REPORT TO THE GOVERNOR

AND THE LEGISLATURE ON

NEW JERSEY'S ROADWAY PAVEMENT SYSTEM

FISCAL YEAR 2007

Prepared by:

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Commissioner

August 2008

State of New Jersey

DEPARTMENT OF TRANSPORTATION
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JON S. CORZINE
Governor

KRIS KOLLURI
Commissioner

August 2008

Dear New Jersey Resident:

I am pleased to submit the Department's fiscal year 2007 Report on New Jersey's Pavement Infrastructure. The state highway network is one of New Jersey's largest assets and preserving our pavement investment continues to be a high priority for the Department. The state highway system carries approximately 41 per cent of the State's vehicular travel and is an essential element of New Jersey's economy.

The Statewide Capital Investment Strategy strives to maintain the roadway infrastructure in a state of good repair and address deficiencies. Funding for pavement projects is the major constraint to network improvement. Over the last decade, the backlog of deficient pavements has continued to increase. A recent analysis has predicted that continuation of current funding levels over the next decade will not eliminate the deficiency problem. A dedicated program to eliminate the backlog of deficient pavements over the next ten years is estimated to cost $600 million per year. Moreover, considering structural strength in addition to road roughness and surface cracking, it is estimated that approximately $1 billion per year over the next ten years would be required to bring the entire state highway system to a good condition. Improving the condition of the state highway network is a difficult task in a time of tough competition for limited financial resources.

The Department is utilizing a comprehensive Pavement Management Plan to make the most effective use of available resources. This strategy includes a mix of pavement treatments ranging from preventive maintenance to rehabilitation and reconstruction and takes advantage of the Department's expedited project pipeline delivery system. This plan seeks to minimize the cost of managing our pavement assets by expending funds on the ***right treatment*** at the ***right time*** in the ***right place*** at the ***right cost***.

This report highlights work completed through the Plan in fiscal year 2007 and additional projects planned for fiscal year 2008.

Sincerely,

Kris Kolluri
Commissioner

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY

New Jersey's State Highway System

The New Jersey state highway system, owned and maintained by the New Jersey Department of Transportation (NJDOT), constitutes the heart of our state's surface transportation network and plays a major role in stabilizing and enhancing the economic vitality of New Jersey. It is an indispensable element in the economic health of New Jersey and its residents providing safe access and mobility to and from residential, commercial, industrial and recreational land uses and producing employment, business, and tourism opportunities. Therefore, preservation of New Jersey's investment in the state highway system is critical to New Jersey's transportation driven economy and remains one of the highest priorities at the NJDOT.

Maintaining the structural integrity and ride quality of the state highway system pavements is a major task. The state highway system consists of approximately 2340 one-way centerline miles of roadway, which amounts to approximately 8300 lane miles of mainline roadway, 3650 lane miles of shoulders, and 900 lane miles of ramps. While the NJDOT has jurisdiction over only 6% of the entire New Jersey roadway network (counties, municipalities, and toll and bridge authorities own the other 94%), about 41% of all New Jersey traffic, including a high percentage of heavy trucks, is carried on NJDOT maintained roads. With the highest population density of the fifty states, New Jersey experiences traffic volumes that are roughly 3.5 times the national average[1]. This onslaught of heavy traffic coupled with a severe freeze-thaw environment accelerates pavement deterioration.

Efforts to reduce the rate of pavement deterioration have been made by implementing numerous reconstruction and rehabilitation, resurfacing and preventive maintenance projects. However, the heavy traffic volume and environmental effects, coupled with competing needs for transportation dollars, have allowed the backlog of deficient pavement sections to increase over time. **Serious underfunding of pavement preservation over the last decade has brought the state highway system pavement condition to a critical state.** Despite efforts to make best use of available resources, investment in pavement repair and maintenance activities has not been enough to offset deterioration.

Current Status of the Roadway System

A recent evaluation of the nation's transportation infrastructure by the American Society of Civil Engineers (ASCE)[2] has rated **New Jersey's highways among the worst in the country**. It is estimated that New Jersey motorists paid approximately $3.2 billion in extra vehicle repairs and operating costs due to poor road conditions in 2005. These **extra vehicle repair costs break down to approximately $554 dollars per New Jersey motorist in 2005 (almost double the amount per motorist in neighboring states).** ASCE estimates that **approximately 71% of the major roads in New Jersey are in either poor or mediocre condition, generally twice the amount in surrounding states.**

[1] Federal Highway Administration, Policy, *Highway Statistics 2005, Table HM-81*, page 34
[2] American Society of Civil Engineers, *2005 Report Card for America's Infrastructure*

In a study funded by the Reason Foundation[3], the performance of state maintained roads from 1984 to 2005 in 12 different categories was measured including traffic fatalities, congestion, pavement condition, bridge condition, highway maintenance, and administrative costs to determine each state's ranking and cost effectiveness. The study found that **New Jersey's gridlocked highways, poor pavement conditions and high repair costs put the state last in overall cost effectiveness for the eighth consecutive year.**

The yearly assessment of the state highway system by NJDOT is based on data collected and compiled within the Department's Pavement Management System. The current analysis utilizes 2006 data from the Pavement Management System database to evaluate the mainline roadway of the state highway system. The pavement condition assessment is divided into the following categories:

- **Pavement Structural Adequacy:** Based on pavement structural adequacy, it is estimated that ***53% of the state highway system is deficient*** to carry the design traffic loads and is in danger of quickly deteriorating and becoming more costly to repair.

- **Pavement Functional Adequacy:** Based upon functional adequacy as measured by the International Roughness Index for ride quality and the Surface Distress Index for surface condition, current Pavement Management System data indicates that ***49% of the system is deficient and overdue for rehabilitation (15% is deficient based on roughness alone, 22% is deficient based on distress alone, and 12% is deficient based on roughness and distress combined). At the same time, 29% of the system is in mediocre condition and 10% is in fair condition.*** *The mediocre/fair portion of the roadway network currently requires less costly treatments to retard deterioration and restore a good condition, but will slip into the poor category within the next few years if action is not taken.* ***Only 12% of the system is considered in good condition.***

- **Pavement Remaining Service Life:** Remaining service life estimates the number of years before a particular pavement segment reaches a condition below acceptable performance standards. Results of a recent analysis indicate that ***the vast majority (approximately 70%) of the state highway system has little or no remaining service life.***

New Jersey's Pavement Preservation Effort

NJDOT has responded to this challenge by initiating a comprehensive pavement preservation program. The Pavement Management & Technology Unit, which oversees pavement efforts, has developed an innovative Pavement Plan that utilizes sophisticated engineering data collection and analysis along with economic analyses that consider pavement performance, costs/benefits, vehicle travel, and long-range system optimization under limited funding scenarios.

Some key elements of the initiative are:

- **Advances in Data Acquisition**: To more accurately assess pavement system conditions, NJDOT utilizes an accelerated program to test the entire state highway system on an

[3] The Reason Foundation, *16th Annual Report on the Performance of State Highway Systems (1984-2005)*

annual basis and has upgraded its data collection equipment with a state-of-the-art, laser equipped high-speed road profiler.

- **Improved Data Analysis and Condition Reporting**: The computerized pavement data management system has been enhanced by developing sophisticated databases and utilizing powerful engineering software to more accurately evaluate the condition of the pavement infrastructure and to plan for its restoration and preservation.

- **Partnership with Rutgers Pavement Resource Program:** The Department has partnered with Rutgers Center for Advanced Infrastructure and Transportation. The Center's Pavement Resource Program is a university-based collaborative effort among federal and state agencies, local municipalities, and industry and has extensive capabilities in all areas of pavement engineering and management including paving materials, material testing, and construction quality control methods.

- **Enhanced Quality Control for New Pavement Projects**: NJDOT has designed and implemented an incentive/disincentive ride quality specification for contractors based upon the International Roughness Index to insure the highest quality of construction practices and materials in roadway restoration and optimum ride quality on new pavement surfaces. Ride quality is a primary index by which pavements are rated and initially smooth pavements have been shown to last up to 50% longer.

- **Redesigned Pavement Treatment Plan**: This plan focuses on reducing the substantial backlog of deficient pavements while at the same time utilizing a multi-year prioritization approach containing a "mix of fixes" for pavements in various condition stages. Many of the pavement treatments utilized are detailed in Appendix A of this report. This proactive approach includes preventive maintenance designed to maintain acceptable pavements in acceptable condition and to free up funding for deficient backlog reduction because preventive maintenance treatments are completed at a fraction of the cost of resurfacing, rehabilitation and reconstruction activities. The ability to selectively fast-track projects through special project delivery pipelines plays a significant role in implementing this plan.

These overall strategies will result in expending funds on the ***right treatment*** at the ***right time*** in the ***right place*** at the ***right cost***. If significantly increased funding is provided for pavement restoration, the Pavement Management & Technology Unit plans to focus on reducing the backlog of deficient pavement sections while at the same time utilizing elements of the multi-year prioritization approach to preserve our "good" pavement infrastructure.

Statewide Capital Investment Strategy

The Statewide Capital Investment Strategy is an asset management, performance-based capital programming mechanism that links broad transportation goals and policies to specific investment choices. The investment strategy includes road assets and pavement condition as essential elements. With regards to pavement preservation, the strategy uses the latest technological advances in performance measurement and pavement management to make decisions, provide

strategic direction and link the selection of projects for capital funding with broad program objectives.

Funding levels for pavement preservation over the past decade have resulted in a substantial backlog of deficient pavement sections. Efforts to reduce this deficiency and the rate of pavement deterioration under these funding levels have not succeeded and the mileage of deteriorated pavement segments has increased over time. Funding allocations for more expansive pavement improvements are constrained by the necessity to balance the capital program to fund other competing needs such as high cost bridges, safety improvements, congestion management and strategic mobility projects. Pavement preservation funding amounts for fiscal year 2007 are shown in Table 3 on page 21 and historical funding amounts over several fiscal years are shown in Figure 8 on page 24 of this report.

To provide strategic direction for future planning, the strategy includes performance trend analyses conducted by the Pavement Management & Technology Unit to determine how well various investment scenarios perform over time. Results of these analyses are shown in Figure 7 on page 23 of this report. The severity of the situation is underscored by these results which show that under the current funding level of $275 million it will take approximately 10 years to reduce the current backlog of deficient pavements by one-half and approximately $600 million per year to entirely eliminate the backlog. The need to improve the structural integrity and smoothness of the state highway network continues to be a challenging endeavor.

Based on these analyses, recommendations were made for fiscal year 2008 to continue with increased funding levels for highway resurfacing, highway capital maintenance, and highway rehabilitation and reconstruction programs. The Department's fiscal year 2008 Capital Program identifies a funding level of approximately $268 for the pavement preservation program. Details of this funding program are outlined in Section 1 of Appendix B of this report. This program funds a comprehensive pavement plan consisting of various treatments for highway problems in order to decelerate the continuing downward trend in condition level. These treatments include relatively expensive rehabilitation and reconstruction projects for significant problems, less expensive resurfacing projects that extend service life and improve smoothness, and a wide range of lower-cost and often innovative preventive maintenance repair techniques.

An investment strategy to maintain, rehabilitate, and reconstruct New Jersey's transportation infrastructure must receive a strong emphasis. New Jersey has a large investment in its highway infrastructure. Existing roadways, constructed over many years, will have to carry the bulk of commuter, freight and recreation traffic now and for many years in the future. Deterioration and other inadequacies in this infrastructure will be felt by frustrated motorists and ultimately by the economy.

In terms of pavement performance, there is a significant difference in "where we are now" and "where we would like to be". Our ability to invest in pavement preservation at the levels needed to shrink the current and projected backlog and significantly enhance performance cannot be realized due to a lack of adequate funding. The unavailability of adequate funding to properly reconstruct, rehabilitate, maintain, and preserve our roadway infrastructure can prove to be an extremely expensive situation in the future.

Work Completed in Fiscal Year 2007

The Department of Transportation's Construction Program for fiscal year 2007 was its largest ever. The Department awarded 139 projects with a total construction value of $720 million. The distribution of this work covered all of New Jersey's 21 counties. Roadway pavement work on the state highway system, such as resurfacing and reconstruction, accounted for approximately $265 million of this total. In compliance with the requirements of the "Congestion Relief and Transportation Trust Fund Renewal Act" enacted on July 20, 2000, this report documents the state highway system pavement-related projects with construction funding in fiscal year 2007 (see "Work Completed in Fiscal Year 2007" on page 27 of this report). These projects are organized into the following major areas and represent the following expenditures for pavement maintenance and repair:

- **Highway Capital Maintenance Projects** totaling approximately $15 million.

- **Highway Resurfacing – Operations Division Projects** consisting of 20 contracts initiated through the Department's Division of Operations Support valued at $60.52 million.

- **Highway Resurfacing – Capital Program Management Projects:** Eleven projects valued at $115.14 million.

- **Rehabilitation and Reconstruction – Capital Program Management Projects** with significant pavement system improvement benefits and construction funding in fiscal year 2007. There are three projects valued at $73.91 million. These projects are often funded and constructed over several years.

In addition to pavement projects completed on the state highway system, the Department funded pavement activities through its Local Aid Program. Funds were made available to counties and municipalities through the Transportation Trust Fund. Of the $175 million provided in fiscal year 2007, $78.75 million was used for local county aid and $78.75 million was used for local municipal aid. The remaining $17.5 million was available as local aid – discretionary to both counties and municipalities. About 60 to 75 percent of the completed projects funded through the local county aid program and 90 percent of completed projects funded through the local municipal aid program involved some form of pavement resurfacing.

Planned Work Programmed For Fiscal Year 2008

The Department's Pavement Management System was utilized to generate lists of critical pavement projects planned for implementation in fiscal year 2008. This planned work is included in Appendix B of this report.

STATUTORY MANDATE

The "Congestion Relief and Transportation Trust Fund Renewal Act" (Trust Fund Renewal Act) enacted on July 20, 2000 contains two sections of law that concern pavement evaluation and management.

> **N.J.S.A. 27:1B-21.23 Evaluation of road pavements**
> *"The commissioner shall continue to evaluate roadway pavements on the State highway system and assign numerical ratings to roads for maintenance and repair similar to any nationally recognized method."*
>
> **N.J.S.A. 27:1B-21.24 Report; numerical rankings of pavements**
> *"The commissioner shall issue a report to the Governor and the Legislature at the end of each fiscal year containing the numerical ranking of pavements for roads needing maintenance and repair in accordance with the method developed in section 10 of this act. The report shall also identify the repair and maintenance projects that were completed during the fiscal year, including an estimate of the cost impact to the department for each maintenance and repair project that utilized road surface material or treatment."*

Pursuant to the sections of law cited above, the New Jersey Department of Transportation (NJDOT) issues this report.

NJDOT PAVEMENT MANAGEMENT SYSTEM

Background and History

The development of the current NJDOT Pavement Management System has been an evolution over many years. Initially, NJDOT established a Pavement Skid Resistance Testing Unit in 1974 to measure frictional characteristics of pavements in response to the Federal Highway Administration (FHWA) requirement that each state have a "Highway Safety Program". One goal of the FHWA program was to reduce wet weather accidents. The skid resistance data was merged with accident records and then analyzed to identify pavement resurfacing needs based on wet weather crashes.

In December 1980, NJDOT formally established a Pavement Management Unit. In addition to pavement skid resistance testing, this unit began evaluating roadway surface conditions in order to identify pavement resurfacing needs and prioritize resurfacing projects.

Subsequently, the federal "Intermodal Surface Transportation Efficiency Act of 1991" (ISTEA) required that each state establish a pavement management program for roads on the National Highway System (NHS) and the Non-NHS Federal Aid System. The Department's Pavement Management Unit complied with the Federal directive. Even though the federal "National Highway System Designation Act of 1995" lifted the ISTEA pavement management mandates, the Department continued its pavement management system since it was considered a good business tool which provided NJDOT management with data necessary to choose cost-effective strategies and maintain roadways in serviceable condition.

The federal "Transportation Equity Act for the 21st Century" (TEA-21), enacted in June 1998, encouraged states to develop, implement and maintain systems for managing pavement on Federal Aid highways. In addition, the FHWA required the Department to prepare pavement life-cycle cost analyses for major federally funded projects.

Current Pavement Management System

In compliance with the Trust Fund Renewal Act, NJDOT's Pavement Management & Technology Unit develops and maintains the Pavement Management System (PMS). **The primary function of the system is to assess the pavement condition on the state highway system.** To this end, the unit utilizes sophisticated, automated equipment to collect pavement condition data measuring ride quality (smoothness), surface distress (cracking and structural deterioration), rutting (grooves in wheel paths) and skid resistance (surface friction) on an annual basis. In addition to collecting these traditional pavement surface condition indices, the Department has implemented Falling Weight Deflectometer testing which assesses the structural condition of the entire pavement structure throughout its multiple layers. The information gathered from this device allows engineers to better determine pavement structural adequacy, estimate remaining pavement service life, and identify limits of homogeneous sections of roadway that should receive the same rehabilitation treatment.

A second major function of the PMS is to supply information to drive the Department's capital pavement programs. PMS data is continually updated, analyzed, and reported to myriad users inside NJDOT in order to make engineering and management decisions.

- Capital investment strategists rely on PMS data analyses to optimize resources and develop the Department's capital program.
- The Department's Pavement Management & Technology Unit, which oversees the programs for the preservation, rehabilitation and reconstruction of pavements, utilizes PMS data to develop pavement projects that are implemented through Capital Program Management and the Operations branches of the Department.
- Utilizing data from the PMS, engineers at NJDOT have developed innovative programs to make the New Jersey roadway system safer and more efficient. An example is a project where roadway sections with an abnormally high incidence of wet weather accidents were analyzed using PMS frictional skid resistance data. Areas with poor pavement skid resistance received special traction enhancing treatments to reduce crashes and the resulting tremendous economic and emotional burden to drivers.

Thirdly, the PMS supplies vital information to a multitude of users outside NJDOT, including federal, state, county, and municipal agencies; consultants; contractors; and suppliers. This information assures continued federal funding for much needed pavement projects and allows coordination with other agencies and consultants to provide cost effective treatments and enhancements to the pavement network.

Significant Accomplishments in Pavement Management & Technology

- **Advances in Data Acquisition**: In an attempt to more accurately assess the condition of New Jersey's pavement infrastructure, NJDOT utilizes an accelerated program to test the entire state highway system on an annual basis, and has upgraded its data collection equipment with a state-of-the-art high-speed road profiler. This equipment collects more accurate and useful pavement data, including advanced digital images and road surface roughness and rut measurements, at highway speeds and thereby avoids the need for lane closures and resulting traffic delays.
- **Improved Data Analysis and Condition Reporting**: Allied with the data acquisition upgrades, the computerized pavement data management system was enhanced by developing sophisticated databases and supporting computer software to make pavement data more accessible to users and to process large quantities of more complex data. Powerful engineering software has been utilized to more accurately evaluate the condition of the pavement infrastructure and to plan for its preservation and restoration.
- **Enhanced Quality Control for New Pavement Projects**: NJDOT has designed and implemented an incentive/disincentive ride quality specification for new pavement work. Based on laser-measured smoothness criteria defined in terms of the International Roughness Index, this initiative assures the highest quality of construction practices and materials in roadway restoration.
- **Redesigned Pavement Preservation Plan**: Based upon recommendations from the Federal Highway Administration and outside consultants, NJDOT has developed an innovative Pavement Preservation Plan that focuses on reducing the substantial backlog of deficient pavements while at the same time utilizing a multi-year prioritization approach containing a "mix of fixes" for pavements in various condition stages. This proactive approach utilizes sophisticated engineering and economic analyses that consider pavement performance, costs/benefits, user delay, and long-range system optimization under limited funding scenarios. It is designed to maintain acceptable pavements in acceptable condition utilizing preventive maintenance treatments which retard pavement deterioration and are completed at a fraction of the cost of rehabilitation or reconstruction activities to free up funding for deficient backlog reduction. Activities in the Plan include the following "mix of fixes":

  - Concrete diamond grinding
  - Concrete slab stabilization using urethane grout injection
  - High performance thin overlays
  - Longitudinal joint repairs and crack/joint sealing

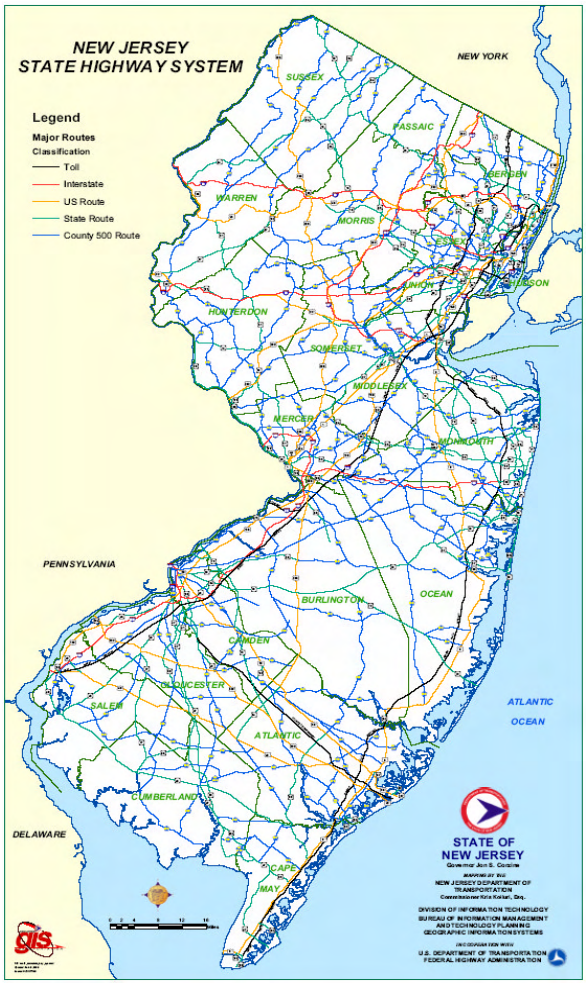
  } Preventive maintenance (lower cost repairs)

  - Rubblization of old concrete pavements followed by asphalt overlays
  - Use of the Reflective Crack Interlayer system (an innovative approach to delay reflective cracking when concrete pavements are overlaid by asphalt)
  - Milling and resurfacing asphalt pavements (moderately expensive projects that extend pavement life and improve smoothness)
  - Reconstruction and rehabilitation (expensive projects for serious problems)

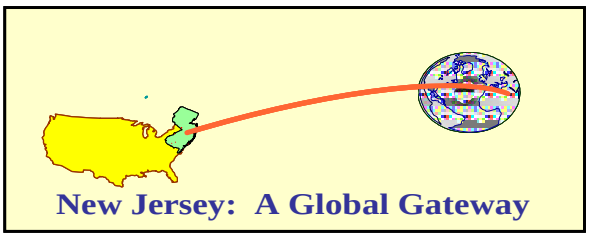
CURRENT STATUS OF THE STATE HIGHWAY SYSTEM

Introduction

The state highway system constitutes the heart of New Jersey's surface transportation network and plays a major role in stabilizing and enhancing the economic vitality of New Jersey by serving as a conduit to local, regional and national activity centers. It provides safe access and mobility to and from residential, commercial, industrial and recreational land uses producing employment, business and tourism opportunities.



Internationally, New Jersey serves as a global gateway for the world economy. The distribution of goods to, from and within New Jersey is extremely dependent upon the physical status of the roadway infrastructure. One of the keys to building and sustaining a strong economy is to minimize the cost of transporting people and goods by maintaining transportation systems that are efficient, well-planned, and in a state of good repair.



There are approximately 37,512 centerline (CL) miles of roadways in New Jersey. NJDOT maintains approximately 2,340 CL miles of roads, commonly referred to as the state highway system. Most of the remaining mileage is under the jurisdiction of counties (6,390 CL miles) and municipalities (28,340 CL miles). The major toll roads are the Garden State Parkway (194 CL miles) and the New Jersey Turnpike (173 CL miles) administered by the New Jersey Turnpike Authority and the Atlantic City Expressway (47 CL miles) administered by the South Jersey Transportation Authority. In addition, bridge authorities maintain 28 CL miles of roadway. As shown in Figure 1, NJDOT only maintains

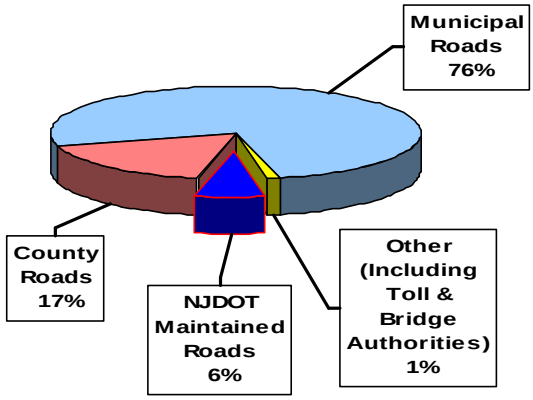
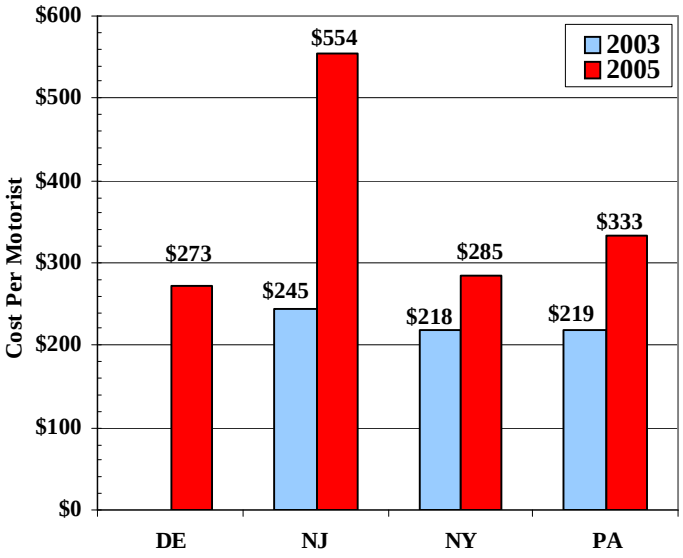


FIGURE 1
New Jersey Roadway System
Breakdown by Centerline Miles

about 6% of the total statewide mileage, but approximately 41% of all traffic, including a high percentage of heavy trucks, is carried on NJDOT maintained roads.

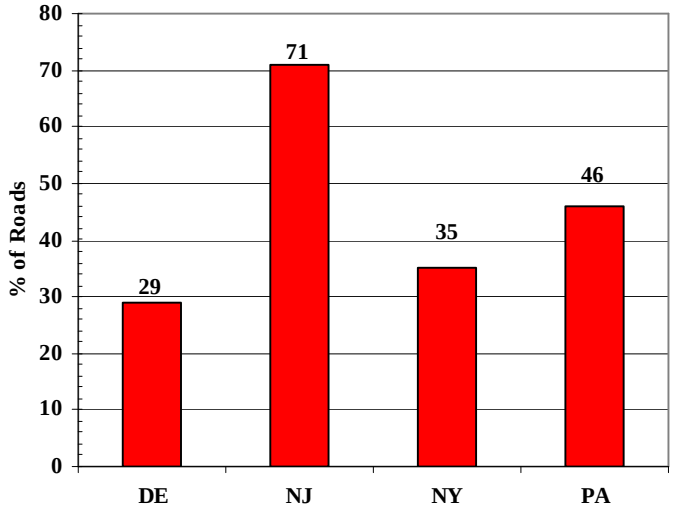
With the highest population density of the fifty states, New Jersey experiences traffic volumes that are roughly 3.5 times the national average[4] and over the past several decades axle load repetitions have doubled every ten years. New Jersey's older pavements are not structurally adequate to handle this increase in axle loading. In addition, pavement repair and maintenance work has been underfunded over the last decade. The result is a large backlog of roadway segments in poor or mediocre condition.

FIGURE 2
ASCE's Costs Per Motorist in Extra Vehicle Repairs and Operating Costs Due to Poor Road Conditions



Source: ASCE, 2005 Report Card for America's Infrastructre

FIGURE 3
ASCE's % of Major Roads in Poor or Mediocre Condition in 2005



Source: ASCE, 2005 Report Card for America's Infrastructre

In fact, a recent evaluation of the nation's transportation infrastructure by the American Society of Civil Engineers (ASCE)[5] rated New Jersey's highways among the worst in the country. The study showed that:

- New Jersey motorists paid a total of $3.2 billion in vehicle repairs and operating costs due to poor road conditions in 2005. Up from $1.4 billion in 2003, this is the largest total and largest 2-year increase in the nation. These extra vehicle repairs amount to approximately $554 annually per New Jersey motorist which is almost double the amount for the states surrounding New Jersey (see Figure 2).
- Approximately 71% of the major roads in New Jersey were determined to be in either poor or mediocre condition in 2005. This is a significant percentage of substandard pavements and illustrates how the neglect of pavement preservation can cause an immediate impact on New Jersey's highways. Compared to surrounding states, New Jersey has almost twice the amount of poor to mediocre condition highways (see Figure 3).

[4] Federal Highway Administration, Policy, *Highway Statistics 2005, Table HM-81*, page 34
[5] American Society of Civil Engineers, *2005 Report Card for America's Infrastructure*

In a study funded by the Reason Foundation[6], the performance of state maintained roads from 1984 to 2005 in 12 different categories including traffic fatalities, congestion, pavement condition, bridge condition, highway maintenance, and administrative costs was measured to determine each state's ranking and cost effectiveness. The study found that **New Jersey's gridlocked highways, poor pavement conditions and high repair costs put the state last in overall cost effectiveness for the eighth consecutive year.**

Assessment of the State Highway System by NJDOT

Evaluation of the New Jersey state highway system by NJDOT is based upon data collected on state maintained roads and stored in the Pavement Management System. The Pavement Management & Technology Unit analyzes this data to assess current pavement conditions. Pavement evaluation can be divided into the following categories:

Pavement Structural Adequacy

The Falling Weight Deflectometer (FWD) testing assesses the structural condition of the in-situ pavement structure throughout its multiple layers. The information gathered from this device allows engineers to determine whether pavement sections have sufficient strength to sustain design traffic conditions. This data is difficult to collect on a network level because lanes must be closed and traffic is impacted with this type of testing. The time and cost involved are substantial. However, a recent needs analysis using FWD technology was conducted on New Jersey's interstate highway system and results of this study were then extrapolated for the non-interstate portion of the system using statistical methodologies. The study estimated that approximately **53% of the current state roadway system is not structurally adequate** to sustain the current traffic load. Also, at existing funding levels, the deficient percentage will increase steadily to 90% deficient by fiscal year 2013. This is an alarming statistic since structural deficiency leads to accelerated pavement deterioration requiring extensive and costly rehabilitation or reconstruction to correct.

Pavement Functional Adequacy

Attributes related to functional adequacy primarily deal with pavement surface conditions. The Pavement Management System contains the following functional adequacy indices:

- **IRI (International Roughness Index)** estimates roughness as perceived by vehicle occupants using lasers to determine the actual variations in the pavement surface from a perfectly flat condition, measured in inches per mile.
- **SDI (Surface Distress Index)** assesses surface distress and visible deterioration by evaluating cracking, patching, faulting, shoulder drop, and joint deterioration. SDI is reported on a scale of 0 to 5 (5 is a perfect pavement free of any distress).
- **Rut Depth** measures depths of grooves primarily in vehicle wheel paths.
- **Skid Number** measures the pavement surface frictional characteristics.

[6] The Reason Foundation, *16th Annual Report on the Performance of State Highway Systems (1984-2005)*

While all of the indices listed above are considered in selecting locations and types of pavement rehabilitations, IRI and SDI are most indicative of functional adequacy and are used here to evaluate the system status. IRI is a national standard supported by the Federal Highway Administration and SDI is a New Jersey standard used for many years in roadway assessment.

The current analysis utilized 2006 data from the NJDOT Pavement Management System (PMS) database to evaluate the state highway system consisting of approximately 2340 one-way centerline miles of roadway. This amounts to approximately 8300 lane miles of mainline roadway, 3650 lane miles of shoulders, and 900 lane miles of ramps that are state owned and maintained. In this analysis, the criteria shown in Table 1 below were used to evaluate the mainline roadway condition.

TABLE 1
Condition Criteria

Condition Status	IRI (International Roughness Index, in/mi)	SDI (Surface Distress Index)	Engineering Significance
Deficient (Poor)	**> 170**	**≥ 0 and ≤ 2.5**	**These roads are overdue for treatment.** Drivers on these roads are likely to notice that they are driving on a rough surface, which puts stress on their vehicles. These pavements may have deteriorated to such an extent that they affect the speed of free flow traffic. Flexible pavements may have large potholes and deep cracks. These roads often show significant signs of wear and deterioration, and may have significant distress in the underlying foundation. Roads in this condition will generally be most costly to rehabilitate.
Mediocre	**≥ 120 and ≤ 170**	**> 2.5 and ≤ 3.0**	**These roads exhibit minimally acceptable ride quality** that is noticeably inferior to those of new pavements and may be barely tolerable for high-speed traffic. These pavements may show some signs of deterioration such as rutting, map cracking and extensive patching. Most importantly, roads in this category are in jeopardy and should immediately be programmed for some cost-effective treatment that will restore them to a good condition and avoid costly rehabilitation in the near future.
Fair	**≥ 95 and < 120**	**> 3.0 and < 3.5**	
Good	**≥ 0 and < 95**	**≥ 3.5 and ≤ 5.0**	**These roads exhibit good ride quality** with little or no signs of deterioration. A proactive preventive maintenance strategy is necessary to keep roads in this category as long as possible.

Source: The Road Information Program, April 2004

The PMS database was queried using these criteria to calculate lane miles of roadway falling into each condition status category, after which a further analysis was performed on the deficient portion using the following three conditions:

1. **Rough Only:** Road segments with excessive roughness (IRI > 170) but without severe distress (SDI > 2.5).
2. **Distressed Only:** Road segments with severe distress (SDI ≤ 2.5) but without excessive roughness (IRI ≤ 170).
3. **Rough and Distressed:** Road segments with excessive roughness (IRI > 170) and severe distress (SDI ≤ 2.5).

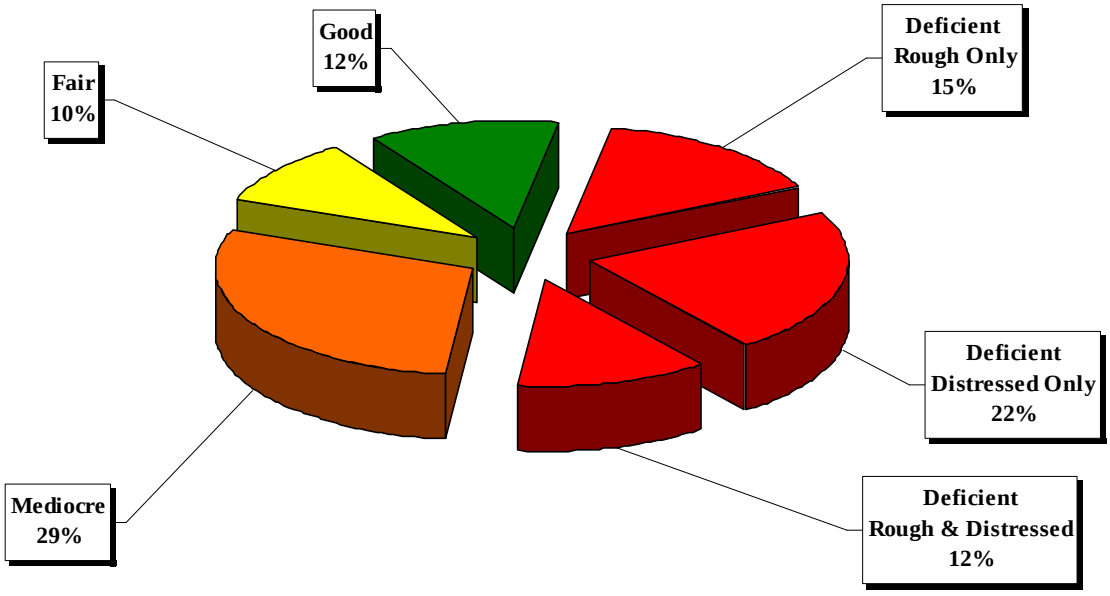
Results of the analysis are presented in tabular form in Table 2 and graphically in Figure 4.

TABLE 2
Current Functional Adequacy of NJ State Highway System
(Based on Roughness and Distress)

Condition	Road Miles (Two Directions)	Lane Miles (Two Directions)	% of Total System Lane Miles
Deficient by Roughness Alone	**759**	**1287**	**15%**
Deficient by Distress Alone	**913**	**1816**	**22%**
Deficient by Roughness & Distress	**536**	**973**	**12%**
Total Deficient	**2208**	**4076**	**49%**
Total Mediocre	**1410**	**2386**	**29%**
Total Fair	**477**	**785**	**10%**
Total Good	**540**	**1038**	**12%**
Total State System	**4635**	**8285**	**100%**

Source: NJDOT Pavement Management System, 2006 Data

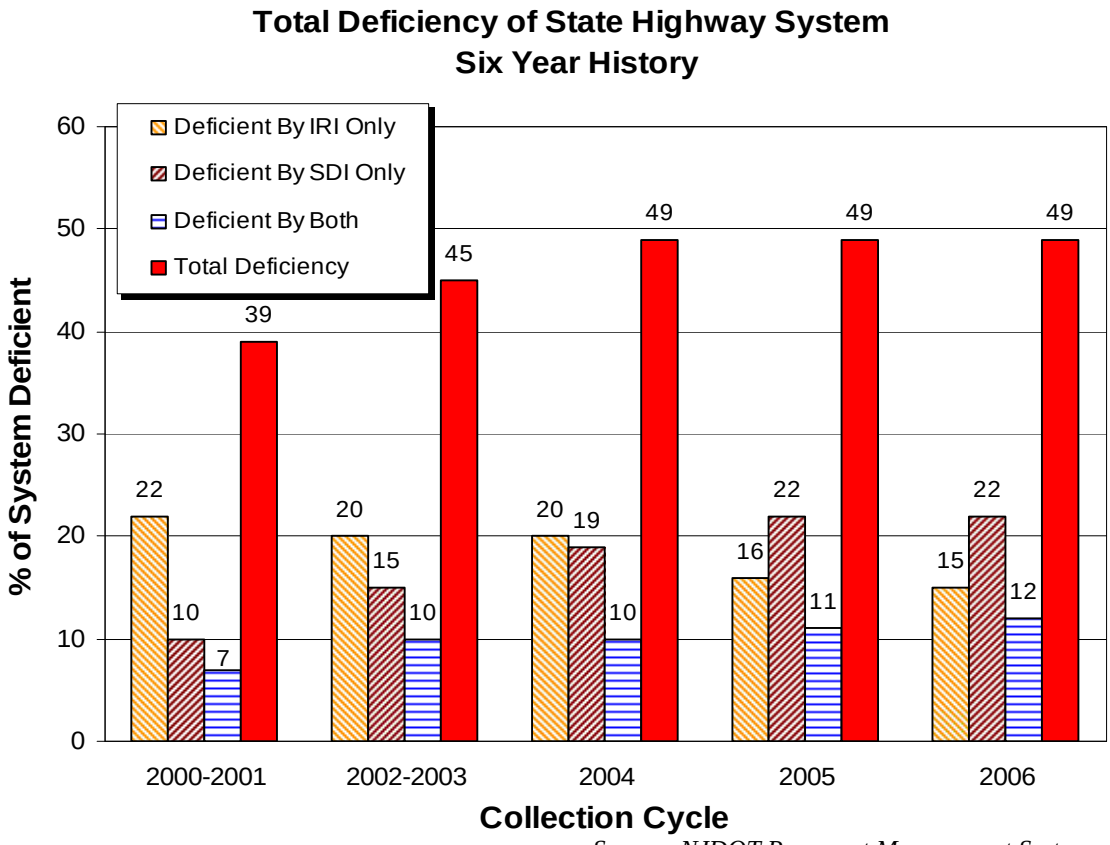
Figure 4
Current Functional Adequacy of NJ State Highway System
(Based on Roughness and Distress)



Source: NJDOT Pavement Management System, 2006 Data

These results underscore the severity of the functional deficiency (49% of the system). Further analysis using deficiency numbers over the last 6 years shows that the overall deficiency has risen over time and that increased efforts will be needed to reverse this situation (see Figure 5 below).

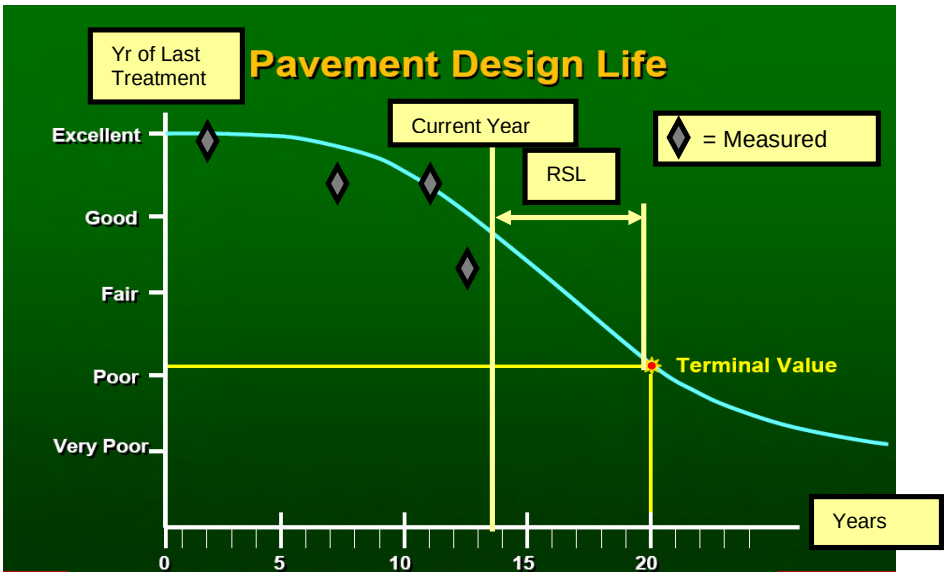
FIGURE 5



Source: NJDOT Pavement Management System

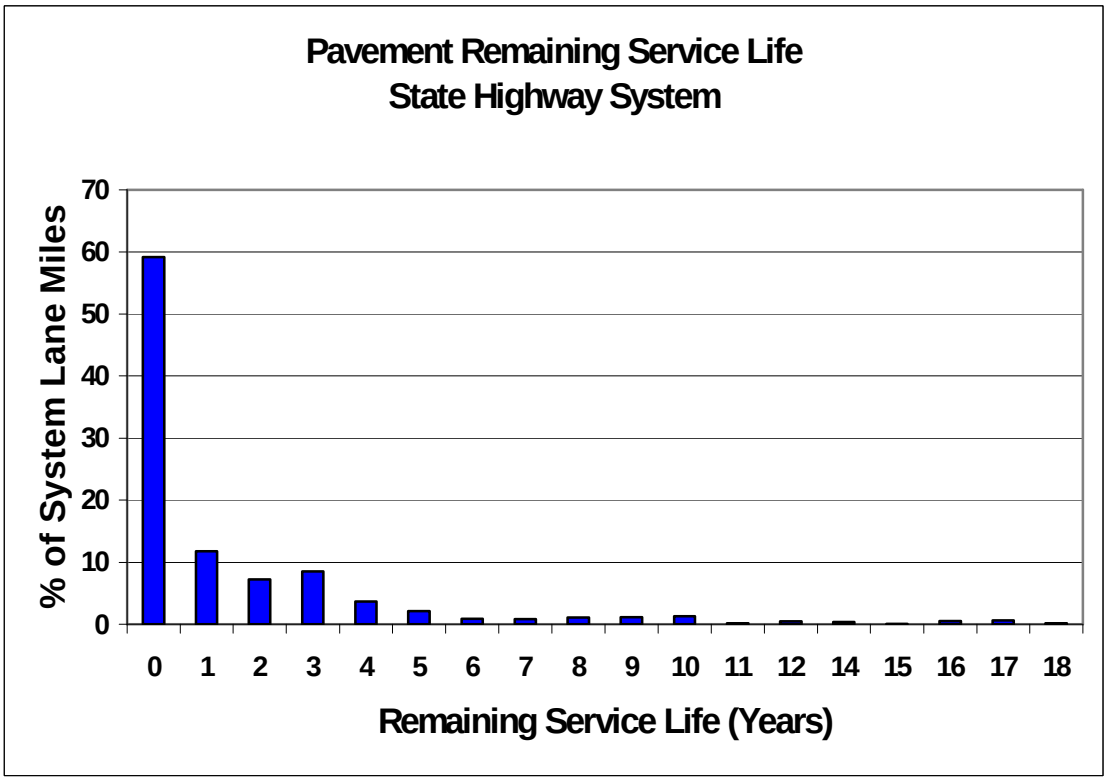
Pavement Remaining Service Life

Another way to view pavement system status is to estimate the Remaining Service Life (RSL) of pavement segments in the system. As shown in the diagram to the right, RSL estimates the number of years before a particular pavement segment becomes unserviceable. For each pavement segment, computer software generates a



pavement deterioration curve using measured condition data to calculate RSL. These results are compiled for all the individual segments in the system. Results of a recent analysis, presented in Figure 6 below, indicate that the vast majority (approximately 70%) of the state highway system has little or no RSL.

FIGURE 6



Source: NJDOT Pavement Management System, 2006 Data

Overall Status

- Based on pavement **structural adequacy**, results of a recent analysis utilizing Falling Weight Deflectometer testing for New Jersey's interstate highway system and then extrapolated for the entire state highway system indicated that ***53% of the state roadway system is deficient*** to carry future traffic loads and is in danger of quickly deteriorating and becoming most costly to rehabilitate.

- Based on **functional adequacy** as measured by the International Roughness Index for ride quality and the Surface Distress Index for surface deterioration, 2006 Pavement Management System data indicates the following:

49% of the system is deficient

- **15% deficient by roughness alone**
- **22% deficient by distress alone**
- **12% deficient by roughness and distress**

29% of the system is mediocre

10% of the system is fair

12% of the system is good

- Based on **Remaining Service Life**, the vast majority (approximately 70%) of the state highway system has little or no Remaining Service Life.

PAVEMENT TREATMENTS & RELATED RESEARCH

Research and development of new pavement treatment technologies is a regular practice at the Department. Through the Bureau of Research, various units within NJDOT have partnered with university researchers to implement new pavement materials and develop tools to evaluate materials in both the laboratory and the field. Ongoing studies are being conducted to evaluate high performance concrete materials that can be used to extend the life of concrete pavement and fast track concrete that can reduce lane closure durations from days to hours, expediting pavement repairs. Computerized models are utilized to estimate and predict traffic loading and to develop design procedures that optimize pavement durability and performance. The Department is currently working with industry to implement more stringent standards for pavement smoothness achieved during construction. The use of recycled materials to preserve New Jersey's natural resources, while reducing waste and costs, is also constantly being investigated.

Partnership with Rutgers Pavement Resource Program

The Department has partnered with Rutgers Center for Advanced Infrastructure and Transportation. In the area of pavement technology, the Center's Pavement Resource Program (PRP) is a university-based collaborative effort among federal and state agencies, local municipalities, and industry. Its goal is to maintain and improve the quality and durability of New Jersey's roads and highways. With extensive capabilities in all areas of pavement engineering and management, the program serves the public through the implementation of world class research related to roadway infrastructures and the education of future professionals in the field. The PRP's research extends to a wide range of paving materials, material testing, construction quality control methods, and pavement management including:

- Composite pavement (asphalt over concrete) design to prevent rutting, fatigue, and reflective cracking
- Tire/pavement noise measurement
- Pavement material modeling
- Conventional and polymer-modified asphalt
- Innovative materials in hot mix asphalt
- Recycled materials in pavements

Supporting the efforts of the PRP is the Rutgers Asphalt Pavements Laboratory which is one of only seven university research laboratories accredited by the American Association of State Highway and Transportation Officials (AASHTO). This facility uses both conventional and state-of-the-art equipment in evaluating cutting edge materials to enhance the durability and cost effectiveness of New Jersey's pavement network.

Some recently completed and on-going PRP research projects are highlighted below:

- **System Research and Development:** The PRP has established an office at NJDOT to assist the Department with enhancements to the Pavement Management System. This initiative will result in the development of improved pavement condition indices and mathematical models to better predict pavement deterioration and plan for system remediation. The PRP is

also assisting the Department in the acquisition, development and implementation of improved engineering computer software to more effectively plan pavement treatments.

- **Mechanistic-Empirical Pavement Design:** Spearheading training in a new Mechanistic-Empirical Pavement Design methodology for NJDOT, FHWA, and the consultant community, the PRP has organized workshops and will assist NJDOT with laboratory testing to provide a database/catalog of critical pavement material properties used to develop vital models for this methodology.

- **Effective Asphalt Overlays for Concrete Pavements:** Approximately 40% of state maintained roadways are classified as composite pavements (asphalt overlay on top of concrete pavement), with an additional 10% to 15% of the system comprised of concrete pavements which could receive asphalt overlays in the future. One of the primary distresses witnessed in composite pavements is reflective cracking. At one time or another, all New Jersey motorists have experienced the results of reflective cracking in the regularly spaced thumping beneath their tires. Reflective cracking is classified as "bottom-up" cracking that occurs at the joint area in the underlying concrete pavement. Cracks form at bottom of the asphalt overlay and propagate upwards to the pavement surface. Over the past three years, the PRP has researched performance-based hot mix asphalt design procedures for the development of Reflective Crack Interlayer (RCI) mixes that mitigate the onset of reflective cracking. Material sampled from a project completed using these procedures indicated that the RCI mix has over 1,000 times the fatigue cracking life of the traditional hot mix asphalt typically used in resurfacing pavements. Another benefit of the RCI mixture is that it has an extremely low permeability, which seals the underlying concrete pavement from the infiltration of water.

- **Measurement and Analysis of Tire/Pavement Noise:** Tire/pavement noise is defined as the noise directly produced by the tire traveling over the pavement surface, not considering other traffic-related noise such as vehicle engines, braking, etc. Research by the PRP has resulted in an initial database of noise values for different pavement surfaces that are typically encountered on New Jersey highways and an evaluation of the effect of vehicle speed on the magnitude of tire/pavement related noise. This information is important since the type of pavement can significantly affect the resulting amount of tire/pavement noise.

- **Pavement Applications for Recycled Asphalt and Concrete:** The Department of Transportation has a responsibility to be environmentally friendly and promote recycling. However, the Department must also consider the pavement infrastructure and prudently use recycled materials in applications where appropriate. The PRP is utilizing performance-based laboratory tests to develop guidelines that maximize the use of recycled materials without being detrimental to the pavement infrastructure.

Utilizing cutting edge technology spawned by research efforts like these, NJDOT employs myriad pavement treatments for preventive maintenance, resurfacing, rehabilitation, and reconstruction activities. Descriptions of many of these treatments are contained in Appendix A of this report.

STATEWIDE CAPITAL INVESTMENT STRATEGY

The state highway system constitutes the heart of New Jersey's surface transportation network. Unfortunately, the system continues to have a serious backlog of deficient pavements. Approximately 49% of the state highway system is deficient based on roughness and surface distress measurements. The fact that about 41% of the vehicular travel in New Jersey takes place on state maintained highways underscores the urgency of this situation. A lack of significant funding available for increased roadway preservation investment allocated to resurfacing, rehabilitation, reconstruction, and particularly preventive maintenance programs remains the major constraint to pavement quality improvement.

The Statewide Capital Investment Strategy (SCIS) is a performance-based capital programming mechanism that links broad transportation goals and policies to specific investment choices. The investment strategy includes pavement preservation as one of its essential elements. It evaluates the need for investment in pavement preservation programs compared to other allocations for competing highway improvements.

Within its overall "Fix It First" goal, NJDOT is committed to a long-term program to shrink the backlog of deficient highway segments and to identify and implement state-of-the-art engineering techniques and management practices. The SCIS provides strategic direction to achieve these goals and objectives. It offers assistance in answering practical questions: Where are we now and where would we like to be? How well is our pavement infrastructure performing over time? What is our return on investment?

The need to upgrade the structural integrity and smoothness of the state highway system continues to be a challenging endeavor. Serious efforts to reduce pavement deterioration have been made by implementing numerous reconstruction and rehabilitation, resurfacing and preventive maintenance projects. Severe pavement deterioration has continued as age, the effects of freeze-thaw cycling, and the constant bombardment by heavy traffic takes its toll. In addition, investment in repair and maintenance activities in the past has not been enough to offset the accruing deterioration. These factors have resulted in a significant backlog of deficient pavement sections.

One of NJDOT's top priorities is restoring deficient parts of this network to a state of good repair and maintaining the entire system at the best possible condition level. New Jersey currently has an immense investment in its highway infrastructure. As noted in the New Jersey Long Range Transportation Plan:

"New Jersey has already invested billions of dollars in its transportation infrastructure; protecting this investment remains the state's highest priority."

"A modern, efficient highway system is essential to meet the needs of our growing population, our expanding economy, and our national security." … President Dwight Eisenhower, 1955

Fiscal Year 2007 Funding

The Fiscal Year 2007 Transportation Capital Program allocated funds for pavement preservation activities as described in Table 3 on page 21 of this report.

TABLE 3
FY 2007 Pavement Preservation Funding

Program Category	Description	Funding Amount (Millions)
Highway Capital Maintenance - Betterments (State Funding)	This is an ongoing program of minor improvements to the state highway system for miscellaneous maintenance repair contracts, repair parts, miscellaneous needs for emergent projects, handicap ramps, and drainage rehabilitation/maintenance.	$9
Highway Capital Maintenance - Pavement Preservation (Federal Funding)	This program will provide funding for eligible federal pavement preservation activities which help to keep New Jersey's highway system in a state of good repair.	$3
Highway Capital Maintenance – Regional Action Program & Maintenance Mgt. System (State Funding)	Regional Action is a program of low-cost, quick-turnaround capital improvements to be accomplished under the management of Regional Operations in each of the NJDOT regions. The Maintenance Mgt. System provides enhanced data accumulation and cost management dissemination capabilities for maintenance operations and a required compatible data source for related systems.	$3
Highway Resurfacing - Operations Projects (State Funding)	This is a comprehensive program of providing renewed riding surfaces to state highways to prolong the life of the pavement and provide a smoother ride for users of the system.	$60
Highway Resurfacing - Capital Program Mgt. Projects (State & Federal Funding)	This program funds larger scale projects administered through Capital Program Management which are primarily involved with pavement resurfacing.	$121
Highway Rehabilitation & Reconstruction - Capital Program Mgt. Projects (State & Federal Funding)	This program funds larger scale projects administered through Capital Program Management with many activities (e.g. bridge rehab, signal & safety improvements, pavement, sidewalks and curbs, etc.).	$79 **(See note)**
Total		**$275**

Note: *The funding amount shown for the Highway Rehabilitation & Reconstruction program category is the amount allocated for projects with a significant emphasis on pavement system improvement. This program category also contains an additional $75 million to fund projects which improve highway performance (e.g. congestion relief, bridge rehabilitations, traffic signal improvements, safety improvements, sidewalks and curbs, etc.) but do not necessarily improve pavement system conditions.*

Refer to the section entitled **Work Completed in Fiscal Year 2007** on page 27 of this report for a description of projects completed as a result of this funding.

Fiscal Year 2008 Funding

For fiscal year 2008, the Transportation Capital Program allocates funds for roadway preservation activities as described in Appendix B, Section 1 of this report. Refer to Appendix B of this report for a listing of planned projects utilizing this funding.

Statewide Capital Investment Strategy and Future Projections

With regards to pavement preservation, the SCIS is a decision-making, asset management methodology which uses the latest thinking in performance measurement and technological advances in the pavement management system to link the selection of projects for capital funding with broad program objectives. Based on the established pavement preservation goals and objectives, performance analyses are conducted in order to determine how well various investment scenarios perform over time. This in turn explicitly identifies program tradeoffs and the outcomes to be expected from the resulting project mix. The various investment scenarios provide outputs (in terms of prospective project lists) and outcomes (in terms of system condition) for high, medium, and low investment levels. An investment benchmark is then set that is designed to pursue goal achievement. This technique is referred to as "performance-based programming".

The SCIS strongly recommends investment to restore and maintain our infrastructure at a high performance level. The intent of the SCIS is to allocate resources to achieve this objective. In addition to safety and upgrades to meet current design standards, achieving a "state of good repair" for New Jersey's highway system and maintaining that system to ensure maximum useful life are some of the Department's key objectives. The SCIS provides guidance in determining how the network is affected by our project selections, budget decisions and possible tradeoffs required to achieve our goals.

In order to evaluate pavement performance over time in response to different investment scenarios, performance analyses were conducted by the Pavement Management & Technology Unit using the performance measures of pavement roughness measured by International Roughness Index (IRI) and surface distress measured by Surface Distress Index (SDI). The following investment scenarios were evaluated over a multi-year analysis period:

Funding Scenarios

In order to most accurately predict network trends, funding scenarios from the FY 2009-2018 Statewide Capital Investment Strategy were used. For the scenarios indicated below, dedicated funding levels of $275 million and $268 million were applied in fiscal years 2007 and 2008, respectively. In fiscal years 2009 through 2018, the amount indicated in the scenario description was applied each year.

- **Scenario A:** Reduced funding ($225 million/year)

- **Scenario B:** Funding continued at current level ($275 million/year)

- **Scenario C:** Funding required to reduce the backlog of deficient pavement sections over a ten year period to 50% of current levels ($275 million/year)

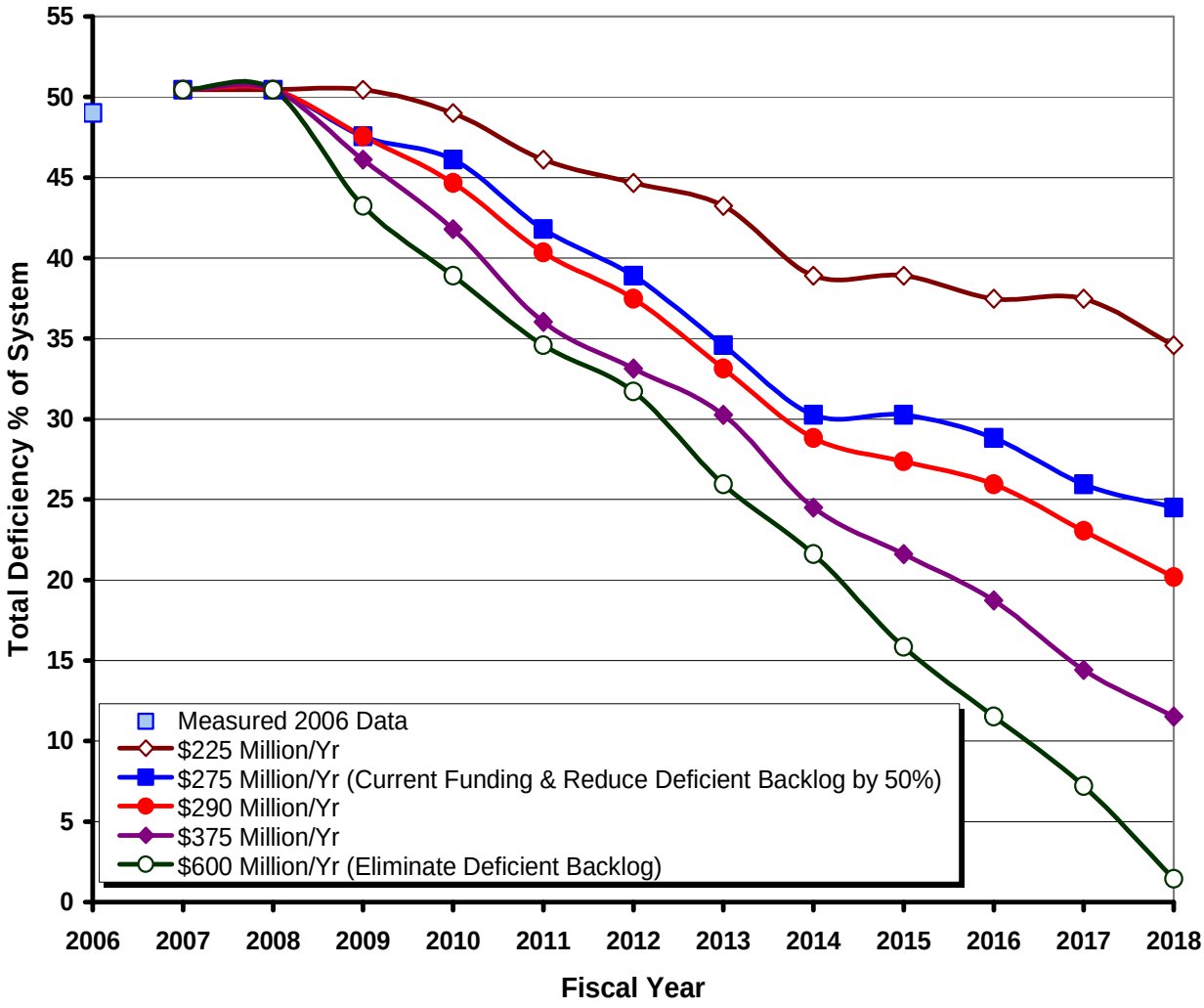
- **Scenario D:** Increased funding ($290 million/year)

- **Scenario E:** Increased funding ($375 million/year)

- **Scenario F:** Funding required to eliminate the backlog of deficient pavement sections over a ten year period ($600 million/year)

Results of the performance analyses showing pavement system total deficiency based on pavement roughness (IRI) and surface distress index (SDI) are shown in Figure 7 below.

FIGURE 7
Multi-Year Performance Analysis
State Highway System Total Deficiency Based on IRI & SDI

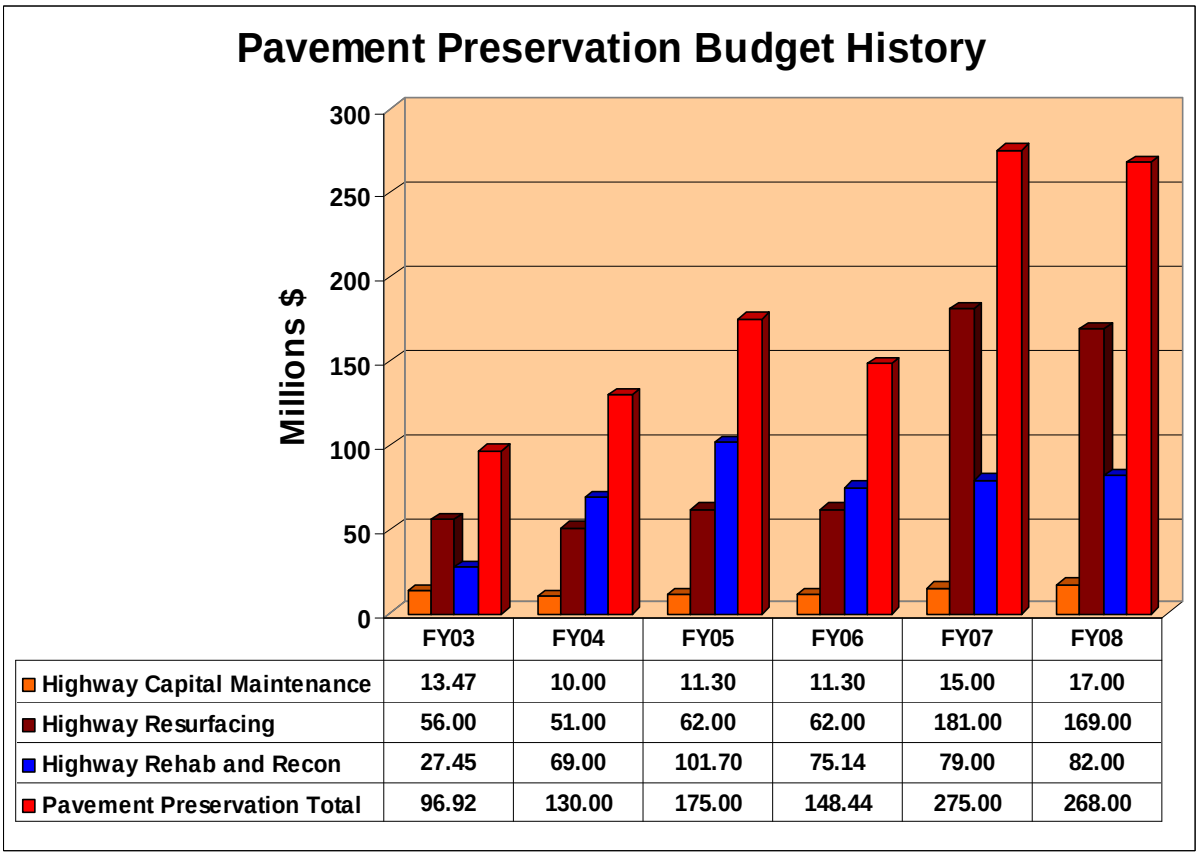


It should be stressed that these performance analyses assume that the funding amounts are applied to pavement priority projects. Roadway rehabilitation and reconstruction projects administered through NJDOT Capital Program Management are large-scale projects often including many activities (e.g. bridge rehabilitation, widening, traffic signals, safety improvements, utilities, sidewalks and curbs, etc.) which do not directly improve the existing pavement network condition. Care must be taken in project selection to assure that an adequate percentage of existing lane miles are treated each year to achieve the desired performance level.

These analyses indicate that in order **to eliminate one-half the backlog of deficient pavements over the next 10 years** as specified in New Jersey's Transportation Trust Fund Act (NJSA 27:1B-22), a funding level of **approximately $275 million per year** for priority projects would be required. Furthermore, approximately **$600 million per year** would be **needed to entirely eliminate the backlog of deficient pavements in ten years.** Moreover, considering structural strength in addition to road roughness and surface cracking, **it was estimated that approximately $1 billion per year over the next ten years would be required to bring the entire state highway system to a good condition.**

Based on these findings, FY 2007 Capital Program pavement preservation funding was increased to achieve the backlog reduction objectives and move closer to restoring the system to a state of good repair. The FY 2007 funding level of approximately $275 million represented an increase of about $127 million more than the previous year. As shown in the Figure 8 below, this represents an 85% increase in funding over FY 2006 and a 100% increase over the average investment level from FY 2003 to FY 2006. Funding in FY 2008 continues at an increased level.

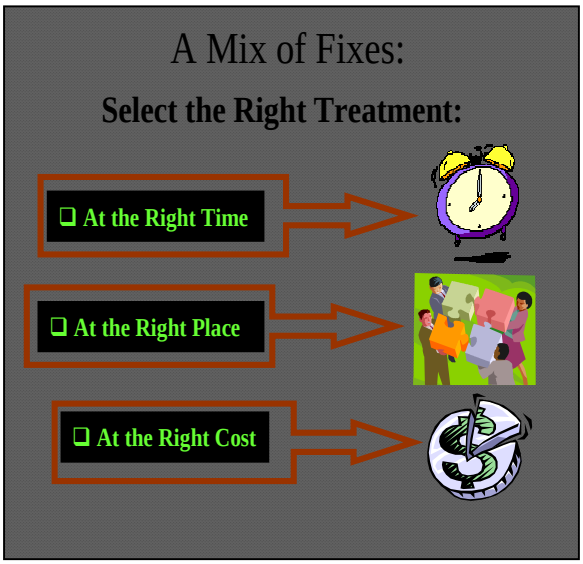
FIGURE 8



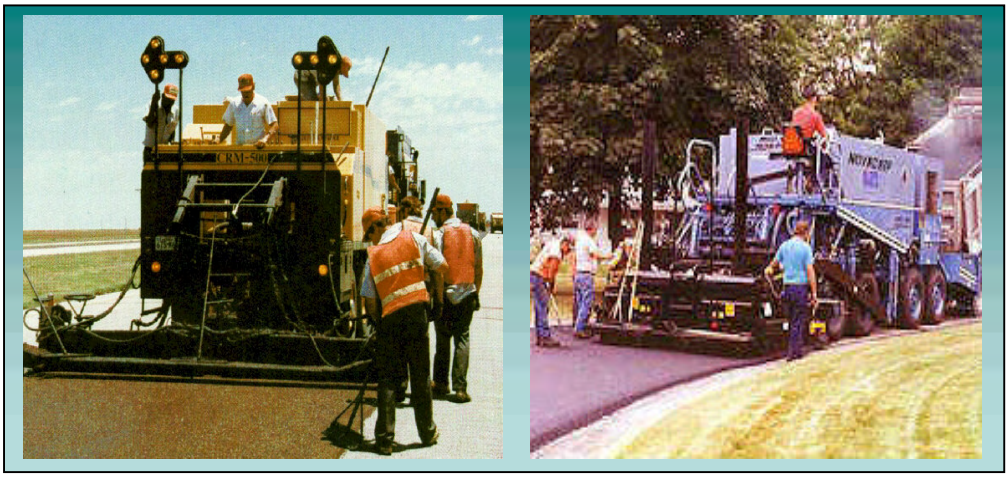
	FY03	FY04	FY05	FY06	FY07	FY08
Highway Capital Maintenance	13.47	10.00	11.30	11.30	15.00	17.00
Highway Resurfacing	56.00	51.00	62.00	62.00	181.00	169.00
Highway Rehab and Recon	27.45	69.00	101.70	75.14	79.00	82.00
Pavement Preservation Total	96.92	130.00	175.00	148.44	275.00	268.00

Due to the growth of competing transportation needs and limited state and federal funding, the Statewide Capital Investment Strategy is focusing on producing "better" system-wide pavement quality as opposed to the "best" pavement conditions. This means achieving acceptable condition levels in the most productive and manageable fashion. The incorporation of a "budget sensitive" shorter-term design-life policy allows for the implementation of more small-scale projects such as resurfacing and minor rehabilitation improvements statewide. In order to "fit within our means," NJDOT is budgeting for a diverse pavement preservation program that is balanced with a variety of projects designed to protect New Jersey's infrastructure investments.

The implementation of the Pavement Preservation investment strategy pursues a more cost effective, practical approach to pavement management in New Jersey utilizing an asset management approach that implements "The Right Treatment, At the Right Time, In the Right Place, At the Right Cost". This course of action promotes the most efficient use of available funding based on timing, treatment selection, and priority locations.



As a result, the Capital Program funds a significantly increased comprehensive pavement program consisting of various treatments for highway problems in order to prevent the constant downward trend in condition level. These treatments include relatively expensive rehabilitation and reconstruction projects for significant problems, less expensive resurfacing projects that extend service life and improve smoothness, and a wide range of lower-cost and often innovative preventive maintenance repair techniques. This approach is vital to addressing the backlog of deficient pavements.



Statewide Capital Investment Conclusions

The Statewide Capital Investment Strategy's recommendations to maintain, rehabilitate, and reconstruct New Jersey's transportation infrastructure must receive a strong emphasis. New Jersey has a large investment in its highway infrastructure. Existing highways, constructed over many years, will have to carry the bulk of commuter, freight and recreation traffic now and for many years in the future. Deterioration and other inadequacies in this infrastructure will be felt by frustrated motorists and ultimately by the economy.

In terms of pavement performance, there is a significant difference in "where we are now" and "where we would like to be." Our ability to invest in pavement preservation at the levels needed to shrink the current and projected backlog and significantly enhance performance cannot be realized due to a lack of adequate funding. The inability to provide funding to properly reconstruct, rehabilitate, maintain, and preserve our roadway infrastructure can prove to be an extremely expensive situation in the future.

The SCIS sets out the *overall strategy* that NJDOT and other transportation agencies will follow for investing future capital transportation dollars. In a time of multiple competing needs and limited capital, the SCIS seeks a cost-effective return on public investments. It tells us how we can get more "bang for our bucks" for pavement preservation. It enables NJDOT, the Metropolitan Planning Organizations, and the Legislature to make informed decisions about which projects and programs receive funding. The result is a cost-effective approach to improving the overall quality of New Jersey's transportation system.

WORK COMPLETED IN FISCAL YEAR 2007

The Department of Transportation's Construction Program for fiscal year 2007 was its largest ever. The Department awarded 139 projects with a total construction value of $720 million. The distribution of this work covered all of New Jersey's 21 counties. Roadway pavement work on the state highway system, such as resurfacing and reconstruction, accounted for approximately $265 million of this total. The Department's Operations Division administers highway maintenance and resurfacing projects. The Department's Capital Program Management area administers resurfacing projects which are more involved with regards to required project documents and scoping, and rehabilitation and reconstruction pavement restoration projects. Project work directly related to pavement system improvements is broken down and described by program categories in the sections which follow.

A notable pavement project completed in FY 2007 was the resurfacing of Interstate 95 in Mercer County from Scotch Road in Ewing to Route 1 in Lawrence. The surface course on this project was an innovative crumb rubber asphalt mix using over 80,000 old tires that were processed into tiny crumbs and used as one of the main ingredients in the mix. The mix offers excellent skid resistance, reduced tire noise, superior ride quality, lower pavement maintenance costs, reduced water spray in wet weather, increased nighttime visibility, and superior resistance to extreme weather conditions. Furthermore, tests have shown that roads can be constructed with half the thickness of rubberized asphalt compared to traditional asphalt. Perhaps most significant is that rubberized asphalt is environmentally friendly, helping to eliminate waste tires from landfills.

I-95 Rubberized "Quiet" Roadway Asphalt

Fiscal Year 2007 Highway Capital Maintenance Projects

Approximately $15 million was spent in fiscal year 2007 on pavement-related maintenance work administered through the Operations Division of NJDOT. In-house maintenance crews regularly perform a variety of preventive maintenance tasks to extend the life of pavements. Sweeping and drain cleaning keep water away from travel lanes. Patching small potholes keeps the riding surface intact and keeps moisture out of the pavement layers. Quick-set concrete is used to patch and repair bridge decks. When numerous patches accumulate in a given area, the Department has the ability to mill (or remove) the top layer of pavement and resurface to restore functionality. Crack sealing and joint repairs are other types of preventive treatment performed by NJDOT maintenance crews.

In addition, specialized maintenance work is performed through contracts. Crack sealing and longitudinal joint patching prolong pavement life. Ultra-thin overlays, including Microsurfacing, NovaChip, and Open Graded Friction Course restore the pavement surface and improve ride quality. Slab jacking is utilized on concrete pavements to restore road profile at localized depressions and to fill voids beneath the slabs. Diamond grinding of concrete pavement improves ride quality, skid resistance through surface macrotexture, wet weather visibility and reduced tire noise. A brief description of these treatments is given in Appendix A of this report.

Fiscal Year 2007 Highway Resurfacing – Operations Division Projects

Because of the backlog of needed work, most deficient pavements are beyond a condition where a preventive treatment would be appropriate when they are finally addressed. If the pavement deterioration is not severe enough to warrant a complete reconstruction, a viable option is to mill (or remove) a depth of the distressed asphalt pavement and resurface with new material. Asphalt materials are preferred for resurfacing projects due to their availability, cost, constructability and shorter travel lane downtimes. The Department also uses rapid-setting concrete that will reach design strength in about six hours. However, much preparatory work is needed before the concrete can be placed on the road, extended lane closures are necessary, and the repair procedure is expensive. As a result, this is only used in relatively small quantities.

Table 4 on page 29 of this report lists pavement resurfacing contract work awarded in fiscal year 2007 through the Department's Division of Operations Support. Twenty contracts valued at $60.52 million are listed.

TABLE 4
HIGHWAY RESURFACING CONTRACTS AWARDED IN FY 2007
THROUGH OPERATIONS SUPPORT DIVISION

(Note: MRC = Maintenance Resurfacing Contract; MRRC = Maintenance Roadway Repair Contract)

Contract # (See note above)	**Route**	**Dir** (B=Both)	**Start Mile-Post**	**End Mile-Post**	**Total Lane Miles**	**County**	**Total Cost** (Millions)
MRC # 145, Re-advertised	46	B	70.40	71.30	5.4	Bergen	$1.94
MRRC # 158	10	E	7.04	9.54	5.0	Morris	$2.91
	10	E	10.07	10.63	1.1		
	10	W	7.04	9.54	5.0		
	10	W	10.07	10.50	0.9		
MRRC # 159	57	B	18.50	19.40	1.8	Warren	$1.33
	94	B	8.20	10.70	5.0		
MRRC # 160	7	B	6.01	6.50	2.0	Essex	$2.05
	7	B	9.30	10.10	1.6	Essex	
	21	N	4.20	5.00	2.4	Essex	
	21	S	5.80	6.20	1.2	Essex	
	185	N	0.00	0.65	1.3	Hudson	
	185	S	0.00	0.62	1.2	Hudson	
MRRC # 161	22	E	48.40	52.20	7.6	Union	$1.76
MRC # 258	202	N	20.30	22.40	4.2	Somerset	$3.15
	202	S	22.26	24.00	3.5		
MRRC # 263	202	N	6.76	11.40	9.3	Hunterdon	$4.99
	202	S	7.00	11.40	8.8		
MRRC # 265	12	B	0.95	5.00	8.1	Hunterdon	$4.44
	12	B	9.80	11.69	3.8		
MRRC # 266	29	B	9.45	17.08	15.3	Mercer	$4.26
	175	B	2.15	2.95	1.6	Mercer	
	179	B	0.37	1.41	4.2	Hunterdon	
MRRC # 267	33	E	21.17	24.20	6.1	Monmouth	$3.17
	33	W	21.16	24.31	6.3		
MRC # 268	202	S	13.43	17.04	7.2	Hunterdon	$3.87
MRRC # 270	31	N	29.60	31.73	4.3	Hunterdon	$3.22
	31	S	29.60	31.77	4.3		
MRC # 271, Re-advertised	206	B	46.96	50.00	6.1	Mercer	$4.11
	206	B	51.21	51.36	0.3		

Table 4 Operations Resurfacing Contracts Awarded in FY 2007 - Continued

Contract # (See note above)	Route	Dir (B=Both)	Start Mile-Post	End Mile-Post	Total Lane Miles	County	Total Cost (Millions)
MRC # 272	22	W	0.55	2.15	4.8	Warren	$1.50
MRRC # 326	38	B	13.65	16.76	12.4	Burlington	$4.19
MRRC # 327	70	B	8.61	12.06	9.7	Burlington	$3.11
MRRC # 328	40	E	24.87	26.31	2.9	Gloucester	$2.31
	56	B	4.80	7.45	5.3	Salem	
	56	B	7.65	7.85	0.8	Cumberland	
MRRC # 329	30	B	4.44	7.79	6.7	Camden	$2.47
MRC # 346	47	B	47.69	49.33	3.3	Cumberland	$1.92
MRC # 510	Various					Various	$3.82
Total					**180.6**		**$60.52**

FY 2007 Highway Resurfacing – Capital Program Management Projects

The capital program was restructured in FY 2007 with the inclusion of special resurfacing projects administered through Capital Program Management using a fast track delivery system. These projects are more involved than those administered through the Operations Division with regards to required project documentation and scoping. This comprehensive program seeks to provide renewed state highway riding surfaces to prolong the life of the pavement and provide a smoother ride for users of the system. The resurfacing program is a key component of NJDOT's broader Pavement Management Program, which is aimed at preserving and extending the life of state highways. Individual highway segments are selected for resurfacing or other treatments through the Department's Pavement Management System. The program consists primarily of resurfacing highway segments, but may also include selected repair activities, minor upgrades such as curbing and guardrails, application of long-life pavement markings and raised pavement markers, and acquisition of essential equipment and materials.

Table 5 on page 31 of this report lists highway resurfacing projects with construction funding in fiscal year 2007 administered through Capital Program Management. Eleven projects valued at $115.14 million are listed.

TABLE 5
HIGHWAY RESURFACING PROJECTS WITH FY 2007 CONSTRUCTION FUNDING ADMINISTERED THROUGH CAPITAL PROGRAM MANAGEMENT

Project Description	Dir (B= Both)	Start Mile-Post	End Mile-Post	Total Lane Miles	County	Funding Source	Funding Amount (Millions)
Route 24, I-287 Interchange to West of Route 124 Interchange, Resurfacing	B	0.00	6.80	27.1	Morris	State	$12.60
Route 55, North of Lamb Road to South of Almonesson Creek, Resurfacing	B	51.24	60.07	35.4	Gloucester	State	$5.76
Route 55, South of Leonard Cake Road to South of Black Water Brook, Resurfacing	B	34.30	40.00	22.8	Cumberland, Gloucester	State	$9.10
Route 80, East of Delaware River to West of Knowlton Road, Resurfacing	B	0.40	8.00	42.1	Warren	State	$16.50
Route 80, Westbound, West of CR 631 to West of Route 202, Resurfacing	W	28.50	43.25	52.9	Morris	State	$23.20
Route 95, Vicinity of Route 29 to Route 1, Resurfacing	B	0.20	2.30	45.0	Mercer	State	$16.80
	B	3.35	8.77				
Route 195, I-295 Interchange to East of Lakeside Drive, Resurfacing	B	0.00	1.54	8.4	Mercer	Federal	$3.49
Route 195, Route 9 Interchange to Route 34 Interchange, Resurfacing	B	27.20	34.20	28.0	Monmouth	State	$9.45
Route 287, Northbound, North of Passaic River to South of Morristown/Morris Twp. Line, Resurfacing	N	30.02	35.00	13.8	Morris, Somerset	State	$6.24
Route 295, Marne Highway Vicinity to Burlington Township Line, Resurfacing	N	40.80	45.20	31.8	Burlington	State	$7.20
	S	40.80	46.50				
Route 440, Southbound, I-95 (NJ Tpk) Interchange to South of Kreil Ave, Resurfacing	S	0.00	3.80	11.1	Middlesex	Federal	$4.80
Total				**318.4**			**$115.14**

FY 2007 Highway Rehab. & Reconstruct – Capital Program Mgt. Projects

Projects in this funding program category are generally large-scale ones with many activities (e.g. pavement improvements, bridge rehabilitation, safety improvements, congestion improvements, operational improvements, traffic signals, sidewalks and curbs, etc.). Table 6 below lists Highway Rehabilitation & Reconstruction projects administered through Capital Program Management having significant pavement system network improvement benefits and construction funding in FY 2007. The three projects shown with a funding of approximately $74 million represent roughly one-half of the FY 2007 construction funding in this general program category.

TABLE 6
HIGHWAY REHAB & RECONSTRUCTION PAVEMENT IMPROVEMENT PROJECTS WITH FY 2007 CONSTRUCTION FUNDING ADMINISTERED THROUGH CAPITAL PROGRAM MANAGEMENT

Project Description	Dir (B= Both)	Start Mile-Post	End Mile-Post	Total Lane Miles	County	Funding Source	Funding Amount (Millions)
Route 1&9, Secaucus Road to Broad Avenue (28)	B	56.80	63.00	23.9	Bergen, Hudson	Federal	$25.94
Route 78, Union County Rehabilitation, Contract A	B	50.59	52.80	22.0	Union	Federal	$20.84
Route 295, Tomlin Station Road to Route 45, Rehabilitation	B	14.60	24.50	59.9	Gloucester	Federal	$27.13
Total				**105.8**			**$73.91**

FY 2007 Local Aid Pavement Activities

The Transportation Trust Fund provides the opportunity for state assistance to local governments for the funding of road, bridge and other transportation projects. Through the Department's Local Aid Program, $175 million was distributed in fiscal year 2007. Of this amount, $78.75 million was used for local county aid and $78.75 million was used for local municipal aid. The remaining $17.5 million was available as local aid-discretionary to both counties and municipalities.

Local Aid projects are separate from the Department's Capital Program and do not directly improve the state highway system. They are summarized below:

- Approximately 100 projects are annually funded through the local county aid program. About 60 to 75 percent of the completed projects involve some form of pavement resurfacing.

- Approximately 400 projects are annually funded through the local municipal aid program. About 90 percent of the completed projects involve some form of pavement resurfacing.

- Counties and municipalities generally used traditional bituminous mixtures in their pavement resurfacing projects. Since 2004, the Division of Local Aid and Economic Development has promoted the use of Superpave bituminous mixes. Between FY 2004 and FY 2006, counties and municipalities were encouraged to use Superpave on a voluntary basis, and a good number of them chose to do so. The use of Superpave was mandatory beginning in FY 2007.

FISCAL YEAR 2008 PAVEMENT PLAN

The Fiscal Year 2008 Pavement Plan is attached to this report in Appendix B. The pavement treatments include: Crack Sealing, Longitudinal Joint Patching, Ultra Thin Overlays, Slab Jacking, Diamond Grinding, Resurfacing, and Heavy Rehabilitation/Reconstruction. The Pavement Plan is divided into five sections as follows:

- **Section 1** shows the **primary funding sources** for pavement fixes that are identified in the FY 2008 Transportation Capital Program. While the plan contains fixes which are in line with the identified funds, the Department is prepared to implement additional fixes during the fiscal year if additional funds become available.

- **Section 2** discusses **Highway Capital Maintenance Program** fixes.

- **Section 3** details fiscal year 2008 **planned projects within the Highway Resurfacing Program administered through the Operations Support Division**.

- **Section 4** lists **planned projects within the Highway Resurfacing Program administered through Capital Program Management** with fiscal year 2008 construction funding.

- **Section 5** describes **planned projects within the Highway Rehabilitation/Reconstruction Program administered through Capital Program Management** with fiscal year 2008 construction funding. Projects in this funding program category are generally large-scale with many activities (e.g. pavement improvements, bridge rehabilitation, safety improvements, congestion improvements, operational improvements, traffic signals, sidewalks and curbs, etc.). The projects listed are those which have significant pavement system network improvement benefits.

REFERENCES

1. American Society of Civil Engineers, *2005 Report Card for America's Infrastructure*, www.asce.org/reportcard/2005.

2. Federal Highway Administration, Policy, *Highway Statistics 2005, Table HM-81*, www.fhwa.dot.gov/policy/ohim/hs05/roadway_extent.htm.

3. New Jersey Department of Transportation, *Capital Investment Strategy FY 2007-2011*, March 31, 2006.

4. New Jersey Department of Transportation, *Capital Investment Strategy FY 2008-2012*, March 30, 2007.

5. New Jersey Department of Transportation, *Capital Investment Strategy FY 2009-2018*, March 31, 2008.

6. New Jersey Department of Transportation, *FY 2007 – 2010 Statewide Transportation Improvement Program.*

7. New Jersey Department of Transportation, *FY 2008 – 2011 Statewide Transportation Improvement Program*.

8. New Jersey Department of Transportation, *Long Range Transportation Plan, Transportation Choices 2025,* March 2001.

9. New Jersey Department of Transportation, *The New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction,* 2007.

10. New Jersey Department of Transportation, *Transportation Capital Program, Fiscal Year 2007*.

11. New Jersey Department of Transportation, *Transportation Capital Program, Fiscal Year 2008*.

12. The Reason Foundation, *16th Annual Report on the Performance of State Highway Systems (1984-2005),* www.reason.org/ps360, 2007.

13. The Road Information Program, *Bumpy Roads Ahead: Cities With the Roughest Rides and Strategies to Make Our Roads Smoother,* April 2004.

14. The Road Information Program, *Rough Ride Ahead: Metro Areas With the Roughest Rides and Strategies to Make Our Roads Smoother,* May 2005.

15. The Road Information Program, *The Condition of New Jersey's Roads and Bridges: Key Transportation Projects Needed in the State and the Importance of Dependable Funding,* October 2000.

APPENDIX A

PAVEMENT TREATMENTS

PAVEMENT TREATMENTS

The following pavement treatments are currently in some form of implementation on an as-needed basis:

- **Ultra-thin White Topping** is a three or four inch thick Portland cement concrete placed over an existing asphalt pavement. It was utilized for a new connector road between Rising Sun Road and Route 206 in Burlington County. The Department considers ultra-thin white topping for ramps and intersections with recurring asphalt rutting problems.

- **Reflective Crack Interlayer** has been successfully used to reduce reflective cracking in overlays on concrete. The system consists of a fine-graded, high polymer asphalt mixture placed on a concrete pavement or bridge deck prior to a hot mix asphalt overlay. This highly flexible layer significantly retards reflective cracks of joints in underlying concrete slabs and seals the pavement. After a crack ultimately comes to the surface, the interlayer remains intact, thus preventing the intrusion of water, de-icing chemicals and debris that leads to further deterioration of the pavement. A generic specification for this material has been developed and implemented.

- **Diamond Grinding** of Portland cement concrete pavement improves ride quality, skid resistance through surface macrotexture, wet weather visibility and reduced tire noise. It has been successfully used on the Route 29 Tunnel in Trenton, a twenty-mile section of Route I-287 and on a Route I-80 widening project for both new and existing Portland cement concrete pavements. The Department plans to use this method on rough or polished sections of Portland cement concrete pavement where structural integrity still exists, thus eliminating the need to place more expensive hot mix asphalt overlays. It is also a tool in the new preventive maintenance program. A standard specification for this pavement treatment is included in the 2007 *NJDOT Standard Specifications for Road and Bridge Construction*.

- **Perpetual Pavements** are being implemented on several construction projects, including Route 18 in New Brunswick, Route I-78 in Union County and Route I-295 in Camden County. These pavements are designed to provide infinite service life with only periodic maintenance of the surface layer. On several pavement projects an asphalt rich base layer was incorporated to eliminate the potential of bottom-up cracking. User delay and cost of reconstruction is deferred for 40 to 50 years with this approach.

- **Stone Matrix Asphalt** is a durable, rut-resistant hot mix asphalt surface material developed in Europe for use on heavy traffic applications and is currently included on several projects. The asphalt is reinforced with fiber and polymer and the mix provides stone-on-stone contact for strength and high binder content for durability. This material comprises the wearing surface for some perpetual pavements. This material has been utilized on several interstate highway projects. Future plans include coupling this material with a Reflective Crack Interlayer to provide a more durable overlay for concrete pavements. A standard specification for this pavement treatment is included in the 2007 *NJDOT Standard Specifications for Road and Bridge Construction*.

- **High Density Polyurethane Slab Stabilization** has recently been demonstrated to stabilize weak road base materials and correct depressed concrete pavement slabs. The grout is a two component, closed-cell polyurethane that is pumped under low pressure through small holes drilled in the pavement. Set time is approximately 15 seconds and cure is within 15 minutes, which allows rapid reopening to traffic. This new technology eliminates the need for costly full depth replacement and quickly repairs dips in the roadway profile. It is proposed for preventive maintenance as well as capital program projects. A standard specification for this pavement treatment is included in the 2007 *NJDOT Standard Specifications for Road and Bridge Construction*.

- **Rapid Setting Portland Cement Concrete** has been developed and used for full depth concrete pavement slab replacement overnight. These patches offer a substantial improvement in ride quality and service life compared to the hot mix asphalt used in the past. Both capital improvement and maintenance projects are using this method. A standard specification for this pavement treatment is included in the 2007 *NJDOT Standard Specifications for Road and Bridge Construction*.

- **Rubblization** of Portland cement concrete pavement was extremely successful for sections of Route I-295 in Camden County and Route I-78 in Union County. The process recycles the existing concrete pavement in place, substantially reducing material hauling, construction duration and overall project cost. A standard specification for this pavement treatment is included in the 2007 *NJDOT Standard Specifications for Road and Bridge Construction*.

- **Geosynthetic Subgrade Reinforcement** is being used in combination with recycled pavement materials in place of subbases consisting of virgin soil aggregates that are becoming increasingly scarce and costly. This material was utilized on Route I-78 in Union County and Route I-295 in Camden County. The utilization of geotextile material and the elimination of a subbase saved New Jersey taxpayers millions of dollars.

- **Crumb Rubber Modified Asphalt** is being evaluated as a way to recycle a portion of the three million waste tires generated each year in New Jersey. Research is being conducted to evaluate performance and investigate health and environmental issues.

- **Open Graded Friction Course** is a thin, porous surface material that improves wet weather friction, reduces spray, and lowers tire noise when compared to conventional pavement surfaces. The spray reduction is reported to improve highway runoff water quality. Currently, applications include highways with above average wet weather accidents and locations where highway noise is above thresholds for neighboring residents. De-icing problems reported by snow emergency crews have hindered wider application of this material. A possible solution to the winter maintenance problem by modifying existing de-icing chemicals and application methods is under investigation.

- **Microsurfacing** is a cold overlay process in which polymer-modified emulsified asphalt and cement are applied in a thin layer over existing pavements. Microsurfacing can extend service life three to five years and delay costly rehabilitation or reconstruction work. Like other preventive maintenance treatments, it must be applied to a pavement in good condition

to be cost effective. Because the material is a thin, non-structural layer, it should not be applied if the pavement has even moderate severity cracking.

- **NovaChip** is a surface treatment that places a thin layer of gap-graded hot mix over a sprayed asphalt membrane. The NovaChip process utilizes a specially designed paver to rapidly place material that cures almost instantly for opening to traffic. A standard specification for this pavement treatment is included in the 2007 *NJDOT Standard Specifications for Road and Bridge Construction*.

- **Flexible Concrete Repair** is a resin based material used to repair pop-outs, corner and edge breaks, and other partial depth distresses in concrete pavements. This process utilizes a hot applied synthetic polymer resin compound. This repair product has tensile, compressive and elastic properties that result in a performance advantage over rigid repair materials. The completed patch remains flexible and can be opened to traffic as soon as the material cools, typically in about an hour.

- **Crack and Joint Sealants** extend pavement life by preventing water from entering the pavement structure. The Department has researched sealants based on the latest ASTM and industry standards and has specified the optimum materials for use on NJDOT highways.

APPENDIX B

FISCAL YEAR 2008 PAVEMENT PLAN

- **Section 1 – Roadway Preservation Funding** identified in the FY 2008 Transportation Capital Program.
- **Section 2 – Highway Capital Maintenance Program** activities.
- **Section 3 – Highway Resurfacing Program through Operations Support Division:** Fiscal year 2008 planned projects.
- **Section 4 – Highway Resurfacing Program through Capital Program Management:** Planned projects with fiscal year 2008 construction funding.
- **Section 5 – Highway Rehabilitation/Reconstruction Program through Capital Program Management:** Planned selected projects with significant pavement emphasis and fiscal year 2008 construction funding.

APPENDIX B - SECTION 1
FISCAL YEAR 2008 ROADWAY PRESERVATION FUNDING

Program Category	Description	Funding Amount (Millions)
Highway Capital Maintenance – Betterments (State Funding)	This is an ongoing program of minor improvements to the state highway system for miscellaneous maintenance repair contracts, repair parts, miscellaneous needs for emergent projects, handicap ramps, and drainage rehabilitation/maintenance.	$10
Highway Capital Maintenance – Pavement Preservation (Federal Funding)	This program will provide funding for eligible federal pavement preservation activities which help to keep New Jersey's highway system in a state of good repair.	$4
Highway Capital Maintenance – Regional Action Program & Maintenance Mgt. System (State Funding)	Regional Action is a program of low-cost, quick-turnaround capital improvements to be accomplished under the management of the Regional Director for Regional Operations in each of the NJDOT regions. The Maintenance Mgt. System provides enhanced data accumulation and cost management dissemination capabilities for maintenance operations and a required compatible data source for related systems.	$3
Highway Resurfacing - Operations Projects (State Funding)	This is a comprehensive program of providing renewed riding surfaces to state highways to prolong the life of the pavement and provide a smoother ride for users of the system.	$70
Highway Resurfacing - Capital Program Mgt. Projects (State & Federal Funding)	This program funds larger scale projects administered through Capital Program Management which are primarily involved with pavement resurfacing.	$99
Highway Rehabilitation & Reconstruction - Capital Program Mgt. Projects (State & Federal Funding)	This program funds larger scale projects administered through Capital Program Management with many activities (e.g. bridge rehab, signal & safety improvements, pavement, sidewalks and curbs, etc.).	$82 **(See note)**
Total		**$268**

Note: *The funding amount shown for the Highway Rehab & Reconstruction program category is the amount allocated for projects with a significant emphasis on pavement system improvement. This program category also contains an additional $93 million to fund projects which improve highway performance (e.g. congestion relief, bridge rehabilitations, traffic signal improvements, safety improvements, sidewalks and curbs, etc.) but do not necessarily improve pavement system conditions.*

APPENDIX B - SECTION 2
FISCAL YEAR 2008 PLANNED HIGHWAY CAPITAL MAINTENANCE

Approximately $17 million is budgeted for Highway Capital Maintenance work in fiscal year 2008. In-house NJDOT maintenance crews perform a variety of preventive maintenance tasks to extend the life of pavements. Sweeping and culvert cleaning maintain water drainage from travel lanes. Pothole patching keeps the riding surface intact and prevents the intrusion of water and ice into the pavement layers. When numerous patches accumulate in a given area, the Department has the ability to mill (or remove) the top layer of pavement and repave it to restore surface condition. Crack sealing and joint repairs are other preservation activities performed by NJDOT maintenance crews.

Of the $17 million budgeted, approximately $4 million is federally funded and is budgeted for specialized maintenance work performed through contracts. Treatments regularly used by the Department include the following:

- **Crack sealing and longitudinal joint patching** to seal out moisture and prolong pavement life.
- **Ultra-thin overlays**, including Microsurfacing, NovaChip, and Open Graded Friction Course seal and restore the pavement surface and improve ride quality.
- **Slab jacking** of concrete pavements restores the roadway profile at localized depressions and fills voids beneath concrete pavement slabs.
- **Diamond grinding** of concrete pavements improves ride quality, skid resistance through surface macrotexture, wet weather visibility and reduced tire noise.

For fiscal year 2008, the following federally funded pavement preservation thin overlay projects are planned for interstates. They will be administered through the Operations Support Division:

Pavement Preservation Thin Overlay Projects on Interstates

Federal Project Number	Location	County	Total Cost (Millions)
IM-287-3(073)	Route 287 Southbound, Mileposts 30.17 to 35.50	Morris	$3.32
IM-295-2(112)	Route 295 Northbound, Mileposts 8.70 to 14.00	Gloucester, Salem	$1.15

APPENDIX B - SECTION 3
HWY RESURFACING THROUGH OPERATIONS SUPPORT DIVISION
FISCAL YEAR 2008 PLANNED PROJECTS

(Note: MRC = Maintenance Resurfacing Contract; MRRC = Maintenance Roadway Repair Contract)

Contract # (See note above)	**Route**	**Dir** (B = Both)	**Start Mile-Post**	**End Mile-Post**	**Total Lane Miles**	**County**	**Total Cost** (Millions)
MRRC # 162	46	E	31.32	33.34	4.0	Morris	$3.27
		W	31.32	33.12	3.6	Morris	
		B	37.49	41.13	14.6	Morris	
MRC # 347	73	B	21.35	23.63	9.1	Burlington	$3.94
MRC # 348	45	B	22.60	25.00	9.6	Gloucester	$4.50
MRRC # C101	22	W	25.51	31.60	12.2	Hunterdon, Somerset	$7.05
	29	B	0.47	2.17	10.2	Mercer	
MRRC # C201	202	N	13.21	20.33	14.2	Hunterdon, Somerset	$8.52
	202	N	22.22	24.80	5.2	Somerset	
	202	S	24.07	24.82	1.5	Somerset	
	202	N	25.61	28.32	5.4	Somerset	
	202	S	26.16	28.33	4.3	Somerset	
	202	B	29.88	31.18	5.2	Somerset	
MRRC # C301	9	N	117.63	123.49	14.7	Monmouth, Middlesex	$8.89
	18	S	17.38	21.86	9.0	Monmouth	
	72	B	6.01	12.98	13.9	Burlington, Ocean	
MRRC # N101	23	N	19.50	20.65	2.3	Passaic	$5.17
	23	S	19.80	23.25	6.9	Passaic, Morris	
	23	N	25.56	27.15	3.2	Sussex, Passaic, Morris	
	23	S	26.49	27.15	1.3	Sussex, Morris	
	23	B	27.15	27.40	0.5	Sussex	
	94	B	18.70	21.82	6.2	Sussex	
	94	B	25.05	27.74	5.4	Sussex	
MRRC # N201	3	B	1.10	4.30	19.2	Passaic	$5.14
	161	B	0.00	1.10	4.4	Passaic	
MRRC # N301	1 Truck	B	0.00	3.59	18.0	Essex, Hudson	$5.89
	7	B	0.50	4.13	14.5	Bergen, Hudson	
	9W	B	5.45	5.97	1.0	Bergen	
	9W	B	6.32	6.67	0.7	Bergen	
	9W	B	7.32	8.98	3.3	Bergen	
MRRC # N302	21	N	5.01	10.57	16.7	Essex, Passaic	$9.00
	21	S	6.20	10.50	12.9	Essex, Passaic	

HIGHWAY RESURFACING FY 2008 OPERATIONS PROJECTS - CONTINUED

Contract # (See note)	**Route**	**Dir** (B = Both)	**Start Mile-Post**	**End Mile-Post**	**Total Lane Miles**	**County**	**Total Cost** (Millions)
MRRC # N303	82	B	0.00	1.30	5.2	Union	$1.60
	82	B	1.55	2.30	1.5	Union	
	124	B	11.11	11.47	1.4	Union	
MRRC # S101	130	B	51.16	51.77	2.4	Burlington	$6.64
	130	B	52.63	55.75	12.5	Burlington	
	206	B	11.60	12.64	3.1	Burlington	
	206	B	12.90	13.93	2.1	Burlington	
	206	B	34.32	35.66	5.4	Burlington	
MRRC # S201	55	S	26.50	33.00	13.0	Cumberland	$5.61
	322	B	2.15	4.15	8.0	Gloucester	
MRRC # S301	9	B	34.23	38.12	7.8	Atlantic	$2.42
	40	B	44.86	45.73	1.7	Atlantic	
MRC # 511	Various					Various	$3.78
Total					**317.4**		**$81.42**

APPENDIX B - SECTION 4
HWY RESURFACING THROUGH CAPITAL PROGRAM MGT.
PLANNED PROJECTS WITH FY 2008 CONSTRUCTION FUNDING

Project Description	**Dir** (B= Both)	**Start Mile-Post**	**End Mile-Post**	**Total Lane Miles**	**County**	**Funding Source**	**Funding Amount** (Millions)
Route 78, Drift Road to Route 124	B	42.20	50.60	57.5	Union	State	$24.28
Route 80, West of Knowlton Road to West of Hope Johnsonburg Road	B	8.00	12.80	32.4	Warren	State	$16.12
Route 195, Eastbound, West of Ivanhoe Brook to East of Route 9, Resurfacing	E	16.00	27.20	22.4	Monmouth, Ocean	State	$11.45
Route 280, 4th Street to Newark-Jersey City Turnpike, Resurfacing	B	14.70	16.80	11.4	Hudson	Federal	$8.24
Route 287, New Jersey Turnpike to Stelton Road, Resurfacing	B	0.00	5.90	39.0	Middlesex	State	$27.00
Route 287, Northbound, Vicinity of Stelton Road to Vicinity of Main Street, Resurfacing	N	5.90	12.90	21.0	Middlesex, Somerset	Federal	$4.82
Total				**183.7**			**$91.91**

APPENDIX B - SECTION 5
HWY REHAB./RECONSTRUCT. THROUGH CAPITAL PROGRAM MGT.
PLANNED PROJECTS WITH FY 2008 CONSTRUCTION FUNDING

Projects in this funding program category are generally large-scale with many activities (e.g. pavement improvements, bridge rehabilitation, safety improvements, congestion improvements, operational improvements, traffic signals, sidewalks and curbs, etc.). Listed below are Highway Rehabilitation & Reconstruction projects administered through Capital Program Management which have significant pavement system network improvement benefits and have construction funding in FY 2008. The two projects shown with a funding of approximately $80 million represent roughly one-half of the FY 2008 construction funding in this general program category.

Project Description	**Dir** (B= Both)	**Start Mile-Post**	**End Mile-Post**	**Total Lane Miles**	**County**	**Funding Source**	**Funding Amount** (Millions)
Route 280, Laurel Avenue to 6th Street, Pavement Rehabilitation	B	6.20	14.40	48.2	Essex	Federal	$23.33
Route 295, Tomlin Station Road to Route 45, Rehabilitation	B	14.60	24.50	59.9	Gloucester	State	$12.20
						Federal	$44.58
Total				**108.1**			**$80.11**