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LAQM Detailed Assessment of PM10 in Ayr

Client: South Ayrshire Council
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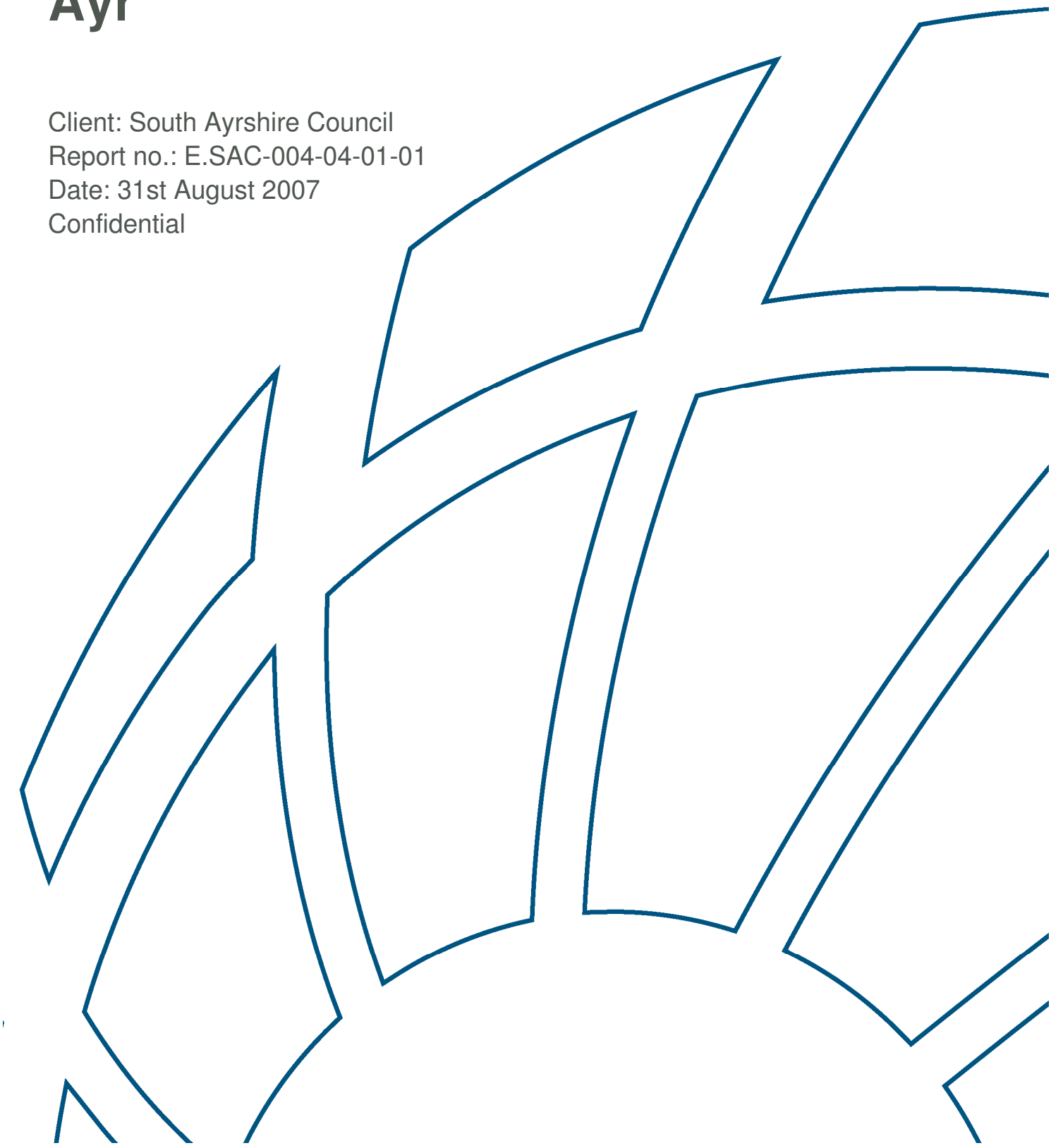

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1 INTRODUCTION

Part IV of the Environment Act 1995 requires local authorities to carry out regular reviews of current and future air quality within their area to assess compliance with national air quality standards and objectives. The air quality standards and objectives are set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland[1] (AQS) and have been transposed into legislation through the Air Quality (Scotland) Regulations 2000 and the Air Quality (Scotland) Amendment Regulations 2002.

The AQS also sets out the Local Air Quality Management framework. Under the LAQM framework, local authorities must carry out an Updating and Screening Assessment (U&SA) every three years to assess ambient pollutant concentrations for compliance with the objectives. Where a U&SA identifies the risk of exceeding an air quality objective, the local authority must undertake a Detailed Assessment to investigate the risk more thoroughly and to determine whether it is necessary to declare an Air Quality Management Area (AQMA).

South Ayrshire Council undertook a U&SA of local air quality in 2006. The USA identified that PM_{10} concentrations in the vicinity of New Bridge Street in Ayr were at risk of exceeding the 2010 air quality objectives for PM_{10}. In response to the results of the U&SA, BMT Cordah Limited has been commissioned by South Ayrshire Council to undertake a Detailed Assessment of PM_{10} concentrations in the vicinity of New Bridge Street in Ayr.

The Detailed Assessment includes:

- a review of meteorological influences on local PM_{10} concentrations;
- a review of monitored PM_{10} concentrations; and
- an atmospheric dispersion modelling study of road traffic emissions.

The assessment follows the guidance set out in the LAQM Technical Guidance[2] and the LAQM Policy Guidance[3].

[1] Defra et al (2000). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Working Together for Clean Air.
[2] Defra et al (2003). Part IV of the Environment Act 1995. Local Air Quality Management Technical Guidance, LAQM.TG(03).
[3] Defra et al (2003). Part IV of the Environment Act 1995. Local Air Quality Management Policy Guidance, LAQM.PG(03).

2 ASSESSMENT CRITERIA

The air quality objectives for PM_{10} are presented in Table 1. There are two phases of objectives, an initial phase, which had to complied with by 2004, and a second phase of objectives which are more stringent and come into force in 2010.

The air quality objectives apply at areas of relevant public exposure as defined in the LAQM Technical Guidance. Long term objectives, such as the annual mean objectives should be applied at all locations where members of the public might be regularly exposed, for example, residential properties and institutional buildings. Relevant public exposure for short term objectives includes all locations for which the annual mean objectives are relevant as well as all other outdoor locations where the public might reasonably be expected to spend the applicable exposure period for the objective.

Table 1: PM_{10} air quality objectives

PM_{10} objective concentration	Measured as	Equivalent percentile	Date to be achieved by
50µg/m^3 not to be exceeded more than 35 times a year	24-hour mean	90.4th percentile of 24-hour mean concentrations	31/12/2004
40µg/m^3	Annual mean	-	31/01/2004
50µg/m^3 not to be exceeded more than 7 times a year	24-hour mean	98th percentile of 24-hour mean concentrations	31/12/2010
18µg/m^3	Annual mean	-	31/12/2010

3 REVIEW OF METEOROLOGICAL INFLUENCES ON PM_{10} CONCENTRATIONS

Pollutant dispersion in the atmosphere is influenced by the state of the atmospheric boundary layer. The atmospheric boundary layer varies in height depending on the time of day and meteorological conditions at the time. The main meteorological parameters affecting the boundary layer are the wind speed and level of sunshine. The atmospheric boundary layer is usually described in terms of stability ranging from stable to unstable. Stable conditions occur on cold, still, cloudless nights, and unstable conditions occur on hot, sunny days with light winds. The most commonly experienced conditions in the UK are neutral conditions which are categorised by cloudy conditions with medium to strong winds.

The town of Ayr is situated on the west coast of Scotland where the local weather patterns are affected by a strong maritime influence. As with the majority of Scotland, the predominant wind direction in Ayr is south westerly. The strongest wind speeds also come from this direction.

The mean temperature in Ayr is higher than average temperatures across the rest of Scotland which is likely to be due to the moderating affect of the sea. Ayr also has fewer days of ground frost than the Scottish average which indicates that very cold, still nights are less frequent due to the coastal influences. Cold still nights can lead to higher pollutant concentrations if a temperature inversion occurs because pollutants get trapped under a layer of cold air and are unable to disperse.

The average number of hour's sunshine experienced in Ayr is greater than the Scottish average. Warm sunny conditions help to disperse ground level pollutants due to the formation of large convective air currents which carry pollutants into the atmosphere.

The average amount of rainfall experienced at Ayr is slightly less than the Scottish average. Rainfall has the effect of washing PM_{10} particles out of the air and thus can reduce concentrations. Higher PM_{10} concentrations are generally experienced on days will little or no rainfall.

4 REVIEW OF PM_{10} MONITORING DATA

South Ayrshire Council monitors PM_{10} concentrations at three locations using automatic monitoring equipment. Two of the monitoring stations are located in the vicinity of New Bridge Street, the locations of which are presented in Table 2.

Table 2: Automatic PM_{10} monitor locations

Monitoring site	Grid reference (m)
New Bridge Street/High Street	233712 622118
Sandgate	233572 621937

The monitor located at Sandgate is an OSIRIS monitor. To date, there were frequent problems with the monitor which reduced the amount of data gathered. There is insufficient data for use in this assessment.

The monitor situated at the corner of New Bridge Street and High Street is a Tapered Element Oscillating Microbalance (TEOM) analyser. The monitor was located to this site in February 2007 to determine PM_{10} concentrations in the area identified as potentially exceeding PM_{10} objectives. Six months of monitoring data from this location is therefore available for use in this assessment.

The PM_{10} air quality objectives are based on the use of the European transfer reference sampler which is a gravimetric sampler. The gravimetric sampler uses a filter held at ambient temperatures whereas the TEOM analyser uses a filter held at a temperature of

50℃. The TEOM analyser, therefore, can underestimate PM_{10} concentrations because of the potential loss of some more volatile particles. To account for the loss of any volatile particles LAQM Technical Guidance recommends that monitoring results from TEOM analysers are factored to account for any potential underestimation. LAQM Technical Guidance recommends the use of a 1.3 adjustment factor, however correspondence from the Scottish Executive states that it is permissible to use a locally derived factor in preference to the 1.3 factor. Where a local adjustment factor is unavailable the Scottish Executive state that the results should be adjusted using both the 1.3 factor and a 1.14 factor (identified by Edinburgh City Council) for use in the study.

The results of the monitoring for the six-month period from 2nd February and 6th August for the New Bridge Street automatic monitor are presented in Table 3. Results adjusted using both the 1.3 and 1.14 factors are presented for reference.

Table 3: Measured PM_{10} concentrations, New Bridge Street (2nd February to 6th August 2007), µg/m^3

Site	Period annual mean (µg/m^3)			98th percentile of 24-hour mean concentrations (µg/m^3)			90.4th percentile of 24-hour mean concentrations (µg/m^3)		
	Raw data	1.3 factor	1.14 factor	Raw data	1.3 factor	1.14 factor	Raw data	1.3 factor	1.14 factor
New Bridge Street	15.2	19.6	17.2	34.7	45.0	39.5	23.4	30.4	26.7

As only six months of monitoring data are available for the New Bridge Street automatic monitoring station the measured six-month mean concentration should be adjusted to approximate to an annual mean concentration. LAQM Technical Guidance describes a method for adjusting the results of short term monitoring in order to obtain an indication of the expected annual mean concentration. The adjustment method uses the ratio between the period mean and the annual mean from nearby monitoring sites and applies the average ratio to the site with short term results.

The closest PM_{10} monitoring stations to Ayr are situated over 50km from Ayr. An adjustment ratio has therefore been calculated using monitoring data from the closest four non-kerbside national network monitoring stations. Due to the distance from Ayr to each of the three other monitoring sites the results should be viewed with caution, however they should provide a good indication of seasonal trends in measured concentrations. The calculated ratios are presented in Table 4. The results indicate that on average the measured average concentration over the six-month period February-August 2007 was marginally higher than the equivalent annual mean concentration (February 2006-February 2007).

Table 4: Calculated measured PM_{10} seasonal adjustment factor

Site	Site classification	Annual mean ($\mu g/m^3$)	Period mean ($\mu g/m^3$)	Adjustment factor
Auchencorth Moss	Rural	12.33	14.23	0.866
Edinburgh St Leonards	Urban background	20.09	21.25	0.946
Grangemouth	Urban industrial	17.80	19.53	0.911
Glasgow Centre	Urban Centre	21.23	21.06	1.008
Average				0.932

The average adjustment factor was applied to the measured concentrations to determine an annual mean equivalent concentration for the New Bridge Street. Using the methods and factors described in LAQM Technical Guidance the 2007 equivalent annual mean concentrations has been factored to predict the likely annual mean concentration at the site in 2010. The respective estimated 2007 and 2010 PM_{10} concentrations are presented in Table 5.

Table 5: Estimated and projected annual mean concentrations

Site	Estimated 2007 annual mean concentrations ($\mu g/m^3$)			Projected 2010 annual mean concentrations ($\mu g/m^3$)		
	Raw data	1.3 factor	1.14 factor	Raw data	1.3 factor	1.14 factor
New Bridge Street	14.2	18.3	16.0	13.5	17.3	15.16

The monitoring results indicate that the PM_{10} concentrations are currently in compliance with the 2004 PM_{10} air quality objectives. The current annual mean concentration is, however, greater than the 2010 PM_{10} air quality objective if the 1.3 adjustment factor is applied. The projections indicate, however, that the annual mean PM_{10} concentrations in 2010 are likely to meet the 2010 annual mean objective at the monitoring location.

The 98th percentile of 24 hour mean concentrations recorded within the monitoring period was below the 50$\mu g/m^3$ objective. The measured 24-hour mean concentration was higher than 50$\mu g/m^3$ on one occasion where the 1.14 factor was applied to the results and on two occasions if the 1.3 factor is applied to the results. The measured 24-hour mean concentrations therefore meet both the 2004 and 2010 objectives regardless of the adjustment factor applied to the results, although it should be noted that the 24-hour mean concentration is particularly dependent on short-term pollution episodes and the number of these episodes that will occur in a year.

5 DISPERSION MODELLING STUDY

In order to determine PM_{10} concentrations along the New Bridge Street and in the surrounding areas a dispersion modelling study of road traffic emissions was undertaken. Modelling predictions were undertaken for the baseline year (2006) and for 2010 for comparison with air quality objectives.

5.1 Model description

The atmospheric dispersion modelling study was undertaken using the proprietary model ADMS Roads. ADMS Roads is a version of ADMS which is suitable for modelling the atmospheric pollutants released from road traffic and industrial sources. ADMS Roads is supplied by Cambridge Environmental Research Consultants (CERC) and has been extensively validated using several data sets. ADMS Roads characterises the atmospheric boundary layer in terms of the boundary layer depth and the Monin-Obukhov length. This method of modelling pollutant dispersion allows for more accurate prediction of pollutant concentrations.

5.2 Background data

In assessing air quality levels, background pollution sources should be considered in order to account for the cumulative effect of many pollution sources on overall concentrations in the atmosphere. The LAQM website[4] provides background concentrations for most pollutants on a 1km by 1km grid square basis. Background concentrations for South Ayrshire Council area were obtained from the LAQM website.

In order to avoid double counting PM_{10} concentrations, background concentrations were not taken from the grid square which contains New Bridge Street. Background concentrations were taken from surrounding grid squares and the results averaged to obtain the background concentrations used in the model. The background concentrations used in the modelling study are presented in Table 6.

Table 6: 2006 and 2010 background concentrations

Pollutant	Background concentration (µg/m^3)	
	2006	2010
PM_{10}	11.23	10.68

5.3 Road traffic emissions parameters

5.3.1 Traffic count data

The modelling study considered road traffic emissions from five streets in Ayr town centre:

- Sandgate;

[4] Defra et al (2006). Local Air Quality Management. http://www.airquality.co.uk/archive/laqm/laqm.php

- New Bridge Street;
- High Street;
- the A719; and
- the A79.

To determine emissions from road traffic on these streets certain information on road traffic flows were obtained. The road traffic information used in the modelling study is presented in Table 7. Traffic data for New Bridge Street and High Street were obtained from South Ayrshire Council Roads Department and traffic data for the A719 and the A79 were obtained from Transport Scotland. The traffic data obtained for New Bridge Street were extended into Sandgate as it is a continuation of the same road.

Traffic count data for New Bridge Street and High Street were provided in the form of 24 hour average 7-day average flows and assumed to be equivalent to an annual average daily traffic (AADT) flow. The traffic flow obtained for New Bridge Street was used for Sandgate. Automatic traffic count data for the A719 and the A79 included hourly flows and detailed vehicle split information from which an annual average hourly traffic flow was calculated.

The detailed vehicle split information for the A719 and A79 was used to obtain an average percentage of HGV's on these two road segments. No detailed vehicle split was obtained for New Bridge Street or Sandgate; therefore, the percentage of HGV's for the A719 was applied to the traffic counts obtained for New Bridge Street. The vehicle split information for High Street included a separation of vehicles into categories of less than or equal to 5.2m and those greater than 5.2m. These vehicle splits were taken as a proxy for LGV's and HGV's/buses respectively.

The modelling study required 2010 traffic flows for future modelling predictions. Estimated 2010 traffic flows were obtained using measured 2006 traffic flows and applying an estimated growth factor of 5.5% for HGV's and 7.7% for LGV's as obtained from the Department for Transport[5].

[5] Department for Transport (2002). Transport Statistics Bulletin: road traffic statistics

Table 7: Road traffic input data

Road name	Average number of light vehicles per hour	LGV speed (km/hr)	Average number of heavy vehicles per hour	HGV speed (km/hr)	Road width (m)	Canyon height (m)
2006 traffic flows						
Sandgate	898	45	18	40	20	20
New Bridge Street	898	45	18	40	15	0
High Street	52	45	25	40	15	0
A719	749	45	15	40	20	0
A79	886	45	18	40	10	0
2010 traffic flows						
Sandgate	967	45	19	40	20	20
New Bridge Street	967	45	19	40	15	0
High Street	56	45	26	40	15	0
A719	807	45	16	40	20	0
A79	954	45	19	40	10	0

5.3.2 Diurnal profiles

The model requires the traffic data to be input as an average vehicle flow per hour. The accuracy of the traffic flow information can be improved by use of time varying emissions factors which details the diurnal profile of the road. The time varying factors allow the average hourly traffic flow to be multiplied by a factor representative of the expected traffic flow at each hour of the day. The traffic flow factors are calculated as a ratio between the hourly flow and the average hourly flow.

Detailed hourly traffic flow information was available for High Street, the A719 and the A79 and diurnal profiles were calculated for these three roads. The diurnal profile for the A719 was used for New Bridge Street and Sandgate as these roads are linked and it was assumed that the A719 would give the closest representation of the expected profile of New Bridge Street and Sandgate. For High Street, diurnal profiles for Monday to Friday and for Monday to Sunday were available. The profile for Monday to Friday was used for weekdays and the Monday to Sunday profile was used for weekends. The diurnal profiles used in the modelling study are presented in Table 8.

Table 8: Diurnal profiles for High Street, the A719 and the A79

Hour	High Street			A719			A79		
	Weekdays	Saturday	Sunday	Weekdays	Saturday	Sunday	Weekdays	Saturday	Sunday
1	0.19	0.25	0.25	0.12	0.32	0.42	0.14	0.39	0.53
2	0.13	0.22	0.22	0.07	0.19	0.25	0.07	0.26	0.40
3	0.12	0.21	0.21	0.06	0.15	0.24	0.06	0.21	0.37
4	0.04	0.11	0.11	0.03	0.12	0.17	0.03	0.13	0.30
5	0.01	0.03	0.03	0.05	0.09	0.10	0.05	0.09	0.13
6	0.08	0.06	0.06	0.13	0.12	0.12	0.14	0.13	0.13
7	0.35	0.32	0.32	0.41	0.24	0.22	0.38	0.25	0.21
8	0.71	0.62	0.62	0.98	0.51	0.39	1.07	0.49	0.34
9	1.25	1.17	1.17	1.72	0.94	0.56	1.84	0.97	0.45
10	1.77	1.66	1.66	1.57	1.25	0.97	1.57	1.36	0.70
11	2.04	1.93	1.93	1.50	1.62	1.56	1.50	1.68	1.22
12	2.27	2.17	2.17	1.59	1.95	2.04	1.62	1.98	1.62
13	2.26	2.22	2.22	1.72	2.07	2.32	1.68	2.03	2.15
14	2.17	2.15	2.15	1.68	2.14	2.40	1.60	2.00	2.35
15	2.22	2.19	2.19	1.69	1.98	2.28	1.76	1.98	2.38
16	2.00	2.01	2.01	1.78	1.97	2.00	1.78	1.80	2.22
17	1.87	1.90	1.90	1.87	1.87	1.92	1.95	1.81	2.06
18	1.54	1.56	1.56	1.79	1.61	1.57	1.84	1.51	1.57
19	0.85	0.87	0.87	1.50	1.26	1.25	1.41	1.12	1.33
20	0.57	0.59	0.59	1.27	1.17	1.06	1.16	1.11	1.16
21	0.52	0.57	0.57	0.94	0.82	0.87	0.84	0.84	0.86
22	0.44	0.48	0.48	0.77	0.62	0.61	0.70	0.70	0.67
23	0.36	0.41	0.41	0.49	0.59	0.41	0.48	0.63	0.49
24	0.26	0.30	0.30	0.26	0.41	0.25	0.32	0.53	0.34

5.3.3 Additional vehicle emissions

The modelling study calculated PM_{10} emissions from road traffic exhausts based on the traffic flow data and assumption on the vehicle fleet mix. Road traffic also generates PM_{10} emissions through brake and tyre wear and through dust re-suspension. The study therefore considered these additional PM_{10} emissions. The additional non-exhaust emissions were calculated using PM_{10} emissions factors published on the National Atmospheric Emissions Inventory website emissions factor database[6] and the number of vehicles per day. The additional emissions from brake and tyre wear and dust re-suspension included in the model are presented in Table 9.

Table 9: Additional emissions due to brake and tyre wear and dust re-suspension

Road name	Additional emissions due to brake and tyre wear and dust re-suspension (g/km/s)	
	2006 traffic flows	2010 traffic flows
Sandgate	0.000507	0.000546
New Bridge Street	0.000507	0.000546
High Street	0.0000451	0.0000482
A719	0.000423	0.000455
A79	0.0005	0.000538

[6] http://www.naei.org.uk/emissions/selection.php

5.4 Modelled domain and receptors

PM_{10} concentrations were calculated over a regular Cartesian grid pattern and at specified receptor points. The modelled domain consisted of a 1km by 1km grid. The number of calculation points was set at 50 by 50 which provides predicted concentrations every 20m.

The 'Intelligent gridding' feature of the model was also used. This feature adds additional receptor points along the edge of each road source and increases the resolution of the model output in the vicinity of the emissions sources.

The locations of the receptors included in the modelling study are presented in Table 10 and Figure 1.

Table 10: Receptor locations

Receptor	Grid reference (m)
TEOM monitor	233712, 622118
OSIRIS monitor	233572, 621937
Bus station	233596, 621857
Town hall	233700, 622072
Library	233828, 622279
Ayr Academy	233526, 622130
Receptor 1	233547, 621903
Receptor 2	233589, 621975
Receptor 3	233641, 622052
Receptor 4	233671, 622096
Receptor 5	233654, 622025

5.5 Meteorological data

The meteorological station closest to New Bridge Street in Ayr is at Prestwick Airport. Measured hourly sequential meteorological data from 2003, 2005 and 2006 were obtained for this site. Prestwick meteorological monitoring station is located approximately 8km to the north of New Bridge Street. A sensitivity analysis was conducted to determine the year of meteorological data which provided 'worst case' pollutant concentrations (see section 6.1).

Wind roses of measured wind data during 2003, 2005 and 2006 at Prestwick are presented in Figure 2. The wind roses indicate that the most frequent wind directions were from a south westerly direction. Measured data in 2006 displayed slightly stronger wind speeds than 2003 and 2005 but there was little variation between the three years.

5.6 Surface characteristics and terrain

The surface characteristics of an area have an influence on the dispersion of atmospheric pollutants through the generation of turbulence. The surface roughness factor used in the model is a measure of this turbulence. The surface roughness value of 1m has been used in this assessment which is representative of the turbulence generated by large built up areas.

The terrain of an area can have an influence on the dispersion of atmospheric pollutants where there is a gradient rise of 1 in 10 or more. The model is able to take into account the effect of terrain where necessary. The town of Ayr is situated near the coast on a relatively flat area of land. It was, therefore, not necessary to include the effect of terrain in the modelling study.

6 MODELLING RESULTS

6.1 Sensitivity analysis

The results of dispersion modelling are sensitive to the input data used which can affect the accuracy of modelling predictions. A sensitivity analysis of the effect of different meteorological conditions was therefore undertaken to assess the effects of different meteorological conditions on predicted concentrations. The results of the sensitivity analysis are presented in Table 11. The results indicate very little variation in the predicted concentrations for each year; however, 2003 meteorological conditions resulted in higher predicted annual mean concentration than 2005 and a higher 98th percentile of 24 hour mean concentrations than 2006. The final modelling predictions were therefore undertaken using the 2003 meteorological dataset. The year of meteorological data is not likely to have a significant impact on predicted concentrations.

Table 11: Results of the sensitivity analysis

Objective	Year of meteorological data			% difference between highest and lowest concentration
	2003	2005	2006	
Annual mean	12.3	12.2	12.3	0.8%
90.4th percentile of 24 hour mean concentrations	13.3	13.3	13.3	0%
98th percentile of 24 hour mean concentrations	14.4	14.5	14.1	2.8%

6.2 Model verification

In order to determine the accuracy of modelling predictions, it is useful to verify the predicted concentrations against monitored data. Modelling verification must be carried out

using monitoring data, meteorological data and traffic flow data from the same time period. In this study, monitoring data, meteorological data and traffic flow data from the same time period were not available.

Modelling predictions have therefore been undertaken and the results assessed in comparison to measured data. No adjustment of the modelling results has been applied, however the results are reviewed in the context of measured concentrations.

6.3 Modelling predictions

The results of the modelling study are presented in Table 12. Contour plots of predicted PM_{10} concentrations are presented in Figures 3 to 8.

Table 12: Maximum predicted ground level PM_{10} concentrations

Receptor	2006 traffic flows			2010 traffic flows		
	Annual mean	98th percentile of 24-hour mean concentrations	90.4th percentile of 24-hour mean concentrations	Annual mean	98th percentile of 24-hour mean concentrations	90.4th percentile of 24-hour mean concentrations
Maximum concentration from calculation grid	12.3	14.4	13.3	11.6	13.2	12.4
TEOM monitor	11.7	12.4	12.1	11.1	11.6	11.4
OSIRIS monitor	12.1	13.3	12.7	11.4	12.4	11.9
Bus station	11.3	11.5	11.4	10.8	11.0	10.9
Town hall	11.5	11.9	11.7	10.9	11.2	11.1
Library	11.5	11.8	11.6	10.9	11.2	11.0
Ayr Academy	11.3	11.6	11.4	10.8	11.0	10.9
Receptor 1	11.8	13.1	12.3	11.1	12.2	11.5
Receptor 2	11.7	12.8	12.2	11.1	12.0	11.4
Receptor 3	11.7	12.9	12.2	11.1	12.0	11.5
Receptor 4	11.7	13.0	12.3	11.1	12.1	11.5
Receptor 5	11.5	12.2	11.9	10.9	11.4	11.2

The modelling predictions indicate that annual average PM_{10} concentrations across the modelling domain in 2006 are fairly uniform and range from 11.5-12.3µg/m^3. The predictions indicate a reduction in PM_{10} concentrations between 2006 and 2010 as the expected improvement in vehicle emission rates and the lower background concentrations will outweigh the effect of increased traffic flows. Comparison of modelling predictions with the assumed background concentration indicates that road traffic generated PM_{10} emissions account for less than 1µg/m^3.

Analysis of the modelling predictions in comparison to measured PM_{10} concentrations indicates that the model has under-estimated annual mean monitored concentrations by

around 40%. Analysis of short-term modelling predictions indicates that the model has underestimated the 98th percentile of 24 hour mean concentrations by an average of 72% and 90.4th percentile of 24 hour mean concentrations by an average of 60%.

It is possible that the model has under predicted the pollutant concentrations since all roads adjoining New Bridge Street were not modelled, also the model may not have included some local emission sources such as idling traffic close to the monitoring location or cold-start emissions.

For the purposes of assessing the likelihood of exceeding PM_{10} objectives the predicted 2010 concentrations have been factored to account for the potential model under-prediction. The predicted PM_{10} concentrations at the top five receptors, taking into account the difference between modelled and measured concentrations are presented in Table 13. The results indicate that predicted concentrations are below the PM_{10} air quality objectives even when the potential model under-prediction has been accounted for.

Table 13: Predicted PM_{10} concentrations with percentage difference applied

Receptor	Annual mean concentration	98th percentile of 24 hour mean concentrations	90.4th percentile of 24 hour mean concentrations
Maximum grid output	17.2	24.8	21.3
TEOM location	16.4	21.3	19.4
Receptor 1	16.5	22.5	19.7
Receptor 2	16.4	22.0	19.5
Receptor 3	16.4	22.2	19.5
Receptor 4	16.4	22.4	19.7

7 CONCLUSION

The measured concentrations from New Bridge Street automatic monitoring station indicate the estimated annual mean concentration for 2007 is sensitive to the adjustment factor applied. The application of the 1.3 factor resulted in the concentration being above the 2010 annual mean objective level whereas when the lower 1.14 adjustment factor is applied measured concentrations are below the objective level. When predicted concentrations are projected forward to 2010 the estimated annual mean concentration is below the annual mean objective level whichever adjustment factor is applied.

Dispersion modelling predictions indicate that PM_{10} concentrations are likely to be below both the 2004 and 2010 air quality objectives for PM_{10}. Analysis of the modelling predictions indicate that the model is under-estimating PM_{10} concentrations, however, even in allowing for the potential under-estimation the predicted concentrations are below both the 2004 and 2010 air quality objectives.

Based on the monitoring results and the results of the dispersion modelling study it is considered that there is no requirement to declare an Air Quality Management Area for PM_{10} at this time. It is recommended that South Ayrshire Council:

- to continue monitoring at New Bridge Street to obtain 12 months monitoring data; and
- re-assess the situation in the 2009 Progress Report once 12 months monitoring data has been gathered.