REPORT OF THE

OFFICE OF THE AUDITOR GENERAL

TO THE

JOINT LEGISLATIVE AUDIT COMMITTEE

264

# REPORT ON THE SOUTH COAST AIR BASIN VEHICLE EMISSION INSPECTION PROGRAM BUREAU OF AUTOMOTIVE REPAIR

JUNE 1976

# Joint Legislative Audit Committee

OFFICE OF THE AUDITOR GENERAL

# California Legislature



June 7, 1976

The Honorable Speaker of the Assembly
The Honorable President pro Tempore of
the Senate
The Honorable Members of the Senate and the
Assembly of the Legislature of California

Members of the Legislature:

Your Joint Committee respectfully submits the Auditor General's management audit report of the South Coast Air Basin Vehicle Emission Inspection Program.

Potential savings of $164 million over a ten-year period are identified.

Respectfully submitted,

MIKE CULLEN, Chairman
Joint Legislative Audit Committee


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## SUMMARY

Our review of the Vehicle Inspection Program study contract shows that inadequate technical analyses were performed by the contractor and state personnel resulting in unjustified program recommendations.

Our findings are summarized below.

- Unnecessary engine diagnostic measurements could result in an excessive expenditure of $144.6 million over a ten-year period.

- Vehicles which marginally fail emission tests may incur excessive repair costs because more than necessary maintenance may be required.

- Eliminating engine diagnostic measurements would simplify emission testing, data recording and analysis. This would probably void the need for 84 expensive mini-computers and save $10.5 million over the ten-year cost calculation period.

- Vehicle inspections in the desert regions outside the South Coast Air Basin contribute little to the air quality, yet add about $8.7 million to the program cost over a ten-year period.

The lack of adequately qualified Bureau of Automotive Repair (BAR) technical personnel to monitor and direct contractor performance was the primary cause for these problems. The Personnel Section of the Department of Consumer Affairs and the State Personnel Board delayed hiring a Program Technical Director for over nine months. In our opinion, however, State personnel involved in the Vehicle Inspection Program were superior, though understaffed in technical areas.

We conclude that the program cost could be reduced by about $164 million if all our recommendations for the South Coast Air Basin are accepted. These cost savings will occur over a ten-year period, and would be passed on to consumers through reduced inspection fees. The consumer would also benefit as a result of lower automobile repair charges. Savings would almost double if the emission inspection program were extended to four other California air basins.

Primary recommendations resulting from our study include:

- Diagnostic engine measurements beyond basic emission testing should be eliminated from consideration for the Vehicle Inspection Program at this time. Future legislative requirements or technological changes could modify this recommendation.

- Consideration should be given to increasing the Program's technical staff to assure adequate ongoing analyses of the operational program.

- The Personnel Section of the Department of Consumer Affairs and the State Personnel Board should implement "exception" procedures whereby they can be more responsive to staff hiring in high-cost/impact programs.

- Recommended vehicle repair procedures should be revised to provide that, for those vehicles experiencing only marginal failures, the low-cost adjustment procedure be attempted before more costly repair procedures.

- One lane of the Riverside Trial Program should be used for an indefinite period as a "pilot lane" to fully evaluate the manual inspection concept for comparison with the automated inspections.

- The Bureau of Automotive Repair should perform a cost effectiveness study of the ultimate automated inspection concept to determine if the use of mini-computers is justified.

- Legislation should be passed* to exempt vehicle owners residing in desert regions outside the South Coast Air Basin from emission inspection.

We analyzed the procurement process which resulted in the design study contract because (a) the Program Manager was once a consultant to the

*AB 2481 introduced on August 11, 1975 excludes areas outside the South Coast Air Basin from emission inspections.

company awarded the contract, (b) the contract was awarded to the highest bidder and (c) a sole source contract was subsequently awarded to the same company. Although the best contractor selection procedures were not used, we did not find evidence of illegal or conflicting activities, or undue pressures exerted in awarding both contracts to Olson Laboratories, Inc.

The following projects ten-year program cost savings which could accrue if all our recommendations are implemented. Table 1 shows the operational cost savings which influence inspection fees, but does not include consumer cost savings due to modifying repair procedures for marginal emission failures.

Table 1

Adjusted Cost Savings for
Site Reduction of One-Third

| | Item | Cost Savings |
|---|---|---|
| a. | Facilities reduction | $140,522,579 |
| b. | Ignition analyzers | 4,104,341 |
| | Subtotal | 144,626,920 |
| c. | Desert sites | 8,668,613 |
| d. | Computing equipment | 10,475,296 |
| | TOTAL | $163,770,830 |

Detailed assumptions and cost calculations for the above items are presented in Section D of the Supplement. These data have been

adjusted to account for the contractor's cost understatement of $65.9 million discussed in "Other Pertinent Information".

The facilities reduction assumes that one-third of the lanes have been eliminated by reducing the number of inspection sites. The other cost savings are due to elimination of two-thirds of the ignition analyzers, desert sites, and computing equipment, since one-third of these were eliminated in the facilities' reduction.

## INTRODUCTION

In response to a legislative request, the Office of the Auditor General analyzed the contractor's performance and final report on the South Coast Air Basin Vehicle Emission Inspection Program Design Study. The objective of this request was to evaluate the Program's proposed uses of the mini-computer, and their acquisition process.

Those portions of the study contract which had bearing on the use of mini-computers were reviewed in considerable detail by our technical specialist; however, we did not evaluate the entire study contract due to limited availability of our audit staff. Technical documentation for our findings is a Supplement to this report.

## BACKGROUND

Senate Bill 479 (Ch. 1154, Stat. 1973) resulted in the South Coast Air Basin Emission Inspection Program Design Study. The objective of this study was to design and recommend a program for periodic inspection of motor vehicle exhaust emissions for the six counties of Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara and Ventura. SB 479 specified a timetable for implementing various phases of the Program to inspect most motor vehicles weighing less than 6,002 pounds.

The Bill further provided that owners of vehicles failing these tests be given written notice of the probable cause of failure. The legislation specified that exhaust emissions would be measured while using a dynamometer, or equivalent device, but made no stipulation concerning other engine testing or measurements.

The Department of Consumer Affairs awarded Contract EST #77-107 for $250,000 (a later amendment added $67,000) to Olson Laboratories, Inc. (Olson) to perform the design study. Major task requirements included:

- Develop technical and cost criteria to select the optimum loaded-cycle* inspection concept from many feasible alternatives

*Loaded-cycle is testing in which engine performance under highway driving conditions is simulated through the use of dynamometer.

- Select a loaded-cycle inspection concept for further definition and analysis subject to Bureau of Automotive Repair approval.

- Identify the number of vehicles subject to inspection, and project the inspection requirements through the year 2000.

- Develop specifications and procedures for recommended emission-related automotive repairs and tune-ups.

- Develop methods for, and conduct technical and cost-benefit analyses of, the designed inspection program; accurately determine total program costs.

- Develop a test program required to complete all other tasks, such as those described above.

The Bureau of Automotive Repair of the Department of Consumer Affairs was given total contract responsibility, while the Air Resources Board was to provide assistance as required. Contract EST #77-107 was approved by the Department of General Services on April 30, 1974, and a final report under the contract with Olson was issued in May 1975. The final report was a recommended program implementation plan with a set of system specifications. Work performed under this contract provides the foundation for future activities, such as: (a) City of Riverside Trial Inspection Program; (b) mandatory inspection program for six southern counties; and (c) possible expansion of inspections to other geographic areas in the State. The Riversie Inspection Facility is a proving

ground for the selected inspection concept prior to full implementation in the six counties.

The proposed inspection program consists of 84 vehicle inspection stations in the six counties of the South Coast Air Basin. This number could double, however, if the Program is extended to four other California air basins.

The first stage of the Vehicle Inspection Program is being implemented under a $579,000 sole-source contract with Olson to establish two inspection stations for the City of Riverside. The next phase of the program will be to construct and operate an additional 23 inspection sites in the six-county area. Only vehicles involved in a change of ownership will be inspected at these 25 stations.

The final phase of the Program involves the procurement and operation of the remaining 59 sites. This phase of the Program will provide for periodic emission inspection of all "required" vehicles in the counties of Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara and Ventura.

Numerous delays have been experienced in the Program, and Assembly Bill 723 (Chapter 170, Statutes of 1975) further delays the program implementation dates of SB 479 by six months. The Program is experiencing still further delays, and the statutory dates of AB 723 will not be met.

## FINDINGS

### THE CONTRACTOR'S INCOMPLETE DESIGN STUDY HAS RESULTED IN AN EMISSION INSPECTION PROPOSAL NOW BEING IMPLEMENTED WHICH COULD COST THE STATE AN UNNECESSARY $144 MILLION OVER A TEN-YEAR PERIOD.

Legislation required a plan to implement mandatory vehicle emission inspections and repairs for residents in the six counties of the South Coast Air Basin. A contract to produce the plan was awarded to Olson Laboratories, Inc. However, the plan which Olson submitted was based upon an incomplete analysis, and accordingly, their recommendations were found to be without adequate substantiation. A contributing factor to these problems was a significant delay in hiring the Program Technical Director to provide contractor guidance.

#### Contractor Approach to Mandated Requirements

Senate Bill No. 479 (Chapter 1154, Statutes of 1973), concerning the exhaust emission inspections, required:

> A measurement of the vehicle's hydrocarbon, carbon monoxide, and oxides of nitrogen emissions, performed with a dynamometer, or equivalent device, using a probe or other device to sample the vheicle's exhaust.

The vehicle owner is to receive a written statement indicating the probable cause for vehicle failure of the emission tests.

The Olson design study was based on the premise that basic emission testing is a minimum to adequately satisfy the statutes. Olson then analyzed the desirability of implementing engine diagnostic measurement facilities as an addition to the basic emission testing equipment. The basic emission tests provide significant information to determine which engine system or component is faulty. Engine diagnostic measurements further pinpoint the failing engine component. For diagnostic measurements beyond basic emission testing to benefit the State program, two conditions must be true: (1) the added diagnostic testing must significantly increase information on engine component failure, such that consumer protection is markedly enhanced; (2) the cost to implement the additional engine diagnostic measurements must be more than offset by consumer cost savings from (1) above.

## The Contractor Performed an Incomplete Study Analysis

The inspection concept resulting from the Olson study contract was based on some early erroneous assumptions. These assumptions, perhaps reasonable at the time they were made, were later disproven during the research phase of the study.

In a research and development study, many assumptions are often necessary because adequate knowledge about the study subject does not exist. Before completing a research and development study, initial

assumptions are usually appraised to determine if they are still valid, and if not, their impact on subsequent work is estimated.

The following steps are typical for research and development work. The Program design study did not include steps four and five below.

Step 1. Make the best possible initial assumptions relative to important variables, considering that limited knowledge is available about the subject.

Step 2. Study all feasible program alternatives, using the assumptions from Step 1, and perform screening trade-offs to select a single concept for further analysis.

Step 3. Perform research and development work and make detailed analysis of the selected concept.

Step 4. (Omitted in VIP design study) Based on the considerable new knowledge gained from Step 3, determine if the early assumptions in Step 1 were correct and if the selected alternative from Step 2 is still the best choice.

Step 5. (Omitted in VIP design study) If Step 4 did not produce the best program alternative, repeat all previous steps until the proper alternative is selected.

Step 6. Prepare the final report.

The State's request for proposal did not specifically require additional analysis if the initial assumptions were disproven during the research phase of the design study. This additional analysis was not specified in the Olson proposal nor in the contract between the State and Olson. However, the basic research and development work performed by the contractor was thorough enough that all necessary data were available, and the analysis could have been made at minimal cost.

Our analysis of the available data is summarized below and discussed in the Supplement to this report.

Early in the study, Olson assumed that additional diagnostic measurements could effectively isolate individual engine component failure. Many measurable engine characteristics were considered, but most were dropped because they were not feasible for a high volume inspection program. The diagnostic measurements which were selected offer very little more consumer protection than the basic emission tests. All recommended repair procedures for vehicles failing emission testing provide such latitude even with additional diagnostic measurements that unnecessary repairs could still be performed. Olson did not estimate potential savings to customers for repair cost that could result from the recommended diagnostic measurements.

The additional diagnostic measurements implemented in the Riverside Trial Program identify only one of five recommended repair procedures. This one additional repair procedure is actually a subset of a repair procedure obtained through basic emission testing.

Even though diagnostic measurements can provide useful information on all engine systems, such as ignition and carburetion, the selected diagnostic measurements only relate to the ignition system. Test data from Olson indicate only about four percent of the automobiles tested will experience problems in this engine system. Therefore, the value of the recommended additional diagnostic measurements is limited to a refinement which is of any value only to a small percentage of vehicle owners.

Early in the study, Olson assumed diagnostic measurements and basic emission testing could be performed simultaneously, with a slight inspection cost increase due primarily to the cost of equipment for measurements. Data obtained by Olson during the latter phases of the study indicate that all diagnostic measurements could not be conducted simultaneously with the basic exhaust emission tests. Consequently, fewer automobiles can be inspected in a given time period than if only exhaust emissions are tested.

If diagnostic testing is eliminated, the number of inspection sites or lanes can be reduced by one-third and still allow the required number of inspections. Total ten-year program savings would be $144.6 million by reducing the number of sites by one-third, or alternatively $102.1 million by reducing the number of lanes. Approximately $4.1 million of this cost savings would result from elimination of ignition analyzer equipment, which, as we have shown, provides potential benefits to only a small percentage of vehicle owners. Analysis and cost calculations leading to the above conclusions are presented in the Supplement to this report.

Emission inspection programs exist or are being considered in New York City, Chicago, Colorado, New Jersey, and Arizona. None of these programs currently plan to perform engine diagnostic measurements beyond basic emission tests.

## Inadequate State Technical Superivision of Contractor Performance

In December 1973, the Bureau of Automotive Repair drafted job specifications and requested a new job classification for Vehicle Inspection Technical Director. The position was not filled until nine and a half months later on October 1, 1974. This was nine months after the start of the Program and five months after the design study contract award. Without technical staff to monitor the study for the State, the program manager had to rely on the contractor as his "technical arm".

On the other hand, employees of the Personnel Section of the Department of Consumer Affairs (DCA) and the State Personnel Board (SPB) explained that defining job specifications and hiring for this particular position had been faster than normal. We found that establishing the job class and providing a detailed job description of Program Technical Director required about six and one-half months. Four months of this time was attributed to the Personnel Section of the Department of Consumer Affairs while the remaining two and one-half months was consumed by the State Personnel Board. While this time may have been "faster than normal" as characterized by the DCA and SPB, we believe that the time consumed in defining the position in minute detail for a dynamic new

program in which the duties of Program Technical Director are yet to evolve, was excessive when related to the pressing need for contractor oversight.

Before the Program Technical Director was hired, all major decisions on the selection of the inspection concept had been made. The scope of the project had been defined. The tradeoff analysis of alternative inspection concepts had been completed and a single inspection concept had been selected.

Once the Technical Director was hired, he worked full-time organizing and implementing the Riverside Inspection Facility, and he was unavailable to evaluate the design study and the contractor's performance. In our judgment, more technical personnel are needed to perform ongoing cost-benefit analyses to achieve program cost savings as the opportunities arise.

## CONCLUSION

An incomplete contractor analysis produced an emission inspection program plan which is not substantiated. Delays in hiring technical staff preventedthe State from adequately monitoring the contractor's study. Further, our analysis of existing data shows that diagnostic testing can be eliminated to produce significant cost savings without jeopardizing inspection program objectives.

## RECOMMENDATIONS

We recommend that the Bureau of Automotive Repair:

(1) - Eliminate from the Vehicle Inspection Program diagnostic engine measurements beyond basic emission testing, until it is determined that consumer benefits from such activities more than offset their cost.

(2) - Consider increasing the technical staff to provide for ongoing cost analyses of the operational program as it evolves.

We further recommend that the Personnel Section of the Department of Consumer Affairs and the State Personnel Board:

(3) - Reevaluate their hiring procedures so that "exception" conditions can be effective in high-cost/impact programs.

## SAVINGS AND BENEFITS

Implementation of recommendation (1) will result in a ten-year cost savings of about $144.6 million if the number of inspection sites is reduced, or $102.1 million if the number of inspection lanes is reduced.

## INADEQUATE CONSIDERATION GIVEN TO VEHICLES WHICH MARGINALLY FAIL EMISSION TESTING.

The Vehicle Inspection Program makes no distinction between vehicles that only marginally fail the emission tests and vehicles that experience gross failures. The same repair procedures are recommended for marginal failures as for gross emission failures. Consequently, vehicle owners may incur more repair costs than needed to pass the emission test. The validity of this "pass/fail" technique is questionable in view of the inconsistent emission test results discussed later in this report under Other Pertinent Information.

### Recommended Repair Procedures

Under current procedures, the driver of a vehicle that fails the emission tests receives a list of test results and a brief description of the probable cause of failure from the inspection station. The description of the probable cause of failure identified a recommended repair procedure which has been furnished to the repair industry. The recommended repair procedures are mandatory for vehicle owners who have the work done at a state-qualified shop before the vehicle is reinspected. State-qualified shops are required to provide the consumer with a guarantee whereas non-state qualified shops are not.

All recommended repair procedures contain a series of repair and diagnostic steps and conclude with the relatively minor "final adjustment" procedures.

A principal objective of the Program is to minimize the cost for consumers to comply with established emission standards. For example, the added diagnostic measurements are intended to reduce consumer costs by more specifically identifying the probable cause of a vehicle's failure to pass the emission test.

Many Cars Could Pass
Inspection With Only
Minor Engine Adjustments

The low cost "final adjustments" may alone be sufficient to enable vehicles which only marginally fail emission testing to subsequently pass. Previous emission testing research by Olson indicated a majority of vehicles which failed emission testing were subjected to only part of the State's "final adjustment" procedures and subsequently passed the tests.

The Program implementation plan recommends repair procedures for all vehicles that fail the emission tests. There is no differentiation between marginal and gross failures; and both are subject to the same repair procedures.

Directly applicable cost data are not available to precisely predict cost savings from implementing the following recommendation. However, calculations presented in the Supplement to this report, based on similar test programs, indicate repair cost savings to vehicle owners may be up to $26 million yearly. These savings would result from lower repair costs to vehicle owners.

## CONCLUSION

Revising the recommended repair procedures could produce significant consumer repair cost savings while not affecting compliance with state-mandated emission standards.

## RECOMMENDATION

We recommend that the Bureau of Automotive Repair revise its repair procedures so that only low-cost "final adjustments" are made to those vehicles experiencing only marginal emission failure, before more costly repair procedures are required.

## SAVINGS AND BENEFITS

Implementation of the above recommendation will result in vehicle owner cost savings of up to $26 million yearly.

## THE NEED FOR MINI-COMPUTERS AND PERIPHERAL EQUIPMENT COSTING $10.5 MILLION OVER A TEN-YEAR PERIOD HAS NOT BEEN ESTABLISHED.

The Vehicle Inspection Study Program contractor has recommended the use of a mini-computer at each of the proposed 84 inspection sites. Mini-computers are installed at each inspection site of the Riverside Trial Program.

Computer need should be determined by a cost-benefit analysis; however, the study contractor did not perform such an analysis. In our opinion, the primary use of the computer in the Vehicle Inspection Program is for diagnostic measurements beyond the emission testing required by law. It is probable that a mini-computer is justified with this full testing requirement; however, if diagnostic measurements are eliminated, testing becomes simplified to the extent that the need for computers probably no longer exists. Computing requirements of the Program with and without diagnostic measurements are discussed in the Supplement to this report.

Cost savings from eliminating the mini-computers is approximately $10.5 million over a ten-year period (calculations provided in Supplement.) This cost savings is based on the assumption that the number of sites is reduced by one-third. If computers are eliminated at all 84 proposed inspection sites, savings of $15.7 million could be realized.

The Olson contract "implied" an analysis would be made to determine the value of adding automation. The contractor stated that there was an "unwritten understanding" with the State that mini-computers

were to be used. This understanding was denied by the manager of the Vehicle Inspection Program.

The Riverside Trial Program presents an ideal opportunity to field test computerized and noncomputerized inspections. Back-up procedures exist to perform noncomputerized inspections in the event of equipment failure. A low-cost test program can be run in which one of the four lanes of the Riverside inspection station can be operated, in a controlled environment, to compare computerized to noncomputerized inspections.

## CONCLUSION

Vehicle emission testing in which no engine diagnostic measurements are made could result in simplified test procedures that would eliminate the need for mini-computers at each inspection facility, yet still meet mandated emission inspection requirements.

## RECOMMENDATIONS

We recommend that the Bureau of Automotive Repair:

- Operate one lane of the Riverside Trial Program as a "pilot lane" to compare the manual inspection concept with automated inspections

- Study the cost effectiveness to determine if the use of mini-computers is justified for the inspection concept ultimately adopted.

## SAVINGS AND BENEFITS

A ten-year cost savings of approximately $10.5 million can be obtained if the mini-computers and their peripheral gear are not required and if sites are reduced by one-third. A cost savings of $15.7 million will occur if computers are eliminated at all 84 proposed inspection sites.

## UNNECESSARY DESERT INSPECTION SITES WILL RESULT IN AN EXPENDITURE OF $8.7 MILLION OVER A TEN-YEAR PERIOD.

The Program Design Study recommended at least five inspection stations in desert sites outside the South Coast Air Basin, but within the six counties addressed by SB 479.

The inspection program mandated by SB 479 specified vehicle emission inspections for the area consisting of Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, and Ventura Counties. These are the six counties that are included in whole or in part in the South Coast Air Basin.

The federal Environmental Protection Agency has strongly advocated vehicle emission inspections in certain California air basins, but the agency has not proposed regulations for the Southeast Desert. According to the agency's statements, the air pollution in the Southeast Desert comes almost entirely from the Los Angeles Region. As shown by the map on the following page, significant portions of Riverside, San Bernardino and Los Angeles Counties are in the Southeast Desert Air Basin rather than the South Coast Air Basin.

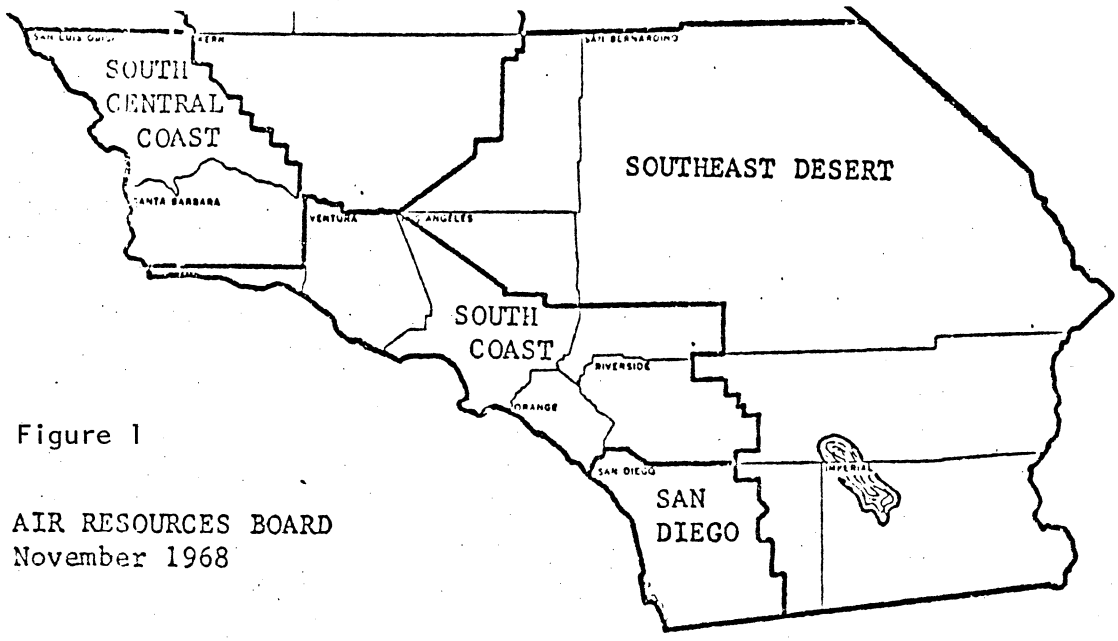



Figure 1

CALIFORNIA AIR RESOURCES BOARD
Adopted November 1968

Discussions with both the study contractor representatives and the Program Manager indicate inspection of vehicles registered in desert areas contributes little to improving air quality either in the desert areas or in the South Coast Air Basin. They feel inspection in these areas is unnecessary.

Cost analyses in the Supplement show that program costs can be reduced by $8.7 million over a ten-year period by eliminating the requirement for desert resident automotive emission inspections.

Eliminating inspection requirements for desert residents' autos requires legislation, since Senate Bill 479 specifies inspections throughout the six-county area. Assembly Bill 2481, which was introduced on August 11, 1975, excludes areas outside the South Coast Air Basin from emission inspections.

## CONCLUSION

Excluding desert residents' autos from emission testing outside the South Coast Air Basin could produce significant reductions in Program cost, while not compromising the Vehicle Inspection Program objectives.

## RECOMMENDATION

We recommend the passage of legislation to exempt those desert residents outside the South Coast Air Basin from vehicle exhaust emission inspection.

## SAVINGS AND BENEFITS

Implementation of the above recommendation could reduce program costs by $8.7 million during a ten-year period.

## OTHER PERTINENT INFORMATION

### Ten-Year Cost Estimate Is Understated by $65.9 Million

Omissions and mathematical errors in the design study cost analysis by Olson resulted in an understatement of Program cost by $65.9 million. Consequently, the $367.5 million ten-year cost projection should be increased to $433.4 million.

An 18 percent, or $56.3 million understatement of the ten-year costs resulted because the contractor's cost analysis did not properly consider projected vehicle population growth. Sixty-three of the 84 inspection sites used in the cost analysis will have their capacity exceeded during the ten-year cost estimation period. The estimated cost to increase capacity as needed is $56.3 million.

The study contractor recommended 84 sites comprised of 1, 2 and 4 lane facilities with a total of 290 inspection lanes. The cost estimates, however, were based on 84 sites comprised of 1, 2, 3 and 4 lane facilities with a total of only 279 lanes. Failure to consider the cost of these 11 inspection lanes resulted in a $7.6 million cost understatement for the ten-year period.

In addition to these two omissions, a $2 million mathematical error produced the remainder of the $65.9 million cost understatement.

## Emission Testing Variability Not Addressed in the Design Study

The impact of inherent variability in testing of vehicle emissions was not addressed in the design study final report. Such variability could have an effect on cost-performance tradeoffs, test procedures, instrumentation specifications, suggested repair procedures, and test pass/fail criteria.

Emission testing variability can be due to instrumentation error, test procedures or inherent vehicle exhaust emission variability. Instrumentation error has been minimized in the Program by use of quality hardware and adequate maintenance. Training and adequate supervision can minimize test procedure problems. However, inherent vehicle emission variability cannot effectively be controlled, but should have been defined, understood, and accounted for in the design of the Program.

As an example of testing variability, we processed an automobile through the Riverside emission testing facility. The automobile was tested once in one lane, and twice in another lane. The three tests indicated the automobile passed inspection one time, but failed the other two inspections to varying degrees. Different repair procedures were issued for the two failing inspection tests.

We processed another automobile through the four-lane and the new two-lane Riverside inspection facilities on March 23, 1976. Five emission inspections were made at the four-lane facility, while three

inspections were made at the two-lane facility in a short period of time using the same automobile. Both carbon monoxide and hydrocarbon measurements showed a 100 percent variation between the low and high measured values.

Details on these and other emission testing variability examples are presented in the Supplement.

## Computer Purchase

Section 4 of the Budget Act of 1974 and state regulations provide that with certain exceptions, the purchase of computing equipment will be subject to a particular approval process including a feasibility study. In response to our recent request, the Legislative Counsel advises that computing equipment for the Vehicle Inspection Program is not exempt, and is subject to provisions of Section 4 of the Budget Act. In conflict with the above opinion, the Department of Finance EDP Control and Development has ruled this application is not subject to Section 4 of the Budget Act and a feasibility study was therefore not required.

## Award of Study Contract

The award of a study contract to the highest bidder and a subsequent sole-source contract award to the same contractor were not irregular, though the best procedures were not used. Prices quoted by the four firms bidding on the study contract are as follows.

| | |
|---|---|
| Olson Laboratories | $250,000 |
| Jet Propulsion Laboratories | $249,951 |
| Hamilton Standard | $247,279 |
| TRW | $233,046 |

The procurement process for the design study contract was analyzed to determine if irregularities existed because (a) the Program Manager was once a consultant to the company awarded the contract and (b) the contract award was made to the highest bidder.

We found no evidence of improprieties in the contract award to the particular vendor. Good vendor-selection procedures were defined by the Program Manager. He prepared and issued evaluation guidelines prior to receipt of proposals. This was a thorough, comprehensive and unbiased plan. These guidelines were not followed by the Chief, Bureau of Automotive Repair, and a poor selection process ensued. Specifically, technical expertise was not solicited for contractor proposal evaluation, and the voting members at the vendor selection meeting were not familiar with all aspects of the proposals.

The Program Manager disqualified himself from the selection process because of his previous affiliation with one of the bidders and suggested a proposal evaluation team be comprised of individuals from the Bureau of Automotive Repair, Air Resources Board, California Highway Patrol and Department of Motor Vehicles.

This suggestion was rejected by the Chief, Bureau of Automotive Repair, who appointed the selection committee consisting of himself as chairman, three other members of his bureau, and a member from the Department of Consumer Affairs. Three of the committee members were from upper management, while the remaining two were from middle management. The two middle-management committee members were the only members who had read the proposals and submitted scoring sheets on the four proposals. The two individuals who completed the scoring sheets had automotive-mechanic backgrounds and were able to adequately evaluate part of the proposals, however, they were unqualified to evaluate the engineering research and development aspects of the proposals.

The vendor selection meeting was held on a Saturday morning. It was attended by the three upper management members of the selection committee, and by the Program Manager, who served as a nonvoting consultant. The two selection committee members who had completed the contractor rating sheets were not present, but copies of their results had been obtained. Two of the three voting members present at the Saturday meeting stated they had not read the proposals. The third committee member, the Chief, Bureau of Automotive Repair, has not been interviewed because he is no longer in state service. The selection committee awarded the contract to Olson Laboratories, Inc. for $250,000.

The State was not required to select the low bidder since this contract award was not conducted under competitive bidding rules.

An additional $579,213 sole-source contract was subsequently awarded to Olson Laboratories, Inc. for follow-up work to implement a trial program in the City of Riverside consisting of two inspection stations. The primary reason given by the Program Manager for the sole-source justification was the severe time schedule mandated by SB 479.

The Department of General Services, Office of Procurement, estimated that a minimum of an additional six months would be required to develop the detailed specifications necessary to put the project out to bid. The Program was already six months behind the schedule specified in SB 479 and the competitive bid cycle would further delay the Program.

The Riverside Trial Program objective is to refine and amplify tentative procedures developed under the study contract and to produce final systems specifications which can be used to competitively bid future Program contracts. As such, the sole-source procurement is an extension of work initiated in the design study contract and, according to the program manager, both contracts would have been awarded initially to the same contractor had adequate funds been available. This intent is verified in a statement from the study contract Request for Proposal which states:

> The DCA [Department of Consumer Affairs] is attempting to obtain federal funding in support of the trial program, which program will be covered in a separate RFP [Request for Proposal] or an amendment to any contract resulting from this RFP.

Lease Price for Riverside
Two-Lane Inspection Facility
Far Exceeds Study Estimate

The lease price for the two-lane Riverside inspection facility is $151,000 for each of the first two years, reducing to $48,000 per year thereafter. The cost factor used by the study contractor in his cost model for this same type of facility was $43,100 per year. Should this excess cost prevail for procurement of the other 82 inspection sites, the ten-year cost estimates will exceed Olson's cost estimate.

The two-lane inspection facility is located in a section of the City of Riverside which has numerous closed business establishments and the site selected was a vacant auto sales agency. The lessor claims he paid $184,000 for the property for which the assessor's valuation was $120,000. In the opinion of Space Management Division, Department of General Services, the two-lane facility has proven excessively expensive and they recommended against its lease.

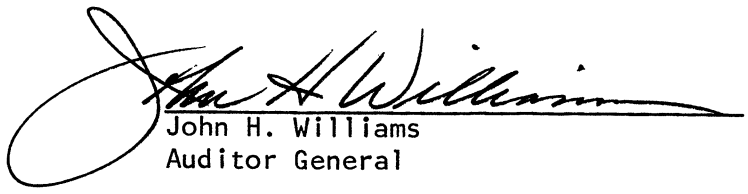
There were a number of restrictions and factors which eliminated bidding competition for the inspection site. After an unsuccessful attempt by the State to locate property, an individual who ultimately

became the lessor volunteered to try to find a site. According to the Leasing Officer of the Space Management Division, the lessor believed his offerings were the only ones being considered.

Approximate Nature of
Projected Costs

Many uncertainties in the study program make projections of ten-year program costs very approximate at best. The assumptions on vehicle inspection facility output rate have perhaps the greatest impact on program costs of any of the unknown items in the study. Facility output rate is the number of vehicles inspected in an inspection lane during a given period of time. This throughput rate will be accurately determined only after the Program is operational using state-employed inspectors. For example, should the state-employed inspectors require 30 seconds more at each station to inspect a vehicle than assumed in the study, ten-year program costs could increase by $110 million. It is suggested that actual inspection-throughput rates using state employees be accurately determined; if significantly different from those used in the study, ten-year cost projections should be updated.

Respectfully submitted,



John H. Williams
Auditor General

June 2, 1976

Staff: Richard V. Alexander

DEPARTMENT OF Consumer Affairs
1020 N STREET, SACRAMENTO, CALIFORNIA 95814
(916-445-4465)

June 1, 1976

John H. Williams
Auditor General
925 L Street, Suite 750
Sacramento, CA 95814

Dear Mr. Williams:

Your draft Report on the South Coast Air Basin Vehicle Emission Inspection Program has been reviewed as submitted to Mr. Jack Dolan, Assistant Chief, Bureau of Automotive Repair, of this Department. You are to be commended for calling attention to the issues and problems associated with this air pollution control program. In fact, the present Administration shared many of your concerns when we began to familiarize ourselves with the program upon taking office in January, 1975.

In April, 1974 the design study contract referred to in your Report was let to Olson Laboratories, Inc. and their work was substantially completed under the previous administration. Therefore, it was logical that your staff did not interview the current directorate of this department or the current Chief of the Bureau of Automotive Repair in the preparation of your Report. However, it will be of interest to you to know that Olson Laboratories, Inc. is facing litigation with this department for payments which have not been released as scheduled in the design study contract.

This Administration has also taken steps to correct administrative problems arising from the split responsibilities imposed on the Bureau and the Air Resources Board in the conduct of the program. For example, we assisted in the development of the provision of AB 4161 which would consolidate within the Air Resources Board all pollution control activities currently performed by the Bureau, including this air pollution inspection program.

Toward that end, by Interagency Agreement with the Bureau of Automotive Repair, the Air Resources Board since January, 1975 has taken the policy and day-to-day administrative and decision-making responsibility for this program. For this reason, the current Executive Officer of the Air Resources Board was asked to respond to your Report. His comments address the technical and financial aspects of your Report and are attached.

Sincerely,

Richard A. McManus

TAKETSUGU TAKEI
Director

TT:pv
Att.

State of California

# Memorandum

To : Robert N. Wiens, Chief
Bureau of Automotive Repair
3116 Bradshaw Road
Sacramento, CA 95827

Date : June 1, 1976

Subject: Report on the South Coast Air Basin Vehicle Emission Inspection Program Bureau of Automotive Repair May 1976

From : **Air Resources Board**
William H. Lewis, Jr.
Executive Officer

Attached are the comments I feel should be included in your letter of response to the Auditor General's report.

Bill

I have reviewed the attached comments and concur with the substance thereof.

Jack Dolan

Comments on finding number 1, THE CONTRACTOR'S INCOMPLETE DESIGN STUDY HAS RESULTED IN AN EMISSION INSPECTION PROPOSAL NOW BEING IMPLEMENTED WHICH COULD COST THE STATE AN UNNECESSARY $144 MILLION OVER A TEN YEAR PERIOD.

The purpose of the Design Study was to develop a program that could be tried in an experimental phase in Riverside. The purpose of the Riverside phase was to revise and refine the program for an operational system. Based on this phase of the program, we have concluded that there can be substantial costs savings. Modifications have been proposed as a result of a Riverside surveillance study which we estimate will reduce the program costs by $54.5 million dollars over a ten year period. The cost savings will result from a 23% reduction in facilities made possible by changes in the inspection regime. We have forwarded the Auditor General a copy of the report on the findings of the Riverside program including the surveillance study which is entitled "Evaluation of Mandatory Vehicle Inspection and Maintenance Programs." The report describes the modifications to the program that the Air Resources Board has recommended to the Legislature.

$140,000,000 of the savings estimated by the Auditor General are attributed to a one-third reduction in the number of facilities required. This higher figure appears to be primarily the result of misunderstandings regarding the time saved by elimination of the engine diagnosis and the ability to redistribute tasks to be performed in the inspection facilities. The discussion below sets forth greater detail regarding these misunderstandings.

1. Facilities Reduction

The "Analysis of Number of Required Inspection Lanes" (beginning on page 5-27) is the basis for reducing the number of lanes and facilities. The primary emphasis is on the efficiency of the diagnostic equipment in isolating vehicle failures. The Auditor General assumes that, if the diagnostic equipment is removed from Inspection Station 2, then Key Mode testing can be accomplished in 48 seconds while with the diagnostics 72 seconds would be consumed. By redistributing the inspector tasks (not explained in the analysis), the average time per station would then be 85 seconds or a one-third reduction from the 127.5 seconds he calculated to be the average station task time. The analysis further indicates that, with a one-third reduction in throughput time, the number of lanes and facilities could be reduced correspondingly.

Discussion

In actual testing of vehicles, the average inspector task times at station one were 2.8 minutes and 3.1 minutes at station two. These times include the 65% efficiency factor for personnel and queuing. Regardless of how the tasks are redistributed, the tasks at one station are going to take at least 2.8 minutes. Since the station requiring the longest time controls the output rate, a one-third reduction in facilities required is not possible. The Auditor General's assumption that, if the diagnostic equipment is removed other inspector tasks may be evenly distributed, is incorrect. There are no tasks which can be redistributed so that the logical sequence of inspections can be maintained.

In actual operation, the present system samples the exhaust gas and while the gas analyzers are stabilizing in each of the three modes, the diagnostic equipment is measuring various parameters. Thus, by eliminating the diagnostic equipment at station 2, 30 seconds may be saved for each vehicle requiring the power drop, and an average of 15 seconds for other vehicles. Assuming all of the failed vehicles were for HC emission and a 25 percent failure rate, this would only remove about 25 seconds from station 2, and not 45 seconds as the Auditor General calculated. However, as discussed above, the reduction in station 2 of about 15-25 seconds per vehicle would not make a redistribution of tasks possible, as assumed by the Auditor General, without disrupting the necessary, logical and practical sequence of inspector tasks. Therefore, without a redistribution, the average task time per inspector would remain the same.

$4,000,000 of the savings estimated by the Auditor General are attributed to the elimination of ignition analyzers. Based on the Riverside optimization program, we concur that the analyzers can be eliminated and have included this cost savings in our own estimates.

Comments on finding number 2, INADEQUATE CONSIDERATION GIVEN TO VEHICLES WHICH MARGINALLY FAIL EMISSION TESTING.

We disagree with the Auditor General's recommendations to use a different repair procedure for vehicles which exceed the emission standards for the program by only a small amount. The procedures have been designed so that the most simple repairs are made first so that costs are minimized if the problem is corrected with simple repairs. If, however, the Auditor General's

recommendations were followed to pass vehicles which meet the inspection standards after first making the "final adjustments," the effectiveness of the program would be diminished as less emission reduction would be achieved. This is true because the inspection standards were established to fail vehicles which are gross emitters. Therefore, a vehicle which has emissions close to the level of the standards does not represent a clean vehicle. In addition, cars with emission levels over, but close to, the standards are "gross emitters" and while adjustments may reduce their emission levels to a point somewhat under the inspection standards, other problems responsible for high emissions will not be corrected. Accordingly, the repair procedures require that vehicles should be adjusted to levels well under the inspection standards.

We feel the Auditor General's recommendation is based on an assumption that vehicles which exceed the inspection standards by a small amount are far less likely to need repairs in order to achieve low emission levels. As the foregoing indicates this assumption is not realistic.

Comments on finding number 3, THE NEED FOR MINI-COMPUTERS AND PERIPHERAL EQUIPMENT COSTING $10.5 MILLION OVER A TEN YEAR PERIOD HAS NOT BEEN ESTABLISHED.

We do not concur with this finding or much of the rationale advanced in support thereof. The report erroneously assumes that the primary purpose of the process controller (minicomputer) is to perform diagnostic measurements. The mini-computer performs many functions which include:

1. Enters vehicle identification data which correctly identifies the emission level for that model year, and engine and automatically selects the correct pass/fail emission level.

2. In the Riverside system it programs the dynamometer and introduces the settings for the test sequence.

3. Controls exhaust emission sample collection.

4. Corrects sample for instrument drift and initiates calibrations.

5. Initiates printout of emission levels and commands pass/fail decision. (Eliminates cheating)

6. Performs significant function of recording on tape the results of all tests. Quarterly reports on repair industry effectiveness are required by local geographical area. The transmission of thousands of hand written forms weekly to a control EDP point is unworkable, whereas tapes are manageable.

The computer minimizes human error in recording vehicle identification emission test settings, vehicle emission results, and pass/fail determination. It also gives assurance to the public and enhances public acceptance to know that human error has been minimized and the pass/fail decision is not based on an arbitrary human judgment.

Removal of the computer from the inspection facility will result in a greater expenditure of inspector task times at the emission

test station and also the certification station or the addition of station personnel which could increase annual operation costs by up to $50 million over a ten year period.

The inspector tasks at station 2 require a driver to observe and maintain the required speed range for each mode to obtain valid exhaust samples. If the gas measurements in each mode were to be noted and recorded manually, an additional observer-recorder would be required at station 2. In the Arizona program that the Auditor General's report mentions, the inspection facility is privately operated under franchise to the state. This profit motivated operation, which does not include vehicle diagnosis, does include computer controlled data processing.

In summary, we estimate that elimination of the mini-computers from the inspection facilities would substantially increase program costs. Our conservative estimate of the ten-year program cost increase due to elimination of the mini-computers is $50 million. An increase of $116 million would result if the number of inspection lanes required were increased in order to make up for reduced output rates.

Comments on finding number 4, UNNECESSARY DESERT INSPECTION SITES WILL RESULT IN AN EXPENDITURE OF $8.7 MILLION OVER A TEN-YEAR PERIOD.

The program was statutorily established in the six counties which lie in whole or in part within the South Coast Air Basin. Reducing the number of vehicles currently subject to the program by approximately 6 to 7 percent through elimination of these sparsely populated outlying areas would not appear to interfere significantly with the potential benefits in the basin itself. We support legislation which would so limit the program.