The State of New Jersey
Department of Environmental Protection

Enhanced Inspection and Maintenance (I/M) Program for the State of New Jersey

Performance Standard Modeling

January 30, 1998

Preface

This document provides the United States Environmental Protection Agency (USEPA) with the final performance standard modeling for the State of New Jersey's enhanced inspection and maintenance (I/M) program. This modeling is required as a condition of the USEPA's conditional interim approval of New Jersey's enhanced I/M program State Implementation Plan (SIP) and its subsequent revision[†].

Acknowledgments

The New Jersey Department of Environmental Protection (NJDEP) acknowledges the efforts and assistance of the many agencies and individuals whose contributions were instrumental in the preparation of this enhanced inspection and maintenance performance standard modeling submittal. In particular, the NJDEP wishes to acknowledge the many individuals within the New Jersey Department of Transportation (NJDOT), the New Jersey Division of Motor Vehicles (NJDMV), the United States Environmental Protection Agency (USEPA) Region II, and the staff within the NJDEP for their assistance and guidance.

[†] 40 C.F.R. §52, 62 Fed. Reg. 26401 (May 14, 1997).

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Acronyms and Abbreviations:

CO	Carbon monoxide
FIP	Federal Implementation Plan
gpm	Grams per Mile
HC	Hydrocarbons
I/M	Inspection and Maintenance
LEV	Low Emission Vehicle
MY	Model Year
NHSDA	National Highway System Designation Act
NJDEP	New Jersey Department of Environmental Protection
NJDMV	New Jersey Division of Motor Vehicles
NO_x	Oxides of Nitrogen
ROP	Rate of Progress
RPM	Revolutions per Minute
SIP	State Implementation Plan
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

Executive Summary

The purpose of this document is to provide the United States Environmental Protection Agency (USEPA) with the final performance standard modeling for the New Jersey enhanced inspection and maintenance (I/M) program. This modeling was required as a condition of the USEPA's interim approval of New Jersey's enhanced I/M program State Implementation Plan (SIP) and its subsequent revision[††]. The State's performance standard modeling demonstrates that New Jersey's enhanced I/M program will meet the USEPA's performance standard for all three pollutants of interest, volatile organic compounds (VOCs), oxides of nitrogen (NO_x) and carbon monoxide (CO), by January 1, 2002.

By submitting this performance standard modeling by February 1, 1998, New Jersey is fulfilling its commitment to the USEPA and cures the second of two major deficiencies in New Jersey enhanced I/M SIP and its revision identified by the USEPA. New Jersey must still cure eight (8) de minimis deficiencies identified by the USEPA by the end of the 18-month interim period (that is, December 13, 1998)[†††]. The satisfaction of these de minimis deficiencies does not affect the conditional interim approval status of the State's program.

[††] 40 C.F.R. §52, 62 Fed. Reg. 26401 (May 14, 1997).

[†††] 40 C.F.R. §52, 62 Fed. Reg. 26401 (May 14, 1997).

I. Introduction:

As part of its final rule for inspection and maintenance (I/M) requirements, the USEPA established a "model" program for enhanced I/M areas. This model program is termed by the USEPA as the "performance standard" and is defined by a specific set of program elements[1]. The purpose of the performance standard is to provided a gauge by which the USEPA can evaluate the adequacy and effectiveness of each state's enhanced I/M program. As such, states are required to demonstrate that their enhanced I/M programs achieve applicable area-wide emission levels for the pollutants of interest which are equal to, or lower than, those which would be realized by the implementation of the model program.

On October 31, 1996, the United States Environmental Protection Agency (USEPA) proposed granting conditional interim approval to New Jersey's enhanced Inspection and Maintenance (I/M) State Implementation Plan (SIP)[2]. Subsequently, on May 14, 1997, the USEPA adopted this proposal and granted conditional interim approval to New Jersey's enhanced I/M SIP[3]. This interim SIP approval, which became effective on June 13, 1997, addressed both the State's original June 29, 1995 enhanced I/M SIP submittal and the revisions made to that SIP submittal by the State in a March 27, 1996 SIP revision.

Final approval of New Jersey's enhanced I/M SIP was predicated on the State's ability to remedy two (2) major deficiencies identified by the USEPA as conditions of its interim approval. Specifically, New Jersey had to provide final test equipment specifications, test procedures and emission standards to the USEPA by January 31, 1997 and had to provide modeling demonstrating that the State's enhanced I/M program would meet the performance standard to the USEPA by no later than February 1, 1998[4]. New Jersey's cured the first major enhanced I/M SIP deficiency by providing final and complete test equipment specifications, test procedures and emission standards to the USEPA by January 31, 1997[5]. This submittal provides the performance standard modeling demonstration and thus cures the second major enhanced I/M SIP deficiency identified by the USEPA in its conditional interim approval on New Jersey's enhanced I/M SIP. For an overview history of the USEPA and State actions regarding New Jersey's enhanced I/M SIP and its approval, see Appendix I.

II. Performance Standard Modeling:

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[1] 40 C.F.R. §51.351, 57 Fed. Reg. 52988-52989 (November 5, 1992).

[2] 61 Fed. Reg. 56172 (October 31, 1996).

[3] 40 C.F.R. §52, 62 Fed. Reg. 26401 (May 14, 1997).

[4] 40 C.F.R. §52, 62 Fed. Reg. 26401(May 14, 1997).

[5] These documents were submitted as an attachment to a letter dated January 31, 1997 from Commissioner Robert C. Shinn, Jr., New Jersey Department of Environmental Protection, to Jeanne M. Fox, Regional Administrator, USEPA, Region II.

In accordance with the USEPA's final rule for I/M requirements, a state must design and implement its enhanced I/M program such that it meets or exceeds a minimum performance standard, expressed as emission levels in area-wide average grams per mile (gpm) achieved from highway mobile sources as a result of the program[6]. New Jersey is required to meet the enhanced I/M performance standard for hydrocarbons (HC), oxides of nitrogen (NO_x) and for carbon monoxide (CO) because of its nonattainment status for ozone and carbon monoxide and its inclusion in the Northeastern Ozone Transport Region.

A. The USEPA's Performance Standard:

As stated in Section I, the USEPA's performance standard is defined by a specific set of program elements which are set forth in its final rule on I/M program requirements[7]. Table I outlines each of the major performance standard program elements and the applicable values used to determine the performance standard emission factors.

Although each state must model the performance standard using the values specified in Table I, the performance standard emission factor results will vary for each state. This variation is mainly the result of a state's decision to use state-specific registration distribution and/or Vehicle Miles Traveled (VMT) mix or to rely instead on the model default values. New Jersey uses a 10 year rolling average of the State's registration data developed by the New Jersey Institute of Technology (NJIT) in December of 1993 as part of a study for the New Jersey State Legislature on the environmental impacts and costs of adopting California's Low Emission Vehicle Program[8]. The State choose to use the model default VMT mix, which is based on national averages. Other local parameters, such as minimum, maximum and ambient temperatures, add to state variations in determining the emission factors from the USEPA's model program. For New Jersey, the resulting performance standard emission factors are 1.63 gpm, 1.71 gpm and 15.90 gpm for VOCs, NO_x and CO, respectively.

Table I: USEPA Performance Standard Program Elements

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[6] 40 C.F.R. §51.351(a), 57 Fed. Reg. 52988 (November 5, 1992).

[7] 40 C.F.R. §51.531, 57 Fed. Reg. 52988-52989 (November 5, 1992).

[8] "Adoption of the California Low Emission Vehicle: An Analysis of the Environmental Impact and Cost," James F. Fitzgerald and Richard S. Magee, Sc.D., P.E., DEE, New Jersey Institute of Technology, December 1993, Appendix 4 - Constructing a Mean Model Year Distribution.

Program Element	Values Used
Network Type	100% centralized emission testing
Program Start Date	1983*
Test Frequency	annual
Model Year (MY) Coverage	1968 and later MY
Vehicle Type Coverage	All light-duty gasoline-fueled vehicles and trucks (up to 8,500 lbs. GVWR**)
Exhaust Emission Test	IM240 - 1986 and later MY Two speed idle - 1981-1985 MY Idle - pre-1981 MY
Emission Standards	vary according to model year and exhaust emission test given***
Emission Control Devices	Visual inspection of the catalytic converter and fuel inlet restrictor - 1984 and later MY
Evaporative System Function Checks	Pressure Testing - 1983 and later MY Purge Testing - 1986 and later MY
Pre- 1981 MY Stringency	20%
Waiver Rate	3%
Compliance Rate	96%
Evaluation Date	January 1, 2002
On-Road Testing	0.5% of the subject vehicle population or 20,000 vehicles (whichever is less)

* For programs with existing I/M programs, like New Jersey's basic I/M program.
** GVWR means "Gross Vehicle Weight Rating."
*** 40 C.F.R. §51.351(a)(7)(I)-(viii), 57 Fed. Reg. 52988-52989 (November 5, 1992).

1.Emission Model:

In addition to requiring that a state's enhanced I/M program meet or exceed the USEPA performance standard for enhanced I/M programs, the USEPA's final rule on I/M requirements state that equivalency of the emission levels achieved by the state's enhanced I/M program design to those of the performance standard must be demonstrated using the most current version of USEPA's mobile source emission model[9]. Although, MOBILE5b

[9] 40 C.F.R. §51.351(d), 57 Fed. Reg. 52988, November 5, 1992

is the latest version of the USEPA's mobile source emission model, with a release date of October 11, 1996, the USEPA has stated that this version of the model is not yet approved for use in any SIP submissions (other than 15 percent plan recalculations as prescribed by the USEPA) or for determining transportation conformity findings[10]. Therefore, New Jersey has completed its performance standard modeling using MOBILE5a-H, the previous version of the USEPA's mobile model.

B.New Jersey Enhanced I/M Program:

This Section describes the parameters used by New Jersey in its analysis of its enhanced I/M program. Table II outlines each major modeling parameter and the values used to complete the performance standard modeling. The remainder of this Subsection provides a detailed discussion of these major modeling parameters and assumptions. The State has also included, in Appendix II of this document, the MOBILE5a-H input and output files for New Jersey's performance standard modeling and the spreadsheet used to complete all of the "off-model" calculations.

Table II: Major Modeling Parameters

Modeling Parameters/Assumptions	Values Used

[10]USEPA Memorandum dated October 11, 1996, entitled "Release of MOBILE5b" from Philip A. Lorang, Director for the Assessment and Modeling Division, to Regional Air Directors.

Network Type	hybrid - 70% centralized/30%decentralized
Credit Assumed for Decentralized Program	80%
Test Frequency	biennial
Program Start Date	January 1, 2000
ASM5015 MY Coverage	1981 and newer*
Emission Standards for ASM5015	final - beginning January 1, 2000
Idle Test MY Coverage	pre-1981**
Pressure and Purge Test MY Coverage	1981 and newer***
Gas Cap Test Only MY Coverage	pre-1981
Visual Catalyst Inspection MY Coverage	1975 and newer
Pre-1981 Stringency	30%
1981 and Newer Waiver Rate****	3%
Compliance Rate	98%
Evaluation Date	January 1, 2002
On-Road Testing	N/A

* Except those vehicles not amenable to dynamometer-based testing and low mileage vehicles, both of which will receive a 2500 RPM test.
** Only those pre-1981 vehicles which were equipped with sealed gas caps will be subject to the gas cap check. The State estimates that model year vehicles prior to 1970 were not equipped with a sealed gas cap.
*** Except that those vehicles receiving the 2500 RPM test instead of the ASM5015 test will not be subject to purge testing.
**** No waiver rate is assumed for pre-1981 vehicles.

1. Network Type:

New Jersey's enhanced I/M program will be comprised of a hybrid network, similar to the State's basic I/M network. For modeling purposes, the State has assumed a 70/30 split for its enhanced I/M network (that is, 70 percent of the vehicle owners are expected to pass inspection at a centralized inspection facility; the remaining 30 percent are expected to pass inspection at a decentralized private inspection facility). This assumption is based on the centralized facility build-out mandates for the enhanced I/M program. In 1997, the State's basic I/M program has a network split of 68/32[11] (that is, 68 percent of the vehicle owners

[11] This hybrid network split was derived by the NJDMV from the inspection reports it receives from both the centralized and decentralized inspection centers in New Jersey.

pass inspection at a centralized inspection facility; the remaining 32 percent pass inspection at a decentralized private inspection facility).

In accordance with the flexibility afforded states by the National Highway System Designation Act of 1995 (NHSDA), New Jersey claimed that the decentralized portion of its enhanced I/M program would be 80 percent as effective as the centralized portion of its program[12]. Therefore, New Jersey has assumed 80 percent credit for the decentralized portion of its program in its performance standard modeling contained herein.

To account for the hybrid nature of New Jersey's enhanced I/M program, two separate modeling runs (one completely centralized; the other completely decentralized) are needed. The emission factors obtained from these runs are then adjusted using two "off-model" calculations. First, the decentralized emission factor is adjusted to account for the State's 80 percent credit claim, as the results from the MOBILE5a-H mobile source emission model reflects only 50 percent credit for a completely decentralized program. Second, both the centralized emission factor and the 80% adjusted decentralized emission factor are weighted to account for the 70/30 hybrid network split. The following equations were used to complete these two "off-model" calculations:

Equation 1: 80% Decentralized EIM EF = EF_D - (3/5)*(EF_D-EFc)

Where:

EF_D =decentralized EIM emission factor from MOBILE5a-H; and
EF_C =centralized EIM emission factor from MOBILE5a-H.

Equation 2: Hybrid Network Adjusted EF = (EF_{D80} * 0.30) + (EF_C * 0.70)

Where:

EF_{D80} = decentralized EIM emission factor from MOBILE5a-H adjusted for the 80% credit cl

[12] Revision to the State Implementation Plan (SIP) for the Control of Mobile Source Ozone Air Pollution--Enhanced Inspection and Maintenance (I/M) Program, March 27, 1996, Section 3, Network Type and Program Evaluation, pages 14-15.

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EF_C = centralized EIM emission factor from MOBILE5a-H.

2. Start Date:

According to a USEPA guidance memorandum on use of the mobile model[13], the I/M program start date is defined as the date on which vehicles were first inspected using a tailpipe exhaust emission inspection. The USEPA further states in this memorandum that the primary use of the I/M program start date in the model is to determine the start of the tampering deterrence effect of an I/M program. As such, the I/M credits for the 1981 and newer model year vehicles do not depend on the start date of the I/M program at all, provided that at least one full cycle of the inspections has been completed. Thus, the start date chosen by New Jersey for its performance standard modeling submission is only used to determine the implementation date of the evaporative pressure and purge tests, thereby determining the emission reductions anticipated from the implementation of those two tests. For determining the anticipated emission reductions for the exhaust emission test procedures, the modeling relies on the date when emission inspections of any kind (i.e., the State's current basic I/M program) began, which, for New Jersey, was 1974.

According to the NJDEP's regulations governing the enhanced I/M program, all of the enhanced I/M inspections (both the exhaust and evaporative emission tests) will begin twelve months after the USEPA's interim approval of the enhanced I/M SIP and its revision[14]. As stated earlier, the USEPA adopted its conditional interim approval of New Jersey's enhanced I/M SIP on May 14, 1997 and this adopted rule became effective on June 13, 1997. Therefore, in accordance with the NJDEP rules for the enhanced I/M program, New Jersey will implement its program on June 13, 1998 (12 months from the operative date of the USEPA's conditional interim approval).

As a result of current delays in the implementation of New Jersey's enhanced I/M program, the State is concerned that full implementation of New Jersey's enhanced I/M program will not occur by the June 13, 1998 date set forth in the NJDEP regulations. The USEPA has

[13] Memorandum dated October 29, 1993 from Philip A. Lorang, then Director Emission Planning and Strategies Division, Office of Mobile Sources, USEPA to Air Management Division Directors, USEPA entitled "MOBILE5a Input of I/M Program Start Date."

[14] N.J.A.C. 7:27-15.5.

already taken action against New Jersey, based on the delays in the implementation of its enhanced I/M program, by disapproving the State's 15 percent rate of progress (ROP) plans[15]. This disapproval started both a sanction process (2:1 offsets followed by federal highway approval and funding restrictions) and a Federal Implementation Plan (FIP) process for New Jersey. In order to stop the sanctions process and FIP actions, New Jersey needs to: 1) submit revised 15 rate of progress plans which include adopted State regulations that provide for the necessary emission reductions; and, 2) notify the USEPA that the State has begun implementation of its enhanced I/M program. In addition, the USEPA would need to officially approve these plans in a Federal Register notice. Therefore, New Jersey is working with the USEPA to insure that implementation of its enhanced I/M program occurs as soon as practicable. For modeling purposes, the NJDEP assumed an enhanced I/M start date of January 1, 2000.

On November 24, 1997, New Jersey began enhanced I/M testing in two demonstration lanes within the State. These demonstration lanes were devised to familiarize New Jersey motorists with the new program and to analyze and resolve any operational issues prior to full implementation of the program. In addition, it is the State's intention to transition from basic to enhanced testing as testing facilities are completed. This will insure that a portion of the total vehicle fleet will receive enhanced inspections prior to *full* implementation of the program.

3. Test Frequency:

Overall, the State intends to implement its enhanced I/M program on a biennial basis (that is, vehicles are inspected once every two year, instead of annually). However, there are several types of "off-cycle" inspections which, due to their nature, result in vehicles being inspected annually, rather than biennially. Off-cycle inspections include random roadside inspections, remote sensing inspections, retail and casual change of ownership inspections and courtesy inspections. Each category of off-cycle inspection is discussed in greater detail below. In addition, Table III gives an overview of the vehicle inspection types and the number of vehicles anticipated to receive those inspections annually under the new enhanced I/M program[16].

Random Roadside Inspections:

[15] Letter dated December 12, 1997 to Commissioner Robert C. Shinn, Jr., NJDEP and Commissioner John J. Haley, Jr., New Jersey Department of Transportation, from Deputy Regional Administrator William J. Muszynski, P.E., USEPA, Region II. A similar, but less detailed letter, was sent on the same day to New Jersey Governor Christine Todd Whitman from Regional Administrator Muszynski.

[16] The numbers listed throughout Subsection 3 and included in Table III represent the number of vehicles the State anticipated will be subjected to the various types of inspections (initial and off-cycle). These numbers were obtained through personal communications with Tom Wright, Coordinator for Technical Support, NJDMV and represent emission inspections only, unless otherwise indicated.

Random roadside inspections are used as an enforcement mechanism and are designed to insure compliance with the enhanced I/M program. The NJDMV estimates that it conducts approximately 50,000 roadside safety and emission tests annually under the basic I/M program. The State has determined that this number of random roadside inspections will remain relatively constant once the new enhanced I/M program is implemented. A vehicle which fails an roadside inspection is required to return to either a centralized or decentralized inspection facility for reinspection.

Remote Sensing Inspections:

Similar to the random roadside inspections, remote sensing technology is used as a method of enforcement and compliance with the enhanced I/M program. As such, vehicles identified by the remote sensing device as non-complying are required to return to either a centralized or decentralized inspection facility for reinspection. Although the State does plan to use remote sensing technology as part of its enhanced I/M program, the State has not determined to what extent this technology will be used. Therefore, it is not yet possible to estimate how many vehicles will be effected.

Change of Ownership Inspections:

Although this type of inspection is no longer required by the New Jersey Motor Vehicle Traffic Laws, the State will allow motorists the option of having a vehicle inspected upon change of ownership. The NJDMV estimates that, under the State's basic I/M program, 900,800 change of ownership inspections are performed annually by retail agencies (e.g., used vehicle dealerships), and 399,200 change of ownership inspection are performed annually due to casual automobile sales. This results in a total combined number of retail and casual change of ownership inspections of 1.3 million annually.

However, because change of ownership inspections will no longer be mandated by the State, the NJDMV had to project the fraction of vehicles which would continue to receive a voluntary change of ownership inspection under the new enhanced I/M program. The NJDMV estimated that 95 percent of retail-sold vehicles would continue to have change of ownership inspection performed on them as a customer courtesy, while only 10 percent of the casually-sold vehicles would continue to be subjected to this additional inspection. For modeling purposes, the NJDEP decided to use more conservative projected percentages; 90 percent for retail sales and 5 percent for casual sales. These conservative percentage result in an expected 830,680 annual change of ownership inspections (both retail and casual) for the enhanced I/M program.

Courtesy Inspections:

Under the State's basic I/M program, the NJDMV conducts about 150 courtesy inspections at the request of motorists. This number is not anticipated to change once the new enhanced I/M program is implemented.

Table III: Anticipated Vehicle Inspections

Vehicle Inspection Category	Anticipated Inspections
Total Vehicle Population Eligible for Inspection	5,170,000
Expected Annual Initial Inspections	2,585,000
Expected Annual Change of Ownership Inspections	830,680
Expected Annual Roadside Inspections	50,000
Expected Annual Courtesy Reinspections	150
Total Expected Annual Off-Cycle Inspections	880,830
Total Expected Annual Initial and Off-Cycle Inspections Combined	3,465,830

The combination of roadside, change of ownership and courtesy inspections expected under the enhanced I/M program results in 880,830 annual inspections, or 25.4 percent of the total expected annual inspections (that is, annual initial and off-cycle inspections combined). The remaining 74.6 percent of the inspections performed are due to those vehicles scheduled for their "biennial" inspection in that year. Therefore, in modeling to determine compliance with the performance standard, the NJDEP assumed that 25.4 percent of the total vehicle population would to receive an annual inspection.

To factor in the impact of these annual inspections on emission reductions, an adjustment to the emission factor is needed. This adjustment requires two additional modeling simulations; one assuming a 100 percent annual test frequency and the second one assuming a 100 percent biennial test frequency. The emission factors from these modeling runs are then adjusted to account for an 80 percent decentralized credit claim and for the 70/30 hybrid network using Equations 1 and 2. The resulting emission factors are weighted using the following equation to determine the newly adjusted emission factor:

Equation 3:Annual Adjusted EF = (0.254 * annual EF) + (.746 * biennial EF)

4. Model Year and Vehicle Type Coverage:

All gasoline-fueled vehicles in New Jersey, regardless of model year, will receive some type of emissions inspection once the enhanced I/M program is implemented, unless specific regulatory exemptions apply. However, only 1981 and newer model year vehicles which are: 1) classified as light-duty gasoline-fueled motor vehicles (LDGVs), or light-duty gasoline-fueled trucks 1 and 2 (LDGT1s and LDGT2s)[17], 2) amenable to dynamometer-based testing, and 2) not "specifically exempted" from enhanced testing, will be subjected to the enhanced inspection test procedures. "Specifically exempted" vehicles are those vehicles which have been exempted from enhanced emission testing, or alternatively, from emission testing as a whole, through NJDMV regulations and statute. These vehicles include collector motor vehicles, low mileage vehicles, and historic motor vehicles. Table IV outlines each vehicle category and which exhaust and evaporative emission tests, if any, are applicable to that vehicle category.

5. Exhaust Emission Test Type:

Table IV outlines the different vehicle categories and the applicable tests for those categories as reflected in the performance standard modeling. The remainder of this Subsection contains a description of how various vehicle categories were modeled to determine compliance with the performance standard.

The ASM5015 exhaust emission test procedure (a single mode ASM test) will be performed on all 1981 and newer LDGVs, LDGT1s and LDGT2s which are amenable to dynamometer-based testing and are not specifically exempted from enhanced testing. In contrast, all pre-1981 LDGVs, LDGT1s and LDGT2s, and all HDGVs, will continue to receive an idle test, New Jersey's basic exhaust emission test, as their official exhaust emissions inspection.

For modeling purposes, the State determined that approximately one (1) percent of 1981 and newer vehicles would not be amenable to dynamometer-based testing. Vehicles which are not amenable to dynamometer-based testing are those vehicle which employ full-time, four-wheel drive or which are installed with non-switchable traction control. This percentage was determined by first analyzing national market sales of four-wheel drive vehicles. The resulting percentage from this analysis was then adjusted downward to account for those vehicles with switchable four-wheel drive capabilities; since these vehicles can be inspected on a dynamometer. Finally, the percentage was rounded up to one (1) percent to account for vehicles with non-switchable traction control. Although the NJDEP could not find national statistics regarding the number of vehicles manufactured with non-switchable traction control, it was assumed that these vehicles comprise a very small percentage of the overall vehicle fleet. The NJDEP analysis for determining the

[17] To determine whether a vehicles is classified as a LDGV, LDGT1, LDGT2, or HDGV, please refer to the definition section of either of the NJDEP's rules for the implementation of the enhanced I/M program at N.J.A.C. 7:27-15.1 and N.J.A.C. 7:27B-4.1.

percentage of 1981 and newer vehicles which are not amenable to dynamometer-based testing is contained in Appendix III.

Table IV: Various Vehicle Categories and Applicable Emission Tests

Vehicle Category	Exhaust Emission Test	Evaporative Emission Test(s)
pre-1981 vehicles	idle	gas cap test only**
1981 and newer vehicles*	ASM5015	both pressure (including gas cap test) and purge test
1981 and newer vehicles not amenable to enhanced testing***	2500 RPM	pressure (including gas cap test) test
low mileage vehicles****	2500 RPM	pressure (including gas cap test) test
collector motor vehicles*****	exempt	exempt
historic motor vehicles	exempt	exempt

*unless the vehicle not amenable to dynamometer-based testing or is specifically exempt.
** Only those pre-1981 vehicles which were equipped with sealed gas caps will be subject to the gas cap check. The State estimates that model year vehicles prior to 1970 were not equipped with a sealed gas cap.
*** "enhanced testing" refers to dynamometer-based testing; specifically, the ASM5015.
**** The "low mileage vehicles" category was required by the enhanced I/M legislation is defined and discussed at P.L. 1995, Chapter 112, Section39:8-2b.(1), approved June 2, 1995.
***** The "collector motor vehicles" category was required by the enhanced I/M legislation is defined and discussed at P.L. 1995, Chapter 112, Section39:8-1a., approved June 2, 1995.

The NJDMV's regulations and statute specifically exempt several types of vehicles which would otherwise be subjected to enhanced I/M testing from either the enhanced tests (that is, subjecting these vehicles, instead, to a lesser exhaust emission test) or from emission testing as a whole. These vehicles include: 1) low mileage vehicles, and 2) collector motor vehicles. To determine whether or not a vehicle qualifies for either of these categories, see the NJDMV's definitions at N.J.A.C. 13:20-43.1. In addition, the NJDMV's regulations maintain a vehicle category currently in existence which exempts applicable vehicles from basic I/M emission testing. These vehicles are classified by the NJDMV as historic motor vehicles. To determine whether or not a vehicle qualifies as a historic motor vehicle, see the NJDMV's definitions at N.J.A.C. 13:20-43.1 and N.J.S.A. 39:3-27.3.

In determining the percentage of low mileage vehicles which are part of the overall New Jersey fleet, NJDEP consulted "Update of Fleet Characterization Data for Use in MOBILE6," a document completed by Acurex Corporation for USEPA in May of 1997. This document characterized the 1996 National fleet and the average mileage accumulation of that fleet. The NJDEP analyzed the report's data on 1981 and newer LDGVs with a mileage accumulation below 5,000 annually and calculated their percentage of the entire light-duty gasoline-fueled motor vehicle fleet. This percentage was then rounded up to account for those vehicles which have such an unusually low average mileage accumulation that they would not have been accounted for in the Acurex report. The State's analysis resulted in the estimation that one (1) percent of the State fleet would qualify as a low mileage vehicle. The NJDEP analysis for determining the percentage of low mileage vehicles in New Jersey is contained in Appendix IV.

Although it is not possible to determine the number of applications the State will receive under the enhanced I/M program for designation as a collector motor vehicle, the State believes that the number will be insignificant, well under 1 percent. Therefore, collector motor vehicles were not accounted for in the performance standard modeling. The NJDEP also did not account for historic motor vehicles, as the vehicles in this category, by definition, fall well outside the 25 model year analysis window examined at by the MOBILE5a-H model.

The combination of vehicles not amenable to dynamometer-based testing and those classified as low mileage vehicles are estimated to be 2 percent of the 1981 and newer vehicle population. Thus, this 2 percent of the 1981 and newer vehicles in the State would receive a 2500 RPM test instead of the ASM5015 test.

To model the effects of subjecting this 2 percent of the 1981 and newer vehicle population to the 2500 RPM exhaust emission test, the NJDEP ran two model scenarios; one assuming that 100 percent of the 1981 and newer vehicles were receiving an ASM5015 exhaust test, the other assuming that 100 percent of the 1981 and newer vehicles were receiving an 2500 RPM exhaust test. The emission factors from the first run (100 percent ASM5015) are then adjusted to account for an 80 percent decentralized credit claim, for the 70/30 hybrid network, and for the annual change of ownership inspections using Equations 1, 2 and 3. The emission factors from the second run (100 percent 2500 RPM) are adjusted to account for an 80 percent decentralized credit claim and for the 70/30 hybrid network using Equations 1 and 2. The resulting adjusted emission factors are weighted using the following equation to determine the final emission factor for New Jersey's enhanced I/M program:

Equation 4: Final EF = (0.98 * 100% ASM5015 EF) + (0.02 * 100% 2500 RPM EF)

6. Emission Standards:

Since the performance standard evaluation year is January 1, 2002 (see explanation of Evaluation Date in Subsection 12), the State used final ASM cutpoints in completing its performance standard modeling.

7. Emission Control Device Inspections:

A visual inspection to determine the presence of a catalytic converter will be performed on all 1975 and newer motor vehicles. This was assumed in the State's performance standard modeling. In addition, the State assumed that all vehicles subject to either the full pressure test or the gas cap check alone would also receive a visual gas cap check.

Finally, the State included in its performance standard modeling fuel inlet restrictor testing for all applicable model years. The purpose of the fuel inlet restrictor test is to determine whether or not a leaded gasoline pump nozzle could fit into the vehicle's gasoline inlet, allowing for the possibility of leaded gasoline usage. Use of leaded gasoline interferes with effectiveness of the vehicle's catalytic converter. Although fuel inlet restrictor testing had been part of the State's annual inspections since June 1990, New Jersey stopped performing inlet restrictor tests in 1994 because it was no longer possible for New Jersey motorists to obtain leaded gasoline. However, according to a USEPA guidance memorandum on highway source modeling[18], states that have, in the past, performed fuel inlet tests for at least one full cycle (and have required catalyst replacement upon failure) may claim the SIP credit associated with this testing without future testing. Since New Jersey meet these qualifications, the State is still permitted to take emission credit for the fuel inlet restrictor test.

8. Evaporative System Function Checks:

Table IV shows which vehicle categories will be subjected to each of the various evaporative emission tests. This table shows that 1981 and newer vehicles subject to the enhanced ASM5015 exhaust emission test will also receive a evaporative purge test. However, the purge test will not be administered immediately upon implementation of the enhanced I/M program. Subsequent evaluation of the purge test by the USEPA, and use of this type of testing in other states which have already implemented their enhanced programs, has revealed significant operational problems with the administration of the purge test. The USEPA acknowledged that these problems existed in a memorandum to its regional air directors[19]. As such, the USEPA made the determination not to require this type of testing in the interim but has allowed states who committed to performing the purge test in the future to claim the applicable emission credit in its performance standard modeling[20].

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[18] Memorandum dated September 16, 1994 from Phil Lorang, then Director of the Emission Planning and Strategies Division, USEPA to All Regional Air Directors entitled "Discontinuation of Tail Pipe Lead and Fuel Inlet Tests."

[19] Memorandum dated November 5, 1996 from Margo T. Oge, Director of the USEPA's Office of Mobile Sources to all USEPA Regional Air Division Directors entitled "I/M Evaporative Emissions Sources."

[20] Memorandum dated December 23, 1996 from Leila H. Cook, Group Manager, Regional and State Programs Division, Office of Mobile Sources, USEPA to all USEPA Regional Air Division Direction entitled "I/M Evaporative Emissions Test - An Addendum."

All of the currently-developed purge tests require a dynamometer-based exhaust test to induce vehicle purge. This means that those 1981 and newer vehicles receiving the 2500 RPM test could not be subjected to these purge tests using the existing technology. As such, the NJDEP's rules for the implementation of an enhanced I/M program specifically exempt these vehicles from purge testing[21].

The NJDEP's regulations for implementation of an enhanced I/M program also include a gas cap check for any vehicle not already subject to the evaporative pressure test[22]. This gas cap check will insure that the gas cap seals properly and has no leaks. The USEPA model only looks at the last 25 model years from the evaluation date. Therefore, for a January 1, 2002 evaluation year, the MOBILE5a-H only looks at model years 1977 to 2002. As such, only four model years (1977-1980) would be modeled as not having a pressure test. However, New Jersey's program would give a gas cap check to these four model years plus all prior model years not accounted for in the model.

To estimate the benefit of the gas cap test alone instead of the entire pressure test for these vehicles, the NJDEP ran two model scenarios; one assuming pressure testing for all 1981 and newer vehicles, the other assuming pressure testing of all 1970 and newer vehicles. Please note that the second run only looks at 1970 and newer vehicles because NJDEP estimates that sealed gas caps were not used on model years prior to 1970.

The difference between these two VOC emission factors represents the additional benefit of pressure testing model years 1970 and newer motor vehicles. However the State is only doing a portion of the pressure test, namely the gas cap check, on these vehicles. Since the USEPA has stated that the gas cap check accounts for 40 percent of the full pressure test benefit[23], the following equation is used to calculated the pre-1981 gas cap benefit:

Equation 5:Pre-1981 gas cap benefit EF = $EF_{81+} - [(EF_{81+} - EF_{70+})*0.40]$

Where:

EF_{81+} = 1981 and newer pressure test VOC emission factor from MOBILE5a-H; and
EF_{70+} = 1970 and newer pressure test VOC emission factor from MOBILE5a-H.

This adjustment of the VOC emission factors is applied prior to using any or all of the Equations found is Subsection 1, 3 or 5 above.

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21 N.J.A.C. 7:27-15.5(f)5.

22 N.J.A.C. 7:27-15.5(f)6.

23 40 C.F.R. 52, 62 Fed. Reg. 26402 (May 14, 1997).

9. Stringency:

For modeling purposes, a 30 percent emission test failure rate was assumed for pre-1981 vehicles.

10. Waiver Rate:

In accordance with 40 C.F. R. §51.360(d)(1), each state's SIP must include "a maximum waiver rate expressed as a percentage of initially failed vehicles." The purpose of this waiver rate is to estimate emission reduction benefits in a modeling analysis. In the USEPA enhanced I/M performance standard, a 3 percent waiver rate was assumed[24]. Using this 3 percent assumption as guidance for its own enhanced I/M program, New Jersey assumed a 3 percent waiver rate for 1981 and newer vehicles in its performance standard modeling.

Under New Jersey's enhanced I/M program, any vehicle which applies for a waiver must show compliance with the idle test, in addition to meeting the minimum cost expenditure. Since all pre-1981 vehicles receive the idle test as their official inspection test under the enhanced I/M program, these vehicles are not eligible for a waiver. Thus, the pre-1981 waiver rate is assumed to be zero. The current basic I/M program in New Jersey does not provide for waiver.

11. Compliance Rate:

For modeling purposes, a 98 percent compliance rate was assumed for the overall enhanced I/M program. Under the current basic I/M program, a 96 percent compliance rate is maintained by the State program. See Figure 1. This is determined through random inspection sticker surveys performed by both the NJDEP and the NJDMV and documented in quarterly reports submitted to the USEPA[25]. It is the State's assumption that going from a sticker-enforced inspection program to a registration denial-enforced program will increase compliance with the program by approximately 2 percent.

12. Evaluation Date:

The USEPA's performance standard model program included evaluation dates. These were the dates by which states had to demonstrate, through modeling, that their enhanced I/M programs could attain equivalent or lower emission levels than the performance standard program[26]. Specifically, states had to demonstrate that the emission levels achieved by

[24] 40 C.F.R. §51.351(a)(11), 57 Fed. Reg. 52989 (November 5, 1992).

[25] Quarterly Inspection and Maintenance Compliance Reports for April 1993 through September 1997, submitted quarterly to Ronald Borsellino, Chief of the Division of Environmental Planning and Protection, Air Program Section, the USEPA, Region II from John C. Elston, Administrator of the Office of Air Quality Management, NJDEP.

[26] 40 C.F.R. §51.351(a)(13), 57 Fed. Reg. 52988 (November 5, 1992).

their enhanced I/M program were equivalent to, or lower than, those achieved by the performance standard program by 2000 for ozone (VOC and NO_x) and 2001 for CO.

The USEPA, in its proposal for the conditional interim approval of New Jersey's enhanced I/M SIP and its revision, modified these evaluation dates[27]. The USEPA stated in this proposal that "based on the provisions of the NHSDA, the evaluation dates in the current [federal] I/M rule have been superseded." The provisions of the NHSDA allowed for state development of an enhanced I/M program commencing later than those dates set forth in the USEPA's final rule on Inspection and Maintenance Requirements. Therefore, to be consistent with the intent of the NHSDA, the USEPA stated that the initial evaluation date, for all three criteria pollutants, would be January 1, 2002. As such, the performance standard modeling contain herein models for an evaluation date of January 1, 2002.

[27] 61 Fed. Reg. 56172 (October 31, 1996).

Figure 0: **Quarterly Compliance Rate**

C. Other Modeling Parameters and Assumptions:

In addition to the parameters and assumptions discussed previously in Subsection B, the NJDEP had to make other assumptions in order to complete its performance standard modeling. The following table shows what those assumptions were and what values where used to complete the modeling:

Table V: Other Modeling Assumptions

Modeling Parameters	Value Used for Summertime Runs (VOC and NO_x)	Value Used for Wintertime Runs (CO)
Maximum Temperature	95	38
Minimum Temperature	71	38
Ambient Temperature	75	38
Speed	19.6	19.6
Operating Modes	20.6, 27.3, 20.6	16.2, 20.0, 16.2
Mechanic Training and Certification assumed	yes - 100%	yes - 100%
LEV program assumed	no	no
RFG program assumed	yes	yes
Wintertime oxygenated fuels assumed	N/A*	N/A*

*Assuming RFG in a modeling run nullifies an assumption of wintertime oxygenated fuels beyond the wintertime RFG requirements[28].

III. Performance Standard Modeling Results:

The following table shows the emission factors obtained from both the performance standard program and New Jersey's enhanced I/M program for January 1, 2002.

Table VI: Modeling Results

Program Type	VOC	NO_x	CO

[28] USEPA document dated July 24, 1996 entitled "MOBILE5a Model Frequently Asked Question #1." Question #1 was "How can I model the federal reformulated gasoline (RFG) program using MOBILE5a?"

Performance Standard	1.63	1.71	15.90
New Jersey Program	1.63	1.65	15.37

IV. Conclusion:

As can be seen from Table VI, New Jersey's enhanced I/M program will achieve equivalent VOC emission levels to, and lower NO_x and CO emission levels than, the "model" enhanced I/M program developed by the USEPA. This demonstration, submitted to the USEPA by New Jersey's commitment date of February 1, 1998, cures the second major deficiency identified by the USEPA in New Jersey's enhanced I/M SIP and its revision.