Annual Progress Report (APR)

2022 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

January 2023

Dumfries and Galloway Council

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Executive Summary: Air Quality in Our Area

Air Quality in Dumfries and Galloway Council

This report comprises Dumfries and Galloway Council's Annual Progress Report on air quality within the Council's area. Within this report results of NO_2 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 mostly a rural region, with two hundred miles of coast line; area 6,426 square kilometres; estimated population 148,290 (by 2037 the population of Dumfries & Galloway is projected to decline to 141,619). The main towns are Dumfries and Locharbriggs (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 community.

Recent monitoring in 2021 for NO_2 has not identified any new requirement to proceed to a detailed assessment with concentrations all below the objectives and NO_2 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 are all unlikely to exceed the objective 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.

Due to a perceived increase in traffic levels following the re-location of the Stena Line port from Stranraer to Old House Point, Cairnryan PM_{10} (+ $PM_{2.5}$) reference method monitoring was carried out at Cairnryan from 22nd March 2018 – 08th October 2018 with results provided in 2019 Annual Progress Report.

Reference method monitoring showed that no Air Quality Management Areas were required to be designated for PM_{10} or $PM_{2.5}$ in Cairnryan.

Actions to Improve Air Quality

In general, the air quality in Dumfries & Galloway is very good and because of this there are no designated Air Quality Management Areas (AQMAs) in Dumfries and Galloway. The focus of the air quality work undertaken by Dumfries and Galloway Council revolves and continues to revolve around NO_2 with transportation being the primary source of emissions. Environmental Health are continuing to expand working relationships with colleagues in Sustainable Transport as well as Education colleagues in anticipation of a greater potential involvement in Air Quality Initiatives such as Clean Air Day.

Local Priorities and Challenges

Environmental Health continue to monitor at 14 passive diffusion tube sites that have shown sustained compliance. The 2020 report discussed the possibility of changing or expanding monitoring locations throughout Dumfries and Galloway to maximise available resources. Dumfries and Galloway Council in 2021 retained the locations of the existing diffusion tube monitoring sites as sites with higher potential NO2 exposures were not identified.

The previously triplicate tube site at Buccleuch Street Bridge remains a duplicate site and a previous duplicate site at Buccleuch Street West remains a single tube site in 2021 in order to measure NO2 levels at the entrance to the Stena Port in Cairnryan and in order to respond to a complaint of poor air quality in Kirkcudbright.

Dumfries and Galloway Council recognises that good air quality and health are intrinsically linked. We are keen to increase public knowledge and perception of air quality in the region and are working to create a programme of work which will increase the profile of air quality issues such as vehicle anti-idling campaigns, clean air day promotion and alternative travel. We have previously engaged with Dumfries and Galloway Council's Environment Champion and have participated in Clean Air Day Activities.

How to Get Involved

Members of the public can access several previously published air quality reports including results of monitoring in our area which are available at:

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

Dumfries and Galloway Council's priorities are Build the local economy; Provide the best start in life for all our children; Protect our most vulnerable people; Be an inclusive council; Urgently respond to climate change and transition to a carbon neutral region; and Delivering our priorities and commitments.

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 effect 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.

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in Dumfries and Galloway during 2021. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) 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 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 (APR) 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

Pollutant	Air Quality Objective Concentration	Air Quality Objective Measured as	Date to be Achieved by
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
Nitrogen dioxide (NO_2)	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
Particulate Matter (PM_{10})	18 µg/m^3	Annual mean	31.12.2010
Particulate Matter ($PM_{2.5}$)	10 µg/m^3	Annual mean	31.12.2021
Sulphur dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide (SO_2)	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
Sulphur dioxide (SO_2)	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

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 Cleaner Air for Scotland 2

Cleaner Air for Scotland 2 – Towards a Better Place for Everyone (CAFS2) is Scotland's second air quality strategy. CAFS2 sets out how the Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities over the period 2021 – 2026. CAFS2 was published in July 2021 and replaces Cleaner Air for Scotland – The Road to a Healthier Future (CAFS), which was published in 2015. CAFS2 aims to achieve the ambitious vision for Scotland "to have the best air quality in Europe". A series of actions across a range of policy areas are outlined, a summary of which is available on the Scottish Government's website.

Progress by Dumfries and Galloway Council against relevant actions for which local authorities are the lead delivery bodies within this strategy is demonstrated below.

2.2.1 Placemaking – Plans and Policies

Local authorities with support from the Scottish Government will assess how effectively air quality is embedded in plans, policies, City Deals and other initiatives, and more generally in cross departmental working, identifying, and addressing evidence, skills, awareness and operational gaps.

Dumfries and Galloway Council has Placemaking in the Local Development Plan (LDP2). The Plan states that Development proposals should be compatible with the character and amenity of the area and should not conflict with nearby land uses. Air Quality issues as a result of LDP2 which may result from the development will be a material consideration in the assessment of proposals.

Placemaking policies in other areas such as building design, active travel and transport relate directly to sustainability and climate change mitigation within which improving air quality is implicit.

2.2.2 Transport – Low Emission Zones

Local authorities working with Transport Scotland and SEPA will look at opportunities to promote zero-carbon city centres within the existing LEZs structure.

In general, the air quality in Dumfries & Galloway is very good and because of this there are no designated Air Quality Management Areas (AQMAs) in Dumfries and Galloway. The focus of the air quality work undertaken by Dumfries and Galloway Council revolves and continues to revolve around NO_2 with transportation being the primary source of emissions.

As Dumfries and Galloway is predominantly rural Dumfries and Galloway Council does not have the association of high traffic density within urban conurbations which characterise poor air quality in urban areas. Dumfries and Galloway Council will be led by Regional and National strategies, including outcomes relating to avoiding unnecessary travel, promoting active travel and reducing transport emissions.

Details of measures completed, in progress or planned are contained in both the Dumfries and Galloway Council Carbon Management Plan 2 (CMP2) and the Dumfries and Galloway Council Active Travel Strategy which are accessible at:

Carbon Management Plan 2 (dumgal.gov.uk)
https://www.dumgal.gov.uk/article/16715/Active-Travel-Strategy

2.3 Progress and Impacts of Measures to address Air Quality in Dumfries and Galloway Council

Dumfries and Galloway Council currently does not have any AQMAs, and therefore does require an Air Quality action plan.

Dumfries and Galloway Council has taken forward a number of measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in the Dumfries and Galloway Council Carbon Management Plan 2 (CMP2) which is accessible at:

Carbon Management Plan 2 (dumgal.gov.uk)

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 Southwest 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

The Scottish Government work for the Strategic Transport Projects Review (STPR) and the Strategic Transport Projects Review 2 will inform transport investment in Scotland for the next 20 years. STPR2 is a Scotland-wide review of the strategic transport network across all transport modes, including walking, wheeling, cycling, bus, rail and car, as well as reviewing wider island and rural connectivity.

STPR2 will help to deliver the vision, priorities and outcomes for transport set out in the National Transport Strategy (NTS2) and will align with other national plans such as the Infrastructure Investment Plan, National Planning Framework (NPF4) and the Climate Change Plan.

The key aim of previous work with SPTR was 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

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 2021. 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 has been adjusted are included in Appendix C.

Dumfries and Galloway Council have been informed that due to technical issues relating to the automatic (continuous) measurement of NO2 at Eskdalemuir whilst measured values for 2021 from this site are included in the 2021 Annual Progress Report it is unlikely that data from this site will be available for future reports.

3.1.2 Non-Automatic Monitoring Sites

Dumfries and Galloway Council undertook non-automatic (passive) monitoring of NO_2 at 14 sites during 2021. 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 (NO_2)

In 2021 there were no exceedances of air quality objectives for NO_2 recorded in Dumfries and Galloway

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40 µg/m^3.

For diffusion tubes, the full 2021 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. It is noted that there was 1 exceedance of the hourly mean which was noted on 28/11/2021 at 14:00hrs (201.86 µg/m^3). It is believed that this exceedances may have been caused by an idling bus at a nearby bus stop as levels for the following hour fell to 35.7 µg/m^3.

3.2.2 Particulate Matter (PM_{10})

Previous monitoring for PM_{10} at a worst-case junction in Dumfries showed that no air quality management areas were required to be designated for PM_{10} in Dumfries. No PM_{10} monitoring is currently carried out at Dumfries.

PM_{10} monitoring was carried out at Cairnryan as a result of a perceived increase in traffic levels following the re-location of the Stena Line port from Stranraer to Old House Point, Cairnryan. An Osiris PM_{10} 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. As readings from the Osiris PM_{10} monitor were taken over two APR reporting periods both the annualised means for PM_{10} and $PM_{2.5}$ for the 2016 and

2017 reporting years were in excess of prescribed limits in terms of annualised means and PM_{10} levels exceeded seven 24-hour means greater than 50µg/m^3.

As a result of the higher than expected levels of particulate matter at Cairnryan Dumfries and Galloway Council's Environmental Health installed an approved (reference-method equivalent) Fidas 200 EN-certified fine dust monitoring and ambient air measuring system PM_{10} (+ $PM_{2.5}$) monitor in order to carry out a detailed assessment of PM_{10} levels at Cairnryan. If, as a result of reference method equivalent monitoring levels were shown to exceed the objective(s) then Environmental Health would thereafter be able to designate the whole or part of the village of Cairnryan as an Air Quality Management Area.

The Fidas 200 EN-certified fine dust monitoring and ambient air measuring system Equipment was installed and become operational in 2018 from the 22nd March 2018 – 08th October 2018

As a result of the 2018 monitoring no further PM_{10} monitoring has carried out by Dumfries and Galloway Council as further monitoring is not warranted

3.2.3 Particulate Matter ($PM_{2.5}$)

An Osiris PM_{10} 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/m^3 which was in excess of the annual mean objective of 10µg/m^3 but using 2016 valid data capture and the same data set after ratification this result is now reduced to 8·45µg/m^3.

As a result of the higher than expected levels of particulate matter at Cairnryan Dumfries and Galloway Council's Environmental Health installed an approved (reference-method equivalent) Fidas 200 EN-certified fine dust monitoring and ambient air measuring system PM_{10} (+ $PM_{2.5}$) monitor in order to carry out a detailed assessment of $PM_{2.5}$ levels at Cairnryan. If, as a result of reference method equivalent monitoring levels were shown to exceed the objective(s) then Environmental Health would thereafter be able to designate the whole or part of the village of Cairnryan as an Air Quality Management Area.

The Fidas 200 EN-certified fine dust monitoring and ambient air measuring system Equipment was installed and become operational in 2018 from the 22nd March 2018 – 08th October 2018

As a result of the 2018 monitoring no further $PM_{2.5}$ monitoring has carried out by Dumfries and Galloway Council as further monitoring is not warranted

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3.2.4 Sulphur Dioxide (SO_2)

A detailed assessment of the influence of shipping on SO_2 levels in Cairnryan was carried out in 2004 when it was found that the SO_2 levels met the objectives and an AQMA was not required.

Currently Dumfries and Galloway Council does no LAQM monitoring for SO_2 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 no 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 with an impact on air quality have been identified since the completion of last year's report.

4.1 Road Traffic Sources

No significant road traffic sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2021 reporting year that may significantly change traffic flows or affect target air quality objectives.

4.2 Other Transport Sources

No other transport sources relevant with respect to air quality in Dumfries and Galloway have been identified in the 2021 LAQM APR reporting year.

4.3 Industrial Sources

No industrial sources relevant with significant impact to air quality in Dumfries and Galloway have been identified in the 2021 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 2021 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 little cumulative impact.

4.5 New Developments with Fugitive or Uncontrolled Sources

No new developments with fugitive or uncontrolled sources relevant with respect to air quality in Dumfries and Galloway have been newly identified in the 2021 LAQM APR reporting year. Environmental Health have received and investigated a complaint in the 2021 reporting year relating to fugitive dust emissions arising from the crushing of limestone at an existing rural quarry.

5 Planning Applications

No planning applications have been identified in the 2021 LAQM APR reporting year which would have significant effects with respect to air quality in Dumfries and Galloway.

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

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. NO2 concentrations have been stable for the past nine years.

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

Monitoring during 2021 confirmed levels of atmospheric NO_2 continue to be well below the air quality objective. Therefore no actions to reduce NO_2 concentrations, are required to meet Air Quality Objectives.

Dumfries and Galloway Council recognises that good air quality and health are intrinsically linked. We are keen to increase public knowledge and perception of air quality in the region and are working to increase the profile of air quality issues such as vehicle anti-idling campaigns, clean air day promotion, alternative travel etc. We have engaged with elected members with respect to air quality initiatives such as clean air day and Environmental Health intends to continue to build on this in conjunction with Education, Sustainable Transport, Fleet Services with respect to work toward the Council Priorities.

Results of monitoring and other air quality assessment work will be presented in the next Annual Progress Report due in June 2023.

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	N	Chemiluminescent	<1	4·3	2·2
Eskdalemuir	Rural	323551	603022	NO_2	N	Chemiluminescent	N/A	225	4·0

Notes:

(1) 0m 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) (2)	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
Charlotte St. Stranraer	Roadside	206085	560859	NO_2	No	<1	4·0	No
A77 Cairnryan (P&O)	Roadside	207216	567422	NO_2	No	19	2·0	No
Nithbank Dumfries (3)	Roadside	297712	575254	NO_2	No	0	1·7	No
Castle Break Ecclefechan (3)	Roadside	319272	575029	NO_2	No	1	1·5	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) (2)	Tube collocated with a continuous analyser?
Gretna Loaning Gretna (3)	Roadside	332110	568264	NO_2	No	1	1·4	No
A77 Cairnryan (Stena)	Roadside	206109	569375	NO2	No	5	5	No
Kirkcudbright	Roadside	268574	551126	NO_2	No	<1	2.0	No

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results ($\mu g/m^3$)

Site Name	Site Type	Monitoring Type	Valid Data Capture 2021 (%) [1]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [2]												
				2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Buccleuch Street Dumfries	Roadside	Automatic	91.7	35·0	39·9	31·5	33·1	30·2	30·5	30·1	30·9	30.2	29.5	31.1	22.1	22.2
Eskdalemuir	Rural	Automatic	91.7	4·3	3·0	3·2	3·0	2·5	2·3	2·2	2·0	2	1.9	1.8	1.65	1.6
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	24.7	17.9	17.7
Buccleuch St. (E) Dumfries	Roadside	Diffusion Tube (Triplicate)	91.7	34·2	39·8	31·5	33·2	30·3	30·4	30·2	30·7	30.6	29.9	30.8	22.4	19.7
Buccleuch St. (W) Dumfries	Kerbside	Diffusion Tubes (Duplicate)	91.7*	31·3	35·2	30·0	31·4	27·8	28·6	29·1	28·5	28.7	27	28.5	23	20.9
Buccleuch St. (S) (Sheriff) Dumfries	Kerbside	Diffusion Tube	91.7	32·5	36·1	34·1	31·9	30·3	30·9	28·4	29·3	30.9	30.2	29.9	21.4	20.8
Buccleuch St. Bridge Dumfries	Roadside	Diffusion Tubes (Triplicate)	91.7**	32·3	34·0	28·2	28·8	26·6	26·8	25·1	25·0	25.2	25.3	26.2	19.1	18.6
St. Michael St. Dumfries	Roadside	Diffusion Tube	91.7	24·9	28·5	23·8	26·7	22·4	20·8	20·9	23·7	21.2	20.3	21.3	15.3	15.6
Argyll Drive Dumfries	Urban Background	Diffusion Tube	91.7	11·0	12·1	10·7	12·1	8·7	9·2	9·4	9·0	9.5	8.4	9.5	7.6	6.5
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	18.7	15.5	14.9
A77 Cairnryan P&O	Roadside	Diffusion Tube	83.3	19·2	21·6	19·6	21·5	20·9	21·5	19·3	19·8	17.9	17.4	18.1	17.4	16.9
Nithbank Dumfries [3]	Roadside	Diffusion Tube	91.7	N/A	N/A	N/A	N/A	N/A	24·5	23·0	27·4	22.8	19.8	21	14.1	14.3
Castle Break Ecclefechan [3]	Roadside	Diffusion Tube	91.7	N/A	N/A	N/A	N/A	N/A	14·4	14·5	15·9	13.1	13.2	13.2	9.5	10.6
Gretna Loaning Gretna [3]	Roadside	Diffusion Tube	91.7	N/A	N/A	N/A	N/A	N/A	17·9	19·1	16·2	17.5	14.3	14.2	11.3	10.5
Kirkcudbright	Kerbside	Diffusion	91.7***	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	16.3	12.9	14.7
A77 Cairnryan Stena	Kerbside	Diffusion Tube	91.7****	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15.6	16	15.6
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	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	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	N/A	N/A	N/A

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in bold.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(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)

* Previously Duplicate - Single from August 2019

** Previously Triplicate - Duplicate from November 2019

*** New Site from November 2019

**** New Site from August 2019

Table A.4 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site Name	Monitoring Type	Valid Data Capture 2021 (%) (1)	NO_2 1-Hour Means > 200µg/m^3												
			2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Buccleuch Street, Dumfries	Automatic	98	0	3	2	0	1	1	1	0	1	0	0	3	1
Eskdalemuir	Automatic	51.2*	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200 µg/m^3 not to be exceeded more than 18 times/year) are shown in bold.

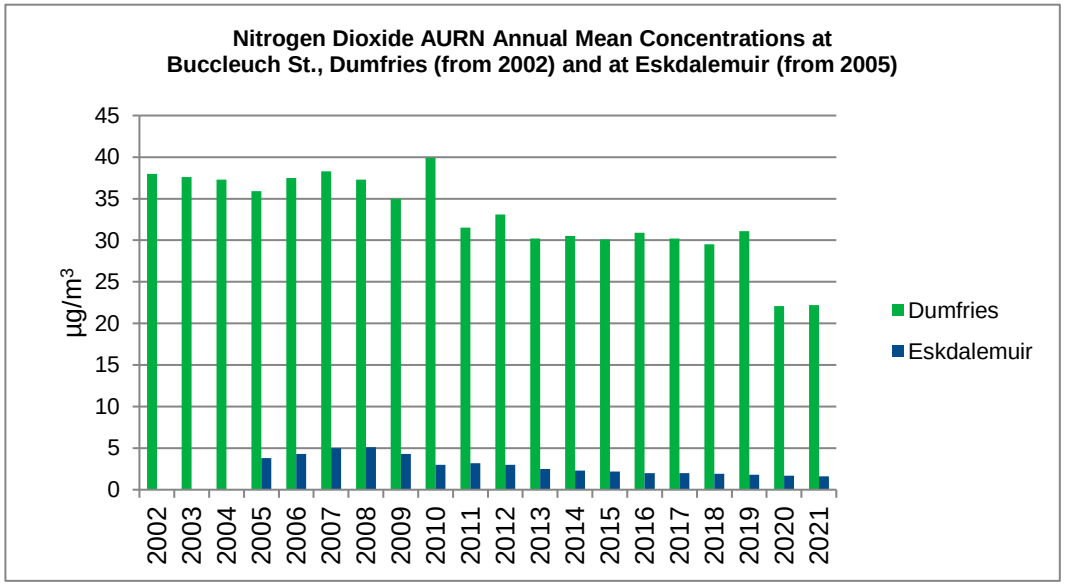
If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(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)

* Data Annualised as data capture for the year was less than 75%

Figure A.1 Trends in Annual Mean NO_2 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.

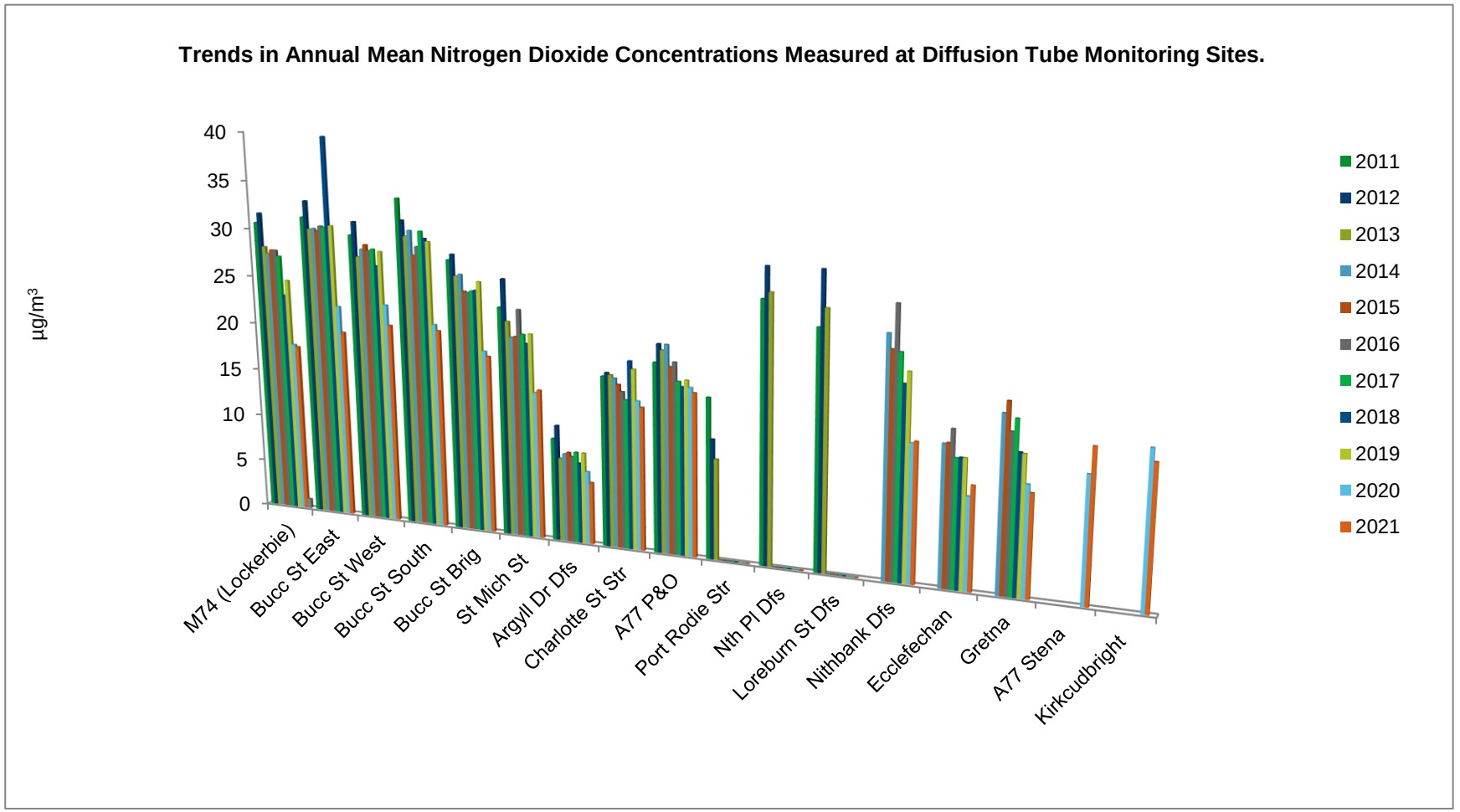


Figure A.3 **Graph Showing Historical Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations at Sites in Buccleuch Street, Dumfries.**

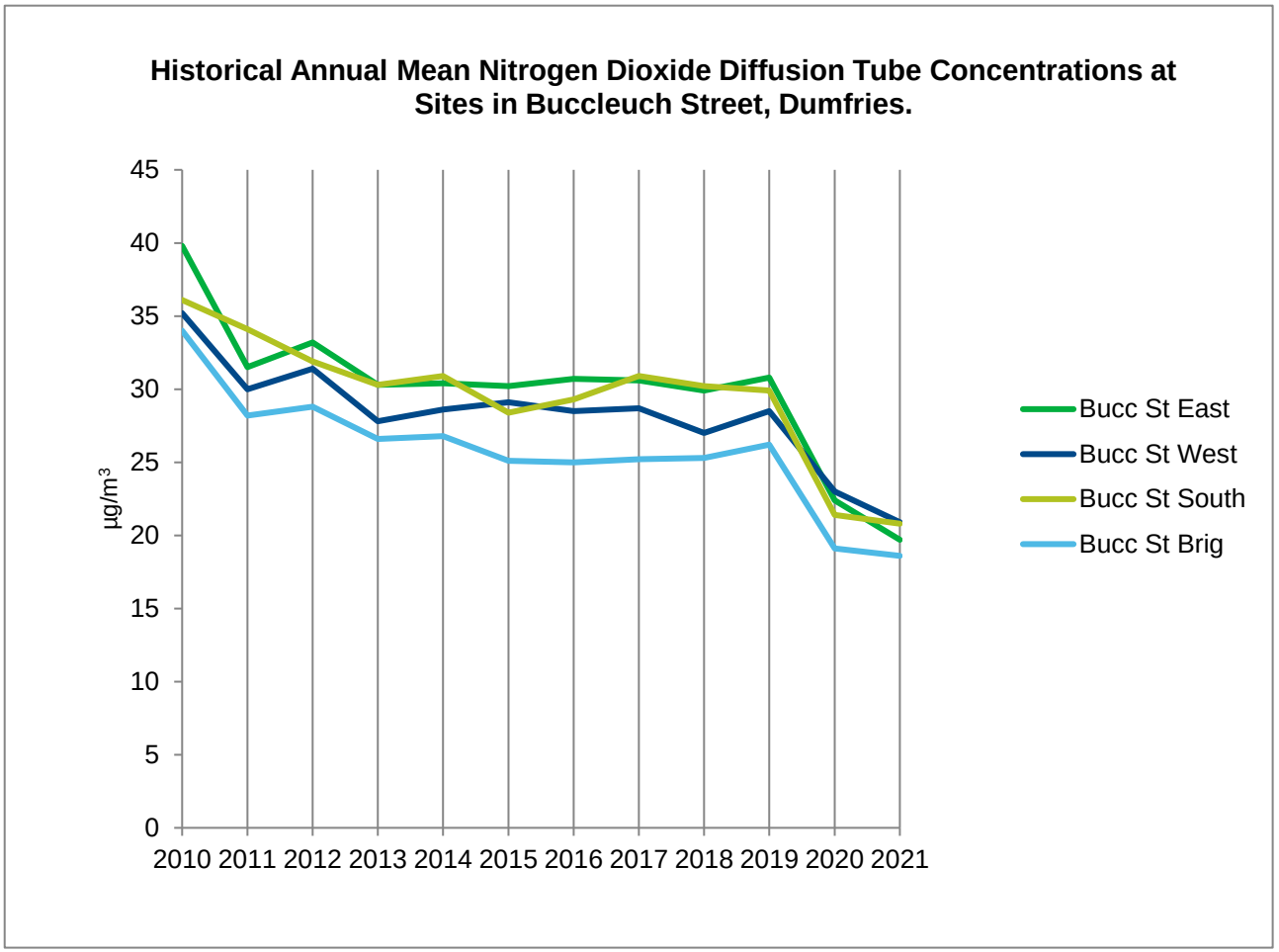


Figure A.4 **Graph Showing Historical Annual Mean Nitrogen Dioxide Diffusion Tube Concentrations at Sites Other Than Buccleuch Street, Dumfries.** *(Excluding discontinued sites)*

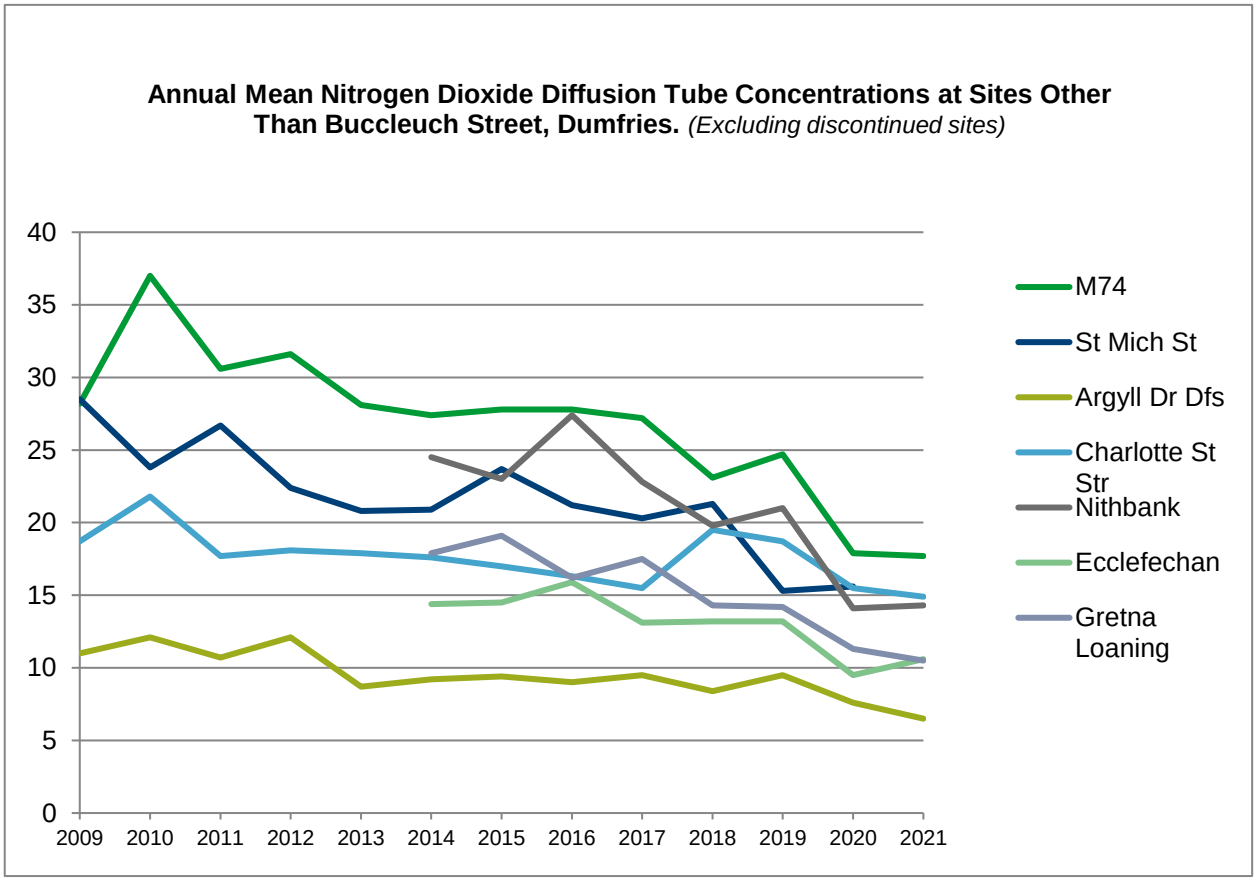
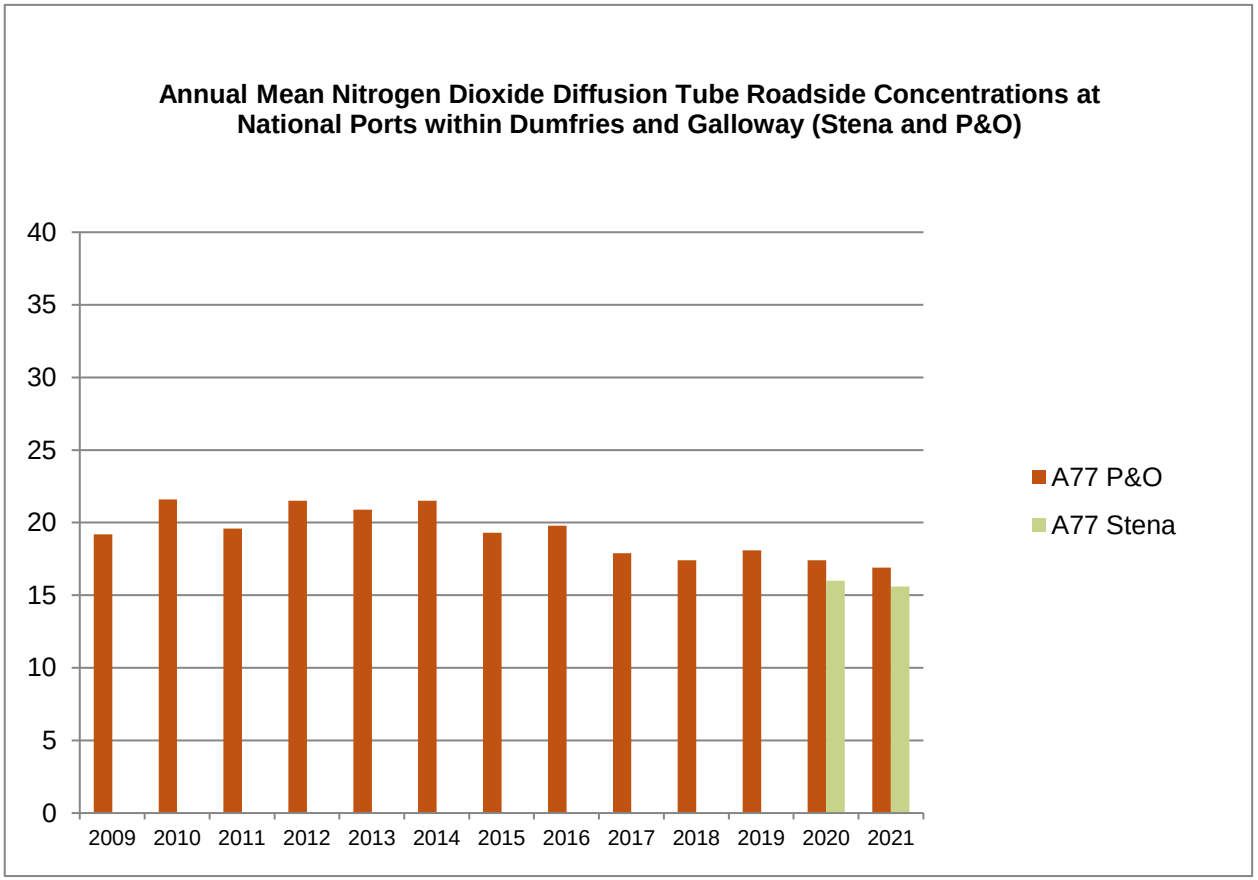


Figure A.5 **Graph Showing Annual Mean Nitrogen Dioxide Diffusion Tube Roadside Concentrations at National Ports within Dumfries and Galloway (P&O and Stena Line)**



Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Monthly Diffusion Tube Results ($\mu g/m^3$)

Site Name	NO_2 Mean Concentrations ($\mu g/m^3$)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	
													Raw Data	Bias Adjusted (1)
M74 Slip Road, Lockerbie	No Data	17.6	19.8	18.3	19.2	14.3	16.4	17.7	20	21.7	29.5	26.9	20.1	17.7
(2)Buccleuch St	No Data	26.2	20.4	25.3	21.7	19.8	19.4	18.8	24.7	25.5	31.1	27.2	22.4	19.7
(East)	No Data	26.3	20.2	22.7	26.7	20	19.9	18.5	23.7	22.3	29.5	31.9		
Dumfries	No Data	25.7	21.4	27.5	22.1	19.8	19.8	22.5	25.5	24.2	30.5	31.6		
(3)Buccleuch St (West)													23.8	20.9
Dumfries	No Data	25.5	20.5	25.2	23.7	19.8	19.7	22.1	27.9	24.4	31.0	33.3		
Buccleuch St (South)(Sheriff) Dumfries	No Data	25	21.2	17.3	23.7	20.8	19	21.8	29.5	29.3	31	33.6	23.7	20.8
(4)Buccleuch St	No Data	19.8	17.8	20.6	24.1	22.8	19.2	21.6	26.6	26.2	23.9	29.7	21.2	18.6
Bridge, Dumfries	No Data	18	12.8	20.1	23.6	19.6	18.2	21.1	24.2	24.7	23.6	28.6		
Nithbank Dumfries	No Data	19.8	10.8	20.4	16.4	12.6	12.4	15	16.9	16.3	21.9	24.8	16.3	14.3
St Michael St Dumfries	No Data	21.3	14.4	18.3	17.6	13.2	14.4	15	17.8	19.3	24.1	28.6	17.7	15.6
Argyll Drive Dumfries	No Data	9.1	6.2	6	5.8	4.9	4.2	6.2	6.9	8.9	12.4	14.7	7.4	6.5
Castle Break Ecclefechan	No Data	12.7	9.1	13.7	11.7	7.7	10	10.7	10.3	12.4	15.7	18	12.0	10.6
Gretna Loaning Gretna Green	No Data	10.6	9.3	7.5	11.2	10.2	10.6	8.5	12.5	15.2	18.9	16.8	11.9	10.5
Charlotte St Stranraer	No Data	16.8	14.4	18.2	18.5	15.1	16.7	19.5	14.7	17.8	21.2	21.4	16.9	14.9
A77 Cairnryan Stranraer P&O	No Data	V	21.4	15.3	18.5	18.8	17.9	20.5	22.5	15.9	20.7	20.5	19.2	16.9
A77 Cairnryan Stena Port	No Data	15.8	18.9	18.1	11	18.4	18.8	18.8	17.5	16.8	19.6	20.8	17.7	15.6
Kirkcudbright	No Data	15.9	14.5	12.8	25.3	13.1	16.6	15.8	17.5	14.4	18.8	19.4	16.7	14.7

Notes:

(1) See Appendix C for details on bias adjustment.

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

(3) Duplicate tubes

(4) Duplicate tubes (previously Triplicate)

(V) Tubes vandalised (or otherwise removed or sample tubes contaminated

(No Data) Tube exposure times in excess of tube accuracy and results omitted.

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

New or Changed Sources Identified Within Dumfries and Galloway Council During 2021

Dumfries and Galloway Council has not identified any new sources relating to air quality within the reporting year of 2021.

Additional Air Quality Works Undertaken by Dumfries and Galloway Council During 2021

Dumfries and Galloway Council has not completed any additional works within the reporting year of 2021. Dumfries and Galloway Council does not have any AQMAs within its area as there is no exceedance, nor is there likely to be exceedance in the future of air quality objectives.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes were prepared and analysed by SOCOTEC (Didcot) using 50% triethanolamine (TEA) in acetone. SOCOTEC has been a participant in the AIR PT proficiency scheme since its inception and was a participant in its predecessor WASP also since inception. Over the past two years SOCOTEC (formerly Environmental Scientifics Group, Didcot) has achieved 100% in the Air PT proficiency scheme.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within Dumfries and Galloway Council recorded data capture of above 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

Diffusion Tube Bias Adjustment Factors

Dumfries and Galloway Council have applied a local bias adjustment factor of 0.88 to the 2021 monitoring data. A summary of bias adjustment factors used by Dumfries and Galloway Council over the past five years is presented in Table C.1.

Triplicate diffusion tubes at Buccleuch Street (East) Dumfries are co-located with the NO_2 continuous monitor and are used to derive a local bias-adjustment factor.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	Local	-	0.88
2020	Local	-	0.91
2019	Local	-	0.89
2018	Local	-	0.84
2017	Local	-	0.86

NO_2 Fall-off with Distance from the Road

No diffusion tube NO_2 monitoring locations within Dumfries and Galloway Council required distance correction during 2021.

QA/QC of Automatic Monitoring

Routine calibrations of the automatic monitor are carried out fortnightly by Council staff, with six-monthly audits carried out by Ricardo Energy and Environment. Ratification is carried out by the Quality Assurance and Control (QA/QC) Unit at Ricardo Energy and Environment. (The NO_2 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 NO_2 continuous monitor and are used to derive a local bias-adjustment factor.

Automatic Monitoring Annualisation

The automatic monitoring location operated by Dumfries and Galloway Council located at Buccleuch Street East Inlet recorded data capture of greater than 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

Data obtained from the automatic (continuous) monitoring undertaken by the British Geological Society / Met Office only recorded a data capture of 51.2% for the 2021 LAQM APR reporting year due to a technical issue onsite. Data from this site was annualised using relevant data sets from Glasgow Townhead, Belfast Centre and Ballymena Ballykeel Urban Background AURN sites. Annualisation data is presented in Table C.2

NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within Dumfries and Galloway Council required distance correction during 2021.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

Site Name ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Annualisation Factor Glasgow Townhead UB	Annualisation Factor Belfast Centre UB	Annualisation Factor Ballymena Ballykeel UB	Average Annualisation Factor	Raw Data Time Weighted Annual Mean (µg/m3)	Annualised Data Time Weighted Annual Mean (µg/m3)
			Sufficient (>85%) annual data capture	Sufficient (>85%) annual data capture	Sufficient (>85%) annual data capture			
Eskdalemuir AURN	323551	603022	0.8760	1.010	0.8505	0.9122	1.8	1.6

Background Site	Annual Mean 2021 (Am)	Period Mean 2021 * (Pm)	Ratio Am/Pm)
Glasgow Townhead UB	18	20.6	0.87
Belfast Centre UB	20.7	20.5	1.01
Ballymena Ballykeel UB	11	13	0.85
	Average Ra		0.91

* (Period Mean calculated from available Eskdalemuir 2021 data cross referenced with same period mean background sites namely: 00:00hrs 01/01/2021 - 00:00hrs 23/02/2021 & 13:00hrs 22/03/2021 - 10:00hrs 27/6/2021)

Table C.3 – Local Bias Adjustment Calculations

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1													
2	04/02/2021	05/03/2021	26.2	26.3	25.7	26	0.3	1	0.8	22.2	81.1	Good	Good
3	05/03/2021	29/03/2021	20.4	20.2	21.4	21	0.6	3	1.6	17.39	99.1	Good	Good
4	29/03/2021	05/05/2021	25.3	22.7	27.5	25	2.4	10	6.0	24.59	98.9	Good	Good
5	05/05/2021	02/06/2021	21.7	26.7	22.1	24	2.8	12	6.9	22	99.9	Good	Good
6	02/06/2021	30/06/2021	19.8	20.0	19.8	20	0.1	1	0.3	17	99.7	Good	Good
7	30/06/2021	05/08/2021	19.4	19.9	19.8	20	0.3	1	0.7	17	99	Good	Good
8	05/08/2021	01/09/2021	18.8	18.5	22.5	20	2.2	11	5.5	17	99.9	Good	Good
9	01/09/2021	29/09/2021	24.7	23.7	25.5	25	0.9	4	2.2	21	99.1	Good	Good
10	29/09/2021	03/11/2021	25.5	22.3	24.2	24	1.6	7	4.0	21	99.8	Good	Good
11	03/11/2021	01/12/2021	31.1	29.5	30.5	30	0.8	3	2.0	26.4	100	Good	Good
12	01/12/2021	05/01/2022	27.2	31.9	31.6	30	2.6	9	6.5	26.9	99.8	Good	Good
13													
										Overall survey -->		Good precision	Good Overall DC

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

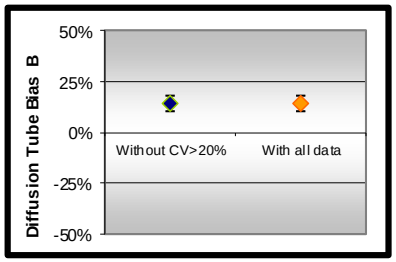
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Buccleuch St East (Inlet)

Precision 11 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 11 periods of data	
Bias factor A	0.88 (0.85 - 0.91)
Bias B	14% (10% - 17%)
Diffusion Tubes Mean:	24 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	21 μgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	21 (20 - 22) μgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.88 (0.85 - 0.91)
Bias B	14% (10% - 17%)
Diffusion Tubes Mean:	24 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	21 μgm^{-3}
Data Capture for periods used:	98%
Adjusted Tubes Mean:	21 (20 - 22) μgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

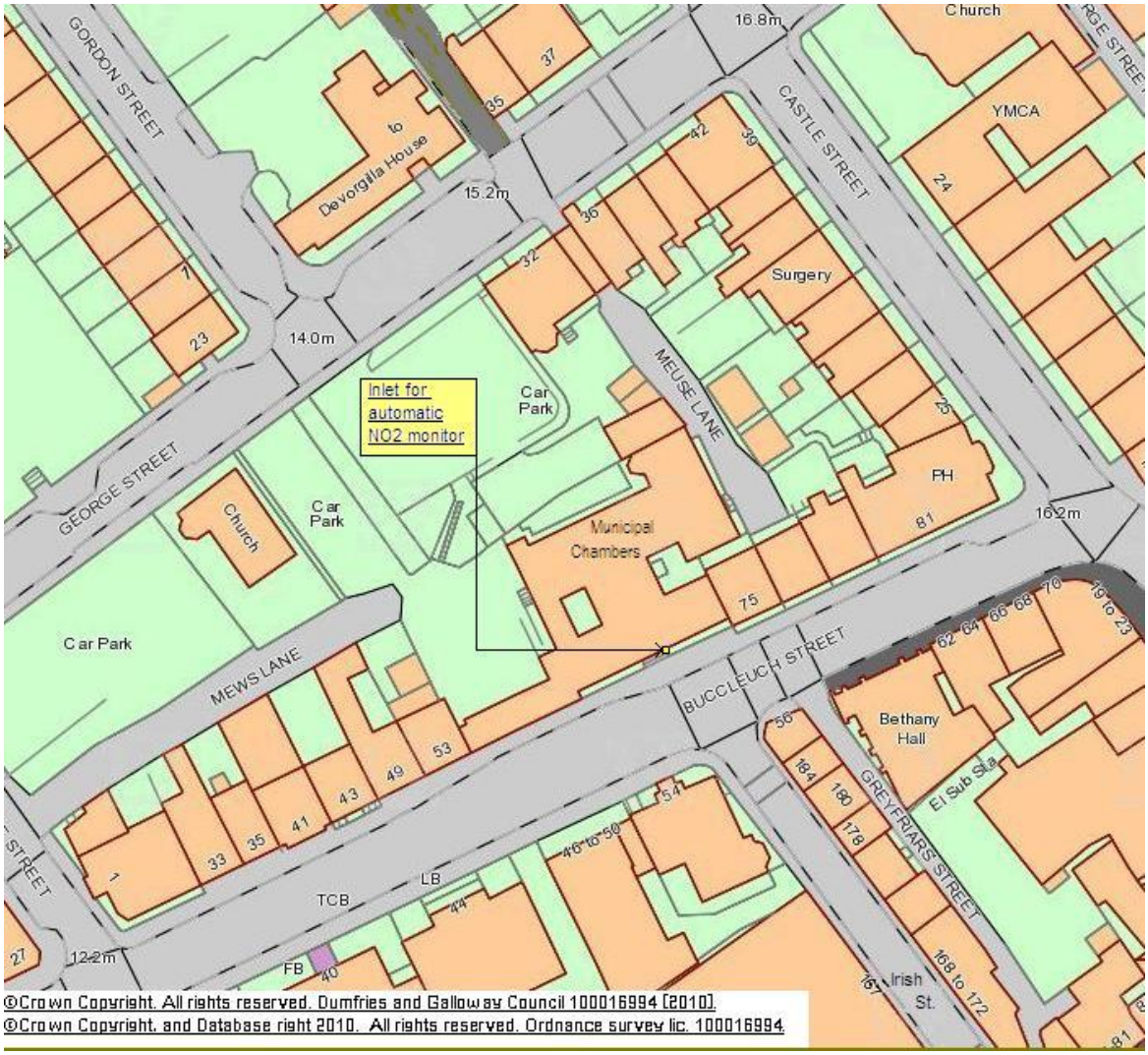
Notes:

The local bias adjustment factor of 0·88 has been used in preference to the national bias-adjustment factor of 0·78 derived by amalgamation of 23 studies. The national bias adjustment spreadsheet (version 09/21) is available to download at: http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html

A single local bias adjustment factor has been used to bias adjust the 2021 diffusion tube results.

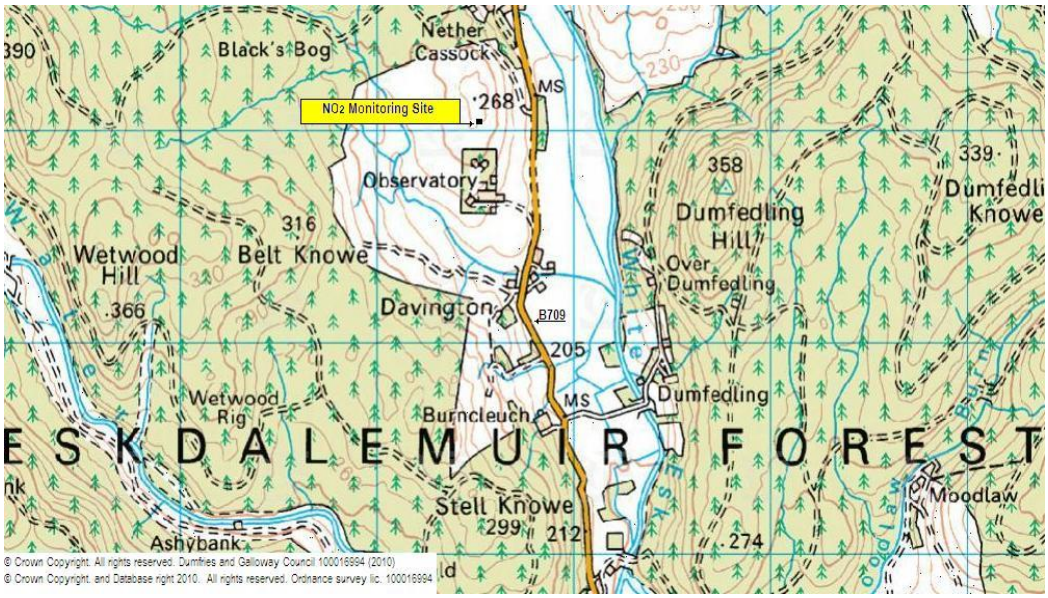
Appendix D Maps showing the location of the monitoring sites.

Figure D.1 Map of NO_2 automatic monitoring site at Buccleuch St., Dumfries.



The air intake for the AURN monitor is situated to the rear of a sign at the entrance to Municipal Chambers. The air-intake tube goes through a window to the monitor which is located in the basement of the building.

Figure D.2 Map of NO_2 automatic monitoring site at Eskdalemuir



Since December 2004 a continuous NO_2 monitor has been located at the Observatory[iii] 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.

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.

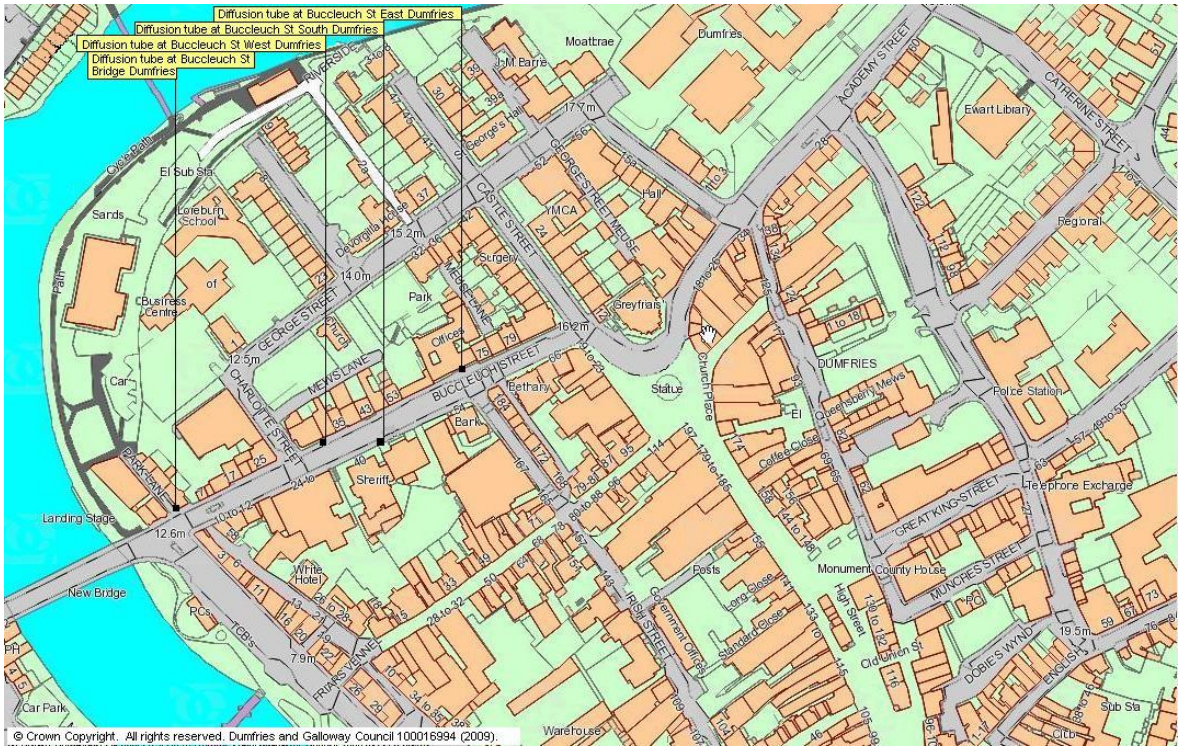
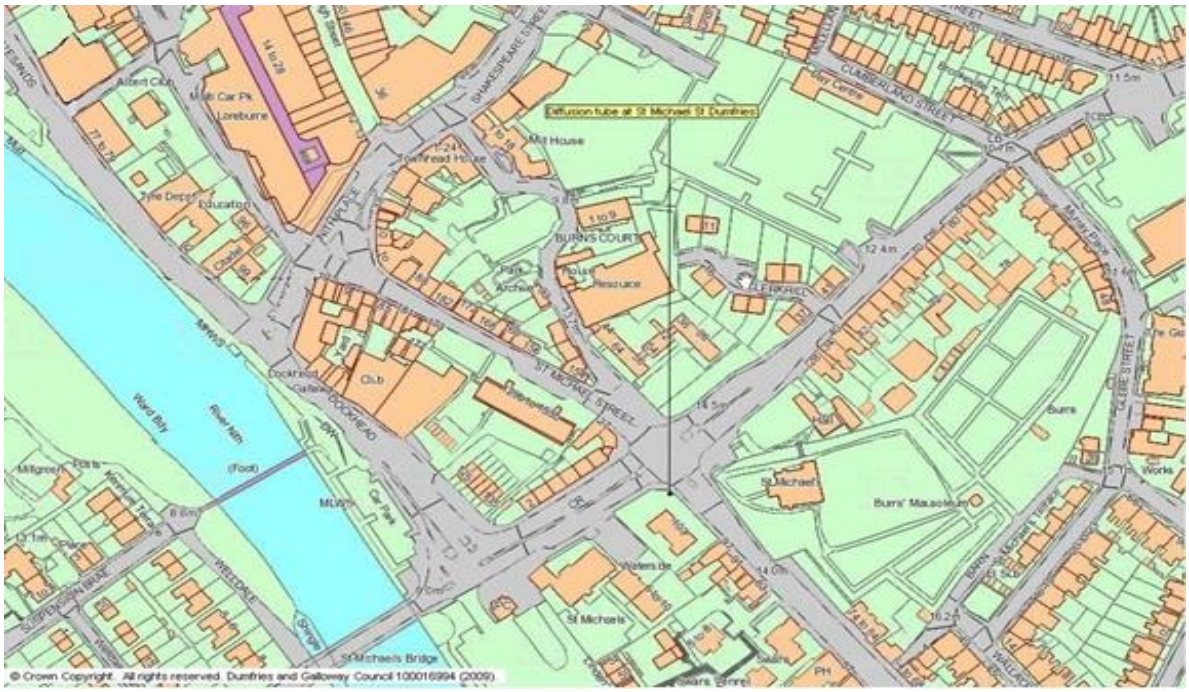


Figure D.5 Map of diffusion tube site at St Michael Street Dumfries



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

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

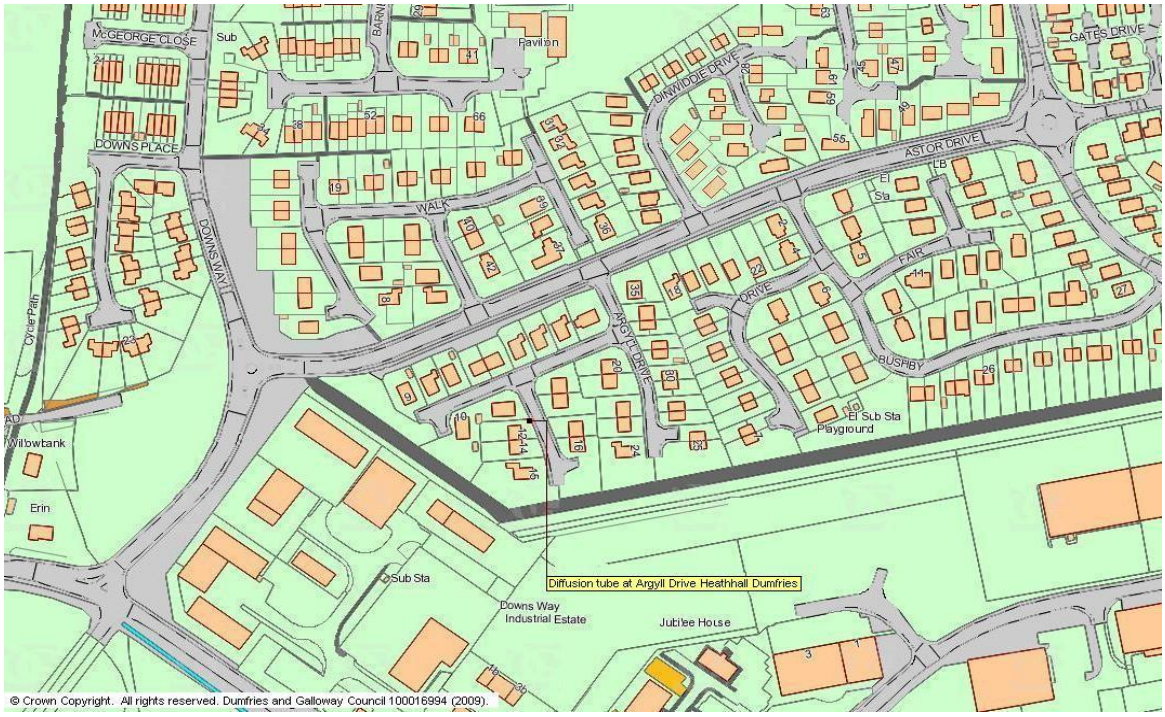


Figure D.7 Map of diffusion tube site at Charlotte St., Stranraer.

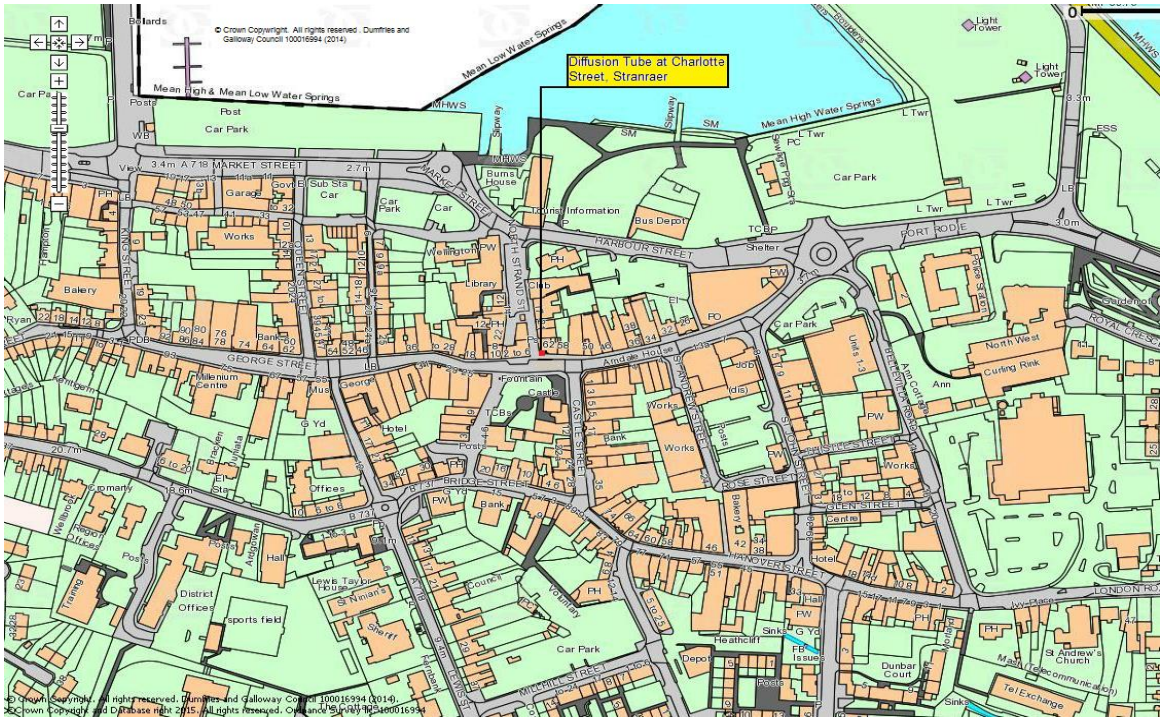


Figure D.8 Map of diffusion tube site at A77 Cairnryan (P&O).

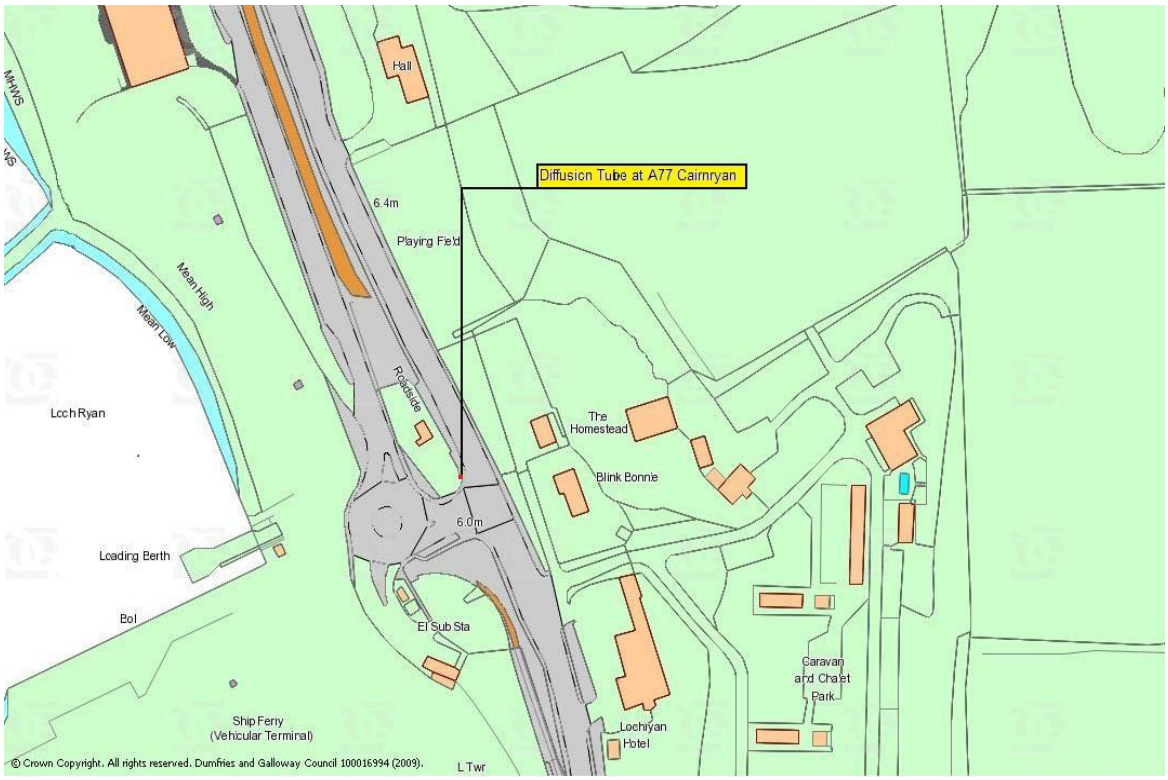


Figure D.9 Map of diffusion tube site at Nithbank, Dumfries.

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

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

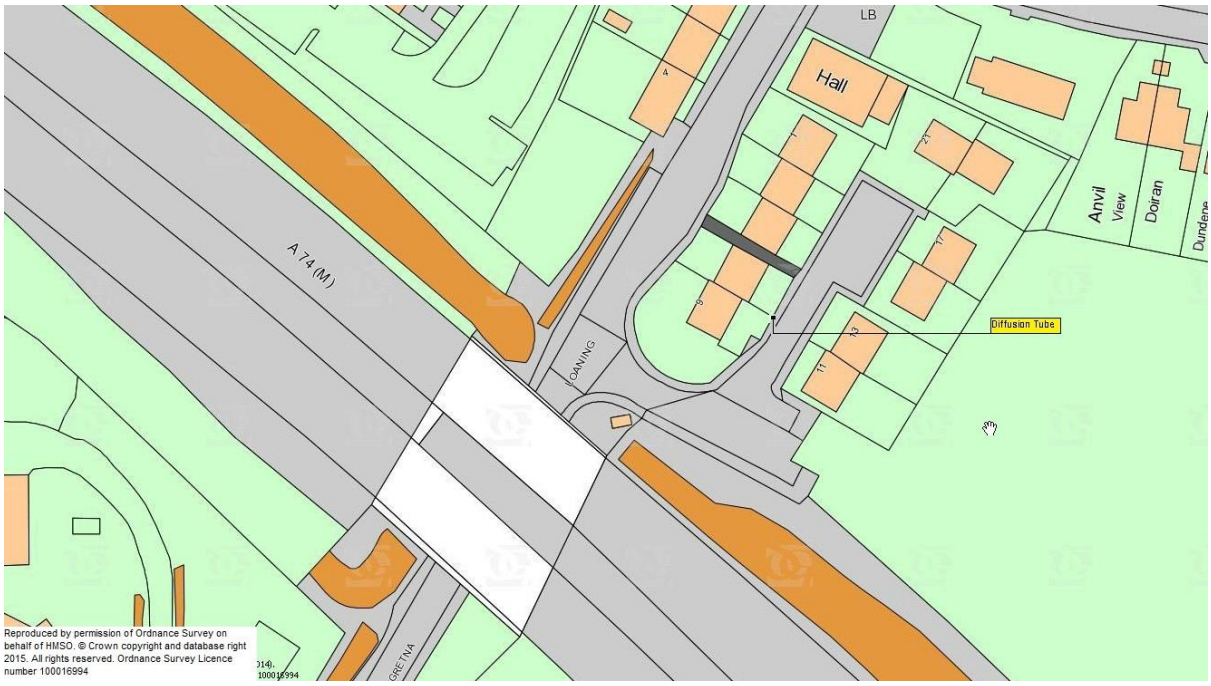


Figure D.12 Map of diffusion tube site at A77 Cairnryan Stena Line Port, Stranraer

Figure D.13 Map of diffusion tube site at Kirkcudbright

Glossary of Terms

Abbreviation	Description
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
APR	Air quality Annual Progress Report
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
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

References

1. DEFRA Local Air Quality Management Technical Guidance (TG16) April 2016