Dumfries and Galloway Council

Local Air Quality Management – Updating and Screening and Assessment

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CONTENTS

Page

1 INTRODUCTION

1.1 Project Background

Casella Stanger was commissioned by Dumfries and Galloway Council to carry out an Updating and Screening Assessment (USA) of air pollution sources that may affect local air quality within the Dumfries and Galloway area. The USA is required to be undertaken as part of the local authority's statutory duties as defined within Part IV of the Environment Act, 1995.

This report has been prepared by Casella Stanger, in partnership with Dumfries and Galloway Council. Data collation has been co-ordinated by Dumfries and Galloway Council, and has been sought from departments within the Local Authority, and external organisations where appropriate. The opinion of officers in the locality has been obtained throughout this assessment in order to accurately report existing conditions. The guidance contained in LAQM.TG(03) has been used to make predictions as appropriate.

1.2 Legislative Background

Part IV of the Environment Act, 1995, places a statutory duty on local authorities to periodically review and assess the air quality within their area. This involves consideration of present and likely future air quality against air quality standards and objectives. Guidelines for the 'Review and Assessment' of local air quality were published in the 1997 National Air Quality Strategy (NAQS) [1] and associated guidance and technical guidance. Standards and objectives for seven pollutants were prescribed through the Air Quality Regulations 1997, which were overtaken by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) [2] in 2000, along with a further addendum in 2002[3]. The Air Quality (Scotland) Regulations were published in 2000[4] and subsequently amended in 2002[5].

New Technical Guidance (LAQM.TG(03))[6] and Policy Guidance (LAQM.PG(03))[7] were issued on behalf of DEFRA in January 2003. This guidance sets the framework for the requirements of review and assessment for future years, taking account of experiences from the previous rounds of review and assessment.

1.3 Scope of USA

The USA should be used to identify those matters that have changed since the last review and assessment (the First Round), and to identify those sources that may lead to air quality objectives being exceeded. A series of checklists for pollutants, and different screening tools for industrial and road traffic sources may be used in order to determine those remaining sources that may have significant contributions to potential exceedances of the air quality objectives.

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[1] DoE (1997) The United Kingdom National Air Quality Strategy The Stationery Office
[2] DETR (2000) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working together for Clean Air, The Stationery Office
[3] Defra (2002) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum, The Stationery Office
[4] DETR (2000) The Air Quality (Scotland) Regulations 2000, The Stationery Office
[5] Defra (2002) The Air Quality (Scotland) Amendment Regulations 2002,The Stationery Office
[6] Defra (2003) Technical Guidance LAQM.TG(03), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationery Office
[7] Defra (2003) Policy Guidance LAQM.PG(03), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationery Office

The USA should, if possible, determine what has changed since the last round of review and assessment, but where the information from the last round is not clear, or new information has become available, an additional screening of sources for significance can be carried out. In many cases it may also have been 3 years since information on sources was last collated and this could therefore be out of date.

It is important to recognise that during previous assessment, information, such as road traffic data, may only have been collated for those roads considered to be important at the time of the previous assessments, and in relation to the risk of exceedance of objectives set at the time. During previous rounds this may have concentrated on motorways, and roads with greater than 20,000 vehicles per day. However, the new technical guidance indicates that in some cases, where there is relevant exposure, roads with approximately 10,000 vehicles per day may lead to exceedances of the objectives (particularly NO_2 and PM_{10}).

Therefore Casella Stanger have approached the USA as an opportunity to collate a new set of baseline information for the major sources of air pollution within the authority's boundary. This includes identifying all Part A and Part B processes, re-collecting the information on the site locations and emissions data (where available), and reviewing all traffic data available for locations within the authority's boundary.

The newly collated source data will be used to screen the relevant sources following the new technical guidance. The data will also be useful for future reviews of air quality and progress reports.

Where a risk of exceeding an air quality objective at relevant exposure locations has been identified through the USA, a detailed assessment is required (due to be reported by April 2004). The detailed assessment should identify with reasonable certainty where or not a likely exceedance will occur.

1.4 Assessment Criteria

The objectives included in the Air Quality (Scotland) Regulations 2000 and Air Quality (Scotland) Amendment Regulations 2002 have been used for the purposes of local air quality management and the process of review and assessment. These are summarised below in Table 1.1 for the seven pollutants of concern.

Table 1: USA Assessment Criteria

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 μg/m^3	running annual mean	31.12.2003
	3.25 μg/m^3	running annual mean	31.12.10
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 [a]	31.12.2003
Lead	0.5 μg/m^3	annual mean	31.12.2004
	0.25 μg/m^3	annual mean	31.12.2008
Nitrogen dioxide	200 μg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31.12.2005
	40 μg/m^3	annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)[b]	50 μg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004
	40 μg/m^3	annual mean	31.12.2004
	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
Sulphur dioxide	350 μg/m^3 not to be exceeded more than 24 times a year	1 hour mean	31.12.2004
	125 μg/m^3 not to be exceeded more than 3 times a year	24 hour mean	31.12.2004
	266 μg/m^3 not to be exceeded more than 35 times a year	15 minute mean	31.12.2005

a. The Air Quality Objective in Scotland has been defined in Regulations as the running 8-hour mean, in practice this is equivalent to the maximum daily running 8-hour mean.

b. Measured using the European gravimetric transfer sampler or equivalent.

1.5 Reporting of USA

The USA is reported in the following order so that the data used for sources can be clearly identified, and the process of deciding and justifying the need for any further detailed assessment is set out clearly.

In general, the report has been set out for sets of source type. For each source type relevant pollutants have been highlighted and screened using technical guidance (LAQM.TG(03)).

The following sections provide further details with respect to the specific aspects of the USA highlighted below:

1)	**Background Concentrations**	
2)	**Monitoring Data**	
3)	**Industrial Sources**	
	Part A Processes	Part B Processes
	Petrol Stations	Major Fuel Storage Depots
	Areas of Domestic Coal Burning	
	Shipping	Railways
	Other Sources	
4)	**Road Traffic Sources**	
	Main Roads	Significant Junctions
	Other roads	Bus Stations
5)	**Other Considerations**	
6)	**Conclusions and Recommendations**	

2 LOCAL BACKGROUND CONCENTRATIONS

Background air quality data for Dumfries and Galloway Council were obtained from NETCEN, made available through the Air Quality Information Archive located at www.airquality.co.uk which allows the user to download information files containing background concentrations for individual authorities. The background concentrations are provided for certain base years, including 2001. Background concentrations are required to be projected for relevant assessment years, which, for the purposes of the LAQM USA are the same as the date by which objectives are required to be achieved. For the projection of background concentrations to other years, the methodology described on the Dispersion Modelling Helpdesk has been used[8].

The original background concentrations for Dumfries and Galloway Council are provided in Appendix 1. The background concentrations for the centre of Dumfries have also been factored for relevant years using the relevant tables in LAQM.TG(03) and are also shown in Table 2.

Table 2: background concentrations for the centre of Dumfries

Year	CO (mg/m^3)	Benzene ($\mu g/m^3$)	1,3-Butadiene ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
2000	0.22	0.26	0.10	15.1		15.2
2001	0.20	0.24	0.09	14.6	2.20	14.8
2003	0.16	0.21	0.07			
2004						13.8
2005				13.0		
2010		0.15				12.1

NB no data were provided by www.airquality.co.uk on background lead concentrations

[8] Y.Brown (2003), Guidance Note for Use of Projection Factors for Background and Roadside pollutant concentrations. http://www.casellastanger.com/JointProjects/Detail.asp?id=88&jointprojectid=7

3 MONITORING DATA

The following sub-sections provide further updates with respect to monitoring of air pollutants carried out within the authority's area. It draws upon existing local data sets and, where necessary, national data sets, which highlight the current monitoring position within the authority's area and where there is evidence to show (through monitoring alone) whether there is a likelihood of exceeding any of the current national air quality objectives. Monitoring data used in this assessment are included in Appendix 2.

Dumfries and Galloway Council has not declared an Air Quality Management Area (AQMA) following the results of the first round of Review and Assessment. Therefore all monitoring refers to that undertaken outwith an AQMA.

3.1 Carbon Monoxide (CO)

Monitoring for CO is undertaken at a kerbside site in the centre of Dumfries (Buccleuch Street (NX970762 – see Appendix 2 for location) using an API M300 analyser. This site is considered to be the primary pollution hotspot in the Dumfries and Galloway area following the first round of review and assessment. The site forms part of the UK Automatic Urban and Rural Network for air quality monitoring across the UK and monitors for CO on a real time basis, reporting hourly concentrations via the Central Management and Co-ordination Unit and the QA/QC unit at AEA Technology NETCEN. Ratified data for 2002 were supplied by NETCEN. Analysis of the results revealed 94% data capture and an average running 8 hour mean of 0.61mg/m^3 and a maximum running 8 hour mean of 3.87mg/m^3. This is below the NAQO.

3.2 Benzene

Road traffic is the main source of benzene in the UK. However, results from the first round of review and assessment have highlighted the need to also consider emissions from petrol stations in the vicinity of residential properties in closer detail. Consequently, it is these two sources that provide the focus of attention with respect to benzene in the current work.

No monitoring has been undertaken for benzene in the Dumfries and Galloway area for this round of review and assessment. A passive diffusion tube had been located in Buccleuch Street, Dumfries, for a period of one month, during the first round of review and assessment (June 1999). The reported concentration was 8.12μg/m^3. This is below the current NAQO for 2003, but above the NAQO for 2010. Based on the correction factors presented in Box 3.4 of LAQM.TG(03), the above concentration could decrease to 1.90μg/m^3 by 2010. This is below the NAQO for 2010.

3.3 1,3-Butadiene

Monitoring for 1,3-butadiene was undertaken in the vicinity of the Gates Rubber Company and Gates Power Transmission during the first round of review and assessment, following concerns that the NAQO may be breached.

The tubes were supplied by Clyde Analytical, and use molecular sieve packing as the absorbent material. Internal QA/QC measures are applied in the absence of external programmes.

Monitoring was undertaken at five locations (see Appendix 2 for locations) between 1st November 2000 and 1st May 2001 for periods of one month at each location. All concentrations were reported to be below 2.25μg/m^3, and were thus below the current NAQO.

Since the conclusion of the first round, the Gates Rubber Company has changed its trading name to Interfloor Ltd.

3.4 Lead

Since 1 January 2000, the sale of leaded petrol has been banned across Member States of the European Union, with the result that lead emissions from road traffic are now negligible. As such, the focus of attention with respect to lead and its occurrence is hot-spots arising from industrial emissions.

Lead concentrations had been monitored at Eskdalemuir as part of the UK multi-element network, which aims to provide information for a range of trace metals across the UK, and the likely compliance with any EU Directives.

The annual concentration of lead recorded at Eskdalemuir had been below 0.02μg/m^3 since 1986.

3.5 Nitrogen Dioxide

Monitoring for NO_2 has been undertaken using continuous and passive methods.

Continuous monitoring data

A continuous analyser (API M200a) is located on Buccleuch Street in Dumfries, which was identified as the authority's hot spot during the first round of review and assessment. The site forms part of the UK Automatic Urban and Rural Network for air quality monitoring across the UK and monitors for NOx/NO_2 on a real time basis, reporting hourly concentrations via the Central Management and Co-ordination Unit and the QA/QC unit at AEA Technology NETCEN.

Ratified data for 2002 were supplied by NETCEN. The data reported a 95% capture and an annual average concentration of 36.1μg/m^3 with no hourly mean above 200μg/m^3. Thus, ambient concentrations for 2002 suggest that the NAQOs for NO_2 will not be exceeded in 2005, which is consistent with the results of the first round.

Passive Monitoring Data

Dumfries and Galloway Council has used passive diffusion tubes to ascertain NO_2 concentrations throughout the area. The tubes are prepared and analysed by Casella SEAL (formerly known as GMSS) using UKAS accredited method AQ/02 (10% TEA in water) (see Appendix 2 for the Schedule of Accreditation).

Bias Correction of Diffusion Tubes

Dumfries and Galloway Council has undertaking a local co-location exercise between the diffusion tubes and the continuous analyser located in Buccleuch Street. Dumfries and Galloway Council currently has only three months of data available and therefore

any comparisons at this stage should be taken as indicative. The data were manipulated as detailed in Box 6.4 of LAQM.TG(03). The results are presented in Table 3.

Table 3: average concentrations reported by the two monitoring methods on Buccleuch Street, Dumfries (μg/m³).

	Average concentration (continuous)	Average concentration (Passive)	Ratio continuous/passive
March	36.4	43.3	0.841
April	38.3	39.0	0.982
May	30.8	28	1.100
Average	**35.2**	**36.8**	**0.956**

Although currently limited in its use, the average concentrations over the three month period demonstrates a good agreement between the two monitoring methods. However, there is possibly a seasonal trend with the bias rising between March and May, although further data are required to confirm this. This seasonal trend may become clearer during an annual period of monitoring. It will also then be possible to calculate a method bias that can be applied to the annual means of the diffusion tube monitoring.

Considerable attention has been paid to the accuracy of passive diffusion tubes since the first round of review and assessment. A recent study[9] has analysed results of co-location studies across a number of authorities in an attempt to define default correction (bias) factors for diffusion tubes prepared by different laboratories, whilst additionally determining whether site location and/or seasonal differences occur.

A comparison between Dumfries and Galloway Council data and Derbyshire County Council data can be made through the above study. Derbyshire County Council used Casella GMSS (now Casella SEAL) NO_2 diffusion tubes that had been prepared using the 10% TEA in water method and exposed over 1 month. These are the same preparation and exposure methods used in the Dumfries and Galloway study.

The annual period (2001) of exposure revealed a seasonal variation in the bias, with diffusion tubes under-reading compared with the continuous analyser in the summer months, and over-reading in the winter months as detailed in Table 4 below. This is similar to the initial trend observed in Buccleuch Street. The annual bias for the Derbyshire County Council data was found to be an under-read of the diffusion tube method, compared with the continuous method, of 5.6%.

[9] Laxen, D.P.H. (2002) Compilation of diffusion tube collocation studies carried out by local authorities, Defra and the Devolved Adminsitrations.

Table 4: data obtained from an annual monitoring period using preparation and exposure periods similar to those on Buccleuch Street, Dumfries – directly reported from ref.[9]

	Concentration (μg/m^3)		Bias
	Tube	Continuous	
Summer	23	30	-22.8%
Winter	47	45	+6.0%
Average	35	37	-5.6%

Passive Monitoring Results

Passive monitors were located in several areas as detailed in Table 5 and Appendix 2. The data cover a ten-month period from August 2002 to May 2003.

Table 5: Passively monitored NO_2 concentrations throughout Dumfries and Galloway

Location	Town	Classification	Average (10 months)	Standard Deviation	Bias Corrected Average AQ Consultants[9]
Buccleuch St (W)	Dumfries	Kerbside	34.5	8.57	36.4
M74 Slip Road	Lockerbie	Intermediate	27.7	10.1	29.3
Loreburn St	Dumfries	Kerbside	35.3	7.9	37.3
St Michael St	Dumfries	Roadside	21.7	7.2	22.9
Argyll Drive	Dumfries	Background	12.4	6.1	13.1
Charlotte St	Stranraer	Kerbside	18.8	8.9	19.9
Port Rodie Car Park	Stranraer	Intermediate	18.4	8.6	19.4
A77 Cairnryan	Stranraer	Roadside	16.0	3.5	16.9

All average concentrations are below the annual mean NAQO, based on the ten months of data. The highest concentration was observed at Loreburn Street in Dumfries (37.3μg/m^3 bias corrected). This is located in the centre of Dumfries, close to Buccleuch Street, and demonstrates a good agreement with the average concentration observed here, by the real time method.

If the average bias from the above Derbyshire County Council study is applied to the average diffusion tube concentrations for Dumfries and Galloway, it can be seen that the NO_2 concentrations remain below the NAQO for 2005. However, a more rigorous approach would be to use the bias obtained from an annual period of monitoring on Buccleuch Street.

3.6 Sulphur Dioxide

Real time monitoring for SO_2 has been undertaken in Sanquhar (Dumfries and Galloway Council Housing Office, 100 High Street, Sanquhar – see Appendix 2 for location), which is a coal burning area. This area was highlighted as an area of potential concern during the first round of review and assessment.

An SO_2 monitor was installed at 100 High Street, Sanquhar, between December 2001 and March 2002 inclusive. The model used was API 100A continuous UV Fluorescent SO_2 analyser. This analyser is approved for use on the UK monitoring networks by AEA NETCEN, and can therefore be considered to be fit for use in this instance. The analyser was manually calibrated on a fortnightly basis throughout the monitoring period. The SO_2 gas used for the fortnightly calibrations was from a certified gas cylinder traceable to a primary source at Messer UK. An integral SO_2 source (non-traceable) automatically gauged performance on a daily basis. Measurements were collected remotely once per day and checked.

The average 15 minute concentration over the three month monitoring period was 28μg/m^3 and the maximum was 255μg/m^3; for the 1 hour monitoring period, the average over the three month survey was 28μg/m^3 with a maximum of 196μg/m^3; the average 24 hour concentration was 27.5μg/m^3, with a maximum of 65.4μg/m^3. These concentrations are below the NAQOs and suggest that SO_2 concentrations in Sanquhar are not a cause for concern. Further discussion of the monitoring programme, with specific reference to coal burning, is presented in section 4.4.

3.7 Particulate matter - PM_{10}

Monitoring for PM_{10} is currently undertaken in Buccleuch Street, Dumfries, using a Rupprecht and Patshnick (R&P) Partisol 2025 unit. This is a sequential gravimetric sampler containing an automatic filter exchange mechanism that enables up to 16 days unattended monitoring. Filters are weighed in accordance with the requirements of the European reference method for gravimetric sampling of PM_{10} (EN12341) for filter handling. The site forms part of the UK's compliance measurements for reporting against the EU's First Daughter Directive. NETCEN provide the necessary QA/QC procedures associated with the production of ambient concentration data.

The data for 2002 reported a 94% data capture, and the average 24 hour mean was 21.4μg/m^3 with 17 days in excess of 50μg/m^3. Based on this assessment, the NAQO will not be exceeded in 2004, although these figures are currently above the NAQO to be achieved in 2010. Using the guidance in Box 8.6 and the conversion factors on Box 8.7, the annual mean may fall to 19.5μg/m^3 by 2010. This is still above the NAQO.

3.8 Conclusions of existing monitoring within Dumfries and Galloway

There is sufficient evidence to indicate that all of the NAQOs will be met at the monitoring locations, with the exception of PM_{10} in Buccleuch Street in 2010. The monitoring locations have been carefully selected to represent those areas with the highest potential for exceedance. Therefore, it is likely that no other area will be subject to a potential exceedance of any of the NAQOs.

4 INDUSTRIAL SOURCES

4.1 Prescribed Processes

Prescribed processes are considered to be important sources of airborne pollutants. Data were obtained from the Public Register held at the Scottish Environment Protection Agency West Region Headquarters in East Kilbride. Appendix 3 contains the lists of prescribed processes relevant to Dumfries and Galloway. It was necessary to consider prescribed process sources for all of the target pollutants except CO, according to LAQM.TG(03).

Benzene

There are no major industrial sources of benzene in the area (Appendix 3).

Gates Power Transmission Ltd is the only process within Dumfries and Galloway that is authorised to emit benzene. However no emission has been reported on the Public Register, therefore it can be assumed that the process does not pose a risk of exceedance of the NAQO in 2003 nor 2010.

1,3-Butadiene

There are no new industrial sources of 1,3-butadiene in the area (Appendix 3).

Lead

Industrial processes that emit lead are included in Appendix 3. Many of these sites have been previously assessed and have not demonstrated a problem with the attainment of the air quality objective for lead. However, there is one new source of lead that has commenced in Dumfries and Galloway since the first round of review and assessment. This is Aggregate Industries UK Ltd, which is a roadstone coating process (tar and bitumen). It has an emission limit of 5mg/m^3, measured as lead in oil. This process is not considered to present a risk to the NAQO in accordance with LAQM.TG(03).

There are no other industrial sources with substantial or increased emissions of lead to air within the area.

NO_2

Appendix 3 shows the list of industrial processes from which NOx/NO_2 is emitted. Many of these sites have been previously assessed and have not demonstrated a problem with the attainment of the air quality objective for NO_2 objectives. However, there is one new source of NO_2 that has commenced since the first round of review and assessment. This is Alubrite Ltd, which is an acid process involving the surface treatment of metals. The emission limit for NO_x (NO_2 equivalent) is 400mg/m^3. This process is not considered to pose a risk to the NO_2 NAQOs in accordance with LAQM.TG(03).

In addition, a power generating company is seeking to develop an electricity generating plant, located to the north of Lockerbie, that will operate on biomass. This is a potential source of NO_x and therefore NO_2. Dumfries and Galloway Council will consider the potential impact of this plant on ambient air quality and the NAQOs through their input to the planning system. There is also a proposal for an energy from waste plant at Dargavel that has recently been granted planning consent.

There are no other industrial sources with substantial or increased emissions of NO_2 to air within the area.

SO_2

Appendix 3 shows the list of industrial processes from which SO_2 is emitted. Many of these sites have been previously assessed and have not demonstrated a problem with the attainment of the air quality objectives for SO_2. However, there is one new source of SO_2 that has commenced since the first round of review and assessment. This is Incineration Scotland, an animal cremation facility. This process has an emission limit of 300mg/m^3 of SO_2. It is not considered to pose a risk to the NAQO in accordance with the general guidance issued in LAQM.TG(03).

There are no other industrial sources with substantial or increased emissions of SO_2 within the area.

PM_{10}

Appendix 3 shows the list of industrial processes from which PM_{10} is emitted. There are fourteen APC (Part B) and one PPC processes that are authorised to emit PM_{10}. Many of these sites have been previously assessed and have not demonstrated a problem with the attainment of the air quality objectives for PM_{10}. Of the fourteen APC processes, there are three new industrial sources of PM_{10}. These are:

- Youngs Bluecrest Seafoods Ltd, treatment/processing of animal matter, which has a particle emission limit of 50mg/m^3;
- Aggregate Industries UK Ltd, coating of roadstone with bitumen/tar, which has a particle emission limit of 100mg/m^3; and
- Incineration Scotland, cremation of animal remains, which has a particle emission limit of 100mg/m^3.

Process authorisations tend to set emission limits on total suspended particles rather than PM_{10}. Thus these emission limits should not be considered as limits on PM_{10}. However, for the purpose of this assessment it can be assumed that all particles emitted from point sources associated with the stack are done so in the PM_{10} fraction, which provides a worse-case scenario (ignoring those particles that are omitted that occur in the size fraction > 10 microns in diameter). None of these processes are considered to pose a risk to the NAQOs in 2004 nor 2010 following consultation with SEPA and with reference to LAQM.TG(03) Appendix E.

In addition, a power generating company is seeking to develop an electricity generating plant, located to the north of Lockerbie, that will operate on biomass. If the plant gains planning permission, there is the potential for this plant to be a new source of particles. Dumfries and Galloway Council will consider the impact of these proposed processes through their input to the planning process.

Planning consent has also been granted for an energy-from-waste (pyrolysis) plant at Dargavel, near Dumfries, a proposed refuse-derived-fuel plant for the physico-chemical treatment of waste (evaporation and drying) also near Dargavel, and a crematorium (single cremator), near Collin. None of these processes have, as yet, commenced operation, but have the potential to be in operation by 2010.

There are no industrial sources with substantial or increased emissions of PM_{10}.

4.2 Petrol Stations

Petrol stations are considered to be potential sources of benzene. However, the extent to which these are of concern depends upon their proximity to residential properties and the design of the forecourt, alongside the annual turnover of volumes of petrol and whether vapour-recovery systems are installed.

There are 59 petrol stations in the Dumfries and Galloway area. Of these, 33 are authorised by SEPA. Nineteen of the 33 authorised processes have an annual turnover in excess of 1000m^3 per year. In addition, 21 of the 59 petrol stations in Dumfries and Galloway have residential properties within 10m of the petrol pumps. None of these 21 petrol stations are located on roads with AADT flows in excess of 30,000.

Therefore, according to Box 3.2 of LAQM.TG(03), none of the petrol stations have the potential to result in an exceedance of the NAQO.

4.3 Major Fuel Storage Depots

There are no major fuel (petrol) storage depots in the Dumfries and Galloway area.

4.4 Areas of Domestic Coal Burning

The first round of review and assessment indicated that Sanquhar, which is the primary area where coal burning for domestic heating purposes takes place, did not exceed a density of 300 coal burning properties per 1km^2 grid. At the time, no data were available on the frequency of coal burning through fuel use surveys, and this remains the same for the current assessment, albeit against an assessment of new criteria for SO_2 and PM_{10}.

Real time monitoring for SO_2 was undertaken in the village between December 2001 and March 2002, covering a total period of almost four months, when fuel use was expected to be at its highest. The average 15 minute concentration was 28$\mu g/m^3$ and the maximum was 255$\mu g/m^3$. The data capture was 79%.

The highest concentration recorded was lower than the NAQO, although the data capture was lower than is normally accepted for monitoring studies. However, the monitoring was undertaken during the period most likely to experience higher concentrations of SO_2 due to coal burning, and no exceedances were recorded. Therefore, despite the uncertainties due to the limited monitoring period and the low data capture, it is unlikely that the NAQO will be exceeded.

The background concentration of PM_{10} reported for the village in 2004 is 13.1$\mu g/m^3$; this falls to 12.5$\mu g/m^3$ in 2010. It is therefore unlikely that the PM_{10} NAQO will be exceeded either in 2004 or 2010. However, a survey will be undertaken to ascertain the density and occurrence of coal burning in Sanquhar to confirm this assumption and will be reported once the data have been compiled.

4.5 Shipping

There are two ports within Dumfries and Galloway. These are Cairnryan and Stranraer. Data were sourced on the fuel types and movements by the operators of each port. Cairnryan is operated by P&O European Ferries (Irish Sea) Limited, and

Stranraer is operated by Stena Line Limited. Shipping is considered to be a potential source of SO_2.

Two types of vessel use the port at Cairnryan: these are two conventional ferries and a 'fast craft'. The ferries use heavy fuel oil, and the fast craft uses marine gas oil. The average number of ship movements per year was reported to be 5670, with an estimated 5650 in 2005. There are no residential properties within 200m of the ferry terminal at Cairnryan. Given that one of the three vessels operating from this port, uses marine gas oil which is low in sulphur content, it is unlikely that shipping in Cairnryan poses a risk to the NAQO.

Stena Line Limited operate two ferries out of the port of Stranraer. One ferry uses heavy fuel oil and the other ferry uses marine gas oil. The budgeted number of ship movements for 2003 is 9872. A fuel analysis report for each fuel was received from the operating company. The company moved to low sulphur fuels in October 2002, and reported sulphur contents of 0.2 and 0.9%m/m (mass/mass) respectively for the two fuels noted above. In addition, there are no residential properties within 300m of the ferry terminal at Stranraer and the berths are down wind of the town under prevailing wind conditions.

Based on the above information, Dumfries and Galloway Council proposes to undertake a Detailed Assessment with respect to shipping.

4.6 Railways

There are no locations where diesel locomotives are regularly stationary for periods of 15 minutes or more, where there is the potential for regular outdoor exposure of members of the public.

4.7 Other Sources

Small boilers (>5MW$_{(Thermal)}$) burning coal or oil

Four boilers had been identified by a Scottish Executive publication (dated 2000)[10] as having a rating in excess of 5MW burning coal or oil in Dumfries and Galloway. Since then the authorisation has been revoked for two boilers operated by Chirex Ltd. The two boilers operated by the Caledonian Cheese Company are still in operation, but now operate on light gas oil rather than heavy fuel oil as detailed by the Scottish Executive publication. Therefore they do not pose a risk to the NAQO according to Box 7.2 of LAQM.TG(03). According to local knowledge, there are no other small boilers that have commenced operation since the report was written.

There are also two British Gas compressor stations within the area, but these are not considered, by SEPA, to pose a risk to the NAQO due to the absence of public exposure.

Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc.

There are five quarries where authorised activities occur, and six where mobile plant is occasionally used; eleven landfill sites (taking inert, household and/or commercial waste) and one opencast coal site (that has planning consent but is not yet in operation)

[10] Scottish Executive, 2000. Emissions of Sulphur Dioxide from Small Combustion Plants of <20MW.. Prepared by Entec.UK Limited.

in Dumfries and Galloway. However, none present a risk to the PM_{10} NAQO due to a lack of human exposure and the low PM_{10} background observed across Dumfries and Galloway – the PM_{10} background concentration is below 16μg/m^3 and there are no residential properties within 200m of the activity on site (p.8-20 of LAQM.TG(03)).

In addition, no complaints had been received either by SEPA nor Dumfries and Galloway Council with respect to nuisance dust or odours as a consequence of operations taking place at any of the sites.

Aircraft

There are no major airports in Dumfries and Galloway.

4.8 Summary of industrial and area sources

This part of the assessment has been completed based on SEPA records, Scottish Executive publications, data from operators and local knowledge. There are few areas that have posed any concern. Although it is not believed that SO_2 or PM_{10} concentrations in Sanquhar will be a problem, Dumfries and Galloway Council will undertake an assessment of the density of coal burning, for future reference. Dumfries and Galloway Council will also undertake a Detailed Assessment of shipping activities, to be reported in 2004.

5 ROAD TRAFFIC SOURCES

The first round of review and assessment highlighted Buccleuch Street in Dumfries as being a potential area for exceedance of the NAQOs. This route has also been historically monitored for road traffic flows. Consequently the assessment of exposure to traffic emissions in this area has been the focus of the assessment.

However, there are also several trunk routes that pass through Dumfries and Galloway. Traffic flows on these routes have been obtained from the Roads Department and the Scottish Executive and assessed against current guidance. No areas were identified where the flows were above the relevant AADT trigger levels and where there was the potential for exposure.

Data used in the assessment are presented in Appendix 4.

5.1 Main Roads

CO

The background figure reported for the centre of Dumfries and factored for 2003 is 0.16mg/m^3 and the annual average daily traffic (AADT) flows for the single carriageway through the centre of Dumfries was reported to be between 14,400 and 15,500 over four years from 1998 to 2001. Both the background concentration and the traffic flows are below the trigger levels established in Box 2.2 of the Technical Guidance (LAQM.TG(03)). None of the trunk roads in the area were reported, by the Roads Department of Dumfries and Galloway Council, to have AADT flows in excess of the trigger levels.

Benzene

The background figure reported for the centre of Dumfries and factored for 2003 is 0.21μg/m^3 and the annual average daily traffic (AADT) flows for the single carriageway through the centre of Dumfries was reported to be between 14,400 and 15,500 over four years from 1998 to 2001. Both the background concentration and the traffic flows are below the trigger levels established in Box 3.2 of the Technical Guidance (LAQM.TG(03)). None of the trunk roads in the area were reported, by the Roads Department of Dumfries and Galloway Council, to have AADT flows in excess of the trigger levels.

NO_2

Narrow congested streets with residential properties close to the kerb

The main street of concern is Buccleuch Street in Dumfries. This street is not considered to be a street canyon as the road is approximately 16m wide, while the average height of the buildings on either side is approximately 12m. However, there are residential properties where the front façade is within 10m of the route centre line.

The AADT flow in 2001, based on five months of data was 14,487. This was almost 1000 vehicles per day (~6%) less than the AADT flow reported for 1998 (12 months of data – 15,348).

The DMRB assessment was based on the traffic flow for 2000. This was the last year that 12 months of data was available for the traffic counter on Buccleuch Street, and the first year that AADT flows were reported for Buccleuch Street Bridge as part of

the SCOOT system assessment. The AADT flow on Buccleuch Street has decreased over four years, as detailed above (by 6%) and carries two thirds of the traffic flowing across Buccleuch Street bridge. Traffic on Whitesands carries the remaining one third of traffic, away from Buccleuch Street, and demonstrated a 1.7% growth between 2000 and 2002. Therefore, using data reported for 2000 allows for direct comparison between the two traffic flows and also represents a worst case scenario under current changes in flow.

The background concentration, reported for 2001, was factored for 2005 using the conversions reported in LAQM.TG(03). The speed was based on field observation, and the HGV split was based on a 12 hour manual count reported for an average weekday (29 April 2003).

Following the first round of review and assessment, the annual mean for NO_2 was found to be more stringent than the 1 hour mean with Air Quality Management Areas with respect to NO_2 only being declared due to a predicted exceedance of the annual mean. The NO_2 annual mean was predicted for a property located 10m from the carriageway centre line, at the junction of Buccleuch Street and Whitesands (see Appendix 4 for the location). This is considered to be worst case as the property is located close to the traffic flows on each of the carriageways. It is one of the few residential properties on Buccleuch Street. Any pedestrians located on Buccleuch Street would be found within the 8 to 10m band away from the carriageway centre line, and thus, this receptor can be considered to be representative of pedestrian exposure. It should be noted that relatively few pedestrians would be expected in this area as it is not one of the busiest shopping streets.

The predicted annual mean at the receptor for 2005 was 21.0μg/m^3. This is below the NAQO.

In addition, real time and passive diffusion tube monitoring reported for 2002 was also below the annual mean NAQO. This suggests that the annual mean NO_2 NAQO will not be exceeded in Buccleuch Street, Dumfries. It is therefore unlikely that any street in the area will experience annual mean NO_2 concentrations above the NAQO in 2005.

Busy streets where people may spend 1 hour or more close to traffic

Given the above assessment for Buccleuch Street, it is unlikely that any street in Dumfries and Galloway will result in an exceedance of the NO_2 NAQOs.

PM_{10}

Busy roads and junctions in Dumfries and Galloway

Buccleuch Street in Dumfries is the primary cause for concern in the area. The AADT flow for 2000 was used to predict future concentrations for 2004 and 2010 for a receptor located 10m from the carriageway centre line (see the assessment of NO_2 for further details). The background concentration reported for Dumfries in 2001 was factored for the appropriate year.

The predicted concentration for 2004 was 17.3μg/m^3 with one day in excess of 50μg/m^3. For 2010, the predicted concentration was 14.1μg/m^3 with no days above 50 μg/m^3. Both of these predicted figures are below the NAQOs for the relevant years.

5.3 Significant Junctions

Given the above assessment for Buccleuch Street and Whitesands, it is unlikely that any junctions in Dumfries and Galloway will result in an exceedance of the NO_2 or PM_{10} NAQOs.

5.4 Other roads

Roads with high flows of buses and/or HGVs

There are no roads with high flows of buses and/or HGVs.

New roads constructed or proposed since the first round of review and assessment

No significant new roads have been constructed in the area since the first round of review and assessment. No details were provided by the Planning Department to suggest that any new roads are currently being proposed.

Roads close to the objective during the first round of review and assessment

The only road that was considered to be close to the objective following the first round of review and assessment was Buccleuch Street in Dumfries. The above assessments have indicated that, based on current data, the NAQOs will not be exceeded.

Roads with significantly changed traffic flows

A SCOOT system was implemented on Buccleuch Street to improve the flow of traffic. Any measure to improve flows will result in an improvement in air quality. There are no other roads with significantly changed traffic flows.

5.5 Bus Stations

Bus stances are located in the centre of the town for the purposes of dropping off and picking up of passengers. The flow of buses is not greater than 1000 buses per day and are therefore not considered to be a source of relevant exposure.

5.6 Summary of Road Traffic Sources

This part of the assessment has used traffic flows obtained from the Scottish Executive and the Roads Department of Dumfries and Galloway Council, manual 12 hour counts and local knowledge. The method contained in the Design Manual for Roads and Bridges, Air Quality Volume 11 Section 3 Part 1 (2003) has been used throughout to predict future concentrations. This is a widely recognised and approved predictive method, used by regulatory bodies throughout the UK.

The assessment has not identified any areas where traffic emissions present a risk of exceeding any of the NAQOs.

6 OTHER CONSIDERATIONS

Areas with Combined Impacts

There are no areas in Dumfries and Galloway that give any cause for concern due to combined impacts.

Neighbouring Authorities

Dumfries and Galloway Council has been in consultations with the neighbouring authorities. None have reported any potential or new developments that might have an impact on the local air quality in Dumfries and Galloway.

7 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions can be drawn from this assessment:

CO

The maximum measured running 8-hour mean for Buccleuch Street in Dumfries, the local authority's hot spot, was reported to be below the current NAQO to be achieved by the end of the year (2003). In addition, there are no roads above the action triggers reported in the Technical Guidance. There are no other major sources of CO in the area. However, an electricity generating company is currently seeking to develop an electricity generating plant, located to the north of Lockerbie, that will be fuelled by biomass. The company will provide dispersion modelling profiles to establish the impact of emissions, which will contain CO, as part of their submission for planning permission. Dumfries and Galloway Council will consider such emissions with respect to the current NAQO when providing their input to the planning process. **Based on the current information, Dumfries and Galloway Council does not need to consider CO at the Detailed Assessment stage.**

Benzene

None of the potential sources of benzene in the Dumfries and Galloway area are considered to be at risk of resulting in ambient concentrations in the vicinity of receptors in excess of the NAQOs for 2003 and 2010. However, ambient concentrations in Buccleuch Street, Dumfries, monitored in 1999, were above the NAQO for 2010, although, when factored for 2010 using the Technical Guidance, the figure was predicted to be below the 2010 NAQO. Traffic flows and background concentrations were below the trigger levels reported in LAQM.TG(03). **Based on the above information, Dumfries and Galloway Council do not need to consider benzene at the Detailed Assessment stage.**

1,3-butadiene

The first round of review and assessment highlighted a process at the Gates Rubber Company as being a potential risk with regard to exceedance of the 1,3-butadiene NAQO. Monitoring revealed that the ambient concentrations at five locations were below the current NAQO. There are no other sources of 1,3-butadiene that give cause for concern. **Therefore Dumfries and Galloway Council does not need to consider 1,3-butadiene at the Detailed Assessment stage.**

Lead

There are no sources of lead that give cause for concern. **Therefore Dumfries and Galloway Council does not need to consider lead at the Detailed Assessment stage.**

NO_2

The above assessments have considered the likelihood of the NO_2 NAQOs being exceeded in 2005. Based on current information and knowledge it is unlikely that any of the above aspects will result in an exceedance of the NAQOs. **Therefore Dumfries and Galloway Council does not need to proceed to a Detailed Assessment with respect to NO_2.** However, Dumfries and Galloway Council will

continue NO_2 monitoring using the diffusion tube method in order to establish local bias between the passive and continuous monitoring methods based on long-term data sets.

SO_2

The above assessment has considered the potential for the SO_2 NAQOs to be exceeded. Based on current information and knowledge, no aspect of the assessment will result in an exceedance of the NAQOs, although there is some uncertainty with regard to the impact of shipping and the density of coal burning in Sanquhar. **Consequently, Dumfries and Galloway Council will consider SO_2 with respect to shipping as part of a Detailed Assessment, and will report on a survey to be undertaken in Sanquhar with respect to coal burning.**

PM_{10}

The above assessment has considered the potential for the PM_{10} NAQO to be exceeded by the objective target dates of 2004 and 2010. Although monitored data, when factored for 2010, were above the NAQO, the predicted concentration, based on traffic flows, was below the NAQO. No industrial sources were considered to be a problem. **Dumfries and Galloway Council proposes to continue with the monitoring of PM_{10} in Buccleuch Street, and re-address this assessment once further monitoring data and traffic data become available. This will be reported in 2006 during the next USA. In addition the density of coal burning in Sanquhar will be investigated and reported as part of the Detailed Assessment report. Other than this, Dumfries and Galloway Council does not need to consider PM_{10} at the Detailed Assessment stage.**

Summary

This assessment has considered, in depth, the current air quality in Dumfries and Galloway. Casella Stanger and Dumfries and Galloway Council, in partnership, have considered the conclusions of the first round, and, in conjunction with the updated guidance, investigated the current situation in order to assess how air quality in the area is progressing towards the current NAQOs.

The assessment concludes that it is likely that the majority of the NAQOs will be met, even under the worst case conditions.

Dumfries and Galloway Council will proceed to a Detailed Assessment purely because of a lack of information at this stage with regard to SO_2 (with respect to shipping). A survey will also be undertaken in Sanquhar to ascertain the extent of coal burning in the area. This is more for information rather than as a requirement for the Detailed Assessment. Dumfries and Galloway Council will also continue with the passive diffusion tube triplicate monitoring of NO_2 in Buccleuch Street, for comparison with the AURN monitoring, for information purposes. Continued PM_{10} monitoring (on the automatic urban monitoring network) will also enable the assessment of progress towards meeting the NAQO in 2010.

8 REPORT STATEMENT AND DISCLAIMER

Casella Stanger completed this report on the basis of a defined programme of works and within the terms and conditions agreed with the Client. This report was compiled with all reasonable skill and care, bearing in mind the project objectives, the agreed scope of works, prevailing site conditions and degree of manpower and resources allocated to the project as agreed.

Casella Stanger cannot accept responsibility to any parties whatsoever, following issue of this report, for any matters arising which may be considered outside the agreed scope of works.

This report is issued in confidence to the Client and Casella Stanger cannot accept any responsibility to any third party to whom this report may be circulated, in part or in full, and any such parties rely on the contents of the report at their own risk. (Unless specifically assigned or transferred within the terms of the contract, Casella Stanger asserts and retains all copyright, and other Intellectual Property Rights, in and over the report and its contents).

Any questions or matters arising from this report may be addressed in the first instance to the Project Manager.

Appendix 1: Background concentrations

This appendix contains:

- background concentrations reported for Dumfries and Galloway
- background concentrations for Dumfries and factored for the relevant years
- background concentrations for Sanquhar

Unfortunately it has not been possible to reproduce the information contained in the appendices due to the size and format of the files. For further information please contact:-

Environmental Health Service Headquarters,

Planning and Environment,

Dumfries and Galloway Council

Cannonwalls,

High Street,

Kirkcudbright.

DG6 4JG

Tel. 01557 330291

Fax. 01557 331982

E-mail EHHQ@dumgal.gov.uk

Appendix 2: Monitoring data

This appendix contains:

- monitoring data for CO, NO_2 (passive and continuous), PM_{10} and SO_2
- location maps of all monitoring sites
- Schedule of Accreditation for Casella SEAL

Unfortunately it has not been possible to reproduce the information contained in the appendices due to the size and format of the files. For further information please contact:-

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Appendix 3: Industry data

This appendix contains:

- register of IPC processes
- register of Part B processes
- register of PPC processes
- register of Waste Management Licences (WML)

Unfortunately it has not been possible to reproduce the information contained in the appendices due to the size and format of the files. For further information please contact:-

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Appendix 4: Traffic data

This appendix contains:

- map of receptors
- Dumfries traffic data
- trunk road data
- traffic count data

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