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IMPLEMENTATION PLAN REVIEW

FOR

ALASKA

AS REQUIRED

BY

THE ENERGY SUPPLY

AND

ENVIRONMENTAL COORDINATION ACT

U. S. ENVIRONMENTAL PROTECTION AGENCY

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

PREPARED BY THE FOLLOWING TASK FORCE:

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Office of Air Quality Planning and Standards
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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 (NAAQS). 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 SIP's, 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 parallels 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 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 SIP's were approved by EPA if they demonstrated the attainment of NAAQS 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 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 AQCR's 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 one percent sulfur oil to be burned statewide where the use of three 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 belives 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 quality air. 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 NAAQS, 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 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 AQCR's. 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 State Implementation Plan Review has addressed the emissions from fuel combustion sources in each of Alaska's four Air Quality Control Regions (AQCR's). The major findings of the review are as follows:

- The review indicates that SO_2 emission regulations may be revised in all the AQCRs without jeopardizing attainment and maintenance of NAAQS. The review also indicates that emissions from present fuel burning practices are in over-compliance with SO_2 emission regulations in the Cook Inlet and Northern Alaska AQCRs (due to the use of low sulfur fuels), and that there is room to increase SO_2 emissions significantly before violating the emission regulations in these regions.

- Particulate emission regulations do not appear to be overly restrictive in any of the four Alaska AQCRs. In each of the regions, fugitive dust, suspended by traffic and other activities, is suspected to be the major contributor to suspended particulate matter in each of the AQCRs. In rural areas, where fugitive dust does not pose as difficult a problem as in the urban areas, it may be possible to revise particulate

emission regulations from fuel-burning sources. However, revisions of particulate regulations in areas of worst air quality (urban areas) would only aggravate the existing and projected air pollution problems for particulates.

- Areas in which SO_2 or particulate emission regulations may be revised without jeopardizing attainment of federal air standards, are candidates for clean fuel savings. In addition, there are regions where significant fuel savings may be accomplished within the constraints of the regulation emission limits, and without jeopardizing attainment of federal air standards. The review analysis indicates that SO_2 emissions may be increased significantly (to obtain clean fuel savings) without violation of emission regulations or interference with attainment of air quality standards for SO_2 in the Cook Inlet and Northern Alaska AQCRs. However, the analysis shows that while particulate emissions may be significantly increased without violation of combustion emission regulations in the Cook Inlet AQCR, potential clean fuel savings programs which would cause such an increase in particulate emissions would probably be in conflict with attainment of federal air quality standards in the urban areas of this region.

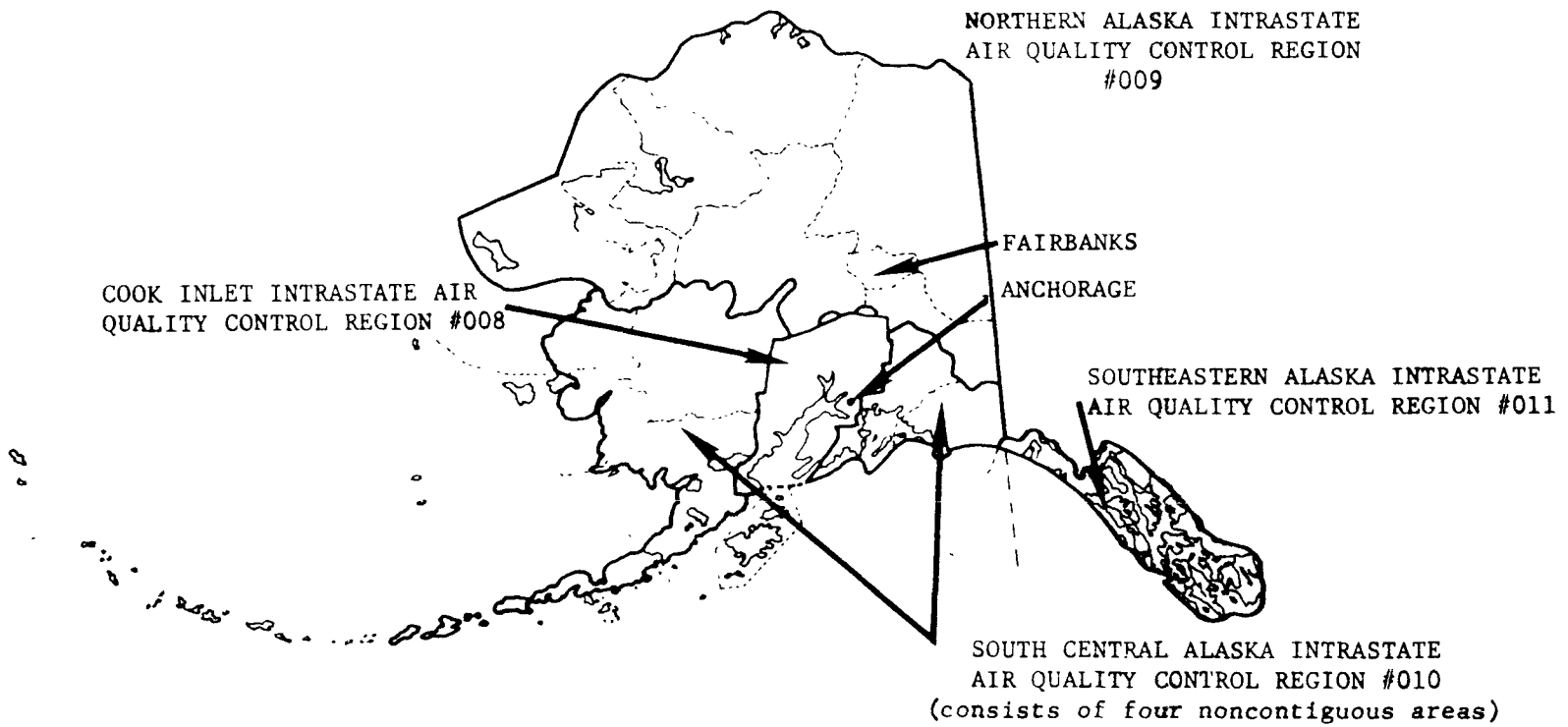

Figure 1-1. Air Quality Control Regions in Alaska

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 initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?
- Are there 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?
- Based on the State Implementation Plan, are there indications of a tolerance for increasing emissions in 1975?
- Are the total emissions from stationary fuel combustion sources less than those from all other sources?
- Must emission regulations be revised to accomplish significant fuel switching?
- Do modeling results for specific fuel combustion sources indicate there is a potential for a regulation revision?

The following portion of this report is directed at answering these questions. An AQCR's potential for revising regulations is then determined by a consideration of the air quality indications represented in the responses to the above questions.

Table 2-1. Alaska State Implementation Plan Review (Summary)

"INDICATORS"	STATE		Cook Inlet AQCR		Northern Alaska AQCR		South Central AQCR		South Eastern AQCR	
	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	Yes[e]								
• Does the State have emission limiting regulations for control of:										
1. Power plants	Yes	Yes								
2. Industrial sources	Yes	Yes								
3. Area sources	No	No								
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	No[a]	No[a]								
• Has the State initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?	No	No								
• Are there proposed Air Quality Maintenance Areas?	No	No								
• Are there indications of a sufficient number of monitoring sites within a region?			Yes	Yes	Yes	Yes	No	No	Yes	Yes
• Is there an expected 1975 attainment date for NAAQS?			No	Yes	No	Yes	No	Yes	No	Yes
• Based on reported (1973) Air Quality Data, does air quality meet NAAQS?			No	Yes	No	Yes	No	N/A[f]	No	Yes
• Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?			No[b]	Yes	No[b]	Yes	No[b]	Yes	No[b]	Yes
• Are the total emissions from stationary fuel combustion sources lower than those of other sources combined?			Yes	Yes	Yes[c]	Yes	Yes	Yes	Yes	Yes
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?	←		No modeling results are available							→
• Must emission regulations be revised to accomplish significant fuel switching?			No	No	Yes	No	Yes	Yes	Yes	Yes
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?			Poor[d]	Good	Poor[d]	Good	Poor[d]	Good	Poor[d]	Good
• Is there a significant Clean Fuels Saving[g] potential in the region?			No[b]	Yes	No[b]	Yes	No[b]	Yes	No[b]	Yes

[a] The state of Alaska developed a control plan for attainment of the federal air standards by addressing the specific air pollution problems in each of the AQCRs separately.

[b] A "no" assessment in these instances does not rule out the possibility that significant particulate emission tolerance or clean fuel savings potential may exist in the region's rural areas, away from the urban areas possessing worst air quality levels of suspended particulate matter.

[c] The "yes" assessment here was made on the basis that fugitive dust is suspected to be the major contributor to the highest levels of suspended particulates measured in the Northern Alaska AQCR. (This portion of the particulate inventory has not quantified and was not included in the emissions summary of Table A-8.)

[d] A "poor" assessment in these instances does not rule out possibility of potential for revising fuel combustion source emission regulations in rural areas (see note b).

[e] Although the state has air quality standards for SO_2 more stringent than NAAQS, the Implementation Plan of Alaska addressed attainment of the federal standards, rather than those of the state.

[f] Data not available, however SO_2 readings are known to be very low in this region since there are no significant sources of SO_2

[g] "Clean fuel savings" refers to the replacement of current fuel schedules with "dirtier" fuels. (Wherever emissions from fuel burning sources can be increased without jeopardizing attainment of NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings.")

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, and E.

Based on an overall evaluation of EPA's current information, AQCR's have been classified as good, marginal, or poor candidates for regulation revisions. Table 2-1 summarizes the State Implementation Plan Review. The remaining portion of the report supports this summary with explanations.

2.1 AIR QUALITY SETTING - STATE OF ALASKA

The following discussion provides a characterization of the various AQCRs in terms of air quality. It includes an examination of ambient air standards, emission inventories, and air-monitoring networks.

2.1.1 Air Quality Control Regions

The State of Alaska has been divided into four federal air quality control regions to provide a basis for the adoption of regional air quality standards and the implementation of these standards. The four regions and their boundaries are shown in Figure A-1. These regions cover an area of 586,000 square miles (which is approximately 17 percent of the area of the rest of the United States), in which only 302,400 people live (1970 census). Because of Alaska's rather remote position relative to the rest of the United States, no interstate air quality control problems are foreseen. Although Alaska borders Canada for a considerable distance, no air quality control problems are foreseen for some time because of the unpopulated nature along the boundary.

The priority classification for each of the air quality control regions for particulates, SO_2, and NO_x, is presented in Table A-2. The most pressing air pollution problem in the State involves particulates. Two of the four AQCRs, the Cook Inlet and Northern Alaska AQCRs, have been designated Priority I for particulates. Only one AQCR, the South Eastern Region, has been designated Priority I for sulfur oxides. Remaining classifications are all Priority III. Table A-2 also shows that no sectors in the State of Alaska have been designated as Air Quality Maintenance Areas.

2.1.2 Ambient Air Quality Standards

Ambient Air Standards for the State of Alaska are shown in Table A-4. The State primary particulate standards are equivalent to the federal secondary standards, but Alaska has adopted considerably more stringent standards for SO_2 than the federal government.

2.1.3 Air Quality Status

The 1973 air quality status for particulate levels in the various AQCRs is given in Table A-5. Three of the four regions reported air monitoring data. Table A-5 summarizes the worst cases of air quality for particulates in each of the regions in 1973 (or 1974, in the case of the South Central AQCR). Violations of the federal air standards for suspended particulates occurred in each of the AQCRs, and were more severe in terms of the 24-hour basis. Based on proportional rollback criteria applied to the air quality of Table A-5, particulate emissions must be reduced by 56 to 87% in the various AQCRs before air quality will attain the federal air standards. Almost all of the AQCRs are subject to heavy particulate loadings by traffic generated dust. This causes consistent high particulate measurements in the downtown areas of Anchorage and Fairbanks, where the worst air quality for particulates is measured. There was suspicion that the worst particulate air quality reading obtained for an annual value in the Northern Alaska AQCR in the Plan baseyear was not representative of ambient particulate levels, since the sampler was located only five feet above the street level in downtown Fairbanks. Current data show, however, that more severe violations occur regularly for the 24 hour value, at many different sampler locations, and at various different heights.

Air monitoring data for SO_2 within the Alaska AQCRs is very limited. Three of the regions are reportedly well within ambient air standards for SO_2. The measurements reported for the Northern Alaska Region, from a single sampler located there, indicates very low values for SO_2. It should be noted however, that only eight valid values were reported from the station throughout the year. Measurements of SO_2 from the single sampler in Cook Inlet AQCR show SO_2 values there to be very low also. In the only other region (South Eastern AQCR) reporting measured values of ambient SO_2, all readings were well within the 24 hour standard (the data was not complete enough to warrant reporting an annual mean). This would indicate that attainment of federal air standards has been achieved in the South Eastern, Priority 1A, AQCR.

2.1.5 Emissions Summary

Table A-8 provides a summary of particulate emissions generated throughout the various Alaska AQCRs. The vast majority of the

identified man-made emission sources included in the emissions inventory (excluding traffic generated dust) is located within the vicinity of Fairbanks. It is estimated that 7,700 tons/year of man-made particulate emissions are generated within the Northern Alaska AQCR. Man-made emission sources in the South Central and Cook InletAAQCRs produce relatively negligible particulate emission inventories as seen in Table A-8. Fugitive dust arising from traffic and other activities is suspected to account for the major portion of total suspended particulate matter. While the inventory of Table A-8 does not include fugitive dust emissions, it does show clearly the mix of fuel combustion emissions, and demonstrates the substantial role of combustion emissions in the overall process-related emissions inventory.

Table A-7 lists the number of combustion emission sources in each of the AQCRs. These are the number of emission sources which have been inventoried in the NEDS and/or the Federal Power Commission Data System. Only 12 power plants have been identifed as significant emission sources throughout the State. (Half of these are in the South Eastern AQCR.) There are slightly more industrial-commercial fuel combustion sources, and half of these are located in the Cook Inlet AQCR (near Anchorage).

Table A-9 provides a summary of SO_2 emissions generated throughout the various Alaska AQCRs. The inventory is not believed to be very reliable as was indicated by the conflicting values of SO_2 emissions displayed in separate NEDS publications. The role of fuel combustion in SO_2 emissions is seen to change only slightly from region to region. Relatively little SO_2 is generated from power plant activity. In most AQCRs, industrial/commercial combustion sources account for the most substantial portion of the SO_2 emissions inventory. The quantity of SO_2 emissions from industrial/commercial sources varies sharply for one of the regions. In the Cook Inlet AQCR, relatively minor industrial/commercial emission sources exist, accounting for only 1.4% of the overall SO_2 inventory. The impact of fuel revisions or relaxation of combustion source emission regulations would have very minor effects on the air quality in the Cook Inlet. However in the Northern Alaska, South Central, and South Eastern AQCRs, a substantial portion (17 to 32%) of the SO_2 emissions are generated from industrial sources, and it is expected that air quality could be affected by either a change in fuel burning schedules, or a relaxation in regulations.

2.2 BACKGROUND ON THE DEVELOPMENT OF THE STATE IMPLEMENTATION PLAN

This section provides a characterization of the implementation control strategies, a comparative evaluation of air quality/emissions relationships assumed at the time of the strategy development and those which can be assumed from more recent data, and an evaluation of the tolerance each of the AQCRs possesses for increased emissions of particulates and SO_2.

2.2.1 Particulate Control Strategy

The State of Alaska developed a control plan for achievement of the federal air standards for particulates by addressing the air pollution problems in the Priority I AQCRs separately. Candidate control strategies were investigated, but difficulties arose in developing emission inventories, and in calculating emission reductions from the candiate strategies. These difficulties stemmed from insufficient air quality data, and an incomplete quantification of emission sources. As a result of these deficiencies, the EPA judged the Alaska Plan to be inadequate for attainment of the secondary standards for particulates (primary standards were considered attainable however, as shown in Table A-3). The State was granted an extension to study the particulate matter problem further, and to develop an appropriate control strategy.

Traffic generated dust is suspected to account for the major portion of suspended particulate matter in the Cook Inlet AQCR (in Anchorage), and in the Northern Alaska AQCR (in Fairbanks). Similar problems with fugitive dust appear in urban areas of the South Central and South Eastern AQCRs. A large segment of the roads in these areas are unpaved. Paved roads are very dusty, due to dust produced by vehicles on unpaved roads within the central business district and the residential areas. The amount of dust arising as suspended matter in the atmosphere from these activities is unknown.

In the plan development, an area model estimation procedure was used in an attempt to relate known emission rates to air quality. Air quality estimates were calculated for the Anchorage Area (Cook Inlet AQCR) for known source emitters. The calculated air qualities resulting from the known tonage

(2620 tons) of particulate emissions in the area were found to be several times lower than measured values at sampling sites. The results implied that sources other than known particulate emission sources in the inventory contribute greatly to the air quality problem in Anchorage. The sources of particulates not included as known quantifiable emissions are traffic generated road dust, and natural sources.

The proposed control strategy for both the Cook Inlet and Northern Alaska AQCR consists of 1) application of reasonable control technology to existing industrial sources, and 2) initiating a program to reduce traffic generated dust and dust from other sources. An emphasis will be placed on identification of the particulate origins, and to measure the impact of the proposed candidate control measures as they are implemented. These measures consist of 1) paving roads, 2) oiling roads, 3) planting vegetation, 4) street cleaning. Evaluations of the impact of each of these measures supported by air quality monitoring data, will be conducted to define the particulate problem in the Cook Inlet and Northern Alaska AQCRs. In the formulation of the control strategy for the South Eastern and South Central AQCRs, it was assumed that air quality for particulates there was within the federal air standards, hence, no control plan was proposed for these regions.

It should be immediately clear that the efforts of this review are severely constrained by the interim status of the particulates control strategy for the two Priority I regions. Until the proposed road dust control measures can be evaluated and until the dust emissions may be measured and related to air quality, it will not be possible to assess regional clean fuel savings or emission regulation restrictiveness, except within the very loose context of the uncertain status of the Plan.

Table A-10 summarizes pertinent data used in the development of particulate control strategies for the various AQCRs. The worst air quality

for 1973 was measured as a 24 hour average in all AQCRs. Since the control strategies were formulated on the basis of the annual readings rather than the worst violation values, it follows that the control strategies are targeted for under-design.

2.2.2 SO_2 Control Strategy

The EPA assessment of the Alaska Control Strategy for SO_2 determined it was adequate for achievement of the national secondary standards. Modeling performed for the South Eastern AQCR indicates that secondary standards will be met in that region, based on control of two sulfite pulp mills. One mill is located in Sitka and the other in Ketchikan. These mills are approximately 180 miles apart and are not expected to cause any combined effect. Since there is no air quality data presently available, emissions from the Ketchikan mill were used to estimate the effect on air quality. Because this problem is point source oriented, reductions were based on the more stringent 24-hour standard. An emission factor of 30 pounds of sulfur dioxide per ton of pulp produced (a figure supplied by the pulp mill), was used to determine emissions. The estimated maximum 24-hour value indicated by a point source model is 310 $\mu g/m^3$. By applying the State's regulation, which is equivalent to reasonably available control technology (20 pounds of sulfur dioxide per ton of pulp produced), a maximum 24-hour concentration of 240 $\mu g/m^3$ is predicted. This is sufficient to attain and maintain the national standards for sulfur oxides in Ketchikan and Sitka, since emissions from the latter mill are slightly lower.

The remaining regions in Alaska, the Cook Inlet, Northern Alaska, and South Central AQCR, are classified Priority III for sulfur oxides. It is reported by the Plan that atmospheric levels of sulfur oxides in these regions are well within air standards, and that air quality will be maintained by enforcement of regulations adopted under the Plan. Table A-11 provides a summary of the overall control strategy and related data.

2.2.3 Emission Tolerance Evaluation

Table A-10 and A-11 provide an assessment of the tolerance which each of the AQCRs possesses for increased emissions of particulates or SO_2. If a region has a tolerance for more emissions, then this indicates 1) it is

possible that fuel burning schedules may be revised so that clean fuel savings may be accomplished, and 2) it is possible that fuel combustion emission regulations may be (but not necessarily) relaxed. The methodology used in calculating the emission tolerance is explained in detail in Tables A-10 and A-11. There are basically two ways in which the tolerance is derived: 1) by a comparison of the allowable region wide emissions with the actual emissions forecast in 1975, using the data from the Implementation Plan analysis, or 2) by a comparison of allowable region wide emissions with the actual 1973 emissions as determined using 1973 air quality/emissions data. The former method is chosen when the Implementation Plan forecasts appear to be reconcilable with recent air quality/emissions data. In this case, forecasts of the plan are considered valid, and used to develop an emissions tolerance. If justified, this method is preferable, since the emission tolerance developed in this way reflects the full impact of the control strategies after their implementation is complete in 1975. The emission tolerance becomes a measure of the degree of "over-cleaning" accomplished by the Plan, or in cases where the region was already within air quality standards and did not require additional pollution controls, the tolerance is an expression of the degree of degradation possible before federal air quality standards are jeopardized. However, if irreconcialiabilities exist from the comparison of Implementation Plan forecasts with more current air quality and emissions data, it will be necessary to abort the first approach discussed above, and determine the emission tolerance based on 1973 air quality status in the region, before any substantial controls have been implemented from the control strategy.

Table A-10 provides a summary of the data used to generate a particulate emission tolerance in each of the AQCRs. None of the regions possesses an overall tolerance for increased emission of particulates. This is suspected to be due mainly to substantial atmospheric loadings of fugitive dust, arising mainly from urban traffic related activity. Although air monitoring data is not available to provide a spatial characterization of the fugitive dust problem, it is suspected that rural areas would be less subject to the high levels of particulate loadings experienced in the urban centers. It is possible therefore, that certain rural areas within a region may possess a significant tolerance for increased particulate emissions.

Table A-11 provides a summary of the data used to develop a SO_2 emission tolerance in the various AQCRs. Substantial tolerances appear to exist in all four regions. Data was unavailable to permit the quantification of the tolerance in the South Central AQCR (although the relatively low SO_2 emissions inventory there would appear to suggest substantial room for more emissions). Because of very limited monitoring data available to characterize SO_2 air quality in the Fairbanks area, no emissions tolerance was calculated for the Northern Alaska AQCR.

2.2.5 Fuel Combustion Regulations Summary

Table A-12 provides a summary of the fuel combustion emission regulations which have been adopted as the control strategy of the State Air Program Implementation Plan. The regulations apply statewide. SO_2 emissions are limited to 500 ppm from the stack of combustion units. Particulate stack emissions are limited to .1 grain/SCF for coal combustion, and .05 grain/SCF for oil and gas burning.

2.3 SPECIAL CONSIDERATIONS

This section provides a brief narrative on special considerations which may impact to some degree the final assessments to be developed in this report.

2.3.1 Planned Revisions to the Implementation Plan

The EPA granted an extension to the State of Alaska to study the particulates problem in the Cook Inlet and Northern Alaska AQCRs. The EPA recognized the State Plan for particulates was adequate for the attainment of the primary particulate standards, and expects the State to proceed with an enforcement schedule to insure compliance from the applicable emission sources. The State has submitted a study methodology to investigate the effects of candidate measures to control traffic generated dust in Anchorage and Fairbanks, and has scheduled an evaluation completion for the study by the end of 1974. It is expected that the study will lead to a definition of the particulates problem (origin and quantity), and a determination of appropriate control measures which may be implemented to insure attainment of standards in the two Priority I regions.

2.3.2 Fuels and Fuel Conversions

As related in Section 3.0, fuel oils and coals used in the Cook Inlet and Northern Alaska AQCRs contain very low sulfur content. This has resulted in a substantial over-compliance with regard to SO_2 emission regulations in these regions. Sulfur contents in the oil could be increased from a typical .25% to .8%S while still complying with emission regulations. Similarly, sulfur levels in the coal could be tolerated at far higher levels than that presently used. While it is apparent that clean fuel savings potential in the two regions appears feasible within compliance requirements, there may be some doubt as to whether the relatively large emissions increases would jeopardize maintenance of SO_2 air quality standards. Substantially more data is required to illuminate this issue.

3.0 AQCR ASSESSMENTS

This section provides 1) an assessment of the feasibility for accomplishing clean fuel savings in the various AQCRs, and 2) an assessment of fuel combustion emission regulations to determine if they are overly restrictive for the attainment of National Ambient Air Quality Standards in the various AQCRs.

The first assessment is carried out with an evaluation of various regional air quality indicators developed in Section 2 and compiled in Appendix A. The regional air quality indicators considered are comprised of criteria shown in Table B-1 and B-2, and include 1) the breadth of air quality violations, 2) expected attainment dates, 3) AQMA designations, 4) total regional emissions, 5) portion of emissions from fuel combustions, and 6) regional tolerance for emission increase. The emission tolerance possibly provides the most important indicator, since, if it is known (either quantitatively or qualitatively), it provides a measure of the over-cleanliness of the region, now or projected, and indicates how much additional pollution (from dirtier fuels) can be permitted.

The assessment of the restrictiveness of fuel combustion regulations was performed with an evaluation of the impact of fuel burning operations on air quality when those operations emit at a level equivalent to the ceiling limit of the emission regulations. These emissions are calculated in Appendices C, D, and E for power plants, industrial/commercial point sources, and area sources, and then synthesized in the analysis of Appendix F.

The assessment of the various AQCRs is discussed below.

3.1 ASSESSMENT BY REGIONAL AIR QUALITY INDICATORS

Table B-1 indicates that all four AQCRs can be considered as poor candidates for clean fuel savings (or possibly regulation relaxation) when they are constrained by attainment of the particulate standards alone. The candidacy of these regions must depend largely on the adequacy of the new control plan (being prepared by the State under an extension) to define and

eliminate the substantial particulate loading problem caused by natural sources and primarily by traffic generated dust. If over-attainment can be demonstrated with an effective dust control program, it is probable that emissions from the fuel combustion source sector, which would comprise a rather small fraction (probably less than 20%) of the overall inventory, once defined, could be increased to accommodate clean fuel savings without jeopardizing attainment of the air standards. Moreover, it would appear probable that rural areas may be rated as good candidates for clean fuel savings provided they are sufficiently removed from the impact of fugitive dust in urban areas. However, within the present context of the State control plan, and with respect to attainment of particulate air standards in the major urban areas of the Cook Inlet, Northern Alaska, and South Eastern AQCRs, each of these regions must be rated as poor candidates for clean fuel savings or regulation relaxation.

Table B-2 shows that, unlike the assessment related to particulate emissions, all of the AQCRs can be assigned as good candidates to accomplish clean fuel savings when they are constrained by attainment of the SO_2 air standards only. This evaluation results primarily from the fact that the four candidates are presently demonstrating attainment with the standards and it is probable that substantial SO_2 emission tolerances could exist in each of the regions.

3.2 ASSESSMENT BY SOURCE ANALYSIS OF POWER PLANTS/INDUSTRIAL-COMMERCIAL/ AREA SOURCES

Power generation in Alaska is produced by either gas, oil, or coal-fired combustion equipment. Fuel use and emission data for the major fuel burning power plants in Alaska is shown in Table C-1. In general, coal burning plants consume low sulfur coal (.22 - .25% sulfur) available in the area, and emit SO_2 well within regulations. However, particulate emissions have yet to be controlled sufficiently from these plants to meet the .1 gram/SCF emission limitation. Table C-1 includes a tabulation of SO_2 and particulate emissions presently emitting from the power plants, and a computation of the emissions which are allowable at the emission regulation limits. It is

apparent that almost all the plants are in substantial compliance with SO_2 emission regulations. However, many of the plants are not presently meeting the emission regulations for particulates.

Table D-1 provides a summary of the major industrial/commercial fuel combustion point sources in the various AQCRs. The number of these sources which have been identified in the NEDS emission inventory is reported on Table A-7. The fuel usage of industrial/commerical point sources closely parallels that of the power plants. Gas and oil are used in the Cook Inlet AQCR, whereas coal and oil are burned in the Northern Alaska AQCR, oil in the South Central Region, and oil and wood in the South Eastern Region. As might be expected, the Cook Inlet AQCR demonstrates the highest degree of particulate and SO_2 control, achieved primarily as a result of its clean fuels usage. The Northern Alaska AQCR experiences the most difficulty achieving particulate emission regulations of all the regions, due to its use of coal in the major boiler installations.

The significance of the area source depends greatly on the degree of industrialization of the area (Tables A-8 and A-9). In more rural areas such as the South Central and South Eastern AQCRs, area source fuel combustion accounts for about 5% of the SO_2 emissions inventory, and less than 20% of the particulate emissions (excluding fugitive dust). In more populated areas such as Anchorage (South Central) and Fairbanks (Northern Alaska), area sources account for up to 34% of the SO_2 emission inventory, and up to 36% of the man-made particulate emissions. Area sources are comprised essentially of residential space heating units which burn distillate fuel oils, except in Anchorage where a large percentage of natural gas is used. These residential units are exempt from emission control, and cannot in general be practically converted to alternative fuel use. Therefore it does not appear, for the most part, that substantial fuel savings can be accomplished from the area source sector of the fuel consuming sources.

Tables F-1 and F-2 synthesize the information of Appendix C and D (power plants and industrial/commercial emission sources) to provide an assessment of the restrictiveness of emission regulations for fuel burning

equipment. The assessment is carried out by evaluating the difference between the projected fuel combustion emissions in 1975 and those emissions which are emitted at the level of emission regulations. This difference constitutes the additional emissions which would result if, after compliance with regulations in 1975, all fuel burning sources were to alter fuels or operations, causing emissions to rise up to the level of the regulations. It is clear that if the additional emissions calculated are more than the emission tolerance compiled for the region (Tables A-10 and A-11), the emission regulations are not overly restrictive, and they should not be relaxed.

In Table F-1 it can be seen that particulate emission regulations are not overly restrictive in any of the AQCRs with the possible exception of rural areas, where it may be possible to revise regulations because air there may be clear of the serious fugitive dust problems found in the urban areas. Currently the State of Alaska is studying the emissions/air quality relationships in the various AQCRs to determine the adequacy of proposed particulate control strategies, and specifically, to define the problem of particulate emissions arising from traffic generated dust. It is believed that traffic generated particulate emissions comprise the major portion of the particulate inventory being measured at the monitoring sites.

In Table F-2, it is demonstrated that it would probably be possible to relax SO_2 emission regulations in all the AQCRs without interfering with maintenance of the air quality standards. Relaxation of regulation would have greatest impact on the Cook Inlet and Northern Alaska AQCRs. Compliance emissions in 1975 for both these AQCRs are expected to be well below that allowed by regulation limits. This high degree of compliance is due to the use of very low sulfur fuels (oil and coal) available in this region. If alternative, or higher sulfur fuels were substituted in fuel burning equipment, such that emission regulation limits were approached, substantial SO_2 emission increases would result in both the Cook Inlet and Northern Alaska AQCRs (see Table F-2). Air quality and SO_2 emissions data in the areas of greatest SO_2 emission density show that the emissions tolerance is sufficient to permit these increases in SO_2 emissions without

jeopardizing federal air quality standards. It also appears, based on the analysis, that SO_2 emissions regulations could be relaxed to permit yet more SO_2 emissions without jeopardizing NAAQS.

The Cook Inlet and Northern Alaska AQCRs are examples which demonstrate the distinction between a region's potential for clean fuel savings and the region's potential for regulation relaxation. Under the circumstances related here, both these AQCRs are good candidates for clean fuel savings, as both now burn low sulfur fuels and would be able to use far higher sulfur fuels (.9% sulfur) before violating emission regulations. The analysis also suggests that further emission increases beyond the compliance emission levels may be tolerated without violation of the air quality standards, and hence the region's potential for regulation relaxation would also be good.

In the South Central and South Eastern AQCRs, fuel usage practices yield SO_2 combustion emissions which more closely approach the limits allowable by SO_2 regulations (500 ppm stack concentration). When fuel usage practices are revised to burn emissions of SO_2 at regulation limits, the resulting SO_2 emissions inventory for these two AQCRs is substantially less than that in the Cook Inlet or Northern Alaska Regions. It is estimated that such a fuel revision would increase the SO_2 inventory in the South Central Region by 16%, and that in the South Eastern by only 4%. In the South Eastern Region, where an emission tolerance estimate has been quantified, it can be seen that the 4% SO_2 emission increase would not jeopardize air quality standards, therefore it appears that the SO_2 regulations can be relaxed greatly in this region. In view of the relatively small inventory of SO_2 emissions in the South Central Region, and the relatively small emissions increase expected if the projected compliance cushion is erased, it is anticipated that SO_2 regulations could probably be safely relaxed significantly in this region before affecting clean air goals.

APPENDIX A

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. 1973 SAROAD data for SO_2 and TSP monitoring stations are summarized for the various AQCRs in the State. NEDS emissions data[1] are tabulated for the various fuel burning categories in each of the AQCRs.

Tables A-10 and A-11 show a comparison of emission inventories in the original SIP and those from the NEDS. An emission tolerance which might be allowed in the AQCR without violation of national secondary ambient air quality standards, is calculated for SO_2 and particulates. The intent of this calculation is to indicate possible candidate regions for clean fuel savings. The tolerance was based on either the degree of control expected by the SIP or upon air quality/emission relationships which are calculated from the more recent NEDS and SAROAD data. The value of the emission tolerance provides an indication of the degree of potential an AQCR possesses for clean fuel savings and regulation relaxation.

Methodology for Increased Emissions Tolerance

A tolerance for increased emissions was determined as follows. First, an "allowable emissions" was calculated for each AQCR based on the current 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-5 and A-6). This "allowable" was then compared to that from the SIP. If reasonable agreement occurred, then the "estimated emissions" which would result after implementation of the SIP in that AQCR was used to calculate an emissions tolerance. Thus, some credit could be given to an AQCR which might be restricting emissions more than required by ambient air quality standards. In the event that no data existed or was available

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

from the SIP for an AQCR, the current air quality was used to assign emissions tolerance based on proportional rollback or rollup. The current air quality was also used to assign emissions tolerances when emissions data from the SIP and the NEDS did not appear to be comparable (this is often the case).

It is emphasized that emissions tolerance is based on region-wide emission figures. It is evident that the calculation and use of this tolerance is more appropriate for an urban AQCR with many closely spaced emissions sources, than a largely rural AQCR with geographically dispursed emissions.

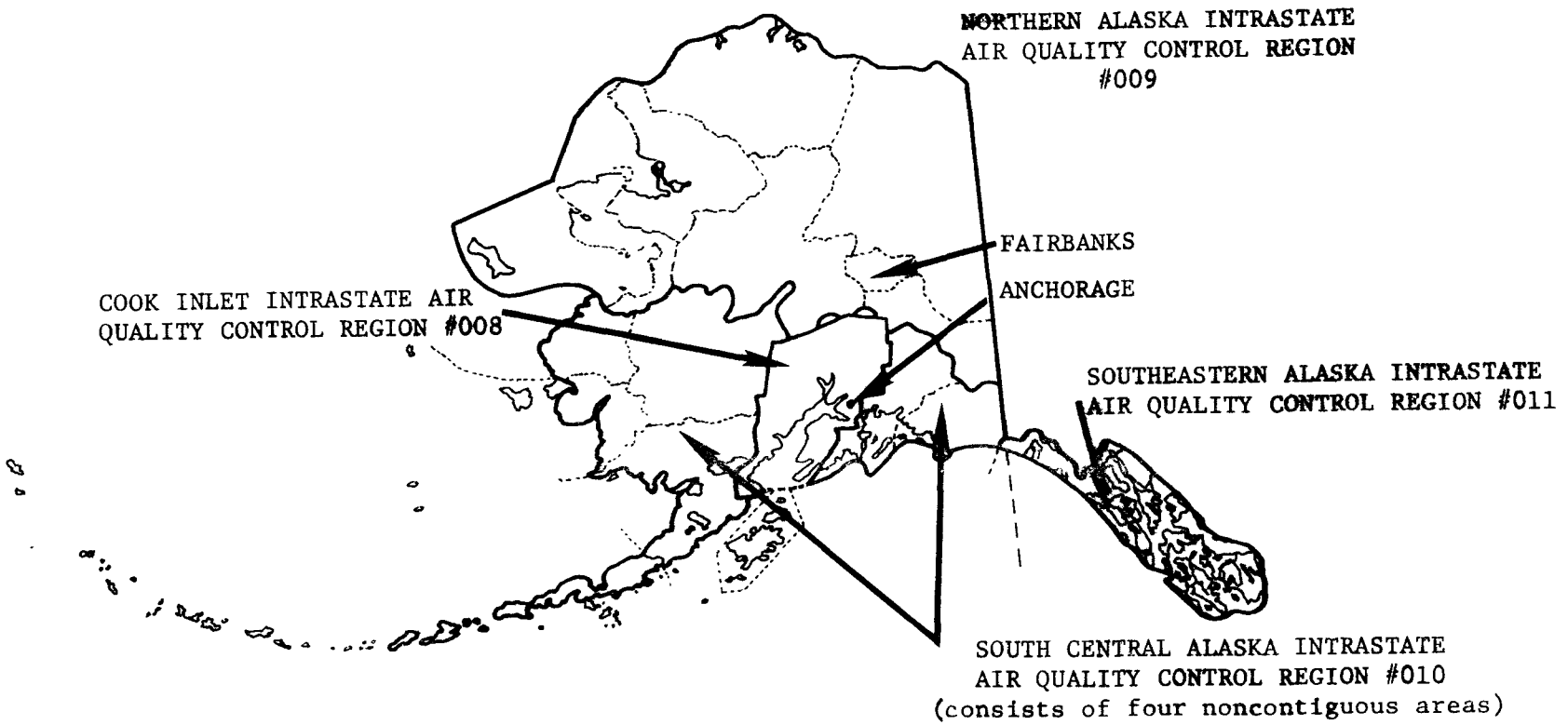

Figure A-1. Air Quality Control Regions in Alaska

Table A-1. Alaska Air Pollution Control Areas

Air Quality Control Region (AQCR)	AQCR Number	Priority Classification [a]			Air Quality Maintenance Area (AQMA) Designations
		Particulates	SO_2	NO_x	
Cook Inlet	8	I	III	III	None
Northern Alaska	9	I	III	III	None
South Central	10	III	III	III	None
South Eastern	11	III	I	III	None

[a]Priority classifications are based on the criteria below:

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

Table A-2. Regional Summary Information

AQCR	1970 Population	Area Square Miles	Largest City
Cook Inlet (8)	149,430	44,000	Anchorage
Northern Alaska (9)	69,300	320,000	Fairbanks
South Central (10)	41.050	180,000	Kodiak
South Eastern (11)	42,560	35,000	Janeau

Table A-3. Air Quality Attainment Dates

AQCR	Particulates Attainment Dates Primary	Secondary	Sulfur Dioxide Attainment Dates Primary	Secondary	Nitrogen Oxides Attainment Dates
Cook Inlet (8)	7/75	b	a	a	a
Northern Alaska (9)	7/75	b	a	a	a
South Central (10)	c	c	a	a	a
South Eastern (11)	c	c	a	7/75	a

[a]Measured air quality levels are presently within standards.

[b]Alaska has been granted an extension for submittal of a plan for attainment of the secondary standards.

[c]No attainment dates are available since the control strategy did not address the particulate problem in either the South Central or South Eastern AQCRs (air quality there was assumed to be within the NAAQS).

Table A-4. Federal and State Ambient Air Quality Standards

		All Concentrations in $\mu gms/m^3$				
		Total Suspended Particulate		Sulfur Dioxide		
		Annual	24-Hour	Annual	24-Hour	3-Hour
Federal	Primary	75 [G]	260[a]	80 [A]	365[a]	-
	Secondary	60 [G]	150[a]	-	-	1300[a]
State	Primary	60 [G]	150[a]	60 [A]	260[a]	1300[a]

[a]Not to be exceeded more than once per year.

[A] Arithmetic mean
[G] Geometric mean

Table A-5. Summary of Air Quality Status for Particulates[a]

AQCR	No. Stations Reporting	TSP Concentration ($\mu g/m^3$) Highest Reading Annual	Highest Reading 24-Hour	2nd Highest 24-Hour	Number of Stations Exceeding NAAQS Primary Annual	Primary 24-Hour[b]	Secondary Annual	Secondary 24-Hour[b]	Emission Reduction Required to Meet Secondary Standards[c] Annual	24-Hour
Cook Inlet (8)	11	90	1393	1094	1	3	1	7	40%	87%
Northern Alaska (9)	11	64	404	377	0	4	1	9	8%	63%
South Central (10)	1	d	208	195	d	1	d	1	d	25%
South Eastern (11)	6	58	367	318	0	1	0	4	e	56%

[a]Compiled from 1973 air quality data in National Data System as of June 1974. Data for South Central AQCR was obtained from new monitoring station in Valdez reporting from July 1973 to September 1974.

[b]Violations are based on readings which exceed the value of the NAAQS after the first time.

[c]Percent reduction required = $\frac{A-C}{A-B} \times 100$ where A = 2nd highest measured air quality for period of standard
B = background concentration (15 $\mu g/m^3$)
C = concentration value of standard

[d]Annual average is not available for this region.

[e]Air Quality is presently within air quality standards.

Table A-6. Summary of Air Quality Status for SO_2[a]

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	Emission Reduction Required to Meet Secondary Standards[c] Annual	Secondary Standards[c] 24-hour
Cook Inlet (8)	1	0	-	25	24	0	0	-	d	d
Northern Alaska (9)	1	0	-	11	9	0	0	-	d	d
South Central (10)	-	-	-	-	-	-	-	-	d	d
South Eastern (11)	4	0	-	167	76	0	0	-	d	d

Blanks (-) denote that data was not reported for this region. However, for the Cook Inlet, Northern Alaska, and South Central AQCRs, the plan indicates that SO_2 air quality is well within the federal air standards.

a. Compiled from 1973 air quality in National Data System as of June 1974. Data for the Cook Inlet AQCR was obtained from a new monitoring station in Anchorage for the period of November 1973 through September 1974.

b. Violations are based on readings which exceed the value of the NAAQS after the first time.

c. % reduction required = $\frac{A-C}{A} \times 100$. Where A = 2nd highest air quality for period of standard
C = the concentration value of the standard.

d. Air quality presently within air quality standards.

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

AQCR	Number of Power Plants	Number of Industrial and Commercial Point Sources	
		TSP	SO_2
Cook Inlet (8)	2	8	7
Northern Alaska (9)	3	3	3
South Central (10)	1	3	3
South Eastern (11)	6	2	2

[a]This represents the total number of combustion point sources inventoried in the NEDS 1973 Rank-Order Source Summary. Only emission sources of 1 ton/year or greater are reported.

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

AQCR	Total[b] 10^3 Tons/Year	Percent of Total Emissions from Fuel Combustion	Electricity Generation 10^3 tons/yr	Electricity Generation %	Industrial/ Commercial Point Source Fuel Combustion 10^3 tons/yr	Industrial/ Commercial Point Source Fuel Combustion %	Area Source Fuel Combustion 10^3 tons/yr	Area Source Fuel Combustion %
Cook Inlet (8)	2.1	42.4	.06	2.9	.07	3.3	.76	36.2
Northern Alaska (9)	7.7	85.6	4.6	59.7	.09	1.2	1.9	24.7
South Central (10)	1.8	24.5	0	0	.10	5.6	.34	18.9
South Eastern (11)	4.3	7.9	0	0	1.4	32.6	.28	6.5

[a]Emissions extracted from NEDS, "1972 National Emissions Report."

[b]These emissions include process related sources only, excluding emissions from natural sources and traffic generated dust (both believed to be substantial in Alaska).

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

AQCR	Total 10^3 Tons/Year[b]	Percent from Fuel Combustion	Electricity Generation		Point Source Fuel Combustion		Area Source Fuel Combustion	
			10^3 Tons/Year	%	10^3 tons/yr	%	10^3 tons/yr	%
Cook Inlet (8)	1.4	40.0	.06	4.2	.02	1.4	.48	34.0
Northern Alaska (9)	9.4	42.0	1.5	16.0	1.6	17.0	.83	8.8
South Central (10)	4.4	46.0	.04	.9	1.8	40.6	.20	4.5
South Eastern (11)	5.8	38.0	.06	1.0	1.9	32.5	.26	4.4

[a]Total SO_2 emissions were extracted from NEDS data bank, and the mix proportions were derived from the NEDS "1972 National Emissions Report."

Table A-10. Assessment of Emission Tolerance, Particulates

Baseyear and Forecasted Information from State Implementation Plan							Air Quality and Emissions Data from SAROAD and NEDS[f]				
AQCR	Level of AQ Selected as Control Value for SIP ($\mu g/m^3$)	Reduction Req'd for Attainment Based on Selected Value	1970 Baseyear Emissions[c] Contributing to Worst Air Quality measurement (10^3 tons/yr)	Allowable Region-wide Emissions for Attainment	Region-wide Emissions[c] Forecasted for AQCR under SIP in 1975 (10^3 tons/yr)	Comments on Control Strategy and Expected Impact on Emissions and Air Quality	Level of Worst Air Quality[e] in 1973 $\mu g/m^3$	Reduction Required for Attainment	1972 Region-wide Emissions,[c] 10^3 tons/yr	Region-wide Allowable Emissions 10^3 tons/yr	Summary of Emission Tolerance of AQCR
Cook Inlet (8)	175[b] (annual)	72%	2.6	Indeterminant	1.1	Control strategy achieves 58% reduction of man made sources. The impact of a program to reduce traffic generated dust has not been quantified.	1094 (24-hr)	87% (24-hr)	2 1	d	None indicated except possibly in rural areas away from effects of emissions arising from traffic generated dust No emission tolerance can be assigned until road generated dust can be quantified
Northern Alaska (9)	104[b] (annual)	50%	7.0	Indeterminate	3.0	Strategy achieves 57% reduction of man-made sources. This reduction has been evaluated adequately for attainment of the air standards in winter, when dust generated by traffic is nil.	377 (24-hr)	63% (24-hr)	7 7	d	Same as above
South Central (10)	a	0%	-	-	-	Application of state regulations is expected to maintain air quality within federal air standards.	195 (24-hr)	25% (24-hr)	1 8	d	Same as above
South Eastern (11)	a	0%	-	-	-	" " " " "	318 (24-hr)	56% (24-hr)	4.3	d	Same as above

a Air quality reported to be within secondary ambient air standards. No measured values were available
b The mean annual value was selected as the control criteria for development of the control strategy, despite the fact measurements were available to demonstrate that the 24 hour standard for particulates was more severely violated.
c This emissions total includes man made sources only The contribution of particulate emissions from natural sources and traffic generated dust are thought to be substantial, but have not yet been quantified
d These values were considered unquantifiable since the emission inventories do not reflect emissions resulting from traffic generated dust, considered to be the major source of atmospheric particulates.
e Refers to highest second high 24-hour average value in region, or to highest annual value, whichever constitutes the worst air quality relative to the federal air standards (see Table A-4 for definition of federal air quality standards)
f Air quality data is for the year of 1973, from SAROAD Emissions data was available from NEDS for the year 1972.

Table A-11. Assessment of Emission Tolerance, SO_2

Base year and Forecasted Information from State Implementation Plan							Air Quality and Emissions Data from SAROAD and NEDS[h]				
AQCR	Level of AQ Selected as Control Value for SIP ($\mu g/m^3$)	Reduction Req'd for Attainment Based on Selected Value	1970 Baseyear Emissions Contributing to Worst Air Quality Measurement (10^3 tons/yr)	Allowable Region-wide Emissions for Attainment	Region-wide Emissions Forecasted for AQCR under SIP in 1975	Comments on Control Strategy and Expected Impact on Emissions and Air Quality	Level of Worst Air Quality in 1973[g] ug/m^3	Reduction Required for Attainment	1972 Region-wide Emissions[e] (10^3 tons/yr)	Region-wide Allowable Emissions (10^3 tons/yr)	Summary of Emission Tolera. e of AQCR
Cook Inlet (8)	a	0%	c	-	-	Application of state SO_2 regulations is expected to insure air quality maintenance. Plan defined SO_2 emissions as negligible	24 (24-hr)	0%	1 4	19	17 6 x 10^3 tons/yr
Northern Alaska (9)	a	0%	c	-	-	" " " " "	(24[g]-hr)	0%	9 4	Indeterminate[d]	Not quantified because of very limited air quality data. The available data indicate very low concentrations of SO_2 in area of highest SO_2 emission density (Fairbanks) Hence, tolerance is probably substantial in all areas of regions
South Central (10)	a	0%	c	-	.	" " " " "	a	0%	4.4	Indeterminate[d]	Not quantified because of lack of air quality data. Relatively small SO_2 emissions would indicate tolerance to be appreciable.
South Eastern (11)	310[b] (24 hr)	16%	9.3	7.8	6.3	33% control is expected by application of state regulations for SO_2 emissions. Attainment demonstrated by modeling.	76 (24-hr)	0%	5 8	8 8	3 x 10^3 tons/yr Implementation appears on target [f]

a. Air quality reported to be within secondary ambient air standards. No measured values were available.
b. This value was estimated (not measured) by an emission/air quality model analysis.
c. Not available.
d. Allowable emissions were not quantifiable since air quality data was not available or was very limited in these regions.
e. Emissions reported in this column are based on tabulation of individual source summary sheets obtained from NEDS.
f. This tolerance is conservative as it 1) reflects "rollup" of region-wide emission totals based on air quality readings which are point source oriented.
g. Refers to highest second high 24-hour average value in region, or to highest annual value, whichever constitutes the worst air quality relative to the federal air standards (see Table A-4 for definition of federal air quality standards)
h. Air quality data is for the year of 1973, from SAROAD. Emissions data was available from NEDS for the year 1972.

Table A-12. Alaska Current Regulations for Stationary Combustion Sources in Approved SIP

Source Category	Regulation Number	Control Strategy	Compliance Date
Industrial Processes and Fuel Burning Equipment			
1. Sources not burning coal, wood or municipal waste	50.050 (b)(1)	0.05 grain/SCF	Immediate
2. Sources operating prior to July 1, 1972 and for equipment burning coal or municipal waste	50.050 (b)(2)	0.1 grain/SCF	Immediate
3. Sources burning wood	50.050 (b)(3)	0.15 grain/SCF	Immediate
Sulfur compound emissions	50.050 (c)	500ppm SO_2	Immediate

APPENDIX B

The purpose of Appendix B is to provide an assessment of the feasibility for accomplishing clean fuel savings and regulation relaxation. This assessment is carried out with an evaluation of various regional air quality indicators developed in Section 2 and compiled in Appendix A. The regional air quality indicators considered are comprised of criteria shown in Table B-1 and B-2, and include:(1) the breadth of air quality violations, (2) expected attainment dates for NAAQS, (3) AQMA designations, (4) total regional emissions, (5) portion of emissions from fuel combustion sources, and (6) regional tolerance for emissions increase. When it is quantifiable and suitably applied, the emission tolerance possibly provides the most important indicator, since it provides a measure of the over-cleanliness of the region, now or projected, and indicates how much additional pollution (such as from dirtier fuels) can be permitted without resulting in violations of federal air standards.

Table B-1. Candidacy Assessment for Clean Fuel Savings/Particulates Regulation Relaxatio

AQCR	Number of Counties in AQCR with Air Quality Violations in 1973	Expected Attainment Date	Counties with AQMA Designations	Total Part. Emissions in AQCR in 1972 10^3 tons/yr.[c]	% Emissions from Fuel Combustion	Tolerance for Particulate Emissions Increase, 10^3 tons/yr.	Overall Regional Evaluation
Cook Inlet (8)	3/4	a	None	2.1	42.4	None indicated except possibly in rural areas. Attainment of standards is uncertain near urban areas.	Poor candidate[d]
Northern Alaska (9)	1/7	a	None	7.7	85.6		Poor candidate[d]
South Central (10)	0/8	b	None	1.8	24.5		Poor candidate[d]
South Eastern (11)	4/9	b	None	4.3	7.9		Poor candidate[d]

a. Attainment date for secondary ambient air standard has not been determined. Alaska has been granted an extension to develop a plan to show attainment.

b. No control strategy was specified for this region on the basis that air quality was within standards. This decision was based on the fact annual mean measurements were meeting the air standards. However the data show that 24 hour measurements are in violation of the air standards.

c. This emissions total includes man made sources only. The contribution of particulate emissions from natural sources and traffic generated dust are thought to be substantial, but have not yet been quantified.

d. It should be recognized that there is distinct possibility that rural areas of the various AQCRs may be good candidates for clean fuel savings or regulation revisions. Additional air quality data is needed to confirm this likelihood.

Table B-2. Candidacy Assessment for Clean Fuel Savings/SO_2 Regulation Relaxation

AQCR	Number of Counties in AQCR with Air Quality Violations in 1973	Expected Attainment Date	Counties with AQMA Designations	Total SO_2 Emissions in AQCR in 1972 10^3 tons/yr.	% Emissions from Fuel Combustion	Tolerance for SO_2 Emissions Increase, 10^3 tons/yr.	Overall Regional Evaluation
Cook Inlet (8)	0	a	None	1.4	40.0	17.6 x 10^3 tons/yr	Good candidate
Northern Alaska (9)	0	a	None	9.4	42.0	Actual magnitude unknown. Expected to be appreciable, especially in areas outside Fairbanks	Good candidate
South Central (10)	0	a	None	4.4	46.0	Not quantifiable due to limited air quality data	Good candidate
South Eastern (11)	0	a	None	5.8	38.0	3 x 10^3 tons/yr (conservative figure)	Good candidate

a - air quality levels within standards in 1973 and expected to remain so through 1975.

APPENDIX C

This section provides a characterization of individual power plants by AQCR. Current power plant information used to prepare Table C-1 were obtained from three main sources: (1) Federal Power Commission computerized listings of power plants and their associated fuel use, (2) the National Coal Association "Steam Tables" listing of power plants and fuel use in 1972, and (3) emission data in the NEDS data bank as of 1974. 1973 fuel schedules were extracted from the FPC (1 above) data, or when this was not available, 1972 fuel schedules were reported in Table C-1 from values extracted from the Steam Tables. Heat inputs were calculated based on the fuel heating values obtained from either (1) or (3) above. The SO_2 and particulates emissions reported in Table C-1 correspond to the fuel schedules reported, and were extracted from (1) or (3) above. When emissions and fuel schedule figures were not available for the same year, emissions were scaled proportionately to reflect the 1973 fuel schedule.

After the name of each plant is a listing of the fuels for which the plant was designed (from source 2). For the purposes of this study, 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 in Table C-1 are the 1975 regulations which are currently applicable to the given plant, taken from Table A-12.

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-8, A-9). 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. Alaska Power Plant Characterization

County	Plant Name, Size, and Fuel Design	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual Quantity[a]	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6BTU	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6BTU	Emissions: TSP Existing tons/yr	Emissions: TSP Existing lbs/10^6BTU	Emissions: TSP Allowable tons/yr	Emissions: TSP Allowable lbs/10^6BTU
Cook Inlet AQCR (8):												
Anchorage	Chugach Elec.	Gas	2356	269	1	<.01	194	.97	18	0.02	72	.08
Henai-Cook Inlet	Chugach Elec. Anchorage	Oil 0.2%S	4586	74.3	65.1 *	0.02	316	.97	34.4 *	0.11	25	.08
Anchorage	Anchorage Municipal Light & Power	Gas	2709	495	.8	<.01	2069	.97	20.3	.01	173	.08
Total					66.9		2579		72.7		270	
Northern Alaska AQCR (9):												
Fairbanks	Golden Valley Electric	Oil 0.02%S	847	13.1	9	0.16	54.6	.97	7	0.12	4.7	.08
Fairbanks	Municipal Utilities Sys	Coal 0.22%S 10.0%A	164160	319	747	0.53	1367	.97	528	0.38	153	.11
		Oil 0.02%S	50	0.78	1	0.20	4.9	.97	1	0.29	0.28	.08
Yukon-Koyukuk	Golden Valley Electric Anchorage	Coal 0.26%S 8.6%A	121326	235	710	0.69	998	.97	3210	3.12	113	.11
Total					1467		2425		3746		271	
South Central AQCR (10):												
Kodiak	Kodiak Elec.	Oil 0.10%S	2632	41.2	36	0.20	175	.97	17	0.09	15.1	.08
Total					36		175		17		15.1	

*Calculated using emission factor from EPA Document, AP-42, "Compilation of Air Pollution Emission Factors"

Table C-1. Alaska Power Plant Characterization (Continued)

County	Plant Name, Size, and Fuel Design	Fuel Use: Type & Sulfur & Ash	Fuel Use: Annual Quantity[a]	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2: Existing tons/yr	Existing lbs/10^6BTU	Allowable tons/yr	Allowable lbs/10^6BTU	TSP: Existing tons/yr	Existing lbs/10^6BTU	Allowable tons/yr	Allowable lbs/10^6BTU
South Eastern AQCR (11):												
Wrangell Petersburg	Wrangell Muni. Power	Oil 0.50%S	733	11.4	10	0.20	48.5	.97	5	0.10	4.0	.08
Wrangell Petersburg	Petersburg Electric	Oil 0.20%S	1367	21.2	18	0.19	91.9	.97	9	0.10	7.2	.08
Juneau	Alaska Light & Power	Oil 0.20%S	1351	22.9	2	0.20	97	.97	2	0.02	8.0	.08
Ketchikan	Ketchikan Public Utility	Oil 0.01%S	970	15.1	13	0.20	63.1	.97	6	0.09	5.3	.08
Haines	Haines Light & Power	Oil 0.2%S	609	9.45	8	0.19	40.8	.97	4	0.10	3.2	.08
Ketchikan	Kotzebue Muni. Utility	Oil 0.2%S	499	7.7	7	0.21	32.3	.97	3	0.09	2.7	.08
Total					58		373.6		29		30.4	

[a] Oil- 10^3 gal, Gas- 10^6 CF, Coal- tons

Source:

1) Federal Power Commission, U.S. Power Plant Statistics Stored in EPA Data Bank, September 1974.
2) "Steam-Electric Plant Factors/1972," 22nd Edition National Coal Association
3) Emissions data in NEDS data bank as of June 1974.

APPENDIX D

This section provides a characterization of individual industrial/commercial/institutional fuel combustion emission sources. The data was derived from a NEDS rank order emissions listing, and from emissions data in the NEDS data bank as of June 1974.

Table D-1. Alaska Industrial-Commercial Fuel Combustion Point Source Characterization

County	Plant Name, Size, and Fuel Design	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual Quantity[a]	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Existing lbs/10^6BTU	Allowable tons/yr	Allowable lbs/10^6BTU	TSP Existing tons/yr	Existing lbs/10^6BTU	TSP Allowable tons/yr	Allowable lbs/10^6BTU
Cook Inlet AQCR (8):												
Kenai-Cook Inlet	Marathon Oil	Gas	909	134	0.27	< .01	262	.97	2	< .01	32	.08
		Gas	1635	196	2	< .01	1940	.97	18	0.02	72	.08
Kenai-Cook Inlet	ARCO #15 Anchorage	R. Oil 0.05%S	284	4.44	1.1*	< .01	1067	.97	3.3*	< .01	52.8	.08
		Gas 0.22%S	546	81	0.2*	< .01	194	.97	4.9*	.01	39.2	.08
Kenai-Cook Inlet	ARCO #15 Anchorage	R. Oil 0.05%S	2780	43.8	1	< .01	970	.97	1	< .01	16	.08
		Gas	1331	198	.03*	< .01	291	.97	12*	.01	96	.08
Kenai-Cook Inlet	Union Oil #18	R. Oil 0.20%S	472	7.1	7.5*	0.24	30.3	.97	5.4*	0.07	6.2	.08
		Gas	1767	225	0.5*	< .01	485	.97	15.9*	0.02	795	.08
Kenai-Cook Inlet	Union Oil #19	Gas	2428	275	0.73*	< .01	708	.97	8	0.01	64	.08
Anchorage	Standard Oil	Gas	267	32	.08	< .01	77.6	.97	2	.01	16	.08
		Gas	125	28.5	.04	< .01	38.8	.97	1	.01	8	.08
		Gas	359	82	1	< .01	970	.97	4	.01	32	.08
Anchorage	Fort Richardson	D. Oil 0.20%S	370	5.7	5	0.2	24.3	.97	3	0.1	2.4	.08
		Gas	2300	264	1	< .01	970	.97	21	0.02	84	.08
Total					20.7		8028		101.5		1316	

Table D-1. Alaska Industrial-Commercial Fuel Combustion Source Characterization (Continued)

County	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual Quantity[a]	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6BTU	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6BTU	Emissions: TSP Existing tons/yr	Emissions: TSP Existing lbs/10^6BTU	Emissions: TSP Allowable tons/yr	Emissions: TSP Allowable lbs/10^6BTU
Northern Alaska AQCR (9):												
Fort Richardson	Ft. Wainwright	Coal 0.20%S 10%A	166240	322.6	668	0.47	1379	.97	795	0.56	156	.11
Fort Richardson	Eielson	Coal 0.2%S 10%A	150000	291	570	0.44	1257	.97	975	0.76	141	.11
Fort Richardson	U. of Alaska	Coal 0.5%S 10%A	33288	64.6	316	1.12	274	.97	84	0.30	30.8	.11
Southeast Fairbanks	Ft. Greely	D. Oil 0.5%S 10%A	3152	51.1	52	0.23	219	.97	24	0.11	17.5	.08
Fort Richardson	N. Star Boro School Dist.	Coal 0.22%S 10%A	3100	6.0	12	0.46	25.3	.97	78	2.97	2.9	.11
Total					1618		3154		1956		348	

Table D-1. Alaska Industrial-Commercial Fuel Combustion Source Characterization (Continued)

County	Plant Name, Size, and Fuel Design	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual Quantity[a]	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6BTU	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6BTU	Emissions: TSP Existing tons/yr	Emissions: TSP Existing lbs/10^6BTU	Emissions: TSP Allowable tons/yr	Emissions: TSP Allowable lbs/10^6BTU
South Central Alaska AQCR (10):												
Aleutian Islands	ADAK Naval Station	D. Oil 2.8%S 1.4%A	2680	46.5	533	2.62	203	.97	20	0.10	16	.08
		D. Oil 0.30%A	6489	99.3	100	0.23	422	.97	43	0.10	34.4	.08
Aleutian Islands	Shemya	D. Oil 0.20%S	4763	75.5	65	0.20	315	.97	32	0.10	25.6	.08
Kodiak	DOT USCG Kodiak	Oil 2.5%S	6334	86.8	1124	2.96	368	.97	48	0.13	29.5	.08
Total					1822		1308		143		105.5	

Table D-1. Alaska Industrial-Commercial Fuel Combustion Source Characterization (Continued)

County	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual Quantity[a]	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6BTU	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6BTU	Emissions: TSP Existing tons/yr	Emissions: TSP Existing lbs/10^6BTU	Emissions: TSP Allowable tons/yr	Emissions: TSP Allowable lbs/10^6BTU
South Eastern AQCR (11):												
Sitka	AK Lumber & Pulp	D. Oil 1.5%S	17035	247	1814	1.7	1035	0.97	128	0.12	85.3	.08
[illegible]	Wood Combustion	Wood	146444	201	111	0.13	828	0.97	304	0.12	887	0.35
Total					1925		1863		432		972	

* Calculated based on emission factors from "Compilation of Air Pollutant Emission Factors," Document AP-42, April 1973.

[a] Oil - 10^3 gal; gas - 10^6 CF, Coal - tons.

APPENDIX E

Table E-1 shows area source fuel use for the entire state of Alaska. The approximate energy values are compared for each fuel along with the percent of overall energy derived from each fuel. The bottom row entitled "all fuels, all sources" may not match totals from Appendices A, C, and D, exactly, since neither the NEDS or individual appendix totals are all-inclusive. Also fuel schedules may change from one year to the next.

Table E-1. Total State Area Source Fuel Use[a]

Source (Area Only)	Coal		Residual Oil		Dist. Oil		Gas		Wood		Total
	10^3 Tons	10^9 Btu	10^3 Gal	10^9 Btu	10^3 Gal	10^9 Btu	10^6 Ft^3	10^9 Btu	10^3 Tons	10^9 Btu	10^9 Btu
Residential	27.6	635	0	0	105.3	14.7	7.9	7.9	44.9	538	1195.6
Industrial	0	0	36.8	5.2	17.9	2.5	4.4	4.4	0	0	12.1
Commercial - Institutional	33.3	766	1.3	0.2	16.9	2.4	10.1	10.1	0	0	778.7
Total (area sources)	60.9	1400	38.1	5.4	140.1	19.6	22.4	22.4	44.9	538	1985.4
% of all fuel used by area sources		70.5		0.3		1.0		1.1		27.1	
Total (all fuels, all sources)	780.7	17956	38.1	5.4	193.6	27.1	63.3	63.3	191.3	2293	20344.8
% of total fuel used by all sources		88.3		0.03		0.1		0.3		11.3	

[a]NEDS data bank, September 1974.

APPENDIX F

Tables F-1 and F-2 illustrate the effect on emissions of particulates and SO_2 when power plant and industrial fuel burning sources listed in Appendices C and D are allowed to emit at the ceiling rate permitted by emission regulations. It is assumed that heat input remains the same, and existing regulations are applied to gross heat input for each AQCR. It is emphasized that this table is hypothetical in that no fuel mix may exist to allow all sources to emit exactly at regulation levels. The calculations do give some insight into adequacy of existing regulations for allowing air quality standards to be achieved if a fuel schedule different from the one at present were in effect.

Table F-1. Assessment of Restrictiveness of Particulate Emission Regulations for Fuel Combustion Sources

AQCR	Fuel Burning Emissions Projected for 1975,[a] 10^3 tons/yr	1975 Fuel Combustion Emissions at Regulation Limit Rates[b] 10^3 tons/yr	Increase in 1975 Emissions in AQCR When Combustion Units Emit at Regulation Limits		Tolerance for Particulate Emissions Increase in AQCR in 1975 10^3 tons/yr	Assessment of Restrictiveness of Combustion Emission Regulations [c]
			10^3 tons/yr	Percentage of Total Emission Inventory [e]		
Cook Inlet (8)	.90	2.19	1.29	60%	None, except possibly in rural areas	Not overly restrictive in present context,[d] except possibly in rural areas
Northern Alaska (9)	2.52	2.52	0	0%	None, except possibly in rural areas.	
South Central (10)	.46	.46	0	0%	None, except possibly in rural areas.	
South Eastern (11)	.94	1.28	.34	7.9%	None, except possibly in rural areas.	

[a] Projected fuel combustion emissions for 1975 were assumed to be the sum of those tabulated in Appendix C and D with the following adjustments: Those sources which were out of compliance with emission regulations were assigned a 1975 level equivalent to source operation at the emission regulation limit. No growth was assumed for the purpose of these calculations.

[b] These emissions have been calculated in Appendix C and D.

[c] The restrictiveness of the combustion emission regulations is judged by comparing the increase in 1975 fuel burning emissions caused by operation at regulation limits with the "emission tolerance" the AQCR is appraised to have (Table A-10). If the increase exceeds the emission tolerance, then it is clear that the regulations are not overly restrictive. When the increase does not exceed the emission tolerance, the regulations may be relaxed to allow higher emission rates. When no emission tolerance has been determined, a qualitative assessment of the regulations is included.

[d] "In the present context" refers to the extension status of the control strategy development for particulates air quality. Since no plan has been demonstrated adequate for attainment of the secondary standards, relaxation of regulations would only aggravate the severity of the current particulates problem.

[e] Total emission inventory refers to man-made emissions, exclusive of traffic-generated dust and natural sources.

Table F-2. Assessment of Restrictiveness of SO_2 Emission Regulations for Fuel Combustion Sources

AQCR	Fuel Burning Emissions Projected for 1975,[a] 10^3 tons/yrs	1975 Fuel Combustion Emissions at Regulation Limit Rates[b] 10^3 tons/yr	Increase in 1975 Emissions in AQCR When Combustion Units Emit at Regulation Limits		Tolerance for SO_2 Emissions Increase in AQCR in 1975 10^3 tons/yr	Assessment of Restrictiven of Combustion Emission Regulations [c]
			10^3 tons/yr	Percentage of Total Emission Inventory [e]		
Cook Inlet (8)	.57	10.7	10.1	720 %	19 x 10^3 tons/yr.	Overly restrictive.[d]
Northern Alaska (9)	3.83	6.41	2.58	27 %	Not quantified due to limited data. Tolerance probably substantial.	Overly restrictive.[d]
South Central (10)	.97	1.68	.71	16%	Relatively small SO_2 emissions suggests tolerance is substantial	Probably overly restrictive.
South Eastern (11)	2.24	2.47	.23	4 %	1.2 x 10^3 tons/yr (conservative)	Overly restrictive

[a] Projected fuel combustion emissions for 1975 were assumed to be the sum of those tabulated in Appendix C and D with the following adjustments: Those sources which were out of compliance with emission regulations were assigned a 1975 level equivalent to source operation at the emission regulation limit. No growth was assumed for the purpose of these calculations.

[b] These emissions have been calculated in Appendix C and D.

[c] The restrictiveness of the combustion emission regulations is judged by comparing the increase in 1975 fuel burning emissions caused by operation at regulation limits with the "emission tolerance" the AQCR is appraised to have (Table A-10). If the increase exceeds the emission tolerance, then it is clear that the regulations are not overly restrictive. When the increase does not exceed the emission tolerance, the regulations may be relaxed to allow higher emission rates. When no emission tolerance has been desired, a qualitative assessment of the regulations is included.

[d] Fuel combustion operations are presently emitting SO_2 well below the ceiling permitted by regulations. In raising these emissions to the regulation limit (by the use of alternative or higher sulfur fuels), substantial increases of SO_2 would be released to the atmosphere. It would appear that these increases could be tolerated without jeopardizing maintenance of the air quality standards.

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(Please read Instructions on the reverse before completing)

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16. ABSTRACT

Section IV of the Energy Supply and Environmental Coordination Act of 1974, (ESECA) 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 interferring with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

17. KEY WORDS AND DOCUMENT ANALYSIS

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