REPORT TO THE GOVERNOR
AND THE LEGISLATURE ON
NEW JERSEY'S ROADWAY PAVEMENT SYSTEM
FISCAL YEAR 2006

Prepared by:

New Jersey Department of Transportation
Design Services Division

Kris Kolluri
Commissioner

July 2007

State of New Jersey

DEPARTMENT OF TRANSPORTATION
P.O. Box 600
Trenton, New Jersey 08625-0600

JON S. CORZINE
Governor

KRIS KOLLURI
Commissioner

July 2007

Dear New Jersey Resident:

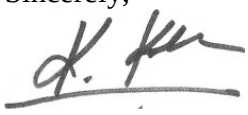
I am pleased to submit the Department's fiscal year 2006 Report on New Jersey's Pavement Infrastructure. The state highway network is one of New Jersey's largest assets and preserving our pavement investment continues to be a high priority for the Department. The state highway system carries approximately two-thirds of the State's vehicular travel and is an essential element of New Jersey's economy.

The Department's Capital Investment Strategy strives to maintain the roadway infrastructure in a state of good repair and address the backlog of deficiencies. Funding for pavement projects is the major constraint to network improvement. The backlog of deficient pavements continues to increase over time and recent analysis has predicted that continuation of current funding levels will result in further decline in network condition. Considering road roughness alone, a dedicated program to eliminate the backlog of deficient pavements over the next ten years is estimated to cost $500 million per year. Moreover, 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 with regards to road roughness, surface cracking, and structural strength. 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 2006 and additional projects programmed for completion in fiscal year 2007.

Sincerely,



Kris Kolluri
Commissioner

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY 1

STATUTORY MANDATE 5

NJDOT PAVEMENT MANAGEMENT SYSTEM 5
- Background and History 5
- Current Pavement Management System 6
- Significant Accomplishments in Pavement Management & Technology 7

CURRENT STATUS OF STATE ROADWAY SYSTEM 8
- Figure 1: New Jersey Roadway System, Breakdown By Centerline Miles 8
- Figure 2: ASCE's Costs Per Motorist Due to Poor Road Conditions 9
- Figure 3: ASCE's Percent of Major Roads in Poor or Mediocre Condition 9
- Pavement Structural Adequacy 10
- Pavement Functional Adequacy 10
  - Table 1: Condition Criteria 11
  - Table 2: Current Functional Adequacy of NJ State Highway System 12
  - Figure 4: Current Functional Adequacy of NJ State Highway System 12
  - Figure 5: Total Deficiency of State Highway System Six Year History 13
- Pavement Remaining Service Life 13
  - Figure 6: Pavement Remaining Service Life State Highway System 14
- Overall Status 14

PAVEMENT TREATMENTS & RELATED RESEARCH 16
- Partnership With Rutgers Pavement Resource Program 16

CAPITAL INVESTMENT STRATEGY 18
- Fiscal Year 2006 Funding 20
  - Table 3: FY 2006 Pavement Preservation Funding 20
- Fiscal Year 2007 Funding 21
- Capital Investment Strategy and Future Projections 21
  - Figure 7: Multi-Year Performance Analysis 23
  - Figure 8: Pavement Preservation Budgets 24
  - Figure 9: Pavement Condition With Increased Funding 25
- Pavement Preservation Capital Investment Strategy Guidelines 26
  - Figure 10: CIS for Pavement Preservation 27
- Capital Investment Conclusions 28

WORK COMPLETED IN FISCAL YEAR 2006 29
- FY '06 Highway Capital Maintenance Projects 29
- FY '06 Rehabilitation and Reconstruction Projects 29
  - Table 4: Projects 29
- FY '06 Highway Resurfacing Projects 31
  - Table 5: Contracts 32
- FY '06 Local Aid Pavement Activities 31

FISCAL YEAR 2007 PAVEMENT PLAN 33

REFERENCES 34

APPENDICES

A. Pavement Treatments A-1
B. Fiscal Year 2007 Pavement Plan B-1
- Section 1: FY '07 Roadway Preservation Funding B-2
- Section 2: Highway Capital Preventive Maintenance B-3
- Section 3: Hwy Resurfacing - Operations Support - Programmed Projects B-4
- Section 4: Hwy Resurfacing - Operations Support - Unfunded Projects B-5
- Section 5: Hwy Resurfacing Through CPM - Programmed Projects B-6
- Section 6: Hwy Rehab/Reconstr. Through CPM - Programmed Projects B-7

EXECUTIVE SUMMARY

New Jersey's Highway System

Preservation of New Jersey's investment in the state highway network is critical to New Jersey's transportation driven economy and remains one of the highest priorities at the New Jersey Department of Transportation (NJDOT). Safe and efficient travel on the state highway system is an indispensable element in the economic health of New Jersey and its residents. An enormous backlog of deficient pavements, restrained pavement budgets, and heavy traffic volumes have prevented this strategy from arresting the rate of pavement decline.

The age of the state highway system has reached a point where a large percentage of pavements are overdue for resurfacing, rehabilitation or reconstruction. With the highest population density of the fifty states, New Jersey experiences traffic volumes that are roughly 3.5 times the national average (Reference 2, page 34). This onslaught of heavy traffic coupled with a severe freeze-thaw environment accelerates pavement deterioration.

Maintaining the structural integrity and ride quality of the State's 2344 centerline miles of heavily traveled pavements is a major task. While the NJDOT has jurisdiction over only 6 percent of the entire New Jersey roadway network (counties, municipalities, and toll and bridge authorities own the other 94 percent), about two-thirds of total travel within New Jersey takes place on state-owned roads.

The need to improve the structural integrity and smoothness of the state highway network continues to be a challenge. 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 severe freeze-thaw environment, coupled with competing needs for transportation dollars, have allowed the backlog to increase over time. 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) has rated New Jersey's highways among the worst in the country. It is estimated that New Jersey motorists have paid approximately $3.2 billion in extra vehicle repairs and operating costs due to poor road conditions in 2005. These extra vehicle repairs break down to approximately $554 dollars per New Jersey motorist. This is 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.

NJDOT's evaluation of the state roadway network is based on data collected and compiled within the Pavement Management System (PMS). The current analysis utilized 2005 data from the PMS database to evaluate the state highway system consisting of approximately 2344 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. Mainline 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 (IRI) for ride quality and the Surface Distress Index (SDI) for surface condition, current Pavement Management System data indicates that ***49% of the system is deficient and overdue for rehabilitation (16% is deficient based on roughness alone, 22% is deficient based on distress alone, and 11% is deficient based on roughness and distress combined). At the same time, 33% of the system is in mediocre condition and 8% 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 10% of the system is considered in good condition.***

- **Pavement Remaining Service Life (RSL):** RSL 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 RSL.***

New Jersey's Pavement Preservation Effort

NJDOT has responded to this challenge by initiating a comprehensive pavement preservation program. Data collection efforts have been expanded to obtain accurate pavement condition data with which informed decisions can be made. State-of-the-art data collection, data analysis, design practices, and materials engineering have been developed and are now routinely used in New Jersey.

The Pavement Management & Technology Unit, in conjunction with the Department's multi-disciplinary Pavement Steering Committee, oversees the programs for pavement preservation and rehabilitation and reconstruction of the roadway infrastructure. This group has developed an innovative Pavement Management 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. However, the effectiveness of such a plan has been severely limited by the severe backlog of deficient roadway segments due in large part to underfunding of pavement repair and maintenance work over the last decade. If significantly increased funding is provided for pavement restoration, the Pavement Management & Technology Unit plans to focus on reducing the deficient backlog while at the same time utilizing elements of the multi-year prioritization approach to preserve our "good" pavement infrastructure. A proactive approach that maintains good pavements in good condition is designed to free up funding for pavement backlog reduction because preventive maintenance treatments are completed at a fraction of the cost of rehabilitation or reconstruction activities. Initiatives have been made to assure the highest quality of materials and construction practices in roadway restoration. A new incentive/disincentive ride quality specification based

upon IRI (International Roughness Index) has been implemented to insure optimum ride quality from 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. The ability to selectively fast-track projects through project delivery pipelines will play a significant role in implementing this plan. These overall strategies will result in expending funds on the ***right treatment*** at the ***right time*** at the ***right place*** at the ***right cost***.

Capital Investment Strategy

In order to reduce the backlog of deficient pavement conditions on state highways over the next decade, NJDOT has developed a Capital Investment Strategy (CIS) that provides strategic direction on how to put New Jersey's pavement system in a state of good repair and keep it there. However, funding availability for resurfacing, rehabilitation and reconstruction, and preventive maintenance programs continues to be the major constraint to this effort. Pavement preservation funding for fiscal year 2006 is presented in Table 3 of this report and historical funding amounts over several fiscal years are shown in Figure 8.

Underfunding of pavement preservation work over the last decade has resulted in a substantial backlog of deficient pavement sections. Efforts to reduce this deficiency and the rate of pavement deterioration under past funding levels have been unable to reverse this trend 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.

The severity of the situation is underscored by recent trend analyses. Considering road roughness alone, analysis has indicated that if previous annual funding levels of approximately $148 million remain unchanged for the main pavement programs, then a serious decline in the overall network condition will occur over the next 10 years. It was also determined that a funding level of approximately $290 million per year would be required to reduce one-half the current backlog of deficient pavements and approximately $500 million per year would be required to entirely eliminate the backlog in ten years. Moreover, considering road roughness, surface cracking and structural strength, 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. The need to improve the structural integrity and smoothness of the state highway network continues to be a challenging endeavor.

Based on this analysis, recommendations were made for fiscal year 2007 to increase funding levels for highway resurfacing, highway capital maintenance, and highway rehabilitation and reconstruction programs. The fiscal year 2007 Capital Program identifies a funding level of approximately $279 million, an increase of about $131 million over the previous year, redirected to the pavement preservation program. This program funds a significantly increased 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. Details of the fiscal year 2007 funding program are outlined in Section 1 of Appendix B.

The Pavement Preservation CIS pursues a more cost effective, practical approach to pavement management in New Jersey. Using life cycle cost analyses, a strategy was developed that maps out a plan for implementing **"The Right Treatment, At the Right Time, At 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.

Work Completed in Fiscal Year 2006

In compliance with the requirements of the "Congestion Relief and Transportation Trust Fund Renewal Act" (Trust Fund Renewal Act) enacted on July 20, 2000, this report documents the pavement-related projects awarded in fiscal year 2006. These projects are organized into four major areas and represent the following expenditures for pavement maintenance and repair:

- **Highway Capital Maintenance Projects** totaling approximately $11 million.

- **Rehabilitation and Reconstruction (Capital Program Management) Projects** with a significant roadway resurfacing or reconstruction component that were awarded during fiscal year 2006, with a total project cost of approximately $430 million and an estimated pavement cost of $108 million. It should be noted that rehabilitation and reconstruction projects administered through Capital Program Management are large-scale projects with many activities (e.g. bridge rehabilitation, traffic signals, safety improvements, sidewalks and curbs, etc.). The estimated pavement cost is an estimate of the actual costs to restore roadway pavement which directly improves the pavement system infrastructure. Also, these projects were awarded in FY 2006 but they are often funded and constructed over several years.

- **Highway Resurfacing Projects** consisting of 15 contracts initiated through the Department's Division of Operations Support valued at $53 million.

- **Local Aid Pavement Activities** with funds made available to counties and municipalities through the Transportation Trust Fund. Of the $145 million provided in fiscal year 2006, $67.5 million was used for local county aid and $67.5 million was used for local municipal aid. The remaining $10 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 involve some form of pavement resurfacing.

Work Programmed For Fiscal Year 2007

The NJDOT Pavement Management System was utilized to generate lists of critical pavement projects for implementation in fiscal year 2007. This programmed 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 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. This unit began evaluating roadway surface conditions in order to identify pavement resurfacing needs. A combined pavement index based on ride quality and surface distress was developed as a way to prioritize resurfacing projects. In addition, the Pavement Management Unit continued to perform pavement skid resistance testing.

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. To comply with the FHWA requirement, the Department's Pavement Management Unit collected data on the NHS roads. A consultant was hired to collect data on the Non-NHS Federal Aid System roads and to enhance NJDOT's Pavement Management System. 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. The system 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). 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. This information is an important management tool in the selection of appropriate pavement treatments and the determination of major rehabilitation/reconstruction projects.

A second major function of the PMS is to supply information to drive the Department's pavement programs. PMS data is continually updated, analyzed, and reported to a myriad of 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 five-year capital program. In addition, 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 will receive special traction enhancing treatments to reduce crashes and the resulting tremendous economic 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.

Significant Accomplishments in Pavement Management & Technology

- **Advances in Data Acquisition**: In an attempt to more accurately assess the condition of the New Jersey pavement infrastructure, NJDOT has accelerated its testing of the entire state highway system from a two-year collection cycle to an annual one and has upgraded its data collection equipment with the purchase of a new high-speed road profiler. This equipment collects more accurate and useful pavement data, including advanced digital imaging 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 underscore the dire condition of the pavement infrastructure and to plan for its rejuvenation. As a result, the Department has programmed the biggest pavement improvement plan in its history (approximately $279 million).
- **Enhanced Quality Control for New Pavement Projects**: NJDOT has designed and implemented a new incentive/disincentive ride quality specification for new pavement work. Based on laser-measured smoothness criteria defined in terms of the International Roughness Index (IRI), this initiative will assure the highest quality of construction practices and materials in roadway restoration.
- **Redesigned Pavement Preservation Plan**: Under the guidance of the newly formed, multi-disciplinary Pavement Steering Committee, NJDOT has developed an innovative Pavement Preservation Plan. Based upon recommendations from the Federal Highway Administration and outside consultants, the revamped plan focuses on reducing the staggering 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 and to free up funding for deficient backlog reduction since preventive maintenance treatments, which retard pavement deterioration, are completed at a fraction of the cost of rehabilitation or reconstruction activities. However, the effectiveness of such a strategy has been limited by the severe backlog of deficient roadway segments, due in large part to underfunding of repair and maintenance work over the last decade. 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 ROADWAY SYSTEM

There are approximately 36,000 centerline miles of roadways in New Jersey. NJDOT maintains slightly more than 2,300 centerline miles of state-owned roads. Most of the remaining mileage is under the jurisdiction of county and municipal governments (see Figure 1 below).

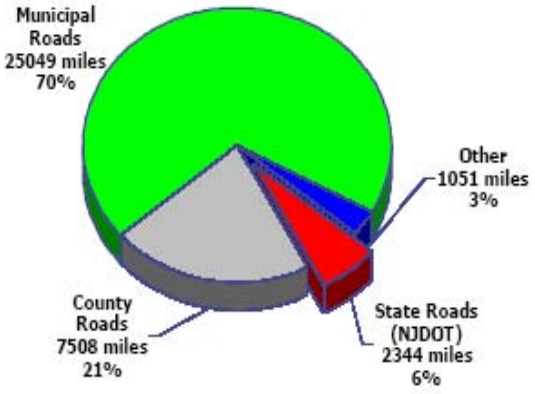
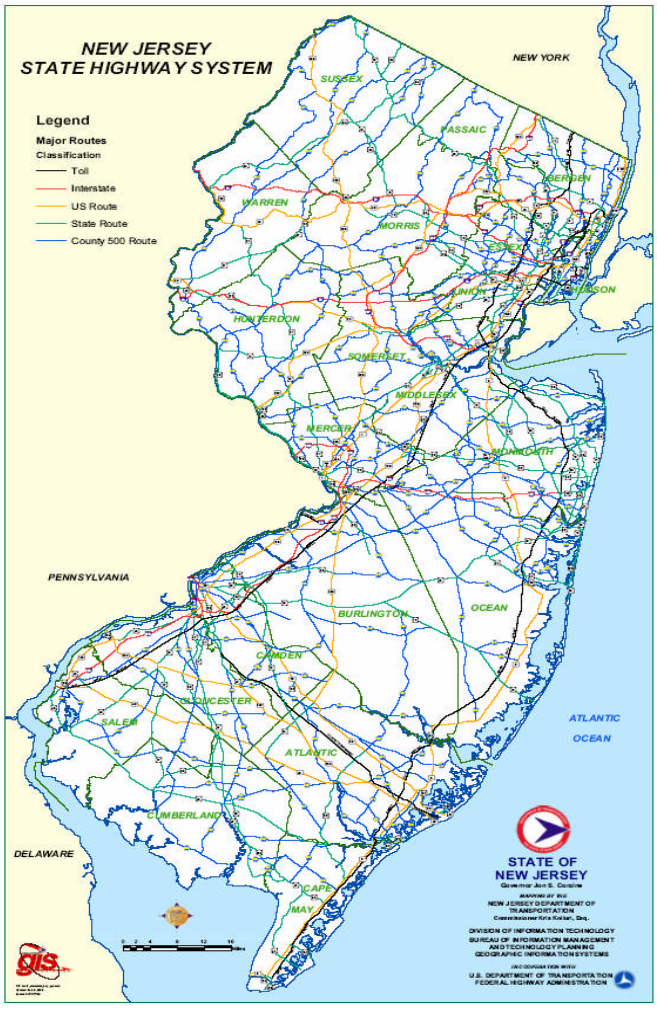


FIGURE 1
New Jersey Roadway System
Breakdown by Centerline Miles

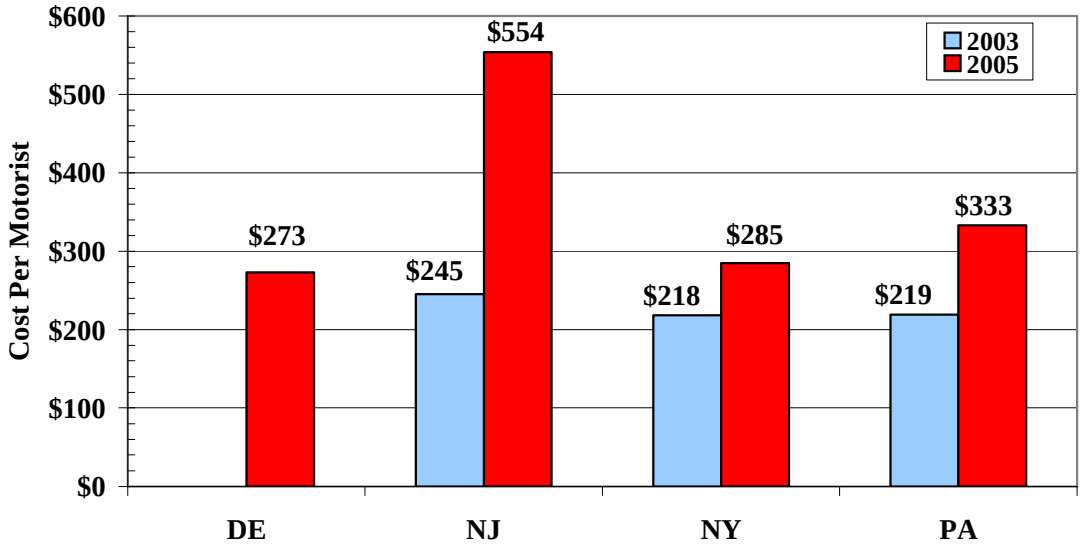
"Other" includes toll roads and bridge authorities



Although NJDOT jurisdiction represents only about 6% of the total statewide mileage, approximately two-thirds of all traffic, including a high percentage of heavy trucks, is carried on state-owned roads. Heavy traffic volumes have a significant impact on pavement deterioration 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. In fact, a recent evaluation of the nation's transportation infrastructure by the American Society of Civil Engineers (ASCE) rated New Jersey's highways among the worst in the country. Some staggering statistics from the study show that:

- New Jersey motorists have paid a total of $3.2 billion dollars in vehicle repairs and operating costs due to poor road conditions in 2005. This is up from $1.4 billion dollars in 2003. This is the largest total and largest 2-year increase in the nation. These extra vehicle repairs break down to approximately $554 dollars per New Jersey motorist. This is almost double the amount per motorist for the states surrounding New Jersey (see Figure 2 below).

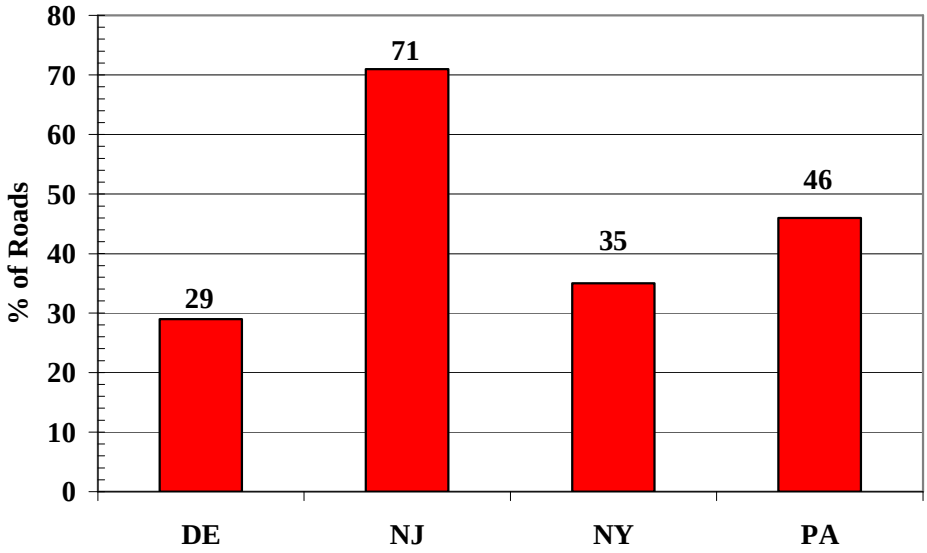
FIGURE 2
ASCE's Costs Per Motorist in Extra Vehicle Repairs and Operating Costs Due to Poor Road Conditions



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

- 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. When compared to surrounding states, New Jersey has almost twice the amount of poor to mediocre condition highways (see Figure 3 below).

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



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

NJDOT's evaluation of the New Jersey state highway system is based upon data collected on state 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. 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 by 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.

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 2005 data from the NJDOT Pavement Management System (PMS) database to evaluate the state highway system consisting of approximately 2344 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. The database was queried using these condition limits to calculate lane miles of roadway falling into each category.

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

After the system was broken down into deficient, mediocre, fair and good categories, further analysis was performed on the deficient portion. The database was queried for the following 3 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).

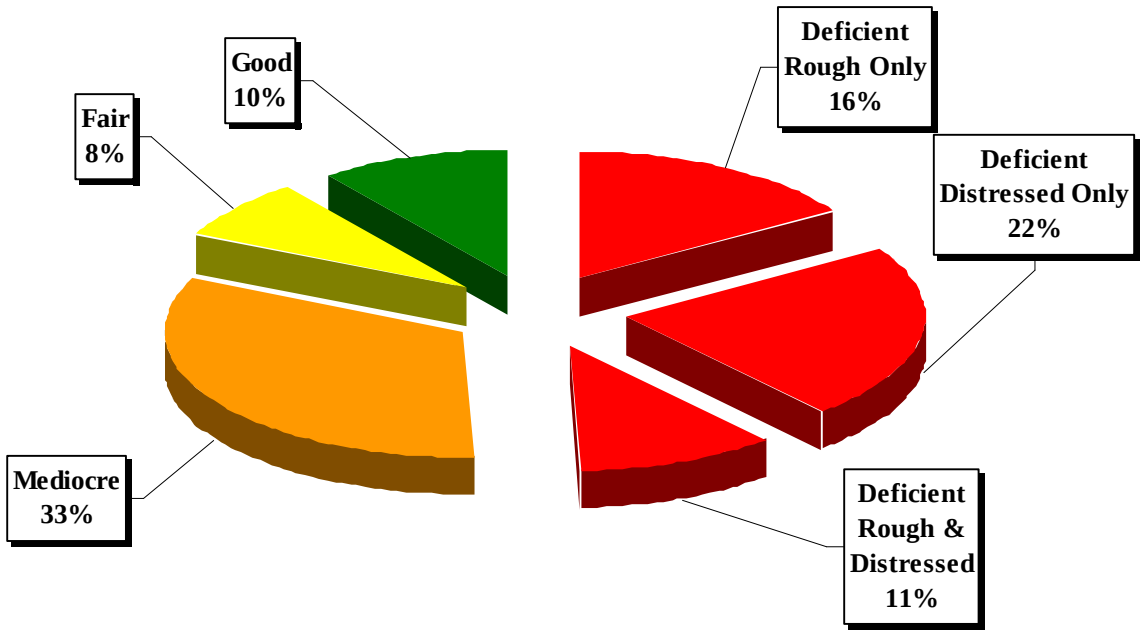
Results of the analysis for smoothness and surface distress are presented in tabular form in Table 2 and graphically in Figure 4 below.

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
Deficient by Roughness Alone	758	1334	16%
Deficient by Distress Alone	953	1873	22%
Deficient by Roughness & Distress	491	882	11%
Total Deficient	2202	4089	49%
Total Mediocre	1604	2709	33%
Total Fair	377	629	8%
Total Good	446	860	10%
Total State System	4629	8287	100%

Source: NJDOT Pavement Management System, 2005 Data

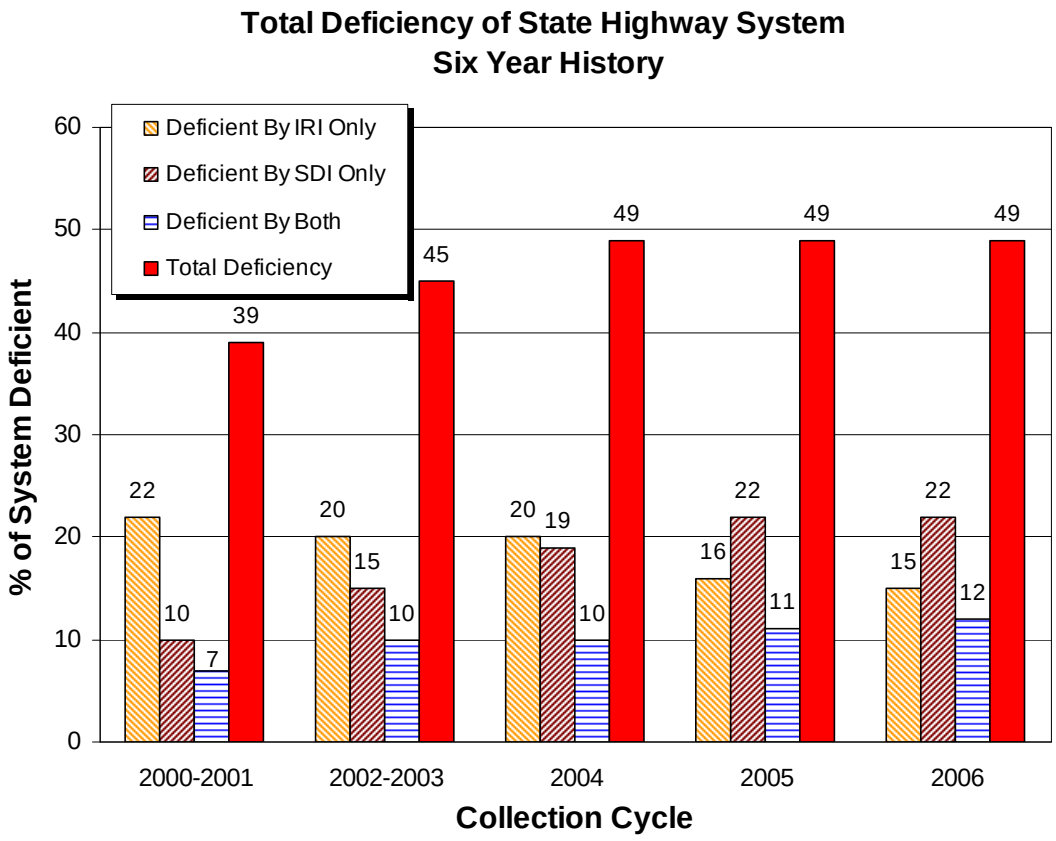
FIGURE 4
Current Functional Adequacy of NJ State Highway System
(Based on Roughness and Distress)



Source: NJDOT Pavement Management System, 2005 Data

These results underscore the severity of the deficiency backlog (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).

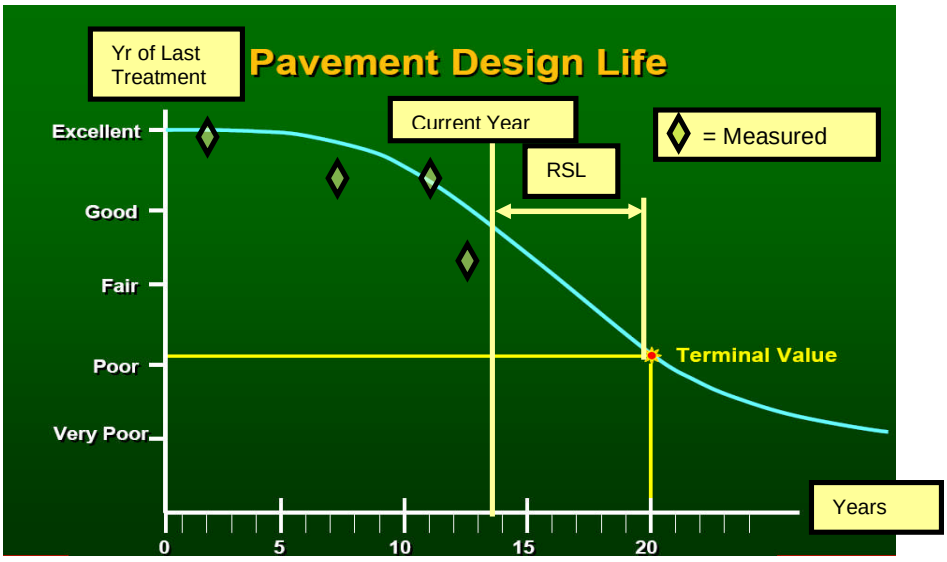
FIGURE 5



Source: NJDOT Pavement Management System

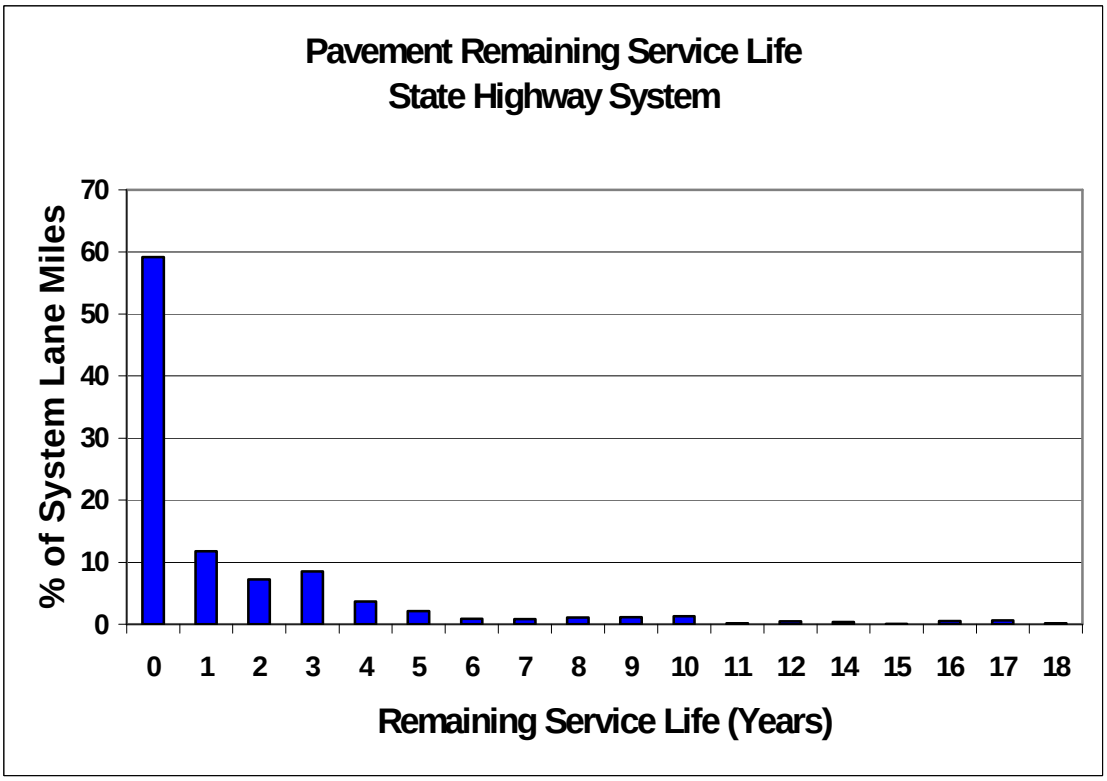
Pavement Remaining Service Life

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

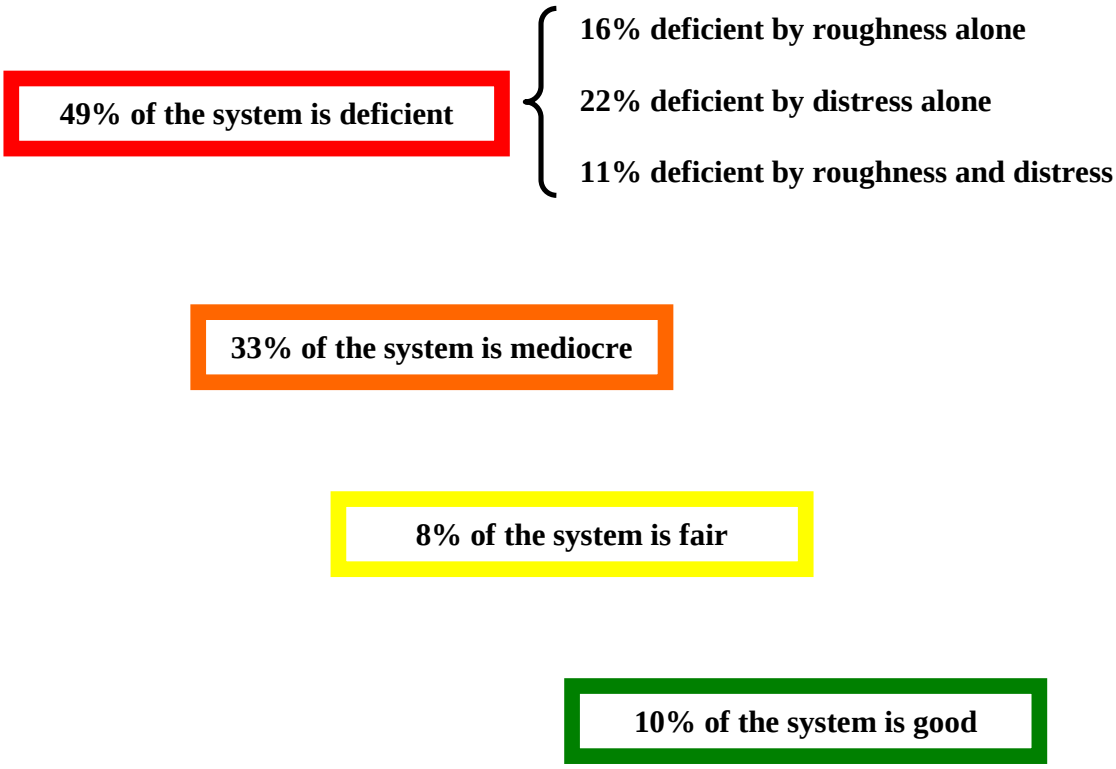


Source: NJDOT Pavement Management System, 2005 Data

Overall Status

- Based on pavement **structural adequacy**, results of a recent needs 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 (IRI) for ride quality and the Surface Distress Index (SDI) for surface deterioration, 2005 Pavement Management System data indicates the following:



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

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 the 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 (CAIT). In the area of pavement technology, CAIT'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, maintenance and upkeep of roadway infrastructures, and educating future professionals in the field. The PRP's research extends to a wide range of paving materials, material testing systems and procedures, construction quality control methods, and pavement management areas 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 (RAPL) 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:

- **Remaining Service Life Evaluation of the Pavement Network:** The PRP has established an office at NJDOT to assist the Department with evaluating the Remaining Service Life (RSL) concept in improving the Pavement Management System. The RSL provides a simple

method to assess the condition of pavements and estimate the life remaining before treatment or action is needed. The RSL analysis of the current pavement management data projected that approximately 70% of the state-maintained network has little or no RSL. The RSL concept is especially useful in planning preventive maintenance projects which extend pavement life.

- **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 as 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.

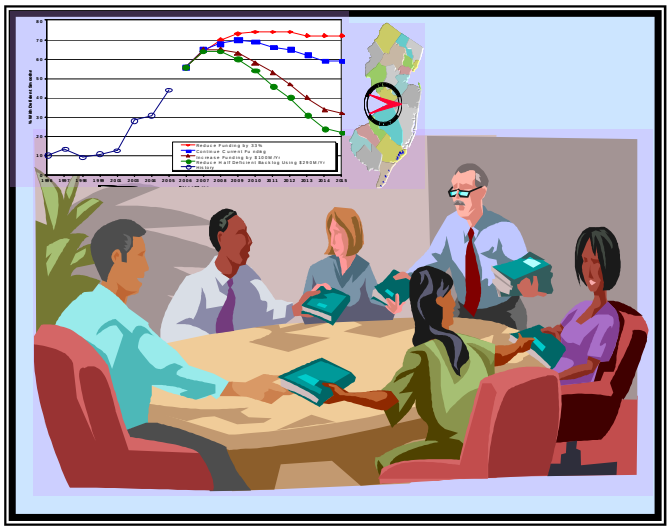
- **Measurement and Analysis of Tire/Pavement Noise:** Tire/pavement noise is defined as the noise directly produced by the tire traveling over the pavement surface, not considering other traffic-related noise such as automobile/truck engines, braking, etc. Research by the PRP has resulted in an initial 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 a myriad of pavement treatments for preventive maintenance, resurfacing, rehabilitation, and reconstruction activities. Descriptions of many of these treatments are contained in Appendix A of this report.

CAPITAL INVESTMENT STRATEGY

The state highway system constitutes the heart of New Jersey's surface transportation network. Unfortunately, state highways continue to be faced with 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 two-thirds of the travel in New Jersey takes place on state-owned highways underscores this problem. A lack of significant funding availability for increased roadway preservation investments allocated towards resurfacing, rehabilitation, reconstruction, and particularly preventive maintenance programs remains the major constraint to pavement quality improvement.



NJDOT's Capital Investment Strategy (CIS) is a performance-based capital programming mechanism that links broad transportation goals and policies to specific investment choices. The investment strategy includes pavement condition 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 CIS 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?

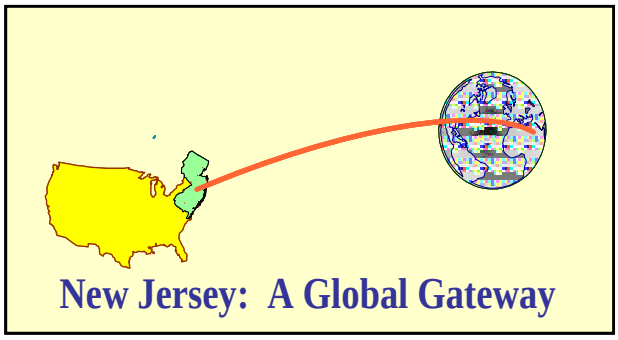
The need to upgrade the structural integrity and smoothness of the state's highway network continues to be a challenging endeavor. Serious efforts to reduce pavement deterioration have been made by implementing numerous reconstruction and rehabilitation, resurfacing and preventive maintenance projects. 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 state's 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

The state highway system 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 is an indispensable element providing 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. Investment in maintaining and upgrading the structural integrity and surface condition of the state's highway network is mandatory. 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.

Fiscal Year 2006 Funding

The FY 2006 Transportation Capital Program allocated funds for pavement preservation activities as described in Table 3 below:

TABLE 3
FY 2006 Pavement Preservation Funding

Program Category	Comments	Funding Amount (Millions)
Highway Capital Maintenance (State Funding)	Roadway betterments (minor repairs)	$8
Highway Capital Maintenance (Federal Funding)	Interstate preventive maintenance	$3
Highway Resurfacing (State Funding)	Resurfacing and minor safety improvements	$60
Highway Resurfacing (Federal Funding)		$2
Rehabilitation and Reconstruction (Federal and State Funding)	Larger scale projects	$75 (See note)
Total		**$148**

Note: *Rehabilitation and reconstruction projects administered through Capital Program Management are large-scale projects with many activities (e.g. bridge rehabilitation, traffic signals, safety improvements, sidewalks and curbs, etc.). Total project costs for these projects include substantial work which will ameliorate problems related to congestion, safety, etc., but will not necessarily improve pavement system conditions. The funding amount above represents an estimate of the project costs applied to restoring pavements.*

Some significant projects included in this funding plan are highlighted below. Refer to the section of this report entitled **"WORK COMPLETED IN FISCAL YEAR 2006"** for a more complete listing of projects.

- **Route 1&9, Secaucus Rd. to Broad Ave., Mileposts 56.8 – 63.0: rehabilitation and reconstruction (year 1 construction) -**
  $58.1 million anticipated total construction cost:
  - $18.0 million in FY06
  - $14.2 million programmed in FY05

- **Route 78, Union County Rehabilitation, Contract A, Mileposts 50.6 – 52.9: rehabilitation and reconstruction (year 1 construction) -**
  $38.5 million anticipated total construction cost:
  - $15.5 million programmed in FY06

- **Route I-295, I-195 to Route 1, Mileposts 60.4 – 67.80: rehabilitation (multi-year construction) -**

  $14 million anticipated total construction cost:
  - $7.0 million programmed in FY06
  - $7.0 million programmed in FY05

- **Route I-80, Parsippany-Troy Hills Roadway Improvement, Mileposts Route 80: 41.50 – 45.60 and Route 287: 41.50 – 41.80: rehabilitation and reconstruction (multi-year construction) -**

  $69.7 million anticipated total construction cost:
  - $5.9 million programmed in FY06
  - $63.8 million programmed in later years

Fiscal Year 2007 Funding

For FY 2007, the Transportation Capital Program allocates funds for roadway preservation activities as described in Appendix B, Section 1 of this report.

Some significant projects included in this funding plan are highlighted below. Refer to Appendix B of this report for detailed listings of planned projects.

- **Route 1&9, Secaucus Rd. to Broad Ave., Mileposts 56.8 – 63.0: rehabilitation and reconstruction (year 2 construction) -**

  $58.1 million anticipated total construction cost
  - $25.9 million programmed in FY07 to complete construction

- **Route 78, Union County Rehabilitation, Contract A, Mileposts 50.6 – 52.9: rehabilitation and reconstruction (year 2 construction) -**

  $38.5 million anticipated total construction cost:
  - $23.0 million programmed in FY07 to complete construction

- **Route 295, Tomlin Station Road to Route 45, Rehabilitation, Mileposts 15.0 – 24.53: rehabilitation and reconstruction (year 1 construction) -**

  $41.2 million anticipated total construction cost:
  - $27.1 million programmed in FY07

Capital Investment Strategy and Future Projections

NJDOT utilizes a plan-driven, performance-based capital programming tool called a "capital investment strategy" (CIS). With regards to pavement preservation, the CIS is a decision-making, asset management methodology. It 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 alternative investment scenarios perform over time. This in turn explicitly identifies program tradeoffs and the outcomes to be expected from the resulting project mix. The alternative investment scenarios include 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 NJDOT Long Range Transportation Plan goal and objective that relate to pavement condition are as follows:

> **Goal:** Improve and maintain the transportation infrastructure.
> **Objective:** Maintain the structural integrity and ride quality of the state highway system.

NJDOT's FY 2007-2011 CIS calls for a bold obligation to re-invest in restoring and maintaining our infrastructure to achieve a high performance level. The intent of the CIS is to allocate resources to achieve this objective. In addition to safety, achieving a "state of good repair" for New Jersey's highway system and maintaining that system to ensure maximum useful life is one of the Department's key objectives. Goals identify a starting point and a destination. The CIS will provide guidance in determining how the network is affected by our project selections, budget decisions and possible tradeoffs required to achieve our goals.

As an asset management tool, the CIS provides strategic direction to the capital program in implementing NJDOT's "Fix It First" policy. This exemplifies the high priority given to achieving and maintaining a state of good repair for New Jersey's transportation system. Therefore, the CIS for pavement preservation is simply based on a "commitment" to renew and sustain our transportation infrastructure. However, this financial plan will not be successful without increased funding allocations necessary to shrink the backlog of pavement deficiencies projected in the future.

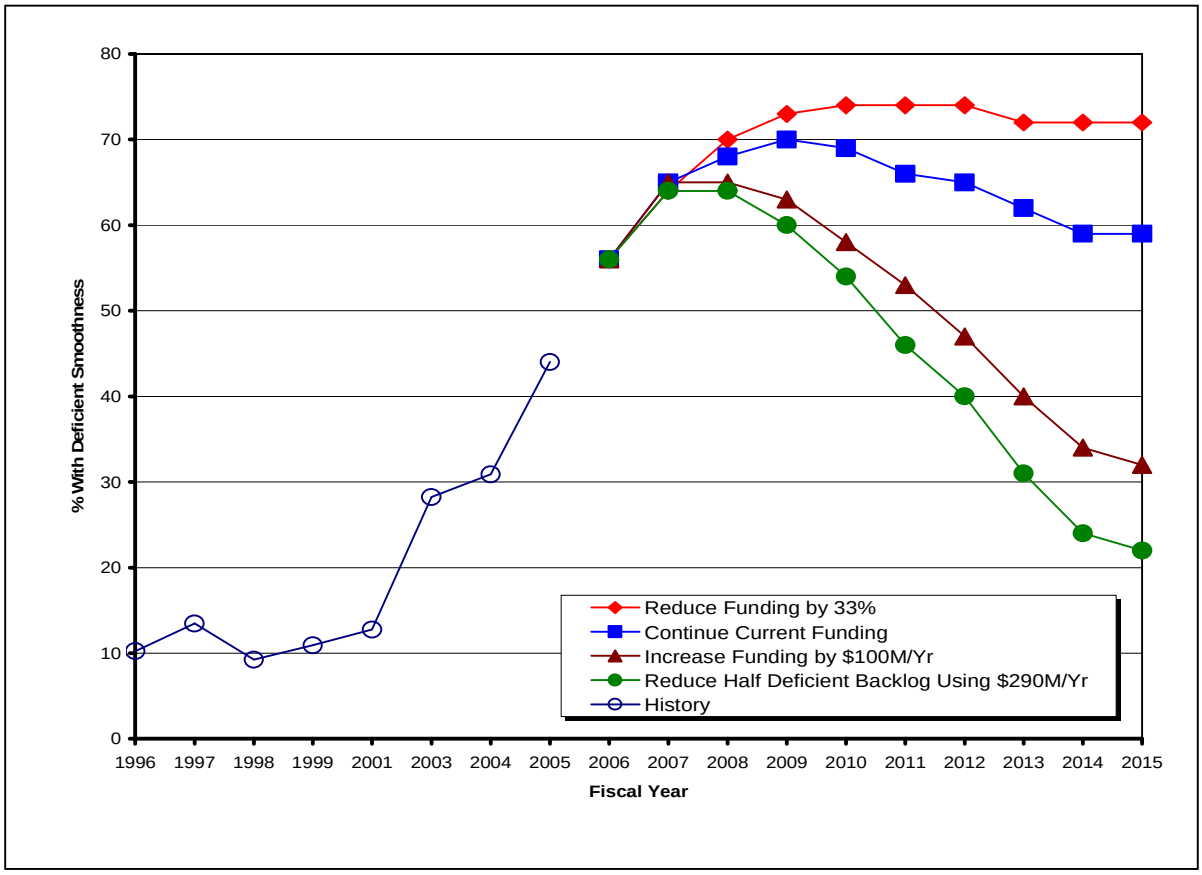
In order to evaluate pavement performance over time in response to different investment scenarios, a performance analysis was conducted using roughness parameters alone without considering surface distress or structural adequacy (total system deficiencies will be significantly greater). The following investment scenarios developed by CIS analysts were evaluated over a 10-year period:

- Scenario A: Yearly funding reduced below current level
- Scenario B: Yearly funding continued at current level
- Scenario C: Yearly funding increased by $100M over current level
- Scenario D: Yearly funding required to reduce the deficient backlog by 50 percent ($290M/Yr)

This analysis considered current, decreased, and increased funding amounts and the funding required to eliminate one-half the current backlog of deficient pavement in ten years. Figure 7 below summarizes the results.

FIGURE 7
Multi-Year Performance Analysis
Percent of System Deficient Based on Roughness*

The figure below demonstrates trends over time based on roughness only. Total system deficiency based on all performance indices would yield significantly greater percentages than those shown below.



It should be stressed that the performance analysis above assumes that the funding amounts are applied to pavement priority projects. Roadway rehabilitation and reconstruction projects administered through Capital Program Management are large-scale projects often with many activities (e.g. bridge rehabilitation, widening, traffic signals, safety improvements, utilities, sidewalks and curbs, etc.) which do not directly improve the 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.

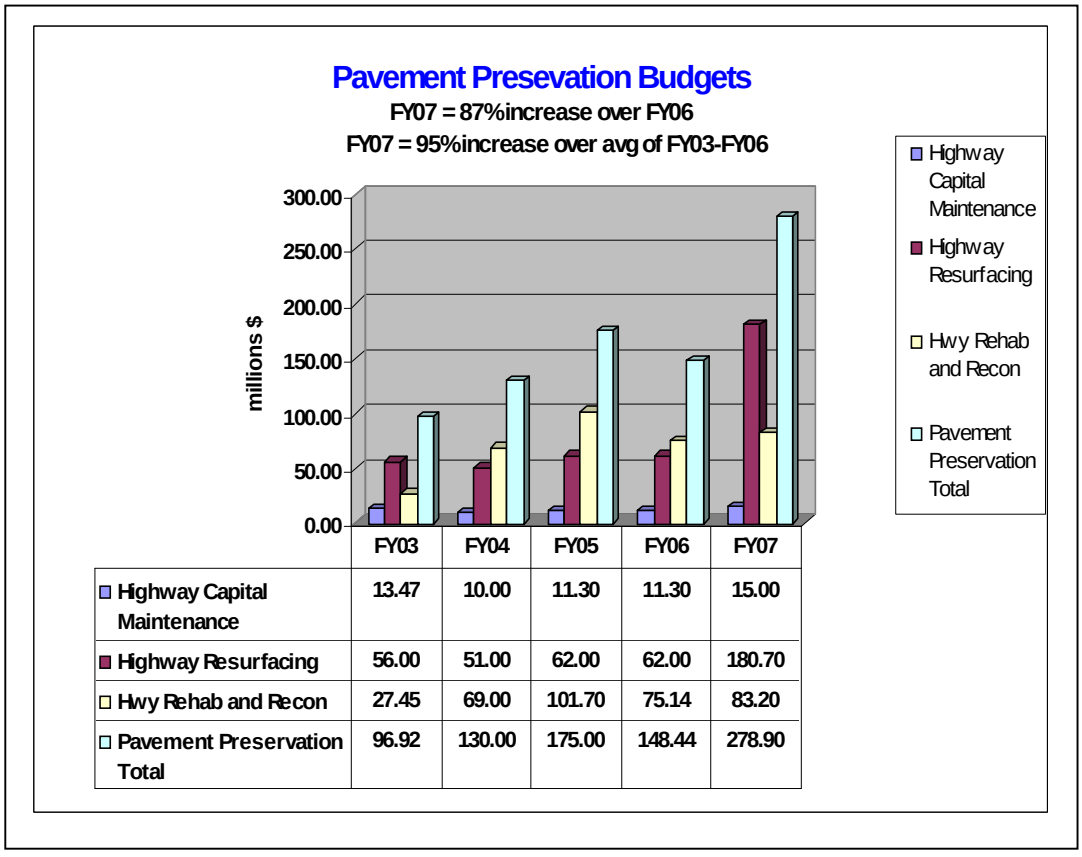
The investment analysis determined that continued annual funding at the current level of approximately $148 million per year for priority pavement projects is projected to result in a serious decline in the overall network condition over the next 10 years. In other words, pavement performance, including structural integrity and ride quality, will further deteriorate creating an accruing backlog that becomes financially overwhelming to eliminate. Obviously,

this investment level does not renew and sustain our infrastructure investments to achieve a state of good repair.

Moreover, 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 $290 million per year for priority projects would be required** (**a minimum increase of approximately $140 million per year over current funding levels)**. While not shown in the analysis above, the amount of funding required to entirely eliminate the backlog of deficient pavement was evaluated as well. It was concluded that **approximately $500 million per year would be needed to entirely eliminate the backlog of deficient pavements in ten years. Moreover, considering road roughness, surface cracking and structural strength, 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 results, recommendations were made for FY 2007 to increase funding levels for highway resurfacing, highway capital maintenance, and highway rehabilitation and reconstruction programs to achieve the backlog reduction objectives. For example, the FY 2007 Capital Program identifies a funding level of approximately $279 million, an increase of about $131 million over the previous year, redirected to the pavement preservation program. As shown in Figure 8 below, this represents an 87% increase in funding over FY 2006 and a 95% increase over the average investment level since FY 2003.

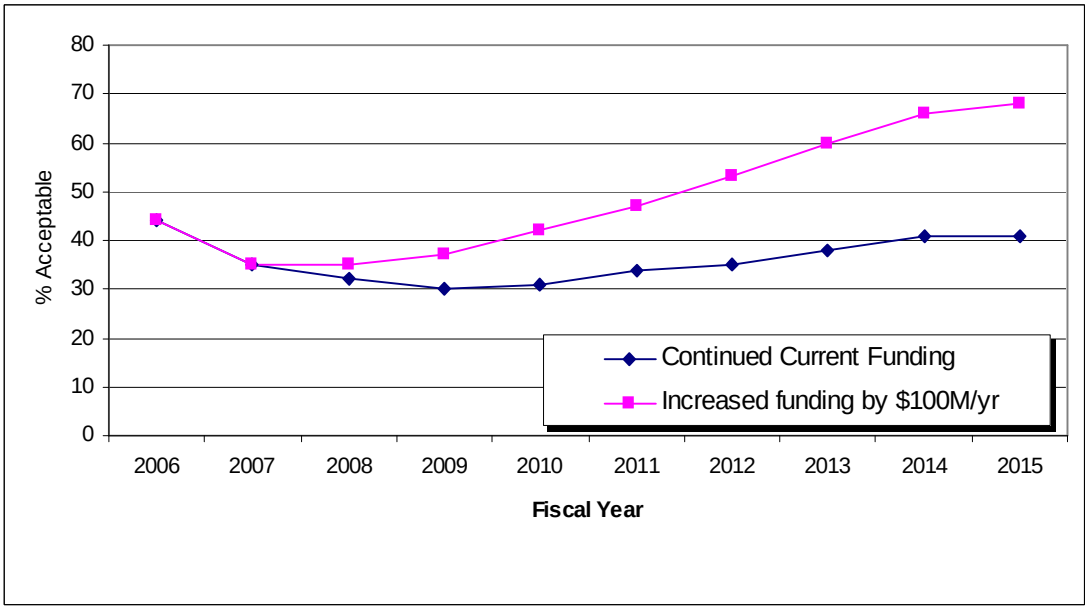
FIGURE 8



	FY03	FY04	FY05	FY06	FY07
Highway Capital Maintenance	13.47	10.00	11.30	11.30	15.00
Highway Resurfacing	56.00	51.00	62.00	62.00	180.70
Hwy Rehab and Recon	27.45	69.00	101.70	75.14	83.20
Pavement Preservation Total	96.92	130.00	175.00	148.44	278.90

The performance analysis demonstrates that a $100 million per year investment increase yields an approximate improvement of 30% in pavement smoothness at the end of the ten year period as illustrated in Figure 9 below. If funding levels do not increase, pavement smoothness quality is not expected to improve significantly.

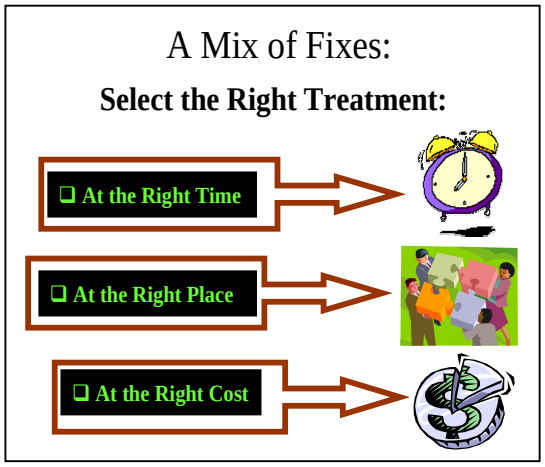
FIGURE 9
Pavement Condition With Increased Funding



The FY07 Capital Program funds a significantly increased comprehensive pavement program consisting of various treatments for highway problems in order to reverse 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.

Due to the growth of competing transportation needs and limited state and federal funding, the Department's current CIS 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 FY 2007-2011 Pavement Preservation CIS pursues a more cost effective, practical approach to pavement management in New Jersey. Using life cycle cost analyses, a strategy was developed that maps out a plan for implementing "The Right Treatment, At the Right Time, At 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. For example, the NJDOT recently employed a new, innovative Pavement Management Plan that emphasizes preventive maintenance. It moves the Department away from a "worst first" outlook and toward a "best first", multi-year prioritization mode of operation. The plan contains a "mix of fixes," including diamond grinding, ultra thin overlays, longitudinal crack repair, and crack and joint sealing, as well as the more traditional resurfacing and rehabilitation projects. This approach is vital to addressing the backlog of deficient pavements. The ability to selectively fast track projects through a streamlined project development pipeline will play a significant role in implementing this investment strategy. The capability to optimize investments by reallocating, redirecting and increasing funding levels will have a greater impact on preserving New Jersey's pavement infrastructure.



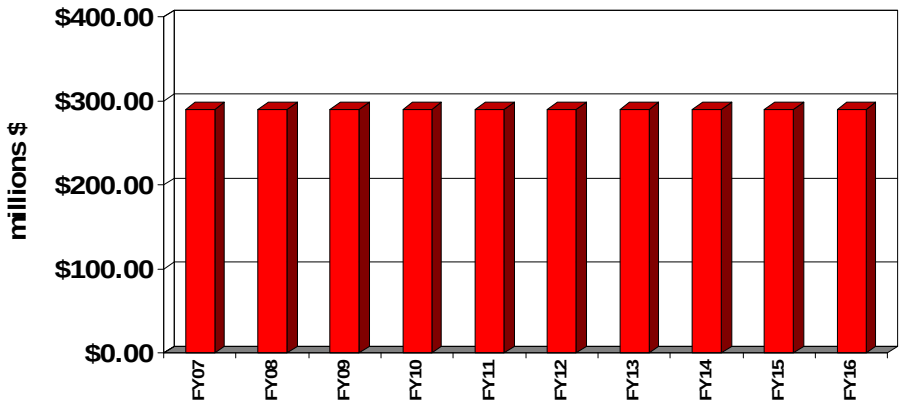
Pavement Preservation Capital Investment Strategy Guidelines

1. **As an investment strategy, state highway infrastructure preservation projects are top priorities.** Many segments of our state highway system are at an age at which they need substantial rehabilitation or reconstruction. Increased investment levels will continue to be pursued to shrink the backlog of pavement deficiencies.

2. **As a primary goal, program an investment level that maintains the existing system to insure safe, reliable travel for users of the state highway system. Continue to program all eligible, affordable pavement preservation projects in FY 2007 and FY 2008 at a funding level of approximately $290 million.** This investment benchmark is referenced in the NJDOT Fiscal Year 2007-2011 Capital Investment Strategy Report. In fact, as shown in Figure 10 below, this is the required annual funding commitment necessary over the next ten years to significantly improve the state highway system by eliminating one-half of the current backlog of deficient pavements. If the significant backlog of deficient pavements can be reduced to an acceptable level, a more proactive approach to maintaining existing highway pavements can be embraced. Timely pavement preservation activities would enable the Department to reduce costly and disruptive reconstruction projects, and provide the traveling public with improved safety and mobility, reduced congestion, and smoother, longer lasting pavements.

FIGURE 10

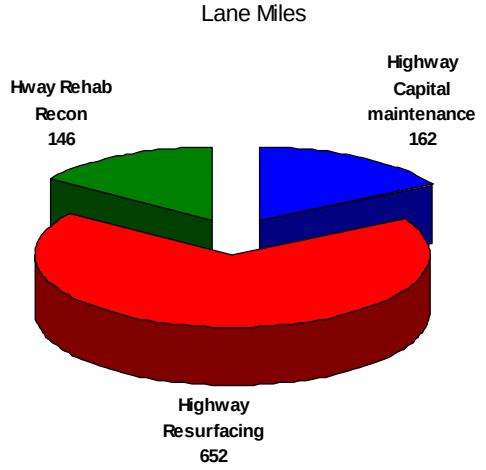
CIS for Pavement Preservation



3. **Focus investments on a prioritized list of rehabilitation/reconstruction, resurfacing and pavement preservation projects based on previously defined needs.** The list contains both projects with designs already significantly completed and new pavement projects. The Department's latest CIS recommends the following pavement preservation budget in FY07 to reverse the current negative trend and move closer toward restoring the system to a state of good repair.

Highway Resurfacing	$ 181 M
Highway Rehabilitation and Reconstruction	$ 83 M
Highway Capital Maintenance	$ 15 M
Total	**$ 279 M**

This represents an increase of about $131 million in funding for highway rehabilitation and resurfacing projects due to an enhanced program level, plus other economies (funding in FY06 was about $148 million). As shown below, approximately 960 lane miles of our state highway system will be rehabilitated, resurfaced, or treated by pavement preservation measures in FY07.



Projected Pavement Preservation For Fiscal Year 2007

Category	Lane Miles
Highway Capital Maintenance	162
Highway Resurfacing	652
Highway Rehab Recon	146
TOTAL =	**960**

4. **Continue to advance future roadway preservation projects through the study and development stages so that they will be ready for future funding**. Continue to operate a pavement management system that provides a balanced mix of fixes with a proactive approach in selecting and implementing **pavement preservation activities.** Continued investment at this level will enable us to turn the corner on the deterioration of our state highway system.

5. **Program a "Mix of Fixes" developed from the Pavement Management System that implements "The Right Treatment, At the Right Time, At the Right Place, At the Right Cost".** The proposed capital program funds a comprehensive pavement program consisting of various specific treatments for pavement deficiencies. 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.

Capital Investment Conclusions

A Capital 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. The state's 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 CIS sets out the overall *strategy* that the NJDOT follows for investing capital transportation dollars for pavement preservation in the future. In a time of multiple competing needs and limited capital, the CIS seeks a cost-effective return on public investments. It tells us how we can get more "bang for our bucks". 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 improvement of the overall quality of New Jersey's transportation system.

WORK COMPLETED IN FISCAL YEAR 2006

FY '06 Highway Capital Maintenance Projects

As in the past several years, approximately $11 million was spent in fiscal year 2006 on pavement-related maintenance work administered through the Operations branch 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 (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, macro texture (friction), wet weather visibility and reduces tire noise. A brief description of these treatments is given in Appendix A of this report.

FY '06 Rehabilitation and Reconstruction Projects

Table 4 shown below lists Capital Program Management projects which were awarded in fiscal year 2006. It should be noted that rehabilitation and reconstruction projects administered through Capital Program Management are large-scale projects with many activities (e.g. bridge rehabilitation, traffic signals, safety improvements, sidewalks and curbs, etc.). The estimated pavement cost is an estimate of the actual costs to restore roadway pavement which directly improves the pavement system infrastructure. Also, these projects, although awarded in FY 2006, are often funded and constructed over several years.

TABLE 4
Rehabilitation and Reconstruction Projects
Awarded in FY 2006 Through Capital Program Management

Project Description	Start Mile-Post	End Mile-Post	Total Lane Miles	County	Cost (Millions)	
					Total	Pavement
Route 1 & 9/Route 35 Interchange, South of Interchange to Tappan Street	35.80	36.80	5.4	Middlesex	$23.90	$6.36
Route 1 & 9, Sect 1K & 3M, Production Way to East Lincoln Avenue	37.99	39.74	9.5	Middlesex & Union	$39.92	$11.05

Table 4 CPM Projects Awarded in FY '06 - Continued

Project Description	Start Mile-Post	End Mile-Post	Total Lane Miles	County	Cost (Millions)	
					Total	Pavement
Route 1 & 9, Sect (28), Secaucus Road to Broad Ave.	56.80	63.00	23.9	Hudson & Bergen	$44.47	$13.00
Route 9 - Bus Shoulder Lanes & Pedestrian Improvements	122.12	123.52	8.3	Middlesex	$6.43	$3.30
	124.63	126.66	12.3			
Route 29 Main Street Lambertville	18.62	19.87	3.4	Hunterdon	$7.25	$1.47
Route 30/130 Collingswood Circle (Phase A)	4.19	4.33	0.6	Camden	$26.56	$4.34
Route 33, Section 9A	41.70	42.03	0.8	Monmouth	$16.63	$4.54
Route 40 (4)	16.50	20.38	7.8	Salem	$10.00	$2.20
Route 46 / Route 159	52.08	53.22	4.4	Essex & Morris	$5.90	$1.47
	1.08	1.36	0.6			
Route 52 Causeway Contract A1	0.21	1.76	6.4	Atlantic & Cape May	$141.35	$3.93
Route 78 Resurfacing, Route 31 Interchange to Potterstown Road	17.87	23.05	31.7	Hunterdon	$8.50	$7.10
Route 78 Local & Express Roadway Improvement, Contract A	50.59	52.80	22.0	Union	$32.57	$21.23
Route 80 Eastbound Resurfacing	28.14	41.00	45.0	Morris	$11.44	$8.00
Route 82/County Rt. 629 (Morris Avenue) Intersection Improvements	1.32	1.50	0.8	Union	$10.18	$2.18
Route 94 Hardyston/Vernon Drainage & Roadway Improvements	36.48	37.24	1.4	Sussex	$5.27	$1.79
	40.96	41.36	0.8			
Route 280 at Garden State Parkway Interchange 145	11.78	12.46	4.2	Essex & Morris	$17.04	$3.44
Route 287 Northbound Resurfacing, North of Burnt Mills Road to Passaic River	21.50	30.20	20.8	Somerset	$5.80	$4.60
Route 287 Resurfacing, North of Littleton Rd to Passaic River	42.20	47.10	29.4	Morris	$7.70	$6.60
FY '06 Totals			**239.5**		**$429.91**	**$108.10**

FY '06 Highway Resurfacing 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 (remove) a depth of the distressed hot mix 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. Much preparatory work is needed, however, before the concrete can be placed on the road. These production constraints, combined with lane closure limitations, allow this product to be only used in relatively small quantities. In addition, the repair procedure is expensive and only recommended where the percentage of defective pavement is less than two percent of the total roadway surface.

The Department has completed implementation of the Superpave mix design system for hot mix asphalt. Superpave is an advanced mix design and specification for hot mix asphalt; it is more durable and rut resistant than traditional asphalt mixes. *The New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction* published in 2001 lists Superpave as the preferred hot mix asphalt. It is used on all classes of paving projects sponsored by NJDOT.

Table 5 on the next page lists pavement resurfacing contract work awarded in fiscal year 2006. A large percentage of the resurfacing projects were implemented through the Department's Division of Operations Support. Fifteen contracts valued at $53.32 million are listed.

FY '06 Local Aid Pavement Activities

The Transportation Trust Fund provided $145 million in local aid funding for counties and municipalities in fiscal year 2006. Of the $145 million, $67.5 million was used for local county aid and $67.5 million was used for local municipal aid. The remaining $10 million was available as local aid-discretionary to both counties and municipalities. Local aid projects, which do not directly improve the state highway system and are separate from the Department's Capital Program, are summarized below.

- Approximately 100 projects annually are 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 funded annually through the local municipal aid program. About 90 percent of the completed projects involve some form of pavement resurfacing.

- Counties and municipalities generally use traditional bituminous mixtures in their pavement resurfacing projects. However, the Division of Local Aid and Economic Development has promoted the use of Superpave bituminous mixes since 2004. Between FY 2004 and FY 2006, counties and municipalities were encouraged to use Superpave on a voluntary basis, and a good number of them have chosen to do so. The use of Superpave will be mandatory for FY 2007 projects.

TABLE 5
Highway Resurfacing Contracts Awarded in FY 2006
Through Operations Support Division

Contract # (See note)	Route	Dir (B=Both)	Start Mile-Post	End Mile-Post	Total Lane Miles	County	Estim Cost (Millions)
MRC #146	10	B	18.90	21.80	9.0	Essex	$2.89
MRRC #153	1	N	54.50	56.00	3.0	Hudson	$0.97
	21	S	4.20	5.40	3.6	Essex	
MRC #155	206	B	117.60	120.65	6.2	Sussex	$6.61
	206	B	121.10	122.06	2.8	Sussex	
	206	B	124.60	127.90	6.6	Sussex	
MRRC #157	57	B	3.90	6.60	5.4	Warren	$3.71
	57	B	8.40	11.00	5.2	Warren	
	31	B	41.02	43.55	7.3	Warren	
MRRC #247	22	E	19.25	20.90	2.9	Hunterdon	$2.28
	22	W	19.29	19.83	0.5	Hunterdon	
	22	W	21.50	23.80	4.6	Hunterdon	
MRRC #250	29	N	3.84	4.82	2.1	Mercer	$2.26
	29	S	4.21	4.82	1.2	Mercer	
MRRC #252	27	B	0.00	1.44	2.8	Mercer	$2.93
	27	B	16.60	18.50	6.2	Middlesex	
	27	B	20.90	23.60	5.5	Middlesex	
	27	B	26.80	27.13	0.9	Middlesex	
MRRC #255	37	W	6.20	9.40	9.3	Ocean	$2.70
MRC #257	34	N	0.30	7.60	15.0	Monmouth	$6.44
MRRC #261	79	B	2.20	9.90	16.5	Monmouth	$3.37
MRRC #264	31	B	1.15	4.30	12.3	Mercer	$2.76
	31	B	7.70	10.50	5.6	Mercer	
MRRC #269	9	B	55.15	56.76	3.2	Burlington	$3.10
	9	B	57.23	59.88	5.4	Burlington	
MRRC #321	130	B	25.10	29.37	23.0	Gloucester & Camden	$3.50
MRRC #322	130	B	29.37	34.12	22.9	Camden	$4.60
MRRC #324	73	N	28.22	34.10	13.7	Burlington & Camden	$5.20
	73	S	27.20	34.10	16.6	Burlington & Camden	
Total					**219 Lane Miles**		**$53.32 Million**

Note: *MRC = Maintenance Resurfacing Contract; MRRC = Maintenance Roadway Repair Contract*

FISCAL YEAR 2007 PAVEMENT PLAN

The Fiscal Year 2007 Pavement Plan is attached to this report in Appendix B. The fixes in the Plan include: Crack Sealing, Longitudinal Joint Patching, Ultra Thin Overlays, Slab Jacking, Diamond Grinding, Resurfacing, and Heavy Rehabilitation/Reconstruction. The Pavement Plan is divided into six sections as follows:

- **Section 1** of the Plan shows the **primary funding sources** for pavement fixes that are identified in the proposed FY '07 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 2007 **programmed projects within the Highway Resurfacing Program administered through the Operations Support Division**.

- **Section 4** lists **additional** fiscal year 2007 **projects** planned but currently unfunded within the **Highway Resurfacing Program administered through the Operations Support Division**.

- **Section 5** provides fiscal year 2007 **programmed projects within the Highway Resurfacing Program administered through Capital Program Management.**

- **Section 6** describes fiscal year 2007 **programmed projects within the Highway Rehabilitation/Reconstruction Program administered through Capital Program Management.**

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 2006-2010,* March 15, 2005.

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

5. New Jersey Department of Transportation, *FY 2006 – 2008 Statewide Transportation Improvement Program,* October 1, 2005.

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

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

8. New Jersey Department of Transportation, *NJDOT Pavement Management Program: CET Orientation for Pavement Management Systems, 2000-2001,* October 2000.

9. New Jersey Department of Transportation, *The New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction,* 2001.

10. New Jersey Department of Transportation, *Transportation Capital Program, Fiscal Year 2006.*

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

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

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

14. 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.

15. Zaghloul, S., Z. He, N. Vitillo and J.B. Kerr. "Project Scoping Using Falling Weight Deflectometer Testing: New Jersey Experience." In *Transportation Research Record 1643,* TRB, National Research Council, Washington, D.C. 1998, pp. 34-43.

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 (UTW)** 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 UTW for ramps and intersections with recurring asphalt rutting problems.

- **Reflective Crack Interlayer (RCI)** 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 strata layer 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, macro texture (friction), wet weather visibility and reduces 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 has been written for this pavement treatment for publication in the 2006 *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 RCI (Reflective Crack Interlayer) to provide a more durable overlay for concrete pavements. A standard specification has been developed and is planned for inclusion in the 2006 *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 specification has been developed for inclusion in the 2006 *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 specification is planned for publication in the 2006 *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 has developed for publication in the 2006 *NJDOT Standard Specifications for Road and Bridge Construction*.

- **Geosynthetic Subgrade Reinforcement** is being used in combination with recycled pavement materials in place of virgin soil aggregates (subbase) 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 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 has been developed for publication in the 2006 *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 2007 PAVEMENT PLAN

- **Section 1 – Roadway Preservation Funding** identified in the FY ’07 Transportation Capital Program.
- **Section 2 – Highway Capital Maintenance Program** activities.
- **Section 3 – Highway Resurfacing Program through Operations Support Division:** Fiscal year 2007 programmed projects.
- **Section 4 – Highway Resurfacing Program through Operations Support Division:** Fiscal year 2007 additional projects identified by the pavement management system but currently unfunded.
- **Section 5 – Highway Resurfacing Program through Capital Program Management:** Fiscal year 2007 programmed projects.
- **Section 6 – Highway Rehabilitation/Reconstruction Program through Capital Program Management:** Fiscal year 2007 programmed projects.

APPENDIX B - SECTION 1
FY '07 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.	$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 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.	$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 Rehab & 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 rehabilitation, traffic signals, safety improvements, pavement, sidewalks and curbs, etc.). Funding amounts and associated total project costs for these projects include substantial work which will ameliorate problems related to congestion, safety, etc., but will not necessarily improve pavement system conditions.	$83
Total		**$279**

APPENDIX B - SECTION 2
FY '07 HIGHWAY CAPITAL MAINTENANCE

Approximately $15 million is budgeted for Highway Capital Maintenance work in fiscal year 2007. 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 (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 $15 million budgeted, approximately $3 million 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, macro texture (friction), wet weather visibility and reduces tire noise.

To improve the effectiveness and efficiency of the preventive maintenance program, the Department invited industry experts from the National Center for Pavement Preservation (NCPP) to conduct appraisals of the Department's pavement preservation efforts. This evaluation was completed in September 2005 and generated numerous recommendations that will assist the Department in optimizing capital expenditures for pavements treatments.

APPENDIX B - SECTION 3
HIGHWAY RESURFACING PROGRAM - OPERATIONS SUPPORT DIVISION
FISCAL YEAR '07 PROGRAMMED PROJECTS

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

Contract # (See note)	Route	Dir (B=Both)	Start Mile-Post	End Mile-Post	Total Lane Miles	County	Total Cost (Millions)
MRC # 145	46	B	70.40	71.30	3.2	Bergen	$1.94
MRRC # 158	10	E	7.04	9.54	6.9	Morris	$2.91
	10	E	10.07	10.63	1.0		
	10	W	7.04	9.54	7.5		
	10	W	10.07	10.50	1.2		
MRRC # 159	57	B	18.50	19.40	1.8	Warren	$1.33
	94	B	8.20	10.70	5.0		
MRC # 258	202	N	20.33	22.22	3.8	Somerset	$3.15
	202	S	22.25	24.08	3.7		
MRRC # 263	202	N	6.80	11.40	9.2	Hunterdon	$4.99
	202	S	7.00	11.40	9.2		
MRRC # 265	12	B	1.00	5.00	9.2	Hunterdon	$4.44
	12	B	9.80	11.69	4.2		
MRRC # 266	29	B	9.45	17.08	15.2	Mercer	$4.26
	175	B	2.15	2.95	1.6	Mercer	
	179	B	0.00	1.41	4.4	Hunterdon	
MRRC # 267	33	B	21.20	24.20	12.0	Monmouth	$3.17
MRC # 268	202	S	13.40	17.00	7.2	Hunterdon	$3.00
MRRC # 270	31	B	29.70	32.50	11.2	Hunterdon	$3.20
MRC # 271, Readvertised	206	B	47.00	50.00	6.0	Mercer	$4.50
	206	B	51.21	51.35	0.4		
MRC # 272	22	W	0.65	2.10	4.0	Warren	$2.00
MRRC # 326	38	B	13.40	17.00	15.4	Burlington	$4.19
MRRC # 327	70	B	8.61	12.06	10.0	Burlington	$3.11
MRRC # 328	40	E	24.87	26.30	1.9	Gloucester	$2.31
	56	B	4.80	9.30	12.0	Salem & Cumberland	
MRRC # 329	30	B	4.40	7.70	6.6	Camden	$3.50
	45	B	22.60	25.00	9.5	Gloucester	
MRC # 346	47	B	47.67	49.29	3.2	Cumberland	$1.70
MRC # 510	Various					Various	$3.82
Total					**187**		**$57.52**

APPENDIX B - SECTION 4
HIGHWAY RESURFACING PROGRAM - OPERATIONS SUPPORT DIVISION
FISCAL YEAR '07 ADDITIONAL PROJECTS - CURRENTLY UNFUNDED

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

Contract # (See note)	**Route**	**Dir** (B=Both)	**Start Mile-Post**	**End Mile-Post**	**Total Lane Miles**	**County**	**Total Cost** (Millions)
MRRC # 160	7	B	9.30	10.10	1.6	Essex	$2.50
	21	N	4.20	5.00	2.4	Essex	
	21	S	5.80	6.20	1.2	Essex	
	185	B	0.00	0.65	2.8	Hudson	
MRRC # 161	22	E	48.30	52.10	7.8	Union	$4.00
MRRC # 162	46	B	31.30	33.40	8.2	Morris	$4.20
	46	B	39.10	39.90	3.2	Morris	
	46	E	55.20	56.00	1.6	Essex & Passaic	
MRRC # 330	30	B	29.70	31.05	5.6	Atlantic	$2.13
	206	B	11.60	16.50	11.1	Burlington	
MRC # 347	73	B	21.40	23.10	6.8	Burlington	$4.25
Total					**52**		**$17.08**

APPENDIX B - SECTION 5
HIGHWAY RESURFACING PROGRAM THROUGH CAPITAL PROGRAM MGT.
FISCAL YEAR '07 PROGRAMMED PROJECTS

Project Description	Dir (B=Both)	Start Mile-Post	End Mile-Post	Total Lane Miles	County	Total Cost (Millions)
Route 24, I-287 Interchange to West of Route 124 Interchange	B	0.00	7.00	28.7	Morris	$7.84
Route 55, North of Black Water Brook to South of Leonard Cake Road	B	34.30	40.00	22.8	Cumberland, Gloucester, Salem	$4.60
Route 55, North of Lamb Road to South of Almonesson Creek	B	51.24	60.07	35.4	Gloucester	$5.76
Route 80, East of Delaware River to West of Knowlton Road	B	0.50	8.20	43.1	Warren	$11.70
Route 80, Westbound, West of CR 631 to West of Route 202	W	28.14	42.28	50.5	Morris	$19.60
Route 95, Vicinity of Route 29 to Route 1	B	0.20	2.30	12.6	Mercer	$19.17
	N	3.40	5.64	6.6		
	S	4.00	5.64	4.8		
	B	5.64	8.77	19.2		
Route 195, I-295 Interchange to East of Lakeside Drive	B	0.00	2.00	10.4	Mercer	$3.49
Route 195, Route 9 Interchange to Route 34 Interchange	E	27.20	34.17	14.0	Monmouth	$6.20
	W	32.00	34.17	4.4		
Route 287, Northbound, North of Passaic River to South of Morristown/Morris Twp. Line	N	30.02	35.00	15.0	Somerset, Morris	$3.96
Route 295, Marne Highway Vicinity to Burlington Township Line, Concrete Pavement Rehab. & Diamond Grinding	N	40.80	45.20	14.7	Burlington	$8.70
	S	40.80	46.50	17.1		
Route 440, Southbound, I-95 (NJ Tpk) Interchange to South of Kreil Ave.	S	0.00	3.80	12.5	Middlesex	$4.80
Total				**311.8**		**$95.82**

APPENDIX B - SECTION 6
HWY REHAB/RECONSTRUCT PROGRAM THROUGH CAPITAL PROGRAM MGT.
FISCAL YEAR '07 PROGRAMMED PROJECTS

Project Description	Dir (B=Both)	Start Mile-Post	End Mile-Post	Total Lane Miles	County	FY '07 Cost (Millions)
Route 1 & 9, Sect 28, Secaucus Road to Broad Avenue	B	56.80	63.00	23.9	Hudson, Bergen	$25.94
Route 78, Contract A, Union County Rehabilitation, Local & Express Lanes Roadway Improvement	B	50.59	52.80	22.0	Union	$32.58
Route 295, Tomlin Station Road to Route 45, Rehabilitation	B	14.60	24.53	59.9	Gloucester	$27.13
Total				**105.8**		**$85.65**