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PHOTOCHEMICAL ASSESSMENT MONITORING STATIONS IMPLEMENTATION MANUAL

Office of Air Quality
Clean Air
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U. S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Radiation
Office of Air Quality Planning and Standards
Technical Support Division
Research Triangle Park, North Carolina 27711

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NOTICE

This document has been reviewed in accordance with United States Environmental Protection Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

FOREWORD

This document replaces the ***Enhanced Ozone Monitoring Network Design and Siting Criteria Guidance Document***, EPA-450/4-91-033, dated November 1991. This implementation manual is being published in loose-leaf form for the convenience of the user; periodically, additional sections of the document not included with this first publication and subsequent revisions will be sent to the user community.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACT	-	Clean Air Act
AFS	-	AIRS Facility Subsystem
AG	-	AIRS Graphics
AGENCY	-	United States Environmental Protection Agency
AIRS	-	Aerometric Information Retrieval System
ALAPCO	-	Association of Local Air Pollution Control Officials
AMS	-	Area and Mobile Subsystem (AIRS)
AMTIC	-	Ambient Monitoring Technology Information Center
APTI	-	Air Pollution Training Institute
AQCR	-	Air Quality Control Region
AQS	-	Air Quality Subsystem (AIRS)
AREAL	-	Atmospheric Research and Exposure Assessment Laboratory
BACT	-	Best Available Control Technology
BBS	-	Bulletin Board System
BLIS	-	RACT/BACT/LAER Information Systems
BPS	-	Bytes Per Second
C	-	Carbon
CAAA	-	Clean Air Act Amendments of 1990
CBD	-	Central Business District
CDS	-	Compliance Data System
CFR	-	Code of Federal Regulations
CHIEF	-	Clearinghouse for Inventories/Emission Factors
CICS	-	Customer Information Control System
CMSA	-	Consolidated Metropolitan Statistical Area
COMPLI	-	COMPLIance Information on Stationary Sources of Air Pollution

CTC	-	Control Technology Center
CYO	-	Create-Your-Own
DQO	-	Data Quality Objective
EKMA	-	Empirical Kinetic Modeling Approach
EMTIC	-	Emission Measurement Technical Information Center
EPA	-	United States Environmental Protection Agency
FIPS	-	Federal Information Processing Standards
FRM	-	Federal Reference Method
FY	-	Fiscal Year
GCS	-	Geographic and Common Subsystem (AIRS)
HNO_3	-	Nitric Acid
ID	-	Identification
LAER	-	Lowest Achievable Emission Rate
MCB	-	Model Change Bulletin
MSA	-	Metropolitan Statistical Area
MW	-	Molecular Weight
NAAQS	-	National Ambient Air Quality Standards
NADB	-	National Air Data Branch
NAMS	-	National Air Monitoring Stations
NARS	-	National Asbestos Registry System
NATICH	-	National Air Toxics Information Clearinghouse
NCC	-	National Computer Center
NEDS	-	National Emissions Data System
NESHAP	-	National Emission Standards for Hazardous Air Pollutants
NMOC	-	Nonmethane Organic Compound
NO	-	Nitrogen Oxide
NO_2	-	Nitrogen Dioxide

NO_x	-	Oxides of Nitrogen
NO_y	-	Total Reactive Oxides of Nitrogen
NSPS	-	New Source Performance Standard
NSR	-	New Source Review
NWS	-	National Weather Service
O_3	-	Ozone
OAQPS	-	Office of Air Quality Planning and Standards
OMS	-	Office of Mobile Sources
PAMS	-	Photochemical Assessment Monitoring Stations
PAN	-	Peroxyacetyl Nitrate
PICS	-	Products of Incomplete Combustion
PPB	-	Parts Per Billion
PPM	-	Parts Per Million
PSD	-	Prevention of Significant Deterioration
PWD	-	Primary Wind Direction
QA	-	Quality Assurance
QC	-	Quality Control
RACT	-	Reasonably Available Control Technology
REVIEW COMMITTEE	-	EPA PAMS Network Design Review Committee
RFP	-	Reasonable Further Progress
ROM	-	Regional Oxidant Model
RTV	-	Ready-to-View
RULE	-	40 CFR Part 58, as Amended February 12, 1993
SAROAD	-	Storage and Retrieval of Aerometric Data
SCRAM	-	Support Center for Regulatory Air Models
SIP	-	State Implementation Plan

SLAMS	-	State and Local Air Monitoring Stations
SOP	-	Standard Operating Procedure(s)
SPM	-	Special Purpose Monitor
SSCD	-	Stationary Source Compliance Division
STAPPA	-	State and Territorial Air Pollution Program Administrators
SYSOP	-	Systems Operator
T	-	Temperature
TAD	-	Technical Assistance Document
TO	-	Toxic Organic Method
TTN	-	Technology Transfer Network
UAM	-	Urban Airshed Model
UTM	-	Universal Transverse Mercator
V	-	Volume
VOC	-	Volatile Organic Compound(s)
W	-	Weight

1.0 INTRODUCTION

1.1 REGULATORY BACKGROUND AND OBJECTIVES

Section 182(c)(1) of the 1990 Clean Air Act Amendments (CAAA) required the Administrator to promulgate rules for the enhanced monitoring of ozone, oxides of nitrogen (NO_x), and volatile organic compounds (VOC) to obtain more comprehensive and representative data on ozone air pollution. Immediately following the promulgation of such rules, the affected States were to commence such actions as were necessary to adopt and implement a program to improve ambient monitoring activities and the monitoring of emissions of NO_x and VOC. Each State Implementation Plan (SIP) for the affected areas must contain measures to implement the ambient monitoring of such air pollutants. The subsequent revisions to Title 40, ***Code of Federal Regulations***, Part 58 (40 CFR 58) (Reference 1) required States to establish Photochemical Assessment Monitoring Stations (PAMS) as part of their SIP monitoring networks in ozone nonattainment areas classified as serious, severe, or extreme (Figure 1-1). The criteria for judging the severity of an ozone nonattainment area utilizing the ozone design value is listed in Table 1-1. The air quality design value is intended to provide a measure of the need for reduction in ozone concentrations essential to achieve attainment or, equivalently, the degree of severity of the nonattainment area represented by the monitoring site. Given the expected exceedance form of the ozone National Ambient Air Quality Standard (NAAQS), the ozone design value is defined as the concentration with the expected number of exceedances equal to one (see References 2 and 3).

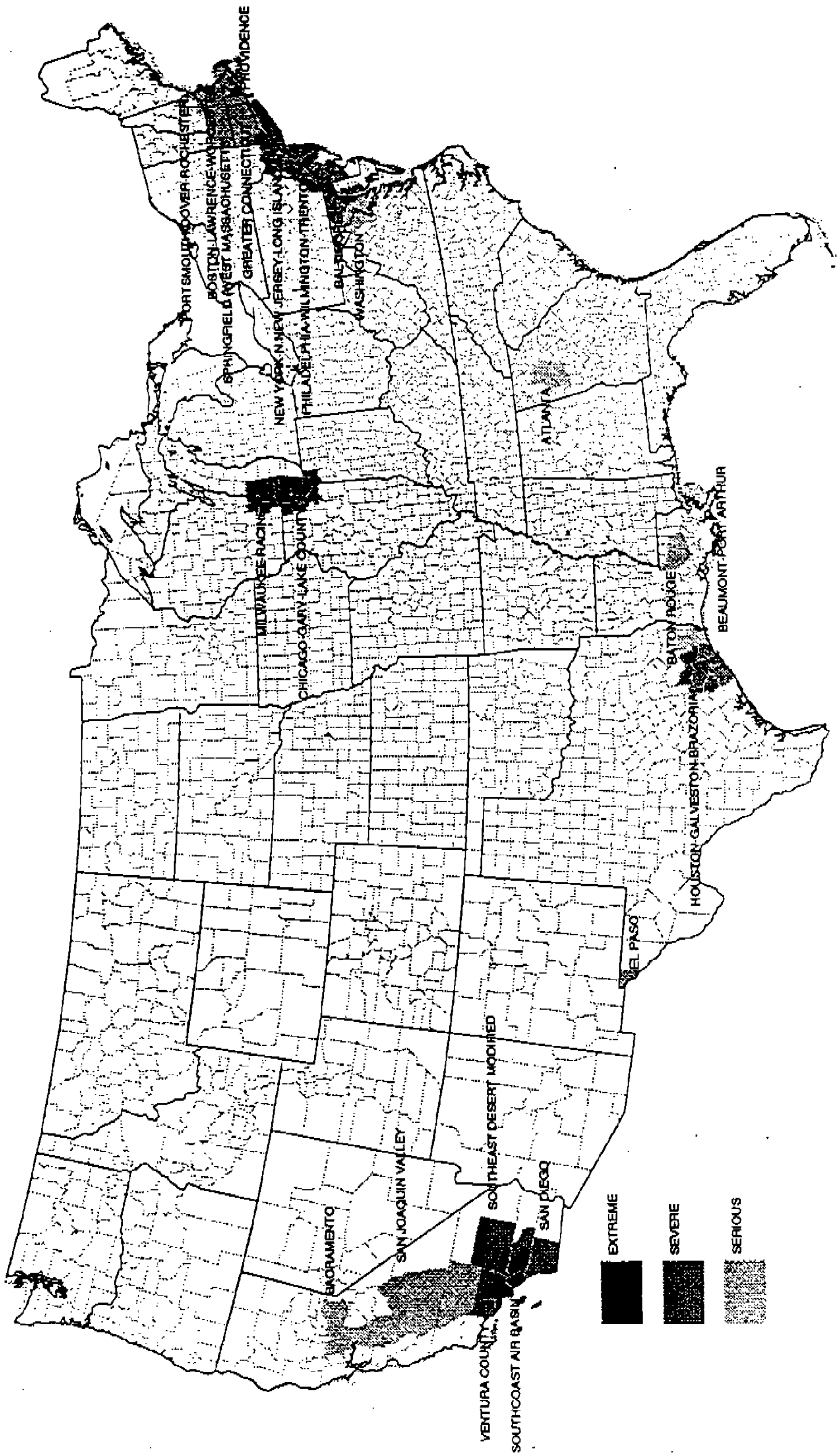


FIGURE 1-1. PAMS OZONE NONATTAINMENT AREAS

TABLE 1-1. NONATTAINMENT SEVERITY CLASSIFICATIONS

NONATTAINMENT AREA CLASSIFICATION	OZONE DESIGN VALUE (ppm)
Marginal	0.121 up to 0.138
Moderate	0.138 up to 0.160
Serious	0.160 up to 0.180
Severe	0.180 up to 0.280
Extreme	0.280 and above

The principal reasons for requiring the collection of additional ambient air pollutant and meteorological data are, primarily, the lack of attainment of the NAAQS for ozone nationwide, and, secondly, the need for a more comprehensive air quality database for ozone and its precursors.

The chief objective of the enhanced ozone monitoring revisions is to provide an air quality database that will assist air pollution control agencies in evaluating, tracking the progress of, and, if necessary, refining control strategies for attaining the ozone NAAQS. Ambient concentrations of ozone and ozone precursors will be used to make attainment/nonattainment decisions, aid in tracking VOC and NO_x emission inventory reductions, better characterize the nature and extent of the ozone problem, and prepare air quality trends. In addition, data from the PAMS will provide an improved database for evaluating photochemical model performance, especially for future control strategy mid-course corrections as part of the continuing air quality management process. The data will be particularly useful to States in ensuring the implementation of the most cost-effective regulatory controls.

This document was designed to familiarize State and local air authorities with the enhanced ozone monitoring program and to provide guidance for designing PAMS networks. In addition to this revised document, EPA has also prepared a revised guidance document on PAMS measurement methods for ozone and ozone precursor compounds entitled ***Technical Assistance Document for Sampling and Analysis of Ozone Precursors*** (Reference 4). The user is encouraged to refer to that document for information on manual and automated sampling techniques for VOC, nonmethane organic compounds (NMOC), and methodologies for measuring NO_x and carbonyls.

1.2 DEVELOPING DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are statements that relate the quality of environmental measurements to the level of uncertainty that decision-makers are willing to accept for results derived from the data. The process of developing DQOs starts with the program or project objectives, in which the goals of the monitoring are laid out. This is followed by a description of the data objectives, which state the kind of monitoring that will be performed. The DQOs then carry the process to its conclusion, stating how "good" the data need to be to satisfy the program objectives, with a specified level of confidence. Thus, it is critical that any set of DQOs be tied closely to the Program Objectives, ensuring that the monitoring will truly address the stated needs.

It is never possible to be absolutely certain that a future data set will satisfy the data needs exactly. There is always a chance that variables, variation, and uncertainty beyond the program's control will lead to a "softness" in the data and a resulting uncertainty that the subsequent decisions are appropriate. For example, it is not possible to be 100% certain that a downward trend in ozone concentration has been confirmed or denied, since it is possible that local meteorology unexpectedly affected the two highest-reading days, one way or the other. By carefully designing the equipment and schedules, however, it is possible to reduce to acceptable levels the possibility of making an erroneous call. In order to accomplish this task, it is first necessary to narrow each Program Objective to one or more specific monitoring or data objectives that must be accomplished in order to allow the Program Objective to be met. Then, a meaningful DQO can be developed for each Program Objective.

The DQOs themselves must quantify the variability or possible error as well as possible in order for the decision-making risk to be assessed fairly. This can only happen if there is a base of experience using the technologies and/or methods to be used in the project. In the case of the PAMS Program, there has never been a monitoring program of this scope covering these parameters and with similar project objectives.

During the summer of 1990, the EPA conducted a major monitoring study in Atlanta, Georgia, to address ozone measurements and their precursors. This project was undertaken to obtain an information base to support the development and implementation of improved strategies for reducing ozone in cities that are not attaining the NAAQS for ozone. The study was jointly sponsored by the EPA Atmospheric Research and Exposure Assessment Laboratory (AREAL) and the Office of Air Quality Planning and Standards (OAQPS), located in the Research Triangle Park, North Carolina. This study is further described in References 5, 6, and 7. The data compiled in the Atlanta Study, among others, have provided initial information for the development of these DQOs.

The next section of this document contains the program objectives and specific DQOs that have been developed for the PAMS Program. As described above, these DQOs are tied directly to each of the Program Objectives. This is done informally through a narrowed focus on specific monitoring objectives. It is important to note, however, that all possible uses of the PAMS data are not now known; therefore, every practical attempt should be made to improve the quality of the data beyond that necessary to satisfy the explicit DQOs specified here. In addition, the DQOs may be used as guides for evaluating requests to utilize alternative networks, methods, etc.

The DQOs included in this document are preliminary and are expected to be updated as

- improvements are made in thc monitoring and statistical methodologies;
- changes and/or additions are made in the Program Objectives or in the specific uses of the data; and/or
- results of the monitoring indicate a need.

1.3 PAMS PROGRAM OBJECTIVES AND INITIAL DATA QUALITY OBJECTIVES

In contrast to the State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS) network and siting design criteria, which are pollutant specific, PAMS design considerations are site specific. Concurrent measurements of ozone, NO_x, speciated VOC (including carbonyls), and meteorology are obtained at each PAMS site; upper air meteorological parameters, however, are required only in one representative location in each affected area. Design criteria for the PAMS network are based on selection of an array of sites located specifically to monitor the impact of an area's emissions of ozone precursors given the predominant wind directions associated with high ozone events. Specific and often different monitoring objectives (and often different data uses) are therefore associated with each specific PAMS location. The overall network should supply information sufficient to develop responsible and cost-effective ozone control strategies; provide appropriate data support for photochemical grid modeling efforts; allow the reconciliation of emissions inventories; enable characterization of ozone, ozone precursor and meteorological trends; provide for improved assessments of ozone attainment; and provide a measure of information for determining population exposure. A maximum of five PAMS sites is required in an affected nonattainment area depending on the population of the Metropolitan Statistical

Area/Consolidated Metropolitan Statistical Area (MSA/CMSA) or nonattainment area, whichever is larger.

The monitoring objectives for PAMS can be classified into the six general categories depicted in Figure 1-2. A monitoring network based on these six principles will provide the initial stepping stones that constitute a pathway toward attainment of the NAAQS for ozone.

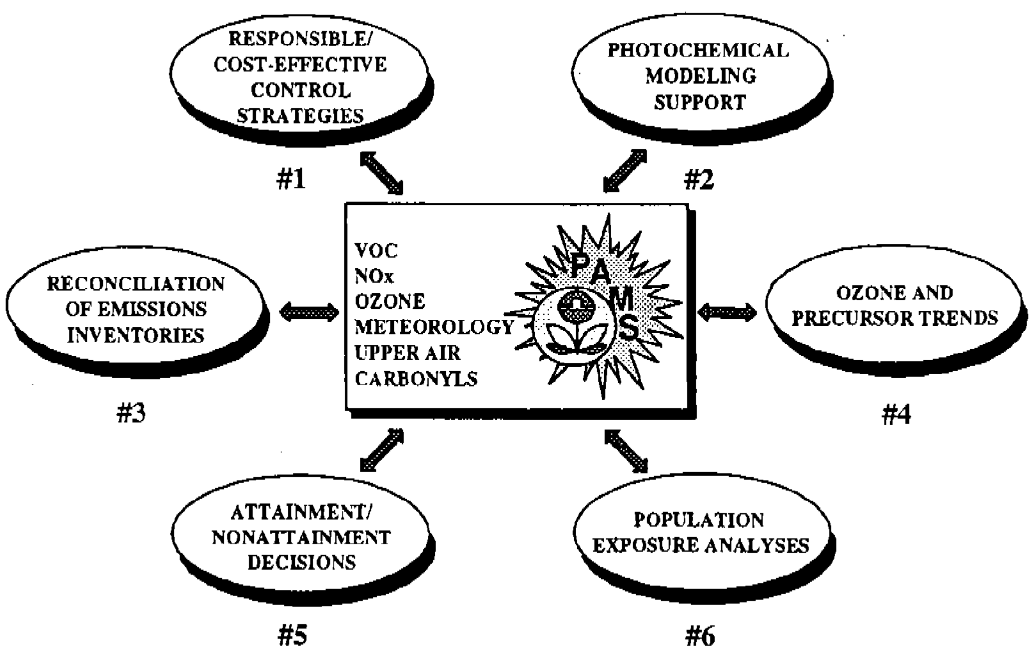
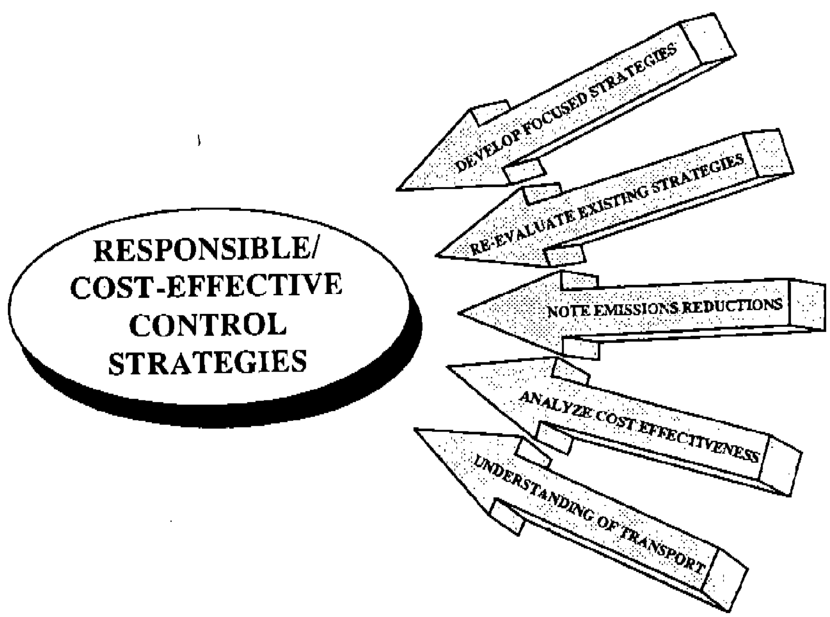


FIGURE 1-2. PAMS PROGRAM AND DESIGN OBJECTIVES

The design of a PAMS program should result in a network which can be used to maximize the utility of these data and program design objectives. The EPA acknowledges that compromises must be achieved (*i.e.*, some more crucial objectives will be better satisfied than other less important objectives). Nevertheless, each affected air pollution control agency should make every effort to craft a network which satisfies as many of these objectives as practicable, yet does not become a financial or operational burden.

OBJECTIVE #1: Provide a speciated ambient air database which is both representative and useful for ascertaining ambient profiles and distinguishing among various individual VOC. These data can later be used as evaluation tools for control strategies, cost-effectiveness, and for understanding the mechanisms of pollutant transport.



Clearly, a fundamental objective of the enhanced ozone and ozone precursor monitoring regulations is to provide a mechanism whereby air pollution control agencies can obtain an air quality database that will assist in evaluating, tracking the progress of, and, if necessary, refining control strategies for attaining the ozone NAAQS. This comprehensive database will allow the States to focus their control strategies where they will be the most beneficial to attain the NAAQS and to reevaluate their existing ozone control programs with the aim of appropriate mid-course corrections as part of the continuing air quality management process. These PAMS data, especially those collected at Sites #1 and #2 (see Section 2.2 for network site descriptions), will enhance the characterization of ozone concentrations and provide critical information on the precursors which cause ozone. Speciation of measured VOC data and additional NO_x data are expected to allow the determination of which species are most affected by local emissions reductions and assist in developing cost-effective, selective VOC and/or NO_x reductions and control strategies.

INITIAL DQOs FOR OBJECTIVE #1:

The primary purpose of the PAMS monitoring networks is to provide speciated ambient air quality data that can be used

- initially, to provide baseline profiles, and
- eventually, to evaluate and develop cost-effective ozone control strategies.

Based on the results of the Atlanta Study and other recent ambient air monitoring projects, the PAMS network design and monitoring practices can provide this information. It is important to include both the network configurations and the monitoring practices themselves in defining the necessary quality of the monitoring efforts. The DQOs for this project objective are thus complex and, to some degree subjective. It is not possible to specify exactly the monitoring accuracy that is needed or possible, since an effort of this scope has never been conducted for the precursor compounds. However, based on the Atlanta Study and on EPA's considerable experience with the NAMS/SLAMS networks, it is possible to define DQOs that make sense.

Quantifiable DQOs refer to the ability of the network to identify diurnal trends in the monitoring data corresponding to the diurnal meteorological and emission patterns, and to detect changes in those patterns after control strategies have been implemented.

Daily Patterns

Ambient monitoring data for all of the pollutants considered in the PAMS program will be used to:

- Determine whether or not there is a daily cycle or pattern in the concentrations of one or more of the pollutants;
- Determine whether or not there is a change in the daily cycle or pattern over time; and,
- By implication, contribute to the evaluation of whether the SIP controls or other factors (such as land or resource use changes or voluntary emission reductions) are having an effect on the pattern.

Based on the ozone precursor and ozone data available, it is believed that the most likely daily cycle would be what is termed "a diurnal cycle" in which the concentration of one or more pollutants increases to a level significantly above the mean at one time during the day, and/or decreases to a level significantly below the mean at another time during the day. An easily measurable surrogate for the diurnal cycle would be the presence or absence of a single hourly (or three-hourly) time period within a day with a mean concentration 20% above or below the daily mean. In order to allow a determination of whether this represents a pattern, the data must be of sufficient quality to show that this phenomenon has occurred over a given period of time.

Thus, the following is the first DQO.

DQO #1.1 ***The data for any given pollutant measured at a PAMS site must be able to show the presence of a diurnal pattern, if one exists, with an 80% confidence level.***

In an individual day, a "diurnal cycle" is the presence of any given hourly (or three-hourly) time period at a given site for which the mean concentration of the specific pollutant is at least 20% above or below the mean concentration for that day. A "diurnal pattern" is the presence of a diurnal cycle that persists over a defined set of daily measurements. A diurnal pattern is defined as occurring when the mean of the averages of the single specific hourly (or three-hourly) periods is at least 20% above or below the mean of the daily averages over the defined set of days. In this case, the defined set of days (the averaging time periods) are defined as those days for all sites and pollutants for which daily data are available during the ozone season.

Effects of Controls on Daily Patterns

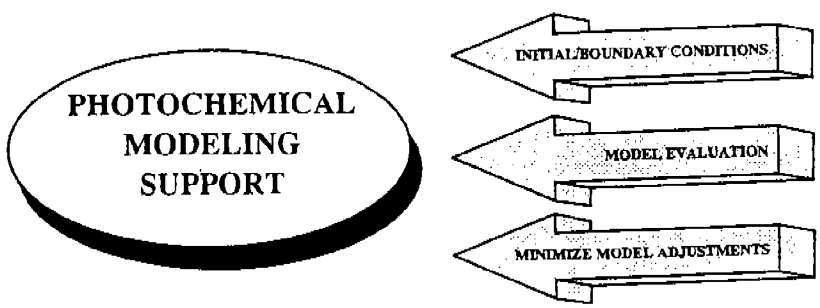
The second value of the PAMS data as they relate to daily patterns will be the data's ability to identify a change in the patterns once ozone control strategies have been implemented.

Thus, the following is the second DQO.

DQO #1.2 ***The data for any given pollutant measured at a PAMS site must be able to show a change in the diurnal pattern, if a change exists, with an 80% confidence level.***

A diurnal cycle and a diurnal pattern, as well as the defined set of monitoring days, are the same as for DQO #1.1. The magnitude of the diurnal pattern is the specific percent difference between the mean of the hourly (or three-hourly) values and the daily averages. A change in the diurnal pattern is defined as an increase or decrease in the percent differences of greater than 20% of the daily averages.

OBJECTIVE #2: Provide local, current meteorological and ambient data to serve as initial and boundary condition information for photochemical grid models. These data can later be used as a baseline for model evaluation and to minimize model adjustments and reliance on default settings.



The PAMS network requirements are tailored to provide specific data measurements which can be utilized by photochemical modelers to refine their estimates of initial and boundary conditions, provide a means to evaluate the predictive capability of the models, and minimize the adjustment of model inputs. Such information will tend to increase the probability that the model's calculations will reflect the "right answer for the right reason" rather than the "right answer for the wrong reason" and reduce the uncertainties associated with estimated model inputs. In fact, the upwind site (Site #1) and the downwind site (Site #4) are located so as to quantify the atmospheric conditions at the upwind and downwind extremes of the photochemical modeling domain.

Heretofore, the national air pollution control program has not had the benefit of comprehensive ozone precursor data as a tool for evaluating, calibrating, or otherwise adjusting and conducting reality checks on the operation of the Urban Airshed Model (UAM). EPA views the PAMS networks as vital steps forward in complementing grid model applications.

INITIAL DQO FOR OBJECTIVE #2:

PAMS data will serve as important inputs to mathematical and statistical photochemical grid models, in particular, the UAM. The networks, then, must be able to produce data and data quality sufficient for use in those models. The specific data quality needed, however, is not easily quantifiable, since the models will "run" with data of almost any quality. Better data will simply improve the predictive power of the models. As a result, modeling needs are that the data be "as good as they can be." In practice, this means that the monitoring must satisfy all of the criteria specified in the regulations. This includes all aspects of monitor siting, as well as operation.

Thus, the DQO is as follows.

DQO #2.1 ***The speciated VOC, ozone, NO_x and meteorological data must satisfy the regulations, including monitor siting, operation, and data quality criteria.***

OBJECTIVE #3: Provide a representative, speciated ambient air database which is characteristic of source emission impacts. These data can be particularly useful in analyzing emissions inventory issues and corroborating progress toward attainment.

The emissions inventory serves as an essential element of the air management process as well as a fundamental input for photochemical models. Verification of reported inventories and the tracking of changes in the atmospheric VOC profiles can assist in the evaluation of control strategy effectiveness. Given that the inventory is the foundation building block for the entire SIP development process, it is critical that its accuracy be optimized. While the regulatory assessments of progress will be made in terms of emission inventory estimates, the ambient data can provide independent trend analyses and corroboration of these assessments which either verify or highlight possible errors in emissions trends indicated by inventories. The ambient assessments, using speciated data, can gauge the accuracy of estimated changes in emissions. The speciated data can also be used to assess the quality of the speciated VOC and NO_x emission inventories. Utilizing other computer modeling techniques, PAMS data will help resolve the roles of transported and locally emitted ozone precursors in producing an observed exceedance and may be utilized to identify specific sources emitting excessive concentrations of precursors.

PAMS data will be used to corroborate the quality of VOC and NO_x emissions inventories. Although a perfect mathematical relationship between emissions inventories and ambient measurements does not exist, a comparison of the relative concentrations of various compounds in the ambient air over a given time period can be contrasted roughly to emissions inventory estimates over the same time period to evaluate the accuracy of the emissions inventory reductions. In addition, PAMS data that are gathered year round, such as the VOC and NO_x concentrations at the #2 Sites, will allow tracking of the VOC and NO_x emission reductions on peak and high ozone days (as well as on an annual and seasonal basis), provide additional information necessary to support Reasonable Further Progress (RFP) calculations, and corroborate emissions trends analyses.

INITIAL DQOs FOR OBJECTIVE #3:

There are two DQOs for this Program Objective, one dealing with total VOC, and the other with speciated VOC.

Total VOC Monitoring

In order for the PAMS data to be useful for this purpose, the network design and operation must be sufficient to allow a detection of a 3% annual reduction in the seasonal average concentration over a 5-year monitoring period. The same percent reduction is specified by Title I of the CAAA for emission reductions for most nonattainment areas. The season will most often be defined as the highest three-month period.

The results from the Atlanta Study are useful for predicting the likelihood of detecting a trend in ambient concentrations over time. Based on selected speciated VOC data and the pooled VOC data, the results indicate that the pooling of data from more than one site clearly improves the probability that the network will detect a trend in ambient concentrations. For this reason, the ability of the network to assess the relative accuracy of emissions inventories for an MSA/CMSA will increase significantly with the addition of a second #2 Site.

Based on the analysis of the predictive value of the Atlanta Study data, the following is the DQO.

DQO #3.1 ***The monitoring data for Total Volatile Organic Compound (Total VOC) concentrations collected at #2 Sites must be able to demonstrate a 3% annual trend (upward or downward) over a 5-year monitoring period, if it exists, with an 80% confidence level.***

The power, or probability of detecting such a trend for the #2 Site will be 70%. As an example, in an MSA with an actual reduction in Total VOC ambient concentrations of greater than 15% over a 5-year period (that is, more than 3% per year), we can have an 80% confidence level that the data will demonstrate that reduction at least 70% of the time.

Speciated VOC Monitoring

As part of the emissions inventory reconciliation, speciated VOC data will be used for the following:

- Determining baseline species profiles.
- Determining and differentiating the contributions of various sources and source types.
- Determining changes in species profiles over time (as may have resulted from emission control programs, land or resource use changes, voluntary reductions, etc.).

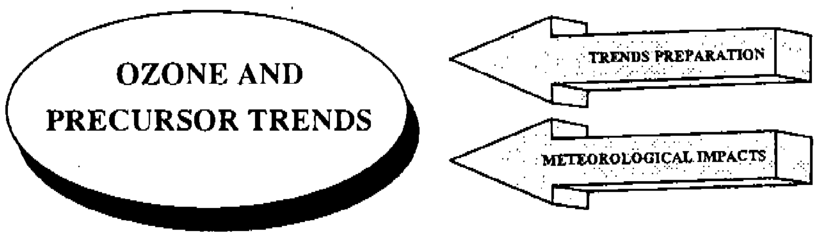
Because of the combined effects of the large mass of data that will be collected, and the expected variability between sites and between individual compounds, the data may not provide meaningful information on the changes in one compound from one year to the next. In order to assess these changes, it may be necessary to group the speciated VOC into classes.

The results from the Atlanta Study are useful for predicting the likelihood of detecting a trend in ambient concentrations over time. Selected speciated VOC data indicate that the pooling of data by compound class clearly improves the probability that the network will detect a trend in ambient concentrations.

Thus, the following is the second DQO.

DQO #3.2 ***The speciated VOC monitoring data collected at a #2 Site, when composited into categories, must be able to demonstrate a 20% change (upward or downward) in the seasonal average between two consecutive years, if it exists, with an 80% confidence level.***

OBJECTIVE #4: Provide ambient data measurements which would allow later preparation of unadjusted and adjusted pollutant trends reports.



Long-term PAMS data will be used to assess ambient trends for speciated VOC, NO_x, and, in a more limited way, for toxic air pollutants. Multiple statistical indicators will be tracked, including ozone and its precursors during the events encompassing the days during each year with the highest ozone concentrations, the seasonal means for these pollutants, and the annual means at representative locations. The more PAMS that are established in and near nonattainment areas, the more accurate the trends data will become. Note, however, that in general it will only be appropriate to combine data from like sites; therefore, trends will likely need to be constructed on a site-by-site or combination-of-like-sites basis. As the spatial distribution and number of ozone and precursor monitors improves, trends analyses will be less influenced by instrument or site location anomalies. The requirement that surface meteorological monitoring be established at each PAMS will help maximize the utility of these trends analyses by permitting comparisons with meteorological data and transport influences. The meteorological data can also help interpret the ambient air pollution trends by taking meteorological factors into account.

There are two basic concepts which may be employed in preparing trends analyses: (1) displaying unadjusted measurements which portray the quality of the air actually breathed by the public, and (2) calculating adjusted trends to infer progress towards attainment of standards due to the influences of pollutant control programs. In either case, the cornerstone of the analyses are the actual air quality and meteorological measurements such as those required by PAMS. Particularly, for evaluating the effectiveness of control programs, it may be appropriate to integrate such factors as meteorology and emissions inventory data. (Note Appendix B of this document; a similar process could be utilized for VOC.) Since all PAMS sites will gather comprehensive ambient data in addition to surface meteorological measurements, all data will be useful for developing pollutant trends, particularly from Sites #2 and #3.

INITIAL DQOs FOR OBJECTIVE #4:

Based on the historical trends found to be of interest in previous Trends Reports, and on an analysis of the data from the Atlanta Study, the following is the DQO.

DQO #4.1 ***The composite monitoring data for a given MSA/CMSA for ozone, NO_x, and speciated VOC must be able to demonstrate a yearly downward trend with an 80% confidence level until an area achieves attainment.***

The composite data are defined as the average of the ozone season data for a given pollutant over like monitoring sites in the MSA/CMSA over a 10-year period, as follows:

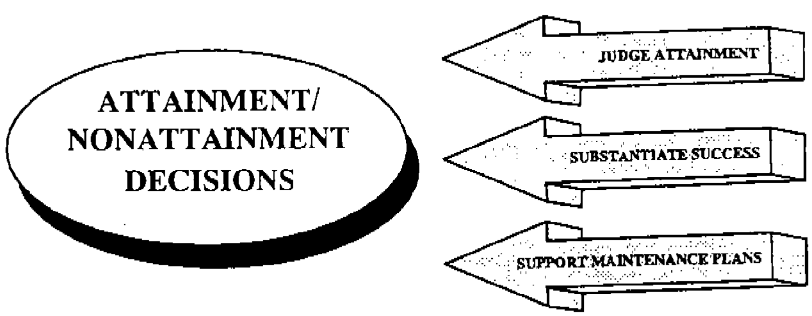
- Ozone - annual second highest daily maximum one-hour concentration
- VOC/NO_x - seasonal average

Depending on the total number of sites in an MSA/CMSA, the power, or probability of detecting such a trend will be as follows:

1 Site - 70%
2 Sites - 80%
3 Sites - 90%

As an example, in an MSA with a single #2 Site and with an actual reduction in toluene ambient concentrations of more than 30% over a 10-year period (that is, over 3% per year), we can have an 80% confidence level that the data will demonstrate that reduction at least 70% of the time.

OBJECTIVE #5: Provide additional measurements of selected criteria pollutants. Such measurements can later be used for attainment/nonattainment decisions and to construct NAAQS maintenance plans.



Like SLAMS and NAMS data, PAMS data will be used for monitoring ozone exceedances and providing input for attainment/nonattainment decisions (see Reference 8 and

Appendix C of this document). Additionally, the nitrogen dioxide (NO_2) data can be utilized to augment monitoring for compliance with the NAAQS for NO_2 where such data are gathered with the Federal Reference Method (FRM) and taken on a year-round basis. Ultimately, the success of any air pollution control strategy is appraised by its ability to achieve compliance with the NAAQS. (Note that the PAMS will expand the spatial coverage of NAAQS monitoring.) Although the data at any PAMS site can be used for these purposes, it is expected that Site #3 will more likely constitute the maximum concentration site for comparison with the NAAQS. Further, the additional data will provide an expanded foundation for developing and administering maintenance plans required by the CAA.

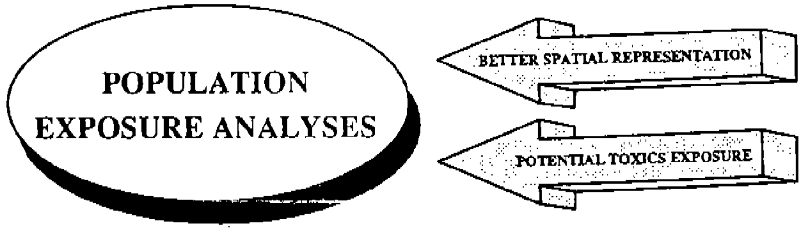
The ambient ozone monitoring data collected at the PAMS stations must be sufficient for use in the determinations of attainment status with respect to the ozone NAAQS. As such, the data must satisfy all of the criteria specified in the NAMS and SLAMS network regulations, namely 40 CFR 58, which specifies the monitoring criteria (such as monitor location) and the data quality criteria (such as the required precision and accuracy.)

INITIAL DQOs FOR OBJECTIVE #5:

Thus, the DQO is as follows.

DQO #5.1 ***The ozone (and NO_2 where appropriate) monitoring data must satisfy the criteria specified in the NAMS and SLAMS monitoring regulations (see Reference 1), including monitor siting, operation, and data quality criteria.***

OBJECTIVE #6: Provide additional measurements of selected criteria and non-criteria pollutants from properly-sited locations. Such measurements can later be used for evaluating population exposure to air toxics as well as criteria pollutants.



PAMS data can be used to better characterize ozone and toxic air pollutant exposure to populations living in serious, severe, or extreme areas. Annual mean toxic air pollutant concentrations can be calculated to help estimate the average exposure of the population in urban environments to individual VOC species which are considered toxic. Specifically, by measuring the VOC targeted by PAMS, a number of toxic air pollutants will also be measured. Although compliance with Title I, Section 182 of the CAAA does not require the measurement and analysis of additional toxic air pollutants, EPA believes that the PAMS stations can serve as cost-effective platforms for an enhanced air toxics monitoring program. The adjunct use of PAMS for air toxics monitoring will allow the consideration of air toxics impacts in the development of future ozone control strategies. The establishment of a second PAMS Site #2 in an MSA/CMSA will provide an even better database for such uses. Both Sites #2 and #3 will probably be the best choices for exposure analyses for air toxics and ozone respectively. EPA notes that the PAMS network is not ideal as a source of primary ambient air toxics data and regards the collection of air toxics data as an incidental and secondary, though still important, objective of the PAMS system (see also Appendix J).

INITIAL DQO FOR OBJECTIVE #6:

The DQO is as follows.

DQO 6.1 ***The speciated VOC monitoring data must be able to provide annual average concentration data at #2 Sites to within ±50%, with a confidence level of 80%.***

1.4 GENERAL APPROACH

Design criteria for the PAMS network are based on the selection of an array of data collection sites that satisfy the monitoring objectives as described in Section 1.3 of this document and which are further delineated in Appendix D, Section 4, of 40 CFR 58. These sites would allow ambient data on ozone precursor source areas and predominant wind directions associated with high ozone events to be collected and made accessible through the Aerometric Information Retrieval System (AIRS) national database. Specific monitoring objectives are associated with each site location or combination of site locations. The PAMS network design will enable better characterization of precursor emission sources within an MSA/CMSA, transport of ozone and ozone precursors into and out of an MSA/CMSA, and photochemical processes that result in ozone exceedances.

1.5 ORGANIZATION

Section 2.0 of this document describes the PAMS network design and includes minimum network requirements, and descriptions of monitoring sites and the site selection process. Section 3.0 defines monitoring methods and network operations. Section 4.0 describes the network planning and approval process. Section 5.0 is reserved. Section 6 contains information on AIRS. Section 7.0 deals with the Technology Transfer Network (TTN). Section 8.0 contains references.

2.0 NETWORK DESIGN AND SITING FOR PAMS

2.1 INTRODUCTION

Title 40, ***Code of Federal Regulations***, Part 58 establishes specific criteria and requirements for national ambient air monitoring systems and provides for the reporting of the collected measurements and associated data to a national computerized database. Inasmuch as the vast majority of ambient monitoring stations are operated by the State and local air pollution control agencies, these existing rules form the foundation for the SLAMS. Additionally, these agencies operate other ambient monitoring stations which are termed Special Purpose Monitors (SPM). Although the data collected at most SPM are acceptable to satisfy national monitoring goals, the stations have been established for SIP purposes and are not required to comply with the strict data reporting requirements of SLAMS.

A subset of the SLAMS monitors has been formally designated as NAMS. These stations require the approval of EPA Headquarters prior to establishment or alteration and therefore provide the nation with a sense of permanence for at least a base or core national monitoring network. The newly-instituted PAMS will also constitute a subset of the SLAMS monitors and may be located coincident to NAMS sites.

Each PAMS station will sample for speciated VOC including several carbonyls, ozone, NO_x, and surface (10-meter) meteorological parameters; the frequency requirements vary somewhat with the size of the MSA/CMSA. Additionally, each area must monitor upper air meteorology at one representative site. The Rules allow a 5-year transition or phase-in schedule for the program at a rate of at least one station per area per year. Further, the Rules provide for the submission and approval of alternative network designs and sampling schemes. Such alternative mechanisms for compliance with the Rules are especially valuable to States which are currently engaged in other forms of ozone precursor monitoring which have proved adequate for their SIP needs.

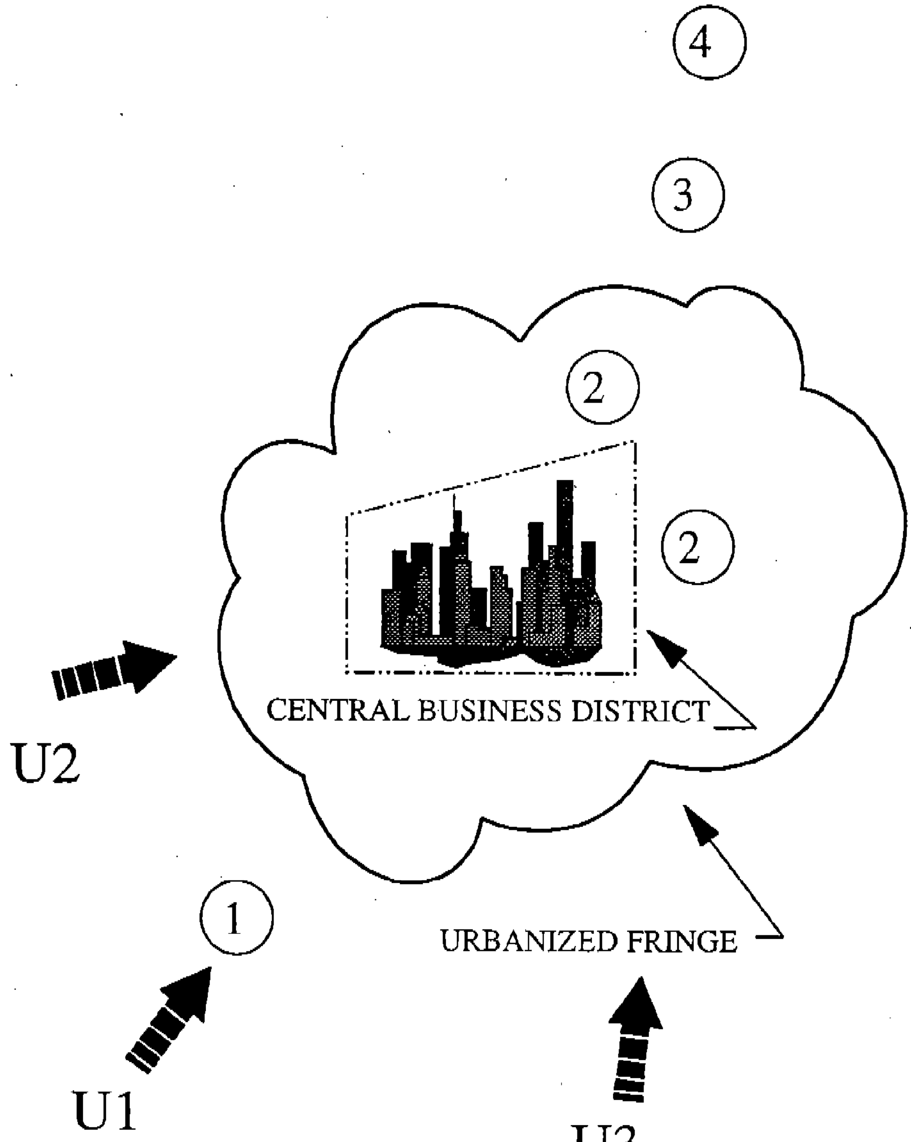
2.2 PAMS SITE DESCRIPTIONS

The PAMS network array for an area should be fashioned to supply measurements which will assist States in understanding and solving ozone nonattainment problems. EPA has determined that for the larger areas, the minimum network which will provide data sufficient to satisfy a number of important monitoring objectives should consist of five sites (Figure 2-1):

Site #1 - **Upwind and background characterization site.** These sites are established to characterize upwind background and transported ozone and its precursor concentrations entering the area and will identify those areas which are subjected to overwhelming incoming transport of ozone. The #1 Sites are located in the predominant morning upwind direction from the local area of maximum precursor emissions and at a distance sufficient to obtain urban scale measurements. Typically, these sites will be located near the upwind edge of the photochemical grid model domain.

Site #2 - **Maximum ozone precursor emissions impact site.** These sites are established to monitor the magnitude and type of precursor emissions in the area where maximum precursor emissions representative of the MSA/CMSA are expected to impact and are suited for the monitoring of urban air toxic pollutants. The #2 Sites are located immediately downwind (using the same morning wind direction as for locating Site #1) of the area of maximum precursor emissions and are typically

FIGURE 2-1. ISOLATED AREA NETWORK DESIGN



LEGEND:

(1)- PAMS SITES
U1 - HIGH OZONE DAY PREDOMINANT MORNING WIND DIRECTION
U2 - SECOND MOST PREDOMINANT HIGH OZONE DAY MORNING WIND DIRECTION
U3 - HIGH OZONE DAY PREDOMINANT AFTERNOON WIND DIRECTION

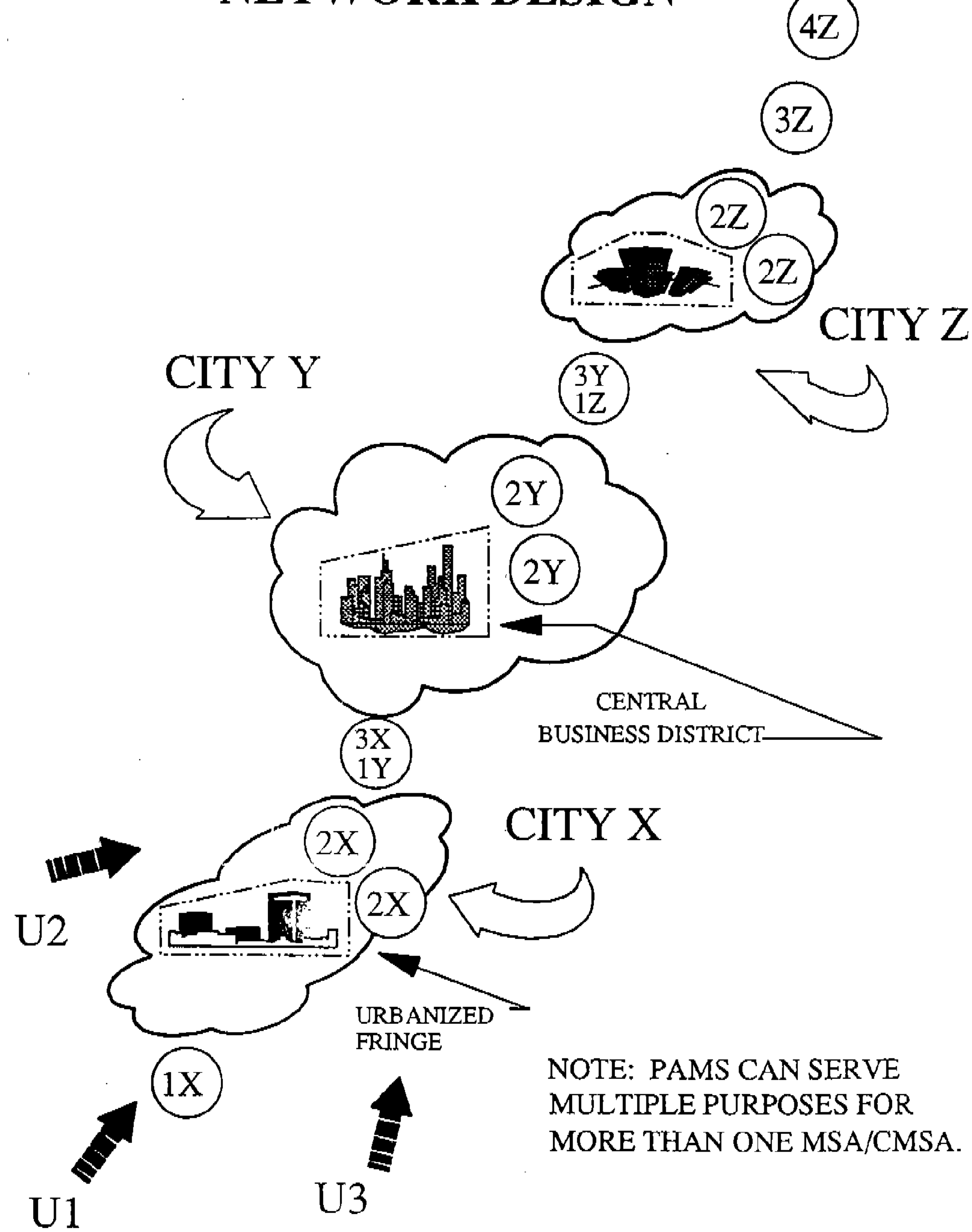
placed near the downwind boundary of the central business district (CBD) or primary area of precursor emissions mix to obtain neighborhood scale measurements. Additionally, **a second #2 Site may be required** depending on the size of the area, and should be placed in the second-most predominant morning wind direction.

Site #3 - **Maximum ozone concentration site.** These sites are intended to monitor maximum ozone concentrations occurring downwind from the area of maximum precursor emissions. Locations for #3 Sites should be chosen so that urban scale measurements are obtained. Typically, these sites are located 10 to 30 miles from the fringe of the urban area.

Site #4 - **Extreme downwind monitoring site.** These sites are established to characterize the extreme downwind transported ozone and its precursor concentrations exiting the area and will identify those areas which are potentially contributing to overwhelming ozone transport into other areas. The #4 Sites are located in the predominant afternoon downwind direction from the local area of maximum precursor emissions at a distance sufficient to obtain urban scale measurements. Typically, these sites will be located near the downwind edge of the photochemical grid model domain.

States which experience significant impact from long-range transport of ozone or its precursors or are proximate to other nonattainment areas (even in other States) can collectively submit a network description which contains alternative sites to those that would be required for an isolated area as shown in Figure 2-1. Such coordinated network plans should, as a guide, be based on the example depicted in Figure 2-2, and must include a

FIGURE 2-2. MULTI-AREA AND TRANSPORT AREA NETWORK DESIGN



LEGEND:

- ① - PAMS SITES
- U1 - HIGH OZONE DAY PREDOMINANT MORNING WIND DIRECTION
- U2 - SECOND MOST PREDOMINANT HIGH OZONE DAY MORNING WIND DIRECTION
- U3 - HIGH OZONE DAY PREDOMINANT AFTERNOON WIND DIRECTION

demonstration that the alternative design satisfies the monitoring data uses and fulfills the PAMS objectives described in Section 1.3.

2.3 SELECTION OF CANDIDATE PAMS SITES

Site selection is one of the most important tasks associated with monitoring network design and must result in the most representative location to monitor the air quality conditions being assessed. General recommendations for site selection are provided in this document. Additional details concerning site selection for monitoring ozone and precursor pollutants may be found in ***Site Selection for the Monitoring of Photochemical Air Pollutants*** (Reference 9). PAMS site selection will follow the general guidance found in that reference. It is further recommended that photochemical models be used to assist in the design of the PAMS network.

2.3.1 Spatial Scales

The basis for monitor site selection, according to the referenced guidelines, is to first match each site-specific monitoring objective to an appropriate scale of spatial representation, and to then choose a monitoring location that is characteristic of that spatial scale. Five spatial scales are commonly applied to air pollution monitoring: microscale, middle scale, neighborhood scale, urban scale, and regional scale. The spatial scales that are most relevant to the enhanced ozone monitoring network are the urban and neighborhood scales.

The regional scale defines conditions within an area of reasonably homogeneous geography and extends in distance from tens to hundreds of kilometers.

The urban scale characterizes city-wide conditions with dimensions on the order of 4 to 50 km. Measurements on an "urban" scale represent concentration distributions over a metropolitan area. Monitoring on this scale relates to precursor emission distributions and control strategy plans for an MSA/CMSA. PAMS Sites #1, #3, and #4 are characteristic of the urban scale.

The neighborhood scale defines conditions within some extended areas of the city that have a relatively uniform land use and range from 0.5 to 4 km. Measurements on a neighborhood scale represent conditions throughout a homogeneous urban subregion. Precursor concentrations, on this scale of a few kilometers, will become well mixed and can be used to assess exposure impacts and track emissions. Neighborhood data will provide information on pollutants relative to residential and local business districts. VOC sampling at Site #2 is characteristic of a neighborhood scale. Measurements of these reactants are ideally located just downwind of the edge of the urban core emission areas. Further definition of neighborhood and urban scales is provided in Appendix D of 40 CFR 58 and Reference 9.

2.3.2 General Monitoring Area

After choosing the appropriate spatial scale of representation, a general monitoring area must be selected that is characteristic of the required spatial scale and consistent with the monitoring objectives. This is done by reviewing certain background information, including area land use patterns, emissions inventories, population densities, traffic distributions, climatological and meteorological data, and any existing monitoring data. The use of gridded photochemical models is especially useful in defining expected areas of steep concentration gradients and important source/receptor relationships. Candidate monitoring sites are then selected from within the general monitoring area by eliminating from consideration all locations that might be unduly influenced by emissions from specific non-representative pollution sources or by non-representative topography.

Using the previous guidance, a close examination should be made of the MSAs or CMSAs under review before selecting the monitor locations. A distinction should be made between MSAs that are isolated and those that are consolidated into a corridor of urban areas. The possibility of multi-day transport should be considered in defining isolated urban areas or corridors of urban areas. Table 2-1 shows all current areas in the United States listed as serious, severe, or extreme and delineates the size of the minimum PAMS network required by 40 CFR 58.

Meteorological factors are used to identify which general monitoring areas qualify for upwind or downwind PAMS sites. The wind patterns, combined with the length of time required to form ozone, are important factors in locating the monitors for measuring both maximum precursor and maximum downwind ozone concentrations. The idealized network design described in this section is partly based on consideration of meteorological conditions. Meteorological data measurements from existing sites or often from National Weather Service (NWS) stations can be used to determine the influence of prevailing wind patterns on major sources in order to pinpoint optimum monitor locations. If available, gridded photochemical air quality models should be utilized to assist in the siting process.

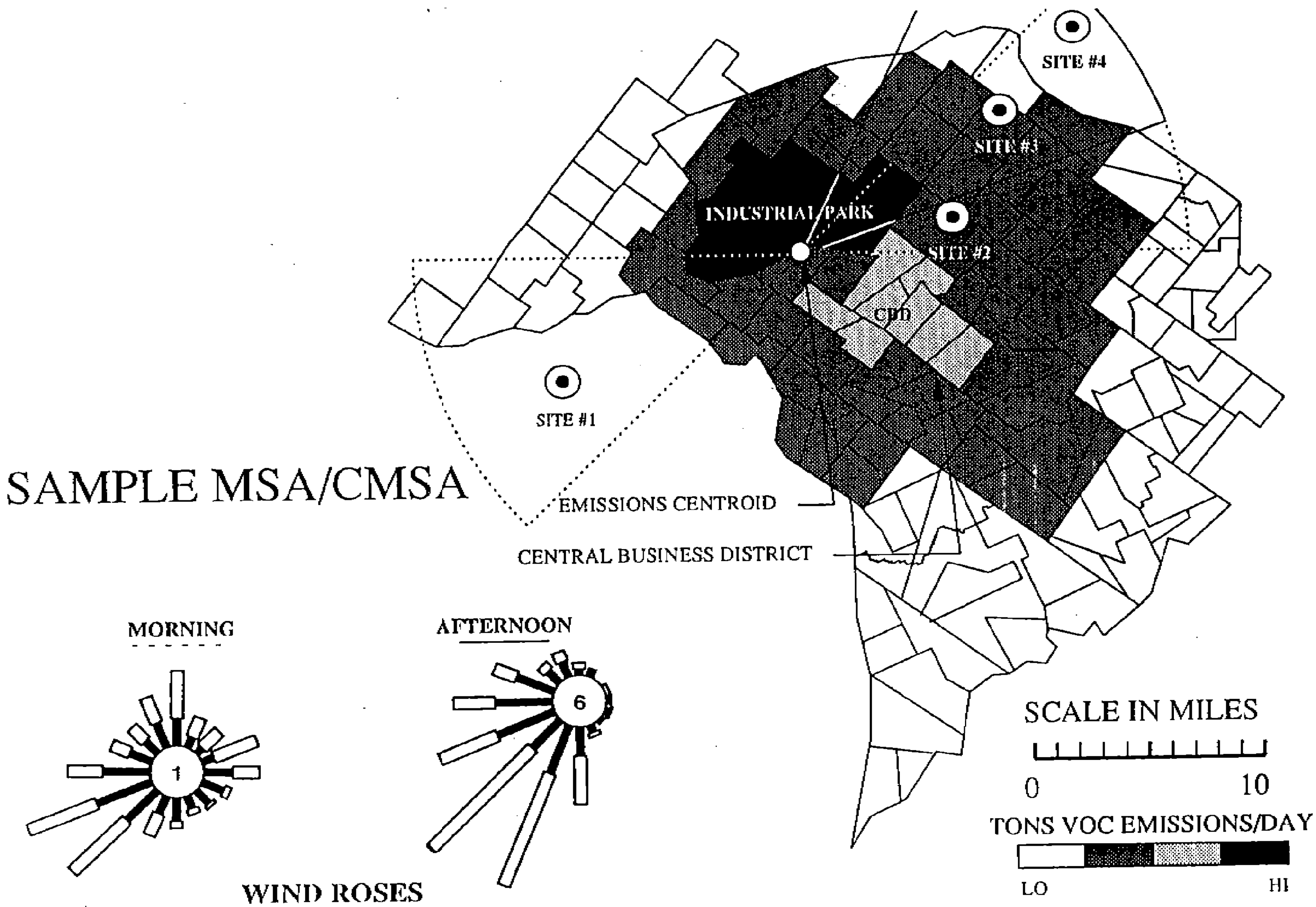
2.3.3 Selection of General Site Locations

There is considerable flexibility when micrositing each PAMS within a nonattainment area or transport region. Based on the Rule and the number of required sites obtained from Table 2-1 (or computed from Table 3-1), the recommended zone areas illustrated in Figure 2-3 should be considered for narrowing the choices for a final site location. The prime area for locating a site would be defined by a 45° sector drawn from the center of the MSA/CMSA (or more accurately, from the centroid of the emissions in the MSA/CMSA) utilizing the appropriate wind direction designated by the Rule. The centroid may be calculated utilizing computer modeling techniques or subjectively located using emissions density maps. The Sector would be limited at its ends by the stipulations of the Rule regarding approximate distances from the edge of the Central Business District (CBD) or area

TABLE 2-1. ESTIMATED PAMS REQUIREMENTS FOR CURRENTLY-AFFECTED AREAS

CURRENTLY-AFFECTED AREA NAME	POPULATION RANGE	CLASSIFICATION OF NONATTAINMENT AREA	MINIMUM NUMBER OF REQUIRED SITES
Beaumont-Port Arthur. TX	Less Than 500,000	Serious	2
Portsmouth-Dover-Rochester, NH-ME		Serious	2
Southeast Desert Modified AQMA, CA		Severe	2
Baton Rouge, LA	500,000 to 1,000,000	Serious	3
El Paso, TX		Serious	3
Springfield, MA		Serious	3
Ventura County, CA		Severe	3
Milwaukee-Racine, WI	1,000,000 to 2,000,000	Severe	4
Providence-Pawtucket-Fall River, RI-MA		Serious	4
Sacramento, CA		Serious	4
Atlanta, GA	More Than 2,000,000	Serious	5
Baltimore, MD		Severe	5
Boston-Lawrence-Worcester, MA-NH		Serious	5
Chicago-Gary-Lake County (IL), IL-IN-WI		Severe	5
Greater Connecticut, CT		Serious	5
Houston-Galveston-Brazoria, TX		Severe	5
Los Angeles-South Coast Air Basin, CA		Extreme	5
New York-New Jersey-Long Island, NY-NJ-CT		Severe	5
Philadelphia-Wilmington-Trenton, PA-NJ-DE-MD		Severe	5
San Diego, CA		Severe	5
San Joaquin Valley, CA		Serious	5
Washington, DC-MD-VA		Serious	5
Totals	-----	22 Areas	90

FIGURE 2-3. SECTOR ANALYSIS NETWORK DESIGN



of maximum precursor emissions. Note that as depicted in Figure 2-4, an MSA/CMSA may be proximate to a fixed area of stationary emissions sources which may be distinctly separate from the CBD. In such cases, the PAMS site should be located in conjunction with the centroid of the emissions, or in relation to an area which approximates the best mix of similar sources. The use of this sectoring technique allows an air pollution control agency to limit its area of search for appropriate PAMS monitoring sites.

2.3.4 Selection of Final PAMS Sites

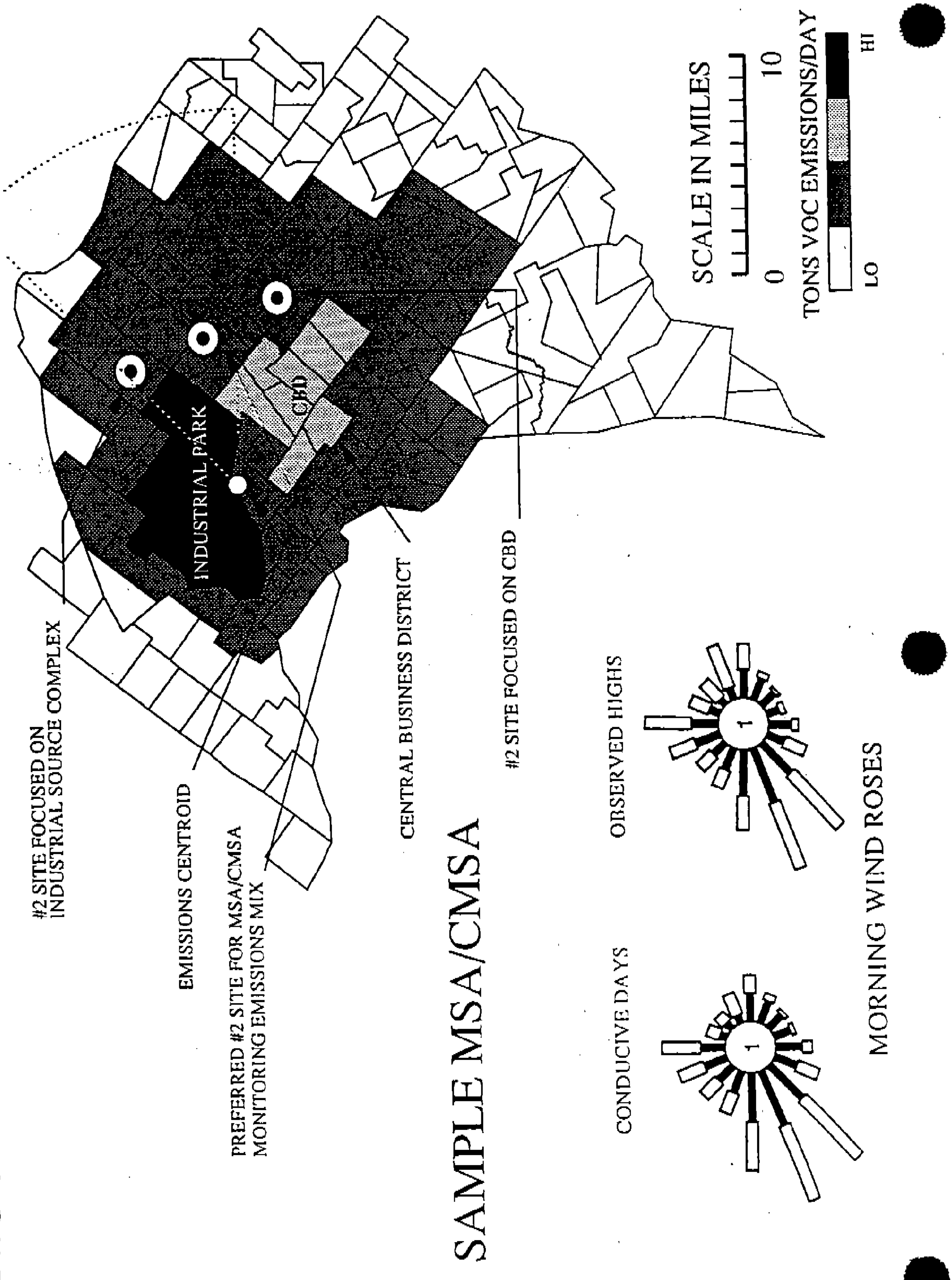
There are three fundamental criteria to consider when locating a final PAMS site: sector analysis, distance, and proximate sources. These three criteria are considered carefully by EPA when approving or disapproving a candidate site for PAMS.

Sector Analysis - The site needs to be located in the appropriate downwind (or upwind) sector (approximately 45°) and as indicated by Figure 2-3 utilizing appropriate wind directions. Ideally, local/nearby meteorological information is used to develop wind roses to place these sectors. If current, local information is not available, the wind roses contained in Appendix F may be used. These roses were generated in accordance with the intent of the Rule utilizing the following criteria:

- Years Used For The 10-Year Data Set: 1982-1991
- Years Used For The 5-Year Data Set: 1987-1991
- Months used: June, July, and August
- Ozone Conducive Criteria:

  Temperature ≥ 85° F
  7:00-10:00 a.m. Wind Speed ≤ 10 Knots
  1:00- 4:00 p.m. Wind Speed ≤ 14 Knots
  1:00- 4:00 p.m. Relative Humidity ≤ 60%

FIGURE 2-4. PREFERRED SITE #2 - EMISSIONS MIX



- Observed High Ozone Days: Ozone Concentration ≥ 0.10 ppm
- Morning Was Defined As 7:00-10:00 a.m. Local Time
- Afternoon Was Defined As 1:00-4:00 p.m. Local Time
- The Arms Of The Roses Point To Where The Wind Was Coming From
- The Length Of The Arm Is Proportional To The Percentage Of Time That The Wind Was Coming From That Direction
- The Various Pieces Of The Arm Represent Speed Categories

Rather than using a few single day wind roses to delineate the appropriate sectors, it is vital that long-term average roses be employed for the specified time periods on high ozone days or on those days which exhibit the potential for producing high ozone levels. A 5- or 10-year database should be sufficient to avoid problems with variability.

Distance - PAMS sites should be located at distances appropriate to obtain a representative sample of the area's precursor emissions and represent the appropriate monitoring scale as shown in Table 2-2.

TABLE 2-2. PAMS MEASUREMENT SCALES

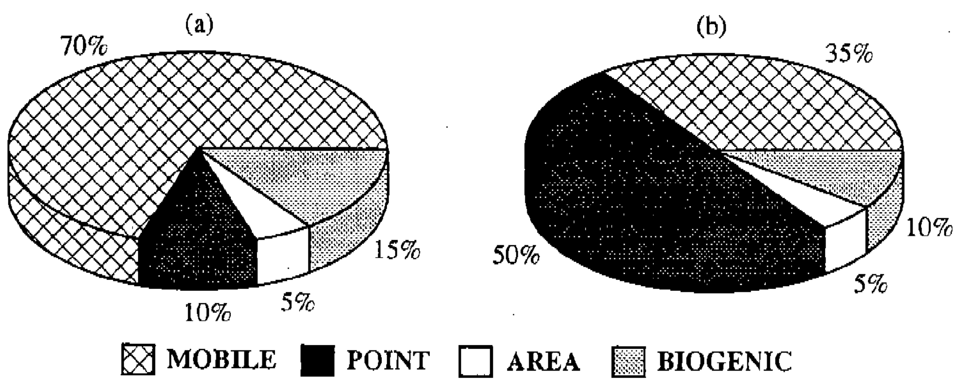
SITE	DIRECTION	LOCATION	MEASUREMENT SCALE
#1	Hi-Ozone (Or Ozone-Conducive) Day Predominant A.M. Wind	Upwind Edge of Photochemical Model Domain	Urban
#2	Hi-Ozone (Or Ozone-Conducive) Day Predominant A.M. Wind	Area of Representative Maximum Precursor Emissions - Immediately Downwind (Primary A.M. Wind)	Neighborhood
#2a	Hi-Ozone (Or Ozone-Conducive) Day Second-Most Predominant A.M. Wind	Area of Maximum Representative Precursor Emissions - Immediately Downwind (Secondary A.M. Wind)	Neighborhood
#3	Hi-Ozone (Or Ozone-Conducive) Day Predominant P.M. Wind	Fringe of Urban Area - 10 to 30 Miles Downwind	Urban
#4	Hi-Ozone (Or Ozone-Conducive) Day Predominant P.M. Wind	MSA/CMSA at Downwind Edge of Photochemical Model Domain	Urban

Most importantly, PAMS sites should be located to measure a representative mix of the ambient precursors present in a nonattainment MSA/CMSA. Sites #1 should be placed to intercept the incoming plume of precursors and ozone from other urban areas upwind and provide information to supplement the data for photochemical modeling.

Sites #2 should be placed in an area where the representative precursor mix from the particular MSA/CMSA is expected to impact. To ensure that the sensitivities of the sampling methods are optimized, it is vital that within this sector of impact the levels measured by the Site #2 are maximized. This location may differ dramatically from a monitoring site which has been noted to have the maximum historical ozone precursor measurements. Additionally, although the Rule observes that the #2 Site may typically be located near the downwind boundary of the CBD, there are a number of situations where this location would not be appropriate. For example, if a MSA/CMSA contained a significant percentage of stationary sources which were located in an area different from the CBD, the #2 Site might need to achieve a compromise location (Figure 2-5) which would monitor both CBD (mostly mobile and combustion) sources and the group of stationary sources. Ideally, the State would propose more than one #2 Site for these purposes. Further, a very large MSA/CMSA, especially those which extend over a number of smaller urban areas and across State lines, may need to adjust the location of the #2 Site such that it is close enough to the stationary sources so that the effects of the sources' emissions are not lost in the magnitude of the mobile source emissions.

Siting for #2 sites should also, within reason, represent the composition of the emissions inventory. For example, for an emissions inventory as shown in Figure 2-5(a) which has a 70% mobile source component, Site #2 should not be located so that it is entirely dominated by stationary point sources. Conversely, as depicted by Figure 2-5(b), an area which has a significant stationary source component should clearly not contain a PAMS

FIGURE 2-5. SAMPLE EMISSIONS INVENTORY DESCRIPTIONS



monitor which is overwhelmed by mobile sources. The difficulty for the Site #2 will be obtaining a reasonable mix of sources which complements the mix of the emissions inventory. Information on emissions inventories such as included in Figure 2-5, should be made a part of any PAMS network plan submittal.

Sites #3 should routinely correspond to the maximum ozone site for the MSA/CMSA which is located downwind. Note that this #3 Site may not necessarily be collocated with the ozone design value site for a particular MSA/CMSA. Historically, the design value site may even be located upwind of the area and be influenced totally by long-range transport of ozone. Further, an existing site downwind, measuring the highest ozone levels in the area, may not be the ideal location for a PAMS #3 Site. Site #3 should be reevaluated in light of the wind directions for siting stipulated by the PAMS Rules, possibly requiring the establishment of a new location for PAMS.

Sites #4 should be balanced to provide sufficient downwind information to assist in photochemical grid models, and also provide the information necessary to replace a Site #1 for a downwind MSA/CMSA whenever possible.

A State or local agency may wish to locate monitoring sites more precisely than this rather simplified sector analysis would allow. In such cases, conventional vector analysis employing the appropriate wind roses may be used to track emissions over time and locate the PAMS sites.

2.3.5 The Use of Saturation Monitoring Techniques

Following the use of a sector and/or vector analysis to locate the suitable area for a PAMS site, especially the #2 Site, it is preferable to utilize a short-term sampling study to choose the final PAMS location. A technique which is currently available to simplify such a monitoring project is the use of "saturation" monitors. Such a study entails the deployment of a number of portable samplers during the time period of interest, in this case the PAMS monitoring season, at potential PAMS sites located within the appropriate sector for the particular site being located. The data from as short a time period as 10 days can be analyzed to predict with some surety, which sites would be the best candidates for permanent PAMS installations.

For Sites #1, #3, and #4, such sampling could potentially focus on ozone with either portable monitors or with passive ozone monitors, modified for short-term use in the ambient air (see References 10, 11, and 12). These techniques will generally provide average concentrations. For Sites #2, VOC canister samplers with fixed orifices such as used by sampling method TO-12 with speciation would be more appropriate. PAMS sites would commonly be sited in the area of maximum concentration located in the appropriate sector, yet not unduly influenced by any particular point source of emissions. Since saturation studies generally provide only a limited data set, avoiding these particular local influences is highly important. The usefulness of the short-term data sets can be enhanced by sampling only on days predicted to experience high ozone levels. Further information on the use of such saturation sampling techniques can be obtained from Reference 13.

2.3.6 Practical Considerations and Constraints

The are a number of practical considerations which may affect PAMS siting such as costs, security, topography, and meteorology.

Costs - Given the expense of installing the new technologies for monitoring required by the PAMS Rules, it is possible that one of the strong driving forces for choosing a particular site may be State or local budget constraints. EPA estimates the nationwide cost of constructing a minimum PAMS network to be in excess of $79 million over the first 5 years of the program, the period designated by the Rule for phase-in. In an effort to foster compliance with Congressional intent, the EPA formally began funding the PAMS program through the §105 Grant process in FY-93. It is expected that air pollution control agencies will supplement the grant funds via use of user fees such as permit charges, automobile tag fees, etc. Nevertheless, it is important that the quality of PAMS sites not be compromised simply for costs' sake. Since the data will be used to satisfy a number of program objectives, it is clearly advantageous to choose the best available site within the limits of the agency's budget constraints.

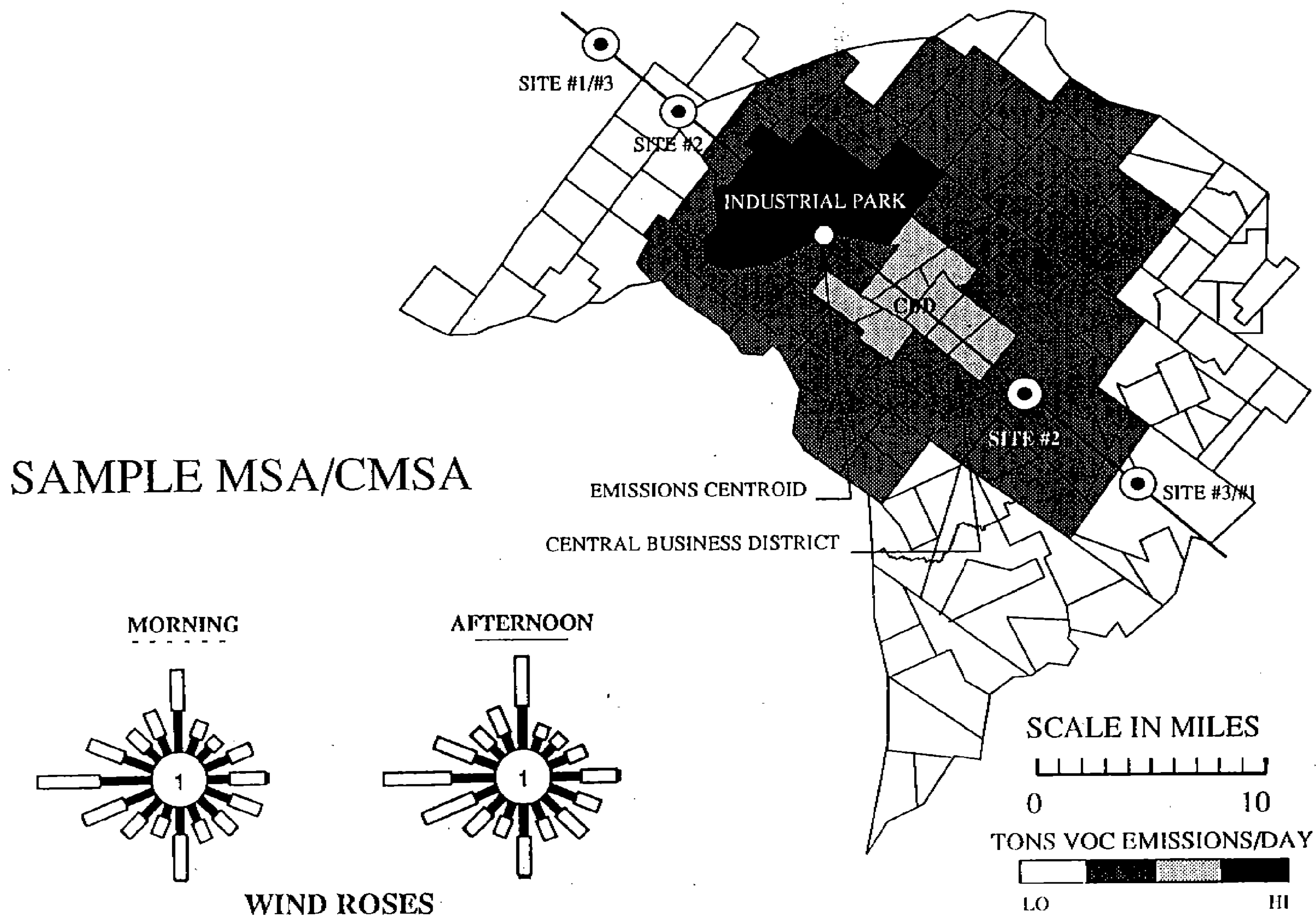
In some cases, a State or local agency may be able to locate the PAMS monitors at an existing SLAMS, NAMS, or private monitoring site. Since some of these existing site locations may be adequate for PAMS, it would be prudent, especially in light of funding shortfalls, to evaluate these existing stations to determine which are properly located to meet the PAMS objectives.

Security - Experience has shown that in some cases, a particular sector of a MSA/CMSA may not be appropriate for the establishment of an ambient monitoring station simply due to problems with the security of the equipment in a certain area. If the problems cannot be remedied via the use of standard security measures such as lighting, fences, etc., then attempts should be made to locate the site as near to the identified sector as possible while maintaining adequate security.

Topography - In cases where unique topography would cause difficulties in locating a PAMS site (*e.g.*, a site located offshore by the sector analysis), an alternate site or strategy may be proposed by the State or local agency. Such alternatives must meet the additional requirements outlined in Section 4.3 of this document.

Meteorology - (Reference 14) In many areas, there are three types of high ozone days: namely, overwhelming transport, weak transport (or mixed transport and stagnation) and stagnation. The wind rose concept to site monitors is only applicable to the transport types, but not applicable to the stagnation type. In general, transport types dominate north of 40°N, stagnation types dominate the Ohio River Valley and northern Gulf Coast, and a mixture of the two is observed in the rest of the eastern United States. In areas where stagnation dominates the high ozone days, a well-defined primary wind direction (PWD) may not be available. If no well-defined PWD can be resolved, the major axes of the emissions sources should be used as substitutes for the PWDs and the PAMS monitors should be located along these axes (Figure 2-6) with ozone monitors located not more than 10 miles from the urban fringe. The reasons for these recommendations are as follows: (1) Completely calm conditions seldom last more than one hour during the day. Most stagnation days have light (<3kts), but variable winds; (2) Ozone concentrations are likely to be the highest when the winds

FIGURE 2-6. NETWORK DESIGN - LIGHT WINDS



are along the axis of emissions, because precursor concentrations are likely to be highest and dispersion is minimal.

For coastal cities, synoptic winds are generally influenced by the seabreeze or lake breeze circulations. This is typically reflected in the difference of the morning and afternoon PWDs. The maximum ozone monitors should be located at the downwind side of the resultant winds (*i.e.*, the vector average of the morning and afternoon PWDs), keeping the monitors close to the sea/lake breeze convergence zone.

2.3.7 Screening for Effects from Nearby Emissions Sources

The success of the PAMS monitoring program is predicated on the fact that no site is unduly influenced by any one stationary emissions source or small group of emissions sources. Any significant influences would cause the ambient levels measured by that particular site to mimic the emissions rates of this source or sources rather than following the changes in nonattainment area-wide emissions as intended by the Rule. For purposes of this screening procedure, if more than 10% of the typical "lower end" concentration measured in an urban area is due to a nearby source of precursor emissions, then the PAMS site must be relocated or a more refined analysis conducted than is presented here. In order to minimize the possibility of locating a source-influenced site, the following simplified procedure has been included:

a. After locating potential PAMS sites, access the AIRS Facility Subsystem (see Section 6.0) database or other emissions information to determine the proximity of any ozone precursor emissions sources.

b. If any sources are closer than 3000 meters in the predominant upwind direction from the proposed monitoring site, calculate (from the emissions inventory) the average emissions rate during a typical summer day in grams per second.

c. Enter either Figure 2-7 for point sources (stack emissions) or Figure 2-8 for area sources (multiple sources and/or fugitive emissions, *e.g.*, landfills, lagoons, etc.) with the distance to the proximate source in meters on the X-axis. (Model inputs and outputs are located in Appendix G of this document for reference.)

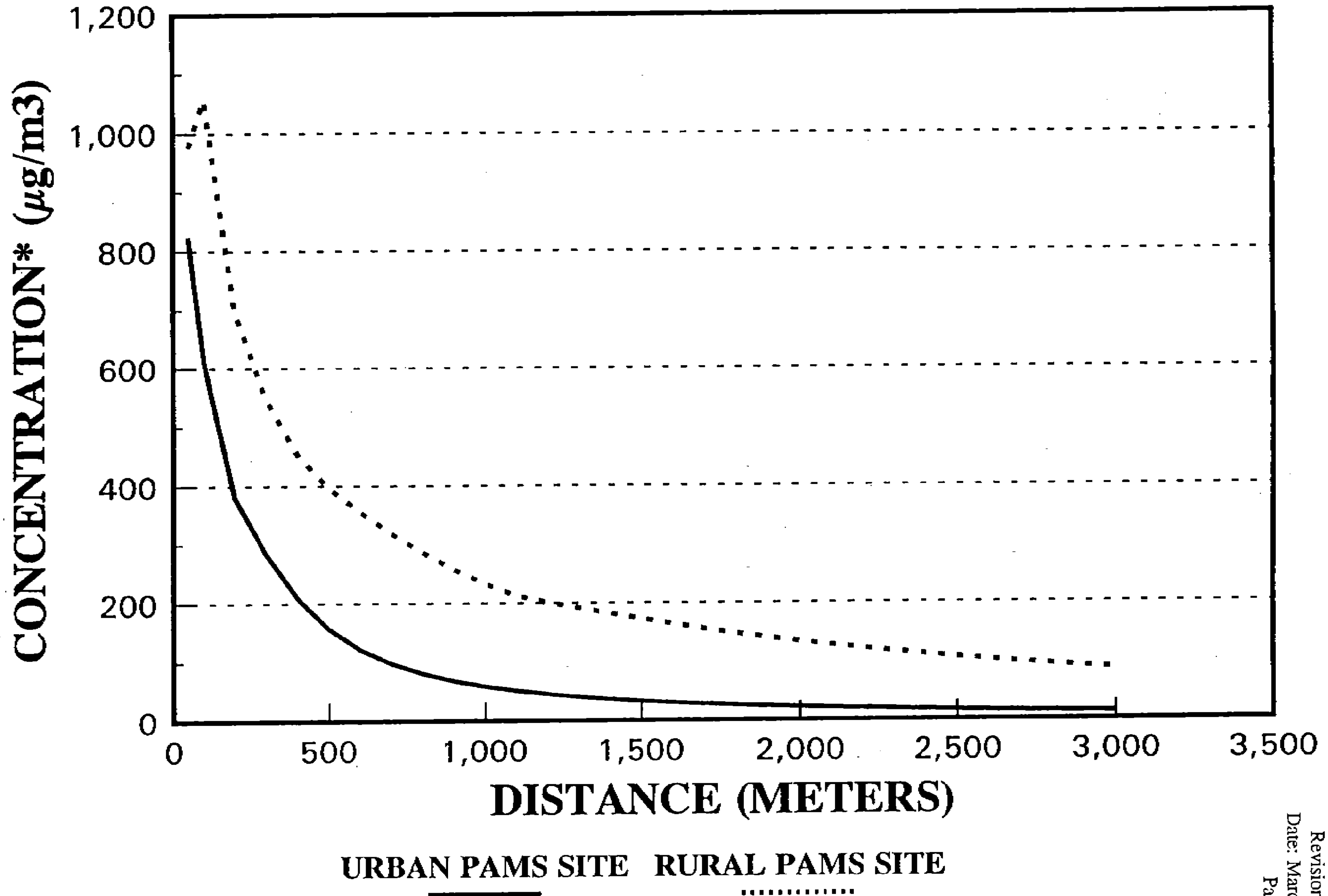
d. Read the corresponding concentration in micrograms per cubic meter ($\mu g/m^3$) from either the "urban" site or the "rural" site graph. Note that the algorithms utilized by the SCREEN2 Model (see Reference 15) differentiate between sites which are located in an urban setting and those which would be considered rural due to the differences in plume rise noted from large paved and "built-over" areas to natural areas such as fields, grass, and trees. As a "rule of thumb", Site #2 should be considered urban. Depending on the situation, Sites #1, #3, and #4 may be considered urban or rural. For example, in a transport area such as the northeastern United States, Sites #1, #3, and #4 are most likely to be urban in nature, whereas in an isolated nonattainment area, the upwind and downwind sites would more likely be considered rural.

e. Multiply the resultant concentration obtained from the graph by the emissions from the source in grams per second to obtain the resultant concentration due to the source at the proposed site location.

f. Compare this resultant concentration to a typical concentration for the nonattainment area in question.

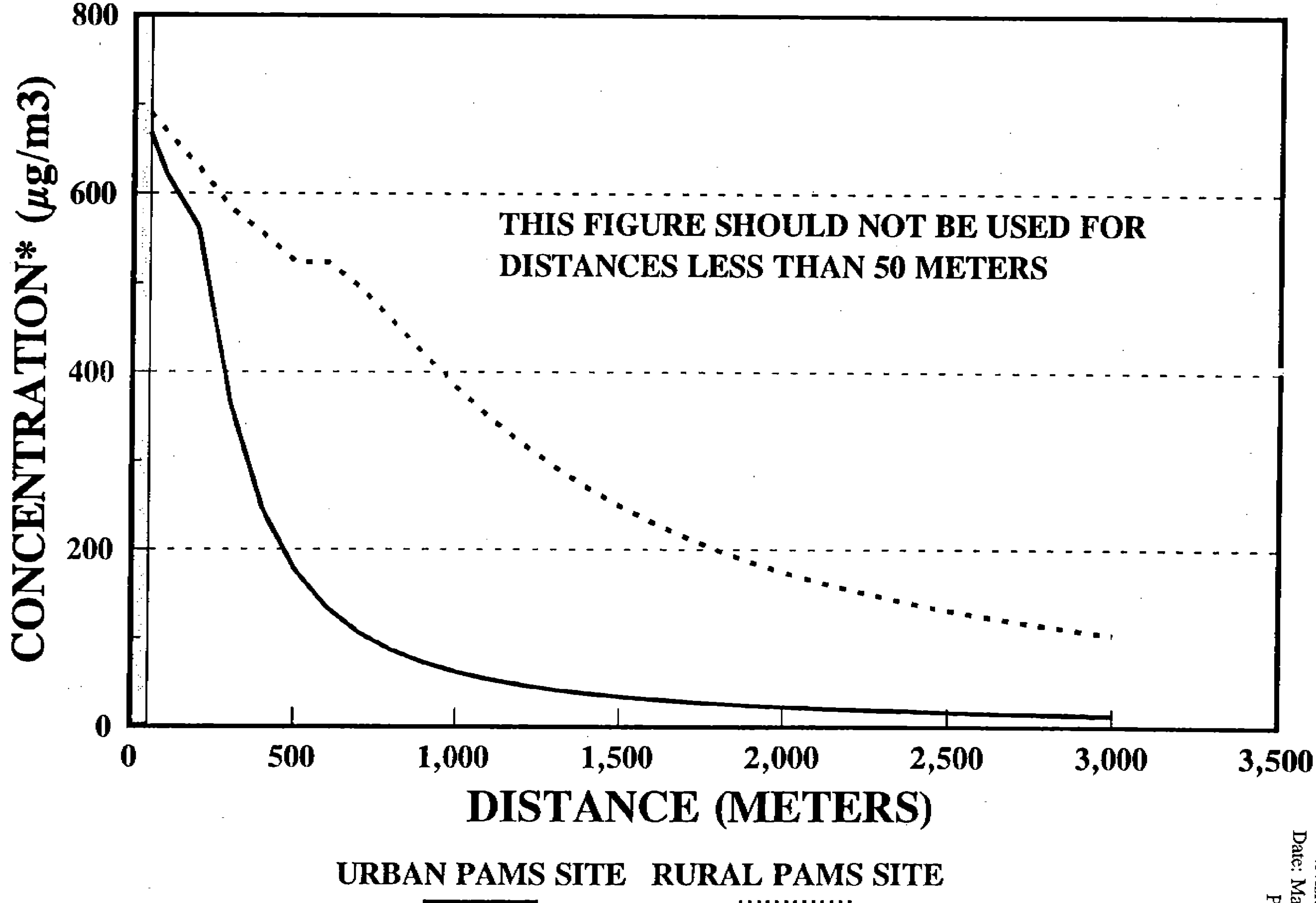
g. If the computed value is greater than 10% of the typical concentration, then the site may be improperly sited and be overly reflective of changes in precursor emissions from a local source or group of sources. In this case, further more detailed modeling analyses are recommended to clarify the actual impact of the source(s) on the monitoring site; or, the air pollution control agency should consider alternate site locations.

FIGURE 2-7. POINT SOURCE EFFECTS ON SITING



SCREEN2
*[illegible]an emission rate of 1 gram/second.

FIGURE 2-8. AREA SOURCE EFFECTS ON SITING



SCREEN2
* At an emission rate of 1 gram/second for a 50mx50m source.

FOR EXAMPLE, a typical "lower end" concentration of Total VOC noted in a recent short-term urban study was approximately .358 ppmC (358 ppbC).

a. AIRS identifies a stationary source of VOC approximately 2000 meters upwind of a potential PAMS Site #2 located in an urban setting. Most emissions were fugitive or from roof vents.

b. The average daily emissions for this source were determined to be approximately 157 pounds of VOC or 6.54 pounds per hour (24-hour operation). Since the emissions were determined to be approximately 6.54 pounds per hour then:

Emissions = (6.54 lb/hr)(454 g/lb)(1/3600 hr/sec) = .825 g/sec

The typical mix of compounds in the source emissions obtained from emissions inventory data [or in this case, from the EPA *Volatile Organic Compound/Particulate Matter Speciation Data System* (SPECIATE)] was as follows:

TABLE 2-3. SAMPLE SOURCE VOC EMISSIONS PROFILE

COMPOUND	NO. CARBONS	MOL. WEIGHT	%W/W
Hexane	6	86.17	7.00
Heptane	7	100.20	35.80
Trimethylfluorosilane	3	92.00	40.00
Benzene	6	78.11	13.60
Toluene	7	92.13	3.60

c. Since the emissions from this source were mostly fugitive or from roof vents without stacks, Figure 2-8 was consulted.

d. Accordingly, from this graph, at a PAMS site located 2000 meters downwind, this source could affect the VOC measurements by 23 $\mu g/m^3$ per gram/second of emissions.

e. Then, the

Change in Concentration Due to the Source = (.825 g/sec)(23 $\mu g\text{-}sec/m^3\text{-}g$)

$$= 19\ \mu g/m^3$$

Utilizing Equation #5 from Table 2-4 and the information in Table 2-3,

$$\text{Molecular Weight}_{MIX} = (86.17)(.07) + (100.20)(.358) + (92)(.4) + (78.11)(.136) + (92.13)(.036)$$

$$\text{Molecular Weight}_{MIX} = 92.\ g/g\text{-mole}$$

f. The typical urban concentration could be estimated by Equation #2 from Table 2-4,

$$\mu g/m^3 = \frac{(ppbV)(MW)}{22.4} \times \frac{273°K}{298°K}, \text{ assuming } T = 25°C$$

where ppbV is estimated from Equation #1 from Table 2-4 as,

$$ppbV = ppbC \div (\#C\ Atoms)$$

For this mix,

$$\#C\ Atoms_{AVERAGE} = (6)(.07) + (7)(.358) + (3)(.4) + (6)(.136) + (7)(.036)$$

from Equation #5 of Table 2-4, or

$$\#C\ Atoms_{AVERAGE} = 5.2$$

Then, given that ppbC = 358,

$$ppbV = 358 \div 5.2 = 68.8 \text{ ppbC}$$

and the typical urban concentration in $\mu g/m^3$ would be

$$\mu g/m^3 = \frac{(68.8)(92.6)}{22.4} \times \frac{273°K}{298°K}, \text{ assuming } T = 25°C$$

or

$$\mu g/m^3 = 260$$

Then the percent impact this one source has on the proposed PAMS site is estimated to be

$$(19\ \mu g/m^3 \div 260\ \mu g/m^3) \times 100\% = 7.3\%$$

g. Since this value is less than the "rule-of-thumb" cut-off value of 10%, the site is considered not unduly influenced by the identified source according to the screening procedure and may be approved as a PAMS monitoring site. If the screening value was greater than 10%, more complex analyses would need to be conducted to support site approval. For the site to be approved, the results of more comprehensive modeling analyses would need to indicate an impact of less than 10%.

2.3.8 Probe Siting and Exposure Criteria

The probe siting and exposure criteria for PAMS monitors are similar to those for NAMS/SLAMS monitors for such items as the minimum distance of the inlet probe from obstructions, vertical and horizontal probe placement, minimum distances from trees, and spacing from roadways. These criteria are given in the following subsections. More detailed guidance can be found in References 4, 9, and 16.

TABLE 2-4. USEFUL EQUATIONS FOR VOC MIXTURES

1. For estimating ppbV from ppbC:

$$\text{ppbV} = \text{ppbC} \div (\text{\#C Atoms})$$

Example: For benzene (C_6H_6), with a concentration of 6.0 ppbC:

$$\text{ppbV} = 6 \div 6 = 1 \text{ and therefore}$$

$$6 \text{ ppbC} = 1 \text{ ppbV for benzene}$$

Where,

ppbC = parts per billion as carbon

ppbV = parts per billion by volume

2. For calculating concentrations in $\mu g/m^3$, given the constituents of a VOC mix and the concentration in ppbV then,

$$\mu g/m^3 = \frac{(\text{ppbV})(\text{MW})}{22.4} \times \frac{273°K}{298°K}, \text{ assuming } T = 25°C$$

3. For calculating concentrations in ppbV, given the constituents of a VOC mix and the concentration in $\mu g/m^3$ then,

$$\text{ppbV} = \frac{(\mu g/m^3)(22.4)}{\text{MW}} \times \frac{298°K}{273°K}, \text{ assuming } T = 25°C$$

or $$\text{ppbV} = (\mu g/m^3) \times \frac{24.45}{\text{MW}}$$

4. Or,

$$\text{ppbC} = (\text{\#C}) \frac{(\mu g/m^3)(22.4)}{\text{MW}} \times \frac{298°K}{273°K}, \text{ assuming } T = 25°C$$

and, $$\text{ppbC} = (\text{\#C}) (\mu g/m^3) \times \frac{24.45}{\text{MW}}$$

5. For VOC mixes:

$$\text{Molecular Weight} = \text{MW} = [\Sigma(\text{MW})(\%w/w) \div 100] \text{ and}$$

$$\text{\#Carbons} = \text{\#C} = [\Sigma(\text{\#C})(\%w/w) \div 100]$$

Vertical and Horizontal Probe Placement - To achieve comparability with NAMS/SLAMS ozone monitoring data, the height of the inlet probe for PAMS monitors should be as close as possible to the breathing zone, but must be located 3 to 15 meters above ground level. Since PAMS involve multi-pollutant measurements, this range serves as a practical compromise for finding suitable probe positions in the siting area. The probe must also be located more than 1 meter vertically or horizontally away from any supporting structure. Since VOC are not routinely measured as part of most NAMS/SLAMS monitoring programs, additional siting criteria comparable to those required for Prevention of Significant Deterioration (PSD) (Reference 17) monitoring of noncriteria pollutants should also be applied. These criteria include a minimum separation distance of 2 meters between the inlet probe and any walls, parapets, penthouses, etc. for probes located on roofs or other structures. In addition, probes should be located far from any furnace or incineration flues.

Spacing from Obstructions - The probe must be located away from obstacles and buildings such that the distance between any obstacle and the inlet probe is at least twice the height that the obstacle protrudes above the sampler. There must be unrestricted airflow in an arc of at least 270° around the inlet probe, and the predominant and second most predominant wind direction during the sampling period must be included in the 270° arc. If the probe is located on the side of a building, 180° clearance is required.

Spacing from Trees - Trees can provide surfaces for adsorption and/or chemical reactions, and can also affect normal wind flow patterns. To limit these effects, probe inlets should be placed at least 20 meters from the dripline of any trees and must be more than 10 meters from the dripline of any trees that are located between the urban city core area (or other area of maximum ozone precursor emissions) and the monitoring station along the predominant sampling period daytime wind direction utilized for establishing the site.

Spacing from Roads - Motor vehicle emissions constitute a major source of both ozone precursors and ozone-scavenging compounds. It is important, therefore, to maintain a minimum separation distance between roadways and PAMS monitoring sites such that the representation of the resulting monitoring data is not compromised. Table 2-5 gives the required minimum separation distances from roadways for various traffic volumes. The minimum separation distance must also be maintained between a PAMS station and other similar areas of automotive traffic, such as parking lots. Nearby roads should be far enough away from Sites #2 and #3 probe inlets to avoid producing localized ozone sinks. Likewise, nearby roads should not be located near Sites #1, #3, and #4 probe inlets, as precursor pollutants could have a local influence on these area-representative sites.

TABLE 2-5. SEPARATION DISTANCE BETWEEN PAMS AND ROADWAYS (EDGE OF NEAREST TRAFFIC LANE)[1]

ROADWAY AVERAGE DAILY TRAFFIC VEHICLES PER DAY	MINIMUM SEPARATION DISTANCE BETWEEN ROADWAYS AND STATIONS IN METERS[2]
<10,000	>10
15,000	20
20,000	30
40,000	50
70,000	100
>110,000	>250

[1] Reference 1, Appendix E

[2] Distances should be interpolated based on traffic flow.

Exposure of Meteorological Instruments - The 10-meter meteorological tower at each PAMS site should be located such that the resulting measurement data are representative of the meteorological conditions that affect pollutant transport and dispersion within the area that the monitoring site is intended to represent. Meteorological instruments should be located away from the immediate influence of trees, buildings, steep slopes, ridges, cliffs, and hollows.

Additional guidance for siting meteorological instruments is given in References 4, 16, 17, 18, and 19.

3.0 MONITORING METHODS AND NETWORK OPERATIONS

3.1 MONITORING METHODS

The ***Code of Federal Regulations*** Part 50 (40 CFR 50) delineates the NAAQS for six ambient air pollutants, often termed "criteria" pollutants. The associated approved or "reference" methods for ambient sampling and analysis (in accordance with 40 CFR 53) are also codified in the appendices to Part 50. Acceptable equivalent methods, as determined by the procedures outlined in 40 CFR Part 53 (Reference 20), are periodically published by the EPA Atmospheric Research and Exposure Assessment Laboratory (AREAL). The most recent list is included in Appendix H of this document.

The PAMS rules (40 CFR 58) require the use of automated reference or equivalent methods to monitor for ambient concentrations of ozone, NO, NO_2, and NO_x, when measured at PAMS stations. Current methods for measuring NO_2 also measure NO and NO_x, therefore, the result of the PAMS rules is to require continuous monitoring for ozone and NO_2 and the additional reporting of the coincidently measured NO and NO_x.

The Federal Reference Method (FRM) for NO_2 has limited ability to accurately describe the role of NO_x in the local photochemical process during all periods of a summer day, and to discriminate among the impacts of various sources of NO_x. Consequently, EPA has encouraged State air pollution control agencies to employ more sensitive measurement techniques for NO_x. Additionally, EPA has noted the value of deploying instrumentation designed to measure total reactive oxides of nitrogen (NO_y), which includes such compounds as NO_x, NO, NO_2, peroxyacetyl nitrate (PAN), and nitric acid (HNO_3). Since the PAMS network is primarily designed to quantify the local precursors of ozone and not serve as an additional principal network for NO_2 attainment purposes, EPA is predisposed to allow such non-FRM techniques for the measurement of NO_x. Any techniques other than the FRM, however, will need to be detailed in the network description required by 40 CFR 58.40 and subsequently approved by the Administrator as part of an area-specific plan. Further, the Agency has recognized that the measurement of more highly oxidized forms of nitrogen requires a high degree of skill/training using non-standard techniques to measure pollutants at very low concentrations and has determined that it is premature to require such efforts in a routinely-operated network. Future revisions to this guidance will contain information for conducting more sensitive and definitive NO_x measurements.

With the promulgation of the PAMS rules, for the first time, EPA rules require national ambient monitoring for pollutants (such as VOC and meteorological parameters) which do not have associated NAAQS. Additionally, no FRMs have been established for these compounds. Consequently, to maintain a reasonable level of national consistency and comparability, States are required by 40 CFR 58, Appendix C, to follow the guidance for sampling and analysis of these parameters published in References 4, 16, 17, 18, and 19.

The ***Technical Assistance Document for Sampling and Analysis of Ozone Precursors*** (hereafter referred to as the ***Technical Assistance Document*** or TAD) provides technical information and guidance to Regional, State, and local air pollution control agencies responsible for measuring ozone precursor compounds in the ambient air. Sampling and analytical methodology for speciated VOC, total non-methane organic compounds (NMOC) and selected carbonyl compounds (*i.e.*, formaldehyde, acetaldehyde and acetone) are specifically addressed. This document also addresses the methodology for measuring NO_x and discusses many of the issues associated with measuring NO_y and includes technical direction, to supplement the information provided in Reference 16, for measuring the meteorological parameters prescribed by the regulations.

The technical guidance for measuring VOC ozone precursors is based on emerging and developing technology. Guidance for automated applications, in particular, is based to a significant extent on the experience obtained from the application of the technology during past ozone precursor studies such as the 1990 Atlanta Ozone Precursor Study. The VOC sampling and analysis methods explained in the ***Technical Assistance Document*** are based on these state-of-the-art emerging technologies, and they will be subjected to continuing evaluation and will be periodically revised to incorporate resulting improvements and clarifications.

3.2 OPERATING SCHEDULES AND SAMPLING FREQUENCIES

3.2.1 General Operating Requirements

In addition to requiring reasonably consistent methodologies for sampling precursors and meteorological parameters, 40 CFR 58.13 (and subsequently 40 CFR 58, Appendix D), specifies minimum network requirements and sampling frequencies. For clarity, Table 2 of Appendix D of the codified Rule has been reformatted and follows as Table 3-1. The monitoring requirements are explained further in Sections 3.2.3 to 3.2.6 of this document. In summary, these standards require the use of continuous monitors for ozone, NO_x and meteorological parameters. VOC and carbonyls can utilize manual methods, but due to the required frequencies, continuous monitoring technology appears to be more cost-effective. Further information on the target VOC listed in Reference 4 may be found in Tables 3-2 and 3-3.

Section 4.3 of 40 CFR 58, Appendix D, stipulates that the PAMS monitoring should be conducted annually throughout the months of June, July and August as a minimum. In most States, these months incorporate the periods when peak ozone values are likely to occur. EPA, however, encourages the States to extend the PAMS monitoring period whenever feasible to include the entire ozone season or perhaps the entire calendar year. Monitoring

TABLE 3-1. PAMS MINIMUM NETWORK REQUIREMENTS

MINIMUM NETWORK REQUIREMENTS

POPULATION OF MSA/CMSA	FREQ TYPE	SITE LOCATION
LESS THAN 500,000	A or C	(1)
	A/D or C/F	(2)
500,000 TO 1,000,000	A or C	(1)
	B/E	(2)
	A or C	(3)
1,000,000 TO 2,000,000	A or C	(1)
	B/E	(2)
	B/E	(2)
	A or C	(3)
GREATER THAN 2,000,000	A or C	(1)
	B/E	(2)
	B/E	(2)
	A or C	(3)
	A or C	(4)

VOC SAMPLING FREQUENCY REQUIREMENTS

Type	Requirement
A	8 3-Hour Samples Every Third Day 1 24-Hour Sample Every Sixth Day
B	8 3-Hour Samples Everyday 1 24-Hour Sample Every Sixth Day (year-round)
C	8 3-Hr Samples 5 Hi-Event/Previous Days & Every 6th Day 1 24-Hour Sample Every Sixth Day

CARBONYL SAMPLING FREQUENCY REQUIREMENTS

Type	Requirement
D	8 3-Hour Samples Every Third Day
E	8 3-Hour Samples Everyday
F	8 3-Hr Samples 5 Hi-Event/Previous Days & Every 6th Day

MINIMUM PHASE-IN

YEARS AFTER PROMULGATION	NUMBER OF SITES OPERATING	OPERATING SITE LOCATION RECOMMENDATION
1	1	2
2	2	2,3
3	3	1,2,3
4	4	1,2,3,4
5	5	1,2,2,3,4

which is conducted on an intermittent schedule should be coincident with the previously-established intermittent schedule for particulate matter sampling. The codified ozone monitoring seasons for the PAMS-affected States are displayed in Table 3-4.

TABLE 3-2. TARGET VOC OZONE PRECURSORS AND SYNONYMS

CHEMICAL ABSTRACT SERVICE, (CAS) #	PAMS RECOGNIZED REPORTING NAME	COMMON SYNONYM
74-86-2	Acetylene	Ethyne
74-85-1	Ethylene	Ethene
74-84-0	Ethane	Methylmethane
115-07-1	Propylene	Propene
74-98-6	Propane	Dimethylmethane
75-28-5	Isobutane	2-Methylpropane
106-98-9	1-Butene	Ethylethylene
106-97-8	n-Butane	Butane
624-64-6	trans-2-Butene	
590-18-1	cis-2-Butene	
563-45-1	3-Methyl-1-Butene	Isopropylethylene
78-78-4	Isopentane	2-Methylbutane
109-67-1	1-Pentene	Propylethylene
109-66-0	n-Pentane	Amyl Hydride
78-79-5	Isoprene	3-Methyl-1,3-Butadiene
646-04-8	trans-2-Pentene	
627-20-3	cis-2-Pentene	cis-ß-n-Amylene
513-35-9	2-Methyl-2-Butene	
75-83-2	2,2-Dimethylbutane	Neohexane
142-29-0	Cyclopentene	
691-37-2	4-Methyl-1-Pentene	
287-92-3	Cyclopentane	Pentamethylene
79-29-8	2,3-Dimethylbutane	Diisopropyl
107-83-5	2-Methylpentane	Isohexane
96-14-0	3-Methylpentane	Diethylmethylmethane
76-32-91	2-Methyl-1-Pentene	1-Methyl-1-Propylethylene
110-54-3	n-Hexane	
4050-47-7	trans-2-Hexene	
7688-21-3	cis-2-Hexene	
96-37-7	Methylcyclopentane	
108-08-7	2,4-Dimethylpentane	
71-43-2	Benzene	
110-82-7	Cyclohexane	Hexamethylene
591-76-4	2-Methylhexane	Isoheptane
565-59-3	2,3-Dimethylpentane	
589-34-4	3-Methylhexane	
540-84-1	2,2,4-Trimethylpentane	
142-82-5	n Heptane	Dipropylmethane
108-87-2	Methylcyclohexane	Hexahydrotoluene
565-75-3	2,3,4-Trimethylpentane	
108-88-3	Toluene	Methylbenzene
592-27-8	2-Methylheptane	Isooctane
589-81-1	3-Methylheptane	
111-65-9	n-Octane	
100-41-4	Ethylbenzene	Phenylethane
106-42-3	p-Xylene**	1,4-Dimethylbenzene
100-42-5	Styrene	Ethenylbenzene
95-47-6	o-Xylene	1,2-Dimethylbenzene
111-84-2	n-Nonane	Nonyl Hydride
98-82-8	Isopropylbenzene	Cumene
103-65-1	n-Propylbenzene	1-Phenylpropane
7785-70-8*	α-Pinene	
108-67-8	1,3,5-Trimethylbenzene	Mesitylene
95-63-6	1,2,4-Trimethylbenzene	Pseudocumene
127-91-3*	ß-Pinene	Nopinene
124-18-5	n-Decane	
1120-21-4	n-Undecane	
108-38-3	m-Xylene**	1,3-Dimethylbenzene
50-00-0	Formaldehyde	Oxymethylene
67-64-1	Acetone	Dimethylketone
75-07-0	Acetaldehyde	Acetic Aldehyde
-	Total non-methane organic compounds	Total NMOC

*Generic CAS #'s for these compounds. **Co-eluters on the GC column.

TABLE 3-3A. TARGET VOC OZONE PRECURSORS - HYDROCARBONS

CHEMICAL ABSTRACT SERVICE, (CAS) #	PAMS RECOGNIZED REPORTING NAME	AIRS PARAMETER CODE #	CHEMICAL FORMULA	PAMS RECOGNIZED ABBREVIATION
74-86-2	Acetylene	43206	C_2H_2	acety
74-85-1	Ethylene	43203	C_2H_4	ethyl
74-84-0	Ethane	43202	C_2H_6	ethan
115-07-1	Propylene	43205	C_3H_6	prpyl
74-98-6	Propane	43204	C_3H_8	propa
75-28-5	Isobutane	43214	C_4H_{10}	isbta
106-98-9	1-Butene	43280	C_4H_8	1bute
106-97-8	n-Butane	43212	C_4H_{10}	nbuta
624-64-6	trans-2-Butene	43216	C_4H_8	t2bte
590-18-1	cis-2-Butene	43217	C_4H_8	c2bte
563-45-1	3-Methyl-1-Butene	43282	C_5H_{10}	3m1be
78-78-4	Isopentane	43221	C_5H_{12}	ispna
109-67-1	1-Pentene	43224	C_5H_{10}	1pnte
109-66-0	n-Pentane	43220	C_5H_{12}	npnta
78-79-5	Isoprene	43243	C_5H_{10}	ispre
646-04-8	trans-2-Pentene	43226	C_5H_{10}	t2pne
627-20-3	cis-2-Pentene	43227	C_5H_{10}	c2pne
513-35-9	2-Methyl-2-Butene	43228	C_5H_{10}	2m2be
75-83-2	2,2-Dimethylbutane	43244	C_6H_{14}	22dmb
142-29-0	Cyclopentene	43283	C_5H_8	cypne
691-37-2	4-Methyl-1-Pentene	43234	C_5H_{10}	4m1pe
287-92-3	Cyclopentane	43242	C_5H_{10}	cypna
79-29-8	2,3-Dimethylbutane	43284	C_6H_{14}	23dmb
107-83-5	2-Methylpentane	43285	C_6H_{14}	2mpna
96-14-0	3-Methylpentane	43230	C_6H_{14}	3mpna
763-29-1	2-Methyl-1-Pentene	43246	C_6H_{12}	2m1pe
110-54-3	n-Hexane	43231	C_6H_{14}	nhexa
4050-47-7	trans-2-Hexene	43289	C_6H_{12}	t2hex
7688-21-3	cis-2-Hexene	43290	C_6H_{12}	c2hex
96-37-7	Methylcyclopentane	43262	C_6H_{12}	mcpna
108-08-7	2,4-Dimethylpentane	43247	C_7H_{16}	24dmp
71-43-2	Benzene	45201	C_6H_6	benz
110-82-7	Cyclohexane	43248	C_6H_{12}	cyhxa
591-76-4	2-Methylhexane	43263	C_7H_{16}	2mhxa
565-59-3	2,3-Dimethylpentane	43291	C_7H_{16}	23dmp
589-34-4	3-Methylhexane	43249	C_7H_{16}	3mhxa
540-84-1	2,2,4-Trimethylpentane	43250	C_8H_{18}	224tmp
142-82-5	n-Heptane	43232	C_7H_{16}	nhept
108-87-2	Methylcyclohexane	43261	C_7H_{14}	mcyhx
565-75-3	2,3,4-Trimethylpentane	43252	C_8H_{18}	234tmp
108-88-3	Toluene	45202	C_7H_8	tolu
592-27-8	2-Methylheptane	43960	C_8H_{18}	2mhep
589-81-1	3-Methylheptane	43253	C_8H_{18}	3mhep
111-65-9	n-Octane	43233	C_8H_{18}	noct
100-41-4	Ethylbenzene	45203	C_8H_{10}	ebenz
--	m/p-Xylene**	45109	--	m/pxy
106-42-3	(p-Xylene)**	45206	C_8H_{10}	pxyl
100-42-5	Styrene	45220	C_8H_8	styr
95-47-6	o-Xylene	45204	C_8H_{10}	oxyl
111-84-2	n-Nonane	43235	C_9H_{20}	nnon
98-82-8	Isopropylbenzene	45210	C_9H_{12}	ispbz
103-65-1	n-Propylbenzene	45209	C_9H_{12}	npbz
7785-70-8*	alpha-Pinene	43256	α-$C_{10}H_{16}$	apine
108-67-8	1,3,5-Trimethylbenzene	45207	C_9H_{12}	135tmb
95-63-6	1,2,4-Trimethylbenzene	45208	C_9H_{12}	124tmb
127-91-3	beta-Pinene	43257	β-$C_{10}H_{16}$	bpine
124-18-5	n-Decane	43238	$C_{10}H_{22}$	ndec
1120-21-4	n-Undecane	43954	$C_{11}H_{24}$	nundc
108-38-3	(m-Xylene)**	45205	C_9H_{12}	mxyl
--	Total Non-Methane Organic Compounds	43102	--	tnmoc

*Generic CAS # for this compound. **m-Xylene and p-Xylene co-elute on the GC column, use m/p-Xylene parameter code for reporting.

TABLE 3-3B. TARGET VOC OZONE PRECURSORS - CARBONYLS

CHEMICAL ABSTRACT SERVICE, (CAS) #	PAMS RECOGNIZED REPORTING NAME	AIRS PARAMETER CODE #	CHEMICAL FORMULA	PAMS RECOGNIZED ABBREVIATION
50-00-0	Formaldehyde	43502	HCHO	form
67-64-1	Acetone	43551	CH_3COCH_3	acet
75-07-0	Acetaldehyde	43503	CH_3CHO	aceta

TABLE 3-4. OZONE MONITORING SEASONS PAMS-AFFECTED STATES

STATE	BEGIN MONTH	END MONTH
California	January	December
Connecticut	April	October
Delaware	April	October
District of Columbia	April	October
Georgia	March	November
Illinois	April	October
Indiana	April	October
Louisiana	January	December
Maine	April	October
Maryland	April	October
Massachusetts	April	October
New Hampshire	April	October
New Jersey	April	October
New York	April	October
Pennsylvania	April	October
Rhode Island	April	October
Texas AQCR 4, 5, 7, 10, 11	January	December
Texas AQCR 1, 2, 3, 6, 8, 9, 12	March	October
Virginia	April	October
Wisconsin	April	October

3.2.2 Explanation of Specific PAMS Network Requirements

For ease in determining the specific monitoring requirements for any particular MSA/CMSA, the following sections detail the minimum network requirements specified by Table 3-1.

3.2.3 Requirements for MSA/CMSAs With Populations Less Than 500,000

The following is a summary of the PAMS monitoring requirements for small MSA/CMSAs having populations of less than 500,000, according to the most recent decennial United States census population report:

REQUIRED MONITORING SITE	POLLUTANT	MINIMUM MONITORING FREQUENCIES
SITE #1	VOC	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) **OR** if an agency chooses to monitor episodes, the following may be substituted: Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round)
	Carbonyls	No regulatory requirement - Monitoring is preferred according to the schedule chosen for VOC
SITE #2	VOC	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) and,
	Carbonyls	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) **OR** if an agency chooses to monitor episodes, the following may be substituted:
	VOC	Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) and,
	Carbonyls	Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and. One 24-hour sample every sixth day during the monitoring period (preferably year-round)

In addition to the required monitoring for VOC and carbonyls, the following monitoring for other measurements is specified by the Rule:

REQUIRED MONITORING SITE	POLLUTANT	MINIMUM MONITORING REQUIREMENTS
ALL SITES	Ozone	Continuous monitoring during the entire ozone season listed in Table 3-2
	Oxides of Nitrogen	Continuous monitoring during the PAMS monitoring period (preferably year-round)
	Meteorology	Surface (10-meter) continuous monitoring of wind speed/direction, ambient °T, barometric pressure, relative humidity, and solar radiation during the PAMS monitoring period (preferably year-round)
ONE REPRESENTATIVE SITE PER AREA	Upper Air Measurements	Continuous monitoring of mixing height or surrogate during the PAMS monitoring period (preferably year-round)

Since only two PAMS monitoring stations are required for these MSA/CMSAs, the recommended order for establishing sites is Site #2, then Site #1. The network should be complete within 2 years.

3.2.4 Requirements for MSA/CMSAs With Populations of 500,000 to 1,000,000

The following is a summary of the PAMS monitoring requirements for MSA/CMSAs having populations of 500,000 to 1,000,000, according to the most recent decennial United States census population report:

REQUIRED MONITORING SITE	POLLUTANT	MINIMUM MONITORING FREQUENCIES
SITE #1	VOC	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) **OR** if an agency chooses to monitor episodes, the following may be substituted: Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round)
	Carbonyls	No regulatory requirement - Monitoring is preferred according to the schedule chosen for VOC
SITE #2	VOC	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round and,
	Carbonyls	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round
SITE #3	VOC	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) **OR** if an agency chooses to monitor episodes, the following may be substituted: Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round)
	Carbonyls	No regulatory requirement - Monitoring is preferred according to the schedule chosen for VOC

In addition to the required monitoring for VOC and carbonyls, the following monitoring for other measurements is specified by the Rule:

REQUIRED MONITORING SITE	POLLUTANT	MINIMUM MONITORING REQUIREMENTS
ALL SITES	Ozone	Continuous monitoring during the entire ozone season listed in Table 3-2
	Oxides of Nitrogen	Continuous monitoring during the PAMS monitoring period (preferably year-round)
	Meteorology	Surface (10-meter) continuous monitoring of wind speed/direction, ambient °T, barometric pressure, relative humidity, and solar radiation during the PAMS monitoring period (preferably year-round)
ONE REPRESENTATIVE SITE PER AREA	Upper Air Measurements	Continuous monitoring of mixing height or surrogate during the PAMS monitoring period (preferably year-round)

Since three PAMS monitoring stations are required for these MSA/CMSAs, the recommended order for establishment of sites is Site #2, Site #3, then Site #1. The network should be complete within 3 years.

3.2.5 Requirements for MSA/CMSAs With Populations of 1,000,000 to 2,000,000

The following is a summary of the PAMS monitoring requirements for MSA/CMSAs having populations of 1,000,000 to 2,000,000, according to the most recent decennial United States census population report:

REQUIRED MONITORING SITE	POLLUTANT	MINIMUM MONITORING FREQUENCIES
SITE #1	VOC	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) **OR** if an agency chooses to monitor episodes, the following may be substituted: Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round)
	Carbonyls	No regulatory requirement - Monitoring is preferred according to the schedule chosen for VOC
SITE #2	VOC	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round and,
	Carbonyls	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round
SITE #2 (Second)	VOC	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round and,
	Carbonyls	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round
SITE #3	VOC	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) **OR** if an agency chooses to monitor episodes, the following may be substituted: Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round)
	Carbonyls	No regulatory requirement - Monitoring is preferred according to the schedule chosen for VOC

In addition to the required monitoring for VOC and carbonyls, the following monitoring for other measurements is specified by the Rule:

REQUIRED MONITORING SITE	POLLUTANT	MINIMUM MONITORING REQUIREMENTS
ALL SITES	Ozone	Continuous monitoring during the entire ozone season listed in Table 3-2
	Oxides of Nitrogen	Continuous monitoring during the PAMS monitoring period (preferably year-round)
	Meteorology	Surface (10-meter) continuous monitoring of wind speed/direction, ambient °T, barometric pressure, relative humidity, and solar radiation during the PAMS monitoring period (preferably year-round)
ONE REPRESENTATIVE SITE PER AREA	Upper Air Measurements	Continuous monitoring of mixing height or surrogate during the PAMS monitoring period (preferably year-round)

Since four PAMS monitoring stations are required for these MSA/CMSAs, the recommended order for establishment of sites is Site #2, Site #3, Site #1, then the second Site #2. The network should be complete within 4 years.

3.2.6 Requirements for MSA/CMSAs With Populations of Greater Than 2,000,000

The following is a summary of the PAMS monitoring requirements for MSA/CMSAs having populations of greater than 2,000,000, according to the most recent decennial United States census population report:

REQUIRED MONITORING SITE	POLLUTANT	MINIMUM MONITORING FREQUENCIES
SITE #1	VOC	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) OR if an agency chooses to monitor episodes, the following may be substituted: Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round)
	Carbonyls	No regulatory requirement - Monitoring is preferred according to the schedule chosen for VOC
SITE #2	VOC	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round and,
	Carbonyls	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round

REQUIRED MONITORING SITE	POLLUTANT	MINIMUM MONITORING FREQUENCIES
SITE #2 (Second)	VOC	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round and,
	Carbonyls	Eight 3-hour samples every day during the monitoring period and, One 24-hour sample every sixth day year-round
SITE #3	VOC	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) **OR** if an agency chooses to monitor episodes, the following may be substituted: Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round)
	Carbonyls	No regulatory requirement - Monitoring is preferred according to the schedule chosen for VOC
SITE 4	VOC	Eight 3-hour samples every third day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round) **OR** if an agency chooses to monitor episodes, the following may be substituted: Eight 3-hour samples on the five peak ozone days plus each previous day and, Eight 3-hour samples every sixth day during the monitoring period and, One 24-hour sample every sixth day during the monitoring period (preferably year-round)
	Carbonyls	No regulatory requirement - Monitoring is preferred according to the schedule chosen for VOC

In addition to the required monitoring for VOC and carbonyls, the following monitoring for other measurements is specified by the Rule:

REQUIRED MONITORING SITE	POLLUTANT	MINIMUM MONITORING REQUIREMENTS
ALL SITES	Ozone	Continuous monitoring during the entire ozone season listed in Table 3-2
	Oxides of Nitrogen	Continuous monitoring during the PAMS monitoring period (preferably year-round)
	Meteorology	Surface (10-meter) continuous monitoring of wind speed/direction, ambient °T, barometric pressure, relative humidity, and solar radiation during the PAMS monitoring period (preferably year-round)
ONE REPRESENTATIVE SITE PER AREA	Upper Air Measurements	Continuous monitoring of mixing height or surrogate during the PAMS monitoring period (preferably year-round)

Since five PAMS monitoring stations are required for these MSA/CMSAs, the recommended order for establishment of sites is Site #2, Site #3, Site #1, Site #4, and then the second Site #2. The network should be complete within 5 years.

Intermittent monitoring in all MSA/CMSAs, regardless of population, should be coincident with the previously-established intermittent schedule for particulate matter to ensure a degree of national consistency in accordance with 40 CFR 58, Appendix D, Section 4.3.

3.3 ALTERNATIVE SAMPLING AND ANALYSIS METHODOLOGY

EPA recognizes that State and local air pollution control agencies will be subject to unique problems and authority limitations. Further, their operation of the PAMS network may need to be tailored to complement unusual geographical and demographical situations, especially distinctive meteorology. Appendix C of 40 CFR 58 notes that deviations from the guidance are acceptable for sampling and analysis so long as the alternatives are detailed in the network description required by §58.40 and subsequently approved by the Administrator.

3.4 MONITORING FOR AIR TOXICS

An urban air toxics monitoring research program is required for a number of VOC species and other hazardous air pollutants by Title III, Section 301, of the CAAA. EPA believes that the PAMS stations will be available as platforms for the additional monitoring of air toxics compounds. Specifically, it is noted by the Agency that by measuring the VOC targeted in Reference 4, a number of toxic air pollutants will also be measured. Although compliance with Title I, Section 182 of the Act does not require the measurement and analysis of additional toxic air pollutants, the Agency believes that the PAMS stations can serve as cost-effective platforms for an enhanced air toxics research and ambient monitoring program. The adjunct use of PAMS for air toxics monitoring will allow the consideration of air toxics impacts in the development of future ozone control strategies. The establishment of a second PAMS #2 site will provide an even better database for such uses. The Agency, however, notes that the PAMS network is not ideally located as a source of primary air toxics data, but the network will serve as a base for future air toxics monitoring activities.

Methods typically used for air toxics measurement are not addressed in this guidance document. Manual methods, such as canister sampling for VOC species, will be used for both quality assurance purposes to check the continuous VOC measurement data and to provide estimates of annual means for air toxics assessment purposes. Other hazardous compounds, including metals, pesticides, semi-volatiles, polar compounds and products of incomplete combustion (PICs) will be measured, provided resources are available.

4.0 PAMS NETWORK PLAN AND APPROVAL

4.1 INTRODUCTION

Two types of network plans are allowed under the Part 58 PAMS regulations: (1) a standard network plan, which conforms to the criteria for a network description as described in Section 58.41 and Appendices A and D of the Rule, including all of the elements listed; and (2) an alternate network plan, which includes one or more of the acceptable alternative network elements described in the Rule, but otherwise complies with the criteria for a standard network.

The procedures for reviewing a State or local agency PAMS network plan consist of two steps: in the first step, the submitted network plan is reviewed for administrative completeness; in the second step, the plan is reviewed for conformance to the PAMS acceptance criteria.

4.2 REQUIREMENTS FOR STANDARD PAMS NETWORK PLANS

The Part 58 regulations allow for submittal of standard or alternate network plans. Standard network plans, which are described in this section, conform to the criteria for a network description outlined in Section 58.41 and Appendices A and D of the Rule. In order for a standard plan to be approved the plan must meet the completeness criteria contained in Section 4.2.2 and the acceptance criteria of Section 4.2.3. A summary of the review and approval process and a description of the completeness and acceptability criteria for standard network plans are included in the remainder of this section. A decision tree flow diagram of this procedure is presented in Figure 4-1.

FIGURE 4-1. PROCEDURES FOR REVIEW AND APPROVAL OF STANDARD PAMS NETWORK PLANS

4.2.1 Summary Procedures for Review and Approval of a Standard PAMS Network Plans

1. State/local agencies prepare a PAMS standard network plan (including the critical elements and sub-items of a standard plan which are listed and described in Section 4.2.2) and declare the plan as a standard plan. Joint network plans may be submitted by groups of State/local agencies in accordance with Section 58.40 of the 40 CFR Part 58 regulations. Agencies are encouraged to work with Regional Offices in network plan development.

2. The plan is submitted to the appropriate EPA Regional Office for preliminary review. If any of the critical elements are missing or considered inadequate, the Regional Office requests that the submitting agency remit the additional or revised material and notifies EPA Headquarters of the plan receipt and status.

3. State/local agencies submit missing and/or new material to the Regional Office which reviews the material for completeness and adequacy, and subsequently forwards the information to EPA Headquarters with the Regional recommendation when deemed complete.

4. EPA Headquarters conducts a general review of the overall plan and reviews the standard network plan according to the standard plan completeness criteria described in Section 4.2.2. If any of the critical items are judged to be incomplete or missing, the Regional Office is contacted, which in turn requests the additional or missing material from the responsible agency or agencies (in the case of a multi-area plan).

5. EPA Headquarters reviews the resubmitted material and determines if the plan submittal is complete. If incomplete, the cycle is repeated until the plan satisfies the

completeness criteria. After a plan is determined to be complete, it is sent to the EPA PAMS Network Design Review Committee (Review Committee) for a standard network plan acceptability determination. If the submitted plan is judged to contain any of the Part 58 allowable alternative plan revisions, the plan is reviewed according to the alternative plan review procedures presented in Section 4.3.1. Before proceeding with the alternative plan review process, EPA Headquarters notifies the Regional Office that the plan is considered to be an alternative plan and that a final decision is needed from the responsible agency official(s) on whether EPA should proceed. The Regional Office notifies the appropriate agency; if that agency's official(s) agree that the plan is an alternative network plan and desire an alternative plan review, the plan is processed according to the alternative plan review procedures presented in Section 4.3.1. If the agency disagrees and prefers to continue to seek a standard plan review, alternative plan provision(s) must be removed and replaced with the standard network plan provision(s).

6. The Review Committee reviews the standard network plan for conformance to the standard plan acceptance criteria listed and described in Section 4.2.3 (Alternative plan acceptance criteria are described in Section 4.3.3). If the submitted plan is determined to conform to the standard plan acceptance criteria, the Review Committee recommends approval of the network plan and forwards it to the EPA approving official for formal approval. **Note that formal approval is only for each of the sites that are to be established in the next ozone monitoring period. The process is repeated each year additional sites are to be implemented. Complete approval of the entire network plan is contingent upon completion of each phase of the network description including conformance to the PAMS network design criteria.**

7. The EPA approving official signs an approval memorandum and sends it to the Regional Office which notifies responsible agency official(s).

8. If the Review Committee determines that the standard network plan does not satisfy the critical elements, the Regional Office is contacted. The Regional Office notifies the responsible submitting agency official(s) of the deficiencies and requests corrective action to be taken. EPA Headquarters holds the plan in abeyance until the plan corrections are received.

9. The State/local agency submits the corrected deficiencies to the Regional Office. The Regional Office reviews the material for completeness and forwards it to EPA Headquarters with the Regional recommendation when judged complete.

10. The Review Committee reviews corrections and if the revised plan is determined to conform to the standard plan acceptance criteria, the Review Committee recommends plan approval and forwards it to the EPA approving official for formal approval.

11. The EPA approving official signs the PAMS standard network plan approval memorandum and submits it to the Regional Office which then notifies the responsible agency official(s).

4.2.2 Completeness Criteria for Standard PAMS Network Plans

The completeness determination consists of checking the submitted plan against the prescribed list of critical elements of a network plan, which have been grouped into the following categories:

- Network overview
- Site identification
- Sampling and analysis methods
- Monitoring period
- Sampling frequencies
- Meteorological monitoring
- Network implementation schedule
- Quality assurance

In order to be considered complete, a plan must include each of these basic elements. Within these basic elements are a number of specific items that need to be included in the plan in order for the basic element to be complete. These specific items are described in Section 4.2.3.

When submitting a completed standard network plan to the EPA Regional Office, the responsible State or local agency should label it as a standard plan, and ensure that it contains all the critical elements described in this section and listed in the Checklist contained in Section 4.4. The elements of the submitted network plan must fully conform to the criteria laid out in this section and 40 CFR Part 58. If the review by the EPA Regional Office determines that any of the critical elements are missing and/or the plan is considered inadequate, the submitting agency will be requested to provide the missing items and/or submit additional material. After the standard network plan is deemed complete and adequate by the Regional Office, it is forwarded to EPA Headquarters.

To avoid delay and confusion in the approval process, all materials required as part of a network plan submittal must be included in the submittal package. References alone to other documents or database retrievals are not acceptable.

The remainder of this section is devoted to detailed descriptions of the categories of critical elements listed previously. The individual critical elements which make up each category are enumerated, along with the criteria for acceptability.

4.2.3 Acceptance Criteria for Standard PAMS Network Plans

Once the standard network plan is determined to be administratively complete, it is forwarded to the Review Committee where it is reviewed for conformance to the standard plan acceptance criteria, which are based on the network plan requirements specified in the regulations.

Network Overview - In order to be acceptable, a PAMS MSA/CMSA network plan must include a clear description of the entire network. The network overview should contain a brief narrative describing the number and types of sites that will make up the network, and the rationale for their placement. The narrative should also briefly describe the monitoring area represented, noting any geographical features, emissions information, meteorological and climatological trends, or other factors which influenced the design of the network. Pertinent information must be included as a part of the network plan submittal package, rather than referenced.

Each PAMS network description must include a description of the monitoring area represented [Section 58.41 (a)]. The description of the monitoring area represented must include information on the population and nonattainment status of the network plan MSA/CMSA. The number and types of PAMS sites required for a given area depend on these two factors (Table 4-1). For areas with serious, severe, or extreme nonattainment status, the minimum requirements vary from two sites for an MSA/CMSA with a population under 500,000; to five sites for an MSA/CMSA with a population over 2,000,000. Further guidance on network design and siting is provided in Section 2 of this document. The description must

TABLE 4-1. MINIMUM PAMS NETWORK REQUIREMENTS[a]

Population of MSA/CMSA or nonattainment area[b]	Number of sites of each type			
	Upwind Background (#1)	Maximum Representative Precursors (#2)	Maximum Ozone (#3)	Downwind Transport (#4)
Less than 500,000	✓	✓		
500,000 to 1,000,000	✓	✓	✓	
1,000,000 to 2,000,000	✓	✓✓	✓	
More than 2,000,000	✓	✓✓	✓	✓

[a] For nonattainment areas classified as serious, severe, or extreme
[b] Whichever is larger

also include a map of the entire MSA/CMSA, showing the proposed relative location of the sites that make up the PAMS network, and a detailed area map showing the precise location for the sites to be installed during the current ozone monitoring period. In addition, the description should include the street address, County, Parish, or Township; Latitude/Longitude; and Universal Transverse Mercator (UTM) coordinates for each proposed site which is scheduled for operation in the next ozone monitoring period. Other information, such as emissions inventories for ozone precursors, meteorological data, climatological summaries, or topographic maps showing land features and geographical influences must be included. Preferred examples of this information are provided in Appendix I.

Provisions have been made in the regulations to allow for alternative networks with a different number or arrangement of sites, including multi-area networks covering several MSAs/CMSAs (40 CFR Part 58, Appendix D, Section 4.2). Plans containing an alternate number or arrangement of sites must be submitted as alternate network plans in accordance with the requirements for submittal of alternative network plans discussed in Section 4.3 of this manual.

Site Identification - Detailed information, noted in the previous section and further described or demonstrated in Appendix I, must be supplied for sites to be implemented in the next ozone monitoring period. In order to be complete, a PAMS network plan should include the following for each site scheduled for operation in the next ozone monitoring period.

1. AIRS site and monitor ID information for each proposed station [See list of required information in the Checklist (Section 4), Section III, Part B].

2. Morning wind roses for high ozone days (days exceeding 0.1 ppm) or ozone conducive days for Site #1 and Site #2 monitoring sites. Alternate methods of specifying the wind direction must be approved by EPA. (40 CFR Part 58, Appendix D, Section 4.2). In situations where simple wind roses are not applicable, appropriate representative wind direction summaries should be included.

3. Afternoon wind roses for high ozone days or ozone conducive days for Site #3 and Site #4 monitoring sites. Alternate methods of specifying the wind direction must be approved by EPA. (40 CFR Part 58, Appendix D, Section 4.2).

4. Maps showing nearby ozone precursor emission sources of 10 tons/year or greater for the immediate surroundings of the site (within ¼ mile of the site), and a less detailed map for the entire MSA/CMSA (See Appendix I of this document for a detailed description of required emissions information for sites to be established in future years).

5. Breakdown of source categories (mobile/point/area). (See Appendix I of this document).

6. Description of terrain around sites, including roadways and land use (topographic map preferred).

7. Photographs and/or video of sites.

8. Details of meteorological monitoring.

9. Other information as available - modeling information, saturation monitoring results, etc.

Detailed site information must be submitted to the Regional Office no later than January 1 of the year in which a site is scheduled for implementation [40 CFR Part 58, Section 58.41(d)]. Less detailed information (a map of the general location of the site, a description of the site number, and morning and afternoon wind roses for high ozone days) should be supplied for sites to be implemented in future years [40 CFR Part 58, Section 58.41(d)].

Sampling and Analysis Methods - The PAMS program requires monitoring of multiple pollutants (NO, NO_2, NO_X, ozone, carbonyls, and speciated VOC) at each of the sites in affected MSAs/CMSAs. In order to ensure that comparable data are produced, it is essential that the sampling and analysis methodologies called for in the Part 58 regulations and the ***Technical Assistance Document***, are used by all PAMS networks.

Use of automated reference or equivalent methods (40 CFR Part 58, Section 50.1) is required for ozone, and recommended for NO, NO_2, and NO_x (40 CFR Part 58, Appendix C, Sections 4.1 and 4.2). VOC and carbonyl monitoring must be performed using the methods described in the TAD (40 CFR Part 58, Appendix C, Section 4.3) or approved alternative methodology. Meteorological measurements must be conducted according to the guidance in the TAD described above, and the ***Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV, Meteorological Measurements*** (40 CFR Part 58, Appendix C, Section 4.3). Details of reference or equivalent methods and unmodified methods from the TAD need not be included in network plan submittals; they may be referenced.

Regulatory provisions allow for the use of alternative methods to measure NO, NO_2, NO_x, VOC, and carbonyls (40 CFR Part 58, Appendix C, Sections 4.2 and 4.3). Plans which include any modifications to the designated methods, or propose alternate methodologies, must be submitted as alternative network plans in accordance with the requirements discussed in Section 4.3 of this document. Complete documentation of the modification or alternative methods must be submitted with the alternate network plan.

Monitoring Period - At a minimum, ozone precursor monitoring must be conducted during the months of June, July, and August, when peak ozone conditions are generally expected. Monitoring during the entire prescribed ozone season for an area as defined in 40 CFR Part 58, Appendix D, is preferred. Alternate precursor monitoring periods may be submitted for approval as part of a PAMS alternative network description (40 CFR Part 58, Appendix D, Section 4.3) in accordance with the requirements described in Section 4.3 of this manual.

Sampling Frequencies - Monitoring of ozone for the PAMS network must be continuous, and on the same schedule as the NAMS/SLAMS networks (40 CFR Part 58, Appendix D, Section 2.5). Monitoring for NO, NO_2, and NO_x should be continuous and may be limited to the months of June, July and August. Several sampling frequency options are available for monitoring of VOC and carbonyls by PAMS networks (see Section 4.3.2 of this document) (40 CFR Part 58, Appendix D, Section 4.4, Table 2). Some of the available sampling frequency options call for monitoring on and before peak ozone days. Agencies choosing to use these options must provide a description of the ozone event forecasting scheme they will use to predict peak ozone days and a demonstration of its effectiveness (40 CFR Part 58, Appendix D, Section 4.4). The demonstration must be based on recent ambient ozone data (preferably not more than 5 years old), from years that are representative of typical weather patterns in the area.

The regulations provide for the use of alternative sampling frequencies [40 CFR Part 58, Section 58.40(a)(3)]. Plans containing alternative sampling frequencies must be submitted as alternate network plans, in accordance with the requirements described in Section 4.3. In order to be approved, a PAMS network plan incorporating an alternative sampling frequency must include a demonstration of its equivalency with the prescribed Part 58 PAMS frequency.

Meteorological Monitoring - Each PAMS station, or a nearby area representative of each PAMS, must be equipped with meteorological monitoring equipment, including wind measurements at 10 meters above ground (40 CFR Part 58, Appendix D, Section 4.6). Details on the meteorological equipment at each site must be included in the individual site description.

One upper air meteorological monitoring site is required for each PAMS-affected area. The upper air monitoring site may be located separately from the other PAMS sites, but it must be representative of the upper air data in the MSA/CMSA nonattainment area (40 CFR Part 58, Appendix D, Section 4.6). The PAMS network description must contain a detailed description of the upper air monitoring measurement system, including monitoring methods and frequencies, and specific site location.

Network Implementation Schedule - PAMS network plans must include a schedule for implementing the entire network [40 CFR Part 58, Section 58.41(h)]. The schedule must include a timetable for locating, establishing, and submitting the AIRS site ID form for each scheduled PAMS site that has not been located at the time the network plan is submitted. The schedule must include a timetable for phasing in the required number and types of sites according to the priorities defined in 40 CFR Part 58, Appendix D, Sections 4.4 and 4.5. The recommended order of site implementation called for in Part 58 is as follows: primary Site #2, Site #3, Site #1, Site #4, and last, the secondary Site #2.

Quality Assurance (QA) - PAMS network plans must include a schedule for modification of the QA program already in place for NAMS/SLAMS to include QA for the PAMS network [40 CFR Part 58, Section 58.41 (h)(3)]. PAMS QA programs must be designed in accordance with the provisions of 40 CFR Part 58, Appendix A, which includes requirements for QA activities and reporting, and data quality assessment.

4.3 REQUIREMENTS FOR ALTERNATIVE PAMS NETWORK PLANS

If a proposed plan has been determined to contain any of the alternative elements that are allowed under the alternative element provisions of the regulations (alternate sampling and analysis methods, sampling frequency, sampling period, number and type of sites, and alternate procedures for selecting wind direction), the plan is declared an alternate plan. In order for an alternative plan to be approved the plan must meet the completeness criteria contained in Section 4.3.3 and the acceptance criteria of Section 4.3.4. The completeness criteria for alternative plans include all of the requirements of a standard plan plus the Section 4.3.3 criteria. Alternate plans are subject to additional network plan submittal requirements as described in this section. The plan is examined for administrative completeness with regard to these additional items. If the plan is found to be incomplete, the submitting agency will be notified and requested to submit the missing information or data. After the alternative plan is judged to be administratively complete, it is forwarded to the Review Committee and evaluated for conformance to the acceptance criteria for alternative plans. The alternative network plan review and approval process is summarized below, and illustrated in a decision tree flow diagram (Figure 4-2).

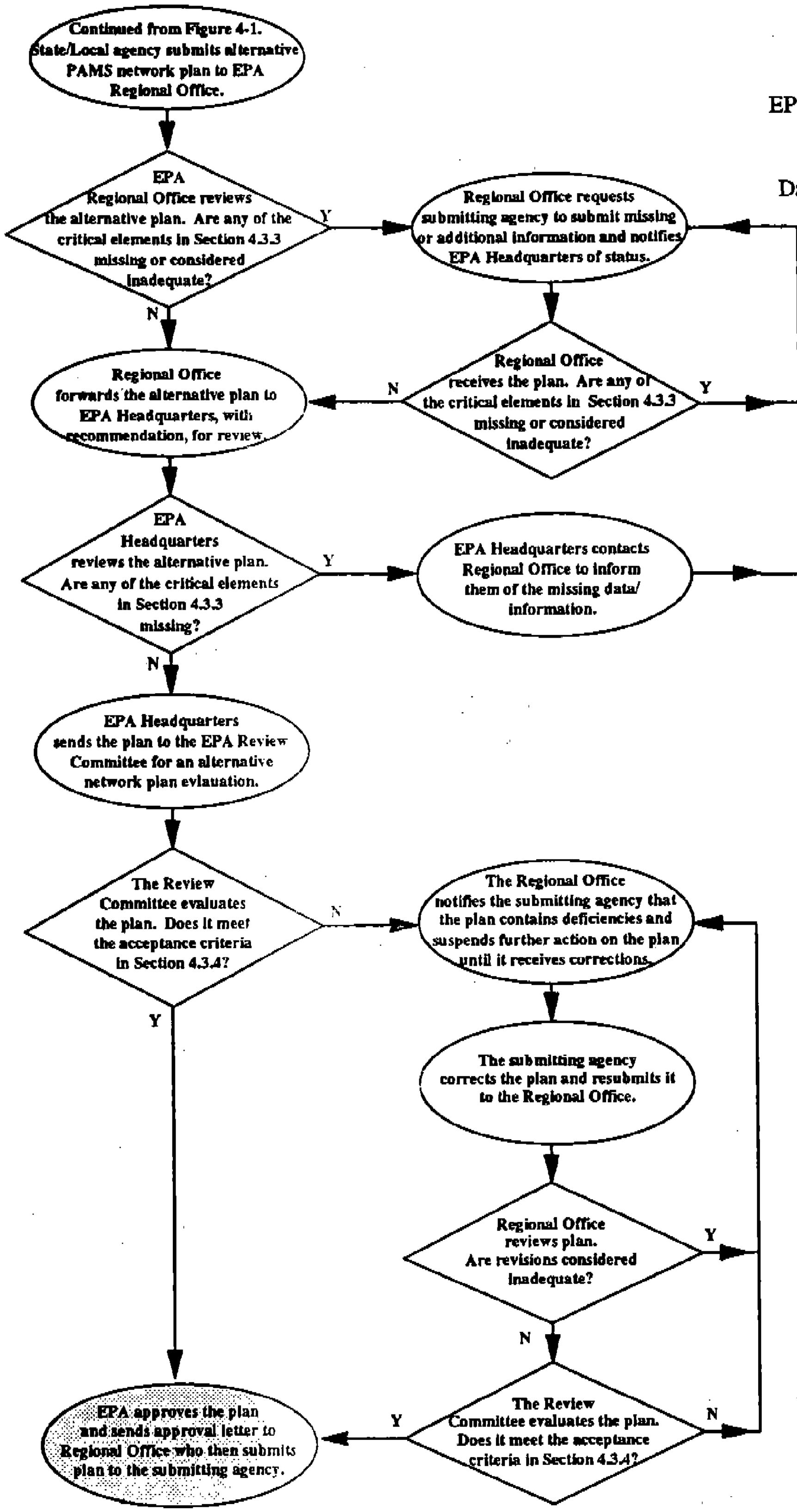


FIGURE 4-2. PROCEDURES FOR REVIEW AND APPROVAL OF ALTERNATIVE PAMS NETWORK PLANS

4.3.1 Summary Procedures for Review and Approval of Alternative PAMS Network Plans

1. State/local agencies prepare a PAMS alternative network plan (includes the critical elements of an alternative plan which are listed and described in this section). Agencies are encouraged to work with the Regional Offices during plan development.

2. The plan is submitted to the EPA Regional Office for preliminary review. If any of the PAMS alternative plan critical elements items are missing or considered inadequate, the Regional Office requests the submitting agency to send the missing material and/or revise the submitted material.

3. The State/local agencies submit missing or revised material to the Regional Office; the Regional Office reviews the material for completeness and adequacy and forwards it to EPA Headquarters with the Regional recommendation when it is considered complete and adequate.

4. EPA Headquarters reviews the network plan for the alternative plan completeness determination. If any of the critical element items of an alternative plan are valued as incomplete or missing, the Regional Office is contacted, which in turn requests the additional or missing material from the responsible agency or agencies (in the case of a multi-area plan).

5. The State/local agency sends the missing or additional material to the appropriate Regional Office. Regional Office sends the material to EPA Headquarters with the Regional recommendation when ruled complete and adequate.

6. EPA Headquarters reviews the resubmitted material and determines whether the alternative plan submittal is complete. If incomplete, the cycle is repeated until the plan satisfies the completeness criteria. After the alternative plan is determined to be complete, it is sent to the EPA Review Committee for an alternative plan acceptability determination.

7. The EPA Review Committee reviews the alternative network plan for conformance to the acceptance criteria for an alternative plan. If the submitted plan is determined to conform to the alternative plan acceptance criteria, the Review Committee recommends approval of the network plan and forwards the plan to the EPA approving official for formal approval. **Note that the PAMS alternative network plan formal approval only applies to each of the sites that are to be established in the next ozone monitoring period. The process is repeated each year for all additional sites scheduled for implementation in that same year. Complete approval of the entire network plan is contingent upon completion of each phase of the entire network description.**

8. The EPA approving official signs an alternative network plan approval memorandum and sends it to the Regional Office, which notifies the responsible agency official(s).

9. If the EPA Review Committee determines that the alternative network plan does not satisfy the critical elements delineated in Section 4.3, the Regional Office is contacted. The Regional Office notifies the responsible submitting agency official(s) of the deficiencies and requests that corrective action be taken. EPA Headquarters holds the plan in abeyance until the plan corrections are received. In some cases EPA may consider a plan for conditional approval.

10. The State/local agency submits the corrected deficiencies to the appropriate Regional Office. The Regional Office reviews the material for completeness and forwards to EPA Headquarters with a recommendation when the Region considers the corrected alternative network plan complete.

11. The EPA Review Committee reviews the corrections. If the revised plan is determined to conform to the alternative plan acceptance criteria, the Review Committee recommends approval of the alternative plan and forwards the plan to the EPA PAMS network plan approving official for formal approval.

12. The EPA approving official signs the PAMS alternative network plan approval memorandum and submits it to the Regional Office which then notifies the responsible agency official(s).

4.3.2 Regulatory Provisions for Alternative PAMS Network Plans

The PAMS regulations have been crafted to allow PAMS networks to be tailored to fit the individual needs of State and local programs. The purpose of the flexibility written into the rule is to ensure that the overall goals of the PAMS program are met while allowing for States to design their networks and take into account any factors that are unique to their own programs (*e.g.*, problems, strategies, limitations, and particular authorities, or physical constraints such as geography, demographics, or unusual meteorology).

The PAMS regulations contain provisions for alternative network elements in five areas:

- Sites - Number and Arrangement
- Methodology - Sampling and Analysis
- Monitoring Season - Months with Highest Ozone

- Sampling Frequency
- Meteorology - Establishing Wind Directions for Siting

If a State chooses to incorporate one or more of these alternative elements in its PAMS network design submittal, it must state that its submittal is an alternative PAMS network design. In order to be accepted, a network plan containing alternative elements must demonstrate fulfillment of the PAMS monitoring objectives and program objectives. The PAMS monitoring objectives are the basis for the four PAMS site designations and include the following:

- Upwind background (#1 Sites)
- Representative maximum precursors (#2 Sites)
- Maximum ozone (#3 Sites)
- Downwind transport (#4 Sites)

The PAMS program objectives are also referred to as PAMS data uses and include the following (more detailed descriptions are included in Section 4.3.4):

- NAAQS attainment and control strategies
- SIP control strategy evaluation
- Emissions tracking
- Exposure assessment
- Support for urban airshed modeling

4.3.3 Completeness Criteria For Alternative PAMS Network Plans

Network plans for PAMS networks containing alternative elements must include all the elements of a standard PAMS network plan. Alternative network plans must also include the following documentation:

- Narrative explanation of the alternative element(s)
- Justification for the alternative elements
- Demonstration of comparability

An alternative network plan will be considered complete if each of these items and associated material is presented. Alternative elements must correspond to one of the five alternative element areas specified in the regulations. If material from one part of a network plan submittal is applicable elsewhere (for example, a justification for an alternative method), it may be referenced in the other portions of the plan. For each required documentation, however, the applicable material must be contained somewhere within the submittal package. Network plan submittals containing references to sources not contained within the submittal package will be considered incomplete. After review by the Regional Office, if any element is found missing or considered inadequate, the submitting agency will be asked to supply the missing items.

Section 4.3.4 of this document contains more detailed guidance on the types of information that may be used to fulfill this requirement, and instances in which such demonstrations may be required.

4.3.4 Acceptance Criteria For Alternative PAMS Network Plans

After the alternative network plan is determined to be administratively complete, it must be reviewed for conformance to the alternative plan acceptance criteria. These criteria are as follows:

- The acceptance criteria for all the standard elements contained in the alternative plan (Section 4.2.2 of this document)
- A detailed narrative explanation of the alternative elements
- A justification for the alternative elements
- A demonstration of compliance with the monitoring objectives and data uses

The standard network plan acceptance criteria are described in Section 4.2.2 of this document. To be considered acceptable, the narrative explanation must clearly describe the proposed alternative elements. For example, if an alternate measurement method is proposed, a complete description of the alternate method must be included in the plan. Details similar to those included in standard operating procedures (SOPs) should be submitted. The justification should fully explain why the alternative element is proposed, such as geographical constraints, local ordinance restrictions, physical obstructions, and/or improved data quality. The comparability demonstration must provide a thorough explanation showing that the proposed alternative network will produce results comparable to those produced by a standard PAMS network, and that the proposed network will fulfill the PAMS monitoring objectives and data uses. When using alternative sampling or analytical methods (including meteorological methods) or alternative sampling or monitoring frequencies, the documentation for the demonstration must: (a) include historical data collected within the last three years or during the time period used to declare the MSA/CMSA nonattainment, and (b) show a relationship between the proposed alternative methodology and the methodology described in the TAD. Rulings on the acceptability of alternative methods will be made on a case-by-case basis by the EPA Review Committee.

The PAMS regulations were designed to allow flexibility in implementation. They contain several provisions for alternatives to the prescribed standard network design. Section 58.40(a)(3) of the PAMS regulations states "Alternative networks, including different monitoring schedules, periods, or methods, may be submitted, but they must include a demonstration that they satisfy the monitoring data uses and fulfill the PAMS monitoring objectives as described in sections 4.1 and 4.2 of appendix D to this part." Sections 4.1 and 4.2 of Appendix D to 40 CFR Part 58 contain detailed descriptions of the PAMS data uses and monitoring objectives, respectively.

There are five major PAMS data uses described in Section 4.1 of Appendix D to 40 CFR Part 58. Alternative network plans must demonstrate that they can meet these data uses:

- NAAQS attainment and control strategy development
- SIP control strategy evaluation
- Emissions tracking
- Trends
- Exposure assessment

The five major data uses, examples of particular data uses specified in the regulations, and how alternative network plans will be assessed on their ability to meet these data uses are discussed in the following sections.

In addition, the regulations specify certain uses within the five major categories of data uses. Each of these particular uses is listed below and discussed in the context of how to demonstrate that an alternative network plan will meet these particular uses. In cases where a particular use may be met based on another objective or criterion, the discussion will indicate how to reference the material contained elsewhere and explain how the other material is relevant to meeting a particular data use.

NAAQS Attainment and Control Strategy Development - For this PAMS data use category, the regulations list the following six particular uses and additional subsidiary uses:

- monitor exceedances
- provide input for attainment/nonattainment decisions
- help resolve roles of transported and locally emitted ozone precursors in producing an observed exceedance
- identify specific sources emitting excessive ozone precursor concentrations and potentially contributing to ozone exceedances
- enhance the characterization of ozone concentrations
- provide critical information on the precursors causing ozone and thus extend the database for future demonstrations based on photochemical grid modeling and other approved analytical methods
    - -- areas and episodes to model to develop appropriate control strategies
    - -- boundary conditions required by the models to produce quantifiable estimates of necessary emissions reductions
    - -- evaluation of the predictive capability of the models used

Particular uses, such as monitoring exceedances of the NAAQS and helping to resolve the role transported and locally emitted ozone precursors play in producing observed exceedances, are strongly dependent on meeting criteria for site locations, sampling frequency, and monitoring period. The criteria used to assess the adequacy of the alternative plan for a particular data use will be whether the alternative network plan provides data of sufficient quantity, quality, representativeness, and comparability compared to the standard network design. Among the questions that should be answered are the following:

1. Will the alternative network design provide data that are compatible with making an informed attainment/nonattainment decision? For example, will the design capture the highest ozone concentration days? Will the time resolution of ozone precursors be compatible with meteorological measurements and allow adequate differentiation of upwind/downwind conditions and transport?

2. Will the alternative network design provide data that are compatible in spatial and temporal bounds and resolution with applicable photochemical grid models?

3. Are there special conditions (either geographic, meteorological, or logistical) that would prevent the standard network design from being implemented or providing the data intended, or are there special conditions that mean that the alternative network design will do a better job of meeting the data uses or other PAMS objectives?

Identifying specific sources emitting excessive ozone precursor concentrations and potentially contributing to ozone exceedances is strongly dependent on siting criteria, particularly those dealing with location with respect to certain source types, the scale of representativeness, the absence of very localized influences, etc.

Among the questions to be answered are the following:

1. Will the alternative network design provide data that are comparable to and representative of the general conditions of the typical type of PAMS?

2. On what basis were the specific sources identified as possibly emitting excessive ozone precursors, and how much of a contribution to ozone exceedances are these sources expected to make?

3. How will the alternative network design characterize precursor emissions from these sources?

SIP Control Strategy Evaluation - The PAMS regulations discuss the following data uses under the category SIP control strategy evaluation:

- Evaluating the effectiveness of control strategies using long term PAMS data
- Evaluating the impact of VOC and NO_x emission reductions on ambient air quality ozone levels
- Determining which organic species are most affected by emissions reductions

The PAMS alternative network plan must demonstrate that the VOC and NO_x data will be comparable to the data collected by the sampling stations from a standard network. At a minimum, the comparability demonstration required should answer the following questions:

1. Will the alternative plan provide fixed permanent monitoring stations that will provide valid, quality assured data for long-term PAMS control strategy evaluation and in particular for the time period covering control strategy implementation?

2. Will the alternative plan capture VOC speciated compounds and NO_x concentrations in the area of representative maximum concentrations in order to tie in air quality levels with emission sources in the MSA/CMSA?

3. Will the data collected by the alternative network represent around-the-clock concentrations so that any major VOC emissions occurring at different time periods during the day are accounted for, thus allowing for the development of strategies that are most suited and cost-effective for the area?

Emissions Tracking - The following four uses are cited in the Part 58 regulations for the PAMS data use category of emissions tracking:

- Corroborate the quality of VOC and NO_x emission inventories
- Track the reduction of VOC and NO_x emissions
- Support reasonable further progress (RFP) calculations
- Corroborate emissions trends reporting

In general, for emission inventory corroboration, tracking of emissions, RFP calculations, and the corroboration of emissions trends, an alternative network plan must demonstrate that its VOC and NO_x ambient air quality data will be capable of providing enhanced or similar data compared to a standard network plan. The following questions need to be answered:

1. Will the alternative network capture the maximum representative VOC concentration?
2. Will the alternative network be able to discriminate among anthropogenic and biogenic VOC contributors?
3. Will the alternative plan allow for the corroboration of RFP calculations?

Preliminary guidance recommends that data from Site #2 be used for comparison to emissions inventory estimates and that data from Site #3 may be used on a case-by-case basis. The alternative network plan must demonstrate that its proposed monitoring stations will provide data comparable to a Site #2. In addition, the alternative network plan must show that its sampling schedule will provide data comparable to sampling for all of the weekdays to comply with the emission inventory's collection and reporting of data based on a summer weekday. Weekdays should be emphasized in the comparability analyses. Since RFP emission reduction requirements apply exclusively to anthropogenic emissions, emission inventory estimates should exclude biogenic emissions. Also, since acetaldehyde and formaldehyde are normally secondary reactive products in ozone formation, it is good practice to exclude them from the emissions estimates unless they are emitted as primary pollutants. Finally, ethane, which is not considered a reactive hydrocarbon, should also be omitted. Because the emission inventories exclude these pollutants, the alternative plan should demonstrate that appropriate procedures could be implemented to subtract such pollutants from the ambient data collected.

Trends - For this PAMS data use category, the regulations give the following five particular uses and additional subsidiary uses:

- establish speciated VOC, NO_x, and limited toxic air pollutant trends using long-term data
- supplement the ozone trends database
- track multiple statistical indicators
  - -- ozone and its precursors during the events for the days of each year with the highest ozone concentrations
  - -- seasonal means for these pollutants
  - -- annual means at representative locations
- compare pollutant trends analyses with meteorological trends and transport influences through the use of PAMS surface meteorological monitoring
- help to interpret ambient air pollution trends by taking meteorological factors into account with the use of PAMS meteorological data

In general, an alternative network design must demonstrate that its speciated VOC, NO_x, and limited toxic air pollutant data will be roughly comparable to or better than the data from the standard network design in terms of representativeness (spatial and temporal), data quality for statistical indicators (*e.g.*, accuracy and precision), and compatibility with meteorological data. The design should explicitly list and candidly discuss any tradeoffs in trend analyses. For example, will the alternative monitoring network design provide better statistical analysis for events with high ozone concentrations at the expense of poorer or biased statistical analysis of seasonal or annual trends? Will an alternative design provide for a better analysis of toxic air pollutant trends at the expense of annual and seasonal ozone means? On what basis were these choices made? Reviewers of alternative designs will evaluate their suitability for trends reporting giving greatest weight to the following:

1. tracking statistical indicators for ozone and its precursors for the highest ozone concentration events during the year
2. providing unbiased seasonal and annual means at representative locations
3. establishing speciated VOC, NO_x, and toxic air pollutant trend data over the long-term
4. providing the appropriate quantity and precision of measurements to permit trends reporting

The alternative network design must also address the ability of the design to provide pollutant data and meteorological data that are consistent with one another spatially and temporally. Will the meteorological data be representative of the area where the pollutant data are being acquired? For example, will airport data or other meteorological data in complex terrain be adequate to characterize the movement of air parcels over the area where toxic pollutants are being sampled?

Exposure Assessment - The regulations provide two particular uses for this data category.

- Better characterize ozone and toxic air pollutant exposure to populations living in serious, severe, or extreme areas

- Calculate the annual mean toxic air pollutant concentrations to help estimate the average risk to the population associated with individual toxic VOC species in urban environments

In general, alternative PAMS network designs must demonstrate that they can provide equivalent or improved estimates of population exposure to ozone and toxic air pollutants. In practice, it is desirable that the network design show that one or more monitoring locations will be representative of general population exposure and demonstrate that annual mean concentrations of toxic air pollutants will not be biased by the proposed sampling schedule or frequency. For example, alternative network designs using a predictive scheme for sampling on the highest ozone concentration days must show how statistically representative and unbiased sampling can be obtained for annual sources of toxic air pollutants. In addition, the application should address any tradeoffs made by alternative designs between trend reporting and exposure assessments, and the rationale for doing so. For example, a given nonattainment area may have varied and geographically dispersed sources of toxic air pollutants. If the meteorological and boundary conditions for the area are believed to be relatively simple, the network may be appropriate to better characterize exposure to toxic pollutants.

4.4 COMPLETENESS CHECKLIST FOR PAMS NETWORK PLANS

4.4.1 Instructions for Using Checklist

The following checklist is intended for persons preparing PAMS network plans and for persons reviewing and approving those plans. The checklist will help the user determine whether or not the information requirements of a PAMS network plan have been satisfied.

The checklist is organized into five sections. Section I identifies background information about the proposed plan, such as the agency submitting it and the classification of the ozone nonattainment area. Section II covers the design of the network; the required number and types of sites for the nonattainment area. Section III reviews several site-specific information requirements, such as AIRS site ID forms, and several network information requirements, such as the sampling methods to be used at all of the network's proposed sites. Section IV covers the network schedule for both the implementation and operation of new sites. The last section, Section V, provides a quick overview of the completeness status of the proposed network plan.

If a State or local agency has not provided the necessary data and information in its plan, this should be indicated on the checklist. The agency using the appropriate procedures should be contacted to obtain the necessary data and information. If the proposed plan includes alternative provisions, such as a site layout that differs from those stipulated in the regulations, documentation must be provided supporting the alternative elements. The documentation must demonstrate that the plan will meet the data uses and monitoring objectives of a standard PAMS network plan.

4.4.2 Completeness Checklist for PAMS Network Plan

Section I *General Information*

A. State or Local Agency:____________________________________
Contact:____
Address:____
____
Telephone #:____

State or Local Agency (if more than one):________________________
Contact:____
Address:____
____
Telephone #:____

State or Local Agency (if more than one):________________________
Contact:____
Address:____
____
Telephone #:____

B. EPA designation of the ozone nonattainment area. Please check the one that applies.

Serious:_______ Severe:_______ Extreme:______

C. In which range does the population of the metropolitan statistical area (MSA) or the consolidated metropolitan statistical area (CMSA) fall?

Less than 500,000:____________________
500,000 to 1,000,000:____________________
1,000,000 to 2,000,000:____________________
More than 2,000,000:____________________

D. AIRS Name and number of the MSA/CMSA

____

E. Is the proposed plan for an isolated area network or for a multi-area, transport network? Please circle one.

Isolated area network or Multi-area, transport network

F. If the plan is for a multi-area network, are all the other affected agencies identified in the plan? Please circle one. Y or N

Section II *Network Design*

A. Based on the information provided in Section I, please fill in the box as it applies.

Population of MSA/CMSA	Required # of Sites	Required Types of Sites	Proposed # of Sites	Proposed Types of Sites
Less than 500,000	2	1, 2		
500,000 to 1,000,000	3	1, 2, 3		
1,000,000 to 2,000,000	4	1, 2, 2, 3		
More than 2,000,000	5	1, 2, 2, 3, 4		

B. **If the State has submitted a plan for a network design that differs from the required number of sites or types of sites, the plan is considered an alternative plan.** If this occurs, has the following information been supplied? Please check appropriate space for each question:

	Y	N
1. A narrative explanation?		
2. Sufficient justification?		
3. Demonstration of comparability?		
4. Demonstration that the monitoring objectives are met?		
5. Demonstration that the data uses are satisfied?		

Section III *Network Description - Site Specific*

A. Identification of the Monitoring Area

Each PAMS network description must include a description of the monitoring area. Are the following items included in the description?

	Y	N
1. A map of the entire MSA/CMSA with the proposed location of each site, including those to be established in future years? (Sites to be established in future years may be indicated within a 2 km radius on the MSA/CMSA map.)		
2. Climatological information?		

B. Identification of PAMS Sites

			Y	N
1.		Full Site Description: The following requirements apply to individual PAMS sites that are scheduled to be implemented during the coming year. Except for the sites scheduled to begin monitoring in 1993, the information for each site should be supplied before the first of January of the year in which they are to be implemented. Was the information included in the plan?		
	a.	Completed AIRS site ID information for each proposed site? (AMP380 report required, not individual ID forms)		
		Site Identification Form Items		
	i.	Card A1, Columns 1–59, 79–80		
	ii.	Card A2, Columns 1–22, 35–36, 79–80		
	iii.	Card A3, Columns 1–52, 79-80, repeat for each major roadway surrounding the site. A minimum of one roadway group is required.		
	iv.	Card A4, Columns 1–12, 13–27, 79–80 or 28–50, 79–80		
	v.	Card A5, Columns 1–80		
	b.	Completed AIRS monitor ID information for each proposed site as an AMP380 report? ID information required for each monitored pollutant (VOC, carbonyls, ozone, NO_x, meteorological parameters).		
		Monitor Identification Form Items		
	i.	Card F1, Columns 1–38, 72–75, 79–80, plus 39-44 for existing sites		
	ii.	Card F2, Columns 1–80		
	iii.	Card F3, Columns 1-16, 23-46 (as applicable), 79-80		

		Y	N
c.	A map of the area within a 1/4 mile radius of the proposed site? (Should include roadways, buildings, stationary sources, tree lines, etc.)		
d.	A topographical map showing land features and geographical influences?		
e.	Emissions inventories and maps for ozone precursors (as described in Section 2 and Attachment C)?		
f.	Meteorological data?		
i.	A.M. wind roses for number 1 and 2 sites on high ozone or ozone conducive days?		
ii.	P.M. wind roses for number 3 and 4 sites on high ozone or ozone conducive days?		

2.	General Site Description: The following information applies to PAMS sites to be implemented in future years.		
	a. Description of the role the site will play in the network (*e.g.*, PAMS site number)?		
	b. Wind roses for high ozone or ozone conducive days?		
	i. A.M. wind roses for number 1 and 2 sites?		
	ii. P.M. wind roses for number 3 and 4 sites?		

C. Sampling and Analysis Methods

		Y	N
1.	Do the proposed sampling and analysis methods adhere to the following guidelines?		
	a. Reference or equivalent methods for ozone?		
	b. Reference or equivalent methods for NO_2, NO, NO_x?		
	c. For VOC monitoring, the methods described in *Technical Assistance Document for Sampling and Analysis of Ozone Precursors (TAD)*?		
	d. For meteorological measurements, the guidance provided by the *TAD* and the *Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements*?		
2.	If the answer to 1.b. is no, do the NO, NO_2 and NO_x methods adhere to the guidance in the TAD?		
3.	For reference or equivalent methods, have the designation numbers been supplied?		
4.	Does the plan account for the sampling of all of the pollutants (VOC, NO_x, carbonyls) at each of the sites?		
5.	**If the State/local agency has indicated that the sampling and analysis method(s) differ from the methods described in the TAD, the plan is considered an alternative plan.** If this occurs, has the following information been supplied?		
	a. A narrative explanation?		
	b. Sufficient justification?		
	c. Demonstration of comparability?		
	d. Demonstration that the monitoring objectives are met?		
	e. Demonstration that the data uses are satisfied?		

D. Sampling Frequencies

		Y	N
1.	Are NO_x (including NO and NO_2) measured continuously?		

2. Which of the following sampling frequencies does the State propose to use? Please circle the letters that apply.

Population of MSA or CMSA	Required Site Type	Minimum Speciated VOC Sampling Frequency	Minimum Carbonyl Sampling Frequency
Less than 500,000	1	A or C	
	2	A or C	D or F
500,000 to 1,000,000	1	A or C	
	2	B	E
	3	A or C	
1,000,000 to 2,000,000	1	A or C	
	2	B	E
	2	B	E
	3	A or C	
More than 2,000,000	1	A or C	
	2	B	E
	2	B	E
	3	A or C	
	4	A or C	

A = Eight 3-hour samples every third day and one additional 24-hour sample every sixth day during the monitoring period.

B = Eight 3-hour samples every day during the monitoring period and one additional 24-hour sample every sixth day year-round.

C = Eight 3-hour samples on the five peak ozone days plus each previous day, eight 3-hour samples every sixth day and one additional 24-hour sample every sixth day during the monitoring period.

D = Eight 3-hour samples every third day during the monitoring period.

E = Eight 3-hour samples every day during the monitoring period.

F = Eight 3-hour samples on the five peak ozone days plus each previous day and eight 3-hour samples every sixth day during the monitoring period.

		Y	N
3.	Do the sampling frequencies for carbonyls match the sampling frequencies for speciated VOC including year round 1/6 day sampling?		
4.	If sampling frequencies C or F are proposed, did the State submit an ozone event forecasting scheme?		
5.	If the site will collect multiple samples on a daily basis, do the samples begin at midnight local time and consist of sequential nonoverlapping sampling periods?		
6.	**If the State proposes to use alternative sampling frequencies, the plan is considered an alternative plan.** If this occurs, has the following information been supplied?		
	a. A narrative explanation?		
	b. Sufficient justification?		
	c. Demonstration of comparability?		
	d. Demonstration that the monitoring objectives are met?		
	e. Demonstration that the data uses are satisfied?		

E. Meteorological Monitoring

		Y	N
1.	Does the plan include a provision for equipping each of the proposed PAMS sites or area representative of a PAMS with surface meteorological monitoring equipment, including a 10-meter tower?		
2.	Is there a plan for establishing an upper air meteorological monitoring site?		
3.	Is the site representative of the upper air data in the nonattainment area?		
4.	Has the State supplied documentation that the upper air meteorological data will meet the needs of the State's modeling program?		

Section IV *Network Schedule*

The following items on the checklist pertain to the entire PAMS network for the given nonattainment area:

A. Implementation Schedule

		Y	N
1.	Does the plan include a schedule for implementing each PAMS site?		
2.	Does the schedule comply with the EPA recommendations for priority of implementation? (See Appendix D, Section 4.4, 40 CFR Part 58.)		
3.	Does the schedule include a timetable for submitting the AIRS site ID information (AMP380 report) for each scheduled PAMS site that had not been located at the time the network description was submitted?		
4.	Does the plan include a schedule for implementing quality assurance procedures?		

B. Operating Schedules

		Y	N
1.	Does the operating schedule of the PAMS network meet the minimum requirement that the monitoring be conducted during the months of June, July and August?		
2.	**If the State proposes an alternative operating schedule for the site, the plan is considered an alternative plan.** If this occurs, has the following information been supplied?		
	a. A narrative explanation?		
	b. Sufficient justification?		
	c. Demonstration of comparability?		
	d. Demonstration that the monitoring objectives are met?		
	e. Demonstration that the data uses are satisfied?		

Section V *Summary Checklist for PAMS Network Plan*

Item On Checklist	Yes	No
Section I *General Information*		
A. Name of agency, address, contact, etc.		
B. EPA designation of nonattainment area		
C. Population range of MSA/CMSA		
D. AIRS Name and number of MSA/CMSA		
E. Isolated vs. multi-area network		
F. Identification of other affected agencies		
Section II *Network Design*		
A. Table 1. Network Design		
B.1. **Narrative explanation (for alternative plan)**		
B.2. **Sufficient justification (for alternative plan)**		
B.3. **Demonstration of comparability (for alternative plan)**		
B.4. **Monitoring objectives met (for alternative plan)**		
B.5. **Data uses satisfied (for alternative plan)**		

Section III *Network Description - Site Specific*		
A.1. Map of MSA/CMSA area		
A.2. Climatological information (optional)		
B.1.a. Completed AIRS site ID information (AMP380 report)		
B.1.b. Relevant hardcopy form for PAMS		
B.1.c. 1/4 mile radius map		
B.1.d. Topographical map		
B.1.e. Emissions inventories for ozone precursors (VOC, NO, NO_2, NO_x)		
B.1.f. Meteorological data		
B.1.f.i High ozone or ozone conducive days - A.M. wind roses for number 1 and 2 sites		
B.1.f.ii High ozone or ozone conductive days - P.M. wind roses for number 3 and 4 sites		
B.2.a. Description of sites role within network		
B.2.b.i High ozone or ozone conducive days - A.M. wind roses for number 1 and 2 sites		
B.2.b.ii High ozone or ozone conducive days - P.M. wind roses for number 3 and 4 sites		

Item On Checklist	Yes	No
Section III *Network Description - Site Specific cont'd.*		
C.1.a. Reference or equivalent methods for ozone		
C.1.b. Reference or equivalent methods for NO_2		
C.1.c. VOC monitoring - TAD		
C.1.d. Meteorological measurements - TAD and QA Handbook		
C.2. Adherence of NO, NO_2 and NO_x methods to guidance in the TAD		
C.3. Designation numbers for reference or equivalent methods (optional)		
C.4. Accounting for the sampling of all relevant pollutants		
C.5.a. **Narrative explanation (for alternative plan)**		
C.5.b. **Sufficient justification (for alternative plan)**		
C.5.c. **Demonstration of comparability (for alternative plan)**		
C.5.d. **Monitoring objectives met (for alternative plan)**		
C.5.e. **Data uses satisfied (for alternative plan)**		
D.1. Continuous measuring of ozone and NO_x		
D.2. Table 2. Sampling Frequencies for VOC, carbonyls		
D.3. Matching of sampling frequencies for carbonyls and speciated VOC		
D.4. Ozone event forecasting scheme for sampling frequencies C or F		
D.5. Daily sampling - beginning at midnight local time; sequential, nonoverlapping periods		
D.6.a. **Narrative explanation (for alternative plan)**		
D.6.b. **Sufficient justification (for alternative plan)**		
D.6.c. **Demonstration of comparability (for alternative plan)**		
D.6.d. **Monitoring objectives met (for alternative plan)**		
D.6.e. **Data uses satisfied (for alternative plan)**		
E.1. Equipping PAMS sites or locations representative of PAMS with meteorological monitoring equipment		
E.2. Upper air meteorological monitoring site		
E.3. Site representative of upper air data in nonattainment area		
E.4. Upper air data meeting needs of State's modeling program		

Item On Checklist	Yes	No
Section IV *Network Schedule*		
A.1. Schedule for implementing each site of PAMS network		
A.2. Timetable for phasing in required number and types of sites		
A.3. EPA's recommendations for priority of implementation met by schedule		
A.4. Schedule for sites not located on network description		
A.5. Schedule for implementing quality assurance procedures		
B.1. Requirement for conducting monitoring during June, July, and August		
B.2.a. **Narrative explanation (for alternative plan)**		
B.2.b. **Sufficient justification (for alternative plan)**		
B.2.c. **Demonstration of comparability (for alternative plan)**		
B.2.d. **Monitoring objectives met (for alternative plan)**		
B.2.e. **Data uses satisfied (for alternative plan)**		

5.0 "RESERVED"

6.0 THE AEROMETRIC INFORMATION RETRIEVAL SYSTEM

6.1 OVERVIEW

The Aerometric Information Retrieval System (AIRS) is a computer-based repository of information about airborne pollution in the United States. AIRS was developed to allow State and local air pollution control agencies to submit and retrieve air pollution data. The system is administered by the EPA and may be used by anyone with access to the EPA computer system.

AIRS consists of five subsystems: the Air Quality Subsystem (AQS), the AIRS Facility Subsystem (AFS), the Area and Mobile Subsystem (AMS), the Geographic and Common Subsystem (GCS), and AIRS Graphics (AG).

- **AQS** contains air quality information, such as measurements of ambient air pollutant concentrations and meteorological conditions reported by thousands of monitoring stations operated by State and local agencies and the EPA. In addition to individual measurements, this subsystem contains summary statistics for each monitoring station, such as the annual arithmetic mean and number of times the measured concentration exceeded a national ambient air quality standard. AQS also contains descriptive information about each monitoring station, including its geographic location and the operating agency. AQS will be the subsystem designated for the storage of PAMS ambient measurements data. AQS contains four types of air quality data:

  (1) **Monitoring Site Descriptions** characterize the monitoring sites that provide data to AIRS. The information, which resides in the AIRS Site file, includes site location [geographic coordinates, street address, city, county, State, Air Quality Control

Region (AQCR), etc.], site operational dates, the organization responsible for the monitor operation, and many other items. State and local agencies provide site information to AIRS.

(2) **Raw Data** are the individual values of pollutant concentrations or meteorological conditions measured at the monitoring sites and supplied to AIRS by the State and local agencies that operate the monitors. AIRS contains three raw data files:

(a) The hourly file contains data sampled at intervals of less that 24 hours (of which the 1-hour interval is most common).

(b) The daily file contains data for sampling intervals of 24 hours or more (of which the 24-hour interval is most common).

(c) The composite file contains data from composite samples (multiple samples combined and analyzed as one).

There are actually two sets of raw data files. One set holds public data, and the other holds private, or "secured" data that are available only to the supplying organization.

(3) **Summary Data** are derived from raw data. There are two summary files in AIRS: the air quality summary file and the SLAMS summary file. The air quality summary file is derived entirely by AIRS software from information in the raw data files; there is no direct input to the file. Conversely, the SLAMS summary file consists entirely of the annual summary data each SLAMS monitoring agency is required to submit to the EPA in accordance with the CAA.

(4) **Precision and Accuracy Data** characterize the precision and accuracy of air quality monitors. The AIRS precision-accuracy file contains summaries of the precision and accuracy of groups of monitors (all those operated by a particular reporting organization).

The AIRS AQS site file, raw data files, and air quality summary file contain all data that were in SAROAD, the predecessor of AIRS. The AIRS/AQS site file includes information about discontinued monitoring sites as well as active sites. The AQS raw data and summary files contain all values from SAROAD, some of which date back to 1957. Since the AQS uses the Federal Information Processing Standards (FIPS) geographic codes, site IDs were changed when the data were converted from SAROAD.

- **AFS** contains point source emissions and compliance information. AFS is essentially a merging of the former National Emissions Data System (NEDS) and the Compliance Data System (CDS). AFS became operational in 1989.

- **AMS** contains emissions information from sources that are too small to be stored in AFS and also holds information about mobile sources as well as biogenic data. AMS is the newest of the subsystems and became operational in 1993.

- **GCS** contains reference information that is used by all the subsystems. Reference information includes codes and code descriptions used to identify places, pollutants, and processes; populations of cities, counties, and similar geo-political entities; and numerical values, such as air quality standards and emission factors. EPA compiles and maintains this reference information.

- **AG** utilizes information from all the above subsystems, and displays the data graphically. Maps, bar charts, line graphs, and multiple line charts are all available via AG. Maps may be generated on a national, State, or county level. Future enhancements include maps by MSA and zip codes. (Samples of typical outputs from AG may be found in Appendix K.)

6.2 DATA INPUT AND UPDATE PROCEDURES

Nearly all the air quality data in AQS come directly from the SLAMS and NAMS air monitoring networks, which are operated by State and local pollution control agencies. A small amount of raw data comes from the EPA or private sources.

New air quality data are loaded into the AQS and existing data are modified or deleted using transactions that have the format of punched cards (80-character records). There are transactions for site and monitor information, SLAMS summary data, and raw data. A local, State, or EPA organization submitting air quality data to AQS creates a file of transactions (usually on magnetic tape) on the IBM computer system at the EPA's National Computer Center (NCC). The organization submitting data uses AQS software to load the transaction into a "screening file," check the validity of the transactions, and correct any errors found. A screening file is part of the AQS database and is used to hold AQS transactions during validation. Each organization submitting data to AQS has a screening file for its own exclusive use.

When the transactions in a screening file have passed validation checks, the organization submitting the data notifies the AIRS database administrator that the screening file is ready to be used for updating the AIRS database. The database administrator performs updates on a regular schedule (usually once per week) using all screening files that are ready at that time. The transactions used to update the database are automatically removed from the screening file by the update program; any transactions that have not passed validation checks or that have been excluded from update processing by the submitting organization remain in the screening file. To complete the update cycle, the database administrator notifies the submitting organization that the update has been completed, and that the screening file is ready to accept a new set of transactions. Further information on data submission, validation, and updates procedures can be found in volumes ***AQ2 - The AQS Data Coding Manual*** (Reference 21) and ***AQ3 - AQS Data Storage Manual*** (Reference 22).

6.3 DATA RETRIEVAL

The air quality data in AIRS are public and as such are available to any person or organization with legitimate access to the EPA NCC. There are a few minor procedural requirements for retrieving air quality data, however, which result from computer center policies and procedures. AIRS users must be able to use the Customer Information Control System (CICS) and NATURAL (programming language) on the IBM computer system. Users also must have the functional equivalent of an IBM 3270 terminal. The AIRS hotline may be contacted for further information at 1-800-333-7909.

There are three ways to retrieve air quality data from the AIRS database. The easiest way is to use the standard reports that have been defined by the National Air Data Branch (NADB). There are two types of standard reports, batch and on-line. The batch standard reports allow users to produce a printed report or data file (or both). The user specifies the criteria for data selection and sorting, and chooses the option that affect the report format or content. The AIRS software automatically takes this information and submits a batch run to produce the report and/or workfile. Therefore, the user does not have to construct the output format of the report. The on-line standard reports allow users to view a report screen. The user specifies the criteria for data selection and the AIRS software retrieves the data that meet the criteria and produces a report screen. Volume ***AQ4 - Air Quality Retrievals Manual*** (Reference 23) contains instructions for using the standard reporting facility and describes the features of each report.

If the standard air quality reports or the on-line data retrievals do not satisfy the user's requirements, other reports can be defined using the AIRS ad hoc reporting function. The use of "ad hoc" requires reasonable knowledge of the organization of the database, names of data fields, etc. Volume ***AQ5 - AQS Ad Hoc Retrievals Manual*** (Reference 24) explains how to use the ad hoc reporting function.

The third type of data retrieval available for air quality data is via AIRS Graphics. AG has both "ready-to-view" (RTV) maps (such as monitor locations, nonattainment areas) as well as "create-your-own" (CYO) maps. The information used in constructing the RTV maps cannot be changed. The CYO maps allow the users to select geographic areas, parameters desired, and time period of interest. Used in conjunction with a raw data listing workfile from AQS, AG can even produce time-series line graphs. The data from AG can be viewed on-line and/or in hard copy.

Further information on data handling for PAMS and AIRS may be found in References 21-24 of this manual.

7.0 TECHNOLOGY TRANSFER NETWORK (TTN)

7.1 BACKGROUND

The Technology Transfer Network (TTN) is a network of electronic bulletin boards developed and operated by EPA's OAQPS in the Research Triangle Park, North Carolina. The network provides information and technology exchange in multiple areas of air pollution control, ranging from emission test methods to regulatory air pollution models.

The TTN is comprised of a number of electronic bulletin board systems (BBS) which are computer systems comprised of hardware and software that receive telephone calls from other computers. The BBS concept began as a means for users to enter messages and read messages addressed to them by other users. The modern BBS performs a variety of services that include the exchange of programs, software, databases, and files of all descriptions. The most important function of a BBS is easy and friendly access to expedite and promote the exchange of information. Users are free to scan messages and pick those which are of particular interest. Information may be exchanged over long distances and at high speeds. For the ambient air monitoring community, especially PAMS users, the TTN is a vehicle for accessing the Ambient Monitoring Technology Information Center (AMTIC).

7.2 THE AMBIENT MONITORING TECHNOLOGY INFORMATION CENTER BULLETIN BOARD

The AMTIC BBS is accessed through the TTN and is available to all persons interested in ambient monitoring. It currently contains all FRM and Equivalent Methods for the criteria pollutants, all Toxic Organic (TO) Methods, all Federal regulations pertaining to ambient air monitoring, information on quality assurance/quality control (QA/QC), monitoring studies, information pertaining to ambient monitoring publications and documents, available related training courses, upcoming meetings of interest, air quality trend and nonattainment information, photochemical assessment monitoring documents and regulations, points of contact, public message boards, and more.

There is no cost to utilize AMTIC unless the user is accessing the system through a long distance telephone line (in which case the user is paying the cost of the call). To access the AMTIC or TTN, the following steps are necessary:

Step 1 - Install a modem and communications software on your computer; a wide variety are available.

Step 2 - Set the following parameters on your communications software:

Data Bits: 8
Parity: N
Stop Bits: 1
Terminal Emulation: VT100 or ANSI

Step 3 - Call the network using your communications software:
(919) 541-5742 for a 1200, 2400, or 9600 bps modem

Step 4 - Log on to the system and answer the questions on the screen.

First Name? - Type your first name and press **ENTER**.
Last Name? - Type your last name and press **ENTER**.
Calling from (City, State)? - Type your city and state abbreviation, for example, **Raleigh, NC** and press **ENTER**.

You are then asked to verify this information - Type **Y** or **N**.

Next, select a password that you can easily remember. After this, you will see some information about the system. Press **ENTER** until you reach the main menu for unregistered users. At this point you can select an option or exit the system. Options available include *Descriptions of OAQPS TTN Bulletin Board System*, which contains a brief description of the different bulletin boards available on the network, and *System Utilities*, which contains various options that are also available after you are a registered user. To select an option, type the character shown within the brackets (< >).

Step 5 - Select ***Registration*** and enter your company name, address, and telephone number. Then select the bulletin board you plan to use most often. For PAMS users, this should be AMTIC. Note that you will still be able to access any bulletin board on the network.

You are asked to verify this information. (Type **Y**, **N**, or **Q** for quit.)

After this information is accepted, you will see the Registered Users menu. From here you can access any BBS.

7.3 OTHER TTN BULLETIN BOARDS

Currently, in addition to AMTIC, access to the following bulletin boards is available through the TTN:

AIRS - Aerometric Information Retrieval System - The focus of the AIRS BBS is to encourage the exchange of information among State and local agencies that utilize AIRS documents and information. AIRS BBS is operated by OAQPS and NADB.

The AIRS BBS maintains the current AIRSLETTER; relevant brochures, pamphlets, and bulletins; and information on meetings, conferences, training seminars, and permits. User-supplied AIRS-related demonstration software is circulated, as well as EPA PC-based AIRS related software. All AIRS user's manuals and guides are available for download. The AIRS bulletin board also contains a current listing of AIRS contact personnel. Answers to frequently asked questions are available, as well as public and private electronic mail for use in obtaining information from the AIRS user community.

APTI - Air Pollution Training Institute - The Air Pollution Training Institute (APTI) offers the widest scope of air pollution training in the United States. Funded by the EPA, APTI develops instructional material for and provides technical assistance to training activities conducted in support of the nation's regulatory programs of air pollution abatement.

EPA-sponsored lecture and laboratory courses, using APTI materials, are scheduled at several locations across the country. Self-instructional courses, providing opportunities for individual training at home or in places of employment, are obtainable from APTI. Training material is continually updated, and individual courses undergo periodic major revision.

APTI publishes a "Chronological Schedule of Air Pollution Training Courses" generally once a year. This publication describes the training being offered with a description of the APTI courses and how to obtain the training. If you would like a copy of "Chronological Schedule of Air Pollution Training Courses" contact the Registrar at (919) 541-2497.

BLIS - RACT/BACT/LAER Information System - The BLIS BBS contains information from the Reasonably Available Control Technology (RACT)/Best Available Control Technology (BACT)/Lowest Achievable Emission Rate (LAER) Clearinghouse. This information is distilled from air permits submitted by most of the State and local air pollution control programs in the United States. The data are meant to assist State/local agency personnel and private companies in determining what types of controls other air pollution agencies have applied to various sources. The BLIS database option allows the user to perform interactive searches of the database.

CAAA - Clean Air Act Amendments - The Clean Air Act Amendments Bulletin Board System (CAAA BBS) is designed to provide access to information on the CAAA. Through this electronic information dissemination vehicle, the CAAA BBS allows regulators, the regulated community and members of the general public to easily obtain access to that information that is relevant to the CAAA. In this manner, the task of understanding, implementing and complying with the requirements of the new law will be made easier.

CHIEF - Clearinghouse for Inventories/Emission Factors - The CHIEF BBS provides access to tools for estimating emissions of air pollutants and performing air emission inventories. CHIEF will serve as EPA's central clearinghouse for the latest information on air emission inventories and emission factors. Emission estimation databases, newsletters, announcements, and guidance on performing inventories will be included in CHIEF.

COMPLI - COMPLIance Information on Stationary Sources of Air Pollution - The COMPLI BBS contains three databases:

- NARS - National Asbestos Registry System - A listing of all asbestos contractors, their inspections and the results of them. This database is used to target contractors for inspection.

- Determinations Index - This is a compilation of clarifications and determinations issued by EPA concerning selected subparts of the *Federal Register*. It consists of two major parts: NSPS determinations and NESHAP determinations.

- Woodstoves - A database of EPA Certified Woodstoves and woodstove manufacturers.

This COMPLI BBS is maintained by EPA's Stationary Source Compliance Division (SSCD). Problems, suggestions, or additional information should be directed to the COMPLI BBS SYSOP.

CTC - Control Technology Center - The CTC is a cooperative effort for engineering assistance to State and local air pollution control agencies (and private companies to an extent) by the Air and Energy Engineering Research Laboratory (AEERL) and OAQPS. It is a cooperative effort with the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO).

The CTC provides three levels of assistance:

- HOTLINE - (919) 541-0800
- Engineering Assistance
- Technical Guidance

The CTC's goal is to provide technical support to State and local agencies and to EPA Regional Offices in implementing air pollution control programs. The CTC assists regulatory and permitting agencies, but does not provide policy guidance and compliance advice which is the responsibility of the EPA Regional Office. CTC services are available at no cost to State and local air pollution control agencies and EPA Regional Offices. Other government agencies may use the HOTLINE for technical assistance or to order CTC documents.

EMTIC - Emission Measurement Technical Information Center - The EMTIC BBS provides technical guidance on stationary source emission testing issues, particularly to those who conduct and/or oversee emissions tests in support of the development and implementation of emission standards, emission factors, and SIPs.

NATICH - National Air Toxics Information Clearinghouse - NATICH is an information service cooperatively provided by EPA and STAPPA/ALAPCO to support their efforts at controlling toxic (non-criteria) air pollutants. Thus, the Clearinghouse is designed to facilitate the exchange of information among federal, State, and local agencies concerned with control of toxic air pollutants.

To achieve this goal the Clearinghouse annually collects, classifies, and disseminates information submitted by State and local agencies regarding their air toxics programs. In addition, NATICH also provides information on current federal activities in controlling air toxics.

The Clearinghouse provides the following:

- Quarterly Newsletter
- Hardcopy Reports of the Database Contents
- Telephone Helpline: (919) 541-0850

NSR - New Source Review - The NSR BBS provides material and information pertaining to New Source Review (NSR) permitting. The user can search the abstracted index of the "New Source Review Prevention of Significant Deterioration and Nonattainment Area Guidance Notebook" by selected key words or a customized text word or text string.

OAQPS - Office of Air Quality Planning and Standards - This bulletin board provides fundamental information regarding the organization and function of each unit in EPA's OAQPS. Additionally, information services and reports on the status of air pollution control activities are available.

OMS - Office of Mobile Sources - The purpose of the bulletin board is to provide the user with information pertaining to mobile source emissions, including regulations, test results, models, guidance, etc. The following information is available on the BBS:

- Office of Mobile Sources Contact List
- OMS Rulemaking Packages and Reports per the Clean Air Act
- Vehicle and Engine Certification Guidance
- Fuel Economy Information
- Vehicle Emissions Models (*e.g.*, MOBILE5)
- Public Awareness Information ("Fact Sheets")
- Other Relevant Mobile Source Emission Documents

SCRAM - Support Center for Regulatory Air Models - The SCRAM BBS is the Agency's primary source for the acquisition of the computer codes for the regulatory air models. Changes to the models, including updates, corrections, and new regulatory codes are main features of the SCRAM. Significant announcements and new information are indicated in the SCRAM ALERTS section of the BBS.

The new user can obtain a quick review of BBS services by browsing through the main menu options. In addition to code, model related news and important bulletins are provided concerning model modifications, status, etc. An especially important feature is the "Model Change Bulletin" (MCB) provided for each model/program. MCB #1 lists information on the initial status of that model; new MCBs are posted for each model as required.

7.4 USING THE AMTIC/TTN

The TTN and AMTIC are available 24 hours per day, 7 days per week except for Monday morning 8:00 a.m. to 12:00 noon Eastern Time (unless otherwise noted), when the system is down for maintenance and system backup.

There are several methods for accessing the TTN BBS. Some methods may involve incurring long distance telephone charges, but others are completely free. Not all methods are available to all people. The following access methods are currently available:

- Conventional Modem Dialup
- EPA Ethernet Connection
- X.25 Pads (Packet Switching Network)
- Internet

7.4.1 Conventional Modem Dialup

Anyone with a computer, a modem, and communications software may log on to the TTN by setting their modem to 8 data bits, no parity, and 1 stop bit (8-N-1), and dialing (919)541-5742. New users must fill out a short registration survey, and will be given full access on their first call. Using this method, the user must pay any long distance charges that are accrued.

7.4.2 EPA Ethernet Connection

This method of connection is available only to EPA employees located in Research Triangle Park, NC. The EPA Ethernet allows all users free access to the TTN through Crosstalk.

7.4.3 X.25 Pads (Packet Switching Network)

To promote electronic communications among the EPA Regional Offices, the EPA has arranged for a network of X.25 pads connecting the EPA Regional Offices to computer facilities in Research Triangle Park, NC. The X.25 pads allow users to dial up a local number in their city and connect to remote computer facilities. Access to the X.25 pads is available to all EPA Regional Offices and may be available to State and local Air Quality Control Offices as well. For further information, contact your local EPA Regional Office.

7.4.4 Internet

The TTN is now available through Internet. If you are connected to the Internet via an "Internet Access Provide" you can now reach the TTN. To reach the TTN on Internet, you must invoke the "TELNET" service. "TELNET" is capable of hosting a fully interactive session. Other Internet services such as Internet mail and FTP will not allow you to connect to the TTN.

Use the following "TELNET" command, which includes the TTN Internet address:

TELNET ttnbbs.rtpnc.epa.gov

Your Internet provider may use a slightly different procedure or syntax. If you are unsure how to initiate a "TELNET" session, please check with your Internet provider. Accessing the TTN through the Internet is free of charge. However, your Internet access provider may charge a fee for access to the Internet.

Assistance with accessing the systems may be obtained during normal business hours (Eastern Time) by contacting the TTN Helpline at (919)541-5384.

8.0 REFERENCES

1. *Code of Federal Regulations*, Title 40, Part 58, U.S. Government Printing Office, 1992.

2. *Clean Air Act Ozone Design Value Study*, Preliminary Draft, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, April 1993.

3. *Guideline for the Interpretation of Ozone Air Quality Standards*, EPA-450/4-79-003, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, January 1979.

4. Purdue, Larry J., Dave-Paul Dayton, Joann Rice and Joan Bursey, *Technical Assistance Document for Sampling and Analysis of Ozone Precursors*, EPA-600/8-91-215, U.S. Environmental Protection Agency, Atmospheric Research and Exposure Assessment Laboratory, Research Triangle Park, North Carolina, October 1991.

5. Purdue, Larry J., "Summer 1990 Atlanta Ozone Precursor Study," presented at the VOC Workshop Assessment and Evaluation, Amersfoort, The Netherlands, January 26-28, 1993.

6. Purdue, Larry J., J. A. Reagan, W. A. Lonneman, T. C. Lawless, R. J. Drago, G. Zalaquet, M. Holdren, D. Smith, C. Spicer and A. Pate, *Atlanta Ozone Precursor Monitoring Study*, U.S. Environmental Protection Agency, Atmospheric Research and Exposure Assessment Laboratory, Research Triangle Park, North Carolina, April 3, 1992.

7. Lewis, Charles W. and Teri L. Conner, "Source Reconciliation of Ambient Volatile Organic Compounds Measured in the Atlanta 1990 Summer Study: The Mobile Source Component," U.S. Environmental Protection Agency, Atmospheric Research and Exposure Assessment Laboratory, Research Triangle Park, North Carolina, September 1991.

8. *Code of Federal Regulations*, Title 40, Part 50, U.S. Government Printing Office, 1992.

9. Ludwig, F.L. and E. Shelar, *Site Selection for the Monitoring of Photochemical Air Pollutants*, EPA-450/3-78-013, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, April 1978.

10. Liu, L.-J. Sally, Petros Koutrakis, Helen H. Suh, James D. Mulik, and Robert M. Burton, "Use of Personal Measurements for Ozone Exposure Assessment: A Pilot Study," "Environmental Health Perspectives," *Journal of the National Institute of Environmental Health Sciences*, Vol. 101, No. 4, September 1993.

11. Mulik, James D., Jerry L. Varns, Petros Koutrakis, Mike Wolfson, Dennis Williams, William Ellenson, and Keith Kronmiller, "The Passive Sampling Device as a Simple Tool for Assessing Ecological Change - An Extended Monitoring Study in Ambient Air," presented at the Measurement of Toxic and Related Air Pollutants symposium, Durham, North Carolina, May 1992.

12. Koutrakis, Petros, Jack M. Wolfson, Arnold Bunyaviroch, Susan E. Froehlich, Koichiro Hirano, and James D. Mulik, "Measurement of Ambient Ozone Using a Nitrite-Coated Filter," *Analytical Chemistry*, Vol. 65, 1993.

13. Schweiss, Jon, "Draft Guidance for the Use of Portable Samplers," U.S. Environmental Protection Agency, Seattle, Washington, February 1991.

14. Shao-Hang Chu, "Meteorological Considerations in Siting Monitors of Photochemical Pollutants," presented at the Regional Photochemical Measurement and Modeling Study Conference, San Diego, California, November 1993.

15. *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources*, Revised, EPA-454/R-92-019, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, October 1992.

16. *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume IV: Meteorological Measurements, EPA-600/4-82-060, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1989.

17. *Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD)*, EPA-450/4-87-007, U.S. Environmental Protection Agency, Research Triangle Park, May 1987.

18. *On-Site Meteorological Program Guidance for Regulatory Modeling Applications*, EPA-450/4-87-013, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1987.

19. *On-Site Meteorological Instrumentation Requirements to Characterize Diffusion from Point Sources*, EPA-600/9-81-020, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1981.

20. *Code of Federal Regulations*, Title 40, Part 53, U.S. Government Printing Office, 1992.

21. *AIRS Users Guide*, Volume AQ2, "Air Quality Data Coding," U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1993.

22. *AIRS Users Guide*, Volume AQ3, "Air Quality Data Storage," U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1993.

23. *AIRS Users Guide*, Volume AQ4, "Air Quality Data Retrieval," U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1993.

24. *AIRS Users Guide*, Volume AQ5, "AIRS Ad Hoc Retrieval," U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1993.

A list of bibliographic material related to PAMS implementation and monitoring is included in Appendix L.

APPENDIX A

PAMS PROPOSAL AND FINAL RULE

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 58

AD-FRL-4099-6]

Ambient Air Quality Surveillance

AGENCY: Environmental Protection Agency.

ACTION: Proposed rule.

SUMMARY: This notice proposes to revise the ambient air quality surveillance regulations (40 CFR part 58) to include provisions for enhanced monitoring of ozone and oxides of nitrogen, and for additional monitoring of volatile organic compounds (including aldehydes) and meteorological parameters. These revisions are being proposed in accordance with title I, section 182 of the 1990 Clean Air Act Amendments. The revisions would require States to establish photochemical assessment monitoring stations (PAMS) as part of their State Implementation Plan (SIP) monitoring network in ozone nonattainment areas classified as serious, severe, or extreme. Included in the proposal are minimum criteria for network design, monitor siting, monitoring methods, operating schedule, quality assurance, and data submittal.

DATES: Comments must be received on or before April 3, 1992.

ADDRESSES: Submit comments to (duplicate copies are preferred) to: Central Docket Section, U.S. Environmental Protection Agency, Attn. Docket No. A-91-22, 401 M Street, SW., Washington, DC 20460. Docket No. A-91-22 is located in the Central Docket Section of the U.S. Environmental Protection Agency, West Tower Lobby Gallery I, 401 M St., SW., Washington, DC 20460. The docket may be inspected between 8 a.m. and 4 p.m. on weekdays. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Geraldine J. Dorosz, Technical Support Division (MD-14), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, N.C. 27711, phone: 919-541-5492 or (FTS) 629-5851.

SUPPLEMENTARY INFORMATION:

Background

Section 110(a)(2)(C) of the Clean Air Act requires ambient air quality monitoring for purposes of the State Implementation Plan (SIP) and reporting of the data to EPA. Uniform criteria for measuring air quality and provisions for the reporting of a daily air pollution index are required by section 319 of the Act. To satisfy these requirements, on May 10, 1979 (44 FR 27571), EPA established 40 CFR part 58 which provided detailed requirements for air quality surveillance and data reporting for all the pollutants except lead for which ambient air quality standards (criteria pollutants) has been established. On September 3, 1981 (46 FR 44164) similar rules were promulgated for lead and on July 1, 1987 (52 FR 24740) for particulate matter (PM_{10}).

The intent of the enchanced ozone monitoring revisions being proposed today is to provide an air quality data base that will assist air pollution control agencies in evaluating, tracking the progress of, and, if necessary, refining control strategies for attaining the ozone National Ambient Air Quality Standards (NAAQS). Ambient concentrations of ozone (O_3), oxides of nitrogen (NO_x, NO_2, and NO), and speciated volatile organic compounds (VOC) including aldehydes (or their surrogates) and meteorological data collected by the PAMS will be used to make attainment/nonattainment decisions, aid in tracking VOC and NO_x emission inventory reductions, better characterize the nature and extent of the ozone problem, and prepare air quality trends. In addition, data from the PAMS will provide an improved data base for evaluating model performance, especially for future control strategy mid-course corrections as part of the continuing air quality management process. The data will be particularly useful to states in ensuring the implementation of the most cost effective, socially acceptable regulatory controls.

The regulations proposed in this notice address the minimum requirements for the enhancement of ambient air monitoring for ozone and nitrogen oxides as well as monitoring for speciated VOC and meteorological parameters. Title I, section 182 of the 1990 Clean Air Act Amendments requires enchanced monitoring for ozone and its precursors. Also, section 184(d) requires that the best available air quality monitoring and modeling techniques be used in making determinations concerning the contribution of sources in one area to concentrations of ozone in another area which is a nonattainment area for ozone. In the process of developing proposed regulations to address this requirement, the EPA sought the assistance of the Standard Air Monitoring Work Group (SAMWG). SAMWG members represent State and local air pollution control agencies and EPA program and regional offices. SAMWG members were an active partner in developing and reviewing the 1979 part 58 rulemaking package which formally established the existing framework of the ambient air quality surveillance and data reporting regulations. They also played a prominent role in all subsequent revisions to part 58.

Accordingly, the Agency is soliciting comment on all aspects of the proposed rules and particularly on the general scope and adequacy of the proposal, the necessity and/or adequacy of the individual components of the monitoring approach, and the Agency's estimated monitoring costs.

Proposed Revisions to Part 58—Ambient Air Quality Surveillance

Section 58.1 Definitions

The revisions proposed today would add definitions of the terms "PAMS" (photochemical assessment monitoring stations), "NO_2" (nitrogen dioxide), "NO" (nitrogen oxide), "NO_x" (oxides of nitrogen), "VOC" (volatile organic compounds), and meteorological measurements.

Section 58.2 Purpose

Currently, part 58 contains a provision to establish a national ambient air quality monitoring network for the purpose of providing timely air quality data upon which to base national ambient air assessments and policy decisions. This national network is a subset of the State and Local Air Monitoring Stations (SLAMS), and these stations in the network are designated as National Air Monitoring Stations (NAMS). The NAMS are subject to monitoring and reporting requirements contained in subpart D of part 58. The proposed revision to this section adds a revised paragraph (d) which explains that part 58 acts to establish a network of PAMS which are also subsets to SLAMS but subject to monitoring and reporting requirements contained in the redesignated and revised subpart E of this part.

Section 58.13 Operating Schedule

The current operating schedule for SLAMS continuous analyzers is given in paragraph (a) of this section and requires collecting consecutive hourly averages except during periods of routine maintenance, instrument calibration, and periods or seasons exempted by the Regional Administrator. This same operating schedule also applies to the proposed PAMS continuous O_3 and NO_x analyzers and automated gas chromatographs. For manual methods except for lead, the current requirements are specified in paragraph (b) and require States to obtain at least one 24-hour sample every 6 days except during periods or seasons exempted by the Regional Administrator. Paragraph (b) is being revised to also exempt manual VOC samples. In addition, a new paragraph (c) is proposed which presents the operating schedule for manual speciated VOC measurements. Changes to operating schedules for PAMS must be approved by the Administrator. The existing paragraph (c) is redesignated as paragraph (d). The Agency seeks comment on the proposed operating schedule for PAMS and the sampling frequencies for VOC and aldehydes.

Section 58.20 Air quality surveillance: Plan content

This section originally required States by January 1, 1980 to submit a SIP revision which included provisions for establishing and operating the SLAMS network to measure ambient concentrations of those pollutants for which standards have been established in part 50 of title 40 (criteria pollutants). The section included provisions to apply to criteria of part 58 of title 40, appendices A (quality assurance), C (monitoring methods), D (network design), and E (probe siting) to designing and implementing the SLAMS network. It also provided for an annual network review and monitoring during all stanges of air pollution episodes. Currently, § 58.20 does not require States to include in their SIP a provision for monitoring non-criteria pollutants. Because enhanced ozone monitoring will require monitoring of non-criteria pollutants (NO_x, NO, and speciated VOC) and meteorology, paragraph (a) of this section is revised to include a provision that SLAMS designated as PAMS will obtain these additional measurements. It is likely that due to the multiple monitoring objective for PAMS, that the site locations will, in some cases, coincide with existing SLAMS (or NAMS) monitoring sites. In these cases, the sites only need to be supplemented with those instruments necessary to comply with PAMS monitoring requirements. To establish the PAMS, a new paragraph (f) provides that States with ozone nonattainment areas designated as serious, severe, or extreme will be required to submit a SIP revision which includes additional provisions for monitoring these non-criteria pollutants and obtaining meteorological data. These revisions would be due 6 months after the effective date of promulgation or redesignation and reclassification of any area to serious, severe, or extreme ozone nonattainment. The Agency seeks comment regarding the adequacy of the 6-month period for preparation and promulgation of SIP revisions to accommodate PAMS.

This revision is in accord with section 182 of title I of the 1990 Clean Air Act Amendments. Other revisions to § 58.20 include a change to paragraph (c) which adds the word "criteria" before the words "pollutant except Pb". This change is being proposed since the proposed revisions in paragraph (a) include monitoring non-criteria pollutants while the requirement for monitoring during an emergency episode was only intended to apply to criteria pollutants.

Subpart E—Air Quality Index—Redesignation as Photochemical Assessment Monitoring Stations

For purposes of continuity in Subpart Headings and Content (subpart C addresses SLAMS, subpart D addresses NAMS) the existing subpart E—Air Quality Index Reporting, and subpart F—Federal Monitoring are proposed to be redesignated as subparts F and G, respectively. In addition to being redesignated, subpart F would be renumbered starting with § 58.50 and subpart G would be renumbered starting with § 58.60. The newly designated subpart E would start with § 58.40 and address PAMS network establishment.

Section 58.40 PAMS Network Establishment

This section would require that a description of the PAMS network and a schedule for implementation be submitted to the Administrator within 6 months of the effective date of promulgation of the regulations or redesignation and reclassification of any area to serious, severe, or extreme ozone nonattainment. The network description is not a part of the SLAMS SIP revision required by § 58.20 and need not be submitted with the SLAMS SIP revision which also has the same submittal date. The Agency requests comment concerning the adequacy of the 6-month period to prepare the PAMS network description. Also included in this section is a requirement that the network design criteria in appendix D be followed in the process of designing the PAMS network. In cases where the ozone nonattainment areas extend beyond State or EPA Regional boundaries, the affected States are encouraged to collectively design and submit a combined PAMS network for the adjoining areas and to cooperate in establishing PAMS sites in areas which fall outside of a nonattainment area, if necessary. If States choose to submit individual network descriptions for each affected nonattainment area irrespective of its proximity to other affected areas, those networks must fulfill the requirements for isolated areas as described in section 4 of appendix D. In all cases, network descriptions are to be submitted to the Administrator through the appropriate Regional office(s). Provisions are included which allow the submittal of alternative network designs, but those designs must include a demonstration that they satisfy the monitoring data uses and fulfill the PAMS monitoring objectives described in sections 4.1 and 4.2 of appendix D. Certain alternative plans must be published in the Federal Register, subjected to public comment, and subsequently approved by the Administrator. The Agency seeks comment on what criteria should be used to determine whether such alternative monitoring plans are "equivalent" to the proposed statutory minimum, given the intended uses for the PAMS data.

Section 58.41 PAMS Network Description

In order for the Administrator to approve individual or combined State PAMS network descriptions certain information pertaining to the stations such as station location, AIRS site identification codes, methodology, operating schedule and schedule for implementation are needed at the national level. This section describes the information to be included in the network description submittal required by § 58.40.

Section 58.42 PAMS Approval

Ambient air data from the PAMS are intended for diverse multiple uses including supporting NAAQS attainment decisions and demonstrations, corroborating VOC and NO_x emission inventories and tracking emission reductions, evaluating the effectiveness of control strategies, providing input for future photochemical grid modeling exercises and evaluating model performance, characterizing population exposure, preparing national air quality trends, and developing national policies. Users of the data collected from the PAMS will include State and local air pollution control agencies and EPA regions. EPA offices at the national level will likewise be a major user of the data particularly for preparing national trends, evaluating national control strategies, and developing national policy. Because of these latter uses, the need for national consistency, the concern for uniformity of methods and operating schedule, and the recognized need for flexibility, the PAMS networks ˜ be subject to the approval of the ıinistrator. More detailed ..ormation regarding the uses of PAMS data may be found in appendix D of the proposal. The Agency seeks comment on the appropriateness of the intended PAMS data uses and probable data users.

Section 58.43 PAMS Methodology

This section would require that all PAMS meet the PAMS monitoring methodology requirements specified in appendix C. Existing stations would be required to meet the method requirements at the time of network description submittal. Future stations would need to meet those requirements upon their establishment.

Section 58.44 PAMS Network Completion

The completion date for the establishment of the PAMS network would be 5 years after the effective date of the promulgation of the regulations or redesignation and reclassification of the area to serious, severe, or extreme ozone nonattainment. A five-year phase-in period was proposed to follow a reasonable buildup of resources at the State and local agency level, to accommodate the expected evolution of ˜ sampling technology, and to allow a ıring-up" period to develop the ..essary expertise and infrastructure to conduct this complex mointoring effort. Full details of the proposed 5-year transition process are provided in appendix D.

In light of the importance of the PAMS data to the development and evaluation of alternative State Implementation Plan (SIP) strategies, the Agency seeks comment on the pros and cons of shorter or longer phase-in periods, especially as they relate to modelling demonstrations required of the affected areas. The Agency therefore seeks comment on periods of 1, 2, 3 years or longer.

Section 58.45 PAMS Data Submittal

This section would establish the reporting requirements for the PAMS data. The data from O_3, and NO_x (including NO and NO_2 data) monitors would be required to be submitted to EPA's Aerometric Information Retrieval System (AIRS)—Air Quality Subsystem (AQS) within 60 days following the end of each quarterly reporting period. Meteorological data and speciated VOC data must be submitted within 6 months after the end of the quarterly reporting period. Inasmuch as meteorological data will often be used to interpret ozone ecursor ambient data and how they relate to ozone precursor emissions, it also is required to be submitted within the 6-month time frame specified for speciated VOC data. Given the complexity and interpretive expertise required to analyze speciated VOC data and especially given the rapid evolution of the monitoring technology, 6 months was established as a reasonable time period for speciated VOC data submittal. The Agency seeks comment on the reasonableness of this time peirod.

Section 58.46 System Modification

This section would include a requirement that any changes in the PAMS network be evaluated during the annual SLAMS review specified in § 58.20. Changes that are proposed by the State would be evaluated by the EPA Regional Office and must be approved by the Administrator. An implementation time of 1 year would be granted to complete the approved changes. This procedure would also apply to changes to the PAMS network which resulted from a redesignation of the area to attainment.

Revisions to Appendix A–Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)

Appendix A is being revised to include a provision that refers to Agency guidance on quality assurance criteria for VOC measurements. Monitoring techniques for speciated VOC are emerging technologies, and quality assurance criteria equivalent to that in part 58 for the criteria pollutants are currently not available for VOC. EPA is, however, preparing guidance on VOC mointoring technology and this document will address quality assurance for VOC as well as for meteorological measurements.

Appendix C—Monitoring Methodology

The requirements in appendix C were promulgated to provide limitations on the allowance of methods to be used in the SLAMS and NAMS network. The purpose of the limitations are to restrict allowable methods to those which have been tested and proven to be reliable or to those which show significant probability of being reliable.

The proposed revisions to appendix C would include a similar but less restrictive limitation on PAMS measurements. The revisions would require that PAMS O_3 and NO_x monitoring methods be automated reference or equivalent methods. However, reference or equivalent methods for meteorological measurements or speciated VOC measurements are not available since reference or equivalent requirements or specifications for these methods are not currently included in EPA regulations. In the absence of such specifications and because of EPA concerns about the need for minimum uniform criteria concerning measurement methodology, EPA has prepared a document which provides Agency guidance on methods for conducting meteorological measurements and measurements for VOC. Appendix C would require States to use this guideline document in selecting and conducting such measurements at PAMS. Should States prefer to propose alternative methods for conducting VOC measurements, the methods must be detailed in the network description required by § 58.40. Such proposed alternative methodology must be published in the Federal Register, subjected to public comment, and subsequently approved by the Administrator.

Appendix D—Network Design for State and Local Air Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS), and Photochemical Assessment Monitoring Stations (PAMS)

Appendix D currently contains criteria to be used in designing networks to meet the monitoring objectives for SLAMS and NAMS. The design criteria are intended to provide uniformity in locating air monitoring stations for the SLAMS and NAMS networks. A new section 4 of appendix D is being proposed to provide a similar concept of minimum criteria for designing a PAMS network. Section 4 contains a description of the major uses of data from the PAMS. These uses include ozone attainment/nonattainment decisions, preparation of control strategies for ozone nonattainment areas, tracking of VOC, NO_x, and toxic air pollutant emission inventory reductions, providing future input to photochemical models and data for model evaluation, preparation of air quality trends, and characterization of population exposure to ozone and urban air toxic pollutants. Specific objectives that must be addressed include assessing ambient trends in VOC and its species, determining spatial and diurnal variability of VOC species and assessing changes in the species profiles that occur over time, particularly those occurring due to the reformulation of fuels. Note that data from stations which operate NO_2 monitors year round can also be utilized to determine attainment or nonattainment with the NO_2 National Ambient Air Quality Standard which is expressed as an annual arithmetic mean.

Designing and implementing a network to adequately satisfy all of these data uses would require extraordinary resources; consequently, a practical compromise on the minimum number of stations in a PAMS network is proposed. The proposal identifies five types of PAMS, which have different monitoring objectives or functions relative to the MSA/CMSA nonattainment area. The number and types of stations vary depending on the size of the MSA/CMSA or nonattainment area, whichever is larger. For a larger MSA/CMSA, as many as five sites would be needed to provide a data base sufficient to consider spatial variations and to develop trends for VOC and its species within that MSA/CMSA. By utilizing population as a surrogate for total MSA/CMSA (or nonattainment area) emissions density, the requirements for numbers of sites is stratified from two to five sites per area. Such differing criteria are required to accomodate the impact of transport on the smaller MSA's/CMSA's, to account for the spatial variations inherent in large areas, and to satisfy the differing data needs of large versus small areas due to the intractability of the ozone nonattainment problem. Given these assumptions, the Agency seeks comment on the extent to which the aforesaid "practical compromise" network requirements would provide sufficient data to fulfill the data uses described in appendix D, section 4.1 and 4.2, and summarized in Table 1. Additionally, comment is sought regarding the cost and content of substitute mechanisms for establishing the minimum monitoring requirements which would also fulfill the proposed objectives and data uses. In particular, the Agency seeks information on substitute sampling regimes (both frequency and duration), the use of statistical approaches to supplement (or in lieu of) sampling, and other sampling methods.

The Agency recognizes that other proxies for emissions density, and therefore requirements for numbers of sampling sites, could have been tendered. The Agency also seeks comment on whether more complex mechanisms which include factors such as precursor emissions, geography, meteorology, other demographical indicators, etc., should be utilized.

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TABLE 1. MEASUREMENTS ..ECESSARY TO MEET MONITORING OBJECTIV..

MONITORING OBJECTIVES			NECESSARY MEASUREMENTS — SITE TYPE (1)					(2)					(3)					(4)					(5)				
			OZN	VOC	NOX	TOX	MET	OZN	VOC	NOX	TOX	MET	OZN	VOC	NOX	TOX	MET	OZN	VOC	NOX	TOX	MET	OZN	VOC	NOX	TOX	MET
NAAQS	OVERWHELMING TRANSPORT		•	•	•		•	••	••	••		••															
ATTAINMENT & CONTROL STRATEGY DEVELPMNT	PHOTOCHEMICAL GRID MODELS	BOUNDARY CONDITIONS	•	•	•		•						••	••	••		••	•	•	•		•	•	•	•		•
		MODEL INPUT REQUIREMENT	•	•	•		•	•	•	•		•	•	•	•		•	•	•	•		•	•	•	•		•
		MODEL PERFORMANCE	•	•	•		•	•	•	•		•	•	•	•		•	•	•	•		•	•	•	•		•
	ATTAINMENT DECISIONS		••		••		••	•		••		••	•		•		••	•		•		••	•		•		••
SIP CONTROL STRATEGY EVALUATION	EVALUATE EFFECTIVENESS OVER LONG-TERM		•	•	•		•	•	•	•		•	••	••	••		••	•	•	•		•	•	•	•		•
EMISSIONS TRACKING	CORROBORATE NOX AND VOC EMISSION INVENTORIES		••	•	•		•	••	•	•		•	••	•	•		•	••	•	•		•	••	•	•		•
	TRACK NOX AND VOC EMISSION INVENTORY REDUCTIONS			•	•	•	•		•	•	•	•		•	•	••	•		••	••	••	•		••	••	••	•
TRENDS			•	•	•	•	•	••	•	••	•	•	•	•	•	•	•	•	••	••	••	•	•	••	••	••	•
EXPOSURE ASSESSMENT			••	••	••	••	••	•	••	••	•	•	•	••	••	•	•	•	••	••	••	•	•	••	••	••	•

LEGEND
VOC - VOLATILE ORGANIC COMPOUNDS
NOX - OXIDES OF NITROGEN (NO, NO2, & NOX)
TOX - TOXIC AIR POLLUTANTS ALSO MEASURED AS VOC
OZN - OZONE
• - PRIMARY OBJECTIVE
•• - SECONDARY OBJECTIVE

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Type (1) PAMS sites would characterize the upwind background and transported precursor concentrations entering the nonattainment area. Type (2) sites would be intended to monitor areas of maximum precursor (VOC and NO_x) emissions, be ideally suited for the monitoring of urban air toxic pollutants, and might typically be located near the predominantly downwind edge of the central business district or other area of maximum precursor emissions such as from a large industrial area or major traffic area. Type (2) sites, however, should not be unduly influenced by single emission sources. The Agency seeks comment on the reasonableness of the view that this one site would suffice for the purpose of reporting on urban air toxics and assessing exposure. Type (3) sites would monitor changes in precursor concentrations and ratios downwind of the emission sources and would be located between sites (2) and (4) typically at the population fringe of the urbanized area. Type (4) and Type (5) sites would be sites located to measure the maximum ozone concentrations. Site (4) would be located in the predominant downwind direction during the ozone period and site (5) would be located in the second most predominant downwind direction. Given the large variability in emissions, meteorology, geography, etc., from area to area, the Agency recognizes that situations may occur where the minimum monitoring system required by the proposed rule is inadequate. The Agency also seeks comment on the criteria for determining such inadequacy and on a process for resolving the issue.

Because of the relatively large resource requirements to conduct PAMS monitoring, 3 months is being proposed as the minimum annual precursor monitoring period for the PAMS; however, EPA encourages the establishment of a monitoring period for the entire ozone season in order to provide a more comprehensive air quality data base and increase the possibility of actually conducting monitoring during most of the worst ozone episodes. PAMS ozone monitors must adhere to the ozone monitoring season specified in section 2.5 of appendix D.

Also included in appendix D are ciriteria for establishing ground level meteorological stations and a recommendation for obtaining upper air meteorological data. Ground level stations would be required to be operational upon establishment of the station. The Agency requests comment on the general need for meteorological stations and the adequacy of the proposed on-site measurements. Based on comments received during the Streamlined review process, the Agency recognizes that in rare cases it may not be possible to site a 10-meter meteorological monitoring tower at a particular PAMS site. The Agency, therefore, seeks comments on the criteria to determine how meteorological data collected at a nearby site could be used to represent the meteorology at a PAMS site where the tower and the air monitoring equipment cannot be collocated.

Appendix E—Probe Siting Criteria for Ambient Air Quality Monitoring

This appendix currently contains detailed provisions for specifically locating the sampler or analyzer probe inlet after the general location of the SLAMS or NAMS sampler or monitor has been selected.

Overall, the siting criteria for the PAMS monitors are similar to the NAMS/SLAMS criteria for such items as the minimum distance of the inlet probe from obstructions, vertical and horizontal probe placement, minimum distances from trees and spacing from roadways. The intent is that nearby roadways should not provide a local ozone sink for site Types (2) and (3), nor serve as precursor sources for site Types (1), (4), and (5).

Waiver provisions are revised to indicate that written requests for PAMS waivers must be forwarded to the Administrator for consideration.

In addition to seeking comment on the issues previously mentioned, the Agency solicits comment on adding the following requirements: Monitoring upper air meteorology in each area; adding more PAMS sites; increasing the monitoring frequency at those sites operating less than everyday, e.g., to daily; requiring shorter sampling averaging times, e.g., hourly samples, at all sites; elevated (altitude) sampling for all parameters; monitoring for other nitrogen and oxygen containing compounds which participate in ozone formation (e.g., peroxyacetylnitrate, nitric acid, etc.), often termed NOy; and ozone-season long monitoring for all precursor and meteorological parameters.

Estimated Cost of Proposal

The regulations proposed in this notice affect only those MSA/CMSAs which are located in ozone nonattainment areas designated as serious, severe, or extreme; therefore, the economic impact will be focused on the State and local air pollution control agencies having jurisdiction in those areas. These affected areas have been formally designated by amendments to 40 CFR part 81, published in the Federal Register on Wednesday, November 6, 1991. The specific MSA/CMSAs affected by this notice, and therefore subject to the enhanced ozone monitoring requirements, are lsited in Table 2. Each of the involved State and local air pollution control agencies have previously been sent a detailed compendium of the monitoring requirements and expected costs associated with the PAMS program. The primary responsibility for implementing the program with its associated costs rests with the States. EPA expects to supplement the funds provided by the States with grant monies pursuant to section 105 of the Clean Air Act.

TABLE 2. ESTIMATED REQUIREMENTS FOR PAMS

[Jan. 8, 1992]

CMSA/MSA	Number of new sites					Estimated cumulative cost FY-93 to FY-97
	O3	NO2	Meteor.	Aldehyde	VOC	
Los Angeles-Anaheim-Riverside, CA	0	0	5	2	5	$2,050,000
Houston-Galveston-Brazoria, TX	0	0	5	2	5	2,050,000
New York-Northern New Jersey-Long Island, NY-NJ-CT	0	0	5	2	5	2,050,000
Baltimore, MD	0	2	5	2	5	2,117,800
Chicago-Lake County (IL), IL-IN-WI	0	0	5	2	5	2,050,000
San Diego, CA	0	0	5	2	5	2,050,000
Philadelphia-Wilmington-Trenton, PA-NJ-DE-MD	0	0	5	2	5	2,050,000
Milwaukee-Racine, WI	0	2	4	2	4	1,973,820
Muskegon, MI	1	2	2	1	2	1,[illegible],520

TABLE 2. ESTIMATED REQUIREMENTS FOR PAMS—Continued

(Jan. 8, 1992)

CMSA/MSA	Number of new sites					Estimated cumulative cost FY-93 to FY-97
	O3	NO2	Meteor.	Aldehyde	VOC	
Sheboygan, WI	1	2	2	1	2	1,383,520
Hartford-New Britain-Middletown, CT	1	3	4	2	4	2,072,420
Fresno, CA	0	0	3	1	3	1,580,160
El Paso, TX	0	2	3	1	3	1,729,560
Bakersfield, CA	0	0	3	1	3	1,580,160
Springfield, MA	1	2	3	1	3	1,742,080
Boston-Lawrence-Salem, MA-NH	0	1	5	2	5	2,880,000
Washington, DC-MD-VA	0	0	5	2	5	2,050,000
Portsmouth-Dover-Rochester, NH-ME	1	2	2	1	2	1,383,520
Baton Rouge, LA	0	1	3	1	3	1,653,060
Atlanta, GA	1	3	5	2	5	2,217,000
Providence-Pawtucket-Fall River, RI-MA	2	3	4	2	4	2,124,820
Sacramento, CA	0	0	4	2	4	1,890,120
Beaumont-Port Arthur, TX	0	0	2	1	2	1,208,320
Totals	6	25	80	37	80	42,489,960

Table 2 also delineates the estimated increases in monitoring costs (above the present national ambient air monitoring network) associated with the establishment of PAMS sites in the affected areas. For the purpose of these estimates, EPA has assumed that 84 ozone monitors and 86 NO_2 monitors which are currently in operation will be converted to PAMS components. The cost estimates, therefore, do not include any provision for these monitors since operation and sample analysis costs are already included in the current national ambient air monitoring program. The cost estimates for each MSA/CMSA do include new capital expenditures, operational costs, and labor costs associated with the hiring of new senior environmental chemists/chromatographers and statisticians/data analysts. The PAMS costs are expressed as 5-year cumulative costs, from initiation of the network through required completion (based on the phase-in schedule proposed in appendix D) which amounts to a total of approximately $45 million nationally. Continuing annual costs for the operation and maintenance of the PAMS system, including an allowance for equipment replacement, are about $11.6 million. By comparison, current national costs for routine ozone-related monitoring programs involve the operation of 826 ozone monitors for $13.8 million and 329 NO_2 monitors at $6.9 million per year. Current total criteria monitoring capital and operating costs amount to $57 million annually. Further detail on the bases for these cost estimates is provided in Table 3.

TABLE 3. COST PER ENHANCED OZONE MONITORING STATION

Item	Yearly operational cost	Capital cost
Establish Monitoring Station (1st year only)	6,900	38,700
Ozone (O3)		20,300
7-month	7,500	
9-month	9,800	
12-month	12,800	
Nitrogen Dioxide (NO_2)		22,100
7-month	7,900	
9-month	10,200	
12-month	13,600	
Volatile Organic Compounds (VOC)		
Frequency "A" (Canister)	60,200	47,700
Frequency "B" (GC & Canister)	57,300	85,400
Frequency "C" (GC & Canister)	41,500	80,800
Aldehydes		
Frequency "D"	15,400	2,800
Frequency "E"	41,800	6,500
Meteorology	2,400	8,000
Data Analysis & Trends	12,500	

During the first year of operation, the PAMS network is likely to cost approximately $5.2 million. Additionally, present ozone control cost estimates amount to $8–10 billion on an annual basis compared to a continuing investment of less than $12 million to operate PAMS (only 0.2 percent). PAMS are designed to ensure that the most cost-effective ozone control strategies are devised in implemented and provide the basis to track their success.

Impact on Small Entities

The Regulatory Flexibility Act requires that all Federal Agencies consider the impacts of final regulations on small entities, which are defined to be small businesses, small organizations, and small governmental jurisdictions (5 U.S.C. 601 et seq.). EPA's consideration pursuant to this Act indicates that no small entity group would be significantly affected in an adverse way by the proposal. Therefore, pursuant to 5 U.S.C. 605(b), the Administrator certifies that these proposed amendments would not have a significant economic impact on a substantial number of small entities.

Other Reviews

Since this revision is classified as minor, no additional reviews are required. The proposed revisions to part 58 were submitted to the Office of Management and Budget (OMB) for review [under Executive Order 12291]. This is not a "major" rule under E.O. 12291 because it does not meet any of the criteria defined in the Executive Order.

Paperwork Reduction Act

The Office of Management and Budget (OMB) has approved the information collection requirements for Ambient Air Quality Networks under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* and has assigned OMB control number 2060-0084. The information collection requirements in this proposed rule, which will amend the Information Collection Request (ICR) for Ambient Air Quality Networks, have been submitted for approval to the OMB under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* An ICR has been prepared by EPA (ICR No. 940.09) and a copy may be obtained from Sandy Farmer, Information Policy Branch (PM-223Y); U. S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460 or by calling (202) 260–2740.

This proposed rule is estimated to increase the annual burden of affected control agencies by 99,840 hours for the first full year of operation. This burden would increase to 287,495 hours in the fifth year of implementation when all required sampling is operational. This estimate includes the time for site installation, sampler operation, data reduction, data reporting, and data analysis.

Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Chief, Information Policy Branch (PM-223Y); U. S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, marked "Attention: Desk Officer for EPA." The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

List of Subjects in 40 CFR Part 58

Air pollution control, Intergovernmental relations, Air quality surveillance and data reporting, Pollutant standard index, Quality assurance program, Ambient air quality monitoring network design and siting.

Dated: January 22, 1992.

William K. Reilly,

Administrator.

For the reasons set forth in the Preamble, part 58 of chapter I of title 40 of the Code of Federal Regulations is proposed to be amended as follows:

PART 58—AMBIENT AIR QUALITY SURVEILLANCE

1. Authority citation for 40 part 58 is revised to read as follows:

Authority: 42 U.S.C. 7410, 7601(a), 7613, and 7619.

2. Section 58.1 is amended by revising paragraph (f) and by adding paragraphs (w), (x), and (y) to read as follows:

§ 58.1 Definitions.

* * * * *

(f) *NO_2* means nitrogen dioxide. *NO* means nitrogen oxide. *NO_x* means oxides of nitrogen and is defined as the sum of the concentrations of NO_2 and NO.

* * * * *

(w) *PAMS* means Photochemical Assessment Monitoring Stations.

(x) *VOC* means volatile organic compounds.

(y) *Meteorological* measurements means continuous measurements of wind speed, wind direction, barometric pressure, temperature, relative humidity, and solar radiation.

3. Section 58.2 is amended by redesignating paragraph (d) as paragraph (e) and by adding a new paragraph (d) to read as follows:

§ 58.2 Purpose.

* * * * *

(d) This section also acts to establish a Photochemical Assessment Monitoring Stations (PAMS) network as a subset of the State's SLAMS network for the purpose of enhanced monitoring in ozone nonattainment areas listed as serious, severe, or extreme. The PAMS network will be subject to the data reporting and monitoring methodology requirements as contained in subpart E of this part.

4. Section 58.13 is amended by revising paragraph (b); redesignating paragraph (c) as paragraph (d); and adding a new paragraph (c) to read as follows:

§ 58.13 Operating schedule.

* * * * *

(b) For manual methods (excluding PM_{10} samplers and PAMS VOC samplers), at least one 24-hour sample must be obtained every sixth day except during periods or seasons exempted by the Regional Administrator.

(c) For PAMS VOC samplers, samples must be obtained as specified in section 4.4 of appendix D to this part. PAMS operating schedules must be included as part of the network description required by § 58.40 and must be approved by the Administrator.

* * * * *

5. Section 58.20 is amended by revising paragraphs (a) and (c) and adding paragraph (f) to read as follows:

§ 58.20 Air quality surveillance: Plan content.

* * * * *

(a) Provide for the establishment of an air quality surveillance system that consists of a network of monitoring stations designated as State and Local Air Monitoring Stations (SLAMS) which measure ambient concentrations of those pollutants for which standards have been established in part 50 of this chapter. SLAMS (including NAMS) designated as PAMS will also obtain ambient concentrations of speciated VOC and NO_x, and meteorological measurements. PAMS may therefore be located at existing SLAMS or NAMS sites when appropriate.

* * * * *

(c) Provide for the operation of at least one SLAMS per criteria pollutant except Pb during any stage of an air pollution episode as defined in the plan.

* * * * *

(f) Within 6 months after the effective date of promulgation or date of nonattainment designation (whichever is later), States with ozone nonattainment areas designated as serious, severe, or extreme shall adopt and submit a plan revision to the Administrator. The plan revision will provide for the establishment and maintenance of PAMS. Each PAMS site will provide for the monitoring of ambient concentrations of criteria pollutant (O_3, NO_2,), and non-criteria pollutant (NO_x, NO, and speciated VOC) as stipulated in section 4.2 of appendix D to this part, and meteorological measurements. The PAMS network is part of the SLAMS (including NAMS) network and the plan provisions in paragraphs (a) through (e) of this section will apply to the revision.

Subpart E (§ 58.40) [Redesignated as Subpart F (§ 58.50)]

Supart F (§§ 58.50, 58.51) [Redesignated as Subpart G (§§ 58.60, 58.61)]

6. Subparts E (§ 58.40) and F (§§ 58.50 and 58.51) are redesignated as subparts F (§ 58.50) and G (§§ 58.60 and 58.61), respectively. Subpart E is added to read as follows:

Subpart E—Photochemical Assessment Monitoring Stations (PAMS)

Subpart E—Photochemical Assessment Monitoring Stations (PAMS)

§ 58.40 PAMS network establishment.

(a) In addition to the plan revision, the State shall submit a photochemical assessment monitoring network description including a schedule for implementation to the Administrator within 6 months after the effective date of promulgation or redesignation and reclassification of the area to serious, severe, or extreme ozone nonattainment. The newtwork description will apply to all serious, severe, and extreme ozone nonattainment areas within the State. Some ozone nonattainment areas may extend beyond State or Regional boundaries. In instances where PAMS network design criteria as defined in appendix D to this part require monitoring stations located in different States and/or Regions, the network description and implementation schedule may be submitted jointly the States involved. Network descriptions shall be submitted through the appropriate Regional Office(s).

Alternative networks may be submitted, but they must include a demonstration that they satisfy the monitoring data uses and fulfill the PAMS monitoring objectives described in sections 4.1 and 4.2 of appendix D to this part. Certain alternative plans described in section 4.2 of appendix D to this part must be published in the Federal Register, subjected to public comment, and subsequently approved by the Administrator.

(b) For purposes of plan development and approval, the stations in the PAMS network must be stations from the SLAMS network required by § 58.20.

(c) The requirements of appendix D to this part applicable to PAMS must be met when designing the PAMS network.

§ 58.41 PAMS network description.

The PAMS network description required by § 58.40 must contain the following:

(a) Identification of the monitoring area represented.

(b) The AIRS site identification form for existing stations.

(c) The proposed location for scheduled stations.

(d) Identification of the site type and location within the PAMS network design for each station as defined in appendix D to this part.

(e) The sampling and analysis method for each of the measurements.

(f) The operating schedule for each of the measurements.

(g) A schedule for implementation. This schedule should include the following:

(1) A timetable for locating, and submitting the AIRS site identification form for each scheduled PAMS that is not located at the time of submittal of the network description,

(2) A timetable for phasing-in operation of the required number and type of sites as defined in appendix D to this part, and

(3) A schedule for implementing the quality assurance procedures of appendix A to this part for each PAMS.

§ 58.42 PAMS approval.

The PAMS network required by § 58.40 is subject to that approval of the Administrator. Such approval will be contingent upon completion of the network description as outlined in § 58.41 and upon conformance to the PAMS network design criteria contained in appendix D to this part.

§ 58.43 PAMS methodology.

PAMS monitors must meet the monitoring methodology requirements of appendix C to this part applicable to PAMS.

§ 58.44 PAMS network completion.

(a) The complete, operational PAMS network will be phased in as described in appendix D to this part over a period of 5 years after the effective date of promulgation or redesignation and reclassification of any area to serious, severe, or extreme ozone nonattainment.

(b) The quality assurance criteria of appendix A to this part must be implemented for all PAMS.

§ 58.45 PAMS data submittal.

(a) The requirements of this section apply only to those stations designated as PAMS by the network description required by § 58.40.

(b) All data shall be submitted to the Administrator in accordance with the format and for the reporting periods specified in § 58.35.

(c) The State shall report O_3, NO, NO_2, and NO_x data within 60 days following the end of each quarterly reporting period.

(d) The State shall report speciated VOC data and meteorological data within 6 months following the end of each quarterly reporting period.

§ 58.46 System modification.

(a) Any proposed changes to the PAMS network description will be evaluated during the annual SLAMS Network Review specified in § 58.20. Changes proposed by the State must be approved by the Administrator. The State will be allowed 1 year (until the next annual evaluation) to implement the appropriate changes to the PAMS network.

(b) PAMS network requirements are mandatory only for serious, severe, and extreme ozone nonattainment areas. When such area is redesignated to attainment, the State may revise its PAMS monitoring program subject to approval by the Administrator.

7. A new sentence is added before the last sentence in the first paragraph of section 2.2 of appendix A to read as follows:

Appendix A—Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)

* * * * *

2.2 * * * Quality assurance guidance for VOC and meteorological measurements at PAMS is contained in reference 5. * * *

* * * * *

8. References 5, 6, and 7, of Appendix A are redesignated as references 6, 7, and 8 repectively and new reference 5 is added to read as follows:

References

* * * * *

5. Technical Guidance for Monitoring Ozone Precursor Compounds. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC. Draft May 1991.

* * * * *

9. Sections 4.0, 5.0 and 5.1 of appendix C are redesignated as sections 5.0, 6.0, and 1, respectively (reference 5.1 therefore will become reference 1 of section 6.0), sections 4.0, 2, and 3 are added and newly redesignated Section 6.0 is revised to read as follows:

Appendix C—Ambient Air Quality Methodology

* * * * *

4.0 Photochemical Assessment Monitoring Stations (PAMS)

4.1 Methods used for O_3 monitoring at PAMS must be automated reference or equivalent methods as defined in § 50.1 of this chapter.

4.2 Methods used for NO and NO_x monitoring at PAMS must be automated reference or equivalent methods as defined for NO_2 in § 50.1 of this chapter.

4.3 Methods for meteorological measurements and speciated VOC monitoring are included in the guidance provided in references 2. and 3. If alternative VOC monitoring methodology, which is not included in the guidance, is proposed, it must be detailed in the network description required by § 58.40 and must be published in the Federal Register, subject to public comment, and subsequently approved by the Administrator.

* * * * *

6.0 References

1. Pelton, D.J. Guideline for Particulate Episode Monitoring Methods. GEOMET Technologies, Inc., Rockville, MD. Prepared for U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA Contract No. 68-02-3584. EPA 450/4-83-005. February 1983.

2. Technical Guidance for Monitoring Ozone Precursor Compounds. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. Draft May 1991.

3. Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/4-82-060. February 1983.

10. The heading of Appendix D is revised to read as follows:

Appendix D—Network Design for State and Local Air Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS), and Photochemical Assessment Monitoring Stations (PAMS)

11. The second sentence of the first paragraph of Section 1 of Appendix D is revised to read as follows:

1. * * * It also describes criteria for determining the number and location of National Air Monitoring Stations (NAMS) and Photochemical Assessment Monitoring Stations (PAMS). These criteria will also be used by EPA in evaluating the adequacy of the SLAMS/NAMS/PAMS networks.* * *

* * * * *

12. Section 4 and section 5 of appendix D are redesignated as section 5 and section 6, respectively. A new section 4 is added to read as follows:

4 Network Design for Photochemical Assessment Monitoring Stations (PAMS)

In order to obtain more comprehensive and representative data on ozone air pollution, the 1990 Clean Air Act Amendments require enhanced monitoring for ozone (O_3), oxides of nitrogen (NO_x), and volatile organic compounds (VOC) in ozone nonattainment areas classified as serious, severe, or extreme. This will be accomplished through the establishment of a network of photochemical assessment monitoring stations (PAMS).

4.1 PAMS data uses.—Data from the PAMS are intended to satisfy several coincident needs related to attainment of the National Ambient Air Quality Standards (NAAQS), SIP control strategy development and evaluation, corroboration of emissions tracking, preparation of trends appraisals, and exposure assessment.

(a) *NAAQS attainment and control strategy development.* Like SLAMS and NAMS data, PAMS data will be used for monitoring ozone exceedances and providing input for attainment/nonattainment decisions. In addition, PAMS data will help resolve the roles of transported and locally emitted ozone precursors in producing an observed exceedance and may be utilized to identify specific sources contributing to observed exceedances and excessive concentrations of ozone precursors. PAMS data will also assist in characterizing the concentrations of ozone and precursors occurring on days when high ozone levels are measured and therefore extend the data base available for future attainment demonstrations. These demonstrations will be based on photochemical grid modeling and other approved analytical methods and will provide a basis for prospective mid-course control strategy corrections. PAMS data will provide (1) information concerning which areas and episodes to model to develop appropriate control strategies; (2) boundary conditions required by the models to produce quantifiable estimates of needed emissions reductions; and (3) a means to evaluate the predictive capability of the models used.

(b) *SIP control strategy evaluation.* The PAMS will provide data for SIP control strategy evaluation. Long-term PAMS data will be used to evaluate the effectiveness of these control strategies. Data could be used to validate the impact of VOC and NO_x emission reductions on air quality levels for ozone if retrieved at the end of a time period during which control measures were implemented. Additionally, ambient monitoring data will be used to determine in what portion of the day, the VOC emissions reductions occur. Speciation of measured VOC data will allow determination of which organic species are most affected by the emissions reductions and assist in developing cost effective selective VOC reductions and control strategies. A State or local air pollution control agency can therefore ensure that strategies which are implemented in their particular nonattainment area, are those which are best suited for that area and achieve the greatest VOC and NO_x emissions reductions (and therefore largest impact) at the least cost.

(c) *Emissions tracking.* PAMS data will be used to corroborate the quality of VOC and NO_x emission inventories. Although a perfect mathematical relationship between emission inventories and ambient measurements does not yet exist, a qualitative assessment of the relative contributions of various compounds to the ambient air could be roughly compared to current emission inventory estimates to judge the accuracy of the emission inventories. In addition, PAMS data which is gathered year round will allow tracking of VOC and NO_x emission reductions, provide additional information necessary to demonstrate Reasonable Further Progress (RFP) toward the specific reductions required to achieve the ozone NAAQS, and corroborate emissions trends analyses. While the regulatory assessments of progress will be made in terms of emission inventory estimates, the ambient data can provide independent trends analyses and corroboration of these assessments which either verify or highlight possible errors in emissions trends indicated by inventories. The ambient assessments, using speciated data, can gage the accuracy of estimated changes in emissions. The speciated data can also be used to assess the quality of the VOC speciated and NO_x emission inventories for input during photochemical grid modeling exercises and identify urban air toxic pollutant problems which deserve closer scrutiny.

The speciated VOC data will be used to determine changes in the species profile, resulting from the emission control program, particulary those resulting from the reformulation of fuels.

(d) *Trends.* Long-term PAMS data will be used to establish speciated VOC, NO_x, and toxic air pollutant trends, and supplement the O_3 trends data base. Multiple statistical indicators will be tracked, including ozone and its precursors on the ten days during each year with the highest ozone concentration, the seasonal means for these pollutants, and the annual means at representative locations.

The more PAMS that are established in and near nonattainment areas, the more effective the trends data will become. As the spatial distribution and number of ozone and ozone precursor monitors improves, trends analyses will be less influenced by instrument or site location anomalies. The requirement that surface meteorological monitoring be established at each PAMS help maximize the utility of these trends analyses by comparisons with meteorological trends, and transport influences. The meteorological data will also help interpret the ambient air pollution trends.

(e) *Exposure assessment.* PAMS data will be used to better characterize ozone and toxic air pollutant exposure to populations living in serious, severe, or extreme areas. Annual mean toxic air pollutant concentrations will be calculated to determine the risk to the population associated with individual VOC species in urban environment.

4.2 *PAMS monitoring objectives.*—Unlike the SLAMS and NAMS design criteria which are pollutant specific, PAMS design criteria are specific to site location. Concurrent measurements of O_3, NO_x, speciated VOC, and meteorology are obtained at PAMS. Design criteria for the PAMS network are based on selection of an array of site locations relative to ozone precursor source areas and predominant wind directions associated with high ozone events. Specific monitoring objectives are associated with each location. The overall design should enable characterization of precursor emission sources within the area, transport of ozone and its precursors into and out from the area, and the photochemical processes related to ozone nonattainment, as well as developing an initial urban air toxic pollutant data base. Specific objectives that must be addressed include assessing ambient trends in O_3, NO, NO_2, NO_x, VOC, and VOC species, determining spatial and diurnal variability of O_3, NO, NO_2, NO_x, and VOC species and assessing changes in the VOC species profiles that occur over time, particularly those occurring due to the reformulation of fuels. A maximum of five PAMS sites are required in an affected nonattainment area depending on the population of the Metropolitan Statistical Area/Consolidated Metropolitan Statistical Area (MSA/CMSA) or nonattainment area, whichever is larger. Specific monitoring objectives associated with each of these sites result in five distinct site types.

Type (1) sites are established to characterize upwind background and transported ozone and its precursor concentrations entering the area and will identify those areas which are subjected to overwhelming transport. Type (1) sites are located in the predominant upwind direction from the local area of maximum precursor emissions during the ozone season and at a distance sufficient to ensure urban scale measurements are obtained as defined elsewhere in this Appendix. Typically, the (1) sites will be located 10–30 miles in the predominant upwind direction from the city limits or fringe of the urbanized area. Data measured at site type (1) will be used principally for the following purposes:

• Future development and evaluation of control strategies.

Identification of incoming emissions.

Corroboration of NO_x and VOC emission ...ntories.

• Establishment of boundary conditions for future photochemical grid modeling and mid-course control strategy changes.

• Analysis of pollutant trends.

Type (2) sites are established to monitor the magnitude and type of precursor emissions in the area where maximum emissions are expected to impact and are ideally suited for the monitoring of urban air toxic pollutants. Type (2) sites are located immediately downwind of the area of maximum precursor emissions and are typically placed near the downwind boundary of the central business district to ensure neighborhood scale measurements are obtained. Data measured at site type (2) will be used principally for the following purposes:

• Development and evaluation of imminent and future control strategies.

• Corroboration of NO_x and VOC emission inventories.

• Augmentation of RFP tracking.

• Verification of photochemical grid model performance.

• Characterization of ozone and toxic air pollutant exposures (maximum site for toxic emissions impact).

• Analysis of pollutant trends, particularly toxic air pollutants and annual ambient speciated VOC trends to compare with trends in annual VOC emission estimates.

• Determination of attainment with the NAAQS for NO_2 and O_3

Type (3) sites monitor changes in precursor ...centrations and ratios downwind of the emissions source. Type (3) sites should be located in an intermediate position between the area of maximum precursor emissions and the downwind area where maximum ozone concentrations would be expected to ensure neighborhood scale measurements are obtained (between sites (2) and (4)). Typically, type (3) sites are 10–20 miles from the central business district or at the fringe of the urbanized area in the predominant downwind direction during the ozone season. Data measured at site type (3) will be used principally for the following purposes:

• Determination of attainment with the NAAQS, for NO_2 and O_3 (this site may coincide with an existing maximum NO_2 NAMS monitoring site).

• Measurement of transport and reactivity of precursors.

• Verification of photochemical grid model performance.

• Characterization of air pollutant exposures.

• Corroboration of NO_x and VOC emission inventories.

• Augmentation of RFP tracking.

• Analysis of pollutant trends.

Type (4) and (5) sites are intended to monitor maximum ozone concentrations occurring downwind from the area of maximum precursor emissions in the first and second most frequently occurring wind directions, respectively. Locations for type (4) and (5) sites should be chosen so that urban scale measurements are obtained. Typically, type (4) and (5) sites will be located 10–30 miles downwind from the fringe of the urban area or from site type (3). Data measured at site types (4) and (5) will be used principally for the following purposes:

• Determination of attainment with the NAAQS for ozone and NO_2 (this site may coincide with an existing maximum concentration ozone or a population exposure NO_2 NAMS monitoring site).

• Establishment of boundary conditions for photochemical grid modeling.

• Future development and evaluation of control strategies.

• Analysis of pollutant trends.

• Characterization of ozone pollutant exposures.

States choosing to submit individual network descriptions for each affected nonattainment area irrespective of its proximity to other affected areas, must fulfill the requirements for isolated areas as described in section 4 of appendix D and illustrated by Figure 1. States containing areas which experience significant impact from long-range transport or are proximate to other nonattainment areas (even in other States) may collectively submit a network description which contains alternative sites to those that would be required for an isolated area. Such a submittal should, as a guide, be based on the example provided in Figure 2, but must include a demonstration that it satisfies the monitoring data uses and fulfills the PAMS monitoring objectives described in sections 4.1 and 4.2 of this Appendix D. EPA recognizes that specific monitoring sites identified for one area may serve to fulfill the monitoring objectives for different site in another area: for example, a downwind site for one area may suffice as an upwind site for another. These alternative network designs must be reviewed and approved by the Administrator.

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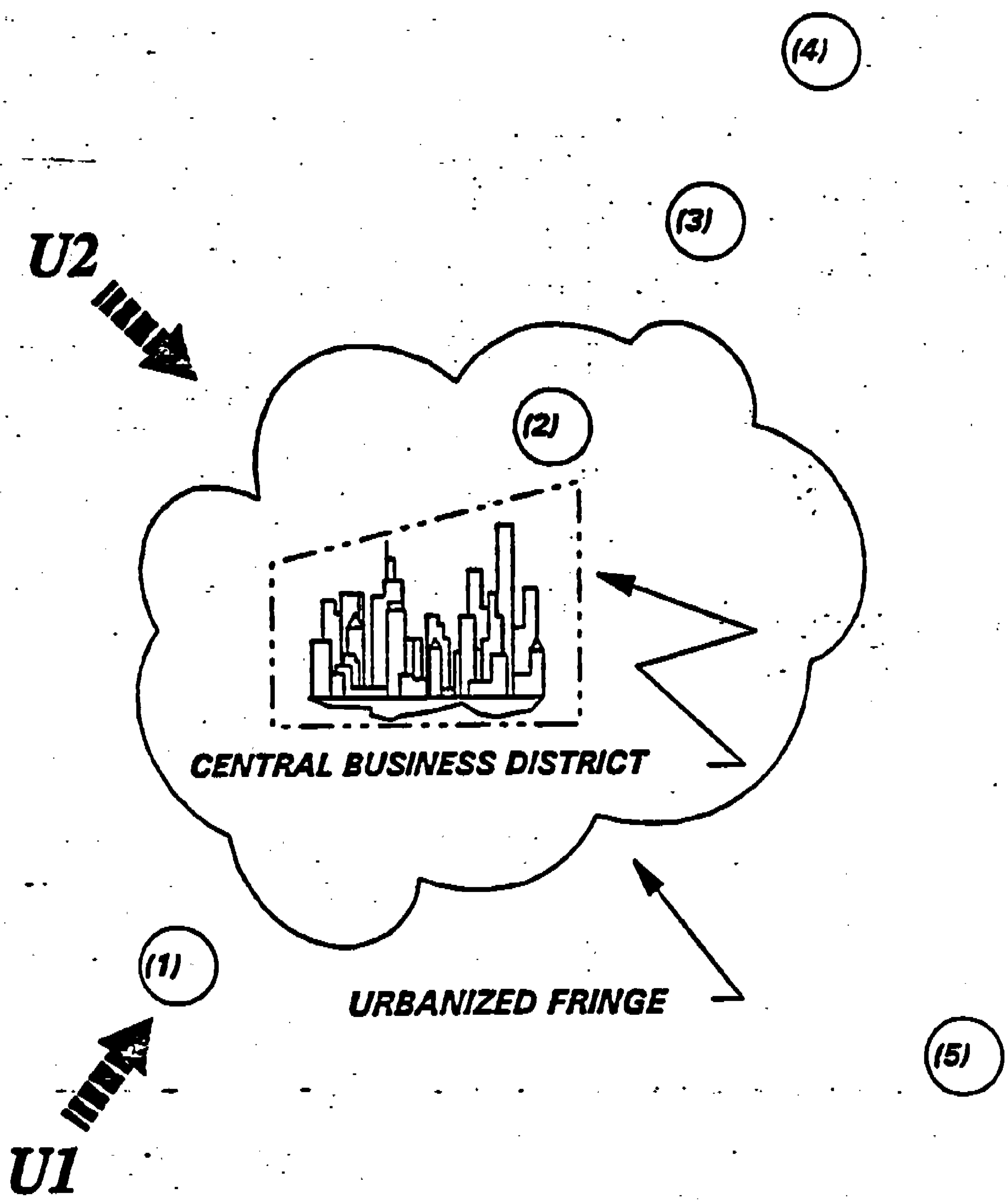
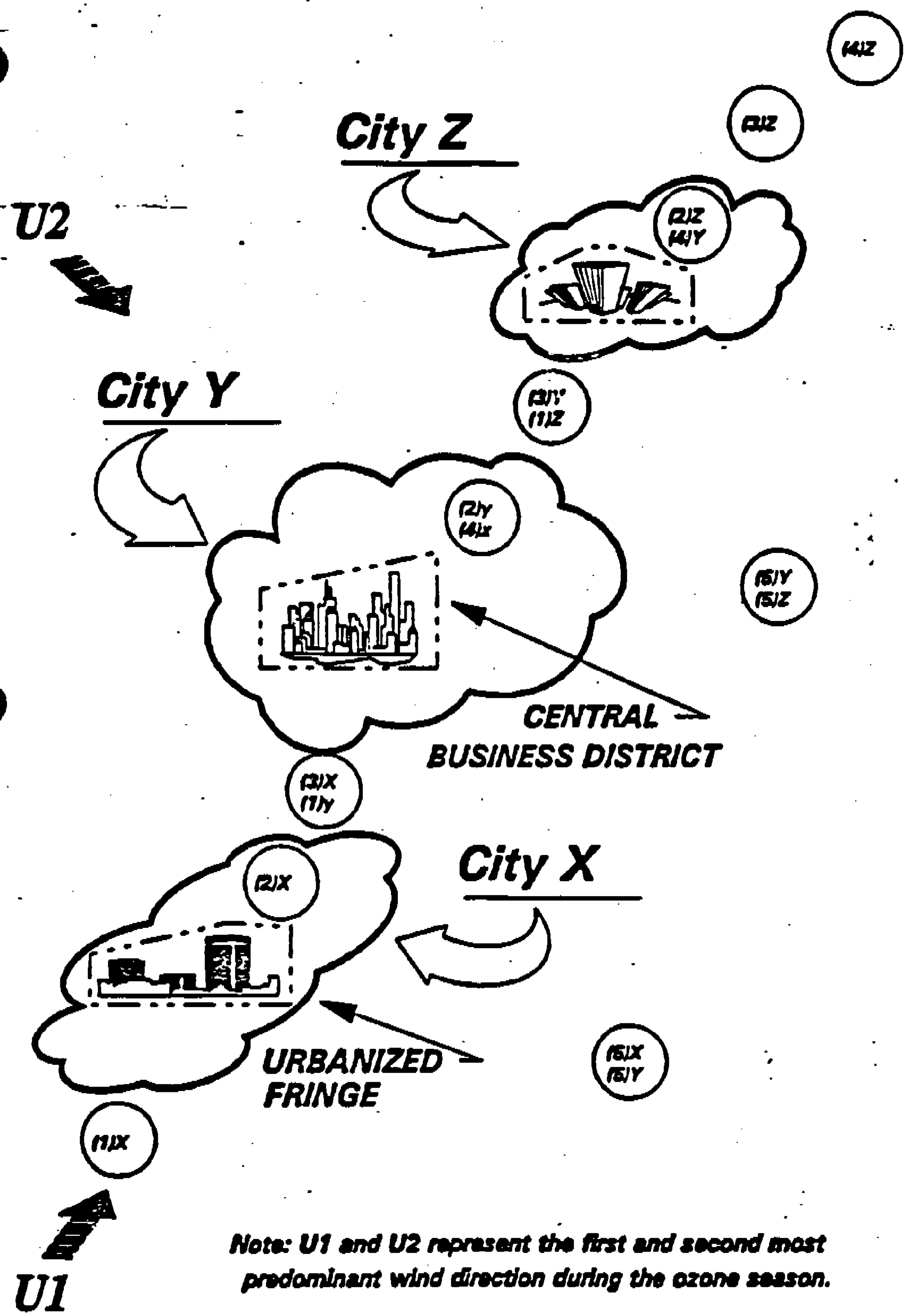
Figure 1 - Isolated Area Network Design



Note: U1 and U2 represent the first and second most predominant wind direction during the ozone season.

Figure 2 - Multi-Area/Transport Network Design



Note: U1 and U2 represent the first and second most predominant wind direction during the ozone season.

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Alternative plans which propose different or reduced frequencies of sampling or reduced spatial coverage must also be proposed for approval by the Administrator in the Federal Register, subjected to public comment, and subsequently considered by the Administrator for final approval or disapproval based on the comments received. Site locations are submitted as part of the network description required by § 58.40 and are subject to approval by the Administrator.

4.3 Monitoring period.—PAMS precursor monitoring will be conducted annually throughout the months of June, July and August (as a minimum) when peak ozone values are expected in each area; however, precursor monitoring during the entire ozone season for the area is preferred. Alternate precursor monitoring periods may be submitted for approval as a part of the PAMS network description required by § 58.40. Changes to the PAMS monitoring period must be identified during the annual SLAMS Network Review specified in § 58.20. PAMS ozone monitors must adhere to the ozone monitoring season specified in Section 2.5 of this Appendix D.

4.4 Minimum network requirements.—The minimum required number and type of monitoring sites and sampling requirements are based on the population of the affected MSA/CMSA or nonattainment area (whichever is larger). The MSA/CMSA basis for monitoring network requirements was chosen because it typically is the most representative of the area which encompasses the emissions sources contributing to nonattainment. The MSA/CMSA emissions density can also be effectively and conveniently portrayed by the surrogate of population. Additionally, a network which is adequate to characterize the ambient air of an MSA/CMSA often must extend beyond the boundaries of such an area (especially for ozone and its precursors); therefore, the use of smaller geographical units (such as counties or nonattainment areas which are smaller than the MSA/CMSA) for monitoring network design purposes is inappropriate. Various sampling requirements are imposed according to the size of the area to accommodate the impact of transport on the smaller MSA's/CMSA's, to account for the spatial variations inherent in large areas, to satisfy the differing data needs of large versus small areas due to the intractability of the ozone nonattainment problem, and to recognize the potential economic impact of implementation on State and local government. Population figures must reflect the most recent decennial U.S. census population report. Specific guidance on determining network requirements is provided in reference 19. Minimum network requirements are outlined below:

Population of MSA/CMSA or nonattainment area [1]	Required site type [2]	Minimum VOC sampling frequency [3]	Minimum aldehyde sampling frequency [3]
Less than 500,000.	(1)	A	—
	(2)	A	D
500,000 to 1,000,000.	(1)	A	—
	(2)	B	E
	(4)	A	—
1,000,000 to 2,000,000.	(1)	A	—
	(2)	B	E
	(3)	C	E
	(4)	A	—
More than 2,000,000.	(1)	A	—
	(2)	B	E
	(3)	C	E
	(4)	A	—
	(5)	A	—

[1] Whichever area is larger.
[2] See figure 1.
[3] Frequency requirements are as follows: A—Eight 3-hour samples every third day and one 24-hour sample every sixth day during the monitoring period; B—Eight 3-hour samples, everyday during the monitoring period and one 24-hour sample every sixth day year-round; C—Eight 3-hour samples, everyday and one 24-hour sample every sixth day during the monitoring period; D—Four 6-hour samples, every third day during the monitoring period; E—Four 6-hour samples, everyday during the monitoring period.

Note that for purposes of network implementation and transition only, priority has been given to the particular monitoring sites as follows:

- Site type (2) which provides the most comprehensive data concerning ozone precursor emissions and toxic air pollutants,
- Site type (1) which delineates the effect of incoming precursor emissions and concentrations of ozone,
- Site type (4) which provides a maximum ozone measurement and total conversion of ozone precursors,
- Site type (3) which depicts the changes in concentrations of ozone and precursors as the pollutants travel across an area, and
- Site type (5) which serves a similar purpose as site type (4) in the second most predominant wind direction.

4.5 *Transition period*.—A variable period of time is proposed for phasing in the operation of all required PAMS. Within 1 year after the effective date of promulgation or redesignation and reclassification of the area to serious, severe, or extreme ozone nonattainment (whichever is later), a minimum of one type (2) site must be operating. Operation of the remaining sites must, at a minimum, be phased in over the subsequent 4 years as outlined below:

Years after promulgation/designation	No. of sites operating	Operating site type [1]
1	1	(2)
2	2	(1),(2)
3	3	(1),(2),(4)
4	4	(1),(2),(3),(4)
5	5	(1),(2),(3),(4),(5)

[1] See figure 1

Note that given the need to differentiate the monitoring network requirements due to the spatial and emissions characteristics of the various sizes of MSA/CMSA or nonattainment areas, the criteria and priorities given in Section 4.4 were applied. These criteria and priorities result in networks of varying proportions, provid[illegible] reasonable data coverage, and stratifie[illegible] monitoring requirements.

4.6 *Meteorological monitoring*.—In order to support monitoring objectives associated with the need for various air quality analyses and model inputs and performance evaluations, meteorological monitoring at 10 meters above ground is required at each PAMS site. Monitoring should begin with site establishment. In addition, upper air meteorological monitoring should be initiated as warranted in areas where such data is not available. The upper air station may be located separately from sites (1) through (5). The location should be representative of the upper air data in the nonattainment area. Upper air meteorological data should be collected for approximately 10 to 20 key days per year corresponding to model input requirements. Specific guidance on monitoring methods and siting is provided in reference 20 and 21.

5 Summary

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13. In appendix D references 19 through 23 are added to section 6 to read as follows:

6 References

* * * * *

19. Enhanced Ozone Monitoring Network Design and Siting Criteria Guideline Document. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC. D[illegible] May 1991.

20. Technical Guidance for Monitoring Ozone Precursor Compounds. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC. Draft May 1991.

21. Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/4-82-060. February 1983.

22. Criteria for Assessing the Role of Transported Ozone/Precursors in Ozone Non-Attainment Areas. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA-450/4-91-015. May 1991.

23. Guidelines for Regulatory Application of the Urban Airshed Model. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC. Draft, March 1991.

14. Appendix E is amended by adding a new paragraph after the first paragraph in section 9, by redesignating sections 10, 11, and 12 as sections 11, 12, and 13, redesignating Table 5 as Table 6, adding a new Table 5, adding a new section 10, amending the last sentence in

newly redesignated section 11 to add reference to PAMS, and amending newly redesignated section 12 by adding an entry to the bottom of Table 6 for VOC to read as follows:

Appendix E—Probe Siting Criteria for Ambient Air Quality Monitoring

* * * * *

9 * * *

For VOC monitoring at those SLAMS designated as PAMS, FEP teflon is unacceptable as the probe material because of VOC adsorption and desorption reactions on the FEP teflon. Borosilicate glass, stainless steel, or its equivalent are the acceptable probe materials for VOC and aldehyde sampling. Care must be taken to ensure that the sample residence time is 20 seconds or less.

* * * * *

10 Photochemical Assessment Monitoring Stations (PAMS)

10.1 *Horizontal and Vertical Probe Placement.*—The height of the probe inlet must be located 3 to 15 meters above ground level. This range provides a practical compromise for finding suitable sites for the multi-pollutant PAMS. The probe inlet must also be located more than 1 meter vertically or horizontally away from any supporting structure.

10.2 *Spacing From Obstructions.*—The probe must be located away from obstacles and buildings such that the distance between the obstacles and the probe inlet is at least twice the height that the obstacle protrudes above the sampler. There must be unrestricted airflow in an arc of at least 270° around the probe inlet and the predominant wind direction for the season of greatest pollutant concentration must be included in the 270° arc. If the probe is located on the side of the building, 180° clearance is required.

10.3 *Spacing From Roads.*—It is important in the probe siting process to minimize destructive interferences from sources of nitrogen oxide (NO) since NO readily reacts with ozone. Table 5 below provides the required minimum separation distances between roadways and PAMS (excluding upper air measuring stations):

TABLE 5.—SEPARATION DISTANCE BETWEEN PAMS AND ROADWAYS

[Edge of nearest traffic lane]

Roadway average daily traffic	Minimum separation distance between roadways and stations in meters
Vehicles per day:	
<10,000	[1]>10
15,000	20
20,000	30
40,000	50
70,000	100
>110,000	>250

[1] Distances should be interpolated based on traffic flow.

Sites types (1), (4) and (5) are intended to be regionally representative and should not be unduly influenced by an NO_x source from a nearby roadway. Similarly, a nearby roadway should not act as a local ozone sink for site types (2) and (3).

10.4 *Spacing From Trees.*—Trees can provide surfaces for adsorption and/or reactions to occur and can obstruct normal wind flow patterns. To minimize these effects at PAMS, the probe inlet should be placed at least 20 meters from the drip line of trees. Since the scavenging effect of trees is greater for ozone than for the other criteria pollutants, strong consideration of this effect must be given in locating the PAMS probe inlet to avoid this problem. Therefore, the samplers must be at least 10 meters from the drip line of trees that are located between the urban city core area and the sampler along the predominant summer daytime wind direction.

10.5 *Meteorological Measurements.*—The 10-meter meteorological tower at each PAMS site should be located so that measurements can be obtained that are not immediately influenced by surrounding structures and trees. It is important that the meteorological data reflect the origins of, and the conditions within, the air mass containing the pollutants collected at the probe. Specific guidance on siting of meteorological towers is provided in references 31 and 32.

11 Waiver Provisions

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For those SLAMS also designated as NAMS or PAMS, the request will be forwarded to the Administrator.

12 Discussion and Summary

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TABLE 6.—SUMMARY OF PROBE SITING CRITERIA

Pollutant	Scale	Height above ground, meters	Distance from supporting structure, meters		Other spacing criteria
			Vertical	Horizontal [a]	
* * *					
VOC	—	3–15	>1	>1	1. Should be >20 meters from the dripline and must be 10 meters from the dripline when the tree(s) act as an obstruction. 2. Distance from probe inlet to obstacle must be at least twice the height the obstacle protrudes above the inlet probe. 3. Must have unrestricted air flow in an arc of at least 270° around the probe inlet and the predominant wind direction for the season of greatest pollutant concentration must be included in the 270° arc. If probe located on the side of a building unrestricted air flow must be 180°. 4. Spacing from roadways (see Table 5).

[a] When probe is located on rooftop, this separation distance is in reference to walls, parapets, or penthouses located on the roof.

* * * * *

15. References number 31 and 32 are added to newly redesignated section 13 of appendix E to read as follows:

13 References

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31. Technical Guidance for Monitoring Ozone Precursor Compounds. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC. Draft May 1991.

32. Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/4-82-060. February 1983.

[FR Doc. 92-2535 Filed 3-3-92; 8:45 am]

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40 CFR Part 180

[OPP-300239; FRL-3948-6]

RIN 2070 AC-18

Acetic Acid; Tolerance Exemption

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: This document proposes that an exemption from the requirement of a

federal register

Friday
February 12, 1993

Part II

Environmental Protection Agency

40 CFR Part 58
Ambient Air Quality Surveillance; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 58

[AD-FRL-4099-6]

RIN 2060-AD16

Ambient Air Quality Surveillance

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This final rule revises the ambient air quality surveillance regulations to include provisions for the enhanced monitoring of ozone and its precursors including oxides of nitrogen, volatile organic compounds (including carbonyls) and meteorological parameters. These revisions satisfy the requirements of title I, section 182 of the 1990 Clean Air Act Amendments. These revisions require States to establish photochemical assessment monitoring stations (PAMS) as part of their State Implementation Plan (SIP) monitoring network in ozone nonattainment areas classified as serious, severe, or extreme. Included in these revisions are minimum criteria for network design, monitor siting, monitoring methods, operating schedules, quality assurance, and data submittal.

EFFECTIVE DATE: These regulations take effect on February 12, 1993.

ADDRESSES: Docket Statement: All comments received relative to this rule have been placed in Docket No. A-91-22, located in the Central Docket Section, Room M1500 (First Floor, Waterside Mall), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460. This docket is available for public inspection and copying from 8:30-12 a.m. and from 1:30-3:30 p.m., Monday through Friday. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Geri Dorosz-Stargardt, Technical Support Division (MD-14), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711, phone: (919) 541-5492.

SUPPLEMENTARY INFORMATION:

Background

Section 110(a)(2)(C) of the Clean Air Act requires ambient air quality monitoring for purposes of the State Implementation Plan (SIP) and reporting of the data to EPA. Uniform criteria for measuring air quality and provisions for the reporting of a daily air pollution index are required by section 319 of the Act. To satisfy these requirements, on May 10, 1979 (44 FR 27571), EPA established 40 CFR part 58 which provided detailed requirements for air quality surveillance and data reporting for all the pollutants except lead for which ambient air quality standards (criteria pollutants) had been established. On September 3, 1981 (46 FR 44164) similar rules were promulgated for lead and on July 1, 1987 (52 FR 24740) for particulate matter (PM_{10}).

On March 4, 1992, these rules were proposed in the Federal Register as amendments to 40 CFR part 58. These regulations address the minimum requirements for the monitoring of speciated volatile organic compounds (VOC), oxides of nitrogen (NO_X), and meteorological parameters as well as additional ambient air monitoring for ozone (O_3). Title I, section 182 of the 1990 Clean Air Act Amendments requires EPA to promulgate regulations for the enhanced monitoring of O_3 and its precursors and for the affected States to incorporate the requirements as a part of their State Implementation Plans. Also, section 184(d) requires that the best available air quality monitoring and modeling techniques be used in making determinations concerning the contribution of sources in one area to concentrations of O_3 in another area which is a nonattainment area for ozone. Additionally, these enhanced ozone and ozone precursor monitoring rules adhere to the fundamental recommendations, regarding ambient monitoring, of the National Academy of Sciences (NAS) in the report entitled, Rethinking the Ozone Problem in Urban and Regional Air Pollution, which was prepared pursuant to section 185B of the 1990 Clean Air Act Amendments. In that report, the NAS noted the need for additional feedback mechanisms for evaluating the effectiveness of ozone control strategies.

The intent of these enhanced ozone and ozone precursor monitoring regulations is to require air pollution control agencies to obtain an air quality database that will assist in evaluating, tracking the progress of, and, if necessary, refining control strategies for attaining the ozone National Ambient Air Quality Standards (NAAQS). Photochemical assessment monitoring stations (PAMS) will be established to collect ambient concentrations of ozone (O_3), oxides of nitrogen (NO_X), nitrogen dioxide (NO_2), nitrogen oxide (NO), and speciated VOC including carbonyls, and meteorological data to better characterize the nature and extent of the O_3 problem, aid in tracking VOC and NO_X emission inventory reductions, assess air quality trends, and make attainment/nonattainment decisions. In addition, the PAMS will provide a more definitive database for evaluating photochemical model performance, especially for future control strategy mid-course corrections as part of the continuing air quality management process. The data will be particularly useful to States in ensuring the implementation of the most cost-effective regulatory controls.

In the process of developing these regulations, EPA sought the assistance of the Standing Air Monitoring Work Group (SAMWG). SAMWG was established by EPA in 1975 to assist in developing air monitoring strategies, correcting identified monitoring problems, and improving overall national monitoring operations. SAMWG members represent State and local air pollution control agencies and EPA program and Regional Offices. SAMWG members were active partners in developing and reviewing the 1979 part 58 rulemaking package which formally established the existing framework of the ambient air quality surveillance and data reporting regulations. The group also played a prominent role in all subsequent revisions to part 58.

Public Comments

The object of Federal Register proposals is to allow comments on new regulations prior to their promulgation, thereby providing an opportunity for the public to participate in the rulemaking process. On March 4, 1992, these rules were proposed in the Federal Register with a 30-day comment period. In response to requests from the public, especially from the regulated community of State and local air pollution control agencies, on April 3, 1992, EPA extended the public comment period on the enhanced O_3 and O_3 precursor monitoring regulations until May 4, 1992.

EPA received 40 written comment letters on the proposal of March 4, 1992. All of the written comments submitted to EPA are contained in EPA's Docket No. A-91-22. Of the letters reviewed, 16 come from State agencies, 10 from industry, 2 from institutes and universities, 6 from State/local associations, 5 from local agencies, and 1 from a federal agency. A list of all commenters writing to the public docket is provided in Docket A-91-22.

The following discussion covers the substantive comments. A detailed discussion of the basic concepts of the regulations can be found in the preamble to the March 4, 1992 proposal.

A. General Comments

The comments discussed under this heading were not specific to any rule or appendix, but were general comments on some aspect of the proposed monitoring program.

One commenter noted that the Muskegon nonattainment area had been reclassified from a serious to a moderate classification and therefore should be withdrawn from consideration in the final rules. Since this area and the Sheyboygan area have been reclassified and are no longer serious, severe, or extreme O_3 nonattainment areas, EPA agrees that these rules would not apply to either Muskegon or Sheyboygan. Accordingly, Muskegon and Sheyboygan are not included in EPA's estimated requirements for PAMS. Note that applicability of these enhanced O_3 and O_3 precursor monitoring rules is determined by the classification of the O_3 nonattainment area and not by the fact that an area is listed specifically in or omitted from this notice.

One commenter observed that Ventura County, California, was created as a separate O_3 nonattainment area from the Los Angeles Consolidated Metropolitan Statistical Area (CMSA) and requested clarification as to this area's status with regard to the enhanced O_3 and O_3 precursor monitoring requirements. EPA notes that since Ventura County was classified as a severe O_3 nonattainment area, the county is subject to these rules.

One commenter agreed with the basic concepts proposed on March 4, but suggested that the final promulgation not add additional requirements. A second commenter expressed a similar opinion that EPA not kill the effort with additional mandates unless the Agency is willing to proceed slowly and absorb the costs. EPA evaluated the substantive comments on their individual and collective merits and has incorporated a number of modifications to the original proposal. Only those additional activities addressed, in the March 4 proposal, were added. Regarding resources, EPA has demonstrated its willingness to participate in the funding process; a further discussion of resource needs and funding follows under Resources and Costs.

One commenter indicated that although the regulation is reasonably specific concerning network design, it lacks specificity for the submittal of SIP revisions. Given the complexity of the rules, EPA believed that it was necessary to provide extensive detail concerning the design of the new PAMS networks. The wide variability, inherent in SIPs, precludes such specificity when requiring SIP revisions. Each currently-approved SIP contains appropriate provisions for establishing and operating the network of State and Local Air Monitoring Stations (SLAMS) including those stations identified as National Air Monitoring Stations (NAMS). The SIPs generally provide that SLAMS and NAMS will measure ambient concentrations of those criteria pollutants for which standards have been established in 40 CFR part 50. The SIP revisions submitted to comply with these revisions to 40 CFR part 58.20 will additionally provide for the monitoring of ambient concentrations of non-criteria pollutants such as speciated VOC including carbonyls, NO and NO_x, as well as meteorological parameters in the same manner that the criteria pollutants were addressed. Note that the reference to aldehydes has been changed to carbonyls to more accurately reflect the requirements of the technical assistance document (Reference 2 of Appendix C). The guidance currently stipulates sampling and analysis for the following carbonyls: Formaldehyde, acetaldehyde, and acetone.

The same commenter contends that the rules indicate virtually no need for new O_3 sites and a modest expansion of the NO_2 monitoring effort and believes that these conclusions are based in great part on the assumption that PAMS monitors could be located at existing O_3 and/or NO_2 monitoring sites. The commenter was concerned that if this assumption is in error, the expansion needs of the networks may be underestimated. In fact, EPA did assume that some of the PAMS stations could be located at existing SLAMS or NAMS sites. For example, the PAMS type (3) site is located at the downwind site where maximum O_3 concentrations are expected to occur. This description corresponds to the category (a) NAMS O_3 site specified in appendix D of 40 CFR part 58. Such a site is required for all urban areas having a population of greater than 200,000. Because most of the nonattainment areas classified as severe, serious, or extreme for O_3 are located in urbanized areas which exceed this population threshold, each area would currently be expected to be operating a category (a) NAMS O_3 site. Assuming that these sites are properly located, it would therefore be common to find the PAMS type (3) site and the NAMS category (a) site coincident. In siting NAMS NO_2 sites in urban areas with populations greater than 1,000,000, the monitoring sites could potentially be collocated with one of the two PAMS type (2) sites. Generally, EPA believes that some collocation of PAMS and SLAMS/NAMS sites is highly likely. In addition, in areas where a substantial number of SLAMS O_3 and NO_2 sites currently exist, it is not unreasonable, for purposes of estimating costs, to assume that the State air pollution control agency will relocate ambient monitors and appurtenances rather than purchase only new monitors to develop the PAMS network. For example, in one nonattainment area, 26 O_3 monitors and 15 NO_2 monitors were in operation during the 1991 fiscal year compared to a PAMS requirement of only 5 sites, some of which could obviously be located coincident with existing sites. In response to the concerns expressed by the commenters, however, EPA has adjusted its cost estimates to reflect the collocation of PAMS with existing monitors at only two sites in a five-site network.

One commenter was doubtful that the potential benefits to be received from the program would be justified given the estimated implementation costs and the unaddressed technical questions. A slower, more cautious schedule was recommended. In designing the requirements for the PAMS network, EPA considered the potential benefits of the data and weighed those against the projected costs and uncertainties. In light of the Agency's estimate for future O_3 control costs of $8 to 12 billion per year (Ozone Nonattainment Analysis—Clean Air Amendments of 1990. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. DRAFT. September 1991), the potential return in benefits for a cost of $5 to 12 million per year provides an exceptionally prudent investment. Nevertheless, the Agency made every effort to craft a minimum requirement which would in great part satisfy a number of important objectives, yet not become a financial burden either upon the air pollution control agencies or the States (note further discussions of financial burden in this preamble under Resources and Costs). Modifications to the proposed five-year transitional period address the commenter's concern and should provide ample flexibility.

This commenter also indicated that computer model sensitivity analyses should be conducted for all parameters to be measured and that the rule should acknowledge the need for measuring pollutant concentrations aloft. EPA notes that although the PAMS network design is not the direct result of sensitivity analyses for each affected area, it nevertheless reflects the current expectations of the photochemical models. Heretofore, the national program has not had the benefit of the availability of comprehensive O_3 precursor data as a tool to evaluate, calibrate, or otherwise adjust and conduct reality checks on the operation of the Urban Airshed Model (UAM). EPA views the PAMS networks as a vital step forward in complementing grid model applications and control strategy assessments and refinements.

Although the sampling of pollutant concentrations aloft may also be a highly valuable activity, EPA does not agree that such activities should be included in the specifications for minimum routine measurements. These rules, however, do not preclude a State agency from proposing such pollutant measurements (made either on a routine basis or at periodic intervals during more intensive sampling efforts), including them in their EPA-approved comprehensive network description, and subsequently utilizing Clean Air Act Section 105 Grant monies, in part, to support these monitoring efforts. In fact, EPA has encouraged affected air pollution control agencies to view these rules as a base upon which to tailor and expand the precursor monitoring program to meet the States' individual needs. Monitoring pollutant concentrations aloft has therefore been assigned to the category of desirable, yet optional activities.

Two commenters suggested that EPA adjust its program to reflect information from previous field studies (i.e., base the rules on actual field-verified techniques rather than on good technical assumptions alone). EPA recognizes the value of quality measurements and field-proven techniques. In fact, the fundamental tenets of the proposal were based on the demonstration of emerging measurement technology and data obtained during a number of field studies, particularly the Atlanta O_3 Precursor Study conducted during the summer of 1990 (Reference 32 of Appendix D). Although technical assumptions were necessary to some extent due to the emerging nature and complexity of the measurement technology, EPA believes that these assumptions were warranted considering the need for more definitive O_3 precursor data to develop improved O_3 control strategies. States are encouraged to take full advantage of experience and data obtained in past studies and routine monitoring efforts, and use that experience to refine and focus their individual PAMS network designs.

One commenter noted that the requirements for intensive daily sampling will engender major database management activities. EPA agrees that the measurement of numerous compounds during multiple hours of the day will create a very large database. Consequently, the Agency is proceeding to revise the capabilities of its computer-based Aerometric Information and Retrieval System (AIRS) to allow these data to be securely stored, retrieved, and adequately analyzed via the existing national system. The AIRS is currently utilized by all States for the storage and/or retrieval of NAMS and SLAMS data. The data required to be submitted by § 58.45 will be deposited in this same data bank. Further information on AIRS and its capabilities may be obtained by contacting any of the 10 EPA Regional Offices or the National Air Data Branch, Technical Support Division (MD-14), Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711. The Agency is also revising its technical assistance document (Reference 2 of Appendix C) to include additional guidance regarding the processing of data at the State and local agency level, i.e., generic procedures for data processing and validation.

In a related topic, another commenter estimated that the proposed rules will result in a workload increase of 60 percent, predominantly in data reporting burden. This commenter advocates the development by EPA of expert software for use with the VOC analyzers. The Agency notes this concern and has therefore undertaken the aforesaid modifications to the AIRS system and to its technical assistance document.

One commenter was concerned that a bias in O_3 measurements often occurs on design-value days, in part due to differences in measurement techniques. While the Agency cannot substantiate a particular problem occurring on O_3 design value days, the Agency notes that data which is gathered in accordance with 40 CFR part 58 and the quality assurance procedures of appendix A, are acceptable for use in computing design values and for conducting attainment/nonattainment determinations.

The same commenter believes that EPA should examine the following four areas more carefully before finalizing the rule: (1) The linking of monitoring specifications with monitoring objectives, (2) the consequences for an urban area adhering to the minimum stipulated monitoring requirements, (3) the rationale for recommended averaging times and frequencies for sampling of VOC, and (4) the rationale for air quality and meteorological siting requirements. The Agency considered these suggestions, recognized their value, and subsequently incorporated these considerations into the final rules. Specific recommendations made by this commenter are addressed elsewhere in this preamble.

Two commenters expressed concern that EPA had not adequately addressed critical issues relating to the role of NO_X in the photochemical process. These commenters assert that EPA must ensure that the data gathered will be appropriate for NO_X sensitivity modeling and will facilitate discrimination and impact of various sources of NO_X. EPA is concerned about the function of nitrogenous compounds in O_3 formation, particularly in the southeastern United States. Special studies are being initiated as joint projects with EPA in the Southeast employing research monitoring concepts to derive the most effective strategies for NO_X monitoring and control. These integrated projects are expected to have a significant impact on future O_3 control actions. Modeling predictions of various nitrogen species (e.g., total reactive oxides of nitrogen (NO_y), NO_X, NO, NO_2, peroxyacetyl nitrate (PAN), and nitric acid (HNO_3), etc.) can then be examined by the research community to determine the performance of chemical mechanisms in predicting non-O_3 oxidants. This will help ensure that chemistry, leading to O_3 formation in urban and rural areas, is properly characterized and may lead to further modeling improvements. Note that the measurement of more highly oxidized forms of nitrogen requires a high degree of skill/training using nonstandard techniques to measure pollutants at very low concentrations. EPA has determined that it is premature to require such efforts in a routinely operated network, but encourages and recommends that States consider the option of deploying more sensitive NO_X instruments when establishing future PAMS sites. For the near term, the current NO_X monitoring methodology (Federal Reference Method for NO_2) will be acceptable. The Agency will develop future guidance for more sensitive and definitive NO_X methods and measurements.

One commenter expressed concern that many technical, logistical, and fiscal issues remain to be resolved to ensure the success of the PAMS monitoring program. This respondent asserted that its comments, analyses and suggestions were, for the most part, ignored. On the contrary, however, the Agency has considered all comments and suggestions received by the Agency. This commenter's suggestions, being rather comprehensive, complicated, and unique, received careful scrutiny by EPA. In a number of cases, these suggestions were incorporated both in the previous draft proposals as well as in this final promulgation. In fact, the final regulation has been revised to allow alternative monitoring schemes and intermittent sampling frequencies in section 4 of appendix D, in part in direct response to this commenter. The fact that EPA did not radically change its approach to identically match the suggestions of this particular respondent in no way diminishes the importance of the suggestions, nor does it equate to ignoring the recommendations. Each specific recommendation has been addressed elsewhere in this preamble.

B. Public Comments—Resources and Costs

Several commenters were concerned with the statement in the proposal which says that the primary responsibility for implementing the program with its associated costs rests with the States. The commenters feel strongly that EPA needs to make a much larger financial commitment to the program to ensure its success. EPA understands that this unique program will require a strong federal presence both as a partner in system management and in providing appropriate technical and financial assistance. EPA has provided funds during FY–92 to initiate monitoring for air toxics in 10 areas. These sites, which are generally located consistent with the requirements for PAMS type (2) sites, will be continued as part of the PAMS program in 1993. Additionally, the Agency has earmarked approximately $4,000,000 in § 105 Grant monies for distribution to the States in FY–93 and has provided technical support via contract and direct EPA involvement and participation. Overall, EPA will have borne the burden of financing a significant portion of the costs of initiating sampling during FY–92 and FY–93. The Agency has plans for subsequent years which will ensure a major financial role in this partnership for EPA.

Eighteen commenters submitted other observations related to funding and resource needs to properly implement the PAMS program. Ten of those commenters believed that the proposed levels of federal funding (discussed above) are generally inadequate to support the PAMS program. Three commenters noted that the potential benefits of the program outweigh the projected costs, that serious consideration should be given to utilizing permit fees collected under title V of the Clean Air Act Amendments for this program, and/or that the monitoring costs are only a fraction of the costs incurred by society in attaining the air quality standards.

Two commenters expressed strong objections to the use of reprogramming of existing funds to support the PAMS program. As previously discussed, EPA has provided substantial section 105 Grant funds to support both FY–92 and FY–93 monitoring activities. The Agency expects to continue to provide significant support through section 105 grants in subsequent years. Reprogramming of existing monies is an action which historically has been used by the Agency to designate certain portions of section 105 Grant funds, provided annually to the States for support of air pollution planning and control programs. EPA believes that this mechanism is a legitimate tool to focus its limited grant funds in part on particular air pollution problems having high national priorities. Rarely does the Agency suggest using this mechanism unless the priority of a competing program or project is significantly greater than the currently-funded activity. EPA has determined that the potential benefits of the PAMS program are significant enough to justify taking this unilateral action.

One commenter suggested that the distribution of section 105 Grant funds be based on the number of sites and monitors operated regardless of the location of the nonattainment areas. Perennially, it has been EPA's practice to develop reasonable allocation schemes for the available grant dollars based on defensible parameters such as activity levels, numbers of sources, etc. In the case of the monies set aside for the photochemical assessment monitoring program, EPA concluded that an appropriate mechanism for the distribution of funds was to consider the number of required PAMS sites. Each affected Regional Office receives an allocation of funds based on a national prorata scheme; the final allocation to State or local grantees is computed by the Region. During FY–93, the primary allocation criteria was essentially the minimum number of PAMS sites that would be required in each area by the regulation. By FY–94, the Agency will have received more information on individual network designs from each affected State and will therefore be able to consider the actual number of sites to be operated during the year as one of the criteria for the distribution of grant funds.

Another commenter suggested that if States are unable to hire additional personnel, they could return grant monies in exchange for EPA contracted services or perhaps pool analytical support among a group of States. Given the continuing nature of much of the federal funding for photochemical assessment monitoring, EPA asserts that it would not be inappropriate for a State agency to utilize the monies to hire new personnel. Further, due to economies of scale and within permissible limitations, States may take advantage of EPA contracts which are designed to provide support to State agencies. Additionally, the EPA Regions may at the urging of a group of States, reserve certain monies for a particular State who would agree to, in turn, provide services to the others.

One commenter was concerned that the design of the enhanced O_3 and O_3 precursor monitoring program was influenced more by financial constraints than by scientific constraints. EPA disagrees with this contention, and instead has attempted to provide a sensible balance between the costs of the program and degree to which the program objectives are satisfied. In any case, EPA has only provided the framework for a minimum required monitoring strategy. States are encouraged to implement larger, more comprehensive networks if those networks will provide a superior database for the fulfillment of the data objectives.

Five commenters expressed concern that EPA's estimates for the costs of implementing this monitoring program were too low. EPA's costs estimates were prepared from data gathered during 1990 and 1991, and therefore are generally expressed as 1990 and 1991 dollars. It is not surprising that estimates prepared in 1992 should be somewhat higher. In many cases it was difficult to compare estimates prepared by the commenters, since they often utilized different wage scales, different quoted equipment costs, and different operating scenarios. In most cases, recognizing that these figures are only estimates of the true implementation costs, the Agency believes that its original estimates reflected a reasonable appraisal of the resources needed to implement a minimally-acceptable program at that time. EPA has, however, incorporated many of the suggestions of the commenters for computing costs and has compiled an updated version of its cost estimates. These estimates reflect the changes in the boundaries of several nonattainment areas, changes in classification of others, higher equipment and labor costs, revised sampling frequencies, additional allocations for data processing; upper air measurements, O_3 and NO_X monitors, security concerns, and larger monitoring shelters. For information, the Agency's updated cost estimates for each affected area may be found in Table 1.

TABLE 1.—ESTIMATED REQUIREMENTS FOR PAMS

Area name	Population range	Classification of nonattainment area	Number of required sites	Estimated five-year cumulative cost[1]
Beaumont-Port Arthur, TX	Less Than 500,000.	Serious	2	$2,323,920
Portsmouth-Dover-Rochester, NH-ME	do	Serious	2	2,227,135
Southeast Desert Modified AQMA, CA	do	Severe	2	2,280,860
Baton Rouge, LA	500,000 to 1,000,000.	Serious	3	3,198,135
El Paso, TX	do	Serious	3	3,198,135
Springfield, MA	do	Serious	3	3,127,485
Ventura County, CA	do	Severe	3	3,198,135
Milwaukee-Racine, WI	1,000,000 to 2,000,000.	Severe	4	3,769,460
Providence-Pawtucket-Fall River, RI-MA	do	Serious	4	3,769,460
Sacramento, CA	do	Serious	4	3,873,070
Atlanta, GA	More than 2,000,000.	Serious	5	4,031,150
Baltimore, MD	do	Severe	5	3,995,300
Boston-Lawrence-Worcester, MA-NH	do	Serious	5	3,995,300
Chicago-Gary-Lake County (IL), IL-IN-WI	do	Severe	5	3,995,300
Greater Connecticut, CT	do	Serious	5	3,995,300
Houston-Galveston-Brazoria, TX	do	Severe	5	4,084,850
Los Angeles-South Coast Air Basin, CA	do	Extreme	5	4,084,850
New York-New Jersey-Long Island, NY-NJ-CT	do	Severe	5	3,995,300
Philadelphia-Wilmington-Trenton, PA-NJ-DE-MD	do	Severe	5	3,995,300
San Diego, CA	do	Severe	5	4,084,850
San Joaquin Valley, CA	do	Serious	5	4,084,850
Washington, DC-MD-VA	do	Serious	5	3,995,300
Totals			90	79,346,410

[1] 1992 Dollars.

Additionally, several commenters were concerned that EPA only computed costs for the three-month period of June, July, and August, while the draft rule implies that monitoring should be conducted during the entire O_3 season, which can be much longer. EPA indeed states that monitoring for precursors should be conducted during the entire O_3 season, but recognizes that monitoring for only 3 months is an acceptable minimum. The preamble from the March 4, 1992 proposal clearly stated that because of the relatively large resource requirements to conduct PAMS monitoring, 3 months was proposed as the minimum annual precursor monitoring period for the PAMS. EPA did encourage, however, the establishment of a monitoring period for the entire O_3 season in order to provide a more comprehensive air quality database and increase the possibility of actually conducting monitoring during most of the worst O_3 episodes. EPA goes further, however, in the revised section 4.3 of appendix D, stating that alternate precursor monitoring periods may be submitted for approval as a part of the PAMS network description. This action, therefore, allows a State to propose a monitoring season which will best meet its particular needs as long as the proposal will capture those worst O_3 events. The length of any particular PAMS monitoring season may therefore vary from area to area.

Two commenters asserted that the data collection requirements of the rule were excessive for some of the stated purposes and inadequate for others. EPA has continually maintained that in formulating the data requirements for the PAMS program, it was necessary to achieve some compromises, (i.e., some more crucial objectives would be better satisfied than other less important objectives). Regardless, the Agency has reconsidered the requirements for data collection, and has modified the specifications to better reflect a balance of the needs of the data users.

One commenter alleged that EPA committed to provide full funding for all efforts required under the Photochemical Assessment Monitoring Program and further alleged that EPA committed that it would not require state or local agencies to perform the specified monitoring if full funding of all materials, equipment and labor is not provided by EPA. That commenter also requested that EPA clearly articulate this assertion in the rules promulgated today. Another commenter asserts that EPA indicated this intent in the proposed regulation. It is common practice for State agencies to share substantially in the costs of implementing and operating all air pollution monitoring and control programs. In fact, the Clean Air Act Amendments of 1990, section 802, revise section 105 of the Act to require that States provide an overall minimum of 40 percent of the costs of implementing programs for the prevention and control of air pollution or implementation of national primary and secondary ambient air quality standards. EPA is therefore unable to commit that it would provide 100 percent of the funding for such a substantial program. Evidently, some confusion has resulted from EPA's attempts to provide maximum monetary support for the implementation of the enhanced O_3 and O_3 precursor monitoring regulations.

One commenter believed that although the proposed funding for this program may be adequate to encompass capital expenses, provisions for skilled labor costs will be a problem. EPA notes that provisions for the hiring of highly skilled chemists and statisticians were included in its cost estimates and planning for PAMS. Further, these estimates were reviewed by the Agency and revised upward to reflect changes in the national labor burden and the expressed needs of the State and local air pollution control agencies.

One commenter believed that the comprehensive sampling and analysis schedule stipulated by the proposed rules is the primary contributor to the high costs of the program. As previously stated, EPA is committed to only requiring a minimum program which will comprise the best technical-fiscal balance to satisfy a variety of data objectives. Since the proposal was published, EPA has refined its sampling and analysis requirements to better reflect the data needs.

In an effort to focus resources and reduce the costs of implementation, several commenters have recommended totally different strategies that they believe will also achieve the data objectives of the PAMS program. The Agency has reviewed these different proposals and believes that they do not constitute appropriate national minimum requirements, but may be considered as alternative networks for particular nonattainment areas if they are submitted pursuant to the requirements of § 58.40 and appendix D as promulgated. EPA has determined that the suggestions were too closely tailored to particular geographic areas to be applied nationally.

One commenter was concerned that the costs of measuring air toxics was a substantial addition to the price of the PAMS program. EPA has noted that the PAMS stations would be available as platforms for the additional monitoring of air toxics compounds if necessary. Specifically, it is noted by the Agency that by measuring the VOC targeted in reference 2 appendix C, a number of toxic air pollutants will also be measured. Although compliance with title I, section 182 of the Clean Air Act Amendments does not require the measurement and analysis of additional toxic air pollutants, the Agency believes that the PAMS stations can serve as cost-effective platforms for an enhanced air toxics monitoring program. The adjunct use of PAMS for air toxics monitoring will allow the consideration of air toxics impacts in the development of future O_3 control strategies. The establishment of a second PAMS type (2) site will provide an even better data base for such uses. The Agency, however, takes note of the concerns of several respondents that the PAMS network is not ideal as a source of primary air toxics data and further, regards the collection of air toxics data as an incidental and secondary, though important, objective of the PAMS system.

In overall response to concerns over the estimates of costs previously provided by the Agency, EPA has recomputed its estimates including such additions noted previously as inflation factors, additional capital equipment, etc.; the new computations are summarized in Table 1.

C. Public Comments—Regulations

The following discussions address the comments received on specific provisions of the enhanced O_3 and O_3 precursor monitoring regulations:

1. Public Comments—Section 58.1—Definitions

Four commenters suggested adding definitions for the term NO_y, a relatively new term for total reactive oxides of nitrogen including NO, NO_2, PAN, HNO_3, and organic nitrite compounds which all participate in the photochemical process. Current research has revealed that these other compounds may indeed play a significant role in O_3 formation. EPA does not disagree with the commenters. Since no readily-available monitoring method has been designated for these species, however, and most information on the role of NO_y, or other such compounds, still lies within the research community, EPA has determined that inclusion of any definition and/or regulatory requirements for monitoring for NO_y is premature. Future revisions to 40 CFR part 58 will reexamine the state of the research and reconsider this issue. Nevertheless, EPA encourages the deployment of this emerging technology at PAMS sites to further augment the value of the O_3 and O_3 precursor measurements.

Additionally, two commenters recommended that the definition of VOC be clarified and perhaps focused to indicate a reference to reactive organic gases. Further, one commenter suggested that an acronym be included for toxic air pollutants. Inasmuch as EPA has specifically named the compounds (VOC) targeted for monitoring and analysis by this program, see reference 2 appendix C, and expects that list to evolve as the monitoring program matures, the Agency believes that a more focused regulatory definition is not needed at this time. Such a move, made prematurely, might unnecessarily constrain development of the program in future years and inadvertently limit the data available to the States to craft the most effective O_3 control strategies. Since the foci of this monitoring program are clearly O_3 precursors and O_3, these rules are not the most appropriate vehicle to define or name air toxics compounds. Such actions will be subsequently considered by the Agency's air toxics control programs.

2. Public Comments—Section 58.2—Purpose

One commenter felt that it is an oversight not to consider application of this regulation to moderate O_3 nonattainment areas. EPA notes that enhanced information on O_3, O_3 precursors, and meteorology would be beneficial to any State government wrestling with the enigma of any level of O_3 nonattainment. Section 182(c)(1) of the Clean Air Act Amendments of 1990, however, authorized the Agency to develop rules only for those areas classified as serious or above for O_3 nonattainment. The fact that States with moderate areas will not be required to institute these specifications, should not impede those State agencies from configuring monitoring strategies which are similar to the photochemical assessment monitoring program.

3. Public Comments—Section 58.13—Operating Schedule

One commenter recommended that this section be amended to restate the monitoring period requirements of section 4.3 of appendix D. EPA notes that it would be beneficial to include a reference to section 4.3 in § 58.13, and has amended the final rule accordingly.

4. Public Comments—Section 58.20—Air Quality Surveillance Plan Content

Four commenters expressed concern that the requirements for VOC and/or meteorological parameters were too comprehensive and constituted excessive collection of data. Additionally, several commenters believed that the substitution of measurements for total VOC, non-methane organic compounds (NMOC), or total non-methane hydrocarbons (NMHC) (note that these acronyms essentially represent the same group of species) would be adequate to fulfill the PAMS data objectives, at least at some of the designated sites. EPA has reexamined its position regarding requirements for the speciation of VOC analyses and has concluded that continuation of the speciated requirement is both appropriate and necessary. This conclusion is based on the need for more definitive information regarding VOC at the specific geographic locations where O_3 exceeds the National Ambient Air Quality Standard (NAAQS), in order to address the multi-faceted PAMS objectives. The sampling for speciated VOC data allows the verification of NMOC measurements and provides a better understanding of the biogenic contribution to the O_3 problem. The corroboration of progress in the reduction of O_3 precursor emissions inventories would necessitate the quantification of the biogenic and anthropogenic fractions for those areas where biogenics represent a significant component of the ambient air. Additionally, the Agency has modified the sampling and analysis requirements to reflect the acceptance of event sampling at 3 of the 5 minimally-required sites. Such a modification has the potential to reduce the data handling requirements, costs, and level of technology needed. The amended sampling and analysis requirements are specified in section 4.4 of appendix D. Alterations to the requirements for the measurement of meteorological parameters are discussed in section 4.6 of appendix D. Note, however, that the promulgated sampling requirements for speciated VOC do not preclude the submittal of alternative sampling schemes as a part of the network design required by § 58.40.

Three commenters felt that 6 months is too short a time frame for SIP development, processing, and approval. Note the brief discussion of SIPs under General Comments. EPA believes that the required SIP revision to empower States to implement the enhanced O_3 and O_3 precursor monitoring regulations will be a relatively uncomplicated procedure. Given the intrinsic need for the data required in this promulgation, the Agency recommends that all States, including those which are not affected by these rules, develop such SIP revisions. Based on a review of common SIP procedures, EPA has subsequently modified § 58.20 to allow 9 months for the submittal of a revision to the SIP for the establishment and maintenance of PAMS.

5. Public Comments—Section 58.40—PAMS Network Establishment

Seven commenters asserted that 6 months is insufficient time for a State to develop and submit a PAMS network description. Inter- and intra-State cooperation, data needs, and complexity issues were cited as reasons for the demand for more time. EPA Headquarters and the EPA Regional Offices have been working with affected State and local air pollution control agencies as well as cooperative bodies such as the Northeast States for Coordinated Air Use Management (NESCAUM) and the Mid-Atlantic Regional Air Management Association (MARAMA), to develop the basics of individual and regional PAMS network descriptions. Additionally, EPA has provided funding during FY-92 to begin the establishment of monitoring sites, many of which will eventually constitute the first PAMS type (2) sites. Given the extensive preparatory work conducted since 1990 by both the Agency and the States, EPA believes that a 6-month requirement for the submittal of a network design is both achievable and appropriate. In response to the concerns of the commenters, however, EPA has clarified, in § 58.41, its need for detail in the initial network design submittal and has indicated that specific details on the first PAMS type (2) site plus general information on other sites, would constitute a complete submittal for fulfillment of the requirements of § 58.40. Note, however, that since the network design must receive the approval of the Administrator as stipulated by § 58.42, EPA will require the submittal of subsequent phases of detailed network design by January 1 of each year of implementation. In this way, a State may focus its resources on an annual basis toward the establishment of one site per area. For groups of States planning to submit coordinated network designs, the process will also be simplified somewhat. Sections 58.40, 58.41, and 58.42 have been amended accordingly.

Four commenters felt that the language of § 58.40, which allows the joint submittal of network descriptions and implementation schedules by disparate States (and further discussed in section 4.2 of appendix D), should be strengthened to make such inter/intra-State cooperation mandatory to ensure consistency and coordination, especially in O_3 transport regions. In general, EPA believes that cooperation among State and local air pollution control agencies should be encouraged, but not required. The Agency has demonstrated its preference for cooperation by its technical, administrative, and financial support of such multi-State cooperative agencies as the State and Territorial Air Pollution Program Administrators and the Association of Local Air Pollution Control Officials (STAPPA/ALAPCO), NESCAUM and permanent Federal-State-local work groups such as the Standing Air Monitoring Work Group (SAMWG), the Standing Air Emissions Work Group (SAEWG), and the Standing Air Simulation Work Group (SASWG), affiliated with STAPPA/ALAPCO. This particular provision of the rule is designed to enable the exercise of cooperative efforts, but does not serve as the tool to require States to plan and implement programs jointly. Note, however, that section 182(j) of the Clean Air Act Amendments of 1990 does stipulate that each State in which there is located a portion of a single O_3 nonattainment area which covers more than one State should take all reasonable steps to coordinate, substantially and procedurally, the revisions and implementation of State implementation plans applicable to the nonattainment area concerned. Also, interstate transport regions established pursuant to section 176A of the Clean Air Act Amendments should be guided in multi-State coordination and consistency via the establishment of transport commissions. Further, section 184 of the Act indicates that such procedures are requisite for those northeastern States included in an O_3 transport region. These premises have been articulated in an advance notice of how EPA generally intends to take action on SIP submissions and to interpret various title I provisions in the Federal Register on April 16, 1992, as amendments to 40 CFR part 52. It is therefore inappropriate for EPA to separately require such cooperation as a part of these enhanced O_3 and O_3 precursor monitoring rules. The Agency has, however, modified the rules to indicate this preference for cooperation and joint network design submittal, where appropriate.

One commenter suggested that EPA support joint submittals, but not joint implementation schedules. In § 58.40, EPA indicates a preference for coordination, but does not necessarily require identical designs and implementation schedules for cooperating States. Differences in designs and schedules would be evaluated on a case-by-case basis.

One commenter recommended that regional plans be given favorable if not at least equal attention as is given to State-by-State plans within the same regional area. EPA has previously expressed its preference for regionally coordinated network designs, but must provide equal consideration to both types of descriptions allowed by these rules.

Two commenters suggested that the approval of the PAMS program be relegated to the Regional Offices in lieu of requiring approval by the Administrator. In considering this comment, EPA agrees with the contention of the commenter that the Regions are more familiar with the idiosyncrasies of each O_3 nonattainment area and, as a result, Regional Office concurrence on each network design is required. In several cases, however, the areas subject to these rules, cross both State and EPA Regional boundaries. The Agency is convinced that a program of this magnitude requires intensive national oversight and a high degree of consistency and coordination; final approval must therefore rest with a central reviewing authority.

Two commenters suggested that flexibility be included to allow each network to be designed on a case-by-case basis because each area has unique features such as irregular terrain or distinct meteorology, such as sea/lake breezes, which should be addressed separately. EPA also believes that each area's network design should be specifically tailored to fit that particular area or region. The network design parameters promulgated today are those considered by the Agency as a minimum and/or a default network for those State agencies wishing to omit comprehensive, area-specific planning exercises. Although EPA does not recommend minimizing planning, the Agency recognizes that State resources and technical expertise often demand a fallback position in lieu of extensive investments in the planning process. Note that the Agency is revising the siting criteria guidance document (Reference 19 of Appendix D) to provide guidance on siting and network design for areas with complex terrain or unique meteorology.

One commenter recommended that a working group be established to deal with the coordination of monitoring strategies and network designs in the Northeast Ozone Transport Region. The commenter recommended two specific groups associated with electric utilities, as technical resources for such a working group. EPA maintains that the responsibility for the implementation, and therefore the coordination, of SIP strategies lies with the States. The Agency is therefore cooperating with NESCAUM, MARAMA, and the Regional Ozone Modeling for Northeast Transport (ROMNET) committees to form a working group of State, local, and EPA officials to provide guidance in the development of a coordinated monitoring network for the Northeast.

Another commenter encouraged EPA to perform quantitative statistical analyses to ensure that the minimum-required network is sufficient to corroborate emission inventories and determine precursor trends. Due to the emerging nature of the technology for corroborating emission inventories and procedures for determining precursor trends, it is not feasible at this time to perform quantitative statistical analyses for this purpose. EPA believes, however, that these analyses can be performed effectively once the PAMS networks are in place and producing data. Adjustments based on these analyses will be appropriate when the procedures are more mature and the data bases are more complete. To shed light on these comments, EPA has prepared a Data Quality Objectives (DQO) document which was used to evaluate the original network proposal of March 4, 1992, and this modified final rule. That document is identified as reference 24 of appendix D. Additionally, EPA supported and/or noted other analyses concerning data for emissions inventory applications and trends. Those studies are noted as references 26, 27, 28, 29, and 30 of appendix D.

Several commenters pointed out the need for EPA to better articulate guidance on the submittal of information for network approval and any criteria EPA would utilize for approval of these and any alternative network submittals. Further information concerning network design is included in section 4 of appendix D. EPA has also incorporated additional information and criteria regarding the approval of alternative networks in section 4 of appendix D as a part of this promulgation.

During the comment period, several agencies submitted proposals for their areas which are considered to be alternative network descriptions. EPA will review those designs individually and respond directly to the particular agency. Those designs are not considered germane to the requirements of the regulation and so are not specifically reviewed in this notice of rulemaking.

One commenter urged EPA to eliminate the public notice requirements of alternative plans and subject them to the same process as other network designs. EPA realizes that although it is today promulgating minimum criteria for PAMS networks, many designs will have peculiarities which may qualify them as alternative networks and subject them to the proposed public notice requirements of § 58.40 and further, sections 4.3 of appendix C and 4.2 of appendix D. To facilitate the submittal of network descriptions and to expedite their processing by the Agency, EPA is today removing the proposed requirements for public notice for alternative network descriptions and will instead focus resources on improving the quality of the negotiation, review and approval process.

One commenter noted that it may be necessary to site PAMS monitoring stations near major roadways and certain large stationary sources because of the possibility of their direct influence on local concentrations of O_3. The regulations promulgated today require the siting of certain monitors at the location of the maximum impact of emissions from sources of O_3 precursors. EPA recognizes that in some instances this site may be substantially affected by one or more very large major stationary sources which constitute a principal source of O_3 precursors for the nonattainment area. Additionally, if the major impact on O_3 in a particular area originates from mobile sources, it would be logical to place a PAMS site downwind of a major roadway. In any case, it is crucial to consider and account for local NO_x sources including roadways which may act as local depressors for O_3 when designing a network as described in section 10 of appendix E.

6. Public Comments—Section 58.42—PAMS Approval

Note that comments submitted recommending approval of network designs at the EPA Regional Office level were previously addressed under § 58.40.

One commenter in voicing support of the flexibility of allowing alternative plans noted that their agency does not feel that national consistency and uniformity of methods are essential, given that different areas are at different levels of learning with respect to their area's O_3 precursor composition and concentrations. EPA notes that each air pollution control agency program is subjected to its own particular set of problems, strategies, limitations, and coverage; in many cases some of these factors are quite unique. EPA, on the other hand, must deal with national databases and national problems under an entirely dissimilar set of limitations than any particular air pollution control agency. To that end, EPA is charged with ensuring some reasonable degree of national consistency so that national trends, comparisons, and strategies can be devised. Further, the Agency is convinced that during the phase-in period specified in section 4.5 of appendix D, most agencies will be capable of rising to the challenge of developing the necessary expertise to operate PAMS.

Concerning the approval of network designs, one commenter recommended that this section (and specifically section 4.2 of appendix D) be revised to require an EPA approval or disapproval within 60 days of the receipt of an alternative plan. Although EPA notes this commenter's sense of urgency with regard to the approval and implementation of the PAMS monitoring program, the Agency has determined that instituting artificial approval deadlines would not prove beneficial to improving the quality of alternatives, nor would the public be served by imposing restrictions which could result in lowering the quality of the review and approval process. EPA has therefore not incorporated this 60-day deadline.

7. Public Comments—Section 58.43—PAMS Methodology

One commenter suggested that additional language be added to the rules to establish a process by which EPA could streamline the review and approval of innovative monitoring and analytical techniques. Further, this commenter recommended the use at PAMS of a particular new type of monitor which continuously tracks key photochemical oxidant components. The Agency believes that the new requirements provide sufficient flexibility for the incorporation of innovative monitoring and analytical techniques. The Atmospheric Research and Exposure Assessment Laboratory (AREAL) is currently responsible for the development, evolution, review and testing of new methodology to ensure its applicability and appropriateness for emerging national air monitoring needs. Regarding the use of this new measurement technology for photochemical oxidant tracking, AREAL, in conjunction with other interested parties, is engaged in an evaluation study of the proposed instrumentation to determine its utility in depicting the photochemical process. Additionally, research is underway to ascertain the usefulness of the data gathered by this instrument and others in meeting necessary O_3 control objectives such as those described in this rule. The results of these investigations will likely have a significant bearing on the future uses of the proposed instrumentation. In any case, neither the current research status of the procedures nor the innovative nature of the methods preclude their use at PAMS stations. A State air pollution control agency may, at its own initiative, implement this monitoring strategy as an adjunct to the minimum PAMS requirements; or, may submit a sampling scheme utilizing this technology exclusively, for consideration by EPA as an alternative pursuant to § 58.40 of this regulation.

8. Public Comments—Section 58.44—PAMS Network Completion

Ten commenters provided observations regarding the 5-year transition (phase-in) period further delineated in section 4.5 of appendix D. Four of those respondents indicated that total implementation of the program was not only possible, but also desirable in a 2- to 3-year period. One commenter, however, in supporting a 3-year transition, indicated that the reporting of VOC data should be deferred for 5 years due in great part to the technical, financial, and technology issues associated with VOC monitoring. Four of the ten commenters also characterized the urgency of expediting the implementation of PAMS to provide data support to the 1994 SIP photochemical grid modeling process. Five commenters indicated that the 5-year schedule is reasonable or at least ambitious, although two of these respondents suggested that the initial phases of the transition be either deferred or prolonged, essentially to allow for testing and evaluation of the new monitoring technologies and for training of professional staff. One commenter suggested that due to technology issues, the implementation simply be delayed one year. Five of the ten commenters reiterated their concerns with funding and urged EPA to provide substantial, adequate resources to complete the PAMS transition. One additional commenter urged EPA to allow sufficient flexibility for States to phase-in the program over time in a manner consistent with the level of available resources.

Due to expected near-term changes to the atmospheric mix of O_3 precursors and the need to begin monitoring as soon as practicable to provide a measure of support to SIP strategy development and emission inventory corroboration efforts, EPA believes that deferral of implementation is not a preferred option. Accordingly, the Agency is continuing efforts to support FY–92 and FY–93 PAMS-type monitoring initiatives via the Section 105 Grant process. Noting, however, the real concerns of State and local air pollution control agencies regarding the phase-in details, EPA is, in this promulgation, reconfirming the transition requirements, previously proposed, of one station per year and modifying the requirements to include provisions for flexibility.

9. Public Comments—Section 58.45—PAMS Data Submittal

Seven respondents expressed the opinion that the 6-month time period allowed by § 58.45 is reasonable and adequate for the submittal of VOC data. Three of these commenters indicated that allowing a reporting deadline of 9 months to a year for the first 2 years or so of the program would be preferable. This data phase-in would then allow added time for training in the implementation and interpretation of data and the data acquisition system. The final rules stipulate that the VOC data must be reported within 6 months following the end of each quarterly reporting period. Since the PAMS minimum monitoring season runs from June through August and encompasses two quarterly reporting periods, the June data would not be due until January 1 of the following year, and the remainder of July and August data would not be due until the following April 1. The Agency believes that when the systems of data analysis, handling, and reporting are routinized, these time periods will be more than adequate for VOC data reporting. The Agency understands, however, as States begin to wrestle with new personnel and technology, that even such a reasonable reporting deadline may be difficult to meet during the initial years of implementation.

One commenter questioned the need to delay submittal of the meteorological data past the time period required for submittal of the NO_X and O_3 data. EPA agrees that the measurement and data handling technology for meteorological parameters is currently sufficient for States to be capable of submitting such information on a more expedited schedule. The Agency recognizes, however, that the uses for such data in photochemical modeling, receptor analysis, and emissions inventory functions, generally requires integration with the VOC data. Since the utility of expediting this data submittal would be only marginal, EPA has required that the meteorological measurements be submitted on the same time schedule as the VOC data.

Concurrent with the development of the photochemical assessment monitoring proposal of March 4, 1992, EPA was considering a modification to the data reporting requirements for SLAMS and NAMS monitoring as iterated in §§ 58.26 and 58.35. The stipulation for 60-day reporting for O_3, NO, NO_2, and NO_X, outlined in § 58.45(c), was patterned after the changes to the draft requirements for NAMS, since at that time it was expected that these other revisions would be complete. Since the revisions to NAMS and SLAMS requirements have not yet been proposed and subjected to public comment, EPA today is promulgating a modification to § 58.45(c) which would cause these pollutants to be reported on an identical schedule to that stipulated in § 58.35 for NAMS. Changes to the reporting schedule for all monitors will thus be considered in a separate Federal Register notice at a later date. This modification would also be consistent with the comments from two of the respondents.

Two commenters expressed the belief that EPA should make a greater commitment to assist the States in developing and implementing VOC data acquisition and processing systems to ensure timely compliance with the 6-month requirement for VOC data submittal. An additional commenter expressed a similar concern, that given the large data handling requirements, the 6-month limitation would be difficult to meet. EPA has sponsored parallel projects involving the acquisition, processing, analysis, and interpretation of VOC data which may provide needed assistance to States in the handling of the massive VOC data base. Further, the Agency has revised its PAMS cost estimates upwards to consider the necessary costs of VOC data acquisition and processing and is considering the inclusion of additional guidance in the technical assistance document (Reference 2 of Appendix C).

One respondent suggested that a target list of VOC species should be developed and augmented with a shorter priority list for reporting. EPA notes that such a target list has been published by the Agency in reference 2 of appendix C, but believes that placing limits on reporting via a priority list is premature and would in no case be universally applicable.

Two commenters pointed out the immediate need to make appropriate changes to the Aerometric Information Retrieval System (AIRS), the national ambient air monitoring database, to accommodate the new PAMS data elements. EPA has incorporated such changes to AIRS.

One commenter suggested that § 58.45(d) be reworded to allow the monitoring and reporting of NMHC (non-methane hydrocarbons) in lieu of VOC. Note that this issue has been previously addressed in comments pertaining to § 58.20.

10. Public Comments—Section 58.46—System Modification

One commenter stated that they believe that changes in attainment status should not reduce the requirements of the PAMS and that monitoring should continue to be funded by EPA. A second commenter suggested that once an area demonstrates attainment of the O_3 NAAQS, EPA should either reduce the PAMS monitoring requirements or assume responsibility for the PAMS funding in that area. EPA believes that continued PAMS monitoring, even after a demonstration of attainment is performed, will be crucial to maintaining the O_3 NAAQS over time. Nevertheless, if a State can demonstrate that it can properly track unexpected changes in the ambient VOC mix and emission inventories, while maintaining the NAAQS, it may propose changes, even reductions, in its PAMS monitoring network as stipulated by § 58.46(b). EPA is not authorized to accept a cessation of PAMS monitoring, however, until an area is redesignated to attainment.

EPA has demonstrated its willingness to provide substantial funding to States for ambient air monitoring activities via the section 105 Grant process. Although the Agency is predisposed to continue to contribute to ambient air monitoring programs such as PAMS, it is of course subject to the limitations of section 105, in part described in the Resources and Costs section of this Preamble.

One commenter felt that the annual network review should be conducted and approved by the Regional Administrator. EPA notes that the network review for ambient air monitoring systems described in § 58.20 is currently conducted and approved annually by the appropriate EPA Regional Office. Section 58.46 articulates a national approval process for changes to PAMS networks similar to that required for NAMS and referenced in §§ 58.32 and 58.36. National data needs and consistency dictate Headquarters EPA approval for changes in both cases.

11. Public Comments—Appendix A—Quality Assurance

All five commenters on this section pointed out the explicit need for a specific, uniform, improved system of quality assurance (QA) for the VOC sampling and analysis requirements (especially) mandated by PAMS. One respondent added the following three recommendations for a national QA program: (1) The establishment of uniform QA criteria including calibration schedules, duplicates schedules, blanks schedules, (2) the establishment of standardized audit procedures, and (3) the establishment of laboratory audit samples and an interlaboratory exchange program between States and EPA laboratories.

EPA is aware that the PAMS sites will require a QA program similar to the one now used for SLAMS criteria pollutants. EPA is currently developing the audit materials and QA guidance required to establish such a system for the pollutant monitoring systems that will be located at the PAMS sites. These materials for the VOC measurement systems are being developed in conjunction with the evaluation study EPA is now conducting on the candidate VOC instrumentation for use at PAMS sites. This study is briefly described in the public comments on § 58.43—PAMS Methodology. Additionally, EPA plans to provide VOC samples to the State and local agencies operating PAMS sites to assist them in validating their VOC monitoring systems and the performance of the personnel operating these systems.

12. Public Comments—Appendix C—Monitoring Methodology

Five commenters recommended that equivalency of methodology must be established at least on a regional level and perhaps even nationally. Several commenters went so far as to recommend that EPA develop federal reference and equivalent methods for VOC. Further, several commenters reiterated their perception of the need for routine inter-State, inter-area quality assurance procedures. Given that the complexity of the technology for VOC sampling and analysis and its rapid rate of development and change, EPA has chosen to publish specific guidance for monitoring methodology in lieu of publishing federal reference or equivalent methods. Such guidance has been published and is available as reference 2 of appendix C. The Agency will track the progress of the development of new methods and will reconsider the specificity of methods in the future. EPA agrees that common and continuing, or at least comparable, methodologies are desirable on a region-wide basis. Comparability of data will be one factor used by the Agency in approving coordinated, region-wide network designs.

One commenter pointed out that the rules should not preclude the expansion of the monitoring period to longer than 3 months, noting also that the length of the monitoring season is not necessarily proportional to the total network operational costs. EPA notes that provisions for changing the monitoring period are promulgated today in section 4.3 of appendix D. EPA agrees with this respondent that monitoring periods should be consistent across a regional network. This factor would also be scrutinized when approving joint networks. EPA recognizes the role that the length of the monitoring period plays in the computations of total costs and has weighted that role accordingly.

One commenter felt that EPA should specify a particular chromatographic column for use on gas chromatographs (GCs) analyzing for the various VOC. Reference 2 of appendix C specifies those column characteristics which AREAL believes are necessary to produce meaningful data on the target VOC compounds. The laboratory even goes so far as to provide specifications on several acceptable columns, but falls short of requiring a chromatographer to choose any one particular design. EPA reiterates its position that the technology for VOC sampling is simply evolving too quickly to allow such specificity at this time.

One commenter believed that the VOC monitoring technology is not yet advanced enough for State and local agencies to economically operate a speciated VOC monitoring program. As previously stated, the Agency believes that States are capable of competency in utilizing new monitoring methods, and in fact a number of State agencies are currently employing such emerging techniques with success. Per this commenter's suggestion, EPA is providing significant financial and technical assistance for implementation of this technology.

In a related issue, a commenter suggested that the rules should tighten the equipment design and performance standards for VOC in order to drive the technology. Noting the progress made to date by the researchers, designers, and fabricators of VOC sampling equipment, EPA believes that the existing technical specificity and market pressures are sufficient to spark development in new and emerging sampling and analysis methods. One other respondent encourages the development of less labor-intensive methodologies to counter the specter of future resource constraints. AREAL has continued to articulate its support for such efforts and will continue to exercise flexibility in investigating new, more economical, and uncomplicated procedures as recommended by yet another commenter.

One commenter felt that EPA should append the provisions of the rules (and particularly appendix C) to facilitate and encourage the use of innovative analytical technologies which are useful for O_3 control strategies. Although EPA is investigating the use of such innovative monitoring technology, and specifically the technology recommended by this commenter, the Agency has not yet determined how the use of these sampling methods will fit into the current SIP process. Nevertheless, EPA does not wish to preclude the use nor discourage the development of new monitoring technologies and so has amended the language of appendix C accordingly. In a related issue, a second commenter was concerned that the stipulations of section 4.2 of appendix C required the use of reference or equivalent methods for the monitoring of NO and NO_x at PAMS. This respondent recommends the use of more advanced and sensitive methods for such monitoring. EPA notes that in great part, the use of the NO_x data measured at PAMS is dictated by the need for precursor information rather than for comparison with the NO_2 NAAQS. Since the Agency does not wish to preclude the use of potential innovations or more sensitive monitoring devices for either VOC or NO_x, it has therefore added additional language to sections 4.2 and 4.3 of appendix C to indicate that such other methodology may be proposed by the State as alternatives. Further, although the Agency has determined that such new technologies may be proposed and even encourages and recommends their use, it is premature to make their use a requirement.

One commenter specifically raised a number of technical questions for consideration by EPA. In response, EPA has determined that pressurized and nonpressurized canister samples are equivalent and that drying of samples prior to analysis to reduce water content is an acceptable procedure. Additionally, the Agency notes that an O_3 scrubber is required on the carbonyl samplers, and C–18 cartridges are equivalent to silica gel cartridges for such analyses. Guidance on standardization protocols (what gas, how many points, what concentrations?) will be addressed in future revisions to the Technical Assistance Document for Sampling and Analysis of O_3 Precursors (EPA 600/8–91–215). Further detail concerning such information may be found in reference 2 of appendix C.

13. Public Comments—Appendix D—Network Design for SLAMS, NAMS, and PAMS

The following discussions address the comments received on specific provisions to appendix D:

14. Public Comments—Section 4.1 of Appendix D—PAMS Data Uses

Five commenters expressed concern that the PAMS program might be insufficient for the purpose of verifying emissions inventories. One suggested that further flexibility be built into the regulation since techniques for inventory verification are still in the developmental stages. Further, two commenters expressed conflicting views in the use of air quality data and/or emissions inventory data for the tracking of emissions reductions over time. The use of air quality data, and especially that of photochemically reactive species, is admittedly an evolving science. EPA does believe, however, that such data have been demonstrated to be a constructive adjunct tool to emissions inventories in qualitatively verifying their accuracy and serving as a corroborative instrument to calculations of reasonable further progress (RFP) in reductions of emissions (See References 26–30 of Appendix D). Note that the Clean Air Act clearly stipulates that RFP is defined via reductions of emissions rather than progress in air quality measurements for precursors or for O_3. Emissions inventory reduction calculations must therefore persist as the primary tool for evaluating both progress and reductions. These facts do not lessen the importance, however, of ensuring that those calculated values are corroborated by actual air quality measurements. EPA would be remiss if it allowed the disregard of air quality information in judging the adequacy of State Implementation Plan performance. The Agency notes that since the inventory corroboration techniques are not specified or limited by this section, adequate flexibility is incorporated in the rule.

In a related matter, one commenter suggested that EPA has not shown the correlation of target list compounds to actual emissions inventories and proposes that continuous NMOC monitoring in conjunction with integrated canister samples would be a better indicator of emissions inventories. As previously iterated, EPA is promulgating rules which can be applied nationally as a minimum requirement. The Agency recognizes and clearly articulates that the PAMS network requirements are designed to provide information which can be used in maximizing the utility of a number of data objectives. Were a commenter to demonstrate that their particular method of monitoring is superior to PAMS for one data use, it is possible that further scrutiny would reveal that it is not ideal for the remainder. Air pollution agencies are not precluded by the rule from instituting monitoring strategies additional to the PAMS minimums or proposing alternatives more tailored to their particular geographic area. Similarly, one commenter was concerned that the program may not fulfill the needs for SIP control strategy evaluation and suggests that modeling is the preferable tool for this purpose. The Agency agrees that modeling is the more appropriate tool to determine the potential for the success of a proposed SIP strategy; however, the Agency asserts that knowing what changes actually occurred in the ambient air is an extremely useful measure of the true effectiveness of any control program.

Two commenters indicated the need for the Agency to publish a data uses guidance document. They imply that such a document should expound on the details of how the data generated by PAMS can be used to meet the data objectives. One respondent complained that it currently does not have a program that can use the data provided by the PAMS. EPA has prepared documents dealing with the data quality objectives (DQOs) for the PAMS program. Additionally, other demonstrations of the continuing use of such data are noted as references 26–31 of appendix D. Further, in response to these comments, minor revisions have been made to clarify section 4.1 of appendix D. Those State agencies which have recognized their lack of ability to use these important data may employ the additional section 105 Grant monies made available for PAMS toward enhancing their data processing and analysis capabilities.

Four respondents noted that although some of the stated objectives for PAMS support application of photochemical grid modeling techniques, the network design does not seem to effectively accomplish this feat. Further, three commenters protest that the network specifically does not meet the data requirements of their State's photochemical modeling protocol. EPA has reexamined the overall data needs of the photochemical modeling community and has modified the network to be more responsive. Since the Agency is attempting to ensure that PAMS is compatible with national needs, particular States may find that the requirements provide better data than needed to execute a minimal modeling run or that their particular model application demands other information not measured by PAMS. In the latter case or as one commenter noted, when more intensive data is needed, the State is free to measure those additional parameters which they feel are necessary to drive and/or evaluate future model applications.

One commenter questioned why the methodology to determine air quality trends is not specified in the rules. This respondent joined with another to point out the need to address and eliminate the variability of air quality data due to meteorology. EPA maintains that a rule which specifies monitoring requirements and network design, is not an appropriate vehicle to promulgate particular statistical techniques for calculating or presenting trends analyses. Given the variety of such techniques available to the State and local air pollution agencies today, it would be nearly presumptuous for EPA to attempt to limit their ability to analyze their own data via rulemaking. The absence of specific trends requirements allows the States to retain the maximum flexibility and employ the most appropriate state-of-the-art analysis techniques. Clearly, there are two basic concepts which may be employed in preparing trends analyses: (1) Displaying unadjusted measurements which portray the quality of the air actually breathed by the public, or (2) calculating adjusted trends to infer progress towards attainment of standards due to the influences of pollutant control programs. In either case, the cornerstone of the analyses are the actual air quality and meteorological measurements such as those required by PAMS. Particularly, for evaluating the effectiveness of control programs, it may be appropriate to integrate such factors as meteorology and emissions inventory data. EPA simply disagrees that this rule is the correct forum to expound on specific procedures for the analysis of pollutant trends. Trends techniques utilized by EPA for criteria pollutants have appeared perennially in the Agency's National Air Quality and Emissions Trends Report. Further, EPA is currently evaluating techniques for improving the effectiveness of O_3 control strategies including indicators for assessing progress. This work will address techniques for integrating meteorology, emissions, and ambient data.

The second commenter concerning trends went further to question whether or not the 5-site PAMS network is sufficient to conduct O_3 and O_3 precursor trends analyses. Since PAMS sites are located to detect particular characteristics of the air quality, such as maximum O_3 or upwind transport, the 5 sites have been determined by EPA to be the minimum network necessary for larger areas to encompass specific situations of interest. Experience with the NAMS network requirements has shown that some areas may choose to supplement this minimum network to meet their own objectives. EPA has decided that the 5-site network represents a minimum core requirement which will provide a consistent and stable database to be used for trends. Additionally, the Agency notes that for areas which submit coordinated, joint network designs, it is expected that more than 5 sites will be established and become available for trends analyses.

One commenter noted that sampling sites located to measure either VOC or air toxics impacts may not be an optimal location for the other. EPA has previously articulated its view on this matter in this preamble's discussion of Resources and Costs.

One commenter vociferously criticized the basic tenets of the PAMS program and professes that a successful PAMS program can be cultivated via a program of less-frequent focused sampling for generalized precursor data (e.g., NMOC) with a minimum of speciation information. They believe that their experience with this type of program has been largely ignored in designing the PAMS program. EPA again observes that a program which has been simplified or merely focused to meet the specific data needs of a particular locale, may not be appropriate to fulfill the data uses for a national program which is generally routine O_3 precursor data-poor. Nevertheless, the opportunity is provided by section 4 of appendix C and section 4 of appendix D for the approval of such focused alternative networks in accordance with § 58.40, especially where significant historical precursor monitoring data are available. The adoption of different or more comprehensive requirements, as discussed further in the Agency's response to comments on § 58.42, does not imply deficiencies in an existing monitoring program. EPA's program simply highlights that national needs are often different and more inclusive than local needs.

15. Public Comments—Section 4.2 of Appendix D—PAMS Monitoring Objectives

Four respondents revived the issue that the sites chosen for PAMS would not necessarily constitute appropriate locations for the monitoring of air toxics. Further, these commenters seem to support a separate and expanded air toxics monitoring effort. As noted by EPA in the discussion of resources and costs in this preamble, the Clean Air Act Amendments call for a network which is geared toward the monitoring of photochemical parameters. The Agency agrees that PAMS may not be the ideal platform for monitoring air toxics, but feels that the establishment of additional air toxics monitoring at these sites is a valuable adjunct to the PAMS program. Separate national air toxics monitoring networks are not currently a highly-ranked, nationally mandated priority.

Two additional commenters requested that the Agency continue its efforts to define and monitor NO_y. EPA previously expressed, in addressing comments to § 58.1, its reluctance to rush the regulatory and monitoring program for NO_y. EPA will continue its investigations of this concept and will propose future revisions to 40 CFR part 58 if appropriate.

One commenter espoused the importance of measuring VOC aloft. EPA has previously indicated its reluctance to require this monitoring in the discussions of the general comments.

The same commenter felt that rural sites for the collection of boundary condition carbon monoxide (CO) and NO_X data should be added to the PAMS program. EPA also has recognized the importance of including sites that will better define boundary conditions. Consequently, section 4.2 of appendix D and its associated Figures have been modified to better reflect the measurement of boundary conditions. Note that since CO was not addressed in section 182 of the Clean Air Act Amendments as a required pollutant for PAMS, no monitoring requirements for CO were included. This omission does not preclude a State from adding CO monitoring to its network design.

One commenter believes that due to the effects of complex meteorology, the placement of PAMS sites should be based more on studies of past O_3 episodes rather than the generic model proposed by EPA. The Agency agrees in principal with this comment and has altered the location of the PAMS sites to correspond more closely with the wind conditions associated with O_3 events.

One commenter requested that EPA provide more specificity for locating PAMS type (2) sites, the sites where maximum emissions are expected to impact. In response, EPA has clarified and added additional detail for this site's location.

One commenter was concerned that many of their current NAMS and SLAMS monitors are not located at potential PAMS sites. EPA notes this concern and considered that some, but not all PAMS sites might be coincident with SLAMS or NAMS in its recomputation of cost estimates. Reference is made to a similar discussion under General Comment : and Resources and Costs in this preamble.

One commenter also requested that existing data be allowed to be used as a part of alternative PAMS monitoring schemes. Note as discussed in § 58.40 that EPA has amended section 4.2 of appendix D to include broad criteria for the approval of alternative networks. The use of existing information and existing monitoring networks is not precluded by these changes to the rule.

16. Public Comments—Section 4.3 of Appendix D—Monitoring Period

Ten commenters expressed opinions regarding the length and specificity of the monitoring period for the PAMS. Three of those respondents supported the proposed requirement of 3 months, especially June, July, and August, although they indicated that more sampling would obviously be better; that consistency across regions is crucial, and that more specificity would be useful. Three others indicated that they felt that the 3-month period was too short and would create staffing problems for affected State governments with a minimal cost savings over sampling for longer periods such as the entire O_3 season. One of these commenters asserted that 5 months would be a better choice, especially in the State of California. Five commenters believed that employing O_3 level forecasting and episode monitoring would be a more efficient use of resources and provide a more intensive database for the critical periods and could make better use of manual sampling methods. One commenter felt that the length of the sampling period should best be specified on a regional basis and that while a 3-month period would likely capture the majority of episodes in the Northeast, such a period would be insufficient for the South and West.

EPA agrees that more than 3-months would be preferable and has articulated this opinion in section 4.3. The Agency has recognized, however, that other particular months rather than June, July, and August may, on a case-by-case basis be more appropriate. Accordingly, EPA has expressed its intent to allow other monitoring periods if submitted and approved as a part of the network description required by § 58.40. In the discussion concerning comments to § 58.40 in this preamble, EPA has clearly espoused its support for coordination and consistency among States and across regions and noted that other requirements of the Clean Air Act Amendments may require such coordination, in this case in establishing the monitoring period for PAMS. The Agency's goal in choosing the 3-month period was to attempt to capture the highest O_3 events for the year. The Agency has established only a minimum sampling period: any affected State or region may expend this period to a longer time to meet its particular needs. Flexibility has been included in the rule to allow the use of either manual or continuous sampling technologies. Given that the Agency recognizes the utility and efficiency of focussing its efforts on O_3 events, section 4.4 sampling requirements have been amended in this promulgation to allow the sampling for such events and as an option make the use of manual methods more feasible. A discussion of those changes follow under section 4.4. EPA has included a stipulation in section 4.3 that intermittent sampling must follow the previously-established national schedule for intermittent sampling such as the one-in-six-day schedule used for particulate matter.

17. Public Comments—Section 4.4 of Appendix D—Minimum Network Requirements

Twenty-four commenters responded to this section of the proposed rule concerning the details of PAMS network sampling and design. Eleven of those respondents specifically indicated their concern that the proposed requirements for VOC sampling were excessive and the rule should be amended to allow less intensive sampling. Many suggested that such a less-intensive sampling program would save funds which could be better allocated for other purposes, upper atmospheric monitoring for example. Several commenters included suggested sampling plans for implementation in lieu of the proposed schedule. Six commenters believed that a better use of limited resources would be to focus VOC monitoring on days when high O_3 levels would be expected or forecast. EPA has examined the proposed optional sampling schedules, considered the economic impact of the schedule, revisited the current state of the monitoring technology and has concluded that it is appropriate to make a number of changes to the minimum sampling schedule for VOC. To respond to the data needs of the Agency and the State and local air pollution control agencies, EPA has decided the following: Sampling schedules for NO, NO_2, NO_X, O_3 and surface meteorological parameters remain unchanged. EPA has determined that the minimum requirements for pollutant sampling will continue to mirror those for gaseous criteria pollutants, (i.e., continuous measurements). The minimum sampling period for precursors is designated as three months, specifically June, July, and August unless a different 3-month period is proposed by the State and approved by EPA. The minimum sampling period for ozone remains for the entire ozone season. The Agency has added an option for VOC monitoring at sites other than PAMS type (2) sites. In lieu of one in 3-day sampling (as stipulated by Frequency A in section 4.4 of appendix D), a State may substitute monitoring before and during O_3 events as specified by section 4.4 of appendix D plus one in 6-day sampling. Since the Agency is not promulgating a preferred event forecasting method, each State choosing this option (identified as sampling Frequency C by section 4.4 of appendix D), must submit an O_3 event forecasting scheme as a part of the PAMS network description as delineated in § 58.41. States or areas proposing the joint submittal of network descriptions and choosing this option should include a strategy for ensuring a coordinated, network-wide response to O_3 event monitoring. Such a change in focus to event monitoring will also increase the feasibility of utilizing manual sampling methods as requested by several commenters.

Also in response to these concerns and in order to ensure the collection of data sufficient to conduct emission inventory verification and reconciliation exercises, establish source-receptor relationships, corroborate reasonable further progress (RFP) calculations, and produce meaningful precursor trends analyses, the proposed PAMS type (3) site has been changed to an additional PAMS type (2) site. To respond to other photochemical modeling concerns, the proposed PAMS type (5) site has been moved downwind of the new type (3) site and renumbered PAMS type (4). Responding to observations by six commenters that sampling schedules should be standardized to promote data comparability among parameters, carbonyl sampling requirements have been amended to more closely coincide with the required frequencies for VOC.

Eleven respondents suggested alternative locations or numbers of PAMS sampling stations. There was considerable variation among the suggested options, with several commenting that more sites were needed, others noting that specific local terrain and meteorological effects require different station placement. Five respondents in particular recommended that the collected data should be more responsive to the needs of the photochemical grid modeling process. EPA has closely surveyed the specific data needs engendered by the program objectives, especially the necessity to provide a measure of support for photochemical grid modeling, and has concluded that further clarification on the location of the PAMS sites is requisite. Accordingly, EPA has provided detail regarding the use of particular high O_3 day wind data, rather than general seasonally-predominant winds, for the location of potential PAMS monitoring sites. Further the Agency has provided guidance in reference 19 of appendix D to aid in specifying the location of sites, particularly sites type (2), when there are no predominant high O_3 day winds which can be accurately identified. Also, the Agency has relocated the upwind and downwind sites to correspond more appropriately to the data needs for photochemical grid models and has added guidance on the location of monitors, especially site types (3) or (4), in areas of complex terrain, e.g., mountain-valley, coastal, etc., to reference 19.

One commenter inquired why there is no requirement for a site in the area of greatest O_3 concentration given that the rule's objectives include making attainment/nonattainment decisions and characterizing the nature and extent of the O_3 problem. EPA notes that the siting requirements for PAMS type (3) sites and its monitoring objectives as articulated in section 4.2 and section 4.4 of appendix D clearly require its location to be the maximum O_3 monitoring site for the area.

Several respondents suggested that the requirement for each PAMS site to monitor all parameters was not necessary, i.e., that some PAMS sites should be allowed to operate with monitoring conducted for only some of the specified pollutants. EPA has revisited its PAMS data objectives and has determined this monitoring requirement should remain unchanged. Elimination of parameters at individual sites would weaken an otherwise comprehensive database and decrease its utility for fulfillment of the PAMS data objectives and future undiscovered data needs.

One commenter, while recommending alternate monitoring technologies for the PAMS, stated that in lieu of monitoring 1-hour averages for VOC monitoring, the sampling of 10-minute average for VOC equivalents or surrogates should be allowed. The technology recommended by this commenter is currently being scrutinized by the AREAL laboratory to determine its utility in the SIP process as noted in the discussion of § 58.43. EPA has otherwise determined that VOC monitoring at increments of 10 minutes is not practical at this time.

Several other commenters suggested the use of 24-hour and/or continuous NMOC monitoring (with periodic speciation) as an adjunct to or even as a replacement for the PAMS speciated VOC monitoring. They assert that the technology for NMOC monitoring is proven and that the subsequent data are sufficient for the development and tracking of control strategies. EPA has considered these arguments and has determined that although some of the PAMS objectives may be fulfilled via total NMOC data, the remainder require the gathering of speciated VOC measurements. The Agency has therefore not adopted the use of NMOC instead of speciated VOC as a national requirement as discussed previously under the public comments to § 58.20. The PAMS requirements, however, do not preclude the collection of additional NMOC data as an adjunct or for the submittal of alternative networks which propose elements of NMOC monitoring.

Two commenters questioned the utility of gathering a 24-hour integrated and speciated VOC sample to supplement the 1-hour speciated VOC samples. EPA notes that given the variations inherent in continuous/1-hour VOC measurement technology, the addition of a periodic 24-hour sample for purposes of quality assurance is a prudent and necessary reality check. Additionally, the year-round 24-hour periodic sample will provide information on emissions inventories, RFP, and long-term VOC trends and data for exposure assessments.

One State commenter felt that the guidance for regional network design, provided by figure 2 of appendix D, is too generic. This respondent suggests specifically that EPA should develop the PAMS monitoring network description for the Northeast O_3 Transport Region. EPA recognizes the unique nature of the O_3 problem occurring in the northeastern United States. Further, the Agency agrees with the principle that a strong federal contribution to the development of a region-wide monitoring network is critical to develop the needed consistency, cohesiveness, and comparability of the PAMS in the Northeast. Accordingly, the Agency has offered and is supplying both technical and financial assistance to coordinated region-wide State and local efforts. EPA does not agree, however, that the Agency should, by rule, usurp the State Implementation Plan process established by section 110 of the Clean Air Act, nor shortcut the requirements for the submittal of a network description for PAMS. Failure of a State to comply with the requirements for submittal of a SIP could, however, ultimately require EPA to promulgate and implement a Federal Implementation Plan for that State pursuant to section 110.

Several agencies submitted a PAMS monitoring plan which was fundamentally different from the proposed rule and requested that EPA substitute those requirements as the national requirements for PAMS monitoring. EPA observes that these agencies, being proximate to one another, would benefit greatly by submitting and implementing similar monitoring strategies. In this respect, EPA applauds those agencies' efforts toward consistency across a geographical region. On the contrary, however, for the same reasons that the requirements are specifically tailored to the characteristics of that particular region, the Agency does not believe that it would suffice as a national minimum program.

18. Public Comments—Section 4.5 of Appendix D—Transition Period

Six commenters responded to this section, with varying points of view, although most were discussed as part of the debate outlined in § 58.44. Additionally, however, two commenters suggested that the early years of the program requirements should not be overly prescriptive and that areas be allowed to build up their programs over time, intimating that technology changes and resource needs could be phased in along with the monitoring program. In response, EPA has incorporated additional transition period flexibility as iterated in the discussion of § 58.44.

19. Public Comments—Section 4.6 of Appendix D—Meteorological Monitoring

Sixteen commenters provided observations regarding the meteorological monitoring requirements proposed by section 4.6 of appendix D and further stipulated by reference 2 of appendix C. Eleven of these respondents indicated support for the collection of upper air meteorological data in each area, especially if high quality upper air data are not currently available. Several supported this suggestion with notations that the photochemical grid models demand such data. One commenter, although recognizing the need for upper air monitoring, advised caution and deferral of such requirements due to the current state of atmospheric sounding technology. EPA has investigated the merits and projected costs of upper air meteorological monitoring and has concluded that the benefits of incorporating a requirement for upper air measurements are substantial. In response, therefore, the Agency has amended section 4.6 to reflect these requirements and has further indicated its predisposition to allow adequate time for securing data from this network. EPA also believes that States should take advantage of existing upper air monitoring programs and where possible, substitute these data for the PAMS requirements. EPA will provide guidance for the collection of these data.

Several respondents provided specific recommendations concerning the particular meteorological parameters which should be monitored and those for which they believed monitoring should be limited. EPA notes that with the exception of dew point measurements, the recommendations for particular parameters are incorporated into reference 2 of appendix C. Concerning dew point, one commenter stated that their meteorological staff find dew point temperature measurements to be much more useful than relative humidity to the study and forecasting of O_3 episodes. The measurement technique for dewpoint is straightforward; States are encouraged to include such measurements at PAMS, if they find them useful. The Agency has not required the measurement of this parameter since it may not be essential for all locations and may be derived from temperature and relative humidity measurements. As observed by one commenter, barometric pressure generally does not vary widely within a large area, except in areas with complex terrain features. EPA therefore indicates its predisposition to allow approved network designs which offer limited measurements of barometric pressure (or other parameters) if the State can demonstrate that the area's topography is not conducive to significant pressure (or other) variations.

One respondent indicated that the rule should allow measurements at a minimum height, or a range, above ground rather than specify 10 meters. For consistency, EPA has retained the 10-meter requirement. The Agency has determined that the lack of flexibility in this requirement should not constitute any hardship inasmuch as measurements at 10 meters are traditional as well as practical. States may institute additional monitoring at other heights, at their own volition.

In the preamble to the March 4, 1992 proposal, EPA recognized the potential difficulty in siting a 10-meter meteorological monitoring tower at a particular PAMS site. The Agency therefore requested comments on criteria to determine how such data collected at a nearby site could be used to represent the meteorology at a PAMS site where the tower and air monitoring equipment could not be collocated. One respondent agreed with the premise that nearby data (such as collected at airports or National Weather Service stations) should be accepted, but provided no suggestions for criteria to judge the representativeness of those data. EPA has consequently decided to consider requests to use nearby existing meteorological data, both surface and upper air, on a case-by-case basis.

20. Public Comments—Appendix E—Probe Siting Criteria for Ambient Air Quality Monitoring

Four respondents provided specific comments regarding the placement of the probe and siting criteria for PAMS. One was particularly concerned over the description for the PAMS site to be located downwind in the second-most prevalent wind direction noting that the probe siting criteria were based on the primary wind direction. EPA recognizes this deficiency, and notes that the rules have been amended to eliminate this PAMS type (5) site. Additional language has been added to sections 10.2 and 12 of appendix E to correct this anomaly for the other sites.

One commenter, based on experience, recommends that VOC samplers should be located further from sources than criteria pollutant monitors if they are to measure area-emitted and regionally-transported VOC. EPA notes that the minimum network detailed in section 4 of appendix D, stipulates 3 site types which are located to adequately measure incoming transported emissions [type (1)], maximum O_3 measurements [type (3)], and downwind outgoing conditions [type (4)], all sited as urban scale monitors.

Two agencies recommend the use of a vertical manifold for the measurement of ambient O_3 precursor data rather than a horizontal manifold. They further recommend that a heated line from the manifold to the GC be employed to ensure the transmission of heavy hydrocarbons through the line. EPA notes no compelling reason to specify the orientation of the sampling manifold. The requirements published in the technical assistance document (Reference 2 of Appendix C) do not preclude the use of a vertical sampling manifold. Likewise, the Agency has not specified nor prohibited the heating of the manifold which may be necessary in high humidity areas.

One commenter believes that the specifications for separation distance between PAMS and roadways, trees and obstacles appear to be lenient and should be more stringent. EPA believes that the specifications are adequate based on current best judgement. As more information becomes available, the Agency will revisit this issue.

D. Public Comments Concerning Impact on Small Entities

The U.S. Small Business Administration (SBA) requested further detail regarding the impact of these regulations on small entities which are defined to include small businesses, small organizations, and small governmental jurisdictions (5 U.S.C. 601 et seq.). Since EPA is utilizing the State Implementation Plan process as outlined in section 110 of the Clean Air Act, the provisions of these regulations promulgated today, apply directly only to State Governments, and particularly, to the State air pollution control agencies having jurisdiction over O_3 nonattainment areas classified as severe, serious, or extreme. EPA therefore has concluded that no small entities would be affected by the proposal. At the request of the SBA's Chief Counsel for Advocacy, this certification has been clarified. Therefore, pursuant to 5 U.S.C. 605(b), the Administrator certifies that these amendments would not have a significant economic impact on a substantial number of small entities.

Classification

Since this revision is classified as minor, no additional reviews are required. The rules were submitted to the Office of Management and Budget (OMB) for review (under Executive Order 12291). This is not a major rule under E.O. 12291 because it does not meet any of the criteria defined in the Executive Order.

List of Subjects in 40 CFR Part 58

Air pollution control, air quality surveillance and data reporting, ambient air quality monitoring network design and siting, intergovernmental relations, pollutant standard index, quality assurance program.

Effective Date of Regulation

These revisions to 40 CFR Part 58 incorporate a flexible, reasonable, transition schedule for efficient phase-in of the rules in lieu of a waiting period for a rule effective date. This schedule accounts for the anticipated delays encountered by States in hiring qualified personnel, obtaining equipment, and providing training. Given that States will need to begin as soon as possible to prepare for O_3 season sampling, a 30-day waiting period is not appropriate and an effective date of immediately upon promulgation is deemed necessary. This explanation is provided pursuant to the requirements of 5 U.S.C. 553.

Dated: January 19, 1993.

William K. Reilly,

Administrator.

For the reasons set forth in the preamble, part 58 of chapter I of title 40 of the Code of Federal Regulations is amended as follows:

PART 58—AMBIENT AIR QUALITY SURVEILLANCE

1. The authority citation for part 58 is revised to read as follows:

Authority: 42 U.S.C. 7410, 7601(a), 7613, and 7619.

2. Section 58.1 is amended by revising paragraph (f) and by adding paragraphs (w), (x), and (y) to read as follows:

§ 58.1 Definitions.

* * * * *

(f) NO_2 means nitrogen dioxide. *NO* means nitrogen oxide. NO_X means oxides of nitrogen and is defined as the sum of the concentrations of NO_2 and NO.

* * * * *

(w) *PAMS* means Photochemical Assessment Monitoring Stations.

(x) *VOC* means volatile organic compounds.

(y) *Meteorological measurements* means measurements of wind speed, wind direction, barometric pressure, temperature, relative humidity, and solar radiation.

3. Section 58.2 is amended by redesignating paragraph (d) as paragraph (e) and by adding a new paragraph (d) to read as follows:

§ 58.2 Purpose.

* * * * *

(d) This section also acts to establish a Photochemical Assessment Monitoring Stations (PAMS) network as a subset of the State's SLAMS network for the purpose of enhanced monitoring in O_3 nonattainment areas listed as serious, severe, or extreme. The PAMS network will be subject to the data reporting and monitoring methodology requirements as contained in subpart E of this part.

* * * * *

4. Section 58.13 is amended by revising paragraph (b), redesignating paragraph (c) as paragraph (d), and adding a new paragraph (c) to read as follows:

§ 58.13 Operating schedule.

* * * * *

(b) For manual methods (excluding PM10 samplers and PAMS VOC samplers), at least one 24-hour sample must be obtained every sixth day except during periods or seasons exempted by the Regional Administrator.

(c) For PAMS VOC samplers, samples must be obtained as specified in sections 4.3 and 4.4 of appendix D to this part. Area-specific PAMS operating schedules must be included as part of the network description required by § 58.40 and must be approved by the Administrator.

* * * * *

5. Section 58.20 is amended by revising paragraphs (a) and (c) and adding paragraph (f) to read as follows:

§ 58.20 Air quality surveillance: Plan content.

* * * * *

(a) Provide for the establishment of an air quality surveillance system that consists of a network of monitoring stations designated as State and Local Air Monitoring Stations (SLAMS) which measure ambient concentrations of those pollutants for which standards have been established in part 50 of this chapter. SLAMS (including NAMS) designated as PAMS will also obtain ambient concentrations of speciated VOC and NO_X, and meteorological measurements. PAMS may therefore be located at existing SLAMS or NAMS sites when appropriate.

* * * * *

(c) Provide for the operation of at least one SLAMS per criteria pollutant except Pb during any stage of an air pollution episode as defined in the plan.

* * * * *

(f) Within 9 months after;

(1) February 12, 1993; or

(2) Date of redesignation or reclassification of any existing O_3 nonattainment area to serious, severe, or extreme; or

(3) The designation of a new area and classification to serious, severe, or extreme, affected States shall adopt and submit a plan revision to the Administrator.

The plan revision will provide for the establishment and maintenance of PAMS. Each PAMS site will provide for the monitoring of ambient concentrations of criteria pollutants (O_3, NO_2), and non-criteria pollutants (NO_X, NO, and speciated VOC) as stipulated in section 4.2 of appendix D, and meteorological measurements. The PAMS network is part of the SLAMS network, and the plan provisions in paragraphs (a) through (f) of this section will apply to the revision. Since NAMS sites are also part of the SLAMS network, some PAMS sites may be coincident with NAMS sites and may be designated as both PAMS and NAMS.

Subparts E and F—[Redesignated as Subparts F and G]

6. Subparts E (§ 58.40) and F (§§ 58.50 and 58.51) are redesignated as subparts F (§ 58.50) and G (§§ 58.60 and 58.61), respectively. Subpart E is added to read as follows:

Subpart E—Photochemical Assessment Monitoring Stations (PAMS)

Sec.

Subpart E—Photochemical Assessment Monitoring Stations (PAMS)

§ 58.40 PAMS network establishment.

(a) In addition to the plan revision, the State shall submit a photochemical assessment monitoring network description including a schedule for implementation to the Administrator within 6 months after:

(1) February 12, 1993; or

(2) Date of redesignation or reclassification of any existing O_3 nonattainment area to serious, severe, or extreme; or

(3) The designation of a new area and classification to serious, severe, or extreme O_3 nonattainment.

The network description will apply to all serious, severe, and extreme O_3 nonattainment areas within the State. Some O_3 nonattainment areas may extend beyond State or Regional boundaries. In instances where PAMS network design criteria as defined in appendix D to this part require monitoring stations located in different States and/or Regions, the network description and implementation schedule should be submitted jointly by the States involved. When appropriate, such cooperation and joint network design submittals are preferred. Network descriptions shall be submitted through the appropriate Regional Office(s). Alternative networks, including different monitoring schedules, periods, or methods, may be submitted, but they must include a demonstration that they satisfy the monitoring data uses and fulfill the PAMS monitoring objectives described in sections 4.1 and 4.2 of appendix D to this part.

(b) For purposes of plan development and approval, the stations established or designated as PAMS must be stations from the SLAMS network or become part of the SLAMS network required by § 58.20.

(c) The requirements of appendix D to this part applicable to PAMS must be met when designing the PAMS network.

§ 58.41 PAMS network description.

The PAMS network description required by § 58.40 must contain the following:

(a) Identification of the monitoring area represented.

(b) The AIRS site identification form for existing stations.

(c) The proposed location for scheduled stations.

(d) Identification of the site type and location within the PAMS network design for each station as defined in appendix D to this part except that during any year, a State may choose to submit detailed information for the site scheduled to begin operation during that year's PAMS monitoring season, and defer submittal of detailed information on the remaining sites until succeeding years. Such deferred network design phases should be submitted to EPA for approval no later than January 1 of the first year of scheduled operation. As a minimum, general information on each deferred site should be submitted each year until final approval of the complete network is obtained from the Administrator.

(e) The sampling and analysis method for each of the measurements.

(f) The operating schedule for each of the measurements.

(g) An O_3 event forecasting scheme, if appropriate.

(h) A schedule for implementation. This schedule should include the following:

(1) A timetable for locating and submitting the AIRS site identification form for each scheduled PAMS that is not located at the time of submittal of the network description;

(2) A timetable for phasing-in operation of the required number and type of sites as defined in appendix D to this part; and

(3) A schedule for implementing the quality assurance procedures of appendix A to this part for each PAMS.

§ 58.42 PAMS approval.

The PAMS network required by § 58.40 is subject to the approval of the Administrator. Such approval will be contingent upon completion of each phase of the network description as outlined in § 58.41 and upon conformance to the PAMS network design criteria contained in appendix D to this part.

§ 58.43 PAMS methodology.

PAMS monitors must meet the monitoring methodology requirements of appendix C to this part applicable to PAMS.

§ 58.44 PAMS network completion.

(a) The complete, operational PAMS network will be phased in as described in appendix D to this part over a period of 5 years after:

(1) February 12, 1993; or

(2) Date of redesignation or reclassification of any existing O_3 nonattainment area to serious, severe, or extreme; or

(3) The designation of a new area and classification to serious, severe, or extreme O_3 nonattainment.

(b) The quality assurance criteria of appendix A to this part must be implemented for all PAMS.

§ 58.45 PAMS data submittal.

(a) The requirements of this section apply only to those stations designated as PAMS by the network description required by § 58.40.

(b) All data shall be submitted to the Administrator in accordance with the format, reporting periods, reporting deadlines, and other requirements as specified for NAMS in § 58.35.

(c) The State shall report NO and NO_X data consistent with the requirements of § 58.35 for criteria pollutants.

(d) The State shall report VOC data and meteorological data within 6 months following the end of each quarterly reporting period.

§ 58.46 System modification.

(a) Any proposed changes to the PAMS network description will be evaluated during the annual SLAMS Network Review specified in § 58.20. Changes proposed by the State must be approved by the Administrator. The State will be allowed 1 year (until the next annual evaluation) to implement the appropriate changes to the PAMS network.

(b) PAMS network requirements are mandatory only for serious, severe, and extreme O_3 nonattainment areas. When any such area is redesignated to attainment, the State may revise its PAMS monitoring program subject to approval by the Administrator.

7. Two new sentences are added before the last sentence in the first paragraph of section 2.2 of appendix A to read as follows:

Appendix A to Part 58—Quality Assurance Requirements for State and Local Air Monitoring Stations (SLAMS)

* * * * *

2.2 * * * Quality assurance guidance for meteorological systems at PAMS is contained in reference 3. Quality assurance procedures for VOC, NO_X (including NO and NO_2), O_3, and carbonyl measurements at PAMS must be consistent with EPA guidance. * * *

* * * * *

8. In the *References* section of appendix A redesignate references 5, 6, and 7 as references 6, 7, and 8, respectively, and a new reference 5 is added to read as follows:

References

* * * * *

5. Technical Assistance Document for Sampling and Analysis of Ozone Precursors.

Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/8-91-215. October 1991.

* * * * *

9. Sections 4.0, 5.0 and 5.1 of appendix C are redesignated as sections 5.0, 6.0, and 6.1, respectively (reference 5.1 will become reference 6.1 of section 6.0), sections 4.0, 4.2, and 4.3 are added, and newly redesignated section 6.0 is revised to read as follows:

Appendix C—Ambient Air Quality Methodology

* * * * *

4.0 Photochemical Assessment Monitoring Stations (PAMS)

4.1 Methods used for O_3 monitoring at PAMS must be automated reference or equivalent methods as defined in § 50.1 of this chapter.

4.2 Methods used for NO, NO_2 and NO_X monitoring at PAMS should be automated reference or equivalent methods as defined for NO_2 in § 50.1 of this chapter. If alternative NO, NO_2 or NO_X monitoring methodologies are proposed, such techniques must be detailed in the network description required by § 58.40 and subsequently approved by the Administrator.

4.3 Methods for meteorological measurements and speciated VOC monitoring are included in the guidance provided in references 2 and 3. If alternative VOC monitoring methodology (including the use of new or innovative technologies), which is not included in the guidance, is proposed, it must be detailed in the network description required by § 58.40 and subsequently approved by the Administrator.

* * * * *

6.0 References

* * * * *

1. Pelton, D. J. Guideline for Particulate Episode Monitoring Methods, GEOMET Technologies, Inc., Rockville, MD. Prepared for U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA Contract No. 68-02-3584. EPA 450/4-83-005. February 1983.

2. Technical Assistance Document For Sampling and Analysis of Ozone Precursors. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/8-91-215. October 1991.

3. Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/4-90-0003. August 1989.

10. The heading of appendix D is revised to read as follows:

Appendix D—Network Design for State and Local Air Monitoring Stations (SLAMS), National Air Monitoring Stations (NAMS), and Photochemical Assessment Monitoring Stations (PAMS)

11. The second sentence of the first paragraph of section 1 of appendix D is revised to read as follows:

1. * * * It also describes criteria for determining the number and location of National Air Monitoring Stations (NAMS) and Photochemical Assessment Monitoring Stations (PAMS). These criteria will also be used by EPA in evaluating the adequacy of the SLAMS/NAMS/PAMS networks. * * *

* * * * *

Sections 4 and 5 of Appendix D [Redesignated as Sections 5 and 6]

12. Section 4 and section 5 of appendix D are redesignated as section 5 and section 6, respectively, and a new section 4 is added to read as follows:

* * * * *

4. Network Design for Photochemical Assessment Monitoring Stations (PAMS)

In order to obtain more comprehensive and representative data on O_3 air pollution, the 1990 Clean Air Act Amendments require enhanced monitoring for ozone (O_3), oxides of nitrogen (NO, NO_2, and NO_X), and monitoring for VOC in O_3 nonattainment areas classified as serious, severe, or extreme. This will be accomplished through the establishment of a network of Photochemical Assessment Monitoring Stations (PAMS).

4.1 *PAMS Data Uses.* Data from the PAMS are intended to satisfy several coincident needs related to attainment of the National Ambient Air Quality Standards (NAAQS), SIP control strategy development and evaluation, corroboration of emissions tracking, preparation of trends appraisals, and exposure assessment.

(a) *NAAQS attainment and control strategy development.* Like SLAMS and NAMS data, PAMS data will be used for monitoring O_3 exceedances and providing input for attainment/nonattainment decisions. In addition, PAMS data will help resolve the roles of transported and locally emitted O_3 precursors in producing an observed exceedance and may be utilized to identify specific sources emitting excessive concentrations of O_3 precursors and potentially contributing to observed exceedances of the O_3 NAAQS. The PAMS data will enhance the characterization of O_3 concentrations and provide critical information on the precursors which cause O_3, therefore extending the database available for future attainment demonstrations. These demonstrations will be based on photochemical grid modeling and other approved analytical methods and will provide a basis for prospective mid-course control strategy corrections. PAMS data will provide information concerning (1) which areas and episodes to model to develop appropriate control strategies; (2) boundary conditions required by the models to produce quantifiable estimates of needed emissions reductions; and (3) the evaluation of the predictive capability of the models used.

(b) *SIP control strategy evaluation.* The PAMS will provide data for SIP control strategy evaluation. Long-term PAMS data will be used to evaluate the effectiveness of these control strategies. Data may be used to evaluate the impact of VOC and NO_X emission reductions on air quality levels for O_3 if data is reviewed following the time period during which control measures were implemented. Speciation of measured VOC data will allow determination of which organic species are most affected by the emissions reductions and assist in developing cost-effective, selective VOC reductions and control strategies. A State or local air pollution control agency can therefore ensure that strategies which are implemented in their particular nonattainment area are those which are best suited for that area and achieve the most effective emissions reductions (and therefore largest impact) at the least cost.

(c) *Emissions tracking.* PAMS data will be used to corroborate the quality of VOC and NO_X emission inventories. Although a perfect mathematical relationship between emission inventories and ambient measurements does not yet exist, a qualitative assessment of the relative contributions of various compounds to the ambient air can be roughly compared to current emission inventory estimates to evaluate the accuracy of the emission inventories. In addition, PAMS data which are gathered year round will allow tracking of VOC and NO_X emission reductions, provide additional information necessary to support Reasonable Further Progress (RFP) calculations, and corroborate emissions trends analyses. While the regulatory assessments of progress will be made in terms of emission inventory estimates, the ambient data can provide independent trends analyses and corroboration of these assessments which either verify or highlight possible errors in emissions trends indicated by inventories. The ambient assessments, using speciated data, can gauge the accuracy of estimated changes in emissions. The speciated data can also be used to assess the quality of the VOC speciated and NO_X emission inventories for input during photochemical grid modeling exercises and identify potential urban air toxic pollutant problems which deserve closer scrutiny.

The speciated VOC data will be used to determine changes in the species profile, resulting from the emission control program, particularly those resulting from the reformulation of fuels.

(d) *Trends.* Long-term PAMS data will be used to establish speciated VOC, NO_X, and limited toxic air pollutant trends, and supplement the O_3 trends database. Multiple statistical indicators will be tracked, including O_3 and its precursors during the events encompassing the days during each year with the highest O_3 concentrations, the seasonal means for these pollutants, and the annual means at representative locations.

The more PAMS that are established in and near nonattainment areas, the more effective the trends data will become. As the spatial distribution and number of O_3 and O_3 precursor monitors improves, trends analyses will be less influenced by instrument or site location anomalies. The requirement that surface meteorological monitoring be established at each PAMS will help maximize the utility of these trends analyses by comparisons with meteorological trends, and transport influences. The meteorological data can also help interpret the ambient air pollution trends by taking meteorological factors into account.

(e) *Exposure assessment.* PAMS data will be used to better characterize O_3 and toxic air pollutant exposure to populations living in serious, severe, or extreme areas. Annual mean toxic air pollutant concentrations will be calculated to help estimate the average risk to the population associated with individual VOC species, which are considered toxic, in urban environments.

4.2 *PAMS Monitoring Objectives.* Unlike the SLAMS and NAMS design criteria which are pollutant specific, PAMS design criteria are site specific. Concurrent measurements of O_3, NO_X, speciated VOC, and meteorology are obtained at PAMS. Design criteria for the PAMS network are based on selection of an array of site locations relative to O_3 precursor source areas and predominant wind directions associated with high O_3 events. Specific monitoring objectives are associated with each location. The overall design should enable characterization of precursor emission sources within the area, transport of O_3 and its precursors into and out of the area, and the photochemical processes related to O_3 nonattainment, as well as developing an initial, though limited, urban air toxic pollutant database. Specific objectives that must be addressed include assessing ambient trends in O_3, NO, NO_2, NO_X, VOC (including carbonyls), and VOC species, determining spatial and diurnal variability of O_3, NO, NO_2, NO_X, and VOC species and assessing changes in the VOC species profiles that occur over time, particularly those occurring due to the reformulation of fuels. A maximum of five PAMS sites are required in an affected nonattainment area depending on the population of the Metropolitan Statistical Area/Consolidated Metropolitan Statistical Area (MSA/CMSA) or nonattainment area, whichever is larger. Specific monitoring objectives associated with each of these sites result in four distinct site types. Note that detailed guidance for the locating of these sites may be found in reference 19.

Type (1) sites are established to characterize upwind background and transported O_3 and its precursor concentrations entering the area and will identify those areas which are subjected to overwhelming transport. Type (1) sites are located in the predominant morning upwind direction from the local area of maximum precursor emissions during the O_3 season and at a distance sufficient to obtain urban scale measurements as defined in section 1 of this appendix. Typically, type (1) sites will be located near the edge of the photochemical grid model domain in the predominant morning upwind direction from the city limits or fringe of the urbanized area. Depending on the boundaries and size of the nonattainment area and the orientation of the grid, this site may be located outside of the nonattainment area. The appropriate predominant morning wind direction should be determined from historical wind data occurring during the period 7 a.m. to 10 a.m. on high O_3 days or on those days which exhibit the potential for producing high O_3 levels, i.e., O_3-conducive days as described in reference 25. Alternate schemes for specifying this morning wind direction may be submitted as a part of the network description required by §§ 58.40 and 58.41. Data measured at type (1) sites will be used principally for the following purposes:

- Future development and evaluation of control strategies,
- Identification of incoming pollutants,
- Corroboration of NO_X and VOC emission inventories,
- Establishment of boundary conditions for future photochemical grid modeling and mid-course control strategy changes, and
- Development of incoming pollutant trends.

Type (2) sites are established to monitor the magnitude and type of precursor emissions in the area where maximum precursor emissions are expected to impact and are suited for the monitoring of urban air toxic pollutants. Type (2) sites are located immediately downwind of the area of maximum precursor emissions and are typically placed near the downwind boundary of the central business district to obtain neighborhood scale measurements. The appropriate downwind direction should be obtained similarly to that for type (1) sites. Additionally, a second type (2) site may be required depending on the size of the area, and should be placed in the second-most predominant morning wind direction as noted previously. Data measured at type (2) sites will be used principally for the following purposes:

- Development and evaluation of imminent and future control strategies,
- Corroboration of NO_X and VOC emission inventories,
- Augmentation of RFP tracking,
- Verification of photochemical grid model performance,
- Characterization of O_3 and toxic air pollutant exposures (appropriate site for measuring toxic emissions impact),
- Development of pollutant trends, particularly toxic air pollutants and annual ambient speciated VOC trends to compare with trends in annual VOC emission estimates, and
- Determination of attainment with the NAAQS for NO_2 and O_3.

Type (3) sites are intended to monitor maximum O_3 concentrations occurring downwind from the area of maximum precursor emissions. Locations for type (3) sites should be chosen so that urban scale measurements are obtained. Typically, type (3) sites will be located 10 to 30 miles downwind from the fringe of the urban area. The downwind direction should also be determined from historical wind data, but should be identified as those afternoon winds occurring during the period 1 p.m. to 4 p.m. on high O_3 days or on those days which exhibit the potential for producing high O_3 levels. Alternate schemes for specifying this afternoon wind direction may also be submitted as a part of the network description required by §§ 58.40 and 58.41. Data measured at type (3) sites will be used principally for the following purposes:

- Determination of attainment with the NAAQS for O_3 (this site may coincide with an existing maximum concentration O_3 monitoring site),
- Evaluation of future photochemical grid modeling applications,
- Future development and evaluation of control strategies,
- Development of pollutant trends, and
- Characterization of O_3 pollutant exposures.

Type (4) sites are established to characterize the extreme downwind transported O_3 and its precursor concentrations exiting the area and will identify those areas which are potentially contributing to overwhelming transport in other areas. Type (4) sites are located in the predominant afternoon downwind direction, as determined for the type (3) site, from the local area of maximum precursor emissions during the O_3 season and at a distance sufficient to obtain urban scale measurements as defined elsewhere in this appendix. Typically, type (4) sites will be located near the downwind edge of the photochemical grid model domain. Alternate schemes for specifying the location of this site may be submitted as a part of the network description required by §§ 58.40 and 58.41. Data measured at type (4) sites will be used principally for the following purposes:

- Development and evaluation of O_3 control strategies,
- Identification of emissions and photochemical products leaving the area,
- Establishment of boundary conditions for photochemical grid modeling,
- Development of pollutant trends,
- Background and upwind information for other downwind areas, and
- Evaluation of photochemical grid model performance.

States choosing to submit an individual network description for each affected nonattainment area, irrespective of its proximity to other affected areas, must fulfill the requirements for isolated areas as described in section 4 of appendix D, as an example, and illustrated by Figure 1. States containing areas which experience significant impact from long-range transport or are proximate to other nonattainment areas (even in other States) should collectively submit a network description which contains alternative sites to those that would be required for an isolated area. Such a submittal should, as a guide, be based on the example provided in Figure 2, but must include a demonstration that the design satisfies the monitoring data uses and fulfills the PAMS monitoring objectives described in sections 4.1 and 4.2 of appendix D. EPA recognizes that specific monitoring sites identified for one area may serve to fulfill the monitoring objectives for a different site in another area; for example, a downwind site for one area may suffice as an upwind site for another. These alternative network designs must also be reviewed and approved by the Administrator.

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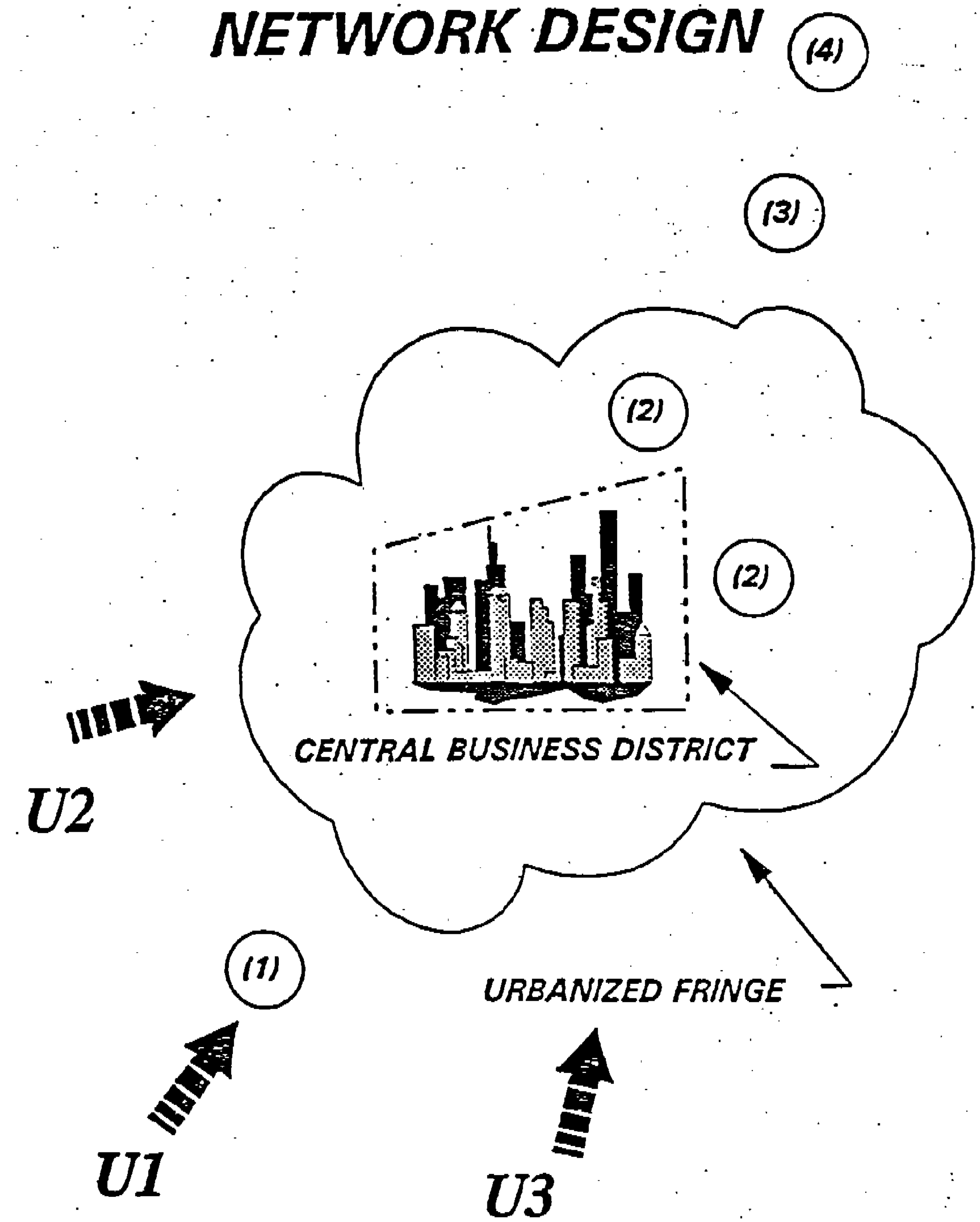
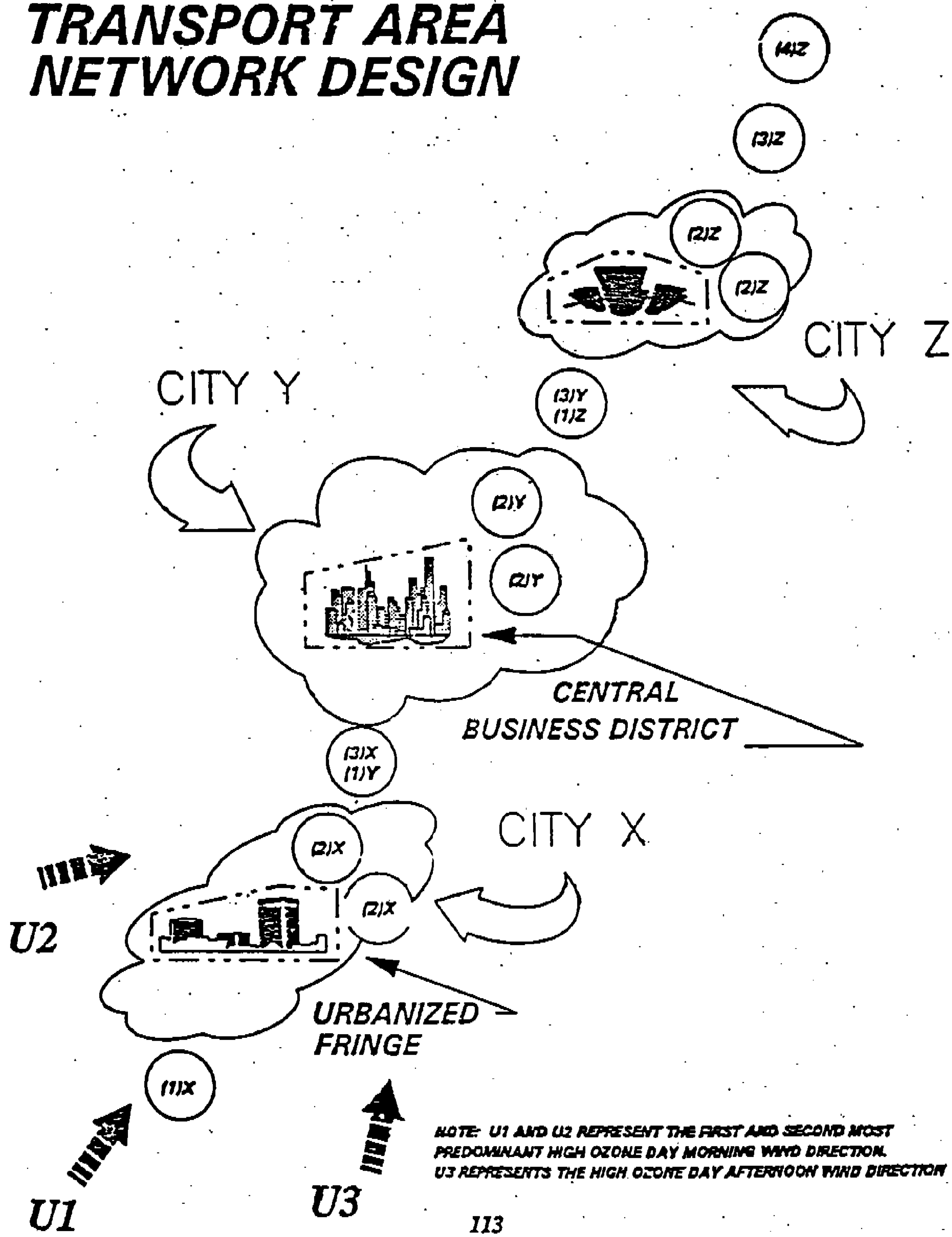
FIGURE 1 - ISOLATED AREA NETWORK DESIGN



NOTE: U1 AND U2 REPRESENT THE FIRST AND SECOND MOST PREDOMINANT HIGH OZONE DAY MORNING WIND DIRECTION.
U3 REPRESENTS THE HIGH OZONE DAY AFTERNOON WIND DIRECTION.

FIGURE 2 - MULTI-AREA AND TRANSPORT AREA NETWORK DESIGN



NOTE: U1 AND U2 REPRESENT THE FIRST AND SECOND MOST PREDOMINANT HIGH OZONE DAY MORNING WIND DIRECTION.
U3 REPRESENTS THE HIGH OZONE DAY AFTERNOON WIND DIRECTION

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Alternative PAMS network designs should, on a site-by-site basis, provide those data necessary to enhance the attainment/nonattainment database for criteria pollutants and explain the origins of overwhelming O_3 transport. The alternative PAMS data should be usable for the corroboration and verification of O_3 precursor emissions inventories and should comprise a qualitative (if not quantitative) measure of the accuracy of RFP calculations. The data should be sufficient to evaluate the effectiveness of the implemented O_3 control strategies and should provide data necessary to establish photochemical grid modeling boundary conditions and necessary inputs including appropriate meteorological parameters, and provide measurements which can serve as model evaluation tools. Further, utilizing its PAMS database (alternative or not), a State should be able to draw conclusions regarding population exposure and conduct trends analyses for both criteria and non-criteria pollutants. Overall, the PAMS network should serve as one of several complementary means, together with modeling and analysis of other data bases (e.g., inventories) and availability of control technology, etc., for States to justify the modification of existing control programs, design new programs, and evaluate future courses of actions for O_3 control.

4.3 *Monitoring Period.* PAMS precursor monitoring will be conducted annually throughout the months of June, July and August (as a minimum) when peak O_3 values are expected in each area; however, precursor monitoring during the entire O_3 season for the area is preferred. Alternate precursor monitoring periods may be submitted for approval as a part of the PAMS network description required by § 58.40. Changes to the PAMS monitoring period must be identified during the annual SLAMS Network Review specified in § 58.20. PAMS O_3 monitors must adhere to the O_3 monitoring season specified in section 2.5 of appendix D. To ensure a degree of national consistency, monitoring for the 1993 season should commence as follows:

One in 3-day sampling—June 3, 1993.
One in 6-day sampling—June 6, 1993.

These monitoring dates will thereby be coincident with the previously-established, intermittent schedule for particulate matter. States initiating sampling earlier (or later) than June 3, 1993 should adjust their schedules to coincide with this national schedule.

4.4 *Minimum Monitoring Network Requirements.* The minimum required number and type of monitoring sites and sampling requirements are based on the population of the affected MSA/CMSA or nonattainment area (whichever is larger). The MSA/CMSA basis for monitoring network requirements was chosen because it typically is the most representative of the area which encompasses the emissions sources contributing to nonattainment. The MSA/CMSA emissions density can also be effectively and conveniently portrayed by the surrogate of population. Additionally, a network which is adequate to characterize the ambient air of an MSA/CMSA often must extend beyond the boundaries of such an area (especially for O_3 and its precursors); therefore, the use of smaller geographical units (such as counties or nonattainment areas which are smaller than the MSA/CMSA) for monitoring network design purposes is inappropriate. Various sampling requirements are imposed according to the size of the area to accommodate the impact of transport on the smaller MSAs/CMSAs, to account for the spatial variations inherent in large areas, to satisfy the differing data needs of large versus small areas due to the intractability of the O_3 nonattainment problem, and to recognize the potential economic impact of implementation on State and local government. Population figures must reflect the most recent decennial U.S. census population report. Specific guidance on determining network requirements is provided in reference 19. Minimum network requirements are outlined in Table 2.

TABLE 2.—PAMS MINIMUM MONITORING NETWORK REQUIREMENTS [1]

Population of MSA/CMSA or nonattainment area [2]	Required site type [3]	Minimum speciated VOC sampling frequency [4]	Minimum carbonyl sampling frequency [4]
Less than 500,000	([illegible])	A or C	
	([illegible])	A or C	D or F [5]
500,000 to 1,000,000	([illegible])	A or C	
	([illegible])	B	E
	([illegible])	A or C	
1,000,000 to 2,000,000	([illegible])	A or C	
	([illegible])	B	E
	([illegible])	B	E
	([illegible])	A or C	
More than 2,000,000	([illegible])	A or C	
	([illegible])	B	E
	([illegible])	B	E
	([illegible])	A or C	
	([illegible])	A or C	

[1] O_3 and NO_x (including NO and NO_2) monitoring should be continuous measurements.

[2] Whichever area is larger.

[3] See Figure 1.

[4] Frequency Requirements are as follows: A—Eight 3-hour samples every third day and one additional 24-hour sample every sixth day during the monitoring period; B—Eight 3-hour samples, every day during the monitoring period and one additional 24-hour sample every sixth day year-round; C—Eight 3-hour samples on the 5 peak O_3 days plus each previous day, eight 3-hour samples every sixth day, and one additional 24-hour sample every sixth day, during the monitoring period; D—Eight 3-hour samples every third day during the monitoring period; E—Eight 3-hour samples every day during the monitoring period; F—Eight 3-hour samples on the 5 peak O_3 days plus each previous day and eight 3-hour samples every sixth day during the monitoring period. (NOTE: multiple samples taken on a daily basis must begin at midnight and consist of sequential, non-overlapping sampling periods.)

[5] Carbonyl sampling frequency must match the chosen speciated VOC frequency.

Note that the use of Frequencies C or F requires the submittal of an ozone event forecasting schema.

For purposes of network implementation and transition, EPA recommends the following priority order for the establishment of sites:

- The type (2) site which provides the most comprehensive data concerning O_3 precursor emissions and toxic air pollutants,
- The type (3) site which provides a maximum O_3 measurement and total conversion of O_3 precursors,
- The type (1) site which delineates the effect of incoming precursor emissions and concentrations of O_3 and provides upwind boundary conditions,
- The type (4) site which provides extreme downwind boundary conditions, and
- The second type (2) site which provides comprehensive data concerning O_3 precursor emissions and toxic air pollutants in the second-most predominant morning wind direction on high O_3 days.

Note also that O_3 event (peak day) monitoring will require the development of a scheme for forecasting such high O_3 days or will necessitate the stipulation of what meteorological conditions constitute a potential high O_3 day; monitoring could then be triggered only via meteorological projections. The O_3 event forecasting and monitoring scheme should be submitted as a part of the network description required by §§ 58.40 and 58.41 and should be reviewed during each annual SLAMS Network Review specified in § 58.20.

4.5 *Transition Period.* A variable period of time is proposed for phasing in the operation of all required PAMS. Within 1 year after (1) February 12, 1993, (2) or date of redesignation or reclassification of any existing O_3 nonattainment area to serious, severe, or extreme, or (3) the designation of a new area and classification to serious, severe, or extreme O_3 nonattainment, a minimum of one type (2) site must be operating. Operation of the remaining sites must, at a minimum, be phased in at the rate of one site per year during subsequent years as outlined in the approved PAMS network description provided by the State.

4.6 *Meteorological Monitoring.* In order to support monitoring objectives associated with the need for various air quality analyses, model inputs and performance evaluations, meteorological monitoring including wind measurements at 10 meters above ground is required at each PAMS site. Monitoring should begin with site establishment. In addition, upper air meteorological monitoring is required for each PAMS area. Upper air monitoring should be initiated as soon as possible, but no later than 2 years after (1) February 12, 1993, (2) or date of redesignation or reclassification of any existing O_3 nonattainment area to serious, severe, or extreme, or (3) the designation of a new area and classification to serious, severe, or extreme O_3 nonattainment. The upper air monitoring site may be located separately from the type (1) through (4) sites, but the location should be representative of the upper air data in the nonattainment area. Upper air meteorological data must be collected during those days specified for monitoring by the sampling frequencies in Table 2, of section 4.4 of this appendix D in accordance with current EPA guidance.

* * * * *

Section 6 of Appendix D [Amended]

13. References 19 through 32 are added to section 6 of appendix D to read as follows:

6. References

* * * * *

19. Enhanced Ozone Monitoring Network Design and Siting Criteria Guideline Document. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 450/4-91-033. November 1991.

20. Technical Assistance Document For Sampling and Analysis of Ozone Precursors. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/8-91-215. October 1991.

21. Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/4-90-0003. August 1989.

22. Criteria for Assessing the Role of Transported Ozone/Precursors in Ozone Non-attainment Areas. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA-450/4-91-015. May 1991.

23. Guideline for Regulatory Application of the Urban Airshed Model. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA-450/4-91-013. July 1991.

24. Ambient Air Monitoring Data Quality Objectives (DQOs) for the Photochemical Assessment Monitoring Stations (PAMS) Program. Guideline Document. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. Draft Report. July 1992.

25. Shao-Hung Chu, "Using Windrose Data to Site Monitors of Ozone and Its Precursors", Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. Draft Report. June 1992.

26. Lewis, Charles W., and Teri L. Conner, "Source Reconciliation of Ambient Volatile Organic Compounds Measured in the Atlanta 1990 Summer Study: The Mobile Source Component", Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. September 1991.

27. Fujita, Eric M., Bart E. Croes, Charles L. Bennett, Douglas R. Lawson, Frederick W. Lurmann, and Hilary H. Main, "Comparison of Emission Inventory and Ambient Concentration Ratios of CO, NMOG, and NO_x in California's South Coast Air Basin", J. Air and Waste Management Association 42:264-276. March 1992.

28. Nelson, P. F., S. M. Quigley and M. Y. Smith, "Sources of Atmospheric Hydrocarbons in Sydney: A quantitative Determination Using a Source Reconciliation Technique", Atmospheric Environment Vol 17, No. 3. 1983.

29. Mayrsohn, H. and J. H. Crabtree, "Source Reconciliation of Atmospheric Hydrocarbons", Atmospheric Environment Vol 10. 1976.

30. Mayrsohn, Henry, James H. Crabtree, Mutsuo Kuramoto, Ray D. Sothern, and Henry Mano, "Source Reconciliation of Atmospheric Hydrocarbons 1974", Atmospheric Environment Vol 11. 1977.

31. Analysis of the Ambient VOC Data Collected in the Southern California Air Quality Study, State of California Air Resources Board—Research Division, 1800 15th Street, Sacramento, CA 95814, Final Report, Contract No. A832-130. February, 1992.

32. Purdue, Larry J., "Summer 1990 Atlanta Ozone Precursor Study", presented at the 84th Annual Meeting and Exhibition of the Air and Waste Management Association, Vancouver, British Columbia, Canada. June 1991.

14. Appendix E is amended by adding a new paragraph after the first paragraph in section 9, redesignating sections 10, 11, and 12 as sections 11, 12, and 13, and adding a new section 10, redesignating Table 5 as Table 6 in newly redesignated section 12, and adding a new Table 5 in new section 10, amending the last sentence in newly redesignated section 11 to add reference to PAMS, and amending newly redesignated section 12 by adding an entry to the bottom of Table 6 for VOC to read as follows:

Appendix E—Probe Siting Criteria for Ambient Air Quality Monitoring

* * * * *

9. * * *

For VOC monitoring at those SLAMS designated as PAMS, FEP teflon is unacceptable as the probe material because of VOC adsorption and desorption reactions on the FEP teflon. Borosilicate glass, stainless steel, or its equivalent are the acceptable probe materials for VOC and carbonyl sampling. Care must be taken to ensure that the sample residence time is 20 seconds or less.

* * * * *

10. Photochemical Assessment Monitoring Stations (PAMS)

10.1 *Horizontal and Vertical Probe Placement.* The height of the probe inlet must be located 3 to 15 meters above ground level. This range provides a practical compromise for finding suitable sites for the multipollutant PAMS. The probe inlet must also be located more than 1 meter vertically or horizontally away from any supporting structure.

10.2 *Spacing from Obstructions.* The probe must be located away from obstacles and buildings such that the distance between the obstacles and the probe inlet is at least twice the height that the obstacle protrudes above the sampler. There must be unrestricted airflow in an arc of at least 270° around the probe inlet. Additionally, the predominant wind direction for the period of greatest pollutant concentration (as described for each site in section 4.2 of appendix D) must be included in the 270° arc. If the probe is located on the side of the building, 180° clearance is required.

10.3 *Spacing from Roads.* It is important in the probe siting process to minimize destructive interferences from sources of nitrogen oxide (NO) since NO readily reacts with O_3. Table 5 below provides the required minimum separation distances between roadways and PAMS (excluding upper air measuring stations):

TABLE 5.—SEPARATION DISTANCE BETWEEN PAMS AND ROADWAYS

[Edge of Nearest Traffic Lane]

Roadway average daily traffic vehicles per day	Minimum separation distance between roadways and stations in meters[1]
<10,000	>10
15,000	20
20,000	30
40,000	50
70,000	100
>110,000	>250

[1] Distances should be interpolated based on traffic flow.

Type (1), (3) and (4) sites are intended to be regionally representative and should not be unduly influenced by nearby roadways. Similarly, a nearby roadway should not act as a local depressor of O_3 concentrations for type (2) and (3) sites.

10.4 *Spacing from Trees.* Trees can provide surfaces for adsorption and/or reactions to occur and can obstruct normal wind flow patterns. To minimize these effects at PAMS, the probe inlet should be placed at least 20 meters from the drip line of trees. Since the scavenging effect of trees is greater for O_3 than for the other criteria pollutants, strong consideration of this effect must be given in locating the PAMS probe inlet to avoid this problem. Therefore, the samplers must be at least 10 meters from the drip line of trees that are located between the urban city core area and the sampler along the appropriate wind direction.

10.5 *Meteorological Measurements.* The 10-meter meteorological tower at each PAMS site should be located so that measurements can be obtained that are not immediately influenced by surrounding structures and trees. It is important that the meteorological data reflect the origins of, and the conditions within, the air mass containing the pollutants collected at the probe. Specific guidance on siting of meteorological towers is provided in references 31 and 32.

11. Waiver Provisions

* * * * *

For those SLAMS also designated as NAMS or PAMS, the request will be forwarded to the Administrator.

12. Discussion and Summary

* * * * *

TABLE 6.—SUMMARY OF PROBE SITING CRITERIA

Pollutant scale	Height above ground, meters	Distance from supporting structure, meters		Other spacing criteria
		Vertical	Horizontal[a]	
*	*	*	*	*
VOC	3–15	>1	>1	1. Should be >20 meters from the dripline and must be 10 meters from the dripline when the tree(s) act as an obstruction. 2. Distance from probe inlet to obstacle must be at least twice the height the obstacle protrudes above the inlet probe. 3. Must have unrestricted air flow in an arc of at least 270° around the probe inlet and the predominant wind direction for the period of greatest pollutant concentration (as described for each site in section 4.2 of appendix D) must be included in the 270° arc. If probe located on the side of a building unrestricted air flow must be 180°. 4. Spacing from roadways (see Table 5).

[a] When probe is located on rooftop, this separation distance is in reference to walls, parapets, or penthouses located on the roof.

* * * * *

Section 13 of Appendix E [Amended]

15. References 31, 32, and 33 are added to section 13 of appendix E to read as follows:

13. References

* * * * *

31. Technical Assistance Document For Sampling and Analysis of Ozone Precursors. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/8–91–215. October 1991.

32. Quality Assurance Handbook for Air Pollution Measurement Systems: Volume IV. Meteorological Measurements. Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 600/4–90–0003. August 1989.

33. On-Site Meteorological Program Guidance for Regulatory Modeling Applications. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711. EPA 450/4–87–013. June 1987.

[FR Doc. 93–3072 Filed 2–11–93; 8:45 am]

BILLING CODE 6560-50-P

APPENDIX B

METEOROLOGICALLY ADJUSTED OZONE TRENDS IN URBAN AREAS

Meteorologically Adjusted Ozone Trends in Urban Areas: A Probabilistic Approach

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ABSTRACT

A method has been developed that explicitly accounts for the effect of meteorological fluctuations on the annual distribution of ground level ozone in urban areas. The model includes a trend component that adjusts the annual rate of change in ozone for concurrent impacts of meteorological conditions, including surface temperature and wind speed. The model was applied using available data from 25 eastern U.S. urban areas where ozone levels frequently exceed the National Ambient Air Quality Standard. The results suggest that the meteorologically adjusted 99th percentile of ozone is decreasing in most urban areas over the period from 1981 through 1990. The median rate of change was -1.1 percent per year, indicating that ozone levels have decreased approximately 10 percent over this time period. Trends estimated by ignoring the meteorological component appear to underestimate the rate of improvement in ozone primarily because of the uneven year-to-year distribution of meteorological conditions favorable to ozone.

INTRODUCTION

Meteorological conditions, including daily temperature and wind speed, are known[1-3] to play an important role in determining the severity of ground-level ozone concentrations. Because annual variations in meteorological conditions can be substantial, year-to-year fluctuations in annual ozone statistics can also be quite large. The effect of such variations is to mask any long-term trends[4-6] in ozone that might reasonably be related to changes in precursor emissions (VOC, NO_x).

A method has been developed that explicitly accounts for the effect of yearly meteorological fluctuations on the annual frequency distribution of ground-level ozone levels. The method is based on a probability model in which the frequency distribution of ozone is described in terms of daily meteorological parameters and a trend component. The parameters are estimated using the method of maximum likelihood in which measured daily maximum ozone levels are quantitatively related to daily maximum temperature and other daily weather conditions.

The method has been applied to data collected in 25 urban areas in the eastern portion of the U. S. Trends in ozone concentrations over the 10-year period from 1981-1990 are estimated for each city. In addition, the model has been used to calculate expected annual ozone air quality statistics estimated using annual meteorological data that have been adjusted to a reference period. The bootstrap method is used to determine standard errors associated with the parameter estimates and to calculate confidence limits for the annual adjusted ozone concentrations statistics.

DATA BASE

Hourly average concentrations of ozone were obtained from EPA's AIRS data base for all available monitoring stations within each of the 25 Metropolitan Statistical Areas (MSA) where ozone levels have been historically high. The data were selected for the time period 1981 through 1990 and include the months during which daily maximum ozone levels were likely to be near or above EPA's National Air Quality Standard (120 ppb). Typically these months spanned from June through September in more northerly areas (e.g., Chicago, New York, Boston) and from April through October in more southerly areas (e.g., Houston and Miami). For each day, the maximum hourly average ozone value was selected from all available station-hours.

The meteorological data base was assembled from hourly average data obtained from the National Weather Service. Both surface and upper air data were used to create approximately 100 daily meteorological parameters[7] that might be potentially important predictors of daily ozone levels. These parameters encompass many of those that have been previously identified with high ozone levels such as daily maximum surface temperature, relative humidity, mixing height, and cloud cover. Daily maximum ozone values for each urban area were paired with corresponding meteorological data at the nearest surface and upper air station.

The data were screened using graphical and regression methods to determine which meteorological parameters seemed to be most strongly associated with day-to-day fluctuations in daily maximum 1-hour ozone. Generally, it was found that 6 meteorological parameters explained most of the variability in daily ozone concentrations. These 6 variables were (1) daily maximum surface temperature (positive association), (2) morning average wind speed (negative), (3) afternoon average wind speed (negative), (4) relative humidity (negative), (5) opaque cloud cover (negative) and, (6) morning mixing height (negative).

Figure 1 shows box plots of the annual distributions for each of the 6 meteorological parameters in the Chicago urban area. Median and upper percentiles of daily maximum temperatures were higher in 1983 and 1988 than for any of the other years. Since temperature shows a strong positive association with ozone, ozone levels in these 2 years would be expected to be higher. Also, relative humidity and cloud cover for 1988 was significantly lower than for any other year during the 10 year span. Since relative humidity and cloud cover are generally negatively related to ozone, ozone levels in 1988 would be expected to be higher as a result. Although wind speeds and mixing height are important predictors of day-to-day changes in ozone, the annual distribution of wind speeds and mixing height across the 10 year period is relatively flat. Thus, annual variations in these 3 parameters appear to be less important in terms of accounting for year-to-year changes in ozone levels in Chicago.

While a qualitative link was evident between meteorology and daily ozone, a more quantitative association is desirable. Such a quantitative link is established by modeling the probability distribution of daily maximum ozone levels as a function of daily meteorological parameters.

PROBABILISTIC MODELING

A probability model is proposed that incorporates the effects of daily meteorological conditions on the probability distribution of ozone concentration levels. The probability model is based on the Weibull distribution in which the scale parameter is allowed to vary from day to day in response to changes in meteorological conditions favorable to ozone. With this model structure, annual ozone statistics may be computed by simply combining daily ozone distributions fitted from the model. Thus, it is possible to quantitatively explain how shifts in the annual distribution of say, temperature, affect the annual distribution of ozone. Conversely, the distribution of ozone under more typical conditions may be predicted simply by substituting meteorological conditions into the model and recomputing the distribution of ozone. The basic form of the probability model is:

$$Prob\,[y > Y]_i = Exp\,\{-(\frac{Y}{\sigma_i})^{\lambda}\} \qquad (1)$$

where
Prob = Probability that daily ozone exceeds Y
σ_i = Scale Parameter for day i
λ = Shape Parameter

The scale parameter for any given day is allowed to vary as a function of the meteorological conditions in the following manner:

$$\sigma_i = Exp\,\{\sum \beta_j * M_{ij} + \xi * T\} \qquad (2)$$

where
β_j = Regression coefficient for parameter j
M_{ij} = Meteorological parameter j on day i
ξ = Annual Trend Rate
T = Year (T=1,2,...10)

This model is designed to account for the effects of daily variations in meteorological conditions and slowly changing trends that may take place over a number of years. The advantage is that meteorological and trend effects are estimated simultaneously to avoid potential confounding between the 2 types of effects. The model was applied using the data base assembled for the Chicago MSA. Maximum Likelihood Estimates of the parameters were obtained from code prepared using the SAS Interactive Matrix Language[4] (IML). Results shown in Table 1 include the parameter estimates, standard errors and t ratio. The 6 meteorological parameters represent the most significant predictors of ozone over the geographic region containing the 25 urban areas used in this analysis. The interaction term formed between temperature and morning average wind speed was included to account for the combined effects of these parameters. The trend component was positive and marginally significant (t=2.2).

Because the scale parameter is expressed exponentially, the parameter estimates represent a fractional change per unit change in the independent variable. For example, the afternoon wind speed coefficient is -0.021 which means that each 1 meter per second increase in afternoon wind speed produces a 2.1 percent decrease in the scale parameter. The linear trend parameter was estimated at 0.0074 which means that on average, ozone is estimated to be increasing at slightly less than 1 percent per year over the ten-year period.

To assess the validity of the model, the measured- and model-predicted 95th and 99th percentiles of daily maximum ozone levels were compared for each of the 10 years. Predicted values were obtained by substituting parameter estimates and solving for the value of Y such that the sum of the probabilities given in equation (1) is equal to the product N*P, where N is the number of ozone measurements in a year and P is the percentile expressed as a fraction. For 95th percentiles, the model fits the observed data fairly well for each of the

10 years. For 99th percentiles, the predicted values were underestimated (approximately 10 percent) in 1988 and slightly overestimated (approximately 5 percent) in 1989 and 1990.

ADJUSTED OZONE STATISTICS

While the meteorologically adjusted annual trend rate is estimated at approximately +0.7 percent per year, it is visually more appealing to display the meteorologically adjusted ozone percentiles for each of the years. Meteorologically adjusted ozone percentiles are computed by using typical meteorological data in place of the actual meteorological conditions for each year. For convenience, a reference meteorological period is defined in terms of meteorological conditions that occur over at least a 10 year period. The reference period is characterized in terms of averages and standard deviations of meteorological parameters that are found to be important ozone predictors. For example, the mean relative humidity for the reference period is computed as the mean of the daily relative humidities across the 10 year period from 1981 through 1990. Similarly, the standard deviation for the reference period is computed as the average of the 10 yearly standard deviations of daily relative humidity.

The method used to adjust the meteorological data involves translation of meteorological parameters such that each parameter has the same mean and standard deviation as the reference period. Effectively, data values within each year are scaled such that they become centered over the distribution of meteorological parameters corresponding to the reference period. Notationally, the calculation of scaled meteorological data is as follows:

$$Y = Mr + (Xb - Mb)*(Sr/Sb).$$

where

Mb	=	Mean value for the given period
Sb	=	Standard deviation for the given period
Mr	=	Mean value for the reference period
Sr	=	Standard deviation for the reference period
Xb	=	Daily meteorological parameters for the given year
Y	=	Scaled meteorological parameters for the given year

As before, model-predicted values of ozone are obtained by substituting parameter estimates and solving for the value of Y such that the sum of the probabilities given in equation (1) is equal to the product N*P, where N is the number of ozone measurements in a year and P is the percentile expressed as a fraction. The meteorology used in this calculation is the scaled meteorology such that it has the same mean and standard deviation as the reference period.

Figure 2 shows the result of this adjustment for Chicago along with the original 99th percentiles. The adjusted result for any given year may be interpreted as the expected value for the ozone statistic if the distribution of meteorology in that year had resembled the long term (10-year) average. Overall, the year-to-year changes in the adjusted 99th percentiles are much less abrupt and convey a smoother sense of trends over the 10 year period. Upper and lower 95 percent confidence bounds on the 99th percentile were obtained using the bootstrap technique which is described below.

BOOTSTRAP ESTIMATE OF ERRORS

One of the important assumptions associated with maximum likelihood estimation is that the individual observations (days) are independent. Because of meteorological persistence, this is usually not the case. The effect of non-independence among the daily values is to bias the estimate of standard errors associated with the parameter estimates. Because of the positive association among daily values, the effect is to cause the asymptotic standard errors to be underestimated. A more realistic estimate of the standard error of the parameters can be obtained using a resampling scheme such as the Bootstrap or Jackknife[9,10]. Because of its simplicity, the blocked bootstrap is used as the procedure to estimate the sampling errors. The sampling strategy involved first partitioning the days into consecutive 3-day blocks. This was done to preserve the dependence that usually exists among meteorological conditions and, of course, resulting ozone levels.

Next, annual bootstrap samples were chosen by randomly selecting (with replacement) data in 3-day blocks until a complete annual (ozone season) sample had been formed. For each annual sample (ozone and accompanying meteorological data) the parameter estimates were obtained along with the adjusted meteorological data and adjusted ozone statistics. This step was repeated until 100 annual samples had been constructed. The standard errors of parameter estimates (Table 1 and Table 2) were computed as simply the standard deviation of the bootstrap estimates of the parameters. Typically, the bootstrap estimates of the standard error were 30 to 40 percent larger than the asymptotic results.

URBAN AREA RESULTS

The model was applied using data for 25 urban areas (Table 2) located throughout the eastern portion of the U.S. The same 6 meteorological parameters, including wind speed and temperature interaction, were included in the model. Model performance showed some variation among the urban areas. Model performance is typically good in all areas except for southern coastal cities including Miami, Tampa, and Jacksonville, Florida. For these areas, source/receptor alignment and meso-scale meteorological effects (land/sea breezes) not accounted for may be related to poorer model performance.

Table 2 shows the estimated trend parameter along with the bootstrap adjusted standard error and t ratio. The urban areas are sorted such that cities at the top of the list show the most marked improvements while cities near the bottom of the list show the least improvements over time. The t ratio statistic provides a measure of the significance of the trend rate. Absolute values of the t ratio greater than 2.0 indicate significance at approximately the 95 percent level.

Three of the urban areas displayed improvements that exceeded 2 percent per year (Houston, Louisville, and Dallas) while another 10 urban areas had rates of improvement better than 1 percent per year. Several cities listed near the bottom of the list actually showed slight increases in ozone over the 10-year period. The median rate of change among the 25 urban areas indicates a 1.1 percent per year decrease in ozone which is equivalent to an improvement of approximately 10 percent over the 10-year period.

For comparison purposes, ozone trends in the 25 urban areas were recomputed using the Weibull probability model with only the linear trend component included in the scale parameter. The purpose for this calculation was to contrast the difference between estimated trend rates with and without consideration of annual meteorological fluctuations. For 21 of the 25 urban areas, the adjusted trend rate was lower than the unadjusted rate. The median rate of change for the unadjusted trends was a 0.5 percent decrease per year indicating that improvements after adjustment are substantially greater than before adjustment. Clearly, the adjusted ozone trends provide an indication that national efforts to reduce the severity of the urban ozone problem have been more productive than would otherwise be suggested from the data.

CONCLUSIONS

A statistical model has been developed for describing day-to-day changes in the probability distribution of ground level ozone as a function of meteorological conditions. The model includes a long-term trend component such that meteorological effects are accounted for directly in the estimation procedure. The model was applied to data available from 25 urban areas for the summer period covering 1981 through 1990. The performance of the model was evaluated by comparing measured- and model-predicted 95th and 99th percentiles. Overall, the measured- and model-predicted percentiles tracked closely in the northern latitudes but performed less well in southern coastal areas where meso-scale meteorological conditions are suspected to dominate.

Generally, the adjusted 99th percentiles have considerably less year-to-year variability than do the unadjusted 99th percentiles. The median rate of change in daily maximum 1-hour ozone levels among the 25 Eastern U.S. urban areas reflected a 1.1 percent per year decrease over the period from 1981 through 1990. Since annual changes in meteorological conditions are directly considered, the method produces adjusted trend rates that are less influenced by meteorology than those produced without consideration of meteorological fluctuations.

REFERENCES

1. S. M. Bruntz, W. S. Cleveland, T. E. Graedel, B. Kleiner and J. L. Warner, "Ozone Concentrations in New Jersey and New York: Statistical Association with Related Variables," Science, 186 (1974).

2. B. Lamb, A Guenther, D. Gay and H Westberg, "A National Inventory of Biogenic Hydrocarbon Emissions," Atmospheric Environment, 21 (1987).

3. V. Pagnotti, "Seasonal Ozone Levels and Control by Seasonal Meteorology," J. Air Waste Management Association, 40 (1990).

4. U.S. EPA, National Air Quality and Emission Trends Report, 1989 EPA-450/4-91-003, U.S. Environmental Protection Agency, Research Triangle Park, NC, 1990.

5. T. E. Stoeckenius and A. B. Hudischewskyj, Adjustment of Ozone Trends for Meteorological Variation, SYSAPP-90/008, Systems Applications, Inc., San Rafael, CA, 1990.

6. P. G. Wakim, "1981 to 1988 Ozone Trends Adjusted to Meteorological Conditions for 13 Metropolitan Areas," 83rd AWMA Annual Meeting and Exhibition, June 1990, Paper #90-97.9.

7. W. M. Cox, and S. Chu, "Using Meteorological/Ozone Relationships to Establish an Index of Potential Ozone Severity," 84th AWMA Annual Meeting and Exhibition, June 1991, Paper #91-119.14

8. SAS Institute Inc., SAS/IML Software: Usage and Reference, Version 6, First Edition, Cary, NC: SAS Institute Inc., 1989.

9. B. Efron, The Jackknife, the Bootstrap and other Resampling Plans, Society for Industrial and Applied Mathematics, Philadelphia, PA, 1982

10. J. W. Tukey, Kinds of Bootstraps and Kinds of Jackknives Discussed in Terms of a Year of Weather-related Data, Technical Report No. 292, Dept of Statistics, Princeton University, 1987.

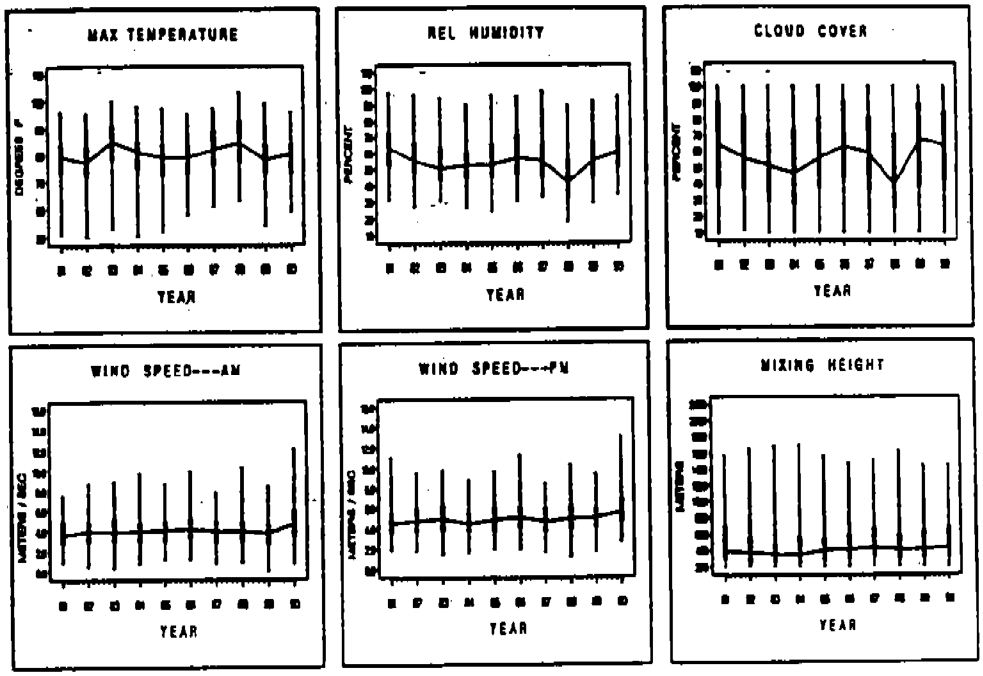

FIGURE 1. Chicago Meteorological Data

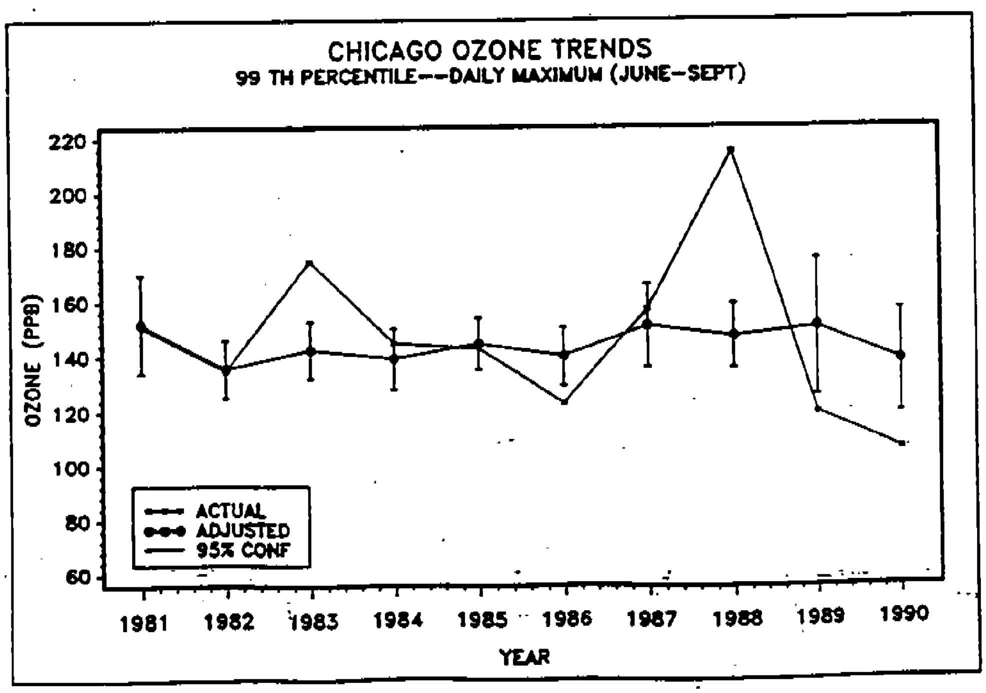

FIGURE 2. Ozone Trend Statistics with 95% Confidence Limits

TABLE 1

Parameter Estimates and Standard Errors (Chicago)

Variables	Parameter Estimates	Standard Errors	T Ratio
Lambda	4.3800	0.1780	24.6
Constant	1.2126	0.2000	6.1
Maximum Sfc Temperature	0.0433	0.0023	18.8
Wind Speed (7-10 AM)	0.2513	0.0468	5.9
Temp X Wind Speed (AM)	-0.0038	0.0006	-6.8
Wind Speed (1-4 PM)	-0.0213	0.0070	-3.0
Relative Humidity (10-4PM)	-0.0010	0.0011	-0.9
Opaque Cloud Cover	-0.0004	0.0003	-1.3
Mixing Height (AM)	-0.00009	0.00005	-1.8
Year	0.0074	0.0034	2.2

Note: Standard Errors are based on 100 bootstrap replications. They are approximaely 30 to 40 percent larger than asymptotic results.

TABLE 2

OZONE TRENDS ADJUSTED FOR METEOROLOGY EASTERN U.S URBAN AREAS--1981 THROUGH 1990

	TREND RATE (PERCENT/YEAR)	STANDARD ERROR	T-RATIO
HOUSTON	-2.8	0.43	-6.5
LOUISVILLE	-2.6	0.57	-4.6
DALLAS	-2.3	0.29	-7.9
NEW YORK	-1.9	0.39	-4.9
PITTSBURGH	-1.7	0.32	-5.3
ST LOUIS	-1.6	0.27	-5.9
TAMPA	-1.5	0.32	-4.7
BIRMINGHAM	-1.4	0.28	-5.0
CLEVELAND	-1.3	0.37	-3.5
DETROIT	-1.3	0.31	-4.1
CINCINNATI	-1.2	0.45	-2.7
PHILADELPHIA	-1.0	0.31	-3.9
BALTIMORE	-1.1	0.34	-3.2
MILWAUKEE	-0.7	0.40	-1.8
KANSAS CITY	-0.7	0.39	-1.8
WASHINGTON	-0.4	0.37	-1.1
BATON ROUGE	-0.4	0.38	-1.1
CHARLOTTE	-0.4	0.21	-1.9
BOSTON	-0.2	0.38	-0.5
TULSA	-0.1	0.23	-0.4
COLUMBIA	0.2	0.24	0.8
JACKSONVILLE	0.6	0.38	1.6
MIAMI	0.6	0.44	1.4
CHICAGO	0.7	0.34	2.1
ATLANTA	0.8	0.26	3.1

Note: Dark lines separate cities with downward trends (top) no change (middle) or upward trends (bottom)

APPENDIX C

GUIDELINE FOR THE INTERPRETATION OF OZONE AIR QUALITY STANDARDS

United States Environmental Protection Agency

Office of Air Quality Planning and Standards Research Triangle Park NC 27711

EPA-450/4-79-003
OAQPS No. 1.2-108
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Guideline Series

Guideline for the Interpretation of Ozone Air Quality Standards

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Monitoring and Data Analysis Division

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Office of Air, Noise, and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

January 1979

OAQPS GUIDELINE SERIES

The guideline series of reports is being issued by the Office of Air Quality Planning and Standards (OAQPS) to provide information to state and local air pollution control agencies, for example, to provide guidance on the acquisition and processing of air quality data and on the planning and analysis requisite for the maintenance of air quality. Reports published in this series will be available - as supplies permit - from the Library Services Office (MD-35), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711; or, for a nominal fee, from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

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