CONTENTS

1.0 EXECUTIVE SUMMARY

The Stage 4 assessment has been carried out in accordance with Government issued guidance (October 2001) which outlines the aims and recommendations of further review. Stage 4 provides stronger evidence to support the need for action to reduce the impact of emissions from road transport along the A282 Tunnel Approach Road. Further monitoring of nitrogen dioxide (NO_2) and fine particles (PM_{10}) has been undertaken within the Air Quality Management Area (AQMA) and the results confirm model predictions that exceedences of the annual NO_2 standard and PM_{10} 24 hour standard are occurring and target dates are unlikely to be met. Levels of PM_{10} were found to be higher than model predictions at the nearest receptors on the west side of the A282 near the crossing where queues regularly occur towards the tolls.

Source apportionment showed that HGV movements were responsible for half of the emissions of NO_2 and PM_{10} from the A282 despite being less than a fifth of the total vehicle movements, indicating that targeting HGV movements for traffic reduction or clean up would have a more significant effect on emissions. Model runs using only local sources, to estimate the local contribution to pollution levels, showed that PM_{10} levels would meet the 24 hour standard without the through traffic element and NO_2 would only marginally exceed the annual standard at a small number of receptors. Modelled scenarios of potential measures to reduce pollution levels, in particular NO_2, predicted that substantial measures would be required to achieve the NO_2 annual and PM_{10} 24 hour air quality objectives and this will require action at a national level.

Remodelling with the proposed new emissions factors has been undertaken and shows predictions for NO_2 annual objective have been underestimated and thus the geographical extent of exceedences is likely to increase with new areas, previously marginal, requiring further investigation regarding potential designation.

2.0 BACKGROUND

2.1 The National Air Quality Strategy

The Environment Act 1995 introduced a system of local air quality management (LAQM), placing new legal duties on local authorities, and a requirement that the Government publish a National Air Quality Strategy containing air quality targets which would protect people's health.

The National Air Quality Strategy (NAQS) was published in 1997 and has since been revised in 2000. The Strategy contains standards and objectives for eight air pollutants; nitrogen dioxide (NO_2), sulphur dioxide, carbon monoxide, fine particles (PM_{10}), ozone, lead, 1,3-butadiene and benzene. Local authorities have a responsibility to assess levels of these pollutants, with the exception of ozone, and implement measures to reduce pollution where objectives are not met by the target deadlines which range from 2003 to 2005. Appendix 1 shows the current standards and objectives as set out in the Air Quality Regulations 2000. Consultation is currently underway on proposals for new air quality objectives for fine particles, benzene, carbon monoxide and polycyclic aromatic hydrocarbons. These objectives will be incorporated into the next phase of review and assessment of air quality to be completed by the end of 2003.

Local authorities must review and assess current and projected pollutant levels and where it appears the targets will not be met by the designated time they must declare an Air Quality Management Area (AQMA) and draw up action plans to meet the targets. Further assessment of these designated areas is required under S84 of the Environment Act 1995 to confirm predictions and provide technical information to support possible measures to improve air quality within AQMA's - this is called the Stage 4.Guidance has been produced by the Government to aid these further assessments and this will be referred to in this report.

New vehicle emissions factors have been published in 2002 which will have an impact on previous review and assessment work. This will effect road traffic emission predictions, especially for nitrogen dioxide which has been underestimated previously and the implications will be considered in this report.

2.2 Review and Assessment of Air Quality in Dartford Stages 1 – 3

The first three Stages of Review and Assessment are summarised in Table 1 below. Two pollutants were taken forward to the more detailed Stage 3 Review and Assessment – fine particles (PM_{10}) and nitrogen dioxide (NO_2).

Table 1: Summary of Stages 1 - 3

Stage 1 (June 1998)	Stage 2 (December 1998)	Stage 3 (December 2000)
Benzene		
1,3-Butadiene		
Carbon monoxide	Carbon monoxide	
Lead		
Nitrogen dioxide	Nitrogen dioxide	***Nitrogen dioxide***
PM_{10}	PM_{10}	***PM_{10}***
Sulphur dioxide	Sulphur dioxide	

The main findings of the Stage 3 were that the geographical majority of the Borough is expected to meet the standards. However, there is a narrow corridor along the A282 junctions 1a-1b where it is anticipated that the standards are unlikely to be achieved for NO_2 (annual) and PM_{10} (24 hour). The major cause of the problem is the impact of emissions from locally, regionally and nationally generated traffic movements along the A282 on the residential properties in close proximity to this major road. Other sources include roads within the local road network, such as the A226 and A296 and to a lesser extent, industry and domestic/commercial sources. The problem reduces with increasing distance from the roads of concern and relatively small areas are involved. On the basis of the Stage 3 Review, the Council declared an Air Quality Management Area (AQMA) and the Order became effective as from 1st October 2001.

2.3 Challenges for Dartford

Lying within Kent Thameside, part of the Thames Gateway regeneration area, Dartford is primed for significant growth in terms of development and travel demand. In Regional Planning Guidance (RPG9), Thames Gateway has been confirmed as a national priority for regeneration. Kent Thameside also includes a major part of Gravesham Borough and collectively there are large-scale development plans that are expected to yield approximately 50,000 new jobs and 30,000 new homes over a 20 – 30 year period. The Channel Tunnel Rail Link is under construction and stage 2, expected to be completed by 2007, will include a new international and domestic station within the Borough at Ebbsfleet. Dartford Borough has two of the four centres of high traffic growth in Kent identified in the Local Transport Plan (The Dartford Crossing and Bluewater shopping centre, as well as major proposed developments).

It is anticipated that travel demand in the area could double, with road traffic on the major and local road network increasing significantly as a result. This has important implications for air quality and therefore while it is the aim of the Borough and County Councils' to ensure sustainable development, it is difficult to envisage any absolute reduction in traffic levels. This requires consideration within the review and assessment process as this will have impacts on the AQMA and other areas previously considered marginal.

3.0 INTRODUCTION

In carrying out their duties under S84 of the Environment Act 1995, a local authority which has declared an AQMA must carry out a further assessment of air quality (Stage 4) within 12 months of designation. Air Quality Action Plans should be drawn up in parallel setting out the measures to work towards achieving the air quality objectives.

The Government has issued guidance (October 2001) as to what the aims and main requirements of the Stage 4 should be and the aims are briefly outlined below:

3.1 Aims

Aims	How they will be addressed
1. Confirm that the original assessment and designation of the AQMA are correct and corroborate any assumptions	Model refinement and further monitoring data (see sections 5.0 and 6.0)
2. Calculate the improvement required to achieve air quality objectives	Improvement calculated for nearest receptors (see section 4.0)
3. Undertake source apportionment to target action plans	Source apportionment assessment undertaken (see section 4.0)
4. Take account of any new national policy developments	Objectives in Regulations 2000 considered and new proposed emissions factors (some remodelling undertaken – see sections 5.0 and 7.0). Due to the timing of release of finalised factors in March 2002 and work already undertaken for Stage 4, old factors are supplemented by modelling of new factors based on proposed factors October 2001. However, the differences are expected to be small.
5. Take account of any local policy developments which may impact on the AQMA	Air Quality Impact Assessments for major developments required and assessed in the light of review and assessment work (see section 3.2)
6. Carry out further monitoring as necessary	Further monitoring undertaken (see section 6.0)
7. Respond to comments from Statutory Consultees on Stage 3	Response to DEFRA (then DETR) Stage 3 appraisal included (see Appendix 2)

3.2 Local policy developments in Dartford

The Local Transport Plan 2001 – 2006 sets out the local transport authority (Kent County Council) proposals to meet the travel demands of the major proposed development within Kent Thameside - One of the major solutions proposed being the Fastrack public transport system. Phase One of Fastrack is due to start construction in 2003/04 and this potentially has an impact on Dartford's AQMA at Junction 1b of the

A282. According to the traffic projections for this first phase, there are no predicted improvements to receptors within the AQMA. Several receptors are predicted as receiving marginally worse air quality due to the road realignment, but mitigation measures will be adopted as necessary.

Improvements to Thames Road in neighbouring Bexley Council will result in an increase in traffic flows along the A206 University Way. This feeds into the A282 at junction 1a and will impact on the AQMA. Model predictions indicate that the AQMA will have to be extended along the A206 should this Scheme be progressed and mitigation measures have been requested by Dartford Borough Council (DBC) to be incorporated into the Scheme. The objections and requests of DBC have not been addressed and therefore it is likely that increases in through traffic along this route will worsen air quality resulting in further declarations in the future and potentially hindering proposed action plan measures.

Major developments in the Borough within the next 5-10 years which may impact on the AQMA include the development (mixed commercial and residential) at North Dartford at the former Joyce Green Hospital site. Traffic from this development would increase traffic flows along the A206 University Way and thus may impact on the AQMA as well as receptors in clos e proximity to this major road. In the light of the above road scheme, this is a likely scenario. The air quality assessment is being considered in the light of the review and assessment process and mitigation measures will be incorporated as necessary. Other major developments at Ebbsfleet and Eastern Quarry will also have impacts on air quality which need to be considered and will require detailed air quality assessments to be submitted and approved.

The Kent Structure Plan is being reviewed, to be completed by 2004, and any proposed changes which will have an impact on the Borough of Dartford will be considered in the light of the review and assessment process and in consultation with the Kent and Medway Air Quality Partnership.

4.0 SOURCE APPORTIONMENT AND REQUIRED IMPROVEMENTS IN AIR QUALITY

Table 2: Local source apportionment

(a) PM10

PM10	%ROADS	%DOMESTIC	%INDUSTRY	%OTHER	TOTAL%
Dartford	51	16	17	16	100
AQMA	78.5	7	9	5.5	100

(b) NOx

NOX	%ROADS	%DOMESTIC	%INDUSTRY	%OTHER	TOTAL%
Dartford	65	11	5	19	100
AQMA	94	3.5	0.5	2	100

Ref. NAEI data (average of 1 x 1 emission grids 1998)

Table 2 above shows the source apportionment of PM_{10} and NO_X locally, according to the national atmospheric emissions inventory (NAEI). Source apportionment confirms that the major contributor to polluting emissions is road traffic. There is scope for reduction in PM_{10} from other sectors other than roads e.g. through enforcement, increased awareness and planning. However, there is little scope for reduction in NO_X within the AQMA other than targeting road traffic emissions.

As mentioned in the Stage 3, fugitive emissions are not considered to be a major contribution to sources in Dartford and are insignificant within the AQMA. However, there are localised sources that have been identified including CTRL and other construction works, quarry processes and industrial processes, which are all regulated. These will be considered in more detail in the next round of Review and Assessment, especially in the Northfleet and Swanscombe areas where there are a number of such sources. It is proposed that PM_{10} monitoring be undertaken at nearby receptors to assess the impact of these emissions.

With regard to industrial sources, further confirmation was provided by the Environment Agency in their 'Air Quality Assessment in Thames Zone of Industry' (2001) that Part A Industrial processes are not predicted to make a significant contribution to NO_2 emissions (a few percent at most to NO_2 annual concentrations in the Thames Region).

Table 3: Fleet breakdown A282: J1A – J1B: AQMA

			AVE SPEED: 105KPH LDV; 95KMH HGV	
	Fraction	No.vehicles	Proportion NO_X	Proportion PM
Total	1.00	140000	100.00	100.00
LDV	0.86	120400	43.47	53.54
Petrol	0.81	97524	40.21	46.58
Diesel	0.19	22876	3.26	6.96
P1983	0.10	10142	16.17	2.31
P1991	0.23	22333	9.84	16.75
P1996	0.29	28087	3.59	4.65
P2000	0.38	37059	10.62	22.87
D1983	0.02	503	0.03	0.08
D1991	0.17	3980	0.88	1.71
D1996	0.32	7229	0.38	1.14
D2000	0.49	11163	1.97	4.02
HGV	0.14	19600	56.53	46.46
1996	0.18	3528	17.37	15.93
Stage1	0.10	1960	5.37	7.14
Stage2	0.72	14112	33.79	23.38

Emissions factors (based on 1998 data) from AAQuIRE 2000 model database.

Table 3 shows that HGV's account for 56.5% NO_X and 46.5 % PM emissions on the A282 even though they are only 14% of the total vehicles. Targeting HGV's for traffic reduction (e.g. rail freight) or clean up will therefore have the greatest effect on emissions.

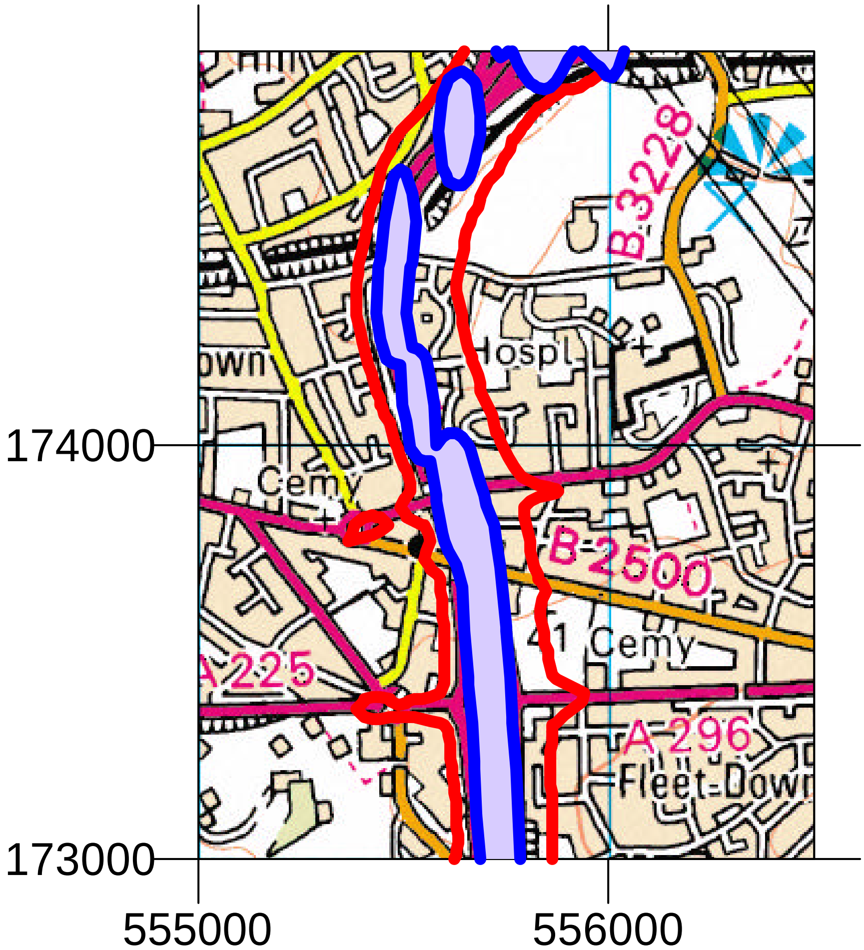
4.1 Required reduction in PM_{10} and NO_2 using AAQuIRE 2000 Model runs

Local contribution (j1a and j1b A282):

The local contribution to the emissions in the AQMA has been modelled to determine the influence of through traffic along the A282 on Dartford residents. Traffic flows to and from junction 1a and 1b of the A282 were used in addition to other local sources. This was considered to be a reasonable approach, if not precautionary, as traffic to neighbouring Boroughs Bexley and Gravesham also use these junctions.

The model results show that PM_{10} levels do not exceed the standard at any receptors.

NO_2 annual levels exceed the Objective by up to 9.5% (i.e. 23 ppb) at a small number of receptors (55, of which 44 are within two blocks of flats) in close proximity (8 – 20m) to the A282.



Local (blue) and total (red) contributions to predicted exceedences of the NO_2 annual standard 2005 - 21ppb contours shown

Map scale: 1:50000

Through traffic contribution:

The model results which included all sources i.e. through traffic on the A282, show that PM_{10} 24 hour mean objective (2004) is exceeded by up to 50% (75 $\mu g/m^3$) at the nearest receptor point to the A282 (NB annual mean reduction of 54% required - see below).

The NO_2 annual objective (2005) is exceeded by up to 62% (34ppb) at the nearest receptor to the A282.

The Air Quality Management Area (AQMA), as shown on the map above, incorporates both the NO_2 and PM_{10} exceedences. 668 receptors fall within this area, half of which are within 22 blocks of flats.

Table 4: Breakdown of NO_2 annual emission sources in the AQMA from modelling

SOURCE	RANGE (%)	AVERAGE (%)
Through traffic	13 - 33	25
Local traffic	42 - 56	50
Background:	18 - 35	25
*Domestic**		3.5
*Industry**		0.5
Other sources		21

* Percentages from Table 2 have been used for these contributions.

Table 4 shows the % of NO_2 annual mean emissions which can be attributed to each source, based on the modelled results for 'local' and 'all' sources, as well as estimated background levels (30µg/m3 NO_X). Other sources will include sources outside the area as well as possibly unaccounted sources e.g. traffic emissions underestimated in the modelling (This will be considered in the validation with monitored data) or fugitive emissions. It shows that potentially 46% of emissions are from sources outside the area and outside the control of the local authority. The Highways Agency is responsible for the A282 trunk road and therefore can influence the 'through' traffic proportion.

Local sources of NO_2 from traffic, domestic and industrial sources make up 54% of the total emissions. Of the local traffic sources, 50% of emissions, the responsibility will lie with the local authority and Kent County Council, for the local road network, as well as the Highways Agency for the A282 trunk road.

Calculation: minimum reduction in NO_2 annual concentration required at the nearest receptor (555484, 174388)

Local contribution:

- 23ppb to 21ppb = 2ppb
- Breakdown of NO_2 sources: traffic 11.25ppb (from modelling)
  background 11.75ppb*
- Maximum permitted from traffic: (21 – 11.75) = 9.25 ppb i.e. a reduction of 2ppb (9.5%) required

.
All sources:

- 34ppb to 21ppb= 13ppb
- Breakdown of NO_2 sources: traffic 22.25ppb (from modelling)
  background 11.75ppb*
- Maximum permitted from traffic: (21 – 11.75) = 9.25 ppb i.e. a reduction of 13ppb (62%) required

* background figure NOx of 30ppb for 2005 agreed on advice from LAQM help line; NOX:NO_2 of 2.55:1 for 5-10m from kerbside.

The NOx reduction required for the 2ppb 'local' and 13ppb 'all ' sources modelled, as shown above, would be as follows:

Table 5: NO_X reduction from traffic

	NO_2 LOCAL	NO_X LOCAL	NO_2 ALL	NO_X ALL
Modelled total	11.25ppb	29ppb	22.25ppb	57ppb
Need to reduce to	9.25ppb	24ppb	9.25ppb	24ppb
Difference	2ppb	5ppb	13ppb	33ppb

Table 5 shows the significance of through traffic on the nearest receptors to the A282. The reduction required in NO_X is approximately 7 times greater and the implications with regard to the actions required to achieve the objectives are far more significant.

Calculation: minimum reduction in PM_{10} required at the nearest receptor (555484, 174388)

As already mentioned PM_{10} levels do not exceed the Objectives when local sources are modelled. The exceedences which occur when all sources are modelled can therefore be attributed to the through traffic portion.

All sources:

24 hour objective (90th percentile)

- $75\mu g/m^3$ to $50\mu g/m^3$= $25\mu g/m^3$

annual mean

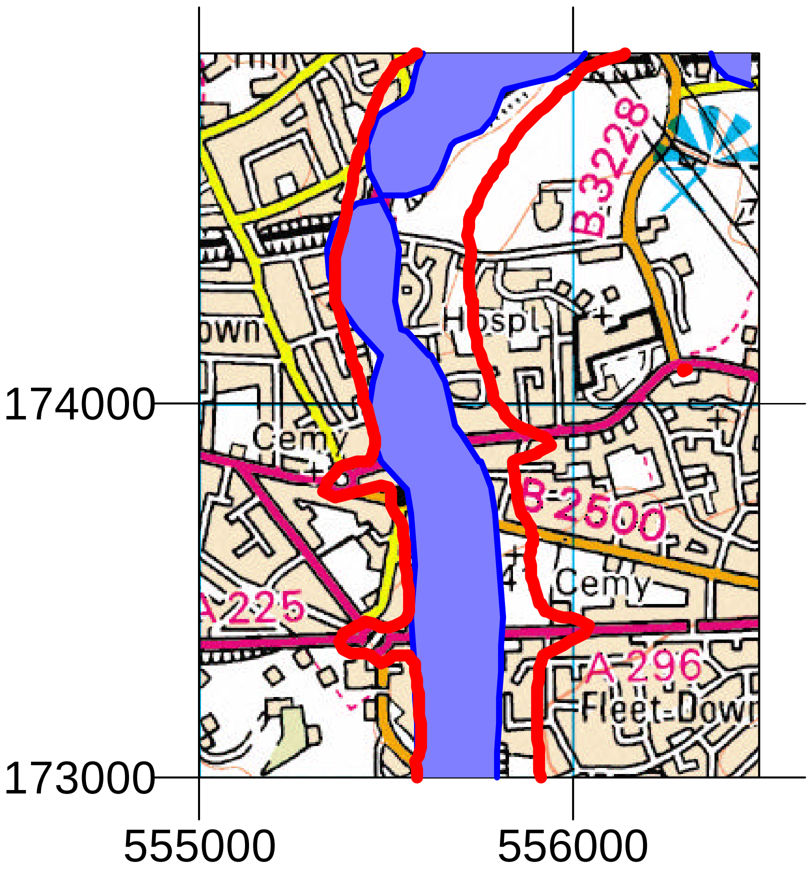
- $43\mu g/m^3$ to $28\mu g/m^3$= $15\mu g/m^3$

Using surrogate statistic (LAQM.TG4(00)) as >$28\mu g/m^3$= possible exceedence of 24 hour objective

- Breakdown of PM_{10} sources: traffic $18\mu g/m^3$ (from modelling); background $25ug/m^3$

Maximum permitted from traffic: (28 – 25) = $3\mu g/m^3$ i.e. a reduction of $15\mu g/m^3$ (54%) required

NB Modelling for source apportionment has been based on the 1998 emissions factors. Remodelled predictions using the new proposed emissions factors reduce the required reduction at the nearest receptor for PM_{10}. For NO_2, however, the reduction required will be greater than previously predicted.



Local (blue) and total (red) contributions to exceedences of the NO_2 annual objective 2005 - 21ppb contours shown – New emissions factors

Map scale: 1: 50000

TABLE 6: Predicted concentrations at receptors

AQMA Nearest receptors								
Street	E/W	Distance to A282 (m)	X	Y	2005 NO2 (ppb)	% above standard	2004 PM10 (ug/m3)	% above standard
Osbourne Road	E	8	555484	174388	34	62	75	50
Osbourne Road	E	16	555510	174256	30	43	68	36
Queens Gardens	E	13	555764	173185	29	38	66	32
Watling Street	E	11	555730	173606	29	38	65	30
Bow Arrow Lane	E	28	555505	174424	28	33	63	26
Brent Way	E	26	555663	173930	28	33	63	26
Osbourne Road	E	23	555524	174219	28	33	66	32
Osbourne Road	E	30	555512	174301	28	33	62	24
Osbourne Road	E	30	555510	174336	28	33	61	22
Queens Gardens	E	26	555784	173085	28	33	62	24
The Brent	E	25	555671	173904	28	33	67	34
Brent Close	E	23	555566	174149	27	29	64	28
Brent Way	E	27	555614	174026	27	29	62	24
Fairway Drive	E	28	555721	173787	27	29	62	24
Queens Gardens	E	20	555777	173109	27	29	61	22
Queens Gardens	E	21	555769	173208	27	29	62	24
The Brent	W	8	555591	173884	27	29	63	26
Watling Street	E	20	555737	173659	27	29	65	30
Atlee Drive	W	23	555573	174768	26	24	57	14
Bow Arrow Lane	W	8	555431	174423	26	24	62	24
Elliot Road	W	19	555668	174875	26	24	61	22
Finchley Close	W	13	555480	174120	26	24	60	20
The Brent	W	22	555597	173841	26	24	59	18
Watling Street	W	22	555619	173733	26	24	58	16
Wayville Road	W	26	555643	173561	26	24	58	16
Bow Arrow Lane	E	48	555523	174419	25	19	55	10
Brentfield Road	W	20	555495	174075	25	19	58	16
Carlisle Road	W	21	555444	174195	25	19	58	16
Masefield Road	W	32	555643	174863	25	19	55	10
Watling Street	W	30	555625	173684	25	19	58	16
Watling Street	E	24	555738	173704	25	19	64	28
Brent Close	E	50	555634	174031	24	14	55	10
Brentfield Road	W	26	555542	173940	24	14	57	14
Churchill Close	W	20	555657	173215	24	14	57	14
Kipling Road	W	27 (slip)	555677	174913	24	14	53	6
Oakwood Close	W	16	555621	173394	24	14	57	14
Sundridge Close	W	22	555414	174370	24	14	57	14
Bridges Drive	W	23 (slip)	555695	174972	23	10	52	4
Kipling Road	W	33 (slip)	555677	174939	23	10	52	4
Princes Road	E	87	555867	173348	22	5	51	2
Ruskin Grove	W	35	555420	174508	22	5	55	10

Table 6 shows the extent of predicted (AAQuIRE) exceedences of NO_2 annual objective and PM_{10} 24 hour objective at nearby receptors to the A282 within the AQMA.

5.0 FURTHER MODELLING

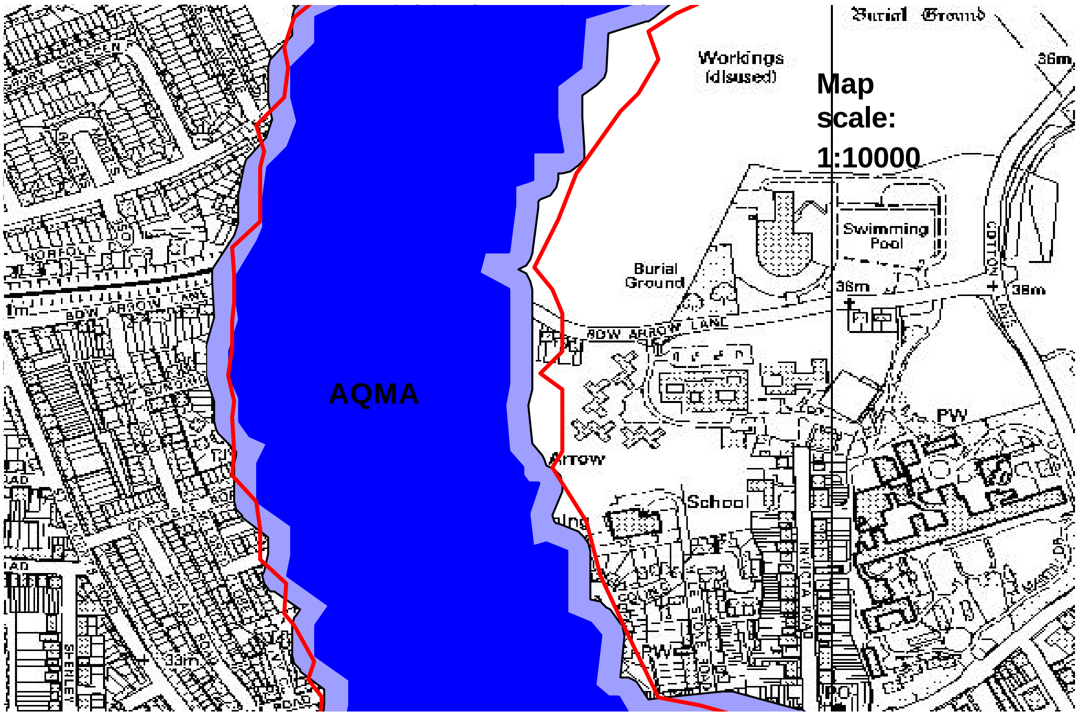
5.1 Model refinement

Since the Stage 3 review, the data input into the AAQuIRE 2000 regional air quality model within the AQMA has been refined to provide greater accuracy in its modelled predictions. Receptor grid areas have been modelled at a finer scale of 30m; traffic data has been updated to 2001 using Kent County Council, Highways Agency and Dartford River Crossing traffic count and vehicle composition data; predicted background levels have been revised (slightly increased) in agreement with LAQM helpline and validation studies (30ppb NOx; 25ug/m^3 PM_{10}); and road characteristics, including mixing widths have been reassessed. The model runs for 2004/5 use mid – high traffic flow projections of 3% per annum, which have been supplied by Kent County Council. Where updated projections have been provided in relation to new developments/road improvements, these have been incorporated.

An area yet to be assessed in detail is the changes in speed diurnally along the A282 and the north and southbound profiles. This is being investigated further by the Highways Agency with regard to investigating the potential for improvement in traffic management (see section 7.0). The differences between the two carriageways in terms of concentration levels at nearest receptors, established through further monitoring, highlighted this issue (see section 6.0).

The meteorological data used remains 1993 data from the Gatwick site based on an average year, following analysis of 10 historical data sets including wind roses and was agreed as being a 'reasonable' approach by the LAQM helpline.

The AQMA and other areas previously considered to marginally meet air quality objectives have been remodelled and the results confirm the Stage 3 predictions and declaration. However, the introduction of new emissions factors have resulted in predicted increase in the AQMA area of exceedence for NO_2 annual objective, as well as an area where previously the objective would have been met (Junction of A226 and A225 at Greenhithe) – see modelled results below. As part of the proposed AQMA consultation in April 2001 and ongoing draft action plan consultation April 2002, receptors within the declared AQMA and 25m outside this area were individually contacted and invited to take an active role in drawing up plans for the area. As the number of receptors has increased with the new emissions factors, further consultation will be required to reach a small number of receptors which fall outside the AQMA and buffer zone (e.g. the area between the outer (red) boundary and buffer zone (lighter blue) in the map shown below).

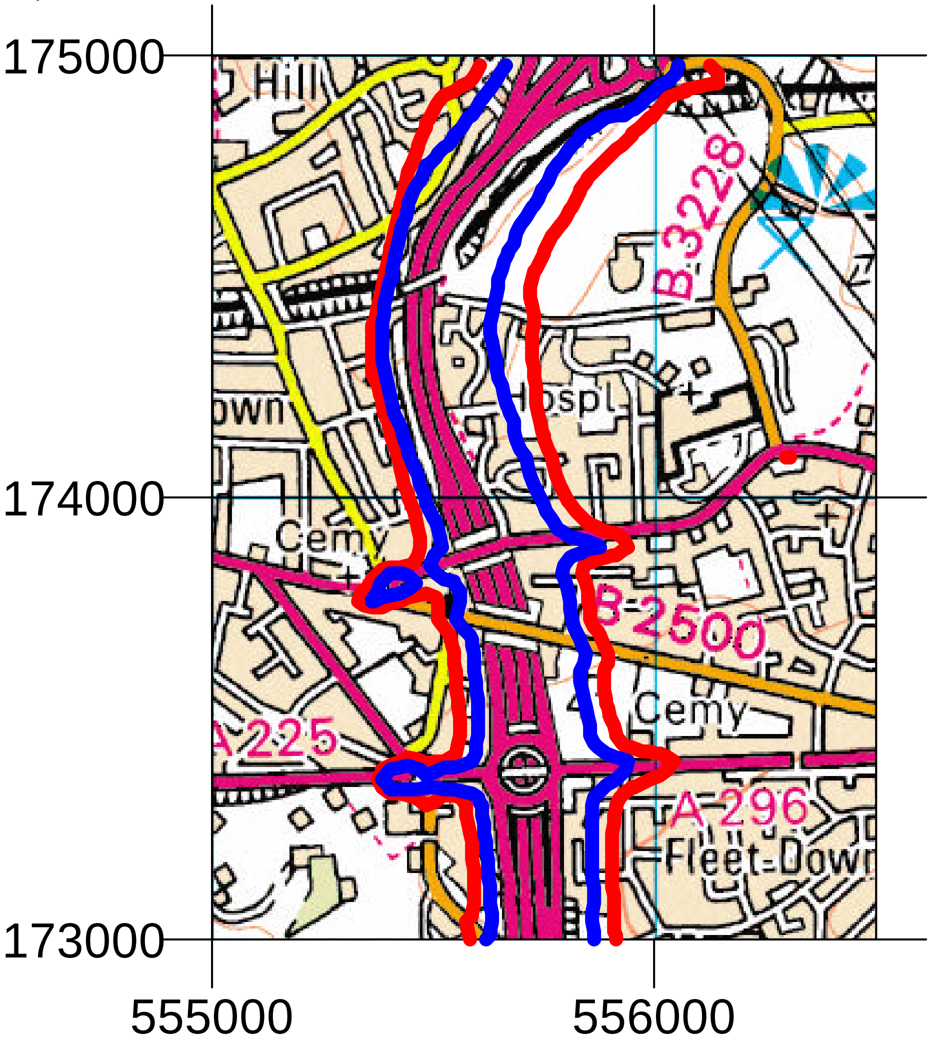


As referred to in Section 3.2, road improvements outside the Borough as well as major developments in the North Dartford area are also likely to lead to areas of exceedence should care not be taken to ensure appropriate mitigation measures are in place to protect nearby receptors.

Exceedences NO_2 Annual (ppb) 2005 Objective – Old (blue) v new (red) Emissions Factors – 21ppb contours shown

Ave Increase (%)	**26.401427**
Min	**8.591044047**
Max	**59.78721389**

Above values are calculated from all 30m receptor grid points within the AQMA.
Map scale: 1:50000

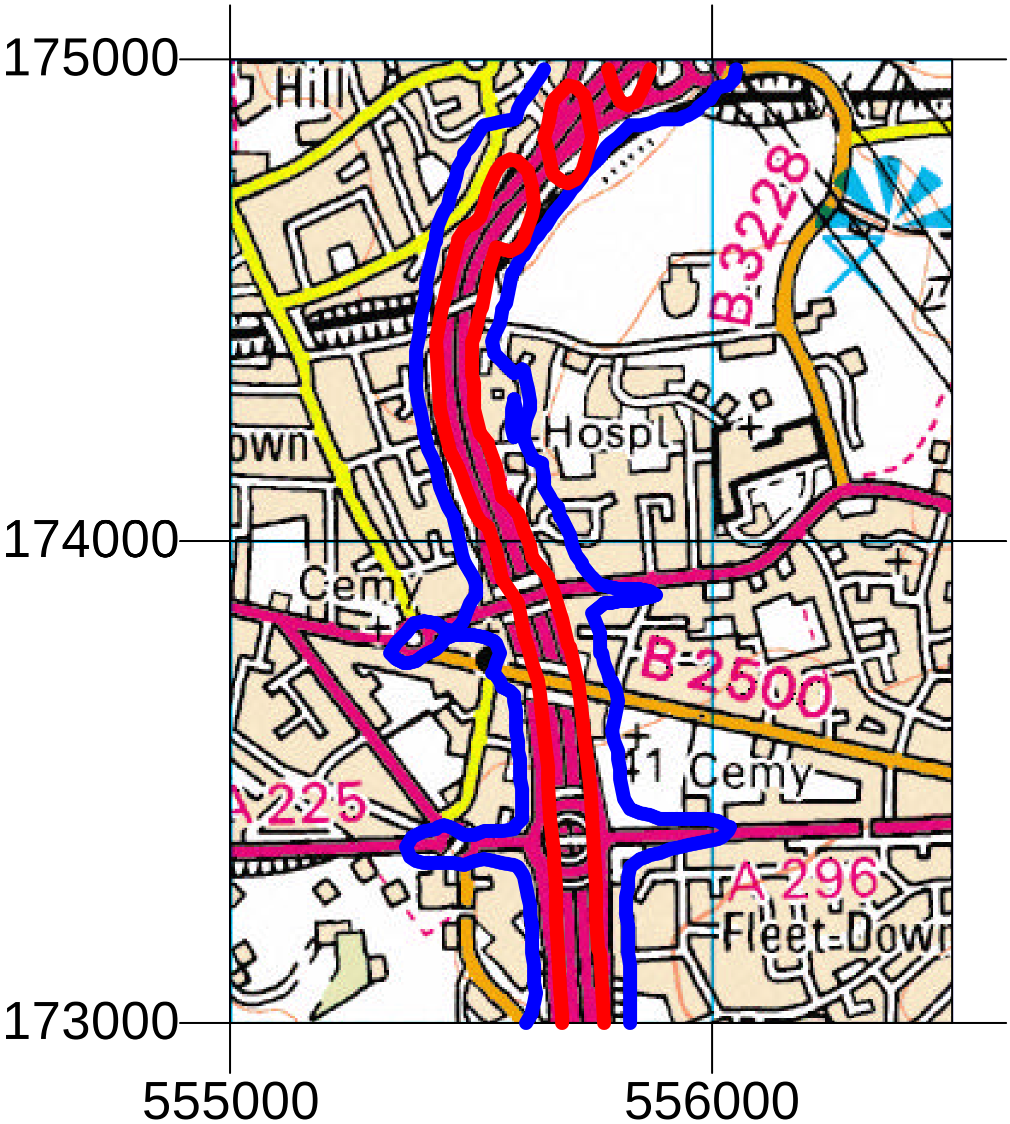


The increase in predicted concentrations at receptors in close proximity to the A282, with the new emissions factors, is shown in table 10.

Exceedences of the PM_{10} 24 Hour ($\mu g/m^3$) 2004 Objectives – Old (blue) v New (red) Emissions Factors - 50$\mu g/m^3$ contours shown

Ave (%)	**0.647501162**
Min	**-12.62421467**
Max	**61.95493047**

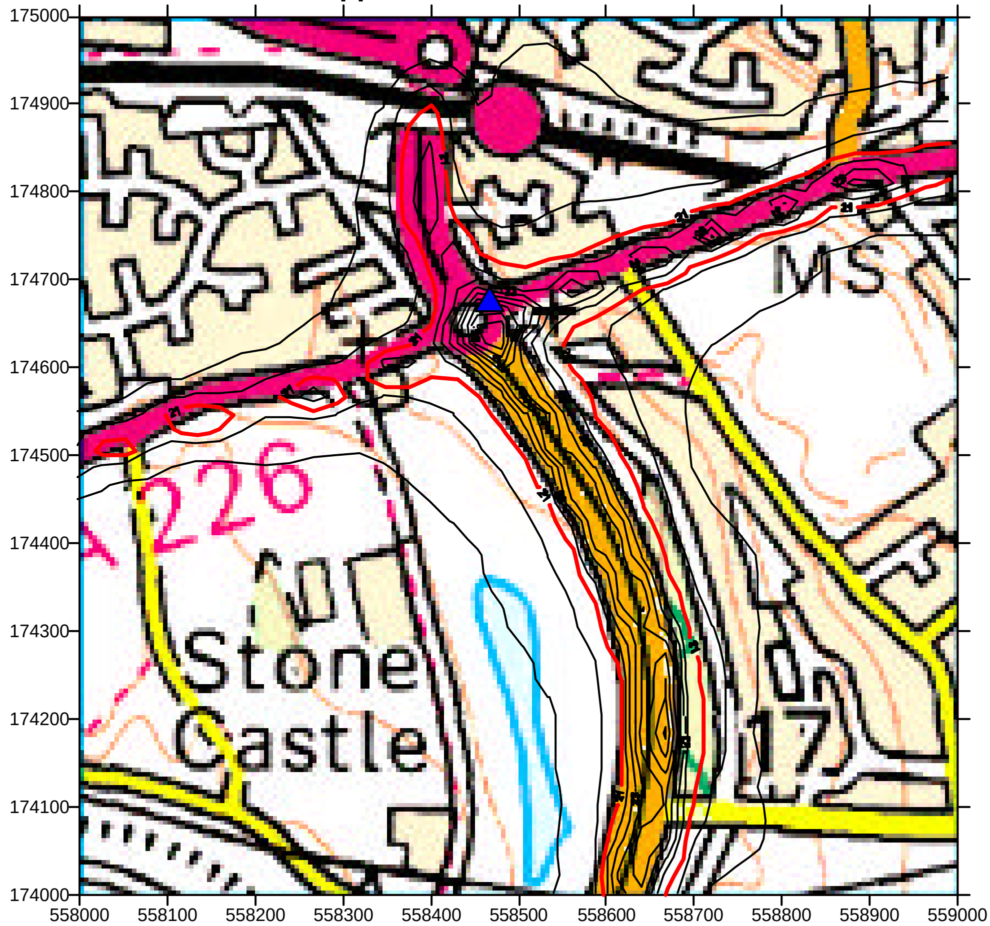
Above values are calculated from all 30m receptor grid points within the AQMA.
Map scale: 1:50000



A226/B225 Junction, Greenhithe: Exceedences of NO2 Annual objective (21ppb) 2005 – New emissions factors

Map scale: 1:50000

21ppb contour shown in red



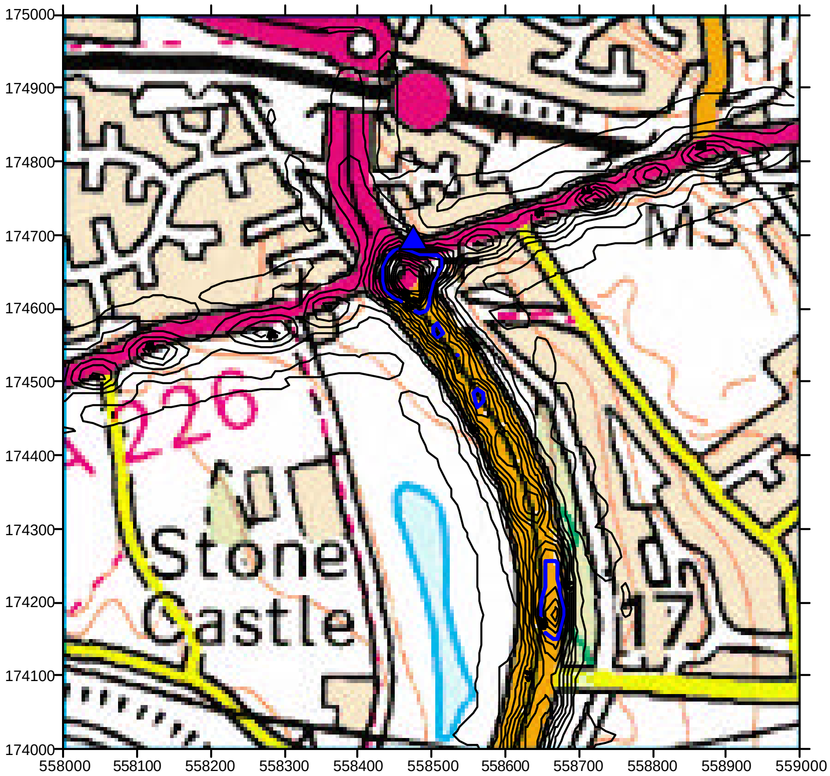
Monitoring station D3

At the nearest receptor, the predicted annual NO_2 for 2005 is 22.5ppb.
This junction is considered as an important node in delivering sustainable transport solutions within the area in the light of the predicted increase in traffic demand from new development (25-30% in the next 10-12 years). The Everards Link/Greenhithe Triangle is a key project identified in the proposed Borough Transport Strategy, of which this node is a key consideration. Kent County Council consultants (KCC) are currently investigating engineering alternatives to this Scheme to address the projected constraints on the existing network. The Council will continue to work with KCC and Kent Thameside stakeholders to ensure that the chosen alternative is a sustainable transport solution and will take into account the impact on air quality at nearby receptors. Air quality considerations need to be part of the design process to ensure appropriate mitigation of traffic emissions.

A226/B225 Junction, Greenhithe: Exceedences of the PM_{10} 24 Hour (50µg/m^3 90^{th} percentile) 2004 – New Emissions factors

Map scale: 1:50000

50µg/m^3 contour shown in blue



There is an automatic monitoring station D3 on the roadside of this busy roundabout, monitoring PM_{10} and NO_2. The results will be considered further in the next section, but further validation of the model was carried out to confirm that exceedences of the 24 hour objective were not occurring at the nearest receptor 20m from the kerbside (DETR Appraisal Stage 3 referred to this – see Appendix 2). Use of the new emission factors in the model resulted in a reduction in predicted PM_{10} concentrations at the nearest receptor.

Table 7: D3 24 hour 90^{th} percentile PM_{10} validation

Site	Year	Monitored 24 hour 90^{th} percentile PM_{10}	Modelled 24 hour 90^{th} percentile PM_{10}	%Difference
D3 Monitoring station (558464,174672)	1999	74.6 µg/m^3	65.5µg/m^3	-12%
D3 Monitoring station (558464,174672)	2004		56µg/m^3	
Nearest receptor, Ivy villas	2004		48.6µg/m^3	

6.0 FURTHER MONITORING

The monitoring network has been increased within the AQMA to provide more detailed information to support the modelled predictions of pollutant concentrations and monitor the performance of the action plan measures. The existing network in Dartford included three continuous air quality monitoring stations (with NO_2 and PM_{10} analysers) which were used to validate the air quality model and 15 NO_2 diffusion tube sites to supplement these. This has been extended in 2001 to incorporate two portable PM_{10} analysers, one portable NO_2 analyser and eight new NO_2 diffusion tube sites within the AQMA.

6.1 Air quality monitoring stations

There have been three continuous air quality monitoring stations operating at roadside locations, as shown below, since 1999.

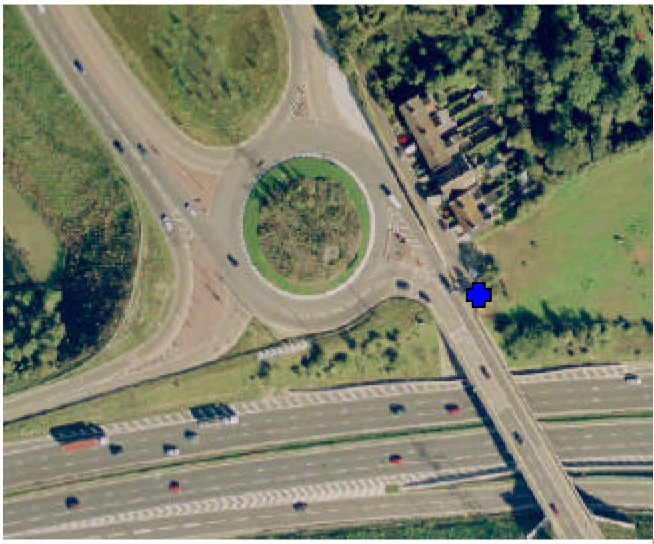
Table 8: Continuous monitoring stations in Dartford

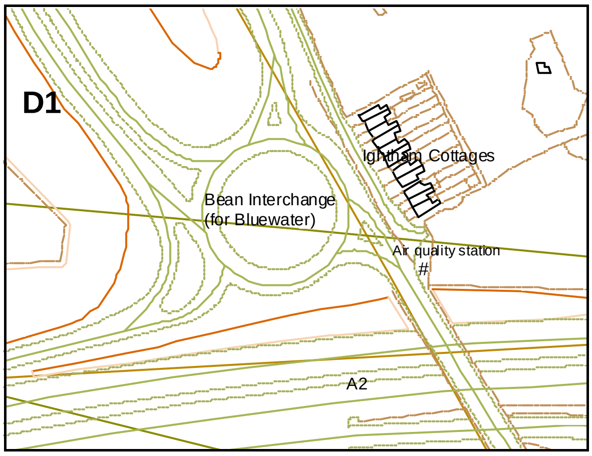
Site	Address	Grid Ref	NO_x Analyser	PM_{10} Analyser
D1	Adjacent to Ightham Cottages, Bean Road, Bean.	558622,172752	API M200A	BAM 1020
D2	Corner of Lowfield Street and Instone Road, Dartford	554117,173852	API M200A	BAM 1020
D3	Outside 1 Ivy Villas, Station Road, Greenhithe	558460,174671	API M200A	BAM 1020

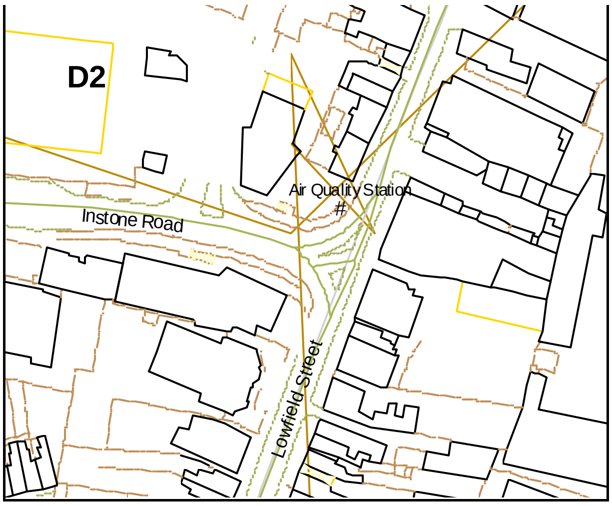
The locations of the stations are shown in the map inserts below.

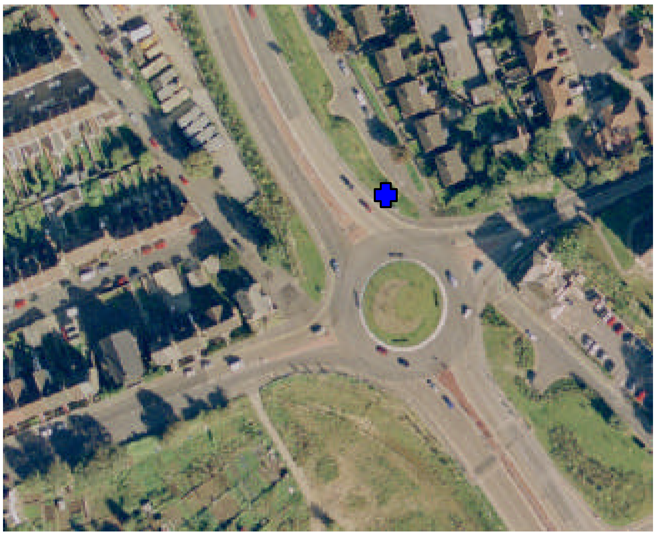
To ensure a high standard of performance of the continuous analysers is maintained, the three sites undergo an independent 6 monthly audit by AEA Technology to assess their performance. The audit results for 2000 and 2001 confirm that the analysers are responding well and are in line with the standards maintained for the national AUN monitoring network.

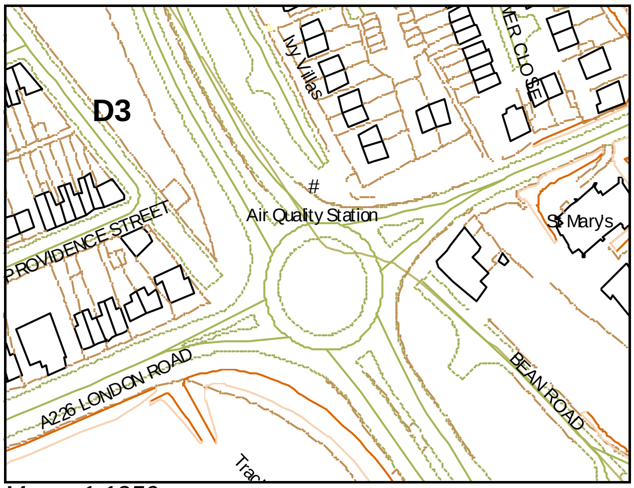
EnviroTechnology carry out routine six monthly servicing of the stations and any necessary emergency call-outs to ensure a data capture rate of 90% as specified in TG1(00). Two weekly site calibrations are carried out in-house and data is checked daily to keep data loss to a minimum (Kings College ERG download and ratify the data from the D3 site which is affiliated to the Kent Air Quality Monitoring Network). Table 9 below shows that since installation only one of the analysers has fallen below 90% data capture and that was the D2 BAM in 2001 which achieved an 85% capture rate.




D1
Ightham Cottages
Bean Interchange
(for Bluewater)
Air quality station
#
A2


D2
Air Quality Station
#
Instone Road
Lowfield Street




D3
Ivy Villas
#
Air Quality Station
PROVIDENCE STREET
St Marys
A226 LONDON ROAD
BEAN ROAD

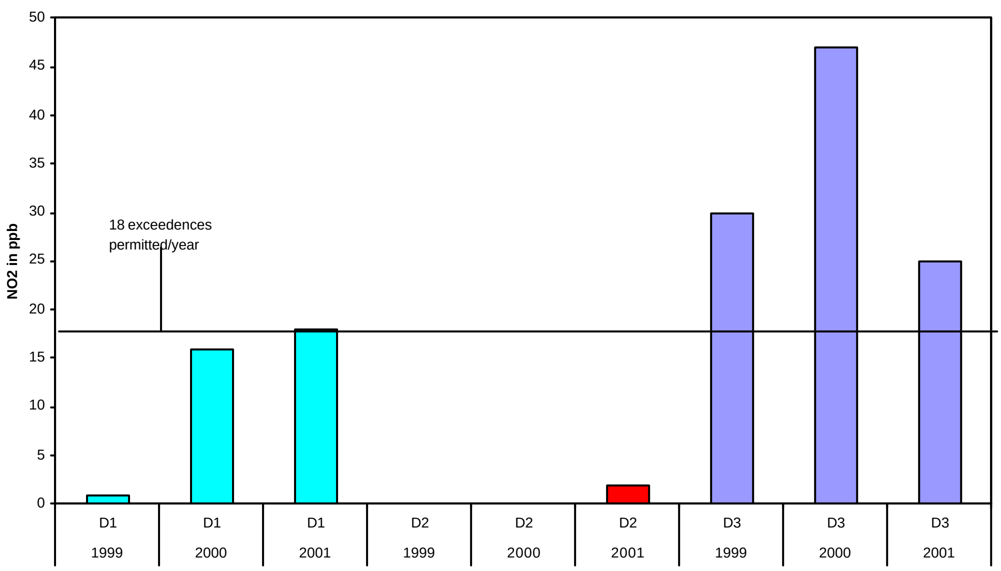
Maps: 1:1250

Table 9: Statistics for 1999 – 2001

Year	Site	Pollutant	annual mean	24 hour No. exceedences	1 hour No. exceedences	% data capture	Period
1999	D1	PM_{10} in µg/m3	32	22		99	6 months
2000	D1	PM_{10} in µg/m3	30	**50**		99.9	
2001	D1	PM_{10} in µg/m3	31	**43**		97.7	
1999	D2	PM_{10} in µg/m3	35	27		97	6 months
2000	D2	PM_{10} in µg/m3	38	**41**		99.5	
2001	D2	PM_{10} in µg/m3	39	**70**		85.2	
1999	D3	PM_{10} in µg/m3	**41**	36		99	6 months
2000	D3	PM_{10} in µg/m3	**61**	**211**		95	
2001	D3	PM_{10} in µg/m3	**50**	**129**		96	
1999	D1	NO_2 in ppb	**25**		1	97	6 months
2000	D1	NO_2 in ppb	**29**		16	97	
2001	D1	NO_2 in ppb	**31**		18	91	
1999	D2	NO_2 in ppb	**27**		0	99.9	6 months
2000	D2	NO_2 in ppb	19		0	92	
2001	D2	NO_2 in ppb	**25**		2	94	
1999	D3	NO_2 in ppb	**35**		**30**	99.9	6 months
2000	D3	NO_2 in ppb	**34**		**47**	98.3	
2001	D3	NO_2 in ppb	**32**		**25**	99	

The results shown in table 9 above are illustrated in the charts below.

Exceedences of one hour NO_2 (105ppb)

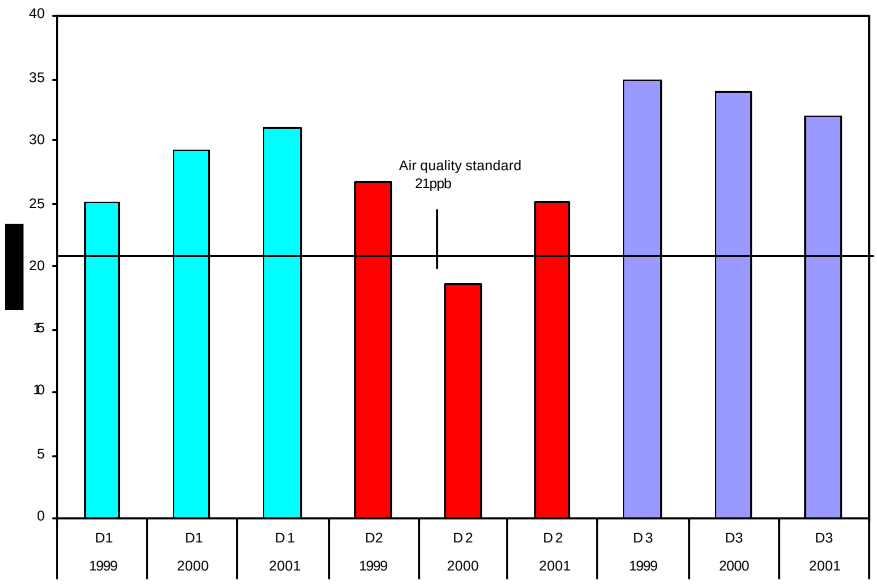


The NO_2 hourly standard is met at two of the three roadside sites. However, the D1 site, near the A2 at Bluewater, is showing an increase in NO2 exceedences since 1999, while D3 at the busy A226/B255 junction in Greenhithe has shown a reduction in 2001 on previous levels.

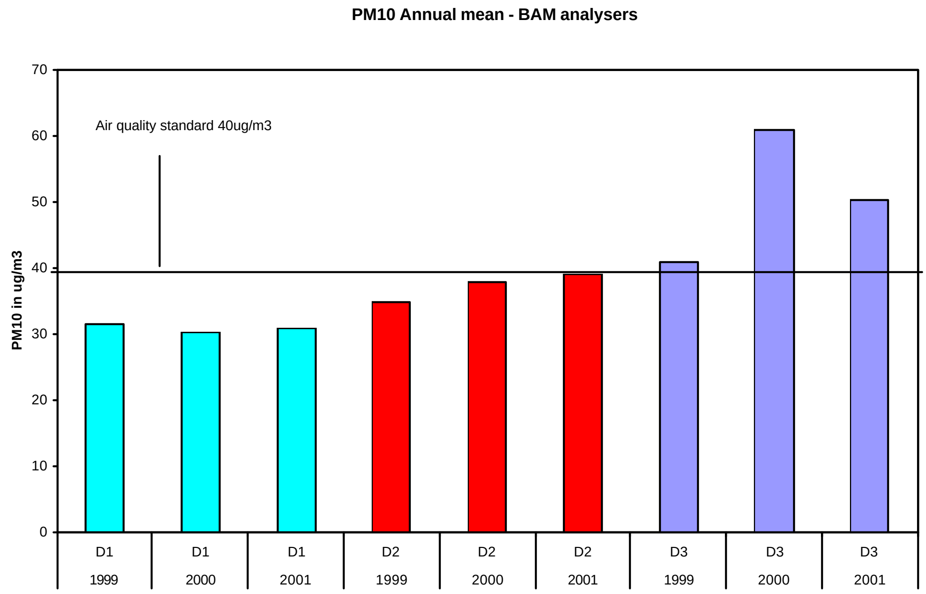
NO2 exceedences of the hourly mean in 2001		
9 sites	periods	days
Belfast Centre	2	1
Billingham	1	1
Bristol Old market	6	2
Bury Roadside	5	1
Glasgow Kerbside	16	2
London A3 Roadside	121	15
Manchester Town Hall	1	1
Salford Eccles	3	1
Stockport	1	1

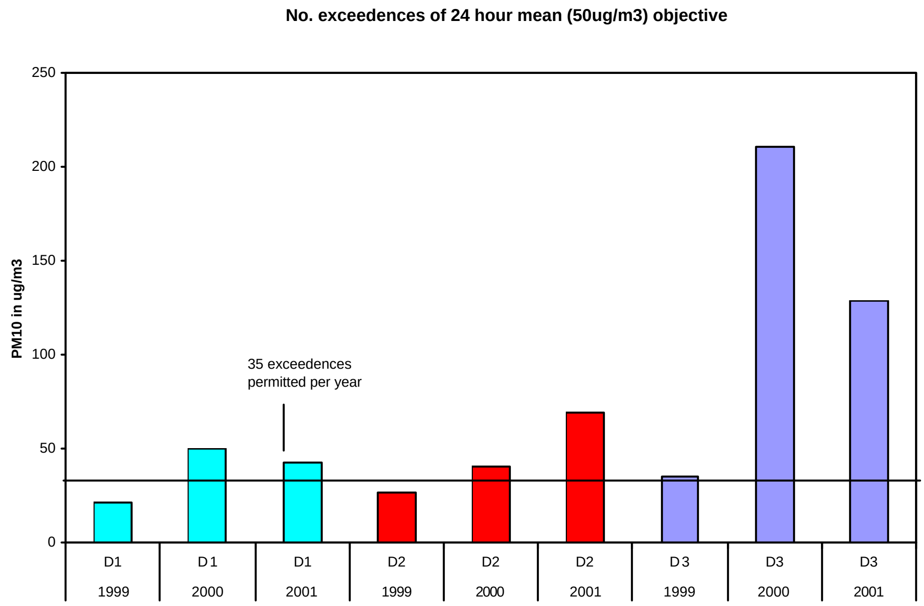
Comparison with sites in the National monitoring network show that the D3 NO_2 hourly data for 2001 is comparable with the busiest roadside sites in the UK; being exceeded by the London A3 site.

NO2 annual mean for Dartford's Continuous Analysers



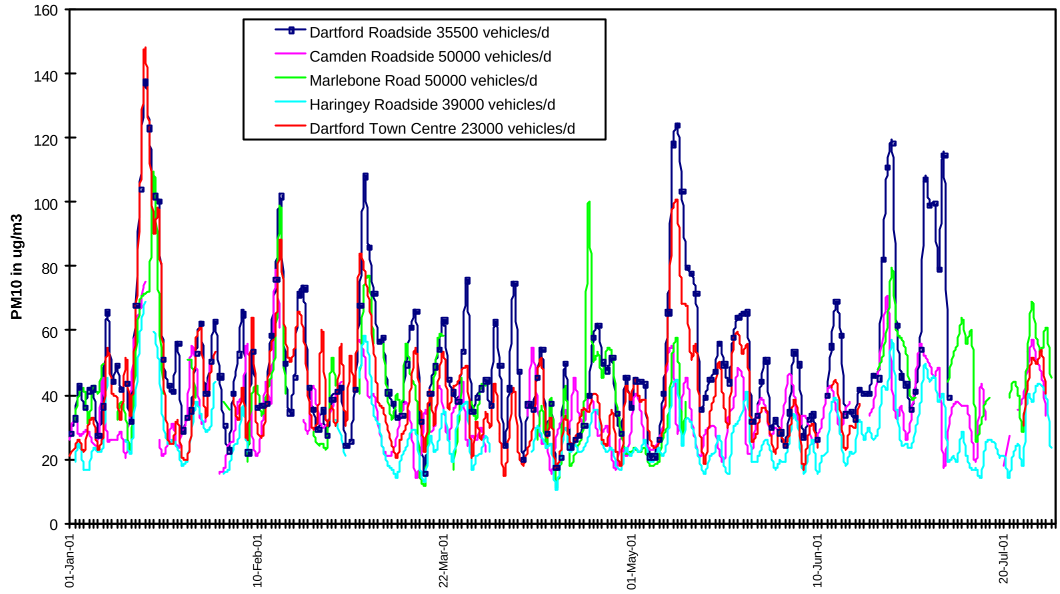
The NO_2 annual mean at the D1 site is showing an increase rather than a reduction with time. This trend is mirrored at neighbouring Borough Gravesham's roadside A2 site and will need to be considered in the assessment of air quality for planned development along the A2 at Ebbsfleet as well as receptors previously considered marginal. The D3 annual mean is the highest of all the monitoring sites within Kent and in 2001 was comparable to busy London roadside sites e.g. Camden Roadside.



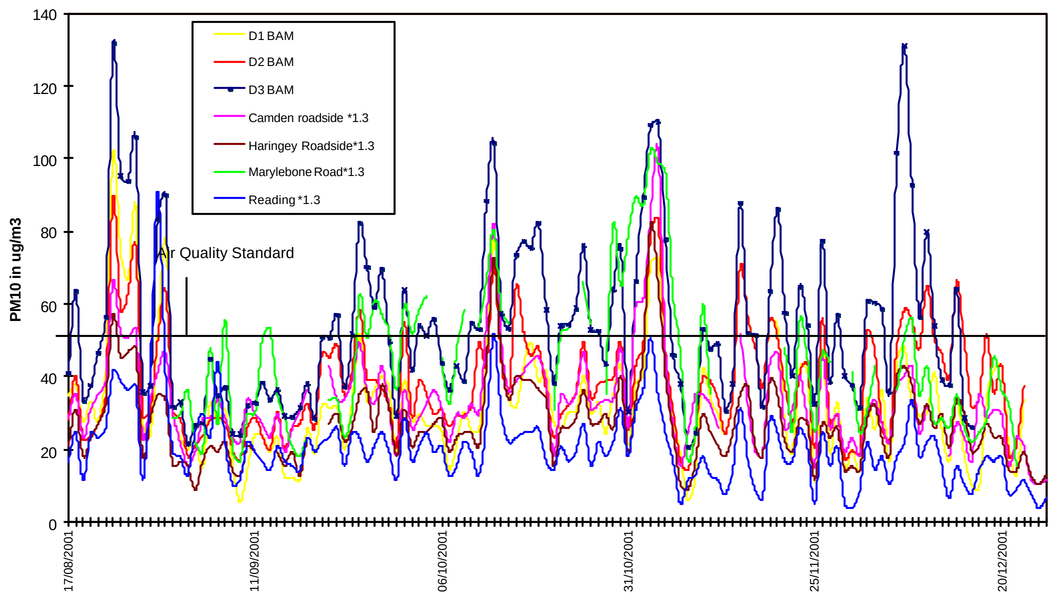


The BAM data show that the annual mean standard is exceeded at D3 and there are more than 35 exceeedences of the 24 hour standard at all three sites. Both the annual and 24 hour mean levels are the highest recorded within the Kent monitoring network, but the difference between the Dartford sites is much greater than for NO_2 (with the exception of Gravesham who also use BAM analysers). The results from the BAM's at these roadside sites show deviation from TEOM results at other roadside sites during peak episodes. This is illustrated with the comparative data below for 2001.

24 Hour MeanPM_{10} (Dartford BAM's v TEOM X 1.3)



24 Hour MeanPM_{10} (Dartford BAM's v TEOM X 1.3)in 2001



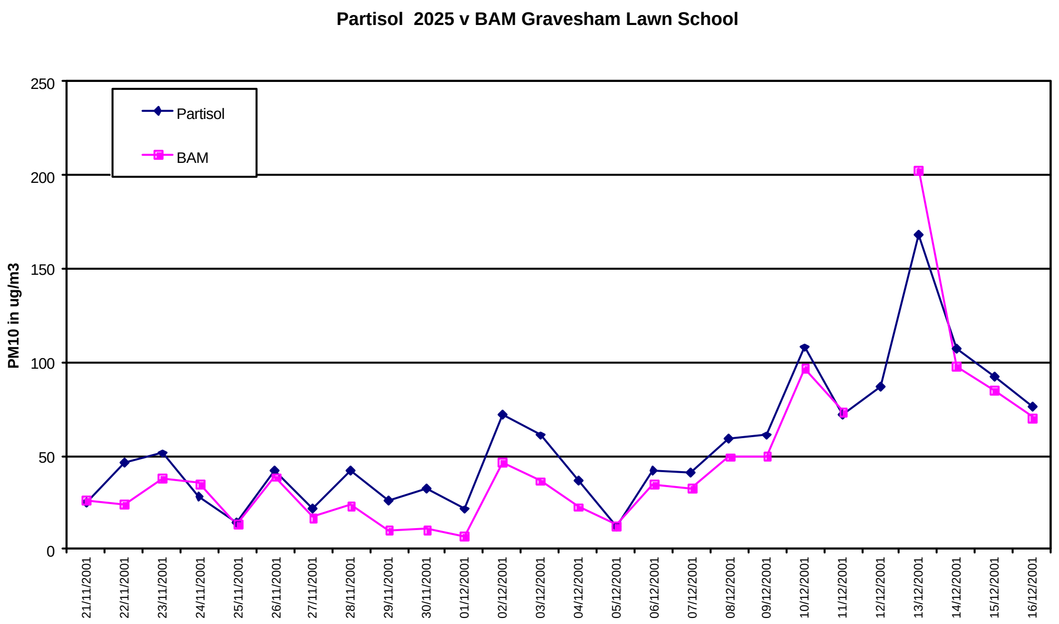
The BAM analyser results should be comparable with gravimetric reference method, while the TEOM require a correction factor, agreed as 1.3. However, the data from the BAM roadside sites show that they do not correspond very well and overestimate the concentration of fine particles. The 24 hour standard 90th percentile is greater at D3 than at the busy Marylebone Road site and at D2 the levels are much higher than expected from the traffic flows which are far below other roadside sites e.g. Camden Roadside and Haringey.

A comparative study by Dave Green, Kings College ERG (1999), considered the relationship between the TEOM, BAM and gravimetric analyser and found that the differences were complex and no one factor could be applied to the BAM. However, an equation of TEOM:0.7BAM and TEOM: 0.6 + 6.07 was found at the Marylebone Road Site. The response was found to be dependant on the type of pollution episode e.g. was pronounced when there was a high proportion of secondary PM_{10}, and varying relative humidity.

A compilation of monitoring data carried out by AQC (October 2001) on behalf of DEFRA also note that the BAM's in the study have a tendency to overead.

A comparative study in 2001 using a BAM co-located with a Partisol 2025 gravimetric analyser at an industrial background site in Gravesham has shown good correlation – as shown below. It is therefore possible that more meaningful and comparable data could be achieved from the BAM it was located away from the busy kerbside where it is susceptible to overestimation during peak pollution episodes.

Use of the BAM analysers to validate the AAQuIRE air quality model have shown that the model underestimates the PM_{10} concentrations and indicates that the background level incorporated should be higher than has previously been used. However, background data from sites at neighbouring Boroughs Thurrock and Gravesham suggest the figure should actually be lower. It is therefore recommended that monitoring of PM_{10} at an urban background location in Dartford be carried out to provide better information and support for the use of a lower background concentration.

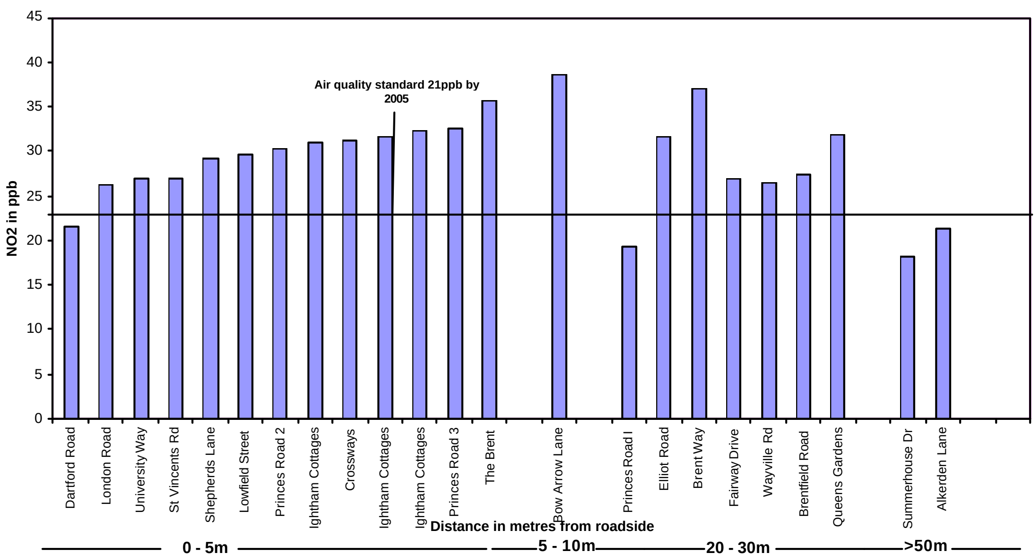


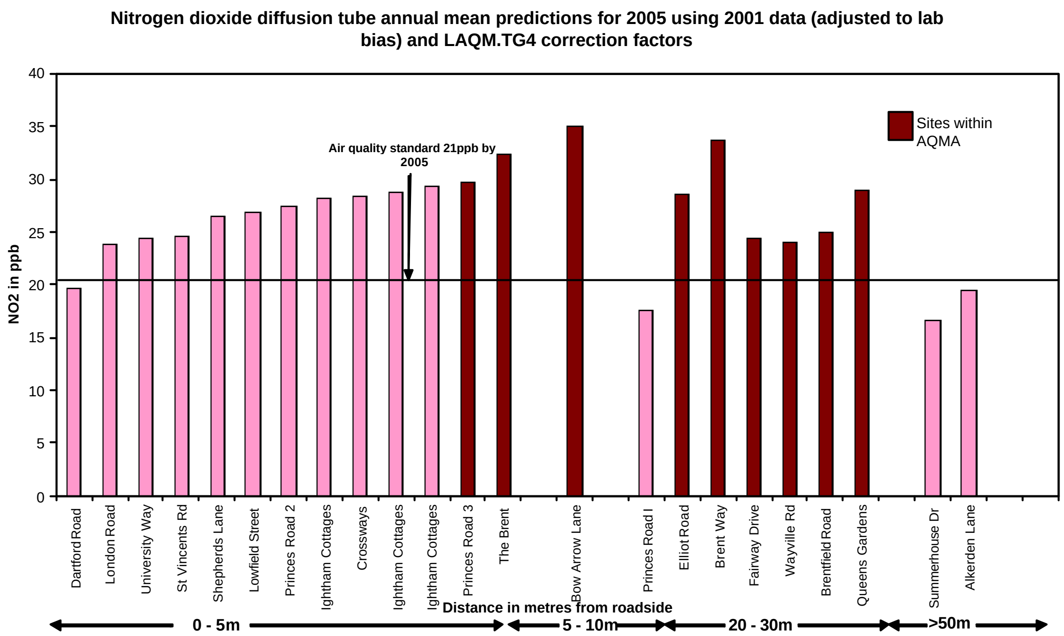
6.2 NO2 Diffusion tube sites

The NO_2 Diffusion sites were rationalised in February 2001 and new sites were incorporated within the AQMA. Triplicates were co-located at the D1 Monitoring station to assess accuracy of the tubes. The results showed an average standard deviation of 3.09 between the triplicate tubes and annual averages of 31.08 – 32.3 ppb (adjusted to lab bias) compared with an annual mean of 31ppb from the automatic analyser. The results therefore correspond very well for long term (annual) trends.

The analysis is carried out by GRADKO International Ltd who takes part in the W.A.S.P. lab measurement proficiency scheme and the AEA UK NO2 Survey QA/QC Scheme. In 2000, the field intercomparison exercise gave an average bias of 21% which has been applied.

Nitrogen dioxide diffusion tube annual mean data for 2001 (adjusted to lab bias)





The 2001 results have been projected for 2005, as illustrated above. These show that all sites within the AQMA are expected to exceed the annual objective, while background sites should achieve the objective.

6.3 New monitoring sites

Apart from the additional nitrogen dioxide diffusion tubes within the AQMA, two portable Osiris PM_{10} analysers, supplied and calibrated by Turnkey Instruments, have been added to the monitoring network and one Streetbox NO_2 analyser, supplied and calibrated by Learian Designs Ltd. These were co-located with automatic analysers prior to their establishment in the AQMA and the results showed a good correlation for indicative analysers (See Appendix 3). The results of the Osiris PM_{10} analyser correlate better with the TEOM automatic analyser than with the BAM (similarly to the Comparative ERG study referred to in section 6.1, a relationship of OSIRIS:0.65BAM gave the best fit) and therefore the use of a 1.3 correction factor to compare with air quality standards has been considered a more reasonable approach.

Table 10 below includes the Osiris data collected thus far, the Bow Arrow Lane site has been established for 10 months and the Elliot Road and Brent Way have 5 months data each. The aim is to move the analysers within the AQMA at different receptors and assess the model predictions against the monitoring data.

Table 10: Modelled versus monitoring results

Site	MP/NR	East/West	X	Y	Distance to A282 (m)	NO2 Annual 2005(ppb)1998EF	NO2 Annual 2005(ppb) 2001EF	PM10 24hr 2004(ug/m3) 1998EF	PM10 24hr 2004(ug/m3) 2001EF	Monitored NO2 (ppb)annual 2001	Projection 2005 monitored NO2	Monitored PM10 24hr(ug/m3) 2001-2
Bow Arrow Lane	MP	E	555484	174441	8	35	39	85	77	39	35	69
Osbourne Road	NR	E	555484	174388	8	34	38	75	68			
Queens Gardens	MP	E	555795	173210	48	25	28	57	36	32	29	
Queens Gardens	NR	E	555764	173185	13	29	34	66	51			
Brent Way	MP	E	555600	174030	26	27	31	62	41	37	34	68
Brent Way	NR	E	555614	174026								
Fairway Drive	MP	E	555718	173805	35	26	29	59	39	27	25	
Fairway Drive	NR	E	555721	173787	28	27	30	62	39			
Elliot Road	MP	W	555660	174863	20	26	30	61	41	32	29	81
Elliot Road	NR	W	555668	174875								
Wayville Road	MP	W	555632	173558	35	24	27	51	30			
Wayville Road	NR	W	555643	173561	26	26	29	58	40	26	24	
Brentfield Road	MP	W	555501	174005	60	23	26	53	35	27	25	
Brentfield Road	NR	W	555495	174075	20	27	29	58	38			
Princes Road	MP	E	555880	173365	87	23	25	51	30	33	30	
Princes Road	NR	E	555867	173348								

Where MP is new monitoring point and NR is the nearest receptor to the A282 at that point

EF are the relevant emission factors, old (1998) or proposed (2001)

NO_2 monitoring results are from diffusion tube data and PM_{10} is from Osiris analysers

Projected data to 2005 uses NO2 diffusion tube results and LAQM.TG4 correction factors

Table 10 indicates that overall the model predictions are reasonable when compared with the monitoring information and projections. However, the NO_2 monitoring results are higher than predicted at Princes Road and Brent Way which are influenced by roads (A226 and A296) in the local network as well as the A282. The PM_{10} results at Elliot road are higher than predicted and this is likely due to the speed/flow characteristics on the West side due to queuing up to the tolls. More detailed speed/flow information will allow a better prediction of emissions at this point and investigation of the impact of the toll system and speed restrictions on traffic will be required to assess whether traffic management measures can reduce emissions of PM_{10} from queuing traffic. The Highways Agency is currently investigating these issues as part of their commitment to the LAQM process.

The results in table 10 do not support the conclusions of the AQC report (October 2001) that outside London, even near motorways, the annual objective for NO_2 and PM_{10} 24 hour objective should be achieved beyond 10m from the kerbside. Sites at over 25m distance from the A282 are predicted to exceed these objectives. As the predicted exceedences extend far beyond this to over 100m from the A282, monitoring at these further distances from the A282 shall be carried out to confirm whether the model predictions are overestimating at these receptors.

7.0 MODELLED SCENARIOS

Table 11

Scenario	**DMRB V2** 2005 NO_2 annual in ppb	**DMRB V2** 2004 PM_{10} 24 hour in ug/m3	**AAQuIRE** model predictions 2005: old **(new)** factors NO_2 annual in ppb	**AAQuIRE** model predictions: old (& **new** factors) PM_{10} 24hr in ug/m3	Monitoring NO_2 annual (2001) in ppb	Monitoring PM_{10} 24hr (90 percentile) (2001) in ug/m3
1. Do nothing	49.38	62.7	34 **(37.5)**	75 **(68)**	38.5	88.0
2. Reduce speed from 60mph to 50mph	47.28	62.72	**35.0**			
3. Reduce speed to 20mph	56.3	71.9				
4. Reduce HGV numbers by 25%	43.5	60.2				
5. Reduce HGV numbers by 50%	37.57	57.62	**33.0** **29.5** (50%HGV + speed 50mph)	**52.0**		
6. Reduce overall traffic by 25%	42.2	62.6	**34.0**	**51.0**		
7. Reduce overall traffic by 50%	34.17	53.72				
8. Reduce car numbers by 25%	47.77	61.1				
9. Reduce HGV numbers by 100%	24.75	52.65	Meets NO_2 annual standard at 25m from kerbside and PM_{10} 24 hour at 20m from the kerbside.			
10. Reduce Car numbers by 100% (i.e. just 14% capacity – ALL HGV)	41.56	55.87				

NB Monitoring data – NO_2 diffusion tube and Turnkey Instruments Osiris Portable PM_{10} monitor.

Scenario details:

DMRB V2 was downloaded from the Stanger Website (Reference made to LAQM TG4(00) procedures where applicable).
Nearest receptor – Osbourne Road, 8m from kerbside, 26m from Centreline A282
Background NOx 2005 – 30ug/m^3
Background PM_{10} 2004 – 25ug/m^3
Ave annual hourly flow – 5850
Speed – 60mph

Limitations of these predictions

- NOX:NO_2 relationship is non-linear and location dependant, therefore predicted reductions may not accurate
- Account not taken of resuspended material to total PM_{10} concentrations
- Speed and flow data are averages. Profile of A282 is such that diurnal and South/North carriageway differences will have a significant impact.

The AAQuIRE model has also been used to estimate the reduction in NO_2 and PM_{10} levels from changes in traffic flow and traffic management. These show levels in the DMRB assessment to be overestimating for annual NO_2 but underestimating for 24hour PM_{10} concentrations.

The DMRB results in Table 11 show that slow moving traffic flows, as are occurring regularly on the northbound carriageway due to queuing to the tolls, can increase NO_2 and PM_{10} levels by 14% and 15% respectively. Targeting traffic management to improve flows, in particular on this side, could result in significant improvements to short term PM_{10} concentrations.

The greatest achievements in terms of reductions are through the reduction or removal of the HGV proportion or substantial reductions in the overall traffic flow, this is especially significant with respect to NO_2 concentrations. The scenarios indicate that substantial changes will be required to ensure the NO_2 annual objective is met and this will involve action at a national level. A suite of measures will be required to achieve the desired reduction and these will be investigated further as part of the action plan measures, including Borough wide measures to reduce emissions from sources outside the AQMA which are adding to the background levels.

Stage 3 public consultation indicated noise as well as air quality problems were of concern to local residents in the AQMA. The model predictions and monitoring results show that towards the tolls the A282 comes out of a cutting and the screening is less effective here leading to higher pollutant concentrations e.g. in the vicinity of Bow Arrow Lane. Improved screening along this stretch could lead to short term improvements in air quality and the Highways Agency is investigating the potential for improvements to the screening.

TABLE 12: Fleet breakdown A282 with speed restrictions

			AVE SPEED: 65MPH LDV; 60MPH HGV		AVE SPEED: 50MPH LDV & HGV	
	Fraction	No.vehicles	Proportion NO_X	Proportion PM	Proportion NO_X	Proportion PM
Total	1.00	140000				
LDV	0.86	120400	43.47	53.54	41.82	51.61
Petrol	0.81	97524	40.21	46.58	38.68	44.72
Diesel	0.19	22876	3.26	6.96	3.14	6.89
P1983	0.10	10142	16.17	2.31	15.47	2.74
P1991	0.23	22333	9.84	16.75	9.44	15.35
P1996	0.29	28087	3.59	4.65	3.58	5.52
P2000	0.38	37059	10.62	22.87	10.19	21.11
D1983	0.02	503	0.03	0.08	0.03	0.10
D1991	0.17	3980	0.88	1.71	0.84	1.60
D1996	0.32	7229	0.38	1.14	0.38	1.35
D2000	0.49	11163	1.97	4.02	1.89	3.84
HGV	0.14	19600	56.53	46.46	58.18	48.39
1996	0.18	3528	17.37	15.93	17.88	16.63
Stage1	0.10	1960	5.37	7.14	5.52	7.51
Stage2	0.72	14112	33.79	23.38	34.78	24.25

Ref. Emissions factors (based on 1998 data) from AAQuIRE 2000 model database.

Table 12 shows in more detail the potential for traffic management on the A282 through speed reduction, assuming an average speed as indicated (in free flow conditions).

Reduction in NOX for a change in speed from 105/95kph – 85kph approx. 19%
Reduction in PM for a change in speed from 105/95kph – 85kph approx. 15%

The results in Table 12 show that the reduction due to speed is more significant for light vehicles (LDV) then for heavy goods vehicles (HGV). However, it does indicate that speed reduction if properly enforced could be an important tool in helping to reduce emissions. The speed along the A282 is very variable diurnally and between northbound and southbound carriageways. Near the tolls northbound there are often congested conditions and queuing, but the flow is generally free on the southbound carriageway at this point. Southbound, restrictions to flow occur further south towards junction 2, where the A282 meets the A2. Speed measurements taken along the A282 have confirmed this, with speeds between 15 (northbound between junctions 1a – 1b) – 120 kph (southbound between junction 1a – 1b).

8.0 CONCLUSIONS

Refinements to the modelling work and further monitoring have been undertaken in the AQMA. These have confirmed that the original assessment and designation of an AQMA was correct, although the incorporation of the new emissions factors predicts exceedences for NO_2 annual objective beyond the current AQMA boundary. This suggests that the AQMA should be extended by over 25m on the east side of the carriageway towards the tolls and where the local road network intersects the A282, with the remaining being largely within the 25m buffer around the area used for targeted public consultation purposes.

Projections of NO_2 monitoring data to 2005 show good correlation with model predictions. There were underestimations of the NO_2 annual objective at receptors influenced by the intersection of the local road network and for 24hour PM_{10}, there has been an underestimation on the northbound side of the A282 near the tolls, where there is slow moving traffic due to queuing. These areas will be further refined with more detailed speed and flow data.

Source apportionment showed that the through traffic element was the principal cause of PM_{10} 24hour exceedences and was the major contributor to NO_2 annual exceedences in the AQMA. HGV numbers are responsible for over half of the emissions in the AQMA.

The required reduction and improvement at the nearest receptors were calculated to be 60% for NO_2 annual and 54% for PM_{10} 24hour at the nearest receptor based on the old emissions factors. The new emissions factors results in an increase in NO_2 of 10% at the nearest receptor and therefore the reduction will be greater than previously calculated (79% above the objective). A number of scenarios have been considered to assess the impact of various potential action plan measures and they have indicated that substantial reductions in traffic flows will be required to achieve these objectives, especially for NO_2 annual, and the reductions are much greater through reductions in HGV numbers.

Remodelling with the new emissions factors shows predictions for NO_2 annual objective at the previously marginal A226/B255 Junction at Greenhithe are now exceeding the objective at the nearest receptors. This needs to be considered in more detail with regard to AQMA designation, especially in the light of increased traffic demand at this important node.

Further monitoring work is recommended to confirm background levels in Dartford, reassess marginal pollution hotspots and establish where levels drop off to background levels within the AQMA with increasing distance from the A282. The relocation of D3 monitoring site away from the kerbside and nearer to receptors is recommended with the aim of achieving more accurate and meaningful PM_{10} data from the BAM analyser. This shall be taken forward into the next Review and Assessment to be completed by December 2003 and results shall be reported at this time.

Changes to the physical boundary of the present AQMA along the A282 Tunnel Approach Road and potential designation of further AQMA's shall be integrated into the next Review and Assessment in 2003.

9.0 REFERENCES

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Air Quality Consultants limited (on behalf of DEFRA) (2001)'Compilation of New Nitrogen Dioxide and PM_{10} Roadside Monitoring Data Obtained by Local Authorities as Part of the Review and Assessment Process'

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Department of the Environment, Transport and the Regions (2000) 'LAQM.TG2(00) – Estimating emissions'

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Department of the Environment, Transport and the Regions (2000) 'LAQM.TG4(00) – Pollutant specific guidance'

Department for Environment, Food and Rural Affairs (2001) 'Guidance to local authorities on the further ("stage4") assessments of air quality required under section 84 of the Environment Act 1995'

Green, David (1999) King's College ERG 'Particulate Monitor Comparison, Marylebone Road'

The Environment Act 1995 Part IV

APPENDIX 1: AIR QUALITY STANDARDS AND OBJECTIVES 2000

Pollutant	Standard		Objective	Date to be achieved by
	Concentration	Measured as		
Benzene	5 ppb	Running annual mean	5 ppb	31 December 2003
1,3-butadiene	1 ppb	Running annual mean	1 ppb	31 December 2003
Carbon monoxide	10 ppm	Running 8 hour mean	10 ppm	31 December 2003
Lead	0.5µg/m^3 0.25µg/m^3	Annual mean Annual mean	0.5µg/m^3 0.25µg/m^3	31 December 2004 31 December 2008
Nitrogen dioxide*	105 ppb 21 ppb	1 hour mean annual mean	105 ppb* not to be exceeded more than 18 times a year 21 ppb*	31 December 2005 31 December 2005
Fine particles (PM_{10})	50µg /m^3 40µg/m^3	24 hour mean Annual mean	50µg/m^3 not to be exceeded more than 35 times a year 40µg/m^3	31 December 2004 31 December 2004
Sulphur dioxide	100 ppb 47 ppb 132 ppb	15 minute mean 24 hour mean 1 hour mean	100 ppb not to be exceeded more than 35 times a year 47 ppb not to be exceeded more than 3 times a year 132 ppb not to be exceeded more than 24 times a year	31 December 2005 31 December 2004 31 December 2004

ppb = parts per billion, ppm = parts per million, µg/m^3 = micrograms per cubic metre.

* These are provisional objectives and may be altered following next review of the National Air Quality Strategy.

APPENDIX 2: RESPONSE TO DEFRA STAGE 3 APPRAISAL REPORT

Environment Directorate

Rob Scott *Director*
Phil Kessel *Environmental Strategic Development Manager*

Mrs Dorothy Dickson
Local Air Quality Management
Air and Environment Quality Division
Department of the Environment, Transport and Regions
Zone 4/E11
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LONDON
SW1E 6DE.

Please ask for: Sharon Atkins
Direct line: 01322 343250
Direct fax: 01322 343963
E-mail: sharon.atkins@dartford.gov.uk
Your ref:
Our ref: SA/DETR/260201

Date: 26th February 2001

Dear Mrs Dickson

STAGE 3 REVIEW AND ASSESSMENT

Thank you for your comments dated 5th January 2001 regarding Dartford's Stage 3 Air Quality Review and Assessment Report. The 8 specific issues you have listed as requiring attention will be incorporated into our Stage 4 Review and Assessment.

I enclose a copy of our Stage 3 Report for the DETR archive. There has been a slight change in presentation; but the detail remains the same. An outline of how your comments will be addressed is set out below along with our proposals for Stage 4.

Commentary:

1) <u>QA/QC of diffusion tubes</u>:
The QA/QC details of the diffusion tube monitoring will be expanded in the Stage 4. Dartford use Gradko laboratory for the analysis of tubes and they are part of the WASP Scheme and AEA UK NO2 Survey QA/QC Scheme. The 1999 field inter-comparison results gave an under read of 18% with chemiluminesence analysers and information will be re-evaluated with this potential bias. Validation of the diffusion tube against a chemiluminescence analyser shall be undertaken using triplicate tubes to assess accuracy.

2) <u>1250 Scale Maps of monitoring stations</u>:
These shall be included in the Stage 4 Report.

3) <u>Scales on contour maps</u>:
These shall be included in the Stage 4 Report.

4) <u>Background measurements for nitrogen dioxide included in the modelling:</u>
The annual background level in Dartford, according to our background nitrogen diffusion tube sites was 15ppb (taking into account the under read bias) in 1999/2000. It is expected that this figure will be lower in 2005. The results have been remodelled using a background of 15 ppb for 2005 and the results are reasonably consistent with the Stage 3 results. However, during the Stage 4, further model refinement will be occurring and this issue will be addressed at this time. All areas where receptors were identified as being close to exceedence of the objectives will be looked at again in detail, as well as the proposed AQMA.

5) <u>Validation for 24 hour PM10:</u>
This shall be included in the Stage 4 Report.

6) Modelling results in the vicinity of D3:
D3 shall be remodelled again in Stage 4 showing residential exposure.

7) <u>Receptor grid spacing:</u>
Contour maps were modelled using 50 m grid spacing. This shall be clarified in the Stage 4 Report when further refinements will be made.

8) <u>Fugitive emissions:</u>
The issue of fugitive sources of PM10 is covered under **3.0 Emission inventories**. In Dartford, there are no significant sources of fugitive dust and controls are in place where the potential arises; for example, through smoke control areas, statutory nuisance legislation, Industrial Part B Authorisations, planning conditions and through the Code of Construction Practice Part A for CTRL works. However, this shall be clarified in the Stage 4 Report.

STAGE 4 PROPOSALS

Main areas to consider:

- **Model refinement**. Areas identified in the Stage 3 as being either within an AQMA or a hotspot warranting further consideration will be looked at in more detail, especially with regard to traffic data, to reduce uncertainty. New emission factors will be used when released.
- **Source apportionment**. Further details on sources, including vehicle fleet breakdown and fugitive emissions, will be investigated and added to the emission inventory, where appropriate.
- **Additional Monitoring** is proposed within the anticipated AQMA for PM10 and NO2.
- **Required Air Quality improvement**. To be calculated at relevant locations in relevant years.
- **Action plans.** To be drawn up alongside the Stage 4 review and any scenarios to be modelled and cost/benefit analysis performed.
- **Liaison with other bodies**. The Highways Agency is responsible for the M25 where the proposed AQMA is located. Kent local authorities will liase closely on this issue, as trunk roads are the major source of exceedence in Kent.

I hope the above information allays the concerns raised in your Stage 3 Review and Assessment Appraisal Report. At present we are carrying out public consultation on our Stage 3 Report and therefore some changes to our proposed AQMA may be warranted. Any further comments will be welcomed.

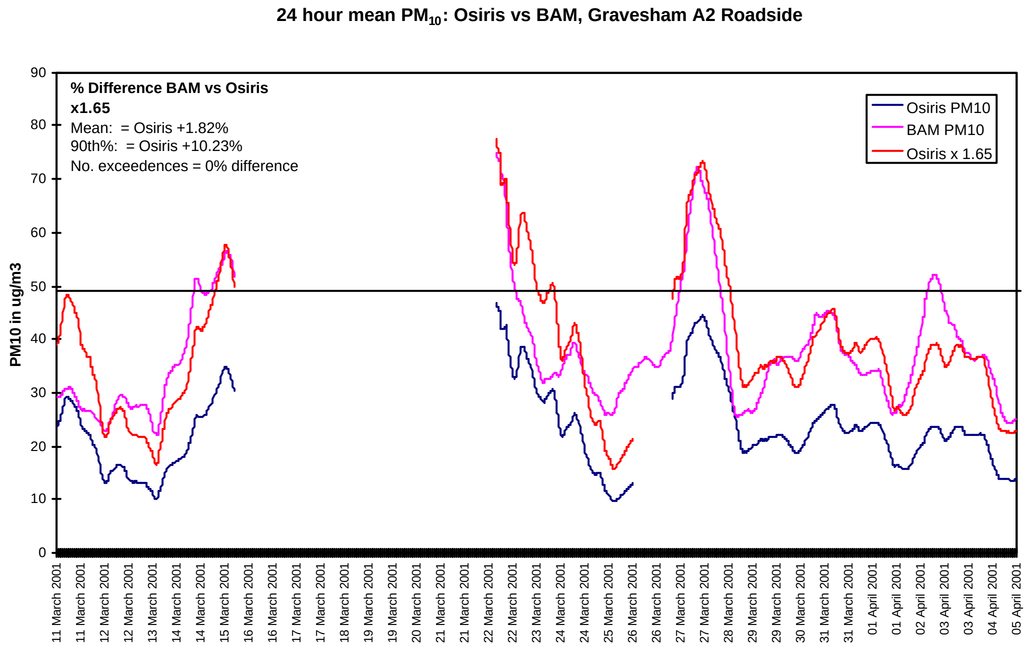
Yours sincerely

Sharon Atkins
Scientific Officer

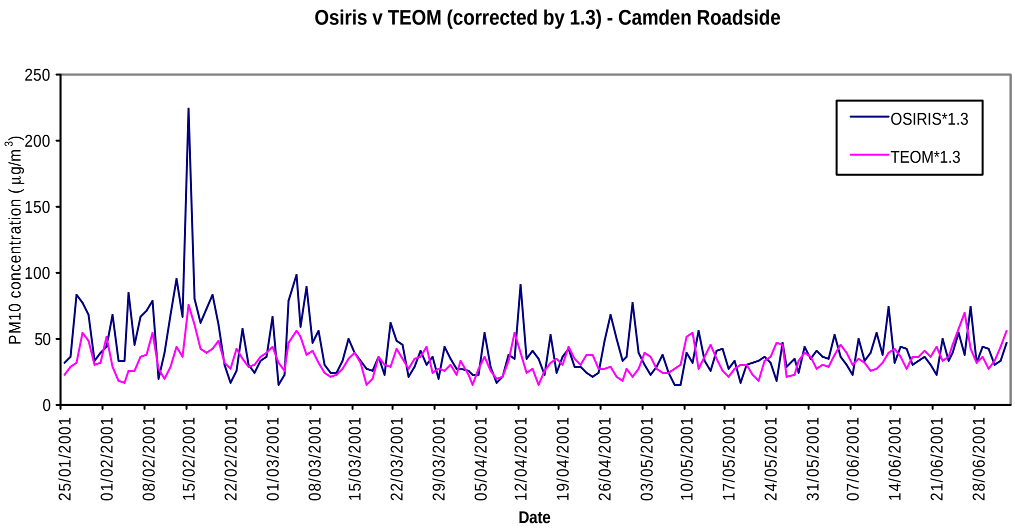
Enc.

APPENDIX 3: MONITORING VALIDATION STUDIES

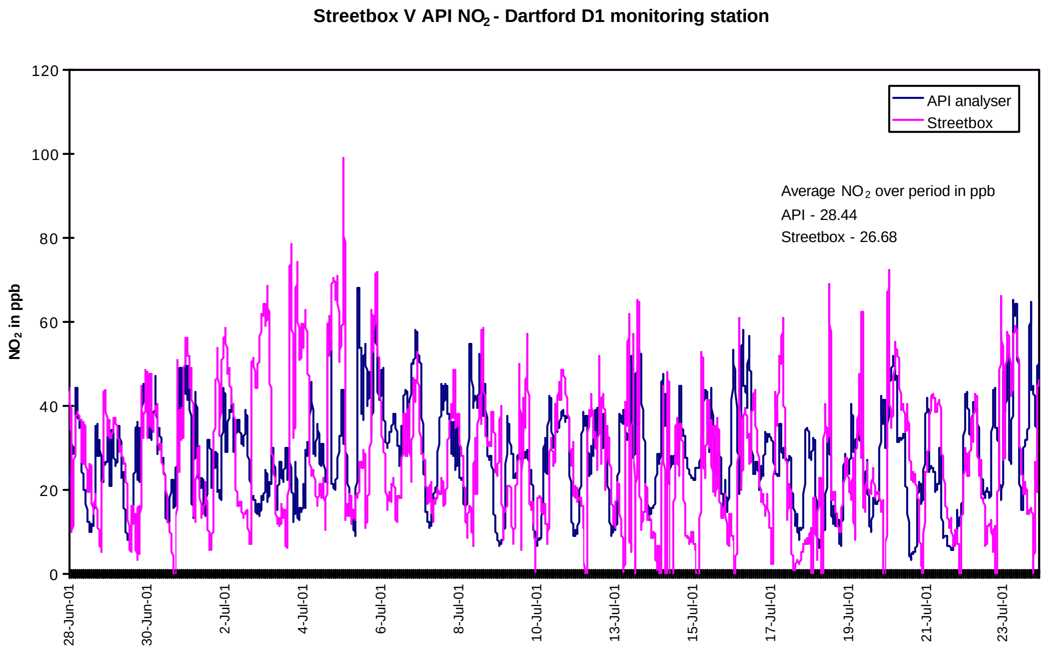
Osiris PM_{10} analyser versus BAM 1020



The Osiris uses a light scattering technique to determine the concentration of fine particles passing through PM_{10}, PM_5 and $PM_{2.5}$ impactors. The light scattered by the particles in the sampled air is converted into an electrical pulse proportional to the size of the particle. Results are expressed in ug/m3 with a resolution down to 0.01. The Osiris is serviced and calibrated by Turnkey Instruments annually and on-going maintenance is carried out in house.



Streetbox NO_2 analyser v API analyser



The Streetbox is an indicative monitor which comprises a data logger and electrochemical sensors for gaseous pollutants, in this case NO2. Learian service and calibrate the Streetbox 6 monthly. Following data capture the baseline and span corrections are manually corrected.