VIII. SOURCE IDENTIFICATION

The presence of the various compounds measured in the exhaust of the Ford Taurus and Toyota Camry can be traced to several possible sources. As discussed in the Results section, several possible sources of halogenated hydrocarbons were examined. Fuel and oil samples and the fuel delivery system of each vehicle were investigated. Fuel samples were drawn from the fuel tank and from the storage barrel and analyzed. No chlorides or bromides were measured above the 1.0 ppm detection limit in any of the fuel samples.

Oil samples from each vehicle were analyzed for the presence of bromine and chlorine. At a detection limit of 50 ppm, bromine was not detected in either oil sample, however, 140 ppm of chlorine was measured in the Taurus oil sample and 30 ppm in the Camry sample at a detection limit of 10 ppm. Antifreeze samples were also analyzed from each vehicle and found to contain chlorine, 50 ppm in the Taurus antifreeze and 10 ppm in the Camry antifreeze at a detection limit of 1 ppm. To determine if antifreeze contamination of the oil was occurring, oil samples from each vehicle were analyzed for ethylene glycol, a major component of antifreeze. No ethylene glycol was measured in the Camry oil sample, but 90 ppm of ethylene glycol was measured in the Taurus oil sample at a detection limit of 50 ppm. Even though ethylene glycol was detected in the Taurus oil sample, it does not appear that the antifreeze was the source of the chlorine in the oil since the antifreeze contained less chlorine than the oil (50 ppm versus 140 ppm).

Oil consumption rates were calculated to determine what quantity of oil would be required to produce the measured levels of chlorinated hydrocarbons in the exhaust. The rates of oil consumption would have to be as high as one quart per 100 miles to produce the higher level of methylene chloride measured in exhaust. Observed oil consumption rates were totally inconsistent with that possibility.

A third possible source of halogenated hydrocarbons, the fuel delivery system, was also investigated. Ford Motor Company and Toyota were contacted for information on chlorine-containing materials in the fuel systems. From discussions with Ford and Toyota representatives, the presence of chlorine-containing materials in the fuel system could not be identified.

Based on the preceding information, the fuel, oil, and fuel-handling systems were apparently not contributing sufficient levels of halogenated compounds to explain the quantity of methylene chloride found in exhaust. Background samples were taken and analyzed to correct ambient concentrations of these compounds. Methyl chloroform and methylene chloride were detected, even though efforts were made to exclude these solvents from the test area. The variability in background levels of methyl chloroform and methylene chloride and the subsequent difficulty in correcting the dilute exhaust sample levels for these background levels would account in part for the detection of these two compounds in exhaust samples.

Several trace metals and other elements were measured in exhaust at levels above the minimum detection limits. They included aluminum, silicon, sulfur, calcium, and iron. Sulfur is present in both the fuel and oil, and calcium is present in the oil. These elements could enter the exhaust via the fuel or the oil. Also, as discussed previously, a few of the elements were also detected in the dilution system (no vehicle), either from the dilution air or from the dilution tunnel. A probable source of the aluminum in the exhaust is the alumina wash coat used on the vehicle catalyst. The source of silicon in exhaust could be traces of dust in the intake air of the vehicle or possibly from sealant used for installing silicon-based gaskets in the engine. The source of iron in exhaust could be from rust in the exhaust system or from engine wear.

The primary source of toxic exhaust emissions is the combustion of fuel. Hydrocarbons in the fuel burn in the presence of oxygen in the air to form partially oxidized hydrocarbon compounds such as carbon monoxide, aldehydes and ketones, and phenols. Unsaturated hydrocarbons (i.e., ethylene,

IX. QUALITY ASSURANCE

A number of steps were taken to ensure the quality of the data generated in this program. Emissions testing was conducted according to the procedures in the Federal Register.[2] Guidelines established in the analytical selection of this report and in earlier programs for the EPA[5,6] were followed for sampling and analyses of unregulated emissions. Some additional checks to assure repeatability of data were also incorporated. When feasible, duplicate samples were taken or repeat tests were performed for the measurement of regulated emissions, C_4 compounds, and trace metals and elements. Duplicate and backup C/T traps were sampled during selected tests. Backup samples were taken for aldehydes/ketones, and for phenols. Results from the analyses of these samples are given in the Results section of this report. Descriptions of procedure validation and qualification experiments plus supplemental procedural information relating to the quality of data are discussed as follows.

External standards were used for quantifying bag samples of 1,3-butadiene when analyzed by GC/FID. A detailed description of procedure development and validation testing is given in the EPA report, "Butadiene Measurement Methodology," Contract No. 68-03-4044.[6] Several parameters involving the analysis of 1,3-butadiene were investigated in the report. The linearity of the GC flame ionization detector was established for 1,3-butadiene and butane using a certified low concentration standard. A gas divider was used to dilute the standard to various levels over the range of expected concentrations of both 1,3-butadiene (0-2.0 ppmC) and butane (0-8.04 ppmC) in dilute exhaust. The detector was found to be linear for both 1,3-butadiene and butane with r^2 values of 1.00 for both compounds. The data used to determine detector linearity can be found in Table 39. The identities of butane and 1,3-butadiene peaks were confirmed by spiking an exhaust sample with standards. The remaining five C_4 compounds are identified by relative retention times.

TABLE 39. DETERMINATION OF DETECTOR LINEARITY

Butane	
Gas Concentration in ppmC by Gas divider(x)	GC Peak Area(y)
8.04	69716
6.83	56045
4.02	33086
0.80	6821
0.0	0
8.04	69411
6.83	58070
r^2 = 1.00	
a = -426	
b = 8569	
1,3-Butadiene	
2.0	16532
1.7	13117
1.0	7528
0.2	1792
0.0	0
2.0	16346
1.7	13539
r^2 = 1.00	
a = -89	
b = 8080	

To determine 1,3-butadiene stability in exhaust, a cold-start 505 (bag 1) dilute exhaust sample from the FTP testing of a 1986 Chevrolet Celebrity (2.8 liter V-6 engine) was spiked with 1,3-butadiene. The sample bag was then analyzed for 1,3-butadiene immediately after the spike (time 0) and at 30, 60, 120, and 240 minutes after the spike. The initial spiked concentration of 1,3-butadiene was on the order of 3 ppmC. After 4 hours, the 1,3-butadiene concentration decreased to 63 percent of the original concentration. A 1,3-butadiene standard (<2.7 ppmC in nitrogen) was analyzed 6 times during the experiment and gave a standard deviation of plus or minus 5.5 percent.

The results of the experiment indicated that if the sample is analyzed within 30 minutes of sample collection, the resulting value will be within the repeatability of the procedure. If the sample is allowed to stand more than one hour before analysis, significant sample loss can occur. Because of the possibility of significant sample loss, sample bags in this program were analyzed for 1,3-butadiene as soon after collection as possible.

Volatile organic and halogenated hydrocarbons were sampled on Carbosieve/Tenax traps. The volatile organic hydrocarbons were analyzed by GC/MS. Internal standards were added to standards, blanks, and samples. A clean trap was spiked with a standard solution for use in quantitation. Approximately 80 to 120 percent of the spike was recovered. Volatile halogenated hydrocarbons were analyzed by GC/ELCD and were compared to an external standard that had been loaded onto a blank trap. Semi-volatile organic compounds were sampled on polyurethane foam traps, extracted with an organic solvent, and analyzed by GC/MS. Internal standards were added before and after extraction for recovery and quantitation determinations. Nitrosamines were sampled in Thermosorb/N traps and analyzed by GLC/TEA using external standards.

The procedure for the mesurement of aldehydes and ketones, as used at SwRI, was validated and qualified in a program for the Coordinating Research Council.[17] This procedure is similar to the procedures used at EPA-RTP and at General Motors for aldehyde and ketone analyses. Validation experiments conducted at General Motors were reported in a Journal of Chromatography article.[79] The experiments that were conducted at SwRI are described in the following paragraphs.

To determine the liquid chromatograph injection repeatability for the aldehydes and ketones over a range of concentrations, three standard solutions, 10 ppm, 20 ppm, and 200 ppm of each aldehyde or ketone derivative were prepared. Each standard mix was injected into the LC nine consecutive times. The UV peak area for each aldehyde and ketone was averaged over the 9 runs and a relative standard deviation was determined. Relative standard deviations ranged from ± 2.9 to ± 7.0 percent for the nine aldehydes and ketones at three different concentrations.

The linearity of the UV detector for aldehydes and ketones was demonstrated on the 1.024 absorbance range. Peaks obtained from the analysis of 1/10, 2/10, 4/10, 6/10, and 8/10 dilutions of a 200 ppm standard of aldehyde and ketone derivatives were plotted against the calculated concentrations. All nine compounds (isobutyraldehyde and MEK treated as one compound) gave relatively linear plots of concentration versus peak area with r^2 values of 0.99 as determined by linear regression.

The sampling conditions that are used to collect the aldehydes and ketones are listed below as is a discussion of their selection. Two impingers trap 98 to 99+ percent of formaldehyde and acetaldehyde in dilute exhaust. The collection efficiencies were determined during collection of samples in the qualification experiments. No advantage was found in using more than two impingers. The first impinger traps 97 to 98 percent of formaldehyde and 86 to 90 percent of the acetaldehyde, while the second impinger traps approximately 2 percent of the formaldehyde and 8 to 12 percent of the acetaldehyde. During sampling, the impingers are in a 0°C ice bath to provide stable sampling temperatures and to lower the acetonitrile vapor pressure to minimize its loss. The sample flow rate

through the impingers is maintained at 4 liters per minute. This flow rate provides the largest amount of sample flow through the absorbing reagent without loss in collection efficiency or physical loss of absorbing reagent. The Teflon sample line connecting the CVS to the impingers is heated to 175°F in order to prevent water from condensing in the sample lines and the subsequent loss of the water soluble aldehydes and ketones in the water.

Validation and qualification experiments were conducted in the development of the phenols procedure. Discussions of these experiments are available in an EPA report.[5] Several parameters were investigated in these experiments including sampling, extraction, and analysis of dilute exhaust. Two impingers in series, each containing about 200 mL of the 1N KOH absorbing solution trapped most of the phenols. Extraction efficiency of the phenols procedure is about 68 percent. From the analytical perspective, the GC flame ionization detector was found to be linear in the range of 0-50 μg/mL for each of the phenols. When the sample phenols concentrations exceed this range, the samples are diluted before analysis. Injection variability was studied as another validation test for the phenols procedure. The coefficient of variation of five injections of a 12 μg/mL standard was 2.2 percent. In addition, neutral hydrocarbons and organic acids were evaluated as possible interferents with the analysis of phenol and were found not to increase or decrease phenol concentration. As a final test, qualification experiments were performed to determine if phenol could travel the length of the dilution tunnel in the presence of dilute exhaust, without significant loss by reaction with exhaust or with the tunnel. The recovery of phenol was on average 100 percent.

Trace metals and other elements were analyzed in particulate samples (collected on fluorocarbon filters) by x-ray fluorescence at EPA RTP. About twice a year, National Institute of Standards and Technology (NIST) standards are analyzed to verify the daily standards for comparison to samples. The precision of the x-ray method is between 1 and 3 percent for all elements. The precision was determined from 25 measurements of each element. The maximum difference (in percent) of each measurement from the average is the precision. The accuracy, which is defined as the difference between the expected or certified value and the measured value, is ± 15 percent. The spectrometer used in the x-ray analysis of particulate filters is calibrated by measuring detector response to standards. Calibration is performed every three month.

Regulated emissions measurements (hydrocarbons, carbon monoxide, and oxides of nitrogen) were conducted according to the quality specifications outlined in the Federal Register.[2] Carbon dioxide was also measured according to Federal Register procedures for the determination of fuel economy.

The integrity of the test fuel was maintained by sealed storage in a refrigerated shed at a temperature of about 40°F. Fuel analyses were performed several times during the program to verify the stability of the fuel parameters.

X. ACKNOWLEDGEMENTS

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REFERENCES

1. State of California Licensed Inspection & Repair Manual, "Smog Check," prepared by Bureau of Automotive Repair, 1987.

2. Code of Federal Regulations, Title 40, Chapter 1, Part 86, Subpart B, Sections applicable to light-duty vehicles.

3. Highway Fuel Economy Driving Schedule (Federal Register, Vol. 41, No. 100, May 21, 1976, Appendix I).

4. New York City Cycle, designed to simulate driving in downtown New York City.

5. Smith, L. R., et al., "Analytical Procedures for Characterizing Unrgulated Emissions from Vehicles Using Middle-Distillate Fuels," Report EPA-600/2-80-068, prepared under Contract No. 68-02-2703, May 1980.

6. Smith, L. R., "Butadiene Measurement Methodology," Final Report EPA 460/3-88-005, prepared under Work Assignment B-1 of Contract No. 68-03-4044, August 1988.

7. Seizinger, D.E., Dimitriades, B., "Oxygenates in Exhaust from Simple Hydrocarbon Fuels." Jounal of the Air Pollution Control Association, Volume 22, No. 1, pp, 47-51, January 1972.

8. Mulawa, P.A., Cadle, S.H., "Measurement of Phenols in Automobile Exhaust." Analytical Letters, 14(A9), pp. 671-687, March 18, 1981.

9. Stenberg, U., Westerholm, R., and Alsberg, T., "Enrichment of Gaseous Compounds from Diluted Gasoline Exhausts: A Comparison Between Adsorption and Cryogenic Condensation." Environmental International, Vol. 11, pp. 119-124, 1985.

10. Hinkamp, J.B., Griffing, M.E., and Zutaut, D.W., "Aromatic Aldehydes and Phenols in the Exhaust from Leaded and Unleaded Fuels." Symposium presented before the Division of Petroleum Chemistry, Inc. American Chemical Society, March 28-April 2, 1971.

11. Gross, G.P., "The Effect of Fuel and Vehicle Variables on Polynuclear Aromatic Hydrocarbon and Phenol Emissions." SAE Paper 720210, 1972.

12. Urban, C.M., "Regulated and Unregulated Exhaust Emissions from a Malfunctioning Three-Way Catalyst Gasoline Automobile." Final Report EPA- 460/3-80-005 to the Environmental Protection Agency under Contract No. 68-03-2692, January 1980.

13. Urban, C.M., "Regulated and Unregulated Exhaust Emissions from Malfunctioning Non-Catalyst and Oxidation Catalyst Gasoline Automobiles." Final Report EPA-460/3-80-003 to the Environmental Protection Agency under Contract No. 68-03-2499, January 1980.

14. Urban, C.M., "Regulated and Unregulated Exhaust Emissions from Malfunctioning Three-Way Catalyst Gasoline Automobiles." Final Report EPA-460/3-80-004 for the Environmental Protection Agency under Contract No. 68-03-2588, January 1980.

REFERENCES (CONT'D)

15. Smith, L.R., and Urban, C.M., "Characterization of Exhaust Emissions from Methanol-and Gasoline-Fueled Automobiles." Final Report EPA 460/3-82-004 to the Environmental Protection Agency under Contract 68-03-3073, Task Specifications 11 and 12, August 1982.

16. Seizinger, D.E., and Dimitriades, B., "Oxygenates in Automotive Exhaust." Effect of an Oxidation Catalyst, United States Department of the Interior, Bureau of Mines Report of Investigation/1973.

17. Smith, L. R., "Characterization of Exhaust Emissions from Alcohol-Fueled Vehicles," Final Report prepared for the Coordinating Research Council, Inc. May 1985.

18. Harsch, D.E., and Rasmussen, R.A., "Identification of Methyl Bromide in Urban Air." Analytical Letters, 10(13), pp. 1041-1047, 1977.

19. Leinster, P., Perry, R., and Young, R.J., "Ethylene Dibromide in Urban Air." Atmospheric Environment, Vol. 12, pp. 2383-2387, 1987.

20. Harsch, D.E., Rasmussen, R.A., Pierotti, D., "Identification of a Potential Source of Chloroform in Urban Air." Chemosphere No. 11, pp 769-775, 1977.

21. Seizinger, D.E., and Dimitriades, B., "Oxygenates in Automotive Exhaust." Estimation of Levels of Carbonyls and Noncarbonyls in Exhaust from Gasoline Fuels, United States Department of the Interior, Bureau of Mines Report of Investigation/1972.

22. Smith, L.R., Monthly Progress Report No. 2, "Butadiene Measurement Methodology." SwRI Project 08-1567-001. August 15, 1987.

23. Brown, R..H, Purnell, C.J., "Collection and Analysis of Trace Organic Vapour Pollutants in Ambient Atmospheres." The Performance of a Tenax-GC Adsorbent Tube, Journal of Chromatography, 178, pp. 79-90, 1979.

24. Riggin, R.M., "Technical Assistance Document for Sampling and Analysis of Toxic Organic Compounds in Ambient Air." Final Report EPA 600/4-83-027 prepared for the Environmental Protection Agency under Contract No. 68-02- 3745, WA-1, June 1983.

25. James, R.H., Adams, R.E., Thomason, M.M., and Dillon, H.K., "Development of Analytical Methods for Ambient Monitoring and Source Testing for Toxic Organic Compounds: Volumes I and II." Final Report SoRI-EAS-86-981 prepared for the California Air Resources Board under Contract A3-123-32, October 30, 1986.

26. Holzer, G., Shanfield, H., and Zlatkis, A., "Collection and Analysis of Trace Organic Emissions from Natural Sources." Journal of Chromatography, 142, pp. 755-764, 1977.

27. Pleil, J.D. and McClenny, W.A., "Temperature-Dependent Collection Efficiency of a Cryogenic Trap for Trace-Level Volatile Organic Compounds," Final Report EPA-600/D-84-133 prepared for the Environmental Protection Agency, May 1984.

REFERENCES (CONT'D)

28. Riggin, R.M., "Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air." Final Report EPA-600/4-84-041 prepared for the Environmental Protection Agency under Contract NO. 68-02- 3745 (WA-9), April 1984.

29. Russell, J.W., "Analysis of Air Pollutants Using Sampling Tubes and Gas Chromatography." Environmental Science & Technology, Volume 9, Number 13, December 1975.

30. Oblas, D., Dugger, D., and Lieberman, S., "The Determination of Organic Species in the Telephone Central Office Ambient."

31. Qazi, A.H., and Ketcham, N.H., "A New Method for Monitoring Personal Exposure to Ethylene Oxide in the Occupational Environment." American Industrial Hygiene Association Journal, (38), pp. 635-647, November 1977.

32. Gough, T.A., Webb, K.S., Pringuer, M.A., and Wood, B.J., "A Comparison of Various Mass Spectrometric and a Chemiluminescent Method for the Estimation of Volatile Nitrosamines." J. Agric. Food Chem, Vol. 25, No. 3, pp. 663-667, 1977.

33. Webb, K.S., and Gough, T.A., "Mass Spectrometric and Chemiliminescent Detection of Picogram Amounts of N-Nitrosodimethylamine." Analytical Chemistry, Vol. 51, No. 7, pp. 989-992, June 1979.

34. Rounbehler, D.P., Reisch, J.W., Coombs, J.R., and Fine, D.H., "Nitrosamine Air Sampling Sorbents Compared for Quantitative Collection and Artifact Formation." Analytical Chemical, Vol. 52, No. 2, pp. 273-276, February 1980.

35. Fisher, R.L., and Reiser, R.W., "Determination of Sub-Microgram per Cubic Meter Levels of N-Nitrosodimethylamine in Air." Analytical Chemistry, Vol. 49, No. 12, pp. 1821-1823, October 1977.

36. Lewis, R.G. and Jackson, M.D., "Modification and Evaluation of a High-Volume Air Sampler for Pesticides and Semivolatile Industrial Organic Chemicals." Analytical Chemistry, 54, pp. 592-594, 1982.

37. Lewis, R.G., Brown, A.R., and Jackson, M.D., "Evaluation of Polyurethane Foam for Sampling of Pesticides, Polychlorinated Biphenyls and Polychlorinated Naphthalenes in Ambient Air." Analytical Chemistry, Vol. 49, No. 12, pp. 1668-1672, October 1977.

38. Clayton, G.D. and Clayton, F.E., "Patty's Industrial Hygiene and Toxicology." Volume 2A Toxicology, 1981.

39. NIOSH, Epichlorohydrin, February 15, 1985.

40. Marano, R.S., Levine, S.P., Harvey, T.M., "Trace Determination of Subnanogram Amounts of Acrylonitrile in Complex Matrices by Gas Chromatography with a Nitrogen-Selective Detector." Analytical Chemistry, Vol. 50, No. 13, pp. 1948-1950, November 1978.

REFERENCES (CONT'D)

41. Whitmore, F.C., Khattak, M.N., and Barden, J.D., "Evaluation of a Technique for Sampling Low Concentrations of Organic Vapors in Ambient Air." Final Report prepared for the Environmental Protection Agency, 1977.

42. Jeltes, R., Burghardt, E., and Breman, J., "Gas Chromatographic Determination of Phosgene and Dichloroacetylene in Air." British Journal of Industrial Medicine, Volume 28, pp. 96-99, 1971.

43. Suleiman, A. and Builbault, G.G., "A Coated Piezoelectric Crystal Detector for Phosgene." Analytica Chimica Acta, 162, pp 970192, 1984.

44. Esposito, G.G., Lillian, D, Podolak, G.E., and Tuggle, R.M., "Determination of Phosgene in Air by Gas Chromatography and Infrared Spectrophotometry." Analytical Chemistry, Vol. 49, No. 12, pp. 1774-1778, October 1977.

45. Dahlberg, J.A. and Kihlman, I.B., "Gas Chromatographic Determination of Chlorinated Acetyl Chlorides and Phosgene Present in Air in Very Low Concentrations." Acta Chem. Scand. 24, No. 2, pp. 644-650, 1970.

46. Priestley, L.J., Crutchfield, F.E., Ketcham, N.H., and Cavender, J.D., "Determination of Subtoxic Concentrations of Phosgene in Air by Electron Capture Gas Chromatography." Analytical Chemistry, Vol. 37, No. 1, pp. 70- 71, January 1965.

47. Singh, H.B., Lillian, D., and Appleby, A., "Absolute Determination of Phosgene: Pulsed Flow Coulometry." Analytical Chemistry, Vol. 47, No. 6, pp. 860-864, May 1975.

48. Pellizzari, E.D., Gutknecht, W.F., Cooper, S., and Hardison, D., "Evaluation of Sampling Methods for Gaseous Atmospheric Samples." Final Report EPA-600/3-84-062 prepared for the Environmental Protection Agency under Contract No. 68-02-2991, May 1984.

49. Smith, L.R., Monthly Progress Report No. 11, "Characterization of Exhaust Emissions from Trap-Equipped Light-Duty Diesels," SwRI Project 08-1280. August 10, 1987.

50. Schulte, H.F., "Current Technology in Sampling for Airborne Radionuclides."

51. Seizinger, D.E. and Dimitriades, B., "Oxygenates in Exhaust from Simple Hydrocarbon Fuels." Journal of the Air Pollution Control Association, Volume 22, No. 1, January 1972.

52. Ninomiya, J.S. and Golovoy, A., "Effect of Air-Fuel Ratio on Composition of Hydrocarbon Exhaust from Isooctane, Diisobutylene, Toluene, and Toluene-n-Heptane Mixture." SAE Paper 690504.

53. Weschler, C.J., "Indoor-Outdoor Relationships for Nonpolar Organic Constituents of Aerosol Particles." Environ. Sci. Technol., Vol. 18, No. 9, 1984.

54. Dong, M.W. and DiCesare, J.L., "Analysis of Priority Pollutants by Very High- Speed LC." Journal of Chromatographic Science, Vol. 20, November 1982.

55. Karasek, F.W. and Parsons, M.L., "Analysis of Houston Aerosol Samples by GC/MS Methods." Final Report EPA-600-2-80-071 under Contract No. 68-02- 2961, April 1980.

56. Selover, S.J., Gunderson, E.C., Beeman, C.W., Boland, P.A., and Coulson, D.M., "Sampling and Analysis of Airborne Dialkyl Phthalates." Analytical Techniques.

57. Bove, J.L. and Dalven, P., "A GC/MS Method of Determining Airborne DI-n- Butyl- and Di-(2-Ethyl Hexyl) Phthalates." J. Environ. Anal. Chem., Vol. 10, pp 189-196, 1981.

58. Thomas, G.H., "Quantitative Determination and Confirmation of Identity of Trace Amounts of Dialkyl Phthalates in Environmental Samples." Environmental Health Perspectives, January 1973.

59. Stein, V.B., Amin, T.A., and Narang, R.S., "Simplified Method for Determining Polychlorinated Biphenyls, Phthalates, and Hexachlorocyclohexanes in Air." J. Assoc., Off. Anal. Chem. Vol. 70, No. 4, 1987.

60. Giam, C.S., Chan, H.S., and Neff, G.S., "Rapid and Inexpensive Method for Detection of Polychlorinated Biphenyls and Phthalates in Air." Analytical Chemistry, Vol. 47, No. 13, November 1975.

61. Giam, C.S., Atlas, E., and Chan, H.S., "Measurement of Phthalate Esters in Marine Air." SAE Paper.

62. Hoff, R.M. and Chan, K-W.. "Measurement of Polycyclic Aromatic Hydrocarbons in the Air along the Niagara River." Environ. Sci, Technol. 21, 556-561, 1987.

63. Singmaster III, J.A. and Crosby, D.G., "Plasticizers as Interferences in Pollutant Analyses." Bulletin of Environmental Contamination & Toxicology, Vol. 16, No. 3, 1976.

64. Brown, R.H., Saunders, K.J., and Walkin, K.T., "A Personal Sampling Method for the Determination of Styrene Exposure." Am. Ind. Hyg. Assoc. J. 48(9) 760-765, 1987.

65. Spicer, C.W., Holdren, M.W., Slivon, L.E., Coutant, R.W., and Shadwick, D.S., "Intercomparison of Sampling Techniques for Toxic Organic Compounds in Indoor Air." Final Report EPA/600/4-87/008, March 1987.

66. Purge and Trap Methods, Sw846 Method 5030-sampling, styrene, Method 8240-analysis of styrene. Environmental Protection Agency, Office of Solid Waste.

67. Kalliokoski, P., Pfaffli, P., "Charcoal Sampling Method for Determining the Concentration of Styrene in Air." Scand. J. Work Environ. & Health 1, 193- 198, 1975.

68. "NIOSH Analytical Methods for Set C," National Institute for Occupational Safety and Health, October 1975.

69. Health Hazard Evaluation Determination Report No. 79-130-645, Craig Power Plant, Craig, Colorado, December 1979.

70. Van Den Hoed, N., Van Asselen, O.L.J., and Van Dongen, J.P.C.M., "Replicate Side-by-Side Field Comparison of 3M Diffusive Samplers Versus Charcoal Tube Samplers for Styrene." Am. Ind. Hyg. Assoc. J. 48(3):252-256, 1987.

71. Choi, K.K. and Fung, K.W., "Determination of Styrene in the Atmosphere near Industrial Sites by Gas Chromatography." Analyst, Vol. 104, May 1979.

72. Hoshika, Y., "Gas Chromatographic Determination of Styrene as Its Dibromide." Journal of Chromatography, 136, 95-103, 1977.

73. Smith, C.G. and Beaver, R., "Determination of styrene-containing polymers using pyrolysis-gas chromatography." Tappi, Vol. 63, No. 8, August 1980.

74. Mann, J.B., Enos, H.F., Gonzalez, J., and Thompson, J.F., "Development of Sampling and Analytical Procedure for Determining Hexachlorobenzene and Hexachloro-1,3-butadiene in Air." Environmental Science & Technology, Volume 8, Number 6, June 1974.

75. "Sampling and Analysis of Selected Toxic Substances, Task 1A - Hexachlorobenzene." Final Report EPA-560/6-76/001, June 1976.

76. Lakings, D.B., Subra, W., and Going, J., "Determination of Pentachlorophenol and Hexachlorobenzene Residues." Final Report EPA-560/13-80-030, June 1980.

77. Hsu, J.P., Wheeler, H.G., Camann, D., Shattenberg, H., Lewis, R.G., and Bond A.E. "Analytical Methods for Detection of Non-Occupational Exposure to Pesticides," Journal of Chromatographic Science, April 1988.

78. Smith, L. R., and Black, F. M., "Characterization of Exhaust Emissions from Passenger Cars Equipped with Three-Way Catalyst Control Systems," SAE Paper 800822, presented at Passenger Car Meeting, Hyatt Regency, Dearborn, June 9-13, 1980.

79. Lipari, F., and Swarin, S. J., "Determination of Formaldehyde and Other Aldehydes in Automobile Exhaust with an Improved 2,4-Dinitrophenylhydrazine Method," Journal of Chromatography 247 (1982), pages 297-306.

APPENDICES

A. ANALYSIS OF CHEVRON UNLEADED GASOLINE BY CHEVRON RESEARCH COMPANY
B. REGULATED GASEOUS EMISSIONS RESULTS FROM A 1987 FORD TAURUS
C. REGULATED GASEOUS EMISSIONS RESULTS FROM A 1986 TOYOTA CAMRY
D. COLD-START UDDS, HOT-START UDDS, AND FTP TEST RESULTS OF UNREGULATED EMISSIONS FROM SCREENING TESTS ON A FORD TAURUS
E. COLD-START UDDS, HOT-START UDDS, AND FTP TEST RESULTS OF UNREGULATED EMISSIONS FROM SCREENING TESTS ON A TOYOTA CAMRY
F. COLD-START UDDS, HOT-START UDDS, AND FTP TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM THE FIRST SCREENING TESTS OF A FORD TAURUS AND A TOYOTA CAMRY
G. TRACE METALS AND OTHER ELEMENTS FROM THE SECOND SET OF SCREENING TESTS OF A FORD TAURUS AND A TOYOTA CAMRY OPERATED OVER A COLD-START, THREE HOT-STARTS, AND A FORCED-COOLED-START UDDS
H. MINIMUM DETECTION LIMITS FOR SCREENING TESTS CONDUCTED OVER AN UDDS, A 5 X UDDS, OR A RAW EXHAUST UDDS
I. MINIMUM DETECTION LIMITS FOR FINAL EMISSIONS TESTS, MG/MI
J. COLD-START AND HOT-START UDDS, AND FTP BENZENE, TOLUENE, XYLENES, AND STYRENE EMISSIONS FROM A FORD TAURUS AND A TOYOTA CAMRY
K. ELAPSED TIME BETWEEN SAMPLING AND ANALYSIS OF 1,3-BUTADIENE FOR A FORD TAURUS
L. ELAPSED TIME BETWEEN SAMPLING AND ANALYSIS OF 1,3-BUTADIENE FOR A TOYOTA CAMRY
M. 1,3-BUTADIENE EMISSIONS RESULTS FROM A FORD TAURUS AND A TOYOTA CAMRY
N. COLD-START UDDS, HOT-START UDDS, FTP, HFET, AND NYCC C_4 COMPOUNDS AND TOTAL HYDROCARBON EMISSIONS FROM THE FINAL EMISSIONS TESTS OF A FORD TAURUS
O. COLD-START UDDS, HOT-START UDDS, FTP, HFET, AND NYCC C_4 COMPOUNDS AND TOTAL HYDROCARBON EMISSIONS FROM THE FINAL EMISSIONS TESTS OF A TOYOTA CAMRY
P. HALOGENATED HYDROCARBON EMISSIONS FROM A FORD TAURUS AND A TOYOTA CAMRY OPERATED OVER THE FTP
Q. FINAL EMISSIONS TEST RESULTS OF ALDEHYDES AND KETONES FROM COLD-START UDDS, HOT-START UDDS, FTP, HFET, AND NYCC TESTS ON A FORD TAURUS AND A TOYOTA CAMRY
R. FTP TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM THE FINAL EMISSIONS TESTS OF A FORD TAURUS AND TOYOTA CAMRY
S. HFET AND NYCC TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM FINAL EMISSIONS TESTS OF A FORD TAURUS
T. HFET AND NYCC TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM FINAL EMISSIONS TESTS OF A TOYOTA CAMRY

APPENDIX A

ANALYSIS OF CHEVRON UNLEADED GASOLINE BY CHEVRON RESEARCH COMPANY

TABLE A-1. PHYSICAL AND CHEMICAL ANALYSES OF UNADDITIZED[a] CHEVRON REGULAR UNLEADED GASOLINE FR 860

Gravity, °API	53.9
D 86 Distillation, °F, at	
% Evaporated	
IBP	92
5	112
10	132
20	159
30	184
40	209
50	232
60	256
70	279
80	300
90	330
95	352
EP	407
RVP, psi	8.9
Lead, g/Gal.	<0.005
Chlorine, ppm	0.41
Phosphorous, g/Gal.	0.00040
Sulfur, ppm	41
Nitrogen, ppm	36.5
Hydrocarbon Type by FIAM	
Aromatics, %	38.4
Olefins, %	5.2
Paraffins and Naphthenes, %	56.4

[a]Contains oxidation inhibitor.

APPENDIX B

REGULATED GASEOUS EMISSIONS RESULTS FROM A 1987 FORD TAURUS

INITIAL TEST
SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
FTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 1 RUN 1
VEHICLE MODEL 0 FORD TAURUS
ENGINE .0 L(0. CID)
TRANSMISSION

BAROMETER 747.27 MM HG(29.42 IN HG)
RELATIVE HUMIDITY 16. PCT

VEHICLE NO.291
DATE 1/21/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)
ABS. HUMIDITY 2.6 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-780-F
ODOMETER 45976. KM(28568. MILES)

NOX HUMIDITY CORRECTION FACTOR .79

BAG RESULTS

BAG NUMBER	1	2	3
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)	787.4 (31.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	40.6 (105.0)	41.7 (107.0)
BLOWER REVOLUTIONS	40586.	69707.	40529.
TOT FLOW STD. CU. METRES(SCF)	76.1 (2689.)	131.4 (4641.)	76.0 (2683.)
THC SAMPLE METER/RANGE/PPM	61.5/ 2/ 62.	9.5/ 2/ 10.	23.3/ 2/ 24.
THC BCKGRD METER/RANGE/PPM	5.4/ 2/ 6.	5.4/ 2/ 6.	5.5/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	56.3/ 1/ 492.	17.4/ 12/ 18.	44.9/ 13/ 105.
CO BCKGRD METER/RANGE/PPM	.9/ 1/ 6.	5.6/ 12/ 6.	2.0/ 13/ 5.
CO2 SAMPLE METER/RANGE/PCT	97.1/ 14/1.0593	79.7/ 14/ .6559	91.2/ 14/ .8968
CO2 BCKGRD METER/RANGE/PCT	15.3/ 14/ .0553	15.1/ 14/ .0544	14.8/ 14/ .0531
NOX SAMPLE METER/RANGE/PPM	90.3/ 1/ 22.6	27.7/ 1/ 7.0	59.7/ 1/ 15.0
NOX BCKGRD METER/RANGE/PPM	1.6/ 1/ .4	1.7/ 1/ .4	2.5/ 1/ .7
DILUTION FACTOR	12.03	20.35	14.73
THC CONCENTRATION PPM	57.	4.	18.
CO CONCENTRATION PPM	474.	12.	98.
CO2 CONCENTRATION PCT	1.0086	.6042	.8473
NOX CONCENTRATION PPM	22.2	6.6	14.3
THC MASS GRAMS	2.49	.34	.81
CO MASS GRAMS	42.01	1.82	8.71
CO2 MASS GRAMS	1406.0	1453.7	1178.6
NOX MASS GRAMS	2.55	1.31	1.65
THC GRAMS/MI	.70	.09	.23
CO GRAMS/MI	11.84	.47	2.46
CO2 GRAMS/MI	396.1	376.0	333.0
NOX GRAMS/MI	.72	.34	.47
FUEL ECONOMY IN MPG	21.27	23.52	26.27
RUN TIME SECONDS	505.	868.	505.
MEASURED DISTANCE MI	3.55	3.87	3.54
SCF, DRY	.985	.989	.987

COMPOSITE RESULTS

TEST NUMBER		1 1
BAROMETER	MM HG	747.3
HUMIDITY	G/KG	2.6
TEMPERATURE	DEG C	22.2

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	368.4	(.0)
FUEL ECONOMY	MPG	23.68	(.00)
HYDROCARBONS (THC)	G/MI	.25	(.00)
CARBON MONOXIDE	G/MI	3.35	(.00)
OXIDES OF NITROGEN	G/MI	.45	(.

FIRST SCREENING TEST
SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
FTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

,T NO. RUN	VEHICLE NO.1	TEST WEIGHT 1588. KG(3500. LBS)
VEHICLE MODEL 87 FORD TAU RUS	DATE 2/29/88	ACTUAL ROAD LOAD 4.9 KW(6.6 HP)
ENGINE 2.5 L(152. CID)	BAG CART NO. 2 / CVS NO. 2	GASOLINE EM-784-F
TRANSMISSION A3	DYNO NO. 3	ODOMETER 46075. KM(28630. MILES)

BAROMETER 744.98 MM HG(29.33 IN HG) DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
RELATIVE HUMIDITY 50. PCT ABS. HUMIDITY 10.4 GM/KG NOX HUMIDITY CORRECTION FACTOR .99

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	787.4 (31.0)	787.4 (31.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)	787.4 (31.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	46.1 (115.0)	43.9 (111.0)	43.9 (111.0)	42.8 (109.0)
BLOWER REVOLUTIONS	40693.	69712.	40580.	69650.
TOT FLOW STD. CU. METRES(SCF)	75.9 (2678.)	129.7 (4581.)	75.8 (2676.)	130.3 (4602.)
THC SAMPLE METER/RANGE/PPM	62.1/ 2/ 62.	9.7/ 2/ 10.	26.4/ 2/ 27.	9.7/ 2/ 10.
THC BCKGRD METER/RANGE/PPM	6.7/ 2/ 7.	6.7/ 2/ 7.	6.3/ 2/ 6.	6.7/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	57.1/ 1/ 501.	13.7/12/ 14.	58.2/13/ 138.	14.1/12/ 14.
CO BCKGRD METER/RANGE/PPM	.1/ 1/ 1.	1.2/12/ 1.	.6/13/ 2.	1.1/ 2/ 14.
CO2 SAMPLE METER/RANGE/PCT	98.6/14/1.1065	82.0/14/ .6979	93.4/14/ .9535	81.2/14/ .6830
CO2 BCKGRD METER/RANGE/PCT	13.9/14/ .0493	14.0/14/ .0497	14.3/14/ .0510	14.2/14/ .0506
NOX SAMPLE METER/RANGE/PPM	69.7/ 1/ 17.5	23.0/ 1/ 5.8	41.3/ 1/ 10.4	20.0/ 1/ 5.1
NOX BCKGRD METER/RANGE/PPM	.5/ 1/ .1	.4/ 1/ .1	1.1/ 1/ .3	.5/ 1/ .1
DILUTION FACTOR	11.54	19.14	13.82	19.55
THC CONCENTRATION PPM	56.	3.	21.	3.
CO CONCENTRATION PPM	482.	12.	132.	1.
CO2 CONCENTRATION PCT	1.0614	.6508	.9062	.6350
NOX CONCENTRATION PPM	17.3	5.7	10.1	5.0
THC MASS GRAMS	2.46	.26	.91	.26
CO MASS GRAMS	42.53	1.86	11.66	.15
CO2 MASS GRAMS	1474.0	1545.6	1257.5	1515.3
NOX MASS GRAMS	2.49	1.41	1.45	1.23
THC GRAMS/MI	.69	.07	.26	.07
CO GRAMS/MI	11.97	.49	3.30	.04
CO2 GRAMS/MI	414.8	405.4	356.0	399.1
NOX GRAMS/MI	.70	.37	.41	.32
FUEL ECONOMY IN MPG	20.35 21.08	21.82	24.50 23.25	22.20
RUN TIME SECONDS	506.	868.	505.	868.
MEASURED DISTANCE MI	3.55 7.37	3.81	3.53 7.33	3.80
SCF, DRY	.974 .976	.978	.975 .977	.978
DFC, WET (DRY)	.935(.920)		.941(.926)	
TOT VOL (SCM) / SAM BLR (SCM)	205.6/ .00		206.1/ .00	

COMPOSITE RESULTS

TEST NUMBER		
BAROMETER	MM HG	745.0
HUMIDITY	G/KG	10.4
TEMPERATURE	DEG C	25.6

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	393.8	(391.9)
FUEL ECONOMY	MPG	22.15	(22.27)
HYDROCARBONS (THC)	G/MI	.25	(.25)
CARBON MONOXIDE	G/MI	3.64	(3.51)
OXIDES OF NITROGEN	G/MI	.45	(.44)

SECOND SCREENING TEST

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

FTP - VEHICLE EMISSIONS RESULTS -

PROJECT 08-1816-001

TEST NO. 1 RUN
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

VEHICLE NO.1
DATE 4/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46114. KM(28654. MILES)

BAROMETER 740.92 MM HG(29.17 IN HG)
RELATIVE HUMIDITY 64. PCT

DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
ABS. HUMIDITY 14.0 GM/KG

NOX HUMIDITY CORRECTION FACTOR 1.12

BAG RESULTS

BAG NUMBER	1	2	3
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	42.8 (109.0)	42.2 (108.0)
BLOWER REVOLUTIONS	40515.	69725.	40576.
TOT FLOW STD. CU. METRES(SCF)	75.3 (2658.)	129.7 (4579.)	75.5 (2668.)
THC SAMPLE METER/RANGE/PPM	74.2/ 2/ 75.	10.5/ 2/ 11.	30.2/ 2/ 31.
THC BCKGRD METER/RANGE/PPM	6.6/ 2/ 7.	6.4/ 2/ 7.	6.5/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	61.7/ 1/ 553.	17.1/ 12/ 17.	59.4/ 13/ 140.
CO BCKGRD METER/RANGE/PPM	.1/ 1/ 1.	.5/ 12/ 1.	.3/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	58.6/ 1/1.0755	81.3/ 14/ .6848	92.3/ 14/ .9247
CO2 BCKGRD METER/RANGE/PCT	2.5/ 1/ .0441	12.8/ 14/ .0448	13.0/ 14/ .0456
NOX SAMPLE METER/RANGE/PPM	67.8/ 1/ 17.0	20.7/ 1/ 5.3	39.2/ 1/ 9.9
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .1	.5/ 1/ .1	.3/ 1/ .1
DILUTION FACTOR	11.80	19.49	14.24
THC CONCENTRATION PPM	68.	5.	24.
CO CONCENTRATION PPM	530.	16.	134.
CO2 CONCENTRATION PCT	1.0352	.6423	.8822
NOX CONCENTRATION PPM	16.9	5.2	9.8
THC MASS GRAMS	2.97	.34	1.06
CO MASS GRAMS	46.42	2.45	11.75
CO2 MASS GRAMS	1426.9	1525.2	1220.3
NOX MASS GRAMS	2.73	1.43	1.58
THC GRAMS/MI	.85	.09	.30
CO GRAMS/MI	13.22	.64	3.31
CO2 GRAMS/MI	406.4	399.3	344.1
NOX GRAMS/MI	.78	.38	.45
FUEL ECONOMY IN MPG	20.63	22.14	25.32
RUN TIME SECONDS	504.	868.	506.
MEASURED DISTANCE MI	3.51	3.82	3.55
SCF, DRY	.969	.973	.971

COMPOSITE RESULTS

TEST NUMBER		1
BAROMETER	MM HG	740.9
HUMIDITY	G/KG	14.0
TEMPERATURE	DEG C	26.1

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	385.6	(.0)
FUEL ECONOMY	MPG	22.58	(.00)
HYDROCARBONS (THC)	G/MI	.30	(.00)
CARBON MONOXIDE	G/MI	3.97	(.00)
OXIDES OF NITROGEN	G/MI	.48	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CFTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 740.92 MM HG(29.17 IN HG)
RELATIVE HUMIDITY 64. PCT

VEHICLE NO.1
DATE 4/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
ABS. HUMIDITY 14.0 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46114. KM(28654. MILES)

NOX HUMIDITY CORRECTION FACTOR 1.12

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	42.8 (109.0)
BLOWER REVOLUTIONS	40515.	69725.
TOT FLOW STD. CU. METRES(SCF)	75.3 (2658.)	129.7 (4579.)
THC SAMPLE METER/RANGE/PPM	74.2/ 2/ 75.	10.5/ 2/ 11.
THC BCKGRD METER/RANGE/PPM	6.6/ 2/ 7.	6.4/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	61.7/ 1/ 553.	17.1/ 12/ 17.
CO BCKGRD METER/RANGE/PPM	.1/ 1/ 1.	.5/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	58.6/ 1/1.0755	81.3/ 14/ .6848
CO2 BCKGRD METER/RANGE/PCT	2.5/ 1/ .0441	12.8/ 14/ .0448
NOX SAMPLE METER/RANGE/PPM	67.8/ 1/ 17.0	20.7/ 1/ 5.3
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .1	.5/ 1/ .1
DILUTION FACTOR	11.80	19.49
THC CONCENTRATION PPM	68.	5.
CO CONCENTRATION PPM	530.	16.
CO2 CONCENTRATION PCT	1.0352	.6423
NOX CONCENTRATION PPM	16.9	5.2
THC MASS GRAMS	2.97	.34
CO MASS GRAMS	46.42	2.45
CO2 MASS GRAMS	1426.9	1525.2
NOX MASS GRAMS	2.73	1.43
THC GRAMS/MI	.85	.09
CO GRAMS/MI	13.22	.64
CO2 GRAMS/MI	406.4	399.3
NOX GRAMS/MI	.78	.38
FUEL ECONOMY IN MPG	20.63	22.14
RUN TIME SECONDS	504.	868.
MEASURED DISTANCE MI	3.51	3.82
SCF, DRY	.969	.973

COMPOSITE RESULTS

TEST NUMBER		1
BAROMETER	MM HG	740.9
HUMIDITY	G/KG	14.0
TEMPERATURE	DEG C	26.1

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	402.7	(.0)
FUEL ECONOMY	MPG	21.39	(.00)
HYDROCARBONS (THC)	G/MI	.45	(.00)
CARBON MONOXIDE	G/MI	6.67	(.00)
OXIDES OF NITROGEN	G/MI	.57	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP1 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 740.92 MM HG(29.17 IN HG)
RELATIVE HUMIDITY 61. PCT

VEHICLE NO.1
DATE 4/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 26.7 DEG C(80.0 DEG F)
ABS. HUMIDITY 13.8 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4
GASOLINE EM-784-F
ODOMETER 46125. KM(28661. MILES)

NOX HUMIDITY CORRECTION FACTOR 1.11

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)	42.2 (108.0)
BLOWER REVOLUTIONS	40576.	69606.
TOT FLOW STD. CU. METRES(SCF)	75.5 (2668.)	129.6 (4576.)
THC SAMPLE METER/RANGE/PPM	30.2/ 2/ 31.	10.1/ 2/ 10.
THC BCKGRD METER/RANGE/PPM	6.5/ 2/ 7.	6.6/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	59.4/ 13/ 140.	19.3/ 12/ 19.
CO BCKGRD METER/RANGE/PPM	.3/ 13/ 1.	.4/ 12/ 0.
CO2 SAMPLE METER/RANGE/PCT	92.3/ 14/ .9247	81.2/ 14/ .6830
CO2 BCKGRD METER/RANGE/PCT	13.0/ 14/ .0456	13.1/ 14/ .0460
NOX SAMPLE METER/RANGE/PPM	39.2/ 1/ 9.9	22.6/ 1/ 5.7
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .1	.3/ 1/ .1
DILUTION FACTOR	14.24	19.54
THC CONCENTRATION PPM	24.	4.
CO CONCENTRATION PPM	134.	18.
CO2 CONCENTRATION PCT	.8822	.6393
NOX CONCENTRATION PPM	9.8	5.7
THC MASS GRAMS	1.06	.29
CO MASS GRAMS	11.76	2.79
CO2 MASS GRAMS	1220.3	1516.9
NOX MASS GRAMS	1.57	1.56
THC GRAMS/MI	.30	.08
CO GRAMS/MI	3.32	.73
CO2 GRAMS/MI	344.1	398.0
NOX GRAMS/MI	.44	.41
FUEL ECONOMY IN MPG	25.32	22.21
RUN TIME SECONDS	506.	868.
MEASURED DISTANCE MI	3.55	3.81
SCF, DRY	.972	.974

COMPOSITE RESULTS

TEST NUMBER		1
BAROMETER	MM HG	740.9
HUMIDITY	G/KG	13.8
TEMPERATURE	DEG C	26.7

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	372.0	(.0)
FUEL ECONOMY	MPG	23.61	(.00)
HYDROCARBONS (THC)	G/MI	.18	(.00)
CARBON MONOXIDE	G/MI	1.98	(.00)
OXIDES OF NITROGEN	G/MI	.43	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP2 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 740.66 MM HG(29.16 IN HG)
RELATIVE HUMIDITY 61. PCT

VEHICLE NO.1
DATE 4/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
ABS. HUMIDITY 13.2 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46138. KM(28669. MILES)

NOX HUMIDITY CORRECTION FACTOR 1.09

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)	42.8 (109.0)
BLOWER REVOLUTIONS	40471.	69623.
TOT FLOW STD. CU. METRES(SCF)	75.3 (2660.)	129.4 (4571.)
THC SAMPLE METER/RANGE/PPM	38.1/ 2/ 38.	10.2/ 2/ 10.
THC BCKGRD METER/RANGE/PPM	6.6/ 2/ 7.	6.9/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	77.4/ 13/ 186.	14.2/ 12/ 14.
CO BCKGRD METER/RANGE/PPM	.4/ 13/ 1.	.6/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	92.1/ 14/ .9195	80.7/ 14/ .6738
CO2 BCKGRD METER/RANGE/PCT	13.4/ 14/ .0473	13.3/ 14/ .0468
NOX SAMPLE METER/RANGE/PPM	46.0/ 1/ 11.5	20.6/ 1/ 5.3
NOX BCKGRD METER/RANGE/PPM	.4/ 1/ .1	.1/ 1/ .0
DILUTION FACTOR	14.24	19.81
THC CONCENTRATION PPM	32.	4.
CO CONCENTRATION PPM	179.	13.
CO2 CONCENTRATION PCT	.8756	.6294
NOX CONCENTRATION PPM	11.4	5.2
THC MASS GRAMS	1.40	.28
CO MASS GRAMS	15.66	2.01
CO2 MASS GRAMS	1207.4	1491.5
NOX MASS GRAMS	1.80	1.41
THC GRAMS/MI	.40	.07
CO GRAMS/MI	4.45	.53
CO2 GRAMS/MI	342.9	389.9
NOX GRAMS/MI	.51	.37
FUEL ECONOMY IN MPG	25.25	22.68
RUN TIME SECONDS	505.	868.
MEASURED DISTANCE MI	3.52	3.83
SCF, DRY	.972	.974

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	740.7
HUMIDITY	G/KG	13.2
TEMPERATURE	DEG C	26.1

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	367.4	(.0)
FUEL ECONOMY	MPG	23.85	(.00)
HYDROCARBONS (THC)	G/MI	.23	(.00)
CARBON MONOXIDE	G/MI	2.41	(.00)
OXIDES OF NITROGEN	G/MI	.44	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP3 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

VEHICLE NO. 1
DATE 4/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46150. KM(28676. MILES)

BAROMETER 740.66 MM HG(29.16 IN HG)
RELATIVE HUMIDITY 60. PCT
DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
ABS. HUMIDITY 12.7 GM/KG

NOX HUMIDITY CORRECTION FACTOR 1.07

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)	42.2 (108.0)
BLOWER REVOLUTIONS	40495.	69585.
TOT FLOW STD. CU. METRES(SCF)	75.4 (2661.)	129.5 (4573.)
THC SAMPLE METER/RANGE/PPM	36.7/ 2/ 37.	10.2/ 2/ 10.
THC BCKGRD METER/RANGE/PPM	6.5/ 2/ 7.	6.7/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	74.2/ 13/ 178.	13.5/ 12/ 14.
CO BCKGRD METER/RANGE/PPM	.3/ 13/ 1.	.5/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	91.4/ 14/ .9018	80.0/ 14/ .6612
CO2 BCKGRD METER/RANGE/PCT	13.3/ 14/ .0468	13.4/ 14/ .0473
NOX SAMPLE METER/RANGE/PPM	42.2/ 1/ 10.6	20.6/ 1/ 5.3
NOX BCKGRD METER/RANGE/PPM	.4/ 1/ .1	.3/ 1/ .1
DILUTION FACTOR	14.52	20.19
THC CONCENTRATION PPM	31.	4.
CO CONCENTRATION PPM	171.	13.
CO2 CONCENTRATION PCT	.8582	.6163
NOX CONCENTRATION PPM	10.5	5.2
THC MASS GRAMS	1.34	.29
CO MASS GRAMS	14.98	1.93
CO2 MASS GRAMS	1184.1	1461.2
NOX MASS GRAMS	1.62	1.37
THC GRAMS/MI	.38	.08
CO GRAMS/MI	4.28	.51
CO2 GRAMS/MI	338.1	384.6
NOX GRAMS/MI	.46	.36
FUEL ECONOMY IN MPG	25.63	22.99
RUN TIME SECONDS	505.	868.
MEASURED DISTANCE MI	3.50	3.80
SCF, DRY	.972	.974

COMPOSITE RESULTS

TEST NUMBER		3
BAROMETER	MM HG	740.7
HUMIDITY	G/KG	12.7
TEMPERATURE	DEG C	25.6

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	362.3	(.0)
FUEL ECONOMY	MPG	24.19	(.00)
HYDROCARBONS (THC)	G/MI	.22	(.00)
CARBON MONOXIDE	G/MI	2.32	(.00)
OXIDES OF NITROGEN	G/MI	.41	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
F-COOL- VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

_ST NO. 1 RUN
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

VEHICLE NO.1
DATE 4/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46162. KM(28684. MILES)

BAROMETER 739.65 MM HG(29.12 IN HG)
RELATIVE HUMIDITY 75. PCT
BAG RESULTS

DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
ABS. HUMIDITY 15.9 GM/KG

NOX HUMIDITY CORRECTION FACTOR 1.21

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)	42.8 (109.0)
BLOWER REVOLUTIONS	40564.	69686.
TOT FLOW STD. CU. METRES(SCF)	75.3 (2659.)	129.4 (4568.)
THC SAMPLE METER/RANGE/PPM	66.0/ 2/ 66.	10.4/ 2/ 11.
THC BCKGRD METER/RANGE/PPM	6.6/ 2/ 7.	6.5/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	88.2/ 14/ 429.	13.5/ 12/ 14.
CO BCKGRD METER/RANGE/PPM	.3/ 14/ 1.	.6/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	96.2/ 14/1.0322	81.4/ 14/ .6867
CO2 BCKGRD METER/RANGE/PCT	13.5/ 14/ .0477	13.6/ 14/ .0481
NOX SAMPLE METER/RANGE/PPM	61.2/ 1/ 15.3	21.6/ 1/ 5.5
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .1	.4/ 1/ .1
DILUTION FACTOR	12.41	19.45
THC CONCENTRATION PPM	60.	4.
CO CONCENTRATION PPM	409.	13.
CO2 CONCENTRATION PCT	.9884	.6411
NOX CONCENTRATION PPM	15.3	5.4
THC MASS GRAMS	2.61	.32
CO MASS GRAMS	35.87	1.90
CO2 MASS GRAMS	1362.8	1518.4
NOX MASS GRAMS	2.65	1.61
THC GRAMS/MI	.73	.08
CO GRAMS/MI	10.00	.50
CO2 GRAMS/MI	379.8	397.1
NOX GRAMS/MI	.74	.42
FUEL ECONOMY IN MPG	22.29	22.27
RUN TIME SECONDS	505.	869.
MEASURED DISTANCE MI	3.59	3.82
SCF, DRY	.966	.969

COMPOSITE RESULTS

TEST NUMBER		1
BAROMETER	MM HG	739.6
HUMIDITY	G/KG	15.9
TEMPERATURE	DEG C	25.6

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	388.7	(.0)
FUEL ECONOMY	MPG	22.28	(.00)
HYDROCARBONS (THC)	G/MI	.40	(.00)
CARBON MONOXIDE	G/MI	5.10	(.00)
OXIDES OF NITROGEN	G/MI	.58	(.00)

THIRD SCREENING TEST
SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
FTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. T-1 RUN 1
VEHICLE MODEL 0 FORD TAURUS
ENGINE .0 L(0. CID)
TRANSMISSION

VEHICLE NO.
DATE 6/22/88
BAG CART NO. 1 / CVS NO. 2
DYNO NO. 3

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46209. KM(28713. MILES)

BAROMETER 741.68 MM HG(29.20 IN HG)
RELATIVE HUMIDITY 51. PCT

DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
ABS. HUMIDITY 9.7 GM/KG

NOX HUMIDITY CORRECTION FACTOR .97

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)	774.7 (30.5)	769.6 (30.3)	769.6 (30.3)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)	774.7 (30.5)	769.6 (30.3)	769.6 (30.3)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)	42.8 (109.0)	42.8 (109.0)	41.1 (106.0)
BLOWER REVOLUTIONS	40538.	69872.	40406.	69480.
TOT FLOW STD. CU. METRES(SCF)	75.3 (2661.)	129.9 (4585.)	75.2 (2654.)	129.6 (4577.)
THC SAMPLE METER/RANGE/PPM	60.5/ 2/ 61.	9.8/ 2/ 10.	22.1/ 2/ 22.	8.8/ 2/ 9.
THC BCKGRD METER/RANGE/PPM	6.6/ 2/ 7.	6.7/ 2/ 7.	6.3/ 2/ 6.	6.3/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	92.2/ 11/ 463.	12.2/ 13/ 11.	48.9/ 12/ 101.	8.4/ 13/ 7.
CO BCKGRD METER/RANGE/PPM	.3/ 11/ 1.	.5/ 13/ 0.	.2/ 12/ 0.	.3/ 13/ 0.
CO2 SAMPLE METER/RANGE/PCT	63.9/ 3/1.1408	78.0/ 11/ .7129	96.5/ 11/ .9967	77.1/ 11/ .7007
CO2 BCKGRD METER/RANGE/PCT	3.3/ 3/ .0538	7.6/ 11/ .0452	7.8/ 11/ .0465	8.1/ 11/ .0483
NOX SAMPLE METER/RANGE/PPM	17.7/ 2/ 17.7	22.1/ 1/ 5.6	42.2/ 1/ 10.6	20.9/ 1/ 5.3
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1	.5/ 1/ .1	.5/ 1/ .1	.6/ 1/ .2
DILUTION FACTOR	11.25	18.74	13.28	19.08
THC CONCENTRATION PPM	54.	3.	16.	3.
CO CONCENTRATION PPM	444.	10.	97.	7.
CO2 CONCENTRATION PCT	1.0918	.6701	.9538	.6549
NOX CONCENTRATION PPM	17.6	5.5	10.5	5.2
THC MASS GRAMS	2.37	.26	.71	.21
CO MASS GRAMS	38.99	1.53	8.50	1.05
CO2 MASS GRAMS	1506.1	1593.2	1312.3	1554.0
NOX MASS GRAMS	2.46	1.32	1.46	1.24
THC GRAMS/MI	.66	.07	.20	.05
CO GRAMS/MI	10.91	.39	2.38	.27
CO2 GRAMS/MI	421.5	409.6	367.1	402.8
NOX GRAMS/MI	.69	.34	.41	.32
FUEL ECONOMY IN MPG	20.12 20.87	21.61	23.87 22.85	21.98
RUN TIME SECONDS	505.	871.	504.	868.
MEASURED DISTANCE MI	3.57 7.46	3.89	3.57 7.43	3.86
SCF, DRY	.973 .975	.977	.974 .976	.977
DFC, WET (DRY)	.934(.918)		.939(.924)	
TOT VOL (SCM) / SAM BLR (SCM)	205.2/ .00		204.8/ .00	

COMPOSITE RESULTS

TEST NUMBER		T-1
BAROMETER	MM HG	741.7
HUMIDITY	G/KG	9.7
TEMPERATURE	DEG C	23.9

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	400.5	(398.4)
FUEL ECONOMY	MPG	21.84	(21.95)
HYDROCARBONS (THC)	G/MI	.22	(.22)
CARBON MONOXIDE	G/MI	3.10	(3.
OXIDES OF NITROGEN	G/MI	.43	(.

BEFORE FINAL EMISSIONS TEST

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

FTP - VEHICLE EMISSIONS RESULTS -

PROJECT 08-1816-001

_ST NO. 1 RUN 1	VEHICLE NO.1	TEST WEIGHT 1361. KG(3000. LBS)
VEHICLE MODEL 87 FORD TAURUS	DATE 11/29/88	ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
ENGINE 2.5 L(152. CID) L-4	BAG CART NO. 2 / CVS NO. 2	GASOLINE EM-784-F
TRANSMISSION A3	DYNO NO. 3	ODOMETER 46547. KM(28923. MILES)

BAROMETER 744.47 MM HG(29.31 IN HG) DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)

RELATIVE HUMIDITY 39. PCT ABS. HUMIDITY 6.6 GM/KG NOX HUMIDITY CORRECTION FACTOR .88

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	779.8 (30.7)	787.4 (31.0)	784.9 (30.9)	784.9 (30.9)
BLOWER INLET P MM. H2O(IN. H2O)	777.2 (30.6)	784.9 (30.9)	784.9 (30.9)	784.9 (30.9)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)	40.0 (104.0)	41.7 (107.0)	40.6 (105.0)
BLOWER REVOLUTIONS	40518.	69483.	40558.	69383.
TOT FLOW STD. CU. METRES(SCF)	75.6 (2669.)	130.2 (4596.)	75.7 (2674.)	129.8 (4585.)
THC SAMPLE METER/RANGE/PPM	86.2/ 2/ 87.	10.0/ 2/ 10.	30.5/ 2/ 31.	10.4/ 2/ 11.
THC BCKGRD METER/RANGE/PPM	6.7/ 2/ 7.	7.1/ 2/ 7.	7.0/ 2/ 7.	7.8/ 2/ 8.
CO SAMPLE METER/RANGE/PPM	72.1/ 1/ 679.	15.7/ 12/ 15.	67.8/ 13/ 162.	16.5/ 12/ 16.
CO BCKGRD METER/RANGE/PPM	.1/ 1/ 1.	.8/ 12/ 1.	.2/ 13/ 0.	.7/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	98.8/ 14/1.1134	81.8/ 14/ .6922	93.3/ 14/ .9508	81.2/ 14/ .6809
CO2 BCKGRD METER/RANGE/PCT	14.5/ 14/ .0498	2.3/ 14/ .0067	14.0/ 14/ .0478	14.1/ 14/ .0482
NOX SAMPLE METER/RANGE/PPM	85.6/ 1/ 21.4	30.9/ 1/ 7.8	59.3/ 1/ 14.9	28.9/ 1/ 7.3
NOX BCKGRD METER/RANGE/PPM	.6/ 1/ .2	.5/ 1/ .1	.5/ 1/ .1	.6/ 1/ .2
DILUTION FACTOR	11.28	19.29	13.82	19.60
THC CONCENTRATION PPM	80.	3.	24.	3.
CO CONCENTRATION PPM	656.	14.	156.	15.
CO2 CONCENTRATION PCT	1.0680	.6858	.9065	.6352
NOX CONCENTRATION PPM	21.3	7.7	14.7	7.2
THC MASS GRAMS	3.50	.25	1.06	.23
CO MASS GRAMS	57.70	2.13	13.79	2.26
CO2 MASS GRAMS	1478.1	1634.1	1257.0	1509.8
NOX MASS GRAMS	2.71	1.68	1.88	1.56
THC GRAMS/MI	.97	.06	.30	.06
CO GRAMS/MI	16.06	.55	3.85	.59
CO2 GRAMS/MI	411.5	419.2	351.0	391.5
NOX GRAMS/MI	.75	.43	.52	.41
FUEL ECONOMY IN MPG	20.16 20.64	21.10	24.77 23.59	22.59
RUN TIME SECONDS	504.	866.	505.	865.
MEASURED DISTANCE MI	3.59 7.49	3.90	3.58 7.44	3.86
SCF, DRY	.977 .980	.981	.979 .980	.981
DFC, WET (DRY)	.935(.923)		.941(.929)	
TOT VOL (SCM) / SAM BLR (SCM)	205.8/ .00		205.6/ .00	

COMPOSITE RESULTS

TEST NUMBER		1
BAROMETER	MM HG	744.5
HUMIDITY	G/KG	6.6
TEMPERATURE	DEG C	22.2

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	399.0	(390.7)
FUEL ECONOMY	MPG	21.77	(22.22)
HYDROCARBONS (THC)	G/MI	.31	(.31)
CARBON MONOXIDE	G/MI	4.65	(4.67)
OXIDES OF NITROGEN	G/MI	.52	(.52)

FINAL TESTS

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

FTP - VEHICLE EMISSIONS RESULTS -

PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

VEHICLE NO.1
DATE 11/30/88
BAG CART NO. 2 / CVS NO. 2
DYNO NO. 3

TEST WEIGHT 1361. KG(3000. LBS.
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46579. KM(28943. MILES)

BAROMETER 750.32 MM HG(29.54 IN HG)
RELATIVE HUMIDITY 26. PCT

DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)
ABS. HUMIDITY 4.1 GM/KG

NOX HUMIDITY CORRECTION FACTOR .82

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	779.8 (30.7)	784.9 (30.9)	779.8 (30.7)	784.9 (30.9)
BLOWER INLET P MM. H2O(IN. H2O)	777.2 (30.6)	787.4 (31.0)	782.3 (30.8)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	39.4 (103.0)	41.7 (107.0)	38.9 (102.0)
BLOWER REVOLUTIONS	40597.	69599.	40551.	69827.
TOT FLOW STD. CU. METRES(SCF)	76.3 (2695.)	131.6 (4648.)	76.4 (2699.)	132.2 (4668.)
THC SAMPLE METER/RANGE/PPM	73.0/ 2/ 73.	8.8/ 2/ 9.	34.2/ 2/ 35.	9.0/ 2/ 9.
THC BCKGRD METER/RANGE/PPM	5.2/ 2/ 5.	6.0/ 2/ 6.	5.8/ 2/ 6.	6.5/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	67.2/ 1/ 618.	17.7/ 12/ 17.	70.1/ 13/ 168.	17.5/ 12/ 17.
CO BCKGRD METER/RANGE/PPM	.0/ 1/ 0.	.6/ 12/ 1.	.0/ 13/ 0.	.0/ 12/ 0.
CO2 SAMPLE METER/RANGE/PCT	98.1/ 14/1.0908	81.5/ 14/ .6865	92.7/ 14/ .9349	80.6/ 14/ .6698
CO2 BCKGRD METER/RANGE/PCT	12.3/ 14/ .0411	12.4/ 14/ .0415	12.2/ 14/ .0407	12.2/ 14/ .0407
NOX SAMPLE METER/RANGE/PPM	89.1/ 1/ 22.3	34.5/ 1/ 8.7	60.6/ 1/ 15.2	33.6/ 1/ 8.5
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .1	.2/ 1/ .1	.1/ 1/ .0	.2/ 1/ .1
DILUTION FACTOR	11.57	19.45	14.04	19.93
THC CONCENTRATION PPM	68.	3.	29.	3.
CO CONCENTRATION PPM	600.	16.	163.	17.
CO2 CONCENTRATION PCT	1.0533	.6472	.8971	.6312
NOX CONCENTRATION PPM	22.2	8.6	15.2	8.4
THC MASS GRAMS	3.01	.24	1.28	.22
CO MASS GRAMS	53.34	2.49	14.55	2.55
CO2 MASS GRAMS	1472.0	1559.6	1255.3	1527.6
NOX MASS GRAMS	2.66	1.79	1.82	1.75
THC GRAMS/MI	.84	.06	.36	.06
CO GRAMS/MI	14.91	.65	4.07	.65
CO2 GRAMS/MI	411.4	404.9	351.1	389.4
NOX GRAMS/MI	.74	.46	.51	.45
FUEL ECONOMY IN MPG	20.27 21.05	21.83	24.73 23.63	22.70
RUN TIME SECONDS	505.	867.	505.	871.
MEASURED DISTANCE MI	3.58 7.43	3.85	3.58 7.50	3.92
SCF, DRY	.981 .984	.985	.983 .984	.985
DFC, WET (DRY)	.936(.928)		.942(.934)	
TOT VOL (SCM) / SAM BLR (SCM)	208.0/ .00		208.6/ .00	

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	750.3
HUMIDITY	G/KG	4.1
TEMPERATURE	DEG C	21.1

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	391.5	(387.0)
FUEL ECONOMY	MPG	22.19	(22.45)
HYDROCARBONS (THC)	G/MI	.31	(.30)
CARBON MONOXIDE	G/MI	4.54	(4.53)
OXIDES OF NITROGEN	G/MI	.53	( )

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CFTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 750.32 MM HG(29.54 IN HG)
RELATIVE HUMIDITY 26. PCT

VEHICLE NO. 1
DATE 11/30/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)
ABS. HUMIDITY 4.1 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46579. KM(28943. MILES)

NOX HUMIDITY CORRECTION FACTOR .82

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	779.8 (30.7)	784.9 (30.9)
BLOWER INLET P MM. H2O(IN. H2O)	777.2 (30.6)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	39.4 (103.0)
BLOWER REVOLUTIONS	40597.	69599.
TOT FLOW STD. CU. METRES(SCF)	76.3 (2695.)	131.6 (4648.)
THC SAMPLE METER/RANGE/PPM	73.0/ 2/ 73.	8.8/ 2/ 9.
THC BCKGRD METER/RANGE/PPM	5.2/ 2/ 5.	6.0/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	67.2/ 1/ 618.	17.7/ 12/ 17.
CO BCKGRD METER/RANGE/PPM	.0/ 1/ 0.	.6/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	98.1/ 14/1.0908	81.5/ 14/ .6865
CO2 BCKGRD METER/RANGE/PCT	12.3/ 14/ .0411	12.4/ 14/ .0415
NOX SAMPLE METER/RANGE/PPM	89.1/ 1/ 22.3	34.5/ 1/ 8.7
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .1	.2/ 1/ .1
DILUTION FACTOR	11.57	19.45
THC CONCENTRATION PPM	68.	3.
CO CONCENTRATION PPM	600.	16.
CO2 CONCENTRATION PCT	1.0533	.6472
NOX CONCENTRATION PPM	22.2	8.6
THC MASS GRAMS	3.01	.24
CO MASS GRAMS	53.34	2.49
CO2 MASS GRAMS	1472.0	1559.6
NOX MASS GRAMS	2.66	1.79
THC GRAMS/MI	.84	.06
CO GRAMS/MI	14.91	.65
CO2 GRAMS/MI	411.4	404.9
NOX GRAMS/MI	.74	.46
FUEL ECONOMY IN MPG	20.27	21.83
RUN TIME SECONDS	505.	867.
MEASURED DISTANCE MI	3.58	3.85
SCF, DRY	.981	.985

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	750.3
HUMIDITY	G/KG	4.1
TEMPERATURE	DEG C	21.1

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	408.1	(.0)
FUEL ECONOMY	MPG	21.05	(.00)
HYDROCARBONS (THC)	G/MI	.44	(.00)
CARBON MONOXIDE	G/MI	7.51	(.00)
OXIDES OF NITROGEN	G/MI	.60	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP1 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 750.57 MM HG(29.55 IN HG)
RELATIVE HUMIDITY 20. PCT

VEHICLE NO.1
DATE 11/30/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)
ABS. HUMIDITY 3.4 GM/KG

TEST WEIGHT 1361. KG(3000. LBS
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46591. KM(28950. MILES)

NOX HUMIDITY CORRECTION FACTOR .81

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	779.8 (30.7)	784.9 (30.9)
BLOWER INLET P MM. H2O(IN. H2O)	782.3 (30.8)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	41.7 (107.0)	38.9 (102.0)
BLOWER REVOLUTIONS	40551.	69827.
TOT FLOW STD. CU. METRES(SCF)	76.5 (2700.)	132.2 (4670.)
THC SAMPLE METER/RANGE/PPM	34.2/ 2/ 35.	9.0/ 2/ 9.
THC BCKGRD METER/RANGE/PPM	5.8/ 2/ 6.	6.5/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	70.1/ 13/ 168.	17.5/ 12/ 17.
CO BCKGRD METER/RANGE/PPM	.0/ 13/ 0.	.0/ 12/ 0.
CO2 SAMPLE METER/RANGE/PCT	92.7/ 14/ .9349	80.6/ 14/ .6698
CO2 BCKGRD METER/RANGE/PCT	12.2/ 14/ .0407	12.2/ 14/ .0407
NOX SAMPLE METER/RANGE/PPM	60.6/ 1/ 15.2	33.6/ 1/ 8.5
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .0	.2/ 1/ .1
DILUTION FACTOR	14.03	19.93
THC CONCENTRATION PPM	29.	3.
CO CONCENTRATION PPM	164.	17.
CO2 CONCENTRATION PCT	.8971	.6312
NOX CONCENTRATION PPM	15.2	8.4
THC MASS GRAMS	1.28	.22
CO MASS GRAMS	14.58	2.56
CO2 MASS GRAMS	1255.7	1528.2
NOX MASS GRAMS	1.79	1.72
THC GRAMS/MI	.36	.06
CO GRAMS/MI	4.08	.65
CO2 GRAMS/MI	351.2	389.6
NOX GRAMS/MI	.50	.44
FUEL ECONOMY IN MPG	24.72	22.69
RUN TIME SECONDS	505.	871.
MEASURED DISTANCE MI	3.58	3.92
SCF, DRY	.985	.987

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	750.6
HUMIDITY	G/KG	3.4
TEMPERATURE	DEG C	22.8

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	371.3	(.0)
FUEL ECONOMY	MPG	23.62	(.00)
HYDROCARBONS (THC)	G/MI	.20	(.00)
CARBON MONOXIDE	G/MI	2.29	(.00)
OXIDES OF NITROGEN	G/MI	.47	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP2 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 750.57 MM HG(29.55 IN HG)
RELATIVE HUMIDITY 17. PCT

VEHICLE NO.1
DATE 11/30/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)
ABS. HUMIDITY 2.9 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46603. KM(28958. MILES)

NOX HUMIDITY CORRECTION FACTOR .80

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	784.9 (30.9)	784.9 (30.9)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	40.6 (105.0)	38.3 (101.0)
BLOWER REVOLUTIONS	40550.	69456.
TOT FLOW STD. CU. METRES(SCF)	76.6 (2703.)	131.7 (4650.)
THC SAMPLE METER/RANGE/PPM	33.1/ 2/ 33.	9.3/ 2/ 10.
THC BCKGRD METER/RANGE/PPM	5.3/ 2/ 5.	6.0/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	70.8/ 13/ 170.	17.7/ 12/ 17.
CO BCKGRD METER/RANGE/PPM	.0/ 13/ 0.	.0/ 12/ 0.
CO2 SAMPLE METER/RANGE/PCT	93.0/ 14/ .9428	80.3/ 14/ .6643
CO2 BCKGRD METER/RANGE/PCT	12.2/ 14/ .0407	12.1/ 14/ .0403
NOX SAMPLE METER/RANGE/PPM	67.9/ 1/ 17.0	36.0/ 1/ 9.1
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .0	.1/ 1/ .0
DILUTION FACTOR	13.92	20.09
THC CONCENTRATION PPM	28.	4.
CO CONCENTRATION PPM	166.	17.
CO2 CONCENTRATION PCT	.9051	.6260
NOX CONCENTRATION PPM	17.0	9.0
THC MASS GRAMS	1.25	.28
CO MASS GRAMS	14.78	2.58
CO2 MASS GRAMS	1268.5	1509.4
NOX MASS GRAMS	1.98	1.81
THC GRAMS/MI	.35	.07
CO GRAMS/MI	4.09	.66
CO2 GRAMS/MI	350.8	386.1
NOX GRAMS/MI	.55	.46
FUEL ECONOMY IN MPG	24.75	22.89
RUN TIME SECONDS	505.	867.
MEASURED DISTANCE MI	3.62	3.91
SCF, DRY	.986	.988

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	750.6
HUMIDITY	G/KG	2.9
TEMPERATURE	DEG C	22.8

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	369.1	(.0)
FUEL ECONOMY	MPG	23.75	(.00)
HYDROCARBONS (THC)	G/MI	.20	(.00)
CARBON MONOXIDE	G/MI	2.31	(.00)
OXIDES OF NITROGEN	G/MI	.50	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP3 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 750.82 MM HG(29.56 IN HG)
RELATIVE HUMIDITY 16. PCT

VEHICLE NO.1
DATE 11/30/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
ABS. HUMIDITY 2.9 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46615. KM(28965. MILES)

NOX HUMIDITY CORRECTION FACTOR .80

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	779.8 (30.7)	784.9 (30.9)
BLOWER INLET P MM. H2O(IN. H2O)	782.3 (30.8)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	40.6 (105.0)	41.7 (107.0)
BLOWER REVOLUTIONS	40520.	69435.
TOT FLOW STD. CU. METRES(SCF)	76.6 (2704.)	130.9 (4620.)
THC SAMPLE METER/RANGE/PPM	29.1/ 2/ 29.	9.5/ 2/ 10.
THC BCKGRD METER/RANGE/PPM	5.9/ 2/ 6.	6.4/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	62.2/ 13/ 147.	16.4/ 12/ 16.
CO BCKGRD METER/RANGE/PPM	.0/ 13/ 0.	.0/ 12/ 0.
CO2 SAMPLE METER/RANGE/PCT	92.2/ 14/ .9219	80.6/ 14/ .6698
CO2 BCKGRD METER/RANGE/PCT	12.1/ 14/ .0403	12.2/ 14/ .0407
NOX SAMPLE METER/RANGE/PPM	56.1/ 1/ 14.1	36.1/ 1/ 9.1
NOX BCKGRD METER/RANGE/PPM	.4/ 1/ .1	.5/ 1/ .1
DILUTION FACTOR	14.27	19.93
THC CONCENTRATION PPM	24.	3.
CO CONCENTRATION PPM	144.	16.
CO2 CONCENTRATION PCT	.8844	.6312
NOX CONCENTRATION PPM	14.0	9.0
THC MASS GRAMS	1.05	.26
CO MASS GRAMS	12.81	2.38
CO2 MASS GRAMS	1240.0	1512.0
NOX MASS GRAMS	1.63	1.79
THC GRAMS/MI	.29	.07
CO GRAMS/MI	3.58	.61
CO2 GRAMS/MI	346.4	390.0
NOX GRAMS/MI	.45	.46
FUEL ECONOMY IN MPG	25.13	22.67
RUN TIME SECONDS	505.	867.
MEASURED DISTANCE MI	3.58	3.88
SCF, DRY	.986	.989

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	750.8
HUMIDITY	G/KG	2.9
TEMPERATURE	DEG C	23.9

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	369.1	(.0)
FUEL ECONOMY	MPG	23.79	(.00)
HYDROCARBONS (THC)	G/MI	.18	(.00)
CARBON MONOXIDE	G/MI	2.04	(.00)
OXIDES OF NITROGEN	G/MI	.46	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
F-COOL- VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

ST NO. 2 RUN 1	VEHICLE NO.1	TEST WEIGHT 1361. KG(3000. LBS)
VEHICLE MODEL 87 FORD TAURUS	DATE 11/30/88	ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
ENGINE 2.5 L(152. CID) L-4	BAG CART NO. 2	GASOLINE EM-784-F
TRANSMISSION A3	DYNO NO. 3	ODOMETER 46634. KM(28977. MILES)
	CVS NO. 2	
BAROMETER 748.28 MM HG(29.46 IN HG)	DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)	
RELATIVE HUMIDITY 15. PCT	ABS. HUMIDITY 3.0 GM/KG	NOX HUMIDITY CORRECTION FACTOR .80

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)	782.3 (30.8)
BLOWER INLET P MM. H2O(IN. H2O)	767.1 (30.2)	777.2 (30.6)
BLOWER INLET TEMP. DEG. C(DEG. F)	44.4 (112.0)	42.2 (108.0)
BLOWER REVOLUTIONS	40500.	69531.
TOT FLOW STD. CU. METRES(SCF)	75.9 (2679.)	130.6 (4610.)
THC SAMPLE METER/RANGE/PPM	68.4/ 2/ 69.	9.7/ 2/ 10.
THC BCKGRD METER/RANGE/PPM	5.3/ 2/ 5.	6.9/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	61.2/ 1/ 547.	21.0/ 12/ 20.
CO BCKGRD METER/RANGE/PPM	.1/ 1/ 1.	.9/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	97.1/ 14/1.0596	81.2/ 14/ .6809
CO2 BCKGRD METER/RANGE/PCT	13.1/ 14/ .0442	13.2/ 14/ .0446
NOX SAMPLE METER/RANGE/PPM	95.2/ 1/ 23.7	36.9/ 1/ 9.3
NOX BCKGRD METER/RANGE/PPM	.6/ 1/ .2	.8/ 1/ .2
DILUTION FACTOR	11.97	19.59
THC CONCENTRATION PPM	64.	3.
CO CONCENTRATION PPM	533.	19.
CO2 CONCENTRATION PCT	1.0191	.6386
NOX CONCENTRATION PPM	23.6	9.1
THC MASS GRAMS	2.79	.24
CO MASS GRAMS	47.06	2.92
CO2 MASS GRAMS	1415.5	1526.5
NOX MASS GRAMS	2.73	1.81
THC GRAMS/MI	.78	.06
CO GRAMS/MI	13.11	.75
CO2 GRAMS/MI	394.2	391.7
NOX GRAMS/MI	.76	.46
FUEL ECONOMY IN MPG	21.25	22.56
RUN TIME SECONDS	505.	867.
MEASURED DISTANCE MI	3.59	3.90
SCF, DRY	.985	.989

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	748.3
HUMIDITY	G/KG	3.0
TEMPERATURE	DEG C	25.0

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	392.9	(.0)
FUEL ECONOMY	MPG	21.91	(.00)
HYDROCARBONS (THC)	G/MI	.40	(.00)
CARBON MONOXIDE	G/MI	6.68	(.00)
OXIDES OF NITROGEN	G/MI	.61	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFET1 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 751.84 MM HG(29.60 IN HG)
RELATIVE HUMIDITY 30. PCT

VEHICLE NO.1
DATE 12/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
ABS. HUMIDITY 5.4 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46671. KM(29000. MILES)

NOX HUMIDITY CORRECTION FACTOR .85

BAG RESULTS

TEST CYCLE	HFET1
BLOWER DIF P MM. H2O(IN. H2O)	792.5 (31.2)
BLOWER INLET P MM. H2O(IN. H2O)	792.5 (31.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)
BLOWER REVOLUTIONS	61458.
TOT FLOW STD. CU. METRES(SCF)	115.7 (4085.)
THC SAMPLE METER/RANGE/PPM	14.8/ 2/ 15.
THC BCKGRD METER/RANGE/PPM	6.4/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	73.8/ 12/ 73.
CO BCKGRD METER/RANGE/PPM	1.5/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	71.1/ 1/1.3102
CO2 BCKGRD METER/RANGE/PCT	2.7/ 1/ .0476
NOX SAMPLE METER/RANGE/PPM	75.1/ 1/ 18.8
NOX BCKGRD METER/RANGE/PPM	.4/ 1/ .1
DILUTION FACTOR	10.16
THC CONCENTRATION PPM	9.
CO CONCENTRATION PPM	69.
CO2 CONCENTRATION PCT	1.2672
NOX CONCENTRATION PPM	18.7
THC MASS GRAMS	.61
CO MASS GRAMS	9.36
CO2 MASS GRAMS	2683.9
NOX MASS GRAMS	3.53
RUN TIME SECONDS	765.
DFC, WET (DRY)	.902 (.893)
SCF, WET (DRY)	1.000 (.978)
VOL (SCM)	115.7
SAM BLR (SCM)	.00
MI (MEASURED)	10.21

TEST NUMBER,		1
BAROMETER,	MM HG	751.8
HUMIDITY,	G/KG	5.4
TEMPERATURE,	DEG C	23.3
CARBON DIOXIDE,	G/MI	262.8
FUEL ECONOMY,	MPG	33.5
HYDROCARBONS, (THC)	G/MI	.06
CARBON MONOXIDE,	G/MI	.92
OXIDES OF NITROGEN,	G/MI	.35

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFET2 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TST NO. 2 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 751.84 MM HG(29.60 IN HG)
RELATIVE HUMIDITY 32. PCT
BAG RESULTS

VEHICLE NO.1
DATE 12/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
ABS. HUMIDITY 6.1 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46690. KM(29012. MILES)

NOX HUMIDITY CORRECTION FACTOR .87

TEST CYCLE	HFET2
BLOWER DIF P MM. H2O(IN. H2O)	789.9 (31.1)
BLOWER INLET P MM. H2O(IN. H2O)	789.9 (31.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.9 (111.0)
BLOWER REVOLUTIONS	61392.
TOT FLOW STD. CU. METRES(SCF)	115.4 (4074.)
THC SAMPLE METER/RANGE/PPM	17.5/ 2/ 18.
THC BCKGRD METER/RANGE/PPM	7.2/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	46.4/ 13/ 107.
CO BCKGRD METER/RANGE/PPM	.6/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	71.2/ 1/1.3121
CO2 BCKGRD METER/RANGE/PCT	2.7/ 1/ .0476
NOX SAMPLE METER/RANGE/PPM	62.8/ 1/ 15.7
NOX BCKGRD METER/RANGE/PPM	.8/ 1/ .2
DILUTION FACTOR	10.12
THC CONCENTRATION PPM	11.
CO CONCENTRATION PPM	102.
CO2 CONCENTRATION PCT	1.2691
NOX CONCENTRATION PPM	15.5
THC MASS GRAMS	.74
CO MASS GRAMS	13.66
CO2 MASS GRAMS	2680.7
NOX MASS GRAMS	2.98
RUN TIME SECONDS	765.
DFC, WET (DRY)	.901 (.892)
SCF, WET (DRY)	1.000 (.978)
VOL (SCM)	115.4
SAM BLR (SCM)	.00
MI (MEASURED)	10.23
TEST NUMBER,	2
BAROMETER, MM HG	751.8
HUMIDITY, G/KG	6.1
TEMPERATURE, DEG C	24.4
CARBON DIOXIDE, G/MI	262.1
FUEL ECONOMY, MPG	33.5
HYDROCARBONS, (THC) G/MI	.07
CARBON MONOXIDE, G/MI	1.34
OXIDES OF NITROGEN, G/MI	.29

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFET3 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 3 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 752.09 MM HG(29.61 IN HG)
RELATIVE HUMIDITY 29. PCT

VEHICLE NO.1
DATE 12/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
ABS. HUMIDITY 5.5 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46705. KM(29021. MILES)

NOX HUMIDITY CORRECTION FACTOR .85

BAG RESULTS

TEST CYCLE	HFET3
BLOWER DIF P MM. H2O(IN. H2O)	787.4 (31.0)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.9 (111.0)
BLOWER REVOLUTIONS	61364.
TOT FLOW STD. CU. METRES(SCF)	115.4 (4075.)
THC SAMPLE METER/RANGE/PPM	15.3/ 2/ 16.
THC BCKGRD METER/RANGE/PPM	7.6/ 2/ 8.
CO SAMPLE METER/RANGE/PPM	40.0/ 13/ 91.
CO BCKGRD METER/RANGE/PPM	.4/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	71.2/ 1/1.3121
CO2 BCKGRD METER/RANGE/PCT	2.8/ 1/ .0494
NOX SAMPLE METER/RANGE/PPM	73.0/ 1/ 18.3
NOX BCKGRD METER/RANGE/PPM	.8/ 1/ .2
DILUTION FACTOR	10.13
THC CONCENTRATION PPM	9.
CO CONCENTRATION PPM	87.
CO2 CONCENTRATION PCT	1.2675
NOX CONCENTRATION PPM	18.1
THC MASS GRAMS	.57
CO MASS GRAMS	11.70
CO2 MASS GRAMS	2678.0
NOX MASS GRAMS	3.41
RUN TIME SECONDS	765.
DFC, WET (DRY)	.901 (.893)
SCF, WET (DRY)	1.000 (.979)
VOL (SCM)	115.4
SAM BLR (SCM)	.00
MI (MEASURED)	10.26

TEST NUMBER,		3
BAROMETER,	MM HG	752.1
HUMIDITY,	G/KG	5.5
TEMPERATURE,	DEG C	24.4
CARBON DIOXIDE,	G/MI	261.0
FUEL ECONOMY,	MPG	33.7
HYDROCARBONS, (THC)	G/MI	.06
CARBON MONOXIDE,	G/MI	1.14
OXIDES OF NITROGEN,	G/MI	.33

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFET4 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

ST NO. 4 RUN 1	VEHICLE NO.1	TEST WEIGHT 1361. KG(3000. LBS)
VEHICLE MODEL 87 FORD TAURUS	DATE 12/ 5/88	ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
ENGINE 2.5 L(152. CID) L-4	BAG CART NO. 2	GASOLINE EM-784-F
TRANSMISSION A3	DYNO NO. 3	ODOMETER 46721. KM(29031. MILES)
	CVS NO. 2	
BAROMETER 751.84 MM HG(29.60 IN HG)	DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)	
RELATIVE HUMIDITY 30. PCT	ABS. HUMIDITY 5.9 GM/KG	NOX HUMIDITY CORRECTION FACTOR .86

BAG RESULTS

TEST CYCLE	HFET4
BLOWER DIF P MM. H2O(IN. H2O)	789.9 (31.1)
BLOWER INLET P MM. H2O(IN. H2O)	789.9 (31.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.9 (111.0)
BLOWER REVOLUTIONS	61335.
TOT FLOW STD. CU. METRES(SCF)	115.3 (4070.)
THC SAMPLE METER/RANGE/PPM	16.3/ 2/ 17.
THC BCKGRD METER/RANGE/PPM	8.1/ 2/ 8.
CO SAMPLE METER/RANGE/PPM	41.8/ 13/ 95.
CO BCKGRD METER/RANGE/PPM	.2/ 13/ 0.
CO2 SAMPLE METER/RANGE/PCT	71.8/ 1/1.3234
CO2 BCKGRD METER/RANGE/PCT	2.7/ 1/ .0476
NOX SAMPLE METER/RANGE/PPM	59.2/ 1/ 14.8
NOX BCKGRD METER/RANGE/PPM	.4/ 1/ .1
DILUTION FACTOR	10.04
THC CONCENTRATION PPM	9.
CO CONCENTRATION PPM	92.
CO2 CONCENTRATION PCT	1.2805
NOX CONCENTRATION PPM	14.7
THC MASS GRAMS	.61
CO MASS GRAMS	12.30
CO2 MASS GRAMS	2702.0
NOX MASS GRAMS	2.80
RUN TIME SECONDS	765.
DFC, WET (DRY)	.900 (.892)
SCF, WET (DRY)	1.000 (.978)
VOL (SCM)	115.3
SAM BLR (SCM)	.00
MI (MEASURED)	10.25
TEST NUMBER,	4
BAROMETER, MM HG	751.8
HUMIDITY, G/KG	5.9
TEMPERATURE, DEG C	25.0
CARBON DIOXIDE, G/MI	263.5
FUEL ECONOMY, MPG	33.4
HYDROCARBONS, (THC) G/MI	.06
CARBON MONOXIDE, G/MI	1.20
OXIDES OF NITROGEN, G/MI	.27

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
NYCC1 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 751.33 MM HG(29.58 IN HG)
RELATIVE HUMIDITY 28. PCT

VEHICLE NO.1
DATE 12/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
ABS. HUMIDITY 5.7 GM/KG

TEST WEIGHT 1361. KG(3000. LBS
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46755. KM(29052. MILES)

NOX HUMIDITY CORRECTION FACTOR .86

BAG RESULTS

TEST CYCLE	NYCC1
BLOWER DIF P MM. H2O(IN. H2O)	779.8 (30.7)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.9 (111.0)
BLOWER REVOLUTIONS	48060.
TOT FLOW STD. CU. METRES(SCF)	90.4 (3193.)
THC SAMPLE METER/RANGE/PPM	31.4/ 2/ 32.
THC BCKGRD METER/RANGE/PPM	8.2/ 2/ 8.
CO SAMPLE METER/RANGE/PPM	65.8/ 13/ 156.
CO BCKGRD METER/RANGE/PPM	.4/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	73.3/ 14/ .5478
CO2 BCKGRD METER/RANGE/PCT	14.1/ 14/ .0482
NOX SAMPLE METER/RANGE/PPM	21.9/ 1/ 5.6
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .0
DILUTION FACTOR	23.66
THC CONCENTRATION PPM	24.
CO CONCENTRATION PPM	153.
CO2 CONCENTRATION PCT	.5016
NOX CONCENTRATION PPM	5.6
THC MASS GRAMS	1.24
CO MASS GRAMS	16.06
CO2 MASS GRAMS	830.5
NOX MASS GRAMS	.82
RUN TIME SECONDS	600.
DFC, WET (DRY)	.958 (.949)
SCF, WET (DRY)	1.000 (.986)
VOL (SCM)	90.4
SAM BLR (SCM)	.00
MI (MEASURED)	1.16

TEST NUMBER,		1
BAROMETER,	MM HG	751.3
HUMIDITY,	G/KG	5.7
TEMPERATURE,	DEG C	25.6
CARBON DIOXIDE,	G/MI	712.9
FUEL ECONOMY,	MPG	12.0
HYDROCARBONS, (THC)	G/MI	1.06
CARBON MONOXIDE,	G/MI	13.79
OXIDES OF NITROGEN,	G/MI	.71

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
NYCC2 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 751.08 MM HG(29.57 IN HG)
RELATIVE HUMIDITY 30. PCT

VEHICLE NO.1
DATE 12/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
ABS. HUMIDITY 5.9 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46756. KM(29053. MILES)

NOX HUMIDITY CORRECTION FACTOR .86

BAG RESULTS

TEST CYCLE	NYCC2
BLOWER DIF P MM. H2O(IN. H2O)	779.8 (30.7)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)
BLOWER REVOLUTIONS	48087.
TOT FLOW STD. CU. METRES(SCF)	90.6 (3200.)
THC SAMPLE METER/RANGE/PPM	32.5/ 2/ 33.
THC BCKGRD METER/RANGE/PPM	8.9/ 2/ 9.
CO SAMPLE METER/RANGE/PPM	53.5/ 13/ 125.
CO BCKGRD METER/RANGE/PPM	.5/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	72.5/ 14/ .5357
CO2 BCKGRD METER/RANGE/PCT	14.4/ 14/ .0494
NOX SAMPLE METER/RANGE/PPM	25.6/ 1/ 6.5
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .1
DILUTION FACTOR	24.31
THC CONCENTRATION PPM	24.
CO CONCENTRATION PPM	121.
CO2 CONCENTRATION PCT	.4884
NOX CONCENTRATION PPM	6.4
THC MASS GRAMS	1.26
CO MASS GRAMS	12.76
CO2 MASS GRAMS	810.2
NOX MASS GRAMS	.96
RUN TIME SECONDS	600.
DFC, WET (DRY)	.959 (.950)
SCF, WET (DRY)	1.000 (.985)
VOL (SCM)	90.6
SAM BLR (SCM)	.00
MI (MEASURED)	1.18

TEST NUMBER,		2
BAROMETER,	MM HG	751.1
HUMIDITY,	G/KG	5.9
TEMPERATURE,	DEG C	25.0
CARBON DIOXIDE,	G/MI	688.4
FUEL ECONOMY,	MPG	12.5
HYDROCARBONS, (THC)	G/MI	1.07
CARBON MONOXIDE,	G/MI	10.84
OXIDES OF NITROGEN,	G/MI	.82

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
NYCC3 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 3 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 750.82 MM HG(29.56 IN HG)
RELATIVE HUMIDITY 28. PCT

VEHICLE NO.1
DATE 12/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
ABS. HUMIDITY 5.7 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46758. KM(29054. MILES)

NOX HUMIDITY CORRECTION FACTOR .86

BAG RESULTS

TEST CYCLE	NYCC3
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)
BLOWER REVOLUTIONS	48072.
TOT FLOW STD. CU. METRES(SCF)	90.6 (3198.)
THC SAMPLE METER/RANGE/PPM	31.8/ 2/ 32.
THC BCKGRD METER/RANGE/PPM	8.8/ 2/ 9.
CO SAMPLE METER/RANGE/PPM	52.2/ 13/ 121.
CO BCKGRD METER/RANGE/PPM	.8/ 13/ 2.
CO2 SAMPLE METER/RANGE/PCT	72.8/ 14/ .5402
CO2 BCKGRD METER/RANGE/PCT	14.2/ 14/ .0486
NOX SAMPLE METER/RANGE/PPM	30.1/ 1/ 7.6
NOX BCKGRD METER/RANGE/PPM	.2/ 1/ .1
DILUTION FACTOR	24.13
THC CONCENTRATION PPM	24.
CO CONCENTRATION PPM	117.
CO2 CONCENTRATION PCT	.4936
NOX CONCENTRATION PPM	7.6
THC MASS GRAMS	1.23
CO MASS GRAMS	12.35
CO2 MASS GRAMS	818.6
NOX MASS GRAMS	1.12
RUN TIME SECONDS	600.
DFC, WET (DRY)	.959 (.950)
SCF, WET (DRY)	1.000 (.986)
VOL (SCM)	90.6
SAM BLR (SCM)	.00
MI (MEASURED)	1.17

TEST NUMBER,		3
BAROMETER,	MM HG	750.8
HUMIDITY,	G/KG	5.7
TEMPERATURE,	DEG C	25.6
CARBON DIOXIDE,	G/MI	698.1
FUEL ECONOMY,	MPG	12.4
HYDROCARBONS, (THC)	G/MI	1.05
CARBON MONOXIDE,	G/MI	10.53
OXIDES OF NITROGEN,	G/MI	.96

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
NYCC4 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 4 RUN 1
VEHICLE MODEL 87 FORD TAURUS
ENGINE 2.5 L(152. CID) L-4
TRANSMISSION A3

BAROMETER 750.32 MM HG(29.54 IN HG)
RELATIVE HUMIDITY 28. PCT

VEHICLE NO.1
DATE 12/ 5/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
ABS. HUMIDITY 5.7 GM/KG

TEST WEIGHT 1361. KG(3000. LBS)
ACTUAL ROAD LOAD 5.5 KW(7.4 HP)
GASOLINE EM-784-F
ODOMETER 46759. KM(29055. MILES)

NOX HUMIDITY CORRECTION FACTOR .86

BAG RESULTS

TEST CYCLE	NYCC4
BLOWER DIF P MM. H2O(IN. H2O)	779.8 (30.7)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)
BLOWER REVOLUTIONS	48024.
TOT FLOW STD. CU. METRES(SCF)	90.4 (3192.)
THC SAMPLE METER/RANGE/PPM	26.5/ 2/ 27.
THC BCKGRD METER/RANGE/PPM	8.5/ 2/ 9.
CO SAMPLE METER/RANGE/PPM	37.3/ 13/ 85.
CO BCKGRD METER/RANGE/PPM	.3/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	71.9/ 14/ .5268
CO2 BCKGRD METER/RANGE/PCT	13.8/ 14/ .0470
NOX SAMPLE METER/RANGE/PPM	27.4/ 1/ 6.9
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .1
DILUTION FACTOR	24.92
THC CONCENTRATION PPM	19.
CO CONCENTRATION PPM	82.
CO2 CONCENTRATION PCT	.4817
NOX CONCENTRATION PPM	6.9
THC MASS GRAMS	.96
CO MASS GRAMS	8.66
CO2 MASS GRAMS	797.3
NOX MASS GRAMS	1.02
RUN TIME SECONDS	599.
DFC, WET (DRY)	.960 (.951)
SCF, WET (DRY)	1.000 (.986)
VOL (SCM)	90.4
SAM BLR (SCM)	.00
MI (MEASURED)	1.18
TEST NUMBER,	4
BAROMETER, MM HG	750.3
HUMIDITY, G/KG	5.7
TEMPERATURE, DEG C	25.6
CARBON DIOXIDE, G/MI	677.2
FUEL ECONOMY, MPG	12.8
HYDROCARBONS, (THC) G/MI	.82
CARBON MONOXIDE, G/MI	7.36
OXIDES OF NITROGEN, G/MI	.86

APPENDIX C

REGULATED GASEOUS EMISSIONS RESULTS FROM A 1986 TOYOTA CAMRY

INITIAL TEST
SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
FTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE .0 L(2. CID) -4
TRANSMISSION A4

VEHICLE NO.1
DATE 10/ 8/87
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-774-F
ODOMETER 33144. KM(20595. MILES)

BAROMETER 746.00 MM HG(29.37 IN HG)
RELATIVE HUMIDITY 49. PCT

DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)
ABS. HUMIDITY 8.4 GM/KG

NOX HUMIDITY CORRECTION FACTOR .93

BAG RESULTS

BAG NUMBER	1	2	3
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	41.7 (107.0)	42.2 (108.0)
BLOWER REVOLUTIONS	40462.	69524.	40362.
TOT FLOW STD. CU. METRES(SCF)	75.8 (2675.)	130.5 (4610.)	75.7 (2673.)
THC SAMPLE METER/RANGE/PPM	51.2/ 2/ 51.	6.9/ 2/ 7.	9.4/ 2/ 9.
THC BCKGRD METER/RANGE/PPM	6.3/ 2/ 6.	6.1/ 2/ 6.	5.9/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	77.2/11/ 337.	18.0/13/ 16.	60.8/13/ 58.
CO BCKGRD METER/RANGE/PPM	.5/11/ 1.	1.4/13/ 1.	1.5/13/ 1.
CO2 SAMPLE METER/RANGE/PCT	87.3/11/ .8473	31.5/ 3/ .5271	81.3/11/ .7588
CO2 BCKGRD METER/RANGE/PCT	7.0/11/ .0415	6.9/11/ .0409	6.9/11/ .0409
NOX SAMPLE METER/RANGE/PPM	85.3/ 1/ 21.4	10.0/ 1/ 2.6	28.8/ 1/ 7.3
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .0	.0/ 1/ .0	.1/ 1/ .0
DILUTION FACTOR	15.14	25.31	17.51
THC CONCENTRATION PPM	45.	1.	4.
CO CONCENTRATION PPM	325.	15.	55.
CO2 CONCENTRATION PCT	.8085	.4879	.7203
NOX CONCENTRATION PPM	21.3	2.6	7.3
THC MASS GRAMS	1.98	.08	.17
CO MASS GRAMS	28.64	2.21	4.85
CO2 MASS GRAMS	1121.4	1166.1	998.5
NOX MASS GRAMS	2.87	.60	.98
THC GRAMS/MI	.56	.02	.05
CO GRAMS/MI	8.06	.58	1.36
CO2 GRAMS/MI	315.6	306.1	279.4
NOX GRAMS/MI	.81	.16	.27
FUEL ECONOMY IN MPG	26.87	28.88	31.48
RUN TIME SECONDS	504.	868.	504.
MEASURED DISTANCE MI	3.55	3.81	3.57
SCF, DRY	.976	.979	.977

COMPOSITE RESULTS

TEST NUMBER 1
BAROMETER MM HG 746.0
HUMIDITY G/KG 8.4
TEMPERATURE DEG C 22.2

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	300.7	(.0)
FUEL ECONOMY	MPG	29.09	(.00)
HYDROCARBONS (THC)	G/MI	.14	(.00)
CARBON MONOXIDE	G/MI	2.35	(.00)
OXIDES OF NITROGEN	G/MI	.32	(.00)

FIRST SCREENING TEST

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

FTP - VEHICLE EMISSIONS RESULTS -

PROJECT 08-1816-001

T NO. RUN
VEHICLE MODEL 86 TOYOTA CAMARY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

VEHICLE NO.2
DATE 2/29/88
BAG CART NO. 2 / CVS NO. 2
DYNO NO. 3

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33537. KM(20839. MILES)

BAROMETER 743.20 MM HG(29.26 IN HG)
RELATIVE HUMIDITY 47. PCT

DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
ABS. HUMIDITY 10.2 GM/KG

NOX HUMIDITY CORRECTION FACTOR .98

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	787.4 (31.0)	787.4 (31.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)	787.4 (31.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	44.4 (112.0)	43.3 (110.0)	43.9 (111.0)	41.7 (107.0)
BLOWER REVOLUTIONS	40609.	69703.	40566.	69576.
TOT FLOW STD. CU. METRES(SCF)	75.3 (2659.)	129.5 (4572.)	75.6 (2668.)	130.1 (4594.)
THC SAMPLE METER/RANGE/PPM	66.0/ 2/ 66.	7.1/ 2/ 7.	9.4/ 2/ 10.	7.0/ 2/ 7.
THC BCKGRD METER/RANGE/PPM	6.7/ 2/ 7.	7.0/ 2/ 7.	6.5/ 2/ 7.	6.8/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	75.1/14/ 352.	13.1/12/ 13.	42.7/12/ 43.	15.2/12/ 15.
CO BCKGRD METER/RANGE/PPM	.4/14/ 2.	1.5/12/ 2.	.9/12/ 1.	.8/12/ 1.
CO2 SAMPLE METER/RANGE/PCT	88.1/14/ .8235	72.8/14/ .5438	84.7/14/ .7508	72.2/14/ .5349
CO2 BCKGRD METER/RANGE/PCT	13.4/14/ .0473	13.2/14/ .0464	13.0/14/ .0456	12.9/14/ .0452
NOX SAMPLE METER/RANGE/PPM	76.1/ 1/ 19.1	5.0/ 1/ 1.3	25.9/ 1/ 6.6	6.0/ 1/ 1.6
NOX BCKGRD METER/RANGE/PPM	.4/ 1/ .1	.4/ 1/ .1	.4/ 1/ .1	.3/ 1/ .0
DILUTION FACTOR	15.50	24.55	17.73	24.95
THC CONCENTRATION PPM	60.	0.	3.	0.
CO CONCENTRATION PPM	339.	11.	41.	14.
CO2 CONCENTRATION PCT	.7793	.4992	.7078	.4915
NOX CONCENTRATION PPM	19.0	1.2	6.5	1.5
THC MASS GRAMS	2.60	.03	.15	.04
CO MASS GRAMS	29.75	1.73	3.58	2.15
CO2 MASS GRAMS	1074.4	1183.5	979.1	1170.8
NOX MASS GRAMS	2.68	.29	.92	.36
THC GRAMS/MI	.73	.00	.04	.00
CO GRAMS/MI	8.39	.45	1.00	.56
CO2 GRAMS/MI	303.2	308.4	274.8	303.9
NOX GRAMS/MI	.76	.08	.26	.09
FUEL ECONOMY IN MPG	27.83 28.27	28.69	32.08 30.45	29.09
RUN TIME SECONDS	505.	868.	506.	868.
MEASURED DISTANCE MI	3.54 7.38	3.84	3.56 7.42	3.85
SCF, DRY	.977 .979	.980	.978 .979	.980
DFC, WET (DRY)	.951(.936)		.954(.939)	
TOT VOL (SCM) / SAM BLR (SCM)	204.8/ .00		205.7/ .00	

COMPOSITE RESULTS

TEST NUMBER
BAROMETER MM HG 743.2
HUMIDITY G/KG 10.2
TEMPERATURE DEG C 26.1

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	298.1	(296.8)
FUEL ECONOMY	MPG	29.35	(29.47)
HYDROCARBONS (THC)	G/MI	.17	(.17)
CARBON MONOXIDE	G/MI	2.24	(2.27)
OXIDES OF NITROGEN	G/MI	.27	(.27)

SECOND SCREENING TEST
SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
FTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

VEHICLE NO.2
DATE 3/31/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33573. KM(20861. MILES)

BAROMETER 737.62 MM HG(29.04 IN HG)
RELATIVE HUMIDITY 56. PCT

DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
ABS. HUMIDITY 11.0 GM/KG

NOX HUMIDITY CORRECTION FACTOR 1.01

BAG RESULTS

BAG NUMBER	1	2	3
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	42.2 (108.0)	43.3 (110.0)
BLOWER REVOLUTIONS	40586.	69761.	40438.
TOT FLOW STD. CU. METRES(SCF)	75.0 (2650.)	129.2 (4564.)	74.8 (2640.)
THC SAMPLE METER/RANGE/PPM	69.5/ 2/ 70.	6.7/ 2/ 7.	8.6/ 2/ 9.
THC BCKGRD METER/RANGE/PPM	6.3/ 2/ 6.	5.7/ 2/ 6.	5.8/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	73.0/ 14/ 340.	13.6/ 12/ 14.	31.6/ 12/ 32.
CO BCKGRD METER/RANGE/PPM	.4/ 14/ 2.	1.0/ 12/ 1.	.3/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	87.6/ 14/ .8124	71.7/ 14/ .5276	84.0/ 14/ .7367
CO2 BCKGRD METER/RANGE/PCT	12.7/ 14/ .0444	12.6/ 14/ .0440	12.4/ 14/ .0432
NOX SAMPLE METER/RANGE/PPM	73.7/ 1/ 18.5	5.7/ 1/ 1.5	24.1/ 1/ 6.1
NOX BCKGRD METER/RANGE/PPM	.5/ 1/ .1	.3/ 1/ .0	.1/ 1/ .0
DILUTION FACTOR	15.72	25.30	18.09
THC CONCENTRATION PPM	64.	1.	3.
CO CONCENTRATION PPM	327.	12.	30.
CO2 CONCENTRATION PCT	.7708	.4853	.6359
NOX CONCENTRATION PPM	18.3	1.4	6.1
THC MASS GRAMS	2.76	.09	.14
CO MASS GRAMS	28.57	1.87	2.61
CO2 MASS GRAMS	1059.1	1148.5	952.6
NOX MASS GRAMS	2.66	.35	.88
THC GRAMS/MI	.77	.02	.04
CO GRAMS/MI	7.95	.49	.72
CO2 GRAMS/MI	294.7	295.6	264.9
NOX GRAMS/MI	.74	.09	.24
FUEL ECONOMY IN MPG	28.64	29.92	32.32
RUN TIME SECONDS	505.	868.	503.
MEASURED DISTANCE MI	3.59	3.89	3.60
SCF, DRY	.975	.977	.975

COMPOSITE RESULTS

TEST NUMBER		1 1
BAROMETER	MM HG	737.6
HUMIDITY	G/KG	11.0
TEMPERATURE	DEG C	24.4

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	287.0	(.0)
FUEL ECONOMY	MPG	30.49	(.00)
HYDROCARBONS (THC)	G/MI	.18	(.00)
CARBON MONOXIDE	G/MI	2.09	(.
OXIDES OF NITROGEN	G/MI	.27	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CFTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

VEHICLE NO.2
DATE 3/31/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33573. KM(20861. MILES)

BAROMETER 737.62 MM HG(29.04 IN HG)
RELATIVE HUMIDITY 56. PCT

DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
ABS. HUMIDITY 11.0 GM/KG

NOX HUMIDITY CORRECTION FACTOR 1.01

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	42.2 (108.0)
BLOWER REVOLUTIONS	40586.	69761.
TOT FLOW STD. CU. METRES(SCF)	75.0 (2650.)	129.2 (4564.)
THC SAMPLE METER/RANGE/PPM	69.5/ 2/ 70.	6.7/ 2/ 7.
THC BCKGRD METER/RANGE/PPM	6.3/ 2/ 6.	5.7/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	73.0/ 14/ 340.	13.6/ 12/ 14.
CO BCKGRD METER/RANGE/PPM	.4/ 14/ 2.	1.0/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	87.6/ 14/ .8124	71.7/ 14/ .5276
CO2 BCKGRD METER/RANGE/PCT	12.7/ 14/ .0444	12.6/ 14/ .0440
NOX SAMPLE METER/RANGE/PPM	73.7/ 1/ 18.5	5.7/ 1/ 1.5
NOX BCKGRD METER/RANGE/PPM	.5/ 1/ .1	.3/ 1/ .0
DILUTION FACTOR	15.72	25.30
THC CONCENTRATION PPM	64.	1.
CO CONCENTRATION PPM	327.	12.
CO2 CONCENTRATION PCT	.7708	.4853
NOX CONCENTRATION PPM	18.3	1.4
THC MASS GRAMS	2.76	.09
CO MASS GRAMS	28.57	1.87
CO2 MASS GRAMS	1059.1	1148.5
NOX MASS GRAMS	2.66	.35
THC GRAMS/MI	.77	.02
CO GRAMS/MI	7.95	.48
CO2 GRAMS/MI	294.7	295.6
NOX GRAMS/MI	.74	.09
FUEL ECONOMY IN MPG	28.64	29.92
RUN TIME SECONDS	505.	868.
MEASURED DISTANCE MI	3.59	3.89
SCF, DRY	.975	.977

COMPOSITE RESULTS

TEST NUMBER		1 1
BAROMETER	MM HG	737.6
HUMIDITY	G/KG	11.0
TEMPERATURE	DEG C	24.4

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	295.2	(.0)
FUEL ECONOMY	MPG	29.29	(.00)
HYDROCARBONS (THC)	G/MI	.38	(.00)
CARBON MONOXIDE	G/MI	4.07	(.00)
OXIDES OF NITROGEN	G/MI	.40	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP1 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

VEHICLE NO.2
DATE 3/31/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33584. KM(20868. MILES)

BAROMETER 737.62 MM HG(29.04 IN HG)
RELATIVE HUMIDITY 53. PCT
DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
ABS. HUMIDITY 11.2 GM/KG

NOX HUMIDITY CORRECTION FACTOR 1.02

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	41.1 (106.0)
BLOWER REVOLUTIONS	40438.	69723.
TOT FLOW STD. CU. METRES(SCF)	74.8 (2640.)	129.4 (4570.)
THC SAMPLE METER/RANGE/PPM	8.6/ 2/ 9.	6.3/ 2/ 6.
THC BCKGRD METER/RANGE/PPM	5.8/ 2/ 6.	5.5/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	31.6/ 12/ 32.	7.8/ 12/ 8.
CO BCKGRD METER/RANGE/PPM	.8/ 12/ 1.	.5/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	84.0/ 14/ .7367	58.4/ 14/ .3610
CO2 BCKGRD METER/RANGE/PCT	12.4/ 14/ .0432	12.4/ 14/ .0432
NOX SAMPLE METER/RANGE/PPM	24.1/ 1/ 6.1	4.3/ 1/ 1.1
NOX BCKGRD METER/RANGE/PPM	.1/ 1/ .0	.0/ 1/ .0
DILUTION FACTOR	18.09	36.97
THC CONCENTRATION PPM	3.	1.
CO CONCENTRATION PPM	30.	7.
CO2 CONCENTRATION PCT	.6959	.3190
NOX CONCENTRATION PPM	6.1	1.1
THC MASS GRAMS	.14	.07
CO MASS GRAMS	2.61	1.10
CO2 MASS GRAMS	952.6	756.0
NOX MASS GRAMS	.89	.28
THC GRAMS/MI	.04	.02
CO GRAMS/MI	.73	.28
CO2 GRAMS/MI	264.9	195.5
NOX GRAMS/MI	.25	.07
FUEL ECONOMY IN MPG	33.32	45.25
RUN TIME SECONDS	503.	869.
MEASURED DISTANCE MI	3.60	3.87
SCF, DRY	.976	.979

COMPOSITE RESULTS

TEST NUMBER		1 1
BAROMETER	MM HG	737.6
HUMIDITY	G/KG	11.2
TEMPERATURE	DEG C	25.6

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	228.9	(.0)
FUEL ECONOMY	MPG	38.59	(.00)
HYDROCARBONS (THC)	G/MI	.03	(.00)
CARBON MONOXIDE	G/MI	.50	(.00)
OXIDES OF NITROGEN	G/MI	.16	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP2 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 737.62 MM HG(29.04 IN HG)
RELATIVE HUMIDITY 50. PCT

VEHICLE NO.2
DATE 3/31/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 26.1 DEG C(79.0 DEG F)
ABS. HUMIDITY 11.0 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33595. KM(20875. MILES)

NOX HUMIDITY CORRECTION FACTOR 1.01

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)	41.7 (107.0)
BLOWER REVOLUTIONS	40512.	69659.
TOT FLOW STD. CU. METRES(SCF)	75.1 (2650.)	129.2 (4561.)
THC SAMPLE METER/RANGE/PPM	8.5/ 2/ 9.	6.4/ 2/ 7.
THC BCKGRD METER/RANGE/PPM	5.7/ 2/ 6.	5.5/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	33.7/ 12/ 34.	17.4/ 12/ 18.
CO BCKGRD METER/RANGE/PPM	.5/ 12/ 1.	.6/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	83.6/ 14/ .7288	70.9/ 14/ .5161
CO2 BCKGRD METER/RANGE/PCT	12.8/ 14/ .0448	12.8/ 14/ .0448
NOX SAMPLE METER/RANGE/PPM	25.5/ 1/ 6.5	6.1/ 1/ 1.6
NOX BCKGRD METER/RANGE/PPM	.5/ 1/ .1	.4/ 1/ .1
DILUTION FACTOR	18.28	25.85
THC CONCENTRATION PPM	3.	1.
CO CONCENTRATION PPM	32.	17.
CO2 CONCENTRATION PCT	.6864	.4730
NOX CONCENTRATION PPM	6.3	1.5
THC MASS GRAMS	.14	.08
CO MASS GRAMS	2.82	2.49
CO2 MASS GRAMS	943.2	1118.7
NOX MASS GRAMS	.92	.37
THC GRAMS/MI	.04	.02
CO GRAMS/MI	.79	.64
CO2 GRAMS/MI	263.8	289.0
NOX GRAMS/MI	.26	.10
FUEL ECONOMY IN MPG	33.45	30.57
RUN TIME SECONDS	505.	868.
MEASURED DISTANCE MI	3.58	3.87
SCF, DRY	.977	.979

COMPOSITE RESULTS

TEST NUMBER		1 1
BAROMETER	MM HG	737.6
HUMIDITY	G/KG	11.0
TEMPERATURE	DEG C	26.1

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	276.9	(.0)
FUEL ECONOMY	MPG	31.89	(.00)
HYDROCARBONS (THC)	G/MI	.03	(.00)
CARBON MONOXIDE	G/MI	.71	(.00)
OXIDES OF NITROGEN	G/MI	.17	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP3 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 1 RUN 4
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

VEHICLE NO.2
DATE 3/31/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33608. KM(20883. MILES)

BAROMETER 737.11 MM HG(29.02 IN HG)
RELATIVE HUMIDITY 51. PCT
DRY BULB TEMP. 27.2 DEG C(81.0 DEG F)
ABS. HUMIDITY 12.0 GM/KG

NOX HUMIDITY CORRECTION FACTOR 1.05

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)	41.7 (107.0)
BLOWER REVOLUTIONS	40493.	69611.
TOT FLOW STD. CU. METRES(SCF)	74.9 (2644.)	129.0 (4555.)
THC SAMPLE METER/RANGE/PPM	9.0/ 2/ 9.	6.3/ 2/ 6.
THC BCKGRD METER/RANGE/PPM	5.5/ 2/ 6.	5.7/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	38.2/ 12/ 38.	14.1/ 12/ 14.
CO BCKGRD METER/RANGE/PPM	.7/ 12/ 1.	.5/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	82.1/ 14/ .6998	71.2/ 14/ .5204
CO2 BCKGRD METER/RANGE/PCT	12.7/ 14/ .0444	12.7/ 14/ .0444
NOX SAMPLE METER/RANGE/PPM	26.5/ 1/ 6.7	8.8/ 1/ 2.3
NOX BCKGRD METER/RANGE/PPM	.6/ 1/ .2	.5/ 1/ .1
DILUTION FACTOR	19.02	25.65
THC CONCENTRATION PPM	4.	1.
CO CONCENTRATION PPM	36.	13.
CO2 CONCENTRATION PCT	.6577	.4777
NOX CONCENTRATION PPM	6.6	2.2
THC MASS GRAMS	.17	.06
CO MASS GRAMS	3.18	2.02
CO2 MASS GRAMS	901.8	1128.2
NOX MASS GRAMS	.98	.56
THC GRAMS/MI	.05	.02
CO GRAMS/MI	.89	.52
CO2 GRAMS/MI	252.2	291.3
NOX GRAMS/MI	.27	.14
FUEL ECONOMY IN MPG	34.95	30.35
RUN TIME SECONDS	505.	868.
MEASURED DISTANCE MI	3.58	3.87
SCF, DRY	.977	.979

COMPOSITE RESULTS

TEST NUMBER		1 1
BAROMETER	MM HG	737.1
HUMIDITY	G/KG	12.0
TEMPERATURE	DEG C	27.2

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	272.6	(.0)
FUEL ECONOMY	MPG	32.39	(.00)
HYDROCARBONS (THC)	G/MI	.03	(.00)
CARBON MONOXIDE	G/MI	.70	(.00)
OXIDES OF NITROGEN	G/MI	.21	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
F-COOL - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 1 RUN 5
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

VEHICLE NO.2
DATE 3/31/88
BAG CART NO. 2
DYNO NO. 3
CVS NO. 2

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33619. KM(20890. MILES)

BAROMETER 733.81 MM HG(28.89 IN HG)
RELATIVE HUMIDITY 79. PCT

DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
ABS. HUMIDITY 15.7 GM/KG

NOX HUMIDITY CORRECTION FACTOR 1.20

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET P MM. H2O(IN. H2O)	762.0 (30.0)	762.0 (30.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)	42.8 (109.0)
BLOWER REVOLUTIONS	40548.	69733.
TOT FLOW STD. CU. METRES(SCF)	74.5 (2632.)	128.3 (4531.)
THC SAMPLE METER/RANGE/PPM	69.7/ 2/ 70.	7.6/ 2/ 8.
THC BCKGRD METER/RANGE/PPM	6.8/ 2/ 7.	7.3/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	75.8/ 14/ 356.	17.6/ 12/ 18.
CO BCKGRD METER/RANGE/PPM	.5/ 14/ 2.	1.3/ 12/ 1.
CO2 SAMPLE METER/RANGE/PCT	87.5/ 14/ .8102	71.9/ 14/ .5305
CO2 BCKGRD METER/RANGE/PCT	12.7/ 14/ .0444	13.0/ 14/ .0456
NOX SAMPLE METER/RANGE/PPM	71.3/ 1/ 17.9	6.5/ 1/ 1.7
NOX BCKGRD METER/RANGE/PPM	.3/ 1/ .0	.4/ 1/ .1
DILUTION FACTOR	15.74	25.14
THC CONCENTRATION PPM	64.	1.
CO CONCENTRATION PPM	339.	16.
CO2 CONCENTRATION PCT	.7686	.4867
NOX CONCENTRATION PPM	17.8	1.6
THC MASS GRAMS	2.73	.04
CO MASS GRAMS	29.45	2.38
CO2 MASS GRAMS	1049.0	1143.4
NOX MASS GRAMS	3.04	.47
THC GRAMS/MI	.76	.01
CO GRAMS/MI	8.16	.61
CO2 GRAMS/MI	290.6	292.7
NOX GRAMS/MI	.84	.12
FUEL ECONOMY IN MPG	29.00	30.20
RUN TIME SECONDS	505.	869.
MEASURED DISTANCE MI	3.61	3.91
SCF, DRY	.967	.970

COMPOSITE RESULTS

TEST NUMBER		1 1
BAROMETER	MM HG	733.8
HUMIDITY	G/KG	15.7
TEMPERATURE	DEG C	24.4

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	291.7	(.0)
FUEL ECONOMY	MPG	29.61	(.00)
HYDROCARBONS (THC)	G/MI	.37	(.00)
CARBON MONOXIDE	G/MI	4.23	(.00)
OXIDES OF NITROGEN	G/MI	.47	(.00)

THIRD SCREENING TEST

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH

FTP - VEHICLE EMISSIONS RESULTS -

PROJECT 08-1816-001

TEST NO. 1 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

VEHICLE NO.2
DATE 6/21/88
BAG CART NO. 1 / CVS NO. 2
DYND NO. 3

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33643. KM(20905. MILES)

BAROMETER 743.46 MM HG(29.27 IN HG)
RELATIVE HUMIDITY 52. PCT

DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
ABS. HUMIDITY 10.2 GM/KG

NOX HUMIDITY CORRECTION FACTOR .98

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)	774.7 (30.5)	774.7 (30.5)	774.7 (30.5)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)	774.7 (30.5)	774.7 (30.5)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)	41.7 (107.0)	42.2 (108.0)	40.0 (104.0)
BLOWER REVOLUTIONS	40558.	69542.	40467.	69448.
TOT FLOW STD. CU. METRES(SCF)	75.6 (2669.)	129.9 (4585.)	75.5 (2665.)	130.1 (4593.)
THC SAMPLE METER/RANGE/PPM	66.7/ 2/ 67.	7.2/ 2/ 7.	9.3/ 2/ 9.	6.9/ 2/ 7.
THC BCKGRD METER/RANGE/PPM	7.4/ 2/ 7.	6.2/ 2/ 6.	6.3/ 2/ 6.	6.3/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	81.0/ 11/ 365.	31.3/ 13/ 29.	35.8/ 13/ 33.	24.2/ 13/ 22.
CO BCKGRD METER/RANGE/PPM	.9/ 11/ 2.	2.3/ 13/ 2.	1.7/ 13/ 1.	1.6/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	86.4/ 11/ .8336	63.8/ 11/ .5339	81.3/ 11/ .7588	61.1/ 11/ .5030
CO2 BCKGRD METER/RANGE/PCT	7.8/ 11/ .0465	7.6/ 11/ .0452	7.4/ 11/ .0440	7.6/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM	20.0/ 2/ 20.0	4.5/ 1/ 1.2	17.2/ 1/ 4.4	5.3/ 1/ 1
NOX BCKGRD METER/RANGE/PPM	.3/ 2/ .3	.0/ 1/ .0	.3/ 1/ .0	.2/ 1/ .0
DILUTION FACTOR	15.30	24.93	17.56	26.49
THC CONCENTRATION PPM	60.	1.	3.	1.
CO CONCENTRATION PPM	351.	26.	30.	20.
CO2 CONCENTRATION PCT	.7902	.4905	.7174	.4595
NOX CONCENTRATION PPM	19.7	1.2	4.3	1.3
THC MASS GRAMS	2.61	.09	.15	.06
CO MASS GRAMS	30.91	3.91	2.67	3.02
CO2 MASS GRAMS	1093.5	1166.2	991.4	1094.2
NOX MASS GRAMS	2.80	.28	.61	.32
THC GRAMS/MI	.73	.02	.04	.02
CO GRAMS/MI	8.64	1.02	.75	.78
CO2 GRAMS/MI	305.5	303.3	278.1	284.3
NOX GRAMS/MI	.78	.07	.17	.08
FUEL ECONOMY IN MPG	27.59 28.34	29.08	31.73 31.37	31.05
RUN TIME SECONDS	505.	867.	505.	867.
MEASURED DISTANCE MI	3.58 7.42	3.85	3.56 7.41	3.85
SCF, DRY	.976 .977	.978	.976 .978	.979
DFC, WET (DRY)	.951(.935)		.955(.939)	
TOT VOL (SCM) / SAM BLR (SCM)	205.4/ .00		205.6/ .00	

COMPOSITE RESULTS

TEST NUMBER		1 1
BAROMETER	MM HG	743.5
HUMIDITY	G/KG	10.2
TEMPERATURE	DEG C	24.4

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	296.9	(291.2)
FUEL ECONOMY	MPG	29.42	(29
HYDROCARBONS (THC)	G/MI	.17	(.
CARBON MONOXIDE	G/MI	2.52	(2.45)
OXIDES OF NITROGEN	G/MI	.25	(.25)

BEFORE FINAL EMISSIONS TEST
SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
FTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

VEHICLE NO.2
DATE 11/29/88
BAG CART NO. 1 / CVS NO. 2
DYNO NO. 3

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33853. KM(21035. MILES)

BAROMETER 743.20 MM HG(29.26 IN HG)
RELATIVE HUMIDITY 40. PCT

DRY BULB TEMP. 25.6 DEG C(78.0 DEG F)
ABS. HUMIDITY 8.3 GM/KG

NOX HUMIDITY CORRECTION FACTOR .93

BAG RESULTS

BAG NUMBER	1	2	3	4
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)	777.2 (30.6)	774.7 (30.5)	782.3 (30.8)
BLOWER INLET P MM. H2O(IN. H2O)	767.1 (30.2)	769.6 (30.3)	764.5 (30.1)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)	40.0 (104.0)	42.2 (108.0)	40.0 (104.0)
BLOWER REVOLUTIONS	40605.	69264.	40515.	69486.
TOT FLOW STD. CU. METRES(SCF)	75.8 (2676.)	129.8 (4582.)	75.6 (2671.)	130.1 (4593.)
THC SAMPLE METER/RANGE/PPM	76.1/ 2/ 76.	9.1/ 2/ 9.	13.3/ 2/ 13.	9.3/ 2/ 9.
THC BCKGRD METER/RANGE/PPM	8.5/ 2/ 9.	9.2/ 2/ 9.	8.9/ 2/ 9.	9.2/ 2/ 9.
CO SAMPLE METER/RANGE/PPM	97.6/ 11/ 519.	37.9/ 13/ 35.	78.8/ 13/ 78.	37.2/ 13/ 34.
CO BCKGRD METER/RANGE/PPM	.4/ 11/ 1.	1.3/ 13/ 1.	.1/ 13/ 0.	.4/ 13/ 0.
CO2 SAMPLE METER/RANGE/PCT	89.6/ 11/ .8830	67.0/ 11/ .5718	82.3/ 11/ .7731	65.3/ 11/ .5515
CO2 BCKGRD METER/RANGE/PCT	7.8/ 11/ .0465	7.8/ 11/ .0465	7.7/ 11/ .0458	7.7/ 11/ .0458
NOX SAMPLE METER/RANGE/PPM	21.6/ 2/ 21.6	2.0/ 2/ 2.0	8.1/ 2/ 8.1	1.7/ 2/ 1.7
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1	.3/ 2/ .3	.0/ 2/ .0	.1/ 2/ .1
DILUTION FACTOR	14.24	23.26	17.14	24.11
THC CONCENTRATION PPM	68.	0.	5.	0.
CO CONCENTRATION PPM	502.	33.	75.	33.
CO2 CONCENTRATION PCT	.8398	.5273	.7300	.5076
NOX CONCENTRATION PPM	21.5	1.7	8.1	1.6
THC MASS GRAMS	2.98	.02	.21	.04
CO MASS GRAMS	44.33	4.98	6.63	5.00
CO2 MASS GRAMS	1165.2	1252.7	1010.8	1208.7
NOX MASS GRAMS	2.89	.39	1.09	.37
THC GRAMS/MI	.83	.01	.06	.01
CO GRAMS/MI	12.31	1.28	1.84	1.28
CO2 GRAMS/MI	323.5	322.3	280.8	310.4
NOX GRAMS/MI	.80	.10	.30	.10
FUEL ECONOMY IN MPG	25.67 26.51	27.35	31.23 29.68	28.38
RUN TIME SECONDS	506.	864.	505.	867.
MEASURED DISTANCE MI	3.60 7.49	3.89	3.60 7.49	3.89
SCF, DRY	.979 .981	.982	.980 .981	.982
DFC, WET (DRY)	.947(.935)		.952(.940)	
TOT VOL (SCM) / SAM BLR (SCM)	205.5/ .00		205.7/ .00	

COMPOSITE RESULTS

TEST NUMBER		1
BAROMETER	MM HG	743.2
HUMIDITY	G/KG	8.3
TEMPERATURE	DEG C	25.6

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	311.2	(307.6)
FUEL ECONOMY	MPG	27.92	(28.23)
HYDROCARBONS (THC)	G/MI	.19	(.19)
CARBON MONOXIDE	G/MI	3.71	(3.72)
OXIDES OF NITROGEN	G/MI	.30	(.30)

FINAL EMISSIONS TEST
SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
FTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

VEHICLE NO.2
DATE 12/ 1/88
BAG CART NO. 1 / CVS NO. 2
DYNO NO. 3

TEST WEIGHT 1304. KG(2875. LBS.
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33894. KM(21061. MILES)

BAROMETER 752.60 MM HG(29.63 IN HG)
RELATIVE HUMIDITY 19. PCT
BAG RESULTS

DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)
ABS. HUMIDITY 3.0 GM/KG

NOX HUMIDITY CORRECTION FACTOR .80

BAG NUMBER	1	2	3	4
DESCRIPTION	COLD TRANSIENT	STABILIZED	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	787.4 (31.0)	792.5 (31.2)	774.7 (30.5)	797.6 (31.4)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)	792.5 (31.2)	772.2 (30.4)	792.5 (31.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)	35.0 (95.0)	41.1 (106.0)	37.2 (99.0)
BLOWER REVOLUTIONS	40588.	69604.	40621.	69563.
TOT FLOW STD. CU. METRES(SCF)	76.6 (2705.)	133.2 (4704.)	77.0 (2719.)	132.5 (4677.)
THC SAMPLE METER/RANGE/PPM	71.2/ 2/ 71.	7.4/ 2/ 7.	10.7/ 2/ 11.	7.7/ 2/ 8.
THC BCKGRD METER/RANGE/PPM	5.9/ 2/ 6.	6.8/ 2/ 7.	7.0/ 2/ 7.	7.5/ 2/ 8.
CO SAMPLE METER/RANGE/PPM	89.1/ 11/ 434.	40.3/ 13/ 37.	51.7/ 13/ 49.	30.2/ 13/ 27.
CO BCKGRD METER/RANGE/PPM	.6/ 11/ 2.	1.6/ 13/ 1.	1.3/ 13/ 1.	1.5/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	87.4/ 11/ .8488	64.7/ 11/ .5444	80.7/ 11/ .7504	63.4/ 11/ .5293
CO2 BCKGRD METER/RANGE/PCT	7.4/ 11/ .0440	7.5/ 11/ .0446	7.6/ 11/ .0452	7.6/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM	25.9/ 2/ 25.9	2.3/ 2/ 2.3	8.3/ 2/ 8.3	1.8/ 2/ 1.8
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .2	.1/ 2/ .1	.1/ 2/ .1	.1/ 2/ .1
DILUTION FACTOR	14.92	24.42	17.72	25.15
THC CONCENTRATION PPM	66.	1.	4.	0.
CO CONCENTRATION PPM	422.	35.	46.	26.
CO2 CONCENTRATION PCT	.8078	.5017	.7077	.4859
NOX CONCENTRATION PPM	25.7	2.2	8.2	1.7
THC MASS GRAMS	2.90	.07	.18	.04
CO MASS GRAMS	37.68	5.47	4.17	3.97
CO2 MASS GRAMS	1133.1	1223.4	997.6	1178.3
NOX MASS GRAMS	3.01	.45	.96	.34
THC GRAMS/MI	.80	.02	.05	.01
CO GRAMS/MI	10.45	1.40	1.16	1.02
CO2 GRAMS/MI	314.1	314.3	277.3	301.7
NOX GRAMS/MI	.83	.12	.27	.09
FUEL ECONOMY IN MPG	26.62 27.32	28.01	31.75 30.39	29.23
RUN TIME SECONDS	505.	867.	506.	868.
MEASURED DISTANCE MI	3.61 7.50	3.89	3.60 7.50	3.91
SCF, DRY	.986 .988	.989	.987 .988	.989
DFC, WET (DRY)	.950(.944)		.954(.948)	
TOT VOL (SCM) / SAM BLR (SCM)	209.8/ .00		209.5/ .00	

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	752.6
HUMIDITY	G/KG	3.0
TEMPERATURE	DEG C	21.1

		3-BAG	(4-BAG)
CARBON DIOXIDE	G/MI	304.2	(300.4)
FUEL ECONOMY	MPG	28.62	(28.99)
HYDROCARBONS (THC)	G/MI	.19	(.19)
CARBON MONOXIDE	G/MI	3.21	(3.09)
OXIDES OF NITROGEN	G/MI	.31	(

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
CFTP - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 752.60 MM HG(29.63 IN HG)
RELATIVE HUMIDITY 19. PCT

VEHICLE NO.2
DATE 12/ 1/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 21.1 DEG C(70.0 DEG F)
ABS. HUMIDITY 3.0 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33894. KM(21061. MILES)

NOX HUMIDITY CORRECTION FACTOR .80

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	787.4 (31.0)	792.5 (31.2)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)	792.5 (31.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)	35.0 (95.0)
BLOWER REVOLUTIONS	40588.	69604.
TOT FLOW STD. CU. METRES(SCF)	76.6 (2705.)	133.2 (4704.)
THC SAMPLE METER/RANGE/PPM	71.2/ 2/ 71.	7.4/ 2/ 7.
THC BCKGRD METER/RANGE/PPM	5.9/ 2/ 6.	6.8/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	89.1/ 11/ 434.	40.3/ 13/ 37.
CO BCKGRD METER/RANGE/PPM	.6/ 11/ 2.	1.6/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	87.4/ 11/ .8488	64.7/ 11/ .5444
CO2 BCKGRD METER/RANGE/PCT	7.4/ 11/ .0440	7.5/ 11/ .0446
NOX SAMPLE METER/RANGE/PPM	25.9/ 2/ 25.9	2.3/ 2/ 2.3
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .2	.1/ 2/ .1
DILUTION FACTOR	14.92	24.42
THC CONCENTRATION PPM	66.	1.
CO CONCENTRATION PPM	422.	35.
CO2 CONCENTRATION PCT	.8078	.5017
NOX CONCENTRATION PPM	25.7	2.2
THC MASS GRAMS	2.90	.07
CO MASS GRAMS	37.68	5.47
CO2 MASS GRAMS	1133.1	1223.4
NOX MASS GRAMS	3.01	.45
THC GRAMS/MI	.80	.02
CO GRAMS/MI	10.45	1.40
CO2 GRAMS/MI	314.1	314.3
NOX GRAMS/MI	.83	.12
FUEL ECONOMY IN MPG	26.62	28.01
RUN TIME SECONDS	505.	867.
MEASURED DISTANCE MI	3.61	3.89
SCF, DRY	.986	.989

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	752.6
HUMIDITY	G/KG	3.0
TEMPERATURE	DEG C	21.1

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	314.2	(.0)
FUEL ECONOMY	MPG	27.32	(.00)
HYDROCARBONS (THC)	G/MI	.40	(.00)
CARBON MONOXIDE	G/MI	5.75	(.00)
OXIDES OF NITROGEN	G/MI	.46	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP1 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 753.11 MM HG(29.65 IN HG)
RELATIVE HUMIDITY 18. PCT

VEHICLE NO.2
DATE 12/ 1/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 22.2 DEG C(72.0 DEG F)
ABS. HUMIDITY 3.1 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33907. KM(21069. MILES)

NOX HUMIDITY CORRECTION FACTOR .80

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)	797.6 (31.4)
BLOWER INLET P MM. H2O(IN. H2O)	772.2 (30.4)	792.5 (31.2)
BLOWER INLET TEMP. DEG. C(DEG. F)	41.1 (106.0)	37.2 (99.0)
BLOWER REVOLUTIONS	40621.	69563.
TOT FLOW STD. CU. METRES(SCF)	77.1 (2721.)	132.6 (4681.)
THC SAMPLE METER/RANGE/PPM	10.7/ 2/ 11.	7.7/ 2/ 8.
THC BCKGRD METER/RANGE/PPM	7.0/ 2/ 7.	7.5/ 2/ 8.
CO SAMPLE METER/RANGE/PPM	51.7/ 13/ 49.	30.2/ 13/ 27.
CO BCKGRD METER/RANGE/PPM	1.3/ 13/ 1.	1.5/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	80.7/ 11/ .7504	63.4/ 11/ .5293
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0452	7.6/ 11/ .0452
NOX SAMPLE METER/RANGE/PPM	8.3/ 2/ 8.3	1.8/ 2/ 1.8
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1	.1/ 2/ .1
DILUTION FACTOR	17.72	25.15
THC CONCENTRATION PPM	4.	0.
CO CONCENTRATION PPM	47.	26.
CO2 CONCENTRATION PCT	.7077	.4859
NOX CONCENTRATION PPM	8.2	1.7
THC MASS GRAMS	.18	.04
CO MASS GRAMS	4.17	3.98
CO2 MASS GRAMS	998.3	1179.2
NOX MASS GRAMS	.97	.35
THC GRAMS/MI	.05	.01
CO GRAMS/MI	1.16	1.02
CO2 GRAMS/MI	277.5	301.9
NOX GRAMS/MI	.27	.09
FUEL ECONOMY IN MPG	31.73	29.21
RUN TIME SECONDS	506.	868.
MEASURED DISTANCE MI	3.60	3.91
SCF, DRY	.987	.989

COMPOSITE RESULTS

TEST NUMBER	2 1
BAROMETER MM HG	753.1
HUMIDITY G/KG	3.1
TEMPERATURE DEG C	22.2

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	290.2	(.0)
FUEL ECONOMY	MPG	30.37	(.00)
HYDROCARBONS (THC)	G/MI	.03	(.00)
CARBON MONOXIDE	G/MI	1.09	(.00)
OXIDES OF NITROGEN	G/MI	.17	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP2 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 753.11 MM HG(29.65 IN HG)
RELATIVE HUMIDITY 18. PCT

VEHICLE NO.2
DATE 12/ 1/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
ABS. HUMIDITY 3.1 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33919. KM(21076. MILES)

NOX HUMIDITY CORRECTION FACTOR .80

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	789.9 (31.1)	792.5 (31.2)
BLOWER INLET P MM. H2O(IN. H2O)	789.9 (31.1)	789.9 (31.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	40.6 (105.0)	37.8 (100.0)
BLOWER REVOLUTIONS	40462.	69514.
TOT FLOW STD. CU. METRES(SCF)	76.6 (2706.)	132.4 (4674.)
THC SAMPLE METER/RANGE/PPM	12.4/ 2/ 12.	8.7/ 2/ 9.
THC BCKGRD METER/RANGE/PPM	7.9/ 2/ 8.	8.6/ 2/ 9.
CO SAMPLE METER/RANGE/PPM	46.8/ 13/ 44.	26.3/ 13/ 24.
CO BCKGRD METER/RANGE/PPM	.0/ 13/ 0.	.2/ 13/ 0.
CO2 SAMPLE METER/RANGE/PCT	80.2/ 11/ .7433	63.6/ 11/ .5316
CO2 BCKGRD METER/RANGE/PCT	7.6/ 11/ .0452	7.7/ 11/ .0458
NOX SAMPLE METER/RANGE/PPM	6.8/ 2/ 6.8	1.7/ 2/ 1.7
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1	.1/ 2/ .1
DILUTION FACTOR	17.89	25.06
THC CONCENTRATION PPM	5.	0.
CO CONCENTRATION PPM	43.	23.
CO2 CONCENTRATION PCT	.7006	.4876
NOX CONCENTRATION PPM	6.7	1.6
THC MASS GRAMS	.22	.03
CO MASS GRAMS	3.81	3.58
CO2 MASS GRAMS	983.1	1181.7
NOX MASS GRAMS	.79	.33
THC GRAMS/MI	.06	.01
CO GRAMS/MI	1.06	.92
CO2 GRAMS/MI	273.4	303.7
NOX GRAMS/MI	.22	.08
FUEL ECONOMY IN MPG	32.22	29.06
RUN TIME SECONDS	505.	868.
MEASURED DISTANCE MI	3.60	3.89
SCF, DRY	.987	.989

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	753.1
HUMIDITY	G/KG	3.1
TEMPERATURE	DEG C	23.3

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	289.1	(.0)
FUEL ECONOMY	MPG	30.49	(.00)
HYDROCARBONS (THC)	G/MI	.03	(.00)
CARBON MONOXIDE	G/MI	.99	(.00)
OXIDES OF NITROGEN	G/MI	.15	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFTP3 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 753.11 MM HG(29.65 IN HG)
RELATIVE HUMIDITY 16. PCT

VEHICLE NO.2
DATE 12/ 1/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
ABS. HUMIDITY 2.9 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33930. KM(21083. MILES)

NOX HUMIDITY CORRECTION FACTOR .80

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	787.4 (31.0)	789.9 (31.1)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	40.6 (105.0)	38.9 (102.0)
BLOWER REVOLUTIONS	40542.	69434.
TOT FLOW STD. CU. METRES(SCF)	76.8 (2712.)	132.0 (4660.)
THC SAMPLE METER/RANGE/PPM	10.7/ 2/ 11.	9.0/ 2/ 9.
THC BCKGRD METER/RANGE/PPM	8.3/ 2/ 8.	8.8/ 2/ 9.
CO SAMPLE METER/RANGE/PPM	46.7/ 13/ 44.	26.8/ 13/ 24.
CO BCKGRD METER/RANGE/PPM	.0/ 13/ 0.	.1/ 13/ 0.
CO2 SAMPLE METER/RANGE/PCT	80.4/ 11/ .7461	63.4/ 11/ .5293
CO2 BCKGRD METER/RANGE/PCT	7.7/ 11/ .0458	7.8/ 11/ .0465
NOX SAMPLE METER/RANGE/PPM	5.4/ 2/ 5.4	1.6/ 2/ 1.6
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1	.1/ 2/ .1
DILUTION FACTOR	17.83	25.16
THC CONCENTRATION PPM	3.	1.
CO CONCENTRATION PPM	43.	24.
CO2 CONCENTRATION PCT	.7029	.4847
NOX CONCENTRATION PPM	5.3	1.5
THC MASS GRAMS	.13	.04
CO MASS GRAMS	3.82	3.66
CO2 MASS GRAMS	988.5	1171.0
NOX MASS GRAMS	.62	.30
THC GRAMS/MI	.04	.01
CO GRAMS/MI	1.06	.94
CO2 GRAMS/MI	274.7	301.2
NOX GRAMS/MI	.17	.08
FUEL ECONOMY IN MPG	32.07	29.30
RUN TIME SECONDS	506.	867.
MEASURED DISTANCE MI	3.60	3.89
SCF, DRY	.988	.990

COMPOSITE RESULTS

TEST NUMBER 2
BAROMETER MM HG 753.1
HUMIDITY G/KG 2.9
TEMPERATURE DEG C 23.9

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	288.5	(.0)
FUEL ECONOMY	MPG	30.57	(.00)
HYDROCARBONS (THC)	G/MI	.02	(.00)
CARBON MONOXIDE	G/MI	1.00	(.00)
OXIDES OF NITROGEN	G/MI	.12	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
FCOOL - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 750.57 MM HG(29.55 IN HG)
RELATIVE HUMIDITY 20. PCT

VEHICLE NO.2
DATE 12/ 1/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
ABS. HUMIDITY 3.8 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33948. KM(21094. MILES)

NOX HUMIDITY CORRECTION FACTOR .81

BAG RESULTS

BAG NUMBER	1	2
DESCRIPTION	HOT TRANSIENT	STABILIZED
BLOWER DIF P MM. H2O(IN. H2O)	777.2 (30.6)	782.3 (30.8)
BLOWER INLET P MM. H2O(IN. H2O)	772.2 (30.4)	784.9 (30.9)
BLOWER INLET TEMP. DEG. C(DEG. F)	44.4 (112.0)	41.7 (107.0)
BLOWER REVOLUTIONS	40551.	69566.
TOT FLOW STD. CU. METRES(SCF)	76.2 (2689.)	131.1 (4629.)
THC SAMPLE METER/RANGE/PPM	55.4/ 2/ 55.	8.4/ 2/ 8.
THC BCKGRD METER/RANGE/PPM	6.8/ 2/ 7.	7.7/ 2/ 8.
CO SAMPLE METER/RANGE/PPM	83.4/ 11/ 385.	32.8/ 13/ 30.
CO BCKGRD METER/RANGE/PPM	.1/ 11/ 0.	.8/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	85.8/ 11/ .8246	64.8/ 11/ .5456
CO2 BCKGRD METER/RANGE/PCT	7.5/ 11/ .0446	7.5/ 11/ .0446
NOX SAMPLE METER/RANGE/PPM	22.5/ 2/ 22.5	2.2/ 2/ 2.2
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1	.0/ 2/ .0
DILUTION FACTOR	15.44	24.39
THC CONCENTRATION PPM	49.	1.
CO CONCENTRATION PPM	376.	29.
CO2 CONCENTRATION PCT	.7829	.5028
NOX CONCENTRATION PPM	22.4	2.2
THC MASS GRAMS	2.15	.08
CO MASS GRAMS	33.32	4.39
CO2 MASS GRAMS	1091.7	1206.9
NOX MASS GRAMS	2.66	.45
THC GRAMS/MI	.60	.02
CO GRAMS/MI	9.34	1.14
CO2 GRAMS/MI	305.9	313.4
NOX GRAMS/MI	.75	.12
FUEL ECONOMY IN MPG	27.50	28.13
RUN TIME SECONDS	505.	868.
MEASURED DISTANCE MI	3.57	3.85
SCF, DRY	.986	.989

COMPOSITE RESULTS

TEST NUMBER		2
BAROMETER	MM HG	750.6
HUMIDITY	G/KG	3.8
TEMPERATURE	DEG C	24.4

		2-BAG	(3-BAG)
CARBON DIOXIDE	G/MI	309.8	(.0)
FUEL ECONOMY	MPG	27.82	(.00)
HYDROCARBONS (THC)	G/MI	.30	(.00)
CARBON MONOXIDE	G/MI	5.08	(.00)
OXIDES OF NITROGEN	G/MI	.42	(.00)

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFET1 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 752.35 MM HG(29.62 IN HG)
RELATIVE HUMIDITY 27. PCT
BAG RESULTS

VEHICLE NO.2
DATE 12/ 2/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 21.7 DEG C(71.0 DEG F)
ABS. HUMIDITY 4.4 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 33981. KM(21115. MILES)

NOX HUMIDITY CORRECTION FACTOR .83

TEST CYCLE	HFET1
BLOWER DIF P MM. H2O(IN. H2O)	789.9 (31.1)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)
BLOWER REVOLUTIONS	61457.
TOT FLOW STD. CU. METRES(SCF)	116.0 (4095.)
THC SAMPLE METER/RANGE/PPM	8.3/ 2/ 8.
THC BCKGRD METER/RANGE/PPM	6.1/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	12.1/ 13/ 11.
CO BCKGRD METER/RANGE/PPM	3.5/ 13/ 3.
CO2 SAMPLE METER/RANGE/PCT	59.2/ 3/1.0469
CO2 BCKGRD METER/RANGE/PCT	2.7/ 3/ .0440
NOX SAMPLE METER/RANGE/PPM	4.1/ 2/ 4.1
NOX BCKGRD METER/RANGE/PPM	1.1/ 2/ 1.1
DILUTION FACTOR	12.78
THC CONCENTRATION PPM	3.
CO CONCENTRATION PPM	8.
CO2 CONCENTRATION PCT	1.0063
NOX CONCENTRATION PPM	3.1
THC MASS GRAMS	.18
CO MASS GRAMS	1.03
CO2 MASS GRAMS	2136.4
NOX MASS GRAMS	.57
RUN TIME SECONDS	765.
DFC, WET (DRY)	.922 (.914)
SCF, WET (DRY)	1.000 (.982)
VOL (SCM)	116.0
SAM BLR (SCM)	.00
MI (MEASURED)	10.31

TEST NUMBER,		1
BAROMETER,	MM HG	752.3
HUMIDITY,	G/KG	4.4
TEMPERATURE,	DEG C	21.7
CARBON DIOXIDE,	G/MI	207.2
FUEL ECONOMY,	MPG	42.8
HYDROCARBONS, (THC)	G/MI	.02
CARBON MONOXIDE,	G/MI	.10
OXIDES OF NITROGEN,	G/MI	.05

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFET2 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 2 RUN 1	VEHICLE NO.2	TEST WEIGHT 1304. KG(2875. LBS)
VEHICLE MODEL 86 TOYOTA CAMRY	DATE 12/ 2/88	ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
ENGINE 2.0 L(122. CID) L-4	BAG CART NO. 1	GASOLINE EM-784-F
TRANSMISSION A4	DYNO NO. 3	ODOMETER 33997. KM(21125. MILES)
	CVS NO. 2	
BAROMETER 752.86 MM HG(29.64 IN HG)	DRY BULB TEMP. 22.8 DEG C(73.0 DEG F)	
RELATIVE HUMIDITY 23. PCT	ABS. HUMIDITY 3.9 GM/KG	NOX HUMIDITY CORRECTION FACTOR .82

BAG RESULTS

TEST CYCLE	HFET2
BLOWER DIF P MM. H2O(IN. H2O)	789.9 (31.1)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)
BLOWER REVOLUTIONS	61423.
TOT FLOW STD. CU. METRES(SCF)	115.7 (4087.)
THC SAMPLE METER/RANGE/PPM	8.1/ 2/ 8.
THC BCKGRD METER/RANGE/PPM	6.1/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	10.4/ 13/ 9.
CO BCKGRD METER/RANGE/PPM	1.9/ 13/ 2.
CO2 SAMPLE METER/RANGE/PCT	58.3/ 3/1.0290
CO2 BCKGRD METER/RANGE/PCT	2.5/ 3/ .0408
NOX SAMPLE METER/RANGE/PPM	3.3/ 2/ 3.3
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1
DILUTION FACTOR	13.00
THC CONCENTRATION PPM	2.
CO CONCENTRATION PPM	7.
CO2 CONCENTRATION PCT	.9914
NOX CONCENTRATION PPM	3.2
THC MASS GRAMS	.16
CO MASS GRAMS	1.00
CO2 MASS GRAMS	2100.9
NOX MASS GRAMS	.58
RUN TIME SECONDS	765.
DFC, WET (DRY)	.923 (.916)
SCF, WET (DRY)	1.000 (.983)
VOL (SCM)	115.7
SAM BLR (SCM)	.00
MI (MEASURED)	10.31
TEST NUMBER,	2
BAROMETER, MM HG	752.9
HUMIDITY, G/KG	3.9
TEMPERATURE, DEG C	22.8
CARBON DIOXIDE, G/MI	203.7
FUEL ECONOMY, MPG	43.5
HYDROCARBONS, (THC) G/MI	.02
CARBON MONOXIDE, G/MI	.10
OXIDES OF NITROGEN, G/MI	.06

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFET3 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 3 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 752.86 MM HG(29.64 IN HG)
RELATIVE HUMIDITY 24. PCT

VEHICLE NO.2
DATE 12/ 2/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)
ABS. HUMIDITY 4.2 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 34015. KM(21136. MILES)

NOX HUMIDITY CORRECTION FACTOR .82

BAG RESULTS

TEST CYCLE	HFET3
BLOWER DIF P MM. H2O(IN. H2O)	787.4 (31.0)
BLOWER INLET P MM. H2O(IN. H2O)	787.4 (31.0)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.3 (110.0)
BLOWER REVOLUTIONS	61429.
TOT FLOW STD. CU. METRES(SCF)	115.8 (4088.)
THC SAMPLE METER/RANGE/PPM	7.9/ 2/ 8.
THC BCKGRD METER/RANGE/PPM	6.4/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	12.1/ 13/ 11.
CO BCKGRD METER/RANGE/PPM	1.7/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	58.9/ 3/1.0409
CO2 BCKGRD METER/RANGE/PCT	2.9/ 3/ .0473
NOX SAMPLE METER/RANGE/PPM	3.6/ 2/ 3.6
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1
DILUTION FACTOR	12.85
THC CONCENTRATION PPM	2.
CO CONCENTRATION PPM	9.
CO2 CONCENTRATION PCT	.9973
NOX CONCENTRATION PPM	3.5
THC MASS GRAMS	.13
CO MASS GRAMS	1.22
CO2 MASS GRAMS	2113.9
NOX MASS GRAMS	.64
RUN TIME SECONDS	765.
DFC, WET (DRY)	.922 (.915)
SCF, WET (DRY)	1.000 (.983)
VOL (SCM)	115.8
SAM BLR (SCM)	.00
MI (MEASURED)	10.33

TEST NUMBER,		3
BAROMETER,	MM HG	752.9
HUMIDITY,	G/KG	4.2
TEMPERATURE,	DEG C	23.3
CARBON DIOXIDE,	G/MI	204.7
FUEL ECONOMY,	MPG	43.3
HYDROCARBONS, (THC)	G/MI	.01
CARBON MONOXIDE,	G/MI	.12
OXIDES OF NITROGEN,	G/MI	.06

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
HFET4 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

T NO. 4 RUN 1	VEHICLE NO.2	TEST WEIGHT 1304. KG(2875. LBS)
HICLE MODEL 86 TOYOTA CAMRY	DATE 12/ 2/88	ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
ENGINE 2.0 L(122. CID) L-4	BAG CART NO. 1	GASOLINE EM-784-F
TRANSMISSION A4	DYNO NO. 3	ODOMETER 34031. KM(21146. MILES)
	CVS NO. 2	
BAROMETER 752.60 MM HG(29.63 IN HG)	DRY BULB TEMP. 23.3 DEG C(74.0 DEG F)	
RELATIVE HUMIDITY 21. PCT	ABS. HUMIDITY 3.7 GM/KG	NOX HUMIDITY CORRECTION FACTOR .81

BAG RESULTS

TEST CYCLE	HFET4
BLOWER DIF P MM. H2O(IN. H2O)	787.4 (31.0)
BLOWER INLET P MM. H2O(IN. H2O)	789.9 (31.1)
BLOWER INLET TEMP. DEG. C(DEG. F)	43.9 (111.0)
BLOWER REVOLUTIONS	61427.
TOT FLOW STD. CU. METRES(SCF)	115.6 (4081.)
THC SAMPLE METER/RANGE/PPM	7.9/ 2/ 8.
THC BCKGRD METER/RANGE/PPM	6.2/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	13.7/ 13/ 12.
CO BCKGRD METER/RANGE/PPM	.6/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	59.6/ 3/1.0548
CO2 BCKGRD METER/RANGE/PCT	3.2/ 3/ .0522
NOX SAMPLE METER/RANGE/PPM	4.4/ 2/ 4.4
NOX BCKGRD METER/RANGE/PPM	.2/ 2/ .2
DILUTION FACTOR	12.68
THC CONCENTRATION PPM	2.
CO CONCENTRATION PPM	11.
CO2 CONCENTRATION PCT	1.0068
NOX CONCENTRATION PPM	4.2
THC MASS GRAMS	.15
CO MASS GRAMS	1.53
CO2 MASS GRAMS	2130.2
NOX MASS GRAMS	.76
RUN TIME SECONDS	766.
DFC, WET (DRY)	.921 (.915)
SCF, WET (DRY)	1.000 (.984)
VOL (SCM)	115.6
SAM BLR (SCM)	.00
MI (MEASURED)	10.30
TEST NUMBER,	4
BAROMETER, MM HG	752.6
HUMIDITY, G/KG	3.7
TEMPERATURE, DEG C	23.3
CARBON DIOXIDE, G/MI	206.8
FUEL ECONOMY, MPG	42.8
HYDROCARBONS, (THC) G/MI	.01
CARBON MONOXIDE, G/MI	.15
OXIDES OF NITROGEN, G/MI	.07

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
NYCC1 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 1 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 752.60 MM HG(29.63 IN HG)
RELATIVE HUMIDITY 22. PCT

VEHICLE NO.2
DATE 12/ 2/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
ABS. HUMIDITY 4.0 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP.
GASOLINE EM-784-F
ODOMETER 34047. KM(21156. MILES)

NOX HUMIDITY CORRECTION FACTOR .82

BAG RESULTS

TEST CYCLE	NYCC1
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)
BLOWER REVOLUTIONS	48292.
TOT FLOW STD. CU. METRES(SCF)	91.2 (3222.)
THC SAMPLE METER/RANGE/PPM	11.7/ 2/ 12.
THC BCKGRD METER/RANGE/PPM	6.1/ 2/ 6.
CO SAMPLE METER/RANGE/PPM	59.0/ 13/ 56.
CO BCKGRD METER/RANGE/PPM	.1/ 13/ 0.
CO2 SAMPLE METER/RANGE/PCT	54.2/ 11/ .4279
CO2 BCKGRD METER/RANGE/PCT	6.9/ 11/ .0409
NOX SAMPLE METER/RANGE/PPM	3.8/ 2/ 3.8
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1
DILUTION FACTOR	30.83
THC CONCENTRATION PPM	6.
CO CONCENTRATION PPM	55.
CO2 CONCENTRATION PCT	.3884
NOX CONCENTRATION PPM	3.7
THC MASS GRAMS	.31
CO MASS GRAMS	5.86
CO2 MASS GRAMS	648.8
NOX MASS GRAMS	.53
RUN TIME SECONDS	600.
DFC, WET (DRY)	.968 (.961)
SCF, WET (DRY)	1.000 (.989)
VOL (SCM)	91.2
SAM BLR (SCM)	.00
MI (MEASURED)	1.23

TEST NUMBER,		1
BAROMETER,	MM HG	752.6
HUMIDITY,	G/KG	4.0
TEMPERATURE,	DEG C	23.9
CARBON DIOXIDE,	G/MI	528.6
FUEL ECONOMY,	MPG	16.5
HYDROCARBONS, (THC)	G/MI	.25
CARBON MONOXIDE,	G/MI	4.77
OXIDES OF NITROGEN,	G/MI	.43

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
NYCC2 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

ST NO. 2 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 752.35 MM HG(29.62 IN HG)
RELATIVE HUMIDITY 22. PCT

VEHICLE NO.2
DATE 12/ 2/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 23.9 DEG C(75.0 DEG F)
ABS. HUMIDITY 4.0 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 34049. KM(21157. MILES)

NOX HUMIDITY CORRECTION FACTOR .82

BAG RESULTS

TEST CYCLE	NYCC2
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.8 (109.0)
BLOWER REVOLUTIONS	47999.
TOT FLOW STD. CU. METRES(SCF)	90.6 (3200.)
THC SAMPLE METER/RANGE/PPM	12.7/ 2/ 13.
THC BCKGRD METER/RANGE/PPM	6.7/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	62.1/ 13/ 59.
CO BCKGRD METER/RANGE/PPM	.8/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	54.2/ 11/ .4279
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0415
NOX SAMPLE METER/RANGE/PPM	4.4/ 2/ 4.4
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1
DILUTION FACTOR	30.80
THC CONCENTRATION PPM	6.
CO CONCENTRATION PPM	58.
CO2 CONCENTRATION PCT	.3878
NOX CONCENTRATION PPM	4.3
THC MASS GRAMS	.33
CO MASS GRAMS	6.09
CO2 MASS GRAMS	643.5
NOX MASS GRAMS	.61
RUN TIME SECONDS	599.
DFC, WET (DRY)	.968 (.961)
SCF, WET (DRY)	1.000 (.989)
VOL (SCM)	90.6
SAM BLR (SCM)	.00
MI (MEASURED)	1.21

TEST NUMBER,		2
BAROMETER,	MM HG	752.3
HUMIDITY,	G/KG	4.0
TEMPERATURE,	DEG C	23.9
CARBON DIOXIDE,	G/MI	531.3
FUEL ECONOMY,	MPG	16.4
HYDROCARBONS, (THC)	G/MI	.27
CARBON MONOXIDE,	G/MI	5.03
OXIDES OF NITROGEN,	G/MI	.50

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
NYCC3 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

TEST NO. 3 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 752.09 MM HG(29.61 IN HG)
RELATIVE HUMIDITY 20. PCT

VEHICLE NO.2
DATE 12/ 2/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 24.4 DEG C(76.0 DEG F)
ABS. HUMIDITY 3.8 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 34051. KM(21158. MILES)

NOX HUMIDITY CORRECTION FACTOR .81

BAG RESULTS

TEST CYCLE	NYCC3
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)
BLOWER REVOLUTIONS	48009.
TOT FLOW STD. CU. METRES(SCF)	90.7 (3203.)
THC SAMPLE METER/RANGE/PPM	15.3/ 2/ 15.
THC BCKGRD METER/RANGE/PPM	6.6/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	70.5/ 13/ 68.
CO BCKGRD METER/RANGE/PPM	.7/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	55.0/ 11/ .4363
CO2 BCKGRD METER/RANGE/PCT	7.1/ 11/ .0421
NOX SAMPLE METER/RANGE/PPM	4.8/ 2/ 4.8
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1
DILUTION FACTOR	30.14
THC CONCENTRATION PPM	9.
CO CONCENTRATION PPM	67.
CO2 CONCENTRATION PCT	.3956
NOX CONCENTRATION PPM	4.7
THC MASS GRAMS	.47
CO MASS GRAMS	7.05
CO2 MASS GRAMS	657.1
NOX MASS GRAMS	.66
RUN TIME SECONDS	599.
DFC, WET (DRY)	.967 (.961)
SCF, WET (DRY)	1.000 (.990)
VOL (SCM)	90.7
SAM BLR (SCM)	.00
MI (MEASURED)	1.22

TEST NUMBER,		3
BAROMETER,	MM HG	752.1
HUMIDITY,	G/KG	3.8
TEMPERATURE,	DEG C	24.4
CARBON DIOXIDE,	G/MI	540.4
FUEL ECONOMY,	MPG	16.1
HYDROCARBONS, (THC)	G/MI	.38
CARBON MONOXIDE,	G/MI	5.80
OXIDES OF NITROGEN,	G/MI	.55

SOUTHWEST RESEARCH INSTITUTE - DEPARTMENT OF EMISSIONS RESEARCH
NYCC4 - VEHICLE EMISSIONS RESULTS -
PROJECT 08-1816-001

ST NO. 4 RUN 1
VEHICLE MODEL 86 TOYOTA CAMRY
ENGINE 2.0 L(122. CID) L-4
TRANSMISSION A4

BAROMETER 751.84 MM HG(29.60 IN HG)
RELATIVE HUMIDITY 21. PCT

VEHICLE NO.2
DATE 12/ 2/88
BAG CART NO. 1
DYNO NO. 3
CVS NO. 2
DRY BULB TEMP. 25.0 DEG C(77.0 DEG F)
ABS. HUMIDITY 4.1 GM/KG

TEST WEIGHT 1304. KG(2875. LBS)
ACTUAL ROAD LOAD 6.0 KW(8.1 HP)
GASOLINE EM-784-F
ODOMETER 34052. KM(21159. MILES)

NOX HUMIDITY CORRECTION FACTOR .82

BAG RESULTS

TEST CYCLE	NYCC4
BLOWER DIF P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET P MM. H2O(IN. H2O)	774.7 (30.5)
BLOWER INLET TEMP. DEG. C(DEG. F)	42.2 (108.0)
BLOWER REVOLUTIONS	48043.
TOT FLOW STD. CU. METRES(SCF)	90.7 (3204.)
THC SAMPLE METER/RANGE/PPM	14.0/ 2/ 14.
THC BCKGRD METER/RANGE/PPM	6.6/ 2/ 7.
CO SAMPLE METER/RANGE/PPM	62.0/ 13/ 59.
CO BCKGRD METER/RANGE/PPM	.6/ 13/ 1.
CO2 SAMPLE METER/RANGE/PCT	54.5/ 11/ .4311
CO2 BCKGRD METER/RANGE/PCT	7.0/ 11/ .0415
NOX SAMPLE METER/RANGE/PPM	4.9/ 2/ 4.9
NOX BCKGRD METER/RANGE/PPM	.1/ 2/ .1
DILUTION FACTOR	30.57
THC CONCENTRATION PPM	8.
CO CONCENTRATION PPM	58.
CO2 CONCENTRATION PCT	.3909
NOX CONCENTRATION PPM	4.8
THC MASS GRAMS	.40
CO MASS GRAMS	6.11
CO2 MASS GRAMS	649.5
NOX MASS GRAMS	.69
RUN TIME SECONDS	599.
DFC, WET (DRY)	.967 (.961)
SCF, WET (DRY)	1.000 (.989)
VOL (SCM)	90.7
SAM BLR (SCM)	.00
MI (MEASURED)	1.20

TEST NUMBER,		4
BAROMETER,	MM HG	751.8
HUMIDITY,	G/KG	4.1
TEMPERATURE,	DEG C	25.0
CARBON DIOXIDE,	G/MI	540.9
FUEL ECONOMY,	MPG	16.1
HYDROCARBONS, (THC)	G/MI	.33
CARBON MONOXIDE,	G/MI	5.09
OXIDES OF NITROGEN,	G/MI	.57

APPENDIX D

COLD-START UDDS, HOT-START UDDS, AND FTP TEST RESULTS OF UNREGULATED EMISSIONS FROM SCREENING TESTS ON A FORD TAURUS

TABLE D-1. COLD-START UDDS, HOT-START UDDS, AND FTP TEST RESULTS OF UNREGULATED EMISSIONS FROM SCREENING TESTS ON A FORD TAURUS

	Sampling Media	Emission Rate, mg/mi											
		First Screening Test			Second Screening Test			Third Screening Test[a]			Raw Exhaust Test		
		Cold-Start	Hot-Start	Composite	Cold-Start	Hot-Start	Composite	Cold-Start	Hot-Start	Composite	Cold-Start	Hot-Start	Composite
Hydrocarbons													
Benzene	C/T[b]	21	6	12	23	6	13	14	3	8	c	c	c
1,3 Butadiene	Bag	1.5	0.1	0.7	1.9	ND	0.8	c	c	c	c	c	c
Toluene	C/T	30	10	19	38	10	22	24	4	13	c	c	c
Xylenes	C/T	31	8	18	41	8	22	90	15	47	c	c	c
Styrene	C/T	ND[d]	ND	ND	2.0	Trace[e]	1.0	0.7	ND	0.3	0.9	0.2	0.5
Chlorinated Hydrocarbons													
Methyl chloroform	C/T	Trace	Trace	Trace	0.8	0.4	0.6	Trace	ND	Trace	Trace	Trace	Trace
Methylene chloride	C/T	1.2	0.8	1.0	0.6	Trace	0.4	Trace	0.5	0.4	ND	ND	ND

[a]Background corrected.
[b]C/T - Carbosieve/Tenax Trap.
[c]Not sampled in screening tests.
[d]ND - Not detected. Less than the detection limit.
[e]Trace - Detected but not quantifiable above the detection limit.

APPENDIX E

COLD-START UDDS, HOT-START UDDS, AND FTP TEST RESULTS OF UNREGULATED EMISSIONS FROM SCREENING TESTS ON A TOYOTA CAMRY

TABLE E-1. COLD-START UDDS, HOT-START UDDS, AND FTP TEST RESULTS OF UNREGULATED EMISSIONS FROM SCREENING TESTS ON A TOYOTA CAMRY

		Emission Rate, mg/mi											
		First Screening Test			Second Screening Test			Third Screening Test[a]			Raw Exhaust Test		
	Sampling Media	Cold-Start	Hot-Start	Composite	Cold-Start	Hot-Start	Composite	Cold-Start	Hot-Start	Composite	Cold-Start	Hot-Start	Composite
Hydrocarbons													
Benzene	C/T[b]	26	1	12	10	1	5	10	1	5	c	c	c
1,3 Butadiene	Bag	1.9	ND[d]	0.8	2	ND	0.9	c	c	c	c	c	c
Toluene	C/T	65	4	30	24	2	12	33	0.5	14	c	c	c
Xylenes	C/T	70	1	31	31	1	14	80	3	36	c	c	c
Styrene	C/T	ND	ND	ND	1.6	ND	0.7	0.7	ND	0.3	ND	0.05	0.03
Chlorinated Hydrocarbons													
Methyl chloroform	C/T	e	e	e	Trace[f]	Trace	Trace	ND	ND	ND	0.02	0.004	0.01
Methylene chloride	C/T	e	e	e	Trace	ND	Trace	Trace	Trace	Trace	ND	0.02	0.01

[a]Background corrected.
[b]C/T - Carbosieve/Tenax Trap.
[c]Not sampled in screening tests.
[d]ND - Not detected. Less than the detection limit.
[e]Unexplained high levels of methylene chloride and methyl chloroform - possible artifact.
[f]Trace - Detected but not quantifiable above the detection limit.

APPENDIX F

COLD-START UDDS, HOT-START UDDS, AND FTP TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM THE FIRST SCREENING TESTS OF A FORD TAURUS AND A TOYOTA CAMRY

TABLE F-1. COLD-START UDDS, HOT-START UDDS, AND FTP TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM THE FIRST SCREENING TESTS OF A FORD TAURUS AND A TOYOTA CAMRY

	Ford Taurus Metal and Elemental Emissions, μg/mi			Toyota Camry Metal and Elemental Emissions, μg/mi			Composite Detection Limit, μg/mi
	Cold-Start	Hot-Start	FTP[a]	Cold-Start	Hot-Start	FTP[a]	
Sodium[b]	--	--	--	--	--	--	116
Magnesium	74	19	43	6	4	5	3
Aluminum	146	37	84	27	10	18	4
Silicon	51	11	28	18	11	14	8
Phosphorus	176	37	97	13	4	8	2
Sulfur	322	79	180	60	41	49	4
Chlorine	199	20	97	13	ND[c]	6	5
Potassium	12	5	8	ND	ND	ND	4
Calcium	160	42	94	75	49	60	5
Titanium	ND	ND	ND	ND	ND	ND	7
Vanadium	ND	ND	ND	ND	ND	ND	33
Chromium	206	285	250	168	289	240	68
Manganese	79	ND	34	ND	ND	ND	55
Iron	3120	1050	1900	1350	727	990	49
Cobalt	ND	74	42	ND	ND	ND	46
Nickel	102	60	78	ND	ND	ND	46
Copper	230	176	200	117	143	130	54
Zinc	239	ND	100	79	ND	34	56
Arsenic	96	ND	41	ND	ND	ND	82
Selenium	ND	ND	ND	ND	ND	ND	99
Bromine	ND	ND	ND	ND	ND	ND	106
Strontium	278	ND	120	397	220	300	209
Molybdenum	ND	ND	ND	ND	ND	ND	1206
Cadmium	ND	ND	ND	ND	ND	ND	3
Tin	ND	53	30	ND	ND	ND	30
Antimony	ND	ND	ND	ND	ND	ND	14
Cesium	ND	ND	ND	ND	ND	ND	20
Barium	ND	ND	ND	ND	ND	ND	22
Platinum	ND	ND	ND	ND	ND	ND	198
Mercury	ND	ND	ND	ND	ND	ND	215
Lead	ND	ND	ND	ND	ND	ND	394

[a]Composite elemental emissions = 0.43 x cold-start + 0.57 x hot-start emissions.
[b]Suspected occurrence of uncorrectable systematic biases.
[c]ND - Not detected, less than the detection limit.

APPENDIX G

TRACE METALS AND OTHER ELEMENTS FROM THE SECOND SET OF SCREENING TESTS OF A FORD TAURUS AND A TOYOTA CAMRY OPERATED OVER A COLD-START, THREE HOT-STARTS, AND A FORCED-COOLED-START UDDS

TABLE G-1. TRACE METALS AND OTHER ELEMENTS FROM THE SECOND SET OF SCREENING TESTS OF A FORD TAURUS AND A TOYOTA CAMRY OPERATED OVER A COLD-START, THREE HOT-STARTS, AND A FORCED-COOLED-START UDDS

	Composite FTP Emissions, μg/mi		
	1987 Ford Taurus	1986 Toyota Camry	Detection Limit, μg/mi
Sodium[a]	—	—	21
Magnesium	15	2	0.5
Aluminum	61	36	0.8
Silicon	15	17	1.4
Phosphorus	26	5	0.3
Sulfur	99	37	0.7
Chlorine	31	12	0.9
Potassium	6	3	0.7
Calcium	49	37	0.9
Titanium	ND[b]	2	1.2
Vanadium	ND	ND	5.7
Chromium	22	28	11
Manganese	13	14	8.5
Iron	1600	1100	8.8
Cobalt	ND	ND	8.1
Nickle	12	ND	8.1
Copper	39	35	9.4
Zinc	36	ND	9.9
Arsenic	ND	ND	14
Selenium	ND	ND	18
Bromine	ND	19	19
Strontium	69	63	36
Molybdenum	ND	ND	211
Cadmium	ND	ND	0.5
Tin	ND	ND	5.3
Antimony	ND	ND	2.5
Cesium	ND	ND	3.5
Barium	ND	ND	3.8
Platinum	ND	ND	35
Mercury	ND	ND	38
Lead	90	ND	69

[a]Suspected occurrence of uncorrectable systematic biases.
[b]ND - Not detected. Less than the detection limit.

APPENDIX H

MINIMUM DETECTION LIMITS FOR SCREENING TESTS CONDUCTED OVER AN UDDS, A 5 X UDDS FTP, OR A RAW EXHAUST UDDS

TABLE H-1. MINIMUM DETECTION LIMITS FOR SCREENING TESTS CONDUCTED OVER A UDDS, A 5 x UDDS, AND A RAW EXHAUST UDDS

Compound	Minimum Detection Limit		
	mg/mi		μg/mi
	UDDS	5 x UDDS	Raw Exhaust UDDS
Acrolein	0.1	a	b
Halogenated Hydrocarbons			
Allyl chloride	0.7	a	17
Benzyl chloride	0.8	0.2	2
Carbon tetrachloride	0.2	a	3
Chlorobenzene	0.2	a	3
1,3-Dichlorobenzene	0.8	0.2	2
1,4-Dichlorobenzene	0.8	0.2	2
1,2-Dichlorobenzene	0.8	0.2	2
Chloroform	0.2	a	3
Chlorophenols	0.8	0.2	2
Dichlorophenols	0.8	0.2	2
Trichlorophenols	0.8-4	0.2-1	2-10
Tetrachlorophenols	2-4	0.4-1	4-10
Pentachlorophenol	4	1	10
Chloroprene	0.7	a	17
Ethylene dibromide	0.2	a	3
Ethylene dichloride	0.2	a	3
Hexachlorobenzene	0.8	0.2	37
Methyl bromide	0.2	a	3
Methyl chloroform	0.2	a	3
Methylene chloride	0.3	a	7
Perchloroethylene	0.2	a	3
Polychlorinated biphenyls	0.8-3.8	0.2-0.8	37-185
Monochlorobiphenyls	0.8	0.2	2
Dichlorobiphenyls	0.8	0.2	2
Trichlorobiphenyls	2	0.4	4
Tetrachlorobiphenyls	2	0.4	4
Pentachlorobiphenyls	2	0.6	6
Hexachlorobiphenyls	2	0.6	6
Octachlorobiphenyls	3	0.8	8
Nonachlorobiphenyls	3	0.8	8
Decachlorobiphenyls	4	1	10
Trichloroethylene	0.2	a	3
Vinyl chloride	0.3	a	7
Vinylidene chloride	0.2	a	3
Hydrocarbons			
Benzene	0.2	a	3
1,3-butadiene	0.5	a	b
Styrene	0.2	a	3
Toluene	0.2	a	3
Xylenes	0.2	a	3

TABLE H-1 (CONT'D). MINIMUM DETECTION LIMITS FOR SCREENING TESTS CONDUCTED OVER A UDDS, A 5 x UDDS, AND A RAW EXHAUST UDDS

Compound	Minimum Detection Limit		
	mg/mi		μg/mi
	UDDS	5 x UDDS	Raw Exhaust UDDS
Metals and Other Elements			
Lead, Strontium, Molybdenum	0.2-1.2	0.04-0.2	b
All Other Metals	0.002-0.2	0.003-0.04	b
Nitrogen Compounds			
Acrylonitrile	0.7	a	17
Nitrobenzene	0.8	0.2	37
Nitrosamines			
N-nitrosodimethylamine	0.003	a	b
N-nitrosodiethylamine	0.004	a	b
N-nitrosodipropylamine	0.004	a	b
N-nitrosodibutylamine	0.006	a	b
N-nitrosopiperidine	0.004	a	b
N-nitrosopyrrolidine	0.004	a	b
n-Nitrosomorpholine	0.004	a	b
Oxygenates			
1,4-Dioxane	0.7	a	17
di-(2-Ethylhexylphthalate)	0.8	0.2	37
Ethylene oxide	0.7	a	17
Maleic anhydride	1.5	0.3	74
Propylene oxide	0.7	a	17
Phenol	0.1	a	b
Cresols	0.1	a	b
Radionuclides[c]			
alpha	0.1	0.1	b
beta	4	3	b
gamma	20	12	b

[a]Impinger, bag, Tenax/Carbosieve, and Thermosorb/N traps not sampled on 5 x UDDS.
[b]Not sampled in raw exhaust tests.
[c]Measured in nanocuries/mi.

APPENDIX I

MINIMUM DETECTION LIMITS FOR FINAL EMISSIONS TESTS, MG/MI

TABLE I-1. MINIMUM DETECTION LIMITS FOR FINAL EMISSIONS TESTS, MG/MI

	FTP			HFET			NYCC		
	2-Bag UDDS FTP	5x2-Bag UDDS	4-Bag Cold UDDS + 6-Bag Hot UDDS[a]	HFET	2xHFET	4xHFET	NYCC	2xNYCC	4xNYCC
Aldehydes and Ketones			0.04			0.03			0.1
Formaldehyde									
Acetaldehyde									
Acrolein									
Propionaldehyde									
Acetone									
Crotonaldehyde									
Isobutyraldehyde/ Methylethylketone									
Benzaldehyde									
Hexanaldehyde									
Halogenated Hydrocarbons									
Chlorobenzene	0.02				0.01			0.08	
Chloroform	0.01				<0.01			0.02	
Ethylene dibromide	0.01				<0.01			0.04	
Methyl bromide	0.02				0.01			0.08	
Methyl chloroform	0.01				<0.01			0.02	
Methylene chloride	0.02				0.01			0.06	
Pentachlorophenol		0.03				0.3			2.3
Hydrocarbons									
Benzene	0.1				0.04			0.4	
1,3-Butadiene	0.5			0.2			1.3		
Propylene oxide	0.6				0.2			2	
Styrene	0.1				0.04			0.4	
Toluene	0.1				0.04			0.4	
Xylenes	0.1				0.04			0.4	

TABLE I-1 (CONT'D). MINIMUM DETECTION LIMITS FOR FINAL EMISSIONS TESTS, MG/MI

	FTP			HFET			NYCC		
	2-Bag UDDS FTP	5x2-Bag UDDS	4-Bag Cold UDDS + 6-Bag Hot UDDS[a]	HFET	2xHFET	4xHFET	NYCC	2xNYCC	4xNYCC
Nitrosamines									
N-nitrosodimethylamine	0.003					0.0005			0.004
N-nitrosodiethylamine	0.004					0.0008			0.007
N-nitrosodipropylamine	0.004					0.0008			0.007
N-nitrosodibutylamine	0.006					0.001			0.009
N-nitrosopiperidine	0.004					0.0008			0.007
N-nitrosopyrrolidine	0.004					0.0008			0.007
N-nitrosomorpholine	0.004					0.0008			0.007
Phenols			0.06			0.05			0.4
Phenol									
Salicylaldehyde									
m- and p-Cresol									
p-Ethylphenol, 2-Isopropylphenol, 2,3-Xylenol, 2-5-Xylenol, and 2,4,6-Trimethylphenol									
2-n-Propylphenol									
2,3,5-Trimethylphenol									
2,3,5,6-Tetramethylphenol									

[a]Weighted for 2-UDDS and 3-UDDS segments.

APPENDIX J

COLD-START AND HOT-START UDDS, AND FTP BENZENE, TOLUENE, XYLENES, AND STYRENE EMISSIONS FROM A FORD TAURUS AND A TOYOTA CAMRY

TABLE J-1. COLD-START AND HOT-START UDDS, AND FTP BENZENE, TOLUENE, XYLENES, AND STYRENE EMISSIONS FROM A FORD TAURUS AND A TOYOTA CAMRY

	Ford Taurus Emissions, mg/mi					
	First Sample			Duplicate Sample		
	Cold-Start	Hot-Start	FTP	Cold-Start	Hot-Start	FTP
Benzene	40	12	24	27	13	19
Toluene	58	16	34	37	16	25
Xylenes	50	12	28	28	12	19
Styrene	ND[a]	ND	ND	ND	ND	ND

	Toyota Camry Emissions, mg/mi		
	First Sample		
	Cold-Start	Hot-Start	FTP
Benzene	32	0.7	14
Toluene	40	1.8	18
Xylenes	45	2	21
Styrene	2.6	ND	1.1

[a]ND - Not detected. Less than the detection limit.

APPENDIX K

ELAPSED TIME BETWEEN SAMPLING AND ANALYSIS OF 1,3-BUTADIENE FOR A FORD TAURUS

TABLE K-1. ELAPSED TIME BETWEEN SAMPLING AND ANALYSIS OF 1,3-BUTADIENE FOR A FORD TAURUS

	Bag	Elapsed Time, min. FTP	Test	Elapsed Time, min HFET	Elapsed Time, min NYCC
Cold-Start	1	24	1	—[a]	—[a]
	2	62	2	—[a]	—[a]
Hot-Start	3	193	3	—[b]	—[b]
	4	[b]	4	—[b]	—[b]
Hot-Start	5	[b]			
	6	[b]			
Hot-Start	7	[b]			
	8	[b]			
Forced-Cooled-Start[c]	9	18			
	10	53			

[a]Elapsed time inadvertently not measured.
[b]1,3-Butadiene not analyzed.
[c]Forced-cooled-start - engine cooled with fans to an oil temperature of 80-84° F.

APPENDIX L

ELAPSED TIME BETWEEN SAMPLING AND ANALYSIS OF 1,3-BUTADIENE FOR A TOYOTA CAMRY

TABLE L-1. ELAPSED TIME BETWEEN SAMPLING AND ANALYSIS OF 1,3-BUTADIENE FOR A TOYOTA CAMRY

	Bag	Elapsed Time, min. FTP	Test	Elapsed Time, min HFET	NYCC
Cold-Start	1	64	1	19	17
	2	101	2	34	36
Hot-Start	3	59	3	a	a
	4	a	4	a	a
Hot-Start	5	a			
	6	a			
Hot-Start	7	a			
	8	a			
Forced Cooled-Start[b]	9	29			
	10	64			

[a]1,3-Butadiene not analyzed.
[b]Forced-cooled-start - engine cooled with fans to an oil temperature of 80-84° F.

APPENDIX M

1,3-BUTADIENE EMISSIONS RESULTS FROM A FORD TAURUS AND A TOYOTA CAMRY

TABLE M-1. 1,3-BUTADIENE EMISSION RESULTS FOR EACH FTP SEGMENT ON A FORD TAURUS

	Emissions, mg/mi except as noted								
	Cold-Start						Hot-Start		
	Bag 1			Bag 2			Bag 3		
	Test 1	Test 2	Avg.	Test 1	Test 2	Avg.	Test 1	Test 2	Avg.
Total Hydrocarbons	970	840	905	60	60	60	300	360	330
1,3-Butadiene	3.79	3.83	3.81	ND[a]	ND	ND	Trace[b]	Trace	Trace
1,3-Butadiene Detection Limit			0.4			0.6			0.4
1,3-Butadiene as a Percent of Total Hydrocarbons	0.39	0.46	0.43	0	0	0	0	0	0

	Emissions, mg/mi, except as noted	
	Bag 1	Bag 2
	Forced Cool	Forced Cool
Total Hydrocarbons	780	60
1,3-Butadiene	3.09	ND
1,3-Butadiene Detection Limit	0.4	0.4
1,3-Butadiene as a Percent of Total Hydrocarbons	0.40	0

[a]ND - None detected. Less than the detection limit.
[b]Trace - Detected but not quantifiable above the detection limit.

TABLE M-2. 1,3-BUTADIENE EMISSION RESULTS FOR EACH FTP SEGMENT ON A TOYOTA CAMRY

	Emissions, mg/mi except as noted								
	Cold-Start						Hot-Start		
	Bag 1			Bag 2			Bag 3		
	Test 1	Test 2	Avg.	Test 1	Test 2	Avg.	Test 1	Test 2	Avg.
Total Hydrocarbons	830	800	815	10	20	15	60	50	55
1,3-Butadiene	4.75	4.18	4.47	ND[a]	ND	ND	ND	ND	ND
1,3-Butadiene Detection Limit			0.4			0.6			0.4
1,3-Butadiene as a Percent of Total Hydrocarbons	0.57	0.52	0.55	0	0	0	0	0	0

	Emissions, mg/mi, except as noted	
	Bag 1	Bag 2
	Forced Cool	Forced Cool
Total Hydrocarbons	600	20
1,3-Butadiene	3.84	ND
1,3-Butadiene Detection Limit	0.4	0.4
1,3-Butadiene as a Percent of Total Hydrocarbons	0.64	0

[a]ND - None detected. Less than the detection limit.

APPENDIX N

COLD-START UDDS, HOT-START UDDS, FTP, HFET, AND NYCC C_4 COMPOUNDS AND TOTAL HYDROCARBON EMISSIONS FROM THE FINAL EMISSIONS TESTS OF A FORD TAURUS

TABLE N-1. COLD-START UDDS, HOT-START UDDS, FTP, HFET, AND NYCC C_4 COMPOUNDS AND TOTAL HYDROCARBON EMISSIONS FROM THE FINAL EMISSIONS TESTS OF A FORD TAURUS

	C_4 and Total Hydrocarbon Emissons, mg/mi						
	Cold-Start			Hot-Start			Average
	Test 1	Test 2	Avg.	Test 1	Test 2	Avg.	FTP
Total Hydrocarbons	501	437	469	173	200	187	310
1,3 Butadiene	1.82	1.84	1.83	ND[a]	ND	ND	0.78
Butane	7.50	6.85	7.18	5.62	5.80	5.71	6.35
Isobutane	2.84	1.86	2.35	2.30	1.80	2.05	2.15
1-Butene	2.00	1.93	1.97	0.94	1.37	1.16	1.50
Isobutylene	2.42	2.15	2.29	0.64	0.90	0.77	1.40
cis-2-Butene	0.83	0.71	0.77	0.71	0.96	0.84	0.81
trans-2-Butene	1.06	0.96	1.01	0.54	0.73	0.64	0.80

	C_4 and Total Hydrocarbon Emissons, mg/mi					
	HFET			NYCC		
	Test 1	Test 2	Avg.	Test 1	Test 2	Avg.
Total Hydrocarbons	60	70	65	1060	1070	1065
1,3 Butadiene	Trace[b]	Trace	Trace	Trace	Trace	Trace
Butane	1.4	3.6	2.5	56.5	47.6	52.1
Isobutane	0.68	0.96	0.82	24.3	18.7	21.5
1-Butene	0.26	0.26	0.26	3.2	7.7	5.5
Isobutylene	0.20	0.20	0.20	4.9	5.4	5.2
cis-2-Butene	Trace	Trace	Trace	2.2	6.3	4.3
trans-2-Butene	Trace	Trace	Trace	2.7	3.2	3.0

[a]ND - None detected. Less than the detection limit.
[b]Trace - Detected but not quantifiable above the detection limit.

APPENDIX O

COLD-START UDDS, HOT-START UDDS, FTP, HFET, AND NYCC C_4 COMPOUNDS AND TOTAL HYDROCARBON EMISSIONS FROM THE FINAL EMISSIONS TESTS OF A TOYOTA CAMRY

TABLE O-1. COLD-START UDDS, HOT-START UDDS, FTP, HFET, AND NYCC C_4 COMPOUNDS AND TOTAL HYDROCARBON EMISSIONS FROM THE FINAL EMISSIONS TESTS OF A TOYOTA CAMRY

	C_4 and Total Hydrocarbon Emissons, mg/mi						
	Cold-Start			Hot-Start			Average
	Test 1	Test 2	Avg.	Test 1	Test 2	Avg.	FTP
Total Hydrocarbons	401	396	399	33	29	31	190
1,3 Butadiene	2.28	2.01	2.15	ND[a]	ND	ND	0.93
Butane	4.39	4.92	4.66	0.12	0.72	0.41	2.25
Isobutane	1.75	1.48	1.62	0.34	0.12	0.23	0.83
1-Butene	2.83	2.15	2.49	ND	ND	ND	1.06
Isobutylene	2.12	1.79	1.96	ND	ND	ND	0.84
cis-2-Butene	1.54	0.84	1.19	ND	ND	ND	0.51
trans-2-Butene	1.07	0.84	0.96	ND	ND	ND	0.42

	C_4 and Total Hydrocarbon Emissons, mg/mi					
	HFET			NYCC		
	Test 1	Test 2	Avg.	Test 1	Test 2	Avg.
Total Hydrocarbons	20	20	20	250	270	260
1,3 Butadiene	ND	ND	ND	ND	ND	ND
Butane	0.28	0.28	0.28	5.9	5.4	5.7
Isobutane	ND	ND	ND	4.1	2.7	3.4
1-Butene	ND	ND	ND	Trace[b]	0.90	0.45
Isobutylene	ND	Trace	ND	Trace	1.3	0.65
cis-2-Butene	ND	Trace	ND	Trace	ND	ND
trans-2-Butene	ND	ND	ND	Trace	ND	ND

[a]ND - None Detected. Less than the detection limit.
[b]Trace - Detected but not quantifiable above the detection limit.

APPENDIX P

HALOGENATED HYDROCARBON EMISSIONS FROM A FORD TAURUS AND A TOYOTA CAMRY OPERATED OVER THE FTP

TABLE P-1. HALOGENATED HYDROCARBON EMISSIONS FROM A FORD TAURUS AND A TOYOTA CAMRY OPERATED OVER THE FTP

Vehicle	Compound	Emissions, mg/mi		
		Cold-Start	Hot-Start	FTP
Ford Taurus	Chloroform	ND[a]	0.16	0.09
Toyota Camry	Methyl chloroform	0.13	ND	0.06

[a]ND - None detected. Less than the detection limit.

APPENDIX Q

FINAL EMISSIONS TEST RESULTS OF ALDEHYDES AND KETONES FROM COLD-START UDDS, HOT-START UDDS, FTP, HFET, AND NYCC TESTS ON A FORD TAURUS AND A TOYOTA CAMRY

TABLE Q-1. FINAL EMISSIONS TEST RESULTS OF ALDEHYDES AND KETONES FROM COLD-START UDDS, HOT-START UDDS, FTP, HFET, AND NYCC TESTS ON A FORD TAURUS AND A TOYOTA CAMRY

	Ford Taurus Emission Rate, mg/mi				
Aldehydes and Ketones	Cold-Start	Hot-Start	FTP[a]	HFET	NYCC
Formaldehyde	3.72	0.87	2.10	0.42	1.50
Acetaldehyde	2.02	0.37	1.08	0.27	1.84
Acrolein	0.93	ND[b]	0.40	ND	0.11
Acetone	0.46	ND	0.20	ND	ND
Propionaldehyde	0.33	ND	0.14	0.03	ND
Crotonaldehyde	0.45	ND	0.19	ND	ND
Isobutyraldehyde/ methylethylketone	0.29	ND	0.12	ND	ND
Benzaldehyde	ND	ND	ND	ND	0.55
Hexanaldehyde	ND	ND	ND	ND	ND

[a]Composite - 0.43 x cold-start emissions + 0.57 x hot-start emissions.
[b]ND - None detected. Less than the detection limit.

	Toyota Camry Emission Rate, mg/mi				
Aldehydes and Ketones	Cold-Start	Hot-Start	FTP[a]	HFET	NYCC
Formaldehyde	2.70	0.07	1.20	Trace[b]	0.44
Acetaldehyde	1.63	0.07	0.74	Trace	0.33
Acrolein	0.60	ND[c]	0.26	ND	ND
Acetone	ND	ND	ND	ND	ND
Propionaldehyde	0.40	ND	0.17	ND	ND
Crotonaldehyde	0.16	ND	0.07	ND	ND
Isobutyraldehyde/ methylethylketone	0.16	ND	0.07	ND	ND
Benzaldehyde	0.75	ND	0.32	ND	ND
Hexanaldehyde	ND	ND	ND	ND	ND

[a]Composite - 0.43 x cold-start emissions + 0.57 x hot-start emissions.
[b]Trace - Detected but not quantifiable above the detection limit.
[c]ND - None detected. Less than the detection limit.

APPENDIX R

FTP TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM THE FINAL EMISSIONS TESTS OF A FORD TAURUS AND TOYOTA CAMRY

TABLE R-1. FTP TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM THE FINAL EMISSIONS TESTS OF A FORD TAURUS AND A TOYOTA CAMRY

	Metal and Elemental Emissions, μg/mi			
	Ford Taurus	Toyota Camry		
	Final Emissions Test	Final Emissions Test Filter No. 1	Final Emissions Test Filter No. 2	Detection Limit, μg/mi
Sodium	ND[a]	ND	ND	21
Magnesium	9	Trace[b]	3	0.7
Aluminum	37	16	19	0.9
Silicon	21	16	13	1.8
Phosphorus	13	3	3	0.7
Sulfur	49	13	13	1.7
Chlorine	14	4	5	0.7
Potassium	4	3	4	0.5
Calcium	49	25	32	1.0
Titanium	Trace	ND	Trace	1.3
Vanadium	ND	ND	ND	6.1
Chromium	Trace	38	Trace	13
Manganese	ND	ND	ND	9.4
Iron	9	270	300	8.7
Cobalt	ND	ND	ND	8.2
Nickel	ND	ND	ND	8.3
Copper	ND	ND	ND	9.1
Zinc	ND	ND	ND	9.9
Arsenic	ND	ND	ND	14
Selenium	ND	ND	ND	17
Bromine	ND	ND	ND	26
Strontium	ND	ND	ND	78
Molybdenum	ND	ND	ND	228
Cadmium	ND	ND	ND	0.9
Tin	ND	ND	ND	5.7
Antimony	ND	ND	ND	2.6
Cesium	ND	ND	ND	3.7
Barium	ND	ND	ND	4.0
Platinum	ND	ND	ND	35
Mercury	ND	ND	ND	37
Lead	ND	ND	ND	117

[a]ND - None detected. Less than detection limit.
[b]Trace - Element was detected but was not quantifiable above the detection limit.

APPENDIX S

HFET AND NYCC TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM FINAL EMISSIONS TESTS OF A FORD TAURUS

TABLE S-1. HFET AND NYCC TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM FINAL EMISSIONS TESTS OF A FORD TAURUS

	HFET Emissions, g/mi			NYCC Emissions, μg/mi		
	HFET Filter No. 1	HFET Filter No. 2	HFET Detection Limit, μg/mi	NYCC Filter No. 1	NYCC Filter No. 2	NYCC Detection Limit, μg/mi
Sodium	ND[a]	ND	19	ND	ND	168
Magnesium	10	9	0.6	Trace[b]	Trace	5.6
Aluminum	27	18	0.8	21	34	6.9
Silicon	13	7	1.7	Trace	Trace	15
Phosphorus	13	11	0.6	ND	19	5.4
Sulfur	31	28	1.6	50	49	14
Chlorine	8	5	0.7	Trace	ND	6.0
Potassium	3	2	0.5	Trace	Trace	4.1
Calcium	21	16	0.8	52	66	7.5
Titanium	Trace	Trace	1.1	Trace	Trace	10
Vanadium	ND	ND	5.6	ND	ND	4.9
Chromium	Trace	Trace	12	Trace	Trace	106
Manganese	ND	ND	8.4	Trace	Trace	76
Iron	460	330	8.0	250	370	71
Cobalt	ND	ND	7.4	ND	ND	67
Nickel	ND	ND	7.7	ND	ND	69
Copper	ND	ND	8.4	ND	ND	76
Zinc	Trace	Trace	8.9	Trace	ND	80
Arsenic	ND	ND	13	ND	ND	119
Selenium	ND	ND	16	ND	ND	143
Bromine	ND	ND	24	ND	ND	208
Strontium	ND	ND	73	ND	ND	639
Molybdenum	ND	ND	211	ND	ND	1860
Cadmium	ND	ND	0.8	ND	ND	6.7
Tin	ND	ND	4.9	ND	ND	45
Antimony	ND	ND	2.3	ND	ND	21
Cesium	ND	ND	3.3	ND	ND	31
Barium	Trace	ND	3.6	ND	ND	32
Platinum	ND	Trace	32	ND	ND	292
Mercury	ND	ND	34	ND	ND	311
Lead	ND	ND	108	ND	ND	953

[a]ND - None detected. Less than the detection limit.
[b]Trace - Element was detected but was not quantifiable above the detection limit.

APPENDIX T

HFET AND NYCC TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM FINAL EMISSIONS TESTS OF A TOYOTA CAMRY

TABLE T-1. HFET AND NYCC TRACE METAL AND OTHER ELEMENTAL EMISSIONS FROM FINAL EMISSIONS TESTS OF A TOYOTA CAMRY

	HFET Emissions, g/mi			NYCC Emissions, μg/mi		
	HFET Filter No. 1	HFET Filter No. 2	HFET Detection Limit, μg/mi	NYCC Filter No. 1	NYCC Filter No. 2	NYCC Detection Limit, μg/mi
Sodium	ND[a]	ND	19	ND	ND	168
Magnesium	Trace[b]	Trace	0.6	ND	ND	5.6
Aluminum	9	9	0.8	Trace	Trace	6.9
Silicon	6	7	1.7	Trace	ND	14.9
Phosphorus	3	3	0.6	ND	ND	5.4
Sulfur	8	8	1.6	Trace	ND	14
Chlorine	3	Trace	0.7	ND	ND	6.0
Potassium	2	Trace	0.5	Trace	ND	4.1
Calcium	18	16	0.8	66	56	7.5
Titanium	Trace	Trace	1.1	ND	Trace	10
Vanadium	ND	ND	5.6	ND	ND	4.9
Chromium	Trace	Trace	12	Trace	ND	106
Manganese	Trace	ND	8.4	ND	ND	76
Iron	150	110	8.0	Trace	360	71
Cobalt	ND	ND	7.4	ND	ND	67
Nickel	ND	ND	7.7	ND	ND	69
Copper	ND	ND	8.4	ND	ND	76
Zinc	ND	ND	8.9	ND	ND	80
Arsenic	ND	ND	13	ND	ND	119
Selenium	ND	ND	16	ND	ND	143
Bromine	ND	ND	24	ND	Trace	208
Strontium	ND	ND	73	ND	ND	639
Molybdenum	ND	ND	212	ND	Trace	1860
Cadmium	ND	ND	0.8	ND	ND	7
Tin	Trace	ND	4.9	ND	ND	45
Antimony	ND	ND	2.3	ND	ND	21
Cesium	ND	ND	3.3	ND	ND	30
Barium	ND	ND	3.6	ND	ND	32
Platinum	ND	ND	32	ND	ND	292
Mercury	ND	ND	34	ND	ND	311
Lead	ND	ND	108	ND	ND	953

[a]ND - None detected. Less than the detection limit.
[b]Trace - Element was detected but was not quantifiable above the detection limit.

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ASSET