Dumfries and Galloway Council

Local Air Quality Management

Environment Act 1995: Part IV

Air Quality Progress Report - 2008

Belfast-to-Stranraer Ferry on Loch Ryan

Contents

1. Introduction

1.1 In terms of Part IV of the Environment Act 1995[1] every local authority is required to regularly review and assess the air quality in its area to determine whether the Government's air quality objectives will be met. Such reviews and assessments are generally carried out every three years. In the intervening years, unless a more detailed assessment is being carried out, an air quality progress report is required.

1.2 The specific atmospheric pollutants for which objectives have been set for the protection of human health are:-

- nitrogen dioxide (NO_2),
- sulphur dioxide (SO_2),
- particulate matter (PM_{10} & $PM_{2.5}$)
- benzene (C_6H_6),
- 1,3 butadiene (C_4H_6),
- carbon monoxide (CO),
- lead (Pb),
- polycyclic aromatic hydrocarbons (PAHs), and,
- ozone (O_3).

1.3 The objectives are based on standards set on health grounds and essentially consist of target concentrations to be achieved by specific dates. The current objectives which apply for the purposes of local air quality management (LAQM) in Scotland (see appendix 2) are prescribed in the Air Quality (Scotland) Regulations 2000[2] as amended by the Air Quality (Scotland) (Amendment) Regulations 2002. (Objectives for O_3, PAHs and $PM_{2.5}$, have been set in the Government's Air Quality Strategy[3] [updated July 2007] but have not been included in the regulations).

1.4 If the results of a review and assessment indicate that any of the prescribed objectives is/are not likely to be met by the requisite date the local authority is required to declare an air quality management area and to produce an action plan with a view to meeting the objective(s) concerned.

2. Background

2.1 The findings of the first review and assessment[4] of air quality in Dumfries and Galloway (commenced in 1998) were that the air quality objectives were likely to be met. As a consequence no air quality management areas were declared in Dumfries and Galloway. (which is still the position to date).

2.2 In 2003, as part of a second round of review and assessment Casella Stanger (consultants) were employed to carry out an initial updating and screening assessment[5] (USA) of air quality in Dumfries and Galloway. The consultants supported the conclusions of the first round but, in line with the Department for Environment, Food and Rural Affairs' (DEFRA's) revised technical guidance[6] (first revision February 2003) in relation to sulphur dioxide, concluded that a detailed assessment at the ferry terminals at Stranraer and Cairnryan would be required.

[1] see references at appendix 1 on page 11

2.3 In 2004 a detailed assessment[7] of the influence of shipping on SO_2 levels at Cairnryan was carried out, the conclusion of which was that an air quality management area was not required. Stena Line Ltd's proposed re-location to a site next to P&O's ferry terminal at Cairnryan has not taken place to date. So far as SO_2 levels from shipping at Stranraer are concerned there is no relevant exposure in the vicinity of the shipping emission sources; the technical guidance[6] revised in January 2006 provides that an authority should only need to proceed to a detailed assessment where there is relevant exposure within 250 metres of the emission sources and there are between 5,000 to 15,000 ship movements per year (or where there is relevant exposure within 1 kilometre and over 15,000 movements per year).

2.4 In 2005 the results of routine monitoring were detailed in a progress report[8]. The results reported were within the relevant objectives therefore there was no requirement to proceed to a detailed assessment for any of the relevant pollutants.

2.5 In 2006 the most recent updating and screening assessment[9] was carried out by Bureau Veritas consultants who concluded that the air quality objectives for benzene, 1,3-butadiene, CO, Pb, PM_{10}, NO_2 and SO_2 would be met and that consequently there was no requirement to undertake a detailed assessment for any of these pollutants.

2.6 In 2007 the results of routine monitoring were detailed in a progress report[10]. The conclusion of the report was that: "*The results of air quality monitoring in Dumfries and Galloway indicate that the current air quality objectives for the relevant pollutants are being met. Projected PM_{10} levels at the *AURN monitoring site at Buccleuch Street, Dumfries indicate that the more stringent annual mean PM_{10} objective of 18 µg/m^3 to be achieved by 31/12/10 will not be met, however there is no relevant exposure at this roadside site. With regard to three Dumfries road junctions referred to in the 2006 updating and screening assessment that were predicted to marginally exceed the 2010 PM_{10} objective it is intended that traffic flows at these sites will be checked to see if they are in line with predictions, if necessary, by commissioning manual counts. New industrial developments are not considered likely to result in any of the relevant air quality objectives being breached, however the new housing development at Marchfield on the outskirts of Dumfries has the potential to cause increased traffic levels in the town centre resulting in increased levels of PM_{10} and NO_2 levels. Monitoring will continue."*

**Automatic Urban and Rural Air Quality Monitoring Network.*

3. Monitoring Results

3.1 NO_2 (Automatic)

3.1.1 A continuous (chemiluminescent) NO_2 monitor (API M200a) is located at the Municipal Chambers, Buccleuch Street, Dumfries and forms part of the UK Automatic Urban and Rural Air Quality Monitoring Network (AURN). Results for the past 6 years are as shown in Table 1. All the results shown are based on ratified data. Ratification is carried out by the Quality Assurance and Control (QA/QC) Unit at AEA Energy & Environment.

Table 1 AURN NO_2 Results at Buccleuch Street Dumfries (Roadside Site)

Year	Annual Mean µg/m^3	Number of exceedences of 200 µg/m^3 hourly mean	Data capture
2002	38·0	0	95·1%
2003	37·6	2	97·9%
2004	37·3	0	96·6%
2005	35·9	1	96·8%
2006	37·5	0	94·3%
2007	38·3	5	98·6%
objective (by 31/12/05)	*≤ 40*	*≤ 18*	*≥ 90%*

(µg/m^3 = micrograms per cubic metre) (≤ = less than or equal to) (≥ = greater than or equal to)

3.1.1.1 Results in Table 1 meet the objectives.

3.1.2 Since December 2004 a continuous NO_2 monitor has been located at the Observatory[11] at Eskdalemuir as part of the AURN. The results for 2005-07 are shown in Table 2. All the results shown are based on ratified data. Ratification is carried out by the QA/QC unit at AEA Energy & Environment. (Ozone is also monitored at this site). (See appendix 6 for location map).

Table 2 AURN NO_2 Results at Eskdalemuir (Rural Site)

Period	Annual Mean µg/m^3	Number of exceedences of 200 µg/m^3 hourly mean	Data capture
2005	3·8	0	92·8%
2006	4·3	0	89·1%
2007	5·0	0	78·1%
objective (by 31/12/05)	*≤ 40*	*≤ 18 per year*	*≥ 90%*

(µg/m^3 = micrograms per cubic metre) (≤ = less than or equal to) (≥ = greater than or equal to)

3.1.2.1 The data capture for 2006 & 2007 is low but otherwise the results in Table 2 meet the objectives.

3.2 NO_2 (Diffusion tubes)

3.2.1 NO_2 diffusion tubes are deployed for monthly exposure periods at the twelve sites shown in Table 3. Further details of the sites and location maps and are shown in appendices 3 and 5 respectively. The tubes are prepared and analysed by Bureau Veritas Laboratories (formerly Casella CRE Air) using UKAS-accredited method AQ/02 (10% triethanolamine [TEA] in water - method proposed to be changed to 20% TEA in water from the commencement of 2009 following the publication in February 2008 of AEA Energy & Environment's - Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance[12]). Triplicate tubes are used at two sites at Buccleuch Street, Dumfries [Buccleuch Street (East), and Buccleuch Street Bridge], duplicate tubes at Buccleuch Street (West) whereas the rest of the sites have single tubes.

3.2.2 Measurement by diffusion tubes is less accurate than measurement by continuous (chemiluminescent) sampler. Diffusion tubes are however less expensive and more convenient to use. The performance of diffusion tubes supplied by different laboratories can vary significantly but when triplicate diffusion tubes are collocated with a continuous monitor a bias adjustment factor (a measure of how much the tube results deviate over a period from the chemiluminescent sampler results) can be calculated and applied to the results of all of the diffusion tubes used locally (from the same laboratory).

3.2.3 Results of collocation studies carried out by different local authorities using the same laboratory can be combined to give a national bias adjustment factor for the laboratory.

3.2.4 The diffusion tubes at Buccleuch Street (East) (Municipal Chambers) have been collocated with the AURN continuous NO_2 monitor since March 2003. The results of this local collocation study have been used to derive the bias adjustment factor shown in Table 3 (see appendix 4 for details of the bias adjustment calculation). Table 3 also shows averages obtained using a more sophisticated AEA Energy and Environment collocation bias adjustment spreadsheet which in addition to calculating the bias gives an estimate of the error in the tube results.

3.2.5 The national bias adjustment factor for Bureau Veritas Laboratories (10% TEA in water) is:- 0·90 for 2007 (*amalgamation of 11 studies including Dumfries & Galloway's*).

3.2.6 The locally-obtained bias adjustment factor for 2007 is 1·010. Use of the national bias adjustment factor would therefore give appreciably lower averages than those shown in Table 3.

Table 3 Diffusion Tube Results

Location of tube		Annual Average 2007 µg/m^3	Annual Average 2007 *(bias corrected x 1·010)*	Annual Average using AEA Energy and Environment Spread-sheet
M74 Slip Road	Lockerbie	33·7	34·0	35 ± 3
**Buccleuch St. (E)	Dumfries	37·7	38·1	39 ± 3
†Buccleuch St. (W)	Dumfries	35·1	35·5	35 ± 3
Loreburn St.	Dumfries	27·9	28·2	29 ± 2
St Michael St.	Dumfries	25·4	25·7	26 ± 2
Argyll Drive	Dumfries	13·6	13·7	14 ± 1
Charlotte St.	Stranraer	19·9	20·1	21 ± 2
Port Rodie Car Park	Stranraer	17·8	18·0	18 ± 2
A77 Cairnryan	Stranraer	23·2	23·4	24 ± 2
Buccleuch St. (S)	Dumfries	32·5	32·8	33 ± 3
††Buccleuch St Bridge	Dumfries	29·9	30·2	30 ± 3
Nith Place	Dumfries	This site commenced in August 2007 therefore average annual data are not available for this site. The 5-month average to December was 34·6 uncorrected.		

(µg/m^3 = *micrammes per cubic metre)*

** *Triplicate tubes collocated with automatic monitor*

† *Duplicate tubes*

†† *Triplicate tubes*

3.2.7 All the results in Table 3 are within the objective for the NO_2 annual mean. ($\leq$40 µg/m^3).

(The upper error limit at Buccleuch Street (E) is slightly above the objective according to AEA Energy and Environment's spreadsheet).

3.3 PM_{10}

3.3.1 A gravimetric PM_{10} Partisol Sequential Air Sampler situated on a flat roof adjacent to the Municipal Chambers, Buccleuch Street, Dumfries has formed part of the AURN for the past 6 years. (The monitoring site is close to a bus-stop.) The Department of Food and Rural Affairs (Defra) and the Devolved Administrations have recently reviewed their monitoring needs in the light of the updated Air Quality Strategy and as a consequence the Partisol has been switched off and is due for removal from the AURN. Results for the past 6 years are as shown in Table 4. All the results are based on ratified data. Ratification is carried out by the QA/QC unit at AEA Energy & Environment.

Table 4 AURN PM_{10} Results at Buccleuch Street, Dumfries

Year		Annual Mean µg/m^3	Number of exceedences of 24-hour mean of 50 µg/m^3	Data capture
2002		21·4	18	93·7%
2003		23·3	22	93·4%
2004		17·5	4	91·8%
2005		20·1	6	97·5%
2006		23·8	9	88·5%
2007		23·5	11	95·3%
2010 (projected)		22·4	7	N/A
objective	*by 31/12/04*	*≤ 40*	*≤ 35*	*≥ 90%*
	by 31/12/10	*≤ 18*	*≤ 7*	

(µg/m^3 = micrometres per cubic metre) (≤ = less than or equal to) (≥ = greater than or equal to)

3.3.2 The data capture for 2006 is slightly low but otherwise the results shown in Table 4 meet the objectives that were to be achieved by 31/12/04. The projected 2010 results, obtained by using the methods outlined in the technical guidance[6] together with the LAQM tools available from the UK Local Air Quality Archive[13], predict that the 2010 annual mean will not be met however it should be noted that there is no relevant exposure at this location. With regard to the three road junctions referred to in the 2006 updating and screening assessment that were predicted to marginally exceed the 2010 PM_{10} objective, namely the junctions of Brooms Road/Annan Road, Buccleuch Street/Glasgow Street and Buccleuch Street/Whitesands, all in Dumfries, manual traffic counts have been undertaken at these junctions and the data obtained therefrom will be used in the next updating and screening assessment to check/update the predicted levels. The construction of a new by-pass south of Dumfries may help to alleviate pressure on these junctions. The new by-pass was listed as a medium-term priority in the Regional Transport Strategy (RTS)[14] which was submitted to the Minister for Transport on 30/03/07. Work is currently being carried out on a re-submission of the RTS.

3.4 $PM_{2·5}$

3.4.1 A Partisol $PM_{2·5}$ monitor was installed beside the Partisol PM_{10} at Buccleuch Street Dumfries from 01/02/07 to 31/01/08 on behalf of the Scottish Government but no data have been made available as yet.

3.5 CO

3.5.1 A continuous CO monitor (API M300) was located at the Municipal Chambers, Buccleuch Street, Dumfries from 2001 to 2007 and formed part of the AURN. Results are shown in Table 6. All the results are based on ratified data. Ratification is carried out by the QA/QC unit at AEA Energy & Environment.

Table 6 AURN CO Results at Buccleuch Street, Dumfries

Year	Maximum 8-hour running mean (mg/m^3)	Average 8-hour running mean (mg/m^3)	Maximum hourly mean (mg/m^3)	Data capture
2002	3·875	0·616	5·8	93·0%
2003	2·863	0·614	5·2	97·4%
2004	2·150	0·551	4·3	98·5%
2005	2·700	0·550	4·6	97·2%
2006	2·275	0·639	4·9	84·6%
objective (by 31/12/03)	*≤ 10*	*N/A*	*N/A*	*≥ 90%*
##2007 (Jan-Sep only)	1·463	0·442	3·7	89·5% (over period)

mg/m^3 = *milligrammes per cubic metre*
≤ = *less than or equal to*
≥ = *greater than or equal to*

3.5.1.1 The data capture for 2006 is slightly low but otherwise the results for 2002 to 2006 shown in Table 6 meet the objectives.
##The Department of Food and Rural Affairs (Defra) and the Devolved Administrations have recently reviewed their monitoring needs in the light of the Air Quality Strategy and as a consequence the CO monitor was removed from the site in October 2007. The results for the nine-month period January to September 2007 have been included for completeness - data capture for the nine-month period was slightly low.

4. New Local Developments

- Construction of a pyrolysis plant (a type of incinerator) also referred to as an energy-from-waste (EFW) plant for which planning consent has been granted in respect of a site at Dargavel (Locharmoss) near Dumfries has not commenced as yet. Impact of emissions on the pollutant levels of most relevance SO_2, NO_2 and PM_{10} (among others) have been assessed and the objectives are not considered likely to be breached.

- A 40 megawatt wood-burning power station has commenced operation at Steven's Croft 2½ miles north of Lockerbie. The main fuel used is forestry-related materials in the form of small roundwood and sawmill co-products but the plant is designed to burn a percentage of short-rotation coppice and recycled timber. The plant is adjacent to an existing sawmill. The impacts of emissions on the pollutant levels of most relevance, NO_2, PM_{10} and SO_2 (among others) have been assessed and the objectives are not considered likely to be breached.

- Following a public local inquiry in December 2006 a Harbour Empowerment Order (HEO) was granted by the Scottish Ministers in May 2007 to facilitate Stena Line Ltd's proposed re-location from Stranraer to Cairnryan to share port facilities with P&O. The re-location has not however taken place to date, the plans to share port facilities having been abandoned in October 2007.

- A major housing development is underway at Marchfield, an area on the north-eastern edge of Dumfries between Edinburgh Road and Lockerbie Road and extending to the A75 by-pass. This site is the largest development site in Dumfries and Galloway with an allocation to build 920 new houses. The development represents a significant urban expansion and may add to road traffic levels in the town giving rise to increased levels of NO_2 and PM_{10}. Provision will be made for cycleways, footways and bus services to provide alternative means of access to the town centre. This is the initial phase of a potentially larger development extending to 1300 - 1500 houses.

5. Conclusion

The results of air quality monitoring in Dumfries and Galloway indicate that the current air quality objectives for the relevant pollutants are being met. Projected PM_{10} levels at the AURN monitoring site at Buccleuch Street, Dumfries indicate that the more stringent annual mean PM_{10} objective of 18 $\mu g/m^3$ to be achieved by 31/12/10 will not be met, however there is no relevant exposure at this roadside site. With regard to three Dumfries road junctions referred to in the 2006 updating and screening assessment that were predicted to marginally exceed the 2010 PM_{10} objective manual traffic counts have been undertaken at these sites and the data obtained therefrom will be used in the next updating and screening assessment to check/update the predicted levels. New industrial developments are not considered likely to result in any of the relevant air quality objectives being breached, however the new housing development at Marchfield on the outskirts of Dumfries has the potential to cause increased traffic levels in the town centre resulting in increased levels of PM_{10} and NO_2 levels. Additional monitoring sites/requirements will be assessed in due course.

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Appendix 1

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Appendix 2

Air Quality Objectives

Substance	Air Quality Objective	Prescribed date
Benzene	≤ 16·25 µg/m^3 *(when expressed as a running annual mean)*	31st December 2003
	≤ 3·25 µg/m^3 *(when expressed as a running annual mean)*	31st December 2010
1,3 butadiene	≤ 2·25 µg/m^3 *(when expressed as a running annual mean)*	31st December 2003
Carbon monoxide	≤ 10 mg/m^3 (when expressed as a running 8-hour mean)	31st December 2003
Lead	≤ 0·5 µg/m^3 *(when expressed as an annual mean)*	31st December 2004
	≤ 0·25 µg/m^3 *(when expressed as an annual mean)*	31st December 2008
Nitrogen dioxide	≤ 200 µg/m^3 *(when expressed as an hourly mean) (not to be exceeded more than 18 times a year)*	31st December 2005
	≤ 40 µg/m^3 *(when expressed as an annual mean)*	31st December 2005
Particles (PM_{10})	≤ 50 µg/m^3 *(when expressed as a 24-hour mean) (not to be exceeded more than 35 times a year)*	31st December 2004
	≤ 50 µg/m^3 *(when expressed as a 24-hour mean) not to be exceeded more than 7 times a year*	31st December 2010
	≤ 40 µg/m^3 *(when expressed as an annual mean)*	31st December 2004
	≤ 18 µg/m^3 *(when expressed as an annual mean)*	31st December 2010
Sulphur dioxide	≤ 350 µg/m^3 *(when expressed as an hourly mean) (not to be exceeded more than 24 times a year)*	31st December 2004
	≤ 125 µg/m^3 *(when expressed as a 24-hour mean) (not to be exceeded more than 3 times a year)*	31st December 2004
	≤ 266 µg/m^3 *(when expressed as a 15-minute mean) (not to be exceeded more than 35 times a year)*	31st December 2005

µg/m^3 micrograms per cubic metre

≤ - less than or equal to

Appendix 3

Further Details of NO_2 Diffusion Tube Locations

Location of tube(s)		Grid Reference	Site Type	Distance from edge of kerb (m)	Width of pavement (m)	Height of tube (m)
M74 Slip Rd	Lockerbie	NY133814	Intermediate	1·930	on grass	2·600
Buccleuch St. (E)	Dumfries	NX970762	Roadside	4·290	4·000	2·171
Buccleuch St. (W)	Dumfries	NX969762	Kerbside	1·000	2·640	2·700
Buccleuch St. (S)	Dumfries	NX970762	Kerbside	0·600	3.000	2·700
Buccleuch St. Bridge	Dumfries	NX968762	Roadside	5.000	4·200	3·000
Loreburn St.	Dumfries	NX974762	Kerbside	1·000	2·800	2·800
St. Michael St.	Dumfries	NX975756	Roadside	3·120	2·290	2·970
Argyll Drive	Dumfries	NX994788	Background	1·730	1·730	2·780
Nith Place	Dumfries	NX973758	Kerbside	0·680	3·850	2·850
Charlotte St.	Stranraer	NX061608	Kerbside	0·500	2·570	2·620
Port Rodie Car Park	Stranraer	NX063610	Other	N/A	N/A	2·600
A77 Cairnryan	Stranraer	NX073674	Roadside	1·950	1·900	2·900

M74 Slip Rd., Lockerbie
Nearest houses are approximately 32m from the tube location. Tube location is approximately 100m from the M74.

Buccleuch St., East (E) & West (W), Dumfries
Both sets of tubes are on same side of street about 100m apart. Triplicate tubes at Buccleuch St (E) have been collocated with an automatic monitor since March 2003. Nearest houses are on Buccleuch Street approximately 100m to the west of tube location Buccleuch St.(W) (duplicate tubes). Buccleuch Street is a shopping street close to the pedestrianised town centre.

Buccleuch Street, Dumfries (South)
New site commenced 4th November 2005. To investigate any possible canyon effect in Buccleuch Street this diffusion tube site is located on the opposite side of the street from the other three Buccleuch Street sites namely Buccleuch Street (East), Buccleuch Street (West) and Buccleuch Street Bridge.

Buccleuch Street Bridge, Dumfries
Monitoring at this site, close to the junction of Whitesands and Buccleuch Street, Dumfries, was suggested by the Bureau Veritas consultant who carried out the updating and screening assessment in 2006 on behalf of the Council. Monitoring commenced on 4th November 2005 directly outside a former house in multiple occupation (HMO) (see the first map in appendix 5) which had been for sale since before October 2005. Permission had been sought to put the diffusion tube (changed to triplicates at the start of March 2006) on a downpipe on the facade of the former HMO but permission was refused. Consequently the tubes were sited on a lamppost directly in front of the former HMO. However, the tubes were vandalised in March 2006, then again successively in June, July and August 2006, and because of this an alternative location was chosen on a downpipe of an adjacent building within 15 metres of the original and still close to the junction. The triplicate tubes were re-sited from 30/08/06. The former HMO has been renovated and is currently being advertised for let as furnished accommodation.

Appendix 3 (continued)

Further Details of NO_2 Diffusion Tube Locations

Loreburn St., Dumfries
One-way street close to town centre. The nearest houses are situated on the first and second floors above a public house at Loreburn St. The facade of this building is 2·8m from the edge of the kerb.

Argyll Drive, Heathhall, Dumfries
Formerly used for sulphur dioxide diffusion tube location. In a residential area in the vicinity of rubber factories at Heathhall. Urban background for NO_2 monitoring purposes.

St. Michael St., Dumfries
At busy intersection, nearest houses are on opposite side of St Michaels Bridge Road.

Nith Place, Dumfries
New site commenced August 2007. One-way street at a busy junction. Flats on first floor with facade of building 3·85 metres from edge of kerb.

Charlotte St., Stranraer
Busy shopping street - one-way traffic. Nearest houses are on opposite side of street on first floor above shops. Sunbathers in summer lie on grassy area just off pavement at the tube location.

Port Rodie Car Park
Car park for Stena Line ferry to Belfast.

A77 Cairnryan
On A77 at entrance to P&O ferry terminal (to Larne).

Appendix 4

Collocation Study at Buccleuch Street Dumfries

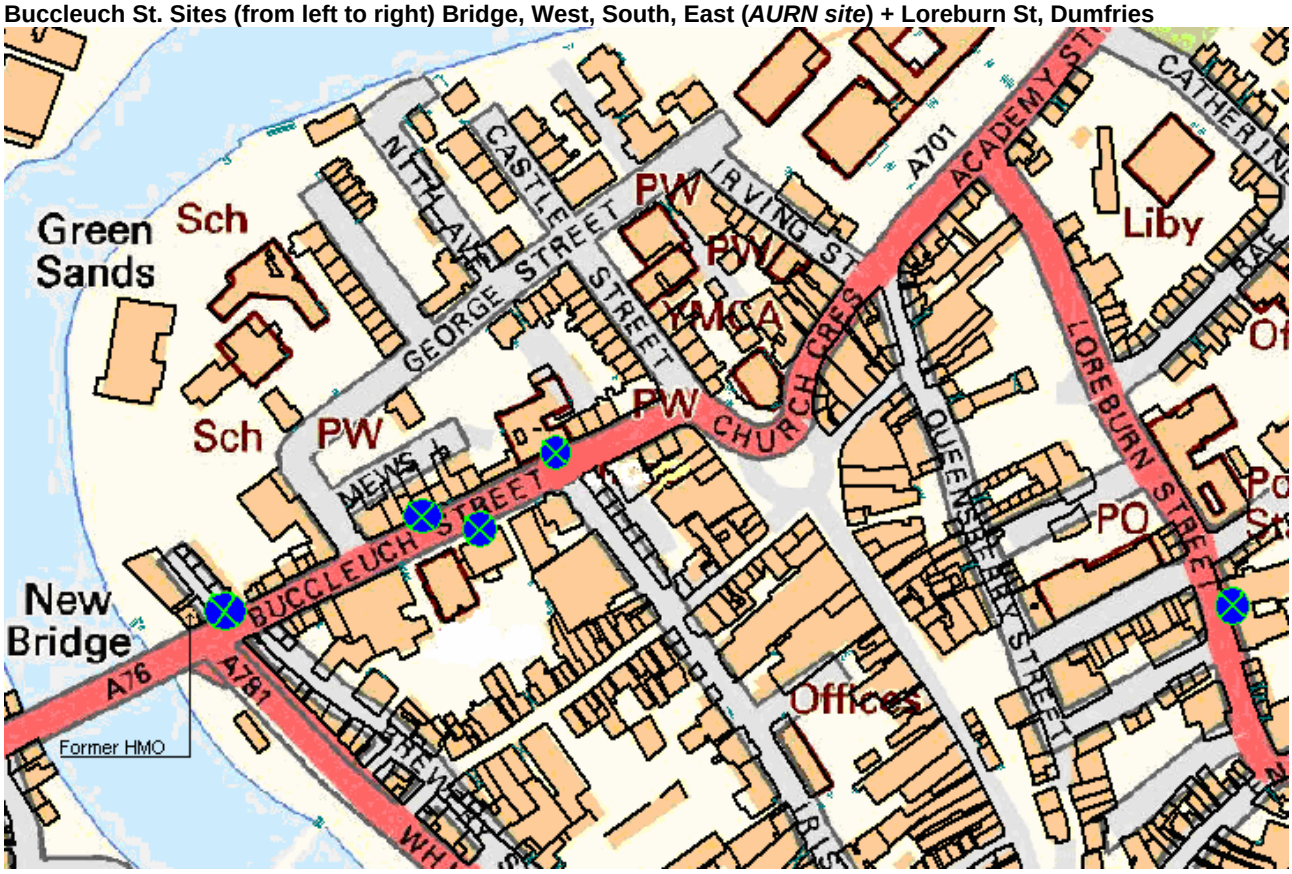
Date	Average (continuous) (µg/m^3)	‡R/P	Data capture %	Average Diffusion Tube (µg/m^3)	Ratio:- continuous/ diffusion tube result
2007					
January	34·32	R	99·40	35·0	0·981
February	42·51	R	95·60	46·7	0·910
March	42·09	R	96·67	42·3	0·995
April	35·74	R	99·85	32·7	1·093
May	33·11	R	99·85	33·5	0·988
June	35·64	R	99·76	40·5	0·880
July	30·08	R	95·54	31·3	0·961
August	33·89	R	98·66	36·0	0·941
September	38·26	R	99·64	40·0	0·957
October	41·65	R	99·85	30·5	1·366
November	43·71	R	99·57	43·3	1·009
December	45·86	R	99·77	40·7	1·127
12-month average	38·07		98·68	37·71	#1·010

#Bias adjustment factor = continuous mean/diffusion tube mean = 38·07/37·71 = 1·010.
Diffusion tube bias = (diffusion tube mean minus continuous mean)/continuous mean = (37·71 - 38·07)/38·07 = −0·009 i.e. tubes under-read by approximately 1%.
‡**R**atified or **P**rovisional data.

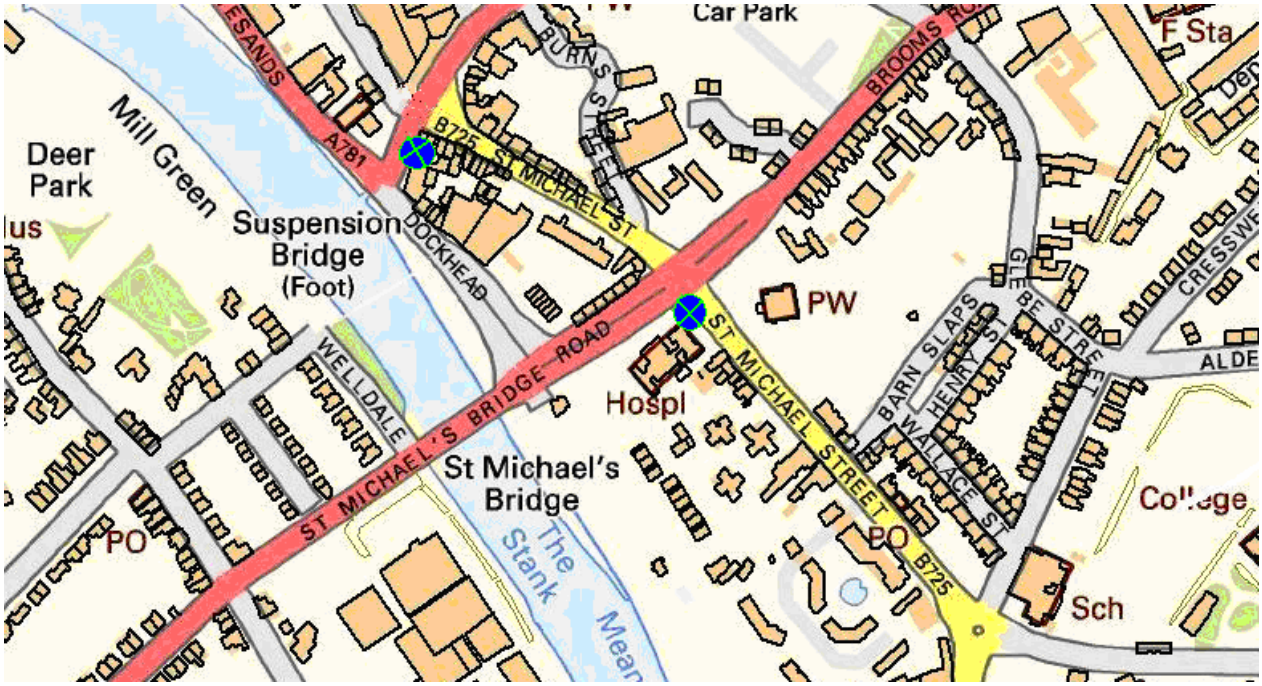
Diffusion Tube Location Maps

Appendix 5

Buccleuch St. Sites (from left to right) Bridge, West, South, East (*AURN site*) + Loreburn St, Dumfries



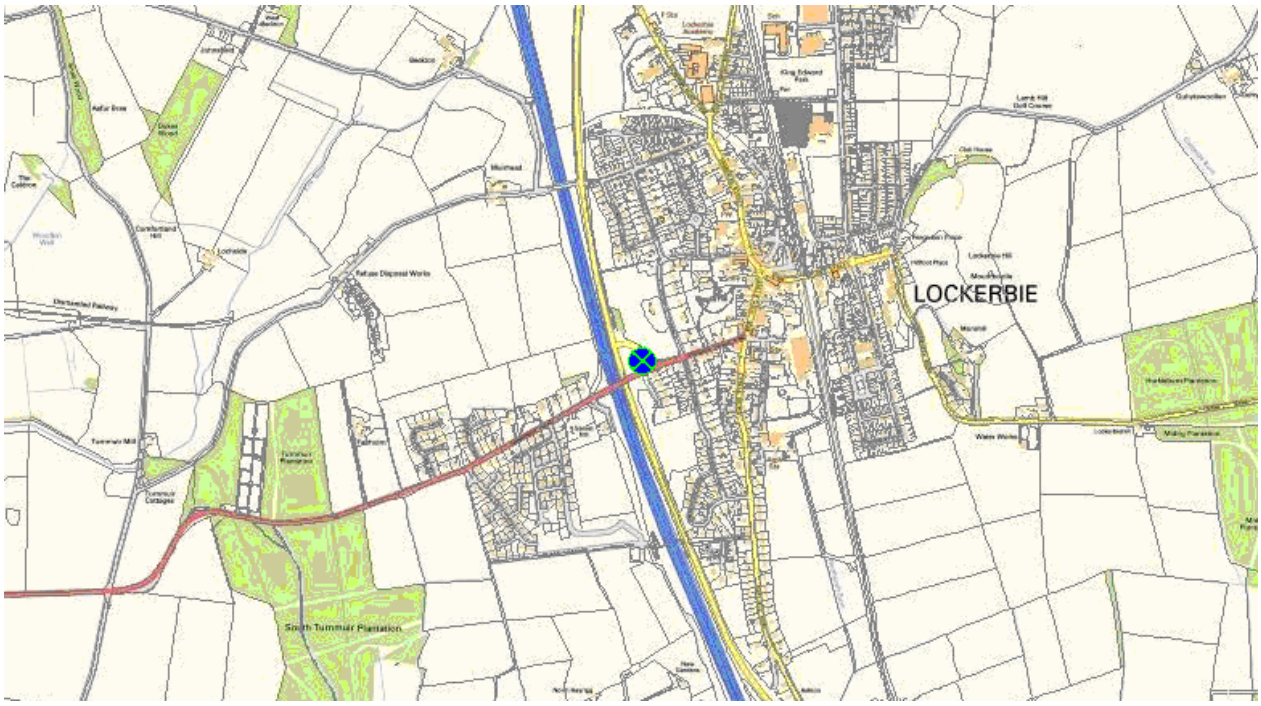
Nith Place and St Michael St Dumfries



Diffusion Tube Location Maps (Continued) Appendix 5

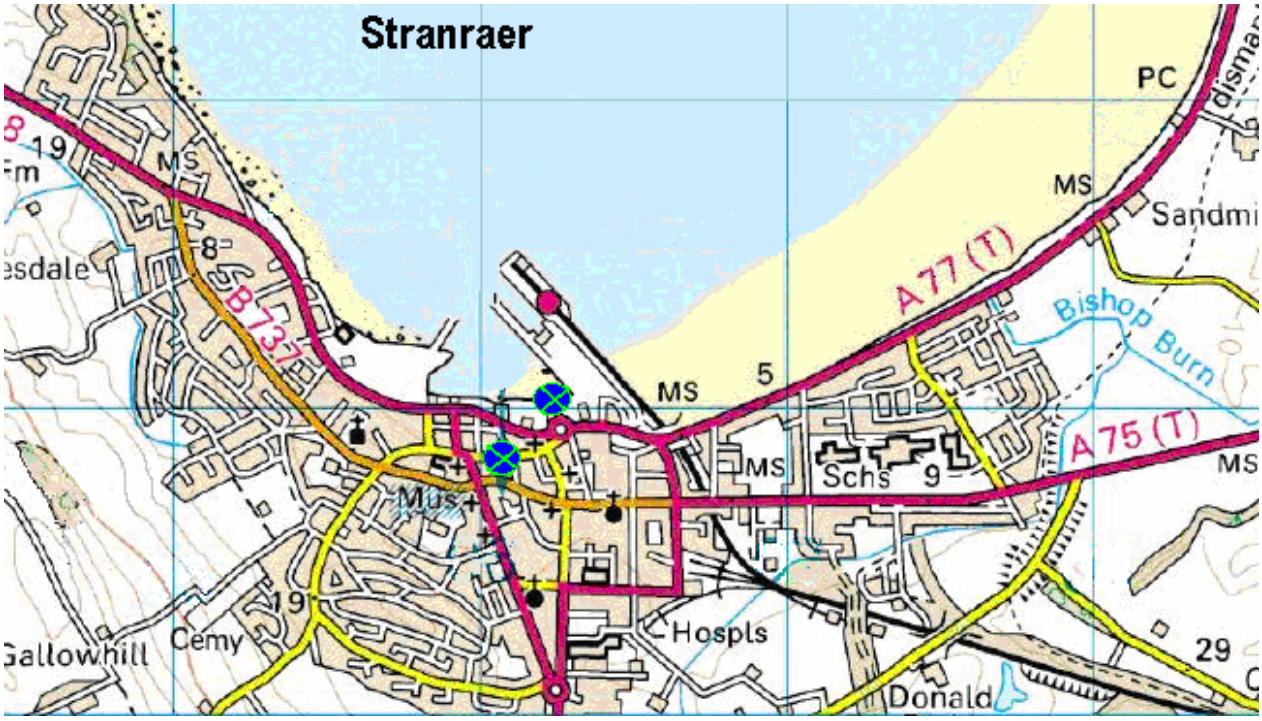
Argyll Drive, Heathhall, Dumfries

M74 Lockerbie



Diffusion Tube Location Maps (Continued) Appendix 5

Port Rodie Car Park & Charlotte St Stranraer



A77 Cairnryan

Appendix 6

NO_2 Automatic Monitor Location at Eskdalemuir