FRONT PAGE

Summary

This report has been produced as part of Winchester City Council's statutory duties under the Air Quality Regulations 1997 to assess the air quality within its' District. The Department of the Environment, Transport and Regions (DETR) has issued guidance regarding these duties, which specifies a three staged approach for predicting the levels of 7 key pollutants against air quality targets for 2005. This report covers the stage 1 assessments, which involves the use of existing data available both locally and nationally to quantify the necessity for further detailed assessments. It also makes recommendations for the scope of subsequent stage 2 and 3 assessments.

In conclusion, it is considered that only Nitrogen Dioxide, Particulate Matter (PM10's) and Carbon Monoxide require further assessment. Of these, additional capital costs are recommended only for further PM10 studies. These additional stage 2 or 3 assessments need to completed before the end of 1999 and will be the subject of further specific detailed reports.

Contents

1.0 Introduction

The Air Quality Regulations 1997 place a duty on each Local Authority to conduct an air quality assessment of its District. This assessment has to consider the following pollutants, with standards that should be achieved by the year 2005.

Carbon Monoxide (CO)	10ppm	(8 hour running mean)
Benzene	5ppb	(running annual average)
1,3 Butadiene	1ppb	(running annual average)
Lead	0.5$\mu g/m^3$	(running annual average)
Nitrogen Dioxide (NO_2)	150ppb	(hourly average)
	and 21ppb	(annual average)
Particulates (PM10)	50$\mu g/m^3$	(running 24 hour average)
Ozone	50ppb	(8 hour running mean) *
Sulphur Dioxide (SO_2)	100ppb	(15 minute average)

Except for Lead, these standards were derived by the Expert Panel on Air Quality Standards (EPAQS) and have now been incorporated into the National Air Quality Strategy. Detailed guidance on all aspects of conducting such an assessment has recently been issued by the Department of the Environment, Transport and the Regions (DETR) and the most important of these documents is the "Review and Assessment, Pollutant Specific Guidance". This introduces a 3 staged approach to reviewing the above pollutants, except for the secondary pollutant Ozone for which a review is not required.

This report follows the format and concepts laid out within this guidance with separate chapters dealing with each specific pollutant of concern. **It covers only the stage 1 assessments together with recommendations for appropriate stage 2 and 3 work.** The stage 2 and 3 assessments will then be the subject of additional reports within 1999.

Stage 1 - The compilation of existing data sources to predict the likelihood of air quality failures. This considers potential significant sources for the pollutant, if these are absent then the likelihood of failures can be considered minimal and further investigations are thus not required.

Stage 2 – The use of simple emission inventories, dispersion models and indicative or lower accuracy quantitative monitoring devices to obtain further information on the pollutant of concern. This should enable a better understanding of the likely extent, if any, of the problem. Where failures in the air quality standards are still likely then a stage 3 assessment has to be performed. On occasion, a combination of stage 2 and 3 methodologies will be required to obtain sufficient information.

Stage 3 – This is the use of detailed modelling, emission inventories and monitoring to obtain accurate information on the level and extent of current failures. This will allow detailed projection as the likelihood of failures occurring after 2005 without additional intervention. Where such is predicated then an Air Quality Management Area (AQMA) will have to

be declared for that pollutant. The stage 3 investigations have thus to be sufficiently detailed in order to draw up such an action plan. Further discussion on AQMA's will be provided at a later date together with all appropriate stage 3 reports.

This staged approach has, to some extent, been pre-empted by the real time monitoring data that is already being performed within Winchester town centre. Since May 1996 real time monitoring has been performed for PM10's, CO and NO_2, jointly by Winchester City and Hampshire County Councils, at two locations within the town centre. Further information on this monitoring is included in Appendix 5. Although such information could be classified as a stage 3 approach it is sensible to utilise such data summaries in making appropriate stage 2 assessments.

This report includes an introduction to each pollutant but has deliberately not covered the health concerns regarding each pollutant. Such information has already been produced separately in an information pack, which is available from the Environmental Health Department.

2.0 Carbon Monoxide (CO)

2.1 Background Information

In the UK the major source of Carbon Monoxide is from road transport, which in 1996 accounted for an estimated 71 percent of total emissions. This is one of the pollutants that has been monitored in real time within Winchester town centre since May 1996, as detailed in Appendix 5. The Government has adopted a standard of 10ppm as a running 8-hour average, to be met by 2005. It is anticipated by the guidance "that failures in 2005 are only anticipated in the near vicinity of heavily trafficked roads or in the vicinity of certain stationary sources. It is expected, for this pollutant, that most local authorities will not need to progress past the first stage."

2.2 First Stage Review

There are 3 stage one criteria in assessing the necessity for detailed assessments for Carbon Monoxide. These are listed below together with the relevant data used in making such an assessment.

2.21 Road links with current or projected annual daily traffic flow greater than 50,000

Traffic flow data is listed in Appendix 1, data was provided by both WSP of Basingstoke and Hampshire County Council. The 1997 National Road Traffic Forecasts (NRTF) recommends using of 3.2 percent growth per annum in order to predict future traffic flows. Also included in Appendix 1 is an extract from "Transport Monitoring in Hampshire 1998" which shows actual traffic increases on the M3 between 1993 and 1997. The percentage increases between 1996 and 1997 were between 1.8 percent for junction 10 and 11 and 5.9 percent between junctions 11 and 12. Even larger increases were recorded in previous years but these must be set against the expected increases in traffic usage following the completion of the Twyford Down motorway link between junctions 10 and 11. Therefore the current traffic flow data has been projected using both a 3.2 and 5 percent annual growth. The data available for both directions of flow supports the assumption that flows are comparable in both directions. Thus where data is available only for one direction of flow, the total flow has been taken to be twice this figure. These results are shown in table 1 below:

Road Location	Predicted 2005 Average Daily Traffic Flows (3.2% Growth)	Predicted 2005 Average Daily Traffic Flows (5.0% Growth)
M3 (Junction 8-9)	69,044	77,928
M3 (Junction 9-10)	109,663	123,774
M3 (Junction 10-11)	121,328	136,939
M3 (Junction 11-12)	127,201	143,568
M27 (Junction 10-11)	102,405	115,582
A34 (South of Bullington)	47,160	53,228

Table 1 – Roads predicted to exceed 50,000 vehicles per day in 2005

The Standard for Carbon Monoxide is expressed as an eight hour running mean and exposure over this period can thus occur at either office or domestic locations. The Ordnance Survey (OS) digital maps and local knowledge have been used to establish the main target locations. These were all confirmed by visiting the sites identified to verify the accuracy of such data. Minimum distances have been taken from the centre of the carriageway to the curtilage of the property excluding the garden. These results are summarised in table 2.

Road	Location	Minimum Distance from Road (Metres)
M3	Winchester –Weeke	50.04 (Limetree Walk)
M3	Winchester - Highcliffe	84.45 (Fivefields Road)
M3	Compton & Shawford	40.63 (Cliff Way)
M3	Otterbourne	26.33 (Tilden Road)
M27	Whiteley	65.84 (Lady Betty's Drive)
A34	Kingsworthy	27.50 (Kingsworthy Foundry)

Table 2 – Nearest properties to roads with flows greater than 50,000

2.22 Part A authorised processes with the potential to emit significant quantities of CO

These are the processes prescribed for pollution control under Part 1 of the Environmental Protection Act 1990, which are authorised by the Environment Agency for pollution control to all three media of land, air and water. The list of Part A processes within Hampshire is included in Appendix 3 and includes no significant local sources of CO emissions within, or adjacent to, Winchester's District. Regional sources from authorised incineration and petrochemical processes have been assessed but discussions with the Environment Agency confirms that such sources are likely to be of local importance only. In addition the DETR Web site shows no significant emission point sources for Hampshire

2.23 Planned developments of the above mentioned types in the locality, including those which will increase traffic flow.

There is currently an application by Southern Electric for an open cycle gas turbine on a site near Fort Widley, near Portsmouth. Due to the possible prohibition on the use of natural gas for such processes it is currently unknown whether this site will be built. However, the IPC application has been the subject of two air dispersion modelling studies the latter by Cambridge Environmental Research Consultants Ltd using the Atmospheric Dispersion Modelling System (ADMS) model. This report considered the impact of the pollutants emitted and the significance of this additional source on the ability to meet air quality standards. It predicted a maximum hourly average process ground level contribution of only 93 $\mu g/m^3$ when burning on gas and 58 $\mu g/m^3$ when burning distillate oil. In addition the site is in a rural location and is not predicted to overlap with any major road sources. This site is not therefore considered to be an issue regarding long term Carbon Monoxide compliance.

2.3 Stage 2 Assessment (Initial Comments)

Phase 1 investigations indicate that the CO impact of the M3, M27 and A34 on adjacent housing requires a phase 2 assessment. Several methodologies have been reviewed for making this further assessment, which are discussed below:

2.31 Existing DETR Data

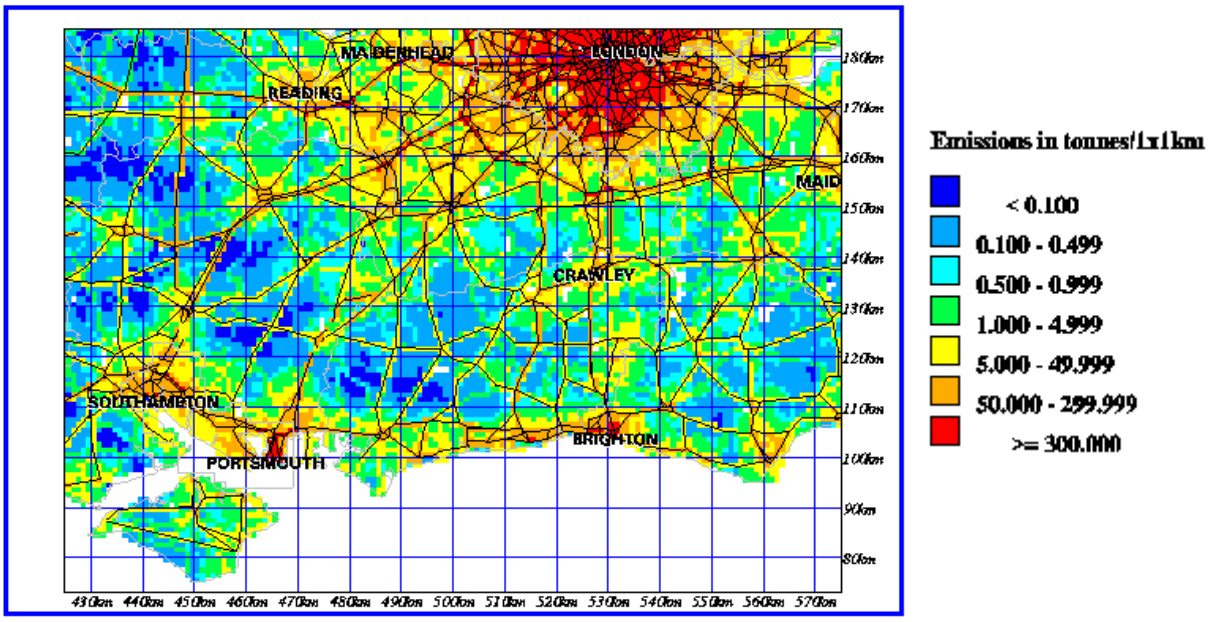


Figure 1 – 1996 Estimates for CO Mass Emissions from Road Sources

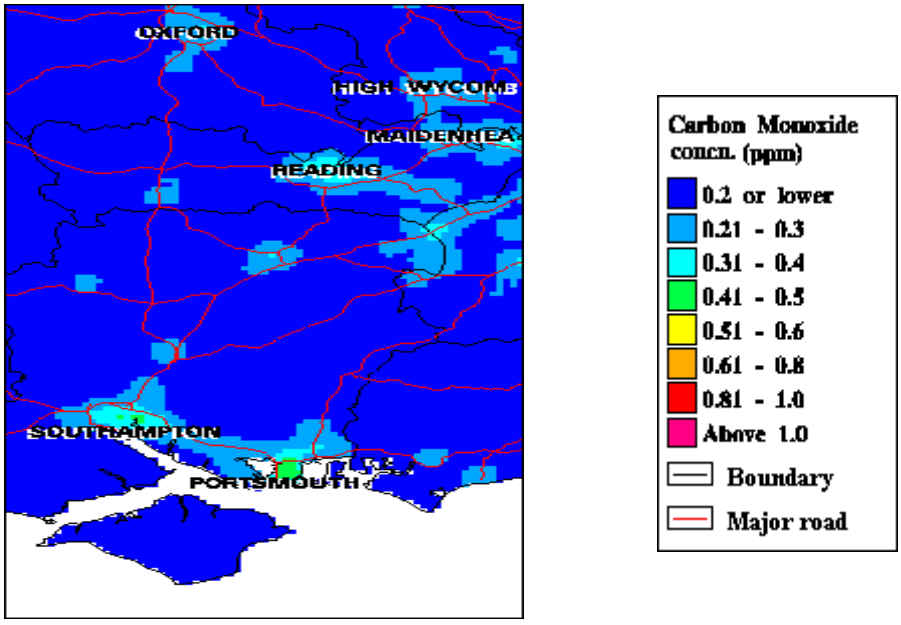


Figure 2 – 1996 Estimates for Background CO Concentrations

Year	Annual Mean (ppm)	Max Running 8 Hr Average (ppm)
1994	0.8	8.6
1996	0.7	6.5
1997	0.7	9.2

Table 3 – Summary Data for the Southampton Monitoring Network

Figure 1 shows that mass Carbon Monoxide emissions from road transport within Southampton town centre are equal to those predicted for the major road links through Winchester's District. As expected the overall background Carbon Monoxide concentration estimates in figure 2 show higher levels within Southampton than the surrounding more rural areas, including Winchester's District. Data within table 3 shows that the Southampton Urban Centre site has recorded no failures in the years 1994-96, with a higher background CO and comparable transport emission environment this suggests that widespread failures are unlikely within Winchester. It is thus only in the close environment of a major road that further investigations are required.

2.32 Modelling using the Design Manual for Roads and Bridges (DMRB)

The use of this model has been discussed with Stanger Science who operate the DETR help line regarding emission modelling. This manual is currently undergoing significant revision to the extent that any modelling performed using the existing version will require remodelling under the new guidance. We were thus advised to await the new version of DMRB early in 1999 before performing such stage two modelling.

However DMRB calculations have already been performed in 1997 as part of the trial authority duties performed in Hampshire, these have been detailed in a submission to the DETR in the publication "Review and Assessment of Air Quality (Pilot Area Study). Table 4 summarises the results obtained for predicted Carbon Monoxide levels.

Road	Predicted 2005 CO (Max 8 Hour) in ppm
M3, 8-9	1.2
M3, 9-10 ***(1)***	0.9
M3, 9-10 ***(2)***	0.2
M3, 11-12 ***(1)***	2.1
M3, 11-12 ***(2)***	1.2
A34	1.8
M27, 9-10	1.2
A303	0.6

Notes
(1) **=** Nearest Property
(2) **=** Nearest School

Table 4 – Old DMRB Calculation Summary for Predicted CO Levels in 2005

2.33 Real Time Monitoring Data within Winchester Town Centre

Information is available for Winchester Town Centre for both roadside and background locations as detailed in Appendix 5. Data from these sites is summarised in table 5, 1998 data shown is for January to September only and is likely to be an under estimate, as higher levels are recorded in the winter months(*).

Location/Year	Annual Mean (ppm)	Max Running 8 Hr Average (ppm)
Roadside 1997	1.1	4.9
Background 1997	0.6	3.5
Roadside 1998*	1.1	5.1
Background 1998*	0.4	4.6

Table 5 – Summary Data for Winchester Real Time Monitoring Stations

Table 5 shows that there have never been any failures for Carbon Monoxide at either roadside or background locations. In addition, the maximum 8-hour averages recorded are lower than that for the Southampton site detailed in table 3. The Southampton site is considered to be an “urban centre site” and this is reflected in the annual mean Carbon Monoxide results, which are higher than the Winchester background site but lower than the roadside site. It is thus considered that the only risk of Carbon Monoxide failures within Winchester’s District is adjacent to the major roads identified in stage 1.

2.34 Initial Conclusions

The existing data demonstrates that Carbon Monoxide is unlikely to fail the standards by 2005. If failures do occur, then these will be at limited locations immediately adjacent to the sites identified in table 2. DMRB models have already been run as part of the phase 1 trial authority work and these predicted results well below the standard of 10ppm. However, in order to confirm this conclusion DMRB calculations will be performed using the revised version when it becomes available.

3.0 Benzene

3.1 Background Information

In the UK the major source of Benzene is from the combustion and distribution of petrol, in which Benzene is a constituent comprising about 2 percent by volume. The most important source of benzene is thus the transport sector and in particular the petrol motor vehicle. Industrial processes can also be a significant local contributor to Benzene levels, as can evaporative losses from bulk petrol storage facilities.

The Government has adopted a standard of 5ppb as a running annual average to be met by 2005. It is anticipated by the guidance that a stage two survey will only be required where local authorities have "major industrial processes which either handle, store or emit Benzene, which have the potential, in conjunction with other sources, to result in elevated levels of benzene in relevant locations".

3.2 First Stage Review

There are 2 stage one criteria in assessing the necessity for detailed assessments for Benzene. These are listed below together with the relevant data used in making such an assessment

3.21 One or more Part A or Part B processes of the type indicated to be a potential significant source of benzene (Annexes 1 and 2 of guidance)

These are the processes prescribed for pollution control under Part 1 of the Environmental Protection Act 1990. Part A processes are authorised by the Environment Agency for pollution control to all three media of land, air and water. The generally smaller Part B processes are authorised by Local Authorities for control of air emissions only. The list of Part B processes within Winchester City Council's area is included in Appendix 2 and a list of Part A process within Hampshire in Appendix 3.

The guidance specifically excludes the consideration of petrol stations within this review and advises that further updates of the guidance note will take account of current research regarding the impact from such sites. On this basis it is concluded that there are no other significant Part A or B processes within Winchester's District. However some consideration has to be given to longer range impacts from Part A processes at Fawley Oil Refinery (multiple Part A processes) and Hamble Oil Terminal. The following information is already available regarding these processes:

- The Southampton national monitoring site lists an annual mean of 1.9ppb for 1996 and 1.8ppb for 1995 (Sept onwards). This site is in the town centre which has a higher traffic flow density than that found within Winchester's District and is also nearer to Fawley in a similar prevailing wind direction. It is considered that this site thus includes a greater traffic and industrial component in comparison with that found anywhere within Winchester's District.

- A study of hydrocarbons levels was commissioned by New Forest District Council in July 1996 and included a 3 month study of benzene at residential locations in the immediate vicinity of Fawley. This employed BTX (Benzene, Toluene and Xylene) tubes and of the ten sites monitored only one site exceeded the 5ppb standard. This was located immediately adjacent to a petrol filling station.

- A trial study in the use of BTX tubes was performed by Hampshire Authorities as part of the phase one authority studies commissioned by the DETR. Portsmouth City Council produced the subsequent report of these findings. This study included the use of BTX tubes at 48 sites across a wide band of Southern Hampshire, including 18 sites within New Forest DC due to the presence of Fawley and 12 sites in Eastleigh BC due to the Hamble Oil Terminal. Samples were also taken in Southampton CC, Fareham BC, Winchester CC, Isle of Wight and Portsmouth CC. Although this report questioned the accuracy of the BTX tubes used, particularly at higher concentrations, no average result over the 3 month sampling period exceeded the standard of 5ppb. The two sites within Winchester's District were at Wickham Square and the Southwick Road (between Southwick and Denmead), which gave average results of 2.6 and 0.7 respectively. Geographically the sites are located fairly close to each other in comparison with the possible point sources. The major difference in the sites is the local transport contribution, with Wickham square being used as a car park adjacent to a main road, whilst Southwick Road is in rural location on a minor road.

- 1996 estimated background concentrations of Benzene, as shown below:

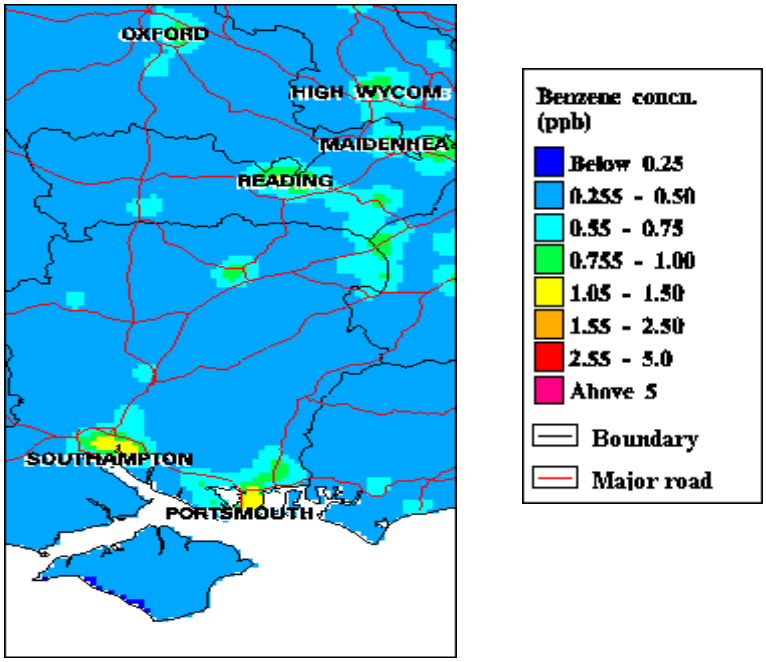


Figure 3 – 1996 Estimated Background Concentrations of Benzene

After consideration of the above data it is considered acceptable to discount these sources as important local contributors to long term average Benzene levels within Winchester's District

3.22 Planned developments of the above mentioned types in the locality

None, although ongoing consultation with the Planning Department will ensure such developments are considered with regards to air quality

3.3 Conclusions

No further investigations are required for Benzene, a further review will only be required if a significant industrial Benzene process commences within, or adjacent to Winchester's district, or if further guidance is received regarding the impacts from petrol stations

Benzene levels within Winchester City Council's area are currently predicted to be in compliance with the recommended air quality standard by 2005.

4.0 1,3-Butadiene

4.1 Background Information

In the UK the major source of 1,3-Butadiene is from the combustion of olefins in petrol. The most important source of 1,3-Butadiene is thus the transport sector and in particular the petrol motor vehicle. Industrial processes can also be a significant local contributor, although it is handled in bulk at only a few locations within the UK.

The Government has adopted a standard of 1ppb as a running annual average to be met by 2005. It is anticipated by the guidance that a stage two survey will only be required where local authorities have “major industrial processes which either handle, store or emit 1,3-Butadiene, which have the potential, in conjunction with other sources, to result in elevated levels of 1,3-Butadiene in relevant locations”.

4.2 First Stage Review

There are 2 stage one criteria in assessing the necessity for detailed assessments for 1,3-Butadiene. These are listed below together with the relevant data used in making such an assessment

4.21 One or more Part A or Part B processes of the type indicated to be a potential significant source of 1,3-butadiene (Annexes 1 and 2 of guidance)

These are the processes prescribed for pollution control under Part 1 of the Environmental Protection Act 1990. Part A processes are authorised by the Environment Agency for pollution control to all three media of land, air and water. The generally smaller Part B processes are authorised by Local Authorities for control of air emissions only. The list of Part B processes within Winchester City Council’s area is included in Appendix 2 and a list of Part A process within Hampshire in Appendix 3.

There are no significant industrial sources of 1,3-butadiene from either Part A or B processes within Winchester’s District. As for the benzene assessment the crude oil and petrochemical processes at Fawley and Hamble come to light as potential regional sources. Unfortunately, due to the lack of indicative tests for this parameter less data is currently available. However, data from the Southampton national monitoring site gave an annual average result of 0.5ppb for 1995 (Sept onwards) and 0.4ppb for 1996 and using provisional unratified data a 1997 figure of 0.32ppb has been calculated. These results are amongst the highest recorded on the 13 national sites, although the site is the only Urban Centre site and results are similar to the London UCL roadside site. All results are, however, well below the 1ppb standard.

There are no background maps available for this pollutant, although figure 4 shows Non Methyl Volatile Organic Compound (NMVOC’s) from point sources for 1996. This would include, in a small part, 1,3-Butadiene sources and again highlights the Fawley and Hamble sources already discussed:

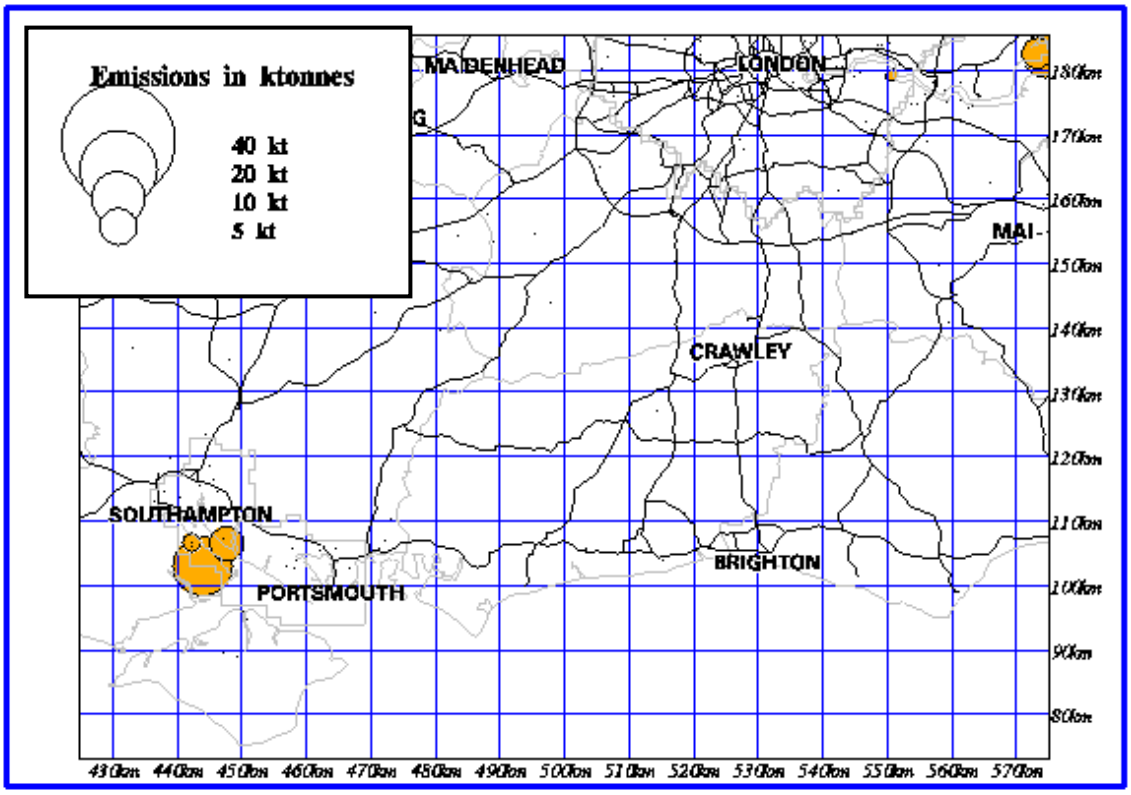


Figure 4 – 1996 NMVOC Emissions from Point Sources

4.22 Planned Developments of the above types in the locality

None, although ongoing consultation with the Planning Department will ensure such developments are considered with regards to air quality.

4.3 Conclusions

The data from the Southampton site is considered to be a representative worst case scenario for Winchester's District. This site is located in a large urban conurbation with greater traffic densities and flows and is also nearer to Fawley in a similar prevailing wind direction. It is concluded that a further assessment of 1,3-Butadiene is not currently required, although the Southampton data will be reviewed yearly to ensure this remains the case.

1,3-Butadiene levels within Winchester City Council's area are currently predicted to be in compliance with the recommended air quality standard by 2005.

5.0 Lead

5.1 Background Information

Lead is the most widely used non-ferrous metal and has a large number of industrial applications, both in its elemental form and in alloys and compounds. Importantly tetraethyl lead has been used extensively as an additive to increase the octane rating of petrol. Following concerns over the health effects of lead from road transport, the maximum permissible lead contained in fuel was reduced in 1986 from 0.4g/l to 0.15g/l. In 1987 lead free, or unleaded petrol, was introduced with pricing incentives to encourage its use. In addition, since 1993, catalytic converters are required on all new cars, which will only run with unleaded petrol. Data from roadside locations in urban areas have thus shown a significant decrease in levels over recent years.

The Government has adopted a standard of 0.5$\mu g/m^3$ as an annual average to be met by 2005. It is anticipated by the guidance that a stage two survey will only be required where local authorities have "Significant industrial sources, which have the potential to result in elevated levels of lead in relevant locations."

5.2 First Stage Review

There are 4 stage one criteria in assessing the necessity for detailed assessments for Lead. These are listed below together with the relevant data used in making such an assessment.

5.21 Part A processes with the potential to emit significant quantities of lead.

These are the processes prescribed for pollution control under Part 1 of the Environmental Protection Act 1990, which are authorised by the Environment Agency for pollution control to all three media of land, air and water. The list of Part A processes within Hampshire is included in Appendix 3 and includes no significant local sources of lead emissions within, or adjacent to, Winchester's District.

5.22 Part B processes, or a number of such processes in close proximity, which collectively have the potential to emit significant quantities of lead.

These are the processes prescribed for pollution control under Part 1 of the Environmental Protection Act 1990. Part B processes are authorised by Local Authorities for control of air emissions only. The list of Part B processes within Winchester City Council's area is included in Appendix 2 and includes no significant sources of lead emissions.

5.23 Industrial or other sites with non-prescribed processes with the potential to emit significant quantities of lead

No known sources were located. The background concentrations due to dispersed road transport sources are shown if figure 5. These are considered to

be the most important source for lead within the District, although well below the standard of 0.5μg/m^3 (500ng/m^3).

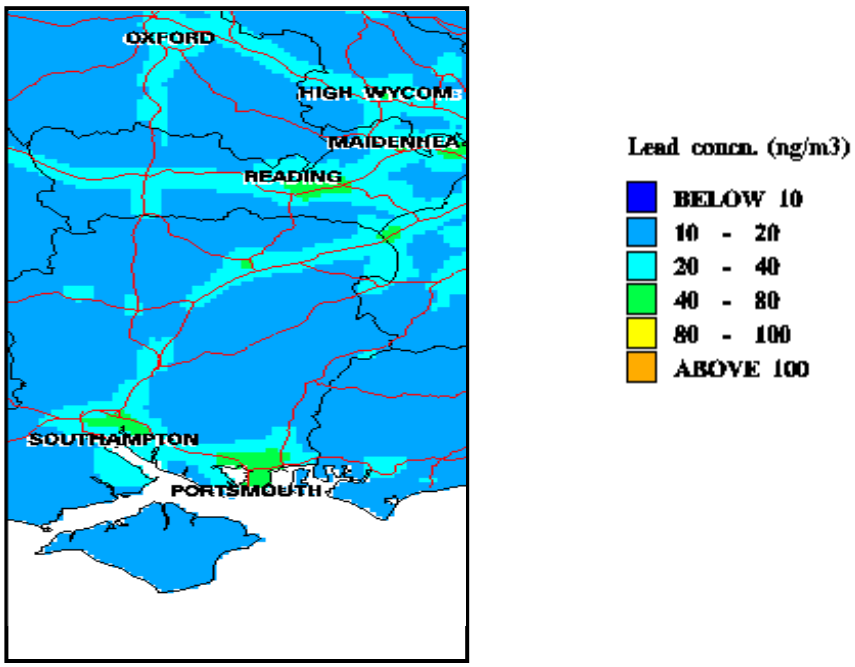


Figure 5 – Estimated 1996 Background Lead Concentrations from Dispersed Road Transport

5.24 Planned development of the above mentioned types in the locality

None, although ongoing consultation with the Planning Department will ensure such developments are considered with regards to air quality.

5.3 Conclusions

No further investigations are required for lead, a further review will only be required if a significant industrial lead process commences within, or adjacent to, Winchester's district.

Lead levels within Winchester City Council's area are currently predicted to be in compliance with the recommended air quality standard by 2005.

6.0 Nitrogen Dioxide (NO_2)

6.1 Background Information

Nitrogen Dioxide (NO_2) and Nitric Oxide (NO) are both oxides of nitrogen and together they are referred to as NOx. All combustion processes generate NOx but the health concerns are only with the NO_2 component, which is mainly formed by the subsequent oxidation of NO in the atmosphere. However, there is no direct relationship between the proportion of NO to NO_2 as this is dependent on the level of NO_2 in the primary emission and the availability of atmospheric oxidants such as ozone. The main source of NOx is road transport, which in 1996 accounted for 47 percent of total emissions, with power generation accounting for another 22 percent. The Government has adopted two standards for Nitrogen Dioxide a 1-hour average of 150ppb and an annual average of 21ppb to be met by 2005. This requires the consideration of two appropriate exposure locations. It is recommended by the guidance that the emphasis should be placed on non-occupational, near ground level outdoor locations which might reasonably be expected to be exposed over the relevant period. The consideration of the location will thus be different for 1-hour exposures compared to one year.

6.2 First Stage Review

There are 4 stage one criteria in assessing the necessity for detailed assessments for Nitrogen Dioxide. These are listed below together with the relevant data used in making such an assessment.

6.21 An annual mean urban background NO_2 concentration in 1996 of greater than 30ppb.

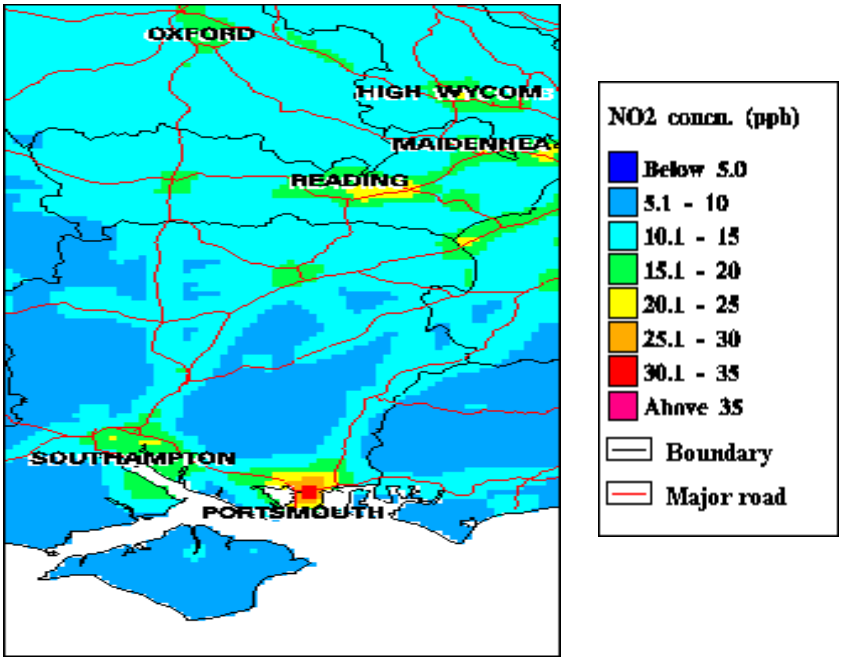


Figure 6 - Estimated 1996 Mean Urban Background Concentrations of NO2

Figure 6 from the DETR web site shows that none of Winchester's District has estimated NO_2 concentrations above 30ppb.

6.22 One or more existing or planned roads with a projected annual average daily traffic flow of greater than 20,000 in 2005

Traffic flow data is listed in Appendix 1, data was provided by both WSP of Basingstoke and Hampshire County Council. The 1997 National Road Traffic Forecasts (NRTF) recommends use of a 3.2 percent growth per annum in order to predict future traffic flows. Also included in Appendix 1 is an extract from "Transport Monitoring in Hampshire 1998" which shows actual traffic increases on the M3 between 1993 and 1997. The percentage increases between 1996 and 1997 were between 1.8 percent for junction 10 and 11 and 5.9 percent between junctions 11 and 12. Even larger increases were recorded in previous years but these must be set against the expected increases in traffic usage following the completion of the Twyford Down motorway link between junctions 10 and 11. Therefore the current traffic flow data has been projected using both a 3.2 and 5 percent annual growth. The data available for both directions of flow supports the assumption that flows are comparable in both directions. Thus where data is available only for one direction of flow, the total flow has been taken to be twice this figure. These results are shown in table 6 below:

Road Location	Predicted 2005 Average Daily Traffic Flows (3.2% Growth)	Predicted 2005 Average Daily Traffic Flows (5.0% Growth)
M3 (Junction 8-9)	69,044	77,928
M3 (Junction 9-10)	109,663	123,774
M3 (Junction 10-11)	121,328	136,939
M3 (Junction 11-12)	127,201	143,568
A303 (Micheldever)	41,036	46,316
M27 (Junction 10-11)	102,405	115,582
A34 (South of Bullington)	47,160	53,228

Table 6 – Roads predicted to exceed 20,000 vehicles per day in 2005

6.23 One or more Part A or Part B processes of the type indicated to be a potential significant source of NOx.

These are the processes prescribed for pollution control under Part 1 of the Environmental Protection Act 1990. Part A processes are authorised by the Environment Agency for pollution control to all three media of land, air and water. The generally smaller Part B processes are authorised by Local Authorities for control of air emissions only. The list of Part B processes within Winchester City Council's area is included in Appendix 2 and a list of Part A process within Hampshire in Appendix 3. It is concluded that there are no significant sources of NOx within or immediately adjacent to Winchester's District.

On a regional basis the Part A processes at Hamble Oil Terminal and Fawley Oil Refinery (multiple Part A processes) together with the nearby CEGB power station and Rechem waste incinerator are once again highlighted as the most important regional sources. The 1996 DETR emission inventory for NOx point sources is shown in figure 7 and shows Fawley to be the major point source.

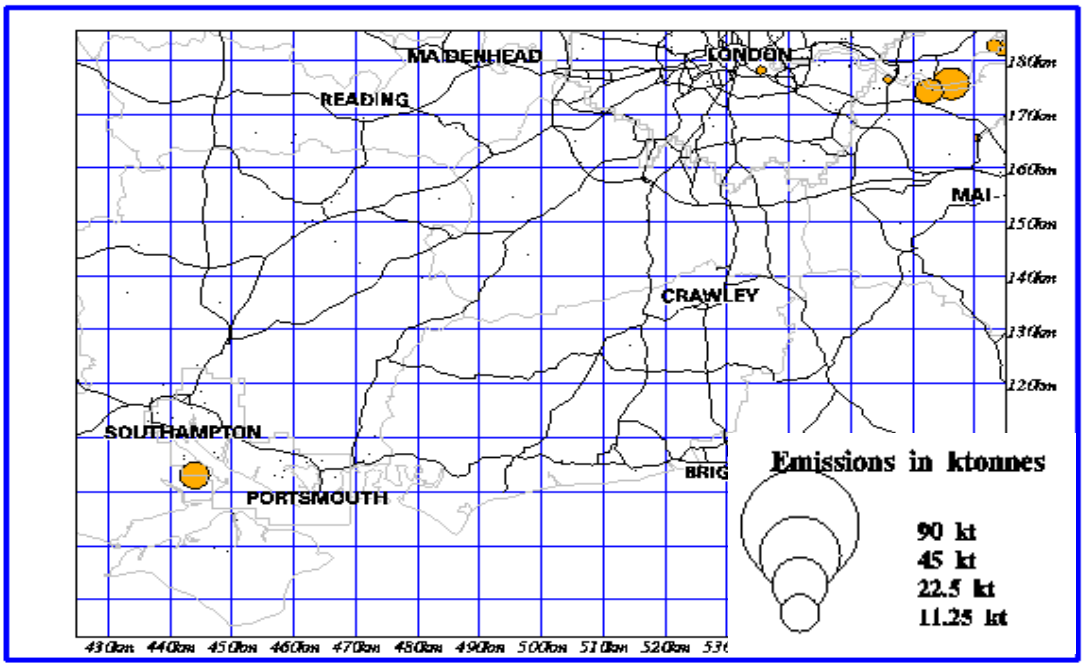


Figure 7 - 1996 Estimated NOx Emissions from Point Sources

6.24 An indication of existing sources acting in combination to exceed a current annual mean NO_2 concentration of 30ppb (for example as measured by diffusion tubes or automatic measurement methods)

There are two sources of data for Winchester's District, real time monitoring within Winchester Town centre as detailed in Appendix 5 and diffusion tube monitoring as detailed in Appendix 4. Further information on the full Quality assessment and control (QC/QA) programme and additional data analysis will be presented in subsequent stage 2/3 assessments as discussed in section 6.3.

Real time monitoring performed at the Roadside site, which is considered to be indicative of likely short term exposures, gave an average of 43.3ppb in 1997 and 31.6ppb in 1998 (till Sept 98). The Background site, which is considered more typical of long term city centre exposures and thus more relevant to the annual mean standard, gave an average of 18.5ppb in 1997 and 21.3ppb in 1998 (till Sept 98).

The diffusion tube data for the financial year 1997/98 gave the following averages:

Winchester Road, Denmead	13.7 ppb
Wickham Square, Wickham	13.7 ppb
Winchester Road, Bishops Waltham	18.4 ppb
Broad Street, Alresford	14.9 ppb
Echo Office, Winchester	21.3 ppb
City Road, Winchester	24.0 ppb
Chesil Street, Winchester	22.0 ppb
Alresford Road, Winchester	17.9 ppb
Roadside Monitor, Winchester	No data (new for 1998/99)

All these results are below 30ppb, with the exception of the real time monitoring data from the road site, which is not considered indicative of a location for long term exposures.

6.3 Stage 2 (Initial Comments)

The Stage 1 assessment suggests that further focus should be placed upon assessing the levels at properties adjacent to the roadside locations detailed in table 6. However, the decision as to stage 2 and/or 3 methodologies to adopt has to some extent been pre-empted by the real time monitoring and diffusion tube studies already being performed. The diffusion tube data currently shows that the highest results for longer term averages is within the town centre. These sites are higher than for other town/village locations as would be expected but is also higher than the Alresford road site, which is immediately adjacent to the M3. However, other major road sources have been identified for which there is currently no diffusion tube monitoring data available.

The real time monitoring performed has also shown few failures in the one hour standard of 150ppb. There have never been any failures at the urban background site, whilst at the roadside site failures are restricted to the winter months during periods of poor dispersion as summarised in table 7:

Month	Number of Failures of 150ppb standard	Number of days in which failures occurred
Jan 1997	17	7
Oct 1997	4	1
Nov 1997	2	2
Dec 1997	2	2

Table 7 – Failures in 150ppb one-hour NO_2 Standard – Roadside Site, Winchester. (January 1997 till September 1998)

Reviewing this data, it is considered that widespread failures for NO_2 are unlikely. Additional consideration should, however, be given to short and long term failures at properties adjacent to the roads identified in table 6 and short term failures within Winchester town centre. It is considered that the continuation of the stage 2 and 3 work already being performed will provide sufficient information in fully assessing this pollutant with regards to these concerns. It is therefore recommended that the following is actioned:

- Continuation of the real time monitoring and diffusion tube studies already being performed.

- The forecasting of roadside contributions from the road sources identified in table 6 using the revised DMRB model when available.

- The relocation of 2 of the town centre diffusion tubes (which have been shown to produce similar results) to cover the M3 at Otterbourne and the M27 at Whitely, at locations considered typical of long term exposure such as nearby housing.

7.0 Particulate Matter (PM10's)

7.1 Background Information

Particulate material in the atmosphere is composed of a wide range of materials arising from a variety of sources. Examples of man-made sources are carbon particles from incomplete combustion, ash and secondary particles or aerosols formed by chemical reactions in the atmosphere. As well as being emitted directly from combustion sources, man made particles can arise from mining, quarrying and construction operations, from brake and tyre wear in motor vehicles and from road dust re-suspended by moving traffic or strong winds. Natural sources of particles include wind blown dust, sea salt and biological particles such as pollen and fungal spores. The particle fraction, which has on average an aerodynamic diameter of less than 10 μm (one millionth of a metre), is referred to as the PM10 fraction or PM10's. It is this finer dust fraction which is breathed into the lungs, which is of concern to human health. The Government has adopted a running 24-hour average of 50μg/m^3 as the air quality standard to be achieved by 2005, as the 99th percentile of daily maximum running 24-hour averages. This means that the levels of PM10's must not exceed this standard on more than four days in a year after 2005.

Particulate material can be divided into the primary and secondary fractions. The primary fraction is that which is generated directly from local or regional sources, whilst the secondary fraction is formed in the atmosphere by the chemical interaction of gaseous pollutants to form solids such as sulphates and nitrates. Elevated secondary fractions often occur when the wind blows pollutants over from the main European continent. It is thus only the primary fraction that can be effectively influenced using local action plans.

PM10's have been monitored at the two locations in the Town Centre, since May 1996, at the locations shown in Appendix 5. Of these two sites, the data obtained from the background site is considered more relevant for comparison with the standard, which is based on an averaged 24-hour exposure.

7.2 First Stage Review

There are 5 stage one criteria in assessing the necessity for detailed assessments for PM10's. These are listed below together with the relevant data used in making such an assessment.

7.21 *Urban areas for which the annual average regional background due to secondary particles is currently greater than 8 μg/m3.*

Information for 1996 is available from the DETR Web and a copy of the map is shown in figure 8. As this is the most recent data set available, it has been assumed that this is representative of the situation for 1998. In accordance with this data Winchester can be expected to have an average regional background secondary particle concentration of around11μg/m^3.

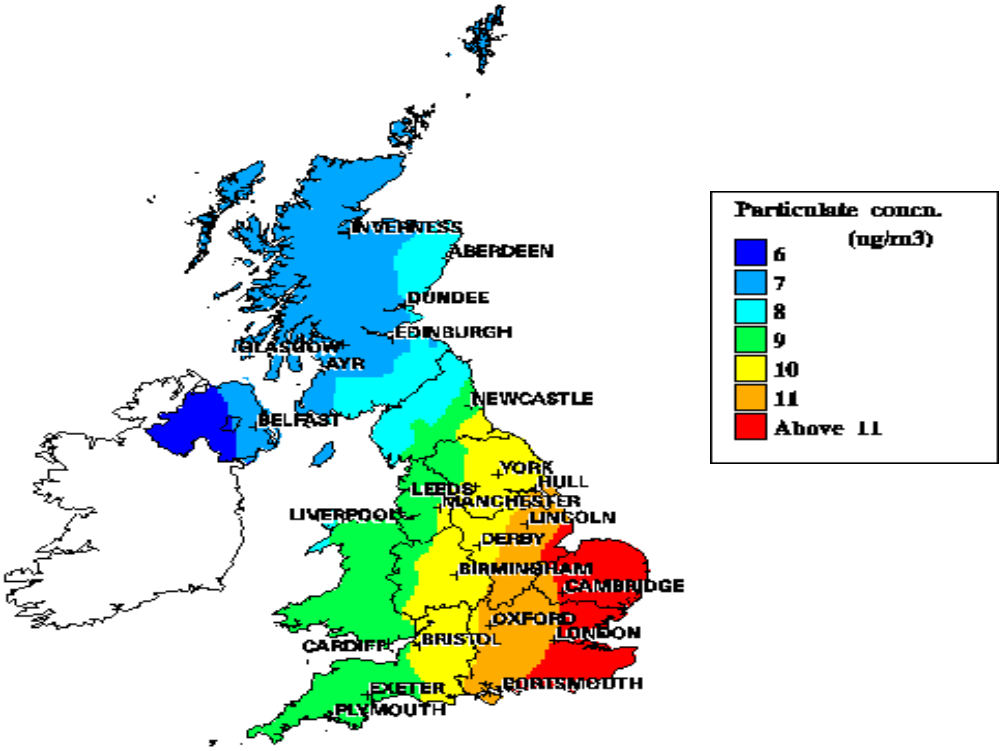


Figure 8 - 1996 Background Concentrations of Secondary PM10's

Based on this data it is considered that Winchester, in common with the rest of England and Wales, fails this criterion and will require a stage 2 or 3 assessment.

7.22 Emissions from low-level dispersed sources (including road traffic) greater than 10 tonnes in any single 1km x1km grid square or an average of 5 tonnes in several adjacent squares.

The resolution in the map overleaf is fairly poor and thus the associated data file was used as the prime source of information, this has not been included as it runs to several hundred pages. However, it can be seen from this map that there were only two 1km-grid squares in, or within 1 km of, Winchester City Council's boundary with levels exceeding 10 tonnes per annum in 1996. These are listed below:

- **Ref 444 123** – This is shown as having a total emission of 62.78 tonnes per annum with 62.55 tonnes being listed in the "other" category. However, this result can be attributed to the Otterbourne incinerator, which has now been shut. There are currently no plans for a new incinerator on this site so this emission source can be currently dismissed.
- **Ref 460 106** – This is shown as having a total emission of 12.09 tonnes per annum with 5.01 and 6.99 tonnes being listed in the traffic and small industry category respectively. This 1km square is mainly outside Winchester's area with only the far top of the square being within the District adjacent to Fort Nelson. The M27 runs through this square explaining the traffic component, the small industry component is thought most likely to be due to the presence of Fareham Crematoria in the far South of this square.

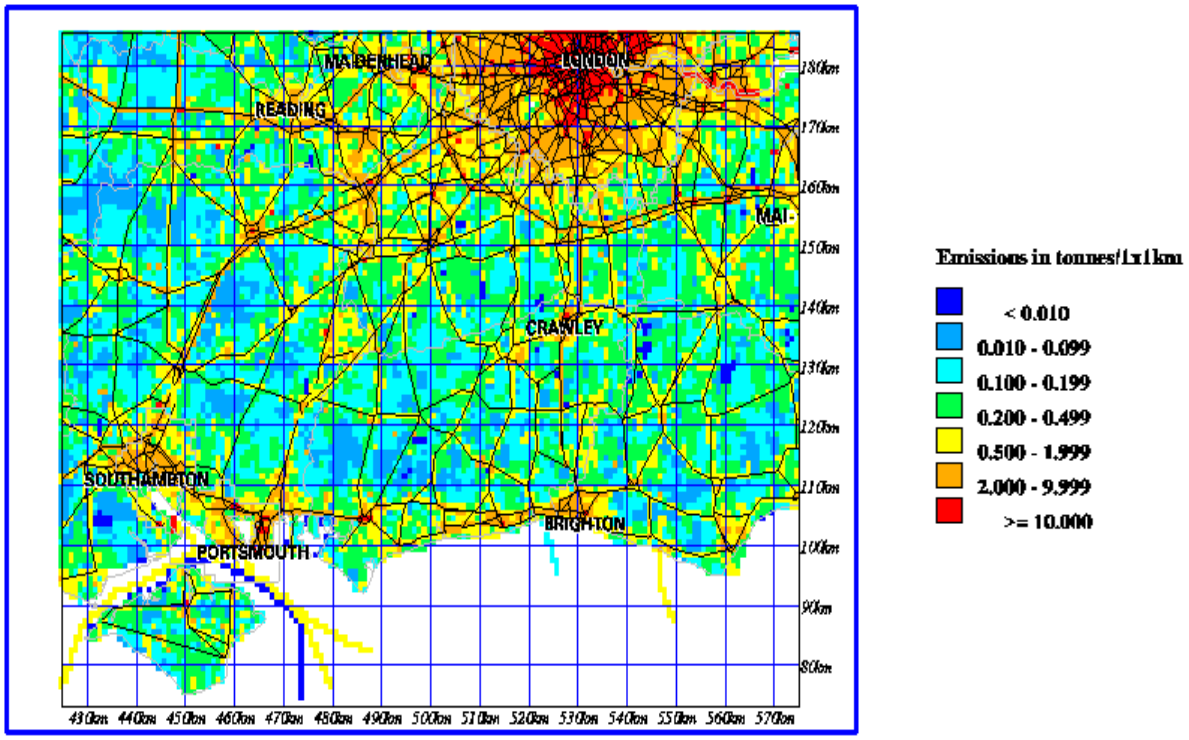


Figure 9 - 1996 Annual average estimated total PM10 emissions

In addition, the following grid references were found to be exceeding 5 tonnes per annum:

- **Ref 452 108** – This is listed as having 6.18 tonnes with 5.01 being attributed to traffic sources. This site includes junction 9 of the M27.
- **Ref 463 106** – This is listed as having 8.13 tonnes with 7.21 being attributed to small industry sources. Only the far north of this 1-km grid square is within Winchester's boundary, with the majority being within the Paulsgrove District of Portsmouth City Council. The site includes the chalk pits of Portsdown hill that are clearly visible from the motorway.
- **Ref 446 124** – This site is listed as having 5.13 tonnes with 4.51 being attributed to traffic sources. This site includes the Compton/Shawford area of the M3.

There are thus no groupings of 1km-grid squares which exceed 5 tonnes. The grouping that is nearest to this value is that which represents the City of Winchester, where values ranging between 3.0 to 4.6 tonnes per annum were found. There is also a clear grouping of results following the line of the M3 but all but one of these results is below 5 tonnes.

7.23 One or more existing or planned roads with a projected annual average daily traffic flow of greater than 25,000.

Traffic flow data is listed in Appendix 1, data was provided by both WSP of Basingstoke and Hampshire County Council. The 1997 National Road Traffic Forecasts (NRTF) recommends using of 3.2 percent growth per annum in order to predict future traffic flows. Also included in Appendix 1 is an extract from "Transport Monitoring in Hampshire 1998" which shows actual traffic increases on the M3 between 1993 and 1997. The percentage increases between 1996

and 1997 were between 1.8 percent for junction 10 and 11 and 5.9 percent between junctions 11 and 12. Even larger increases were recorded in previous years but these must be set against the expected increases in traffic usage following the completion of the Twyford Down motorway link between junctions 10 and 11. Therefore the current traffic flow data has been projected using both a 3.2 and 5 percent annual growth. The data available for both directions of flow supports the assumption that flows are comparable in both directions. Thus where data is available only for one direction of flow, the total flow has been taken to be twice this figure. These results are shown in table 8 below:

Road Location	Predicted 2005 Average Daily Traffic Flows (3.2% Growth)	Predicted 2005 Average Daily Traffic Flows (5.0% Growth)
M3 (Junction 8-9)	69,044	77,928
M3 (Junction 9-10)	109,663	123,774
M3 (Junction 10-11)	121,328	136,939
M3 (Junction 11-12)	127,201	143,568
A303 (Micheldever)	41,036	46,316
M27 (Junction 10-11)	102,405	115,582
A34 (South of Bullington)	47,160	53,228

Table 8 – Roads predicted to exceed 25,000 vehicles per day in 2005

It can be seen that using this criterion the only roads above 25,000 are the main link roads through the District. Traffic data for the Winchester City area shows that none of the town centre roads exceed, or even approach, this criterion.

7.24 One or more Part A or Part B processes of the type indicated to be a potential significant source of PM10.

These are the processes prescribed for pollution control under Part 1 of the Environmental Protection Act 1990. Part A processes are authorised by the Environment Agency for pollution control to all three media of land, air and water. The generally smaller Part B processes are authorised by Local Authorities for control of air emissions only. The list of Part B processes within Winchester City Council's area is included in Appendix 2 and a list of Part A process within Hampshire in Appendix 3.

In comparison with the list of processes most likely to release significant quantities of PM10's, the only Part B processes highlighted are the roadstone coating processes. It is considered that the fully covered nature of the Foster Yeoman site, from delivery and storage to finished product, eliminates this as a significant source of dust or PM10's. The Micheldever Coating plant has outside storage of raw materials and is considered to have a higher potential for dust emissions but is a relatively small process in an isolated rural location.

The major sources of PM10 material from Part A processes are considered to be the Fawley oil refinery (multiple Part A processes), the CEGB power station and the Rechem waste incinerator. These emissions are shown in figure 10.

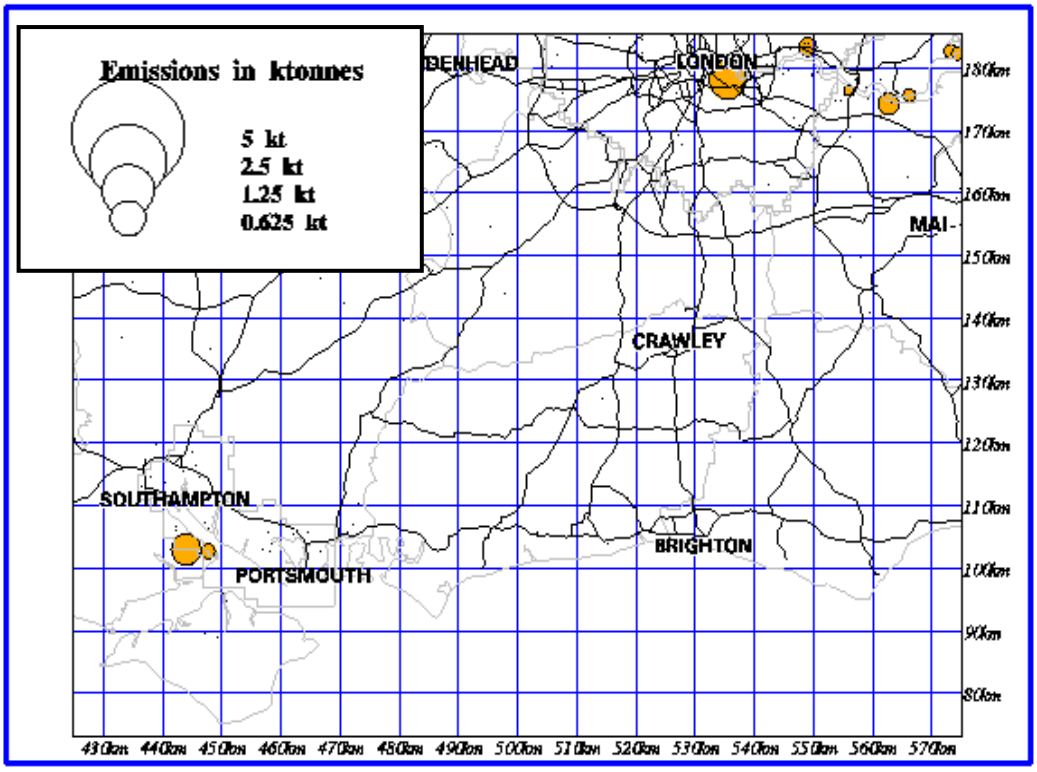


Figure 10 - 1996 Estimated PM10 Bulk Emissions from Point Sources

7.25 Any industrial process that emits significant quantities of dust in the form of PM10 from uncontrolled or fugitive sources within the plant.

The Environmental Health Department's computerised complaint records for dust emissions from industrial processes was used as an additional source of information together with officer's local knowledge. The only complaints relating to dust were from a local timber yard and a stone mason. Both of these premises are considered to be important only in the immediate locality, as they are both small scale in operation and have subsequently taken measures to prevent fugitive dust emissions causing a nuisance. There are several other timber yards in the District, although in accordance with the guidance, they are likely to be significant sources only of larger particulate dusts and not PM10's.

The map for industrial PM10 mass emissions is shown below and shows little in the way of industrial contributions to PM10 levels within the District. In conclusion it is considered that other industrial processes are not a significant source of PM10's within the District compared with point sources within the Southampton Water area.

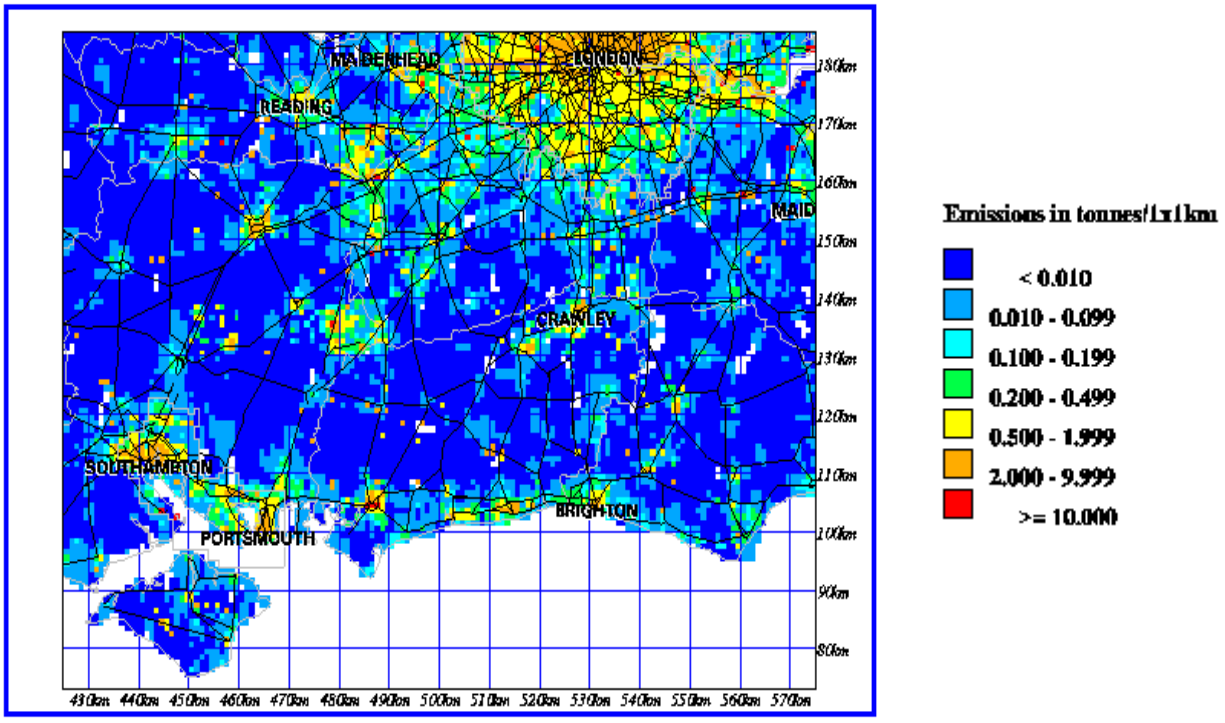


Figure 11 - 1996 Estimated PM10 Bulk Emissions from Industrial Sources

7.3 Second Stage Review

From the above phase one criterion it is clear that additional investigations for PM10's are required. From the stage 1 data, it can be concluded that the most important contributions to the PM10 levels are:

- High background secondary PM10 levels.
- Traffic contributions from major link roads through District including the M3, M27, A34 and A303.
- Regional contributions from point sources and specifically the power generation and incineration processes along Southampton Water near Fawley.
- Regional contributions from diffuse road and industrial sources along the Solent from Southampton to Portsmouth, which runs along the Southern boundary of Winchester's District.

The review and assessment guidance advises that:

- If low-level combustion sources other than road transport are significant, the authority may wish to undertake a second stage review and assessment but should also complete a third stage review and assessment. This is because the available data on emission densities from sources other than road transport are inadequate for a reliable second stage review and assessment.

- If an industrial source emits significant quantities of PM10 from sources other than regulated stacks, the authority should similarly complete a third stage review. The second stage review and assessment methodology is inadequate for the estimation of the impact of large localised sources of PM10 in the form of fugitive or uncontrolled dusts.

The current review document advises that "The Airborne Particles Expert Group (APEG) have been formed to advise on sources of PM10 in the UK and current and future ambient concentrations. Their conclusions are expected by the end of 1998 and further advice to local authorities on review and assessment will be formulated in the light of the APEG conclusions." In addition, the guidance on "Monitoring for air quality" advises that black smoke measurements can only be used as an indicator of PM10 hotspots and that there is no consistent correlation between black smoke and PM10's.

Thus establishing a suitable methodology for a phase 2 approach is currently problematic due to a lack of firm guidance. However, waiting for this guidance before commencing additional investigations will reduce the time frame over which to try and obtain representative data. The consideration of whether to currently progress with a phase 2 or 3 investigation is somewhat academic as real time monitoring for PM10's is already being performed in Winchester town centre. However, what cannot currently be established with certainty is how representative these readings are for the District as a whole. It is therefore proposed to extend the phase 3 monitoring to obtain such data, which is discussed below.

7.4 Third Stage Review (Initial Comments)

Since May 1996, Winchester City Council has performed real time analysis for PM10's at two sites within the Town Centre, as detailed in Appendix 5. Summaries of the results obtained are shown in figures 12 and 13. The background site results are considered more representative of exposures over a 24 hour period. It can be clearly seen that a significant number of PM10 failures have occurred at both sites, particularly in the winter months. **Unless the guidance or standards change then it is highly probable that Winchester City Council will have to declare an air quality management area for PM10's**. The question that cannot currently be answered is the extent of the area that will have to be declared.

It is therefore recommended that comparative monitoring for PM10 levels is performed at the locations which have been identified in the stage 1 assessment as having potentially high PM10 levels. It is thus recommended that monitoring is performed at:

- The new housing development at Whiteley adjacent to M27.
- Kingsworthy or Sutton Scotney adjacent to A34.
- Otterbourne/Shawford/Compton adjacent to M3.
- Adjacent the A303 (less important due to lack of nearby properties).

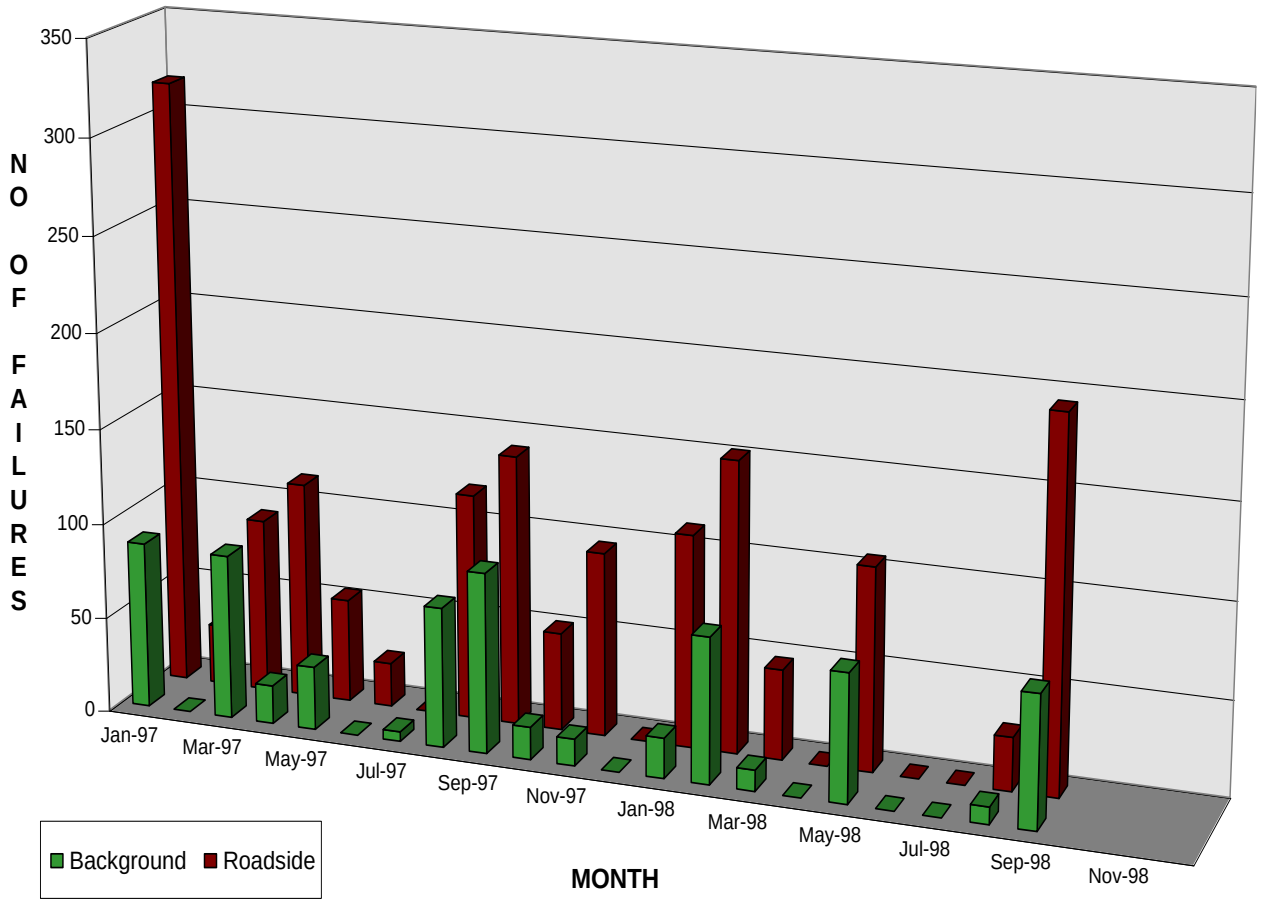


Figure 12 – Number of Failures of PM10 Standard (Jan 1997 to Sept 1998)

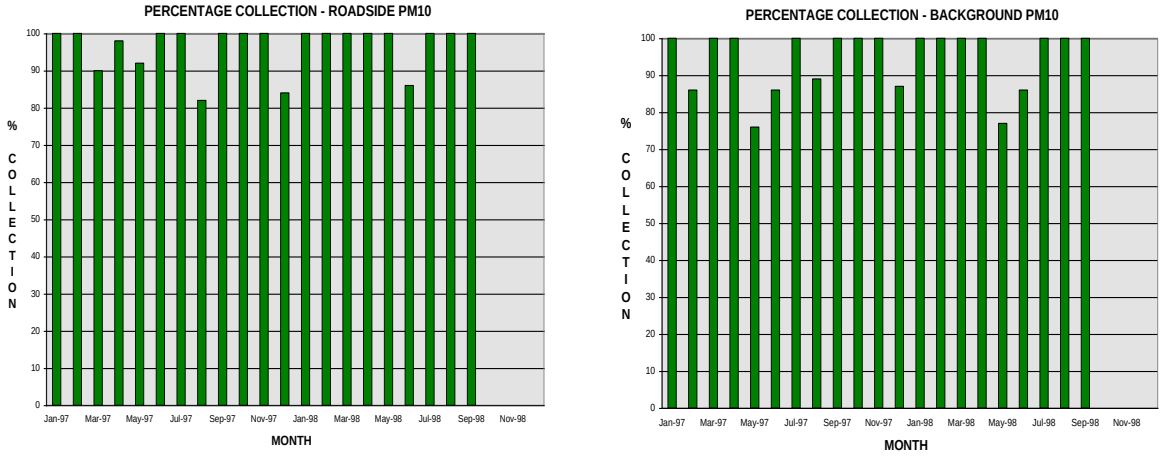


Figure 13 – Data Collection Efficiency (Jan 1997 to Sept 1998)

In addition it is recommended that monitoring is performed at a rural location to provide data on the more regional components of PM10's which will be necessary in assessing the relative importance of local primary PM10's compared to regional primary and secondary PM10's. This will be important, as any local management plan will only be able to tackle the localised primary component.

The only indicative test available for obtaining comparative data would be black smoke tests, but as already indicated there is no consistent way of converting black smoke readings to PM10 readings. It is thus recommended that the only remaining option is the purchase of additional equipment to monitor actual PM10 levels at these locations. Such equipment can be left at the above locations for several months and the results obtained can be "calibrated" against the real time monitoring results obtained concurrently within the town centre.

To ensure internal consistency in sampling methodologies it is recommend to purchase one additional BAM analyser together with mobile housing, as detailed in Appendix 5. This instrument has the advantage of being able to log the results with a 1-hour definition and will only need to be visited on occasion to download the data. This could be combined with the diffusion tube survey work already performed. Upon completion of this initial survey this analyser could then be permanently located at the site initially found to have the highest comparative PM10 levels.

8.0 Sulphur Dioxide (SO_2)

8.1 Background Information

The main source of Sulphur Dioxide is from the combustion of coal and oil. Historically this pollutant was the subject of some of the first pollution control legislation following the London smogs earlier this century. In 1996 it was estimated that 65 percent of emissions were from power generation, 24 percent from industry and 6 percent from commercial and domestic heating. Road transport is not a significant source of Sulphur Dioxide accounting for only about 2 percent of total emission in 1996.

The Government has adopted a standard of 100ppb as a 15 minute average which must be achieved 99.9 percent of the time by 2005 (this equates to all but 35 periods of 15 minutes per year). With such a short exposure period then consideration has to focus on exposures at non-occupational outdoor locations adjacent to industrial and power generation sources.

8.2 First Stage Review

There are 4 stage one criteria in assessing the necessity for detailed assessments for Sulphur Dioxide. These are listed below together with the relevant data used in making such an assessment.

8.21 Part A industrial processes of the type listed in Annex 1

These are the processes prescribed for pollution control under Part 1 of the Environmental Protection Act 1990, which are authorised by the Environment Agency for pollution control to all three media of land, air and water. The list of Part A processes within Hampshire is included in Appendix 3. The Pentax oil site at Larkwhistle Farm near Winchester was reviewed for Sulphur Dioxide emissions, but using public register data, the only source was concluded to be low level emissions from the diesel fired heaters. Therefore it has been concluded that no part A processes require further assessment for Sulphur Dioxide.

There is currently an application by Southern Electric for an open cycle gas turbine on a site near Fort Widley, near Portsmouth. Due to the possible prohibition on the use of natural gas for such processes it is currently unknown whether this site will be built. However, the IPC application has been the subject of two air dispersion modelling studies the latter by Cambridge Environmental Research Consultants Ltd using the Atmospheric Dispersion Modelling System (ADMS) model. This report considered the impact of the pollutants emitted and the significance of this additional source on the ability to meet air quality standards. Although the plant will run on gas it is understood that the interruptible contract will result in frequent use of distillate oil. The report predicted a process contribution of 113μg/m3 compared to the air quality standard of 270μg/m3 (100ppb) as a 99.9 percentile15 minute compliance. This will thus be the most significant local source of Sulphur Dioxide but with no other overlapping sources

it is considered unlikely to be an issue regarding local compliance with the air quality standard.

Figure 14 shows data from the DETR web site for mass emissions from point sources and once again highlights the oil refineries and the GECB power station near Fawley as important sources.

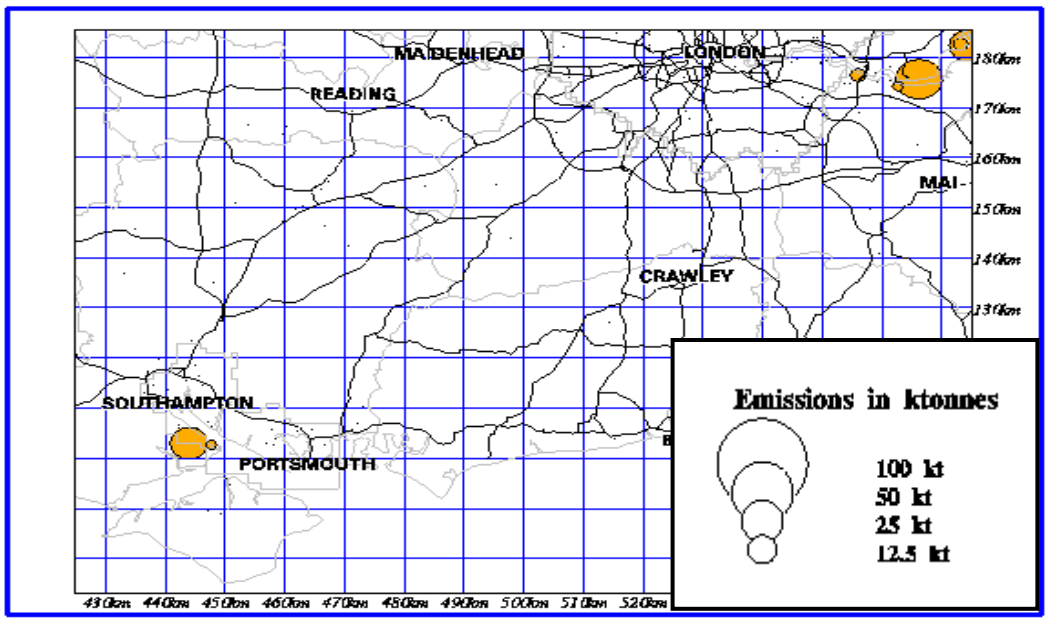


Figure 14 - 1996 Estimated Mass Emission from Point Sources

Year	99.9th Percentile of 15 Min means (ppb)	Maximum Hourly Averages (ppb)
1994	47	101
1995	N/A (Only 72% data capture)	62
1996	42	108
1997	31	61

Table 9 – Southampton National Monitoring Site –SO2 Data Summary

The Southampton national monitoring site data is listed in table 9 and shows levels in compliance with the air quality standard from 1994 to 1997. A 15-minute average level over 100ppb was recorded on only 1 day in 1994 (2 occasions) and 1996 (3 occasions) and on no occasions in 1995 and 1997. The site is nearer to Fawley in a similar prevailing wind direction. It is considered that this site would include a higher industrial component from such sources in comparison with that found within Winchester's District and that regional contributions from such Part A processes can thus be discounted.

8.22 Part B industrial process of the type listed in Annex 2

These are the processes prescribed for pollution control under Part 1 of the Environmental Protection Act 1990. Part B processes are authorised by Local

Authorities for control of air emissions only. The list of Part B processes within Winchester City Council's area is included in Appendix 2, the only processes with the potential to be significant Sulphur Dioxide sources are the roadstone coating plants. Foster Yeoman at Botley uses natural gas, on an interruptible contract with a gas oil backup that is only used on several days of the year. The Raynesway Construction site at Micheldever uses gas oil but is located in a rural location well away from any public access and thus has no nearby receptors. Therefore it has been concluded that no part B processes require further assessment for Sulphur Dioxide.

8.23 A solid-fuel or fuel oil combustion system with thermal power greater than 5MW

A telephone survey was conducted of known large boilers, which due to the lack of any register regarding such matters was based on local knowledge. The following were considered:

- Royal Hampshire County Hospital, Winchester - Greater than 5 MW but uses a natural gas supply. There is fuel oil storage supply, which is used in the event of a failure in the gas supply. Although the fuel oil burning is tested regularly, it has not been used for any duration for several years. Fuel oil would be considered in the future if it becomes cheaper than gas.
- Hampshire County Council – All school boilers are gas fired with fuel oil backup. Although the gas contract is in theory interruptible the oil fuel lines are currently disconnected. All boilers well below 5MW.
- Her Majesty's Prison, Winchester– Uses a series of small dispersed gas boilers.
- Winchester City Council (Including River Park Leisure Centre) - Use a series of gas boilers for offices and public buildings, solid or fuel oil only used in domestic residences.
- Winchester Linen – Uses a steam boiler burning heavy fuel oil, maximum rating of 1.496MW output at 80 percent efficiency. Boiler is run at approximately 50 percent maximum, burning around 80 litres of fuel an hour for around 50 hours per week. This equates to an input rating well below 5MW.
- King Alfred College, Winchester – Series of small units. Student village gas fired, main campus oil fired units at a maximum rating of 750KW.
- Winchester School of Art – Gas Powered, maximum 0.5MW boilers, no fuel oil standby.
- Worthy Down AJC – Mainly gas powered only one oil fired heating/hot water boiler system which is below 5MW.
- HMS Dryad, Southwick – Prime fuel is gas (interruptible contract) with fuel oil standby used less than 5 percent of the time. Heat output of boilers is three at 3MW and one at 1MW. Boilers are co-located but not all are on line at the same time, however combined heat input can, at times, be above 5MW.

It is considered that none of the above sites meet this criterion except when standby fuel oil is being used. In such instances there are two sites above this criteria but this occurs only on rare occasions at the Royal Hampshire Hospital in order to test the system and at HMS Dryad site only at peak times of combined

boiler usage when using standby fuel oil. In conclusion there are currently no significant sources of concern, but this may alter if fuel prices for oil compared with gas change in the future.

8.24 A 1km x 1km grid square in the authority's area for which maximum low-level (i.e. domestic combustion and other short stack) emissions are greater the 25kg per hour or 40 tonnes per year etc.

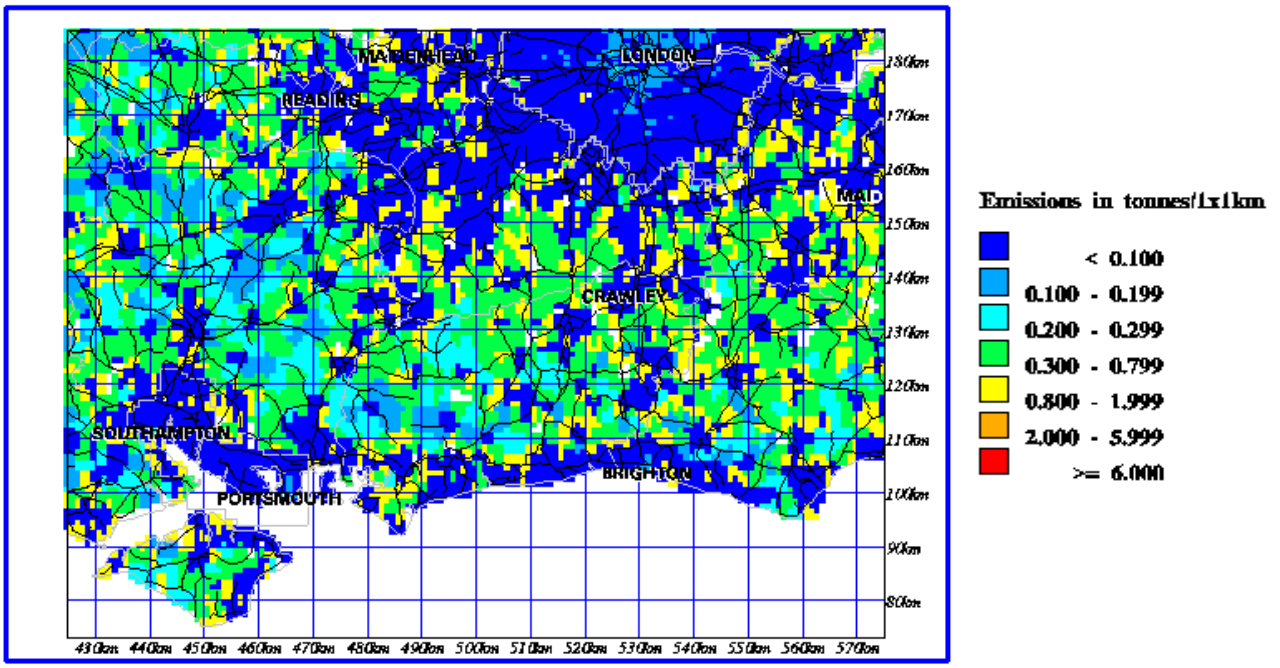


Figure 15 - 1996 Estimated Mass Emissions of SO_2 from Domestic Sources

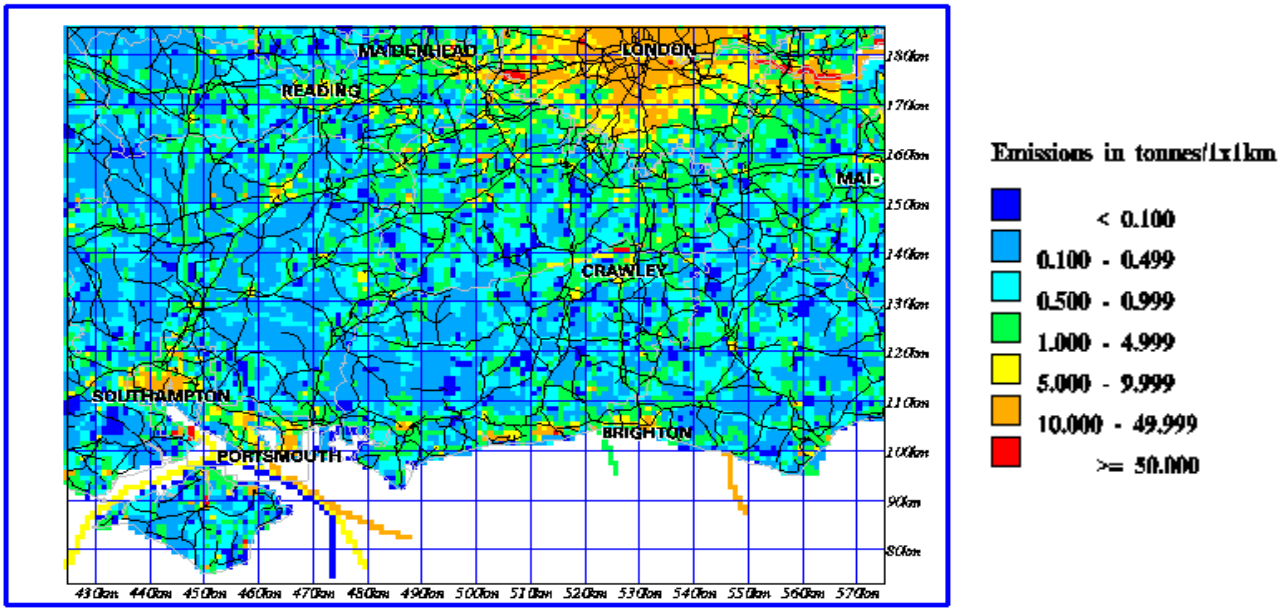


Figure 16 – 1996 Estimated Total Mass Emissions of SO_2

Figure 15 shows the DETR web site data on the mass emissions from domestic sources, these are estimated at a maximum of just below 2 tonnes per kilometre grid square. It is considered due to the nature of Winchester's District that there would not be a significant additional contribution from other low lying sources, this is however difficult to quantify exactly. Therefore total mass emissions have been reviewed as shown in figure 16. Reviewing the data set used to compose this map shows that total mass emissions for "All Sources" are below 40 tonnes per annum within Winchester's District.

8.3 Conclusion

No further investigations are required for Sulphur Dioxide, a further review will only be required if a significant industrial process commences within, or adjacent to Winchester's district, or if there is a shift in usage within large boilers from natural gas back to fuel oils. Sulphur Dioxide levels within Winchester City Council's area are currently predicted to be in compliance with the recommended air quality standard by 2005.

9.0 Conclusions and Recommendations

Pollutant	Stage 1 Conclusion	Next Steps	Target Completion Date	Additional Resource Costs*
Benzene	No further assessment required.	None	Complete	None
1,3-Butadiene	No further assessment required.	None	Complete	None
Lead	No further assessment required.	None	Complete	None
Sulphur Dioxide	No further assessment required.	None	Complete	None
Carbon Monoxide	Failures in 2005 unlikely but cannot be dismissed adjacent to main link roads (M3, M27, A303 and A34) without stage 2 modelling.	Modelling using new DMRB when available	July 1999	None
Nitrogen Dioxide	Failures in 2005 unlikely except at locations adjacent to main link roads (M3, M27, A303 and A34) especially where these are adjacent to urban conurbations.	A combined stage 2 and 3 assessment using existing equipment: 1. Diffusion tubes (with alteration in current locations) 2. Real time Monitoring data from Winchester town centre 3. Modelling using new DMRB when available	December 1999	None (existing equipment only)

Particulate Matter (PM10's)	Widespread failures in PM10 standard anticipated, extent and location of failures requires data currently unavailable.	Lack of suitable stage 2 indicative monitoring or modelling techniques means a stage 3 assessment will be required using: 1. Existing monitoring equipment within Winchester town centre: 2. A mobile station to obtain comparative data adjacent to the M3, M27 and A34 as well as accurate rural background levels. Data to be benchmarked against existing town centre data	December 1999	**£14,000** (includes purchase of equipment and one years servicing and maintenance)

***Additional resource costs does not include costs already being incurred in running existing monitoring programme or the additional staff time required in performing the stage 2 and 3 assessments.**

APPENDIX 1
TRAFFIC FLOW DATA

TRAFFIC FLOW DATA

ADT – Average Daily Traffic (Average of all flows)
AWT – Average Weekday Traffic (Average of Monday to Friday flows only)
16HR - Considers only daytime and evening flows.
12HR - Considers only daytime flows.

Location – M3, Junctions 8-9 (South Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	23147	25085	21704	23668	18418	20148
28	Feb 98	26043	27831	24433	26244	20758	22311
31	Mar 98	26275	27883	24667	26311	20865	22285
30	Apr 98	27070	28628	25339	26861	21476	22781
17	May98	27925	28906	26140	27062	22301	22936
11	Jun 98	29141	29879	27168	28016	22831	23472
31	Jul 98	29978	30956	27998	29061	23410	24204
19	Aug 98	31991	32515	29927	30544	25311	25754
8	Sep 98	28886	30014	26964	28138	22715	23722
21	Oct 98	27795	29379	25990	27603	21831	23271
-	Nov 98						
-	Dec 98						
227	Average	27825	29101	26033	27351	21992	23088

Location – M3, Junctions 9-8 (North Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	23164	24755	21651	23172	18498	19851
28	Feb 98	25704	27014	24078	25337	20360	21557
31	Mar 98	25953	26907	24241	25161	20420	21344
30	Apr 98	26782	27993	24709	25746	20807	21688
17	May98	27809	28794	24781	25346	20328	20754
11	Jun 98	28981	29024	26828	26975	22206	22819
31	Jul 98	29288	29601	27177	27584	22450	23088
19	Aug 98	31463	31023	28817	28749	22921	23315
8	Sep 98	28887	29136	26907	27149	22550	22993
21	Oct 98	27537	28482	25727	26631	21679	22596
-	Nov 98						
-	Dec 98						
227	Average	27557	28273	25492	26185	21222	22001

Location – M3, Junctions 10-9 (North Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	37160	40260	34616	37476	29630	32035
28	Feb 98	40612	43299	37866	40312	32097	34204
31	Mar 98	41467	43775	38620	40728	32684	34529
30	Apr 98	42891	45479	39970	42357	33847	35877
31	May98	45135	47575	41799	44077	34529	36594
30	Jun 98	45166	46486	41770	42979	34769	36049
31	Jul 98	46599	47809	43142	44308	35817	37047
31	Aug 98	49580	50082	45679	46369	36956	37929
30	Sep 98	47171	48313	43833	44830	36681	37631
21	Oct 98	44042	46357	40992	43095	34663	36493
-	Nov 98						
-	Dec 98						
294	Average	43982	45944	40829	42653	34167	35839

Location – M3, Junctions 10-11 (South Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	41911	45745	39357	43231	33658	37105
28	Feb 98	45675	49476	42793	46563	36200	39428
31	Mar 98	45868	48777	43021	46006	36424	39015
29	Apr 98	44145	47741	41771	45157	36020	38774
31	May98	48242	50559	45305	47733	38141	40063
30	Jun 98	51150	53895	47764	50655	40101	42542
15	Jul 98	55193	57400	51411	53787	42984	44987
-	Aug 98						
-	Sep 98						
-	Oct 98						
-	Nov 98						
-	Dec 98						
209	Average	47455	50513	44489	47590	37647	40273

Location – M3, Junctions 11-10 (North Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	43875	47538	41020	44452	35295	38211
28	Feb 98	47832	51044	44750	47734	38148	40740
31	Mar 98	48747	51499	45409	47915	38675	40844
29	Apr 98	50223	53357	45404	47729	38374	39919
31	May98	52469	55339	48768	51520	40489	43015
30	Jun 98	52576	54385	48846	50595	40890	42719
15	Jul 98	53336	55436	49584	51665	41595	43522
-	Aug 98						
-	Sep 98						
-	Oct 98						
-	Nov 98						
-	Dec 98						
195	Average	49865	52657	46254	48801	39067	41281

Location – M3, Junctions 11-12 (South Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	45109	49389	42231	46519	36092	39918
28	Feb 98	49658	53728	46450	50536	39454	43001
31	Mar 98	50590	54410	47351	51179	40106	43435
29	Apr 98	51579	55391	48376	51990	41492	44472
31	May98	53901	56718	50166	52997	42136	44428
30	Jun 98	54263	57417	50469	53746	42398	45155
28	Jul 98	56228	58931	52262	55114	42741	46156
	Aug 98						
	Sep 98						
	Oct 98						
	Nov 98						
	Dec 98						
208	Average	51618	55141	48186	51726	40774	43795

Location – M3, Junctions 12-11 (North Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	44333	48146	41416	44998	35528	38563
28	Feb 98	48462	51922	45303	48543	38552	41365
31	Mar 98	49416	52455	46015	48813	39139	41558
29	Apr 98	50672	54039	45841	48410	38737	40499
31	May98	52891	56098	49128	52210	40782	43600
30	Jun 98	52992	55185	49209	51337	41193	43351
28	Jul 98	54123	55998	50295	52172	41963	43878
-	Aug 98						
-	Sep 98						
-	Oct 98						
-	Nov 98						
-	Dec 98						
208	Average	50413	53406	46744	49498	39413	41831

Location – A303 Micheldever (West Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	13041	14039	12281	13283	10513	11348
28	Feb 98	14806	15718	13949	14863	11915	12644
31	Mar 98	15127	15920	14251	15045	12113	12759
30	Apr 98	16533	17389	15593	16418	13331	13991
31	May98	16886	17264	15839	16237	13367	13616
30	Jun 98	17219	17638	16113	16564	13597	13904
31	Jul 98	18023	18218	16869	17154	14229	14399
31	Aug 98	18538	18369	17252	17247	14585	14525
30	Sep 98	17195	17456	16136	16438	13704	13904
22	Oct 98	16004	16791	15041	15824	12765	13395
-	Nov 98						
-	Dec 98						
295	Average	16337	16880	15332	15907	13012	13449

Location – A303 Micheldever (East Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	13624	14188	12868	13412	11112	11656
28	Feb 98	14842	15347	14001	14492	11912	12481
31	Mar 98	15136	15511	14250	14614	12124	12589
30	Apr 98	16566	17108	15598	16108	13228	13749
31	May98	17248	17812	16122	16656	13382	13927
30	Jun 98	17259	17071	16070	15944	13470	13595
31	Jul 98	17937	17634	16792	16530	14058	14034
31	Aug 98	18862	18396	17518	17141	14397	14290
30	Sep 98	17993	17674	16901	16613	14242	14194
22	Oct 98	16322	16537	15375	15588	13098	13468
-	Nov 98						
-	Dec 98						
295	Average	16579	16728	15550	15710	13102	13398

Location – M27, Junctions 9-10 (East Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	36065	40135	34142	38223	29891	33549
28	Feb 98	39567	43652	37486	41577	32590	36242
31	Mar 98	40184	44083	38056	41990	32958	36482
30	Apr 98	39947	43763	37756	41583	32571	35985
31	May98	41828	45562	39392	43163	33594	36961
30	Jun 98	42527	46111	40075	43750	34309	37670
31	Jul 98	43667	47325	41175	44916	35074	38497
31	Aug 98	44205	47235	41617	44763	35226	38081
30	Sep 98	43301	46539	40900	44242	35063	38086
14	Oct 98	41866	45788	39569	43577	34118	37725
	Nov 98						
	Dec 98						
287	Average	41316	45019	39017	42778	33539	36928

Location – M27, Junctions 10-9 (West Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	35597	39919	33700	37958	29556	33374
28	Feb 98	39162	43520	37118	41398	32410	36250
31	Mar 98	39803	43972	37672	41770	32773	36481
30	Apr 98	39455	43371	37331	41207	32275	35775
31	May98	41134	45032	38818	42681	33310	36763
30	Jun 98	41863	45555	39430	43106	33828	37220
31	Jul 98	42827	46712	40359	44281	34592	38181
31	Aug 98	43801	46996	41117	44389	34790	37902
30	Sep 98	43173	46667	40744	44209	35062	38240
14	Oct 98	41446	45583	39132	432334	33842	37561
-	Nov 98						
-	Dec 98						
287	Average	40826	44733	38542	42423	33244	36775

Location – A34, South of Bullington (South Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	15987	17492	14985	16461	12771	14131
28	Feb 98	17465	18970	16354	17832	13733	15062
31	Mar 98	17980	19387	16842	18224	14091	15334
30	Apr 98	18629	19954	17398	18670	14598	15764
31	May98	19454	20604	18083	19197	15058	16005
14	Jun 98	19482	20534	18151	19223	15121	16076
9	Jul 98	21526	21951	19949	20501	16559	17139
31	Aug 98	20997	21488	19514	20044	16310	16791
30	Sep 98	20205	21097	18834	19754	15753	16641
22	Oct 98	18918	20225	17638	18971	14799	16063
-	Nov 98						
-	Dec 98						
256	Average	19064	20170	17775	18888	14879	15901

Location – A34, South of Bullington (North Bound)

Days Data Available	Month	24 HR		16HR		12HR	
		ADT	AWT	ADT	AWT	ADT	AWT
31	Jan 98	15877	17532	14886	16424	12897	14218
28	Feb 98	17137	18672	16060	17473	13769	15002
31	Mar 98	17773	19231	16679	18036	14282	15459
30	Apr 98	18481	19912	17357	18694	14864	15993
31	May98	19086	20414	17846	19113	14984	16088
30	Jun 98	19306	20184	18056	18901	15207	16001
31	Jul 98	20020	20849	18666	19479	15666	16411
31	Aug 98	20887	21319	19421	19888	15972	16473
30	Sep 98	20274	20983	18984	19634	16065	16648
22	Oct 98	18794	20183	17635	18935	15094	16216
-	Nov 98						
-	Dec 98						
295	Average	18764	19928	17559	18658	14880	15851

Manual Classified Count Data for Winchester City

Location	12 Hour Two Way Traffic Flow			1997 - 24 Hr Average Annual Daily Traffic[T]
	1993	1995	1997	
Stockbridge Road	7432	7784	7021	6768
Romsey Road	12057	11291	9816	9463
St Cross Road	10225	12400	10907	10514
Andover Road	10479	9618	9591	9245
Chesil Street	9670	10038	10056	969
Garnier Road	1506	3736	4140	3991
Easton Lane	5135	5927	7958	7672
Worthy Road	8831	8239	7523	7252
Alresford Road	6715	7008	6555	6319
Barfield Close	1284	892	876	844

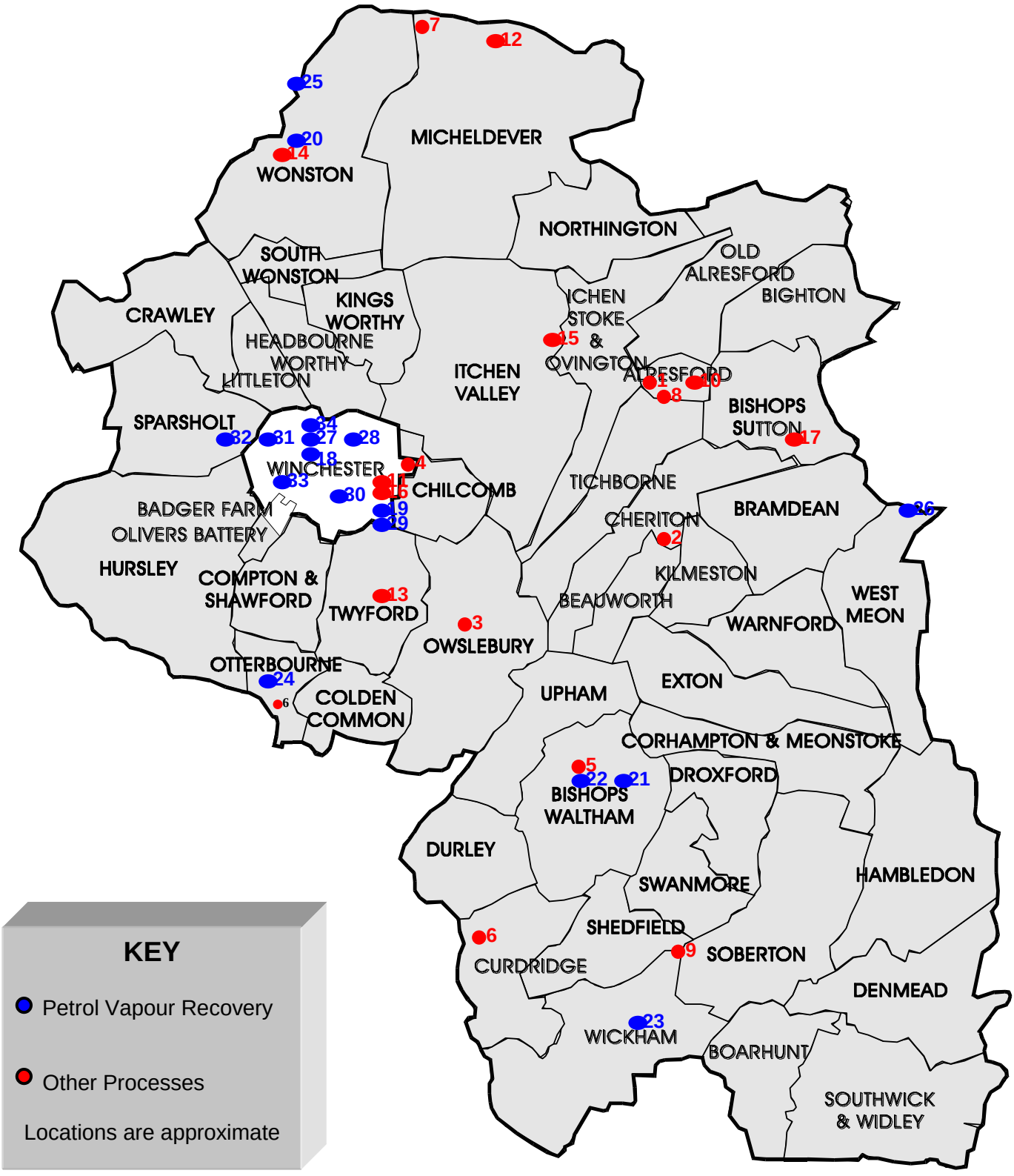
*[T] Data has been converted using the 1995 conversion factors supplied by Hampshire County Council. The 1997 data was taken in June so the appropriate E*M conversion factor was 0.964*

M3 Traffic Increases - Based on Transport Monitoring in Hampshire 1998

Location on M3	Year		%age	Year	%age	Year	%age	Year	%age
	1993	1994	93/94	1995	94/95	1996	95/96	1997	96/97
Junc 4-4a	84860	86432	1.9	92096	6.6	94114	2.2	97026	3.1
Junc 4a-5	75276	76673	1.9	81305	6.0	83657	2.9	86930	3.9
Junc 5-6		81283	-	85644	5.4	88902	3.8	91293	2.7
Junc 6-7	70340	70652	0.4	76131	7.8	79186	4.0	82133	3.7
Junc 7-8	70757	71217	0.7	78157	9.7	81573	4.4	84645	3.8
Junct 8-9	40760	42033	3.1	48298	14.9	50839	5.3	52631	3.5
Junc 9-10			-	-	-	83992	-	85500	1.8
Junc 10-11			-	91136	-	96174	5.5	97696	1.6
Junc 11-12		77927	-	91555	17.5	97038	6.0	102737	5.9
Junc 12-13		78389	-	89750	14.5	107651	6.5	99203	3.8
South Junc 13			-	-				110212	2.4
Average Growth			8.2%		10.8%		6.4%		3.4%

APPENDIX 2
LOCATION OF PART B PROCESSES WITHIN WINCHESTER CITY COUNCIL

WINCHESTER CITY COUNCIL
LOCATION OF PART B PROCESSES



REF	OPERATOR	ADDRESS	PROCESS
1	Advanced Surface Coatings	New Farm Road, Alresford	Surface Coating Processes
2	Crossroad Garage Ltd	New Cheriton	Waste Oil Burner <0.4MW
3	Emery Rees Feeds Ltd	Underdown Farm, Owslebury	Animal Feed Compounding
4	Evans Halshaw	Hyde St, Winchester	Respraying Road Vehicles
5	Field Motors	Station Rd, Bishops Waltham	Waste Oil Burner <0.4MW
6	Foster Yeoman Ltd	Station Yard, Botley	Roadstone Coating Plant
7	Raynesway Construction	Micheldever Station	Roadstone Coating Plant
8	Hankins Ltd	West St, Alresford	Waste Oil Burner <0.4MW
9	JT Sydenham & Co Ltd	Mislingford, Wickham	Timber Processes
10	New Farm Services	New Farm Road, Alresford	Waste Oil Burner <0.4MW
11	Ready Mixed Concrete	Easton Lane, Winchester	Bulk Cement Processes
12	SCATS Ltd	Micheldever Station	Animal Feed Compounding
13	SJD Humphrey Holdings Ltd	Hazeley Road, Twyford	Animal Feed Compounding
14	Taylors of Sutton Scotney	The Garage, Sutton Scotney	Waste Oil Burner <0.4MW
15	Veterinary Investigation Centre	Northington Road, Itchen Abbas	Animal Carcass Incinerator
16	Wiggins of Winchester	Easton Lane, Winchester	Respraying of Road Vehicles
17	Hi-Tech Surface Treatment Ltd	Old Park Road, Bishops Sutton	Coating Processes
18	J Sainsburys Plc	Badger Farm Road, Winchester	Petrol Vapour Recovery
19	Tesco	Easton Lane, Winchester	Petrol Vapour Recovery
20	Sutton Scotney Garage	Oxford Road, Sutton Scotney	Petrol Vapour Recovery
21	Priory Service Station	Winchester Road, Bishops Waltham	Petrol Vapour Recovery
22	Glider Services	Winchester Road, Bishops Waltham	Petrol Vapour Recovery
23	Shell Service Station	Fareham Road, Wickham	Petrol Vapour Recovery

REF	OPERATOR	ADDRESS	PROCESS
24	Williams Garage	Main Road, Otterbourne	Petrol Vapour Recovery
25	Granada Road Services	A34, Sutton Scotney	Petrol Vapour Recovery
26	Meon Hut Service Station	A32, West Meon	Petrol Vapour Recovery
27	Shell UK Ltd – Berewick Services	Stockbridge Road, Weeke	Petrol Vapour Recovery
28	Esso Petroleum Company Ltd	Andover Road, Winchester	Petrol Vapour Recovery
29	Shell UK Ltd	Easton Lane, Winchester	Petrol Vapour Recovery
30	Murco Service Station	Bar End Road, Winchester	Petrol Vapour Recovery
31	Pittvale Service Station	Romsey Road, Pitt	Petrol Vapour Recovery
32	Yew Tree Service Station	Romsey Road, Pitt	Petrol Vapour Recovery
33	St Cross Service Station	St Cross Road, Winchester	Petrol Vapour Recovery
34	Harestock Garage	Priors Dean Road, Winchester	Petrol Vapour Recovery

APPENDIX 3
LOCATION OF PART A PROCESSES WITHIN HAMPSHIRE

Local Authority	Operator Name	Operator Address	Grid Ref	Process Sector
Basingstoke & Dean BC	Portals Holdings Plc	Portals Ltd, Overton Paper Mill, Overton, Basingstoke, Hants, RG25 3JG	SU 51805100	Combustion Processes
Basingstoke & Dean BC	B F Goodrich Component Services Ltd	Units 1 and 2 Cherrywood, Chineham Business Park, Cineham, Basingstoke, Hants	SU 62605050	Inorganic Chemical Processes
Basingstoke & Dean BC	Leverton Clarke Ltd	Units 16&17, Sherrington Way, Lister Road Ind Est, Basingstoke, Hants, RG22 4DQ	SU 65105430	Inorganic Chemical Processes
Basingstoke & Dean BC	Coltax Aerospace Ltd	Bilton Industrial Estate, 16/18 Bilton Road, Basingstoke, Hants, RG24 8LJ	SU 66604620	Petroleum Processes
Basingstoke & Dean BC	Soco (UK) Ltd	Humbly Grove, Oilfield, The Avenue, Lasham, Alton, Hants, GU34 5SY	SU 69304430	Petroleum Processes
East Hants	Soco (UK) Ltd	Holybourne Oil Terminal, Cuckoos Corner, Holybourne, Alton, Hants, GU34 4JA	SU 69304430	Petroleum Processes
East Hants	Soco (UK) Ltd	Horndean Oilfield, Pyle Farm Sheepwash Lane(B site) and the Holt (C Site) Horndean	SU 71101225	Petroleum Processes
Eastleigh BC	Aerostructures Hamble Ltd	Building No 84, Titanium Etch Dept, Kings Avenue, Hamble, Southampton, SO3 5NF	SU 47100730	Acid Processes
Eastleigh BC	Pirelli Cables Ltd	Optical Fibre Unit, PO Box 23, Chickenhall Lane, Eastleigh, Hants, SO50 6YU	SU 46101910	Other Mineral Fibres
Eastleigh BC	Mobil Oil Co	Hamble Oil Terminal, Hamble Lane, Hamble, Southampton, SO3 5NR	SU 47700660	Petroleum Processes
Eastleigh BC	Ryvan Chemical Co Ltd	Botley Road., Hedge End, Southampton, So3 3HE	SU 40001400	Processes involving Halogens
Fareham BC	Southern Water Services Ltd	Hampshire Divison, Peel Common, Newgate Lnae , Fareham, Hants, Po14 1BA	SU 56500340	Incineration
Gosport BC	MOD	RNAY Fleetlands, Gosport Road, Gosport, Hants PO13 OAW	SU 58900410	Inorganic Chemical Processes
Gosport BC	Cyanamid Agriculture Ltd	154 Fareham Road, Gosport, Hampshire, PO13 0AS	SU 58300410	Inorganic Chemical Processes
Gosport BC	Cyanamid Agriculture Ltd	Fareham Road, PO Box 7, Gosport, Hampshire, PO13 0AS	SU 58300410	Pesticide Processes
Havant BC	Thermofil Poltmers (UK) Ltd	New Lane, Havant, Hampshire, PO9 2NQ	SU 72300700	Inorganic Chemical Processes
New Forest DC	National Power Plc	Central Electricity Generating Board, Fawley Power Station, Fawley SouthamptonSO45 1TW	SU 47400230	Combustion Processes
New Forest DC	Esso Petroleum Co Ltd	ESSO Refinery, Fawley, Southampton, SO45 1TX	SU 45600370	Combustion Processes
New Forest DC	Enichem UK Ltd	Charleston Road, Hardley, Hythe, Southampton, SO4 6ZE	SU 43900585	Combustion Processes
New Forest DC	Rechem International Ltd	Charleston Road, Hardley, Hythe Southampton, SO45 3NX	SU 43230573	Incineration
New Forest DC	Enichem Uk Ltd	Charleston Road, Hardley, Hythe Southampton, SO4 6YY	SU 43800560	Manufacture and use of organic chemicals

New Forest DC	Inspec Uk Ltd	Charleston Industrial Estate, Hardley, Hythe Southampton, SO4 6ZG	SU 43500590	Manufacture and use of organic chemicals
New Forest DC	NALCO/EXXON Energy Chemicals Ltd	Cadland Road, Hythe, Southamton, SO4 6NP	SU 46300410	Manufacture and use of organic chemicals
New Forest DC	NALCO/EXXON Energy Chemicals Ltd	Cadland Road, Hythe, Southamton, SO4 6NP	SU 46300410	Manufacture and use of organic chemicals
New Forest DC	Bitmac Ltd	Totton Works, Ealing Wharf, Totton, Southampton, SO40 9LH	SU 36681320	Manufacture and use of organic chemicals
New Forest DC	NALCO/EXXON Energy Chemicals Ltd	Cadland Road, Hythe, Southamton, SO4 6NP	SU 46300410	Manufacture and use of organic chemicals
New Forest DC	NALCO/EXXON Energy Chemicals Ltd	Cadland Road, Hythe, Southamton, SO45 3NP	SU 46300410	Manufacture and use of organic chemicals
New Forest DC	NALCO/EXXON Energy Chemicals Ltd	Cadland Road, Hythe, Southamton, SO4 6NP	SU 46300410	Manufacture and use of organic chemicals
New Forest DC	Enichem UK Ltd	Charleston Road, Hardley, Hythe, Southampton SO4 6YY	SU 43900585	Manufacture and use of organic chemicals
New Forest DC	Inspec UK Ltd	Charleston Ind Estate, Hardley, Hythe, Southampton SO4 6AG	SU 43500590	Manufacture and use of organic chemicals
New Forest DC	Inspec UK Ltd	Charleston Ind Estate, Hardley, Hythe, Southampton SO45 3ZG	SU 43400590	Manufacture and use of organic chemicals
New Forest DC	Nalco/Exxon Energy Chemicals Ltd	Cadland Road, Hythe, Southampton, SO4 6NP	SU 46300410	Manufacture and use of organic chemicals
New Forest DC	Nalco/Exxon Energy Chemicals Ltd	Cadland Road, Hythe, Southampton, SO4 6NP	SU 46300410	Manufacture and use of organic chemicals
New Forest DC	Nalco/Exxon Energy Chemicals Ltd	Cadland Road, Hythe, Southampton, SO4 6NP	SU 46300410	Manufacture and use of organic chemicals
New Forest DC	Inspec UK Ltd	Charleston Road, Hardley, Hythe, Southampton SO45 3ZG	SU 43400590	Petrochemical Processes
New Forest DC	Exxon Chemical Ltf	Cadland Road, Hythe, Southampton, SO4 6NP	SU 46300410	Petrochemical Processes
New Forest DC	Exxon Chemical Ltf	Cadland Road, Hythe, Southampton, SO4 6NP	SU 46300410	Petrochemical Processes
New Forest DC	Exxon Chemical Ltf	Cadland Road, Hythe, Southampton, SO4 6NP	SU 46300410	Petrochemical Processes
New Forest DC	Exxon Chemical Ltf	Cadland Road, Hythe, Southampton, SO4 6NP	SU 46300410	Petrochemical Processes
New Forest DC	Great Marsh Ltd	Totton Works, High Street, Totton, Southampton SO40 9TN	SU 36501310	Petroleum Processes
New Forest DC	ESSO Petroleum CO Ltd	ESSO Refinery, Fawley, Southampton, SO45 1TX	SU 45600370	Petroleum Processes
Portsmouth CC	Fleet Support Ltd	NDE and Nucleonic Calibration Facility, HM Naval Base, Portsmouth, PO1 3NH	SU 63500110	Coating Processes and Printing
Portsmouth CC	Vosper Thornycroft (UK) Ltd	Porchester Shipyard, 223 Southampton Rd, Paulsgrove, Portsmouth PO6 4QA	SU 67000310	Coating Processes and Printing
Portsmouth CC	Fleet Support Ltd	NDE and Nucleonic Calibration Facility, HM Naval Base, Portsmouth, PO1 3NH	SU 38901190	Combustion Processes

Portsmouth CC	Portsmouth Aviation Ltd	Airport Service Road, Portsmouth, Hampshire, PO6 3PX	SU 67000310	Inorganic Chemical Processes
Southampton CC	A and P Southampton Ltd	Berth 201-202, Western Avenue, Western Way, Southampton, SO15 0HH	SU 38901190	Coating Processes and Printing
Southampton CC	GEC Marconi Infra-red Ltd	PO Box 217, Millbrook Industrial Estate, Southampton, Hampshire SO15 0EG	SU 37901330	Inorganic Chemical Processes
Southampton CC	Morgan Matroc Ltd	Transducer Products Division, Thornhill, Southampton, SO19 7TG	SU 46541213	Inorganic Chemical Processes
Test Valley BC	Resadhesion Ltd	53 Royce Close, Andover, Hampshire, Sp10 3TS	SU33884611	Manufacture and use of organic chemicals
Test Valley BC	Borden Chemical UK Ltd	Thomas Road, North Baddesley, Southampton SO52 9ZB	SU 39101970	Manufacture and use of organic chemicals
Winchester CC	**Hydro Agi (UK) Ltd**	**Larkwhistle Farm Road, Micheldever, Winchester, Hants**	**SU 53504170**	**Chemical Fertiliser Production**
Winchester CC	**Pentex Oil UK Ltd**	**Larkwhistle Farm, Stockbridge Site Office, Crawley Down, Winchester**	**SU 45203520**	**Petroleum Processes**

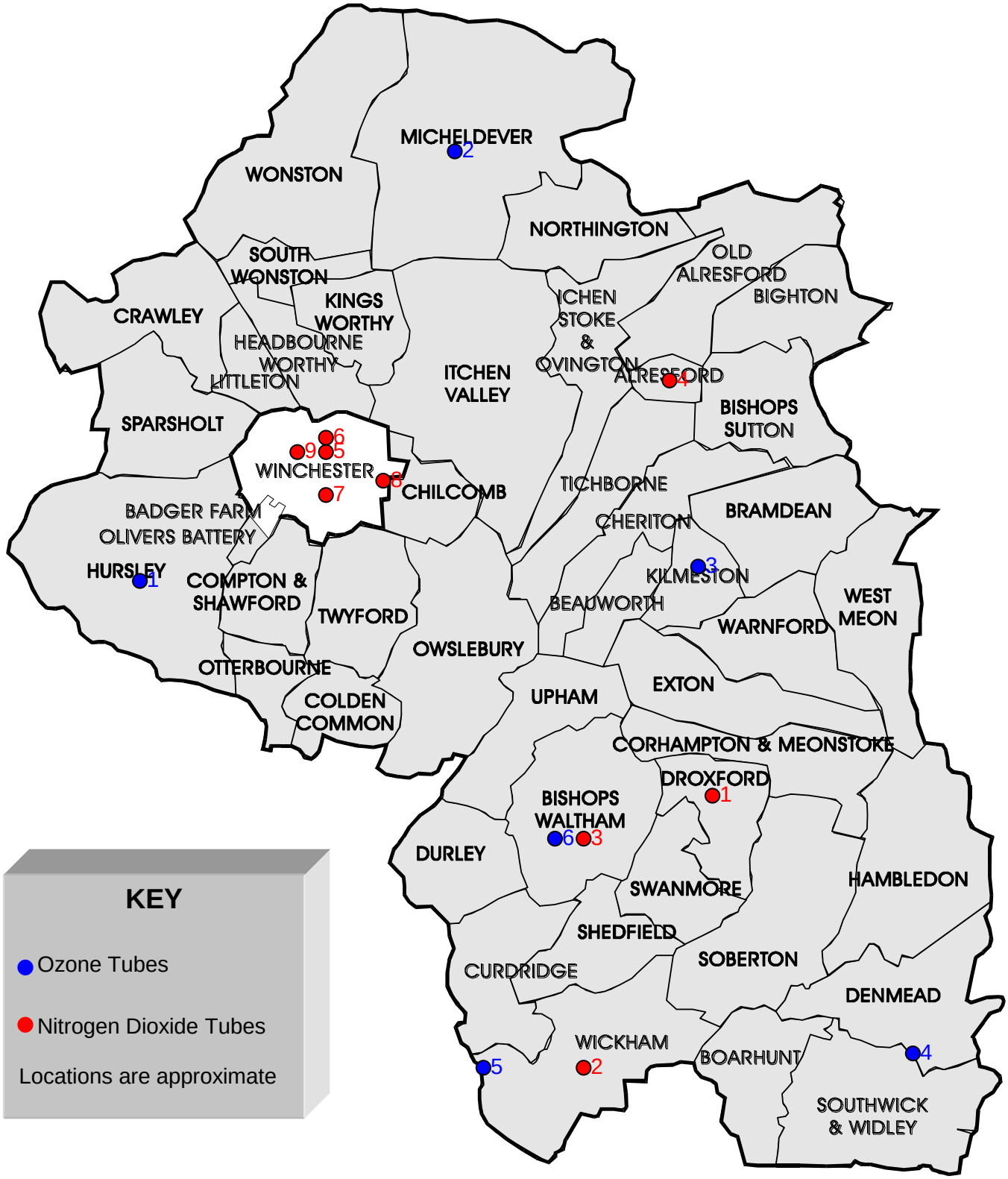
NOTE

1. This table is reproduced from data provided by the Environment Agency and its use is subject to the copyright terms and conditions of that organisation.

2. Where an entry appears more than once, this is due to that site holding more than one authorisation for different site locations and/or processes.

APPENDIX 4
LOCATION OF DIFFUSION TUBES

WINCHESTER CITY COUNCIL
LOCATION OF DIFFUSION TUBES



LOCATION OF DIFFUSION TUBES

OZONE

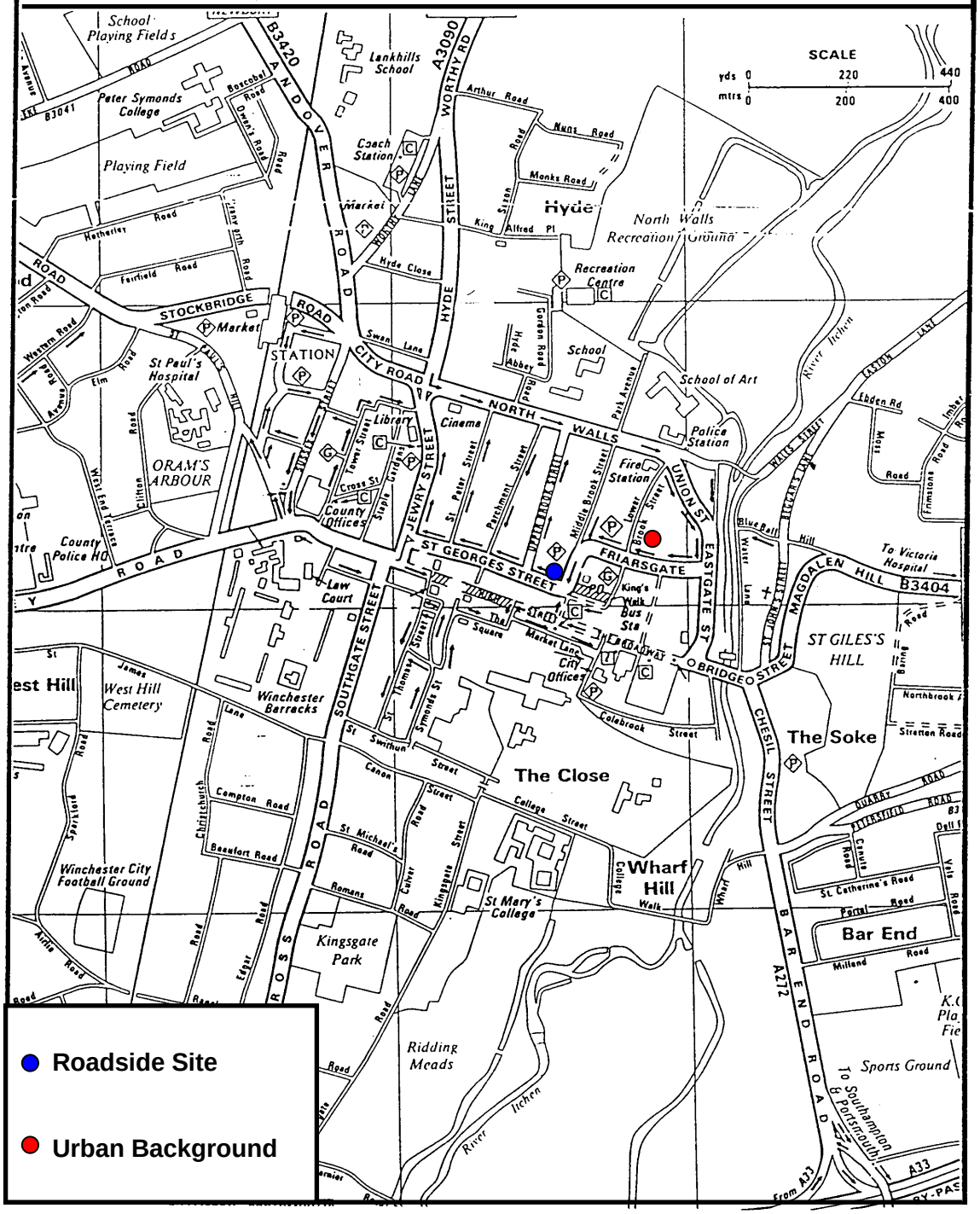
1 Hursley Estate, Hursley
2 The Vicarage, Micheldever
3 Kilmeston Village Centre
4 Southwick Road, Denmead
5 Solent Business Park, Whiteley
6 Winchester Road Bishops Waltham

NITROGEN DIOXIDE

1 Winchester Road, Denmead
2 Wickham Square, Wickham
3 Winchester Road, Bishops Waltham
4 Broad Street, Alresford
5 Echo Office, Winchester
6 City Road, Winchester
7 Chesil Street, Winchester
8 Alresford Road, Winchester
9 Roadside Monitor, Winchester

APPENDIX 5
REAL TIME MONITORING STATIONS

WINCHESTER TOWN CENTRE – LOCATION OF REAL TIME MONITORS



REAL TIME MONITORING STATIONS

The locations of these sites are shown on the above map. Described below is the basic monitoring principles employed together with the Quality Control performed. This is designed to be an overview, more detailed information will be submitted in relevant stage 3 assessment reports.

The roadside site is located in St George's Street directly behind the Echo office, next to the phone boxes, in a grey cabinet similar to those seen adjacent to traffic lights. This site monitors exposure, which is typical for the pedestrian in close proximity to a busy road within the town centre. The background site is off Lawn Street, in the walled area to the side of Godson House, in the brick effect hut with a large mast attached supporting the meteorological monitoring equipment. This site monitors exposure typical of a person living or working within the town centre. In addition, this site is fitted with an automatic basic meteorological station, which monitors on an hourly average, wind speed and direction, temperature and relative humidity.

Both these sites are run jointly by Winchester City Council and Hampshire County Council. The analysers are fully serviced every six months by Enviro Technology Services Plc who were the original suppliers. Currently, Hampshire County Council meets the running costs including the equipment servicing and supply of calibration gases for which contracts are in place. Winchester City Council in return provides the personnel for the day to day running and calibration of the equipment. The sites are connected via modem to computer databases and public displays at Winchester City Council and Hampshire County Council. All air quality data is expressed in terms of Greenwich Mean Time (GMT) which is one hour behind British Summer Time (BST), whilst in winter GMT and local time are the same.

Both these sites run identical equipment, which monitors for the following pollutants:

- Oxides of Nitrogen (NO and NO_2)
- Carbon Monoxide (CO)
- Fine particulates (PM10's)

The basic operation of these monitors is described below:

API 200A NO Analyser

This analyser works on the principle of chemiluminescence where Nitric Oxide (NO) in the sample reacts with ozone to produce activated or high energy state NO_2 which then emits energy as light as it drops to a lower energy state:

$$NO + O_3 \longrightarrow NO_2^* + O_2$$

$$NO_2^* \longrightarrow NO_2 + h\nu$$

The total light emitted is thus proportional to the concentration of NO present, this is measured using a photomultiplier tube (PMT) which converts the result into a digital signal. The ozone required for this reaction is generated internally by the application of a high voltage AC electric supply to a pre-dried air supply. Having analysed the NO

concentration the sample is passed over a heated molybdenum catalyst at 315^{o}C which reduces all NO_2 present to NO by the following reaction:

$$3NO_2 + Mo \xrightarrow{315^{o}C} 3NO + MoO_3$$

This is then re-routed by switchable valves back through the analyser with the resultant concentration being the total of NO and NO_2 (converted to NO) referred to as the NOx concentration. The concentration of NO_2 is then calculated by the difference between the two readings.

The air is pumped through the analyser using an externally fitted pump that has recently been installed to replace the unreliable internal pumps originally provided.

API 300 CO Analyser

This analyser works on the principle of the absorption of Infrared (IR) light at wavelengths close to 4.7 microns. In practice the instrument generates a broad band IR light source using a high energy heated element. This is then passed using a rotating gas filter wheel at 30 cycles per second alternately through one of two gas cells, one filled with Nitrogen (The Measure Cell) and one filled with a Carbon Monoxide & Nitrogen mixture (The Reference Cell). During the reference phase the light is effectively stripped of absorbable light by the CO in the reference cell whilst in the measure cycle the Nitrogen in the measure cell does not affect the light which can then be adsorbed by any CO in the sample cell. After the gas filter wheel the IR beam enters a multi-pass sample cell which uses optics to increase the length of the absorption path to increase the maximum sensitivity. The beam is then passed through a filter which only allows light of the wavelength of interest through. This is passed to a thermoelectrical cooled solid state photoconductor, which measures the light intensity striking it and then converts this into an electrical signal. The reading during the reference cycle is displayed as CO REF and during the measurement cycle as MEAS. The concentration of CO is thus proportional to the amount of light absorbed during the measurement cycle with the reference cycle being used as the calibration reference point.

MET ONE ABM 1020 PM10 Analyser

This analyser uses a principle that is different to most real time PM10 analysers. An external vacuum pump draws the sample through a PM10 head which uses a cyclone effect to separate out the PM10 fraction. This is then passed onto the automatic filter paper strip where the collected dust is filtered out. The instrument then measures the amount of dust collected on the filter paper by passing beta radiation through the sample from a carbon 14 source. The instrument works on a one hour sampling period by measuring the amount of beta particles absorbed by the blank filter paper, then collecting a sample and finally remeasuring the amount absorbed by the now dust covered filter paper. During the cycle the instrument also performs an autocalibration of the plain filter paper against an inbuilt reference membrane of known standard material. The difference between the two readings is the amount of beta absorption or attenuation caused by the dust, which is proportional to the mass density of the dust collected. The hourly average dust concentration is thus calculated from the total air volume filtered, which is monitored by the instrument and the known total mass of material collected.

ODESSA DSM 3260 Data Logger & Envaid/Envicom Software

This collects the hourly averaged data from the CO, PM10 and NO analysers as well as information from the automatic calibration results and meteorological equipment. It is fitted with a Data cartridge, with a five day battery backup, which stores upto 64K (Approximately 3-4 months) of raw data on a overwrite basis. It is connected by modem to terminals at Winchester City Council (WCC) Environmental Protection Section and Hampshire County Council (HCC) as well as public displays at both HCC and WCC.

Meteorological Data

The background site only is fitted with basic meteorological equipment which consists of the following:

- Mast
- Temperature Probe
- Wind anemometer and Vane
- Humidity Probe
- Data Logger

Site Inspections and Calibration

A recorded weekly site visit is made to the analysers, with the CO and NO analysers being checked every two weeks to gas cylinders containing a known gas concentration. AEA Technology double checks these gases prior to purchase to ensure the accuracy of the calibration gas concentrations quoted. The CO analysers are checked to a known CO gas concentration of approximately 20ppm and the NOx analysers to a known NO gas concentration of approximately 500ppb. The NO gas cylinder also has a known NOx concentration, which the instrument is also checked against. Currently no NO_2 gas checks are made. All gas checks are performed through the sampling ports to ensure consistency. The NO readings are taken with an excess flow of 600cc per minute through a bleed off rotameter. All gas cylinders are dated and returned after a maximum of one year.

Both CO and NO analysers perform an automatic calibration check between 00.45 and 01.05 each night. The envaid software is set to poll data from the dataloggers twice per day at 7.00am and 7.00pm. The software is set to download the previous day's data together with an overnight auto calibration check. This is set to run the CO analysers to the gas cylinders connected to the instruments at both sites. The NO analysers are checked using a permeation tube, which is attached to the rear of these instruments, and electrically generates a standard concentration of NO_2, which is considered to be a suitable secondary indicative standard. In addition to these "Span" readings both instruments also check their "Zero" readings using the in-built gas scrubbers.

All instruments are also on a full service contract with Enviro Technology, the original equipment providers, and are fully serviced every six months. All breakdowns are also attended to within 5 working days.

More detailed information on the QC/QA programme can be provided upon request and will be included in any future stage 3 assessments.

REFERENCES

REFERENCES

1. Environment Act 1995-Chapter 25, HMSO, ISBN 0 10 542595 8

2. Department of the Environment - Expert Panel on Air Quality Standards, Benzene, HMSO, ISBN 0 11 752859 5

3. Department of the Environment - Expert Panel on Air Quality Standards, Particles, HMSO, ISBN 0 11 753199 5

4. Department of the Environment - Expert Panel on Air Quality Standards, Ozone, HMSO, ISBN 0 11 752873 0

5. Department of the Environment - Expert Panel on Air Quality Standards, Nitrogen Dioxide, HMSO, ISBN 0 11 753352 1

6. Department of the Environment - Expert Panel on Air Quality Standards, Carbon Monoxide, HMSO, ISBN 0 11 753035 2

7. Department of the Environment - Expert Panel on Air Quality Standards, Sulphur Dioxide, HMSO, ISBN 0 11 753135 9

8. Department of the Environment - Expert Panel on Air Quality Standards, 1,3-Butadiene, HMSO, ISBN 0 11 753034 4

9. Department of the Environment - The United Kingdom National Air Quality Strategy, The Stationery Office, ISBN 0 10 135872 5

10. AEA Technology - UK Nitrogen Dioxide Survey 1995, AEA Technolog(National Environmental Technology Centre), January 1997.

11. AEA Technology - Air Quality Monitoring: A Handbook for Local Authorities, AEA Technology, August 1996, AEA/RAMP/20029001/01.

12. Her Majesty's Inspectorate of Pollution (Environment Report) - Air Quality in the Vicinity of Southampton Water, ERM

14. Department of the Environment - First Report of the Quality of Urban Air Review Group (QUARG), Urban Air Quality in the United Kingdom, January 1993, ISBN 0 9520771 1 6

15. Department of the Environment - Second Report of the Quality of Urban Air Review Group (QUARG), Diesel Vehicle Emissions and Urban Air Quality, December 1993, ISBN 0 9520771 2 4

16. Department of the Environment - Third Report of the Quality of Urban Air Review Group (QUARG), Airborne Particulate Matter in the United Kingdom, May 1996, ISBN 0 9520771 3 2

17. Warren Spring Laboratory - Air Pollution in the UK 1992/3, ISBN 0 85624 860 6

18. AEA Technology - Air Pollution in the UK 1993/4, ISBN 0 85356 422 1

19. AEA Technology - Air Pollution in the UK 1994, ISBN 0 85356 432 9

20. AEA Technology - Air Pollution in the UK 1995, ISBN 0 7058 1724 5

21. Department of the Environment Transport and the Regions - National Air Quality Information at www.aeat.co.uk/netcen/airqual/welcome

22. Department of the Environment Transport & Regions - Air Quality and Traffic Management, The Stationery Office, ISBN 0 11 753427 7

23. Department of the Environment Transport & Regions - Air Quality and Land Use Planning, The Stationery Office, ISBN 0 11 753424 2

24. Department of the Environment Transport & Regions - Framework for Review and Assessment of Air Quality, The Stationery Office, ISBN 0 11 753426 9

25. Department of the Environment Transport & Regions - Developing Local Air Quality Action Plans and Strategies: The Principal Considerations, The Stationery Office, ISBN 0 11 753425 0

26. The Air Quality Regulations 1997, SI 1997 3043, ISBN 0 11 065315 7

27. Department of the Environment Transport & Regions – Selection and Use of Dispersion Models, The Stationery Office, ISBN 0 11 753435 8

28. Department of the Environment Transport & Regions – Preparation and Use of Atmospheric Emissions inventories, ISBN 0 11 753434 X

29 Department of the Environment Transport & Regions – Monitoring for Air Quality Reviews and Assessments, The Stationery Office, ISBN 0 11 753429 3

30 Department of the Environment Transport & Regions – Review and Assessment: Pollutant Specific Guidance LAQM.TG4(98) – Loose Leaf Publication.

31 Hampshire/Isle of Wight Pilot Area (Portsmouth City Council) – The Assessment of Ambient Benzene Levels around Fawley Oil Refinery and Hamble Oil Terminal using BTX Diffusion Tubes, 27 October 1997.

32 New Forest District Council – A Study of Hydrocarbons in the New Forest, Hampshire July 1996.

33 CIEH/AEA – Air Quality, Guidance Manual on the Application of Procedures Prescribed for Local Authority Air Quality Management, Volume 1 General Aspects.

34 Cambridge Environmental Research Consultants Ltd, Air Dispersion Modelling Study of an OCGT at Fort Widley. Report to Environment Agency, Southern Region. 6 September 1998, FM308.