APTD-1506

A STUDY OF EMISSIONS FROM 1966-1972 LIGHT-DUTY VEHICLES IN WASHINGTON, D. C. SECOND EDITION

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Mobile Source Air Pollution Control
Certification and Surveillance Division
Ann Arbor, Michigan 48105

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A STUDY OF EMISSIONS FROM 1966-1972 LIGHT-DUTY VEHICLES IN WASHINGTON, D. C. SECOND EDITION

Prepared by

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General Environments Corporation
6840 Industrial Road
Springfield, Virginia 22151

Contract Number 68-01-0454

EPA Project Officer: John T. White III

Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Mobile Source Air Pollution Control
Certification and Surveillance Division
Ann Arbor, Michigan 48105

January 1974

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Publication Number APTD-1506

ABSTRACT

General Environments Corporation (GEC) of Springfield, Virginia was selected to participate in the 1972 Emission Factors Program (Six Cities Program) by the Environmental Protection Agency (EPA). One hundred and seventy privately owned passenger vehicles from the Metropolitan Washington, D.C. area were tested for exhaust emission levels of carbon monoxide, carbon dioxide, hydrocarbons and oxides of nitrogen according to the 1975 Federal Test Procedure. Testing of vehicles included both cold and hot start cycles. The test results were then used to calculate emission factors based on both the 1972 and 1975 Federal Test Procedures.

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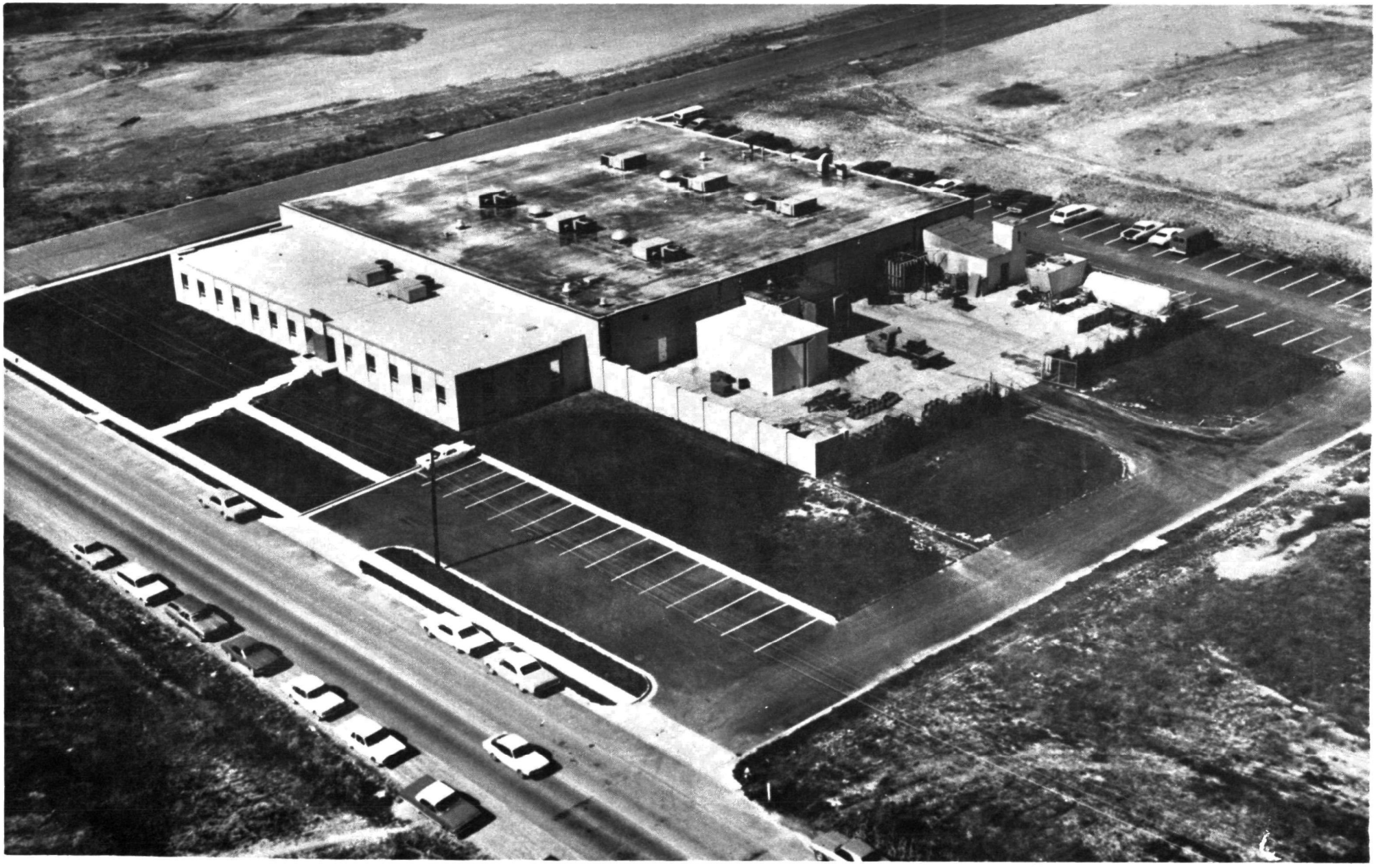


GENERAL ENVIRONMENTS CORPORATION
SPRINGFIELD, VIRGINIA

1.0 INTRODUCTION

General Environments Corporation (GEC), of Springfield, Virginia, formerly called General Testing Laboratories, was awarded a contract by the Environmental Protection Agency for conducting "A Study of Emissions from 1966-1972 Light-Duty Vehicles in Washington, D.C." The contractual date was 7 September 1972.

One hundred eighty tests were conducted on one hundred seventy vehicles using the 1975 Federal Test Procedure over a six week period.

Punched computer cards have been provided to EPA for grams of pollutant per test vehicle per test cycle and the final gm/mile results have been calculated according to the 1972 and 1975 Federal Test Procedures.

2.0 TEST PROGRAM

2.1 PROGRAM OBJECTIVE

The objective of this program was to provide the Environmental Protection Agency with data on emissions of 1966-1972 model year vehicles representative of the nationwide vehicle population.

Information has previously, through a prior year contract, been acquired for 1957-1971 model year vehicles. This is the first information available for 1972 model year vehicles, and updates the emission data for prior model year vehicles.

The vehicles were tested in an as-received condition, thus the reported emissions can be considered representative of the actual emissions generated by these makes/models/engine types in this metropolitan area.

Similar contracts were performed in Washington, D.C.; Houston, Texas; Los Angeles, California; Denver, Colorado; Chicago, Illinois; and St. Louis, Missouri to provide the same information.

2.2 PROGRAM DESIGN

Individual exhaust emission tests were conducted on 170 light-duty vehicles from model years 1966-1972. Each vehicle was operated on a chassis dynamometer through the EPA urban driving cycle from both a cold start and a hot start. In addition, ten vehicles were retested to provide replicate data to be used to determine the test to test reproducibility on the same car.

The exhaust emissions from each vehicle were measured during the transient and stabilized portions of both the cold and hot start runs. The emission rates of total hydrocarbons, nitric oxide, total nitrogen oxides, carbon monoxide and carbon dioxide were determined. In addition, undiluted CO concentration in raw tailpipe exhaust was measured while the vehicle was idling.

The data obtained allow computation of gm/mile emission rates for hydrocarbons, carbon monoxide, total oxides of nitrogen and carbon dioxide in accordance with the 1972 and 1975 Federal Test Procedures.

2.2.1 Pretest Phase

EPA certification of equipment, procedures and personnel was completed prior to commencement of test scheduling. Concurrently test vehicles were located.

2.2.2 Test Phase

Vehicles were scheduled for test on a daily basis and after receipt of a test car the vehicle was inspected and prepared for test. A 12 hour temperature soak permitted the vehicle to attain the temperature required by the Federal Test Procedure. Both cold start and hot start exhaust emission tests were conducted on all vehicles in general accordance with the provisions of the Federal Register and the contract scope of work.

2.2.3 Data Acquisition, Processing, and Submission

Test data was processed as acquired by both manual and computer methods. Each vehicle data set was maintained separately and identified by a vehicle number and a run number.

A computer program was constructed to perform the required emission calculations and to provide punched cards for submission to EPA. Additional programs were developed to perform the 1972 calculations, the 1975 calculations, and the calculations required for preparation of the tables required in the final report.

2.3 TEST VEHICLE PROCUREMENT

The test program required the testing of 170 cars of the years 1966-1972 and the retesting of a select number of cars for each model year.

2.3.1 Selection Procedure

Guidelines for the selection of test vehicles were provided in the contract and are reproduced in the following table (Table No. 1). The sample sizes are based on vehicle miles traveled for each model year's vehicles.

TABLE I

NUMBER OF VEHICLES TO BE TESTED IN WASHINGTON, D.C.

Vehicle Model Year	Sample Size/Model Year
1972	35
1971	30
1970	27
1969	22
1968	21
1967	18
1966	17
All	170

The Environmental Protection Agency provided a list of specific cars to be tested. R.L. Polk & Co., Marketing Service Division, provided mailing labels (Exhibit A) for the desired vehicle types (See Table 2). Several mailings (Exhibits B, C & D) were conducted using these labels. A program of newspaper ads and personal contact was instituted to fill the differences between the set of mailing labels and the EPA requirements.

70FLN 8
MS CLAIRE C SIZER
1829 WYOMING AV NW
WASHINGTON DC 20009

72FLN 6
MR PHILLIP E MORRIS
1475 EUCLID ST NW
WASHINGTON DC 20009

67FLN 8
MR JAMES H WIERZBA
1601 18TH ST NW
WASHINGTON DC 20009

66FOR 8
MR MARSHALL LOGAN
1853 VERNON ST NW
WASHINGTON DC 20009

67FOR 8
MR JAMES S ALLEN
1325 RIGGS ST NW
WASHINGTON DC 20009

66FOR 8
MR WILLIAM PALMER
1518 SWANN ST NW
WASHINGTON DC 20009

72OLD 8
MS VIRGINIA J WYATT
2701 14TH ST NW
WASHINGTON DC 20009

66OLD 8
MS EMMA J ROBINSON
2113 12TH ST NW
WASHINGTON DC 20009

66PLY 6
MR BRINDLEY B PIETERS
2401 ONTARIO RD NW
WASHINGTON DC 20009

67MUS 8
MS DORIS E SMITH
1910 KALORAMA RD NW
WASHINGTON DC 20009

68MUS 8
MR MICHAEL D WEBB
1616 18TH ST NW
WASHINGTON DC 20009

67MUS 8
MR ALI R SHAJARIAN
1921 19TH ST NW
WASHINGTON DC 20009

66MUS 8
MR JOSE L CHAVEZ
1801 CLYDESDALE NW
WASHINGTON DC 20009

70OLD 8
MR PHILIP F JOHNSON
1714 SUMMIT PL NW
WASHINGTON DC 20009

72PIN 4
MR CLARENCE E BEVERLY JR
2342 15TH ST NW
WASHINGTON DC 20009

72PON 8
MR HERBERT S HAWKINS
1350 CLIFTON ST NW
WASHINGTON DC 20009

TABLE 2

QUANTITY OF LABEL LISTINGS BY MODEL YEAR

	No. of Cylinders	1966	1967	1968	1969	1970	1971	1972
Cadillac	8	200	200	150	150	100	100	100
Oldsmobile	8	200	200	150	150	100	100	100
Buick	8	None	200	150	150	100	100	100
Pontiac	8	200	200	150	150	100	100	100
Mercury	8	None	200	150	150	None	None	100
Lincoln	8	None	None	None	None	100	100	100
Chrysler	8	200	200	150	150	100	100	100
Chevrolet	8	200	200	150	150	100	100	100
Chevrolet	6	200	200	150	150	100	100	100
Chevrolet	4	None	None	None	None	None	100	100
Ford	8	200	200	150	150	100	100	100
Ford	6	200	200	150	150	100	100	100
Ford	4	None	None	None	None	None	100	100
Volkswagen	4	200	200	150	150	100	100	100
Datsun	4	None	None	None	None	100	100	100
Mercedes Benz	8	None	None	None	None	None	100	100
Toyota	4	None	None	None	None	100	100	100
Plymouth	8	200	200	150	150	100	100	100
Plymouth	6	200	None	150	150	100	100	100
AMC	8	None	None	None	150	100	100	100
AMC	6	None	200	150	150	100	100	100

GENERAL

General Testing Laboratories, Inc. / 6840 Industrial Road, Springfield, Virginia 22151 / (703) 354-2000

Form No. 4505-1

Form Approved
Office of Management
& Budget No. 158-S-72033

Dear Vehicle Owner:

You may be able to make an important contribution towards controlling the nation's air pollution problem, and receive a $25 U.S. Savings Bond for your cooperation.

As you may know, the U.S. Environmental Protection Agency is conducting an important testing program for vehicle exhaust pollution in six major metropolitan areas: Chicago, St. Louis, Denver, Los Angeles, Houston, and Washington, D.C. Our organization has been selected by the Government to perform these tests in this area. We are writing you because your vehicle has been randomly selected as a candidate for testing.

Enclosed is a postpaid card which you should complete and return at your earliest convenience. Printed on the card is the model year and make of a vehicle registered in your name. Please indicate if you still own this vehicle, and if you are willing to submit it to our laboratory where it will be tested under simulated normal driving conditions. No unusual operations will be performed and no adjustments will be made to your vehicle. It will be fully insured while in our possession.

We have been authorized by the Environmental Protection Agency to award a $25 U.S. Savings Bond to each participant whose vehicle is tested. Also, if you wish, we will provide you, free of charge, a late-model, fully-insured rental car for your use during the time your vehicle is being tested.

We know you will want to be a part of this important project. Please complete and return the enclosed postage-paid postcard today. We will contact you shortly to schedule the test.

Sincerely yours,

GENERAL TESTING LABORATORIES DIVISION
General Environments Corporation

R. G. Kolb

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

December 15, 1972

A Message to the Vehicle Owner

The U.S. Environmental Protection Agency, in carrying out the Clean Air Act, has contracted with competent testing organizations to conduct emission tests on certain randomly-selected 1966-1972 model vehicles. The purpose of these tests is to develop emission factors for use in making nationwide emission estimates. The test results from any individual vehicle will be used only by the EPA in comparison with the test results from all similar vehicles. The outcome of the test on any individual vehicle cannot result in any enforcement action against the vehicle owner.

The enclosed letter to you, from one of these testing organizations, explains this project in detail, and it asks to test your vehicle. The purpose of this message is to urge that if at all possible, you allow your vehicle to be tested in this program.

To assure valid results from this program, the specific vehicles that will comprise the sample to be tested are randomly selected in proportion to a nationwide vehicle population average, without bias, from vehicle registration lists provided by private research firms. Your vehicle has been tentatively selected by means of this process. Your participation in the test will represent a real and significant contribution to the cause of clean air.

Please read the enclosed letter. You will note that it says a follow-up will be made. Should you have an unlisted telephone number, or if for any other reason it may be difficult for the testing organization to reach you by phone, please call the number given in the enclosed letter to arrange for your participation.

Sincerely yours,

Eric O. Stork
Director
Mobile Source Pollution Control Program

Enclosure

EXHIBIT C

Form No. 4505-2

Form Approved
Office of Management
& Budget No. 158-S-72033

Vehicle registration lists show that the motor vehicle shown below is registered in your name:

If Incorrect,
Please Correct

Do you still own this vehicle? Yes ☐ No ☐

If yes, will you be willing to allow us to conduct pollution tests on this vehicle? Yes ☐ No ☐

If yes, please indicate a telephone number where we can reach you to make arrangements.

Phone:_____Best Time to Call:_____

EXHIBIT D

Once the original contact was made, a file was kept by year and make. Information was obtained from the car owners concerning engine size, transmission and carburetor venturis. If the car fit the set of cars needed, the owner was contacted at a later date when an appointment time was set.

Once a car arrived at the laboratory, a preliminary inspection was conducted which consisted of an inspection to determine if there were obvious problems with the exhaust or emission control systems and the vehicle had the proper engine, transmission, and carburetor combination. Included in this inspection was general mechanical condition of the vehicle as well as driveability and safety of operation.

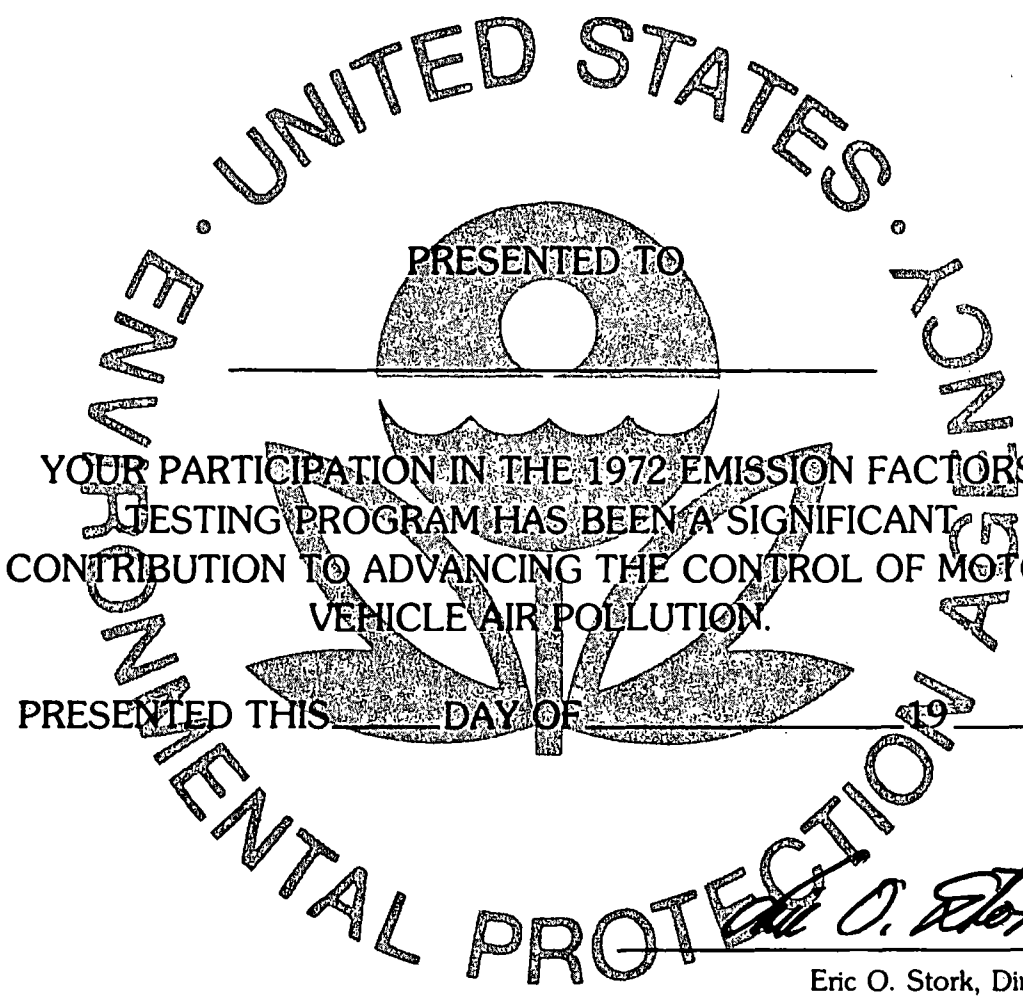
Any replacements to be made due to aborted tests or non-compliance with the test requirements were contacted from a reserve file.

2.3.2 Test Vehicle Handling

After the preliminary inspection was conducted, an exchange of cars and receipts took place. The car owner received a courtesy car with a full tank of gas and after the test a $25.00 savings bond and an Environmental Protection Agency certificate of appreciation (Exhibit E). The test vehicle was driven to the defueling area and the gas tank emptied. The gasoline was deposited into a 55 gallon drum. The specified volume of test fuel was pumped into the car's gas tank.

A 10 minute course was set up through the industrial park where GEC is located and each car was driven over this course before being placed in the laboratory. The cars were driven into the laboratory and parked. At this point the date and time was posted on each car's windshield. The owner's drive to the laboratory and the 10 minute purge run constituted the vehicle preconditioning.

Certificate of Appreciation



PRESENTED TO

_____

YOUR PARTICIPATION IN THE 1972 EMISSION FACTORS TESTING PROGRAM HAS BEEN A SIGNIFICANT CONTRIBUTION TO ADVANCING THE CONTROL OF MOTOR VEHICLE AIR POLLUTION.

PRESENTED THIS _____ DAY OF _____ 19____

Eric O. Stork

_____

Eric O. Stork, Director
Mobile Source Pollution Control Program
Environmental Protection Agency

EXHIBIT E
11

The car was hand pushed within the laboratory at all times and included hand pushing onto the dynamometer to start the test.

The fuel used in all tests was Texaco Indolene 30 test fuel. A certified analysis of the test fuel is included as Appendix I of this report.

A final inspection was performed after the car was situated on the dynamometer before the actual test was begun. It was determined that the emission controls were connected and that the engine had not been modified extensively. This ensured vehicles which were representative of the vehicle population. The technician attached the sampling boot to the exhaust system.

After the test was completed, the ignition timing, idle speed and dwell were measured and recorded. The percent of carbon monoxide in the exhaust was measured and recorded while the engine was idling.

2.3.3 Test Vehicle Procurement

Test vehicle procurement was based on the EPA vehicle mix referred to in Section 2.3.1 of this report. The proper vehicle mix was sought through the use of mailing labels, newspaper ads, radio ads, and flyers. A very minor number of test vehicles were received from civic or fraternal organizations. Several vehicles were obtained through local college groups. There were no rental vehicles used in this program. A listing of the EPA proposed test cars and the test cars substituted by GEC is provided in Table 3. Only those vehicles in the columns marked "Actual" were substituted for the adjacent vehicle in the proposed column. Those vehicles listed only in the "Proposed" column were tested as described.

1972 EMISSION FACTORS PROGRAM

TEST SITE: WASHINGTON, D. C. CONTRACTOR: GENERAL ENVIRONMENTS CORPORATION

MAKE	TOTALS	1972		1971		1970		1969		1968		1967		1966	
		Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual
American Motors	5	6-258A1				8-304A2				8-290A2	6-232A1	6-232A2	8-343A2	6-232M1	6-232A1
Buick	12	8-350A2		8-350A2		8-350A2	8-350A4	8-350A2		8-430A4	8-400A4	8-300A2		8-340A2	
		8-455A4		8-455A4		8-455A4		8-430A4							
		8-455A4													
Cadillac	4	8-472A4						8-472A4		8-472A4(*)				8-429A4	
Chevrolet	39	4-140A2	4-140M2	4-140M1		6-250A1		6-230M1		6-164M2	6-250A1	6-230M1	6-250M1	6-194A1	6-194M1
		8-307A2		8-307A2		8-307A2(*)		8-307A2(*)		8-307A2		8-283A2	8-283M2	8-283M2	
		8-350M2	8-350A2	8-350A2		8-350A2		8-307A2		8-307A2		8-283A2		8-283A2(*)	
		8-350A2		8-350A2		8-350A2		8-350A2	8-350A4	8-327A4		8-283A2(*)		8-283A2	
		8-350A2		8-350A4	8-350A2	8-400A2		8-350A4		8-396A4		8-327A4			
		8-350A4	8-350A2	8-400A2											
		8-400A2	8-350A2	8-402A4	8-350A2										
		8-454A4	8-402A4												
Chrysler	4	8-400A2	8-440A4			8-440A4				8-383A2		8-383A2	8-383A4		
Dodge	10	6-225A1		6-225M1	6-225A1	8-318A2		8-383A2		8-318A2		6-225A1	8-318A2	8-383A2	
		8-360A2		8-383A2		8-383A2	8-383A4(*)								
Ford	35	4-122M2	4-122A2	4-97.6M1		6-200M1		6-200A1	6-200M1	6-200M1	6-240A2	8-289A2		6-200M1	6-200A1
		8-302A2		6-200A1		6-250A1	6-200M1	8-302A2		8-289A2		8-289M2	8-289A2	8-289A2	
		8-302A2		8-302A2	6-250A1	8-302A2		8-302A2		8-289A2		8-390A2		8-390A2	
		8-351A2(*)		8-351A2		8-302A2		8-351A2		8-390A2					
		8-351A2		8-351A2		8-351A2		8-390A4	8-390A2	8-428A4	8-390A4				
		8-400A2		8-429A4	8-400A4	8-351A2									
		8-429A4	8-400A2												
Lincoln	1			8-460A4											
Mercury	7	8-400A2	8-351A2	8-351A2	8-351A4	8-429A2	8-351A4	8-390A2		8-302A2		8-390A2		8-390A2	8-390M2
Opel	1			4-116M2											
Oldsmobile	11	8-350A2		8-350A2		8-350A2		8-350A4	8-350A2	8-350A2	8-350A4	8-330A2		8-330A2	
		8-455A4	8-455M4	8-455A4		8-455A4		8-455A4	8-455A2						

(*) Replicates

TABLE 3 (continued on next page)

MAKE	TOTALS	1972		1971		1970		1969		1968		1967		1966	
		Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual	Proposed	Actual
Plymouth	12	8-360A2 8-318A2(*) 8-340A4	8-318A2	6-198A1 8-318A2(*)	6-225A1	6-225M1 8-318A2	6-225A1	6-225A1 8-318A2	8-383A2	8-273M2	8-318A2	8-318A2		6-225M1	6-225A1
Pontiac	14	8-350A2 8-400A2		8-350A2 8-455A2	8-400A2 8-400A2(*)	8-350A2 8-400A2		8-350A2 8-400A2		8-350A2 8-400A2	8-400M2	8-326A2 8-400A2		8-326A2 8-389A2	8-389A4
Volkswagen	10	4-103A0 4-96.6M1		4-96.6M1 4-96.6M1		4-96.6M1 4-96.6M1	4-96.6A1	4-91M1		4-91M1		4-91M1		4-78M1	
Datsun	2	4-97.4M2	4-97.4A2	4-97.4M2											
Toyota	3	4-120M2	4-120M1	4-71M1		4-71M1	4-71A1								
TOTALS	170	35		30		27		22		21		18		17	

(*) Replicates

TABLE 3

Approximately 15 percent of the selected test vehicles were rejected upon arrival at the laboratory due to the failure of the vehicle to meet the test specifications for engine cylinders, cubic inch displacement, and/or number of carburetor venturis. This necessitated overscheduling to meet the daily test schedule. Over the entire test period about 10 percent of the selected test vehicles failed to show up for testing.

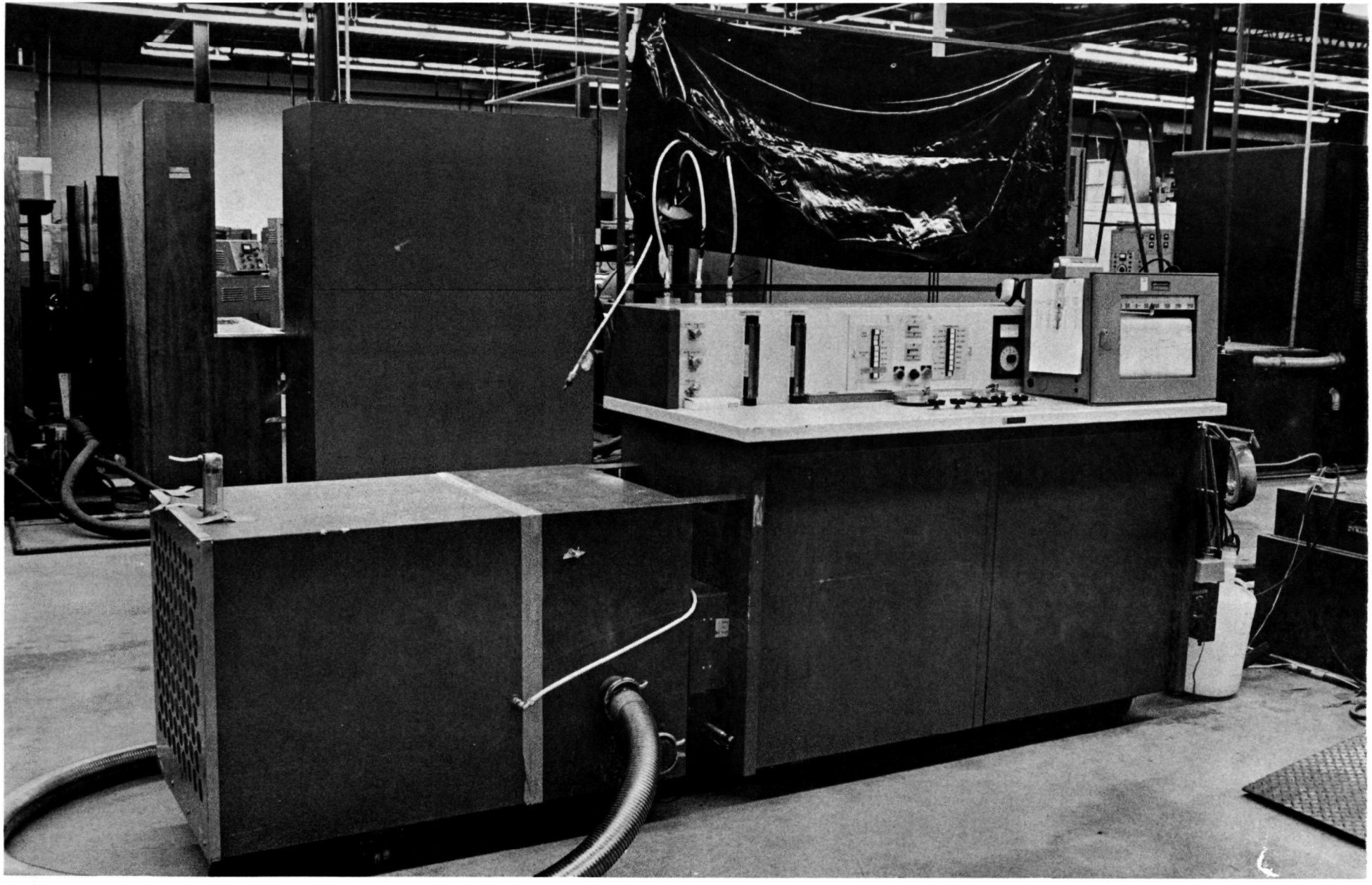
2.4 FACILITIES AND EQUIPMENT

2.4.1 Test Location

All testing covered by this report was conducted at the Washington Laboratories of General Environments Corporation located at 6840 Industrial Road, Springfield, Virginia. This facility is located about nine miles south of the city limits of Washington, D.C. Geographically the Washington, D.C. area has a maximum elevation of 400 feet above sea level. The average summer temperature is about 75 degrees Fahrenheit and winter temperatures average about 35 degrees Fahrenheit.

2.4.2 Constant Volume Sampler

The constant volume sampler employed in the performance of this contract was the Scott Constant Mass Flow Exhaust Sampler, Model 301 (Figure 1). The Model 301 was designed to collect and condition all of the raw exhaust gases from a passenger vehicle operated over the Federal Exhaust Emission Test Cycle and to retain a representative sample of those gases for subsequent analysis applicable to mass emission calculations.



FIGURE(1) SCOTT CONSTANT MASS FLOW
EXHAUST SAMPLER, MODEL 301

The constant volume sampler (CVS) was modified in the following areas to meet the test requirements specified in the scope of work.

a. The CVS was not equipped with a temperature recorder for providing a graphic recording of the pump mass flow temperature or ambient air temperature. A 12-channel Honeywell Temperature Recorder Model 153X12-P-X was employed to alternately monitor the pump mass flow temperature and ambient air temperature at fifteen second intervals. The accuracy of the recorder was $\pm$ 1°F.

b. A mercury manometer was installed at the mass pump to monitor the pressure change across the mass pump as required in 35 Federal Register 219, paragraph 85.81.

c. A 1/4 inch teflon tube was installed between the CVS and the exhaust analysis console to permit rapid transfer of sample and airbag contents for analysis.

d. A five (5) gallon accumulator and valve orifice (Figure 2) was installed at the CVS to dampen the pulsations of the water manometer monitoring the mass pump input pressure.

2.4.3 Exhaust Analysis Console

A Scott Research Exhaust Analysis Console (EAC) Model 119 (Figure 3) was employed to analyze automotive exhaust gas samples collected by the CVS. The EAC consists of a cabinet approximately 71" x 64" x 30" housing two non-dispersive infrared analyzers (NDIR) for measurement of carbon monoxide (CO) and carbon dioxide (CO_2). In addition there are two Scott dual

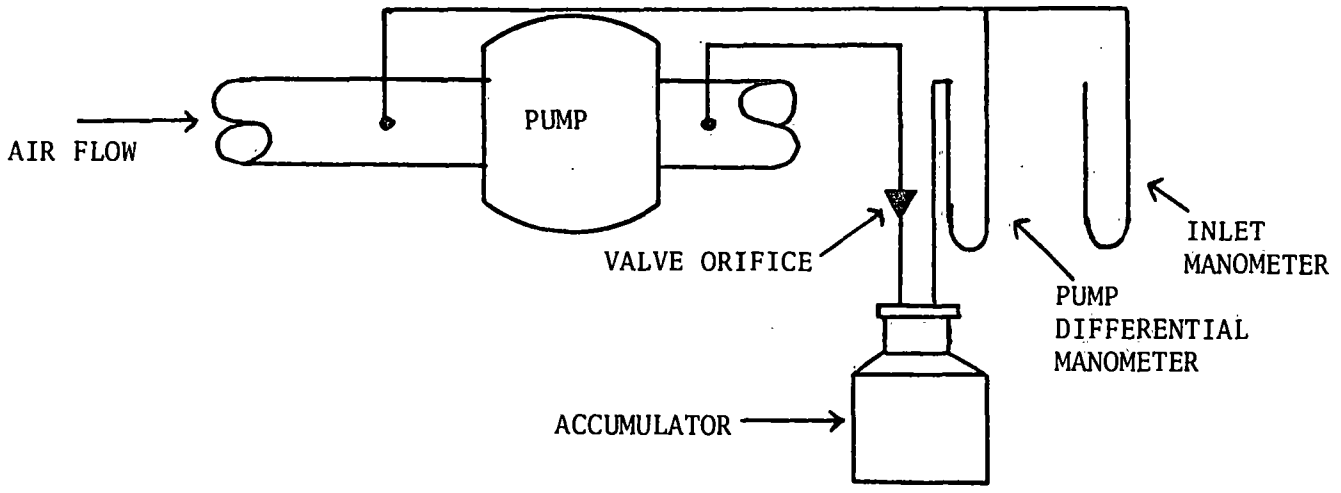
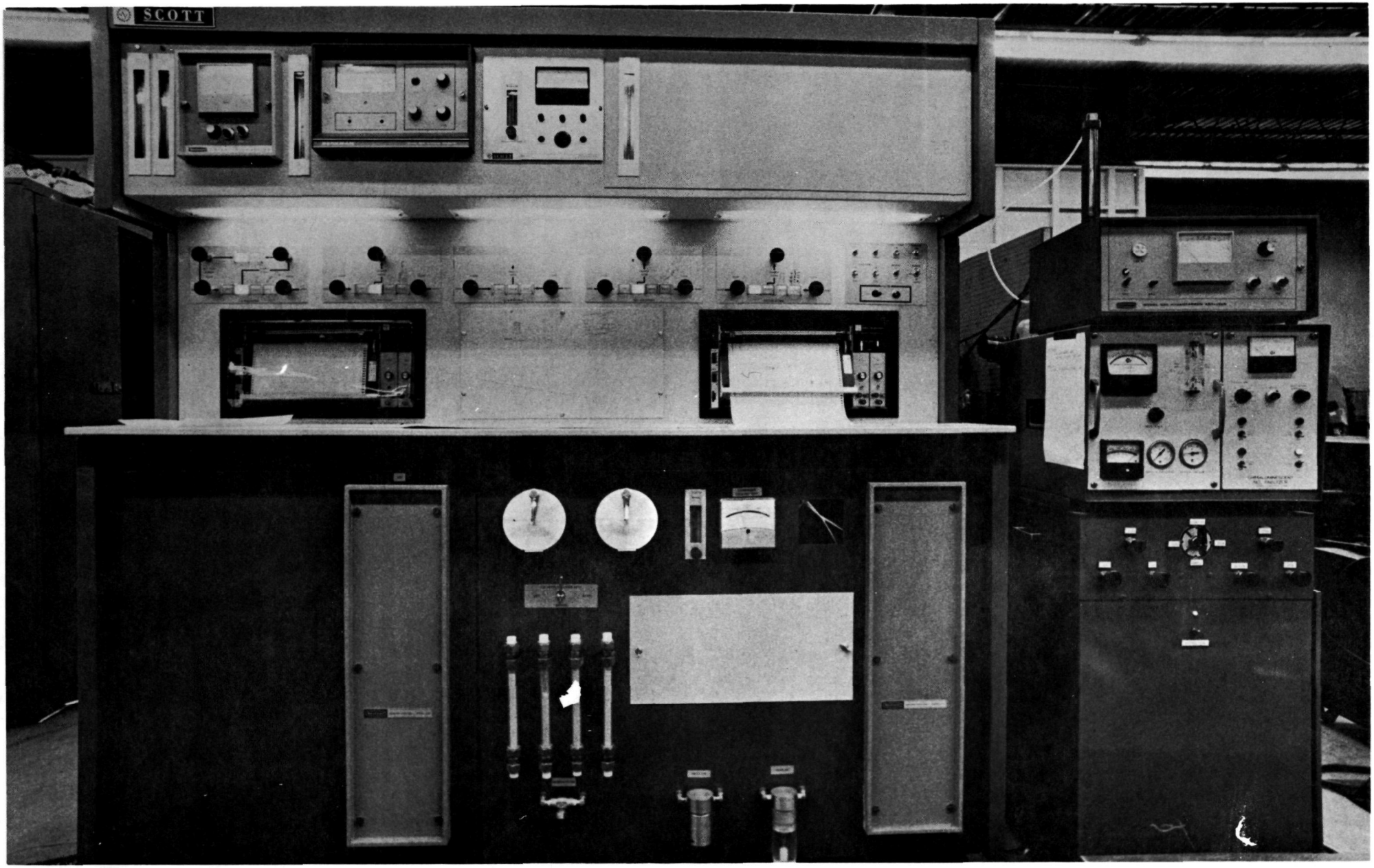


FIGURE (2) CVS ACCUMULATOR INSTALLATION



FIGURE(3) SCOTT EXHAUST ANALYSIS CONSOLE
MODEL 119

pen recorders, a Scott dryer/scrubber, a bubbler and a cut out for a CVS remote panel.

In-house hydrocarbon (THC) and NO/NOX analyzers were used in the performance of the test program.

The hydrocarbon analyzer (Figure 4) was a Beckman Model 400 which utilizes the flame ionization method of detection.

The NO/NOX analyzer was of the chemiluminescent type manufactured by Thermo-Electron Incorporated of Waltham, Massachusetts (Figure 5).

2.4.4 Laboratory Standard Calibration Gases

Calibration gases were procured from Scott Research and forwarded to the Environmental Protection Agency for concentration certification prior to commencement of the test phase of the program. The following gas mixtures were obtained at levels of approximately 10, 25, 40, 50, 60, 70, 85, and 100 percent of scale for each expected range; Hydrocarbon (Propane) in Air, Carbon Monoxide in Nitrogen, Carbon Dioxide in Nitrogen, Nitric Oxide in Nitrogen.

Zero grade air or zero grade nitrogen was employed for instrument zeroing and was reported to contain not more than 0.1 ppm total hydrocarbons and less than 10 ppm carbon monoxide.

After testing by EPA the gases were forwarded to GEC and upon receipt were logged in the master gas cylinder log as Gold Standard gases for calibration of instruments. Each bottle was provided with a gold cylinder cap to ensure easy identification.

Upon completion of instrument calibrations, a series of gas mixtures obtained from Scott were analyzed at GEC and the actual concentrations determined by comparing instrument response to indicated value on the calibration curve. These gases were labeled as working gases and entered in the master gas cylinder log.

The following table is a listing of the gases used for instrument spanning during the test program.

Instrument	Concentration	
CO	4.56%	in N_2
CO	0.50%	in N_2
CO	0.2909%	in N_2
CO	1.65%	in N_2
CO_2	2.474%	in N_2
CO_2	1.001%	in N_2
NOX	212 ppm	in N_2
FID	144 ppm	in air
FID	272 ppm	in air
FID	1513 ppm	in air
FID	879 ppm	in air
FID	2115 ppm	in air
FID	2646 ppm	in air

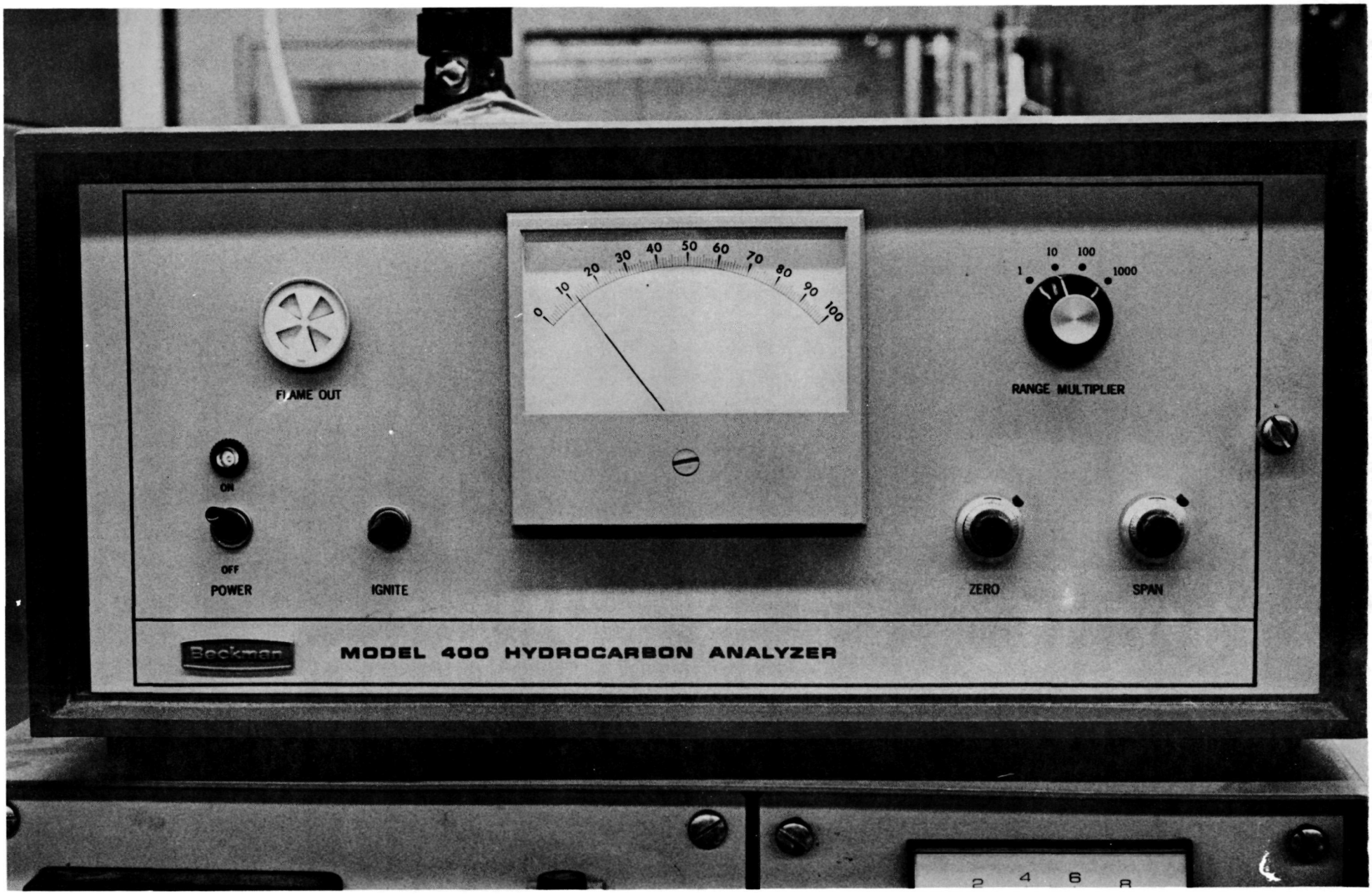


FIGURE (4) BECKMAN MODEL 400 HYDROCARBON ANALYZER

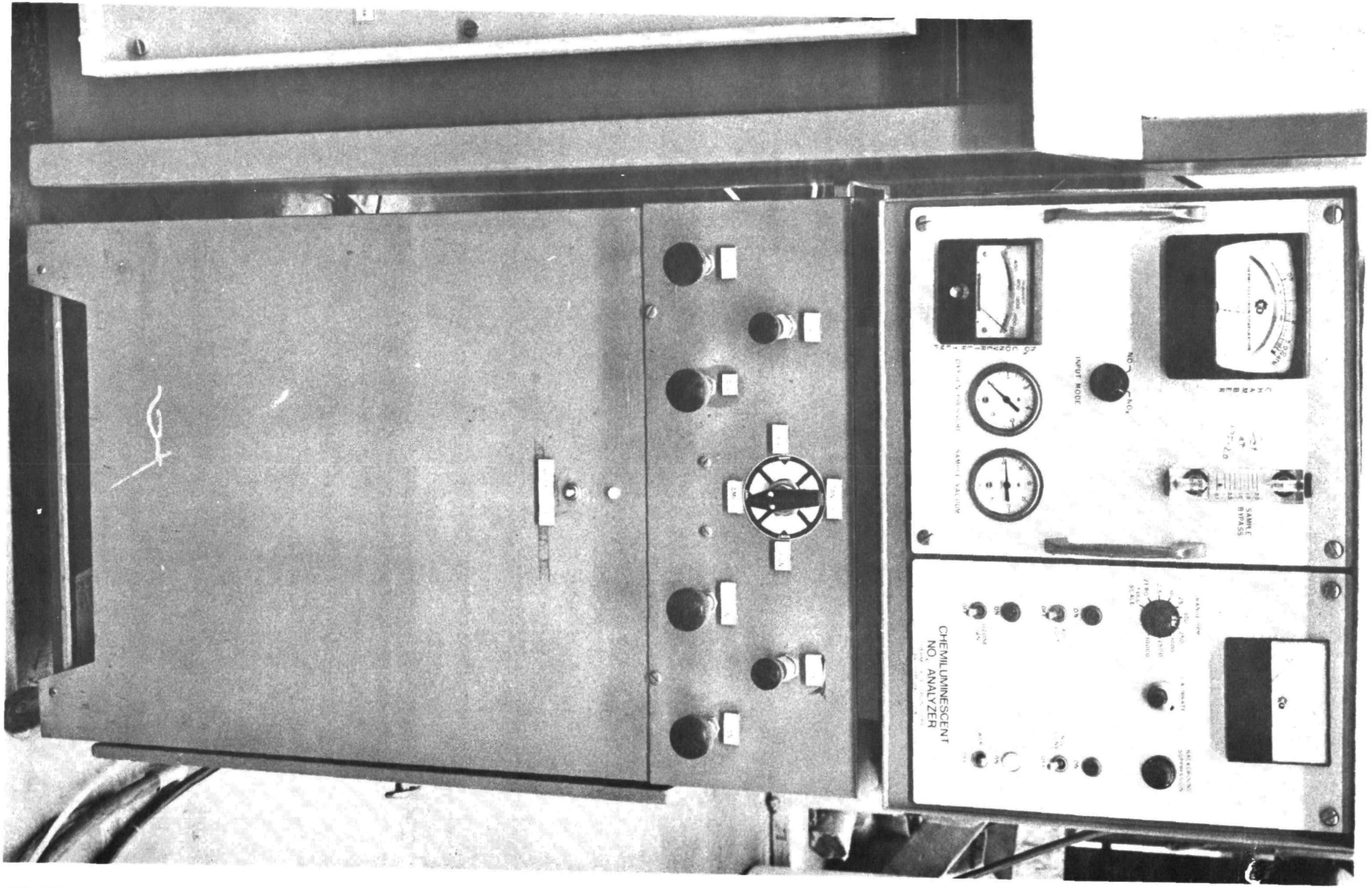


FIGURE (5) THERMO ELECTRON CHEMILUMINESENCE
NO/NOX ANALYZER

2.4.5 Chassis Dynamometer

A Model ECE-50-0 Emission Dynamometer with belt driven drive variable inertia flywheel (Figure 6) was purchased from the Clayton Manufacturing Company of El Monte, California.

The ECE-50 dynamometer consists of

(1) a roll and frame section which provides a "treadmill" to support and transmit power from the drive wheels of the vehicle under test,

(2) a power absorption unit which provides the method and controls to absorb engine horsepower consistent with that required to operate the vehicle on the highway,

(3) a variable inertia flywheel assembly which provides a means of dynamically simulating the mass weight of the vehicle being tested,

(4) ramps to position the vehicle in a level position,

(5) and read-out instrumentation (speedmeter and road load horsepower meter) which provides a reference between dynamometer operation and road simulation.

2.4.6 Miscellaneous Equipment

A Mettler analytical balance, Model H315 was used to weigh propane cylinders used during propane recovery tests of the CVS. The balance accuracy was 0.1 milligram and the range 0-1000 grams.

A Varian Associates Model G-1000 Time/Speed Recorder was employed to provide a graphic record of the simulated vehicle speed versus the prescribed driving course. Prior to implementing the test schedule the chart speed of the driver's aide was determined several times. The chart speed was determined to be within the $\pm$ 2 second tolerance.

FIGURE (6) CLAYTON DYNAMOMETER
MODEL ECE-50-0

A Penske timing light model 244.2115 was employed to determine test vehicle engine timing. A Snap-on Model MT416 primary tach dwell meter was used to measure point dwell and idle r.p.m.

Additonal items of equipment included a cooling fan to move air through the test vehicle radiator, front wheel restraining blocks, vehicle restraining cables, tire pressure gage (0-50 psi) and miscellaneous tools.

A Meriam Laminar Flow Element (LFE) Model 50MC2-6SF with a range of 0-1000 SCFM was employed to calibrate the constant volume sampler mass airflow. The LFE was employed with a Model 310EF10 inlet absolute pressure gage and a Model 40HE35 differential pressure indicator.

A standard mercurial barometer was used to determine local atmospheric pressure.

A Brown-Honeywell 12-channel temperature recorder was employed to monitor and record soak area temperature at 30 second intervals.

2.5 EQUIPMENT QUALIFICATION, CALIBRATION, AND CROSS CHECK

Instrumentation was selected for the conduct of the test phase according to the guidelines provided in 35 Federal Register 219 Part II, 36 Federal Register 128, and the basic contract scope of work.

2.5.1 Constant Volume Sampler (CVS)

The constant volume sampler mass airflow was determined by means of a Meriam Laminar Flow element at 10 increments of flow. Incremental flow changes were effected by means of a valve situated between the laminar flow element and the CVS. The differential pressure across the mass pump was recorded for each increment of flow. The standard volume per revolution of the pump was calculated and plotted against the differential pressure.

The CVS was calibrated by injecting known amounts of propane into the CVS and caluclating the propane recovery based on the total air volume moved by the CVS. Consistent readings within the range of $\pm$ 2.0 percent were obtained. A typical propane recovery calculation is presented in Exhibit F.

2.5.2 Exhaust Analysis Console

The exhaust analysis console consists of the following subsystems - sampling pumps, valves and flowmeters, analyzers, and recorders. Each system is briefly discussed in the following paragraphs. The sample handling system includes stainless steel bellows pumps for moving the sample from the CVS to the various analytical instruments. All piping, valves, fittings, and sample lines were of stainless steel or teflon. Daily leak checks of the sampling system were conducted by placing all instruments in the sample mode and sealing the inlet of the sample line. This resulted in a zero flow indication on all instrument flowmeters. Sample bags were checked for leaks by sampling an evacuated bag to ensure a zero flow existed.

2.5.2.1 Analytical Instrumentation

The calibration of the analytical instrumentation consisted of establishing the manufacturers' operational parameters and then introducing gold standard gases to determine instrument response. The following ranges were established.

Carbon Monoxide	0-0.3 percent
	0-3 percent
	0-10 percent
Carbon Dioxide	0-4 percent
Total Hydrocarbons	0-300 ppm carbon
	0-3000 ppm carbon
	0-30,000 ppm carbon
Nitrogen Oxides	0-250 ppm NOX
	0-1000 ppm NOX

EPA Propane Injection Calculation Sheet

$$V_{mix} = K_1 \times V_o \times N \times \frac{P_p}{T_p}$$

$V_{mix} = .6947368 \times V_o$ 3060 $\times N$ 16348 $\times \frac{P_p\ 740.8746}{T_p\ 570}$ = 4517.2717

$$HC_{mass} = V_{mix} \times 17.3 \times \frac{HC_{conc}}{1{,}000{,}000}$$

HC_{mass} = 4517.2617 x 17.3 x .0002417 = 18.8886

EXHIBIT F
28

Bar = 29.65 inHG x 25.4 = mmHG 753.1100

Inlet Dep. = 6.55 inH_2O x 1.868 = mmHG 12.2354

P_p = Bar - inlet dep. 740.8746

T_p = 460 + temp. of exhaust gas 570

Δp = 16 mm Hg

Cyl Wt. Before 462.1474

Cyl Wt. After 443.3830

Δ Wt. 18.7644

Calc. Wt. 18.8886

% Diff. +.66% ✓

Weekly three point analytical checks were conducted to ensure analytical consistency.

The calibration curves were reconstructed each month to verify instrument response.

Two dual pen strip chart recorders complete the sample analytical system. One recorder monitored the output from the CO and CO_2 analyzer while the other monitored hydrocarbon and NO/NOX. Each channel of the recorders provided a full scale deflection with 10 millivolts of input signal.

2.5.3 Chassis Dynamometer

The chassis dynamometer met the specifications contained in 35 Federal Register 219, Part II, 36 Federal Register 128 and the contract scope of work. The dynamometer was calibrated both for speed and road load horsepower.

Speedometer calibration was accomplished by accelerating the dynamometer to 46.5 miles per hour and measuring roller revolutions with a strobotach. At 46.5 miles per hour the roller rpm was 1800 as specified by the manufacturer.

Rated load horsepower (RLHP) calibration consisted of warming the dynamometer for 15 minutes at 30 mph with a non-test vehicle. This vehicle was then employed to accelerate the dynamometer rollers to 50 mph. This indicated road load horsepower at 50 mph was recorded. The vehicle then accelerated to an indicated 60 mph and the drive wheels physically lifted from the rollers with a forklift truck. The coast time from 55 to 45 mph was determined by means of a 5th wheel and stop-clock. Triplicate runs were conducted for several points over the working range. The following calculation was employed to determine the actual road load horsepower:

$$HP_d = (1/2)\ (W_1/82.2)\ (V_1^2 - V_2^2/550t) \qquad \text{or:}$$

$$HP_d = 0.06073\ (\frac{W_1}{t})$$

where:

W_1 = Equivalent inertia in pounds

V_1 = Initial velocity in ft/sec
(55 mph = 80.67 ft/sec)

V_2 = Final velocity in ft/sec
(45 mph = 66 ft/sec)

t = Elapsed time for rolls to coast
from 55 mph to 45 mph

35 Federal Register 219 Appendix B

A plot of the indicated RLHP versus the actual RLHP is presented in Figure 7. This plot was translated to a table and posted near the speedmeter and road load horsepower meter to provide a quick reference for the test crew.

2.6 TEST PROCEDURES

2.6.1 Vehicle and Equipment Preparation

2.6.1.1 Vehicle Preparation

Upon arrival at the laboratory each vehicle was carefully inspected for exhaust system continuity, engine size, number of carburetor venturis, completeness, condition of existing emission control systems, and driveability. Each item was checked on a list as completed. The vehicle was then moved to the defuel/fuel area and the contents of the gas tank emptied into a drum by means of a high capacity fuel pump. Test fuel was then introduced to a level of 40 percent of tank capacity. Pumping time was calculated by the following equation:

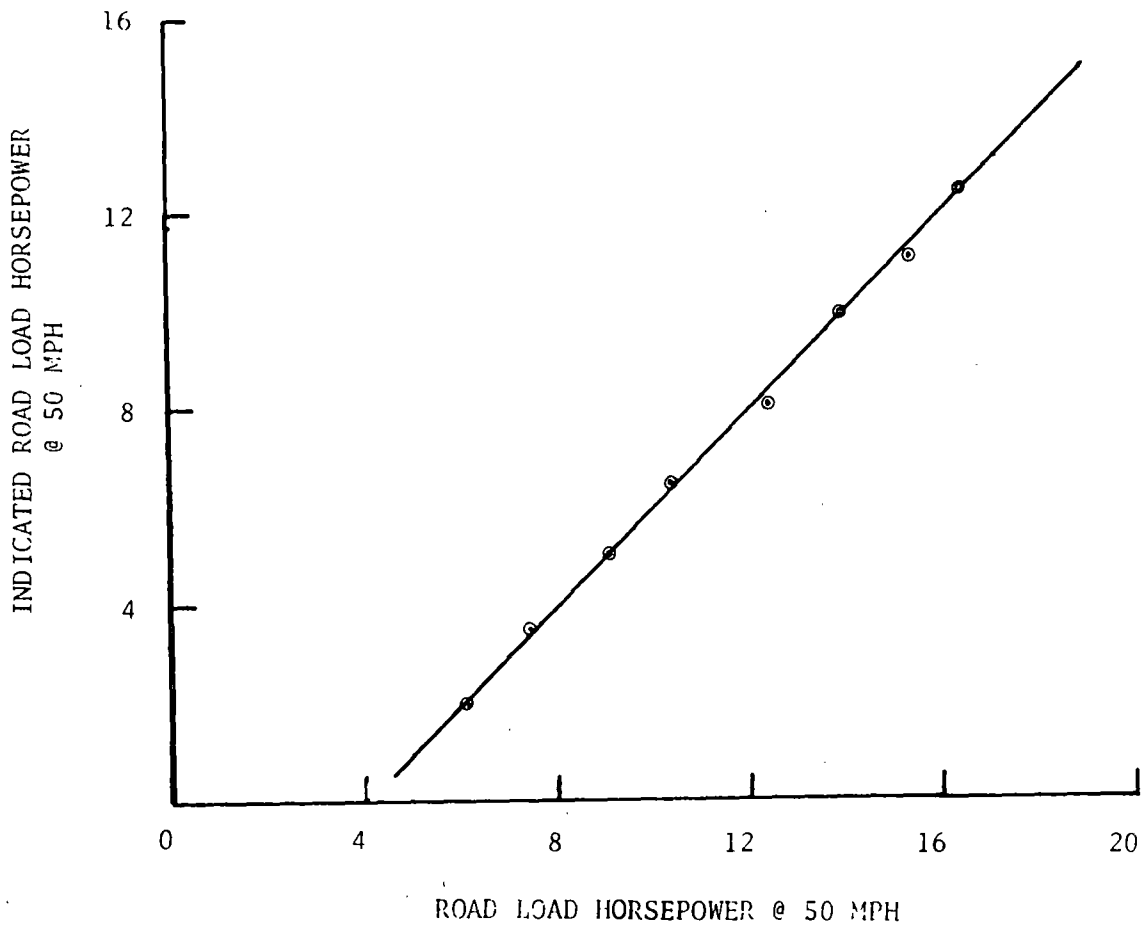


FIGURE (7) ROAD LOAD HORSEPOWER CALIBRATION.

$$\text{Pump time [Min]} = \frac{[0.4]\ [\text{Tank Capacity}]}{\text{Pump rate in gallons per minute}}$$

Upon completion of the fueling each vehicle was driven over a prescribed 10 minute course to remove residual non-test fuel from the fuel lines, fuel pump, and carburetor. This run to the laboratory and the ten minute course comprised the initial vehicle preparation.

The vehicles were placed inside the laboratory with the time and data recorded for the start of the temperature soak period. After 12 hours the vehicle was pushed onto the dynamometer by hand. Just prior to test each vehicle was reinspected to ensure that no change had occurred since the initial inspection. Tires were inflated to 45 pounds per square inch, the cooling fan positioned and turned on, the hood opened, the tail pipe connector attached, and the driver's aide placed in the car.

2.6.1.2 Equipment Preparation

The dynamometer was warmed up prior to each day's testing. The CVS was turned on at 300 CFM for a minimum of 20 minutes prior to use and the analytical instrumentation was turned on for at least 30 minutes prior to system leak checks and prior to conducting the daily propane recovery test. Flow rates were established for each instrument and zero gas response verified. Prior to introducing test samples all instruments were zeroed and spanned to ensure accurate sample response.

2.6.2 Federal Exhaust Emission Test Procedure

The test procedures employed were as detailed in 35 Federal Register 219, Part II of November 10, 1970 as amended by 36 Federal Register 55 and 36 Federal Register 128, and as modified by the contract scope of work.

2.6.2.1 Pretest Procedures

The analytical instruments were turned onto the range to be used and allowed to warm up. The analyzers were zeroed with zero grade air and then spanned to adjust the attenuation of each instrument to the desired range. The values were then compared to previous readings and adjusted if required to within one percent of span. The NOX to NO converter was checked for efficiency by preparing a gas bag of nitric oxide and oxygen. The bag was mixed and connected to the sample inlet of the NO/NOX analyzer. Alternately the NO and NOX values were read at one minute intervals for a period of 12-15 minutes. Routinely the NOX value remained constant while the NO value reduced with time.

A propane recovery test was conducted daily prior to starting the vehicle tests. The propane recovery test consisted of injecting known amounts of propane in the sample inlet of the CVS over a 15 minute period and collecting an aliquot of the diluted sample in a plastic (Tedlar) bag. Subsequent analysis of the diluted propane from the sample bag and a parallel sample from the air bag provided a means of calculating the recovery percent for the sampling system. A recovery of $\pm$ 2.0 percent of propane injected was experienced during the test phase of the program. This was sufficient to reveal any significant leaks in the CVS system.

The analysis console and the sampling system (CVS) were leak checked daily to determine that the systems were airtight.

2.6.2.2 Test Procedure

The vehicle was manually placed on the dynamometer with the drive wheels situated on the rollers. The engine compartment cover was opened and the cooling fan turned on. The CVS and dynamometer were in a

warmed up condition with the CVS pump running but not sampling and the heat exchanger steady at 110°F. The sample flow rates were adjusted and the flexible exhaust tube connected to the tailpipe. At the beginning of the test the pump revolution counter and sample collection were simultaneously started. After 15 seconds the vehicle was placed in gear and 20 seconds after the engine started the driving schedule commenced. At the 505 second point in the driving schedule the sample was directed into a second bag through the five second period after the final deceleration. Analysis of the 505 second bag commenced immediately. At the conclusion of the test the sampling was stopped and the sample and air bags analyzed, The tail pipe connector was disconnected, the engine compartment cover closed and the cooling fan turned off. The interval between the cold start test and the hot start test was 10 minutes. The test procedure was repeated for the hot start test. Upon completion of the hot start test the tail pipe connector was removed and the engine timing idle rpm and dwell were measured, and recorded. The raw exhaust carbon monoxide level was determined.

2.6.3 Daily Test Schedule

The daily test schedule was generated by a scheduling clerk. Owners were contacted by phone and requested to have their cars at the laboratory at a specified time. The clerk prepared a schedule envelope (Exhibit G) on which the reporting date and time were indicated. All available vehicle information including the vehicle inspection checklist was imprinted on the envelope. All recorder tracings and test documents were placed in this envelope which became the vehicle file folder. Upon completion of testing for each vehicle the schedule envelope was returned to the clerk who checked the contents and removed each car tested from the needed vehicle list.

GENERAL ENVIRONMENTS CORPORATION
6840 INDUSTRIAL ROAD
SPRINGFIELD, VIRGINIA 22151

NAME_____ TEST DATE_____ CAR MANUFACTURER_____
VEHICLE NO._____ RUN NO._____ CAR MODEL_____
DESCRIPTION: 2 door ( )
4 door ( )
Convertible ( )
Station Wagon ( )
Sedan ( )
Hardtop ( )
Air Conditioned Yes ( ) No ( )
Transmission
Standard 3 Speed ( ) 4 Speed ( )
Automatic ( )

BOND INFORMATION

Name_____ SSN_____
Co-Maker_____ SSN_____
Beneficiary, POD_____
Address_____
_____

OWNER NEEDS

Directions ( ) Courtesy Car ( ) Automatic ( )
Standard ( )
Not needed ( )

TEST INFORMATION

Car to be delivered_____date/time
Car to be picked up_____date/time

INSPECTION

		Yes	No
1.	Engine size agrees with code	( )	( )
2.	Exhaust system in good shape	( )	( )
3.	Pollution systems appear intact	( )	( )
4.	Brakes operative	( )	( )
5.	Engine modified	( )	( )
6.	Transmission agrees with code	( )	( )
7.	No. of carburetor venturis agrees with code	( )	( )

Remarks:_____
_____

_____
Signed

THIS ENVELOPE MUST CONTAIN:

( ) Computer data sheet
( ) Receipt acknowledge (2)
( ) CO-CO_2 recorder chart
( ) NOX-THC recorder chart
( ) CVS data sheet
( ) Driver schedule cold start
( ) Driver schedule hot start

EXHIBIT G

Normally two eight hour shifts were utilized for the testing. Cars were put into soak 12 hours prior to the commencement of each shift and removed from the test area after testing. An average of five cars were tested each day.

2.7 DATA HANDLING

2.7.1 Data Collection

All necessary data were collected in worksheet form prior to data debugging and final report tabulation. Initial vehicle data, and CVS test information were recorded on GEC TEST DATA SHEET 4363.1 (Figure 8). Propane Injection Test Data were recorded on the EPA PROPANE INJECTION CALCULATION SHEET (Figure 9) and the results were also entered in the Master Test Log.

After vehicle test completion, analytical and vehicle data were transferred to the AUTO EMISSION TEST DATA WORKSHEET (Figure 10). This worksheet comprises the raw input data to be used in computer data reduction and final hard copy and punched card output.

Other information pertinent to test conditions was recorded in the Master Test Log. A typical master test log sheet is presented in Exhibit H.

2.7.2 Data Processing

Processing of data was accomplished by means of a subcontract to Computer Systems Group, Inc. of Annandale, Virginia. A Control Data Corporation Model 6600 computer was utilized to calculate and tabulate the final results of this emissions program.

GEC TEST DATA SHEET 4363-1 GENERAL ENVIRONMENTS CORPORATION LIGHT DUTY VEHICLE
EMISSION DATA 6840 INDUSTRIAL ROAD DATE _____ TIME _____
TEST NUMBER _____ SPRINGFIELD, VIRGINIA
TYPE OF TEST _____
INSTRUMENT OPERATION _____ VEHICLE OPERATOR _____

MANUFACTURE

VEHICLE

MANUFACTURER _____, MODEL _____, YEAR _____,
TRANSMISSION TYPE _____, NUMBER OF SPEEDS _____,
ODOMETER READING _____, ENGINE DISPLACMENT _____,
FUEL TANK LOCATION _____, AIR COND. _____, DWELL _____,
UNDILUTE CO _____, VEHICLE ID. NUMBER _____,
IDLE TIMING _____, IDLE R.P.M. _____

DYNAMOMETER

MAKE Clayton, MODEL ECE-50-0, SERIAL NO. D-33152A-261, ACTUAL ROAD H.P. AT 50 M.P.H. _____, INDICATED ROADLOAD POWER ABSORPTION AT 50 M.P.H. _____,
DRIVE WHEEL TIRE PRESSURE _____, INERTIA _____

SAMPLING SYSTEM INFORMATION

SERIAL NO. 6274, MODEL NO. 301, MANUFACTURER Scott Research Labs, TYPE Variable Dilution

Test	P_B In Hg	ΔP mm Hg	Inlet Dept. In H_2O	Total Revs	Tp ^oR	Tp ^oR	W^o ^oF	D^o ^oF	TR ^oF	Sample Flow SCFH	Air Flow SCFH
02T											
02S											
03T											
03S											

FIGURE (8)

EPA Propane Injection Calculation Sheet

$$V_{mix} = K_1 \times V_o \times N \times \frac{P_p}{T_p}$$

V_{mix} = .6947368 x V_o _____ x N _____ x $\frac{P_p}{T_p}$ = _____

$$HC_{mass} = V_{mix} \times 17.3 \times \frac{HC_{conc}}{1{,}000{,}000}$$

HC_{mass} = _____ x 17.3 x _____ = _____

Bar = inHG x 25.4 = mmHG _____

Inlet Dep. = inH_2O x 1.868 = mmHG _____

P_p = Bar - inlet dep. _____

T_p = 460 + temp. of exhaust gas _____

Cyl Wt. Before _____ GMS.

Cyl Wt. After _____ GMS.

Δ Wt. _____ GMS.

Calc. Wt. _____ GMS.

% Diff. _____

FIGURE (9)

GENERAL ENVIRONMENTS CORPORATION

AUTO EMISSION TEST DATA WORKSHEET

HEADER CARD

CAR #	·	RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT
7 8 9 10	11	12 13 14 15	16 17 18 19 20 21	22 23	24 25	26 27 28 29 30	31 32 33 34	35 36 37	38	39 40 41 42	

RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	E
43 44 45 46 47	48 49 50 51 52 53	54	55	56	57	58	59 60 61 62 63 64	65 66	67 68 69 70	71	72 73 74	75 76 77 78	79 80		

TEST 02T

"01"

ALPHA CAR NO.	PUMP VOLUME	PUMP REVS	BARO. PR.	INLET PR	TEMP		GRAINS/LB. OF AIR
1 2 3 4 5 6 7 8 9 10	11 12 13 14 15 16 17 18 19 20	21 22 23 24 25 26 27 28 29 30	31 32 33 34 35	36 37 38 39 40	41 42 43 44 45	46 47 48 49 50	51 52 53 54 55 56 57 58 59 60
0 0 3 1 6 3	0 0 0 0 .	0 0 0 0	.	.	.		0 0 0 0 .

"02"

SAMPLE BAG					AIRBAG				
Sc%HC	Sc%CO	Sc%CO2	Sc%NOX	Sc%NO	Sc%HC	Sc%CO	Sc%CO2	Sc%NOX	Sc%NO
1 2 3 4 5	6 7 8 9 10	11 12 13 14 15	16 17 18 19 20	21 22 23 24 25	26 27 28 29 30	31 32 33 34 35	36 37 38 39 40	41 42 43 44 45	46 47 48 49 50
.	.	.	.	.	.	.	.	.	.

AUTO EMISSION TEST DATA WORKSHEET (cont'd)

TEST 02S

CARD 01

ALPHA CAR NO.										PUMP VOLUME										PUMP REVS										BARO. PR.					INLET PR					TEMP										GRAINS/LB. OF AIR									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
0	0	3	1	6	3					0	0	0	0	.						0	0	0	0																													0	0	0	0	.					

CARD 02

SAMPLE BAG																									AIRBAG																																	
Sc%HC					Sc%CO					Sc%CO2					Sc%NOX					Sc%NO					Sc%HC					Sc%CO					Sc%CO2					Sc%NOX					Sc%NO																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50										
			.				.						.					.					.					.					.					.					.																	

TEST 03T

CARD 01

ALPHA CAR NO.										PUMP VOLUME										PUMP REVS										BARO. PR.					INLET PR					TEMP										GRAINS/LB. OF AIR									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
0	0	3	1	6	3					0	0	0	0	.						0	0	0	0																													0	0	0	0	.					

CARD 02

SAMPLE BAG																									AIRBAG																																	
Sc%HC					Sc%CO					Sc%CO2					Sc%NOX					Sc%NO					Sc%HC					Sc%CO					Sc%CO2					Sc%NOX					Sc%NO																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50										
			.				.						.					.					.					.					.					.					.																	

TEST 03S

CARD 01

ALPHA CAR NO.										PUMP VOLUME										PUMP REVS										BARO. PR.					INLET PR					TEMP										GRAINS/LB. OF AIR									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
0	0	3	1	6	3					0	0	0	0	.						0	0	0	0																													0	0	0	0	.					

CARD 02

SAMPLE BAG																									AIRBAG																																	
Sc%HC					Sc%CO					Sc%CO2					Sc%NOX					Sc%NO					Sc%HC					Sc%CO					Sc%CO2					Sc%NOX					Sc%NO																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50										
			.				.						.					.					.					.					.					.					.																	

EXHIBIT H

31 March 1973

0700 CVS turned on for 20 minute warmup. F.I.D. analyzer on, NOx analyzer on. Leak check of all instrument and sampling systems - OK.

0720 Propane injection started. CVS operated @ 300 CFM.

0730 NO_x converter efficiency test conducted - results satisfactory.

0745 Dyno warmed up. Repeat leak check of instrument systems - OK.

0750 Results of propane injection - 0.19% - OK.

0805 Dyno warmup completed with non-test vehicle. Inertia weights and RLHP set at 4500 and 9.35(i) respectively. Speed recorders checked.

0815 Olds Delta 88 LN# VA CMS-694 placed on dyno. Vehicle No. 0001. Run 0001.

0840 Test (cold start) commenced. Veh. 0001, Run 0001.

0914 Hot start test started on Veh. No. 0001, Run 0001.

1005 C.S. test started Veh. No. 0002, Run 0002.

1034 H. S. test started Veh. No. 0002, Run 0002.

1200 C. S. test started on Veh. No. 0003, Run 0003. Lic. No. DME-657 (VA).

1232 H.S. test started Veh. No. 0003, Run 0003.

1321 C.S. test started Veh. No. 0004, Run 0004. Lic. No. FDD-130 (VA).

1352 H.S. test started Veh. No. 0004, Run 0004.

Data was keypunched and key verified from the input provided by GEC. Tab runs were made at intervals to double-check data for any obvious errors. Each four-card set required in the contract scope of work for submission to EPA was generated from a nine-card set which contained vehicle identification and analytical data. This nine-card set containing raw data was used as the computer input and as a means of cross checking the four-card output for errors of data entry and keypunching. Tabular listings of data were generated during the test phase to provide ready access of completed data. Four-card sets and nine-card sets were cross-checked against the header card input and tab run concentration values. Errors discovered in data as a result of input mistakes were immediately recoded in correct form. Errors attributable directly to the testing program were eliminated by retest of the vehicle.

Calculation of the exhaust emissions for 1972 and 1975 were performed according to the procedures defined in Exhibits I and J, respectively.

EXHIBIT I

(1) Hydrocarbon Mass:

$$HCmass = Vmix \times DensityHC \times \frac{HCconc}{1{,}000{,}000}$$

(2) Carbon Monoxide Mass:

$$COmass = Vmix \times DensityCO \times \frac{COconc}{100}$$

(3) Oxides of Nitrogen Mass:

$$NOXmass = Vmix \times DensityNO_2 \times \frac{NOXconc}{1{,}000{,}000}$$

Meaning of symbols:

HCmass	= Hydrocarbon emissions, in grams per vehicle mile.
DensityHC	= Density of hydrocarbons in the exhaust gas, assuming an average carbon to hydrogen ratio of 1:1.85, in grams per cubic foot at 68°F. and 760 mm Hg pressure (16.33 gm/cu ft).
HCconc	= Hydrocarbon concentration of the dilute exhaust sample minus hydrocarbon concentration of the dilution air sample, in ppm carbon equivalent, i.e., equivalent propane X 3.
COmass	= Carbon monoxide emissions, in grams per vehicle mile.
DensityCO	= Density of carbon monoxide in grams per cubic foot at 68°F. and 760 mm Hg pressure (32.97 gm/cu ft).
COconc	= Carbon monoxide concentration of the dilute exhaust sample minus the carbon monoxide concentration of the dilution air sample, in volume percent.
NOXmass	= Oxides of nitrogen emissions, in grams per vehicle mile.
$DensityNO_2$	= Density of oxides of nitrogen in the exhaust gas, assuming they are in the form of nitrogen dioxide, in grams per cubic foot at 68°F. and 760 mm Hg pressure (54.16 gm/cu ft).
NOXconc	= Oxides of nitrogen concentration of the dilute exhaust sample minus the oxides of nitrogen concentration of the dilution air sample, in ppm.
Vmix	= Total dilute exhaust volume in cubic feet per mile, corrected to standard conditions (528°R. and 760 mm Hg).
Vmix	$= K_1 \times V_0 \times N \times \frac{P_p}{T_p}$

where: $K_1 = \frac{528°R.}{760 \text{ mm Hg} \times 7.5 \text{ miles}} = 0.09263$

V_0 = Volume of gas pumped by the positive displacement pump, in cubic feet per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

N = Number of revolutions of the positive displacement pump during the test while samples are being collected.

P_p = Absolute pressure of the dilute exhaust entering the positive displacement pump, in mm Hg, i.e., barometric pressure minus the pressure depression below atmospheric of the mixture entering the positive displacement pump.

T_p = Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, in degrees Rankin.

K_H = Humidity correction factor.

$$K_H = \frac{1}{1 - 0.0047 (H - 75)}$$

where: H = Absolute humidity in grains of water per pound of dry air.

Example calculation of mass emission values:

Assume V_0 = 0.265 cu ft per revolution; N = 20,250 revolutions; H = 85 grains per lb of dry air; P_p = 730 mm Hg; T_p = 550°R.; HCconc = 160 ppm carbon equivalent; COconc = 0.09%; and NOXconc = 70 ppm.

Then: Vmix = (0.09263) (0.265) (20,250) (730/550 = 659.8 cu ft per mile.

$$K_H = \frac{1}{1 - 0.0047 (85 - 75)} = 1.049.$$

(1) For a 1972 light-duty vehicle.

$$\text{HCmass} = 659.8 \times 16.33 \times \frac{160}{1,000,000} = 1.72 \text{ grams per vehicle mile}$$

$$\text{NOXmass} = 659.8 \times 54.16 \times \frac{70}{1,000,000} \times 1.049 = 2.62 \text{ grams per vehicle mile}$$

(2) For a 1972 utility vehicle.

$$\text{COmass} = 659.8 \times 32.97 \times \frac{0.09 \times 0.85}{100} = 16.6 \text{ grams per vehicle mile.}$$

EXHIBIT J

(a) For light-duty vehicles:

$$Ywm = (0.43Yct + 0.57Yht + Ys)/7.5$$

where: Ywm = Weighted mass emissions of each pollutant, i.e., HC, CO, or NOX, in grams per vehicle mile.

Yct = Mass emissions as calculated from the "transient" phase of the cold start test, in grams per test phase.

Yht = Mass emissions as calculated from the "transient" phase of the hot start test, in grams per test phase.

Ys = Mass emissions as calculated from the "stabilized" phase of the cold start test, in grams per test phase.

(b) The mass of each pollutant for each phase of both the cold start test and the hot start test is determined from the following:

(1) Hydrocarbon Mass:

$$HCmass = Vmix \times DensityHC \times \frac{HCconc}{1,000,000}$$

(2) Carbon monoxide Mass:

$$COmass = Vmix \times DensityCO \times \frac{COconc}{1,000,000}$$

(3) Oxides of nitrogen Mass:

$$NOXmass = Vmix \times DensityNO_2 \times \frac{NOXconc}{1,000,000} \times K_H$$

(c) Meaning of symbols:

HCmass = Hydrocarbon emissions, in grams per test phase.

DensityHC = Density of hydrocarbons in the exhaust gas, assuming an average carbon to hydrogen ratio of 1:1.85, in grams per cubic foot at 68°F and 760 mm Hg pressure (16.33 gm/ft)

HCconc = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in ppm carbon equivalent, i.e., equivalent propane X 3.

HCconc = HCe - HCd (1 - 1/DF)

where: HCe = Hydrocarbon concentrations of the dilute exhaust sample as measured, in ppm carbon equivalent.

HCd = Hydrocarbon concentration of the dilution air as measured ppm carbon equivalent.

NOXmass = Oxides of nitrogen emissions, in grams per test phase.

$DensityNO_2$ = Density of oxides of nitrogen in the exhaust gas, assuming they are in the form of nitrogen dioxide, in grams per cubic foot at 68°F and 760 mm Hg pressure (54.16 gm/ft^3).

NOXconc = Oxides of nitrogen concentration of the dilute exhaust sample corrected for background in ppm.

NOXconc = NOXe - NOXd (1 - 1/DF)

where: NOXe = Oxides of nitrogen concentration of the dilute exhaust sample as measured in ppm.

NOXd = Oxides of nitrogen concentration of the dilution air as measured in ppm.

COmass = Carbon monoxide emissions, in grams per test phase.

DensityCO = Density of carbon monoxide in grams per cubic foot at 68°F and 760 mm Hg pressure (32.97 gm/ft^3).

COconc = Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor and CO2 extraction in ppm.

COconc = COe - COd (1 - 1/DF)

where: COe = Carbon monoxide concentration of the dilute exhaust sample volume corrected for water vapor and carbon dioxide extraction in ppm. The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.

COe = (1 - 0.01925CO2e - 0.00323R) COem

where: COem = Carbon monoxide concentration of the dilute exhaust sample as measured in ppm.

CO2e = Carbon dioxide concentration of the dilute exhaust sample in mole percent.

R = Relative humidity of the dilution air in percent.

COd = Carbon monoxide concentration of the dilution air corrected for water vapor extraction in ppm.

$$COd = (1 - 0.000323R)\ COdm$$

where: COdm = Carbon monoxide concentration of the dilution air sample as measured in ppm.

$$DF = \frac{13.4}{CO2e + (HCe + COe) \times 10^{-4}}$$

Vmix = Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528°R and 760 mm Hg).

$$Vmix = V_0 \times N \frac{(P_B - Pi)\ (528°R)}{(760\ mm\ Hg)\ (Tp)}$$

where: V_0 = Volume of gas pumped by the positive displacement pump, in cubic feet per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

N = Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

P_B = Barometric pressure in mm Hg.

Pi = Pressure depression below atmosphere measured at the inlet to the positive displacement pump.

Tp = Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, in degrees Rankin.

K_H = Humidity correction factor.

$$K_H = \frac{1}{1 - 0.0047\ (H - 75)}$$

where: H = Absolute humidity in grains of water per pound of dry air.

$$H = \frac{(43.478)\ Ra \times Pd}{P_B - Pd \times Ra/100}$$

Ra = Relative humidity of the ambient air, in percent.

Pd = Saturated vapor pressure, in mm Hg at the ambient dry bulb temperature.

(d) Example calculation of mass emission values:

(1) For the "transient" phase of the cold start test assume

V_0 = 0.29344 cu ft per revolution; N = 10, 485; R = 48.0%;

R_a = 48.2%; P_B = 762 mm Hg; P_d = 22.225 mm Hg; P_i = 70 mm Hg;

T_p = 570°R.; HC_e = 105.8 ppm carbon equivalent; NOX_e = 11.2 ppm;

CO_{em} = 306.6 ppm; CO_{2e} = 1.43%; HC_d = 12.1 ppm. NOX_d = 0.8 ppm;

CO_{dm} = 15.3 ppm. Then:

$$Vmix = \frac{(0.29344)\ (10{,}485)\ (762 - 70)\ (528)}{(760)\ (570)} = 2595.0 \text{ cu ft per test phase.}$$

$$H = \frac{(43.478)\ (48.2)\ (22.225)}{762 - (22.225 \times 48.2/100)} = 61.99 .$$

$$K_H = \frac{1}{1 - 0.0047\ (62 - 75)} = 0.9424.$$

$$CO_e = (1 - 0.01925\ (1.43) - 0.000323\ (48))\ 306.0 = 293.4 \text{ ppm.}$$

$$CO_d = (1 - 0.000323(48))\ 15.3 = 15.1 \text{ ppm.}$$

$$DF = \frac{13.4}{1.43 + (105.8 + 293.4) \times 10^{-4}} = 9.116.$$

HCconc = 105.8 - 12.1 (1 - 1/9.116) = 95.03.

HCmass = (2595) (16.33) (95.03/1,000,000) = 4.027 grams per test phase.

NOXconc = 11.2 - 0.8 (1 - 1/9.116) = 10.49.

NOXmass = (2595) (54.16) (10.49/1,000,000) (0.9424) = 1.389 grams per test phase.

COconc = 293.4 - 15.1 (1 - 1/9.116) = 280.

COmass = (2595) (32.97) (280/1,000,000) = 23.96 grams per test phase.

(2) For the "stabilized" portion of the cold start test assume that similar calculations resulted in HCmass = 0.62 grams per test phase; NOXmass = 1.27 grams per test phase; and COmass = 5.98 grams per test phase.

(3) For the "transient" portion of the hot start test assume that similar calculations resulted in HCmass = 0.51 grams per test phase; NOXmass = 1.38 grams per test phase; and COmass = 5.01 grams per test phase.

(4) For a 1975 light-duty vehicle:

$$HC_{wm} = ((0.43)\ (4.027) + (0.57)\ (0.51) + 0.62)/7.5$$
$$= 0.352 \text{ gram per vehicle mile.}$$

$$NOX_{wm} = ((0.43)\ (1.389) + (0.57)\ (1.38) + 1.27)/7.5$$
$$= 0.354 \text{ gram per vehicle mile.}$$

$$CO_{wm} = ((0.43)\ (23.96) + (0.57)\ (5.01) + 5.89)/7.5$$
$$= 2.55 \text{ grams per vehicle mile.}$$

37 Federal Register 221, 15 November 1972

J. A. NERE CO., INC.

TELEPHONE 373-1543

HEATING OILS
GASOLINES
DIESEL FUELS
INDUSTRIAL LUBRICANTS
TEXACO PRODUCTS

P. O. BOX 822
FREDERICKSBURG, VA. 22401

CERTIFICATE OF ANALYSIS

CONSIGNEE: J. A. NERE CO. INC.
P.O. Box 822
Fredericksburg, Va.

P.O. # 4040 dated 2/2/73
PRODUCT: Indolene Leaded Motor Fuel No. 30
TANK: 25
DATE TESTED: 3-25-72

PRODUCT ANALYSIS

TEST	TEST RESULTS SAMPLE NO. D-18059
API Gravity	59.5
Distillation % F.	
Initial Boiling Point	92
10% Evap.	132
50% Evap.	221
90% Evap.	316
Maximum	401
10% Slope	2.8
Reid Vapor Pressure	9.0
Oxidation Stability Minutes	600+
Gum, mg/100 ml (after Hexane work)	2.4
TEL Content, cc/gal.	3.02
Sulfur Weight, %	0.06
Olefin, %	5.9
Aromatic, %	27.3
Saturates, %	66.8
Octane Research with 3.0 cc Tel/Gal.	104.1
Octane Motor with 3.0 cc Tel/Gal.	96.1
Sensitivity with 3.0 cc Tel/Gal.	8.0

J. A. GRANT, Superintendent-Laboratories

per J. G. DUBECK

RECEIVED
BY
MAR 9 1973
J. A. NERE CO., INC.
FREDERICKSBURG, VA. 22401

APPENDIX II

TABLE 1A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

VEHICLE MAKE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
AMC	5	4.53	2.15	78.47	53.80	423.24	73.55	3.21	.81
BUICK	12	6.39	5.25	81.49	37.03	617.75	154.21	4.30	1.59
CADILLAC	4	3.45	2.56	55.93	36.37	664.92	186.28	4.34	1.56
CHEVROLET	39	6.53	5.24	74.37	38.35	511.42	150.91	3.68	1.40
CHRYSLER	4	5.97	1.96	79.46	41.03	562.05	79.66	5.10	1.48
DATSUN	2	2.43	.38	15.63	1.74	312.45	13.29	4.56	1.52
DODGE	10	5.73	4.13	78.42	39.28	482.85	86.25	4.35	1.24
FORD	35	4.72	2.45	60.65	33.17	567.58	135.54	4.54	1.53
LINCOLN	1	5.25	0.00	133.35	0.00	635.97	0.00	2.30	0.00
MERCURY	7	5.83	4.04	82.25	47.07	575.95	82.47	4.06	1.52
OLDSMOBILE	11	5.57	2.76	86.18	39.34	620.07	140.96	3.76	1.36
OPEL	1	2.32	0.00	41.82	0.00	215.79	0.00	1.82	0.00
PLYMOUTH	12	4.10	1.48	69.26	32.33	451.99	98.19	4.79	1.52
PONTIAC	14	5.66	3.31	65.73	29.63	603.84	111.94	4.20	1.64
TOYOTA	3	2.21	.19	19.32	6.88	318.13	55.19	3.67	1.15
VOLKSWAGEN	10	9.48	17.88	44.01	31.02	255.36	63.72	2.15	.72
ALL VEHICLES	170	5.64	5.61	68.81	37.69	509.94	155.25	4.02	1.52

TABLE 1B

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

VEHICLE MAKE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
AMC	5	3.98	1.81	69.58	52.15	415.51	79.14	3.27	1.07
BUICK	12	5.68	5.19	64.56	38.09	590.21	141.49	4.46	1.72
CADILLAC	4	3.05	2.39	49.07	35.38	650.67	167.44	4.33	1.62
CHEVROLET	39	5.97	5.13	62.74	34.75	497.68	146.06	3.71	1.35
CHRYSLER	4	4.98	1.94	67.40	43.03	540.04	68.25	5.32	1.40
DATSUN	2	2.38	.29	15.29	1.85	306.84	1.38	4.72	1.57
DODGE	10	5.10	3.75	58.93	44.13	469.56	74.60	4.64	1.18
FORD	35	4.29	2.38	52.80	33.36	494.60	129.86	4.69	1.64
LINCOLN	1	4.13	0.00	111.27	0.00	618.53	0.00	2.17	0.00
MERCURY	7	5.19	3.62	72.15	46.81	560.41	81.18	4.30	1.70
OLDSMOBILE	11	4.55	1.49	70.37	32.74	603.66	133.21	3.86	1.39
OPEL	1	1.60	0.00	22.13	0.00	219.06	0.00	1.97	0.00
PLYMOUTH	12	3.66	1.33	60.45	29.07	441.47	92.84	5.09	1.61
PONTIAC	14	5.03	2.94	54.99	29.89	578.58	109.36	4.35	1.73
TOYOTA	3	2.06	.19	17.96	5.35	307.74	54.58	3.63	1.10
VOLKSWAGEN	10	9.22	18.34	41.47	31.25	252.39	56.34	2.03	.64
ALL VEHICLES	170	5.08	5.57	58.70	35.62	495.28	147.55	4.14	1.60

TABLE 2A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

VEHICLE MANUFACTURER

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
AMC	5	4.53	2.15	78.47	53.80	423.24	73.55	3.21	.81
CHRYSLER	26	5.02	2.89	74.35	35.22	480.75	95.60	4.67	1.38
FORD	43	4.91	2.71	65.86	37.19	521.70	129.66	4.41	1.53
GM	81	6.02	4.53	74.22	36.65	561.83	156.27	3.88	1.47
NISSAN	2	2.43	.38	15.63	1.74	312.45	13.29	4.56	1.52
TOYOTA	3	2.21	.19	19.32	6.88	318.13	55.19	3.67	1.15
VOLKSWAGEN	10	9.48	17.88	44.01	31.02	255.30	63.72	2.15	.72
ALL VEHICLES	170	5.64	5.61	68.81	37.69	509.94	155.25	4.02	1.52

TABLE 2B

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

VEHICLE MANUFACTURER

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
AMC	5	3.98	1.81	69.58	52.15	415.51	79.14	3.27	1.07
CHRYSLER	26	4.42	2.61	64.78	36.22	467.44	86.74	4.95	1.39
FORD	43	4.43	2.57	57.31	36.57	508.19	124.46	4.57	1.66
GM	81	5.37	4.34	61.53	33.86	543.88	148.50	3.96	1.50
NISSAN	2	2.38	.29	15.29	1.85	306.84	1.38	4.72	1.57
TOYOTA	3	2.06	.19	17.96	5.35	307.74	54.58	3.63	1.10
VOLKSWAGEN	10	9.22	18.34	41.47	31.25	252.39	56.34	2.03	.64
ALL VEHICLES	170	5.08	5.57	58.70	35.62	495.28	147.55	4.14	1.60

TABLE 3A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

MODEL YEAR

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
1966	17	12.54	13.61	108.91	38.57	406.42	98.64	3.08	1.37
1967	18	9.30	4.47	108.41	28.86	430.76	95.83	3.19	1.34
1968	21	5.20	2.07	71.66	33.16	489.81	95.18	4.00	1.58
1969	22	4.51	1.01	69.50	25.98	516.35	107.27	5.09	1.66
1970	27	4.78	2.73	63.15	33.61	495.11	127.00	3.88	1.23
1971	30	4.25	3.16	53.22	29.68	516.36	182.49	4.14	1.55
1972	35	3.23	1.27	44.58	27.94	614.92	192.20	4.23	1.31
ALL VEHICLES	170	5.64	5.61	68.81	37.69	509.94	155.25	4.02	1.52

TABLE 3B

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

MODEL YEAR

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
1966	17	11.46	13.96	95.36	39.82	396.41	96.49	3.20	1.49
1967	18	8.68	4.62	97.26	26.31	416.77	90.15	3.36	1.37
1968	21	4.72	2.00	63.19	32.44	478.10	89.11	4.12	1.69
1969	22	4.15	1.29	57.74	22.46	498.04	104.38	5.16	1.79
1970	27	4.10	2.40	50.25	29.12	489.45	121.04	4.10	1.40
1971	30	3.80	3.00	43.61	29.53	502.83	176.12	4.27	1.59
1972	35	2.78	1.01	38.44	27.20	590.30	181.67	4.27	1.42
ALL VEHICLES	170	5.08	5.57	58.70	35.62	495.28	147.55	4.14	1.60

TABLE 4A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

NUMBER OF CYLINDERS

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
8	130	5.80	4.01	75.02	38.02	564.90	130.41	4.19	1.51
6	21	4.05	2.00	58.63	28.54	379.70	45.23	4.09	1.36
4	19	6.31	13.11	37.61	25.42	277.81	60.45	2.73	1.14
ALL VEHICLES	170	5.64	5.61	68.81	37.69	509.94	155.25	4.02	1.52

TABLE 48

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

NUMBER OF CYLINDERS

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
8	130	5.19	3.81	63.74	36.36	547.48	124.05	4.35	1.59
6	21	3.52	1.73	49.81	23.13	373.30	41.99	4.14	1.41
4	19	6.03	13.42	34.05	25.31	273.01	54.73	2.70	1.17
ALL VEHICLES	170	5.08	5.57	58.70	35.62	495.28	147.55	4.14	1.60

TABLE 5A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

ENGINE DISPLACEMENT (CUBIC INCHES)

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
LESS THAN 251	40	5.15	9.08	48.95	28.48	330.26	72.71	3.43	1.42
251 - 330	43	7.34	5.27	76.79	41.03	466.00	82.41	3.88	1.48
331 - 399	57	5.42	3.38	80.28	38.70	577.30	106.62	4.17	1.48
MORE THAN 399	30	4.27	1.79	62.08	30.21	644.51	117.13	4.69	1.53
ALL VEHICLES	170	5.64	5.61	68.81	37.69	509.94	155.25	4.02	1.52

TABLE 5B

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

ENGINE DISPLACEMENT (CUBIC INCHES)

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
LESS THAN 251	40	4.73	9.28	42.61	27.39	324.47	68.90	3.44	1.47
251 - 330	43	5.68	5.02	66.21	36.50	453.43	78.70	4.05	1.53
331 - 399	57	4.88	3.16	67.96	38.74	560.47	102.77	4.35	1.55
MORE THAN 399	30	3.63	1.70	51.82	29.99	659.17	110.22	4.79	1.69
ALL VEHICLES	170	5.08	5.57	58.70	35.62	495.28	147.55	4.14	1.60

TABLE 6A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

VEHICLE INERTIA WEIGHT (LBS)

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
1501-2000	9	9.86	18.94	42.72	33.81	257.89	81.82	2.18	1.07
2001-2500	11	3.23	.94	37.43	19.26	300.89	35.22	3.13	1.03
2501-3000	28	6.25	5.75	65.76	35.91	387.38	53.72	3.65	1.26
3001-3500	31	6.20	4.52	73.93	38.95	526.04	93.13	3.62	1.19
3501-4000	44	5.78	3.34	80.18	42.45	527.75	104.21	4.22	1.62
4001-4500	39	4.74	1.72	71.75	29.88	633.55	120.76	4.92	1.38
4501-5000	7	3.43	1.81	52.29	39.57	746.78	134.01	4.58	1.62
5001-5500	1	3.97	0.00	76.79	0.00	747.82	0.00	4.51	0.00
ALL VEHICLES	170	5.64	5.61	68.81	37.69	569.94	155.25	4.02	1.52

TABLE 58

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

VEHICLE INERTIA WEIGHT (LBS)

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
1501-2000	9	9.77	19.36	40.64	33.92	255.96	74.34	2.20	1.03
2001-2500	11	2.82	.84	32.33	17.48	292.77	32.18	3.03	1.15
2501-3000	28	5.81	5.75	57.76	35.42	380.57	52.08	3.73	1.33
3001-3500	31	5.60	4.12	63.64	38.07	510.93	89.37	3.74	1.21
3501-4000	44	5.00	2.91	67.60	38.75	512.45	98.62	4.44	1.73
4001-4500	39	4.23	1.73	60.27	31.05	509.92	114.81	5.05	1.44
4501-5000	7	2.97	1.68	42.62	33.32	724.27	115.12	4.65	1.80
5001-5500	1	2.53	0.00	44.55	0.00	775.00	0.00	4.75	0.00
ALL VEHICLES	170	5.08	5.57	58.70	35.62	495.28	147.55	4.14	1.60

TABLE 7A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

TRANSMISSION TYPE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
AUTOMATIC	144	5.19	3.44	70.27	36.55	539.96	138.60	4.31	1.43
MANUAL	26	8.13	11.71	60.76	43.36	343.68	138.21	2.38	.80
BOTH TYPES	170	5.64	5.61	68.81	37.69	509.94	155.25	4.02	1.52

TABLE 78

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

TRANSMISSION TYPE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
AUTOMATIC	144	4.61	3.19	59.53	34.56	523.75	131.77	4.46	1.50
MANUAL	26	7.66	11.98	54.13	41.49	337.62	131.68	2.35	.77
BOTH TYPES	170	5.08	5.57	58.70	35.62	495.28	147.55	4.14	1.60

TABLE 8A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

NUMBER OF CARBURETOR VENTURIS

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
FOUR BARREL	31	5.04	2.82	72.52	33.96	626.14	137.89	4.67	1.41
TWO BARREL	104	5.88	4.25	73.92	39.44	534.69	130.27	4.03	1.53
ONE BARREL	34	5.54	9.82	51.51	29.47	333.68	74.39	3.44	1.39
FUEL INJECTN	1	2.38	0.00	11.77	0.00	326.71	0.00	2.42	0.00
ALL TYPES	170	5.64	5.61	68.81	37.69	569.94	155.25	4.02	1.52

TABLE 8B

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

NUMBER OF CARBURETOR VENTURIS

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
FOUR BARREL	31	4.50	2.69	59.77	32.13	604.59	128.18	4.75	1.43
TWO BARREL	104	5.26	4.05	63.29	37.64	519.06	125.06	4.20	1.62
ONE BARREL	34	5.14	10.03	45.07	28.52	328.57	70.53	3.45	1.46
FUEL INJECTN	1	1.97	0.00	12.49	0.00	302.33	0.00	2.25	0.00
ALL TYPES	170	5.08	5.57	56.70	35.62	495.28	147.55	4.14	1.60

TABLE 9A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

REPLICATE TESTING USING PAIRED *T* TEST

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
FIRST TEST	10	7.59	7.75	67.66	35.04	524.61	131.54	3.97	.97
SECOND TEST	10	6.63	4.87	62.23	36.15	547.48	178.64	3.90	.88
BETWEEN TESTS (PAIRED *T*)	10	.96	3.54	5.43	24.25	-22.87	100.73	.07	.96

FIRST AND SECOND TESTS

MEAN = SUM OF EA. VEHICLE GM/MI BY GAS DIVIDED BY NUMBER VEHICLES

SD = SQ RT (NUMBER VEHICLES X SUM EA. SCORE SQUARED - SUM OFSCORES SQUARED DIVIDED BY NO. VEHICLES X NO. VEHICLES-1)

BETWEEN TESTS

MEAN = MEAN TEST1 - MEAN TEST2

SD = SQ RT (NUMBER VEHICLES X SUM OF((SCORE TEST1-SCORE TEST2)SQUARED) - SUM OF SCORE TEST1 - SCORE TEST2 SQUARED DIVIDED BY (NO. VEHICLES X NO. VEHICLES - 1))

TABLE 98

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

VS.

REPLICATE TESTING USING PAIRED *T* TEST

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

	NUMBER OF VEHICLES	HC MEAN	HC S.D.	CO MEAN	CO S.D.	CO2 MEAN	CO2 S.D.	NOXC MEAN	NOXC S.D.
FIRST TEST	10	6.89	7.26	57.57	29.83	509.13	127.93	4.14	1.12
SECOND TEST	10	5.90	4.47	51.99	29.84	528.07	175.48	3.95	1.00
BETWEEN TESTS (PAIRED *T*)	10	.99	3.38	5.58	17.10	-18.93	91.20	.20	.85

FIRST AND SECOND TESTS

MEAN = SUM OF EA. VEHICLE GM/MI BY GAS CIVIDED BY NUMBER VEHICLES

SD = SQ RT [NUMBER VEHICLES X SUM EA. SCORE SQUARED - SUM OFSCORES SQUARED DIVIDED BY NO. VEHICLES X NO. VEHICLES-1]

BETWEEN TESTS

MEAN = MEAN TEST1 - MEAN TEST2

SD = SQ RT [NUMBER VEHICLES X SUM OF((SCORE TEST1-SCORE TEST2)SQUARED) - SUM OF SCORE TEST1 - SCORE TEST2 SQUARED DIVIDED BY (NO. VEHICLES X NO. VEHICLES - 1)]

TABLE 10A

VEHICLES MEETING 1972 FEDERAL STANDARDS

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

	HC < 3.4 GM/MI		CO <39 GM/MI		BOTH HC AND CO <3.4 GM/MI AND <39 GM/MI	
	NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
AMC	1	20.00	1	20.00	1	20.00
BUICK	3	25.00	2	16.67	2	16.67
CADILLAC	3	75.00	1	25.00	1	25.00
CHEVROLET	9	23.08	7	17.95	3	7.69
CHRYSLER	1	25.00	1	25.00	1	25.00
DATSUN	2	100.00	2	100.00	2	100.00
DODGE	3	30.00	1	10.00	1	10.00
FORD	12	34.29	7	20.00	6	17.14
LINCOLN	0	0.00	0	0.00	0	0.00
MERCURY	1	14.29	1	14.29	0	0.00
OLDSMOBILE	1	9.09	1	9.09	0	0.00
OPEL	1	100.00	0	0.00	0	0.00
PLYMOUTH	4	33.33	1	8.33	1	8.33
PONTIAC	1	7.14	1	7.14	1	7.14
TOYOTA	3	100.00	3	100.00	3	100.00
VOLKSWAGEN	3	30.00	7	70.00	3	30.00
1966	0	0.00	0	0.00	0	0.00
1967	0	0.00	0	0.00	0	0.00
1968	3	14.29	2	9.52	1	4.76
1969	5	22.73	2	9.09	1	4.55
1970	7	25.93	5	18.52	3	11.11
1971	11	36.67	9	30.00	5	16.67
1972	22	62.86	18	51.43	15	42.86
ALL VEHICLES	48	28.24	36	21.18	25	14.71

COLUMN DEFINITIONS FOR TABLE 12

Column	Description
Alpha No.	Site and Contractor number
Car #	Car number
Run #	Run number
Date	Date (year, month, day)
Mod Yr.	Model year
Mk Cd	Make code
MAKE	Vehicle make (first 4 letters)
MODEL	Vehicle model (first 4 letters)
CID	Engine displacement
V	Number of carburetor venturis
T	Transmission (1-auto, 3-three gears, etc.)
WGHT	Inertia weight
RLHP	Roal load horsepower
W°	Wet bulb temperature (°F.)
D°	Dry bulb temperature (°F.)
BARM	Barometric pressure (inches of mercury)
C	Number of cylinders .
A	Air conditioned (1=yes, 2=no)
E	Evaporative control device (1=yes, 2=no)
X	Exhaust control device (1=yes, 2=no)
P	PCV present (1=yes, 2=no)
ODOM	Odometer reading
TK CAP	Fuel tank capacity
IDLE RPM	Idle revolutions per minute
G	Gear during idle rpm (1=drive, 2=neutral)
DWELL	Dwell in degrees
TIME	Timing (- indicates ATDC)
S	Tested as air conditioned (1=yes, 2=no)
E	Evaporative test (1=yes, 2=no)

TABLE 12

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #	RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0001	0001	730331	72	04	OLDS	DELT	350	2	1	4500	140	61	73	3000	8	1	1	1	1	038837	25	410	1	340	-030	12
013163	0002	0002	730331	71	03	CHEV	CAPR	400	2	1	4500	140	62	75	3000	8	1	1	1	1	024601	24	0640	2	280	040	12
013163	0003	0003	730331	70	01	BUIC	LESA	350	4	1	4500	140	63	75	3000	8	1	1	1	1	055653	25	0600	1	320	-035	12
013163	0004	0193	730507	70	06	FORD	MAVE	200	1	3	2750	099	59	68	3009	6	1	1	1	1	040159	16	0500	2	360	060	22
013163	0005	0005	730402	68	03	CHEV	IMPA	327	4	1	4000	132	61	75	2943	8	1	2	1	1	086037	24	0580	2	296	010	12
013163	0006	0006	730402	72	03	CHEV	IMPA	350	2	1	4500	140	61	71	2945	8	1	1	1	1	007315	24	0530	2	292	060	12
013163	0007	0007	730403	71	06	FORD	MAVE	250	1	1	3000	103	58	73	2955	6	1	1	1	1	017602	17	0420	2	400	000	22
013163	0008	0008	730403	66	02	CADI	COUP	429	4	1	4500	140	59	75	2956	8	1	2	2	1	042751	26	0490	2	280	200	12
013163	0009	0009	730403	69	03	CHEV	IMPA	350	4	1	4500	140	60	77	2957	8	1	2	1	1	039703	24	0520	1	315	040	12
013163	0010	0010	730403	68	16	VOLK	BEET	91	1	4	2000	083	59	74	2957	4	2	2	1	1	039279	10	0920	2	640	-100	22
013163	0011	0011	730404	68	04	OLDS	F85C	350	4	1	3500	123	60	71	2928	8	1	2	1	1	066188	20	0500	1	290	020	12
013163	0012	0012	730404	67	03	CHEV	IMPA	327	4	1	4000	120	62	73	2925	8	2	2	2	1	080802	24	0380	1	250	090	22
013163	0013	0013	730405	66	03	CHEV	CHFL	283	2	1	3000	103	56	71	2956	8	2	2	2	1	117124	20	0400	1	248	050	22
013163	0013 R	0096	730420	66	03	CHEV	CHFL	283	2	1	3000	103	59	70	3018	8	2	2	2	1	117341	20	0400	1	248	050	22
013163	0014	0014	730405	69	01	BUIC	SPEC	350	2	1	3500	123	55	71	2961	8	1	2	1	1	068395	20	0530	1	275	010	12
013163	0015	0015	730405	71	10	DODG	DART	225	1	1	3500	112	56	71	2957	6	1	1	1	1	020785	18	0540	1	420	-030	22
013163	0016	0016	730406	72	01	BUIC	SPEC	350	2	1	4000	132	55	71	3002	8	1	1	1	1	007700	20	0620	1	265	040	12
013163	0017	0017	730406	71	04	OLDS	NINE	455	4	1	4500	140	59	76	3001	8	2	1	1	1	043719	25	0700	2	250	080	12
013163	0018	0018	730406	70	03	CHEV	NOVA	250	1	1	3000	103	63	81	2999	6	2	2	1	1	028402	18	0710	1	310	040	22

TABLE 12 (CONT.)

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #	RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0019	0019	730406	69	05	PONT	CATA	400	2	1	4000	132	62	80	2995	8	1	2	1	1	052368	27	0500	1	311	060	12
013163	0020	0020	730406	67	06	FORD	MUST	289	2	1	3000	103	63	81	2996	8	2	2	2	1	063000	16	0440	1	230	105	22
013163	0021	0021	730406	71	10	DODG	CHAR	383	2	1	3500	123	59	78	2987	8	1	2	1	1	033633	21	0740	2	240	050	12
013163	0022	0022	730407	69	06	FORD	CUST	351	2	1	4000	132	57	73	2983	8	1	2	1	1	044565	25	0380	2	240	020	12
013163	0023	0023	730407	71	05	PONT	SAFA	400	2	1	5000	147	59	75	2983	8	1	1	1	1	019193	23	0780	2	295	105	12
013163	0024	0024	730407	69	04	OLDS	DELT	350	2	1	4000	132	61	78	2984	8	1	2	1	1	044923	25	0490	2	280	000	12
013163	0025	0025	730407	70	01	BUIC	ELEC	455	4	1	4500	140	65	76	2986	8	1	2	1	1	036543	25	0550	2	285	090	12
013163	0026	0026	730407	71	08	MERC	COUG	351	4	1	3500	123	61	78	2983	8	1	1	1	1	012283	20	0500	2	310	-080	12
013163	0027	0027	730409	72	03	CHEV	MALI	350	2	1	3500	123	60	78	2996	8	1	1	1	1	032008	19	0350	2	280	090	12
013163	0028	0042	730410	72	03	CHEV	NOVA	307	2	1	3500	112	54	72	2963	8	1	1	1	1	011059	16	0580	1	280	100	22
013163	0030	0030	730409	72	03	CHEV	IMPA	350	2	1	4500	140	60	77	2999	8	1	1	1	1	020992	23	0450	2	295	050	12
013163	0031	0031	730409	68	08	MERC	MONG	302	2	1	3500	112	59	75	2982	8	2	2	2	1	073760	20	0540	2	320	-030	22
013163	0033	0033	730409	67	05	PONT	EXEC	400	2	1	4500	140	60	74	2980	8	1	2	2	1	079928	27	0580	2	285	060	12
013163	0034	0035	730410	72	12	PLYM	FURY	360	2	1	4000	120	57	74	2954	8	1	1	1	1	021105	23	0500	2	999	-020	22
013163	0035	0036	730410	72	06	FORD	LTD	400	2	1	4500	140	57	75	2955	8	1	1	1	1	015483	22	0600	1	255	170	12
013163	0036	0037	730410	72	03	CHEV	MONT	350	2	1	4000	132	56	75	2955	8	1	1	1	1	015565	19	0570	1	275	060	12
013163	0037	0038	730410	66	05	PONT	TEMP	326	2	1	3500	112	57	74	2955	8	1	2	1	1	096056	22	0430	1	260	030	22
013163	0038	0039	730410	70	06	FORD	COUN	351	2	1	4500	140	56	73	2954	8	2	2	1	1	028435	25	0500	2	320	-040	12
013163	0039	0040	730410	69	06	FORD	LTD	390	2	1	4000	132	57	73	2958	8	1	2	1	1	051257	25	0500	2	220	100	1

TABLE 12 (CONT.)

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #		RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0040		0041	730410	72	15	TOYO	MARK	120	1	4	2750	099	55	72	2960	8	?	1	1	1	013441	13	0600	2	045	-070	22
013163	0041		0043	730410	68	06	FORD	LTDW	390	4	1	4500	140	56	75	2986	8	1	2	1	1	065723	25	0500	2	275	050	12
013163	0042		0044	730411	70	04	OLDS	CUTL	350	2	1	3500	123	56	75	2987	8	1	2	1	1	043627	20	0500	2	320	-020	12
013163	0043		0045	730411	72	01	BUIC	CENT	455	4	1	4500	140	55	74	2989	8	1	1	1	1	027088	25	0680	1	290	040	12
013163	0044		0046	730412	71	04	OLDS	VIST	350	2	1	4500	140	55	70	2981	8	1	1	1	1	043951	20	0580	1	275	130	12
013163	0045		0047	730412	69	12	PLYM	VAL1	225	1	1	2750	103	56	71	2930	6	?	2	1	1	033283	18	0580	1	375	050	22
013163	0046		0048	730412	70	10	DODG	POLA	318	2	1	4000	120	56	71	2976	8	1	2	1	1	047892	24	0500	1	305	050	22
013163	0047		0196	730507	71	05	PONT	SAFA	400	2	1	5000	147	63	78	3012	8	1	1	1	1	044386	23	0740	2	260	120	12
013163	0047	R	0198	730509	71	05	PONT	SAFA	400	2	1	5000	147	70	78	2985	8	1	1	1	1	044529	23	0740	2	260	120	12
013163	0048		0050	730412	66	03	CHEV	IMPA	283	2	3	4000	120	57	73	2976	8	?	2	2	1	117837	20	0640	2	250	160	22
013163	0049		0051	730412	70	06	FORD	MUST	302	2	1	3000	113	58	74	2980	8	1	2	1	1	037045	22	0620	1	260	060	12
013163	0050		0054	930413	67	05	PONT	TEMP	326	2	1	3500	112	54	74	3015	8	1	2	2	1	105380	22	0580	1	345	100	22
013163	0051		0053	730412	72	16	VOLK	0411	102	0	1	2500	094	60	76	2988	4	?	1	1	1	005463	13	0850	1	999	270	22
013163	0052		0055	730413	70	03	CHEV	CHEL	307	2	1	4000	132	55	75	3010	8	1	2	1	1	041243	22	0340	1	265	-100	12
013163	0052	R	0062	730414	70	03	CHEV	CHEL	307	2	1	4000	132	58	77	3030	8	1	2	1	1	041300	22	0340	1	255	-100	12
013163	0053		0056	730413	66	06	FORD	MUST	289	2	1	3000	103	56	75	3010	8	?	2	2	1	039316	16	0500	1	250	090	22
013163	0054		0057	730414	67	09	CHRY	NEWP	383	4	1	4500	140	57	76	3012	8	1	2	2	1	048580	25	0500	2	260	100	12
013163	0055		0058	730413	67	04	OLDS	VIST	330	2	1	4000	132	57	76	3012	8	1	2	2	1	076767	24	0610	1	240	075	12
013163	0056		0205	730518	72	05	PONT	CATA	400	2	1	4500	140	59	72	2976	8	1	1	1	1	015934	26	0625	1	300	100	12

TABLE 12 (CONT.)

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #	RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0057	0066	730415	70	15	TOYO	COPL	71	1	1	2000	083	60	80	3040	4	2	2	1	1	021640	13	0830	1	500	020	22
013163	0058	0061	730414	69	16	VOLK	BEET	91	1	4	2000	083	57	75	3034	4	2	2	1	1	059352	10	1000	2	420	075	22
013163	0059	0063	730415	70	06	FORD	LTD	351	2	1	4000	132	58	75	3043	8	1	2	1	1	017332	25	0340	1	335	050	12
013163	0060	0064	730415	69	05	PONT	TEMP	350	2	1	3500	123	59	77	3043	8	1	2	1	1	059069	22	0480	1	290	040	12
013163	0061	0065	730415	72	06	FORD	TORI	302	2	1	3500	112	60	79	3046	8	1	1	1	1	008191	23	0420	1	295	060	22
013163	0062	0067	730415	70	05	PONT	LEMA	350	2	1	4000	132	60	80	3038	8	1	2	1	1	030300	20	0430	1	270	050	12
013163	0063	0068	730416	66	04	OLDS	JETS	330	2	1	4000	120	58	76	3031	8	1	2	2	1	058707	25	0395	1	290	060	22
013163	0064	0070	730417	67	16	VOLK	BEET	92	1	4	2000	083	62	75	3022	4	2	2	2	1	085710	10	1000	2	635	100	22
013163	0065	0071	730417	72	16	VOLK	BEET	97	1	4	2250	097	62	74	3020	4	1	1	1	1	005004	10	0780	2	480	000	22
013163	0066	0072	730417	71	16	VOLK	BEET	97	1	4	2000	083	62	74	3015	4	2	1	1	1	032696	10	0900	2	460	075	22
013163	0067	0073	730417	71	16	VOLK	KARM	97	1	4	2000	083	61	73	3015	4	2	1	1	1	039558	10	0780	2	520	000	22
013163	0069	0074	730418	66	03	CHEV	BELA	283	2	1	4500	127	60	71	3016	8	2	2	2	1	116453	20	0470	1	280	000	22
013163	0070	0075	730418	70	13	AMC	JAVE	304	2	1	3500	112	62	73	3016	8	2	2	1	1	036375	19	0540	1	240	050	22
013163	0071	0076	730418	72	01	BUIC	CENT	455	4	1	4500	140	63	77	3014	8	1	1	1	1	014595	25	0680	2	290	020	12
013163	0072	0077	730418	71	03	CHEV	BELA	350	2	1	4000	132	62	76	3014	8	1	1	1	1	023705	24	0580	1	275	080	12
013163	0073	0078	730418	71	06	FORD	COUN	351	2	1	4500	140	62	77	3014	8	1	1	1	1	022542	20	0460	2	320	100	12
013163	0074	0079	730418	68	06	FORD	MUST	289	2	1	3000	113	63	76	3013	8	1	2	1	1	075476	16	0320	1	320	060	1
013163	0075	0080	730418	68	03	CHEV	CHEL	307	2	1	3500	112	62	74	3013	8	2	2	1	1	094326	20	0490	1	290	120	22
013163	0076	0081	730418	72	03	CHEV	VEGA	140	2	4	2500	094	62	76	3013	4	2	1	1	1	010959	11	0880	2	290	+100	22

TABLE 12 (CONT.)

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #		RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0077		0082	730419	72	05	PONT	FIRE	350	2	1	3500	123	61	72	3014	8	1	1	1	1	016277	17	0620	1	252	120	12
013163	0078		0083	730419	71	06	FORD	PINT	98	1	4	2250	088	62	74	3014	4	1	1	1	1	024554	11	0780	2	400	140	22
013163	0079		0084	730419	67	12	PLYM	FURY	318	2	1	4000	120	62	74	3014	8	1	2	2	1	068942	25	0650	1	270	200	22
013163	0080		0085	730419	71	01	BUIC	ESTA	455	4	1	5500	153	63	76	3014	8	1	1	1	1	034441	23	0580	1	315	000	12
013163	0081		0086	730419	72	10	DODG	POLA	360	2	1	4000	132	63	77	3012	8	1	1	1	1	006915	23	0480	2	999	000	12
013163	0082		0087	730419	71	06	FORD	MAVE	200	1	1	2750	099	64	79	3012	6	2	1	1	1	027301	15	0420	1	330	070	22
013163	0083		0094	730420	72	13	AMC	HORN	258	1	1	3000	103	63	73	3017	6	1	1	1	1	023735	16	0520	1	310	040	22
013163	0084		0089	730419	72	06	FORD	GALA	351	2	1	4000	132	66	77	3011	8	1	1	2	1	023819	22	0420	1	260	050	12
013163	0084	R	0095	730420	72	06	FORD	GALA	351	2	1	4000	132	60	72	3017	8	1	1	1	1	023830	22	0420	1	260	050	12
013163	0085		0090	730419	67	03	CHEV	BELA	283	2	1	4000	132	64	75	3011	8	1	2	2	1	089423	24	0550	1	260	060	12
013163	0085	R	0097	730420	67	03	CHEV	BELA	283	2	1	4000	120	58	70	3021	8	1	2	2	1	089438	24	0550	1	260	060	22
013163	0086		0091	730420	71	03	CHEV	MONT	350	2	1	4000	120	59	69	3011	8	1	1	1	1	018618	19	0610	1	350	020	22
013163	0087		0092	730420	71	06	FORD	COUN	351	2	1	4500	127	61	71	3015	8	1	1	1	1	031177	22	0580	1	215	200	22
013163	0088		0093	730420	71	03	CHEV	CHEL	350	2	1	3000	103	63	74	3017	8	2	1	1	1	033238	19	0550	1	300	050	22
013163	0089		0098	730420	72	10	DODG	SWIN	225	1	1	3000	113	59	71	3022	6	1	1	1	1	005162	16	0800	2	410	000	12
013163	0090		0100	730424	67	06	FORD	CUST	390	2	1	4000	132	59	72	2976	8	1	2	2	1	074087	25	0680	1	310	100	1
013163	0091		0101	730424	70	12	PLYM	DUST	225	1	1	3000	103	60	73	2976	6	2	2	1	1	016144	18	0800	2	380	060	22
013163	0092		0102	730424	68	03	CHEV	BELA	307	2	1	4000	120	60	77	2976	8	2	2	1	1	058651	24	0620	2	270	-050	22
013163	0093		0103	730424	72	06	FORD	TORI	351	2	1	4000	132	59	74	2977	8	1	1	1	1	015332	20	0540	1	252	100	1

TABLE 12 (CONT.)

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #	RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0094	0104	730424	66	01	BUIC	LESA	340	2	1	4000	132	60	75	2977	8	1	2	2	1	071913	25	0630	1	120	175	12
013163	0095	0105	730424	66	10	DODG	POLA	383	2	1	4000	132	60	74	2977	8	2	2	2	1	078419	25	0540	1	290	075	12
013163	0096	0106	730424	70	06	FORD	FAIR	302	2	1	3500	112	60	74	2977	8	2	2	1	1	040038	22	0580	1	225	050	22
013163	0097	0107	730425	71	17	OPEL	GT	116	2	4	2250	088	60	71	2977	4	2	1	1	1	021609	12	0900	2	560	020	22
013163	0098	0108	730425	69	03	CHEV	NOVA	230	1	3	2000	083	59	70	2977	6	2	2	1	1	042108	18	0540	2	300	-040	22
013163	0099	0109	730425	69	01	BUIC	ELEC	430	4	1	4500	140	62	75	2978	8	1	2	1	1	093659	25	0450	1	330	-040	12
013163	0100	0110	730425	69	03	CHEV	TOWN	350	4	1	4500	140	61	74	2476	8	1	2	1	1	086250	24	0680	1	270	-040	12
013163	0101	0138	730428	70	16	VOLK	SQUA	97	1	1	2250	088	60	75	2938	4	1	2	1	1	042557	10	0500	2	460	-050	22
013163	0102	0116	730426	68	06	FORD	TORI	289	2	1	3500	112	62	72	2964	8	1	2	1	1	055776	20	0630	2	280	080	22
013163	0103	0113	730425	70	05	PONT	CATA	400	2	1	4500	140	62	73	2969	8	1	2	1	1	026088	26	0630	1	290	050	12
013163	0104	0114	730425	68	03	CHEV	CAPR	396	4	1	4000	132	62	73	2972	8	1	2	1	1	062556	24	0520	1	300	070	12
013163	0105	0115	730425	67	08	MERC	COMM	390	2	1	4500	140	63	74	2972	8	2	2	2	1	054961	20	0530	1	260	000	12
013163	0106	0117	730426	71	14	DATS	510	97	2	4	2250	088	61	72	2964	4	2	1	1	1	032616	12	0480	2	560	-250	22
013163	0107	0118	730426	67	01	BUIC	SPEC	300	2	1	4500	140	61	72	2966	8	1	2	2	1	042014	20	0600	2	280	025	12
013163	0108	0129	730427	71	07	LINC	CONT	460	4	1	5000	147	63	73	2935	8	1	1	1	1	017170	24	0540	2	300	100	12
013163	0109	0134	730427	72	04	OLDS	442	455	4	4	3500	123	63	75	2923	8	2	1	1	1	030748	23	1100	2	300	-150	12
013163	0110	0215	730629	72	03	CHEV	IMPA	350	2	1	4500	140	68	75	2971	8	1	1	1	1	010867	23	0975	2	265	080	12
013163	0111	0122	730426	72	12	PLYM	DUST	318	2	1	3000	103	63	75	2966	8	1	1	1	1	006847	16	0470	2	999	070	22
013163	0111 R	0133	730427	72	12	PLYM	DUST	318	2	1	3000	103	64	75	2923	8	1	1	1	1	006863	16	0470	1	999	070	22

TABLE 12 (CONT.)

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #		RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0112		0123	730426	70	09	CHRY	NEWY	440	4	1	4500	140	63	75	2969	8	1	2	1	1	060709	24	0620	1	270	100	12
013163	0113		0124	730426	68	02	CADI	CALA	472	4	1	5000	147	64	76	2969	8	1	2	1	1	030231	26	0570	1	270	040	12
013163	0113	R	0132	730427	68	02	CADI	CALA	472	4	1	5000	147	63	74	2923	8	1	2	1	1	030247	26	0570	1	270	040	12
013163	0114		0125	730427	68	05	PONT	LEMA	350	2	1	3500	112	63	75	2969	8	1	2	1	1	036273	19	0640	1	280	070	22
013163	0115		0126	730427	68	10	DODG	CORO	318	2	1	4000	120	62	74	2963	8	1	2	1	1	130918	19	0600	1	310	-025	22
013163	0116		0127	730427	69	06	FORD	GALA	302	2	1	4000	132	61	72	2941	8	1	2	1	1	062843	25	0870	1	230	300	12
013163	0117		0128	730427	69	03	CHEV	MALI	307	2	1	3500	112	60	71	2934	8	1	2	1	1	041999	20	0580	1	250	040	22
013163	0118		0130	730427	70	03	CHEV	IMPA	350	2	1	4000	132	63	74	2923	8	1	2	1	1	050110	25	0600	1	240	-060	12
013163	0119		0131	730427	66	03	CHEV	CHE2	194	1	3	3000	103	62	72	2923	6	2	2	2	1	070776	16	0780	2	230	-100	22
013163	0120		0135	730428	69	02	CADI	FLEE	472	4	1	5000	147	64	75	2924	8	1	2	1	1	117143	26	0630	1	260	075	12
013163	0121		0136	730428	71	12	PLYM	VALI	225	1	1	3000	103	64	76	2923	6	1	1	1	1	022897	18	0620	2	999	020	22
013163	0122		0137	730428	66	12	PLYM	BELE	225	1	1	3500	112	56	68	2934	6	2	2	2	1	079325	19	0740	2	390	025	22
013163	0123		0139	730428	68	09	CHRY	NEWP	383	2	1	4500	140	60	75	2939	8	1	2	1	1	060200	24	0620	2	300	075	12
013163	0124		0140	730428	69	06	FORD	FALC	200	1	3	2500	094	61	76	2942	6	2	2	1	1	058113	16	0580	2	240	040	22
013163	0126		0142	730429	70	16	VOLK	SQUA	97	1	4	2500	094	59	75	2990	4	2	2	1	1	031335	10	0875	2	500	050	22
013163	0127		0143	730429	66	13	AMC	RAMB	232	1	1	3000	103	59	75	2990	6	2	2	2	1	092377	16	0640	2	250	060	2
013163	0128		0144	730429	69	04	OLDS	DELT	455	2	1	4000	132	59	76	2990	8	1	2	1	1	068304	25	0700	1	230	040	12
013163	0129		0145	730429	70	10	DODG	CHAR	383	4	1	3500	123	60	77	2990	8	1	2	1	1	060662	18	0650	1	270	150	12
013163	0129	R	0149	730430	70	10	DODG	CHAR	383	4	1	3500	123	62	78	3010	8	1	2	1	1	060677	18	0650	1	270	150	1.

TABLE 12 (CONT.)

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #		RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0130		0146	730429	71	12	PLYM	VALI	318	2	1	3000	113	61	78	2990	8	1	1	1	1	015938	18	0500	2	230	000	1
013163	0130	R	0147	730430	71	12	PLYM	VALI	318	2	1	3000	113	59	73	3010	8	1	1	1	1	015955	18	0500	1	230	000	1
013163	0131		0148	730430	67	03	CHEV	CHE2	283	2	3	2750	099	58	74	3010	8	1	2	2	1	073519	16	0520	2	260	-040	2
013163	0133		0150	730501	72	02	CADI	DEVI	472	4	1	5000	147	64	77	3009	8	1	1	1	1	005719	28	0640	2	240	080	1
013163	0134		0152	730501	68	05	PONT	GTO	400	2	4	3500	112	65	78	3009	8	2	2	1	1	053428	22	0560	2	290	060	2
013163	0135		0163	730503	67	03	CHEV	BISC	250	1	3	4000	120	65	74	2989	8	2	2	2	1	072193	20	0500	2	300	020	2
013163	0136		0154	730501	69	06	FORD	MUST	302	2	1	3000	113	66	81	3009	8	1	2	1	1	064468	25	0640	2	270	080	1
013163	0137		0155	730503	66	06	FORD	THUN	360	2	1	4500	127	65	75	2945	8	1	2	2	1	063228	22	0450	1	255	110	2
013163	0138		0166	730503	67	03	CHEV	MALI	283	2	1	3500	112	68	76	2980	8	1	2	2	1	043102	20	0450	1	240	040	2
013163	0139		0157	730503	71	06	FORD	COUN	400	4	1	4500	140	65	76	2996	8	1	1	1	1	022324	22	0380	1	265	095	1
013163	0140		0158	730503	70	08	MERC	COUG	351	4	1	3500	123	65	75	2991	8	1	2	1	1	058599	25	0620	1	250	150	1
013163	0141		0159	730503	72	14	DATS	510	97	2	1	2250	088	65	75	2988	4	2	1	1	1	014925	12	0640	2	500	050	2
013163	0142		0160	730503	72	12	PLYM	FURY	318	2	1	4000	132	65	73	2987	8	1	1	1	1	026669	23	0720	2	280	050	1
013163	0143		0161	730503	69	03	CHEV	MALI	307	2	1	3500	123	65	72	2986	8	1	2	1	1	042972	20	0640	2	240	020	1
013163	0143	R	0195	730507	69	03	CHEV	MALI	307	2	1	3500	123	61	74	3012	8	1	2	1	1	043037	20	0600	2	280	000	1
013163	0144		0162	730503	72	03	CHEV	KING	402	4	1	5000	147	65	73	2983	8	1	1	1	1	015946	23	0680	1	240	080	1
013163	0146		0175	730505	71	03	CHEV	VEGA	140	1	4	2750	109	59	71	2982	4	1	1	1	1	032865	11	0700	2	250	060	1
013163	0148		0168	730503	72	06	FORD	TORI	302	2	1	4000	120	64	73	2980	8	2	1	1	1	010536	22	0560	1	300	050	2
013163	0149		0169	730504	71	15	TOYO	CORL	71	1	3	2000	083	64	75	2980	4	2	1	1	1	014528	10	0630	2	500	-100	2

TABLE 12 (CONT.)

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #	RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0150	0170	730504	66	06	FORD	MUST	200	1	1	2750	099	66	75	2980	6	2	2	2	1	075666	16	0740	1	320	100	22
013163	0151	0171	730504	68	12	PLYM	FURY	318	2	1	4000	127	63	74	2980	8	1	2	1	1	089933	24	0480	1	270	-050	22
013163	0152	0172	730504	69	10	DODG	POLA	383	2	1	4000	120	63	75	2977	8	1	2	1	1	055010	24	0520	2	335	000	22
013163	0153	0173	730504	71	01	BUIC	SKYL	350	2	1	3500	123	63	74	2976	8	1	1	1	1	023409	25	0680	2	250	120	12
013163	0154	0174	730505	70	04	OLDS	98	455	4	1	4500	140	64	71	2980	8	1	2	1	1	053571	25	0500	2	340	050	12
013163	0155	0176	730505	70	12	PLYM	FURY	318	2	1	4000	132	63	71	2985	8	1	2	1	1	062735	24	0430	1	295	000	12
013163	0156	0177	730505	68	06	FORD	CUST	240	2	1	4000	120	63	72	2985	6	2	2	1	1	042254	25	0530	1	415	020	22
013163	0158	0179	730506	72	06	FORD	COUN	400	2	1	4500	140	64	72	2985	8	1	1	1	1	017971	22	0460	1	255	060	12
013163	0159	0180	730506	66	05	PONT	CATA	389	4	1	4500	127	64	72	2985	8	2	2	2	1	082312	27	0640	1	210	080	22
013163	0160	0181	730506	69	08	MERC	MONY	390	2	1	4500	140	61	72	2985	8	2	2	1	1	056079	24	0460	1	250	120	12
013163	0161	0182	730506	69	12	PLYM	SUBU	383	2	1	4500	140	63	75	2999	8	1	2	1	1	051410	22	0540	2	290	050	12
013163	0162	0183	730506	72	09	CHRY	NEWY	440	4	1	4500	140	63	75	2998	8	1	1	1	1	015213	23	0640	2	255	100	12
013163	0163	0184	730506	70	03	CHEV	CAMA	350	2	1	3000	103	62	75	2999	8	2	2	1	1	030611	19	0620	2	310	-020	22
013163	0164	0185	730506	71	03	CHEV	MALI	307	2	1	3500	123	60	71	2995	8	1	1	1	1	028376	15	0480	1	265	100	12
013163	0165	0186	730506	67	13	AMC	AMBA	343	2	1	3500	123	60	68	3000	8	1	2	2	1	056008	22	0500	0	210	020	12
013163	0166	0187	730506	68	03	CHEV	BELA	250	1	1	4000	120	62	74	3001	6	1	2	1	1	069419	24	0690	7	150	000	22
013163	0167	0188	730506	66	08	MERC	MONK	390	2	3	4000	132	63	74	3000	8	2	2	2	1	083809	25	0580	2	280	070	12
013163	0168	0189	730507	68	06	FORD	COUN	390	2	1	4000	132	63	75	3000	8	1	2	1	1	062300	20	0540	1	200	150	12
013163	0169	0190	730507	72	06	FORD	PINT	122	2	1	2250	088	62	73	3000	4	2	1	1	1	031530	11	700	1	360	020	22

TABLE 12 (CONT.)

VEHICLE INFORMATION SUMMARY WASHINGTON, D.C.

ALPHA NO.	CAR #	RUN #	DATE YYMMDD	MOD YR.	MK CD	MAKE	MODEL	CID	V	T	WGHT	RLHP	W°	D°	BARM	C	A	E	X	P	ODOM.	TK CAP	IDLE RPM	G	DWELL	TIME	SE
013163	0170	0191	730507	70	06	FORD	MAVE	200	1	3	2750	099	62	73	3008	6	1	2	1	1	023510	16	0540	2	410	040	22
013163	0171	0192	730507	68	13	AMC	RAMB	232	1	1	3000	103	62	72	3010	6	1	2	1	1	032220	22	0470	1	270	080	12
013163	0172	0194	730507	68	01	BUIC	SKYL	400	4	1	4000	132	61	71	3010	8	1	2	1	1	052683	20	0420	2	310	000	12
013163	0173	0197	730509	70	03	CHEV	CAPR	400	2	1	4500	140	69	75	2984	8	1	2	1	1	030436	25	0640	2	300	055	12
013163	0174	0200	730511	72	08	MERC	MONG	351	2	1	4000	132	63	77	2963	8	1	1	1	1	013008	20	0640	1	280	060	12
013163	0175	0201	730511	66	16	VOLK	BEET	79	1	4	2000	083	63	77	2963	4	2	2	2	1	051798	10	1050	2	470	100	22
013163	0176	0202	730515	67	10	DODG	CORO	318	2	1	3500	112	65	73	2996	8	2	2	2	1	110073	19	0650	2	235	170	22
013163	0177	0203	730515	67	06	FORD	MUST	289	2	1	2750	099	65	75	2996	8	2	2	2	1	137284	17	0500	2	260	040	22
013163	0178	0204	730515	71	03	CHEV	IMPA	350	2	1	4500	140	65	75	2996	8	1	1	1	1	041924	24	0660	1	300	080	12

TABLE 13A

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0001	1972	OLDS	350	4.55	99.30	610.72	3.20	1.06	4.26	4.00	4.75	11.4
0002	1971	CHEV	400	3.51	55.25	588.43	4.36	1.02	5.38	5.07	0.89	12.9
0003	1970	BUIC	350	4.11	85.10	495.43	3.32	.79	4.11	3.97	4.04	13.8
0004	1970	FORD	200	4.68	40.14	303.15	2.62	.74	3.36	3.23	1.28	23.3
0005	1968	CHEV	327	5.86	78.39	419.80	3.49	1.28	4.78	4.43	3.86	15.8
0006	1972	CHEV	350	2.76	39.35	675.42	3.53	.92	4.45	4.24	2.30	11.9
0007	1971	FORD	250	3.03	40.63	382.43	5.01	1.97	6.98	6.18	3.99	19.5
0008	1966	CADI	429	7.09	98.25	499.42	3.28	1.37	4.66	4.15	7.64	13.1
0009	1969	CHEV	350	4.44	67.67	517.26	5.43	2.78	8.21	7.23	4.66	13.9
0010	1968	VOLK	91	4.37	67.15	280.85	1.36	.16	1.51	1.36	5.26	22.2
0011	1968	OLDS	350	5.77	61.67	530.31	4.14	1.55	5.68	5.25	4.78	13.7
0012	1967	CHEV	327	8.39	92.90	429.36	3.78	1.17	4.95	4.75	9.31	14.7
0013	1966	CHEV	283	26.01	47.60	358.96	3.78	1.33	5.10	4.47	3.78	17.2
0013 R	1966	CHEV	283	15.51	28.76	215.52	2.22	.51	2.72	2.52	3.88	28.6
0014	1969	BUIC	350	2.93	69.23	542.85	3.68	1.03	4.71	4.03	1.83	13.4
0015	1971	DODG	225	3.33	49.41	376.42	4.30	2.11	6.41	5.58	5.14	19.1
0016	1972	BUIC	350	2.30	36.87	728.50	3.31	.90	4.21	3.59	0.19	11.2
0017	1971	OLDS	455	3.49	40.55	763.19	4.05	1.26	5.31	4.65	0.68	10.6
0018	1970	CHEV	250	2.81	48.03	441.23	2.88	.85	3.73	3.47	3.99	16.9

TABLE 13A (CONT.).

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0019	1969	PONT	400	5.18	70.56	606.58	3.33	.85	4.19	3.82	3.88	12.1
0020	1967	FORD	289	12.16	157.40	317.20	1.94	.18	2.12	1.96	10.26	14.7
0021	1971	DODG	383	5.35	142.30	550.19	2.68	.53	3.21	2.81	3.78	11.2
0022	1969	FORD	351	3.04	40.29	643.78	3.13	.72	3.84	3.35	3.07	12.4
0023	1971	PONT	400	6.09	39.53	851.59	4.43	1.76	6.19	5.51	4.54	9.5
0024	1969	OLDS	350	5.57	125.45	533.42	2.83	.65	3.48	3.12	7.87	11.9
0025	1970	BUIC	455	5.66	89.04	596.65	3.56	.97	4.53	4.49	1.55	11.8
0026	1971	MERC	351	3.16	54.55	636.16	3.07	.77	3.83	3.48	1.93	12.1
0027	1972	CHEV	350	4.59	77.19	515.79	2.69	1.42	4.11	3.69	9.09	13.6
0028	1972	CHEV	307	2.44	9.31	664.36	3.59	1.16	4.75	4.00	0.01	12.9
0030	1972	CHEV	350	3.34	47.48	795.38	4.07	1.10	5.17	4.63	4.10	10.1
0031	1968	MERC	302	4.16	35.17	522.39	2.99	1.21	4.20	3.74	3.88	15.0
0033	1967	PONT	400	7.66	103.54	513.39	3.79	1.81	5.60	5.13	6.22	12.7
0034	1972	PLYM	360	5.17	112.39	530.55	4.14	1.34	5.48	4.77	11.32	12.3
0035	1972	FORD	400	3.38	68.07	646.70	4.59	3.58	8.17	7.06	1.46	11.6
0036	1972	CHEV	350	3.05	54.83	590.89	2.81	.56	3.37	2.85	2.11	12.9
0037	1966	PONT	326	3.99	57.49	505.36	3.04	.81	3.86	3.32	0.12	14.6
0038	1970	FORD	351	4.73	74.41	672.33	2.98	.97	3.94	3.36	0.13	11.0
0039	1969	FORD	390	5.54	89.15	586.99	5.17	2.63	7.80	6.79	4.54	11.9

TABLE 13A (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0040	1972	TOYO	120	2.39	26.49	358.32	3.38	1.08	4.46	3.80	3.47	21.8
0041	1968	FORD	390	6.37	115.78	585.26	3.70	1.88	5.58	4.73	9.77	11.3
0042	1970	OLDS	350	5.48	95.71	492.20	3.04	.80	3.84	3.25	4.43	13.4
0043	1972	BUIC	455	3.70	51.08	905.64	5.26	2.99	8.24	6.92	1.18	8.9
0044	1971	OLDS	350	5.01	67.12	770.91	4.69	2.50	7.19	6.19	0.82	9.9
0045	1969	PLYM	225	3.05	47.33	359.58	4.25	1.82	6.07	5.31	1.65	20.0
0046	1970	DODG	318	6.05	80.35	505.87	3.83	2.53	6.36	5.53	7.87	13.6
0047	1971	PONT	400	4.12	39.85	715.43	4.60	1.85	6.45	6.09	0.19	11.2
0047 R	1971	PONT	400	4.26	39.50	729.60	4.02	1.10	5.11	5.72	0.19	11.0
0048	1966	CHEV	283	17.50	130.15	360.07	2.26	.44	2.69	2.35	6.07	14.3
0049	1970	FORD	302	3.94	39.26	536.99	2.47	.97	3.43	3.03	0.01	14.5
0050	1967	PONT	326	15.51	78.28	540.30	4.68	1.43	6.10	5.05	2.40	12.5
0051	1972	VOLK	102	2.38	11.77	326.71	2.29	.39	2.68	2.42	0.55	25.2
0052	1970	CHEV	307	5.35	80.27	461.96	3.07	1.07	4.14	3.46	8.46	14.7
0052 R	1970	CHEV	307	3.91	20.82	483.78	3.72	1.20	4.92	4.25	8.46	16.7
0053	1966	FORD	289	7.13	102.39	384.05	4.19	1.41	5.60	4.75	5.79	15.6
0054	1967	CHRY	383	6.40	107.50	452.76	2.83	.75	3.58	3.08	2.97	13.8
0055	1967	OLDS	330	6.64	121.83	533.88	2.56	.48	3.17	2.71	10.26	11.9
0056	1972	PONT	400	2.43	30.96	797.96	2.57	.88	3.44	3.14	0.19	10.4

TABLE 13A (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0057	1970	TOYO	71	2.00	12.77	255.20	3.47	1.44	5.41	4.76	1.83	31.5
0058	1969	VOLK	91	3.95	14.18	254.48	2.36	.65	3.01	2.59	2.21	30.7
0059	1970	FORD	351	3.91	23.41	581.59	5.43	2.29	7.72	6.74	0.01	14.1
0060	1969	PONT	350	3.65	46.54	477.85	4.48	1.85	6.32	5.57	2.97	15.8
0061	1972	FORD	302	2.27	24.05	598.30	3.32	.92	4.24	3.70	3.07	13.8
0062	1970	PONT	350	3.93	56.41	527.76	3.99	1.39	5.38	4.74	5.79	14.1
0063	1966	OLDS	330	13.27	154.07	429.13	1.62	.18	1.81	1.57	2.78	12.4
0064	1967	VOLK	92	4.59	52.90	169.06	1.14	.13	1.27	1.20	6.52	33.3
0065	1972	VOLK	97	3.75	34.55	295.62	2.32	.39	2.71	2.58	3.88	24.5
0066	1971	VOLK	97	4.73	29.97	192.38	1.61	.23	1.85	1.66	3.78	34.9
0067	1971	VOLK	97	3.33	36.29	282.14	1.89	.23	2.12	1.99	1.93	25.4
0069	1966	CHEV	283	8.42	134.67	432.23	2.23	.37	2.60	2.45	3.57	13.2
0070	1970	AMC	304	4.65	43.48	507.78	3.00	.58	3.59	3.44	0.82	15.0
0071	1972	BUIC	455	2.03	23.47	747.04	3.31	.61	3.92	3.78	1.00	11.2
0072	1971	CHEV	350	3.71	33.86	574.84	4.20	1.10	5.30	4.93	0.46	13.9
0073	1971	FORD	351	3.06	29.61	602.26	4.72	1.67	6.40	5.95	1.37	13.5
0074	1968	FORD	289	9.31	57.07	401.34	2.67	.44	3.12	2.96	5.93	17.1
0075	1968	CHEV	307	5.87	91.75	378.96	1.37	.35	1.72	1.60	3.99	16.4
0076	1972	CHEV	140	4.24	36.07	355.52	1.95	.31	2.27	2.17	0.28	20.9

TABLE 13A (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0077	1972	PONT	350	5.00	113.77	580.06	1.65	.15	2.00	1.90	5.26	11.5
0078	1971	FORD	98	2.70	47.68	273.37	3.03	.54	3.57	3.40	1.46	24.9
0079	1967	PLYM	318	8.12	147.75	368.38	1.90	.23	2.13	2.03	2.02	14.2
0080	1971	BUIC	455	3.97	76.79	747.82	3.94	.78	4.72	4.51	0.50	10.1
0081	1972	DODG	360	2.84	21.69	642.76	4.96	1.59	6.55	6.22	0.0	12.9
0082	1971	FORD	200	2.27	18.90	374.04	4.85	1.31	6.16	5.89	1.09	21.6
0083	1972	AMC	258	1.40	14.17	400.23	3.09	1.24	4.33	4.22	0.19	20.8
0084	1972	FORD	351	1.24	14.08	782.92	3.65	.55	4.20	4.37	0.09	11.0
0084 R	1972	FORD	351	1.32	23.52	797.73	2.97	.90	3.88	3.60	0.0	10.5
0085	1967	CHEV	283	6.65	99.90	451.43	2.92	.66	3.58	3.52	3.57	14.1
0085 R	1967	CHEV	283	8.15	112.30	626.11	3.52	1.75	5.27	4.77	4.32	10.7
0086	1971	CHEV	350	4.56	57.49	484.33	2.42	.53	2.95	2.75	5.66	15.1
0087	1971	FORD	351	4.51	60.91	627.81	3.98	1.19	5.18	4.96	3.99	12.0
0088	1971	CHEV	350	3.53	61.49	500.81	1.83	.29	2.12	2.06	4.43	14.6
0089	1972	DODG	225	2.28	48.13	368.42	3.71	1.43	5.15	4.72	2.49	19.7
0090	1967	FORD	390	6.67	90.09	489.56	3.48	1.00	4.48	4.08	2.97	13.6
0091	1970	PLYM	225	2.61	51.28	327.96	3.62	1.45	5.07	4.67	4.10	21.3
0092	1968	CHEV	307	4.67	51.88	389.23	2.77	2.23	5.00	4.48	6.37	18.3
0093	1972	FORD	351	2.40	18.68	672.39	4.35	1.48	5.83	5.26	0.28	12.5

TABLE 13A (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0094	1966	BUIC	340	12.57	158.09	342.75	1.57	.30	1.87	1.70	11.32	14.1
0095	1966	DODG	383	5.02	93.01	461.23	2.99	.72	3.71	3.39	3.57	14.2
0096	1970	FORD	302	4.26	40.06	514.45	3.04	.69	3.73	3.41	0.28	15.0
0097	1971	OPEL	116	2.32	41.82	215.79	1.57	.38	1.95	1.82	0.10	30.7
0098	1969	CHEV	230	3.24	33.25	401.25	1.84	.30	2.14	1.97	0.64	19.1
0099	1969	BUIC	430	5.99	82.05	597.17	4.50	2.42	6.92	6.53	5.93	11.9
0100	1969	CHEV	350	5.01	108.47	567.87	3.37	1.61	4.98	4.65	4.43	11.8
0101	1970	VOLK	97	2.69	38.19	294.18	3.02	.86	3.88	3.53	2.11	24.5
0102	1968	FORD	289	3.33	17.36	520.53	4.06	1.11	5.17	4.99	0.46	15.9
0103	1970	PONT	400	4.00	47.11	644.20	3.40	.99	4.39	4.19	2.02	12.1
0104	1968	CHEV	396	8.43	150.47	508.96	3.00	.52	3.52	3.39	9.09	11.5
0105	1967	MERC	390	5.47	73.97	577.87	5.41	-.34	5.07	4.94	2.59	12.5
0106	1971	DATS	97	2.69	14.40	321.84	3.02	.67	3.69	3.48	2.78	25.1
0107	1967	BUIC	300	8.52	128.22	441.79	2.60	.63	3.23	3.06	6.67	13.2
0108	1971	LINC	460	5.25	133.35	635.97	2.91	.33	2.35	2.30	8.37	10.3
0109	1972	OLDS	455	4.50	32.60	864.40	2.38	.25	2.43	2.34	0.10	9.5
0110	1972	CHEV	350	2.89	42.94	975.06	3.34	.71	4.05	4.45	0.0	53.8
0111	1972	PLYM	318	4.53	71.97	420.29	3.20	.65	3.85	3.71	7.51	16.2
0112 R	1972	PLYM	318	4.95	69.25	425.28	3.14	.76	3.91	3.84	7.51	16.1

TABLE 13A (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0112	1970	CHRY	440	3.09	31.39	579.21	3.94	1.96	5.91	5.70	1.83	13.9
0113	1968	CADI	472	2.07	42.47	549.79	2.42	.60	3.02	2.95	2.88	14.2
0113 R	1968	CADI	472	3.14	68.99	753.65	3.13	.57	3.70	3.59	1.65	10.1
0114	1968	PONT	350	3.43	49.22	588.26	2.08	.42	2.51	2.41	2.11	13.1
0115	1968	DODG	318	3.70	52.03	423.17	2.53	.46	2.99	2.84	0.73	17.2
0116	1969	FORD	302	5.36	46.02	530.47	5.93	2.86	8.79	8.31	2.78	14.3
0117	1969	CHEV	307	5.78	76.41	494.57	4.39	1.58	5.97	5.59	5.66	14.0
0118	1970	CHEV	350	8.25	156.66	418.84	1.57	.22	1.79	1.74	4.54	12.8
0119	1966	CHEV	194	9.37	103.95	346.32	2.25	.56	2.82	2.72	5.39	16.5
0120	1969	CADI	472	3.32	69.61	695.54	5.07	1.61	6.69	6.56	2.68	10.9
0121	1971	PLYM	225	2.81	50.80	353.34	3.93	1.06	4.99	4.87	4.10	20.1
0122	1966	PLYM	225	3.97	73.88	378.66	2.57	1.29	3.86	3.54	5.02	17.5
0123	1968	CHRY	383	7.39	119.07	572.38	4.12	1.42	5.54	5.04	9.77	11.3
0124	1969	FORD	200	4.55	76.68	310.68	3.01	1.00	4.01	3.69	7.69	19.9
0126	1970	VOLK	97	4.74	35.80	312.97	2.30	.57	2.86	2.55	3.02	23.1
0127	1966	AMC	232	6.28	140.31	335.48	1.97	.45	2.42	2.15	5.26	15.4
0128	1969	OLDS	455	4.00	103.23	550.19	3.55	1.45	5.30	4.70	5.93	12.2
0129	1970	DODG	383	16.71	133.33	499.51	3.17	.44	3.61	3.24	3.57	11.6
0129* R	1970	DODG	383	14.64	109.84	471.67	3.09	.97	4.05	3.75	4.43*	12.8

TABLE 13A (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0130	1971	PLYM	318	3.41	53.94	466.57	2.75	.63	3.38	3.07	2.02	15.8
0130 R	1971	PLYM	318	3.20	45.21	476.73	2.72	.80	3.52	3.12	2.11	15.9
0131	1967	CHEV	283	21.86	109.39	349.12	1.24	.18	1.42	1.25	3.57	15.0
0133	1972	CADI	472	1.32	13.40	914.95	3.00	.83	3.82	3.71	0.0	9.4
0134	1968	PONT	400	8.78	127.01	545.46	1.02	.18	1.20	1.19	6.38	11.5
0135	1967	CHEV	250	7.40	87.44	417.76	1.84	.20	2.03	2.06	3.88	15.3
0136	1969	FORD	302	5.28	64.10	431.43	4.14	1.54	5.68	5.61	7.69	16.2
0137	1966	FORD	390	7.12	121.33	541.11	2.14	.39	2.53	2.55	7.33	11.8
0138	1967	CHEV	283	15.77	163.18	400.77	1.77	.44	2.21	2.36	9.77	12.5
0139	1971	FORD	400	4.27	73.18	655.24	4.63	1.63	6.26	6.25	2.11	11.3
0140	1970	MERC	351	3.91	66.12	525.80	2.85	.63	3.48	3.51	6.37	13.8
0141	1972	DATS	97	2.16	16.86	303.05	3.67	1.92	5.59	5.63	4.32	26.4
0142	1972	PLYM	318	3.11	28.56	626.83	4.62	1.21	5.23	5.36	0.28	13.0
0143	1969	CHEV	307	5.82	93.21	540.10	3.68	.99	4.67	4.81	5.79	12.6
0143 R	1969	CHEV	307	7.21	104.11	494.70	3.22	1.07	4.29	3.85	5.93	13.0
0144	1972	CHEV	402	1.87	27.84	864.21	3.59	1.06	4.66	4.94	1.65	9.7
0146	1971	CHEV	140	3.45	28.22	359.62	3.03	.70	3.74	3.43	0.0	21.4
0148	1972	FORD	302	4.22	47.34	647.94	3.24	.88	4.12	4.12	1.55	12.1
0149	1971	TOYO	71	2.25	18.70	340.88	1.93	.57	2.51	2.46	1.18	23.5

TABLE 13A (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0150	1966	FORD	200	4.78	74.96	367.06	2.30	.72	3.02	3.11	3.67	17.8
0151	1968	PLYM	318	4.30	53.66	481.58	4.72	1.80	6.52	6.33	1.93	15.3
0152	1969	DODG	383	4.94	61.06	559.71	2.98	1.27	4.24	4.09	1.65	13.2
0153	1971	BUIC	350	20.20	103.00	587.47	2.35	.45	2.81	2.72	3.57	10.9
0154	1970	OLDS	455	3.02	46.42	742.45	3.00	.55	3.55	3.59	0.73	10.8
0155	1970	PLYM	318	4.16	78.95	545.67	4.70	2.21	6.91	6.86	6.52	13.0
0156	1968	FORD	240	1.99	42.03	442.30	4.22	1.66	5.88	5.80	0.73	17.2
0158	1972	FORD	400	3.51	67.17	658.79	4.09	1.69	5.78	5.81	2.49	11.4
0159	1966	PONT	389	5.44	59.88	559.53	4.38	2.30	6.69	6.75	0.55	13.2
0160	1969	MERC	390	4.65	83.83	594.69	4.98	2.06	7.05	6.67	4.54	12.0
0161	1969	PLYM	383	3.94	60.58	563.44	3.95	3.30	7.25	6.99	2.59	13.2
0162	1972	CHRY	440	7.01	59.88	643.85	4.48	2.32	6.81	6.56	0.10	11.7
0163	1970	CHEV	350	6.43	114.06	433.97	1.76	.44	2.21	2.33	6.07	14.0
0164	1971	CHEV	307	3.66	37.42	496.15	3.22	1.11	4.33	4.05	0.64	15.7
0165	1967	AMC	343	6.71	126.27	490.97	2.02	.39	2.42	2.64	2.59	12.5
0166	1968	CHEV	250	6.81	68.44	487.90	4.49	1.85	6.34	6.03	0.0	14.4
0167	1966	MERC	390	14.84	182.11	462.52	1.51	.25	1.76	1.73	6.07	11.2
0168	1968	FORD	390	4.26	81.26	596.49	3.45	1.23	4.68	4.53	4.21	12.0
0169	1972	FORD	122	3.31	57.91	300.14	2.69	.60	3.29	3.15	6.37	22.1

TABLE 13A (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1972 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0170	1970	FORD	200	4.84	53.44	417.45	2.71	.62	3.33	3.19	3.78	17.2
0171	1968	AMC	232	3.61	68.09	381.27	3.53	.14	3.67	3.58	4.21	17.8
0172	1968	BUIC	400	4.64	74.90	679.88	4.97	1.63	6.61	6.29	5.79	10.9
0173	1970	CHEV	400	3.15	43.97	734.11	2.27	.31	2.58	2.88	0.10	10.9
0174	1972	MERC	351	4.63	80.02	712.24	3.53	1.03	4.56	4.33	0.37	10.4
0175	1966	VOLK	79	60.32	119.29	144.73	1.43	.27	1.70	1.61	5.26	17.0
0176	1967	DODG	318	7.09	102.89	440.87	3.78	1.19	4.97	5.07	6.22	14.2
0177	1967	FORD	289	11.72	107.85	369.14	2.19	.39	2.58	2.60	0.82	15.4
0178	1971	CHEV	350	3.72	59.62	763.41	4.50	1.44	6.04	6.09	1.93	10.2

TABLE 139

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0001	1972	OLDS	350	4.25	84.41	590.35	3.31	1.10	4.41	4.16	4.75	12.1
0002	1971	CHEV	400	3.03	37.06	576.90	4.47	.86	5.34	5.04	0.89	13.8
0003	1970	BUIC	350	3.72	65.69	485.10	3.60	1.02	4.62	4.45	4.04	14.8
0004	1970	FORD	200	4.09	33.03	336.81	2.50	.77	3.27	3.11	1.28	22.1
0005	1968	CHEV	327	5.15	61.78	407.07	3.75	1.34	5.09	4.73	3.86	17.1
0006	1972	CHEV	350	2.18	25.52	658.20	3.55	.94	4.49	4.27	2.30	12.6
0007	1971	FORD	250	3.00	33.32	369.01	4.87	2.09	6.96	6.18	3.99	20.6
0008	1966	CADI	429	5.46	93.73	480.20	3.50	1.18	4.68	4.17	7.64	13.7
0009	1969	CHEV	350	3.17	50.72	495.43	4.20	2.33	6.54	5.79	4.66	14.8
0010	1968	VOLK	91	3.98	60.22	275.37	1.28	.15	1.43	1.28	5.26	23.2
0011	1968	OLDS	350	5.35	51.16	512.67	4.23	1.49	5.72	5.33	4.78	14.5
0012	1967	CHEV	327	7.74	88.14	415.29	3.83	1.32	5.15	4.92	9.31	15.3
0013	1966	CHEV	283	24.55	43.06	352.07	3.75	1.42	5.18	4.57	3.78	17.8
0013 R	1966	CHEV	283	14.19	27.94	202.91	2.17	.50	2.67	2.47	3.88	30.4
0014	1969	BUIC	350	2.25	44.17	530.33	3.86	1.21	5.07	4.35	1.83	14.6
0015	1971	DODG	225	2.95	41.26	368.43	4.45	2.09	6.53	5.68	5.14	20.1
0016	1972	BUIC	350	2.09	31.34	690.57	3.25	.85	4.10	3.50	0.19	11.9
0017	1971	OLDS	455	2.99	32.44	743.05	4.12	1.29	5.41	4.76	0.68	11.0
0018	1970	CHEV	250	2.44	33.71	434.27	2.99	.93	3.92	3.64	3.99	17.9

TABLE 13B (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0019	1969	PONT	400	4.52	60.62	580.09	3.43	.96	4.40	4.00	3.88	12.9
0020	1967	FORD	289	12.07	149.22	309.95	1.94	.29	2.23	2.06	10.26	15.2
0021	1971	DODG	383	4.93	162.77	532.30	2.65	.59	3.24	2.83	3.78	11.0
0022	1959	FORD	351	2.81	37.20	618.87	3.06	.70	3.76	3.29	3.07	12.9
0023	1971	PONT	400	5.72	27.98	817.47	4.42	1.86	6.27	5.61	4.54	10.1
0024	1969	OLDS	350	4.54	104.82	516.43	2.91	.68	3.59	3.23	7.87	12.8
0025	1970	BUIC	455	5.22	62.65	601.68	4.16	1.54	5.69	5.52	1.55	12.4
0026	1971	MERC	351	3.24	43.63	617.61	3.20	.83	4.03	3.66	1.93	12.7
0027	1972	CHEV	350	4.35	77.35	497.47	2.90	1.16	4.06	3.63	9.09	14.0
0028	1972	CHEV	307	2.03	6.34	628.56	3.41	1.11	4.52	3.81	0.01	13.8
0030	1972	CHEV	350	2.65	36.37	759.04	4.17	.88	5.04	4.52	4.10	10.8
0031	1968	MERC	302	3.63	31.73	501.82	3.11	1.12	4.22	3.77	3.88	15.8
0033	1967	PONT	400	6.94	100.13	479.62	3.75	1.79	5.55	5.08	6.22	13.5
0034	1972	PLYM	360	4.70	101.53	514.43	4.33	1.49	5.82	5.07	11.32	12.9
0035	1972	FORD	400	2.97	51.44	620.48	5.10	3.49	8.59	7.44	1.46	12.5
0036	1972	CHEV	350	2.71	49.11	572.98	2.79	.56	3.35	2.86	2.11	13.5
0037	1966	PONT	326	3.62	43.98	485.39	3.11	.94	4.06	3.47	0.12	15.7
0038	1970	FORD	351	3.85	44.36	673.56	3.42	1.33	4.74	4.06	0.10	11.7
0039	1969	FORD	390	5.01	63.01	575.90	5.47	3.64	9.10	7.91	4.54	12.8

TABLE 13B (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0040	1972	TOYO	120	2.15	22.85	346.76	3.30	1.09	4.39	3.72	3.47	22.8
0041	1968	FORD	390	5.96	113.85	557.98	3.83	1.86	5.69	4.80	9.77	11.7
0042	1970	OLDS	350	4.58	78.43	479.00	3.09	.86	3.96	3.34	4.43	14.4
0043	1972	BUIC	455	2.79	38.40	835.42	4.96	3.06	8.02	6.74	1.18	9.8
0044	1971	OLDS	350	4.32	52.01	747.71	4.74	2.83	7.57	6.51	0.82	10.5
0045	1969	PLYM	225	2.44	40.45	341.33	4.28	1.81	6.09	5.32	1.65	21.5
0046	1970	DODG	318	5.21	68.17	487.60	4.02	2.77	6.79	5.92	7.87	14.5
0047	1971	PONT	400	3.77	30.67	679.99	4.89	2.21	7.10	6.70	0.19	12.0
0047 R	1971	PONT	400	3.80	30.26	699.76	4.34	1.29	5.63	6.30	0.19	11.6
0048	1965	CHEV	283	15.65	118.86	337.01	2.15	.44	2.59	2.27	6.07	15.5
0049	1970	FORD	302	3.80	27.70	524.63	2.76	.82	3.57	3.15	0.01	15.3
0050	1967	PONT	326	13.50	71.63	486.26	4.36	1.53	5.89	4.88	2.40	13.8
0051	1972	VOLK	102	1.97	12.49	302.33	2.17	.35	2.52	2.25	0.55	27.0
0052	1970	CHEV	307	4.47	61.24	455.23	3.31	1.18	4.49	3.79	8.46	15.7
0052 R	1970	CHEV	307	3.81	17.70	475.80	3.79	1.23	5.02	4.33	8.46	15.2
0053	1965	FORD	289	6.50	88.99	382.32	4.38	1.80	6.18	5.28	5.79	16.4
0054	1967	CHRY	383	5.89	90.93	459.79	3.18	.99	4.17	3.58	2.97	14.3
0055	1967	OLDS	330	5.13	119.66	520.73	2.47	.58	3.05	2.61	10.26	12.2
0056	1972	PONT	400	1.98	22.90	769.50	2.66	.73	3.39	3.09	0.19	10.9

TABLE 138 (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0057	1970	TOYO	71	1.84	12.25	245.38	3.99	1.34	5.33	4.69	1.83	32.8
0058	1969	VOLK	91	3.56	11.44	252.41	2.34	.55	2.89	2.48	2.21	31.5
0059	1970	FORD	351	3.52	14.77	561.38	5.53	2.45	7.98	6.98	0.01	14.9
0060	1969	PONT	350	3.27	37.33	462.71	4.64	1.77	6.41	5.63	2.97	16.7
0061	1972	FORD	302	2.13	21.92	579.79	3.31	.89	4.20	3.68	3.07	14.3
0062	1970	PONT	350	3.43	44.37	506.46	4.09	1.37	5.46	5.54	5.79	15.1
0063	1966	OLDS	330	7.82	98.38	442.55	2.01	.35	2.36	2.07	2.78	14.3
0064	1967	VOLK	92	4.40	51.60	176.29	1.25	.16	1.41	1.37	6.52	32.7
0065	1972	VOLK	97	3.36	32.47	281.24	2.11	.34	2.45	2.33	3.88	25.9
0066	1971	VOLK	97	4.92	31.79	214.35	1.77	.39	2.16	1.97	3.78	31.7
0067	1971	VOLK	97	2.80	33.57	281.10	1.89	.23	2.12	1.99	1.93	25.9
0069	1966	CHEV	283	6.98	111.83	411.40	2.32	.35	2.67	2.52	3.57	14.6
0070	1970	AMC	304	3.95	32.36	513.10	3.41	.77	4.17	4.00	0.82	15.4
0071	1972	BUIC	455	1.33	12.34	606.42	2.50	.41	2.92	2.81	1.00	14.1
0072	1971	CHEV	350	3.37	28.41	545.83	4.23	1.01	5.24	4.88	0.46	14.8
0073	1971	FORD	351	2.84	20.53	599.01	5.17	1.65	6.82	6.37	1.37	13.9
0074	1968	FORD	289	3.54	52.80	385.00	2.62	.49	3.12	2.95	5.93	17.9
0075	1968	CHEV	307	5.54	82.44	367.56	1.46	.25	1.71	1.60	3.99	17.2
0076	1972	CHEV	140	3.47	30.97	349.71	2.07	.35	2.42	2.32	0.38	21.7

TABLE 138 (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0077	1972	PONT	350	4.13	98.33	561.85	1.85	.17	2.02	1.92	5.26	12.2
0078	1971	FORD	98	2.39	41.95	268.87	3.13	.52	3.65	3.49	1.46	25.9
0079	1967	PLYM	318	7.19	126.46	370.19	2.32	.29	2.61	2.47	2.02	15.0
0080	1971	BUIC	455	2.53	44.55	775.00	4.16	.82	4.97	4.75	0.50	10.4
0081	1972	DODG	360	2.35	14.99	621.34	5.11	1.51	6.62	6.29	0.0	13.6
0082	1971	FORD	200	2.02	15.32	363.54	4.12	2.07	6.19	5.89	1.09	22.5
0083	1972	AMC	258	1.37	11.37	394.42	3.44	1.14	4.58	4.44	0.19	21.3
0084	1972	FORD	351	1.63	13.63	756.23	3.54	.62	4.16	4.26	0.09	11.3
0084 R	1972	FORD	351	1.48	20.61	784.83	3.21	.78	3.99	3.72	0.0	10.8
0085	1967	CHEV	283	5.61	80.02	405.24	2.65	.60	3.26	3.18	3.57	16.2
0085 R	1967	CHEV	283	6.93	91.16	552.11	3.19	1.14	4.33	3.92	4.32	12.3
0086	1971	CHEV	350	4.11	49.89	455.45	2.47	.50	2.97	2.79	5.66	16.2
0087	1971	FORD	351	3.75	43.99	599.24	3.75	1.40	5.15	4.95	3.99	13.0
0088	1971	CHEV	350	3.00	48.01	483.05	1.88	.29	2.17	2.11	4.43	15.6
0089	1972	DODG	225	2.05	39.88	371.82	3.77	1.75	5.52	5.09	2.49	20.1
0090	1967	FORD	390	5.98	68.11	497.99	3.85	1.36	5.21	4.74	2.97	14.2
0091	1970	PLYM	225	2.41	42.27	338.99	4.08	1.52	5.60	5.18	4.10	21.5
0092	1968	CHEV	307	5.27	51.33	410.57	3.45	1.99	5.44	4.88	6.37	17.5
0093	1972	FORD	351	2.17	14.38	660.09	4.44	1.45	5.89	5.34	0.28	12.9

TABLE 13B (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0094	1966	BUIC	340	12.37	155.50	320.90	1.40	.23	1.63	1.48	11.32	14.7
0095	1966	DODG	383	4.03	60.35	477.25	3.84	1.05	4.88	4.47	3.57	15.2
0096	1970	FORD	302	3.58	30.62	505.84	3.08	.77	3.85	3.53	0.28	15.7
0097	1971	OPEL	116	1.60	22.13	219.06	1.75	.38	2.13	1.97	0.10	34.3
0098	1969	CHEV	230	2.93	26.53	384.71	1.85	.30	2.15	1.99	0.64	20.4
0099	1969	BUIC	430	5.51	69.08	583.07	4.60	2.27	6.88	6.49	5.93	12.5
0100	1969	CHEV	350	4.44	91.30	554.02	3.58	1.59	5.17	4.87	4.43	12.5
0101	1970	VOLK	97	2.53	34.14	286.22	2.96	.79	3.76	3.41	2.11	25.5
0102	1968	FORD	289	3.89	15.25	497.41	3.93	1.17	5.10	4.91	0.46	16.6
0103	1970	PONT	400	3.54	38.33	623.15	3.58	.91	4.49	4.30	2.02	12.8
0104	1968	CHEV	396	7.72	137.65	483.97	2.94	.57	3.50	3.39	9.09	12.2
0105	1967	MERC	390	5.07	67.14	566.48	5.11	.71	5.82	5.64	2.59	12.9
0106	1971	DATS	97	2.58	13.98	307.81	3.09	.72	3.81	3.61	2.78	26.3
0107	1967	BUIC	300	7.99	112.05	432.15	2.73	.72	3.46	3.27	6.67	14.0
0108	1971	LINC	460	4.13	111.27	618.53	1.96	.27	2.23	2.17	0.37	11.0
0109	1972	OLDS	455	4.01	26.04	839.69	2.04	.24	2.28	2.20	0.10	9.9
0110	1972	CHEV	350	2.63	33.02	954.78	3.41	.77	4.18	4.64	0.0	55.3
0111	1972	PLYM	318	4.23	72.26	409.69	3.32	.79	4.11	3.97	7.51	16.5
0111 P	1972	PLYM	318	4.73	63.51	408.57	3.25	.87	4.12	4.06	7.51	16.9

TABLE 13B (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0112	1970	CHRY	440	2.38	24.18	555.29	4.17	1.83	6.00	5.79	1.83	14.8
0113	1968	CADI	472	1.55	36.21	573.33	2.34	.52	2.86	2.80	2.88	14.0
0113 R	1968	CADI	472	2.18	50.11	747.25	2.95	.48	3.43	3.33	1.65	10.6
0114	1968	PONT	350	3.04	34.38	577.05	2.17	.47	2.64	2.54	2.11	13.9
0115	1968	DODG	318	3.70	47.75	451.62	2.95	.59	3.53	3.36	0.73	16.5
0116	1969	FORD	302	4.66	42.29	523.84	6.09	2.96	9.05	8.58	2.78	14.7
0117	1969	CHEV	307	4.95	60.94	504.11	4.70	1.65	6.35	5.96	5.66	14.4
0118	1970	CHEV	350	6.38	123.61	425.17	1.93	.25	2.18	2.13	4.54	13.9
0119	1966	CHEV	194	8.15	92.60	336.72	2.33	.53	2.86	2.77	5.39	17.5
0120	1969	CADI	472	2.94	56.51	678.74	5.07	1.66	6.73	6.60	2.68	11.4
0121	1971	PLYM	225	2.54	46.37	347.19	3.97	1.09	5.06	4.94	4.10	20.7
0122	1966	PLYM	225	3.53	63.66	371.66	2.80	1.16	3.96	3.64	5.02	18.4
0123	1968	CHRY	383	6.89	115.58	521.62	3.94	1.55	5.49	5.01	9.77	12.2
0124	1969	FORD	200	4.56	69.41	300.30	2.78	.84	3.62	3.33	7.69	20.9
0126	1970	VOLK	97	3.34	27.34	311.71	2.28	-.43	1.84	1.64	0.02	24.3
0127	1966	AMC	232	5.65	136.36	321.48	1.69	.31	2.00	1.78	5.26	16.0
0128	1969	OLDS	455	3.51	93.74	533.61	3.92	1.47	5.39	4.78	5.93	12.8
0129	1970	DODG	383	14.87	115.58	492.82	3.40	1.01	4.41	3.97	3.57	12.3
0129 R	1970	DODG	383	13.46	97.42	475.27	3.36	1.07	4.44	4.10	4.43	13.2

TABLE 13B (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0130	1971	PLYM	318	3.00	44.79	444.17	2.85	.67	3.52	3.19	2.0[illegible]	16.9
0130 R	1971	PLYM	318	2.86	39.13	458.76	2.87	.74	3.61	3.19	2.11	16.7
0131	1967	CHEV	283	23.01	88.69	338.17	1.39	.23	1.62	1.43	3.57	16.1
0133	1972	CADI	472	1.24	9.83	870.40	3.04	.81	3.85	3.76	0.0	10.0
0134	1968	PONT	400	8.26	115.52	530.87	1.05	.16	1.21	1.19	6.38	12.0
0135	1967	CHEV	250	6.34	82.80	400.80	1.89	.23	2.11	2.20	3.88	16.1
0136	1969	FORD	302	4.90	63.02	410.18	3.93	1.74	5.67	5.59	7.69	16.9
0137	1965	FORD	390	6.03	120.93	518.34	2.07	.37	2.45	2.47	7.33	12.2
0138	1967	CHEV	283	14.20	142.87	393.17	2.04	.37	2.40	2.60	9.77	13.4
0139	1971	FORD	400	3.68	60.46	628.62	4.87	1.65	6.53	6.52	2.11	12.1
0140	1970	MERC	351	3.73	57.68	516.38	2.94	.61	3.55	3.58	6.37	14.3
0141	1972	DATS	97	2.17	16.59	305.86	3.92	1.87	5.79	5.84	4.32	26.2
0142	1972	PLYM	318	2.78	21.64	612.25	4.10	1.22	5.32	5.45	0.28	13.5
0143	1969	CHEV	307	5.14	78.19	522.57	3.77	1.07	4.84	5.00	5.79	13.4
0143 R	1969	CHEV	307	5.51	82.04	475.43	3.39	1.14	4.53	4.07	5.93	14.2
0144	1972	CHEV	402	1.43	25.85	831.40	3.39	1.22	4.61	4.89	1.65	10.1
0146	1971	CHEV	140	3.01	21.47	348.25	2.95	.73	3.68	3.37	0.0	22.7
0148	1972	FORD	302	3.72	35.81	630.48	3.24	.98	4.22	4.22	1.55	12.7
0149	1971	TOYO	71	2.19	18.77	331.09	2.14	.39	2.53	2.49	1.18	24.1

TABLE 138 (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0150	1966	FORD	200	4.22	55.59	365.10	2.51	.65	3.16	3.26	[illegible]67	19.1
0151	1968	PLYM	318	3.75	42.24	472.21	4.98	2.07	7.06	6.85	1.93	16.1
0152	1969	DODG	383	3.72	41.87	468.50	2.70	1.00	3.71	3.58	1.65	16.3
0153	1971	BUIC	350	18.93	73.44	576.19	2.41	.42	2.83	3.19	3.57	11.8
0154	1970	OLDS	455	2.48	32.95	714.27	2.95	.50	3.44	3.48	0.73	11.5
0155	1970	PLYM	318	3.63	68.32	522.74	4.94	2.42	7.36	7.31	6.52	13.8
0156	1968	FORD	240	1.00	33.09	429.71	4.18	1.49	5.66	5.59	0.7[illegible]	18.3
0158	1972	FORD	400	3.07	101.71	626.16	4.34	1.86	6.20	6.24	2.4[illegible]	11.2
0159	1966	PONT	389	4.66	43.96	539.77	4.40	2.44	6.84	6.90	0.55	14.2
0160	1969	MERC	390	3.80	72.22	566.80	4.88	2.66	7.54	7.14	4.54	12.8
0161	1969	PLYM	383	3.71	55.43	552.78	4.46	3.46	7.92	7.63	2.59	13.6
0162	1972	CHRY	440	4.75	38.92	623.48	4.66	2.51	7.17	6.91	0.10	12.7
0163	1970	CHEV	350	5.27	109.26	473.10	1.56	.36	1.92	2.04	6.07	3.4
0164	1971	CHEV	307	3.30	28.41	482.92	3.38	1.06	4.44	4.15	0.64	16.5
0165	1967	AMC	343	5.70	108.74	479.43	2.10	.44	2.54	2.64	2.59	13.3
0166	1968	CHEV	250	5.30	49.66	481.50	4.56	1.94	6.49	6.17	0.0	15.4
0167	1966	MERC	390	13.30	173.60	453.83	1.56	.29	1.85	1.81	6.07	11.5
0168	1968	FORD	390	3.81	69.83	588.08	3.74	1.39	5.14	4.95	4.21	12.5
0169	1972	FORD	122	3.04	54.15	287.33	2.68	.65	3.32	3.18	6.37	23.2

TABLE 13B (CONT.)

EXHAUST EMISSION TEST RESULTS IN GRAMS/MILE

WASHINGTON, D.C.

1975 FEDERAL TEST PROCEDURE

VEHICLE NUMBER	YEAR	MAKE	CID	HC	CO	CO2	NO	NO2	NOX	NOXC	ICO	FUEL ECON
0170	1970	FORD	200	3.71	40.17	412.39	2.82	.64	3.46	3.32	3.78	18.2
0171	1968	AMC	232	3.22	59.09	369.09	3.50	.12	3.62	3.51	4.21	18.8
0172	1968	BUIC	400	3.47	65.47	645.66	5.40	1.93	7.33	6.98	5.79	11.7
0173	1970	CHEV	400	2.62	33.66	732.80	2.24	.30	2.54	2.84	0.10	11.2
0174	1972	MERC	351	3.53	59.08	699.92	3.70	1.07	4.77	4.53	.37	11.0
0175	1966	VOLK	79	61.35	119.60	142.91	1.38	.24	1.62	1.54	5.26	16.9
0176	1967	DODG	318	7.18	96.70	423.93	3.93	1.17	5.11	5.19	6.22	14.8
0177	1967	FORD	289	11.35	105.74	346.38	2.15	.39	2.54	2.56	0.82	16.2
0178	1971	CHEV	350	3.38	48.06	743.19	4.63	1.59	6.22	6.27	1.93	10.7

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General Environments Corporation (GEC) of Springfield, Virginia was selected to participate in the 1972 Emission Factors Program (Six Cities Program) by the Environmental Protection Agency (EPA). One hundred and seventy privately owned passenger vehicles from the Metropolitan Washington, D. C. area were tested for exhaust emission levels of carbon monoxide, carbon dioxide, hydrocarbons and oxides of nitrogen according to the 1975 Federal Test Procedure. Testing of vehicles included both cold and hot start cycles. The test results were then used to calculate emission factors based on both the 1972 and 1975 Federal Test Procedures.

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