SUPPLEMENTARY WORKBOOK FOR WORKSHOPS ON PROCEDURES TO DEMONSTRATE ATTAINMENT OF THE NAAQS FOR OZONE IN 1982 SIP'S

by

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APRIL 1981

CONTENTS

1.0 INTRODUCTION

This workbook is intended to serve as a supplement to workshops concerning:

1) the U.S. EPA's policy concerning 1982 State Implementation Plans (SIPs) for ozone, ~~and~~

2) ~~one~~ procedure which may frequently be used to demonstrate that implemented controls are likely to be sufficient to attain the National Ambient Air Quality Standard (NAAQS) for ozone.

The workshops take place during April 1981 in three cities. Each workshop is three days in length. The first day is spent discussing key policy-related issues including timing requirements, Federal versus State/local roles, stationary source consideration, inspection/maintenance policy and its rationale and additional transportation control measures. At the end of the first day, participants should have a working knowledge of the policy and U.S. EPA personnel should gain insight into points which need further clarification.

The second and third days of the workshop are used to describe application of city-specific EKMA to demonstrate attainment of the ozone NAAQS. It is anticipated that this model will be widely used in the 1982 SIPs. However, many of the issues which arise with city-specific EKMA are pertinent even if other procedures are used to demonstrate attainment. It is intended for participants to first gain a general sense of what "city-specific EKMA" is and then why it is viewed by the EPA as an acceptable, expedient approach for use in 1982 SIPs.

The conceptual model underlying EKMA implies several needs for air quality, meteorological and emissions data. These data needs are next identified. A detailed discussion of how these required data are applied to generate the ozone isopleths used in EKMA follows. Once graphs of ozone isopleths are obtained, control requirements can be estimated using the EKMA procedure. Determination of control requirements is described and illustrated by the use of several examples.

It is of interest to know how well EKMA works. Efforts to evaluate the performance of city-specific EKMA are next described. Finally, there is likely to be a number of questions concerning the application of models in the 1982 SIPs. Each workshop concludes with an open discussion of issues raised by members of the audience.

At the end of each workshop, the audience should have a general understanding of the EPA's policy concerning 1982 ozone SIPs, data needs, how to generate and apply the ozone isopleths used in city-specific EKMA, and how well the model has performed in evaluations conducted to date.

The remainder of this supplementary workbook is organized in the following manner. Section 2.0 contains the agenda and overall outline followed in each workshop. Section 3.0 provides a synopsis of the material covered in each of the ten major paragraphs enumerated in the workshop outline. Each of the ten subsections in Section 3.0 consists of an identification of the key points and ideas the speaker wishes to convey, an outline of the speaker's presentation and the sequence of slides used in the presentation. Throughout each workshop, a number of acronyms or terms may be used which are not familiar to all members of the audience. Section 4.0 is a glossary of such terms. Section 5.0 presents the EPA policy on 1982 SIPs for ozone and carbon monoxide. Finally, Section 6.0 identifies a number of references which provide additional information on various requirements in the 1982 SIP submittals and on city-specific EKMA.

2.0 OUTLINE AND AGENDA FOR THE WORKSHOP

I. INTRODUCTION

A. Administrative Details

B. Purposes of Workshop

1. - to identify and clarify policy related to attainment demonstrations in the 1982 SIPs.

2. - to describe in depth application of the simplest acceptable approach (city-specific EKMA) for demonstrating attainment of the ozone NAAQS in 1982 SIPs;

C. Outline Contents of Workshop

D. Definition of Commonly-used terms

- EKMA
- OZIPP
- City-Specific EKMA, or Level III analysis.

E. Briefly outline SIP requirements for 1982, with emphasis on pertinent regulations or guidance on demonstration requirements

- pertinent excerpts from FR notices
- list of guidance documents and contents.

II. POLICY FOR SUBMITTAL OF 1982 OZONE IMPLEMENTATION PLANS

A. General Overview of Policy

- what constitutes reasonable further progress?
- what is the policy on the use of models?
- what degree of flexibility exists with regard to the July 1982 submittal date?
- what is to be done if it is impossible to hold public hearings within alloted time frame?
- how are these requirements affected by the Clean Air Act review?
- what is the policy with regard to cities which have not requested extensions and do not meet standards by 1982?
- what is the relationship between rural and urban nonattainment areas?
- nonattainment projected for 1987?

B. Stationary Source Commitments

- what size sources must have RACT?
- what CTG's will be available before 1982, and when?
- what should a State do about sources not covered by a CTG?
- what is meant by additional stationary source controls?
- what are the inventory requirements for stationary sources?

C. Inspection/Maintenance

- what guidance is available on the implementation of I/M programs?
- what type of I/M programs are acceptable?
- when must I/M be implemented?
- must regulations be submitted on a commitment to implement?

D. Other Transportation Measures

- what other transportation measures must be included in the 1982 submittal?
- what is considered an unimplementable measure that can be excluded from the 1982 plan submitted?

E. Miscellaneous Items

- what are the air quality and emission data submittal requirements?
- what is the policy on the size of the modeling area?
- what is the policy if the peak impact occurs in another jurisdictio
- how will uncertainty in model predictions be handled?

III. NATURE OF AIR QUALITY STANDARD AND RESULTING IMPLICATIONS

A. State the NAAQS. Note the implications -- we are interested in demonstrating that in the post-control state, a daily maximum concentration of ozone is not expected to be greater than 0.12 ppm more than once per year at any monitoring site.

B. Note that O_3 levels depend on a number of factors (e.g., transport, trajectory, etc.) and that there is not necessarily a linear relationship between VOC controls and peak O_3. Hence, the day with the second highest ozone concentration will not necessarily correspond to the control requirement needed to demonstrate attainment.

C. Illustrate what we are interested in determining with a frequency distribution diagram of control requirements.

D. Describe procedure recommended to demonstrate attainment and its underlying rationale and advantage. Contrast with procedure used in previous SIPs.

IV. CONCEPTUAL BASIS FOR EKMA

A. Distribution of photochemical pollutants in urban areas.

B. Factors affecting ambient ozone levels.

C. Desirable attributes for a model to have in simulating impact of controls. Discuss the extent to which city-specific EKMA is consistent with these attributes.

D. Physical model underlying EKMA (OZIPP)

- illustrate column model and its ability to consider such factors as
    - diurnal mixing height variations
    - varying sunlight intensity
    - varying emissions
    - transported pollutants
    - reactivity
- Justify assumptions concerning uniform vertical mixing with data from Philadelphia and St. Louis and use of automotive exhaust as an indicator of reactivity.

E. Chemical model in OZIPP

- how derived and calibrated

F. Summarize advantages/disadvantages of city-specific EKMA

- say what EKMA is appropriate for.

V. MONITORING EFFORTS NEEDED TO SUPPORT THE APPLICATION OF CITY-SPECIFIC EKMA IN ATTAINMENT DEMONSTRATIONS (1 hour)

A. Purposes -- to characterize highest O_3 concentrations under meteorological conditions most conducive to high ozone

- to provide input to OZIPP and EKMA to enable adequate simulation of the impact of hypothetical changes in VOC and/or NO_x on peak ozone levels.

B. Emission Inventory Needs of the Model

C. Network design

- refer to November 14, 1979 FR
- ozone -- purpose downwind max and transport estimates
- NMOC -- initial conditions before photochemistry
- NO_x -- same as NMOC
- give individual siting requirements of O_3, NMOC and NO_x sites and the underlying rationale
- wind, temperature, pressure measurements.

D. Elaboration on Certain Aspects of Monitoring

1. estimating O_3 transport -- difficulties, methods for doing so

2. estimating precursor transport

3. measurement of NMOC

    - sources of difficulty
    - range of accuracy
    - reason for using robust indicators
    - best instruments and procedures according to EMSL TAD.

VI. USE OF DATA TO GENERATE OZONE ISOPLETHS WITH OZIPP

A. Make connection with previous section on monitoring -- idea to get across is "how do we use the data which have been collected."

B. Selection of days to be modeled.

C. Give overview of different inputs affecting the shape of the isopleth diagram obtained with OZIPP

- dilution
- transport of ozone
- light intensity
- transport of precursors
- "post 8 a.m. emissions"
- reactivity.

D. Light Intensity

- why important
- what data are used
- sensitivity of predictions to parameter (i.e., how much care is needed in estimating this input).

E. Dilution

- why important
- relationsip to mixing heights
- how mixing heights are estimated using temperature, pressure and radiosonde data
- description of computer program (how to run and what inputs are needed)
- illustrate exact format of input required
- sensitivity of predictions to parameter (i.e., how much care is needed in estimating this input).

F. Transport of Ozone

- why important
- what data are needed
- some "typical" levels
- sensitivity of predictions to parameter (i.e., how much care is needed in estimating this input).

G. Transport of Precursors

- why or why not important
- what data are needed -- need to explain why downtown and upwind data are needed
- distinguish between surface transport and transport aloft
- typical, observed levels
- sensitivity of predictions to parameters (i.e., how much care is needed in estimating this input).

H. Post 8 A.M. Emissions

- why important
- what data are needed (spatial and temporal detail in emission inventory)
- go through procedure of calculating emission fractions carefully, illustrating amply with examples
- sensitivity of predictions to parameter (i.e., how much care is needed in estimating this input).

I. Reactivity

- sensitivity or lack thereof to different aspects of reactivity
- note difficulty in considering changes in reactivity with propylene/butane mechanism
- recall previously described justification for using automotive exhaust.

J. Computer Operations with OZIPP

1. Go through the format for each input card.
2. Illustrate with a numerical example.
3. Describe pertinent procedures using OZIPP.
4. Describe output
    - with and without offline plotter
    - what typical running times and costs might a user expect?
    - meaning of different outputs (e.g., NOT MAX., etc.), utility of CALC mode
    - operations and considerations (e.g., properly-centered diagrams, program messages)
    - illustrate output with an example.

VII. USE OF THE OZONE ISOPLETHS IN CITY-SPECIFIC EKMA TO ESTIMATE CONTROLS NEEDED TO REACH 0.12 PPM CONCENTRATIONS OF OZONE

A. Make connection with previous discussion on how to generate isopleths -- now that we have isopleth diagrams, how can they be used to estimate controls needed to reduce ozone to 0.12 ppm on a given day? This is the EKMA procedure.

B. First step is to establish a starting point on the isopleth diagram. This is done using prevailing 6-9 a.m. NMOC/NO_x ratios and day-specific ozone design values.

  - use material in EPA-450/2-77-021b to show how to estimate NMOC/NO_x ratio; illustrate with example.

C. Go through example of how to calculate

  1. control requirements
  2. impact of specified control reductions.

D. Note underlying assumptions:

  1. both initial concentrations and post 8 a.m. emissions are reduced proportionally
  2. other input, such as transported ozone, remain constant.

E. Illustrate how EKMA is applied when conditions D1 and D2 are not met

  1. - post 8 a.m. emissions change differently than initial conditions (in what cases might this occur?)
  2. - transported pollutants change
  3. - elaborate on the most important case -- the case of changing transport
     - how are future transported ozone and/or precursors estimated
     - what is the rationale?
  4. illustrate application of EKMA with concurrently changing transport with a numerical example (including computer input and output).

F. Note that it is possible to consider more than one concurrent change simultaneously.

VIII. USING EKMA TO DEMONSTRATE ATTAINMENT OF THE OZONE NAAQS

A. Make connection with previous discussion -- we now know how EKMA can be used to show what levels of control are needed to reach 0.12 ppm O_3 on specific days. The final step is to use this information to demonstrate attainment of the NAAQS.

B. Go through two participative examples to insure audience understands how to demonstrate attainment of the statistical NAAQS for ozone.

IX. RESULTS OF EFFORTS TO VALIDATE EKMA

A. We are most interested in establishing that EKMA provides good estimates of VOC and/or NO_x control requirements

  - not necessarily the same thing as successfully predicting O_3 concentrations in the base state

- problem: there are no "absolute" right answers against which to compare model performance.

B. Procedures

1. - comparison with trends
   - rationale, steps and limitations
2. - comparison with sophisticated models' predictions
   - rationale, steps and limitations
3. - comparison with observed data
   - rationale, steps and limitations
4. - evaluation of OZIPP as used in city-specific EKMA as an indicator of a city's ozone-forming potential
   - rationale, steps and limitations.

C. Extent of Comparisons

D. Results

1. with trends
2. with observed data
3. with other models -- elaborate on this
   Note additional advantages of considering several days.
4. use of OZIPP as an indicator of a city's ozone forming potential.

E. Ongoing work

X. MODELING RELATED ISSUES

This will consist of a fairly informal discussion between the speakers and the audience. Possible topics which could arise are:

- ° size of modeling region
- ° relationship to political boundaries
- ° degree of uncertainty in modeling
- ° use of different chemical mechanism or other deviations from the "standard approach"
- ° use of default values
- ° eliminating certain days from consideration.

The content of the discussion will depend on the interests expressed by members of the audience.

WORKSHOP AGENDA

PROCEDURES TO DEMONSTRATE ATTAINMENT OF THE NAAQS FOR OZONE IN THE 1982 SIPs

Time		Topic	Speaker
DAY 1			
	8:30	Registration	
	9:00	Introduction	Edwin Meyer
	9:30	General overview of the policy for submittal of 1982 ozone SIPs	Johnnie Pearson
	10:45	BREAK	
	11:00	Policy for submittal of 1982 ozone SIPs	Johnnie Pearson
	12:15	LUNCH	
	1:15	Transportation control measures	Representative of OTLUP
	3:00	BREAK	
	3:15	Inspection/Maintenance	Representative of OMSAPC
	4:15	Open discussion	Johnnie Pearson
	5:15	ADJOURN	

AGENDA (continued)

Time	Topic	Speaker
DAY 2		
8:30	Implications of the ozone standard	Edwin Meyer
9:00	Conceptual basis for EKMA	Robert Kelly
9:45	Monitoring requirements	Edwin Meyer
10:45	BREAK	
11:00	Generating ozone isopleths for use in EKMA	Gerald Gipson
12:15	LUNCH	
1:15	Generating ozone isopleths for use in EKMA (continued)	Gerald Gipson
2:45	BREAK	
3:00	Generating ozone isopleths for use in EKMA (continued)	Gerald Gipson
4:15	Open discussion	Edwin Meyer
5:15	ADJOURN	
DAY 3		
8:30	Application of isopleths in EKMA procedure	Gerald Gipson
10:30	BREAK	
10:45	Estimating the SIP control requirement	Gerald Gipson
11:15	EKMA validation	Edwin Meyer
12:30	LUNCH	
1:30	Modeling related issues and general discussion	Edwin Meyer
4:30	ADJOURN	

SPEAKERS

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3.0 MAJOR TOPICS

3.1 Introduction

Introductory remarks are intended to set the tone for the workshop. This is accomplished by identifying the purpose of the workshop and by indicating how each major topic logically follows from the previous ones. The content of the workbook is briefly touched on. Emphasis is placed on those acronyms appearing in the glossary which are likely to be most frequently used during the workshop. Key additional references, as well as references available at the workshop, are also identified. The introductory remarks conclude with a brief synopsis of events, key *Federal Register* notices and legal requirements which have led to the need for submitting SIPs to the EPA Regional Offices by July 1982 demonstrating attainment of the ozone NAAQS by 1987.

Introduction -- Outline

A. Administrative Details

B. Purposes of Workshop

1. Policy clarification

2. Description of city-specific EKMA

C. Contents of Workshop

To the extent possible, we would prefer to defer questions until the end of each speaker's presentation. We will try to follow agenda closely. Indicate speakers for each session.

1. On the first day, outline key aspects of agency policy on 1982 ozone SIPs. Note that policy is in Section 5.0 of the workbook.

2. Identify key aspects of the ozone NAAQS and how it impacts on demonstration of attainment, particularly with city-specific EKMA.

3. Provide a conceptual discussion of EKMA as an overview.

4. Describe the air quality, meteorological and emission information needed to support a city-specific EKMA analysis.

5. Describe how the information thus obtained is used to generate city-specific ozone isopleth diagrams.

6. Show how the city-specific isopleths were used to make control estimates (city-specific EKMA procedure).

7. Indicate how attainment requirements are determined.

8. Describe the extent to which city-specific EKMA and the OZIPP model have been validated.

9. Discuss modeling-related issues raised by attendees.

D. Identify Other Key Features of Workbook

1. Alert attendees to key acronyms and note their presence in Section 4.0 of the workbook.

EKMA
OZIPP
City-specific EKMA

2. Identify key references listed in Section 6.0 of the workbook and how to obtain references.

EKMA Guideline
User's Manual
TAD for NMOC instruments
Emission Inventory Guideline

E. Provide a Brief Background of Events Leading to 1982 SIPs

1. February 24, 1978 Administrator's SIP criteria memo

2. 1979 SIPs containing provision for those areas not able to demonstrate attainment by 1982

3. 1979 FR on data needs

4. CTG development on continuing basis

5. Emission inventory workshops

6. September 30, 1980 policy proposal and comments

7. Policy published in FR (January 1981)

8. EKMA guideline developed and revised in accordance with comments

9. Technical Assistance Document on operation of continuous NMOC monitors published

10. These workshops.

PURPOSE OF WORKSHOP

- Clarify policy concerning 1982 SIPs
- Describe city-specific EKMA and its uses for demonstrating attainment of the ozone NAAQS

OZONE WORKSHOP

- AGENCY POLICY ON 1982 SIPs
- NATURE OF OZONE NAAQS
- CONCEPTUAL VIEW OF EKMA
- INFORMATION NEEDED TO USE EKMA

- How to generate city-specific isopleths
- How isopleths used to estimate controls
- How control estimates used to demonstrate NAAQS attainment
- Validation of EKMA
- Modeling issues

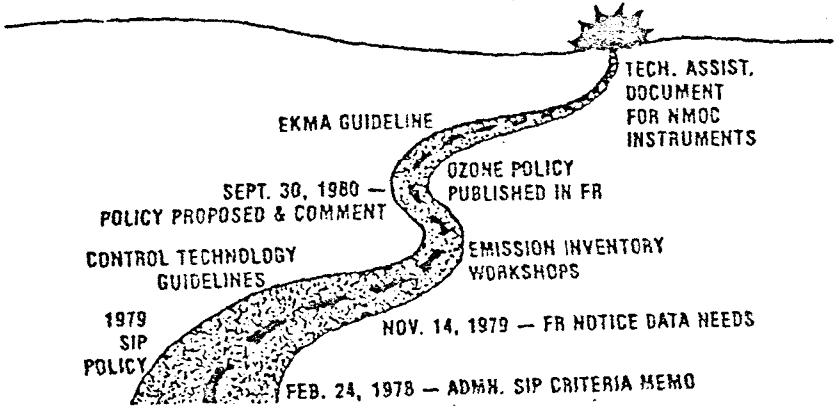
KEY ACRONYMS

NAAQS
OZIPP
EKMA
City-Specific EKMA
RFP
CTG
I/M

WRITE
OR CALL

U.S. EPA Library
MD 35
Research Triangle Park,
North Carolina 27711

919/541-2777 (comm.)
919/629-2777 (FTS)



THIS WORKSHOP

TECH. ASSIST. DOCUMENT FOR NMOC INSTRUMENTS

EKMA GUIDELINE

OZONE POLICY PUBLISHED IN FR

SEPT. 30, 1980 — POLICY PROPOSED & COMMENT

EMISSION INVENTORY WORKSHOPS

CONTROL TECHNOLOGY GUIDELINES

1979 SIP POLICY

NOV. 14, 1979 — FR NOTICE DATA NEEDS

FEB. 24, 1978 — ADMN. SIP CRITERIA MEMO

3.2 Policy

The Clean Air Act provides for attainment of the National Ambient Air Quality Standards (NAAQS) by December 1982, except where a State has requested and received an extension for either carbon monoxide or ozone. States receiving such extensions are required to submit a SIP revision which demonstrate attainment of these standards by 1987. In order that States be aware of the requirements surrounding SIP revisions due in 1982, the Agency, on January 22, 1981 (46 FR 7182), published its policy on the submission of CO and ozone SIPs in July 1982. The purpose of this policy is to set forth the basic and minimum requirements that must be met by these States to have an approvable SIP. Many of these requirements were previously stated in policy memorandum or workshops and should come as little surprise to those agencies who have been planning, since the submission of the 1979 SIP, for the 1982 submittal.

These requirements, or criteria for approval, can best be separated into four general categories: (1) Control strategies and attainment demonstration; (2) SIP development process, (3) data collection, and (4) modeling.

It must first be remembered that Congress, as a condition for extending the attainment date, required that each SIP contains certain provisions regarding stationary source control, vehicle Inspection/Maintenance and transportation measures. These measures are to be implemented regardless of the attainment date, if attainment is projected after 1982. Vehicle Inspection/Maintenance and transportation measures will be addressed in additional presentations. This presentation deals primarily with Stationary Source Controls.

RACT

The Clean Air Act in Section 172(b) requires States to impose Reasonably Available Contract Technology (RACT) as expeditiously as practicable. To assist States in this effort, EPA has prepared a number of Control Techniques Guidelines (CTGs) covering most of the nationally important sources of organic compounds. The drafts of the last in these series are currently available. However, it is important to remember that the State must determine what other stationary sources exist within the nonattainment area and must develop and submit legally enforceable emission limitations representing RACT for these sources in addition to those covered by the CTGs. States should look at the CTG documents for assistance in these areas because many of the control technologies presented may be equally applicable, transferrable to other sources under consideration. It should also be recognized that this is a minimum requirement. States that are unable to demonstrate attainment by 1987 with the application of RACT, must develop more stringent stationary source measures.

RFP

One of the major new provisions of the amendment of 1977, was the concept of reasonable further progress. Congress was obviously concerned that even though standards may not be attained for several years that we progress at a specified rate toward that goal. The policy requires that reasonable further progress be defined as a linear reduction in emissions from the base year (1980) inventory to the attainment date. Several commenters on the policy suggested that this was an unreasonable request because of the time necessary to implement some of the measures, EPA believes that the linear requirement is realistic because (a) States can, to some extent, modify compliance dates particularly with respect to control of stationary source emissions, (b) many of the emission reductions projected from the 1979 plan submittal will not have taken place until 1980 or after and can be included in the reasonable further progress determination and (c) any other scheme would be virtually impossible to implement or monitor.

Extensions Beyond 1987

The Agency recognizes that there may be a few areas that may not be able to demonstrate attainment by 1987 even after imposing stringent stationary source controls and implementing mobile source measures. In order to ensure that thse areas are imposing the most stringent controls available EPA will, after submission of the 1982 SIPs, prepare a compilation of the most stringent measures applied by any area as presented in the SIPs. Areas unable to demonstrate attainment will be required to (1) examine the feasibility of each measure and revise their SIPs accordingly, (2) provide documentation measures already adopted are as stringent, or (3) explain why equivalent measures cannot be adopted. In support of these areas, EPA intends to address this issue of nonattainment in 1987 to the Congress in the upcoming review of the Clean Air Act. One option available is to request authority to extend the attainment date beyond 1987 on a case-by-case basis. In such a case, extensions would be most likely dependent upon the area demonstrating that the most stringent measures possible have been adopted.

SIP Contents

The plan submitted in 1982 must include legally enforceable control measures which demonstrate attainment of the CO or ozone NAAQS. If all measures which can be implemented by 1987 are not adequate to demonstrate attainment, additional measures which can be implemented after 1987 must be identified and adopted and attainment must be demonstrated by the earliest possible date. The date of attainment, either before 1987 or after 1987, must be identified in the SIP. The SIP submittal must also include implementation schedules and commitments, with respect to data requirements, the most recent three years of air quality data must be reduced, validated, and summarized in the plan, this will generally reflect data collected through the third quarter of 1981. For the emission inventory, the data should be submitted in the recommended format for both the base year, generally 1980, and for the year of expected attainment. These two inventories will be used to define the RFP line.

Transportation Control Plans (TCP)

The EPA guidance for the transportation portion of the 1979 SIP submittal placed primary emphasis on the establishment of a continuing air quality-transportation planning process. This guidance, which included the June 1978 EPA-DOT Transportation-Air Quality Planning Guidelines and the Administrator's February 24, 1978 memorandum, "Criteria for Approval of the 1979 SIP Revisions," remains as the principal set of policies that EPA will use in approving 1982 transportation control plans (TCP).

The final 1982 SIP policy reiterates and attempts to clarify the TCP requirements. For example, the policy presents more detail on the requirements for commitments and schedules. Also, the policy calls for an expansion of the portion of the SIP submittal that will be dedicated towards meeting "basic transportation needs." The need for two new requirements, a monitoring plan and a contingency plan, are explained.

The policy also outlines a step-by-step procedure for nonattainment areas that will find it difficult to attain the standards by 1987. The policy then discusses the approach EPA believes should be followed by those few large urban areas where air quality problems are so severe that analysis may indicate that attainment by 1987 is not possible.

The provisions of section 176(c), which requires all Federal activities to conform to the SIPs, and section 316(b), which requires accommodation of any emissions associated with a wastewater treatment facility, are addressed by the policy.

The final subject for the OTLUP presentation is the SIP Development Process which includes consultation among State and local officials; establishment of emission reduction targets; and analysis of alternatives.

Inspection/Maintenance (I/M)

According to the Clean Air Act, all major urban areas needing an extension beyond 1982 for attainment of a standard for ozone and/or carbon monoxide were required to include vehicle I/M as an element of the 1979 SIP revision. States were required at that time to submit only evidence of adequate legal authority, a commitment to implement and enforce a program that will reduce hydrocarbon and carbon monoxide exhaust emissions from light duty vehicles in 1987 by 25 percent, and a schedule for implementation.

The purpose of the 1982 SIP revision for I/M, which is due on July 1, 1982, is to incorporate in the SIP the final design elements of the program. EPA's 1982 SIP policy for I/M names ten specific program elements which must be officially submitted as part of the SIP. They are: 1) inspection test procedures; 2) emission standards; 3) inspection station licensing requirements; 4) emission analyzer specification and maintenance/calibration requirements; 5) record keeping and record submittal requirements; 6) quality control, audit, and surveillance procedures; 7) procedures to assure that noncomplying vehicles are not operated on the public roads; 8) any other official program rules, regulations, and procedures; 9) a public awareness plan; and 10) a mechanics training program if additional emission reduction credits are being claimed for mechanics training.

As part of the 1982 SIP review process, EPA will determine the overall adequacy of the critical elements of each I/M program and, therefore, the approvability of the 1982 SIP by comparing those elements to established I/M policy. I/M program elements must be consistent with EPA policy or a demonstration must be made that the program elements are equivalent.

With the completion of the 1982 revision, the SIP will contain a specific and detailed I/M control strategy which is supported by the necessary authority, commitments and resources. Where basic requirements of Part D of the Clean Air Act have been met in previous SIP revisions, a state need not resubmit this information in the 1982 SIP, but rather may choose to incorporate this information by reference.

Special Considerations for I/M Planners

1) EPA policy regarding minimally acceptable programs is set out in memoranda from David G. Hawkins to the EPA Regional Administrators dated July 17, 1978 and February 21, 1979, and is clarified in a memorandum from Michael P. Walsh to the Air and Hazardous Materials Division Directors dated January 19, 1981.

2) EPA policy requires that I/M programs achieve minimum emission reductions in 1987 relative to a non-I/M scenario. The amount of emission reduction produced by the I/M program is determined based on estimated program stringency, geographic coverage, vehicle types subject to inspection, test type, and start-up date, as modified by age exemptions, cost waivers, and mechanics training. Specific information on these program elements must be available in the SIP, and a demonstration must be made by the State using either MOBILE 1 or MOBILE 2 that the minimum emission reductions will be achieved.

3) Following program start-up, States must report annually to EPA information on program implementation and enforcement (42 U.S.C. 7410(a)(2)(B), 7414 and 40 CFR 51.321-51.328). The SIP should contain a commitment to report to EPA data which allow a determination of I/M program effectiveness.

4) One of the basic requirements for all SIP control strategies is the identification and commitment of sufficient personnel and financial resources to carry out the provisions of the plan (42 U.S.C. 7472(b)(7)). The 1982 I/M SIP, therefore, must contain a demonstration that adequate resources have been committed to implement, operate, and enforce the program.

GENERAL OVERVIEW OF POLICY - OUTLINE

I. Schedule

  A. Policy proposed on September 30, 1980.

  B. Comment period closed on December 1, 1980.

  C. Final policy published on January 22, 1981.

  D. Data base submitted on or before December 31, 1982.

  E. SIP revision submitted by July 1, 1982.

  F. Attainment by 1987.

II. Introduction

  A. Congress recognized the difficulties involved with attaining the CO and ozone NAAQS by 1982.

  B. Many areas have requested and received extensions beyond 1982.

  C. Attainment must be as expeditious as practicable but must be by 1987.

  D. Certain minimum requirements must be met for areas attaining after 1982. These minimum measures are discussed in Section I of the policy.

  E. Development of the 1982 SIP must follow certain processes and procedures. These are presented in Section II of the policy.

  F. 1982 SIP submittal must include updated emissions and air quality data. The data requirements are discussed in Section III.

  G. Section IV describes the modeling requirements for the 1982 plan submittal.

III. Control Strategies and Attainment Demonstration

A. 1982 SIPs must contain a fully adopted, technically justified program.

B. Program must commit to implement adopted control measures that will result in attainment of NAAQS.

C. SIP must provide for attainment of CO/Ozone NAAQS by 1987.

D. SIP must provide for "reasonable further progress" between 1980 and attainment date.

E. Attainment after 1987

1. State must adopt additional measures implementable after 1987.

2. Attainment date must be specified and be as early as possible after 1987.

3. EPA will evaluate all SIPs for stringency and compile a list of the most effective controls.

4. Areas unable to attain by 1987 will be required to adopt most stringent measures or demonstrate reasons for not doing so.

F. Control measures must be adopted in legally enforceable form.

G. SIP must also include implementation schedules and committments.

IV. Stationary Source Control

A. All major stationary sources must have RACT.

B. If attainment by 1987 not demonstrated using RACT, State must go beyond RACT.

C. Stationary source commitments. As a condition for extending the attainment date, Congress required that each SIP contain certain control provisions for stationary sources. Key stationary source policy questions are:

1. What size sources must have RACT?

2. What CTG's will be available before 1982 and when?

3. What should a state do about sources not covered by a CTG?

4. What is meant by additional stationary source controls?

5. What are the inventory requirements for stationary sources?

V. Vehicle Inspection/Maintenance

A. All major urban areas needing an extension beyond 1982 for ozone must have I/M.

B. Also applies to CO.

VI. Transportation Measures

A. Reasonably available transportation control measures listed in Section 108(f) of the CAA.

B. These are minimally acceptable requirements.

VII. Reasonable Further Progress (RFP)

A. SIP must demonstrate reasonable further progress.

B. RFP must be demonstrated from 1980 to the date of attainment.

C. Annual reduction must be at least equal to a linear reduction in emissions.

D. RFP tracks emissions, not Air Quality.

E. RFP tracks actual emissions.

F. RFP tracking is not just a paper exercise. Emission decreases obtained as a result of physically installing equipment, actually implementing transportation measures, or imposition of permit limitations on process, operating conditions or hours of operation only are to be reported.

G. Emissions increases authorized as a result of new source permitting must be included at time of permit approval (minus offsets not already accounted for).

H. Projected emission reductions must be at least equal to the linear reduction line.

I. All reductions since 1980 are creditable regardless of whether they result from 1979 or 1982 plan.

J. Demonstration of RFP must include a breakdown between stationary and mobile source emissions.

VIII. Additional Control Measures To Attain

A. More stringent stationary source control measures than RACT.

B. Extending controls to sources smaller than the minimum RACT levels.

C. Implementing a broader range of transportation measures.

D. Adoption of post-1987 measures.

IX. SIP Development Process

A. Consultation with State and local officials.

1. Section 121 of the Act requires consultation with
   a. local governments
   b. organizations of locally elected officials
   c. federal land managers.

2. Section 174 of the Act requires a joint determination of respective roles in
   a. SIP development
   b. SIP implementation
   c. SIP enforcement.

3. 1982 SIP must contain designation of responsible agencies.

B. Establish mode of emission reductions targets--1982 SIP must reflect agreement between State and local officials on the mix of emission reduction measures necessary to achieve the NAAQS.

C. Analysis of Alternatives

1. Where alternative control measures exist, particularly with respect to more stringent controls, the State must analyze the effect of the alternatives.

2. The CAA requires that SIPs include an analysis of
   a. air quality effects
   b. health effects
   c. welfare effects
   d. economic effects
   e. energy effects, and
   f. social effects.

3. EPA believes two other national concerns should be addressed
   a. Conservation of petroleum and natural gas, and
   b. protection of economies of declining areas.

X. Areas requesting extensions are presented in Appendix A of January 22, 1981 policy notice.

XI. Miscellaneous Issues

A. The following are modeling related issues which were not specifically addressed in the final ozone and CO policy.

1. What are the air quality and emission data submittal requirements?

2. What is the policy on the size of the modeling area?

3. What is the policy if the peak impact occurs in another jurisdiction?

TCM Outline

I. Transportation Control Measures
    A. Reasonably available transportation measures
    B. Commitments
    C. Schedules
    D. Basic Transportation Needs
    E. Public Participation
    F. Monitoring Plan
    G. Contingency Provision

II. Additional Control Measures Required for Attainment
    A. Control Measures needed for Attainment by 1987
    B. Post 1987 Attainment

III. Conformity of Federal Actions
    A. Section 176(c)
    B. Section 316

IV. SIP Development Process
    A. Consultation Among State and Local Officials
    B. Establishment of Emission Reduction Targets
    C. Analysis of Alternatives

I/M Presentation Outline

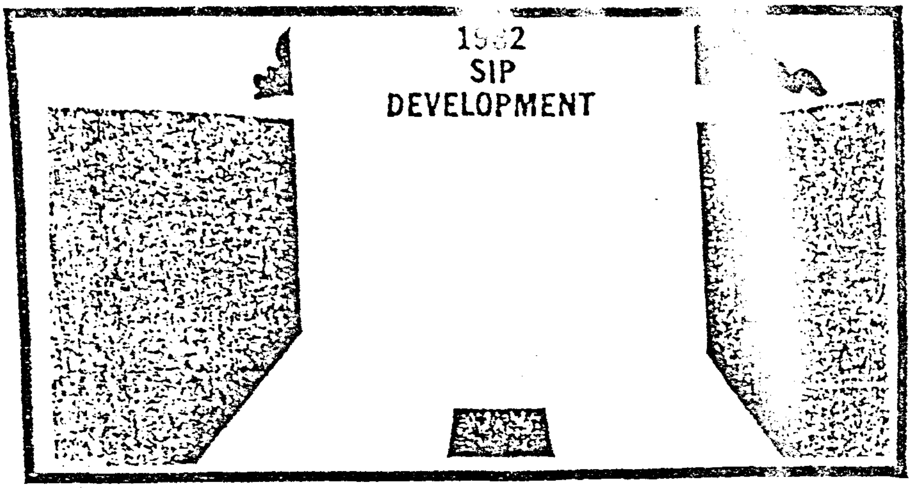
I. Purpose of the I/M SIP Revision
   A. Documentation of the I/M Control Strategy
   B. EPA Policy & Guidance
   C. Basic SIP Requirements

II. SIP Elements
   A. Inspection test procedures
   B. Emission Standards
   C. Inspection station licensing requirements
   D. Emission analyzer specification and maintenance/calibration requirements
   E. Record keeping and records submittal requirements
   F. Quality control, audit and surveillance procedures
   G. Procedures to assure that non-complying vehicles are not operated on the public roads
   H. Other official program rules, regulations and procedures
   I. Public awareness plan
   J. Mechanics training

III. RACT Compliance
   A. Use of the emission factor model
   B. Program design consideration

IV. EPA SIP processing
   A. Partial submittals
   B. Total I/M program approval

NOTES



1982
SIP
DEVELOPMENT

- Policy Proposed — 9/30/80

- Policy Proposed — 9/30/80
- Comment Period — 12/1/80

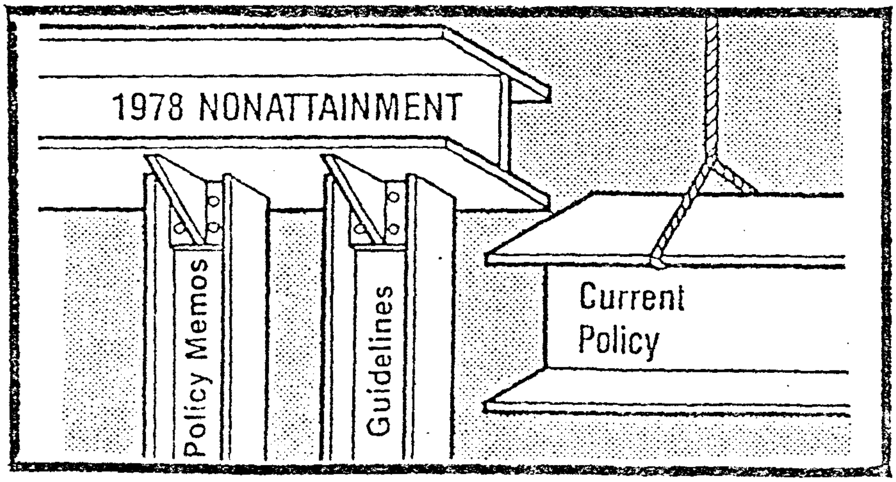
- Policy Proposed — 9/30/80
- Comment Period — 12/1/80
- Final Policy Published — 1/22/81

NOTES

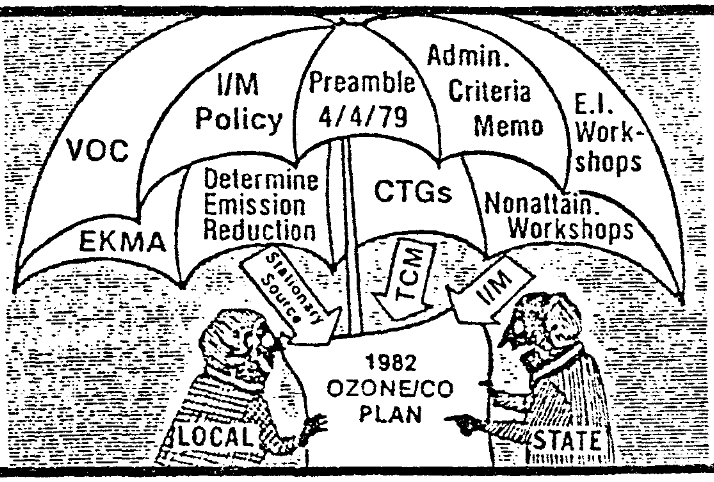
- Policy Proposed — 9/30/80
- Comment Period — 12/1/80
- Final Policy Published — 1/22/81
- E.I. Data Base Due — 12/31/81

- Policy Proposed — 9/30/80
- Comment Period — 12/1/80
- Final Policy Published — 1/22/81
- E.I. Data Base Due — 12/31/81
- SIP Submitted — 7/1/82

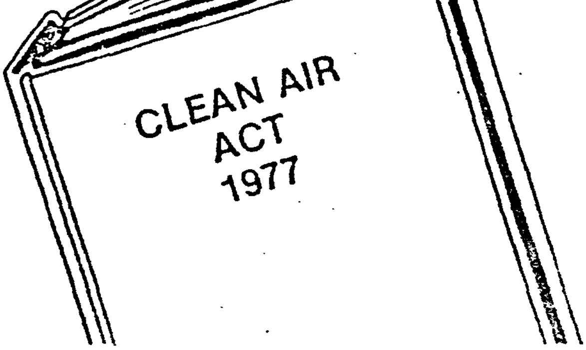
- Policy Proposed — 9/30/80
- Comment Period — 12/1/80
- Final Policy Published — 1/22/81
- E.I. Data Base Due — 12/31/81
- SIP Submitted — 7/1/82
- Attainment — 1987



Current Policy
Basically Compilation
of Previous Guidance



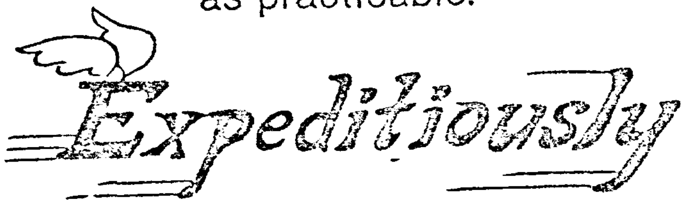
INTRODUCTION TO POLICY



NOTES

Many areas requested time extension to beyond 1982.

Plan must demonstrate attainment as practicable.



NO LATER THAN 1987

Certain minimum requirements must be met — Section I of Policy

Development of SIP must follow certain processes — Section II of Policy

1982 SIP must include
updated emissions and AQ data —
Section III of Policy

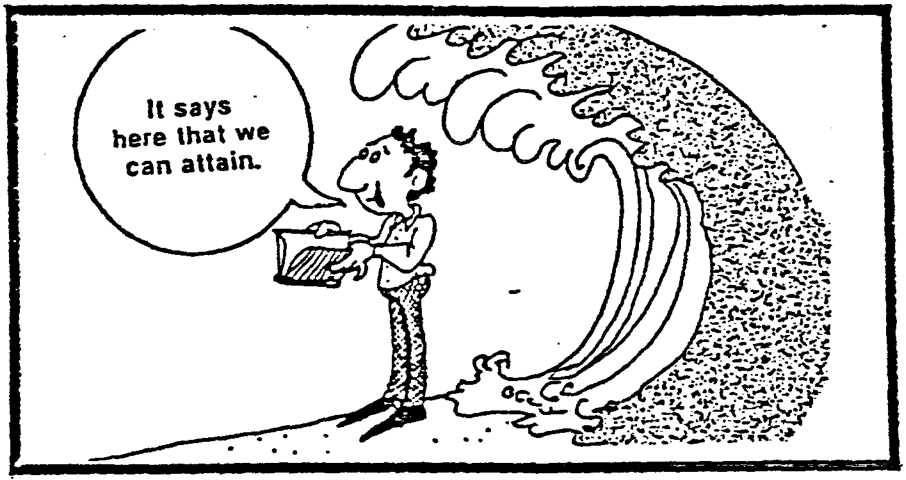
SIP development must follow
certain modeling requirements —
Section IV of Policy

CONTROL STRATEGIES
AND
ATTAINMENT DEMONSTRATIONS

'82 SIP must be
fully adopted
and technically justified.

REASONABLE FURTHER PROGRESS

ATTAIN NO LATER THAN 1987



ATTAINMENT AFTER 1987 ?

SIPs Demonstrating
Attainment After
1987 May Be Accepted.

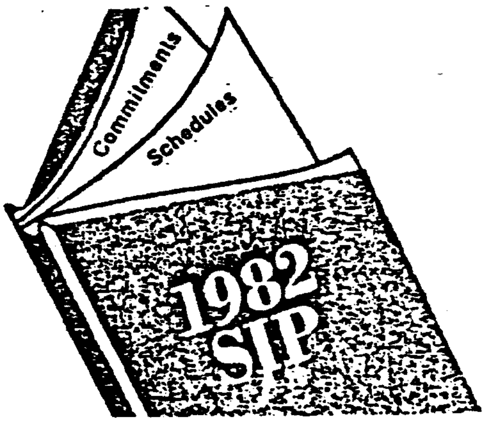
Attainment Must Be
At Earliest Possible
Date After 1987.

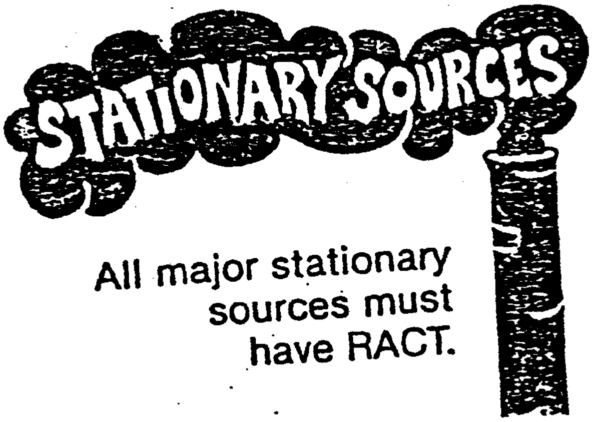
Must Include Adopted
Measures Implementable
After 1987.

Stringency

State Will Be
Required To Adopt
Most Stringent Measures.

All measures must be
legally enforceable
in '82 SIP





All major stationary
sources must
have RACT.

REASONABLY AVAILABLE CONTROL TECHNOLOGY

REQUIREMENTS

A. SECTION 172 (b) (2) OF THE CLEAN AIR ACT

APPLICABILITY OF DISCUSSION

A. RACT

B. STRINGENT BUT REASONABLE MEASURES

RACT

"THE LOWEST EMISSION LIMIT THAT A PARTICULAR SOURCE IS CAPABLE OF MEETING BY THE APPLICATION OF CONTROL TECHNOLOGY THAT IS REASONABLY AVAILABLE CONSIDERING TECHNOLOGICAL AND ECONOMIC FEASIBILITY"

TYPES OF INFORMATION AVAILABLE

A. NEW SOURCE PERFORMANCE STANDARD (NSPS) SUPPORT DOCUMENTS
B. NATIONAL EMISSION STANDARD FOR HAZARDOUS AIR POLLUTANTS (NESHAPS) SUPPORT DOCUMENTS
C. CONTROL TECHNIQUE DOCUMENTS FOR SPECIFIC POLLUTANTS
D. EXISTING STATE AND FEDERAL REGULATIONS
E. CONTROL TECHNOLOGY GUIDELINE DOCUMENTS FOR VOC.

If Can't Demonstrate
Attainment By 1987 —
Go Beyond RACT.

STATIONARY SOURCE SPECIFICS

What size
source must
have RACT?

- Present CTG Sources
- Future CTG Sources
- Major VOC Sources ≥100 tons/yr
- CO Sources ≥1000 tons/yr

What CTG's will be available in 1981?

- VOC STORAGE
- PETROLEUM DRY-CLEANING
- OFFSET LITHOGRAPHY

- FUGITIVE VOC, NATURAL GAS AND NATURAL GAS PROCESSING PLANTS
- POLYMERS AND RESINS
- FUGITIVE VOC, SOCMI
- STYRENE-BUTADIENE COPOLYMER MANUFACTURING
- AIR OXIDATION SOCMI

How should states handle major sources not covered by a CTG?

- Determine if additional controls = RACT
- Legally enforceable measures implementing RACT
- Documentation supporting existing controls represent RACT

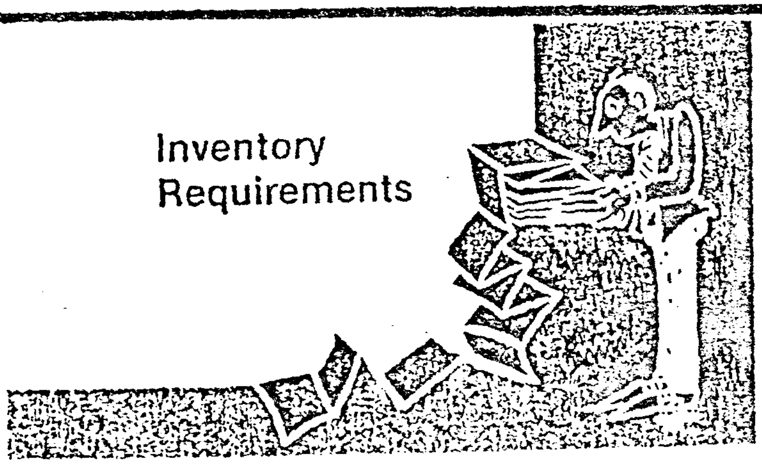
ADDITIONAL STATIONARY CONTROLS

- IMPLEMENTABLE BY 1987
- NO PAPER DEMONSTRATIONS

Examples

—More stringent than RACT
—Extend controls to minor sources

Inventory Requirements



WHAT ARE THE CLEAN AIR ACT REQUIREMENTS FOR EMISSION INVENTORIES

?

WHAT ARE THE CLEAN AIR ACT REQUIREMENTS FOR EMISSION INVENTORIES?

- CLEAN AIR ACT SECTION 172 (b) (4)
- COMPREHENSIVE, ACCURATE, CURRENT INVENTORY

1982 OZONE SIP INVENTORIES
Comprehensive

- All > 100 tn/yr (minimum) point sources (RVOC or NO_x) included
- All emissions not covered by point source inventory to be included in area source inventory as a result of categorical data or individual source summation efforts
- All "CTG/RACT" sources inventoried and appropriately categorized

---

1982 OZONE SIP INVENTORIES
Current

- Major sources (> 100 tn/yr) updated with reliable "hard" data (e.g. questionnaires, plant permits, inspections, source tests, etc.) to represent 1980
- All smaller point and area sources updated by surveys or local data collection efforts to represent 1980

1982 OZONE SIP INVENTORIES
Accurate

- Quality Assurance program to assure completeness and accuracy of data (point/area)
- Internal auditing, error detection and correction programs in effect

---

WHAT IS THE PURPOSE OF AN EMISSION INVENTORY

?

WHAT IS THE PURPOSE OF AN EMISSION INVENTORY?
- PLAN DEVELOPMENT
- REASONABLE FURTHER PROGRESS EVALUATION

WHAT SOURCES OF EMISSIONS SHOULD BE INVENTORIED

?

WHAT SOURCES OF EMISSIONS SHOULD BE INVENTORIED?

- NEED ACCURATE ACCOUNTING
- SOURCES GREATER THAN 100 TONS PER YEAR POTENTIAL
- MOBILE SOURCES

1982 OZONE SIP INVENTORIES

Pollutants/VOC Policy

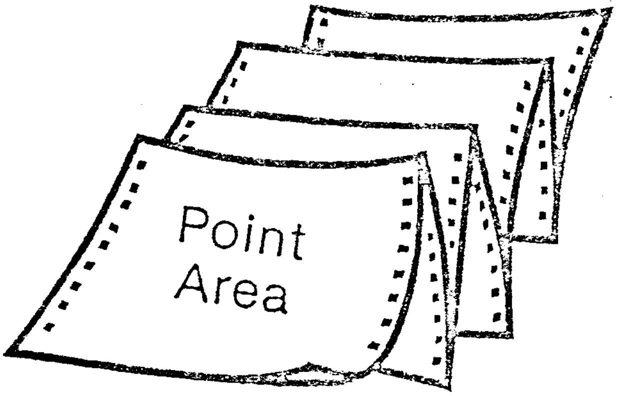
- Reactive Volatile Organic Compounds (RVOC)
- NO_x
- VOC Policy References
  42 FR 35314 (July 8, 1977)
  45 FR 32424 (May 16, 1980)
  45 FR 48941 (July 22, 1980)

1982 OZONE SIP INVENTORIES

EPA's VOC Policy excludes the following compounds from the inventory and ozone SIP regulation

- methane
- ethane
- methylene chloride
- methyl chloroform
- trichlorotrifluoroethane (CFC-113)
- trichlorofluoromethane (CFC-11)
- dichlorodifluoromethane (CFC-12)
- chlorodifluoromethane (CFC-22)
- trifluoromethane (FC-23)
- dichlorotetrafluoroethane (CFC-114)
- chloropentafluoroethane (CFC-115)

Some of these compounds may be regulated by other means

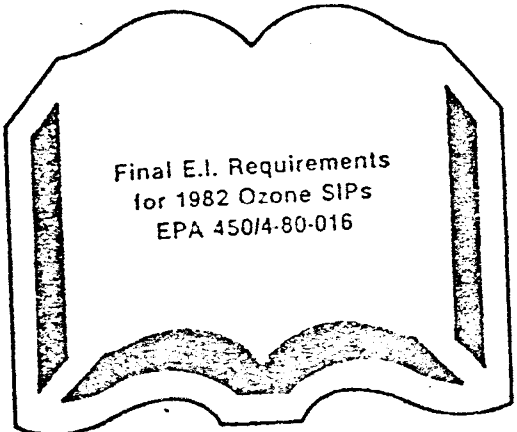


Area

- Entire Nonattainment Area
- Countywide

Base Year

- 1980 Data Base
- Impact of Implemented SIP Regulations

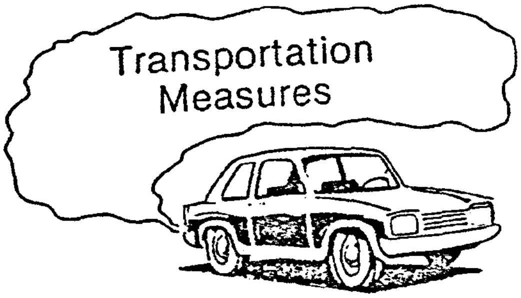


Final E.I. Requirements
for 1982 Ozone SIPs
EPA 450/4-80-016

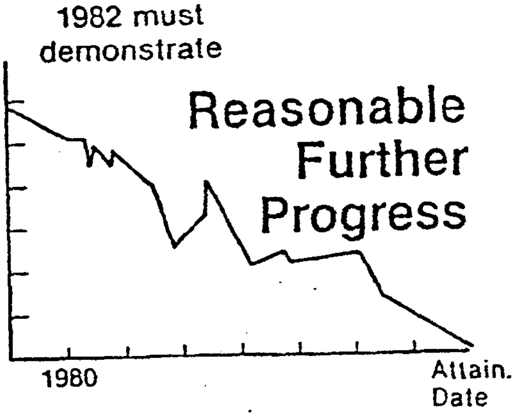
Projected Baseline Attainment Year Inventory

- Growth Impact
- Impact of Adopted Regulations
- Other Anticipated Changes in Emissions

I/M Required in All Urban Areas Not in Attainment by 1982



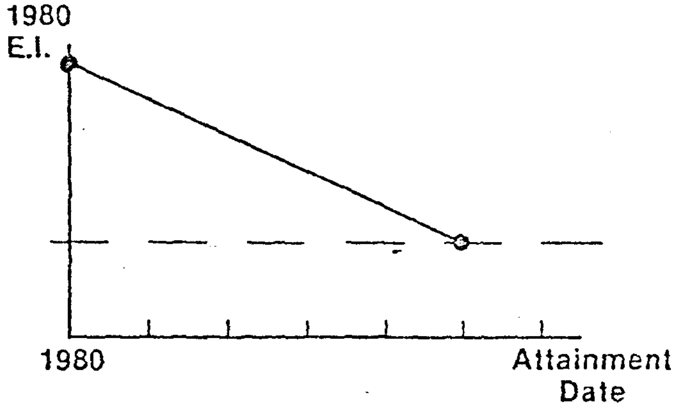
RTCM in Section 108(f) in '82 SIP



Reasonable Further Progress

NOTES

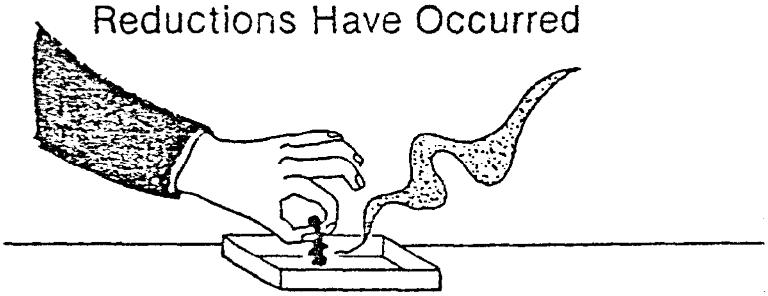
Annual Emission Reductions
At Least Equal To
Linear Reduction in Emissions



RFP TRACKS
ACTUAL EMISSIONS —
NOT AQ

RFP IS NOT
PAPER EXERCISE

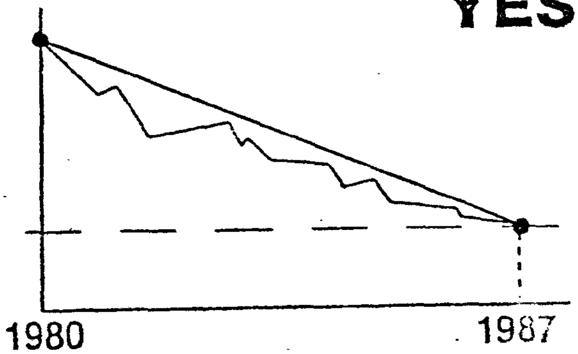
Reductions Creditable
Only When Actual
Reductions Have Occurred



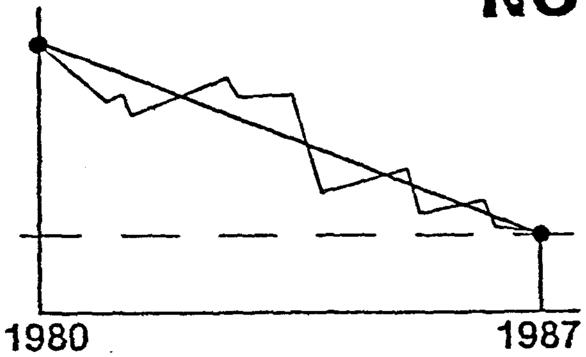
Emission Increases Due to
New Sources Included at
Time of Operation

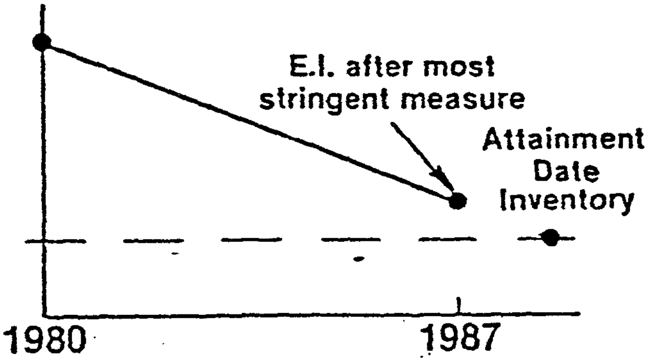
Projected Emissions
At Least Equal To
Linear Reduction Line

YES



NO

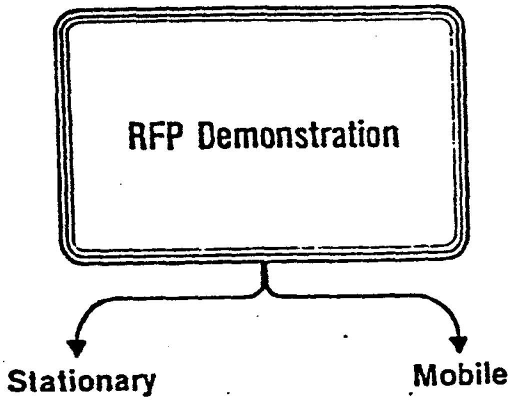




Intermediate Year Inventories

- Each year between base year and attainment year
- Distinguish between mobile and stationary

All Reductions Since 1980 Are Creditable.



RFP Demonstration

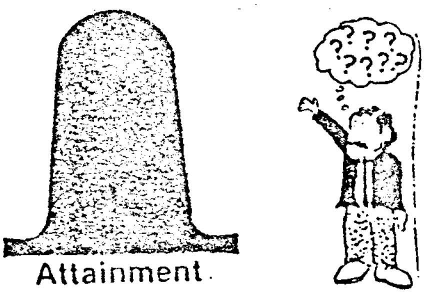
Stationary

Mobile

ADDITIONAL CONTROL MEASURES TO ATTAIN

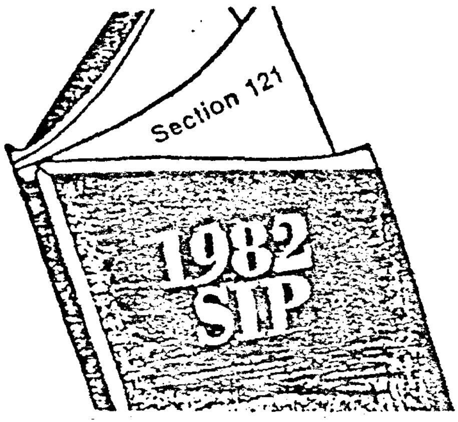
- STATIONARY BEYOND RACT
- EXTEND CONTROLS TO SMALLER THAN MINIMUM RACT SIZE

- BROADER RANGES OF TRANSPORTATION MEASURES
- INCREASED COVERAGE AND STRINGENCY OF I/M



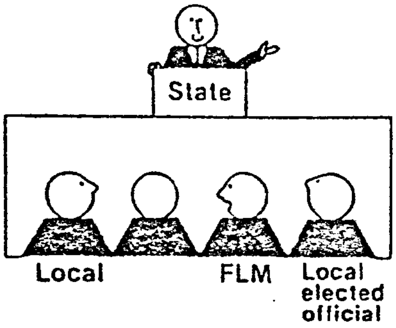
Adopt Measures To Be
Implemented After 1987

SIP
DEVELOPMENT
PROCESS



NOTES

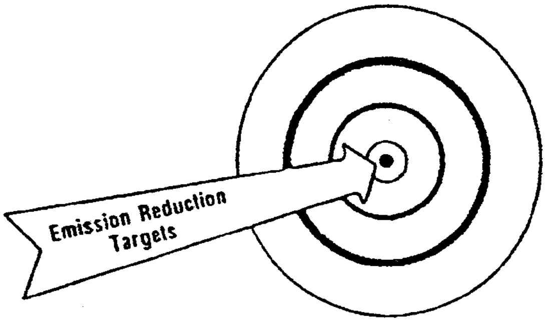
CONSULTATION



Section 174 requires joint determinations in SIP. . .

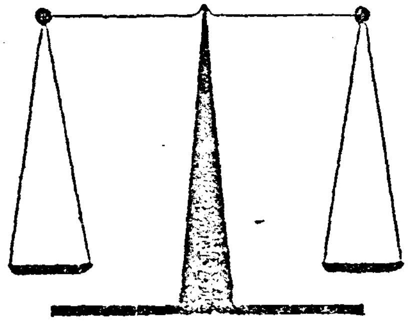
- Development
- Implementation
- Enforcement

'82 SIP must designate responsible agency



'82 SIP must contain agreement on mix of control measures

ANALYSIS OF



ALTERNATIVES

Act requires analysis to include:

Air Quality

Health

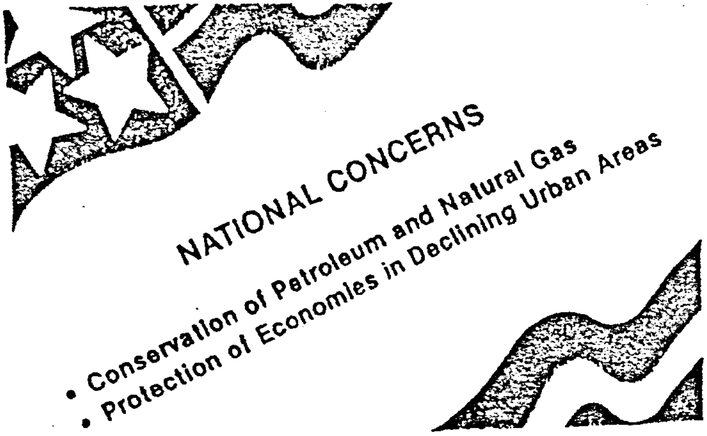
Welfare

Economics

Energy

Social

NOTES



NATIONAL CONCERNS

- Conservation of Petroleum and Natural Gas
- Protection of Economies in Declining Urban Areas

Miscellaneous Issues

Projected 1982 Ozone SIP Strategy

- Impact of Additional Regulatory Controls
- Impact of '79 SIP

What are the AQ and Emissions Data submittal requirements?

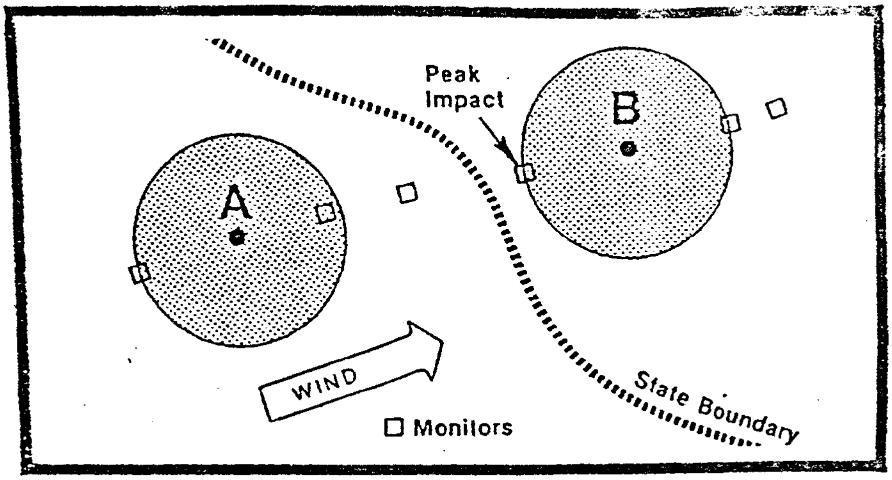
- 1980 Inventory
- December 31, 1981
- Population and other forecast consistency
- Most recent 3-year AQ
- Modeling data
- 3rd Quarter 1981 AQ

Size of Modeling Area

- Urban Area
- Area of Maximum Emissions
- Downwind Area of Maximum Concentration
- Multiple Urban Areas

POLICY IF PEAK IMPACT OCCURS IN ANOTHER JURISDICTION

NOTES



1982 OZONE AND CARBON MONOXIDE STATE IMPLEMENTATION PLAN REQUIREMENTS

FEDERAL REGISTER NOTICE

- Control Strategies and Attainment Demonstration
- SIP Development Process
- Air Quality and Emission Data Bases
- Modeling

CONTROL STRATEGIES AND ATTAINMENT DEMONSTRATION

- Minimum Control Measures
- Additional Control Measures
- RFP

CSAD
Additional Controls

- Beyond RACT for major stationary sources
- Extend controls to smaller sources
- Broader range of transportation controls
- Increased I/M

CSAD

If with additional controls you don't attain in 1987:

- Additional Control beyond 1987
- Clean Air Act Review

CSAD

RFP

- No lag
- Distinguish mobile and stationary source reductions

MODELING CO SIPs

- Guidelines for Air Quality Models

AIR QUALITY AND EMISSION DATA BASES

- General Quality
  - 79 Best Data Available
  - 82 Data Update
- Submittal by 12/31/81
- 1980 Inventories
- Most recent 3 years air quality data

PLAN REQUIREMENTS FOR NONATTAINMENT AREAS

SECTION 172 (a)

"— — —PROVIDE FOR ATTAINMENT OF EACH NATIONAL AMBIENT AIR QUALITY STANDARD IN EACH SUCH AREA AS EXPEDITIOUSLY AS PRACTICABLE — — —" (CONTROL STRATEGY)

SECTION 172 (b)

"THE PLAN PROVISIONS REQUIRED BY SUBSECTION (a) SHALL — — —"

---

(1) BE ADOPTED BY STATE (OR PROMULGATED BY THE ADMINISTRATOR) AFTER REASONABLE NOTICE AND PUBLIC HEARING.

---

(2) PROVIDE FOR IMPLEMENTATION OF ALL REASONABLY AVAILABLE CONTROL MEASURES AS EXPEDITIOUSLY AS PRACTICABLE.

(3) REQUIRE INTERIM REASONABLE FURTHER PROGRESS.

(4) INCLUDE A COMPREHENSIVE, ACCURATE CURRENT INVENTORY OF ACTUAL EMISSIONS FROM ALL SOURCES AND SHOULD BE RESUBMITTED AS FREQUENTLY AS NECESSARY TO ASSURE COMPLIANCE WITH REASONABLE FURTHER PROGRESS PROVISIONS.

(5) EXPRESSLY IDENTIFY AND QUANTIFY EMISSIONS FROM CONSTRUCTION AND OPERATION OF NEW OR MODIFIED SOURCES.

(6) REQUIRE PERMITS FOR CONSTRUCTION AND OPERATION OF NEW OR MODIFIED SOURCES IN ACCORDANCE WITH SECTION 173 (PERMIT REQUIREMENTS.)

NOTES

(7) IDENTIFY AND COMMIT THE FINANCIAL AND MANPOWER RESOURCES TO CARRY OUT PLAN.

(8) CONTAIN EMISSION LIMITATIONS, SCHEDULES OF COMPLIANCE.

(9) EVIDENCE OF PUBLIC AND LOCAL GOVERNMENTAL INVOLVEMENT AND CONSULTATION.

IDENTIFICATION AND ANALYSIS OF AIR QUALITY, HEALTH WELFARE, ENERGY AND SOCIAL EFFECTS.

SUMMARY OF PUBLIC COMMENT ON ANALYSIS.

(10) WRITTEN EVIDENCE OF STATE, LOCAL GOVERNMENT ETC. HAVE ADOPTED NECESSARY REQUIREMENT TO IMPLEMENT AND ENFORCE PLAN.

---

(11) MEET CERTAIN REQUIREMENTS IF ATTAINMENT DATE AFTER 1982.

ADDITIONAL NEW SOURCE REVIEW ANALYSIS

SCHEDULE FOR IMPLEMENTING I & M

IDENTIFY OTHER MEASURES NECESSARY TO ATTAIN BY 12-31-87

PLAN REQUIREMENTS

- CONTROL STRATEGY
- ADOPTION AFTER PUBLIC HEARING
- IMPLEMENT RACM
- REASONABLE FURTHER PROGRESS
- EMISSION INVENTORY FOR STRATEGY -- DEVELOPMENT AND REASONABLE FURTHER PROGRESS
- QUANTIFICATION OF EMISSIONS FROM NEW OR MODIFIED SOURCES
- PERMITS FOR NEW OR MODIFIED SOURCES
- FINANCIAL AID MANPOWER REQUIREMENTS
- EMISSION LIMITATION, SCHEDULES OF COMPLIANCE
- CONSULTATION
- ANALYSIS OF IMPACT OF PLAN & ALTERNATIVES & COMMENT SUMMARY
- EVIDENCE OF COMMITTMENT TO IMPLEMENT & ENFORCE
- REQUIREMENTS FOR PLANS WITH PROJECTED ATTAINMENT BEYOND 1982

3.3 Implications of the NAAQS for Ozone

Prior to discussing city-specific EKMA, it is appropriate to address the National Ambient Air Quality Standard (NAAQS) for ozone. The NAAQS affects the choice of ozone values input to EKMA, as well as the stringency of a city's calculated control requirements.

The National Ambient Air Quality Standard for ozone is attained when the expected number of days per calendar year, with maximum hourly average concentrations above 0.12 ppm, is equal to or less than one. Such a standard contains several implications concerning demonstrations that a State Implementation Plan (SIP) is sufficient to attain the NAAQS.

Two important differences with past practices occur as a result of the new standard. First, only one hourly value is considered for each site on each day. This can affect the set of candidate "ozone design values" used to estimate the amount of controls needed to reach 0.12 ppm ozone. Formerly, extremely rare episode days with a number of very high ozone values at any given site were weighted disproportionately. The new standard inherently recognizes this problem by allowing only one concentration (and therefore one control estimate) to be considered per site per day.

Second, the phrase, "...expected number of days per calender year..." reduces a concern with the former standard that those States which have maintained conscientious monitoring programs over the years are penalized. Since the expected or "average" number of days per year with daily maximum ozone concentrations greater than 0.12 ppm is of concern, this means that there can be more than one day observing ozone concentrations in excess of 0.12 ppm if the data base is one or more ozone seasons in length.

Another implication of the NAAQS is that the frequency distribution of ozone concentrations at each monitoring site which occurs after the implementation of controls is the key consideration in demonstrating attainment. This has always been the case. In the past, however, very simplistic models (e.g., rollback, envelope curves) were used to demonstrate attainment. Minimal use was made of meteorological or air quality data. Under such circumstances, choosing the ozone value to input into a model in order to calculate control requirements was very straightforward. The design value was simply the second highest value observed.

The degree of control needed to attain the NAAQS, however, is a function of many things in addition to observed ozone concentrations during the base period. For example, controls needed to attain the NAAQS are a function of pollution transported from upwind sources, prevailing NMOC/NO_x ratios and atmospheric dilution. Therefore, it is conceivable that the second highest ozone design value would not require the second highest control requirement to attain the NAAQS if one uses city-specific EKMA or more sophisticated models. Of paramount interest is the frequency distribution of control estimates calculated with such models. Depending on the length of the period of record at any given monitoring station, one would choose the control estimates which would insure that, on average, the daily maximum hourly ozone concentration would not exceed 0.12 ppm more than once per year at any monitoring site. For example, if the period of record at one site were three years, the fourth highest calculated control estimate would be chosen as demonstrating attainment at that site. The control requirement needed to demonstrate attainment for the city as a whole is whatever is necessary to demonstrate attainment at all ozone monitoring sites.

The procedure summarized in the previous paragraph is described at greater length in Chapter 2.0 of Guideline for Use of City-Specific EKMA in Preparing Ozone SIPs. Numerical examples illustrating the procedure are discussed in the Guideline and in Section 3.8 of this workbook.

Implications of the NAAQS for Ozone -- Outline

A. State the NAAQS for ozone

1. Highlight differences from previous standard

    - expected number
    - days per calendar year
    - 0.12 ppm

2. Implications -- why important in demonstration of attainment

    - affects ozone value input to EKMA
    - affects severity of control requirements
    - applies at all sites
    - de-emphasizes rare episodes
    - States with conscientious long term monitoring programs less penalized than formerly

B. Note that for demonstration purposes, the prime concern is with whether or not the NAAQS is attained after implementing controls.

1. Indicate NAAQS depends on a number of factors which can be explictly considered in EKMA.

2. Therefore, it does not necessarily follow that implementation of sufficient controls to reduce peak O_3 below 0.12 ppm on the day seeing the highest O_3 will be sufficient to attain the NAAQS.

C. Therefore, surest way to demonstrate attainment is to estimate control requirements for several days and choose requirements as being the one sufficient to show no more than one daily maximum O_3 concentration above 0.12 ppm per year on average.

In essence, what one needs is to estimate a frequency distribution of control estimates.

D. The foregoing may present resource problems. A compromise suggested in the EKMA Guidance is to model five days with highest ozone at each site and select the control requirements accordingly. This approach will be illustrated in Section 3.8.

- Note that a site is assumed to have an ozone season's worth of data if 75% or more days have valid observed daily maxima.

E. Examples to Illustrate Implications of NAAQS

1) Example 1 -- illustrates benefit of long term monitoring and that attainment means meeting standard at all sites.

2) Example 2 -- in addition to the above, Example 2 illustrates that standard is only concerned with daily maximum values at each site.

OZONE NAAQS

The NAAQS for ozone is attained when the *expected number* of *days per calendar year* with *maximum hourly average concentrations* above *0.12 ppm* is *one or less.*

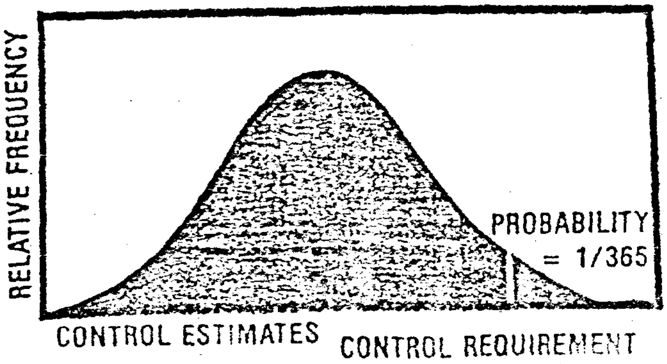
Implications of Ozone NAAQS in Demonstrating Attainment

- Affects O_3 value input to EKMA run.
- Affects severity of the control estimate chosen for the control requirement.
- Applies at all sites
- Deemphasizes rare episodes
- More equitable for states with long history of monitoring.

Achievement of NAAQS depends on:

- — Observed maximum O_3 values
- — Transported ozone
- — NMOC/NO_x ratio
- — Atmospheric dilution
- — Differing patterns of fresh emissions

CONTROL REQUIREMENTS NEEDED TO DEMONSTRATE ATTAINMENT OF OZONE NAAQS



Example 1

Calculated Control Estimates (%)

Day	Site 1 (2 years)	Day	Site 2 (3 years)	Day	Site 3 (1 year)
1	60	1	58	1	41
2	57	6	51	2	45
3	45	7	54	3	40
4	38	8	55	6	37
5	47	5	49	7	39

Example 2

Calculated Control Estimates (%)

Day	Site 1 (2 years)	Day	Site 2 (3 years)	Day	Site 3 (2 years)
1	45	2	57	2	45
2	48	3	51	3	47
2	46	5	48	4	41
3	54	6	57	5	39
4	59	6	56	6	40
5	52	7	46		

3.4 Conceptual Basis for EKMA

The purpose of this section is to provide a broad overview of the ozone problem and resulting needs for modeling analyses. The extent to which city-specific EKMA can meet these needs is briefly discussed. Features of city-specific EKMA are discussed in greater depth in subsequent sessions of the workshop, in Sections 3.6 - 3.8 of the workbook, and in Chapter 3 and 4 of Guideline for Use of City-Specific EKMA in Preparing Ozone SIPs.

High ozone concentrations result from the interaction of organic pollutants and oxides of nitrogen (NO_x) in the presence of sunlight and, as a rule, limited atmospheric dilution. Highest concentrations of precursors (i.e., organic pollutants and NO_x) are typically found within large urban areas. Because net production of ozone from precursors takes some time, and because the most immediate effect of fresh NO_x emissions is to scavenge ozone, highest ozone concentrations are likely to be found several hours travel time downwind from cities. The peak ozone concentrations found downwind of cities are also functions of ozone and, to a lesser extent, precursors transported over long distances.

There are five desirable attributes for a model to possess if it is used to demonstrate attainment of the NAAQS in ozone SIPs.

1. The model should have a sound chemical and physical basis.

2. The model should have the ability to explicitly consider key factors affecting high ozone concentrations.

3. The model should have general applicability to a wide variety of cities.

4. There should be some demonstration that the model's predictions are accurate.

5. The resources to generate information required to run the model must be capable of being borne by State and local agencies responsible for preparing SIPs.

To some extent, the fifth attribute is in conflict with the preceding four. As a result, some compromises in the first four criteria are needed in order to accommodate the fifth. City-specific EKMA represents such a compromise.

The model used to generate ozone isopleths needed in the city-specific EKMA approach is called OZIPP. OZIPP assumes a well mixed column of air, containing concentrations of locally generated precursors, is located over an urban area in mid-morning. As the day progresses, these pollutants are transported downwind until their location corresponds to that of the maximum observed ozone concentration at the time of the observed maximum. As the hypothetical column of air is transported, precursor concentrations interact with each other, with fresh emissions, and with pollutants which are entrained from aloft as the atmospheric mixing layer lifts due to solar heating. Chemical reactions among the pollutants are simulated using a checmial kinetics mechanism that produces good agreement with smog chamber experiments in which automotive exhaust was irradiated with artificial light.

OZIPP allows the user to explicitly account for a number of factors affecting the production of ozone. These include the date and location of the simulated episode, atmospheric dilution, fresh emissions, and pollutants transported from upwind sources. Because the model is predicated on some physical basis and the user can manipulate the aforementioned inputs, OZIPP has greater potential to be more generally applicable than simple models used in past SIP applications. Once ozone isopleths have been generated using OZIPP, city-specific EKMA is applied to estimate the impact of control programs on peak ozone. The prevailing ratio of ambient organic pollutants to NO_x and the highest ozone concentration observed on each day modeled are used to identify a starting point on the isopleth diagram.

There has been and continues to be an ongoing effort to "validate" both OZIPP and the control predictions obtained with city-specific EKMA. These efforts are described in a subsequent session of the workshop and in Section 3.9 of the workbook.

Information needed to support a city-specific EKMA analysis has been identified on pages 65669-65670 of the November 14, 1979 Federal Register. The information requested is consistent with the conceptual framework of the OZIPP model. It has been minimized in recognition of the resource constraints which exist for many State and local agencies. The rationale for requested information is discussed in the next workshop session and in Section 3.5 of this workbook.

Conceptual Basis for EKMA - Outline

A. Ozone Chemistry

B. Factors Affecting Ambient Ozone Levels

C. Application to Ozone Problems in Urban Areas

  1. Illustration of Ozone Formation in an Urban Area
  2. Ozone Distribution in an Urban Area
     - Ozone Peak Downwind of City
     - Stagnation Case

D. Desirable Attributes for a Model that Simulates the Impact of Ozone Control Strategies

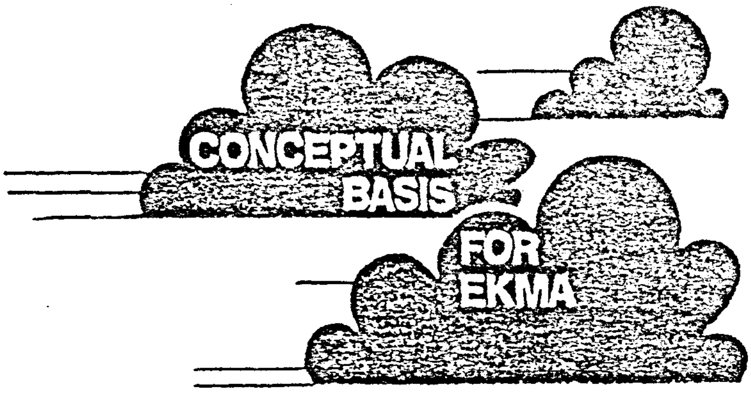
E. Physical Model Underlying EKMA (OZIPP)

  1. User Controlled Factors in EKMA
  2. Internal Factors
  3. Simplifying Assumptions

F. Chemical Model in OZIPP

G. Advantages/Limitations of City-Specific EKMA

NOTES



CONCEPTUAL BASIS FOR EKMA

OZONE CHEMISTRY WITHOUT ORGANIC COMPOUNDS —

START: NO_2, O_3, Sunlight

$$\text{Sunlight} \rightsquigarrow NO_2 \longrightarrow NO + O$$
$$O_2 + O \rightarrow O_3$$
$$O_3 + NO \longrightarrow NO_2 + O_2$$

OZONE CHEMISTRY WITH ORGANIC COMPOUNDS —

START: NO_2, O_2, $RO_2^{\bullet}$ (Oxidized Organic Radical), Sunlight

$$\text{Sunlight} \rightsquigarrow NO_2 \longrightarrow NO + O$$
$$O_2 + O \longrightarrow O_3$$
$$NO + RO_2\bullet \longrightarrow NO_2 + RO\bullet$$

FINISH: NO_2, O_2, RO•, O_3

OZONE CHEMISTRY

OZONE CHEMISTRY WITHOUT ORGANIC COMPOUNDS —

START: NO_2, O_3, Sunlight

$$\text{Sunlight} \rightsquigarrow NO_2 \longrightarrow NO + O$$
$$O_2 + O \longrightarrow O_3$$
$$O_3 + NO \longrightarrow NO_2 + O_2$$

OZONE CHEMISTRY WITH ORGANIC COMPOUNDS —

START: NO_2, O_2, $RO_2\bullet$ (Oxidized Organic Radical), Sunlight

$$\text{Sunlight} \rightsquigarrow NO_2 \longrightarrow NO + O$$
$$O_2 + O \longrightarrow O_3$$
$$NO + RO_2\bullet \longrightarrow NO_2 + RO\bullet$$

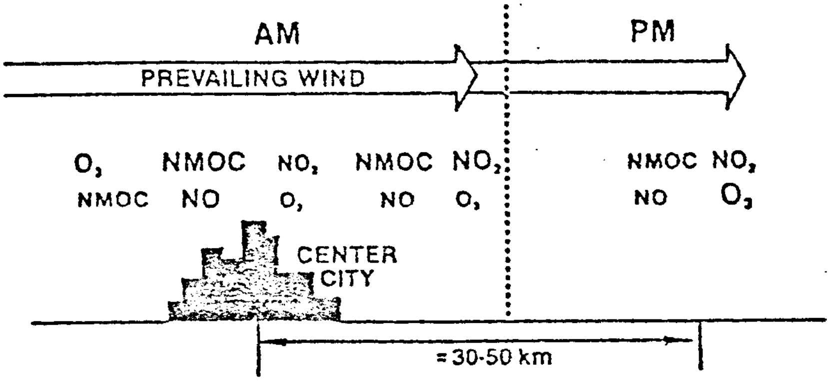
FINISH: NO_2, O [illegible] RO•, O_3

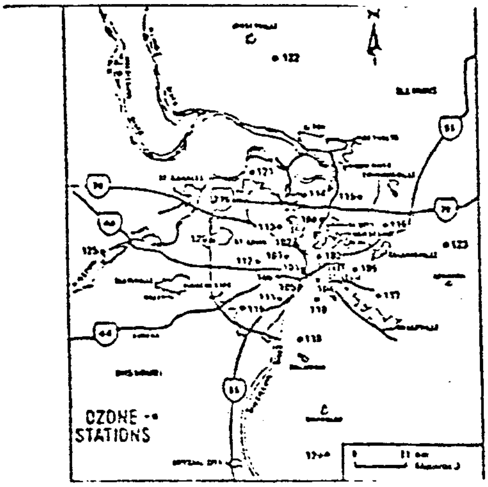
NOTES

FACTORS AFFECTING OZONE CONCENTRATIONS

- Precursor Concentrations and Chemistry
- Sunlight
- Dilution
- Windspeed
- Areal Extent and Intensity of Emissions
- Ozone and Precursor Transport From Upwind Areas

DISTRIBUTION OF PHOTOCHEMICAL POLLUTANTS IN-AN URBAN AREA





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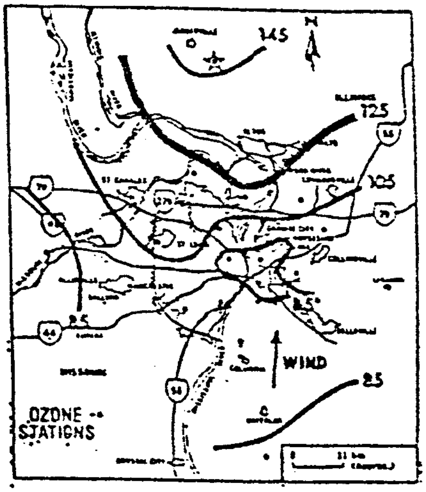
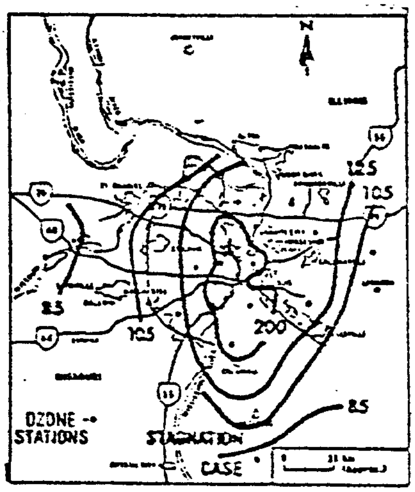
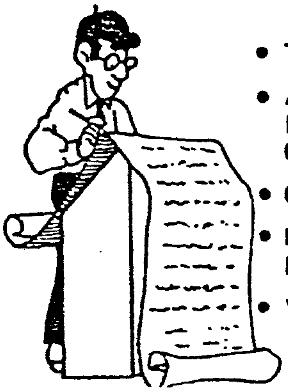


JULY 19, 1976 ST. LOUIS RAPS DATA
maximum hourly average (ppb)



OCT. 1, 1976 ST. LOUIS RAPS DATA
maximum hourly average (ppb)

DESIRABLE ATTRIBUTES FOR MODELS



- Theoretical or Physical Basis
- Ability to Consider Explicitly Factors Affecting Ozone Concentrations
- General Applicability
- Relatively Small Resource Requirements
- Validity

NOTES

Resource Requirements for Various Modeling Approaches

	Ozone Monitors	NO_x, NMOC Monitors
Linear Rollback	At least 3	None
City-Specific EKMA	At least 3	1-2
Urban Airshed	10-20	6-12 NO_x 3-6 NMOC

	Meteorological Measurements
Linear Rollback	None
City-Specific EKMA	Morning and afternoon mixing heights at one site Surface winds and temperatures at two sites
Urban Airshed	10-25 surface wind sites 5-15 surface temperature sites 3-5 mixing height sites 2-3 sites to measure solar reduction

	Emission Inventory	Computer Requirements
Linear Rollback	Countywide inventory for typical summer day	None
City-Specific EKMA	Countywide inventory for typical summer day	Canned program; small computers approx. $20-$30/run
Urban Airshed	Hourly gridded inventory estimates split into 3-6 organic classes	Extensive computer program; large computers approx. $400-$600/run

NOTES

FACTORS IN EKMA

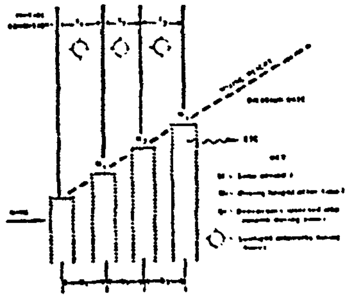
User Specifies

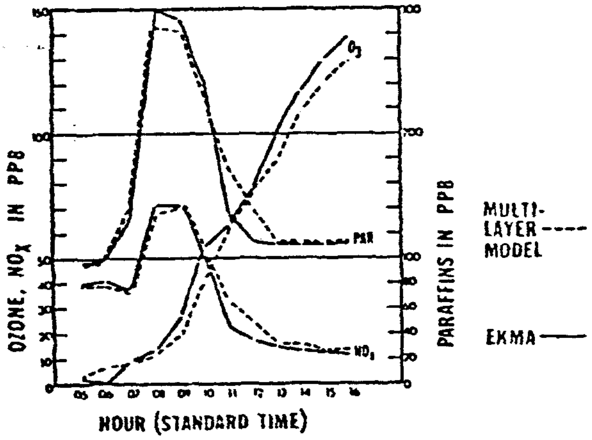
- — Day of year } → City-specific solar radiation
- — Location of city }
- — Mixing heights → Dilution
- — Concentrations of pollutants in early-morning urban area
- — Emissions
- — Transported pollutants

Internal to Model

- — Rate of change of mixing height
- — Diurnal variation of sunlight
- — Chemistry

Column Model





BASIS FOR THE CHEMISTRY USED IN EKMA

- *Propylene/butane mixture used as surrogate for atmospheric mixture.*
- Reactions of these compounds observed and modeled extensively.
- Combination of propylene and butane selected to approximate behavior of irradiated automotive exhaust.
- Input to model (e.g., sunlight, dilution) typifies local conditions.

NOTES

CITY-SPECIFIC EKMA

Advantages:

- Isopleth curves give control requirements based on organic compound/NO_x/O_3.
- Can explicitly consider transported pollutants.
- Can consider changes in factors such as transport, emissions, etc. concurrently.

Limitations:

- Requires computer.
- City-specific data must be collected.
- Lack of spatial resolution.
- Complete validation is difficult.

3.5 Monitoring Needs

The preceding discussion of the OZIPP model and the scenarios it is intended to simulate imply several needs for monitoring and other data. Specifically, the following needs are apparent:

1. estimating the peak ozone concentration downwind of a city;

2. estimating precursor concentrations during the morning within the city being reviewed;

3. estimating ozone (and, in some cases, precursors) transported from upwind sources;

4. estimating emissions encountered by the hypothetical column of air as it moves downwind toward the site observing maximum ozone concentrations;

5. estimating the height of the well-mixed layer into which pollutants are dispersed;

6. estimating wind velocity to verify that air within the city during mid-morning (6-11 a.m.) is likely to impact the site observing highest ozone concentrations.

Specific air quality and meteorological measurements and siting requirements are identified on pages 65669 - 65670 of the November 14, 1979 Federal Register. Emission inventory needs are also described in a report, Final Emission Inventory Requirements for 1982 Ozone State Implementation Plans (EPA-450/4-80-016, December 1980) and were elaborated upon in workshops held during October 1980. The information presented in these references is summarized below:

1) At least three ozone monitoring sites

- one in the predominant summer daytime upwind direction
- one on the downwind edge of the city to measure peak ozone during atmospheric stragnation periods;
- one somewhat further downwind (e.g., 15-40 km) to estimate peak ozone during periods with light but well-defined winds.

2) At least one but preferably two collocated NMOC (non-methane organic compounds) and NO_x monitors

- site(s) located within the commercial district of the city to characterize the urban $NMOC/NO_x$ ratio and to estimate morning precursor concentrations.

3) Countywide reactive VOC and NO_x emission estimates for a typical summer weekday.

4) Surface temperature and pressure measurements at a well ventilated site near the center of the urban area. If need be, pressure data taken at a nearby airport can be used instead. These data are used in conjunction with National Weather Service (NWS) radiosonde data or locally obtained urban vertical temperature measurements of the atmospheric mixing layer. Use of these data to estimate mixing heights is described in detail in Section 3.1.2 and Appendix A of Guideline for Use of City-Specific EKMA in Preparing Ozone SIPs and in Section 3.6 of this workbook.

5) Surface wind speed and direction should be measured at at least two sites, one of which is located in an area of high emissions. Wind data are needed to verify that the site observing highest ozone is being impacted by the city. In city-specific EKMA, such sparse wind data are not used to generate the "exact" trajectory followed by a hypothetical column of air.

Most of the measurements described in the previous paragraphs have been commonly performed in the past. Two exceptions are the efforts to measure transported ozone, and efforts to measure NMOC. As discussed in subsequent sessions, ozone transported aloft appears to exert the most significant impact on ozone concentrations modeled with OZIPP. Although several problems and procedures for measuring O_3 aloft are identified in the workshop, use of surface measurements of ozone taken upwind from the city shortly after the breakup of the nocturnal radiation inversion appears to be an acceptable approach for estimating ozone transported aloft.

Measurement of ambient NMOC requires greater care than other routine air quality measurements. An additional problem results from the fact that ambient NMOC is estimated by taking the difference of two large numbers (total organic pollutants and methane). As a result, small, apparently random, errors result in NMOC measurements. The problem may be particularly severe for NMOC concentrations less than about 0.5 ppmC. To circumvent difficulties imposed by these random errors, robust indicators of ambient NMOC are used. Appropriate indicators are identified in Section 3.2.2 of Guideline for Use of City-Specific EKMA in Preparing Ozone SIPs. A detailed Technical Assistance Document for the calibration and operation of automated ambient non-methane organic analyzers has recently become available. It is recommended that persons operating these instruments become thoroughly familiar with procedures described therein.

Monitoring Support - Outline

A. Purpose:

To characterize conditions corresponding to highest observed concentrations of ozone so that as realistic input as possible is used in the model.

B. Implications for Monitoring Posed by City-Specific EKMA

1. Must estimate wind velocity to determine "upwind" and "downwind" and consistency of the model's assumptions concerning trajectories.

2. Must estimate ozone and, possibly, precursors upwind of city.

3. Must estimate morning precursor concentrations within the city.

4. Must estimate the height of a well-mixed layer of air into which pollutants are dispersed.

5. Must estimate typical summertime emissions encountered by an air parcel.

6. Must estimate peak ozone concentrations downwind of the city.

C. Wind Velocity

1. Purpose: upwind-downwind determinations.

2. What _is_ upwind?

3. Indicate why more detailed data are not required for city-specific EKMA.

D. Measurement of Upwind Ozone

1. Difficulties

2. Possible methods of measurement

   a. aircraft
   b. ozonesondes
   c. surface data

3. Preference for surface data -- primarily because it is continuous.

4. What are we trying to measure
   - note importance of ozone aloft versus surface ozone

5. Where and when should measurements be made?
   - 40+ km upwind
   - shortly after breakup of the nocturnal inversion, before photochemistry has had a chance to proceed very far.

E. Measurement of Upwind NMOC and NO_x

1. Note that concentrations will generally be low (~ 0.1ppmC NMOC, min. detectable for NO_x).

2. Sum of species should be used for NMOC

   - note disadvantage of this discontinuous method. Can only estimate surface transport. Measurements aloft must be done aboard aircraft.

3. Should measure 6-9 a.m. concentrations. As with O_3, monitor should be 40+ km upwind.

F. Precursor Concentrations Within City

1. Why needed

   - NMOC/NO_x ratios
   - as a basis for considering the role of fresh emissions

2. Siting Requirements

   - NMOC and NO_x monitors should be collocated in urban core
   - two or more sites preferable
   - locate more than 200 m from major individual sources
   - monitor during ozone season (at least 30 days)

3. Difficulties

   - with commercially available FID instruments cannot reliably measure NMOC < 0.5ppmC with single instrument due to random errors arising from taking the differences of two large numbers.

   - use robust measures

     (a) ratio = $NMOC_{6-9}/NO_{x\ 6-9}$

     (b) for single monitor use median 6-9 NMOC/NO_x ratio for five high days

     (c) for multiple sites whose ratios agree with 30% of their mean, use the mean ratio for the day being modeled.

   - NMOC instruments require greater care than most.

G. Mixing Layer

1. Ordinarily calculated from surface temperatures, pressure measurements and vertical temperature - pressure profiles such as those available from the NWS at nearby airports.

2. At least one temperature site at an urban location.

3. Collocated pressure data are preferable.

H. Emissions Data

- countywide reactive VOC and NO_x emissions for a typical summer day
- for standard EKMA chemistry speciation is not required
- gridding is not required because it is not commensurate with the wind field information

I. Downwind Ozone Data

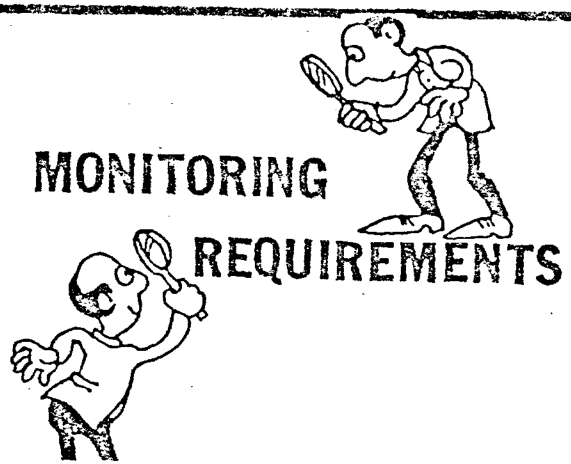
1. Needed to measure maximum ozone due to city

2. Siting: (a) not within 200 m of major source of NO_x
   (b) on downwind edge of city to account for stagnation days
   (c) 15-30 km downwind from city's edge. For large cities, this distance may be most appropriately 40+ km

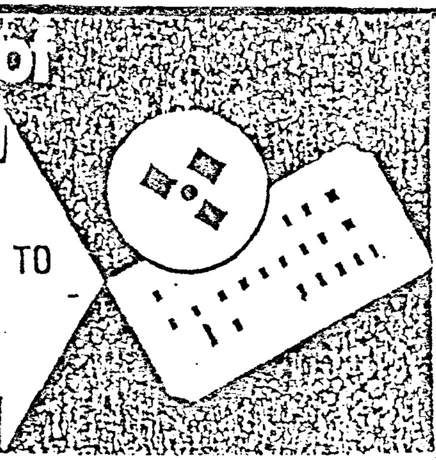
J. Summary

- at least two wind monitors
- at least one temperature, pressure sensors
- at least three ozone monitors
- at least one NMOC, NO_x monitor
- countywide reactive VOC and NO_x emission inventory for summer day

NOTES

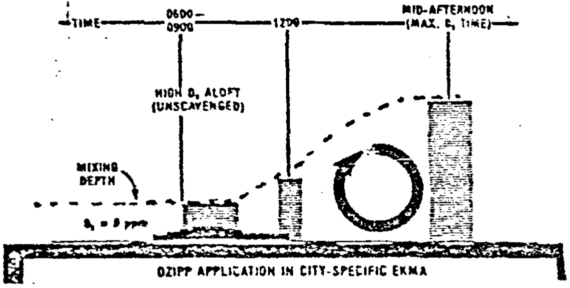


MONITORING REQUIREMENTS



purpose of monitoring

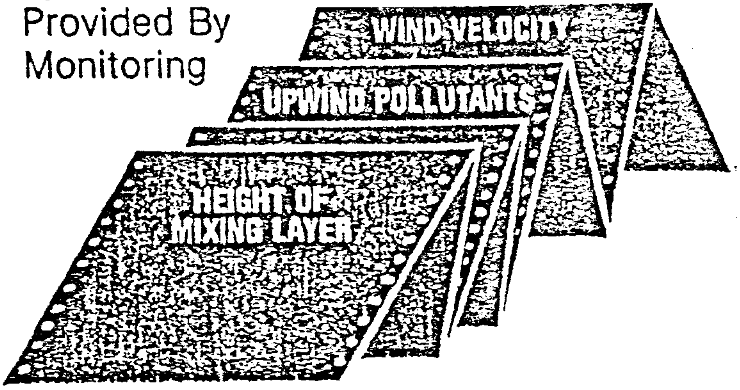
REALISTIC INPUT INTO MODELS USED TO DEMONSTRATE ATTAINMENT

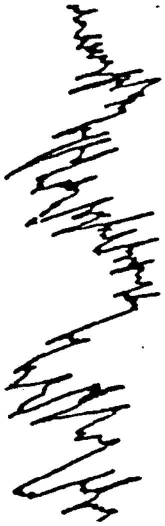


OZIPP APPLICATION IN CITY-SPECIFIC EKMA

NOTES

Specific Information Provided By Monitoring



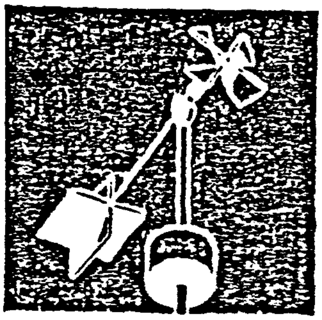


URBAN PRECURSOR POLLUTANTS

FRESH PRECURSOR EMISSIONS

PEAK OZONE CONCENTRATION

Wind Velocity

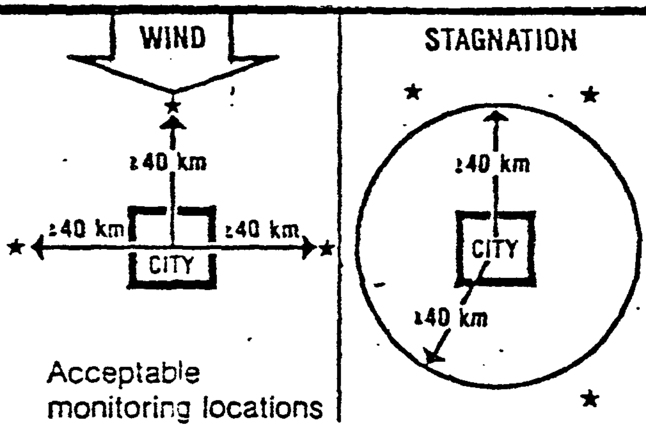


MAKE

UPWIND-

DOWNWIND

DETERMINATIONS



Acceptable
monitoring locations
for estimating transported ozone

Upwind Ozone Measurement

- Measuring and isolating transport component
- Complications introduced by atmospheric stratification
- Determining extent of urban recirculation
- Demarcation between an urban area and its upwind neighbors is not always clear.

Methods of Measuring Upwind Ozone

- Surface Measurements
- Aircraft
- Balloons (ozonesondes)

Surface Measurements

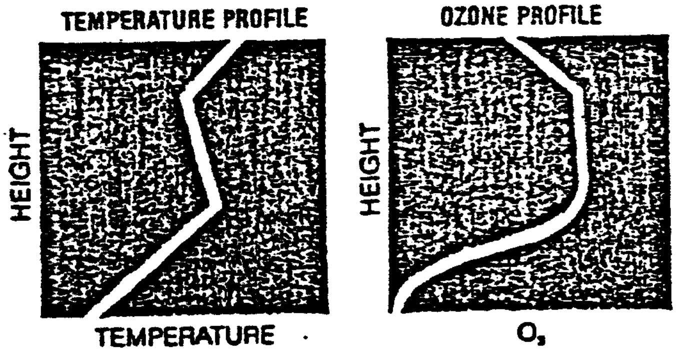
- Low levels caused by scavenging and deposition
- Little impact on urban peak ozone
- Take between 6 and 9 a.m.

ESTIMATING OZONE ALOFT

- CAN BE SIGNIFICANT, EVEN >0.12 PPM.
- HAVE IMPACT ON PEAK OZONE CONCENTRATIONS, AS OZONE IS ENTRAINED FROM ALOFT
- IF SURFACE MEASUREMENTS ARE USED, ALOFT MEASUREMENTS SHOULD BE MADE DURING MID-MORNING AFTER BREAKUP OF NOCTURNAL INVERSION
- 40 + KM UPWIND

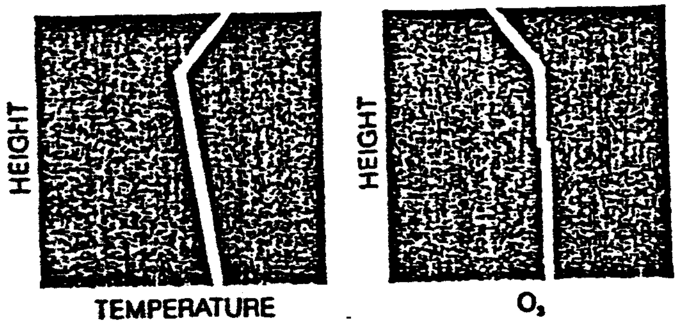
MEASUREMENT OF UPWIND OZONE

SUNRISE



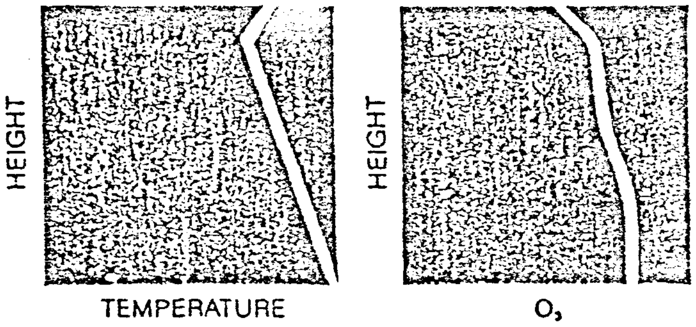
MEASUREMENT OF UPWIND OZONE

MID-MORNING



MEASUREMENT OF UPWIND OZONE

AFTERNOON



Measurement of Upwind Precursors

- Low concentrations likely
- NMOC measured by sum of species
- Measurements between 6 and 9 a.m. of most interest
- Aloft measurements must be made directly.

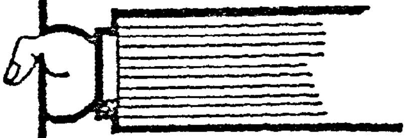
Purpose of Monitoring Precursor Concentration in City

- To estimate NMOC/NO_x ratios
- To consider fresh emissions

Siting Considerations — City Precursors

- NMOC and NO_x monitors co-located
- Two or more sites preferred
- At least 200 m from major sources
- Montoring should occur for at least 30 days during ozone season.

DERIVING $NMOC/NO_x$ RATIOS FOR EKMA



- 1 monitor — Use median ratio of highest ozone days with precursor data.

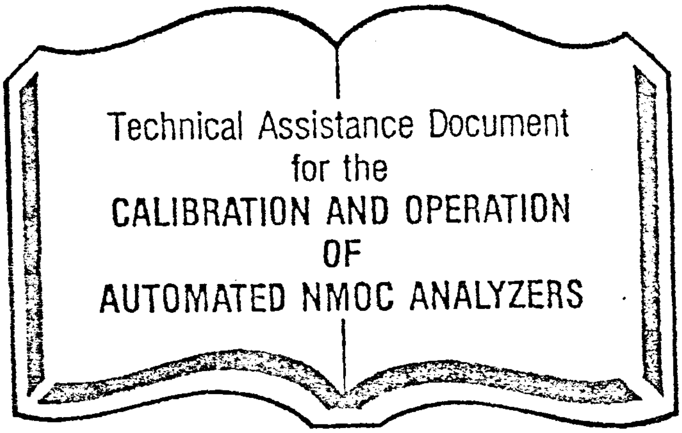
- 2 or more monitors —
  - —If site ratios within 30% of average, use day-specific ratio.
  - —If not, use mean median ratio from all sites.

Day	Site 1	Site 2	Average
1	9:1	7:1	8:1
2	10:1	11:1	10.5:1
3	13:1	8:1	10.5:1
4	7:1	6:1	6.5:1
5	4:1	12:1	8:1
	Median 9:1	Median 8:1	

Mean Median Ratio = 8.5:1

On Day 5, use a ratio of 8.5:1

NOTES



Technical Assistance Document
for the
CALIBRATION AND OPERATION
OF
AUTOMATED NMOC ANALYZERS

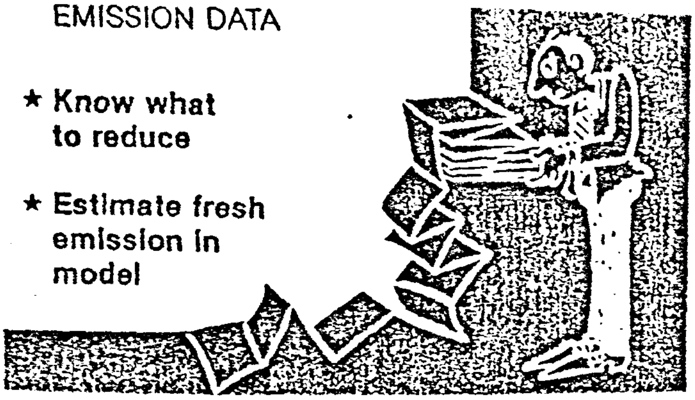
MIXING LAYER

- Surface Temperature Data
  - At least one urban site
- Surface Pressure Data
  - Co-located with temperature data.
  - If not, need to know elevation.
- Vertical Temperature Profiles
  - Can use NWS data.

NOTES

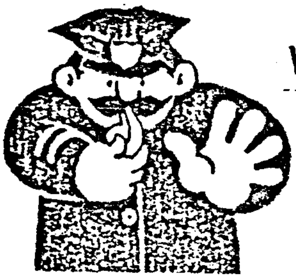
EMISSION DATA

- ★ Know what to reduce
- ★ Estimate fresh emission in model



COUNTYWIDE REACTIVE VOC for a Summer Weekday

NO_x EMISSIONS INVENTORY for a Summer Weekday



PURPOSE OF DOWNWIND OZONE DATA

— To measure maximum ozone attributable to city.

SITING FOR DOWNWIND OZONE DATA

- At least 200 m from major NO_x sources
- At least two sites needed:
  - — One at downwind edge — stagnations
  - — One 15 to 40 + km downwind — well-defined winds.

NOTES

SUMMARY OF MONITORING REQUIREMENTS

- At least two wind monitors

SUMMARY OF MONITORING REQUIREMENTS

- At least two wind monitors
- At least one urban temperature and pressure sensor

SUMMARY OF MONITORING REQUIREMENTS

- At least two wind monitors
- At least one urban temperature and pressure sensor
- At least three ozone monitors

SUMMARY OF MONITORING REQUIREMENTS

- At least two wind monitors
- At least one urban temperature and pressure sensor
- At least three ozone monitors
- At least one NMOC monitor

SUMMARY OF MONITORING REQUIREMENTS

- At least two wind monitors
- At least one urban temperature and pressure sensor
- At least three ozone monitors
- At least one NMOC monitor
- At least one NO_x monitor co-located with NMOC instrument

SUMMARY OF MONITORING REQUIREMENTS

- At least two wind monitors
- At least one urban temperature and pressure sensor
- At least three ozone monitors

- At least one NMOC monitor
- At least one NO_x monitor co-located with NMOC instrument
- Countywide reactive VOC and NO_x emission inventory

3.6 Use of Data to Generate Isopleths

Previous discussions have focused on the conceptual basis for the model underlying the EKMA technique and on the monitoring requirements for successful application of the model. In this section, we see how these are put together such that city-specific ozone isopleth diagrams can be generated. Formulating input data and running the OZIPP computer program to produce the necessary diagrams are each described.

The city-specific input variables to the OZIPP program can be grouped in six categories: light intensity, dilution, O_3 transport, precursor transport, post 0800 emissions, and reactivity. These city-specific inputs determine the positioning of the isopleths on a diagram, and thus directly affect control calculations. Procedures for determining appropriate values for each of the city-specific inputs have been developed, and are described below. In some instances, optional procedures may be more suitable, and these are also discussed to some extent.

The city-specific inputs controlling light intensity are city latitude, longitude, and time zone, as well as specification of the day being modeled. These inputs are straightforward, and present no problems to the OZIPP user. Furthermore, sensitivity analyses suggest that this particular set of input variables does not have a substantial impact on control estimates, and this is not a critical element of an OZIPP/EKMA analysis.

Dilution in OZIPP is determined by the morning mixing height and the maximum afternoon mixing height. Additional options allow specifying the time of growth, but normally default times are assumed (i.e., 0800-LDT and the afternoon time corresponding to 70% of the daylight hours). The recommended procedure for estimating the mixing heights themselves makes use of city measurements of temperature and pressure used in conjunction with National Weather Service (NWS) radiosonde measurements. If other radiosonde measurements or special studies (e.g., helicopter flights) are available, they may be used in place of the NWS measurements. If neither of these are available, and the NWS data are not representative, climatological data may be used. However, because of the critical nature of these variables, this approach should only be used as a last resort. Sensitivity of control estimates to this set of variables is very complex due to the interactions of pollutants transported aloft and effects of post 0800 emissions. Thus, every effort should be made to obtain accurate estimates of these variables.

Another critical element of an OZIPP/EKMA analysis is estimating the levels of ozone transported into the urban area from upwind. Such transport occurs by two mechanisms: transport in the surface-based mixed layer and transport aloft above the early morning mixed layer. Transport in the surface layer has been found to be unimportant due to scavenging by readily available NO, and is recommended to be set to zero. If explicit consideration is desired, 6-9 a.m. urban average levels of O_3 may be used to provide appropriate estimates. On the other hand, transport of O_3 aloft has long been recognized as a significant factor, and must be addressed in an OZIPP/EKMA analysis. The recommended approach for estimating the O_3 level aloft is to use a mid-morning average concentration measured at a surface based continuous monitor which is located upwind of the city on the day being modeled. The mid-morning time should correspond to the breakup of the nocturnal inversion; but if information on the latter is not available, an 1100-1300 LDT average is recommended. If direct measurements of O_3 aloft are available (e.g., aircraft, helicopter, towers, etc.), they may be used in place of surface data. If day-specific measurements are not available, the median of all available estimates of O_3 aloft for all days being modeled should be used.

Little evidence exists to suggest that the transport of precursors is a significant problem. Furthermore, sensitivity analyses suggest that low to moderate levels of precursor transport are unimportant in an OZIPP/EKMA analysis. As a result, explicit treatment of precursor transport is not normally recommended, and all transport levels should be set to zero. If detailed monitoring of precursor transport levels is available and indicates significant transport levels, then precursor transport should be addressed. In this instance, Appendix B in Guideline for Use of City-Specific EKMA in Preparing Ozone SIPs should be reviewed, and any questions forwarded to EPA for special consultation.

The consideration of post 0800 emissions in an OZIPP/EKMA analysis can be an important factor in many instances, and therefore should be explicitly considered in the analysis. The procedure for developing the input data represents a compromise between accurately representing the physical processes taking place and their associated data requirements. Because the latter can be extremely resource intensive, several simplifying assumptions have been made to permit the consideration of post 0800 emissions in a routine manner. First, the post 0800 emissions are determined by the air parcel trajectory leading to the observed peak O_3 level of interest. This trajectory is assumed to originate in the urban core and move at uniform speed to the site of peak ozone by the time it is observed. The actual hourly levels of post 0800 emissions are determined by the magnitude of VOC and NO_x emission densities in each county, and the county in which the air parcel is located during each hour. However, post 0800 emissions are input to OZIPP as fractions of initial concentrations added each hour. The hourly emission densities defined by the trajectory are converted to fractions by means of the model initial conditions, i.e., urban, early morning, precursor concentrations, and mixing height. Thus, post 0800 emissions fractions input to OZIPP are functions of the hypothetical trajectory, county emission densities, early morning urban precursor levels, and initial (i.e., 0800 LDT) mixing height.

Three city-specific inputs are associated with reactivity in OZIPP. Two of these, the fraction of NMOC which is assumed to be propylene and the fraction which is added as aldehydes, are associated with the overall reactivity of the organic compounds. This reactivity was based on smog chamber studies of irradiated automobile exhaust, and is explicitly tied to this study. To date, these fractions have not been related to other atmospheric mixes and the specific recommended values must be used. The other reactivity variable is the initial NO_2/NO_x ratio. Normally, this variable is not critical, and a value of .25 is recommended. If specific inputs are desired, the NO_2/NO_x ratio may be derived from 6-9 a.m. NO_2 and NO_x measurements taken in the urban core.

The preceding city-specific variables are input to OZIPP by means of exercising specific options (e.g., the option DILUTION would be used to input mixing height data). Each option contains a set of associated default inputs which are assumed unless over-ridden by new input data. To actually generate an isopleth diagram, the user exercises the ISOPLETH option. The scales of abscissa and ordinate, as well as the ozone isopleths plotted, can be controlled by the user. All city-specific options exercised prior to the ISOPLETH option will be reflected in the diagram. In deriving the diagram, it is important that the O_3 isopleth of interest be located in the right half of the diagram to facilitate computation of control estimates. The CALCULATE option is an inexpensive means of checking to insure that this occurs. This option performs a single simulation corresponding to one point on the isopleth diagram. Thus, candidate scales of the abscissa and ordinate can be checked using the CALCULATE option to insure that 1) the ozone level of interest is found within these scales, and 2) the isopleth of interest is towards the right edge of the diagram.

Generating Ozone Isopleth Diagrams - Outline

A. Introduction

- Overview of Discussion
- Summary of OZIPP Inputs
- Effects of City-Specific Inputs

B. Formulation of City-Specific Input Variables

1. Sunlight Intensity

   a. Significance

   b. City-Specific Inputs
      - Latitude
      - Longitude
      - Date
      - Time Zone

   c. Sensitivity
      - Important for Ozone Generation
      - Not Critical for Estimating Controls

2. Dilution

   a. Significance

   b. City-Specific Inputs
      - Morning Mixing Height
      - Final Mixing Height
      - Start Time for Rise
      - Ending Time of Rise

   c. Procedures for Estimating Inputs

   d. Sensitivity
      - Complex Interactions
      - Critical With Respect To Ozone Generation
      - Control Estimates Tend to be Insensitive to Small Changes in Dilution
      - Affects Importance of Pollutants Transported Aloft

3. Ozone Transport

    a. Significance

    b. Mechanisms of Transport

    c. City-Specific Inputs
        - Level Aloft
        - Level in Surface Layer

    d. Procedures for Estimating Inputs

    e. Sensitivity
        - Surface Layer Transport Unimportant
        - O_3 Aloft is More Complex

4. Precursor Transport

    a. Significance

    b. City-Specific Inputs
        - Levels Transported in Surface Layer
        - Levels Transported Aloft

    c. Recommended Procedures

    d. Sensitivity
        - NMOC Transport May Be Important if Levels Are High
        - NO_x Transport Not Critical

5. Post 0800 Emissions

    a. Significance

    b. City-Specific Inputs
        - Definition of Emission Fractions
        - Sources of Data
        - Conceptual Basis

    c. Example Procedure for Estimating Inputs

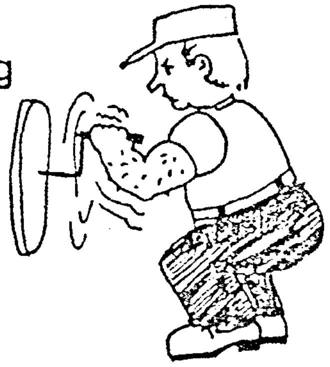
    d. Sensitivity
        - Complex Interactions
        - Sensitivity Increases with Lower Initial Concentrations

6. Reactivity
   - a. Significance
   - b. City-Specific Inputs
     - Propylene Fraction
     - NO_2/NO_x Ratio
     - Aldehyde Fraction
   - c. Recommended Treatment of Reactivity
   - d. Sensitivity

C. OZIPP Computer Operations

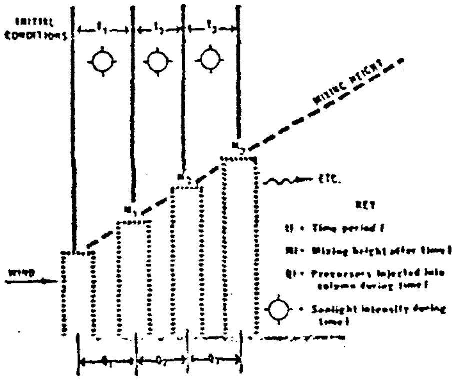
1. System Overview
2. OZIPP Options and Card Formats
   - PLAC
   - DILU
   - TRAN
   - EMIS
   - REAC
   - ISOP
   - CALC
3. Format for City-Specific Inputs
4. CALCULATE Procedure
   - Purpose and Uses
   - Computer Resources
   - Options
   - Outputs
5. ISOPLETH Procedure
   - Purpose
   - Computer Resources
   - Options
   - Outputs

Generating Ozone Isopleths



Generating an Ozone Isopleth Diagram

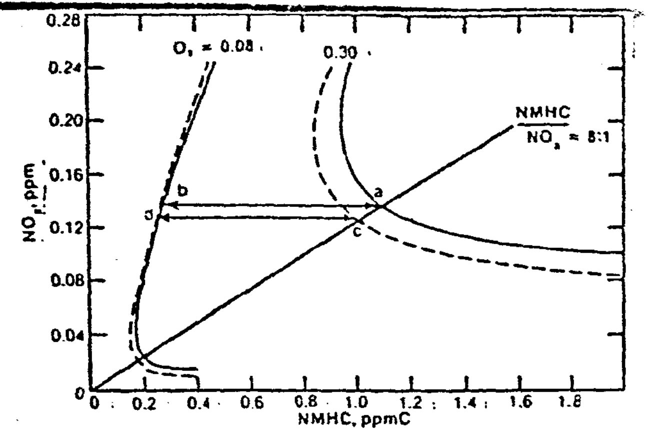
- Formulation of City-Specific Inputs
  - Significance of each variable
  - Use of available monitoring data
  - Sensitivity
- Operational Aspects of OZIPP



OZIPP INPUT VARIABLES

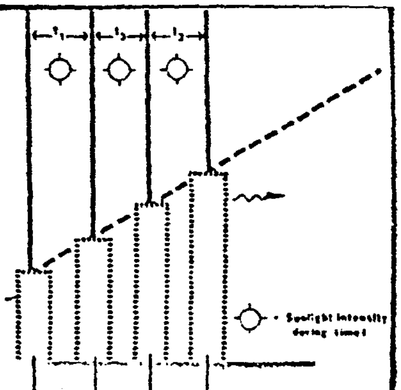
1) Light Intensity
2) Dilution
3) Ozone Transport
4) Precursor Transport
5) Emissions
6) Reactivity

NOTES



Solid isopleths — Light Intensity for Condition A
Dashed isopleths — Light Intensity for Condition B

Sunlight



Significance: Determines reaction rates for all photolytic reactions, the most important being:

$$NO_2 \xrightarrow{h\nu} NO + O$$

LIGHT INTENSITY

Inputs to OZIPP:

1) Latitude and longitude of city
2) Date
3) Time zone

SENSITIVITY

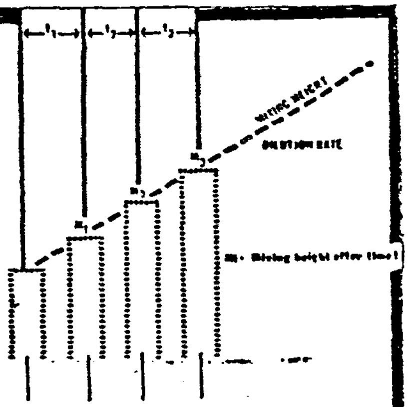
June 21 Los Angeles
versus
Sept. 15 Philadelphia

- Decreases in predicted maximum 1-h levels of 4 to 23 %
- Control requirements reduced by 1 to 2 %

SUMMARY

Inputs Straightforward
Results Relatively Insensitive to Inputs

Dilution



Significance: Determines 1) dilution of pollutants within surface-based mixed layer and 2) rate of entrainment of pollutants trapped aloft above the early morning mixed layer.

DILUTION

Inputs to OZIPP:

1) Initial mixing height
2) Final mixing height
3) Starting time of rise in mixing height
4) Ending time of rise in mixing height

SOURCES FOR ESTIMATING INPUTS

Recommended:	National Weather Service Radiosonde Data
Option 1:	Special Monitoring Data
Option 2:	Climatological Data

SENSITIVITY

Sensitivity complicated by interactions with pollutants aloft and post 0800 emissions. In general,

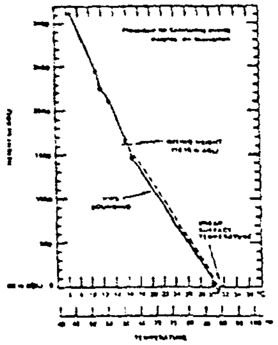
- Ozone production reduced by increased dilution (can be substantial)
- Control requirements relatively insensitive to small changes in dilution
- Importance of pollutants aloft heightened with increasing dilution

SUMMARY

Inputs estimated from day specific meteorological measurements or climatological data

Normally only 0800 LDT mixing height and maximum afternoon mixing height estimated and default times assumed for rise

Relative mixing heights are most important inputs



DATA NEEDED FOR ESTIMATION OF MIXING HEIGHT

Surface Data:

0800 LCT-Temperature: 23.2°C
Pressure: 1010.3 mb
Maximum Temperature: 31.4°C at 1700 LCT
1700 LCT Pressure: 1008.6 mb

Sounding Data:

1200 GMT Sounding			0000 GMT Sounding		
Pressure (mb)	Height (m ASL)	Temp. (°C)	Pressure (mb)	Height (m ASL)	Temp. (°C)
S 1015	5	23.0	S 1012	8	31.0
M 1000	139	23.0	M 1000	114	30.6
S 967	—	24.4	M 850	1537	18.4
M 850	1550	18.2	S 831	—	15.4
S 827	—	14.2	S 791	—	13.2
S 817	—	13.8	S 778	—	11.6
M 700	3168	4.8	S 750	—	11.2
S 680	—	5.8	M 700	3184	7.0
S 661	—	5.6	S 670	—	1.6
S 606	—	0.4	S 560	—	−1.5
M 500	5860	−6.3	M 500	5860	−7.3
S 491	—	−8.3	M 400	7560	−18.9
S 453	—	−12.7	S 371	—	−21.7
S 438	—	−13.9	M 300	9650	−33.1
M 400	7580	−16.7	S 265	—	−39.9
S 368	—	−20.1	M 250	10900	−42.9
S 349	—	−26.3	S 205	—	−52.5
S 324	—	−29.7	M 200	12370	−53.3
M 300	9640	−33.7	M 150	14190	−61.1
S 267	—	−39.5	S 127	—	−64.9
M 250	10890	−47.7	S 120	—	−61.7
M 200	12370	−51.7	M 100	16690	−63.3
M 150	14190	−60.9	M 70	18900	−58.5
S 144	—	−61.5	M 50	21040	−54.5
			M 30	24350	−49.9
			M 20	27030	−44.7
			S 15	—	−42.1

Note: M = Mandatory Levels and S = Significant Levels
For NWS data, both the mandatory and significant levels are needed
The 0000 GMT Sounding is the following day in GMT.

DATA FORMAT FOR MIXING HEIGHT PROGRAM

First Line — ƀƀƀ1ƀƀ1700.

Columns 1-4 O = 0800 LCT Mixing Height
1 = Maximum Mixing Height
Columns 5-11 Climatological Value for Maximum Mixing Height (in meters above ground level)

Notes: ƀ = Blank Column

2nd line — bbbb62.0bb 1008.6bb 31.4 Urban surface data
3rd line — bbb114.0bb 1000.0bb 30.6 Sounding data

Columns 1-8 — Height above sea level in meters
Columns 9-16 — Pressure in millibars
Columns 17-22 — Temperature in degrees Celsius

Notes: b = Blank column.
For missing data
— use 99999.9 for height.
— use 999.9 for temp.
Urban surface data replace surface
level on the sounding (2nd line).

INPUT:

INPUT/OUTPUT FOR MAXIMUM MIXING HEIGHT EXAMPLE

LINE NUMBER			
1.	1	1700.	
2.	62.0	1008.6	31.4
3.	114.0	1000.0	30.6
4.	1537.0	850.0	16.4
5.	99999.9	831.0	15.4
6.	99999.9	791.0	13.2
7.	99999.9	778.0	11.8
8.	99999.9	760.0	11.2
9.	3164.0	700.0	7.0
10.	@EOF		

```
OUTPUT:

                                          POTENTIAL
   HEIGHT     PRESSURE       TEMP.          TEMP.

    MASL         MB          DEG.C          DEG.K
    62.0       1008.6        31.4           303.9
   114.0       1000.0        30.6           303.8
  1537.0        850.0        16.4           303.4
 99999.9        831.0        15.4           304.3
 99999.9        791.0        13.2              .0
 99999.9        778.0        11.8              .0
 99999.9        760.0        11.2              .0
  3164.0        700.0         7.0              .0

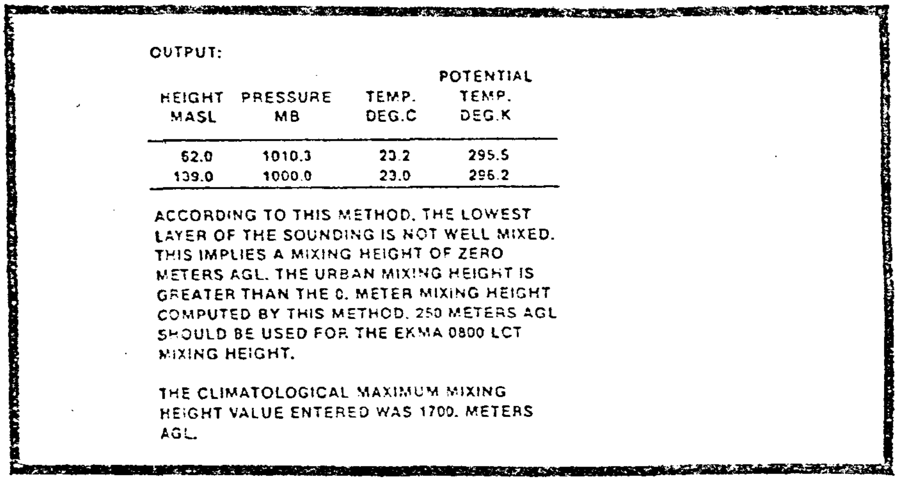
MAX. MIXING HEIGHT 1613.
METERS AGL. 837.3 MILLIBARS.
THE CLIMATOLOGICAL MAXIMUM MIXING HEIGHT
VALUE ENTERED WAS 1700. METERS AGL.
```

INPUT:

INPUT/OUTPUT FOR 0800 LCT MIXING HEIGHT EXAMPLE

LINE NUMBER			
1.		0	1700.
2.	62.0	1010.3	23.2
3.	139.0	1000.0	23.0
4.	99999.9	967.0	24.4
5.	1550.0	850.0	16.2
6.	99999.9	827.0	14.2
7.	99999.9	817.0	13.6
8.	3168.0	700.0	4.6
9.	@EOF		

NOTES



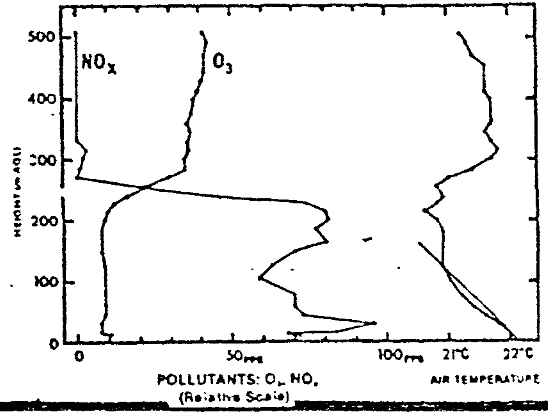
```
OUTPUT:

                                       POTENTIAL
HEIGHT   PRESSURE       TEMP.           TEMP.
 MASL       MB          DEG.C           DEG.K
--------------------------------------------------
  62.0    1010.3         23.2           295.5
 139.0    1000.0         23.0           296.2
--------------------------------------------------

ACCORDING TO THIS METHOD, THE LOWEST
LAYER OF THE SOUNDING IS NOT WELL MIXED.
THIS IMPLIES A MIXING HEIGHT OF ZERO
METERS AGL. THE URBAN MIXING HEIGHT IS
GREATER THAN THE 0. METER MIXING HEIGHT
COMPUTED BY THIS METHOD. 250 METERS AGL
SHOULD BE USED FOR THE EKMA 0800 LCT
MIXING HEIGHT.

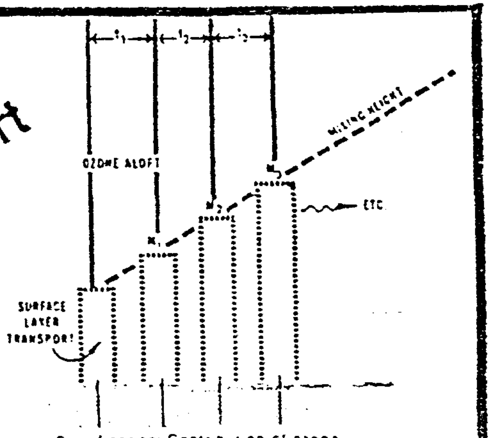
THE CLIMATOLOGICAL MAXIMUM MIXING
HEIGHT VALUE ENTERED WAS 1700. METERS
AGL.
```

EARLY MORNING URBAN PROFILE:
PHILADELPHIA, AUGUST 14, 1979, 0752 EDT.

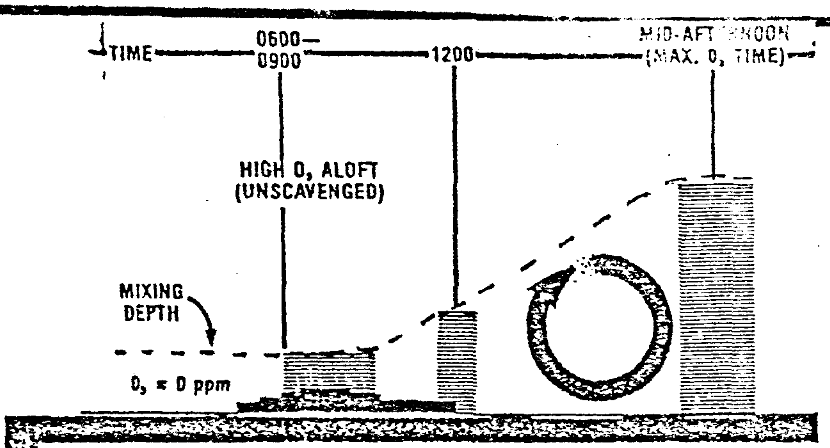


OZONE TRANSPORT

Ozone Transport



Significance: Contribution of ozone transported from areas upwind of city.



OZIPP APPLICATION IN CITY-SPECIFIC EKMA

INPUTS TO OZIPP

1) Concentration of O_3 aloft, ppm
2) Concentration of O_3 transported in surface layer, ppm

SOURCES FOR ESTIMATING INPUTS

- **O_3 Aloft**

  Recommended: Use 1100-1300 LDT average upwind surface measurement for day modeled

  Option 1: Use available direct measurements (e.g., aircraft, balloons, towers)

- **Surface Layer O_3**

  Recommended: Set to zero.
  Option 1: Use 6-9 a.m. urban average levels.

SENSITIVITY

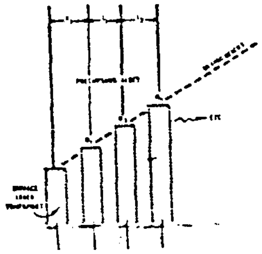
- Ozone production and control estimates are not sensitive to surface layer transport of ozone.
- Sensitivity to ozone aloft is complicated by interactions of dilution and post-0800 emissions. In general —
  - — O_3 maxima increase with increasing O_3 aloft (generally 50% additive).
  - — Control estimates increase with O_3 aloft.

NOTES

SUMMARY

- O_3 aloft usually is obtained from upwind surface measurements.
- Surface layer transport can normally be neglected.
- Consideration of O_3 aloft is a critical input.

Precursor Transport



Significance: Contribution of NMOC and NO_x transported from areas upwind of city. Little evidence exists to suggest significant levels of transported precursors, either aloft or in the surface layer.

INPUTS TO OZIPP

1) NMOC and/or NO_x concentrations transported in surface layer.

2) NMOC and/or NO_x concentrations transported aloft.

SOURCES FOR ESTIMATING INPUTS

A) Precursors Aloft

Recommended Approach: Set to zero.

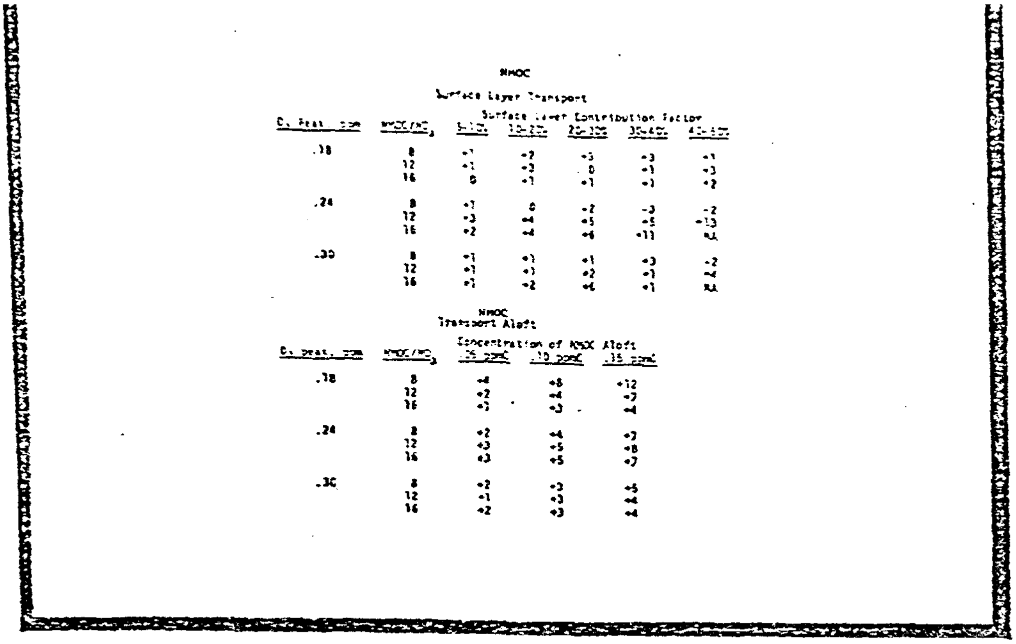
Option 1: If direct measurements are available and levels are significant, use measurements to estimate transported levels aloft.

B) Surface Layer Transport

Recommended Approach: Set to zero.

Option 1: Use upwind measurements to derive contribution of transport to urban levels. Follow guidance contained in EPA 450/4-80-027, Appendix B.

NOTES



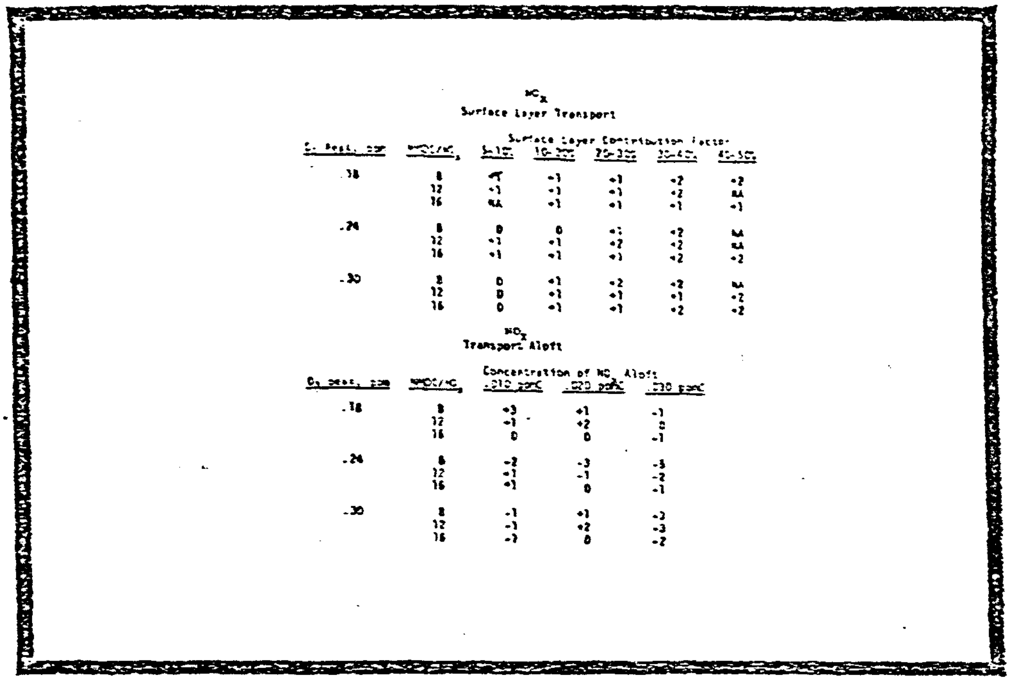
NMOC

Surface Layer Transport

		Surface Layer Contribution Factor				
O_3 Peak, ppm	NMOC/NO_x	5-10%	10-20%	20-30%	30-40%	40-50%
.18	8	+1	+2	+3	+3	+1
	12	+1	+3	0	+1	+3
	16	0	+1	+1	+1	+2
.24	8	+1	0	+2	-3	-2
	12	+3	+4	+5	+5	+13
	16	+2	+4	+6	+11	NA
.30	8	+1	+1	+1	+3	-2
	12	+1	+1	+2	+1	+4
	16	+1	+2	+4	+1	NA

NMOC
Transport Aloft

		Concentration of NMOC Aloft		
O_3 peak, ppm	NMOC/NO_x	.05 ppmC	.10 ppmC	.15 ppmC
.18	8	+4	+8	+12
	12	+2	+4	+7
	16	+1	+3	+4
.24	8	+2	+4	+7
	12	+3	+5	+8
	16	+3	+5	+7
.30	8	+2	+3	+5
	12	+1	+3	+4
	16	+2	+3	+4



NO_x
Surface Layer Transport

		Surface Layer Contribution Factor				
O_3 Peak, ppm	NMOC/NO_x	5-10%	10-20%	20-30%	30-40%	40-50%
.18	8	+1	+1	+1	+2	+2
	12	+1	+1	+1	+2	NA
	16	NA	+1	+1	+1	+1
.24	8	0	0	+1	+2	NA
	12	+1	+1	+2	+2	NA
	16	+1	+1	+1	+2	+2
.30	8	0	+1	+2	+2	NA
	12	0	+1	+1	+1	+2
	16	0	+1	+1	+2	+2

NO_x
Transport Aloft

		Concentration of NO_x Aloft		
O_3 peak, ppm	NMOC/NO_x	.010 ppmC	.020 ppmC	.030 ppmC
.18	8	+3	+1	-1
	12	+1	+2	0
	16	0	0	-1
.24	8	-2	-3	-5
	12	+1	-1	-2
	16	+1	0	-1
.30	8	-1	+1	-3
	12	-1	+2	-3
	16	-1	0	-2

NOTES

SUMMARY

- Consideration not normally recommended (i.e., assume zero).

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- Sensitivity studies suggest NO_x transport would not have a significant impact on control estimates.

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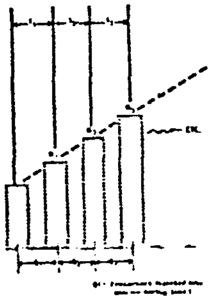
- Consideration not normally recommended (i.e., assume zero).
- Sensitivity studies suggest NO_x transport would not have a significant impact on control estimates.
- Direct measurements must be available for precursor transport.

Post 0800 Emissions



Significance: Contribution of emissions occurring subsequent to 0800 CDT along the air parcel trajectory

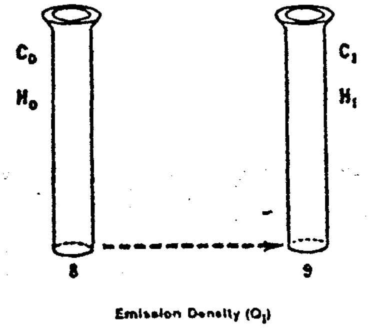
INPUTS TO OZIPP

- Emission fractions for NMOC and NO_x for each hour of emissions. Fractions express post-0800 emissions relative to initial NMOC and NO_x concentrations.

SOURCES FOR ESTIMATING INPUTS

- Relationship between ozone maximum and urban core (i.e., trajectory).
- Countywide emission inventory.
- Estimate of initial NMOC and NO_x concentrations.

Basis for Calculation of Emission Fractions



Example:

1) Assume an NO_x emission density of 47.3 kg/km²-h.

2) Let this emission flux be dispersed into a column of constant height (0.250 km) for a period of one hour. After one hour the NO_x concentration in the column should be —

$$C = \frac{QAt}{V} = \frac{Qt}{H}$$

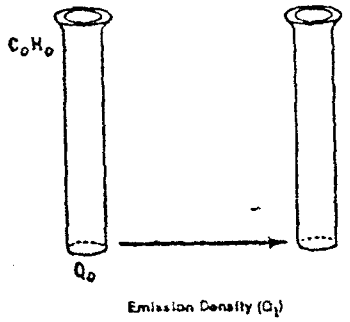
$$C = \frac{(47.3 \text{ kg/km}^2\text{-h})\ (1 \text{ hour})}{(1890 \text{ kg/km}^3 \text{ ppm})\ (0.25 \text{ km})} = 0.100 \text{ ppm}$$

Thus, the 47.3 kg/km²-h emission density would produce a concentration of 0.100 ppm in the column.

3) An NO_x emission fraction for one hour should be calculated by dividing the emission-produced concentration by the initial concentration. For example:

Initial Concentration	Emission Fraction
0.050	2.0
0.100	1.0
0.200	0.50

Alternative Approach to Calculation of Emission Fractions



Example:

1) Assume the initial NO_x concentration = 0.200 ppm and the initial mixing height = 0.250 km.

2) First, calculate an emission density that would generate the initial concentration after one hour.

$$Qo = \frac{CV}{At} = \frac{CH}{t}$$

$$Qo = \frac{(0.200 \text{ ppm})\ (0.250 \text{ km})\ (1890 \text{ kg/km}^3 \text{ ppm})}{(1 \text{ hour})}$$

$$= 94.5 \text{ kg/km}^2\text{-h}$$

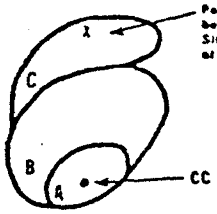
3) Calculate emission fractions by dividing hourly emission densities by this initial emission density. For example —

Hourly Emission Density	Emission Fraction
23.6 kg/km²-h	0.25
47.5	0.50
94.5	1.0

POST-0800 EMISSIONS EXAMPLE CALCULATION

Step 1: Determine hourly sequence of emissions.

A) Information Available



Peak ozone measured between 1400-1500 LCT. Site is 35 km downwind of center-city (CC).

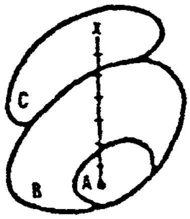
County Emissions Data

County	Area, km²	Adjusted VOC Emissions kg/yr	Adjusted NO_x Emissions kg/yr
A	150	5.45 × 10[illegible]	2.96 × 10[illegible]
B	500	3.93 × 10[illegible]	3.38 × 10[illegible]
C	300	1.68 × 10[illegible]	1.17 × 10[illegible]

B) Determine Trajectory Segments

A straight line is drawn between the center-city and the downwind site.

The line is divided into seven equal segments, representing the number of hours between 800 and 1500 LCT.



C) Calculate hourly, countywide emission densities

County	Area, km²	Adjusted VOC Emissions, kg/yr	Adjusted VOC Emission* density, kg/km²-h	Adjusted NO_x Emissions, kg/yr	Adjusted NO_x Emission* density, kg/km²-h
A	150	5.45 × 10[illegible]	41.5	2.96 × 10[illegible]	22.5
B	500	3.93 × 10[illegible]	9.0	3.38 × 10[illegible]	7.7
C	300	1.68 × 10[illegible]	.6	1.17 × 10[illegible]	0.4

*Emission density = emissions/(8760 × area)

NOTES

D) Specify Sequence of Emission Densities

Hour	Time, LCT	Trajectory Segment Location (County)	Adjusted VOC Emission density, kg/km² – h	Adjusted NO_x Emission density, kg/km² – h
1	8-9	A	41.5	22.5
2	9-10	A/B	25.3	15.1
3	10-11	B	9.0	7.7
4	11-12	B	9.0	7.7
5	12-13	B	9.0	7.7
6	13-14	B/C	4.8	4.1
7	14-15	C	0.6	0.4

Step 2: Determine initial conditions and calculate initial emission density.

A) Available Information

	Urban Monitor	Pollutant	6-7	7-8	8-9	6-9 Avg.
— Air Quality Data	1	NMOC	2.3	2.0	1.5	1.9
		NO_x	0.250	0.200	0.180	0.210
NMOC [=] ppmC						
NO_x [=] ppm	2	NMOC	1.7	1.7	1.6	1.7
		NO_x	0.190	0.210	0.170	0.190

— 0900 LCT Mixing Height
= 0.250 km

B) Calculate Urban Average 6-9 LCT Concentration

$$\overline{C}_{NMOC} = \frac{1.9 + 1.7}{2} = 1.8$$

$$\overline{C}_{NO_x} = \frac{0.210 + 0.190}{2} = 0.200$$

C) Calculate Initial Emission Densities

For VOC

$Qo = \alpha\ Co\ Ho = (595\ ^{kg}/_{km^2}\ ppmC)(1.8\ ppmC)(0.25\ km) = 268\ ^{kg}/_{km^2}$

For NO_x

$Qo = \alpha\ Co\ Ho = (1890\ ^{kg}/_{km^2}\ ppm)(0.200\ ppm)(0.25\ km) = 95\ ^{kg}/_{km^2}$

Step 3: Calculate hourly emission fractions by dividing hourly emission densities by the initial emission density for each precursor.

Hour	Time, LCT	VOC Hourly Emission Density* kg/km²	NMOC Emission Fraction**	NO_x Hourly Emission Density* kg/km²	NO_x Emission Fraction**
1	8-9	41.5	0.15	22.5	0.24
2	9-10	25.3	0.09	15.1	0.16
3	10-11	9.0	0.03	7.7	0.08
4	11-12	9.0	0.03	7.7	0.08
5	12-13	9.0	0.03	7.7	0.08
6	13-14	4.8	0.02	4.1	0.04
7	14-15	0.6	0.00	0.4	0.00

* Hourly Emission Densities
** Emission Fraction = (Emission Density)(Initial Density)

— Initial VOC Density' = 268 kg/km²
— Initial NO_x Density = 95 kg/km²

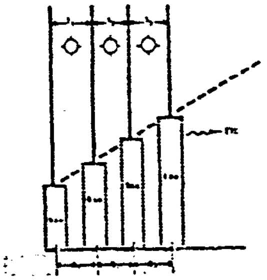
SENSITIVITY

- Sensitivity of control estimates to post-0800 emissions is complicated by interactions between initial conditions and mixing heights. Sensitivity is greater at low initial concentrations.
- Generally, ozone maxima increase with increasing post-0800 emissions.
- Control estimates may be reduced with inclusion of post-0800 emissions.

SUMMARY

- Post-0800 emissions information derived from assumed trajectory, available emission inventory, and initial conditions.
- Post-0800 emissions should be considered because they can be important under some circumstances.

Reactivity



Significance: Affects rates of chemical reactions and ultimately, rate of ozone production.

INPUTS TO OZIPP

1) Propylene/butane split
2) Initial NO_2/NO_x ratio
3) Fraction of initial NMOC added as aldehydes

ESTIMATION OF INPUTS

1) Propylene/butane fraction should be set to recommended value, i.e., 25% propylene.

2) NO_2/NO_x ratio of 0.25 is recommended; however, the ratio can be calculated from urban 6-9 a.m. measurements of NO_2 and NO_x.

3) Aldehyde fraction should be set to recommended value, i.e., 5%.

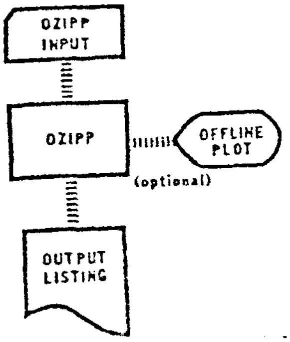
SENSITIVITY

- No basis for altering HC reactivities.
- Limited smog chamber studies suggest that ozone production is not critically sensitive to HC composition changes.
- O_3 production and control estimates are insensitive to NO_2/NO_x ratio.

SUMMARY

- Recommended values for HC reactivity must be used.
- CONSIDERATION of NO_2/NO_x IS not important.

OZIPP COMPUTER OPERATIONS



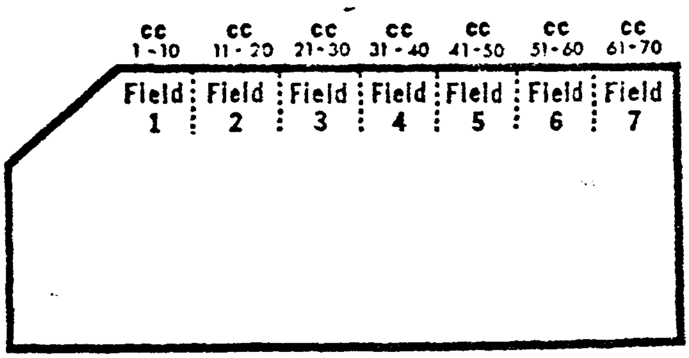
NOTES

OZIPP COMPUTER OPERATIONS

Inputs

Input Variables	OZIPP Option
Light Intensity	PLACE
Dilution	DILUTION
Ozone Transport	TRANSPORT
Precursor Transport	TRANSPORT
Post-0800 Emissions	EMISSIONS
Reactivity	REACTIVITY
Isopleth Diagram	ISOPLETH
Single Simulation	CALCULATE

Format*



*Option always goes in Field 1.

OZIPP COMPUTER OPERATIONS INPUT FORMAT

Field 1	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7
Place*	Latitude (34.058)	Longitude (118.250)	Time zone (8.0)	Year (1975.)	Month (6.)	Day (21.)
Dilution	Z1 (510.)	Z2 (630.)	Time 1 (800.)	Time 2 (1700.)		
Transport	O_3 S.L. (0.0)	O_3 aloft (0.0)	NMOC S.L. (0.0)	NMOC aloft (0.0)	NO_x S.L. (0.0)	NO_x aloft (0.0)
Reactivity	Propylene fraction (0.25)	NO_2/NO_x (0.25)	Aldehyde fraction (0.05)			
Emissions**	No. of hours (0.0)	NMOC Hour 1 (0.0)	NMOC Hour 2 (0.0)	NMOC hour 3 (0.0)	NMOC hour 4 (0.0)	NMOC hour 5 (0.0)
Calculation	Initial NMOC (0.0)	Initial NO_x (0.0)	Info. option (0.0)	Print control start (60.0)	Print control step (60.0)	
Isopleth	NMOC scale (2.0)	NO_x scale (.25)	No. of isopleths (11.0)	Info option (0.0)		

* A free format card must follow the place option if the latitude or longitude is different from defaults

** Continuation cards for emission fractions

NOTES

OZIPP COMPUTER OPERATIONS

Calculation Procedure

Purpose: To perform a single simulation for a given initial NMOC and NO_x level (corresponds to one point on the isopleth diagram).

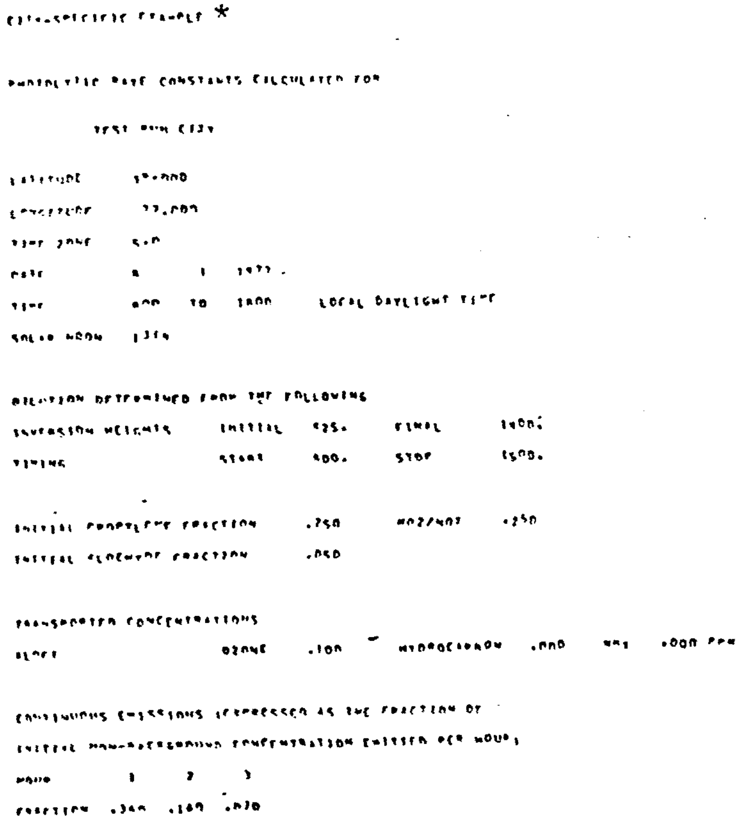
Uses:
1) To make an absolute ozone prediction.
2) To define scales of isopleth diagram.

Computer Resources:

Time: < 20 seconds
Cost: < $1.00
(UNIVAC 1100)

Output Options:

Minimal information option = 0.0
Maximum information option = 1.0



```
CITY-SPECIFIC EXAMPLE *

PHOTOLYTIC RATE CONSTANTS CALCULATED FOR

        TEST RUN CITY

LATITUDE       39.000

LONGITUDE       77.000

TIME ZONE      5.0

DATE           8        1    1977.

TIME           800    TO    1800      LOCAL DAYLIGHT TIME

SOLAR NOON    1316

DILUTION DETERMINED FROM THE FOLLOWING

INVERSION HEIGHTS      INITIAL    425.      FINAL       1400.

TIMING                 START      800.      STOP        1500.


INITIAL PROPYLENE FRACTION      .750       NO2/NOX     .250

INITIAL ALDEHYDE FRACTION       .050


TRANSPORTED CONCENTRATIONS

ALOFT                  OZONE     .100     HYDROCARBON   .000    NOX    .000 PPM

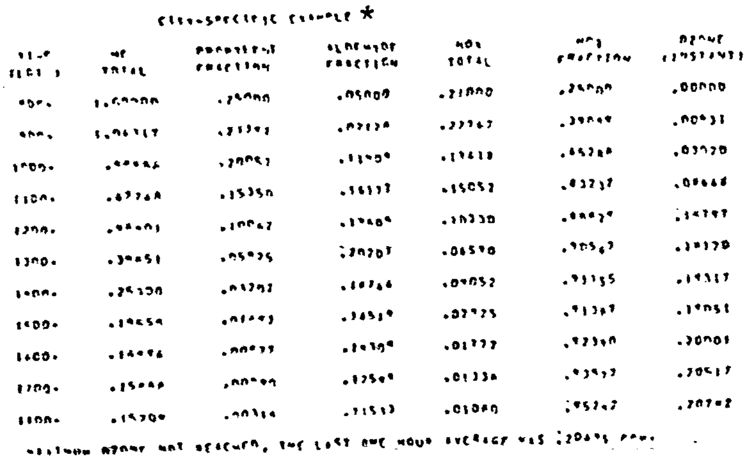

CONTINUOUS EMISSIONS (EXPRESSED AS THE FRACTION OF

INITIAL NON-BACKGROUND CONCENTRATION EMITTED PER HOUR)

HOUR         1      2      3

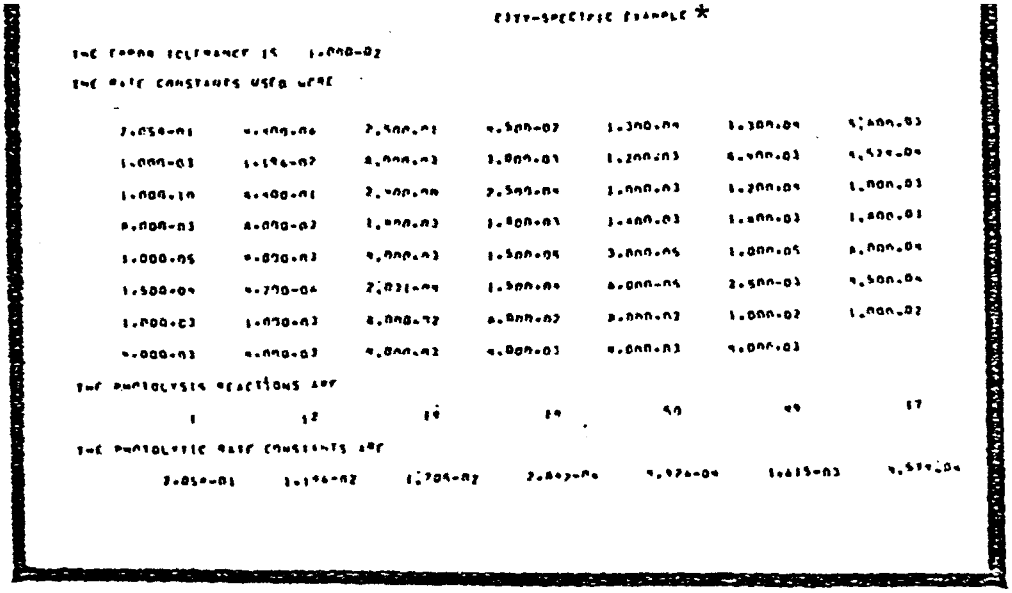
FRACTION  .340   .180   .030
```

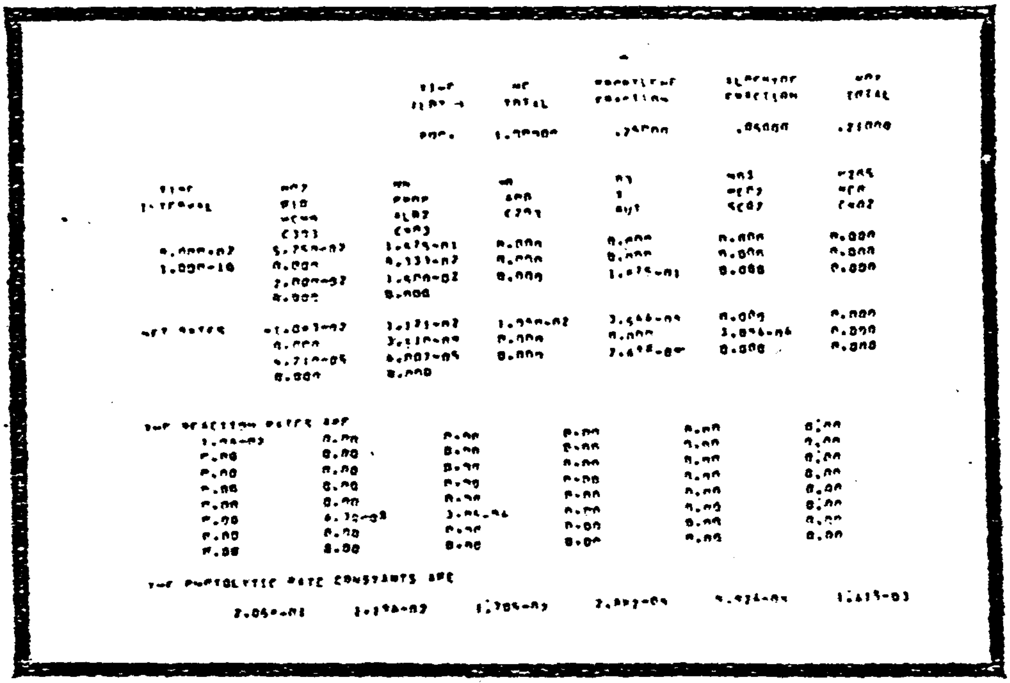
*Note: Examples of similar outputs are shown in User's Manual for Kinetics Model and Ozone Isopleth Plotting Package, EPA-600/3-78-014a.



```
                          CITY-SPECIFIC EXAMPLE *

 TIME        HC        PROPYLENE      ALDEHYDE        NOX          NO2        OZONE
(EDT )      TOTAL      FRACTION       FRACTION       TOTAL       FRACTION   (INSTANT)
 800.     1.00000       .25000         .05000        .21000       .25000     .00000
 900.     1.06117       .23393         .07138        .22767       .39049     .00931
1000.      .89986       .20053         .11959        .19418       .65268     .03920
1100.      .67768       .15350         .16117        .15052       .83237     .08668
1200.      .48401       .10067         .19469        .10330       .88929     .14797
1300.      .30451       .05925         .20707        .06590       .90567     .18170
1400.      .25130       .03293         .18746        .04052       .93135     .19317
1500.      .19659       .01443         .16519        .02925       .91367     .19951
1600.      .16476       .00837         .14309        .01777       .92340     .20001
1700.      .15448       .00509         .12549        .01334       .93932     .20517
1800.      .15709       .00314         .11513        .01080       .95242     .20742
  MAXIMUM OZONE NOT REACHED, THE LAST ONE HOUR AVERAGE WAS .20475 PPM.
```

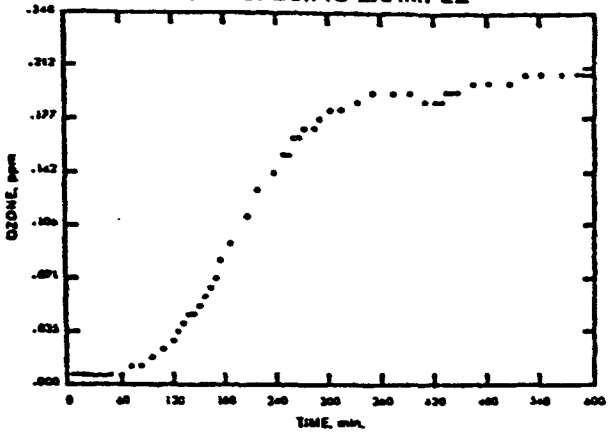




*Note: Examples of similar outputs are shown in User's Manual for Kinetics Model and Ozone Isopleth Plotting Package, EPA-600/3-78-014a.

NOTES

CITY-SPECIFIC EXAMPLE



OZIPP COMPUTER OPERATIONS

Isopleth Option

Purpose: To generate an ozone isopleth diagram.

Computer Resources:

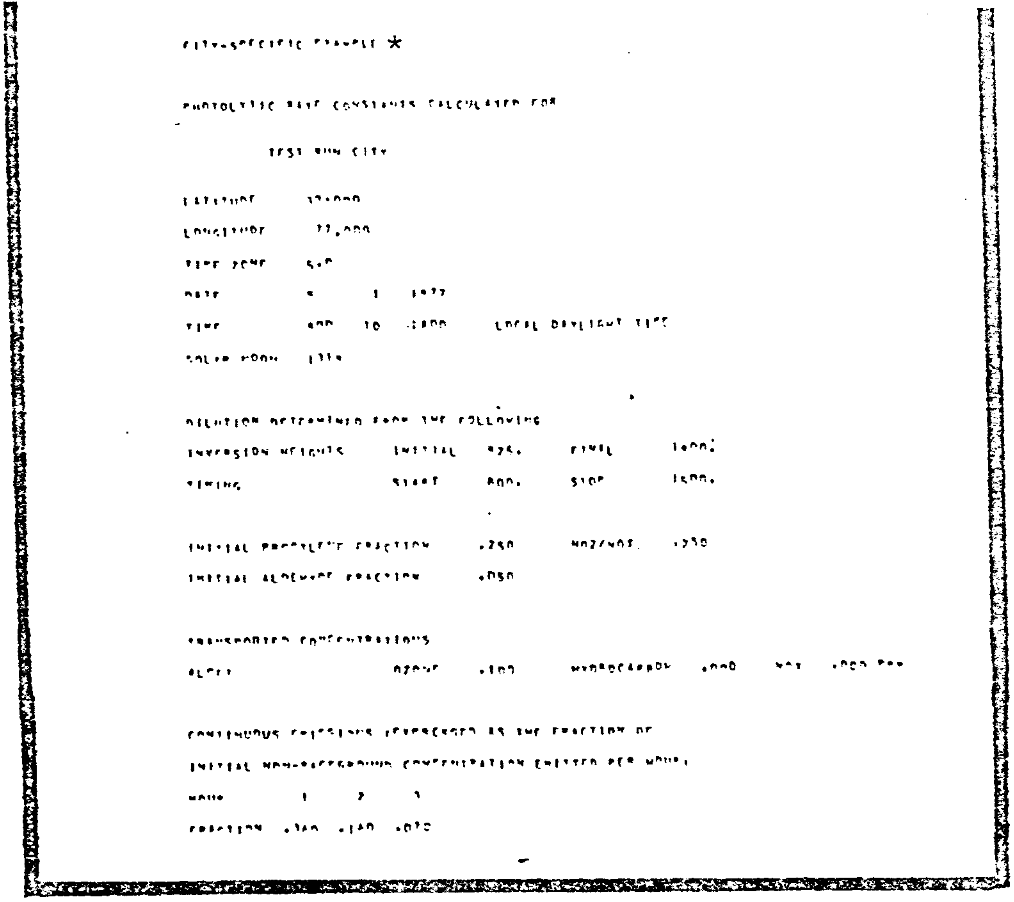
Time: <10 minutes

Cost: <$30

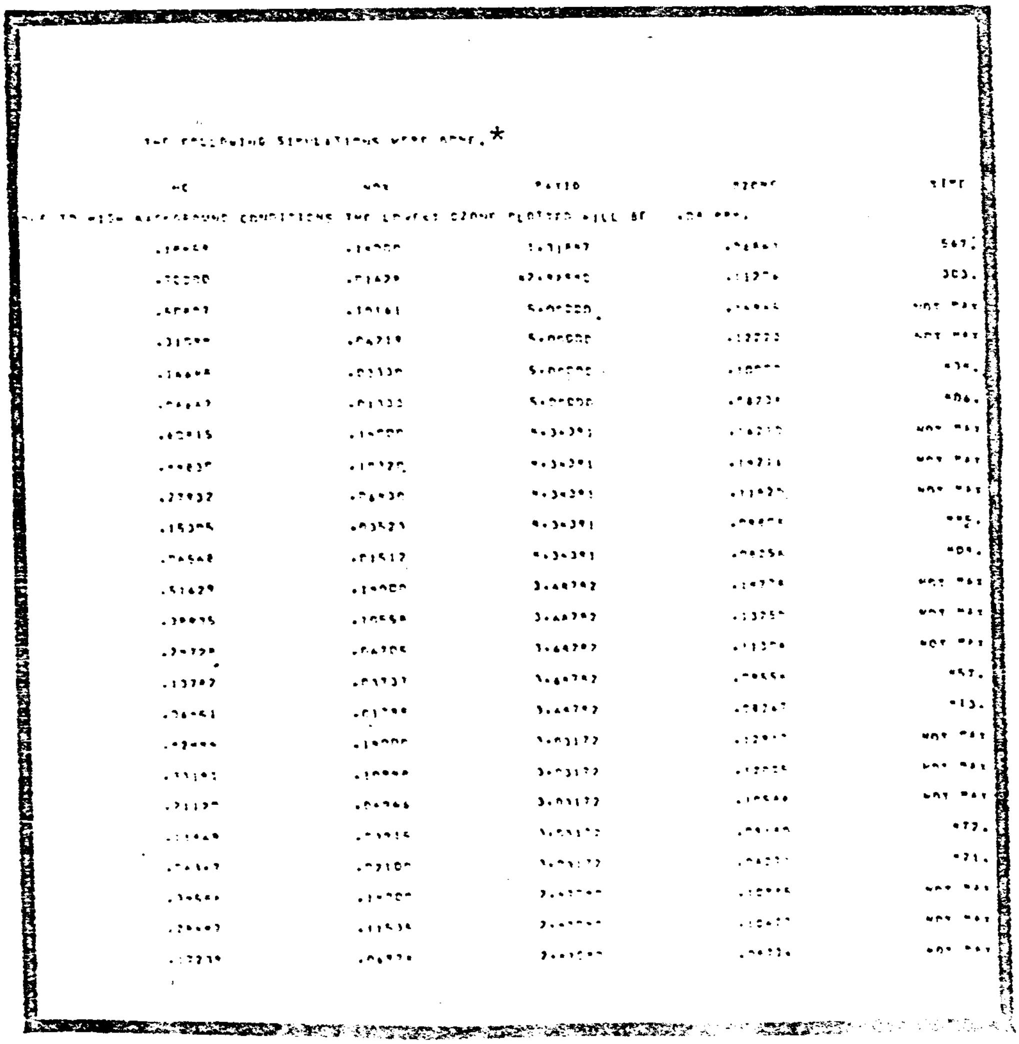
Output Options:

1) Print time of O_3 peak
2) Generate offline plot of isopleth diagram (Use Plot Option)
3) Set scales of diagram
4) Set isopleth levels to be plotted

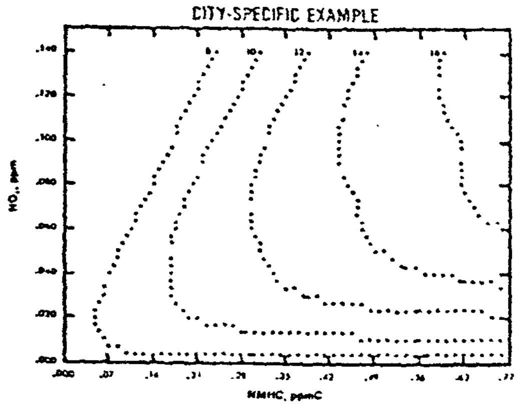
NOTES



*Note: Similar examples of outputs are shown in User's Manual for Kinetics Model and Ozone Isopleth Plotting Package, EPA-600/3-78-014A.



NOTES


CITY-SPECIFIC EXAMPLE
8
10
12
14
16
NO_x, ppm
.000
.020
.040
.060
.080
.100
.120
.140
NMHC, ppmC
.000
.07
.14
.21
.28
.35
.42
.49
.56
.63
.77

3.7 Application of Isopleth Diagrams in EKMA

The preceding section described how individual ozone isopleth diagrams are generated. Each diagram corresponds to conditions leading to the peak ozone concentration measured at one particular site on a given day. In order to determine the overall SIP control requirement, an estimate is needed of the VOC emission reduction necessary to lower the observed peak to 0.12 ppm. The VOC emission reduction for each specific case is estimated by means of the EKMA technique using the isopleth diagram, observed peak ozone, and measured data on the NMOC/NO_x ratio. Described below are the assumptions underlying this approach, and procedures which should be used to make the calculations.

An isopleth diagram is generated by performing repeated simulations with differing assumptions about initial precursor concentrations. Post 0800 emissions also vary in proportion to the initial concentrations because these emissions are expressed relative to the initial concentrations. Therefore, points on a diagram represent different emission levels. One point exists on each diagram which corresponds to the base conditions (i.e., the measured NMOC/NO_x ratio and observed O_3 peak). All other points represent effects of changing precursor emissions (i.e., both pre- and post 0800), relative to the base case, assuming everything else remains constant. For example, assume the NMOC and NO_x coordinates of the base point are 1.2 ppmC and .16 ppm, respectively. The point found at 0.6 ppmC NMOC and .12 ppm NO_x would represent a 50% reduction in VOC emissions and a 25% reduction in NO_x emissions. Thus, once the base point is defined, the diagram may be used 1) to evaluate the effect on any proposed emission reduction, and 2) to estimate the overall degree of VOC emission reduction needed to reduce the ozone peak to 0.12 ppm, given a change in NO_x emissions. As indicated above, all emissions (i.e., both pre-0800 and post 0800) are assumed to change by the same percentage. Also, when a single diagram is used for one of two purposes described above, ozone is predicted as a result of precursor emission changes alone, with all other conditions remaining fixed. For example, when a single diagram is used, the level of transport aloft is assumed to remain constant.

The actual procedure for estimating the VOC emission reduction needed to lower a peak ozone level to 0.12 ppm consists of 1) locating a base point on the diagram, and 2) finding a point representing the post-control state (i.e., the point at which the O_3 peak is predicted to be 0.12 ppm). The key to finding the starting point is estimating the appropriate NMOC/NO_x ratio. A day specific NMOC/NO_x ratio may be derived from urban 6-9 a.m. measurements of NMOC and NO_x provided that measurements are available from more than one site, and little variability exists among individual site ratios (i.e., ratios for each site are within +30% of the mean ratio). If neither of these criteria are met, then the NMOC/NO_x ratio used in control calculations should be the median of the NMOC/NO_x ratios calculated for each day being modeled. The starting point on the diagram is found by the intersection of this ratio with the ozone isopleth corresponding to the measured peak. Note that, in effect, the OZIPP model is calibrated to measured data by this procedure. The post control point is found by first estimating the change in NO_x emissions likely between the base period and the post control period (usually 1987). The NO_x level found at the base point is adjusted by this anticipated percentage change in NO_x emissions. The adjusted NO_x level is then located on the 0.12 ppm isopleth in order to find the post control point. The required VOC emission reduction is computed as the percentage difference in the NMOC levels associated with the base point and post control point. This is the VOC emission reduction necessary to reduce the peak ozone level to 0.12 ppm for a particular site/day combination, assuming all other factors remain unchanged.

In some instances, control estimates should take into account changes in other factors besides emissions. For example, the levels of ozone transported aloft may change as a result of implementing control programs in areas upwind of the city. Even though estimating these changes is an extremely difficult problem, guidelines have been developed for deriving potential reductions (EPA-450/4-80-027). The procedure for incorporating changes concurrent with emission reductions involves the use of two isopleth diagrams. The first diagram represents the base conditions and is generated exactly as described before. The base point is found in the standard manner described in the previous paragraph. However, the post control point is located on a new diagram reflecting the future conditions. For example, assume that for the base conditions, the level of ozone aloft is found to be .08 ppm. The base diagram would be generated using this value. However, according to EPA-450/4-80-027, the level aloft may be reduced in the future by as much as .02 ppm. Assuming that the level of ozone aloft in the future would be .06 ppm, a new diagram would be generated with all inputs the same as for the base diagram except for this new level of ozone aloft. The post control point would then be located on this new diagram, and the VOC emission reduction calculated in the standard fashion. If other conditions are assumed to change (e.g., precursor transport or gross changes in post 0800 emissions), all changes should be reflected in the new, or future case, diagram.

Application of Isopleth Diagrams in EKMA

A. Introduction

1. Overview of Discussion

2. Assumptions Underlying Diagram

3. Use of Diagrams

4. Locating Base Point on Diagram
   - O_3 Level
   - $NMOC/NO_x$ Ratio

B. Estimating Controls Using One Diagram

1. Procedure

2. Example Problems

C. Estimating Controls with Two Diagrams

1. Examples of Conditions Necessitating This Appraoch

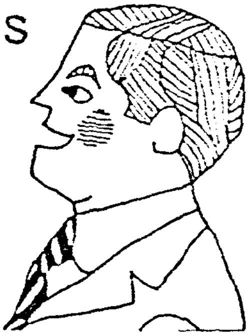
2. Procedure

3. Example Problems with Change in O_3 Aloft
   - Problem Statement
   - Procedures for Estimating Future O_3 Aloft
   - Problem Solution

4. Example Problem with More Than Two Concurrent Changes

NOTES

APPLICATIONS OF ISOPLETH DIAGRAMS IN EKMA

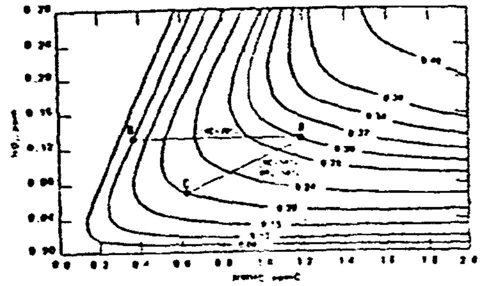


ESTIMATING CONTROLS

- Isopleth Diagram Assumptions
- Establishing Base Point
  - — NMOC/NO$_x$ Ratio
  - — O$_3$ Peak

- Using Single Diagrams
- Consideration of Changes Concurrent With Emission Reductions (e.g., Transport Levels)

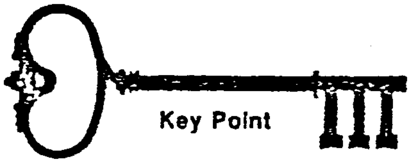
STANDARD OZONE ISOPLETH CONDITIONS



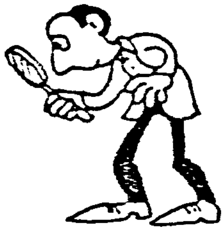
B = Base point, all others represent changes in emissions

Isopleth Diagram can be used to:

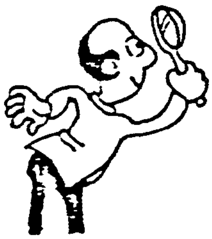
- Estimate reduction in emissions necessary to reduce peak O_3 to 0.12 ppm (e.g., Point B)
- Evaluate effect of specified control requirements (e.g., Point C)



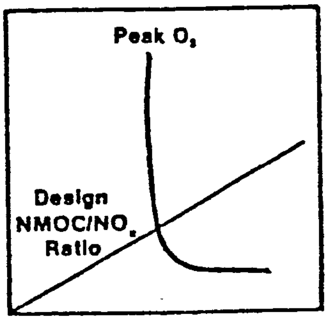
In evaluating controls, only emissions are assumed to change (dilution, transport, etc. remain unchanged).

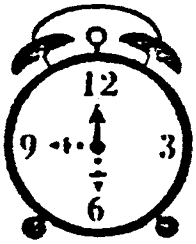


LOCATING BASE POINT



- Intersection of appropriate O_3 isopleth with design NMOC/NO_x ratio.





- O_3 isopleth corresponds to O_3 peak at site/day being modeled.
- NMOC/NO_x ratio established 6-9 a.m. measurements in urban core. Ratio surrogate for initial conditions.

NMOC/NO_x DESIGN RATIO

- Calculate site-specific 6-9 a.m. average.
- Compute site-specific ratios.
- If more than one site, average.

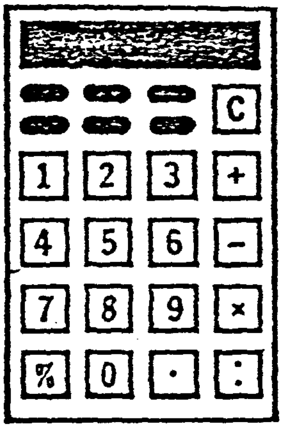
If any individual ratio does not differ from mean by more than 30%, use ratio.

If not...

Use median of all ratios for all days being modeled.

If NMOC and/or NO_x data are not available, use previous procedure.

Examples of Calculation Design $NMOC/NO_x$ Ratios



Given: Ratios at five urban core sites on the day being modeled are 9.1, 6.2, 6.4, 6.5, and 9.8, respectively.

Solution: First calculate the average ratio

$$\bar{R} = \frac{9.1 + 6.2 + 6.4 + 6.5 + 9.8}{5}$$

$$\bar{R} = 7.6$$

NOTE:

All the ratios are within ± 30% of $\bar{R}$, i.e., all the ratios are between 5.3 and 9.9. Then, the design ratio is

$$DR = \bar{R} = 7.6$$

Given: Assume that only one site is available for the study. Assume also that the NMOC/NO_x ratios are available for five of the design days. These ratios are 8.8, 8.6, 15.5, 9.7 and 14.3, respectively.

Solution: Since only one site is available, the design ratio is

$DR = \text{median}\ (8.8,\ 8.6,\ 15.5,\ 9.7,\ 14.3)$

$DR = 9.7$

ESTIMATE CONTROLS
(Single Diagram)

1) Generate base diagram
2) Locate base point
3) Calculate future NO_x from emission inventory assumptions

4) Locate post-control point

5) Compute VOC reduction

$$\%R = \frac{(NMOC)_1 - (NMOC)_2}{(NMOC)_1} x\, 100$$

EXAMPLE 1

O_3 Design Value = 0.24

Design NMOC/NO_x = 8.1

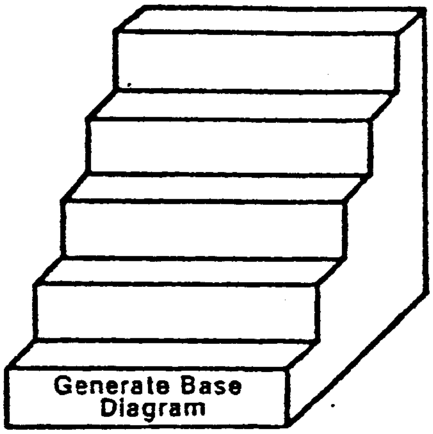
Present Transport = 0.08 ppm

Change NO_x = +10%

City-Specific Data:

Latitude = 38.6
Longitude = 90.2
Time Zone = 6.0 (CDT)
Day = June 8, 1976
Morning Mixing Height = 250 m
Afternoon Mixing Height = 1500 m
NMOC Emission Fractions = 0.25, 0.02, 0.02, 0.02
NO_x Emission Fractions = 0.42, 0.04 0.04, 0.04,

What reduction in VOC emissions will be needed to reduce 0.24 ppm to 0.12 ppm?



OZIPP INPUT DATA

```
TITLE
EXAMPLE 1 BASE CASE
PLAC  38.6   90.2   6.0     1976.  6. 8.

ST. LOUIS
DILU  250    1500
TRAN  0.08
EMIS  -4.0   0.25   0.82   0.02   0.02
      0.42   0.04   0.04   0.04
ISOP  4.0    0.56

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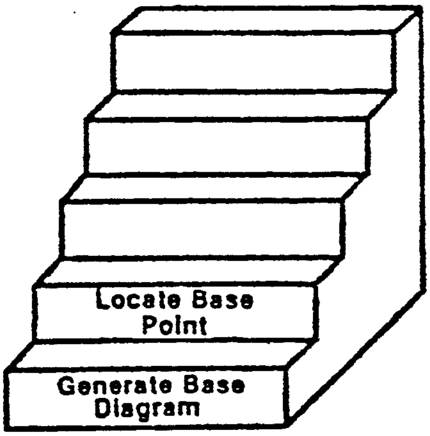
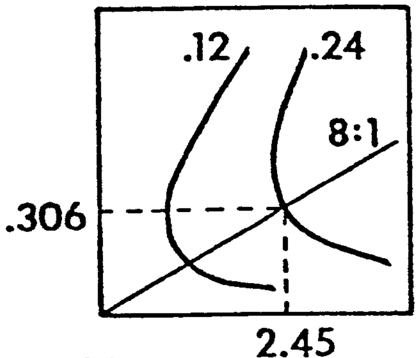
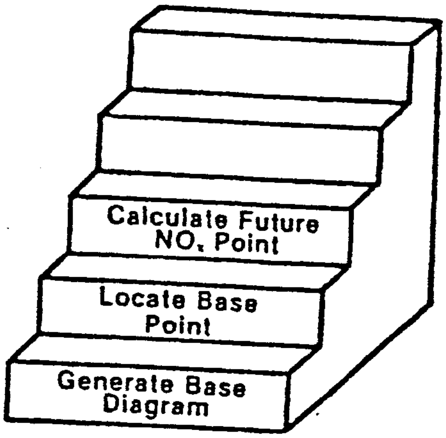




Base Point NMOC = 2.45
Base Point NO_x = 0.306



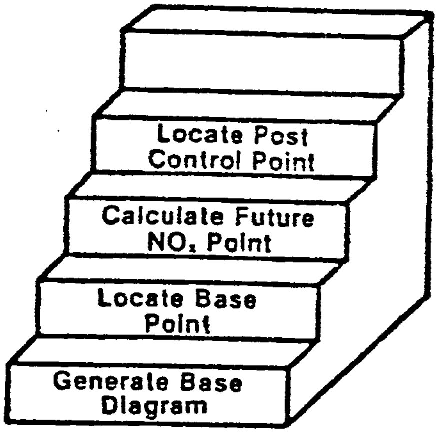
Calculate Future NO_x Point

Locate Base Point

Generate Base Diagram

$$(NO_x)_2 = (NO_x)_1 \times (1 - \frac{NO_x}{100})$$

$$(NO_x)_2 = 0.306 \times (1 + \frac{10}{100}) = 0.337 \text{ ppm}$$

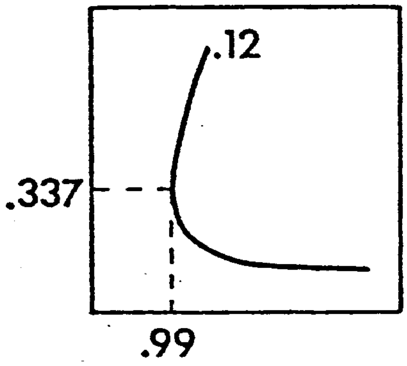


Locate Post Control Point

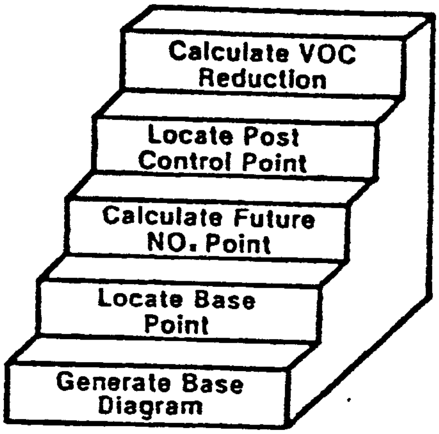
Calculate Future NO_x Point

Locate Base Point

Generate Base Diagram



$(NMOC)_2 = .99$



Calculate VOC Reduction

Locate Post Control Point

Calculate Future NO_x Point

Locate Base Point

Generate Base Diagram

$$\%R = \frac{2.45 - 0.99}{2.45} = 60\%$$

EXAMPLE 2

Same conditions as Example 1

FIND —

Predicted O_3 if VOC emissions reduced 50%.

NOTES

Solution:

1) Base point is the same as Example 1

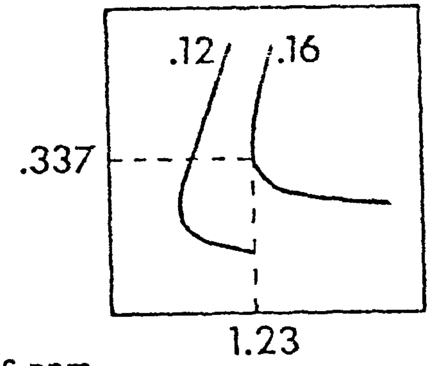
$(NMOC)_1 = 2.45$ $(NO_x)_1 = 0.306$

2) Future point is calculated as follows

$(NO_x)_2 = (0.306) \times (1 + \frac{10}{100}) = 0.337$

$(NMOC)_2 = (2.45) \times (1 - \frac{50}{100}) = 1.23$

Step 3: Locate Future Point on Diagram and Estimate O_3.



$O_3 = 0.16$ ppm

CHANGES CONCURRENT WITH EMISSION REDUCTIONS

(Two Diagrams)

Examples:

A) Change in ozone aloft due to upwind control programs

B) Changes in precursor transport

C) Post-0800 emissions change differently from initial conditions:

- Gross treatment only
- Example: rapid growth in outlying county

NOTES

Methodology: Use two diagrams — one representing base conditions and the other representing future conditions.

1) Generate base diagram
2) Locate base point on base diagram
3) Calculate future NO_x point from anticipated changes in NO_x emissions
4) Generate future case diagram
5) Locate post-control point in future case diagram
6) Compute VOC reduction

EXAMPLE 3

Given: Assume the same conditions as for Example 1 except that O_3 aloft will change in the future because of implementation of upwind controls.

FIND —

Reduction in VOC emissions needed to reduce 0.24 ppm peak to 0.12 ppm.

Solution:

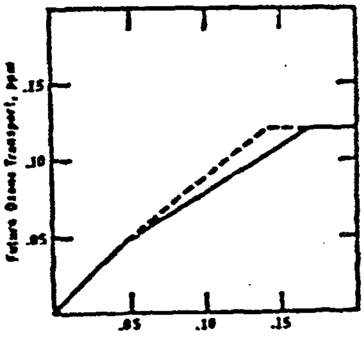
Steps 1 through 3 are exactly the same as for Example 1. Therefore:

$(NMOC)_1 = 2.45$

$(NO_x)_1 = 0.306$

$(NO_x)_2 = 0.337$

Step 4: Generate Future Diagram. First, future O_3 aloft must be estimated.



- Nonattainment upwind areas $\Delta HC = -40\%$ $\Delta NO_x = 0\%$
- Attainment upwind areas $\Delta HC = -20\%$ $\Delta NO_x = 0\%$

Assume upwind nonattainment areas. Therefore, O_3 aloft reduced to about 0.06 from 0.08.

STEP 4. GENERATE FUTURE DIAGRAM

```
TITLE
EXAMPLE 3 FUTURE
PLAC  38.6   90.2   6.0    1976.  6.     8.

ST. LOUIS
DILU  250.   1500.
TRAN         0.06
EMIS  -4.0   0.25   0.02   0.02   0.02   0.02
0.42  0.04   0.04   0.04
ISOP  2.0    0.28

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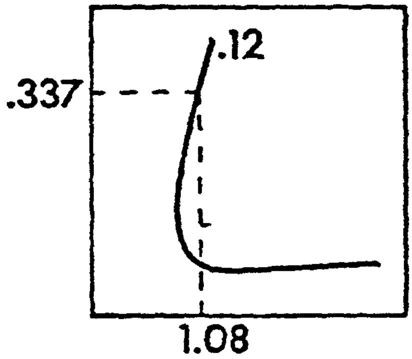
```

Step 5: Locate Post Control Point



$(NMOC)_2 = 1.08$

STEP 6. COMPUTE VOC REDUCTION

$$\%R = \frac{2.45 - 1.08}{2.45} = 56\%$$

EXAMPLE 4

More Than Two Concurrent Changes

Problem: Repeat Example 3 except assume that VOC and NO_x emissions for the last 3 hours will triple in the future.

NOTES

STEPS 1 THROUGH 3 REMAIN THE SAME

That is: Base Point

$(NMOC)_1 = 2.45$

$(NO_x)_1 = 0.306$

$(NO_x)_2 = 0.337$

Future o_3 aloft $= 0.06$

However, emission fractions for hours 2 through 4 will now increase by a factor of 3.

STEP 4. GENERATE FUTURE DIAGRAM

```
TITLE
EXAMPLE 4 FUTURE
PLAC  38.6   90.2   6.0    1976.  6.     8.

ST. LOUIS
DILU  250.   1500.
TRAN         0.06
EMIS  -4.0   0.25   0.06   0.06   0.06
0.42  0.12   0.12   0.12
ISOP  4.0    0.56

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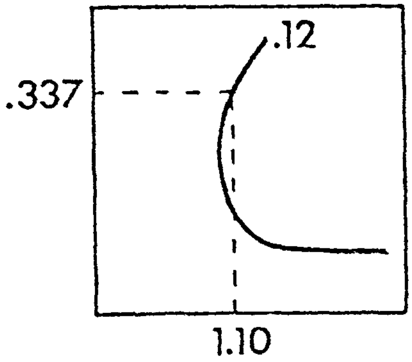
```

Step 5: Locate Post Control Point



$(NMOC)_2 = 1.10$

STEP 6. COMPUTE VOC REDUCTION

$$\%R = \frac{2.45 - 1.10}{2.45} = 55\%$$

3.8 Determining the Overall SIP Control Requirement

By applying the EKMA technique with city-specific diagrams, controls needed to reduce peak ozone levels to 0.12 ppm can be calculated. From these results, the control level which will insure achievement of the NAAQS should be selected. The choice of control level must be made in accordance with the statistical form of the standard.

As noted earlier, controls are calculated for a minimum of five high ozone days for each site experiencing ozone peaks above 0.12 ppm. Normally, this would require application of the OZIPP/EKMA technique at least five times for each appropriate site/day combination (i.e., at least five base case diagrams for each site). In practice, however, considerable duplication in high ozone days is likely for many sites in a monitoring network. When this occurs, the same isopleth diagram (or set of isopleths) can usually be used to make control estimates for a number of sites. The only exception to this rule occurs when significantly different post 0800 emissions are found for trajectories leading to different monitoring sites and these differences significantly affect positioning of the isopleths on the diagram. Thus, the number of isopleth diagrams to be generated may be reduced by careful review of the highest days at all sites. Use of the CALCULATE option can facilitate appropriate sensitivity tests. In any event, control levels must be estimated for the ozone levels found at each site on the five days with the highest peaks (i.e., peaks greater than 0.12 ppm).

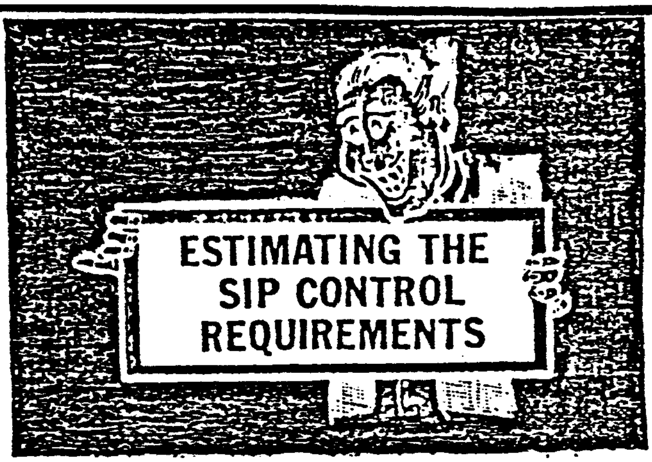
The NAAQS for ozone is site specific, requiring that the daily maximum hourly ozone concentration must not exceed 0.12 ppm more than once per year at each site. A site specific control level is chosen such that the frequency distribution of ozone levels at that site occurring after implementation would not violate the standard. If a three year data base were used, this would be the fourth highest control estimate; for a two year data base, it would be the third highest; and for only one year of data it would be the second highest control level. By choosing these particular levels of control, only one peak level above 0.12 ppm would be predicted for each site. The final step in determining the SIP control level is selecting the highest site specific control estimate. This level of control is necessary to insure that the NAAQS is achieved at all monitoring sites.

DETERMINE THE OVERALL SIP CONTROL REQUIREMENT

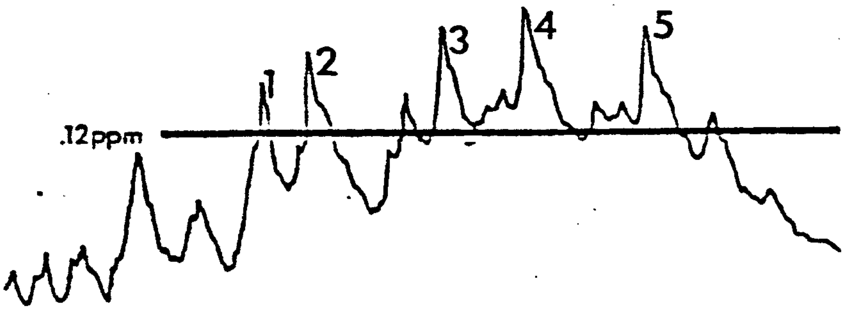
A. Overview

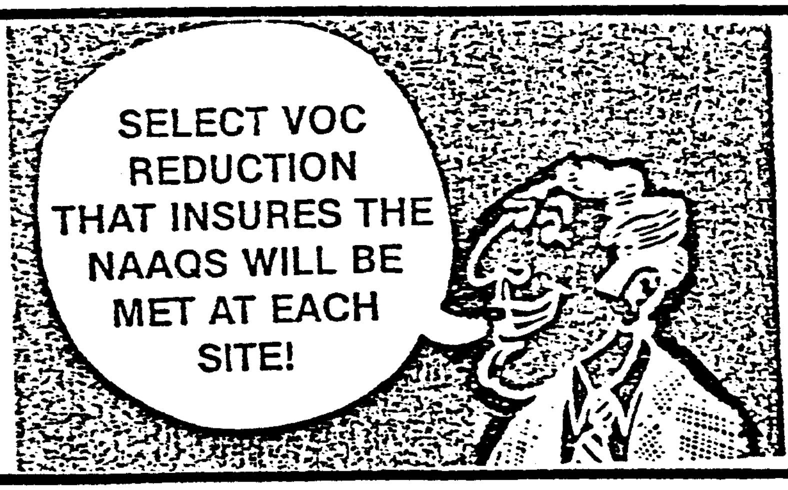
B. Example 1

C. Example 2



Estimates of VOC reductions needed to reduce five highest peaks at each site to .12 ppm





- Control Selected for Each Site:

Years of Data	Choice of Control
1	2nd
2	3rd
3	4th

- SIP control equals highest of site-specific controls.

NOTES

Example 1

One Year of Data

Rank of Day	Site 1			Site 2		
	Date	O_3	%R	Date	O_3	R%
1	10/1	0.24	60	6/8	0.22	58
2	6/8	0.18	57	8/25	0.19	54
3	10/2	0.16	45	10/2	0.18	55
4	8/13	0.15	39	8/26	0.18	51
5	8/21	0.14	39	7/26	0.17	49

SIP Control Requirement = 57%

Example 2

Multiple Years of Data

Rank of Day	Site 1*			Site 2**		
	Date	O_3	%R	Date	O_3	%R
1	7/6/79	0.24	57	8/25/79	0.26	65
2	10/1/80	0.24	60	7/13/79	0.24	60
3	6/7/78	0.23	55	6/8/80	0.22	58
4	6/7/79	0.22	50	9/14/79	0.21	53
5	8/5/79	0.21	51	8/25/80	0.19	54

SIP Control Requirement = 58%

* Assume 3 years' data

** Assume 2 years' data

3.9 Efforts to Validate EKMA

The primary question concerning validation of city-specific EKMA is, "how well does the model estimate control requirements needed to attain the ozone NAAQS?" This question cannot be answered unequivocally, because there is no observed or "right" answer against which to compare model performance. Hence, four less direct approaches have been used to validate EKMA.

Approach 1. Comparison with Historical Trends

This approach is to compare the observed impact of implemented controls with that which would have been predicted had city-specific EKMA been applied prior to the implementation of controls. The approach has been tried in Los Angeles using air quality and emissions data collected between 1963 and 1978. Comparisons suggest that about 70% of the predictions agree with observations within a rather narrow band of uncertainty. If uncertainty in NMOC/NO_x ratios prevailing in the early 1960's is considered, all observations and predictions agree. However, in the latter case uncertainty is rather large.

Approach 2. Comparison with Predictions Obtained with Validated Sophisticated Models

This approach compares the impact of specified reductions in precursor levels using city-specific EKMA with that obtained with validated sophisticated photochemical dispersion models. Agreement suggests that the control estimates obtained with city-specific EKMA are about as good as is possible with state-of-the-art models. Such comparisons have been performed in St. Louis, Los Angeles, San Francisco, Sacramento, and Tulsa using several different dispersion models. Of the 33 comparisons available, 26 agreed within 10%. If the major concern is that city-specific EKMA may prescribe more controls than are necessary to attain the NAAQS, these comparisons suggest that chances of prescribing a control requirement that is more than 10% too severe is only about one in nine.

Approach 3 is to compare predicted peak ozone and corresponding ambient precursor estimates with observed ambient air quality. Such an approach requires a more detailed data base than is likely to be available for use with city-specific EKMA. Consequently, it is a less direct test of city-specific EKMA as it is used in SIPs. However, if it can be demonstrated that the OZIPP model underlying EKMA works well in predicting absolute levels of ozone with a detailed data base, the credibility of city-specific EKMA is enhanced. Approach 3 has been applied in St. Louis, Los Angeles and San Francisco. In these tests, the OZIPP model was found to systematically underpredict peak observed ozone. It is apparent that surface wind data provide an inadequate descriptor of wind flow for some of the days tested. Primarily for this reason, estimates agreed with observations within 30% on only 10 of 16 occasions. The inconsistent applicability of surface wind data in these tests suggests that more complete wind information than anticipated in the November 14, 1979 Federal Register notice is needed if EKMA is to be applied as a simplified trajectory model (i.e., Level II analysis).

Approach 4 is to see whether city-specific EKMA is a good indicator of a city's maximum ozone forming potential. As described above, sometimes it is very difficult to estimate a trajectory from surface data. The trajectory assumed in city-specific EKMA should tend to maximize the peak ozone predicted by the model. In addition, simulations with photochemical grid models often suggest that the maximum hourly ozone concentration does not occur at any of a limited number of monitoring sites. Hence, if the other inputs to OZIPP are accurate and the model is valid, it should act as an upper limit to observed values.

Although this test has been applied for several cities with the standard EKMA isopleths (Level IV analysis), Approach 4 has only been tried in St. Louis for city-specific isopleths. The same ten cases tested in Approach 3 have also been tried with Approach 4. The results indicate that the model provides unbiased predictions of observed peaks, with eight of ten estimates agreeing within ±30% of the observations.

EKMA Validation Efforts -- Outline

A. Identify Key Questions in Evaluating Model Performance

- how well does a model predict control requirements needed to attain the ozone NAAQS?

B. Problems

- there are no observations or "right" answers against which to compare predictions
- non-linearity of ozone
- therefore, cannot present an unequivocal demonstration that model works.

C. Approaches for Validating EKMA

1. Approach 1: Comparison with Historical Trends

(a) Procedure:

(1) - review ambient precursor (or emissions) and ozone data from a period prior to initiation of major controls;

(2) - note changes in ambient precursors or emissions;

(3) - use EKMA isopleths to estimate corresponding changes in ozone concentrations;

(4) - compare estimated changes with observed changes in ozone.

(b) Strengths and Weaknesses

(1) - intuitively most appealing -- comes closest to answering key questions concerning model performance;

(2) - only LA has sufficient data to apply the approach;

(3) - much uncertainty about key parameters in base period (e.g., NMOC/NO_x ratio in early sixties, transported ozone, mixing heights);

(4) - relatively small changes in precursor levels.

2. Approach 2: Comparison of Changes in Ozone Predicted by EKMA versus Those Predicted with Validated Sophisticated Models

(a) Procedure:

(1) - simulate a limited number of days for which sufficient data exist using a "Level I" model;

(2) - satisfy oneself that the sophisticated model agrees satisfactorily with observations;

(3) - simulate a control strategy with the sophisticated model;

(4) - simulate the same strategy with EKMA and note how closely predicted changes in ozone agree with those in step (3).

(b) Strengths and Weaknesses

(1) - enables one to assess accuracy of predicted <u>changes</u> in O_3 concentrations;

(2) - can examine under range of changes than possible with trend data;

(3) - more flexible than Approach 1;

(4) - method assumes sophisticated model predicts changes in ozone concentrations accurately -- non-linearity;

(5) - many of the data required by the sophisticated model may be suspect;

(6) - laborious and requires large data base.

3. Approach 3: Comparison of Predicted Peak Ozone and Corresponding Ambient Precursor Estimates with Ambient Air Quality Data

(a) Procedure -- the same as is used for sophisticated models

(1) - select a limited number of days with detailed meteorological and air quality data;

(2) - simulate each day as accurately as possible within the limits imposed by the model (i.e., use a Level II analysis);

(3) - compare predictions with observations.

(b) Strengths and Weaknesses

(1) - stringent test utilizing an intense data base;

(2) - similar to tests of sophisticated models;

(3) - does not address key question directly;

(4) - is not the way in which city-specific EKMA is likely to be applied;

(5) - laborious and data intensive.

4. Approach 4: Use of City-Specific EKMA as an Indicator of a City's Maximum Ozone Forming Potential

(a) Rationale -- becuase of the assumed trajectory and limited Air Quality Monitoring Network, city-specific EKMA should tend to maximize a city's predicted impact on peak ozone. However, if predictions are near or only slightly above observations, this suggests simplifications invoked may not be critical.

(b) Procedures

(1) - predict peak ozone concentrations using OZIPP as recommended in city-specific EKMA;

(2) - plot observed versus estimated peak ozone;

(3) - for most points on scatterplot, predictions should be close to or above observations.

(c) Strengths and Weaknesses

(1) - reflects use of OZIPP as applied in city-specific EKMA;

(2) - does not rely so much on difficult-to-obtain data;

(3) - does not directly address the key question concerning performance of city-specific EKMA;

(4) - less rigorous test than Approach 3.

D. Extent of Comparisons

1. Historical Trends: 1 city -- Los Angeles 1963-78.

2. Comparison with Sophisticated Models: 4 cities: St. Louis, Los Angeles, San Francisco and Sacramento. Sophisticated models include Airshed, LIRAQ and SAI Trajectory Model.

3. Comparison with Air Quality Data Using Level II EKMA

10 comparisons in St. Louis, 3 comparisons in Los Angeles, 1 comparison in San Francisco.

4. Using EKMA as an Indicator of Ozone-Forming Potential

10 observations in 1 city: St. Louis

E. Results

1. Historical Trends

(a) trend parameters used (maximum daily O_3 and 95th percentile max. daily O_3)

(b) illustrate graphical output and show why each comparison is independent

(c) cite sources of shown uncertainty band as well as other sources of uncertainty

- running 3 year averages
- spatial differences in precursors
- uncertainties in $NMOC/NO_x$ ratio
- lack of constant meteorology

(d) Of 16 available comparisons, approximately 70% agreed with shown bands of uncertainty for both 95th percentile and maximum ozone

(e) Within all uncertainties, all comparisons agree. However, these uncertainties can be large.

2. Comparisons with Sophisticated Models

   (a) explain types of strategies investigated. Note that 33 comparisons have been made

   (b) show example from St. Louis

   (c) show and explain distribution diagram

      - essentially, city-specific EKMA tends to provide unbiased estimates of sophisticated model estimates

   (d) emphasize left-hand portion of diagram -- this represents likelihood of prescribing controls which are too stringent. Results suggest a likelihood of only about one chance in six of overpredicting needed controls by more than 10%.

3. Comparison with Air Quality Data Using Level II EKMA

   (a) briefly describe how predictions were made and the data base used in making the comparison

   (b) present scatter diagram and note correspondence of better predictions with days having consisient definition of wind fields. Mention results of sensitivity tests to kinetics mechanism.

4. Use of City-Specific EKMA as an Indicator of Maximum Ozone-Forming Potential

   (a) note that predictions of absolute ozone concentrations were made following the procedures outlined in the EKMA guidance

   (b) present and describe scatter diagram of results

F. Summary

1. No approach provides irrefutable evidence that city-specific EKMA works.

2. Comparison with historical trends suggests agreement, but only within a range of uncertainty.

3. Generally similar results are obtained with EKMA and sophisticated models.

4. Level II EKMA tends to underpredict observed peak O_3 in St. Louis, with worst predictions tending to occur on days with the most ambiguous wind fields.

5. City-specific EKMA tends to perform better than Level II EKMA in estimating peak ozone concentrations.

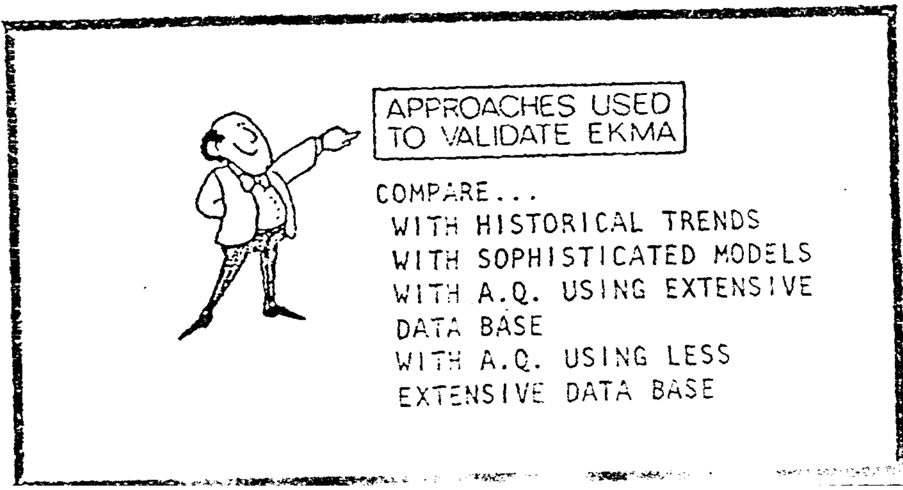
NOTES

EFFORTS TO VALIDATE EKMA

How well does model estimate controls needed to attain NAAQS?

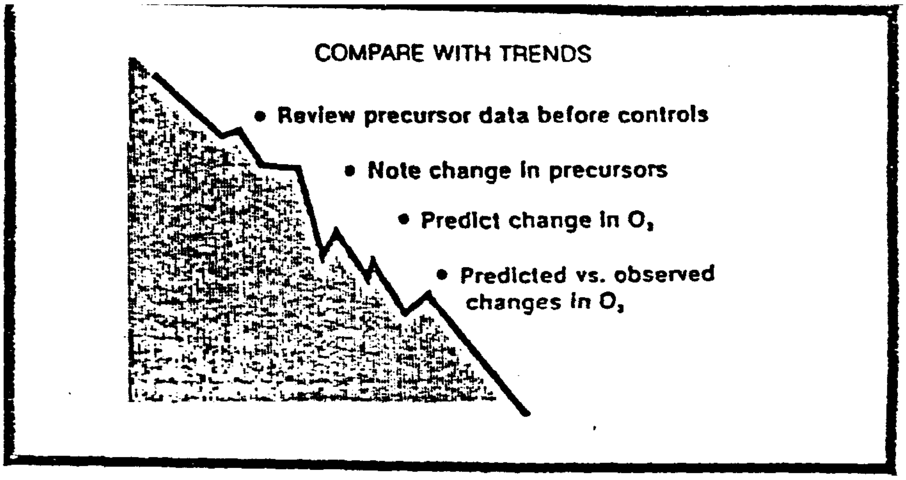
Problems In Evaluating Model Performance

- No "right" answer for comparison
- Nonlinearity of ozone



APPROACHES USED TO VALIDATE EKMA

COMPARE...
WITH HISTORICAL TRENDS
WITH SOPHISTICATED MODELS
WITH A.Q. USING EXTENSIVE DATA BASE
WITH A.Q. USING LESS EXTENSIVE DATA BASE

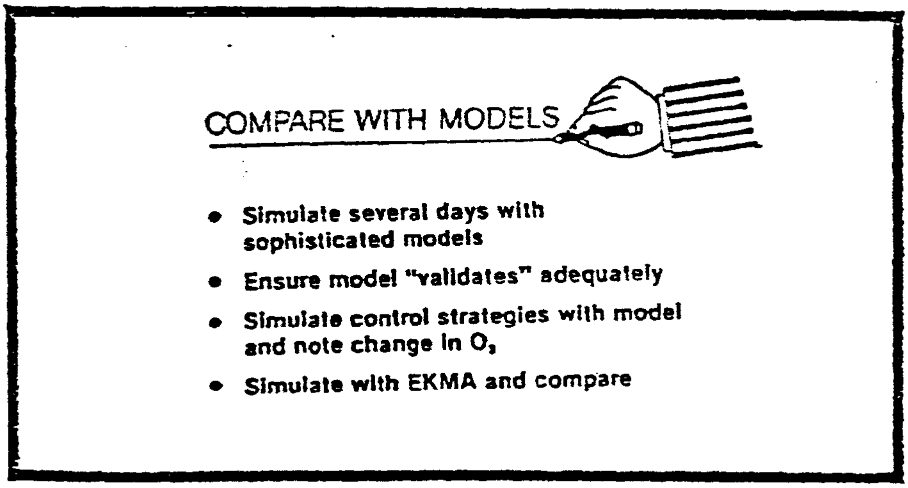


COMPARE WITH TRENDS

- Review precursor data before controls
- Note change in precursors
- Predict change in O_3
- Predicted vs. observed changes in O_3

COMPARE WITH TRENDS

Strengths	Weaknesses
• Intuitively appealing.	• Only LA has sufficient data.
• Comes close to addressing key question.	• Much uncertainty exists.
	• Relatively small changes observed.



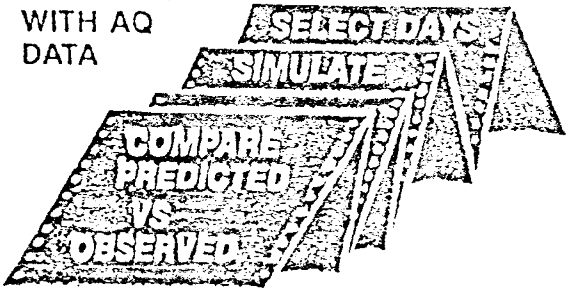
COMPARE WITH MODELS

- Simulate several days with sophisticated models
- Ensure model "validates" adequately
- Simulate control strategies with model and note change in O_3
- Simulate with EKMA and compare

COMPARE WITH MODELS

Strengths	Weaknesses
• Assesses accuracy of predicted changes in ozone.	• Assumes changes predicted with sophisticated model are accurate
• Can examine wider range of changes than is possible with trend data.	• Data required by sophisticated model may be suspect.
• More flexible than Approach 1.	• Resource-intensive.

COMPARE WITH AQ DATA



COMPARE WITH AIR QUALITY DATA

Strengths	Weaknesses
• Stringent test with detailed data base. • Similar to validation exercises with sophisticated models.	• Does not directly address key question. • Not the way city-specific is likely to be applied. • Resource-Intensive.

COMPARE WITH A.Q. USING LEVEL III DATA

- Predict peak ozone with OZIPP.
- Plot observed vs. predicted ozone on scatter diagram.
- Most predictions should be near or above observations.

COMPARE WITH A.Q. USING LEVEL III DATA

Strengths	Weaknesses
• Reflects use of OZIPP as applied in city-specific EKMA. • Not data-intensive.	• Does not directly address key question. • Less rigorous than Approach 3.

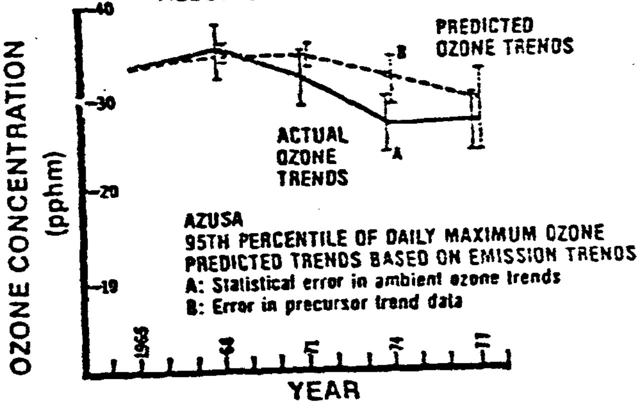
EXTENT OF EKMA EVALUATIONS

City	Approach 1	Approach 2	Approach 3	Approach 4
St. Louis		x	x	x
Los Angeles	x	x	x	
San Francisco		x	x	
Sacramento		x		

Results of Approach 1 — Trends Parameters

- Maximum daily O_3 concentration
- 95th percentile daily maximum O_3 concentration

RESULTS OF THE VALIDATION STUDIES



Sources of Uncertainty in Comparsion of EKMA With Trends

- Smoothed averages
- Spatial differences in precursors
- $NMOC/NO_x$ ratios in 1960's
- Unknown meteorological variations

NOTES

Summary of Los Angeles Trend Comparisons*

	Trend Parameters 95th Percentile	Trend Parameters Maximum Ozone
Using Ambient Precursor Trends	12/16	14/20
Using Emission Trends	10/16	13/20
Including Uncertainty in in NMOC/NO_x ratio	16/16	20/20

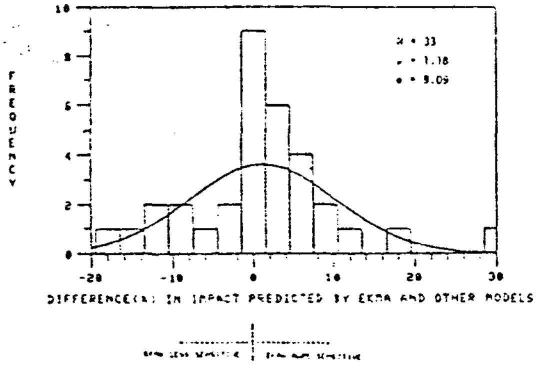
* Numerator : Cases of agreement within uncertainty bounds

Denominator : Number of comparisons

Example Set of Comparisons Between EKMA and Another Model for St. Louis*
June 7, 1976

%Δ NMOC		+67	+17	−17	−42	−70	0	−42	−42
%Δ NO_x		0	0	0	0	0	+20	+20	−20
%Δ O_3	Airshed Model	+5	+3	−7	−25	−49	+1	−32	−19
	EKMA	+15	+5	−6	−21	−53	+3	−26	−21
Difference in Sensitivity (EKMA-Airshed)		10	2	−1	−4	4	2	−5	2

*Changes and differences all expressed in %

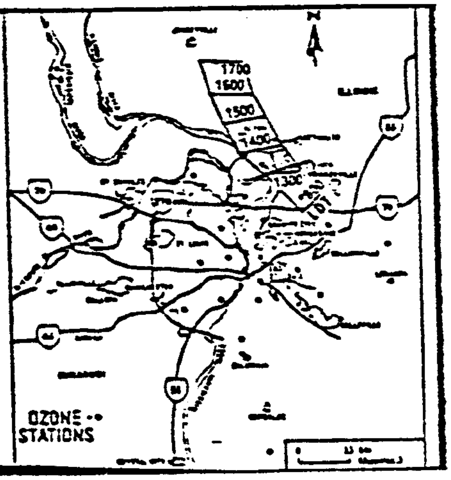


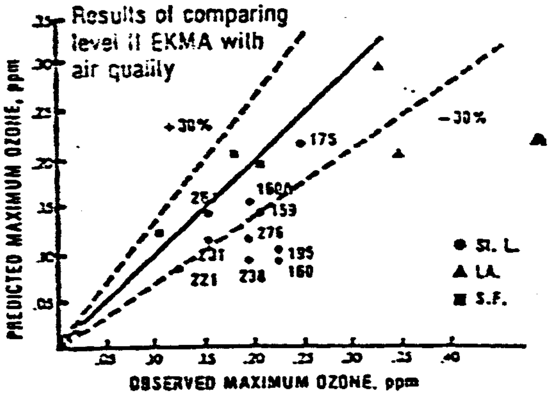
DISTRIBUTION OF DIFFERENCES BETWEEN CITY-SPECIFIC EKMA AND OTHER MODELS

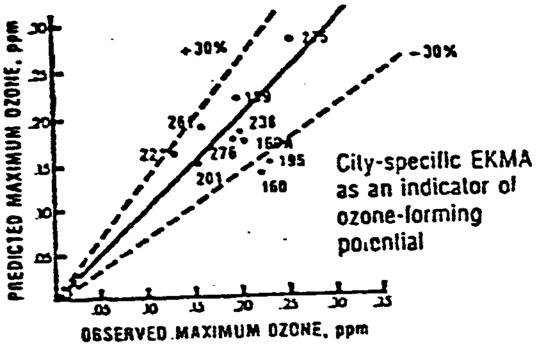
PROBABILITY OF UNDERESTIMATING IMPACT OF CONTROLS

SIZE OF UNDERESTIMATE	LIKELIHOOD
≥ 20%	1/100
≥ 15%	1/27
≥ 10%	1/9
≥ 5%	1/4

TRAJECTORY FOR DAY 159, JUNE 7/SITE 122




Results of comparing level II EKMA with air quality


City-specific EKMA as an indicator of ozone-forming potential

Summary of Results

- Each approach used to validate EKMA has flaws.

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- Each approach used to validate EKMA has flaws.
- EKMA agrees with trends, but within a fairly large range of uncertainty.
- Generally similar results are obtained with sophisticated models.
- Level II EKMA tends to underpredict observed peak ozone.
- City-specific EKMA appears to perform better than Level II EKMA in predicting peak ozone.

3.10 Modeling Related Issues

This page may be used for notes concerning issues which arise during this session of the workshop.

4.0 COMMONLY USED TERMS AND ACRONYMS

BACT	Best Available Control Technology
City-Specific EKMA	Also known as "Level III analysis." The OZIPP computer model is used to generate ozone isopleths for use in EKMA. The isopleths reflect locally applicable meteorological data, diurnal emission patterns and transported ozone and precursors.
CTG	Control Techniques Guidelines
EKMA	Empirical Kinetics Modeling Approach. This is a procedure in which an ozone isopleth diagram is used to estimate reductions in NMOC and/or NO_x needed to attain the ozone NAAQS.
I/M	Inspection and Maintenance
Level I Analysis	Use of a validated photochemical atmospheric dispersion model.
Level II Analysis	This has also been called a "simplified trajectory model." In this analysis, specific trajectories are derived from an extensive array of wind data. Specific air quality, emissions and meteorological inputs encountered by an air parcel as it follows individual trajectories, are used to derive the appropriate ozone isopleths utilized in the EKMA procedure for each trajectory.
NAAQS	National Ambient Air Quality Standard. The NAAQS for ozone is discussed in Section 3.3.
NMOC	All organic compounds measured in the atmosphere with the exception of methane.
NO_x	Oxides of Nitrogen -- includes nitric oxide (NO) and nitrogen dioxide (NO_2). The $NMOC/NO_x$ ratio is an important determinant of how much controls will be needed to attain the National Ambient Air Quality Standard for Ozone.
OZIPP	Ozone Isopleth Plotting Package. This is a computer model which generates the ozone isopleths used in the EKMA procedure.
RACT	Reasonable Available Control Technology
RFP	Reasonable Further Progress

SIP	State Implementation Plan
Standard EKMA	Also known as "Level IV analysis." Utilizes a published set of isopleth curves in applying the EKMA procedure.
VOC	Volatile Organic Compounds. An abbreviation for the organic emissions important in the formation of ozone.

5.0 U.S. EPA POLICY ON 1982 SIP'S FOR OZONE AND CARBON MONOXIDE AND ADMINISTRATOR'S SIP CRITERIA MEMO

federal register

Thursday
January 22, 1981

Part VI

Environmental Protection Agency

State Implementation Plans; Approval of 1982 Ozone and Carbon Monoxide Plan Revisions for Areas Needing an Attainment Date Extension; and Approved Ozone Modeling Techniques; Final Policy and Proposed Rulemaking

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 51

[A-FRL 1722-8]

State Implementation Plans; Approval of 1982 Ozone and Carbon Monoxide Plan Revisions for Areas Needing an Attainment Date Extension

AGENCY: Environmental Protection Agency.

ACTION: Final policy.

SUMMARY: Provisions of the 1977 Clean Air Act Amendments require states that have received an extension of the attainment date for a national ambient air quality standard (NAAQS) for ozone or carbon monoxide beyond 1982 to submit a state implementation plan (SIP) revision by July 1, 1982. This policy describes the criteria that the Environmental Protection Agency (EPA) will use to review these 1982 SIP submittals and also updates and supplements the Administrator's February 24, 1978 memorandum, "Criteria for Approval of 1979 SIP Revisions," (43 FR 21673) and subsequent guidance.

EPA proposed this policy on September 30, 1980 (45 FR 54855) and announced a 60-day period for public comment. The comments received on major issues, EPA's response to the comments, and the changes to the proposed policy are summarized below. A more detailed summary of comments and the EPA responses have been included in Docket No. A-79-43 and are also available for review at EPA regional offices.

DATES: Final policy effective January 22, 1981.

ADDRESS: Docket No. A-79-43, containing material relevant to this action, is located at the EPA Central Docket Section, West Tower Lobby, Gallery 1, 401 M Street, SW., Washington, D.C. 20460. The docket may be inspected between 8:00 a.m. and 4:00 p.m. on weekdays and a reasonable fee may be charged for copying. A summary of the comments received on the proposed policy and EPA responses to the comments are also available for review at the EPA regional office locations listed in Appendix E.

FOR FURTHER INFORMATION CONTACT: Additional information about the policy is available from the following: General policy contact: Mr. Johnnie L. Pearson, Standards Implementation Branch, Environmental Protection Agency (MD-15), Research Triangle Park, North Carolina 27711, telephone (919) 541-5497.

Transportation policy contact: Mr. Gary C. Hawthorn, Office of Transportation and Land Use Policy (ANR-445), Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460, telephone (202) 755-0603.

Vehicle inspection and maintenance contact: Mr. Donald White, Motor Vehicle Emission Test Lab, Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105, telephone (313) 668-4350.

SUPPLEMENTARY INFORMATION: During the 60-day comment period for the proposed policy EPA received comments from 28 organizations and individuals. Comments from over 30 other organizations and individuals were received after the close of the comment period. EPA carefully considered all the comments and made several changes to the policy. Major issues raised by those submitting comments, EPA's responses, and any resultant changes in the policy are summarized below. A more detailed summary of comments and EPA responses are included in Docket No. A-79-43 and available at EPA regional offices.

Attaining NAAQSs After 1987

In the proposed policy EPA recognized that a few large urban areas with very severe ozone and carbon monoxide problems may not be able to attain NAAQSs by December 31, 1987, the deadline set in the Clean Air Act. EPA proposed that such areas should submit SIP revisions by July 1, 1982 that demonstrate attainment as soon as possible after 1987 using additional, more effective measures beyond those required in other areas.

Some public and private organizations commenting on this portion of the proposal supported the course of action outlined by EPA. Others believed, however, that such a policy would encourage some areas to slow or abandon their air quality clean-up efforts. For example, one state environmental agency commented that granting any delay was inappropriate as federal policy and that asking the public to accept additional years of poor air quality was unacceptable. Several state and local agencies stated they believed that the EPA Administrator would be exceeding his authority under the Clean Air Act if he accepted a SIP that did not demonstrate attainment by 1987.

The final EPA policy still permits the submission from a few urban areas with severe ozone and carbon monoxide problems of SIPs that provide for expeditious attainment of NAAQSs by a specific date after 1987. The policy now makes more explicit, however, EPA's intent to carefully evaluate the effectiveness of measures in SIPs for all area and ensure that the most effective measures have been adequately considered in any area that does not demonstrate attainment by 1987.

EPA recognized in the proposal that current provisions of the Clean Air Act may not allow approval of a SIP that provides for attainment of NAAQSs after 1987 and that action by the Congress may be necessary. EPA considers any request to the Congress for additional delay of attainment deadlines to be a serious step and one that should be considered only after it is clear that all available and implementable control measures will be adopted.

Providing Adequate Time for SIP Adoption

The proposed policy reiterated and expanded upon the Clean Air Act requirements that a fully adopted, legally enforceable SIP revision must be submitted to EPA by July 1, 1982. Several state and local agencies responsible for SIP development commented that they would be unable to ensure the adoption and submittal of all required measures by July 1982, particularly if EPA guidance mentioned in the proposed policy is not available early in 1981. EPA recognizes that meeting the July deadline may be a problem for some areas, but is constrained by the Clean Air Act from granting any time extensions.

EPA will continue the practice of granting conditional SIP approval followed in acting on the plan revisions due in 1979. If a SIP revision is in substantial compliance with Part D of the Clean Air Act and the state provides assurances that remaining minor deficiences will be remedied within a short time, EPA may approve the plan with conditions that corrective actions will be completed according to a specified schedule. For example, if missing regulations applying RACT to required sources constitutes a minor deficiency in the SIP and the state commits to a schedule for submitting those regulations, then EPA may conditionally approve the SIP.

The proposed policy included the requirement that states must adopt regulations applying reasonably available control technology (RACT) to all sources of volatile organic compounds (VOCs) covered by a control technique guideline (CTG) and to all other major sources of VOCs. EPA also announced its intent to issue additional CTGs during 1981. A number of agencies responsible for developing SIPS commented that they do not have sufficient resources to finalize regulations for both CTG and non-CTG source categories. Some of the agencies also indicated that the time necessary to satisfy state and local procedural requirements makes it unlikely that the required regulations will be fully adopted by July 1982. A state environmental agency, for example, stated that although the agency agrees in principle with the requirements for regulating both CTG and non-CTG source categories, the agency does not have adequate staff and financial resources to complete the necessary technical analysis and rulemaking activities. In addition, the requirements of the state administrative review process cannot be met by July 1982, even if rulemaking is limited only to CTG sources. A local environmental agency commented that it may not be possible to submit regulations for source categories covered by CTGs issued late in 1981. In order for the regulations to be included in the July 1982 submittal, the local agency must provide the regulations to the state by the end of 1981.

To help ensure that states have adequate opportunity to meet the July 1982 deadline, EPA will issue the new CTGs as early as possible in 1981. The CTGs are in preparation and will be available in draft form between January and May 1981. The final CTGs will be published between July and October 1981. If state and local agencies begin now to develop the necessary data and work with the draft CTGs, they should be able to complete development of regulations by July 1982.

Providing for the Implementation of I/M Programs

The proposed policy included the requirement that states submit, by July 1982, the rules and regulations for vehicle inspection and maintenance (I/M) programs, as well as documentation of 10 other critical I/M program elements. The proposed policy stated that EPA would update I/M guidance for determining I/M program adequacy.

Some state and local agencies commented that guidance not available for their use in planning and implementing I/M programs should not be used to evaluate the I/M portion of the 1982 SIP. Many of these agencies were concerned that updated guidance would include new requirements which could adversely affect I/M activities already in progress and which could not be completed by July 1, 1982. Other agencies commented that EPA should not evaluate individual elements of an I/M program, but should evaluate the program as a whole; that the I/M guidance should be promulgated through rulemaking to allow review and comment by interested parties; and that the intent of requiring the I/M public awareness plan in the 1982 SIP is unclear.

A state agency also questioned whether additional emission reductions from other source categories could be used to offset any shortfall from I/M, rather than making the I/M program more stringent. That agency also questioned whether, in a state with a post-1978 attainment date and with legislative authority which needed to be changed before I/M effectiveness could be increased, commitments to obtain needed legislative changes were adequate for the 1982 SIP, rather than having the legislative changes themselves before July 1982.

EPA's basic requirements for I/M programs are included in a widely distributed July 17, 1978 policy memorandum. Subsequent clarifications to that policy have defined the factors involved in designing I/M program elements and provided information on designing programs which optimize technical and cost effectiveness. Additional information along these lines will be provided.

The July 17, 1978 policy memorandum will be the primary basis for determining I/M program adequacy in the 1982 SIP process. The final policy has been revised to reflect this. EPA agrees that the policy should contain provisions for those states that are meeting an approved schedule, but will not be able to make a complete I/M submission by July 1982. Appropriate changes have been incorporated into the final policy. EPA also agrees that the I/M program must be evaluated as a whole, rather than element by element.

EPA does not believe that I/M policy and guidance needs to be promulgated through rulemaking, but does agree that review and comment by interested parties are important. The appropriate place for rulemaking for I/M is the SIP review and approval process. EPA feels that the states and other interested parties have always been extensively involved in the policy and guidance development process. EPA will continue to seek such review and comment.

EPA feels that the I/M public awareness plan is critical for the successful implementation of an I/M program and that it must be included as part of the 1982 SIP. EPA recognizes, however, that much of the public awareness activity should generally have been completed before the 1982 SIP deadline and will work with the states in developing and implementing their public awareness plans. Guidance is available on what should be included in a good public awareness plan.

If an I/M programs fails to achieve the requisite emission reduction, then the program will have to be modified to obtain that reduction. Additional emission reductions from other source categories cannot be used to compensate for a shortfall from I/M.

Because section 172(c) of the Act requires all measures in the 1982 SIP to be legally enforceable, any further legislative authority will have to be obtained before the 1982 SIP is submitted. A commitment to obtain such authority will not be sufficient for the 1982 SIP.

Making Commitments to Implement Transportation Measures

The proposed policy required that the 1982 SIP submittal include commitments by state and local governments to implement the necessary transportation measures. The documentation of the commitment must include identification of costs, funding sources, and responsibilities of state and local agencies and officials. Several state and local agencies commenting on the proposal expressed concern about making commitments to transportation improvement projects that are only in the early stages of planning and have not been included in state and local budgets or been approved for federal funding.

The definition of implementation commitments contained in Appendix C has been expanded to clarify the form of the commitment for projects that are progressing towards implementation, but have not received budget approvals. Essentially, the implementation commitment for these projects or measures should be a schedule of the major steps required to advance the project through the planning and programming processes. This schedule should also contain an identification of the responsible agencies that must take significant actions to implement the measure. An illustration of such a schedule is also contained in Appendix C.

If a particular measure cannot be implemented because the necessary funds cannot be obtained from the funding source identified in the schedule and if the SIP planning agencies can demonstrate compliance with the provisions of the Clean Air Act requiring priority treatment for projects important for improved air quality and basic transportation needs, then the measure may justifiably be delayed. If this does occur, another substitute measure may be needed for replacement to ensure that NAAQSs are attained (see the section on contingency plans).

Developing Monitoring and Contingency Plans for Transportation Measures

The proposed policy included requirements for developing a monitoring plan for regularly assessing the effectiveness of transportation measures and a contingency plan for implementing additional transportation measures if forecasted emission reductions do not occur. A number of state and local governments commented that they do not have sufficient time and resources to develop monitoring and contingency plans at the same time that they are developing the measures to meet the emission reduction targets for transportation. Some of those commenting interpreted the monitoring requirements as being primarily for air quality monitoring.

In the final policy the monitoring plan requirements emphasize the use of methods that rely on surrogate measures and on data already being collected for other purposes. The monitoring plan need *not* include additional air quality monitoring.

The requirements for a contingency plan have been revised to require a listing only of transportation measures and projects that, because of their potentially adverse effect on air quality, will be delayed while a SIP is being revised. The projects will be delayed when the Administrator of EPA finds that a SIP is inadequate to attain ozone or carbon monoxide NAAQSs and calls for a SIP revision under section 110(c) of the Clean Air Act. EPA has also adopted the suggestion of a local transportation planning agency and is requiring that the SIP include a description of the process to be used to develop and implement additional transportation control measures when they are determined necessary.

Establishing Emission Reduction Targets

The proposed policy required state and local officials to reach agreement on the emission reductions necessary to attain NAAQSs, the extent to which the emission reductions will come from controls on mobile or stationary sources, and the responsibilities for implementation of the measures. Several comments were received noting the difficulties in determining emission reduction targets for meeting the ozone NAAQS because of the form of the standard, the characteristics of the Empirical Kinetic Modeling Approach (EKMA) model, and the effects of pollutant transport. Other comments reflected confusion about where in the SIP development process the identification of targets would occur.

An August 1, 1978 EPA policy memorandum outlined the reasons for establishing emission reduction targets through a negotiated process involving state and local officials from affected jurisdictions. In the past, emission reduction targets and responsibilities for achieving the targets have sometimes been determined without adequate intergovernmental consultation. In some instances, for example, states attempted to require local agencies to make up large shortfalls in needed reductions entirely through transportation measures without examining whether other measures, such as more stringent emission limitations for stationary sources, might make up some of the shortfall.

The final policy has been revised to help clarify the intent of the section on emission reduction targets. The process for negotiating emission reduction targets becomes especially important in those areas where the minimum control measures described in subsections LB–LD are not sufficient to attain NAAQSs and additional measures must be evaluated and selected. The subsection on analysis of alternatives has been revised to indicate that the results of the evaluation of alternatives should be used in defining emission reduction targets.

Demonstrating Reasonable Further Progress

The proposed policy included requirements for demonstrating reasonable further progress towards attaining NAAQSs. A substantial number of comments were received objecting to the requirement for a "linear attainment program" represented graphically by a straight line from base year to attainment year emissions. Those commenting noted that many control measures, particularly those for vehicle emissions, have long lead times and do not have significant effects within the first few years after adoption. Those measures that are implemented within the early years will generally not result in a linear rate of emission reduction.

The final policy has been redrafted to clarify that the linear attainment program represents only the upper limit for annual net emissions from 1980 through the year of attainment. The measures encompassed by the linear attainment program include those in both the 1979 and 1982 submittals. Although there may be some lag time before the measures in the 1982 submittal result in emission reductions, reductions should already be occurring as a result of measures in the 1979 submittal.

The final policy now also reiterates the reporting requirements included in the approval criteria for the 1979 submittal and asks that the annual reasonable further progress reports be combined with related information already being submitted on July 1 of each year.

Ensuring Conformity of Federal Actions

Section 176(c) of the Clean Air Act requires that federal actions conform to SIPs. The proposed policy indicated that states should, where possible, identify the emissions associated with federal actions planned during the period covered by the SIP. A number of comments received on that portion of the proposed policy requested clarification of the process for ensuring conformity and the respective responsibilities of federal, state, and local governments. The comments noted the potentially large number of actions involved, the associated work load for state and local governments, and the lack of available state and local resources. The comments also included questions about the methods to be used for determining conformity.

The final policy outlines the general responsibilities of federal, state, and local governments. Further clarification will be provided in a proposed rule that EPA intends to issue shortly. Section 176(c) states that the assurance of conformity of federal actions is the affirmative responsibility of the head of each federal agency. EPA believes that each federal agency should establish criteria and procedures for making conformity determinations and that state and local governments should have opportunity to review proposed criteria and procedures, as well as the individual conformity determinations that result from their application. The proposed rule that EPA is preparing encourages the use of existing review processes, such as those required by the National Environmental Policy Act and Office of Management and Budget Circular A–95, to reduce the resources required for ensuring conformity.

Interim criteria for use in making and reviewing conformity determinations are included in an advance notice of proposed rulemaking published by EPA on April 1, 1980 (45 FR 21590). Criteria and procedures for evaluating the direct and indirect air quality effects of wastewater treatment facilities funded under the Clean Water Act are included in the section 316 policy published on August 11, 1980 (45 FR 53382). Identification, during SIP preparation, of the emissions associated with future major federal actions will facilitate state and local review of conformity determinations.

Consultation Among State and Local Officials

Two state environmental agencies commenting on the proposed policy thought that the consultation provisions were generally unclear. A local planning agency asked that the policy be supplemented to indicate that the designations of agency responsibilities made by governors prior to the 1979 plan submittals remain in effect. A public interest group requested that the policy forbid states from making unilateral changes in SIP provisions developed by local governments.

Modifications were made in the consultation provisions of the final policy to help clarify apparently ambiguous points and to indicate that new section 174 agency designations are not necessary. Although EPA agrees that a state should not revise a locally developed SIP provision without consulting local officials, EPA believes that the regulations for implementing section 121 of the Clean Air Act already adequately cover such a situation and provide opportunity for appeal to EPA if adequate consultation does not take place.

Determining Data and Modeling Requirements

The proposed policy required that emission inventories should, where possible, be prepared for a 1980 base year. The policy also required that base year and projected year emission inventories for the ozone portion of the SIP be seasonally adjusted annual inventories. The proposal required the SIP to be based on the most recent three years of air quality data, generally including data collected through the third quarter of 1981. The proposal recommended use of the city-specific EKMA model to develop the ozone portion of the SIP.

Several agencies responsible for developing emission inventories commented that agreements had been reached and work had already begun on inventories for base years other than 1980. The agencies recommended that EPA remain flexible in the final policy and accept inventories for those other base years. The final policy continues to allow inventories for base years other than 1980 to be used.

A number of state and local agencies questioned the validity of requiring seasonally adjusted annual inventories of VOCs. Most of those commenting recommended that the inventories be prepared for a typical summer weekday instead. The final policy requires the weekday inventory.

Several agencies indicated in their comments that their normal processing time to validate air quality data would prevent them from using data through the third quarter of 1981, if the SIP was to be developed and submitted by July 1982. The final policy encourages the use of data through the third quarter of 1981, but allows states to use earlier data. If a state selects to use earlier data, it still must present a summary of air quality data through 1981 in its July 1982 submittal and describe how the data may affect the SIP.

State and local agencies that had applied photochemical dispersion models in their previous SIP development work commented that they should be allowed to use these models, rather than the less sophisticated city-specific EKMA model, in developing their 1982 submittals. The final polciy encourages the use of the photochemical dispersion models where the agency developing the SIP has a demonstrated capability to use such models and wishes to do so. Use of a model other than city-specific EKMA or its equivalent must be approved by EPA.

Final Policy—Criteria for Approval of The 1982 Plan Revisions

Introduction

In circumstances where a state has received an extension beyond 1982 for attaining a NAAQS for ozone or carbon monoxide, the Clean Air Act Amendments of 1977 [Section 129(c) of Pub. L. 95-95] require the state to adopt and submit a SIP revision to the Administrator of EPA by July 1, 1982. The areas that are affected by this requirement are listed in Appendix A. The purpose of this notice is to outline the criteria that EPA will use in evaluating the adequacy of the 1982 SIP revisions. These criteria fall into four general categories: (1) Control strategies and attainment demonstration, (2) SIP development process, (3) data collection, and (4) modeling.

The Clean Air Act Amendments of 1977 require all SIPs for the areas that have received an extension beyond 1982 to demonstrate attainment of the NAAQSs for ozone and carbon monoxide as expeditiously as practicable, but not later than December 31, 1987. As a condition for extending the attainment date, Congress also required that each SIP contain certain control provisions covering stationary sources, vehicle I/M, and transportation measures. The control provisions must be included in the SIP for an area where an extension has been granted, regardless of the date after December 31, 1982 when attainment can be demonstrated. These minimum measures and their relationship to the plan's attainment demonstration are described in Section I. Section I also discusses the approach that EPA believes should be followed by those few large urban areas where air quality problems are so severe that analyses may indicate that attainment by 1987 is not possible.

In addition to including a demonstration of attainment, the development of the 1982 SIP must conform to the process and follow the procedures required by the Clean Air Act and described in subsequent EPA guidance. Section II identifies the major steps in the SIP development process. Selected EPA guidance documents for the SIP process are listed in Appendix B. Terms used in the transportation-air quality process are defined in Appendix C. Also, the air quality and emissions data bases to be used in developing the 1982 SIP must be updated. The data requirements for both ozone and carbon monoxide are explained in Section III. The data base for the ozone portion of the SIP must be sufficient to support at least a Level III modeling analysis. The requirements for a Level III analysis are summarized in Appendix D.

Finally, Section IV describes the status of the various air quality models and alerts states to modeling requirements. EPA recommends application of city-specific EKMA or an equivalent method for developing the ozone portion of the SIP, unless the agency preparing the SIP already has the capability and wants to apply a more sophisticated level of modeling. For the carbon monoxide portion, EPA recommends application of the models identified in existing EPA guidance.

I. Control Strategies and Attainment Demonstration

A. Summary

The Clean Air Act requires the 1982 SIPs to contain a fully adopted, technically justified program that adopts and commits to implement groups of control measures that will result in attainment of the ozone and carbon monoxide NAAQSs no later than 1987 and that will provide reasonable further progress in the interim. All plans must contain the three categories of minimum control measures described in this section. If these minimum control measures are not adequate to show attainment by 1987, additional measures which can be implemented by 1987 must be identified and adopted. If all measures which can be implemented by

1987 are not adequate to demonstrate attainment by 1987, additional measures which can be implemented after 1987 must be identified and adopted and attainment must be demonstrated by the earliest possible date. the date of attainment must be specified in all SIPs. In order to ensure equity among the areas unable to demonstrate attainment by 1987, EPA intends to evaluate all SIPs submitted in July 1982 for the effectiveness of measures applied in all areas. Should EPA find that any of the areas not demonstrating attainment by 1987 have failed to adopt the most effective measures available, EPA will compile a list of such controls and require these areas to revise their SIPs to include the more effective control measures.

Subsections B–D describe in detail the minimum control measures which must be contained in each plan submitted in July 1982. The state must demonstrate that adoption and implementation of these elements will result in the attainment of the ozone and carbon monoxide standards by the most expeditious date possible. Control measures must be adopted in legally enforceable form. The SIP submittal must include implementation schedules and commitments. Subsections E and F describe reasonable further progress and attainment demonstration requirements. Subsection G describes the conformity of federal actions requirement.

B. Stationary Sources

Section 172(b) of the Clean Air Act requires states to implement all reasonably available control measures as expeditiously as practicable and, in the interim, maintain reasonable further progress, including such reduction in emissions from existing sources as may be obtained through the adoption, at a minimum, of RACT. In order to complete the requirement to adopt all reasonably available control measures, states must include as part of the 1982 submittal, adopted regulations applying RACT to the following categories of sources: (1) All sources of VOCs covered by a CTG, (2) all remaining major (emitting more than 100 tons per year potential emissions as defined under section 302(j) of the Clean Air Act) stationary sources of VOCs, and (3) all sources of carbon monoxide emitting more than 1,000 tons per year potential emissions.

The guidelines for the 1979 ozone submittals permitted states to defer the adoption of regulations until the CTG for a source category was published. This delay allowed the states to make more technically sound decisions regarding the application of RACT. EPA anticipates issuing a number of additional CTGs in 1981 for various source categories of VOCs. These documents, in conjunction with the previously issued CTGs, will address most of the major source categories which are of national importance. Legally enforceable measures implementing RACT for all sources addressed by these documents must be included in the July 1982 submittal.

There will remain numerous other major sources of VOCs that may be of local importance for which a CTG will not be available. For the major sources for which a CTG does not apply, a state must determine whether additional controls representing RACT are available. EPA will require the submittal to include either legally enforceable measures implementing RACT on these sources or documentation supporting a determination by the state that the existing level of control represents RACT for each of these sources.

If application of RACT to all sources covered by a CTG and all other major sources, together with implementation of a vehicle I/M program and transportation controls, does not result in attainment of the ozone standards by 1987, then additional stationary source controls must be adopted by the state.

C. Vehicle Inspection and Maintenance

All major urban areas needing an extension beyond 1982 for attainment of a standard for ozone or carbon monoxide were required to include vehicle I/M as an element of the 1979 SIP revision. States were required at that time to submit only evidence of adequate legal authority, a commitment to implement and enforce a program that will reduce hydrocarbon and carbon monoxide exhaust emissions from light duty vehicles in 1987 by 25 percent, and a schedule for implementation. Full implementation of that program, in accordance with EPA's established I/M policy, is required in all cases by December 31, 1982.

States with areas that have I/M programs under development or operational as part of their 1979 SIP revisions were required to submit only qualitative descriptions of their I/M program elements in the 1979 SIP submittal. The documentation discussed below must be submitted by July 1982, if not previously submitted as evidence of compliance with the 1979 implementation schedule. The 1982 SIP revision must include rules and regulations and all other I/M elements which could affect the ability of the I/M program to achieve the minimum emission reduction requirements. More specifically, the 1982 submittal must include: (1) Inspection test procedures; (2) emission standards; (3) inspection station licensing requirements; (4) emission analyzer specification and maintenance/calibration requirements; (5) recordkeeping and record submittal requirements; (6) quality control, audit, and surveillance procedures; (7) procedures to assure that noncomplying vehicles are not operated on the pubic roads; (8) any other official program rules, regulations, and procedures; (9) a public awareness plan; and (10) a mechanics training program if additional emission reduction credits are being claimed for mechanics training.

As part of the 1982 SIP review process, EPA will determine the overall adequacy of the critical elements of each I/M program and, therefore, the approvability of the 1982 SIP by comparing those elements to established I/M policy. I/M program elements must be consistent with EPA policy or a demonstration must be made that the program elements are equivalent.

State or local governments that have I/M programs, but plan to increase the coverage and/or stringency of the programs in order to achieve greater reductions, must submit the progam modifications in legally enforceable form through the 1982 SIP revision process.

If a state wishes to submit all or part of the I/M elements required for the 1982 SIP revision before July 1982, with or without other portions of the 1982 SIP revision, EPA will review and evaluate the submittal and take appropriate action as expeditiously as practicable. In the case of a partial submittal, EPA's action will be limited to the available program elements. Final action on the total I/M program must be reserved until all elements are submitted and reviewed in order to assure that the program satisfies the provisions in Part D of the Clean Air Act.

If a state is implementing an I/M program on an approved schedule which extends beyond July 1, 1982, and the state is unable to finalize some of the critical elements of its I/M program in time to include them in the 1982 SIP revision, the state may submit those elements at a later date. This later date must, however, be identified and justified by the state in its 1982 SIP revision and be consistent with the I/M implementation schedule in its 1979 SIP submittal. In such cases EPA will review the available program elements and, if adequate, conditionally approve the I/M program on the submittal (by the designated date) and approval of the outstanding elements.

D. Transportation Measures

The portion of the 1982 SIP addressing emission reductions to be achieved through the implementation of transportation measures must include the basic provisions listed below.

Further guidance will be issued, as necessary, to describe these requirements in greater detail.

1. An updated emission reduction target for the transportation sector. As discussed below, the target must be determined by consultation among state and local officials using the procedures established under sections 121 and 174 of the Act.

2. All reasonably available transportation measures and packages of measures necessary for the expeditious attainment of the transportation emission reduction target. Categories of reasonably available transportation measures are identified in section 108(f) of the Act. The submittal should present documentation, based on technical analysis, of the basis for not implementing any of the measures identified in this section. The 1982 SIP submittal must contain transportation emission reduction estimates for adopted measures and packages of measures for each year between 1982 and the attainment date. Any reasonably available transportation measures that have been adopted between the submission of the 1979 revision and the preparation of the 1982 revision should be included in the 1982 submittal along with the associated emission reductions.

3. Commitments, schedules of key milestones, and, where appropriate, evidence of legal authority for implementation, operation, and enforcement of adopted reasonably available transportation measures. Costs and funding sources for planning, implementing, operating, and enforcing adopted measures must be determined for all measures. Tasks and responsibilities of state and local agencies and elected officials in carrying out required programming, implementation, operation, and enforcement activities associated with adopted transportation measures must be identified. The 1982 submittal must also include documentation that state and local governments are continuing to meet the schedules and commitments for the transportation measures included in the 1979 SIP.

4. Comprehensive public transportation measures to meet basic transportation needs. The measures must be accompanied by an identification and commitment to use, to the extent necessary, federal, state, and local funds to implement the necessary improvements. Commitments and schedules for the implementation of these measures must also be submitted.

5. A description of public participation and elected official consultation activities during development of the transportation measures.

6. A monitoring plan for periodically assessing success or failure of transportation measures or packages of measures in meeting emission reduction projections. The plan should contain methods for determining the reasons for success or failure.

7. Administrative and technical procedures and agency responsibilities for ensuring, in response to section 176(c) of the Clean Air Act, that transportation plans, programs, and projects approved by a metropolitan planning organization (MPO) are in conformance with the SIP.

8. A two-part contingency provision. the first part is applicable to only those areas with populations of 200,000 or more. These areas must submit as part of the SIP a list of planned transportation measures and projects that may adversely affect air quality and that will be delayed, while the SIP is being revised, if expected emission reductions or air quality improvements do not occur. The second part, which must be submitted by all areas preparing 1982 SIP revisions, consists of a description of the process that will be used to determine and implement additional transportation measures beneficial to air quality that will compensate for the unanticipated shortfalls in emission reductions. The contingency provision must be initiated when the EPA Administrator determines that a SIP is inadequate to attain NAAQSs and that additional emission reductions are needed.

The Administrator's February 24, 1978 memorandum, "Criteria for Approval of 1979 SIP Revisions," and the October 1978 SIP Transportation Checklist identified the elements necessary for the transportation portion of the 1979 SIP. The provisions listed above supplement the elements described in the earlier guidance.

The guidance for 1979 placed primary emphasis on the establishments of a continuing air quality-transportation planning process. This continuing planning process must be used in developing the transportation portion of the 1982 SIP revision. The process is described in the June 1978 EPA-Department of Transportation (DOT) Transportation-Air Quality Planning Guidelines and the May 1, 1980 EPA-DOT Expanded Guidelines for Public Participation. Where the process for an area has changed from that described in the 1979 submittal, an updated description, including key planning, programming, and funding decision points, should be submitted in 1982.

Solutions to carbon monoxide problems can be found through metropolitan-wide planning, as well as through analyses of relatively small ("hotspot") problem areas. Evidence of specific carbon monoxide problem areas is derived from modeling and monitoring information. Although the geographic area that is nonattainment for carbon monoxide may be small, the measures necessary to meet standards may have to be applied over a larger area. It is essential to guard against selecting measures that will solve the carbon monoxide problem in a small geographic area, but that will worsen the ozone problem or simply transfer the carbon monoxide problem to another area.

E. Reasonable Further Progress

The July 1982 submittal must demonstrate that reasonable further progress toward attainment of the ozone and carbon monoxide standards will continue to be made and reported throughout the period of nonattainment. The annual emission reductions must at least equal the emission reductions that would be achieved through a linear attainment program. As described in the criteria for approval of the 1979 SIP submittal, this program is represented graphically by a straight line drawn from the emissions inventory for the base year of the 1979 submittal to the allowable emissions on the attainment date. Compliance with the reasonable further progress requirement does not authorize delays in implementation or adoption of any measures. All controls must be implemented as expeditiously as practicable.

The demonstration of reasonable further progress must indicate the total amount of the annual reduction in emissions and must distinguish between those reductions projected to result from mobile source and stationary source measures. The projected reductions to be achieved from these source categories must be consistent with the emission reduction targest established through the consultation process involving state and local officials.

The criteria for approval of the 1979 submittal recognized that there would be a lag in the early years in achieving reasonable further progress because most measures would not achieve immediate reductions. By 1982, however, a significant number of the stationary source controls and transportation measures included in the 1979 submittal will be implemented, as will the vehicle emission I/M program. Emission reductions will also continue to result from the control systems required by the Federal Motor Vehicle Control Program for new vehicles. Accordingly, each plan must demonstrate for each year until attainment is achieved that the annual net emissions fall on or below the point representing that year on the straight line. No lag period will be allowed in 1982 and later years.

The criteria for approving the 1979 SIP submittals included a requirement for annual reporting of reasonable further progress. The information demonstrating reasonable further progress shall be submitted along with the source emissions and annual state action report required by July 1 of each year (40 CFR 51.321–51.328).

F. Additional Control Measures Required for Attainment

If the minimum control measures described in subsections B–D are not adequate to demonstrate attainment by 1987, the state must identify, evaluate, and adopt additional measures which can be implemented as quickly as possible, but no later than 1987. Examples of such measures include the following:

(1) Requiring control of all major stationary sources to levels more stringent than those generally regarded as RACT,

(2) Extending controls to stationary sources and source categories other than those subject to the minimum control measures described in subsection B,

(3) Implementing a broader range of transportation controls (e.g., extending the geographic coverage of some measures or providing more intensive implementation), and

(4) Increasing the coverage and stringency of the vehicle emission I/M program.

If implementation of all measures which can be implemented by 1987 will still not demonstrate attainment by 1987, the state should then analyze the transportation and other measures possible *in a longer time frame* that, together with the measures already evaluated, will result in attainment as quickly as possible after 1987. The specific date for attainment shall be included in the SIP. State and local governments must commit to implementation of such measures.

Given the additional time and potential resources available to areas with a post-1987 attainment date, more extensive evidence will be required to demonstrate that any of the measures identified in section 108(f) of the Clean Air Act is not reasonably available. Many transportation measures which cannot be implemented by 1987 can, because of the additional time and resources available, be implemented by a post-1987 attainment date. The 108(f) measures ultimately selected should, both individually and collectively, be at least as ambitious as applications of these measures in other comparable areas. EPA, in consultation with the DOT, will act as a clearinghouse in identifying ambitious performance levels for specific measures.

The 1982 SIP revision to achieve a post-1987 emission reduction target must include a convincing demonstration that the target cannot be achieved by 1987 and that the post-1987 date is the most expeditious date possible. The demonstration must identify the minimum times needed for planning, programming, and implementation of adopted transportation and stationary source control measures and must demonstrate that all possible measures will be implemented prior to 1987. In addition, the demonstration must show that projected resources from available sources (federal, state, and local) are insufficient for faster implementation of the measures.

EPA will use the technical evaluation prepared by a state to assess whether areas are making all efforts possible to attain the ozone and carbon monoxide standards by 1987. If an area is unable to attain the ozone and carbon monoxide NAAQSs by 1987, then the "most expeditious date beyond 1987" must be agreed to by state and local agencies. The transportation and stationary source control measures necessary for demonstrating attainment by the most expeditious date must be adopted as part of the 1982 SIP submitted to EPA.

EPA believes that an approach which requires a state to demonstrate attainment by a certain date using measures it is committed to implement is more in keeping with the spirit of the Clean Air Act than an approach which would accept "paper" demonstrations of attainment by 1987 which relied on measures which would be virtually impossible to implement. EPA will not approve a plan which relies on such unimplementable measures to demonstrate attainment, when it is clear that the state is not committed to implement and enforce those aspects of the plan.

EPA will review plans with post-1987 attainment dates in accordance with the requirements of the Clean Air Act. If EPA concludes that the current provisions of the Act do not allow approval of a SIP that provides for expeditious attainment of standards after 1987, EPA intends to seek legislative changes that will allow such an approval. The nature of any legislative change that the Agency may request will be based on a careful evaluation of the status of state efforts to develop plans which attain the standards on or before 1987. One option for legislative change that EPA will consider recommending would provide area-specific schedules and control requirements for each of the areas that cannot demonstrate attainment by 1987.

G. Conformity of Federal Actions

Section 176(c) of the Clean Air Act requires all federal projects, licenses, permits, financial assistance and other activities to conform to SIPs. Assurance of conformity is an affirmative responsibility of the head of each federal agency. In addition, section 316(b) requires that the direct and indirect emissions associated with any wastewater treatment facility funded under the Clean Water Act be accommodated in the SIP. In preparing the 1982 SIP revision, states and local governments should identify, to the extent possible, the direct and indirect emissions associated with major federal actions, including wastewater treatment facility grants, that will take place during the period covered by the SIP. Explicit identification of emissions will enable state and local governments to more quickly and easily evaluate subsequent federal conformity determinations. To assist in determining conformity, the population projections on which the 1982 SIP revision is based should be capable of being disaggregated at the time of project analysis so that the areas affected by individual federal actions not explicitly accounted for in the SIP can be identified.

II. SIP Development Process

The Clean Air Act, as amended in 1977, and subsequent regulations, policies and guidance from EPA have defined specific procedural requirements for developing SIP revisions for nonattainment areas. Appendix B includes a list of selected guidance documents that should be used in the preparation of the 1982 SIP. EPA regional offices will work with states and affected local governments during the preparation of the SIP to help ensure that procedural requirements are satisfied and that interim products and activities are completed on a schedule that will enable the July 1, 1982 submittal deadline to be met.

A. Consultation Among State and Local Officials

Section 121 of the Clean Air Act requires each state to provide a process for consultation with local governments, organizations of local elected officials, and federal land managers during certain actions under the Act, including preparation of SIP revisions for nonattainment areas. Section 174 of the Act requires a joint determination by state and local officials of the roles that various governmental agencies will take in the SIP development, implementation, and enforcement process. Section 174 also requires the governor of each state to designate the agency or agencies responsible for SIP development. The designation made by the governor for the 1979 SIP submittal remains in effect, unless the governor designates a new agency. The joint determination of responsibilities and any revised agency designations should be completed early in the process and must be submitted as a part of the 1982 SIP revision. Final regulations on section 174 and 121 (40 CFR Part 51, (Subpart M) were published on June 18, 1979 (44 FR 35176).

B. Establishment of Emission Reduction Targets

The control strategy for the 1982 SIP must reflect agreement among affected state and local officials on the emission reductions needed to attain NAAQSs. It is particularly important that the emission reduction targets established for stationary and mobile sources be determined through a process of negotiation among state and local officials of affected jurisdictions. In most cases, the initial emission reduction targets will be established soon after the technical evaluation of reasonably available stationary and mobile source control measures. Targets may have to be revised as additional information becomes available during SIP development. Revised targets should also be determined through consultation among state and local officials.

C. Analysis of Alternatives and Their Effects

In order for decision-makers and the public to have adequate information during development of SIPs requiring measures beyond the minimum described in subsections I.B.–I.D, alternative control strategies should be developed and analyzed. For example, where a vehicle I/M program and RACT applied to all major stationary sources will not be sufficient, in combination with reasonably available transportation measures, to attain standards, a range of more stringent stationary and mobile source controls should be evaluated to determine the best combination to achieve the required emission reductions. This evaluation should be used in determining the emission reduction targets described in the previous subsection. Examples of these more stringent controls are listed in subsection I.F.

The Clean Air Act requires that SIP submittals include an analysis of air quality, health, welfare, economic, energy, and social effects of the SIP and of the alternative measures considered during SIP development. EPA believes that, in assessing the effects of alternative control measures, two national concerns should receive special emphasis. These concerns are (1) conservation of petroleum and natural gas, and (2) protection of the economies of declining urban areas. Additional emphasis on the effects of SIPs on energy conservation and economies of distressed urban areas will implement the intent of Executive Order 12185, Conservation of Petroleum and Natural Gas (45 FR 8537, February 7, 1980), and the National Urban Policy.

III. Air Quality and Emission Data Bases

The requirements for the 1979 SIP submittal included use of the best data available at the time of SIP development. Although states generally complied with this provision, in many cases the available data base had many shortcomings. All states will have had adequate time by 1982 to have an updated data base.

States will need to have the data necessary for SIP development significantly before the July 1, 1982 submittal date. To ensure that this effort receives appropriate priority and attention, EPA expects states to complete data collection, analyses, and documentation by December 31, 1981. This requirement in no way relieves a state from any prior commitments to have such data available at an earlier date.

Emission inventories should, where possible, be prepared for a 1980 base year and projected to a date that will, at a minimum, include the anticipated year of attainment. Population projections and other forecasts used for determining growth rates and areawide emission estimates must be consistent with population projections developed in accordance with the EPA's cost-effectiveness guidelines for wastewater treatment facilities (40 CFR Part 35, Supart E, Appendix A).

The most recent three years of air quality data from the state and local air monitoring system network must be reduced, validated, and summarized in the plan submittal. Generally, this will include all data collected through the third quarter of 1981. All data from special studies implemented to support the modeling effort must also be compiled, reduced, and documented. If a state cannot reduce, evaluate, and validate data through the third quarter of 1981 in sufficient time to develop the SIP revision and still meet intergovernmental consultation, public participation, and other requirements, the state shall present the data in the SIP submittal and describe how the data may effect the plan.

A. Data for Ozone SIP Revisions

EPA previously described the minimum data that the Agency anticipated would be necessary to prepare an ozone modeling effort for four levels of analyses (44 FR 65667, November 14, 1979). It now appears, however, that many of the areas requiring the more sophisticated levels of modeling will not be able to complete the more extensive data base collection efforts required for these models in time to support the 1982 SIP submittal. Accordingly, every urban area must complete a data base sufficient to support at least a Level III (city-specific EKMA) modeling analysis. The elements of this data base are summarized in Appendix D.

EPA anticipates that states with especially severe ozone problems will need to apply a photochemical dispersion model or an equivalent technique in subsequent modeling analyses after 1982. Data collection efforts should be structured to provide for this contingency.

In order to ensure that all the data bases will be compatible and that there is a consistent level of documentation and quality assurance, state submittals of environmental data must be consistent in format and content with the EPA guideline document, *Emission Inventory Requirements for 1982 Ozone SIPs.*

B. Data for Carbon Monoxide SIP revisions

The emission inventory for carbon monoxide must be of sufficient accuracy and detail to provide the necessary input to models, and to determine the effectiveness of proposed control measures. The inventory should normally represent a typical weekday during the worst carbon monoxide season and should cover the entire urban area. More detailed inventories for smaller hotspot areas may be needed for analyzing specifically identified problems. In developing carbon monoxide emission inventories states may, if they desire, limit the identification of stationary sources to those with potential emissions of 1000 tons per year. The final acceptability of the inventory developed will be dependent on the modeling approach selected and will be judged on a case-by-case basis.

IV. Modeling

States will need to apply the best tools available in their 1982 SIP submittal. The air quality models that EPA considers acceptable are identified below.

A. Ozone Models

Photochemical dispersion models have the greatest potential for evaluating the effectiveness of ozone control strategies. This potential arises primarily from the ability to relate emissions directly to ambient ozone concentrations, taking into account atmospheric chemistry and dispersion. In most cases, however, data requirements associated with applying these models by 1982 are prohibitive. Of the generally available, less data intensive models, only the various applications of EKMA consider local meteorological influences and atmospheric chemistry in evaluating control requirements. The city-specific EKMA approach is the most promising for 1982 and EPA recommends its use. If the agency preparing the SIP already has the capability to apply a more sophisticated level of modeling and wants to do so, EPA encourages such applications. The use of a modeling approach other than city-specific EKMA must be approved by EPA prior to a commitment by the state to its use. EPA is currently finalizing the guideline on the use of city-specific EKMA; the guideline should be available by March 1981.

The inability of other simpler models to adequately consider chemical kinetics and meteorological parameters reduces their ability to represent local situations. Accordingly, EPA will not consider plans based on linear or proportional rollback to provide an adequate demonstration of attainment. EPA is publishing a proposal in today's Federal Register to modify 40 CFR 51.14 by deleting the provision allowing the use of rollback as an acceptable modeling technique. A state that used rollback in the SIP revision submittal in 1979 to demonstrate attainment by 1982 will not be required to revise the analysis on which its SIP is based, unless EPA determines the SIP to be deficient for attaining the ozone NAAQS. Upon such a determination, the state will be required to meet the provisions of this policy including adoption of the minimum control measures, as well as the modeling requirements.

B. Carbon Monoxide Models

States and urban areas must estimate the impact of local and regional control strategies on carbon monoxide nonattainment areas and demonstrate attainment of the carbon monoxide standard. The generally available carbon monoxide models are described in *Guideline on Air Quality Models,* April 1978, EPA 450/2-78-027. These guidelines, and any subsequent updates, should be followed in preparing a carbon monoxide attainment analysis. The acceptability of models other than those listed in the guideline will be evaluated on a case-by-case basis. Other models proposed for use must be adequately documented and validated.

Dated: January 13, 1981.

Douglas M. Costle,

Administrator.

Appendix A—Extension Areas

Table 1.—*Areas Requesting an Extension Beyond 1982 for Attaining the Ozone Standard*

EPA region	State	Metropolitan area
I	Connecticut	Statewide.
	Massachusetts	Statewide.
	Rhode Island	Statewide.
II	New Jersey	Statewide.
	New York	New York City.
III	Delaware	Wilmington.
	District of Columbia	Washington.
	Maryland	Baltimore, Washington.
	Pennsylvania	Allentown, Philadelphia, Pittsburgh, Scranton/Wilkes-Barre.
	Virginia	Richmond, Washington.
IV	Kentucky	Cincinnati, Louisville.
	Tennessee	Nashville.
V	Illinois	Chicago, St. Louis.
	Indiana	Chicago, Louisville.
	Michigan	Detroit.
	Ohio	Cincinnati, Cleveland.
	Wisconsin	Milwaukee.
VI	Texas	Houston.
VII	Missouri	St. Louis.
VIII	Colorado	Denver.
	Utah	Salt Lake City.
IX	California	Fresno,[1] Sacramento, San Diego, San Francisco Bay Area Basin, South Coast Basin, Ventura-Oxnard.[2]
X	Oregon	Portland.
	Washington	Portland, Seattle.

[1] San Joaquin Valley Nonattainment Area.

[2] South Central Coast Nonattainment Area.

Table 2.—*Areas Requesting an Extension Beyond 1982 for Attaining the Carbon Monoxide Standard*

EPA region	State	Metropolitan area
I	Connecticut	Bridgeport, Hartford, New Haven.
	Massachusetts	Boston, Springfield, Worcester.
	New Hampshire	Manchester, Nashua.
II	New Jersey	Atlantic City, Burlington, Camden, Elizabeth, Freehold, Hackensack, Jersey City, Morristown, Newark, Paterson, Penns Grove, Perth Amboy, Somerville, Toms River, Trenton.
	New York	New York City.
III	District of Columbia	Washington.
	Maryland	Baltimore, Washington.
	Pennsylvania	Pittsburgh, Philadelphia.
IV	Georgia	Atlanta.
	Kentucky	Louisville.
	North Carolina	Charlotte.
	Tennessee	Nashville, Memphis.
V	Illinois	Chicago.
	Ohio	Cincinnati, Cleveland.
	Michigan	Detroit.
	Wisconsin	Milwaukee.
VI	New Mexico	Albuquerque.
VII	Missouri	St. Louis.
VIII	Colorado	Denver, Colorado Springs, Fort Collins, Greely.
	Utah	Salt Lake City.
IX	Arizona	Phoenix.
	California	Fresno, Lake Tahoe, Sacramento, San Diego, San Francisco Bay Area Basin, South Coast Basin.
	Nevada	Las Vegas.
X	Oregon	Eugene, Medford, Portland.
	Washington	Seattle, Tacoma.
	Idaho	Boise.

Appendix B—Selected EPA Guidance for SIP Development

The following list identifies selected EPA guidance for SIP development. A compilation of major EPA guidance for SIP development is included in the "Air Programs Policy and Guidance Notebook," which is distributed to state and local agencies. Copies of the notebook are available for copying at the EPA Public Information Reference Unit in Washington, D.C. and at each EPA regional office.

1. Criteria for Approval of 1979 SIP Revisions, memorandum from Douglas M. Costle, Administrator of EPA to Regional Administrators, Regions I–X, February 24, 1978 (43 FR 21673).
2. Memorandum of Understanding Between DOT and EPA Regarding the Integration of Transportation and Air Quality Planning, June 1978.
3. EPA–DOT Transportation-Air Quality Planning Guidelines, June 1978.
4. Inspection/Maintenance Policy, memorandum from David G. Hawkins to Regional Administrators, Regions I–X, July 17, 1978.
5. Determination of Emission Reduction Responsibilities, memorandum from David G. Hawkins to Regional Administrators, August 1, 1978.

6. General Preamble for Proposed lemaking. April 4, 1979 (44 FR 20372). The neral Preamble was amended on the llowing dates: April 30, 1979 (44 FR 25243); ly 2, 1979 (44 FR 38583); August 28, 1979 (44 50371); September 17, 1979 (44 FR 53161); d November 23, 1979 (44 FR 67182).

7. 40 CFR Part 51, Subpart M—tergovernmental Consultation, June 18, 1979 FR 35176)

8. EPA-DOT Expanded Public rticipation Guidelines, May 1, 1980 (45 FR 032).

9. DOT-EPA Procedures for Conformance Transportation Plans, Programs and ojects with Clean Air Act State plementation Plans, June 12, 1980.

10. Policy and Procedures to Implement ction 316 of the Clean Air Act, as mended, memorandum from Douglas M. stle to Regional Administrators, Regions X, July 23, 1980, (45 FR 53382).

ppendix C—Description of Terms Used in e Transportation-Air Quality SIP evelopment Process

dopted Measures

A transportation measure, program, or olicy that state and local planning and plementing agencies and governments ave agreed to include in the official SIP bmission.

lanning Process

The process defined in the September 17, 975 Federal Highway Administration FHWA)-Urban Mass Transportation dministration (UMTA) regulations, the June 978 EPA-DOT Transportation-Air Quality lanning Guidelines, and the May 1, 1980 PA-DOT Expanded Public Participation uidelines. Through this process ransportation measures are introduced, valuated, placed in the Transportation ystems Management (TSM) or long range lement of the urban transportation plan, and dvanced to the Transportation Improvement rogram (TIP) and the annual element of the TIP.

rogramming Process

The process by which transportation measures are advanced from the annual element of the TIP to the capital programs and budgets of implementing agencies and then to funding by state and local governments, FHWA (through the statewide 105 program), or UMTA (through the section 3 and 5 programs).

Expeditious Attainment Date

The attainment date approved in the 1979 SIP submission. This date may be modified if the analysis of alternatives done as part of the development of the 1982 SIP submittal shows that an earlier date is possible through expeditious implementation of all reasonably available control measures or that a later date is necessary because the approved attainment date cannot be achieved.

Reasonably Available Transportation Measures

A measure that has been determined to be beneficial to air quality and which will not result in substantial and long-term adverse impacts. These measures need to be adopted by the affected state and local officials participating in the planning and programming processes. The process of determining reasonably available transportation measures is analytical, participatory, and negotiatory, and involves the public, as well as local, state, and federal agencies and officials. The analytic part of the process includes determinations of technical and economic feasibility.

Expeditious Implementation of Reasonably Available Transportation Measures

Implementation by the earliest possible date considering:

1. The minimum time required to advance the measure through planning and programming processes.
2. The minimum time required to obtain implementation commitments.
3. The minimum time required to construct (if needed) and begin operation of the measures.

Implementation Commitments

Certification (may be by reference to budgets or other legally adopted documents) by federal, state, and local agencies with the authority to implement SIP measures that (1) funds to implement the measure are obligated and (2) all necessary approvals have been obtained. Identification by the implementing agency of the scheduled dates for start of construction (if appropriate) and for start of operation.

If a project has not reached the stage of receiving budget approval, then the implementation commitment should be in the form of a schedule that lists the projected dates for completing the major steps required to advance the measure through the remaining planning and programming processes. The schedule should also contain an identification of the responsible agencies that must take significant actions to implement the measure.

Actions by many agencies and elected officials are usually required before a transportation project is implemented. The SIP should list the important actions, the agencies or officials required to take each action, and a schedule that will lead to implementation.

The lead planning agency is usually charged with obtaining the various commitments. This requires:

1. Identifying all remaining actions and the agency or official responsible for each action.
2. Consulting with each agency or official to establish the date by when the action will be taken.

The product of these efforts should be submitted in the SIP in a form similar to the following example.

Example

The MPO for an urban area has adopted for inclusion in the SIP a busway that will connect a suburban residential area with the central business district. Operation of the busway will require the purchase of 25 new buses. Corridor location studies have been completed and final design is underway. The provision in the 1982 SIP submittal should include an approximate schedule similar to that outlined below for completion of the project:

1. MPO places project in annual element of the SIP; each funding agency prepares budget requests for necessary funds—Complete.
2. Transit operating agency adopts project as part of capital program—Complete.
3. Transit operating agency or appropriate project sponsor solicits approval of local government share of project costs from the city and county councils—Fall 1982.
4. Transit operating agency submits project application to state department of transportation—Winter 1982.
5. State department of transportation requests state legislature to appropriate state share of matching funds—Spring 1983.
6. Transit operating agency submits a grant application to UMTA (submittal occurs if the funding match has been approved; if the project is delayed at this point, contingency provisions will be adopted)—Summer 1983.

(Checkpoint: project receives approval from UMTA)—Spring 1984.

7. Transit operating agency places order for new buses—Spring 1984.
8. State department of transportation starts construction contract for busway—Winter 1985.
9. Agreement with state and local enforcement authorities is signed—Spring 1986.

(Checkpoint: Buses delivered and construction completed)—Summer 1986.

10. Transit operating agency initiates operation—Summer 1986.

Justification for not Adopting a Section 108(f) Measure

Justification should include:

1. Documentation of air quality, health, welfare, economic, energy, social and mobility effects of the measure, as appropriate for the type of measure and the scale of application.
2. Documentation that the measure was considered in a process that involved the public and state and local officials.
3. Determination that implementation of the measure results in substantial and long-term adverse impacts.
4. Demonstration that the air quality standards can be expeditiously attained without the measure.

Monitoring Plan

The monitoring plan to be contained in the 1982 SIP should be designed for periodically assessing the extent to which transportation measures, either individually or packaged, are resulting in projected emission reductions and the reasons for any shortfalls in reductions. The monitoring plan need *not* cover air quality monitoring. The plan should contain methods for determining the reasons for success or failure of the emission reduction achievements of the transportation measures contained in the 1982 SIP. The monitoring plan should depend upon existing data, regularly collected data, surrogate emission indicators (such as the number of auto trips, trip speeds, etc.) and approximation techniques. Collection of new data should be minimized.

Contingency Plan

The contingency provision is needed in the event that EPA calls for a SIP revision based on its determination that the reasonable further progress schedule is not being met. The contingency provision contains two parts. The first part is only for areas over 200,000 population. For these areas, the contingency provision should include a locally developed list of projects which implementing agencies have agreed can be delayed during an interim period while the SIP is being revised. The second part of the contingency provision is a description of a process for determining additional transportation measures beneficial to air quality that can be implemented to compensate for unanticipated shortfalls in emission reductions or can be accelerated to replace adopted measures that are not proceeding on schedule. This second part of the contingency provision should be included in every 1982 SIP submittal.

Appendix D—Summary of Minimum Level III Data Requirements for 1982 Ozone Modeling Submittals

A. Emission Data Requirements

1. *Spatial Resolution.* County-wide emission inventories for VOCs and nitrogen oxides (NO_x) are needed for a Level III analysis.

2. *Temporal Resolution.* Typical summer weekday emission estimates are required as part of the Level III data submittal. Preparation of these estimates is described in the guideline, *Emission Inventory Requirements for the 1982 Ozone SIPs.*

3. *VOC Categories.* Classification into reactive species of VOCs is not required for a Level III analysis.

4. *Source Category Delineation.* It is necessary to separate the emissions estimates according to major source categories such as is described in the guideline, *Emission Inventory Requirements for the 1982 Ozone SIPs.* This disaggregation of estimates is useful for making projections of future aggregated emissions.

B. Air Quality Data Requirements

1. *Ozone Monitors* (3 sites). Ozone monitors should be located at (a) one upwind site, (b) one downwind site at the edge of the urbanized area, and (c) one downwind site approximately 15–40 kilometers from the urbanized area.

2. *THC/CH_4 NO_x Monitors* (1 site required, 2 sites desirable). Guidance presented in EPA-450/4-80-011, *Guidance for the Collection of Ambient NMOC Data for Use in 1982 Ozone SIP Development, and Network Design and Siting Criteria for the NMOC and NO_x Monitors,* should be followed.

3. *Upwind Precursor Data.* Optional air quality data for Level III are measurements of ambient NO_x and THC/CH_4 at one site upwind of an urbanized area. These data are generally unnecessary and are needed only for unusual cases when it is desirable to take explicit account of transported precursors in the analysis. Most studies have indicated that transported ozone is of greater significance than transported precursors in contributing to urban problems. Because of the lack of precision associated with nonmethane hydrocarbon (NMHC) estimates from continuous THC/CH_4 monitors at low concentrations, use of these instruments at upwind sites is not recommended. It is preferable to collect a limited number of grab samples, analyze these chromatographically, and sum species to estimate upwind NMHC. Guidance presented in EPA-450/4-80-008, *Guidance for the Collection and Use of Ambient Hydrocarbon Species Data in the Development of Ozone Control Strategies,* should be followed. Continuous measurement of NO/NO_x is appropriate.

C. Meteorological Data Requirements

1. *Upper Air and Surface Temperature Data.* Estimates of the morning (8:00 a.m.) and maximum afternoon mixing heights are required. Preferably, estimates should be obtained using the nearest National Weather Service radiosonde data (if available) in conjunction with hourly urban surface temperature data. If radiosonde data are not available, morning and afternoon mixing heights can be estimated using AP-101, "Mixing Heights, Wind Speeds and Potential for Urban Air Pollution Throughout the Contiguous United States."

2. *Surface Wind Data.* Surface wind data at two sites (one site located in an area of high precursor emissions and another outside the urban core) are required. The wind data are used to help ensure that the recorded design value is measured downwind of the city.

Appendix E—Regional Office Locations of Comments and Responses on the Proposed 1982 SIP Policy

The locations and times for review of the comments on the proposed 1982 SIP policy and EPA responses may be determined by contacting the following:

Harley F. Laing, Chief, Air Programs Branch, EPA—Region I, John F. Kennedy Federal Building, Boston, MA 02203, 617-223-6883
Bill Baker, Chief, Air Programs Branch, EPA—Region II, 26 Federal Plaza, New York, NY 10007, 212-264-2517
Raymond Cunningham, Chief, Air Programs Branch, EPA—Region III, Curtis Building, 6th & Walnut Streets, Philadelphia, PA 19106, 215-597-8175
Winston Smith, Chief, Air Programs Branch, EPA—Region IV, 345 Courtland Street, N.E., Atlanta, GA 30308, 404-881-3043
Steve Rothblatt, Chief, Air Programs Branch, EPA—Region V, 230 South Dearborn Street, Chicago, IL 60604, 312-353-6030
Jack Divita, Chief, Air Programs Branch, EPA—Region VI, First International Building, 1201 Elm Street, Dallas, TX 75270, 214-767-2742
Art Spratlin, Chief, Air Programs Branch, EPA—Region VII, 324 East Eleventh Street, Kansas City, MO 64106, 816-374-3791
Robert DeSpain, Chief, Air Programs Branch, EPA—Region VIII, 1860 Lincoln Street, Denver, CO 80295, 303-837-3471
David Howekamp, Chief, Air Programs Branch, EPA—Region IX, 215 Fremont Street, San Francisco, CA 94105, 415-556-4708
Richard Thiel, Chief, Air Programs Branch, EPA—Region X, 1200 6th Avenue, Seattle, WA 98101, 206-442-1230

[FR Doc. 81-2221 Filed 1-21-81; 8:45 am]
BILLING CODE 6560-26-M

Memorandum,
"Criteria for Approval of 1979 SIP Revisions"

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND WASTE MANAGEMENT

FEB 24 1978

SUBJECT: Criteria for Approval of 1979 SIP Revisions

FROM: The Administrator (A-100)

TO: Regional Administrators, I-X

The attachment to this memo summarizes the elements which a 1979 State Implementation Plan (SIP) revision for a non-attainment area must contain in order to be approved by EPA as meeting the requirements of Part D of the Clean Air Act.

In summary, the Act requires the demonstration of attainment of the air quality standards (primary and secondary) as expeditiously as practicable, but in the case of national primary standards not later than December 31, 1982. However, for carbon monoxide (CO) and oxidants (Ox), if the State can demonstrate attainment is not possible by 1982 despite the implementation of all reasonable stationary source and transportation control measures, the Act provides for up to a five-year extension. In those cases the plan revisions must demonstrate attainment as expeditiously as practicable but no later than December 31, 1987. The extension is not automatic; a demonstration of need must be made and the State must fulfill the other statutory requirements.

It is the intent of the Agency to establish reasonable and achievable goals for SIP submissions and to take a firm posture on the imposition of sanctions where the reasonable goals are not achieved. Accordingly, while the policy requires a commitment to many specific strategies in the 1979 submissions (e.g., RACT on stationary sources, inspection/maintenance programs where attainment for carbon monoxide or oxidants extends beyond 1982, other reasonable transportation control measures, etc.) the memo also requires (for carbon monoxide and oxidants) a commitment to a continuing process. This process must be one which extensively involves the public as well as State and local elected officials and which ambitiously pursues a wide range of alternatives.

Since reliance on stationary controls and Federal new car standards alone will not enable most areas with oxidant and carbon monoxide problems to attain these standards by 1982, each Regional Office will need to put particular emphasis on additional measures to reduce transportation system emissions. The process committed to in the 1979 plan submission must lead to the expeditious selection and implementation of comprehensive transportation control measures. In judging the adequacy of the 1979 plan submission for the transportation sector, each Regional Administrator should ensure that ambitious alternatives (as described in the draft "Transportation Planning Guidelines" which have been circulated) will be analyzed.

The Department of Transportation (DOT), Housing and Urban Development (HUD) and EPA are seeking to integrate the transportation/air quality planning and implementation required by the Clean Air Act into existing planning and programming procedures. The air planning activities should be included in the Unified Work Program required by DOT and the adopted transportation measures should be included in the Transportation Improvement Program required by DOT. In complying with the Clean Air Act requirements, the Regions should also keep in mind the requirements of the HUD-EPA Agreement which provides for coordination of air quality planning and planning assisted under the HUD Comprehensive Planning Assistance (701) Program. Integration of air and transportation planning with comprehensive planning which incorporates growth management concerns should improve the effectiveness of air quality planning and could reduce the need for enforcement measures in the future.

States will be provided some discretion regarding the amount of emissions growth to be accommodated within the SIP. EPA generally will not question the growth rates desired by the State so long as reasonable further progress is demonstrated and there is a demonstration of attainment by the statutory deadline (1982 or 1987). However, the growth rate identified in the SIP must be consistent with growth rates used (or implied by) other planning programs in the area (e.g., FWPCA §208, 201, HUD §701, FHWA §134).

You should note that there are other SIP revisions which are not discussed in the attachment but which are required by the 1977 Amendments. These include:

1. Section 128 (relating to State boards)
2. Section 126 (relating to interstate pollution)
3. Section 127 (relating to public notification)
4. Part C (relating to prevention of significant deterioration)
5. Section 110(a)(2)(K) (relating to permit fees)
6. Section 123-(relating to stack heights for existing source in other than non-attainment areas)
7. Section 121 (relating to consultation)

Although incorporation of these provisions is required by the law, failure to achieve final approval by July 1, 1979 does not trigger the new source prohibition of Section 110(a)(2)(I).

It is important to emphasize to the States that all current SIP requirements remain in effect despite the development of the 1979 revisions. Any suspension or discontinuance of an existing SIP provision must be submitted for EPA approval. This should be done as part of the revision submitted in January 1979. Exceptions to this procedure may be found in certain new provisions of §110 relating to reduction of on-street parking, bridge tolls, and other measures.

The development of the January 1979 SIPs to meet the minimum requirements of the Clean Air Act Amendments of 1977 is a complex and demanding program. It will require the commitment of significant resources on the part of the air programs staff of the Regional Office to ensure that the States develop and submit a comprehensive and approvable plan. We are working with your staff to develop the necessary guidance and follow-up programs which will assist your office and the State to carry out this very difficult but important part of the overall air program.

Attachment

cc: Air & Hazardous Division Directors
Air Branch Chiefs

Criteria for Approval of 1979 State Implementation Plan Revisions for Non-Attainment Areas

Purpose

The purpose of this document is to define the criteria by which State Implementation Plan (SIP) revisions for non-attainment areas required by the Clean Air Act Amendments of 1977 (the Act) will be approved. These revisions are to be submitted to EPA by January 1, 1979.

Categories of SIP Revisions

SIP revisions submitted by January 1, 1979 can be divided into two categories:

1. Those which provide for attainment of the Primary Ambient Air Quality Standards (primary standards) for all criteria pollutants on or before December 31, 1982.

2. Those which provide for attainment of the primary standards for sulfur dioxide, nitrogen oxides, and particulate matter on or before December 31, 1982 but show that despite the implementation of all reasonable transportation and stationary source emission control measures attainment of the primary standards for carbon monoxide and/or oxidants cannot be achieved until after this date. In these cases, the revisions must demonstrate attainment as expeditiously as practicable but no later than December 31, 1987.

In order for an adequate SIP revision to fall into the second category, the State has an affirmative responsibility to demonstrate to the satisfaction of EPA that attainment of the primary carbon monoxide and/or oxidants standards is not possible in an area prior to December 31, 1982.

It should be noted that SIP revisions of either category should also provide for attainment of Secondary Ambient Air Quality Standards (secondary standards) as expeditiously as practicable although there is no specific deadline contained in the Act.

General Requirements of All 1979 SIP Revisions

Each 1979 SIP revision must contain the following:

1. A definition of the geographic areas for which control strategies have been or will be developed. Consideration should be given to the practical benefits of defining areas which correspond whenever possible to those substate districts established pursuant to Part IV, Attachment A of OMB Circular No. A-95.

2. An accurate, comprehensive, and current (1977 calendar year) inventory of existing emissions.

3. A determination of the level of control needed to demonstrate attainment by 1982 (including growth). This demonstration should be made by the application of modeling techniques as set forth in EPA's Guideline on Air Quality Models. For oxidants, any legitimate modeling technique (e.g., those referenced in "Use, Limitation and Technical Basis of Procedures for Quantifying Relationships Between Photochemical Oxidants and Precursors." EPA 450/2-77-021a. November 1977) can be used. Consideration of background and transport for oxidants should generally be in accordance with the procedures documented in "Procedures for Quantifying Relationships Between Photochemical Oxidants and Precursors." In developing photochemical oxidant control strategies for a particular area, states may assume at a minimum that the standard will be attained in adjacent states.

If a state can demonstrate that the level of control necessary for attainment of the primary standards for carbon monoxide and/or oxidant is not possible by 1982 despite the application of all reasonable measures, an extension past 1982 (but not beyond 1987) is authorized.

4. Adoption in legally enforceable form[1] of all measures necessary to provide for attainment by the prescribed date or, where adoption of all such measures by 1979 is not possible, (e.g., certain transportation control measures, and certain measures to control the oxides of nitrogen and total suspended particulate) a schedule for expeditious development, adoption, submittal, and implementation of these measures. The situations in which adoption of measures may be scheduled after 1979 are discussed in the pollutant specific sections of this document. Each schedule must provide for implementation of all reasonably available control measures as expeditiously as practicable. During the period prior to attainment, these measures must be implemented rapidly enough to provide at a minimum for reasonable further progress (see discussion

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[1] Written evidence that the State, the general purpose local government or governments, or a regional agency designated by general purpose local governments for such purpose, have adopted by statute, regulation, ordinance or other legally enforceable document, the necessary requirements and schedules and timetables for compliance, and are committed to implement and enforce the appropriate elements of the plan. The relevant organizations shall provide evidence that the legally enforceable attainment measures and the "criteria, standards and implementing procedures necessary for effectively guiding and controlling major decisions as to where growth shall and shall not take place," prepared by State and local governments in compliance with Section 701 of the Housing Act of 1954, as amended, are fully coordinated in the attainment and maintenance of the NAAQS.

below). Each schedule will be considered part of the applicable implementation plan and thus will represent a commitment on the part of the State to meet the key milestones set forth in the submitted schedule.

5. Emission reduction estimates for each adopted or scheduled control measure or for related groups of control measures where estimates for individual measures are impractical. It is recognized that reduction estimates may change as measures are more fully analyzed and implemented. As such estimates change, appropriate responses will be required to insure that the plan remains adequate to provide for attainment and for reasonable further progress.

6. Provision for reasonable further progress toward attainment of the primary and secondary standards in the period prior to the prescribed date for attainment. Reasonable further progress is defined as annual incremental reductions in total emissions (emissions from new as well as existing sources) to provide for attainment by the prescribed date. The plan shall provide for substantial reductions in the early years with regular reductions thereafter.

Reasonable further progress will be determined for each area by dividing the total emission reductions required to attain the applicable standard by the number of years between 1979 and the date projected for attainment (not later than 1987). This is represented graphically by a straight line drawn from the emissions inventory submitted in 1979 to the allowable emissions on the attainment date. However, EPA recognizes that some measures cannot result in immediate emission reduction. Therefore, if a State can show that some lag in emissions reduction is necessary, a SIP will be acceptable even though reductions sufficient to produce decreases at the "straight-line rate" are not achieved for a year or two after 1979. This lag in achieving the "straight-line rate" for emissions reduction is to be accepted only to accommodate the time required for compliance with the first set of regulations adopted on or before January 1, 1979, if immediate compliance is not possible. It does not authorize delays in adoption of control requirements.

The requirement to demonstrate reasonable further progress will, in most areas designated non-attainment for oxidant or carbon monoxide, necessitate a continuous, phased implementation of transportation control measures. In areas where attainment of all primary ambient standards by 1982 is not possible EPA will not accept mere reliance on the Federal Motor Vehicle Control Program by itself as a demonstration of reasonable further progress.

In determining "reasonable further progress", those emission reductions obtained from compliance between August 7, 1977, and December 31, 1979, with (1) SIP revisions that have been submitted after August 7, 1977, and (2) regulations which were approved by the Agency prior to the enactment of the 1977 Clean Air Amendments, can be treated as having been achieved during 1979. There should be an assurance, however, that these are real emission reductions and not just "paper" ones.

7. An identification and quantification of an emissions growth increment which will be allowed to result from the construction and operation of major new or modified stationary sources within the area for which the plan has been developed. Alternatively, an emissions offset regulation can be adopted to provide for major new source growth.

The growth rates established by states for mobile sources and new minor stationary sources should also be specified, and in combination with the growth associated with major new or modified stationary sources will be accepted so long as they do not jeopardize the reasonable further progress test and attainment by the prescribed date. However, the growth rate identified in the SIP must be consistent with the growth rates used (or implied by) the other planning programs in the area (e.g., FWPCA Section 208 [201], HUD Section 701, FHWA Section 134). A system for monitoring the emission growth rates from major and minor new stationary sources and from transportation sources and assuring that they do not exceed the specified amounts must also be provided for in the revision.

8. Provision for annual reporting on the progress toward meeting the schedules summarized in (4) above as well as growth of mobile sources, minor new stationary sources, major new or modified stationary sources, and reduction in emissions from existing sources to provide for reasonable further progress as in (6) above. This should include an updated emission inventory.

9. A requirement that permits be issued for the construction and operation of new or modified major sources in accordance with Section 173 and 110(a)(2)(D).

10. An identification of and commitment to the financial and manpower resources necessary to carry out the plan. The commitment should be made at the highest executive level having responsiblity for SIP or that portion of it and having authority to hire new employees. This commitment should include written evidence that the State, the general purpose local government or governments, and all state, local or regional agencies have included appropriate provision in their respective budgets and intend to continue to do so in future years for which budgets have not yet been finalized, to the extent necessary.

11. Evidence of public, local government, and state legislative involvement and consultation. It shall also include an identification and brief analysis of the air quality, health, welfare, economic, energy, and social effects of the plan revisions and of the alternatives considered by the State, and a summary of the public comment on such analysis.

12. Evidence that the SIP was adopted by the state after reasonable notice and public hearing.

Additional Requirements for Carbon Monoxide and Oxidant SIP Revisions which Provide for Attainment of the Primary Standards Later than 1982

For those SIP revisions which demonstrate that attainment of the primary standards for carbon monoxide and/or oxidants is not possible in an area prior to December 31, 1982 despite the implementation of all reasonable emission control measures the following items must be included in the January 1, 1979 submission in addition to all the general requirements listed above:

1. A program which requires prior to issuance of any permit for construction or modification of a major emitting facility an analysis of alternative sites, sizes, production processes, and environmental control techniques for such proposed source which demonstrates that benefits of the proposed source significantly outweigh the environmental and social cost imposed as a result of its location, construction, or modification.

2. An inspection/maintenance program or a schedule endorsed by and committed to by the Governor for the development, adoption, and implementation of such a program as expeditiously as practicable. Where the necessary legal authority does not currently exist, it must be obtained by June 30, 1979. Limited exceptions to the requirement to obtain legal authority by June 30, 1979 may be possible if the state can demonstrate that (a) there was insufficient opportunity to conduct necessary technical analyses and/or (b) the legislature has had no opportunity to consider any necessary enabling legislation for inspection/maintenance between enactment of the 1977 Amendements to the Act and June 30, 1979. In addition, where a legislature has adequate opportunity to adopt enabling legislation before January 1, 1979, the Regional Administrator should require submission of such legal authority by January 1, 1979. In no case can the schedule submitted provide for obtaining legal authority later than July 1, 1980.

Actual implementation of the inspection/maintenance program must proceed as expeditiously as practicable. EPA considers two and one half years from the time of legislative adoption to be the maximum time required to implement a centralized inspection/maintenance program and one and one half years to implement a decentralized program. In no case may implementation of the program, i.e., mandatory inspection and mandatory repair of failed vehicles be delayed beyond 1982 in the case of a centralized program (either state lanes or contractor lanes) or beyond 1981 in the case of a decentralized (private garage) system.

3. A commitment by the responsible government official or officials to establish, expand, or improve public transportation measures to meet basic transportation needs as expeditiously as is practicable.

4. A commitment to use insofar as is necessary Federal grants, state or local funds, or any combination of such grants and funds as may be consistent with the terms of the legislation providing such grants and funds, for the purpose of establishing, expanding or improving public transportation measures to meet basic transportation needs.

Note that HUD has prepared guidelines for local development codes and ordinances to provide special requirements for areas which for significant periods of time may exceed the primary standards. These guidelines specify criteria for new construction operation of buildings which minimize pollutant concentrations to ensure a healthy indoor and outdoor environment. States are encouraged to adopt such measures as part of the SIP.

Pollutant Specific Requirements

Sulfur Dioxide

Specifically, with regard to item (4) of the General Requirements, the January 1979 plan revisions dealing with sulfur dioxide must contain all the necessary emission limitations and legally enforceable procedures to provide for attainment by no later than December 31, 1982 (i.e., schedules for the development, adoption, and submittal of regulations will not be acceptable).

Nitrogen Oxides

For NO_x, the January 1979 plan must contain all the necessary emission limitations and the legally enforceable procedures, or as a minimum, the appropriate schedules to adopt and submit the emission limitations and legally enforceable procedures which provide for implementation so that standards will be attained by no later than December 31, 1982. EPA is currently evaluating the need for a short term NO_2 standard and expects to promulgate such a standard during 1978. If such a standard for air quality is promulgated, a new and separate SIP revision will be required for this pollutant.

Particulate Matter

The January 1979 plan revisions dealing with particulate matter must contain all the necessary emission limitations and legally enforceable procedures for traditional sources. These emission limitations and enforceable procedures must provide for the control of fugitive emissions, where necessary, as well as stack emissions from these stationary sources. Where control of non-traditional sources (e.g., urban fugitive dust, resuspension, construction, etc.) is necessary for attainment, the plan shall contain an assessment of the impact of these sources and a commitment on the part of the state to adopt appropriate control measures. This commitment shall take the form of a schedule to develop, submit, and implement the legally enforceable procedures, and programs for controlling non-traditional particulate matter sources. These schedules must include milestones for evaluating progress and provide for attainment of the primary standards by no later than December 31, 1982, and attainment of the secondary standards as expeditiously as practicable. States should initiate the necessary studies and demonstration projects for controlling the non-traditional sources as soon as possible.

Carbon Monoxide and Oxidant

An adequate SIP for oxidant is one which provides for sufficient control of volatile organic compounds (VOC) from stationary and mobile sources to provide for attainment of the oxidant standard. Accordingly, the 1979 plan revision must set forth the necessary emission limitations and schedules to obtain sufficient control of VOC emissions in all non-attainment areas. They must be directed toward reducing the peak concentrations within the major urbanized areas to demonstrate attainment as expeditiously as practicable but in no case later than December 31, 1987. This should also solve the rural oxidant problem by minimizing VOC emissions and more importantly oxidants that may be transported from urban to rural areas. The 1979 submission must represent a comprehensive strategy or plan for each non-attainment area; plan submissions that address only selected portions of non-attainment are not adequate.

For the purpose of oxidant plan development, major urban areas are those with an urbanized population of 200,000 or greater (U.S. Bureau of Census, 1970). A certain degree of flexibility will be allowed in defining the specific boundaries of the urban area. However, the areas must be large enough to cover the entire urbanized[2] area and adjacent fringe areas of development. For non-attainment urban areas, the highest pollutant concentration for the entire area must be used in determining the necessary level of control. Additionally, uniform modeling techniques must be used throughout the non-attainment urban area. These requirements apply to interstate as well as intrastate areas.

Adequate plans must provide for the adoption of reasonably available control measures for stationary and mobile sources.

For stationary sources, the 1979 oxidant plan submissions for major urban areas must include, as a minimum, legally enforceable regulations to reflect the application of reasonably available control technology (RACT)[3] to those stationary sources for which EPA has published a Control Techniques Guideline (CTG) by January 1978, and provide for the adoption and submittal of additional legally enforceable RACT regulations on an annual basis beginning in January 1980, for those CTGs that have been published by January of the preceeding year.

For rural non-attainment areas, the Ox plan must provide the necessary legally enforceable procedures for the control of large HC sources (more than 100 ton/year potential emissions) for which EPA has issued a CTG by January 1978, and to adopt and submit additional legally enforceable procedures on an annual basis beginning in January 1980, after publication of subsequent CTGs as set forth above.

For mobile sources in urbanized area (population 200,000) SIPs must provide for expeditious implementation of reasonably available control measures. Each of the measures for which EPA will publish information documents during 1978 is a reasonably available control measure. These measures are listed on the following page:

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[2] As defined by the U.S. Bureau of Census, urbanized area generally include core cities plus any closely settled suburban areas.

[3] While it is recognized that RACT will be determined on a case-by-case basis, the criteria for SIP approval rely heavily upon the information contained in the CTG. Deviations from the use of the CTG must be adequately documented.

1. To be published by February 1978
    a. inspection/maintenance
    b. vapor recovery
    c. improved public transit
    d. exclusive bus and carpool lanes
    e. area wide carpool programs

2. To be published by August 1978
    a. private car restrictions
    b. long range transit improvements
    c. on street parking controls
    d. park and ride and fringe parking lots
    e. pedestrian malls
    f. employer programs to encourage car and van pooling, mass transit, bicycling and walking
    g. bicycle lanes and storage facilities
    h. staggered work hours
    i. road pricing to discourage single occupancy auto trips
    j. controls on extended vehicle idling
    k. traffic flow improvements
    l. alternative fuels or engines and other fleet vehicle controls
    m. other than light duty vehicle retrofit
    n. extreme cold start emission reduction programs

The above measures (either individually or combined into packages of measures) should be analyzed promptly and thoroughly and scheduled for expeditious implementation. EPA recognizes that not all analyses of every measure can be completed by January 1979 and, where necessary, schedules may provide for the completion of analyses after January 1, 1979 as discussed below. (If analysis after January 1979 demonstrates that certain measures would be unnecessary or ineffective, a decision not to implement such measures may be justifiable. However, decisions not to implement measures will have to be carefully reviewed to avoid broad rejections of measures based on conclusory assertions of infeasibility.)

As described previously, annual incremental reductions in total emissions must occur in order to achieve reasonable further progress during the period prior to attainment of the standards. Therefore, not all transportation measure implementation activities should wait until the comprehensive analyses of control measures are completed. Demonstration studies are important and should accompany or precede full scale implementation of the comprehensive strategy. It is EPA's policy that each area will be required to schedule a representative selection of reasonable transportation measures (as listed above) for implementation at least on a pilot or demonstration basis prior to the end of 1980.

Every effort must be made to integrate the air quality related transportation plan and implementation required by the Clean Air Act into planning and programming procedures administered by DOT. EPA will publish "Transportation Planning Guidelines" which will, if followed carefully, insure that an adequate transportation planning process exists.

EPA recognizes that the planning and implementation of very extensive air quality related transportation measures can be a complicated and lengthy process, and in areas with severe carbon monoxide or oxidant problems, completion of some of the adopted measures may extend beyond 1982. Implementation of even these very extensive transportation measures, however, must be initiated before December 31, 1982.

In the case of plan revisions that make the requisite showing to justify an extension of the date for attainment, the portion of the 1979 plan submittal for transportation measures must:

1. Contain procedures and criteria adopted into the SIP by which it can be determined whether the outputs of the DOT Transportation planning process conform to the SIP.

2. Provide for the expeditious implementation of currently planned reasonable transportation control measures. This includes reasonable but unimplemented transportation measures in existing SIPs and transportation controls with demonstrable air quality benefits developed as part of the transportation process funded by DOT.

3. Present a program for evaluating a range of alternative packages of transportation options that includes, as a minimum, those measures listed above for which EPA will develop information documents. The analyses must identify a package of transportation control measures to attain the emission reduction target ascribed to it in the SIP.

4. Provide for the evaluation of long range (post-1982) transportation and growth policies. Alternative growth policies and/or development patterns must be examined to determine the potential for modifying total travel demand. One of the growth alternatives evaluated should be that prepared in response to Section 701 of the Housing Act of 1954, as amended.

5. Include a schedule for analysis and adoption of transportation control measures as expeditiously as practicable. The comprehensive analysis of alternatives (item 2 above) must be completed by July 1980 unless the designated planning agency can demonstrate that analysis of individual components (e.g., long range transit improvements) may require additional time. Adopted measures must be implemented as expeditiously as practicable and on a continuous schedule that demonstrates reasonable further progress from 1979 to the attainment date. Determinations of the reasonableness of a schedule will be based on the nature of the existing or planned transportation system and the complexity of implementation of an individual measure.

Additional Carbon Monoxide and Oxidant Monitoring Requirements

It is EPA's policy to require that all SIPs which provide for attainment of the oxidant standard after December 31, 1982, must contain commitments to implement a complete oxidant monitoring program in major urbanized areas in order to adequately characterize the nature and extent of the problem and to measure the effectiveness of the control strategy for oxidants. The 1979 plan submittal must provide for a schedule to conduct such CO monitoring as necessary to correct any deficiencies as identified by the Regional Office.

SIPs for Unclassified Areas Redesignated Non-Attainment

With respect to unclassified areas which are later found to be non-attainment areas the state will be required to submit a plan within nine months of the non-attainment determination. During plan development, the state will be required to implement the offset policy for that area. However, it should be noted that in many cases, because of previous plan revisions or adoption of previous control regulations, the baseline for offsets will be more restrictive and thus offsets may be more difficult to obtain. For oxidants, state-wide regulatory development (for at least all sources greater than 100 tons/year), however, would permit the state to utilize the regulations developed for the entire state as the applicable plan for the newly designated non-attainment area. This would normally constitute an approvable SIP per the above criteria and could essentially accommodate the proposed growth within the previously submitted state plan and not require offsets once the area is designated as non-attainment.

6.0 USEFUL REFERENCES

*1. U.S. Environmental Protection Agency, Guideline for Use of City-Specific EKMA in Preparing Ozone SIPs, EPA-450/4-80-027, (March 1981).

Describes how air quality, meteorological and emissions data are used to generate ozone isopleths in EKMA. Then describes how city-specific EKMA is used to demonstrate attainment of the ozone NAAQS in SIPs.

*2. G. Z. Whitten and H. Hogo, User's Manual for Kinetics Model and Ozone Isopleth Plotting Package, EPA-600/3-78-014a, (July 1978).

Describes features of and how data are input to the OZIPP computer program.

*3. U.S. Environmental Protection Agency, Ozone Isopleth Plotting Package (OZIPP), EPA-600/3-78-014b, (July 1978).

Computer tape of the OZIPP model.

4. U.S. Environmental Protection Agency, Uses, Limitations and Technical Basis of Procedures for Quantifying Relationships Between Photochemical Oxidants and Precursors, EPA-450/2-77-021a, (November 1977).

Introduction to and conceptual discussion of EKMA.

5. U.S. Environmental Protection Agency, Procedures for Quantifying Relationships Between Photochemical Oxidants and Precursors: Supporting Documentation, EPA-450/2-77-021b, (November 1978).

Useful discussion of procedures for estimating NMOC/NO_x ratios.

6. T. C. Curran, Guideline for Interpretation of Ozone Air Quality Standard, EPA-450/4-79-003, (January 1979).

Discussion of the ozone NAAQS and the implications resulting from its statistical form.

7. U.S. Environmental Protection Agency, Guidance for Collection of Ambient Non-Methane Organic Compound (NMOC) Data for Use in 1982 Ozone SIP Development, and Network Design and Siting Criteria for the NMOC and NO_x Monitors, EPA-450/4-80-011, (June 1980).

General information on use of commercially available NMOC instruments for use in ozone SIPs.

8. U.S. Environmental Protection Agency, Final Emission Inventory Requirements for 1982 Ozone State Implementation Plans, EPA-450/4-80-016, (December 1980).

*9. F. W. Sexton, R. A. Michie, Jr., F. F. McElroy, and V. L. Thompson, Technical Assistance Document for the Calibration and Operation of Automated Ambient Non-Methane Organic Compound Analyzers, EPA (March 1981).