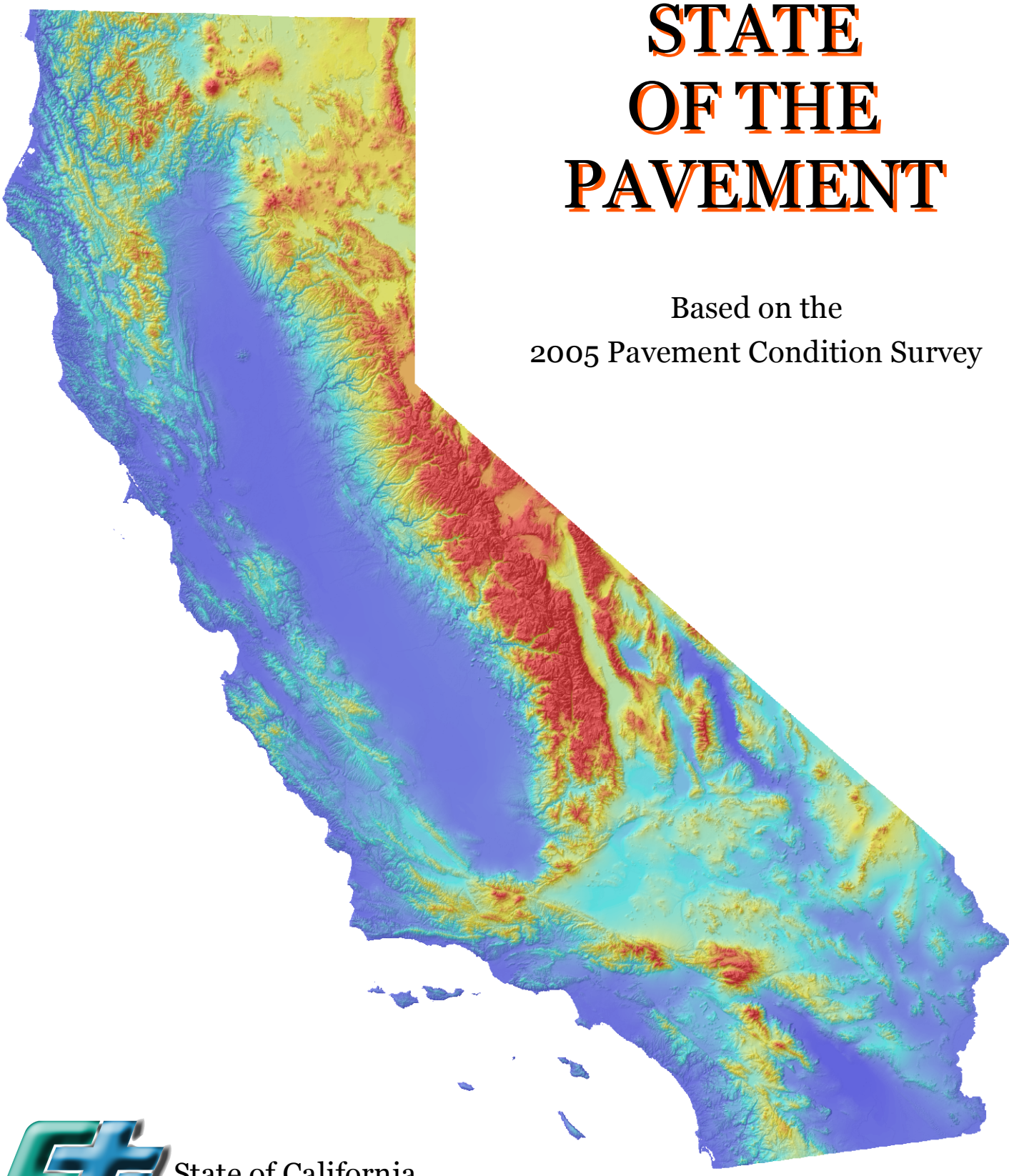
2005 STATE OF THE PAVEMENT



Based on the
2005 Pavement Condition Survey

State of California
Department of Transportation
Division of Maintenance

California
State of the Pavement Report, 2005

California Department of Transportation
Division of Maintenance
December 2006

This report is prepared by the California Department of Transportation, Division of Maintenance, Offices of Roadway Rehabilitation and Roadway Maintenance to summarize the 2005 pavement condition and expenditures on the State highway system for Department management and others.

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The completed 2005 PCR can be downloaded from the Roadway Rehabilitation intranet page:
http://onramp.dot.ca.gov/hq/maint/roadway_rehab/index.htm

For useful data and mapping relating to Maintenance and pavement rehabilitation, please visit:
http://onramp.dot.ca.gov/hq/maint/roadway_rehab/gis/index.htm

Information about the Pavement Management System is available from:
California Department of Transportation, Division of Maintenance, Office of Roadway Rehabilitation, Pavement Management Information Branch, 1120 'N' Street, Room 3100, MS-31, Sacramento, CA, 95814, telephone (916) 651-2011 or Calnet 461-2011.

Copies of this report may be obtained from:
http://onramp.dot.ca.gov/hq/maint/roadway_rehab/index.htm

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Highway Condition and Needs

The California Department of Transportation (Department) is responsible for maintaining the State highway system, which has close to 15,000 centerline miles and over 49,000 lane miles. To effectively manage this pavement, the Department conducts an annual Pavement Condition Survey (PCS). Table 1 is a summary of the results of the 2005 PCS and shows the distribution of lane miles by pavement condition classification. "Major Structural Distress" indicates the pavement has severe cracking and may also have a poor ride. This type of distressed pavement is remedied by rehabilitation or reconstruction projects. "Minor Structural Distress" indicates the pavement has moderate cracking and may have a poor ride. This type of distressed pavement is remedied by CAPM or rehabilitation projects. "Poor Ride Quality (Only)" indicates the pavement exhibits few cracks but has a poor ride condition. This pavement is generally treated with CAPM strategies. Pavement Maintenance lane miles are the total for base (corrective) and preventive maintenance.

TABLE 1 Pavement Condition Classification

Pavement Condition	2004			2005		
	Lane Miles	Percent of Distressed Pavement	Percent of System	Lane Miles	Percent of Distressed Pavement	Percent of System
Major Structural Distress	10,257	81%	21%	11,518	83%	23%
Minor Structural Distress	2,126	17%	4%	2,078	15%	4%
Poor Ride Quality (Only)	241	2%	0%	249	2%	1%
Total Distressed Pavement	12,624	100%	25%	13,845	100%	28%
Pavement Maintenance	14,763		30%	15,536		31%
Excellent Pavement	22,174		45%	20,180		41%
Total System Lane Miles*	49,561		100%	49,561		100%

** Excludes bridges, ramps and frontage roads*

Lane Miles not surveyed in 2005 used 2004 surveyed lane miles.

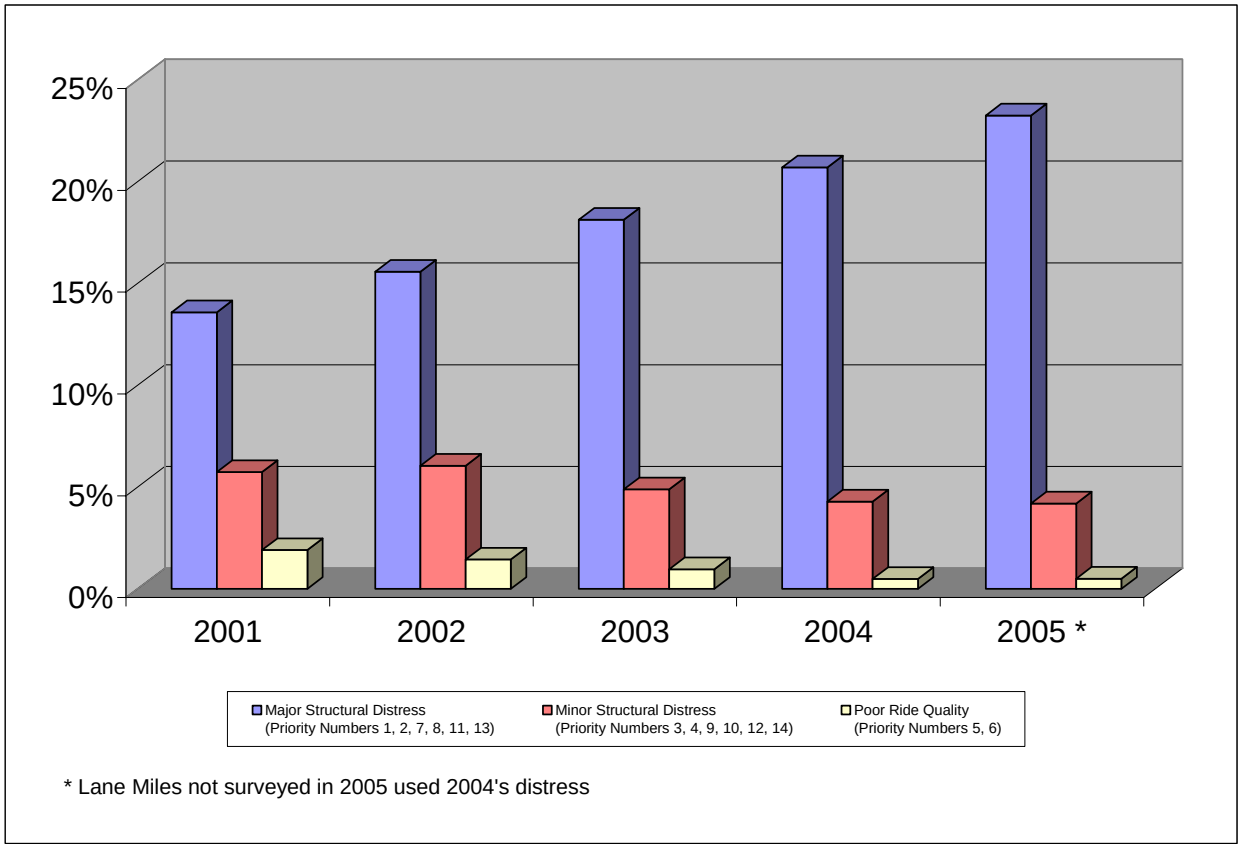
The 2005 PCS began in March 2005 and was completed in April 2006. As shown in Table 1, the PCS identified 13,845 lane miles of distressed pavement requiring Capital Preventive Maintenance (CAPM) or rehabilitation work. This is 9% higher than the 12,624 distressed lane miles reported in the 2004 survey. The majority of this distressed pavement was on Maintenance Service Level (MSL) Class 1 roads, but as a percentage of total lane miles for each class, Class 3 roads had the highest percentage. (See Glossary for a definition of MSL). Table 2 summarizes the distribution of distressed pavement by MSL classification.

TABLE 2-Distressed Pavement by Highway Classification

Highway Classification	2004		2005	
	Distressed Pavement as a Percentage of Total System Lane-Miles	Distressed Pavement as a Percentage of Total Highway Classification Lane-Miles	Distressed Pavement as a Percentage of Total System Lane-Miles	Distressed Pavement as a Percentage of Total Highway Classification Lane-Miles
Class 1	12%	21%	48%	21%
Class 2	8%	28%	32%	28%
Class 3	5%	35%	20%	35%

The 2005 survey also identified 15,536 lane miles requiring some type of pavement maintenance, which is also higher than what was identified in the 2004 survey. Over 60% of California pavements need some type of pavement rehabilitation or maintenance. The distribution of lane miles by priority group for the surveys performed from 2001 through 2005 is presented in Figure 2. Although the 2005 survey shows the number of lane miles with poor ride quality and minor structural problems did not change considerably from the 2004 survey, there was an increase of over 1,200 lane miles of distressed pavement with major structural problems. The percentages shown in Figure 2 are the percent of the distressed lane miles to the total system miles (excluding bridges).

FIGURE 2-Distressed Lane Miles as a Percentage of Total System Lane Miles, by Priority Group, 2001-2005.



Vehicle Miles Traveled on Rough/Smooth Pavements

The Department's Division of Maintenance conducted an Internet-based survey of California residents during December 2004 and January 2005. The survey was designed to evaluate the traveling public's satisfaction and priorities for highway maintenance work and activities. When asked to grade the job the Department is doing in providing a smooth riding road, 33% of respondents rated the ride as rough.

The pavement's "smoothness" is measured using a standardized scale, called the International Ride Index (IRI). This is generally accepted as a worldwide pavement roughness measurement. The IRI measures a vehicle's up and down movement over the pavement in inches per one mile of driving. For example, on a new pavement or a recently completed pavement rehabilitation project, the up and down movements are very low and the IRI value would be less than 60 inches per mile.

The Federal Highway Administration (FHWA)'s *2002 Conditions and Performance Report* simplified the measurement of ride quality into two descriptive terms: "Good" or "Acceptable." To be rated acceptable, pavement performance must have an IRI value of less than or equal to 170 inches per mile. A poor or rough pavement, therefore, is greater than 170 inches per mile and a smooth pavement has an IRI value less than 95 inches per mile.

FIGURE 3-VMT on Rough Pavement, 2001 – 2005

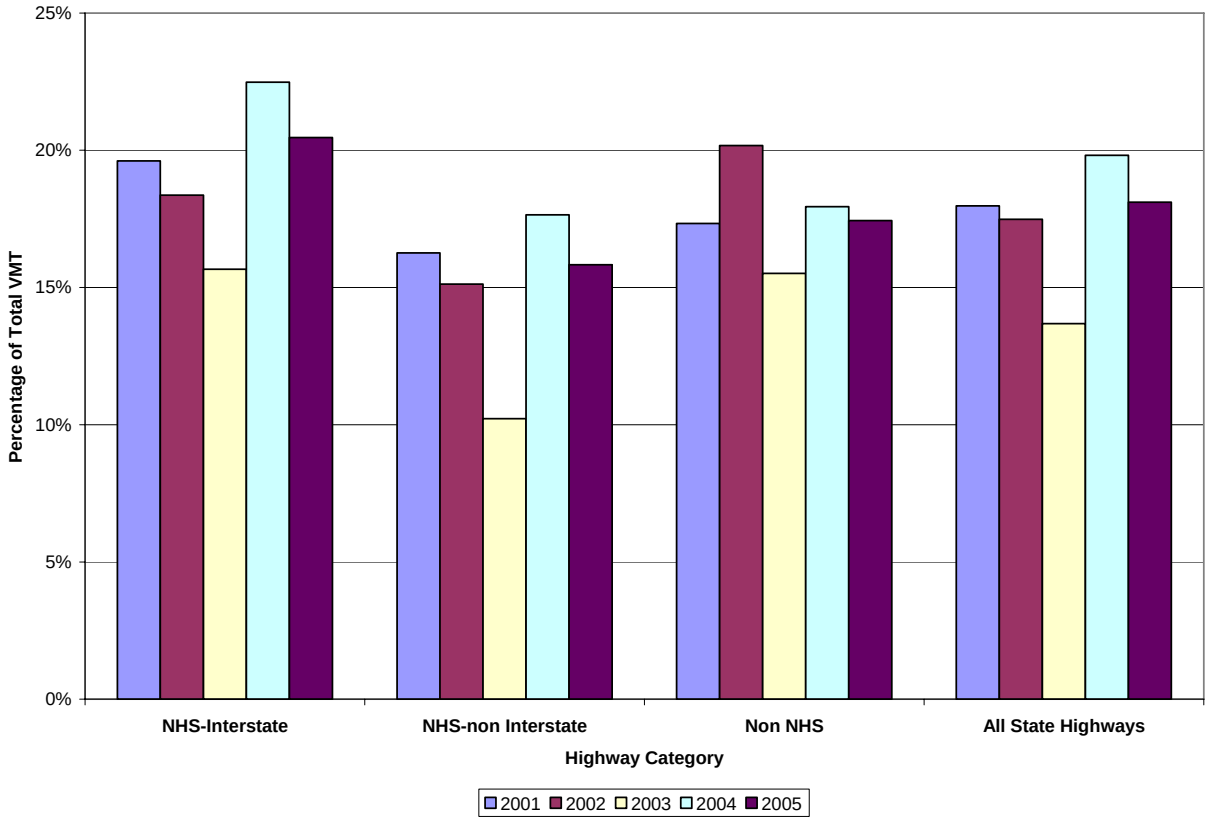


Figure 3 shows the percentage of vehicle miles traveled (VMT) on rough-riding pavement (IRI >170) for National Highway System (NHS) Interstate, NHS non-Interstate, and non-NHS routes. From 2004 to 2005, the percentage of VMT on rough-riding pavement decreased on NHS Interstate, NHS non-Interstate, and non-NHS routes from 22% to 20%, 18% to 16%, and 18% to 17%, respectively. On the entire State highway system, the rough-riding pavement decreased from 18% to 17%.

FIGURE 4-VMT on Smooth Pavement, 2001 – 2005

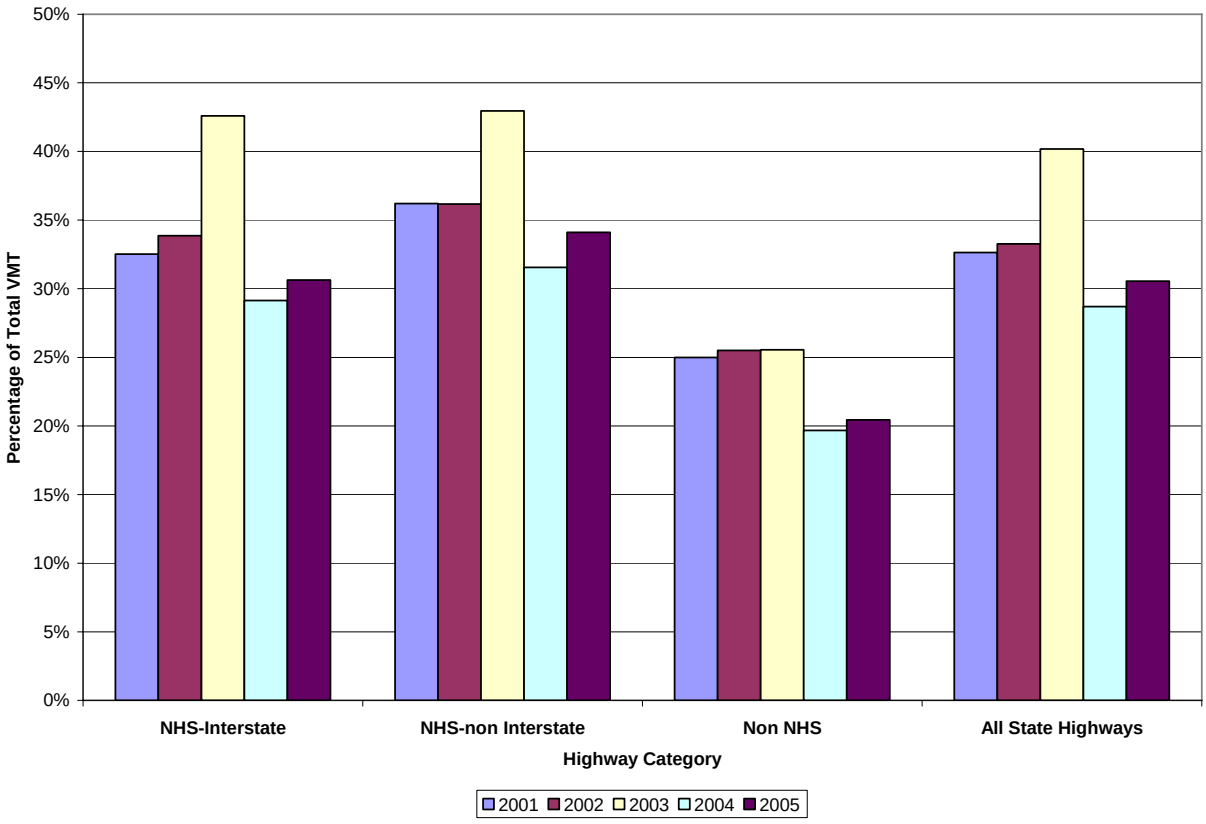


Figure 4 shows the percentage of VMT on smooth-riding pavement (IRI <95) for NHS Interstate, NHS non-Interstate, and non-NHS routes. From 2004 to 2005, the percentage of VMT on smooth pavement increased on the NHS Interstate from 29% to 31% and on the NHS non-Interstate from 32% to 34%; on non-NHS routes the percentage remained at 20%. On the entire State highway system, the smooth-riding pavement increased from 29% to 31%.

Description of Pavement Condition Survey

The PCS consists of a visual inspection of the pavement surface using a team of pavement raters and an automated ride quality inspection using a van equipped with two high-speed Profilers. For flexible pavement, the visual inspection is done by taking a 100 foot sample of the pavement for every change in pavement condition. The rater enters the extent and type of the distress into a database which is downloaded at the end of the day. For rigid pavement, the concrete slabs are continuously rated and each section is approximately one mile in length.

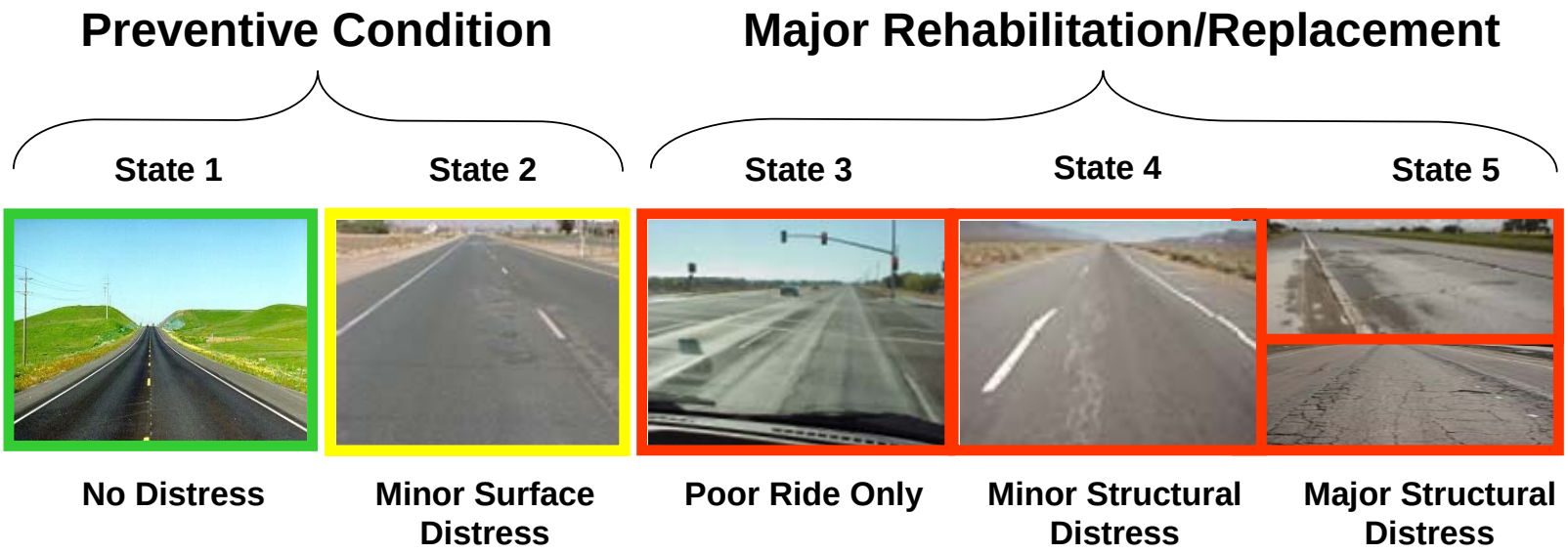
For the ride quality inspection, data is automatically collected using lasers mounted in a special front rut bar to measure the road profile in each wheel path. Every 0.1 mile of travel a value

called the international roughness index, (IRI) is created. The IRI is used throughout the world for road roughness. The high-speed profiler gathers accurate data from speeds of 10 mph to over 70 mph. In addition to IRI values, the profilers accurately measure rutting, faulting and surface texture. Data from the PCS is downloaded to a FoxPro database program called the Pavement Condition Report (PCR), which provides a detailed pavement inventory, identifies project needs, prioritizes pavement distress, and summarizes the condition of the system.

The original PCS was developed in the mid 1970s and new PCR software came into use in 1998. The original system was intended to only identify distressed pavement, i.e. pavement having major distress, minor distress or poor ride. All other surveyed pavement was considered to have little or no distress. In 2004, new functionality was added that further classifies pavement with minor distress or no distress into segments requiring base (corrective) maintenance, preventive maintenance or excellent pavement. Figure 1 shows the different Pavement Condition States.

The PCR software has three basic reports, Inventory, Location Summary and Project Recommendations. The inventory report is the actual survey information and is broken down by direction, lane number and survey length. The summary report combines the segments for each lane of a multi-lane freeway into one segment. This new segment is the same length as the inventory but is not divided into different lanes. The distress for this new segment is the worst of the multi-lanes. The project recommendation report goes one step further and combines the summary lengths into suggested projects. For 2 lane roads and undivided highways, the directions are merged as well. The resultant segments are longer and the distress is the worst of the different summary segment lengths. The PCR is accessible on the Caltrans intranet.

FIGURE 1-Pavement Condition States



State 1: Excellent condition with no, few potholes or cracks - Future Preventive Maintenance project
State 2: Good condition with minor potholes or cracks - Preventive or Base Maintenance project
State 3: Fair condition with moderate potholes and cracks - CAPM project
State 4: Poor condition with significant cracks - CAPM project or Rehabilitation candidate
State 5: Poor condition with extensive cracks - Long Life or Rehabilitation/Reconstruction candidate

Prioritizing Pavement Needs

As mentioned previously, the pavement surveyed is classified into distressed lane miles requiring major or minor rehabilitation (those with poor structural condition or with poor ride quality), pavement maintenance and excellent pavement. Distressed lane miles are reported in the Department's *State Highway System Performance Measures*. Ride quality, structural distress, and Maintenance Service Level (MSL) are used to prioritize the distressed pavement lane mile roadway segments for rehabilitation and CAPM work and the pavement maintenance lane mile roadway segments for base and preventive maintenance work. The combination of ride quality data and structural distress data are used to identify strategies for repairing the pavement. That information is integrated with the MSL value to establish the 'Priority Number' assigned to that pavement. Maintenance Service Level describes the role a route fulfills within the state highway network and the volume of traffic it serves.

A priority matrix of twenty-one values results from the combination of ride quality, structural distress, and MSL. The priority number identifies the class of treatment a pavement requires, either maintenance or rehabilitation. In the case of two pavement segments with identical priority values, the site that will receive project development and funding depends upon factors such as safety issues, traffic volume, project costs, and ongoing maintenance expenditures as well as a detailed condition comparison.

TABLE 3 Priority Matrix

Ride Quality	Structural Distress	MSL 1	MSL 2	MSL 3
		Priority Number	Priority Number	Priority Number
Poor Ride	Major Rehabilitation	1	2	11
	Minor Rehabilitation	3	4	12
	None	5	6	12
Acceptable Ride	Major Rehabilitation	7	8	13
	Minor Rehabilitation	9	10	14
	Minor Maintenance	31, 32, 33, 41, 42	31, 32, 33, 41, 42	31, 32, 33, 41, 42
	No Distress	98, 99	98, 99	98, 99

Distressed Lane Miles

Pavements requiring major or minor rehabilitation, i.e., priority numbers less than or equal to 14 are repaired by projects that improve the pavement's structural integrity. For pavements requiring only maintenance work, i.e., priority numbers greater than 14 and less than 98, various strategies are implemented. A Major Maintenance Program priority matrix rates this category of pavement. Preventive and Base Maintenance treatments are based on the defects as shown in the following table.

TABLE 4-Maintenance Program Treatment Matrix

Maintenance Type	Work Group	Defect
Preventive	Fog Seals	Coarse Raveling, Weathering
	Premium Seal/Overlay	Low Alligator A, Low Alligator B (on High ADT Routes)
	Cracks – Crack Seal	Alligator A, Misc. Cracks
	Chip Seal/Slurry Seal	Alligator A, Low Alligator B (on Low ADT Routes), Misc. Cracks
Base	Overlay	Patching, Alligator A, High Alligator B
	Mill & Resurface	Wheel Rutting, High Alligator A, Shoving, Bleeding
	Potholes/Spalls	Potholes, Spalls
	Slab Replacement	Slab Cracking
	Mill and Resurface (Shoulder)	Joint Depression, Open Cracks, Alligator A & B, Raveling

The pavement is categorized into work groups based on the type of treatment recommended for the low level distresses observed. The work groups are the basis for the Major Maintenance Budget Model and the allocation of funds to the Districts for Contract Major Maintenance. They will also be a basis for the proposed Pavement Level of Service rating system for all maintenance work (Caltrans maintenance forces and contracted maintenance). This process links budget modeling, allocations and pavement ratings together using actual data collected through the Pavement Condition Survey.

Costs, Expenditures and Funding

In the 2004/05 Fiscal Year (FY), $329 million of rehabilitation and maintenance contracts were awarded. Of this amount, $238 million was for Roadway Rehabilitation and CAPM projects that repaired 1,293 lane miles of pavement. The $91 million in Major Maintenance projects (Preventive and Base) repaired 2,392 lane miles of roadway and replaced 371 concrete slabs.

Figure 5 shows the accomplishments for Maintenance and Rehabilitation projects in terms of contract dollars awarded and lane miles of pavement repaired in the 2004/05 FY.

FIGURE 5-Accomplishments /Contracts Awarded, 2004/05 FY

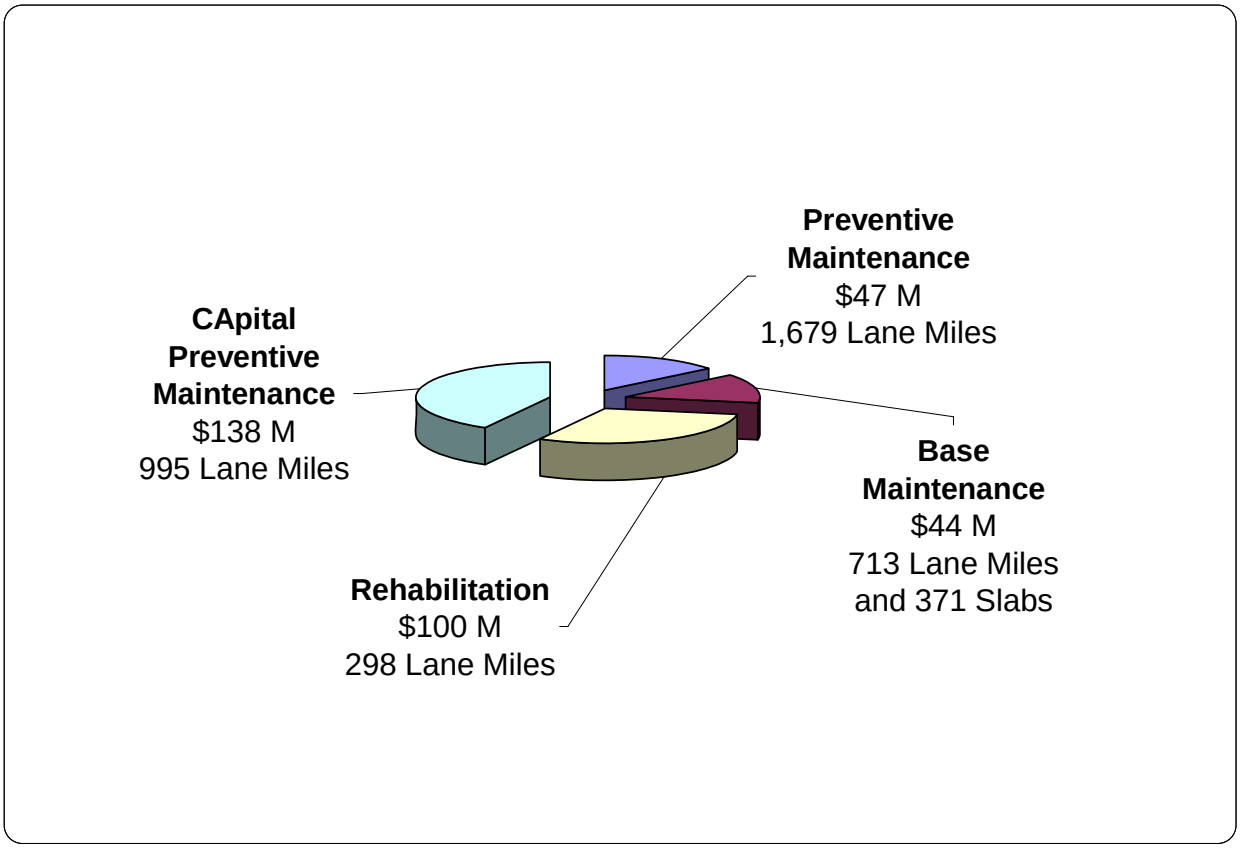


Figure 6 shows the cost and number of lane miles paved using a Preventive Maintenance (PM) strategy for Major Maintenance contracts awarded in the 2004/05 FY. A Major Maintenance contract performed on pavement in good condition is considered preventive. Preventive Maintenance strategies for flexible pavements include seal coats such as chip seals, slurry seals, and micro surfacing, as well as thin asphalt concrete overlays (overlays equal to or less than 1 inch), and crack sealing. Similar PM treatments for concrete pavements include crack and joint sealing, spall repairs, and diamond grinding for smoothness and improved pavement texture. These treatments reduce the amount of water that may infiltrate the pavement, slow the rate of deterioration, and correct surface roughness.

FIGURE 6-HM-1 Preventive Maintenance Projects by Strategy, 2004/05 FY

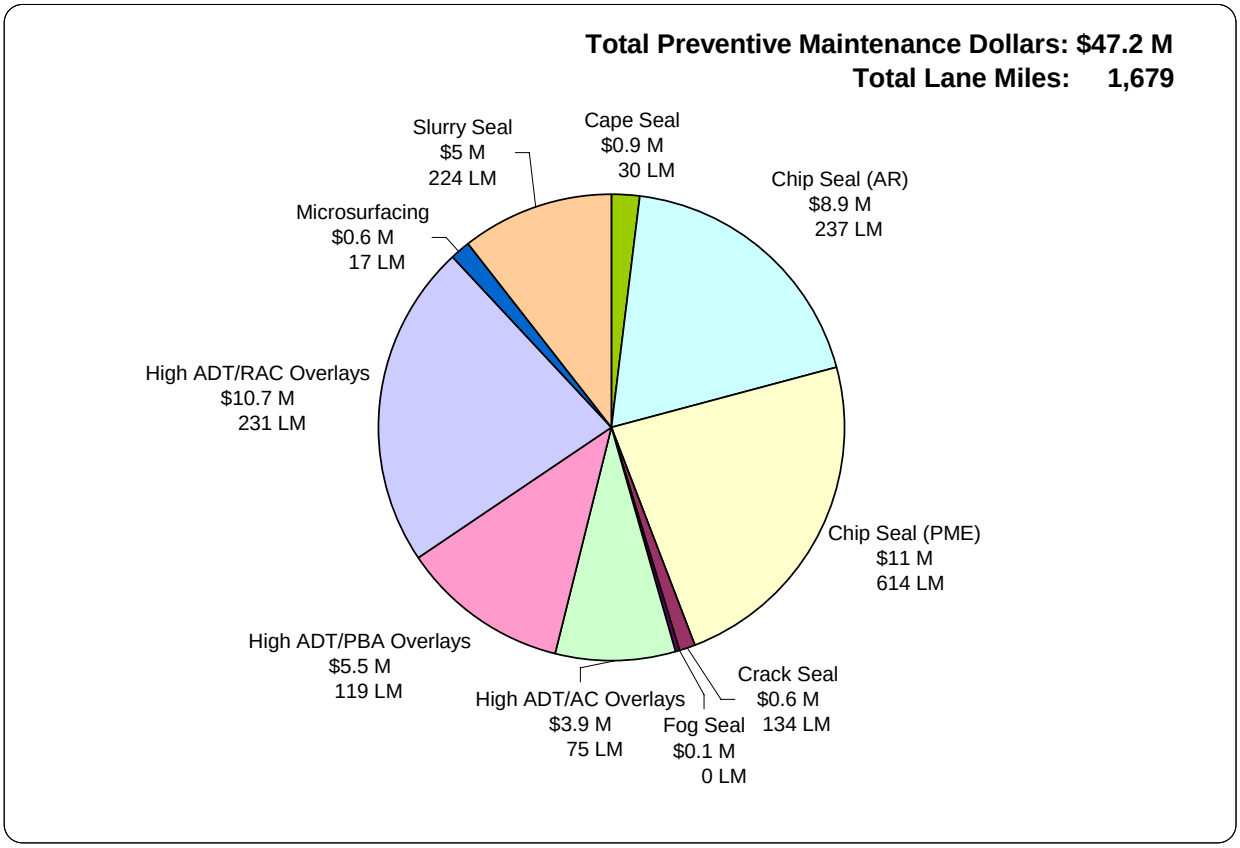
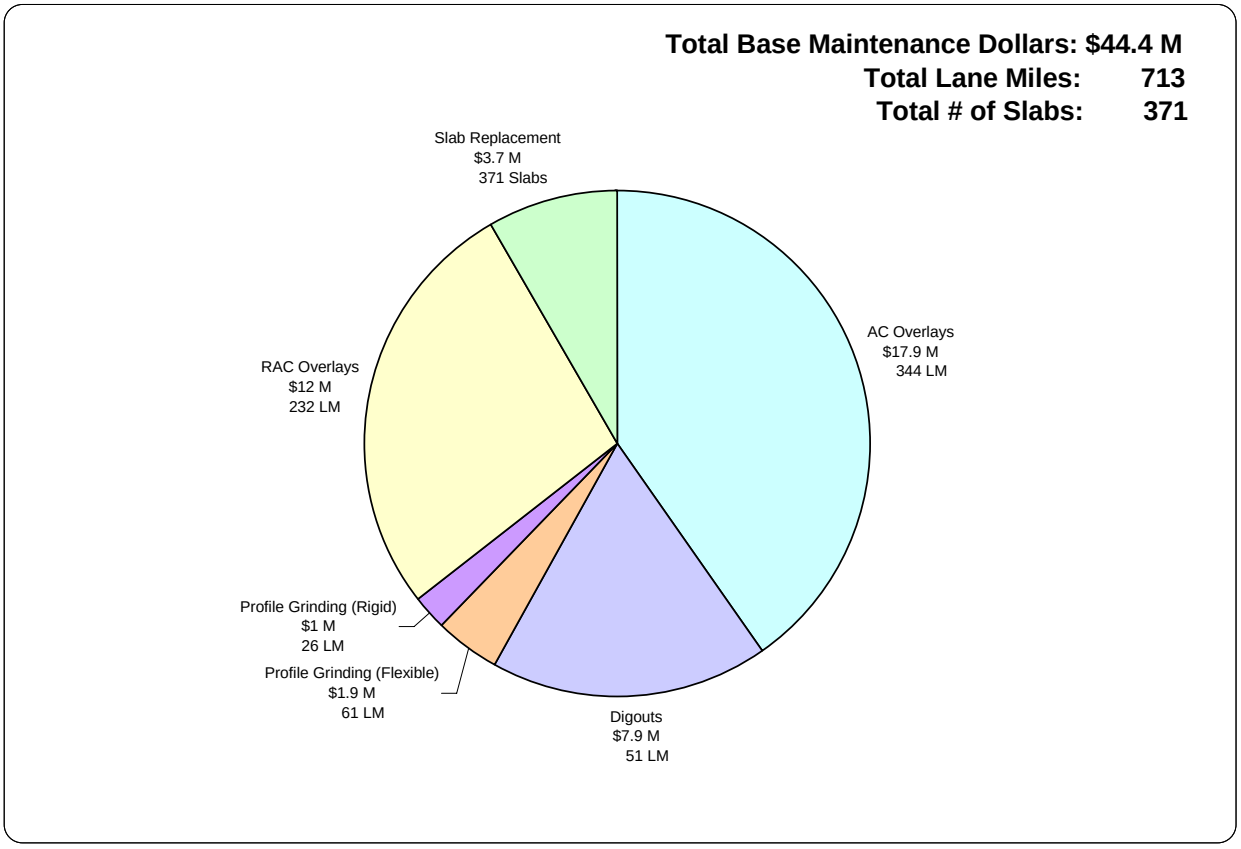


Figure 7 shows the contract dollars and the lane miles repaired using Base Maintenance strategies for Major Maintenance contracts awarded in the 2004/05 FY. Base Major Maintenance preserves the riding qualities, safety characteristics, and structural integrity of the roadways. Thin asphalt overlays, slab replacements and dig outs of pavement at spot locations are common strategies used for these projects.

FIGURE 7-HM-1 Base Maintenance Projects by Strategy, FY 2004/05



Storm Response

The 2004/05 winter storms produced record rainfall in Southern California, causing severe damage on many state routes. Due to water saturation of the base and sub-base, several pavement sections failed. Concrete pavement failures included broken slabs, rocking slabs, pumping and differential settlement. Asphalt pavement failures included potholing, delaminating, and rutting. A state of emergency was declared in eight counties. In response, the Department awarded thirty-six contracts, valued at $100 million, for emergency highway repairs and reconstruction.

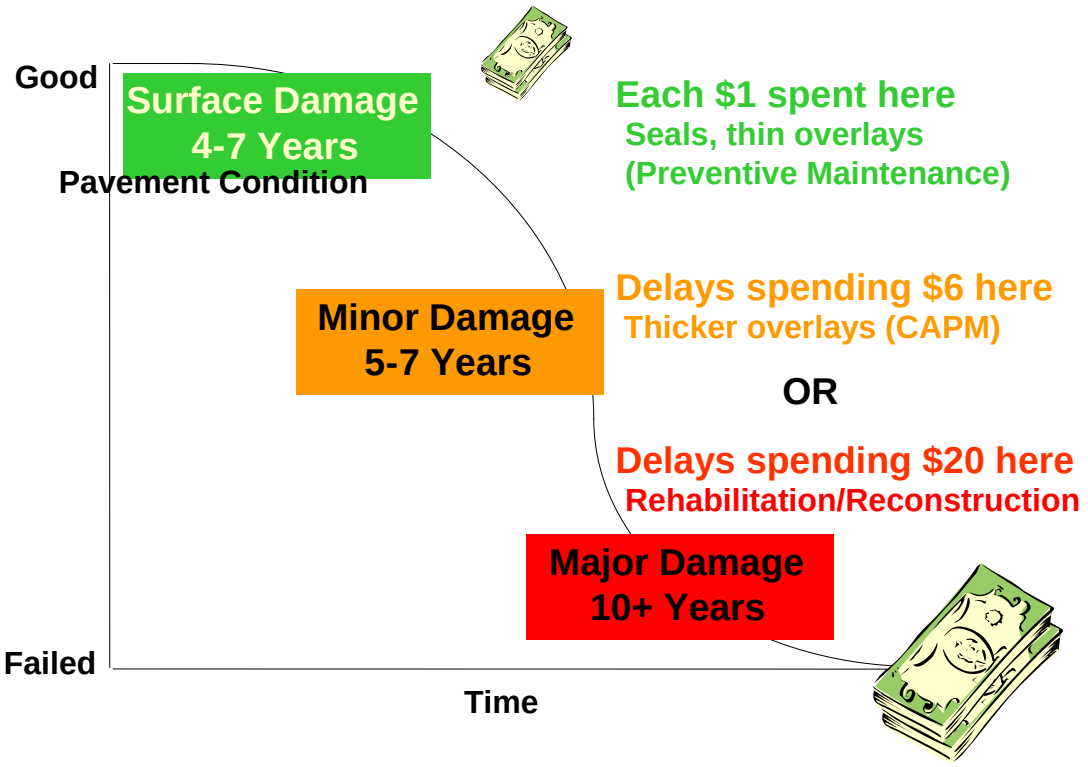
Cost Effectiveness of Pavement Treatments

Figure 8 shows that six to twenty dollars of future money are saved for each dollar spent when the treatment is applied before the pavement deteriorates into a condition warranting a major rehabilitation or reconstruction project.

Preventive maintenance treatments keep good pavement in good shape and studies show that pavement in good condition costs less to maintain. Base maintenance treatments are used to remedy most minor surface problems. These maintenance strategies can maintain or extend a pavement's service life four to seven years depending on the traffic volumes and environmental conditions. Preventive and Base Major Maintenance project treatments cost, on average, between $10,000 and $45,000 per lane-mile.

A CAPM strategy (pavement grinding or asphalt concrete overlays greater than 1 inch, but less than 2 inches) is typically performed on pavement with minor distress. A moderate cost CAPM project can successfully restore pavement to an excellent condition and provide a service life of Five to seven years. CAPM projects awarded in the 2004/05 FY had an overall average of $139,000 per lane-mile. (The overall average is the total cost of all projects divided by the total lane miles completed for those projects).

FIGURE 8-Cost Effectiveness of Pavement Treatments



Rehabilitation and reconstruction are the most expensive treatments. They remove and replace the pavement structural section rather than the pavement surface. A roadway that is rehabilitated should provide ten years or more of service life with relatively low maintenance expenditures. The costs for rehabilitation projects, including the upgrade of related facilities, awarded in the 2004/05 FY ranged from $29,000 to $472,000 per lane-mile with an overall average of $337,000 per lane-mile. A summary of the various contracted Maintenance and Rehabilitation treatments for the past five years is provided in Table C, page 24.)

Long-life pavement strategies apply to roadways with major distress and with traffic volumes greater than 150,000 average daily traffic vehicles or greater than 15,000 average daily truck vehicles. Some long-life strategies include rigid pavement reconstruction, reconstruction of concrete pavement with asphalt concrete, and crack-seat and overlay strategies that provide longer life than the current practice. Long-life pavement design extends the pavement life to more than thirty-five years and reduces traffic interruptions and delays to the traveling public due to highway construction.

The State highway system will eventually require substantial rehabilitation or replacement. By delaying rehabilitation, existing conditions deteriorate and the scope of work and costs needed to rehabilitate the facility continue to increase. If timely rehabilitation is not performed, the life of the facility is reduced and its replacement is needed sooner.

The Department is undertaking several efforts to improve the efficiency of how its pavements are designed, constructed, and maintained. Design improvements involve changing the method of designing pavements to allow designers to take site-specific information and tailor pavements to meet predetermined performance criteria regarding fatigue, ride quality, and durability. Construction improvements include developing end result and performance based specifications. These are intended to define the conditions that the pavement is expected to be in when constructed and then provide incentives and disincentives for work that is better or worse than expectations. Maintenance improvements involve enhancing the pavement management system to better track pavement performance and to predict future maintenance needs and costs to facilitate the optimization of agency funds.

Pilot Programs and Pilot Projects

Pilot programs are often initiated when changes are deemed necessary or when innovative treatments need to be evaluated. Pilot programs typically require the construction of pilot projects to evaluate the proposed change(s); especially, if the change involves an improved maintenance or construction practice, validating enhancements to pavement performance and/or life; and changes in material properties or sampling and testing. Some of the Department's current pavement pilot projects are discussed below.

Warranty Projects

The Department recently completed a five-year pilot program to determine the overall cost versus the benefit of including one-year warranties on typical preventative maintenance projects. The purpose of a one-year warranty is to provide protection for both materials and workmanship. Under a warranty specification, the contractor is responsible for quality control and quality assurance as quality is measured based on actual product performance.

Twenty warranty projects were compared with twenty-three similar non-warranty projects. The evaluation compared the potential higher cost of construction for warranty projects to the economic benefits resulting from better quality materials and workmanship. There are several potential benefits to using warranties, such as lower human resource costs, shifting risk from the department to the contractor and greater contractor innovation, but the one that seemed evident in this evaluation was generally improved quality in the constructed project. Contractors apparently have more incentive to provide better workmanship and higher quality materials on projects with warranties compared to projects without warranties, to prevent the need for repair work during the warranty period. Based on the interim findings, the review team recommended the Department continue to construct highway maintenance surface treatment projects with one-year warranty specifications.

Quiet Pavements

Traffic noise is a public concern. Studies show that 75-90% of highway noise comes from vehicle tires contacting the pavement. Over the past several years, increasing attention has been given to the issue of controlling noise at the point where the tire meets the roadway, rather than dealing with noise after it has been made.

The FHWA Noise Abatement Criteria states that when traffic noise levels meet or exceed 67 dB noise abatement should be provided for residential areas. In the past, noise barriers or soundwalls were the only solution for noise reduction. Although the FHWA does not recognize quiet pavement as a replacement for soundwalls to lessen traffic noise, the Department was granted a pilot program to use pavement surface treatments to minimize the noise problem. The

cost of a soundwall is about $1.3 million per mile, while diamond grinding is $70,000 per lane-mile and a quiet pavement overlay is less than $50,000 per lane-mile.

The Department has identified or is looking at strategies, textures, and mixes to provide better noise performance. One quiet pavement strategy for rigid pavements is diamond grinding. For flexible pavements the quiet pavement strategy could be open graded asphalt. The Department has embarked on a program of traffic noise and pavement condition monitoring of thin lift asphalt overlays. The first of these projects, on a portion of Interstate 80, west of Sacramento, is in its seventh year of assessment.

The goal of the Department's Quieter Pavement Project is to identify and provide the surface treatments, materials, and construction methods for a quieter roadway that is also safe, durable, and cost-effective.

Rubberized Asphalt Concrete

In 2003, the Department set a statewide goal that 15% of the asphalt concrete pavement contracts awarded will incorporate rubberized asphalt concrete (RAC). RAC usage can produce a more durable pavement with the same service life of conventional dense graded asphalt concrete, at half the thickness. Some benefits of RAC are a longer lasting pavement, with resistance to reflective cracking, and a smoother ride. In addition, RAC has the potential of significantly reducing tire noise. Utilizing RAC saves valuable resources and reduces the number of tires entering California landfills.

During the 2004/05 FY, $39.1 million was invested in eleven Roadway Preservation RAC projects. These projects repaired 289 lane miles of distressed pavement. Over the same time period, $22.8 million was awarded on forty-four Major Maintenance RAC projects that preserved 462 lane miles.

Ground Penetrating Radar

The final report titled "Pilot Project for the Fixed Segmentation of the Pavement Network" was published in February 2006by the UC Pavement Research Center (UCPRC), University of California, Davis and Berkeley. The goal of this pilot project was to study a small GPR sample of the state highway network to determine the cost of the GPR on the entire pavement network. The pilot network consisted of a total of eight roadways: three interstate highways (I-5, I-505, and I-80), four state routes (SR-16, SR-45, SR-99, and SR-113), and one U.S. highway (US-50). The project's work included evaluating the effectiveness of GPR on measuring pavement layer thicknesses and types, applying an algorithm to determine "fixed" segmentation of the pilot network, populating a database for the pilot network, and then assessing costs of these activities. Background information summarizing the experiences of several other states in using GPR for pavement work was also presented.

Comparison of the cores retained by the UCPRC with the layer types and thicknesses identified by the GPR showed that the GPR data was reliable, especially for the top two layers of the pavement. Fixed segmentation can be used by the Pavement Management System (PMS) to

develop the pavement performance models. These models are essential for predicting future performance of pavement segments of the network, and identifying the most cost-effective maintenance and rehabilitation (M&R) strategies based on life-cycle costs. Pavement layer type and thickness data are also needed to develop effective pavement performance models and to conduct effective condition surveys of composite pavements (asphalt overlays of PCC pavement). The data are also useful for project-level engineering. Approximately $20 million of contracted field work consisting of GPR use and coring samples (including collection and analysis), plus 12.3 person-years of additional analysis work are needed to complete the segmentation for the entire state highway network.

Additional studies will determine whether PMS performance data and fixed segments can provide reasonable performance histories for the segment, and whether the performance models developed by the UCPRC from Washington State Department of Transportation PMS data can be verified with Caltrans PMS performance histories using the fixed network segments and other necessary data developed in this pilot project.

Pavement Goals versus Ten-Year Plan for Addressing Distressed Lane Miles

California Streets and Highways Code Section 164.6 requires the Department to prepare a Ten-Year State Highway Operation and Protection Plan (SHOPP) for rehabilitation and reconstruction of all State highways and bridges, and to set goals for each program. The SHOPP is updated every two years. The SHOPP's statewide pavement performance goal is to reduce the total distressed lane miles throughout the state to 5,500 by the 2015/16 FY (a reduction from 25% of the network needing rehabilitation to no more than 10%). Each District has developed a Ten-Year Plan to identify project needs and priorities to achieve its portion of the statewide goal.

TABLE 5-Districts' Actual vs. Planned Goal for Distressed Lane Miles, 2005

District	Actual Distressed Lane Miles per 2005 PCS*	Planned Distressed Lane Miles per Performance Goal**	Difference between Actual and Goal of Distressed Lane Miles
1	511	320	191
2	983	540	443
3	1,489	560	929
4	1,887	599	1,288
5	877	372	505
6	1,361	611	750
7	2,219	712	1,507
8	2,189	660	1,529
9	240	146	94
10	1,226	449	777
11	556	297	259
12	307	234	73
TOTAL	13,845	5,500	8,345

** Lane Miles not surveyed in 2005 used 2004's distress*

*** from the current Ten-Year State Rehabilitation Plan*

Table 5 compares the Districts' distressed lane miles from the 2005 PCS to the Ten-Year Plan for Pavement Preservation performance goals. According to this data, distressed lane miles in Districts 2 and 5 decreased from last year's survey. One District reached seventy-six percent of its goal and two Districts achieved more than sixty percent of their goals. The other Districts are 259 to 1,529 lane miles from reaching their goals. To reach the statewide goal, all urban districts need to retire distressed lane miles.

Five-Year Maintenance Plan

Streets and Highways Code Section 164.6 also requires the Department to prepare a five-year Maintenance Plan to address the maintenance needs of the State highway system. Together, the 2006 SHOPP and the 2006 Maintenance Plan attempt to balance resources between SHOPP and maintenance activities to achieve identified milestones and goals at the lowest possible long-term total cost.

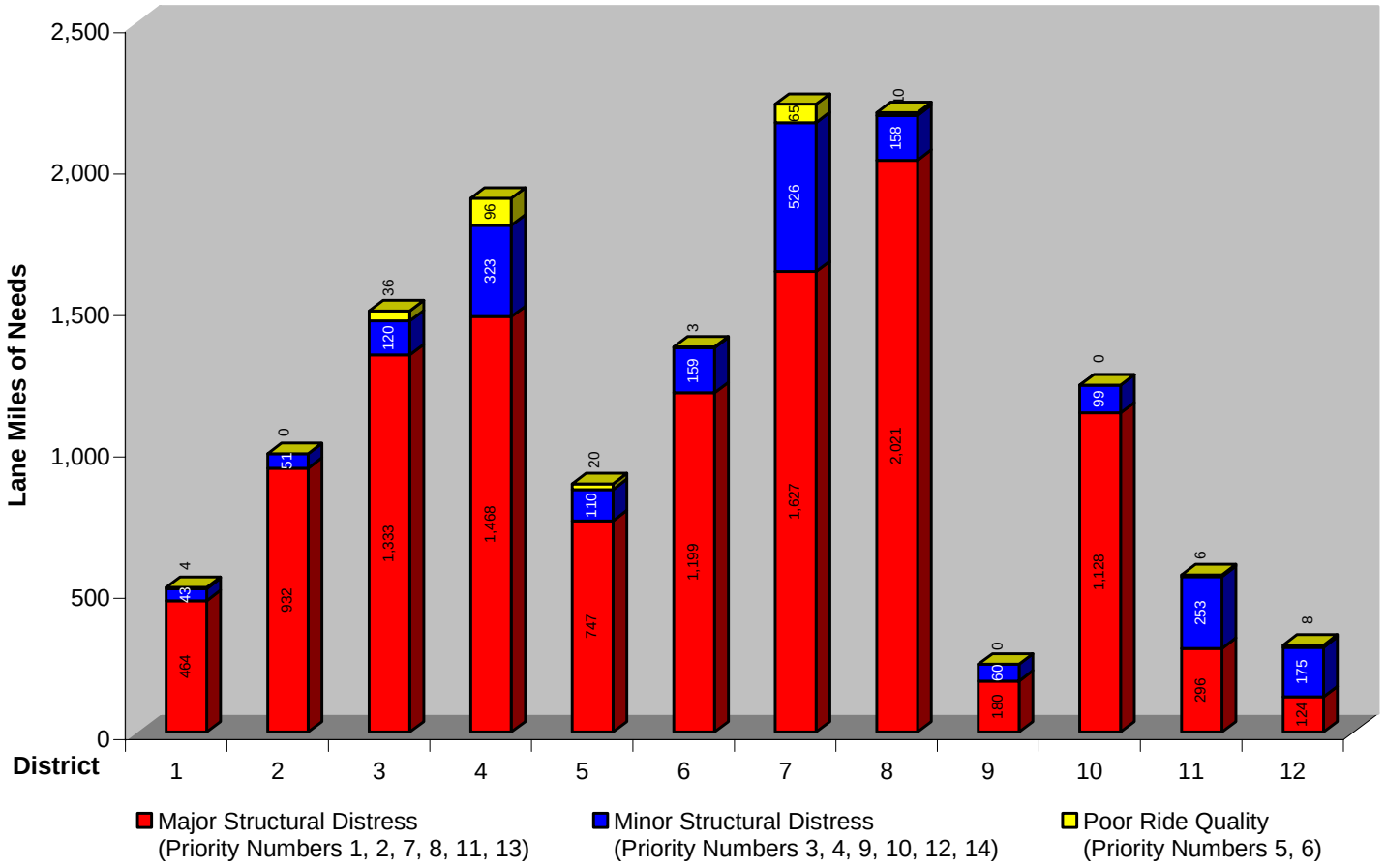
The 2006 Maintenance Plan recommends a permanent funding increase in the annual Maintenance budget for preventive maintenance that will produce a future SHOPP cost avoidance of $546 million for roadway projects. The 2006 Maintenance Plan also proposes to emphasize preservation. The 2006 SHOPP implements this recommendation by including $53 million of roadway projects to preserve 1,350 lane miles of pavement.

District Pavement Condition

In 2005, the total lane miles of distressed pavement increased by 1,221 miles. Districts 3 (Marysville), 4 (San Francisco), 7 (Los Angeles), and 8 (San Bernardino/Riverside) have the greatest needs. Districts 3, 4, 7, and 10 (Stockton) each had increases of over 250 distressed lane miles compared to the 2004 Pavement Condition Survey.

Each year a project location priority list, generated from the PCS data is provided to the districts. From these lists, the districts develop their pavement preservation candidate lists. While the PMS suggests an initial project sequence, district knowledge of local needs and funding availability determines the project priorities for maintenance and rehabilitation projects. The field review determines the most cost-effective repair strategy.

A percentage distribution of distressed pavement, by district, from the 2005 PCS is presented in Figure 9 (next page). Total needs, as indicated by the bars, are still high – seven of the twelve districts have distressed pavement greater than 25% of their total pavements. Of the 13,845 distressed lane miles identified by the 2004 PCS, 11,518 lane miles (83%) have major structural distress. Ten districts have distressed pavement where major structural distress represents the majority of their damaged inventory. In Districts 4, 7, and 9 (Bishop) major structural distress accounts for over 70% of their damaged inventory; in Districts 5 (San Luis Obispo) and 6 (Fresno) major structural distress accounts for over 80% of their damaged inventory; and in Districts 1 (Eureka), 2 (Redding), 3, 8, and 10 major structural distress accounts for over 90% of their damaged inventory.



District:	1	2	3	4	5	6	7	8	9	10	11	12
System lane miles:	2,330	3,995	4,307	5,976	3,187	5,718	6,269	6,641	1,777	3,472	3,937	1,950
Distressed lane miles:	511	983	1,489	1,887	877	1,361	2,219	2,189	240	1,226	556	307
% of system:	22%	25%	35%	32%	28%	24%	35%	33%	14%	35%	14%	16%

FIGURE 9-District Needs in Lane Miles, 2005 PCS

Appendix

Map of Caltrans Districts

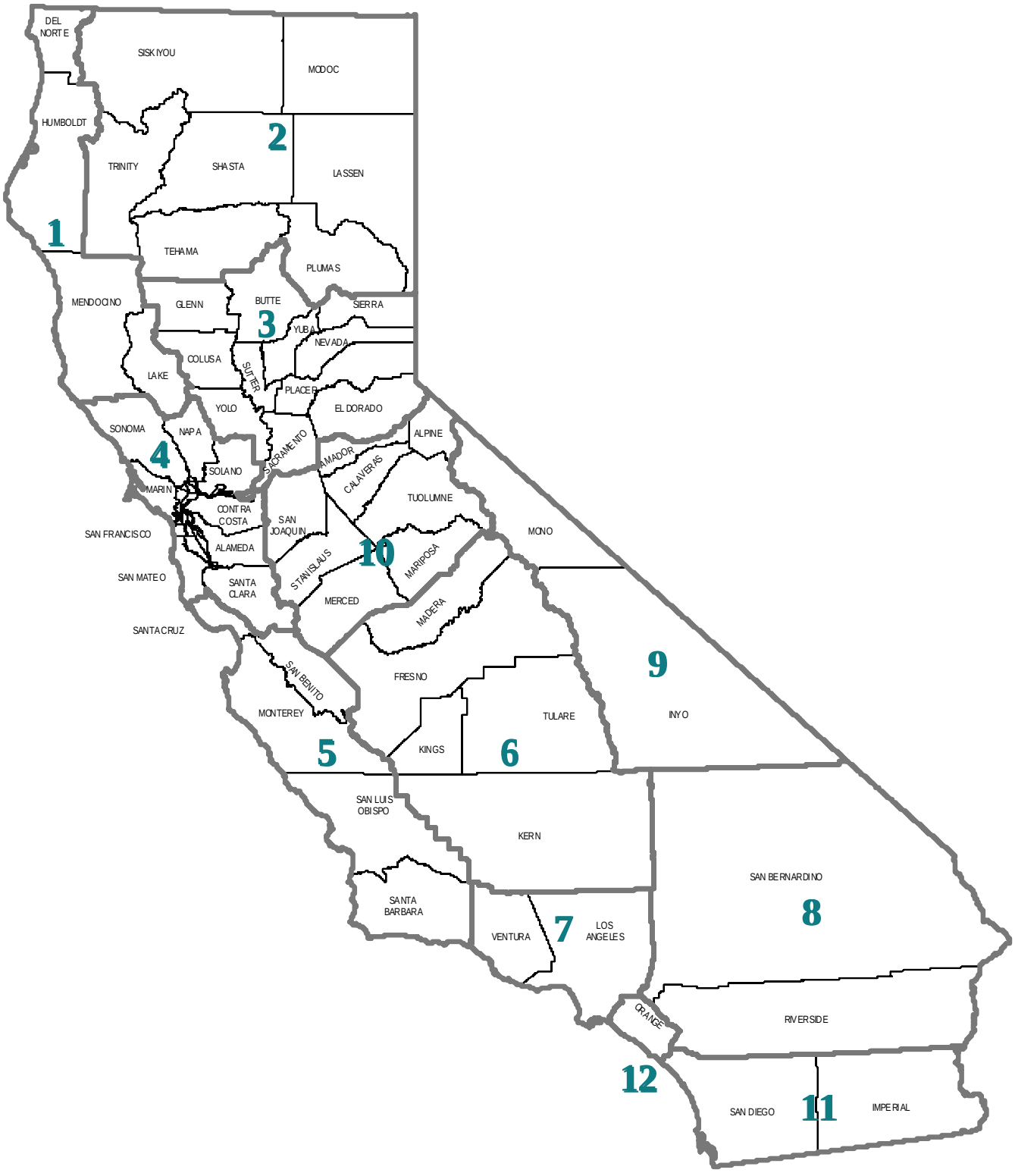


TABLE A Distribution of Centerline Miles and Lane miles, 2005.

	Center line miles		Lane Miles		Distressed Lane Miles		Major Structural Distress	Minor Structural Distress	Poor Ride Quality
TOTAL	14,897	100%	49,561	100%	13,845	28%	11,518	2,078	249
PRIORITY									
Major Structural Distress					11,518	23%			
Minor Structural Distress					2,078	4%			
Poor Ride Quality					249	1%			
NONE (Not Distressed)					35,716	72%			
					49,561	100%			
MSL									
1	5,969	40%	27,767	56%	7,073	51%			
2	5,353	36%	14,355	29%	4,477	32%			
3	3,537	24%	7,192	15%	2,296	17%			
	14,859	100%	49,314	100%	13,845	100%			
DISTRICT									
1	927	6%	2,330	5%	511	4%	463.78	43.21	4.22
2	1,719	12%	3,995	8%	983	7%	932.22	51.04	0.20
3	1,455	10%	4,307	9%	1,489	11%	1,332.75	119.87	36.06
4	1,368	9%	5,976	12%	1,887	14%	1,467.67	323.40	95.68
5	1,149	8%	3,187	6%	877	6%	746.83	109.92	20.17
6	2,017	14%	5,718	12%	1,361	10%	1,199.18	158.50	3.36
7	1,078	7%	6,269	13%	2,219	16%	1,627.34	526.46	64.78
8	1,892	13%	6,641	13%	2,189	16%	2,020.84	158.36	10.22
9	739	5%	1,777	4%	240	2%	179.98	59.97	0.09
10	1,304	9%	3,472	7%	1,226	9%	1,127.50	98.72	0.00
11	973	7%	3,937	8%	556	4%	296.01	253.26	6.24
12	278	2%	1,950	4%	307	2%	124.05	175.24	7.77
	14,897	100%	49,561	100%	13,845	100%	11,518	2,078	249
ROAD TYPE									
Multi-Lane Divided	5,615	38%	30,378	61%	7,755	56%			
Multi-Lane Undivided	391	3%	1,344	3%	1,247	9%			
Two-Lane	8,891	60%	17,838	36%	4,843	35%			
	14,897	100%	49,561	100%	13,845	100%			
CITY									
City	2,780	19%	16,240	33%	6,391	46%			
Non-city	12,117	81%	33,320	67%	7,454	54%			
	14,897	100%	49,561	100%	13,845	100%			
NATIONAL HIGHWAY SYSTEM									
NHS Interstate	2,237	15%	13,579	27%	3,415	25%			
NHS non-Interstate	4,776	32%	17,413	35%	4,646	34%			
Non-NHS roads	7,884	53%	18,569	37%	5,784	42%			
	14,897	100%	49,561	100%	13,845	100%			
INTERMODAL CORRIDORS OF ECONOMIC SIGNIFICANCE (ICES)									
ICES	3,328	22%	18,102	37%	4,629	33%			
Non-ICES roads	11,569	78%	31,459	63%	9,216	67%			
	14,897	100%	49,561	100%	13,845	100%			
PAVEMENT TYPE									
Flexible	12,224	82%	33,322	67%	8,740	63%			
Rigid	2,675	18%	16,247	32%	5,105	37%			
	14,899	100%	49,569	99%	13,845	100%			

Distress	Priority Numbers
Major Structural Distress	1, 2, 7, 8, 11, 13
Minor Structural Distress	3, 4, 9, 10, 12, 14
Poor Ride Qualilty	5, 6

(Excludes bridges, ramps and frontage roads)

TABLE B

Distressed Lane Miles by Priority Group

	2001			2002			2003			2004			2005		
District	Major Structural Distress	Minor Structural Distress	Poor Ride Quality	Major Structural Distress	Minor Structural Distress	Poor Ride Quality	Major Structural Distress	Minor Structural Distress	Poor Ride Quality	Major Structural Distress	Minor Structural Distress	Poor Ride Quality	Major Structural Distress	Minor Structural Distress	Poor Ride Quality
1	199	84	33	243	95	20	273	69	12	427	53	6	464	43	4
2	752	125	22	709	171	15	858	114	2	952	86	1	932	51	0
3	544	204	56	842	220	46	1,119	142	27	1,091	129	7	1,333	120	36
4	809	492	158	879	450	121	1,041	365	144	1,202	348	57	1,468	323	96
5	513	151	24	621	156	32	772	139	16	880	117	28	747	110	20
6	1,093	292	123	1,093	312	40	1,249	204	30	993	203	7	1,199	159	3
7	909	620	238	815	724	254	1,003	657	142	1,432	438	94	1,627	526	65
8	1,095	319	99	1,441	256	70	1,483	186	50	1,979	186	13	2,021	158	10
9	119	58	0	130	62	0	112	40	0	155	55	0	180	60	0
10	477	128	32	735	203	19	833	162	16	900	76	1	1,128	99	0
11	122	167	57	107	218	9	137	233	7	113	301	5	296	253	6
12	36	177	92	54	109	87	58	100	32	133	137	22	124	175	8
Totals	6,668	2,818	935	7,669	2,976	710	8,938	2,410	476	10,257	2,126	241	11,518	2,078	249

District Lane Miles by Pavement Condition Survey Year

	2001			2002			2003			2004			2005		
District	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System	System Lane Miles	Distressed Ln Miles	Pct. of System
1	2,330	316	14%	2,330	358	15%	2,330	354	15%	2,330	485	21%	2,330	511	22%
2	3,992	899	23%	3,992	894	22%	3,995	973	24%	3,995	1,039	26%	3,995	983	25%
3	4,284	804	19%	4,284	1,108	26%	4,285	1,288	30%	4,307	1,227	28%	4,307	1,489	35%
4	5,957	1,459	24%	5,958	1,450	24%	5,958	1,549	26%	5,976	1,606	27%	5,976	1,887	32%
5	3,187	688	22%	3,187	809	25%	3,187	926	29%	3,187	1,025	32%	3,187	877	28%
6	5,734	1,508	26%	5,751	1,446	25%	5,751	1,483	26%	5,718	1,203	21%	5,718	1,361	24%
7	6,106	1,767	29%	6,106	1,792	29%	6,158	1,802	29%	6,269	1,964	31%	6,269	2,219	35%
8	6,492	1,512	23%	6,575	1,767	27%	6,575	1,719	26%	6,641	2,178	33%	6,641	2,189	33%
9	1,777	178	10%	1,777	192	11%	1,777	152	9%	1,777	210	12%	1,777	240	14%
10	3,452	637	18%	3,462	957	28%	3,471	1,011	29%	3,472	976	28%	3,472	1,226	35%
11	3,909	347	9%	3,923	334	9%	3,927	377	10%	3,937	419	11%	3,937	556	14%
12	1,888	305	16%	1,904	249	13%	1,904	190	10%	1,950	292	15%	1,950	307	16%
Totals	49,108	10,421	21%	49,249	11,356	23%	49,318	11,824	24%	49,561	12,624	25%	49,561	13,845	28%

Statewide Pavement Needs by Survey Year and Priority Group

	2001			2002			2003			2004			2005		
Priority	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System	Distressed Ln Miles	Pct. Of Needs	Pct. of System
Major	6,668	64%	14%	7,669	68%	16%	8,938	76%	18%	10,257	81%	21%	11,518	83%	23%
Minor	2,818	27%	6%	2,976	26%	6%	2,410	20%	5%	2,126	17%	4%	2,078	15%	4%
Poor Ride	935	0	2%	710	0	1%	476	0	1%	241	0	0%	249	0	1%
Total	10,421	100%	21%	11,356	100%	23%	11,824	100%	24%	12,624	100%	25%	13,845	100%	28%

Source: 2001-2005 Pavement Condition Surveys, Pavement Management System.
Caltrans, Division of Maintenance, Office of Roadway Rehabilitation, Pavement Management Information Branch.

Distress	Priority Numbers
Major Structural Distress	1, 2, 7, 8, 11, 13
Minor Structural Distress	3, 4, 9, 10,12, 14
Poor Ride Qualilty	5, 6

TABLE C Maintenance and Rehabilitation Cost and Usage, 2001-2005

Maintenance, Contracted	Average	00/01	01/02	02/03	03/04	04/05
Cost per Lane Mile, by Fiscal Year						
CHIP SEAL (AR)	$ 30,880	$ 29,864	$ 30,403	$ 23,165	$ 30,705	$ 40,252
CHIP SEAL (PMA)	$ 16,940	$ 13,800	$ 25,179	$ 12,385	$ 16,410	N/A
CHIP SEAL (PME)	$ 15,920	$ 12,456	$ 15,547	$ 16,908	$ 14,464	$ 20,229
CRACK SEAL	$ 5,100	$ 7,308	$ 1,310	$ 4,381	$ 7,463	$ 5,025
* MICROSURFACING	$ 34,460	$ 21,573	$ 44,147	$ 39,966	$ 31,423	$ 35,212
* THIN BONDED WEARING COURSE	$ 68,710	N/A	$ 72,697	$ 66,360	$ 79,598	$ 56,195
OPEN GRADE AC	$ 36,050	$ 33,260	$ 38,550	$ 36,333	N/A	N/A
RUBBERIZED AC SURFACING	$ 46,520	$ 42,852	$ 58,440	$ 46,029	$ 34,545	$ 50,711
SLURRY SEAL	$ 21,050	$ 16,032	$ 16,367	$ 32,894	$ 14,189	$ 25,767
THIN BLANKET	$ 39,190	$ 37,241	$ 29,424	$ 35,225	$ 28,392	$ 65,678
CAPE SEAL	$ 35,250	N/A	N/A	N/A	N/A	$ 35,253
DIGOUT	$ 49,860	N/A	$ 45,230	$ 16,510	$ 43,936	$ 93,756
PCC GRIND	$ 33,320	N/A	N/A	$ 26,363	N/A	$ 40,279
** PCC SLAB EACH	$ 6,450	$ 3,352	$ 4,377	$ 5,717	$ 8,860	$ 9,944
Lane Miles Treated, by Fiscal Year						
CHIP SEAL (AR)	174	245	63	77	250	237
CHIP SEAL (PMA)	76	158	84	33	31	N/A
CHIP SEAL (PME)	584	1,047	426	385	447	614
CRACK SEAL	173	322	185	144	81	134
* MICROSURFACING	40	142	31	4	5	17
* THIN BONDED WEARING COURSE	55	N/A	92	11	20	97
OPEN GRADE AC	345	538	217	281	N/A	N/A
RUBBERIZED AC SURFACING	188	25	25	173	255	462
SLURRY SEAL	165	122	226	16	236	224
THIN BLANKET	596	1,251	853	342	80	456
CAPE SEAL	30	N/A	N/A	N/A	N/A	30
DIGOUT	194	N/A	26	257	458	34
PCC GRIND	25	N/A	N/A	24	N/A	26
** PCC SLAB EACH	1,111	2,374	722	1,196	893	371
TOTAL, CONTRACT MTCE. LANE MILES	2,404	3,850	2,228	1,747	1,862	2,331

Rehabilitation, Contracted	Average	00/01	01/02	02/03	03/04	04/05
Cost per Lane Mile, by Fiscal Year						
ACOL FLEX, CAPM	$ 149,530	$ 128,468	$ 109,431	$ 125,112	N/A	$ 235,093
ACOL RIGID, CAPM	$ 81,040	$ 81,042	N/A	N/A	N/A	N/A
*** CPR, CAPM	$ 142,860	N/A	N/A	N/A	$ 142,861	N/A
GRINDING, CAPM	$ 104,720	$ 79,551	$ 161,434	N/A	$ 58,335	$ 119,558
MILL AND REPLACE AC, CAPM	$ 99,600	N/A	N/A	N/A	$ 87,423	$ 111,772
RUBBERIZED AC, CAPM	$ 131,110	$ 115,376	N/A	$ 145,178	$ 129,115	$ 134,765
SLAB REPLACEMENT, CAPM	$ 308,060	N/A	N/A	N/A	$ 244,784	$ 371,333
ACOL FLEX, REHABILITATION	$ 296,810	$ 271,009	$ 324,775	$ 125,349	$ 290,581	$ 472,319
ACOL RIGID, REHABILITATION	$ 251,230	$ 568,194	$ 278,715	N/A	$ 129,382	$ 28,628
*** CPR, REHABILITATION	$ 310,210	N/A	$ 451,835	N/A	$ 154,403	$ 324,400
GRINDING, REHABILITATION	$ 211,310	N/A	$ 211,306	N/A	N/A	N/A
MILL AND REPLACE AC, REHABILITATION	$ 306,800	$ 98,103	$ 221,692	$ 247,364	$ 495,544	$ 471,302
RUBBERIZED AC, REHABILITATION	$ 186,900	$ 176,176	$ 118,139	$ 280,329	$ 221,897	$ 137,947
PCC OVERLAY	$ 979,710	N/A	N/A	$ 979,710	N/A	N/A
SLAB REPLACEMENT, REHABILITATION	$ -	N/A	N/A	N/A	N/A	N/A
Lane Miles Treated, by Fiscal Year						
ACOL FLEX, CAPM	234	529	218	130	N/A	59
ACOL RIGID, CAPM	102	102	N/A	N/A	N/A	N/A
*** CPR, CAPM	19	N/A	2	N/A	36	N/A
GRINDING, CAPM	398	795	64	N/A	109	623
MILL AND REPLACE AC, CAPM	102	N/A	N/A	N/A	136	67
RUBBERIZED AC, CAPM	487	1,506	N/A	62	146	236
SLAB REPLACEMENT, CAPM	52	N/A	N/A	N/A	95	10
ACOL FLEX, REHABILITATION	327	756	378	185	269	46
ACOL RIGID, REHABILITATION	157	307	179	N/A	88	55
*** CPR, REHABILITATION	144	N/A	16	N/A	394	23
GRINDING, REHABILITATION	178	N/A	178	N/A	N/A	N/A
MILL AND REPLACE AC, REHABILITATION	146	267	20	162	159	121
RUBBERIZED AC, REHABILITATION	76	113	36	99	81	53
PCC OVERLAY	21	N/A	N/A	21	N/A	N/A
SLAB REPLACEMENT, REHABILITATION	-	N/A	N/A	N/A	N/A	N/A
Subtotal, CAPM	1,341	2,931	283	192	427	995
Subtotal, REHABILITATION	1,102	1,442	807	467	1,085	298
TOTAL CAPM/REHAB LANE MILES	2,443	4,373	1,090	659	1,512	1,293
TOTAL, ALL CONTRACT LANE MILES	4,330	8,223	3,318	2,406	3,374	3,624

N/A - NOT AVAILABLE OR STRATEGY NOT UTILIZED

* PILOT PROJECTS

** PCC SLABS ARE ACTUAL COUNT OF SLABS OR COST PER SLAB

*** CPR INCLUDES SLAB REPLACEMENTS (CAPM/REHAB); GRIND, SLAB REPLACE, ROUT AND SEAL CRACKS (REHAB & CAPM); DOWEL BAR RETROFIT

Definitions/Glossary

AADT – Annual Average Daily Traffic – Average daily traffic over an entire year, estimated from a traffic sample collected over a one to seven day time period.

AC – Asphalt Concrete – Consisting of sand, gravel, and a petroleum binder; also called 'bituminous', 'flexible' or 'black' pavement.

ACOL – Asphalt Concrete Overlay – Placing layers of asphalt and inner membranes over an existing roadway. Typically, 6 inches of asphalt are added.

Alligator (Fatigue) cracking – Cracks in asphalt that are caused by repeated traffic loadings. The cracks indicate fatigue failure of the asphalt layer. When cracking is characterized by interconnected cracks, the cracking pattern resembles that of an alligator's skin.

> Alligator A – A single or two parallel longitudinal cracks in the wheel path; cracks are not spalled or sealed; rutting or pumping is not evident.
>
> Alligator B – An area of interconnected cracks in the wheel path forming a complete pattern; cracks may be slightly spalled; cracks may be sealed; rutting or pumping may exist.
>
> Alligator C – An area of moderately or severely spalled interconnected cracks outside of the wheel path forming a complete pattern; cracks may be sealed.

AR – Asphalt Rubber – A mixture of asphalt concrete containing rubber 'crumbs' and synthetic binders.

Base Maintenance – A planned treatment, intended to temporarily correct a specific pavement distress or delay future need to rehabilitate the pavement.

BWC – Bonded Wearing Course, also known as a Thin Bonded Wearing Course (Nova Chip), is a polymer-modified emulsion typically used as a pavement preservation treatment.

CAPM – CApital Preventive Maintenance – Use of heavy maintenance treatments such as intermediate thickness asphalt blankets (flexible pavements), or grinding the pavement surface (rigid pavements) to provide five to seven years of additional pavement life.

Centerline mile – A mile of highway, without considering the number of lanes in the facility.

Chip Seal – A surface treatment in which the pavement is sprayed with asphalt (generally emulsified) and then immediately covered with aggregate and rolled with a pneumatic tire roller.

CPR – Concrete Pavement Restoration – May involve surface grinding, slab replacements, or full lane replacement.

Crack, seat, and overlay – The existing pavement is cracked into small pieces that are rolled (seated) into the existing roadbed and overlaid with asphalt.

Definitions/Glossary

Grinding – Removing the irregularities in the surface of a pavement to improve ride quality, typically on rigid pavement.

Faulting – Slabs of Portland Cement Concrete (PCC) that are tilted, causing a drop off of the departure end of one slab onto the leading edge of the next slab.

Five-Year Maintenance Plan (Plan) – Required by Streets and Highways Code Section 164.6. A five-year plan that addresses the maintenance needs of the state highway system, prepared each odd-numbered year, concurrent with the rehabilitation plan. The plan identifies only maintenance activities that, if not performed, could result in increased SHOPP costs in the future.

Flexible pavement – Pavement constructed from asphalt concrete, also known as 'bituminous' or 'black' pavement.

GPR – Ground Penetrating Radar – GPR technology produces an underground cross-sectional image of soils and subsurface features.

HA22 (currently known as highway program codes 201.120, 201.121 and 201.125) – The highway program(s) that funds long-term corrective strategies such as reconstruction or rehabilitation and capital preventive maintenance of pavements. HA22 program projects are an element of the four-year SHOPP.

HM1 – The highway program which funds Routine and Major Maintenance on the State highway network. HM1 programs are funded from Caltrans' annual operating budget.

ICES – Intermodal Corridors of Economic Significance – The ICES is California's primary goods movement system. ICES is an interconnected network of freight distribution routes within California that provides direct access among major highways, seaports, airports, rail yards and national and international markets.

IRI – International Roughness Index – A standardized method of measuring the roughness of the pavement surface, expressed in inches per mile or centimeters per kilometer, developed by the World Bank.

Lane mile – A pavement measuring one mile long and one lane wide. A mile stretch of a two-lane road equals two lane miles. A segment of road one mile long and four lanes wide is four lane miles. This is the unit of measure used to develop the total cost of pavement projects.

Long-life pavement – A pavement intended to last thirty-five years or more between rehabilitation treatments.

Maintenance – Work, either by contract or by State forces that preserves the riding qualities, safety characteristics, functional serviceability and structural integrity of the facilities that comprise the roadways on the State highway system.

Definitions/Glossary

Maintenance Program – The program, within the California Department of Transportation, that is responsible for the preservation and keeping of rights of way, and each type of roadway, structure, safety convenience or device, planting, illumination equipment, and other facilities, in the safe and usable condition to which it has been improved or constructed.

MSL – Maintenance Service Level – For maintenance programming purposes, the State highway system has been classified as Class 1, 2, and 3 highways based on the MSL descriptive definitions:

> MSL 1 – Contains route segments in urban areas functionally classified as Interstate, Other Freeway/Expressway, or Other Principal Arterial. In rural areas, the MSL 1 designation contains route segments functionally classified as Interstate or Other Principal Arterial.
>
> MSL 2 – Contains route segments classified as an Other Freeway/Expressway, or Other Principal Arterial not in MSL 1, and route segments functionally classified as minor arterials not in MSL 3.
>
> MSL 3 – Indicates a route or route segment with the lowest maintenance priority. Typically, MSL 3 contains route segments functionally classified as major or minor collectors and local roads, routes segments with relatively low traffic volumes. Route segments where route continuity is necessary are also assigned MSL 3 designation.

Major Maintenance – Use of various types of surface treatments, such as thin blankets and chips seals, to extend the service life of a pavement, usually by four to seven years. These treatments keep the roadway in a safe, useable condition but do not include structural capacity improvement or reconstruction.

Major Maintenance Budget Model – Budget modeling, using data collected by the Pavement Condition Survey, to determine annual needs by applying a cost to maintain the system in a "steady state" condition whereby existing needs are being eliminated at the same rate as new needs develop.

NHS – National Highway System – Includes five subsystems of roadways important to the nation's economy, defense, and mobility:

> Interstate – The Eisenhower Interstate System of highways retains its separate identity within the NHS.
>
> Other Principal Arterials – Highways in rural and urban areas that provide access between an arterial and a major port, airport, public transportation facility, or other intermodal transportation facility.
>
> Strategic Highway Network (STRAHNET) – A network of highways that provide defense access, continuity and emergency capabilities for defense purposes.

Definitions/Glossary

Major Strategic Highway Network Connectors – Highways that provide access between major military installations and highways that are part of the STRAHNET.

Intermodal Connectors – Highways that provide access between major intermodal facilities and the other four subsystems making up the NHS.

OGAC – Open Graded Asphalt Concrete or Open Graded Blanket – A surface layer of asphalt approximately 1 inch thick, containing few fine particles between the larger pieces of aggregate. This allows water to enter the voids and drain out through the edges of the pavement, reducing standing water on the pavement, and improving skid resistance in wet weather.

Pavement Performance Model – A model used to develop budget needs and to perform impact analyses in which the effects of different pavement management strategies and funding levels can be demonstrated.

PCC – Portland Cement Concrete – 'Rigid' pavement.

PCS – Pavement Condition Survey – An annual survey of the State highway system conducted by the California Department of Transportation.

PLOS – Pavement Level of Service – A Needs based scoring system, using data collected by the Pavement Condition Survey, used to measure the pavement's condition with respect to maintenance target goals/priorities.

PMA – Polymer Modified Asphalt – A binder used in a seal coat or dense and open-graded AC.

PME – Polymer Modified Emulsion – A binder used in a seal coat or as a tack coat for construction.

Preventive Maintenance – A planned treatment on a road in good condition that is intended to preserve the system, retard future deterioration and prolong the service life.

Priority Number – A number assigned to a segment of pavement based on the combination of ride quality, structural condition, and MSL.

RAC – Rubberized asphalt concrete – Material produced for hot mix applications by mixing asphalt rubber or rubberized asphalt binder with graded aggregate. RAC may be dense-, gap-, or open-graded.

Raveling – Wearing away of the pavement surface caused by the dislodging of aggregate particles and loss of binder through weathering and aging.

Rigid pavement – Pavement constructed from Portland Cement Concrete (PCC).

Roadway Preservation – Keeping the roadway and appurtenant facilities in the safe and usable condition to which it has been improved or constructed.

Definitions/Glossary

Roadway Preservation Program – The program, within the California Department of Transportation, that is responsible for preserving the State highway network.

Roadway Rehabilitation Program – The program, within the California Department of Transportation, that is responsible to rehabilitate roadways that ride rougher than established maximums and/or exhibit substantial structural distress. Work incidental to pavement rehabilitation or replacement of other highway appurtenances that are failing, worn out or functionally obsolete, such as drainage facilities, retaining walls, lighting, signal controllers, and fencing.

Routine maintenance – Low-level maintenance treatments, such as crack sealing, joint sealing, and minor patching, used to extend the life of a pavement.

Rutting – A longitudinal surface depression in the wheel path caused by the consolidation or lateral movement of roadbed material under heavy loads.

Seal coat – A sealant applied uniformly to the entire pavement surface, usually with embedded sand or gravel 'chips', primarily to prevent water infiltration, improve traction, and renew the pavement surface.

State Highway Operation and Protection Plan (Plan) – Required by Streets and Highways Code Section 164.6. A ten-year state rehabilitation plan, prepared each odd-numbered year, by the Department that identifies rehabilitation needs, schedules for meeting those needs, and strategies for cost control and program efficiencies.

State Highway Operation and Protection Program (SHOPP) – Required by Government Code Section 14526.5. A four-year listing of projects proposed for construction consistent with the goals and priorities in the latest Plan. SHOPP projects are limited to capital improvements relative to maintenance, safety and rehabilitation of State highways and bridges that do not add new capacity lanes to the system.

Slab – A unit of Portland Cement Concrete (PCC) pavement defined by surrounding expansion joints.

Slurry seal – A petroleum-based emulsion seal coat (with embedded fine aggregates) applied to the pavement surface.

Spalling – Spalling occurs at joints or cracks when incompressible materials are confined in the opening. It also occurs where uniform slab support is lacking and there is vertical movement due to wheel load impact. Spalling results in progressive widening of the joint or cracks, and ultimately, deterioration of aggregate interlock at the joint.

State highway network – The entire system of highways maintained by the California Department of Transportation. For pavement management purposes, excludes bridge decks and ramps.

Definitions/Glossary

State Highway System Performance Measures – A periodic report prepared by the California Department of Transportation to track a variety of performance and accountability measures for routine review by Department management and others.

Vehicle miles traveled – The number of miles that residential vehicles are driven.