"The most pressing environmental problem is air pollution, everyone has to breathe the air"

Jennifer Wilkinson
Independence High School

THE HEALTH EFFECTS OF OZONE: A PHYSICIAN'S PERSPECTIVE

As a physician, I have seen how poor air quality has impacted the respiratory health of my patients.

While the growth of our community has afforded us many opportunities, it has created a number of growing pains. The significant decrease in air quality is something that we need to be aware of and strive to improve. In this article, I would like to first discuss air pollution and its impact on respiratory health and then comment on its impact on our community.

By way of introduction, my formal training in medicine was 4 years in Internal Medicine at Wayne State University in Detroit, Michigan and 2 years of training in Asthma, Allergy and Immunology at the National Jewish Respiratory Center and at the University of Colorado Health Science Center in Denver, Colorado. For fifteen years, I have been in private practice at the Allergy and Asthma Center in Charlotte. As part of a group of respiratory specialists, we have been able to perform a large number of clinical research studies in our office.

The Impact Of Air Pollution On Respiratory Health

The role of air pollution - the atmospheric accumulation of substances injurious to humans has a distinct impact on our ability to breathe, though the exact nature as to how it affects us is unknown. The world has seen a significant increase in asthma, allergic nasal disorders and respiratory illnesses over the past 25 years. At least part of this increase has been attributed to poor air quality in industrialized nations.

While air pollution consists of a large number of various chemicals and substances, several of them are of such quantity and reactivity that they should be considered more significant as a cause of respiratory illness. The most common pollutant in this group is ozone, which is generated through the interaction of hydrocarbons and nitrogen oxides under the influence of sunlight. Ozone concentrations commonly exceed safe levels in many cities of the world. Sulfur dioxide, produced by heat and power plants that burn coal or oil, is another common substance harmful to humans. Likewise, particulate matter, in the form of smoke products and products of burning fuel, can have an impact on health. These respirable particles are measured and noted by their size, either as particulate matter of 10 microns or less, PM10, or as particulate matter of 2.5 microns or less, PM2.5.

Studies to evaluate the exact impact of these substances have not been easy. Diesel exhaust particles (PM10) can enhance the production of allergy and inflammatory factors in humans, creating greater susceptibility to allergic disease and have been implicated in the worldwide increased prevalence of allergic asthmatic disease (1). Of even greater concern is the effect of pollution on non-smokers (smokers have their own personal pollution to worry about) and non-asthmatics. A study by Abbey et al. published in 1998 (2) tried to answer what happens to anyone exposed to general pollutants. Individuals were questioned as to their symptoms and had lung function tests over a 25 year period. Air quality was also studied over that same period of time. Exposure to particulate matter correlated with a 7.3% diminished percent of lung function in non-smoking men and a greater fluctuation in lung function in women and men. A rise of 23 parts per billion (ppb) ozone as an 8-hour average was correlated with a 6.3 % decrease in lung function

Dr. Errington examines a patient.

The world has seen a significant increase in asthma, allergic nasal disorders and respiratory illnesses over the past 25 years.

in men whose parents had asthma, bronchitis, emphysema or hay fever. A study by Romieu and et. al.(3) done on children with mild asthma in Mexico City found a strong correlation between respiratory symptoms and the increased levels of ozone and PM10. Measuring different parameters of lung function showed that each pollutant worked independently of each other to lower lung function.

These studies give further support for current efforts to limit suspended particulate matter exposure and ozone exposure in the urban environment.

Sulfur dioxide, ozone, and oxides of nitrogen are known to increase bronchial reactivity under experimental conditions with concentrations at or only slightly greater than peak levels recorded at times in industrialized urban areas (4). Ozone not only increases our immediate risk of respiratory difficulties, but in asthmatics, it increases our general responsiveness to airborne allergy factors (indoors and outdoors). Asthmatics are then more likely to become sensitive to an even greater degree to airborne allergy factors (5). Increased bronchial reactivity from one aeropollutant may also induce vulnerablility in asthmatic patients to another aeropollutant (6), to aeroallergens(7), infective agents and meteorologic changes (8), and vice versa. Ozone during exercise at 0.12 parts per million (ppm)[i.e. the National Ambient Air Quality Standard (NAAQS)]—a level exceeded at least 4 days annually in most metropolitan United States cities—may or may not produce bronchospasm in asthmatic subjects (9). Ozone at greater than or equal to 0.2 ppm—Southern California Stage 1 Smog Alert— during intermittent exercise causes decreases in lung function on testing and increases symptoms in persons with asthma (5). Delfino et. al. (10) evaluated children aged 9 to 16 with mild asthma as to the effect of ozone and allergy factors on respiratory symptoms. The children kept symptom scores and levels of ozone were monitored in the ambient air and they also wore a Harvard passive sampler on themselves for 12 hrs. per day. They found that symptoms increased with ozone exposure and with fungal exposure, but independent of each other. They also found that symptom severity correlated very well with their personal exposure to ozone (as measured by their personal packs) vs. the ambient ozone levels measured in the atmosphere. They concluded that the persons own exposure to ozone was critical in aggravating their asthma and that asthma worsened with more long term exposure to ozone vs. necessarily the highest levels of ozone in a given area. Frequently the asthmatic patient recognizes a correlation of intensity of their symptoms and aeropollution exposure; while difficult to quantify, the patient and the physician can presume a relationship exists and can consider it clinically relevant. Sulfur dioxide at a concentration of 0.5 ppm, in the upper range experienced in photochemical smog, incites bronchoconstriction in asthmatic subjects(11), especially during exercise (12).

"Poor air quality affects me, my friends and family, and everyone in the county. Air and water are non-negotiable. Without clean air and water, the quality of our lives and our health are at risk."

Hugh McColl, Jr.
Chairman and Chief Executive Officer Bank of America

The Impact Of Air Pollution On The Community

This brings us to the Mecklenburg County experience. Data on air pollutants collected by the Mecklenburg County Department of Environmental Protection has identified significantly elevated aeropollutant levels throughout the county at different times, with higher ambient levels and peak levels occurring in the warmer months. There are elevated levels of ozone, particulate matter (measured as PM10 and PM 2.5) and carbon monoxide.

Because the prevalence of lower respiratory disease in the population at any time is approximately 5-10% and the prevalence of upper respiratory tract disease at any one time approximates 20% of the population, the impact of poor air quality on the quality of life in any community is significant. Illness not only creates a cost burden in health care —hospital visits, doctor visits and medication expense —it also results in lost work hours, decreased productivity at work and lost quality time at home.

Those most at risk of adverse health effects from exposure to pollutants are the very young, the elderly, smokers, workers whose jobs expose them to toxic materials and persons with heart and lung disease. My own medical practice is primarily caring for patients with allergic and respiratory disease and there is a measurable increase in respiratory complaints during the warmer months. While some of this is attributable to allergy exposure and occasional infections, there are significant problems among the nonallergic patients as well. Complaints include increased cough, shortness of breath, especially on exertion, and chest tightness. There are also significant upper respiratory complaints, such as nasal burning, congestion, drainage and throat and eye irritation. Patients often relate this to periods of time spent outdoors. While many patients can relate their onset of trouble to specific days, there are a large number of patients whose symptoms simply deteriorate over time. Indeed it is more common to see patients presenting not with acute respiratory failure, but with a slow deterioration of lung function and progressively worsening symptoms over time. The process can be so slow that people do not sense the worsening of symptoms until they are having marked difficulty breathing. Certainly those individuals who have severe chronic respiratory disease already are

more sensitive to the deleterious effects of poor air quality and get into real respiratory trouble more quickly even with less exposure. It is an important part of a physician's task to assess a person's breathing status such that the person can be advised as to their likelihood of trouble, and to give that person reasonable expectations of acceptable exposure to the outdoor envirnoment. The physician can create a plan with the patient to help the patient assess their own status at home and to have at their disposal a treatment plan for self-help should symptoms deteriorate. People who can respond early to symptoms and seek treatment early seem to have a shorter course of illness. It is difficult to assess the loss in work and productivity related to these problems triggered by air pollution in our community, but I feel it must be sizable.

I am one physician among many who care for patients experiencing significant respiratory problems. Their ability to breathe is adversely affected by environmental factors, both allergic and irritant. As presented above, some of these irritant factors, generated by man, can have profound effects on our quality of life. Exposure needs to be as limited as possible. SOER

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OZONE - SUNLIGHT, CHEMISTRY AND OUR REACTION

Charlotte skyline on good and bad ozone days.

Every year as things begin to warm up, talk turns to one of Charlotte's most ubiquitous pollutants - OZONE. Most of us have heard something about its adverse effects and have experienced its brown haze signature on the summer sky. But does anyone actually realize what ozone is? Pull up a chair and get comfortable. It is a fascinating story.

Ozone - Where Is It Found?

Ozone, or O_3, is an oxygen molecule made up of three oxygen atoms. It is a photochemical oxidant, meaning that it is a molecule formed as a result of some complex atmospheric chemical reactions that will be discussed later in this article. One of the most interesting things about ozone is that it can be either beneficial or harmful, depending on where it is. Beneficial ozone is found in one of the upper layers of Earth's atmosphere called the stratosphere, therefore, it is commonly known as stratospheric ozone. The stratosphere is the layer of the atmosphere extending from seven to thirty miles above the surface of the Earth. The ozone layer is relatively thin (about a mile) compared to the stratosphere. It is found at a height of about 22 miles, a little more than half-way into the stratosphere. Stratospheric ozone is regarded as beneficial because it shields the Earth from the damaging ultraviolet radiation of the sun. A different type of ozone is found in the lowest level of the Earth's atmosphere, the troposphere. The troposphere extends from the Earth to a height of seven miles above the surface. Simply put, the troposphere is the layer of the atmosphere that sustains life for us due to presence of the oxygen that we breathe. Unfortunately, the tropospheric ozone, usually referred to as ground level ozone, is harmful.

The Harmful Effects Of Ozone

There are several harmful effects associated with ground level ozone, which is a major component of photochemical smog. Smog is a generic term for that pervasive brown haze that forms around Charlotte and many other cities during the summer season. Ozone, in high concentrations, has been associated with respiratory problems in small children, the elderly, asthmatics, individuals with emphysema or other similar disorders. In very high concentrations, even healthy adults experience a reduction in lung capacity when exposed for long periods or during heavy outdoor exercise. High ozone levels also affect crop production. Some fruits and vegetables, particularly tobacco, grapes, soybeans and citrus fruits are highly sensitive to ozone. The United States Environmental Protection Agency (EPA) estimates that annual crop damage caused by ozone amounts to $3 billion nationwide.

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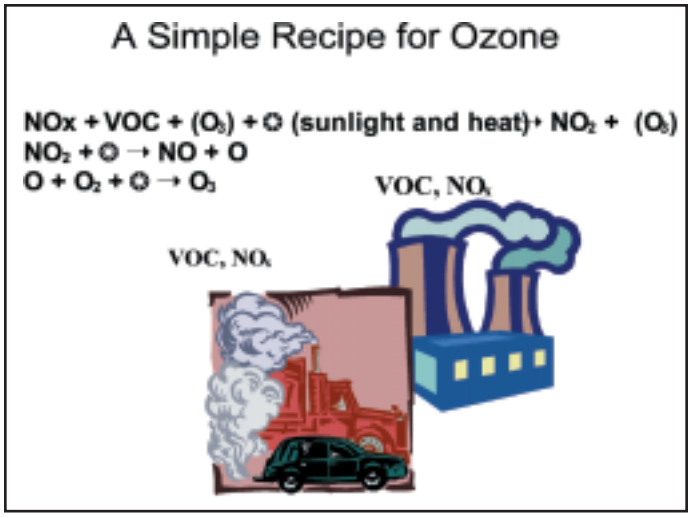
Other harmful effects are manifested on materials. Ozone destroys natural rubber very quickly. That is why articles like windshield wipers and weather stripping are now made with synthetic materials in an effort to thwart one of its more destructive capabilities. It can also affect textile dyes in the same manner as does ultraviolet radiation. Either directly or indirectly, the harmful effects of ground level ozone have one thing in common, they all cost us money for the havoc they wreak.

The Not So Secret Formula For Atmospheric Ozone Formation

Well, now we know what ozone is and why we do not want it to be around us. Let's briefly discuss how it is formed in the atmosphere. To form ground level ozone, we need ozone precursors, sunlight, and heat. The ozone precursors are volatile organic compounds (VOCs) and nitrogen oxides (NOx). VOCs can be either biogenic (naturally occurring) or anthropogenic (man made). Biogenic sources include the natural respiration of trees and the natural decomposition of organic matter. Anthropogenic sources range from the combustion of fossil fuels to the use of solvents. Nitrogen oxides are anthropogenic generated emissions which are almost exclusively formed by the combustion of fossil fuels in gasoline powered vehicles and coal fired power plants.

The chemistry behind ozone formation may be described as a photochemical cycle. The major photochemical oxidants are ozone and nitrogen dioxide (NO_2). Although the chemistry of the atmospheric reactions taking place is very complex, the general mechanism for ozone formation can be described as follows: Nitrogen oxides and VOCs react in the atmosphere in the presence of sunlight. Atmospheric conditions play an important role in ozone formation. The air needs to be relatively stagnant and the temperature needs to be warm. The products of the atmospheric reactions are called photochemical oxidants. Simply stated, VOCs and nitrogen oxides react to form ozone and NO2. NO2 reacts with the ultraviolet radiation in sunlight to form nitrogen oxide and an oxygen radical. The oxygen radical combines with atmospheric oxygen in the presence of VOCs to form more ozone. This cycle continues as long as there are precursors, sunlight, and heat. This is why ozone formation occurs in the summer, when the sunlight energy is more intense and the relative temperature is high. If precursor levels are unchanged or are increased, then a long hot summer will result in the formation of high concentrations of ozone.



Did all of that register? If it did, go to the head of the class. Fortunately, no quiz will be given.

Driving Destinations Help Determine Ozone's Destiny

How does this affect the Mecklenburg County area? The day to day operation of numerous mobile sources contributes significant quantities of nitrogen oxides to the atmosphere which eventually will increase the likelihood of additional ground level ozone. The more cars there are on the road, the more potential there is for ozone to be in the air. The public shares joint responsibility with industry in being obligated to try and find effective means by which to reduce and control ozone formation by decreasing the prevalence of precursor emissions. Industrial emissions of ozone precursors are governed by the EPA, state and local air quality programs. The public, and private industry, can reduce emissions by following the Ozone Action Tips published by MCDEP.

From 1990 through 1997, the Charlotte area did not violate the federal standard for ozone concentrations in the ambient air. Until 1997, the federal standard was 0.12 ppm over one hour. The new standard is 0.08 ppm averaged over eight hours. However, current monitoring data shows that the ambient ozone levels are on the increase. Mecklenburg County had exceedences of the federal eight-hour standard thirty-four times in 1999.

It should be noted that ozone is a regional problem. Ozone formation does not start and stop at the county line. Ozone precursors from automobiles traveling to and from surrounding counties contribute to our local ozone problem. Pollutants from nearby power plants are transported by the wind, only to join with other locally produced precursors to form ozone. Ozone itself, once formed, will migrate to adjacent locales. As the summers get hotter and the number of automobiles on the road increases, the ozone problem in Charlotte will become more and more serious. The summer of 1999 ozone season was a good example of this phenomenon because several hot days led to repeated instances of high concentrations of ozone. We cannot control the weather, but we can control ourselves. The collective actions that are taken will make a positive difference in preventing the development of ozone and deterring its detrimental impact on the quality of our air. SOER

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AS OZONE STANDARDS FLUCTUATE, WHERE DO WE STAND?

Mecklenburg County just withstood a steamy, hot summer in 1999 and weathered yet another challenging ozone season. As is characteristic of the North Carolina Piedmont, the summer months brought us elevated ozone levels. From April through October 1999, the Mecklenburg County Department of Environmental Protection (MCDEP) monitored the local ambient air ozone levels for comparison to the National Ambient Air Quality Standard (NAAQS) to determine our degree of compliance with the applicable ambient standards. The measured ozone levels, associated health advisories, controversy and litigation over the new federal ozone standard kept ozone under the scrutiny of the public's critical eye for most of the year.

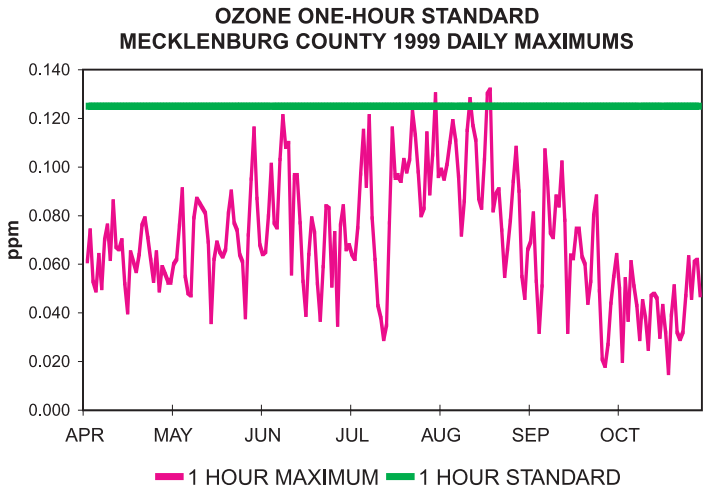
One-Hour and Eight-Hour Standards

A discussion of the ozone levels measured in 1999 would not be complete without a discussion of the changes in the federal standard over the past few years. The original federal ozone standard of 0.12 parts per million (ppm) based on one-hour concentrations of ozone was promulgated by the United States Environmental Protection Agency (EPA) in the 1970's. Regulations allow for an average of one exceedance of the standard per year over a 3-year period per monitoring site in each air quality region. Therefore, four exceedance days at any one of the monitoring sites in Mecklenburg County over three years would constitute a violation of this standard. A statistical number called the "design value" is used as an indicator to measure the degree of violation, and is the fourth highest one hour value over three years. It is the single number representing the ozone level for three years and is used to determine an area's nonattainment status category. Due to the 1990 Clean Air Act (CAA) amendments, Mecklenburg and Gaston Counties were designated as a moderate nonattainment area; however, in 1995, as a result of three successive years of no violations being recorded, both were officially redesignated as an attainment area for the one-hour ozone standard.

In July 1997, EPA promulgated a new eight-hour ozone standard. The new standard of 0.08 ppm averaged over an eight-hour period was the result of a lengthy scientific review process on the effects of ozone on the public health and the environment. A violation occurs when the design value for any monitor in an area exceeds the standard. The "design value" for the eight-hour standard is a three-year average of the fourth highest ozone concentrations recorded during a given year. With the passage of the new standard, the EPA revoked the old one-hour standard in many areas that met the old standard, including Mecklenburg County.

Do We Have A Standard?

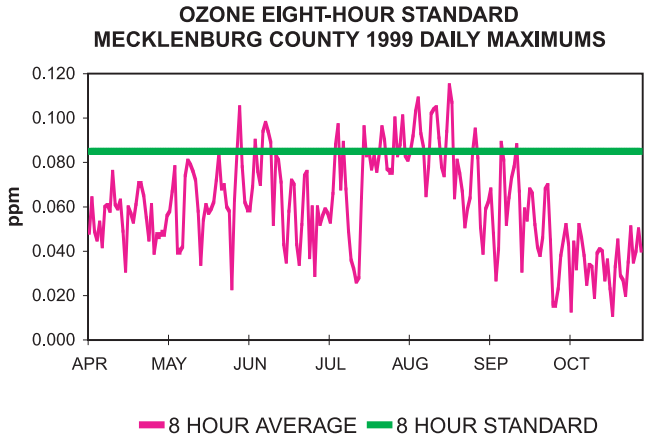
In response to challenges to the new eight-hour standard filed by industry and others, a three-judge panel of the United States Court of Appeals issued a decision on May 14, 1999. Among other items, the panel (1) remanded the eight-hour standard for further consideration, (2) concluded the Clean Air Act (CAA) as it was being applied effects an unconstitutional delegation of legislative power, and (3) concluded that the EPA lacks authority to implement the new standard. This left Mecklenburg County and about 3,000 other counties nationwide without any enforceable federal public

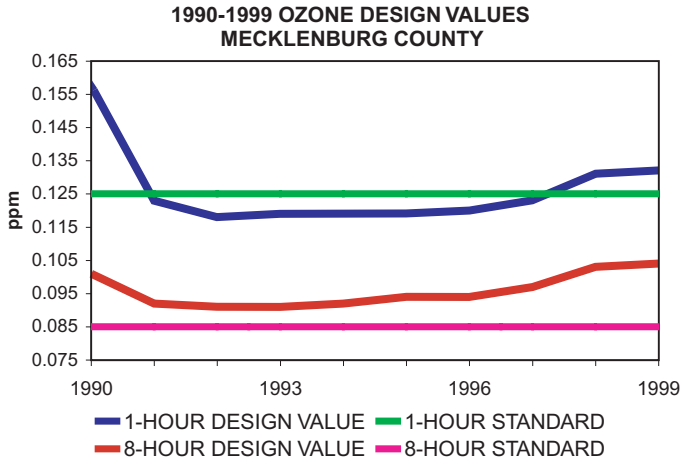


health standard for ozone. On June 28, 1999, the EPA filed a rehearing request but on October 29, 1999, the court denied the request.

As a result of the court's decisions of May 14, 1999 and October 29, 1999, the new standard was allowed to remain in place, but the EPA cannot enforce it. As the fate of the new standard teeters precariously in the scales of justice due to ongoing litigation, the EPA proposed a rule on October 20, 1999, to reinstate the old one-hour standard. The public comment period for this proposal ended on January 3, 2000. Even through all of this, the appeal process for the eight-hour standard continues.

On April 1, 1999, the State of North Carolina adopted the eight-hour standard and on November 16, 1999, Mecklenburg County adopted the State standard by reference. Therefore, the eight-hour standard is enforceable on both the State and County level, but there is no enforceable standard on the federal level.





1990-1999 Ozone Data

During 1999, MCDEP recorded four days of one-hour ozone standard exceedances and 34 days of eight-hour ozone standard exceedances. In summary, the ozone levels measured in Mecklenburg County have been increasing over the past few years and have exceeded both the one-hour and eight-hour standards.

If the one-hour ozone standard is reinstated, EPA will not redesignate Mecklenburg and Gaston Counties as being a nonattainment area in the near future because we have an air quality "maintenance plan" to follow. All affected agencies will have to work very closely together to determine the appropriate course of action to follow while considering what additional air pollution control measures to employ to hasten the reduction of ozone concentrations and demonstrate attainment with the one-hour standard. The CAA requires EPA to collect data and designate the attainment/nonattainment status within three years of a new standard promulgation. The eight-hour ozone standard attainment/nonattainment status designations should be declared by July, 2000. Unfortunately, despite all of the plans and discussions, the future of Mecklenburg County's ozone standard and compliance status remains as unclear as the sky on a steamy, hot day in mid-July.

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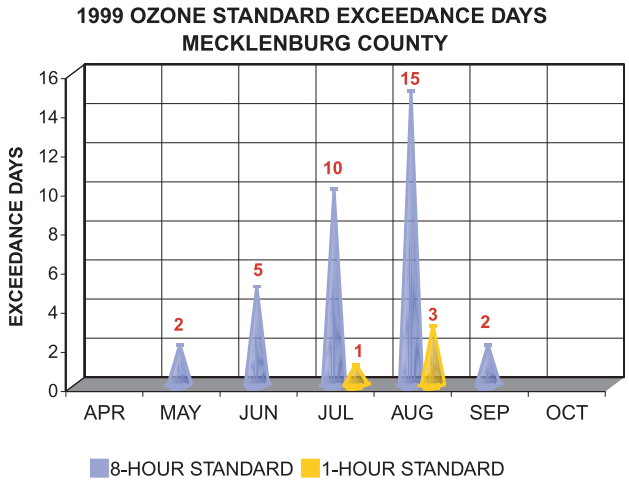


A SIMPLE MEASURE OF QUALITY OF LIFE: THE AIR QUALITY INDEX

Deprived of breathing air we can only live a few short minutes. The air we breathe is a precious resource which we are dependent upon for our entire lifetime. One simple measure of our quality of life in Mecklenburg County is the quality of our air.

Locally, the Mecklenburg County Department of Environmental Protection (MCDEP) is responsible for compiling and reporting this information in the form of the Air Quality Index (AQI). How do we measure the quality of the air we breathe? The AQI is calculated daily for each monitored pollutant and the pollutant with the highest AQI value is determined to be the critical pollutant for that particular day. The index provides information on pollutant concentrations for ground-level ozone, particulate matter, carbon monoxide, sulfur dioxide, and nitrogen dioxide. In simple terms, values equal to or less than 100 on the index scale are considered "good" to "moderate" air quality; values greater than 100 are considered unhealthy. It is equally important to have specific information regarding the health effects of the various pollutants that are reported in the index. For the Charlotte area, during summer months, ozone is usually the critical pollutant, but during the remainder of the year, particulate matter and carbon monoxide are the critical pollutants in our area.

"Sadly, my first reaction to a high ozone warning is to go outside less, which is illustrative of the problem we all face if we do not take the steps to protect our environment. These warnings, however, also motivate me to work harder than ever with my teammates and my community to create environmental solutions that will protect the future for all of us."

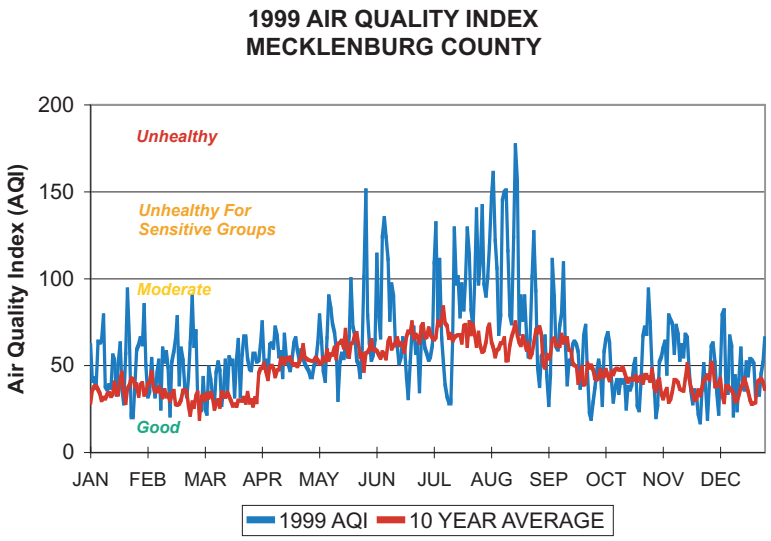
Hugh McColl, Jr.
Chairman and Chief Executive Officer
Bank of America

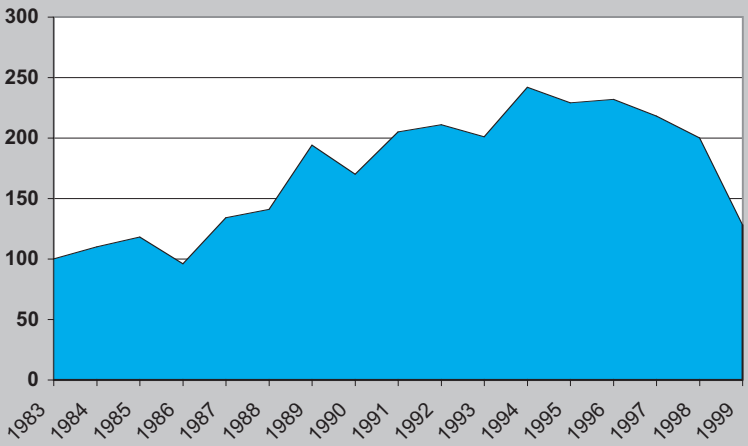
Air Quality Index
Category Index Values, Descriptors, and Colors

Index Values	Descriptor	Color
0 - 50	Good	Green
51 - 100	Moderate	Yellow
101 - 150	Unhealthy for Sensitive Groups	Orange
151 - 200	Unhealthy	Red
201 - 300	Very Unhealthy	Purple
301 - 500	Hazardous	Maroon

Pollutant Specific Health Effects Statements for the Air Quality Index (AQI)

AQI Category		Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy	Hazardous
Ozone (ppm)	8-hour	None	Unusually sensitive individuals, may experience respiratory symptoms.	Increasing likelihood of respiratory symptoms and breathing discomfort in active children and adults and people with respiratory disease, such as asthma.	Greater likelihood of respiratory symptoms and breathing difficulty in active children and adults, and people with respiratory disease such as asthma; possible respiratory effects in general population	Increasingly severe symptoms and impaired breathing likely in active children and adults, and people with respiratory disease such as asthma; increasing likelihood of respiratory effects in general population	Severe respiratory effects and impaired breathing likely in active children and adults and people with respiratory disease such as asthma; increasingly severe respiratory effects likely in general population.
	1-hour	None					
Particulate Matter ($\mu g/m^3$)	PM-2.5 24-hour	None	None	Increasing likelihood of respiratory symptoms in sensitive individuals, aggravation of heart or lung disease, and premature mortality in persons with cardiopulmonary disease and the elderly	Increased aggravation of heart or lung disease, and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	Significant aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; significant increase in respiratory effects in general population	Serious aggravation of heart or lung disease, and premature mortality in persons with cardiopulmonary disease and the elderly; serious risk of respiratory effects in general population.
	PM-10 24-hour	None	None	Increasing likelihood of respiratory symptoms, and aggravation of lung disease such as asthma.	Increased respiratory symptoms and aggravation of lung disease such as asthma; possible respiratory effects in general population.	Significant increase in respiratory symptoms and aggravation of lung disease, such as asthma; increasing likelihood of respiratory effects in general population	Serious risk of respiratory symptoms and aggravation of lung disease such as asthma; respiratory effects likely in general population.
Carbon Monoxide (ppm)	1-hour	None	None	Increasing likelihood of reduced exercise tolerance due to increased cardiovascular symptoms, such as chest pain, in people with cardiovascular disease.	Reduced exercise tolerance due to increased cardiovascular symptoms such as chest pains in people with cardiovascular disease.	Significant aggravation of cardiovascular symptoms, such as chest pain, in people with cardiovascular disease	Serious aggravation of cardiovascular symptoms such as chest pains in people with cardiovascular disease; impairment of strenuous activities in general population.
	8-hour	None	None				
Sulfur Dioxide (ppm)	24-hour	None	None	Increasing likelihood of respiratory symptoms, such as chest tightness and breathing discomfort, in people with asthma.	Increased respiratory symptoms such as chest tightness and wheezing in people with asthma; possible aggravation of heart or lung disease.	Significant increase in respiratory symptoms, such as wheezing and shortness of breath, in people with asthma; aggravation of heart or lung disease	Severe respiratory symptoms such as wheezing and shortness of breath in people with asthma; increased aggravation of heart or lung disease; possible respiratory effects in general population.
Nitrogen Dioxide (ppm)	1-hour	None	None	None	None	Increasing likelihood of respiratory symptoms and breathing discomfort in children and people with respiratory disease such as asthma.	Greater likelihood of respiratory symptoms and breathing difficulty in children and people with respiratory disease such as asthma.





The Revised AQI

In August 1999, the index reporting system was revised to incorporate two new standards as required by EPA regulations promulgated in July 1997. The previous ozone standard was 0.12 ppm averaged over a one (1) hour period, however, the revised ozone standard is 0.08 ppm averaged over an eight (8) hour period. Fine particulate matter less than or equal to an aerodynamic diameter of 2.5 microns (PM2.5), was added to the required parameters. To complement specific information regarding the health effects of the various pollutants, the revised AQI went a step further and identified sensitive groups for each pollutant:

Ozone-	People and children with asthma.
Particulate Matter 2.5-	People with respiratory or heart disease, the elderly and children.
Particulate Matter 10-	People with respiratory disease.
Carbon Monoxide-	People with heart disease.
Sulfur Dioxide-	People with asthma.

Colors have been assigned to each index level which correlate to a specific descriptor and were added to allow regional mapping of air quality data for public access by electronic media. This data is also available at http://www.epa.gov/airnow/ during the summer months.

Air Quality Data and Trends

The public can dial (704) 333-SMOG (7664) to access a computerized message that is updated hourly, which provides the current AQI for Mecklenburg County. The AQI for the preceding day is published daily in The Charlotte Observer weather section. If you want to learn more about how differing pollutant concentrations are used to determine the breakpoints for the AQI category designations, you can go to the appendix at the end of the report. Being aware of the condition of our air is a simple way to work toward keeping AQI values as low as possible.

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"WHERE IS THAT NEW ROAD GOING TO GO?

"ASK MUMPO, THEY WILL KNOW

Just as individuals and companies keep a close watch on their financial budgets, as an air quality maintenance area, Mecklenburg County has its own air pollution budget to oversee. And this budget has to be maintained, even as we build new roads. Once Mecklenburg County demonstrated compliance with national air quality standards, a maintenance budget was established to ensure compliance was sustained. The air emissions budget became a reality through the cooperation and coordination of work efforts by EPA, North Carolina Department of Transportation, Charlotte Department of Transportation, and others. The budget was established for the three pollutants of concern -carbon monoxide (CO), nitrogen oxide(NOx), and volatile organic compounds (VOC). NOx and VOC emissions were included because they react together in the presence of sunlight to form ozone. Air emission budgets were established for four distinct categories - stationary sources, area sources, off-road sources and mobile sources. The budgets were determined using the Urban Airshed Model, which is a Gaussian dispersion model.

Conformity: Matching Air Quality Plans with Transportation Plans

Transportation Conformity requires that as new roads are built, the resulting mobile source emissions stay within the alloted air emission budget in actual tons per day emitted for CO, NOx and VOCs. Mecklenburg County underwent a transportation conformity demonstration for mobile sources in April 1999. Specific data about vehicles (i.e. roadway speeds, miles traveled, and age of the fleet) were compiled. The data were used in a Mobile-5B model to obtain CO, NOx, and VOC emissions, which were compared with the respective mobile source budgets for CO, NOx, and VOCs in 1990 (i.e. the year budget conformity began), 1999 and 2005. Budget conformity was confirmed since the actual/estimated emissions were less than the budgeted emission tonnage. Additional future conformity was confirmed when the analyses of the mobile source emissions for the years 2015 and 2020 were performed and compared to those of 2005, the last budget year in the air quality plan.

In a joint effort to remain in "conformity," many government agencies have decided to work together for the common good to a degree that is rarely observed among municipalities, politicians, etc. This was initiated by the federal government's mandate for the establishment of Metropolitan Planning Organizations (MPOs). The MPO for Mecklenburg County is also known as the Mecklenburg-Union Metropolitan Planning Organization (MUMPO). It is supported by and comprised of responsible, local officials from 13 separate organizations who ultimately decide where roadway funds are to be spent. These officials do not pretend to have the necessary engineering, environmental, planning, or other technical knowledge needed for road project design and construction. Because of this, they have established a Technical Coordinating Committee (TCC) to evaluate technical issues and make informed recommendations to the MUMPO. The TCC is comprised of the various member towns, usually represented by their planning/zoning staffs.

Life After Nonconformity

If the actual/estimated emissions from mobile sources exceeded the budget, the Mecklenburg County area would be designated as being "out of conformity." This undesirable designation would have potentially devastating ramifications and repurcussions on the finances of local governments. Federal funds from the United States Department of Transportation (USDOT), which includes both the Federal Highway Administration and Federal Aviation Administration, would not be allowed to come to Mecklenburg County or the State of North Carolina for use in Mecklenburg County. Funding for projects underway would stop as well. Both figuratively and literally, "the bucks would stop here."

Funding for certain projects that by design would decrease air pollution could continue even if Mecklenburg County should be designated as being "out of conformity." One example of such a project would be better coordination of traffic timing signals so as to minimize the occurrence of traffic congestion. Another example would be that portions of the Charlotte International Airport's planned expansion still would be allowed to be constructed, since the improved design would result in a reduction of the amount of time an aircraft remains idling on the ground, and thereby would lessen the generation of excess emissions from the engine.

Despite the careful, meticulous planning of groups such as the TCC and MUMPO, the conformity budgets do not always work as planned. Even though Mecklenburg County has not yet exceeded our budgeted amounts for NOx or VOCs, we have violated both the new (8-hour) and old (1-hour) ozone standards in 1999. Both the conformity budget and the general public may be "seeing red" if this pattern continues.

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'HEY BUDDY, *CAN YOU* "SPARE THE AIR"?

The Air Quality Coalition is looking dejected, disheveled and disoriented as they shuffle slowly down the street, tightly clutching a small tin cup, eagerly awaiting anybody who would consider making an ozone action contribution. Finally, a few kind hearted, concerned individuals give what they can from their frugal resources, while the masses hurriedly drive the other way. It is going to be another very lonely night on Atmosphere Alley. Get the picture? We have the solution and so do you whether you realize it or not.

What Is "Spare The Air"?

Mecklenburg County and the surrounding region just completed its fourth "Spare the Air" campaign in 1999. This community education outreach program is designed to help make businesses, schools, and the general public more aware of the effects of ground level ozone on their day-to-day lives, as well as how ozone can be prevented. "Spare the Air" emanated from a voluntary group of approximately 100 businesses over an 8 county region known as the Regional Air Quality Coalition. This group has concerns about the status of our region's air quality and they have joined together to do something about it. They have committed both time and resources toward educating their employees about how they can personally reduce their contributions to the total ozone problem. The Mecklenburg County Department of Environmental Protection (MCDEP) has lead this campaign in cooperation with the North Carolina Division of Air Quality (NCDAQ) since its inception.

"Spare the Air" is necessary in our county and region for many reasons.The primary pollutant that is a precursor to the formation of ozone is nitrogen oxides (NO_X). It is discharged from fossil fueled combustion sources such as car engines, gas fired yard equipment, generators, etc.. Since Mecklenburg County does not have a major industry releasing NO_X into the atmosphere, it would seem logical that there should be no ozone problems here. However, there is one pervasive source that releases NO_X in such quantities that ground level ozone continues to increase . . . automobiles. Our use of automobiles is not limited as a source of air pollution, so "Spare the Air" is geared toward helping educate the public on how they as individuals can help reduce ozone pollution.

During the ozone season, which begins in April and ends in October, NCDAQ meteorologists predict when the conditions are conducive to the formation of ozone. Generally, these conditions occur on hot, sunny days when there is very little wind present. When high ozone days are predicted (Code Orange or Code Red), a variety of announcements are made to heighten the level of public awareness and to present the public with opportunities to help lessen or prevent ozone formation. The ozone action alerts are announced via the television, newspaper, recorded phone messages and through employers involved in the Regional Air Quality Coalition.

In 1999, a creative, new emphasis was placed on educating the children attending public school in the Charlotte-Mecklenburg School System about ozone. An ozone booklet, developed through grant monies received by MCDEP, was distributed to fifth graders in each of the Charlotte-Mecklenburg schools. It included a host of educational activities, including a board game and poster, to help inform the students and their parents about the ozone problem and assorted ozone actions. The outreach also provided a special incentive for children to have their parents participate in ozone actions that could help make a difference. The parents signed a special form stating that they and their child(ren) performed certain actions to help reduce ozone. Those children correctly completing the challenge were eligible for a drawing for a bicycle that was to be given away at each school. In 1999, 45 bicycles were awarded to deserving students. The ozone educational booklet will be distributed again for use during the spring of the 2000 school year.

1999 Ozone Forecast Accuracy

Code	PPB	AQI	Forecast	# Correct	%Correct
Green	0 - 64	0 - 50	47	36	76.6%
Yellow	65 - 84	51- 100	64	33	51.6%
Orange	85 - 10	101 - 150	36	18	50.0%
Red	105 - 124	151 - 200	6	1	16.7%

During the ozone season, which begins in April and ends in October, NCDAQ meteorologists predict when the conditions are conducive to the formation of ozone.

Ozone Forecasting

A vital role in the overall ozone prevention efforts undertaken in the community is the forecasting of ozone action days. Various levels of ozone are categorized into groups and assigned a corresponding color. In 1999, the EPA revised its Air Quality Index (AQI) scale for determining what type of ozone day would be forecasted. A code green indicates the likelihood of a potentially "good" day with little ozone being present. The public should both figuratively and literally see red on a code red day which indicates that there will be an unhealthy level of ozone present in the air, having the potential to create conditions detrimental to our health. The highest category in the AQI for ozone code declarations is maroon. A code maroon represents the likely presence of hazardous ozone conditions. Fortunately, our ozone dilemma has not yet deteriorated to that level. We still have time to make a difference in projected and realized ozone levels in Mecklenburg County.

It is important that the forecasting be as accurate as possible so that the public does not feel as if the regulatory agency is "crying wolf" with every CODE ORANGE day that is predicted. The 1998 forecasting data indicated that the accuracy slightly decreased in 1999. During 1999, there were a total of 65 days when the forecasted ozone code was not achieved. Of those, 36 days were projected to be worse than they actually were and 29 were projected to be less severe than they were. Undoubtedly, the ozone actions taken by businesses and the public helped to adjust the outcome of the ozone levels that were ultimately realized.

Make A Difference, Not An Excuse

Mecklenburg County and the surrounding region are growing by leaps and bounds. The ozone issue will not be resolved without the voluntary participation of businesses, schools and individuals helping make a difference in the daily ozone levels. Prevention is the key. Here are some simple things one can do to help "Spare the Air":

- car pool, take your lunch/walk to lunch
- refuel vehicles after 6 PM
- conserve electricity
- drive smart, combine errands to minimize excess trips

No amount of wishful thinking is going to make the local ozone problem go away anytime soon. Until the ozone problem is rectified, the "Spare the Air" campaign will continue in its endeavors to educate the public about ground level ozone and the effects it has on health. If you would like to contribute to eliminating the cause, obtain additional information, or are interested in becoming involved in the coalition, please call the Spare the Air Hotline at 704-336-6859. The hotline is available between May and September each year.

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A TALE OF THREE CITIES

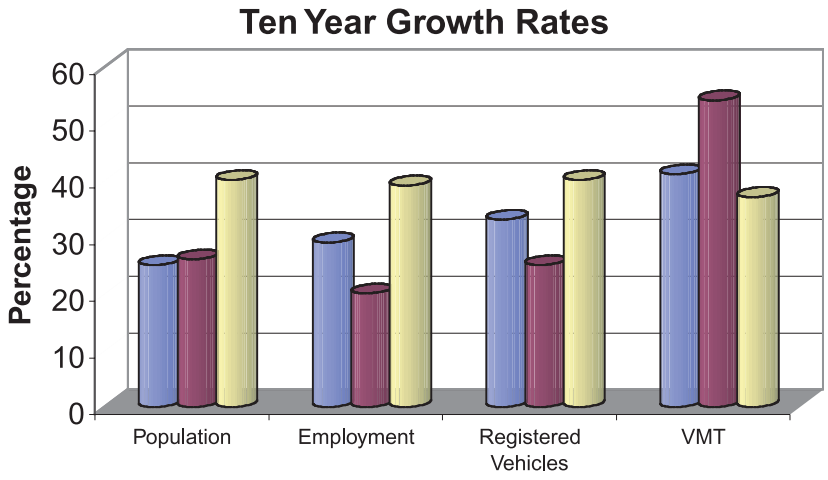
When it comes to the realm of air pollution, Charlotte is not the only city in the region contending with problems. Nashville, Birmingham, Atlanta, Columbia, and Raleigh, to name a few, are also struggling with their air pollution. Interestingly enough, each one seems to have a problem with one pollutant in particular - ozone. Just because we are dealing with the same pollutant, does not necessarily mean we each toil to the same degree. Let's take a closer look by narrowing down the scope of cities to just Charlotte, Atlanta, and Raleigh. Atlanta and Raleigh are good cities to compare to Charlotte. All three are experiencing high growth rates in terms of population, employment, the number of cars on the road, and the vehicle miles traveled (VMT), which are all factors directly contributing to the ozone problems. So, how does Charlotte fare in this side by side comparison of three leading southern cities? The answer just might surprise you.

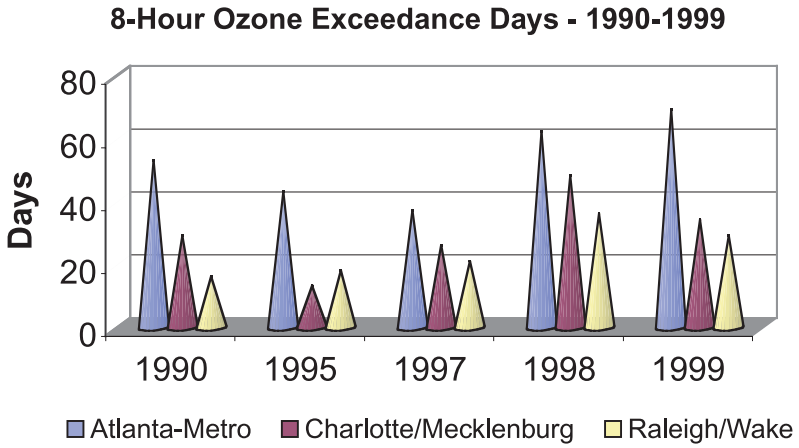

Charlotte, NC


Atlanta, Georgia


Raleigh, NC

A Tale of Three Cities





Growth and Ozone

For Atlanta, Charlotte and Raleigh it has been the best of times with all experiencing high growth and prosperity. Since 1990, growth in population, employment, registered vehicles and vehicle miles traveled has increased for all. Atlanta and Charlotte have grown at around 20%-30 % while Raleigh's growth has been more dramatic with rates hovering around 40%. The one ominous exception is VMT where Charlotte has experienced a 54% increase in 10 years. Vehicles are a major source of nitrogen oxide (NOx) emissions, one of the two ozone precursors; and the more we travel the more nitrogen oxide is exhausted into the air. This is not a category which Charlotte wants to lead.

While growth and prosperity have been high for all three cities, it has been the worst of times for ozone levels and the number of ozone exceedance days. In general, all the cities experienced high levels in the early 90s, moderation in the mid 90s and dramatic increases in the late 90s. Raleigh, with the largest change in growth factors, has seen the greatest increase in ozone exceedance days, with 18 in 1995 and 29 in 1999 - up 61%. In addition, Raleigh's ambient ozone levels have also steadily risen. In 1999, Atlanta had 69 days when it exceeded the eight hour ozone standard, over two-thirds of the summer. This was a 60% increase over 43 days experienced in 1995. Ozone levels have also steadily climbed in Atlanta, with the fourth highest maximum value reaching an eight hour high of 0.132 ppm in 1999. Charlotte's number of ozone exceedance days has more than doubled since 1995 from 13 to 34 days. In contrast to the other cities however, Charlotte's fourth highest eight hour ozone level for 1999 was lower than the previous two summers.

Ozone Control Strategies

According to "Georgia's State Implementation Plan for the Atlanta Ozone Non-Attainment Area, October 28, 1999." Atlanta is considered a "serious" non-attainment area. Its extensive menu of control strategies to reduce unhealthful ozone levels stretch from a minimum 13 county area to an entire region encompassing 45 counties, depending on the particular strategy. The strategies include: GA low sulfur gasoline; NOx reductions for large electric utility steam generators; Smog Free GA - voluntary partnerships; reductions from large NOx units in 13 counties; 0.15 lb/mmBtu NOx emission limit for five coal-fired power plants; changes in vehicle enhanced inspection and maintenance in 13 counties; expanded permitting requirements for new industry; expanded RACT rules for existing industry; new air quality rules for new boilers/fuel burning equipment/stationary engines/gas turbines; national Low Emission Vehicle program; and new standards for locomotive engines, consumer/commercial products, marine engines, and nonroad diesel engines.

What is in the air for Charlotte and Raleigh? Although, neither is yet in Atlanta's league for population and number of ozone exceedance days, the number of unhealthful summer days are high and on the rise. A draft of "Governor Hunt's Clean Air Plan for North Carolina - A Strategy for Reducing Ground Level Ozone by the Year 2007" calls for 20 % NOx reductions from industry and an 8% NOx reduction from the public's cars and trucks by 2007. Industrial reductions target the largest coal-fired electric utility boilers, while mobile source reductions rely mainly upon low sulfur fuels and an expanded vehicle enhanced inspection and maintenance program.

One has to wonder if North Carolina's plan is timely and if it is far reaching enough after looking at the Georgia plan. No one can predict Charlotte's future growth. But if we continue to emulate our past role model - Atlanta, will we not end up in the same place? It would be a far, far better thing to do than we've ever done before to do more than is required and prevent our summer days from being plagued by unhealthful air.

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Big plans and Big bucks for cleaner air

The boom in population growth and its effect on traffic have contributed to the increase in ozone levels in the Charlotte area over the past decade and it is expected to continue.

The City of Charlotte continues to reach milestones in its effort to improve our local air quality, particularly as it relates to transit. The passage of the one-half cent sales tax, the purchase of new, low emission buses, the beginning of the county-wide transit plan, and the continuation of the mass transit corridor studies are all part of its overall plan for improving Charlotte-Mecklenburg's air quality, especially ozone.

The boom in population growth and its effect on traffic have contributed to the increase in ozone levels in the Charlotte area over the past decade and it is expected to continue. During the next 26 years, the population in the Charlotte-Mecklenburg area is estimated to grow by 345,000 people, which is an astounding 57 percent increase. Use of innovative transit initiatives will improve air quality, as well as the quality of life for all Mecklenburg County residents.

New and Improved Buses

Certain improvements to the Charlotte Transit fleet are already in place with the addition of 51 new buses in early 1999, with another 46 expected to arrive by the end of 2000. The new buses are 74% more fuel-efficient and they emit 40% ess exhaust emissions. Remarkably, even the dark, sooty exhaust most people associate with the operation of diesel buses (i.e. particulates), has been reduced by 85%. This dramatic decrease is plainly visible in the following pictures.

Another innovation for Charlotte Transit is the addition of bicycle carrying racks to its fleet of buses. The 46 buses on order will have factory installed bike racks placed on the outside front end of the bus just ahead of the driver with the remainder of the bus fleet to be similarly equipped over the next year. From this vantage point, the driver will be able to safely watch as the passenger loads/unloads their bicycle from the bike rack. This is an important step in extending the range of potential transit riders and maximizing alternative modes of travel. Transportation planners have recommended that bike racks and lockers be provided at major transit connections and they are included in the concept designs for future rapid transit stations and hubs.

"There are alternatives to driving an automobile."

Andy Christy
Independence High School

Countywide and 2025 Integrated Transit/Land Use Plans

The half-cent sales tax provides a big portion of the funds needed to initiate many air quality improvements. Although passed by voters in November 1998, actual collection of the sales tax for transit began in April 1999. Between then and September 1999, $21 million has been collected and projections indicate that the tax will generate approximately $50 million per year. Combined with other continued funding from the City, Mecklenburg County and other neighboring towns, the new Metropolitan Transit Commission will oversee an

Outdated diesel bus

New, fuel efficient bus

Proposed transit oriented development at Remount Road, Charlotte, North Carolina. (Photo curtesy: LDR International, Columbia, MD)

annual budget of $90 million. These funds are designated to implement plans already on the drawing board and fund additional proposed services over the next 25 years. One initiative funded by the transit tax is a new Countywide Transit Plan. This plan addresses short term needs and will make countywide transit service a reality over the next five years. It will accomplish this through the addition of new express routes, local routes, carpool and vanpool initiatives, special innovative forms of transit service and by extending service to the surrounding towns in Mecklenburg County.

The success of the Countywide Transit Plan is very important development toward the implementation of the 2025 Integrated Transit/Land Use Plan. The countywide plan will result in the availability of increased transportation choices, as well as additional riders. In the short term, this plan may help check the trend of soaring growth in vehicle miles traveled.

The ultimate goal of the 2025 Integrated Transit/Land Use Plan is the completion of the five rapid transit corridors. The South Corridor continues to progress toward becoming a reality. Key public meetings and analysis have already been completed. The locally preferred mode of mass transit is expected to be approved in early 2000 and the major investment study is almost complete. Staff's recommendation for this corridor calls for the use of light rail transit, which is significantly more environmentally friendly than the current predominant modes of transportation. Following approval of the locally preferred mode of mass transit for the South Corridor, work can move forward on the environmental analysis and facility design, as well as studies for the North, University, Independence, and Airport rapid transit corridors.

A Telling Future For Rapid Transit And Land Use

Future completion of the rapid transit corridors is expected to provide an attractive alternative to the single occupant vehicle and to significantly increase transit patrons over current levels. In itself, this will provide an air quality benefit; however, Charlotte Transit's most significant contribution toward achieving cleaner air may be altering its impact on land use.

The promotion of mixed-use, pedestrian friendly transit oriented developments along the transit corridors and around rapid transit stations will have a dramatic effect on the reduction of vehicle miles traveled. This type of land use not only reduces the number of vehicle trips by encouraging transit, bicycle and pedestrian travel, it also reduces the length of the remaining trips that must still rely on the auto. The combination of all these factors will play a key role in improving air quality within the Charlotte-Mecklenburg Metro Area. SOER

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OZONE AND THE FUTURE FOR MECKLENBURG COUNTY

The three ozone monitors in Mecklenburg County have each recorded violations of the United States Environmental Protection Agency's (EPA's) new 8-hour ozone standard. To maintain compliance with the 8-hour average (standard), the recorded ozone concentrations cannot exceed 0.08 parts per million (ppm). Unfortunately, the ozone monitor located at the Mecklenburg County line, has the dubious distinction of registering the highest 3-year average in North Carolina (0.104 ppm). Mecklenburg County is only one of two areas in the state, with Raleigh being the other, that has recently violated the previous 1-hour ozone standard (1-hour standard is 0.12 ppm). This represents the first 1-hour violation since 1991.

Expected EPA Actions

The Washington DC Federal Circuit Court ruled in May 1999 that the EPA had not defined the intelligible principle for the setting of the new 8-hour standard the agency established in July 1997. The court instructed EPA that the 8-hour standard could not be enforced until such an intelligible principle had been defined in court. EPA then requested a rehearing before the entire panel since only three members of an eleven judge panel had ruled on the original decision. The full panel denied the rehearing request. EPA is now expected to appeal the decision to the U.S. Supreme Court. The future of the 8-hour standard is very uncertain because it could be delayed from being reinstated for several years while awaiting the outcome of the Supreme Court decision. The Washington DC Federal Circuit Court instructed EPA to move forward on designations for the 8-hour standard since they are required to do so under the provisions of the Clean Air Act. Therefore, EPA is expected to finalize the designations in July 2000. The Governor of North Carolina will be asked to make a recommendation in early 2000. The EPA has issued guidance that suggests the minimum nonattainment area should be the full metropolitan statistical area (MSA), which includes the following counties: Mecklenburg, Gaston, Union, Rowan, Cabarrus, and Lincoln in North Carolina, and York of South Carolina.

In December 1999, the EPA proposed reinstating the 1-hour standard for areas of the country where the standard had been revoked following the adoption of the 8-hour ozone standard, but had recently observed violations of the 1-hour standard. EPA proposed this action since it will take so long to resolve the 8-hour legal issues, and many areas around the country did not have a health standard in effect for ozone. EPA is expected to finalize this action in February 2000.This action will require an evaluation of necessary control measures to be implemented that will result in improved air quality and attainment of the 1-hour standard in Charlotte.

> "We must reduce power plant and other fixed emissions and reduce the number and level of motor vehicle emissions."
>
> Ron Bryant
> Catawba Lands Conservancy

Pollution Control Measures Needed To Meet The Federal Ozone Requirements

The North Carolina General Assembly passed the Clean Air Bill in July 1999 to address necessary mobile source control strategies to help attain the 8-hour standard. These control measures include a cleaner low sulfur gasoline to be sold throughout the state and a technologically changed/geographically expanded vehicle inspection and maintenance program (i.e. oxides of nitrogen will now be included in the emissions test that will be conducted in 48 of the 100 counties in the state). Additionally, there will be goals promoting the expanded use of alternative fuel vehicles, emphasizing methods to employ to reduce the growth rate of vehicle miles traveled (VMT), and advocating telecommuting (i.e. working at home via computer terminal). The state Environmental Management Commission is currently considering additional controls on utility emissions. A modeling analysis is under way to assess what other controls might be warranted for industrial facilities, cars and trucks. Public meetings will be held in late 2000 to gather input on recommendations for further controls.

The North Carolina Department of Environment and Natural Resources (NCDENR) currently believes the controls in the Clean Air Bill and the utility regulations under consideration will solve the 1-hour nonattainment problem. However, solving the 8-hour problem may prove to be much tougher.

A declaration of Mecklenburg County being designated as a nonattainment area of the 8-hour standard will result in local citizens paying more for the improved vehicle inspection and maintenance program in 2002 and cleaner gasoline in 2004. Federal transportation dollars could conceivably be withheld from Mecklenburg County. In order to avoid the tightening of the Federal purse strings, the state must positively impact the local air quality by developing an air quality plan for the 8-hour standard and implementing an appropriate ozone reduction control measure scheme . In nonattainment counties, a loss of potential new industrial growth is likely to occur. However, to close on a more positive note, all of us, especially our children, will be able to breathe easier and rest assured knowing that we have done our part to help clean the air for this and future generations.

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Quality

CONTEMPLATING CRITERIA POLLUTANTS

For most of us, breathing comes about as easy as "falling off of a log". If and when one falls off of that log, whether it be figurative or literal, the obstacle that impaired our progress may not have been seen. Immediately afterwards, one wonders what just happened. Similarly, when one takes a deep breath, the ambient air pollutants that are present in the air breathed cannot be seen, but it does give one reason to pause and ponder what was just inhaled. It always pays to be fully aware of the quality of air that is being breathed.

NAAQS Facts

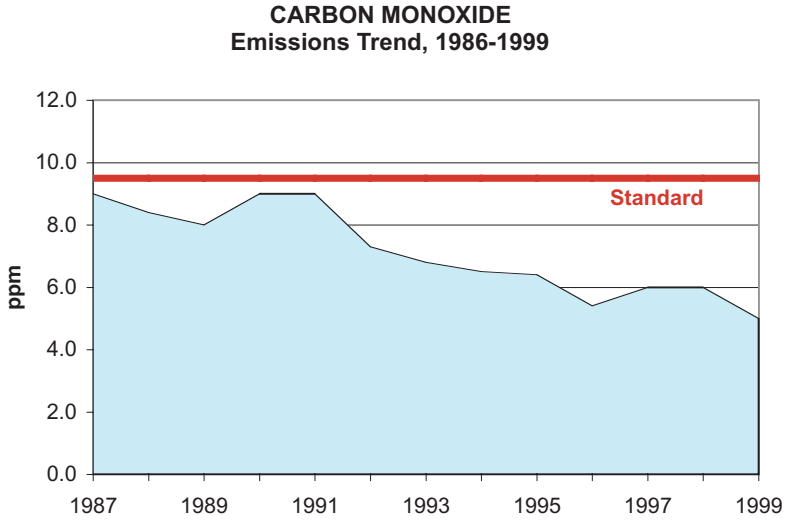
Major ambient air pollutants ("criteria pollutants") were first regulated by the federal government in 1970 with the establishment of National Ambient Air Quality Standards (NAAQS). These new regulations included both primary standards, which are designed to protect the public health and secondary standards, which are established to protect the public welfare. The specific criteria pollutants of concern were carbon monoxide (CO), sulfur dioxide (SO_2), total suspended particulate matter (TSP), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb). Hereafter, the use of the term "standards" refers to all of the emission levels estab-

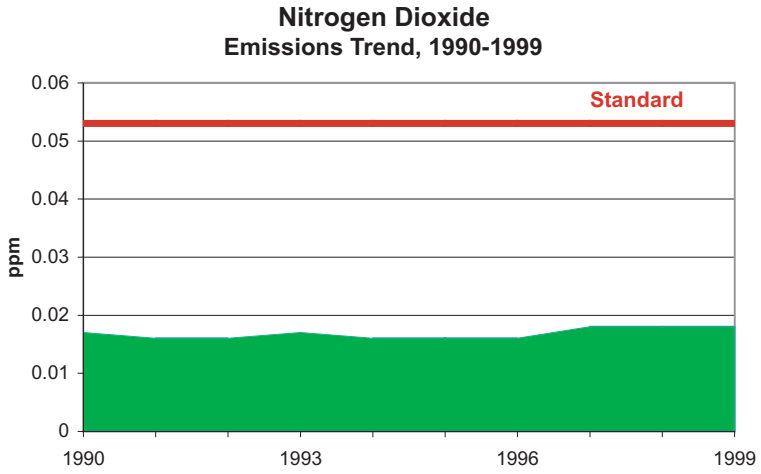
lished for a given criteria pollutant. On July 1, 1987, PM10 (particulate matter with an aerodynamic diameter of 10 microns or less) standards were promulgated and in 1997, PM2.5 (particulate matter with an aerodynamic diameter of 2.5 microns or less) standards were also promulgated. Particulate matter in general is an all inclusive term referring to total suspended particulates, PM10 and PM2.5. These pollutants are closely monitored via the Mecklenburg County Department of Environmental Protection ambient air monitoring network and the information that is gathered is used to help determine the status of our local air quality.

Carbon Monoxide (CO)

Carbon monoxide (CO) is produced by the incomplete combustion (i.e. the fuel is not completely burned during the combustion process) of fossil fuels in engines, boilers, furnaces, etc. It is a colorless, odorless gas that can pose a danger to people from localized concentrations found on traffic congested city streets. When inhaled, CO enters the bloodstream and reduces the body's ability to deliver oxygen to vital organs and tissues. At low concentrations, CO causes fatigue and impairs mental functions. The ill effects of excess CO exposure are especially serious for those who suffer from cardiovascular disease. In higher concentrations, CO intoxication may actually result in death of the exposed individual(s).

Local year round monitoring of CO began in 1976. A violation would be recorded if there was more than one exceedance of the CO standard in a calendar year. A violation of the carbon monoxide standard has not occurred since 1986 or even an exceedance of the standard since 1990 despite a steady growth in automobile registrations and number of vehicle-miles-traveled (VMT). Less polluting engines found in newer vehicles is the main factor accounting for the reduction in CO concentrations in our air quality. Mecklenburg County was officially designated as a carbon monoxide attainment area in 1995.



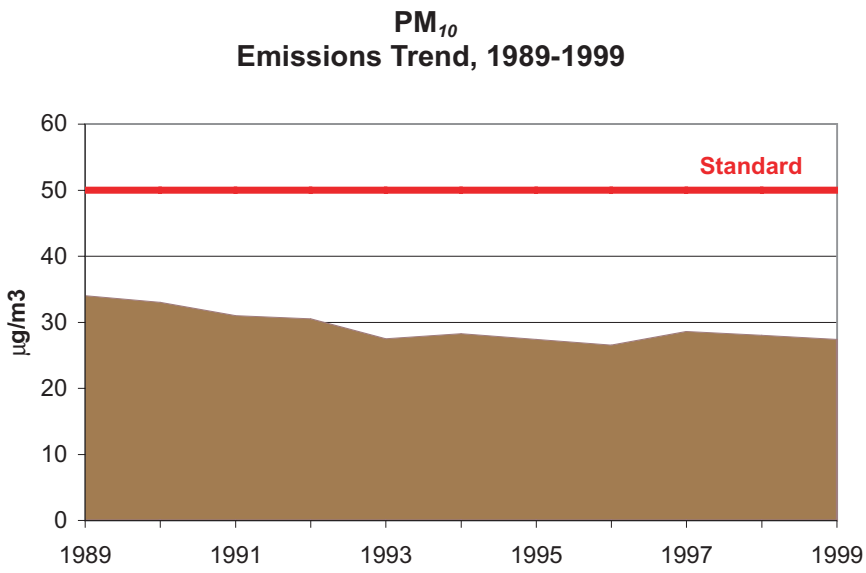


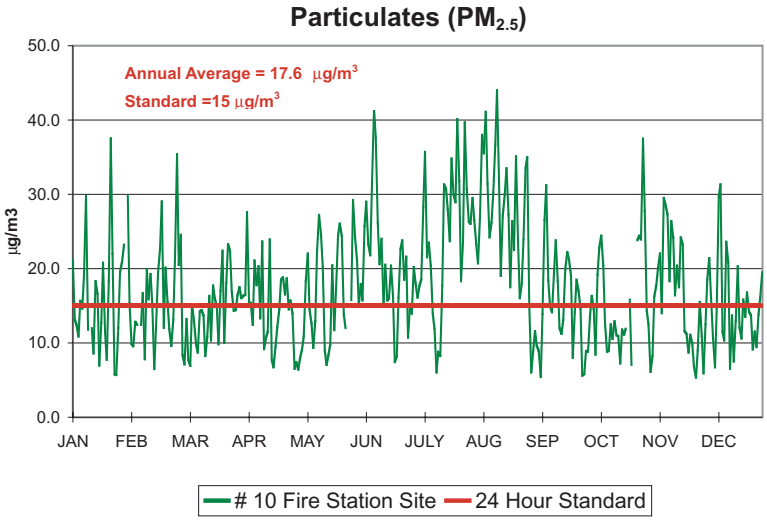
Sulfur Dioxide (SO_2)

Sulfur dioxide (SO_2) can adversely affect public health primarily as a respiratory irritant, the environment by damaging crops and forming acid rain, and visibility reduction through the presence of suspended sulfate particulates in the atmosphere. Monitoring for sulfur dioxide in Mecklenburg County began in the mid-1960s, but was discontinued in 1984 when ambient air concentrations were deemed to be at very low levels. Monitoring resumed in 1994 and has continually demonstrated compliance with the annual, 3-hour, and 24-hour standards for sulfur dioxide levels.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide (NO_2) is primarily formed as a waste gas exhausted from incomplete fuel combustion and, like sulfur dioxide, can lead to crop damage and acid rain formation. In a concentration as low as 0.5 ppm, nitrogen dioxide can begin to affect the respiratory system of children and asthmatics. Monitoring for nitrogen dioxide began in the mid-1960s, but was discontinued in 1986 due to the presence of very low concentrations. Monitoring was resumed in 1989 due to recent studies emphasizing the role of nitrogen dioxide in the formation of ozone. Nitrogen dioxide levels have remained steady and are not likely to exceed the NAAQS; however,





new control strategies for limiting ozone formation will likely involve reducing nitrogen dioxide emissions from both industrial and mobile sources.

PM10

As we breathe, extremely small particulate matter (PM10) can easily be inhaled and penetrate deeply into the innermost recesses of our lungs. Health effects from PM10 exposure depend on the type, amount, and duration of particles inhaled and vary widely from respiratory aggravation to the development of cancer. PM10 monitoring results for Mecklenburg County indicate concentration levels consistently below the NAAQS.

PM2.5

In an attempt to better protect the public's health, the EPA determined that a more restrictive particulate matter standard was needed. The PM2.5 standard (15 micrograms of PM2.5 particulate matter/cubic meter of air)] was adopted in 1997. Mecklenburg County started monitoring for PM2.5 in 1999. The standard requires three (3) years worth of data to determine the area's compliance status. Compliance with the annual PM2.5 standard will be demonstrated when the three year average of the spatially averaged annual means is less than or equal to 15 micrograms per cubic meter. As a result, Mecklenburg County's PM2.5 compliance status is currently unknown.

Lead (Pb)

The NAAQS for lead was adopted in 1978. Presently, it is set at 1.5 micrograms per cubic meter, maximum arithmetic mean over a calendar quarter. Lead (Pb) can be present in the air as either a particle or gas. Nationally in 1985, 73% of airborne lead originated from motor vehicle combustion of gasoline containing antiknock agents such as tetraethyl lead. Essentially, there are no industrial sources of lead emissions in this area, virtually all local atmospheric lead emissions come from transportation sources. In 1985, EPA mandates began reducing the lead content of gasoline. The standard for lead content in gasoline was 0.1 grams Pb/gal on January 1, 1986, but the complete prohibition of Pb from gasoline did not become effective until January 1, 1996. Currently, Mecklenburg County is not conducting any ambient air lead sampling.

Although the ambient air levels of CO, SO_2, NO_2, PM10, and Lead are all considerably below the federal standards throughout Mecklenburg County and are expected to continue to be for the forseeable future, the curent regimen of air quality monitoring for the pollutants of concern will continue. Breathing may indeed be as simple as falling off of a log, but it is reassuring, while one is taking those deep breaths, to know more about the criteria pollutants present in the complex gaseous mixture called ambient air that is being breathed by one and all.

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MONITORING THE AIRWAYS

As in school settings years ago when strategically placed hallway monitors reported errant students, the Mecklenburg County Department of Environmental Protection's (MCDEP) ambient air monitoring laboratory reports information about air pollution occurring in our airways. The data is collected to determine compliance with the National Ambient Air Quality Standards (NAAQS). The NAAQS were established by the United States Environmental Protection Agency (EPA) to protect public health and welfare. High quality air pollution monitoring data is collected for the benefit of the citizens of Mecklenburg County.

Growth Of The Ambient Air Monitoring Network

Mecklenburg County has been measuring air pollution concentrations since the 1960's. Periodic measurements of ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter (TSP), and lead (Pb) were conducted during the 1970s. The air monitoring network (network) developed into its current design around 1980 and has since undergone several adaptive revisions. Today the network consists of ten (10) separate sites. Atmospheric concentrations of the following pollutants are routinely recorded: ozone, sulfur dioxide, nitrogen dioxide, carbon monoxide, particulate matter (TSP, PM10, and PM2.5), reactive oxides of nitrogen (NOy and NOx), and volatile organic compounds (VOC).

Ozone Monitoring

There are three ozone monitoring stations in operation all of which are located along a SW to NE line, our primary summer wind direction. These locations were chosen to measure expected maximum concentrations and evaluate population exposure. Ozone is a primary ingredient in summertime smog in our county.

PM2.5 Monitoring

The latest additions to the network are samplers measuring fine particulate matter (PM2.5), the most recent particulate regulated by EPA. PM2.5 is particulate matter less than or equal to an aerodynamic diameter of 2.5 microns or approximately 1/30 the size of a human hair. It would literally take several thousand particles of this size to fit on the period at the end of this sentence. The minute particles easily penetrate to the deepest parts of the lungs. Three sampling sites are situated in areas of Mecklenburg County that are expected to provide data on maximum pollutant exposures to the highest population density.

Typical PM2.5 particulate monitor.

TSP/PM10 Monitoring

Monitoring is also performed for coarse particulate matter in the form of PM10 and total suspended particulate (TSP). PM10 is particulate that has an aerodynamic diameter of 10 microns or less. When these particles are inhaled, they may cause adverse health effects because of their ability to reach the lower regions of the respiratory tract. TSP is particulate matter with an aerodynamic diameter of approximately 40 microns or less. MCDEP operates five PM10 sites and two TSP sites.

CO Monitoring

Carbon monoxide (CO) concentrations are recorded at three locations. The CO sampling site at the Discovery Place science museum has an inlet located above the sidewalk near the entrance. This is a high traffic street canyon site located in the central business district with potential for elevated CO levels to be present. There are two additional CO sampling sites located in neighborhood settings in order to check population exposure on a larger scale.

Carbon monoxide monitoring site in Charlotte. The sampling probe is located directly beneath the letter "E" in the word "PLACE"

SO_2, NO_2 And VOC Monitoring

Other parameters measured in the network include SO_2 and NO_2 , each with their own location. Oxides of nitrogen (NOy and NOx) and volatile organic compounds (VOC) data are collected in two areas in conjunction with the ozone network.

Access To Monitored Emissions Data

The data collected in the ambient air monitoring network is reported to the United States Environmental Protection Agency. The public can access historical data on the EPA website at *http://www.epa.gov/airsweb*. For more timely MCDEP operates the SMOG-LINE, which is a recorded message that is updated hourly regarding the status of Mecklenburg County's air quality. The SMOG-LINE may be accessed by telephone at 704-333-SMOG (7664).

MCDEP's ambient air monitoring network is the gauge used to measure public exposure to the pollutants listed in this article. Reliable, accurate, and representative data collected in this network provide the information necessary to evaluate Mecklenburg's compliance with NAAQS.

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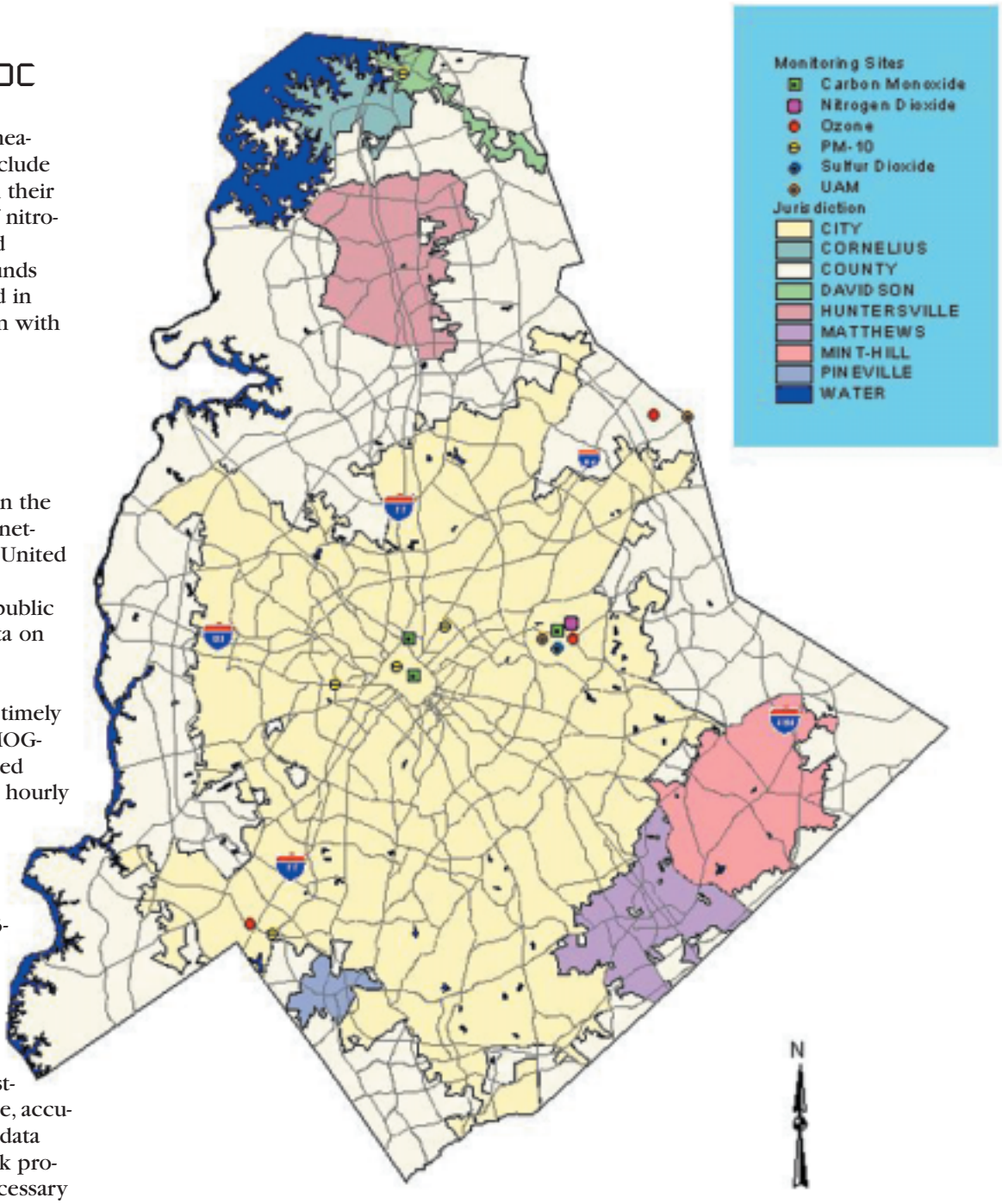

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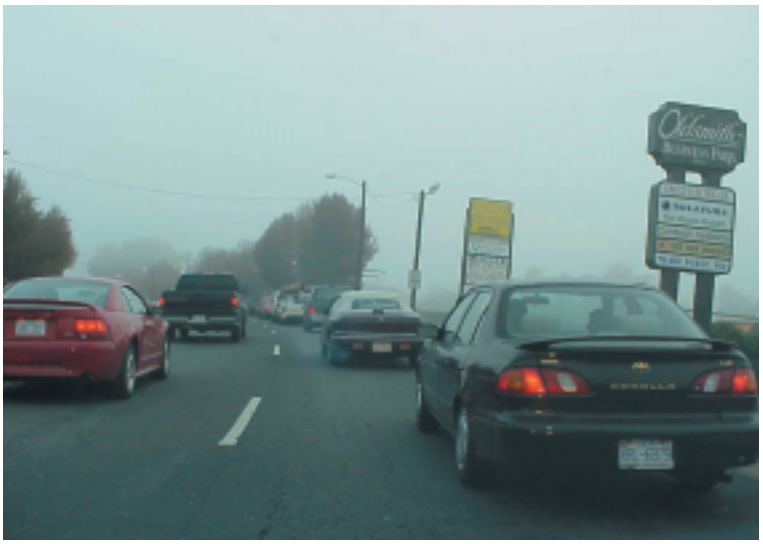
ONLY SUPER SPIES ARE ALLOWED TO SMOKE UP THE SKIES



White smoke emitted from the exhaust pipe of a vehicle in traffic.

Agent Ozone is being hotly pursued by enemy agents and is in desperate need of an evasive maneuver. With a flip of a switch on the sleek dashboard, a wall of white smoke belches out from under the vehicle. Agent Ozone will make it home in time for dinner.

Smoke And Mirrors

One's imagination does tend to wander while waiting at stoplights, rail crossings, etc., but we all suddenly are awakened and brought back to reality, especially if a nearby vehicle is fumigating the area with thick smoke as if it were a mosquito control vehicle making its rounds. As with all mechanical systems, motor vehicles need to be maintained. Unlike Agent Ozone, most of us do not want our vehicle to smoke like a chimney on a moment?s notice. One indication that the engine needs maintenance is if smoke comes from the tailpipe. A smoking tailpipe can be as simple to fix as getting an engine tune-up, or as complicated as needing to replace the entire engine.

The smoking tailpipe indicates that unnecessary pollutants are being emitted to the atmosphere. Black smoke primarily is soot (ash or particulates) and unburned fuel (organics or VOCs). Blue smoke/haze usually indicates the presence of organics (VOCs) in the exhaust gases. Both black and blue smoke indicate excess carbon dioxide (CO_2). A rotten egg odor, which may not be associated with smoke, indicates sulfur dioxide (SO_2) emissions.

Stop Smoking

Under North Carolina General Statute 20-128.1 - "Control of Visible Emissions," no vehicle may have excess visible emissions. This includes emissions from cars, trucks, buses, and motorcycles using gasoline and/or diesel fuels. The regulation is enforced on area roadways by any sworn officer (i.e. Mecklenburg County's Police Department or Sheriff's Office, N. C. Highway Patrol, or the N. C. Division of Motor Vehicles).

There are a number of ways that citizens can report smoking vehicles observed within Mecklenburg County. These can be reported by phone (704-336-5500), by FAX (704-336-4391), by e-mail (*MCDEP01@Co.Mecklenburg.NC.US*), or through the world wide web (*http://www.co.mecklenburg.nc.us/coenv/smoking_vehicle_form.htm*). For each of these reporting methods, the following information is required:

- North Carolina license plate number
- Make of Vehicle (Ford, Chevy, Honda, Mack, etc.)
- Model of Vehicle (if available - Escort, Nova, Civic, etc.)
- Location (street/intersection/parking lot where the smoking vehicle was observed)
- Town (City/County where observation was made)
- Date (observation was made)
- Time (observation was made)
- A name for the observer
- An address for the observer

Once the information is received, MCDEP mails a letter notifying the owner of the vehicle that it was observed smoking excessively and the requirements of State law, and requesting that the vehicle be repaired or adjusted to eliminate the problem. The letter also reminds the owner that air quality improvement efforts such as these do make a difference in improving the overall air quality in Mecklenburg County.

So the next time someone doing a cheap imitation of Agent Ozone's latest escape maneuver is driving in your neck of the world, take a moment and reach for a pen and paper. Jot it down and give us a call. After all, "the pen is mightier than the sword." SOER

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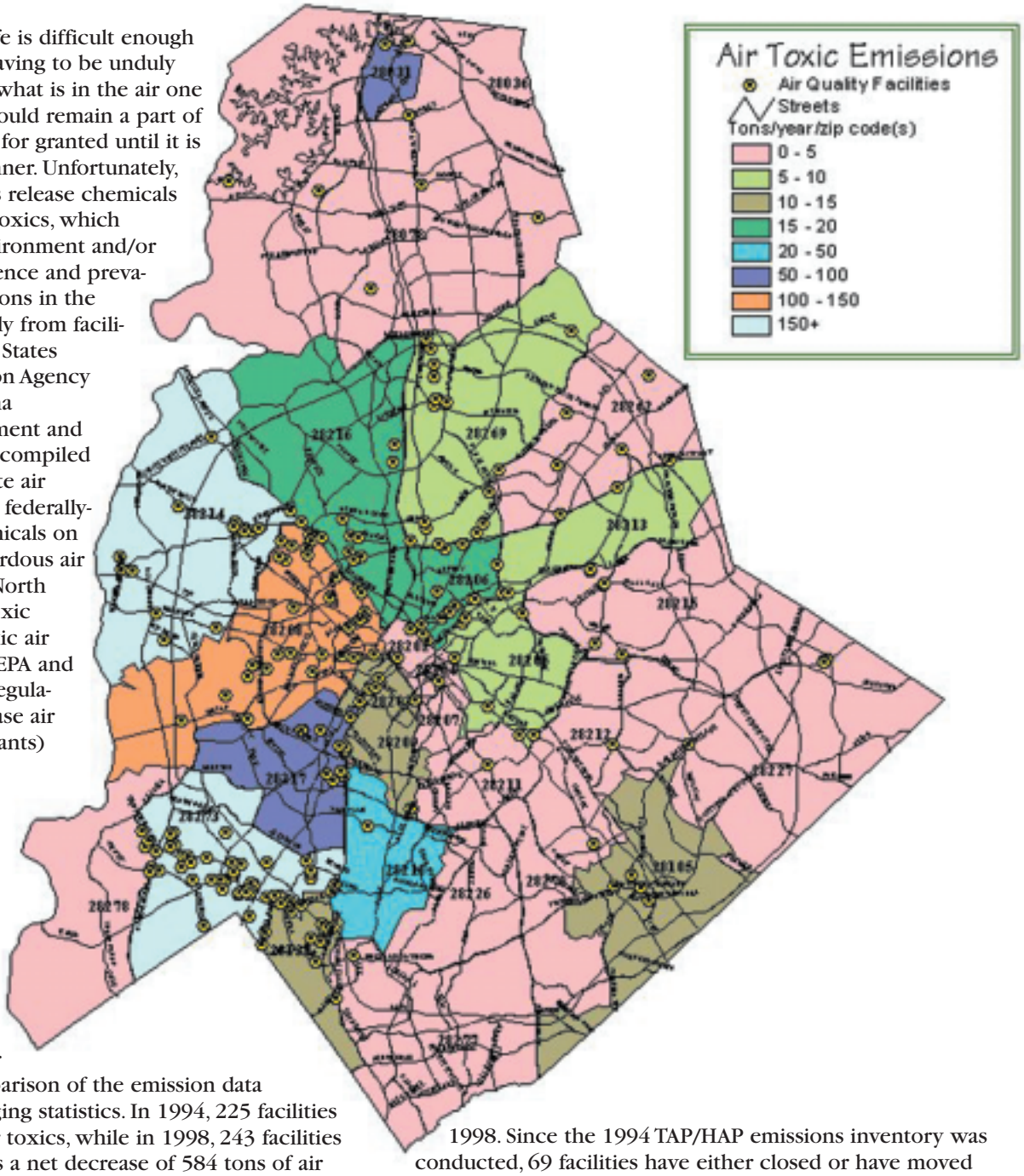
REGULATORY COMPLIANCE AND INDUSTRY INITIATIVES DECREASE AIR TOXICS POLLUTION

For most people, life is difficult enough already without having to be unduly concerned about what is in the air one is breathing. It is and should remain a part of life that most of us take for granted until it is threatened in some manner. Unfortunately, many industrial facilities release chemicals generally known as air toxics, which adversely affect the environment and/or human health. The presence and prevalence of air toxic emissions in the atmosphere varies widely from facility to facility. The United States Environmental Protection Agency (EPA) and North Carolina Department of Environment and Natural Resources have compiled different federal and state air toxic pollutant lists. The federally-regulated air toxic chemicals on EPA's list are called hazardous air pollutants (HAPs), and North Carolina regulated air toxic chemicals are called toxic air pollutants (TAPs). Both EPA and the State have written regulations designed to decrease air toxics (and other pollutants) from industrial facilities.



Emission Inventory Comparison

The Mecklenburg County Department of Environmental Protection (MCDEP) collected 1994 and 1998 TAP/HAP emission inventory data from Mecklenburg County air quality facilities. A comparison of the emission data revealed some encouraging statistics. In 1994, 225 facilities emitted 1503 tons of air toxics, while in 1998, 243 facilities emitted 919 tons. That is a net decrease of 584 tons of air toxics emissions! The 1998 TAP/HAP emissions inventory included 87 facilities that were not permitted in 1994.

These 87 facilities emitted 72 tons of air toxics in 1998. Since the 1994 TAP/HAP emissions inventory was conducted, 69 facilities have either closed or have moved out of the County resulting in a decrease of 211 tons of air toxics. The facilities reporting TAP/HAP emissions in both 1994 and 1998 inventories reported a 445 ton decrease.

Initiatives Decrease Air Toxics Pollution

Both the individual and total air toxics emissions have significantly decreased since the 1994 TAP/HAP emissions inventory was conducted. The exceptions were increases in acetaldehyde, glycol ethers and hexane isomers. The acetaldehyde emissions increased between 1994 and 1998 due to discovery of an acetaldehyde emission source in 1999 that was unaccounted for in 1994. Appropriate controls were added to the emission source upon discovery and the acetaldehyde emissions are expected to decrease dramatically in calendar year 2000. The increased reporting of hexane isomers and glycol ethers is at least partly due to additional knowledge about the chemicals which are included in these groups.

Comparison of 1994 and 1998 Air Toxic Pollutant Emissions

	Total Number of Facilities		Overall change [1] in emissions from 1994 to 1998 (tons)
	1994	1998	
Facilities that reported emissions in 1994 **only**	69		-211
Facilities that reported emissions in 1998 **only**		87	+72
Facilities that reported emissions for 1994 and 1998	156	156	-445
All facilities reporting emissions in Mecklenburg County	225	243	-584

[1] Change in emissions is equal to 1998 emissions minus 1994 emissions. A positive number indicates an increase in emissions. A negative number indicates a decrease in emissions.

Reasons Contributing To The Decline In Air Toxics Emissions

The mere existence of air toxics regulations could be the main reason behind the emissions decreases that are being realized. In order to comply with or avoid applicability to the toxic regulations, several facilities implemented product reformulation, process changes, and/or removal of larger sources of air toxic pollutants. Changes between the 1994 and 1998 air toxic inventories result from other factors, including emissions reductions due to safety improvements and health concerns, business fluctuations, and the latest information on emissions. With overall TAP/HAP emissions reductions occurring all around us, we can all breathe a little easier.

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A PACT FOR MORE MACTs AND GACTs

The 1970 Clean Air Act set health-based standards for eight hazardous air pollutants (HAPs). The 1990 CAA Amendments expanded the list to 189 HAPs and directed the EPA to develop technology-based standards [i.e. Maximum Achievable Control Technology (MACT) and Generally Available Control Technology (GACT) standards] for these HAPs in all listed source categories. All MACT standards target major sources of HAPs and some even have requirements for small sources of HAPs. GACT standards target small sources.

At this date, EPA has written more than 30 MACT/GACT regulations. More than half of these regulations became effective in or after 1997. Seven of the promulgated MACT/GACT regulations directly affect 16 permitted air quality facilities in Mecklenburg County. The most recent MACT standard affecting a Mecklenburg County facility was for Flexible Polyurethane Foam Production, which became effective on October 7, 1998.

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Top Air Toxic Pollutants Emitted in 1994 and 1998

Air Toxic	Effects [1,2]		1994 Inventory			1998 Inventory		
	Health	Environmental	Rank	Tons Emitted	Number of Facilities Emitting This Air Toxic	Rank	Tons Emitted	Number of Facilities Emitting This Air Toxic
Methylene chloride / dichloromethane	A, R, CN, N		1	322	33	1	105	22
Ammonia	A, N	-	2	226	43	2	96	35
Acetaldehyde	A, D, CN, N	S	52	1	20	3	93	32
Toluene / methylbenzene	A, C, D, R, N	S	4	176	134	4	82	186
n-Hexane	A, C, D, N	S	6	114	37	5	77	69
Methyl Ethyl Ketone / 2-butanone	A, C, D, R, N	S	5	161	65	6	65	64
Hexane isomers [3,4]	A, N	S		ND [5]		7	58	7
Xylene / dimethylbenzene	A, C, D, R, N	S	7	35	131	8	31	144
Glycol ethers [4]	A, C, D, R, N	S	21	6	19	9	29	40
Hydrogen chloride / hydrochloric acid	A	-	3	182	21	10	29	20
Ethyl acetate	A, N	S	10	24	27	12	23	34
Perchloroethylene / tetrachloroethylene	A, D, R, CN, N	-	9	25	23	15	16	21
1,1,1-trichloroethane / methyl chloroform	A, C, D, R, N	O	8	12	31	26	4	23

[1] Effects may be known or suspected.
[2] For chemical groups (hexane isomers and glycol ethers) effects may be applicable only to certain chemicals in the groups.
[3] Codes: Health: A=acute, C=chronic (non cancer), D=developmental, R=reproductive, CN=cancer, N=neurotoxic/central nervous system
Environmental: S=smog formation, O=stratospheric ozone depletion
[4] This group of isomers does not include n-hexane.
[5] No data is available.

Uncle Sam, Urban Air Toxics and You

Since the Clean Air Act (CAA) was passed in 1970, much has been done to reduce air pollution across the country. A great deal of attention has been given to the unique air quality related problems of our nation's cities and suburbs. However, more needs to be done. The first major revision of the CAA came with the passage of the Clean Air Act Amendments (CAAA) of 1990. In response to the amendments, the EPA compiled a list of 188 toxic substances, labeled Hazardous Air Pollutants (HAPs), and expanded their role in indentifying toxic urban air pollutants that they were now charged with regulating. Such toxic air pollutant (TAP) emissions in and around our cities are usually emitted from a heavy concentration of factories, numerous motor vehicles, and other commercial activities. EPA is currently focusing its work efforts on the TAPs present in such areas and is developing an integrated corrective action strategy that will effectively target those pollutants posing the greatest public health threat.

In urban areas, TAPs are of particular concern because of the multitude of people living in close proximity to sources of these types of emissions. The current witch's brew of TAPs being emitted from vehicles, industry and multiple area sources serves to create a recipe for an unhealthy air mixture that widely varies in its potency depending upon a host of local variables, such as geography, industry, population, and other miscellaneous contributing factors.

TAPs can cause assorted human health effects ranging from nausea and difficulty in breathing to cancer. Other potential health effects can also include birth defects, serious developmental delays in children, and reduced immunity to disease in adults and children. TAPs falling onto the soil or into lakes and streams can weaken ecological systems and concentrate as they move progressively higher in the food chain, eventually increasing the odds of adversely affecting human health when eaten in a food, such as contaminated fish.

The Mechanics Of EPA's New Urban Air Toxics Strategy

The goal of EPA's new urban air toxics strategy is to reduce health risks. As a first step, under Section 112 of the CAA, EPA has identified 33 of the 188 known TAPs as being the greatest threat to public health in urban areas in terms of their various sources, toxicity and emissions. These select 33 pollutants are responsible for an estimated 38% of all TAP emissions. Based on a 1998 toxic air pollutant inventory conducted for permitted air pollution sources in Mecklenburg County, the most prevalent of these pollutants locally are acetaldehyde, methylene chloride, and perchloroethylene.

Where it is appropriate to do so, urban TAPs will be subject to national and local controls as EPA exercises its CAA authority and other statutes to reduce TAP emissions from area, mobile and major sources. EPA will obtain more reliable information on TAPs through enhanced mon-

List of 33 Air Toxics identified by EPA to be high risks in urban areas

acetaldehyde	coke oven emissions*	manganese and compounds
acrolein	dioxin	mercury and compounds
acrylonitrile	ethylene dibromide*	methylene chloride
arsenic and compounds	propylene dichloride	nickel and compounds
benzene	1,3-dichloropropene	polychlorinated biphenyls (PCB)
beryllium and compounds	ethylene dichloride	polycyclic organic matter (POM)
1,3-butadiene	ethylene oxide	quinoline
cadmium and compounds	formaldehyde	1,1,2,2-tetrachloroethane
carbon tetrachloride*	hexachlorobenzene	perchloroethylene
chloroform	hydrazine	trichloroethylene
chromium VI and compounds	lead and lead compounds	vinyl chloride

* Toxic air pollutants with less significant emissions contributions from area sources.

itoring, additional research, reducing public health risk, and implementing specific controls that will be most beneficial to the greatest number of people in and around cities.

The urban air toxics strategy identifies 29 area source categories that emit significant amounts of the listed air toxics. Some of these sources are already subject to emission standards and some could be subject to future regulation. It also identifies the need for further studies of mobile and stationary sources in urban environments and will focus on both near- and long-term objectives to achieve the desired level of TAP emission reductions.

Public Input Process

The urban air toxics strategy will cover most of the major metropolitan areas in the United States. Within these urban areas, various interests may perceive the proposed actions to be taken differently. EPA is making every effort to address the unique perspectives of the following groups and welcomes their input to support an equitable approach:

Public Health Groups - Public health concerns of susceptible groups, like children and seniors, are a priority to EPA and emphasis will be placed on identifying the health risk impact of air toxics on them.

Environmental Justice Communities - The cumulative impact of multiple emission sources on minority populations and low income populations in urban areas is of special concern. The urban air toxics strategy will help identify and plan actions to decrease emissions that affect these communities.

Small Business Communities - Because of the focus on reducing emissions from area sources in the urban air toxics strategy, impacts could be felt by small businesses. However, EPA strives to ensure that any regulations will not unfairly affect them.

State and Local Governments - National standards for mobile and major sources may not adequately address the risks in urban areas because of the combined emissions from these and many different types of smaller sources. For this reason, state and local agencies will have an active role in tailoring local approaches to reducing risks in urban areas and will be asked to help develop practical programs that allow them to carry out the strategy.

Environmental Interest Groups - Environmental groups will be encouraged to help EPA ensure that it improves public health while also providing flexibility for the business community.

Urban Developers - The urban air toxics strategy is designed so as not to unfairly limit the efforts of developers interested in creating business opportunities in urban industrial sites or areas needing revitalization. EPA will work with these interests to ensure that public health protection is achieved and economic development is encouraged.

Urban Air Toxics Strategy Timeline

The EPA's urban air toxics strategy was published as a final document on July 19, 1999. It includes a 2-year schedule to develop and implement mobile source standards for air toxics, coupled with a 10-year schedule to develop

List of 29 Area Source Categories

Area source categories already subject to standards or which will be subject to standards

Chromic Acid Anodizing	Industrial Boilers
Commercial Sterilization Facilities	Institutional/Commercial Boilers
Other Solid Waste Incinerators (Human/Animal Cremation)	Municipal Waste Combustors
Decorative Chromium Electroplating	Medical Waste Incinerators
Dry Cleaning Facilities	Portland Cement Manufacturing
Halogenated Solvent Cleaners	Open Burning of Scrap Tires
Hard Chromium Electroplating	Secondary Lead Smelting
Hazardous Waste Combustors	Stationary Internal Combustion Engines

New area source categories being listed

Cyclic Crude and Intermediate Production	Municipal Landfills
Flexible Polyurethane Foam Fabrication Operations	Oil and Natural Gas Production
Hospital Sterilizers	Paint Stripping Operations
Industrial Inorganic Chemical Manufacturing	Plastic Materials and Resins Manufacturing
Industrial Organic Chemical Manufacturing	Publicly Owned Treatment Works
Mercury Cell Chlor-Alkali Plants	Synthetic Rubber Manufacturing
Gasoline Distribution (Stage I)	----------

urban area source emissions standards and a work plan to address remaining risks.

Each year in the U.S. millions of tons of HAPs are released into the air. By cutting emissions of air toxics, we are reducing significant health and environmental risks. The urban air toxics strategy promises to make great strides toward identifying the most effective ways to control these pollutants. As compared to 1990, it is expected that nationwide, the end result of deployment of this new urban air toxics strategy will be the achievement of at least a 75% reduction in cancer occurrence due to exposure to air toxics, as well as reductions in risks of other diseases. The information in this article was derived from US EPA publications EPA/452-F-98-002, "Air Toxics Emissions In The City: EPA's Strategy for Reducing Health Risks in Urban Areas" and 64FR38705, "National Air Toxics Program: The Integrated Urban Strategy." SOER

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WHAT ARE AALs ?

At the outset of its air toxics program, North Carolina decided to take an approach protective of public health. It established airborne concentrations of chemicals "above which the substance may be considered to have an adverse effect on human health." These substances became known as toxic air pollutants or TAPs and the concentrations were called acceptable ambient levels or AALs. AALs are expressed in weight per unit volume and are most often written as milligrams/cubic meter. North Carolina has developed acceptable ambient levels for 105 toxic air pollutants (TAPs).

Establishment of AALs

AALs were established by two means:

1. For health effects other than cancer, the AALs were set by taking the occupational exposure guidelines and lowering the acceptable concentration levels by a safety factor of 10 to 160, depending on the nature and severity of the toxic effect and the amount of information known about the health effects of that chemical. Generally speaking, highly toxic chemicals such as mercury have much higher safety factors and lower AALs. (Occupational standards are essentially "no effect levels" and as such, safety factors tend to decrease those concentrations well below the level at which adverse health effects have been demonstrated in occupationally exposed humans.)
2. For substances known to cause cancer in humans (i.e. carcinogens), the AALs were set at levels calculated to represent a "one in a million" risk. That is, if one million individuals are exposed continuously for 70 years to a carcinogen at its AAL concentration, one person might be expected to contract cancer as a result of that exposure. For "probable" human carcinogens the corresponding risk levels are set lower to reflect the uncertainty of the evidence for human carcinogenicity and reduced health risk.

North Carolina's air toxics program does not set state-wide or even community ambient standards for TAPs in the same sense as national standards are set for familiar air pollutants such as ozone and carbon monoxide. National standards set ambient targets for the air we all breathe and every state is expected to meet these standards. Wide-ranging pollution control strategies have been adopted to enable us to achieve these standards. AALs are applied on a much smaller scale.

AALs, Computer Modeling and Compliance

Although termed acceptable ambient levels, North Carolina's AALs actually are used as industrial permitting limits to insure that toxic air pollutants from new or modified facilities do not make matters worse on a case by case basis. Since we do not know the background levels for the 105 toxic air pollutants, the program focuses on what applicable facilities add to the existing environment. For example, if a facility tests its emissions and then conducts air dispersion computer modeling and finds that each of its toxic emissions is below the AAL, we say that the facilty has not added concentrations of toxic pollutants to the air that are harmful to human health. This statement is independent of the existing environmental conditions. The results of the computer modeling are used to determine a facility's compliance with the AALs. (Air dispersion computer models use mathematical equations to simulate the real world. These equations attempt to account for all conditions affecting the release and dispersal of the pollutant, such as wind, temperature, terrain, exit velocity, and stack height. The model input conditions are used to predict the downwind concentration at a certain location of a given pollutant.)

The North Carolina Division of Air Quality maintains a scientific body of experts known as the Science Advisory Board to continually review the AALs and update them, as necessary. Their reviews tend to be more complex than the use of occupational standards and safety factors, but the goal is the same: to establish airborne concentrations for toxic substances that allow an ample margin of safety for potentially exposed individuals. SOER

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INDUSTRY VOLUNTEERS DEMONSTRATE AIR TOXICS COMPLIANCE

Currently, there are 243 facilities in Mecklenburg County known to emit one or more of the 105 North Carolina regulated toxic air pollutants (TAPs) and/or one or more of the 188 federally regulated hazardous air pollutants (HAPs). Since 1996, 21 industrial facilities have voluntarily demonstrated that toxic air emissions from their operations do not increase the public health risk due to cancer. TAPs are defined as being any of the carcinogens, chronic toxicants, acute systemic toxicants, or acute irritant air pollutants regulated under Mecklenburg County Air Pollution Control Ordinance (MCAPCO) Regulation 2.1104 - "Toxic Air Pollutant Guidelines." A HAP is identified as being any pollutant listed in Section 112(b) of the federal Clean Air Act. Most of the time, a facility becomes subject to these rules only if their TAP emissions increased after 1990. Facilities that are subject are required to demonstrate that their facility does not add an amount of toxic air pollutant(s) to the environment, which would increase the public's risk to adverse health effects. Facilities that emit TAPs can avoid applicability to TAP requirements if they do not install or modify equipment that would result in an increase in TAP emissions.

INVENTORIES PROACTIVELY USED TO INITIATE VOLUNTARY COMPLIANCE DEMONSTRATIONS

The Mecklenburg County Department of Environmental Protection (MCDEP) Air Quality Program has taken a pro-active approach to addressing the TAP emissions being released in Mecklenburg County. The following timeline portrays the actions taken to date:

- In 1995, MCDEP conducted an air toxics emissions inventory of all permitted facilities for their 1994 emissions. The inventory also addressed federal hazardous air pollutants (HAPs) that were being emitted. Two hundred twenty-five facilities were identified as actual TAP/HAP emitters. Six of of the top 17 facilities had already demonstrated compliance with North Carolina TAP regulations through the air quality permitting process. The remaining 11 facilities were requested to voluntarily demonstrate that their toxic air emissions did not exceed acceptable ambient levels. Seven facilities conducted air dispersion modeling and demonstrated compliance, and the four remaining facilities showed that their TAP emission rates were below the minimum rule applicability levels.
- In 1998, additional facilities were selected from the previous TAP/HAP inventory for voluntary demonstrations. The selection criteria included facilities reporting carcinogenic emissions in excess of 100 times the toxic permitting emission rate. After disqualifying facilities that only had TAP emissions from combustion processes, facilities that were previously contacted and facilities that already had TAPs regulated in their permits, or had gone out of business, the list was whittled down to ten. Six facilities conducted voluntary modeling demonstrating compliance with North Carolina TAP regulations, and the remaining four provided additional emission information that eliminated the need for modeling.

CONTINUED PROMOTION OF VOLUNTARY COMPLIANCE DEMONSTRATIONS EXPECTED

In 1999, MCDEP conducted another TAP/HAP emissions inventory of all permitted facilities relating to their 1998 annual emissions. A total of 281 facilities forwarded their emissions data with only 243 actually emittting TAP/HAP's. The available information will be reviewed and additional requests for voluntary toxic compliance demonstrations are expected to be sent to facilities of interest.

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A FIRST FROM THE LAST CENTURY

Typical polyurethane form manufacturing facility.

During the 20th century, there were many first's for mankind. Some of the more memorable moments were breaking the sound barrier, splitting the atom, walking on the moon, and in 1999, the North Carolina Division of Air Quality (NCDAQ) made it's first "Director's Call" for toxic air pollutants. Due to increasing public concern over the potentially harmful health effects of the chronic toxicant toluene diisocyanate (TDI) that is emitted by polyurethane foam ("PUF") manufacturing facilities, NCDAQ began conducting studies in August 1997. NCDAQ tried to determine if TDI emissions from the eight PUF manufacturing facilities in North Carolina were in compliance with the acceptable ambient level (AAL) listed in the state toxic air pollutant regulations. After carefully reviewing the data that was received, NCDAQ determined that three PUF manufacturing facilities were in compliance with the toluene diisocyanate acceptable ambient level; however, four other facilities each released TDI emissions that were two to two hundred times higher than the AAL. The remaining facility was closed voluntarily. Alan Klimek, Director of NCDAQ, issued the first "Director's Call" for toluene diisocyanate to those four PUF manufacturing facilities on October 26, 1999. The facilities each received a letter instructing them to meet with NCDAQ within 30 days, submit computer modeling analyses within 60 days and a complete air quality permit application demonstrating that they are below the applicable emission limit within 180 days. It also recommended that the PUF manufacturers examine their methylene chloride emissions; however, they do not have to be quantified at this time. The gathering of emissions data is being delayed because all facilities have to comply with the new federal Environmental Protection Agency rules for methylene chloride by October, 2001.

In July 1998, MCDEP received modeling information from the only local PUF manufacturing operation. The review of the pertinent emissions data indicated the qualifying criteria for participation in the "Director's call" regarding TDI emissions were not met. The facility will have to modify the production process and/or add air pollution control equipment to comply with the federal standards for methylene chloride by October 2001. Mecklenburg County air toxics regulations require the facility to comply with the TDI standard at that same time.

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THE *RETRIBUTION*, RESERVATIONS and REVIVAL of ASBESTOS USE

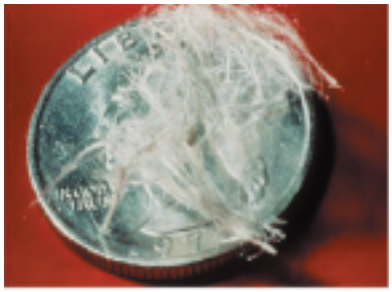
"I've worked around asbestos for years and I ain't got sick. Don't know what the fuss is about."This "it ain't killed me yet" attitude is also that of many cigarette/cigar smokers when discussing the harmful effects of tobacco. But just as with lung cancer being caused by smoking, illnesses such as asbestosis or mesothelioma, which are associated with asbestos exposure, often require long term exposure and have a lengthy latency period. Generally, many years of breathing high concentrations of asbestos fibers is required before lung impairment is apparent and its presence begins to adversely affect the health status of an exposed individual.

There is no known safe exposure to asbestos.

No Known Safe Exposure To Asbestos

Information published by the American Lung Association (ALA) states "There is no known safe exposure to asbestos.The greater the exposure, the greater the risk of developing asbestos-related diseases." EPA considers asbestos exposure such a threat that it has pursued banning most uses of asbestos.A rule published July 12, 1989, banned most applications of asbestos, only to be overturned by the Fifth Circuit Court of Appeals in October 1991. However, the court did maintain the ban on certain uses of asbestos, such as in textured ceiling spray and sprayed-on fireproofing for structural support beams.

One may ask how can the use of something considered so dangerous by the EPA, ALA, and the Occupational Safety and Health Administration (OSHA) be allowed. After all, OSHA estimates that 1.3 million employees in construction and general industry face significant asbestos risk of exposure on the job. Understanding what asbestos is and its many varied uses may help explain the court's decision. Asbestos is the common name for a group of naturally occurring silicate minerals that separate into strong fibers having exceptional thermal and electrical insulating properties. They are so small that individual asbestos fibers cannot be seen without the aid of a microscope because they are so small.



EPA does have a regulation in place which requires removal of certain asbestos-containing materials prior to demolition. It is generally accepted that common demolition practices can release significant amounts of asbestos fibers, potentially exposing the general public to an unnecessary health risk. The Mecklenburg County Department of Environmental Protection is responsible for enforcing Title 40 Part 61 - Subpart M of the Code of federal regulations, often called the National Emission Standards for Hazardous Air Pollutants - Subpart M. Subpart M addresses demolition and renovation with regard to asbestos fiber releases. During this recent economic period of growth, Mecklenburg County area has continued to replace older buildings at an increasing rate, thus the incidences requiring asbestos removal has also increased.

The New Look Of Asbestos In The Marketplace

Six different asbestos minerals have been used in thousands of private, commercial and public applications. The Asbestos Institute reports that "modern asbestos products are as different from the old ones as night and day." Only one of the six asbestos minerals is presently used in the marketplace. Chrysotile, which is the form of asbestos having the longest and largest fibers and therefore is less likely to be inhaled or ingested, historically has been the variety of the mineral used most widely in the manufacturing arena and that remains the same today. The Asbestos Institute further touts the safety of the present asbestos materials by saying many of the old products of the 1970s were dusty, easily crumbled under hand pressure and could readily release asbestos fibers. Currently, the asbestos industry only markets dense and non-friable materials in which the fiber is "bound" or encapsulated in a cement or resin. Of the asbestos that is mined worldwide, ninety percent (90%) of it is being mixed with cement in the form of pipes, sheets and shingles resulting in a product that tightly binds the asbestos fibers together, thereby minimizing potential fiber release.

Asbestos removal is still a frequent occurrence. It is a very costly procedure which is regulated by federal and state regulations, and is generally required to be conducted by highly specialized contractors. These regulations are written to pre-

vent significant public exposure to airborne asbestos fibers during building demolition or renovation.

Actions To Take When Dealing With Asbestos

Very few individuals dispute the fact that asbestos can cause illness. The best advice is to take appropriate steps to minimize the likelihood of asbestos exposure. There are still no regulations that require removal of asbestos containing materials, unless the structures are being demolished or renovated. Asbestos-containing materials that are in good condition and are not sanded or sawed are often better left in place and perhaps covered over for additional stability and protection. EPA recommends a proactive established management program with removal of the asbestos-containing materials occurring only if they are in poor condition or when they are likely to release asbestos fibers as a result of some type of contact activity. Finally, the labels of new construction products should be examined closely to learn if asbestos is one of the materials used in the manufacturing process. This will be valuable information when determining whether to use the material and if so, how to manage it after installation.

Asbestos. The desirable, physical properties of this valuable natural mineral remain as unchanged as the Rock of Gibraltar. However, the asbestos industry has been forced to change itself for the better in order to compete as a building component in today's marketplace, reduce its potential liabilities and to help protect the innocent and unknowing from undue exposure to asbestos fibers. SOER

Partial List Of Products Which May Contain Asbestos

Acoustical Plaster	Fire Curtains
Adhesives	Fire Doors
Asbestos Floor Tile	Fireproofing Materials
Base Flashing	Heating and Electrical Ducts
Blown-in Insulation	High-temperature Gaskets
Boiler Insulation	HVAC Duct Insulation
Breeching Insulation	Joint Compounds
Caulking / Putties	Laboratory Gloves
Ceiling Tiles and Lay-in Panels	Laboratory Hoods / Table Tops
Cement Pipe	Packing Materials
Cement Siding	Pipe Insulation
Chalkboards	Roofing Felt
Cooling Towers	Roofing Shingles
Construction Mastics (adhesives)	Spackling Compounds
Decorative Plaster	Spray-Applied Insulation
Ductwork Flexible Fabric Connections	Taping Compounds
Electrical Cloth	Textured Paints/Coatings
Electrical Panel Partitions	Thermal Paper Products
Electric Wiring Insulation	Vinyl Floor Tile
Elevator Brake Shoes	Vinyl Sheet Flooring
Elevator Equipment Panels	Vinyl Wall Coverings
Fire Blankets	Wallboard

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Just Like The Stock Market, MCDEP'S NESHAP Notifications Continue To Rise

Mecklenburg County's burgeoning building boom continues to maintain its pace. No where is that more evident than in the number of NESHAP notifications received by Mecklenburg County Department of Environmental Protection (MCDEP) in a given calendar year. NESHAP is an acronym for the National Emission Standard for Hazardous Air Pollutants which is found in the Code of Federal Regulations Title 40 Part 61, Subpart 61, Section 61.145 - "Standard for demolition and renovation." A critical part of the regulation requires the owner or operator of the demolition to submit a completed notification form providing key information for each demolition/renovation project. 373 NESHAP notifications were received and processed during 1999 – more than at anytime in the past. That is an average of more than one a day for every day of the year! The next closest year was back in 1994 when 319 NESHAP notifications were processed. During the time period between 1994 to 1998, the number of NESHAP notifications held fairly steady as it hovered between 290 to 300 notifications for each of those years.

When To File A NESHAP Notification Form

NESHAP notifications are filed with MCDEP whenever a facility (i.e. industrial, commercial, business, school, church buildings, even private residences in certain circumstances) is scheduled to either:

- undergo extensive renovation entailing the disturbance of significant quantities of identified regulated asbestos containing materials (RACM) (i.e. quantities equaling or exceeding 260 linear feet/160 square feet/35 cubic feet), or
- undergo partial or complete demolition of the facility.

Subpart M is applicable and enforced by MCDEP whenever removal of RACM is to occur at a facility that is undergoing renovation/demolition or is to be demolished even though it contains little or no RACM.

When one does finally decide to invest in a building by extensively renovating it or chooses to demolish an entire city block to accommodate development of a new high rise building, it is just like buying a large number of blue chip stocks, both paths to profits and progress come at a very high price. All the appropriate paperwork has to be filed with the authorities, whether they be the Securities and Exchange Commission (SEC) or MCDEP, in order to proceed.

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Air Environmental Indicators 1999				
Tons Emitted in 1999				
Pollutant	Stationary Sources	Mobile Sources	Area Sources	Total
Carbon Monoxide (CO)	1,875	84,315	40,628	126,819
Volatile Organic Compounds (VOCs)	2,383	6,570	14,511	23,464
Nitrogen Oxides (NO_x)	926	12,410	6,715	20,050
Source Totals	5,184	103,295	61,854	170,233
Permitted Air Pollution Sources				
Major	> 100 tons actual emissions			14
Minor	< 100 tons actual emissions			264
Stage I	Gasoline Distribution Facilities (not including terminals)			309
Transportation	Parking Lots/Decks/Garages			39
Days Exceeding the National Ambient Air Quality Standard				
Ozone	1-hour			4
	8-hour			34
Carbon Monoxide	1-hour			0
	8-hour			0
Particulates	<= 2.5 microns			0
	<= 10 microns			0
	<= 100 microns			0
Nitrogen Oxides				0
Sulfur Oxides				0
Air Quality Index (AQI) Designations				
Good (Green Days)				128
Moderate (Yellow Days)				203
Unhealthy for Sensitive Groups (Orange Days)				29
Unhealthy (Red Days)				5
Mobile Source Activity				
Registered Vehicles in Mecklenburg County				540,363
Daily Vehicle Miles Traveled (VMT) in Mecklenburg County				16,373,330
Bus Transit Ridership (Total Passengers)				11,959,875
Number of Vehicle Emissions Testing Stations in Mecklenburg County				346
Weather				
Days Classified as Hazy				77
Days with Temperatures > 90° F				41
Notices of Violation				
Permitted (Stationary and Area) Sources				133
Permitted - Non-Procedural				32
Total Issued				153