

Annual Progress Report (APR)



2019 Air Quality Annual Progress Report (APR) for Dumfries and Galloway Council

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

July 2019

Local Authority Officer	Jim Coltart / William Jackson
Department	Environmental Health Communities Directorate
Address	Dumfries and Galloway Council Municipal Chambers Buccleuch Street Dumfries DG1 2AD
Telephone	030 3333 3000
E-mail	environmentalstandards@dumgal.gov.uk jim.coltart@dumgal.gov.uk william.jackson@dumgal.gov.uk
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Executive Summary: Air Quality in our Area

Air Quality in Dumfries and Galloway

This report comprises Dumfries and Galloway Council's Annual Progress Report on air quality within the Council's area. Within this report results of NO₂ monitoring within the Council's area are also presented and evaluated in relation to national objectives.

Under the Local Government in Scotland Act 2003 Dumfries and Galloway Council is responsible for the provision of a range of services, including: mandatory powers (e.g. providing school education for 5-16 year-olds, Roads Services and Social Work Services); permissive powers (e.g. economic development and recreation services); and regulatory powers (e.g. Planning, Environmental Health, Licensing).

Dumfries and Galloway is a mostly rural region, with two hundred miles of coastline; area 6,426 square kilometres; population 149,670 (2015, by 2037 the population of Dumfries & Galloway is projected to decline to 141,619). The main towns are Dumfries and Lochaberbriggs (38,900 residents), Stranraer (10,600), Annan (9,000), Lockerbie (4,300) Dalbeattie (4,200) and Castle Douglas (4,200). All other settlements have populations of less than 4,000. The entire region lies in the Solway Tweed river basin district.

Dumfries and Galloway's key economic sectors are: Volume Sectors - Agriculture; Creative Industries (cultural business); Food and drink; Health and social care; Tourism/leisure/hospitality. Value Sectors - Creative Industries (digital business); Energy—particularly renewables and their supply chain; forest and timber technologies.

The air quality in Dumfries & Galloway is generally very good and currently there are no designated Air Quality Management Areas (AQMAs). This is mainly due to the fact that there is a limited amount of heavy industry with the majority of pollution assessed to arise from road vehicles as in terms of accessibility 30% of the population are 'remote' i.e. living further than a 30-minute drive from a large town.

Recent monitoring for NO₂ has not identified any new requirement to proceed to a detailed assessment with concentrations all below the objectives and NO₂ levels in Dumfries and Galloway have essentially been static over the past number of years.

Previous air quality assessments in Dumfries and Galloway have concluded that concentrations of carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide and nitrogen dioxide are all unlikely to exceed the relevant objectives and, in accordance with technical guidance, these pollutants are not currently monitored.

Details of monitoring undertaken by the Council can be found in Chapter 3 of this report.

Previous monitoring for PM₁₀ at a worst-case junction in Dumfries showed that no Air Quality Management Areas were required to be designated for PM₁₀ in Dumfries.

Actions to improve air quality

Due to a perceived increase in traffic levels following the relocation of the Stena Line port from Stranraer to Old House Point, Cairnryan and, due to the fact that the majority of air quality pollutants arising in Dumfries and Galloway are created as a result of road traffic, PM₁₀ monitoring has been carried out at Cairnryan.

In 2015/16 an Osiris PM₁₀ monitor was deployed for a period of 10 months as a screening method and the annualised results did not meet the PM₁₀ objective indicating that it would be necessary to proceed to a detailed assessment for PM₁₀.

In 2018 Dumfries and Galloway Council's Environmental Health Service installed an approved (reference-method-equivalent) Fidas 200 EN-certified fine-dust-monitoring and ambient-air-measuring system PM₁₀ / PM_{2.5} monitor in order to carry out a detailed assessment of PM₁₀ levels at Cairnryan.

Annualised PM₁₀ and PM_{2.5} levels recorded at Cairnryan using the Fidas 200 monitor demonstrated that measured levels did not exceed the annual mean objectives for PM₁₀ and PM_{2.5} and no exceedances of the PM₁₀ 24-hour objective were identified therefore Environmental Health are satisfied that there is no requirement to designate the whole or part of the village of Cairnryan as an Air Quality Management Area.

Local Priorities and Challenges

Apart from the detailed assessment of PM₁₀ levels in Cairnryan no significant air quality issues have been identified in the Dumfries and Galloway Council area. A detailed assessment was carried out in 2004 at Cairnryan to assess SO₂ levels from shipping, and in 2008/9 for PM₁₀ levels in Dumfries but no air quality management areas were required and there are currently no AQMAs in Dumfries and Galloway.

How to get involved

Several previously published air quality reports including results of monitoring in our area are available at:

<http://www.scottishairquality.co.uk/news/reports?view=laqm>

Dumfries and Galloway Council's priorities, since October 2014, have been: Build the local economy; Provide the best start in life for all our children; Protect our most vulnerable people; Be an inclusive council; Provide an attractive location to do business; Support children to be healthy and active and; Keep our communities safe.

By safeguarding that air quality within Dumfries and Galloway remains within national objective levels and ensuring that via the planning process and its regulatory functions any air pollution potential which may give rise to a risk of an exceedance of an air quality objective is considered at consultation phase, the Environmental Health Service works toward meeting a number of Dumfries and Galloway Council's priorities by providing a safe, attractive place to live and do business.

Members of the public can also choose to support or object to planning applications that may have an impact on air quality. All applications are published on-line and are accessible on-line via <https://eaccess.dumgal.gov.uk/online-applications/>. Grounds for commenting can relate to planning issues such as: local and national planning policy and guidance; traffic, access or parking; impact of the proposal on the built or natural environment, design/materials/scale of the proposal and its relationship to its surroundings; residential amenity, overshadowing, overlooking, etc.; effect on the setting of a Listed Building or the character and appearance of a Conservation Area.

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1. Local Air Quality Management

This report provides an overview of air quality in Dumfries and Galloway during 2018. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act 1995⁽ⁱ⁾ and the relevant Policy and Technical Guidance^(iv) documents.

The LAQM process⁽ⁱⁱⁱ⁾ 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 an exceedance is considered likely the local authority must 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. This Annual Progress Report summarises the work being undertaken by Dumfries and Galloway Council to improve air quality and any progress that has been made.

Table 1.1 – Summary of Air Quality Objectives in Scotland⁽ⁱⁱ⁾

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Nitrogen dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean	31/12/2005
	40 µg/m ³	Annual mean	31/12/2005
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 7 times a year	24-hour mean	31/12/2010
	18 µg/m ³	Annual mean	31/12/2010
Particulate Matter (PM _{2.5})	10 µg/m ³	Annual mean	31/12/2020
Sulphur dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31/12/2004
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31/12/2004
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean	31/12/2005
Benzene	3.25 µg/m ³	Running annual mean	31/12/2010
1,3 Butadiene	2.25 µg/m ³	Running annual mean	31/12/2003
Carbon Monoxide	10.0 mg/m ³	Running 8-Hour mean	31/12/2003
Lead	0.25 µg/m ³	Annual Mean	31/12/2008

⁽ⁱ⁾ See references on page 46

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12 months, setting out measures it intends to put in place in pursuit of the objectives.

Dumfries and Galloway Council currently does not have any AQMAs.

2.2 Progress and impact of measures to address air quality in Dumfries and Galloway

Dumfries and Galloway Council has taken forward a number of measures during the reporting year of 2018 in pursuit of improving local air quality. Details of planned measures are set out in the Public Sector Climate Change Duties 2015-2016 Report which is available online at:

<http://egenda.dumgal.gov.uk/aksdumgal/images/att42349.pdf>

This Dumfries and Galloway Council document in addition to carbon reporting covers: alternatives to private vehicle use; corporate freight and delivery management; policy guidance and development control; promotion of low emission plants and promoting low emission transport; promoting travel alternatives; transport planning and infrastructure and includes initiatives such as vehicle fleet efficiency and driver training.

Many of the measures outlined in the South West of Scotland Transport Partnership (SWESTRANS) Climate Change Strategy together with previous SWESTRANS initiatives have had and will have direct implications for the improvement of air quality in our Council area. The Climate Change Strategy is available at

<http://www.swestrans.org.uk/CHttpHandler.ashx?id=12123&p=0>

In the 2017-18 Programme for Government, the Scottish Government committed to commence work for the second Strategic Transport Projects Review (STPR) in the Dumfries and Galloway area. Responding to this commitment, in 2018 AECOM and Peter Brett Associates (PBA) were commissioned to carry out the first stage in the Scottish Transport Appraisal Guidance (STAG) process, researching the case for investment in transport interventions in the South West of Scotland through an Initial Appraisal: Case for Change study.

The key aim of the work is to consider the rationale for improvements to road, rail, public transport and active travel on key strategic corridors in the South West of Scotland, including those served by the A75, A76, A77, A701 and A709 as well as the railway corridors to Stranraer and Carlisle via Kilmarnock / Dumfries with a particular focus on access to the ports at Cairnryan. The report can be available at: <https://www.transport.gov.scot/media/45046/initial-appraisal-case-for-change-south-west-scotland-transport-study.pdf>

2.3 Cleaner Air for Scotland

Cleaner Air for Scotland – The Road to a Healthier Future (CAFS) is a national cross-government strategy that sets out how the Scottish Government and its partner organisations propose to reduce air pollution further to protect human health and fulfil Scotland's legal responsibilities as soon as possible. A series of actions across a range of policy areas are outlined, a summary of which is available at <http://www.gov.scot/Publications/2015/11/5671/17>. Progress by Dumfries and Galloway Council against relevant actions within this strategy is demonstrated below.

2.3.1 Transport – Avoiding travel – T1

All local authorities should ensure that they have a corporate travel plan (perhaps within a carbon management plan) which is consistent with any local air quality action plan. Details of all measures planned in Dumfries and Galloway are set out in the Public Sector Climate Change Duties 2015-2016 Report which is available online at: <http://egenda.dumgal.gov.uk/aksdumgal/images/att42349.pdf>

2.3.2 Climate Change – Effective co-ordination of climate change and air quality policies to deliver co-benefits – CC2

Scottish Government expects any Scottish local authority which has or is currently developing a Sustainable Energy Action Plan to ensure that air quality considerations are covered. Details of Dumfries and Galloway Council's Public Sector Climate Change Duties 2015-2016 are available online at:

<http://egenda.dumgal.gov.uk/aksdumgal/images/att42349.pdf>

3. Air Quality Monitoring Data and Comparison with Air Quality Objectives

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how local concentrations of the main air pollutants compare with the objectives.

Dumfries and Galloway Council undertook automatic (continuous) monitoring at one site during 2018. Results of automatic monitoring undertaken at Eskdalemuir by the British Geological Society / Met Office have also been included in this report. Table A.1 in Appendix A shows the details of the sites. National monitoring results for both sites are available at <http://www.scottishairquality.co.uk/>

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data have been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Dumfries and Galloway Council undertook non-automatic (passive) monitoring of NO₂ at 12 sites during 2018. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

3.2 Individual pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for annualisation and bias. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

In 2018 there were no exceedances of air quality objectives for NO₂ recorded in Dumfries and Galloway.

Table A.3 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past ten years with the air quality objective of 40µg/m³.

For diffusion tubes, the full 2018 dataset of monthly mean values is provided in Appendix B.

Figures A.1 to A.5 show trends in NO₂ levels over the past ten years or more. No exceedances of the objectives for NO₂ have been recorded and the trend for the last eight years has been fairly static and significantly below the relatively high level recorded at Buccleuch Street Dumfries in 2010.

Table A.4 in Appendix A compares the ratified continuously monitored NO₂ hourly mean concentrations for the past ten years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year. No hourly means greater than 200µg/m³ have been recorded in 2018 and historically have only been recorded a few times over the years at Dumfries and never at Eskdalemuir.

3.2.2 Particulate Matter (PM₁₀)

Previous monitoring for PM₁₀ at a worst-case junction in Dumfries showed that no air quality management areas were required to be designated for PM₁₀ in Dumfries. No PM₁₀ monitoring is currently carried out at Dumfries.

PM₁₀ monitoring was carried out at Cairnryan as a result of a perceived increase in traffic levels following the relocation of the Stena Line port from Stranraer to Old House Point, Cairnryan. As previously reported an Osiris PM₁₀ monitor was deployed for a period of 10 months from 10th October 2015 to 11th August 2016 for screening purposes only as this type of monitor is not reference-method-equivalent. The monitor was situated on the northernmost façade of the recently re-built Village Hall in Cairnryan adjacent to an outdoor children's play area with swings and other play equipment. As such the location was representative of relevant public exposure in respect of both the annual and the 24-hour means. As readings from the Osiris PM₁₀ monitor were taken over two APR reporting periods the PM₁₀ mean for the monitoring period was annualised for 2015 and 2016 and both results were found to be in excess of the objective. In addition there were significantly more than seven exceedances of the 24-hour mean recorded over the monitoring period.

As a result of the higher than expected levels of particulate matter at Cairnryan, Dumfries and Galloway Council's Environmental Health Service installed an approved (reference-method-equivalent) Fidas 200 EN-certified fine-dust-monitoring and ambient-air-measuring system PM₁₀ (+ PM_{2.5}) monitor in order to carry out a detailed assessment of PM₁₀ levels at Cairnryan.

The Fidas 200 monitoring equipment was installed at Cairnryan Village Hall and became operational from the 22nd March 2018 to 08th October 2018.

Tables A.5 and A.6 in Appendix A compare the ratified and annualised monitored PM₁₀ annual mean concentration and the PM₁₀ daily mean concentrations with the air quality objective of 18µg/m³ (or less) for the annual mean and 50µg/m³ (or less) (not to be exceeded more than seven times per year) for the 24-hour mean

Table C2 in Appendix C shows details of the annualisation of the period mean to the annual mean. Figure A.6 shows a graph of the recorded PM₁₀ 24-hour means over the monitoring period.

3.2.3 Particulate Matter (PM_{2.5})

As previously reported an Osiris PM₁₀ monitor was deployed for a period of 10 months from 10th October 2015 to 11th August 2016 for screening purposes only as this type of monitor is not reference-method-equivalent. The monitor was situated on the northernmost façade of the recently re-built Village Hall in Cairnryan adjacent to an outdoor children's play area with swings and other play equipment. As such the location was representative of relevant public exposure in respect of both the annual and the 24-hour mean.

The annualised mean for 2015 was 10.2µg/m³ which was in excess of the annual mean objective of 10µg/m³ but using 2016 valid data capture and the same data-set after ratification the annualised mean reduced to 8.45µg/m³.

As a result of the higher than expected levels of particulate matter at Cairnryan, Dumfries and Galloway Council's Environmental Health Service installed an approved (reference-method-equivalent) Fidas 200 EN-certified fine-dust-monitoring and ambient-air-measuring system PM₁₀ / PM_{2.5} monitor in order to carry out a detailed assessment of PM_{2.5} levels at Cairnryan.

The Fidas 200 monitoring equipment was installed and become operational from the 22nd March 2018 to 08th October 2018

Table A.7 in Appendix A compares the ratified and annualised monitored PM_{2.5} annual mean concentration with the air quality objective 10µg/m³ (or less) (to be achieved by 31/12/20).

Table C.3 in Appendix C shows details of the annualisation of the period mean to the annual mean.

Figure A.6 shows a graph of the recorded 24-hour means over the monitoring period.

3.2.4 Sulphur Dioxide (SO₂)

A detailed assessment of the influence of shipping on SO₂ levels in Cairnryan was carried out in 2004 when it was found that the SO₂ levels met the objectives and an AQMA was not required.

Currently Dumfries and Galloway Council does not carry out any LAQM monitoring for SO₂ within Council-area.

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

Monitoring for carbon monoxide and 1,3 butadiene have been carried out previously in Dumfries, where the levels were found to meet the relevant objectives.

Currently Dumfries and Galloway Council does not carry out any LAQM monitoring for carbon monoxide, lead or 1,3 butadiene within the Council-area.

4. New Local Developments

Despite a number of large developments proposed within Dumfries and Galloway no new relevant local developments have been identified since completion of last year's report.

4.1 Road traffic sources

No road traffic sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2018 LAQM APR reporting year that may significantly change traffic flows.

4.2 Other transport sources

No other transport sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2018 LAQM APR reporting year.

4.3 Industrial sources

No industrial sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2018 LAQM APR reporting year.

4.4 Commercial and domestic sources

No relevant industrial sources with respect to air quality in Dumfries and Galloway have been identified in the 2018 LAQM APR reporting year.

A number of planning consultations received in relation to installation of proposed biomass combustion systems have been assessed but these proposals are predominately in rural areas with diminutive cumulative impact.

4.5 New developments with fugitive or uncontrolled sources

No developments with fugitive or uncontrolled sources relevant with respect to air quality in Dumfries and Galloway have been newly identified.

5. Planning Applications

Planning applications for biomass boilers that have been given consent and have become operational have been assessed but no requirement to proceed to a detailed assessment has been found to be necessary in respect of any such installations.

6. Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

There were no exceedances of the NO₂ air quality objectives identified within Dumfries and Galloway Council. In general NO₂ concentrations have been fairly stable for the past eight years and are significantly lower than the relatively high levels recorded in 2010.

Annualised PM₁₀ levels recorded at Cairnryan using a Fidas 200 PM₁₀ / PM_{2.5} monitor demonstrated that measured levels did not exceed the annual means for PM₁₀ and PM_{2.5} and no exceedances of the PM₁₀ 24-hour objective were identified therefore Environmental Health are satisfied that there is no requirement to designate the whole or part of the village of Cairnryan as an Air Quality Management Area.

6.2 Conclusions relating to New Local Developments

No new relevant local developments have been identified since completion of last year's report.

6.3 Proposed Actions

At the time of writing this report Dumfries and Galloway Council have opened a dialogue with SEPA to discuss the possibility of relocating some of the non-automatic NO₂ monitoring locations which have historically low NO₂ levels.

The relocation of the non-automatic NO₂ monitoring locations is part of a larger review of monitoring locations in order to ensure the continuation of best value for monies allocated to environmental monitoring.

Details of any newly proposed locations for non-automatic NO₂ monitoring locations will be included in the 2020 APR.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ?	Monitoring Technique	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Inlet Height (m)
Buccleuch Street Dumfries	Roadside	297025	576259	NO ₂	No	Chemiluminescent	<1	4.3	2.2
Eskdalemuir	Rural	323551	603022	NO ₂	No	Chemiluminescent	N/A	225	4.0
Village Hall Cairnryan	Other	207185	567585	PM ₁₀ / PM _{2.5}	No	Optical light scattering	20	29	2.0

(1) 0 if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to relevant exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m)	Tube collocated with a continuous analyser?
M74 Slip Road. Lockerbie	Other	313345	581416	NO ₂	No	32	1.9	No
Buccleuch St. (E) Dumfries	Roadside	297025	576259	NO ₂	No	<1	4.3	Yes
Buccleuch St. (W) Dumfries	Kerbside	296949	576218	NO ₂	No	<1	1.0	No
Buccleuch St. (S) Dumfries	Kerbside	296978	576219	NO ₂	No	<1	0.6	No
Buccleuch St. Bridge Dumfries	Roadside	296868	576182	NO ₂	No	<1	5.0	No
St. Michael St. Dumfries	Roadside	297457	575692	NO ₂	No	<1	3.1	No
Argyll Drive Dumfries	Background	299378	578847	NO ₂	No	1	1.7	No

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to relevant exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m)	Tube collocated with a continuous analyser?
Charlotte St. Stranraer	Roadside	206085	560859	NO ₂	No	<1	4.0	No
A77 Cairnryan	Roadside	207216	567422	NO ₂	No	19	2.0	No
Nithbank Dumfries ⁽²⁾	Roadside	297712	575254	NO ₂	No	0	1.7	No
Castle Break Ecclefechan ⁽²⁾⁽³⁾	Roadside	319272	575020	NO ₂	No	1	1.5	No
Gretna Loaning Gretna ⁽²⁾	Roadside	332110	568264	NO ₂	No	1	1.4	No

(1) 0 if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) New sites from 01/01/14.

(3) The grid reference is slightly altered from previous years because the lamppost to which the diffusion tube was secured was removed and replaced on the other side of the road.

Table A.3 – Annual Mean NO₂ Monitoring Results

Site Name	Site Type	Monitoring Type	Valid Data Capture 2018 (%) ⁽¹⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽²⁾									
				2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Buccleuch Street Dumfries	Roadside	Automatic	99.4	35.0	39.9	31.5	33.1	30.2	30.5	30.1	30.9	30.2	29.5
Eskdalemuir	Rural	Automatic	97.4	4.3	3.0	3.2	3.0	2.5	2.3	2.2	2.0	2.0	1.9
M74 Slip Road. Lockerbie	Other	Diffusion Tube	91.7	28.2	37.0	30.6	31.6	28.1	27.4	27.8	27.8	27.2	23.1 ⁽⁶⁾
Buccleuch St. (E) Dumfries	Roadside	Diffusion Tube (Triplicate)	100	34.2	39.8	31.5	33.2	30.3	30.4	30.2	30.7	30.4	29.9
Buccleuch St. (W) Dumfries	Kerbside	Diffusion Tubes (Duplicate)	100	31.3	35.2	30.0	31.4	27.8	28.6	29.1	28.5	28.7	27.0
Buccleuch St. (S) Dumfries	Kerbside	Diffusion Tube	100	32.5	36.1	34.1	31.9	30.3	30.9	28.4	29.3	30.9	30.2
Buccleuch St. Bridge Dumfries	Roadside	Diffusion Tubes (Triplicate)	100	32.3	34.0	28.2	28.8	26.6	26.8	25.1	25.0	25.1	25.3
St. Michael St. Dumfries	Roadside	Diffusion Tube	100	24.9	28.5	23.8	26.7	22.4	20.8	20.9	23.7	21.2	20.3
Argyll Drive Dumfries	Urban Background	Diffusion Tube	100	11.0	12.1	10.7	12.1	8.7	9.2	9.4	9.0	9.5	8.4
Charlotte St. Stranraer	Roadside	Diffusion Tube	91.7	18.7	21.8	17.7	18.1	17.9	17.6	17.0	16.3	15.5	19.5
A77 Cairnryan	Roadside	Diffusion Tube	100	19.2	21.6	19.6	21.5	20.9	21.5	19.3	19.8	17.9	17.4 ⁽⁵⁾
Nithbank Dumfries ⁽³⁾	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	24.5	23.0	27.4	22.8	19.8
Castle Break Ecclefechan ⁽³⁾	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	14.4	14.5	15.9	13.1	13.2
Gretna Loaning Gretna ⁽³⁾	Roadside	Diffusion Tube	100	N/A	N/A	N/A	N/A	N/A	17.9	19.1	16.2	17.5	14.3
Port Rodie Car Park, Stranraer ⁽⁴⁾	Kerbside	Diffusion Tube	N/A	17.5	18.2	16.6	12.4	10.4	N/A	N/A	N/A	N/A	N/A
Nith Place, Dumfries ⁽⁴⁾	Kerbside	Diffusion Tube	N/A	30.8	35.0	26.8	30.0	27.5	N/A	N/A	N/A	N/A	N/A
Loreburn St. Dumfries ⁽⁴⁾	Kerbside	Diffusion Tube	N/A	26.0	30.8	24.5	30.1	26.4	N/A	N/A	N/A	N/A	N/A

Notes: Exceedances (if any) of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, (if any) indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

(1) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(2) means for diffusion tubes have been corrected for bias.

(3) new sites from 01/01/14

(4) sites discontinued from 01/01/14.

(5) annual mean reduces to 12.3 µg/m³ at the nearest location relevant for exposure, when corrected for distance as directed in current technical guidance LAQM TG(16), using the NO₂-Fall-Off-With-Distance-From-Road-Calculator v.4.2.xls.

(6) the NO₂-Fall-Off-With-Distance-From-Road-Calculator v.4.2.xls can only be used where the influence of one road source is present, therefore cannot be used at this location.

Table A.4 – 1-Hour Mean NO₂ Monitoring Results

Site Name	Monitoring Type	Valid Data Capture 2018 (%) ⁽¹⁾	NO ₂ 1-Hour Means > 200µg/m ³									
			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Buccleuch Street, Dumfries	Automatic	99.4	0	3	2	0	1	1	1	0	1	0
Eskdalemuir	Automatic	97.4	0	0	0	0	0	0	0	0	0	0

Notes: Exceedances (if any) of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

(1) data capture for the full calendar year

Table A.5 – Annual Mean PM₁₀ Monitoring Results (Objective ≤ 18 µg/m³)

Site Name	Site Type	Valid Data Capture for Monitoring Period 22/03/2018 – 08/10/2018 (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	PM ₁₀ Annual Mean Concentration (µg/m ³) ⁽³⁾
				2018
Village Hall Cairnryan	Other	100	54.9	11.67

Notes: (1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) all means have been “annualised” as per LAQM.TG(16), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Table A.6 – 24-Hour Mean PM₁₀ Monitoring Results (Objective ≤ 50µg/m³ not to be exceeded more than 7 times per year)

Site Name	Site Type	Valid Data Capture for Monitoring Period 22/03/2018 – 08/10/2018 (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	PM ₁₀ 24-Hour Means >50µg/m ³ ⁽³⁾
				2018
Village Hall Cairnryan	Other	100	54.9	0 (24.5)

Notes: Exceedances (if any) of the PM₁₀ 24-hour mean objective (50µg/m³ not to be exceeded more than 7 times/year) are shown in **bold**.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 98.1st percentile of 24-hour means is provided in brackets.

Table A.7 – Annual Mean PM_{2.5} Monitoring Results (Objective ≤ 10 µg/m³ by 31/12/20)

Site Name	Site Type	Valid Data Capture for Monitoring Period 22/03/2018 – 08/10/2018 (%) ⁽¹⁾	Valid Data Capture 2018 (%) ⁽²⁾	PM _{2.5} 24 Annual Mean Concentration (µg/m ³) ⁽³⁾
				2018
Village Hall Cairnryan	Other	100	54.9	7.52

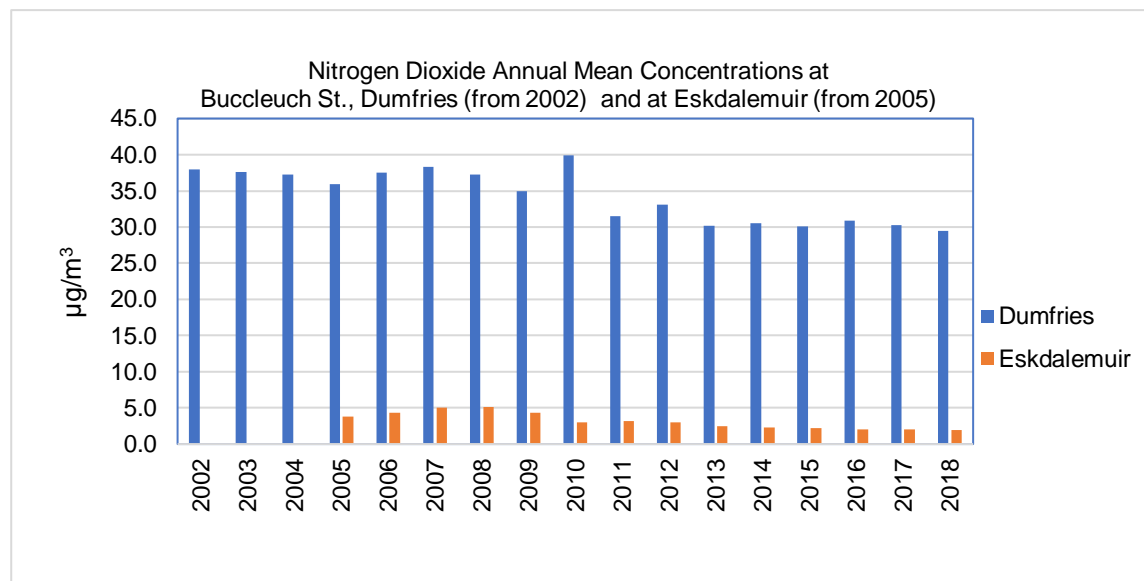
Notes: Exceedances (if any) of the PM₁₀ annual mean objective of 10µg/m³ are shown in **bold**.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

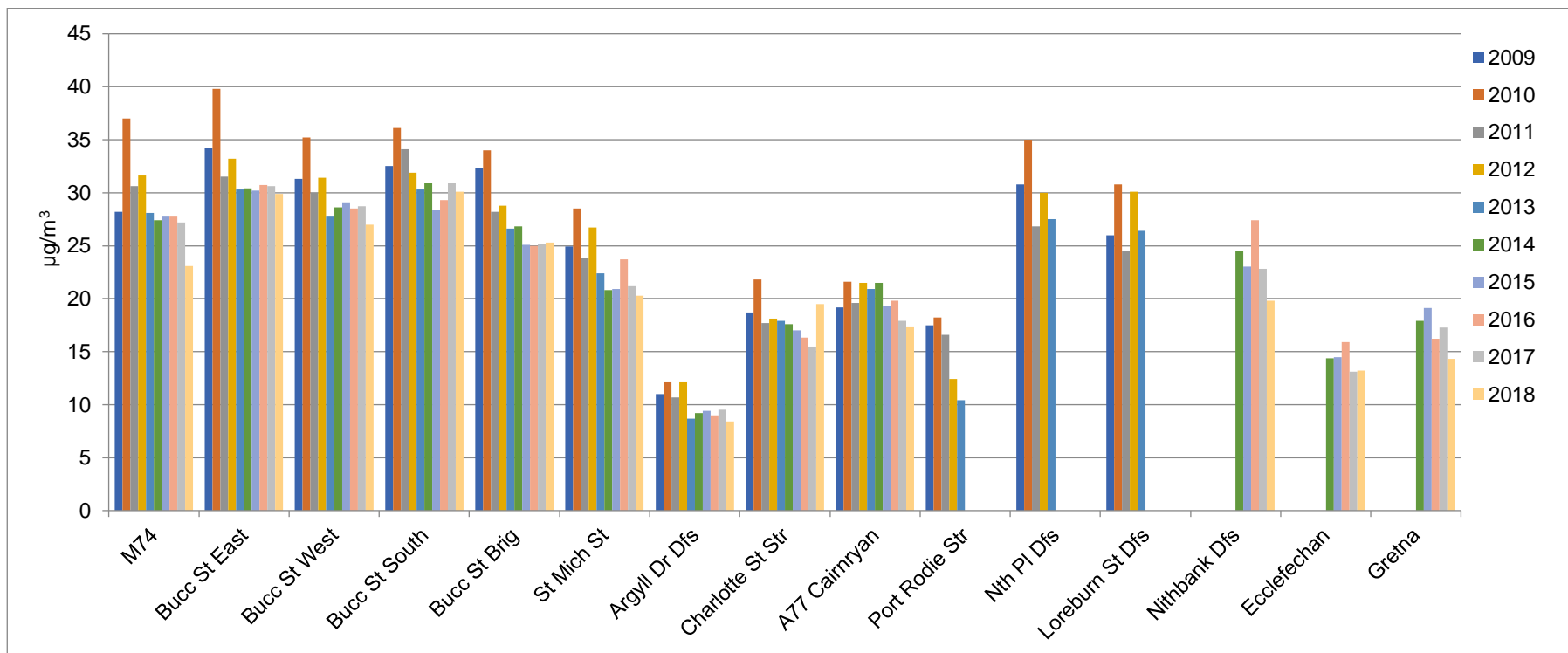
(3) All means have been “annualised” as per LAQM.TG(16), valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 Trends in Annual Mean NO₂ Concentrations at Automatic Monitoring Sites at Dumfries and at Eskdalemuir.



The above chart shows that annual mean concentrations at the roadside site at Buccleuch Street, Dumfries have fallen significantly below the annual mean objective since 2010. The concentrations at Eskdalemuir remain well below the objective reflecting the site's rural background status.

Figure A.2 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites.



Most sites show a general reduction in NO₂ annual average levels from 2010 to 2018.

Figure A.3 **Graphs Showing Historical Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations at Sites in Buccleuch Street, Dumfries.**

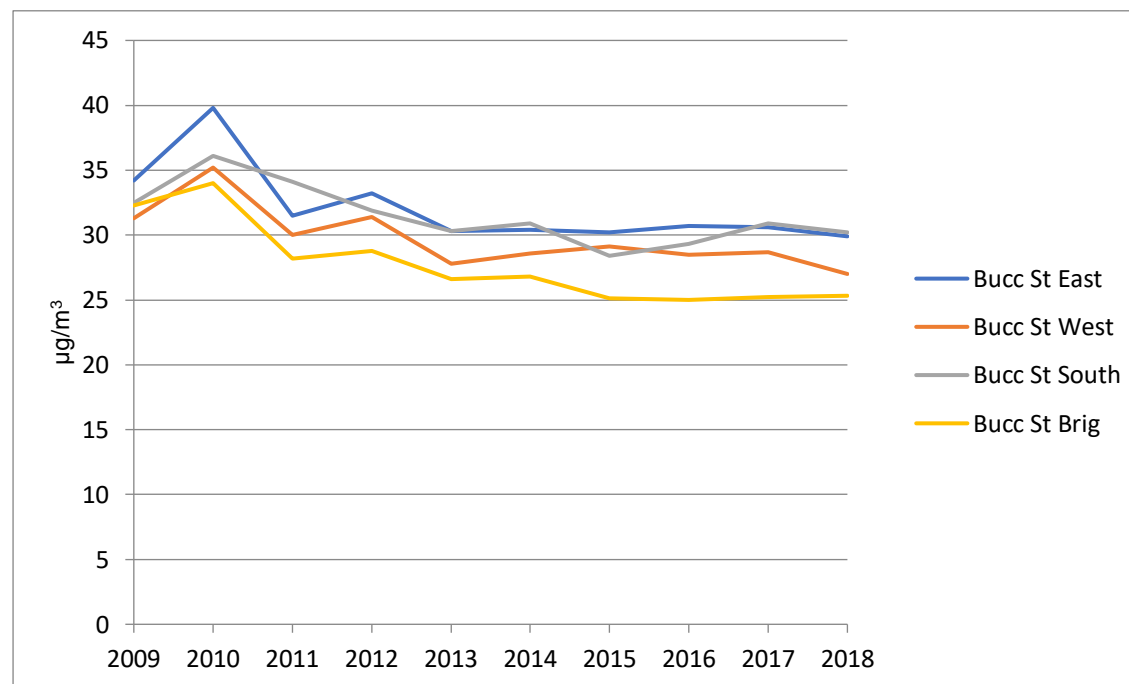


Figure A.4 **Graphs showing Historical Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations at Sites other than Buccleuch Street, Dumfries.**
(Excluding new and discontinued sites)

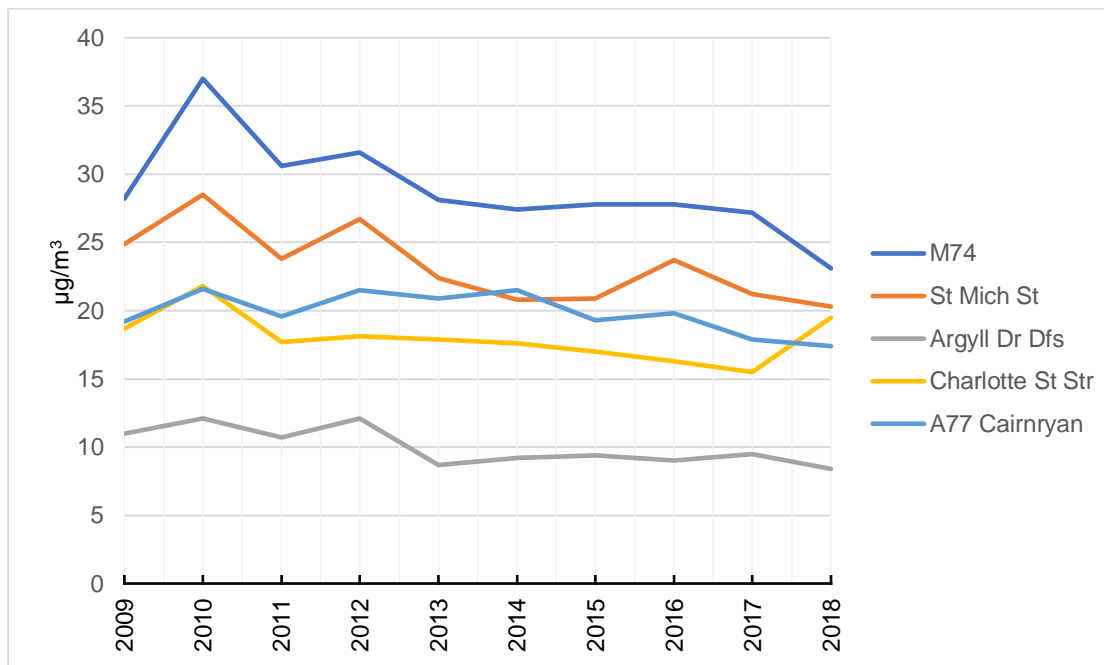


Figure A.5 **Graphs Showing Historical Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations at All Sites**
(Excluding new sites).

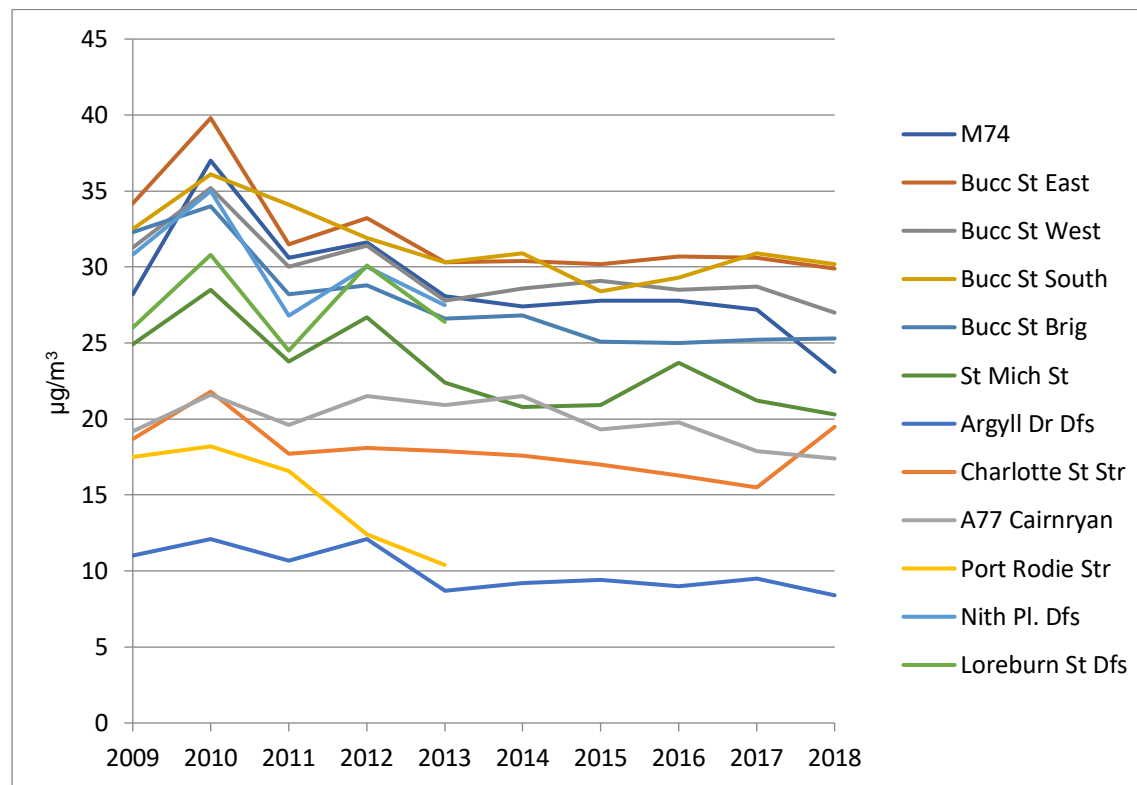
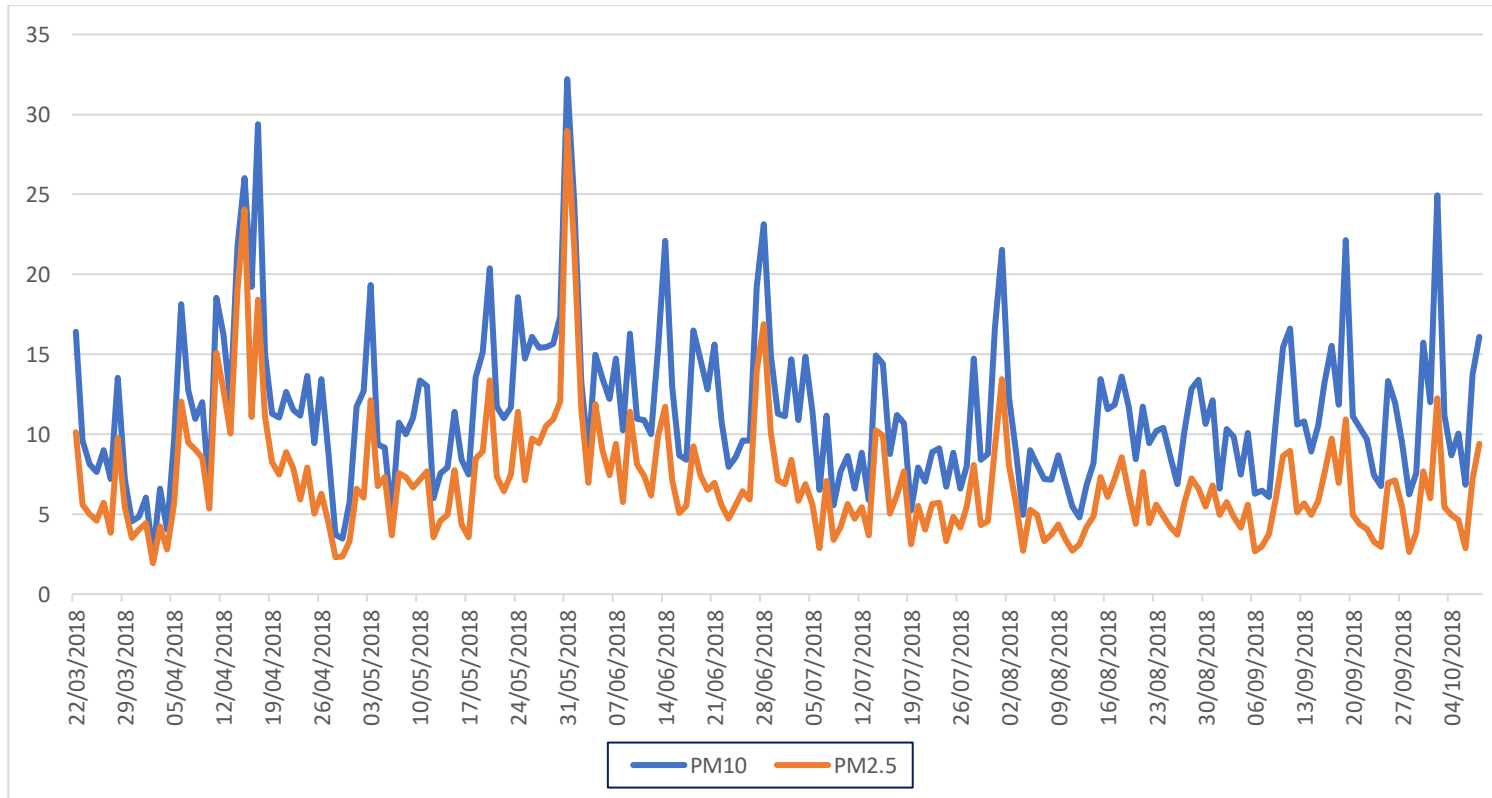


Figure A.6 Graphs showing PM₁₀ & PM_{2.5} daily mean concentrations (µg/m³) over the monitoring period.



Appendix B: Full Monthly Diffusion Tube Results for 2018

Table B.1 – NO₂ Monthly Diffusion Tube Results for 2018

Site Name	NO ₂ Mean Concentrations (µg/m ³)													Annual Mean	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Raw Data	Bias Adjusted ⁽¹⁾	
M74 Slip Road, Lockerbie	36.3	30.3	26.1	24.8	21.9	23.2	22.6	24.4	28.2	32.2	V	31.8	27.44	23.05	
⁽²⁾ Buccleuch St (East) Dumfries	46.7	36.0	37.5	36.7	34.1	33.1	30.4	26.5	30.8	34.5	33.7	39.8	35.64	29.94	
	44.4	41.0	38.7	40.2	33.6	31.1	25.5	29.3	27.2	35.7	37.2	40.1			
	43.6	43.3	44.3	40.4	35.4	34.1	29.5	29.4	31.4	29.1	38.2	40.4			
⁽³⁾ Buccleuch St (West) Dumfries	43.2	34.7	39.4	33.0	30.0	26.6	23.8	24.5	29.3	26.2	38.0	32.7	32.13	26.99	
	40.2	33.2	41.0	33.1	29.5	27.0	25.9	24.1	27.8	30.5	37.0	40.4			
Buccleuch St (South) Dumfries	40.6	40.8	45.3	38.5	33.9	31.2	29.6	26.9	27.6	33.9	39.6	43.9	35.98	30.23	
⁽⁴⁾ Buccleuch St Bridge, Dumfries	34.1	36.6	35.2	31.4	29.9	26.3	23.2	21.0	21.2	30.9	36.7	25.9	30.14	25.32	
	36.4	37.6	36.4	32.4	31.6	23.9	25.3	18.6	21.5	30.3	39.0	37.1			
	35.1	36.5	36.2	33.3	31.4	25.7	25.2	19.9	19.4	27.0	32.8	40.2			
Nithbank Dumfries	28.7	29.5	26.2	26.3	22.8	18.4	15.7	12.2	12.2	24.3	34.9	31.2	23.53	19.77	
St Michael St Dumfries	30.2	29.9	29.6	24.6	22.7	18.5	16.7	14.8	16.1	21.7	30.7	34.4	24.16	20.29	
Argyll Drive Dumfries	14.4	13.1	12.1	8.9	5.2	5.9	6.1	5.3	7.7	10.4	14.3	16.6	10.00	8.40	
Castle Break Ecclefechan	21.1	16.1	19.9	16.2	13.0	11.9	9.9	10.1	10.1	16.7	20.3	23.2	15.71	13.20	

Site Name	NO ₂ Mean Concentrations (µg/m ³)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted ⁽¹⁾
Gretna Loaning Gretna Green	19·1	20·3	18·6	14·2	6·8	11·5	15·7	16·6	17·3	19·9	20·6	23·5	17·01	14·29
Charlotte St Stranraer	V	35·4	26·1	22·4	21·6	24·9	18·4	15·4	17·3	23·6	23·7	26·1	23·17	19·47
A77 Cairnryan Stranraer	23·6	19·7	20·3	20·5	20·9	23·4	18·0	18·7	16·4	21·8	19·2	26·1	20·72	17·40

(1) See Appendix C for details on bias adjustment

(2) Triplicate tubes (co-located with automatic monitor)

(3) Duplicate tubes

(4) Triplicate tubes

(V) Tube(s) vandalised (or otherwise removed or sample tubes contaminated or result[s] rejected).

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

NO₂ continuous monitor

A continuous (chemiluminescent) NO₂ monitor (Teledyne API T200) is located at the Municipal Chambers, Buccleuch Street, Dumfries and forms part of the UK Automatic Urban and Rural Air Quality Monitoring Network (AURN).

QA/QC continuous monitor

Routine calibrations of the automatic monitor are carried out fortnightly by Council staff, with six-monthly audits carried out by Ricardo AEA. Ratification is carried out by the Quality Assurance and Control (QA/QC) Unit at Ricardo AEA. (The NO₂ continuous monitor at Eskdalemuir also forms part of the AURN and is subject to the same audit regime). Triplicate diffusion tubes at Buccleuch Street (East) Dumfries are co-located with the NO₂ continuous monitor and are used to derive a bias-adjustment factor.

Table C.1 Details of co-location study at Buccleuch Street Dumfries 2018.

Date	Monthly average (continuous monitor) (µg/m ³)	Ratified/provisional data	Data capture %	Monthly average (diffusion tubes) (µg/m ³)	Ratio:- continuous / diffusion tube result
January	36.76	Ratified	98.96	44.90	0.82
February	37.17	Ratified	99.57	40.10	0.93
March	33.62	Ratified	99.55	40.17	0.84
April	33.19	Ratified	99.76	39.10	0.85
May	29.01	Ratified	99.52	34.37	0.84
June	26.47	Ratified	99.54	32.77	0.81
July	24.27	Ratified	99.40	28.47	0.85
August	22.79	Ratified	99.17	28.40	0.80
September	24.00	Ratified	98.96	29.80	0.81
October	26.48	Ratified	99.56	33.10	0.80
November	29.12	Ratified	99.52	36.37	0.80
December	34.53	Ratified	99.17	40.10	0.86
Average	29.78		99.39	35.64	0.84

*Bias-adjustment factor = continuous mean/diffusion tube mean = 29.78 / 35.64 = **0.84***

Diffusion tube bias = (diffusion tube mean minus continuous mean) divided by continuous mean = (35.64 - 29.78) / 29.78 = 0.20 i.e. tubes over-read by approximately 20%.

The local bias adjustment factor of 0.84 has been used in preference to the national bias-adjustment factor of 0.76 derived by amalgamation of 28 studies including Dumfries and Galloway's. The national bias adjustment spreadsheet (version 06/19) is available to download at

<http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

QA/QC for diffusion tubes

The diffusion tubes were prepared and analysed by Socotec (Didcot) using 50% triethanolamine (TEA) in acetone. Socotec demonstrated satisfactory performance for 2018 in the Workplace Analysis Scheme for Proficiency (WASP) (an independent analytical performance-testing scheme).

Table C.2 Annualisation of PM₁₀ monitoring data at Cairnryan.

Site	Site Type	Annual Mean 2018 (A _m) µg/m ³	Period Mean 22/03/2018 – 08/10/2018 (P _m) µg/m ³	Ratio A _m /P _m
Edinburgh St Leonards	Urban Background	10.69	10.80	0.99
St Marnock St Kilmarnock	Urban Background	10.70	9.93	1.08
High St Irvine	Roadside	14.42	14.29	1.01
Average				1.03
Village Hall Cairnryan	Other	Estimated 2018 annual mean = 11.33 x 1.03 = 11.67 µg/m ³		

Data capture for comparison sites should ideally be at least 85% as per LAQM TG(16).

Table C.3 Annualisation of PM_{2.5} monitoring data at Cairnryan.

Site	Site Type	Annual Mean 2018 (A _m) µg/m ³	Period Mean 22/03/2018 – 08/10/2018 (P _m) µg/m ³	Ratio A _m /P _m
Edinburgh St Leonards	Urban Background	6.31	6.02	1.05
St Marnock St Kilmarnock	Urban Background	6.24	5.48	1.14
High St Irvine	Roadside	8.06	7.71	1.05
Average				1.08
Village Hall Cairnryan	Other	Estimated 2018 annual mean = 6.96 x 1.08 = 7.52 µg/m ³		

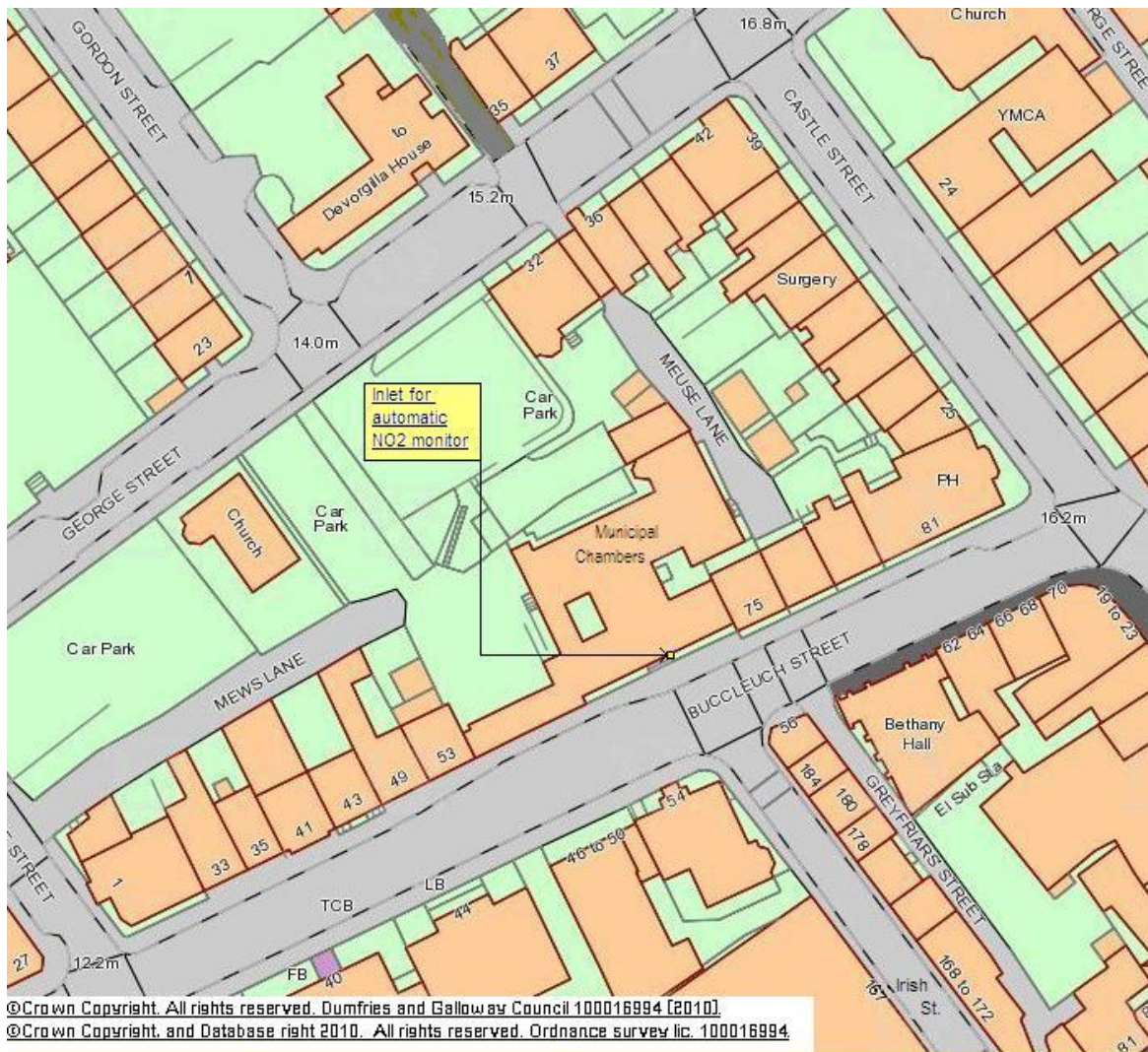
Data capture for comparison sites should ideally be at least 85% as per LAQM TG(16).

QA/QC Fidas 200 monitor

The Fidas 200 monitor was brand new at the start of the hire period and QA/QC was carried out by Air Monitors Ltd as part of the hire agreement. From the start of the hire period results together with wind speed and direction were available to download by Council staff with only an approximate 24-hour delay.

Appendix D Maps showing the location of the monitoring sites.

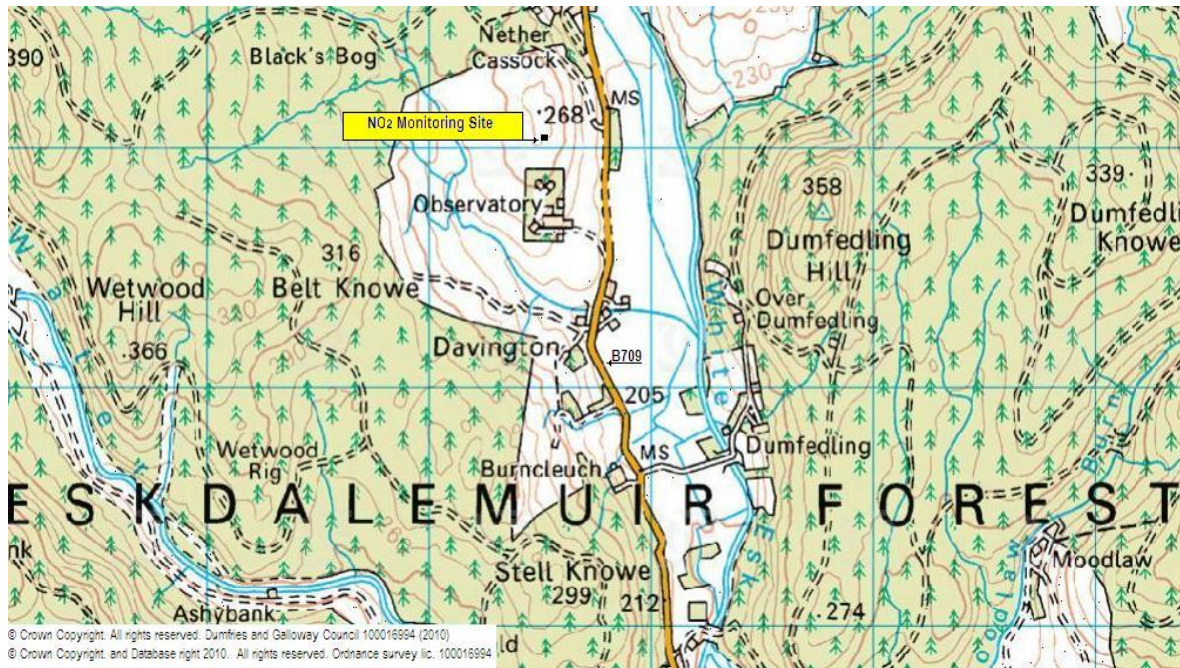
Figure D.1 Map of NO₂ automatic monitoring site at Buccleuch St., Dumfries.



The air intake for the monitor is situated at a height of approximately 2.2 metres in the supporting framework of one of two decorative lamps on either side of the Municipal Chambers entrance. The air-intake tube goes through a window to the monitor which is located in the basement of the building.

Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.2 Map of NO₂ automatic monitoring site at Eskdalemuir



Since December 2004 a continuous NO₂ monitor has been located at the Observatory^(v) at Eskdalemuir as part of the AURN. The Observatory is currently managed by the British Geological Society and the Met Office

Figure D.3 Map of diffusion tube site at M74 Lockerbie.



Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.4 Map of diffusion tube sites at (from left to right) Buccleuch St. Bridge, Buccleuch St. West, Buccleuch St. South, & Buccleuch St. East, Dumfries.

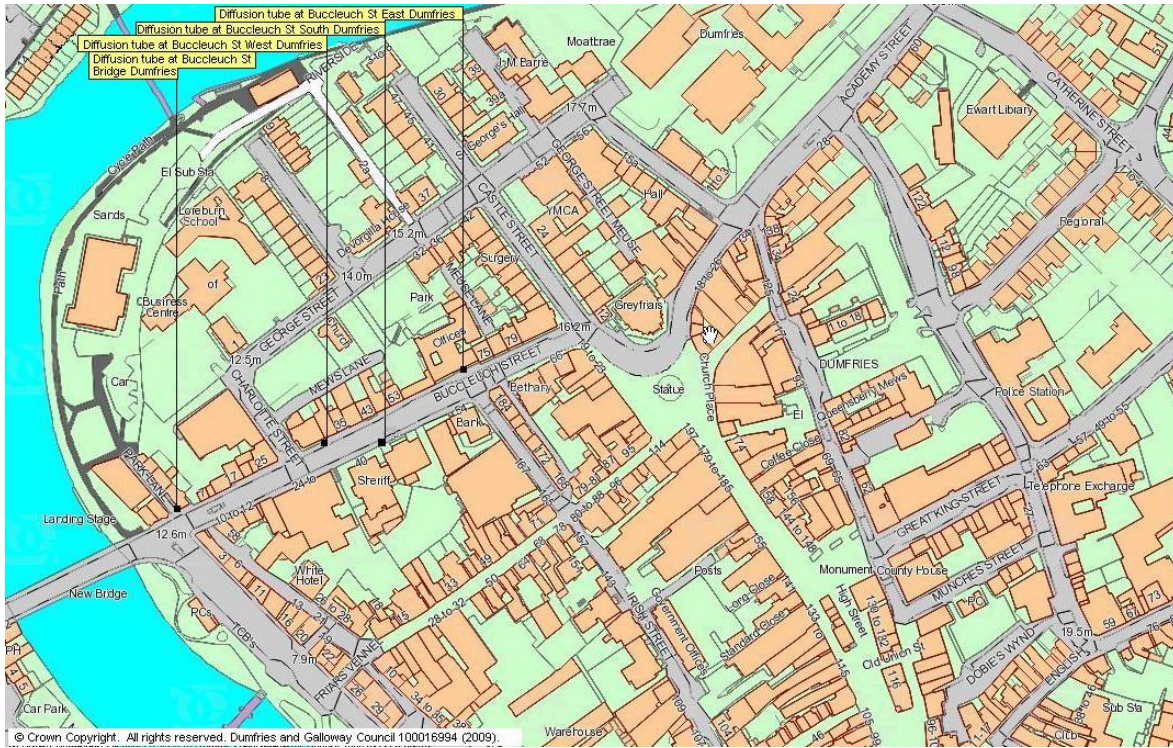


Figure D.5 Map of diffusion tube site at St Michael Street Dumfries

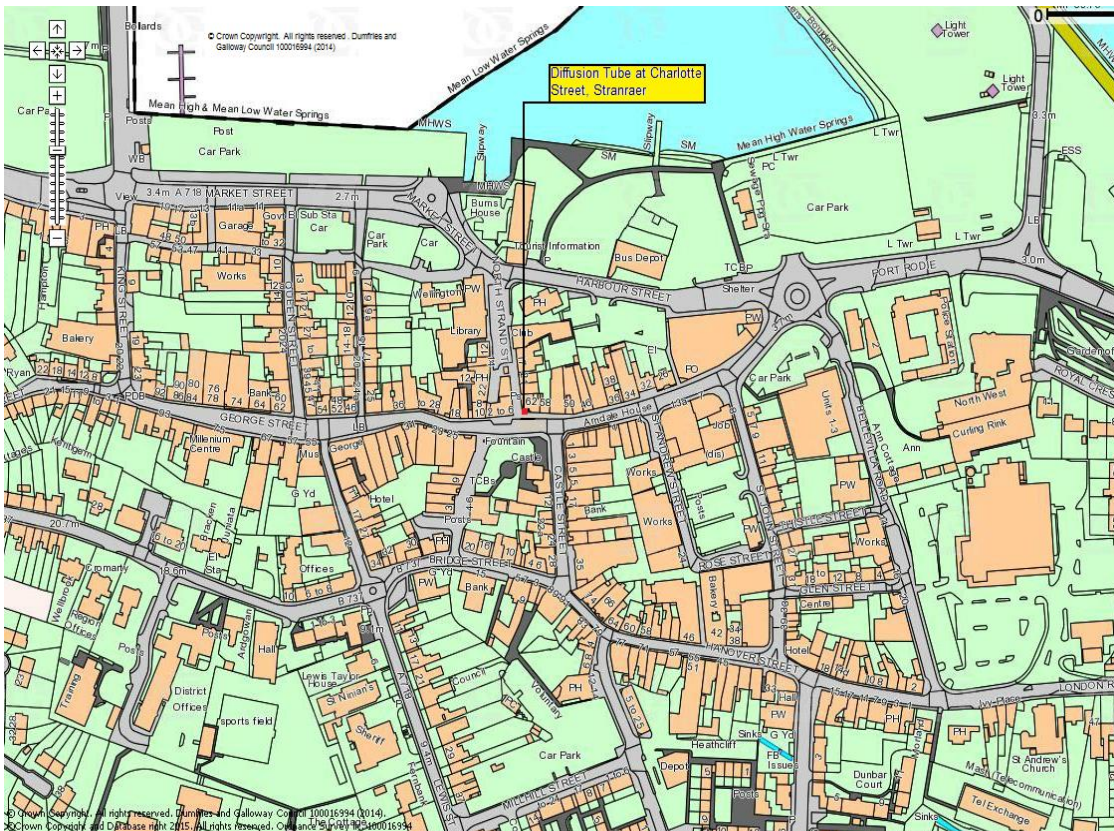


Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.6 Map of diffusion tube site at Argyll Drive, Heathhall Dumfries.



Figure D.7 Map of diffusion tube site at Charlotte St., Stranraer.



Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.8 Map of diffusion tube site at A77 Cairnryan.

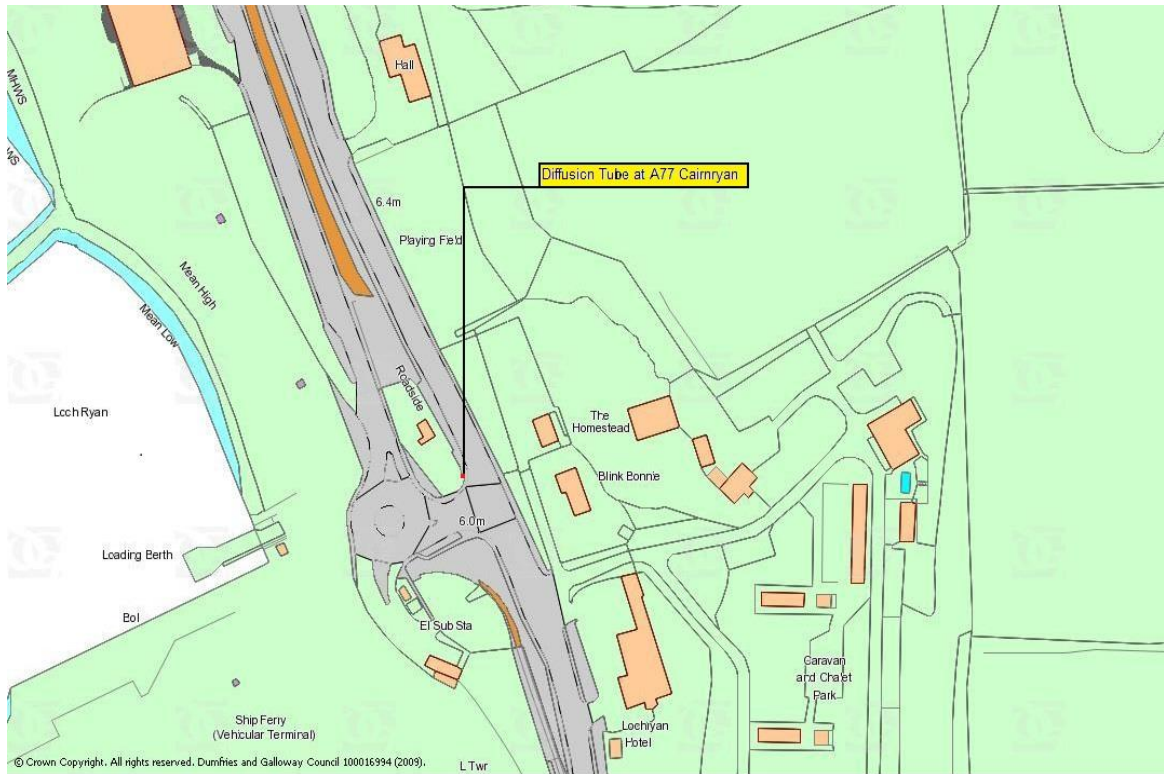


Figure D.9 Map of diffusion tube site at Nithbank, Dumfries.

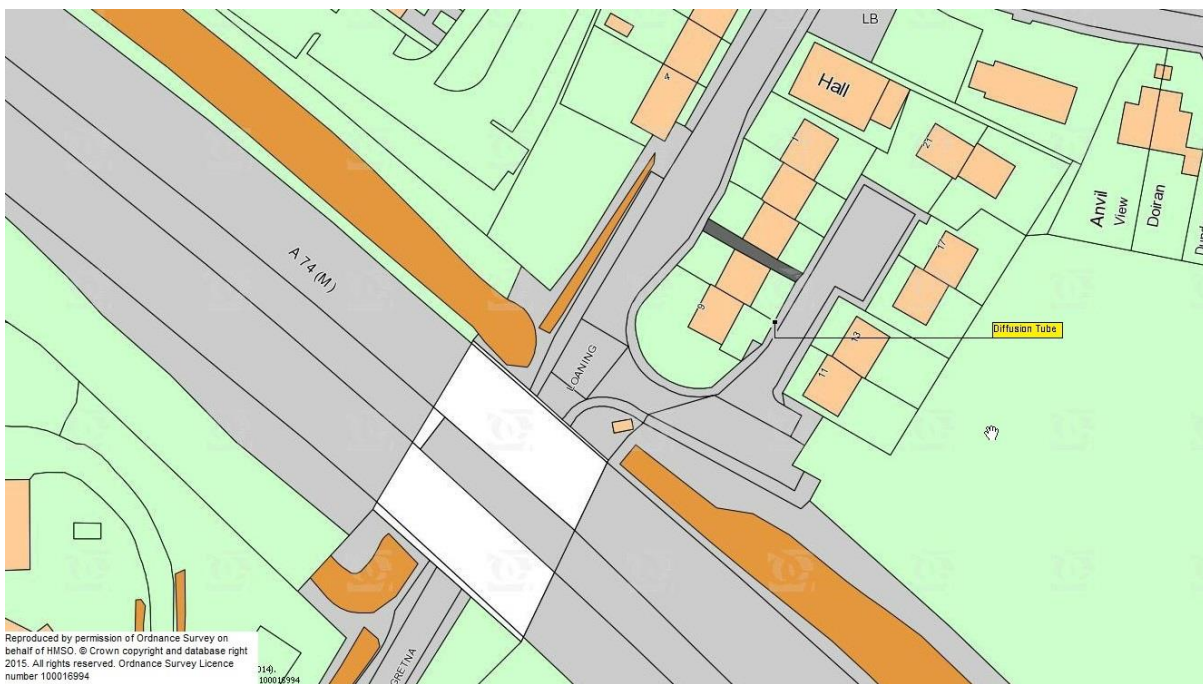


Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.10 Map of diffusion tube site at Castle Break, Ecclefechan.



Figure D.11 Map of diffusion tube site at Gretna Loaning, Gretna,



Appendix D Maps showing the location of the monitoring sites (continued).

Figure D.12 Map of PM₁₀ & PM_{2.5} monitoring site at Cairnryan.



Glossary of Terms

Abbreviation	Description
APR	Air Quality Annual Progress Report
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Bucc St	Buccleuch Street (Dumfries)
Defra	Department for Environment, Food and Rural Affairs
Dfs	Dumfries
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PM ₁₀	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM _{2.5}	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO ₂	Sulphur Dioxide
St Mich St	St Michael Street (Dumfries)
Str	Stranraer

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- ii. The Air Quality (Scotland) Regulations 2000 Scottish Statutory Instrument (SSI) Number 97.
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<http://www.opsi.gov.uk/legislation/scotland/ssi2000/20000097.htm>
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- iii. LAQM Policy Guidance PG(S) (16)
<http://www.gov.scot/Publications/2018/04/3184/0>
- iv. Local Air Quality Management Technical Guidance LAQM.TG (16): DEFRA April 2016
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- v. Eskdalemuir Observatory.
[Eskdalemuir Magnetic Observatory](http://www.eskdalemuir.gov.uk/)