CHAPTER 7 AIR QUALITY

Introduction

The link between poor air quality and deteriorating human health has been recognised for many years. This relationship was clearly demonstrated in the 1950s when a period of smog was estimated to have caused 4,000 additional deaths across the country from respiratory and related illness. The effects of poor air quality are not limited to human health and the quality of life. Poor air quality can produce harmful effects to the environment and its fauna and flora. It can also severely corrode materials and buildings.

However, the effects of poor air quality on human health are of primary concern. It is important to note that the effects on health can be either acute or chronic, depending upon a number of factors, including: -

- the age and general health of the subject,
- the nature of the pollutant,
- the concentration of the pollutant,
- the duration of the exposure, and,
- the level of activity.

This chapter of the report considers air quality in Reading and its potential effects on health.

Contents

Legislation and Guidance

Environmental Protection Act 1990

Controls air pollution from a range of industrial processes known as prescribed processes.

Clean Air Act 1993

Controls smoke from industrial, commercial and domestic premises; grit and dust from industrial and commercial premises; makes provision for smoke control areas and regulates the composition of fuel oil.

Environment Act 1995

Introduced a National Air Quality Strategy, including standards for the main urban pollutants and objectives for their achievement. It places a duty on local authorities to carry out regular assessments of air quality in their areas and to prepare plans and target action areas of poor air quality.

Standards and Guidelines

High levels of air pollution can affect human health, cause damage to crops and materials and degrade sensitive ecosystems. The Department of the Environment, Transport and the Regions (DETR), as well as other organisations, such as the European Community and the World Health Organisation, set standards and guidelines for levels of air pollution.

These are concentrations that are considered to be acceptable in the light of what is known about the effects of each pollutant on the environment. The standards can be used to review air pollution and also to provide a benchmark to see if air pollution is getting better or worse.

The Environment Act 1995 made wide-ranging provision for the management and improvement of air quality in the UK. The National Air Quality Strategy was adopted by the Government in July 1997, and now forms the framework of the Government's policy on air quality. The strategy sets health based standards for eight priority pollutants and objectives to be reached by the year 2005. These are summarised in the table below.

The health-based standards adopt the recommendations of the Expert Panel on Air Quality Standards (EPAQS) – a group of independent medical and scientific experts who advise the Government on air quality standards. Where EPAQS has not made a recommendation World Health Organisation guidelines have been adopted.

Several of the standards are defined as running averages. These are averages that are calculated hourly for the preceding period of time defined by the standard. For instance, a 24-hour running average is calculated hourly for the preceding 24 hours rather that being calculated once every 24 hours for the consecutive blocks of data.

Pollutant	Concentration	Measured as	Objective by 2005
Benzene	5ppb	Running annual mean	5ppb
1,3 butadiene	1ppb	Running annual mean	1ppb
Carbon monoxide	10ppm	Running 8-hour mean	10ppm
Lead	0.5g/m3	Annual mean	0.5ug/m3
Nitrogen dioxide	150ppb	1-hour mean	150ppb
	21ppb		21ppb
	50ppb		50ppb (97^{tth} percentile)
	50ug/m3	Annual mean	50mg/m3 (99th percentile)
Ozone		Running 8-hour mean	
Particles (PM10)		Running 24-hour mean	
Sulphur dioxide	100ppb	15-minute mean	100ppb (99.9^{tth} percentile)

Source: Department of Transport, Environment and the Regions
Table 7.1: Air Quality Standards and Objectives

With the exception of ozone, all other pollutant standards contained in the National Air Quality Strategy have been included in the Air Quality Regulations 1997.

Air Quality Monitoring in Reading

Currently, five parameters of air pollution – carbon monoxide; nitrogen dioxide; ozone; particles and sulphur dioxide are measured at the fixed monitoring station in East Reading. Two parameters – carbon monoxide and nitrogen dioxide are measured at the fixed monitoring station in West Reading and, three parameters, carbon monoxide, nitrogen dioxide and sulphur dioxide are measured by the mobile air quality monitoring station. Lead and benzene have been measured in the past, either continuously or as short-term samples.

- **Benzene**

Benzene is a chemical consisting of six atoms each of carbon and hydrogen, arranged in a ring structure. At normal ambient temperatures it is liquid, but it readily evaporates and small amounts are detectable in the atmosphere. Almost all of the benzene found at ground level in the northern hemisphere is likely to have resulted from human activities, in particular the combustion of petroleum fuels by motor vehicle engines. Other sources, of which cigarette smoking is a major one, make important contributions to the exposure of individuals.

Benzene is naturally broken down by chemical reactions in the atmosphere, but these reactions take several days. Thus, in common with inhabitants of other industrial and industrialising nations, people living in the UK are exposed to benzene in the air they breathe.

Benzene is a chemical that people may also be exposed to in certain industrial workplaces, and studies of several such groups of workers exposed in the past have shown that those heavily exposed have a small, but definite, increase in risk of developing certain types of leukaemia. Studies of laboratory animals have shown similar effects, and have suggested that benzene exerts its effects by damaging the genetic makeup of the cells – in other words it is a genotoxic carcinogen. This means that it is impossible to determine a concentration to which people might be exposed where there is no risk detectable by existing methods. Leukaemia is, however, a relatively rare group of diseases, affecting about one adult in 6000.

Limited benzene monitoring has been undertaken in Reading and the results are tabulated below:

Measuring location	Period	Concentration (ppb)
Cemetery Junction	February/April 1996	2
Brock Barracks	February/April 1996	2
Cemetery Junction	April 1996	3
Brock Barracks	April 1996	1
Cemetery Junction	April/May 1996	1
Brock Barracks	April/May 1996	1
Cemetery Junction	June/July 1996	1
Brock Barracks	June/July 1996	1

Source: Reading Borough Council
Table 7.2: Benzene Concentrations in Reading

- **1,3 Butadiene**

1,3 butadiene is a chemical compound, the molecule of which comprises four carbon and six hydrogen atoms. At normal ambient temperature it is a gas, and trace amounts can be found in the atmosphere that we breathe. These derive mainly from the combustion of petroleum in motor vehicle engines and from other sources such as fossil fuels and accidental fires.

Laboratory studies have shown that 1,3 butadiene causes a variety of cancers in rodents and damages the genetic structure of the cell. It is a genotoxic carcinogen and, in theory, it is not possible to determine an absolutely safe level for human exposure.

There is little or no preformed 1,3 butadiene in diesel or petrol, either leaded or unleaded; the emissions in the exhaust gases being produced by the combustion process itself. The chemicals in petrol from which the 1,3 butadiene is derived have been present in increasing proportion in petrol over the past decade, and it is likely that the amounts of 1.3 butadiene have therefore been rising. However, 1,3 butadiene is removed efficiently by catalytic converters on motor cars and this is likely to reverse any such trend, while the increasing use of diesel as a vehicle fuel would be expected to counter this.

No measurement of 1,3 butadiene has been undertaken in Reading.

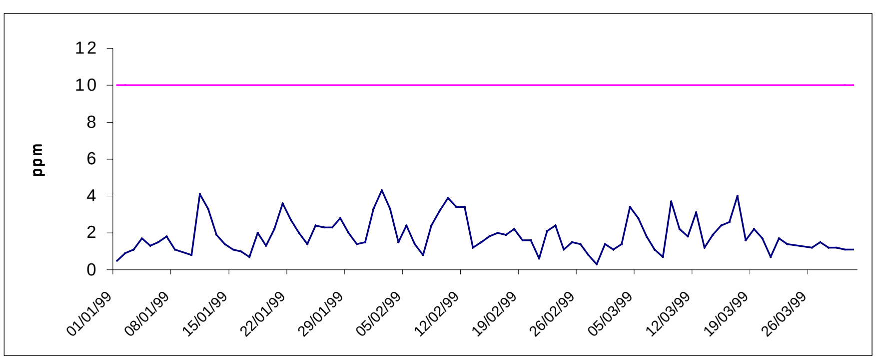
- **Carbon Monoxide**

Carbon monoxide is a gas produced in the process of combustion, be it from a motor car engine, domestic heating, a cigarette or a forest fire. Of all the pollutant gases, it is one of the most dangerous since it can and does cause death. However, this fatal consequence is confined to people exposed to very high levels produced, for example, by fires in buildings, blockage of flues, faulty appliances and deliberate self-poisoning by car exhaust fumes. In the indoor environment individuals are exposed to carbon monoxide from sources such as domestic fuel burning heaters and gas cooking appliances. Outdoors, the main sources of carbon monoxide are vehicle exhausts, and the threat to health in such circumstances is a reduction in the oxygen-carrying capacity of the blood that may increase the risk of problems in individuals with ischaemic heart disease.

The gas is produced by the incomplete combustion of organic substances or those that are essentially just carbon, such as coke. Complete combustion, in the presence of sufficient oxygen, leads to the production of carbon dioxide, whereas if there is a slight deficiency of oxygen some carbon monoxide is formed. Thus most combustion processes produce some carbon monoxide, depending on the efficiency of the process and the availability of oxygen. From the point of view of human health, some forms of exposure to carbon monoxide are particularly important. For example, in some industrial processes and in coalmines, pockets of high concentrations of carbon monoxide may occur and cause serious health effects. In the home, gas cookers, paraffin heaters and bottled gas heaters operating in poorly ventilated rooms, or badly installed or maintained flued gas, oil or solid fuel heaters may cause high levels of carbon monoxide in the air, leading to lassitude, unconsciousness or even death.

Apart from major accidental and domestic sources of comparatively high levels of carbon monoxide, the most important general exposure of individuals to the gas come from cigarettes and vehicles. Cigarettes are mainly responsible for exposure of smokers, although some passive exposure of others will occur from inhalation of other people's smoke indoors. The amount of carbon monoxide in the blood of a regular smoker is considerably greater that that which can be obtained by breathing air in even heavily polluted streets. For non-smokers, the main source of outdoor exposure to carbon monoxide is general pollution of the atmosphere by vehicle exhausts. As far as total exposure is concerned, again for non-smokers, indoor sources can account for a larger proportion than traffic.

Carbon monoxide is measured at the two fixed air quality monitoring stations in Reading as well as by the mobile air quality monitoring station. Concentrations at East Reading are shown below. The straight line on the graph represents the government standard for carbon monoxide.



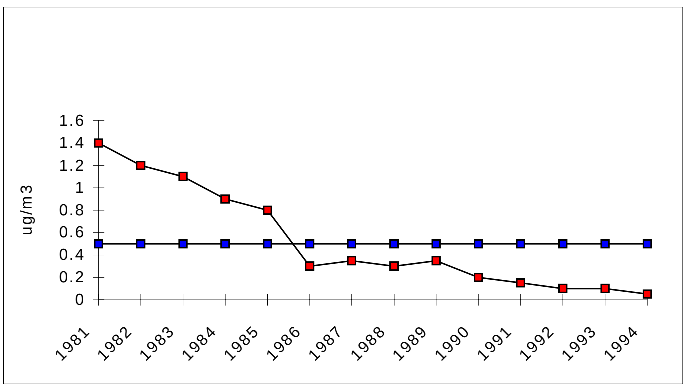
Source: Reading Borough Council
Figure 7.1: Carbon monoxide concentrations in Reading

- **Lead**

Lead is second only to iron amongst the most widely used metals, having applications in the manufacture of batteries, pigments, alloys, plastics and ammunition. It has also been widely used in organic compounds as a petrol additive, although this application is now declining. It is no longer mined in the UK, but industrial workers may be exposed to it in smelting and refining operations, battery manufacture, scrap metal work, painting, soldering, ship repair and demolition, plumbing, manufacture of pottery and many other less common situations.

Lead can be absorbed into the body both through the lungs and through the stomach and intestines. Thus people may be at risk of absorbing it when exposed either in the air, dust, soil or as a contaminant in food and drink. In industrial situations there is a risk from inhaling lead-bearing dust or fumes from heated lead and much of the knowledge about the harmful effects of lead comes from studies of workers. Among the general public two sources of exposure are of particular importance; contamination of drinking water from lead pipes and contamination of the air from industrial sources and from the combustion of leaded petrol. Lead in the air may not only be absorbed directly by the lungs but may also settle out and contribute to contamination of crops and be ingested inadvertently by children.

The following chart shows the decrease of lead within Reading resulting initially from the reduction of the lead concentration in petrol and then by the introduction of unleaded petrol. Lead measurements were discontinued in 1994. The straight line on the chart represents the government standard.



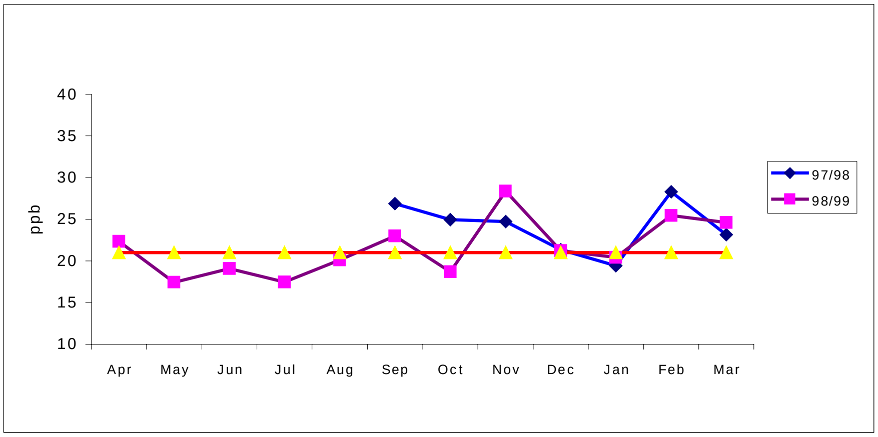
Source: Reading Borough Council
Figure 7.2: Lead concentrations in Reading

- **Nitrogen Dioxide**

Motor vehicles are now a major source of air pollution in many UK cities and large towns, including Reading. The oxide of nitrogen emitted to the atmosphere in the greatest quantity is nitric oxide, which is relatively harmless. However, once in the atmosphere it will change to nitrogen dioxide. The proportion of nitric oxide, which is converted to nitrogen dioxide, depends on climatic conditions and the presence of other chemicals and pollutants. However, the majority of nitric oxide is ultimately converted to nitrogen dioxide.

Nitric oxide is a gas that is produced naturally by cells in the lung and respiratory tract, and has no harmful consequences when inhaled at concentrations likely to occur in the ambient atmosphere. Nitrogen dioxide is an irritant gas, which has been known for many years to have serious and sometimes fatal effects on health when inhaled in the very high concentrations associated with accidental exposure, for example in farm silos and in mines. There is now evidence that it has more subtle effects on health at much lower concentrations than may occur in the ambient atmosphere, both indoors and outdoors.

Current levels of nitrogen dioxide measured at the fixed monitoring station in East Reading are shown below. The straight line on the chart represents the government standard.



Source: Reading Borough Council
Figure 7.3: Nitrogen Dioxide Levels in East Reading

- **Ozone**

The atmosphere in which we live consists largely of oxygen and nitrogen, the first of these two gases being essential to human and animal life. The oxygen in the atmosphere has been generated by plant life, by the process of photosynthesis, which uses atmospheric carbon dioxide as a fuel, oxygen being the waste gas. Thus there is a fine balance between use of oxygen by humans and animals (and also in combustion processes) and its production by plants. Oxygen in the atmosphere exists in two forms, the gas we need to breathe and which contains two oxygen atoms in each molecule, and a closely related substance, ozone, which consists of three oxygen atoms per molecule. Unlike oxygen, ozone exists in the lower atmosphere in very low concentrations; moreover, it is a gas, which has an irritant effect on the delicate surface tissues of the body, such as eyes nose and lungs, if present in air in high concentrations.

Ozone is a naturally occurring gas, generated in the higher layers of the earth's atmosphere, the stratosphere, by the action of ultraviolet light from the sun on oxygen molecules. At this level of the atmosphere it has beneficial effects on health, in that it helps to filter out harmful ultraviolet rays that that can cause skin cancers. Indeed, there is currently much concern about reduction in stratospheric ozone levels by chemicals such as chloroflourocarbons.

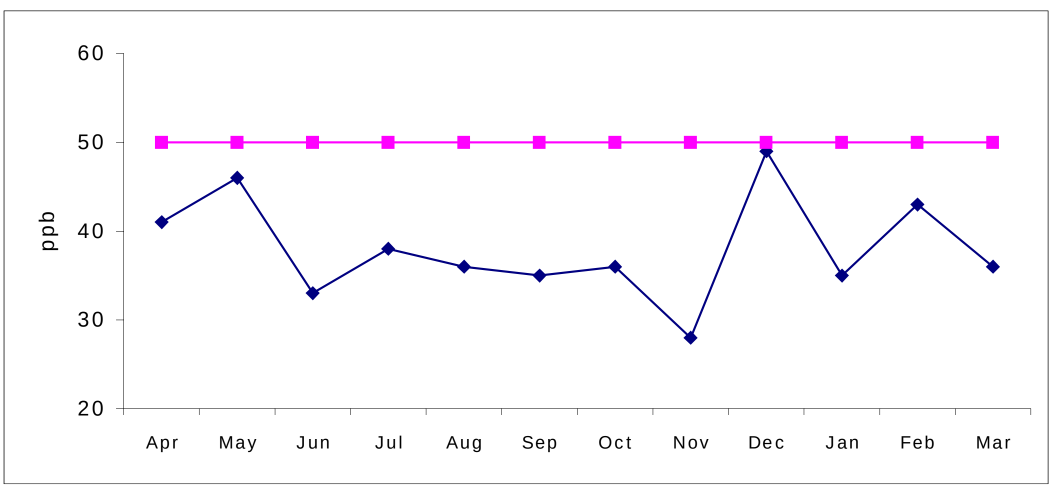
Paradoxically, at the same time as concern has been raised about the depletion of the ozone layer in the upper atmosphere, anxiety has been expressed about possible harmful effects of raised levels of ozone in the lower atmosphere, the troposphere, in which we live. The major chemicals that act as ground level ozone precursors in industrialised nations are oxides of nitrogen and hydrocarbons produced predominantly by motor vehicles and industry. In some circumstances, where heavy traffic occurs in association with strong sunlight, sufficient ozone (together with other chemical pollutants) may be generated to cause people to feel irritant effects – a situation sometimes called photochemical smog.

Ozone is not emitted directly from any man-made source in any significant quantities, but arises from chemical reactions driven by sunlight in the atmosphere. In the stratosphere, ozone is produced by direct action of ultraviolet light on oxygen molecules. Currently, the balance between ozone and oxygen is being upset by the upward migration of chemicals such as chloroflourocarbons, which remove ozone and, therefore, may increase the amount of ultraviolet light that penetrates to the earth's surface.

In the lower levels of the atmosphere, the troposphere, while some ozone arises from periodic winter intrusions of air from the stratosphere, it is primarily generated as a pollutant by a complicated series of chemical reactions driven by sunlight. In these, oxides of nitrogen and hydrocarbons, derived mainly from vehicle exhausts, react in the atmosphere to produce ozone. In normal circumstances ozone is present in the atmosphere in balance with the oxides of nitrogen – a so-called photostationary equilibrium. This equilibrium can be disturbed by the presence of other chemicals in the atmosphere such as carbon monoxide, methane and other volatile organic compounds. These substances are produced by combustion and other industrial processes, but also arise naturally from animals and plants. In particular, the volatile organic compounds produced by vehicles and other sources of combustion may react in the atmosphere to form reactive chemicals which combine with nitric oxide to form nitrogen dioxide. The more nitrogen dioxide and volatile organic compounds in the air, the more ozone will be produced in the presence of sunlight.

These chemical reactions do not take place instantaneously, but over several hours or even days, and once ozone has been produced it may persist for several days. In consequence, ozone produced at one site may be carried for considerable distances in the air, and maximum concentrations usually occur away from the source of the primary pollutants, oxides of nitrogen and volatile organic compounds. Indeed, in urban areas, where concentrations of traffic exhaust gases may be high, nitric oxide from exhaust emissions may react with ozone to form nitrogen dioxide, thus actually reducing ground level ozone concentrations. However, as air movement carries the primary pollutants away, more ozone is generated and concentrations rise over suburban and rural areas. From this, and bearing in mind the importance of sunlight in the reactions, it can be understood that ozone pollution occurs in summer more than in winter, in southern more than in northern areas, and in the country more than in cities. It can also be seen that the problem is an international one, in that ozone precursors generated in countries with large traffic and industrial emissions may effect less polluted ones.

The highest concentrations of ozone occur during hot sunny and relatively windless days in summer, when the chemical reactions described above are promoted by heavy production and poor dispersion of traffic fumes. Such circumstances are well recognised by the public around cities such as Athens and Los Angeles, but also occur, albeit less frequently, in more northerly climates such as that of the UK.



Source: Reading Borough Council
Figure 7.4 Highest Monthly Ozone Levels in East Reading 1998 - 99

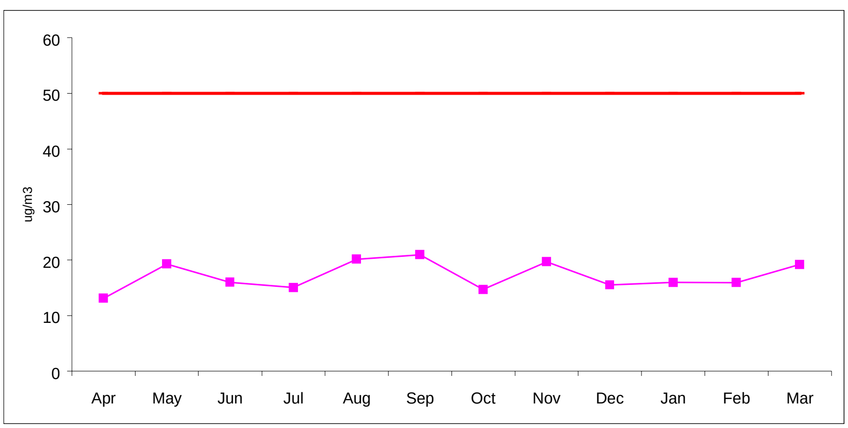
Ozone has been monitored in East Reading since 1997 and details of the maximum monthly levels are shown above. The straight line on the chart represents the government standard for ozone.

- **Particulate Matter (PM10)**

Particles in the air may arise from a wide variety of sources, either natural or man-made. Of the former, forest fires and volcanic eruptions provide dramatic examples, while sea spray and the erosion of soil and rocks by wind are important sources in many localities. Biological sources are ubiquitous, and particularly in rural areas considerable numbers of pollen grains, fungal spores and their fragments contribute to the total mass of airborne particles. Man-made airborne particles result mostly from combustion processes, from working of soil and rock, from many other industrial processes and from the attrition of road surfaces by motor vehicles. These types of particles, together with those derived from natural combustion sources, may be classified as either primary or secondary. The former, such as carbon particles from combustion, mineral particles derived from stone abrasion and salt from the sea, are released directly into the air, while the latter are formed in the atmosphere by the chemical reaction of gases, first combining to form less volatile compounds, which in turn condense into particles. It is important to recognise that these particles, whatever their source or composition, are all measured as PM10 if they fall within the appropriate size range, and that therefore the potential hazards of airborne particles may well be different in different places. For example, in rural districts the components of PM10 more likely to cause adverse effects may be fragments of pollen grains and fungal spores, causing allergic symptoms; whereas in cities the main components are likely to be derived from vehicle emissions and have quite different effects.

Airborne particles arising from human activities come from a wide range of sources. The largest single source in urban areas is road traffic, followed by lead-rich particles derived from cars running on leaded fuel. Currently, the cleanest type of vehicle (in terms of particle emissions) in common use is the petrol car with catalytic convertor running on unleaded fuel. Inventory estimates suggest that in 1990 in Greater London about 86%, by weight, of primary PM10 emissions were derived from vehicle exhaust, and a national inventory of emissions of primary PM10 for the year 1993 ascribed 24%, by weight, of particles to this source. As with many other pollutants, the proportionate contribution of road traffic to pollution in urban areas is significantly greater than in the national inventory.

PM10 particles have been measured continuously in East Reading since September 1997. Monthly averages of PM10 concentrations are shown in the chart below and compared to the government standard represented by the straight line. However the monthly averages conceal higher 24-hour averages on which the standard is based.



Source: Reading Borough Council
Figure 7.5: Monthly Averages of PM10 Levels in East Reading 1998 - 9

- **Sulphur Dioxide and Smoke**

Sulphur dioxide is formed by the combination of one atom of sulphur and two atoms of oxygen. At normal temperature and pressure it is a gas. It dissolves in water to give an acidic solution which is readily oxidised to sulphuric acid. It is one of the gases released into the atmosphere by volcanic activity, which, together with the oxidisation of dimethyl sulphide released from marine organisms, constitutes the major natural source of sulphur dioxide. However, in the UK, the predominant source of sulphur dioxide is from the combustion of sulphur-containing fossil fuels, principally coal and heavy oils.

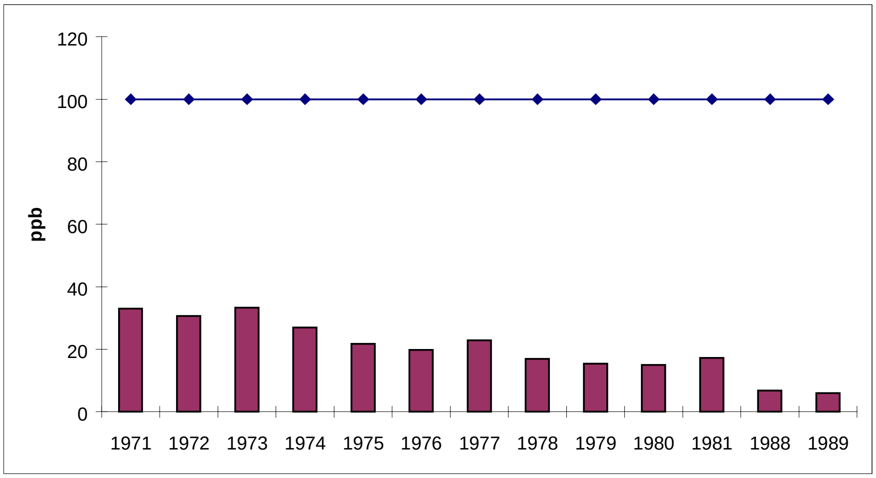
Sulphur dioxide was one of the components of the dense fogs that occurred in industrial cities in the nineteenth century and earlier decades of the present century. The combination of this gas with sooty particles was derived from the widespread burning of coal in homes and factories, and gave rise to the term smoke fog or smog. Public awareness of the effects on health was increased in the 1950s following the major smog episode in London in 1952. Such episodes were shown to be associated with increased numbers of episodes of chest illness and large numbers of excess deaths, mainly among elderly people with heart and lung disease.

The occurrence of these episodes led to the passing, in 1956, of the UK's first Clean Air Act with a subsequent reduction in the use of coal as a domestic and industrial fuel in cities. This resulted in substantial reductions in the concentrations of smoke and sulphur dioxide in the urban atmosphere. In parallel, there was a shift towards the siting of large coal and oil burning power stations in rural areas, and this has meant that sulphur dioxide may now be as much a rural as an urban pollutant.

Sulphur dioxide is an irritant when it is inhaled, because of its acidic nature, and high concentrations may cause breathing difficulties in people exposed to it. Recent studies have shown that people suffering from asthma may be especially susceptible to the adverse effects of sulphur dioxide and that, within the range of concentrations that occur in pollution episodes, it may provoke attacks of asthma.

The introduction of the Clean Air Acts in the 1950s and 1960s resulted in a dramatic decline in both smoke and sulphur dioxide in Reading. The legislation introduced controlled emissions of both dark and black smoke from industrial and commercial sources. The dangerous smoke caused by coal burning in domestic houses was gradually phased out in about 70% of homes by the introduction of smoke control areas. In these areas it became mandatory to burn smokeless fuels on domestic fires. Of the remaining 30%, there was a gradual change to smokeless fuels such as gas, electricity and light fuel oil as the preferred means of heating.

The measurement of smoke and sulphur dioxide in Reading as part of the Government's National Survey was discontinued in the 1981. However, in 1997, measurements of sulphur dioxide were recommenced in Reading at two air quality monitoring stations. The chart below shows the levels of sulphur dioxide in Reading for the last 11 years of measurement under the National Survey Scheme. The continuous line on the chart indicates the government standard for sulphur dioxide.



Source: Reading Borough Council
Figure 7.6: Sulphur Dioxide levels in Reading

There are twenty-one Smoke Control Areas within Reading, which cover 2,496 hectares or 62% of the area of the town. Approximately 45,000 premises are subject to Smoke Control Orders, as set out below: -

SCA No	Name of Smoke Control Area	Date of Operation
1	Coley Park	1st June 1959
2	Broad Street/Friar Street	1st June 1960
3	Coley Park Extension	1st December 1961
4	Burghfield Road	1st November 1961
5	Old Southcote Lodge	1st November 1961
6	Broad Street/Mill Lane	1st November 1961
7	Burghfield Road/Holybrook Crescent	1st November 1961
8	Cockney Hill/Prospect Park	1st November 1963
9	Southcote	1st September 1965
10	Bath Road	1st November 1966
11	Tilehurst	1st September 1968
12	Friar Street	1st July 1969
13	Norcot	1st September 1970
14	East Reading/Abbey Ward	1st September 1971
15	Newtown	1st September 1972
16	Dee Road	1st September 1972
17	Kentwood	1st November 1972
18	Castle/Coley	1st September 1973
19	West Reading	1st November 1974
20	Lower Caversham	1st November 1974
21	Whitley Rise/Basingstoke Road	1st July 1975

Source: Reading Borough Council
Table 7.3: Smoke Control Areas in Reading

Further references to pollutants emanating from exhaust emissions are contained in Chapter 6 – Transport.

Local Review and Assessment of Air Quality

Under Part IV of the Environment Act 1995, local authorities are required to review and assess air quality in their areas. The primary objective of this process is to identify areas where air quality is unlikely to meet the objectives prescribed in the Air Quality Regulations 1997, by the year 2005.

The government has recommended a phased approach to making reviews and assessments of local air quality. Local authorities are to undertake an initial screening process reviewing sources of pollution to be followed, if necessary, by a more detailed survey using simple monitoring and modelling techniques. If these surveys indicate that the prescribed objectives are likely to be exceeded by the year 2005, then a detailed assessment using accurate monitoring, modelling and other techniques should be undertaken.

The council completed its Stage I Review and Assessment by the end of 1998 and the main conclusions are as follows: -

1. Exceedance, or possible exceedance, of government standards and objectives is limited to discrete areas of Reading.

2. There is no need to proceed to a Stage II Review and Assessment of benzene, 1,3 butadiene, lead and sulphur dioxide.

3. Carbon monoxide will require a Stage II Review and Assessment in the locality of Caversham Road and Mill Lane, although it is unlikely that government standards will be exceeded.

4. A Stage II Review and Assessment on nitrogen dioxide will be required at fourteen distributed sites throughout Reading. Data available from the Stage I Review and Assessment indicate that there may be difficulties in achieving the government standard and objective in East Reading.

5. A Stage II Review and Assessment of PM_{10} will be required at thirteen distributed sites throughout Reading. It is envisaged that most sites will meet the government standard and objective, but there may be difficulties within the town centre and in East Reading.

6. Emissions to atmosphere from commercial, industrial and domestic premises and special processes (known as prescribed processes) will not exceed government standards and objectives. Any failure to achieve the standards and objectives for carbon monoxide, nitrogen dioxide or PM_{10} will be the consequence of emissions from the high volumes of road traffic, congestion of highways and poor natural ventilation of some highways within Reading.

7. To achieve compliance with government standards and objectives for carbon monoxide, nitrogen dioxide and PM_{10} a traffic management based solution will be required.

Air Pollution Episodes

Air pollution episode is the term used to describe a period of high air pollution. This can last up to several days and may extend over a large geographical area. In some cases there are high concentrations of many pollutants at the same time, but in others only one pollutant may be involved.

Episodes are caused by different factors: during the coldest winter months, stable weather conditions can trap pollutants close to their sources and prevent their dispersal. This leads to high concentrations building up over several days. In the 1950s and 1960s, domestic coal burning was responsible for the *pea-souper* fogs with their high levels of black smoke and sulphur dioxide.

Today, however, a major source of many air pollutants in most UK cities is road traffic, and high concentrations of nitrogen oxides, particles (PM10) and hydrocarbons such as benzene are usually observed during such mid-winter episodes.

In summer, a completely different type of episode may occur. Hot sunny weather can produce high levels of ozone, sometimes accompanied by nitrogen dioxide or particles (PM10). The species that cause the episode can often travel long distances – sometimes from other parts of Europe. During this large-scale air movement, they undergo a complex series of chemical reactions, driven by sunlight, which produce high levels of ozone and other pollutants.

Main Issues

- There is a link between poor air quality and deteriorating public health,
- There is a link between air quality and quality of life,
- There are comprehensive air quality standards and legislation,
- The council has a duty to undertake a review and assessment of air quality,
- Smoke and sulphur emissions have declined dramatically,
- Measurement of smoke was discontinued in 1981,
- 62% of Reading is subject to smoke control orders,
- Thirteen sites in Reading have been used to study lead,
- There has been a downward trend in air borne lead since 1981,
- The principal source of pollution within the town is road traffic,
- There are areas of high population density adjacent to busy roads,
- There is a need to proceed to a Stage II Review and Assessment of local air quality at a number of locations to determine whether levels of carbon monoxide, nitrogen dioxide and PM10 will exceed government standards and objectives.

Key Contact

For further information, please contact Richard Marks on 0118 939 0314

Reference Documents

1. DETR: Expert Panel on Air Quality Standards - Benzene
2. DETR: Expert Panel on Air Quality Standards - 1,3 Butadiene
3. DETR: Expert Panel on Air Quality Standards - Carbon Monoxide
4. DETR: Expert Panel on Air Quality Standards - Lead
5. DETR: Expert Panel on Air Quality Standards - Nitrogen Dioxide
6. DETR: Expert Panel on Air Quality Standards - Ozone

7. DETR: Expert Panel on Air Quality Standards – Particles

8. DETR: Expert Panel on Air Quality Standards – Sulphur Dioxide

9. DETR: UK Air Pollution