State of California
AIR RESOURCES BOARD

Resolution 81-14

March 26, 1981

WHEREAS, a solicited research Proposal Number 81-14 entitled "Review and Analysis of Special Accounting Practices, Tax Laws and Other Financial Considerations Applicable to Selected California Industries" has been submitted by Price Waterhouse and Company to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding the proposal:

> Proposal Number 81-14 entitled "Review and Analysis of Special Accounting Practices, Tax Laws and Other Financial Considerations Applicable to Selected California Industries" submitted by Price Waterhouse and Company for an amount not to exceed $64,110;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board under the powers and authority granted by the Health and Safety Code, Section 39705, hereby accepts the recommendation of the Research Screening Committee and approves the following proposal:

> Proposal Number 81-14 entitled "Review and Analysis of Special Accounting Practices, Tax Laws and Other Financial Considerations Applicable to Selected California Industries" submitted by Price Waterhouse and Company for an amount not to exceed $64,110.

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $64,110.

I certify that the above is a true and correct copy of Resolution 81-14 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.2
DATE: March 26, 1981

ITEM: Research Proposal 996-81 entitled "Review and Analysis of Special Accounting Practices, Tax Laws, and Other Financial Considerations Applicable to Selected California Industries"

RECOMMENDATION: Adopt Resolution 81-14, approving Research Proposal 996-81 for funding in an amount not to exceed $64,110.

SUMMARY: This proposal if funded would be for a nine month study to investigate the accounting, tax, and financial practices used in California industries. This would result in a comprehensive reference guide to assist the Air Resources Board in determining the "bottom line" costs for an industrial company to comply with the Board's air pollution abatement requirements. The reference guide will be developed by using published sources of financial information and by utilizing the expertise of Price Waterhouse (PW), industry specialists, representatives of firms from within the industries being studied, and individuals from institutions familiar with the industries. Because the literature is boundless, PW industry specialists will provide direction to the appropriate areas of research. Local staff will then research the general and industry literature both within and outside PW, the findings will be summarized and discussed with ARB staff and then reviewed by appropriate industry, trade association, and institutional representatives before the report of their findings is written.

The specific industries to be researched are the electrical utilities; petroleum producers, refiners and marketers; chemical manufacturing; and other manufacturing industries to be selected in consultation with staff. Some sources and items to be examined are: Financial Accounting Standards Board, American Institute of Certified Public Accountants, Securities and Exchange Commission, Internal Revenue Code, PW tax checklists, California Franchise Tax Board, California Public Utilities Commission, large versus small firms, ranges of the cost of capital within each industry, variables likely to change the industries' cost of capital in the future, and financing methods available in each industry.

State of California
AIR RESOURCES BOARD

Resolution 81-15

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, a solicited research Proposal Number 999-81 entitled, "Study of Emissions Impact of Selected Aftermarket Parts" has been submitted by Custom Engineering Performance and Emissions Laboratories to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

- Proposal Number 999-81 entitled, "Study of Emissions Impact of Selected Aftermarket Parts," submitted by the Custom Engineering Performance and Emissions Laboratories for an amount not to exceed $71,022.

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 999-81 entitled, "Study of Emissions Impact of Selected Aftermarket Parts," submitted by the Custom Engineering Performance and Emissions Laboratories for an amount not to exceed $71,022.

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $71,022.

I certify that the above is a true and correct copy of Resolution as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.3
DATE: March 26, 1981

ITEM: Research Proposal 999-81 entitled, "Study of Emissions Impact of Selected Aftermarket Parts."

RECOMMENDATION: Adopt Resolution 81-15, approving research Proposal 999-81 for funding in an amount not to exceed $71,022.

SUMMARY:

Section 27156 of the California Vehicle Code requires that any add-on or modified part which alters or modifies the original design or performance of a vehicle's emission control system be exempted by the Air Resources Board before it can be legally sold for installation on on-road motor vehicles. The number of such devices sold and installed illegally and their impact on emissions has not be adequately determined.

The purpose of this study is to determine the volume and pattern of sales of selected aftermarket parts in California, the differences in emissions between vehicles in the unmodified and modified state, and the factor(s) which contribute to changes in emission levels. Sales and usage data will be obtained for exhaust headers, modified intake manifolds, turbochargers, modified ignition distributors, modified cam-shafts and replacement carburetors. On the basis of the survey, six vehicles will be selected and tested (two for each type of aftermarket part) to determine the effects of exhaust headers, modified intake manifolds, and turbochargers on exhaust levels, fuel economy and driveability. For each device, the first vehicle is to be the one most likely to be modified with the particular part, and the second is to represent the "worst case" application on the basis of potential adverse effect upon emissions.

State of California
AIR RESOURCES BOARD

Resolution 81-16

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 980-81 entitled "Deposition of Particles in Children's Lungs" has been submitted by the University of California at Irvine to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 980-81 entitled "Deposition of Particles in Children's Lungs" has been submitted by the University of California at Irvine for an amount not to exceed $103,425;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 980-81 entitled "Deposition of Particles in Children's Lungs" submitted by the University of California at Irvine for an amount not to exceed $103,425,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $103,425.

I certify that the above is a true and correct copy of Resolution 81-16 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.4
DATE: March 26, 1981

ITEM: Research Proposal No. 980-81 entitled "Deposition of Particles in Children's Lungs".

RECOMMENDATION: Adopt Resolution 81-16 approving Research Proposal No. 980-81 for funding not to exceed $103,425.

SUMMARY: Particulate matter suspended in the air we breathe has been associated with harm to human health for many years. Numerous regulations have been adopted to limit exposures in both the occupational and ambient environment. Research into the health effects of particulate matter has shown that several factors influence the relative risks imposed upon inhalation. These include particle size, chemical composition and physical properties and complex functional parameters of the human lung. Models have been developed to predict how particles behave in the lung and thus to aid in risk assessment. The most notable application of particle deposition to date has been in the occupational setting, which has been limited to healthy young adult males. More sensitive elements of the population require further consideration and protection.

Most scientists believe that children constitute one such sensitive portion of the population. Children exhibit breathing patterns different from adults; they generally inhale more air (and pollution) per pound of body weight than adults; and they often spend a larger fraction of their day out of doors. In addition it is thought that the effects of inhaled pollution could have a more severe effect on a developing lung than on the fully developed lung.

The objective of this proposal is to gather data on how particulate matter deposits in the lungs of children of various ages. These data will be applied to calibrate and verify existing deposition models developed for the adult lung.

This proposal consists of two closely related parts. The first involves casting and studying the lungs of age-segregated child autopsy cases. Approximately 25 to 30 casts would be made. The Los Angeles County Coroner has

agreed to assist in this effort by making the needed cadavers available for the effort. The proponent would fill the lung airways to make a negative cast, either in situ or in lungs excised under controlled conditions. These negative casts would undergo extensive measurement efforts to provide information needed for later modeling efforts. Positive casts would then be made from the negatives to produce hollow airways to be used for deposition studies to determine the pattern of particle deposition by size.

The data collected in the effort described above, together with other available information related to children, will be applied to various deposition models presently in use for adults in the second portion of this study. Adjustments of such models to reflect collected data will be applied to children.

The information to be gained from the proposed effort will provide a basis for a more fully protective fine-particle air quality standard. Moreover, we expect that information gained in this study on deposition in children would help in the design of future epidemiological studies.

State of California
AIR RESOURCES BOARD

Resolution 81-17

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 982-81 entitled "The Influence of Exercise on Lung Injury from Exposure to Ozone" has been submitted by the University of California at Irvine to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval and;

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 982-81 entitled "The Influence of Exercise on Lung Injury from Exposure to Ozone" submitted by the University of California at Irvine for an amount not to exceed $100,000;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 982-81 entitled "The Influence of Exercise on Lung Injury from Exposure to Ozone" submitted by the University of California at Irvine for an amount not to exceed $100,000,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $100,000.

I certify that the above is a true and correct copy of Resolution 81-17 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.5
DATE: March 26, 1981

ITEM: Research Proposal No. 982-81 entitled "The Influence of Exercise on Lung Injury from Exposure to Ozone".

RECOMMENDATION: Adopt Resolution 81-17 approving Research Proposal No. 982-81 for funding not to exceed $100,000

SUMMARY:

Exercise is known to influence pulmonary functional performance of human subjects undergoing ozone exposures. In accordance with theory, results of such tests show that an increase in ventilatory rate results in an increase of dose of ozone. Studies have also shown that athletic performance can be adversely affected on high oxidant days. What is not known is the type and extent of tissue damage accompanying the changes. Such a determination can be obtained by using laboratory test animals which are exposed under controlled exercise, sacrificed and studied for tissue damage.

Previous studies by the proponent have demonstrated responses to ozone exposures as low as 0.4 ppm administered over 4 hour periods of exercise. Lesions were seen at a rate 8 times higher than seen in resting rats. Ozone levels of 0.8 ppm produced death in many exercising rats. It has also been shown that rats will actively avoid ozone exposure at levels as low as 0.2 ppm over a six-hour period. This study will follow up on such observations and extend exposures to lower concentrations. Limited efforts will also be undertaken to relate tissue damage to ventilatory volumes.

This study would involve exposing rats to atmospheres containing ozone. Exercise stress would be included as a variable to investigate previous observations of enhanced sensitivity to ozone in exercising rats.

Rats will be trained to run on treadmills for a period of four hours through a series of trials that employ shock as a stimulus to perform. "Qualified" rats would be exposed for four hours to ozone at 0.35, 0.20 and 0.15 ppm and to ozone free air. Three groups of rats will be used for each exposure level. Each group will receive a different exercise/rest protocol in order to distinguish the impact of the different workloads and therefore different ventilatory rates on tissue damage.

Rats will also be tested to determine if their maximal workload capabilities are affected by the ozone exposure. This will be done by testing rats on the day before and the day following the above described ozone treatment. They will be placed on a variable-speed, variable-slope treadmill. The angle and speed will be increased until the rats fail to continue running and accept shocks.

Lung damage will be studied in exposed rats by killing them two days post exposure and examining prepared lung sections microscopically for lesions in the alveolar region and "free" cells in air spaces. The lung sections will be scored on a graded scale relating to the type of damage and the amount of the lung involved. Workload measurements would then be used to relate damage observations to ventilatory rates on the basis of published relationships between workload and ventilatory rate.

The proposed study would replicate and greatly extend previous exercise protocols and attempt to relate microstructural damage, and work output levels to ozone exposure. The outcome of the study will add to our understanding of health risks to humans in varying levels of exercise/work in the outdoor environment.

State of California
AIR RESOURCES BOARD

Resolution 81-18

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 981-81 entitled, "Monitoring of Mutagens and Carcinogens in Community Air", has been submitted by the Air and Industrial Hygiene Laboratory Section, California Department of Health Services to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 981-81 entitled, "Monitoring of Mutagens and Carcinogens in Community Air", submitted by the Air and Industrial Hygiene Laboratory Section, California Department of Health Services for an amount not to exceed $82,650;

NOW, THEREFORE, BE IT RESOLVED, that the Air resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 981-81 entitled, "Monitoring of Mutagens and Carcinogens in Community Air", submitted by the Air and Industrial Hygiene Laboratory Section, California Department of Health Services for an amount not to exceed $82,650,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $82,650.

I certify that the above is a true and correct copy of Resolution 81-18 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.6
DATE: March 26, 1981

ITEM: Research Proposal No. 981-81 entitled "Monitoring of Mutagens and Carcinogens in Community Air".

RECOMMENDATION: Adopt Resolution 81-18 approving Research Proposal No. 981-81 for funding in an amount not to exceed $82,650.

SUMMARY: The research project proposed by the California Department of Health Services will assess the mutagenic potency of suspended particulate matter in Contra Costa County, an area that has been identified as having high rates of lung cancer. The objectives of this research project include:

1. An analysis of a broad spectrum on organic molecules to better reconcile the chemical data and the observed mutagenicities. The analysis will include polycyclic aromatic hydrocarbons (PAH) and polycyclic organic matter (POM) (e.g., nitro-substituted and oxygenated PAH),
2. The use of chemical signatures in the collected samples to better identify possible sources of carcinogens and mutagens in ambient air,
3. An analysis of three periods of intensive sampling periods designed to investigate possible sources of mutagenic aerosols in ambient air, and
4. The further integration of the chemical and biochemical data into an ongoing epidemiological cancer study in Contra Costa County.

This study proposes to apply the Ames Salmonella mutagenicity test to particulate samples collected in Contra Costa County. These samples will be examined for the presence of POM in an attempt to further identify the chemicals responsible for the observed mutagenic activity. A completed analysis of five PAH's for mutagenic activity showed that these represent only about 2 percent of the total mutagenic activity in ambient air. Thus, the principal sources of mutagens currently remain obscure. In the present research study, unsubstituted, nitro-substituted and oxygenated PAH as well as heterocyclic compounds (e.g., benzacridine) will be tested to elucidate the "excess mutagenicity"

question. In addition to the standard Ames Salmonella tester strains, recently developed nitroreductase mutant strains will be used to indicate the presence of mutagenic nitrosated organics in the air samples.

This study will be carried out in two phases. One phase will provide the baseline information and will consist of hi-vol collection of particulate at three locations in Contra Costa County (Richmond, Concord, and Pittsburg).

Samples will be analyzed for mutagenicity and selected POM as well as total suspended particulate, lead, benzene-soluble organics, sulfates and nitrates. The filter samples from each location will be composited over three four-month intervals: July-October 1981; November 1981-February 1982; March-June 1982. Samples collected for POM and mutagenicity testing will be subjected to special handling. Following collection, these filters will be immediately wrapped in aluminum foil, sealed in envelopes, and refrigerated. They will be transported and stored cold prior to testing. These special procedures may prove critical since preliminary studies indicated that significant losses of organics may occur when filters are stored at room temperature.

The second phase will consist of three periods of intensive sampling and analysis. This phase is designed to identify possible sources of mutagenic material and determine the diurnal and seasonal variations of ambient aerosols. The analysis will include measurements of total particulate mass, sulfates, nitrates, lead, organics, mutagenicity, POM, and multielemental analysis. The analysis will also include concurrent concentrations of the following gaseous pollutants: nitric oxide, nitrogen dioxide, carbon monoxide, sulfur dioxide and ozone. The intensive phase will be conducted on days when meteorological conditions are as follows:

Winter: Air drainage from the east, 0-200 m inversion height. Typically high TSP and NO_2 days in November through January.

Summer: Westerly flow, inversion heigh 200-500 m. Sample during the occurrence of high oxidant days in July through August.

Fall: Stagnant air mass, weak variable winds,

State of California
AIR RESOURCES BOARD

Resolution 81-19

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 1014-81 entitled "Cumulative Effects of Acid Rain on Plant Productivity and Soil Nutrient Supply Under California Conditions", has been submitted by the University of California at Berkeley to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 1014-81 entitled "Cumulative Effects of Acid Rain on Plant Productivity and Soil Nutrient Supply Under California Conditions" submitted by the University of California at Berkeley for an amount not to exceed $129,750;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 1014-81 entitled "Cumulative Effects of Acid Rain on Plant Productivity and Soil Nutrient Supply Under California Conditions" submitted by the University of California at Berkeley for an amount not to exceed $129,750,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $129,750.

I certify that the above is a true and correct copy of Resolution 81-19 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO.: 81-5-3 b.7
DATE: March 26, 1981

ITEM: Research Proposal No. 1014-81 entitled "Cumulative Effects of Acid Rain on Plant Productivity and Soil Nutrient Supply Under California Conditions".

RECOMMENDATION: Adopt Resolution 81-19 approving Research Proposal No. 1014-81 for funding in an amount not to exceed $129,750.

SUMMARY: Damage from acid precipitation to aquatic ecosystems in Sweden and New York State has been well documented. The effects of acid precipitation on vegetation are not yet fully understood, but an extensive research effort is currently under way in the U.S. to assess potential problems.

Sponsored by ARB, the proponent initially surveyed various locations in California and demonstrated the occurrence of acid precipitation in some areas of the State. Further ARB-sponsored research by the proponent demonstrated that simulated acid precipitation (pH 2.0) injured foliage and stimulated unfertilized barley and clover growth, probably by supplying plants with nitrogen and sulfur. This "fertilizer effect" of acid precipitation was not observed when customary amounts of nitrogen and sulfur fertilizers were added to the soil but the adverse effects persisted.

The results of the research imply that short term effects of acid deposition on soils could either stimulate plant growth by nutrient release or damage plant growth by toxic element release. In the long term, however, plant growth is only likely to be impaired because the toxic element aluminum, which is mobilized by acid, is so abundant in soil and could be taken up by plants subjected to acid precipitation for a very extended time. Manganese concentrations could also become sufficiently available to become toxic in some soils.

Two range plants and two forest tree species, both economically important in California, will be grown in soil and subjected to different acid precipitation levels at pH 3.0 and above. The cumulative effects of acid precipitation on plant productivity will be determined after two sequential harvests of the tree species and eight

sequential harvests of the range plants. Soil nutrient levels and pH will be determined after each harvest to determine if toxic minerals accumulate or if essential plant nutrients are solubilized and thus subject to leaching. The important soil-microbe mediated process of nitrification, denitrification and rate of organic matter decomposition will be monitored to determine if acid precipitation is adversely affecting the conversion of soil nitrogen into forms usable by the plant.

The proposed work would provide useful information to the ARB for assessing the impact of acid precipitation on California plant-soil-microbe systems. The study would extend our knowledge in two areas: 1) the cumulative effects of acid precipitation and 2) the effects of acid precipitation on the integrated plant-soil-microbe system.

State of California
AIR RESOURCES BOARD

Resolution 81-20

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 1013-81 entitled "Effects of Ozone and Sulfur Dioxide Mixtures on Forest Vegetation of the Southern Sierra Nevada" has been submitted by the University of California at Riverside to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 1013-81 entitled "Effects of Ozone and Sulfur Dioxide Mixtures on Forest Vegetation of the Southern Sierra Nevada" submitted by the University of California at Riverside for an amount not to exceed $141,318;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 1013-81 entitled "Effects of Ozone and Sulfur Dioxide Mixtures on Forest Vegetation of the Southern Sierra Nevada" submitted by the University of California at Riverside for an amount not to exceed $141,318,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $141,318.

I certify that the above is a true and correct copy of Resolution 81-20 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.8
DATE: March 26, 1981

ITEM: Research Proposal No. 1013-81 entitled "Effects of Ozone and Sulfur Dioxide Mixtures on Forest Vegetation of the Southern Sierra Nevada"

RECOMMENDATION: Adopt Resolution 81-20 approving Research Proposal No. 1013-81 for funding in an amount not to exceed $141,318.

SUMMARY: Relatively high ozone concentrations occur on the eastern slope of the Sierra Nevada Mountains due to transport of ozone and ozone precursors from urban areas of the Central Valley. Scattered surveys in the mountain areas have reported widespread foliar injury from ozone on various tree species. Oil production operations in Kern County generate sulfur dioxide, which is also transported to the eastern slope of the mountains. Sulfur dioxide from smelters and other sources in the U.S. and Canada has also been reported to cause extensive foliar injury on tree species. The forest vegetation in the Sequoia National Forest east of Bakersfield, is impacted by both ozone and sulfur dioxide; yet, no studies have been carried out on the effects of ozone - sulfur dioxide mixtures on forest vegetation in the area.

Research in Canada over a 10-year period demonstrated a high correlation between foliar injury and foliar sulfur content of forest vegetation as a function of distance from the pollutant source, plant species and leaf age. Other Canadian research has shown that sulfur isotope ratios may be useful for determining the source of sulfur in the plant, i.e. fossil fuels or the earth's crust. These techniques may also help determine if mixtures of ozone and sulfur dioxide act additively, synergistically, or antagonistically in terms of California forest vegetation growth and injury.

This study is divided into a field phase and a controlled fumigation phase. The field phase includes gathering soil and foliage samples from locations in the Sequoia National Forest at various distances from SO_2 sources. Samples will be analyzed for sulfur content to develop and apply diagnostic standards for interpreting the effects of ozone-sulfur dioxide mixtures on foliar injury. Ambient concentrations of ozone and sulfur dioxide will also be monitored in the

Sequoia National Forest. Representative samples of soil and foliage will be analyzed for $^{34}S/^{32}S$ ratios to investigate the diagnostic potential of stable sulfur isotopes for determining the source of sulfur metabolized by plants.

The controlled fumigation phase includes exposing several tree species to known concentrations of mixtures of ozone and sulfur dioxide. Foliage from fumigated plants will be analyzed for sulfur content and foliar injury, and growth effects will be correlated with sulfur content. The controlled fumigations will provide data on known concentrations of ozone and sulfur dioxide so the field data can be interpreted.

Correlating foliar sulfur content with injury or damage to plants could help establish threshold doses for sulfur injury for various plant species and provide a ready indicator of atmospheric sulfur inputs. The study may also help determine if the combined ozone-sulfur dioxide air quality standard adequately protects forest vegetation. The determination of $^{34}S/^{32}S$ ratios may be a useful tool for establishing relationships between pollutant sources and receptors.

State of California
AIR RESOURCES BOARD

Resolution 81-21

March 26, 1981

WHEREAS, an unsolicited research Proposal number 1012-81 entitled "Chemical Nature of Particulate Atmospheric Mutagens in California's South Coast Air Basin" has been submitted by the University of California, Riverside to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding the proposal:

> Proposal Number 1012-81 entitled "Chemical Nature of Particulate Atmospheric Mutagens in California's South Coast Air Basin" submitted by the University of California, Riverside for an amount not to exceed $144,816;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board under the powers and authority granted by the Health and Safety Code, Section 39705, hereby accepts the recommendation of the Research Screening Committee and approves the following proposal:

> Proposal Number 1012-81 entitled "Chemical Nature of Particulate Atmospheric Mutagens in California's South Coast Air Basin" submitted by the University of California, Riverside for an amount not to exceed $144,816.

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $144,816.

I certify that the above is a true and correct copy of Resolution 81-21 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.9
DATE: March 26, 1981

ITEM: Research Proposal No. 1012-81 entitled "Chemical Nature of Particulate Atmospheric Mutagens in California's South Coast Air Basin."

RECOMMENDATION: Adopt Resolution 81-21 approving Research Proposal No. 1012-81 for funding in an amount not to exceed $144,816.

SUMMARY: Significant ambient levels of particulate organic matter (POM) are found in California's major air basins; these levels may increase in the 1980s with the increasing popularity of diesel light duty motor vehicles (LDMV) and additional coal-fired power plants. POM contains polycyclic aromatic hydrocarbons (PAH), some of which are potent animal carcinogens (e.g., benzo(a)pyrene (BaP)). Furthermore, these compounds are predominantly associated with small particles (<1 μm) that can be inhaled and deposited in lungs of humans.

The investigators at the Statewide Air Pollution Research Center, U.C. Riverside, have demonstrated that a significant level of direct mutagenicity occurs in the particulate organic matter (POM) collected at various representative locations throughout the South Coast Air Basin. The investigators have shown that this mutagenic activity is not caused by the "classical" polycyclic aromatic hydrocarbons such as benzo(a)pyrene. Three possible sources of this mutagenicity are currently under consideration. These are: 1) an unidentified PAH formed during the combustion process; 2) reaction products of the particulate organic material formed in the atmosphere; or 3) reactions that may occur on filter surfaces during the collection of the POM.

In order to gain information concerning the identity of the chemical components responsible for mutagenicity and to gain insight concerning the mechanisms by which these compounds are formed, the following objectives are proposed:

1) To conduct a search for the compounds in ambient particulate matter in the South Coast Air Basin

that are responsible for the high level of mutagenic activity observed in previous studies.

2. To isolate and characterize compounds present in ambient particulate matter and suspected of being highly mutagenic.

3. Develop methods for sampling aerosol material that will minimize the possibility of forming mutagenic material while the particles are on the filter.

4. To initiate studies of the role of diesel exhaust in the formation of mutagenic particulate material.

The results of this study will be used by the scientific community to improve their sampling methods so that oxidation and/or nitration of the particulate material on the filter is minimized, and ultimately by the Board to develop a control strategy and appropriate regulations to minimize exposure of the public to mutagenic particulate materials.

State of California
AIR RESOURCES BOARD

Resolution 81-22

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 1017-81 entitled "Correlative and Sensitive Discriminants for Air Pollution Control has been submitted by the Professional Staff Association of Los Angeles/University of Southern California to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 1017-81 entitled "Correlative and Sensitive Discriminants for Air Pollution Control" submitted by the Professional Staff Association of Los Angeles/University of Southern California for an amount not to exceed $58,792;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 1017-81 entitled "Correlative and Sensitive Discriminants for Air Pollution Control" submitted by the Professional Staff Association of Los Angeles/University of Southern California for an amount not to exceed $58,792,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount no to exceed $58,792.

I certify that the above is a true and correct copy of Resolution 81-22 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.10
DATE: March 26, 1981

ITEM: Research Proposal No. 1017-81 entitled "Correlative and Sensitive Discriminants for Air Pollution Control".

RECOMMENDATION: Adopt Resolution 81-22 approving Research Proposal No. 1017-81 for funding in an amount not to exceed $58,792.

SUMMARY:

Nitrogen dioxide (NO_2) has frequently been said to be far less toxic than ozone. This assertion is based on several comparisons, some of which are indirect. Even direct comparisons, however, may not be appropriate because of probable differences in the modes of action of ozone and NO_2. Clearly, further work with NO_2 is needed to resolve this question.

The results of studies by the proponent and others have recently provided data that this major constituent of photochemical smog is capable of producing potentially adverse effects at levels approaching those at which ozone has been shown to have an adverse effect. The proponent has demonstrated cellular level changes in lung structure following intermittent exposures to 0.3 ppm NO_2. These cellular alterations can be seen for as long as 10 weeks after the exposures have stopped. The kinds of structural and cellular alterations detected by the proponent are thought to be similar, if not the same as, those seen in the early stages of certain lung diseases where usable air exchange volumes are destroyed. In addition, very consistent spleen-weight changes have been seen in animals exposed to NO_2.

This proposal is simple in concept and design. It consists of placing 100 pregnant mice into a filtered air control chamber and 100 pregnant mice into exposure chambers. They will deliver nearly simultaneously in the chambers. NO_2 exposures will be at 0.35 ppm for the 12 weeks following delivery. The exposure will be for 7 hours a day, 5 days a week. At the end of the twelve week exposure period and at weeks 4, 10, 20 and 32 after the exposure period has been stopped, mice will be removed from each group and killed. Lungs will be removed, preserved and prepared for microscopic study. Alveolar cell type changes as well as alveolar structure will be determined using the image analysis.

Limited study of subcellular components of alveolar cells will also be pursued. Spleen weights will also be measured on all animals. These four parameters, i.e., alveolar cell changes, alveolar structure, subcellular changes and spleen weights, have all been shown to be sensitive indicators of NO_2 exposure. The proposed study will provide valuable information relating to what extent the effects of NO_2 exposures seen in previous studies persist over time and whether or not they are reversible. Such information adds key pieces of information to the previous work. The results of this and earlier studies will serve as a basis for reconsideration of the ambient air quality standards for NO_2.

State of California
AIR RESOURCES BOARD

Resolution 81-23

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 1018-81 entitled, "Chemical Consequences of Air Quality Standards and of Control Implementation Programs" has been submitted by the University of California, Riverside to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommended for funding:

> Proposal Number 1018-81 entitled, "Chemical Consequences of Air Quality Standards and of Control Implementation Programs" submitted by the University of California, Riverside for an amount not to exceed $154,366;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 1018-81 entitled, "Chemical Consequences of Air Quality Standards and of Control Implementation Programs," submitted by the University of California, Riverside for an amount not to exceed $154,366,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $154,366.

I certify that the above is a true and correct copy of Resolution 81-23 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.11
DATE: March 26, 1981

ITEM: Research Proposal No. 1018-81 entitled "Chemical Consequences of Air Quality Standards and of Control Implementation Plans"

RECOMMENDATION: Adopt Resolution 81-23 approving Research Proposal No. 1018-81 for funding in an amount not to exceed $154,366.

SUMMARY:

The smog chamber facility at the Statewide Air Pollution Research Center (SAPEC) at U.C. Riverside will be used for a three element project to: (1) Investigate the source of "chamber effects" which have, at times, made chamber data difficult to interpret and required that empirical corrections be made when smog chamber data are used in control strategy designs and models. (2) Quantify the smog forming potential of relatively inert long-chain hydrocarbons typical of those found in diesel and jet fuels. (3) Measure the reactivity and identify the reaction products of benzene and other aromatic hydrocarbons. Each of these elements are discussed in more detail below.

For nearly ten years it has been recognized that smog chamber studies do not fully agree with photochemical smog reactions, measured in the ambient air. More recently, it has been determined that smog chambers have some unknown source of free radicals. These transient but highly reactive chemical fragments perturb the rates of appearance or disappearance of the various species such as hydrocarbons, nitrogen oxides, and ozone, formed or consumed in the chamber. Research to explain this phenomemon was begun as a part of the 1979-80 research project funded by the ARB. Dr. Pitts and his co-workers plan to conclude this investigation of chamber radical sources by experimentally determining the magnitude of this source of radicals in both the all-Teflon and all-glass configurations of the Riverside 6000-liter chamber.

As a result of a number of hydrocarbon substitution measures beginning with Rule 66, as well as for other reasons, the emissions of "low reactivity" relative to "high reactivity" hydrocarbons and solvents is increasing. The chamber radical source effects would be expected to result in overprediction of the relative reactivities of these "low-reactivity" compounds in standardized tests now

being developed. To better understand these effects and to provide important data for the state-of-the-art urban airshed computer models, the investigators propose to investigate the atmospheric chemistry of the higher alkanes which are important constituents of gasoline, diesel, and jet fuels.

Finally, the investigators propose to study the photochemical reactions and the reaction products of benzene. This compound is of particular interest because of the widespread use of benzene (and its derivatives) as fuels and solvents and especially because benzene (and many of its polycyclic derivates) are known carcinogens. Additionally, knowledge of the reaction products formed by the NOx-air-benzene irradiation will provide important clues to the type of compounds that may be of importance to the SAPRC mutagen study.

State of California
AIR RESOURCES BOARD

Resolution 81-24

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 1016-81 entitled "Effects of Air Pollution on Airway Function" has been submitted by the University of California at San Francisco to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 1016-81 entitled "Effects of Air Pollution on Airway Function" submitted by the University of California at San Francisco for an amount not to exceed $126,989;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 1016-81 entitled "Effects of Air Pollution on Airway Function" submitted by the University of California at San Francisco for an amount not to exceed $126,989,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $126,989.

I certify that the above is a true and correct copy of Resolution 81-24 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.12
DATE: March 26, 1981

ITEM: Research Proposal No. 1016-81 entitled "Effects of Air Pollution on Airway Function".

RECOMMENDATION: Adopt Resolution 81-24 approving Research Proposal No. 1016-81 for funding in an amount not to exceed $126,989.

SUMMARY:

Sulfur dioxide has long been known to affect adversely the human respiratory system. Persons with existing lung diseases appear to be most sensitive to this pollutant.

The proponent has been pursuing research with low levels of SO_2 employing both normal and asthmatic subjects. Work to date has produced some striking findings that have raised questions regarding the adequacy of the protection provided by current SO_2 standards.

These key results have been obtained in lightly exercising asymtomatic asthma subjects: ten-minute exposures to as little as 0.1 ppm SO_2 have been shown to produce bronchoconstriction in some asthmatics. The implications of these findings have caused the studies to be closely scrutinized and, as a result, questions have been raised that might be addressed in further exposure work. Most of the questions here has centered about the suitability of mouthpiece delivery of the air containing SO_2. Many physicians believe that the nose plays an important role in removal of SO_2 before the pollutant reaches the lung so that these studies underestimate the threshold level for the response. Questions have also been raised as to what might be seen if higher exercise rates are employed.

Previous studies by the proponent have indicated that both ozone and SO_2 produce bronchoconstriction. It is therefore suspected that combined exposure to the two pollutants might results in interactive effects. Previous experiments done by the proponents on human subjects were inconclusive.

This proposal has three main objectives. They are: (1) to compare the influence of mouth and nose breathing on SO_2 responses (2) to study the implication of increased workload and thus higher

ventilatory rate on SO_2 responses of human subjects and (3) to study the effects of combined SO_2 and ozone on experimental animals. The end points to be observed in all experiments involving humans are indices of airway constriction.

Four experiments are proposed to address these objectives.

Experiment 1 - It is the intent of the proponent to study the responses of mildly asthmatic subjects to SO_2 at 0.5 to 1 ppm breather through the mouth or nose for 10 minutes. This will be achieved with a mask that allows suppression of either oral or nasal breathing.

Experiment 2 - This study will investigate the response of asthmatics to low levels of SO_2 under moderate and heavy workloads. Six to ten mildly asthmatic subjects will perform light, moderate and heavy exercise loads for 5 to 10 minutes in purified moist air with 0.25 ppm SO_2.

Experiment 3 - This study would involve the use of atropine, a broncho-dilator, to study the mechanisms involved in producing the observed airway resistance increases following SO_2 exposures in the range of 0.5 - 1 ppm. Asthamatic subjects will be employed in these experiments.

Experiment 4 - This study will determine whether any interaction between ozone and SO_2 can be demonstrated employing pulmonary functional tests. Dogs will be used as subjects for this effort. Previous studies by the proponents using human subjects produced indications of interactions but they were difficult to reproduce. The proponent has demonstrated that SO_2 and O_3 alone produce similar bronchoconstriction and that similar mechanisms may be involved. If this is so, it is possible that, under proper conditions, they might interact to produce increased airway resistance and other function changes.

State of California
AIR RESOURCES BOARD

Resolution 81-25

March 24, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 1018-81 entitled "Characterization of Reactants, Reaction Mechanisms and Reaction Products Leading to Extreme Acid Rain and Acid Aerosol Conditions in Southern California," has been submitted by the Meteorology Research Inc., to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 1018-81 entitled, "Characterization of Reactants, Reaction Mechanisms and Reaction Products Leading to Extreme Acid Rain and Acid Aerosol Conditions in Southern California," submitted by the Meteorology Research Inc., ($100,731) with a contribution from California Institute of Technology ($76,917) for a total amount not to exceed ($177,648);

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authoity granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 1018-81 entitled, "Characterization of Reactants, Reaction Mechanisms and Reaction Products Leading to Extreme Acid Rain and Acid Aerosol Conditions in Southern California," submitted by the Meteorology Research Inc., ($100,731) with a contribution from California Institute of Technology ($76,917) for a total amount not to exceed ($177,648),

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $177,648.

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.13
DATE: March 26, 1981

ITEM: Research Proposal No. 1018-81 entitled "Characterization of Reactants, Reaction Mechanisms and Reaction Products Leading to Extreme Acid Rain and Acid Aerosol Conditions in Southern California."

RECOMMENDATION: Adopt Resolution 81-25 approving proposal No. 1018-81 for funding in an amount not to exceed $177,648.

SUMMARY:

The rainfall of the South Coast Air Basin has been shown to be acidic, i.e., to have a pH less than 5.6, as a result of nitric and sulfuric acids present in the atmosphere. The sulfuric and nitric acid content of rainfall is specifically correlated with atmospheric oxidant levels. Highest acidity, nitrate and sulfate concentrations are exhibited during low precipitation intensity episodes. In September 1978, the pH of an individual storm event in Pasadena was 2.89, a value nearly 1000 times more acidic than the unpolluted background value. The South Coast Air Basin has the highest annual number of days of heavy fog in the county. This fact, in combination with the high levels of SO_2, NOx, and oxidants in the South Coast Air Basin means that the potential for acidic gas and dews certainly exists in Southern California.

The objectives of this project are to: 1) determine the composition of cloud droplets and submicron aerosol during conditions of extreme acidity in Los Angeles; 2) determine the relationship of pH, strong acid and oxidant concentrations in cloud and precipitation water samples; 3) investigate hypothesized sulfur or nitrogen oxidation mechanisms of acidity formation; 4) demonstrate the occurence of non-photochemical oxidation processes.

During this study airborne sampling will be carried out during two week-long intensive periods over the South Coast Air Basin. Sampling will be done during periods of high acidity, i.e., stratus conditions, during periods of relative stagnation. At the same time three surface-based sampling sites will be operated to collect cloud water, mist and rain water. One the three sites, at Caltech, will be operated for a one-year period during periods of fog, mist and light rain.

Chemical analysis of the cloud and rain water and aerosol samples will performed in order to understand the relationships between aerosols and cloudwater chemistry. Mechanisms will be proposed to explain the oxidation rates, pH levels, and sulfate and nitrate levels found during this study.

This study will provide valuable information on the oxidation of NOx and SO_2 and their incorporation into cloud water. The proposal work will increase our understanding of the chemistry of formation of acid precipitation and acidic aerosols in the atmosphere.

This information will assist the Board in developing strategies to reduce both acid precipitation and atmospheric acidity to acceptable levels.

State of California
AIR RESOURCES BOARD

Resolution 81-26

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, a solicited research Proposal Number 962-80 entitled, "A Study of Components Influencing the Deterioration of Vehicle Emission Control Systems," has been submitted by Olson Engineering, Inc. to the Air Resources Board; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 962-80 entitled, "A Study of Components Influencing the Deterioration of Vehicle Emission Control Systems," submitted by Olson Engineering, Inc. for an amount not to exceed $91,676;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 962-80 entitled, "A Study of Components Influencing the Deterioration of Vehicle Emission Control Systems," submitted by Olson Engineering, Inc. for an amount not to exceed $91,676,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $91,676.

I certify that the above is a true and correct copy of Resolution 81-26 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.14
DATE: March 26, 1981

ITEM: Research Proposal 962-80 entitled, "A Study of Components Influencing the Deterioration of Vehicle Emission Control Systems."

RECOMMENDATION: Adopt Resolution 81-26, approving Research Proposal 962-80 for funding in an amount not to exceed $91,676.

SUMMARY: The objective of this study is to identify the critical emission control parameters which influence in-use vehicle emissions. This is to be accomplished by a more detailed investigation of twenty ARB surveillance test vehicles that are found to emit excessive emissions due to unidentified or uncertain causes. The components specified by the ARB will be calibrated and replaced if found to be out of specification. Based on the vehicle examination and literature study, the investigator is to make recommendations regarding certification durability requirements and identify important parameters for emission surveillance and vehicle inspection programs.

A proposal submitted by Systems Control, Inc. was previously recommended by the Research Screening Committee and approved for funding by the Board in Resolution 81-7 dated January 30, 1981. SCI subsequently requested additional funding due to a misunderstanding concerning the scope of work. As a result, the competing proposals were re-evaluated by the Research Screening Committee at its March 20 meeting. After careful consideration and discussion, the Committee decided to withdraw their prior recommendation of SCI and to recommend to the Board the proposal submitted by Olson Engineering, Inc. for funding.

State of California
AIR RESOURCES BOARD

Resolution 81-27

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, an unsolicited research Proposal Number 931-77 entitled "Changes in Lung Function and Chronic Exposure to Oxidants" has been submitted to the Air Resources Board by the University of California at Los Angeles ($200,000) and the American Lung Association of Los Angeles ($200,000) for a total of $400,000; and

WHEREAS, the Research staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 931-77 entitled "Changes in Lung Function and Chronic Exposure to Oxidants" submitted by the University of California at Los Angeles and the American Lung Association of Los Angeles for an amount not to exceed $400,000;

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 931-77 entitled "Changes in Lung Function and Chronic Exposure to Oxidants" submitted by the University of California at Los Angeles and the American Lung Association of Los Angeles for an amount not to exceed $400,000,

BE IT FURTHER RESOLVED, that the Executive Officer shall initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed in an amount not to exceed $400,000.

I certify that the above is a true and correct copy of Resolution 81-27 as passed by the Air Resources Board.

Sally Rump

Sally Rump
BOARD SECRETARY

State of California
AIR RESOURCES BOARD

ITEM NO: 81-5-3 b.15
DATE: March 26, 1981

ITEM: Research Proposal No. 931-77 entitled "Changes in Lung Function and Chronic Exposure to Oxidants".

RECOMMENDATION: Adopt Resolution 81-27 approving Research Proposal No. 931-77 for funding in an amount not to exceed $400,000.

SUMMARY:

There is a widely perceived need for information on how long-term, even lifelong, exposure to air pollution affects the health of urban dwellers. Studies to help address this need are difficult to design, organize, perform and interpret, and it is difficult to attract funds for support, owing to the complicated and long-term nature of study protocols.

Measurements of pulmonary function parameters offer the potential of greater sensitivity in early detection of effects of chronic exposures, but are expensive requiring active recruitment, testing, and follow-up of large numbers of subjects. In such studies, lifestyle, occupation, and community pollution factors can be obtained in the course of a study and then accounted for in the analysis. The preferred type of protocol is referred to as a longitudinal study.

The longitudinal design is preferable in that the parameters to be studied are obtained from the same individual, by means of retests, over a period of years.

This procedure allows careful control and study accounting for commonly confounding variables. Few studies of this type have been done in the United States due to cost factors, complexity, and the effort required.

This proposal requests funds for the continuation and completion of an on-going longitudinal pulmonary function study. Funding is to be derived in part from this agency and in major part from EPA.

The initial phase of the study, previously called "CORD", was funded by the National Institute of Environmental Health Science to evaluate how

deterioration of lung function might differ among four carefully chosen census tracts from four widely separated Southern California cities. The areas were chosen to determine how various pollutant exposures might be related to chronic obstructive respiratory disease (CORD). Lancaster was chosen to represent a low pollution city. The other cities chosen, which experience differing combinations of oxidant and/or other pollutants were Burbank, Long Beach and Glendora. Approximately 15,000 subjects were recruited for the baseline studies. These were completed about 5 years ago. Complete lifestyle information, residence location and medical information was collected on these subjects.

Complete pulmonary function characterization was also done on the subjects employing an elaborate mobile testing laboratory, the Breathmobile. The 3,000-4,000 subjects for each city were taken from a single census tract near a SCAQMD air monitoring station in or adjacent to that city.

The study team retested residents from Burbank and Lancaster after a 5-year interval from the baseline tests. The next steps, proposed here, require a retest of the Long Beach subjects first, followed by Glendora, the highest oxidant city in the study. This protocol would complete the originally scheduled field work and encompasses analysis of all data collected over the entire study.

This is a critically important study, the only study now under way that can hope to provide data on chronic exposure to photochemical smog. Its scale is well beyond what the ARB research program is able to support alone. For it to be stopped when the field work is 75 percent complete, as nearly happened, is an unacceptable alternative, in our view. Any new study would have to start at ground zero and would require another decade to complete. In summary, ARB's contribution in addition to EPA's funds, will allow completion of study that is potentially of great use to both the Board and EPA in considering the adequacy of current standards for photochemical oxidant and ozone.

State of California
AIR RESOURCES BOARD

Resolution 81-29

March 26, 1981

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705; and

WHEREAS, a solicited research Proposal Number 963-80 entitled, "Components Influencing the Deterioration of Vehicle Emission Control Systems" was submitted by Systems Control, Inc. to the Air Resources Board; and

WHEREAS, the Research staff reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee reviewed and recommended this proposal for funding; and

WHEREAS, the Air Resources Board pursuant to the authority granted by Health and Safety Code Section 39703, accepted the recommendation of the Research Screening Committee and adopted Resolution 81-7 dated January 30, 1981 approving the following:

> Proposal Number 963-80 entitled "Components Influencing the Deterioration of Vehicle Emission Control Systems" submitted by Systems Control, Inc. for an amount not to exceed $84,982.

WHEREAS, subsequently Systems Control, Inc. requested additional funding of $13,461 because of a misunderstanding of the scope of work; and

WHEREAS, competing proposals have been reevaluated by the Research Screening Committee; and

WHEREAS, the Research Screening Committee has reviewed the various proposals and recommends another proposal for funding; and

WHEREAS, Systems Control, Inc. has been advised of the new recommendation; and

WHEREAS, a contract had not been entered into between the Air Resources Board and Systems Control, Inc. for performance of Proposal 963-80.

NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board rescind Resolution 81-7.

State of California
AIR RESOURCES BOARD

ITEM: 81-5-3 b.17
DATE: March 26, 1981

ITEM: Research Proposal 963-80 entitled, "A Study of Components Influencing the Deterioration of Vehicle Emission Control Systems."

RECOMMENDATION: Adopt Resolution 81-29, rescinding Resolution 81-7, which approved Proposal 963-80 for funding in an amount not to exceed $84,982.

SUMMARY: This proposal, submitted by Systems Control, Inc., was previously recommended by the Research Screening Committee and approved for funding by the Board in Resolution 81-7 dated January 31, 1981. SCI subsequently requested additional funding, apparently because of a misunderstanding concerning the scope of work. As a result, the competing proposals were re-evaluated by staff and by the Research Screening Committee. After careful consideration and discussion, the RSC decided to withdraw their prior recommendation of SCI and select the proposal submitted by Olson Engineering, Inc. for recommendation to the Air Resources Board.

STATE OF CALIFORNIA
AIR RESOURCES BOARD

Resolution 81-30

March 26, 1981

WHEREAS, Marjorie Evans served as a member of the Air Resources Board with distinction from October 1976 through January 1981;

WHEREAS, Marjorie's keen judgment and high ideal of public service have contributed greatly to the work of the Board;

WHEREAS, her commitment to clean and healthy air caused her to take a lead role in developing the Board's sulfur dioxide and sulfate ambient air quality standards and resolving a regulatory impasse that had impeded geothermal development;

WHEREAS, she demonstrated her special concern for the well-being of Northern Californians by leading the Board into a successful campaign for the continuation of rail commuter service on the San Francisco Peninsula as a means to reduce auto use;

WHEREAS, she worked vigorously and persistently to foster mutual respect and understanding between business and community leaders and the members and staff of the Air Resources Board; and

WHEREAS, her broad understanding of scientific research and administrative law provided vital assistance in the development of California's air pollution regulatory program.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board extends its deepest appreciation to Marjorie Evans, and expresses its thanks for her contribution to California's political and technological progress toward clean air.

Mary D. Nichols, Chairwoman

Laurence S. Caretto, Vice-Chairman

Alvin S. Gordon, Member

James G. Leathers, Member

Claire T. Dedrick, Member