East Dunbartonshire Council

AIR QUALITY REVIEW

UPDATING & SCREENING ASSESSMENT

2003

Protective Services,

2 Grange Avenue,

Milngavie,

G62 8QA

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1. EXECUTIVE SUMMARY

- **Existing air quality within East Dunbartonshire is generally satisfactory and, with the exception of PM_{10}, is unlikely to exceed the relevant UK Air Quality Objectives in the relevant future years up to 2010.**

- **There are no new industrial sources or any industrial sources with substantially increased emissions, since the first round of review and assessment, within East Dunbartonshire or the surrounding local authority areas likely to have an adverse impact on air quality.**

- **Traffic flows on major routes within East Dunbartonshire and on links with surrounding local authority roads indicate a general trend in traffic reduction since May 2000.**

- **Road traffic remains the main source of air pollution within East Dunbartonshire and elevated levels of pollutants will, therefore, be found mainly at the kerbside of busy roads.**

- **Levels of carbon monoxide, benzene, 1,3-butadiene and lead have all been declining since the first review and assessment and are unlikely to exceed the air quality objectives in the relevant future years up to 2010.**

- **Nitrogen dioxide levels are highest along the A803 Kirkintilloch Road, Bishopbriggs, however, with national and local measures in place, the levels are expected to reduce further and are unlikely to exceed the air quality objectives in 2005.**

- **The main source of sulphur dioxide in the area is from domestic coal burning, however, monitoring has shown that concentrations are unlikely to exceed the air quality objectives in 2004 and 2005.**

- **It is likely that annual mean concentrations of PM_{10} will exceed the air quality objective in 2010 in East Dunbartonshire, therefore, it is necessary to carry out a detailed assessment of traffic sources of PM_{10}.**

2. THE NATIONAL AIR QUALITY STRATEGY

The Environment Act 1995 required the UK Government and the Scottish Executive to produce a National Air Quality Strategy[1] which provides a framework for air quality control through national strategies and polices for air quality, including the establishment of air quality standards. The strategy was published in January 2000 and set air quality standards and objectives for eight key air pollutants. Local Authorities have a duty to work towards achieving the objectives for seven of these pollutants in the relevant time period laid down in the strategy.

Air Quality Standards are used as benchmarks for setting air quality objectives and represent the levels at which there would be an extremely small or no risk to human health. **Air Quality Objectives** represent the Government's best judgement of the progress which can be made towards getting air quality as close to the benchmark standards as is reasonable and justifiable on the grounds of cost and benefit. They will be used as triggers for action by local authorities. These air quality standards and objectives were given statutory force under the Air Quality (Scotland) Regulations 2000 [2].

The objectives for a number of these pollutants have been revised to take account of the latest health evidence and advice on the impact of particles on people's health and of developments in Europe. Since the review of air quality objectives in 2000/01, tighter objectives have been introduced for these pollutants, with separate objectives for Scotland.

The new air quality objectives for benzene, carbon monoxide and particles were given effect by the Air Quality (Scotland) Amendment Regulations 2002 [2] introduced in June of last year. All Scottish authorities will require to work towards achieving the new objectives in the prescribed period. In addition Part IV of the Environment Act 1995 requires local authorities to undertake new duties for local air quality management. These new duties require local authorities to undertake a second round of review and assessment of air quality within their area. Local authorities have completed the first round of review and assessments which should act as benchmarks against which future progress can be measured and improvements can be made to air quality in their areas. In Scotland three local authorities viz, Aberdeen, Edinburgh and Glasgow, designated Air Quality Management Areas (AQMAs) in city centre locations, based on transport related nitrogen dioxide emissions [3].

Following an evaluation of the first round by the Department of Environment, Food and Rural Affairs (DEFRA) and the devolved administrations, a report recommended that the next round of review and assessment should be carried out in two steps:

- an **Updating and Screening Assessment** based on a checklist to identify those matters that have changed since the first round of reviews and assessments and may require further assessment (to be completed by the end of May 2003).

- a **Detailed Assessment** of those pollutants and/or locations that have been identified as requiring further work.

The **two step** approach outlined above should be used in subsequent review and assessments which will be carried out on a rolling programme up to 2010 as outlined in the Table 2.1. Local authorities are advised to follow the guidance on the recommended phased approach to the review and assessment process set out in LAQM.TG(03) [4]

Table 2.1 Recommended timescale for submission of reviews and assessments and Progress Reports

LAQM Activity	Completion Date	Which Authority
Updating and Screening Assessment	End of May 2003	All authorities
Detailed Assessment	End of April 2004	Those authorities which have identified the need for a Detailed Assessment in their May 2003 Updating and Screening Assessment.
Progress Report	End of April 2004	Those authorities which have identified no need for a Detailed Assessment in their May 2003 Updating and Screening Assessment.
Progress Report	End of April 2005	All authorities
Updating and Screening Assessment	End of April 2006	All authorities
Detailed Assessment	End of April 2007	Those authorities which have identified the need for a Detailed Assessment in their April 2006 Updating and Screening Assessment.
Progress Report	End of April 2007	Those authorities which have identified no need for a detailed Assessment in their April 2006 Updating and Screening Assessment.
Progress Report	End of April 2008	All authorities
Updating and Screening Assessment	End of April 2009	All authorities
Detailed Assessment	End of April 2010	Those authorities which have identified the need for a Detailed Assessment in their April 2009 Updating and Screening Assessment.
Progress Report	End of April 2010	Those authorities which have identified no need for a Detailed Assessment in their April 2009 Updating and Screening Assessment.

The first step of the review and assessment process is an **Updating and Screening Assessment** which is based on a checklist approach to identify those matters that have changed since the first round. The assessment should include new monitoring data, new objectives, new sources or significant changes to existing sources either locally or in neighbouring authorities. Using simple screening techniques for industrial, transport and other sources, it is possible to determine which areas should be the focus of a local authority's attention. In areas well below the air quality objective it may not be necessary to undertake any further investigation, except for a progress report in April 2004 to ensure that there has been no decline in air quality.

Where the Updating and Screening Assessment has identified a risk that an air quality objective will be exceeded at a location with relevant public exposure the local authority is required to undertake a **Detailed Assessment** in accordance with Technical Guidance LAQM.TG(03). The approach in the detailed assessment is to provide an accurate assessment of the likelihood of an air quality objective being exceeded at locations with relevant public exposure. In areas where there is a potential risk of elevated levels of a pollutant, local authorities are required to use quality assured monitoring data and validated modelling methods to determine current and future pollutant concentrations. The assessment should be sufficiently detailed to allow the designation or amendment of any necessary AQMAs. Local authorities are required to predict, with reasonable certainty, whether the air quality objective is unlikely to be met by the relevant future year. This is the crucial factor which will trigger the designation of an **Air Quality Management Area** and the assessment should detail the magnitude and geographical extent of such an area. An Air Quality Management Area should not be declared unless a Detailed Assessment has been completed.

Where local authorities have designated an Air Quality Management Area they have a further duty to produce an **Action Plan** which sets out the measures that the authority intends to introduce in order to achieve the air quality objectives. Local authorities are not obliged to meet the objectives but they must demonstrate that they are taking all reasonable steps in working towards them. Action plans are considered the most cost effective way of tackling local air quality issues and are seen as the most important part of the local air quality management process.

The Scottish Executive recommends that all local authorities prepare or adopt a **Local Air Quality Strategy**, although there is no statutory requirement to do so. In particular those local authorities that have not had to designate an Air Quality Management Area, but areas close to the exceedence levels, should consider drawing up such a strategy. There are many benefits to be gained by local authorities through the development of local air quality strategies. In particular a strategy would raise the profile of air quality issues with the council and local community, allowing local authorities to build partnerships with businesses and encouraging people to do their bit to improve local air quality. This integrated approach allows local authorities to maximise effort and thus achieve the goal of delivering cleaner air and maintaining these high standards for the benefit of the local community.

3. INTRODUCTION

East Dunbartonshire is required to undertake an Updating and Screening Assessment of air quality within its area. The assessment is based on a checklist approach to identify those matters which have changed since the last review and assessment, which might lead to a risk of an air quality objective being exceeded.

The assessment will cover new monitoring data, new objectives, new sources or significant changes to existing sources, either locally or in neighbouring authorities and any other changes that might effect air quality. If there is evidence that these changes may be significant then a simple screening assessment will be carried out.

The Stage 1 Review and assessment was completed in December 1998 and concluded that East Dunbartonshire Council should proceed to a Stage 2 Assessment for PM_{10} only. Feedback from the Scottish Executive and SEPA indicated that both consultees agreed with the findings of the review and assessment. Figure 3.1 below shows the executive summary for the Stage 1 Report.

- **Existing air quality within East Dunbartonshire is generally satisfactory and, with the exception of PM_{10}, is unlikely to exceed the relevant UK Air Quality Objectives in 2005.**
- **There is no significant Part A or Part B processes within the Council or neighbouring local authority areas likely to have an adverse impact on air quality.**
- **Presently, the annual average daily traffic flow data indicates that only one road exceeds 25,000 vehicles/day, however, this is likely to increase to 4 roads exceeding this figure in 2005**
- **Road traffic is the main source of air pollution within East Dunbartonshire and elevated levels of pollutants will, therefore, be mainly found at the kerbside of the busiest roads.**
- **Levels of carbon monoxide, benzene, 1,3-butadiene and lead have all been declining and are unlikely to exceed the relevant air quality objectives.**
- **Nitrogen dioxide levels have been found to be highest at Bishopbriggs Cross, however, with National measures in place, the levels are expected to reduce further and are unlikely to exceed the air quality objectives in 2005.**
- **The main source of sulphur dioxide in the area is from domestic coal burning, however, monitoring has shown that levels have reduced considerably over the years and are unlikely to exceed the air quality objective in 2005.**
- **It is likely that levels of PM_{10} will exceed that air quality objective in East Dunbartonshire, therefore, it is necessary to carry out a stage 2 and/or stage 3 review and assessment of PM_{10}.**

Figure 3.1 Executive Summary - Stage 1 Review and Assessment

The second stage review found that the air quality objective for PM_{10} was unlikely to be exceeded. The statutory consultees concurred with this view and the executive summary is shown below in Figure 3.2.

- **Existing air quality within East Dunbartonshire is generally satisfactory and is unlikely to exceed the National Air Quality Objectives for PM_{10} in 2004.**
- **Emissions of PM_{10} by source within East Dunbartonshire were estimated to total 150 tonnes/year in 1996; 38.3% road transport, 33.1% small industry, 18.7% domestic coal burning and 9.8% from other sources.**
- **Presently, the annual average daily traffic flow data indicates that only one road exceeds 25,000 vehicles/day, however, this is likely to increase to two roads exceeding this figure in 2004.**
- **The higher predicted PM_{10} contribution from roads within East Dunbartonshire was identified as Bishopbriggs Cross with a total annual mean concentrations of 24.5 $\mu g/m^3$ in 2004.**
- **PM_{10} contributions from domestic solid fuel use was generally low with highest predicted total annual mean concentrations of 19$\mu g/m^3$ in Bishopbriggs and Kirkintilloch.**
- **Emissions of PM_{10} from Part A and Part B processes with East Dunbartonshire were generally insignificant with the highest predicted total annual mean concentration from a single process of 22.55$\mu g/m^3$.**
- **Two quarries were highlighted as potential sources of significant fugitive dust emissions, however, the report concluded that they were unlikely to result in an exceedance of the NAQS objectives.**
- **PM_{10} levels within East Dunbartonshire are currently complying with the air quality objectives and, with National measures in place, the levels are expected to reduce further by 2004.**

Figure 3.2 Executive Summary - Stage 2 Review and Assessment of PM_{10}

3.1 AIMS AND OBJECTIVES OF THE STUDY

AIMS

- investigate present and potential future air quality in East Dunbartonshire
- make an assessment of air quality in relation to the requirements of the National Air Quality Strategy
- make recommendations regarding the need to proceed to a detailed assessment

OBJECTIVES

- identify those matters which have changed since the first round review and assessment was completed using the checklist approach and carry out a screening assessment where changes are significant

- identify present and future levels of pollutant concentrations in East Dunbartonshire and highlight areas in the District which are likely to experience the highest concentrations of pollutants

- indicate whether present and predicted future air quality in the District is likely to comply with the requirements of the National Air Quality Strategy

- identify any future actions that are likely to be required by East Dunbartonshire Council under Part IV of the Environment Act 1995; and

- identify areas of work for future investigation

4. DESCRIPTION OF AREA

4.1 LOCALITY AND POPULATION

East Dunbartonshire is located in the Central Belt of Scotland to the North East of Glasgow. The Council's area is bounded by Glasgow City, North Lanarkshire, Stirling and West Dunbartonshire. The main urban areas are concentrated in the South and West of the District including Kirkintilloch, Lenzie, Bishopbriggs, Bearsden and Milngavie. The district covers an area of some 66 square miles, three quarters of which is agricultural land. These rural areas are sparsely populated except for the villages of Torrance, Milton of Campsie, Lennoxtown and Twechar and other smaller villages.

There has been a gradual decline in the population of East Dunbartonshire, due mainly to reduction in family size and increase in the number of elderly living alone. The Scottish census figures for 2001 recorded a population of 108,243 made up of 40,206 households [5]. A large proportion of the population commute out of East Dunbartonshire into Glasgow for both work and leisure.

4.2 TOPOGRAPHY

Figure 4.1 illustrates the topography of the study area. The River Kelvin intersects the district centrally from East to West. The north of the district is bounded by the Campsie Fells and Kilpatrick Hills which extend to approximately 550 metres (m) above ordnance datum (AOD). At the southern foot of the Campsie Fells lie the villages of Lennoxtown and Milton of Campsie. The Glazert Water passes through both villages and flows into the River Kelvin to the South. The district is also crossed by 14km of the Forth and Clyde Canal which passes through Twechar, Kirkintilloch and Bishopbriggs.

The eastern boundary of the district is marked by the village of Twechar and the towns of Bishopbriggs and Lenzie are found on the southern boundary. Whilst this area is generally low lying undulating land, low-lying hilly land is found in the western boundary where the towns of Milngavie and Bearsden are located.

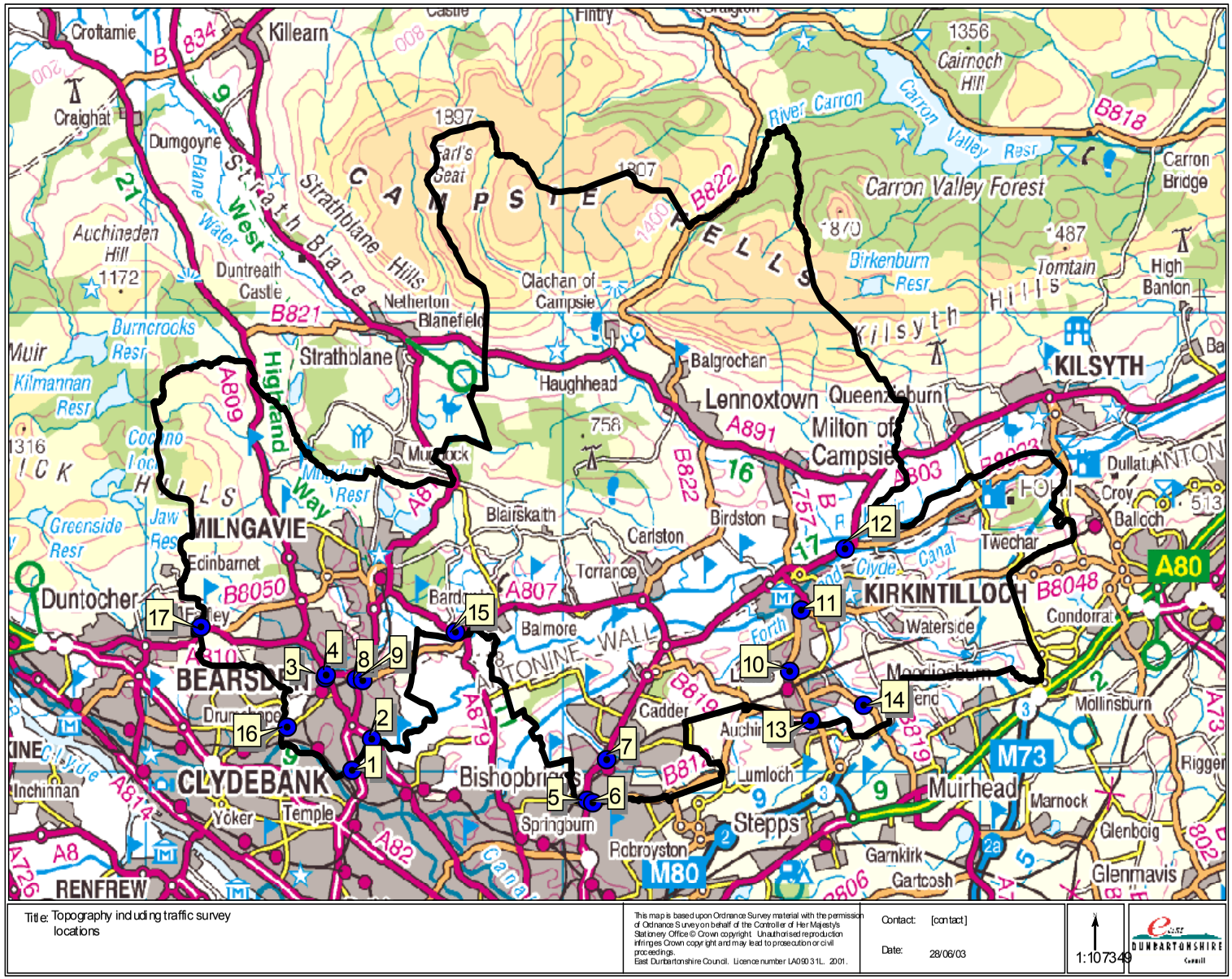


Figure 4.1 Topography including traffic survey locations

4.3 METEOROLOGY

The shape of a plume from any emitting source and its subsequent trajectory is defined by the local meteorology. The main meteorological factors that affect dispersion are wind direction, wind speed and atmosphere turbulence. No meteorological data specific to East Dunbartonshire Council is available, hence data has been presented from measurements taken by the Meteorological Office based at Glasgow Airport, Abbotsinch. Figure 4.2 illustrates the mean wind direction and speed for Glasgow Airport which has been produced from measurements averaged over a 27 year period, 1970 - 1996 [6]. The wind rose indicates that the prevailing wind is predominately south westerly, with the wind blowing from between the south and west for over 50% of the time. Analysis of the month by month data indicates that, whilst for the majority of the year the prevailing wind is south westerly, there is a pronounced north easterly wind during April and particularly May.

Analysis of the mean wind speeds over the 27 year period show that for approximately 65% of the time the wind is light. Even in December, light or moderate winds occur for almost 85% of the time with calm conditions experienced for approximately 3%. The combination of a possible temperature inversion with light winds or calm conditions would allow a build up of pollutants within the area. In view of the fact that the prevailing wind is south westerly, close attention has been paid to air quality within the Glasgow area as emissions particularly from the north west of the city may impact on air quality within East Dunbartonshire.

4.4 ROAD NETWORK

The principal roads in the locality are the A809, A81, A803, A807 and A891. The road network is primarily situated in the south and west of the district. The B roads include the B819, B757, B767, B822 and B8049 together with other minor roads intersecting the primary road network.

Figure 4.1 illustrates the location of the principal road networks within East Dunbartonshire along with the traffic survey locations.

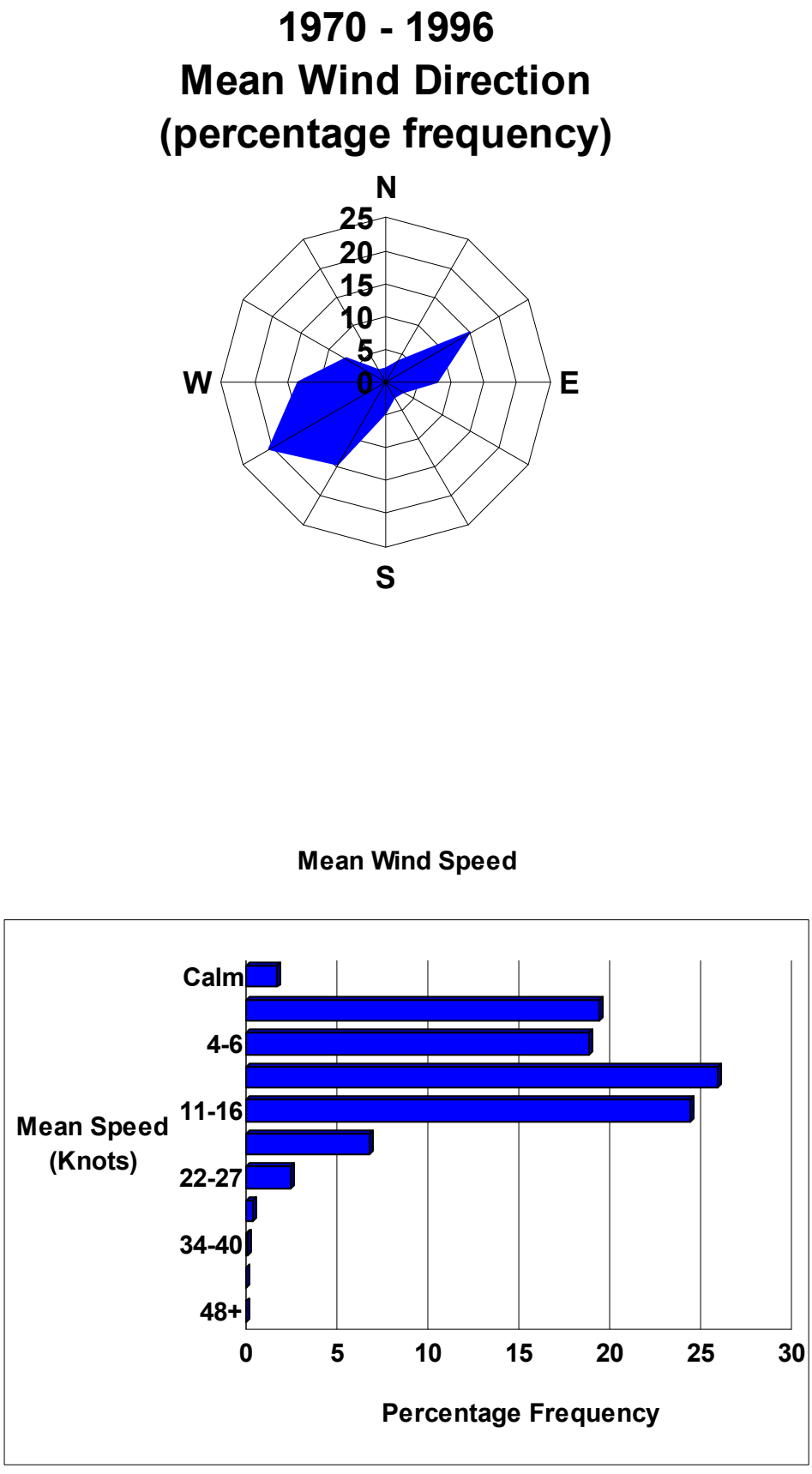


Figure 4.2 Mean wind and direction and speed between 1970 and 1996 at Glasgow Airport

4.4.1 Road Traffic

Road traffic data has been provided by East Dunbartonshire Council's Roads and Infrastructure Division using the principles outlined below.

Traffic flows supplied by the Roads and Infrastructure Division for the Air Quality Management assessment have been calculated from March 1999 turning count surveys and also from the May 2001 Road Traffic Reduction Act surveys.

The March 1999 turning count surveys were undertaken between the hours of 07:30-09:30, 13:00-15:00 and 16:00-18:00. The traffic volumes were factored by all vehicles and Heavy Duty Vehicles (HDV's) using the most appropriate automatic traffic count data to give 24 hour flows. The data was then factored to give a 24 hour Annual Average Daily Traffic Flows (24AADT).

Automatic traffic count surveys undertaken in May 2001 for a full seven consecutive days have been used to calculate traffic flows at several sites. These surveys were carried out initially for Road Traffic Reduction Act 1997 purposes. Automatic traffic count sites are installed if possible to give full vehicle classification.

East Dunbartonshire Council, Roads and Infrastructure Division has been undertaking Automatic Traffic Count Surveys for a full seven days in both the neutral months of May and October at seventeen locations since May 2000 as part of the statutory duty under the Road Reduction Act 1997. Comparison of subsequent traffic volumes at these seventeen automatic traffic count sites since the May 2000 surveys indicates a general trend in traffic reduction in all the time periods analysed. This is supported by the assessment of junction capacity at key sites which is indicating maximum ratio to flow capacity during peak hour. This strongly indicates that traffic flows in these areas are capacity restrained supporting the decision to use zero growth. It is therefore considered that the traffic flows as supplied by the Roads and Infrastructure Division for the base year 2001 should not be factored by NRTF or TEMPRO for future year Air Quality assessments.

NRTF- National Road Traffic Forecasts

TEMPRO - Trip End Model Presentation Program

Table 4.1 summarises the 24 hour annual average daily traffic flow (AADT) for 2001 for the "cordon" roads surveyed under the Road Traffic Reduction Act 1997 [7]. Table 4.2 summarises the AADT for 2001 for the principal roads within East Dunbartonshire with the geographical location shown in Figure 4.1. The A739 Switchback Road has the highest traffic flow at 26,773 vehicles per day. This road is a dual carriageway and is open on both sides of the road, thereby allowing a good dispersion of pollutants. The Stage 1 report identified Bishopbriggs Cross as the most "at risk" site due to the heavy traffic flow, tenement buildings on both sides of the road and the close proximity of both shops and residential flats. This location and other potential "hot spots" will be investigated further in the screening assessment.

ROAD TRAFFIC REDUCTION ACT SURVEYS

7 Day 24 Hour traffic flows summary

MAY 2001

Location	Survey Type		7 Day - 24 Hour Flow			7 Day - 24 Hour HDV			Ave 2 way speed (mph)
			Cordon		2 Way Total	Cordon		2 Way Total	
	Cordon with	Internal	Into EDC	Out of EDC		Into EDC	Out of EDC		
			Internal			Internal			
			WB	EB		WB	EB		
A810 Duntocher Rd	West Dunbartonshire		7432	6956	14388	626	498	1124	37.5
Peel Glen Rd	Glasgow		1424	1620	3044	121	141	262	27.0
Canniesburn Rd	Glasgow		5829	6307	12136	514	511	1025	30.2
A739 Switchback Rd	Glasgow		13083	13690	26773	N/A	N/A	0	N/A
A81 Maryhill Rd	Glasgow		10962	8665	19627	952	957	1909	40.4
A879 Balmore Rd	Glasgow		5673	5570	11243	686	700	1386	39.3
Colston Rd	Glasgow		4917	5404	10321	368	551	919	30.4
A803 Springburn Rd	Glasgow		7763	8426	16189	N/A	N/A	0	N/A
Balgrayhill Rd	Glasgow		7522	6813	14335	N/A	N/A	0	N/A
Northgate Rd	Glasgow		2338	2686	5024	322	396	718	29.6
B765 Hillhead Rd	Glasgow		6258	6140	12398	435	342	777	34.0
B757 Auchinloch Rd	North Lanarkshire		6666	6494	13160	465	418	883	29.4
B757 Lindsaybeg Rd	North Lanarkshire		2409	2385	4794	182	162	344	44.0
B8049 Boclair Rd		YES	5459	5657	11116	395	483	878	39.0
A807 Auchenowie Rd		YES	6023	5730	11753	721	694	1415	47.5
B8048 Kirkintilloch Rd	North Lanarkshire		5315	5236	10551	463	479	942	44.0
A803 Kilsyth Rd	North Lanarkshire		4390	4356	8746	463	442	905	37.1
Standburn Rd	Glasgow		1132	1048	2180	72	38	110	30.7

Cordon Total with West Dunbartonshire	7432	6956	14388	626	498	1124
Cordon Total with Glasgow	66901	66369	133270	3470	3636	7106
Cordon Total with North Lanarkshire	18780	18471	37251	1573	1501	3074
Cordon Total	93113	91796	184909	5669	5635	11304
Internal Total	11482	11387	22869	1116	1177	2293

Notes:-

12 Hour - 07:00 to 19:00 Hours

16 Hour - 06:00 to 22:00 Hours

Table 4.1 Road Traffic Reduction Act Surveys - 7 Day 24 Hour Traffic Flows Summary - May 2001

Site Number	Site Location	AADT 2001	% HDV
1	A739 Switchback Road – south of Henderland Road	26,773	6
2	A81 Maryhill Road – at Garscube Mill	19,627	10
3	A809 Drymen Road (South of Bearsden Cross)	21,330	3
4	Roman Road (at Bearsden Cross)	7,318	2
5	A803 Springburn Road, North of Colston Road	22,281	7
6	B812 Colston Road	12,040	4
7	A803 Kirkintilloch Road North of Bishopbriggs Cross	24,695	11
8	A81 Milngavie Road North of Boclair Road	26,329	5
9	B8049 Boclair Road	12,288	6
10	Kirkintilloch Road at Lenzie Primary School	15,352	3
11	Townhead at Industry Street	15,525	4
12	A803 Kilsyth Road	8,746	10
13	B757 Auchinloch Road	13,160	7
14	B819 Lindsaybeg Road	4,794	7
15	A807 Auchenhowie Road	11,753	12
16	Canniesburn Road at Boundary	12,136	8
17	A810 Duntocher Road	14,388	8

Table 4.2 Traffic Flows for Principal Roads within East Dunbartonshire

4.5 INDUSTRY

A number of authorised industries are located within East Dunbartonshire District. The operator, location and process type are shown in Table 4.3 [8].

This data is reproduced from information supplied by SEPA in February 2003. At that time it was noted that the only change in emissions since the last assessment in March 2000 is with respect to John McGavigan's printing process where there has been an increase in the number of print lines. The emissions from the process are primarily VOC's which would not have an effect on the air quality objectives under consideration in this study. This process has now been relocated from Kirkintilloch to new premises in Westerhill Road, Bishopbriggs. There are additional service stations where the unloading of petrol has been authorised since the last assessment. These sources will be considered in the assessment.

OPERATOR	PREMISES	LOCATION	PROCESS
P.W. Hall	Woodilee Industrial Estate	Kirkintilloch	Inorganic Chemicals
RMC Russell	Gartshore Works	Twechar	Cement Batching
RMC Russell	Gartshore Coating Plant	Twechar	Roadstone Coating
RMC (Scotland) Ltd	Gartshore Concrete	Twechar	Cement Batching
RMC (Scotland) Ltd	Gartshore Mortar Plant	Twechar	Mortar Batching
Marley Building Materials	Kirkintilloch Road	Bishopbriggs	Cement Batching and manufacture of concrete roof tiles
Bardon Aggregates Ltd	Balmore Road	Torrance	Concrete batching
Daniel Montgomery & Son	Old Mill Industrial Estate	Kirkintilloch	Coating of plastic moulded bottle closures by spray application, including metalising lacquers
Robslee Concrete Co Ltd	Southbank Road	Kirkintilloch	Cement batching
Young, Archibald	Milton Road	Kirkintilloch	Brass founders
Gillespie's of Lenzie	Woodilee Industrial Estate	Lenzie	Road vehicle re-finishing (body repair workshop)
Ferrymill Motors	Campsie Road	Torrance	Road Vehicle respraying
John McGavigan Ltd	Westerhill Road	Bishopbriggs	Printing
Arnold Clark Automobiles Ltd	Kirkintilloch Road	Bishopbriggs	Vehicle respraying
Lennox Service Station	Main Street	Lennoxtown	Unloading of petrol at a service station
BP Express Shopping Ltd	Waterside Road	Kirkintilloch	Unloading of petrol at a service station
Malthurts Ltd	Stockiemuir Road	Bearsden	Unloading of petrol at a service station
J. Gillespie (ME) Ltd	Auchinloch Road	Lenzie	Unloading of petrol at a service station
J. Gillespie (ME) Ltd	Kirkintilloch Road	Lenzie	Unloading of petrol at a service station
J. Gillespie (ME) Ltd	Glasgow Road	Milngavie	Unloading of petrol at a service station
J. Gillespie (ME) Ltd	Kilsyth Road	Kirkintilloch	Unloading of petrol at a service station
Esso Petroleum Company Ltd.	Milngavie Road	Bearsden	Unloading of petrol at a service station
Esso Petroleum Company Ltd.	Kirkintilloch Road	Bishopbriggs	Unloading of petrol at a service station
William Potter	Milngavie Road	Bearsden	Unloading of petrol at a service station
Fuel Force Ltd	Duntocher Road	Bearsden	Unloading of petrol at a service station
BP Oil UK Ltd.	Maryhill Road	Bearsden	Unloading of petrol at a service station
Shell UK Ltd.	Glasgow Road	Kirkintilloch	Unloading of petrol at a service station
Shell UK Ltd.	Kirkintiloch Road	Bishopbriggs	Unloading of petrol at a service station

Table 4.3 IPC and Part B processes within East Dunbartonshire

5. NATIONAL AIR QUALITY STRATEGY STANDARDS AND OBJECTIVES

5.1 NAQS STANDARDS AND OBJECTIVES

Table 5.1 Objectives included in the Air Quality Regulations 2000 and (Amendment) Regulations 2002 for the purpose of Local Air Quality Management

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene			
All authorities	16.25μg/m^3	running annual mean	31.12.2003
Authorities in Scotland and Northern Ireland only	3.25μg/m^3	running annual mean	31.12.2010
1,3-butadiene	2.25μg/m^3	running annual mean	31.12.2003
Carbon Monoxide	10.0mg/m^3	running 8-hour mean	31.12.2003
Lead	0.5μg/m^3	annual mean	31.12.2004
	0.25μg/m^3	annual mean	31.12.2008
Nitrogen dioxide	200μg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40μg/m^3	annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50μg/m^3 not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
All authorities	40μg/m^3	annual mean	31.12.2004
Authorities in Scotland only	50μg/m^3 not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18μg/m^3	annual mean	31.12.2010
Sulphur Dioxide	350μg/m^3 not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125μg/m^3 not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266μg/m^3 not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

5.1.1 New Objectives for Scotland

New tighter air quality objectives have been introduced by the Air Quality (Scotland) Amendment Regulations 2002 for particles, benzene and carbon monoxide. The objective for polycyclic aromatic hydrocarbons is included in the strategy for the first time, however, this objective has not yet been passed into regulations for the purposes of Local Air Quality Management. The objective for ozone is not set in regulations since ozone is a national rather than a local authority problem and therefore will not be included in this study.

Pollutant	Objective	Concentration measured as	Date to be achieved by
Benzene	3.25μg/m^3 (1ppb)	running annual mean	31.12.2010
Carbon Monoxide	10mg/m^3 (8.6ppb)	running 8-hour mean	31.12.2003
Polycyclic aromatic hydrocarbons	0.25μg/m^3 B[a]P	as annual average	31.12.2010
Particles (PM_{10})	50μg/m^3 not to be exceeded more than 7 times a year 18μg/m^3	24-hour mean annual mean	31.12.2010 31.12.2010

Table 5.2 New Air Quality Objectives included in the Air Quality Strategy for protecting human health: Scotland

5.2 RELEVANT EXPOSURE

Local authorities are advised to assess likely exceedences of the objectives in relation to "the quality of the air at locations which are situated outside of buildings or other natural or man made structures, above or below ground and where members of the public are regularly present". The Updating and Screening assessment will be focussed on those locations where members of the public are likely to be regularly exposed over the averaging period of the objective. The following approach is recommended to define relevant locations which should be the focus of the review and assessment.

- for objectives with short averaging times (the sulphur dioxide objectives and the 1-hour nitrogen dioxide objective) reviews and assessments should be focussed on any non-occupational, near ground level outdoor location where exposures over such short averaging times are potentially likely

- for objectives with longer averaging times (the objectives for benzene, 1,3-butadiene, carbon monoxide, PM_{10}, lead and the annual objective for nitrogen dioxide), reviews and assessments should be focussed on all non occupational outdoor locations in areas where the public might be reasonably expected to be regularly exposed for substantial periods of the year for annual objectives. Relevant locations include the facades of residential properties, schools, hospitals etc. In addition gardens of residential properties would be relevant locations for assessment of the 24-hour and 8-hour means.

This approach has been used throughout the study in order to assess the likelihood of exposure to each air pollutant. The location of monitoring and modelling sites have also been chosen on this basis in order to represent the outdoor exposure of members of the public.

6. REVIEW AND ASSESSMENT OF CARBON MONOXIDE

6.1 INTRODUCTION

Carbon Monoxide is produced by the incomplete combustion of fossil fuel. In general the more efficient the combustion process, the lower the carbon monoxide emissions.

The main source of carbon monoxide emissions in the UK is road transport, accounting for 67% of total releases in 2000. In some urban areas this figure may be much higher. There has been a downward trend in annual emissions of carbon monoxide since 1970 and a further reduction of 42% in vehicle emissions is expected between 2000 and 2005.

In the outdoor environment concentrations of carbon monoxide can reach levels high enough to cause adverse effects on health. Carbon monoxide prevents oxygen uptake by the body and exposure at low concentrations may increase the risk of heart problems in predisposed individuals. Brain activity may also be impaired by reductions in oxygen supply due to exposure to carbon monoxide.

6.2 STANDARD AND OBJECTIVE FOR CARBON MONOXIDE

The Scottish Executive has adopted an 8-hour running mean concentration of 11.6mg/m^3 as the air quality standard for carbon monoxide. In practice this is equivalent to the maximum daily running 8 hour mean. The new objective has been set at a slightly tighter level of 10mg/m^3 as running 8-hour mean concentration, to be achieved by 2003, bringing it into line with the second Air Quality Daughter Directive limit value.

6.3 THE NATIONAL PERSPECTIVE

There has been a downward trend in annual emissions of carbon monoxide since 1970. National policies have already reduced emissions from motor vehicles and these emissions are expected to fall by a further 42% between 2000 and 2005.

Carbon monoxide levels monitored at National Network sites throughout the UK showed that there were no measured exceedences of the objective at any site between 1999 and 2001. The highest levels of this pollutant are generally expected in the vicinity of heavily trafficked roads (> 80,000 vehicles/day).

A number of urban sites came close to the objective in December 2001 due to certain meteorological conditions which resulted in an accumulation of pollutant emissions. Four UK sites, including Glasgow Centre, recorded levels of carbon monoxide which were within 20% of the objective.

Existing national policies are expected to deliver the objective of 10mg/m^3, as a running 8-hour mean concentration, by 2003.

6.4 LOCAL PERSPECTIVE

The conclusions drawn from the Stage 1 Air Quality Review and Assessment for East Dunbartonshire showed that the air quality objective for the 8-hour running average of 10ppm was unlikely to be exceeded by 2005.

6.5 THE UPDATING AND SCREENING ASSESSMENT FOR CARBON MONOXIDE

In this assessment local authorities are encouraged to build on data collated in the first round review and assessment to identify any areas which are at risk of exceeding the objective, using the following checklist.

Summary of the Updating and Screening Check List Approach for Carbon Monoxide		
Reference Number	**Source, location or data that needs to be assessed**	**Section**
A	Monitoring data	6.5.1
B	Very Busy Roads	6.5.2

6.5.1 (A) Monitoring Data

Monitoring of carbon monoxide is not carried out in East Dunbartonshire, however this report will draw on results obtained from the UK network site at Glasgow City Chambers which lies approximately 5 miles to the South of the District.

6.5.1.1 Distribution of Carbon Monoxide Emissions [9]

The estimated emissions of carbon monoxide by source in East Dunbartonshire is shown in Figure 6.l.

6.5.1.2 Estimated Background Concentrations of Carbon Monoxide [9]

Figure 6.2 illustrates a map of estimated annual mean carbon monoxide concentrations on a 1km^2 grid.

An example of the concentrations found at specific grid reference points is detailed in Table 6.1.

Grid Reference No.	Location	Concentration mg/m^3
East 253 500 North 673 500	Kinnoul Gardens, Bearsden, Baljaffray Primary School	0.29
East 245 500 North 671 500	Drymen Road at St. Germain's Loch, Bearsden.	0.32
East 260 500 North 609 500	Coltpark Avenue, Bishopbriggs.	0.35
East 261 500 North 682 500	Wester Cleddens Road, Bishopbriggs.	0.18
East 264 500 North 672 500	Thornwood Avenue, Kirkintilloch.	0.20

Table 6.1 Estimated Annual Mean Background Concentrations of Carbon Monoxide at Grid Reference Locations within East Dunbartonshire

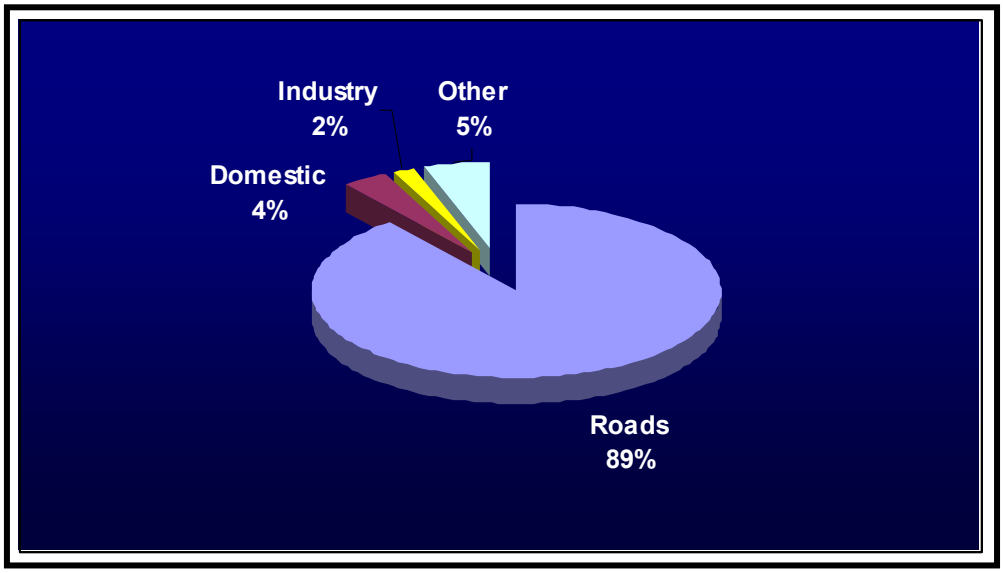


Figure 6.1 Distribution of Carbon Monoxide emissions by source in East Dunbartonshire, 2001

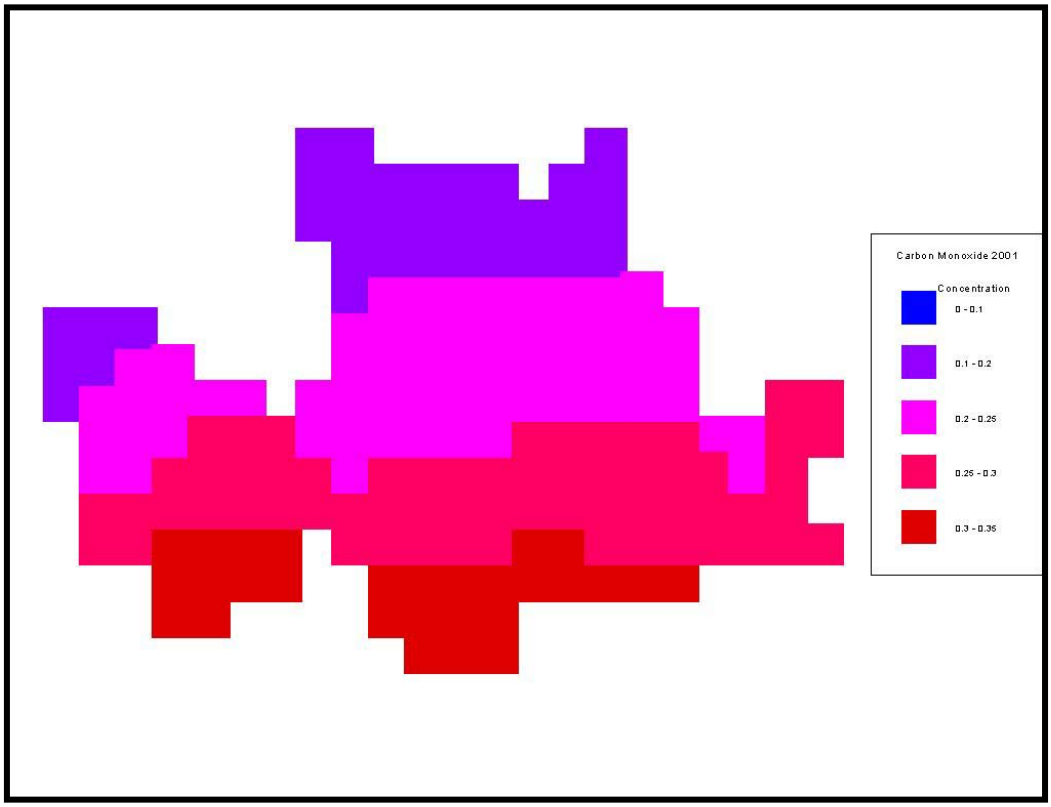


Figure 6.2 Estimated annual mean background concentrations of Carbon Monoxide in East Dunbartonshire

An evaluation of monitoring data from national network sites has indicated a poor relationship between the annual mean concentration and the maximum daily running 8-hour mean. Therefore it is not practicable to adjust the measured maximum daily running 8-hour mean forwards to 2003. For this step of the assessment authorities are advised to assume that the measured concentration in the year of monitoring is applicable to 2003[4].

Glasgow City Chambers urban background site has been in operation since 1987. In view of its location, approximately 5 miles south of East Dunbartonshire's boundary and due to the prevailing wind coming from the Glasgow area, it is likely to provide a valuable guide as to the concentrations of carbon monoxide within the study area. A summary of the data taken from this site is shown in Table 6.2 below.

Year	1999	2000	2001
Maximum Running 8-hour mean	4.2	3.9	7.3
Are any current maximum daily running 8-hour concentrations greater than 10gm/m^3?	No	No	No

Table 6.2 Maximum daily running 8-hour mean carbon monoxide concentrations in mg/m^3 measured at Glasgow City Chambers

The screening assessment requires local authorities to identify the maximum daily running 8-hour concentrations during each year of measurement. The current maximum concentration for this site shown in Table 6.2 is below the objective of 10mg/m^3 for 2003.

Using a comparison of background concentrations between East Dunbartonshire Council and Glasgow City, it can be concluded that carbon monoxide levels in East Dunbartonshire are likely to be lower (based on current estimates).

6.5.2 (B) Very busy roads or junctions in built up areas

This approach requires local authorities to identify "very busy" roads and junctions (> 80,000 vehicles per day) in areas where the 2003 background concentration is expected to be above 1mg/m^3.

Examples of background concentrations of carbon monoxide are shown in Table 6.1 there is no area within East Dunbartonshire where the 2003 background is expected to be above 1mg/m^3.

Table 4.2 lists the main road network in East Dunbartonshire which shows that there are no roads or junctions with average daily traffic flows greater than 80,000 vehicles per day. There is no requirement, therefore, to undertake a screening assessment for road traffic sources of carbon monoxide.

6.6 CONCLUSIONS FOR CARBON MONOXIDE

Information from the map of estimated carbon monoxide concentrations within East Dunbartonshire and from measured urban background concentrations at Glasgow City Chambers indicate that the objective for the maximum daily running 8-hour mean is unlikely to be exceeded in 2003. Therefore there is no requirement to proceed to a detailed assessment for carbon monoxide.

7. REVIEW AND ASSESSMENT OF BENZENE

7.1 INTRODUCTION

In the UK the main atmospheric sources of benzene are petrol-engined vehicles and fugitive emissions from petrol station forecourts. Diesel fuel is a relatively small source. The maximum benzene content in petrol has been reduced from 5% to 1% since January 2000 to meet the requirements of EU Legislation although currently it comprises on average about 0.7% by volume in the UK. Emissions from cars and light goods vehicles will be further reduced by the European Auto-oil programme. These measures, together with controls already in place to reduce emissions during storage and distribution of petrol are predicted to decrease emissions of benzene from the 1995 levels by around 79% by 2010.

Benzene is a genotoxic human carcinogen. Long term, mainly occupational exposure to high levels is known to cause an excess risk of leukaemia. In view of the carcinogenic effects of benzene, no absolutely safe level can be specified in ambient air. In the UK a risk management approach has been adopted whereby policies to reduce benzene concentrations in ambient air aim to achieve levels where risk to health is "exceedingly small". [10]

7.2 STANDARD AND OBJECTIVE FOR BENZENE

The Government and the Scottish Executive have adopted a running annual mean concentration of 16.25 $\mu g/m^3$ as the air quality standard for benzene, with an objective for the standard to be achieved by 2003. Additional tighter objectives have been set following health advice from expert Government panels to reduce concentrations of benzene in air to as low a level as possible. In Scotland a running annual mean of 3.25$\mu g/m^3$ has been adopted as an additional objective to be achieved by the end of 2010.

7.3 THE NATIONAL PERSPECTIVE

Existing national policies are expected to deliver the prescribed air quality objective for benzene at all urban background and roadside/kerbside locations by the end of 2003. The 2010 objective is expected to be met at all urban background locations and most roadside locations. At some locations where there is a possibility of exceedences, additional local measures may have to be employed to achieve this objective.

7.4 THE LOCAL PERSPECTIVE

The Stage 1 Air Quality Review and Assessment for East Dunbartonshire concluded that the objective for the running annual average of 5ppb (16.25 $\mu g/m^3$) was unlikely to be exceeded in 2005. Local Authorities are not required to consider road traffic emissions in their review of the 2003 objective. Only those authorities with relevant locations in the vicinity of major industrial processes that emit benzene will need to progress beyond the Updating and Screening Assessment for the 2003 objective. In their review and assessment of the 2010 objective authorities will have to consider the impact of emissions from petrochemical processes and petrol stations in areas of relevant public exposure.

7.5 UPDATING AND SCREENING ASSESSMENT FOR BENZENE

This assessment requires local authorities to identify any significant changes that may have occurred since the first round of review and assessment completed in December 1998. The following issues will be considered and assessed against the new objectives based on the checklist approach.

Summary of the Updating and Screening check list approach for Benzene		
Ref. No.	**Source, location or data that needs to be assessed**	**Section**
A.	Monitoring data	7.5.1
B.	Very busy roads or junctions in built up areas	7.5.2
C.	Industrial sources	7.5.3
D.	Petrol Stations	7.5.4
E.	Major fuel storage depots (petrol only)	7.5.5

7.5.1 (A) Monitoring Data

Monitoring of benzene is not carried out within East Dunbartonshire and the nearest National monitoring network site is based at Edinburgh Medical School. Data from this site will be reviewed in this assessment in conjunction with estimated background concentrations of benzene.

7.5.1.1 Distribution of Benzene Emissions [9]

The estimated emissions of benzene by source in East Dunbartonshire is shown in Figure 7.1

7.5.1.2 Estimated Background Concentrations of Benzene [9]

Figure 7.2 illustrates a map of estimated annual mean of background concentrations of benzene on a 1km square grid of East Dunbartonshire. An example of the concentrations found at specific reference points in East Dunbartonshire is detailed in Table 7.1 below.

Grid Reference	Location	Concentration 2001	Predicted Concentration	
			2003	2010
East 253 500 North 673 500	Kinnoul Gardens, Bearsden, Baljaffray Primary School	0.525	0.463	0.355
East 245 500 North 671 500	Drymen Road at St. Germain's Loch, Bearsden.	0.636	0.56	0.428
East 260 500 North 609 500	Coltpark Avenue, Bishopbriggs.	0.709	0.624	0.478
East 261 500 North 682 500	Wester Cleddens Road, Bishopbriggs.	0.201	0.178	0.139
East 264 500 North 672 500	Thornwood Avenue, Kirkintilloch.	0.570	0.504	0.389

Table 7.1 Estimated Annual Concentrations of Benzene in $\mu g/m^3$ at Grid Reference locations within East Dunbartonshire

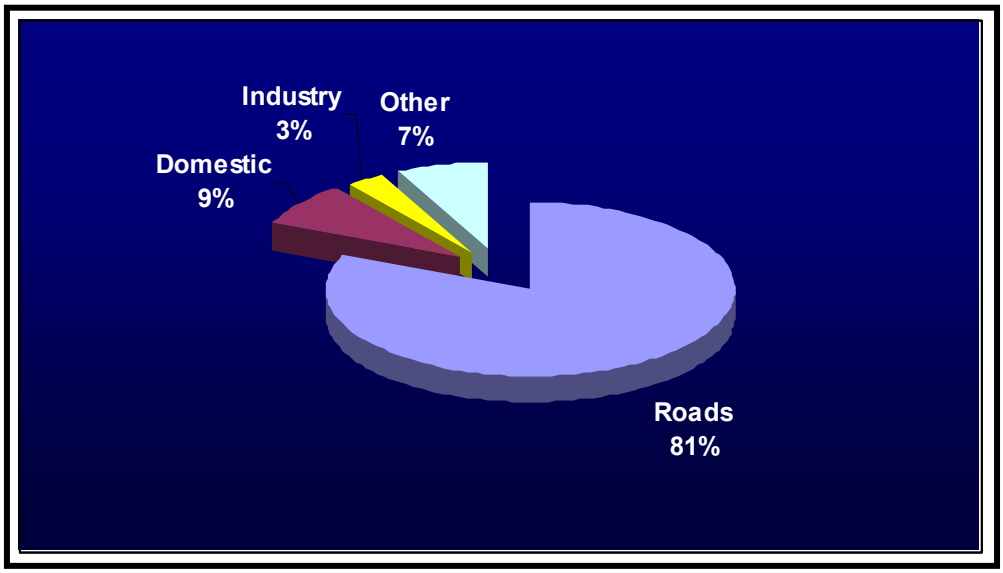


Figure 7.1 Distribution of benzene emissions by source in East Dunbartonshire, 2001

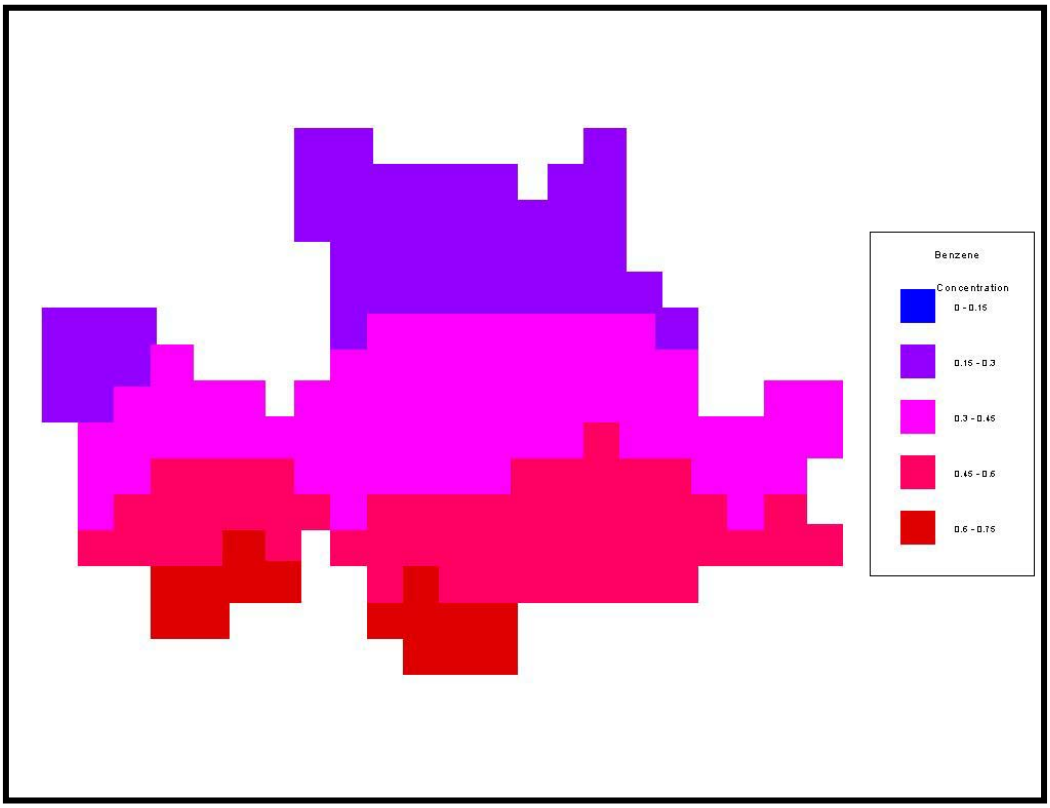


Figure 7.2 Estimated annual mean background concentration of benzene in East Dunbartonshire, 2001

7.5.1.3 Urban Background Concentrations [4]

The nearest National Monitoring Network site for benzene is located at Edinburgh Medical School (Urban Background Site). Whilst there is a considerable distance between the study area and this site the measured concentrations can be assumed to be typical of urban location in the absence of industrial sources likely to emit this pollutant.

A summary of the benzene concentrations at this site is given below along with the predicted levels for the relevant future years 2003 and 2010 using correction factors published in Technical Guidance LAQM.TG(03) Box 3.3. These factors are recommended to predict future years for background map data and monitoring data (separate factors may be used to convert roadside monitoring data).

Year	1999	2000	2001
Maximum running Annual Mean	1.98	1.72	1.38
Predicted Annual Mean in 2003	1.73	1.51	1.21
Are any running Annual Means greater than 16.25μg/m^3 in 2003	No	No	No
Predicted Annual Mean in 2010	1.30	1.13	0.91
Are any running Annual Means greater than 3.25μg/m^3 in 2010?	No	No	No

Table 7.2 Maximum Running Annual mean Concentration for Benzene in μg/m^3 at Edinburgh Medical School 1999 to 2001 (with Predicted Levels for 2003 and 2010)

In common with all of the urban background sites, measured concentrations were significantly below the 2003 running annual mean objective of 16.25μg/m^3 as well as the stricter 2010 objective of 3.25μg/m^3. The concentrations estimated for the relevant future years are also below the 2010 objective.

Information from the estimated map of benzene concentrations within East Dunbartonshire along with the measured data from the network indicates that the objective for the running annual mean of 16.25μg/m^3 is unlikely to be exceeded in 2003 and the running annual mean objective of 3.25 μg/m^3 is unlikely to be exceeded in 2010.

7.5.2. (B) Very Busy Roads or Junctions in built up areas

In accordance with the Technical Guidance LAQMTG(03), local authorities need only undertake a screening assessment for road traffic sources in respect of the 2010 objective where:

- the 2010 annual mean background concentration exceeds 2μg/m^3; and
- the daily average traffic flow (AADT) exceeds 80,000 vehicles per day (on single carriageway roads), 120,000 vehicles per day (dual carriageway roads) or 140,000 vehicles per day (on motorways)

Table 7.1 shows benzene concentrations at a number of locations in East Dunbartonshire, including the maximum concentrations for 2010 which is 0.478μg/m^3 at Coltpark Avenue in Bishopbriggs. In addition there is no road or junction within East Dunbartonshire with an AADT flow greater than 80,000 vehicles per day (Table 4.2).

There is no requirement, therefore, to assess road traffic sources of benzene in East Dunbartonshire.

7.5.3 (C) Industrial Sources

In the UK there may be a few petrochemical works that emit sufficient benzene to put the 2010 objective at risk of being exceeded. Sources which were considered during the first round of review and assessment require to be considered again against the new objective.

There are no petrochemical works within East Dunbartonshire or the surrounding area, therefore no assessment of industrial sources requires to be undertaken.

7.5.4. (D) Petrol Stations

Local authorities are required to identify all petrol stations with an annual throughput of more than 2000m^3 of petrol (2 million litres per annum) and with a busy road nearby. A busy road is one with more than 30,000 vehicles per day.

The Annual Average Daily Traffic Flows for major roads within East Dunbartonshire are shown in Table 4.2. There is no road within the Local Authority area with an AADT greater than 30,000 vehicles per day therefore there is no requirement to carry out an assessment of petrol stations.

7.5.5 (E) Major fuel storage depots (petrol only)

There is no major fuel storage depot within the Local Authority area, therefore no assessment requires to be undertaken.

7.6 CONCLUSIONS FOR BENZENE

The Updating and Screening Assessment for benzene in East Dunbartonshire indicates that the running annual mean objective of 16.25μg/m^3 is unlikely to be exceeded in 2003 and the running annual mean of 3.25μg/m^3 is unlikely to be exceeded in 2010. In addition the assessment shows that there are no significant sources of benzene emissions in the district or surrounding local authority area. Therefore, there is no requirement to proceed to a detailed assessment for benzene.

8. REVIEW AND ASSESSMENT OF 1,3-BUTADIENE

8.1 INTRODUCTION

The presence of 1,3-butadiene in the atmosphere is derived solely from human activity. It is an important industrial chemical, being used particularly in the manufacture of synthetic rubber tyres. Some chemical liquid petroleum gases also contain up to 8 percent by volume. The 1,3-butadiene in ambient air is mainly derived from combustion of petrol and diesel fuels. The UK national atmospheric inventory for 1,3-butadiene shows that in 1999, 85% of national emissions arose from road transport sources. A small number of industrial sources that handle the chemical in bulk, accounts for most of the remainder.

1,3-Butadiene is a potent genotoxic carcinogen. Epidemiological studies in humans occupationally exposed to 1,3-Butadiene in rubber production plants suggest that exposure is associated with an increase in lymphomas and leukaemias.

8.2 THE STANDARD AND OBJECTIVE FOR 1,3-BUTADIENE

The Scottish Executive has adopted a maximum running annual mean concentration of 2.25μg/m^3 as an air quality standard for 1,3-butadiene with the objective for the standard to be achieved by the end of 2003.

8.3 THE NATIONAL PERSPECTIVE

Existing national policies are expected to deliver the air quality objective for 1,3-butadiene by the end of 2003 and no further measurements are thought to be needed. Measured background concentrations of 1,3-butadiene at UK Network sites at urban background and roadside locations are already well below the 2003 objective of 2.25μg/m^3.

Emissions of 1,3-butadiene have been significantly reduced by the increased number of vehicles fitted with 3-way catalytic converters. These levels are expected to be further reduced by the recently agreed improvements to fuel quality, including those as part of the Auto-Oil programme. No further measures are thought to be needed. Only those authorities with relevant locations in the vicinity of major industrial processes which handle, store or emit 1,3-butadiene, are expected to proceed beyond the updating and screening assessment.

8.4 THE LOCAL PERSPECTIVE

There has been no AQMA declared from the first round of review and assessments in respect of the air quality objective for 1,3-butadiene.

The Stage 1 Air Quality Review and Assessment for East Dunbartonshire concluded that the objective for the annual running average of 1ppb (2.25μg/m^3) was unlikely to be exceeded in 2005.

8.5 UPDATING AND SCREENING ASSESSMENT FOR 1,3-BUTADIENE

This assessment encourages local authorities to build on data collated and information gathered in the First Stage review and assessment for 1,3-butadiene. Information will be based on the following checklist approach.

Summary of the Updating and Screening check list approach for 1,3-butadiene.		
Reference No.	**Source, location or data that needs to be assessed**	**Section**
A	Monitoring Data	8.5.1
B	New Industrial sources	8.5.2
C	Industrial sources with substantially increased emissions	8.5.3

8.5.1 (A) Monitoring Data

Local authorities are advised to prioritise the use of measured data from national networks or local monitoring campaigns. Monitoring of 1,3-butadiene is not carried out within East Dunbartonshire and the nearest National monitoring network site is based at Edinburgh Medical School. Data from this site will be reviewed in this assessment in conjunction with estimated background concentrations of 1,3-butadiene.

8.5.1.1 Distribution of 1,3-Butadiene Emissions [9]

The estimated emissions of 1,3-butadiene by source in East Dunbartonshire is shown in Figure 8.1.

8.5.1.2 Estimated Background Concentrations of 1,3-Butadiene [9]

Figure 8.2 illustrates a map of estimated annual mean background concentrations of 1,3-butadiene on a 1km square grid of East Dunbartonshire.

Examples of the concentrations found at specific reference points in East Dunbartonshire are detailed in Table 8.1.

Grid Reference	Location	2001	2003
East 253 500 North 673 500	Kinnoul Gardens, Bearsden, Baljaffray Primary School	0.197	0.158
East 245 500 North 671 500	Drymen Road at St. Germain's Loch, Bearsden.	0.238	0.189
East 260 500 North 609 500	Coltpark Avenue, Bishopbriggs.	0.260	0.203
East 261 500 North 682 500	Wester Cleddens Road, Bishopbriggs.	0.978	0.063
East 264 500 North 672 500	Thornwood Avenue, Kirkintilloch.	0.205	0.161

Table 8.1 Estimated annual mean background concentrations of 1,3-butadiene in $\mu g/m^3$ at grid reference locations in East Dunbartonshire.

8.5.1.3 Urban Background Concentrations [4]

The nearest national monitoring network site for 1,3-butadiene is located at Edinburgh Medical School and is classified as an urban background site. Whilst there is a considerable distance between the study area and this site the measured concentrations can be assumed to be typical of an urban location in the absence of industrial sources likely to emit this pollutant.

A summary of the maximum running annual mean concentration of 1,3-butadiene at this site is shown in Table 8.2. In order to determine if the maximum running annual mean is likely to be exceeded in 2003 use is made of current concentrations because there is no straightforward way to project future exceedences.

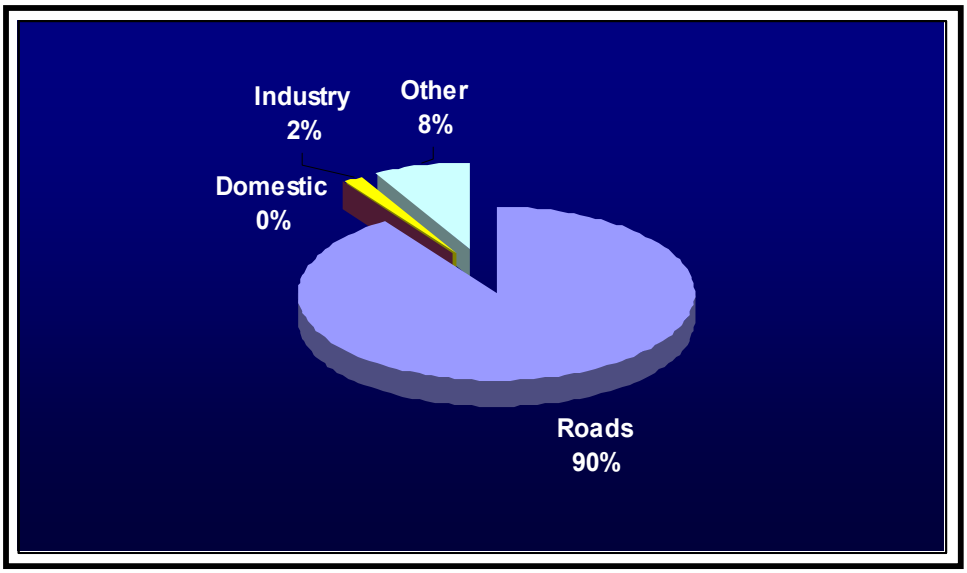


Figure 8.1 Distribution of 1,3-butadiene emissions by source in East Dunbartonshire, 2001

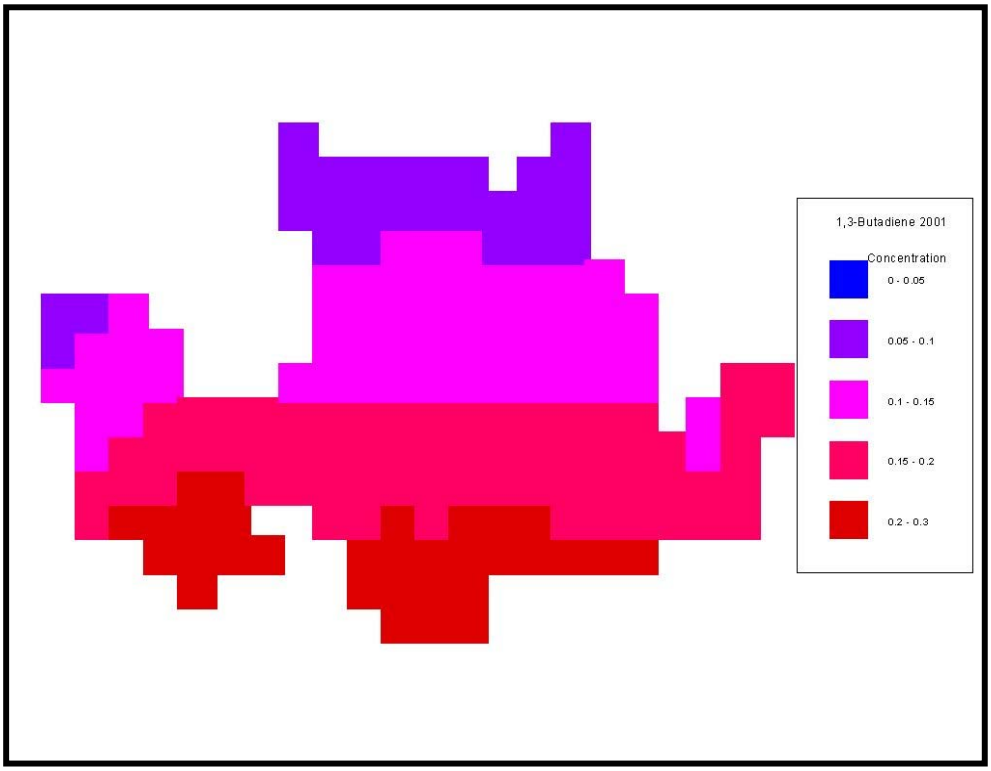


Figure 8.2 Estimated annual mean background concentrations of 1,3-butadiene in East Dunbartonshire

Year	1999	2000	2001
Maximum Running Annual Mean	0.21	0.19	0.20
Are any current running annual means greater than 2.25$\mu g/m^3$?	No	No	No

Table 8.2 Maximum running annual mean concentration of 1,3-butadiene in $\mu g/m^3$ at Edinburgh Medical School

The measured concentrations at this site are significantly below the 2003 maximum running annual mean objective of 2.25$\mu g/m^3$.

Information from the estimated map of background concentrations of 1,3-butadiene within East Dunbartonshire along with measured data from the network indicates that the objective for the running annual mean of 2.25$\mu g/m^3$ is unlikely to be exceeded in 2003.

8.5.2 (B) New Industrial Sources

There are no new industrial sources of 1,3-butadiene emissions within East Dunbartonshire or the surrounding local authority area.

8.5.3 (C) Industrial Sources with Substantially Increased Emissions

A number of authorised industrial processes are located within East Dunbartonshire area. The operator, location and process type are listed in Table 4.3.

There was no process identified within the local authority area in the first round as potentially significant with respect to 1,3-butadiene, therefore, there is no requirement to assess these sources further.

8.6 CONCLUSIONS FOR 1,3-BUTADIENE

The Updating and Screening Assessment for 1,3-butadiene in East Dunbartonshire indicates that the maximum running annual mean objective of 2.25μg/m^3 is unlikely to be exceeded in 2003. In addition the assessment shows that there are no significant sources of 1,3-butadiene emissions in the district or surrounding local authority area, therefore there is no requirement to proceed to a detailed assessment for 1,3-butadiene.

9. REVIEW AND ASSESSMENT OF LEAD

9.1 INTRODUCTION

Lead is the most widely used non ferrous metal and has a large number of industrial applications both in its elemental form and in alloys and compounds. Other uses are as a pigment in paints and glass, in alloys, in radiation shields, tank lining and piping. As the compound tetraethyl lead, it was used as a petrol additive to enhance the octane rating. Formerly, most of the emissions of lead, in the form of fine particles, arose from petrol engined motor vehicles, but the phasing out of leaded petrol has reduced concentrations to levels well below those considered harmful. There are a few locations where industrial sources or other non traffic sources of lead pollution remain. Since 1985, concentrations of lead in the air near to busy roads have fallen considerably. Measured lead concentrations in Glasgow showed a fall from 0.3μg/m^3 in 1985 to 0.05μg/m^3 1995. It is evident from reductions in emissions throughout the UK and in view of the phasing out of leaded petrol in 2000, road transport is no longer considered a significant source of airborne lead pollution.

Lead is a recognised neurotoxin and also exhibits toxic biochemical effects on the kidneys, gastrointestinal tract, joints and reproductive system. Human exposure to lead is through inhalation of lead contaminated air and through the food chain. Children are the most sensitive group and studies have indicated that children with high blood lead levels can suffer behavioural problems and lower I.Q. levels.

9.2 STANDARD AND OBJECTIVE FOR LEAD

The Scottish Executive has adopted an annual mean concentration of 0.5μg/m^3 as the air quality standard for lead, with an objective for the standard to be achieved by the end of 2004. In addition, a lower air quality objective of 0.25μg/m^3 to be achieved by 2008 has also been set.

9.3 THE NATIONAL PERSPECTIVE

Since the introduction of the ban on the sale of leaded petrol in January 2000, emissions of lead have been restricted to the aforementioned industrial processes.

Studies undertaken by the Government and the Devolved Administrations in the vicinity of 30 key industrial sites generally indicate that no exceedences of the 2004 or 2008 objectives are likely, with the exception of locations close to non-ferrous metal production and foundry processes which may present a risk [4].

9.4 THE LOCAL PERSPECTIVE

There have been no AQMA's declared in respect of the 2004 or 2008 Air Quality Objectives for lead from the first round of review and assessments.

The First Stage review and assessment for East Dunbartonshire concluded that the objective for the annual mean of 0.5μg/m^3 was unlikely to be exceeded in 2005.

9.5 UPDATING AND SCREENING ASSESSMENT FOR LEAD

This assessment will identify any significant changes that have occurred since the Stage 1 Review and Assessment for Lead was completed and will be based in the following checklist.

Summary of the Updating and Screening checklist approach for Lead		
Reference No.	**Source, location or data that needs to be assessed**	**Section**
A	Monitoring Data outside an AQMA	9.5.1
B	New Industrial sources	9.5.2
C	Industrial sources with substantially increased emissions	9.5.3

9.5.1 (A) Monitoring Data Outside an AQMA

The Technical Guidance LAQMTG(03) advises that data collected from National monitoring networks is likely to give the most accurate indication of lead concentrations.

All relevant lead monitoring data requires to be collated and assessed to identify locations where exceedences of the annual mean objectives for 2004 and 2008 might occur.

Monitoring of lead is not carried out within East Dunbartonshire, however, information is available from the neighbouring authorities of Glasgow City Council and North Lanarkshire Council.

9.5.1.1 Distribution of Lead Emissions [9]

The estimated emissions of lead by source in East Dunbartonshire is shown in Figure 9.1. In the absence of significant industrial sources of lead, emissions are derived mainly from road traffic sources.

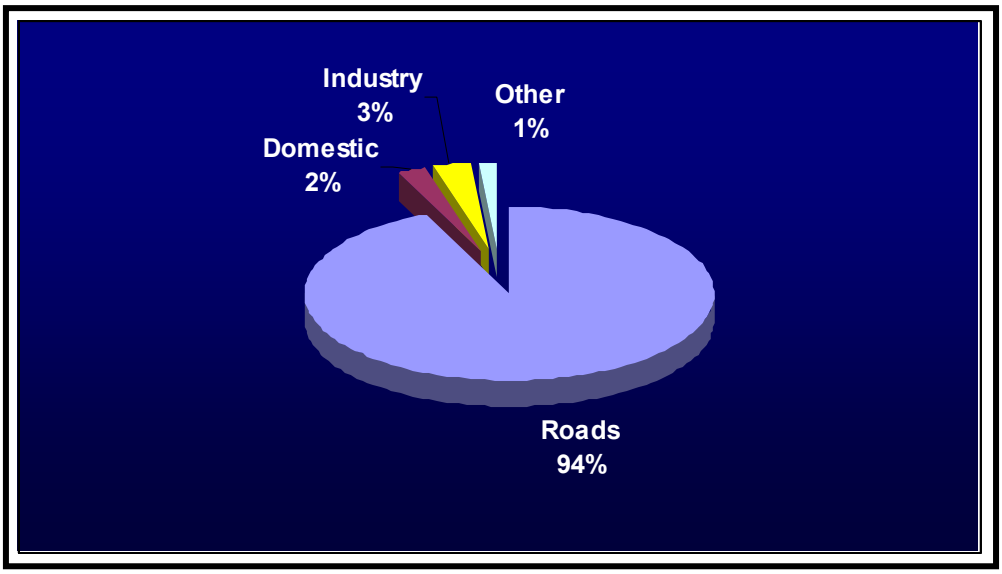


Figure 9.1 Distribution of lead emissions by source in East Dunbartonshire, 2001

9.5.I.2 Urban Background Concentrations

Table 9.1 summarises the annual mean lead-in-air concentrations from National Network sites in Motherwell and Glasgow between 1999 and 2001 [4]. Concentrations of lead have shown an overall downward trend since 1980.

Site	Annual mean Lead-in-air concentrations ($\mu g/m^3$)		
	1999	2000	2001
Glasgow	0.020	0.017	0.025
Motherwell	0.016	0.009	0.016

Table 9.1 Summary of annual mean lead concentrations at Urban background sites in Motherwell and Glasgow

9.5.1.3 Assessment of the Annual Mean Concentrations Against The Objectives for 2004 and 2008

In this assessment use is made of current concentrations because there is no straightforward way to project future exceedences (except where data has been measured in the vicinity of industrial sources,) [4]. The data from these network sites are for locations classified as urban background sites. Lead concentrations within East Dunbartonshire are likely to be similar to levels at these two sites. It can be seen from this data that there are no current annual mean concentrations of lead greater than the 2004 objective of 0.5μg/m^3 or the 2008 objective of 0.25μg/m^3.

Information from the map of estimated lead concentrations in East Dunbartonshire, in addition to the measured decline in concentrations of lead in adjacent authorities, indicates that the objective for the annual mean of 0.5μg/m^3 for 2004 and the objective of 0.25μg/m^3 for 2008 are unlikely to be exceeded.

9.5.2 (B) New Industrial sources

There are no new industrial sources of lead emissions in East Dunbartonshire or the surrounding local authority areas.

9.5.3 (C) Industrial Sources with Substantially Increased Emissions

A number of authorised industrial processes are located within the East Dunbartonshire local authority area. The operator, location and process type are listed in Table 4.3 There was no process identified within the local authority area in the first round of review and assessment as potentially significant with respect to lead emissions, therefore, there is no requirement to assess these sources further.

9.6 CONCLUSIONS FOR LEAD

The Updating and Screening assessment for lead in East Dunbartonshire indicates that the annual mean objective of 0.5μg/m^3 is unlikely to be exceeded in 2004 and the annual mean objective of 0.25μg/m^3 is unlikely to be exceeded in 2008. In addition there are no significant sources of lead in the area, therefore there is no requirement to proceed to a detailed assessment for lead.

10. REVIEW AND ASSESSMENT OF NITROGEN DIOXIDE

10.1 INTRODUCTION

Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen and together they are referred to as nitrogen oxides (NO_x). Nitrogen oxides are released into the atmosphere mainly in the form of NO which is then readily oxidised to NO_2 by reaction with ozone. All combustion processes produce some NO_x but only NO_2 is associated with ill health, affecting the respiratory system.

The main sources of NO_x in the United Kingdom are road transport, accounting for 48% of total UK emissions in 2000. This proportion is typically higher in congested urban areas with slow moving traffic as well as at locations in the vicinity of motorways and major roads carrying high speed traffic.

Nitrogen dioxide has a variety of environmental and health impacts. It is a respiratory irritant, may exacerbate asthma and possibly increase susceptibility to infections. In the presence of sunlight, it reacts with hydrocarbons to produce photochemical pollutants such as ozone, which itself is an irritant.

10.2 STANDARD AND OBJECTIVES FOR NITROGEN DIOXIDE

The Scottish Executive has adopted two Air Quality Objectives for nitrogen dioxide, as an annual mean concentration of 40μg/m^3 and a 1-hour mean concentration of 200μg/m^3 not to be exceeded more than 18 times a year. The objectives are to be achieved by the end of 2005.

These objectives have been derived from the first Air Quality Daughter Directive which are required to be achieved by 2010 and standards set by the Expert Panel on Air Quality Standards (EPAQS). The Directive includes a 1-hour limit value of 200μg/m^3 not to be exceeded more than 18 times per year and an annual mean limit value of 40μg/m^3.

10.3 THE NATIONAL PERSPECTIVE

As a result of various policy measures the contribution of road transport to nitrogen oxide emissions has been reducing in recent years. Traffic emissions are expected to fall by 20% between 2000 and 2005 and by 46% between 2000 and 2010. In the UK, industrial sources including power stations account for some 24% of emissions and commercial sources account for a further 23%.

The annual mean objective of 40μg/m^3 is currently widely exceeded at roadside locations throughout the UK while the short term objective has only been exceeded at roadside sites in close proximity to heavily trafficked areas in major conurbations.

National studies have indicated that the annual mean objective is likely to be achieved in all urban background locations outside London by 2005. The objective is likely to be exceeded more widely at locations in close proximity to busy road links throughout the UK.

10.4 THE LOCAL PERSPECTIVE

Following the first round of review and assessments more than 100 Air Quality Management Areas (AQMAs) were declared. These were mainly related to traffic sources of nitrogen oxide emissions.

Exceedences of the annual objective are likely to occur at locations within 10m of the kerbside close to roads with traffic flows greater than 10,000 vehicles per day. Local authorities are advised to concentrate on "hot spots" where pollutant concentrations are expected to be highest. If there are no exceedences at the most polluted locations, then it is reasonable to assume that there should be no exceedences elsewhere.

In the Stage 1 Air Quality Review and Assessment the conclusions from monitoring results in East Dunbartonshire, together with data from the urban background site in Glasgow indicated that both objectives for the annual mean and maximum 1-hour average were unlikely to be exceeded in 2005.

10.5 THE UPDATING AND SCREENING ASSESSMENT FOR NITROGEN DIOXIDE

This assessment requires local authorities to identify any significant changes that may have occurred since the first round of review and assessment completed in December 1998. The following issues will be considered for assessment against the 2005 objectives based on the checklist approach.

Summary of Updating and screening checklist approach for Nitrogen Dioxide		
Ref No.	**Source, location or data that needs to be assessed**	**Section**
A	Monitoring data outside an AQMA	10.5.1
B	Monitoring data within an AQMA	10.5.2
C	Narrow congested streets with residential properties close to the kerb	10.5.4
D	Junctions	10.5.5
E	Busy streets were people may spend 1 hour or more close to traffic	10.5.6
F	Roads with high flow of buses and/or HGV's	10.5.7
G	New roads constructed or proposed since first round of review and assessment	10.5.8
H	Roads close to the objective during the first round of review and assessment	10.5.9
I	Roads with significantly changed traffic flows	10.5.10
J	Bus stations	10.5.11
K	New industrial sources	10.5.12
L	Industrial sources with substantially increased emissions	10.5.13
M	Aircraft	10.5.14

10.5.1 (A) Monitoring Data Outside an AQMA

Local authorities are recommended to priorities the use of monitoring data in particular from monitoring sites relevant for public exposure and where the highest concentrations are expected. Measured data is expected to give a more accurate indication of nitrogen dioxide levels than modelling studies.

10.5.1.1 Distribution of NO_x Emissions [9]

The estimated emissions of oxides of nitrogen by source in East Dunbartonshire is shown in Figure 10.1.

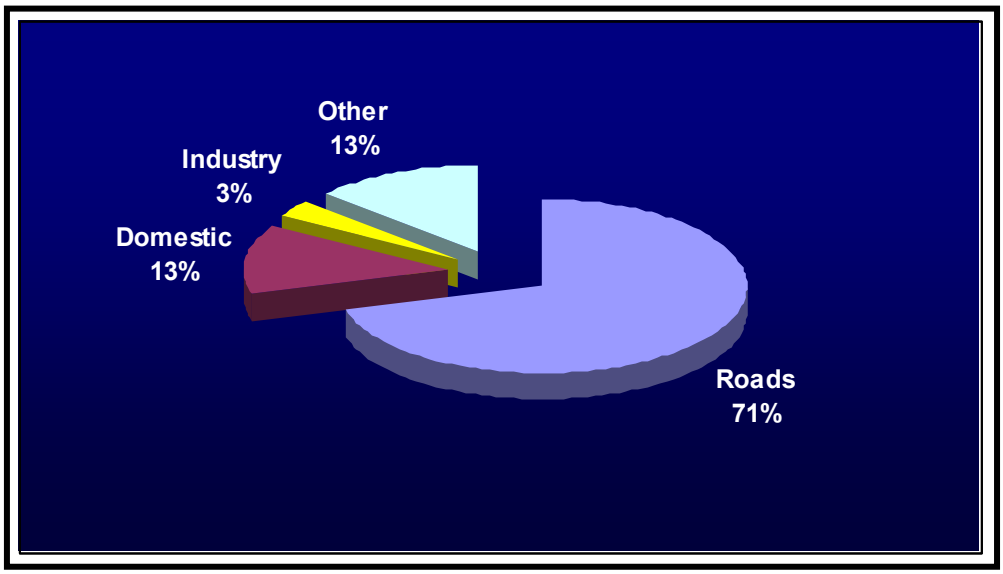


Figure 10.1 Distribution of emissions of nitrogen oxides by source in East Dunbartonshire.

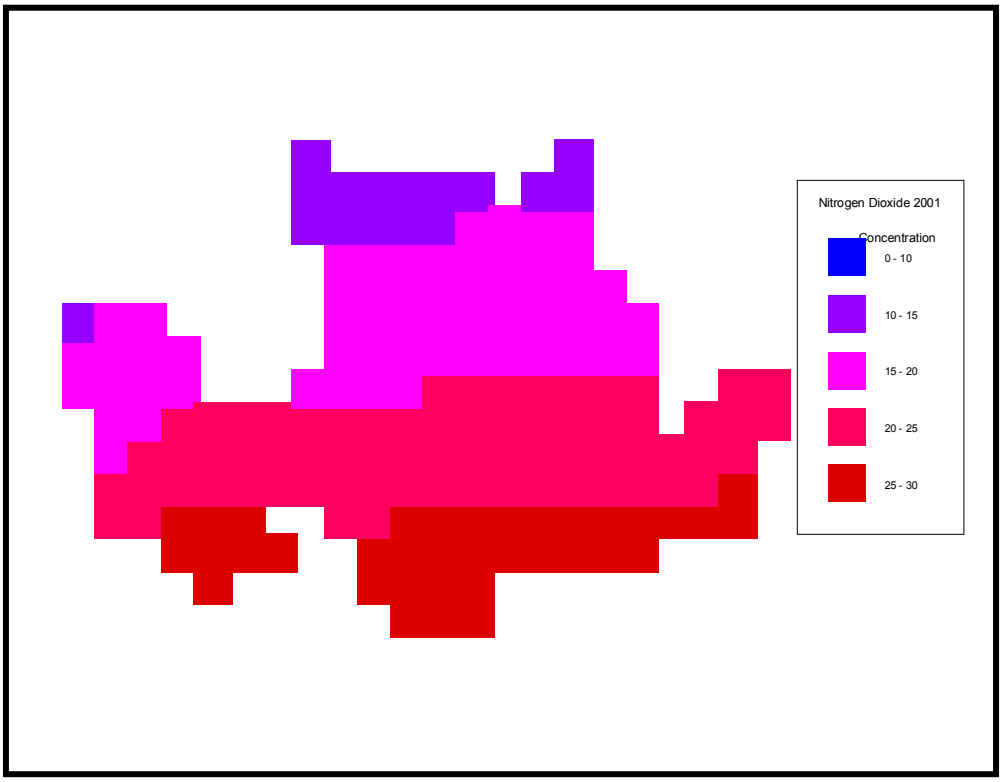


Figure 10.2 Estimated annual mean background concentrations of nitrogen dioxide

10.5.1.2 Estimated Background Concentrations of Nitrogen Dioxide [9]

Figure 10.2 illustrates a map of estimated background concentrations of nitrogen dioxide.

10.5.1.3 Nitrogen Dioxide Diffusion Tube Data

In East Dunbartonshire nitrogen dioxide has been measured by the diffusion tube method since 1992. There are currently a total of 8 sites which are part of the UK Nitrogen Dioxide Network together with 3 non network near road sites. The 8 network sites comprise 4 near road and 4 background sites. All of the sites are listed in Figure10.3 and geographical locations are shown in Appendix 1. These sites provide mean concentrations over a monthly exposure period.

In 2001 the intermediate classification was removed from Network sites. The two intermediate sites were replaced by near road sites, one site at Rannoch Drive in Bearsden which had been established since 1997 and a new site in Kirkintilloch Road, Bishopbriggs which was identified as a potential "hot spot", has been operating since 2001.

The annual mean objective applies at all locations were members of the public might regularly be exposed such as building facades of residential properties, schools and hospitals. All of the monitoring sites are in locations of relevant public exposure, including housing and a school.

The diffusion tubes for all 11 sites are analysed by Glasgow Scientific Services. The laboratory is UKAS accredited for this technique and takes part in WASP and NETCEN external proficiency testing schemes, including the NO_2 Diffusion Tube Field Intercomparison Exercise. In addition to this the laboratory operates an internal quality control system. The diffusion tube preparation method used since June 2001 is the 20% Triehanolamine (TEA) in water method recommended by AEA Technology. Previously tubes were prepared using 50% TEA in water.

WASP	Workplace Analysis Scheme for Proficiency
NETCEN	National Environmental Technology Centre

Figure 10.3 Nitrogen Dioxide Diffusion Tube Sites

NITROGEN DIOXIDE DIFFUSION TUBE NETWORK SITES

1 Bishopbriggs 6 (near road) – Bishopbriggs Cross

2 Bishopbriggs 12 (near road) - 24 Kirkintilloch Road, Bishopbriggs.

3 Bearsden 1 (near road) -118 Drymen Road, Bearsden.

4 Bearsden 10 (near road) - 5 Rannoch Drive, Bearsden.

5 Bishopbriggs 5 (Background) - Huntershill House, Crowhill Road, Bishopbriggs.

6 Bishopbriggs 8 (Background) - 77 Brackenbrae Avenue, Bishopbriggs.

7 Bearsden 3 (Background) - 5 Ravelston Road, Bearsden.

8 Bearsden 4 (Background) - 8 Lowther Avenue, Bearsden.

NON NETWORK NITROGEN DIOXIDE DIFFUSION TUBE SITES

9 Bearsden 7 (near road) - Traffic light at Bearsden Cross.

10 Bearsden 8 (near road) - Hanging Basket Pole at Bearsden Cross.

11 Bearsden 9 (near road) - Switchback Road, at Braemar Crescent, Bearsden.

10.5.1.4 Diffusion Tube Bias Adjustment Factors

Glasgow Scientific Services (GSS) has participated in the UK Nitrogen Dioxide Diffusion Tube Network Intercomparison Exercise since 1998 [11]. However, the bias factors obtained from these exercises are not sufficient for scaling data as the results are derived from only one month of monitoring. The data from these short term intercomparison studies will be used to give an indication of the performance of diffusion tubes in this assessment. Therefore, the diffusion tube monitoring results for East Dunbartonshire sites for the years 1998 to 2000 will be reported only to show trends in diffusion tube performance and concentration in accordance with advice from NETCEN. The data for 2001 will not be used in this report due to the fact that there was a change in the diffusion tube preparation method in 2001.

Bias adjustment factors have been calculated by GSS for 2002, based on results from a co-location study carried out by Glasgow City Council. These bias adjustment factors will be applied to the diffusion tube survey results for East Dunbartonshire for 2002 and the data used to predict annual mean nitrogen dioxide concentrations for 2005.

10.5.1.5 NO_2 Diffusion Tube Field Intercomparison Exercise

Year	**Average Bias Measurement – GSS (recommended target ± 25%)**
1998	+10.3%
1999	+ 4.0%
2000	+ 2.3%

Annual mean concentrations of NO_2 have been calculated from measured diffusion tube data using the above bias adjustment factors for 1998 to 2000.

In accordance with the Technical Guidance LAQM.TG(03), where measured data has been collected then the concentrations will need to be adjusted for the relevant future years. Correction factors have been derived from the estimated reduction in road traffic emissions in future years. Separate correction factors can be applied to roadside and background data. [4].

The correction factors [9] have been applied to the annual mean concentrations from measured diffusion tube data to estimate the annual average concentrations of NO_2 in 2005 and the results summarised in Table 10.1. The annual mean concentrations have been projected forward from each year of monitoring (1998 to 2000) to show the range of future concentration. However, these predictions will not be used to assess compliance with the objective since there are no valid bias adjustment factors available for these years. The decision on compliance will be based on the most recent measured annual mean concentrations for 2002.

SITE LOCATION	1998	2005	1999	2005	2000	2005
Bearsden 1 Drymen Road	24	19	20	17	21	18
Bearsden 7 Bearsden Cross	29	23	25	21	25	22
Bearsden 8 Bearsden Cross	31	25	24	20	24	21
Bearsden 9 Switchback Road	24	19	18	15	18	15
Bearsden 10 Maryhill Road	25	20	20	17	23	20
Bishopbriggs 6 Bishopbriggs Cross	39	31	37	31	40	34
Bearsden 3 Ravelston Road	14	11	12	10	14	12
Bearsden 4 Lowther Road	10	8	8	7	10	9
Bishopbriggs 5 Huntershill House	15	12	12	10	15	13
Bishopbriggs 8 Brackenbrae Avenue	15	12	12	10	14	12

Table 10.1 Annual Mean Concentrations of Nitrogen Dioxide ($\mu g/m^3$) between 1998 and 2000 with estimated concentrations for 2005

10.5.1.6 Trends in Annual Mean Concentration of NO_2

In order to identify possible long term trends in nitrogen dioxide concentrations a simple linear regression was carried out on the diffusion tube data for Bishopbriggs as this spans a 10 year period. This analysis is shown both graphically and in tabular form in Figure 10.5. All three sites show a decline in nitrogen dioxide concentrations over this period.

10.5.1.7 GLASGOW CITY COUNCIL CO-LOCATION STUDY [12]

NITROGEN DIOXIDE DIFFUSION TUBE BIAS CORRECTION

Glasgow City Council have co-located triplicate diffusion tubes with five chemiluminescence sites since mid 2000

These diffusion tubes were analysed in-house until mid 2001 and then analysis moved to Glasgow Scientific Services. Therefore in order to calculate bias factors 2002 is the first full year of valid data.

The results of the diffusion tubes have been compared to the chemiluminescence monitors for the five sites. However due to data capture rate difficulties and other specific issues only two sites worth of data is valid for assessing bias. The results for those sites are detailed below as calculated using the technical guidance.

It should be noted that automatic monitoring data for the last three months of 2002 are not yet ratified.

Glasgow Kerbside

Annual Mean Diffusion Tube Concentration Dm=88.1μg/m^3
Annual Mean Chemiluminiescence Concentration Cm=74.5μg/m^3
Bias Adjustment Factor A = 74.5/88.1 = 0.845
Diffusion Tube Bias B=(Dm-Cm)/Cm = 0.183 or 18.3%
Therefore a factor of 0.845 could be applied to all kerbside diffusion tube results for 2002

Glasgow Centre

After consultation with Glasgow Scientific Services who supply the diffusion tube data it was agreed to remove March results from the analysis. Glasgow Scientific had applied Dickson's test to the data set to identify outliers. This meant March results had also to be removed from AURN dataset. So this calculation is based on 11 months of data for 2002.

Annual Mean Diffusion Tube Concentration Dm=40.0μg/m^3
Annual Mean Chemiluminescence Concentration Cm=32.8μg/m^3
Bias Adjustment Factor A = 32.8/40 = 0.821
Diffusion Tube Bias B=(Dm-Cm)/Cm = 0.219 or 21.9%

Therefore a factor of 0.821 could be applied to all urban background diffusion tube results for 2002.

AURN - Automatic Urbun and Rural Networks

The monthly data and annual mean concentrations of Nitrogen Dioxide measured at near road and background sites for 2002 are shown in Table 10.2. The appropriate bias adjustment has been applied to the annual mean values using the above factor of 0.845 for near road sites and 0.821 for background sites.

SITE LOCATION	SITE CLASSIFICATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL MEAN	BIAS ADJUSTED ANNUAL MEAN
Bearsden 1 Drymen Road	A	32	31	30	29	30	21	19	26	33	2	39	40	28	24
Bearsden 7 Bearsden Cross	A	34	31	31	35	37	33	35	36	38	49	49	44	38	32
Bearsden 8 Bearsden Cross	A	33	33	32	24	29	30	26	31	N	38	N	42	32	27
Bearsden 9 Switchback Road	A	34	28	28	28	25	19	23	25	29	34	44	40	30	25
Bearsden 10 Maryhill Road	A	34	35	38	32	31	26	29	N	35	37	47	45	35	30
Bishopbriggs 6 Bishopbriggs Cross	A	41	42	46	42	40	35	42	45	52	45	50	51	44	37
Bishopbriggs 12 Kirkintilloch Road	A	38	33	40	N	N	29	N	40	51	56	54	68	45	38
Bearsden 3 Ravelston Road	B	19	17	18	18	18	15	13	16	23	29	39	42	22	18
Bearsden 4 Lowther Avenue	B	N	8	12	9	N	N	N	N	15	17	29	30	17	N
Bishopbriggs 5 Huntershill House	B	24	17	15	17	12	11	13	14	24	26	32	35	20	16
Bishopbriggs 8 Brackenbrae Avenue	B	25	19	20	19	16	12	11	10	22	26	35	39	21	17

Table 10.2 Monthly and Annual Mean Nitrogen Dioxide Concentrations in $\mu g/m^3$ from diffusion tube data for 2002

SITE CLASSIFICATION **A = NEAR ROAD** **N = NO DATA**
B = BACKGROUND

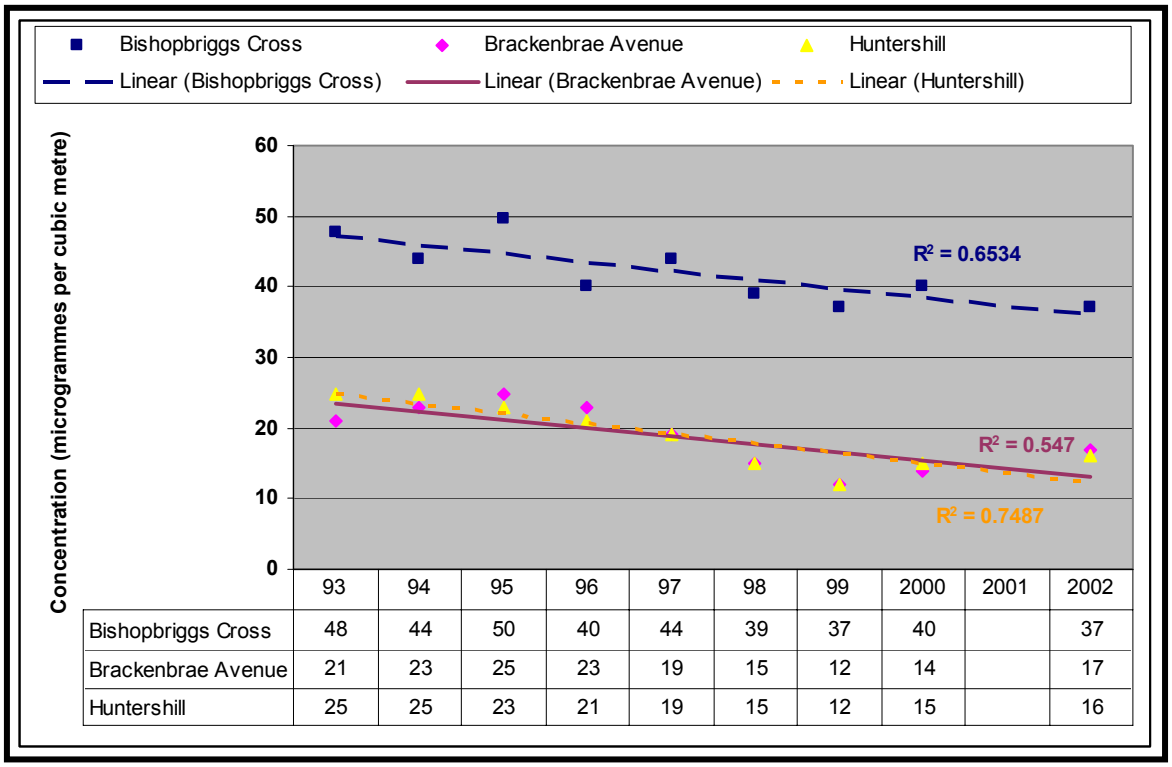
10.5.1.8 Estimated Annual Mean Concentration of Nitrogen Dioxide in 2005 and 2010

Correction factors are provided in Technical Guidance LAQMTG(03) (Box 6.6) to estimate annual average NO_2 concentrations in future years from measured data at roadside sites. These factors have been applied to the measured data for the near road sites for the relevant objective year 2005. Projections for the year 2010 have been included in this study to assess the EU 2010 limit value, although it is extremely unlikely that the limit value will be exceeded if this objective is met. These values have been summarised in Table 10.3 and can be seen graphically in Figure 10.6 for comparison with the 2005 objective. Similarly, correction factors provided in the Technical Guidance (Box 6.7) have been applied to the measured concentrations at background sites to estimate NO_2 concentrations in future years.

NEAR ROAD	SITE CLASSIFICATION	2002	2005	2010
Bearsden 1 Drymen Road	A	24	22	18
Bearsden 7 Bearsden Cross	A	32	29	24
Bearsden 8 Bearsden Cross	A	27	25	20
Bearsden 9 Switchback Road	A	25	23	19
Bearsden 10 Maryhill Road	A	30	28	23
Bishopbriggs 6 Bishopbriggs Cross	A	37	34	28
Bishopbriggs 12 Kirkintilloch Road	A	38	35	29
BACKGROUND				
Bearsden 3 Ravelston Road	B	18	17	14
Bishopbriggs 5 Huntershill House	B	16	15	13
Bishopbriggs 8 Brackenbrae Avenue	B	17	16	14

Table 10.3 Predicted Annual Mean Nitrogen Dioxide concentrations ($\mu g/m^3$) for 2005 and 2010 from measured diffusion tube data for 2002

This summary shows that the highest forecast annual mean of nitrogen dioxide concentration for 2005 is 35$\mu g/m^3$ at the roadside site in Kirkintilloch Road, Bishopbriggs. The monitoring data for East Dunbartonshire indicates that there is no predicted annual mean nitrogen dioxide concentration greater than 40$\mu g/m^3$.



	93	94	95	96	97	98	99	2000	2001	2002
Bishopbriggs Cross	48	44	50	40	44	39	37	40		37
Brackenbrae Avenue	21	23	25	23	19	15	12	14		17
Huntershill	25	25	23	21	19	15	12	15		16

Figure 10.4 **Simple linear regression analysis of annual means for diffusion tube sites in Bishopbriggs, 1993 - 2002**

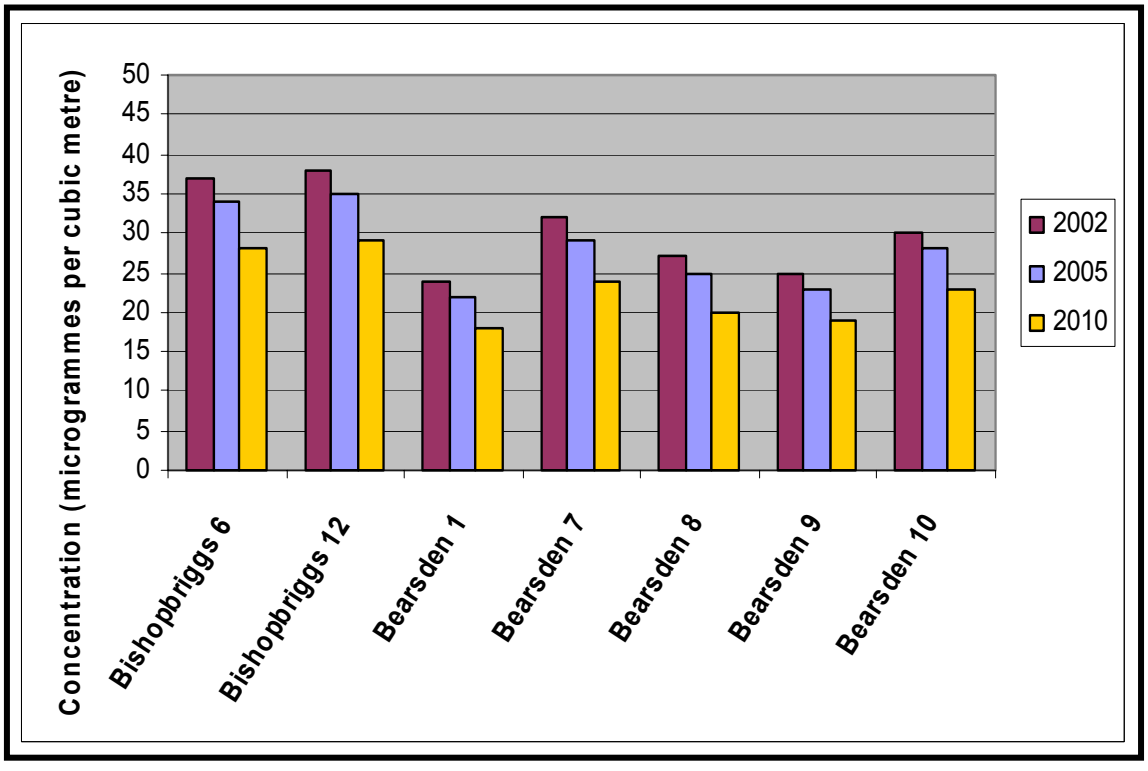


Figure 10.5 **Predicted Annual Mean Nitrogen Dioxide Concentration ($\mu g/m^3$) for 2005 and 2010 from measured diffusion tube data for 2002**

10.5.1.9 Data from National Networks

Although continuous automatic monitoring of nitrogen dioxide is not carried out within East Dunbartonshire, Glasgow City Council has an established urban background site, namely, Glasgow Centre. Two years of data (1999 and 2001) has been analysed and directly compared to the 1-hour and annual mean objectives for nitrogen dioxide, with the number of hourly exceedences shown for each year. It should be noted that this site is in a city centre location and concentrations are likely to have higher 1-hour and annual averages compared to East Dunbartonshire.

Statistics for years 1999 to 2001 for the urban centre site in are shown in Table 10.4 below.

Year	1999	2000	2001
Annual Mean $\mu g/m^3$	39	-	34
No. of hourly exceedences of $200\mu g/m^3$	3	-	0

Table 10.4 Nitrogen Dioxide concentrations and exceedences of the 1 hour objective at Glasgow Centre 1999 to 2001

The annual mean concentrations for nitrogen dioxide at this site are below the objective for 2005. No exceedences of the 1-hour objective were recorded in 2000 and the 3 exceedences recorded in 1999 would not breach the objective which allows for more than 18 exceedences a year. It is unlikely, therefore, that the 1-hour objective of $200\mu g/m^3$ would be exceeded at locations in East Dunbartonshire.

Conclusion for Monitoring Data

The assessment of monitoring data in East Dunbartonshire, together with data from the urban background site in Glasgow, indicates that the objectives for the annual mean of $40\mu g/m^3$ and the 1-hour mean of $200\mu g/m^3$ are unlikely to be exceeded by the end of 2005

10.5.2 (B) Monitoring Data within an AQMA

There are no Air Quality Management Areas within East Dunbartonshire.

10.5.3 Road Traffic Sources

Defra has examined the results of the last round of review and assessment to identify locations and levels of traffic that might lead to exceedences of the objective for nitrogen dioxide. This part of the assessment is structured around those conclusions.

The screening assessment for road traffic sources of nitrogen dioxide has been carried out using the Design Manual for Roads and Bridges (DMRB) published by the Highways Agency [13]. The DMRB model requires input data on annual average speeds, the proportion of different vehicle types, the type of road and the distance from the centre of the road to the receptor. This data, along with the background concentrations of nitrogen oxides and nitrogen dioxide for 2001,2005 and 2010 obtained from the UK air quality archives [9], are entered on the input spreadsheets. Examples of spreadsheets are presented in Appendix 2.

Traffic count data was obtained from East Dunbartonshire, Roads and Infrastructure division using AADT24 flows and local link specific information for % HDVs. A zero growth factor has been applied to estimate flows for future years. Examples of turning count data are shown in Appendix 3. Technical Guidance LAQM.TG(03) advises that, for the DMRB Screening Model Assessment, basic daily average speed for two-way flow is adequate for both road links and junctions. There is no accurate traffic speed data available for the road network in East Dunbartonshire. Limited data is available for the A803 Kirkintilloch Road, Bishopbriggs and this is shown in Appendix 3. This data was used, along with local knowledge, to estimate the speeds for the road links and junctions in this study.

The DMRB model predicts the annual mean concentration for direct comparison with the annual mean objectives. If the annual mean objectives are not exceeded, then the authority may assume that the short term (1-hour) objectives will also be met. Predictions must be carried out at the roadside locations with relevant public exposure. The approach described in section 5.3 of this report was used to identify locations representing relevant exposure for each of the road traffic sources.

10.5.4 (C) Narrow congested streets with residential properties close to the kerb

In this category roads within the following criteria should be identified:

- carriageway is less than 10m wide,
- traffic flow is greater than 10,000 vehicles per day,
- average speed is 50kph or less, and
- there are residential properties within 5m of the kerb.

Roads within this category would typically have flatted dwellings or houses without gardens fronting onto a busy street. There are relatively few of these types of properties in the East Dunbartonshire area. One location (shown in Figure 10.6) was identified where the traffic flow is greater than 10,000 vehicles per day and there are flatted dwellings within 5m of the road, namely Townhead, Kirkintilloch **(site No. 9).** The DMRB screening model was used to assess the predicted annual mean concentration of nitrogen dioxide in 2005. A summary of the traffic flows and relevant input data used in the DMRB spreadsheet for 2005 is shown in Table 10.5. The input spreadsheet and summary output spreadsheets for 2005 and 2010 are presented in Appendix 2.

The predicted annual mean nitrogen dioxide concentration for 2005 at this location is 28μg/m^3. It is unlikely that the objective of 40μg/m^3 would be breached in 2005, therefore there is no requirement to proceed to a detailed assessment for nitrogen dioxide with respect to this category.

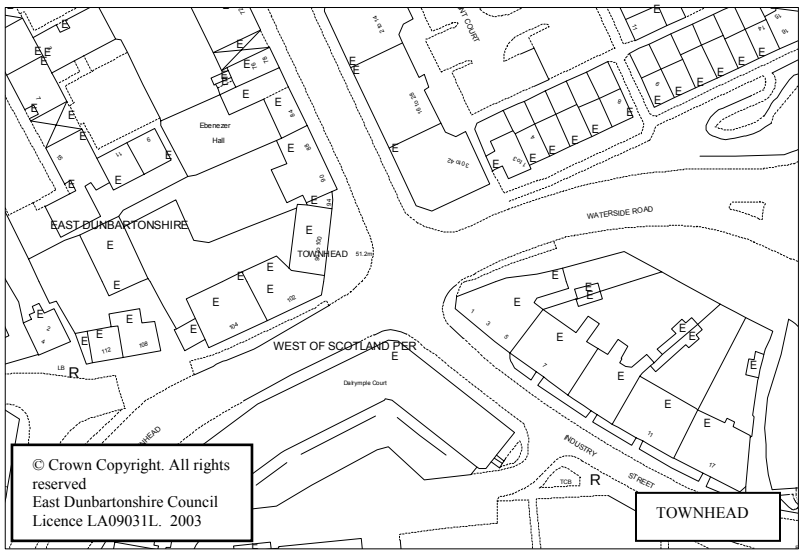


Figure 10.6 Location Map of Site No. 9, Townhead, Kirkintilloch

10.5.5 (D) Junctions

It has been shown from the first round of review and assessments that often junctions were not considered adequately. This assessment is required where there was no specific assessment of junctions during the first round against the 2005 objective. A "busy" junction can be taken to be one with more than 10,000 vehicles per day. There are numerous "busy" junctions within this criteria in East Dunbartonshire, however, for the purpose of this assessment a total of 8 busy junctions were identified with high traffic flows and where background concentrations of nitrogen dioxide are highest. A summary of traffic flows and relevant input data used in the DMRB spreadsheet are shown in Table 10.5. The locations shown in Figures 10.7 and 10.8 represent areas with relevant receptors, within 10 metres of the road, including housing and schools. The appropriate links at the junctions were determined and relevant receptor distances calculated, in accordance with the guidance in the DMRB [13].

The DMRB screening model was used to predict the annual mean nitrogen dioxide concentration in 2005 for comparison with the objective and 2010 to assess compliance with the EU limit value. The input data for 2005 and the predicted annual means for 2005 and 2010 are summarised in Table 10.5. The summary output spreadsheets for all of the roads modelled along with examples of input spreadsheets are presented in Appendix 2.

There is one predicted annual mean nitrogen dioxide concentration greater than 40μg/m^3. i.e. for a residential receptor at Bishopbriggs Cross where the predicted annual mean is 41μg/m^3. However, the Technical Guidance LAQM.TG(03) advises that where monitoring data is available for such locations then these results should be used in preference to the modelled data. The predicted annual mean nitrogen dioxide concentration from measured data for 2002 at Bishopbriggs Cross is 34μg/m^3 . Therefore, there is no requirement to proceed to a detailed assessment for nitrogen dioxide with respect to busy junctions within East Dunbartonshire.

Site No.	Receptor	Link No.	Distance from Link Centre to Receptor (m)	AADT	Annual Average Speed Km/h	Total % HDV	Annual Mean Background Concentration 2005		Predicted Annual Mean Concentrations NO_2 $\mu g/m^3$	
							NO_x $\mu g/m^3$	NO_2 $\mu g/m^3$	2005	2010
1	House Bishopbriggs Cross	1	11	24,496	30	11	41	25	**41**	**34**
		2	20	3,472	30	5				
		3	6	3,457	30	3				
2	House Springburn Rd. at Colston Rd.	1	14	22,281	30	7	45	26	**38**	**32**
		2	13	12,040	30	4				
3	House Switchback Rd	1	22	26,773	40	6	37	23	**29**	**24**
4	House Garscube Mill	1	14	19,627	40	10	39	24	**36**	**30**
		2	24	6,068	30	7				
5	Bearsden Primary School	1	10	21,330	30	3	35	22	**31**	**26**
		2	7	7,318	30	2				
6	House Milngavie Road at Roman Road	1	19	26,329	30	5	37	23	**34**	**28**
		2	11	8,395	30	3				
7	Lenzie Primary School	1	7	15,352	30	3	37	23	**28**	**24**
8	House Milngavie Road Canniesburn Toll	1	64	31,376	40	5	37	23	**36**	**30**
		2	29	12,979	40	5				
		3	12	17,873	40	3				
		4	12	7,275	40	7				
9	House Townhead Kirkintilloch	1	8	15,525	30	4	32	21	**28**	**23**
		2	16	6,634	30	3				

Table 10.5 Input data for DMRB Screening Assessment for Nitrogen Dioxide for 2005 with predicted NO_2 concentrations for 2005 and 2010

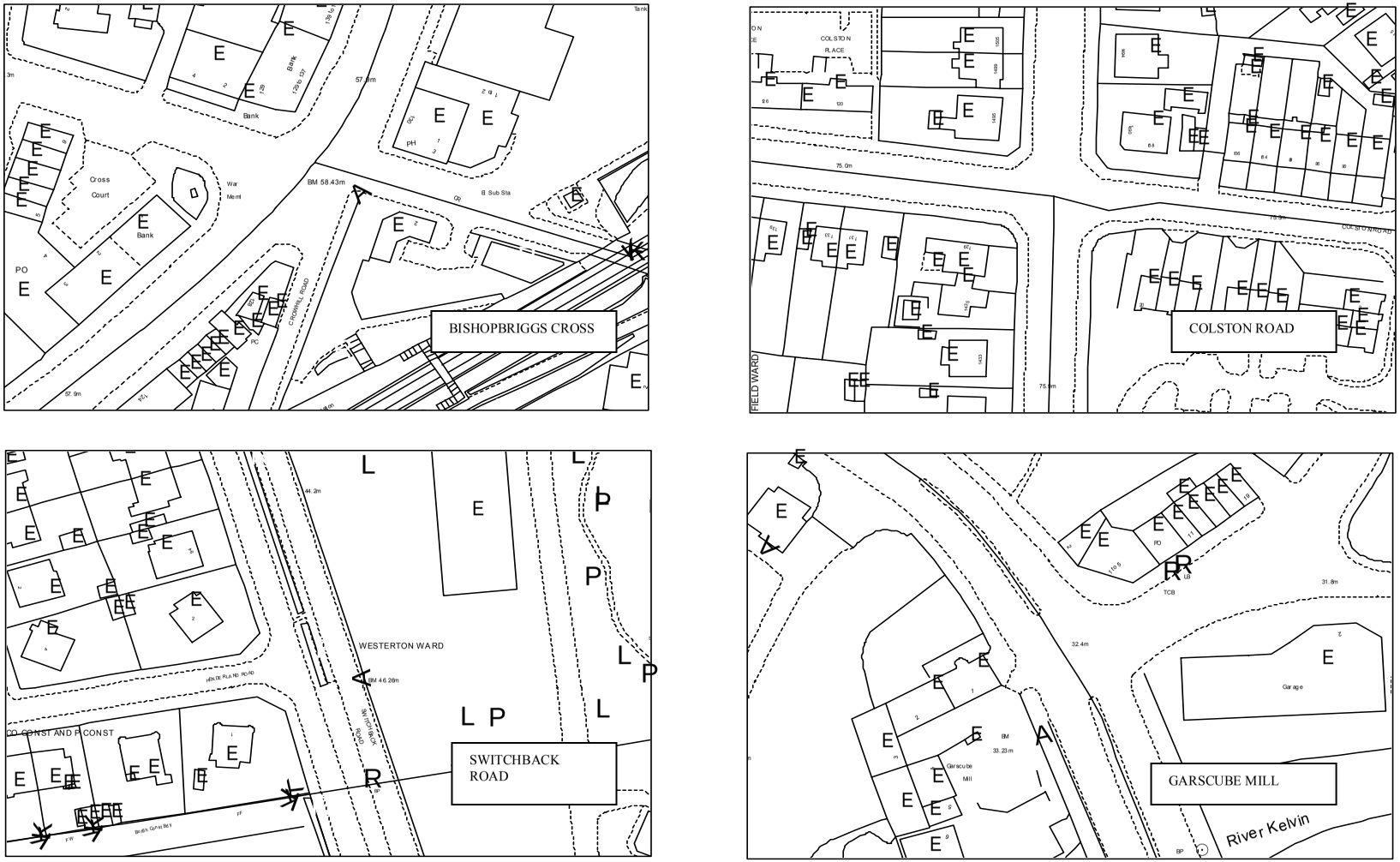


Figure 10.7 DMRB Modelling Locations (Junctions 1- 4)

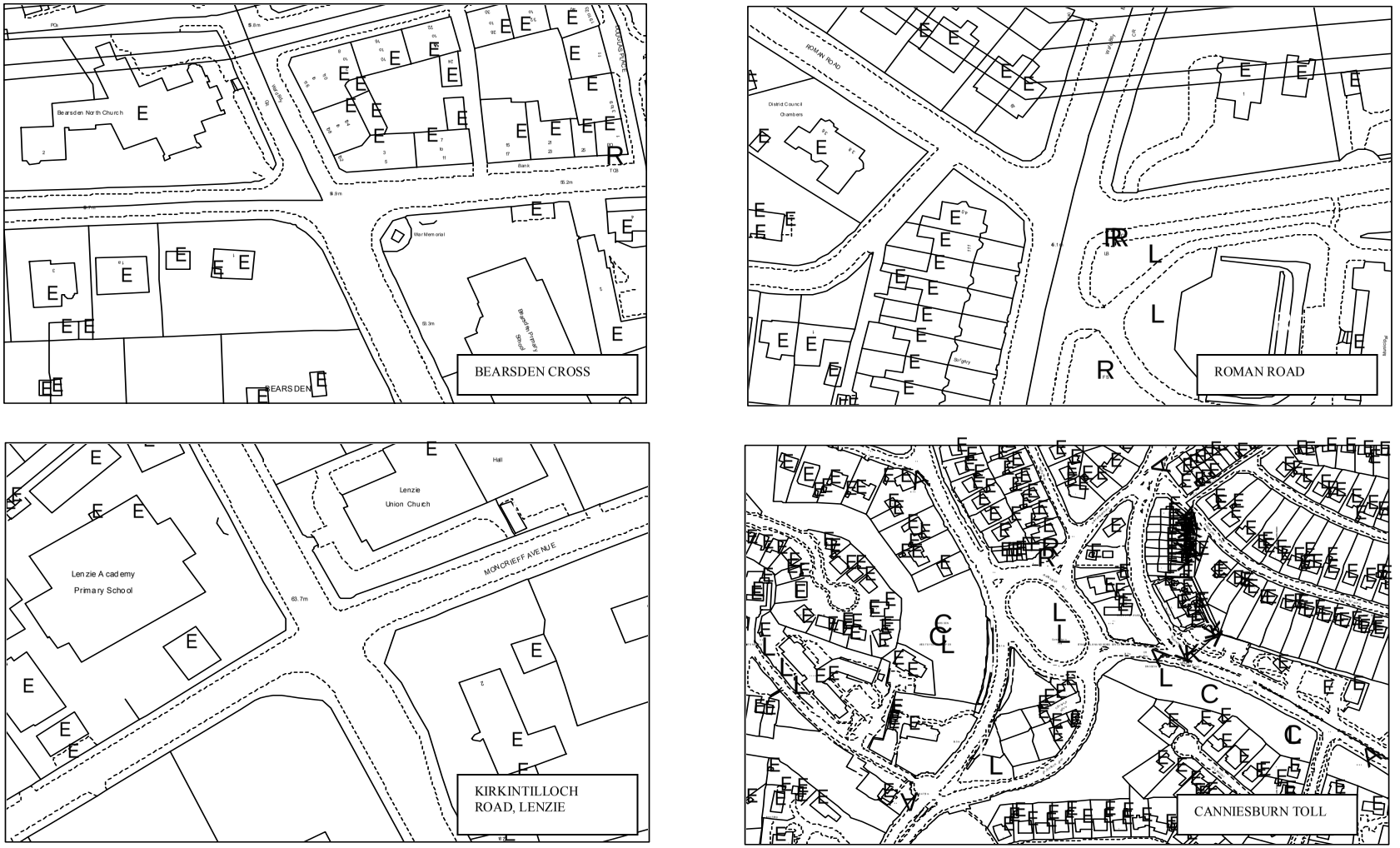


Figure 10.8 DMRB Modelling Locations (Junctions 5 - 8)

10.5.6 (E) Busy Streets where people may spend 1 hour or more close to traffic

Locations in this category are typically busy shopping streets where members of the public may regularly spend 1 hour or more. There are only three streets in this category within East Dunbartonshire.

- Kirkintilloch Road, at Bishopbriggs Cross
- Drymen Road, at Bearsden Cross
- Townhead, at Catherine Street, Kirkintilloch

All of the above locations were fully assessed in the first round and the first two have been assessed in this study under category (D) " junctions".

10.5.7 (F) Roads with High Flows of Buses and/or HGV's

The Technical Guidance LAQM.TG(03) advises that there may be some street locations where traffic flows are not high (less than 20,000 vehicles per day) but there is an unusually high proportion (>25%) of buses and/or HGV's. These can be a major source of nitrogen dioxides emissions.

A summary of the traffic flows and percentage HDVs for the principal roads in East Dunbartonshire is shown in Table 4.2 There are no roads identified with greater than 25% buses and/or HGV's , therefore there is no requirement to assess any roads for this category.

10.5.8 (G) New Roads constructed or proposed since the first round of review and assessment

There is one newly constructed road in East Dunbartonshire, namely, Bishopbriggs Relief Road. A recent survey undertaken by Roads and Infrastructure showed that the traffic flow on the new road is 4,822 vehicles per day. It is anticipated that this road will reduce traffic on the busy A803 Kirkintilloch Road through Bishopbriggs, where the highest levels of nitrogen dioxide are currently found.

There are no proposed new roads in East Dunbartonshire for which planning approval has been granted.

There is no requirement to carry out an assessment for this category.

10.5.9 (H) Roads close to the objective during the first round of review and assessment

This section addresses the changes to the emission factors in 2002. These new factors reflect the expected higher nitrogen oxides emissions in future years from road transport. It deals with locations where results were close to but just below the objective and for which AQMAs were not declared i.e. roads with a predicted annual mean concentration in 2005 above 36μg/m^3 which have not been reassessed using the new emissions factor.

In the Stage1 assessment for East Dunbartonshire the highest predicted annual mean concentration in 2005 was predicted to be 36μg/m^3 at Bishopbriggs Cross. This junction has been fully assessed in this study using diffusion tube data which predicts an annual mean concentration of 34μg/m^3 for this location in 2005.

10.5.10 (I) Roads with significantly changed traffic flows

Roads with more than 10,000 vehicles a day that have experienced more than 25% increase in traffic flow should be considered in this category.

Surveys carried out by East Dunbartonshire Council, Roads and Infrastructure Division, indicates a general trend in traffic reduction in all time periods analysed. This is supported by the assessment of junction capacity at key sites which is indicating maximum ratio to flow capacity during peak hours. This strongly indicates that traffic flows in the area are capacity restrained supporting the conclusion that there is zero growth, therefore there are no roads in East Dunbartonshire with significantly changed traffic flows. A comparison of traffic flows in this study (Table 4.2), with flows in the Stage 1 and Stage 2 reports, illustrates this trend.

10.5.11 (J) Bus Stations

There are no bus stations within East Dunbartonshire area.

10.5.12 (K) New Industrial Sources

There are no new or proposed industrial sources within East Dunbartonshire or the surrounding local authority areas.

10.5.13 (L) Industrial sources with substantially increased emissions

A number of authorised industrial processes are located within the East Dunbartonshire area. The operator, location and process type are listed in Table 4.3.

There was no process within the local authority and surrounding areas identified in the first round as potentially significant with respect to nitrogen dioxide emissions. In addition information has been obtained from SEPA that there are no significant changes to existing industrial processes in the area, therefore, there is no requirement to assess these sources further.

10.5.14 (M) Aircraft

There is no airport within East Dunbartonshire or the surrounding local authority area.

10.6 CONCLUSIONS FOR NITROGEN DIOXIDE

The Updating and Screening Assessment for nitrogen dioxide in East Dunbartonshire indicates that both the objective for the annual mean of 40μg/m^3 and the 1-hour mean of 200μg/m^3 are unlikely to be exceeded in 2005. In addition there is no significant industrial source of nitrogen dioxide emissions in the district. There is no requirement, therefore to proceed to a detailed assessment for nitrogen dioxide.

11. REVIEW AND ASSESSMENT OF SULPHUR DIOXIDE

11.1 INTRODUCTION

Sulphur dioxide (SO_2) is a corrosive acid gas which combines with water vapour in the atmosphere to produce acid rain. Both wet and dry depositions have been implicated in the damage and destruction of vegetation and in degradation of soils, building materials and watercourses. Sulphur dioxide is emitted in the combustion of coal and oil. The main source of sulphur dioxide emissions in the UK is power stations which alone accounted for some 71% emissions in 2000, domestic sources account for only 4% of emissions and other industrial combustion sources account for the remainder. Only about 1% of emissions come from road traffic sources.

Sulphur dioxide is an irritant when it is inhaled and high concentrations may cause breathing difficulties. A recent study commissioned by the Scottish Executive concluded that "the impacts of SO_2 on daily mortality and hospital admissions are small compared to those of other pollutants (such as nitrogen dioxide and particulates), reflecting the relatively low concentrations of SO_2 found in Central Scotland". [14]

11.2 STANDARDS AND OBJECTIVES FOR SULPHUR DIOXIDE

The Scottish Executive has adopted a 15 minute mean of 266μg/m^3 as an air quality standard for sulphur dioxide, with an objective for the standard not to be exceeded more than 35 times in a year by the end of 2005. Additional objectives have been set which are equivalent to the EU limit values specified in the First Air Quality Daughter Directive.

These objectives to be achieved by the end of 2004 are:-

- a 1-hour mean objective of 350μg/m^3, to be exceeded no more than 24 times per year
- a 24-hour objective of 125μg/m^3, to be exceeded no more than 3 times per year.

11.3 THE NATIONAL PERSPECTIVE

National Network surveys have shown that concentrations of sulphur dioxide have fallen at all sites in the period 1999-2001. During this period the objectives were only exceeded at one site in Belfast where the exceedence was associated with domestic coal burning. It is anticipated that local exceedences in the UK may occur in the vicinity of small combustion plant burning coal or oil, in areas of concentrated domestic fuel burning and in the vicinity of major ports.

11.4 THE LOCAL PERSPECTIVE

The small number of AQMAs declared in the first round of review and assessment were related to emissions from some specialist processes, domestic coal burning and shipping at a major port. The Stage 1 report for East Dunbartonshire concluded that from information obtained from sulphur dioxide monitoring and from emissions maps, the 15 minute mean objective was unlikely to be exceeded by the end of 2005.

11.5 UPDATING AND SCREENING ASSESSMENT FOR SULPHUR DIOXIDE

This assessment requires local authorities to identify any significant changes that may have occurred since the first round of review and assessment, completed in 1998, using a checklist approach. The information collated will identify areas in East Dunbartonshire at risk of exceeding the Air Quality Objectives for Sulphur Dioxide in 2004 and 2005.

Summary of the Updating and Screening Assessment checklist approach for Sulphur Dioxide		
Ref No.	**Source, location or data that needs to be assessed**	**Section**
A	Monitoring data outside an AQMA	11.5.1
B	Monitoring data within an AQMA	11.5.2
C	New Industrial Sources	11.5.3
D	Industrial Sources with substantially Increased emissions	11.5.4
E	Areas of Domestic Coal Burning	11.5.5
F	Small Boilers (>5mw$_{(thermal)}$)Burning Coal or Oil	11.5.6
G	Shipping	11.5.7
H	Railway Locomotives	11.5.8

11.5.1 (A) Monitoring data outside AQMA

Local authorities are recommended to prioritise the use of measured sulphur dioxide concentrations where suitable data is available. All of the monitoring sites in East Dunbartonshire are in locations relevant for public exposure. The 3 network sites are in areas not covered by Smoke Control Orders and represent the worst case scenario for the district.

Monitoring of sulphur dioxide has been carried out within East Dunbartonshire using 8 port bubblers since the mid 1970's. There are currently 7 sites where sulphur dioxide is monitored using this technique, locations are shown in Figure 11.1 and graphically in Appendix1. The 3 sites in Kirkintilloch are part of the UK sulphur Dioxide Network, Kirkintilloch 8, Kirkintilloch 9 and Kirkintilloch 10. These sites have been in operation since 1985, 1987 and 1995 respectively. Sulphur dioxide concentrations have, historically, been found to be higher in the Kirkintilloch area than for any other part of the district, therefore data from these Network sites will be used to assess compliance with the objective.

The continuous automatic monitoring site, Glasgow Centre, measures sulphur dioxide and data from 1999 to 2001 has been analysed for direct comparison with the objective.

Site	Location
Kirkintilloch 8 (Network)	Merkland Outdoor Recreation Centre, Merkland Place, Kirkintilloch.
Kirkintilloch 9 (Network)	Environmental Health Office, Unit 4, Whitegates, Lenzie Road, Kirkintilloch.
Kirkintilloch 10 (Network)	John Street Hostel, John Street, Kirkintilloch.
Lennoxtown 9	Craighead Primary School, Craighead Road, Milton of Campsie.
Milngavie 1	1 Grange Avenue, Milngavie.
Bearsden 5	Westerton Hall, Maxwell Avenue, Bearsden.
Bishopbriggs 5	Huntershill Outdoor Recreation Centre, Huntershill House, Bishopbriggs.

Figure 11.1 Smoke/Sulphur Dioxide Sites

11.5.1.1 Distribution of Sulphur Dioxide Emissions [9]

The estimated emissions of sulphur dioxide by source in East Dunbartonshire is shown in Figure 11.2

11.5.1.2 Estimated background Concentrations of Sulphur Dioxide [9]

Figure 11.3 illustrates a map of estimated background concentrations of sulphur dioxide.

11.5.1.3 Sulphur dioxide 8-port bubbler monitoring data

Daily mean sulphur levels are assessed using the 8-port bubbler method and samples are analysed in-house using the total acidity method which is an accepted method for air quality reviews. Data verification and quality assurance visits are undertaken by NETCEN for all smoke and sulphur dioxide Network sites. A full audit of the Network sites and analytical method used in East Dunbartonshire was carried out by NETCEN in 1997.

The Technical Guidance LAQM.TG(03) advised that where net acidity measurements are made, the measured maximum daily mean concentration should be multiplied by 1.25 to take account of a general tendency for bubblers to under-read at high concentrations. Clarification was sought from NETCEN with regard to this issue. NETCEN advised that the correction factor of 1.25 is only applicable to high SO_2 concentrations (around 100μg/m^3 is the threshold at which uncertainty on bubbler measurements starts to increase). The highest daily values are well below this (<70μg/m^3), therefore there is no requirement to apply the correction factor to maximum daily mean concentrations of sulphur dioxide.

The Bubbler technique provides measurements of daily mean sulphur dioxide concentrations which can be directly compared to the 24 hour mean objective.

For comparison with the 15-minute and 1-hour objectives, authorities are advised to use correction factors based on empirical relationships with measured maximum daily mean:

99.9th percentile of 15-minute means = 1.8962 x maximum daily mean[4]

To take account of the uncertainty in these relationships, it may be assumed that **the 15 minute mean objective is unlikely to be exceeded if the maximum daily mean concentration is less than 80μg/m^3.** The bubbler criterion is related to the risk of exceeding the 15 minute objective.

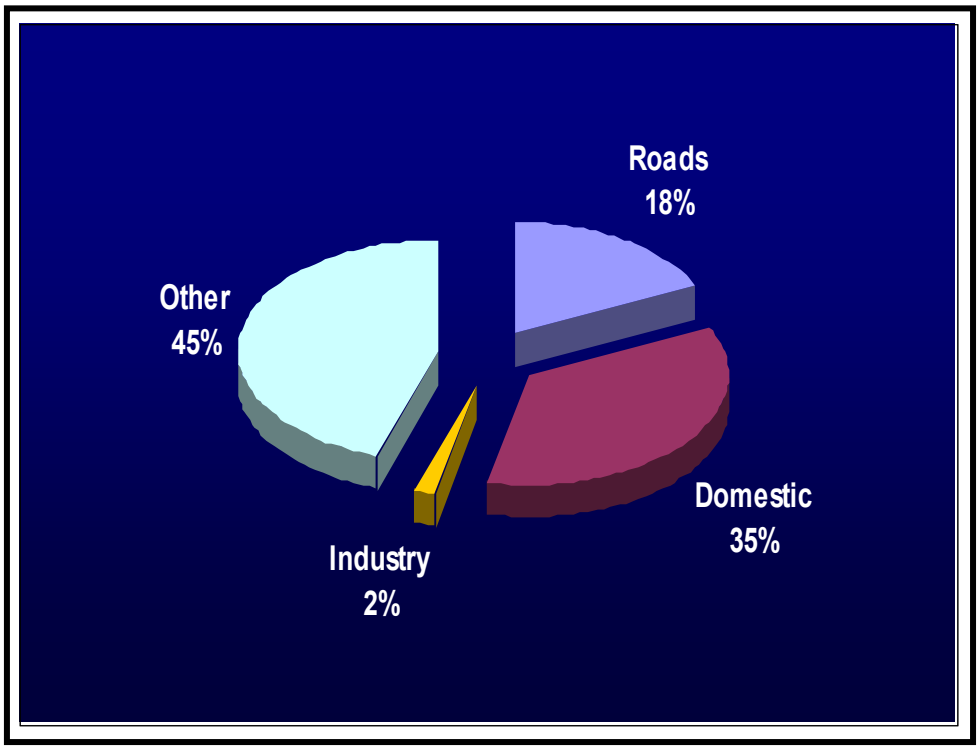


Figure 11.2 Distribution of sulphur dioxide emissions by source in East Dunbartonshire, 2001

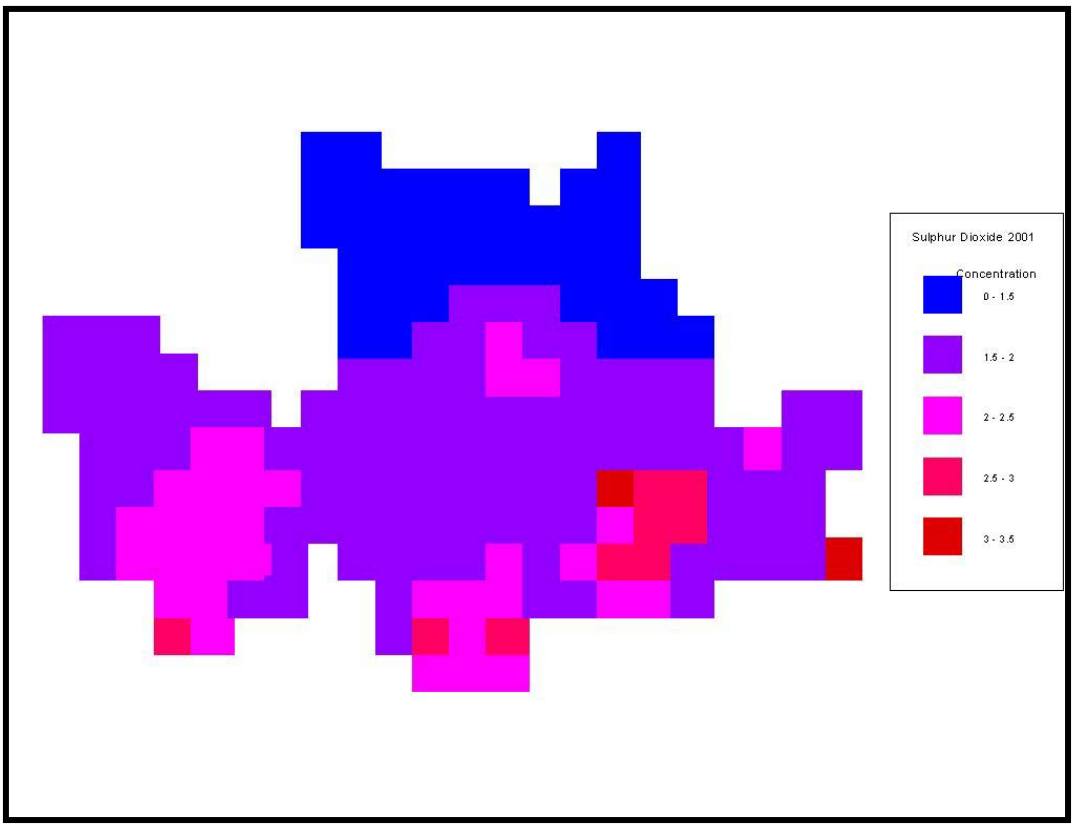


Figure 11.3 Estimated annual mean background concentrations of sulphur dioxide in East Dunbartonshire, 2001

Table 11.1 shows the annual mean and maximum daily mean concentrations of sulphur dioxide at all the monitoring sites in the local authority area.

The maximum daily mean obtained for the Network sites have been used to estimate a 99.9th percentile of 15-minute means by multiplying by 1.8962, in accordance with the Technical Guidance (LAQM.TG(03)). Table 11.2 illustrates these results. It can be clearly seen from this table that there are no exceedences of the 15-minute mean at any of theses sites as **no maximum daily mean sulphur dioxide bubbler result exceeds 80μg/m^3.**

11.5.1.4 Data from National Networks

There is no continuous automatic monitoring of sulphur dioxide within East Dunbartonshire. Glasgow Centre has an established urban centre site and data is available from 1999 to 2001 for comparison with the 15-minute, 1-hour and 24-hour objectives. There were no exceedences of these objectives for sulphur dioxide during this 3 year period at the Glasgow Centre site. Use is made of current concentrations as there is no straightforward way to project future exceedences [4]. This is a city centre site thus the sulphur dioxide levels in East Dunbartonshire are likely to be lower. It is unlikely, therefore, that the objectives will be exceeded in East Dunbartonshire.

Conclusions from Monitoring Data

The monitoring data assessment indicates that the 15-minute mean objective of 266μg/m^3 for sulphur dioxide is unlikely to be exceeded by the end of 2005 and the 24-hour objective of 125μg/m^3 is unlikely to be exceeded by the end of 2004. In addition comparison with background data for the Glasgow Centre site indicates that it is unlikely that any of the objectives will be exceeded in 2004 or 2005.

11.5.2 (B) Monitoring data within an AQMA

There have been no AQMA's declared for East Dunbartonshire.

SITE	1998 Annual Mean	1998 Maximum Daily Mean	1999 Annual Mean	1999 Maximum Daily Mean	2000 Annual Mean	2000 Maximum Daily Mean	2001 Annual Mean	2001 Maximum Daily Mean	2002 Annual Mean	2002 Maximum Daily Mean
Kirkintilloch 9	13	36	14	48	14	74	14	63	15	37
Kirkintilloch 8	9	45	11	45	10	76	11	60	10	66
Kirkintilloch 10	17	42	18	72	20	74	N	N	14	67
Lennoxtown 9	11	34	13	51	15	68	N	N	13	70
Milngavie 1	8	18	11	29	11	65	N	N	7	30
Bearsden 5	13	41	13	47	12	65	15	60	14	48
Bishopbriggs 5	10	31	12	41	11	39	13	35	12	40

Table 11.1 Annual mean and maximum daily mean concentrations of Sulphur Dioxide in $\mu g/m^3$ within East Dunbartonshire

SITE	1998 Maximum Daily Mean	1998 99.9^{th} percentile	1999 Maximum Daily Mean	1999 99.9^{th} percentile	2000 Maximum Daily Mean	2000 99.9^{th} percentile	2001 Maximum Daily Mean	2001 99.9^{th} percentile	2002 Maximum Daily Mean	2002 99.9^{th} percentile
Kirkintilloch 9	36	68	48	91	74	140	63	119	37	70
Kirkintilloch 8	45	85	45	85	76	144	60	114	66	125
Kirkintilloch 10	42	80	72	137	74	140	N	N	67	127

Table 11.2 Maximum daily mean and 99.9^{th} percentile of 15 minute mean concentrations of Sulphur Dioxide in $\mu g/m^3$ at Network Sites within East Dunbartonshire

11.5.3 (C) New Industrial Sources

There are no new industrial sources of sulphur dioxide within East Dunbartonshire or the surrounding local authority areas.

11.5.4 (D) Industrial Sources with Substantially Increased Emissions

A number of authorised industrial processes are located within the East Dunbartonshire area. The operator, location and process type are listed in Table 4.3.

There was no process within the local authority and surrounding areas identified in the first round as potentially significant with respect to sulphur dioxide emissions therefore there is no requirement to assess these sources further.

11.5.5 (E) Areas of Domestic Coal Burning

The first step is to identify areas where significant coal burning still takes place. Smokeless fuel has a similar sulphur content to coal so should be treated in the same way. "Significant" should be taken to be any area of about 500m x 500m where there may be more than 100 houses burning solid fuel as their primary source of heating. Local authorities are advised to use professional judgement if necessary to identify such areas, including experience of coal burning odours in the area on a winter's evening.

The majority of urban areas in East Dunbartonshire have been declared Smoke Control Areas and these are shown in Figure 11.4. There are no areas which can be identified as showing signs of "coal burning odours" within the district. One area has been identified where there is a high concentration of local authority housing where, historically, coal was used as the primary source of heating. This area, shown in Figure 11.5 is Hillhead in Kirkintilloch where a 500m x 500m grid contains some 1,600 houses. The highest levels of sulphur dioxide are found in the Kirkintilloch area with 2 network monitoring sites on the boundary of the Hillhead area which lies outwith the local authority smoke control zones. This area, therefore represents the "worst case scenario" for sulphur dioxide emissions in East Dunbartonshire.

In 1989, when the majority of these properties were in Council ownership, a programme was undertaken by the Council to convert properties still burning solid fuel to gas, electric or solid fuel central heating. A recent council housing stock appraisal undertaken by the Council shows that currently only 24 of the 880 Council- owned houses in Hillhead still use solid fuel as the primary source of heating. At present the Council policy is to replace these heating systems with gas central heating, within two to three years, as part of the heating programme funded by the Housing Capital Programme. It is evident from this information that coal burning in the area is not "significant", therefore there is no requirement to undertake a detailed assessment for domestic coal burning.

11.5.6 (F) Small boilers >5MW $_{(thermal)}$ burning coal or oil

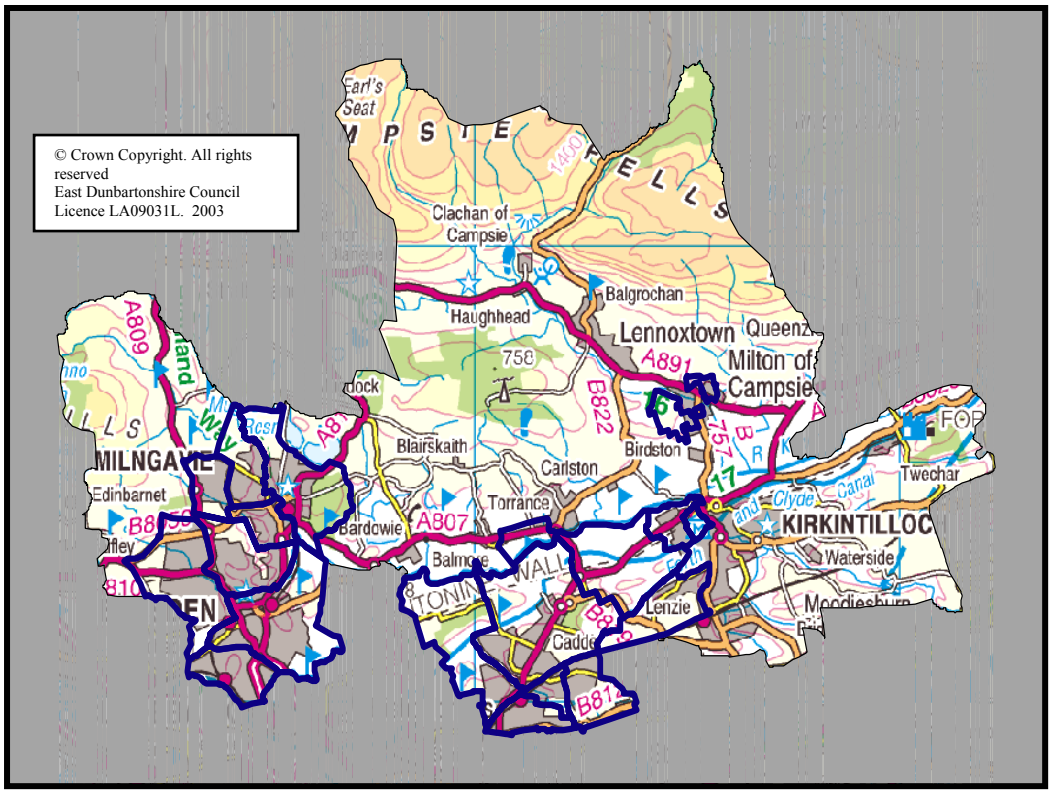
The first round of review and assessment confirmed that boiler plant >5MW $_{(thermal)}$ that burn coal or fuel oil can give rise to high short term concentrations, with the risk that the 15 minute objective may be exceeded. The new regulations limiting the sulphur content of fuel oil to less than 1% from January 2003 mean that boilers using fuel oil are unlikely to be significant on their own. Particular attention should be paid to the combined impact of several sources, including those in neighbouring local authority areas.

In the first round of review and assessment small boilers >5 MW within East Dunbartonshire area were fully investigated in the Stage 1 report. There are no small boilers (solid fuel or fuel oil) with a thermal power rating greater than 5MW identified within the District. However, areas outwith the local authority area were not considered at that time. Subsequently, for the purposes of the updating and screening assessment, all surrounding local authorities were approached with respect to identifying such sources which are within 500m of the boundary with East Dunbartonshire. There were no small boilers identified within the surrounding local authority area.

11.5.7 (G) Shipping

East Dunbartonshire is land bound therefore there are no sources of shipping in the district.

Figure 11.4 Smoke Control Areas in East Dunbartonshire



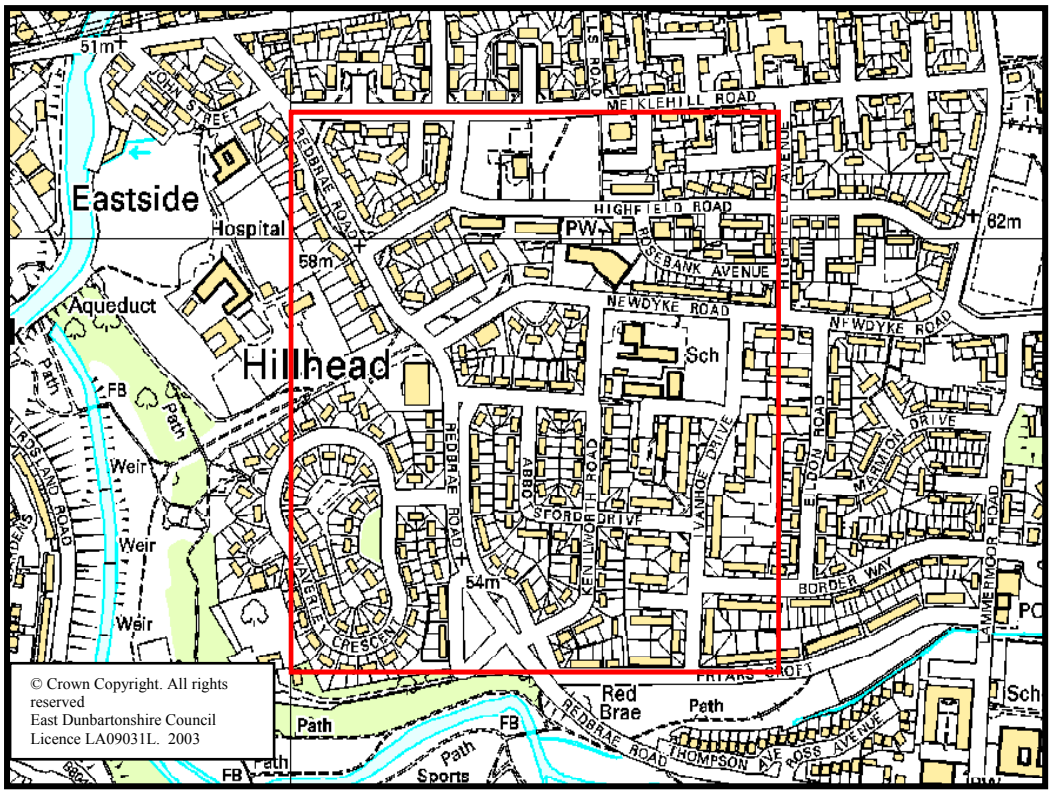


Figure ll.5 Hillhead, Kirkintilloch 500m x 500m grid

11.5.8 (H) Railway Locomotives

Local authorities are required to identify locations where diesel locomotives are regularly stationary for periods of 15 minutes or more. This could be at signals, goods loops depots or stations.

There are two main railway links through East Dunbartonshire :

1. The diesel line from Glasgow through Bishopbriggs and Lenzie Stations.

2. The electric line from Glasgow through Westerton Station terminating at Milngavie. In addition Western Station is on the main north/south diesel line and is used for passengers alighting for connection to Glasgow.

The Strategic Railways Manager at Network Rail was approached for advice on any areas on the above lines where diesel trains might stop for 15 minutes or more. There were no areas identified where trains are likely to be stationary regularly for this period.

11.6 CONCLUSIONS FOR SULPHUR DIOXIDE

The Updating and Screening Assessment for Sulphur Dioxide in East Dunbartonshire indicates that the 15-minute mean objective of 266μg/m^3 is unlikely to be exceeded by the end of 2005 and the objectives for the1-hour mean of 350μg/m^3 and 24-hour mean of 125μg/m^3 are unlikely to be exceeded by the end of 2004. In addition the assessment shows that there are no significant sources of sulphur dioxide emissions in the district or the surrounding local authority area. Therefore, there is no requirement to proceed to a detailed assessment for Sulphur Dioxide.

12. REVIEW AND ASSESSMENT OF PM_{10}

12.1 INTRODUCTION

Airborne particulate matter varies widely in its physical and chemical composition, source and particle size. PM_{10} particles are those with diameters of 10 microns or less. A major source of fine primary particles is combustion processes, in particular diesel combustion, where transport of hot exhaust vapour into a cooler tailpipe or stack can lead to spontaneous nucleation of "carbon" particles before emission. Other combustion processes such as coal burning and industry also lead to the emission of primary PM_{10}.

National UK emissions of primary PM_{10} have been estimated as totalling 186 kilotonnes in 1999. Of this total, around 31.5 kilotonnes was derived from road transport sources, 30 kilotonnes from industrial processes, 19 kilotonnes from public power and 38 kilotonnes from domestic heating. Although road transport only accounts for around a quarter of emissions in the UK, these levels can be much higher in urban areas such as Glasgow where road transport accounts for some 73% of PM_{10} emissions.

A significant proportion of the current annual average PM_{10} is due to the secondary formation of particulate sulphates and nitrates, resulting from the oxidation of sulphur and nitrogen oxides. These are regional scale pollutants and as such the annual concentrations do not vary greatly over tens of kilometers. There are also natural or semi-natural sources such as wind-blown dust and sea salt particles. The impact of local urban sources is superimposed on this regional background. Such local sources are generally responsible for winter episodes of hourly mean concentrations of PM_{10} above 100$\mu g/m^3$ associated with poor dispersion.

As well as creating dirt, odour and visibility problems, PM_{10} particles are associated with health effects including increased risk of heart and lung disease. In addition, they carry surface-absorbed carcinogenic compounds into the lungs.

12.2 STANDARD AND OBJECTIVES FOR PM_{10}

The Government and the Scottish Executive have adopted two Air Quality objectives for fine particles (PM_{10}) which are equivalent to the EU Stage 1 limit values in the first Air Quality Daughter Directive. The objectives to be achieved by the end of 2004 are:

- an annual mean of 40$\mu g/m^3$ and
  a fixed 24-hour mean of 50$\mu g/m^3$ to be exceeded on no more than 35 days per year.

The Scottish Executive has incorporated new objectives for 2010 into Regulations. Local authorities in Scotland require to review and assess air quality against the following objectives to be achieved by the end of 2010.

- a 24-hour mean of 50μg/m^3 not to be exceeded **more than 7 times a year** and
- an annual mean of 18μg/m^3

12.3 THE NATIONAL PERSPECTIVE

There is a wide range of emission sources which contribute to PM_{10} concentrations in the UK. These can usefully be divided into 3 main source categories:

- **Primary Combustion Particles** - particles emitted directly from combustion processes etc. These particles are generally less than 2.5μm and often well below 1μm in diameter.
- **Secondary Particles -** particles formed in the atmosphere following their release in the gaseous phase. These include sulphates and nitrates, formed from emissions of SO_2 and NOx; these particles are again generally less then 2.5μm in diameter.
- **"Coarse" or "Other" Particles** - the so-called "coarse" or "other" particles component comprises emissions from a wide range of non-combustion sources. These include re-suspended dust from road traffic, construction and mineral extraction processes, wind-blown dusts and soils, and sea salt. The particles are generally greater than 2.5μm in diameter.

There are several reasons why it is important to bear in mind the different source categories, and their respective contribution to PM_{10} concentrations, within the review and assessment process:

- The expected reduction in particle emissions in future years is different for each type of source. For example, emissions from road transport will be governed by new legislation on vehicle standards; emissions of secondary particles will be largely governed by controls on power generation, industrial and transport SO_2 and NO_x emissions, both in the UK and in Europe; emissions of coarse particles are largely uncontrolled, and in general are not expected to decline in future years. In forecasting future emissions it is therefore essential to treat each source category separately.
- The principle focus of Local Air Quality Management should be towards the control of emissions at a local level. It is therefore important that the review and assessment process identifies the contribution of **local emission sources**, so that the effectiveness of control policies or action plans can be evaluated.

Analysis of 1995 and 1996 data has indicated that with existing national policy measures and atypical meteorology representing a "worst case scenario", exceedences of the 2004 objectives might be found in the following areas:

- **urban background sites in central London;**
- **areas adjacent to busy roads, particularly within major urban areas;**
- **areas which have significant emissions from the domestic burning of solid fuels;**
- **areas in the vicinity of industrial plant, or which have significant uncontrolled or fugitive emissions (for example quarrying, materials handling facilities etc.).**

According to Technical Guidance LAQM.TG(03) recent analysis of data for the 2010 objective indicates that dependent on meteorological conditions exceedences of the annual mean objectives at background locations are only likely to occur in S.E. England and in London in particular. However, exceedences of the annual mean objectives are still expected at some busy road side sites throughout the UK.

12.4 LOCAL PERSPECTIVE

More than 50% of the AQMAs declared in the UK included exceedences of the 2004 24-hour PM_{10} objective, mainly in combination with nitrogen dioxide and are associated with road traffic sources.

In East Dunbartonshire the Stage 1 Report indicated that there was a possibility of exceedences of the PM_{10} objectives at the end of 2005. Subsequently a Stage 2 Report was published in March 2000 with respect to the Air Quality Review and Assessment of PM_{10}. This report concluded that an exceedance of the National Air Quality Standard Objectives was unlikely in East Dunbartonshire in 2004. The objective for the standards at that time were the same as the current standards for 2004.

12.5 THE UPDATING AND SCREENING ASSESSMENT FOR PM_{10}

This assessment requires local authorities to identify any significant changes that may have occurred since the first round of review and assessment. The following issues will be considered and assessed against the new objectives, based on the checklist approach.

Summary of the Updating and Screening check list approach for PM_{10}		
Reference No.	**Source Location or data that need to be assessed**	**Section**
A	Monitoring data outside an AQMA	12.5.1
B	Monitoring data within an AQMA	12.5.2
C	Busy roads and junctions in Scotland	12.5.3
D	Junctions	12.5.4
E	Roads with high flow of buses and/or HGV's	12.5.5
F	New roads constructed or proposed since first round of review and assessment	12.5.6
G	Roads close to the objective during the first round of review and assessment	12.5.7
H	Roads with significantly changed traffic flows	12.5.8
I	New industrial sources	12.5.9
J	Industrial sources with substantially increased emissions	12.5.10
K	Area with domestic solid fuel burning	12.5.11
L	Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc.	12.5.12
M	Aircraft	12.5.13

12.5.1 (A) Monitoring data outside an AQMA

Local authorities are recommended to prioritise data collected from national monitoring networks or from local monitoring campaigns, where suitable data are available measured data is expected to give a more accurate indication of PM_{10} concentrations than modelling studies. The focus of the assessment should be on "hot spots" at locations where pollutant concentrations are highest to avoid missing areas of potential exceedences.

Monitoring of PM_{10} is not carried out within East Dunbartonshire; the Stage 1 and Stage 2 assessments relied heavily on black smoke monitoring data. Some short term monitoring was

carried out over a three week period in March 2000 as part of the Stage 2 assessment in order to determine background levels of PM_{10} for screening purposes.

Technical Guidance LAQM.TG(03) advises that due to the uncertainty in the relationship between black smoke data using 8-port bubblers and PM_{10} mass, authorities are advised not to place reliance on this data for the Updating and Screening Assessment. Black smoke data may, however, be useful for indicating local "**hot spots"** and thus assist in siting of PM_{10} samplers.

Glasgow City Council has 2 established continuous automatic monitors, Glasgow Centre and Glasgow Kerbside. These sites have been monitoring PM_{10} since 1996 and data from Glasgow Centre will be analysed to give an indication of the number of exceedences of the air quality standard between 1999 and 2001.

12.5.1.1 Distribution of PM_{10} Emissions

The estimated emissions of PM_{10} by source in East Dunbartonshire is shown in Figure 12.1

12.5.1.2 Estimated Background Concentrations of PM_{10}

Figure 12.2 illustrates an estimate of the 2001 annual mean PM_{10} concentrations on a $1km^2$ grid in East Dunbartonshire. The annual mean background concentration range is shown to be between 14-19$\mu g/m^3$ with the highest values found at the southern boundary of the district bordering on Glasgow City. The annual average secondary PM_{10} concentrations estimated for 2001 for East Dunbartonshire is in the range 3.56 to 3.77$\mu g/m^3$.

The above concentrations are used later in this report to assess the significance of local PM_{10} emissions on the total concentrations at relevant locations using the DMRB model.

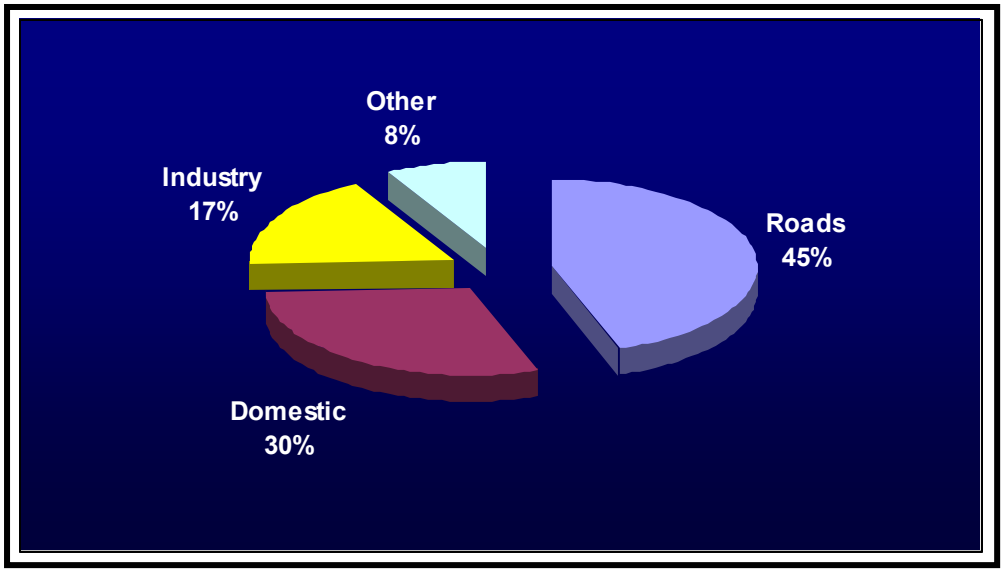


Figure 12.1 Distribution of PM_{10} emissions by source in East Dunbartonshire, 2001

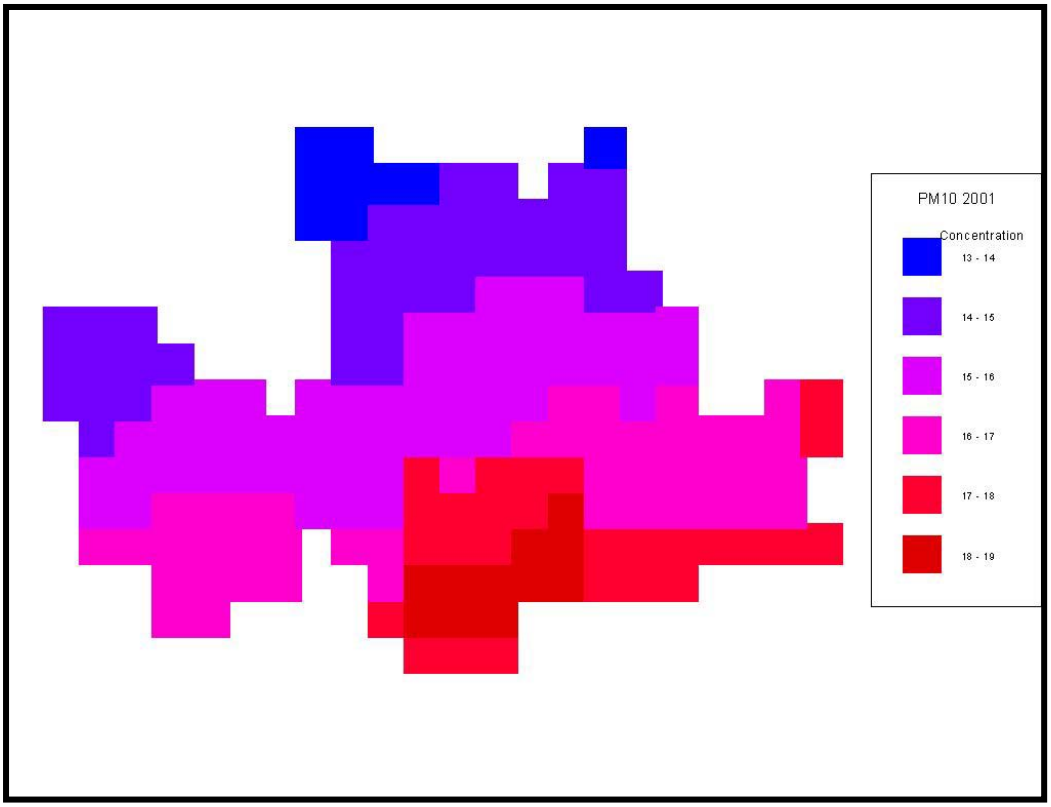


Figure 12.2 Estimated annual mean background concentrations of PM_{10} in East Dunbartonshire

12.5.1.3 Urban Background Concentrations of PM_{10}

In the Stage 2 report results of short term monitoring showed that background PM_{10} levels in East Dunbartonshire, measured using a light scattering device, were broadly comparable with background levels measured at Glasgow Centre Network Site. It would be expected that the Glasgow site would show a higher background concentration of PM_{10}, due to greater emissions from road traffic. The small difference noted in this short-term study is likely to be due to the type of monitor used in East Dunbartonshire.

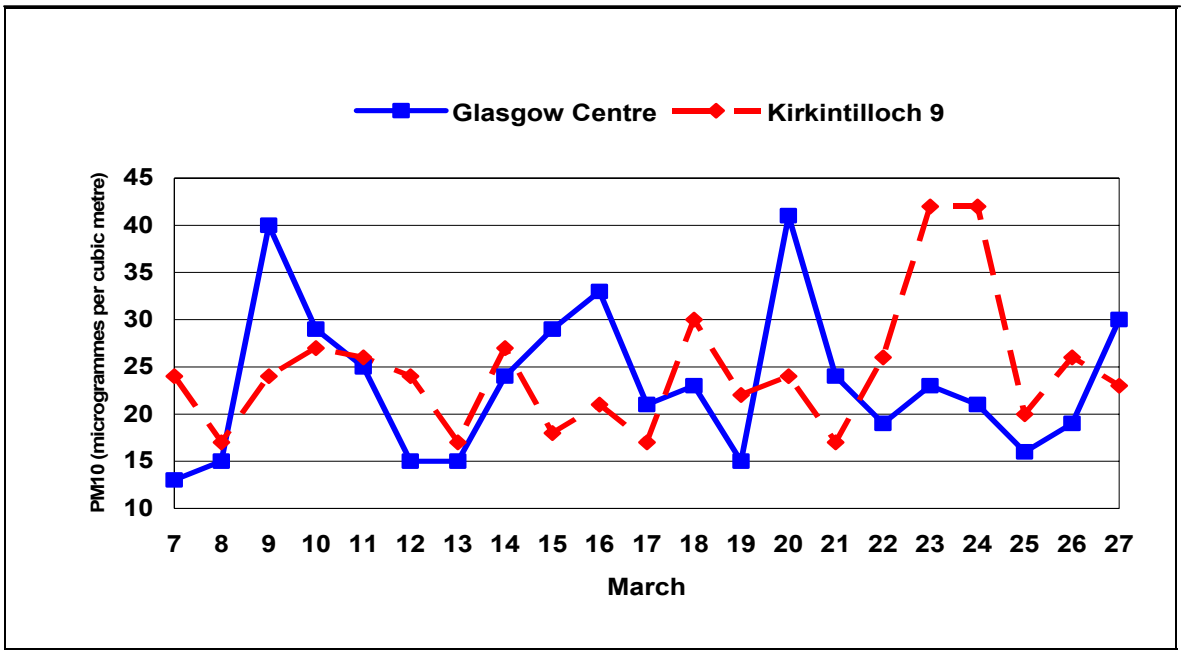


Figure 12.3 Comparison of PM_{10} measurements in East Dunbartonshire and Glasgow Centre for March 2000

The Glasgow Centre site at the City Chambers lies approximately 5 miles to the south of the District. Background levels of PM_{10} are higher (16-21$\mu g/m^3$), and the traffic contribution will be greater due to higher traffic flows in the city centre. Given that the highest background concentration of PM_{10} in 2010 is estimated at17$\mu g/m^3$ in East Dunbartonshire then it is likely that the 2010 objective of 18$\mu g/m^3$ will be exceeded at a number of roadside locations. In Scotland the focus is on the annual mean objective as this is expected to be more stringent than the 24 hour objective.

A summary of the annual mean PM_{10} concentrations ($\mu g/m^3$ gravimetric) measured at the 2 national network sites in Glasgow between 1999 and 2001 is shown Table 12.1 below.

Site	Site Classification	Annual Mean			Number of days > 50$\mu g/m^3$ (gravimetric)		
		1999	2000	2001	1999	2000	2001
Glasgow Kerbside	Kerbside	28	27	31	43	23	36
Glasgow Centre	Urban Centre	23	28	22	9	27	13

Table 12.1 Annual mean PM_{10} concentrations at National Network sites in Glasgow 1999 to 2001

12.5.1.4 Approach to correcting measured PM_{10} Concentrations to 2004 and 2010

The 7 step approach outlined in Technical Guidance LAQM.TG(03) Box 8.6 was used to adjust the measured annual mean PM_{10} forward to 2004 and 2010.

The contribution from different PM_{10} sources will not remain constant between the current year and 2004 or 2010. It is therefore not appropriate to apply a single correction factor to measured data in the current year to estimate concentrations in the future years. The measured data must first be divided into "primary" "secondary" and "coarse" and treated separately. Only the "primary" component is important in terms of local emissions; the "secondary" and "coarse" components can be removed and added back in once future predictions from local sources have been performed. The calculations for 2004 and 2010 are summarised in Tables 12.2 and 12.3 respectively.

It is not possible to directly adjust the measured number of 24-hour exceedences forward to a future year. The approach to this is to adjust the measured annual mean concentrations in the first instance using the 7 steps outlined in Table 12.2. The number of 24-hour exceedences of $50\mu g/m^3$ may then be estimated using the relationship with the annual mean, which is described in Technical Guidance LAQM.TG(03).

Step	Data/Calculation	1999	2000	2001
Step 1	Measured PM_{10} [CGyear] (gravimetric)	23	28	22
Step 2	$Csec_{2001}$ (from map)	3.77	3.77	3.77
Step 3	$Csec_{year}$	3.66	3.36	3.77
Step 4	$Cprim_{year} = CG_{year} - Csec_{year} - 10.5$	8.84	14.14	7.73
Step 5	$Cprim_{2004}$	7.10	12.83	7.19
Step 6	$Csec_{2004}$	3.51	3.51	3.51
Step 7	$CG_{2004} = Cprim_{2004} + Csec_{2004} + 10.5$	21.11	26.84	21.20
Predicted Annual Mean Concentration in 2004		21	27	21
Estimated number of 24-hour exceedences of 50 $\mu g/m^3$ in 2004 LAQM.TG(03) fig. 8.1		4	18	4
Are there more than 35 predicted 24-hour exceedences of 50 $\mu g/m^3$ in 2004?		No	No	No

Table 12.2 Measured PM_{10} concentrations corrected to 2004 (Glasgow Centre)

The above information indicates that the 24-hour objective of 50$\mu g/m^3$ is unlikely to be exceeded in 2004.

Step	Data/Calculation	1999	2000	2001
Step 1	Measured PM_{10} [CGyear] (gravimetric)	23	28	22
Step 2	$Csec_{2001}$ (from map)	3.77	3.77	3.77
Step 3	$Csec_{year}$	3.66	3.36	3.77
Step 4	$Cprim_{year} = CG_{year} - Csec_{year} - 10.5$	8.84	14.14	7.73
Step 5	$Cprim_{2010}$	6.22	11.24	6.30
Step 6	$Csec_{2010}$	2.99	3.00	3.00
Step 7	$CG_{2010} = Cprim_{2010} + Csec_{2010} + 10.5$	29.71	24.74	19.8
Predicted Annual Mean Concentration in 2010		20	25	20
Are any of the predicted Annual Mean PM_{10} concentrations in 2010 greater than 18 $\mu g/m^3$?		Yes	Yes	Yes

Table 12.3 Measured PM_{10} concentrations corrected to 2010 (Glasgow Centre)

The highest annual mean predicted for Glasgow in 2010 is 25$\mu g/m^3$. While the levels in East Dunbartonshire are expected to be lower it would be reasonable to assume that the predicted annual mean in East Dunbartonshire is likely to be greater than 18$\mu g/m^3$.

Conclusion for monitoring data

Information from the assessment of background concentration of PM_{10} in East Dunbartonshire, together with data from the urban centre site in Glasgow indicates that the predicted annual means in 2010 are greater than 18μg/m^3. Therefore a detailed assessment requires to be carried out for PM_{10} in East Dunbartonshire with a view to determining whether to declare an AQMA.

12.5.2 (B) Monitoring data within an AQMA

There are no Air Quality Management Areas within East Dunbartonshire.

12.5.3 (C) Busy Roads and Junctions in Scotland

This approach is designed to assess busy roads and junctions against the 2010 objectives that apply in Scotland.

"Busy" roads and junctions were identified using the following criteria

- Roads and/or junctions with more than **5000 vehicles per day** (AADT), where the annual mean background in 2010 is expected to be **above 15μg/m^3.**
- Roads and/or junctions with more than **10,000 vehicles per day** (AADT), where the annual mean background in 2010 is expected to be **below 15μg/m^3.**

The estimated background concentrations of PM_{10} mapped for East Dunbartonshire show that the annual mean concentrations range from 13 to 17μg/m^3 in 2010. The highest levels are found at the southern boundary of the District bordering on Glasgow City.

There are numerous roads and junctions which fulfil the criteria in East Dunbartonshire. A total of 9 junctions were identified, for the purposes of this assessment, with high traffic flows where background concentrations of PM_{10} are highest. A summary of traffic flows and relevant input data used in the DMRB spreadsheet are given in Table 12.4 These geographical locations, shown in Figures 10.6, 10.7 and 10.8, represent areas with relevant receptors including housing and schools. The appropriate links at the junctions were determined and relevant receptor distances calculated, in accordance with guidance in the DMRB [13].

The DMRB screening model was used to predict the annual mean PM_{10} concentrations in 2010 and to determine if any of these predicted concentrations are greater than 18μg/m^3. The input data and predicted annual means are summarised in Table 12.4. A summary output spreadsheet for all junctions modelled, along with an example of an input spreadsheet, is presented in Appendix 2.

The summary in Table 12.4 shows that of the 9 junctions modelled for East Dunbartonshire there were 7 busy junctions where the predicted annual means were greater than 18μg/m^3. **Therefore a detailed assessment requires to be carried out with respect to busy roads and junctions within East Dunbartonshire.**

12.5.4 (D) Junctions

Junctions are covered in (C) above for the objective in Scotland.

12.5.5 (E) Roads with High Flows of buses and/or HGV's

The Technical Guidance LAQMTG(03) advises that there may be some street locations where there is an unusually high proportion (>20%) of buses and/or HGV's. These can be a major source of PM_{10}.

The road network in East Dunbartonshire is shown in Table 4.2. There are no roads identified with greater than 20% buses and/or HGV's, therefore there is no requirement to assess any roads for this category.

Site No.	Receptor	Link No.	Distance from Link Centre to Receptor (m)	AADT	Annual Average Speed Km/h	Total % HDV	Background Concentration ($\mu g/m^3$) 2010	Predictions Annual Mean ($\mu g/m^3$) 2010
1	House Bishopbriggs Cross	1	11	24,496	30	11	16	22.7
		2	20	3,472	30	5		
		3	6	3,457	30	3		
2	House Springburn Road	1	14	22,281	30	7	16	20.2
		2	13	12,040	30	4		
3	House Switchback Road	1	22	26,773	40	6	15	16.8
4	House Garscube Mill	1	14	19,627	40	10	15	18.5
		2	24	6,068	30	7		
5	Bearsden Primary School	1	10	21,330		3	15	18.4
		2	7	7,318	30	2		
6	House Milngavie Road at Roman Road	1	19	26,329	30	5	15	19.8
		2	11	8,395	30	3		
7	Lenzie Primary School	1	7	15,352	30	3	16	17.8
8	House Milngavie Road Canniesburn Toll	1	64	31,376	40	5	15	19.5
		2	29	12,979	40	5		
		3	12	17,873	40	3		
		4	12	7,275	40	7		
9	House Townhead Kirkintilloch	1	8	15,525	30	4	16	18.5
		2	16	6,634	30	3		

Table 12.4 Input data for DMRB Screening Assessment for PM_{10}

12.5.6 (F) New Roads Constructed or Proposed Since Last Round of Review and Assessment

There is one newly constructed road in East Dunbartonshire, namely, Bishopbriggs Relief Road. A recent survey undertaken by East Dunbartonshire Council, Roads and Infrastructure Division showed that the traffic flow on the new road is 4,822 vehicles per day. It is anticipated that this road will reduce traffic flow on the busy A803 Kirkintilloch Road through Bishopbriggs at Bishopbriggs Cross.

There are no proposed new roads in East Dunbartonshire for which planning approval has been granted.

In view of the above information there is no requirement to carry out an assessment for this category.

12.5.7 (G) Roads close to the Objective During the First Round of Review and Assessment

In the Stage 2 assessment for PM_{10} a DMRB modelling study identified the highest annual mean concentration of PM_{10} as 24 $\mu g/m^3$ at Bishopbriggs Cross. This location has already been assessed under category (C) "busy roads and junctions" in this report. A detailed assessment will be undertaken for roads and junctions in East Dunbartonshire.

12.5.8 (H) Roads With Significantly Changed Traffic Flows

Roads with more than 10,000 vehicles per day that have experienced more than a 25% increase in traffic flow should be considered in this category.

Surveys carried out by East Dunbartonshire Council, Roads and Infrastructure Division, indicates a general trend in traffic reduction in all time periods analysed. This is supported by the assessment of junction capacity at key sites which is indicating maximum ratio to flow capacity during peak hours. This strongly indicates that traffic flows in the area are capacity restrained supporting the conclusion that there is zero growth, therefore there are no roads in East Dunbartonshire with significantly changed traffic flows.

12.5.9 (I) New Industrial Sources

There are no new or proposed industrial sources within East Dunbartonshire or the surrounding local authority area.

12.5.10 (J) Industrial Sources with Substantially Increased Emissions

A number of authorised industrial sources are located within East Dunbartonshire area. The operator, location and process type are listed in Table 4.3. There were 3 processes within the local authority and surrounding area identified in the first round as **potentially** significant sources of PM_{10} .

- PW Hall Inorganic chemical Process
- Russell Concrete Products Cement Batching
- JW Soil (Supplies) Limited Coal Process **(no longer operating)**

Information received from SEPA indicates that there are no changes to the two remaining processes which would result in substantially increased emissions. Russell Concrete Products have carried out improvements to the process which have **reduced** emissions to air. There is no requirement, therefore, to assess these sources further.

12.5.11 (K) Areas with Domestic Solid Fuel Burning

Local authorities are required to identify areas where domestic solid fuel burning is carried out, as this may be a significant source of $PM_{10.}$ This screening assessment should focus on the diversity of houses burning coal over an area of 500m x 500m.

The first step is to identify areas where significant coal burning still takes place. "Significant" should be taken to be any area of about 500m x 500m where there are more than 50 houses burning solid fuel as their primary source of heating. Solid fuels include coal, anthracite, smokeless fuel and wood. As indicated in the Sulphur dioxide assessment professional judgement may be used to identify such areas, including experience of smoke hanging over the area on a winter's evening.

The majority of urban areas in East Dunbartonshire have been declared as smoke control areas and these are shown in Figure 11.4. There are no areas where smoke can be seen "hanging over the area on a winter's evening" and complaints of smoke from domestic fuel burning are rare.

The Hillhead area in Kirkintilloch identified as representing the "worst case scenario" for sulphur dioxide will be used to assess the impact of domestic coal burning on PM_{10} emissions. This assessment shows that currently 24 houses in the 500m x 500m area are known to use solid fuel as the primary source of heating. It is evident from this information that coal burning in the area is not "significant", therefore there is no requirement to undertake a detailed assessment for domestic coal burning.

12.5.12 (L) Quarries/Landfill Sites/Opencast Coal/Handling of Dusty Cargoes at Ports

The above may be potential fugitive sources of PM_{10} emissions from dust which typically contain around 20% PM_{10}. This assessment requires to establish whether there is relevant exposure "near" to the sources of dust emissions.

"Near" can be defined as follows:

- within 1000m if the estimated 2010 annual mean background is greater than or equal to 17μg/m^3.
- within 400m if the estimated 2010 annual mean background is greater than or equal to 16μg/m^3.
- within 200m if the estimated 2010 annual mean background is less than 16μg/m^3.

All distances should be measured from the source. If there is no relevant exposure near to the source then there is no need to proceed further.

The following **potential** sources of fugitive emissions have been identified in the East Dunbartonshire area and the annual mean background concentration determined from maps.

- Douglasmuir Quarry, Stockiemuir Road, Milngavie - Sand/Gravel extraction
- Inchbelle Quarry, Kilsyth Road, Kirkintilloch – Sand/Gravel extraction
- Inchbelle Landfill Site, Kilsyth Road, Kirkintilloch.

The following **potential** sources were identified within 1000m of the East Dunbartonshire boundary.

- Summerston Landfill Site, Balmore Road, Glasgow (257691,671508)
- Dawsholm Refuse Destruction, Glasgow (255490,669351)

Source	Estimates Annual Mean Background PM_{10} $\mu g/m^3$	Relevant Distance from source	Relevant Exposure
Douglas Muir Quarry	14	200m	No
Inchbelle Quarry/Landfill	15	200m	Yes
Summertson Landfill	15	200m	No
Dawsholm Refuse Destruction	16	400m	No

The only source with relevant exposure is Inchbelle Quarry and Landfill Site.

Inchbelle Quarry, which has planning consent to operate until 2008, produces about 40,000 tonnes of sand and gravel per annum and uses only mobile plant. The material is almost all sent to a concrete batching plant at Bargeddie, outwith East Dunbartonshire area. At this site the haul roads are maintained in a manner to suppress dust emissions from vehicle movements. The location of this site, together with a 200 metre buffer zone is shown in Figure 12.4.

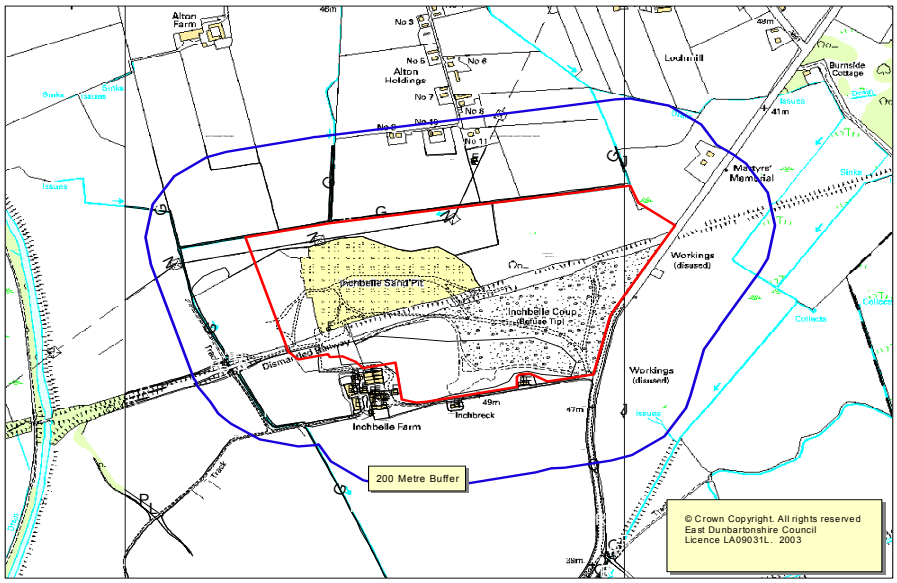


Figure 12.4 200m Buffer zone from Inchbelle Quarry

It can be seen from this map that there are a few isolated properties namely Inchbelle Farm/Cottages and Alton Holdings within 200m of this source.

Inchbelle Landfill site is licensed to accept industrial and commercial waste which consists mainly of construction waste. Officers' knowledge of the area has concluded that operations from both the quarry and the landfill site are small scale with minimal amounts of dust being generated. This is borne out by the Department's records which show no complaints relating to dust emissions from this site. It is concluded, therefore, that this site does not require further assessment.

12.5.13 (M) Aircraft

There is no airport in East Dunbartonshire or the surrounding local authority area.

12.6 CONCLUSIONS FOR PM_{10}

The Updating and Screening Assessment for PM_{10} indicates that from **monitoring data** and modelling of **busy roads and junctions** there is a likelihood that the annual mean objective of 18$\mu g/m^3$ will be exceeded in 2010 at roadside locations. Therefore East Dunbartonshire requires to proceed to **a detailed assessment for PM_{10}** with respect to monitoring and busy roads and junctions with a view to determining whether to declare an AQMA.

13. SUMMARY AND KEY POINTS

This report is the Updating and Screening Assessment of air quality within East Dunbartonshire. The assessment has been carried out using the checklist approach in Technical Guidance LAQMTG.(03) to identify those matters which have changed since the first round of review and assessment. Where monitoring data has been unavailable for the study area, measurements from adjacent local authorities have been used for comparative purposes. It should be noted that much of the air quality data for East Dunbartonshire is not in a suitable format for direct comparison with the UK national air quality standards, however, where possible, the pollutant specific guidance has been used to allow an assessment to be made. The key points for each pollutant are summarised in Table 13.l

13.1 RECOMMENDATIONS FOR EACH POLLUTANT

- **No additional monitoring is required for carbon monoxide, benzene, 1,3-butadiene or lead. Long term trends in pollutant concentrations measured at automatic monitoring sites in neighbouring authorities should be analysed to ensure that the predicted decline in levels is confirmed.**

- **The nitrogen dioxide diffusion tube survey should be continued and expanded to provide an accurate map of the NO_2 concentrations in the area. An automatic monitoring station should be set up at the site where concentration of NO_2 are highest to monitor compliance with the 1-hour objective and undertake a co-location survey to ratify NO_2 diffusion tube data.**

- **The smoke/SO_2 Monitoring sites should be continued to provide daily measurements throughout the district. Consideration should be given to adopting the ion chromatographic analysis method in preference to the current analytic method of net acidity titration.**

- **PM_{10} monitoring should be carried out, using suitable equipment to determine current and future concentrations within East Dunbartonshire. A detailed assessment of road traffic sources of PM_{10} should be carried out.**

Monitoring/Modelling	Predicted/current concentrations for relevant objective year	Likely exceedence of the objective		Proceed to a Detailed Assessment?
CARBON MONOXIDE				
No, data from Glasgow UK Network site (urban background)	Maximum daily running 8-hour concentrations in 1999 to 2001 3.9 – 7.3mg/m^3	Are any current maximum daily running 8-hour concentrations greater than 10mg/m^3?	No	Not required
BENZENE				
No, data from Edinburgh, UK Network site (urban background)	Predicted annual running mean in 2003 1.21 - 1.73μg/m^3	Are any running annual means greater than 16.25μg/m^3?	No	Not required
	Predicted annual running mean in 2010 0.91 – 1.30μg/m^3	Are any running annual mean greater than 3.25μg/m^3?	No	Not required
1,3-BUTADIENE				
No, data from Edinburgh UK Network Site (urban background)	Current running annual mean 1999 – 2001 0.19 to 0.21μg/m^3	Are any current running annual means greater than 2.25μg/m^3?	No	Not required
LEAD				
No, data from Glasgow and Motherwell UK Network Sites (urban background)	Current annual mean 1999 to 2001 0.009 to 0.025μg/m^3	Are any current annual means greater than 0.5μg/m^3? (2004 objective)	No	Not required
		Are any current means greater than 0.25μg/m^3? (2008 objective)	No	Not required
NITROGEN DIOXIDE				
Monitoring Yes, diffusion tube method (UK Network) for annual mean	Predicted annual means in 2005 15 - 35μg/m^3	Are any predicted annual means greater than 40μg/m^3?	No	Not required
No, automatic monitoring data from Glasgow UK Netork (urban background)	Number of 1-hour exceedences of 200μg/m^3 in a year 1999 – 3 exceedences 2001 – 0 exceedences	Are there currently more than 18 exceedences of 200μg/m^3	No	Not required
Modelling (Road Traffic) Yes, using DMRB 8 junctions, narrow congested streets	Predicted annual means in 2005 28 - 41μg/m^3 (Predicted annual mean for Bishopbriggs Cross 41μg/m^3)	Are any predicted annual means in 2005 greater than 40μg/m^3?	Yes	Not required as monitoring data for this location indicates an annual mean of 34μg/m^3
SULPHUR DIOXIDE				
Monitoring Yes, 8-port bubbler method UK Network	Maximum daily mean 1998 to 2002 36 - 76μg/m^3	Does the maximum daily mean bubbler result exceed 80μg/m^3?	No	Not required
PM_{10}				
Monitoring No, data from Glasgow UK Network (urban centre)	Predicted number of exceedences of 50μg/m^3 in 2004 4 predicted from 1999 data 18 predicted from 2000 data 4 predicted from 2001 data	Are there more than 35 predicted 24-hour exceedences of 50μg/m^3 in 2004?	No	Not required for 2004 objective
	Predicted annual mean for 2010 20 - 25μg/m^3	Are any predicted annual means in 2010 greater than 18μg/m^3?	**Yes**	**Yes with respect to 2010 objective**
Modelling (Road Traffic) Yes, using DMRB model	16.8 – 22.7μg/m^3 in 2010	Are any of the predicted annual mean PM_{10} concentrations in 2010 greater than 18μg/m^3?	**Yes**	**Yes for busy roads and junctions**

Table 13.1 Summary of key points for each pollutant

REFERENCES

1. **The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, defra, Scottish Executive, The National Assembly for Wales and The DOE for Nothern Ireland, 2000/3.**

2. **Air Quality (Scotland) Regulations, 2000, and Amendment Regulations, 2002, HMSO**

3. **Part IV of the Environment Act 1995, Local Air Quality Management, Revised Policy Guidance, February 2003, Paper 2003/2**

4. **Technical Guidance LAQM.TG(03), 2003, defra, Scottish Executive.**

5. **www.scrol.gov.uk, Scotland's Census, April 2001.**

6. **Wind Frequency Analysis - Glasgow Airport: 1970 - 1996.**

7. **The Road Traffic Reduction Act, 1997**

8. **Liaison with SEPA**

9. **www.airquality.co.uk**

10. **Expert Panel on Air Quality Standards, Benzene, 1994, HMSO**

11. **NO_2 Diffusion Tube Field Intercomparison Exercise, Glasgow Scientific Services, Aril 2003.**

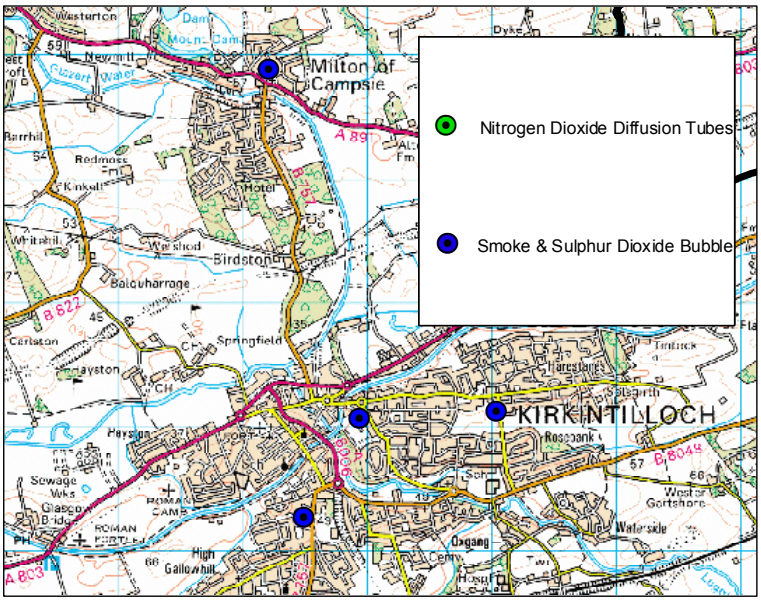
12. **Glasgow City Council Nitrogen Dioxide Diffusion Tube Co-location Study, April, 2003.**

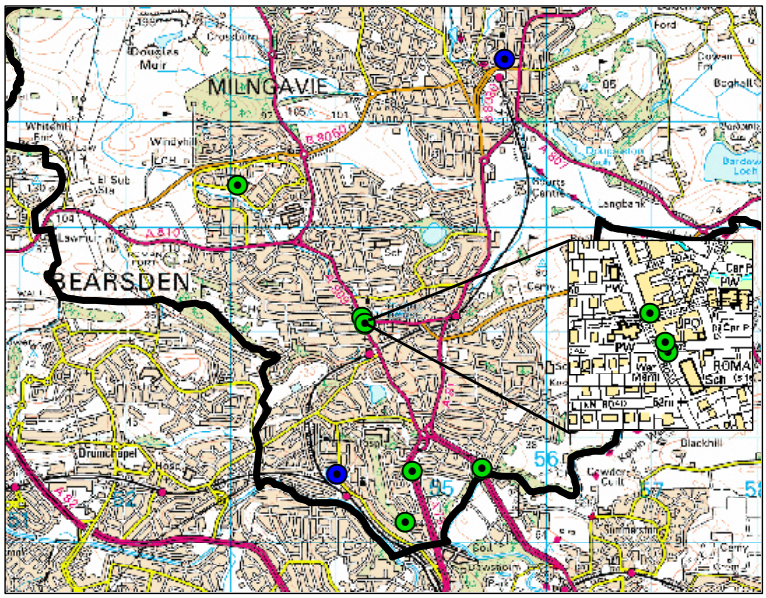
13. **Design Manual for Roads and Bridges Volume 11 Section 3 Part 1, Air Quality, Februray 2003, The Highways Agency.**

14. **A Quantification of the Health Impacts of Pollutants Emitted in Central Scotland, 2003, Searl A. et al**

APPENDIX 1

Geographical Locations of Nitrogen Dioxide and Sulphur Dioxide monitoring sites.





DMRB: Assessment of Local Air Quality — INPUT SHEET

Step 1	Receptor name	House Bishopbriggs Cross	Receptor number	1
Step 2	Year	2005		
Step 3	Number of links	3		

Step 4

Background concentrations for 2005					
CO (mg/m^3)	Benzene ($\mu g/m^3$)	1,3-butadiene ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
0	0	0	41	25	0

Step 5

Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition							
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
					% passen-ger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	11	24696	30	A			89				11
2	20	3472	30	B			95				5
3	6	3457	30	B			97				3
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

Step 6

Step 7

DMRB: Assessment of Local Air Quality — INPUT SHEET

Step 1	Receptor name	House Maryhill Road at Garscube Mill	Receptor number	4
Step 2	Year	2010		
Step 3	Number of links	2		

Step 6

Step 7

Step 4

Background concentrations for 2010					
CO (mg/m^3)	Benzene ($\mu g/m^3$)	1,3-butadiene ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
0	0	0	31	21	15

Step 5

Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition							
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
					% passen-ger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	14	19627	40	A			90				10
2	24	6068	30	C			93				7
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

DMRB: Assessment of Local Air Quality — INPUT SHEET

Step 1	Receptor name	House Townhead Kirkintilloch	Receptor number	9
Step 2	Year	2010		
Step 3	Number of links	2		

Step 6

Step 7

Step 4

Background concentrations for 2010					
CO (mg/m^3)	Benzene ($\mu g/m^3$)	1,3-butadiene ($\mu g/m^3$)	NO_x ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
0	0	0	25	18	16

Step 5

Link number	Distance from link centre to receptor (m)	Traffic flow & speed		Traffic composition							
		AADT (combined, veh/day)	Annual average speed (km/h)	Road type (A,B,C,D)	Vehicles <3.5t GVW (LDV)			Vehicles>3.5t GVW (HDV)			
					% passen-ger cars	% light goods vehicles	Total % LDV	% buses and coaches	% rigid HGV	% articulated HGV	Total % HDV
1	8	15525	30	B			96				4
2	16	6634	30	B			97				3
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

DMRB: Assessment of Local Air Quality — OUTPUT SHEET

Current receptor

Receptor Name	House Townhead Kirkintilloch	Receptor number	9
Assessment year	2005		

Results

Pollutant	Annual mean				For comparison with Air Quality Standards		
	Background concentration	Road traffic component	Total	Units	Metric	Value	Units
CO	0.00	0.19	0.19	mg/m^3	Annual mean*	0.19	mg/m^3
Benzene	0.00	0.21	0.21	$\mu g/m^3$	Annual mean	0.21	$\mu g/m^3$
1,3-butadiene	0.00	0.16	0.16	$\mu g/m^3$	Annual mean	0.16	$\mu g/m^3$
NO_x	32.0	28.8	60.8	$\mu g/m^3$	Not applicable		
NO_2	21.0	7.2	28.2	$\mu g/m^3$	Annual mean*	28.2	$\mu g/m^3$
PM_{10}	0.0	3.94	3.94	$\mu g/m^3$	Annual mean	3.9	$\mu g/m^3$
					Days >50$\mu g/m^3$	0	Days

* See Footnote 4 in DMRB Volume 11 Chapter 3

Contribution of each link to annual mean

Link number	CO (mg/m^3)	Benzene ($\mu g/m^3$)	1,3-butadiene ($\mu g/m^3$)	NOx ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
1	0.14	0.15	0.12	22.01	2.98
2	0.05	0.05	0.04	6.78	0.96
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

All receptors

Receptor number	Name	Year	Pollutant concentrations at receptor						
			CO*	Benzene	1,3-butadiene	NO_x	NO_2*	PM_{10}	
			Annual mean mg/m^3	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Days >50$\mu g/m^3$
1	House Bishopbriggs Cross	2005	0.27	0.27	0.37	122.15	41.34	10.10	0.00
2	House Springburn Road Bishopbriggs	2005	0.25	0.28	0.29	99.94	37.81	7.21	0.00
3	House Switchback Road	2005	0.10	0.14	0.16	62.01	29.19	3.07	0.00
4	House Maryhill Road at Garscube Mill	2005	0.16	0.16	0.22	92.26	35.74	6.28	0.00
5	Bearsden Primary School	2005	0.25	0.27	0.21	73.54	31.09	5.59	0.00
6	House Milngavie Road at Roman Road	2005	0.25	0.27	0.24	84.06	33.68	6.43	0.00
7	Lenzie Primary School	2005	0.14	0.16	0.11	56.68	27.99	2.77	0.00
8	House, Canniesburn Toll Bearsden	2005	0.27	0.30	0.27	96.35	35.91	7.46	0.00
9	House Townhead Kirkintilloch	2005	0.19	0.21	0.16	60.80	28.17	3.94	0.00

* See Footnote 4 in DMRB Volume 11 Chapter 3

DMRB: Assessment of Local Air Quality

OUTPUT SHEET

Current receptor

Receptor Name	House Townhead Kirkintilloch	Receptor number	9
Assessment year	2010		

Results

Pollutant	Annual mean				For comparison with Air Quality Standards		
	Background concentration	Road traffic component	Total	Units	Metric	Value	Units
CO	0.00	0.13	0.13	mg/m^3	Annual mean*	0.13	mg/m^3
Benzene	0.00	0.15	0.15	$\mu g/m^3$	Annual mean	0.15	$\mu g/m^3$
1,3-butadiene	0.00	0.10	0.10	$\mu g/m^3$	Annual mean	0.10	$\mu g/m^3$
NO_x	25.0	19.7	44.7	$\mu g/m^3$	Not applicable		
NO_2	18.0	5.3	23.3	$\mu g/m^3$	Annual mean*	23.3	$\mu g/m^3$
PM_{10}	16.0	2.49	18.49	$\mu g/m^3$	Annual mean	18.5	$\mu g/m^3$
					Days >50$\mu g/m^3$	2	Days

* See Footnote 4 in DMRB Volume 11 Chapter 3

Contribution of each link to annual mean

Link number	CO (mg/m^3)	Benzene ($\mu g/m^3$)	1,3-butadiene ($\mu g/m^3$)	NOx ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)
1	0.10	0.11	0.08	15.09	1.88
2	0.03	0.04	0.02	4.65	0.61
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

All receptors

			Pollutant concentrations at receptor						
Receptor number	Name	Year	CO *	Benzene	1,3-butadiene	NO_x	NO_2 *	PM_{10}	
			Annual mean mg/m^3	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Days >50$\mu g/m^3$
1	House Bishopbriggs Cross	2010	0.20	0.20	0.26	87.10	34.14	21.66	5.75
2	House Springburn Road Bishopbriggs	2010	0.18	0.21	0.20	72.87	31.72	20.22	3.67
3	House Switchback Road Bearsden	2010	0.07	0.11	0.11	45.66	24.47	16.77	0.62
4	House Maryhill Road at Garscube Mill	2010	0.12	0.12	0.16	66.46	29.61	18.53	1.84
5	Bearsden Primary School	2010	0.18	0.20	0.14	53.95	25.67	18.43	1.75
6	House Milngavie Road at Roman Road	2010	0.18	0.19	0.16	60.60	27.87	18.83	2.12
7	Lenzie Primary School	2010	0.10	0.11	0.07	43.50	23.67	17.77	1.23
8	House Canniesburn Toll Bearsden	2010	0.20	0.22	0.18	68.88	29.59	19.47	2.78
9	House Townhead Kirkintilloch	2010	0.13	0.15	0.10	44.74	23.33	18.49	1.80

* See Footnote 4 in DMRB Volume 11 Chapter 3

APPENDIX 3

Kirkintilloch Road North - Arm A - inbound movements 5, 10 & 16
Kenmure Avenue - Arm B - inbound movements 4, 9, & 15
Kirkintilloch Road South - Arm C - inbound movements 3, 8 & 13
Crowhill Road - Arm D - inbound movements 2, 7, 12 &14
Springfield Road - Arm E - inbound movements 1, 6 & 11

	Movement	HDVs a	HDVs b	HDVs c	ALL VEHS a	ALL VEHS b	ALL VEHS c	HDVs a+b+c	ALL VEHS a+b+c	HDVs 6 to 24 factor	ALL VEHS 6 to 24 factor	HDVs 24hr AADT	ALL VEHS 24hr AADT
To Arm 'A'	5	11	10	5	206	184	241	26	631	3.16	2.5052	82	1581
	10	112	137	71	906	1119	1544	320	3569	3.16	2.5052	1011	8941
	16	6	12	5	182	224	200	23	606	3.16	2.5052	73	1518
	Sub Total	129	159	81	1294	1527	1985	369	4806			1166	12040
To Arm 'B'	4	18	14	10	175	162	191	42	528	3.16	2.5052	133	1323
	9	2	3	2	33	45	24	7	102	3.16	2.5052	22	256
	15	0	0	0	130	70	91	0	291	3.16	2.5052	0	729
	Sub Total	20	17	12	338	277	306	49	921			155	2307
To Arm 'C'	3	132	142	123	1664	1012	1016	397	3692	3.16	2.5052	1255	9249
	8	5	5	6	38	42	49	16	129	3.16	2.5052	51	323
	13	2	10	3	143	132	145	15	420	3.16	2.5052	47	1052
	Sub Total	139	157	132	1845	1186	1210	428	4241			1352	10625
To Arm 'D'	2	9	18	16	227	290	308	43	825	3.16	2.5052	136	2067
	7	3	1	3	99	60	62	7	221	3.16	2.5052	22	554
	12	0	7	1	186	56	35	8	277	3.16	2.5052	25	694
	14	0	0	0	9	24	30	0	63	3.16	2.5052	0	158
	Sub Total	12	26	20	521	430	435	58	1386	3.16	2.5052	183	3472
To Arm 'E'	1	0	1	0	1	2	4	1	7	3.16	2.5052	3	18
	6	1	2	0	1	2	0	3	3	3.16	2.5052	9	8
	11	1	0	0	41	0	0	1	41	3.16	2.5052	3	103
	Sub Total	2	3	0	43	4	4	5	51			16	128
	Total	302	362	245	4041	3424	3940	909	11405			2872	28572

A739 Switchback South of Henderland Road Tues, Wed & Thurs 9, 10 & 11 May 2000 updated to 2002 flows

Northbound to Bearsden
Southbound to Glasgow

a - 0700-1000
b - 1500 - 1900

Factors at Maryhill Road ATC site to give 24hr AADT HDVs flows
7hr (a+b) to 24hr AADT for all vehs
7hr (a+b) to 24hr AADT for HDVs

		2000 HDVs a	2000 HDVs b	2000 ALL VEHS a	2000 ALL VEHS b	2000 HDVs a+b	2000 ALL VEHS a+b	HDVs 7 to 24 factor	ALL VEHS 7 to 24 factor	2000 HDVs	2000 ALL VEHS 24hr AADT	2000 HDVs 24hr AADT	2002 ALL VEHS 24hr AADT	2002 HDVs 24hr AADT
Tues.	Northbound	134	105	2248	5434	239	7682							
	Southbound	62	76	4427	4023	138	8450							
	Sub Total	196	181	6675	9457	377	16132							
Wed.	Northbound	122	104	2161	5537	226	7698							
	Southbound	126	142	4392	4142	268	8534							
	Sub Total	248	246	6553	9679	494	16232							
Thurs.	Northbound	111	75	1982	4975	186	6957							
	Southbound	83	103	4284	3630	186	7914							
	Sub Total	194	178	6266	8605	372	14871							
Ave.	Northbound	122	95	2130	5315	217	7446	4.21677	2.13958	915	14665	772	12011	832
	Southbound	90	107	4368	3932	197	8299	4.14719	1.99658	818	15085	702	12888	756
	Sub Total	213	202	6498	9247	414	15745	4.18025	2.06853	1732	32569	1473	24899	1588

A803 JOURNEY RUNS

Strathkelvin Retail Park to Colston Road

Date :- 9 May 2001

AM Peak	08:00 - 09:00
OFF Peak	13:30 - 14:30
PM Peak	16:30 - 17:30

Average journey run

AM Peak

Run No.	1	6
Direction	Southbound	Northbound
Start Time		
	secs	secs
Retail Park R/A	-	52
Westerhill Road	106	105
Hilton Road	60	117
South Crosshill Road	86	36
Bishopbriggs Cross	58	75
Brackenbrae Road	45	64
Colston Road	160	-

OFF Peak

Run No.	1	6
Direction	Southbound	Northbound
Start Time		
	secs	secs
Retail Park R/A	-	56
Westerhill Road	70	83
Hilton Road	96	92
South Crosshill Road	84	48
Bishopbriggs Cross	52	38
Brackenbrae Road	38	64
Colston Road	98	-

PM Peak

Run No.	1	6
Direction	Southbound	Northbound
Start Time		
	secs	secs
Retail Park R/A	-	54
Westerhill Road	83	119
Hilton Road	77	73
South Crosshill Road	99	72
Bishopbriggs Cross	54	57
Brackenbrae Road	68	70
Colston Road	61	-

A803 JOURNEY RUNS

Strathkelvin Retail Park to Colston Road

Date :- 9 May 2001

AM Peak	08:00 - 09:00
OFF Peak	13:30 - 14:30
PM Peak	16:30 - 17:30

Average journey run

AM Peak

Run No.	1	6
Direction	Southbound	Northbound
Start Time		
	Dist (m)	Dist (m)
Retail Park R/A	-	500
Westerhill Road	500	710
Hilton Road	710	790
South Crosshill Road	790	260
Bishopbriggs Cross	260	425
Brackenbrae Road	425	640
Colston Road	640	-

OFF Peak

Run No.	1	6
Direction	Southbound	Northbound
Start Time		
	Dist (m)	Dist (m)
Retail Park R/A	-	500
Westerhill Road	500	710
Hilton Road	710	790
South Crosshill Road	790	260
Bishopbriggs Cross	260	425
Brackenbrae Road	425	640
Colston Road	640	-

PM Peak

Run No.	1	6
Direction	Southbound	Northbound
Start Time		
	Dist (m)	Dist (m)
Retail Park R/A	-	500
Westerhill Road	500	710
Hilton Road	710	790
South Crosshill Road	790	260
Bishopbriggs Cross	260	425
Brackenbrae Road	425	640
Colston Road	640	-

A803 JOURNEY RUNS

Strathkelvin Retail Park to Colston Road

Date :- 9 May 2001

AM Peak	08:00 - 09:00
OFF Peak	13:30 - 14:30
PM Peak	16:30 - 17:30

Average journey run

AM Peak

Run No.	1	6
Direction	Southbound	Northbound
Start Time		
	Speed (kph)	Speed (kph)
Retail Park R/A	-	34.4
Westerhill Road	17.1	24.3
Hilton Road	43.0	24.4
South Crosshill Road	33.1	26.0
Bishopbriggs Cross	16.3	20.5
Brackenbrae Road	34.0	35.8
Colston Road	14.4	-

OFF Peak

Run No.	1	6
Direction	Southbound	Northbound
Start Time		
	Speed (kph)	Speed (kph)
Retail Park R/A	-	32.1
Westerhill Road	25.8	30.8
Hilton Road	26.5	30.8
South Crosshill Road	33.9	19.6
Bishopbriggs Cross	17.9	40.6
Brackenbrae Road	40.3	36.0
Colston Road	23.6	-

PM Peak

Run No.	1	6
Direction	Southbound	Northbound
Start Time		
	Speed (kph)	Speed (kph)
Retail Park R/A	-	33.5
Westerhill Road	21.8	21.4
Hilton Road	33.1	38.8
South Crosshill Road	28.8	12.9
Bishopbriggs Cross	17.3	27.0
Brackenbrae Road	22.6	32.8
Colston Road	38.0	-