

State of California
AIR RESOURCES BOARD

Resolution 82-19

March 31, 1982

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 1099-89 entitled "Rest and Work During Carbon Monoxide Exposure at Altitude", has been submitted by University of California at Santa Barbara to the Air Resources Board; and

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

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

Proposal Number 1099-89 entitled "Rest and Work During Carbon Monoxide Exposure at Altitude", submitted by the University of California at Santa Barbara, for a total amount not to exceed \$144,147 (year 1) and \$142,450 (year 2), a total amount not to exceed \$286,597;

WHEREAS, the Governor's Executive Order B97-82 has prevented the Executive Officer from awarding a number of research contracts already approved for funding by the Board during FY 81-82;

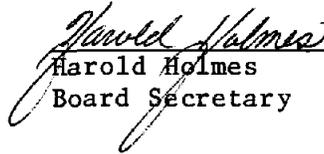
NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 1099-89 entitled "Rest and Work During Carbon Monoxide Exposure at Altitude", submitted by the University of California at Santa Barbara, for a total amount not to exceed \$144,147 (year 1) and \$142,450 (year 2), a total amount not to exceed \$286,597;

BE IT FURTHER RESOLVED, that should the prohibition on awarding new contracts contained in the Governor's Executive Order B97-82 be partially removed so that some portion, but less than the full amount, of the remaining 1981-82 extramural research funds is made available for expenditure by the Board, the staff is directed to present to the Board the recommendations of the Research Screening Committee regarding which of the projects already approved are to be supported with those funds; and

BE IT FURTHER RESOLVED, that, should the prohibition in awarding new contracts contained in Executive Order B97-82 be removed in its entirety, the Executive Officer is authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed \$144,147 (year 1) and \$142,450 (year 2), a total amount not to exceed \$286,597.

I certify that the above is a true
and correct copy of Resolution 82-19
as passed by the Air Resources Board


Harold Holmes
Board Secretary

State of California
AIR RESOURCES BOARD

ITEM NO: 82-8-3b1
DATE: March 31, 1982

ITEM: Research Proposal No. 1099-89(R) entitled "Rest and Work During Carbon Monoxide Exposure at Altitude."

RECOMMENDATION: Adopt Resolution 82-19 approving Research Proposal No. 1099-89(R) for funding in an amount not to exceed \$144,147 (year 1) and \$142,450 (year 2), a total amount not to exceed \$286,597.

SUMMARY: Carbon monoxide (CO) is a pollutant known to have subtle as well as clinically observable effects on the nervous system, heart, blood, and possibly other organs. Present ambient air quality standards for CO set by the federal government are 9 ppm, averaged over eight hours, and 35 ppm for one hour. The State of California has a somewhat more complex standard because the Lake Tahoe Basin is protected separately from the state as a whole. The State's 12-hour standard is 10 ppm, and the 1-hour standard is 40 ppm. The 8-hour Lake Tahoe Basin standard is more stringent at 6 ppm.

This high-altitude standard is based on the concept that the carbon monoxide exposure at altitude should be kept below the value acceptable for sea level. Some question has been raised about the detailed validation of the basis for the Lake Tahoe CO standard. It is thus timely to resolve the question of whether residents or visitors to high altitude locations, such as Lake Tahoe, are at increased risk to CO. To do this, human exposure studies under appropriate conditions are required. Such studies could accomplish two objectives. The first is to validate or invalidate the present calculation-based adjustments for altitude. The second is to provide real, observational data as a basis for a more traditional effects-based standard.

The proposed study is comprised of two basic exposure regimes. Both are designed to provide information on how CO and altitude may interact to reduce work ability and cardiac function, the effects thought to be attributable to CO exposure. Data on CO absorption and elimination under various pollutant-workload regimes will be generated. Such information would be used to validate (or invalidate) theoretical calculations of altitude-CO interactions which serve as the basis for current standards. The two regimes to be employed are: 1) 8-hour, 9 ppm exposures, and 2) 1-hour exposures at 25 and 35 ppm. These regimes were selected to provide information pertinent to current ambient air quality standards. Several parameters will be common to both regimes. They will use ten male subjects in the age range 18-30 years in each group. Altitude exposures will be carried out at a simulated 7000 ft. in a very large hyperbaric chamber. Sea level CO exposures will be done in the same chamber under sham altitude conditions that will not allow subjects to discriminate between the two altitude parameters. In both regimes there will be two types of protocols: subjects at rest and subjects exercising. Cardiac output, blood carboxyhemoglobin, expired oxygen, CO₂ and minute ventilation will be monitored in all subjects. Following exposure, subjects will exercise on a bicycle ergometer to determine maximal work output levels. They will then be allowed to rest for two to four hours, during which time blood samples will be taken to measure CO elimination rates.

Eight-hour protocols:

Two CO levels (CO-free and 9 ppm) would be employed in two different protocols designed to provide information on the intermediate time effects of multi(several) hour exposures to CO both at sea level and at altitude. The first protocol would involve exposure to the CO-free or 9 ppm level while subjects are at rest. The second would employ intermittent, moderate exercise in CO-free air or 9 ppm CO. The purpose of these exposures will be to determine whether exercise accelerates carboxy-hemoglobin formation and whether cardiac output is adversely affected by the altitude and/or CO exposure. A total of 80 8-hour subject exposures will be carried out for these studies.

One-hour protocol:

Three CO levels (0, 25 and 35 ppm) would be employed in two different protocols designed to provide information

pertinent to short-term exposure at altitude. The first protocol would involve a one-hour exposure while at rest to the three pollutant levels at altitude and at sea level. During the last ten minutes of exposure, subjects would be tested for maximum work output. The second study would employ continuous moderate work for 50 minutes, followed by a ten-minute maximal work test. The course of CO elimination would be followed, as in the 8-hour study. Approximately 120 one-hour subject exposures would be carried out in this group of studies.

Statistical analysis of data would consist of repeated measures analysis of variance. When significant effects and/or interactions are observed simple main effects analysis would be performed. Multiple regression analysis would be carried out to determine relative contributions of altitude and CO in causing any observed effects.

State of California
AIR RESOURCES BOARD

Resolution 82-20

March 31, 1982

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 1107-90 entitled "Economic Assessment of the Effects of Air Pollution on Agricultural Crops in the San Joaquin Valley", has been submitted by Energy Resource Consultants, Inc. to the Air Resources Board; and

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

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

Proposal Number 1107-90 entitled "Economic Assessment of the Effects of Air Pollution on Agricultural Crops in the San Joaquin Valley", submitted by Energy Resource Consultants, Inc., for a total amount not to exceed \$125,000;

WHEREAS, the Governor's Executive Order B97-82 has prevented the Executive Officer from awarding a number of research contracts already approved for funding by the Board during FY 81-82;

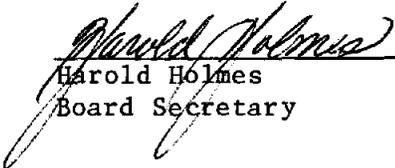
NOW, THEREFORE, BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 1107-90 entitled "Economic Assessment of the Effects of Air Pollution on Agricultural Crops in the San Joaquin Valley", submitted by Energy Resource Consultants, Inc., for a total amount not to exceed \$125,000;

BE IT FURTHER RESOLVED, that should the prohibition on awarding new contracts contained in the Governor's Executive Order B97-82 be partially removed so that some portion, but less than the full amount, of the remaining 1981-82 extramural research funds is made available for expenditure by the Board, the staff is directed to present to the Board the recommendations of the Research Screening Committee regarding which of the projects already approved are to be supported with those funds; and

BE IT FURTHER RESOLVED, that, should the prohibition in awarding new contracts contained in Executive Order B97-82 be removed in its entirety, the Executive Officer is authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein in an amount not to exceed \$125,000.

I certify that the above is a true
and correct copy of Resolution 82-20
as passed by the Air Resources Board



Harold Holmes
Board Secretary

STATE OF CALIFORNIA
AIR RESOURCES BOARD

ITEM NO: 82-8-3b2

DATE: March 31, 1982

ITEM: Research Proposal No: 1107-90 entitled "Economic Assessment of the Effects of Air Pollution on Agricultural Crops in the San Joaquin Valley"

RECOMMENDATION: Adopt Resolution 82-20 approving Research Proposal No. 1107-90 for funding in an amount not to exceed \$125,000.

SUMMARY: This research project is needed to extend and augment the results of controlled experimental studies of air pollution on plants to estimate directly the economic damage to crops growing in the field. The objective of this research project is to assess the total economic damage to nine major crops in the San Joaquin Valley attributable to ozone and SO₂ occurring over the years 1970 to 1980 and to quantify the economic benefits of reducing ozone and SO₂. The San Joaquin Valley is to be the focus of the project because it is the leading area in California in terms of agricultural production and many crops grown there are susceptible to ozone and SO₂ damage.

In Task 1, the contractor will establish a model for each crop which relates ambient ozone and SO₂ levels and other environmental factors to crop yield using air quality data, seasonal crop yield data and environmental data for the ten year period 1970 to 1980. In Task 2, the contractor will estimate the crop yield loss and economic welfare loss due to SO₂ and ozone. The contractor will estimate the change in welfare loss (i.e., the benefit) that would occur if: 1) the ambient ozone levels (alone) were reduced by 10 percent; 2) the ambient SO₂ levels (alone) were reduced by 10 percent; and 3) both the SO₂ and ozone levels were reduced by 10 percent.

The RFP was approved by the Research Screening Committee with the provision that, owing to the complexity of the project, the participation of specialists in diverse fields (such as plant physiology, economics, aerometric measurements, etc.) be encouraged. Eight proposals were received. The proposal submitted by Energy and Resource Consultants, Inc. (ERC) was concluded to be the best response by the staff and the Research Screening Committee. The Committee recommended that Dr. John Trijonis of Santa Fe Research collaborate in the project by providing assistance and peer review in air quality data analysis. The Committee recommended funding ERC for a total amount not to exceed \$125,000, of which not more than \$14,000 is to be used to retain a subcontractor (Dr. Trijonis) who will carry out the review and analysis of air quality data in the San Joaquin Valley.