



**FIRST STAGE REVIEW AND ASSESSMENT  
OF AIR QUALITY**

**IN**

**THE BOROUGH OF REIGATE AND BANSTEAD**

**JUNE 1999**

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***Stage 1 Review and Assessment Report  
For Reigate and Banstead Borough Council  
Under Part IV of the Environment Act 1995***

***June 1999***

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## **Executive summary to Stage 1 Review and Assessment report**

The Government has recognised the concerns expressed regarding air quality and sustainability and has provided the National Air Quality Strategy (NAQS) to map out ambient air quality policy in the UK until the year 2005, under Part IV of the Environment Act 1995.

This Act also conferred important new duties and powers on local authorities with respect to local air quality and its management in order to contribute to improving air quality in the UK. For the first time local authorities are required to:

Review and assess air quality, against the standards and objectives of the Air Quality Regulations 1997, within their respective geographical area for both the current time and 2005

Designate Air Quality Management Areas where the NAQS objectives are unlikely to be met by 2005 and prepare a written action plan for such areas

The Review and Assessment of air quality is the first part of the Local Air Quality Management (LAQM) process, and this report provides the first part of the phased Review and Assessment. The intention of the phasing is to ensure that local authorities only undertake as much work as necessary, enabling those local authorities without air quality problems the opportunity not to use up valuable resources. Specific guidance notes have provided by the DETR for the Review and Assessment.

Every local authority is required to undertake the first stage review and assessment. This consists of an initial screening of industrial, transport and other sources of pollutants, which have a significant impact within an authority's borders. This screening is undertaken for the following air pollutants: benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide, fine particles (specifically PM10), and sulphur dioxide. The first stage then assists local authorities in identifying the pollutants and localities, which should be the focus of the further stages of review and assessments.

This, the Stage 1 report for Reigate and Banstead Borough Council, has reviewed industrial, transport and other sources considered most significant in terms of air quality in the Council's area. To do this the following main sources of data and information have been examined in accordance with the prescriptive methods of the DETR guidance:

Industrial sources - the Environment Agency database and Reigate and Banstead Borough Council's public register of authorised processes

Transport sources – the Surrey County Council Transport Model

Other sources – monitoring data from the London Air Quality Network and the DETR website.

The Stage 1 report provides Reigate and Banstead Borough Council with sufficient detailed information on specific atmospheric emissions and their sources to satisfy the initial requirements of the Environment Act 1995.

The information provided has highlighted that, for the following pollutants, no further action need be taken at the present time:

Benzene  
1,3-Butadiene  
Lead  
Sulphur dioxide

However the report also concludes that further investigation is needed for the remaining pollutants for which air quality objectives have been set:

Carbon monoxide  
Nitrogen dioxide  
PM10

On the basis of these conclusions the Council is recommended to undertake Stage 2 of the Local Air Quality Management Review and Assessment process for these pollutants only.

## **1.0 Introduction**

- 1.0.1 This report is intended to assist the Reigate and Banstead Borough Council undertake the first stage of its review and assessment of air quality under the local air quality management (LAQM) process laid down by the Environment Act 1995.
- 1.0.2 Part IV of the Environment Act 1995 conferred new responsibilities, duties and powers on both the Secretary of State for the environment, and local authorities. The responsibilities of the former included the production of the UK National Air Quality Strategy (NAQS), which details policies for implementing European obligations relating to the quality of air. This Strategy outlines the future of ambient air quality, as far, as is possible, in the United Kingdom until the year 2005. The NAQS is itself currently the subject of a review, which is expected to be complete by the end of this year.
- 1.0.3 The duties imposed upon the Reigate and Banstead Borough Council include:
- Reviewing and assessing air quality, against the standards and objectives of the Air Quality Regulations 1997 (SI 1997/3043), within the local authority's geographical area for both 1995 and 2005
- Designating Air Quality Management Areas where the NAQS objectives are unlikely to be met by 2005 and preparing a written action plan for such areas
- 1.0.4 Part of this process includes consultation with adjoining local authorities, as well as other agencies and stakeholders. The recommended timescale for undertaking this process is two years, following the introduction of the Air Quality Regulations 1997 (SI 1997/ 3043) and the bringing into force of sections 82 - 86 of the Environment Act 1995.

## **2.0 Development of Review and Assessment**

- 2.0.1 The LAQM process is designed to ensure that the Reigate and Banstead Borough Council and other local authorities contribute to the Government's air quality objectives as identified in the NAQS. The purpose of the Review and Assessment, which forms part of the overall process, is to:
- review current air quality across the Council's geographical area  
assess the current air quality in the Council's area against the NAQS objectives  
assess the air quality predicted for 2005 in the Council's area against the NAQS objectives.
- 2.0.2 The Review and Assessment has three stages, although it is only Stage 1 that must be undertaken by all local authorities. The next stage is to be undertaken only if Stage 1 indicates a potential for elevated levels of air pollution. Similarly Stage 3 is only to be undertaken when informed by Stage 2. The overall process for Review and Assessment is summarised in Figure 1, (with NFA indicating where no further action is required). The Government's overall intention of the phased process is that local authorities only undertake as much work as is necessary.

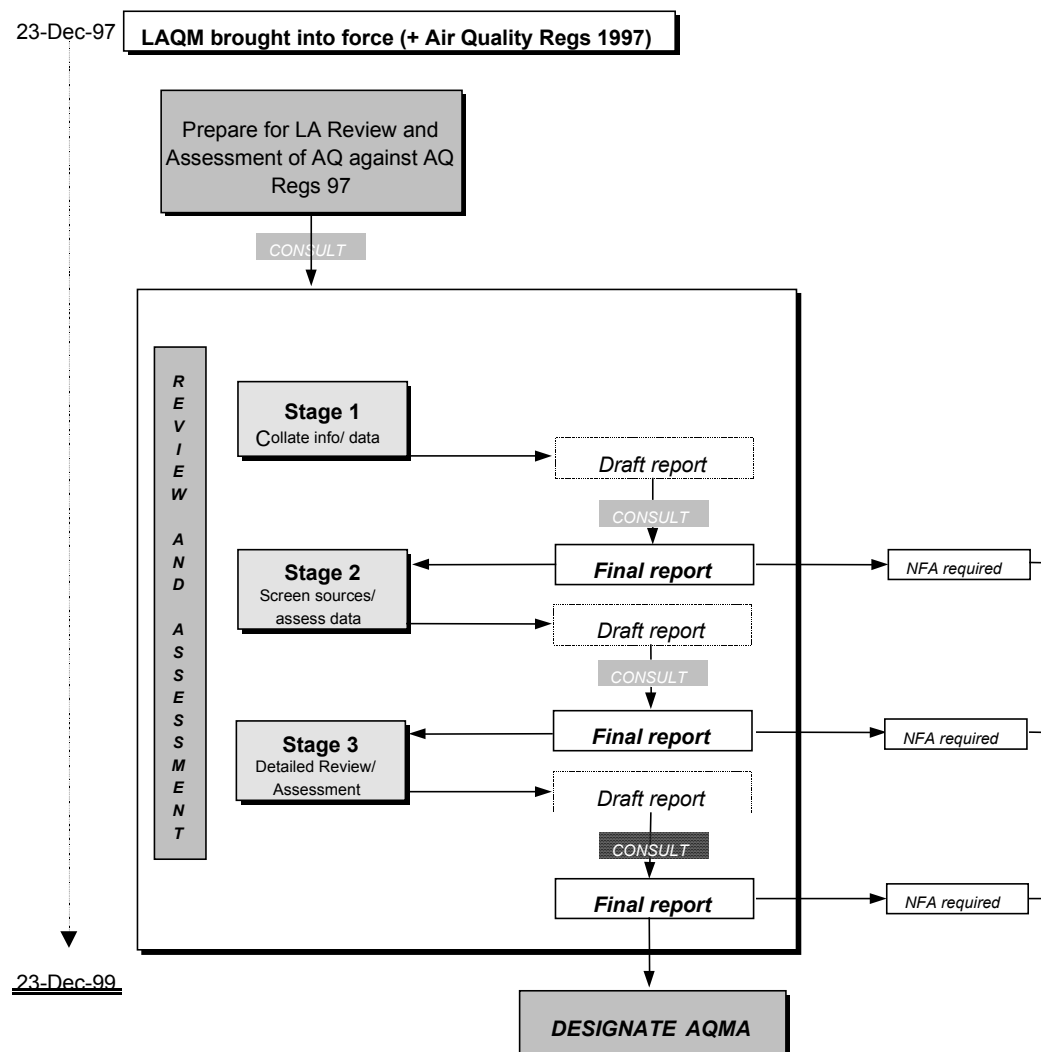


Figure 1

- 2.0.3 Stage 2 of the Review and Assessment is to be undertaken if areas identified by the first stage have the potential to experience elevated levels of pollution. The second stage then includes a further estimation of the areas influenced by the significant sources. This is based on assessments of air quality monitoring and air quality modelling. The latter includes the use of screening models. If the use of these enables predictions of concentrations in 2005 to be below the NAQS objectives for 2005, then it is not necessary to move to Stage 3.
- 2.0.4 Stage 3 is the final stage of the Review and Assessment and it is designed to be an accurate assessment of current and future air quality, requiring an assessment of the geographical extent of the areas of exceedence for each pollutant of concern. This information will then be used in the process of designating potential Air Quality Management Areas.
- 2.0.5 The timetable for the first Review and Assessment of the LAQM process was such that the Government expected it to be completed by the end of 1999, although it has since confirmed that this was for guidance only.

- 2.0.6 Paragraph 2.04 of circular 15/97 advises that the guidance is not prescriptive and that local authorities should use professional and technical judgement to decide how best to conduct an air quality review and assessment, in the light of local circumstances.
- 2.0.7 The guidance for LAQM provided to the Reigate and Banstead Borough Council to date, includes the following:

*Environment Circular 15/97 Part IV the Environment Act 1995 Local Air Quality Management - provides introduction to local air quality management*

*LAQM.G1 (97) Framework for review and assessment of air quality - sets out general principles of reviewing and assessing air quality*

*LAQM.G2 (97) Developing local air quality strategies and action plans: the principal considerations - general advice on main considerations of local air quality strategy and action plan*

*LAQM.G3 (97) Air quality and traffic management - advice on altering traffic management plans to contribute to improving air quality*

*LAQM.G4 (97) Air quality and land use planning - advice on ensuring land use planning makes contribution to improving air quality*

*LAQM.TG1 (98) Monitoring for air quality review and assessments - advice on techniques*

*LAQM.TG2 (98) Preparation and use of atmospheric emission inventories - advice on methods and practise*

*LAQM.TG3 (98) Selection and use of dispersion models - advice on types and use*

*LAQM.TG4 (98) Review and assessment: pollutant specific guidance - advice on review and assessment*

*Assistance with the review and assessment of PM10 concentrations in relation to the proposed EU Stage 1 Limit Values (March 1999)*

### **3.0 Stage 1**

- 3.0.1 The Stage 1 guidance is mainly prescriptive, requiring Reigate and Banstead Borough Council to compile and collate information on any existing or proposed significant sources of pollution. This is in consideration as to whether anyone in the Council's area may reasonably expect to be exposed to a specific atmospheric pollutant over the averaging period of the appropriate objective for that pollutant. This Stage specifically relates to any processes or activities that are either already in, or will be in, operation by the end of 2005, and for which there is potential for exposure in relevant locations.



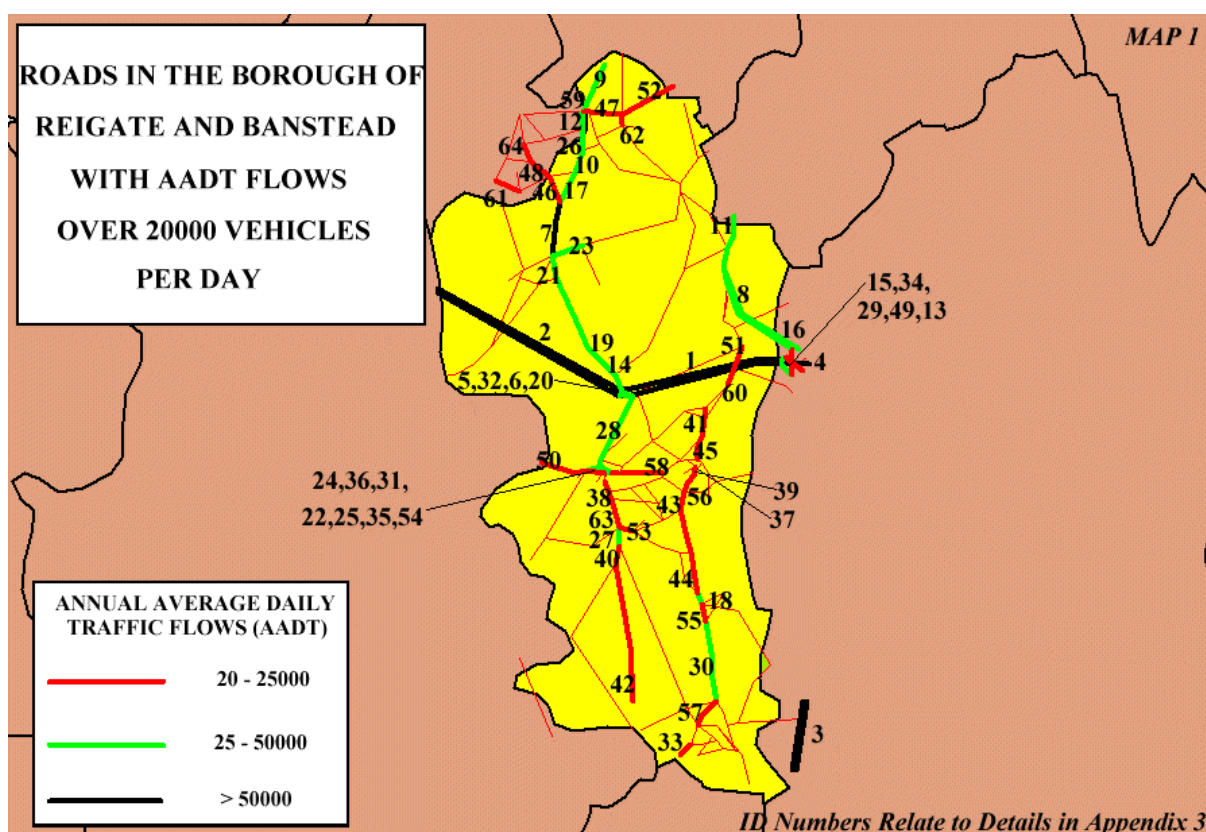
3.0.2 The Air Quality Regulations 1997 set down the air quality objectives for the 7 pollutants identified in the NAQS. The pollutants considered are carbon monoxide, benzene, 1,3-butadiene, lead, nitrogen dioxide, PM<sub>10</sub>, and sulphur dioxide. (Note - the only pollutant excepted from those listed in the NAQS is ozone). Appendix 1 summarises the air quality standards and objectives to be achieved for these pollutants. The expectation of the NAQS is that these will be achieved in much of the country by the end of 2005, although uncertainties remain in a number of cases as to whether the objectives are achievable.

3.0.3 The DETR guidance advises that Reigate and Banstead Borough Council should have regard to locations where individuals are likely to be exposed over the averaging time of each prescribed objective. The following interim approach has been recommended:

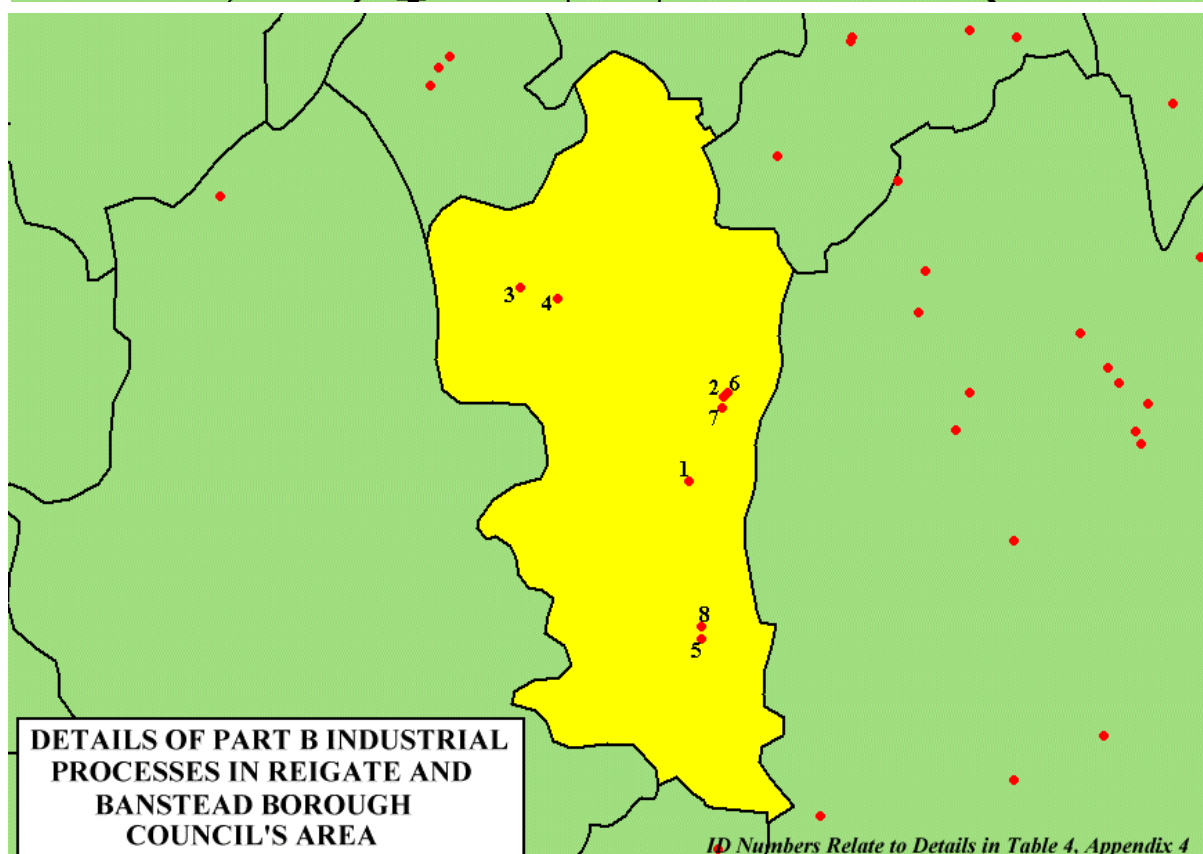
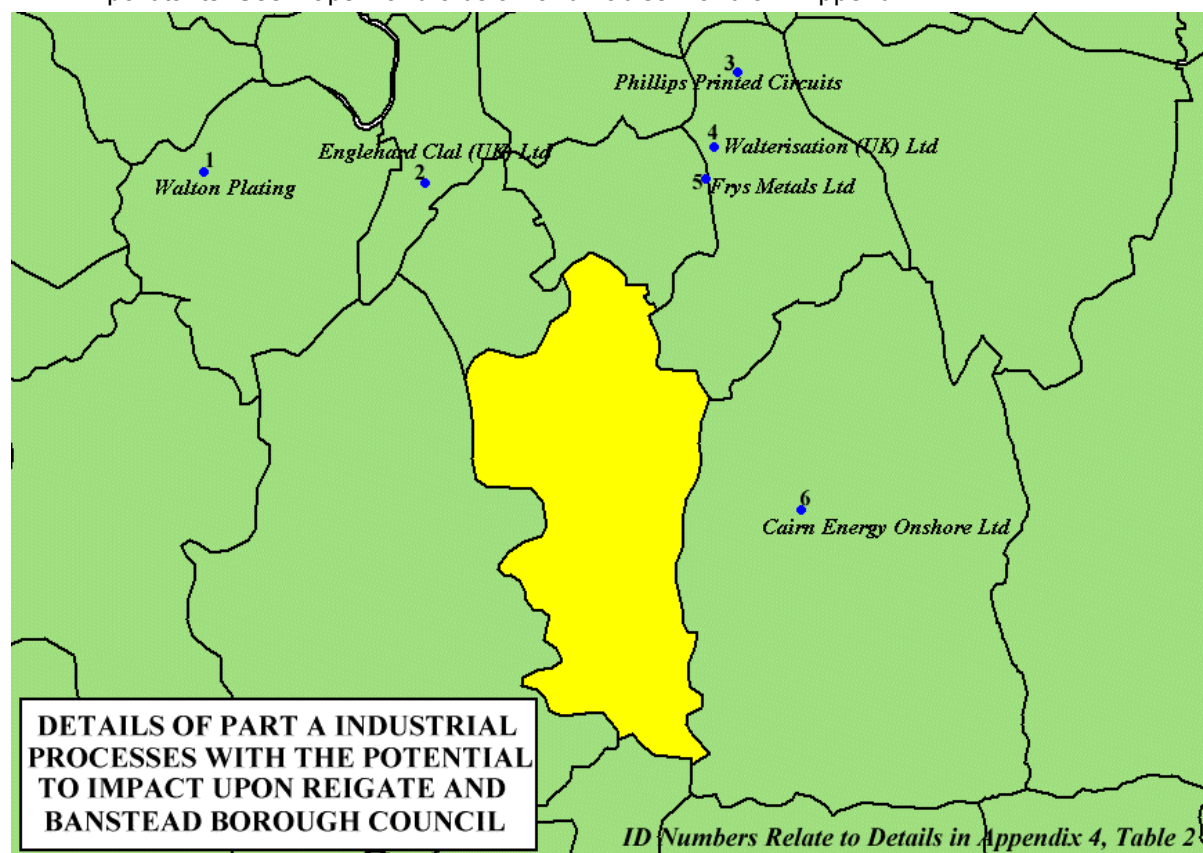
- for objectives with short averaging times (specifically sulphur dioxide and nitrogen dioxide) the review and assessment should focus on any non-occupational, near ground level outdoor location given that exposures over such short averaging times are potentially likely:
- for objectives with longer averaging times (specifically benzene, 1,3 butadiene, carbon monoxide, PM10, lead and the annual objective for nitrogen dioxide) the review and assessment should focus on the following near ground level outdoor locations: background locations; and other areas of elevated pollutant concentrations where a person might reasonably be expected to be exposed (e.g in the vicinity of housing, schools or hospitals, etc.) over the relevant period of the objective.

3.0.4 The guidance suggests that the information to be collated include:

Information on current and 2005 forecast annual average daily traffic flows for major roads. See Map 1 below and Table 1 in Appendix 3.



Prescribed Part A and B processes with the potential to emit significant quantities of the listed pollutants. See Maps 2 and 3 below and Tables 2 and 3 in Appendix 4.



Large solid fuel or oil fired combustion plants

Combinations of sources which could lead to significant emissions, based on a 1 km square grid

Planned developments of the above types

3.0.5 Appendix 2 gives a full summary of the specific information collated.

3.0.6 The Government has recently published its proposals for review of the National Air Quality Strategy, and in particular its proposals for revised and additional objectives for the pollutants. During the review process, as a result of the work of the Airborne Particles Expert Group (APEG)<sup>(1)</sup>, it became apparent that the original PM<sub>10</sub> objective was unrealistic. The APEG report also highlighted the importance of European sources and the limit to which local authority action could control levels of PM<sub>10</sub>. The Government has therefore proposed replacing the objective in regulation with the proposed EC Air Quality Daughter Directive Stage 1 Limit Values<sup>(2)</sup>. Details of these proposed limits can be found in Appendix 1.

3.0.7 The informal guidance produced as a result of these proposed changes, requires local authorities to also gather details of:

- Estimated annual mean background PM<sub>10</sub> concentrations for 2004
- Traffic data for existing or proposed roads with AADT flows over 5000
- Information on domestic fuel use
- Information on existing or proposed Part A and B authorised processes
- Information on sources of uncontrolled or fugitive dust emissions
- Details of planned developments, particularly if they will affect traffic flows
- Details of significant sources of PM<sub>10</sub> in neighbouring areas, which could impact within the authority's area.

3.0.8 The traffic and industrial process data and information have been obtained from Surrey County Council and the Environment Agency. The Review and Assessment requires an understanding of the likely pollution loading for the year 2005, i.e. it is necessary to make an estimate of the future emissions and sources.

3.0.9 Current DETR traffic predictions to 2005<sup>(3)</sup> and beyond indicate that traffic growth for the U.K will continue. Although much of the area close to and within the M25 operates under "capacity restraint" and therefore the rate of growth will be less than the national prediction. It is sufficient for this Stage, as part of the initial collation of information and data, to consider the current situation (i.e. for 1996) with annual average daily traffic flows of greater than 20,000 (for NO<sub>2</sub>), greater than 25,000 (for PM<sub>10</sub>) and greater than 50,000 (for CO). However subsequent assessments of traffic flows for 2005 will be applied to the later Stages of the Review and Assessment (along with changes in traffic speeds) and all major roads, not just those with traffic flows greater than those mentioned above, will be modelled for these Stage 3 assessments.

- 3.0.10 Gatwick Airport situated to the South of the Borough is an area of concern regarding air quality within Reigate and Banstead and needs to be investigated in relation to its contribution to the PM10 and NO<sub>2</sub> objectives. Gatwick Airport carries more than 27.3 million passengers per year and the DETR PM10 assistance document <sup>(2)</sup> highlights that airports with in excess of 5 million passengers per year need to be investigated further with regards to air quality.

#### **4.0 Pollutant Specific - Stage 1 Review and Assessment**

- 4.0.1 Interpretation of the relevant source information, together with background information for each pollutant is given in the following sections:

##### References

1. APEG (1999) Source Apportionment of Airborne Particulate Matter in the U.K
2. DETR (1999) Assistance with the review and assessment of PM10 concentrations in relation to the proposed EU Stage 1 Limit Values
3. DETR (1997) National Road traffic Forecasts

## 4.1 Benzene

### Air Quality Standard and Objective

*The Government has adopted a running annual average of 5ppb as an air quality standard for benzene, with an objective for the standard to be achieved by the end of 2005. The focus of an authority's review and assessment for benzene should be non-occupational near ground level outdoor locations with elevated benzene concentrations in areas where a person might reasonably be expected to be exposed over a year (e.g. in the vicinity of housing, schools, or hospitals, etc.). This has been based on the recommended standard proposed by the Expert Panel on Air Quality Standards <sup>(1)</sup>.*

- 4.1.1 Benzene is a colourless, clear liquid at normal ambient temperatures and is classed as a non-methane volatile organic compound (NMVOC). It therefore readily evaporates and, although small amounts are naturally present in the atmosphere, almost all the benzene detectable is as a result of human activity <sup>(1)</sup>. There are two major concerns related to benzene. The first is the chemical's carcinogenic effects. Research has shown that heavy exposure in industrial workplaces leads to a small but definite increased risk of developing certain leukaemia's <sup>(2)</sup>. The International Agency for Research on Cancer (IARC) has classed benzene as a known human carcinogen. Secondly is the role benzene plays in the production of photochemical smog of which ozone is an important constituent.
- 4.1.2 The major source of benzene is the motor vehicle. It is naturally present in petrol and acts as an anti-knock agent. Since 1989, it has been limited to 5% by volume in both leaded and unleaded petrol by the EC Directive COM (84) 226, although in the UK this level is actually lower with an average content of 2% by volume. The 'cracking' of other aromatic compounds in petrol within the engine and the exhaust also forms benzene. The amount emitted from motor vehicles is therefore dependent as much on the presence of these aromatic compounds, as on the actual amount of benzene present in the petrol. Industry is an additional significant source of benzene emissions, with its main use being as a raw material for the manufacture of other chemicals.
- 4.1.3 The concentration of benzene in the atmosphere depends not only on the emission rates but also on the effectiveness of removal processes. The major loss mechanism in the troposphere is reaction with OH radicals, which is the initial reaction leading to the formation of ozone. There is also some evidence to suggest that dry deposition at the surface is an important route. The lifetime of benzene in the atmosphere when removed by either of the above mechanisms is approximately 12 days.
- 4.1.4 A monitoring survey was carried out across Surrey between April 1996 and March 1997, with each of the Surrey authorities using non-continuous monitoring at one site background and one kerbside site in their respective areas. The result for the Reigate and Banstead background site was 2ppb, with the kerbside site 4ppb, with both expressed as annual means. In fact no background site monitored across the county exceeded the NAQS standard of 5ppb as annual mean <sup>(3)</sup>. Non continuous monitoring results from the London Boroughs also suggest that concentrations have been decreasing in the capital over the last few years, although concentrations of the pollutant are affected greatly by the annual variability in weather patterns influencing general mixing and dispersion.

- 4.1.5 The reduction of benzene emissions arising from motor vehicles will have the most impact on benzene concentrations. Progress has already begun to achieve these, e.g. in 1991 EC Directive 91/441/EEC came into force setting tighter emission limits on emissions of, among other pollutants, VOCs. This required the fitting of a three-way catalytic converter to all new cars from 1 January 1993. The three-way catalysts reduce VOC emissions by approximately 75% although they are only effective once the car has warmed up <sup>(4)</sup>. All new cars are also fitted with small carbon canisters to capture petrol vapours from the fuel tank and the engine. The carbon absorbs VOCs, which are purged periodically and fed to the engine, reducing emissions by as much as 90% from parked cars.
- 4.1.6 Petrol stations are also an important source of public exposure to benzene. Petrol vapour recovery Stage I controls have been put into operation to reduce loss to the atmosphere from stored petrol, its loading, transport and unloading at refineries, distribution terminals and petrol stations. All new service stations must now be fitted with vapour recovery equipment, whilst the controls on existing stations are being phased in by 2004.
- 4.1.7 **Benzene sources relevant to the Reigate and Banstead Borough Council Stage 1 Review and Assessment**

The DETR guidance (LAQM.TG4 (98)) advises that emissions from road transport, even at busy roadsides are expected to be below the 2005 objective and therefore do not need to be considered further in the review and assessment. This is due to the impact of three way catalytic converters as described above in (paragraph 4.1.6). This conclusion has been further expanded in the report on the Review of the NAQS <sup>(5)</sup>, which proposes a more ambitious target of 5ppb as annual mean to be brought forward to 2003.

Details of large industrial processes were collated for the first stage review and assessment (see Appendix 4 and Maps 2 and 3) and from these -

**No relevant Part A or Part B industrial emission sources of benzene were identified (using LAQM.TG4 – Annexes 1 and 2) either within or sufficiently close to, or are planned before 2005, so as to impact significantly on the Council's area.**

#### 4.1.8 Conclusion

The first stage review and assessment has indicated that the risk of the benzene air quality objective being exceeded by the end of 2005 is negligible, in localities where there might be exposure to the public over a year.

The Reigate and Banstead Borough Council therefore need not undertake a second/ and or third stage review of benzene.

#### References

1. Expert Panel on Air Quality Standards (1994), Benzene.
2. DoE, (1995). Air Quality: Meeting the Challenge.
3. Surrey CEHO Group et al. (1998). Air Quality Report for Surrey (April 1995 – March 1997)
4. DoE, (1993). Reducing Emissions of VOCs and Levels of Ground Level Ozone: A UK Strategy.
5. DETR (1999), Review of the National Air Quality Strategy

## 4.2 1,3-Butadiene

### Air Quality Standard and Objective

*The Government has adopted a running annual average of 1ppb as an air quality standard for 1,3-butadiene, with an objective for the standard to be achieved by the end of 2005. The focus of an authority's review and assessment for 1,3-butadiene should be non-occupational, near ground level outdoor locations with elevated 1,3-butadiene concentrations in areas where a person might reasonably be expected to be exposed over a year (e.g. in the vicinity of housing, schools, or hospitals, etc.). This has been based on the recommended standard proposed by the Expert Panel on Air Quality Standards <sup>(1)</sup>.*

- 4.2.1 1,3-Butadiene is a non-methane volatile organic compound (NMVOC), which is present in the atmosphere as a gas at normal ambient temperatures. The major concerns surrounding this chemical are its known carcinogenic properties and its contribution to photochemical smog production. Evidence suggests that workers exposed to high levels of 1,3-butadiene have a marginally increased risk of developing cancers of the lymphoid system and bone marrow, lymphomas and leukaemia <sup>(1)</sup>.
- 4.2.2 All emissions of 1,3-butadiene to the atmosphere are as a result of human activity, with the motor vehicle by far the largest source. There is little or no 1,3-butadiene present in petrol or diesel, but the chemical is formed from the 'cracking' of olefins during combustion. These higher olefins have been increasingly added to petrol over the last ten years and this has probably resulted in an increasing release of 1,3-butadiene into the atmosphere.
- 4.2.3 1,3-Butadiene is also an important industrial chemical used mainly as a monomer for synthetic rubbers and resins. Apart from accidental releases, however, this is a minor emission route in comparison with the emissions from petrol and diesel combustion.
- 4.2.4 No monitoring of 1,3-butadiene is undertaken in Surrey, due its high complexity and cost. However, monitoring at sites in central London do not exceed the NAQS standard of 1 ppb limit is set as a running annual average.
- 4.2.5 The main target reduction measures are emissions from motor vehicle exhausts. There have been a number of measures introduced to reduce VOCs generally. These include the compulsory fitting of three-way catalysts to all new cars since 1 January 1993. These can reduce emissions of 1,3-butadiene by up to 95%<sup>(2)</sup>.
- 4.2.6 The petrol vapour recovery Stage I controls also require the minimisation of losses from stored petrol, its loading, transport and unloading at refineries, distribution terminals and petrol stations.
- 4.2.7 **1,3-Butadiene sources relevant to the Reigate and Banstead Borough Council Stage 1 Review and Assessment**

The pollutant specific guidance (LAQM.TG4 (98)) highlights only specific major industrial processes need be collated for the purposes of the first stage review and assessment. The guidance further advises, as for benzene, that emissions from road transport, even at busy

roadsides are expected to be below the 2005 objective and therefore do not need to be considered further in the review and assessment. This conclusion has been further expanded in the report on the Review of the NAQS <sup>(3)</sup>, which proposes a more ambitious target of 1ppb as annual mean to be brought forward to 2003.

Details of large industrial processes were collated for the first stage review and assessment (see Appendix 4 and Maps 2 and 3) and from these -

**No relevant Part A or Part B industrial emission sources of 1,3 butadiene were identified (using LAQM.TG4 – Annexes 1 and 2) either within or sufficiently close to, or are planned before 2005, so as to impact significantly on the Council's area.**

#### 4.2.8 Conclusion

The first stage review and assessment has indicated that the risk of the 1,3-butadiene air quality objective being exceeded by the end of 2005 is considered negligible, in localities where there might be exposure of the public over a year.

The Reigate and Banstead Borough Council therefore need not undertake a second and/ or third stage review of 1,3-butadiene.

#### References

1. Expert Panel on Air Quality Standards (1994), 1,3-Butadiene.
2. DoE, (1993). Reducing Emissions of VOCs and Levels of Ground Level Ozone: A UK Strategy.
3. DETR (1999), Review of the National Air Quality Strategy



### 4.3 Carbon monoxide

#### Air Quality Standard and Objective

*The Government has adopted an 8-hour running average of 10ppm as an air quality standard for carbon monoxide (CO), with an objective for the standard to be achieved as the maximum 8-hour running average by the end of 2005. The focus of an authority's review and assessment for CO should be non-occupational, near ground level outdoor locations: background locations; roadside locations; and other areas of elevated CO concentrations where a person might reasonably be expected to be exposed over an 8-hour period (e.g. in the vicinity of housing, schools, or hospitals, etc.). This has been based on the recommended standard proposed by the Expert Panel on Air Quality Standards <sup>(1)</sup>.*

- 4.3.1 Carbon monoxide is a colourless gas produced from the incomplete combustion of hydrocarbon fuels. Although it can cause death at very high concentrations these tend to be when people are exposed in physically confined situations. Outdoors in ambient air the main threat to health is a reduction in the oxygen carrying capacity of the blood that may increase the risk of problems in individuals with ischaemic heart disease.
- 4.3.2 In the UK the largest source of carbon monoxide is motor vehicles. This is true on both a national basis and in terms of their contribution to total emissions in urban areas. Emission data indicate that petrol motor vehicles are responsible for about 75% of carbon monoxide emissions.
- 4.3.3 Carbon monoxide concentrations closely follow traffic activity patterns, with a diurnal variation due to rush-hour traffic activity, most notably in heavily trafficked areas and close to the roadside. Weather conditions also affect dispersion of carbon monoxide and these tend to produce higher concentrations in winter than during summer. For carbon monoxide this seasonal effect is enhanced by the influence of cold start emissions, an effect more significant in winter.
- 4.3.4 No monitoring of carbon monoxide has been undertaken in Reigate and Banstead's area. In London, exceedences of the EPAQS <sup>(1)</sup> recommended standard have occurred mainly at the roadside sites. Where exceedences occur at urban background sites it is generally because these sites are close to a major road or by either pedestrian crossings or traffic lights where vehicles stop and start, producing maximum carbon monoxide output. Generally, the recommended standard is exceeded every year, but mainly in heavily trafficked areas in winter.
- 4.3.5 The UK NAQS <sup>(2)</sup> show increases in concentration of approximately 3% per year in central London using measurements made by a number of sites and using a number of different techniques. Future projections of carbon monoxide emissions show a downward trend in emissions (both on a national basis and in London) from 1990 to the year 2010 (when the projections end). These are principally due to improvements in vehicle technology, which leads to Government predicting that there will be no exceedences of the EPAQS recommended standard for carbon monoxide, even under exceptional circumstances by the year 2010.

#### 4.3.6 Carbon monoxide sources relevant to the Reigate and Banstead Borough Council Stage 1 Review and Assessment

The pollutant specific guidance advises that busy roads, specific major industrial processes, areas with high levels of combined source emissions and planned developments need to be identified for the purposes of the first stage review and assessment.

Details of major roads were supplied by the Surrey County Council for the first stage review and assessment (see Appendix 3 and Map 1) and from these –

**The road sources identified (with greater than 50,000 vehicles per day and listed in Table 1) include:**

- **M25**
- **M23**
- **A217**

Details of large industrial processes were collated for the first stage review and assessment (see Appendix 4 and Maps 2 and 3) and from these;

**No relevant Part A industrial emission sources of carbon monoxide was identified (using LAQM.TG4 – Annex 1) either within or sufficiently close to, or planned before 2005, so as to impact significantly on the Council's area. (Note – Part B processes are not considered significant sources of carbon monoxide for the purposes of review and assessment).**

#### 4.3.7 Conclusion

The first stage review and assessment has indicated that the risk of the carbon monoxide air quality objective being exceeded by the end of 2005 is **not** negligible, in localities where there might be exposure of the public over a year.

The Reigate and Banstead Borough Council should therefore undertake a second stage review of carbon monoxide.

#### References

1. Expert Panel on Air Quality Standards (1994), Carbon Monoxide
2. Department of the Environment (1997), The United Kingdom National Air Quality Strategy

## 4.4 Lead

### Air Quality Standard and Objective

*The Government has adopted an annual average of  $0.5\mu\text{gm}^{-3}$  as an air quality standard for lead, with an objective for the standard to be achieved by the end of 2005. The focus of an authority's review and assessment for lead should be non-occupational, near ground level outdoor locations with elevated lead concentrations in areas where a person might reasonably be expected to be exposed over a year (e.g. in the vicinity of housing, schools, or hospitals, etc.). The air quality standard and objective are based on the revised WHO guideline of an annual mean of  $0.5\mu\text{gm}^{-3}$ .*

- 4.4.1 Lead exhibits toxic biological effects in people at both high and low concentrations. In conditions of low level, long-term exposure, critical effects include those on haem synthesis, erythropoiesis, the nervous system and blood pressure. Lead in atmospheric particles is therefore of great interest due to these adverse biological and ecological effects. It was the increase in concentration, medical evidence on the adverse health effects of lead (neurological effects on children) and subsequent public concern, that caused governments to act and legislate to try and reduce the emissions of lead into the environment.
- 4.4.2 High lead emissions have traditionally arisen due to its application as an anti-knock agent in petrol and its emission during industrial combustion processes. In the UK the main source of lead in air is vehicle-derived, with non-ferrous metal processing the second major source to the atmosphere.
- 4.4.3 In the UK the common vehicle-derived lead compounds represent some 0.2% of urban particulate matter. The average urban lead concentration is less than  $0.1\mu\text{gm}^{-3}$  with more than 90% found within the fine fraction<sup>(1)</sup>. Consequently, this concentration of lead within the sub-micrometre particulate range permits long-distance transportation within the atmosphere.
- 4.4.4 Since the mid-1980s the concentration of lead in air has fallen substantially at all site types in the UK. The lead concentration in urban areas has reduced from annual averages of  $770\text{ ngm}^{-3}$  (Brent) and  $646\text{ ngm}^{-3}$  (Central London) in 1980 to  $148\text{ ngm}^{-3}$  and  $74\text{ ngm}^{-3}$  respectively, in 1996. Kerbside sites have also seen an equally impressive decrease; at the Cromwell Road site concentrations have fallen from  $1370\text{ ngm}^{-3}$  in 1983 to  $151\text{ ngm}^{-3}$  in 1996. Industrial emissions have also gradually fallen, although these areas still have higher lead concentrations than both rural and urban areas, ranging from 100-  $1400\text{ ngm}^{-3}$ .
- 4.4.5 The trend in ambient lead concentration is now one of steady decline. The increased penetration of vehicles equipped with catalytic converters and the use of unleaded petrol will perpetuate this trend. The DETR has estimated that by 2015 the emission to the atmosphere of lead from petrol vehicles will decrease by more than 80% of 1995 values. Thus, in areas where traffic is the major source of lead the annual average should decline. However, it is estimated that in pockets of industrial activity individual plants may introduce significant amounts of lead into the atmosphere. At present such industrial processes are subject to BATNEEC and the EPA 1990 which allow process-dependent emissions to the atmosphere.

4.4.6 Therefore, within the UK the trend in lead concentration in ambient air, where traffic is the major source, should decrease in most urban areas to 100-200 ngm<sup>-3</sup>. The DETR expect the NAQS target to be realised by 2005 <sup>(2)</sup>.

4.4.7 In the UK the lead content was reduced from 0.4 to 0.15 g/l in 1986 and fiscal measures were also introduced to reduce the cost of unleaded petrol. As a result emissions of lead from petrol-engine vehicles, decreased from 8,400 tonnes in 1973 to 2,900 tons in 1986 (a 55% reduction of total lead in petrol) <sup>(3)</sup>. This occurred despite a 25% increase in petrol consumption.

#### 4.4.8 **Lead sources relevant to the Reigate and Banstead Borough Council Stage 1 Review and Assessment**

The pollutant specific guidance (LAQM.TG4 (98)) advises that the only relevant sources for the purposes of the first stage review and assessment sources are certain specific major industrial processes. The guidance also advises that existing national policies are expected to deliver the prescribed objective for lead at all urban background and roadside sites by 2005.

Details of large industrial processes were collated for the first stage review and assessment (see Appendix 4 and Maps 2 and 3) and from these -

**No relevant Part A or Part B industrial emission sources of lead were identified (using LAQM.TG4 – Annexes 1 and 2) either within or sufficiently close to, or are planned before 2005, so as to impact significantly on the Council's area.**

#### 4.4.9 **Conclusion**

The first stage review and assessment has indicated that the risk of the lead air quality objective being exceeded by the end of 2005 is considered negligible, in localities where there might be exposure of the public over a year.

The Reigate and Banstead Borough Council therefore need not undertake a second and/ or third stage review of lead.

#### References

1. Committee on the Medical Effects of Air Pollution (COMEAP) (1995), Non-Biological Particles and Health
2. Department of the Environment (1997), The United Kingdom National Air Quality Strategy
3. Department of the Environment (1996), Digest of Environmental Protection and Water Statistics No.18

## 4.5 Nitrogen dioxide

### Air Quality Standard and Objective

*The Government has adopted a 1-hour average of 150ppb as an air quality standard for nitrogen dioxide (NO<sub>2</sub>), with an objective for the standard to be achieved as the hourly maximum by the end of 2005. The Government has also adopted an annual average of 21ppb as an air quality standard with an objective to achieve this by the end of 2005. The focus of an authority's review and assessment should be non-occupational, near ground level outdoor locations with elevated NO<sub>2</sub> concentrations in areas where a person might reasonably be expected to be exposed over a year (e.g. in the vicinity of housing, schools, or hospitals, etc.). The focus of an authority's review and assessment for the hourly objective should be non-occupational, near ground level outdoor locations given that exposures over one hour are potentially likely in these locations. The one hour standard has been based on the recommended standard proposed by the Expert Panel on Air Quality Standards <sup>(1)</sup> and the further longer-term standard/ objective has been based on the WHO guideline of 21ppb as an annual mean.*

- 4.5.1 Nitrogen dioxide is a gas produced by the reaction of nitrogen and oxygen during combustion. The reaction usually takes place in two stages - first to form nitric oxide (NO) and secondly in time to form nitrogen dioxide (NO<sub>2</sub>). The sum of these two compounds is referred to as oxides of nitrogen (NO<sub>x</sub>). The majority of oxides of nitrogen emissions are in the form of nitric oxide (approximately 90-95% in motor vehicle exhaust) which is then oxidised by reaction with oxygen-containing compounds to form nitrogen dioxide. Nitric oxide is not considered harmful to people in the ambient atmosphere, nitrogen dioxide however is an irritant gas, which at high concentrations can have serious effects and even low concentrations are considered to have subtle effects on health, particularly on the respiratory system.
- 4.5.2 The major source of oxides of nitrogen is motor vehicles and this is reflected in the emissions inventories for the UK. The amounts of emissions given in these inventories are expressed as emissions of oxides of nitrogen. Nationally (for 1993) road transport was responsible for 49% of emissions of nitrogen oxides, with other notable contributions from power stations, other industrial combustion and shipping (including oil exploration and production)<sup>(2)</sup>.
- 4.5.3 Once released to the atmosphere, nitric oxide is rapidly oxidised to form nitrogen dioxide in a reaction with ozone. It is this availability of ozone and the primary emissions of nitrogen dioxide, which controls the proportion of nitrogen dioxide in nitrogen oxides. In an urban centre or street canyon location, the rapid reaction of nitric oxide with ozone can deplete the ozone concentration. Mapping of annual mean nitrogen dioxide concentrations in London <sup>(3)</sup> showed the highest annual means were found in the centre of London during 1995, with concentrations declining towards the suburbs in all directions. Roadside and kerbside sites typically show higher annual mean nitrogen dioxide concentrations, with sites in inner London also exhibiting higher annual mean nitrogen dioxide concentrations than sites in outer London.
- 4.5.4 It has been suggested that there are separate mechanisms responsible for 'summer' and 'winter' nitrogen dioxide pollution episodes <sup>(4)</sup>. During summer, under similar conditions to those that may give rise to elevated ozone concentrations, nitrogen dioxide levels may also

be enhanced. This occurs as result of the conversion of nitric oxide to nitrogen dioxide by organic peroxy radicals produced in the photochemical reactions, and also as a result of the direct reaction between nitric oxide and ozone. Such 'summer' episodes are characterised by high nitrogen dioxide/oxides of nitrogen ratios, as much of the oxides of nitrogen are in the form of nitrogen dioxide.

- 4.5.5 During winter episodes, the concentrations of oxides of nitrogen are high, and the ratio of nitrogen dioxide/oxides of nitrogen is only 0.1-0.3. The precise mechanism by which the high levels of nitrogen dioxide are generated is not currently fully understood, but it is thought that the reaction between nitric oxide and oxygen may play a prominent role. During winter air pollution episodes, oxides of nitrogen concentrations can increase dramatically and during one notable episode which occurred in December 1991 concentrations of nitrogen dioxide reached 423ppb at Bridge Place (near Victoria Station), the highest levels recorded since continuous measurements began. Although this was exceptional, winter episodes occur often, and are difficult to manage as they are largely driven by meteorology.
- 4.5.6 The Council at a combined total of 20 kerbside, intermediate and background sites has carried out non-continuous monitoring using diffusion tubes. The annual mean for nitrogen dioxide was exceeded at the five kerbside sites between April 1995 and March 1996, whereas there was an exceedence at only one of sites during the following year. There was no exceedence at any intermediate or background site for either year <sup>(5)</sup>.
- 4.5.7 Reductions of nitric oxide emissions would reduce peak nitrogen dioxide winter concentrations effectively, by reducing total oxides of nitrogen concentrations, whereas, in summer, a much larger reduction of nitric oxide is likely to be needed before a significant reduction in concentration of nitrogen dioxide will result. It should be noted that any reduction in oxides of nitrogen, however, could cause the undesired effect of increasing ozone concentrations.
- 4.5.8 Catalytic converters significantly reduce emissions of nitrogen oxides (nitrogen dioxide equivalent) from petrol-driven vehicles. These, together with other improvements in vehicle and fuel technology, are largely responsible for the estimated reductions in emissions of oxides of nitrogen. The benefits are likely to be overcome in time by the predicted increase in number of vehicles on the road, which will increase emissions for a number of largely vehicle-derived pollutants after about 2010.
- 4.5.9 **Nitrogen oxide sources relevant to the Reigate and Banstead Borough Council Stage 1 Review and Assessment**

The pollutant specific guidance advises that busy roads, specific Part A and B industrial processes and areas with an annual mean nitrogen dioxide urban background level greater than 30ppb need to be identified for the purposes of the first stage review and assessment.

Details of major roads were supplied by the Surrey County Council for the first stage review and assessment (see Appendix 3 and Map 1) and from these –

**The traffic sources identified for those roads with more 20,000 vehicles annual average daily traffic flow (listed in Table 1) include:**

- **M25, M23, A217, A23, A2044, B2221, A25**

Details of large industrial processes were collated for the first stage review and assessment (see Appendix 4 and Maps 2 and 3) and from these -

**No relevant Part A or Part B industrial emission sources of nitrogen dioxide were identified (using LAQM.TG4 – Annexes 1 and 2) either within or sufficiently close to, or are planned before 2005, so as to impact significantly on the Council's area.**

#### 4.5.10 Conclusion

The first stage review and assessment has indicated that the risk of the nitrogen dioxide air quality objectives being exceeded by the end of 2005 is **not** negligible.

The Reigate and Banstead Borough Council should therefore undertake a second stage review of nitrogen dioxide.

#### References

1. Expert Panel on Air Quality Standards (1994), Nitrogen dioxide
2. Department of the Environment (1995) Digest of Environmental Statistics, No 17
3. South East Institute of Public Health (1996) Air Quality in London 1995, The Third Report of the London Air Quality Network.
4. AGMAAPE (1993), Oxides of Nitrogen, HMSO, London.
5. Surrey CEHO Group et al. (1998). Air Quality Report for Surrey (April 1995 – March 1997)

## 4.6 PM10

### Air Quality standard and objective

*The Government has adopted a running 24-hour average of  $50\mu\text{g}/\text{m}^3$  as an air quality standard for PM10, with the objective for the standard to be achieved as the annual 99<sup>th</sup> percentile of daily maximum running 24-hour averages (that is no more than four days exceeding the standard in a year), by the end of 2005. The focus of an authority's review and assessment for PM10 should be non-occupational, near ground level outdoor locations with elevated PM10 concentrations in areas where a person might reasonably be expected to be exposed over a 24 hour period (e.g. in the vicinity of housing, schools, or hospitals, etc.). This has been based on the recommended standard proposed by the Expert Panel on Air Quality Standards <sup>(1)</sup>.*

*The DETR have advised that this objective is likely to change in the light of further research and suggested that it be revised to  $40\mu\text{g}/\text{m}^3$ , measured as the annual mean, and  $50\mu\text{g}/\text{m}^3$ , as a fixed 24 hour mean, with a maximum of 35 exceedences per year (approximately equivalent to the 90<sup>th</sup> percentile) to be achieved by 31.12.2004. This is based on the proposed EC Air Quality Daughter Directive Stage 1 level.*

- 4.6.1 Fine particulate matter, or PM10, is usually defined as particulate matter with a mean aerodynamic diameter less than  $10\mu\text{m}$ ). Fine particulate matter can penetrate deep into the lung where no removal mechanism exists and the effects on health have been examined by epidemiological studies of populations focusing on mortality and morbidity <sup>(1), (2), (3), (4)</sup>.
- 4.6.2 Particulate matter in the atmosphere may be classified as either primary or secondary. Primary particles are generated directly from sources such as fossil fuel burning, road vehicles, wind-blown dust and seaspray. Secondary particles are formed within the atmosphere by a series of chemical reactions and/or by the condensation of gases. Both weather and season affect secondary particle generation. Both primary and secondary particles have natural and anthropogenic sources. Natural sources include sea spray, natural fires, soil dust and volcanoes. The most relevant are soil dust and seaspray (seasalt is measured at most inland locations in the UK).
- 4.6.3 Many processes including combustion, metallurgical processes, quarrying, mining, demolition and construction produce anthropogenic particulate matter. Industrial particulate matter emissions typically consist of large particles, for example from the construction industry, where particulate matter emissions are normally caused by the abrasion of material, producing particles with high settling velocities, which travel short distances. The effect of such sources can be very marked locally.
- 4.6.4 In the urban environment particles from the erosion of road, pavement and other surfaces such as vehicles tyres can be suspended into the atmosphere. Particles  $>5\mu\text{m}$  consist mainly of sea salt, although in winter it is difficult to identify the source of some salt particles.
- 4.6.5 In London, road transport is the dominant source of PM10 although other anthropogenic sources (e.g. construction, mining or combustion processes) may also produce elevated particulate matter concentrations although these fugitive dust emissions have a more



localised effect. It is important to note that emissions from these fugitive sources of PM10 are very difficult to estimate.

- 4.6.6 Very fine particles below 1  $\mu\text{m}$  in diameter may remain suspended in the atmosphere for weeks, whereas those greater than 2.5  $\mu\text{m}$  are removed by settling and rain in a matter of hours. The very fine particles can drift for many miles and cause pollution across national boundaries. They can also penetrate into buildings and therefore indoor environments are unlikely to provide protection from exposure.
- 4.6.7 Earlier studies of urban pollution have shown particles to be predominantly fine, although the chemical composition of PM10 in the UK is not well defined and the quantification of sources is still the subject of research.
- 4.6.8 In urban areas, the annual mean PM<sub>10</sub> concentration is fairly uniform across the UK, falling between 15 and 35  $\mu\text{g m}^{-3}$ . In London and other metropolitan areas, where vehicles are a major source of PM10, the annual concentration is higher. Measurements of PM10 at the roadside have been found to be some 2.5 to 3 times higher than background sites.
- 4.6.9 In 1995, the London Air Quality Network had 8 sites continuously monitoring PM10 mass concentrations. These sites were found to have closely related annual means; and 98th percentile values indicated that at these sites there is uniformity in urban PM10 concentrations with little variation between urban sites. There were exceedences of the EPAQS recommended standard in summer. Currently the only continuous monitoring of particles in nearby in Surrey is at Mole Valley, which started operating in April 1997.
- 4.6.10 Two distinct types of seasonal (summer and winter) exceedence episodes have been identified, both of which are weather related and are characterised by anticyclonic conditions. Elevated concentrations of PM10 during summer were characterised by light winds, high temperatures and clear skies. In the summer, the daily profiles have a single undefined peak, which is accounted for by the increased production of secondary particles in the atmosphere. The winter months are characterised by light winds, low temperatures and shallow mixing layer depths. The winter episodes are thought to be due to two distinct sources:
- a) Industrial: which should exhibit strong correlation with sulphur dioxide, carbon monoxide and PM10.
  - b) Vehicles: which should exhibit strong correlation with nitrogen dioxide, carbon monoxide and PM10.

The winter diurnal variation exhibited by roadside and urban background sites reflects the emission of primary particulates derived from vehicles. The contribution from vehicles will be in the fine particle fraction and although they may contribute greatly to the number of particles, their mass contribution will be negligible.

**4.6.11 PM10 sources relevant to the Reigate and Banstead Borough Council's Stage 1 Review and Assessment**

The pollutant specific guidance (LAQM.TG4 (98)) advises that:

specific Part A and B industrial processes  
roads with an annual average daily traffic flow of more than 25,000 vehicles  
areas with emissions from low level sources greater than 10 tonnes in any single 1 km x 1km grid square (or average 5 tonnes in several adjacent grid squares)  
and areas with an annual background concentration due to secondary particles greater than  $8 \mu\text{gm}^{-3}$

need to be identified for the purposes of the first stage review and assessment.

Details of large industrial processes were collated for the first stage review and assessment (see Appendix 4 and Map 2 and 3) and from these -

**No relevant Part A industrial emission sources of nitrogen dioxide were identified (using LAQM.TG4 – Annex 1) either within or sufficiently close to, or planned before 2005, so as to impact significantly on the Council's area.**

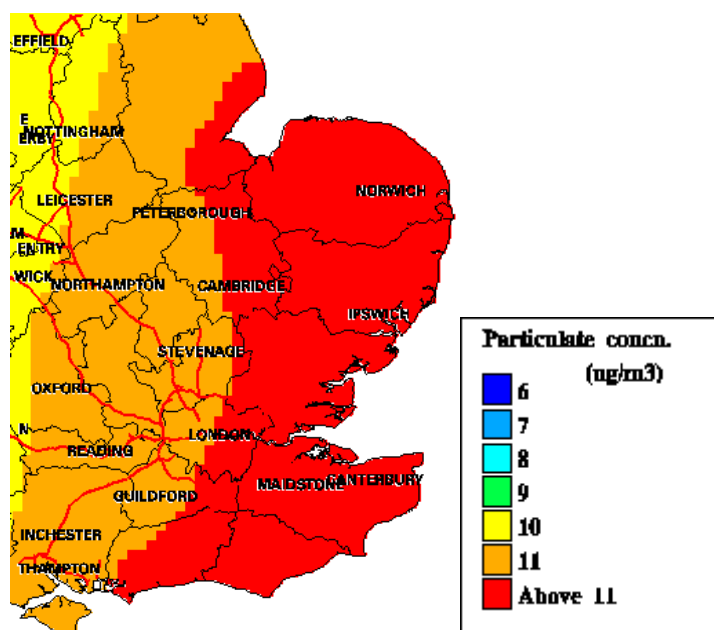
**Part B industrial processes were identified within the Council's area. These are a sand drying process, concrete crushing and quarry processes and a film coating process (Appendix 4).**

Details of major roads were supplied by the Surrey County Council for the first stage review and assessment (see Appendix 3 and Map 1) and from these –

**The roads with daily vehicle flow greater than 25,000 listed in Table 1. These include the M25, M23, A217, A23**

Details of areas with an annual background due to secondary particles greater than  $8 \mu\text{gm}^{-3}$  are as follows;

**The following map from the DETR website (<http://www.environment.detr.gov.uk/airq/aqinfo.html>) shows the concentration of secondary particles for the whole of the Council's area is greater than  $8 \mu\text{gm}^{-3}$ .**



#### 4.6.12 PM10 sources relevant to the Reigate and Banstead Borough Council's Stage 1 Review and Assessment in relation to the proposed EU Stage 1 Limit Values

The assistance document advises that:

Estimated annual mean background PM10 concentrations for 2004

Traffic data for existing or proposed roads with AADT flows over 5000

Roads and road sections with daily average vehicle speeds of less than 12.5 mph and/or HGV proportions of more than 12%

Information on domestic fuel use

Information on existing or proposed Part A and B authorised processes

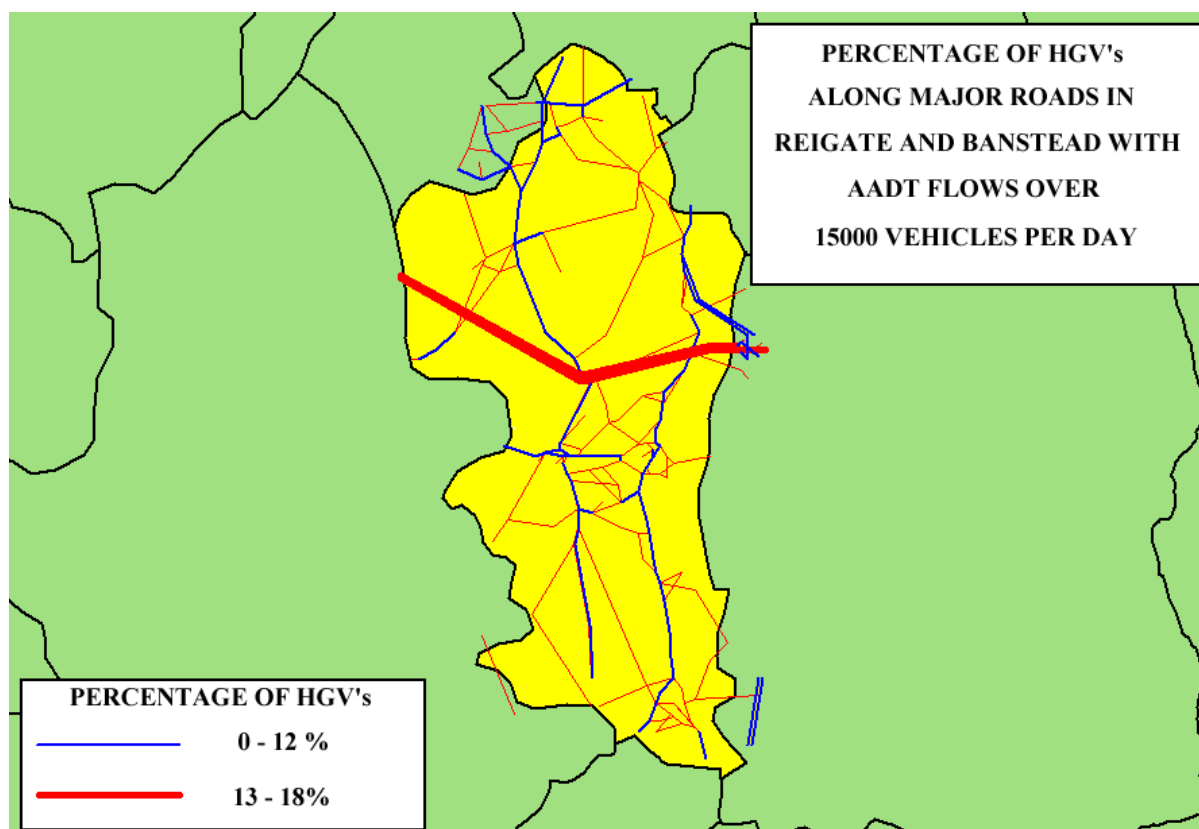
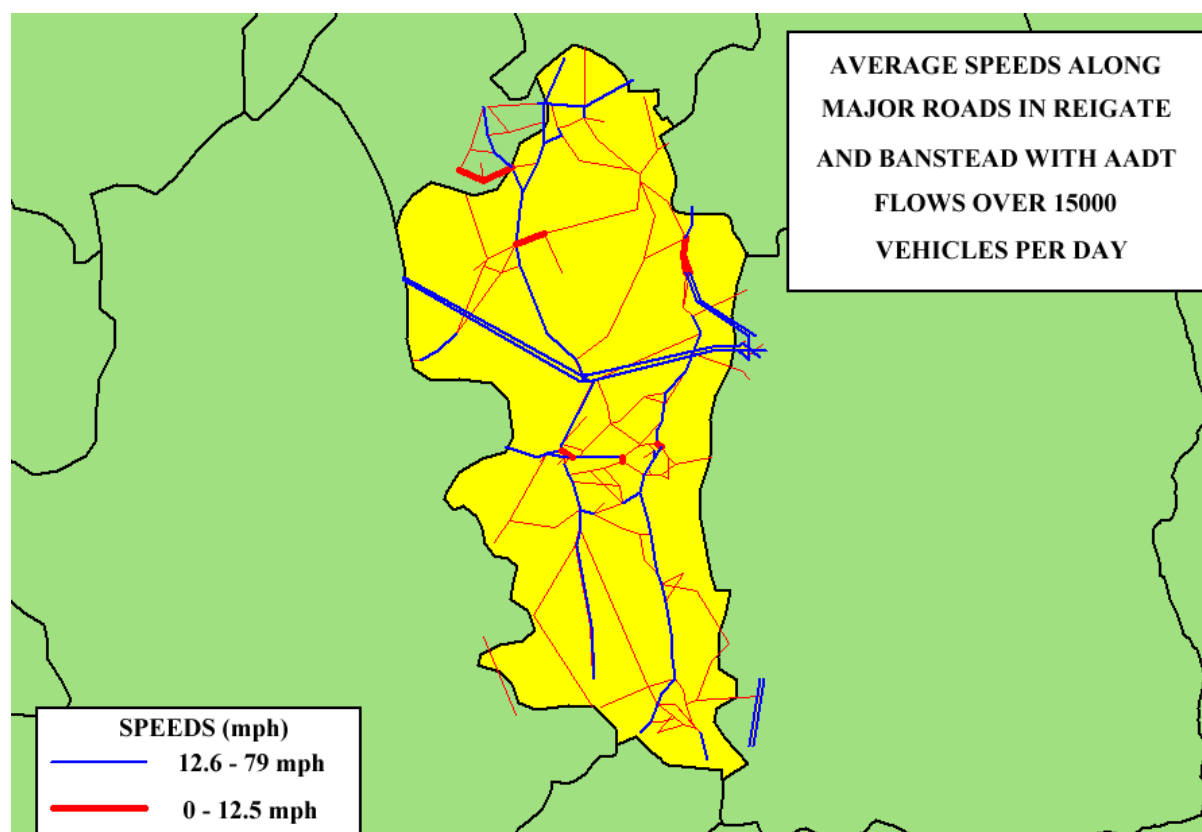
Information on sources of uncontrolled or fugitive dust emissions

Details of planned developments, particularly if they will affect traffic flows

Details of significant sources of PM10 in neighbouring areas which could impact within the authority's area

need to be identified for the purposes of the first stage review and assessment.

Major roads within the Council's area with daily average vehicle speeds of less than 12.5 mph and roads with HGV proportions of more than 12% were identified:



#### 4.6.13 Conclusion

The first stage review and assessment has indicated that the risk of the PM<sub>10</sub> air quality objective being exceeded by the end of 2005 is **not** negligible, across the whole of the Council's area.

The Reigate and Banstead Borough Council should therefore undertake a second stage review of PM<sub>10</sub>.

*The information collated with regard to the proposed EU Stage 1 Limit Value for PM10 also indicates that a second stage review and assessment is required due to the influence of road traffic on the PM10 objective and the proximity of major industrial sources to the Council's area.*

#### References

1. Expert Panel on Air Quality Standards (1995), Particles
2. Committee of the Medical Aspects of Air Pollutants (COMEAP) (1995a) Report on Air Pollution and Asthma
3. Committee of the Medical Aspects of Air Pollutants (COMEAP) (1995b) The Effects of Outdoor Airborne Non-biological Particles on Health
4. Dockery, D. W. et al (1993) An association between air pollution and mortality in six US cities. N. Engl. J. Med., 329, 1753 - 1759
5. QUARG(1993), Diesel vehicle emissions and urban air quality
6. South East Institute of Public Health (1997) The AIM report and Air Quality in London 1996, The Fourth Report of the London Air Quality Network.

## 4.7 Sulphur dioxide

### Air Quality Standard and Objective

*The Government has adopted a 15-minute average of 100ppb as an air quality standard for sulphur dioxide (SO<sub>2</sub>) with the objective for the standard to be achieved as the 99.9<sup>th</sup> percentile (that is, on all but 35 periods of 15 minutes per year), by the end of 2005. The focus of an authority's review and assessment for SO<sub>2</sub> should be on any non-occupational, near ground level outdoor locations given that exposures over 15 minutes are potentially likely in these locations. This has been based on the recommended standard proposed by the Expert Panel on Air Quality Standards <sup>(1)</sup>. There were a large number of exceedences of the recommended EPAQS standard in London during 1995<sup>(2)</sup>.*

- 4.7.1 Sulphur dioxide is an irritant colourless gas, which has been recorded at ambient concentrations as high as 800 µgm<sup>-3</sup>. Sulphur dioxide is closely associated with particulate matter, which carries on its surface pollutants such as sulphates, nitrates and lead. Acid aerosols are an example of how particulate matter and sulphur dioxide can be closely associated. These are produced from sulphur dioxide, nitrogen dioxide and other acid gases being adsorbed onto particulate matter. Medical evidence has indicated that acid aerosols have an adverse effect upon the respiratory system. <sup>(1)</sup>
- 4.7.2 Nationally, the main sources of sulphur dioxide have changed in the past few decades. Before the 1960s the main source of sulphur dioxide emissions in urban areas was coal burning. During the 1960s, there began a shift from coal/oil towards natural gas as the main source of domestic fuel. This change in fuel usage was coupled with a shift towards the establishment of large coal and oil burning power stations in rural areas. Thus, after the passing of the Clean Air Act 1956 and the move towards the increased use of natural gas, sulphur dioxide emissions fell considerably and altered the pattern of emissions, concentrating these in rural areas. Today, therefore, electricity generation by fossil fuel combustion is concentrated in large power stations with tall chimneys, generally situated in rural areas<sup>(1)</sup>. Changes in the sulphur dioxide emission pattern across the United Kingdom have been responsible for an overall decrease in sulphur dioxide concentrations of more than 50% since 1975.
- 4.7.3 There are many sources of SO<sub>2</sub> including power stations, shipping, refineries and non-combustion processes. Nationally, the main source of sulphur dioxide is from power generation; more than 70% of emissions are accounted for by electricity generation alone. The combustion of diesel fuel in motor vehicles is another source of sulphur dioxide. Nationally, this source only accounts for some 2% of sulphur dioxide emissions. In London however, the combustion of diesel fuel has a significant effect on sulphur dioxide emissions, and road transport contributes more than 20% of the sulphur dioxide emissions. Diesel engines emit more sulphur dioxide than petrol engines and the sulphur content of diesel fuels has been reduced from 0.2% by weight to less than 0.05%.
- 4.7.4 It is important to note that whilst large combustion sources do not represent the largest source of sulphur dioxide in London, in terms of the impact on London's air quality it may be the most important, particularly during plume grounding events. For example, the annual average concentration at the Cromwell Road kerbside site is consistently about 10 ppb higher than

that at the background site at Bridge Place. This difference is thought to be due to the sulphur dioxide emissions from diesel exhaust. Peak concentrations occur at the same time at the two sites, however, indicating that there is another source, which may contribute to these peak concentrations such as the grounding of plumes from tall chimney stacks.

- 4.7.5 Emissions are dominated by a few large rural point sources. The pollutants from tall chimney stacks are generally emitted above the temperature inversion and thus the characteristic high concentrations of sulphur dioxide during cold winter smogs no longer occur. The long-term average concentrations in urban areas have greatly decreased. Today, sulphur dioxide pollution is characterised by short-term peak conditions, downwind from power stations where the plume reaches ground level or 'grounds'.
- 4.7.6 Continuous monitoring of sulphur dioxide is carried out by nearby Mole Valley District Council and the results from 1997 indicate there were no exceedences of the NAQS standard for sulphur dioxide <sup>(3)</sup>.
- 4.7.7 In London the annual mean and hourly maximum sulphur dioxide concentration is higher at the London roadside sites than at urban background locations identifying the influence of London sources on sulphur dioxide concentration. In fact the highest annual mean concentrations are found at Southwark 2, Wandsworth 2 and Barking with the lowest at Greenwich and Bexley. Mean concentrations are lower at background locations in London, and further reduce towards outer London, with lowest values being found at the rural Lullington Heath site in Sussex.
- 4.7.8 **Sulphur dioxide sources relevant to the Reigate and Banstead Borough Council Stage 1 Review and Assessment**

The pollutant specific guidance advises that: specific Part A and B industrial processes; solid fuel combustion sources greater than 5MW thermal power; and emissions from low level sources greater than 40 tonnes in any single 1 km x 1km grid square - are required for the purposes of the first stage review and assessment.

Details of large industrial processes were collated for the first stage review and assessment (see Appendix 4 and Maps 2 and 3) and from these the following sources were identified:

**No relevant Part A or Part B industrial emission sources of sulphur dioxide were identified (using LAQM.TG4 – Annexes 1 and 2) either within or sufficiently close to, or are planned before 2005, so as to impact significantly on the Council's area.**

**No other potentially significant sources or high concentration of low level emission sources were identified.**

4.7.9 **Conclusion**

The first stage review and assessment has indicated that the risk of the sulphur dioxide air quality objective being exceeded by the end of 2005 is negligible.

The Reigate and Banstead Borough Council therefore need **not** undertake a second stage review of sulphur dioxide.

References

1. Expert Panel on Air Quality Standards (1995) Sulphur Dioxide
2. South East Institute of Public Health (1996) The Third LAQN Annual Report
3. South East Institute of Public Health (1999) The Fifth LAQN Annual Report



## **5.0 Conclusion and Recommendation**

This report on Stage 1 of the Review and Assessment for the Reigate and Banstead Borough Council provides detailed information on specific atmospheric emissions and their sources to satisfy the initial requirements of the Environment Act 1995. This then enables the Council to make decisions on the need or not to proceed with the next Stage of the Review and Assessment.

The information provided has highlighted that, for the following pollutants, no further action need be taken:

Benzene  
1,3-Butadiene  
Lead  
Sulphur dioxide

**However this report suggests that further investigation is needed for the remaining pollutants for which air quality objectives for 2005 have been set:**

**Carbon monoxide  
Nitrogen dioxide  
PM<sub>10</sub>**

**The Council is therefore recommended to undertake Stage 2 of the Local Air Quality Management Review and Assessment process for these pollutants.**

## **Appendices**

1. List of U.K National Air Quality Strategy standards/objectives
2. Summary of Stage 1 source guidance
3. Table 1 provides details of the mapped road links

*These details are provided in relation to*

- **Nitrogen dioxide**
- **PM<sub>10</sub>**
- **Carbon monoxide**

4.
  - i) Table 2 provides details of Part B sources
  - ii) Table 3 provides details of Part A sources

*These details are provided in relation to:*

- **Sulphur dioxide**
- **Nitrogen oxides**
- **Carbon monoxide**
- **Lead**

## Appendix 1

<b>Pollutant</b>	<b>Standard</b>	<b>Objective for 2005</b>
<b>Benzene</b>	5ppb running annual mean	5ppb running annual mean
<b>1,3-butadiene</b>	1ppb running annual mean	1ppb running annual mean
<b>Carbon monoxide</b>	10ppm running 8 hour mean	10ppm running 8 hour mean
<b>Lead</b>	0.5µg/m <sup>3</sup> annual mean	0.5µg/m <sup>3</sup> annual mean
<b>Nitrogen dioxide</b>	150ppb - one hour mean 21ppb - annual mean	150ppb - one hour mean 21ppb - annual mean
<b>PM10</b>	50µg/m <sup>3</sup> running 24 hour mean	50µg/m <sup>3</sup> running 24 hour mean (measured as 99th percentile)
<b>Sulphur dioxide</b>	100ppb - 15 minute mean	100ppb - 15 minute mean (measured as 99.9th percentile)
<b>Ozone</b>	50ppb running 8 hour mean	50ppb running 8 hour mean (measured as 97th percentile)

<b>Existing Objective</b>	<b>Proposed Objective</b>
50 µgm <sup>-3</sup> , measured as the 99 <sup>th</sup> percentile of the daily maximum running 24 hour mean (equivalent to 4 exceedences per year), to be achieved by 31.12.2005	40 µgm <sup>-3</sup> , measured as the annual mean, and 50 µgm <sup>-3</sup> , as a fixed 24 hour mean, maximum of 35 exceedences per year (approximately equivalent to the 90 <sup>th</sup> percentile) to be achieved by 31.12.2004
Objective is based on measurements carried out using the TEOM analyser, or equivalent	Objectives are based on the European gravimetric transfer reference sampler or equivalent

(Note the proposed NAQS objective is based on proposed EU Stage 1 Limit Values)

## Appendix 2

Information to be collated for First Stage (from LAQM.TG4(98))

### Carbon monoxide

- Roads - links with AADT flow > 50,000
- Industrial - Part A process (as listed)
- Areas - 1 km x 1 km with low level annual emissions > 2,000tonnes in 2005

### Benzene

- Industrial - Part A/B processes (as listed in Annexes 1 and 2)

### 1,3-butadiene

- Industrial - Part A/B processes (as listed in Annexes 1 and 2)

### Lead

- Industrial - Part A/B processes (as listed in Annexes 1 and 2)
- industrial or other sites with non-prescribed processes with the potential to emit significant quantities of lead

### Nitrogen dioxide

- Areas - with annual mean background in 1996 >30ppb
- existing sources measured >30ppb
- Roads - links with project AADT flow > 20,000 in 2005
- Industrial - Part A/B processes (as listed in Annexes 1 and 2)

### PM10

- Area - urban areas for which annual average regional background due to secondary particles is > 8ug/m<sup>3</sup>
- emissions from low level sources > 10tonnes in single 1km x 1km grid square (or over 5tonnes in several adjacent grid squares)
- Industrial - Part A/B processes (as listed in Annexes 1 and 2)
- industrial process that emits significant quantities of dust (as PM10) from uncontrolled or fugitive sources
- Roads - links with project AADT flow > 25,000

### Sulphur dioxide

- Industrial - Part A/B processes (as listed in Annexes 1 and 2)
- solid fuel or fuel oil system with thermal power greater than 5MW
- Areas - 1 km x 1 km with low level annual emissions > 40tonnes

Table 1 Traffic flows of roads in the Reigate and Banstead Borough Council's area  
(AADT - data supplied by the Surrey County Council)

MAP ID	Road Description 1	Road Description 2	AADT Flow (1995)
1	Junction 7 M25 / Junction 8 M23	Junction 8 M25	115034
2	Junction 8 M25	BDY Reigate and Banstead (M25)	106169
3	Junction 10 M23	M23 / B2036	80984
4	Junction 7 M25 Across the Junction		76601
5	Junction 8 M25 Across the Junction		69771
6	Junction 8 M25 Slip		56555
7	A217/B2032	A217/A240	55180
8	Junction 7 M23	BDY Reigate and Banstead (A23)	45959
9	A217/A2022	BDY Reigate and Banstead (A217)	43832
10	A217/B2221	A217/B2219	42956
11	BDY Reigate and Banstead A23	Junction 7 M23	42103
12	A217/A2022 (over Junction)		39778
13	Junction 8 M23 Across the Junction		36835
14	Junction 8 M25	A217/Babylon Lane	36162
15	Junction 8 M23 Across the Junction		35416
16	Junction 7 M25 / Junction 8 M23	?	33593
17	A217/A240	A217/B2221	33551
18	A23 ?	A23/A2044	33288
19	A217/Junction 8 M25	A217/B2032	33047
20	Junction 8 M25/A217	?	32908
21	A217/B2032 Junction		29726
22	A25/A217 Junction		29155
23	A217/B2032	Along the B2032	28392
24	A25/A217 Junction	Along the A217	27749
25	A25/A217 Junction	Along the A25	27369
26	A217/B2219	A217/A2022	27317
27	A217/A2044 Junction	Along the A217	27231
28	A25/A217 Junction	Junction 8 M25/A217	26176
29	M25/M23 Junction		26130
30	A23/B2036	A23/A2044	25605
31	A25/A217 Junction	Along the A25	25472
32	Junction 8 M25		25107
33	A217/A23	?	24793
34	Junction 7 M25	Junction 8 M3	24402
35	A25/A217 Junction	Along the A217	24314
36	A25/A217 Junction	Along the A25	24065
37	A23/A25		23920
38	A25/A217 Junction	Along the A217	23804
39	A25/A23		23687
40	A2044/A217		23424
41	A242/A23	A25/A23	23373
42	A2044/A217	A217 Hookwood	22991
43	A23/A25	Along the A23	22919
44	A23/A25	A23/A2044	22615
45	A23/A25	Along the A23	22403
46	A217/A240	A240/B2221	22311
47	A217/A2022	A2022/B2218	22018
48	A240/B2221	A240/B284	21997
49	Junction 7 M25	Junction 8 M23	21164
50	A25/A217 Junction	Along the A25	20829
51	A23/M25		20723
52	A2022/B2218	A2022/B278	20723
53	A2044/A217 Junction	Along the A2044	20478
54	A25/A217 Junction	Along the A25	20472
55	A2044/A23	A23 Salfords	20443
56	A23/A25 Junction	Along the A23	20350
57	A23/B2036	A23 Horley	20194
58	A25/A217 Junction	Along the A25	20067
59	A217/A2022	A2022/B2219	19997
60	A23/M25		19782
61	B2221/B290		19675
62	A2022/B2218 Junction	Along the B2218	19610
63	A25/A217 (A2944)		19231
64	A240/B284	A240/A2022	19100

Table 2: Details of Part A Industrial Processes in the Vicinity of Reigate and Banstead Borough Council

ID Number From Map	Operator	Borough	Type of Process	Potential to release significant quantities of:						
				Benzene	1,3 Butadiene	Lead	Carbon Monoxide	Sulphur Dioxide	Nitrogen Dioxide	PM10
1	Walton Plating Ltd	Elmbridge	Inorganic			*	*	*	*	*
2	Englehard Clal UK Ltd	LB Kingston upon Thames	Non Ferrous Metals			*	*	*	*	*
3	Philips Printed Circuits (UK) Ltd	Croydon	Halogens process					*	*	
4	Walerisation (UK) Ltd.	Croydon	Inorganic			*	*	*	*	*
5	Frys Metals Ltd	Sutton	Non Ferrous Metals			*	*	*	*	*
6	Cairn Energy Onshore Ltd	Tandridge	Petroleum Extraction	*	*		*	*	*	*

**PROCESSES NON RELEVANT TO FURTHER LAQM REVIEW AND ASSESSMENT**

ID Number From Map	Company Name	Process	Easting	Northing
2	Crash Repair Centre (Riders) Ltd.	Vehicle Respraying	528642	152577
3	Walton Coachworks	Vehicle Respraying	523196	155546
5	Ready Mix Concrete (South East) Ltd	Blending, Packing and Loading of Bulk Cement	528047	146088
7	Witmun Engineering	Waste Oil Burner (less than 0.4 MW)	528606	152335
8	The Repair Centre	Vehicle Respraying	528047	146402

**POTENTIAL PM10 EMISSION SOURCES**

ID Number From Map	Company Name	Process	Easting	Northing
1	Zonal Ltd	Film Coating Process	527705	150349
4	Callaghan Demolition Ltd.	Quarry Process, Concrete Crushing *2	524208	155232
6	Hepworth Minerals and Chemicals Ltd	Sand Drying and Cooling	528780	152684