EPA-450/3-74-083

DECEMBER 1974

IMPLEMENTATION PLAN REVIEW

FOR

OKLAHOMA

AS REQUIRED

BY

THE ENERGY SUPPLY

AND

ENVIRONMENTAL COORDINATION ACT

U. S. ENVIRONMENTAL PROTECTION AGENCY

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IMPLEMENTATION PLAN REVIEW
FOR
OKLAHOMA
REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

PREPARED BY THE FOLLOWING TASK FORCE:

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Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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1.0 EXECUTIVE SUMMARY

The enclosed report is the U. S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQSs). In addition to requiring that EPA report to the State on whether control regulations might be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the States. The States may, as in the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require States to change any existing plan.

Congress has intended that this report provide the State with information on excessively restrictive control regulations. The intent of ESECA is that SIPs, wherever possible, be revised in the interest of conserving low sulfur fuels or converting sources which burn oil or natural gas to coal. EPA's objective in carrying out the SIP reviews, therefore, has been to try to establish if emissions from combustion sources may be increased. Where an indication can be found that emissions from certain fuel burning sources can be increased and still attain and maintain NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel EPA's policy on clean fuels. The Clean Fuels Policy has consisted of reviewing implementation plans with regards to saving low sulfur fuels and, where the primary sulfur dioxide air quality standards were not exceeded, to encourage States to either defer compliance regulations or to revise the SO_2 emission regulations. The States have also been asked to discourage large scale shifts from coal to oil where this could be done without jeopardizing the attainment and maintenance of the NAAQS.

To date, EPA's fuels policy has addressed only those States with the largest clean fuels saving potential. Several of these States have revised or are currently in the process of revising SO_2 regulations. These states are generally in the Eastern half of the United States. ESECA, however, extends the analysis of potentially over-restrictive regulations to all 55 States and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

There are, in general, three predominant reasons for the existence of overly restrictive emission limitations within the State Implementation Plans. These are: 1) the use of the example region approach in developing State-wide air quality control strategies; 2) the existence of State Air Quality Standards which are more stringent than NAAQS; and 3) the "hot spots" in only part of an Air Quality Control Region (AQCR) which have been used as the basis for controlling the entire region. Since each of these situations affect many State plans and in some instances conflict with current national energy concerns, a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal of the SIP's conducted in 1972. At that time SIPs were approved by EPA if they demonstrated the attainment of NAAQSs or more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a State to identify the most polluted air quality control region (AQCR) and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCRs of the State if the control regulations were applied to similar sources. The problem with the use of an example region is that it can result in excessive controls, especially in the utilization of clean fuels, for areas of the State where sources would not otherwise contribute to NAAQS violations. For instance, a control strategy based on a particular region or source can result in a regulation requiring 1 percent sulfur oil to be burned state-wide where the use of 3 percent sulfur coal would be adequate to attain NAAQS in some locations.

EPA anticipates that a number of States will use the review findings to assist them in making the decision whether or not to revise portions of their State Implementation Plans. However, it is most important for those States which desire to submit a revised plan to recognize the review's limitations. The findings of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgment and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources were found, however, they were used in the analysis.

The data upon which the reports' findings are based is the most currently available to the Federal Government. However, EPA believes that the States possess the best information for developing revised plans. The States have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of air quality standards. Therefore, those States desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data supporting EPA's findings. In developing a suitable plan, it is suggested that States select control strategies which place emissions for fuel combustion sources into perspective with all sources of emissions such as smelters or other industrial processes. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and HC emissions which occur in fuel switching, and other potential air pollution problems such as sulfates .

Although the enclosed analysis has attempted to address the attainment of all the NAAQSs, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because stationary fuel combustion sources often constitute the greatest source of SO_2 emissions and are a major source of TSP emissions.

Part of each State's review was organized to provide an analysis of the SO_2 and TSP emission tolerances within each of the various AQCRs. The regional emission tolerance estimate is, in many cases, EPA's only measure of the "over-cleaning" accomplished by a SIP. The tolerance assessments have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for changing emission limitation regulations. In conjunction with the regional analysis, a summary of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D, and E. The following map of Oklahoma shows the State's AQCRs. (Figure A-1).

The major findings of the study are:

- As required by Section IV of ESECA, the SIP for the State of Oklahoma has been reviewed with particular attention to the most frequent causes of over-restrictive emission limiting regulations. Even though the Example Region approach was used in the development of the control strategy, the regulation covering particulate emissions does not appear to be over-restrictive. Due to low ambient SO_2 levels, the State did not have to prepare a control strategy for SO_2 in its SIP.

- Even though there is no delay in scheduled attainment dates for particulates, there are indications of widespread particulate problems. NAAQS violations for TSP were reported in every Oklahoma AQCR. In addition, the State has two proposed TSP AQMAs.

- The State's regulation for existing SO_2 sources is based on ambient air (SO_2) concentrations observed beyond the polluter's property line. For this reason, evaluation of its restrictiveness was precluded using the methodology established for this review. Therefore, it is not definitely known whether Oklahoma's low ambient SO_2 levels are due to an overly restrictive emission regulation, to a low level of overall baseline emissions, or to some other factor.

AIR QUALITY CONTROL REGIONS IN OKLAHOMA

Region	Region Name
017	Fort Smith (Okla.-Ark.)
022	Shreveport - Texarkana-Tyler (Okla.-Ark.La.-Tex.)
184	Central Oklahoma
185	North Central Oklahoma
186	Northeastern Oklahoma
187	Northwestern Oklahoma
188	Southeastern Oklahoma
189	Southwestern Oklahoma

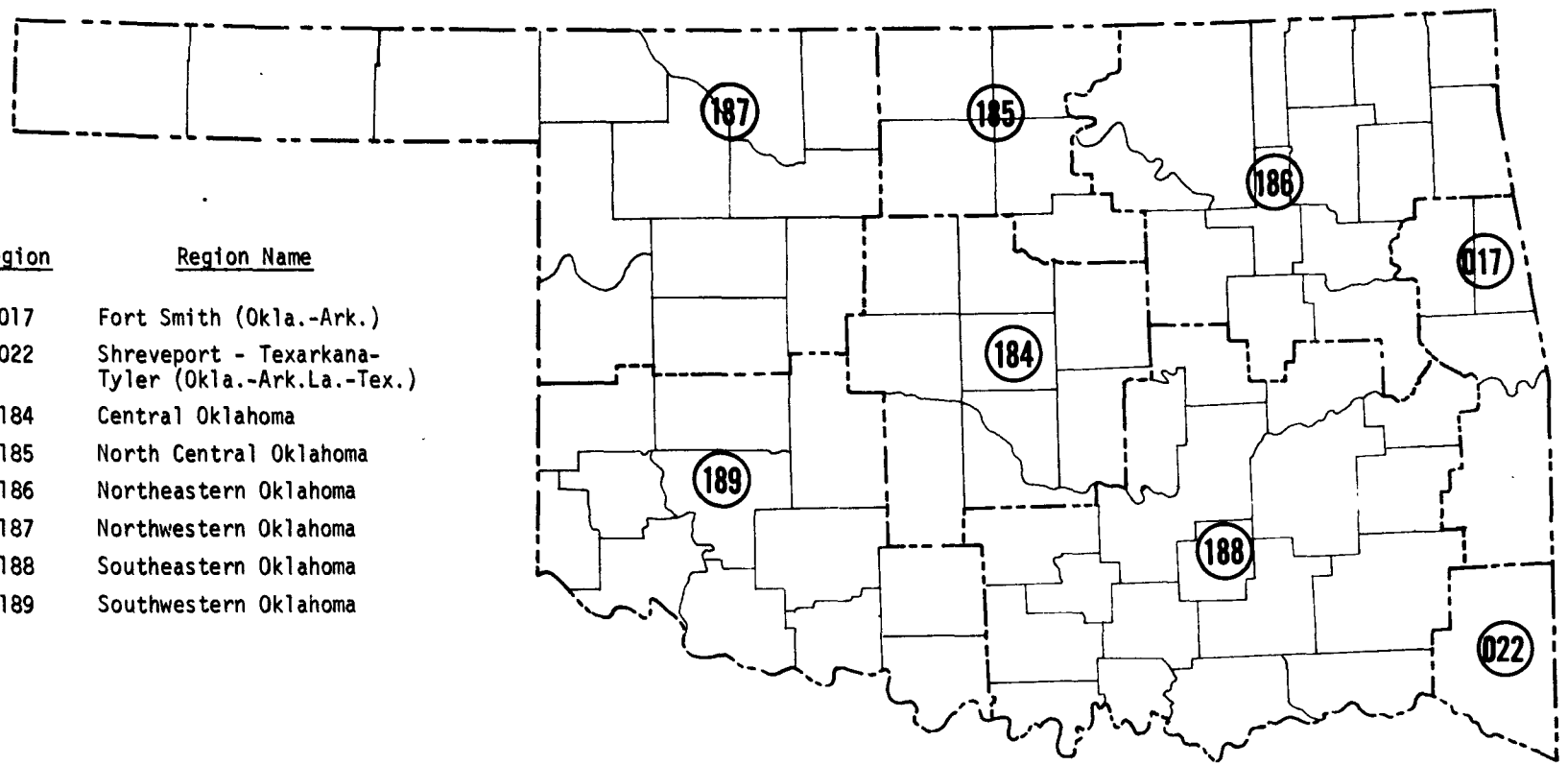

Figure A-1. Oklahoma AQCRs

2.0 STATE IMPLEMENTATION PLAN REVIEW

2.1 SUMMARY

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

- Does the State have air quality standards which are more stringent than NAAQS?
- Does the State have emission limitation regulations for control of (1) power plants, (2) industrial sources, (3) area sources?
- Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?
- Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?
- Are there no proposed Air Quality Maintenance Areas?
- Are there indications of a sufficient number of monitoring sites within a region?
- Is there an expected 1975 attainment date for NAAQS?
- Based on reported (1973) Air Quality Data, does air quality meet NAAQS?
- Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?
- Is the fraction of total emissions from stationary fuel combustion sources higher than those of other sources?
- Do modeling results for specific fuel combustion sources show a potential for a regulation revision?
- Must emission regulations be revised to accomplish significant fuel switching?
- Based on the above indicators, what is the potential for revising fuel combustion source emission limiting
- Is there a significant clean fuels savings potential in the region?

This report is directed at answering these questions. An AQCR's potential for revising regulations increases when there are affirmative responses to the above.

The initial part of the SIP review report, Section 2 and Appendix A, was organized to provide the background and current situation information for the State Implementation Plan. Section 3 and the remaining Appendices provide an AQCR analysis which helps establish the overall potential for revising regulations. Emission tolerance estimates have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for revising emission limiting regulations. In conjunction with the regional analysis, a characterization of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D, E.

Based on an overall evaluation of EPA's current information, AQCRs have been classified as good, marginal, or poor candidates for regulation revisions. The following table on page 8 summarizes the State Implementation Plan Review. The remaining portions of the report support this summary with explanations.

2.2 INTRODUCTION

The purpose of this section is to summarize and review the development and the essential content of Oklahoma's State Implementation Plan (SIP). The SIP is designed to show how the state plans to achieve and maintain national ambient air quality standards. These standards were promulgated by EPA on April 30, 1972. The Clean Air Act required the SIPs to be submitted no later than January 30, 1972. Therefore, the air quality and emission data used in the development of such a plan would necessarily be of the 1970 or 1971 vintage.

Since 1973 air quality data was assembled, reference will occasionally be made to this data to illustrate the continuance or discontinuance of any relavant trends.

2.3 AIR QUALITY SETTING - STATE OF OKLAHOMA

The State of Oklahoma is divided into eight Air Qualtiy Control Regions (AQCRs). These are listed below.

017(7) Fort Smith Interstate
022(8) Shreveport-Texarkana-Tyler Interstate
184(1) Central Oklahoma Intrastate
185(4) North Central Oklahoma Intrastate
186(2) Northeastern Oklahoma Intrastate

STATE IMPLEMENTATION PLAN REVIEW - OKLAHOMA

SUMMARY TABLE

"INDICATORS"	STATE		Fort Smith 017 AQCR		Shvpt. et.al 022 AQCR		Central 184 AQCR		North Central 185 AQCR		North-eastern 186 AQCR		North-western 187 AQCR		South-eastern 188 AQCR		South-western 189 AQCR	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?	NO	NO																
• Does the State have emission limiting regulations for control of:																		
1. Power plants	YES	NO(2)																
2. Industrial sources	YES	NO																
3. Area sources	YES(1)	NO																
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	YES	N/A																
• Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?	YES	YES																
• Are there no proposed Air Quality Maintenance Areas?	NO	YES	NO	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO
• Are there indications of a sufficient number (3) of monitoring sites within a region?	N/A	N/A	YES	NO	NO(4)	NO(5)	YES	YES	NO	NO	YES	YES	NO	NO	YES	NO	YES	NO
• Is there an expected 1975 attainment date for NAAQS?	N/A	N/A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
• Based on reported (1973) Air Quality Data, does air quality meet NAAQS?	N/A	N/A	NO(6)	YES	NO(7)	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
• Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?	N/A	N/A	NO(8)	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
• Are the total emissions from stationary fuel combustion sources lower than those of other sources?	N/A	N/A	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
• Must emission regulations be revised to accomplish significant fuel switching?	N/A	N/A	YES(10)	NO(9)	NO(11)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?	N/A	N/A	Poor	N/A(9)	Poor	N/A	Poor	N/A	Poor	N/A	Poor	N/A	Poor	N/A	Poor	N/A	Poor	N/A
• Is there a significant Clean Fuels Saving potential in the region?	N/A	N/A	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

NOTE: FOOTNOTE's FOLLOW

(1) The particulate emission regulation for fuel burning equipment indicates that any such equipment which has an hourly heat input less than 10 million Btu/hr has a stated emission limit. Thus it would appear that area sources, including home heating units, would also be covered.

(2) In actuality, the State does not have "emission limiting regulations" this control SO_2 emissions from existing fuel burning facilities. The only SO_2 regulations that applies to existing sources is an ambient SO_2 concentration maximum observable beyond the polluter's property line. Such a regulation does not pose direct limits on the amount of SO_2 that may be emitted from a facility.

(3) Any assessment made here would necessarily be subjective. They would also be subject to varying degrees of error, partially because the sufficiency of monitoring sites depend not only on number but also on location with respect to the major sources. Thus the responses to this question should be viewed in light of these facts.

(4) Only one out of 11 stations in Oklahoma.

(5) Only one out of 7 stations in Oklahoma.

(6) Violations in other States; none in Oklahoma.

(7) Of the 11 stations in the entire AQCR, there is only one in Oklahoma. Four of the 11 stations in the AQCR reported violations of the secondary 24-hr standard. One of these four was the Oklahoma station. Three stations reported violation of the secondary annual standard. None of these were in Oklahoma.

(8) 1973 air quality in the Oklahoma portion of this AQCR is at a level which indicates a potential for emissions increase. However, air quality in other portions of AQCR would not permit such increases.

(9) Considering that most of the State's SO_2 emitters fall into the existing source category, and that Oklahoma does not have a regulation for these sources that directly limits emissions, then any discussion about revising emission limiting regulations would not apply to most of the State's SO_2 sources. Therefore, NA was used in this block for all AQCRs.

(10) If the air quality of the Oklahoma portion alone was the sole criteria, emission regulations would not have to be revised to accomplish additional emissions.

(11) The "NO" response for the TSP portion of this question for each of the AQCRs is meant to indicate that, generally speaking, particulate emissions could be increased via various types of fuel switches without violating existing emission limiting regulations. However, for switches that involve coal, the situation is not so clear-cut. The extent to which a switch to coal could be made will depend on how emissions from the coal burning equipment is distributed among the exhaust stacks. If there is a separate stack for the coal burning equipment, then, based on emissions from the State's facilities that have coal burning capabilities, the regulations would be violated. But at the other extreme, if emissions from coal burning equipment and natural gas burning equipment are allowed to exit from one stack, then larger amounts of coal could be used to replace some of the natural gas without violating emission regulations.

187(6) Northwestern Oklahoma Intrastate
188(3) Southeastern Oklahoma Intrastate
189(5) Southwestern Oklahoma Intrastate

The first number in the above listing is the number assigned to the regions by the U. S. Environmental Protection Agency as part of a numbering system for all regions in the United States. The number in parentheses is the number that the State of Oklahoma uses in its system for designating air quality control regions within its boundaries. Therefore, while the numbers 017 and 022 correspond to interstate AQCRs that span the boundaries of at least two states, the numbers 7 and 8 correspond only to the respective portions of those AQCRs that are within Oklahoma's boundaries. For the intrastate AQCRs, the two numbering systems designate identical areas. Figure A-1 shows the regions and their geographical relationship. Table A-1 lists the AQCRs in Oklahoma and also includes:

1) Priority classifications for pollutants under study
2) demographic information, and
3) portions of the State which have been designated Air Quality Maintenance Areas (AQMAs)

Priority classifications give a quick indication of the extent to which certain pollutants pose air quality problems for the AQCR. A Priority I listing indicates that relatively high ambient concentrations of the pollutant have been observed (or estimated, in the absence of air quality data) in the AQCR, while the Priority III designation reflects the pollutant is generally present in concentrations below NAAQSs. At the time the SIP was written, a detailed survey of the then current air quality data showed that two pollutants warranted a Priority I classification. These were particulates and photochemical oxidants, and this was only for two AQCRs (Northeastern and Central Oklahoma).

The listing of an area as a proposed AQMA indicates there is evidence that there may be problems associated with the area maintaining NAAQS. Such problems could be due to the expected addition of new major sources in the future, or to predictions of accelerated growth in the area. If an area ultimately becomes an AQMA, it is likely that special, more restrictive changes, will have to be made to existent regulations and/or air pollution control plans. Table A-1 indicates only two AQCRs have proposed AQMAs. These are for TSP, and correspond to the State's two major urban areas (around Tulsa and Oklahoma City). AQMAs for SO_2 had also been proposed in these same two areas, but recent (approximately 11/20/74) information received from EPA-Region VI indicates that

these proposed designations have been dropped.

Table A-2 presents the dates at which various ambient air quality standards are expected to be attained in the AQCRs in Oklahoma. From this it can be seen that none of the AQCRs have attainment dates past the July 1975 date which had been originally prescribed for all states. Having attainment dates that occur after July 1975 indicates there is evidence (as assessed by either the state or by EPA) of problems which will prevent NAAQS attainment within the time period initially prescribed by law.

A summary of the Federal and Oklahoma ambient air quality standards for the pollutants under study is presented in Table A-3. As noted, these standards are equivalent to the National Primary and Secondary Air Qualtiy Standards.

Of the pollutants under study, the SIP gives air quality data only for particulates, and only for the Northeastern and Central Oklahoma regions. To obtain this data for the SIP, state officials used a network which monitored approximately 10 locations in the Northeastern AQCR (186). The sampler location having the highest measured concentration (that was deemed valid) recorded an Annual Geometric Mean (AGM) of 129 $\mu g/m^3$. The corresponding secondary standard is 60 $\mu g/m^3$. The sampling period was from January 1, 1970 to December 29, 1970. A total of 104 samplers were used to obtain this result.

A somewhat less extensive network was set up to monitor approximately nine locations in the Central Oklahoma AQCR (184). Twenty-four samplers were used during the period from April 5, 1971 to November 28, 1971. In this sampling program the sampler location with the highest concentration showed a reading of 116.4 (AGM).

These results can be compared with 1973 air quality data. Summaries of Oklahoma's 1973 Air Quality status for TSP and SO_2 are presented in Tables A-4 and A-5, respectively. Examination of Table A-4 reveals that there seems to have been a switch between the Northeastern and Central AQCRs as to which has the most adverse air quality with respect to particulates. While both regions continue to violate the secondary annual standard, the Northeastern AQCR (186) exhibits a drop of 40 $\mu g/m^3$ from its annual high in 1970. The Central region shows only a 2.4 $\mu g/m^3$ drop since the readings made in 1971.

The overall result is that the Central AQCR (184) has a highest annual reading which is 25 $\mu g/m^3$ higher than that observed in the Northeastern AQCR (186). Table A-4 also shows that the second highest 24-hour TSP reading in the Central Oklahoma AQCR, is more than three times the second highest reading in any other AQCR in the State.

The SIP did not include air quality data for SO_2, therefore, comparisons cannot be made with 1973 data. However, review of Table A-5 can lead to some possibly relevant observations. Most of the AQCRs exhibited SO_2 air quality which was better than that required by national ambient standards. Information supplied to EPA-Region VI by Oklahoma air pollution control officials indicates that the State's highest reported ambient SO_2 concentrations (high and 2nd highs of 396 and 249 $\mu g/m^3$ for the North Central AQCR-185) were more than likely due to a smelter which has since been closed. It was also indicated to Region VI that the SO_2 concentrations reported to the SAROAD air quality data bank for the Northeastern AQCR (186) were in error. The numbers given in Table A-5 reflect the correction which was due to a misplaced decimal. (SAROAD indicates highest and 2nd highest readings of 1227 and 729 $\mu g/m^3$ respectively. The corrected values are 123 and 73 $\mu g/m^3$).

Examination of Table A-5 also shows that the AQCR with the largest number of stations reporting (Central Oklahoma) has relatively good SO_2 air quality. On the other hand, the AQCR which has the highest SO_2 readings in the State (North Central Oklahoma - AQCR 185) has only one monitor. This is particularly striking because at the time the SIP was written, a non-ferrous smelter located in the North Central AQCR accounted for 75% of all SO_2 emissions in the State.

The Oklahoma SIP contains results of a statewide emission inventory which included SO_2 and particulates. The inventory was performed by GEOMET Incorporated under contract to EPA in conjunction with the Air Pollution Control Division, Oklahoma State Department of Health. This inventory is considered representative of the 1970 calendar year, and though not meant to be interpreted as absolute values, it is to be considered a realistic estimate. A listing of these overall emissions by AQCR for each of the major air pollutants is shown in Table A-6 in Appendix A. It should be noted that this inventory is <u>not</u> identical to that which appeared in the original SIP, but is based on a revised inventory (dated 10/16/72) which was resubmitted along with other portions of the SIP that had been disapproved by EPA. The differences between the two versions was significant

increases in the amounts of point source particulate emissions listed for Northeastern Oklahoma (AQCR 186) and for North Central Oklahoma (AQCR 185). The new estimates were 2.8 and 3.7 times the original emissions in those two respective regions. It would appear that for interstate AQCRs, the inventory applies only to portions of the AQCR within Oklahoma.

According to that inventory, process sources account for most of the particulate emissions in all of the regions, with the exception of the Shreveport-Texarkaka-Tyler Interstate AQCR (022). (The Oklahoma portion of the Shreveport-Texarkana-Tyler Interstate AQCR contributes only 0.2% of total particulate emissions in the statewide inventory, so its effect on overall state trends is minimal.)

In most of the regions,process sources comprise approximately 80% of the particulates. As can be seen in Table A-6, the overwhelming majority (90.3%) of particulates come from point sources.

Oxides of sulfur emissions primarily come from the following three major sources categories: fuel combustion, process sources, and transportation. The percent from each category is fairly evenly distributed throughout all regions except North Central Oklahoma (AQCR 185). In this region a single non-ferrous smelter produces 75% of the SO_2 emissions in the entire state. Point sources contributed 85.6% of the State's sulfur oxide emissions, while the remaining 14.4% come from area sources.

Figure A-2 shows the breakdown of emissions for the two AQCRs for which the SIP provided air quality data, Northeastern (186) and Central (184) Oklahoma. It should be noted that the percentage breakdown for particulates in the Northeastern AQCR is based on the emissions figure for that region as presented in the original SIP. This figure was 33,874 tons. The revised emissions inventory for that AQCR (dated 10/16/74) shows emissions totalling up to 109,210 tons. Thus, the percentage breakdown shown in the figure below for Northeastern Oklahoma may vary depending on how the extra 75,336 tons were distributed among the various categories.

Table A-7 summarizes the fuel combustion sources in the State by AQCR. Inclusion of data from both the National Emission Data Bank System (NEDS), and from a Federal Power Commission printout not only provides current information about power plants in the State, but also points up some of the data inconsistencies that exist.

The most current data available[1] was used to compile the particulates and SO_2 emissions information shown in Tables A-8 and A-9. These tables show that the largest proportion (45%) of the particulates emitted in the State originate in the Northeastern AQCR, while 62% of the State's SO_2 emissions come from the North Central AQCR. The emission inventories included in the SIP also indicated that the Northeastern AQCR accounted for 45% of the State's particulate emissions, but the North Central AQCR's contribution of the State's SO_2 emission was listed as being 78%. Thus, with respect to the State's total SO_2 emissions, the North Central AQCR has actually accomplished a significant decrease since the writing of the SIP.

The particulate emissions shown for the Central AQCR in Table A-8 do not reflect the high TSP measurements recorded in that region as shown in Table A-4.

Tables A-8 and A-9 also show that the emissions which result from fuel combustion are a relatively small component of total emissions, and that most of the emissions from interstate AQCRs do not originate in the Oklahoma portions.

2.4 BACKGROUND ON THE DEVELOPMENT OF THE CURRENT STATE IMPLEMENTION PLAN

Oklahoma's control strategies were based on the Example Region approach. Two AQCRs were used for this purpose, Northeastern (186) and Central Oklahoma (184). The SIP developed control strategies for particulates and photochemical oxidants, and demonstrated its effectiveness via application to estimated emissions from these two example regions. In development of the control strategy, the proportional model was used to determine the amount of rollback necessary to meet the required standards.

Oklahoma's control strategy is based on compliance with selected regulations which have been promulgated pursuant to the Oklahoma Clean Air Act. There are a total of 18 regulations which cover a wide variety of pollutants, including SO_2 and particulates emissions resulting from fuel-burning and other processes. A summary of current regulations which relate to emissions from fuel-burning processes in Oklahoma is presented in Table A-10. The reader will note that the emission limit for particulates from fuel-burning equipment is dependent upon the level of hourly heat input to that equipment. The higher the heat input,

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[1] Information in NEDS as of July 27, 1974

the lower the level of allowed emissions. However, in no case are particulate emissions allowed to be greater than 0.6 lbs/10^6 Btu.

From the way the regulation is written, it appears that the emission limit applies to the pollutants coming from each stack. Thus, the applicable emission limit is based on the heat input to all fuel burning equipment which supplies this stack, and to determine this limit, the number of fuel burning units per stack would have to be known for each facility. This level of detail is beyond the scope of this anlaysis, therefore, the aggregated heat input to all fuel burning equipment at a facility (as based on NEDS data) was used to determine the applicable emission limit.

As shown in Table A-10, Oklahoma has differing SO_2 emission regulations for new and existing sources. The regulation for existing sources is stated in terms of ambient SO_2 concentrations observed beyond the property line of the polluter. It is reasonable to expect that most of the State's stationary fuel burning SO_2 emitters fall into the existing sources category. Therefore, this property line regulation provides the bulk of Oklahoma's control over SO_2 emissions.

This regulation is quite different from Oklahoma's SO_2 emission regulation for new fuel burning sources which specifically relates the amount of emissions allowed directly to the amount of fuel burned (pounds of SO_x per million Btu). The Federal New Source Performance Standards (which applies almost exclusively to new power plant facilities) is also written using this same format.

In effect, Oklahoma's ambient concentration property line regulation does not constitute an emission limiting regulation, mainly because it does not specify an emission limit. The ambient SO_2 concentration maximum stated in the regulation could result from a wide variety of differing emission levels depending on the fuel combustion process, meteorology, monitoring sites and a host of other factors. Furthermore, (and more within the context of this review), it is difficult to address the restrictiveness of a regulation which does not perform a regulatory function. Thus, in light of these points, and also the fact there are no SO_2 NAAQS violations in the State, (thus implying that there may not be a need for a stringent SO_2 emission regulation), it is assumed in this review that Oklahoma has no SO_2 emission limiting regulations for most of the State's stationary fuel combustion sources. It is recognized that new fuel burning sources do have specifically stated emission limits as the result of an Oklahoma regulation for these sources. It is also recognized that new steam generating facilities will have to comply with the SO_2 emission limits imposed by the Federal New Source

Performance Standards. But, it seems reasonable to expect that the emissions from these new sources will be small in comparison to those from existing sources.

The preferred control strategy for particulates as developed in the SIP was based on the following regulations:

Regulation No. 1 - Prohibition of Open Burning

Regulation No. 6 - Pertaining to the Control of the Emission of Particulate Matter from Fuel-Burning Equipment

Regulation No. 8 - Pertaining to the Control of the Emission of Particulate Matter from Industrial and Other Processes and Operations

Regulation No. 9 - Control of Fugitive Dust

For the purpose of control strategy testing as presented in the SIP, it was assumed that there would be additional reductions of particulate emissions as required by the Federal Automotive Emission Control Program, and from increased aircraft utilization of smoke reducing engines. This assumption was teamed up with the first three of the above regulations to form a combined strategy. When this strategy was applied to the emissions of the example region (Northeastern, AQCR 186), the SIP demonstrated that secondary air quality standards could be achieved, and maintained through 1980. When applied to the Central Oklahoma AQCR, similar results were obtained, with the exception that the secondary standard was 3% short of being maintained for 1980. However, the additional (but difficult to quantify) emission reductions that would result from Regulation No. 9 (Control of Fugitive Dust), is expected to provide the extra margin needed.

Since SO_2 did not present a major air pollution problem in the state at the time the SIP was written, (all regions were then classified Priority III for SO_2), the State was not required to formulate a control strategy for this pollutant.

It should be noted that the bulk of the emission reductions fall into the Process Source category. For the Northeastern AQCR, total emissions were given above (including the transportation source reductions for autos and aircraft) results in a total reduction of 106,094 tons/year. These reductions are broken down as shown below:

Process Source Reductions	101,754	tons/year
Fuel Burning Source Reductions	743	tons/year
Open Burning Source Reductions	2,588	tons/year
Transportation Source Reductions	1,009	tons/year
	106,094	

Thus, approximately 96% of the emission reductions are via limitations on process sources while only 0.7% are due to controls on fuel- burning equipment.

2.5 SPECIAL CONSIDERATIONS - OKLAHOMA

As indicated in Table A-1, two areas in Oklahoma have been proposed as AQMAs for TSP. The two areas comprise Tulsa and its surroundings (in the Northeastern AQCR), and the Oklahoma City area (in the Central Oklahoma AQCR). Such a designation indicates special requirements may have to be developed for these areas, and when approved by EPA, may result in modifications on the SIP.

The regulations which comprise the basis of Oklahoma's control strategy for particulates were all supposed to be in effect as of October 15, 1972. Thus, one would expect emissions in Oklahoma to have been controlled as of this date in the same manner they would be controlled at the State's latest expected attainment dates (7/75). The only exceptions to this statement would be: (1) those sources which are presently operating under variance, and (2) the existence of any more stringent regulation which has a later full compliance date. Information from the EPA Region VI office indicates there are only three variances which have been given to major sources in Oklahoma. They were:

1. National Zinc (Bartlesville)
2. Blackwell Zinc
3. Sun Oil Company

Of these, National Zinc will be operating in compliance May 31, 1975: Blackwell Zinc has shut down; and Sun Oil is expected to be in compliance as of December 31, 1974. Thus, unless the emissions from these sources were massive, their operation should not have posed a major threat to adversely alterning the State's air quality.

With regard to the second exception, it appears that the sulfur oxide emission limits on new, liquid fuel burning equipment, is the only regulation involving more stringent regulation taking effect after October 16, 1972. This regulation allows 0.8 lbs/10^6 Btu before July 1, 1975, but only 0.3 lbs/10^6 Btu after that date. However, the burning of oil (or other liquid fuels) at stationary installations in the State account for only a fraction of the total emissions.

Thus, Oklahoma currently has in effect essentially all of the controls which the SIP prescribes for the attainment and maintenance of National Ambient Air Quality Standards. Any indication of attainment being off schedule should be viewed seriously, in that it suggests either a lack of enforcement or an inadequate level of control. Such a situation would be of special importance to any assessment of Oklahoma's ability to relax regulations. In light of these facts, 1973 air quality data for TSP would not allow revisions that would result in less restrictive regulations.

3.0 AQCR ASSESSMENTS

3.1 REGIONAL AIR QUALITY

Tables A-11 and A-12 present the results when a proportional model is used to estimate tolerance for emission increase. This display should be viewed in light of the limitations mentioned in Section 1.0.

The magnitude of negative tolerance for emissions increases, (as shown in Table A-11) should not be used as a measure of an AQCR's relative standing in terms of tolerating more emissions. This magnitude is very much affected by the total emissions in the AQCR. Thus, the -5280 ton TSP tolerance for the Central Oklahoma AQCR (184) does not reflect the fact that this region has ambient TSP levels which are higher (i.e. is dirtier) than does the Northeastern Oklahoma AQCR (which has a TSP tolerance of -25,740 tons).

The inclusion of information from the SIP in Tables A-11 and A-12 is meant to summarize (to the best extent possible with the limited data) the air quality goals of the SIP. However, Oklahoma's SIP lacked the necessary air quality data for either this type of analysis, or for comparison with 1973 data to any large degree. Nevertheless, the SIP data presented does give an idea of the types of reductions which were expected in two AQCRs (Central and Northeastern) once the emission controls were in effect.

Tables B-1 and B-2 provide summaries of some of the indicators which should be considered when estimating the potential for regulation relaxation. The overall regional evaluation of this chart is based upon consideration of these indicators, and on the more complete summary of indicators found at the beginning of Section 2 of this report.

With regards to particulates, the overall assessment is that on an AQCR basis, any increase in particulate emissions would tend to aggravate a situation where NAAQS TSP violations already occur in each of the 8 AQCRs which involve Oklahoma.

Table B-1 highlights one definable area which has an air quality which could tolerate additional particulate emissions. This is the Oklahoma portion of the Fort Smith Interstate AQCR (017), and its good air quality is probably related more to the absence of major point sources rather than to over-restrictiveness of regulations. Examination of Tables A-7, A-8, and those in Appendix D show there is only one fuel combustion point source in this portion of the Fort Smith AQCR. As indicated on Table A-8, this source accounts for only 0.11% of all particulates emanating from fuel combustion in the Oklahoma portion of this AQCR.

The information presented in Table B-2 indicates there is room for increasing SO_2 emissions, to varying degrees, in each of Oklahoma's AQCRs. The tolerance for SO_2 emission increases was calculated for the North Central (185) and Northeastern (186) AQCRs, but was not calculated for other AQCRs because the results would indicate unrealistically high tolerances.

The fact that Oklahoma has a tolerance for increased emissions is mainly due to the State's relatively good ambient SO_2 air quality. This good air quality is evidenced by 1) the absence of SO_2 NAAQS violations, and the absence of proposed SO_2 AQMA designations in the State, and 2) NAAQS attainment expected or achieved before July 1975. The methodology established for this review precludes any definite statement about whether the State's low ambient SO_2 levels are due to overly restrictive emission regulations, to low baseline SO_2 emissions, or to some other factor.

The extent to which significant clean fuel savings could be achieved is somewhat limited by the relatively small percentage of total SO_2 emissions due to fuel combustion in most of the AQCRs. And in those AQCRs where a sizeable percentage (30-40%) of the emissions are from fuel combustion, the total tonnage of emissions is small. As shown in Table A-9, most of these emissions are due to area sources which may have limited usefulness within the context of the clean fuel savings of ESECA.

The degree to which these SO_2 emissions can be safely increased will require more detailed study which, more than likely, will have to include modeling. But in light of the State's TSP problems, any attempt at clean fuel savings which allowed an increase in SO_2 emissions could not have an associated increase in particulate emissions.

It should be noted that particulate limiting regulations do not necessarily have to be relaxed to achieve increased particulate emissions. NEDS point source emission data indicates that significant particulate emission increases could occur within the framework of existing regulations. NEDS data for power plants and industrial fuel combustion facilities is shown in Appendices C and D. In every case where gas is the only fuel burned, the particulate emission regulation is met. Usually these emissions are so low that they could be increased by a factor of ten or more, and still be within the constraints of the applicable regulation. (The situation when fuels other than natural gas are consumed, will be discussed in the following section.) It is not being suggested that the particulate emissions should be increased, for this would only tend to aggravate the adverse TSP air quality problem in the State. However, the point is being made here only to emphasize the apparent fact that Oklahoma's particulate emission regulations are not overly restrictive.

Since there are indications that Oklahoma's particulate emission limiting regulations are not achieving the air quality goals that the SIP had originally set, it was deemed best to classify any region with a negative tolerance as a "bad candidate." If additional evidence shows that Oklahoma's particulate emission regulations are being (or can be) enforced, and its particulate control strategy is adequate to meet its desired goals for air quality, then three other AQCRs could possibly be moved to the "marginal candidate" classification. These would be Northwestern (187), Southeastern (188), and possibly North Central (185). Such a designation would be based on the air quality in those regions (actual readings and number of violations), and the relatively small proportion of the emissions that come from fuel combustion. The rationale here was that if Oklahoma's regulations can effectively control the major emitters (process sources), there may be room for increase emissions from the relatively small fuel combustion sources in these regions.

3.2 POWER PLANT ASSESSMENT

Table C-1 gives relevant data (by AQCR) for power plants now operating in the State of Oklahoma. This listing shows a total of 18 plants varying in size from 40 to 945 megawatts electric (MWe). There are no other major fuel-burning power plants expected to come on line in Oklahoma before 1975. Most of the plants (13) burn only natural gas. For the remaining five, natural gas still provides most (>98% in all cases) of the heat input. With three of these plants the remaining heat is provided with oil, while coal is used in the other two. Two-thirds of the State's 18 power plants are located in three AQCRs (Central (184), North Central (185), and Northeastern (186)).

Based on the information contained in NEDS, power plants utilize approximately 28,460 x 10^6 Btus of the 31,684 x 10^6 Btus of heat liberated every hour from stationary fuel combustion sources in Oklahoma. This corresponds to 89.8%. The remaining 3224 x 10^6 Btus/hour are due to sources in the industrial category. Thus, it would appear that any sizeable savings of clean fuels would have to involve the power plant sector.

As was indicated in an earlier discussion, the plants which are burning natural gas only, all seem to be in compliance with the applicable emission regulation for particulates. However, when a facility also uses oil or coal, not enough information is available to determine whether the particulate emission regulation is being met. The missing information is whether the emissions from the oil or coal exit through a separate stack, or whether these emissions are mixed with the exhaust gases resulting from the combustion of the natural gas. If the former is the case, then the coal burning facilities are definitely exceeding the particulate emission limit, but the oil burners are in compliance. However, <u>if</u> each facility has only one stack for all of its combustion emissions, and the applicable emission limit is based on the aggregated heat input to the entire plant, then <u>all</u> facilities (both power plants and industrial installations) in the State are within the emission limits set by the particulate regulation.

A comparison of the emissions and corresponding limits on emissions for those facilities which burn fuels other than natural gas is shown in Table C-2.

For particulates,this table also supplies the State's maximum emission limit, (0.6 lbs/10^6 Btu). Since this limit applies to units having an hourly heat input of less than 10^6 Btu, it gives the applicable limit if the coal or oil burning facilities were treated as being separate from the gas burning portions of the plant. For the sake of comparison, SO_2 emission limits for new sources are also included in this table, as well as in other tables of Appendices C and D.

Consideration of a possible fuel switch must devote some attention to identifying those locations where such a switch would be technically possible. Data obtained from Electric Steam Plant Factors has provided information relating to the fuel which power plants were designed to use. This information is included in Table C-1. Only two plants were designed for coal, and those are the same two that, according to the NEDS data presented, have experienced coal use. These are the Ponca City (40 MWe) and Mustang (509 MWe) plants operated by the Oklahoma Gas and Electric Company. These plants are in the North Central (185) and Central (184) AQCRs, respectively. Essentially all of the power plants in Oklahoma were designed to burn both oil and gas. Thus, a gas to oil switch would provide greatest flexibility in Oklahoma to effect clean fuel savings.

3.3 INDUSTRIAL/COMMERCIAL/INSTITUTIONAL SOURCE ASSESSMENT

As indicated in the previous section, only 11.2% of the point source Btu liberation are from sources in this category. Three of the 28 identified sources in this category are currently using oil in addition to their major fuel, natural gas. It is not known to what extent any of the other 25 sources can effectively switch to a dirtier fuel. Information relating to these sources are given in Table D-1.

Table D-2 summarizes the emissions from the three installations which burn oil. It indicates that these oil burners are generally not as clean as power plants which use oil.

3.4 AREA SOURCE ASSESSMENTS

There were no area sources in Oklahoma which could be evaluated within the context of Section IV of ESECA.

- State implementation plan information
- Current air quality information
- Current emissions information

Tables in this appendix summarize original and modified state implementation plan information, including original priority classifications, attainment dates, ambient air quality standards, and fuel combustion emission regulations. SAROAD data for SO_2 and TSP monitoring stations are shown for AQCRs in the State. NEDS emissions data by AQCR[1] are tabulated and broken down into fuel burning categories.

Tables A-11 and A-12 show a comparison of emission inventories in the original SIP and those from the NEDS. An emission tolerance, or emission tonnage which might be allowed in the AQCR and still not violate national secondary ambient air quality standards, is shown for SO_2 and particulates. The intent of this calculation is to indicate possible candidate regions for fuel switching. Tolerance was based on either the degree of control expected by the SIP or upon air quality/emission relationships which are calculated from more recent data. The value of the emission tolerance provides an indication of the degree of potential an AQCR possesses for fuel revisions and regulation relaxation.

Methodology for Increased Emissions Tolerance

A tolerance for increased emissions was determined as follows: The "allowable emissions" were calculated for each AQCR based on 1972 NEDS data and the percent reduction (or increase) required to meet the national secondary ambient air quality standards in that AQCR (worst case from Tables A-4 and A-5).

The percentages used in this calculation were obtained via the use of current 1973 air quality data and the proportional rollback model. The values for background TSP concentrations were the same as those used in the SIP. This background value was used in all calculations involving the annual standard, but a zero TSP background was assumed for the calculation of reductions based on the 24-hour standard. (This was done because background levels are, in effect, an annual average, and therefore, should be

[1] "1972 National Emissions Report," EPA - 450/2-74-012, June 1974.

compared with only annual data. It is reasonable to expect that the "real background" for any particular 24-hour period to be different for other 24-hour periods.)

The NEDS emissions are subtracted from the "allowables" to determine the tolerance for emissions increase. A positive value for this result indicates a potential for increasing emissions.

When the current air quality levels were less than one-half of the level represented by an ambient air quality standard, no "rollup" emissions tolerance was calculated in Tables A-11 and A-12. This arbitrary cutoff point was chosen so as not to distort the emissions tolerance for an area. At low levels of a pollutant, the relationship between emissions and air quality is probably not linear. Although this cutoff may leave some AQCRs with no quantifiable emissions tolerance, it was felt that no number at all would be preferable to a bad or misleading number.

It is emphasized that emissions tolerance is a region-wide calculation. This tolerance obviously makes more sense in, say, an urban AQCR with many closely spaced emissions sources than in a largely rural AQCR with geographically dispursed emissions.

A word of caution regarding particulates needs mentioning. Emission source estimates in the NEDS data bank and most state SIP's are for total particulates. Generally, the control strategies for particulates are aimed at total particulates, while the high-volume particulate sampling (SAROAD data) measures only the finer, suspended fraction. A given level of total particulate emissions control will therefore not translate into the same level of measured ambient air quality. Some of the larger particulates being controlled will not remain suspended, and therefore would not be measured by the High-volume technique. Hence, particulate control plans may have underestimated the amount of control necessary to achieve ambient air quality standards.

Table A-1 Oklahoma Air Pollution Control Areas

	Federal Region Number	State Region Number [e]	Priority Classification			Demographic Information [f]			AQMA Designations [d]		
			TSP[b]	SO_x[a]	NO_x[c]	1970 Population	Square Miles	Population Density	TSP Counties	SO_x Counties	NO_x
Fort Smith (Okla.-Ark.)	017	7	II	III	III	93,822 [g]	3,582[g]	26.2	none [g]	none [g]	none
Shreveport-Texarkana- Tyler (Okla.-Ark.-La.-Tex.)	022	8	II	III	III	28,642 [g]	1,800[g]	15.9	none [g]	none [g]	none
Central Oklahoma	184	1	I	III	III	780,430	7,215	108.2	Oklahoma county, plus parts of Canadian and Cleveland Counties	none	none
North Central Oklahoma	185	4	III	III	III	172,948	4,448	38.9	none	none	none
Northeastern Oklahoma	186	2	I	III	III	769,756	10,652	72.3	Tulsa County, plus parts of Rogers, Wagoner, Creek and Osage Counties	none	none
Northwestern Oklahoma	187	3	III	III	III	123,836	16,413	7.5	none	none	none
Southeastern Oklahoma	188	6	III	III	III	305,750	14,164	21.6	none	none	none
Southwestern Oklahoma	189	5	III	III	III	284,279	10,510	27.0	none	none	none

	I	II	III
Priority	Greater than	From - To	Less than
[a]Sulfur oxide:			
Annual arithmetic mean . .	100	60-100	60
24-hour maximum.	455	260-455	260
[b]Particulate matter:			
Annual geometric mean . .	95	60- 95	60
24-hour maximum	325	150-325	150
[c]Nitrogen dioxide	110		110

[d]As indicated in the Proposed Air Quality Maintenance Area Designations for Oklahoma: Background and Rationale, EPA Region VI

[e]This region number has been set by the Air Pollution Control Division, Oklahoma State Department of Health and is used preferentially in the State's Implementation Plan. (SIP)

[f]Based on 1970 census data

[g]For Oklahoma portion of the AQCR only

Table A-2. Oklahoma Attainment Dates[b]

AQCR #	Name	Particulates Attainment Dates		Sulfur Dioxide Attainment Dates		Nitrogen Oxides Attainment Dates
		Primary	Secondary	Primary	Secondary	
017	Metropolitan Fort Smith	a	7/75	a	a	a
022	Shreveport-Texarkana-Tyler	a	7/75	a	a	a
184	Central Oklahoma	7/75	7/75	a	a	a
185	North Central Oklahoma	a	a	a	a	a
186	Northeastern Oklahoma	7/75	7/75	a	a	a
187	Northwestern Oklahoma	a	a	a	a	a
188	Southeastern Oklahoma	a	a	a	a	a
189	Southwestern Oklahoma	a	a	a	a	a

a) Ambient air quality levels were below standards at the t. e the attainment dates were formalized.

b) Based on information obtained from EPA-Durham.

Table A-3 Oklahoma Ambient Air Quality Standards [1]

(all concentrations in $\mu gms/m^3$)

		Total Suspended Particulates		Sulfur Oxides			Nitrogen Dioxide
		Annual	24-hr	Annual	24-hr	3-hr	
Federal (Nov. 1972)	Primary	75(G)	260[a]	80(A)	365[a]		100(A)
State[b] (Feb. 1971)	Secondary	60(G)	150[a]	--	--	1300[a]	100(A)

1. Adopted by the Oklahoma Air Pollution Council, Feb. 16, 1971. Data obtained from Oklahoma SIP.

(A) Arithmetic mean

(G) Geometric mean

[a]not to be exceeded more than once per year

[b]State standards are equivalent to the National Primary and Secondary Air Quality Standards.

Table A-4 Oklahoma AQCR Air Quality Status, (1973) TSP [a]

AQCR Name	AQCR #	# Stations Reporting	TSP Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hr	2nd Highest Reading 24-Hr	# Stations Exceeding Ambient Air Quality Standards Primary Annual	Primary 24-Hr[c]	Secondary Annual	Secondary Annual %	Secondary 24-Hr[c]	Secondary 24-Hr %	% Reduction[d] Required to Meet Standards	Standard on Which % Reduction Is Based
Metropolitan Fort Smith	017[b]	8	83	608	213	1	0	3	38	2	25	43	Annual
	(Okla.)	5	36	608	109	0	0	0	0	0	0	-38	24-hr
Shreveport-Texarkana	022[b]	11	81	580	168	1	0	3	27	4	36	41	Annual
Tyler	(Okla.)	1	57	200	168	0	0	0	0	1	100	11	24-hr
Central Oklahoma	184	28	114	1367	1301	4	2	7	25	13	46	88	24-hr
North Central Oklahoma	185	5	65	154	119	0	0	1	20	0	0	14	Annual
Northeastern Oklahoma	186	26	89	630	335	2	1	6	23	9	35	55	24-hr
Northwestern Oklahoma	187	6	87	315	295	1	1	1	17	3	50	49	24-hr
Southeastern Oklahoma	188	13	71	368	300	0	1	2	15	3	23	50	24-hr
Southwestern Oklahoma	189	13	88	1333	277	1	1	5	38	4	31	48	Annual

[a] 1973 air quality data is National Air Data Bank as of June 7, 1974.
[b] Interstate
[c] Violations based on 2nd highest reading at any station
[d] Formula . $\left[\left(\frac{\text{2nd Highest 24 hr - 24 hr Secondary Standard}}{\text{2nd Highest 24 Hr - Background}}\right) \times 100, \quad \left(\frac{\text{Annual - Annual Secondard Standard}}{\text{Annual - Background}}\right)\right]$

background = 30 $\mu g/m^3$

Table A-5. Oklahoma AQCR Air Quality Status (1973), SO_2[a]

AQCR Name	AQCR #	# Stations Reporting 24-Hr (Bubbler)	# Stations Reporting (Contin.)	SO_2 Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hr	2nd Highest Reading 24-Hr	# Stations Exceeding Ambient Air Quality Stds. Primary Annual	Primary 24-Hr[c]	Secondary 3-Hr	% Reduction[d] Required To Meet Standards	Standard on Which % Reduction Is Based
1. Metro Ft.Smith	017[b]	3	-	3	61	60	0	0	-	e	-
	(Okla)	2	-	6	17	12	0	0	-	e	
2. Shreveport - Texarkana - Tyler	022[b]	7	-	7	25	13	0	0	-	e	-
	(Okla)	1	-		12	7	0	0	-	e	
3. Central Oklahoma	184	10	-	5	9	8	0	0	-	e	-
4. North Central Oklahoma	185	1	-	-	396[f]	249[f]	0	0	-	-47	24 Hr
5. North Eastern Oklahoma	186	8	-	41	123[g]	73[g]	0	0	-	e	-
6. North Western Oklahoma	187	2	-	-	5	2	0	0	-	e	-
7. South Eastern Oklahoma	188	2	-	15	128	67	0	0	-	e	-
8. South Western Oklahoma	189	3	-	8	104	39	0	0	-	e	-

[a] 1973 air quality data is National Air Data Bank as of June 7, 1974.

[b] Interstate.

[c] Violations based on 2nd highest reading at any station.

[d] Formula $\left[\left(\frac{\text{2nd Highest 24 Hr - 24 Hr Standard}}{\text{2nd Highest 24 Hr}} \right) \times 100, \left(\frac{\text{Annual - Annual Standard}}{\text{Annual}} \right) \times 100 \right]$; In calculations 365 used as 24 hr. standard, and 80 as annual standard.

[e] The most adverse air quality reading for this AQCR is less than 1/2 the secondary standard, therefore % reductions were not calculated in order to not mislead the reader with unrealistic percentages.

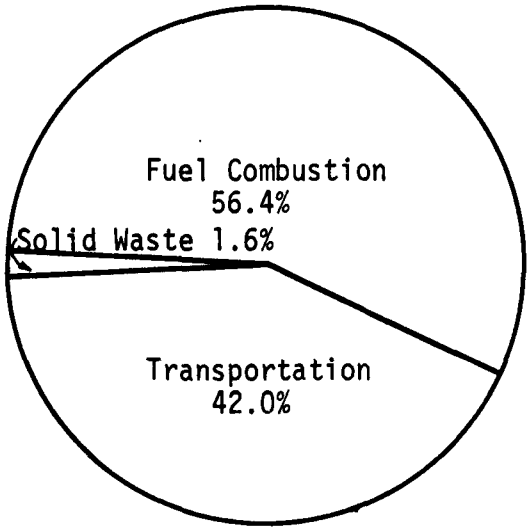
SO_2 - background is assumed to be zero.

[f] Information obtained from EPA - Region VI indicates that these relatively high readings were due to the operation of a smelter which has since closed down.

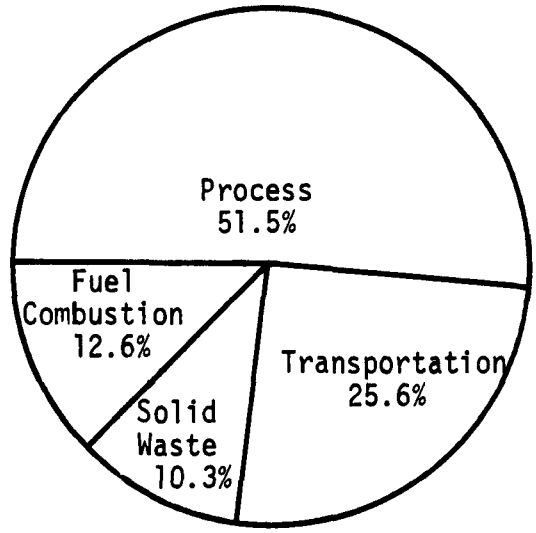
[g] These concentrations are different from those indicated on the SAROAD data sheets that were used for all air quality data in this report. SAROAD showed highest and 2nd highest 24 hour readings of 1227 and 729 $\mu g/m^3$ respectively for this AQCR. However, recent information supplied by Oklahoma air pollution control officials to EPA - Region VI indicates that there was an error in the placement of the decimal point.

Table A-6. Oklahoma State and Regional Area and Point Source Emission Totals

Region		Tons of Air Contaminant Per Year				
		Part	SO_2	CO	HC	NO_x
017	Area	967	377	33,791	7,850	6,341
	Point	3,786	0	1,440	460	44
	Total	4,753	377	35,231	8,310	6,385
022	Area	269	164	1,731	774	478
	Point	100	0	151	33	63
	Total	369	164	1,882	807	541
184	Area	6,811	5,538	366,559	81,232	48,403
	Point	8,588	430	106	6,185	26,200
	Total	15,399	5,968	366,665	87,417	74,003
185	Area	951	1,106	61,242	22,283	8,234
	Point	9,755	96,790	116,391	7,418	8,543
	Total	10,706	97,896	177,633	29,701	16,777
186	Area	5,754	6,030	235,553	87,858	35,892
	Point	103,456	5,525	120,067	12,077	27,163
	Total	109,210	11,555	355,620	99,935	63,055
187	Area	1,580	889	67,384	15,863	12,998
	Point	7,343	6	4	465	19,299
	Total	8,923	895	67,388	16,328	32,297
188	Area	3,470	2,149	136,403	31,355	25,806
	Point	37,003	1,915	24,630	3,234	37,967
	Total	40,473	4,064	161,033	34,589	63,773
189	Area	3,668	1,847	93,929	47,308	14,764
	Point	47,524	2,600	2,334	3,460	25,646
	Total	51,192	4,447	96,263	50,768	40,410
State	Area	23,470	18,100	996,592	294,523	153,916
	Point	217,555	107,262	265,123	33,332	144,925
	Total	241,025	125,362	1,261,715	327,855	298,841

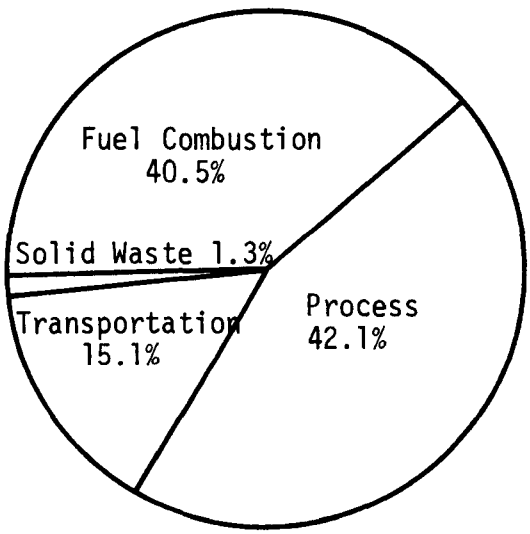


SO_2

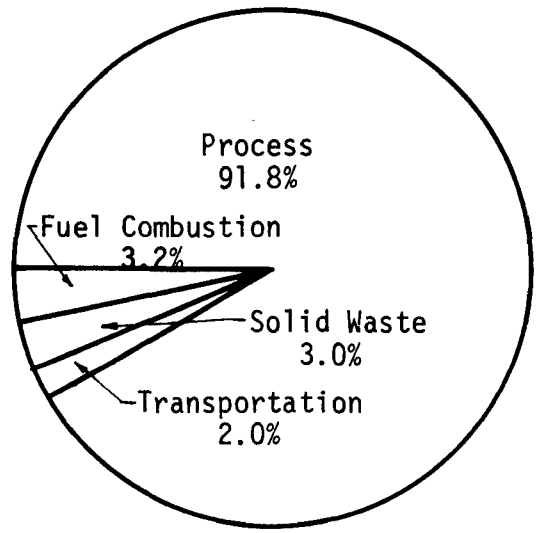


Particulates

Region 184 - Central Oklahoma



SO_2



Particulates

Region 186 - Northeastern Oklahoma

Figure A-2. Emissions by Source Category

Table A-7. Oklahoma Fuel Combustion Source Summary [a]

AQCR	AQCR #	Oklahoma Power Plants		Other Fuel Combustion Point Sources[b]	
		NEDS[b]	FPC[c]	Particulates	SO_2
Fort Smith (Okla.-Ark.)	017	0	0	1	0
Shreveport-Texaskana-Tyler (Okla.-Ark.-La.-Tex.)	022	0	0	0	0
Central Oklahoma	184	4	3	6	1
North Central Oklahoma	185	4	0	5	3
Northeastern Oklahoma	186	4	4	8	4
Northwestern Oklahoma	187	1	1	1	0
Southeastern Oklahoma	188	3	3	6	2
Southwestern Oklahoma	189	2	4	3	0

a) Only sources in Oklahoma are included in those cases where there is an interstate AQCR.

b) All sources from National Emission Data Bank Point Source listing as of June 27, 1974.

c) Federal Power Commission printout information for 1973 of major power plants.

Table A-8. Oklahoma Emissions Summary,[a] Particulates

AQCR Name	AQCR #	Total 10^3 Tons/Year	Percent from Fuel Combustion	Electricity Generation 10^3 Tons/Year	Electricity Generation %	Point Source[c] Fuel Combustion 10^3 Tons/Yr	Point Source[c] Fuel Combustion %	Area Source Fuel Combustion 10^3 Tons/Yr.	Area Source Fuel Combustion %
Ft. Smith	017[b]	11.1	9.0	0	0	0	0	1.0	9.0
	(Okla.)	3.74	13.2	0	0	0.004	0.11	.491	13.1
Shrvprt et al	022[b]	.162	5.7	1.2	0.7	5.9	3.6	2.3	1.4
	(Okla.)	1.1	15.5	0		0		.170	15.5
Cen. Okla.	184	6.0	22.2	0.39	6.5	0.06	1.0	0.88	14.7
N. Cen. Okla.	185	17.9	1.8	0.11	0.61	0.01	0.06	0.21	1.17
NE Okla.	186	46.8	5.9	0.78	1.7	0.49	1.0	1.5	3.2
NW Okla.	187	3.5	26.6	0.80	22.9	0	0	0.13	3.7
SE Okla.	188	13.0	6.9,	0.26	2.0	0.03	0.23	0.61	4.7
SW Okla.	189	11.4	4.5	0.23	2.0	0.03	0.26	0.25	2.2

Total (includes all of interstate AQCRs) 271.70

Total (Oklahoma portion only) 103.44

a) Emissions in Data Bank as of June 27, 1974. The listing above includes external combustion sources only.

b) Interstate emissions based on total of all counties in all states within the AQCR.

c) Does not include minor contributions from miscellaneous point sources, nor contributions for internal combustion sources.

Table A-9. Oklahoma Emissions Summary, SO_2 [a]

AQCR Name	AQCR #	Total 10^3 Tons/Year	Percent from Fuel Combustion	Electricity Generation 10^3 Tons/Year	Electricity Generation %	Point Source Fuel Combustion 10^3 Tons/Yr.	Point Source Fuel Combustion %	Area Source Fuel Combustion 10^3 Tons/Yr.	Area Source Fuel Combustion %
Ft. Smith	017[b]	1.6	25	0	0	0	0	0.4	25.0
	(Okla.)	.465	29.2	0	0	0	0	.136	29.2
Shrvprt et al	022[b]	65.8	7.2	1.0	1.5	1.8	2.7	2.0	3.0
	(Okla.)	.156	44.2	0	0	0	0	.069	44.2
Cen. Okla.	184	4.0	46.0	0.02	0.50	0.12	3.0	1.7	42.5
N. Cen. Okla	185	88.6	2.2	0.03	0.03	1.5	1.7	0.43	0.49
NE Okla.	186	30.3	15.7	0.03	0.10	2.2	7.3	2.5	8.3
NW Okla.	187	0.75	24.0	0	0	0	0	0.18	24.0
SE Okla.	188	5.9	10.5	0.01	0.17	0.04	0.68	0.57	9.7
SW Okla.	189	13.8	3.4	0.01	0.07	0	0	0.45	3.3

Total (includes all of interstate AQCRs) 210.750

Total (Oklahoma portion only) 143.971

a) Emissions in Data Bank as of June 27, 1974. The listing above includes external combustion sources only.

b) Interstate emissions based on total of all counties in all states within the AQCR.

c) Does not include minor contributions from miscellaneous point sources, nor contributions for internal combustion sources.

Table A-10. Fuel Combustion Regulations - Oklahoma [a]

	Existing Sources	New Sources
SO_2	Standard relates to ambient air concentrations at any point outside the contiguous property controlled by the person responsible for the emission. Ambient air concentration not to exceed: 1) 1350 $\mu g/m^3$ in a five min. period of any one hour, 2) A one hour average of 1200 $\mu g/m^3$, 3) A three hour average of 650 $\mu g/m^3$, or 4) A 24 hour average of 130 $\mu g/m^3$.	SO_x emissions from fuel burning equipment:[b] Gas - 0.2 lbs/10^6 BTU heat input Oil - 0.8 lbs/10^6 BTU input (0.8% S fuel) (after 7/1/75) - 0.3 lbs/10^6 BTU input (0.3% S fuel) Solid fuels - 2 lbs/10^6 BTU input

a As described in Regulation No. 16 of the Air Pollution Control Regulation of the State of Oklahoma.

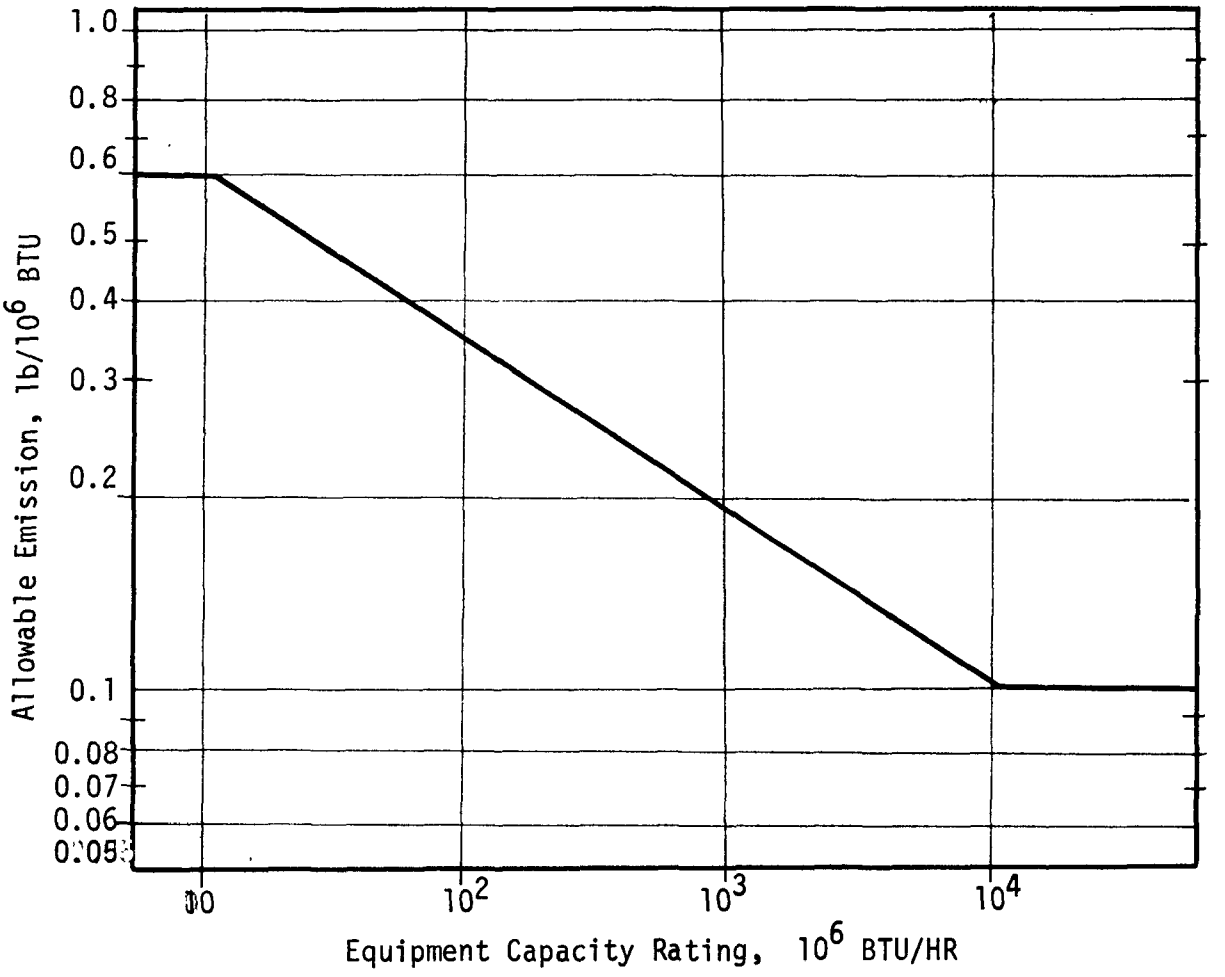
b Emissions are maximum 2 hour averages.

Table A-10. Fuel Combustion Regulations - Oklahoma (Continued)

	Existing Sources	New Sources
Particulates	For particulates emitted from fuel burning equipment[c] **Heat Input** (10^6 BTU/hr) — Maximum Allowable Emissions (lbs/10^6 BTU) 10 — 0.6 100 — 0.35 100 — 0.20 10,000 — 0.10 For other heat inputs between 10 and 10,000 x 10^6 BTU/hr, see Figure A-3. For particulates associated with smoke and other visible emissions.[d] No short-term occurrences in which the density exceeds a No. 3 on Ringelmann for: 1) 5 min. in any consecutive 60 min, or 2) 20 min. in any 24 hr period. At all other times, no densities No.1 on a Ringelman chart.	Regulations for existing sources apply

[c]As described in Regulation No. 6 (pertaining to the control of the emission of particulate matter from Fuel Burning Equipment) of the Air Pollution Control Regulations of the State of Oklahoma.

[d]As described in Regulation No. 7 of the above-mentioned Oklahoma State Regulations.



The curve between the capacity ratings of 10 and 10^4 has been calculated to correspond to $I = 1.0903P^{-.2594}$.

where: I = allowable emissions in lbs/10^6 BTU and
P = equipment capacity rating in 10^6 BTU/hr.

Figure A-3. Particulate Matter Emission Limits for Fuel-Burning Equipment

Table A-11. Oklahoma Required Emission Reductions, Particulates[a]

	SIP				1972 Data			
AQCR	AQ Measurement Control Value	Emissions (tons)	Allowable[b] Emissions (tons)	1975[c] Estimated Emissions After Controls[d] (tons)	Percent Reduction Required Based On 1973 AQ Data	A NEDS Emissions (tons)	B Allowable Emissions (tons)	Tolerance for Emission Increase (tons)
017	NA	-	-	-	43	11,100	6,270	-4830 (B-A)
(Okla. Portion)	NA	4753	-	-	-38	3,740	5,161	+1420
022	NA	-	-	-	41	162,000	95,580	-66,420
(Okla. Portion)	NA	369	-	-	11	1,100	979	-121
184	116.4 (AGM)	15399	5390	5177	88	6,000	720	-5280
185	NA	10,706	-	-	14	17,900	15,394	-2506
186	129 (AGM)	109,210	32,763	5460[e]	55	46,800	21,060	-25,740
187	NA	8,923	-	-	49	3,500	1,785	-1715
188	NA	40,473	-	-	50	13,000	6,500	-6500
189	NA	51,192	-	-	48	11,400	5,928	-5472

[a]Based on a proportional change of emission % to air quality.
[b]To meet secondary standards by using the proportional rollback model.
[c]Based on a population growth factor (1.05) that was estimated at the time the plan was written (1970).
[d]Controls consist of the strategy deemed preferred by the SIP. See text for details.
[e]Calculated based on information in the SIP.

Table A-12. Oklahoma Required Emission Reductions, SO_2[a]

	SIP				1972 Data			
AQCR	AQ Measurement Control Value	Emissions (tons)	Allowable Emissions (tons)	197_ Estimated Emissions After Controls (tons)	Percent Reduction Required Based On 1973 AQ Data	NEDS Emissions (tons)	Allowable Emissions (tons)	Tolerance for Emission Increase (tons)
017	NA	-	-	-	b	1600	-	c
(Okla. Portion)	NA	377	-	-	b	465	-	c
022	NA	-	-	-	b	65,800	-	c
(Okla. Portion)	NA	164	-	-	b	156	-	c
184	NA	5,968	-	-	b	4,000	-	c
185	NA	97,896	-	-	-47	88,600	130,242	41642
186	NA	11,555	-	-	b	30,300	-	c
187	NA	895	-	-	b	750	-	c
188	NA	4,064	-	-	b	5,900	-	c
189	NA	4,447	-	-	b	13,800	-	c

[a]Based on a proportional change of emissions to air quality.

[b]Percent reduction figures were not calculated in these cases because the method used would have called for unrealistic increases in emissions. See Text for discussion.

[c]Available air quality data indicates that there is a sizeable potential for allowing the emissions of sulfur oxides to increase in this region. However, if we used this data to recalculate the tolerance for emissions increase, our results would be unrealistically high.

APPENDIX B

Tables B-1 and B-2 are the assessment of AQCRs which should be examined for the fuel switching impact on particulate and SO_2 emissions. They also provide an identification of those AQCRs which show little potential for fuel revision or regulation relaxation if ambient air standards are to be attained.

The general criteria for candidacy is covered by the list of questions found at the beginning of Section 2.0. Some of the more important criteria is reflected by the tables in this appendix. These criteria include (1) the breadth of air quality violations, (2) the fraction of total emissions resulting from fuel combustion, (3) proposed AQMA designations, (4) expected attainment dates, (5) total regional emissions, and (6) regional tolerances for emissions increase.

It should be noted that an AQCR may not necessarily need relaxation of regulations in order to accomplish fuel switching. Further, a good candidate in Tables B-1 and B-2 may later show little potential for fuel switching after individual sources are examined. Finally, it is possible that an AQCR may have air quality levels below standard at present and may require more <u>strict</u> regulations than currently exist if all fuel burning sources were converted to dirtier fuels, i.e., "average" emission rate now may be below "average" regulations.

B-1. Candidacy Assessment for Relaxation of Particulate Regulations - Oklahoma

AQCR	Air Quality # Stations[a]	Air Quality # Sta. w/ Violations[a]	Expected Attainment Date[b]	Any Counties with Proposed AQMA Designations?	Total Emissions 10^3 tons/yr	% Emission from Fuel Combustion	Tolerance for Emissions Increase (10^3 tons)	Overall Regional Evaluation
017	8	3	---	Yes (in Ark. portion)	11.1	9.0	-4.830	Bad Candidate
(Okla. Portion)	5	0	7/75	No	3.74	13.2	+1.420	Marginal Candidate
022	11	3	---	Yes (in La. portion only)	16.2	5.7	-66.420	Bad Candidate
(Okla. Portion)	1	0	7/75	No	1.1	15.0	- .121	Bad candidate
184	28	7	7/75	Yes	6.0	22.2	-5.280	Bad candidate
185	5	1	(c)	No	17.9	1.8	-2.506	Bad candidate
186	26	6	7/75	Yes	46.8	5.9	-25.740	Bad candidate
187	6	1	(c)	No	3.5	26.6	-1.715	Bad candidate
188	13	2	(c)	No	13.0	6.9	-6.500	Bad candidate
189	13	5	(c)	No	11.4	4.5	-5.472	Bad candidate

[a]In all cases the number of stations violating the annual secondary standard.

[b]Refers to attainment of secondary standards in the state of Oklahoma only.

[c]Ambient air quality was below standards when the attainment dates were formalized.

B-2. Candidacy Assessment for Relaxation of SO_2 Regulations - Oklahoma

AQCR	Air Quality: # Stations[a]	Air Quality: # Sta. w/ Violations	Expected Attainment Date	Any Counties with Proposed AQMA Designations?	Total Emissions 10^3 tons/yr	% Emission from Fuel Combustion	Tolerance for Emissions Increase (10^3 tons)	Overall Regional Evaluation
017	3	0	---	No	1.6	25	(d)	---
(Okla. Portion)	2	0	(c)	No	.465	29.2	(d)	Good candidate
022	7	0	---	No	65.8	7.2	(d)	---
(Okla. Portion)	1	0	(c)	No	.156	44.2	(d)	Good candidate
184	10	0	(c)	No	4.0	46.0	(d)	Good candidate
185	1	0	(c)	No	88.6	2.2	+41642	Good candidate
186	8	0	(c)	No	30.3	15.7	(d)	Good candidate
187	2	0	(c)	No	0.75	24.0	(d)	Good candidate
188	2	0	(c)	No	5.9	10.5	(d)	Good candidate
189	3	0	(c)	No	13.8	3.4	(d)	Good candidate

[a] 1973 data. All stations in Oklahoma use the bubbler method of analysis.

[b] The only violation of the SO_2 standard that occurred in 1973 was these two violations of the primary 24-hr. standard. There were no violations of any other primary or secondary standards.

[c] Ambient air quality was below standards when attainment dates were formalized.

[d] Available air quality data indicates that there is a sizeable potential for allowing the emissions of sulfur oxides to increase in this region. However, if we used this data to calculate the tolerance for emissions increase, our results would be unrealistically high.

APPENDIX C

This appendix provides a characterization of individual power plants by AQCR. Current power plant information used to prepare Table C-1 was obtained from three main sources: (1) Federal Power Commission computerized listings of power plants and their associated fuel use, (2) the National Coal Association's Steam-Power Plant Factors, listing of power plants and fuel use in 1972, and (3) emission data in the NEDS data bank as of June 29, 1974. Fuel schedules for 1973 were extracted from the FPC data (1 above), and this was used in conjunction with NEDS emission data to estimate 1973 emissions for each of the sources. When 1973 fuel schedules were not available, 1972 schedules were used as extracted from Steam-Power Plant Factors. SO_2 and particulates emissions are those associated with the fuel shown. When actual emissions were not listed in NEDS, AP-42 emission factors were used to estimate SO_2 and particulate emissions, based on fuel schedules.

After the name of each plant is a listing of the fuels for which the plant was designed (from source 2). For the purposes here, it is assumed that when a plant is shown to have dual fuel capability, it is able to use entirely one fuel or the other.

Also shown is the 1975 regulations which are currently applicable to the given plant, taken from Table A-10. (Particulate limits are assumed to be based on the entire heat input of the plant.)

It might be cautioned that AQCR total emissions calculated in the tables of Appendix C (and also Appendix D) may not agree exactly with total emissions represented in Appendix A (Tables A-7, A-8). This is a result of both differing fuel schedules in 1973 compared to previous years and the relative "completeness" of the NEDS data bank.

Table C-1. Power Plant Assessment - Central Oklahoma (AQCR 184)

AQCR	Company, Name,[c] Plant Cap.[c] Location[c]	Fuel Designed for[a]	Fuel Use[d] Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions[d] (tons/year) SO_2	Particulates	Emissions ($lbs/10^6$ BTU) SO_2	Particulates	1975 Emission Limit ($lbs/10^6$ BTU) SO_2	Particulates
184	Oklahoma Gas & Elec.	C(P)	Gas	5408	642	255[e]	38[e]	0.09	0.01	0.20	0.15
	945.4 MWe	O									
	Harrah	G	Gas	13580	1601	656[e]	102[e]	0.09	0.01	0.20	0.15
	Horseshoe Lk										
184	Okla. Gas & Electric	C[g]	Coal 1.3% S	174	0.52	5	15	2.2	6.6	2.0	0.16
	509.3 MWe	G	10.0A								
	Okla.City		Gas	13973	1643	5	106	0.007	0.01	0.20	0.16
	Mustang										
184	Okla.Gas & Electric	O	Gas	1101	133	0	9	0	0.02	0.20	0.29
	63.0 MWe	G									
	Okla City		Gas*	278	35.5	13	2	0.08	0.01	0.20	0.29
	Belle Isle										
184	Kingfisher ** Muni Power	-f	Oil	140	2.40	1	2	0.1	0.2	0.30	0.14
			Gas	21840	2646	7	197	0.006	0.02	0.20	0.14

*See footnotes at end of Tables C-1.

Table C-1. Power Plant Assessment - North Central Oklahoma (AQCR 185)

AQCR	Company, Name[c] Plant Cap.[c] Location[c]	Fuel Designed for[a]	Fuel Use[d] Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions[d] (tons/year) SO_2	Particulates	Emissions (lbs/10^6 BTU) SO_2[h]	Particulates	1975 Emission Limit (lbs/10^6 BTU) SO_2[h]	Particulates
185	Okla.Gas & Elec. 40.0 MWe	C(P) G	Coal 2.1%S 11.0A	680	1.7	27	64	3.6	8.6	2.0	0.32
	Ponca City Osage		Gas	956	115.1	0	9	0	0.02	0.2	0.32
185	Okla.Gas & Elec. - Enid -	G[g]	Gas 0	1953	231	0	15	0	0.01	0.2	0.27
185	Dept. of[f] Water & Light*	O[g] G	Oil 0.20%S Gas	149	2.2	5	12	0.008	0.02	0.3	0.3
	Ponca City		0	1303	149					0.2	0.3
185	f Boomer Lake * Station -f -f -f	G[g]	Gas 0	1953	231	0	12	0	0.01	0.2	0.27

*See footnotes at end of Tables C-1.

Table C-1. Power Plant Assessment - Northeastern Oklahoma (AQCR 186)

AQCR	Company, Name[c] Plant Cap.[c] Location[c]	Fuel Designed for[a]	Fuel Use[d] Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions[d] (tons/year) SO_2	Particulates	Emissions (lbs/10^6 BTU) SO_2	Particulates	1975 Emission Limit (lbs/10^6 BTU)[h] SO_2	Particulates
186	Okla.Gas & Elec. 196.7 MWe Muskogee Riverbank	O G	Oil 1.7%S Gas Gas 0	1 10693 664	0.02 1266 78.6	3 0	80 4	0.0006 0	0.01 0.01	0.30 0.2 0.2	0.17 0.17 0.17
186	Grand River Dam Authority 45.0 MWe Chouteau Chouteau	C(P) O G	Gas 0	8500	995	3	64	0.0007	0.01	0.20	0.18
186	Pub.Ser.Co. of Okla. 642.5 MWe Oolagah Northeastern	O G	Gas 0	39158	4470	12	293	0.0006	0.01	0.20	0.12
186	Pub.Serv.Co. of Okla. 482.0 Tulsa Tulsa	O G	Gas 0	44981	5135	8	233	0.0004	0.01	0.20	0.12

*See Footnotes at end of Tables C-1.

Table C-1. Power Plant Assessment - Northwestern Oklahoma (AQCR 187)

AQCR	Company, Name[c] Plant Cap.[c] Location[c]	Fuel Designed for[a]	Fuel Use[d] Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions[d] (tons/year) SO_2	Particulates	Emissions ($lbs/10^6$ BTU) SO_2	Particulates	1975 Emission Limit ($lbs/10^6$ BTU)[h] SO_2	Particulates
187	Western Farmers Coop 191.0 Mooreland Mooreland	O G	Gas	10341	1241	3	7	0.0006	0.001	0.20	0.17

Table C-1. Power Plant Assessment - Southeastern Oklahoma (AQCR 188)

AQCR	Company, Name Plant Cap.[c] Location [c]	Fuel Designed for[a] [c]	Fuel Use[d] Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions[d] (tons/year) SO_2	Particulates	Emissions (lbs/10^6 BTU) SO_2	Particulates	1975 Emission Limit (lbs/10^6 BTU) SO_2[h]	Particulates
188	Okla.Gas & Elec. 590.6 MWe Konawa Seminole	O G	Gas 0	30560	3618	9	229	0.0006	0.01	0.20	0.13
188	Okla Gas & Elec. 74.6 MWe Sulfur Arbuckle	O G	Gas -	2801	332	1	21	0.0007	0.01	0.20	0.24
188	Pub.Serv.Co. of Okla 83.0 MWe Weleetka	G	Gas -	1213	149	0	9	0	0.01	0.20	0.30

Table C-1. Power Plant Assessment - Southwestern Oklahoma (AQCR 189)

AQCR	Company, Name[c] Plant Cap.[c] Location[c]	Fuel Designed for[a]	Fuel Use[d] Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions (tons/year) SO_2	Particulates	Emissions (lbs/10^6 BTU) SO_2	Particulates	1975 Emission Limit (lbs/10^6 BTU) SO_2	Particulates
189	Western Farmers Elec.Coop 84.5 MWe Anadarko Anadarko	O G	Gas 0	2840	339	0	21	0	0.01	0.20	0.24
189	Pub.Serv. Co.of Okla 482.7 MWe Washita Southwestern	O G	Gas 0	28003	3452	7	209	0.0005	0.01	0.20	0.13

Table C-1. Power Plant Assessment - Oklahoma (Footnotes)

[a]C = Coal (S = stoker, P = Pulverized)
O = Oil
G = Gas. Based on information from Steam-Electric Plant Factors, 1973 Edition.

[b]Units are 10^6 cubic feet for gas, 10^3 gallons for oil, and tons for coal.

[c]Based on information from Steam-Electric Plant Factors.

[d]NEDS data, in bank as of 6/29/74.

[e]Emissions calculated using AP-42 factors

[f]Additional data was not available from Steam-Electric Plant Factors, therefore have listed only the data obtainable from NEDS.

[g]No information available to indicate fuel for which plant was designed, therefore it is assumed plant was designed only for the fuels used in 1973.

[h]Based on regulations for new fuel-burning equipment.

*Gas turbine.

**Information from EPA-Region VI indicates that this plant is powered with a natural gas powered reciprocating engine.

Table C-2. Oklahoma Emission and Emission Limits Summary - Power Plants Using Oil and Coal

	Particulates				SO_2			
	Emissions[a] lbs/10^6 BTU (A)	1975 Emission Limits[b] lbs/10^6 BTU (B)		Difference lbs/10^6 BTU (B-A)	Emissions[a] lbs/10^6 BTU (A)	1975 Emission Limits lbs/10^6 BTU (B)		Difference lbs/10^6 BTU (B-A)
	Emission Limit for any Fuel Combustion Source				New Oil Installations before July 1, 1975			
Power Plants								
Oil Burners:								
Kingfisher Muni (184)	0.2	0.14	(0.6)	-0.06	0.1	0.3	(0.8)	0.2
Dept. of Water & Light - Ponca City (185)	0.02	0.30	(0.6)	0.28	0.008	0.3	(0.8)	0.292
Muskogee Riverbank (186)	0.01	0.17	(0.6)	0.16	0.006	0.3	(0.8)	0.294
Coal Burners:								
Farley Station (184)	6.6	0.16	(0.6)	-6.44	2.2	2.0	-	-0.2
Ponce City - Osage (185)	8.6	0.32	(0.6)	-8.28	3.6	2.0	-	-1.6

[a] Based on information in NEDS data bank as of 6-29-74.

[b] Emission limits based on total aggregated heat input to the plant as supplied by all fuels used.

APPENDIX D

The Table D-1 in this appendix lists individual industrial/commercial/institutional sources of particulates and SO_2 emissions which might show fuel switching potential. The sources are from a NEDS rank order emissions listing.

It should be cautioned that the percent emissions accounted for is different than the "% of fuel use accounted for," It is possible that several potential fuel switch sources could be overlooked by the cutoff point on the emissions (i.e., a reasonable sized natural gas used may emit below our cutoff point in the NEDS rank order list).

No information was available for feasibility of <u>any</u> fuel switching.

Table D-1. Oklahoma Industrial Plant Assessment - Fort Smith AQCR[a]

AQCR	Industry	Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions (tons/year) SO_2	Particulates	Emissions (lbs/10^6 BTU) SO_2	Particulates	1975 Emission Limit (lbs/10^6 BTU) SO_2	Particulates
17	Kerr - McGee	Gas	500	57.1	0.15 *	4	<0.01	0.02	0.2	0.38

* Emissions calculated using AP-42 factors.

[a] The sources listed on this sheet account for 100% of the particulate and SO_2 emissions from fuel combustion sources in this AQCR, based on the NEDS rank order listing.

[b] Units are 10^6 cubic feet for gas and 10^3 gallons for oil.

Table D-1. Oklahoma Industrial Plant Assessment - Central Oklahoma AQCR[a]

AQCR	Industry	Type % Sulfur % Ash	Annual[c] Quantity	Heat Input (10^6 BTU/hr)	Emissions (tons/year) SO_2	Emissions (tons/year) Particulates	Emissions ($lbs/10^6$ BTU) SO_2	Emissions ($lbs/10^6$ BTU) Particulates	1975 Emission Limit ($lbs/10^6$ BTU) SO_2	1975 Emission Limit ($lbs/10^6$ BTU) Particulates
184	Ralston Purina	Oil 0.90%S	1602	25.6	114	12	1.02	0.11	0.3	0.34
		Gas 0.08%S	536	65.1	0.16*	6	< 0.01	0.02	0.2	0.34
184	Allied Materials	Gas -	640	76.7	0.19*	6	< 0.01	0.02	0.2	0.35
184	Humble Oil	Gas -	807	96.7	0.24*	5	< 0.01	0.01	0.2	0.33
184	Phillips Petrol.	Oil 0.9%S[b]	579	9.3	40.9*	6.9*	1.0	0.17	0.3	0.38
		Gas -	384	48.3	0.12*	3	< 0.01	0.01	0.2	0.38

[a]The sources listed on this sheet account for 95% of the particulate and SO_2 emissions from fuel combustion sources in this AQCR, based on NEDS rank order listing.

[b]Assumed sulfur content.

[c]Units are 10^6 cubic feet for gas and 10^3 gallons for oil

*Emissions calculated using AP-42 factors.

Table D-1. Oklahoma Industrial Plant Assessment - North Central AQCR[a]

AQCR	Industry	Type % Sulfur % Ash	Annual[c] Quantity	Heat Input (10^6 BTU/hr)	Emissions (tons/year) SO_2	 Particulates	Emissions ($lbs/10^6$ BTU) SO_2	 Particulates	1975 Emission Limit ($lbs/10^6$ BTU) SO_2	 Particulates
185	Great Lakes Carbon	Gas	1457	173	0.44 *	13.1	< 0.01	0.02	0.2	0.29
185	Midland Coop	Gas 3.33% S	727	80.0	1509	7	4.3	0.02	0.2	0.35
185	Cities Service Ambrose	Gas -	729	83.2	0.22 *	7	< 0.01	0.02	0.2	0.35
185	Continental Carbon	Gas Gas	892 68	105 7.98	0.3 *	8.6 *	< 0.01	0.02	0.2	0.32[b]
185	Blackwell Zinc	Gas - Gas	 107 3112	 12.8 373	1.0	29.0	< 0.01	0.02	0.2	0.23[b]

[a]The sources listed on this sheet account for 100% of the particulate and SO_2 emissions from fuel combustion sources in this AQCR, based on NEDS rank order listing.
[b]Based on combined total heat input.
[c]Units are 10^6 cubic feet for gas and 10^3 gallons for oil.

*Emissions calculated using AP-42 factors.

Table D-1. Oklahoma Industrial Plant Assessment - Northeastern AQCR[a]

AQCR	Industry	Type % Sulfur % Ash	Annual[c] Quantity	Heat Input (10^6 BTU/hr)	Emissions (tons/year) SO_2	Emissions (tons/year) Particulates	Emissions ($lbs/10^6$ BTU) SO_2	Emissions ($lbs/10^6$ BTU) Particulates	1975 Emission Limit ($lbs/10^6$ BTU) SO_2	1975 Emission Limit ($lbs/10^6$ BTU) Particulates
186	-	Gas[b]	-	-	413	350	-	-	0.2	-
186	National Zinc	Gas	2309	264	0.7*	20.8*	< 0.01	0.02	0.2	0.26
		Gas	16	1.8	< 0.01*	0.14*	< 0.01	0.02	0.2	0.26
186	-	Gas[b]	-	-	674	32	-	-	0.2	-
186	Petrolite	Gas 0.2%S	1584	181	187	14	0.24	0.02	0.2	0.28
186	Nipak Inc	Gas	920	133	0.28*	8	< 0.01	0.01	0.2	0.31
186	Georgia Pacific	Gas	289	33.8	0.09*	3	< 0.01	0.02	0.2	0.44
186	Pittsburg Plate Glass	Gas	143	16.3	0.04*	1	< 0.01	0.02	0.2	0.53

[a]The sources listed on this sheet account for 100% of the particulate and SO_2 emissions from fuel combustion sources in this AQCR, based on NEDS rank order listing.

[b]There was no NEDS sheet for this source, the above information is from the rank order listing.

[c]Units are 10^6 cubic feet for gas and 10^3 gallons for oil.

*Emissions calculated using AP-42 factors.

Table D-1. Oklahoma Industrial Plant Assessment - Northwestern AQCR[a]

AQCR	Industry	Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions (tons/year) SO_2	 Particulates	Emissions ($lbs/10^6$ BTU) SO_2	 Particulates	1975 Emission Limit ($lbs/10^6$ BTU) SO_2	 Particulates
187	Dorchester Gas Products	Gas 0.01%S	390	46.7	0.12*	4	<0.01	0.02	0.2	0.4
187	Mobil Oil Corp.	Gas 0.01%S	35	4.20	0.01*	4	<0.01	0.02	0.2	0.6
187	Lindsay Electric	Oil 0.09%S 0.1%A	166	2.65	3.9	5.6	0.34	0.48	0.3	0.4
		Gas 0	379	45.4	0.11*	3.41*	<0.01	0.02	0.2	0.4

[a]The sources listed on this sheet account for 100% of the particulate and SO_2 emissions from fuel combustion sources in this AQCR, based on NEDS rank order listing.

[b]Units are 10^6 cubic feet for gas and 10^3 gallons for oil.

*Emissions calculated using AP-42 factors.

Table D-1. Oklahoma Industrial Plant Assessment - Southeastern AQCR[a]

AQCR	Industry	Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions (tons/year) SO_2	Emissions (tons/year) Particulates	Emissions (lbs/10^6 BTU) SO_2	Emissions (lbs/10^6 BTU) Particulates	1975 Emission Limit (lbs/10^6 BTU) SO_2	1975 Emission Limit (lbs/10^6 BTU) Particulates
188	Warren Petr.	Gas	1230	147	0.37 *	11	<0.01	0.02	0.2	0.22
		Gas	3050	366	0.9 *	27.5 *	<0.01	0.02	0.2	0.22
188	Pioneer Gas Co.	Gas	511	61.3	0.15 *	5	<0.01	0.02	0.2	0.37
188	Sohio Petr. Gas	Gas	396	47.5	0.12 *	4	<0.01	0.02	0.2	0.40
188	Signal Oil	Gas	365	43.8	0.11 *	3	<0.01	0.02	0.2	0.41
188	Vickers Petr.	Gas 0.47%S	441	45.3	123	3	0.62	0.02	0.2	0.41

[a]The sources listed on this sheet account for 100% of the particulate and SO_2 emissions from fuel combustion sources in this AQCR, based on NEDS rank order listing.

[b]Units are 10^6 cubic feet for gas.

*Emissions calculated using AP-42 factors.

Table D-1. Oklahoma Industrial Plant Assessment - Southwestern AQCR[a]

AQCR	Industry	Type % Sulfur % Ash	Annual[b] Quantity	Heat Input (10^6 BTU/hr)	Emissions (tons/year) SO_2	Emissions (tons/year) Particulates	Emissions (lbs/10^6 BTU) SO_2	Emissions (lbs/10^6 BTU) Particulates	1975 Emission Limit (lbs/10^6 BTU) SO_2	1975 Emission Limit (lbs/10^6 BTU) Particulates
189	APCO Oil Corp.	Gas	2468	299	0.74*	24	<0.01	0.02	0.2	0.25
189	Shell Oil	Gas	1935	232	0.58*	8	<0.01	0.01	0.2	0.27
189	Halliburton	Gas	336	40.3	0.10*	3	<0.01	0.02	0.2	0.42

[a]The sources listed on this sheet account for 100% of the particulate and SO_2 emissions from fuel combustion sources in this AQCR, based on NEDS rank order listing.

[b] Units are 10^6 cubic feet for gas.

*Emissions calculated using AP-42 factors.

Table D-2. Oklahoma Emission and Emission Limits Summary - Industrial Plants Using Oil

	Particulates				SO_2			
	Emissions[a] lbs/10^6 BTU (A)	1975 Emission Limits[b] lbs/10^6 BTU (B)		Difference lbs/10^6 BTU (B-A)	Emissions[a] lbs/10^6 BTU (A)	1975 Emission Limits lbs/10^6 BTU (B)		Difference lbs/10^6 BTU (B-A)
	Emission Limit for any Fuel Combustion Source				New Oil Installations before July 1, 1975			
Industrial and Other Point Sources								
Oil Burners:								
Ralston Purina (184)	0.11	0.34	(0.47)	0.23	1.02	0.3	(0.8)	-.72
Phillips Petrol. (184)	0.17	0.38	(0.60)	0.21	1.0	0.3	(0.8)	- 0.70
Lindsay Elec. (187)	0.48	0.40	(0.60)	-0.08	0.34	0.3	(0.8)	-0.04

[a]Based on information in NEDS data bank as of 6-29-74.

[b]Emission limits based on total aggregated heat input to the plant as supplied by all fuels used.

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