2012 Air Quality Updating and Screening Assessment for *East Ayrshire Council*

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

July 2012

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Report Reference number	EA/01/2012
Date	July 2012

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 2012 Air Quality Updating and Screening Assessment (USA) of the fifth round of the Review and Assessment process and includes the latest available data up to the end of 2011. 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 2009 Updating and Screening Assessment.

The Updating and Screening Assessment 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}

Automatic Monitoring of PM_{10} within John Finnie Street, Kilmarnock has indicated that levels of PM_{10} exceeded the Annual Mean Air Quality Objective (18 µg/m^3) during both 2010 and 2011 (Table 2.7). On the basis of this data East Ayrshire Council is in the process of commissioning a Detailed Assessment for PM_{10} within Kilmarnock. If the Detailed Assessment confirms the exceedence of the Air Quality Objective then East Ayrshire Council will proceed to the declaration of an Air Quality Management Area. Although no exceedences of the nitrogen dioxide Air Quality Objectives were found within East Ayrshire during 2011 from either automatic or diffusion tube monitoring (Table 2.3, 2.4 and 2.5), nitrogen dioxide will also be included in the Detailed Assessment as both automatic and diffusion tube monitoring has indicated exceedences of the Annual Air Quality Objective in previous years (Table 2.3 and 2.6).

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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 119,600 (2007), giving a population density of 95/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.

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. 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 Table2.5) 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 2.5).

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 are in excess of 17,000 vehicles per day (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 high 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 µg/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 as it lies in an area of extensive open cast coal mining. Concern has been raised about the level of PM_{10} emanating from coal extraction. Castle was chosen as an area which is representative of a typical residential area within the town.

Maps of the area are included in Figure 1.

1.2 Purpose of Report

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

Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

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

The Updating and Screening Assessment 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 microgrammes per cubic metre $\mu g/m^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu g/m^3$	Running annual mean	31.12.2003
	3.25 $\mu g/m^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu g/m^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu g/m^3$	Annual mean	31.12.2004
	0.25 $\mu g/m^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu g/m^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu g/m^3$	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 $\mu g/m^3$, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 $\mu g/m^3$	Annual mean	31.12.2010
Sulphur dioxide	350 $\mu g/m^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu g/m^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu g/m^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

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 2011 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.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

East Ayrshire Council carried out automatic monitoring for NO_2 and PM_{10} and non-automatic monitoring for NO_2 during 2011.

2.1.1 Automatic Monitoring Sites

Automatic Monitoring for NO_2 and PM_{10} was carried out at two locations within East Ayrshire during 2011, using two API Chemiluminescent $NO/NO_2/NO_x$ Analysers and two Met One Instruments BETA Attenuation Mass Monitor (BAM 1020). All monitors are fitted with web logger functionality.

One station is located next to the Sports Hall, Castle, New Cumnock and is representative of residential areas within the town (Figure 3). New Cumnock was chosen for PM_{10} monitoring since it lies in an area of widespread open cast coal mining (Figure 2), with associated potentially raised background levels of PM_{10}. Automatic monitoring was discontinued at New Cumnock in November 2011 due to levels of NO_2 and PM_{10} being well below Air Quality Objectives (Tables 2.3, 2.4, 2.7 and 2.8).

Automatic monitoring commenced for NO_2 and PM_{10} in John Finnie Street, Kilmarnock (Figure 4) in February 2010 and continued during 2011. 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 2.2 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 was replaced by a TEOM FDMS PM_{10} in the early part of 2012 and the BAM1020 and API Chemiluminescent analyser from New Cumnock moved 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 is predicted the analysers were moved to St. Marnock Street, Kilmarnock which is part of the one way system. This second site within the heavily trafficked Kilmarnock one way system will give us additional robust monitoring data which will allow more accurate modelling as part of the commissioned Detailed Assessment.

Further details of all two monitoring stations are provided in Table 2.1. The location of the New Cumnock and Kilmarnock sites are shown in Figure 3 and Figure 4 respectively.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	X OS GridRef	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Does this location represent worst-case exposure?
New Cumnock	Urban Background	261812	613503	NO_2	N	Chemiluminescent	Y (<1m)	45m	N
				PM_{10}	N	BAM1020	Y (<1m)	45m	N
Kilmarnock, John Finnie Street	Roadside	242691	638095	NO_2	N	Chemiluminescent	Y(<1m)	2.85m	Y
				PM_{10}	N	BAM1020	Y (<1m)	2.85m	Y

QA/QC of the Automatic Monitoring

The maintenance of the two monitoring sites at New Cumnock and 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 the Cumnock and Kilmarnock sites are part of the Scottish Air Quality Network and are audited twice yearly by AEA Technology 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, as well being good practice to visit the monitoring stations to pick up any other faults which may arise from time to time.

AEA undertake quality control of the automatic data for both the New Cumnock and 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 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 27 separate locations in East Ayrshire during 2011 (Figures 5a-5h). Monitoring was discontinued at five sites at the end of 2010 due to levels of NO_2 being well below the annual mean Air Quality Objective. (Reference22 2011 Air Quality Progress Report East Ayrshire Council and Table 2.6 USA 2012). These included Hurlford, Auchinleck, Nursery Avenue, Kilmarnock, Galston and Kilmaurs. Monitoring commenced at six new sites in January 2011 including four new sites in Kilmarnock, one site in Newmilns and one new site in Mauchline (Table 2.2 and Figures 5a – 5h).

The diffusion tube locations are described in Table 2.2. All diffusion tubes except for the co-location 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. Three nitrogen dioxide diffusion tubes were also located at the automatic monitoring station in John Finnie Street Kilmarnock to allow a local bias adjustment to be calculated and to add to the National Diffusion Tube Bias Adjustment Factor Spreadsheet for Glasgow Scientific Services. These tubes are located at a height of 1.70m which is the height of the NO_x inlet for the automatic analyser.

Table 2.2 Details of Non-Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location?
1. Fowlds Street/King Street Junction, Kilmarnock	Kerbside	242805	637620	NO_2	N	N (35m)*	< 1m	Y
2. 28 John Finnie Street, Kilmarnock	Roadside	242701	638083	NO_2	N	Y (3 – 4m)	2-3m	Y
3. 19 Lainshaw Street, Stewarton	Kerbside	241907	645820	NO_2	N	Y (2 – 3m)	< 1m	Y
4. 40 Main Street, Newmilns	Roadside	253601	637310	NO_2	N	Y (< 1m)	2-3m	Y
6. 8A Kilmarnock Road, Mauchline	Roadside	249826	627335	NO_2	N	Y (2 – 3m)	2-3m	Y
7. Junction at Main Street & A70 Ochiltree	Roadside	250712	621166	NO_2	N	N (15m)*	1-2m	Y
9.Townhead/Glaisnock Street Junction, Cumnock	Roadside	256889	620133	NO_2	N	N (9m)*	1-2m	Y
11. 96 John Finnie Street, Kilmarnock	Roadside	242657	637883	NO_2	N	Y (3-4m)	2-3m	Y
12. 62 John Finnie Street, Kilmarnock	Roadside	242673	637955	NO_2	N	Y(3 – 4m)	2-3m	Y

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
14. 95/97 John Finnie Street, Kilmarnock	Roadside	242619	637773	NO_2	N	N(100m)**	3m	Y
15. 16 West George Street, Kilmarnock	Roadside	242766	638160	NO_2	N	N(35m)*	1-2m	Y
17. 23/25 Loudoun Road, Newmilns	Roadside	253204	637237	NO_2	N	Y(<1m)	2-3m	Y
18. 100 Main Street, Newmilns	Roadside	253784	637336	NO_2	N	Y(3-4m)	2-3m	Y
19. 57/59 Townhead Street, Cumnock	Roadside	257059	620157	NO_2	N	Y(<1m)	1-2m	Y
20. 66 Main Street, Muirkirk	Roadside	269706	627355	NO_2	N	Y(5m)	2-3m	Y
22. The Cross, Mauchline	Roadside	249863	627257	NO_2	N	N(5-6m)*	2-3m	Y
23. 3/5 Loudoun Street, Mauchline	Roadside	249867	627232	NO_2	N	Y(<1m)	3-4m	Y
24. 5/7 Earl Grey Street, Mauchline	Roadside	249894	627233	NO_2	N	Y(<1m)	2m	Y
25A. John Finnie Street, Kilmarnock	Roadside***	242691	638095	NO_2	N	Y (17m)*	2-3M	Y
25B. John Finnie Street, Kilmarnock	Roadside***	242691	638095	NO_2	N	Y (17m)*	2-3m	Y
25C. John Finnie Street, Kilmarnock	Roadside***	242691	638095	NO_2	N	Y (17m)*	2-3m	Y
26 76 Loudoun Road, Newmilns	Roadside	253015	637232	NO_2	N	Y (9-10m)*	1-2m	Y

27 Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	242771	637711	NO_2	N	(44m)*	<1m	Y
28 2A Welbeck Street, Kilmarnock	Roadside	243212	637338	NO_2	N	(29m)*	2-3m	Y
29 Junction McLelland Drive/Dundonald Road, Kilmarnock	Roadside	242192	637249	NO_2	N	(5m)	2-3m	Y
30 16 Cumnock Road, Mauchline.	Roadside	249943	627024	NO_2	N	(7m)*	1-2m	Y
31 Wellington Street, Kilmarnock	Kerbside	242965	638555	NO_2	N	(8m)*	<1m	Y

*Although these sites are greater than 5m from relevant exposure, 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 relevant exposure.
** On the recommendation of BMT Cordah, Air Quality Consultants, an extra NO_2 diffusion tube was located to provide a better spread of NO_2 levels along John Finnie Street to allow better model verification if any future detailed assessments are required (Section 2.2.1 Kilmarnock).
***Diffusion Tubes 25A, 25B and 25C are collocated with a continuous analyser.

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 the exposed tubes are 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). During 2011 GSS obtained 100% of results submitted (in each quarter) which were subsequently determined to be **satisfactory** based on the z-score system (Reference 4)

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.

During 2011 East Ayrshire Council carried out a local co-location study involving co-locating diffusion tubes in triplicate with the chemiluminescent analyser located in John Finnie Street, Kilmarnock. The tubes were placed within 1m of the analyser inlet and 10cm apart. The co-located tubes were prepared, handled and analysed in exactly the same way as those from the other (non co-located) monitoring sites in the survey. A co-location data questionnaire (Appendix F) was completed and sent to Dr Nick Martin, National Physical Laboratory. A resultant bias adjustment of 1.13 was computed. A combined bias adjustment was determined utilising the spreadsheet from the Review and Assessment Helpdesk Website (Appendix A) (Reference 20) GSS undertakes analysis of diffusion tubes from several sites which runs co-location studies. GSS also participate in the Bureau Veritas Marylebone laboratory inter-comparison study (Reference 23). At the time of writing one site from East Ayrshire, three sites from Glasgow, two sites from West Dunbartonshire and the Marylebone Road site in London were present on the spreadsheet. Overall bias adjustment was therefore calculated from these seven sites using orthogonal regression to allow for 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. An overall bias adjustment of 0.94 was calculated from these seven sites.

The bias adjustment factor applied to the raw annual means of the diffusion tubes was therefore **0.94** for 2011 data. Precision and Bias Adjustment Data (Reference 20) are shown in Appendix A.

The combined bias adjustment figure was used rather than the local bias adjustment figure for the following reasons:-

1/ The survey consists of tubes exposed over a range of settings which differ from the co-location site.

2/ The data capture from the automatic analyser was less than 90%.

3/ The overall bias adjustment figure was based on 7 sites rather than one single site decreasing the error from using a single survey.

4/ The co-location survey was carried out over a period of 11 months whereas the overall survey was carried out over a period of 12 months.

5/ The co-location data from the East Ayrshire site was of poor precision and should therefore be treated with caution.

2.2 Comparison of Monitoring Results with AQ Objectives

This section sets out the results of all monitoring carried out by East Ayrshire Council in 2011 and where relevant, provides results from previous years to identify any trends.

2.2.1 Nitrogen Dioxide

The results of the nitrogen dioxide monitoring at the automatic station at Castle, New Cumnock and John Finnie Street, Kilmarnock together with the results from diffusion tube monitoring from sites across East Ayrshire are presented below.

Automatic Monitoring Data

The results of automatic monitoring for nitrogen dioxide carried out in 2011 at Castle, New Cumnock and John Finnie Street, Kilmarnock are displayed in Table 2.3 and 2.4 and the full report produced by AEA on behalf of the Scottish Government in Appendix C.

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

Site ID/Location	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2011 %	Annual Mean Concentration µg/m^3				
							2009	2010*	2011
A1 New Cumnock	Urban Background	N	97.3	56.8			7	11	9
A2 Kilmarnock	Roadside	N	94.0	83.4				**43**	35

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

Monitoring in Kilmarnock was carried out from 1st January until 20th November 2011 for both NO_x and PM_{10}. Monitoring at New Cumnock was carried out for NO_x from 1st January until 1st August 2011 and for PM_{10} from 1st January until 10th November 2011.

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

Site ID	Site Type	Within AQMA?	Valid Data Capture for period of monitoring %	Valid Data Capture 2011 %	Number of Exceedences of Hourly Mean (200 μg/m^3)				
							2009	2010	2011
A1 New Cumnock	Urban Background	N	97.3	56.8			0	0	0(46μg/m^3)
A2 Kilmarnock	Roadside	N	94.0	83.4				16(197μg/m^3)	1(159μg/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.

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.

Monitoring in Kilmarnock was carried out from 1st January until 20th November 2011 for both NO_x and PM_{10}. Monitoring at New Cumnock was carried out for NO_x from 1st January until 1st August 2011 and for PM_{10} from 1st January until 10th November 2011.

New Cumnock

As can be seen from Table 2.3 annual mean levels of nitrogen dioxide are very low, varying between 7 and11 µg/m^3 between 2009 and 2011, and well within the annual mean Air Quality Objective. No exceedences of the hourly mean Air Quality Objective were found between 2009 and 2011. With these low recorded levels it can be predicted that no exceedences of the 2010 NO_2 Air Quality Objectives are predicted in any area within New Cumnock at present or in future years. For these reasons monitoring of NO_2 has now ceased at New Cumnock.

Kilmarnock

As a result of high levels of nitrogen dioxide found in John Finnie Street during 2007 a Detailed Assessment was carried out by BMT Cordah in 2008 (Reference 5). The modelling study 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 at this time. The 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 report also recommended that an automatic monitoring unit, with triplicate diffusion tubes co-located, be installed on John Finnie Street, to provide a local bias adjustment factor for the diffusion tubes and allow full verification of any future modelling studies. This commenced in John Finnie Street in February 2010 (Figure 4).

Annual mean levels of nitrogen dioxide in John Finnie Street, Kilmarnock 2011 dropped substantially from the previous year (Table 2.3) and were, at 35 µg/m^3, under the annual mean Air Quality Objective. 2010 levels of NO_2 were raised due to long periods of cold still weather and were higher than any year since monitoring started. 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 station has no actual relevant exposure as regards the annual mean it can be regarded as representative of an area of relevant exposure as it is located at a similar distance from the road as other properties along the length of the road. 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. The number of exceedences of the 1-hour mean (200 µg/m^3) at Kilmarnock was 1 (table 2.4). 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 only eleven months of monitoring was carried out at Kilmarnock in 2011 and the data capture was below 90%, the 99.8th percentile should be included. The site at Kilmarnock gave a 99.8th percentile of 159 µg/m^3 (table 2.4) which is significantly below 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 predicated 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 introduction of Euro 6 (VI) legislation. It remains to be seen whether the actual promised emission levels of Euro 5(V) and 6(VI) vehicles live up to expectation.

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 Fig. 5a-5h.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2011

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months or %)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.94) 2011 (μg/m^3)
1.	Fowlds Street/King Street Junction, Kilmarnock	Kerbside	N		12 months	N	25.0
2.	28 John Finnie Street, Kilmarnock	Roadside	N		12 months	N	32.1
3.	19 Lainshaw Street, Stewarton	Kerbside	N		12 months	N	27.0
4.	40 Main Street, Newmilns	Roadside	N		12 months	N	25.9
6.	8A Kilmarnock Road, Mauchline	Roadside	N		11 months	N	27.9
7.	Junction at Main Street & A70 Ochiltree	Roadside	N		12 months	N	19.9
9.	Townhead/Glaisnock Street Junction, Cumnock	Roadside	N		10 months	N	15.6
11.	96 John Finnie Street, Kilmarnock	Roadside	N		12 months	N	27.9
12.	62 John Finnie Street, Kilmarnock	Roadside	N		12 months	N	33.3
14.	95/97 John Finnie Street, Kilmarnock	Roadside	N		11 months	N	34.2

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months or %)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.94) 2011 ($\mu g/m^3$)
15.	16 West George Street, Kilmarnock	Roadside	N		12 months	N	35.8
17.	23/25 Loudoun Road, Newmilns	Roadside	N		12 months	N	30.4
18.	100 Main Street, Newmilns	Roadside	N		12 months	N	22.1
19.	57/59 Townhead Street, Cumnock	Roadside	N		12 months	N	19.0
20.	66 Main Street, Muirkirk	Roadside	N		12 months	N	14.2
22.	The Cross, Mauchline	Roadside	N		12 months	N	29.6
23.	3/5 Loudoun Street, Mauchline	Roadside	N		12 months	N	28.4
24.	5/7 Earl Grey Street, Mauchline	Roadside	N		12 months	N	34.2
25A.	John Finnie Street, Kilmarnock	Roadside***	N	Triplicate and Colocated	11 months	N	28.2
25B.	John Finnie Street, Kilmarnock	Roadside***	N	Triplicate and Colocated	11 months	N	28.0
25C	John Finnie Street, Kilmarnock	Roadside***	N	Triplicate and Colocated	11 months	N	30.6
26	76 Loudoun Road, Newmilns	Roadside	N		11 months	N	21.4

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months or %)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.94) 2011 (µg/m^3)
27	Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	N		12 months	N	30.8
28	2A Welbeck Street, Kilmarnock	Roadside	N		12 months	N	25.6
29	Junction McLelland Drive/Dundonald Road, Kilmarnock	Roadside	N		12 months	N	25.2
30	16 Cumnock Road, Mauchline.	Roadside	N		12 months	N	19.1
31	Wellington Street, Kilmarnock	Kerbside	N		11 months	N	21.8

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

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

Site ID	Location	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) μg/m^3				
				2007 (Bias Adjustment Factor = 1.05)	2008 (Bias Adjustment Factor = 0.97)	2009 (Bias Adjustment Factor = 1.23)	2010 (Bias Adjustment Factor = 1.12)	2011 (Bias Adjustment Factor = 0.94)
A1	Location	Roadside	N	34.6	32.6	34.7	37.8	36.9
1.	Fowlds Street/King Street Junction, Kilmarnock	Kerbside	N	38	35	32.3	39.1	25.0
2.	28 John Finnie Street, Kilmarnock	Roadside	N	39	39	32.8	**40.2**	32.1
3.	19 Lainshaw Street, Stewarton	Kerbside	N	33	32	31.2	35.8	27.0
4.	40 Main Street, Newmilns	Roadside	N	38	38	29.9	33.0	25.9
6.	8A Kilmarnock Road, Mauchline	Roadside	N	34	32	30.7	31.6	27.9
7.	Junction at Main Street & A70 Ochiltree	Roadside	N	26	26	23.2	26.2	19.9
9.	Townhead/Glaisnock Street Junction, Cumnock	Roadside	N	16	16	18.5	17.4	15.6
11.	96 John Finnie Street, Kilmarnock	Roadside	N		31	33.3	34.8	27.9
12.	62 John Finnie Street, Kilmarnock	Roadside	N		38	38.3	**40.0**	33.3
14.	95/97 John Finnie Street, Kilmarnock	Roadside	N			**43.7***	**43.8**	34.2
15.	16 West George Street, Kilmarnock	Roadside	N			39.9*	**43.2**	35.8
17.	23/25 Loudoun Road, Newmilns	Roadside	N			39.8*	**40.6**	30.4

Site ID	Location	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) μg/m^3				
				2007 (Bias Adjustment Factor = 1.05)	2008 (Bias Adjustment Factor = 0.97)	2009 (Bias Adjustment Factor = 1.23)	2010 (Bias Adjustment Factor = 1.12)	2011 (Bias Adjustment Factor = 0.94)
18.	100 Main Street, Newmilns	Roadside	N			24.4*	26.4	22.1
19.	57/59 Townhead Street, Cumnock	Roadside	N			19.6*	22.6	19.0
20.	66 Main Street, Muirkirk	Roadside	N			15.1*	17.8	14.2
22.	The Cross, Mauchline	Roadside	N			28.7*	29.5	29.6
23.	3/5 Loudoun Street, Mauchline	Roadside	N			31.2*	31.4	28.4
24.	5/7 Earl Grey Street, Mauchline	Roadside	N			**41.3***	39.5	34.2
25A.	John Finnie Street, Kilmarnock	Roadside***	N				35.2	28.2
25B.	John Finnie Street, Kilmarnock	Roadside***	N				39.8	28.0
25C	John Finnie Street, Kilmarnock	Roadside***	N				37.8	30.6
Mean 25A-25C	John Finnie Street, Kilmarnock	Roadside***	N				37.7	29.0
26	76 Loudoun Road, Newmilns	Roadside	N					21.4
27	Junction King Street/St. Marnock Street, Kilmarnock	Kerbside	N					30.8
28	2A Welbeck Street, Kilmarnock	Roadside	N					25.6

Site ID	Location	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
				2007 (Bias Adjustment Factor = 1.05)	2008 (Bias Adjustment Factor = 0.97)	2009 (Bias Adjustment Factor = 1.23)	2010 (Bias Adjustment Factor = 1.12)	2011 (Bias Adjustment Factor = 0.94)
29	Junction McLelland Drive/Dundonald Road, Kilmarnock	Roadside	N					25.2
30	16 Cumnock Road, Mauchline.	Roadside	N					19.1
31	Wellington Street, Kilmarnock	Kerbside	N					21.8

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).

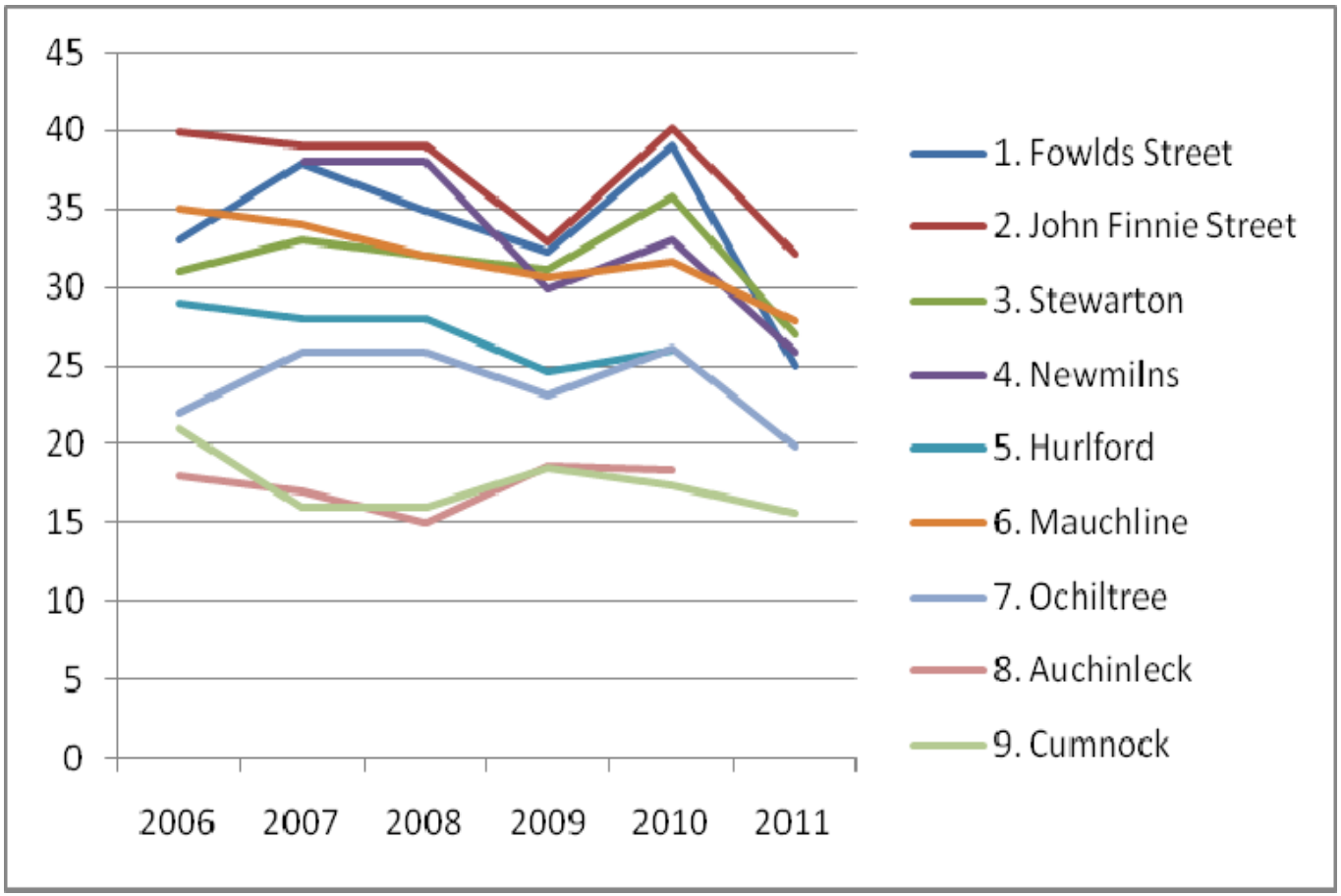
Table 2.6a Results of Nitrogen Dioxide Diffusion Tubes – Relevant Exposure

Site ID	Location	Annual mean concentrations (μg/m^3)			
		2011 Kerbside/ Roadside	2011 Background	2011 Building Facade	2011 Relevant Exposure
1	Fowlds Street/King Street Junction, Kilmarnock	25.0	17.2	22.4	**N/A****
2	28 John Finnie Street, Kilmarnock	32.1	25.5	30.8	**30.8**
3	19 Lainshaw Street, Stewarton	27.0	7.0	21.5	**21.5**
4	40 Main Street, Newmilns	25.9	10.4	25.4	**25.4**
6	8A Kilmarnock Road, Mauchline	27.9	8.7	24.7	**24.7**

11	96 John Finnie Street, Kilmarnock	27.9	17.2	25.5	**25.5**
12	62 John Finnie Street, Kilmarnock	33.3	17.2	30.1	**30.1**
14	95/97 John Finnie Street, Kilmarnock	34.2	17.2	33.5	**N/A****
15	16 West George Street, Kilmarnock	35.8*	25.5	35.2	**N/A****
17	22/25 Loudoun Road, Newmilns	30.4	10.4	29.3	**29.3**
23	3/5 Loudoun Street, Mauchline	28.4	8.7	27.6	**27.6**
24	5/7 Earl Grey Street, Mauchline	34.2	8.7	32.6	**32.6**
25	Monitoring Site, John Finnie Street, Kilmarnock	29.0	25.5	28.9	**N/A****

** No calculation was carried out for these sites since any relevant exposure is more than 35m from the monitor (Table 2.2) and the calculation would be meaningless (Reference 8). It should also be noted that these tubes were sited in locations that are representative of locations of relevant exposure and therefore the levels of NO_2 at the building facade would be similar to locations of relevant exposure along the streets.

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites 2006-2011



Annual mean nitrogen dioxide levels in µg/m^3 (y-axis) were plotted against the year of measurement 2006-20011 (x-axis) for the long term diffusion tube monitoring sites. From the limited data available the overall trend from nine long term monitoring sites within East

Ayrshire over the last 5 years would appear to be marginally downwards from years 2006 -2009 with a sharp rise in 2010 with a significant fall in 2011. 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 marginally downwards.

2010

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). All sites showed a substantial decrease on 2010 levels (Table 2.6).

Kilmarnock

Four new locations were added in Kilmarnock (Table 4 and Figures 5h) in January 2011 to provide an indication of NO_2 levels outwith the one way system and will provide robust data if any future modelling is required and the likely impact if any changes of traffic flow are carried out in the future.

All sites were below the annual mean Air Quality Objective in 2011 (Table 2.5). This showed a substantial fall on 2010 where prolonged very cold weather patterns were experienced which lead to raised levels of NO_2 (Table 2.6).

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.

In summary the diffusion tube results for the one way system in Kilmarnock followed the national trend for 2011(Reference 13, Air Pollution in Scotland 2011) with a significant decrease 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 in 2011 (Table 2.5). This showed a substantial fall on 2010 where prolonged very cold weather patterns were experienced which lead to raised levels of NO_2 (Table 2.4). One additional diffusion tube was added in Newmilns at the western end of Loudoun Road (Figure 5c) to ascertain the spread of NO_2 levels along the A71 running through Newmilns.

Since levels in previous years have been around the of 40 µg/m^3 annual mean objective (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 in 2011 (Table 2.5). This showed a fall on 2010 where prolonged spells of very cold weather were experienced which lead to raised levels of NO_2 (Table 2.6). One additional diffusion tube was added in Mauchline at the southern end of the town to ascertain the spread of NO_2 levels along the A76 running through Mauchline (Figure 5d). Since levels in previous years have been around the of 40 µg/m^3 annual mean objective (Table 2.6) further monitoring is necessary to establish if levels will remain consistently below the annual mean Air Quality Objective.

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 Air Quality Objective annual mean the raised levels indicate the need to carry out further monitoring.

Relevant Exposure

Table 2.6a illustrates NO_2 levels at locations of 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. Table 2.6a illustrates the extrapolated NO_2 levels from the kerbside and roadside data 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.

All annual mean extrapolated results at areas of relevant exposure were found to be below the annual mean objective of 40µg/m^3.

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.)

2.2.2 PM_{10}

The results of the automatic monitoring carried out at New Cumnock and Kilmarnock are set out in table 2.7 and table 2.8 and the full monthly dataset for New Cumnock and Kilmarnock 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 Beta Attenuation Monitor (with unheated inlets) (BAM 1020) continuous analysers during 2009 - 2011. Unheated BAMs tend to over-read PM_{10} with respect to the gravimetric method since they can also read 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 of PM_{10}: Comparison with Annual Mean Objective

Site ID/Location	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %	Valid Data Capture 2011 %	Confirm Gravimetric Equivalent (Y or NA)	Annual Mean Concentration µg/m^3				
						2007	2008	2009	2010	2011
A1 New Cumnock	Urban Background	N	96.9	83.3	Y			12	9	11
A2 Kilmarnock, John Finnie Street	Roadside	N	97.9	86.9	Y				21	20

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

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

Site ID/Location	Site Type	Within AQMA?	Valid Data Capture for monitoring Period %	Valid Data Capture 2011 %	Confirm Gravimetric Equivalent	Number of Exceedences of 24-Hour Mean (50 μg/m^3)				
						2007	2008	2009	2010	2011
A1 New Cumnock	Urban Background	N	96.9	83.3	Y			0	0	0(33μg/m^3)
A2 Kilmarnock, John Finnie Street	Roadside	N	97.9	86.9	Y				0(40μg/m^3)	1(38μg/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.

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.

New Cumnock

As can be seen from Table 2.7 and Table 2.8 the measured annual mean concentration of PM_{10} complied with the 2010 Air Quality Objective and that no exceedences of the 2010 24 hour Air Quality Objective occurred at this site during 2011. The annual mean level recorded for Castle, New Cumnock was at 12 µg/m^3 in 2009 and 9 µg/m^3 in 2010 and 11 µg/m^3, well below the 18 µg/m^3 2010 annual mean Air Quality Objective. With these low recorded levels it can be predicted that no exceedences of the 2010 PM_{10} Air Quality Objectives are predicted in any area within New Cumnock. With these low levels, monitoring was discontinued in November 2011.

Kilmarnock

An annual mean of 20 µg/m^3 was measured at John Finnie Street during 2011. This is significantly higher than the annual mean objective of 18 µg/m^3. Only one exceedence of the 50 µg/m^3 was measured during the 11 month monitoring period in 2011. The 99.8th percentile of daily means was 38 µg/m^3 (included since data capture was below 90%). As in the previous discussion regarding NO_2 the main source of 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.

In summary, automatic monitoring of PM_{10} indicate annual mean levels of $PM_{10\ at}$ 21 µg/m^3 within John Finnie Street in 2010 and 20 µg/m^3 during 2011. Both levels are above the annual mean Air Quality Objective of 18 µg/m^3. East Ayrshire Council Environmental Health is therefore in the process of commissioning a detailed assessment for PM_{10} within Kilmarnock. Further monitoring is also therefore required to chart PM_{10} levels in future years. To this end part funding from the Scottish Government was awarded in June this year and a new TEOM FDMS PM_{10} monitor was commissioned along with the relocated PM_{10} and NO_x analysers from New Cumnock in February this year. This second site within the heavily trafficked Kilmarnock one way system will give us additional robust monitoring data which will allow more accurate modelling as part of the Detailed Assessment.

2.2.3 Sulphur Dioxide

No Sulphur Dioxide monitoring was carried out in East Ayrshire in 2011. 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.

2.2.4 Benzene

No benzene monitoring was carried out in East Ayrshire in 2011. 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.

2.2.5 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 2011.

2.2.6 Summary of Compliance with AQS Objectives

East Ayrshire Council has measured concentrations of PM_{10} above the annual mean objective at relevant locations outside of an AQMA, and **will need to proceed to a Detailed Assessment** for Kilmarnock.

3 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.

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Narrow congested streets were identified in previous rounds of Review and Assessment, including streets within Kilmarnock, Cumnock, Stewarton, the A71 which runs through Newmilns and the A76 which runs through Mauchline. These are at present subject to nitrogen dioxide monitoring. Exceedences of the Air Quality Objectives have been found for both NO_2 and for PM_{10} within Kilmarnock in 2010 and PM_{10} only during 2011. (Refer to Section 2).

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

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

Busy streets within East Ayrshire with significant numbers of shops were previously assessed in previous rounds of Review and Assessment.

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

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

Roads with potentially a high flow of buses and/or HGVs were assessed in previous rounds of Review and Assessment.

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

3.4 Junctions and Busy Roads

Busy roads and junctions (greater than 10,000 vehicles per day), with relevant exposure, were assessed in previous round of Review and Assessment. Where necessary, these junctions and busy roads are subject to further air quality monitoring (Table 2.3, Table 2.4, 2.5, 2.6, 2.7 and 2.8).

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

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

No new roads have been built within East Ayrshire since the last round of Review and Assessment, with either, traffic flow of greater than 10,000 vehicles a day, or, which have increased traffic flow significantly on existing roads having a NO_2 annual mean greater than 36µg/m^3.

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

3.6 Roads with Significantly Changed Traffic Flows

There are no roads within East Ayrshire, with traffic flows of greater than 10,000 which have experienced “large” increases (>25%) in traffic.

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

3.7 Bus and Coach Stations

East Ayrshire Council has two bus stations, one in Kilmarnock and one in Cumnock. Kilmarnock Bus Station has 850 bus movements per day and Cumnock has 420 bus movements per day. These numbers of movements are well below the criteria, of 2500 movements per day, required for an assessment of NO_2 and PM_{10} to be carried out.

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

4 Other Transport Sources

4.1 Airports

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

4.2 Railways (Diesel and Steam Trains)

Information on rail transport was obtained from ScotRail and Network Rail

4.2.1 Stationary Trains (potential SO_2 exposure)

East Ayrshire has 6 railway stations in the towns of Kilmarnock, Kilmaurs, Stewarton, Dunlop, New Cumnock and Auchinleck, with Kilmarnock being the largest with a weekday hourly service to Glasgow (half hourly during the day), nine daily services to Dumfries and Carlisle with three through to Newcastle, seven trains to Ayr with four through to Stranraer. Kilmarnock station has an annual passenger usage of 421,000 (2009/2010). Kilmarnock is the only station with the potential for trains to be stationary for over the 15 minute criteria for further assessment. Information from ScotRail indicates that diesel locomotives have their engines shut off before being stationary for 15 minutes, and in any case, have an automatic cut-off fitted to the engine which activates on a timer after the engine is stationary for 15 minutes. There are also no more than two trains in the station at any one time, and the station has no catering facilities. There is also no residential housing or shops within 15 m of the station. It is therefore unlikely that members of the public will be exposed to 15 minute levels of SO_2 above 266 µg/m^3.

East Ayrshire has several rail sidings for loading and movement of coal, including Killoch, Chalmerston and New Cumnock. There is also a railway carriage refurbishment works, Brush Barclay, located at the Caledonia Works, Kilmarnock. These utilise diesel shunters, which although may be stationary for more than 15 minutes, are located more than 15m from people with relevant exposure.

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

4.2.2 Moving Trains (potential NO_2 exposure)

East Ayrshire has no railway lines with a high usage of diesel locomotives. No further assessment for NO_2 levels is therefore required.

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

4.3 Ports (Shipping)

East Ayrshire Council confirms that there are no ports or shipping within the Local Authority area.

5 Industrial Sources

Information on installations regulated under the Pollution Prevention and Control (Scotland) Regulations 2000 as either Part A or Part B processes was obtained from SEPA. The list of authorised processes is set out in Appendix D.

5.1 Industrial Installations

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

Information on any new or proposed installations for which an air quality assessment has been carried out was obtained from SEPA. Since the last Updating and Screening Assessment, there are two new industrial installations for which planning approval has been granted. The two premises which may have an impact on air quality are:-

Barr Ltd., Moorfield Plant have received planning consent for a roadstone coating plant at Moorfield Industrial Estate, Kilmarnock and the Egger plant at Auchinleck has received planning permission to use clean and dry recycled wood as a replacement for virgin wood in the existing woodchip process. Both installations were covered in the 2010 Progress Report (Reference 22).

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

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

Information obtained from SEPA indicates that there are no existing installations where emissions have substantially increased.

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

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

Information obtained from SEPA indicates that there are no new or significantly changed installations where no previous air quality assessment was carried out.

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

5.2 Major Fuel (Petrol) Storage Depots

Information obtained by SEPA and from Appendix E of LAQM TG(09), confirms that there are no major fuel storage depots within East Ayrshire.

There are no major fuel (petrol) storage depots within the East Ayrshire Council area.

5.3 Petrol Stations

East Ayrshire Council has only one petrol station which has both an annual throughput of petrol greater than 2,000 m^3 and is situated adjacent to a busy road with more than 30,000 vehicles per day. Pace Petrol Station at the Bellfield Interchange, Kilmarnock sits adjacent to the intersection of the A77, A71, A76 and the A735. However, the nearest relevant exposure, a care home, is well in excess of 10m specified criteria, at 180m distant, and therefore, no detailed assessment for benzene is required.

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

5.4 Poultry Farms

East Ayrshire Council has seven poultry farms (Source; Scottish Government Rural Affairs Department) within its boundaries, two in the Mauchline area, three in the Stewarton area and two in the Muirkirk area. All five have fewer than 40,000 birds, and therefore their numbers are well under the specified criteria, for which a Detailed Assessment for PM_{10} would be required.

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

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

The procedure set out in Section D.1b Chapter 5, TG(09) for biomass combustion was followed. Two plants burning Biomass in the 50kW to 20MW range were identified. One burner rated at 2.1MW burning wood pellets is sited at Crosshouse Hospital which lies to the east of Kilmarnock and one burner rated at 220kW burning woodchip sited at Dumfries House which lies to the south-west of Auchinleck. Information was obtained on the following:-

	Crosshouse Hospital	Dumfries House
1/ Height of Stack	38m	6.676m
2/ Diameter of stack	0.72m	0.364m
3/ Dimensions of buildings within 5 times the stack height (above the ground)	24.3m	5.9m (Boiler Room) 15.7m (East Wing) 20.3m (Central Block)
4/ Maximum emission rates (g/sec) of NO_x	0.221g/sec	
5/ Maximum emission rates (g/sec) of PM_{10}	0.0035g/sec	

Description of the combustion appliance.

Crosshouse Hospital:- The boiler is a Binder RRK/PRF 1800-2300 2100kW underfed hearth biomass boiler, operating on virgin wood pellet or chemically untreated wood residues pellet conforming to EN14961-1:2010 and EN14961-2:2011.

Dumfries House:- Ala Talkkari Veto 220kw boiler; combustion control panel; auto de-ashing; flue fan operating on woodchip from the estate.

Crosshouse Hospital

The calculated background adjusted emissions rates for PM_{10} and NO_2 were calculated and found to be well below the threshold determined using the relevant nomogram (TG(09).

	Background Adjusted Emission Rate	Threshold
PM_{10} 24-hour mean	0.00017g/s	0.044g/s
NO_2 annual mean	0.0075g/s	0.13g/s
NO_2 1-hour mean	0.049g/s	0.54g/s

Since the source does not exceed the threshold in the relevant nomogram it is not necessary to proceed to a Detailed Assessment for the relevant objective at this location.

Dumfries House

Since the stack height is less than the surrounding buildings the source will have to be treated as a ground level source. At the time of writing we have not received all the information from the operators of the biomass boiler at Dumfries House. Once we have received the relevant information a screening assessment will be carried out to determine whether a Detailed Assessment is necessary. This information will be submitted once this is complete.

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

6.2 Biomass Combustion – Combined Impacts

The procedure set out in Section D.2 of Chapter 5, TG(09) was followed.

An assessment of domestic solid fuel burning was carried out in previous LAQM assessments (see 6.3 below). The assessments indicated that due to the low density of domestic solid fuel burning no exceedences were likely. As there are only two new biomass installations in East Ayrshire within the 50kW – 20MW range and these are sited in semi rural areas, the combined impact is likely to be low and therefore there is no necessity to carry out a Detailed Assessment of the combined impacts of biomass combustion on PM_{10} levels at this time.

East Ayrshire Council has assessed biomass combustion – combined impacts and concluded that it will not be necessary to proceed to a Detailed Assessment for PM_{10} at this time.

6.3 Domestic Solid-Fuel Burning

As previously mentioned an assessment of domestic solid fuel burning was carried out in previous LAQM assessments. Some physical checks were undertaken in some of the former traditional mining areas to check whether any significant coal burning was still taking place (using the checklist procedure contained in LAQM.TG(03). The results were much less than anticipated, and were substantially less than half of the suggested trigger of 100 houses per 500 by 500 metre grid squares burning solid fuel. Since this research was carried out, the number of houses burning coal has declined significantly, and therefore East Ayrshire Council confirms there are no issues with regards to sulphur dioxide due to domestic solid fuel burning. Past monitoring also confirms low levels of sulphur dioxide throughout the council area. Therefore no Detailed Assessment for domestic properties burning solid fuel (SO_2 concentrations) is required at this time.

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

7 Fugitive or Uncontrolled Sources

Quarrying and mineral extraction sites
Landfill Sites
Coal and material stockyards, or materials handling
Major construction works
Unmade haulage roads on industrial sites
Waste transfer stations etc
Other potential sources of fugitive particulate emissions

The procedure set out in Box E of chapter 5, TG(09) was followed.

Opencast Coal Extraction

At the time of writing (June 2012) the following potential sources of fugitive or uncontrolled particulate matter which are new since the last Updating and Screening assessment have been identified :-

1/ ATH Resources, Duncanziemere, Cumnock – opencast coal extension - operational (details covered in 2011 PG)
2/ Scottish Coal, Ponesk Muirkirk – opencast coal extension – operational.
3/ Scottish Coal, Dalfad, Cronberry, Cumnock – opencast coal extension – operational.
4/ ATH Resources, Netherton, Cumnock – opencast coal extension – operational.
5/ Scottish Coal, Burnston Extension, New Cumnock – opencast coal extension – application approved mid June.
6/ Kier Mining, Greenburn South, New Cumnock – opencast coal extension – approved mid June.
7/ Scottish Coal, Lanehead, House of Water, New Cumnock – opencast coal extension – operational.
8/ Keir Mining, Braehead Farm, New Cumnock – opencast coal extension – operational.
9/ Scottish Coal, Dunstonhill, Patna – opencast coal extraction – operational.

Please note that all applications for open cast coal extraction are extensions of previous mines and as such PM levels from operations are likely to be similar to the levels presently produced, but obviously different properties may be affected and as such have to be assessed.

Duncanziemere opencast coal extension was covered in the 2011 Progress Report and the summary text is repeated below. All opencast operations/extensions have to produce an Environmental Statement as part of the planning application. An Environmental Statement (ES) is a detailed report which contains the findings of an assessment of the potential impacts of the proposed development upon the environment, referred to as an Environmental Impact Assessment (EIA). EIAs are undertaken in accordance with the Environmental Impact Assessment (Scotland) Regulations 1999. As part of the Environmental Statement an Environmental Impact Assessment is undertaken of all impacts that coal extraction will have on the

environment. Part of the Environmental Assessment includes an Air Quality Assessment. They are all similar in nature to the details given below at Duncanziemere. The potential rise in PM is assessed from coal extraction, handling and transport. Coal handling processes at the mines are subject to control under Section 3.4 Part B of Schedule 1 of the Pollution Prevention and Control (Scotland) Regulations 2000. Mine support area and coal handling operations are subject to "Part B" regulation by SEPA and authorisation is required to be varied when any of the extensions to currently operating surface mines are approved. All applications have submitted an Environmental Impact Assessment incorporating an Air Quality Assessment as part of the planning application. Proposed dust mitigation measures are also submitted as part of the application. With these mitigation measures in place, the majority of dust will be controlled at source. East Ayrshire Council have a transportation of coal by road protocol which addresses issues such as dust suppression measures in terms of the use of wheel and body washing, sweeping of public roads and the dampening of internal haul roads during dry and windy weather conditions.

The revised technical guidance for local air quality management (LAQM.TG(09)) requires that detailed assessments should be conducted where there is any potential exposure within 200m of any source, irrespective of background. Detailed assessment of PM_{10} exposure for receptors more than 400m from mines and quarries is unlikely to be required provided the annual mean background is <16 $\mu g/m^3$, implying that the contribution from fugitive dust operations is unlikely to exceed 2 $\mu g/m^3$ within 400m. The guidance also suggests that the level of complaints and dust at the site access to the public road should be taken into account. There has been one recorded complaint about dust or from surface mines (complaint received from the New Cumnock area) since the last Updating and Screening Assessment. To date this complaint has been unsubstantiated as the dust problem has now ceased. Since the background PM_{10} is relatively low where open cast mining is taking place in East Ayrshire at less than 9 $\mu g/m^3$ (Scottish Background Maps Reference 12) (excluding industry contribution),a worst case scenario of a process contribution of 5 $\mu g/m^3$ close to the operational areas would still produce PM_{10} well below the 18 $\mu g/m^3$ annual Air Quality Objective. Actual monitoring at New Cumnock from 2009 to 2011 recorded actual annual mean levels within the town at between 9 and 12 $\mu g/m^3$, well below the annual Air Quality Objective. At these levels only one exceedence of the 24-hour mean of 50 $\mu g/m^3$ was predicted at any of the sites, well within the Air Quality Objective of a maximum of 7 exceedences per year. New Cumnock Air Quality Monitoring site experienced no exceedences of the 24-hour mean during 2009, 2010, or 2011. Similarly a worst case scenario for $PM_{2.5}$ of a process contribution of 2.5 $\mu g/m^3$ would produce $Pm_{2.5}$ levels well below the proposed $PM_{2.5}$ levels of 12 $\mu g/m^3$ since background levels (excluding industry contribution) in areas subject to open cast are at or below 6 $\mu g/m^3$. Actual levels at receptors are significantly lower than the worst case scenario, as PM levels drop off with distance from the working area, and are therefore likely to be well within the Air Quality Objectives.

To summarise, the impacts at receptors within the vicinity of coal extraction and preparation are likely to be of minor adverse significance, with proper mitigation as outlined in the Air Quality Assessments.

Proposed mitigation for effective dust management requires integrated action on three aspects of control, design and engineering control, adequate process supervision and effective monitoring and review. The measures proposed are outlined in the Dust Management Plans submitted as part of the Environmental Statements.

Duncanziemere – text copied from 2010 PG

At the time of writing (2010) ATH Resources had submitted a planning application for a new opencast coal site at Duncanziemere, which lies to the north east of Cumnock. This new site lies to the north of, and adjacent to, the existing site at Laigh Glenmuir, and the application boundary proposed, incorporates the existing site to allow for retention of the existing overburden mound and coal preparation plant throughout the proposed operations. Coal handling processes at the mine will be subject to control under Section 3.4 Part B of Schedule 1 of the Pollution Prevention and Control (Scotland) Regulations 2000. The existing mine support area and coal handling operations are subject to "Part B" regulation by SEPA and this authorisation will require to be varied should the Duncanziemere surface mine be approved. ATH have submitted an Environmental Impact Assessment incorporating an air quality assessment (Reference 11) as part of the planning application.

The recently revised technical guidance for local air quality management (LAQM.TG(09)) requires that detailed assessments should be conducted where there is any potential exposure within 200m of any source, irrespective of background. Detailed assessment of PM_{10} exposure for receptors more than 400m from mines and quarries is unlikely to be required provided the annual mean background is <16 $\mu g/m^3$, implying that the contribution from fugitive dust operations is unlikely to exceed 2 $\mu g/m^3$ within 400m. The guidance also suggests that the level of complaints and dust at the site access to the public road should be taken into account. There have been no recorded complaints about dust or air pollution from the current operations at Laigh Glenmuir.

The nearest receptor, High Glenmuir, is 260m from the coal preparation area. The estimated background PM_{10} for 2010 (Reference 12) is 9.8 $\mu g/m^3$ and $PM_{2.5}$ of 6 $\mu g/m^3$. The process contribution at this distance was assessed at PM_{10} 2-4 $\mu g/m^3$ and $PM_{2.5}$ $\mu g/m^3$ 1-2 $\mu g/m^3$. When added to the respective baseline gives a combined process plus background PM_{10} of <14 $\mu g/m^3$ (well below the air quality objective of 18 $\mu g/m^3$) and $PM_{2.5}$ of <8 $\mu g/m^3$. The assessment for the other receptors in the vicinity of the mine workings also gave estimates of PM_{10} at a maximum <14 $\mu g/m^3$ and $PM_{2.5}$ at a maximum of <8 $\mu g/m^3$. As with the existing Laigh Glenmuir surface mine, monitoring at sensitive receptors will be carried out if SEPA or East Ayrshire Council considers there is a dust issue at nearby receptors. To date there have been no complaints about dust from local residents.

To summarise the impacts at receptors within the vicinity of coal extraction and preparation are likely to be of minor adverse significance with proper mitigation as outlined in the Air Quality Assessment (Reference 11). There are no dwellings within 1 km of the proposed development that are equally close to another surface mine site, and therefore significant adverse impacts from concurrent mining operations are therefore highly unlikely to occur.

Proposed mitigation for effective dust management requires integrated action on three aspects of control, design and engineering control, adequate process supervision and effective monitoring and review. The measures proposed are outlined in the Dust Management Plan submitted as part of the Environmental Statement (Reference 11).

The report concluded that a simple semi-quantitative assessment indicates that the worst case PM_{10} annual mean is unlikely to exceed 14 µg/m^3 at the nearest receptor with ambient PM $_{2.5}$ less than 8 µg/m^3. These are well within Scottish Air Quality Objectives. A monitoring programme should be conducted when excavation operations are within 400m of any sensitive receptor. Cumulative impacts from other activities are likely to be insignificant.

Ponesk Remainder Surface Mine (extension to existing Spireslack), Muirkirk – Scottish Coal Company Ltd – Air Quality Assessment.

The three nearest receptors to the Ponesk works are Darnhunch at 800m, Lightshaw at 900m and Tul-Na-Re 2km distant. The predicted background for PM_{10} during 2010 was 9.23 µg/m^3 and 9.13 µg/m^3 for 2013 (Reference 12). With a maximum process contribution of 2 µg/m^3 (1999 DETR Research, University of Newcastle upon Tyne) it was concluded that PM_{10} levels would be well below the annual mean objective of 18 µg/m^3 at any of the nearest receptors. Such projected combined concentrations would be expected to produce no more than 1 daily exceedence of 50 µg/m^3.
It was concluded that PM_{10} from the proposed surface mine extension is not likely to exceed the Air Quality Objectives and that the continuation of best practice measures implemented on the existing site for dust control is entirely adequate with the majority of dust generated controlled at source.

Dalfad Surface Mine Extension, Cronberry, Cumnock – Scottish Coal Company Ltd – Air Quality Assessment.

The nearest receptors to the Dalfad works are Stonebriggs at 930m (500m from haul route), Carbellow at 730m, several properties at former Cronberry School at 930m, Sunnybrae at 880m, Sunnyside Farm at 800m and Duncanziemere at 620m. With predicted background concentrations of PM_{10} of 8.25 µg/m^3 for 2010 and 8.15 µg/m^3 and a maximum process contribution of 2 µg/m^3 similar conclusions to Ponesk above can be drawn that PM_{10} at all the above receptors would be well below the annual mean objective (18 µg/m^3) at any of the above receptors, and also be expected to produce no more than 1 daily exceedence of 50 µg/m^3.

Netherton Surface Mine Extension, Cumnock – ATH Resources Plc – Air Quality Assessment.

The nearest receptors to the proposed extraction area at Netherton are Mossback at 550m, Muirdyke at 890m, premises on Skares Road at 968m, Crofthead at 990m and Skares Village at 1.6km. The University of Newcastle upon Tyne Research mentioned above also predicated a worst case emissions from combined surface mine activities can potentially contribute up to 5 µg/m^3 towards annual background

concentrations of the course fraction (2.5-10 µg/m^3) of particulates in the immediate area. To ensure a robust assessment of worst case emissions of PM_{10} from the site operations, the upper limit was added to the existing background level to determine whether the Air Quality Objectives were likely to be exceeded during the proposed operations. Adding 5 µg/m^3 to the existing background of 11.7 µg/m^3 (2010) produces a worst case scenario of 16.7 µg/m^3 which is within the 2010 annual mean Air Quality Objective (18 µg/m^3). This is unlikely to happen as PM_{10} levels 100m from source are between 15-20% of the concentration 10m from source (LAQM TG(09). Similarly to above such projected combined concentrations would be expected to produce no more than 1 daily exceedence of 50 µg/m^3.

Burnston Extension to the existing House of Water opencast coal site, New Cumnock – Scottish Coal Company Ltd – Air Quality Assessment.

In terms of The Scottish Office Development Departments publication, Annex B to Planning Advice Note (PAN) 50, entitled The Control of Dust at Surface Mineral Workings, March 1998, there are no facilities that are highly dust sensitive within the immediate area. The nearest properties are Upper Dalgig at 300m from the operations. All other properties are over 1000m from the operations including Nith Lodge at 2.8km, Lanehead at 1.9km, Auchingee at 1.7km and Beoch at 2.7km. The works close to Dalgig will be completed within a period of under 12 months and operations will then be at a minimum of 500m. The existing predicted PM_{10} background for 2010 is 13.1 µg/m^3. To that figure was added a 2.0 µg/m^3 worst case load at the nearest receptors giving a worst case 15.1 µg/m^3 PM_{10} level. This is well below the 2010 PM_{10} annual mean Air Quality Objective of 18 µg/m^3. Such projected combined concentrations would be expected to produce no more than 1 daily exceedence of 50 µg/m^3 in 2010.

Greenburn South Surface Mine (extension to Greenburn Surface Mine), New Cumnock – Kier Mining – Air Quality Assessment.

The nearest receptors to the works are Formouth at 480m, No. 74 Burnfoot Road at 380m, No. 60 Burnfoot Road with short duration soil operations at less than 100m and overburden and coal excavation at 200m, Mother Kelly's Doorstep, Burnside with short duration soil operations at 100m and overburden excavation at 120m and Auchingee with soil operations at 300m and overburden excavation at a minimum of 300m. The existing predicted PM_{10} background concentration including industry contribution for 2010 was 9.81 µg/m^3 falling to 9.67 µg/m^3 by 2020. Adding an extra PM_{10} loading of 2 µg/m^3 worst case scenario at the nearest receptors gives a level of 11.81 µg/m^3 for 2010 falling to 11.67 µg/m^3 by 20120. This is well below the 2010 18 µg/m^3 annual mean Air Quality Objective . Such projected combined concentrations would be expected to produce no more than 1 daily exceedence of 50 µg/m^3 PM_{10}. This assessment is backed up by actual PM_{10} monitoring carried out by Kier Mining at Greenburn Surface Mine which showed that the actual levels are very close to predicted levels for Greenburn South.

Lanehead Extension House of Water Surface Mine, New Cumnock – Scottish Coal Company Ltd – Air Quality Assessment

In terms of The Scottish Office Development Departments publication, Annex B to Planning Advice Note (PAN) 50, entitled The Control of Dust at Surface Mineral

Workings, March 1998, there are no facilities that are highly dust sensitive within the immediate area. The closest receptors include Dalgig at 450m from soil operations and 1.4km from excavation operations, Auchingee at 600m from the coal processing area, Marshallmark at 900m from the excavation area, Knockburnie at 550m from the closest workings (soil) and 1.3km from coal processing and Craighouse at 600m from soil operations and 630m from coal excavation (of short duration). The baseline background PM_{10} concentration was predicted at 13.1 µg/m^3 for 2010 falling to 12.6 µg/m^3 by 2017. Adding an extra PM_{10} loading of 2 µg/m^3 gives a worst case for the extension of 15.1 µg/m^3 falling to 14.6 µg/m^3 in 2017, well below the annual PM_{10} Air Quality Objective of 18 µg/m^3. Such projected combined concentrations would be expected to produce no more than 1 daily exceedence of 50 µg/m^3 PM_{10}.

Braehead Farm Surface Mine, New Cumnock – Kier Mining - Air Quality Assessment.

The nearest receptors to the works are Fordmouth which is in excess of 1km from any works, No. 74 Burnfoot Road which is in excess of 1km from the works, No. 60 Burnfoot Road which is 1.1km from the nearest works, Mother Kelly's Doorstep, Burnside at 1.1km from the nearest works, Lanemark Farm at 630m from soil operations and Farden Farm at 500m from soil operations. The existing predicted PM_{10} background concentration including industry contribution for 2010 was 9.95 µg/m^3. Adding an extra PM_{10} loading of 2 µg/m^3 worst case scenario at the nearest receptors gives a level of 11.95 µg/m^3 for 2010. This is well below the 18 µg/m^3 annual mean Air Quality Objective. Such projected combined concentrations would be expected to produce no more than 1 daily exceedence of 50 µg/m^3 PM_{10}.

Dunstonhill Surface Mine, Patna (Amended Application 2009) – Scottish Coal Company Ltd – Air Quality Assessment

An amended application was submitted in June 2009 which reduced the size of the original site boundary from 1209Ha to 776Ha. This removed phases which were close to the village of Rankinston, thus removing a large number of potential receptors. The transport of coal is now being taken along the Kyle Forest Road which removed the need for the construction of a new road and virtually eliminated Scottish Coal traffic from Patna and Dalmellington. These amended measures have had the effect of reducing PM_{10} levels (compared to the original plans) within and around the site boundary from excavation works and coal haulage by road. As the original planning application predicted PM_{10} levels to be well within the 2010 Air Quality Objectives, it can be concluded that the new amended application would lower worst case scenario PM_{10} levels. With a background PM_{10} concentration of approximately 10 µg/m^3 and adding a worst case scenario of an additional 5 µg/m^3 gave a potential worst case scenario of 15 µg/m^3. This is unlikely to happen as PM_{10} levels 100m from source are between 15-20% of the concentration 10m from source (LAQM TG(09)). Such projected combined concentrations would be expected to produce no more than 1 daily exceedence of 50 µg/m^3 PM_{10}

Further information and viewing of relevant documents, including Environmental Statements, can be obtained from:-

East Ayrshire Council
Planning and Economic Development Services
Department of Neighbourhood Services
The Johnnie Walker Bond
15 Strand Street
Kilmarnock
KA1 1HU

Other Fugitive Sources

There are no other new fugitive sources within East Ayrshire which are likely to have a detrimental impact on air quality.

There was one potential dust complaint from open cast coal sites (previously covered). There were no dust complaints from existing quarries or existing landfill sites (or other fugitive sources) during 2011.

There are no other new fugitive sources within East Ayrshire which are likely to have a detrimental impact on air quality.

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

1/ ATH Resources, Duncanziemere, Cumnock – opencast coal extension - operational (details covered in 2011 PG)
2/ Scottish Coal, Ponesk Muirkirk – opencast coal extension – operational.
3/ Scottish Coal, Dalfad, Cronberry, Cumnock – opencast coal extension – operational.
4/ ATH Resources, Netherton, Cumnock – opencast coal extension – operational.
5/ Scottish Coal, Burnston Extension, New Cumnock – opencast coal extension – application approved mid June.
6/ Kier Mining, Greenburn South, New Cumnock – opencast coal extension – approved mid June.
7/ Scottish Coal, Lanehead, House of Water, New Cumnock – opencast coal extension – operational.
8/ Keir Mining, Braehead Farm, New Cumnock – opencast coal extension – operational.
9/ Scottish Coal, Dunstonhill, Patna – opencast coal extraction – operational.

The above 9 new opencast coal extensions have been assessed and it has been concluded that no Detailed Assessment is required for PM_{10}.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Part-year automatic monitoring carried out during 2011 has shown exceedence of the annual mean Air Quality Objectives for PM_{10} within John Finnie Street, Kilmarnock (Tables 2.7). Only one exceedence of the 24-hour mean occurred in John Finnie Street (Table 2.8). This is well within the 7 times a year objective (Table 1.1). NO_2 levels were all below the annual mean objective for all locations where monitoring was carried out within East Ayrshire (Table 2.3). Only one exceedence of the 1-hour mean occurred during 2011 (John Finne Street, Kilmarnock) (Table 2.4), well below the 18 times a year objective (Table 1.1). Trends from 2006-2011 from diffusion tube data (Figure 2.4) would seem to suggest a slight fall off in NO_2 but levels are still close to the 40 µg/m^3 annual mean objective (Table 2.5 and 2.6).

Previous assessments including a Detailed Assessment carried out by BMT Cordah in 2008 (Reference 5) concluded that no exceedences of the annual mean NO_2 were predicted at locations of relevant public exposure. Furthermore post-2008 levels of NO_2 were predicted to fall off significantly in future years and be well under the annual mean objective. This has not happened and in fact 2010 levels have shown a sharp rise over the previous four years (Figure 2.4.). 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 reduction in emissions from more modern vehicles has been much more limited than predicted.

Conclusions
Since PM_{10} levels have exceeded the annual mean Air Quality Objective for two consecutive years, 2010 and 2011 (Table 2.7) East Ayrshire Council Environmental Health will proceed to a detailed assessment for PM_{10} within Kilmarnock. The detailed assessment will also cover NO_2 since, although annual mean levels were all below the Air Quality Objective in 2011 throughout East Ayrshire, annual mean levels have

fluctuated around the annual mean objective for several years within Kilmarnock (Table 2.6). NO_2 and PM_{10} are linked where road traffic is the primary source and it is therefore eminently sensible to cover both particularly as updated information is now available on road traffic emissions.

8.2 Conclusions from Assessment of Sources

All new local developments (or proposed developments) which may have a significant effect on air quality have been covered in Section 3. The two developments which may impact on air quality, the roadstone coating plant at Moorfield, Kilmarnock and extensions to opencast coal mines have all been subject to air quality assessments which concluded that although all new sources would have a localised impact on air quality, all pollutants included in the Regulations for the purpose of Local Air quality Management in Scotland would be well within the Air Quality Objectives in the areas affected by these.

Kilmarnock Town Centre
The heavily trafficked Kilmarnock Town Centre in combination with multiple sets of lights, and tall buildings continues to give raised levels of PM_{10} and NO_2. Further measures (as well as the measures already in place) will have to be considered in detail to try and lower PM_{10} levels to comply with the Air Quality Objectives.

Local Transport Plan
Objective 3 and Objective 5 (Reference 15) 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. In conclusion these specific measures will result in a reduction in NO_2 and PM_{10}

Updates of Planning Policy that relate to Air Quality
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.

In conclusion this updated policy will ensure that developers will have to minimise the impact on air quality of any new development and if necessary enter into a legal agreement with East Ayrshire Council to ensure this is the case.

8.3 Proposed Actions

Kilmarnock
Due to exceedences of the annual mean Air Quality Objective for PM_{10} (Table 1.1 and Table 2.7) within the centre of Kilmarnock East Ayrshire Council will proceed to a Detailed Assessment. NO_2 will also be included due to previous exceedences (Table 2.3 and 2.6). As stated earlier in Section 2, automatic monitoring for PM_{10} and NO_2 has been extended within Kilmarnock to two sites to provide robust data for future modelling and a check on the success of measures introduced as part of any future Air Quality Action Plan.

Newmilns and Mauchline
Levels of NO_2 (diffusion tube monitoring Table 2.5 and Table 2.6) fell in both towns during 2011 and are significantly below the annual mean objective. As levels in previous years were around the annual mean objective (Table 2.6) further monitoring will be carried out.

New Cumnock
As previously discussed (Section2) due to the low levels of PM_{10} and NO_2 in New Cumnock automatic monitoring has been discontinued.

Location of NO_2 Diffusion Tubes
NO_2 diffusion tubes will be located in the future in any area where air quality issues are likely to occur, such as where there are substantial changes in traffic flow, and also located in areas which are likely to have raised levels of NO_2 due to traffic flow, and which have never been subject to actual monitoring.

The next course of action for East Ayrshire Council will therefore be the submission of a Detailed Assessment for PM_{10} and NO_2 within Kilmarnock.

9 References

1. Defra and The Devolved Administrations, Local Air Quality Management, Technical Guidance LAQM.TG(09), February 2009. Accessed at www.airquality.co.uk/laqm/tools.php

2. Part IV of the Environment Act 1995 Local Air Quality Management Policy Guidance PG(S)(09) February 2009. Accessed at http://www.airquality.co.uk/laqm/tools.php

3. Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users. Report to Defra and the Devolved Administrations. ED48673043 Issue 1a Feb2008. Authors Jaume Targa, Alison Lauder and The Defra Working Group on Harmonisation of Diffusion Tubes. Accessed at http://www.laqmsupport.org.uk/no2qaqc.php

4. The Workplace Analysis Scheme for Proficiency (WASP) – summary of laboratory performance in rounds 103-107. Accessed at http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html

5. Detailed Assessment of John Finnie Street, Kilmarnock, Ayrshire. Compiled by BMT Cordah on behalf of East Ayrshire Council; Report No.: G_EAC-003/04-01-01 dated 7th October 2008. Accessed at http://www.eastayrshire.gov.uk

6. Laxen D and Marner B (2003). Analysis of the relationship between 1-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites. Available at www.airquality.co.uk/archive/reports/list.php

7. Cook A (2008). Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedences of the 1-hour mean AQS Objective. Available at www.airquality.co.uk/archive/reports/list.php

8. Fall-off in nitrogen dioxide concentrations at different distances from roads. The calculator can be accessed at www.airquality.co.uk/archive/laqm/tools.php

9. Harrison D (2006) UK Equivalence Programme for Monitoring of Particulate Matter. Available at www.airquality.co.uk/archive/reports/list.php

10. Kilmarnock Roadstone Coating Plant Dispersion Modelling Assessment 23/01/09. Author: WYG Environment Planning Transport Limited.

11. Duncanziemere Surface Mine Environmental Statement/Air Quality. Author: RBS Group June 2009.

12. Background Pollutant Concentration Maps. Accessed at http://www.scottishairquality.co.uk/

13. Air Pollution in Scotland 2010 and 2011. Produced by AEA on behalf of the Scottish Government. Available at www.scottishairquality.co.uk

14. East Ayrshire Local Plan 2010. Accessed at http://www.east-ayrshire.gov.uk/

15. The East Ayrshire local Transport Strategy 2009 – 2014. Accessed at http://www.east-ayrshire.gov.uk/

16. East Ayrshire Council Carbon Management Programme Strategy and implementation Plan (SIP) October 2007. Accessed at http://www.east-ayrshire.gov.uk/

17. East Ayrshire Community Plan. Accessed at http://www.east-ayrshire.gov.uk/

18. East Ayrshire Council Sustainability Strategy. Accessed at http://www.east-ayrshire.gov.uk/

19. Carbon Trust Local Authority Carbon Management Programme. Accessed at http://www.east-ayrshire.gov.uk/

20. Defra and The Devolved Administrations, Spreadsheet of Bias Adjustment factors, version 03/10. Accessed at http://www.uwe.ac.uk/aqm/review/index.html

21. www.defra.gov.uk/environment/quality/air/airquality/publications/primaryno2-trends/index.htm (Accessed 25th February 2011).

22. East Ayrshire Council Air Quality Reports. Accessed at http://www.eastayrshire.gov.uk/PlanningAndTheEnvironment/Pollution/AirPollution/AirPollution.aspx

23. Bureau Veritas Marylebone laboratory inter-comparison study. Accessed at http://uk-air.defra.gov.uk/

Appendices

Appendix A:

QA/QC Data: Defra and The Devolved Administrations, Spreadsheet of Bias Adjustment Factors, Version Number 03/10. Accessed at www.uwe.ac.uk/aqm/review/index.html

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/12

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 September 2012
LAQM Helpdesk Website

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

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

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

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

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

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

Step 3: Select a Year from the Drop-Down

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

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

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

Analysed By[1]	Method	Year[2]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Glasgow Scientific services	20% TEA in water	2011	K	Marylebone Road Intercompariso	11	115	99	16.6%	G	**0.86**
Glasgow Scientific Services	20% TEA in water	2011	R	West Dunbartonshire Council	12	24	18	30.5%	G	**0.77**
Glasgow Scientific Services	20% TEA in water	2011	R	West Dunbartonshire Council	11	25	21	22.4%	G	**0.82**
Glasgow Scientific Services	20% TEA in water	2011	UB	Glasgow City Council	9	34	37	-9.9%	G	**1.11**
Glasgow Scientific Services	20% TEA in water	2011	UC	Glasgow City Council	12	36	34	5.4%	P	**0.95**
Glasgow Scientific Services	20% TEA in water	2011	K	Glasgow City Council	12	72	72	-1.1%	S	**1.01**
Glasgow Scientific Services	20% TEA in water	2011	R	East Ayrshire Council	12	31	36	-11.8%	P	**1.13**
Glasgow Scientific Services	20% TEA in Water	2002		**Overall Factor[3] (3 studies)**				**Use**		**0.92**
Glasgow Scientific Services	20% TEA in Water	2004		**Overall Factor[3] (3 studies)**				**Use**		**0.89**
Glasgow Scientific Services	20% TEA in Water	2005		**Overall Factor[3] (3 studies)**				**Use**		**0.75**
Glasgow Scientific Services	20% TEA in Water	2006		**Overall Factor[3] (3 studies)**				**Use**		**0.96**
Glasgow Scientific Services	20% TEA in Water	2007		**Overall Factor[3] (4 studies)**				**Use**		**1.05**
Glasgow Scientific Services	20% TEA in Water	2008		**Overall Factor[3] (4 studies)**				**Use**		**0.97**
Glasgow Scientific Services	20% TEA in Water	2009		**Overall Factor[3] (4 studies)**				**Use**		**1.23**
Glasgow Scientific Services	20% TEA in Water	2010		**Overall Factor[3] (6 studies)**				**Use**		**1.12**
Glasgow Scientific Services	20% TEA in water	2011		**Overall Factor[3] (7 studies)**				**Use**		**0.94**

Appendix B: Monthly NO_2 Diffusion Tube Data

East Ayrshire Monthly NO_2 Diffusion Tube Data 2011 ($\mu g/m^3$)

Site Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Mean	Corrected Mean (Bias Factor)
1. Fowlds Street/King Street Junction, Kilmarnock	28.5	32.3	43.3	27.4	22.6	31.2	27.7	16.0	21.5	10.5	28.4	30.0	26.62	**25.0**
2. 28 John Finnie Street, Kilmarnock	51.1	44.6	44.9	30.9	27.1	31.8	30.6	19.1	30.5	23.9	42.0	32.7	34.10	**32.1**
3. 19 Lainshaw Street, Stewarton	30.8	40.3	37.7	28.3	21.3	30.3	26.0	16.0	28.0	22.6	30.2	33.0	28.71	**27.0**
4. 40 Main Street, Newmilns	39.6	35.2	34.1	20.5	25.0	32.5	29.0	15.5	25.4	21.6	21.9	30.7	27.58	**25.9**
6. 8A Kilmarnock Road, Mauchline	33.1		61.4	28.9	27.5	31.4	24.6	12.8	25.0	19.4	38.5	24.0	29.69	**27.9**
7. Junction at Main Street &A70, Ochiltree	25.9	29.0	33.1	17.7	19.0	23.0	22.7	7.7	20.5	11.5	20.6	23.0	21.14	**19.9**
9. Townhead/ Glaisnock Street Junction, Cumnock	23.0	31.0	22.6	13.3	12.5	13.9	12.5	4.6	12.8		19.3		16.55	**15.6**
11. 96 John Finnie Street, Kilmarnock	29.9	45.7	44.1	29.1	19.7	27.4	28.7	15.6	30.1	13.8	42.8	29.3	29.68	**27.9**
12. 62 John Finnie Street Kilmarnock	40.1	66.2	47.5	33.2	27.4	32.6	30.6	14.3	33.4	25.3	39.2	35.9	35.48	**33.3**
14. 95/97 John Finnie Street, Kilmarnock	43.4	38.7	52.9	38.2	35.0		32.4	10.4	35.2	20.5	44.1	49.7	36.41	**34.2**
15. 16 West George Street, Kilmarnock	32.8	52.6	52.9	37.1	28.3	41.7	37.4	15.1	38.0	24.0	48.0	48.6	38.04	**35.8**
17. 22/25 Loudoun Road, Newmilns	50.7	40.2	41.6	30.8	26.6	32.8	31.8	17.9	34.4	15.5	36.9	29.1	32.36	**30.4**
18. 100 Main Street, Newmilns	31.7	36.7	33.8	15.8	20.0	23.9	22.5	15.6	22.5	12.8	23.7	23.0	23.50	**22.1**
19. 57/59 Townhead Street, Cumnock	25.4	28.6	30.7	20.7	15.0	20.1	20.5	7.2	18.0	11.4	19.9	25.6	20.26	**19.0**
20. 66 Main Street, Muirkirk	21.5	19.3	22.7	14.1	11.1	16.1	10.5	8.5	11.9	8.7	19.2	17.8	15.12	**14.2**
22. The Cross, Mauchline	37.0	48.6	37.4	28.9	28.0	28.8	28.8	20.3	28.9	26.0	34.5	30.2	31.45	**29.6**
23. 3/5 Loudoun Street, Mauchline	32.3	45.5	37.7	30.2	28.0	28.1	27.3	20.4	26.4	17.3	33.3	36.1	30.22	**28.4**
24. 5/7 Earl Gray Street, Mauchline	42.4	60.4	51.3	34.0	32.4	36.0	32.4	24.9	30.3	19.6	40.4	32.7	36.40	**34.2**
25A. John Finnie Street Monitor	27.1	50.3	39.6	30.1	23.5	33.9	31.8	14.6	34.0	15.2	30.1		30.02	**28.2**
25B. John Finnie Street Monitor	27.7	35.1	43.1	31.3	26.1	32.5	32.0	17.7	32.8	26.2	23.7		29.84	**28.0**
25C. John Finnie Street Monitor	32.7	45.2	45.4	28.7	27.2	39.2	38.0	23.6	37.8	20.1	20.5		32.58	**30.6**
26. 76 Loudoun Road, Newmilns	35.0	30.1	30.3	17.2	16.0		17.8	15.3	22.6	14.7	20.5	30.4	22.72	**21.4**
27. Junction King St./St. Marnock	41.0	71.9	58.9	22.3	26.1	31.9	30.5	17.9	22.8	18.3	29.4	21.8	32.73	**30.8**

St., Kilmarnock														
28. 2A Welbeck, Street, Kilmarnock	35.6	31.7	37.9	28.9	22.7	28.7	23.3	17.4	26.9	12.0	30.2	31.0	27.19	**25.6**
29. JCT McLelland Drive/Dundonald Road, Kilmarnock	29.1	43.8	37.3	20.9	20.6	28.4	21.1	16.4	26.0	21.2	29.5	27.2	26.79	**25.2**
30. 16 Cumnock Road, Mauchline	31.1	31.5	28.7	16.7	15.3	19.4	21.7	12.8	16.8	14.1	16.4	19.7	20.35	**19.1**
31. Wellington Street, Kilmarnock	18.4	34.6	37.8	22.2	18.9	23.7	22.0	16.5		17.7	22.4	21.1	23.21	**21.8**

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

EAST AYRSHIRE NEW CUMNOCK
1st January to 31st December 2011

These data have been fully ratified by AEA

POLLUTANT	PM_{10}*	NO_2	NO_X
Number Very High	0	0	-
Number High	0	0	-
Number Moderate	0	0	-
Number Low	7077	4973	-
Maximum 15-minute mean	95 µg m^{-3}	86 µg m^{-3}	277 µg m^{-3}
Maximum hourly mean	94 µg m^{-3}	55 µg m^{-3}	206 µg m^{-3}
Maximum running 8-hour mean	53 µg m^{-3}	46 µg m^{-3}	128 µg m^{-3}
Maximum running 24-hour mean	44 µg m^{-3}	37 µg m^{-3}	74 µg m^{-3}
Maximum daily mean	44 µg m^{-3}	37 µg m^{-3}	74 µg m^{-3}
99.8th percentile of hourly means	-	46 µg m^{-3}	-
98.08th percentile of daily means	33 µg m^{-3}	-	-
Average	11 µg m^{-3}	9 µg m^{-3}	12 µg m^{-3}
Data capture	83.3 %	56.8 %	56.8 %

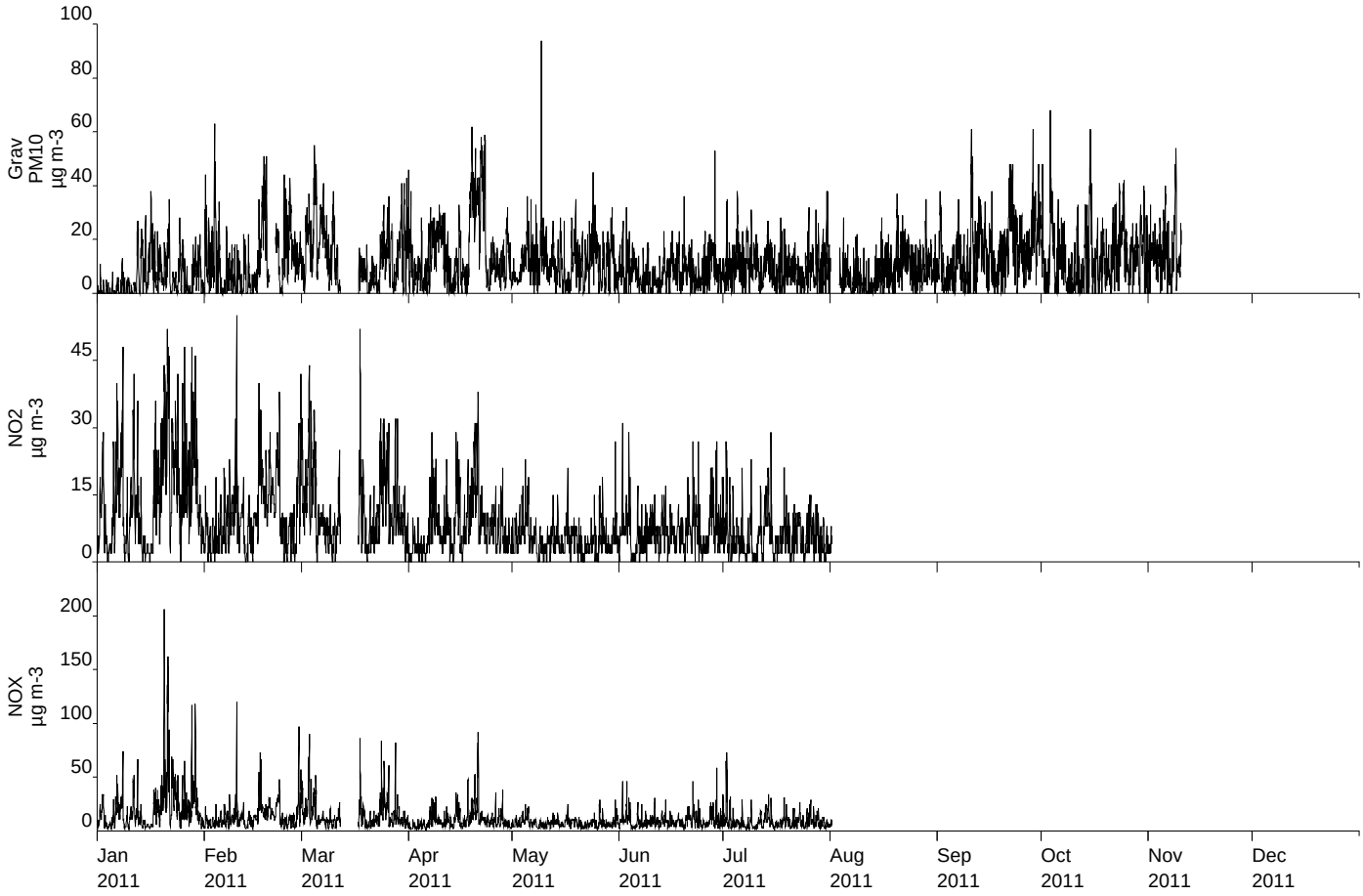
*PM_{10} instruments:
BAM using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent from 1st January 2011 to 10th November 2011
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.
NO_X mass units 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 AEA on behalf of the Scottish Government

East Ayrshire New Cumnock
Hourly Mean Data for 1st January to 31st December 2011



Date Created: 20/03/2012

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Produced by AEA on behalf of the Scottish Government

EAST AYRSHIRE KILMARNOCK JOHN FINNIE ST
1st January to 31st December 2011

These data have been fully ratified by AEA

POLLUTANT	PM_{10}*	NO_2	NO_X
Number Very High	0	0	-
Number High	0	0	-
Number Moderate	0	0	-
Number Low	7634	7306	-
Maximum 15-minute mean	119 µg m^{-3}	600 µg m^{-3}	1461 µg m^{-3}
Maximum hourly mean	119 µg m^{-3}	216 µg m^{-3}	500 µg m^{-3}
Maximum running 8-hour mean	74 µg m^{-3}	121 µg m^{-3}	332 µg m^{-3}
Maximum running 24-hour mean	55 µg m^{-3}	82 µg m^{-3}	234 µg m^{-3}
Maximum daily mean	51 µg m^{-3}	76 µg m^{-3}	215 µg m^{-3}
99.8th percentile of hourly means	-	159 µg m^{-3}	-
98.08th percentile of daily means	38 µg m^{-3}	-	-
Average	20 µg m^{-3}	35 µg m^{-3}	70 µg m^{-3}
Data capture	86.9 %	83.4 %	83.4 %

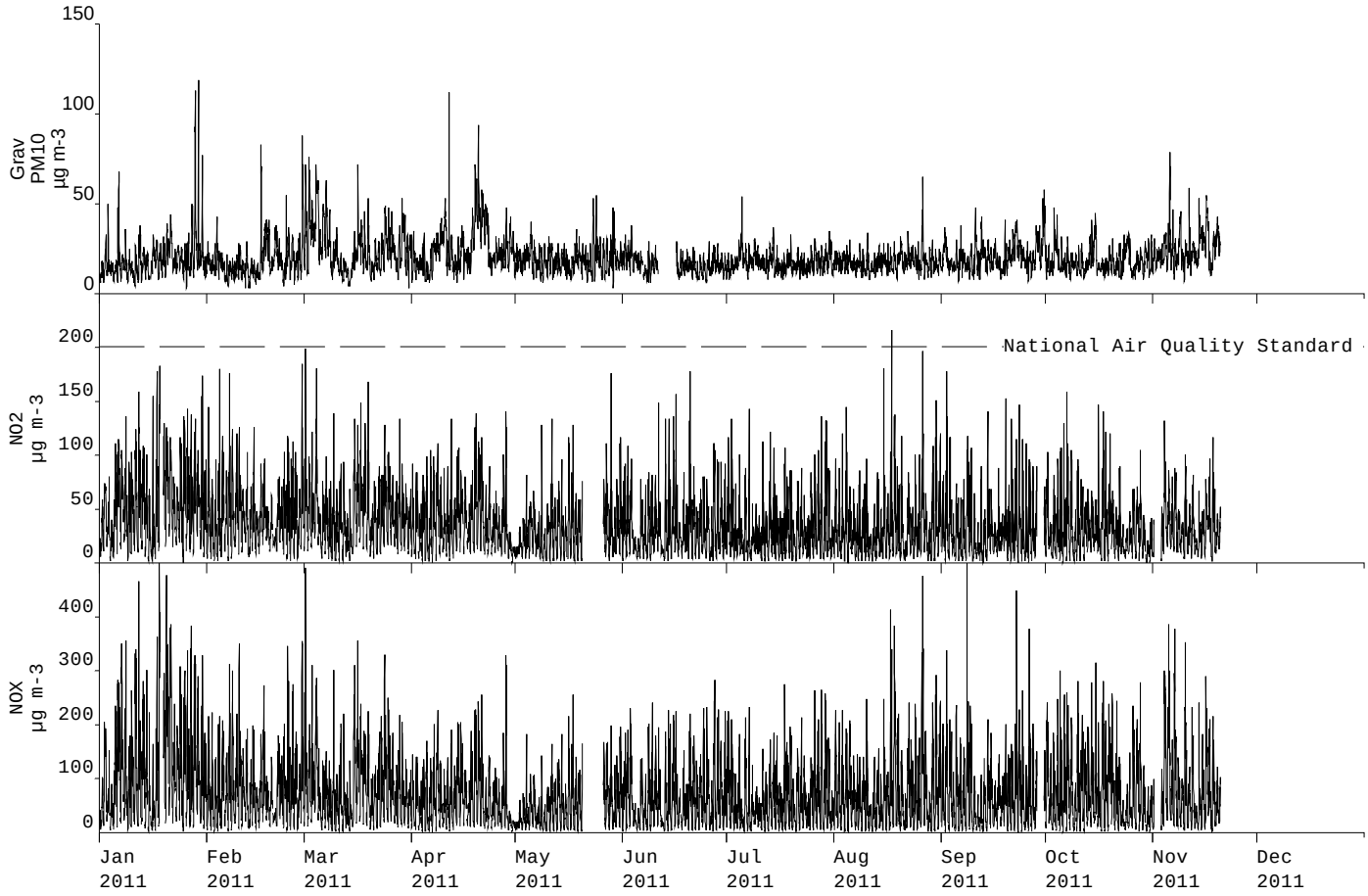
*PM_{10} instruments:
BAM using a gravimetric factor of 0.83333 for Indicative Gravimetric Equivalent from 1st January 2011 to 20th November 2011
All gaseous pollutant mass units are at 20°C and 1013 mb. Particulate matter concentrations are reported at ambient temperature and pressure.
NO_X mass units 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}	1	1
PM_{10} Particulate Matter (Gravimetric)	Annual mean > 18 µg m^{-3}	1	-
Nitrogen Dioxide	Annual mean > 40 µg m^{-3}	0	-
Nitrogen Dioxide	Hourly mean > 200 µg m^{-3}	1	1

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

Produced by AEA on behalf of Scot Exec

East Ayrshire Kilmarnock John Finnie St
Hourly Mean Data for 01 January to 31 December 2011



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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/W/20055	Kilmarnock Abattoir (not operating)	East Ayrshire
PPC/A/1079002	Auldhouse Burn 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

Figure 1: Map of East Ayrshire

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

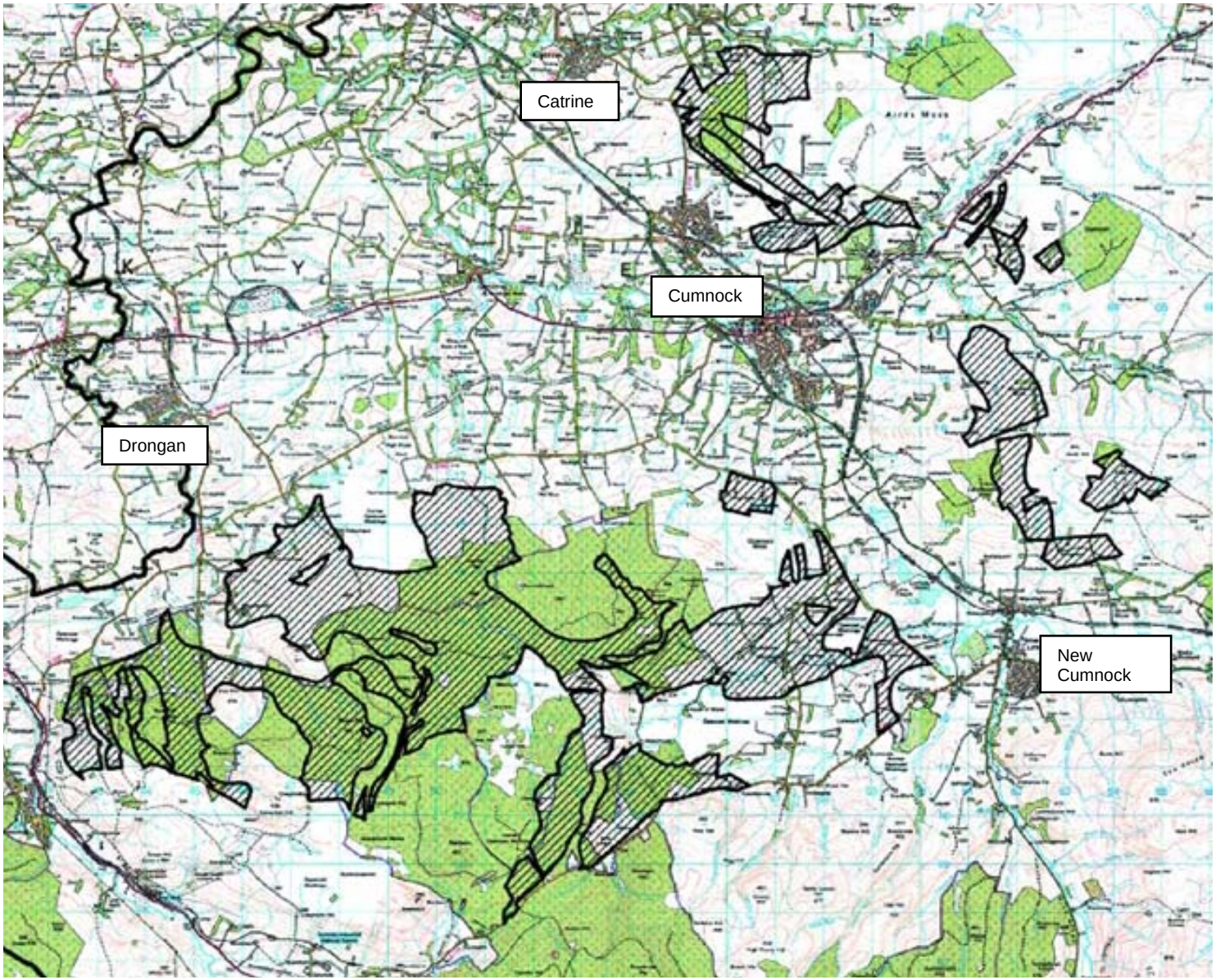

Figure 3: New Cumnock Automatic Monitoring Station

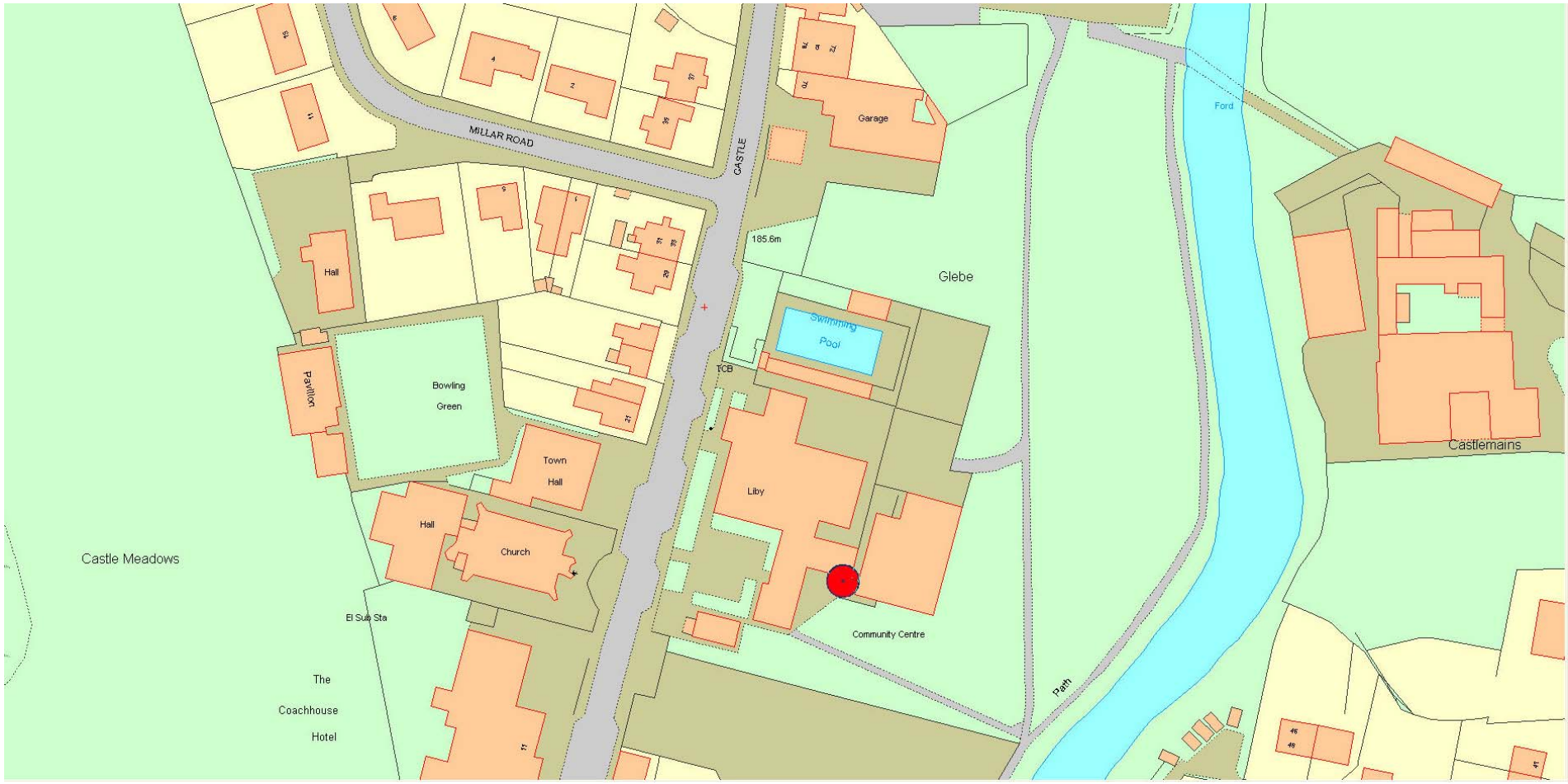

Figure 4: Kilmarnock Automatic Monitoring Stations

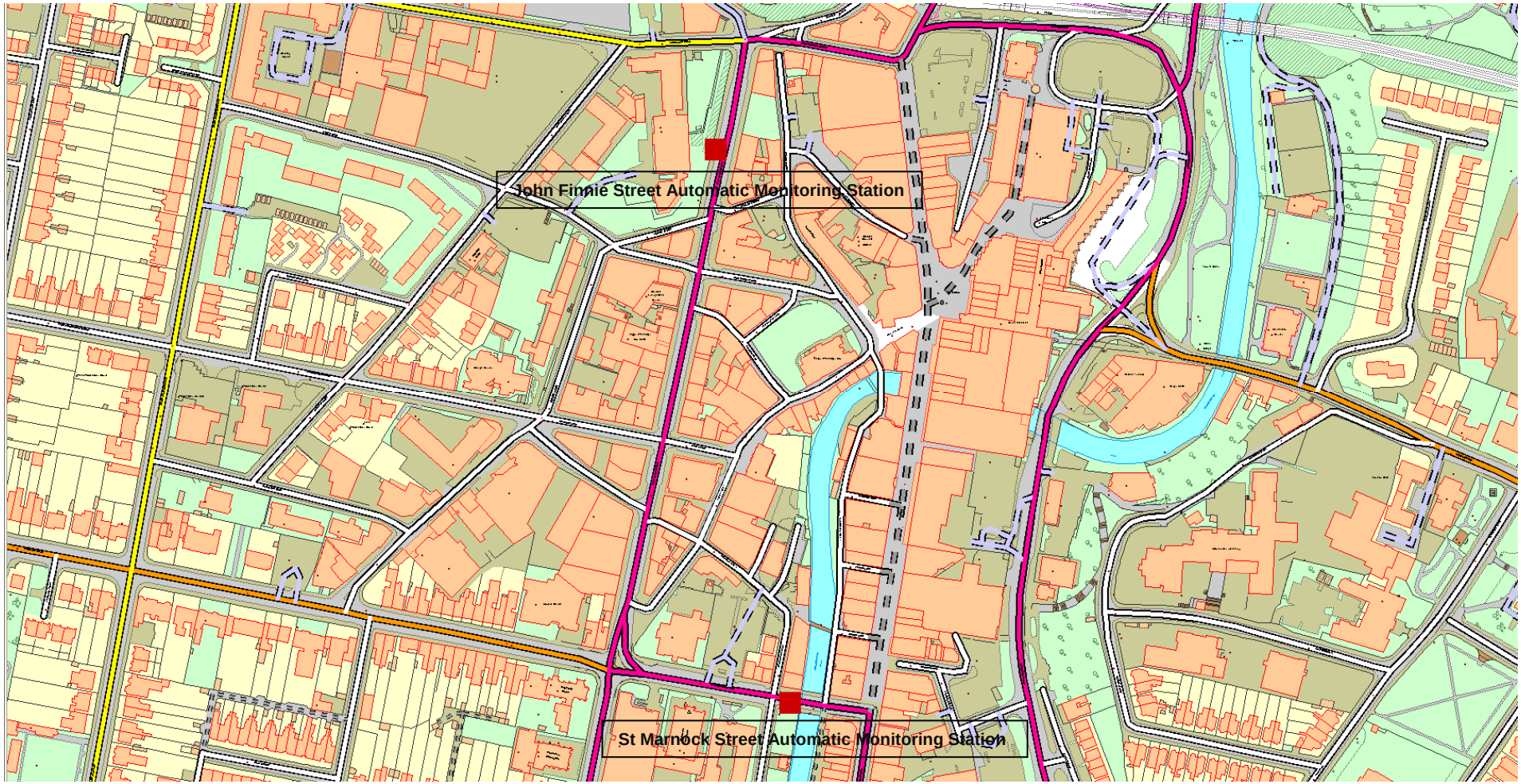

Figure 5a: Stewarton NO2 Diffusion Tube Location

Figure 5b: Kilmarnock Town Centre Air Monitoring Locations

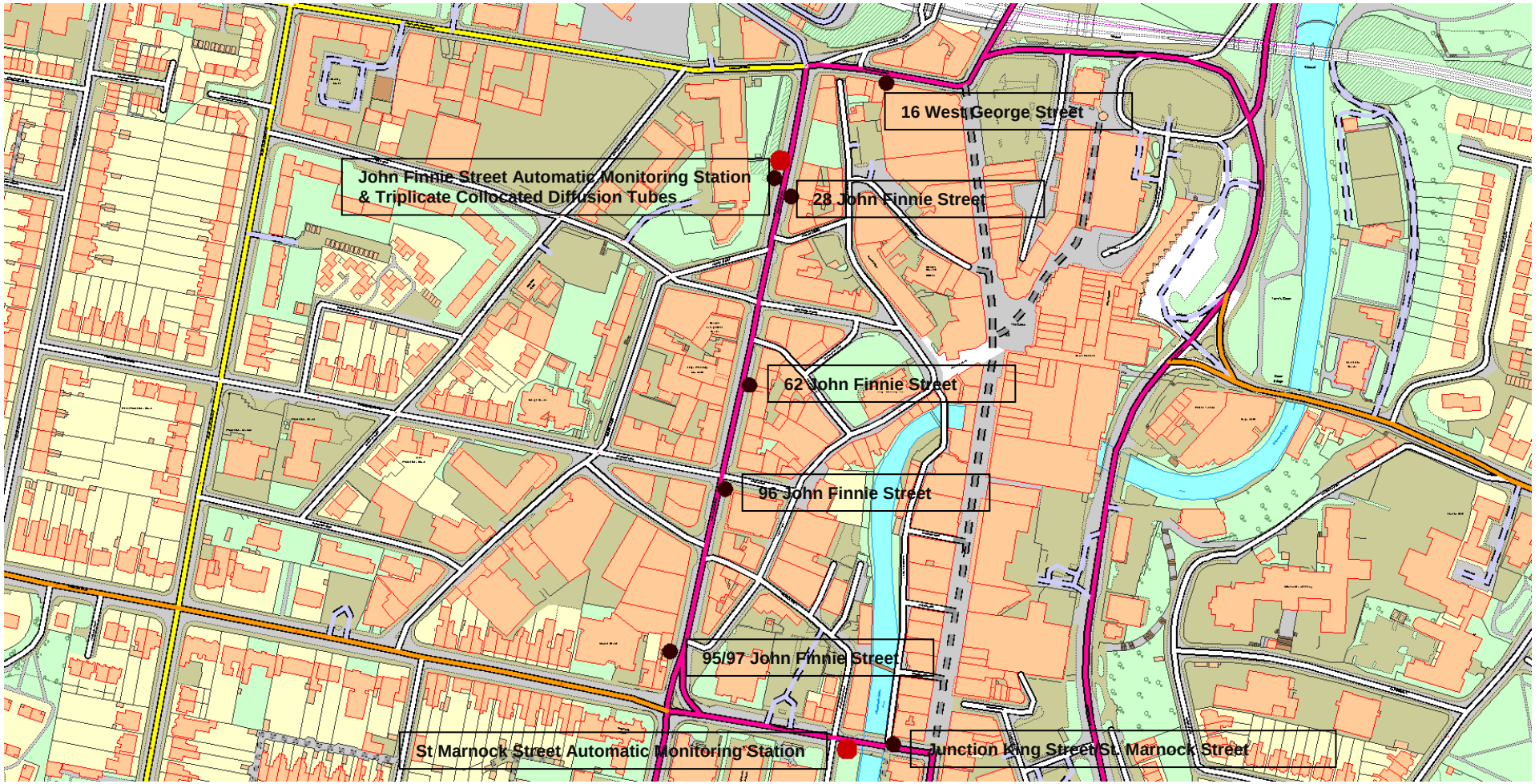

Figure 5c: Newmilns NO_2 Diffusion Tube Locations

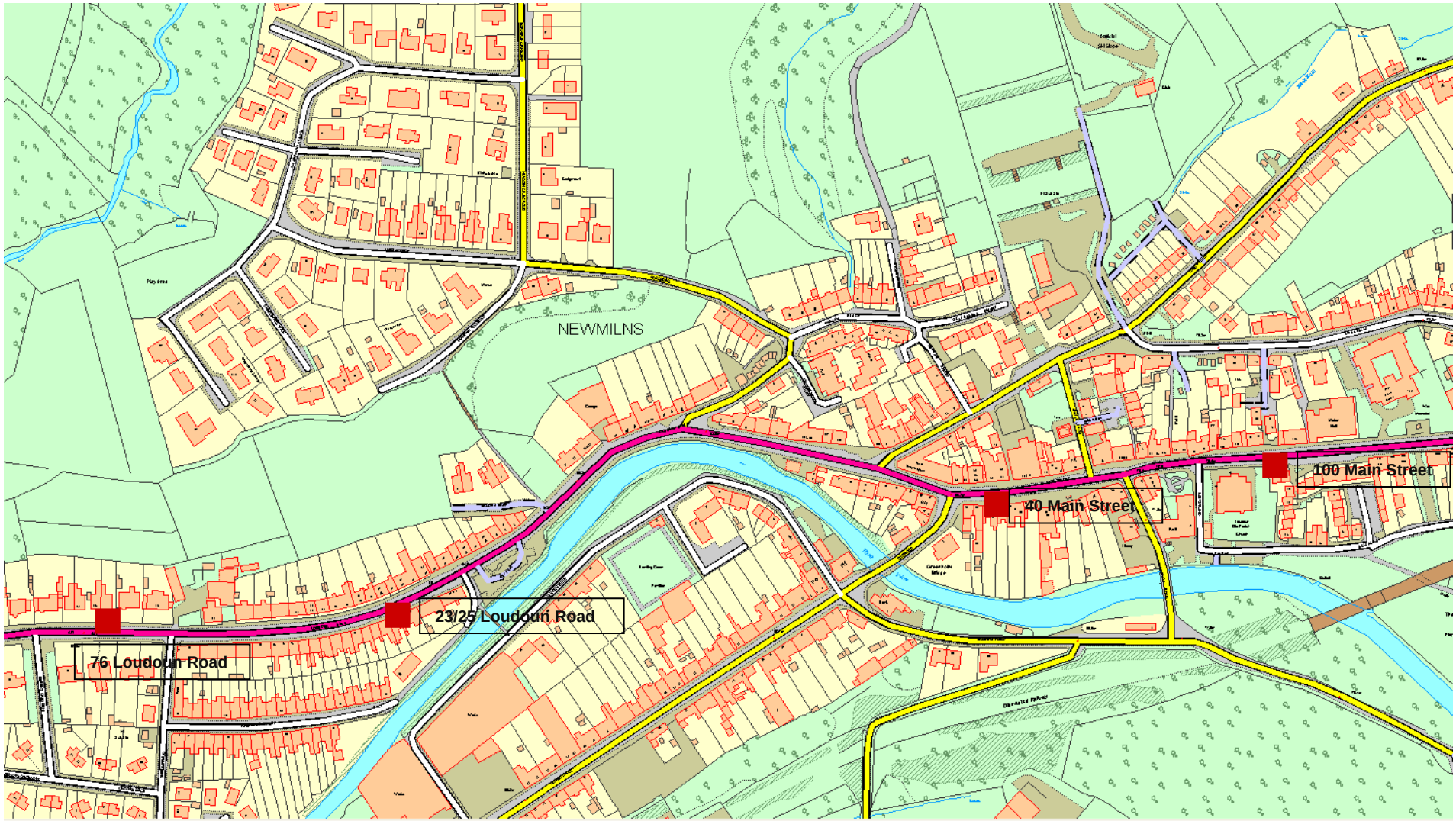

Figure 5d: Mauchline NO_2 Diffusion Tube Locations

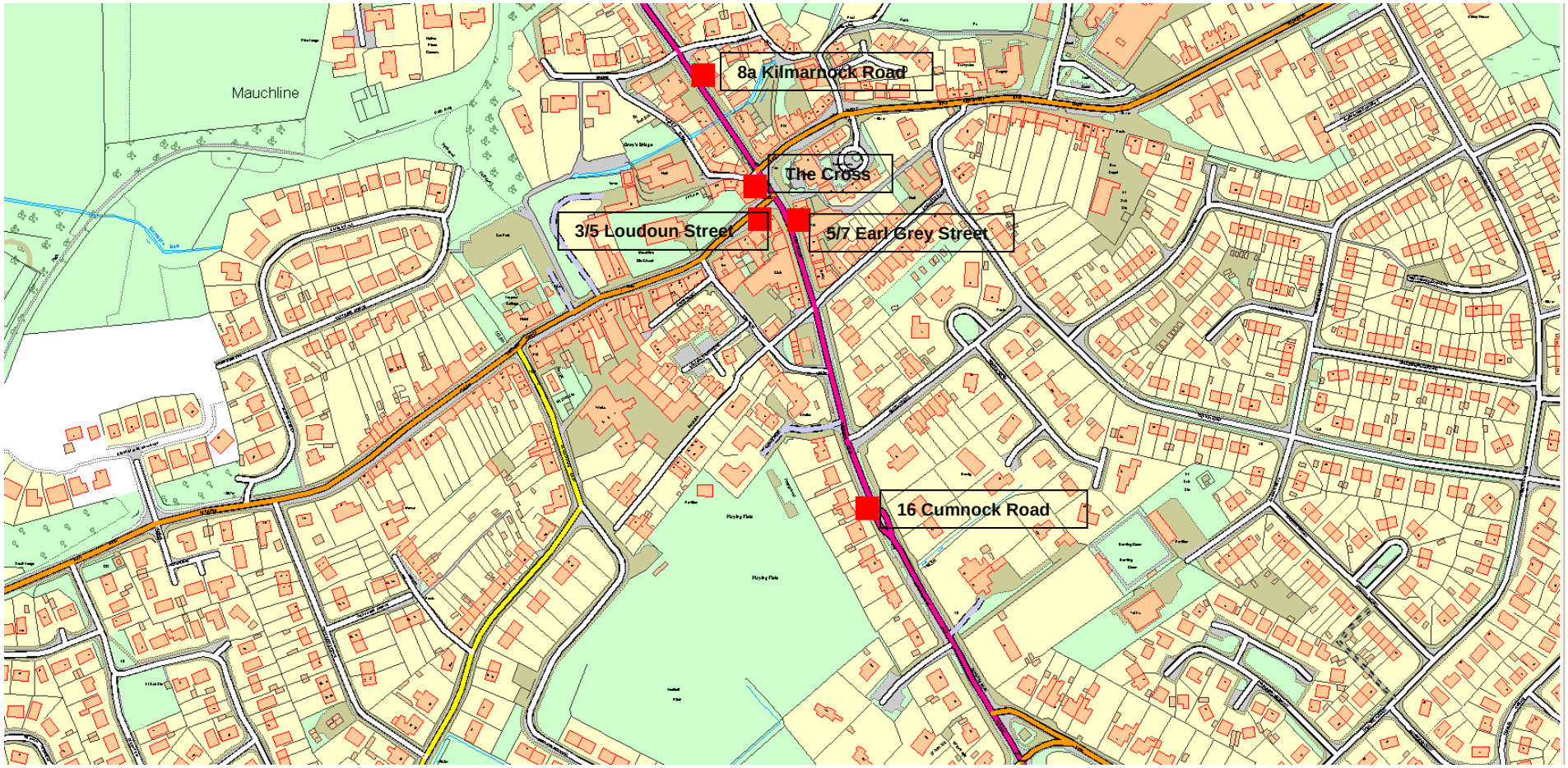

Figure 5e: Muirkirk NO_2 Diffusion Tube Location

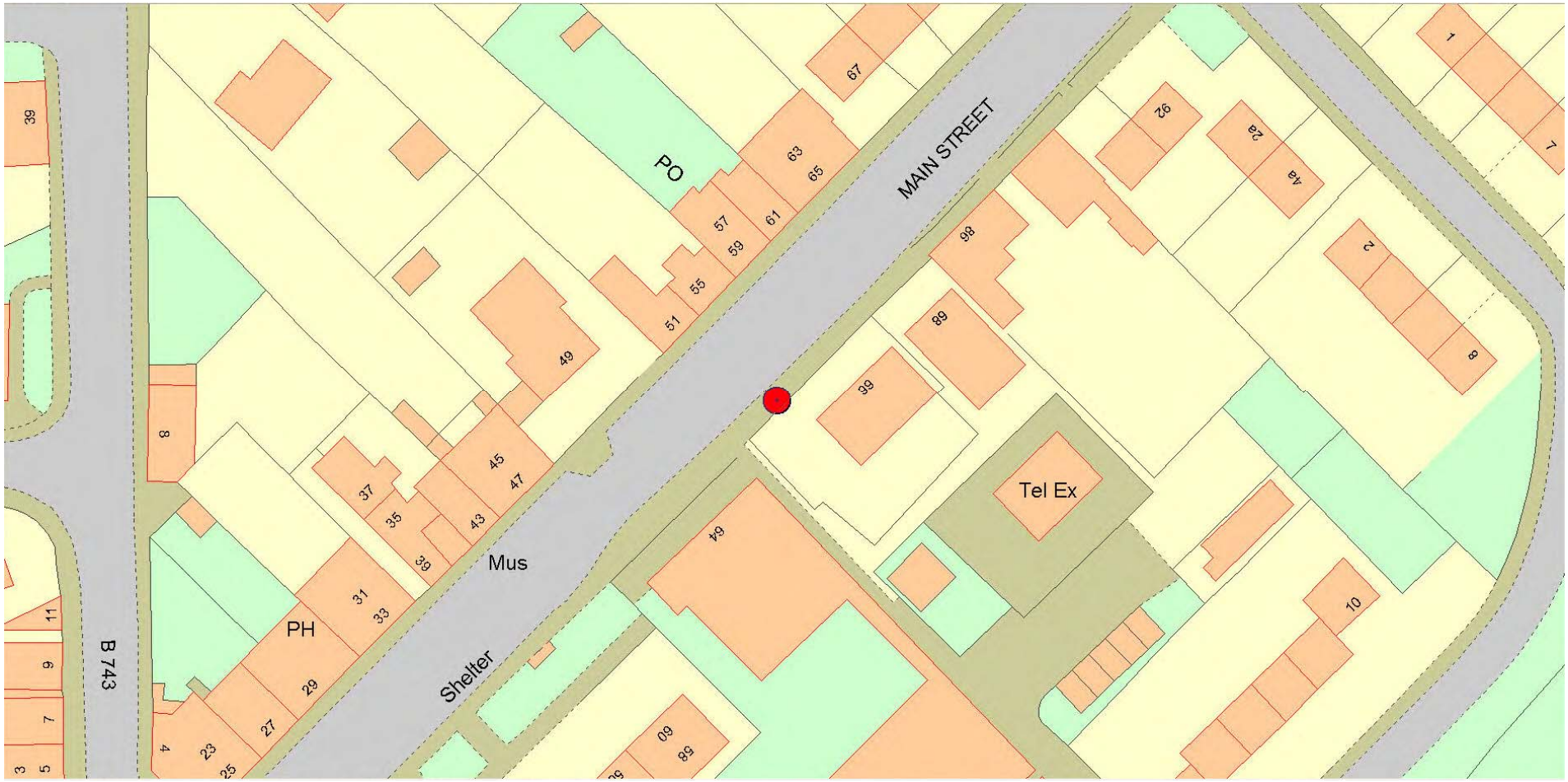

Figure 5f: Ochiltree NO_2 Diffusion Tube Location

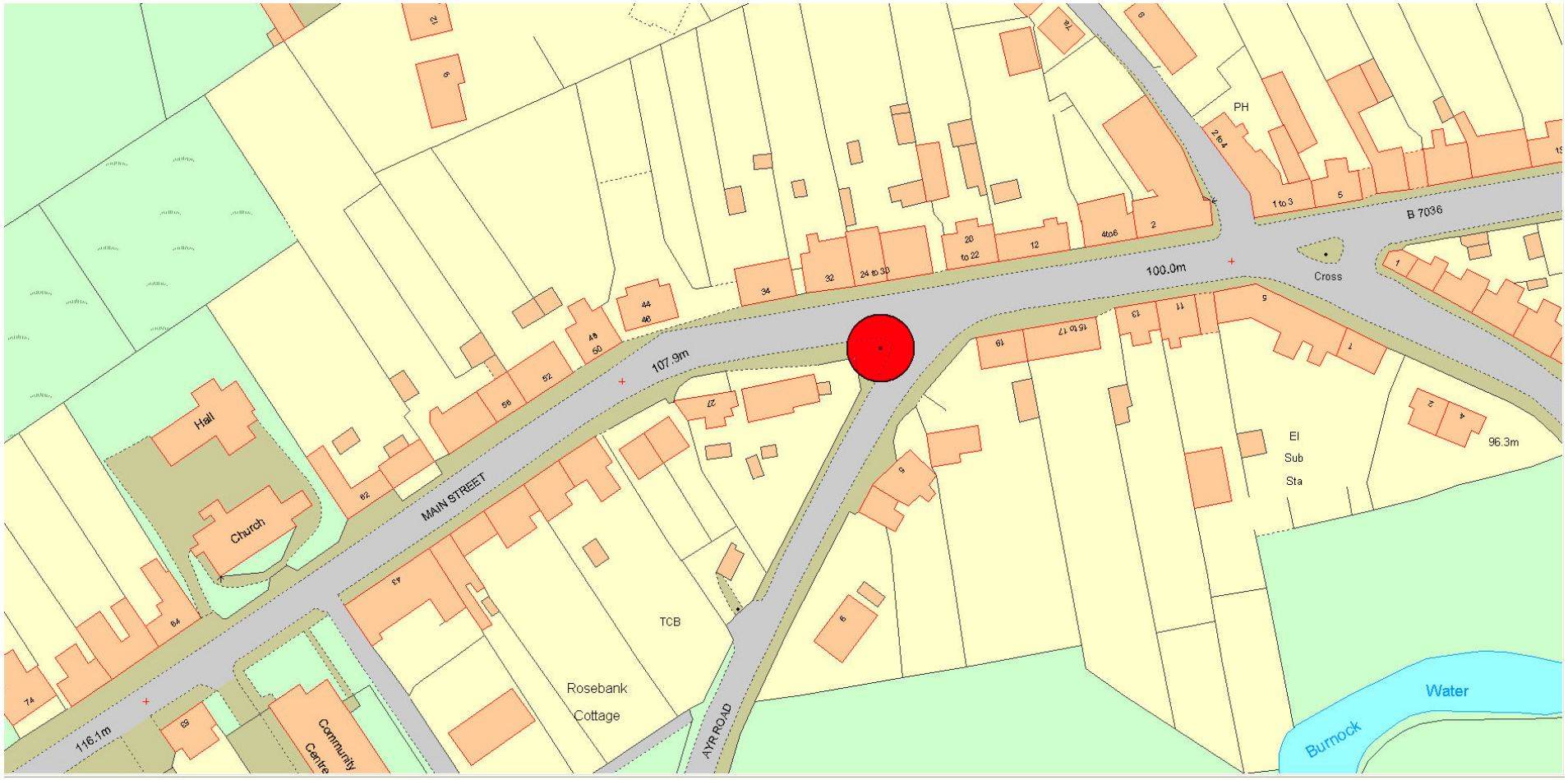

Figure 5g: Cumnock NO_2 Diffusion Tube Locations

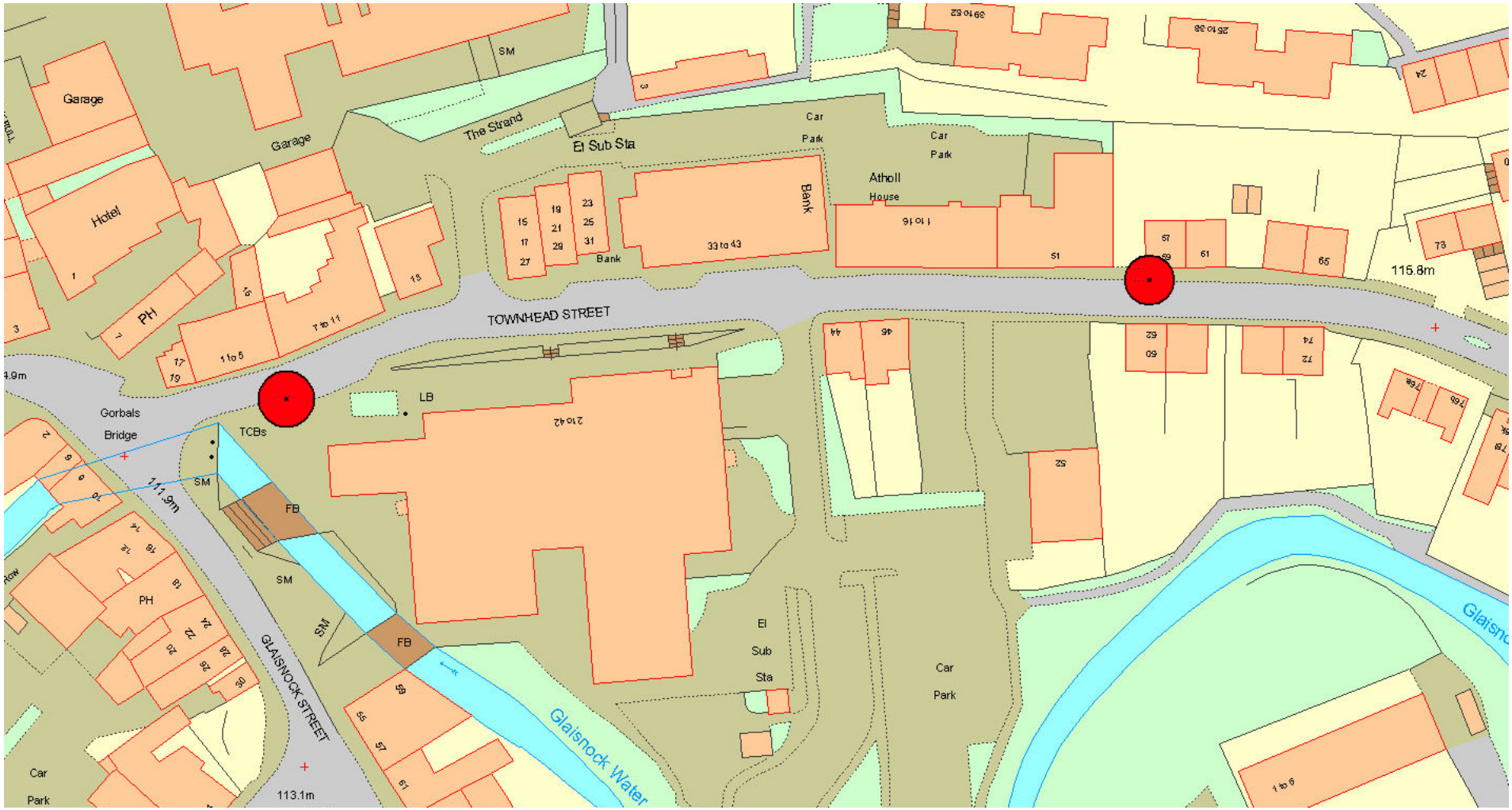

Figure 5h: Kilmarnock NO_2 Diffusion Tube Locations