunniflats Waste Site, Lugton	East Ayrshire
PPC/A/1038885	Billy Bowie Composting, Kilmarnock	East Ayrshire

Part B

PPC/W/30110	Ayr Road Garage, Dalmellington	East Ayrshire
PPC/W/30101	Bridgend Garage, Auchinleck	East Ayrshire
PPC/W/30111	Central Garage, Cummock	East Ayrshire
PPC/W/30112	JK Thomson, Cummock	East Ayrshire
PPC/B/1000090	AM Services, Mauchline	East Ayrshire
PPC/B/1004563	Asda Filling Station, Kilmarnock	East Ayrshire
PPC/W/30100	Blair Garage, Stewarton	East Ayrshire
PPC/W/30116	Bobbin Filling Station, Galston	East Ayrshire
PPC/B/1000092	Pace Petroleum, Galston	East Ayrshire
PPC/B/1000088	Pace Petroleum, Kilmarnock	East Ayrshire
PPC/W/30061	Morrisons, Kilmarnock	East Ayrshire
PPC/W/30114	Shell Glencairn, Kilmarnock	East Ayrshire
PPC/B/1033837	Burnpark FS, Kilmarnock	East Ayrshire
PPC/B/1004562	Western Filling Station, Kilmarnock	East Ayrshire
PPC/B/1004561	Malthurst, Kilmarnock	East Ayrshire
PPC/B/1004559	Campbell Fuel Oils, Kilmarnock	East Ayrshire
PPC/B/1000087	Grange Service Station, Kilmarnock	East Ayrshire
PPC/B/1031777	Tesco Petrol Filling Station, Kilmarnock	East Ayrshire
PPC/W/30071	Braehead Metals	East Ayrshire
PPC/W/30125	Barr Ltd (Mobile)	East Ayrshire

PPC/W/30126	BarrLtd (Mobile)	East Ayrshire
PPC/W/30141	BarrLtd (Mobile)	East Ayrshire
PPC/W/30142	Barr Ltd (Mobile) - Roadstone	East Ayrshire
PPC/W/30146	Killoch (SC) DP	East Ayrshire
PPC/W/30154	Skares OCCS	East Ayrshire
PPC/W/30158	Gasswater (SC)	East Ayrshire
PPC/B/1003136	BarrLtd (Mobile)	East Ayrshire
PPC/B/1003137	BarrLtd (Mobile)	East Ayrshire
PPC/B/1003138	BarrLtd (Mobile)	East Ayrshire
PPC/B/1003139	BarrLtd (Mobile)	East Ayrshire
PPC/B/1003189	BarrLtd (Mobile)	East Ayrshire
PPC/B/1004235	Airdsgreen (SC)	East Ayrshire
PPC/B/1004236	Chalmerston (SC)	East Ayrshire
PPC/B/1005102	BarrLtd (Mobile)	East Ayrshire
PPC/B/1009227	Lugton Limeworks, Lugton	East Ayrshire
PPC/B/1014191	Johnsons Cleaners UK Ltd	East Ayrshire
PPC/B/1015138	Eazyclean Ltd	East Ayrshire
PPC/B/1017559	Crosshouse Launderette	East Ayrshire
PPC/B/1019918	Barr Ltd (Mobile) RMC	East Ayrshire
PPC/B/1024480	Barr Limited, Moorfield Plant	East Ayrshire
PPC/B/1025233	Beez Neez, Stewarton	East Ayrshire
PPC/B/1030092	Barr Ltd (Killoch)	East Ayrshire
PPC/B/1081430	Ve-Tech, Stranhead Cement Batcher	East Ayrshire
PPC/B/1083652	ATH Resources, Netherton	East Ayrshire
PPC/B/1079817	Dunstonhill OCCS, Patna	East Ayrshire
PPC/B/1079266	Piperhill Coal Transfer, Sinclairston	East Ayrshire

Appendix E:

All concentrations are reported as μg m^{-3}

	Period Mean	**Adj Annual Mean**			
John Finnie PM10	**16 (93.3%)**	**15**			
	Period Mean, Pm (01/01/2013 - 05/09/2013)	Annual Mean (Am)	Factor (F = Am/Pm	Pm DC (%)	Am DC (%)
E Dunbartonshire Milngavie	14.7019948	14.18295897	0.96	96.9	91.0
Eskdalemuir					
Glasgow Waulkmillglen	12.6015278	12.0300383	0.95	94.6	95.4
N Lanarkshire Coatbridge Whifflet	14.49277908	13.70422	0.95	86.1	90.1
South Lanarkshire Lanark					
		Average F	0.95		
	Period Mean	**Adj Annual Mean**			
St Marnock NOx	**33 (98.1%)**	**29**			
	Period Mean, Pm (01/01/2013 - 24/06/2013)	Annual Mean (Am)	Factor (F = Am/Pm		
E Dunbartonshire Milngavie					
Eskdalemuir	2.879061194	2.504890984	0.87	96.9	96.9
Glasgow Waulkmillglen	12.7301941	10.99447711	0.86	99.4	99.0
N Lanarkshire Coatbridge Whifflet					
South Lanarkshire Lanark	27.06137617	24.80473715	0.92	99.4	98.8
		Average F	0.87		
	Period Mean	**Adj Annual Mean**			
St Marnock NOx	**30 (99.4%)**	**31**			
	Period Mean, Pm (04/10/2013 - 31/12/2013)	Annual Mean (Am)	Factor (F = Am/Pm		
E Dunbartonshire Milngavie					
Eskdalemuir	2.216235294	2.504890984	1.13	99.5	96.9
Glasgow Waulkmillglen	11.39608965	10.99447711	0.96	98.2	99.0
N Lanarkshire Coatbridge Whifflet					
South Lanarkshire Lanark	24.86103286	24.80473715	1.00	99.7	98.8
		Average F	1.05		

Figure 1: Map of East Ayrshire

Figure 2: Map of Coal Extraction Sites around Cumnock and New Cumnock

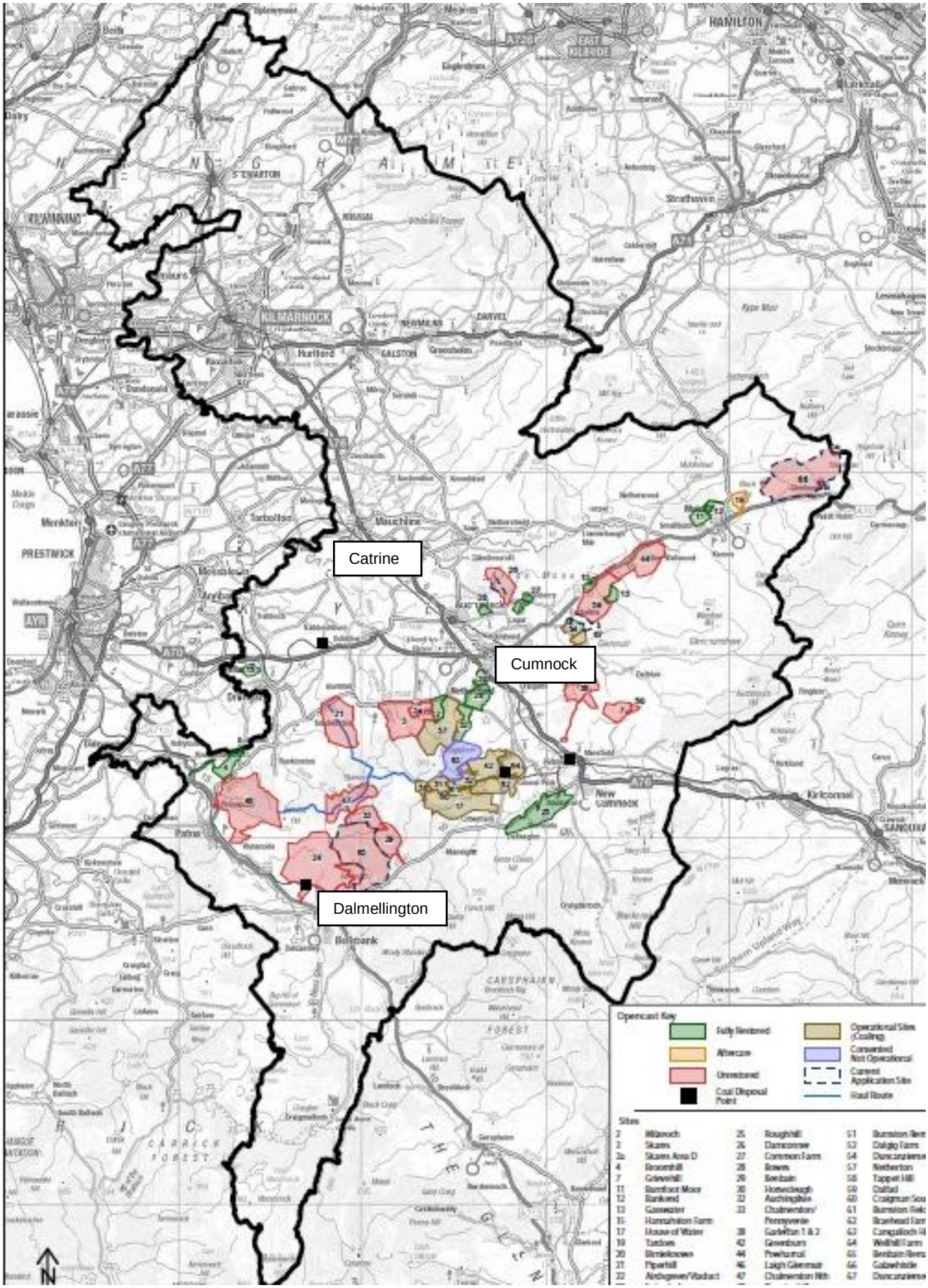


Figure 3: New Cumnock Automatic Monitoring Station

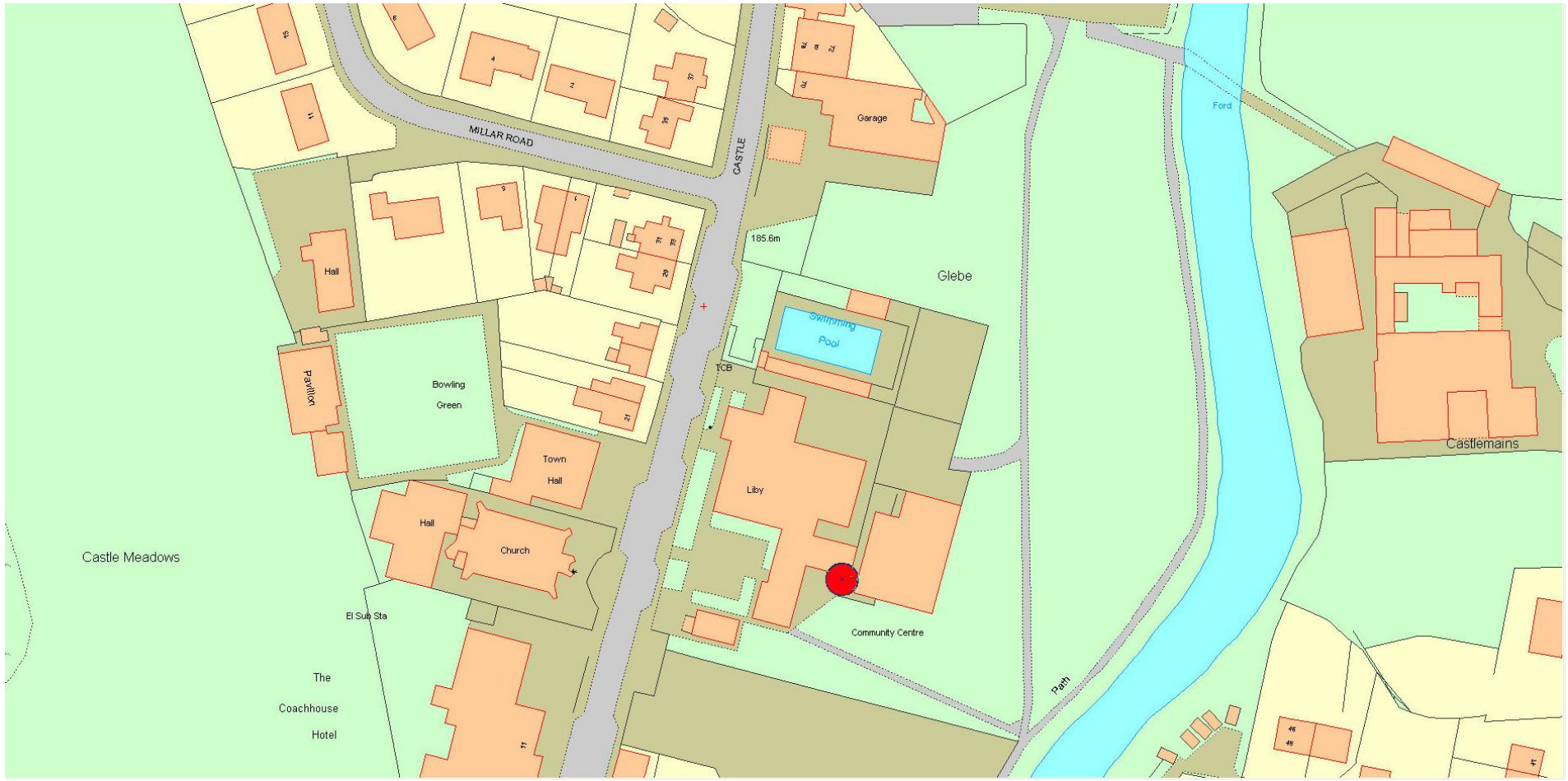


Figure 4: Kilmarnock Automatic Monitoring Stations

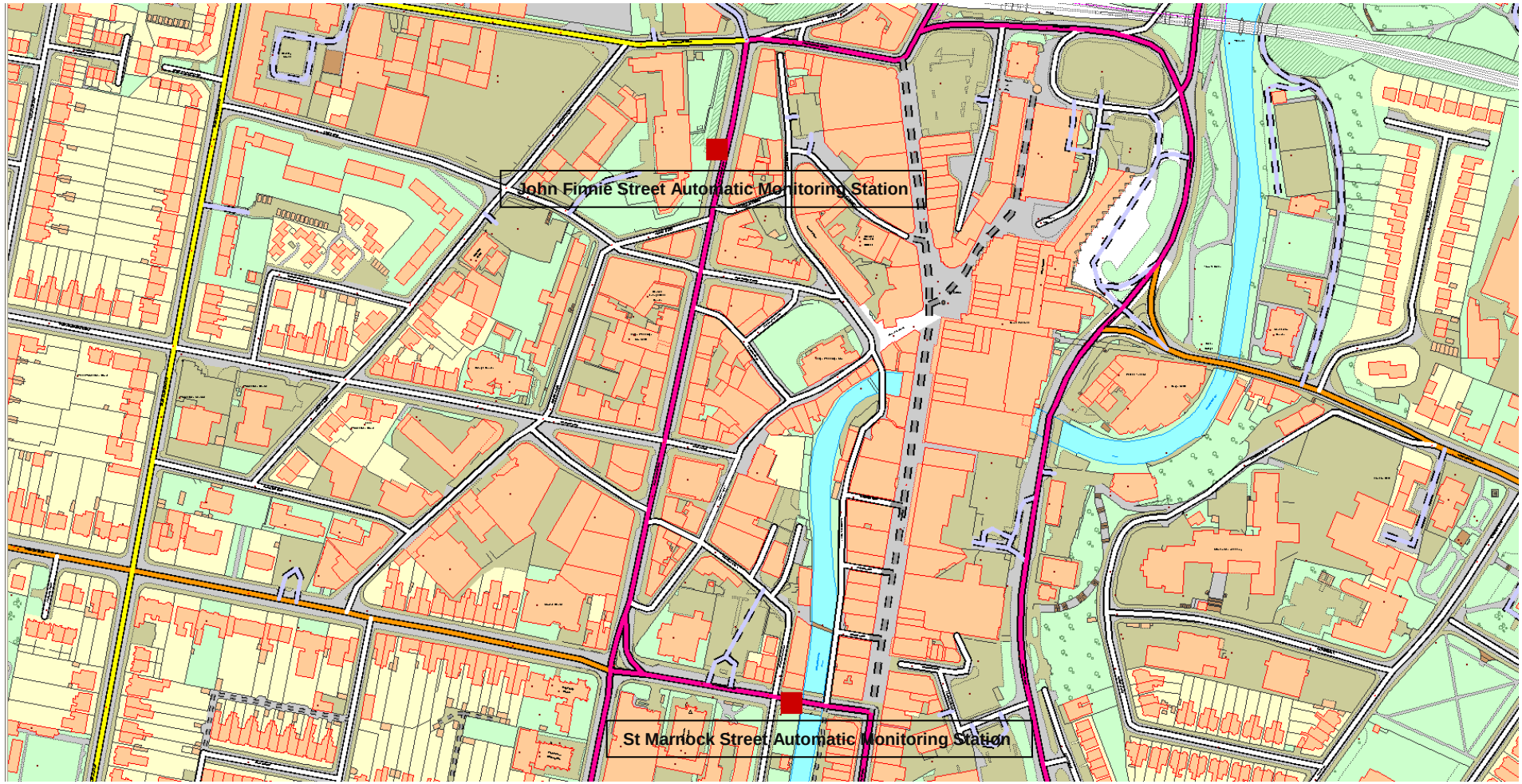


Figure 5a: Stewarton NO2 Diffusion Tube Location

Figure 5b: Kilmarnock Town Centre Air Monitoring Locations

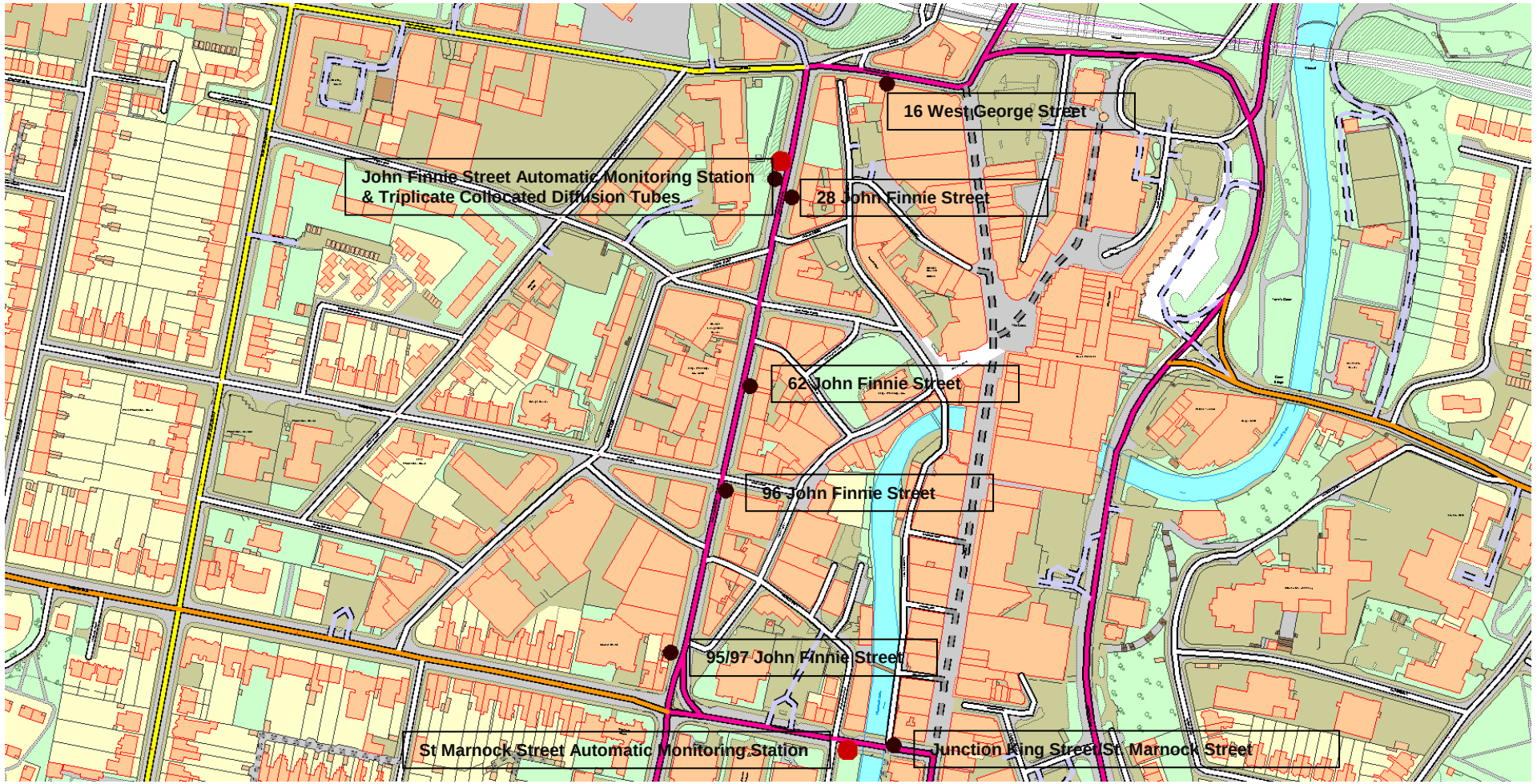


Figure 5c: Newmilns NO_2 Diffusion Tube Locations

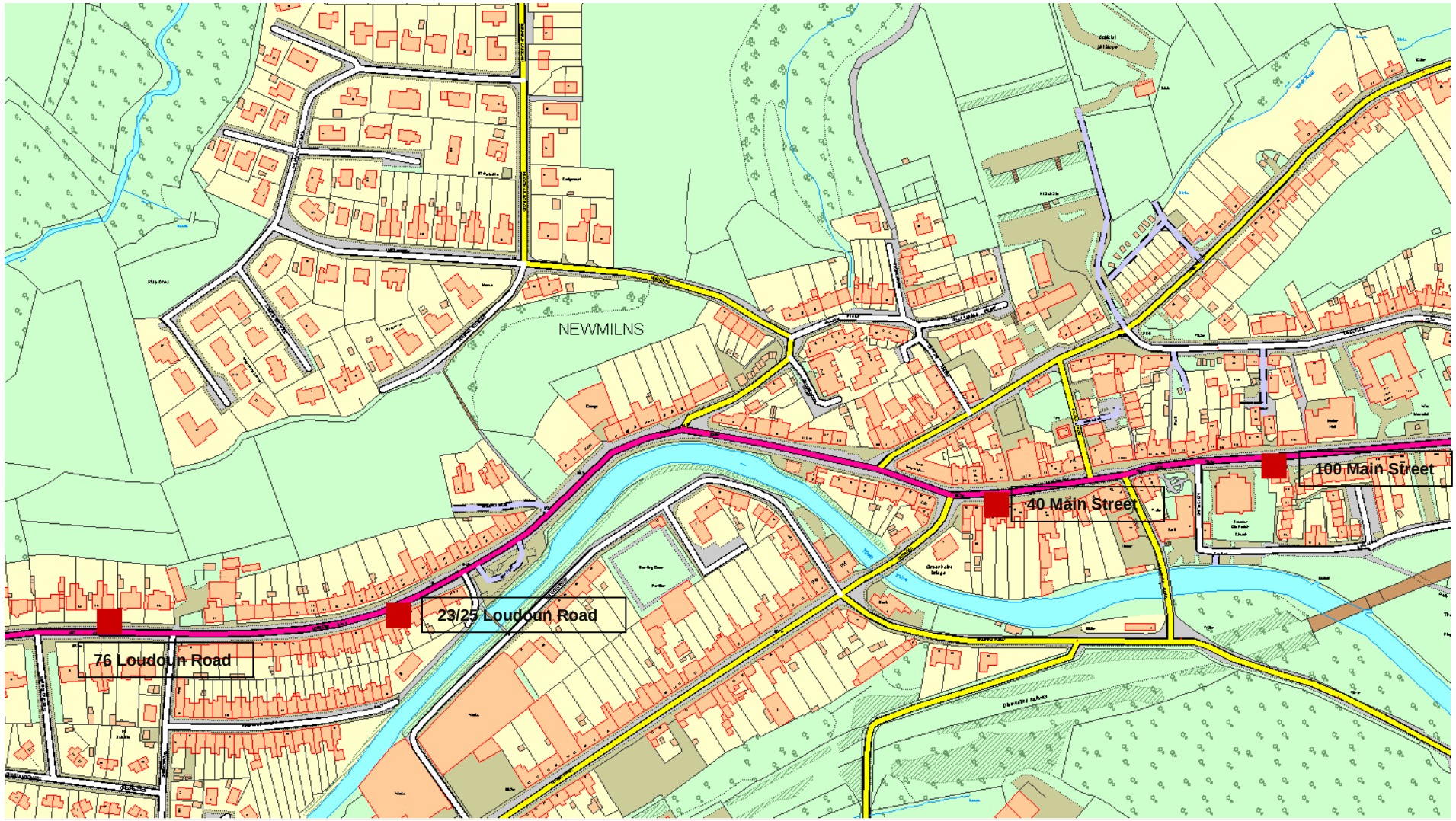


Figure 5d: Mauchline NO_2 Diffusion Tube Locations

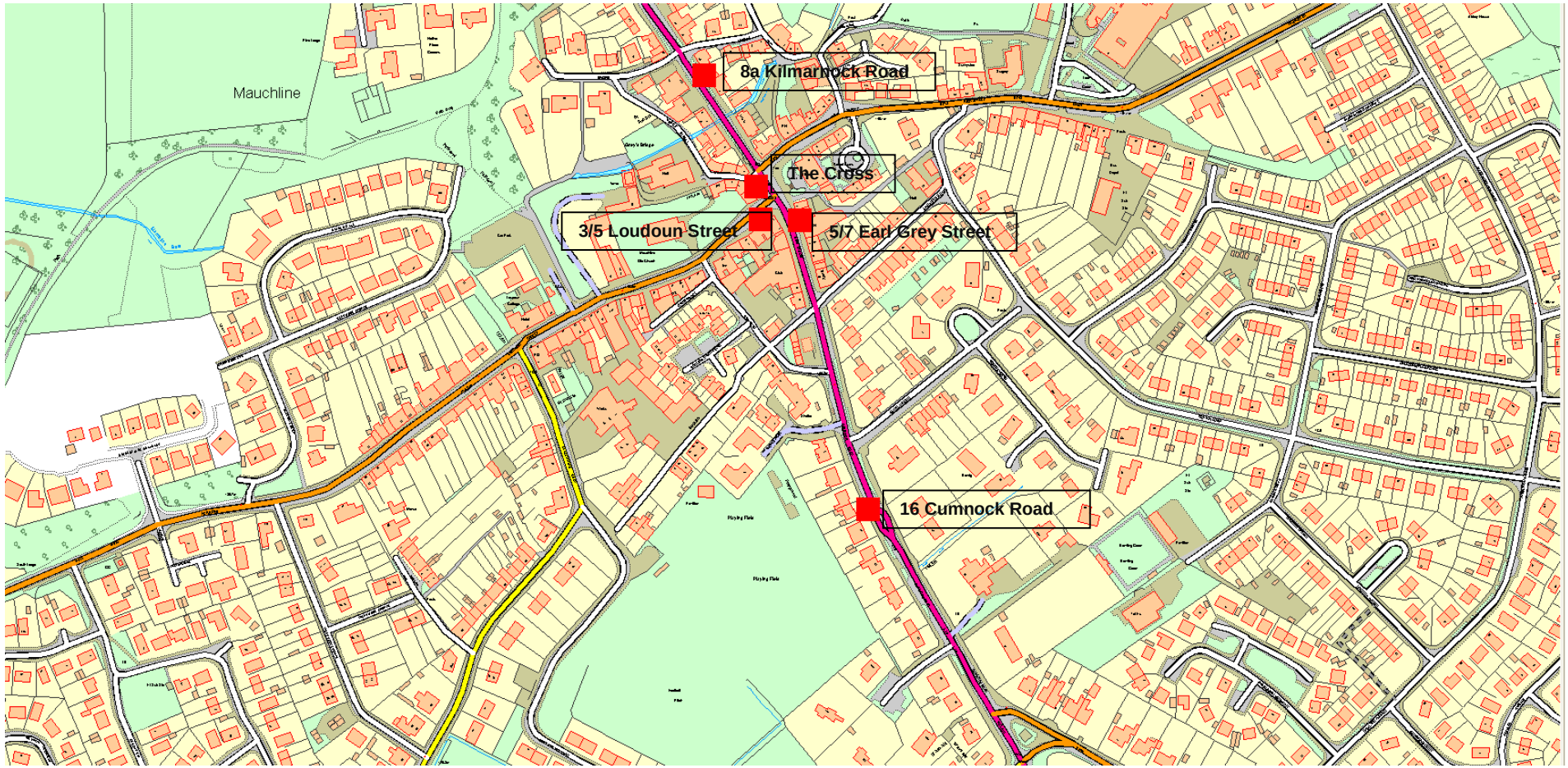


Figure 5e: Muirkirk NO_2 Diffusion Tube Location

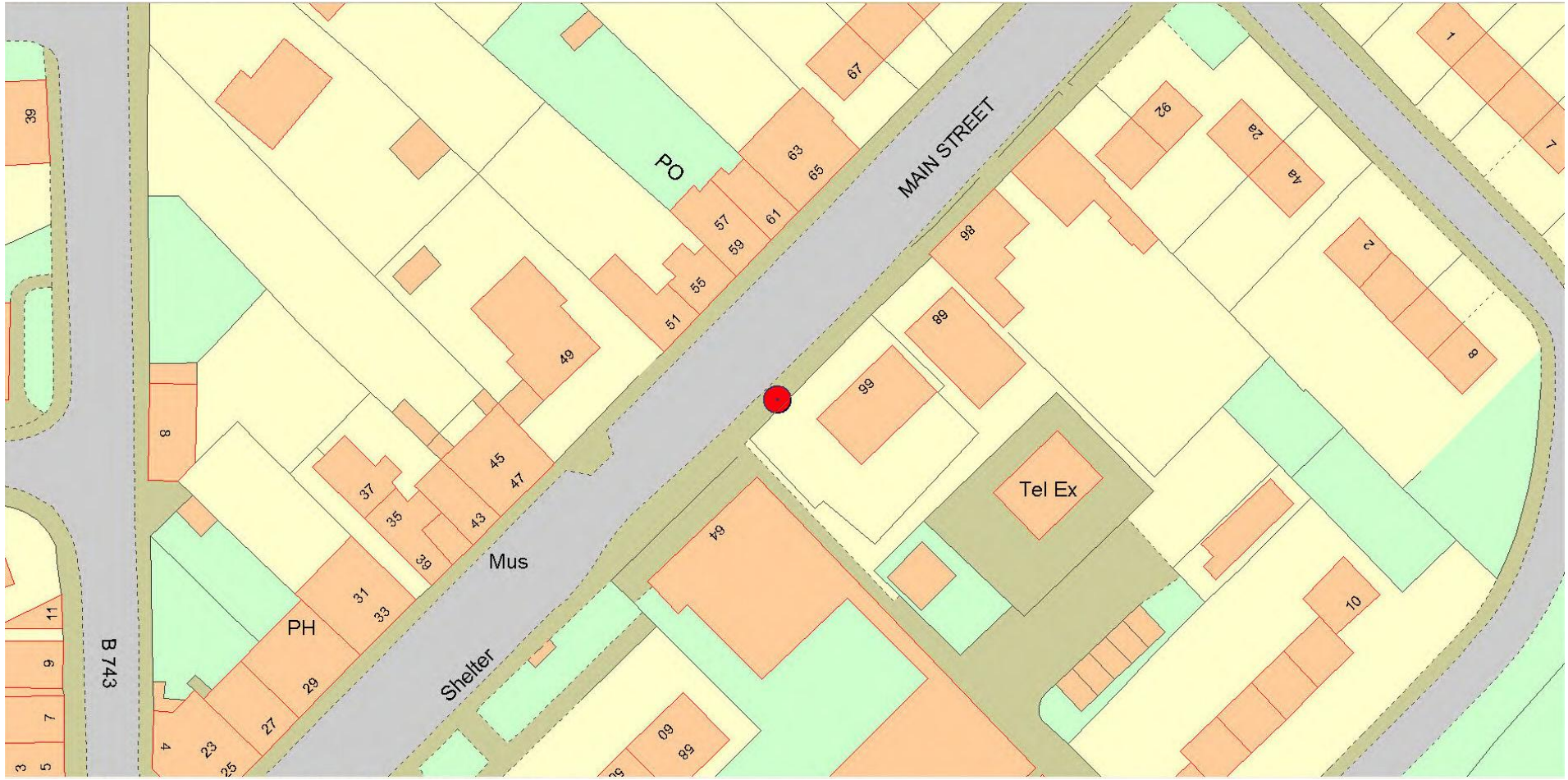


Figure 5f: Ochiltree NO_2 Diffusion Tube Location

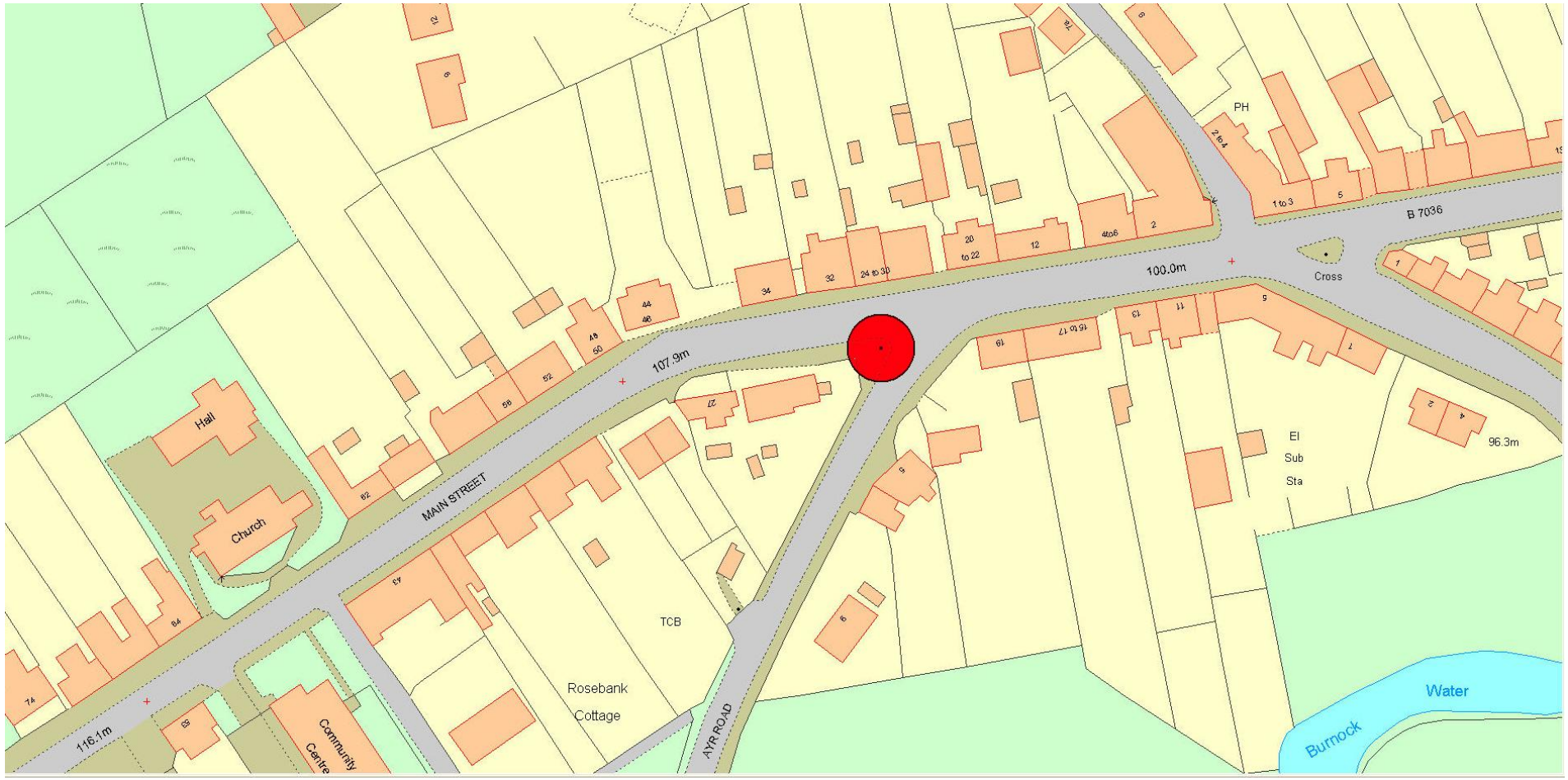


Figure 5g: Cumnock NO_2 Diffusion Tube Locations

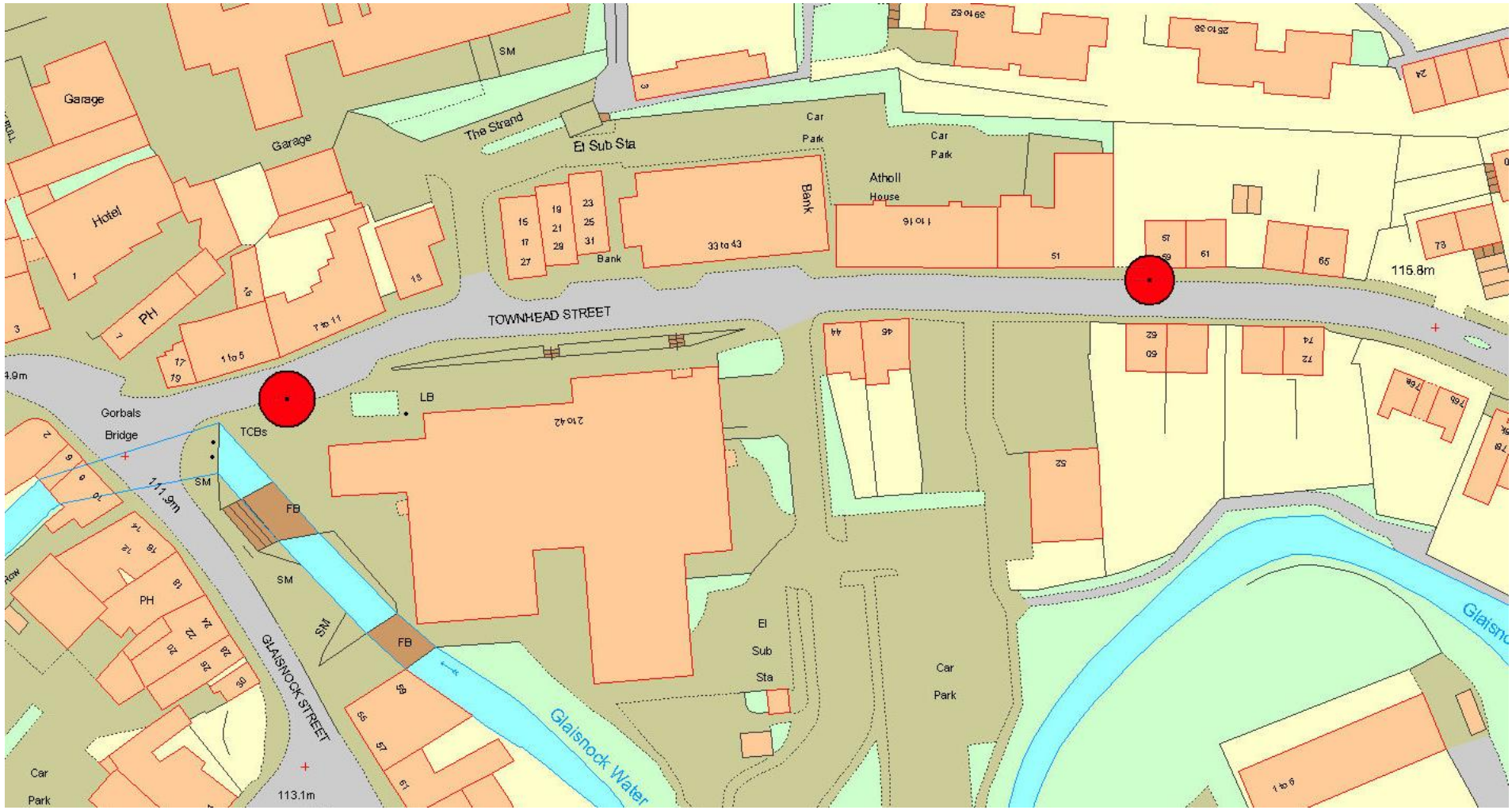
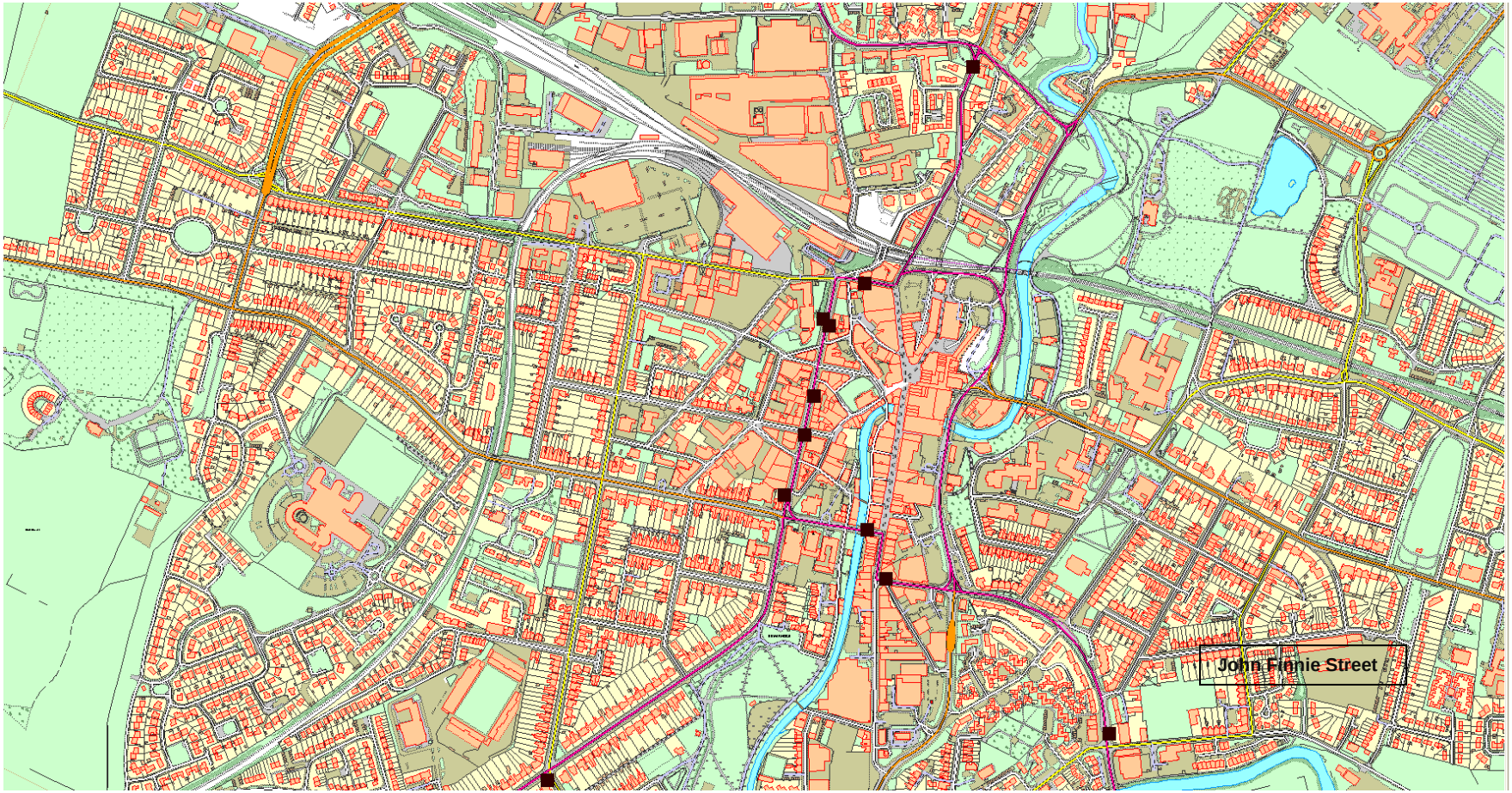


Figure 5h: Kilmarnock NO_2 Diffusion Tube Locations



Junction McLelland Drive/Dundonald Road

Figure 5i: Portland Road, Kilmarnock NO_2 Diffusion Tube Location

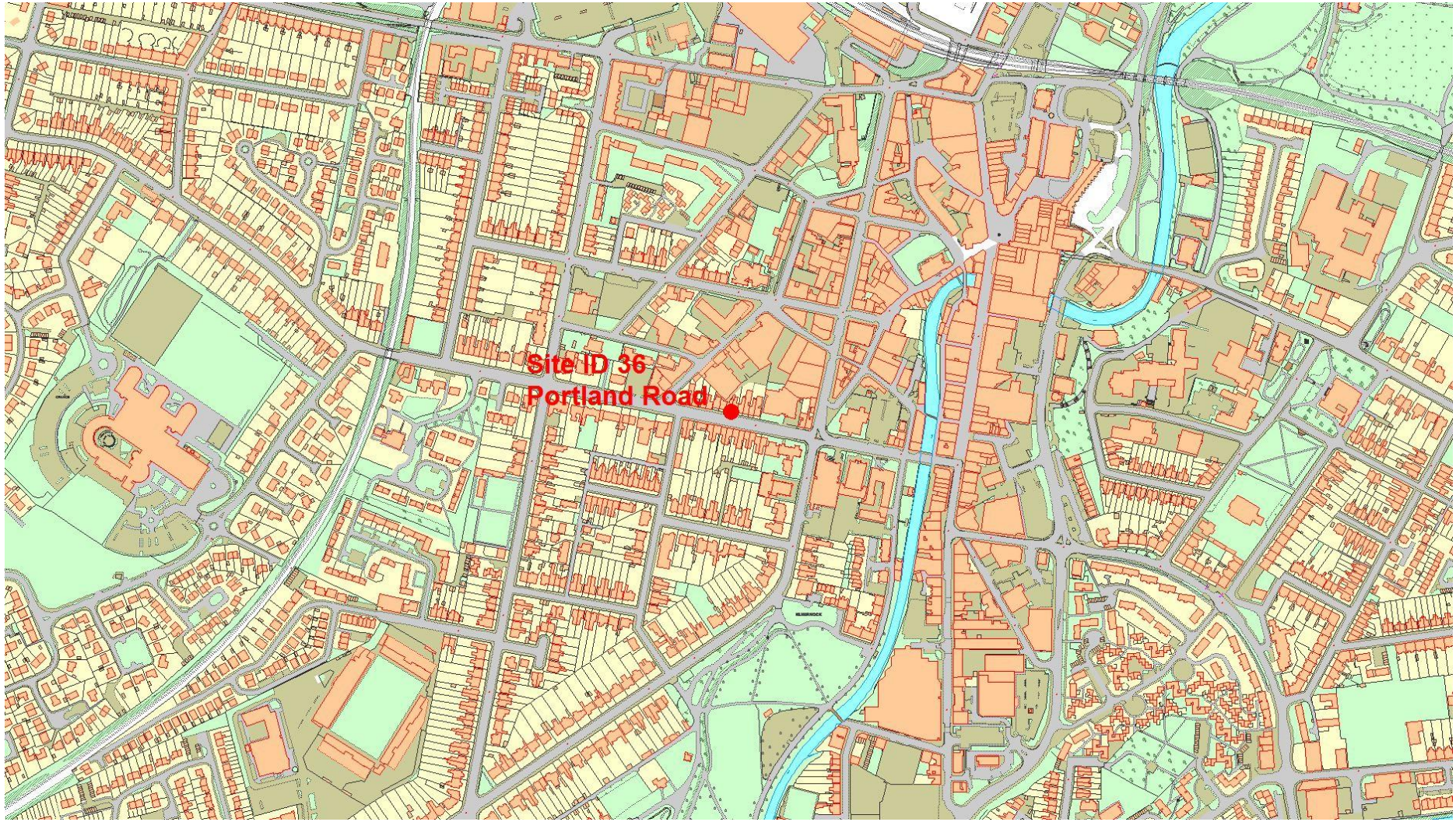


Figure 5j: Sturrock Street, Kilmarnock NO_2 Diffusion Tube Location

Figure 5k: Nelson Street, Kilmarnock NO_2 Diffusion Tube Location

Figure 5l: Kay Park, Kilmarnock NO_2 Diffusion Tube Location

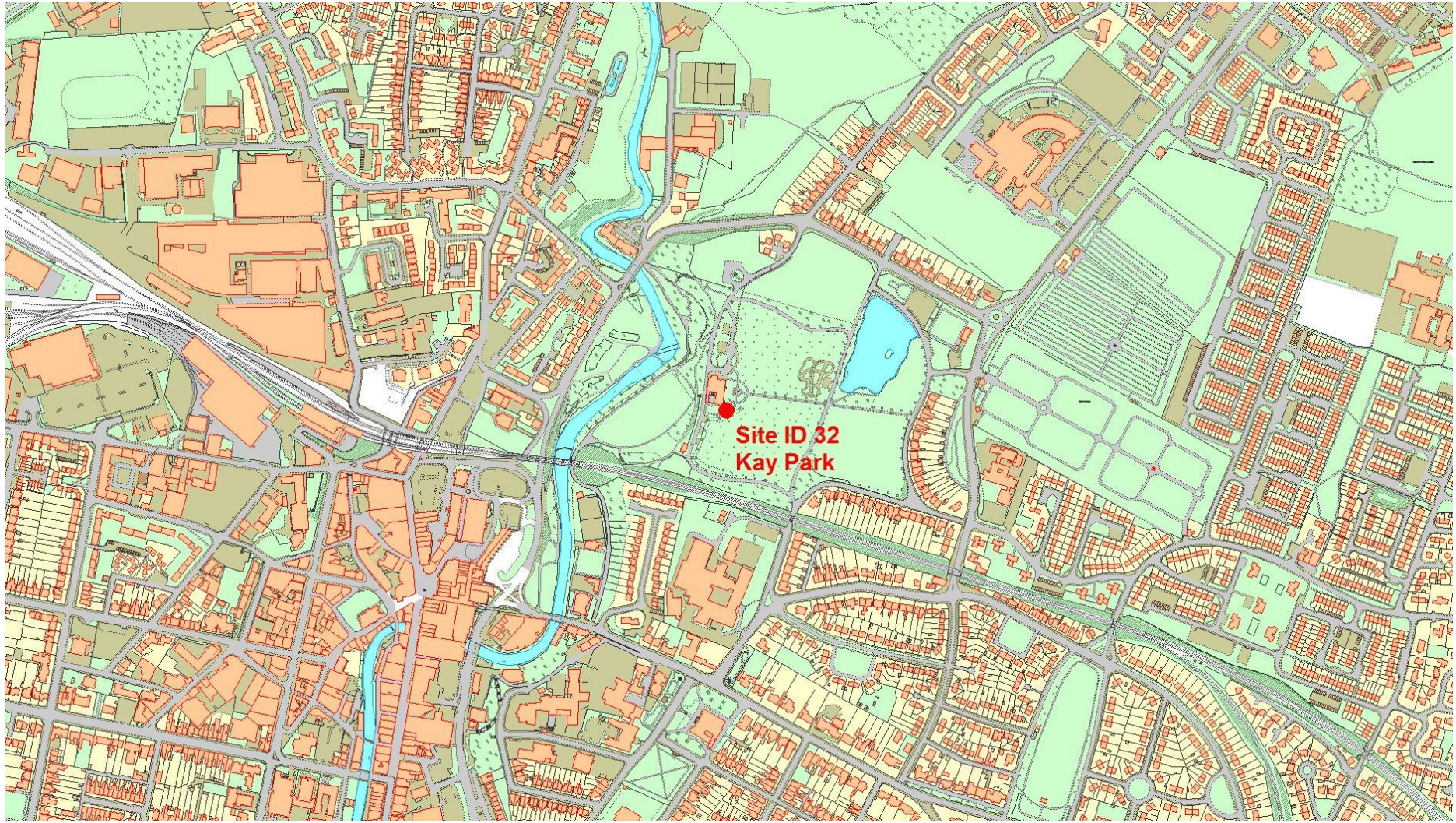


Figure 5m: Howard Park, Kilmarnock NO_2 Diffusion Tube Location

Figure 5n: Loudoun Road, Newmilns NO_2 Diffusion Tube Location