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DEVELOPMENT OF A TRIAL AIR QUALITY MAINTENANCE PLAN FOR THE ST. LOUIS AQMSA

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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DEVELOPMENT OF A TRIAL AIR QUALITY MAINTENANCE PLAN FOR THE ST. LOUIS AQMSA

by

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CONTRACTOR DISCLAIMER

This report was prepared as a trial to test the applicability of administrative and technical guidance given in the EPA Guidelines for the Preparation of Air Quality Maintenance Plans. The study was prepared prior to the release of these guidelines and therefore may not reflect the opinions or policies as stated in the final form of the guidelines or 40 CFR 51.

Because this was a demonstration exercise, rather than an official plan and time and resources were restricted, it was necessary to make certain compromises in data collection, analysis, and plan preparation. In using this report, the reader is cautioned that some numerical results need refinement before using for policy or control measure justification. The States of Illinois and Missouri are in the process of updating and upgrading their data bases and analyses to provide supporting data for an official air quality maintenance plan. In addition, the RAPS program is expected to provide the most accurate representation of air quality in the St. Louis area. Therefore, specific numerical results presented herein may differ from data included in the official State plans.

ACKNOWLEDGEMENTS

Many individuals and organizations actively participated in the preparation of this study effort. Their assistance is gratefully acknowledged.

Project direction and guidance were provided by Mr. Tom Donaldson of the EPA Standards Implementation Branch, and Mr. Dewayne Durst, EPA Region VII, Kansas City.

The following is a list of agencies who provided information and guidance during the preparation of the trial plan:

Federal

EPA Region VII, Region V
Interagency Task Force on Air Quality Maintenance

State Agencies

Missouri Department of Natural Resources
Missouri Air Conservation Commission
Missouri Department of Highways
Illinois Environmental Protection Agency

Regional Agencies

East-West Gateway Coordinating Council
Southwest Illinois Metropolitan Area Planning Commission
Bi-State Development Agency

Local Agencies

St. Louis County Air Pollution Control
St. Louis City of Air Pollution Control
St. Charles County Planning Commission
St. Louis City Planning Commission
Franklin County Planning Commission
St. Louis County Planning Commission

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I. EXECUTIVE SUMMARY

This report summarizes the results of a 20-week project to develop a Trial Air Quality Maintenance Plan (AQMP) for the St. Louis Air Quality Maintenance Area (AQMA). Similar studies were prepared for Baltimore, Denver, and San Diego. The primary objectives of this study were to:

- Prepare a Trial Air Quality Maintenance Plan for the St. Louis Interstate AQMA.

- Critique the EPA Guidelines for the Preparation of Air Quality Maintenance Plans

St. Louis was selected for study as an example of an interstate Air Quality Maintenance Area (AQMA). The states of Missouri and Illinois designated the seven counties and St. Louis City which comprise the Standard Metropolitan Statistical Area (SMSA) as an AQMA. The concentration of diverse industrial process sources, transportation, and commercial activity along the river channels provides the potential for particulates (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), and photochemical oxidants (O_x) air quality attainment and maintenance problems.

The trial AQMP was developed as follows:

- Perform a detailed analysis of existing and projected emissions and air quality

- Select and evaluate a Maintenance Strategy

- Determine the intergovernmental cooperation and coordination necessary to implement the AQMP

ANALYSIS

A detailed analysis of TSP, SO_2, CO, and oxidants was performed to confirm the conclusions of the initial designation and to provide data to determine the most effective air quality maintenance strategy for each pollutant. The analysis included a review of existing air quality, calculation of baseline and projected emissions for 1975, 1980, and 1985, and calculation of projected air quality for 1975, 1980, and 1985. The significant findings from each of these analyses are summarized in Figures I-1 and I-2 and are as follows for the four pollutants evaluated:

- Existing Air Quality
  - TSP air quality in 1971 and 1972 exceeds the standards at several of the eleven monitoring stations in the AQMA. The majority of sites in Missouri record concentrations at or below the primary standard. However, stations are identified in St. Louis City, St. Louis County, and the East St. Louis area where concentrations are 50 to 75 percent over the primary standards. These sites appear to be influenced by major point sources or clusters of sources in the immediate vicinity.
  - SO_2 air quality in Missouri is currently at or better than the annual standards. However, Illinois reports several site concentrations exceeding the primary standards for 24-hour measurements. These sites appear to be influenced by major point sources.
  - CO values for 8-hour periods were recorded in 1972 that were almost twice the 8-hour standard. Urban "hotspots" associated with mobile sources have been identified.
  - Oxidant concentrations also exceed the standards and appear to be increasing
- Emissions Projections
  - TSP areawide total emissions are projected to increase through 1985. Major increases are attributable to point sources and are expected to occur in the vicinity of existing "hotspots."

FIGURE I-1
ST. LOUIS AQMA
EMISSIONS PROJECTIONS (Tons/Year X 10^3)

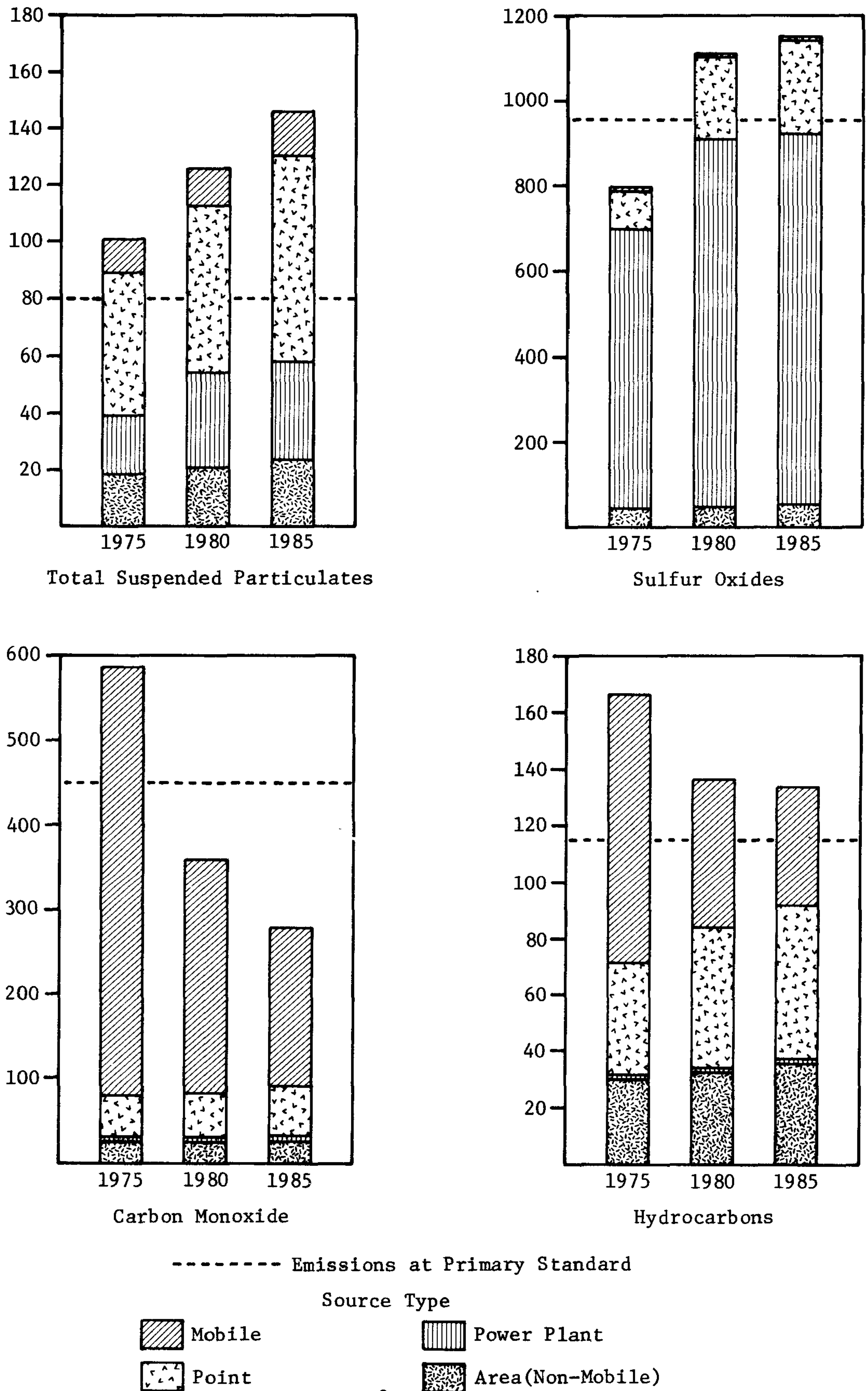
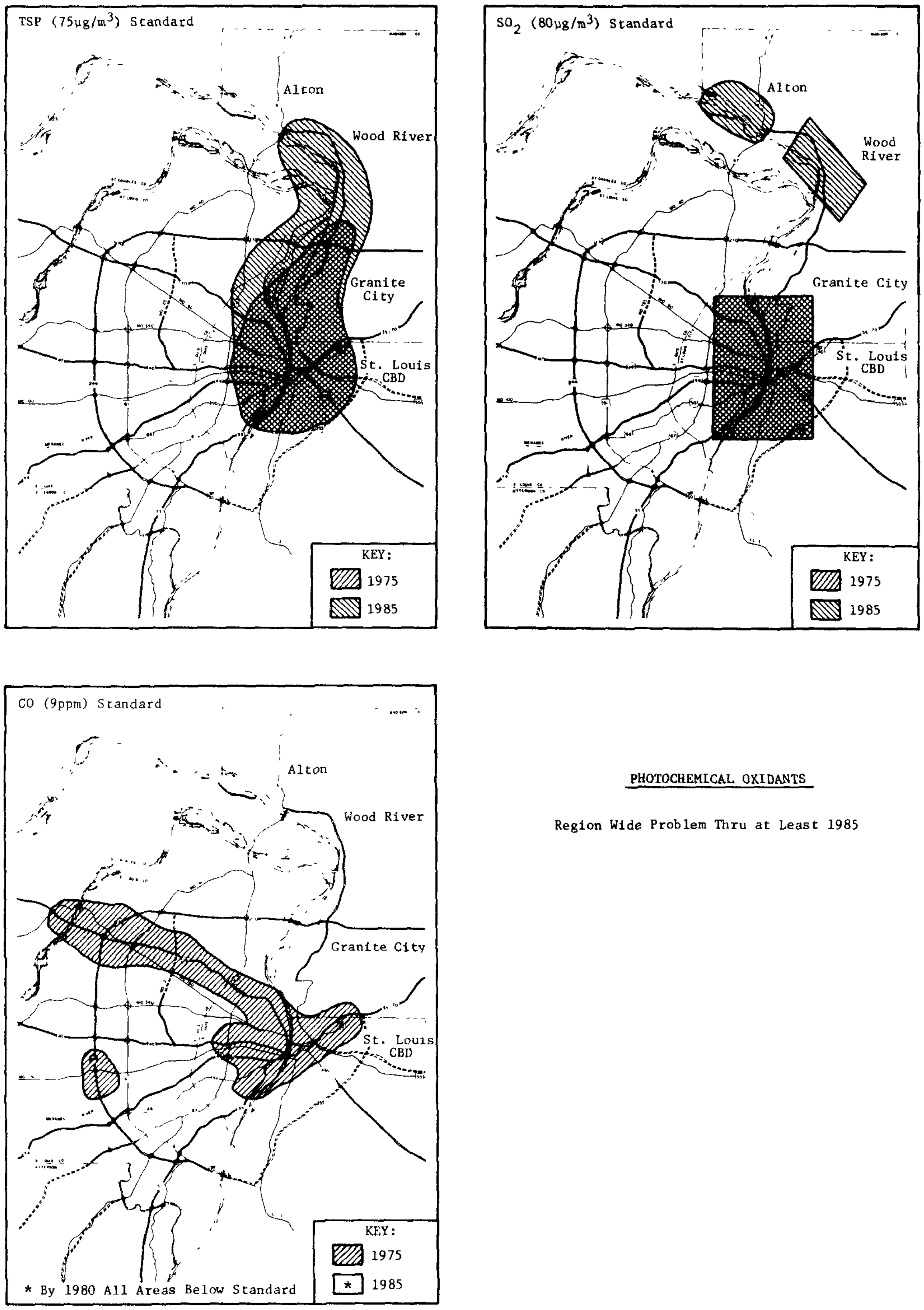


FIGURE I-2

AREAS PROJECTED TO EXCEED TSP, SO_2, CO AND OXIDANT STANDARD IN 1975 AND 1985 IN THE ST. LOUIS AQMA



- SO_2 emissions projections reflect significant increases in power plant capacity projected to occur through 1985.

- CO areawide totals decrease sharply and continuously through 1985 due to the impact of the Federal Motor Vehicle Control Program (FMVCP).

- Total HC projected emissions reveal an overall decrease through 1985. Point and area source emissions increase gradually, while mobile source emissions decrease significantly.

- Air Quality Projections

  - TSP projected concentration distribution pattern shows "hot-spots" continuing to exceed the standards through 1985. Maximum estimated air quality concentration in the "hot-spots" is similar to the 1971 and 1972 maximum values.

  - SO_2 air quality concentrations projected at four major power plants and two isolated multi-source areas indicate a potential to exceed the standards. Two of the four power plant projections show a potential to exceed the standards, depending on short-term operating conditions and assumed operating characteristics and controls. The area source calculations appear to be highly dependent upon the area size selected and show the potential to exceed the standards.

  - CO projections at several selected receptor sites exceed the 8-hour standard in 1975. All selected receptor sites are projected to be below the standards by 1980.

  - Oxidant values (regionwide) are projected to decrease. However, the 1985 projections still exceed the standard.

The conclusions from the analysis with regard to attainment and maintenance of standards for each pollutant are summarized in Table I-1 as follows:

TABLE I-1

OVERVIEW OF POLLUTANTS: FINDINGS AND CONCLUSIONS

Pollutant	Maximum Air Quality (Existing 1985).	Significant Source Contribution (1985)	Action Required	Intergovernmental Cooperation required
TSP	135 μg/m³ (1971) 120 μg/m³ (1985) (75 μg/m³-standard)	Power Plants Point Area	SIP Enforcement Interim Measures Long-term maintenance Plan	EPA, Missouri (MACC), EWGCC, Illinois (IEPA), Industry
SO_2	557 μg/m³ (1972) 400 μg/m³ (1985) (365 μg/m³-standard)	Power Plants Point	SIP Enforcement Interim Measures Long-term maintenance Plan	EPA, Missouri (MACC), Illinois (IEPA), EWGCC, Power Companies, Industry
CO	16.8 ppm (1972) 5 ppm (1985) (9 ppm-standard)	Mobile Point	Transportation Control Plan (TCP). Long-term maintenance plan	EPA, Missouri (MACC), Illinois (IEPA), EWGCC, Industry
O_x (HC)*	300 μ/m³ (1972) 180 μq/m³ (1985) (160 μg/m³-standard)	Mobile Point Area	Transportation Control Plan (TCP). HC Stationary Source Control. Long-term maintenance plan	EPA, Missouri (MACC), Illinois (IEPA), EWGCC, Industry

*Emissions or sources refer to hydrocarbons. Oxidants are a secondary pollutant resulting from the action of sunlight on hydrocarbons and other primary pollutants. The health standard is given for oxidants only.

- An attainment and maintenance strategy is required for the identified "hot-spots." A general approach is required to maintain the secondary standards, especially in areas adjacent to "hot-spots."

- SO_2 standards are expected to be attained and maintained throughout the AQMA with the exception of isolated "hot-spots" in the vicinity of major point sources. A regionwide maintenance strategy is not required. However, measures are required to attain and maintain standards in the "hot-spots."

- Once the 8-hour CO standard is attained, continued decline in mobile source emissions will ensure maintenance through 1985. A Transportation Control Plan (TCP) is required and is currently being considered to provide for attainment--a long-term maintenance plan is advisable.

- The Oxidant standard cannot be attained or maintained with existing controls. A TCP and maintenance strategy are required.

Any analysis of projected air quality contains a degree of uncertainty, dependent upon the methodologies and assumptions applied. In the preparation of this analysis, many simplifying assumptions were made due to time and data constraints. The Federal, state, and local air pollution agencies are currently working on several programs to resolve deficiencies in analysis procedures and data. The RAPS/RAMS program is intended to provide the most complete analysis of air pollution in the St. Louis area over the next five years.

MAINTENANCE STRATEGY DEVELOPMENT

Emissions control and administrative measures were reviewed for inclusion in an Attainment/Maintenance plan. The conclusions of the review are:

- Long-term air quality maintenance requires a regionwide, comprehensive approach associated with the community planning process. Two administrative approaches appear applicable and implementable--Emissions Allocation and Regional Development Planning.

- Measures which have long-term general application and effectiveness as part of a comprehensive approach include: Indirect Source Review and Environmental Impact Statements (EIS), Transportation Control measures, indirect regulatory controls, and Federal New Source Performance Standards.

- Emission Source Control measures which have short-term or long-term effectiveness in the "hot-spot" areas include: more stringent controls on existing sources, phaseout of emission sources, and control of fugitive dust.

The air quality analysis, the review of the status of existing attainment plans, and the review of possible maintenance measures supported the selection of a proposed Attainment/Maintenance Plan. The proposed plan consists of a strategy for each of the four pollutants.

The selected Attainment/Maintenance strategy for each pollutant is summarized in Table I-2. The selected strategy for each pollutant includes attainment measures (where required), a long-term maintenance approach, and interim measures to ensure maintenance during the period required for preparation of the long-term plan.

IMPLEMENTATION RECOMMENDATIONS

The time constraints of this project and the jurisdictional complexity of the AQMA did not allow for sufficient interaction with concerned agencies to select and evaluate the most appropriate approach to long-term air quality maintenance. However, it is apparent from discussion with agency representatives that no long-term approach involving land use and transportation control measures or policies can be prepared or implemented by June 1975. Therefore, the following three-phase approach

TABLE I-2

PROPOSED ATTAINMENT/MAINTENANCE STRATEGY

Pollutant	Attainment	Interim Maintenance	Long-Term Maintenance
Total Suspended Particulates (TSP)	SIP Regulations enforcement, extended monitoring and surveillance	Implement "hot-spot" regulations	Long-term comprehensive approach
Sulfur Dioxide (SO_2)	Enforcement of SIP Regulations, extended monitoring and surveillance	Implement "hot-spot" regulations, burn municipal refuse in power plants, SO_2 reduction at power plants	Long-term comprehensive approach
Carbon Monoxide (CO)	Transportation Control Plan (TCP)	(Required if TCP Strategy II or III* are not implemented). Indirect Source Review, exclusive bus/carpool lanes	Long-term comprehensive approach
Photochemical Oxidants (O_x)	Transportation Control Plan (TCP)	(Required if TCP Strategy III* is not implemented). HC stationary Source Control	Long-Term comprehensive approach

*As described in PEDCo "Attainment Study"
STRATEGY II -- Carpool incentive program plus indirect actions occurring with stimulus of plan.
STRATEGY III -- STRATEGY II plus maximum technically demonstrated stationary source control.

is recommended for consideration in the development of a long-term comprehensive approach to air quality maintenance:*

- Phase 1 (ending June 1975) -- Informal Regional Development Planning, Implementation of Attainment and Interim Maintenance Measures

  A cooperative program between the planning community and air pollution agencies to review and evaluate the impact of the currently proposed significant land use and transportation projects could be implemented by June 1975. The results of the evaluation would be used to develop policies to be included in the updated regional comprehensive plan to represent air quality considerations. In addition, the air pollution agencies and the regional planning body (the East-West Gateway Coordinating Council-EWGCC Advisory Board) could cooperate to persuade new significant sources of TSP and SO_2 to avoid the "hot-spot" areas. All measures required for attainment and Interim Maintenance should be included in the AQMP submitted to EPA in June 1975. All Interim Maintenance Measures should be implemented and enforced by June 1976.

- Phase 2 (ending June 1980) -- Interim Maintenance and Development of Long-Term Approach

  If persuasion fails to obtain the desired control in the "hot-spot" area, the source review procedure requirements relating to "hot-spots" can be strictly enforced as an Interim Maintenance Measure. In Missouri, this allows the air pollution agencies to impose more stringent regulations on existing sources to prevent source clusters from causing the standards to be violated. During this period, the administrative structure and technical procedures required to implement an Emissions Allocation-type procedure can be developed.

- Phase 3 (ending June 1985) -- Long-Term Plan Implementation

  The RAPS/RAMS program and the procedures developed for a regional development planning approach in Phase 1 and 2 should provide sufficient basis for either a formal Emissions Allocation

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*Phase 1 and Phase 2 are approximately consistent with Phase 1 of EPA's phased approach. The St. Louis phased approach was developed prior to EPA's current policy on planning.

program where the emissions ceiling is regulated, or an informal Emissions Allocation procedure where the emissions ceiling serves as a guide for regional development planning. Existing source review procedures and regulations should be strictly enforced to ensure compliance with the air quality constraints of the Regional Comprehensive Plan. All land use and transportation policies or control measures required for long-term maintenance should be fully implemented and enforced.

It is recommended that the final form of the administrative approach and technical review procedure be determined by the cooperative efforts of air pollution agencies and the community (EWGCC Advisory Board) in order to ensure coordination of air quality and community planning goals and policies.

INTERGOVERNMENTAL COORDINATION AND COOPERATION

The Attainment/Maintenance Plan described above includes source control, and long-term transportation and land use policies or control. To be successful, however, the AQMP must realize two administrative objectives. First, the plan must facilitate the coordination of land use and transportation planning with source control measures within an institutional framework which links planning, implementation, and enforcement. Second, the plan must be developed within the constraints of time, jurisdictional complexity, and funding imposed on the process.

Four possible alternative arrangements, or institutional forms, were evaluated to determine the most appropriate mechanisms to meet these two administrative objectives as follows:

- A regional, interstate agency with planning, implementation, and enforcement in each source control area
- A cooperative arrangement between two state air pollution control agencies, each of which had increased functions to include transportation and land use planning

- A Council of Governments (i.e., EWGCC) with all functions and authority provided

- A combination or composite of existing institutions coordinating their particular areas of responsibility with the long-range goal of creating an institutional structure(s) with appropriate enabling powers.

A review of the existing institutional structure in the AQMA suggests that the capability and authority to satisfy these criteria does not currently exist in any one agency. The state air pollution agencies can implement source control measures and they may have the authority to implement transportation and land use controls. However, if such programs should conflict with community land use and transportation goals and policies, they may not be enforceable.

The conclusions from the evaluation of the alternatives and issues in the selection of the most appropriate mechanism for coordination of AQMP development and implementation are as follows:

- Plan development and implementation must be phased

- Coordination mechanisms and responsibilities may vary with each phase to reflect the significant AQMP elements to be planned or implemented

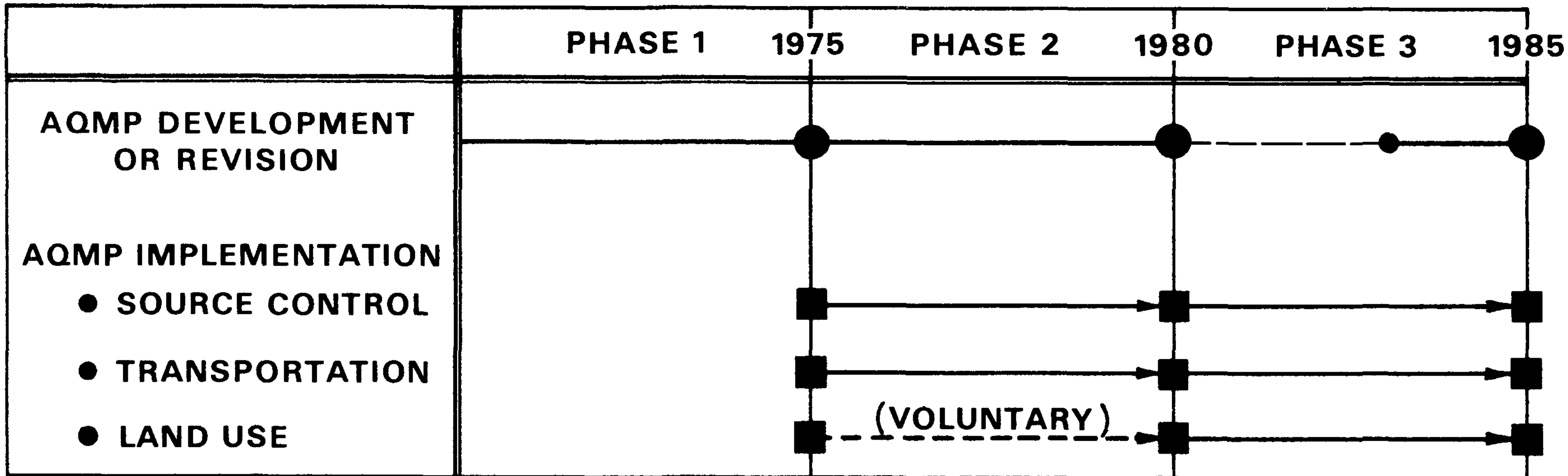
- Participation and coordination in AQMP development and implementation must reflect the existing jurisdictional framework, legal authority, time, and funding constraints.

The review of existing institutional structure and evaluation of alternatives and issues in AQMP development and implementation suggests the following recommendations for intergovernmental coordination and cooperation as summarized in Table I-3:

- AQMP development and implementation should be a cooperative effort among state, county, and local agencies and regional planning agencies.

TABLE I-3

ST. LOUIS AQMP DEVELOPMENT AND COORDINATION



COORDINATION	PHASE 1	PHASE 2	PHASE 3
RESPONSIBLLITY	STATE	STATE-EWGCC	EWGCC
PREPARATION	STATE	STATE-EWGCC	STATE-EWGCC
ADVISORY	EPA EWGCC BOARD EWGCC TASK FORCE	EPA EWGCC BOARD EWGCC TASK FORCE	EPA EWGCC BOARD EWGCC TASK FORCE

- The state air agencies should have the primary responsibility for AQMP development and implementation through the completion of Phase 2 (1980).

- The state air pollution control agencies will retain ultimate responsibility for implementation and enforcement of the Attainment/Maintenance Plan through the states' Air Conservation Laws.

- The East-West Gateway Coordinating Council is recommended as the agency for technical leadership in the areas of land use and transportation and could eventually be responsible for development, and coordination of the implementation of the long-term comprehensive approach.

- The East-West Gateway Council Advisory Board should coordinate Interstate (Intraregional) political and citizen participation in AQMP development and implementation.

LEGAL AUTHORITY

The enabling legislation given in the states' implementation plans forms the basis for implementation of the maintenance plan. This enabling legislation is sufficient for implementation and enforcement of all Attainment and interim maintenance source control measures. The long-term comprehensive approaches to maintenance of air quality are primarily administrative procedures. They maintain air quality indirectly by the application of land use and transportation policies which affect the distribution of emissions. Specific land use control regulations may be adopted to formalize the policies inherent in the procedures. For example, Emissions Allocation can be implemented by adopting an emissions ceiling as a regulation. However, strict enforcement of existing regulations may be considered sufficient to support a strong program of comprehensive air quality and community planning.

IMPLEMENTATION OBSTACLES

The obstacles to implementation of the Attainment or Interim Maintenance measures proposed are limited and primarily reflect technical or cost-effectiveness constraints. However, implementation of the long-term comprehensive strategies has many obstacles including: administrative complexity, jurisdictional complexity, funding, and opposition to enforcement of strong regulations which resemble land use control. Of these, funding for participation in plan development and implementation is the most immediate problem. Jurisdictional complexity may be the most difficult obstacle to implementation and enforcement of the long-term plan. It is recommended that the East-West Gateway Council be funded to participate in initial AQMP development and actively participate in long-term plan development and implementation.

II. INTRODUCTION

All states, pursuant to 40 CFR 51.12(e), are required to identify areas that have the potential to exceed any National Ambient Air Quality Standards (NAAQS) over the 10-year period 1975-1985. For these Air Quality Maintenance Areas (AQMAs), the states must submit plans to prevent any national standards from being exceeded over that 10-year period. Where analysis indicates a potential problem with one or more pollutants, specific maintenance strategies must be submitted. These Air Quality Maintenance Plans (AQMPs) will be prepared, adopted, and submitted in compliance with the requirements of 40 CFR 51 and guidelines issued by EPA.

Restrictions on existing or future point or area source emissions contained in these plans may carry with them political, economic, and social implications. For this reason, the success of an AQMP will depend upon cooperation among government agencies in the development of a realistic, implementable, and enforceable plan.

A. STUDY AREA BACKGROUND AND DESCRIPTION

Historically, Illinois and Missouri have submitted separate air quality control plans for their respective portions of the St. Louis Air Quality Control Region (AQCR). St. Louis was not among the original list of urban areas required to submit a Transportation Control Plan to provide for the attainment of carbon monoxide (CO) and photochemical oxidant (O_x) standards. However, data from the expanded monitoring network for these pollutants indicated a potential attainment problem. Therefore, the Missouri Air Conservation Commission has established an advisory committee to study the problem and prepare a Transportation Control Plan for the AQCR by February 1975. A study was prepared by PEDCo, Environmental Specialists, Inc., which presented proposed strategies for the attainment of CO and O_x standards. The development of the final maintenance strategy for these pollutants is highly dependent upon the selected attainment strategy and its implementation schedule.

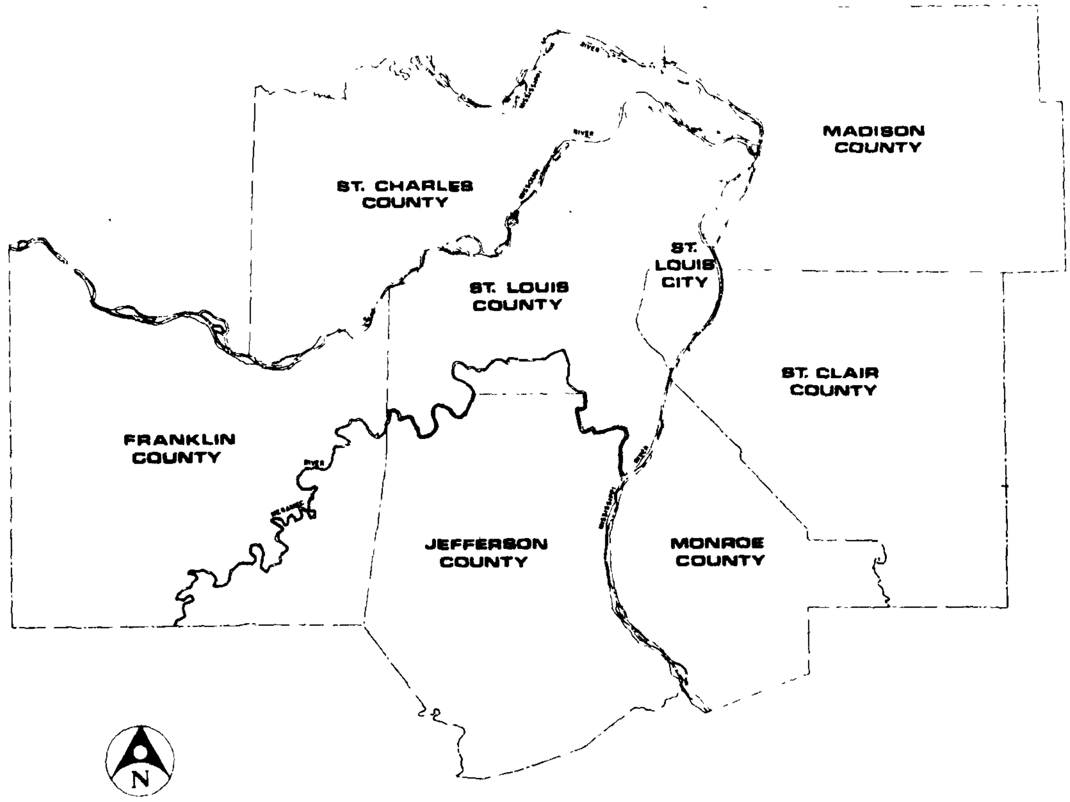
In March 1974, Missouri designated the St. Louis SMSA as a Maintenance Area for total suspended particulates (TSP) and photochemical oxidants (O_x). During the preparation of this final report, Illinois also designated the three Illinois counties in the SMSA as an AQMA for particulates, sulfur dioxide, and oxidants. The AQMA includes St. Louis City, St. Louis County, St. Charles County, Franklin County, and Jefferson County in Missouri. In Illinois, Madison, St. Clair, and Monroe Counties comprise the AQMA (see Figure II-1).

St. Louis was chosen as an example Air Quality Maintenance Area because it is an interstate, interregional Air Quality Control Region (AQCR) with a diversity of pollution sources and problems. St. Louis is a transportation center with river traffic (largest inland waterway port) and rail traffic second only to Chicago. St. Louis is also one of the most commercially active cities in the U.S. It boasts an extremely diverse industrial base of food processors, metal processors and fabricators, oil refineries, foundries, and chemical processing plants.

The St. Louis area has a multifaceted political structure. The AQMA is comprised of two states--Illinois and Missouri--seven counties, one independent city, and over 185 municipalities, each with its own zoning power. Planning activities are equally complex. A council of governments, the East-West Gateway Coordinating Council (EWGCC), is responsible for A-95 Review and comprehensive transportation planning. Participation in the EWGCC is voluntary on the part of the seven counties and St. Louis City and therefore lacks implementation power. The three Illinois counties have formed the Southwest Illinois Metropolitan Area Planning Commission (SWIMPAC) which provides local planning and cooperative input to the EWGCC. The City of St. Louis and the Counties of St. Louis and

FIGURE II-1

ST. LOUIS AIR QUALITY MAINTENANCE AREA



ST. LOUIS METROPOLITAN AREA

UNITED STATES

St. Charles have active planning agencies. Federal environmental planning activity emanates from the Federal Regional Centers: Chicago for the Illinios jurisdictions and Kansas City for Missouri jurisdictions.

B. REPORT ORGANIZATION

Chapter I is an Executive Summary which provides an overview of the significant findings and conclusions of the study. It also describes the background, approaches, and limitations of the study. The Air Quality Maintenance Area Analysis procedures and conclusions are presented in Chapter III.

Chapter IV describes the review and evaluation of maintenance measures for inclusion in the Maintenance Strategy and presents a recommended Attainment/Maintenance strategy for TSP, SO_2, CO, and O_x. The legal authority and constraints to implementation of the proposed strategy are also discussed.

The recommended long-term maintenance strategy is highly dependent on effective long-term community planning and development. Therefore, intergovernmental cooperation and coordination become significant factors in the success of the maintenance plan. Chapter V discusses the issues and alternatives in intergovernmental cooperation and coordination and presents a recommended approach to providing such coordination.

The Appendices contain descriptions of the detailed methodology and assumptions employed in the analysis and strategy development. Two regulations of significance to AQMP implementation are also reproduced.

III. AIR QUALITY MAINTENANCE AREA ANALYSIS

The preparation of an Air Quality Maintenance Plan requires a detailed analysis of existing and projected air quality to determine where and to what extent the air quality standards may be exceeded within the AQMA during the 10-year maintenance interval. The analysis presented in the following sections provides a trial evaluation of existing and projected emissions and air quality for total suspended particulates (TSP), sulfur dioxide (SO_2), carbon monoxide (CO), and photochemical oxidants (O_x).

Much of the analysis described is an extension or extrapolation of previous studies of the St. Louis AQCR. Where problems of data deficiencies or conflicts arose, a "worst-case" estimate was applied for the purpose of continuing with the example plan development. The following sections summarize the methodology and results of the analysis of existing air quality, projected emissions, and projected air quality. The limitations to the analysis and recommendations for resolving deficiencies are also described.

A. EXISTING AIR QUALITY AND MONITORING NETWORKS

All states are required by law (40 CFR 51) to identify areas which exceed or are projected to exceed the National Ambient Air Quality Standards (NAAQS) within the 10-year period 1975 to 1985. Therefore, available monitoring data from Missouri and Illinois were reviewed to determine trends in air quality.

1. Air Quality Data

Monitoring data from 11 stations in the AQMA were reviewed. The Regional Air Pollution Study (RAPS) will add 25 new monitoring stations to this network during the next two years.

Trend calculations were available from selected sites for total suspended particulates, sulfur dioxide, carbon monoxide, and oxidants from the Plan Revision Management System (PRMS) Summary reports.* Results of the trend analysis indicate that most of the TSP problems are related to the 24-hour standard. Three sites were identified as "potential problems." One major "potential problem" with respect to CO was identified near downtown St. Louis. An oxidant problem appeared at four sites distributed throughout the AQMA.

Existing air quality data and air quality projections were reviewed by the Missouri Air Conservation Commission (MACC) and by the Illinois Environmental Protection Agency (IEPA) in order to designate the St. Louis Air Quality Maintenance Area. Table III-1 summarizes the comparison of air quality data with the air quality standards.

2. The RAPS/RAMS Program

The St. Louis Regional Air Monitoring System (RAMS), currently being constructed by Rockwell International Corporation under an EPA contract for a Regional Air Pollution Study (RAPS) will provide continuous data on air pollutants during the next five years. The goal of this program is to gather sufficient information on air pollutants to enable air quality planners to monitor the effectiveness of air quality implementation planning.

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*The Plan Revision Management System - Region VII, U.S. EPA, CPDD, Research Triangle Park, March 1974.

Table III-1

COMPARISON OF EXISTING AIR QUALITY DATA TO AIR QUALITY STANDARDS

Pollutant	Ambient Air Quality Standard	St. Louis, Missouri, Air Quality*	Illinois
Particulate	(a) 75 μg/m^3, annual geometric mean (primary)	135.0 μg/m^3 (1971)	202 μg/m^3 (Granite City)
	(b) 260 μg/m^3, second highest 24-hour avg./yr. (primary)		
	(c) 150 μg/m^3, second highest 24-hour avg./yr. (secondary)		
Sulfur Dioxide	(a) 80 μg/m^3, annual arithmetic mean (primary)		72 μg/m^3 (1973)
	(b) 365 μg/m^3, second highest 24-hour avg./yr. (primary)	346 μg/m^3 (1971)	460 μg/m^3 (estimate)
	(c) 1300 μg/m^3, second highest 3-hour avg./yr. (secondary)		
Carbon Monoxide	10 μg/m^3, second highest 8-hour avg./yr. (primary)	16.8 ppm (1972)	**
Photochemical Oxidants	160 μg/m^3, second highest 1-hour avg./yr. (primary)	300 μg/m^3 (1972)	**

*Missouri Data only

**Insufficient monitoring data to compare to standards

The 25 air monitoring stations are being located on sites selected according to precise criteria to ensure that a comprehensive study of air quality conditions can be developed. Stations will be located in both the Missouri and Illinois portions of the greater St. Louis area. Figure III-1 illustrates selected monitor sites.

Each of the stations is equipped with a minicomputer which controls and acquires data from the advanced electronic air monitoring equipment and meteorological instruments and transmits the information to the central computer at the RAMS main operations facility.

There, data are analyzed by EPA and Rockwell personnel engaged in the program. The central facility is also equipped with a laboratory for analysis of air samples.

In addition to the automated RAMS station, the program will employ helicopter measurements, mobile laboratories, ballon sounding stations, aircraft monitoring and photography, and related sophisticated measurement devices.

Development of the remote RAMS station marks a significant advancement in air monitoring, since the system is the first to provide a wide variety of information on a real-time basis.

This program will advance the degree of air monitoring sophistication in the St. Louis area, and provide the data to determine AQMP effectiveness.

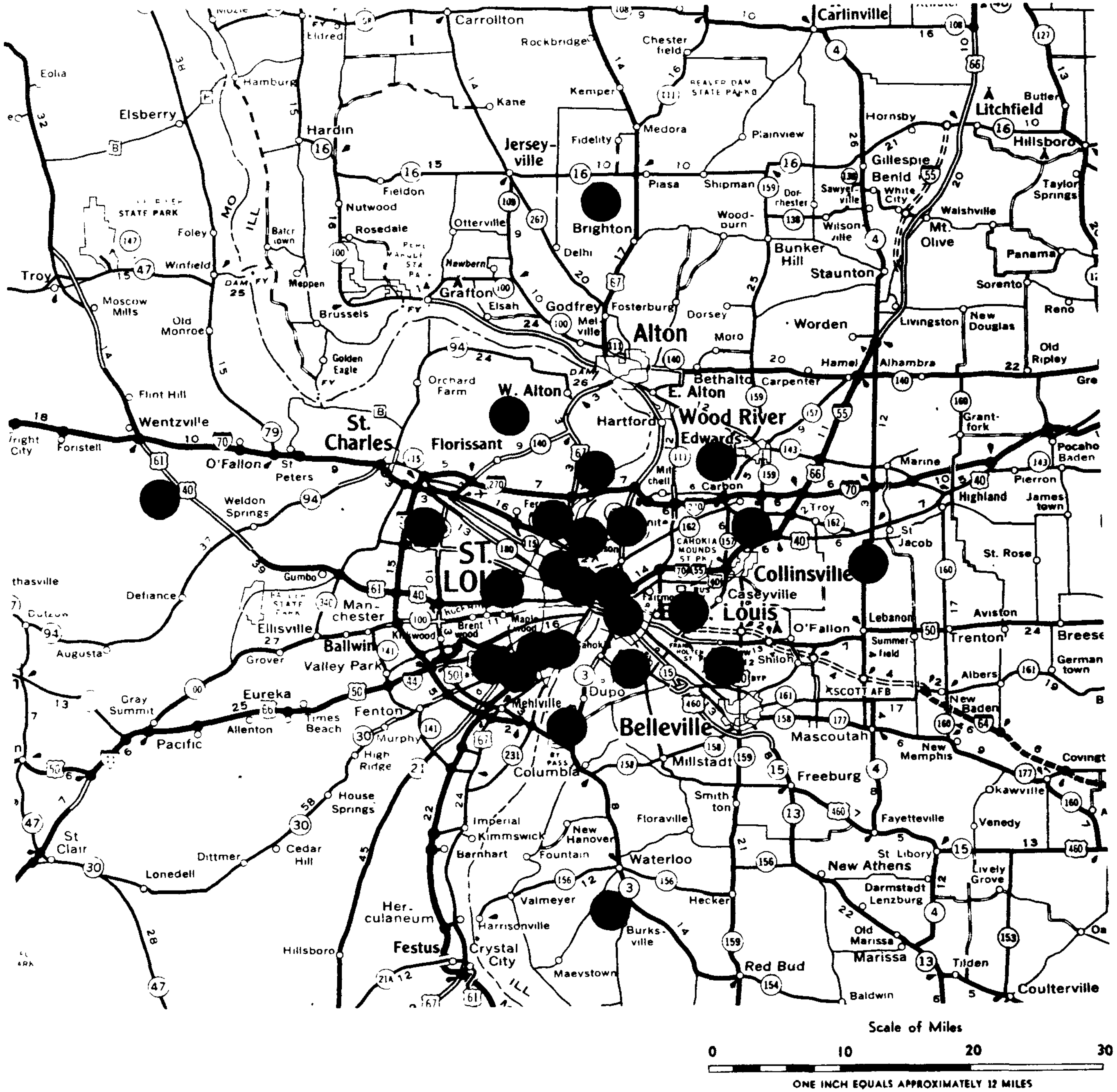
3. Existing Air Quality

The following statements summarize the conclusions from the review of all existing air quality data from the St. Louis AQMA:

- TSP, SO_2, CO, and oxidants all currently exceed the primary standards at some point in the AQMA.

RAPS
Regional Air Pollution Study

FIGURE III-1



- TSP and oxidants exceed the criteria for designation of a maintenance problem.
- SO_2 currently exceeds the standards in isolated areas in the Illinois portion of the AQMA. However, current ambient values are below the primary standard at all sites on the Missouri side.
- CO ambient readings exceed the 8-hour standard at several sites in the urban area and trend data from a central urban site indicate the standard may not be achieved by 1975.

As a result of these findings, TSP and oxidants are subject to detailed analysis requirements. Analysis of CO and SO_2 provide an example and confirm the initial conclusions from the ambient data.

B. EMISSIONS PROJECTIONS

The general approach to projecting emissions for all four pollutants applied the following procedure:

1. Estimate a 1975 baseline inventory of all sources, assuming the sources are in compliance with existing regulations
2. Develop growth factors for each source category from available growth data
3. Apply the growth factors to the 1975 baseline inventory to obtain projected emissions from each source category

The development of the baseline emissions inventory, the specific methodology for projecting emissions for each pollutant and source category, and the results of the emissions projections are described below. The growth factors used and the rationale for their selection are detailed in Appendix D.

1. Baseline Emissions Inventory

Existing inventory data in the St. Louis Air Quality Maintenance Area were found to vary both in the year-of-record for a particular source type and in completeness of information. To overcome the variation in year-of-record, existing inventories were projected to 1975 (year of attainment) for each pollutant. This procedure aligns all emissions data to a baseline year and assumes that all sources will be in compliance and controlled by the 1975 attainment date. To eliminate discontinuities in information, existing information was supplemented by special analyses to provide a complete data baseline.

The information used in the development of the baseline emission inventory was extracted from the following sources:

- Illinois State Implementation Plan
- Missouri State Implementation Plan
- Environmental Protection Agency--National Emissions Data System (NEDS)
- East-West Gateway Coordinating Council 1970-1995 Traffic Assignment Data
- "Study on Attainment of National Air Quality Standards for Carbon Monoxide and Oxidants in the St. Louis Air Quality Control Region" prepared by PEDCO Environmental Specialists, Inc. (cited hereafter as the Attainment Study)
- Union Electric Company and Illinois Power Company
- St. Louis Standard Metropolitan Statistical Area (SMSA) statistics
- Bureau of Economic Analysis (BEA) statistics

The special analyses undertaken were:

- Primary Source Emissions at Compliance (TSP, SO_2)

- Point and area source distribution (for TSP and SO_x only)
- Subcorridor-VMT emission analysis (for CO and HC only). Both these analyses are discussed in detail in the Appendices.

2. Methodology for Projecting Emissions

Once the complete data baseline was established, emissions were projected for four source categories: point, area, power plants, and mobile sources. The specific methodology applied to each source category is discussed in the following sections.

a. Point Source -- Point source emissions data were broken down into primary (sources greater than 100 tons/year) and non-primary sources for each pollutant. For the primary point sources for TSP and SO_x, summaries of source emissions at compliance, prepared by the Illinois Environmental Protection Agency and the Missouri Air Conservation Commission, were used. For the non-primary source emissions, the emissions were assumed to be uncontrolled (except as stated in the SIP) and were taken from NEDS. The CO and HC 1975 point source emissions were taken from the Attainment Study (as corrected by Illinois EPA).

The preferred method for projecting point source emissions for 1980 and 1985 was to obtain growth rates for each company, power plant, and institution that represents a primary point source. BEA growth statistics were used for non-primary point sources and in cases where actual growth rates could not be obtained for a primary point source. Accordingly, a survey was conducted of the primary point sources to gather information on growth rates, productivity increase estimates, and expected increases in capacity. Responses were received from approximately 35 percent of the sources contacted. Once the baseline point source inventory and the growth factors for all the sources were developed, the 1980 and 1985 emissions were generated by multiplying the baseline emissions by the annually compounded growth factors.

b. Area Source -- 1970, 1972, and 1974 area source emissions data were gathered and projected to 1975 by applying the percent emission control as required by the State Implementation Plan and growth factors for each area source.

The method used for projecting area source emissions for 1980 and 1985 was to obtain growth rates from BEA growth statistics and local estimates. Projections were generated by individual area source category (residential, industrial, and commercial) and summarized to give total area source emissions for each pollutant.

c. Power Plant -- Individual plant data were provided by Union Electric Company, Illinois Power Company, Missouri Air Conservation Commission, and the Illinois Environmental Protection Agency. Compliance schedules, control equipment, stack emissions, and growth factors were applied by MACC and IEPA to the power plants data to generate an inventory of controlled emissions in 1975.

To project power plant emissions for 1980 and 1985, the growth factors and the scheduled changes in new and old plants were applied to 1975 baseline controlled emissions. The primary point sources and major power plants (emissions over 100 tons) are shown on the TSP and SO_x source distribution maps in Appendix A.

d. Mobile Source -- Mobile source emissions were divided into two categories: highway and off-highway vehicles. Highway vehicles include both light- and heavy-duty vehicles; off-highway vehicles include railroads, vessels, aircraft, and other vehicles not operated on roads. For highway vehicles, mobile source emissions data were obtained from the Attainment Study for the baseline year of 1975. For off-highway vehicles, mobile source emissions data were gathered from NEDS and the Missouri and Illinois State Implementation Plans. Off-highway emissions were projected using a three percent average growth rate, which parallels the national average. This growth rate was applied to the four pollutants.

Highway emissions for TSP and SO_x were generated by applying TSP and SO_x emissions factors to projected annual VMT (vehicle miles of travel) (see Appendix C). Highway mobile source CO and HC emissions for 1980 were taken from the Attainment Study for the Air Quality Control Region and extrapolated to reflect the Air Quality Maintenance Area. The 1985 emissions were calculated in the special analysis (Subcorridor-VMT Emissions Analysis) for the St. Louis urban-in-fact area by interpolating the 1970 and 1995 traffic network data for each subcorridor and link type and extrapolating to reflect the entire Air Quality Maintenance Area. The distribution of VMT and emissions by subcorridor and link type was calculated in this analysis. The procedure is explained in detail in Appendix B.

3. Projected Emissions

Figures III-2 to III-5 and Table III-2 summarize the St. Louis Air Quality Maintenance Area emissions projections. Emissions are projected for 1975, 1980, and 1985 for each pollutant and source category.

These projections illustrate the relative impact of the four emission source categories on the levels of various pollutants over the 10-year projection period:

- With respect to TSP emissions, major increases are projected to be attributable to point sources (see Figure III-2).

Table III-2

ST. LOUIS AIR QUALITY MAINTENANCE AREA
EMISSION PROJECTION - SUMMARY

Source Category		Emissions, Tons per year 1975	1980	1985
		Total Suspended Particulate		
Point Sources		50,329	57,972	71,617
Area Sources		18,955	20,404	23,563
Power Plants		20,348	34,064	34,863
Mobile Sources:	Highway	8,383	9,622	10,823
	Off-highway	3,647	4,228	4,902
	TOTALS	101,662	126,290	145,768
		Sulfur Dioxide		
Point Sources		194,046	204,013	218,452
Area Sources		40,155	44,510	50,063
Power Plants		577,190	864,748	873,000
Mobile Sources:	Highway	2,065	2,371	2,666
	Off-highway	3,624	4,202	4,872
	TOTALS	797,080	1,119,844	1149,053
		Carbon Monoxide		
Point Sources		46,821	50,870	59,734
Area Sources		28,808	27,565	27,799
Power Plants		1,641	1,641	1,700
Mobile Sources:	Highway	476,242	241,459	146,070
	Off-highway	31,891	36,972	42,859
	TOTALS	585,403	358,507	278,162
		Hydrocarbons		
Point Sources		40,208	50,330	55,009
Area Sources		30,389	32,153	35,370
Power Plants		1,191	1,395	1,666
Mobile Sources:	Highway	82,502	39,217	25,956
	Off-highway	11,217	13,004	15,076
	TOTALS	165,507	136,009	133,085

FIGURE III-2

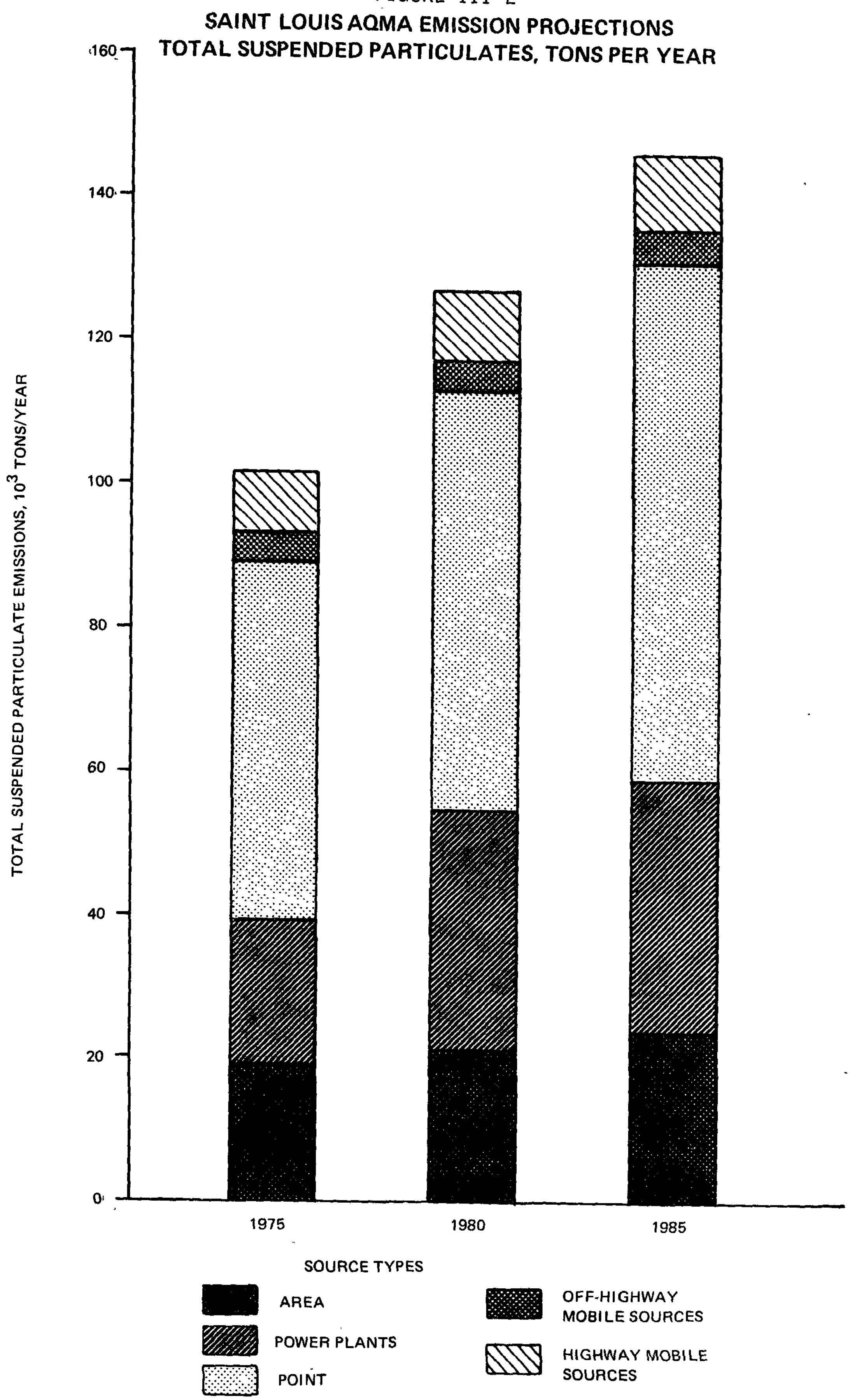

SAINT LOUIS AQMA EMISSION PROJECTIONS
TOTAL SUSPENDED PARTICULATES, TONS PER YEAR
TOTAL SUSPENDED PARTICULATE EMISSIONS, 10^3 TONS/YEAR
160
140
120
100
80
60
40
20
0
1975
1980
1985
SOURCE TYPES
AREA
POWER PLANTS
POINT
OFF-HIGHWAY MOBILE SOURCES
HIGHWAY MOBILE SOURCES

FIGURE III-3

SAINT LOUIS AQMA EMISSION PROJECTIONS SULFUR OXIDES, TONS PER YEAR

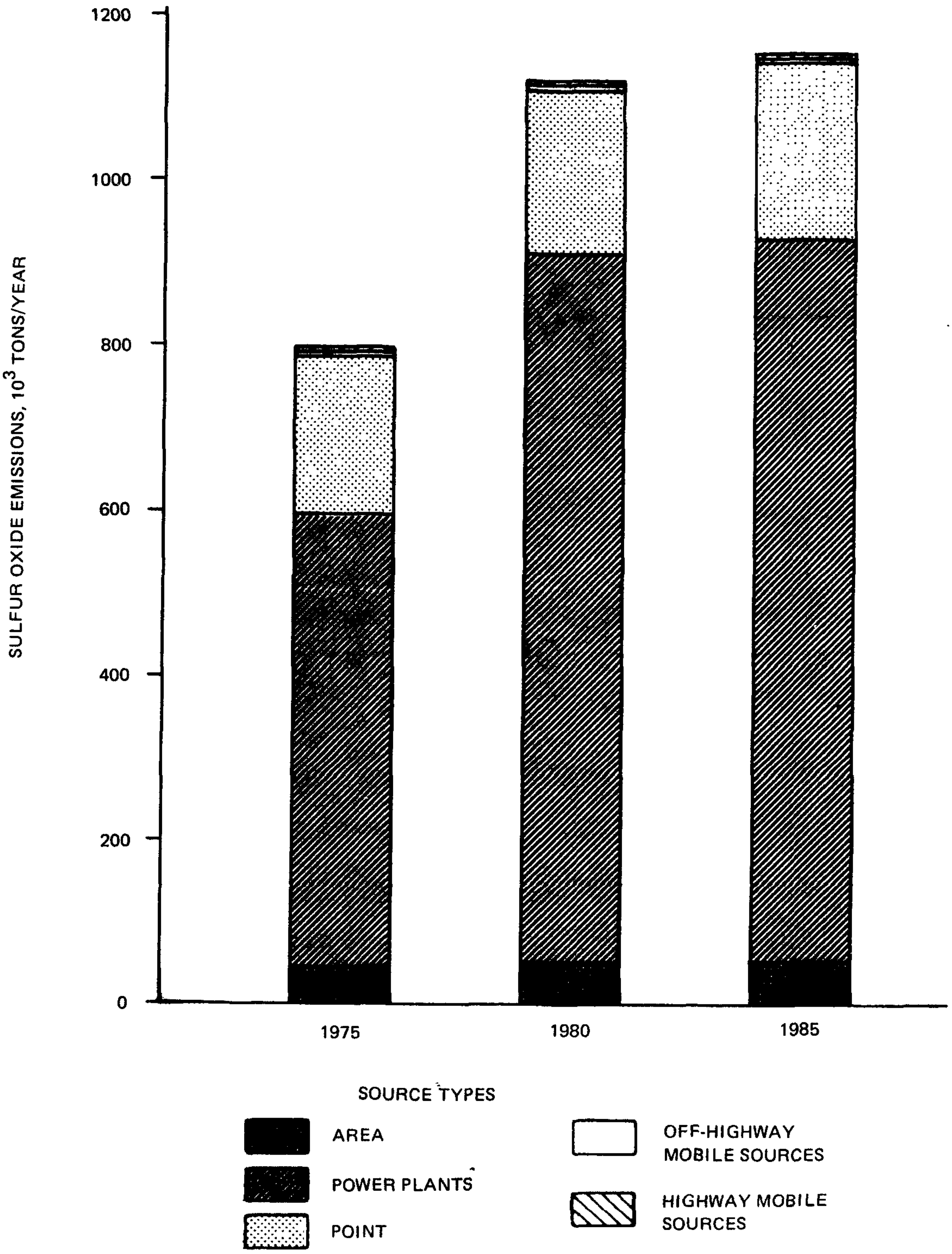


FIGURE III-4

SAINT LOUIS AQMA EMISSION PROJECTIONS
CARBON MONOXIDE, TONS PER YEAR

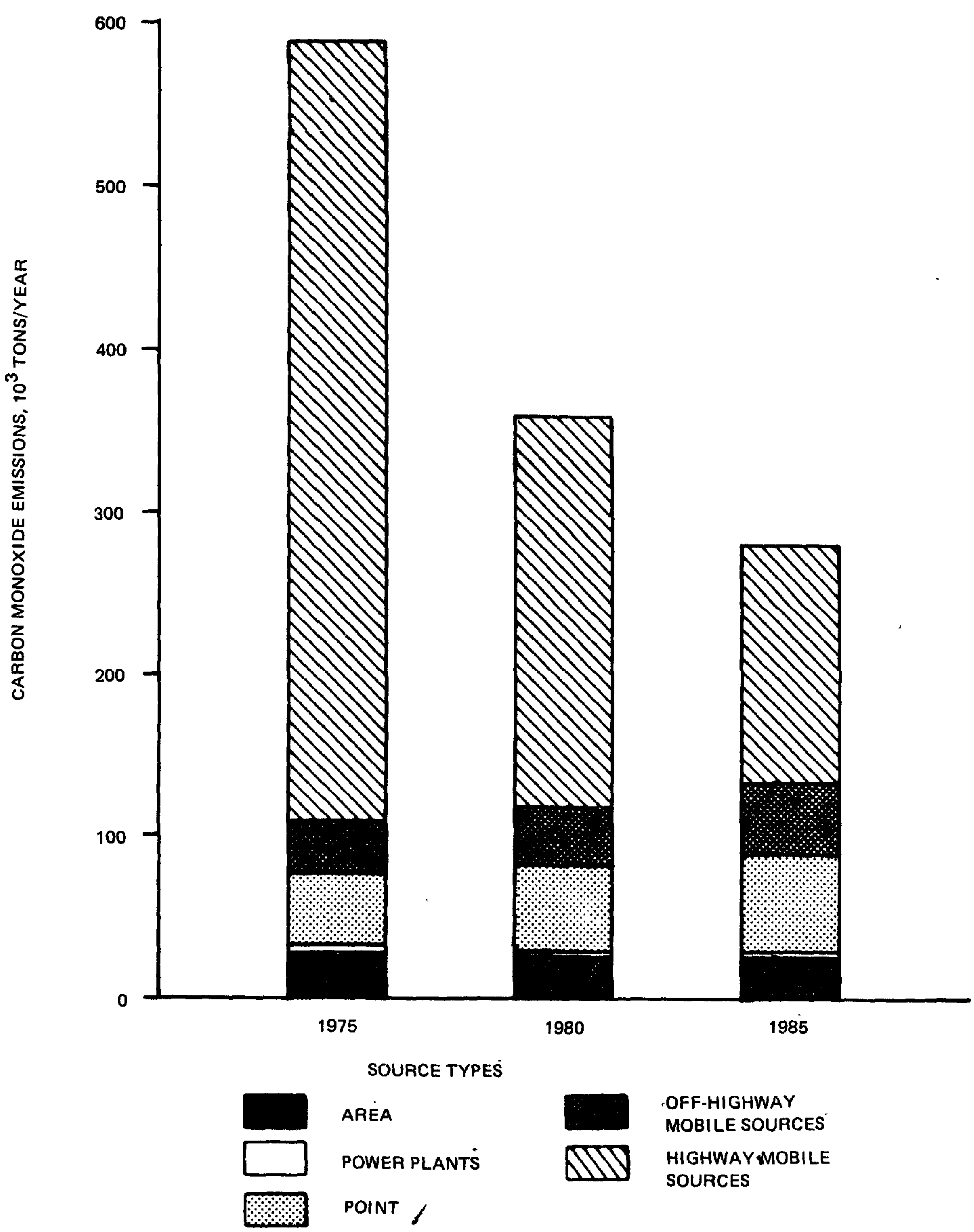
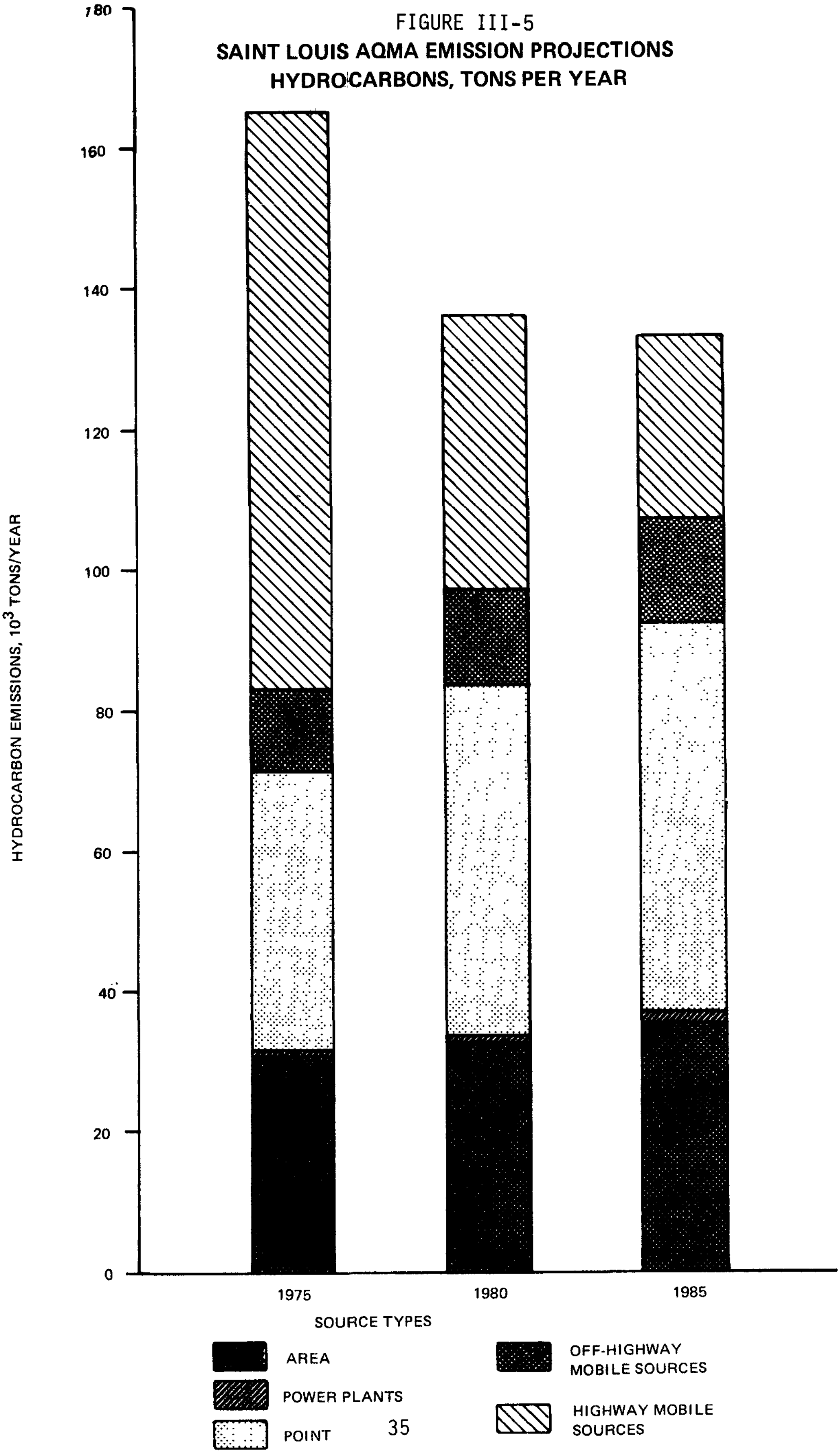


FIGURE III-5

SAINT LOUIS AQMA EMISSION PROJECTIONS HYDROCARBONS, TONS PER YEAR



- Projections for SO_x emissions reveal significant increase in power plant emissions relative to other sources (see Figure III-3).

- CO emission projections show a major decrease in emissions from mobile sources (see Figure III-4).

- Total HC projected emissions reveal a downward trend in which emissions from point and area sources increase slightly while highway mobile sources decrease significantly (see Figure III-5).

C. AIR QUALITY PROJECTIONS

A number of techniques are available for the projection of air quality from emissions data. These techniques range from statistical relationships, such as roll-forward or emission density relationships, to air quality diffusion models, such as the Air Quality Display Model (AQDM), Climatological Dispersion Model (CDM), etc.

In developing air quality projections to 1975, 1980, and 1985 for the St. Louis AQMA, certain general considerations guided the selection of projection techniques. These considerations included the availability of techniques recently applied to St. Louis where forecasts need only be extended to longer time intervals, the availability of a calibrated model for St. Louis based on current data, the availability of data to facilitate the application of a specific technique, and the time constraints posed by this particular report.

Those techniques selected for projecting air quality for total suspended particulates, sulfur dioxide, carbon monoxide, and photochemical oxidants are discussed in the following sections.

1. Total Suspended Particulates

The projection of annual concentrations for TSP was accomplished through application of statistical relationships between TSP emissions density and concentration.* The relationship is displayed as a curve (where 1964 TSP sampling data had been plotted against emissions densities for various land areas larger than 20 square miles). This curve is shown in Appendix E.

The projection method required the summary of emissions from all sources within selected subareas (36 square miles or greater) of the St. Louis AQMA and then determination of emission density values by division of total emissions for each subarea by area size. The estimated annual concentration was then found from the curve and recorded at the center of each selected subarea in the AQMA. Isopleths were drawn, based on concentrations at subarea centers. These isopleths display the mean annual TSP concentration distribution in the St. Louis AQMA. Figures III-6, III-7, and III-8 show distribution of TSP mean annual concentrations for 1975, 1980, and 1985, respectively. Background concentration was estimated at 40 micrograms per cubic meter.**

2. Sulfur Dioxide

The projection of air quality concentrations for SO_2 was accomplished by applying two air quality diffusion models: Miller-Holzworth for the St. Louis central urban area and the Wood River refinery complex, and Pasquill-Gifford plume dispersion for four significant point sources.

These two projection methods required calculation of concentrations from given equations. The Miller-Holzworth equation calculates annual average areawide concentrations of SO_2 from emissions density, mixing depth, urban size, and mean annual wind speed. The Pasquill-Gifford

* U.S. Department of Health, Education, and Welfare, <u>Interstate Air Pollution Study: Phase II Project Report</u>, December 1966.

** Source: Missouri State Implementation Plan plume dispersion calculates a maximum 24-hour average concentration of SO_2 from wind speed, plume rise, emissions rate, stack parameters, meteorological stability, and assumes a Gaussian plume.

Table III-3 summarizes the results of the air quality projections for both point source concentrations and selected area source concentrations. Maximum 24-hour and annual concentrations are given for 1975, 1980, and 1985. Figure III-9 gives the locations for point and selected area sources in the St. Louis AQMA. It can be seen that point source number 2 (Sioux Power Plant) is projected to exceed the 24-hour standard of 365 micrograms per cubic meter in 1980 and 1985. Selected area sources may also exceed the annual standard of 80 micrograms per cubic meter. Area source projections, however, must be carefully evaluated due to the fact that projection calculations are highly dependent upon the size of the area considered and the subsequent derivation of emissions density. Refer to Appendix F for detailed modeling parameters and equations used in projection calculations.

3. Carbon Monoxide

As recently as March 1974, the APRAC 1A Diffusion Model had been applied to carbon monoxide projections for the St. Louis AQMA (the Attainment Study). Estimates of 8-hour CO concentrations were calculated for 1975 at nine selected receptor sites. CO concentrations in 1980 and 1985 at these receptors were extrapolated from the 1975 estimates using the following procedure:

- Assume worst case meteorological conditions do not vary
- Assume concentrations of CO are directly proportional to emissions of CO under constant worst-case meteorological conditions

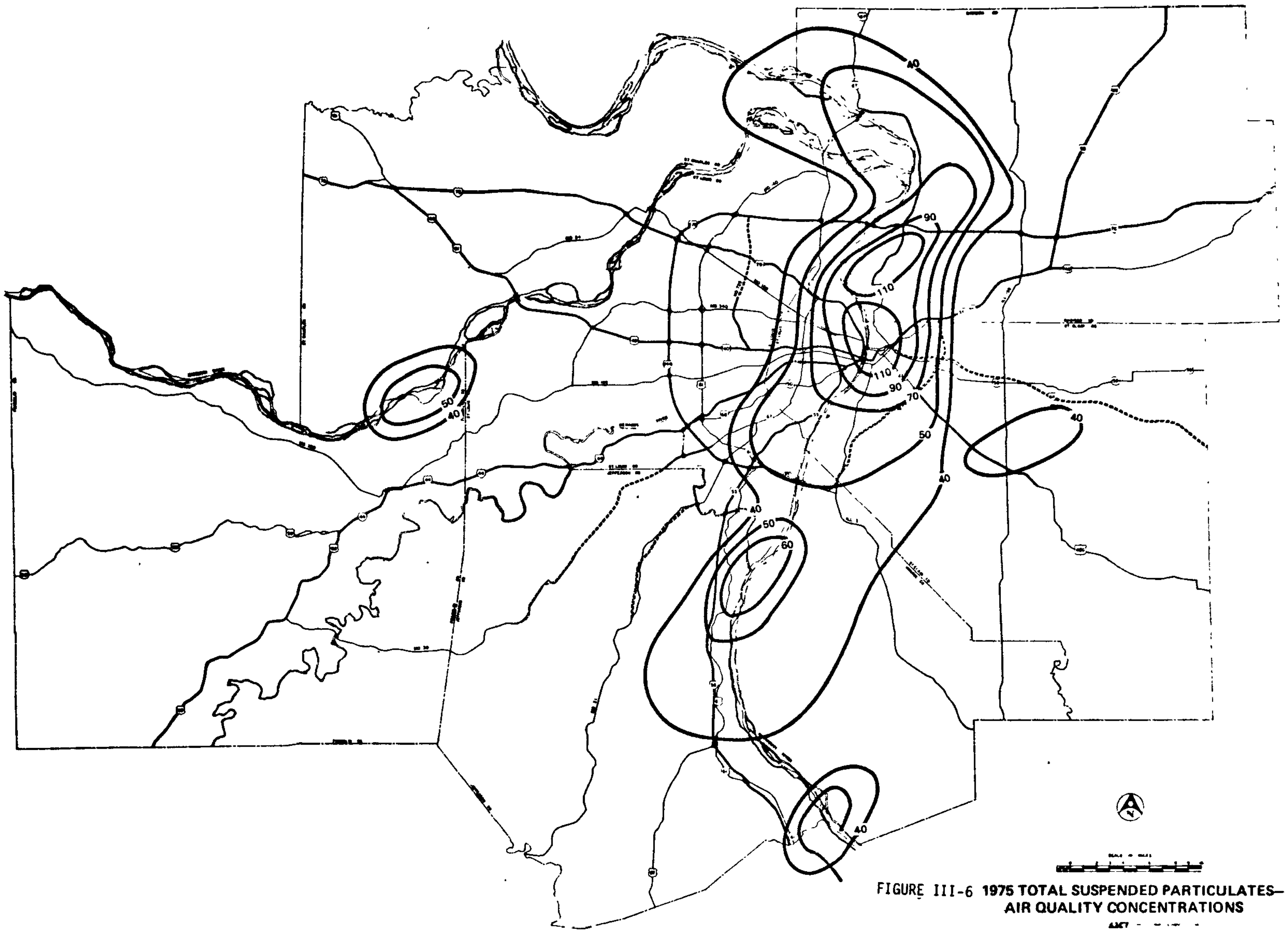


FIGURE III-6 1975 TOTAL SUSPENDED PARTICULATES—
AIR QUALITY CONCENTRATIONS

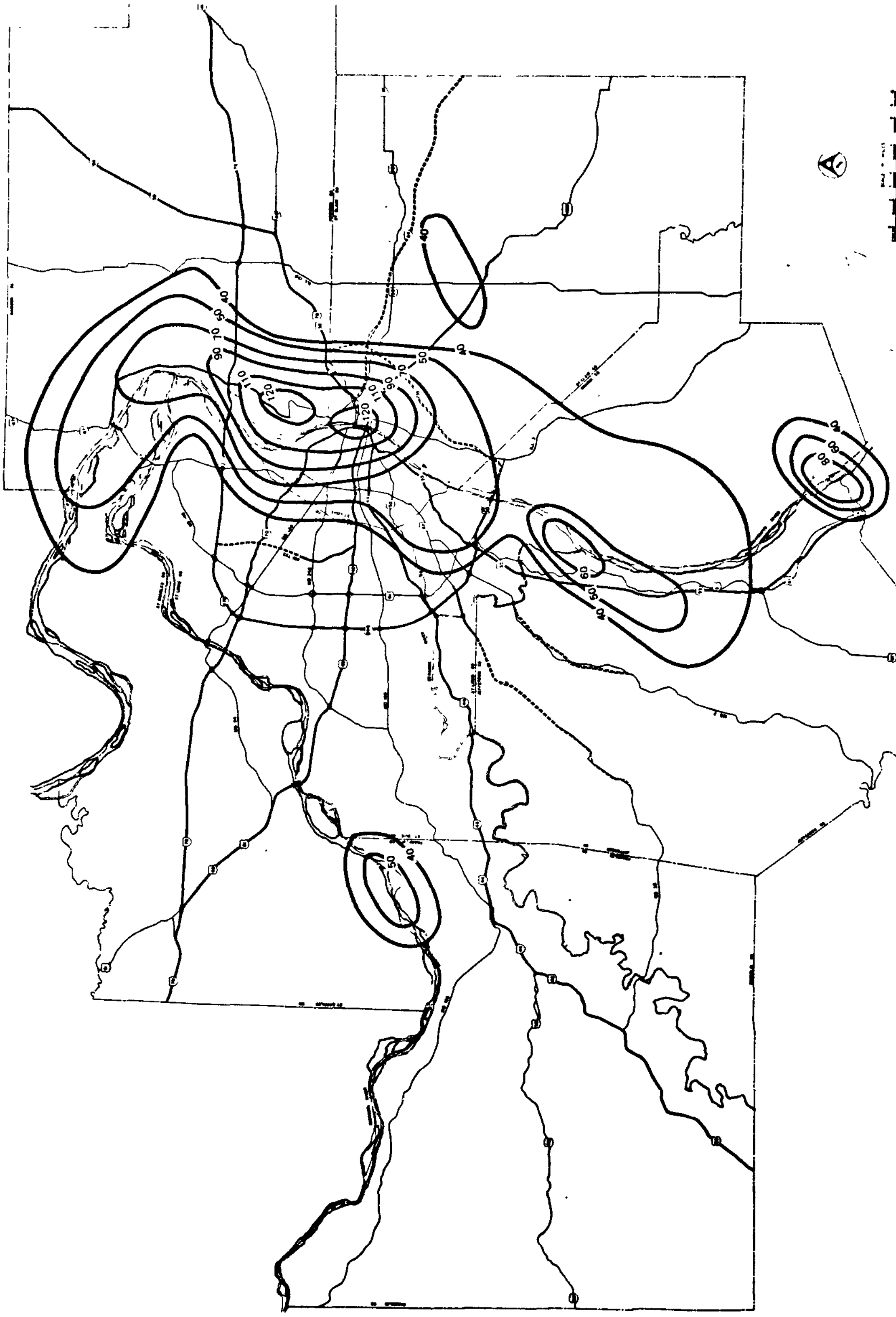


FIGURE III-7 1980 TOTAL SUSPENDED PARTICULATES-AIR QUALITY CONCENTRATIONS

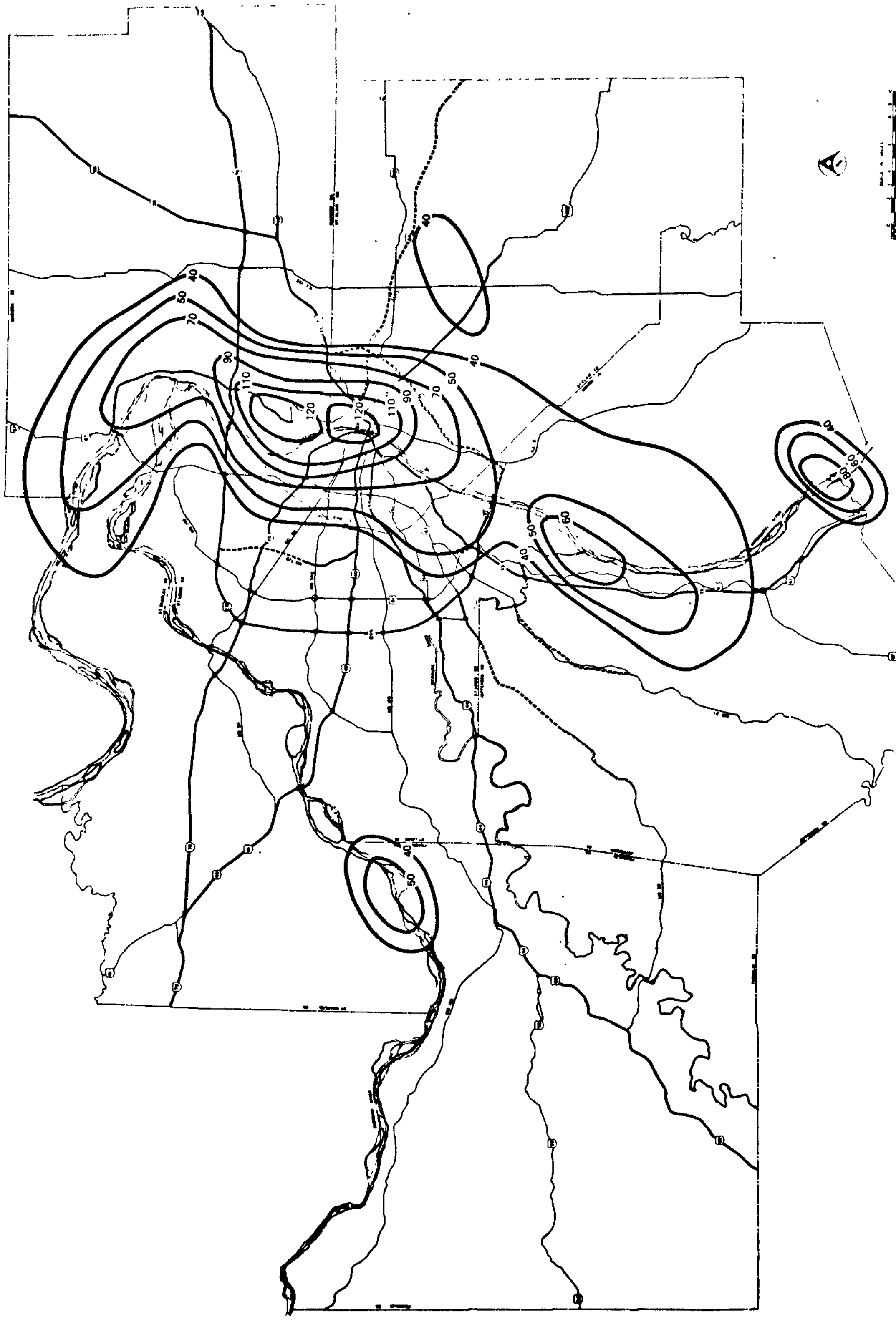


FIGURE III-8 1985 TOTAL SUSPENDED PARTICULATES—
AIR QUALITY CONCENTRATIONS

Table III-3

SULFUR DIOXIDE AIR QUALITY PROJECTIONS*

Point Source Location	Maximum 24 hour concentration, μgm/m³ (standard - 365 μgm/m³)		
	1975	1980	1985
1	38	145	145
2	322	400	400
3	221	243	262
4	308	308	308

Area Source	Maximum annual concentration, μgm/m³ (standard - 80 μgm/m³)		
	1975	1980	1985
1A 144 sq. mile central urban area	101.6	89.8	98.5
1B 182.25 sq. mile central urban area	80.3	71.0	77.8
2 36 sq. mile (Wood River)	66.2	82.4	105.0

*See Appendix F for supporting calculations.

- Calculate 1975, 1980, and 1985 CO emissions in the vicinity of the selected nine receptors using the subcorridor VMT analysis (see Appendix G)

- Calculate the change in emissions in the vicinity of each receptor from 1975 to 1980, and 1980 to 1985.

- Apply the corresponding percent change in emissions to the 1975 concentration at each receptor to obtain 1980 and 1985 concentrations.

This procedure is equivalent to a "roll-forward" type of calculation using the results of a calibrated diffusion model to represent baseline air quality.

Table III-4 shows the maximum 8-hour CO concentrations for the selected receptors for 1975, 1980, and 1985. Significantly, the projections for 8-hour carbon monoxide concentrations generally exceed the standard in 1975; by 1980 and 1985, concentrations are well below the standard. Figure III-10 shows the location of the receptor sites listed in Table III-4.

4. Photochemical Oxidants

The projection of air quality concentration for photochemical oxidants was accomplished by applying Appendix J of the Federal Register 40 CFR 51, Regulations on Preparation of Implementation Plans. Appendix J presents the relationship between percent reduction in hydrocarbon emissions and maximum one-hour photochemical oxidant concentrations. See Appendix H for the curve representing this relationship.

The EPA has defined oxidants as an areawide problem. Consistent with this definition, areawide hydrocarbon emissions from Table III-2 were used to determine percent emission reductions from the air quality

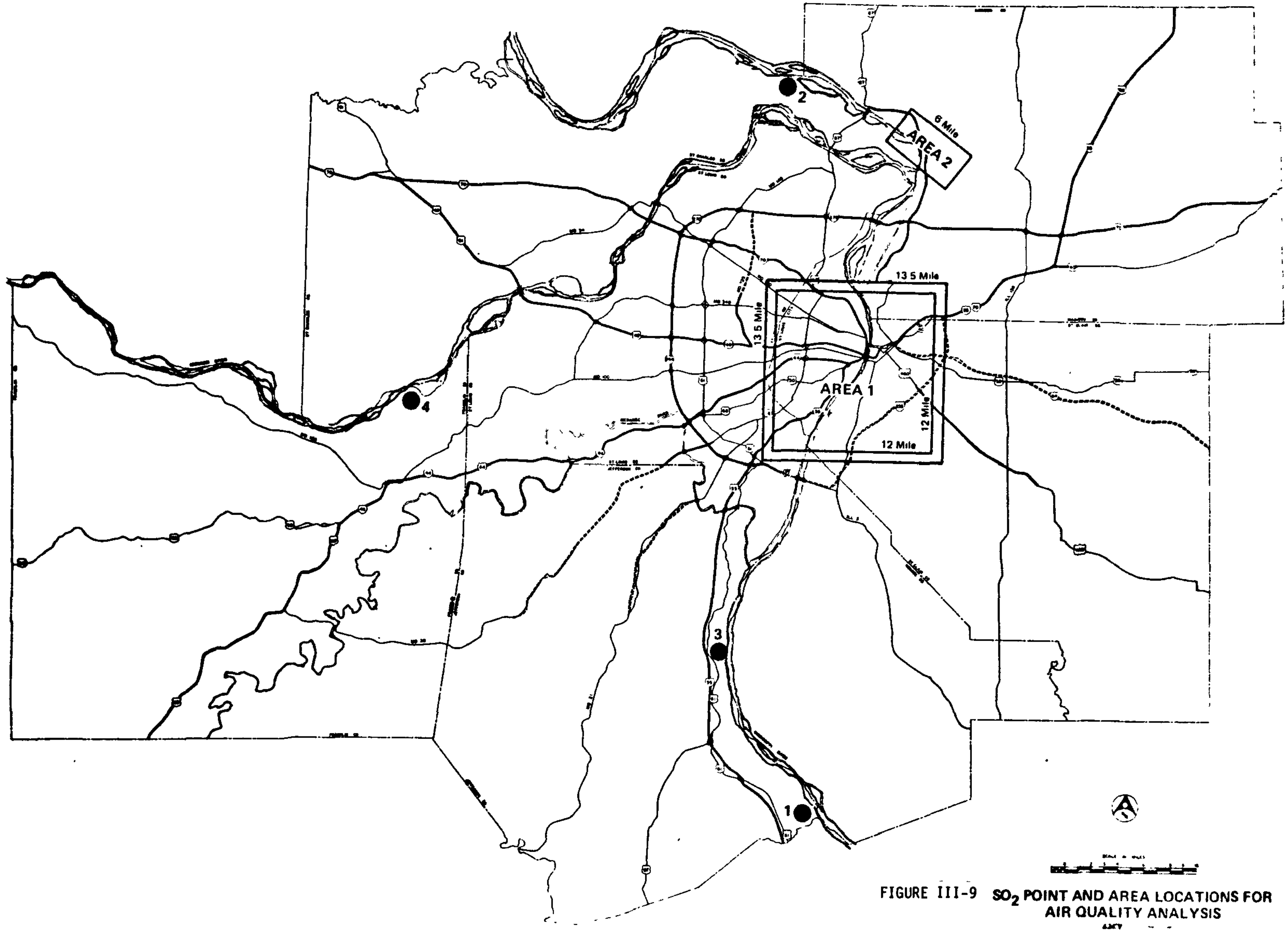


FIGURE III-9 SO_2 POINT AND AREA LOCATIONS FOR AIR QUALITY ANALYSIS

Table III-4

CARBON MONOXIDE AIR QUALITY PROJECTIONS

Receptor	Location	Maximum Eight Hour Concentration, ppm (Standard - 9 ppm)		
		1975 (a)	1980 (b)	1985 (b)
1	CAMP	10.8	5.44	3.15
2	I-70 & I-270	7.2	3.75	2.37
3	I-70 & Shreve	9.6	4.90	2.80
4	Lindbergh & Linferry	12.8	6.95	4.30
5	Hunter Ave. & Clayton	10.5	5.46	3.22
6	St. Ann	9.9	5.25	3.19
7	I-244 & Manchester	10.8	5.88	3.69
8	S.L. airport	8.8	4.60	2.76
9	U.S. 40 & Grand	10.9	4.52	2.37

(a) 1975 concentrations were generated using APRAC-IA urban diffusion model

(b) 1980 and 1985 are extrapolations of the APRAC-IA 1975 data using percent change in emissions from mobile sources generated from the subcorridor emissions analysis baseline year of 1972 to 1975, and 1980 to 1985. The 1972 second highest 1-hour concentration of 300 micrograms per cubic meter was used as the baseline.

Table III-5 shows the projected 1-hour oxidant concentration for 1975, 1980, and 1985. Note that the oxidant concentrations are approaching the standard by 1985 but do not attain it.

D. SUMMARY AND CONCLUSIONS OF THE AQMA ANALYSES

The conclusions of the air quality and emissions analyses follow for each pollutant considered.

1. Total Suspended Particulates (TSP)

a. Air Quality -- Ambient concentrations currently exceed the primary standards at several monitoring stations. The projected concentration distribution pattern changes very little over the 10-year period. "Hot-spot" areas can be identified which have the potential to exceed the standards during the 1975 to 1985 period.

b. Source Contribution -- Point sources and power plants are the primary contributors to the existing problem. However, increases are projected in all source categories. Growth in emissions is expected to be concentrated at existing sources or in the vicinity of existing sources. Growth accounts for less than 20 percent of projected total emissions in 1985. The contribution of fugitive dust to ambient concentrations is not known at this time.

c. Attainment and Maintenance of Standards -- The primary standards are projected to be attained by 1975 and maintained throughout the

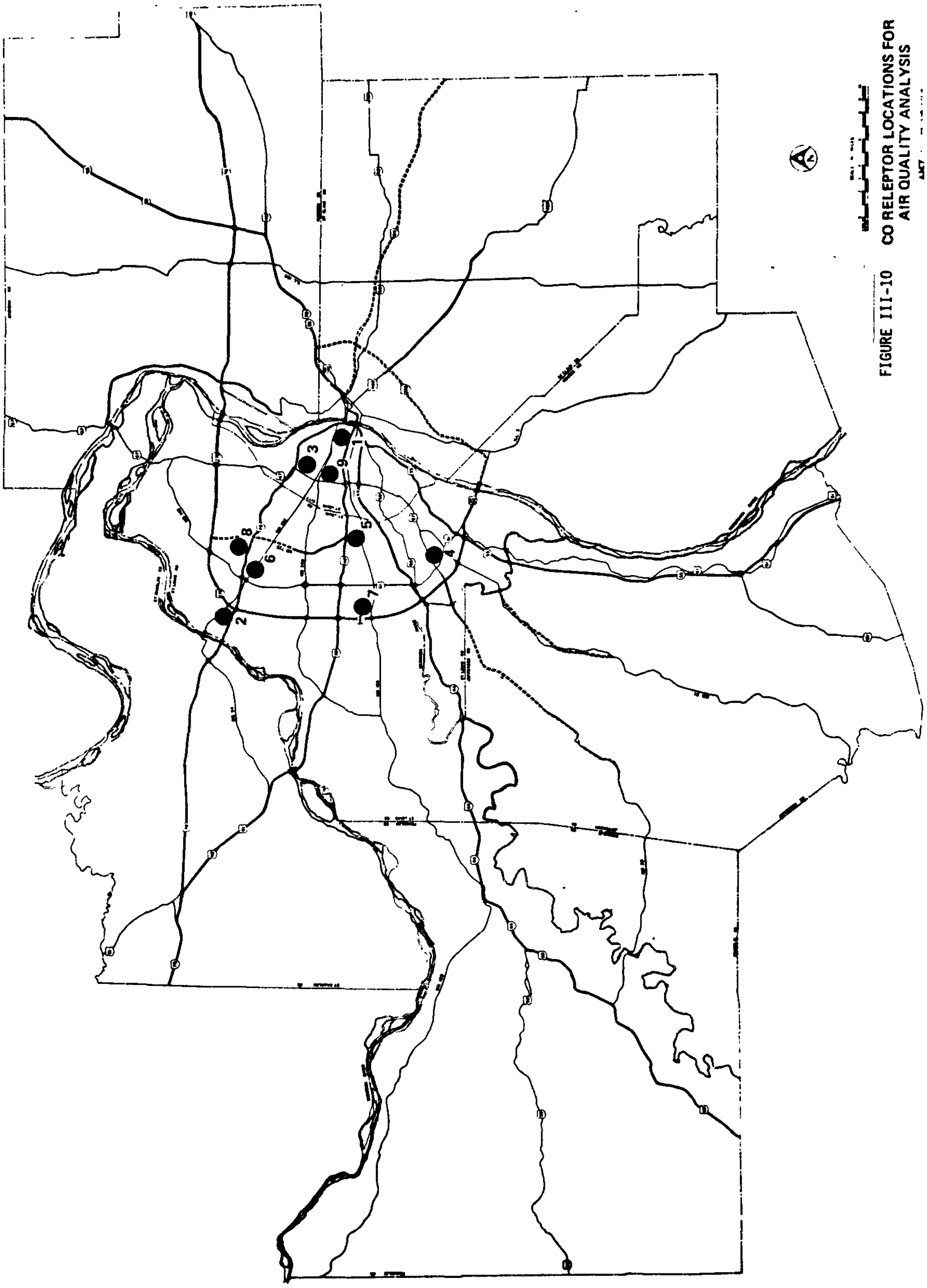


FIGURE III-10 CO RELEPTOR LOCATIONS FOR AIR QUALITY ANALYSIS

Table III-5

PHOTOCHEMICAL OXIDANTS
AIR QUALITY PROJECTIONS*

Location	Peak one hour Concentration $\mu gm/m^3$ (Standard - 160 $\mu gm/m^3$) 1975	1980	1985
Area wide highest value	240	190	180

*Application of Appendix J. Federal Register 40 CFR 51 to percent total hydrocarbon emission reductions for the St. Louis AQMA.

following 10-year period in most of the AQMA. However, "hot-spot" areas are identified where the primary standards are projected to be exceeded beyond the 1975 compliance schedule. Because the growth in emissions is projected to be concentrated in these "hot-spot" areas, maintenance of the standards will be a problem. Secondary standards are projected to be exceeded throughout the 10-year period in large portions of three counties and the city of St. Louis surrounding the "hot-spot" areas.

d. Actions Required -- An attainment and maintenance strategy is required for the "hot-spot" areas. A strategy is needed to maintain the secondary standard for TSP in the area immediately surrounding the "hot-spots."

2. Sulfur Dioxide (SO_2)

a. Air Quality -- Ambient concentrations of SO_2 on the Missouri side of the AQMA are all below the standards. Concentrations at isolated sites in the Illinois portion of the AQMA do currently exceed the primary standard. Air quality projections are highly dependent on the sulfur oxide emissions from isolated sources and indicate that a "potential" to exceed the standards exists only in the vicinity of these sources. No regionwide maintenance problem is projected.

b. Source Contribution -- Power plants and several large industrial point sources account for all significant contributions to existing and projected emissions of sulfur oxides. Growth in emissions is projected to be significant due to power plant expansions.

c. Attainment and Maintenance of Standards -- SO_2 standards are expected to be attained and maintained throughout the AQMA. Exceptions may recur in the vicinity of major power plants or specific point sources.

d. Actions Required -- A regionwide maintenance strategy is not required. However, more extensive monitoring and surveillance of major sources is required to ensure maintenance of the short-term standards in the vicinity of sources. Interim measures may be required to attain and maintain in the "hot-spots."

3. Carbon Monoxide (CO)

a. Air Quality -- Eight-hour standards are currently exceeded at several monitoring stations throughout the AQMA. Projected concentrations indicate several areas will exceed the eight-hour standard in 1975. All selected receptor sites are projected to be well below the standards by 1980. Maximum concentrations are associated with major highways and intersections.

b. Source Contribution -- Mobile sources are the primary contributor to CO emisssions in the AQMA and will still account for more than 50 percent of total emissions by 1985.

c. Attainment and Maintenance of Standards -- Once the 8-hour CO standards are attained, the continued decline in mobile source emissions will assure maintenance to at least 1985.

d. Actions Required -- A Transportation Control Plan (TCP) is currently in preparation to provide attainment of the CO standards. The TCP is expected to be adopted by February 1975. A regional maintenance strategy is not required at this time.

4. Photochemical Oxidants (O_x)

a. Air Quality -- Peak-hour oxidant concentrations currently exceed the standard and limited air quality trend data indicate increasing values. Oxidant values are projected to decrease due to decreases in total hydrocarbon emissions. However, the decreases are projected to be insufficient to attain the standard.

b. Source Contribution -- Mobile sources are currrently the most significant contributor to total regional hydrocarbon emissions. However, stationary point and area sources become more significant by 1985 as mobile source controls become more effective.

c. Attainment and Maintenance of Standards -- The oxidant standard cannot be attained or maintained with the existing SIP control measures. Uncontrolled (no TCP) projected oxidant concentrations exceed the standard beyond 1985.

d. Actions Required -- A Transportation Control Plan (TCP) is required for Attainment and a Maintenance Strategy is required.

E. LIMITATIONS OF ANALYSIS AND RECOMMENDATION FOR RESOLVING DEFICIENCIES

The review of available baseline data, projection data, and projection techniques revealed many deficiencies. In order to develop a sample AQMP within given constraints, the best available information was used and recent analyses were modified or extrapolated where possible. Overall, many simplifying assumptions were made because data are either unavailable or limited in nature. These assumptions and deficiencies should be verified or corrected where possible before plan submittal.

The state and local air pollution control agencies are currently working to resolve many of these deficiencies or conflicts and a revised emissions inventory is expected to be completed by January 1975. In addition, the RAPS/RAMS program is intended to provide a very complete analysis of air pollution and source contribution in the St. Louis area over the next five years.

The following paragraphs describe some of the limiting factors or assumptions in the sample analysis. Recommendations for resolution of these limitations are given where appropriate.

1. Data Base Problems

Many air pollution studies have been conducted in St. Louis over the past decade. Each of these studies produced some analysis of emissions or air quality based on the state-of-the-art in ambient monitoring and emission estimation. However, a review of these studies and available air quality and emissions inventories for the AQCR concluded that no consistent, complete, and current data base exists for the entire AQMA. The major reason for this is that the detailed studies which were performed were not updated on a continuing basis as new emission factors or monitoring methods were available.

a. Air Quality Data -- EPA's SAROAD data bank was the primary source of air quality data. The latest annual data available and verified at the time of this project was the 1972 annual summary. No 1972 Illinois station data were available in SAROAD.

The trend in particulate ambient data does not appear to be explained by the existing emissions inventory (as explained in the PRMS Region VII Summary). The City of St. Louis has increased monitoring frequency and listed additional sources of TSP not in NEDS which may be affecting the trend data. Photochemical oxidant values are increasing as monitoring of this pollutant is expanded. This will markedly affect requirements for emission reductions if this trend continues.

The RAPS/RAMS monitoring program will certainly expand the accuracy and representativeness of the air quality data network. It is recommended that TSP and SO_2 monitoring priorities be placed on sites in the "hot-spot" areas and around power plants.

b. Emissions Data Base -- No complete 1972 emissions inventory was available for the AQMP with the exception of NEDS. The NEDS data included old emissions data which had been converted into the NEDS format intermixed with new emissions data. Incorrect site locations and plant closings errors were among the inaccuracies noted. Illinois does not currently maintain its inventory in NEDS format and the IEPA considers the NEDS data for Illinois to be inaccurate.

The RAPS program will provide detailed emissions baseline data for St. Louis. However, it will not be in NEDS format. It is highly recommended that the detailed data base format used for the RAPS program be maintained and updated periodically and be used to update the NEDS listing for St. Louis. The MACC and IEPA are cooperating with local and Federal agencies in a program to update the emissions inventory. This effort should be complete by January 1975. It is recommended that a fugitive dust inventory be performed to supplement the efforts already under way by the City of St. Louis in this area.

The mobile source emissions data in NEDS are on a county basis. This is considered inadequate for CO modeling purposes. The Federal Highway Administration SAPOLLUT emissions model is recommended as the minimum format required for CO modeling. The EWGCC is currently studying the feasibility of using this program.

c. Emissions Projections -- In order to obtain a consistent controlled data base from which to project 1980 and 1985 emissions and air quality, the available data on emissions sources were first projected to 1975 to obtain the inventory at full compliance with SIP regulations. This assumes that all sources will be in compliance by 1975. The "controlled inventory" was then projected to 1980 and 1985 using available growth and trend data.

The growth factors were based on population trends, employment and industrial earnings projections, and traffic projections. Land use and distribution trends were used to distribute the projected growth in emissions. The use of such trend data as growth factors first assumes that growth in emissions is directly proportional to these growth factors. However, new and more efficient manufacturing techniques and control equipment may cause this assumption to be adjusted.

Population forecasts served as growth and distribution factors. The latest unpublished estimates show a marked decrease from previous projections for the urban area. Since the land use plans do not as yet reflect this change, further adjustment may be necessary. The land use plans also represent projected patterns of industrial and commercial growth and development.

There are four studies currently under way which could significantly alter the growth patterns in the area. They are:

- A railroad relocation study
- An airport study
- A port feasibility study
- A mass transportation plan

However, these plans will probably not be complete within the required time frame for initial AQMP submittal but should be included in further plan analysis.

2. Analysis Procedures

Some simplified procedures for emissions projection and disaggregation were developed as part of this project. They are described in the Appendices. The major drawback to utilizing any sophisticated modeling procedures at this time is the inconsistency and inaccuracy in the emissions data base and the demographic growth rate data.

As these deficiencies are resolved, an effort should be made to coordinate the collection of data in a form useful for input to the analysis techniques. Point source data are currently collected in a form suitable for input to models for particulates and SO_2. However, more short-term operational data would be useful. Area source data for these two pollutants are collected on a county basis which is not a sufficiently detailed scale to input to a model such as AQDM or CDM.

The CAASE program may provide adequate detail if CAASE distribution factors can be projected. Fugitive dust emissions must also be collected for input to the model for particulates.

Projected mobile source emissions data are currently available only on a county basis and are not suitable for input to any carbon monoxide air quality model which illustrates the pollutant distribution.

The results of the RAPS program will be invaluable to upgrading the emissions inventory and analysis procedures for the St. Louis area. However, they will not be available within the proposed time frame for AQMP submittal. Therefore, interim analysis approaches must be used. It is recommended that priority for all such interim analyses be given to the "hot-spot" areas. Recommended analysis procedures for each pollutant are described below.

a. Particulates -- A diffusion model such as AQDM or CDM can be applied to an updated and upgraded emissions inventory. This inventory should include fugitive dust. The assumptions concerning control factors used should be carefully evaluated. The RAPS program should provide the best available inventory and ambient data for such modeling.

b. Sulfur Dioxide -- SO_2 is a point source problem in St. Louis with ten sources contributing more than 90 percent of the AQMA total emissions. These sources should be modeled independently to determine their contribution to ground level SO_2 concentration. Again, the emissions data, stack data, and control information are critical and require a careful inventory or stack testing data.

c. Carbon Monoxide -- The technique developed to evaluate subcorridor growth indicates the potential to exceed the standards beyond 1980 exists only at the microscale or roadside level (assuming the Federal Motor Vehicle Control Program (FMVCP) is effective). If a demonstration of maintenance at this level is desired on an AQMA-wide or regional basis, a detailed traffic network for the year of interest is required to support the modeling effort. A site-by-site analysis could be required through indirect source control or highway Environmental Impact Statement (EIS) requirements.

d. Photochemical Oxidants -- Regionwide application of Appendix J is the only approved methodology for modeling oxidants at this time. Oxidants currently exceed the standards and the levels are apparently increasing in St. Louis. Therefore, a more sophisticated analysis is required to support a control strategy. It is recommended that reactive oxidant modeling be applied as the techniques become available. In order to support such a modeling approach, efforts must begin now to obtain a detailed inventory of reactive and non-reactive hydrocarbon emissions on a detailed (sub-county) basis.

IV. AIR QUALITY MAINTENANCE STRATEGY DEVELOPMENT

The air quality analysis indicates that attainment of the primary standards for TSP, SO_2, CO, and oxidants can not be achieved by 1975. In addition, maintenance strategies are required for TSP, SO_2, and oxidants. The development of a maintenance strategy, therefore, requires a review of existing and proposed attainment plans and an evaluation of alternative maintenance strategies. The following sections provide a brief review of the status of attainment plans and the evaluation of alternative maintenance measures. A proposed maintenance strategy is outlined and the constraints to implementation of the selected strategy are described.

The comments of the technical and administrative representatives of the St. Louis air pollution control and planning agencies have been included where possible. However, it should be recalled that all findings are presented as an example, or trial plan, and are subject to the limitation described in Chapter III.

A. AIR QUALITY ATTAINMENT PLANS

A first step in developing the air quality maintenance strategy is to review the existing air quality plans to determine if they are sufficient to attain and/or maintain the standards. Since all four pollutants were projected to attain the standards in the original SIPs, some discussion of the status of these plans is required.

1. Particulates (TSP)

The original projections included in the Missouri and Illinois SIPs predicted attainment of the TSP standards by 1975. These projections were dependent upon data base, analysis, control technique, and compliance schedule assumptions. In addition, it was assumed that the relationship between emissions and air quality was adequately defined by the analysis technique and the meteorological conditions given as representative of the "worst case."

Any one of these assumptions or conditions could have been too optimistic. However, because the current analysis given in Chapter III is subject to the same conditions, it cannot be assured that the 1975 air quality will exceed the standards.

It would not be justifiable to require additional TSP control measures to attain the standards at this time until it can be determined whether the existing controls are achieving the expected results. Therefore, the only additional attainment measures recommended at this time are measures directed at expanding the monitoring and surveillance programs.

Compliance schedules and source review procedures are currently being reviewed by EPA and state air pollution agencies. The City of St. Louis has increased the frequency of monitoring in order to provide a more accurate assessment of ambient air quality. Monitoring has also been expanded in Illinois. In addition, the RAPS program will eventually provide detailed ambient data and emissions data to determine the relationship between emissions and ambient concentrations.

The City of St. Louis has also compiled a list of sources of particulates not included in the existing inventory. This program could be expanded to include a regionwide compilation of "fugitive dust" emissions.

In summary, although current trends in air quality indicate the particulate standards will not be attained by 1975, the cause of this trend cannot be isolated. Therefore, no new attainment measures can be justified unless 1975 ambient data confirm this trend. Monitoring and surveillance programs are currently being expanded in order to verify the effectiveness of the existing attainment plan. It is recommended that a fugitive dust inventory be completed for the region as a part of this monitoring program.

2. Sulfur Dioxide (SO_2)

The SIPs for Illinois and Missouri both projected attainment of SO_2 standards by 1975. Current air quality is below the primary and secondary standard in Missouri. However, 1972 air quality exceeded the primary standards at several sites in the Illinois portion of the AQMA. The Illinois EPA feels these violations are related to individual sources.

The analysis in Chapter III concluded that the primary standards would not be attained by 1975 at several points in the AQMA due to source oriented problems. In addition, scheduled expansions at power plants provide the "potential" for short term standards to be violated depending upon individual source operational characteristics.

It is concluded that attainment of the SO_2 standards is a specific source oriented problem and efforts are currently underway to determine source compliance with existing regulations. No new attainment measures are required at this time. However, short-term violations of the primary standards are expected to occur in the vicinity of specific sources until compliance is achieved.

3. Carbon Monoxide and Photochemical Oxidants (CO and O_x)

St. Louis was not among the original group of cities required to submit Transportation Control Plans to attain and maintain the NAAQS for CO and oxidants. Recent ambient data from the expanded monitoring network suggest an attainment problem does exist for CO and oxidants. Therefore, the MACC in cooperation with the Illinois EPA and area transportation planning community representatives is currently preparing a Transportation Control Plan (TCP).

A study was performed by PEDCo Environmental Specialists, Inc., on the attainment of CO and oxidant standards* (referred to as the "Attainment Study") in March 1974. The results of this study are summarized briefly as follows:

> Carbon monoxide and oxidant air quality data collected during 1972 indicates that maximum eight-hour CO concentrations must be reduced by 46 percent and maximum one-hour oxidant concentrations must be reduced by 47 percent in order to attain the NAAQS throughout the AQCR. The Federal Motor Vehicle Control Program (FMVCP) will not be sufficient to attain either standard by 1975 or 1977. Therefore, additional measures are needed. Three strategies were evaluated in the Attainment Study as follows:
>
> > Strategy I -- Actions that will occur with the stimulus of a plan including: use of lighter-weight motor vehicles, reduced non-essential travel due to higher gasoline prices, improved mass transit, lower mass transit fares, and transit bus retrofit.
> >
> > Strategy II -- An active carpool incentive program plus the actions of Strategy I.
> >
> > Strategy III -- Application of maximum technically demonstrated stationary source controls plus Strategy II actions.
>
> When these strategies were evaluated and the results compared to the NAAQS, it was observed that Strategy II for CO and Strategy III for hydrocarbons would attain the standards by 1977. It appears impossible to attain the standards by 1975 without "highly disruptive and socially unacceptable control measures such as gasoline rationing or mandatory restrictions on gasoline-powered vehicle usage in the core area of the AQCR."

The results of this study were presented at public hearings in St. Louis. The hydrocarbon stationary source controls received the greatest opposition. This is significant to both attainment and maintenance of

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*PEDCo-Environmental Specialists, Inc. Attainment of National Air Quality Standards for Carbon Monoxide and Oxidants in the St. Louis AQCR. Cincinnati, Ohio: March 1974.

the oxidant standard because the analysis in Chapter III (which does not assume any of the suggested control strategies) indicates the most significant source of increased hydrocarbon emissions is the stationary point and area sources categories. If Strategy III above is adopted and implemented, both attainment and maintenance will be assured at least through 1985. The problems of implementing this strategy are discussed below.

B. EVALUATION OF MAINTENANCE STRATEGY ALTERNATIVES

The maintenance strategy must provide sufficient emission reduction to account for the projected growth or prevent that growth from occuring in areas where the ambient air quality is at or near the standards.

The maintenance problem in the St. Louis AQMA is characterized by a number of areas where existing sources are expected to continue to emit pollutants at rates that virtually preclude the influx of additional emission sources into these areas without violation of ambient air quality standards once they are attained. Maintenance strategies for these areas must include further emission reductions from the existing sources and/or effective methods of preventing new sources from locating in these areas.

The potential maintenance strategies outlined in Volume 3 of the EPA guidelines series for Preparation of Air Quality Maintenance Plans were reviewed and evaluated for application in the St. Louis AQMA. These are divided into two classes: emission source control measures and administrative approaches. In the following discussion those measures considered applicable to the St. Louis AQMA are described and the reasons for including or excluding the measure are discussed.

1. Emission Control Measures

- New Source Performance Standards (EPA)

  - Description -- Standards applicable to new or modified sources in specific stationary source categories proposed and promulgated by EPA.

  - Applicability -- In St. Louis AQMA, only two of the source categories will be affected--petroleum refining and petroleum storage.

  - Implementation Obstacles -- The Clean Air Act defines these as a "standard for emission limitation achievable through the application of the best system of emission reduction which the administrator determined had been adequately demonstrated." Some questions have been raised for the commercial availability of these "best systems."

  - Impact -- This measure is not projected to have a significant impact in the "hotspot" areas of St. Louis during the ten-year maintenance period.

  - Legal Authority -- Federal Regulations are adopted.

- Revision of Existing SIP Control Measures

  - Description -- More stringent emission limitations on existing source or new sources as a new or modified state regulation

  - Applicability -- Most of the major emissions sources have recently installed control equipment to meet SIP requirements by 1975. An emission regulation was found which would provide additional emission reductions in the problem areas. However, any reduction that might be obtained would impose an inequitable requirement on sources that have just completed installation.

    Two major source categories are not controlled under present regulation in all parts of the AQMA: fugitive dust and some stationary sources of HC. Fugitive dust has not been completely inventoried as yet for the AQMA and its impact on ambient concentrations is not known. Optimum control of stationary source hydrocarbon and carbon monoxide emissions has been proposed as an attainment measure.

- Impact -- Reductions in excess of 90 percent in 1972 hydrocarbons and CO could be obtained from such requirements (as described in the Attainment Study). This would more than account for the projected growth in hydrocarbon and CO stationary source emissions in the AQMA.

- Legal Authority -- Existing legislation exists in the permit systems for Illinois and Missouri. The control agencies would have to negotiate revised compliance schedules with affected sources as provided for in the state Air Conservation Laws.

- Implementation Obstacles -- Costs to industry is the primary obstacle. Total capital costs for optimum control of hydrocarbon and CO stationary sources is estimated at $70 million. The specific feasibility of individual systems is undetermined.

● Phaseout or Prohibition of Emission Sources

- Description -- Certain emission sources are eliminated by prohibiting their incorporation into new development. Existing sources are not affected until they require replacement.

- Applicability -- Emission projections have already included the elimination of residential hand fired coal heaters. The disposal of solid waste in electric power plants provides an opportunity to phase out all on-site incinerators.

- Impact -- The reduction of TSP due to elimination of on-site incinerators will depend upon how much of this solid waste would have gone to sanitary land fill as opposed to burning it. It does not appear to be a significant factor in "hot-spot" TSP reduction. However, initial experimental results indicate SO_2 emissions reductions at the power plant of 5 to 10 percent can be achieved. If SO_2 compliance schedules are enforced at the power plants, this additional reduction may be sufficient to ensure maintenance in the vicinity of these sources.

- Legal Authority -- Existing regulations defining the fuel limitations for power plants can be modified to allow the burning of solid waste.

- Implementation Obstacles -- The success of experimental results should eliminate opposition. The only real obstacle is the availability of supply.

- Control of Fugitive Dust Sources

  - Description -- Control of dust resulting primarily from construction activity

  - Applicability -- Fugitive dust has not been inventoried throughout the St. Louis AQMA, although the measure is applicable.

  - Impact -- The City of St. Louis is currently listing small sources of particulates not included in the point source inventory. If these sources contribute significant amounts to the particulate concentrations in the central urban area, control of these sources could be important to attaining the standards in this hot-spot area. Paving and oil treatment of roads is already used to some extent to control fugitive dust.

  - Legal Authority -- If new sources are not covered by existing regulations, new regulations must be added or existing particulate emission regulations tightened.

  - Implementation Obstacles -- Cost-effectiveness of small source control may be an obstacle. The major obstacle at present is the lack of a completed fugitive dust source inventory.

2. Administrative Procedures

a. Emissions Allocation -- The Emission Allocation system requires that emissions of pollutants be limited to ensure the NAAQS levels are met within the AQMA. The purpose of the emission allocation is to utilize land use policies or control measures to maintain air quality levels through the comprehensive land use plan.

Thus, if future levels of land development in a region can be predicted, the type of air quality maintenance policies that would be necessary to ensure that air quality standards will not be violated could be determined. The revised comprehensive plan would provide a description of the nature of future development and the policies required to maintain air quality.

The state air pollution agencies could delegate responsibility for development of an emissions allocation scheme to the regional planning agency (EWGCC). The regional planning agency would then act in an advisory capacity to the state air pollution agencies to inform them of areas which are likely to exceed the emissions limitation.

This administrative procedure can be based on the Regulation XXIII described in Appendix I. The regulation allows the pollution control agency to adopt more stringent regulations in areas which exceed the standards or exceed certain emissions limitations. This regulation would have to be strengthened to provide a variable emissions limitation ceiling to prevent emissions from one jurisdiction which does not exceed the limitation from causing an adjacent area to exceed its ceiling due to atmospheric transport of pollutants. A regional emissions allocation system based on the assimilative capacity of the atmosphere would be the best approach.

The EPA Guidelines documents describe six steps to integrate air quality goals into the land use and transportation planning process under the emission allocation procedures as follows:

- Compile detailed inventories of air pollution emissions in planning subareas of an AQMA or air basin. Emission data must be obtained for each planning subarea and not disaggregated from county or AQMA totals.

- Designate maximum emissions allowable in each planning subarea to achieve and maintain air quality standards, based on an analysis of present air quality and the assimilative capacity of the air to absorb pollutants and still maintain air quality standards.

- Estimate planning subarea emissions likely to be generated by sources indicated in land use and transportation plans for designated future time periods and compare these emissions with the allowable emission limits.

- Evaluate and revise regional land use and transportation plans so that prescribed emissions limits would not be exceeded.

- Adopt and implement regional land use and transportation plans, emission controls, and other measures that are prepared to meet air quality goals and standards.

- Monitor public and private development through a refined environmental impact assessment process in which emissions projected directly or indirectly from proposed projects are accounted for.

The key to this process is the concept of allocating air pollutant emissions within an AQMA. As long as plans and projects conform to prescribed emission limits, air quality standards should be maintained.

The Guidelines document suggests an appeal process would permit deviation from prescribed limits where technical information is available to demonstrate that air quality standards will not be exceeded by the proposed deviation. The state air pollution agencies would create such an appeal process.

Some limitations of this strategy include:

- The assignment of powers over land use to a regional or state agency. Municipalities will feel that they have lost some control over land use decisions to any agency removed from direct popular control.

- The possibility that the regional agency will make land use decisions ignoring other important social needs. Comprehensive planning agencies will argue that "the tail is wagging the dog" in regional land use planning, since air pollution control should be just one of the factors that influence regional land use decisions.

- Using Regulation XXIII as the enforcing mechanism requires the area to exceed the NAAQS as the emissions limitation before corrective action begins.

- It may require an extensive EIS review process.

- It provides no assurance that the policies developed during the preparation of the air quality maintenance segment of the comprehensive plan will be implemented.

The major advantage to this approach is that it can operate within the existing institutional structure with very little additional legal authority required.

b. Regional Development Planning -- This administrative procedure requires that air quality considerations become an integral part of the regional planning process, and that constraints on development be shown in regional plans if they are indicated to be necessary to maintain air quality standards. Regional development policies by themselves may have a significant effect on the location of pollutant emission sources and the exposure of the populace to them.

Several major studies are currently underway in St. Louis that could significantly impact regional growth and development and the resultant air quality. Three such studies are described briefly below:

- Port Facilities Plan -- In late February 1974, a Phase I report on the study of the Port of Metropolitan St. Louis was presented to the Council. This report summarized the results of the six objectives of Phase I of the study:

  - Identify the role of the waterways and the impact of the Port on the regional economy

  - Identify current and potential markets and the Port characteristics to serve them

  - Identify existing Port facilities

- Identify constraints to Port development and needs

- Present findings, conclusions, and recommendations

- Prepare objectives and plans for Phase II

Phase II, to be completed in late 1974, will provide specific recommendations for actions to enhance the position of the St. Louis Port. More details will be given as to the location of new and improved facilities, the organization of a regional port authority, and the location and type of industries that can be attracted to St. Louis with the new and improved port facilities. The output of this study could affect the location of new industrial land and on the type of industry and amount of employment that can be expected from the industry. All these factors will affect the development of the AQMP.

- Railroad Relocation Study -- A draft of the results of this two-year study was represented to the Council in late Spring 1974. The draft presented three proposals for relocating the maze of railroad tracks and yards in the St. Louis region. A total of 63 yards exist within the region. The most ambitious and most costly plan calls for the creation of an 8-mile long main classification yard supplemented by 8 industrial support yards. The proposal, which has been generally backed by both government and business leaders, would free 1200 acres of land for development. Much of this land would be along the riverfront and would be desirable for industrial development. This would have a dramatic effect on potential new point source emissions and on the AQMP development. In addition, many of the 98 at-grade railroad crossings on the Illinois side of the region would be eliminated. This would help to increase vehicular traffic flow and should have an effect on the mobile source pollutants. The final report of the study is expected by the end of 1974.

- Airport Master Plan -- There is presently a controversy in the region concerning new airport facilities. One faction wishes to keep the existing airport, Lambert-St. Louis International, as the main facility until the year 2000. The second faction wishes to build a new 18,000-acre airport along the St. Clair-Monroe County boundary between Columbia and Waterloo, Illinois. Applications for master plans of both facilities have been filed with the Federal Aviation Administration; it appears that a short-range study with no land acquisition will be approved for Lambert and that a full study of the Illinois site will be approved. Estimates are that the Lambert master plan would be completed by the end of 1974 or early 1975 and that the Illinois site planning would commence shortly thereafter. These are vital to the AQMP development because of the drastic change that the Illinois site would make in land use and transportation activities.

The conclusions from these studies can represent regional policy. The impact of these policy decisions on air quality could be evaluated as part of a revised regional comprehensive plan development. For example, the proposed railroad relocation could free many acres of land for redevelopment. If this land is developed for heavy industrial use, it could have a significant impact on air quality.

Regulation Number XVIII - Approval of Planned Installations, Land Use Plans, and Zoning Regulations, requires the Executive Secretary of the MACC to review all land use plans and zoning regulations and proposed changes in zoning classifications prior to formal regulations and prepare recommendations (see Appendix I). No such plans or regulations may be adopted without the approval of the Secretary.

This regulation could form the basis of a review process between the state air pollution control agencies and the regional planning body (EWGCC) to ensure air quality maintenance through the comprehensive plan development process as follows. The state air pollution agencies could review the revised comprehensive plan for consistency with the SIP and in particular air quality maintenance.

The state air pollution agencies could delegate their responsibilities under paragraphs B and C of Regulation Number XVIII to the regional planning body to review the local land use plans and zoning regulations for consistency with the air quality maintenance policies of the revised regional comprehensive plan.

The planning agency (EWGCC) would then inform the air pollution control agencies and the local communities of its review. In the case of inconsistency, EWGCC could advise the community and request a revision be submitted for review.

Since the community planners would participate in the development of the revised regional comprehensive plan, conflict should be minimal. A variance board could resolve conflicts.

This administrative procedure requires the development of a revised regional comprehensive plan with air quality consideration and the periodic review of regional development programs or zoning regulations for their consistency with the air quality maintenance policies of the revised regional comprehensive plan.

It must be recognized that regional plans, as well as community master plans, rarely carry any legal enforcement. They are dependent upon zoning or other land use or ordinances for implementation. Therefore, the review and revision of comprehensive plans or regional development actions alone would not provide for enforcement of these policies.

Some action must be taken by the air pollution control agencies if the actual source development is not consistent with air quality maintenance policies of the community plans. This action could be part of the existing source review procedures.

c. Emission Density Zoning -- Requires that emissions of a pollutant be limited to prescribed levels within a definite spatial area. This measure is related to emissions allocation and is generally applicable. Special application might be to the "hot-spot" areas. As in emissions allocation, the impact is dependent on the ability of this administrative approach to prevent the standard or allowable emissions level from being exceeded. If fully and accurately implemented, it should allow all areas to maintain the standards.

Since each municipality in the St. Louis area has its own zoning ordinance which cannot be overriden by the County, it is assumed that implementation would have to be at the local level. This would require a new zoning ordinance in each municipality. To implement at a regional level would require each State to delegate responsibility for this particular zoning ordinance to a regional agency and the local zoning boards to relinquish their authority in this area. There would be strong political opposition to such a move.

d. Zoning Approval and Other Indirect Regulatory Controls -- This involves controlling and directing urban growth through such techniques as zoning, subdivision regulation, capital facilities ordinances, development timing controls, moratoriums, policies for critical areas, and A-95 review process. These measures are generally applicable at the local level as part of any long-term community planning and development program. These measures can be used to channel growth into areas that are not overburdened from a pollution standpoint.

Currently, the authority to implement exists at the municipal level for this class of measures. However, it is not directed at controlling air pollution. All such indirect growth controls may be in direct opposition to many growth and development policies in the central urban area. As long as environment is not a community priority in these areas, social and political opposition to growth controls must be considered.

e. Transportation Controls -- This term applies to a diverse group of measures that directly or indirectly reduce emissions from mobile sources. All such measures were considered in the attainment study for CO and oxidants and are currently being reviewed for inclusion in the Transportation Control Plan for St. Louis to be submitted in February 1975. The reader is referred to these studies for a review of the applicability of these controls to St. Louis.

f. Indirect Source Review and Environmental Impact Statements -- These are Federal regulations as given in 40CRF 51 and NEPA Section 102(2)(C).

They provide requirements for reviewing and determining the impact of proposed projects. EISs are performed as required by law. However, they do not prevent the completion of a project with adverse air pollution impact. The Indirect Source Review agency has not been designated as yet in Missouri.

The impact of these measures in maintaining air quality is indirect. They act as a monitoring and surveillance program and are dependent upon adherence to conclusions of these reviews.

3. Conclusions

The following criteria were applied to the generally applicable measures described above:

- Long-term effectiveness
- Effectiveness in preventing the location of new sources in "hot-spot" areas.
- General application to the potential problem or "hot-spot areas"
- Implementation obstacles

The conclusions from this evaluation are as follows:

- Long-term air quality maintenance requires a regionwide, comprehensive approach associated with the community planning process. Two administrative approaches appear applicable and implementable--Emissions Allocation and Regional Development Planning.
- Measures which have long-term general application and effectiveness as part of a comprehensive approach include: indirect source review and EIS, transportation control measures, and indirect regulatory controls, Federal New Source Performance Standards.

- Emission source control measures which have short-term or long-term effectiveness in the "hot-spot" areas include: more stringent controls on existing sources, phaseout of emission sources, control of fugitive dust.

C. RECOMMENDED ATTAINMENT/MAINTENANCE STRATEGY

The air quality analysis, status of attainment plans, and evaluation of maintenance strategy alternatives indicate that the best available approach to the attainment and maintenance of air quality in the St. Louis AQMA is a program which includes:

- Full implementation and enforcement of all attainment plan measures included in the state implementation plans
- Expanded monitoring and surveillance through the RAPS/RAMS programs
- Long-term comprehensive approach to air quality maintenance
- Interim measures to ensure maintenance during the period required for development and full implementation of the long-term approach.

A summary of the proposed plan elements for each pollutant is shown in Table IV-1. The following sections describe the recommended Interim Measures and Administrative Approach which could be used as the basis for the long-term comprehensive plan. The Intergovernmental Cooperation required to implement this plan is described in Chapter V.

1. Interim Measures

As indicated in the previous section, immediate interim measures may be the best avenue for air quality maintenance in St. Louis until the AQMP can be incorporated into a comprehensive plan in the late 1970s. Several of these interim measures are described below.

TABLE ~~I-2~~ IV-1

PROPOSED ATTAINMENT/MAINTENANCE STRATEGY

Pollutant	Attainment	Interim Maintenance	Long-Term Maintenance
Total Suspended Particulates (TSP)	SIP Regulations enforcement, extended monitoring and surveillance	Implement "hot-spot" regulations	Long-term comprehensive approach
Sulfur Dioxide (SO_2)	Enforcement of SIP Regulations, extended monitoring and surveillance	Implement "hot-spot" regulations, burn municipal refuse in power plants, SO_2 reduction at power plants	Long-term comprehensive approach
Carbon Monoxide (CO)	Transportation Control Plan (TCP)	(Required if TCP Strategy II or III* are not implemented). Indirect Source Review, exclusive bus/carpool lanes	Long-term comprehensive approach
Photochemical Oxidants (O_x)	Transportation Control Plan (TCP)	(Required if TCP Strategy III* is not implemented). HC stationary Source Control	Long-Term comprehensive approach

*As described in PEDCo "Attainment Study"
STRATEGY II -- Carpool incentive program plus indirect actions occurring with stimulus of plan.
STRATEGY III -- STRATEGY II plus maximum technically demonstrated stationary source control.

a. Municipal Refuse (SO_2 Control at Power Plants) -- Approximately three years ago, the EPA, Union Electric, and the City of St. Louis embarked on a pilot project to determine the feasibility of using municipal solid wastes as a fuel in power plant generators. The results of the experiment were made public in early 1974. They indicated that it was feasible and, in fact, economically profitable for Union Electric. Discussion with Union Electric officials and newspaper reports indicate that by 1977, Union Electric will have a system organized whereby all the public and private refuse collectors will take the refuse to a sorting station, where the burnable refuse will be separated from the nonburnable. The nonburnable, principally metals, will be sold as scrap while that which can be burned will be taken to the main power plants. It will be used as almost 10 percent of the fuel requirements for the generators, with 90 percent of the fuel being coal. This use of refuse as a fuel should reduce SO_2 emission by a minimum of 5 percent and a maximum of 10 percent at the power plants. The trial data indicates TSP emissions at the plant are not significantly increased. This measure does not provide a significant additional decrease in TSP emissions in the "hot-spot" areas due to decreased use of municipal incinerators, because most of this solid waste burning is being phased out due to use of sanitary landfill.

b. Sulfur Dioxide Emission Reductions at Three Major Power Plants -- The projected emission inventory data for the Labadie, Meramec, and Sioux power plants of Union Electric do not contain a future reduction to account for SO_2 control of stack gases, even though the three plants would be in violation of Missouri state regulations for allowable SO_2 emission rates in the St. Louis area (2.3 pounds per 10^6 BTU input). Recently, EPA issued a notice to Union Electric Company which indicated that these three plants may prevent attainment of NAAQS. The notice called for a conference with the company to determine SO_2 compliance schedules for the three plants, which would subsequently be enforceable by EPA.

If emission reductions are required, they will probably occur prior to 1978 and, therefore, may be considered as interim maintenance measures.

These potential reductions represent a large portion of total projected regional SO_2 emissions. Compliance with the existing regulations would bring about the following percentage reductions (from the 1975 projected emissions), according to calculations performed by EPA:

- Labadie -- 56 percent
- Meramec -- 6 percent
- Sioux -- 53 percent

This is equivalent to approximately 383,000 tons/year of SO_2 eliminated for all three plants, or 38 percent of projected 1975 SO_2 emissions in the AQMA.

Reductions at two of the plants probably could not be achieved just by using lower sulfur coal. If control equipment is installed to remove SO_2 from the stack gases, even higher control efficiencies than those required by the regulations might be obtained.

c. Indirect Source Review (Carbon Monoxide Control) -- The Transportation Control Plan for the St. Louis area, scheduled to be submitted in February 1975, will provide for attainment of CO and oxidant standard by at least 1977. The emission analysis in Chapter III indicates that total emissions of CO for the AQMA, individual counties, and the individual subcorridors, should decrease from the attainment date until 1985. This continuing reduction in emissions primarily reflects the greater impact of the Federal Motor Vehicle Control Program (FMVCP).

Based on the projected decrease in emissions and on assumptions that a Transportation Control Plan is approved, the only remaining problems with maintenance of the CO air quality standard through the year 1985 should be a microscale or individual indirect source level.

Significant new and modified indirect sources in the AQMA are subject to a prior analysis of their local impact on CO concentrations by EPA or its designated review agency. This review procedure should ensure that no new or modified indirect sources cause the CO air quality standard to be exceeded locally in the interim period until an air quality analysis can be incorporated into the regional transportation planning process, and should be equally effective thereafter. Thus, indirect source review is capable of preventing all of the near-term potential microscale problems not considered in the Transportation Control Plan. The FMVCP, and indirect source review provides a comprehensive approach to CO control and maintenance in this interim period.

The requirements and general activities of the review process are described in 40 CFR 52 of the Federal regulations. At the time of preparation of this report, Missouri had not yet designated the agency(s) responsible for the review in the St. Louis AQMA, nor had it established the detailed procedure for submitting applications for approval or review of these applications. Therefore, the mechanics of the review and procedures for coordination with the agencies implementing the Transportation Control Plan cannot be described herein.

According to the Federal regulation, approval of a proposed indirect source is to be based on the following two criteria:

- No violation of the applicable control strategy of the Transportation Control Plan
- No violation of the carbon monoxide standard or no delay in the attainment if the date specified for attainment has not been reached

Both of these determinations will require data on existing CO concentrations at proposed sites of indirect sources. It is anticipated that this data would eventually be available from the transportation planning agency as part of their ongoing program. However, during the interim period, this information would need to be generated for each specific location by the applicant or the designated review agency.

d. Exclusive Bus/Carpool Lanes (Carbon Monoxide Control) -- This measure would help reduce the number of vehicle trips made in the AQMA, especially during the morning and evening peak traffic hours. One freeway in St. Louis, I-70, is well suited for such a conversion to bus/carpool lanes. The freeway has two center reversible lanes that are used as express lanes for vehicles in the peak hours. The traffic flow in these lanes is with the major flow of the particular peak hour--inbound to the central business district (CBD) in the morning and outbound in the evening. The lanes could be converted to bus/carpool lanes with a minimum of effort. They would operate similarly to the Shirley Highway (I-95) bus/carpool lanes in the northern Virginia suburbs of Washington, D.C. Prior to the energy emergency in the winter of 1974 a six percent reduction in automotive VMT had been realized on this facility.*

Since traffic volumes along I-70 in St. Louis approach 100,000 vehicles per day, a six percent reduction, especially during the morning and evening peak hours is significant. Using an estimate of a.m. peak-hour volume of 12,000 vehicles on a six mile stretch of I-70, an exclusive bus lane along six miles of the facility would produce 72,000 VMT. A six percent reduction would mean 4,320 less automotive VMT on the freeway during an a.m. peak period.

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*Fisher, R. Shirley Highway Express Bus on Freeway Demonstration Project. Prepared for presentation at Highway Research Board 51st Annual Meeting, January 1972, p. 11.

There should also be some thought given to providing preferential bus usage of curb lanes on major city streets. This measure would increase the speed of buses, thereby making them attractive to the public as a means of transportation. This should increase ridership and reduce the overall number of vehicle trips made in the AQMA. This action would help reduce the amount of HC and CO emissions for the AQMA and thereby improve air quality in the heavily traveled corridors.

Analysis in the Attainment Study report indicated that approximately 160,000 VMT per day would be eliminated along major routes through the increased use of mass transit. A report of the Bi-State Transit System suggested controlled curb lane usage along four routes and the possibility of such usage on two other routes.* The total mileage of the six routes equaled 40, thus, the VMT reduction per mile equalled 4,000. The routes, their length, and subsequent VMT reduction follow:

Route	Length (miles)	VMT Reduction
Natural Bridge/N.Florissant/ 12th Street	8.0	32,000
Lindell/Olive Street	4.5	18,000
Southwest Ave./Vandeventer/ Market Street	6.0	24,000
Gravois/12th Street	7.0	28,000
Kings Highway	8.0	32,000
Delmar	6.5	26,000
TOTAL	40.0	160,000

*Transit Improvement Program, 1971-1975. Bi-State Development Agency, St. Louis, Missouri, January 1971, p. 48.

Additional routes will be developed during the master plan update that the City of St. Louis is preparing and in the regionwide mass transit study that East-West Gateway will initiate by the end of the summer.

Once these routes have been decided, legal authority must be exercised in order to implement them. Along I-70 and any other freeway that may be used, the Missouri Highway Department must be consulted since they own the right-of-way for the freeway and provide all maintenance for it. The Highway Department must agree to any exclusive use of the freeway lanes irrespective of local jurisdiction.

Within the City of St. Louis, an ordinance must be passed that will spell out the uses of the freeway lanes and the preferential curb lanes for each street. This ordinance must specify the street, the section of the street, the time of day, and what vehicles are permitted to use the lane. Penalities and/or fines must also be included in the ordinance. St. Louis County is developing an arterial road system. Should a preferential curb lane that is on the system be required on the street over which the County has jurisdiction, an ordinance must be passed. If the lane is on a street that is not on the system, then the local community has jurisdiction and must pass the ordinance.

<u>e. Cost-Effective Stationary Source Hydrocarbon Controls</u> (Oxidant Reduction) -- The Attainment Study for CO and oxidants described optimum control by major stationary sources in the St. Louis area.* The major objection to this measure is the $70 million cost estimate. These controls are described as "maximum, technically demonstrated, control technology." If these controls are adopted as part of proposed Transportation Control Plan Strategy III, they will provide sufficient control together with Federal New Source Performance Standards for these sources

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*PEDCo-Environmental Specialists, Inc.

to attain and maintain the oxidant standard through at least 1985. If, however, they are not adopted, some form of stationary source HC control will be required as a maintenance measure to account for the projected growth in this category of sources. In this case, it is recommended that a cost-effective level of control be negotiated with each source. This would require the least-cost systems which would provide for maintenance of regional HC emissions at the level of the standard or below. That is, once the standard is attained by the TCP, any expansion at the source must be counteracted by an equivalent reduction due to increased control of existing emissions.

2. Recommended Long-Term Comprehensive Approaches to Air Quality Maintenance

A regional comprehensive approach to air quality maintenance for the St. Louis AQMA is required if long-term land use and environmental objectives are to be attained. While air quality considerations can be incorporated into local planning efforts, the overall guidance must be provided from a regional perspective. The technical and administrative problems of using local planning to achieve air quality support the need for a regional approach to develop policies related to air quality maintenance. For example:

- Local efforts to improve air quality in existing problem areas cannot be accomplished without comparable efforts in other areas, because of the interjurisdictional transport of pollutants.

- Local land use plan impacts on air quality cannot be quantified without a regional approach.

- Local land use plan impacts on traffic volumes and transportation system needs cannot be evaluated except within the context of regional multimodal models.

- Oxidant is an areawide pollution problem that requires regionwide policies for control.

Due to these and other factors, the development of a regional comprehensive approach to air quality maintenance appears to be the primary long-term maintenance strategy for the St. Louis AQMA. To be approveable and effective, such a strategy must be shown to be both implementable and enforceable. This requires the integration of air quality maintenance and comprehensive planning. In fact, specific long-term measures which may be adopted as part of such a regional plan will be dependent on the plan for effective analysis and implementation.

A first step in the implementation process requires the development of a revised or updated regional comprehensive plan using air quality maintenance as a constraint.

This could be accomplished by an evaluation of alternatives for environmental and, in particular, air quality impact. The existing regional plan could be quantified to provide a baseline for comparison of alternatives. A maximum effort would require a detailed quantification of the land use and transportation plans.

Four major studies are currently under way, the results of which could have a significant impact on development of policy, and thus on the urban structure. These are:

- The railroad relocation study
- The airport feasibility study
- The port feasibility study
- The mass transit study with the transportation planning process

The impact of changes in these facilities on air quality must be evaluated. This provides an opportunity to develop the methods to evaluate alternatives. It also provides an opportunity to develop techniques to quantify the effects of policies or policy decisions on air quality.

Air quality maintenance policies may be developed in an attempt to ensure that various alternatives meet the air quality constraints. These policies should be incorporated into the body of policies and goals which are part of the comprehensive plan.

The next step in the implementation and enforcement process would be to follow and enforce an administrative procedure developed to ensure adherence to the policies developed. Two alternative administrative procedures were described above which are considered applicable. The State Air Pollution Agencies, the regional planning agencies, and local and public agency representatives should select the most appropriate method. The selected approach must be presented to the public together with the revised comprehensive plan at public hearings. The comments from the public hearings must be considered in the plan.

Emissions allocation appears to be the best administrative approach for long-term air quality maintenance from a standpoint of adequacy and enforceability. However, the administrative structure and procedures required to implement this approach will take considerable time and effort to establish. It is therefore recommended that Regional Development Planning be implemented until the optimal procedure and structure for implementing an Emissions Allocation approach can be determined and implemented.

A review of the impact of the four land use and transportation projects described above can be used as the first step in implementing this regional development planning. In addition, the Air Pollution Agencies and the EWGCC Advisory Board should cooperate to "persuade" new significant sources of TSP and SO_2 to avoid the "hot-spot" areas.

If persuasion fails to obtain the desired results, the "hot-spot regulation" (see Appendix I) and new source review regulations can be strictly enforced to formalize the planning procedure. The deterrent to strict enforcement of these two regulations is that they are applied after many decisions and commitments have been made by the source. Community priorities or pressures may also be involved at this point, creating political opposition to the enforcement of these regulations.

As the administrative structure and technical review procedures needed for an Emissions Allocation system are developed, they can be phased in by application to the "hot-spots." The RAPS program should provide the data and techniques needed to determine an emissions ceiling in each planning area of the community. Emissions allocation can then be used as a technique to justify strict enforcement of the existing or modified "hot-spot regulation" and Source Review Regulations; or the Emissions Allocation can be formalized by adopting regulations establishing regional and/or local area emissions ceilings.

It is recommended that the final form of the administrative structure and technical review procedures be determined through the cooperative efforts of air pollution agencies and community planning representatives in order to ensure the incorporation of air quality maintenance into comprehensive community planning and community goals and objectives.

D. TIMETABLE FOR DEVELOPMENT AND IMPLEMENTATION OF AIR QUALITY MAINTENANCE

The major feature of the proposed longterm maintenance strategy is a comprehensive approach which incorporates air quality maintenance into the community planning process. There are many issues and constraints which must be resolved before such an approach can be implemented. Discussions with planning community and air pollution agency representatives suggested that the interagency coordination required to implement a long-term comprehensive approach would take two to three years to establish (see Chapter V). If a formal or mandatory control program, such as emissions allocation, is selected as the desired administrative approach, some additional legal authority will be required in order to implement this program on a regional basis. These constraints are discussed in detail in the following section. The conclusion is that the recommended comprehensive approach cannot be fully implemented for three to five years and "stop-gap" measures are therefore required to maintain the standards during the interim period.

It is therefore recommended that the development and implementation of the maintenance plan be phased. Figure IV-1 shows the suggested timetable for development and implementation of the comprehensive air quality maintenance plan. The key milestones are indicated. The chart suggests that the maintenance plan consists of three primary elements:

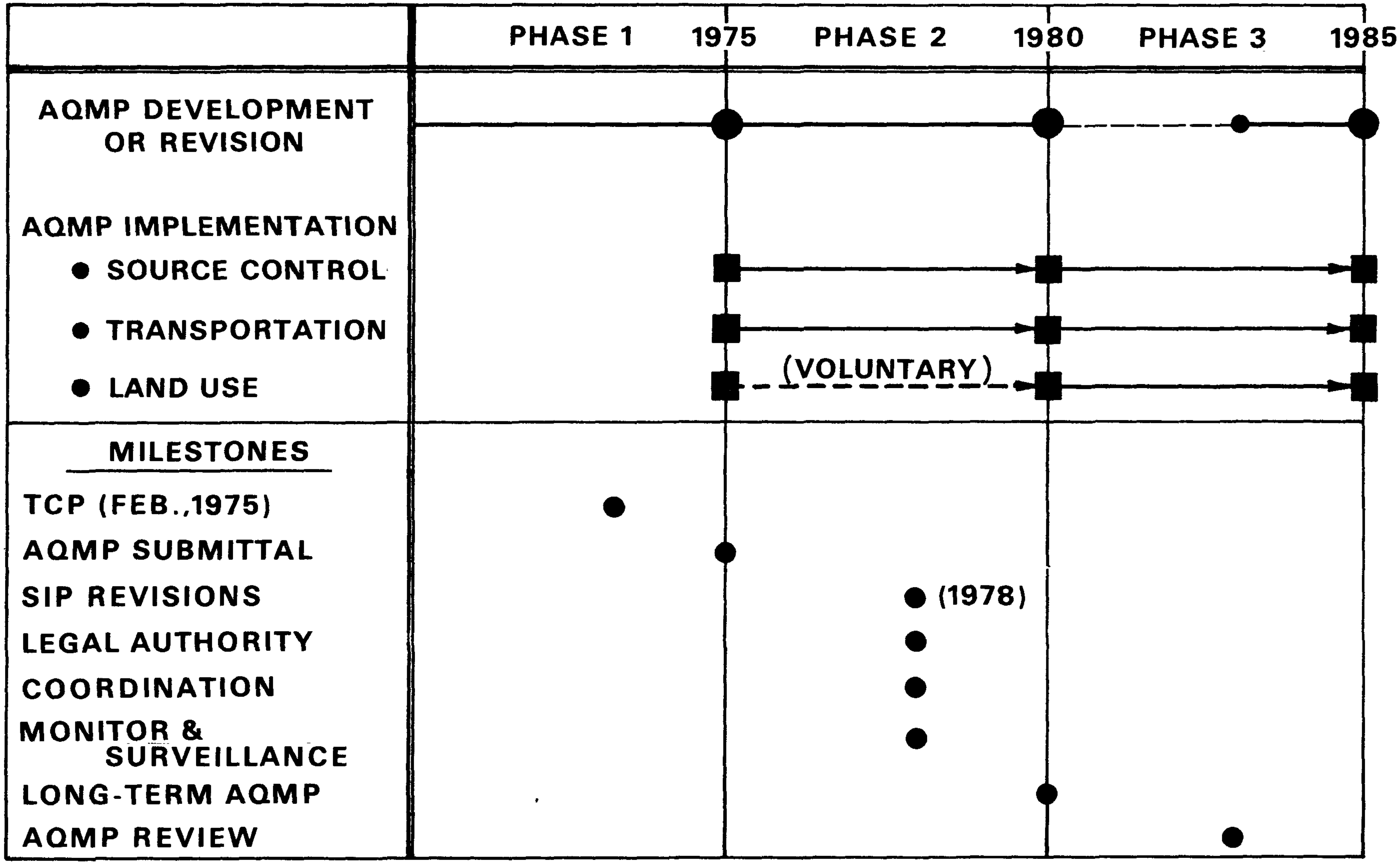
- Source control measures
- Transportation policies or measures
- Land use policies or measures

There are three major phases shown for AQMP development and implementation:

- Phase 1 -- now to June 1975
- Phase 2 -- June 1975 to June 1980
- Phase 3 -- June 1980 to June 1985

During Phase 1, the attainment measures (including the TCP) and the interim measures would be finalized and submitted to EPA in June 1975. The task descriptions, agency responsibilities, and funding requirements for the long-term comprehensive plan development would also be submitted to EPA in June 1975. In addition, interagency memoranda of understanding would be obtained stating the agency responsibility in plan development and agreements to persuade new industry with significant TSP or SO_2 emissions to avoid the "hot spot" areas. Any transportation system improvements or review procedures, mobile source controls, or indirect source

FIGURE IV-1
ST. LOUIS AQMP DEVELOPMENT TIMETABLE



control programs which are required for attainment or maintenance will be delineated and presented in the Transportation Control Plan or the Maintenance Plan submitted in June 1975.

Phase 2 consists of the selection and development of the long-term comprehensive approach; the implementation of all TCP measures, transportation policies or measures required for maintenance, interim source control measures required for maintenance, and voluntary compliance with the "hot-spot" land use policy. If voluntary compliance with the "hot-spot" policy is not effective, the MACC "hot-spot" regulation can be strictly enforced for existing sources. Any SIP revisions will also be completed during this time period.

By 1980, it is expected that all administrative programs, legal authority, and monitoring and surveillance requirements of the comprehensive long-term plan can be implemented. The AQMP development can then become a five-year review and revision cycle, as proposed in the EPA Guidelines.

E. MONITORING AND SURVEILLANCE

In order to ensure that air quality and emissions standards are maintained, the regional planning agency (EWGCC) must monitor development and the state air pollution control agencies must monitor air quality. Maximum allowable emissions can be set according to calculations from current air quality levels in the AQMA. This can be accomplished with a diffusion model that establishes a relationship between total air pollutant emissions in a region and the assimilative capacity of the ambient air. The input data for this calculation must be supplied by both the planning agency and the state air pollution control agency. The allowable emissions in AQMA should be recalculated during the five-year update of the comprehensive plan and whenever there are significant changes in development and urban growth. Therefore, continuous review of ambient air quality data and environmental impact of new development will create a mechanism to monitor the effectiveness of the air quality maintenance plan.

The Interim Measures required to ensure attainment and maintenance of the NAAQS through 1978 or 1980 can be monitored with the expanding monitoring program (RAPS/RAMS). Long-term comprehensive approaches will require additional surveillance. If Emissions Allocation is selected as the means of implementing the strategy, the state air pollution control agency should perform the following monitoring duties:

- Establish allowable emissions for each pollutant
- Provide emissions factors for land use and transportation plans
- Review emissions limits periodically and adopt amendments when new data indicates changes in air quality
- Monitor ambient air quality and source emissions

The regional planning agency should perform the following duties:

- Determine that the comprehensive plan is consistent with the allocation of emissions limits
- Provide a report of projected emissions from the comprehensive plan alternatives
- Coordinate with the state air pollution control agency in approving a comprehensive plan for the AQMA

The overall responsibility for monitoring and surveillance of the AQMP is retained by the state air pollution control agency to ensure compliance with the NAAQS.

In regional development planning, no formal EIS is required to be reviewed by the state air pollution control agencies. Therefore, monitoring and surveillance of the effectiveness of the strategy is limited to the following:

- Review of local land use plans and zoning regulations for consistency with the regional comprehensive plan
- Review of regional development policies for consistency with the regional land use and transportation plans
- Ambient air quality monitoring
- Monitoring of demographic, economic, and social activity trends

F. CONSTRAINTS TO AQMP IMPLEMENTATION

In general, it may be noted that there are few constraints to implementation of the Interim Measures. This is true because measures have been selected which are considered implementable or already underway by June 1975. One notable time constraint is the feasibility or availability of SO_2 controls for power plants. EPA has filed several suits requiring these controls. The outcome of these suits will determine how soon the SO_2 controls can be implemented.

Implementation of the long-term comprehensive plan, however, will have many obstacles or constraints including the complexity of the planning process, funding, and opposition to enforcement of strong legislation.

1. Complexity of Planning Process

The complexity of the government and planning community is described in Chapter V. Air quality planning and implementation are distributed among three agencies with concurrent jurisdiction on the Missouri side, and the Illinois EPA on the Illinois side. Two strong planning agencies exist in the area--the East-West Gateway Coordinating Council and the South-West Illinois Metropolitan Planning Area Council--with the former covering the entire AQMA. The SWIMPAC represents the three Illinois counties only. However, they have no authority to do air quality planning and no funding to carry out such planning.

The comprehensive plan including the land use and transportation components provide major input to the development of the AQMP. At the present time, numerous parts of the comprehensive plan are being prepared, however, several components will not be completed in time for the AQMP development.

a. Land Use Plans -- Of the eight political jurisdictions under the East-West Gateway Coordinating Council, only St. Charles County has an approved land use plan. Franklin County has a land use component of its Sewer and Water Plan but not a complete land use plan. St. Louis County is in the process of revising the land use plan based on new population projections--the plan will be presented for approval late in 1974. The City of St. Louis has a plan which is presently awaiting action before the planning commission. Jefferson County eliminated planning and zoning in 1971 and therefore has no land use plan and apparently does not intend to develop one. In Illinois, Madison and St. Clair Counties' plans are being updated by SWIMPAC, based on new population projections. Monroe County is awaiting a Federal decision as to the location of a new airport before developing a land use plan.

Most of these plans are expected to be completed by the end of 1974 and can then be incorporated by the Council into the region's comprehensive plan.

b. Transportation Plans -- The transportation plan for the region is divided into two portions: streets and highways, and mass transit. The streets and highways portion has been approved and adopted by the Council; the mass transit portion has been deferred, pending a new study. This study is scheduled to begin in the summer or early fall of 1974 and requires approximately nine to twelve months to complete. It is important to the AQMP development because of the impact it will have on the distribution of person trips in the region between highway and transit modes.

2. Funding

In order to ensure that environmental considerations are integrated into the comprehensive planning process, a funding mechanism should be established. This mechanism would provide both the designated comprehensive planning agency and the designated control agency with sufficient funds to ensure proper consideration and enforcement of environmental aspects of the long-term comprehensive maintenance plan.

As with many other programs of other Federal agencies, notably DOT and HUD, EPA could set up a program of providing direct grants for incorporating environmental consideration into the planning process and for enforcement of environmental controls. These grants could be distributed in two ways: directly to the designated air pollution control agencies or directly to the local planning agencies through contract with the state air agencies.

For the situation in the St. Louis AQMA, possibly the best solution would be to set up a mechanism that is basically a combination. Funds for comprehensive transportation and land use elements could be given to the EWGCC and funds for overall AQMP development, implementation and enforcement could be given to the two state agencies; the Missouri Air Conservation Commission and the Illinois Environmental Protection Agency.

3. Enforcement

Opposition to enforcement of regulations will remain the most difficult obstacle to implementation. If alternative growth plans are to be evaluated solely on the basis of air quality impact, then air quality goals will continue to conflict with other community goals with the result that variances may continue to be the rule rather than the exception. If, on the other hand, air quality is incorporated into community goals through the comprehensive planning process, conflict can be minimized, if not eliminated. The role of waste water treatment planning should be considered simultaneously. This incorporation of air quality considerations is a complex process which may require considerable time and effort to institute. The time to implement such planning considerations will be extended by the complexity of the governmental structure and the lack of funding.

G. LEGAL AUTHORITY

The enabling legislation given in the State Implementation Plans is sufficient basis for the implementation of all source control measures required for attainment and maintenance of the standards.

The long-term comprehensive approaches to air quality maintenance described above are administrative approaches. They are intended to maintain air quality indirectly by the application of land use and transportation policies which tend to minimize emissions, especially in the "hot-spot" areas. Specific land use control regulations may be adopted to formalize these policies. For example, emissions allocation can be implemented as a regulation calling for a ceiling on emissions within each small community or geographic area within the AQMA.

The following sections describe existing legislation directly related to air quality maintenance and the modifications or extensions to existing regulations which would be required to implement specific source controls or land use measures.

1. Existing Legislation

The Air Quality Implementation Plans and related regulations as adopted by Missouri and Illinois form the enabling legislation for the

St. Louis AQMA. Attainment of the standards will rely on implementation and enforcement of these regulations. Any regulations adopted as a result of the Transportation Control Plan currently being prepared will become part of this body of regulations.

Two regulations included in the Missouri SIP are particularly applicable to the maintenance of air quality once the standards are attained. These regulations are summarized briefly below. (See Appendix I for complete regulation).

Regulation XVIII. Approval of Planned Installations, Land Use Plans, and Zoning Regulations Required -- This regulation is the basis for permit system for new sources. Paragraph B of this regulation requires the executive secretary of the MACC to review all land-use plans prior to formal adaption and local areas and prepare recommendations according to the regulations. No local plan may be adopted without the approval of the executive secretary. Paragraph C places similar requirements on the review and approval of zoning agency regulations and proposed changes in zoning classifications.

This regulation is not currently implemented in the AQMA and because no penalties are stated for non-compliance, the agency has no enforcement authority. However, it could serve as the basis for monitoring all planned community growth and development.

Regulation XXIII. Additional Air Quality Control Measures May be Required when Sources are Clustered in a Small Land Area -- This regulation applies to particulate and SO_2 emission sources in areas which exceed a given allowable emission density. The MACC may prescribe more restrictive requirements in such areas than are provided in the regulations of general applicability.

This is referred to as a "hot-spot" regulation. It provides for more restrictive controls where source clustering may cause the standards to be exceeded although all emissions limitations are being met. This regulation is not currently being implemented because many compliance schedule deadlines have not been reached. However this regulation could be applied to maintain emission density levels below that level estimated to exceed the standards for particulates and sulfur dioxide. This would require an accurate estimate of the relation between emission density and ambient concentration in a given area. This relationship may vary due to source-receptor characteristics of an area. The RAPS program should provide sufficient data for this determination. Short-term emissions limitations would be the most difficult to establish.

2. Additional Regulations Required to Develop, Implement, or Enforce the Air Quality Maintenance Plan for the St. Louis AQMA

The air quality maintenance strategy described in Chapter IV consists of (1) a package of Interim Measures to ensure air quality maintenance during the period from AQMP submittal (June 1975) to June 1978, and (2) options for a comprehensive approach to long-term air quality maintenance to be developed and implemented from June 1978 to 1980. A brief summary of the additional legal authority required (if any) to implement each segment of the air quality maintenance strategy is given below.

a. Interim Measures -- The Interim Measures described above rely on enabling legislation as adopted by Missouri and Illinois and described in the State Implementation Plans. In addition, the following minor revisions or additions to the existing regulations may be required to implement and enforce these interim measures.

- Strict Enforcement of Power Plant Compliance Schedules may require clarification of the interpretation of existing regulations. However, no new regulations are required.

- Indirect Source Control regulations have not been adopted by the states as yet. The designation by Missouri of the Indirect Source Control Agency and adoption of regulations is expected by January 1975.

- Stationary Source Hydrocarbon Control at least to the level of cost-effectiveness.

b. Long-Term Comprehensive Air Quality Maintenance Planning and Implementation -- Two alternatives are described as mechanisms to implement and enforce a comprehensive approach to air quality maintenance. Enabling legislation and regulations will be proposed as the selected approach is defined.

The two major administration approaches to air quality maintenance and the legal authority required are described briefly below:

- Emission Allocation Procedure -- A relationship is established on a regional level between the assimilative capacity of the ambient air and the amount of emissions that would violate the standards. Regulations are required to establish emissions ceilings. MACC Regulation No. XXIII (See Appendix I) could be modified to form the model regulation.

  The administration of an emissions allocation system must be regionwide to account for transport of pollutants across jurisdictional boundaries. This would require that a regional organization such as the East-West Gateway Coordinating Council, or Bi-State Development Agency be delegated the authority by each state to implement such a system. The authority to enforce the regulations would remain with the air pollution control agencies.

- Air Quality Maintenance as a Constraint in Regional Development Planning -- This option requires the regional planning agency to develop a revised comprehensive plan incorporating air quality maintenance as a constraint in the evaluation of alternatives.

  MACC Regulation No. XVIII requires the review of land use plans and zoning regulations for consistency with the State Implementation Plan before adoption of such plans or regulations.

Therefore, there is some existing authority to support such a revision to the comprehensive plan. However, it would be desirable to provide a mechanism to enforce the policies developed.

The State air pollution agencies could adopt the policies employed to represent air quality maintenance in the revised comprehensive plan as revisions to the SIPs to enforce air quality maintenance. To implement and enforce such policies, the existing source review procedures must require compliance with these policies.

V. INTERGOVERNMENTAL COOPERATION AND COORDINATION

The Air Quality Maintenance Plan described above consists of a set of goals, policies and actions needed to preserve air quality. To be successful, however, the AQMP must realize two major administrative objectives. First, the plan must facilitate the coordination of land use and transportation planning with source control measures, and within an institutional framework which directly links planning, implementation, and enforcement. Second, the plan must be developed within the constraints of time and jurisdictional complexity. The special problem in the St. Louis area focuses on the complexity of developing, administering, and enforcing such a plan in a situation involving two states and two Federal regional jurisdictions.

A. ALTERNATIVE INSTITUTIONAL ARRANGEMENTS

The administrative objectives suggest possibilities for alternative institutional arrangements and new institutional forms, as well as, limit the scope of any new possibilities. Specifically, coordinated land use, transportation planning, and source control measures suggest the possibility of several alternative institutional arrangements. These include:

- A regional, interstate agency with planning, implementation, and enforcement powers in land use and transportation planning, and source control.

- A cooperative arrangement between two state agencies, each of which would have increased current air quality functions to include land use and transportation planning. (This assumes these agencies presently have enforcement powers.)

- An arrangement to increase the technical capabilities of the East-West Gateway Coordinating Council, to include air quality, as well as provide the Council with powers of implementation and enforcement for land use and transportation planning and source control.

- A composite arrangement of existing institutions coordinating their particular areas of responsibility with the long-range goal of creating an institutional structure(s) with the appropriate enabling powers.

B. CONSTRAINTS TO ALTERNATIVE INSTITUTIONAL ARRANGEMENTS

Viewed from the vantage of current constraints, particularly time and jurisdictional complexity, it is doubtful that all but the latter alternative, i.e., to coordinate existing institutions, will be attained.

1. Time

With respect to time, the June 1975 deadline for the AQMP does not allow sufficient time for the passage of appropriate enabling legislation for new agencies or for additional functions and powers for existing agencies, at least for the first phase. Significantly, the June 1975 deadline, even if new agencies did exist, would limit the development of adequate information, appropriate analyses of the data, and proper technical, citizen, and political participation.

2. Jurisdictional Complexity

Similarly, in the context of jurisdictional complexity, the responsiblity for land use, transportation and source control plan elements is widely dispersed throughout the various jurisdictions involved, including the state and local governments (see Figure V-1).

In the area of planning for source controls, the states have prime responsibility. In the case of land use, the prime responsibility lies with the city or county, while in the transportation planning field, it rests with the East-West Gateway Coordinating Council.

Many other jurisdictions are involved in the planning process, primarily in an advisory role. In the area of source control, the Federal, city, and county governments are involved. In the case of land use,

FIGURE V-1

EXISTING AQMA RESPONSIBILITIES

JURISDICTION RESPONSIBLE

POSSIBLE AQMP ELEMENT	FEDERAL	STATE	REGIONAL AGENCY	CITY	COUNTY	PRIVATE SECTOR
SOURCE CONTROL	○	● ■		○ ■	○ ■	□
LAND USE	○	○	○	● ■	● ■	□
TRANSPORTATION HIGHWAY	○	○ □ ■	●	○ □ ■	○ □ ■	
TRANSIT	○	○	● □ ■	○	○	

○ ADVISORY ROLE IN PLANNING FUNCTIONS
● PRIMARY RESPONSIBILITY FOR PLANNING FUNCTIONS
□ RESPONSIBILITY FOR PHYSICAL DEVELOPMENT
■ PRIMARY RESPONSIBILITY FOR CONTROL OR ENFORCEMENT

the states and the East-West Gateway Coordinating Council have advisory roles. In transportation, the Federal, state, and local governments play an advisory role, although the states play a very important role in highways and the Federal government in transit, since they largely control the capital funds.

In the area of implementation, the primary responsibility for source control rests with the states, although in Missouri, because of the competence available at the City of St. Louis and the County of St. Louis levels, the state had assigned this responsibility to the air pollution agency in those jurisdictions. In the area of land use, the primary responsibility for enforcing and controlling development rests with the city or the county, except the county does not have jurisdiction in those sections which are incorporated within its boundaries. In the area of transportation, highways are major facilities developed by the state, while local facilities are provided by the city or county. In transit, major improvements are primarily developed by the Bi-State Development Agency, which is an interstate agency created some time ago primarily to develop the transit system. It operates the existing metropolitan area bus service.

In connection with the control or enforcement related to transportation, the authority for highways rests with the state, the city, or the county. For transit, it primarily rests with the Bi-State Development Agency, although the East-West Gateway Coordinating Council is often concerned with policy issues related to the operation of the system.

Needless to say, institutional patterns such as those outlined above are not easily altered, particularly when long standing institutional prerogatives are at stake. Such wide dispersion of authority and division of labor minimizes any significant chance for major institutional consolidation/reorganization in the short run, especially by the June 1975 deadline.

C. OPPORTUNITIES FOR INSTITUTIONAL COOPERATION AND COORDINATION

The preceding discussion of constraints suggests that the most reasonable approach to meeting administrative objectives relative to the AQMP rests in the coordination of and cooperation between existing institutions servicing the AQMA.

1. Existing Coordinating Mechanisms

The primary coordinating mechanisms in the St. Louis metropolitan area is the East-West Gateway Coordinating Council. This Council was established about 10 years ago, primarily to respond to the highway requirement to set up a continuing, comprehensive, and cooperative planning process in the metropolitan area, referred to as the 3-C Process. Through this process, and the East-West Gateway Coordinating Council (EWGCC), various transportation and land use plans have been developed for the metropolitan area. The Council is also responsible for programs related to open space, recreation, health, housing, and more recently, some of the environmental issues.

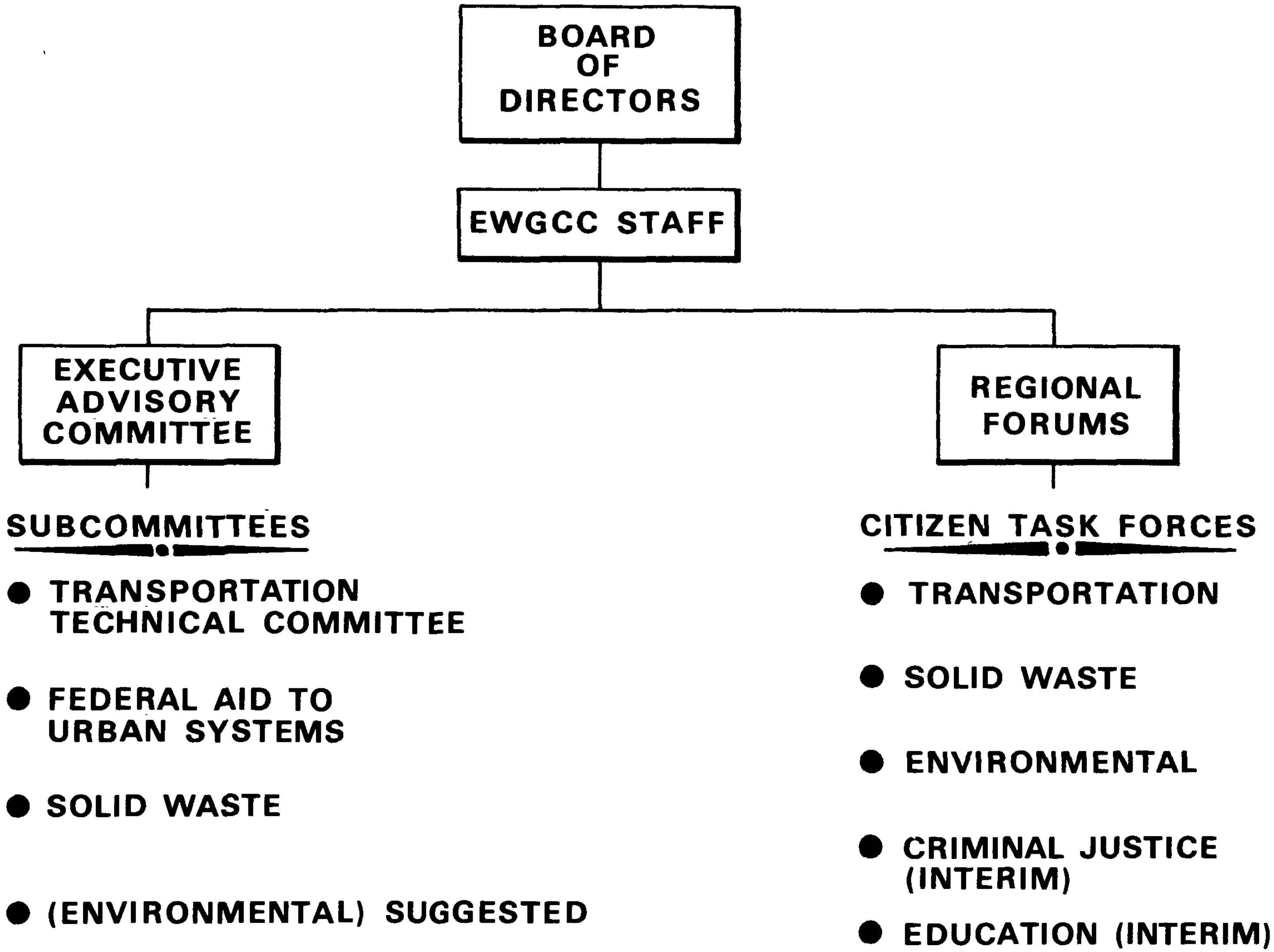
Another responsibility that has been delegated to the East-West Gateway Coordinating Council is the A-95 review. This review stems from the Office of Management and Budget Circular No. A-95, which requires that all Federal projects be reviewed by appropriate agencies that might be affected by such projects. The East-West Gateway Coordinating Council is considered the clearinghouse for such reviews in St. Louis.

Figure V-2 outlines the East-West Gateway Coordinating Council structure. It is headed by a Board of Directors, which includes the key political leaders in the St. Louis Metropolitan Region as members:

Supervisor, St. Louis County
Chairman, Madison County Board
Presiding Judge, Franklin County
Major, City of St. Louis

FIGURE V-2

EAST-WEST GATEWAY COORDINATING COUNCIL



Mayor, City of East St. Louis

Chairman, St. Clair County Board

Presiding Judge, St. Charles County

President, Board of Aldermen, City of St. Louis

President, Southwestern Illinois Council of Mayors

President, St. Louis County Municipal League

President, Southwestern Illinois Metropolitan Area Planning Commission

Vice-President, Southwestern Council of Mayors

Presiding Judge, Jefferson County

Chairman, Board of Commissioners, Monroe County

Chairman, Bi-State Development Agency

Chief Engineer, Missouri State Highway Commission

Chief, Bureau of Planning, Illinois Department of Transportation

Director, Missouri Department of Community Affairs

Director, Illinois Department of Local Governmental Affairs

Because of this strong political representation the Council can be influential, even though it has very little authority. It seeks to get things done by review and persuasion.

In an effort to further involve more people in the planning process, the Council has established a series of technical committees, such as the Transportation Technical Committee. In addition to these technical committees there are various citizen task forces, including transportation, solid waste, environment, criminal justice, and education. Membership includes commerce and industry as well as citizens.

In August 1974, the Missouri Air Conservation Commission established an Advisory Committee on Transportation Control Plan. Figure V-3 shows the membership of this committee--the purpose of which is to develop a transportation control plan by February 1975. It includes representatives of transportation agencies at the state and local levels, as well as

FIGURE V-3

MACC ADVISORY COMMITTEE ON TRANSPORTATION CONTROL PLAN (TCP)

TRANSPORTATION	MISSOURI DEPARTMENT OF TRANSPORTATION BI-STATE TRANSIT AUTHORITY EAST-WEST GATEWAY COORDINATING COUNCIL MISSOURI STATE HIGHWAY DEPARTMENT
INDUSTRY	ASSOCIATED INDUSTRIES OF MISSOURI
PUBLIC	WASHINGTON UNIVERSITY COALITION FOR THE ENVIRONMENT LEAGUE OF WOMEN VOTERS
PLANNING	EAST-WEST GATEWAY COORDINATING COUNCIL ST. CHARLES COUNTY PLANNING AND ZONING
TRAFFIC	ST. LOUIS COUNTY TRAFFIC CONTROL ST. LOUIS CITY TRAFFIC CONTROL
AIR POLLUTION	ST. LOUIS CITY AIR POLLUTION CONTROL ST. LOUIS COUNTY AIR POLLUTION CONTROL MISSOURI AIR CONSERVATION COMMISSION ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

certain planning and air pollution agencies. It also includes representatives from industry and from the public sector. This is an important element in coordinating and developing a transportation control plan for the area.

2. Technical Leadership

In the development of an Air Quality Maintenance Plan, the legal responsibility for the technical phase of the plan rests with the states. The Federal, regional, and local governments play an advisory role. Present patterns of responsibility in the St. Louis area indicate that these responsibilities could be moved toward the East-West Gateway Coordinating Council so that the Air Quality Maintenance Plan can be coordinated with other plans and goals for the region.

The separation between the states and the metropolitan region is particularly significant in implementation of land use and transportation measures. Although the power for implementation rests with the states now, the local areas could be more involved, as in Missouri, where the Missouri Air Conservation Commission has delegated some of its responsibilities to the City of St. Louis and the County of St. Louis. For the long-term maintenance plan, implementation of transportation and land use measures could rest with the East-West Gateway Coordinating Council and the local jurisdictions, under the guidance of the state air pollution agency.

3. Participation

Participation in the long-term maintenance plan development and implementation must be viewed from three sectors--technical, political, and citizen. Each is critical in developing intergovernmental cooperation.

a. Technical -- The state air pollution agencies are responsible for the development of the Air Quality Maintenance Plan and are also involved in the implementation of it, except in those areas where the responsibility has been delegated to the local level--the City of St. Louis and the County of St. Louis. However, if the plan is going to be successful, it should have considerable input from the local and regional agencies, not only in plan development, but in implementation as well.

At the present time, there is no machinery to involve the East-West Gateway Coordinating Council in AQMP development. The Missouri Air Conservation Commission Advisory Committee on Transportation Control Plan could be expanded, however, to cover all elements of the Air Quality Maintenance Plan.

Because of the strong role of the City of St. Louis and some of the other jurisdictions in the metropolitan area, the State should bring these people in on the development of the AQMP through establishment of an advisory committee. Generally, the review process has proven to be an ineffective way of coordinating plan development in the metropolitan area, because it does not call for active participation and the local agencies do not think they have an impact on the outcome.

Participation in plan implementation is an important issue, particularly in the land use area where the local jurisdiction is the only authority that can regulate land. It is not very likely that the power to regulate land use will be relinquished to a regional agency or to the state. However, the MACC has the authority to review and approve or disapprove land use area zoning regulations.

b. Political -- Political participation is very critical, since the implementation of the plan may not agree with local jurisdictional objectives. This can easily be accomplished through the East-West Gateway Coordinating Council. A special task force of political leaders might be set up to study air quality maintenance for the area. This task force could develop the regulations that will be needed for long-term plan implementation.

c. Citizen -- It is becoming more and more apparent that any plan or program that has an impact upon the citizens should be developed through a citizen participation process. The earlier these kinds of programs are initiated, the better, even before any alternatives are developed. Certainly, citizens should have a role in the development and evaluation of alternatives and in making recommendations to the political leaders. At the present time, the East-West Gateway Coordinating Council has moved ahead in this direction in establishing citizen participation in its planning process, and there is now a citizen task force on environment.

D. RECOMMENDED ARRANGEMENT FOR AQMP DEVELOPMENT AND IMPLEMENTATION

The proposed air quality maintenance strategy discussed in Chapter IV recommends a phased approach. Successful plan development and the attainment of maintenance objectives thus requires intergovernmental cooperation and coordination; such cooperative efforts must be structured around the phased approach and fulfill the following conditions:

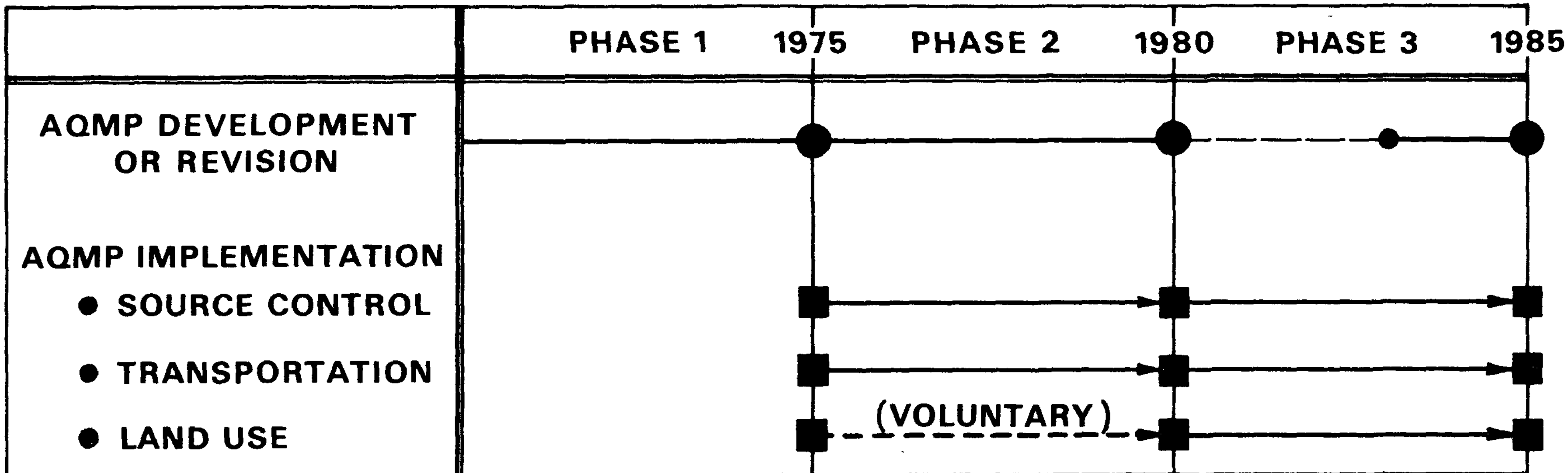
- Coordination mechanism must reflect the existing jurisdictional framework, legal authority, and time and funding constraints.
- Coordination mechanisms should vary with each phase to reflect significant changes in responsibility or new program developments.

The recommended responsibility of different agencies for the various phases is shown in Figure V-4. The timeframe and funding constraints for AQMP preparation do not provide for the active participation of agencies other than the state and local air pollution agencies in the initial

Fig V-4

~~TABLE I-3~~

ST. LOUIS AQMP DEVELOPMENT AND COORDINATION



COORDINATION	PHASE 1	PHASE 2	PHASE 3
RESPONSIBLLITY	STATE	STATE-EWGCC	EWGCC
PREPARATION	STATE	STATE-EWGCC	STATE-EWGCC
ADVISORY	EPA EWGCC BOARD EWGCC TASK FORCE	EPA EWGCC BOARD EWGCC TASK FORCE	EPA EWGCC BOARD EWGCC TASK FORCE

formulation of the AQMP. Because land use planning and transportation planning agencies will not be able to actively participate at this stage, it is doubtful that appropriate control measures in these areas can be proposed in Phase 1.

The Transportation Control Plan Advisory Committee to the MACC has just been established after approximately one year of effort and is expected to prepare and submit a TCP by February 1975. This advisory committee could be expanded in membership and scope to initiate AQMP preparation or it could be replaced by a newly appointed AQMP advisory committee which would be responsible for preparing alternative approaches for long-term AQMP plan development.

Phase 2 includes the timeframe from proposed AQMP submittal in June 1975 to the first AQMP review period in 1980. This time period includes revisions to the SIPs due to failure to attain any of the primary standards by the proposed attainment dates and incorporation of the Transportation Control Plan. The state air pollution agencies will provide the primary technical leadership for SIP revisions during this phase.

During this period, the AQMP should be revised to include the land use and transportation aspects. The EWGCC is therefore recommended as the technical leader for this first major AQMP revision. To do this, the EWGCC powers must be expanded to include appropriate land use policies for the St. Louis AQMA and be delegated the agent responsible for revision and continuous update of the air quality maintenance plan. However, the state agencies would retain responsibility for implementing and enforcing the AQMP.

Phase 3 represents the ongoing 5-year review and revision cycle. At this point, it is assumed that all available source control technology will have been implemented and the emphasis in air quality maintenance will be on land use and transportation alternatives. Therefore, EWGCC is recommended as the technical coordinator for AQMP revisions. The State Air Pollution Control Agencies could then concentrate efforts on new technology and source control programs, and enforcement of existing control programs.

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APPENDIX A

METHOD FOR DISTRIBUTING PROJECTED EMISSIONS OF PARTICULATES AND SO_2

METHODOLOGY FOR DISTRIBUTING PROJECTED EMISSIONS OF PARTICULATES AND SO_2

Projected emissions of TSP and SO_2 for the St. Louis AQMA were allocated to a sub-county grid using the available land use data for the portion of the AQMA contained within the East-West Gateway study area. The 1980 general land use plan was selected as the most consistent base. This plan was extrapolated to reflect the growth between 1975 and 1985 using the available existing detailed land use (1970) plan and the 1995 forecast general plan which resulted in land use estimates for the three time periods considered for a major portion of the area under study.

For the remaining portions of the AQMA, without detailed land use forecasts, the *worst* possible emission allocation was selected. That is, all emission growth was assumed to occur at existing sites.

The land use projections to be used were then distributed to a grid system.* Since the area source emissions were grouped in three categories (residential, commercial, and industrial), only these three land use types were used. For residential and commercial emissions, the corresponding land use was transferred directly to the grid maps, one map for each of the three time periods projected.

Industrial area source emission allocations required three determinations before the land use projections were transferred to the grid system. The area source emissions for industrial sources were defined as those sources which emit less than 100 tons per year.

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* The selected grid was derived from the CAASE grid network for St. Louis. The CAASE grid was simplified to decrease computer costs.

Industrial sources areas emitting greater than 100 tons per year were considered point sources and were projected independently on a source by source basis. The remaining industrial land use was then separated into light and heavy industry for allocation purposes. Heavy industry was defined as primary and secondary manufacturing industry with less than 100 tons per year emissions. Light industry was defined as tertiary and other non-manufacturing industries.

The emission level for each grid within the system was then calculated. For commercial and residential emissions, an average emissions rate per square kilometer was calculated for each county. This was done using the county total yearly emission projections and the total land area by category determined in the previous step. The industrial emission rates were calculated at two levels for each county, one for light industry and one for heavy industry. For the purposes of this analysis, it was assumed that a rate of five tons per year heavy industrial emissions for each ton per year of light industrial emissions would be suitable. This was used only in lieu of substantiating data and is not recommended for general use.

The county industrial emission rates were then calculated using the following equations:

$$\text{tons per square kilometer light industry} = \frac{\text{(total county industrial emissions)}}{\text{square kilometer light industry} + 5\text{ (square kilometer heavy industry)}}$$

$$\text{tons per square kilometer heavy industry} = 5\text{(tons per square kilometer light industry)}$$

These rates where then allocated to the appropriate sections of the grid system.

Finally, total area source emissions for each grid within the AQMA were determined.

To facilitate data analysis, a computer plotting program, CALFORM, was used. This program was prepared by the Laboratory for Computer Graphics and Spatial Analysis, Harvard University. This technique was selected for the cost and time benefits obtainable.

The point source projections, which were determined independent of the area source projections, were then manually plotted on the area source grid maps. This resulted in a composite map of TSP and SO_2 emissions which distinguished between source type. Figure A-1 shows the St. Louis SMSA which was to be gridded. Figure A-2 is the detailed grid. Figures A-3 through A-8 show the results of gridded emissions. Tables A-1 and A-2 list TSP emissions by source category and jurisdiction.

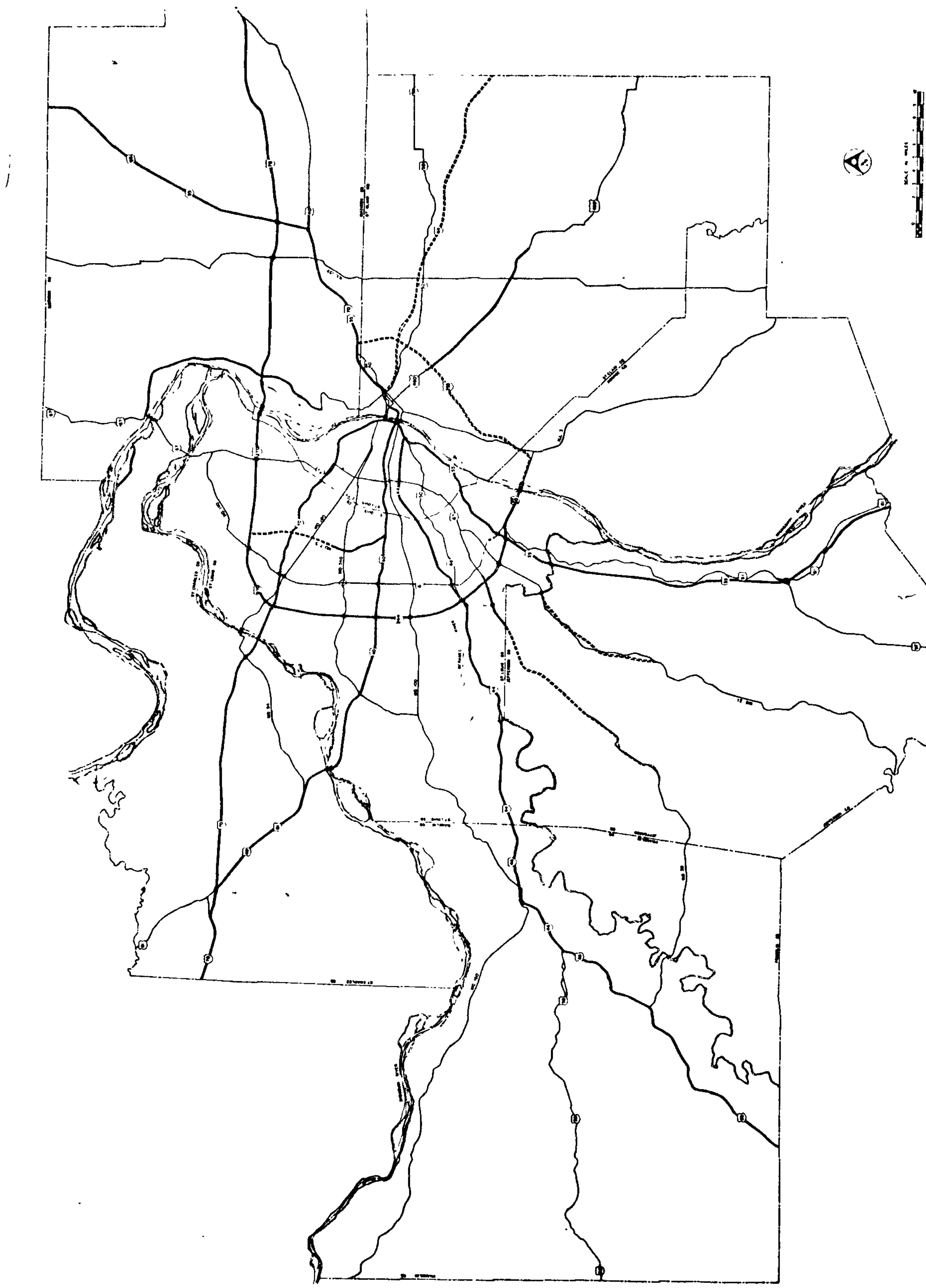

Figure A-1. St. Louis Air Quality Maintenance Study Area

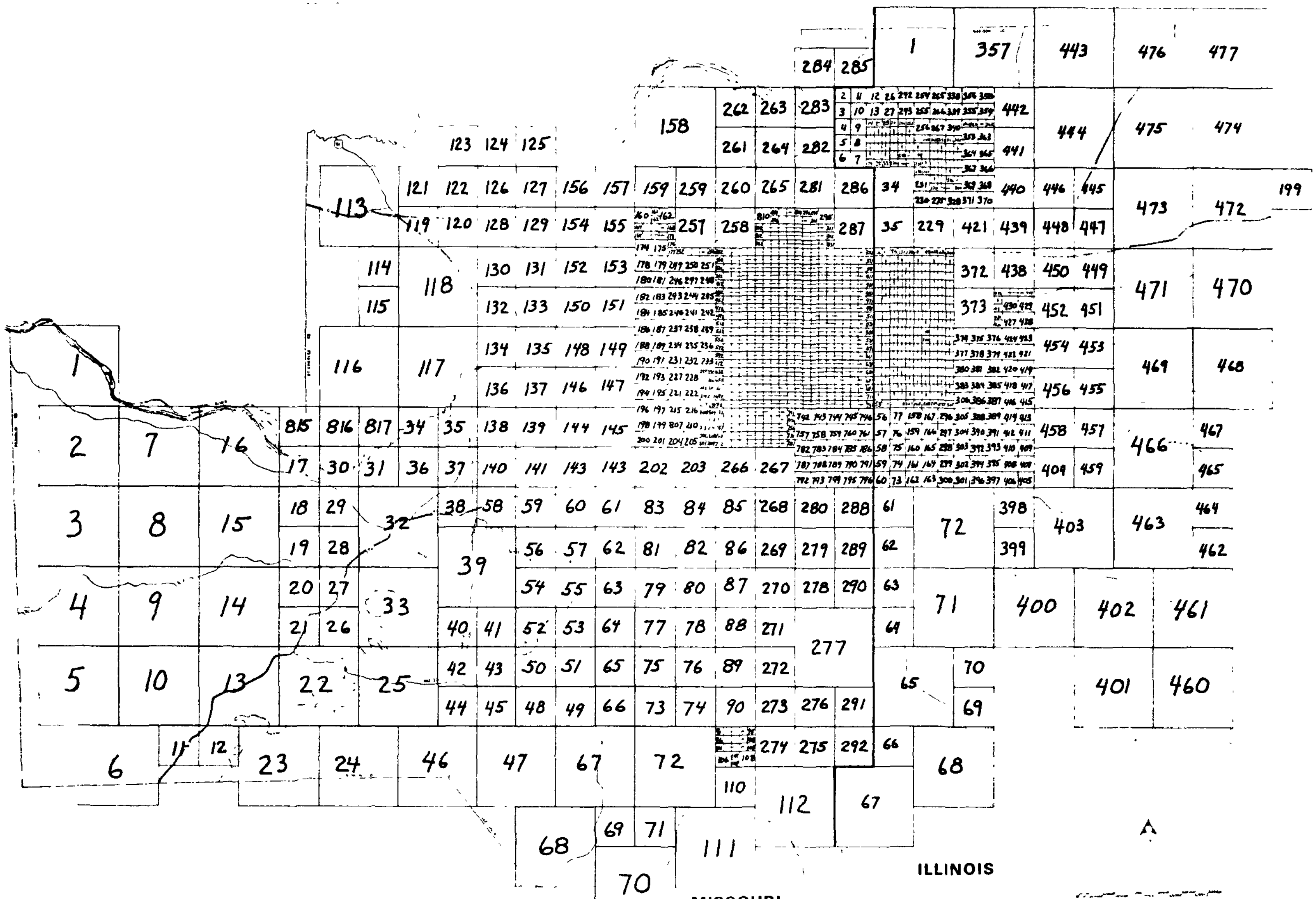

Figure A-2. Grid Network for TSP and SO_2 Emissions Data

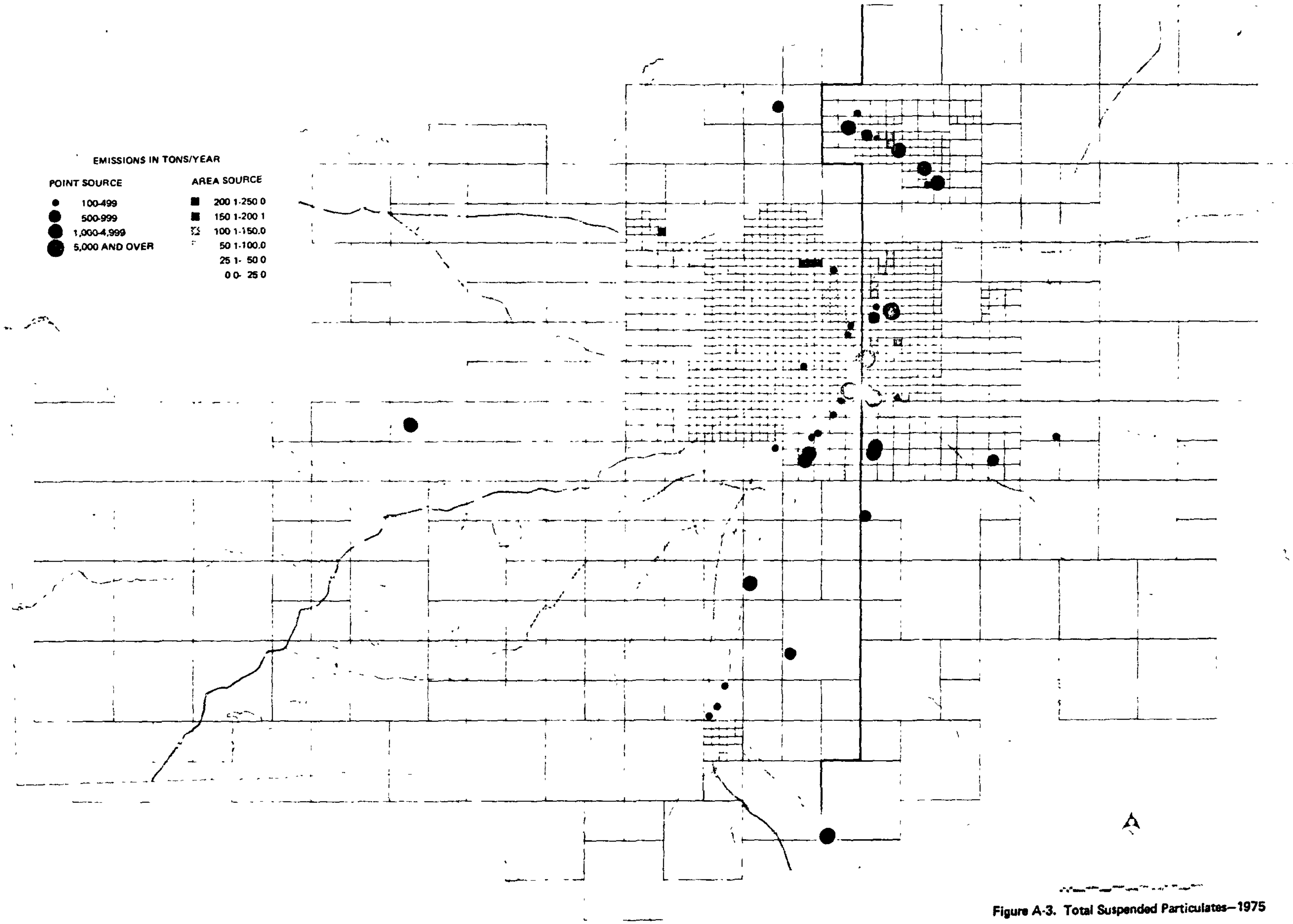

Figure A-3. Total Suspended Particulates—1975

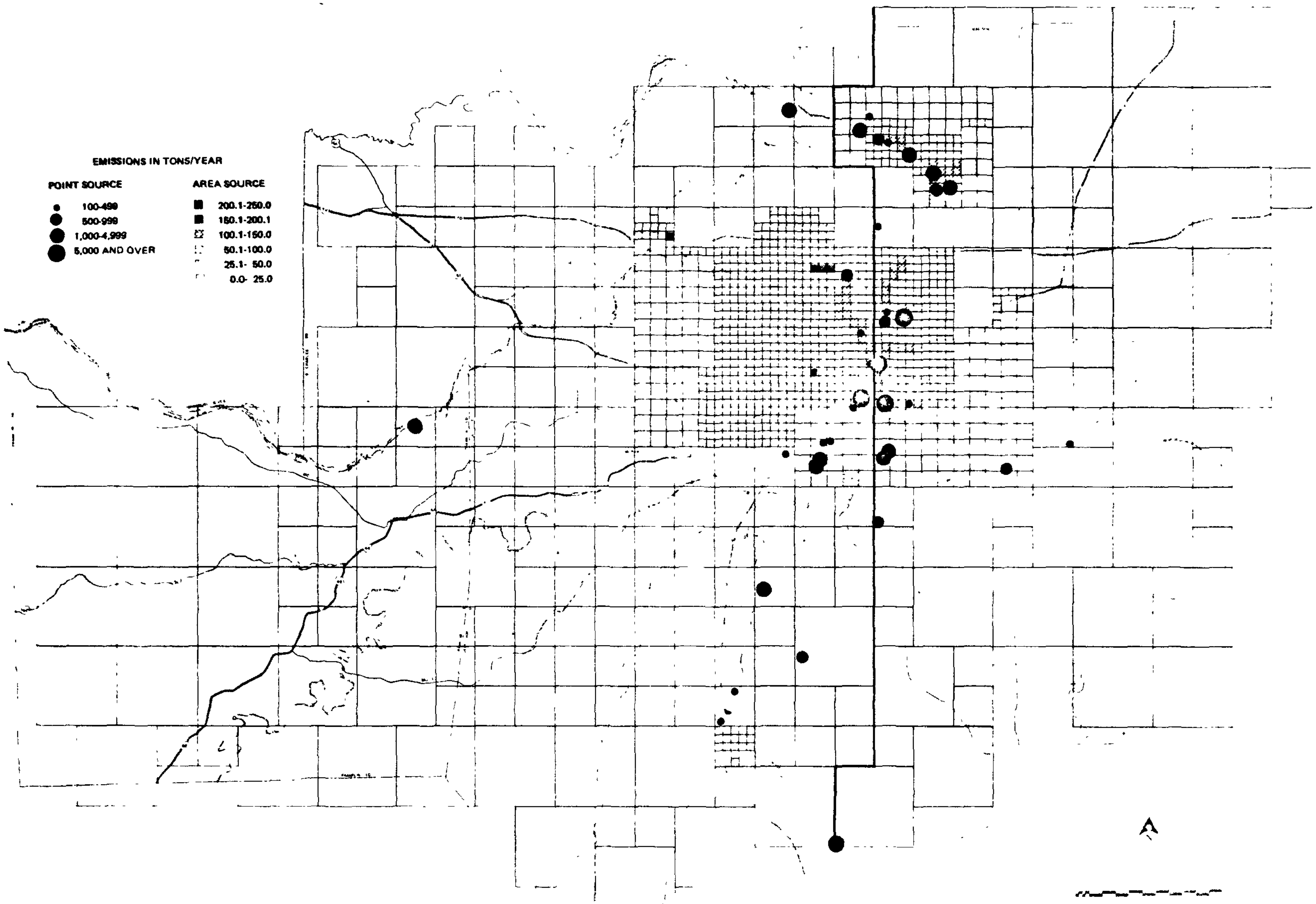

Figure A-4. Total Suspended Particulates—1980

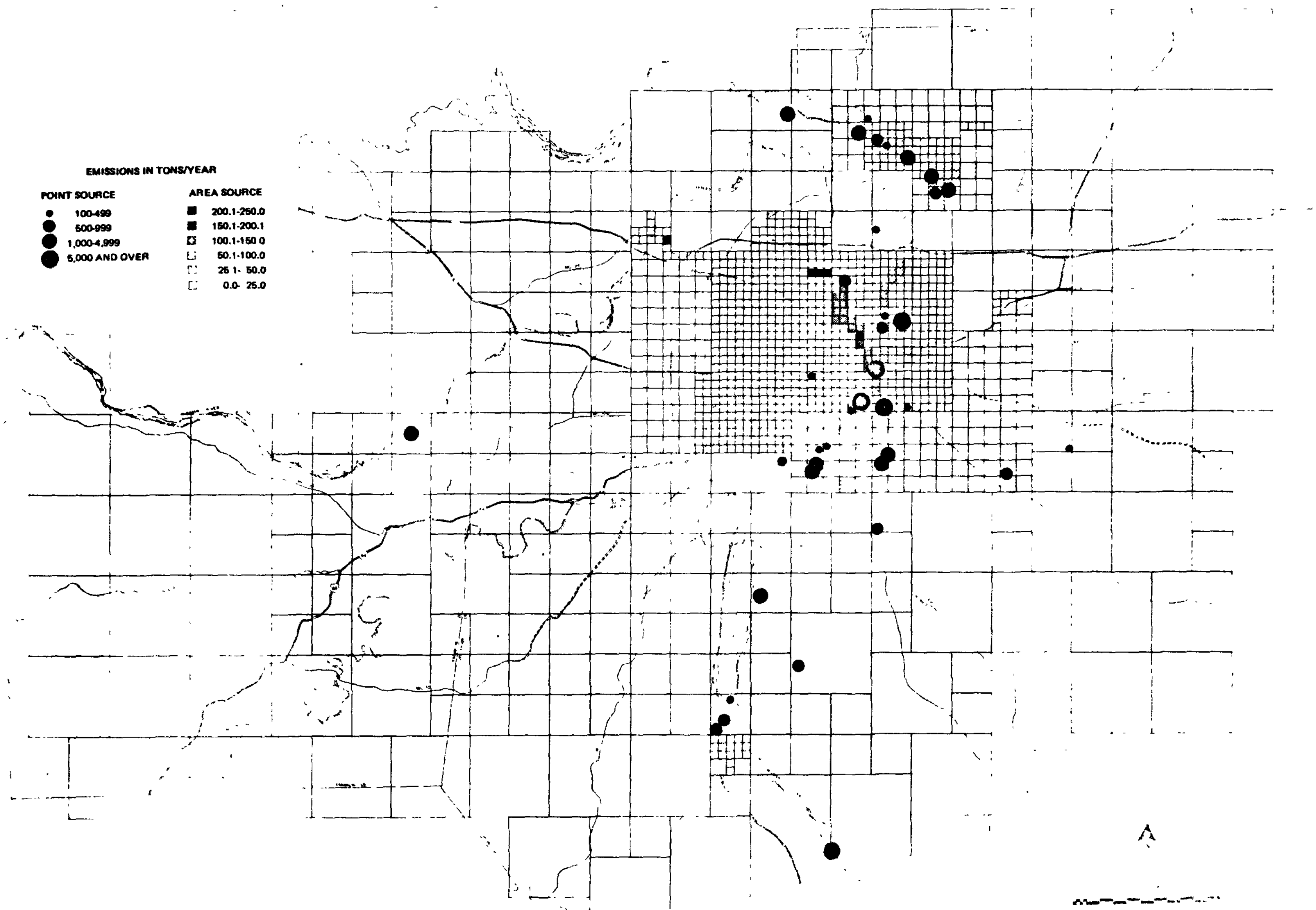

Figure A-5. Total Suspended Particulates—1985

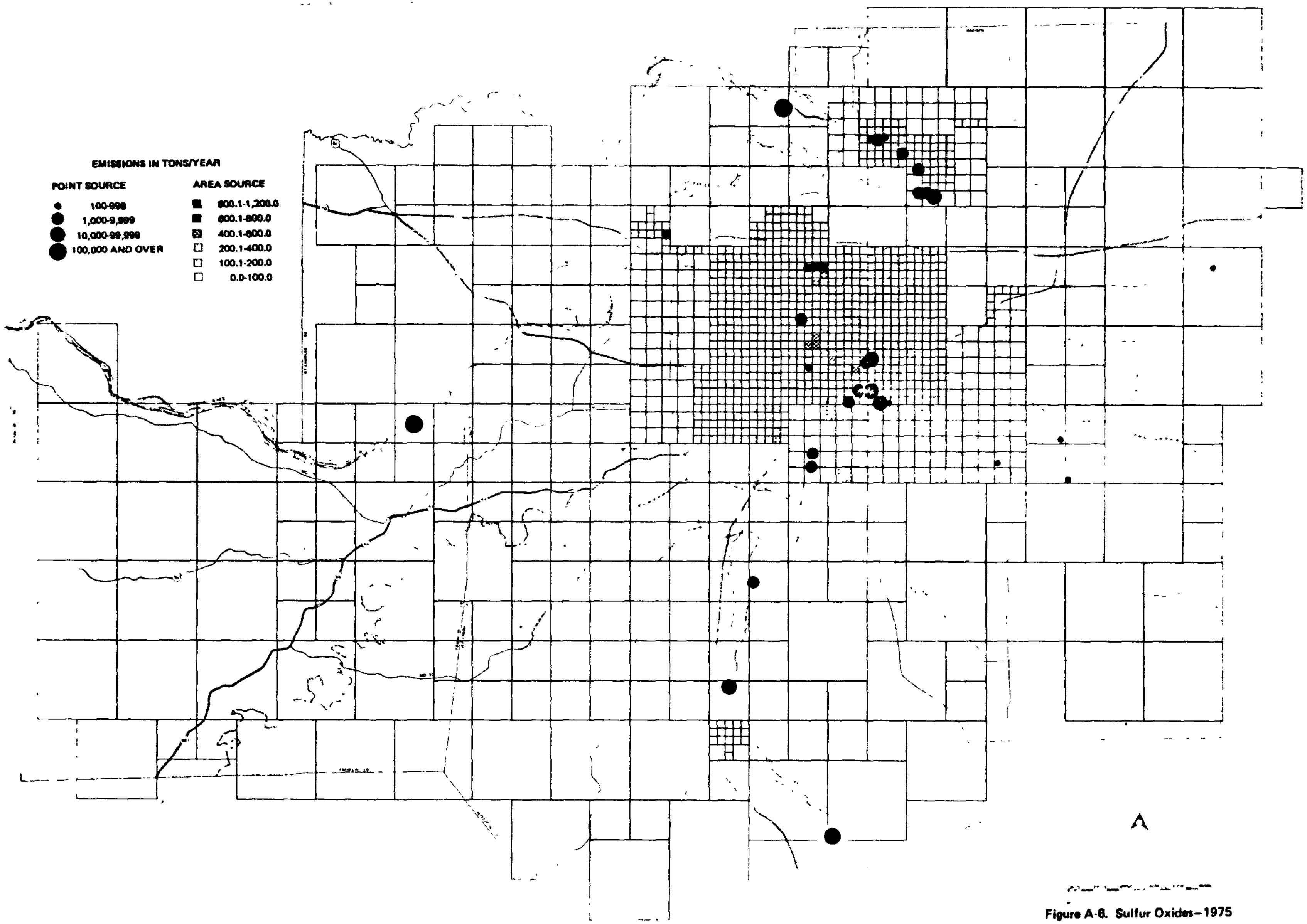

Figure A-6. Sulfur Oxides—1975

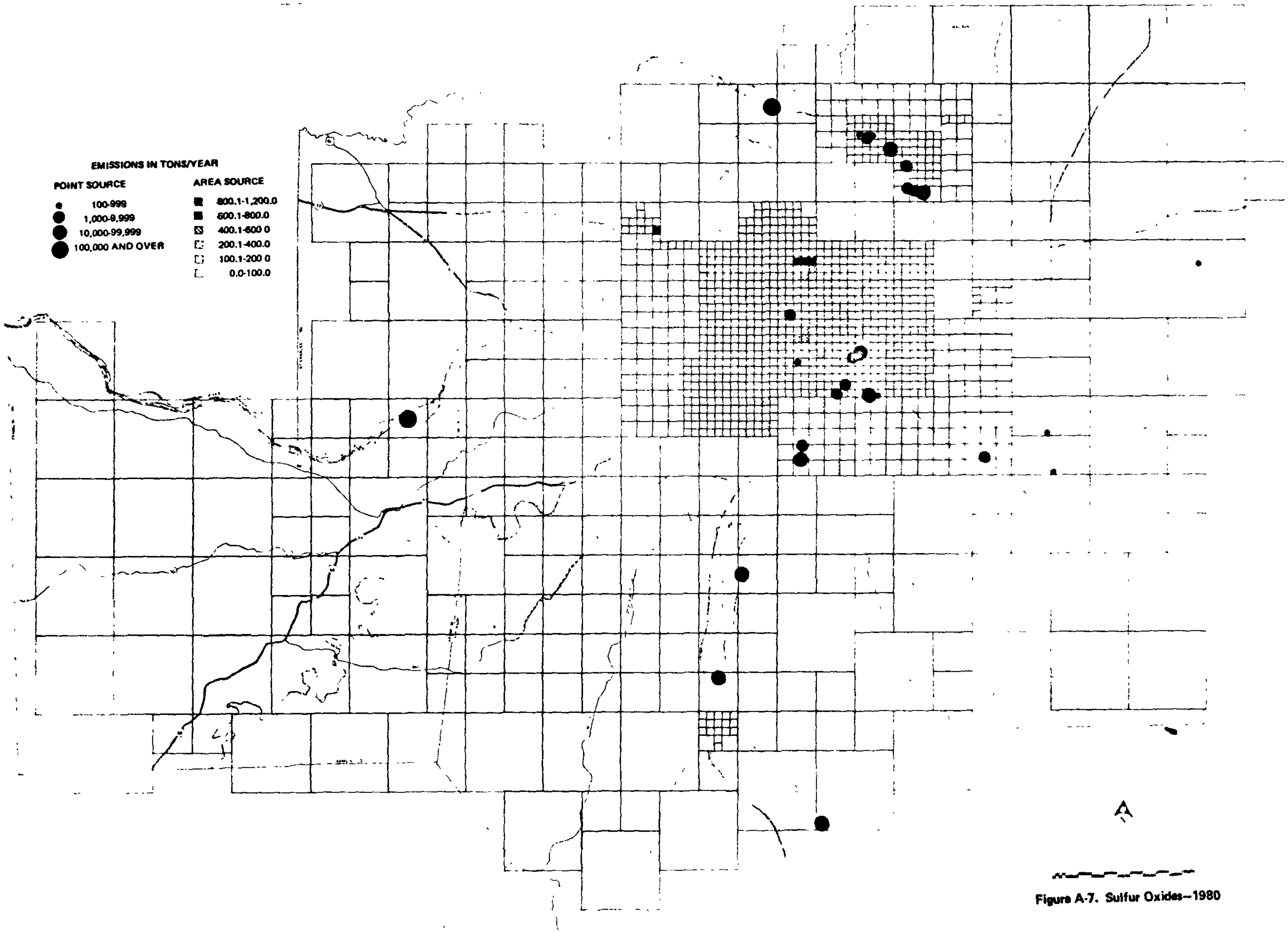

Figure A-7. Sulfur Oxides—1980

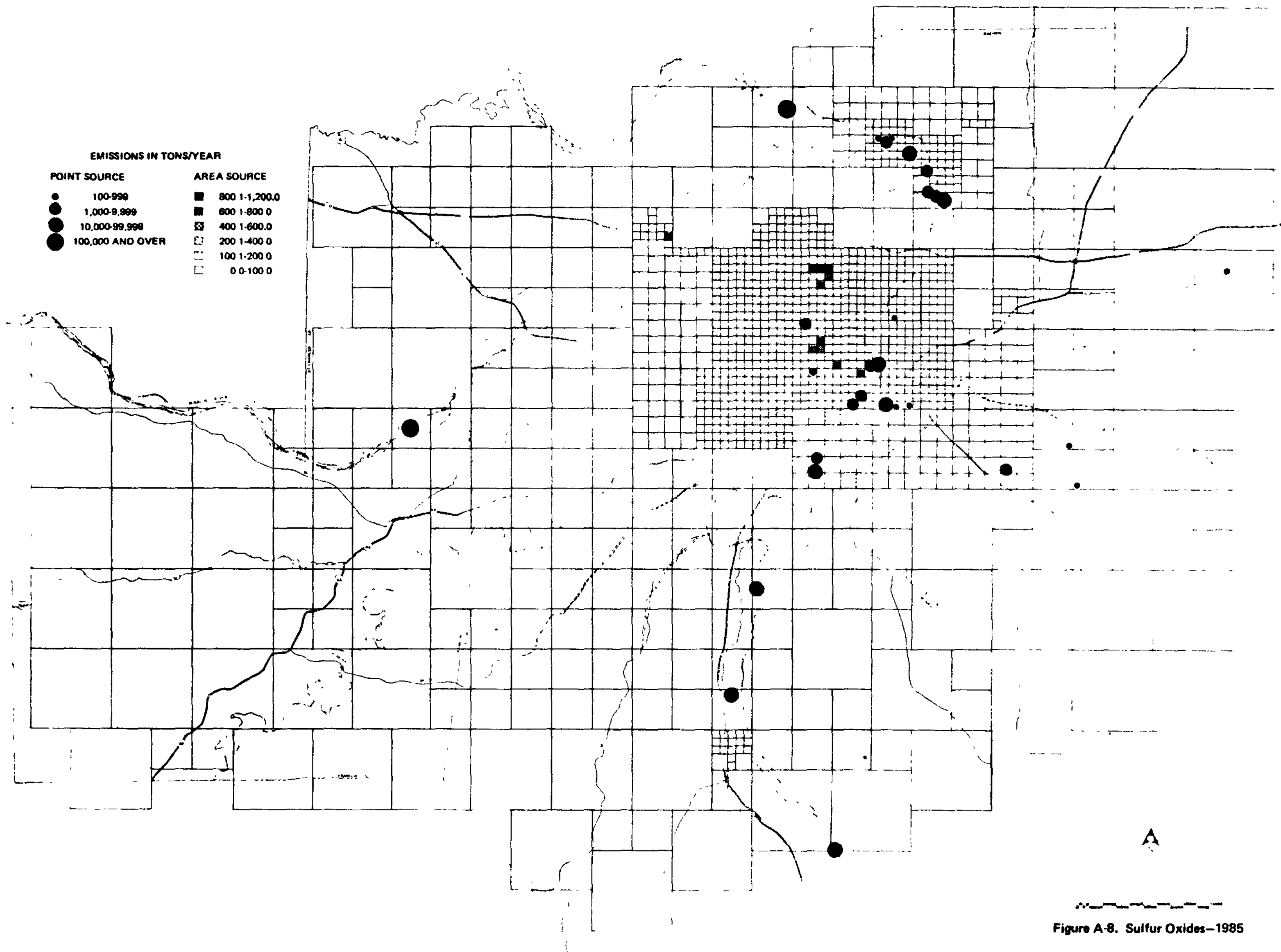

Figure A-8. Sulfur Oxides—1985

Table A-1

TSP Emissions by Jurisdiction (Tons/Year)

Jurisdiction	1975	1980	1985
St. Louis City			
Power Plants	250	250	250
Pt. Sources	8,967	10,212	11,950
Area Sources	5,793	6,892	8,097
Total	15,010	17,354	20,297
Franklin County			
Power Plants	2,900	2,900	2,900
Pt. Sources	0	0	0
Area Sources	1,872	2,192	2,548
Total	4,772	5,092	5,448
Jefferson County			
Power Plants	4,417	17,668	17,668
Pt. Sources	1,020	1,207	1,397
Area Sources	381	433	485
Total	5,818	19,308	19,550
St. Charles County			
Power Plants	600	1,370	1,370
Pt. Sources	0	0	0
Area Sources	326	371	420
Total	926	1,741	1,790
Madison County			
Power Plants	6,643	7,176	7,975
Pt. Sources	25,629	29,450	38,534
Area Sources	3,349	3,762	4,305
Total	35,621	40,388	50,814
St. Clair County			
Power Plants	1,038	0	0
Pt. Sources	12,261	14,441	16,719
Area Sources	2,817	3,090	3,444
Total	16,116	17,531	19,623

Table A-1 (continued)

Jurisdiction	1975	1980	1985
Monroe County			
Power Plants	0	0	0
Pt. Sources	801	881	952
Area Sources	167	119	128
Total	968	1,000	1,080
St. Louis County			
Power Plants	4,700	4,700	4,700
Pt. Sources	1,325	1,781	2,065
Area Sources	4,250	3,545	4,136
Total	10,275	10,026	10,901
St. Louis Area Total			
Power Plants	20,348	34,064	34,863
Pt. Sources	50,329	57,972	71,617
Area Sources	18,955	20,404	23,563
Grand Total	89,632	112,440	130,043

Table A-2

SO_x EMISSIONS BY JURISDICTION (Tons/Year)

Jurisdiction	1975	1980	1985
St. Louis City			
Power Plants	4,380	4,380	4,380
Pt. Sources	15,744	18,390	21,399
Area Sources	8,672	10,100	11,725
Total	28,796	32,870	37,504
Franklin County			
Power Plants	488,000	464,000	464,000
Pt. Sources	0	0	0
Area Sources	1,398	1,615	1,867
Total	489,398	465,615	465,867
Jefferson County			
Power Plants	23,725	90,200	90,200
Pt. Sources	41,500	45,650	49,302
Area Sources	1,333	1,519	1,720
Total	66,558	137,369	141,222
St. Charles County			
Power Plants	200,000	434,200	434,200
Pt. Sources	0	0	0
Area Sources	117	102	98
Total	200,117	434,302	434,298
Madison County			
Power Plants	47,107	51,231	57,418
Pt. Sources	41,732	45,874	50,074
Area Sources	6,344	6,277	6,598
Total	95,183	103,382	114,090
St. Clair County			
Power Plants	19,278	0	0
Pt. Sources	14,070	17,149	20,727
Area Sources	8,858	9,111	9,572
Total	42,206	26,260	30,299

Table A-2 (continued)

Jurisdiction	1975	1980	1985
Monroe County			
Power Plants	0	0	0
Pt. Sources	0	0	0
Area Sources	230	190	172
Total	230	190	172
St. Louis County			
Power Plants	9,700	11,737	13,967
Pt. Sources	81,000	76,950	76,950
Area Sources	13,203	15,596	18,311
Total	103,903	104,283	109,228
St. Louis Area Total			
Power Plants	792,190	1,055,748	1,064,165
Pt. Sources	194,046	204,013	218,452
Area Sources	40,155	44,510	50,063
Grand Total	1,026,391	1,304,271	1,332,680

APPENDIX B

SUBCORRIDOR EMISSION ANALYSIS FOR CO AND HC

SUBCORRIDOR EMISSION ANALYSIS FOR CO AND HC

The development of mobile source emission factors as required for the detailed link models was virtually impractical since the data for the target years was not available. It was concluded, however, that a detailed subcorridor VMT listing for 1970 and 1995 highway assignments within the study area for the region's transportation planning area would give an indication of trends in emission levels previously assumed constant for the entire county. The following paragraphs describe briefly this process.

Input VMT Data

The East West Gateway Coordinationg Council has recently completed a new highway assignment (95002) that represents the selected level of proposed construction of highway facilities. This network represents approximately a demand of 956,000 hours of vehicle travel or, at 3.3 trips/hour, 2.154 million trips per day. Although the transit alternative 95003 was selected, the exact definition of the alignments and vehicle technology appears to require additional study.

VMT summaries were available for 1970 and 1995 by corridor, subcorridor and link type. The 25 radial subcorridors and 18 circumferential subcorridors for the Missouri area of the region and 11 radial, 11 circumferential subcorridors for Illinois provide VMT data for a total 65 geographical units of the region. (Actually only 36 radial or 29 circumferential subcorridors can be described independently since they overlap each other in the region.) Each of these unit areas is represented by all the links within it, and data by link type was coded from these

1970 and 1995 summaries. From this data it was possible to calculate the 25-year growth ratio and simple annual growth rate compounded. Also from this data the 1975, 1980, and 1995 growth rates were calculated. (See Figure B-1 and B-2).

Speed Adjustment

The methodology for calculating emissions factors as defined by Kircher and Armstrong was followed*. The basic emission factor is adjusted by a speed correction factor. The traffic data available assigns average speeds to each link type. The baseline emission rates established by EPA are given for 19.6 mph (Approximately 20 mph) and an adjustment curve is given for increases for slower estimates of speed and decreases for higher estimates of speeds. Since the detailed link assignments are not available to provide the estimated speeds some general level of service that is to be provided will yield typical speeds on each facility type.

The 65 geographic subcorridors were classified as one of the following: urban; suburban and rural; and the 6 link types within each area were assigned an estimated speed. The results of this analysis are shown in Table B-1. It should be noted that these speeds are average 24-hour figures that reflect both peak and off-peak speed.

Vehicle Age

The second relevant factor is the estimate of the actual rates of HC and CO emissions for the average vehicle type in each of the projected years. These emission rates are based on the assumed distribution between light duty (LDV) and heavy duty (HDV) vehicles and the assumed pollution reductions to be effected from the Federal Motor Vehicle Control Program (FMVCP).

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* Kircher and Armstrong, An Interim Report on Motor Vehicle Emission Estimation, EPA, 450/2-7-003, October 1973.

The figures in the Attainment Study were generally utilized without any change for 1975 and 1980. For 1985 a new estimate was derived based on the continued implementation of the same level of control devices from 1976 to 1985 vehicles. Table B-2 summarizes the adjusted emission factors. These are then multiplied by VMT for each link calculated from traffic assignment data to obtain the emissions for each year. The results of the emission projections are given in Tables B-3 to B-19.

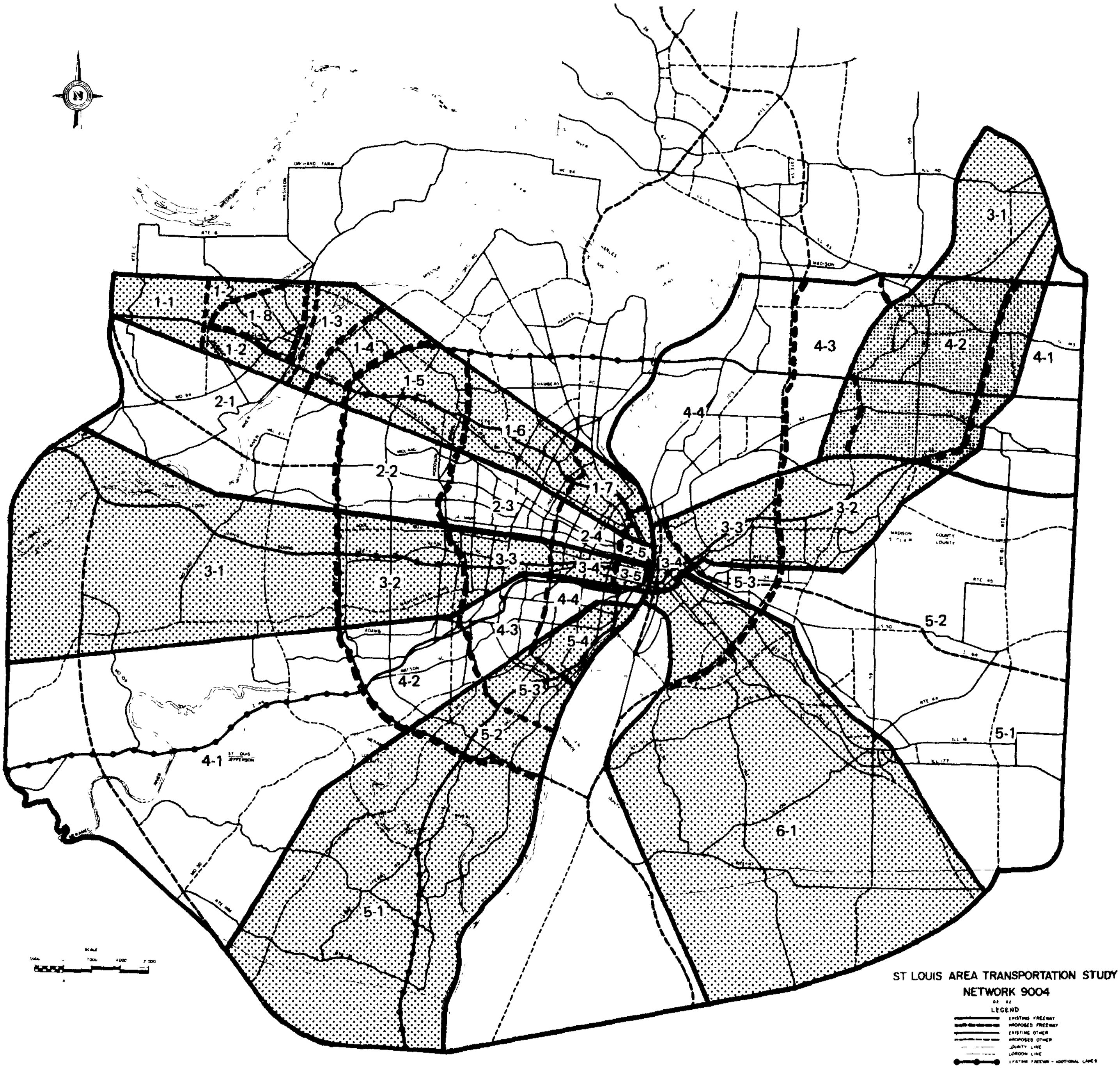


Figure B-1

Location of Radial Sub-Corridors in Tables B-3 to B-19

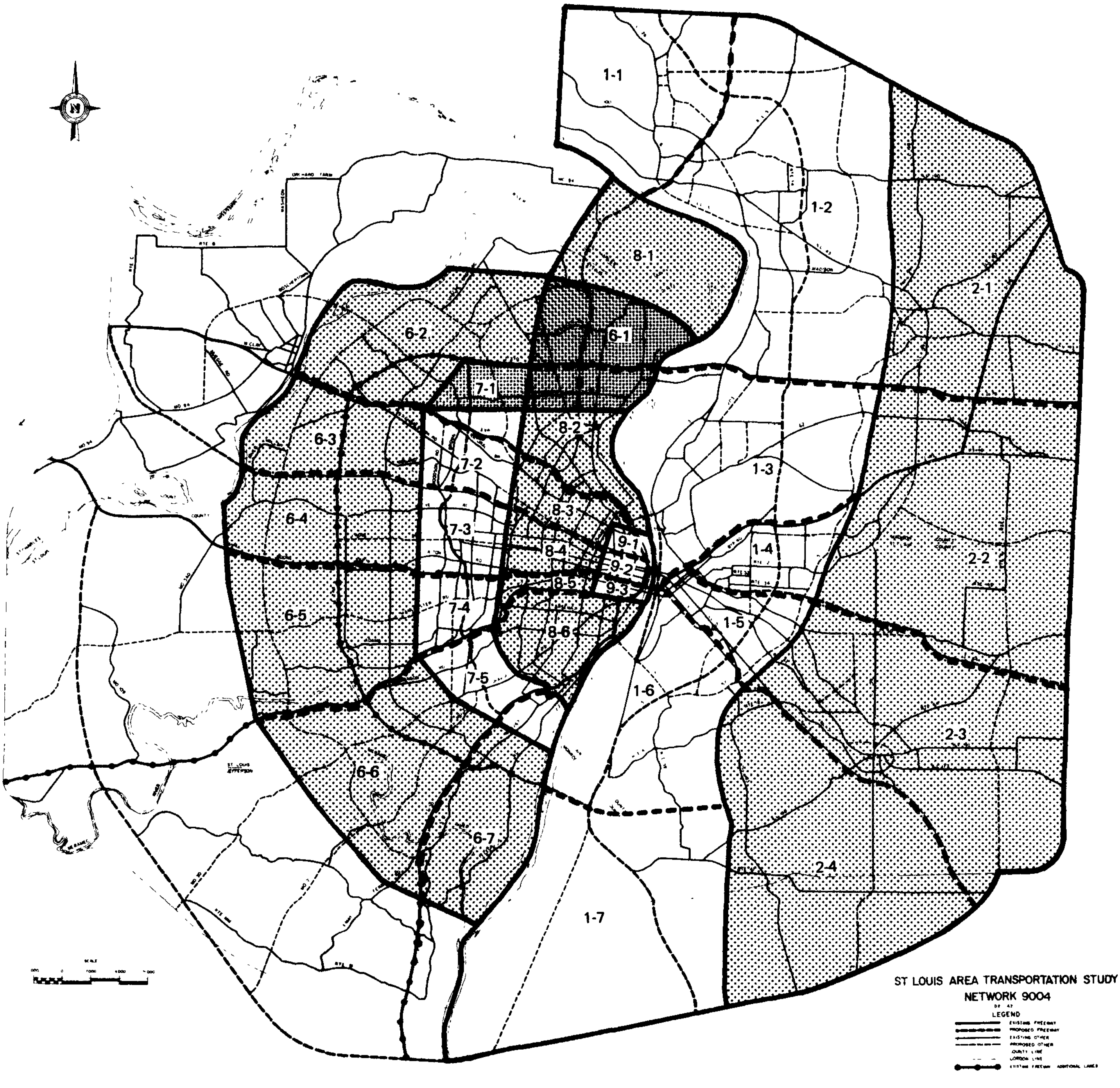


Figure B-2

Location of Circumferential Sub-Corridors in Tables B-3 to B-19

Table B-1

LINK TYPE FACTORS

Estimated 24-hour speed (average)

Facility Type Code	0	1	2	3	4	5	6
Development	Local	Collector	Minor Arterial	Princ. Arterial	X-Way	Free-way	Inter-state
Urban	15	20	25	30	40	45	45
Suburban	20	30	30	35	40	50	50
Rural	25	30	35	40	50	55	60

Corridors & Subcorridors Development Assumption
(x-y, where x=corridor, y=subcorridor)

	Urban	Suburban	Rural
Jurisdiction 1 (Missouri)	1-0,1-7	1-5,1-6	1-1,1-2,1-3,1-4,1-8
	2-4,2-5	2-2,2-3	2-1
	3-4,3-5	3-2,3-3	3-1
	4-4	4-2,4-3	4-1
	5-4	5-2,5-3	5-1
		6-1,6-2,6-3,6-4,6-5,6-6,6-7	
		7-1,7-2,7-3,7-4,7-5	
	8-2,8-3,8-4,8-5,8-6	8-1	
	9-1,9-2,9-3		
Jurisdiction 2 (Illinois)	1-4,1-5	1-1,1-2,1-3,1-6,1-7	
		2-1,2-2,2-3,2-4	
	3-3,3-4	3-2	3-1
		4-2,4-3,4-4	4-1
	5-3,	5-2	5-1
	6-2	6-1	

Table B-2

ST. LOUIS AQMA

HYDROCARBON AND CARBON MONOXIDE EMISSION FACTORS

	Grams/VMT/(Adjusted Contribution)			
	1972	1975	1980	1985
Carbon Monoxide				
HDV	136	133	131	130
5.7 percent of VMT	(7.78)	(7.58)	(7.46)	(7.41)
LDV	65.9	46.3	18.7	6.8
94.3 percent of VMT	(62.1)	(43.7)	(17.6)	(6.5)
Subtotal (CO)	(69.9)	(51.2)	(25.1)	(13.9)
Hydrocarbon				
HDV				
Exhaust	16.6	15.7	13.8	13.3
Crankcase and Evaporation	5.1	4.0	3.4	3.0
	21.7	19.7	17.2	16.3
5.7 percent of VMT	(1.238)	(1.123)	(.982)	(.928)
LDV				
Exhaust	6.1	4.4	2.0	.92
Crankcase and Evaporation	3.0	1.9	.4	.20
	9.1	6.3	2.4	1.12
94.3 percent of VMT	(8.542)	(5.939)	(2.281)	(1.054)
Subtotal (HC)	(9.780)	(7.062)	(3.263)	(1.982)

Source: PEDCo, Attainment Study

Table B-3

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
SUMMARY OF DAILY TONS
OF CARBON MONOXIDE EMISSIONS
FOR THE YEAR 1970

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	0
1	14	1	5	32	1	0	55	108
2	14	0	6	35	2	0	0	57
3	14	0	8	34	4	39	1	100
4	16	1	10	23	1	0	16	68
5	21	0	12	32	2	0	35	102
6	37	0	30	36	0	0	54	159
7	24	0	27	17	0	6	0	74
8	65	6	54	69	9	0	0	204
9	6	0	0	11	0	0	11	28
TOTALS	211	9	153	290	19	45	173	901

Table B-4

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
SUMMARY OF DAILY TONS
OF CARBON MONOXIDE EMISSIONS
FOR THE YEAR 1975

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	0
1	11	1	4	24	1	0	42	83
2	11	0	5	28	2	0	0	45
3	12	0	7	26	3	30	1	79
4	13	1	8	16	1	0	14	52
5	16	0	8	24	2	0	28	78
6	30	0	24	27	0	0	44	126
7	18	0	21	13	0	5	0	57
8	39	5	41	52	7	0	0	144
9	5	0	0	8	0	0	9	22
TOTALS	155	7	117	218	16	35	138	686

* See Table B-1 for Link Type Description

Table B-5

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
SUMMARY OF DAILY TONS
OF CARBON MONOXIDE EMISSIONS
FOR THE YEAR 1980

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	0
1	6	0	2	12	1	0	23	43
2	5	0	3	14	1	0	0	24
3	7	0	4	13	2	16	1	42
4	7	1	4	7	1	0	8	28
5	9	0	3	12	1	0	15	40
6	16	0	13	14	0	0	24	68
7	9	0	11	7	0	3	0	30
8	16	2	21	26	4	0	0	69
9	2	0	0	4	0	0	4	11
TOTALS	78	4	60	109	9	19	74	354

Table B-6

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
SUMMARY OF DAILY TONS
OF CARBON MONOXIDE EMISSIONS
FOR THE YEAR 1985

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	0
1	4	0	1	7	1	0	14	26
2	3	0	2	9	1	0	0	14
3	4	0	2	8	1	9	0	25
4	4	0	3	4	0	0	5	17
5	5	0	2	7	1	0	9	23
6	10	0	8	8	1	0	15	41
7	5	0	6	4	0	2	0	17
8	8	1	12	14	2	0	0	38
9	1	0	0	2	0	0	3	6
TOTALS	45	2	36	62	7	12	46	210

* See Table B-1 for Link Type Description

Table B-7

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
SUMMARY OF DAILY TONS
OF HYDROCARBONS EMISSIONS
FOR THE YEAR 1970

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	0
1	2	0	1	5	0	0	9	17
2	2	0	1	6	0	0	0	9
3	2	0	1	5	1	6	0	16
4	2	0	2	4	0	0	3	10
5	3	0	2	5	0	0	6	16
6	5	0	5	6	0	0	9	24
7	3	0	4	3	0	1	0	11
8	9	1	8	11	1	0	0	30
9	1	0	0	2	0	0	2	4
TOTALS	29	1	24	46	3	7	27	137

Table B-8

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
SUMMARY OF DAILY TONS
OF HYDROCARBONS EMISSIONS
FOR THE YEAR 1975

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	0
1	2	0	1	4	0	0	7	13
2	1	0	1	4	0	0	0	7
3	2	0	1	4	0	5	0	12
4	2	0	1	2	0	0	2	8
5	2	0	1	4	0	0	4	12
6	4	0	4	4	0	0	7	19
7	2	0	3	2	0	1	0	9
8	5	1	6	8	1	0	0	21
9	1	0	0	1	0	0	1	3
TOTALS	21	1	18	34	3	6	21	103

* See Table B-1 for Link Type Description

Table B-9

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
SUMMARY OF DAILY TONS
OF HYDROCARBONS EMISSIONS
FOR THE YEAR 1980

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	0
1	1	0	0	2	0	0	3	6
2	1	0	0	2	0	0	0	3
3	1	0	1	2	0	2	0	6
4	1	0	1	1	0	0	1	4
5	1	0	0	2	0	0	2	6
6	2	0	2	2	0	0	4	10
7	1	0	2	1	0	0	0	4
8	2	0	3	4	1	0	0	10
9	0	0	0	1	0	0	1	2
TOTALS	10	1	9	16	1	3	11	50

Table B-10

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
SUMMARY OF DAILY TONS
OF HYDROCARBONS EMISSIONS
FOR THE YEAR 1985

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	0
1	1	0	0	1	0	0	2	4
2	0	0	0	1	0	0	0	2
3	1	0	0	1	0	2	0	4
4	1	0	0	1	0	0	1	3
5	1	0	0	1	0	0	1	4
6	1	0	1	1	0	0	2	7
7	1	0	1	1	0	0	0	3
8	1	0	2	2	0	0	0	6
9	0	0	0	0	0	0	0	1
TOTALS	6	0	6	10	1	2	7	33

* See Table B-1 for Link Type Description

Table B-11

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
SUMMARY OF DAILY TONS
OF CARBON MONOXIDE EMISSIONS
FOR THE YEAR 1970

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	6	2	8	5	0	0	0	21
1	47	7	10	70	0	0	0	135
2	11	3	2	17	0	0	0	33
3	8	0	5	5	0	0	19	38
4	6	2	5	2	0	0	13	29
5	8	5	6	17	0	0	0	37
6	11	2	22	12	0	0	0	47
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
TOTALS	99	21	59	128	0	0	32	340

Table B-12

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
SUMMARY OF DAILY TONS
OF CARBON MONOXIDE EMISSIONS
FOR THE YEAR 1975

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	5	2	6	3	0	0	0	16
1	38	5	8	43	1	0	0	96
2	10	2	1	13	0	0	0	26
3	6	0	4	4	0	0	15	30
4	5	2	4	2	0	0	10	23
5	7	4	3	11	0	0	0	25
6	9	2	16	7	0	0	0	34
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
TOTALS	80	17	43	84	1	1	26	251

* See Table B-1 For Link Type Description

Table B-13

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
SUMMARY OF DAILY TONS
OF CARBON MONOXIDE EMISSIONS
FOR THE YEAR 1980

	LINK TYPE *							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	2	1	3	1	0	0	0	8
1	21	3	5	18	1	1	0	48
2	5	1	1	7	0	0	0	14
3	3	0	2	2	0	0	8	16
4	3	1	2	1	0	0	6	12
5	4	2	1	5	0	0	0	13
6	5	1	8	3	0	0	0	16
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
TOTALS	44	9	22	37	1	1	15	128

Table B-14

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
SUMMARY OF DAILY TONS
OF CARBON MONOXIDE EMISSIONS
FOR THE YEAR 1985

	LINK TYPE *							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	1	1	2	1	0	0	0	5
1	13	2	3	9	1	1	1	29
2	3	1	0	4	0	0	0	9
3	2	0	1	1	0	0	5	10
4	2	1	1	1	0	0	3	8
5	3	1	1	3	0	0	1	8
6	3	1	4	1	0	0	0	9
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
TOTALS	27	6	13	19	1	1	10	77

* See Table B-1 For Link Type Description

Table B-15

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
SUMMARY OF DAILY TONS
OF HYDROCARBONS EMISSIONS
FOR THE YEAR 1970

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	1	0	1	1	0	0	0	3
1	7	1	2	11	0	0	0	20
2	2	0	0	3	0	0	0	5
3	1	0	1	1	0	0	3	6
4	1	0	1	0	0	0	2	4
5	1	1	1	3	0	0	0	6
6	2	0	3	2	0	0	0	7
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
TOTALS	14	3	9	20	0	0	5	52

Table B-16

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
SUMMARY OF DAILY TONS
OF HYDROCARBONS EMISSIONS
FOR THE YEAR 1975

	LINK TYPE*							
CORRIDOR	0	1	2	3	4	5	6	TOTAL
0	1	0	1	0	0	0	0	2
1	5	1	1	7	0	0	0	14
2	1	0	0	2	0	0	0	4
3	1	0	1	1	0	0	2	5
4	1	0	1	0	0	0	2	3
5	1	1	1	2	0	0	0	4
6	1	0	2	1	0	0	0	5
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
TOTALS	11	3	7	13	0	0	4	37

* See Table B-1 for Link Type Description

Table B-17

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
SUMMARY OF DAILY TONS
OF HYDROCARBONS EMISSIONS
FOR THE YEAR 1980

CORRIDOR	LINK TYPE* 0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	1
1	3	0	1	3	0	0	0	7
2	1	0	0	1	0	0	0	2
3	0	0	0	0	0	0	1	2
4	0	0	0	0	0	0	1	2
5	1	0	0	1	0	0	0	2
6	1	0	1	0	0	0	0	2
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
TOTALS	6	1	3	5	0	0	2	18

Table B-18

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
SUMMARY OF DAILY TONS
OF HYDROCARBONS EMISSIONS
FOR THE YEAR 1985

CORRIDOR	LINK TYPE* 0	1	2	3	4	5	6	TOTAL
0	0	0	0	0	0	0	0	1
1	2	0	1	1	0	0	0	4
2	0	0	0	1	0	0	0	1
3	0	0	0	0	0	0	1	2
4	0	0	0	0	0	0	1	1
5	0	0	0	0	0	0	0	1
6	0	0	1	0	0	0	0	1
7	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
TOTALS	4	1	2	3	0	0	2	12

See Table B-1 for Link Type Description

Table B-19

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
ESTIMATES OF CARBON MONOXIDE EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK* TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
1	1	0	0.25	0.20	0.11	0.06	0.96	0.89	0.91
1	2	0	0.69	0.69	0.46	0.35	1.01	0.93	0.95
1	3	0	0.06	0.05	0.03	0.02	0.97	0.90	0.92
1	5	0	3.00	2.36	1.23	0.73	0.96	0.88	0.91
1	6	0	5.38	4.14	2.13	1.23	0.95	0.88	0.90
1	7	0	3.10	2.27	1.11	0.62	0.94	0.87	0.89
1	8	0	1.87	1.53	0.84	0.52	0.97	0.89	0.91
1	1	1	0.37	0.37	0.25	0.19	1.01	0.93	0.95
1	8	1	0.69	0.49	0.23	0.12	0.94	0.87	0.89
1	0	2	0.06	0.05	0.03	0.02	0.97	0.90	0.92
1	1	2	0.05	0.05	0.03	0.03	1.01	0.94	0.96
1	2	2	0.18	0.16	0.09	0.06	0.97	0.90	0.92
1	4	2	0.46	0.34	0.17	0.10	0.95	0.88	0.90
1	5	2	0.69	0.57	0.31	0.19	0.97	0.89	0.91
1	8	2	3.42	2.51	1.23	0.68	0.95	0.87	0.89
1	2	3	0.04	0.04	0.02	0.02	0.99	0.91	0.93
1	3	3	1.70	0.74	0.21	0.07	0.85	0.79	0.81
1	4	3	1.04	0.77	0.38	0.21	0.95	0.87	0.89
1	5	3	8.91	6.90	3.57	2.08	0.96	0.88	0.90
1	6	3	7.38	5.86	3.10	1.86	0.96	0.89	0.91
1	7	3	11.52	8.32	4.01	2.19	0.94	0.87	0.89
1	8	3	1.50	1.30	0.75	0.49	0.98	0.90	0.92
1	1	4	0.04	0.06	0.07	0.10	1.12	1.04	1.06
1	2	4	0.04	0.07	0.09	0.12	1.14	1.05	1.08
1	3	4	0.04	0.07	0.10	0.15	1.15	1.07	1.09
1	4	4	0.04	0.07	0.09	0.13	1.14	1.06	1.08
1	8	4	0.61	0.49	0.26	0.16	0.96	0.89	0.91
1	1	6	4.30	3.68	2.10	1.35	0.97	0.90	0.92
1	2	6	4.63	3.93	2.22	1.42	0.97	0.90	0.92
1	3	6	3.77	3.16	1.77	1.12	0.97	0.90	0.92
1	4	6	3.87	1.09	0.21	0.04	0.78	0.72	0.74
1	5	6	9.47	8.30	4.86	3.22	0.98	0.90	0.93
1	6	6	20.54	15.54	7.85	4.49	0.95	0.88	0.90
1	7	6	8.54	6.71	3.52	2.09	0.96	0.88	0.91
2	1	0	1.81	1.54	0.87	0.56	0.97	0.90	0.92
2	2	0	2.62	2.09	1.11	0.67	0.96	0.89	0.91
2	3	0	4.85	3.67	1.85	1.06	0.95	0.88	0.90
2	4	0	3.78	2.93	1.52	0.89	0.96	0.88	0.90
2	5	0	0.48	0.30	0.12	0.06	0.91	0.84	0.86
2	1	2	0.55	0.47	0.27	0.17	0.97	0.90	0.92
2	2	2	4.62	3.99	2.30	1.50	0.98	0.90	0.92
2	5	2	0.75	0.65	0.38	0.25	0.98	0.90	0.93
2	1	3	1.41	1.19	0.67	0.43	0.97	0.90	0.92
2	2	3	8.72	6.91	3.66	2.19	0.96	0.89	0.91
2	3	3	17.63	13.61	7.01	4.09	0.95	0.88	0.90
2	4	3	6.37	5.11	2.74	1.66	0.96	0.89	0.91
2	5	3	0.85	0.72	0.41	0.26	0.97	0.90	0.92
2	1	4	0.18	0.15	0.08	0.05	0.97	0.89	0.91
2	2	4	1.99	1.58	0.84	0.50	0.96	0.89	0.91
3	1	0	4.74	4.48	2.83	2.02	0.99	0.92	0.94

* See Table B-1 for Link Type Description

Table B-19 (Continued)

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
ESTIMATES OF CARBON MONOXIDE EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
3	2	0	3.85	2.94	1.50	0.87	0.95	0.88	0.90
3	3	0	3.54	2.69	1.36	0.78	0.95	0.88	0.90
3	4	0	1.16	0.89	0.46	0.26	0.95	0.88	0.90
3	5	0	0.97	0.72	0.36	0.20	0.95	0.88	0.90
3	5	1	0.15	0.11	0.06	0.03	0.94	0.87	0.89
3	1	2	1.85	1.83	1.21	0.90	1.00	0.93	0.95
3	2	2	2.60	2.22	1.27	0.82	0.97	0.90	0.92
3	3	2	2.23	1.77	0.94	0.56	0.96	0.89	0.91
3	4	2	0.62	0.29	0.09	0.03	0.86	0.80	0.82
3	5	2	1.18	0.66	0.25	0.11	0.90	0.83	0.85
3	1	3	8.22	6.44	3.37	1.99	0.96	0.88	0.91
3	2	3	7.25	5.62	2.91	1.70	0.96	0.88	0.90
3	3	3	4.06	3.16	1.64	0.97	0.96	0.88	0.90
3	4	3	10.83	8.18	4.13	2.36	0.95	0.88	0.90
3	5	3	3.77	2.67	1.26	0.68	0.94	0.87	0.89
3	3	4	3.53	3.01	1.72	1.11	0.97	0.90	0.92
3	1	5	4.98	4.62	2.86	2.00	0.99	0.91	0.94
3	2	5	10.67	8.53	4.55	2.75	0.96	0.89	0.91
3	3	5	15.55	11.29	5.48	3.00	0.94	0.87	0.89
3	4	5	7.38	5.57	2.81	1.60	0.95	0.88	0.90
3	5	5	0.04	0.06	0.06	0.08	1.10	1.02	1.04
3	5	6	1.15	1.00	0.58	0.38	0.98	0.90	0.92
4	1	0	5.98	5.15	2.96	1.92	0.98	0.90	0.92
4	2	0	2.54	2.08	1.14	0.71	0.97	0.89	0.91
4	3	0	5.23	3.92	1.96	1.11	0.95	0.88	0.90
4	4	0	2.71	2.00	0.99	0.55	0.95	0.87	0.89
4	1	1	1.27	1.06	0.59	0.37	0.97	0.89	0.92
4	2	1	0.05	0.04	0.03	0.02	0.97	0.90	0.92
4	1	2	1.29	1.27	0.83	0.62	1.00	0.92	0.95
4	2	2	3.03	2.47	1.35	0.83	0.97	0.89	0.91
4	3	2	2.81	2.24	1.20	0.72	0.96	0.89	0.91
4	4	2	2.80	2.02	0.97	0.53	0.94	0.87	0.89
4	1	3	6.69	3.67	1.35	0.56	0.89	0.82	0.84
4	2	3	9.18	6.90	3.46	1.96	0.95	0.88	0.90
4	3	3	6.46	4.52	2.11	1.11	0.94	0.86	0.89
4	4	3	1.06	0.77	0.37	0.20	0.94	0.87	0.89
4	1	4	0.04	0.08	0.11	0.19	1.17	1.08	1.11
4	2	4	0.83	0.71	0.41	0.26	0.97	0.90	0.92
4	1	6	15.12	12.24	6.62	4.04	0.96	0.89	0.91
4	2	6	0.98	1.17	0.93	0.84	1.04	0.96	0.98
4	3	6	0.04	0.08	0.13	0.22	1.19	1.09	1.12
4	4	6	0.04	0.08	0.10	0.15	1.15	1.06	1.09
5	1	0	3.99	3.49	2.04	1.35	0.98	0.90	0.93
5	2	0	1.08	0.86	0.45	0.27	0.96	0.89	0.91
5	3	0	7.85	6.07	3.14	1.83	0.96	0.88	0.90
5	4	0	7.85	5.81	2.87	1.60	0.95	0.87	0.89
5	1	2	9.28	5.41	2.11	0.93	0.90	0.83	0.85
5	3	2	1.11	0.87	0.45	0.27	0.96	0.88	0.90
5	4	2	1.68	1.29	0.66	0.38	0.95	0.88	0.90
5	1	3	8.56	6.59	3.38	1.97	0.95	0.88	0.90

Table B-19 (Continued)

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
ESTIMATES OF CARBON MONOXIDE EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
5	2	3	2.22	1.77	0.94	0.57	0.96	0.89	0.91
5	3	3	7.57	5.78	2.95	1.70	0.95	0.88	0.90
5	4	3	13.53	9.50	4.45	2.35	0.94	0.86	0.89
5	1	4	0.87	0.89	0.61	0.47	1.01	0.93	0.96
5	2	4	1.45	1.16	0.62	0.37	0.96	0.89	0.91
5	1	6	10.25	8.78	5.02	3.24	0.97	0.90	0.92
5	2	6	5.71	4.54	2.41	1.45	0.96	0.89	0.91
5	3	6	6.22	4.82	2.49	1.46	0.96	0.88	0.90
5	4	6	12.73	9.93	5.17	3.04	0.96	0.88	0.90
6	1	0	2.69	2.19	1.19	0.73	0.96	0.89	0.91
6	2	0	8.54	6.96	3.79	2.33	0.96	0.89	0.91
6	3	0	5.92	4.82	2.62	1.61	0.96	0.89	0.91
6	4	0	3.77	3.01	1.60	0.97	0.96	0.89	0.91
6	5	0	4.31	3.41	1.80	1.07	0.96	0.89	0.91
6	6	0	8.23	6.69	3.63	2.22	0.96	0.89	0.91
6	7	0	3.85	3.28	1.87	1.20	0.97	0.90	0.92
6	1	1	0.11	0.11	0.07	0.06	1.01	0.93	0.95
6	5	1	0.27	0.25	0.16	0.11	0.99	0.92	0.94
6	1	2	0.16	0.14	0.08	0.05	0.98	0.90	0.92
6	2	2	14.65	10.26	4.80	2.54	0.94	0.86	0.89
6	3	2	3.24	2.74	1.55	0.99	0.97	0.90	0.92
6	4	2	3.87	3.41	2.00	1.33	0.98	0.90	0.93
6	5	2	4.41	3.71	2.08	1.32	0.97	0.90	0.92
6	6	2	3.82	3.29	1.89	1.22	0.98	0.90	0.92
6	7	2	0.16	0.16	0.10	0.08	1.00	0.92	0.95
6	1	3	0.78	0.61	0.32	0.19	0.96	0.88	0.90
6	2	3	12.55	10.50	5.86	3.70	0.97	0.89	0.92
6	3	3	3.37	2.38	1.12	0.60	0.94	0.87	0.89
6	4	3	3.37	2.46	1.20	0.66	0.94	0.87	0.89
6	5	3	7.85	5.25	2.35	1.19	0.93	0.86	0.88
6	6	3	5.91	4.34	2.13	1.18	0.95	0.87	0.89
6	7	3	2.17	1.90	1.11	0.73	0.98	0.90	0.93
6	2	4	0.04	0.08	0.10	0.14	1.14	1.05	1.08
6	3	4	0.04	0.06	0.06	0.07	1.09	1.01	1.03
6	4	4	0.04	0.07	0.07	0.09	1.11	1.02	1.05
6	5	4	0.04	0.09	0.13	0.21	1.17	1.08	1.11
6	6	4	0.04	0.08	0.09	0.13	1.14	1.05	1.07
6	1	6	3.87	3.16	1.72	1.06	0.97	0.89	0.91
6	2	6	17.82	14.35	7.72	4.69	0.96	0.89	0.91
6	3	6	6.94	5.46	2.87	1.70	0.96	0.88	0.91
6	4	6	8.89	7.00	3.68	2.19	0.96	0.88	0.91
6	5	6	9.11	7.42	4.03	2.48	0.96	0.89	0.91
6	6	6	7.52	6.34	3.57	2.27	0.97	0.90	0.92
6	7	6	0.33	0.40	0.33	0.31	1.05	0.97	0.99
7	1	0	4.08	2.94	1.42	0.77	0.94	0.87	0.89
7	2	0	5.77	4.51	2.36	1.39	0.96	0.88	0.90
7	3	0	7.31	5.57	2.84	1.63	0.95	0.88	0.90
7	4	0	4.46	3.36	1.68	0.96	0.95	0.88	0.90
7	5	0	1.92	1.46	0.74	0.43	0.95	0.88	0.90
7	2	1	0.16	0.13	0.08	0.05	0.97	0.90	0.92

Table B-19 (Continued)

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
ESTIMATES OF CARBON MONOXIDE EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
7	1	2	6.85	5.09	2.52	1.41	0.95	0.87	0.90
7	2	2	5.94	3.77	1.59	0.76	0.92	0.85	0.87
7	3	2	5.73	4.45	2.31	1.35	0.96	0.88	0.90
7	4	2	3.03	2.56	1.45	0.92	0.97	0.90	0.92
7	5	2	5.68	4.85	2.77	1.78	0.97	0.90	0.92
7	1	3	3.78	2.98	1.56	0.93	0.96	0.88	0.91
7	2	3	2.91	2.28	1.20	0.71	0.96	0.88	0.91
7	3	3	2.35	1.83	0.95	0.56	0.96	0.88	0.90
7	4	3	5.26	3.91	1.94	1.09	0.95	0.87	0.90
7	5	3	3.00	2.30	1.18	0.68	0.95	0.88	0.90
7	1	5	0.04	0.07	0.10	0.14	1.15	1.06	1.09
7	2	5	0.04	0.08	0.12	0.21	1.18	1.09	1.12
7	3	5	5.97	4.93	2.72	1.69	0.97	0.89	0.91
8	1	0	1.08	0.89	0.49	0.30	0.97	0.89	0.91
8	2	0	10.66	7.91	3.92	2.19	0.95	0.87	0.90
8	3	0	8.43	6.15	3.00	1.65	0.94	0.87	0.89
8	4	0	34.89	16.87	5.45	1.99	0.87	0.80	0.82
8	5	0	1.16	0.87	0.43	0.24	0.95	0.87	0.90
8	6	0	8.63	6.42	3.19	1.79	0.95	0.87	0.90
8	2	1	0.69	0.55	0.29	0.17	0.96	0.88	0.91
8	3	1	0.15	0.12	0.06	0.04	0.96	0.89	0.91
8	4	1	3.54	2.66	1.33	0.76	0.95	0.88	0.90
8	6	1	1.92	1.45	0.73	0.42	0.95	0.88	0.90
8	1	2	3.66	2.89	1.52	0.91	0.96	0.88	0.91
8	2	2	10.84	8.32	4.26	2.47	0.95	0.88	0.90
8	3	2	15.08	11.44	5.80	3.32	0.95	0.88	0.90
8	4	2	6.23	4.89	2.56	1.52	0.96	0.88	0.91
8	5	2	3.36	2.53	1.27	0.72	0.95	0.88	0.90
8	6	2	15.20	11.38	5.69	3.21	0.95	0.88	0.90
8	1	3	1.02	0.88	0.51	0.33	0.98	0.90	0.92
8	2	3	24.15	18.06	9.02	5.09	0.95	0.88	0.90
8	3	3	9.45	7.09	3.56	2.02	0.95	0.88	0.90
8	4	3	14.22	10.56	5.24	2.93	0.95	0.87	0.90
8	5	3	7.32	5.35	2.61	1.44	0.94	0.87	0.89
8	6	3	13.32	9.70	4.72	2.59	0.94	0.87	0.89
8	1	4	9.06	7.08	3.69	2.18	0.96	0.88	0.90
8	2	4	0.04	0.07	0.09	0.12	1.13	1.04	1.07
9	1	0	2.13	1.58	0.78	0.43	0.95	0.87	0.89
9	2	0	2.13	1.64	0.84	0.49	0.95	0.88	0.90
9	3	0	1.84	1.47	0.78	0.47	0.96	0.89	0.91
9	1	3	3.82	2.83	1.40	0.78	0.95	0.87	0.90
9	2	3	3.29	2.39	1.16	0.63	0.94	0.87	0.89
9	3	3	4.03	2.92	1.42	0.77	0.94	0.87	0.89
9	1	5	0.04	0.04	0.03	0.02	1.01	0.93	0.95
9	2	5	0.04	0.05	0.05	0.05	1.07	0.99	1.02
9	3	5	0.04	0.06	0.07	0.09	1.11	1.03	1.05
9	1	6	5.54	4.39	2.32	1.39	0.96	0.89	0.91
9	2	6	1.73	1.32	0.67	0.39	0.95	0.88	0.90
9	3	6	3.73	2.90	1.50	0.88	0.96	0.88	0.90

Table B-19 (Continued)

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
ESTIMATES OF HYDROCARBONS EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
1	1	0	0.04	0.03	0.01	0.01	0.96	0.88	0.93
1	2	0	0.10	0.10	0.06	0.05	1.00	0.92	0.97
1	3	0	0.01	0.01	0.00	0.00	0.97	0.89	0.94
1	5	0	0.42	0.32	0.16	0.10	0.95	0.87	0.92
1	6	0	0.75	0.57	0.28	0.18	0.95	0.87	0.92
1	7	0	0.41	0.30	0.14	0.08	0.94	0.86	0.91
1	8	0	0.28	0.23	0.12	0.08	0.96	0.88	0.93
1	1	1	0.06	0.06	0.04	0.03	1.00	0.92	0.97
1	8	1	0.11	0.08	0.03	0.02	0.94	0.86	0.90
1	0	2	0.01	0.01	0.00	0.00	0.97	0.89	0.94
1	1	2	0.01	0.01	0.00	0.00	1.01	0.93	0.98
1	2	2	0.03	0.02	0.01	0.01	0.97	0.89	0.94
1	4	2	0.07	0.05	0.03	0.02	0.95	0.87	0.91
1	5	2	0.11	0.09	0.05	0.03	0.96	0.88	0.93
1	8	2	0.54	0.39	0.18	0.11	0.94	0.86	0.91
1	2	3	0.01	0.01	0.00	0.00	0.98	0.90	0.95
1	3	3	0.27	0.12	0.03	0.01	0.85	0.78	0.82
1	4	3	0.17	0.12	0.06	0.03	0.94	0.86	0.91
1	5	3	1.41	1.08	0.53	0.34	0.95	0.87	0.92
1	6	3	1.17	0.92	0.46	0.30	0.96	0.88	0.93
1	7	3	1.80	1.28	0.58	0.35	0.94	0.86	0.91
1	8	3	0.24	0.21	0.11	0.08	0.97	0.89	0.94
1	1	4	0.01	0.01	0.01	0.02	1.12	1.03	1.08
1	2	4	0.01	0.01	0.01	0.02	1.14	1.04	1.10
1	3	4	0.01	0.01	0.01	0.02	1.15	1.05	1.11
1	4	4	0.01	0.01	0.01	0.02	1.14	1.04	1.10
1	8	4	0.10	0.08	0.04	0.03	0.96	0.88	0.93
1	1	6	0.67	0.57	0.30	0.22	0.97	0.89	0.94
1	2	6	0.72	0.60	0.32	0.23	0.97	0.89	0.94
1	3	6	0.59	0.49	0.26	0.18	0.97	0.89	0.94
1	4	6	0.60	0.17	0.03	0.01	0.78	0.71	0.75
1	5	6	1.49	1.29	0.71	0.52	0.98	0.89	0.94
1	6	6	3.24	2.41	1.15	0.72	0.95	0.87	0.92
1	7	6	1.39	1.07	0.53	0.35	0.96	0.87	0.92
2	1	0	0.27	0.23	0.12	0.09	0.97	0.89	0.94
2	2	0	0.37	0.29	0.14	0.10	0.96	0.88	0.93
2	3	0	0.68	0.51	0.24	0.15	0.95	0.87	0.92
2	4	0	0.50	0.38	0.19	0.12	0.95	0.87	0.92
2	5	0	0.06	0.04	0.01	0.01	0.91	0.83	0.88
2	1	2	0.09	0.07	0.04	0.03	0.97	0.89	0.94
2	2	2	0.72	0.61	0.33	0.24	0.97	0.89	0.94
2	5	2	0.11	0.10	0.05	0.04	0.98	0.89	0.94
2	1	3	0.23	0.19	0.10	0.07	0.97	0.89	0.94
2	2	3	1.38	1.08	0.54	0.35	0.96	0.88	0.92
2	3	3	2.79	2.13	1.03	0.66	0.95	0.87	0.92
2	4	3	0.99	0.79	0.40	0.27	0.96	0.88	0.93
2	5	3	0.13	0.11	0.06	0.04	0.97	0.89	0.94
2	1	4	0.03	0.02	0.01	0.01	0.96	0.88	0.93
2	2	4	0.32	0.25	0.13	0.08	0.96	0.88	0.93
3	1	0	0.71	0.66	0.40	0.31	0.99	0.91	0.96

Table B-19 (Continued)

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
ESTIMATES OF HYDROCARBONS EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
3	2	0	0.54	0.41	0.20	0.12	0.95	0.87	0.92
3	3	0	0.49	0.37	0.18	0.11	0.95	0.87	0.92
3	4	0	0.15	0.12	0.06	0.04	0.95	0.87	0.92
3	5	0	0.13	0.09	0.04	0.03	0.95	0.87	0.91
3	5	1	0.02	0.02	0.01	0.00	0.94	0.86	0.91
3	1	2	0.29	0.29	0.18	0.15	1.00	0.91	0.97
3	2	2	0.41	0.34	0.18	0.13	0.97	0.89	0.94
3	3	2	0.35	0.27	0.14	0.09	0.96	0.88	0.93
3	4	2	0.09	0.04	0.01	0.00	0.86	0.79	0.83
3	5	2	0.18	0.10	0.03	0.02	0.89	0.82	0.86
3	1	3	1.32	1.02	0.50	0.33	0.95	0.87	0.92
3	2	3	1.15	0.88	0.43	0.28	0.95	0.87	0.92
3	3	3	0.64	0.49	0.24	0.16	0.95	0.87	0.92
3	4	3	1.69	1.26	0.60	0.38	0.95	0.87	0.92
3	5	3	0.59	0.41	0.18	0.11	0.94	0.86	0.90
3	3	4	0.57	0.48	0.26	0.18	0.97	0.89	0.94
3	1	5	0.79	0.72	0.42	0.33	0.99	0.90	0.95
3	2	5	1.68	1.33	0.67	0.44	0.96	0.88	0.93
3	3	5	2.45	1.75	0.80	0.48	0.94	0.86	0.91
3	4	5	1.20	0.89	0.42	0.27	0.95	0.87	0.92
3	5	5	0.01	0.01	0.01	0.01	1.10	1.00	1.06
3	5	6	0.19	0.16	0.09	0.06	0.97	0.89	0.94
4	1	0	0.90	0.76	0.41	0.30	0.97	0.89	0.94
4	2	0	0.36	0.29	0.15	0.10	0.96	0.88	0.93
4	3	0	0.73	0.54	0.26	0.16	0.95	0.87	0.91
4	4	0	0.36	0.26	0.12	0.07	0.94	0.86	0.91
4	1	1	0.20	0.16	0.09	0.06	0.97	0.88	0.93
4	2	1	0.01	0.01	0.00	0.00	0.97	0.89	0.94
4	1	2	0.20	0.20	0.12	0.10	1.00	0.91	0.97
4	2	2	0.47	0.38	0.20	0.13	0.96	0.88	0.93
4	3	2	0.44	0.35	0.17	0.12	0.96	0.88	0.93
4	4	2	0.42	0.30	0.14	0.08	0.94	0.86	0.91
4	1	3	1.07	0.58	0.20	0.09	0.89	0.81	0.86
4	2	3	1.46	1.08	0.51	0.32	0.95	0.87	0.92
4	3	3	1.02	0.71	0.31	0.18	0.93	0.85	0.90
4	4	3	0.17	0.12	0.05	0.03	0.94	0.86	0.91
4	1	4	0.01	0.01	0.02	0.03	1.17	1.07	1.13
4	2	4	0.13	0.11	0.06	0.04	0.97	0.89	0.94
4	1	6	2.36	1.88	0.96	0.65	0.96	0.88	0.93
4	2	6	0.15	0.18	0.14	0.14	1.04	0.95	1.00
4	3	6	0.01	0.01	0.02	0.04	1.18	1.08	1.14
4	4	6	0.01	0.01	0.02	0.03	1.15	1.05	1.11
5	1	0	0.60	0.52	0.29	0.21	0.98	0.89	0.94
5	2	0	0.15	0.12	0.06	0.04	0.96	0.88	0.93
5	3	0	1.10	0.84	0.41	0.26	0.95	0.87	0.92
5	4	0	1.04	0.76	0.35	0.22	0.94	0.86	0.91
5	1	2	1.47	0.84	0.31	0.15	0.90	0.82	0.87
5	3	2	0.17	0.13	0.07	0.04	0.95	0.87	0.92
5	4	2	0.25	0.19	0.09	0.06	0.95	0.87	0.92
5	1	3	1.37	1.04	0.51	0.32	0.95	0.87	0.92

Table B-19 (Continued)

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
ESTIMATES OF HYDROCARBONS EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
5	2	3	0.35	0.28	0.14	0.09	0.96	0.88	0.93
5	3	3	1.20	0.90	0.44	0.28	0.95	0.87	0.92
5	4	3	2.11	1.46	0.65	0.38	0.93	0.85	0.90
5	1	4	0.14	0.14	0.09	0.08	1.01	0.92	0.97
5	2	4	0.23	0.18	0.09	0.06	0.96	0.88	0.93
5	1	6	1.60	1.35	0.73	0.52	0.97	0.89	0.94
5	2	6	0.90	0.71	0.35	0.23	0.96	0.88	0.93
5	3	6	0.98	0.75	0.37	0.24	0.95	0.87	0.92
5	4	6	2.07	1.59	0.78	0.51	0.95	0.87	0.92
6	1	0	0.38	0.30	0.15	0.10	0.96	0.88	0.93
6	2	0	1.19	0.96	0.49	0.33	0.96	0.88	0.93
6	3	0	0.83	0.66	0.34	0.23	0.96	0.88	0.93
6	4	0	0.53	0.41	0.21	0.14	0.96	0.88	0.93
6	5	0	0.60	0.47	0.23	0.15	0.96	0.88	0.92
6	6	0	1.15	0.92	0.47	0.32	0.96	0.88	0.93
6	7	0	0.54	0.45	0.24	0.17	0.97	0.89	0.94
6	1	1	0.02	0.02	0.01	0.01	1.00	0.92	0.97
6	5	1	0.04	0.04	0.02	0.02	0.99	0.91	0.96
6	1	2	0.02	0.02	0.01	0.01	0.97	0.89	0.94
6	2	2	2.29	1.58	0.70	0.41	0.93	0.85	0.90
6	3	2	0.51	0.42	0.23	0.16	0.97	0.89	0.94
6	4	2	0.60	0.52	0.29	0.21	0.98	0.89	0.94
6	5	2	0.69	0.57	0.30	0.21	0.97	0.89	0.94
6	6	2	0.60	0.51	0.27	0.20	0.97	0.89	0.94
6	7	2	0.02	0.02	0.01	0.01	1.00	0.91	0.97
6	1	3	0.12	0.10	0.05	0.03	0.95	0.87	0.92
6	2	3	1.99	1.64	0.86	0.60	0.97	0.88	0.93
6	3	3	0.53	0.37	0.17	0.10	0.94	0.86	0.90
6	4	3	0.53	0.38	0.18	0.11	0.94	0.86	0.91
6	5	3	1.24	0.82	0.35	0.19	0.93	0.85	0.89
6	6	3	0.94	0.68	0.31	0.19	0.94	0.86	0.91
6	7	3	0.34	0.30	0.16	0.12	0.98	0.89	0.94
6	2	4	0.01	0.01	0.01	0.02	1.13	1.04	1.10
6	3	4	0.01	0.01	0.01	0.01	1.09	1.00	1.05
6	4	4	0.01	0.01	0.01	0.01	1.10	1.01	1.07
6	5	4	0.01	0.01	0.02	0.04	1.17	1.07	1.13
6	6	4	0.01	0.01	0.01	0.02	1.13	1.04	1.09
6	1	6	0.61	0.49	0.25	0.17	0.96	0.88	0.93
6	2	6	2.81	2.23	1.13	0.76	0.96	0.88	0.93
6	3	6	1.09	0.85	0.42	0.28	0.96	0.87	0.92
6	4	6	1.40	1.09	0.54	0.35	0.96	0.87	0.92
6	5	6	1.44	1.15	0.59	0.40	0.96	0.88	0.93
6	6	6	1.19	0.98	0.52	0.37	0.97	0.89	0.94
6	7	6	0.05	0.06	0.05	0.05	1.05	0.96	1.01
7	1	0	0.57	0.41	0.18	0.11	0.94	0.86	0.91
7	2	0	0.81	0.62	0.31	0.20	0.95	0.87	0.92
7	3	0	1.02	0.77	0.37	0.23	0.95	0.87	0.92
7	4	0	0.62	0.46	0.22	0.14	0.95	0.87	0.92
7	5	0	0.27	0.20	0.10	0.06	0.95	0.87	0.92
7	2	1	0.02	0.02	0.01	0.01	0.97	0.89	0.94

Table B-19 (Continued)

ST. LOUIS URBAN AREA (MISSOURI SUBAREA)
ESTIMATES OF HYDROCARBONS EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
7	1	2	1.07	0.78	0.37	0.23	0.94	0.86	0.91
7	2	2	0.93	0.58	0.23	0.12	0.92	0.84	0.88
7	3	2	0.89	0.68	0.33	0.22	0.95	0.87	0.92
7	4	2	0.47	0.39	0.21	0.15	0.97	0.89	0.94
7	5	2	0.89	0.75	0.40	0.29	0.97	0.89	0.94
7	1	3	0.60	0.47	0.23	0.15	0.96	0.87	0.92
7	2	3	0.46	0.36	0.18	0.12	0.95	0.87	0.92
7	3	3	0.37	0.29	0.14	0.09	0.95	0.87	0.92
7	4	3	0.83	0.61	0.29	0.18	0.94	0.86	0.91
7	5	3	0.48	0.36	0.17	0.11	0.95	0.87	0.92
7	1	5	0.01	0.01	0.01	0.02	1.15	1.05	1.11
7	2	5	0.01	0.01	0.02	0.03	1.18	1.08	1.14
7	3	5	0.94	0.77	0.40	0.27	0.96	0.88	0.93
8	1	0	0.15	0.12	0.06	0.04	0.96	0.88	0.93
8	2	0	1.41	1.03	0.48	0.30	0.94	0.86	0.91
8	3	0	1.11	0.80	0.37	0.22	0.94	0.86	0.91
8	4	0	4.61	2.20	0.67	0.27	0.87	0.79	0.84
8	5	0	0.15	0.11	0.05	0.03	0.94	0.86	0.91
8	6	0	1.14	0.84	0.39	0.24	0.94	0.86	0.91
8	2	1	0.10	0.08	0.04	0.02	0.96	0.87	0.92
8	3	1	0.02	0.02	0.01	0.01	0.96	0.88	0.93
8	4	1	0.49	0.37	0.17	0.11	0.95	0.87	0.92
8	6	1	0.27	0.20	0.10	0.06	0.95	0.87	0.92
8	1	2	0.57	0.44	0.22	0.15	0.96	0.87	0.92
8	2	2	1.63	1.23	0.60	0.38	0.95	0.87	0.92
8	3	2	2.26	1.69	0.81	0.51	0.95	0.87	0.92
8	4	2	0.94	0.72	0.36	0.23	0.95	0.87	0.92
8	5	2	0.51	0.37	0.18	0.11	0.95	0.87	0.91
8	6	2	2.28	1.68	0.79	0.49	0.95	0.87	0.91
8	1	3	0.16	0.14	0.07	0.05	0.97	0.89	0.94
8	2	3	3.77	2.78	1.31	0.81	0.95	0.87	0.91
8	3	3	1.47	1.09	0.52	0.32	0.95	0.87	0.91
8	4	3	2.22	1.62	0.76	0.47	0.94	0.86	0.91
8	5	3	1.14	0.82	0.38	0.23	0.94	0.86	0.91
8	6	3	2.08	1.49	0.68	0.41	0.94	0.86	0.91
8	1	4	1.45	1.12	0.55	0.36	0.95	0.87	0.92
8	2	4	0.01	0.01	0.01	0.02	1.13	1.03	1.09
9	1	0	0.28	0.21	0.10	0.06	0.94	0.86	0.91
9	2	0	0.28	0.21	0.10	0.07	0.95	0.87	0.92
9	3	0	0.24	0.19	0.10	0.06	0.96	0.88	0.93
9	1	3	0.60	0.44	0.20	0.13	0.94	0.86	0.91
9	2	3	0.51	0.37	0.17	0.10	0.94	0.86	0.91
9	3	3	0.63	0.45	0.21	0.12	0.94	0.86	0.91
9	1	5	0.01	0.01	0.00	0.00	1.00	0.92	0.97
9	2	5	0.01	0.01	0.01	0.01	1.07	0.98	1.03
9	3	5	0.01	0.01	0.01	0.01	1.11	1.02	1.07
9	1	6	0.90	0.70	0.35	0.23	0.96	0.88	0.92
9	2	6	0.28	0.21	0.10	0.06	0.95	0.87	0.92
9	3	6	0.61	0.46	0.23	0.15	0.95	0.87	0.92

Table B-19 (Continued)

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
ESTIMATES OF CARBON MONOXIDE EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
0	0	0	6.38	4.78	2.39	1.35	0.95	0.88	0.90
0	0	1	2.18	1.85	1.05	0.67	0.97	0.90	0.92
0	0	2	8.17	6.35	3.29	1.93	0.96	0.88	0.90
0	0	3	4.66	3.18	1.45	0.75	0.93	0.86	0.88
0	0	6	0.04	0.07	0.10	0.15	1.15	1.07	1.09
1	1	0	6.46	4.96	2.54	1.47	0.95	0.88	0.90
1	2	0	17.69	14.26	7.67	4.67	0.96	0.89	0.91
1	3	0	10.85	8.64	4.60	2.76	0.96	0.89	0.91
1	4	0	1.65	1.36	0.75	0.47	0.97	0.89	0.91
1	5	0	3.30	2.44	1.21	0.68	0.95	0.87	0.90
1	6	0	5.77	4.64	2.50	1.52	0.96	0.89	0.91
1	7	0	1.62	1.80	1.34	1.13	1.03	0.95	0.97
1	1	1	1.59	0.87	0.32	0.13	0.89	0.82	0.84
1	2	1	3.87	3.26	1.83	1.16	0.97	0.90	0.92
1	3	1	0.11	0.11	0.07	0.06	1.01	0.93	0.95
1	4	1	1.08	0.79	0.39	0.21	0.94	0.87	0.89
1	5	1	0.08	0.06	0.03	0.02	0.94	0.87	0.89
1	6	1	0.05	0.09	0.10	0.13	1.12	1.03	1.06
1	7	1	0.11	0.17	0.18	0.22	1.11	1.02	1.04
1	1	2	3.45	2.69	1.40	0.83	0.96	0.88	0.90
1	2	2	1.49	1.34	0.81	0.55	0.98	0.91	0.93
1	3	2	3.98	3.63	2.22	1.53	0.99	0.91	0.93
1	4	2	0.06	0.10	0.12	0.15	1.11	1.03	1.05
1	5	2	0.12	0.14	0.11	0.10	1.04	0.96	0.98
1	6	2	0.80	0.39	0.13	0.05	0.87	0.80	0.82
1	1	3	4.75	3.19	1.43	0.72	0.93	0.86	0.88
1	2	3	23.26	14.96	6.42	3.12	0.92	0.85	0.87
1	3	3	16.94	10.15	4.06	1.84	0.91	0.84	0.86
1	4	3	5.31	3.62	1.65	0.85	0.93	0.86	0.88
1	5	3	5.89	4.25	2.05	1.12	0.94	0.87	0.89
1	6	3	10.62	6.04	2.30	0.99	0.90	0.83	0.85
1	7	3	3.37	1.05	0.22	0.05	0.80	0.74	0.75
1	1	4	0.33	0.35	0.24	0.19	1.01	0.93	0.96
1	2	4	0.04	0.10	0.16	0.29	1.20	1.10	1.13
1	3	4	0.04	0.10	0.15	0.26	1.19	1.10	1.12
1	6	4	0.04	0.06	0.06	0.07	1.09	1.00	1.03
1	1	5	0.04	0.05	0.04	0.04	1.06	0.98	1.00
1	2	5	0.04	0.09	0.16	0.31	1.21	1.12	1.15
1	3	5	0.04	0.08	0.13	0.23	1.19	1.10	1.12
1	6	5	0.04	0.09	0.14	0.26	1.20	1.11	1.13
1	7	5	0.04	0.09	0.16	0.31	1.21	1.12	1.15
1	4	6	0.04	0.08	0.12	0.21	1.18	1.08	1.11
1	5	6	0.04	0.08	0.10	0.16	1.15	1.07	1.09
1	6	6	0.04	0.09	0.16	0.30	1.21	1.12	1.15
2	1	0	1.85	1.51	0.82	0.50	0.97	0.89	0.91
2	2	0	5.92	5.24	3.10	2.07	0.98	0.91	0.93
2	3	0	2.92	2.35	1.26	0.76	0.96	0.89	0.91
2	4	0	0.54	0.42	0.22	0.13	0.96	0.88	0.91
2	1	1	0.05	0.04	0.02	0.01	0.94	0.87	0.89
2	2	1	1.06	0.90	0.51	0.33	0.97	0.90	0.92

Table B-19 (Continued)

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
ESTIMATES OF CARBON MONOXIDE EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
2	4	1	1.54	1.26	0.69	0.42	0.97	0.89	0.91
2	1	2	1.96	1.42	0.68	0.37	0.94	0.87	0.89
2	2	2	0.05	0.06	0.05	0.05	1.05	0.97	0.99
2	1	3	2.91	2.22	1.14	0.66	0.95	0.88	0.90
2	2	3	7.89	6.33	3.39	2.05	0.96	0.89	0.91
2	3	3	4.80	3.80	2.01	1.20	0.96	0.89	0.91
2	4	3	1.20	0.92	0.47	0.27	0.95	0.88	0.90
3	1	0	0.12	0.10	0.05	0.03	0.96	0.89	0.91
3	2	0	4.69	3.58	1.83	1.05	0.95	0.88	0.90
3	3	0	3.00	2.28	1.16	0.66	0.95	0.88	0.90
3	4	0	0.58	0.47	0.26	0.16	0.96	0.89	0.91
3	3	1	0.31	0.29	0.18	0.12	0.99	0.91	0.94
3	1	2	0.65	0.51	0.27	0.16	0.96	0.88	0.91
3	2	2	1.75	1.50	0.86	0.56	0.98	0.90	0.92
3	3	2	0.62	0.49	0.26	0.15	0.96	0.88	0.91
3	4	2	2.24	1.66	0.82	0.46	0.95	0.87	0.90
3	2	3	0.92	0.75	0.41	0.25	0.96	0.89	0.91
3	3	3	2.07	1.52	0.74	0.41	0.94	0.87	0.89
3	4	3	2.28	1.74	0.89	0.51	0.95	0.88	0.90
3	4	5	0.04	0.06	0.06	0.06	1.09	1.00	1.03
3	1	6	3.31	2.73	1.50	0.94	0.97	0.89	0.91
3	2	6	8.03	6.72	3.76	2.37	0.97	0.90	0.92
3	3	6	3.88	2.92	1.46	0.83	0.95	0.88	0.90
3	4	6	3.73	2.90	1.51	0.89	0.96	0.88	0.90
4	1	0	1.00	0.79	0.41	0.25	0.96	0.88	0.91
4	2	0	1.00	0.88	0.51	0.34	0.98	0.90	0.93
4	3	0	2.69	2.44	1.48	1.01	0.99	0.91	0.93
4	4	0	1.46	1.11	0.57	0.33	0.95	0.88	0.90
4	1	1	0.74	0.62	0.34	0.21	0.97	0.89	0.92
4	2	1	0.37	0.30	0.16	0.10	0.96	0.89	0.91
4	3	1	0.48	0.44	0.27	0.19	0.99	0.91	0.94
4	4	1	0.53	0.40	0.20	0.11	0.95	0.88	0.90
4	1	2	1.71	1.35	0.71	0.42	0.96	0.89	0.91
4	2	2	0.05	0.08	0.07	0.08	1.08	0.99	1.02
4	3	2	1.59	1.11	0.51	0.27	0.93	0.86	0.88
4	4	2	1.86	1.35	0.65	0.36	0.94	0.87	0.89
4	2	3	2.03	1.50	0.74	0.41	0.95	0.87	0.89
4	3	3	0.05	0.06	0.05	0.05	1.06	0.98	1.00
4	4	3	0.28	0.24	0.14	0.10	0.98	0.90	0.93
4	1	6	0.86	0.70	0.38	0.23	0.96	0.89	0.91
4	2	6	2.86	2.28	1.21	0.73	0.96	0.89	0.91
4	3	6	2.82	1.80	0.77	0.37	0.92	0.85	0.87
4	4	6	6.18	5.47	3.23	2.16	0.98	0.91	0.93
5	1	0	3.36	2.68	1.43	0.86	0.96	0.89	0.91
5	2	0	4.15	3.89	2.44	1.72	0.99	0.92	0.94
5	3	0	0.68	0.51	0.26	0.15	0.95	0.88	0.90
5	1	1	3.56	2.74	1.41	0.82	0.95	0.88	0.90
5	2	1	0.53	0.25	0.08	0.03	0.86	0.80	0.82
5	3	1	0.69	0.59	0.33	0.21	0.97	0.90	0.92
5	1	2	5.22	2.30	0.68	0.23	0.85	0.79	0.81

Table B-19 (Continued)

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
ESTIMATES OF CARBON MONOXIDE EMISSIONS

		LINK	DAILY TONS EMITTED				5-YEAR GROWTH RATE		
CORRIDOR	SUBCORRIDOR	TYPE	1970	1975	1980	1985	1975	1980	1985
5	2	2	0.05	0.10	0.13	0.19	1.14	1.06	1.08
5	3	2	1.12	0.86	0.44	0.25	0.95	0.88	0.90
5	1	3	1.95	1.81	1.12	0.78	0.99	0.91	0.94
5	2	3	10.48	6.35	2.57	1.18	0.91	0.84	0.86
5	3	3	4.88	3.10	1.32	0.63	0.92	0.85	0.87
5	1	5	0.03	0.05	0.06	0.07	1.10	1.01	1.04
5	2	6	0.04	0.07	0.10	0.15	1.16	1.07	1.09
5	3	6	0.04	0.10	0.18	0.37	1.22	1.13	1.16
6	1	0	9.54	7.58	4.02	2.41	0.96	0.89	0.91
6	2	0	1.84	1.46	0.77	0.46	0.96	0.89	0.91
6	1	1	1.96	1.62	0.89	0.55	0.97	0.89	0.91
6	2	1	0.08	0.06	0.03	0.02	0.94	0.87	0.89
6	1	2	10.62	8.04	4.07	2.33	0.95	0.88	0.90
6	2	2	11.53	7.85	3.57	1.83	0.93	0.86	0.88
6	1	3	7.94	4.23	1.51	0.61	0.89	0.82	0.84
6	2	3	3.72	2.51	1.14	0.58	0.93	0.86	0.88
6	1	4	0.04	0.09	0.13	0.21	1.17	1.08	1.11
6	2	5	0.04	0.07	0.10	0.14	1.15	1.06	1.08

Table B-19 (Continued)

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
ESTIMATES OF HYDROCARBONS EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
0	0	0	0.89	0.66	0.31	0.19	0.95	0.87	0.91
0	0	1	0.33	0.27	0.15	0.10	0.97	0.89	0.94
0	0	2	1.28	0.98	0.48	0.31	0.95	0.87	0.92
0	0	3	0.74	0.50	0.21	0.12	0.93	0.85	0.90
0	0	6	0.01	0.01	0.01	0.02	1.15	1.05	1.11
1	1	0	0.90	0.68	0.33	0.21	0.95	0.87	0.92
1	2	0	2.47	1.96	1.00	0.67	0.96	0.88	0.93
1	3	0	1.52	1.19	0.60	0.40	0.96	0.88	0.93
1	4	0	0.22	0.18	0.09	0.06	0.96	0.88	0.93
1	5	0	0.44	0.32	0.15	0.09	0.94	0.86	0.91
1	6	0	0.81	0.64	0.32	0.22	0.96	0.88	0.93
1	7	0	0.23	0.25	0.17	0.16	1.02	0.94	0.99
1	1	1	0.25	0.13	0.05	0.02	0.89	0.81	0.86
1	2	1	0.60	0.50	0.27	0.19	0.97	0.89	0.94
1	3	1	0.02	0.02	0.01	0.01	1.00	0.92	0.97
1	4	1	0.15	0.11	0.05	0.03	0.94	0.86	0.91
1	5	1	0.01	0.01	0.00	0.00	0.94	0.86	0.91
1	6	1	0.01	0.01	0.02	0.02	1.12	1.02	1.08
1	7	1	0.02	0.03	0.03	0.04	1.10	1.01	1.07
1	1	2	0.54	0.41	0.20	0.13	0.95	0.87	0.92
1	2	2	0.23	0.21	0.12	0.09	0.98	0.90	0.95
1	3	2	0.62	0.56	0.32	0.24	0.98	0.90	0.95
1	4	2	0.01	0.02	0.02	0.02	1.11	1.02	1.07
1	5	2	0.02	0.02	0.02	0.02	1.03	0.94	1.00
1	6	2	0.12	0.06	0.02	0.01	0.87	0.80	0.84
1	1	3	0.75	0.50	0.21	0.12	0.93	0.85	0.89
1	2	3	3.69	2.34	0.95	0.51	0.92	0.84	0.89
1	3	3	2.68	1.58	0.60	0.30	0.90	0.83	0.87
1	4	3	0.83	0.56	0.24	0.14	0.93	0.85	0.90
1	5	3	0.92	0.65	0.30	0.18	0.94	0.86	0.91
1	6	3	1.68	0.94	0.34	0.16	0.90	0.82	0.87
1	7	3	0.53	0.16	0.03	0.01	0.79	0.73	0.77
1	1	4	0.05	0.05	0.04	0.03	1.01	0.92	0.98
1	2	4	0.01	0.02	0.02	0.05	1.19	1.09	1.15
1	3	4	0.01	0.02	0.02	0.04	1.18	1.08	1.14
1	6	4	0.01	0.01	0.01	0.01	1.08	0.99	1.05
1	1	5	0.01	0.01	0.01	0.01	1.06	0.97	1.02
1	2	5	0.01	0.01	0.02	0.05	1.21	1.11	1.17
1	3	5	0.01	0.01	0.02	0.04	1.18	1.08	1.15
1	6	5	0.01	0.01	0.02	0.04	1.19	1.09	1.15
1	7	5	0.01	0.01	0.02	0.05	1.21	1.11	1.17
1	4	6	0.01	0.01	0.02	0.03	1.17	1.07	1.13
1	5	6	0.01	0.01	0.02	0.03	1.15	1.05	1.11
1	6	6	0.01	0.01	0.02	0.05	1.21	1.11	1.17
2	1	0	0.26	0.21	0.11	0.07	0.96	0.88	0.93
2	2	0	0.83	0.72	0.40	0.30	0.98	0.89	0.95
2	3	0	0.41	0.32	0.16	0.11	0.96	0.88	0.93
2	4	0	0.08	0.06	0.03	0.02	0.96	0.87	0.92
2	1	1	0.01	0.01	0.00	0.00	0.94	0.86	0.91
2	2	1	0.17	0.14	0.07	0.05	0.97	0.89	0.94

Table B-19 (Continued)

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
ESTIMATES OF HYDROCARBONS EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
2	4	1	0.24	0.19	0.10	0.07	0.96	0.88	0.93
2	1	2	0.31	0.22	0.10	0.06	0.94	0.86	0.91
2	2	2	0.01	0.01	0.01	0.01	1.04	0.95	1.01
2	1	3	0.46	0.35	0.17	0.11	0.95	0.87	0.92
2	2	3	1.25	0.99	0.50	0.33	0.96	0.88	0.93
2	3	3	0.76	0.59	0.30	0.19	0.96	0.88	0.92
2	4	3	0.19	0.14	0.07	0.04	0.95	0.87	0.92
3	1	0	0.02	0.01	0.01	0.00	0.96	0.88	0.93
3	2	0	0.66	0.49	0.24	0.15	0.95	0.87	0.92
3	3	0	0.40	0.30	0.14	0.09	0.95	0.87	0.92
3	4	0	0.08	0.06	0.03	0.02	0.96	0.88	0.93
3	3	1	0.04	0.04	0.02	0.02	0.99	0.90	0.95
3	1	2	0.10	0.08	0.04	0.03	0.96	0.87	0.92
3	2	2	0.27	0.23	0.13	0.09	0.97	0.89	0.94
3	3	2	0.09	0.07	0.04	0.02	0.95	0.87	0.92
3	4	2	0.34	0.25	0.11	0.07	0.94	0.86	0.91
3	2	3	0.15	0.12	0.06	0.04	0.96	0.88	0.93
3	3	3	0.32	0.23	0.11	0.07	0.94	0.86	0.91
3	4	3	0.36	0.27	0.13	0.08	0.95	0.87	0.92
3	4	5	0.01	0.01	0.01	0.01	1.08	0.99	1.05
3	1	6	0.52	0.42	0.22	0.15	0.96	0.88	0.93
3	2	6	1.27	1.04	0.55	0.38	0.97	0.89	0.93
3	3	6	0.63	0.47	0.22	0.14	0.95	0.87	0.91
3	4	6	0.61	0.46	0.23	0.15	0.95	0.87	0.92
4	1	0	0.15	0.12	0.06	0.04	0.96	0.87	0.92
4	2	0	0.14	0.12	0.07	0.05	0.98	0.89	0.94
4	3	0	0.38	0.34	0.19	0.14	0.98	0.90	0.95
4	4	0	0.20	0.15	0.07	0.05	0.95	0.87	0.92
4	1	1	0.12	0.09	0.05	0.03	0.97	0.88	0.93
4	2	1	0.06	0.05	0.02	0.02	0.96	0.88	0.93
4	3	1	0.07	0.07	0.04	0.03	0.99	0.90	0.95
4	4	1	0.08	0.06	0.03	0.02	0.95	0.87	0.91
4	1	2	0.27	0.21	0.11	0.07	0.96	0.87	0.92
4	2	2	0.01	0.01	0.01	0.01	1.07	0.98	1.04
4	3	2	0.25	0.17	0.07	0.04	0.93	0.85	0.90
4	4	2	0.29	0.21	0.09	0.06	0.94	0.86	0.91
4	2	3	0.32	0.23	0.11	0.07	0.94	0.86	0.91
4	3	3	0.01	0.01	0.01	0.01	1.06	0.97	1.02
4	4	3	0.04	0.04	0.02	0.02	0.98	0.89	0.94
4	1	6	0.13	0.11	0.05	0.04	0.96	0.88	0.93
4	2	6	0.45	0.35	0.18	0.12	0.96	0.88	0.93
4	3	6	0.44	0.28	0.11	0.06	0.92	0.84	0.89
4	4	6	0.97	0.85	0.47	0.35	0.98	0.89	0.95
5	1	0	0.51	0.40	0.20	0.13	0.96	0.88	0.93
5	2	0	0.58	0.54	0.32	0.25	0.99	0.91	0.96
5	3	0	0.09	0.07	0.03	0.02	0.95	0.87	0.92
5	1	1	0.56	0.42	0.20	0.13	0.95	0.87	0.92
5	2	1	0.08	0.04	0.01	0.00	0.86	0.79	0.83
5	3	1	0.10	0.08	0.04	0.03	0.97	0.89	0.94
5	1	2	0.83	0.36	0.10	0.04	0.85	0.78	0.82

Table B-19 (Continued)

ST. LOUIS URBAN AREA (ILLINOIS SUBAREA)
ESTIMATES OF HYDROCARBONS EMISSIONS

CORRIDOR	SUBCORRIDOR	LINK TYPE	DAILY TONS EMITTED 1970	1975	1980	1985	5-YEAR GROWTH RATE 1975	1980	1985
5	2	2	0.01	0.02	0.02	0.03	1.14	1.04	1.10
5	3	2	0.17	0.13	0.06	0.04	0.95	0.87	0.92
5	1	3	0.31	0.29	0.17	0.13	0.99	0.90	0.95
5	2	3	1.66	0.99	0.38	0.19	0.91	0.83	0.88
5	3	3	0.76	0.48	0.19	0.10	0.92	0.84	0.89
5	1	5	0.01	0.01	0.01	0.01	1.10	1.00	1.06
5	2	6	0.01	0.01	0.01	0.02	1.15	1.06	1.12
5	3	6	0.01	0.02	0.03	0.06	1.22	1.11	1.18
6	1	0	1.33	1.04	0.52	0.35	0.96	0.88	0.93
6	2	0	0.24	0.19	0.09	0.06	0.96	0.88	0.92
6	1	1	0.31	0.25	0.13	0.09	0.96	0.88	0.93
6	2	1	0.01	0.01	0.00	0.00	0.94	0.86	0.91
6	1	2	1.66	1.24	0.59	0.37	0.95	0.87	0.92
6	2	2	1.73	1.16	0.50	0.28	0.93	0.85	0.90
6	1	3	1.26	0.66	0.22	0.10	0.88	0.81	0.85
6	2	3	0.58	0.39	0.16	0.09	0.93	0.85	0.90
6	1	4	0.01	0.01	0.02	0.04	1.17	1.07	1.13
6	2	5	0.01	0.01	0.01	0.02	1.14	1.04	1.10

APPENDIX C

ST. LOUIS AQMA EMISSION PROJECTIONS FOR SO_x AND TSP FROM HIGHWAY SOURCES

ST. LOUIS AQMA EMISSION PROJECTIONS

FOR SO_x AND TSP FROM HIGHWAY SOURCES

		Annual VMT (x 10^6)	Percent by Class	GMS/VMT		GMS/YR x 10^6		TONS/YR	
				TSP	SO_x	TSP	SO_x	TSP	SO_x
1975	LDV	11,925	87.3	.54	.13	6439	1550	7107	1794
	MDV	915	6.7	.54	.13	494	119	545	138
	HDV	779	5.7	.85	.26	662	202	731	233
	Totals	13,660	100.0			7595	1871	8383	2165
1980	LDV	13,689	87.3	.54	.13	7392	1780	8159	1965
	MDV	1,051	6.7	.54	.13	567	136	626	150
	HDV	894	5.7	.85	.26	759	232	837	256
	Totals	15,680	100.0			8718	2148	9622	2371
1985	LDV	15,396	87.3	.54	.13	8313	2001	9175	2208
	MDV	1,182	6.7	.54	.13	638	154	704	170
	HDV	1,005	5.7	.85	.26	855	261	944	288
	Totals	17,638	100.0			9806	2416	10823	2666

APPENDIX D

GROWTH PATTERNS IN THE ST. LOUIS AQMSA

APPENDIX D

GROWTH PATTERNS IN THE ST. LOUIS AQMSA

Of particular significance to air quality maintenance planning is the regional development potential to accommodate predicted growth patterns for industrial land use and population. A growth and distribution projection for population in the region generated for the 1995 Regional Land Use Plan for Metropolitan St. Louis is presented in Table D-1.

Table D-1

Population for Counties in St. Louis Area
(1970, 1995)

Area	1970	1995
Madison County	250,911	407,000
Monroe County	18,831	45,000
St. Clair County	285,199	423,200
St. Louis City	622,236	622,000
Franklin County	55,127	91,500
Jefferson County	105,248	210,200
St. Charles County	92,954	217,100
St. Louis County	951,671	1,520,000
TOTAL	2,382,177	3,536,000

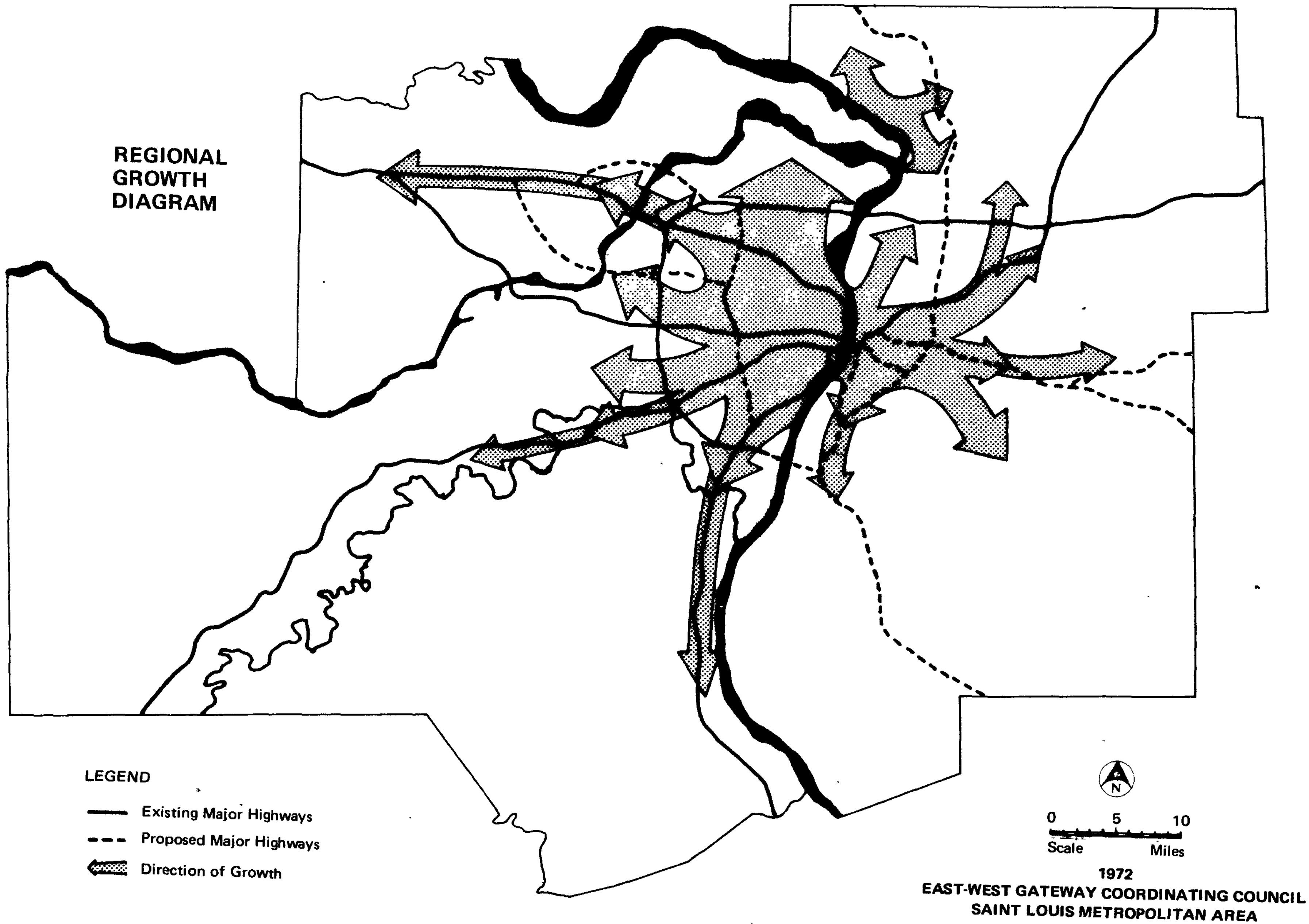
The majority of the population was projected to be located in St. Louis County and City. With substantial increases in St. Charles, Jefferson, St. Clair and Madison Counties.

A land development potential analysis was also conducted as a background study to the 1995 Regional Land Use Plan for Metropolitan St. Louis. The factors used to evaluate land development potential were:

- Highway accessibility
- Availability of water and sewer service
- Proximity of existing urbanization
- Certain physical constraints to development

The results of that study suggested the directions of growth in the metropolitan area would most likely assume the given available land development potential. The analysis indicated corridors of high development potential similar to the directions of growth shown in Figure D-1.

The development potential for specifically industrial land use is critical to air quality maintenance planning as well. In generating the 1995 projection for this land use category, certain factors were considered. It was known the density of manufacturing activities had been decreasing in the region primarily due to the trend in construction of horizontal rather than vertical industrial facilities. Therefore, in projecting industrial land use to 1995, a density of workers of 15-20 per acre was used rather than the current density of 20-25 workers per acre. Consequently, while allocating land for industrial use in 1995, utilizing development potential and population projections for given areas, an additional 15,000-20,000 industrial acres and 300,000 manufacturing employees were projected to be required in the region. This industrial acreage expansion roughly paralleled the river basins and the I-70 corridor. In addition, if the proposed new international airport was located in Illinois on the St. Clair-Monroe County lines, an additional southeasterly industrial expansion could be experienced. Figure D-2 illustrates the projected 1995 industrial land use pattern relative to 1974 major point and area air pollutant emission sources. Table D-2 lists growth factors associated with projected pollutant emission sources in 1975, 1980, and 1985.



REGIONAL
GROWTH
DIAGRAM
LEGEND
Existing Major Highways
Proposed Major Highways
Direction of Growth
N
0 5 10
Scale Miles
1972
EAST-WEST GATEWAY COORDINATING COUNCIL
SAINT LOUIS METROPOLITAN AREA

Figure D-1

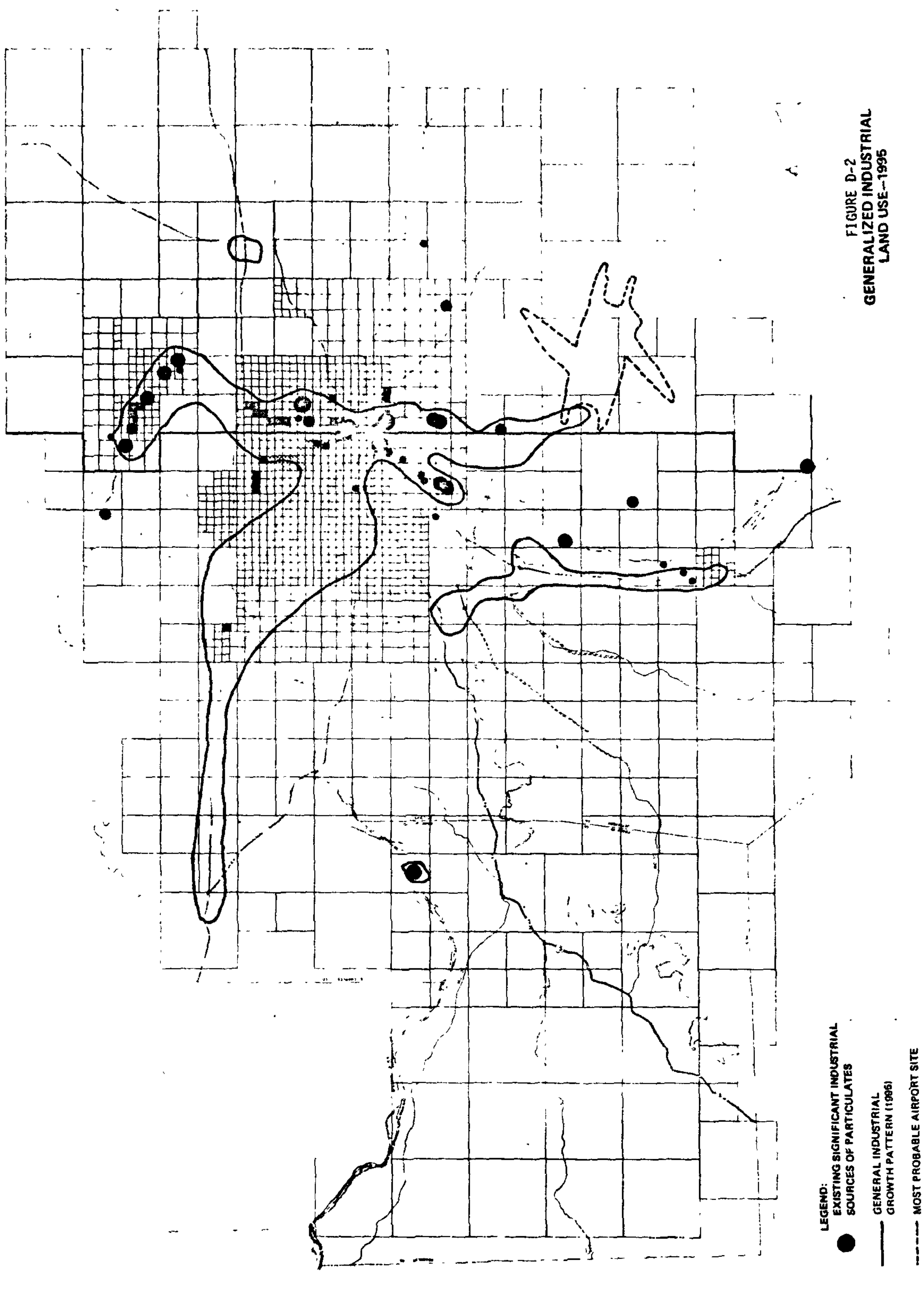


FIGURE D-2
GENERALIZED INDUSTRIAL
LAND USE–1995

TABLE D-2

GROWTH FACTORS USED IN AQMA ANALYSIS

Source Category	Growth Factors 1975 to 1980	1980 to 1985	Source	Comments
Point Sources:				
Fuel Combustion				
Industrial	1.19	1.18	BEA[1] St. Louis SMSA manufacturing earnings growth projections	Manufacturing earnings were the BEA statistic most closely related to industry; growth projections by county not available in usable format for every county
Commercial/Industrial	1.30	1.23	BEA St. Louis SMSA government earnings growth projections	Employment and wholesale growth to commerce and industry; civilian government gives a more conservative emissions estimate
Industrial Process				
Some Primary Sources	Individual growth rates were obtained from some primary point sources[3]		Local survey	Obtain growth rates for all companies which are primary point sources.
Other Sources			BEA or PEDCo[2] St. Louis SMSA earnings growth projections by industrial categories	For those primary sources for which individual growth rates were unobtainable and for non-primary sources, the most appropriate BEA or Pedco industrial projection was used.
Food Products	1.11	1.07	BEA	
Chemicals	1.24	1.22	BEA	
Petroleum	1.08	1.07	PEDCo	BEA statistics were confidential
Mineral	1.19	1.15	BEA	
Primary Metals	1.13	1.12	PEDCo	BEA statistics were confidential
Metal Fabrication	1.21	1.19	BEA	
Misc. Manufacturing	1.16	1.14	BEA	
Solid Waste Disposal	For St. Louis City, growth factor of 0 because trash will be burned by power plants as fuel after 1978		Local information	
Municipal Incinerator	For other areas: 1.07	1.07	BEA St. Louis SMSA population growth projections	Population projections were more closely related to municipal incineration than to any other
Industrial Incinerator	1.19	1.18	BEA St. Louis SMSA manufacturing earnings growth projections	Manufacturing earnings were the BEA statistic most closely related to industry
Commercial/Industrial Incinerator	1.30	1.23	BEA St. Louis SMSA government projections	Employment growth was considered a conservative prediction of commercial/institutional growth
Power Plants	Individual plan information: compliance information, projected growth or phasing out of existing plants, openings of new plants		Information provided by Union Electric Co., Illinois Power Co., Missouri Air Conservation Commission, and Illinois Environmental Protection Agency	Best source-by-source information available
Area Sources				
Fuel Combustion				
Residential	1.07	1.07	BEA St. Louis SMSA population growth projections	
Bituminous Coal	Decrease to 1/2 of 1975	Decrease to 2/5 of 1980	Local estimate	Residential coal burning furnaces are being phased out
Other Fuels: Residual oil, Distillate oil, natural gas	Increase with population growth and with conversion from coal to other fuels in proportion		Fuel balance methodology	BTU's not generated by burning coal were ascribed proportionately to other fuels in absence of information to the contrary
Industrial	1.19	1.18	BEA St. Louis SMSA manufacturing earnings growth projections	Manufacturing earnings were the BEA statistic most closely related to industry
Commercial/Industrial	1.30	1.23	BEA St. Louis SMSA government earnings growth projections	Employment growth was considered a conservative prediction of commercial/industrial growth

Table D-2
Continued

GROWTH FACTORS USED IN AQMA ANALYSIS

Source Category	Growth Factors 1975 to 1980	Growth Factors 1980 to 1985	Source	Comments
Mobile Sources:				
Highway Vehicles Motor Vehicles Light Duty Heavy Duty	Individual growth factors were used for each link (road type), VMT (Vehicle Miles of travel), and applied on a link basis.		PEDCo and Subcorridor VMT Emissions generated with 1970-95 traffic assignment data furnished by East-West Gateway Coordinating Council; Missouri Department of Highways	
Off Highway Vehicles Railroads Vessels Aircraft Other	1.03	1.03	National statistics	

[1] Bureau of Economic Analysis

[2] PEDCo, Inc. : Attainment of National Air Quality Standards for Carbon Monoxide and Oxidants in the St. Louis AQCR, March 1974

[3] On file with the Air Pollution Control Agency

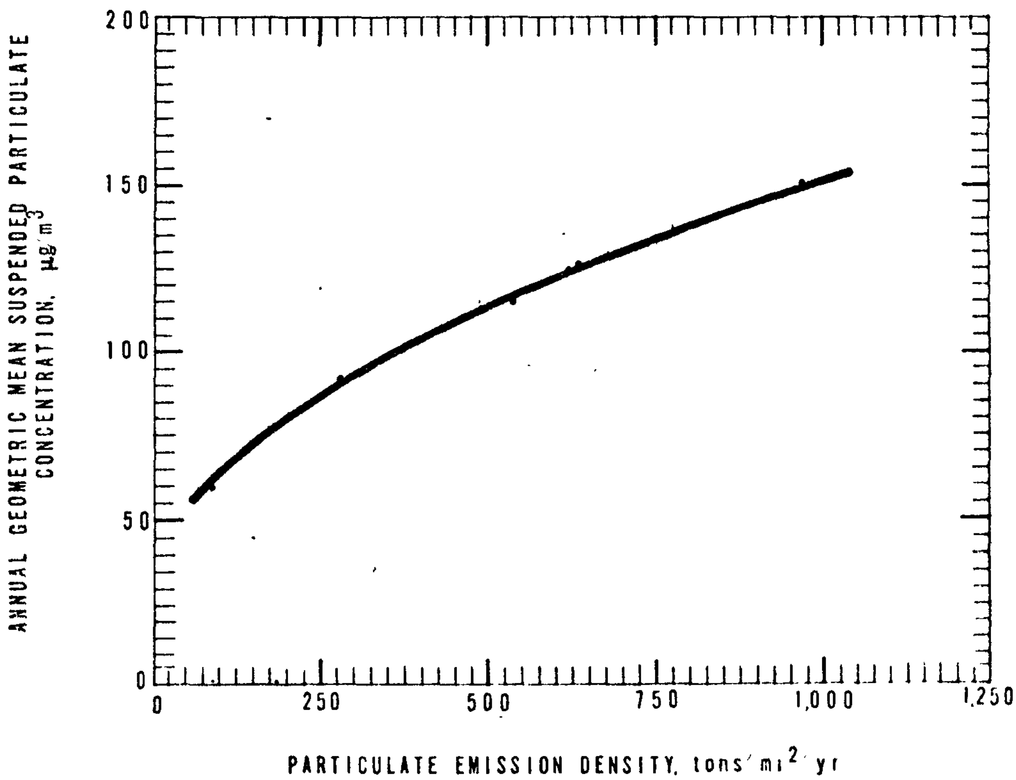
APPENDIX E

TOTAL SUSPENDED PARTICULATES

EMISSION DENSITY VS. ANNUAL CONCENTRATIONS

TOTAL SUSPENDED PARTICULATES

EMISSION DENSITY VS. ANNUAL CONCENTRATIONS*



*U.S. Department H.E.W., Interstate Air Pollution Study Pollution Phase II Project Report, December 1966.

APPENDIX F

SUPPORTING CALCULATIONS FOR SULFUR DIOXIDE CONCENTRATIONS BY SOURCE CATEGORY

MAXIMIM 24-HOUR AVERAGE SO_2 CONCENTRATIONS

AT FOUR MAJOR POINT SOURCES FOR VARIOUS WIND SPEEDS*

(Stability Class D) (Standard-365 $\mu gm/m^3$)

Source	Wind Speed (u) (m/sec)	Effective Stack Height (H) (m)	χ_u/Q_{max}	Maximum 24 hr. Concentrations (χ_{max}) ($\mu gm/m^3$) 1975	1980	1985
Rush Island Power Plant	3.5	301	$.5 \cdot 10^{-6}$	35	133	133
	4.5	275	$.7 \cdot 10^{-6}$	38	145	145
	5.5	258	$.75 \cdot 10^{-6}$	33	127	127
Sioux Power Plant	3.5	301	$.5 \cdot 10^{-6}$	296	360	360
	4.5	275	$.7 \cdot 10^{-6}$	322	400	400
	5.5	258	$.75 \cdot 10^{-6}$	282	340	340
St. Joe Lead	2.5	217	$1.2 \cdot 10^{-6}$	206	226	245
	3.5	185	$1.8 \cdot 10^{-6}$	221	243	262
	4.5	168	$2.3 \cdot 10^{-6}$	220	241	261
Labadie Power Plant	4.5	304	$.45 \cdot 10^{-6}$	282	282	282
	5.5	287	$.6 \cdot 10^{-6}$	308	308	308
	6.5	275	$.68 \cdot 10^{-6}$	295	295	295

* Pasquill-Gifford Plume Dispersion Model from Turner Workbook of Atmospheric Dispersion Estimates

SO_X POINT SOURCE EFFECTIVE STACK HEIGHT FACTORS*

Source	Gas Temp. (^{o}K) (T_s)	Gas Flow Rate (V_s) (m/sec)	Stack Height (h) (meter)	Stack Diameter (meter) (d)	Plume Rise (Δh) (meter)
Rush Island Power Plant	435	9.24	183	5.71	414/u
Sioux Power Plant	435	9.24	183	5.71	414/u
St. Joe Lead	358	8.13	107	6.08	275/u
Labadie Power Plant	413	9.24	213	6.23	409/u

* Holland's Effective Stack Height Equation

$H = h + \Delta h;$

$$\Delta h = \frac{V_s d}{u}\left[1.5 + 2.68 \times 10^{-3} \times p \times \left(\frac{T_s - T_A}{T_s}\right) \times d\right]$$

Assume ambient conditions, $T_A = 20^{o}C$, $P = 970$ mb

MAXIMUM SO_x POINT SOURCE EMISSION RATES (Q_{max})

Source	Emissions, gms/sec. 1975	1980	1985
Rush Island Power Plant	682	2594	2594
Sioux Power Plant	5753	12490	12490
St. Joe Lead	1194	1313	1418
Labadie Power Plant	7853	7853	7853

MAXIMUM ANNUAL SO_2 CONCENTRATION FOR SELECTED AREA SOURCES*

	Size of Urban Area ($miles^2$)	Mean Annual Morning Mixing Height (meters)	Mean Annual Wind Speed (meters/sec)	Emission Density ($tons/yr\text{-}mi^2$)			Maximum Annual Concentration ($\mu gm/m^3$)*		
				1975	1980	1985	1975	1980	1985
Area 1A	144	400	4.5	698	616	676	101.6	89.8	98.5
Area 1B	182.25	400	4.5	551	487	534	80.3	71.0	77.8
Area 2	36	400	4.5	574	716	913	66.2	82.4	105.0

*Miller-Holzworth Model

$$\overline{X} = .011Q\left[3.61X(H)^{.13} + \frac{800(S)}{(u)(H)} - \frac{(5.5 X 10^{-5})(u)(H)^{1.26}}{S}\right]$$

where, Q = Emission Density ($tons/yr\text{-}mi^2$)
H = Mixing Height (m)
S = Side of Urban Area (mi)
U = Wind Speed (m/sec)
$\overline{X}$ = Avg. Concentration (ugm/m^3)

APPENDIX G

PERCENT EMISSION CHANGE FOR CARBON MONOXIDE IN SUBCORRIDORS INFLUENCING NINE RECEPTORS IN THE AQMA

PERCENT EMISSION REDUCTION FOR CARBON MONOXIDE
IN SUBCORRIDORS INFLUENCING NINE RECEPTORS IN THE AQMA

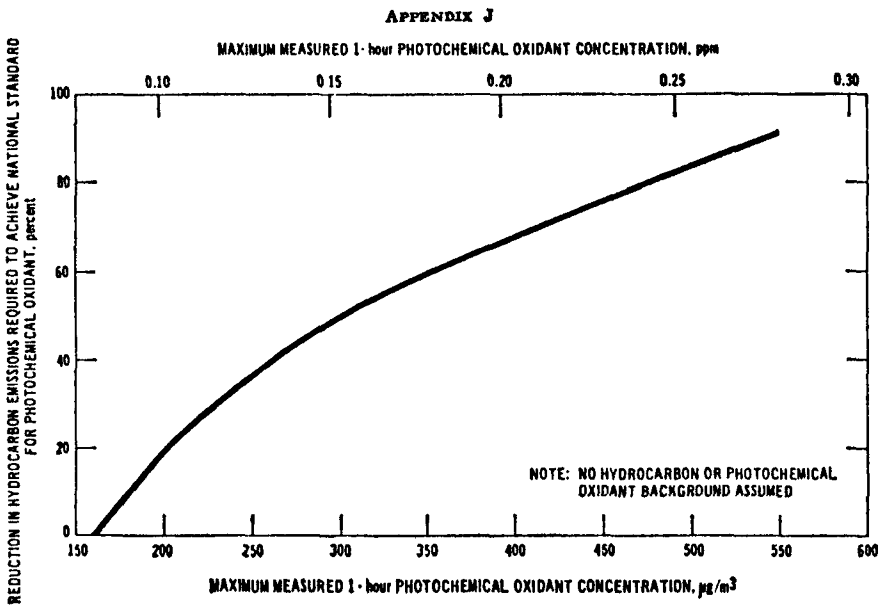
Receptor	Subcorridors	Carbon Monoxide Emissions (Daily Tons) 1975	1980	1985
1	3-5	5.22	2.57	1.48
	9-2	5.40	2.72	1.56
	9-3	7.35	3.77	2.27
	Totals	17.97	9.06	5.25
	Percent Reduction: 1975-1980 - 49.6%			
	1980-1985 - 42.1%			
2	6-2	6.42	3.19	2.02
	6-3	2.31	1.17	.78
	1-4	2.27	.85	.48
	1-5	18.13	9.97	6.22
	Totals	29.13	15.18	9.60
	Percent Reduction: 1975-1980 - 48.0%			
	1980-1985 - 36.8%			
3	1-7	17.30	8.64	4.90
	1-6	23.54	13.08	7.58
	8-2	34.91	17.58	10.04
	8-3	24.78	12.42	7.03
	Totals	100.53	51.72	29.55
	Percent Reduction: 1975-1980 - 48.6%			
	1980-1985 - 43.0%			
4	4-2	13.38	7.32	4.62
	5-2	8.33	4.42	2.66
	6-6	20.74	11.31	7.02
	Totals	42.48	23.05	14.30
	Percent Reduction: 1975-1980 - 45.7%			
	1980-1985 - 38.0%			

Receptor	Subcorridors	Carbon Monoxide Emissions (Daily Tons) 1975	1980	1985
5	3-2	19.31	10.23	6.14
	3-3	21.92	11.14	6.42
	7-3	16.78	8.82	5.23
	Totals	58.01	30.19	17.79
	Percent Reduction: 1975-1980 - 48.0%			
	1980-1985 - 41.0			
6	1-5	18.13	9.97	6.22
	6-3	15.46	8.22	4.97
	7-2	10.77	5.35	3.12
	Totals	44.36	23.54	14.31
	Percent Reduction: 1975-1980 - 47.0%			
	1980-1985 - 39.2%			
7	3-1	17.37	10.27	6.91
	3-2	19.31	10.23	6.14
	6-5	20.13	10.45	6.38
	Totals	56.81	30.95	19.43
	Percent Reduction: 1975-1980 - 46.0%			
	1980-1985 - 38.0			
8	1-5	18.13	9.97	6.22
	7-2	10.77	5.35	3.12
	7-1	11.08	5.60	3.25
	Totals	39.98	20.92	12.59
	Percent Reduction: 1975-1980 - 48.0%			
	1980-1985 - 40.0%			
9	3-4	14.93	7.49	4.25
	8-4	39.87	14.58	7.20
	8-5	8.75	4.31	2.40
	Totals	63.55	26.38	13.85
	Percent Reduction: 1975-1980 - 39.0%			
	1980-1985 - 47.5%			

APPENDIX H

APPENDIX J FEDERAL REGISTER 40CFR51

RELATIONSHIP BETWEEN PERCENT REDUCTION IN HC EMISSIONS AND PHOTOCHEMICAL OXIDANT CONCENTRATION



APPENDIX I

MISSOURI REGULATIONS DIRECTLY RELATED TO AIR QUALITY MAINTENANCE

EXISTING

The existing enabling legislation and regulations included in the State Implementation Plans for the Missouri and Illinois portions of the St. Louis AQCR provide a basis for the attainment and maintenance of air quality. These regulations have particular application to air quality maintenance and are described below:

REGULATION XVIII APPROVAL OF PLANNED INSTALLATIONS, LAND USE PLANS, AND ZONING REGULATIONS REQUIRED

A. Review of Plans and Approval

A. DEFINITIONS:

1. *Commenced - an owner or operator has undertaken a continuous program of construction or modification or that an owner or operator has entered into a binding agreement or contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction or modification.*
2. *Construction - fabrication, erection or installation.*
3. *Modification - any physical change in, or change in method of operation of, an air contaminant source which increases the the amount of any air pollutant emitted by such source or which results in the emission of any air pollutant not previously emitted.*
4. *Startup - the setting in operation of a source for any purpose.*
5. *Owner or operator - any person who owns, leases, operates, controls or supervises an air contaminant source.*

B. [A.] General

1. *No owner or operator shall commence construction or modification of any air contaminant source after the effective date of this regulation without first obtaining a permit from the Executive Secretary.*

2. *Each application for a construction permit shall be accompanied by site information, plans, descriptions, specifications, and drawings showing the design of the source, the nature and amount of emissions, and the manner in which it will be operated and controlled.*
3. *Any additional information, plans, specifications, evidence or documentation that the Executive Secretary may require shall be furnished upon request.*
4. *[The Executive Secretary shall determine if the ambient air quality standards in the vicinity of the source are being exceeded, and shall determine the impact on the ambient air quality standards from the source prior to granting a permit to construct or modify.] No permit to construct or modify shall be issued if it is determined that the proposed source will [interfere or] prevent the attainment or maintenance of [national] ambient air quality standards, or violate any of the regulations pursuant to Chapter 203, RSMo.*
5. *Upon receipt of an application, the Executive Secretary shall act promptly, [but in no case later than sixty (60) days,] and shall notify the applicant in writing of his approval, conditional approval, or denial of the application. The Executive Secretary will set forth his reasons for any denial.*
6. *The Executive Secretary may impose any reasonable conditions, upon a permit, including conditions requiring the source to be provided with:*

   a. *Sampling ports of a suitable size, number and location,*
   b. *Safe access to each port,*
   c. *Instrumentation to monitor and record emission data, and*
   d. *Other sampling and testing facilities.*

7. *A permit may be cancelled if construction or modification work is not begun within two (2) years from the date of issuance, or if work is suspended for one (1) year.*
8. *Any owner or operator subject to the provisions of this regulation shall furnish the Executive Secretary written notification as follows:*

   a. *A notification of the anticipated date of initial startup of source not more than 60 days or less than 30 days prior to such date.*
   b. *A notification of the actual date of initial startup of a source within 15 days after such date.*

9. *Within 60 days after achieving the maximum production rate at which the source will be operated, but [by] not later than 180 days after initial startup of such source, the owner or operator of such source shall conduct performance test(s) in accordance with methods and under operating conditions approved by the Executive Secretary and furnish the Executive Secretary a written report of the results of such performance test.*

   a. *Such tests shall be at the expense of the owner or operator.*
   b. *The Executive Secretary may monitor such tests and may also conduct performance tests.*
   c. *The owner or operator of a source shall provide the Executive Secretary 15 days prior notice of the performance test to afford the Executive Secretary the opportunity to have an observer present.*

10. *Approval to construct shall not relieve any owner or operator of the responsibility to comply with other [all] local, state, and Federal regulations. [which are part of the applicable plan.]*

[B. *Other requirements:*
   1. *A twenty-five dollar ($25.00) filing fee payable to the State of Missouri shall accompany each application, and the application shall not be considered, evaluated, or the permit approved until the filing fee is paid.*
   2. *No manufacturing or processing plant or operating location shall be required to pay more than one filing fee.]*

C. *Exceptions:*
   1. *Fuel burning equipment which use gas or oil or grade #3 or lighter for space heating, air conditioning, or heating water; is used in a private dwelling; or has a heat input as specified by the manufacturer or designer of less than 350,000 BTU's per hour.*
   2. *Mobile internal combustion engines.*
   3. *The construction of a private residence.*
   4. *Portable equipment including, but not limited to rock crushers, asphalt plants, and concrete batching plants shall be exempted from the requirements of this regulation after an initial permit has been obtained, provided that:*

a. *Each new location is reported to the Executive Secretary as early as possible, but in no case later than fourteen (14) days prior to ground breaking or initial equipment erection, and*

b. *The equipment that was originally approved, shall be operated and maintained in a manner identical to that as specified in the initial construction permit.*

5. *Planned periodic modification of air contaminant sources shall be exempted from the requirements of this regulation, provided that:*

   a. *A prior permit has been obtained for all planned air contaminant sources, and,*

   b. *Each modification be reported to the Executive Secretary as soon as possible, and,*

   c. *The prior permit contains provisions for controlling emissions from all probable air contaminant sources that may be expected to come into existence as a result of the periodic modifications.*

6. [4.] *Other sources of minor significance specified by the Executive Secretary.*

B. *Planning Agency Land Use Plans -- Preparation and Approval*

1. *Planning agencies will, in preparing land-use plans, obtain and use information supplied by the Air Conservation Commission concerning:*

   a. *air quality*
   b. *air pollutant emissions*
   c. *air pollution meteorology*
   d. *air quality standards*
   e. *air pollution effects*

2. *The Executive Secretary will review all land-use plans prior to formal adoption and prepare recommendations. No such plan may be adopted without the approval of the Executive Secretary.*

C. *Zoning Agency Regulations -- Preparation and Approval*

1. *Zoning control agencies will, in preparing regulations, obtain and use information supplied by the Air Conservation Commission concerning:*

- a. *air quality*
- b. *air pollutant emissions*
- c. *air pollution meteorology*
- d. *air quality standards*
- e. *air pollution effects*

2. *The Executive Secretary will review all zoning regulations and proposed changes in zoning classifications prior to formal adoption and prepare recommendations. No such regulation or change in classification may be adopted without the approval of the Executive Secretary.*

REGULATION XXIII ADDITIONAL AIR QUALITY CONTROL MEASURES MAY BE REQUIRED WHEN SOURCES ARE CLUSTERED IN A SMALL LAND AREA

A. *Areas to Which This Regulation Applies*

1. *This regulation shall apply to areas in which there are one or more existing sources and/or proposed new sources of particulate matter in any circular area with a diameter of two miles (including sources outside metropolitan area) from which the sum of particulate emissions allowed from such sources by regulations of general application are or would be greater than 2,000 tons per year or 500 pounds per hour.*
2. *This regulation shall apply in areas in which there are one or more existing sources and/or proposed new sources of sulfur dioxide in any circular area with a diameter of two miles from which the sum of sulfur dioxide emissions from such sources allowed by regulations of general application are or would be greater than 1,000 tons for any consecutive three months or 1,000 pounds per hour.*

B. *Air Conservation Commission May Prescribe More Restrictive Air Quality Control Measures*

1. *In areas where this regulation applies, as specified in Section A herein, the Air Conservation Commission may prescribe air quality control requirements that are more restrictive and more extensive than provided in regulations of general application.*

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(Please read Instructions on the reverse before completing)

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

This report documents the development of a Trail Air Quality Maintenance Plan for the St. Louis Air Quality Maintenance Study Area. This is one of four such trial plans prepared as part of the development and testing of EPA Guidelines for air quality maintenance planning. The four areas include St. Louis, San Diego, Denver, and Baltimore. The study area in this report includes the City of St. Louis and the seven counties in Missouri and Illinois which comprise the St. Louis SMSA. The preparation of this trial plan included the review of existing State Implementation Plans, emission inventory analysis and projection, air quality analysis and projection, and the formulation of attainment/maintenance strategies for control of particulates, sulfur dioxide, carbon monoxide, and photochemical oxidants. Both direct emission control measures and administrative or planning measures were examined for applicability to the air quality maintenance problems. Finally, the institutional arrangements and intergovernmental cooperation required to prepare and implement the Trial Plan were explored.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Polution Land Use Regional Planning	Air Quality Maintenance Land Use Controls St. Louis National Ambient Air Quality Standards	

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