The State of New Jersey
Department of Environmental Protection

Proposed State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards

Meeting the Requirements of the Alternative Ozone Attainment Demonstration Policy

Phase II Ozone SIP Submittal

June 30, 1998

Preface

New Jersey is preparing to submit this proposed document as part of its plan to demonstrate attainment with the National 1-Hour Ozone Ambient Air Quality Standard, in accordance with the Clean Air Act and the Alternative Ozone Attainment Demonstration Policy issued by the USEPA (the USEPA memorandum titled "Ozone Attainment Demonstrations," Mary D. Nichols, Assistant Administrator for Air and Radiation, March 2, 1995).

Acknowledgments

The New Jersey Department of Environmental Protection (NJDEP) acknowledges the efforts and assistance of the many agencies and individuals whose contributions were instrumental in the preparation of this State Implementation Plan Revision. The NJDEP would also like to thank the many participants in workshops and working groups, whose insight into the prospective rules and their implementation was most valuable.

In particular, the NJDEP wishes to acknowledge the individuals within the New Jersey Department of Transportation, the United States Environmental Protection Agency Region II, the staffs within the Connecticut Department of Environmental Protection, the New York State Department of Environmental Conservation, the Pennsylvania Department of Environmental Protection, the Delaware Department of Natural Resources and Environmental Control, and the Maryland Department of the Environment for their assistance and guidance.

Table of Contents

List of Tables

List of Figures

List of Appendices

Acronyms and Abbreviations

BTU	British Thermal Unit
CAA	Clean Air Act
CMSA	Consolidated Metropolitan Statistical Area
CTG	Control Technology Guidelines
Department	New Jersey Department of Environmental Protection
DV	Design Value
KM	Kilometer
LAER	Lowest Achievable Emission Rate
MM	Million
NAA	Non-Attainment Area
NAAQS	National Ambient Air Quality Standard
NAPAP	National Acid Precipitation Assessment Program
N.J.A.C.	New Jersey Administrative Code
NLEV	National Low Emission Vehicle
NO_X	Nitrogen Oxides
NSPS	New Source Performance Standard
NSR	New Source Review
OTAG	Ozone Transport Assessment Group
OTR	Ozone Transport Region
PPB	Parts Per Billion
PPM	Parts Per Million
PSD	Prevention of Significant Deterioration
RACT	Reasonably Available Control Technology
Regional NO_X Cap	The Proposed USEPA Regional NO_X Emission Reduction Program
ROM	Regional Oxidant Model
ROP	Rate of Progress
UAM	Urban Airshed Model
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

Executive Summary

Ozone is a highly reactive gas formed in the lower atmosphere or troposphere from the chemical reaction involving oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in the presence of sunlight. At elevated levels, it causes a variety of human health effects as well as damage to crops and materials. The United States Environmental Protection Agency (USEPA) is required by the Clean Air Act to set health and welfare standards for air pollutants, including ozone. These standards are known as the National Ambient Air Quality Standards (NAAQS). Despite substantial federal and state efforts over the past two decades, attainment of the health standards has not been achieved in New Jersey as well as many other areas throughout the country, although significant progress has been made.

Among the provisions of the Clean Air Act is the requirement that areas with ozone concentrations above certain levels, demonstrate that their plans will meet the health standard within the time frame required by the Clean Air Act. New Jersey is required to make such a demonstration for eighteen of its twenty-one counties. These counties are associated with two multi-state nonattainment areas; ones included in the Philadelphia-Wilmington-Trenton nonattainment area or Air Quality Control Region, and the counties included in the New York-Northern New Jersey-Long Island nonattainment area or Air Quality Control Region. The Clean Air Act required the demonstration to be submitted to the USEPA by November 15, 1994. Recognizing the problems the states were having in meeting this requirement, the USEPA administratively created a two phased approach. In Phase I, the states were required to develop their rate of progress plans through 1999 and participate in a consultative process to address the transport of ozone throughout the eastern United States. Upon completion of Phase I, the states were to submit their attainment This document is the New Jersey Phase II submittal. The attainment demonstration, current air quality measurements and modeled projections of air quality benefits have been employed, to project the ozone levels in the required attainment year.

For the Philadelphia - Southern and Central New Jersey area, the results indicate that with further and full implementation of the measures are mandated by the Clean Air Act and with a broad Regional Nitrogen Oxides (NO_x) Emission Reduction cap similar to or more stringent than the one recently proposed by the U.S. Environmental Protection Agency[1], attainment with the 1-hour standard by 2005 in the Region is a reasonable expectation. More specifically, ozone air quality reductions of about 8.6 parts per billion (ppb) are predicted from further Clean Air Act implementation, i.e., from 1997 to 2005, and 11.7 ppb from the regional NO_x emissions cap. Subtracting these anticipated benefits from the current design values within the Philadelphia Region of 140 ppb results in a projected design value in 2005 of 120 ppb. This is below the attainment criterion of 124 ppb. For New Jersey the emission reductions assumed in the analysis projected from full Clean Air Act Implementation and the proposed NO_x emission reduction program are 33% for VOC's and 49% for NO_x relative to 1990 emission levels.

[1] In its proposed Rule for Reducing Regional Transport of Ozone (62FR60317).

With respect to the New York, Northern New Jersey, Southern Connecticut area, the analyses demonstrates that substantial reductions in ozone concentrations will be achieved through further implementation of Clean Air Act measures and a Regional NO_x Cap Program similar to what the USEPA has proposed. However, additional emission reductions are likely to be needed to reach attainment in the region. An estimate of the reductions needed for attainment is provided as well as a New Jersey commitment to assess, and if necessary to adopt additional control measures, that in concert with appropriate federal measures, will reach attainment.

This Phase II SIP submittal also contains a summary of the existing air quality in the New Jersey and the neighboring states, commitments to submit the post-1999 rate of progress plans by the end of the year 2000 and to perform a mid-course evaluation by 2002, and an estimate of the benefits to the 8-hour ozone health standard from the measures considered in the 1-hour attainment demonstration.

I. Introduction

The Clean Air Act, 42 U.S.C. §7511a(c)(2)(A), requires any state with a designated serious or higher classified ozone nonattainment area to demonstrate that its plan will provide for attainment of the health-based ozone National Ambient Air Quality Standard (NAAQS) by the applicable attainment date.[2] This plan was due to be submitted by November 15, 1994. Many, if not all, of the states were not able to meet this requirement. Recognizing that the states had made significant progress, but could not demonstrate attainment of the health-based ozone standard, the USEPA developed a policy[3] to address this failing. The policy created a two-phased approach for demonstrating attainment. In Phase I, the states were required to make a "down payment" by developing and submitting their rate of progress (ROP) plans through 1999 and making several commitments regarding the remaining work to be completed. In Phase II, the states would participate in a consultative process to address the transport of ozone from one region of the country to another. On December 29, 1997, the USEPA clarified their requirements[4] for the Phase II submittal.

---

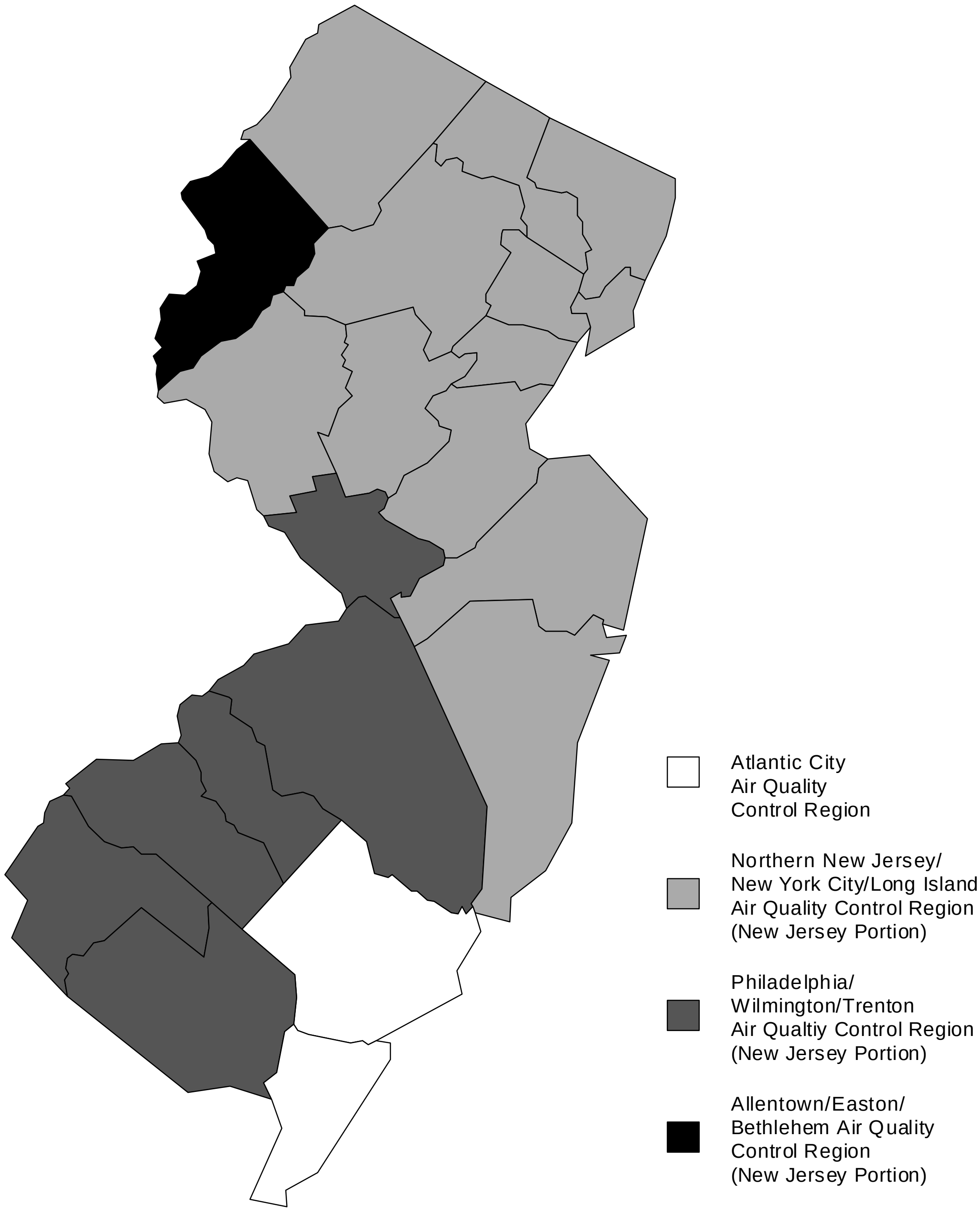
[2] For New Jersey, these dates are: 2005 for Burlington, Camden, Cumberland, Gloucester, Mercer, and Salem counties which are a part of the Philadelphia-Wilmington-Trenton Air Quality Control Region (AQCR); and 2007 for Bergen, Essex, Hunterdon, Hudson, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, and Union counties which are part of the New York-Northern New Jersey-Long Island, New York Air Quality Control Region. Figure 1.

In addition to the New Jersey counties in the Philadelphia-Wilmington-Trenton and New York Air-Northern-New Jersey-Long IslandQuality Control Regions, the Atlantic City Air Quality Control Region (Atlantic and Cape May counties) was originally designated as a moderate non-attainment area. The state contended, and the USEPA concurred that the exceedences in the Atlantic City AQCR) were the result of overwhelming transport from neighboring metropolitan areas, which deferred the time frame for a complete attainment demonstration. Subsequently the area met the ozone standards in 1993, 1994, and 1995 and on August 27, 1996 EPA indicated by letter from Jeanne M. Fox, Regional Administrator that the area did not require a 15% VOC reduction plan or an attainment demonstration. Further on June 5, 1998, the USEPA revoked the 1-hour ozone standard for this area (63FR31014). The remaining New Jersey counties, Warren County which is part of the Allentown-Bethlehem-Eastern AQCR, attained the ozone NAAQS in 1994. Subsequently the USEPA also revoked the 1-hour standard on June 5, 1.

[3]Memorandum dated March 2, 1995 from Mary D. Nichols, Assistant Administrator for Air and Radiation, USEPA to the USEPA Regional Administrators, Regions I-X. This Policy is commonly referred to as "The March 2nd Policy."

[4]Memorandum dated December 29, 1997 from Richard D. Wilson, Acting Assistant Administrator for the USEPA Office of Air and Radiation to the Regional Administrators,

Figure 1: Air Quality Control Regions in New Jersey



USEPA, Regions I-X entitled "Guidance for Implementing the 1-Hour Ozone and Pre-Existing PM_{10} NAAQS".

The Phase II submittal must include:

- Demonstration of attainment of the 1-hour ozone health standard and the necessary supporting documentation.
- Evidence that all the mandated Clean Air Act measures have been adopted and implemented or are on an expeditious schedule to be adopted and implemented.
- A list of measures, rules, and/or a strategy to meet the rate of progress requirements and attain the 1-hour ozone health standard.
- For severe and higher classified areas, like New Jersey, a SIP commitment to submit its post-1999 rate of progress plans on or before the end of the year 2000.
- A SIP commitment and schedule to implement the control programs necessary to meet the rate of progress requirements and to attain the health standard.
- Evidence of a public hearing on the state submittal.

This document is intended to meet the Phase II SIP requirements for the State of New Jersey.

The document is organized into ten sections and provides the following information:

- introductory material
- general background information ;
- information on New Jersey's, and our neighboring states, air quality;
- a plausible demonstration of attainment of the 1-hour ozone health standard (Section IV, coupled with Appendix I for the Philadelphia-Southern and Central New Jersey areas and Appendix II for the New York-Northern New Jersey and Southern Connecticut areas, provides the necessary documents regarding the attainment demonstration);
- a list of the measures relied on for the attainment demonstration as well as measures warranting further assessment;
- the State's commitment to continue to meet the rate of progress requirements;
- information on New Jersey's air quality in relation to the 8-hour ozone health standard; and an attempt to provide insight into how the measures relied on for the 1-hour ozone attainment demonstration will impact air quality in relation to the 8-hour ozone health standard;
- a summary of New Jersey's commitments for further action;
- a discussion of the public participation process; and,
- a presentation of the State's conclusions.

II. General Background

A. The Ozone Problem

Ozone, one of the main constituents of smog, is produced in complex chemical reactions when its precursors, volatile organic compounds (VOCs) and oxides of nitrogen (NO_x), react in the presence of sunlight. The chemical reactions that create ozone can take place while the pollutants are being blown through the air, or transported, by the wind. Therefore, elevated levels of ozone can occur many miles away from the source of the emissions leading to original emissions. Unlike traditional pollutants, e.g., sulfur dioxide and lead, which are emitted directly and can be controlled at their source, reducing ozone concentrations poses a difficult challenge. This challenge is due to the fact that the precursors can be emitted from many different sources, possibly from various geographic locations, thus controls at any one source may not solve the problem.

Ozone found high in the atmosphere (stratosphere) is beneficial because it inhibits the penetration of the sun's harmful ultraviolet rays to the ground. However, ozone formed near the earth's surface (troposphere), hereafter referred to as "ground-level ozone," where it is breathed by or comes in contact with people, animals, crops and other vegetation, can cause a variety of health effects. Specifically, ozone causes the following health effects[5]:

- Decreased lung function, primarily in children active outdoors;
- Increased respiratory symptoms, such as coughing and chest pain upon inhalation, particularly in highly sensitive individuals;
- Increased hospital admissions and emergency room visits for respiratory causes among children and adults with pre-existing respiratory diseases, such as asthma;
- Inflammation of the lung; and,
- Possible long-term damage to the lungs.

In addition to its health effects, ozone interferes with a plant's ability to produce and store nutrients.[6] This causes the plants to become more susceptible to disease, insects, other pollutants and harsh weather. This impacts annual crop production throughout the United States, resulting in significant losses, and injures native vegetation and

[5] 62 Fed. Reg. 60317, (November 7, 1997).

[6] A USEPA Fact sheet on the New 8-Hour Ozone and Fine (2.5 microns) Particulate Matter Health Standards, July 1997.

ecosystems. Ozone can also damage certain man-made materials[7], such as textile fibers, dyes, and paints.

B. Clean Air Act Provisions

For almost 30 years, Congress focused major efforts on reducing ground-level ozone concentrations throughout the United States. The Clean Air Act sets forth many requirements to address nonattainment of the health-based ozone National Ambient Air Quality Standards (NAAQS). However, many states have found it difficult to achieve attainment of this health standard.

Efforts to attain the ozone health standard have failed in the past for a number of reasons, including: 1) a lack of understanding of the sources of ozone precursors, e.g., evaporative losses from gasoline-fueled motor vehicles; 2) the impacts of the transport of ozone and ozone precursors from one region of the United States to another; 3) the prior regulatory focus of controlling volatile organic compounds, as opposed to oxides of nitrogen, to reduce ozone concentrations; 4) delayed implementation of control measures by the states; and, 5) an underestimation of the impact of economic growth and vehicle miles of travel on ozone formation. 42 U.S.C. §7511f required the USEPA, in conjunction with the National Academy of Sciences, to conduct a study on the role of ozone precursors in tropospheric ozone formation and control. As part of this study, the National Academy of Sciences identified and addressed these issues.[8]

In 1990, Congress amended the Clean Air Act to better address, among other things, the continued nonattainment of the ozone health standard by the states. The 1990 Clean Air Act Amendments prescribe many specific measures for both the states and the federal government to implement. Which of these measures is required in a particular area depends on the severity of the areas' ozone air quality levels, as measured by the design value statistic, e.g., an area with higher design value is required to implement more measures than an area with lower design value.[9] In addition, the Amendments to the Clean Air Act require areas to continually reduce ozone precursor emissions until the area's attainment date. An area's attainment date is also dependent upon the level of the ozone design value. For Southern New Jersey, which is associated with the Philadelphia Air Quality Control Region (AQCR), the standard must be attained by no later than 2005. For Northern New Jersey, which is associated

---

[7]ibid.

[8]National Research Council, "Rethinking the Ozone Problem in Urban and Regional Air Pollution," (National Academy Press, 1991).

[9]42 U.S.C. §7511a et seq.

with the New York AQCR, attain must be reached by no later than 2007.

Congress recognized that ozone is a regional, and not just a local, problem. As such, the Clean Air Act established the Ozone Transport Commission.[10] This Commission's primary focus is to address the transport of ozone and its precursors in the states from Virginia to Maine.

C. Ongoing Clean Air Act Implementation

Notwithstanding significant efforts, many states, including New Jersey, were not able to meet the November 15, 1994 statutory deadline[11] for submitting to the USEPA the State's plan to provide for demonstration of attainment the 1-hour ozone health standard by the applicable attainment date. New Jersey made its submittal on December 31, 1996. These failures were due mainly to the lack of sufficient evidence that reductions of ozone and the ozone precursors in upwind areas, in conjunction with local measures, would lead to attainment. In fact, most photochemical modeling performed in support of the attainment demonstrations in the 1993/1994 time frame showed continued nonattainment using the conventional tools and methods available at that time. Although some states submitted, revised and received approval of control measures to reduce emissions, demonstration of attainment, as it was defined by the USEPA[12], was not possible.

D. The USEPA Policies

Recognizing the significant progress that the states had made and acknowledging the difficulties in demonstrating attainment, the USEPA developed: 1) a policy regarding the dates for submittal of the 1-hour ozone attainment demonstration; 2) a two-phased approach to obtain the needed emission reductions; and, 3) a policy describing alternative methods to demonstrate attainment.

The first two items are described in the Policy Memorandum from Mary Nichols,

---

[10]42 U.S.C. §7511c(a)

[11]42 U.S.C. §7511a(c)(2)(A).

[12]The USEPA/OAQPS, "Guideline for Regulatory Application of the Urban Airshed Model." EPA 450/4-91-013, Research Triangle Park, North Carolina, July 1991. This USEPA guidance document is hereafter referred to as "The USEPA 1991 Policy." A copy of this Policy is included in Appendix XII.

Assistant Administrator for Air and Radiation.[13] The third item is discussed in the USEPA's 1996 alternative ozone attainment demonstration guidance[14] on the use of photochemical grid modeling results to demonstrate attainment.

In June of 1996, the USEPA revised its attainment policy[15] from requiring that all grid cells in the resulting photochemical grid model simulation be below 0.120 ppm for all days in all episodes, to allowing some hours to be above the 0.124 ppm level, if other factors provided evidence that attainment could be demonstrated. This approach is referred to as the alternative attainment approach. Further, the USEPA included a "weight of evidence" approach in its guidance to demonstrate attainment. The weight of evidence approach includes the use of additional information such as air quality and emissions data in the decision process, not just relying on the photochemical grid modeling results. If in consideration of all the available information or evidence, leads to a conclusion that attainment is likely, attainment is demonstrated.

The USEPA two-phased approach to obtain sufficient emission reductions to reach attainment, involved a "down payment", Phase I, and a consultative process, Phase II, to address the transport of ozone and ozone precursors throughout the eastern United States.

Phase I generally consisted of: 1) a plan and measures necessary to meet the rate of progress reductions due by the end of 1999 (a 24% reduction from 1990 levels); 2) commitments to adopt, or the adoption of other Clean Air Act mandated and regional control programs, and modeling with interim assumptions, 3) an enforceable commitment to submit any remaining required rate of progress reductions; and, 4) an enforceable commitment to submit the additional State Implementation Plan (SIP) measures needed for attainment. Additionally, Phase I required the Northeast states to include a number of measures in their plans; specifically, reasonability available control technology (RACT) requirements on major sources, adoption and implementation of the OTC NO_x MOU and adoption of a LEV or 49-state car program. The Midwest states were required to include all measures necessary to meet the rate of progress requirements to their attainment date. The Phase I submittal was due at the end of 1995.

---

[13]The March 2nd Policy. A copy of this Policy is included in Appendix XII.

[14]The USEPA/OAQPS, "Guidance on the Use of Modeled Results to Demonstrate Attainment of the Ozone National Ambient Air Quality Standard (NAAQS)." EPA 454B-95-007, Research Triangle Park, North Carolina, June 1996. This USEPA guidance document is hereafter referred to as "The USEPA 1996 Policy." A copy of this Policy is included in Appendix XII.

[15]The USEPA 1996 Policy.

Phase I also required the Northeast and the Midwest states to participate in a consultative process to address regional transport.

Phase II set up a consultative process and structure to assess the transport of ozone in the eastern United States; this process was implemented through what later became known as the Ozone Transport Assessment Group (OTAG). The Phase II submittal consists of the measures needed to meet the rate of progress requirements, the attainment demonstration, additional local rules needed to attain the health standard, and any regional controls needed for all areas in the eastern United States to attainment the health standard. The March 2nd Policy required the Phase II submittal by mid-1997. The OTAG process was envisioned as a two year process, ending by the close of 1996, the OTAG process did not complete its efforts until July 19, 1997. On December 29, 1997, the USEPA revised its Policy[16] to extend the deadline of the Phase II submittal until April 1998. Section I further outlined the necessary submittal requirements of the Phase II submittal.

On July 10, 1996 [17], the USEPA found that ten (10) states, including New Jersey, and the District of Columbia failed to submit their Phase I plans. On December 31, 1996, New Jersey submitted its Phase I Ozone SIP.[18] On June 30, 1997, the USEPA approved New Jersey's Phase I Ozone SIP.[19] This approval stopped any remaining sanction and Federal Implementation Plan (FIP) clocks running at that time.

On December 12, 1997, the USEPA disapproved the 15% VOC Rate of Progress Plan portion of New Jersey's Phase I Ozone SIP.[20] The disapproval was triggered by the

---

[16]Memorandum dated December 29, 1997 from Richard D. Wilson, Acting Assistant Administrator for the USEPA Office of Air and Radiation to the Regional Administrators, USEPA, Regions I-X entitled "Guidance for Implementing the 1-Hour Ozone and Pre-Existing PM_{10} NAAQS," which was promulgated by the USEPA at 63 Fed. Reg. 8196, (February 2, 1998).

[17]61 Fed. Reg. 36292, (July 10, 1996).

[18]State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards, Meeting the Requirements of the Alternative Ozone Attainment Demonstration Policy, Phase I Ozone SIP Submittal, New Jersey Department of Environmental Protection, December 31, 1996.

[19]62 Fed. Reg. 35100, (June 30, 1997).

[20]Letter dated December 12, 1997 from William J. Muszynski, P.E., Deputy Regional Administrator, USEPA, Region II to Commissioners Robert C. Shinn, Jr., NJDEP and John J. Haley, Jr., NJDOT. A similar, though less detailed, letter dated December 12, 1997 was sent to

realization that the benefits included in the Plan from the State's enhanced I/M program would not be obtained within the necessary time frame. This started a new set of sanction and Federal Implementation Plan clocks.

This document is New Jersey's Proposed Phase II submittal. The methodology utilizes the "weight of evidence" approach to demonstrate attainment of the 1-hour ozone health standard.

E. The Ozone Transport Assessment Group (OTAG) Recommendations

The March 2nd Policy called for an assessment of the ozone transport phenomenon. In response, the Environmental Council of States (ECOS) and the USEPA sponsored the formation of the Ozone Transport Assessment Group (OTAG). Active participation in OTAG constituted the consultative process identified in the March 2nd guidance. The OTAG goal[21] was defined as:

> *To identify and recommend a strategy to reduce transported ozone and its precursors, which, in combination with other measures, will enable attainment and maintenance of the ozone standard in the OTAG region. A number of criteria will be used to select the strategy, including but not limited to, cost-effectiveness, feasibility, and impacts on ozone levels.*

The OTAG consisted of a Policy Group, a Modeling and Assessment Subgroup, a Strategy and Controls Subgroup, a Financial Assessment and Implementation Subgroup and an Outreach and Communications Subgroup. As part of the process, many smaller workgroups were formed out of these subgroups. Numerous states, industries, manufacturers, utilities, and environmental groups participated in the OTAG process, yielding well as over 500 interested participants. New Jersey actively participated in the process, as Commissioner Robert C. Shinn, Jr. of the NJDEP chaired the Modeling and Assessment Subgroup. Environmental Commissioners from 37 eastern states participated in the OTAG process. See Figure 2.

After nearly two years of effort and on a 32 to 5 vote, the OTAG states developed and forwarded recommendations to address the regional transport of ozone and its precursors to the USEPA. A summary of the OTAG study conclusions is presented in Table 1. The OTAG recommendations regarding control measures are presented in Table 2, with the full recommendations provided in the OTAG Executive Report [22],

---

Governor Christine Todd Whitman from Deputy Regional Administrator Muszynski.

[21]Ozone Transport Assessment Group (OTAG), Executive Report, 1997.

beginning on page 51, provided in Appendix XIII.

Figure 2: OTAG Participating States

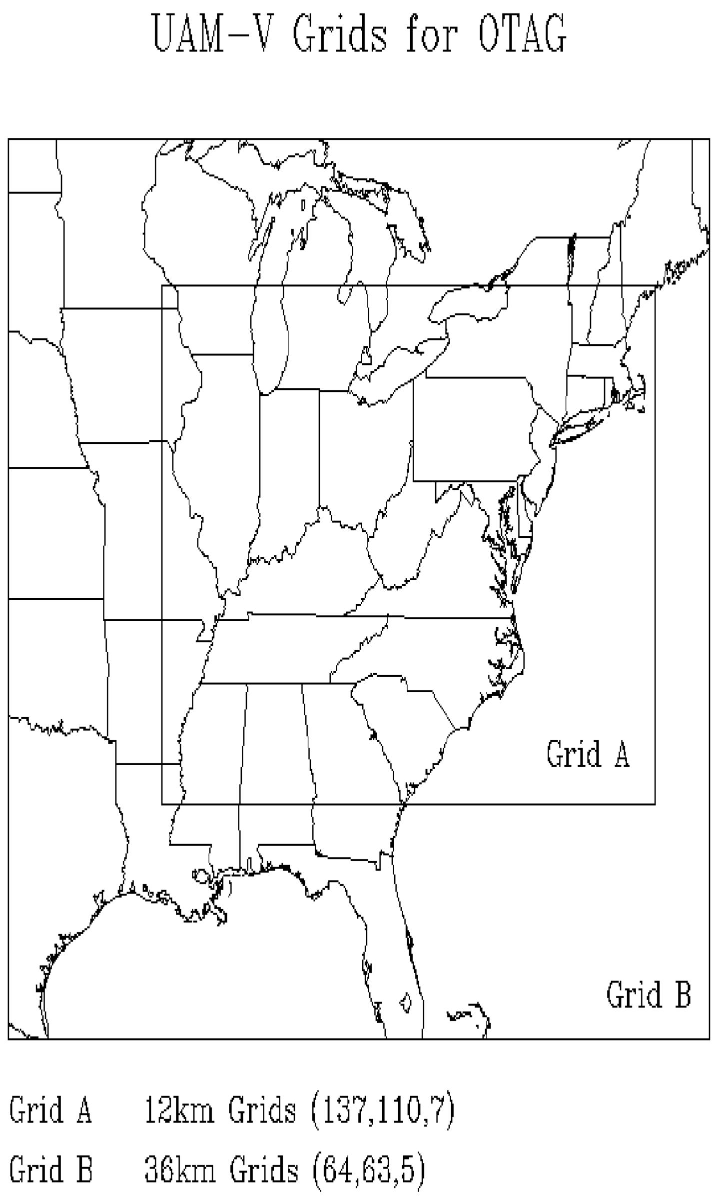


Table 1: OTAG Study Conclusions[22, 23]

- Regional NO_X emission reductions decrease ozone across broad portions of the region
- Clean Air Act programs will provide reductions in ozone concentrations, but not enough to bring many areas into attainment
- Regional NO_X emissions reductions from elevated and low-level sources are both beneficial when considered on a regional basis
- Further mitigation of the ozone problem will require regional NO_X oriented measures in additional to local VOC and/or NO_X controls
- Emission reductions in a given region affect that region most but may affect downwind regions
- Ozone benefits are greatest in the subregions where emission reductions are made
- Downwind ozone benefits decrease with distance
- Downwind ozone benefits increase as the size of the upwind controlled area increases
There are also several general caveats associated with the OTAG regional-scale modeling, namely the following:
- Tendency to underestimate the predicted ozone concentrations in the North and overestimate the predicted ozone concentrations in the South
- Concentrations at night are somewhat underestimated related to daytime predictions
- Low concentrations tend to be over estimated and higher observed concentrations tend to be underestimated
- Concentrations at the start of the episode tend to be underestimated with a tendency for concentrations at the end of the episode to be overestimated
-The model may somewhat underestimate the amount of ozone transport aloft, especially overnight into the early morning hours. Therefore, the contribution of upwind source regions to ozone levels in downwind areas may be greater than estimated by the model, and
-The limitations of regional scale analysis by virtue of using a larger size grid, in addressing specific local urban issues.

[22]The USEPA "Proposed Finding of Significant Contribution and Rulemaking for certain States in the OTAG Region for purposes of Reducing Regional Transport of Ozone, FR62, No. 216, November 7, 1997.

[23]OTAG, Executive Report, 1997. (See also Appendix XIII).

Table 2 : Summary of OTAG Control Measure Recommendations[24]

The OTAG reached consensus on a variety of control strategies to be recommended to the USEPA. The following is a summary of those recommendations.

- **Utility NO_X Controls**
  The range of the OTAG states Utility NO_X controls recommendation in the fine grid should fall between Clean Air Act control levels and the less stringent of 85-percent reduction from the 1990 rate (lb/mmBTU) or 0.15 lb/MMBTU.

- **Non-Utility Point Source Control Levels**

  The OTAG states recommended that the stringency of controls for large non-utility point sources should be established in a manner equitable with the utility control level in each state. A budget or cap for each state would be established which would include these large non-utility point sources. Further, the OTAG recommended that reasonably available control technology (RACT) should be considered for individual medium non-utility point sources, where appropriate. For more specifics regarding the control levels recommended, see Appendix III.

- **National Measures**
  The OTAG states recommended that the USEPA continue to develop, promulgate, and implement stringent national control measures that meet or exceed the emission reduction levels contained in the analysis performed by OTAG. The OTAG analysis outlined nine specific types of measures, the reductions assumed in the modeling for each measure, the recommended adoption date for each measure, and the recommended start/implementation date for each measure. The nine measures include architectural and industrial maintenance coatings, consumer/commercial products, autobody refinishing, reformulated gasoline, small engine standards, heavy-duty (2g) standard, heavy-duty non-road diesel standard, and locomotive standard with rebuild.

- **National Low Emission Vehicle**
  Acknowledging the ability of states to adopt the California Low Emission Vehicle Program and the voluntary National Low Emission Vehicle Program, the OTAG supported and encouraged the implementation of a National Low Emission Vehicle Program.

- **Vehicle Emission Inspection and Maintenance Controls**
  The OTAG states recommended implementation of appropriate and effective vehicle emission inspection and maintenance (I/M) programs where required by the Clean Air Act. The OTAG states additionally recommended that states consider the adoption of enhanced I/M programs in all urbanized areas in the fine grid with a population greater than 500,000.

[24]OTAG, Executive Report, 1997.

The OTAG states further recommended that USEPA recognize and give

Table 2 : Summary of OTAG Control Measure Recommendations Continued

appropriate credit to the state-by-state emission reduction benefits of vehicle I/M programs and their impact on transport of ozone and its precursors.

In recognition of the potential effectiveness of a vehicle on-board diagnostic (OBD) system to alert drivers of emission control system malfunctions and to ensure proper maintenance and operation of the emission control system under real-world driving conditions, the OTAG states encouraged the USEPA to support periodic OBD system checks as part of an effective vehicle I/M program and as a means to provide appropriate program credit.

- **Gasoline**
  The OTAG states recommended that continued use of Federal Reformulated Gasoline (RFG) in mandated and opt-in areas. The OTAG states also supported state flexibility and encouraged opting in to the RFG program or other fuel strategies consistent with the Clean Air Act, including for those attainment areas that contribute to downwind nonattainment situations or that choose to implement strategies to assist in preventing violations of the National Ambient Air Quality Standards for ozone. The OTAG states also recommended that the USEPA adopt and implement by rule an appropriate sulfur standard to reduce emissions further and to assist vehicle technology/fuel systems in achieving maximum long-term performance.

- **Diesel Fuel**
  The OTAG states recommended that by 1999 the USEPA evaluate emission benefits and other effects of cetane adjustments on current technology engines and that USEPA adopt and implement standards as appropriate. The OTAG states also recommended that USEPA use an existing collaborative process to determine whether new diesel fuel standards are beneficial and, if so, that USEPA adopt and implement new standards no later than 2004.

- **Tier 2 Motor Vehicles**
  The OTAG states encouraged the USEPA to reach closure on the Tier 2 Motor Vehicles study and potential benefits for ozone mitigation.

- **Trading Program Framework**
  The OTAG states noted that market-based approaches are generally recognized as having multiple benefits in relation to traditional command and control regulations. The OTAG states defined these benefits as follows:

  – reduction of the cost of compliance;
  – creation of incentives for early reductions;

– creation of incentives for emission reductions beyond those required by regulations;
– promotion of innovation; and
– increase in flexibility without resorting to waivers, exemptions, and other forms of administrative relief.

F. Implementation of the OTAG Recommendations

The USEPA has already taken several actions to implement the OTAG states' recommendations. These actions are summarized in Table 3. In addition to the implementation of specific federal measures, the USEPA proposed to require 23 affected jurisdictions to limit, or cap, the emissions of oxides of nitrogen (NO_X) by September 2002.[25] This cap program is referred to in this document as the regional NO_X cap.

In deriving the emission budget caps for the 23 jurisdictions, the USEPA carefully considered the recommendations made by OTAG on July 19, 1997[26]. The budget caps were established based on a selection of control measures deemed to be the most reasonable and cost effective for achieving regional NO_x reduction during that process. The control measures the USEPA assumed in its proposed calculation generally fell within the range of OTAG's recommendations[27]. These budget caps cover all emission sectors, e.g., utility, area sources, etc., and in implementation, states can choose their own NO_x emission control measures as long as their budget cap is not exceeded.

Additionally, the gasoline industry has proposed a fuel sulfur limitation[28] in response to both the OTAG recommendations and the need for a cleaner fuel for the next generation of gasoline powered vehicles, otherwise known as Tier II vehicles.[29]

---

[25] 62 Fed. Reg. 60317, (November 7, 1997).

[26] (See USEPA, 1997, Appendix A).

[27] (See USEPA, 1997).

[28] Press Release from the American Petroleum Institute (API) dated March 12, 1998 entitled "Lower Sulfur Gasolines - Petroleum industry proposes regulations for cleaner fuels."

[29] 42 U.S.C. §7521(I). A Federal Register notice was recently signed by Richard D. Wilson, Acting Assistant Administrator of the USEPA's Office of Air and Radiation, announcing the availability of the draft Tier 2 Study by the USEPA's Office of Mobile Sources for public comment prior to its submission to Congress.

In a related action, eight northeastern states[30] petitioned the USEPA under 42 U.S.C. § 7426 requesting the USEPA find that major sources or groups of stationary sources in the upwind states significantly contribute to their states' nonattainment or interferes with the states' ability to maintain the 1-hour or 8-hour ozone health standard. To resolve the petitions, the USEPA and the states entered in to an agreement[31] and a public review.[32]

Additionally, the USEPA has issued a supplemental proposed rule on May 11, 1998, regarding the NO_x Cap rule to provide opportunity for review of air quality modeling results related to the emission reductions proposed, and to propose reporting requirements and a model NO_x Cap and Trade rule.

[30]The states of Connecticut, Maine, New Hampshire, New York and Rhode Island and the Commonwealths of Pennsylvania and Massachusetts.

[31]"Memorandum of Agreement (MOA) Concerning the Schedule for the EPA Action on Section 126 Petitions," December 19, 1997.

[32]63 Fed. Reg. 10874 (March 5, 1998).

Table 3: The USEPA Progress on Implementing the OTAG Recommendations

Overall Strategy	
The USEPA proposed a regional NO_X emission cap. This rule, once promulgated, will establish NO_X emission caps for each state. The states have the flexibility to achieve the cap levels using the control measures that make sense for that particular state. The benefits for the following federal measures were included in the calculation of the regional NO_X emission cap.	
OTAG Recommendations	**Progress/Status**
Utility NO_X Controls	NSPS's proposed on 8/9/97
Non-Utility Point Source Control Levels	NSPS's proposed on 8/9/97
National Low Emission Vehicles	The USEPA promulgated its final rule on 1/7/98 (63FR925). New Jersey has opted in to the program contingent on motor vehicle manufacturers participation. To date 23 manufacturers have agreed to participate. The USEPA found the Program to be in effect on March 2, 1998.
Vehicle Emission Inspection and Maintenance (I/M) Controls	The USEPA sets performance standards for I/M controls in state SIPs. New Jersey operates a basic I/M program and is currently reviewing a contractor bid for an enhanced I/M program.
Trading Program Framework	The USEPA has proposed a model cap-and-trade program in its supplemental rule making of May 11, 1998.
National Measures	
Architectural and Industrial Maintenance Coatings	The USEPA proposed its rule on 6/25/96, and entered into a consent decree on 2/20/98 to promulgate regulations or guidelines by 8/15/98.
Consumer/Commercial Products	The USEPA proposed its rule on 4/2/96, and entered into a consent decree on 2/20/97 to promulgate regulations or guidelines by 8/15/98.
Autobody Refinishing	The USEPA proposed its rule on 4/30/96 (61FR19005), and entered into a consent decree on 2/20/98 to promulgate rules or guidelines by 8/15/98.
Reformulated Gasoline	The USEPA promulgated its rules on 2/14/94 (40CFR80).
Small Engine Standards	The USEPA proposed its rule on Phase II standards on 1/27/98 (63FR3950). The final rule is scheduled for adoption in December.
Heavy-Duty Highway Engine (2 g) Standard	The USEPA rule was promulgated on 10/21/97.

Heavy-Duty Non-road Diesel Standard	On September 24, 1997, the USEPA proposed non-road diesel engine standards these proposals were incorporated in development of the (63FR50152), emission budgets for the USEPA's proposed NO_X cap rule.
Locomotive Standards with Rebuild	The final rule was published in April, 1998 (63FR18977).
Diesel Fuel	The USEPA is continuing to investigate the impact of cetane adjustments on prototype 2004 model engines.
Tier 2	The USEPA issued its Draft Tier 2 Vehicle Study on April 23, 1998.

III. Current Air Quality

To determine compliance with the health-based National Ambient Air Quality Standards (NAAQS), ambient air quality measurements are used. The USEPA requires each state to operate and maintain an air monitoring network[33]. Ambient air monitoring for ozone air quality has been ongoing in New Jersey and its neighboring states since the 1970s. Current monitoring sites for the Philadelphia and Southern and Central New Jersey and New York-Northern New Jersey and Southern Connecticut regions are shown in Figures 3 and 4 respectively. The monitoring sites in New Jersey only are shown in Figure 5.

In order to determine compliance with the 1-hour ozone health standard, the USEPA utilizes the design value statistic.[34] Basically, the design value is the fourth highest value monitored over a three year period at each monitoring location. For an entire Air Quality Control Region, the design value is the single highest of all the design values in the region. The design values for New Jersey monitoring sites for the 1995-1997 period are shown in Figure 5. The 1-hour ozone health standard is 0.12 ppm. If the design value is greater than 0.124 ppm (difference due to rounding), then the Air Quality Control Region is considered in violation of the health standard.

Since ozone in formed in the atmosphere, the highest concentrations can occur far downwind of the original precursor source locations. Therefore consideration of an expanded area to see the downwind impact of a source area is necessary[35]. The Philadelphia area of interest, is expanded into southern and central New Jersey beyond the Air Quality Control Region boundary as is the area in Southern Connecticut beyond the New York - Northern New Jersey - Long Island Air Quality Control Region. The Philadelphia, Southern and Central New Jersey area of interest is illustrated in Figure 6. In that Figure the Philadelphia Air Quality Control Region is bounded by the double line, and the expanded area is shown by the hatched lines. The New York area of interest is presented in Figure 7. These areas of interest are termed the "Philadelphia Region" and the "New York Region" in this document.

The design values for New Jersey and the surrounding region for the 1994-1996 time frame are depicted in Figure 8.

---

[33] 40 C.F.R. Part 58

[34] 40 C.F.R. Part 50, Appendix I.

[35] The USEPA 1991 Attainment Guidance Policy.

Figure 3: Philadelphia Area Ozone Monitor Locations

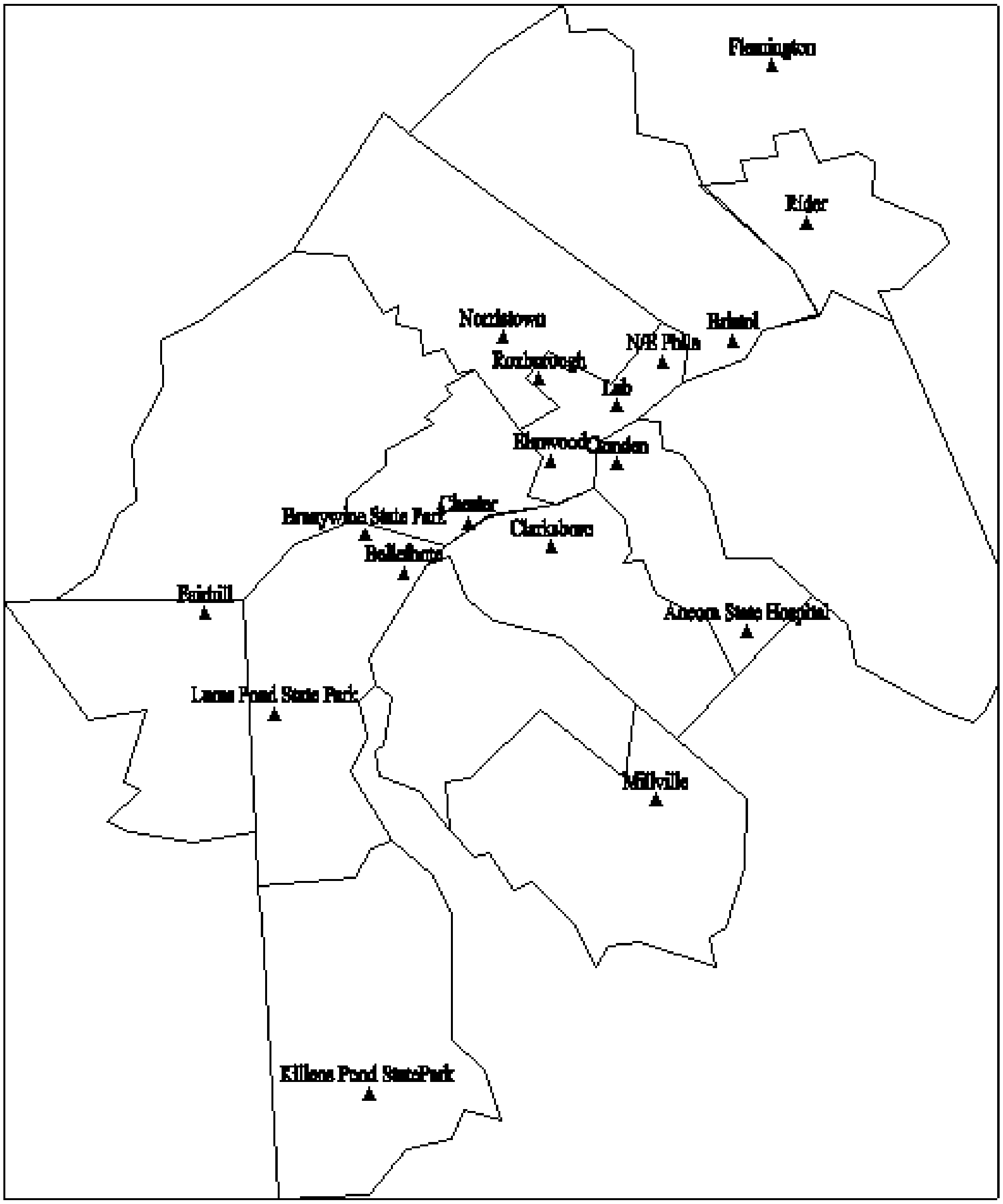


Figure 4: Monitoring Site Locations in the New York Airshed

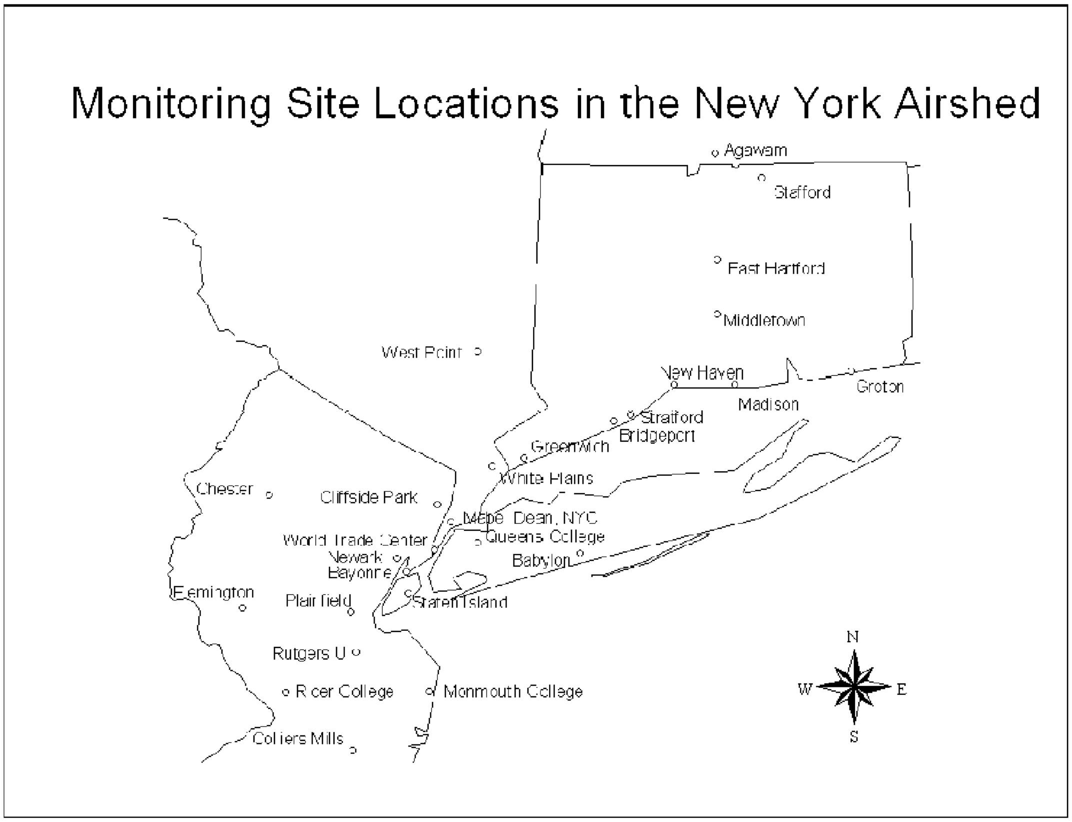
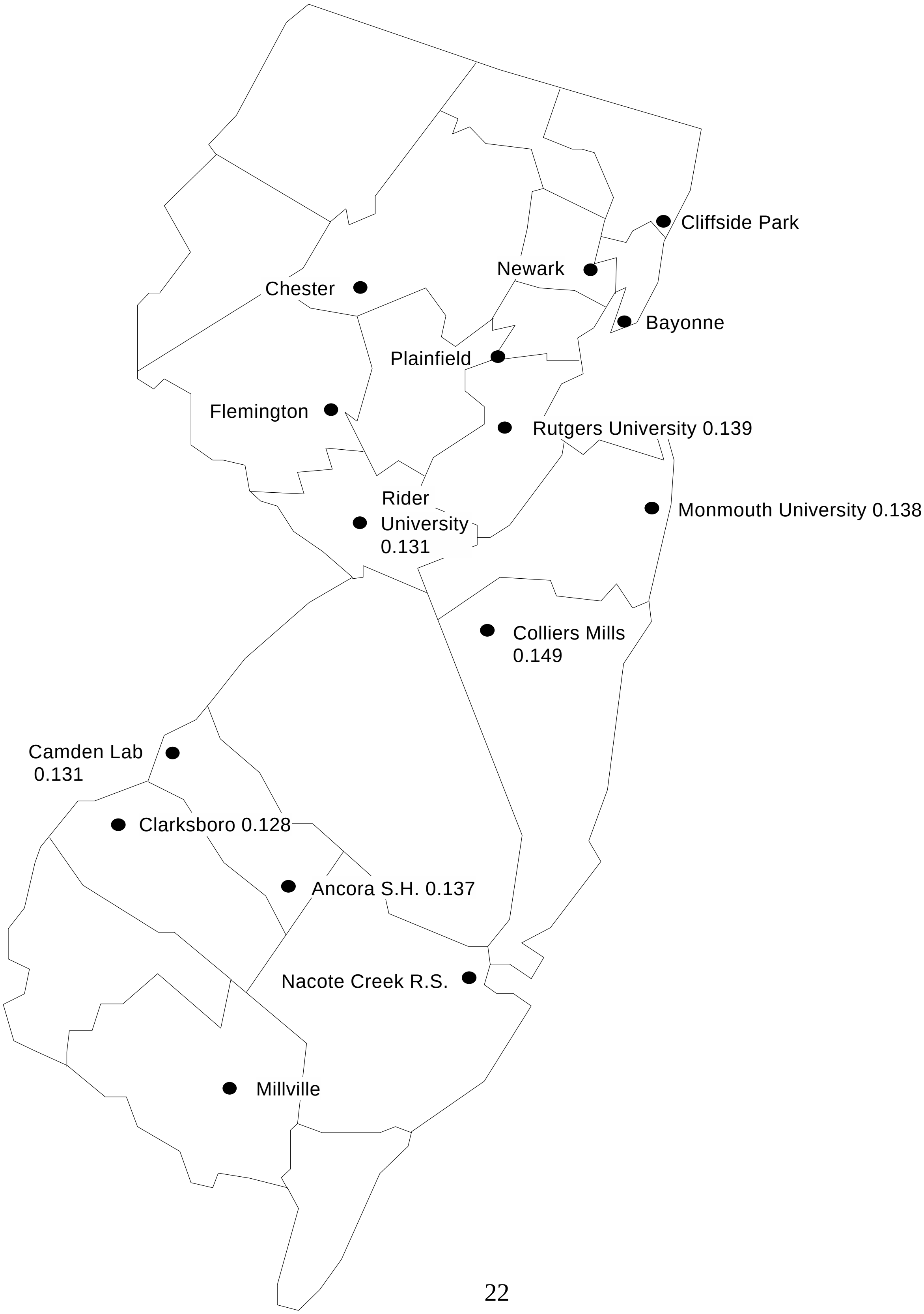


Figure 5: New Jersey Monitoring Sites and Their Ozone Design Values for 1995-1997



A. New Jersey

The trend of the highest design values at the monitoring sites in New Jersey shows a decrease from the mid- and late 1980's with typical levels at 175-195 ppb to levels of 135-150 ppb by the mid-1990's (149 ppb in 1997). The design value trends for all the New Jersey monitoring sites are illustrated in Figure 9. The progress in reducing ozone concentrations is evident in the downward trends. With the exception of one value for the Colliers Mills site for the 1995-97 period, all values are currently below 140 ppb. The Colliers Mills site is in Ocean County, New Jersey. From a regulatory standpoint, it is part of the New York-Northern New Jersey-Long Island Air Quality Control Region, but is more heavily influenced by the Philadelphia urban plume, than the New York City one.

To further examine the geographic aspect of the trends, the design values for the monitoring sites in Northern, Central, and Southern New Jersey are separated and depicted in Figures 10, 11, and 12. Consistent downward trends are evident for Northern, Figure 10, and Southern, Figure 12, New Jersey to the point where the design values are below the health standard. For Central New Jersey, Figure 11, a downward trend exists since 1990 for all sites, but the concentrations remain above the health standard. This is due in most part to the ozone plume from the greater Philadelphia area combining with the transport of ozone from more distant regions and locally generated ozone from emissions in New Jersey.

Figure 6: The Philadelphia, Southern and Central New Jersey Area of Interest

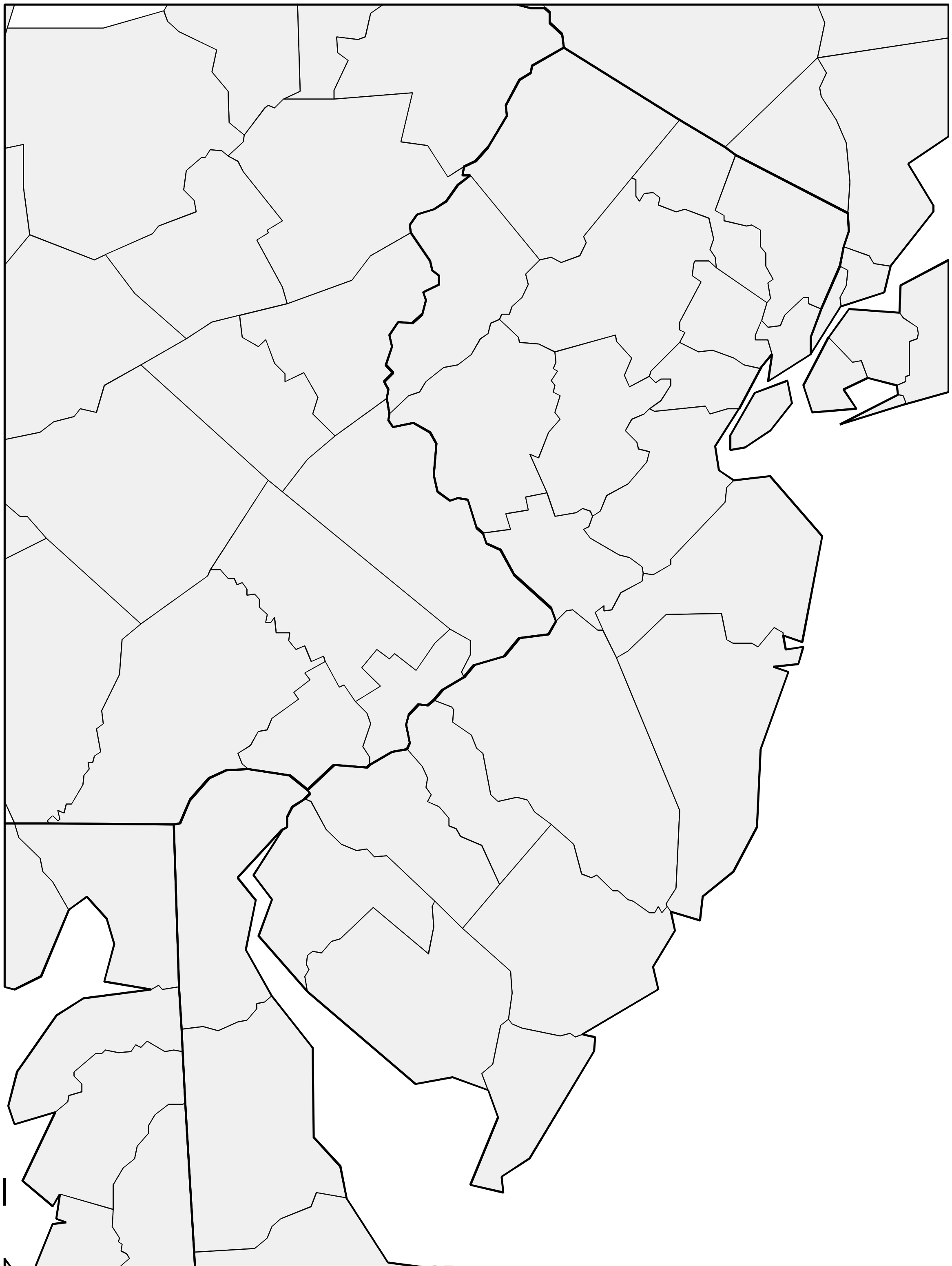


Figure 7: The New York-Northern New Jersey-Long Island Air Quality Area of Interest

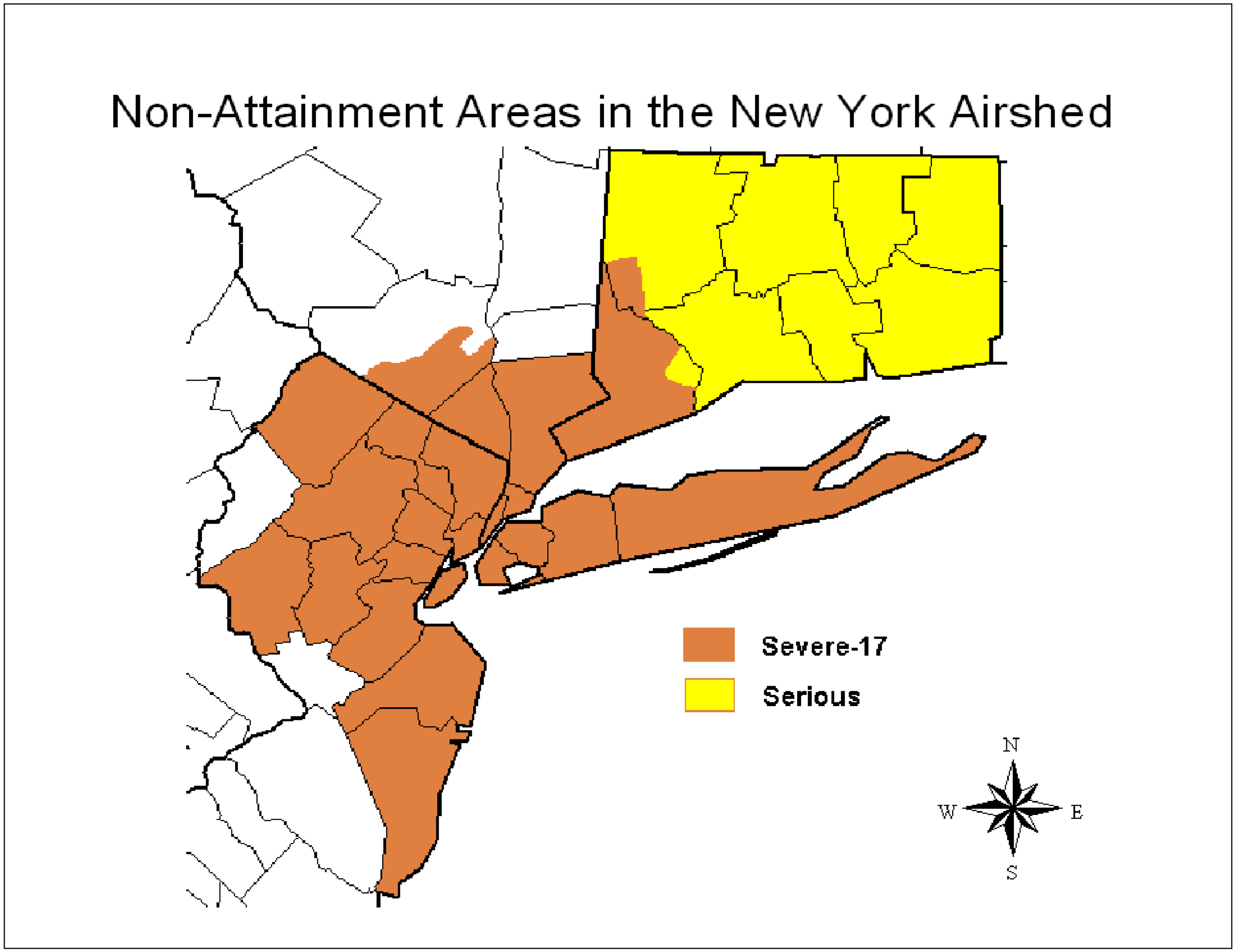


Figure 8: New York Region; Geographical Distribution of Ozone Design Values for the 1994-1996 Measurement Period

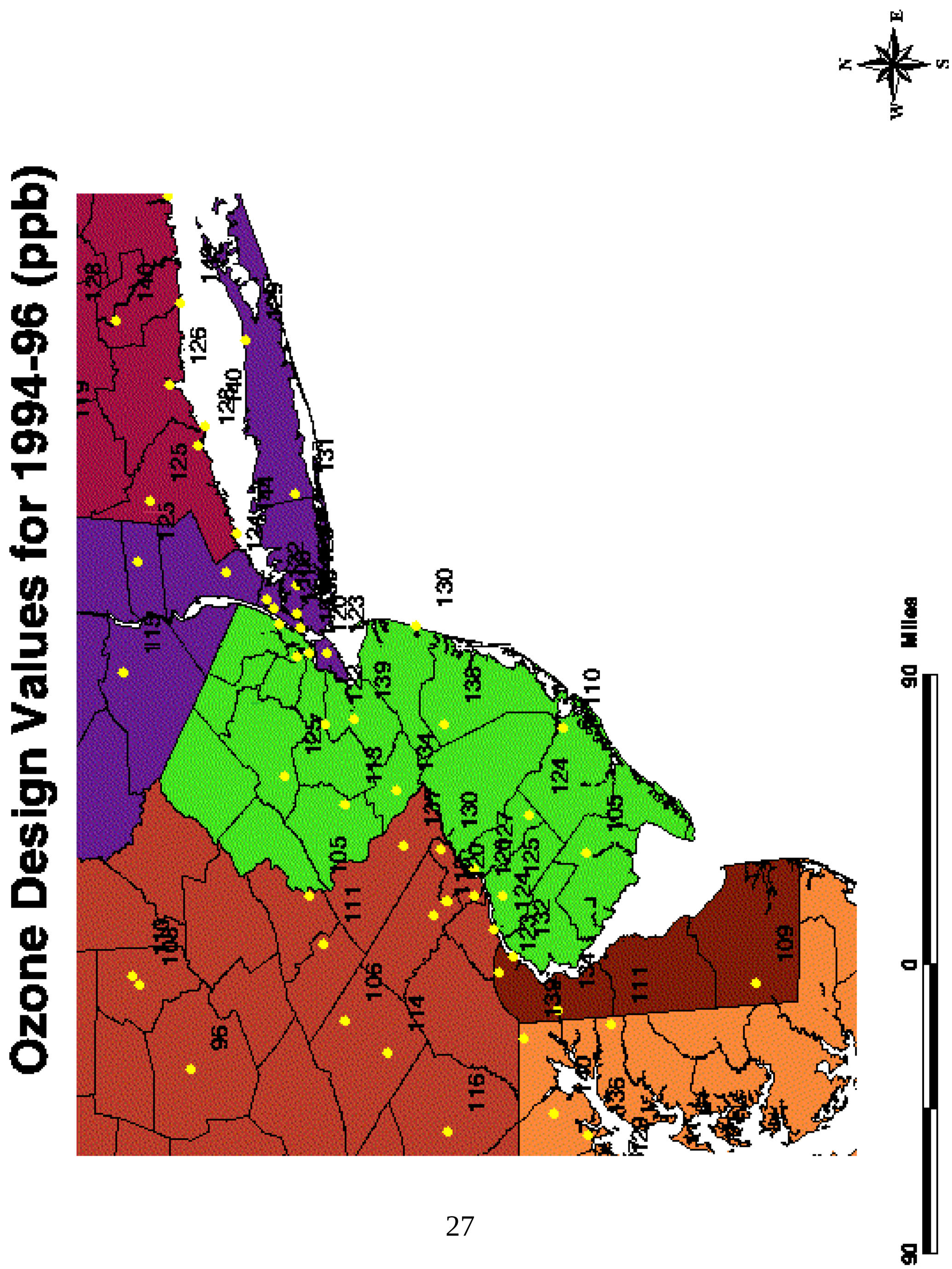


Figure 9: Trends in 1-Hour Ozone Design Values in New Jersey

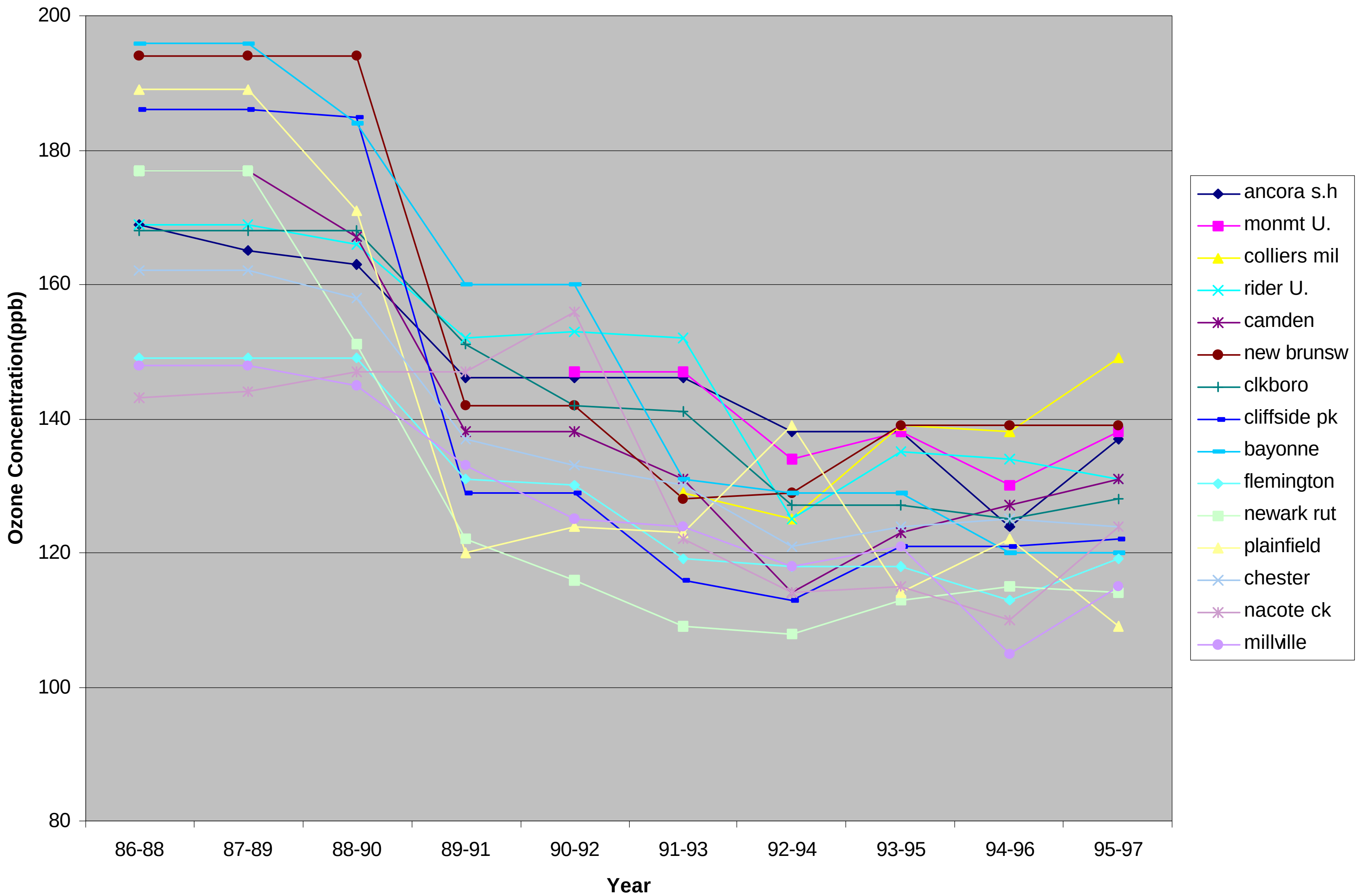


Figure 10: Trends in 1-Hour Ozone Design Values in Northern New Jersey

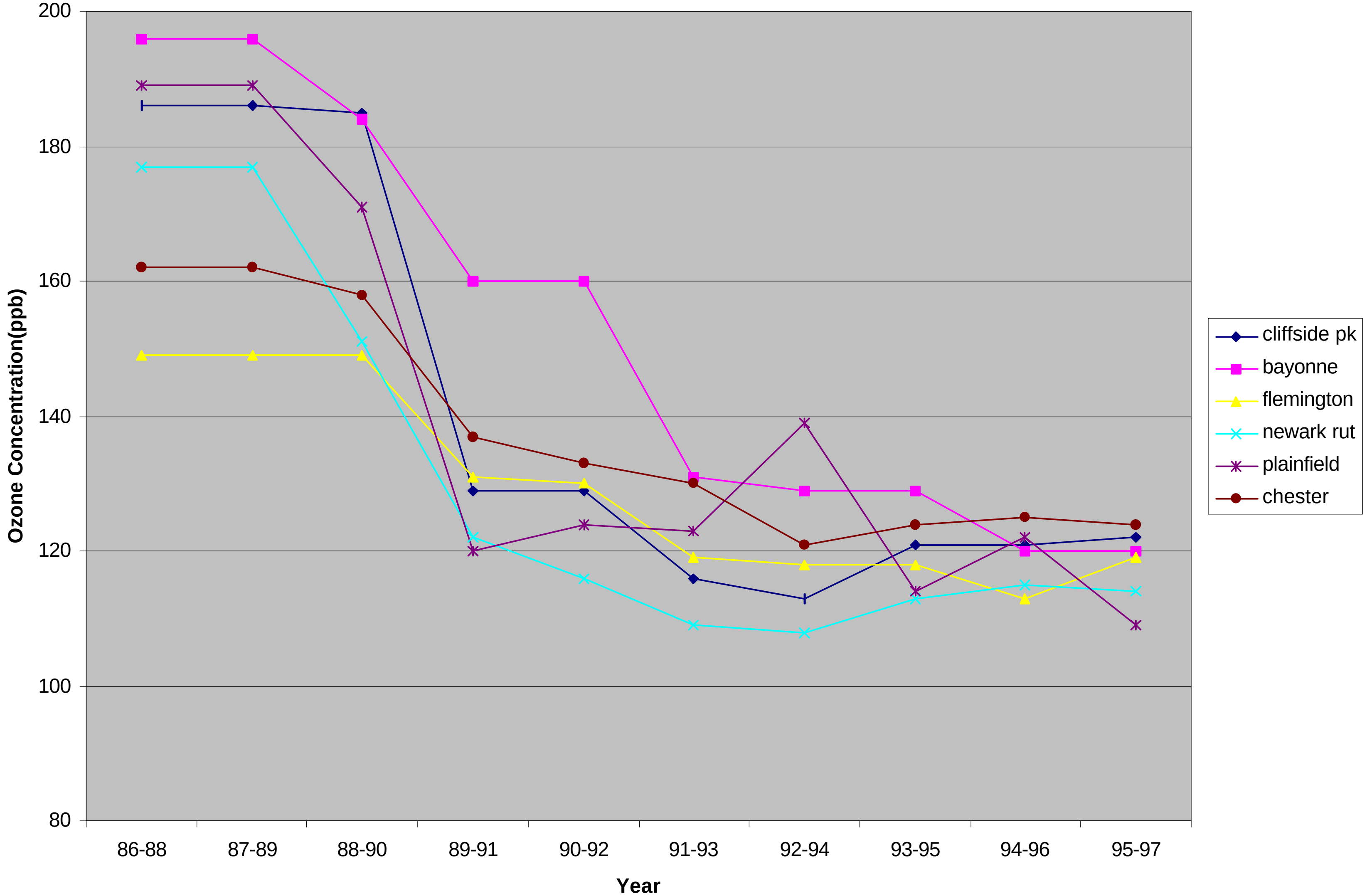

200
180
160
140
120
100
80
Ozone Concentration(ppb)
86-88
87-89
88-90
89-91
90-92
91-93
92-94
93-95
94-96
95-97
Year
cliffside pk
bayonne
flemington
newark rut
plainfield
chester

Figure 11: Trends in 1-Hour Ozone Design Value in Central New Jersey

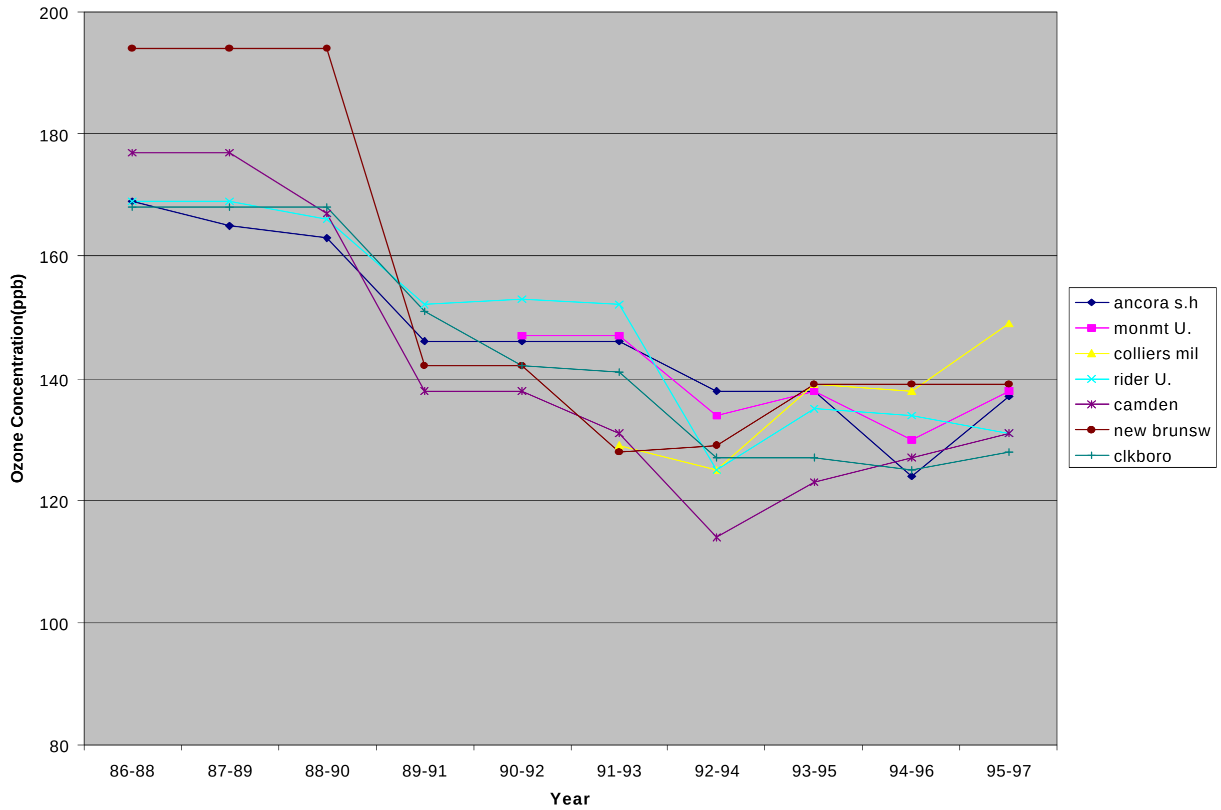
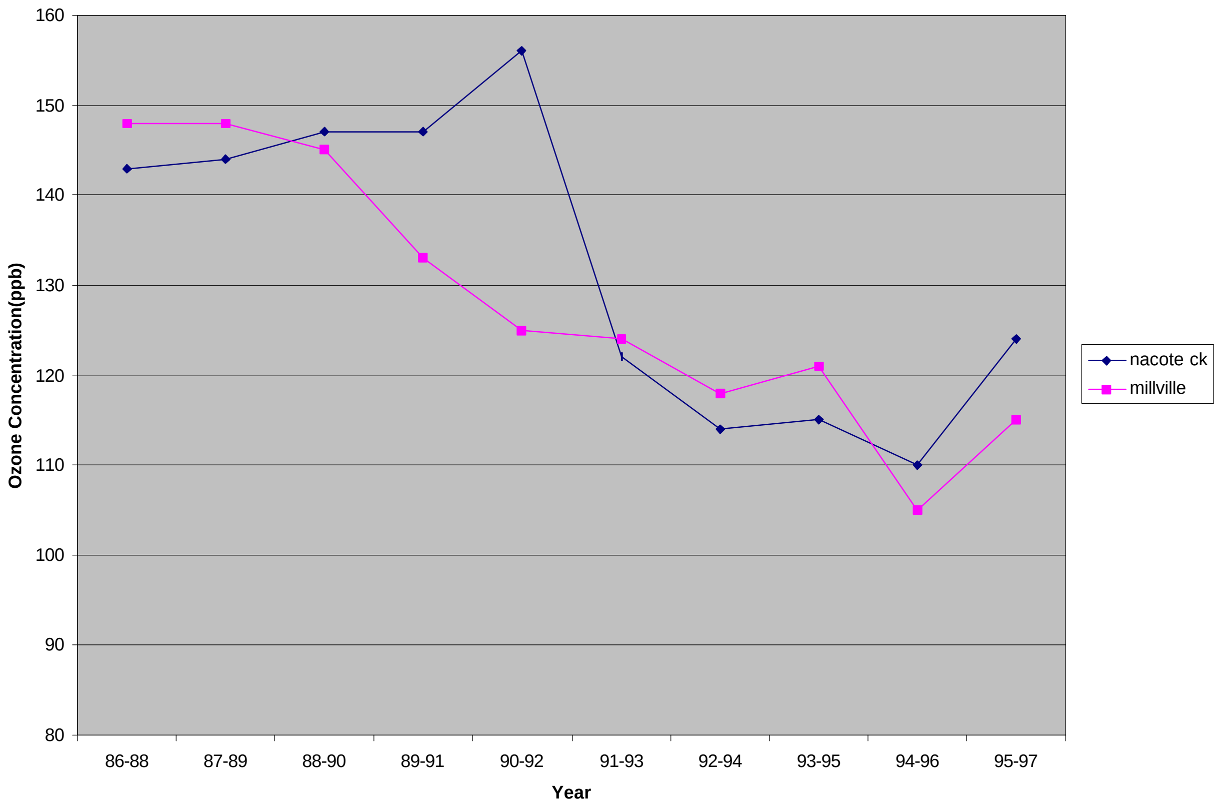


Figure 12: Trend in 1-Hour Ozone Design Value in Southern New Jersey



B. Pennsylvania

The maximum design values for other monitoring sites in the Philadelphia Region were examined by the PADEP.[36] The sites included in their analysis encompassed Cecil county, MD, Newcastle county in DE, Chester, Delaware, Montgomery, Bucks, and Philadelphia counties in Pennsylvania, and Mercer, Camden, Burlington, Gloucester, Cumberland and Salem counties in New Jersey. A linear regression analysis of the data from the 36 monitors that operated within the definition of the Philadelphia region in their study for 1974-1997 illustrates a consistent downward trend in the design value to current maximum design values of about 138 ppb in 1997. (See Figure 13).

The Pennsylvania Department of Environmental Protection also performed ozone trend analysis for monitoring sites upwind, in, and downwind of Philadelphia for the 1974-1997 time period.[37] This included a comparison of the maximum 1-hour and design value trends of a number of monitors, some located upwind of Philadelphia and the rest downwind. Upwind monitors are west and southwest of Philadelphia; downwind monitors east and northeast of Philadelphia. The specific upwind monitors were located at: Norristown, PA, Cecil County, MD, and Kent County, DE. The downwind monitors were located at: Bristol, Roxborough, and Northeast Philadelphia, PA, and at Camden, Ancora State hospital, and Burlington County, NJ.

For the upwind monitors, the results of the trend analysis showed a decline of 23% (over the 1974 to 1997 period) in both 1-hour maximum and design values. For downwind monitors, the maximum 1-hour decline was greater than the corresponding design value decline. Over the 1974 to 1997 period, the maximum 1-hour values declined 46%, with the design values declining 41%.

The results of the PADEP study are used in the design value projection analyses of Section IV, to translate projected benefits in the 1-hour ozone concentrations from the use of photochemical grid modeling to design value benefits for the Philadelphia Region. The downwind monitor results are used because they better reflect the air quality response in the Philadelphia Region to both local and broader (outside the Philadelphia Region) emission reductions. In addition, for the purposes here of predicting future declines in design values, the results for the downwind monitors are more representative of the solutions than those for the upwind monitors. The design value (DV) decline over the 1974 to 1997 period is 0.78 relative to the decline in the peak 1-hour maximum ozone concentration (1-hour). For further information regarding

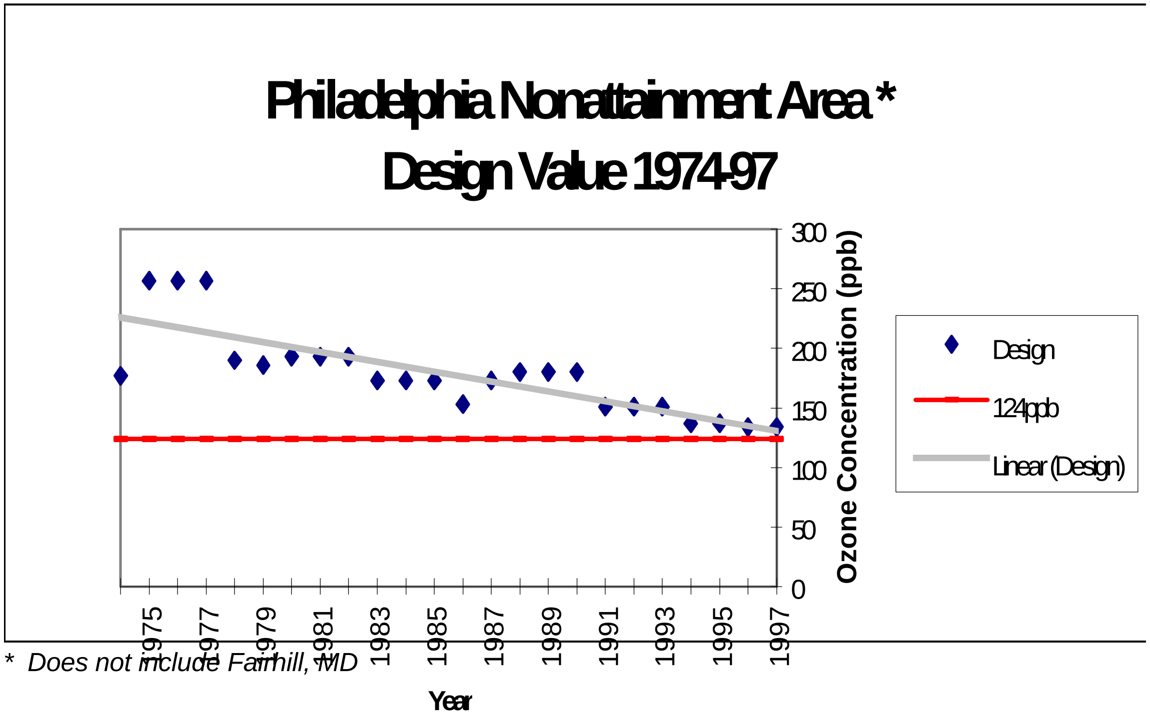
---

[36]The Commonwealth of Pennsylvania Department of Environmental Protection (PADEP), "Proposed State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the National Ambient Air Quality Standard for Ozone Meeting the Requirements of the Alternative Ozone Attainment Demonstration Policy, Phase II Ozone SIP Submittal," January, 1998, page 32.

[37](PADEP, 1997, page 36).

the derivation of this value, see Appendix I.

Figure 13: Long Term Design Value Trends in the Philadelphia Area



Does not include Fairhill, MD

C. Connecticut

Figure 4 shows the location of ozone monitors in the portions of the Connecticut, New Jersey and New York, comprising the New York Region. The trends in the design values for the New York Region for the three states are illustrated in Figure 14. The geographical distribution of ozone design values for the 1994-1996 measurement period is shown in Figure 8. The highest design values in the New York region are generally measured in Southeastern Connecticut, where the design values typically exceeded 200-250 ppb during the 1980's but decreased to 150-160 ppb during the mid-1990's (157 ppb in 1997).

The design value trends for Stratford, Greenwich, Madison and Groton are shown in Figure 15. Ozone levels for Stratford were used to classify the New York Air Quality Control Region as severe in 1991. Stratford's design values have decreased from 275 ppb in 1980, to 201 ppb in 1989, and to 135 ppb in 1997. The highest 1997 design value in the Connecticut portion of the New York severe nonattainment area was 136 ppb measured at Greenwich.

It is interesting to note that higher 1997 design values now exist outside the Connecticut portion of the New York Air Quality Control Region, in Connecticut as well as in New York and New Jersey. The highest design value in Connecticut for the three year period ending 1997 was 157 ppb measured at Madison. This site is actually in the serious ozone nonattainment area known as Greater Connecticut. Another coastal Connecticut site, Groton, has a 1997 design value of 144 ppb.

Figure 14: Trend of Highest 1-Hour Design Values by State in the New York Airshed

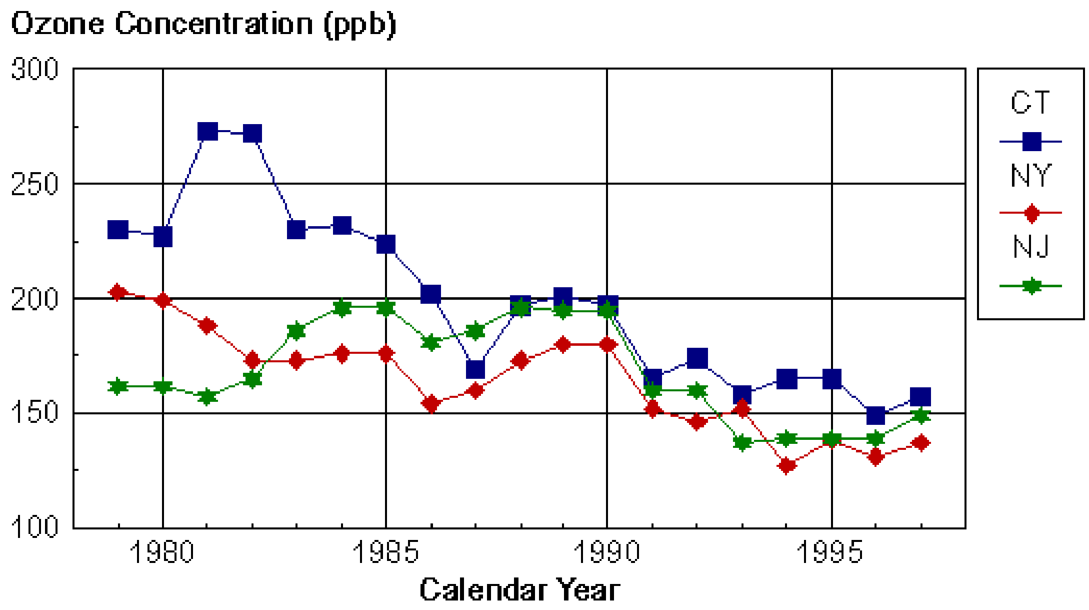
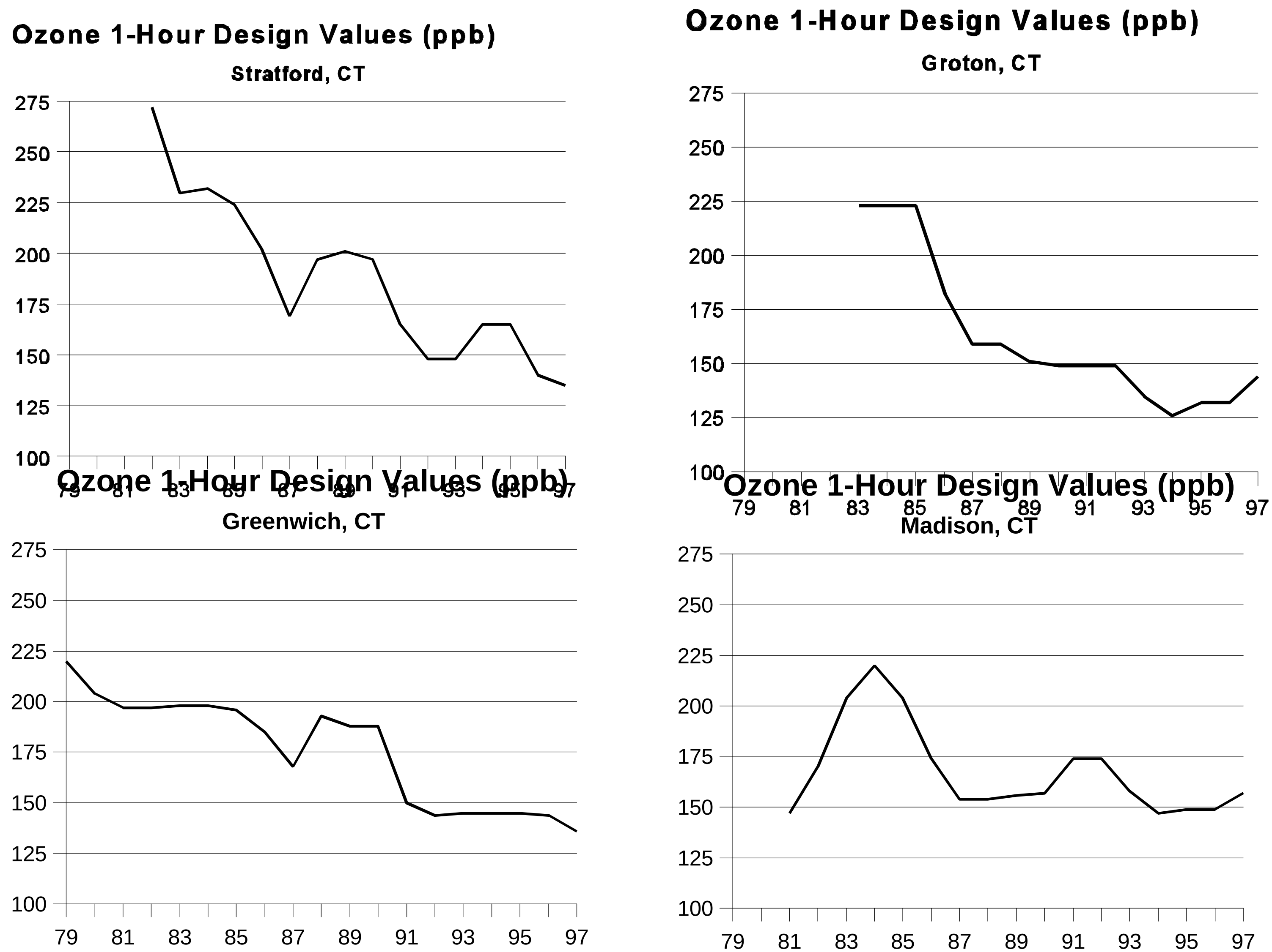


Figure 15: Trend of Highest 1-Hour Ozone Design Values at Selected Sites in Connecticut



D. New York

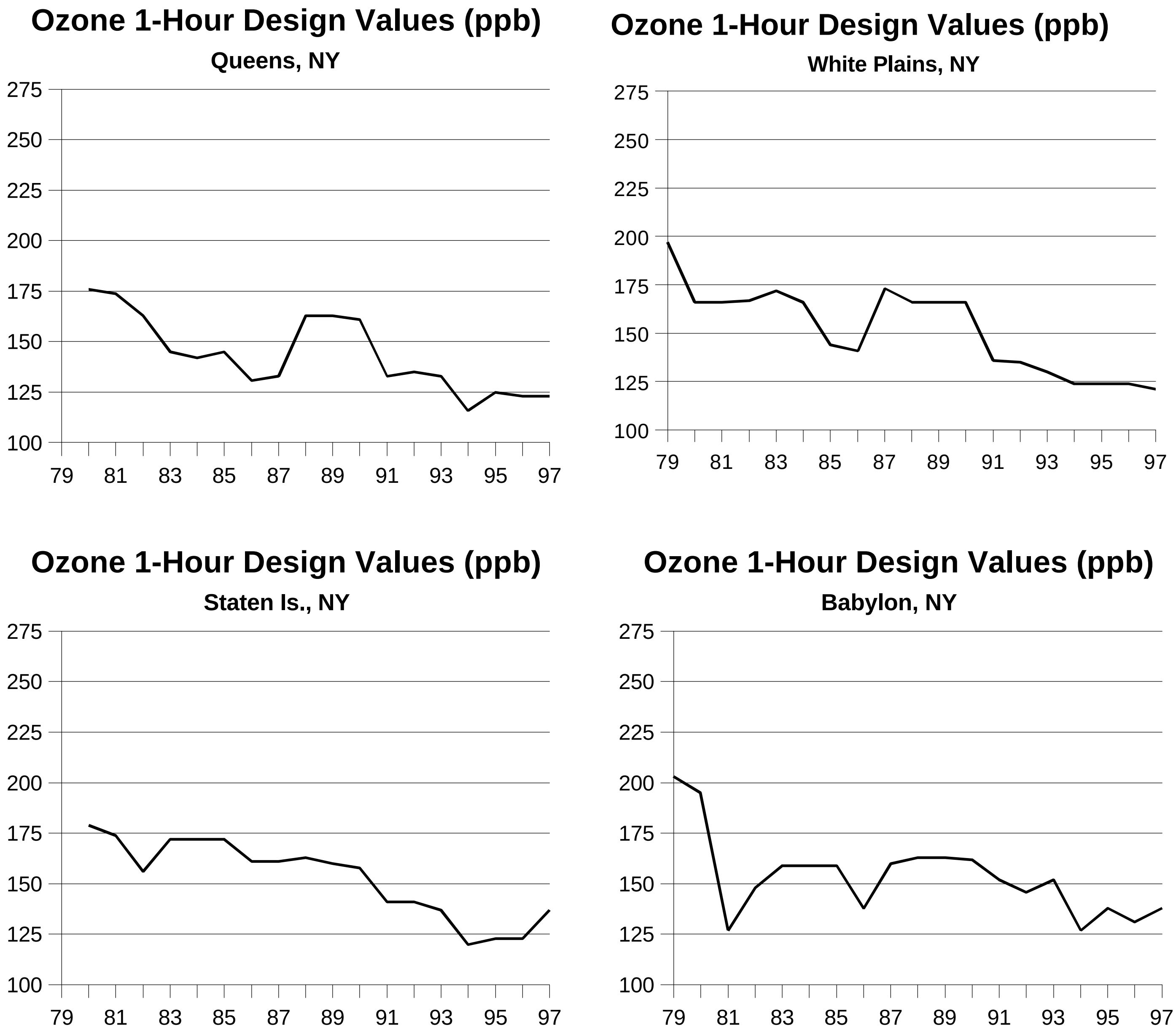
The New York monitoring locations also exhibit a downward trend in ozone design values since the beginning in the 1980's. In the 1980's the highest 1-hour design values were typically in the range of 175-200 ppb. In the 1990's the design values are in the range of 125-150 ppb (138 ppb in 1997).

The design value trends for sites in Queens, Staten Island, Babylon and White Plains are shown in Figure 16. As in Connecticut, all of these sites display downward trends over the period of record. The highest 1997 design value in New York was 138 ppb, found at Babylon, while the next highest level, 137 ppb, was measured on Staten Island at Susan Wagner High School. All of the New York sites display year to year variability superimposed on downward trends over the period of record.

Design values at the Queens and White Plains sites for 1997 were 123 ppb and 124 ppb, respectively. While it is interesting to note that these design values of 124 ppb or less represent attainment with respect to the 1-hour ozone NAAQS, it is felt that these sites may be unduly influenced by a unique phenomenon of atmospheric chemistry.[38] Ozone levels at the urban sites within the New York area are believed to be suppressed by the effect of locally large emissions of nitric oxide (NO). Nitric oxide reacts quickly with ozone (thereby reducing ozone concentrations near sources of nitric oxide); the resulting nitrogen dioxide (NO_2) formed by this reaction becomes available to participate in slower photochemical reactions which again form ozone further downwind.

[38]National Research Council, "Rethinking the Ozone Problem in Urban and Regional Air Pollution," (National Academy Press, 1991).

Figure 16: Trend of Highest 1-Hour Ozone Design Values at Selected Sites in New York



E. Relationship Between Ozone Peak and Design Values for the New York Area

Plots showing the trend for highest and second highest one hour average ozone measured each year were also produced and are presented in Appendix II. These plots display somewhat more year to year variability than the design value trends but they also show a distinct downward trend over the years of record similar to the design values. By definition, the design values are less than or equal to the peak values. In general, the design values are lower than peak one hour concentrations. In fact the average ratio over all sites of 1997 design values to one hour peak ozone is 0.89. Therefore assuming future relative changes in design and peak values are the same, the actual change in design value will be 0.89 as great as the change in the peak value. This factor is used in the design value projection analyses for the New York area in Section IV.

IV. Demonstration of Attainment of the 1-hour Ozone Health Standard

A. Overview

42 U.S.C. § 7511a(c)(2)(A) requires a demonstration that a state's plan will provide for attainment of the ozone health standard using "...photochemical grid modeling or any other analytical method determined by the [USEPA] Administrator... to be at least as effective" New Jersey proposes to use photochemical grid modeling in addition to other methods to demonstrate plausible attainment of the 1-hour ozone health standard by 2005 for the Philadelphia-Southern and Central New Jersey area and by 2007 for the New York-Northern New Jersey-Southern Connecticut area. This approach is consistent with the USEPA revised guidance[39] on attainment demonstrations and is commonly referred to as the "weight of evidence" approach.

The NJDEP maintains an extensive ambient air quality monitoring network. This network collects information on the current air quality for criteria (e.g., ozone) and non-criteria (e.g., toxic) air pollutants, as well as collects meteorological information on a routine basis. In addition, New Jersey and many of the northeastern states participated in the North American Research Study for Tropospheric Ozone - Northeast, NARSTO-NE. NARSTO-NE routinely collected enhanced air quality and meteorological data during the past several summers and more detailed data was collected during ozone episodes. New Jersey sponsored and participated in extensive air quality modeling analyses both at the regional and local level (see Appendix XI). Appendix XI contains a series of reports by the Ozone Research Center on the photochemical grid modeling process including the protocol, evaluation, and results for the Philadelphia-Southern and Central New Jersey region modeling activities. Appendix II contains similar information for the New York-Northern New Jersey-Southern Connecticut region. The information and modeling tools obtained from these collaborative efforts were utilized in the development of this attainment demonstration.

The methods used to demonstrate attainment of the 1-hour ozone health standard are separated into two approaches: (1) a design value projection analyses; and (2) photochemical grid modeling.

(1) Design Value Projection Analyses

To perform the design value projection analyses, New Jersey utilizes the weight-of-evidence approach. This approach incorporates the attributes of the latest air quality measurements with predictive photochemical grid modeling. The design value is used because it is the regulatory measure[40] of attainment with the health standard.

---

[39]The USEPA 1996 Policy.

[40]40 C.F.R. Part 50, Appendix I.

In general, this approach utilizes the most recent air quality information as the starting point. The relative benefits from various control measures, as determined through photochemical grid modeling, are then subtracted from that starting point, resulting in a predicted value for future air quality.

The states adjacent to New Jersey[41] which are part of one of the two multi state nonattainment areas including New Jersey also have extensive ozone measurements through 1997. See Figures 2 and 3. The State of New Jersey believes that this data best represents the current levels of ozone concentrations in the region.

Starting with current monitored ozone design levels, this approach considers the impact from: 1) the anticipated benefits from further implementation of the Clean Air Act requirements from 1997 to the year 2005 (southern New Jersey) or 2007 (northern New Jersey); 2) the benefits from implementation of the regional NO_X cap rule; and, 3) any increases in emissions due to economic growth that may occur during this period in order to project the anticipated design value in 2005 or 2007.

To estimate the air quality benefits from the local implementation of the Clean Air Act measures, photochemical grid modeling, using the Urban Airshed Model Version IV (UAM-IV), was performed for several episodes with the historically highest ozone concentrations.

To estimate the air quality benefits from implementation of the regional NO_x cap, the OTAG modeling results were utilized. The USEPA estimated[42] that the Round 2/Run 5 modeling simulation compares best with the emission reductions expected from the regional NO_X cap.[43] Therefore, these simulation results were compared with the OTAG 2007 base case, which incorporated the implementation of the Clean Air Act measures, to estimate the air quality benefits of the regional NO_X cap.

The air quality benefits from the implementation of both local control measures required by the Clean Air Act and the regional NO_X cap were estimated using the maximum or peak values. While the design value statistic is an extreme value statistic, it is not as extreme as the maximum or peak values used in the modeling analysis. To account for this phenomenon, the historic relationship was developed between the ozone air quality peak value and the design value, Section III. These relationships were then applied to the predicted 1-hour peak air quality benefits from the implementation of the local measures and the regional NO_x cap, to determine benefits to the design

---

[41]Delaware and Pennsylvania, along with New Jersey, comprise the Philadelphia-Wilmington-Trenton Air Quality Control Region (AQCR) and New York and Connecticut, along with New Jersey, comprise the New York-Northern New Jersey-Long Island AQCR.

[42]62 Fed. Reg. 60317 (November 7, 1997).

[43]At 63 Fed. Reg. 4206 (January 28, 1997), the USEPA is committed to estimate the benefits of the NO_X cap as proposed in their final analysis.

value.

In summary, photochemical grid modeling is used to estimate the air quality benefits from the local implementation of the Clean Air Act measures and the implementation of the regional NO_X cap. These air quality benefits are then adjusted to account for the difference between the maximum or peak values and the design value, as the design value is the regulatory measure used to determine attainment. The resulting air quality benefit is then subtracted from the most recent (1997) ozone design values, thereby providing an estimate of future design value. That estimate is compared to the design value criteria of 124 ppb to determine whether attainment is plausible.

(2) Photochemical Grid Modeling

The other approach used in this attainment demonstration relies on the direct use of UAM-IV modeling simulations. In these simulations, the air quality benefits from the local implementation of the Clean Air Act measures and the regional NO_x cap, as well as the air quality benefits of the regional NO_x cap outside the local modeling domain, are implicitly incorporated. Any growth in emissions due to the increased economic activity is also incorporated in the analysis. The air quality benefits resulting from the implementation of the regional NO_x cap outside the local modeling domain are accounted for by changing the boundary and initial conditions incorporated in the analyses. UAM-IV modeling analyses were performed for both the Philadelphia-Southern and Central New Jersey and New York-Northern New Jersey-Southern Connecticut Regions.[44] Many different meteorological conditions or episodes have been analyzed in these modeling domains. This analysis focuses on the 1988, 1991 and 1995 episodes. In assessing these results and comparing them to the design value projections, less weight was given to the 1988 episode, because of the expected infrequent, reoccurrence.

The remaining subsections in the section address the various components of the photochemical grid modeling analyses for the Philadelphia-Southern and Central New Jersey, the New York-Northern New Jersey-Southern Connecticut modeling domains, and the Ozone Transport Assessment Group (OTAG) modeling efforts.

(a) Urban Airshed Modeling Process

The USEPA Guidance documents[45] regarding local photochemical modeling activities,

[44]Memorandum dated December 29, 1997 from Richard D. Wilson, Acting Assistant Administrator for the USEPA Office of Air and Radiation to the Regional Administrators, USEPA, Regions I-X entitled "Guidance for Implementing the 1-Hour Ozone and Pre-Existing PM_{10} NAAQS" and the USEPA SIP call (63 Fed. Reg. 8196, (February 2, 1998)).

[45]OTAG, 1996a. "Ozone Transport & Assessment Group: Modeling Protocol", Version 3.0, February 29, 1996.

require, as one of the first steps, the definition of a modeling protocol. The objective of this protocol is to describe who is involved in the modeling activities, their roles, as well as how the technical process will be carried out. The technical process defined include: specification of the modeling domain; identification of the meteorological episodes to be modeled; specification of how the initial and boundary conditions are to be determined; definition of the emission inventories to be used and their manipulation to transform them into inputs into the model; and defining acceptable performance of the model. New Jersey is in the unique position of being a significant portion of two major modeling efforts, one associated with the Philadelphia metropolitan area, and the other with the New York City metropolitan area. The remaining subsections in this section will provide an overview of the protocol elements. For the specific details of the photochemical grid modeling analyses, regarding the Philadelphia - Southern and Central New Jersey area, alternatively referred to as the Philadelphia Region, see Appendix XI. For issues dealing with the New York - Northern New Jersey - Southern Connecticut area, alternatively referred to as the New York Region, see Appendix II.

A similar protocol was developed as part of the OTAG photochemical modeling process.[46]

(b) Organization of the Modeling Efforts

Each of the urban scale modeling efforts organized themselves in a similar manner. Each effort was managed by a Policy Oversight Committee, consisting of the Air Directors from each the states or an appropriate level of management in the other organizations. A Technical/Coordination Committee provided technical oversight and leadership of the technical process. This coordination committee also developed the strategies for consideration in the modeling. In addition, three work groups were established to address the specific modeling inputs regarding the meteorological data, the emissions data, and the air quality data.

The Philadelphia effort was lead by the State of New Jersey, and the New York effort was lead by the State of New York, although all parties actively participated in the process. The organizations involved in the Philadelphia area effort included:

- Delaware Department of Natural Resources and Environmental Control
- Maryland Department of the Environment
- New Jersey Department of Environmental Protection
- New York State Department of Environmental Conservation
- Pennsylvania Department of Environmental Protection
- Philadelphia Department of Public Health-Environmental Protection Division
- USEPA Office of Air Quality Planning and Standards
- USEPA Region III (Philadelphia)

[46] The USEPA 1991 Policy.

· USEPA Region II (New York)

In the New York area, the organizations involved included:

· Connecticut Department of Environmental Protection
· New Jersey Department of Environmental Protection (NJDEP)
· New York City Department of Environmental Protection
· New York State Department of Environmental Conservation
· Pennsylvania Department of Environmental Protection
· USEPA Office of Air Quality Planning and Standards
· USEPA Region I (New England)
· USEPA Region II (New York)

Computational implementation and scientific analysis of the Philadelphia area modeling project was performed by the Air Quality Modeling Group of the Ozone Research Center at the Environmental and Occupational Health Sciences Institute, a joint organization between Rutgers, the State University of New Jersey and the Robert Wood Johnson Medical School, while the NYSDEC performed similar functions in the New York area effort.

In addition to the above listed agencies, the following organizations also contributed to the modeling effort (a) by providing emission and aerometric data and recommending and evaluating control strategies, (b) by comparing and discussing concurrent modeling efforts in the Northeastern US, and (c) by providing additional technical resources:

· Delaware Valley Regional Planning Commission (DVRPC)
· Mid-Atlantic Regional Air Management Association (MARAMA)
· Modeling Ozone Cooperative Agreement (MOCA) organizations
· Northeast States Coordinated Air Use Management (NESCAUM)
· Ozone Transport Commission (OTC)

The photochemical grid modeling activities in the OTAG effort was under the Modeling and Assessment Subgroup. This Subgroup served as the management functional unit. A Modeling workgroup provided general oversight, while a smaller group representing the individual modeling centers performed the day to day operations.

(c) Modeling Domains

One of the first technical steps is to define the area of interest for each of the modeling efforts. In defining the area or domain, one must consider the locations of local urban area, the downwind extent of the elevated ozone levels, the location of large emission sources, and the availability of meteorological and air quality data.

The domain or spatial extent to be modeled includes as its core the nonattainment area. Beyond this, the domain includes enough of the surrounding area such that major upwind sources fall within the domain and emissions produced in the nonattainment area remain within the domain throughout the day. Definition of the Philadelphia UAM domain boundaries were based on trajectory analyses of the July 1988 episode, and took into account considerations of consistency and alignment with adjacent UAM modeling domains (New York and Maryland) and alignment of the regional modeling grid. The Philadelphia UAM domain includes a small part of New York State, and larger portions of each of the states included in the Philadelphia nonattainment area (Figure 16).

The computational and regulatory UAM-IV modeling domains for the Philadelphia, Central and Southern New Jersey CMSA application are presented in Appendix XI; ORC SIP Technical Support Document, Figure 1.

The numerical simulation in support of ozone SIP development were performed using the computational UAM-IV modeling domain (or a subset of it). Its grid consists of 52x59, $5x5km^2$ cells, in each horizontal layer. Five layers of cells, two below and three above the mixing height, were used in the vertical direction.

The locations of air quality monitoring stations, as well as of the meteorological stations, that are present in the Philadelphia; Central and Southern New Jersey CMSA domain, are shown in Figure 17.

The process of defining the Philadelphia - Central and Southern New Jersey CMSA domain boundaries employed trajectory analyses for the July 1988 episode and took into account considerations of consistency and alignment with the UAM modeling grids to the north and south (New York and Maryland domains) as well as with the regional ROM grid. The nesting of the domain grid within the regional ROM grid is found in Appendix XI, ORC SIP Technical Support Document, Figure 3.

For the New York area, following the modeling protocol[47] and the 1991 USEPA UAM Guidance, the southwest corner of the UAM modeling domain was set north of Philadelphia, PA, extending 290 km east and 230 km north with the northeast corner extending a little beyond the intersection of Connecticut, Rhode Island, and Massachusetts borders. This corresponds at 5 km grid spacing to 58 by 46 cells in the horizontal, with a vertical structure consisting of two layers below and three layers above the mixing height.

The Philadelphia area domain[48] extends from Baltimore, Maryland to the New York

---

[47]New York, 1992, Regulatory application of the UAM to the New York Airshed; Modeling Protocol, NYSDEC, Albany, NY.

[48]The modeling domain for computational purposes is larger than the “regulatory domain.” The “regulatory domain” was made smaller to reduce the likelihood of overwhelming the internal UAM calculations by very high predicted ozone concentrations in the northeast boundary of the

City area, Figure 17, while the New York area modeling domain extends from Northern New Jersey and Southern New York to Connecticut, Figure 18.

The OTAG modeling domain consisted of a fine and coarse grid; and is illustrated in Figure 2 and extended west of the Mississippi River.

---

domains.

Figure 17: The Philadelphia Area Modeling Domain

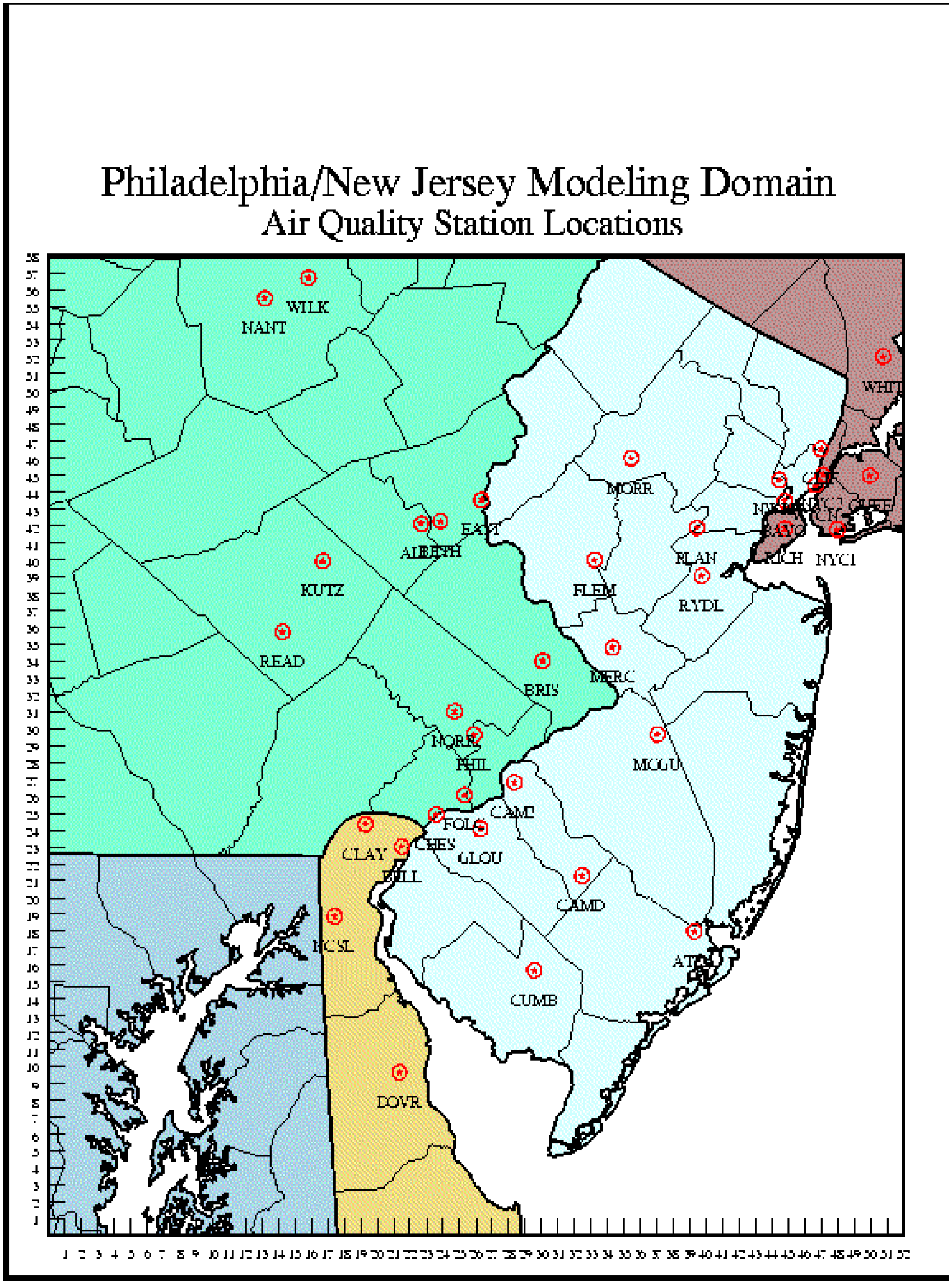
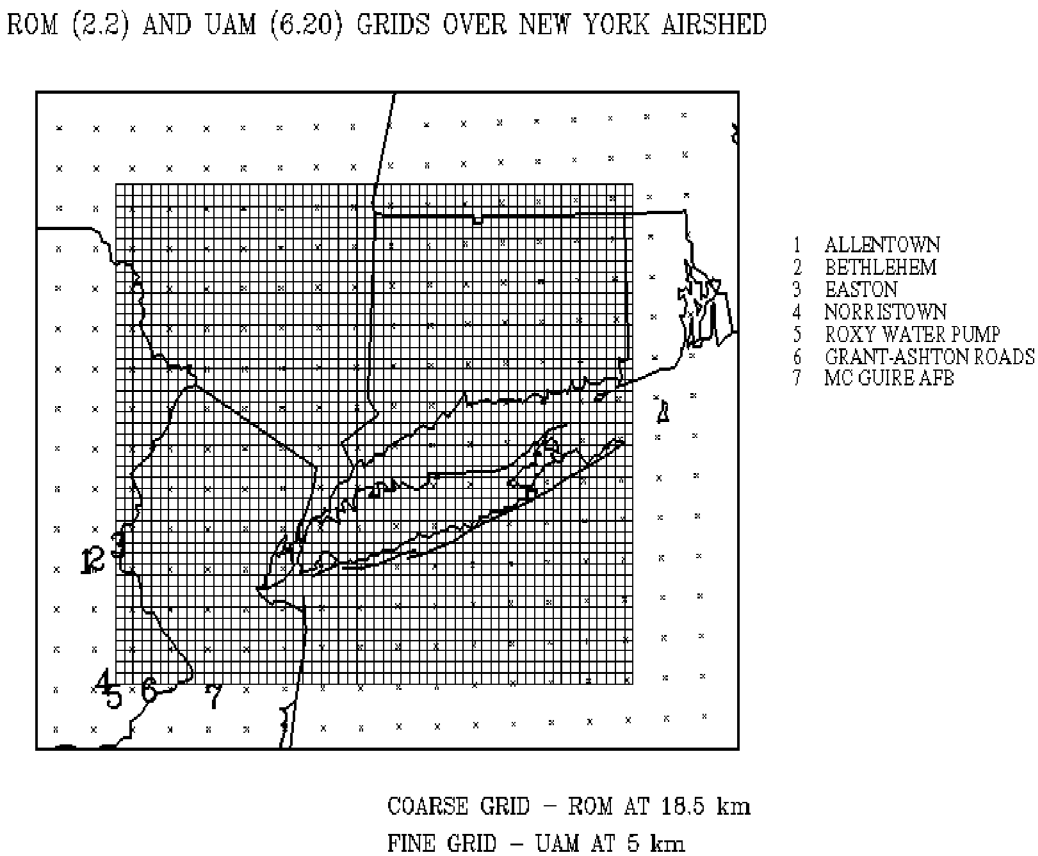


Figure 18: The New York Modeling Domain



(d) Episode Selection

An episode is a multi-day period during which high ozone concentrations are present. The USEPA Guidance[49] recommends the meteorological conditions be considered for episodes with the highest ozone concentrations in the modeling analyses.

The rationale for this consideration, is that if a set of meteorological conditions produced high ozone concentrations in the past, they will in the future. Thus if emission control scenarios are simulated with meteorological conditions favorable to producing the highest ozone concentrations and do not predict exceedences of the ozone health standard, then attainment of the standard would be probable. However, the USEPA 1991 Guidance also suggests consideration of modeling less severe episodes to gain a more comprehensive look at the effectiveness of control strategies.

The Philadelphia area modeling effort targeted to use episodes from 1988, 1991 and 1993. The New York effort used episodes from 1988, 1991 and 1995. Information on these episode selection efforts is provided in Appendices II (New York) and XI (Philadelphia).

Subsequent to the episode selection process for each of the domains, the USEPA devised a ranking methodology for the ozone-forming potential of the meteorological conditions from forty years, 1953 through 1993.[50]

The results of that work are illustrated in Table 2 for various Northeast urban areas, including the cities of Philadelphia (PHI) and New York (NEW). The numbers within Table 4 reflect the severity of the ozone forming potential. It can be seen from Table 4 that 1988 was the year with the highest potential for the Philadelphia area. However, 1991 and 1993 were also relatively severe years, ranking 3rd and 9th respectively. It is important to note that meteorological conditions like the 1988 episode are not predicted to return soon to the Philadelphia area. Based on the formula used in Cox and Chu,[51] the return time is on average once every 62 years, whereas the 1991 and 1993 conditions are expected to be more frequent, with return times of 15 and 5 years respectively.

For the New York area, the 1988 episode was the 2nd highest ranked meteorology, with the 1991 and 1993 episodes also ranking high, i.e., 6th and 7th respectively.

---

[49]The USEPA 1991 Policy.

[50]Cox, W. M. and S. Chu; "Assessment of Interregional Ozone Variation in Urban Areas from a Climatological Perspective," Atmospheric Environment, 30, 1996, pp. 2615-2625, and USEPA Attainment Guidance Policy of 1996. .

[51]Cox, W. M. and S. Chu; "Assessment of Interregional Ozone Variation in Urban Areas from a Climatological Perspective," Atmospheric Environment, 30, 1996, pp. 2615-2625.

Based on more recent work by Cox,[52] the summer of 1995 would also rank high in ozone forming potential severity for both the Philadelphia and New York areas.

Four specific episodes were selected by OTAG for model simulations in order to provide information on a range of meteorological conditions which occur during periods of elevated ozone levels. These episodes are: July 1-11, 1988; July 13-21, 1991; July 20-30, 1993 and July 7-18, 1995. Each of these episodes represent somewhat different episodic characteristics in terms of transport patterns and spatial extent of high ozone concentrations in the eastern US.[53]

For the purpose of estimating ozone reduction benefit from the Regional NO_x cap, all four episodes were considered, but more data was available on the 1991, 1993, and 1995 episodes, for the OTAG control strategy simulations of interest. For the purpose of comparing OTAG modeled results with the design value projections for the Philadelphia Region, considering the 1991 and 1996 USEPA Guidance, the ozone forming potential and frequency of return in the Philadelphia and New York areas, and the OTAG episode selection, the New Jersey focused on the 1991, 1993, and 1995 episodes. Assuming that the meteorological conditions of these three episodes will occur in succession provides a reasonably conservative basis for analyzing attainment for the Philadelphia Region.

For purposes of comparing UAM results with projected design values for the Philadelphia Region, the 1991 episode is used primarily as mentioned above. UAM results were available for the 1988 and 1991 episodes. However while the 1988 episode is indeed the worst case for the area, excessive reliance on it would be overly conservative for ozone attainment demonstration purposes. However, the 1988 episode is considered as a bounding case, and is used to determine sensitivity factors and relative changes.

[52]OTAG 1997a; OTAG Draft Modeling Report, Regional and Urban Scale Modeling Workgroup, February 12, 1997.

[53]OTAG, 1997, Executive Report.

Table 4: Rank Order Statistics at 99th Percentile of Years with Meteorological Conditions Most Conducive to Ozone Formation in 8 Northeast Cities: Baltimore, Boston, Bridgeport, Hartford, New York, Philadelphia, Providence, and Washington DC. (Source: Cox and Chu, 1995)

Year	BAL	BOS	BRI	HAR	NEW	PHI	PRO	WAS	COMBINED
53	2	11	2	9	1	2	12	2	2.0
54	15	31	18	26	9	15	37	4	17.0
55	7	2	1	14	5	4	1	10	3.0
56	19	29	12	40	28	24	14	28	23.0
57	23	23	8	27	8	11	25	7	13.0
58	41	38	17	41	36	40	39	38	41.0
59	25	18	4	21	18	18	24	15	15.0
60	40	19	21	33	37	41	40	41	38.0
61	38	26	27	7	21	36	29	27	29.0
62	27	34	41	36	39	33	41	23	39.0
63	11	6	6	12	13	13	13	17	9.0
64	18	35	34	18	25	20	13	11	22.0
65	31	24	39	8	27	34	16	30	28.0
66	8	25	15	24	10	17	15	6	12.0
67	22	41	37	28	35	31	36	31	36.0
68	10	33	22	19	23	27	23	26	21.0
69	12	28	31	31	41	38	22	20	32.0
70	24	7	29	6	32	26	20	21	19.0
71	35	15	28	5	38	28	19	35	26.5
72	36	36	38	34	40	22	33	39	40.0
73	17	8	9	22	14	16	8	12	11.0
74	37	21	13	23	30	32	28	29	30.5
75	16	10	30	37	22	6	19	13	16.0
76	33	13	32	20	33	25	21	24	26.5
77	5	5	33	15	3	19	3	22	10.0
78	13	20	26	17	34	29	27	33	24.0
79	39	16	35	16	20	39	32	40	33.0
80	3	17	23	13	12	7	2	8	7.5
81	26	22	40	30	26	8	9	19	20.0
82	28	12	20	11	19	21	1 1	18	14.0
83	9	1	16	4	4	5	4	1	3.5
84	14	4	10	10	11	12	1	14	7.5
85	32	40	36	38	31	30	38	25	37.0
86	30	32	25	39	29	23	35	32	34.0
87	20	39	11	29	17	10	18	16	18.0
88	1	3	7	2	**2**	**1**	6	9	1.0
89	29	27	19	35	16	14	26	34	25.0
90	21	37	14	25	15	35	30	36	30.5
91	4	14	5	3	**6**	**3**	5	5	5.5
92	34	30	24	32	24	37	34	37	35.0
93	6	9	3	1	**7**	**9**	7	3	5.5

(e) Meteorological Data Processing

To perform a modeling simulation, numerous meteorological data elements are required. These elements include: i.e., a description of the wind field - including wind speed and direction, a description of the temperature fields, water vapor content as well as cloud cover and solar flux.

In both domains various meteorological models were examined to describe the wind fields, including the ROM-UAM interface system. In the Philadelphia area, the diagnostic wind model (DWM) was chosen, while in the New York domain the CALMET model was selected to describe the windfields.

For the Philadelphia area, meteorological conditions such as wind speed, wind direction, cloud cover, solar radiation and temperature were obtained from a variety of sources, but primarily from National Weather Service (NWS) meteorological stations. All National Weather Service (NWS) meteorological stations within 1° latitude/longitude of the perimeter of the modeling domain and buoy data within 2° latitude of this perimeter were used for the ground level inputs.

Aerometric Information Retrieval Systems (AIRS) data served as a basis for the selection of modeling episodes, and for assessing the ability of the model to replicate an historical episode.

Simulations of all base case episodes were performed with both ROM-derived wind-fields and wind-fields from the DWM. The statistical performance of UAM for these runs is presented in Appendix XI. Mixing height ("diffusion break") fields for each day of the episodes under consideration were obtained using the RAMMET-X and MIXEMUP codes.

These input data to these models were obtained from the numerous surface observation stations in the region. Observation of the parameters above the surface were limited and thereby provides one of the uncertainties in the analysis.

For the New York areas, two methods, CALMET and ROM-UAM interface, were used to provide the necessary gridded meteorological parameters. The data bases and the application of CALMET and ROM-UAM to obtain three dimensional wind fields and other scalar meteorological parameters was described in a New York Report.[54]

[54]NYDEC, 1994b. New York Urban Airshed Modeling for July 16 to 20, 1991 Base Case NYSDEC, Albany, New York 1994.

(f) Emissions Processing

During the period when the photochemical grid modeling was performed, the states developed and refined their estimates of emissions in their states. In fact some of the initial modeling was performed using the USEPA Interim Emission Inventory[55] while the OTAG work was performed using the latest (at that time) inventory estimates from all the states in the OTAG modeling domain. While in total, the inventories were very close, some localized differences do exist which may cause slightly different results.

In the modeling exercises, various types of inventories are needed. These inventories include a base case which serves in most cases as the “parent” inventory off which many other inventories are based. The other types of inventories used include: model performance studies which are specific for an evaluation period; and future year inventories to judge the effectiveness of the control strategies under investigation. In some cases the future year, 2005 in the Philadelphia area, and 2007 in the New York area, is referred to as the future base case. This future base case, includes emissions growth due to any projected increase in economic activity as well as the implementation of existing control measures.

For specific information regarding the emission inventories used in the analyses, see Appendix XI for the Philadelphia area, Appendix II for the New York area and the OTAG Emission Data Base Inventory for the regional modeling efforts.

In general, the states provide a typical day - county specific estimates of the various inventory components, as well as emission estimates from the largest stationary sources. The photochemical grid models require emission estimates in each grid cell for each hour simulated. To transform the county specific emission estimates into day specific hourly estimates for each grid cell, several emissions models were used. In the local UAM-IV efforts, the Emissions Preprocessor System (EPS) was used. Day-specific emissions from biogenic sources were obtained from the ROM-UAM interface system. For the OTAG regional modeling effort, the Emission Modeling System (EMS-95) was used. In addition to geographically transforming the county specific estimates to grid cell estimates, the models also estimate the daily emissions flux as well as the speciation of the emissions. (The states usually provide data for broad categories of emissions, volatile organic compounds (VOC), and oxides of nitrogen (NO_x).) Unless, day specific information was available, the default daily emission profiles and speciation profiles were used in all the modeling analyses.

[55]EPA, 1993; Regional Oxidant Modeling of the 1990 Clean Air Act Amendments; Default Projections and Control Data, Draft, EPA Contract No. E8-DO-0120.

(g) Initial and Boundary Conditions

The objective of a photochemical grid model is to estimate the air quality given a set of meteorological and emissions conditions. When "starting" a modeling simulations, the exact concentration fields are unknown in every grid cell for the "start time". Therefore, typically photochemical grid models are "started" with clean conditions within the domain and allowed to stabilize before the period of interest is simulated. In practice this is accomplished by starting the model two to three days prior the period of interest.

The winds move pollutants into, out of, and within the domain. The model handles the movement of pollutants within the domain and out of the domain. An estimate of the quantity of pollutants moving into the domain is needed. These are called boundary conditions.

To estimate the boundary conditions for the local UAM-IV modeling efforts, a regional photochemical grid model was used. In the early analyses, boundary conditions were derived from the Regional Oxidant Model (ROM) for the future base case as well as for various control measure evaluation scenarios. In the later work, the results of the OTAG work was used to estimate boundary conditions from the UAM-V photochemical grid model. Given that the information in the regional model is computed on a much coarser grid, i.e., ROM utililized at 18.5 km x 18.5 km grid with three vertical layers, the data needs to be interpolated to UAM-IV's finer grid resolution, 5 km x 5 km horizontal grid with five vertical layers). When the ROM results were utilized, the ROM-UAM Interface system was utilized; with the UAM-V regional model the extract_bc software was utilized.

As a best estimate of the USEPA regional NO_x cap, the OTAG Round 2/Run 5 was used to estimate future year boundary conditions. The Round 2/Run 5 simulation was chosen because it best estimated the control programs, the USEPA used[56] in developing its proposed NO_x cap budget. For more specific information on the OTAG simulation, see Appendix III. Round 2/Run 5 includes a 0.15 lbs/mmBTU NO_x emission control limit on utilities (or an 85% reduction from 1990 levels if that is less stringent).   The USEPA proposal has the 0.15 lbs/mmBTU limit alone and thus may be somewhat more stringent regarding this sector. Round 2/Run 5 also includes limits on NO_x emissions from large non-utility boilers (up to a cost of $1,000/ton removed) and certain controls on off-road vehicles (Federal locomotive standards and a 4 gm emission standard on heavy duty internal combustion engines). Comparable emission reduction requirements are included in the USEPA regional NO_x cap proposal. Finally, Round 2/Run 5 includes a National Low Emission Vehicle Program (NLEV), which is also incorporated in USEPA's Regional NO_x cap proposal.

[56] 62 Fed. Reg. 60317 (November 7, 1997).

(h) Diagnostic Analyses

For the Philadelphia - Southern and Central New Jersey region, diagnostic testing of the base case episodes followed the quality assurance testing outlined in the protocol. A range of statistical measures and analytical methods and tests that were considered for implementation, depending on the availability of data and resources.

To aid in the interpretation of the simulation results, predicted and observed ozone concentration maps were constructed for each base case episode. Concentration maps present spatial information on the structure of the ozone plume. Maps at one or two hour intervals were constructed over the periods of interest. While a typical period might be defined as early morning to late afternoon for the day of highest ozone, it is useful to look at more time intervals under recirculation, stagnation, and transport conditions.

Basic diagnostic tests were considered as part of a standard operational model evaluaton and therefore complement and extend the various numerical and graphical measures of model performance by providing a straightforward measure of model robustness. These basic tests include using zero emissions, zero boundary conditions and various percentage reductions in mixing height and wind speed estimates. More elaborate diagnostic analysis test involve sensitvity-uncertainty studies that examine model responses to a range of variation in input parameters, e.g., various changes in emision levels, in emission speciation, etc. All diagnostic steps were documented, to avoid misinterpretation of model performance results (See Appendix XI). Once confidence was gained that the simulation is based on reasonable interpretations of observed data, and model concentration fields generally track, spatially and temporally, know urban scale plumes, performance evaluation based on numerical measures were conducted for each base case eipsode. Details on these efforts can be found in Appendix XI for the Philadelphia-Southern and Central New Jersey region and in Appendix II for the New York-Northern New Jersey and Sourthern Connecticut region.

(i) Performance Evaluation

In order to evaluate model performance, simulated ozone concentrations were compared with ozone measurements recorded during the actual episode at monitoring stations throughout the domain. These comparisons are made to determine how well the model reproduces spatial and temporal features of the ozone field. In addition, sensitivity tests (systematically changing model inputs such as boundary conditions or mixing heights) were performed to investigate whether the model were responding in a logical fashion.

Once it has been determined that the UAM-IV is performing adequately, it can be used to evaluate proposed emission control strategies. Boundary emissions simulated with ROM (based on new control strategies), as well as changes in emissions with the domain are combined with meteorological conditions from the base cases to simulate ozone concentrations.

The performance of the model was analyzed using a series of graphical and numerical measures to determine overall model performance in replicating observed ozone concentrations and patterns including ozone precursors.

For the Philadelphia area local modeling, such an analysis was completed and results show adequate performance. A detailed discussion is included in Appendix XI, Ozone Research State Implementation Plan Technical Support Document.

For the Philadelphia local area, while a number of measures are used to assess the accuracy of peak estimates including bias, error and variance, the simplest method is to compare measured data to predicted concentrations at the same location. Comparative plots from predictions and observed data for July 20, 1991 are shown in the Appendix to the Philadelphia Phase II Ozone SIP[57]. While the observed concentrations are plotted across the Philadelphia area, the predicted concentrations are shown for the entire modeling domain. The winds on the last day of this three-day episode that was modeled were predominantly westerly. Thus the measured and predicted maximum ozone concentrations are found downwind of Philadelphia in eastern central New Jersey. Though the model does an adequate job representing the distribution of ozone levels in the area, the model does tend to over predict concentrations in the central New Jersey area. Unfortunately, no monitors are located to validate the high predictions east of central New Jersey (Ocean county), where the predicted concentrations are as high as 180-190 ppb. Areas immediately upwind did measure 148 ppb where the model is predicting 160-170 ppb. Typically, one cannot compare observed concentrations to predicted concentrations at every modeling grid, due to lack of an extensive modeling network. Furthermore, the predictions from the model are volume-averaged for the entire grid (5 x 5 sq. Km), and the observed values depict the atmospheric concentrations at a specific point. However, the extent that the domain-wide peak predictions exceed the measured values, particularly without regard to the actual location of the peak, indicates the tendency of the model to over predict peak values while adequately representing the spatial distribution of ozone concentrations. More specifically, the measured and predicted peak ozone concentrations are 148 and 190 ppb respectively in central New Jersey.

The resulting overprediction led to the development of the design value methodology as a measure of estimating future air quality concentrations.

[57]Pennsylvania Department of Environmental Protection Proposed Phase II Ozone SIP Submittal, January 1998 [Figure 14, 15]

For the New York Region, several photochemical grid modeling studies were conducted in the Northeastern United States to provide an improved understanding of the physical processes leading to high ozone episodes and potential strategies for ameliorating them. The Urban Airshed Model (UAM) has been used in studies specific to the New York metropolitan area in the 1980's[58]; and again in the 1990's[59] to support the Clean Air Act's requirement for Connecticut, New Jersey and New York to use photochemical grid modeling in the 1994 state implementation plans (SIPs). These, and other observational studies indicated that atmospheric transport of ozone and precursors across state lines was precluding the ability of states to demonstrate attainment without adoption of regional strategies.

The environmental agencies from Connecticut, New Jersey and New York agreed in 1991 to cooperatively participate in a joint modeling exercise whereby the New York Department of Environmental Conservation (NYDEC) would take the technical lead with the UAM-IV model and New Jersey and Connecticut would help provide direction, data and review. NYDEC published reports documenting the modeling protocol to be followed[60]; the selection of meteorological episodes conducive to high ozone formation[61]; and a summary report evaluating model performance for the base period, emissions and additional simulations.[62]

More specifically, UAM simulations were performed for the 1988 episode within both the CALMET and ROM-UAM meteorological data sets. In general, the observed ozone plume appears to be better tracked by the CALMET based simulation than that based upon ROM-UAM. Both simulations tend to overpredict or under predict by about 15 to 20% depending upon the episode day with the exception of July 9, 1988 for which both simulations overpredict significantly. In general, ROM also tends to overpredict with respect to the observed concentrations similar to CALMET.

Application of model performance measures recommended by the USEPA indicate that both simulations are within the suggested limits for acceptance. Other performance measures indicate similar results. The correlation coefficients between the observed and the predicted concentrations paired in space and time are slightly better for the

[58](Rao, et al, 1989)

[59](NYDEC, 1992 and NYDEC, 1994a-d).

[60](NYSDEC, 1992)

[61](Catalano and Wholean, 1992a and b).

[62](NYDEC, 1994a and b).

CALMET based simulation than that based upon the ROM-UAM simulation.[63]

A re-assessment of modeling for the New York Airshed with initial and boundary conditions data obtained from the OTAG for the July 1988, and July 1991 episodes has also been performed. Boundary conditions in this re-assessment are from the most stringent OTAG strategy identified as Run 2, while emissions are the same as those used in the previous NYDEC modeling from the OTC/ROM Case E. Simulations were performed with the Urban Airshed Model, version IV (UAM-IV). Sensitivity simulations were again performed with the new OTAG boundary conditions and no anthropogenic emissions within the domain. More detailed information on the nature of these efforts is provided in Appendix II.

B. Attainment Demonstration Results for the 1-hour Ozone Health Standard

This Section discusses two approaches that will be presented to demonstrate attainment of the 1-hour ozone health based National Ambient Air Quality Standard. These are the design value projection analysis and a photochemical grid model approach using UAM-IV. The results are separated by the two regions which are applicable for New Jersey.

(1) Philadelphia Region

The attainment date for the Philadelphia region is 2005.

(a) Design Value Projection Analyses

In summary, this approach utilizes the current measured ozone design values for the region and subtracts from them the projected ozone concentration reductions from further implementation of Clean Air Act measures and the USEPA's proposed Regional NO_x cap. A summary of the analysis follows. The full details of the approach are presented in Appendix I.

(b) Starting point (Current Ozone Levels)

From Figures 9 and 11 it can be seen that the measured design values for the past five (5) years at the New Jersey sites affected by the Philadelphia ozone plume with the exception of one recent value of 149 ppb at the Colliers Mills monitoring site for 1997, are all below 140 ppb. The maximum design values for the other monitoring sites in the Philadelphia Region have likewise trended below 140 ppb with the exception of one recent value of 145 ppb at the Cecil county, MD site. Therefore, 140 ppb is a reasonably conservative figure that reflects the Region's current ozone design levels.

[63]NYSDEC, 1994; New York Airshed: EPA-OTC 2005 Base and Case-E Scenario for July 16 to 20, 1991 Meteorological Episode, NYSDEC, Albany, N.Y.

The uncertainty introduced by the Colliers Mills reading in 1997 is discussed later.

(c) Projection of the Air Quality Benefits from Further Implementation of Clean Air Act Measures

The projected benefits from further implementation of Clean Air Act measures from 1997 to the year 2005 were found by using the results of photochemical grid modeling using the UAM-IV model. Since the simulations were performed with an early version of the emission inventory which is slightly different than the current state inventories, a scaling methodology was developed to relate the projected air quality benefits to the emission changes currently predicted.

This scaling methodology involved determining a set of sensitivity factors for the region, i.e., the ozone concentration reduction per (%) percentage emission reduction. The sensitivity factors were then multiplied by a more up to date estimate of the emission reductions expected from 1997 to 2005 to yield an estimate of the ozone air quality benefits. The derivation of the sensitivity factors are described in detail in Appendix I. The resulting sensitivity factors are 0.27 ppb per % NO_X emission reduction and 0.22 ppb per % VOC emission reduction.

The emission reductions expected from continued implementation of the Clean Air Act between 1997 and 2005 are 24 % for NO_X and 20 % for VOC (relative to 2005 emission levels). These estimates were obtained from emission inventory work performed by Pechan and Associates, Inc for the USEPA for the Philadelphia Region.[64] Full documentation of the estimation methods is found in Appendix I, Section B.

Multiplying the sensitivity factors by the expected emission reductions is expected to result in a projected peak value benefit of 11.0 ppb, Table 5.

[64]Pechan, 1997; OTAG Emission Inventory Development Report, E.H. Pechan and Associates, Inc. June, 1997, and supplementary transmittal from Pechan, dated 1/20/98.

Table 5: Projected Reduction In the 1-Hour Maximum Ozone Concentration in the Philadelphia Region From Further Clean Air Act Implementation

	Sensitivity Factors ppb ozone/% Emission Change X	% Emission Change 1997-2005 =	Air Quality Benefit (ppb Ozone)
VOC	.22	20.5%	4.5
NO_X	.27	24%	6.6
Total			11.0 ppb

(d) Projection of the Air Quality Benefit from the USEPA's Proposed Regional NO_x cap

As discussed in Section IV.A(1), the ozone concentration differences between OTAG's 2007 base case runs, which reflect Clean Air Act implementation, and OTAG's Round 2/Run 5 simulations which approximates the benefit of Clean Air Act implementation and the proposed USEPA Regional NO_X cap, are used to determine the benefits of the proposed Regional NO_x cap for the Philadelphia Region.

Based on a visual examination of the mapped ozone concentration and ozone concentration differences between Clean Air Act and Round 2/Round 5 simulations for the 1991, 1993 and 1995 episodes, a projected benefit of 15 ppb to the peak 1-hour maximum ozone concentration is reasonable. The ozone concentration maps used are presented in Appendices V, VI, and VII. The OTAG-modeled "difference" results between the two scenarios are presented in Appendix VIII.

(e) Adjustment of the Modeled Maximum 1-hour Benefit to the Design Value Benefit

The photochemical grid modeling efforts are projecting a 1-hour ozone concentration reduction of 11.0 ppb from further implementation of Clean Air Act measures, and a 15 ppb from the USEPA Regional NO_X cap. However, the approach here requires an estimate of the benefit in ozone design value, in order to subtract that benefit from the current ozone design value of 140 ppb.

Changes in the design value may not respond identically to changes in the 1-hour peak or maximum concentration. Therefore an adjustment to the 1-hour maximum benefits defined above is made before subtracting those ozone concentration benefits from the current design value of 140 ppb. The factor to be used in making that adjustment is 0.78 or 78 % as derived in Appendix I, Section D.

Applying this factor to the maximum peak benefits of 11.0 ppb and 15 ppb derived above expected results in an 8.6 ppb design value benefit from further Clean Air Act implementation and 11.7 ppb benefit from the regional NO_X cap.

(f) Projected Design Value in 2005

The results of the design value projection analysis are summarized in Table 6. The projected ozone design level in 2005 is 120 ppb. Since attainment is based on a 124 ppb criteria, the analysis shows that attainment for the Philadelphia Region by 2005 is a reasonable outcome. This assumes full implementation of all Clean Air Act measures and implementation of the USEPA Regional NO_X cap[65].

---

65 62 Fed. Reg. 60317 (November 7, 1997).

Table 6: Projected Ozone Design Levels for the Philadelphia Region in 2005 (ppb)

Contributions to Projected Levels	Ozone Levels
Current Ozone Design Level	140 ppb
Projected Benefit from further Implementation of Clean Air Act Measures	8.6 ppb
Projected Benefit from Regional NO_X Emission Reduction Program	11.7 ppb
Projected Ozone Design Value in 2005	120 ppb

There is however some uncertainty in this projection particularly as regards the Colliers Mills site. The design value analysis assumed a maximum current design value of 140 ppb, which from Figure 9, represents the dominant trend for the New Jersey sites in the region, including Colliers Mills, over the past several years. However the Colliers Mills site had a 149 ppb design value reading in 1997, thereby raising the design value for the 1995-1997 period. If that level were to continue for the next several years, and the projected design value benefit for the region of 20 ppb, shown in Table 6 occurs, the projected design value would be 129 ppb in 2005, 5 ppb above the criterion. On the other hand, the 1997 reading may be somewhat of an anomaly, because it was less than 140 ppb prior to 1997, and the OTAG modeling may have underestimated the degree of ozone transport[66], and consequently the projected design value benefit from a Regional NO_x cap may likewise be underestimated here. Given this uncertainty the Department has committed to revisit the issue by 2002 in the mid course correction process (Section VIII).

As mentioned above, for the Philadelphia area design value projection analyses, a starting point of 140 ppb was assumed to represent the Philadelphia airshed. However, if the Colliers Mills design value readings of 149 ppb for the 1995-1997 period are considered as the starting point for the design value projection analyses, that site would be predicted to be at 20 ppb less after Clean Air Act and Regional NO_x cap implementation or 129 ppb (See Table 6). That would leave the need for an additional 5 ppb in design value to be achieved, or 5/0.78=6 ppb in peak value. Limited OTAG air quality modeling runs are available for emission reductions going beyond the Regional NO_x reduction program. Two runs were made for the 1991 episode simulating additional 60% NO_x and 60 % VOC reductions in the Northeast corridor (Figures 28 and 29) beyond OTAG Run I. Run I approximates the effect of the Regional NO_x cap program. It can be noted that peak value benefits to the Philadelphia Region from the additional 60% VOC reduction scenario are moderate, on the order of

[66]"Earth Tech, 1997, "Assessment of UAM-V Model Performance in Northeast Region of OTAG Episodes", March 1997. Earth Tech Inc., Concord, Massachusetts.

4-12 ppb, however, the OTAG Regional model may not fully reflect the localized impacts of VOC emissions on peak ozone values. The benefits from the additional 60% NO_x reduction scenario are 20-28 ppb. For illustrative purposes, assuming NO_x reductions only, and using 24 ppb as the average benefit from the additional 60% NO_x reduction scenario this equates to the need for an additional 6/24x60=15% NO_x reduction relative to Run I levels, or about 7.5% additional NO_x reductions relative to 1990 NO_x emission levels, for the area defined by subregion 1, 2, and 3 in Figure 21.

Therefore, although the Colliers Mills is from a regulatory standpoint not within the Philadelphia non-attainment area, the monitoring data from the site will be closely tracked. If design levels around 149 ppb were to persist in the next several years, New Jersey would revisit the issue for its mid-course review report scheduled for 2002 (see Section VIII).

There are other important conclusions and considerations to be drawn from Table 6. First, it is important to remember that the projected benefit of about 8.6 ppb in design value from Clean Air Act measures only reflects the benefits from 1997 to 2005. Had an estimate been made of the full air quality benefit from Clean Air Act measures alone from 1990 to 2005, it is likely to be on the same order or higher than the projected benefits from a Regional NO_X cap. Therefore for the Philadelphia Region, both local emission reductions and broader regional NO_X emission reductions are equally important in reaching air quality goals. Neither approach by itself would result in a projected design value below 124 ppb.

Second, the projected benefit of about 11.7 ppb in design value from broad regional NO_x emission reductions assumes essentially full program implementation by the 2003 time frame, since the ozone measurements from 2003 to 2005 will determine the actual design value in 2005. Although the USEPA Regional NO_X cap proposal would provide for full implementation by 2002, the USEPA is considering comments on implementation dates from 2002 to 2004. If significant emission reductions come after 2002 the full 11.7 ppb benefit in design value may not be realized until after the statutory attainment date. This places added importance on realizing the full (9 ppb) benefit from further Clean Air Act measures, and retaining the 2002 Regional NO_x Program implementation date.

(g) Other Anticipated Benefits of Clean Air Act Measures and the NO_x Cap Rule

As discussed above, attainment of the 1-hour ozone standard is based on the number of days exceeding the standard over a consecutive three year period. Health effects from ozone however depend on the ozone concentrations, the number of hours and days with high ozone concentrations, and the population that is exposed to unhealthy ozone levels. The land area of a state or region experiencing higher ozone levels is another indicator of the pervasiveness of ozone exposure and a first approximation for the population exposed.

Therefore, in addition to presenting the benefits on the regulatory standard, it is important to review expectations for these other factors to the extent the available data permits.

(1) Number of Hours of Higher Ozone Levels

The anticipated trend in the reduction in the time of exposure to unhealthy levels in the OTAG Southern Corridor Region (Figure 21) as Clean Air Act measures and a Regional NO_x Program are fully implemented is presented in Figures 19 and 20. Expected reductions in the number of episode-hours above 120 ppb for the 1995 and 1991 episodes are illustrated in Figures 19 and 20. These Tables were created from tabular results from the OTAG data clearinghouse web site. They depict results for the Southern Corridor Region, or Subregion 03, as shown in Figure 21. That subregion encompasses much of the "Philadelphia-Southern and Central New Jersey Region" as used in this report, but extends much further into Maryland, Delaware, and Pennsylvania. As such, the results of Figures 19 and 20 should be reviewed for trend information, i.e., the relative reductions in number of hours above 120 ppb between scenarios, not for absolute values on the number of hours of exposure above 120 ppb for the Philadelphia Region.

Figure 19: Predicted Number of Hours Above 120 PPB in 2007 in the Southern Corridor for the 1995 Episode-Days

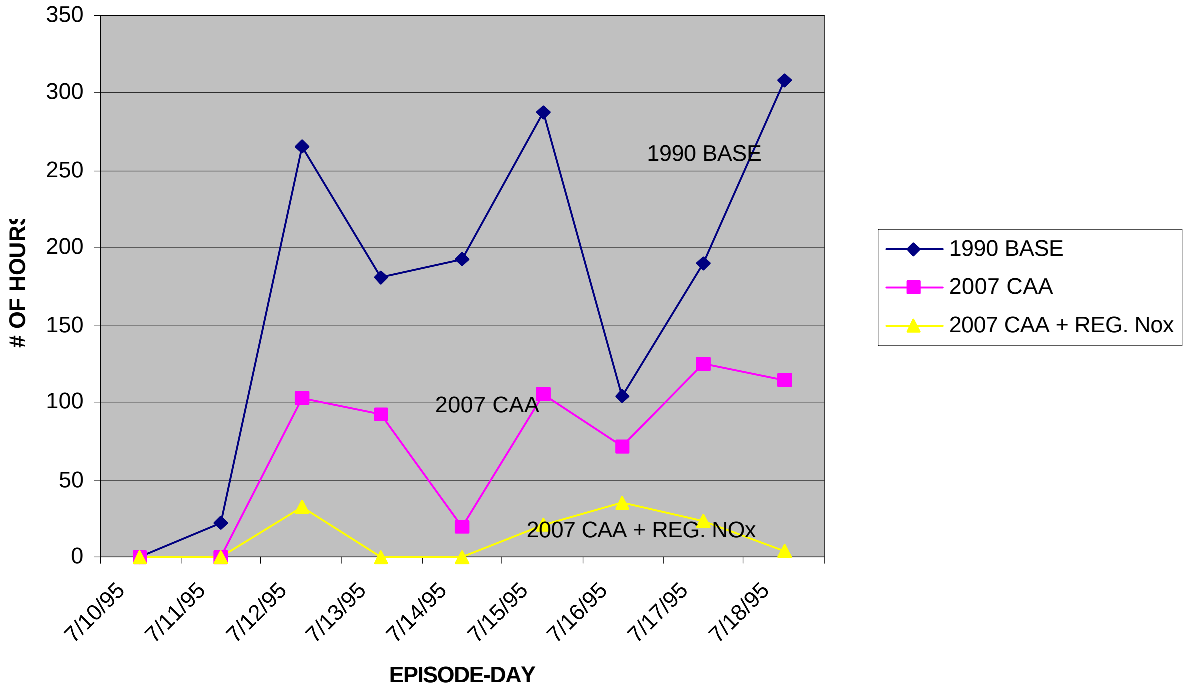


Figure 20: Predicted Number of Hours Above 120 ppb in 2007 in the Southern Corridor Region for the 1991 Episode-Days

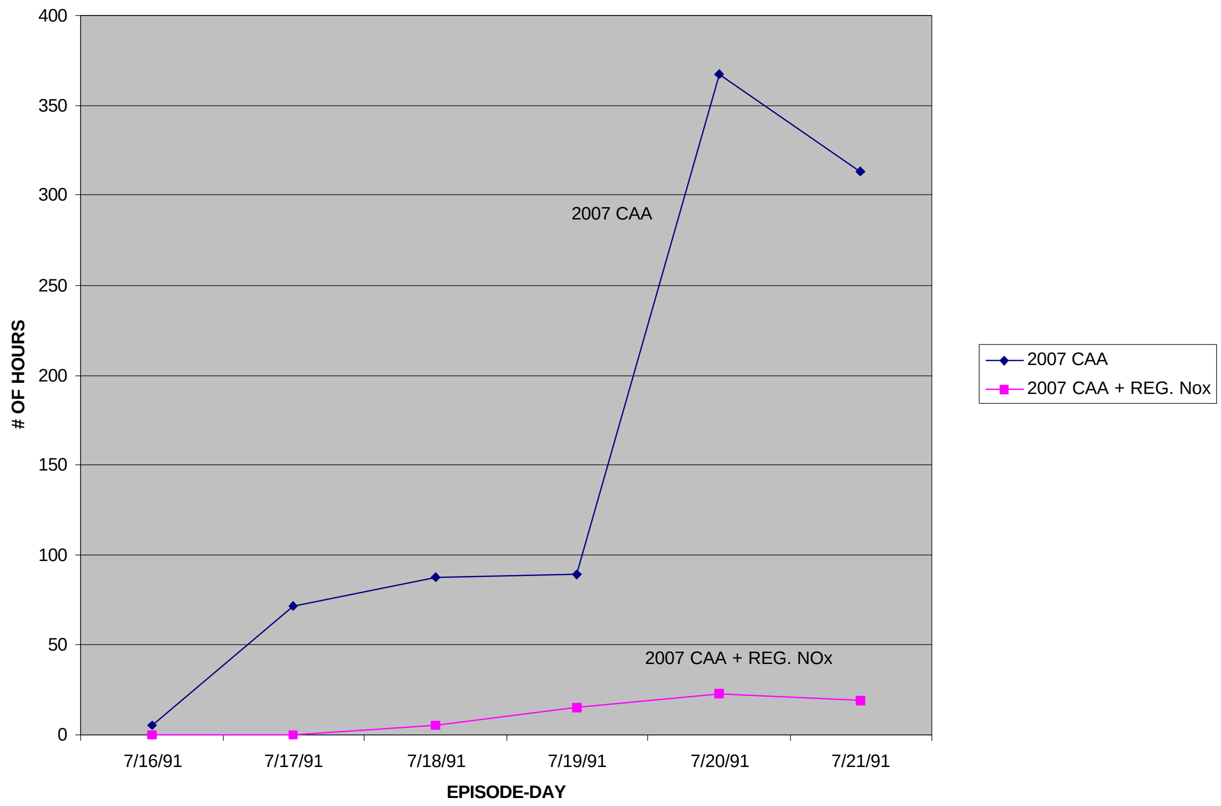
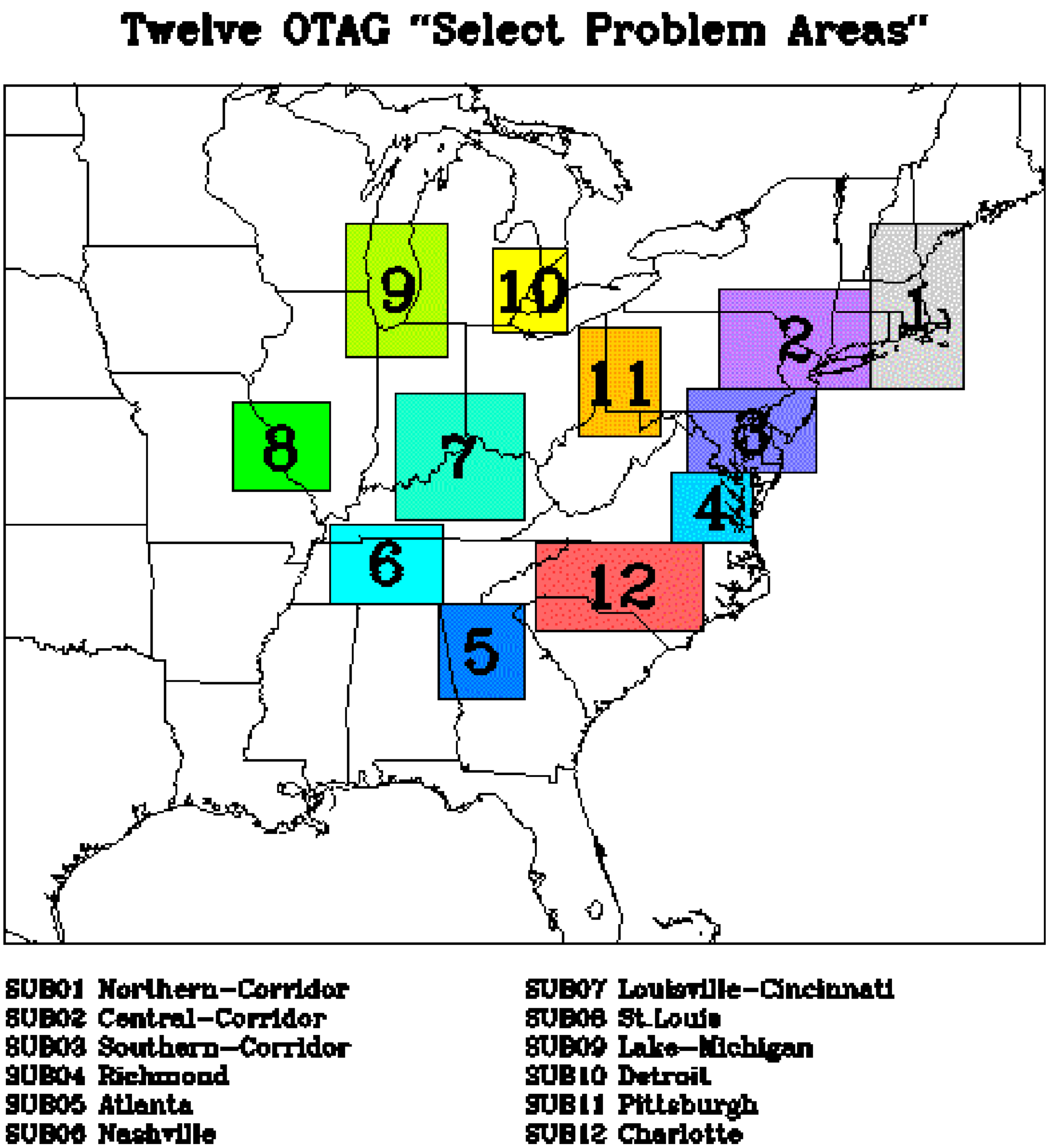


Figure 21: Twelve OTAG "Select Problem Areas"



The trend results in Figures 19 and 20 for the Southern Corridor Region are expected to be similar to those expected in the Philadelphia Region. On a number of 1995 episode days, 95% reductions are achieved for Clean Air Act and Regional NO_X cap implementation scenario as compared to 1990 Base Case simulations. Relative to the 2007 Clean Air Act only scenario simulations, additional reductions of about 75% are expected from the Regional NO_X cap. Even greater percentage reductions relative to the 2007 Clean Air Act simulation occur for the 1991 episode, as illustrated in Figure 20. (note: for the 1991 episode, 1990 Base Case data was not available).

(2) Aerial Extent

Another measure of the pervasiveness of ozone events is the extent of the land area above which ozone concentrations exceed standards. The predicted reductions in the extent of land area affected are illustrated in Figures 22 and 23 where the number of grid cells within the same Southern Corridor described above with modeled ozone concentrations above 120 ppb is presented for the 1995 and 1991 episodes respectively. For perspective, a single grid cell is 12km by 12km or 144 square kilometers, while the southern Corridor Region as a whole is about 62,000 square kilometers. Therefore a single grid cell is about 0.23% of the land area of the Southern Corridor Region.

From Figures 22 and 23 it can be seen that significant deceases in areal extent occur a result of Clean Air Act and Regional NO_X cap implementation. For the 1995 episode, up to 90 % decreases in the number of grid cells above 120 ppb are not uncommon when comparing the results for both Clean Air Act and Regional NO_X cap implementation to those for the 1990 base case. For both the 1995 and 1991 episodes, 65 % reductions relative to 2007 Clean Air Act results occur as a result of the Regional NO_X cap.

Figure 22: Predicted Number of Grid Cells Above 120 PPB in 2007 in the Southern Corridor for the 1995 Episode Days

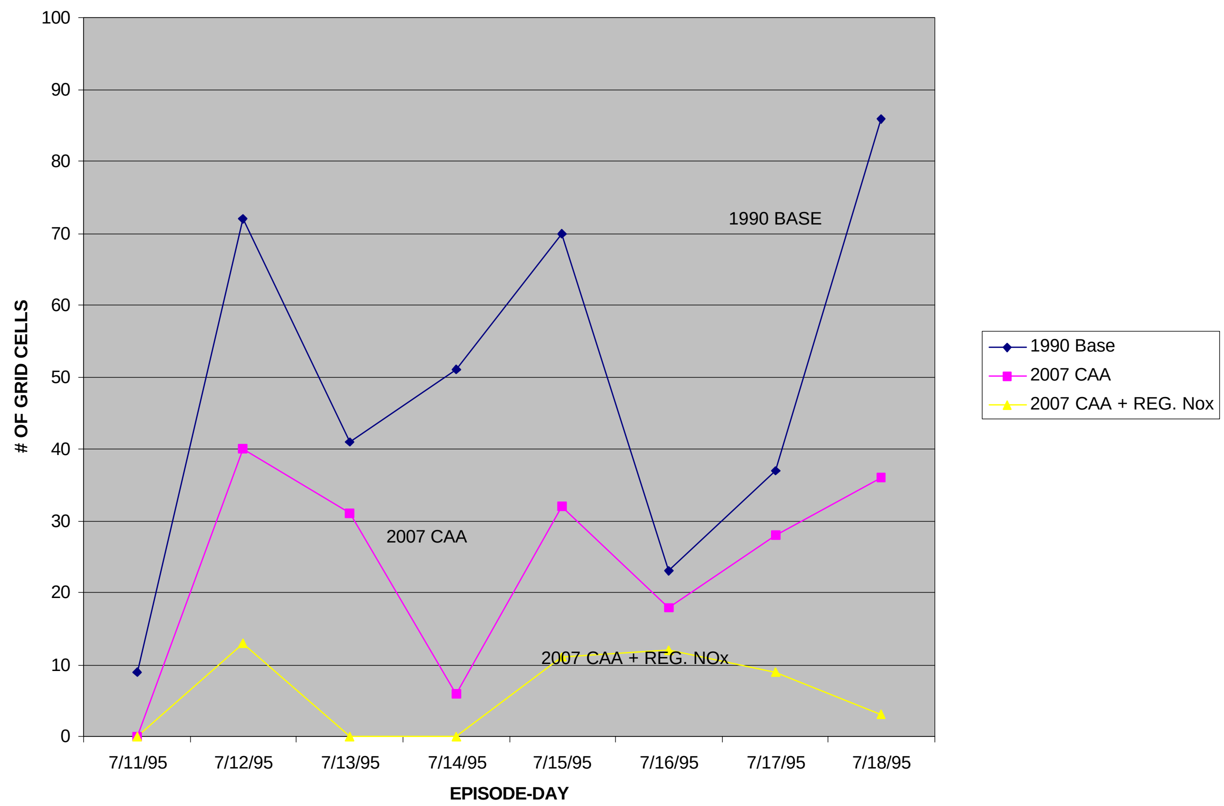
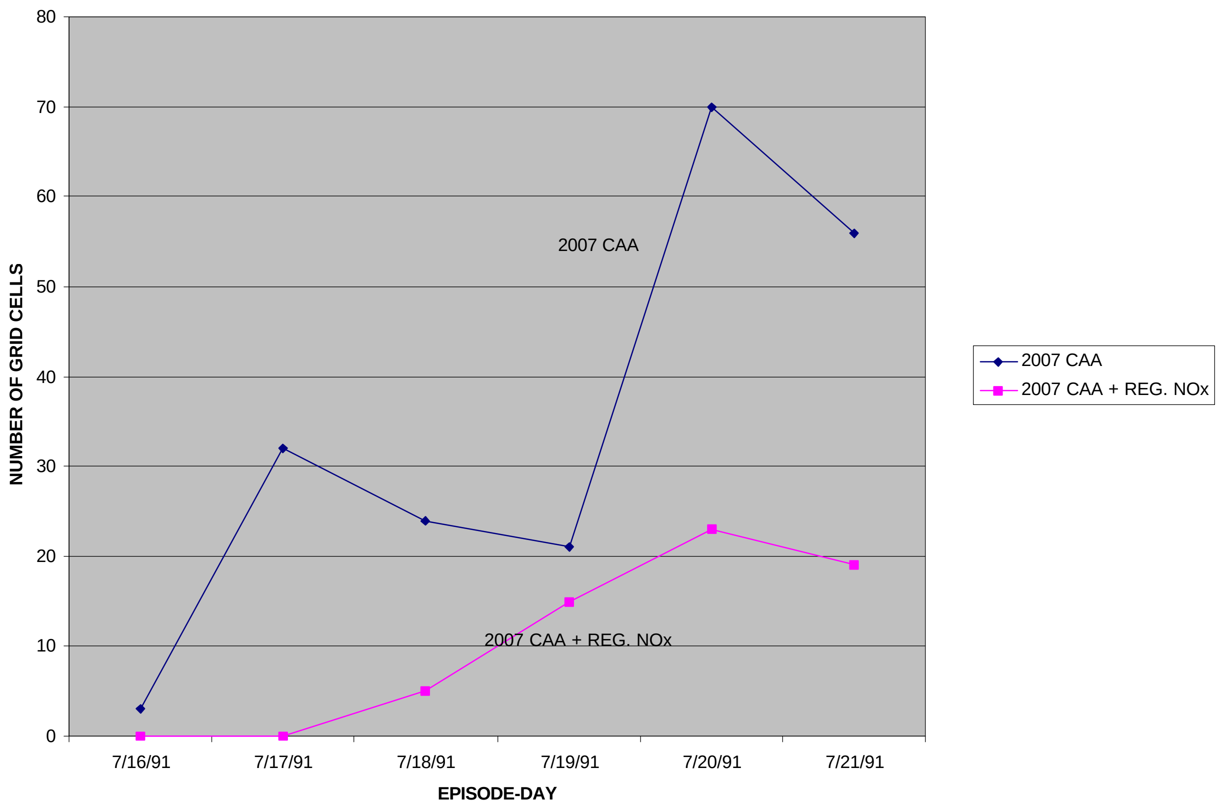


Figure 23: Predicted Number of Grid Cells Above 120 PPB in the 2007 Southern Corridor Region for the 1991 Episode-Days



(h) Photochemical Grid Modeling Approach; Philadelphia, Southern and Central New Jersey Area

Both local modeling simulations using UAM-IV and regional modeling simulation using UAM-V exist. While the use of a regional model in an attainment test may not be fully appropriate because of the grid resolution, it does provide some insight in the analysis.

The design value projection approach relied on actual, current ozone measurements (design values) and modeled differences in ozone concentration resulting in a projected design value of 120 ppb by the year 2005. Another method to project attainment is to use a photochemical grid model to estimate ozone air quality concentrations in the attainment year.

If the 1991, 1993, and 1995 meteorology were assumed to reoccur successively as the attainment year is approached, then by definition of the design value, attainment would be determined by the 4th highest episode-day for those three years. As presented in Table 7 there are two (2) days of the combined 22 episode-days where the ozone concentrations are between 130-145 ppb. There are nine (9) days in the 115-130 ppb range. Therefore 4th highest episode day of the OTAG modeled 1991, 1993, and 1995 episodes assuming Clean Air Act and Regional NO_x cap implementation is in the 115-130 ppb concentration range. This is compatible with the projected design value of 120 ppb determined from the above design value projection analyses.

Local UAM IV simulations of the Philadelphia domain were available with emission reductions comparable to Clean Air Act and Regional NO_X cap implementation for July 19 and 20, 1991[67]. The results from these simulations are provided in Figure 24 and 25. The maximum 1-hour ozone concentrations for the Philadelphia Region from the UAM IV simulations are summarized and presented with similar results from the OTAG effort in Table 8.

[67]ORC, 1996; Sensitivity Modeling for Southeastern Pennsylvania Ozone Stakeholders, Ozone Research Center, Piscataway, NJ, November 5, 1996.

Table 7: Number of Episode-Days within OTAG Ozone Concentration Ranges- Philadelphia Region

Control Scenario	Episode (# of days)	# of episode-days with maximum 1 hour conc. in the range: 145-160 ppb	# of episode-days with maximum 1 hour conc. in the range: 130-145 ppb	# of episode-days with maximum 1 hour conc. in the range: 115-130 ppb	# of episode-days with maximum 1 hour conc. in the range: 100-115 ppb	# of episode-days with maximum 1 hour conc. in the range: less than 100 ppb
2007 with Full Clean Air Act Controls	1991 (5) 1993 (8) 1995 (9)	2 - 0	0 - 6	3 - 0	0 - 1	0 - 2
	Combined	min 2	min 6	min 3	min 1	min 2
2007 with Clean Air Act Controls and Regional NO_X Controls	1991(5) 1993(8) 1995(9)	0 0 0	2 0 0	2 1 6	1 2 1	0 5 2
	Combined Episodes (22)	**0**	**2**	**9**	**4**	**7**

Tables included outside the Philadelphia Region.

Figure 24: Daily Maximum Predicted Ozone Concentrations for the Philadelphia/New Jersey UAM Domain; July 19, 2005

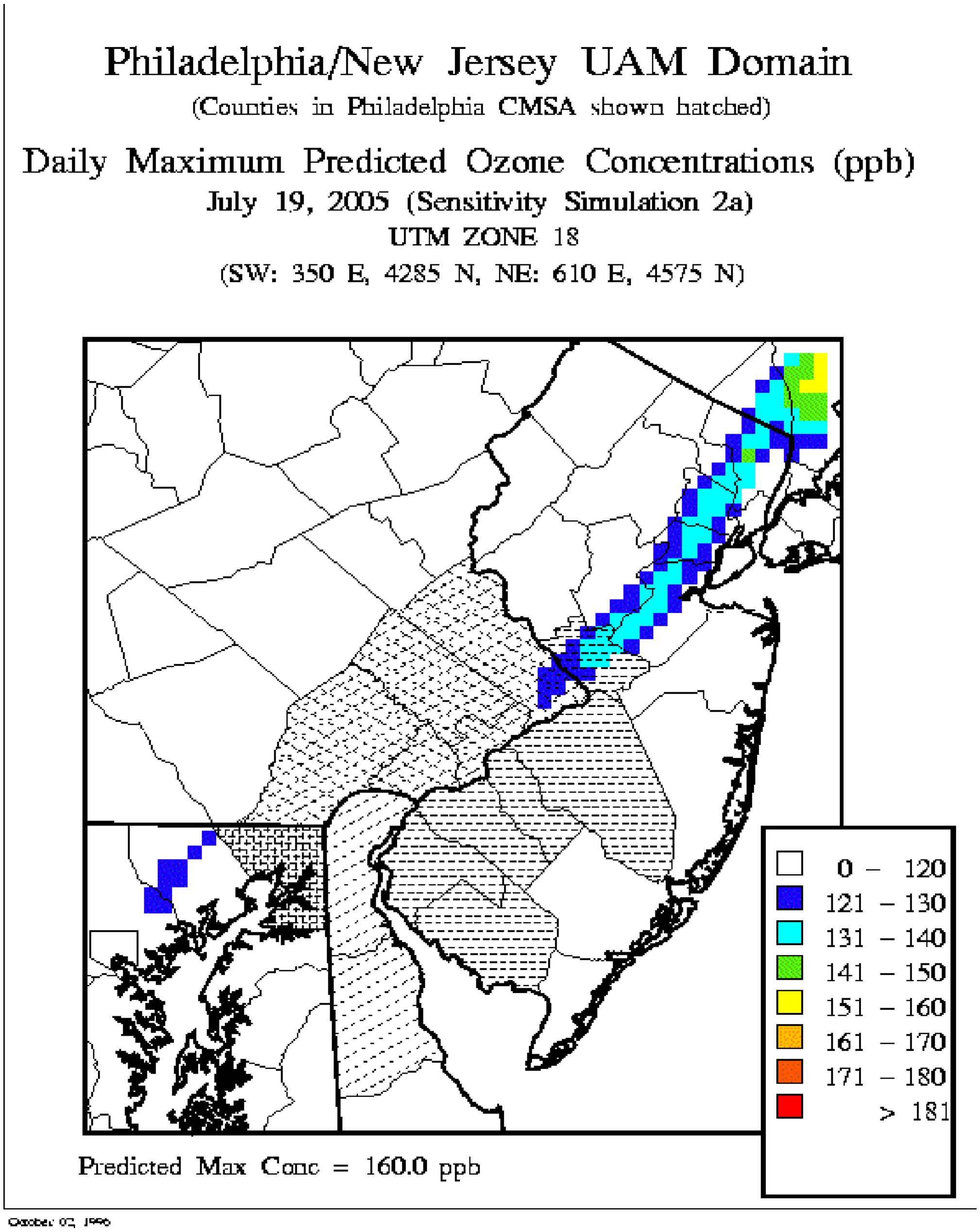


Figure 25: Daily Maximum Predicted Ozone Concentrations for the Philadelphia/New Jersey UAM Domain; July 20, 2005

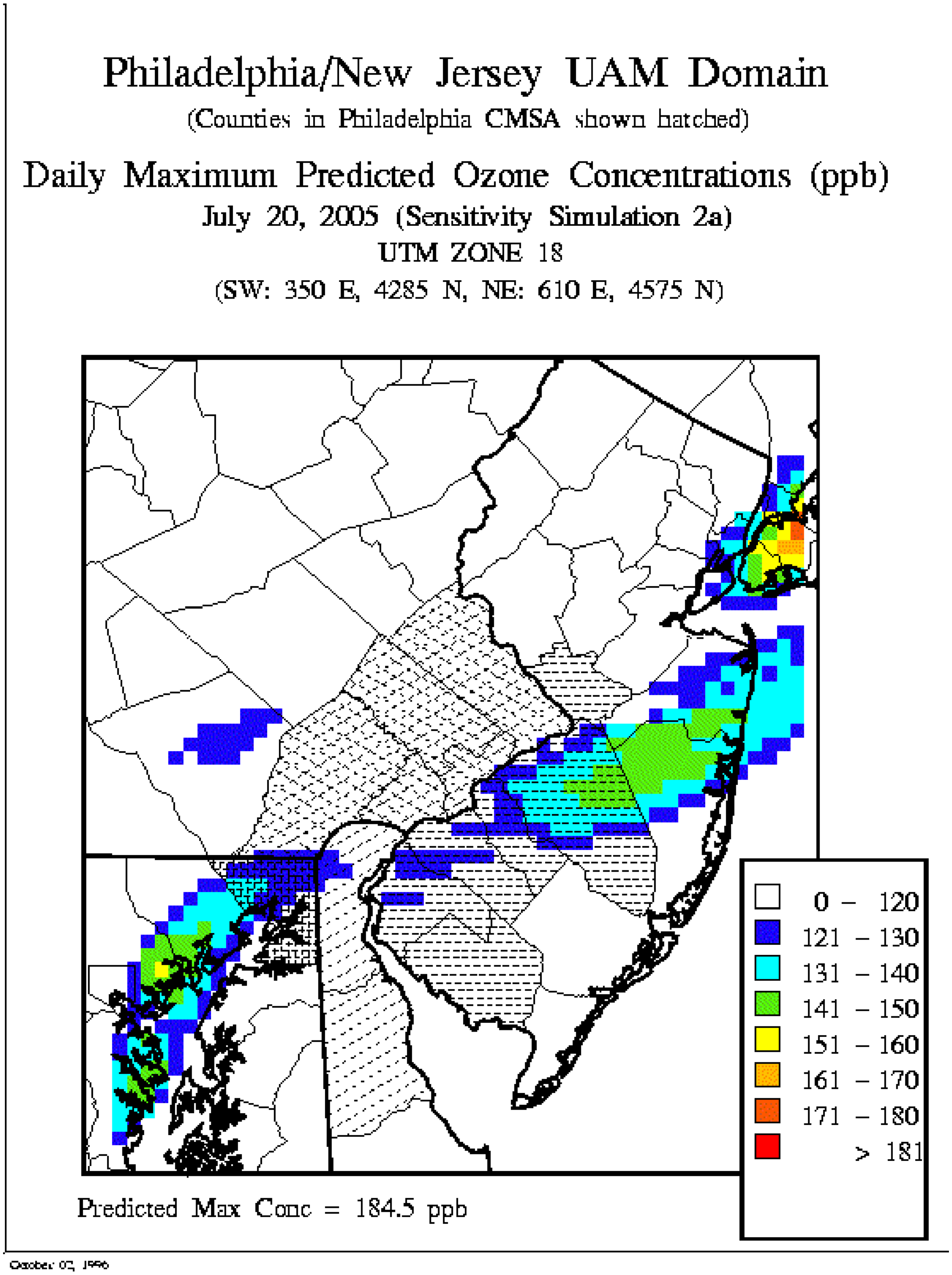


Table 8: Comparison of UAM-IV and OTAG-Modeled Maximum Ozone Concentrations in the Philadelphia Region; July 19 and 20, 1991 Episode-Days (in ppb)

Episode Day	UAM	OTAG
July 19, 1991	131-140	130-145
July 20, 1991	141-150	130-145

The ozone peak value modeling results in Table 8 are greater than the 124 ppb criterion. However it is the 4^{th} highest day ozone concentration over the combined episodes that determines attainment, and based on a review of the OTAG Round 2/Run 5 results for all 22 episode days in the 1991, 1993, and 1995 simulations, the July 19 and 20, 1991 episode-days are the two most severe days. To estimate what the ozone concentration would be on the fourth highest day note that, based on OTAG modeling, all the remaining days including the fourth highest show results at least one OTAG ozone concentration range (15 ppb) lower (see Appendix I, Table I-5) than the July 19 and 20 levels.

Applying this same 15 ppb reduction to the UAM-IV results for July 19 and 20, 1991 would bring the UAM results for the 3^{rd} and 4^{th} episode-days from the 131-150 ppb range to the 116-135 ppb range. Therefore it is plausible to assume that UAM results for other episode days span could be compatible with the 124 ppb design value criteria.

Therefore it is plausible to assume that UAM-IV modeling on other days would yield attainment. However since there is some uncertainty inherent in mixing OTAG and UAM-IV modeled results the State has committed to reexamine the attainment issue in 2002 as part of the mid course correction process.

(i) Conclusions Regarding the Philadelphia, Southern and Central New Jersey Area

Given the design value projection analyses which shows attainment, the underestimation of transport and subsequent benefits from the Regional NO_X cap, the tendency of the local UAM-IV model to overpredict the peak values, and the uncertainties in general in the grid modeling process, it is plausible that the Philadelphia-Central and Southern New Jersey area will attain the 1-hour ozone health standard by the year 2005, assuming full implementation of Clean Air Act measures and the Proposed Regional NO_x emission cap.

(2) New York, Northern New Jersey, Southern Connecticut Region

The attainment date for the New York region is 2007.

(a) Design Value Projection Analyses for the New York, Northern New Jersey, Southern Connecticut Region

In summary, this approach utilizes the current measured ozone design value for the region and subtracts from it the projected ozone concentration reductions from further implementation of Clean Air Act measures and the USEPA's proposed Regional NO_x cap. A summary of the analysis follows. The full details are presented in Appendix II.

(b) Starting point (Current Ozone Levels)

The 1997 ozone design values for monitoring sites in the New York Airshed are provided in Table 9. They range from a low of 108 ppb at Plainfield, NJ to a high of 157 at Madison, CT. Although, the monitoring site at Madison is located in the serious ozone nonattainment area of Greater Connecticut, as are East Hartford, Groton, Middletown, New Haven and Stafford the results are presented as these sites may be impacted by the plume of elevated ozone levels from the New York Region. Note these sites were included in the New York Airshed modeling domain. The highest design value in the New York-Northern New Jersey-Long Island severe nonattainment area boundaries is 149 ppb measured at Colliers Mills, NJ followed by New Brunswick, NJ with a design value of 139 ppb. As noted previously, the Colliers Mills site, located in Ocean County, is predominantly influenced by the Philadelphia metropolitan area. Elsewhere in the severe nonattainment area, the 1997 design values in New York range from a low of 121 ppb at White Plains to a high of 138 ppb at Babylon; and in Connecticut, a low of 123 ppb at Bridgeport and New Haven to a high of 136 ppb at Greenwich.

Table 9: 1997 Ozone Design Values (ppb) at Monitoring Sites in CT, NJ and NY

Connecticut	ppb	New York	ppb	New Jersey	ppb
Bridgeport	123	Babylon	**138**	Rider College	**131**
Danbury	**134**	Queens	123	New Brunswick	**139**
Greenwich	**136**	Staten Is.	**137**	Chester	124
Stratford	**135**	White Plains	121	Cliffside Park	122
E Hartford*	**128**			Bayonne	120
Groton*	**144**			Flemington	119
Madison*	**157**			Newark	114
Middletown*	**135**			Plainfield	108
New Haven*	123			Colliers Mills	**149**
Stafford*	**127**			Monmouth Coll.	**130**
CT Max	**157**	**NY Max**	**138**	**NJ Max**	**149**
Airshed Maximum	**157**				

*sites are located in "Greater CT" serious area

The 1997 design values have been reduced considerably from the 1989 levels which were used to define nonattainment classifications in the 1990 Clean Air Act Amendments. In fact, design values in each state for 1989 were as high as 201 ppb in Stratford, CT, 196 ppb at Bayonne, NJ and 180 ppb at West Point, NY. Clearly, peak ozone levels have decreased and strategies implemented under the Clean Air Act are considered to have played a significant role.

Additional future improvements are expected from mandatory Clean Air Act measures that will be implemented between 1997 and the statutory attainment date of 2007. These measures as well as growth assumptions have been built in to the 2007 base year modeling performed as part of OTAG and also the OTC ROM simulations for base year 2005. The effects of many of these measures are not included in the 1997 design values because they were not fully implemented during the design value period 1995-1997. Yet significant emission reductions are expected in the next decade from such measures as turnover to cleaner vehicles in the fleet of on-road vehicles, actual implementation of enhanced automobile inspection and maintenance programs, Phase II of the OTC NO_x MOU reductions slated for 1999, reformulated and lower volatility gasolines, the federal program to reduce VOC's in a variety of consumer and commercial products, and new federal standards affecting a variety of on-road and off-road engines.

(c) Projection of the Air Quality Benefits from Further Implementation of Clean Air Act Measures

Photochemical grid modeling results were reviewed to estimate the air quality benefits from further implementation of Clean Air Act measures from 1997 to 2007. UAM-V results from OTAG were reviewed for the meteorological episode of July 10th-18th, 1995. A model run with 1995 emission estimates was made by NYSDEC's modeling center, along with a model run performed for year 2007 emissions known as OTAG Base1b. Base1b was the initial base year 2007 emission inventory prepared for OTAG and can be compared directly with the 1995 run to estimate ozone improvements between 1995 and 2007.

Daily peak ozone values were extracted from each run and averaged for the eight day episode. The mean improvement in the average peak ozone predictions between 1995 and 2007 Base1b was 11.1 ppb, resulting from the difference between 133.5 ppb with 1995 emissions and 122.4 ppb with 2007 Base1b emissions.

(d) Projection of the Air Quality Benefit from the USEPA's Proposed Regional NO_x Cap

A review of the ozone difference metrics provided by OTAG for Round2/Run 5 was performed to approximately assess the improvement in ozone that would occur in the New York Airshed from implementation of the USEPA's Regional NO_X cap. The strategies assumed in Round 2/Run 5 produce approximately the same level of reductions anticipated under the USEPA's proposal.

The Round 2/Run 5 simulation produces peak ozone benefits in the New York Airshed of 7 ppb for the 1988 episode, 11 ppb for the 1991 episode and 7 ppb for the 1995 episode. This compares quite well with a 9-15 ppb reduction in peak ozone predicted by the OTC Case-E run relative to base year 2005 (for July 11, 1988 meteorology)..

(e) Adjustment of the Modeling Maximum 1-hour Benefit to the Design Value Benefit

The local photochemical grid modeling efforts are projecting a 1-hour ozone concentration benefit of 11.1 ppb in the average peak hour and a 7-11 ppb improvement from the USEPA regional NO_X cap implementation. However the approach here requires an estimate of the benefit in ozone design value, in order to subtract that benefit from the current ozone design values.

It is assumed that percentage changes in the design value are similar to percentage changes in the 1-hour peak or maximum concentration. However design values are generally less than peak values. Therefore an adjustment to the 1-hour maximum benefits defined above is made before subtracting those ozone concentration benefits from the current design values. The factor to be used in making that adjustment is 0.89 or 89%, which is simply the mean ratio of design value to peak value over all the monitoring sites illustrated in Section III.

Applying this maximum or peak to design value factor to the maximum or peak benefits expected results in a 10 ppb benefit from further implementation of the Clean Air Act, and a 6-10 ppb benefit from implementation of the regional NO_X cap.

(f) Projected Ozone Design Values

It therefore seems reasonable to expect ozone design values to decline by 16 to 20 ppb from the 1997 design values, depending on the final outcome of the USEPA's proposed program to reduce regional transport of ozone and also on actual growth rates and other economic factors which cannot be accurately predicted out to 2007. These reductions have been applied to the 1997 design values in Table 8 and are presented in Table 10.

Table 10 shows a reasonable expectation of attainment at 17 of the 20 monitoring sites in the New York Airshed. However, there is also indication that further emission reductions may be needed to ensure that attainment is achieved by 2007, at all the monitoring sites. A preliminary estimate of the emission reductions needed is provided below.

Limited OTAG air quality modeling runs are available for emission reductions going beyond the Regional NO_x reduction program. Two runs were made for the 1991 episode simulating additional 60% NO_x and an additional 60 % VOC reductions in the Northeast corridor (Figures 28 and 29) beyond OTAG Run I. Run I also approximates the effect of the Regional NO_x cap program. For the New York Northern New Jersey, Southern Connecticut area, the benefits shown from the VOC reductions are moderate, about 4-12 ppb; however the OTAG regional model may not fully reflect the more localized impacts of VOC emissions on peak ozone values. The peak value ozone benefits from the NO_x reductions are about 20-36 ppb to the region. Considering that an additional 19 ppb peak value reduction may be needed as discussed above, and using an average peak value benefit of 28 ppb for an additional 60% NO_x reduction for illustrative purposes, an additional 40 % NO_x reduction would be required using a linear scaling approach from the 2007 Run I level. Since the Regional NO_x Cap program on top of Clean Air Act measures results in about a 50% NO_x reduction relative to the 1990 emission baseline, this is equivalent to about a 20 % further NO_x reduction relative to 1990 NO_x emission levels for the area defined as the Northeast Corridor in Figure 21. With those, or less reductions, depending on the extent of additional national measures deployed, attainment at all the monitoring sites is projected. Given this, New Jersey has committed to assess a suite of both VOC and NO_x control measures to facilitate the future adoption of the measures necessary to assure attainment (See Section VIII).

Table 10: Estimated 2007 Ozone Design Values (ppb) at Monitors in CT, NJ and NY Assuming Full Implementation of Clean Air Act Measures and the USEPA Regional NO_x Cap

Connecticut	**ppb**	**New York**	**ppb**	**New Jersey**	**ppb**
Bridgeport	103-107	Babylon	118-122	Rider College	111-115
Danbury	114-118	Queens	103-107	New Brunswick	119-123
Greenwich	117-120	Staten Is.	117-121	Chester	104-118
Stratford	115-119	White Plains	101-105	Cliffside Park	102-116
E Hartford*	108-112			Bayonne	100-114
Groton*	124-128			Flemington	99-103
Madison*	137-141			Newark	94-98
Middletown*	115-119			Plainfield	88-92
New Haven*	103-107			Colliers Mills	129-133
Stafford*	107-111			Monmouth Coll.	110-114
CT Max	137-141	**NY Max**	118-122	**NJ Max**	129-133
Airshed Maximum	137-141				

* Sites not in the Northern New Jersey, New York City, Long Island Non-Attainment Area

(g) Photochemical Grid Modeling Approach

The results of the modeling analyses for the New York Region are presented in Appendix II. The major conclusions follow here.

Boundary conditions for the New York Airshed were obtained from OTAG Run 2 and the OTC Case E simulations for high ozone episodes occurring in July 1988 and July 1991. Comparing the predicted maximum ozone along the southern boundary of the New York Airshed for the two episodes indicates that the levels are significantly lower for the OTAG Run 2 than OTC Case E both at the surface and at the elevated levels. However, application of the UAM-IV with emissions based on either OTAG Run 2 or OTC Case E for the New York Airshed produces ozone above the level of the ozone NAAQS. A sensitivity simulation performed with no anthropogenic emissions in the domain gives predicted peak ozone levels in the 100 to 125 ppb range. Conversely simulations performed with 'clean' boundaries produce peak ozone in the range of 50 to 95 ppb.

(g)Conclusions Regarding the New York - Northern New Jersey Southern Connecticut region

The design value analysis projects attainment at all monitoring sites given additional emission reductions in the Northeast Corridor. The modeling results are less conclusive; however overall a plausible case for attaining the 1-hour standard is made.

(3) Summary of Boundary Conditions and Emission Reduction Assumptions Used

In demonstrating attainment estimates of emission, and subsequent reductions were utilized in the analysis. In assessing the benefit of Regional NO_X reductions it has assumed the broader emission reductions and boundary conditions of the OTAG Round 2/Run 5 simulation. The emission levels of VOC and NO_x for that OTAG simulation are presented in Table 11.

The local emission source reductions assumed for the Philadelphia attainment analysis that were used to estimate the benefit from Clean Air Act Measures are summarized in Table 12.

The assumed NO_X and VOC emission reductions for the Clean Air Act and Regional NO_x cap for states with counties in the Philadelphia non-attainment area are summarized in Tables 13 and 14. It should be noted from Tables 13 and 14 that the emission reductions for the Clean Air Act and NO_X Program scenario involve percent VOC reductions from the 1990 baseline of at least 33%, and percent NO_X reductions above 40% in all four states. Using NO_x substitution procedures it is anticipated that the VOC and NO_x emission reductions will significantly exceed the 42% Clean Air Act rate of progress requirement for the non-attainment area. The percent emission reductions for the Clean Air Act scenario alone are greater than 28% for VOC's and 17% for NO_X. Similarly, for the New York attainment analyses, the emission reductions assumed in the OTAG Round 2/Run 5 simulation are presented in Tables 15 and 16 for New Jersey, Connecticut, and New York. The percentage reductions are on the order of 40-49% for NO_x and 33-46% for VOCs. Similar reductions are depicted in Figures 26 and 27 for OTAG Run 5 projected simulations. Run 5 in Figures 26 and 27 represents a set of control packets for Connecticut, New Jersey and New York very similar to what the USEPA proposed to require in their regional strategy for reducing ozone transport across the 22 State and District of Columbia region. However, based on the New York design value projection analysis and the air quality modeling analyses, further emission reductions may be needed to reach attainment, regionally and/or locally. Preliminary estimates of the emission reductions required to reach attainment in the New York and Philadelphia Airsheds are provided in their respective attainment demonstration sections under the design value projection analyses, and are summarized below.

For the New York-Northern New Jersey, Southern Connecticut area, an additional 40 % NO_x reduction would be required using a linear scaling approach from the 2007 Run I level (assuming NO_x reductions only). Since the Regional NO_x Cap program on top of Clean Air Act measures results in about a 50% NO_x reduction relative to the 1990 emission baseline, this is equivalent to about a 20 % further NO_x reduction relative to 1990 NO_x emission levels for the area defined as the Northeast Corridor in Figure 21.

For the Philadelphia area, an additional 15% NO_x reduction relative to Run I levels, or about 7.5% additional NO_x reductions relative to 1990 NO_x emission levels, for the

Northeast Corridor in Figure 21 by subregions 1, 2, and 3, to attain the standard at the Colliers Mills site, assuming the 1997 design value of that site persists.

However, considering the limited modeling analyses available and the need to consider impacts of potential national or broader regional measures such as Tier 2 vehicle standards in the analyses, the underestimation of ozone transport in the OTAG modeling analyses, the potential underestimation of VOC benefit by the OTAG regional model, and that New Jersey has recently adopted a NO_x budget that is based on more stringent standards for large boilers than those used for the USEPA proposed Regional NO_x cap, the Department is reluctant to draw conclusions at this time on the actual numerical extent, or nature, i.e. VOC vs. NOx, of the localized emission reductions needed, and commits to analyze the issue further (see Section VIII). New Jersey has provided herein an estimate of the emission reductions that are likely to be needed, however, in order to provide a numerical computation of the emission levels needed for control measures analyses purposes, New Jersey commits to continue its evaluation and analysis incorporating the latest relevant and reliable data to make such a determination. This determination will be made as part of the midcourse correction committed to by the State in the 2002 timeframe. Adoption of measures in this time frame is sufficient to allow the region to achieve compliance by the 2007 attainment date. (See Section VIII).

Nevertheless the emission reductions estimates above are significant and may be difficult to achieve and thus underscore the need for aggressive federal measures to provide a sizeable component of the need. It should also be noted that the incremental emission reduction percentages would decrease if air quality modeling runs covering the entire OTAG domain (as opposed to the Northeast corridor) beyond Run I had been available.

Table 11: VOC and NOx Emissions of the OTAG Round 2/Run 5 Simulation

	VOC EMISSIONS				NOX EMISSIONS			
State	**Utility**	**Area**	**Mobile**	**Total**	**Utility**	**Area**	**Mobile**	**Total**
Alabama	132.32	622.36	280.91	1035.59	419.62	335.69	380.21	1135.52
Arkansas	28.74	453.64	143.13	625.51	82.25	262.83	200.44	545.52
Connect	24.36	287.99	58.06	370.41	51.21	102.87	115.91	269.99
Delaware	12.25	68.08	32.66	112.99	61.32	35.83	56.62	153.77
Dis. Colum	0.71	21.15	7.92	29.78	4.44	26.75	15.19	46.38
Florida	70.36	1373.61	715.95	2159.92	482.35	351.44	865.41	1699.2
Georgia	101.52	801.96	328.84	1232.32	397.45	267.79	520.04	1185.28
Illinois	698.72	1122	357.63	2178.35	642.76	477.65	520.96	1641.37
Indiana	214.45	805.66	335.01	1355.12	590.95	398.21	448.13	1437.29
Iowa	26.34	516	167.74	710.08	144.07	176.65	223.08	543.8
Kansas	72.61	508.99	164.07	745.67	199.85	373.76	190.84	764.45
Kentuck	274.23	561.69	201.63	1037.55	302.96	462.46	309.57	1074.99
Louisiana	102.42	694.86	210.32	1007.61	706.17	717.27	271.76	1695.2
Maine	24.67	129.41	61.78	215.86	68.44	37.88	105.93	212.25
Maryland	45.05	350.28	95.22	490.55	190.16	196.23	191.96	578.35
Mass.	41.83	508.87	72.71	623.41	140.56	208.53	153.61	502.7
Michigan	244.91	807.44	462.19	1514.54	503.57	388.18	544.01	1435.76
Minn.	76.28	732.21	264.41	1072.91	131.91	166.35	346.39	644.65
Miss.	177.59	603.08	163.29	943.96	201.38	370.67	346.39	918.44
Missouri	146.31	758.55	259.79	1164.65	203.15	194.63	369.39	767.17
Nebraska	34.11	272.21	89.71	396.03	70.01	127.61	110.16	307.78
New Hamp	14.24	68.94	38.78	121.96	29.81	34.64	71.68	136.13
New Jers	288.83	540.16	132.3	961.29	296.21	241.66	263.61	801.48
New York	229.94	797.92	383.19	1411.05	352.02	340.98	625.42	1318.42
North Caro	259.98	866.29	345.58	1471.85	336.86	214.94	487.53	1039.33
N. Dakota	0.29	45.51	10.66	56.46	0.39	36.38	15.85	52.62
Ohio	214.67	956.3	445.37	1616.34	627.55	458.48	620.62	1706.65
Oklaho	56.13	491.04	247.47	794.64	150.11	503.59	292.54	946.24
Pennsy	195.38	732.36	426.91	1354.65	775.71	343.61	488.14	1607.46
Rhode Isl	10.28	72.79	19.27	102.34	2.69	18.98	37.87	59.54
S. Caro	106.51	672.41	217.88	996.79	265.35	164.63	330.83	760.81
S. Dak	3.24	114.56	31.58	149.38	8.77	31.29	47.41	87.47
Tennessee	311.08	1101.29	311.87	1724.24	500.21	451.78	451.76	1403.75
Texas	282.51	1639.57	681.71	2603.79	1194.81	713	966.02	2873.83
Vermont	1.79	36.87	34.95	73.61	0.99	12.51	57.46	70.96
Virginia	250.58	793.33	325.28	1369.19	213.87	379.48	533.58	1126.93
West Virg.	125.94	199.84	94.76	420.54	498.87	107.51	144.46	750.84
Wiscon	75.37	585.71	184.32	845.41	241.26	192.28	278.38	711.92
Canada	604.59	1399.61	303.41	2307.61	709.48	730.14	457.18	1896.8
Off shore	131.15			131.15	379.31			379.31
TOTAL	5712.24	23114.54	8708.25	37535.03	12175.81	10654.94	12336.22	35166.97

Table 12: Local (Philadelphia Non-attainment area)[*]
Emission Reductions Assumed in the Attainment Demonstration

Year/Scenario		VOC's		NO_x	
		Tons/day	% reduction from 1990 base	Tons/day	% reduction from 1990 base
1990	Base Case	1116	0	1042	0
1996	Projection	912	18	953	9
1999	Projection	850	24	865	17
2007	Clean Air Act Implementation	680	39	732	30

[*] Source: Extracted by Pechan Associates from OTAG Emissions Inventory Data Base.

Table 13: NO_x Emission Reductions* Assumed in the Attainment Demonstration for the States with Counties in the Philadelphia Region

-In tons per day and percentage decline from 1990 Base Case (%)-

Year/Scenario	**Maryland**		**Delaware**		**Pennsylvania**		**New Jersey**	
	Tons/day	**%**	**Tons/day**	**%**	**Tons/day**	**%**	**Tons/day**	**%**
1990 Base Case	1129	0	265	0	3149	0	1566	0
2007 Clean Air Act Implementation	940	17	165	38	2404	24	1244	21
2007 Clean Air Act and Regional NO_x Program (OTAG Round 2/Run 5 Simulation)	578	49	155	42	1608	49	801	49

* Source: OTAG Emissions Inventory Data Base C

Table 14: VOC Emission Reductions* Assumed in the Attainment Demonstration for the States with Counties in the Philadelphia Region

-In tons per day and percentage decline from 1990 Base Case (%)-

Year/Scenario	Maryland		Delaware		Pennsylvania		New Jersey	
	Tons/day	%	Tons/day	%	Tons/day	%	Tons/day	%
1990 Base Case	818	0	193	0	2059	0	1426	0
2007 Clean Air Act Implementation	526	36	114	41	1394	32	1021	28
2007 Clean Air Act and Regional Program (OTAG Round 2/Run 5 Simulation)	491	40	113	41	1355	34	961	33 NO_X

* Source: OTAG Emissions Inventory Data Base C

Table 15: Minimum Level of NO_x Emission Reductions* Assumed in the Attainment Demonstration for the States with Counties in the New York Region

-In tons per day and percentage decline form 1990 Base Case (%)-

Year/ Scenario	New York Tons/day	New York %	Connecticut Tons/day	Connecticut %	New Jersey Tons/day	New Jersey %
1990 Base Case	2208	0	482	0	1566	0
2007 Clean Air Act Implementation	1674	24	362	25	1244	21
2007 Clean Air Act and Regional NO_X Program (OTAG Round 2/Run 5 Simulation)	1319	40	269	44	801	49

*Source: OTAG Emissions Inventory Data Base C

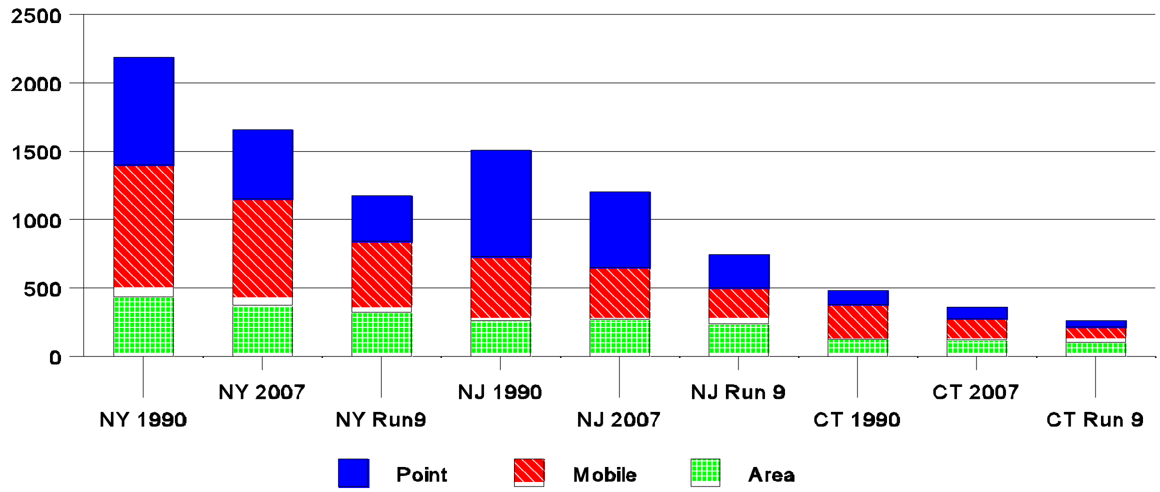
Table 16: Minimum Level of VOC Emission Reductions* Assumed in the Attainment Demonstration for the States with Counties in the New York Region

-In tons per day and percentage decline form 1990 Base Case (%)-

Year/ Scenario	New York		Connecticut		New Jersey	
	Tons/day	%	Tons/day	%	Tons/day	%
1990 Base Case	2649	0	667	0	1426	0
2007 Clean Air Act Implementation	1474	44	391	41	1021	28
2007 Clean Air Act and Regional NO_X Program (OTAG Round 2/Run 5 Simulation)	1411	46	370	44	961	33

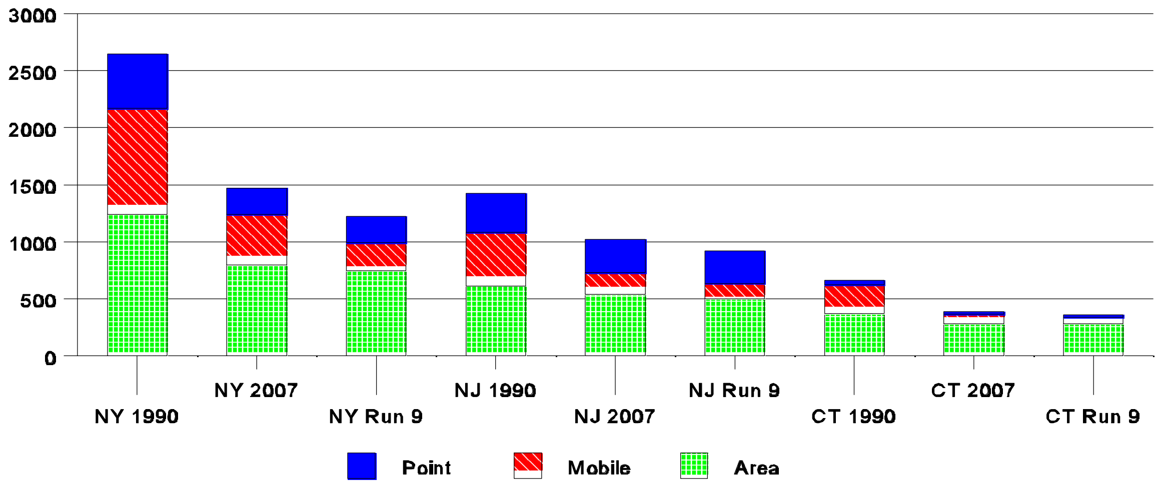
*Source: OTAG Emissions Inventory Data Base C

Figure 26: OTAG NO_x Emissions (TPD) for NY, NJ and CT



NO_x Emissions	NY 1990	NY 2007	NY Run9	NJ 1990	NJ 2007	NJ Run9	CT 1990	CT 2007	CT Run9
Area	433	376	322	264	271	240	128	120	101
Mobile	966	774	519	468	381	262	252	158	115
Point	788	508	334	777	551	240	101	83	48
Total	2187	1658	1175	1509	1203	742	481	361	264

Figure 27: OTAG VOC Emissions (TPD) for NY, NJ and CT



VOC Emissions	NY 1990	NY 2007	NY Run9	NJ 1990	NJ 2007	NJ Run9	CT 1990	CT 2007	CT Run9
Area	1239	797	745	611	540	501	369	284	279
Mobile	929	445	248	473	192	132	255	79	58
Point	477	230	230	340	288	290	40	24	24
Total	2645	1472	1223	1424	1020	923	664	387	361

Figure 28: Peak Ozone Value Impact from a 60% Reduction in the Northeast Corridor relative to Round 3/Run I

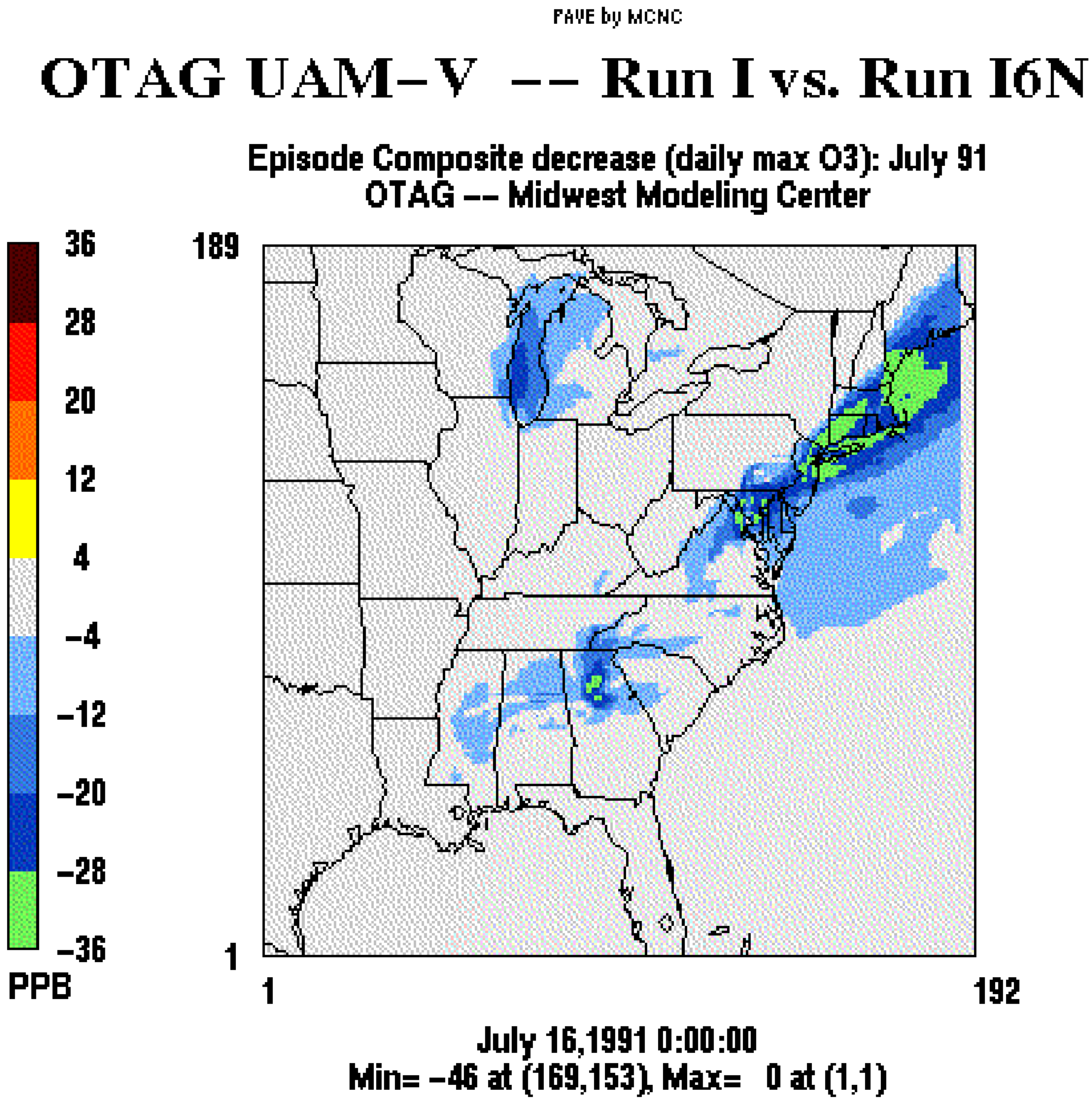
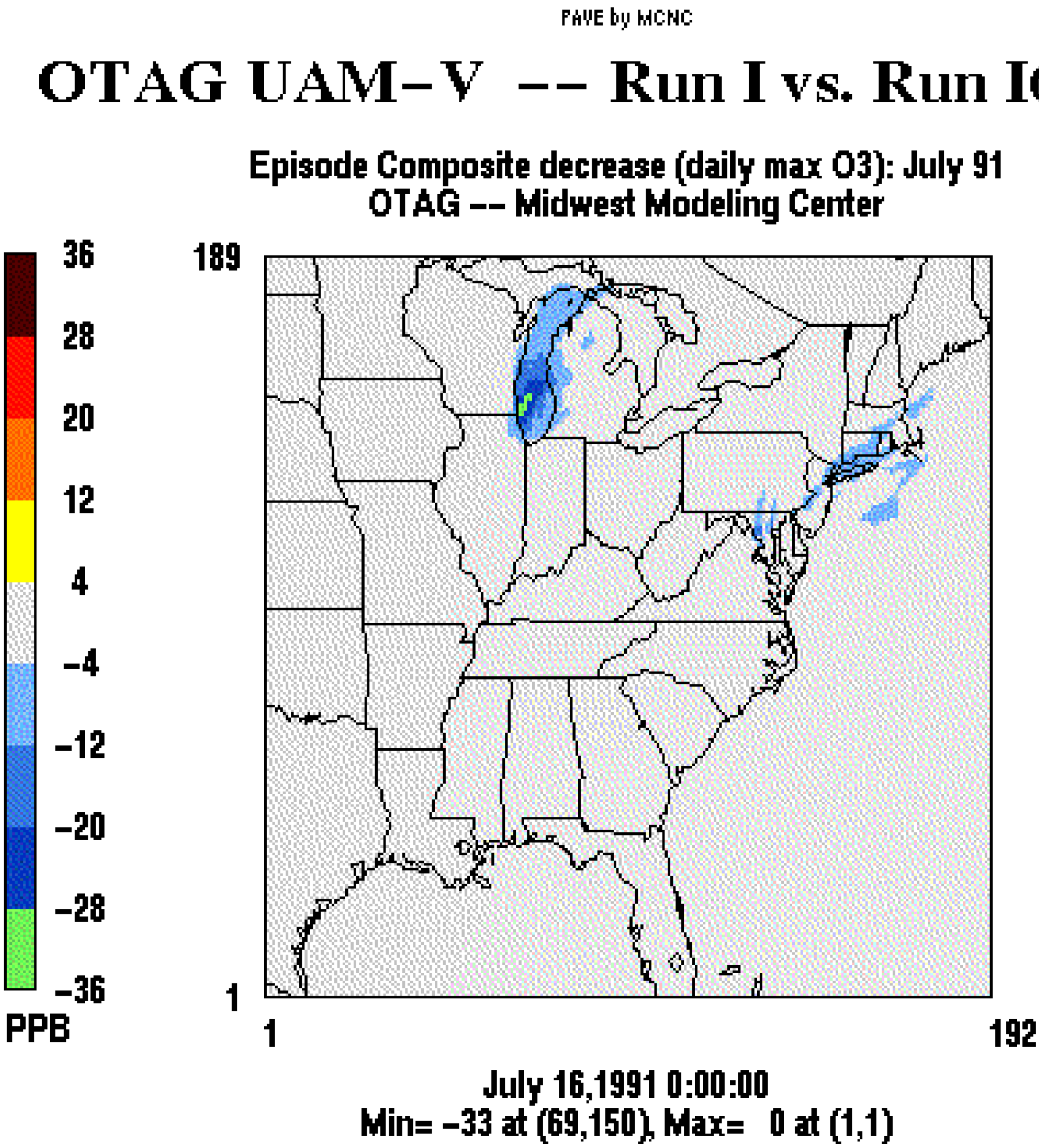


Figure 29: Peak Value Ozone Impact of a 60% NO_x Reduction in the Northeast Corridor Relative to Round 3/Run I



(4) Other Measures of Progress

As previously discussed, attainment of the 1-hour ozone health standard is based on the number of days exceeding the standard over a three year period. Health effects from ozone however depend on the ozone concentrations, the number of days and/or hours with high ozone concentrations, and the population that is exposed to elevated ozone concentrations. The area of a state or region experiencing higher ozone concentrations is another indicator of the pervasiveness of ozone exposure and a first approximation for the population exposed.

Therefore, in addition to demonstrating that attainment with the regulatory form of the standard is plausible, it is important to review the trends in these other factors to the extent the available data permits.

(a) Number of days of Elevated Ozone Concentrations

The number of days during which the 1-hour health standard and 8-hour threshold standard were exceeded statewide over the past nine years is illustrated in Figure 32. It can be seen from Figure 30 that the number of days exceeding the 1-hour standard has decreased significantly since the 1990-1991 period; i.e., by over 50 %, while some progress has been made in relation to the 8-hour health standard level.

Figure 33 shows the number of site days from 1982-1997 which exceeded the 1-hour ozone health standard. A site day is a measure of the aerial extent of elevated ozone levels, by indicating how widespread the elevated ozone concentrations occur. For example, on one day the health standard may be exceeded at more than one monitoring location. In this case, the number of days would be one, while the number of site days could be much greater added to the number of locations or sites above the standard. The data in Figure 33 indicates that significant progress has been made in improving New Jersey's Air Quality as measured by this metric. A 50% improvement rate in Figure 31 for the 1-hour standard.

While progress has been significant when looking at the number of site days, only moderate progress has been made at reducing the number of hours with ozone concentrations above 0.08 ppm. See Figure 32. This is consistent with the slower progress on the 8-hour standard shown in Figure 32.

These findings, reductions in peak concentrations as measured with the 1-hour data and limited reductions in the 8-hour concentrations, supports the hypothesis obtained from the modeling analyses that reductions in volatile organic compounds (VOCs) reduce the peak values while reductions in oxides of nitrogen (NO_x) reduce the aerial extent of elevated ozone concentrations.[68]

---

[68]Ozone Research Center, August 1997, Alternative Metrics for Assessing Relative Effectiveness of NO_x and VOC Emission Reductions in Controlling Ground-Level Ozone, Journal of Air and Waste Management Association.

The past regulatory focus was on reducing volatile organic compounds (VOCs) rather than oxides of nitrogen (NO_x).The rate of progress decreases for the number of days exceeding the 1-hour standard and the number of site-days is about the same indicating that progress has been made on peak values, but not necessarily aerial extent.

(b) Progress in Reducing Emissions in New Jersey

Figure 33 provides a comparison of the emissions from major stationary sources in New Jersey. The data presented for 1990 is from the base year inventory and the 1996 data are preliminary estimates from the Emission Statement[69] reporting requirements. Significant reduction in emissions occurred between 1990 and 1996 for both VOC and NO_x emissions.

[69]NJAC 7:27-21

Figure 30: Number of Days Exceeding the Ozone Health Standards in New Jersey

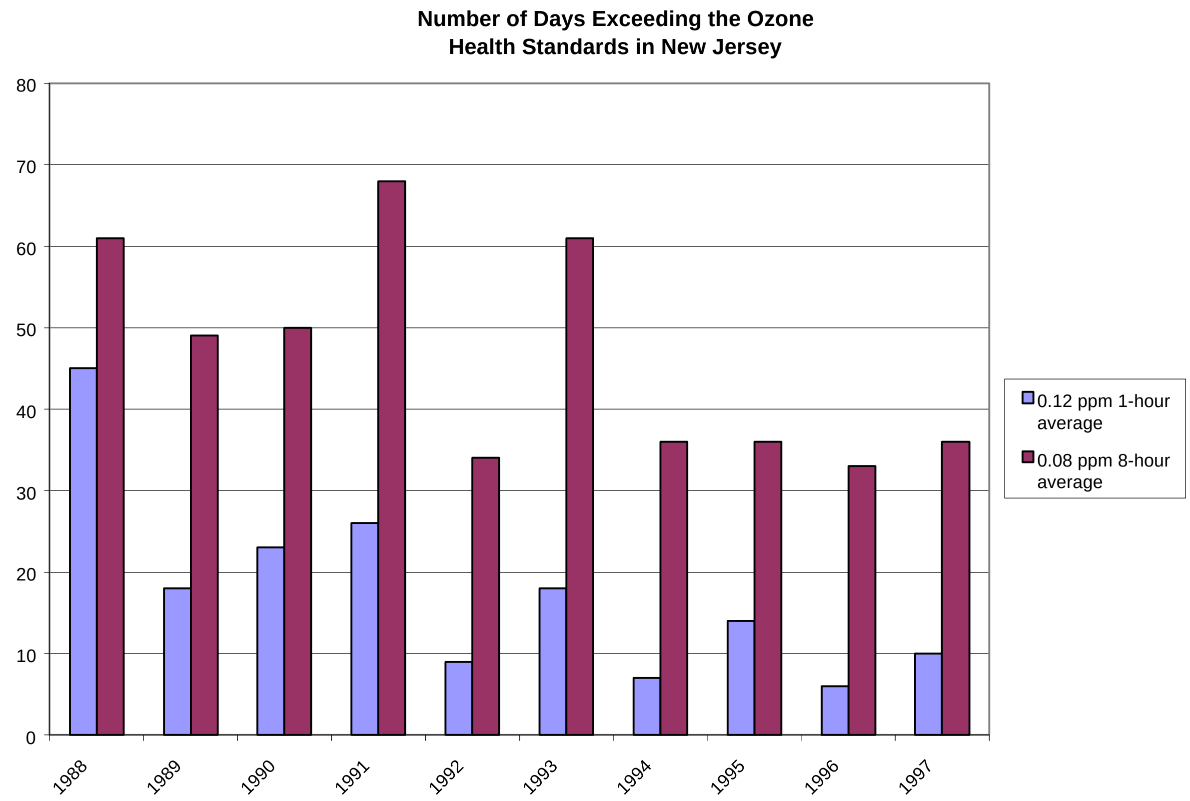


Figure 31: Trend in the Number of Site Days in New Jersey Above the 1-Hour Ozone Standard

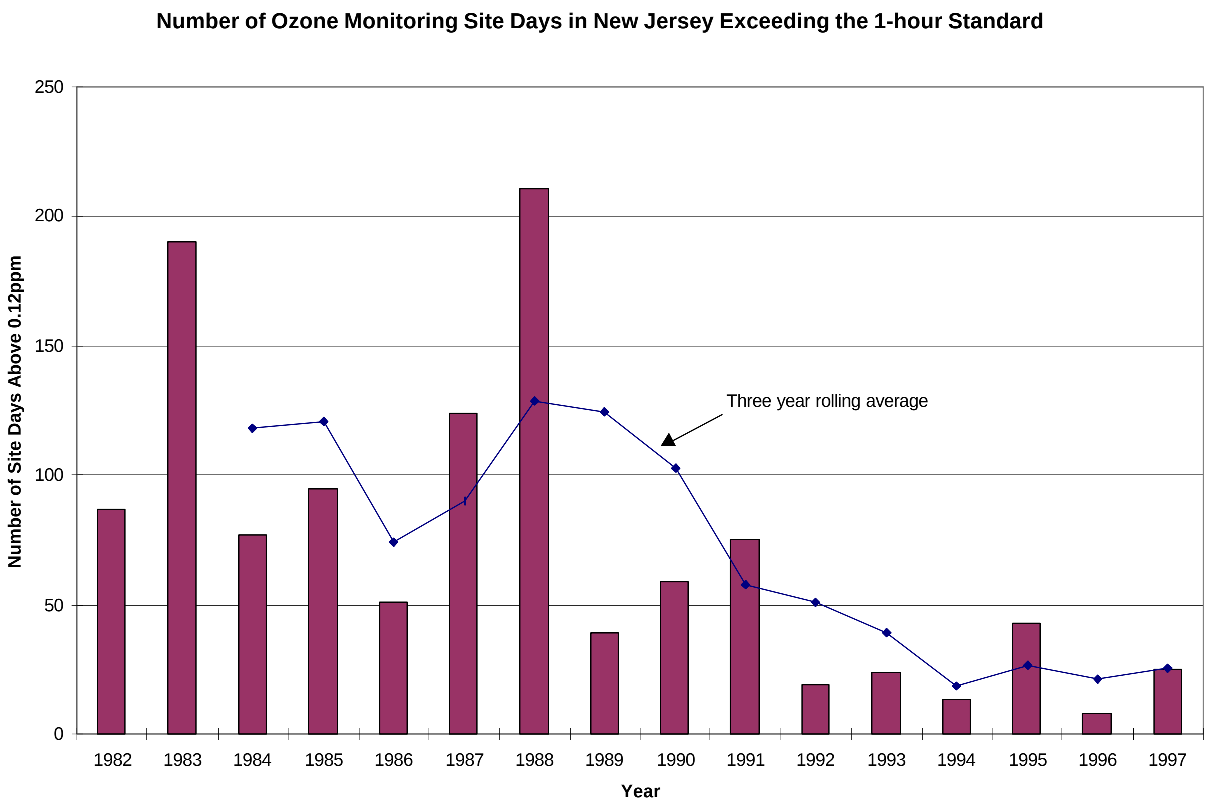


Figure 32: Trends in the Number of Monitored Hours in New Jersey with Ozone Concentrations Exceeding the 8-Hour Ozone Standard

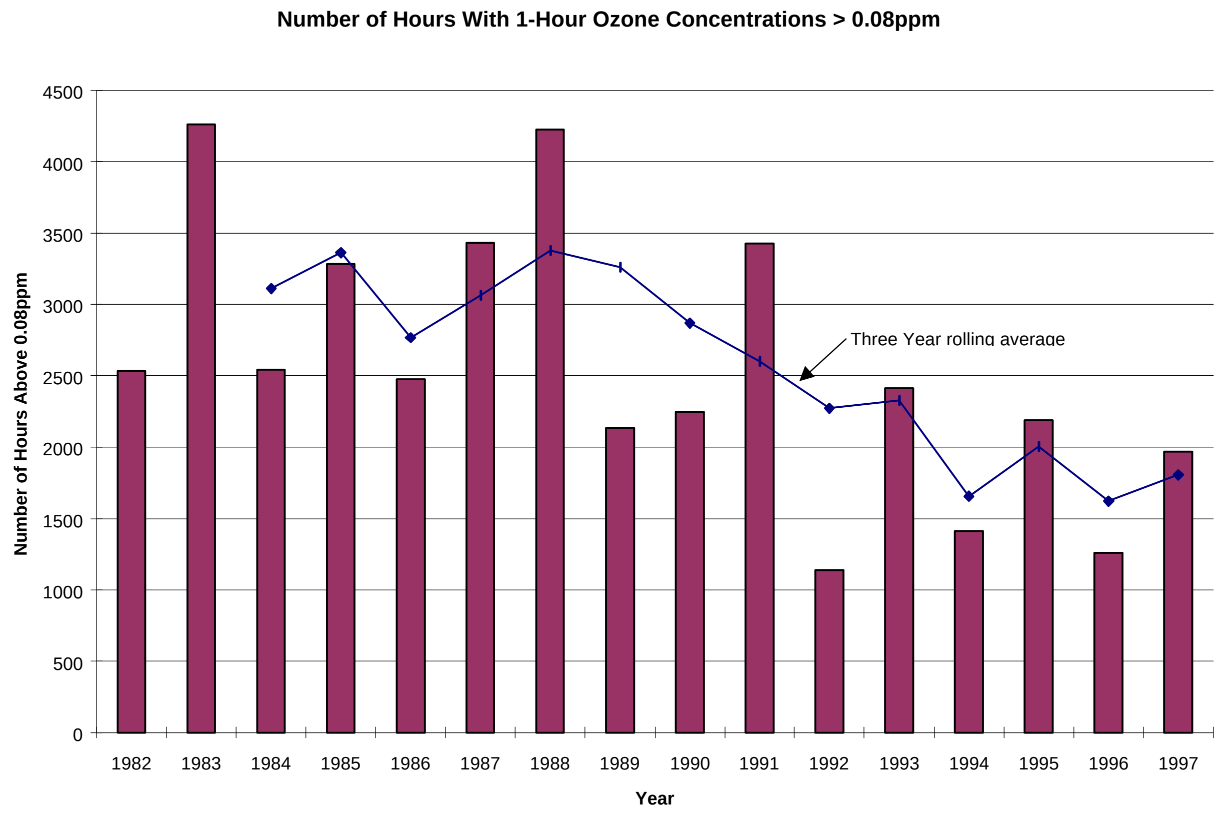
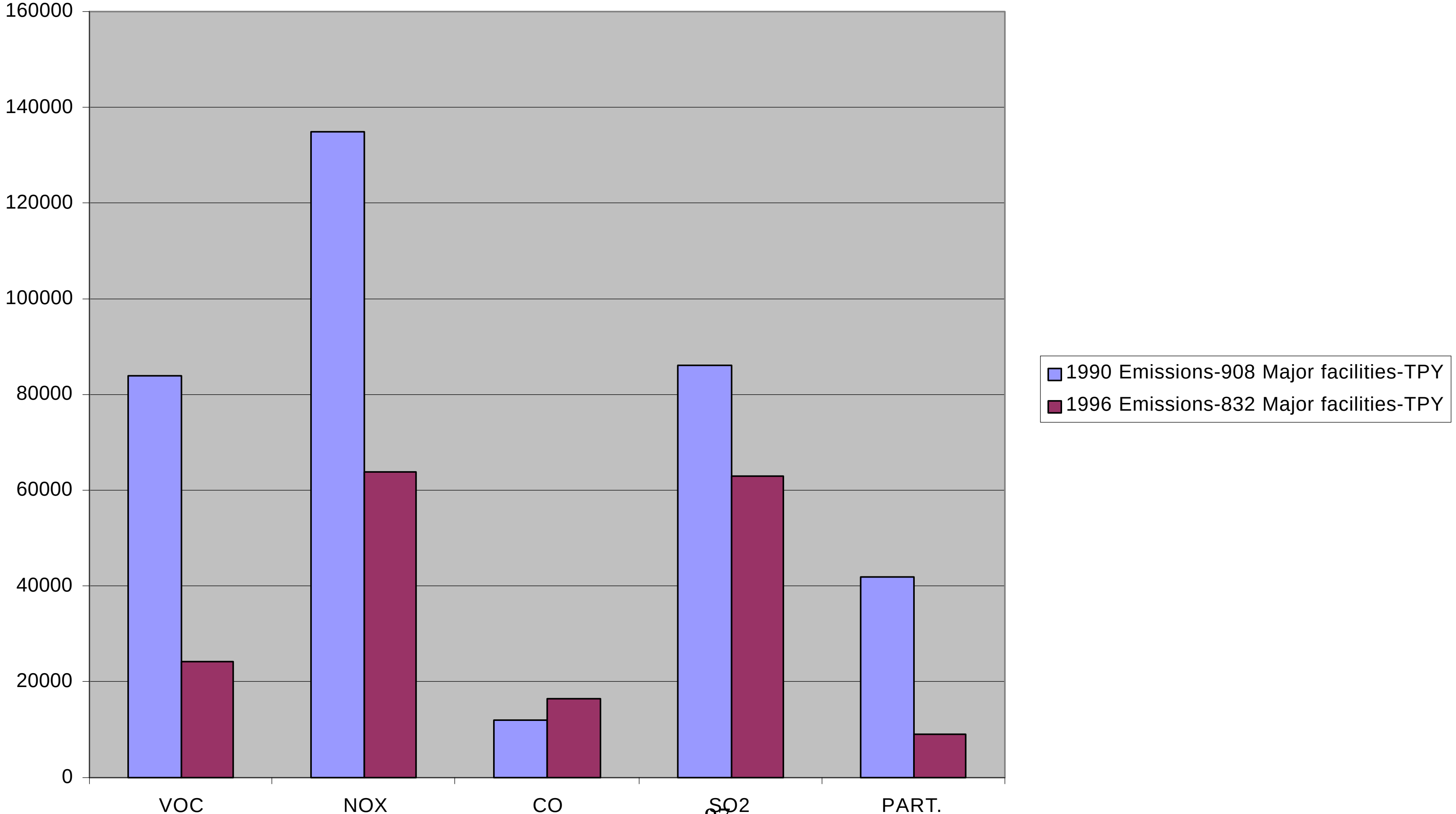


Figure 33: Point Source Emission Trends for Major Sources in New Jersey



V. Control Measures

The December 29, 1997 USEPA guidance[70] indicates the Phase II submittal must include:

- Evidence that all the mandated Clean Air Act measures have been adopted and implemented or are on an expeditious schedule to be adopted and implemented.
- A list of measures, rules, and/or a strategy to meet the rate of progress requirements and attain the 1-hour ozone health standard.
- A SIP commitment and schedule to implement the control programs necessary to meet the rate of progress requirements and to attain the health standard.

The purpose of this section is to provide such documentation. Table 17 provides a list of control measures the State of New Jersey has adopted and implemented through rule to reduce the emissions of the precursors to ozone. It should be noted that Table 17 is included for informational purposes only. To determine applicability of a rule to any source operation, the appropriate rule should be consulted. Copies of all NJDEP rules are available upon request.

Table 18 provides a list of federal measures which have been promulgated and are relied on to demonstrate attainment of the ozone health standard.

Table 19 provides a list of federal measures which have been committed to by the USEPA as part of the OTAG process or otherwise, which have not been promulgated but are relied on to demonstrate attainment of the ozone health standard.

Table 20 provides a list of measures and strategies which the State of New Jersey is pursuing to assist inclosing any gap between programmed reductions, e.g., Clean Air Act measures, regional NO_x cap, and reductions needed for attainment. While these measures have not been explicitly included in the attainment demonstration, they are believed to assist in attaining the 1-hour and 8-hour ozone health standards.

Table 21, part A, provides a list of both VOC and NO_x measures that New Jersey encourages the USEPA to assess and implement as soon as practical on a national basis to facilitate attainment with the 1-hour health standard. Additionally, New Jersey will assess as part of the mid-course review, which New Jersey has committed to develop, the measures or similar measures outlined in Table 21, part B. A report on this assessment will be included as part of the mid-course evaluation effort to be submitted to the USEPA by 2002 (See Section VIII). This assessment will provide an analytic basis to pursue any supplemental emission reduction strategies that may be needed to attain the 1-hour standard, as well as support the planning effort required for attaining the 8-hour standard.

---

[70] Memorandum dated December 29, 1997 from Richard D. Wilson, Acting Assistant Administrator for the USEPA Office of Air and Radiation to the Regional Administrators, USEPA, Regions I-X entitled “Guidance for Implementing the 1-Hour Ozone and Pre-Existing PM_{10} NAAQS”

New Jersey commits to making the decision, on which if any of these measures listed will be implemented to meet the 1-hour standard will be made as part of the mid-course evaluation for the 1-hour standard and the attainment SIP for the 8-hour standard; both of which are due in 2002. The State is only committed to implement the necessary local measures necessary to achieve the ozone health standard if the federal government adheres to its responsibilities to address ozone transport (as it proposed in the Regional NO_x cap) as well as achieves the emission reduction expected and relied on the attainment demonstration outlined in Table 19.

Table 17: New Jersey VOC & NO_x Control Strategies

Note: New Jersey regulations apply statewide.

Control Program	Rules Adopted?	EPA Approved?	Emission limit	Applicability *
VOC STATIONARY & AREA SOURCE				
Group I CTG Rules				
Gasoline Loading Terminals	Y	Y	Consistent with CTG	Consistent with CTG
Gasoline Bulk Plants	Y	Y	Consistent with CTG	Consistent with CTG
Service Stations - Stage I	Y	Y	Consistent with CTG	Consistent with CTG
Fixed Roof Petroleum Tanks	Y	Y	Consistent with CTG	Consistent with CTG
Miscellaneous Refinery Sources	Y	Y	Consistent with CTG	Consistent with CTG
Cutback Asphalt	Y	Y	Consistent with CTG	Consistent with CTG
Solvent Metal Cleaning	Y	Y	CTG limits	Consistent with CTG
Surface Coating of Cans	Y	Y	CTG limits	≥ 3 lbs/hr
Surface Coating of Metal Coils	Y	Y	CTG limits	≥ 3 lbs/hr
Surface Coating of Fabrics	Y	Y	CTG limits	≥ 3 lbs/hr
Surface Coating of Paper Products	Y	Y	CTG limits	≥ 3 lbs/hr
Surface Coating of Automobiles and	Y	Y	CTG limits	≥ 3 lbs/hr
Surface Coating of Metal Furniture	Y	Y	CTG limits	≥ 3 lbs/hr
Surface Coating of Magnet Wire	Y	Y	CTG limits	≥ 3 lbs/hr
Surface Coating of Large Appliances	Y	Y	CTG limits	≥ 3 lbs/hr
Group II CTG Rules				
Leaks from Petroleum Refineries	Y	Y	Consistent with CTG	Consis. with CTG

Control Program	Rules Adopted?	EPA Approved?	Emission limit	Applicability *
Miscellaneous Metal Parts Surface	Y	Y	CTG limits	≥ 3 lbs/hr
Surface Coating of Flat Wood Paneling	Y	Y	CTG limits	≥ 3 lbs/hr
Synthetic Pharmaceutical Manufacture	Y	Y	Consistent with CTG	Consis. with CTG
Rubber Tire Manufacture	NS	Y		
External Floating Roof Petroleum Tanks	Y	Y	Consistent with CTG	Consis. with CTG
Graphic Arts	Y	Y	CTG limits	≥ 3 lbs/hr
Perchloroethylene Dry Cleaning	Y	Y	Consistent withCTG	Consistent withCTG
Gasoline Truck Leaks and Vapor	Y	Y	CTG limits	CTG
Group III CTG Rules				
Manufacture of High-Density Polyethylene,	Y	Y	Consistent with CTG	Consistent with CTG
Fugitive Emissions from Synthetic Chemical,	Y	Y	CTG requirements	CTG
Large Petroleum Dry Cleaners	Y	Y	Consistent with CTG	Consistent with CTG
Air Oxidation Processes in Synthetic	Y	Y	Consistent with CTG	Consistent with CTG
Equipment Leaks from Natural Gas/gasoline	Y	Y	CTG requirements	CTG
Other Control Measures				
Adhesives	Y	Y	10-80% VOC max	Statewide
Aerosol Paints	Y	Y		
Aerospace Manufacturing and Rework	NS			
Aluminum Rolling Mills	NS			
Architectural and Industrial Maintenance Coatings and Consumer Products	Y	Y	25 products	Statewide,
Autobody Refinishing	Y	Y	4.4-6.0 lbs/gal	≥ 3.5 lbs/yr, & ≥ 50 gal.wk
Automobile Assembly	Y	Y	covered by CTG	

Control Program	Rules Adopted?	EPA Approved?	Emission limit	Applicability *
Bakeries	Y	Y	90% control	≥ 3.5 lbs/hr
Batch Processes	Y	Y	85-99% control	≥ 3.5 lb/yr
Coke By-Product Recovery Plants	NS			
Coke Oven Batteries	NS			
Commercial Ethylene Oxide Sterilization	NR		MACT standard	
Consumer and Commercial Products	Y	Y	23 categories	statewide
Degreasing	Y	Y	covered by CTG	
Glass Forming	Y	Y	minimize VOC from combustion	statewide
Graphic Arts Rotogravure and Flexographic	Y	Y	25% VOC or 2.9lb/gal	≥ 3.5 lbs/yr
Highway Paints	Y	Y	2.1 lbs/gal	statewide
Industrial Wastewater Treatment	Y	Y	85% control	≥ 25 ton/yr
Iron and Steel Foundries	NS			
Iron and Steel Industry/Sinter Plants	NS			
Landfill Gases	Y	Y		
Marina Gasoline Refueling	N			
Marine Vessel Loading	Y	Y	95% control	≥ $6x10^6$ gal/yr
Offset Lithographic Printing	Y	Y	3.0%@>55°F, 5.0%@<55°F	≥ 3.5 lbs/hr
Pesticide Application	Y	Y	20-45% VOC max	statewide
Pharmaceuticals	Y	Y	85-99% control	≥ 3.5 lb/hr
Publicly Owned Treatment Works	Y	Y	80% capture, 80% control	≥ 25 ton/yr
Pulp and Paper	Y	Y	Generic RACT	≥ 25 ton/yr
Rule Effectiveness Improvement	N			

Control Program	Rules Adopted?	EPA Approved?	Emission limit	Applicability *
Shipbuilding and Ship Repair	NS			
Stage II Vapor Recovery	Y	Y	95% control	>10,000 gal/mth statewide
Surface Coating of Plastic Parts	Y	Y	Generic RACT	≥ 25 ton/yr
Synthetic Organic Chemical Manufacturing Industry Reactor and Distillation Processes	Y	Y	90% control	≥ 25 ton/yr & 3.5 lb/yr
Treatment, Storage and Disposal Facilities	NR		RCRA air regs	
Underground Storage Tank Vents	N			
Volatile Organic Liquids Storage	Y	Y	based on vapor pressure	tanks >10,000 gal
Wood Furniture Coating	Y	Y	4.7-6.8 lbs/gal, transfer efficiency	≥ 3.5 lb/yr
NOx STATIONARY & AREA SOURCE				
NOx RACT Rules	Y	Y	technology based	utility boilers, turbines, engines
VOC/NOx MOBILE SOURCE CONTROL STRATEGIES				
Basic Motor Vehicle Inspection and	Y	Y		
Enhanced Motor Vehicle Inspection and	Y	Y		
Reformulated Gasoline	NR	NR		
Clean-Fuel Fleets	Y	N		
Transportation Control Measures	**	N		
Reid Vapor Pressure at 9 psi	Y	Y		
ADDITIONAL NEW JERSEY REGULATIONS				
Screen Printing	Y	Y	2.9-3.3 lbs/gal	≥ 3.5 lbs/hr
Glass coating	Y	Y	3.0 lbs/gal	≥ 3.5 lbs/hr
Tablet coating	Y	Y	5.5 lbs/gal	≥ 3.5 lbs/hr
Leather coating	Y	Y	5.8 lbs/gal	≥ 3.5 lbs/hr

Control Program	Rules Adopted?	EPA Approved?	Emission limit	Applicability *
Concrete Pipe Coating	Y	Y	3.0-4.3 lbs/gal	≥ 3.5 lbs/hr
Gravure Printing - sheet fed	Y	Y	25% VOC or 2.9lb/gal	≥ 3.5 lbs/hr
VOC Transfer operations	Y	Y	Stage I controls	≥ 2,000 gal
Chemical plant leak detection & repair	Y	Y	test & repair	550 tons/yr VOC processed
Tanker Ballasting operations	Y	Y	2 lbs VOC/1,000 barrels, or 95% control	≥ $6x10^6$ gal/yr
Combustion controls - VOC	Y	Y	combustion adjustments	major combustion units
National Low Emission Vehicle Program	Y	N		
Alternate Fuel Incentive Program	Y	N		
Natural Gas fueled buses	Y	N		
Generic RACT regulation covering non-CTG major sources of VOC and NO_x	Y	Y	Technology based	Utility boilers, turbines, engines
Title V Operating Permit Program	Y	Y		
OTC NOx MOU & USEPA Proposed SIP	N		Sets budgets for 1999 and 2003	Controls for Sources > 250 mmBTU Budget includes 15 MW Sources.

* NR indicates a National Rule is adopted or scheduled to be adopted.
NS indicates no sources
** Measure constructed but not by rule.

Table 18: Listing of Promulgated Federal Measures

UTILITY

<u>Mandated Clean Air Act Controls</u>

* Acid Rain Controls (Phase 1 & 2 for all boiler types)

NON-UTILITY POINT SOURCES

<u>Mandated Clean Air Act Controls</u>

* 250 Ton PSD and NSPS
* MACT Standards

NONROAD MOBILE

<u>Mandated Clean Air Act Controls</u>

* 9.0 RVP maximum elsewhere in OTAG

HIGHWAY MOBILE

<u>Mandated Clean Air Act Controls</u>

* Tier 1 light-duty and heavy-duty Standards
* Federal reformulated gas (RFG I) (statutory and opt-in areas)
* On board vapor recovery

Table 19: Control Measures and Strategies that the USEPA is Committed to Implement				
Measure	Reductions Assumed in the Modeling		Actual or Projected Adoption Date	Projected Start/Implementation Date
	%[1]	Tons[2, 3]		
Arch & Industrial Maintenance (AIMS) Coatings - Phase I - Phase II	20% VOC 38% VOC	507 861	Aug. 1998	1998/2003
Consumer/Commercial Products - Phase I - Phase II	20% VOC 30% VOC	886 1281	Aug. 1998	Mar. 1998/2003
Autobody Refinishing - Phase I - Phase II	37% VOC 53% VOC	281 391	Aug. 1998	Jan. 1998/2003
Reformulated Gasoline (RFG) Phase II	25%VOC[4] 6.8% NO_x	na[5] na		2000
Phase II Small Engine Standards	43% VOC	1343		2007
Marine Engine Standards	23% VOC	398		1998
Heavy-Duty Highway 2g Standard (Equivalent to a 4g standard in 2007)	Varies by Engine Family	na[5]		2004
Heavy-Duty Nonroad Diesel Standard	37% NO_x	1499		2004
Locomotive Standard with Rebuild	43% NO_x 10% NO_x	na[6] 126		1997

[1] Percent reductions were applied to 1990 emissions projected to 2007.
[2] Tonnage reduction differences are based on 1990 emissions projected to 2007.
[3] Reductions from multi-phase programs are cumulative.
[4] For Phase II RFG, percent reductions are based only on affected emissions.
[5] Tonnage reductions could not be calculated for RFG and the Heavy-Duty Highway 2g Standard since the effects of growth and control could not be accounted for separately by the model used.
[6] The 43% reduction includes rebuild engines; however, rebuilds were not modeled by OTAG. The modeled reductions was only 10%.

Table 20: Control Measures and Strategies Proposed or Being Pursued for Implementation in New Jersey that will Reduce the Emissions of Ozone Precursors to Assist in Meeting the Rate of Progress Requirements and Attainment of the Ozone Health Standard

Control Measures

- **Substitute for the Employee Trip Reduction Program**

  42 U.S.C. §7511a(d)(1)(B) required severe and extreme ozone nonattainment areas to develop and implement an employer trip reduction (ETR) program, also known as the employee commute option (ECO) program. On December 6, 1994, the USEPA proposed approval of New Jersey's program.[71] On December 23, 1995 President Clinton signed Public Law 104-70, which allowed States to withdraw their mandated ETR program in accordance with state law as long as the state achieves the equivalent emission reductions.[72] On November 1, 1996, New Jersey repealed the mandatory ETR sections of the New Jersey Traffic Congestion and Air Pollution Control Act (P.L. 1996, c.121).

  The New Jersey Department of Transportation (NJDOT) is in the process of developing an Employer Trip Reduction Replacement Package which consists of three components. The three components are 1) a voluntary employer trip reduction program (Smart Moves for Business); 2) transportation control measures; and 3) transportation technology measures.

  The Smart Moves for Business program is administered by the NJDOT and encourages employer participation through a tax credit approach. The tax credit rule was adopted on October 6, 1997, and the Smart Moves for Business program was announced on March 13, 1998. To further encourage employer participation, NJDOT has set aside program revenue for challenge grants to employers. Challenge grants are awarded through a competitive application process to those employers who develop the most innovative and cost-effective commute choice ideas. The first challenge grants are expected to be awarded in August 1998.

  The final component of the ETR replacement package is a transportation technology measure. The New Jersey heavy duty diesel catalytic converter retrofit program is currently under development. Contract awards are expected by Mid-1998.

  The schedule for the preparation and submission of the formal ETR Replacement Package SIP is provided below.

---

[71] 59 Fed. Reg. 62646.

[72] 42 U.S.C. §7511a(d)(1)(B).

Table 20-A: Schedule for ETR Program Replacement Package SIP Submittal

Activity	Completion Date
Voluntary Employer Trip Reduction Program	
Propose new rules for tax credit eligibility	July 7, 1997
Adopt new rules for tax credit eligibility	October 6, 1997
Transportation Control Measures	
Analyze and document TCMs	September, 1998
Employer Trip Reduction Replacement Package SIP Submittal	
Hold public hearing with 15% Plan hearing	to be determined

- **New Jersey Implementation of Requirements Beyond the OTC NO_x Memorandum of Understanding (MOU)**

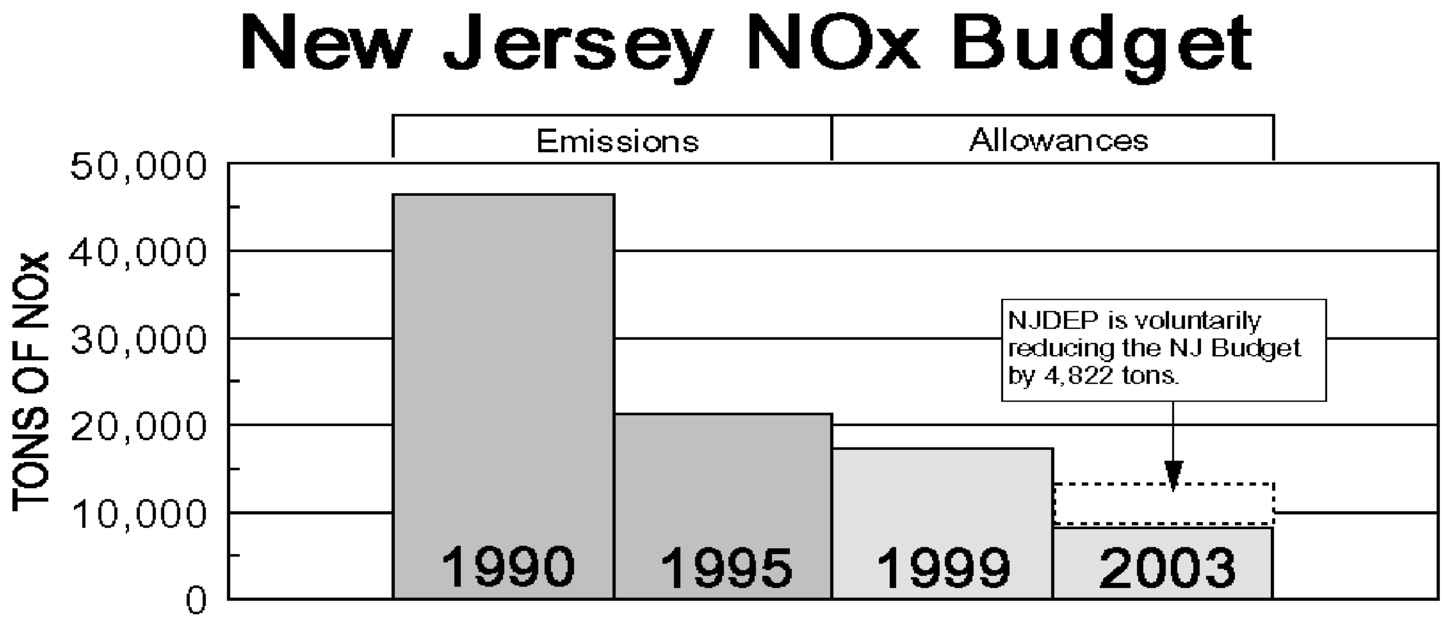
On September 27, 1994, the Northeast Ozone Transport Commission (OTC) agreed to develop a regional program to achieve significant reductions in NO_x emissions from large combustion sources. New Jersey signed the Memorandum of Understanding (MOU) which formalized this program.

In general, the MOU calls for the establishment of a baseline emission inventory and two future-year emission caps. The first cap requires each State to reduce the emissions from the affected sources to a budget level. The 1999 budget cap is calculated by reducing the emission rate for each affected source in a state by the lesser of the RACT level for that source or the higher emission rate resulting from a 65% reduction or 0.2 pounds of NO_x per million BTUs. This emission rate is then applied to the 1990 activity level, i.e. fuel usage, to compute the emissions. The emissions from all the affected sources are summed to calculate the budget cap. In 2002 the budget will be computed similarly, except that a 75% reduction or a 0.15 pounds of NO_x per million BTU rate is used.

New Jersey is pursuing NO_x emission reductions for large boilers that will exceed the OTC NOX MOU phase III requirements. A rule was proposed in the September 15, 1997 New Jersey Register. A hearing was held on October 17, 1997. The rule was adopted in June 1998.

The emission reductions from this rule will provide significantly more reductions than the OTC MOU Phase III requirements as illustrated in Figure 34. The 1999 bar illustrates the proposed amount of allowances to be allocated by New Jersey in the NO_x Budget Program for the years 1999 through 2002. This budget amount reflects a level of control identical to what is established in the OTC NO_x Budget MOU. The 2003 bar illustrates the proposed amount of allowances to be allocated by New Jersey in the NO_x Budget Program for the year 2003 and beyond. This budget amount reflects a level of control more stringent than the OTC NOx Budget MOU control level. The 2003 budget is calculated by applying a 0.15 pound per MMBtu or 90% emission rate reduction to the three most recent years of operational emission data rather than the OTC default of 0.15 pound per MMBtu or 75% emission rate reduction. The USEPA proposed NO_x Cap is based on the 0.15 pound per MMBTU criteria alone. Given the benefits from NO_x reductions in the preceding analyses, the additional reductions provided for by this rule, should provide for significantly improved ambient ozone air quality in New Jersey for both the 1-hour and 8-hour ozone health standards.

Figure 34: New Jersey NO_x Budget



	TONS OF NOx
1990 BASELINE EMISSIONS	46,509
1995 EMISSIONS	21,241
1999 ALLOWANCES	17,340
2003 ALLOWANCES	8,200

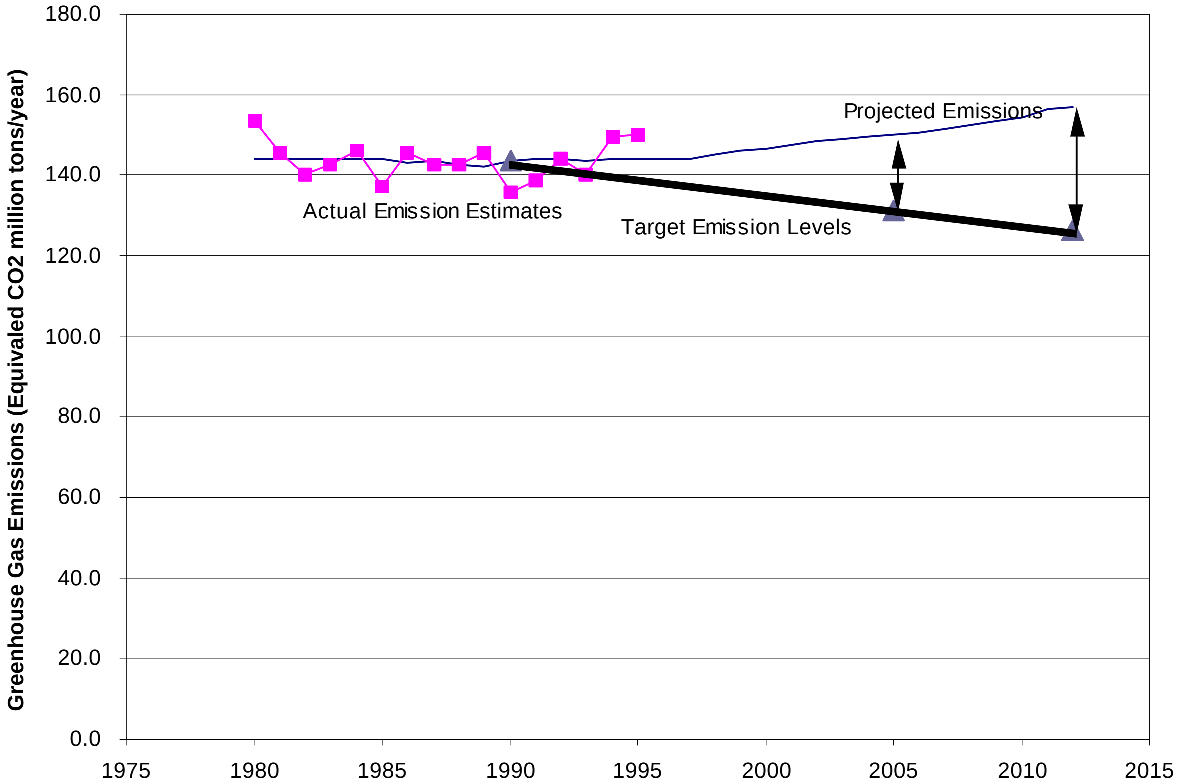
OZONE SEASON DATA (MAY 1 - SEPTEMBER 30)
TOTAL 1999 OTC NOx BUDGET = ABOUT 220,000 TONS

Ozone Related Benefits from Global Warming/Sea Level Rise Initiatives

New Jersey has embarked on an ambitious program to address the issues of climate change and sea level rise. Commissioner Shinn issued an Executive Order on March 17, 1998 that calls for a 3.5% reduction in the state's emissions of greenhouse gases (GHGs), which include carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydroflurocarbons and fully fluoridated compounds, below 1990 levels by 2005, Figure 35. Additionally, recognizing the global cooperation needed to address this issue the Commissioner signed a Letter of Intent with the Ministry of Housing, measures and the Environment of the Netherlands on June 5, 1989. That letter contains that both parties can undertake to gain experience on requisite key actions, such as emissions trading and banking and joint implementation of measures and policies.

The Department is engaged in several activities that will help achieve this goal. Through a grant from the USEPA Office of Policy, Planning and Evaluation, State and Local Climate Change Programs, New Jersey will complete a State Climate Change Action Plan and submit it to the USEPA by September 30, 1998. This plan will identify strategies to achieve Commissioner Shinn's goal. The Department is engaged in two additional climate change projects funded by the USEPA, one to design a carbon dioxide emissions trading program; the other to develop landfill methane emission reduction quantification protocols. A list of research proposals on evaluations of innovative technologies, economic and public opinion assessments, natural resource initiatives and public outreach and education has been developed and presented to the USEPA and US Department of Energy for potential funding. Since CO_2 from combustion is the major component of greenhouse gas emissions many of these initiatives, such as energy conservation are directed at reducing fuel use levels. This should have ancillary benefits regarding NO_x emissions as well as other air contaminants which are likewise produced through combustion. Additionally, New Jersey is actively seeking to cap exist landfills and require venting with flares or other recovery systems. The purpose is to reduce methane emissions, an ancillary reduction in VOC emissions will also occur.

Figure 35: New Jersey Greenhouse Gases Initiative



Land Use Initiatives

New Jersey Governor Christine Todd Whitman announced an ambitious and important agenda toward improving quality of life through sustainable communities. At the center of this agenda is the preservation of one million acres of open space over the next ten years and implementation of the New Jersey State Development and Redevelopment Plan.

Since the early 1950's the state has lost more than one million acres of farmland to development. Many hundreds of thousands of acres of forest, meadows and wetlands have also been transformed into houses, roads or shopping centers. Development has completely changed most of the landscape of New Jersey. The effects of these changes are felt not only in the suburbs and rural areas, but also in the cities because sprawl has drained financial and community resources from New Jersey's urban areas.

With the Governor's directive to fully implement the State Development and Redevelopment plan and commitment to acquire one (1) million acres of open space in 10 years, tangible benefits to air quality throughout the State will also be possible. A significant reduction in the rate of suburban sprawl will result in lower vehicle miles traveled than might otherwise be expected, especially for journey to work destinations. Each day over 160 million miles of travel are recorded on New Jersey roadways. In 1994 alone the vehicle miles traveled increased by over 3% or 5 million additional vehicle miles per day. Technology, by itself, cannot overcome these startling growth figures, never mind the quality life implications.

Emissions of NO_x, VOCs, CO, and CO2, will likely be avoided from implementation of this initiative when compared with unconstrained growth or growth according to existing trends. Much of the emission benefits would be obtained by avoiding the need for vehicle trips or reducing their length by keeping growth in areas favorable to alternative and/or lower polluting methods of travel. Additionally, emission reductions/avoidance would result from the need to develop less infrastructure to support growth in outlying areas, i.e., roadways, sewage treatment facilities, etc. The existing infrastructure could be expanded if necessary, and would be easier to obtain emission reductions through the implementation of controls at potentially larger facilities rather than at many smaller ones. Benefits of this strategy will also result in improvement or avoidance of pollutants into the watersheds and could result in better water quality than unconstrained growth or growth according to the existing. The NJDEP is studying methods to estimate the air quality emission benefits from this initiative.

Technology Encouragement

The NJDEP has an agreement with five other states (New York, Pennsylvania, Massachusetts, California, and Illinois) to establish an interstate reciprocity pathway for environmental technology acceptance. The process is designed to accelerate the time an environmental technology moves from demonstration to fully proven and accepted between states. The pathway is establishing consistent protocols for demonstration and acceptance.

A key to this process is the development of a shared database between states that lists the technology's verification of its operational data and performance. The system would also provide the vendors with up to date performance standards among states. NJDEP is also evaluating a technology database for remedial action treatment technologies. This database is an independently maintained system (not vendor supplied) of the operation data, performance limitation and verification of the technology. It may be potentially expanded to link, through GIS, remediation sites to the technology's demonstrated and the range of operations and results. The system could potentially be expanded to all other types of environmental technology including monitoring, characterization, environmental control, pollution prevention and recycling. These technologies could link, through GIS the sites where the technologies were demonstrated with its overall performance, data and limitation. This would allow other potential users, in similar situations, with proven options.

New Jersey is committed to fostering improvements in technology and their implementation to reduce emissions.

Table 21: List of Measures Warranting Further Assessment

A. Potential national or region-wide measures

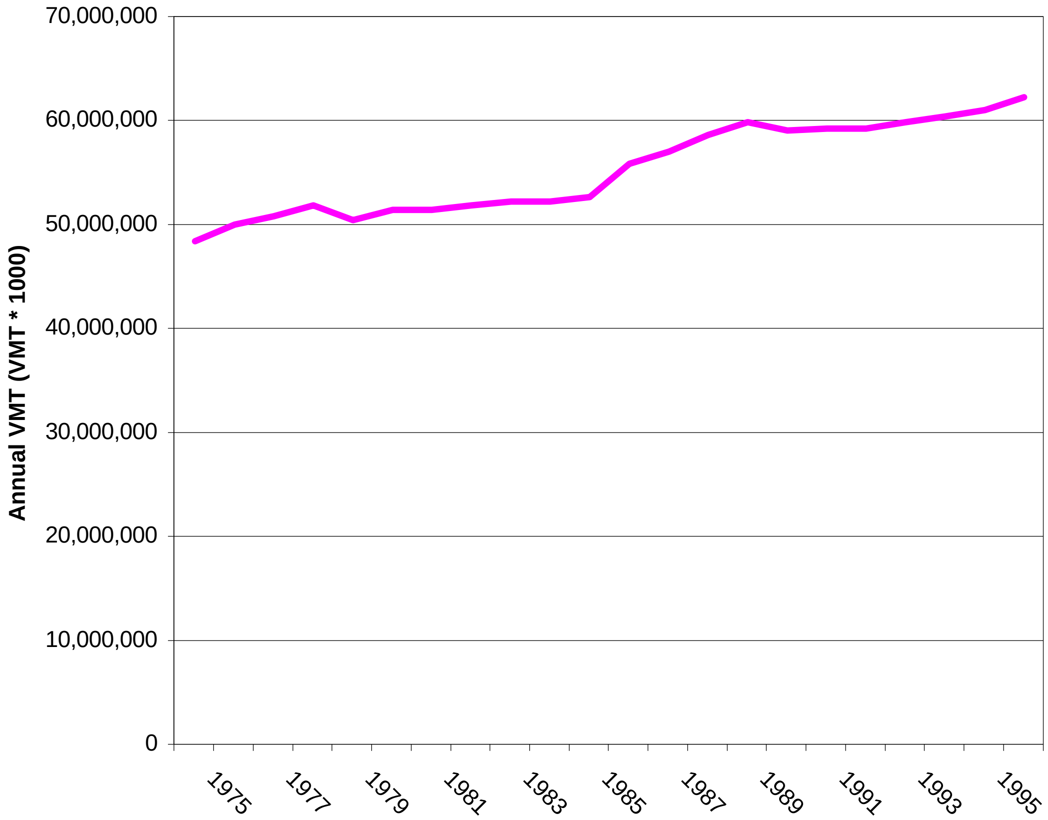
- Federal Tier 2 light duty vehicle standards which are stricter than the current NLEV standards.

  The use of motor vehicles continues to grow nationally at a rate of 2% per year[73], New Jersey vehicle miles traveled data is presented in Figure 36. In order to offset the continued increase in use, cleaner, less polluting vehicles are necessary. The study concludes, that "*The available evidence, ..., supports the need for emission reductions beyond that provided by the Tier I standards, the National LEV program and other control programs. Motor vehicle emissions will remain a significant contributor to air pollution in the country.*" That State of New Jersey strongly encourages the USEPA to propose and promulgate more stringent motor vehicle standards than the NLEV Program now in effect.

---

[73]USEPA Draft Tier 2 Study, April 23, 1998; EPA 420-P-98-009

Figure 36: New Jersey Vehicle Miles Traveled



- Diesel fuel reformulations (including sulfur, aromatics and cetane requirements) to reduce NO_x emissions.

  As gasoline powered vehicles become cleaner the proportion of emissions from diesel vehicles will increase. Further, reductions in $PM_{2.5}$ will likely be needed to assist the States in attaining the $PM_{2.5}$ health standards.

- Aircraft NO_x emissions; jet engines and ground based support equipment.

  Recent scientific information is suggesting that emissions from jet engines at airports and in the landing and take off corridors may contribute to more ozone precursor emissions than previous thought. Further, ground based support equipment also emit emissions of ozone precursors. The NRDC[74] has recently identified airports as significant contributors to elevated ground level ozone concentrations. The State of New Jersey strongly encourages the USEPA to investigate the emission sources and potential control measures. New Jersey will do its part to investigate emission sources and develop methods to reduce such emissions.

B. Potential State or Regional measures

Listed below are potential measures that New Jersey will assess. The measures cover the stationary point, area, and mobile sectors. It should also be noted that a number of the measures involve manufactured products sold in more than one state and/or rely on emission trading to secure the emission reductions sought at the lowest cost. Therefore, it would be preferable to develop many of these measures on a regional basis. As determined necessary, New Jersey commits to work with the regional air quality management organizations, such as OTC, NESCAUM and MARAMA to develop and implement regional solutions.

- Green & Gold Taskforce

  In 1995, the NJDEP convened a Taskforce comprised of industry, environmental groups and public sector representatives. The purpose of the Green & Gold Taskforce is to advise the NJDEP on environmental issues. The NJDEP will seek assistance of the Green & Gold Taskforce to identify specific approaches to reduce ozone precursor emissions from all sectors, e.g., stationary, area, and mobile sources. In past efforts the Green & Gold Taskforce has provided valuable insight into improvements into the NJDEP's Open Market Emission Trading program. Evaluation and incorporation of the recommendations into New Jersey's program is ongoing.

[74]National Resources Defense Council, Flying Off Course - Environmental Impacts of America's Airports; 1996

Stationary Sources

- Declining VOC and/or NO_x emission caps on certain stationary sources or source categories; encourage market trading mechanisms to achieve the emission goals at the lowest cost.

- Stricter NO_x standards for glass and cement manufacturing plants.

Area Sources

- Additional VOC product-specific and/or manufacturer average limits for industrial and commercial solvents/degreasers, metal product coatings, automotive finishers, and industrial adhesives, sealants.

- Additional VOC standards for gasoline dispensing at service stations, and for fugitive emissions from various industrial sources.

- Consumer Product manufacturer pooling, i.e. averaging across product lines, approach, e.g. addressing AIMs, solvents, and aerosol coatings (in cooperation with OTC consumer products program and the EPA Phase 2 program).

- Education for Ozone Action Day.

- Episode bans on open waste burning.

Mobile Sources

- Public disclosure of the expected long term emission control system performance from light-duty vehicles; to foster greater manufactured durability and encourage better maintenance; data based on statistics from the enhanced I/M program.

- Alternate Technology Vehicle (ATV) Encouragement Program.

  On July 29, 1998 when Governor Whitman signed on to the NLEV Program, she directed the NJDEP to develop an Alternate Technology Vehicle Encouragement (ATV) program. The ATV program, while still under development, would provide incentives to accelerate the introduction of alternative technology and fueled vehicles into New Jersey. For the purposes of this program alternately-fueled advanced technology vehicles are considered to be those vehicles with tailpipe emissions significantly lower than those produced by LEVs.

  LEVs will be widely available for sale as the manufacturers meet the fleet average mix requirements of the NLEV program. The goal of this program is to encourage the production and sale of even lower polluting, Ultra Low Emission Vehicles (ULEVs) as they become available.

- Reformulated (primarily lower sulfur) gasoline beyond Federal Phase II requirements.

- Revenue-neutral economic incentives/disincentives to foster the use in New Jersey of lower emitting engine types and fuels and lower polluting technologies by fleet operators and heavy duty vehicle owners.

VI. Rate of Progress (ROP) Plans

The Federal Clean Air Act at 42 U.S.C. §7511a(b)(1) requires states with ozone nonattainment areas classified as moderate, serious, severe or extreme to prepare a plan detailing how these areas will reduce their VOC emissions by 15% from 1990 levels by 1996. New Jersey has three such areas: the New York/Northern New Jersey/Long Island Air Quality Control Region (AQCR), the Philadelphia/Wilmington/Trenton AQCR and the Atlantic City AQCR. In addition to the 15% reduction requirement, 42 U.S.C. §7511a(c)(2)(B) further requires serious, severe and extreme areas to reduce VOC emissions by an additional 3% per year every year from 1996 until the attainment date. This additional requirement is applicable only to the New York-Northern New Jersey-Long Island and Philadelphia-Wilmington-Trenton AQCRs. 42 U.S.C. §7511a(c)(2)(C) allows for the use of NO_x reductions in lieu of VOC reductions to meet the 1999 and beyond emission targets.

As discussed previously, on December 31, 1996, New Jersey submitted its Phase I Ozone SIP, which included its 15% and 24% Rate of Progress Plans.[75] On June 30, 1997, the USEPA approved New Jersey's Phase I Ozone SIP.[76] This approval stopped any remaining sanction and Federal Implementation Plan clocks running at that time. On December 12, 1997, the USEPA disapproved the 15% VOC Rate of Progress Plan portion of New Jersey's Phase I Ozone SIP.[77] The disapproval was triggered by the realization that the benefits included in the Plan from the State's enhanced I/M program would not be obtained within the necessary timeframe. This started a new set of sanction and Federal Implementation clocks.

With the disapproval of New Jersey's 15% VOC Rate of Progress Plans, the losses in benefits for the delayed implementation of the State's enhanced I/M program must be identified. Resolution of this short term shortfall is expected to be addressed prior to the implementation of the first sanction, 2:1 emission offsets for major stationary sources, on July 12, 1999.

Preliminary calculations of the post-1999 Rate of Progress Plans, not included in this document, indicate that the State can meet, and will likely exceed, the Rate of Progress requirements with the measures already adopted by New Jersey and outlined in Section V. As shown in Table 14, the OTAG-predicted VOC emission reduction for New Jersey for 2007 Clean Air Act

---

[75] State Implementation Plan (SIP) Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standards, Meeting the Requirements of the Alternative Ozone Attainment Demonstration Policy, Phase I Ozone SIP Submittal, New Jersey Department of Environmental Protection, December 31, 1996.

[76] 62 Fed. Reg. 35100, June 30, 1997.

[77] Letter dated December 12, 1997 from William J. Muszynski, P.E., Deputy Regional Administrator, USEPA, Region II to Commissioners Robert C. Shinn, Jr., NJDEP and John J. Haley, Jr., NJDOT. A similar, though less detailed, letter dated December 12, 1997 was sent to Governor Christine Todd Whitman from Deputy Regional Administrator Muszynski.

implementation alone is 25%, well beyond the 15% VOC requirement. Additionally, the substantial reductions in oxides of nitrogen afforded by the RACT requirements, implementation of the OTC NO_x MOU, and New Jersey's NO_x cap rules will assist in achieving the ROP requirements for 1999 and beyond.

As outlined in Section VIII, the State of New Jersey commits to develop its required Post-1999 Rate of Progress Plans by no later than December 31, 2000.

VII. Consideration of the New 8-hour Ozone Standard

A. Background and Current Air Quality

42 U.S.C. §7409(d)1 requires the USEPA to review and, if appropriate, revise the National Ambient Air Quality Standards (NAAQS) every five years. On July 18, 1997, the USEPA issued a new ozone health standard. This was in response to scientific evidence that longer-term exposures to ozone at levels below the existing standard were found to cause significant health effects, including asthma attacks, and other breathing and respiratory problems. Consequently, the standard was lowered to 0.08 ppm and based on a longer (8 hour) averaging time. The design value for the new standard is based on the average, over 3 years, of the 4th highest 8-hour ozone level recorded for each year. Recent monitoring data, Figure 37, indicates that the new standard is exceeded at all the monitoring sites in New Jersey. On the peak days the levels exceed the standard threshold by about 25% i.e., by 0.02 ppm or concentrations of 0.10 ppm. Figure 38 displays the trend in 8-hour design values at selected sites in Connecticut and New Jersey. Similar charts from all sites for which data were available are provided in Appendix II. The highest 8-hour 1997 design values in the New York-Northern New Jersey-Southern Connecticut Airshed occur at Madison (108 ppb) and Stratford (105 ppb) in Connecticut. Colliers Mills measured a design value of 109 ppb in 1997 for the Philadelphia-Southern and Central New Jersey area with New Brunswick and Rider College also detecting high values of 101 ppb. Bayonne's design value was 99 ppb.

While the purpose of this attainment demonstration is to address attainment with the 1-hour standard, prudent planning calls for a preliminary examination of anticipated progress toward that standard as well.

B. Photochemical Grid Modeling

To examine the air quality benefit in the 8-hour average ozone concentration from Clean Air Act implementation and the regional NO_x cap, the results from the OTAG Round 2/Run 5 simulation were used. Because of the longer averaging time, it is more difficult to match ambient monitored results over a 3 year period to predicted maximum 8 hour results during particular episodes. The USEPA has performed an analysis to link model predictions to the health-based National Ambient Air Quality Standard as closely as possible.[78] This analysis consisted of comparing the average 4th highest 8-hour concentrations, based on 3 years of ambient data, to the average 1st, 2nd, 3rd and 4th highest 8-hour modeled values. The ambient data used was for the three most recent OTAG episodes (i.e., 1991, 1993 and 1995). The results of this analyses indicate that the average of the episodic 2nd highest 8-hour modeled ozone concentration corresponds best, overall, to the average of the 4th highest 8-hour NAAQS measured data.

[78] 62 Fed. Reg. 60317, (November 7, 1997).

Figure 37: 4th Highest 8-Hour Ozone Maximum Averaged Over a Three Year Period for New Jersey Monitoring Sites

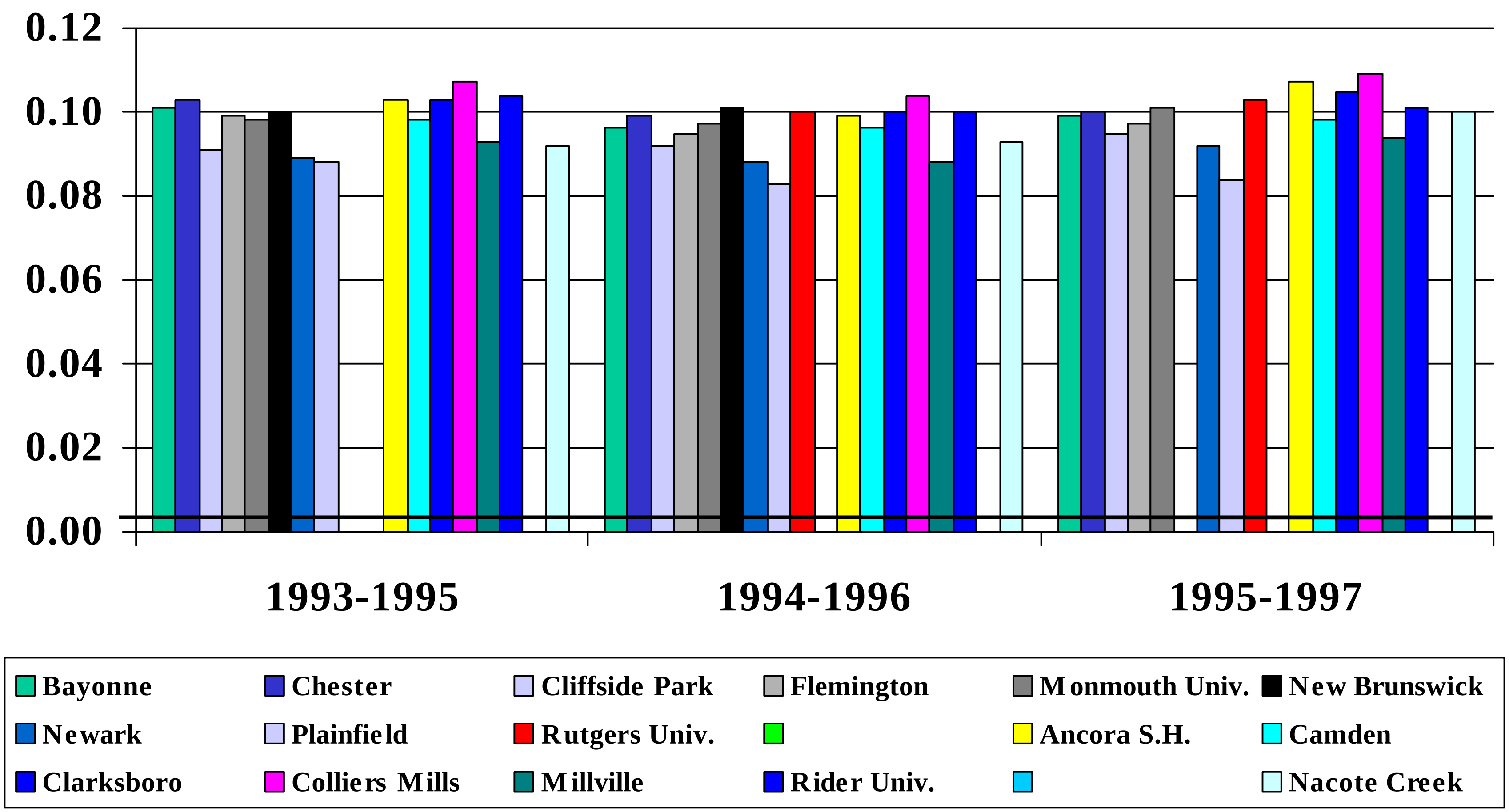
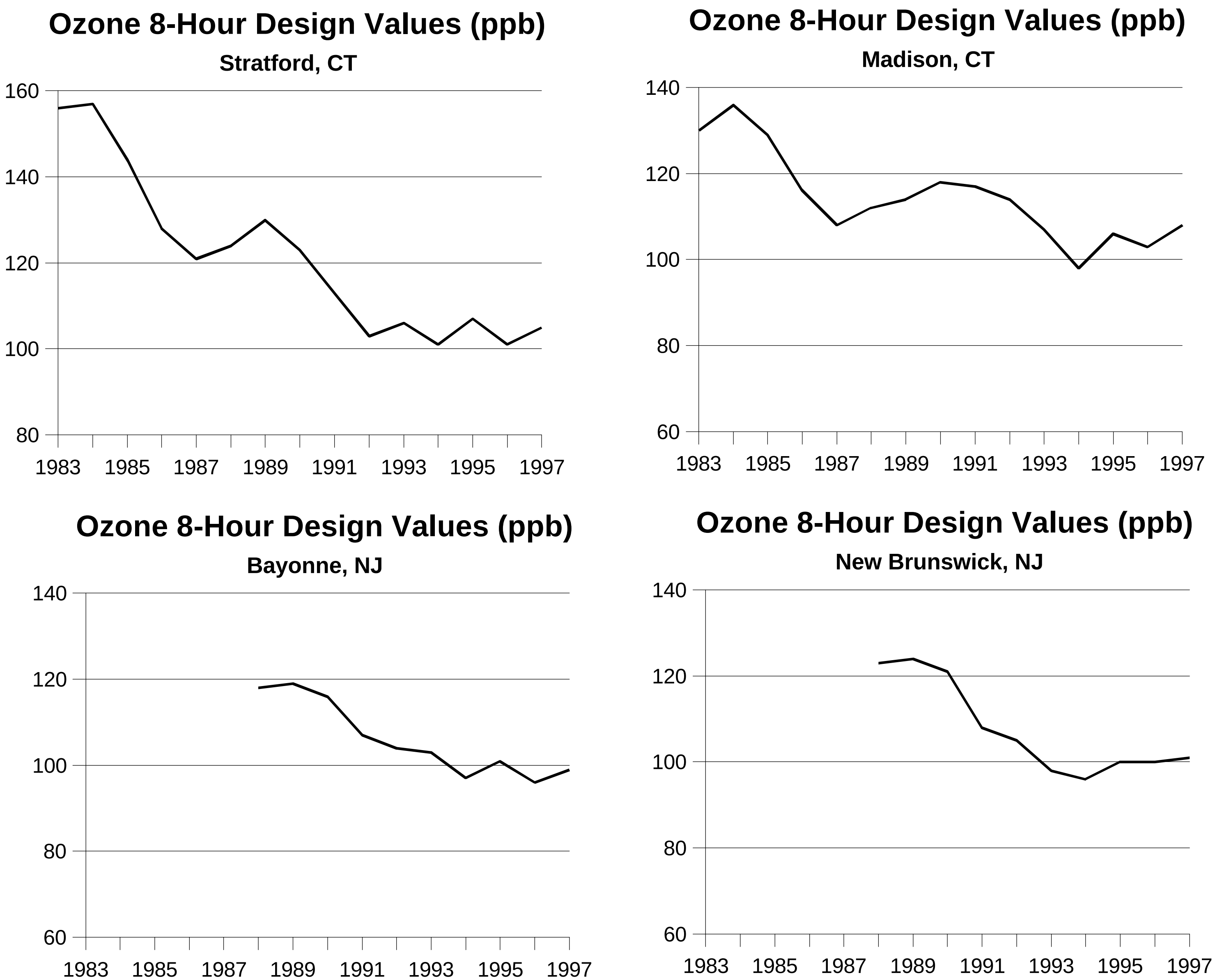


Figure 38: 8-Hour Ozone Design Value Trends for Selected Sites in Connecticut and New Jersey



The matching of 8-hour modeled concentrations to the form of the 8-hour standard will receive greater attention in the future. However the above comparison appears to be the best available at this time, and is employed below to compare 8-hour modeled values to the standard.

(1) The Philadelphia Region

Based on the above discussion the 2nd highest 8-hour modeled values were examined from the Philadelphia-Southern and Central New Jersey Region. The OTAG modeling data was more limited for 8-hour results. The results of the available simulations are provided in Appendix X and summarized in Table 22. Round 2/Run 5 simulation results were available for all episode days for the 1991 and 1993 simulations but not for the 1995 episode. However base case, i.e., Clean Air Act implementation results, were available for the 1995 episode in the form of the 1st, 2nd, 3rd and 4th highest concentration days. A composite ozone difference simulation between the base case and Round 2/Run 5 was also available.

The 8 hour maximum values for the Round 2/Run 5 simulation for the 1991 and 1993 episodes are presented in Table 22. From Table 22 it can be seen that the episodic 2nd highest values are in the 115-130 ppb range for the 1991 episode, and in the 85-100 ppb range for the 1993 episode. For the 1995 episode the Round 2/Run 5 values were estimated by subtracting the difference run results (16 ppb) from the base case (2007 Clean Air Act) values. The resulting range for the 2nd highest episodic values is 109-129 ppb.

The 2nd highest values for each episode from Table 22 are summarized in Table 23 for the low and high end of the OTAG ranges. The predicted average of the 2nd highest 8-hour concentration for the three episodes after Clean Air Act and Regional NO_x Program measures is 103 ppb and 120 ppb for the low and high end of the modeled results, respectively. Therefore, based on the USEPA comparison described above, the ozone concentrations that best represent the form of the standard, i.e., the 3 year average of the 4th highest 8-hour reading for the year, are predicted to be in the 103-120 ppb range, well above the 80 ppb standard.

These modeled results of the 8-hour concentrations may be somewhat pessimistic given that current monitored levels are less than 109 ppb (see Figure 24). Therefore another estimate of the projected 8-hour levels was made using the same approach outlined for the 1-hour standard.

The results of this approach are summarized in Table 24. It assumes a starting point of 109 ppb (from Figure 37) and subtracts the same 20 ppb design value benefit for 8-hour values that was derived for the 1-hour values (see Table 6). The same 20 ppb benefit is used for two reasons. First, the benefit in the 1-hour and 8-hour peak ozone concentrations from the regional NO_x program appear comparable, i.e., 15 ppb for the 1-hour maximum values and about 15 ppb for the 8-hour maximum values (see the “difference” column in Table 22). Second, the relative benefit for the 8-hour “design value” i.e., the benefit in the 3 year 4th highest average relative to the benefit in the maximum 8-hour ozone concentrations, is not likely to be greater than the 78% used for the 1-hour design value. This is expected because the 4th highest 8-hour concentrations are less extreme measures statistically of ozone concentrations than the 1-hour concentrations and are likely to be less responsive to emission reductions.

Using these assumptions the best case estimate for the form of the 8-hour standard is 109 ppb less 20 ppb or 89 ppb, as shown in Table 24 which is in the range of the 0.08 ppm standard. Thus implementation of the measures outlined in the Clean Air Act and the Regional NO_x cap will provide for substantial progress achieving the 8-hour health based standard. Further analysis is needed and is expected to be completed in the 2002 time frame.

Table 22: 8 Hour Averaged Maximum Ozone Levels For the 2007 Clean Air Act and OTAG Round 2/Run 5 Simulations (ppb)

Episode-Day	2007 Clean Air Act	Round 2/Run 5	Difference
July 16, 1991	100-115	85-100	15
July 17, 1991	115-130	100-115	15
July 18, 1991	115-130	100-115	15
July 19, 1991	130-145	115-130	15
July 20, 1991	130-145	115-130	15
July 21, 1991	115-130	100-115	15
July 22, 1993		85-100	
July 23, 1993		55-70	
July 24, 1993		85-100	
July 25, 1993		70-85	
July 26, 1993		40-55	
July 27, 1993		70-85	
July 28, 1993	85-100	85-100	
July 29, 1993		85-100	
July 10-18, 1995	125-145 (highest)	109-129(1)	16(2)
	125-145 (2nd highest)	109-129(1)	
	125-145 (3rd highest)		
	105-125 (4th highest)		

(1) estimated by subtracting 16 ppb from the difference simulation, from the 2007 Clean Air Act Values of 125-145 ppb.
(2) episode composite decrease

Table 23: Second Highest 8- Hour Averaged Ozone Concentration for the Round 2/Run 5 Simulation (ppb)

Episode	Lower Estimate	Higher Estimate
1991	115	130
1993	85	100
1995	109	129
average for all three episodes	103 ppb	120 ppb

Table 24: Projected 4th highest 8-hour average Ozone concentrations Averaged Over a 3 year Period (ppb)

Current Maximum Levels	109
Projected Maximum Benefit From Clean Air Act and Regional NO_x Programs	– 20
Resulting Projection	89 ppb

(2) The New York Region

The latter approach of assuming that the 1-hour and 8-hour design value benefits will be about the same, and then subtracting the previously derived 1-hour benefit from current 8-hour design values, was also applied to the New York-Northern New Jersey-Southern Connecticut Region. The 1997 maximum 8-hour design values for Connecticut and New Jersey monitoring sites in the York-Northern New Jersey-Southern Connecticut Region (from Appendix II) is about 108 ppb. The projected 1-hour design value benefit is 16-20 ppb as discussed in Section IVB(I)(e). Therefore the resulting 8-hour design value is predicted to be approximately 88-92 ppb which is again in the range of the 0.08 ppm standard..

Although, the USEPA has performed an air quality analysis in connection with its recently issued ozone and particulate matter standards.[79] From that analysis, the USEPA concluded that further emission reductions, i.e., beyond Clean Air Act implementation and the Regional NO_x cap, would be needed for both the Philadelphia-Southern and Central New Jersey and York-Northern New Jersey-Southern Connecticut non-attainment areas to reach the 8-hour standard.

C. Conclusions Regarding the 8-Hour Standard

Based on above discussion, it is likely that continued implementation of mandated Clean Air Act controls and the USEPA proposed Regional NO_x cap will significantly reduce ozone levels. With the preliminary assessment provided here, attainment of the health standard is not projected in the Philadelphia-Southern and Central New Jersey or New York-Northern New Jersey and Southern Connecticut Regions. However, given the regional model's underestimation of the transport of ozone, the benefits from the regional NO_x cap may be greater than expected, which will assist the State in reaching this goal. In any event, current USEPA policy calls for the State to develop it's plan to address any nonattainment of the 8-hour ozone health standard and submit it to the USEPA by 2002. Continual progress and implementation of local measures and the regional NO_x cap will substantially assist the State of New Jersey in attaining the 8-hour ozone health standard.

[79]USEPA, 1997; Methodology for Estimating Baseline and Post-Control Ozone Concentrations for the July, 1997 Ozone/PM/RH RIA, July 1997.

VIII. Commitments for Future Action

On December 29, 1997 The USEPA clarified its guidance[80] regarding the Phase II submittals and the relationship of the 1-hour ozone health standard in light of the revised 8-hour ozone health standard. In this guidance, the USEPA notes that the 1-hour standard will continue to apply until such time that an area attains the 1-hour standard. Furthermore, serious and above ozone areas will continue to be subject to the reasonable further progress requirements of 42 U.S.C. 7511a(c)(2) until attainment is achieved. Finally, the USEPA is requiring severe and higher nonattainment areas to commit to submit a plan on or before the end of 2000 which contains (a) target calculations for post-1999 rate of progress milestones up to the attainment date and (b) adopted regulations needed to achieve the post-1999 ROP requirements up to the attainment date and to attain the 1-hour NAAQS.

The State of New Jersey commits to submit a plan on or before the end of the 2000 which will contain: (a) target calculations for post-1999 rate of progress (ROP) milestones up to the attainment date; and (b) the adopted rules that are needed to achieve the post-1999 ROP requirements on a schedule that will allow them to be implemented in a timely manner to meet the rate of progress milestones.

42 U.S.C. 7511a(c)(2) requires states to submit attainment and reasonable further progress demonstrations to the USEPA for ozone nonattainment areas classified as serious and above. The process described in this document is consistent with the attainment demonstration guidelines provided by the USEPA supplemented in this section with a commitment to perform a mid-course review, a reaffirmation of rate of progress obligations and a statement of expectations from the USEPA under recently adopted state and federal partnership agreements.

The USEPA guidance[81] on the use of photochemical grid modeling results to demonstrate attainment with the ozone health standard suggests that, because of the uncertainty inherent in long term projections, that a technically viable attainment demonstration include periodic reviews of air quality, modeling and emissions information to ensure that the plan for attainment remains on track. The USEPA further recommends that the attainment demonstration for severe areas provide for at least one mid-course review as well as a review at or shortly before the attainment date. New Jersey commits to a continuing coordinated effort toward performing such a mid-course review with a report to be submitted to the USEPA by the end of 2002.

The timing of the mid-course review in 2002 is designed to be consistent with other state efforts. For example, the states are required to prepare periodic emission inventories every

---

[80]Memorandum dated December 29, 1997 from Richard D. Wilson, Acting Assistant Administrator for the USEPA Office of Air and Radiation to the Regional Administrators, USEPA, Regions I-X entitled “Guidance for Implementing the 1-Hour Ozone and Pre-Existing PM_{10} NAAQS”.

[81]The USEPA 1996 Policy.

three years, the results of the 1999 periodic emission inventory should be completed by this time. The outcome of the USEPA proposed regional NO_x cap should be know by 2002 with some control technologies already in place. Five additional years of ozone and precursor monitoring data for the summer seasons 1998 through 2002 will be available to assess air quality trends and the effectiveness of programs implemented. In addition, the states are expected to be preparing attainment demonstrations for the 8-hour ozone NAAQS during this same time frame using new and improved techniques. The new techniques should provide a good foundation for reassessing the effectiveness of control programs designed to meet both the 1-hour and 8-hour standards. It is expected that if any shortfalls are identified in this review adequate time will be available to development supplemental emission reduction strategies to ensure attainment with the 1-hour ozone NAAQS by 2005 and 2007.

New Jersey recognizes that additional control measures may be necessary to attain the 1-hour ozone health standard as a result of the mid-course review process. New Jersey commits to evaluate additional control measures (See Table 21) that are identified, in consultation with the USEPA and the public, to confirm that each measure is reasonable and necessary to achieve these goals. New Jersey further commits to proposing such reasonable and necessary control measures, and adopting them in accordance with the New Jersey Administrative Code and other applicable law.

New Jersey will do its fair share to address the ozone attainment issue. However New Jersey's actions cannot by themselves result in attainment. It is therefore necessary for the USEPA to implement all the regional and national control measures to which it has committed.

Additionally, New Jersey commits to meet its obligation for emission reductions and measures to maintain emissions below the final cap levels as proposed[82] in the USEPA's regional NO_x cap.

[82] 62 Fed. Reg. 60317, (November 7, 1997).

IX. Public Participation

A public hearing is schedule for August 6, 1998, on this proposed Phase II Ozone Submittal. Notice of the hearing will be published in prominent newspapers throughout the State and in the New Jersey Register. The comment period is scheduled to close on August 13, 1998. A complete description of the public participation process including the public hearing and any comments received and New Jersey's responses to those comments will be contained in Appendix XIV for final submittal to the USEPA.

X. Conclusions

Based on the above analyses and demonstration, the following conclusions are drawn:

Based on current air quality measurements, and future predicted air quality modeling results, the projected design value for the Philadelphia-Southern and Central New Jersey Region in 2005 is 120 ppb, below the attainment criteria of 124 ppb. OTAG and UAM modeling results for the 1991, 1993, and 1995 episodes are compatible with this result. Therefore the modeling and "weight of evidence" design value method taken together make a plausible case that the Philadelphia Region can reach attainment with the 1-hour ozone standard by the year 2005.

The projected design value benefit of 20 ppb for the Philadelphia Region is consistent with the projected design value benefit of 16-20 ppb for the New York Region. The consistency adds to the weight to be given to these results, especially considering that two different approaches were used to estimate the benefit of further implementation of Clean Air Act measures in the overall calculations.

The above conclusion assumes full implementation of mandated Clean Air Act measures, and of the USEPA's Regional NO_x Cap Program by the year 2002 as proposed. Slippage of that date may jeopardize reaching attainment by 2005 for the Philadelphia-Southern and Central New Jersey Region.

For the Philadelphia-Southern and Central New Jersey Region, both localized Clean Air Act-mandated ozone precursor emission reductions and broader regional (OTAG-wide) NO_x emission reductions are important and both sets of measures are necessary to reach attainment.

As discussed, there is considerable evidence presented herein that the Philadelphia-Southern and Central New Jersey Region as a whole can come into attainment by 2005. Nevertheless there is some uncertainty as regards isolated recent elevated readings at the Colliers Mills site, and whether the benefits of a Regional NO_x program may have been underestimated. Therefore the Department will revisit these issues, as appropriate, for its mid-course review report of 2002 (see Chapter VIII).

For the 8-hour standard, based on available information, it is unlikely, that even with full Clean Air Act and Regional NO_x Program implementation, the Philadelphia-Southern and Central New Jersey Region or the New York-Northern New Jersey-Southern Connecticut Region will reach attainment. Therefore to move toward meeting the 8-hour standard by 2010, as well to provide assurances for meeting the 1-hour standard, the Department will continue to assess its progress towards both standards; and as needed develop innovative strategies to further reduce emissions.

For the New York-Northern New Jersey and Southern Connecticut Region, air quality trends have been downward throughout the airshed over the past two decades. Design values in the last eight years have decreased by about 40 ppb from 175-200 ppb in 1990 to 136-157 ppb in 1997. Other more robust measures of ozone also indicate a downward trend over the period.

Significant further reduction of ozone precursors are expected nationally and locally through 2007. The USEPA's proposed strategy to reduce regional transport of ozone is an integral element in reducing ozone both as it is transported into the New York-Northern New Jersey and Southern Connecticut Region and in reducing ozone levels immediately downwind from the New York area.

Several photochemical grid modeling exercises upwind and over the New York-Northern New Jersey and Southern Connecticut Region have been conducted. While these models perform reasonably well against measured data, there is considerable uncertainty in the model results. This is compounded by uncertainties in estimating future year emissions out to 2007.

The modeling which has been done indicates significant improvements in peak ozone levels will occur over the New York-Northern New Jersey and Southern Connecticut Region if stringent emission control strategies such as the USEPA's proposed regional strategy are assumed. None the less, peak model predictions of ozone in 2007 continue to exceed the level of the NAAQS. However, the models do indicate that the New York-Northern New Jersey and Southern Connecticut Region could attain the NAAQS under clean transport conditions.

For the New York-Northern New Jersey and Southern Connecticut Region, future year design values were estimated using a combination of modeling and air quality data. Design values for 1997 were adjusted downward in proportion to the improvement estimated by the photochemical grid models for a combination of mandatory Clean Air Act programs through 2007 plus an assumed stringent regional NO_x reduction strategy. The resulting design values were in large part less than the level of the NAAQS, with the possible exception of 3 monitoring sites where the upper end of the projected design value range exceeds the attainment criterion of 124 ppb.

The New York-Northern New Jersey and Southern Connecticut Region is projected to benefit from significant ozone reductions as a result of further implementation of mandated Clean Air Act measures, and a Regional NO_x cap similar ro that proposed by the USEPA.

It is likely that additional emission reductions beyond Clean Air Act and Regional NO_x cap driven measures will be needed for all the sites in the New York-Northern New Jersey and Southern Connecticut Region to reach attainment with the 1-hour standard, as well as the 8-hour standard. Preliminary estimates of the reductions needed have been provided. However given a number of uncertainties neither the extent or nature, i.e. VOC or NO_x, of those further emission reductions is clear at this time.

In light of this uncertainty, the states of Connecticut, New Jersey and New York will be conducting a mid-course review in 2002 to assess progress towards attainment by 2007 (See Chapter VIII). By then, the extent of Regional NO_x cap reductions should be known as should the nature of Tier 2 vehicle standards, thereby greatly facilitating the definition of emission reductions that are needed to attain the 1-hour standard. In the interim New Jersey has committed to assess a suite of both VOC and NO_x control measures to provide the technical basis to adopt any additional measures necessary to attain the 1-hour standard.