DECENTRALIZED PRIVATE GARAGE I/M PROGRAM
COST CALCULATION WORKSHEET

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Emission Control Technology Division
Office of Mobile Source Air Pollution Control
U.S. Environmental Protection Agency

Decentralized Private Garage I/M Program
Cost Calculation Worksheet

This worksheet is designed to enable I/M program administrators to project total costs of a decentralized private garage program at early stages of planning. The factors involved in initial and annually recurring costs are systematically organized to compute an annual inspection fee which will cover all program costs for the total length of the program. There is a separate package for projecting costs of a centralized, state- or contractor-operated program. Costs of separate fleet inspections as part of the I/M program are not considered in either of the worksheets. It is assumed that costs of administering such a fleet inspection program would be covered by permit fees to fleet owners.

The worksheet computations obviously depend heavily upon assumptions made by the user. Since in many cases users will not have detailed information, estimates have been provided which may be substituted to allow rough calculations. An example is worked through in the text of the instructions using those estimates. It is absolutely essential that users recognize that the suggested estimates are not intended to apply to every program. They merely provide a reasonable approximation where no better data is available, and worksheet users are expected to use their own best judgement in applying or adjusting them to their own program. Users should adapt the worksheet to meet their own program's unique structure.

To use the worksheet set, remove it as a unit from the back of this instruction package. Set the pages alongside the instructions, for easy cross-referencing as progress is made through the calculations. Flip through the pages while reading the following introductory summary. This will allow a sense of the overall organization of the worksheet and make the logic of the calculations more coherent. It is also a good idea to make several copies of the worksheet itself, particularly if users want to compare several program options or various basic assumptions for their effect on the inspection fee.

The organization of the worksheet set is as follows: First, assumptions which are basic to the cost calculations are enumerated and coded for easy reference as progress is made through the worksheet (section I.A.). From some of these assumptions, basic program parameters are calculated (I.B.). For example, the average annual auto population (AAP) is calculated on the basis of the current population (POP), the estimated annual growth rate (GRT), and the program length (PRL). This result is used as the basis for the program requirements, since provision must be made for more than the current population.

All costs which pertain to the private garages administering the inspections are then calculated (section II). These are divided into initial investment costs (II.A.), such as equipment and mechanic training, and recurring operating costs (II.B.), including equipment maintenance and time and overhead for the inspections themselves. These, in turn, are each converted from a per-garage or per-test basis to an overall program-wide figure.

The program-wide costs for garages are then "annualized" to take into account inflation and interest costs (II.C.). All initial investment costs for the private garages are amortized on the assumption that they depreciate completely over the length of the program. Recurring costs are multiplied by a factor which provides for the average effect of a constant rate of inflation. The annualized costs are summed to yield total program-wide average annual costs to the private garages.

The remainder of the worksheet is devoted to costs incurred by the state for monitoring and administration of the program. Calculation of initial costs to the state (section III) begins with estimates of the state's requirements for examiners to monitor the operation of the private garages (III.A.). Costs of training and hiring these station examiners are included with personnel costs of the central administrative startup staff and other administrative startup costs (III.B.). Several segments are then devoted to estimating investment requirements and costs for land, construction, equipment and personnel for state-operated referee inspection facilities (III.C.).

Annually recurring costs to the state are then computed (section IV). These are also divided between general costs of administration and surveillance of the private garage program (IV.A.) and costs pertaining to the operation of the referee facilities in particular (IV.B.).

All costs to the state are then "annualized", as were the costs to private garages, to handle inflation and interest costs for borrowed capital (section V). The state, if it operates referee facilities, will make initial investments which will retain salvage value at the end of the program. Formulae for calculating annual payment of initial costs to the state are therefore slightly more complicated than that used for the private garages (V.A.). The formula used for calculating the effect of inflation on recurring costs, however, is the same as that for the private garages (V.B.). The annualized costs are summed to yield total annualized program costs to the state (V.C.).

Finally, total annualized costs to the state and to the private garages are combined (section VI). The sum, divided by the average annual auto population, represents the cost-covering inspection fee for a decentralized program.

Before proceeding with the worksheet, users should pause to answer some basic questions regarding the character of the decentralized program they envision. These questions regard political, rather than economic choices. But since they involve basic parameters that vary widely from program to program, and since they have a strong impact on the cost assumptions, the following issues should be considered:

1. How much of a station's overhead resources will the inspection function occupy?

Will stations perform tests only incidentally, or as a more specialized, regular occupation? How many tests will each station be expected to perform? (i.e., over how many inspections may the station's capital costs be defrayed?) How much shop time will be dedicated to each inspection? Will stations be set up to handle only one inspection at a time, or multiple inspections? Will auto owners be able to drive in, have their cars tested, and drive out, or will they be expected to leave their cars at the station for, say, a day or several hours?

2. Will inspection personnel also perform vehicle repairs?

How highly trained - highly paid - must inspection personnel be? Should they be mechanics, or could they be lower paid station attendants? Should the station be expected to absorb some costs of the inspection program with profits made on accompanying repairs, or should the repair and inspection functions be separated? Who should bear costs of specialized mechanic or inspector training?

3. How much use of state-provided challenge facilities is projected?

Use, of course, will be a function of availability, which will in turn be a function of projected use. The decision as to how much challenge facilities will be used will be in part a self-fulfilling prophecy, in part a function of other elements of the program, such as separation of inspection and maintenance functions, degree of training of inspection personnel, and degree of specialization of I/M stations.

4. How will quality control be implemented?

How often will garage instruments be calibrated? Will test result certification require additional instrumentation (e.g., to record test results)? How often will station examiners visit inspection stations? What procedures will station examiners follow? Will roadside checks be performed to measure garage inspection effectiveness?

Obviously these questions are highly interrelated. Costs of a program where a limited number of stations do a high volume of inspections with low-cost personnel and repairs performed elsewhere will vary greatly from those of a program where almost any garage does a very low volume of

inspections, and the mechanic repairs vehicles on the spot. Likewise the type of quality control implemented and availability of challenge facilities provided will have a significant effect on the manner in which the garages carry out the program, and influence the distribution of costs between the state and the garages themselves.

The example worked through in the instruction text is that of an imaginary city called "Smogville". Most assumptions made for the Smogville decentralized program are parallel to those made in the worksheet designed for a centralized program, so that cross-comparison of costs can be made for the two major types of programs. In response to the questions posed above, Smogville planners envision a program where each garage performs an average of fifteen inspections per week, as incidental to its other repair functions. The personnel performing inspections will usually be well-trained mechanics, who also perform such vehicle repairs as are necessary. State challenge facilities will be made available, but only on a limited basis; i.e., sufficient for about three percent of the vehicle population, or about ten percent of anticipated failures. Private garages will be required to calibrate their instruments about four times a week, and will be subject to a brief, unscheduled inspection by a state examiner about once per month. The state examiner will also check the calibration of the garages' test equipment during his inspection. No extra costs are included to account for any additional enforcement of the program, aside from what normal administrative personnel time may be taken up by requiring evidence of passing the inspection for vehicle registration. Other pertinent assumptions made by the Smogville program administrators will be pointed out in the instructions.

I. PROGRAM PARAMETERS

A. Assumptions

1. Present Auto Population (POP): This will be a function of the geographic areas to be covered by the program and their population densities, commuting patterns relative to neighboring jurisdictions, and concentrations of vehicles subject to the inspection program. Subject vehicle classes may be defined by weight and model year ranges, or other characteristics, or by exclusion from exempt vehicle categories. The information needed to derive this figure can usually be provided by the area planning commission, highway patrol or motor vehicle authority. In Smogville, the current auto population is 750,000.

2. Annual Auto Population Growth Rate (GRT): This can be determined over the projected life of the program by use of motor vehicle department records, census data, transportation

(I.A.2, cont.)

planning data, survey information, etc. The Smogville auto population is growing at the rate of 2.6% per year.

3. Annual Inflation Rate (INF): Economists' estimates range anywhere from 5% to 10% or more. Smogville administrators anticipate a rate of 7%.

4. Annual Interest Rate (INT): Lending institutions typically set interest rates about 3.5% higher than the inflation rate, subject to the constraints of the market. Ten to twelve percent is a reasonable estimate at present, if area-specific information is not available. Occasionally, public projects can obtain slightly lower than commercial rates, e.g., through bond issues. In the Smogville program, the state will pay the same rate as private garages, at 12% per annum.

5. Program Length (PRL): Estimates will vary for each program. The program may be set up in segments of five years, if it is not clear how long the program will be required. In that case, use the length of the planning segment. Smogville is using a five-year planning segment.

6. Stringency Factor (STR): The stringency factor to be applied is derived from EPA's MOBILE1 program for calculating program benefits. It corresponds to the percent of autos that would be expected to fail the emissions criteria if there were no I/M program. In Smogville the stringency factor is set for 30%.

7. Stations per 1,000 Autos (STA/1,000): This assumption will reflect the design of the program to the extent of determining how "inspection-intensive" each private garage station must be (i.e., how many inspections each designated station will be responsible for performing). The per-1,000 auto requirement can be easily determined by getting an idea of how many inspections each station should do on an average weekly basis, and dividing 1000/50 = 20 cars/week by this number (this assumes fifty operating weeks per year). For the Smogville program, for example, planners estimate that each station will inspect an average of fifteen cars per week. 20/15 = 1.33; that is 1.33 stations are needed for every 1,000 cars in the population.

8. Garage Costs per Hour (MPH): This assumption also reflects the basic design of the program, particularly with respect to the kind of personnel to be employed as inspectors,

(I.A.8, cont.)

and the extent of each stations' resources to be dedicated to the inspection function. In the Smogville program, since well-trained mechanics will serve as the inspectors, it is estimated that inspectors' time and overhead for garages will typically come to $24 per hour.

9. Garage Time per Inspection (GTI): Again, this assumption hinges on the basic program design. If stations are to be specialized for the emissions inspection, garage time can be kept close to inspection time required for centralized programs (say 5 or 6 minutes). However, if stations are numerous and the I/M functions sporadic in each station, mechanics will have to spend extra time readjusting equipment, moving the autos into place, handling paperwork, etc. Garage time per inspection could then go as high as ten or fifteen minutes. In the Smogville program, ten minutes per auto is assumed (i.e., 0.17 hours).

10. Mechanic and Inspector Training Costs per Garage (MITG): Program designers have several options with respect to mechanic and inspector training requirements, again reflecting their basic conception of the program. The state may subsidize such training, or may require the trainees or the garages sponsoring the trainees to pay the cost, since they will derive economic benefits from the program. If vehicle inspectors will be primarily experienced mechanics responsible for repairs as well, training for the two areas of responsibility may be combined into one course. If the two functions are separated, or requirements for certification as a vehicle inspector not as stringent, separate courses may be offered. Again, policy makers may exact a fee from the individuals or garages being certified, or may simply apply part of the states' portion of the inspection fee to costs for such courses.

Current estimates range about $15-$30 for supplies, teaching equipment and instructor salaries for an 8-10 hour course for either function separately. This would also include examination and certification of the trainee by the state. In Smogville, it is assumed that the two functions will be performed by the same individual. A combined training course is offered for $30 tuition, paid for by the garage or the mechanic taking the course.

In programs where the state will cover part of training costs, that part of the cost paid by the state should be noted separately. If the garages will pay all costs for more than one kind of course, the total cost of all courses paid by the garage should be listed.

(I.A., cont.)

11. Percent of Failures Challenging (FCH): For purposes of the cost analysis worksheets, the state's provision of challenge facilities is based on the projected percent of garage inspection failures who will want to challenge the results of the garage test. For planning and assumption purposes, however, this relationship might be reversed, and the demand on challenge facilities could be a function of their supply and popularity. There is no reliable existing data to predict demand on challenge facilities; therefore the worksheet users must use their own discretion in evaluating this program element. The Smogville program predicts that about 5% of all failures will demand use of the challenge facilities.

12. Challenge Facility Hourly Lane Throughput (CTP): Factors to be taken into account in projecting the number of autos each referee lane can inspect per hour include test mode employed (loaded vs. idle, use of tachometer, parameter or safety inspection, etc.), data handling techniques (automated vs. manual, etc.), inefficiencies of scheduling, personnel, weather, mechanical difficulties, and so forth. Table 1 suggests hourly lane throughputs for three general test formats, including ranges of efficiency. However, more attention probably will be required for those motorists challenging; therefore, Smogville planners expect a throughput of around 10 cars per hour.

Table 1

Vehicle Throughput (Cars per hour) by Program Format

Program Format	Optimal Throughput	Efficiency	Projected Throughput
State/City - operated idle-mode test using tachometer	20-25	50-63%	10-16
State/City - operated idle mode test with safety inspection no tachometer	30-36	50-64%	15-23
Contractor - operated loaded mode test	20-22	61-65%	12-14

(I.A., cont.)

13. Challenge Facility Annual Operating Hours (CHR): This is the number of operating hours per year for the state-operated referee inspection facility lanes. Eight hours daily for 250 days per year would yield 2,000 operating hours. Ten hours daily would yield 2,500 hours. The Smogville program will keep each lane open eight hours per day, five days per week, for fifty weeks per year, totaling 2000 hours per lane per year.

14. Land Acquisition Costs per Square Foot ($LAND/ft^2): (For referee facilities) Land acquisition costs vary widely from locale to locale. Local estimates should be obtained including possibilities of leasing site acreage. Table 2 gives an idea of the idea variation in land costs among several existing programs and proposals. Obviously, where the state can utilize land it already owns or can convert existing facilities, these costs will be much lower. In Smogville, the state will be able to purchase commercial land at $2.50 per square foot.

Table 2

Price Variation in Land Acquisition Costs

Location	Year	Cost per Square Foot
Chicago	1974	$4.00
Denver	1974-75	$2.00-3.00
Portland	1975	$2.75
New Jersey	1975	$1.00-9.00
Cincinnati	1976	$0.92
St. Louis	1976	$1.00-30.00
Kansas	1978	$3.15
Iowa	1978	$0.93
Nebraska	1978	$0.81

15. Construction Costs per Square Foot (CONS/ft^2): Construction of referee facilites should include office, storage and lab areas, and should account for possible expansion of facilities or changes in test mode. Specifications considered should include:

Steel Frame	Overhead Doors	Forced Air MVAC
Concrete Floor	Painted Walls	Underfloor and Roof
Finished Office	Small Restrooms	Exhaust System

(I.A. 15, cont.)

Estimates of construction costs range around $26 - $35 per square foot. Again, use of existing facilites will lower these costs. In Smogville, such construction can be performed for $26 per square foot.

16. Paving Costs per Square Foot ($PAVG/ft^2): (For referee facilities) Present estimates range around $1.00 per square foot. Smogville will use this estimate.

17. Initial Public Information Costs ($IPI): These may include expenditures for testing clinics or demonstrations, media spots, mailings, advertisements, literature, workshops, contact with public interest groups and officials, and so on. Some consultants have suggested that this may amount to up to $.29 per vehicle, although most existing programs allocate quite a bit less to public information. Still, public information continues to assume greater importance for its role in enabling programs to succeed. Many planners would prefer to budget this item as a lump sum rather than as a per-auto cost. Either format is usable for the worksheet. Smogville planners prefer to budget a lump sum of $125,000.

18. Recurring Public Information Costs ($RPI): Public Information efforts should be maintained throughout the program, including several of the items listed above, such as mailings and advertisements. To some extent it may be possible to minimize these costs by, for example, including I/M program information in other motor vehicle department mailings. Some consultants have suggested $.10 per vehicle annually; and again this is more than considered necessary by most currently operating programs. Once more, this assumption can be listed either as a per-vehicle cost or as a recurring lump sum cost, which may be calculated as, say, a fraction of initial public information costs. Smogville planners conceive this cost in the range of $.10 per auto.

19. Inital Program Design, Engineering and Evaluation ($IDE): This item accounts for functions beyond those of the normal administrative staff, which are handled elsewhere in the worksheet. Such functions as research and development, program planning, system design and analysis, etc., are often contracted or subcontracted out to a separate firm, or can be performed by a small auxiliary or temporary staff. This item may also include software development. On a per vehicle basis, $.15 to $.25 is suggested for this item. Smogville planners prefer to consider this as a lump sum, and are budgeting $150,000 for this purpose.

(I.A., cont.)

20. Recurring Program Design, Engineering and Evaluation ($RDE): This is the extension and updating of initial program design functions and evaluation performed beyond the scope of the regular administrative staff. Some programs will prefer to simply incorporate this item with normal staff functions. Smogville is taking this approach and budgeting no funds separately for this function. Other programs will want to maintain a small extra engineering and evaluation project, and an estimated cost for this is about $.05 to $.08 per auto. (Can also be projected as a lump sum).

21. Computer Processing Cost per Test (CPT): This cost category is provided for situations where costs of software development and revision, data storage and retrieval, and computer time are not accounted for separately. For example, if a program does not purchase its own complete data processing system, (costs of which are handled elsewhere), this item could account for fees to a commercial timesharing system. In other cases costs of computer processing of test results may be distributed among normal duties for the administrative data analysis, statistical, and clerical staffs, and software development may be considered part of initial program design. The worksheet is designed so that any of these planning concepts may be applied. Smogville planners believe that computer processing costs are accounted for in other planning categories and are budgeting no separate funds for this. $.05 to $.15 per test is estimated for other situations, with costs varying as a function of the sophistication of the data processing program.

B. Parameter Calculations

1. Average Annual Auto Population (AAP): The average annual population, rather than the maximum, is used as the basis for requirements calculations for a given planning segment. This will minimize both underutilization and overutilization of facilities. The function shown on the worksheet yields the average annual population by computing the populations for each year of the program, and dividing the sum by the length of the program planning segment.

2. Inspection Stations Required (STRQ): The function shown in the worksheet multiplies the per-thousand auto requirement for I/M stations by the number of thousands in the annual average population, to yield the number of stations to be required for the course of the program.

Cost Calculation Worksheet: I/M Program

Decentralized Private Garage Program

SMOGVILLE, USA

I. PROGRAM PARAMETERS

A. Assumptions

1. POP = Present Auto Population = 750,000
2. GRT = Annual Auto Population Growth Rate (%) = 2.6%
3. INF = Annual Inflation Rate (%) = 7%
4. INT = Annual Interest Rate (%) = 12%
5. PRL = Program Length (years) = 5
6. STR = Stringency Factor (%) = 30%
7. STA/1,000 = Stations per 1,000 Autos = 1.33
8. MPH = Garage Costs per Hour (Wages + Overhead) = $24
9. GTI = Garage Time per Inspection (hours) = 0.17
10. MITG = Mechanic/Inspector Training Cost per Garage = $30
11. FCH = Percent of Failures Challenging = 5%
12. CTP = Challenge Facility Hourly Lane Throughput (cars/hr) = 10
13. CHR = Challenge Facility Annual Operating Hours = 2000
14. $LAND/ft^2 = Land Acquisition Costs = $2.50
15. $CONS/ft^2 = Construction Costs = $26
16. $PAVG/ft^2 = Paving Costs = $1
17. IPI = Initial Public Information Cost = $125,000
18. RPI = Annual Public Information Cost = $0.10
19. IDE = Initial Program Design, Eng. & Eval. = $150,000
20. RDE = Annual Program Design, Eng. & Eval. = 0
21. CPT = Computer Processing Cost per Test Result = 0

B. Parameter Calculations

1. Average Annual Auto Population = AAP

$$\frac{(POP)\sum_{i=0}^{PRL-1}(1+GRT)^{i}}{PRL} = 787,500 = AAP$$

2. Inspection Stations Required = STRQ

$$\frac{AAP}{1,000} \times STA/1,000 = 1,047 = STRQ$$

3. Projected Challenge Tests = CHT

$$FCH \times STR \times AAP = 11,812 = CHT$$

4. Annual Challenge Lane Capacity = CAP

$$CTP \times CHR = 20,000 = CAP$$

5. Total Challenge Lanes Required = LAN

$$\frac{CHT}{CAP} = 0.6 = LAN$$

(I.B., cont.)

3. Projected Challenge Tests (CHT): The function shown in the worksheet takes the projected average annual number of failures by multiplying the average annual population by the stringency factor. Multiplying the product by the percentage of failures challenging the private inspection yields the total number of projected users of the state-provided challenge facilities.

4. Annual Challenge Lane Capacity (CAP): This is determined by multiplying projected hourly lane throughput by annual operating hours.

5. Total Challenge Lanes Required (LAN): Divide projected challenge tests by per-lane capacity of challenge facilities to determine the necessary number of challenge lanes.

II. COSTS TO PRIVATE GARAGES

A. Initial Investment Costs

Private garages would normally need only an emissions analyzer and tachometer setup. Costs for these range from $2,500 to $3,500. For mechanic and/or inspector training, insert the portion of the assumed cost from section I.A. that applies to the private garages or mechanics. The sum of these values will represent the average set-up cost to each garage. Multiplying by the number of inspection stations required ("STRQ", from section I.B.) yields the program-wide set-up costs to private garages.

B. Annually Recurring Costs

Equipment repair and replacement costs should be estimated as a percentage of original equipment setup costs as determined in section II.A. Ten percent is typical. and this figure is used for the Smogville program. Calibration gasses can be purchased in 220 ft^3 cylinders, enough to provide calibration for about a year of operation (1 ft^3 per calibration, 200 calibrations per year) for $120-$200. Smaller cylinders of e.g., 35 ft^3, can be purchased for convenience in handling; but the cost is approximately the same as that of the larger cylinders, making the net expense very high in comparison.

The per test cost to the garage of inspector's time and other overhead resources are obtained by multiplying the garage per-hour costs (MPH) and time per inspection (GTI), both assumed in section I.A.

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II. COSTS TO PRIVATE GARAGES

A. Initial Investment Costs

1. Per Garage

Analyzer and Equipment	$2500
Mechanic Training (MITG)	30
Total per Garage	$2530 = PGI

2. Program-Wide

PGI x STRQ = $2,648,910 = PWI

B. Annually Recurring Costs

1. Per Garage

Equipment Repair and Replacement	$250
Calibration Gasses	120
Total per Garage	$370 = PGA

2. Per Test

Garage Inspector's Time and Overhead

GTI x MPH = $4.08 = PTA

3. Program-Wide

(PGA x STRQ)+(PTA x AAP) (1+STR) = $4,680,507 = PWA

(370 x 1047) + (4.08 x 787,500)(1+.30)

C. Annualized Total Costs to Private Garages

1. Amortization of Initial Costs

$$PWI \times \frac{.12 \times 1.7623}{(1 + INT)^{PRL} - 1} = 749,379$$

2. Annual Costs with Inflation

$$PWA \times \frac{\sum_{i=0}^{PRL-1} (1 + INF)^{i}}{PRL} = 5,383,274$$

3. Total Annualized Program Cost to Private Garages = 6,132,653 = TPPG

(II.B., cont.)

Program-wide annual operating costs are obtained by multiplying the per-garage costs by the number of stations required, the per test costs by the annual average number of tests (including the stringency factor to account for retests,) and adding the two products together.

C. Annualized Total Costs to Private Garages

Initial investment costs to private garages are expected to depreciate over the length of the program. Thus the program-wide initial costs constitute a principle which can be paid off in annual payments (including interest) determined by the function shown in the worksheet.

Recurring costs are assumed to rise at a constant annual rate of inflation. The function shown averages the cumulative effect of that annual rate over the length of the program to provide an average annual inflation factor which is multiplied by program-wide recurring costs to account for the average recurring costs including inflation.

The sum of annual payment of initial costs and annual operating costs with inflation yields total program-wide annualized costs to the private garages. (This total, divided by the average annual auto population, would yield the part of the inspection fee incurred by costs to the private garages).

III. INITIAL COSTS TO THE STATE

A. Station Examiner Requirements

The table presented in the worksheet outlines requirements for both initial and recurring costs, for state examiners monitoring the day to day operation of the private garage stations. Such monitoring of inspection procedures, calibration of instruments, and records of the private station will be necessary to guarantee proper quality control and execution of the public trust.

In the Smogville program, each station will be inspected once per month. Each examiner will be responsible for covering about four stations each day, or ninety each month. Based upon 1047 stations to be inspected, this requires 11.6 or 12 examiners. Direct costs of instruction will include course materials, overhead, and instructors' fees. Costs of the students' time at their hourly wage rate is added to these costs, to arrive at total training costs.

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III. INITIAL COSTS TO STATE

A. Station Examiner Requirements

	Number Required	Annual Salary	Duration of Instruction	Direct Cost of Instruction	Total Training Costs	Hiring Costs	Total Training plus Hiring Costs
Individual basis	1 per 90 stations	13,000	80 hrs	$400	$900	$25	$925
Program Total	x(STRQ) = 12 = EXS	156,000 = SES					11,100 = SETH

11.6 ↗

B. Administrative Startup Costs

1. Central Administrative Personnel

Position Area	Prs-Yrs	Cost
Program Administrators	1	32,442
Technical Officers	5	96,315
Data Analysis/Statistical Staff	3	47,760
Clerical and Secretarial Staff	4	33,464
SUBTOTAL		209,981
Overhead, Fringe and Contingency (100%)		209,981
TOTAL $CAPIN =		419,962

2. Total Administrative Startup Costs

a. Central Administrative Personnel = $CAPIN = 419,962

b. Training and Hiring of Station Examiners = $SETH = 11,100

c. Initial Public Information = IPI = 125,000
or IPI x POP

d. Initial Program Design, Engineering and Evaluation = IDE = 150,000
or IDE x POP

e. Mechanic Training (when sponsored by the State)

$MITG_{(s)}$ x STRQ = 31,410

f. Total Administrative Startup Costs = $737,472 = ADMIN

(III., cont.)

B. Administrative Startup Costs

1. Central Administrative Personnel: This is the staff that will initially plan and set up the program. Since planning and setup may last more or less than one full year, personnel requirements are stated in terms of person-years.

2. Total Administrative Startup Costs:

a. Take the total figure for central administrative startup personnel from the previous section, III.B.1.

b. Insert the program-wide total cost for training and hiring of station examiners, as derived in section III.A.

c. Enter the total cost for initial public information. If this was listed as a lump-sum assumption in I.A., enter that. If it was listed as a per-vehicle assumption, multiply that by the present auto population (POP), and enter the product.

d. Repeat step c. for initial program design, engineering and evaluation.

e. This items is to be applied only in programs where the state sponsors part of mechanic or auto inspector training. In such cases, the total amount the state expends for training for each garage should be distinguished in section I.A., line 10. Multiply this amount by the number of stations required, and enter the product. In the Smogville program, all training costs for mechanic/inspectors are covered by the garages.

f. Add a. through e. for total administrative startup costs to the state.

C. Initial Investment Costs for State Challenge Lanes

1. Facility Square Footage Requirements: The table presented provides spaces for listing estimates of square footage requirements for land, office and storage space, the inspection lanes themselves, and external paving. The table is set up for easy computation using an "a(x) + b" formula, where "x" is the number of lanes in a facility, "a" is the amount of square footage in a certain category needed for each lane in the facility, and "b" is a basic square footage requirement needed for each facility, independent of the number of lanes. For construction of the inspection lanes themselves, obviously, there is only a per-lane requirement, and no basic facility requirement.

III. Initial Costs to State (Continued)

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C. Initial Investment Costs for State Challenge Lanes

1. Facility Square Footage Requirement Estimates

Test Mode	LAND		LANES	OFFICE, ETC.		PAVING	
	Basic per Facility	Additional per Lane	(per Lane)	Basic per Facility	Additional per Lane	Basic per Facility	Additional per Lane
IDLE	10,000 ft^2	5000 ft^2	1000 ft^2	800 ft^2	400 ft^2	8200 ft^2	3100 ft^2
LOADED	ft^2						

2. Allocation of Lanes and Square Footage Requirements

LANE ALLOCATION				LAND		BUILDING					
						LANES		OFFICE, ETC.		PAVING	
Lanes per Facility	Mode	# Facilities This Size/Mode	Total Lanes	Each Facility	Total	Each Facility	Total	Each Facility	Total	Each Facility	Total
1	I	1	1	15000	15000	1000	1000	1200	1200	11300	11300
TOTAL		FAC = 1	LAN = 1	LND = 15000		LNS = 1000		OFC = 1200		PVG = 11300	

3. Challenge Facility Personnel Hiring and Training Requirements

Position	Facility Requirement	Annual Salary	Duration of Instruction	Direct Costs of Instruction per Trainee	Total Training Cost	Hiring Costs per Employee	Total Training plus Hiring
Station Manager	1 per facility	$15,000	160 hrs	$400	$1553	$25	1578
Asst. Station Manager	1 per facility or per lane	13,000	120	400	1150	25	1175
Inspection Technicians	3 per Idle Mode lane	12,000	80	400	86	25	886
	per Loaded Mode lane						
Clerks	.75 per lane	11,000	20	80	185	25	210

(III.C.1, cont.)

Thus, given the estimates shown for the Smogville program, a typical one-lane (0.6 lanes rounded off) facility would require (5,000) x (1) + (10,000) = 15,000 square feet of total land. Of this space, (1,000) x (1) = 1,000 square feet for the test lane, plus (400) x (1) + (800) = 1200 square feet for office space, etc., would be allocated to construction. Another (3,100) x (1) + (8,200) = 11,300 square feet would be allocated to external paving for queing area, employee parking, etc. The remaining 1500 square feet (10% of total land area) is allocated to landscaping.

In programs where loaded and idle facilities are both used, planners may want to use different requirement estimates for each mode. Space is provided in the table for such use.

2. Allocation of Lanes and Square Footage Estimates: The table presented in the worksheet is designed to allocate and compute the total square footage requirements in each category among the various size facilities to be built in the program. First, at the bottom of the column marked "Total Lanes", write the number derived in section I.B. (LAN) for the total lanes required. In the first column, list various facility sizes which might be used for the program. Allocate the total number of lanes among the various size facilities. Then sum to find the total number of facilities (FAC). In the Smogville program, only 1.05 lanes will be required. This will be accommodated by only one one-lane facility, kept open for 15 extra days each year.

For each size of stationary facilities, the square footage requirements can be found by applying the "a(x) + b" formula from the previous section. Multiply the results for each facility size by the number which will be that size, and enter the totals for all sizes for each category on the bottom line.

3. Challenge Facility Personnel Hiring and Training Requirements: In this table estimates are made of the number, types and costs of personnel needed to operate the inspection facilities. Four basic personnel categories are suggested, for simplicity of calculation. Since the Smogville facility will ordinarily be open 40 hours per week and facility requirements for inspection technicians are slightly padded. Personnel requirements that will vary with the size of the facility are estimated on a per-lane basis, and fractional estimates can be used to indicate overlapping or part-time scheduling.

(III.C.3, cont.)

In the Smogville program, direct costs of personnel instruction include course materials, overhead and instructors' fees. Costs of the students' time at their hourly wage rate is added to these costs to arrive at total training costs.

4. Challenge Facility Construction and Land Acquisition Costs:

a. Multiply the total square footage requirement for (from III.C.2.) by the assumed cost per square foot (from I.A.), to yield total land acquisition cost.

b. Repeat step a. for paving costs.

c. The total construction square footage requirement will be the sum of lane construction and office space construction (from III.C.2.). Multiply this sum by the assumed cost per square foot (from I.A.) to yield total construction costs.

d. Building costs consist of the sum of paving and construction costs. This item is distinguished because its depreciation period will differ from both that of land and that of other initial investments.

5. Challenge Facility Personnel Hiring and Training Costs:

a. Multiply the total training and hiring cost per employee for station managers, taken from section III.C.3., by the number of facilities (assuming one station manager per facility).

b. Repeat step a. for assistant station managers.

c. Some programs may mix test modes, and hiring and training costs or requirements may be different for the two modes. Spaces are provided for calculating inspection technician costs separately for the two modes. Otherwise simply multiply the costs per employee, by the number of employees per lane, by the total number of lanes for that mode.

d. Repeat for clerks. The per lane requirement and per clerk costs will probably be the same regardless of mode. For the Smogville program one clerk must be trained.

e. Sum a. through d. to yield total initial hiring and training costs for challenge facility personnel.

(III.C., cont.)

6. Challenge Facility Preparation and Equipment Costs: The table shown in the worksheet allows for both the listing of assumptions and the computation of total costs for all inspection facility investment costs beyond land acquisition, construction, and personnel. The table is set up on a principle similar to that of section III.C.2. (for square footage allocation). For each category there is a basic cost assigned per facility independent of the number of lanes, and an additional cost per lane to account for the size of the facility. Other costs not covered elsewhere in the worksheet may be considered in this table as Central Office costs.

In the Smogville program, for example, site preparation costs will include landscaping, hookup of utilities, etc. Test equipment will include analyzers, calibration gases, probes, etc., and backup equipment. Office equipment for the central administrative staff will be listed under personnel costs as overhead, although it could be listed here instead. Data processing equipment will include terminals for the lane, storage and retrieval equipment for the facility, and a main central processing setup, listed under central office provisions.

The total of these costs can be summed by cost category to simplify an analysis of costs by category. Or all costs per facility can be summed, that number multiplied by the number of facilities, and the product added to all per-lane and per central office costs, to simplify calculation.

7. Total Challenge Facility Initial Costs:

a. Land acquisition costs from III.C.4.a. These can be said to retain full salvage value at the end of the program.

b. Insert building costs from III.C.4.d. These can reasonably be said to depreciate over a period of 20 years.

c. Insert challenge facility personnel hiring and training costs from III.C.5.

d. Insert challenge facility preparation and equipment costs from III.C.6.

4. Challange Facility Construction and Land Acquisition Costs

a. Land Acquisition = $LANDACQ = LND x $LAND/ft^2 = $37,500

b. Paving = $PAVING = PVG x $PAVG/ft^2 = 11,700

c. Construction = $CONSTR = (OFC+LNS) x $CONS/ft^2 = 57,200

d. Total Building = $BUILDING = $PAVING + $ CONSTR = 68,500

5. Challenge Facility Personnel Hiring and Training Costs

a. Station Managers:
$ 1578 x FAC $ 1578

b. Assistant Station Managers:
$ 1175 x FAC $ 1175

c. Inspection Technicians:
$ 886 x 3 x LAN (IDLE) $ 2658
$ _____ x _____ x LAN (LOADED) = _____

d. Clerks: $ 210 x 1 x LAN $ 210
.75 ~

e. TOTAL FIELD PERSONNEL HIRING & TRAINING = $FIELDPER $ 5621

6. Challange Facility Preparation and Equipment Costs

Per (Category)	Number	Site Preparation Each	Site Preparation Total	Test Equipment Each	Test Equipment Total	Office & Other Equipmt. Each	Office & Other Equipmt. Total	Data Processing Equipmt. Each	Data Processing Equipmt. Total	TOTAL
Facility	1	5000	5000	5000	5000	2500	2500	25000	25000	37,500
Loaded Lane										
Idle Lane	1	500	500	4000	4000	200	200	5000	5000	9,700
Central Office								150,000	150,000	150,000
TOTAL			$ 5500		$ 9000		$ 2700		$ 180,000	$EQUIP = 197,200

7. Total Challenge Facility Initial Costs

a. $LANDACQ = 37,500 (no depreciation)

b. $BUILDING = 68,500 (20 years)

c. $FIELDPER = 5621

d. $EQUIP = 197,200

e. Total c, d = CHLST = 202,821 (depre = PRL)

f. Total a, b, e = Total Challenge Lanes Initial Cost $ = 308,821

(III.C., 7 cont.)

e. Add c and d. This sum represents costs that can reasonably be depreciated over five years or, alternatively, the length of the program planning segment.

f. Total initial investment costs for challenge facilities can be obtained by adding a,b, and e.

IV. RECURRING COSTS TO THE STATE

A. Administrative and Surveillance Costs

1. Personnel:

a. Central Administrative Personnel: This staff will continue to coordinate and oversee the program. In the Smogville program, its duties will include the handling of complaints, investigation of malfeasance by private garages, program design and evaluation, and coordination with other state agencies, among other administrative duties.

b. Station Examiners: (i) Insert the program-wide total salary cost for station examiners, as derived in section III.A. (ii) Add a percentage for overhead and fringe benefits. (iii) Total station examiners' salary and fringe benefit costs.

c. Add personnel and overhead costs for the central administrative staff and station examiners, for total recurring personnel/overhead costs to the state.

2. Surveillance Costs: These can be estimated on either a per-examiner or a per-station basis, whichever the user prefers. In the Smogville program, planners prefer to conceive of the station examiner traveling about 600 miles per month, at $.20 per mile, for about $1440 each per year. They are also each expected to use up about one small calibration gas cylinder per month, for an annual total of $1800.

The total cost per examiner is multiplied by the required number of examiners (rounded off to 12 for Smogville), as found in section III.A. Alternately, the mileage and calibration cost can be worked up on a per-garage basis, and the sum multiplied by the required number of stations, as derived in I.B.

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IV. RECURRING COSTS TO STATE

A. Administrative and Surveillance Costs

1. Personnel

a. Central Administrative Personnel

Position Area	Number	Cost
Program Administrators	1	32,442
Technical Officers	6	115,578
Data Analysis/Statistical Staff	3	47,760
Clerical and Secretarial Staff	2	16,732
SUBTOTAL		212,512
Overhead, Fringe and Contingency (100%)		212,512
TOTAL $CAPAN =		425,024

b. Station Examiners

annual salaries = SES = $156,000

Overhead and Fringe Benefits (85%) = 132,600

Total Station Examiner Costs = 288,600 = $SEAC

c. Total Recurring Personnel Costs

$CAPAN + $SEAC = 713,624 = REPC

2. Surveillance Costs

a. per station or per examiner

(i) Travel Costs = 1440

(ii) Calibration Equipment = 1800

(iii) Total per Station or per Examiner = $3240

b. Program-wide Total

SCPS x STRQ or SCPX x EXS = 3240 x 12 = 38,880 = PWSC

3. Annual Public Information

RDI or RPI x AAP = 78,750 = PWRPI

4. Annual Program Design, Engineering and Evaluation

RDE or RDE x AAP = — = PWRDE

5. Computer Processing of Test Results

CPT x AAP x (1 + STR (1 + FCH)) = — = PWCPT

6. Total Administrative and Surveillance Costs

REPC + PWSC + PWRPI + PWRDE + PWCPT = 881,254 = REASC

78,750 + 713,624 + 38,880

(IV.A., cont.)

3. Public Information: List a lump sum as estimated in the assumptions, or multiply a per-vehicle assumption by the annual average auto population (AAP) for recurring public information costs.

4. Program Design, Engineering and Evaluation: Repeat step 3 for recurring costs of program design, engineering and evaluation. In the Smogville program, however, these costs are covered under regular administrative personnel functions.

5. Computer Processing of Test Results: Multiply the assumed cost per test by the average annual number of tests, as determined by the function in the worksheet, including one retest for each failure expected, and one re-retest for each failure challenging the private inspection. The Smogville program assumes these costs under the purchase of data processing equipment and functions of the statistical staff.

6. Total Recurring Administrative and Surveillance Costs: Add the totals for items 1 through 5 above.

B. Challenge Facility Operating Costs

1. Challenge Facility Personnel: Multiply the appropriate per-lane or per-facility requirements by the salary costs determined in section III.C.3. Add a factor for overhead and fringe benefits, to yield the total recurring personnel costs for the challenge facilities.

2. Support Services to Facilities: These costs may include janitorial service, heating, electricity, linen and so forth, if they are not otherwise covered under overhead costs or equipment maintenance. They may be calculated using the familiar format of a basic figure per facility, independent of the number of lanes, plus an additional amount for each lane in the facility. In the Smogville program, planners considered these costs to be handled under the categories of overhead and equipment maintenance, and therefore no cost is listed here.

3. Travel: Smogville planners consider that to maintain communication and efficient management, and to transport supplies between the central office and the referee facility, it will be necessary to travel approximately 1500 miles per year for the one facility. At $.20 per mile, this is projected to cost $300 per facility.

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B. Challenge Facility Operating Costs

1. Field Facility Personnel

a. Station Managers: $15000 x FAC = $15,000

b. Assistant Station Managers $13,000 x FAC = 13,000

c. Inspection Technicians
$12000 x (3 x LAN [IDLE]
+ ____ x LAN [LOADED] = 36,000

d. Clerks: $11,000 x .75 x LAN = 8,250

e. SUBTOTAL = 72,250

f. Overhead & Fringe Benefits (85 %) = 61,412

g. Total Field Facility Personnel = $133,662

2. Support Services to Facilities

$____ x FAC + $____ x LAN = 0

3. Travel: $300 x FAC = 300

4. Equipment Maintenance = 20 % x $EQUIP = 38,840

5. Insurance Costs

$1000 x FAC + $1500 x LAN = 2,500

6. Total Annual Challenge Lanes Operating Costs = 41,640 = RECHL

V. ANNUALIZED COSTS TO STATE

A. Amortized Initial Costs

1. Land Acquisition

$LANDACQ x INT - 4,502

2. Building

$BUILDING x INT

$$\times \left(1 + \frac{PRL}{DEPR \times [(1+INT)^{PRL} - 1]}\right)$$

- 10,916

3. Other Startup

$$(ADMIN + CHLST) \times \frac{INT(1+INT)^{PRL}}{(1+INT)^{PRL} - 1}$$

- 269,066

4. Total Annual Payment with Interest

$284,482 = STAPI

(IV.B, cont.)

4. Equipment Maintenance: Recurring equipment maintenance costs can be estimated as a percentage of initial equipment costs. Costs of upkeep on landscaping, data processing equipment and so forth are all considered in a single percentage in the Smogville program. 20% is taken of the total initial expenditure derived in section III.C.6.

5. Insurance Costs: This cost will apply only to those state-operated programs where states are not self-insuring. Insurance costs themselves vary in a manner too complex to be thoroughly represented in a simple worksheet. Elements to be taken into account would include construction materials, location, equipment utilized, and operating hours of the facilities. In the worksheet, this is all reduced to a simple function including a basic factor per facility, independent of the number of lanes, and an additional amount for each lane in the facilities. In the Smogville program, this is estimated at $1,000 per facility and $1500 per lane, or $2500 for the single one-lane facility.

6. Total Recurring Challenge Facility Operating Costs: Add items 1 through 5.

V. ANNUALIZED COSTS TO THE STATE

A. Amortized Initial Costs

1. Land Acquisition: Land is usually assumed not to depreciate in real value, and thus the salvage value of the property at the end of the program is assumed to be equal to the original cost, plus inflation. The annualized cost for the land is thus simply the interest on the original expenditure, $LANDACQ (from section III.C.7., line a).

2. Building: The equation shown in the worksheet calculates the annual payment with interest for items which may have varying periods of depreciation. Twenty years is traditionally assumed as the (straight line) depreciation period for buildings ($BUILDING, from section III.C.7., line b), and is assumed for the Smogville program, although any depreciation period may be substituted for "DEPR" in the equation. For the Smogville program, with a five-year planning segment, this implies that the challenge facility buildings will have 75% salvage value at the end of the program.

(V.A., cont.)

3. Other Startup Costs: These include administrative startup costs (ADMIN, from section III.B.2., line f) and any investments in the challenge facility that are anticipated to depreciate fully over the length of the program planning segment (CHLST, from section III.C.7., line e). Such investments will have no salvage value at the end of the program.

4. Total Annual Payment With Interest: Add the results of calculations for the three items, above, to yield the total annualized payment of initial costs, including interest.

B. Average Recurring Costs Accounting For Inflation

1. Total Recurring Costs: Add recurring costs for administration and surveillance (REASC, from section IV.A., line 6) to operating costs for state challenge facilities (RECHL, from section IV.B., line 6), for total recurring costs to the state.

2. Recurring Costs with Inflation: As for the private garages, recurring costs are assumed to rise at a constant annual rate of inflation. The function presented in the worksheet (identical to that used in section II.C.2) averages the cumulative effect of that annual rate over the length of the program to provide an average annual inflation factor, which is multiplied by total recurring costs to the state to yield actual anticipated "average" recurring costs.

C. Total Annualized Program Costs to the State:

Add the annualized payment of initial costs (STAPI, from section V.A., line 4), to recurring costs with inflation (STANNI) from section V.B., line 2), to yield total annualized program costs to the state.

At this point, the states' portion of the inspection fee can be calculated by dividing the total annualized program costs to the state (TPST) by the average annual auto population (AAP).

VI. TOTAL OVERALL PROGRAM COSTS

A. Total Annualized Overall Program Costs

Add total annualized costs to the state (TPST, from section V.C.) to total annualized costs to the private garages (TPPG, from section II.C., line 3), to yield total overall annualized program costs.

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B. Average Recurring Costs with Inflation

1. Total Recurring Costs

REASC + RECHL = 1,006,58 = STANN

2. Recurring Costs with Inflation

$$STANN \times \frac{\sum_{i=0}^{PRL-1} (1 + INF)^i}{PRL} = 1,157,539\ STANN_1$$

C. Total Annualized Program Costs to State

$STANN_1$ + STAPI = $1,442,021 TPST

VI. TOTAL OVERALL PROGRAM COSTS

A. Total Annualized Overall Program Costs

TPPG + TPST = $7,574,674 = TOTAL

6,132,653 + 1,442,021

$7.79 garage

1.83 State

B. Average Annual Program Cost per Motorist

= Inspection Fee = $\frac{TOTAL}{AAP}$ = $9.62

(VI., cont.)

B. Average Annual Inspection Fee to Motorists

Divide total annualized overall program costs by the average annual auto population, to yield the cost-covering inspection fee per auto.

Cost Calculation Worksheet: I/M Program

Decentralized Private Garage Program

I. PROGRAM PARAMETERS

A. Assumptions

1. POP = Present Auto Population = _____
2. GRT = Annual Auto Population Growth Rate (%) = _____
3. INF = Annual Inflation Rate (%) = _____
4. INT = Annual Interest Rate (%) = _____
5. PRL = Program Length (years) = _____
6. STR = Stringency Factor (%) = _____
7. STA/1,000 = Stations per 1,000 Autos = _____
8. MPH = Garage Costs per Hour (Wages + Overhead) = _____
9. GTI = Garage Time per Inspection (hours) = _____
10. MITG = Mechanic/Inspector Training Cost per Garage = _____
11. FCH = Percent of Failures Challenging = _____
12. CTP = Challenge Facility Hourly Lane Throughput (cars/hr) = _____
13. CHR = Challenge Facility Annual Operating Hours = _____
14. $\$LAND/ft^2$ = Land Acquisition Costs = _____
15. $\$CONS/ft^2$ = Construction Costs = _____
16. $\$PAVG/ft^2$ = Paving Costs = _____
17. IPI = Initial Public Information Cost = _____
18. RPI = Annual Public Information Cost = _____
19. IDE = Initial Program Design, Eng. & Eval. = _____
20. RDE = Annual Program Design, Eng. & Eval. = _____
21. CPT = Computer Processing Cost per Test Result = _____

B. Parameter Calculations

1. Average Annual Auto Population = AAP

$$\frac{(POP)\ \sum_{i=0}^{PRL-1} (1+GRT)^{i}}{PRL} = \_\_\_\_\_ = AAP$$

2. Inspection Stations Required = STRQ

$$\frac{AAP}{1,000} \times STA/1,000 = \_\_\_\_\_ = STRQ$$

3. Projected Challenge Tests = CHT

$$FCH \times STR \times AAP = \_\_\_\_\_ = CHT$$

4. Annual Challenge Lane Capacity = CAP

$$CTP \times CHR = \_\_\_\_\_ = CAP$$

5. Total Challenge Lanes Required = LAN

$$\frac{CHT}{CAP} = \_\_\_\_\_ = LAN$$

II. COSTS TO PRIVATE GARAGES

A. Initial Investment Costs

1. Per Garage

Analyzer and Equipment _____

Mechanic Training (MITG) _____

Total per Garage _____ = PGI

2. Program-Wide

PGI x STRQ = _____ = PWI

B. Annually Recurring Costs

1. Per Garage

Equipment Repair and Replacement _____

Calibration Gasses _____

Total per Garage _____ = PGA

2. Per Test

Garage Inspector's Time and Overhead

GTI x MPH = _____ = PTA

3. Program-Wide

(PGA x STRQ)+(PTA x AAP) (1+STR) = _____ = PWA

C. Annualized Total Costs to Private Garages

1. Amortization of Initial Costs

$$PWI \times \frac{INT\ (1 + INT)^{PRL}}{(1 + INT)^{PRL} - 1} = \_\_\_\_\_$$

2. Annual Costs with Inflation

$$PWA \times \frac{\sum_{i=0}^{PRL-1} (1 + INF)^{i}}{PRL} = \_\_\_\_\_$$

3. Total Annualized Program Cost to Private Garages = _____ = TPPG

III. INITIAL COSTS TO STATE

A. Station Examiner Requirements

	Number Required	Annual Salary	Duration of Instruction	Direct Cost of Instruction	Total Training Costs	Hiring Costs	Total Training plus Hiring Costs
Individual basis	1 per_____ stations						
Program Total	x(STRQ) = = EXS	= SES					= SETH

B. Administrative Startup Costs

1. Central Administrative Personnel

Position Area	Prs-Yrs	Cost
Program Administrators		
Technical Officers		
Data Analysis/Statistical Staff		
Clerical and Secretarial Staff		
SUBTOTAL		
Overhead, Fringe and Contingency (____%)		
TOTAL $CAPIN =		

2. Total Administrative Startup Costs

a. Central Administrative Personnel = $CAPIN = _____

b. Training and Hiring of Station Examiners = $SETH = _____

c. Initial Public Information = IPI = _____
or IPI x POP

d. Initial Program Design, Engineering and Evaluation = IDE = _____
or IDE x POP

e. Mechanic Training (when sponsored by the State)

$MITG_{(s)}$ x STRQ = _____

f. Total Administrative Startup Costs = _____
= ADMIN

C. Initial Investment Costs for State Challenge Lanes

1. Facility Square Footage Requirement Estimates

Test Mode	LAND		LANES	OFFICE, ETC.		PAVING	
	Basic per Facility	Additional per Lane	(per Lane)	Basic per Facility	Additional per Lane	Basic per Facility	Additional per Lane
IDLE	ft^2	ft^2	ft^2	ft^2	ft^2	ft^2	ft^2
LOADED	ft^2						

2. Allocation of Lanes and Square Footage Requirements

LANE ALLOCATION				LAND		BUILDING					
						LANES		OFFICE, ETC.		PAVING	
Lanes per Facility	Mode	# Facilities This Size/Mode	Total Lanes	Each Facility	Total	Each Facility	Total	Each Facility	Total	Each Facility	Total
TOTAL		FAC =	LAN =	LND =		LNS =		OFC =		PVG =	

3. Challenge Facility Personnel Hiring and Training Requirements

Position	Facility Requirement	Annual Salary	Duration of Instruction	Direct Costs of Instruction per Trainee	Total Training Cost	Hiring Costs per Employee	Total Training plus Hiring
Station Manager	1 per facility						
Asst. Station Manager	1 per facility or per lane						
Inspection Technicians	per Idle Mode lane						
	per Loaded Mode lane						
Clerks	per lane						

4. Challange Facility Construction and Land Acquisition Costs

a. Land Acquisition = $LANDACQ = LND x $LAND/ft^2 = _____

b. Paving = $PAVING = PVG x $PAVG/ft^2 = _____

c. Construction = $CONSTR = (OFC+LNS) x $CONS/ft^2 = _____

d. Total Building = $BUILDING = $PAVING + $ CONSTR = _____

5. Challenge Facility Personnel Hiring and Training Costs

a. Station Managers:
$_____ x FAC = _____

b. Assistant Station Managers:
$_____ x FAC = _____

c. Inspection Technicians:
$_____ x _____ x LAN [IDLE] = _____

$_____ x _____ x LAN [LOADED] = _____

d. Clerks: $_____ x _____ x LAN = _____

e. TOTAL FIELD PERSONNEL HIRING & TRAINING = $FIELDPER = _____

6. Challange Facility Preparation and Equipment Costs

Per (Category)	Number	Site Preparation		Test Equipment		Office & Other Equipmt.		Data Processing Equipmt.		TOTAL
		Each	Total	Each	Total	Each	Total	Each	Total	
Facility										
Loaded Lane										
Idle Lane										
Central Office										
TOTAL										$EQUIP =

7. Total Challenge Facility Initial Costs

a. $LANDACQ = _____ (no depreciation)

b. $BUILDING = _____ (20 years)

c. $FIELDPER = _____

d. $EQUIP = _____

e. Total c, d = CHLST = _____ (depre = PRL)

f. Total a, b, e
= Total Challenge Lanes Initial Cost = _____

IV. RECURRING COSTS TO STATE

A. Administrative and Surveillance Costs

1. Personnel

a. Central Administrative Personnel

Position Area	Number	Cost
Program Administrators		
Technical Officers		
Data Analysis/Statistical Staff		
Clerical and Secretarial Staff		
SUBTOTAL		
Overhead, Fringe and Contingency (___%)		
TOTAL $CAPAN =		

b. Station Examiners

annual salaries = SES = _____

Overhead and Fringe Benefits (____%) = _____

Total Station Examiner Costs = _____ = $SEAC

c. Total Recurring Personnel Costs

$CAPAN + $SEAC = _____ = REPC

2. Surveillance Costs

a. per station or per examiner

(i) Travel Costs = _____

(ii) Calibration Equipment = _____

(iii) Total per Station or per Examiner = _____

b. Program-wide Total

SCPS x STRQ = _____ = PWSC
or SCPX x EXS

3. Annual Public Information

RDI
or RPI x AAP = _____ = PWRPI

4. Annual Program Design, Engineering and Evaluation

RDE
or RDE x AAP = _____ = PWRDE

5. Computer Processing of Test Results

CPT x AAP x (1 + STR (1 + FCH)) = _____ = PWCPT

6. Total Administrative and Surveillance Costs

REPC + PWSC
+ PWRPI + PWRDE + PWCPT = _____ = REASC

B. Challenge Facility Operating Costs

1. Field Facility Personnel

a. Station Managers: $_____ x FAC = _____

b. Assistant Station Managers $_____ x FAC = _____

c. Inspection Technicians

$_____ x (_____ x LAN [IDLE]

+ _____ x LAN [LOADED] = _____

d. Clerks: $_____ x _____ x LAN = _____

e. SUBTOTAL = _____

f. Overhead & Fringe Benefits (_____%) = _____

g. Total Field Facility Personnel = _____

2. Support Services to Facilities

$_____ x FAC + $_____ x LAN = _____

3. Travel: $_____ x FAC = _____

4. Equipment Maintenance = ____% x $EQUIP = _____

5. Insurance Costs

$_____ x FAC + $_____ x LAN = _____

6. Total Annual Challenge Lanes Operating Costs = _____ = RECHL

V. ANNUALIZED COSTS TO STATE

A. Amortized Initial Costs

1. Land Acquisition

$LANDACQ x INT = _____

2. Building

$BUILDING x INT

$$\times \left(1 + \frac{PRL}{DEPR \times [(1+INT)^{PRL} - 1]}\right)$$ = _____

3. Other Startup

$$(ADMIN + CHLST) \times \frac{INT(1+INT)^{PRL}}{(1+INT)^{PRL} - 1}$$ = _____

4. Total Annual Payment with Interest = _____

= STAPI

B. Average Recurring Costs with Inflation

1. Total Recurring Costs

REASC + RECHL = _____ = STANN

2. Recurring Costs with Inflation

$$STANN \times \frac{\sum_{i=0}^{PRL-1} (1 + INF)^i}{PRL} = \_\_\_\_\_ \; STANN_i$$

C. Total Annualized Program Costs to State

$STANN_i$ + STAPI = _____ TPST

VI. TOTAL OVERALL PROGRAM COSTS

A. Total Annualized Overall Program Costs

TPPG + TPST = _____ = TOTAL

B. Average Annual Program Cost per Motorist

= Inspection Fee = $\frac{TOTAL}{AAP}$ = _____

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