Information Technology Project Request

Feasibility Study Report
Executive Approval Transmittal

Department Name
Transportation

Project Title (maximum of 75 characters)
Pavement Management System

Project Acronym	Department Priority	Agency Priority
PMS		

APPROVAL SIGNATURES

I am submitting the attached Feasibility Study Report (FSR) in support of our request for approval to undertake this project.

I certify that the FSR was prepared in accordance with State Administrative Manual Sections 4920-4930.1 and that the proposed project is consistent with our information technology strategy as expressed in our current Agency Information Management Strategy (AIMS).

I have reviewed and agree with the information in the attached Feasibility Study Report.

Chief Information Officer	Date Signed
Ann Barsotti **Printed name:** Ann Barsotti	7/3/08
Budget Officer	**Date Signed**
Printed name: Norma Ortega	7/3/08
Chief Financial Officer	**Date Signed**
Cindy McKim **Printed name:** Cindy McKim	7/3/08
Department Director	**Date Signed**
Will Kempton **Printed name:** Will Kempton	7/15/08
Agency Secretary	**Date Signed**
for **Printed name:** Dale E. Bonner	7/17/08

INFORMATION TECHNOLOGY PROJECT SUMMARY PACKAGE
SECTION A: EXECUTIVE SUMMARY

1.	Submittal Date	June 25, 2008

		FSR	SPR	PSP Only	Other:
2.	Type of Document	X			
	Project Number				

			Estimated Project Dates	
3.	Project Title	Pavement Management System	Start	End
	Project Acronym	PMS	10/2009	06/2011

4.	Submitting Department	Department of Transportation
5.	Reporting Agency	Business, Transportation, and Housing Agency

6. Project Objectives

The primary purpose of implementing a Pavement Management System is to provide the Pavement Management Program (PMP) the tools necessary to meet their primary goal of implementing a proactive approach for prioritizing, designing, and maintaining existing highway pavements. The overall goals of the PMS for the PMP are:

1. Improving data integrity and access.
2. Providing the capability to produce timely and accurate reports.
3. Optimizing investment in the state highway network by providing analysis tools to assist in the planning, programming, and budgeting of pavement projects.
4. Creating a centralized system to track pavement management history.
5. Creating a system which provides tools to model and predict pavement performance.

8.	Major Milestones	Est Complete Date
	Project Initiation	10/01/2009
	Requirements Definition	+ 45 days
	Analysis of COTS	+ 60 days
	Project Management Plans	+ 45 days
	Integration Development	+ 360 days
	Configuration and Implementation	+ 570 days
	System Test Execution	+ 630 days
	System Acceptance	+ 630 days
	PIER	+ 660 days
	Key Deliverables	
	Final Functional Requirements	+ 45 days
	Final Project Plan	+ 45 days
	Hardware Implementation	+ 180 days
	Database Setup	+ 250 days
	Database Integration	+ 360 days
	System Test	+ 600 days
	System Acceptance	+ 630 days

7. Proposed Solution

The proposed solution to meet the Department's Pavement Management System (PMS) is to obtain a commercial off-the-shelf (COTS) solution through a competitive solicitation process. Assessment of multiple COTS products indicated that there are solutions in the marketplace that address all of the defined business needs of the Department.

INFORMATION TECHNOLOGY PROJECT SUMMARY PACKAGE
SECTION B: PROJECT CONTACTS

Project #	
Doc. Type	FSR

Executive Contacts								
	First Name	**Last Name**	**Area Code**	**Phone #**	**Ext.**	**Area Code**	**Fax #**	**E-mail**
Agency Secretary	Dale	Bonner	916	323-5401		916	323-5402	secretary@bth.ca.gov
Dept. Director	Will	Kempton	916	654-5267		916	654-6608	will.kempton@dot.ca.gov
Budget Officer	Norma	Ortega	916	654-4556		916	653-2004	norma.ortega@dot.ca.gov
CIO	Ann	Barsotti	916	654-3910		916	654-2949	ann.barsotti@dot.ca.gov
Proj. Sponsor	Mike	Miles	916	654-6823		916	654-6608	michael.miles@dot.ca.gov

Direct Contacts								
	First Name	**Last Name**	**Area Code**	**Phone #**	**Ext.**	**Area Code**	**Fax #**	**E-mail**
Doc. prepared by	Peter	Vacura	916	227-7285				peter.vacura@dot.ca.gov
Primary contact	Gene	Mallette	916	653-4686				gene.mallette@dot.ca.gov
Project Manager	Dennis	Rice	916	653-2031				dennis.rice@dot.ca.gov

INFORMATION TECHNOLOGY PROJECT SUMMARY
SECTION C: PROJECT RELEVANCE TO STATE AND/OR DEPARTMENTAL PLANS

1.	**What is the date of your current Operational Recovery Plan (ORP)?**	**Date**	10/31/2005
2.	**What is the date of your current Agency Information Management Strategy (AIMS)?**	**Date**	08/2007
3.	**For the proposed project, provide the page reference in your current AIMS and/or strategic business plan.**	**Doc.**	AIMS
		Page #	8

Project #	
Doc. Type	FSR

		Yes	**No**
4.	**Is the project reportable to control agencies?**	X	
	If YES, CHECK all that apply:		
X	**a) The project involves a budget action.**		
	b) A new system development or acquisition that is specifically required by legislative mandate or is subject to special legislative review as specified in budget control language or other legislation.		
X	**c) The estimated total development and acquisition cost exceeds the departmental cost threshold and the project does not meet the criteria of a desktop and mobile computing commodity expenditure (see SAM 4989 – 4989.3).**		
	d) The project meets a condition previously imposed by Finance.		

INFORMATION TECHNOLOGY PROJECT SUMMARY PACKAGE
SECTION D: BUDGET INFORMATION

Project #	
Doc. Type	FSR

Budget Augmentation Required?		
No		
Yes	X	

If YES, indicate fiscal year(s) and associated amount:

FY 09/10	FY 10/11	FY 11/12	FY 12/13	FY
$ 880,000	$ 605,000	$ 355,000	$ 0	$ 0

PROJECT COSTS

1.	Fiscal Year	FY 09/10	FY 10/11	FY 11/12	FY 12/13			TOTAL
2.	One-Time Cost	$ 1,133,000	$ 703,000	$ 0	$ 0	$ 0	$ 0	$ 1,836,000
3.	Continuing Costs	$ 0	$ 265,000	$ 531,000	$ 0	$ 0	$ 0	$ 796,000
4.	TOTAL PROJECT BUDGET	$ 1,133,000	$ 968,000	$ 531,000	$ 0	$ 0	$ 0	$ 2,632,000

SOURCES OF FUNDING

5.	General Fund							
6.	Redirection	$ 253,000	$ 363,000	$ 176,000	$ 0	$ 0	$ 0	$ 792,000
7.	Reimbursements	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	
8.	Federal Funds	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	
9.	Special Funds	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	
10.	Grant Funds	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	
11.	Other Funds	$ 880,000	$ 605,000	$ 355,000	$ 0	$ 0	$ 0	$ 1,840,000
12.	PROJECT BUDGET	$ 1,133,000	$ 968,000	$ 531,000	$ 0	$ 0	$ 0	$ 2,632,000

PROJECT FINANCIAL BENEFITS

13.	Cost Savings/Avoidances	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
14.	Revenue Increase	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0

Note: The totals in Item 4 and Item 12 must have the same cost estimate.

INFORMATION TECHNOLOGY PROJECT SUMMARY PACKAGE
SECTION E: VENDOR PROJECT BUDGET

Project #	
Doc. Type	FSR

Vendor Cost for FSR Development (if applicable)	$ 0
Vendor Name	

VENDOR PROJECT BUDGET

1.	Fiscal Year	FY 09/10	FY 10/11	FY 11/12			TOTAL
2.	Primary Vendor Budget	$ 100,000	$ 100,000	$ 0			$ 200,000
3.	Independent Oversight Budget	$ 100,000	$ 50,000	$ 0			$ 150,000
4.	IV&V Budget	$ 0	$ 0	$ 0			$ 0
5.	Other Budget	$ 100,000	$ 300,000	$ 200,000			$ 600,000
6.	TOTAL VENDOR BUDGET	$ 300,000	$ 450,000	$ 200,000			$ 950,000

----------(Applies to SPR only)----------

PRIMARY VENDOR HISTORY SPECIFIC TO THIS PROJECT

7.	Primary Vendor	
8.	Contract Start Date	
9.	Contract End Date (projected)	
10.	Amount	$

PRIMARY VENDOR CONTACTS

	Vendor	First Name	Last Name	Area Code	Phone #	Ext.	Area Code	Fax #	E-mail
11.									
12.									
13.									

Project #	
Doc. Type	FSR

RISK ASSESSMENT

	Yes	No
Has a Risk Management Plan been developed for this project?	X	

General Comment(s)
An initial risk assessment for the PMS project was prepared using the Department's Risk Register. Each identified risk category was evaluated on low, medium or high, risk probability. For each risk category a preventive measure and contingency measure was also identified. The overall risk assessment ranked in the low risk probability with the exception of one high risk related to the funding delays. Details of the risk assessment plan are outlined in Section 7.0.

3.0 BUSINESS CASE

3.1 BUSINESS PROGRAM BACKGROUND

The maintenance needs of the California highway network have not kept up with the demands placed on it by increasing traffic and movement of goods and services. The California Department of Transportation (Department) has taken a strategic move to address this need by creating a pavement program that will strive to reverse the deteriorating condition of the highway network and provide a level of service that will match or exceed the demands on the network. On May 1, 2007, the Department instituted an initiative to implement a new organization, Division of Pavement Management (DPM), to be accountable for the annual investment made in pavement projects. In support of this initiative, the Department of Finance and legislative committees approved a 2008/09 Finance Letter providing resources for an updated condition inventory of the entire State Highway System and a prioritized listing of those pavement segments or corridors with the highest rate of pavement degradation.

The Department's goal for the DPM is to develop and successfully implement a "proactive approach" for prioritizing, preserving, rehabilitating, and maintaining existing highway pavements. By addressing current pavement policies and data collection processes, a significant change in the resource allocation method for pavement projects will be developed based on the data-driven pavement deterioration analysis and prioritized by the DPM. This will result in a significant change in the mix of pavement projects (preventive maintenance, corrective maintenance, rehabilitation, reconstruction) and will reduce the growth of the pavement rehabilitation and major maintenance inventory.

The DPM, which includes the Pavement Management Program (PMP), will be responsible for monitoring and maintaining approximately 50,600 lane miles of state highways at an adequate level of service to meet the demands of the traveling public and movements of goods and services. This highway network has a replacement value of over $1.2 trillion. The DPM must assure that the Department preserves that investment. As competing demands are made on highway funding, wisely allocating the state's resources becomes increasingly important to maintaining a sound transportation infrastructure.

The DPM manages a pavement program allocation of approximately $750 million annually. The program's primary purpose is to develop and implement a proactive approach to maintaining existing highway pavements by addressing pavement policies, standards, data collection, research, and management systems.

The overall goals of the pavement management program are to:

1. Build, preserve, and operate facilities more cost effectively by forecasting the future performance of our pavements.
2. Deliver to the taxpayer the best value for the public tax dollar spent.
3. Enhance the credibility and accountability of the Department to its partners, stakeholders, and the legislature.

The pavement initiative includes four main components:

1. Pavement management organization.
2. Data collection.
3. Research.
4. Enhancing automated reporting, analysis, and optimization tools.

There are two major sets of information required for the program to manage the pavement network and determine future pavement performance:

- One-time pavement structure inventory.
- Annual pavement condition surveys

The University of California Pavement Research Center (UCPRC) has been contracted as part of the Department's existing federally funded State Planning and Research (SP&R) Part 2 Program to perform pavement research and the required analysis and development of performance models for each of the pavement types and environment. Performance curves and tables are provided to the district maintenance engineers to be used as a basis for identifying, recommending, programming, and developing appropriate pavement projects.

Using this data and the current automated tools, the pavement program performs the following two major functions:

1. Creation of the State Highway Operation and Protection Program (SHOPP) budget pavement element. The process for creating the biennial pavement element of the SHOPP budget relies on three criteria: 1) evaluating data from the annual condition survey; 2) prioritizing projects based on pavement need both by the districts and Headquarters pavement staff; 3) allocating funds to best meet those needs. In utilizing the last criterion, the following are considered:

Routine Maintenance. The Department established minimum pavement surface quality triggers such as cracks greater than ¼ inch wide in asphalt concrete pavement are sealed the year following their observation.

"Worst First." Major maintenance or rehabilitation projects are prioritized on a "worst first" basis and triggered when the pavement quality drops to a pre-determined state of distress. Thus, those pavements that are in the worst condition get attention first and, as they are the most expensive, use most of the available funding.

Available Funds - Other Needs. The routine maintenance and "worst first" program elements compete with other funding elements, such as emergency repairs, bridge preservation, collision reduction, mobility and congestion relief, mandates (Americans with Disabilities Act, storm water, etc.), facility upgrades, and roadside preservation.

District Pavement Engineers. Finally, the needs are recommended by the district pavement engineers, who use, as a minimum, pavement condition data and reports from the Department's existing pavement condition reporting system in setting their priorities.

2. Creation of the annual State of the Pavement Report. The State of the Pavement Report identifies the current condition of the network on a district basis as well as a statewide basis. The report covers trends in traffic volume and the influence it has on the network. It provides breakdowns in the funding allocations for SHOPP and major maintenance. The report also reports on the mix of projects with regards to preservation and rehabilitation. This report is provided to the California Transportation Commission (CTC) to summarize how the funding is being distributed across the state and where improvements are being made, as well as defining future needs in order to maintain or improve current conditions.

3.2 BUSINESS PROBLEM/OPPORTUNITY STATEMENT

In order to optimize the activities associated with the maintenance of the highway network, the Department has an opportunity to improve the existing tools and processes it employs to monitor, evaluate, and preserve the highway network. The current Pavement Condition Reporting System (PCRS), a standalone FoxPro database implemented almost ten years ago, is inadequate to meet Department needs in the areas of data storage and validation methods, project tracking processes, forecasting and performance modeling, and budgeting. Additionally, because the system was built on a platform that is not a Department standard, it is not easily supported or capable of being modified. Most importantly, the current system has a different purpose: focusing on reporting current condition threshold triggers rather than anticipation of future condition prediction.

Pavement condition data, specifically International Ride Index profile data, is not readily accessible by the Division of Transportation Systems Information. Currently the data is exported from PCRS, formatted, and sent to the division, which provides the data to Federal Highway Administration's (FHWA) Highway Performance Monitoring System (HPMS).

In June 2005, Cambria Solutions was commissioned by Division of Maintenance, to conduct a business process review of the Department's pavement management processes. As part of this project, they produced a series of reports, including a business process gap analysis, market survey, and as-is reports containing interim solutions to address immediate short-term needs and long-term recommendations. One of the key findings resulting from this effort indicated that current systems and tools are not sufficient to support pavement management processes and inhibit effective decision-making.

Based on this business process review and subsequent study and analysis, the Department has identified the following specific business problems:

1. Data integrity and access in the current system is inadequate to meet the Department's needs.

The current FoxPro system limits the user's ability to adequately maintain the quality and integrity of the data and requires labor-intensive efforts to query and export data.

2. The Department currently has limited reporting capabilities.

Information and data for current reports is pulled from many sources and data are not consistent across districts and headquarters. The Department has no centralized data source or means of assimilating and reporting key information. The PCRS provides only a few reports in which to evaluate the network on a route, district, county, or statewide basis.

3. The Department has no analysis tools available that are capable of prioritizing pavement projects and predicting pavement performance.

There is no tool for quantifying the levels of distress that facilitate the prioritization of pavement segments. Currently, pavements are either distressed or not distressed. Pavement condition needs to cover a great range of conditions (very good, good, fair, poor, very poor) Pavement performance cannot be monitored over time since the same segment is not evaluated each year. The limits vary depending upon on the condition of the pavement in a general vicinity rather than specific limits.

4. The Department has no single database or tools currently available to track the history of pavement projects.

There is no single statewide database or tool for tracking the history of pavement projects. The history of pavement projects is currently maintained at the district level and is collected and managed in a variety of ways. This limits the Department's ability to accurately monitor status of current and past projects as it applies to project limits, strategy, material type, costs, and date constructed. Maintaining a statewide database will allow the Department to monitor the activities across the entire state and provide the necessary history in order to accurately update, monitor, and forecast pavement performance.

5. The Department is unable to perform objective budgeting and optimization of pavement projects.

Current budgeting of pavement projects is based on a prioritized list developed by the districts and headquarters staff. When the annual budget is depleted, all unfunded projects are moved on to the next annual budget in terms of the major maintenance or biennial budget in connection with the SHOPP. This leads to uncertainty regarding whether the right projects for the right locations were selected at the right time. Optimization will mitigate that by selecting a project based on a better defined set of parameters including performance, cost, current pavement condition, life cycle costs, and budget.

3.3 BUSINESS OBJECTIVES

3.3.1 PAVEMENT MANAGEMENT SYSTEM BUSINESS OBJECTIVES

The primary purpose of implementing a Pavement Management System (PMS) is to provide the PMP with the tools necessary to meet the primary goal of implementing a proactive approach to prioritize, preserve, rehabilitate, and maintain existing highway pavements. In order to achieve this goal the PMS has the following business objectives:

Objectives related to improving data integrity and access.

- Create the ability to provide a secure method to assure data integrity and access to all vested and interested parties which will lead to improved communication and help optimize the investment in maintenance activities.
- Allow for importing of data from other systems to create a single source for pavement data to help improve the program and project decision making process.

Objectives related to providing the capability to produce timely and accurate reports.

- Provide a single source of reports for internal and external stakeholders to help improve the project decision making process.
- Provide timely and accurate information to FHWA, CTC, and executive management to help improve the project decision making process.

Objectives related to optimizing investment in the state highway network by providing analysis tools to assist in the planning, programming, and budgeting of pavement projects.

- Create the ability to prioritize pavement projects based on objective distress and condition indices leading to optimized investment and long-term cost avoidance.
- Monitor fixed pavement segments over time to see the change in the pavement condition to help optimize the timing of maintenance decisions leading to long-term cost avoidance.
- Create predictive models for assisting in optimizing the planning and programming of future projects leading to long-term cost avoidance.

Objectives related to creating a centralized system to track pavement management history.

- Provide the ability to centralize and standardize the tracking of history through integration of key data sources to facilitate optimization of the investment in maintenance and rehabilitation activities.
- Provide pavement performance and history of activities at any project location within the network to facilitate optimization at the district level and statewide investments.

Objectives related to creating a system which provides tools to model and predict pavement performance.

- Provide the ability to implement multiple budgeting scenarios based on funding level and a proposed level of service in order to optimize funding leading to long-term cost avoidance.
- Provide the ability to determine a budget level that will support a defined pavement performance level focused on extending the service life by applying preservation treatments early instead of having to rehabilitate the pavement later leading to long-term cost avoidance.
- Improve budgeting to provide the capability to increase the number of lane miles of fair to excellent pavement to 90% of the highway network.

3.3.2 BUSINESS BENEFITS

Analysis has shown that agencies with the appropriate tools to model and predict pavement performance have consistently found they are able to optimize available funds. These agencies, while improving poor pavements, get more work done with limited funds by continuing to improve the overall condition of pavement networks. [1] The implementation of a PMS, coupled with relevant accurate data, allows the Department to develop performance models and identify which segment of highway with similar conditions should be addressed first. The end result is an extension in or improvement of the remaining service life of pavement.

An example of an extension of service life would be the application of a preservation treatment early in lieu of deferring it and having to rehabilitate the pavement sometime in the future. This translates into long-term cost avoidance and a better overall ride quality. This approach is meant to reduce the rate of deterioration and therefore delay more expensive future repairs.

A functioning PMS allows the Department to more effectively use limited funds to treat the right pavement at the right time, thereby keeping good pavements in good condition. The primary challenge in determining the appropriate pavement strategy is defining the condition criteria and treating the appropriate locations. The implementation of a PMS will provide the basis for addressing this challenge.

Historically, funding has never matched the level of need with regard to maintaining the highway network. Optimization tools provided by a PMS will help answer questions about how that limited funding should be spent. Specifically, it will help determine:

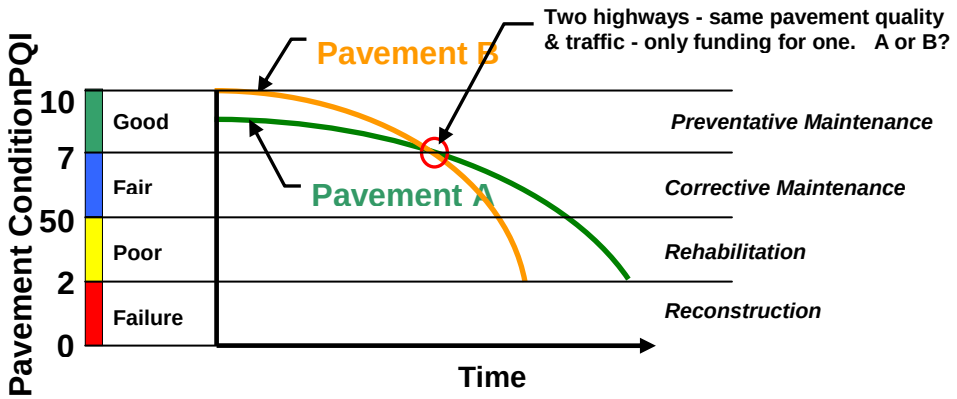
- Which projects the Department should do first.
- The impact of deferring work at certain locations in a given year.
- The cost of deferring rehabilitation projects.
- The cost of maintaining a defined level of service.

[1] *American Society of Civil Engineers (ASCE),* Vol. 53, No. 3, March 1983, pp. 43-47

The optimization will take into account pavement performance models, life cycle costs, current pavement conditions, and budget constraints. This will be a mechanism for the Department to improve its ability to manage the state's highway network by accounting for the proper mix in future costs of preserving, correcting, and rehabilitating pavements, and be able to answer these questions.

The example below illustrates how a performance model will assist the Department in determining if Pavement A will last longer and be less costly to repair in the future if left unattended, allowing focus on Pavement B and its more rapid deterioration.

Benefit of Pavement Management



A tangible example of the benefits of these processes and tools follows:

> "Arizona, using predictive pavement performance modeling saved $14 million in its first year and forecasted a savings of $101 million over the next five years for their 7,400-mile network of highways. Pavements last 2.0 years or 13.5% longer on the average due to the advent of pavement management …." [2]

There is also clear evidence that applying the results of predictive modeling will have tangible impacts on overall pavement performance:

> "… preventive maintenance treatments can restore a pavement surface and 'extend its service life by 5 to 7 years. ... This added service life will delay the need for the more costly pavement rehabilitation, allowing other rehabilitation projects to be funded and constructed.'" [3]

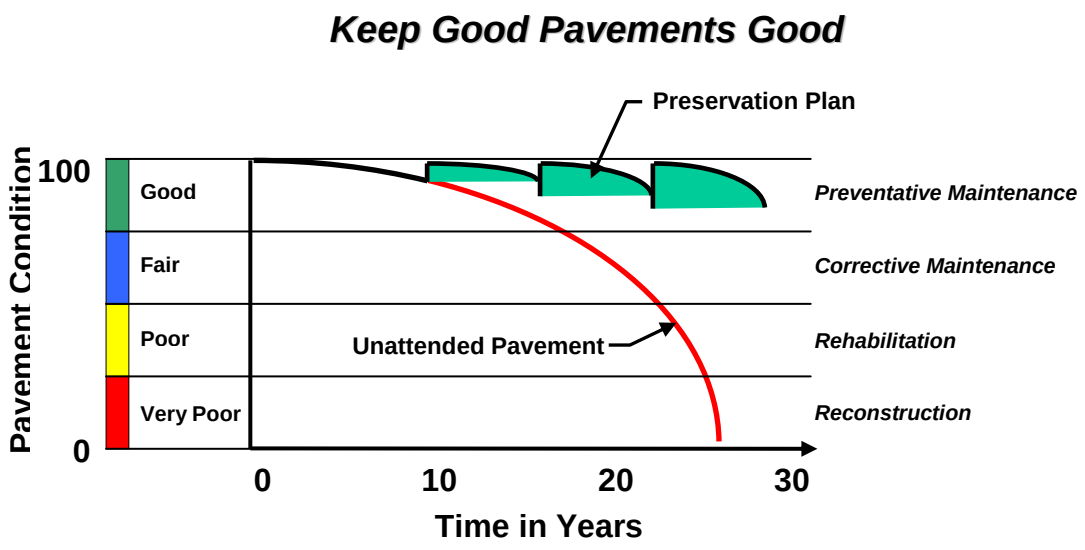
The performance models, optimization, and budgeting tools will allow the Department to select locations and appropriate strategies, and better prioritize projects. Following the

[2] "Quantify the Benefits of Implementing Asset Management", Mizusawa, McNeil, 1st Annual Inter-university Symposium on Infrastructure Management (AISIM), July 8, 2005
[3] FHWA article; Pavement Preservation: Preserving Our Investment in Highways; Robert M. Davies and Jim Sorenson; January/February 2000, Vol. 63, No. 4.

transition to having enough information for developing models and programming projects, this investment will result in significant long-term cost avoidance.

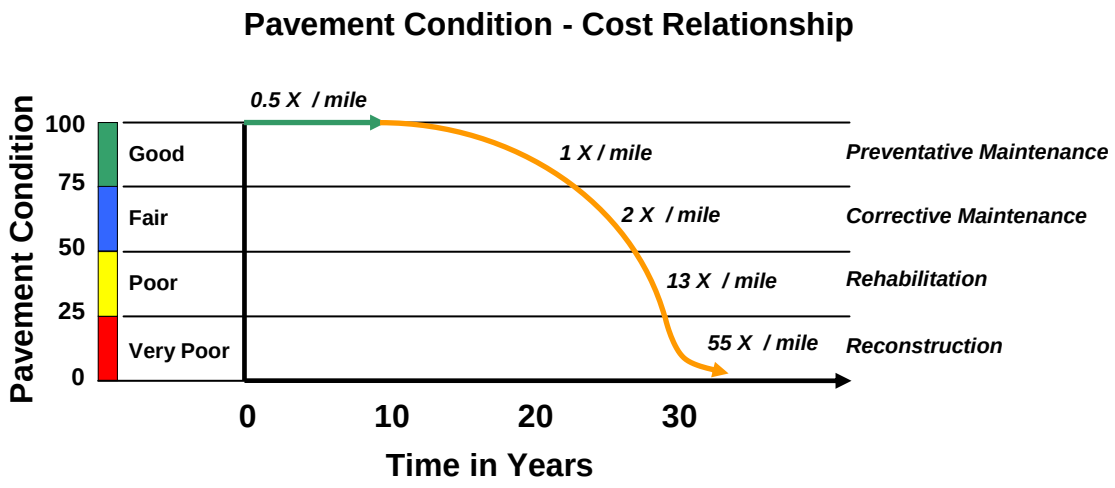
An effective PMS will support the analysis of a full range of preventive maintenance strategies such as fog seals, slurry seals, chip seals, micro-surfacing, thin lift overlays, crack sealing for asphalt concrete, and joint sealing, dowel-bar retrofit, full- and partial-depth concrete pavement repair, and grinding for Portland cement concrete. In the corrective maintenance and rehabilitation arena for asphalt concrete, the strategies would be digouts, overlays, removal, and replacement. Rehabilitation and reconstruction would be removal of either the top surface or the entire structural segment and replacement with a new surface or segment. The challenge is choosing the appropriate strategies and deciding what percentage of the budget is to be assigned to each of these approaches and various strategies.

Pavement preservation is aimed at maintaining the pavement in good condition by extending the life and meeting customer needs. This is accomplished through timely application of carefully selected strategies capable of providing up to seven years of additional life. Timely preventive maintenance treatments will significantly reduce construction related traffic delays over those that would be realized during major rehabilitation projects. The following chart shows the general concept behind pavement preservation as it applies to pavement management.



On the rehabilitation and reconstruction side, a project is currently identified when the pavement segment has been allowed to deteriorate to a point where it exhibits poor ride quality and structural damage, amounting to a poor or very poor pavement condition. Once this has occurred, the objective of the rehabilitative treatment is to repair damage and restore the pavement to a good condition. The traditional approach is reactive, and is a costly and time-consuming process amounting to greater traffic related delays.

The following chart depicts the relative costs of pavement projects that return a pavement to a good condition. On average pavement reconstruction projects cost more than 55 times the amount of preventive maintenance projects.



A PMS will allow the Department to develop the right mix of project types (prevention, correction, rehabilitation, and reconstruction) and implement the strategies necessary to maintain or improve the level of service provided by the highway network. The Department will strive for the optimum mix that will gradually reduce the poor and very poor pavements and maintain or increase the fair and good pavements.

Pavement modeling is a forecasting tool that helps anticipate the rate of deterioration of the network. Models are developed for a variety of pavement types, traffic volumes, and climate regions. Models will give the Department the ability to address pavements influenced by these and other variables. The system is capable of optimizing the project selection process by selecting those locations that will either maintain a specified level of service or improve the level of service. This approach is effective when working with a limited or constrained funding allocation.

The PMS can also determine the funding level required for the Department to maintain the network at a specified level of service. It can determine what increase or decrease in the level of service can be expected by a corresponding increase or decrease in the funding level. The system can also determine what long range funding will be required to meet or exceed a specified level of service. This becomes a valuable decision-making tool when establishing both the five-year maintenance and ten-year SHOPP plans.

Typically, projects are identified in the SHOPP based on past distresses and constructed only after these same pavements realize even further deterioration. This leads to a funding shortfall on a number of these projects due to unforeseen deterioration. The PMS will allow the Department to better anticipate project needs and as a result perform more accurate programming. This efficiency in programming will ultimately result in the ability to address more projects annually.

With a PMS in place to support the PMP, the Department will be able to:

- Build, preserve, and operate facilities more cost effectively with improved performance.
- Deliver to the taxpayer the best value for the public tax dollar spent.
- Enhance the credibility and accountability of the Department to its partners, stakeholders and the legislature.
- In the long-term, increase fair to good pavements to 90% of total inventory.

3.4 BUSINESS FUNCTIONAL REQUIREMENTS

The following table documents the business functional requirements and attributes of the PMS as they relate to the described business problems and objectives.

Business Opportunities/Problems	Business Objectives	Related Functional Requirements

1. Data integrity and access in the current system is inadequate to meet the Department's needs.
 	
The current FoxPro system limits the user's ability to adequately maintain the quality and integrity of the data and requires labor intensive efforts to query and export data.
	• Create the ability to provide a secure method to assure data integrity and access to all vested interested parties which will lead to improved communication and help optimize the investment in maintenance activities.
	• Allow for importing of data from other systems to create a single source for pavement data to help improve the program and project decision making process.
		• The selected system must support the ability to import and store all of the data elements in the current visual condition survey data collection tool (FoxPro database).
		• The selected system must support the ability to import and store a wide variety of data from existing Department data sources, including:
		  • TASAS
		  • HPMS
		  • TSN
		  • Office Engineer Database
		  • CAS
		  • IMMS
		• The selected system must support the ability to store location information based on GPS coordinates.
		• The selected system must support the ability to store pavement structure information.
		• The selected system must support the ability to validate data at the point of entry.
		• The selected system must support the ability to update and correct data after import and collection.

2. The Department currently has limited reporting capabilities.
 	
Information and data for current reports is pulled from many sources and the data is not consistent across districts and headquarters. The Department has no centralized data source or means of assimilating and reporting key information. PCR provides only a few reports in which to evaluate our network on a route, district, county or statewide basis.
	• Provide a single source of reports for internal and external stakeholders to help improve the project decision making process.
	• Provide timely and accurate information to FHWA, CTC, and executive management to help improve the project decision-making process.
		• The selected system must provide the necessary reporting tools to support the preparation of the State of the Pavement Report.
		• The selected system must provide pavement condition reports for the entire network, by district, and corridor.
		• The selected system must provide the ability to produce reports which list candidate projects that require:
		  ○ Preservation
		  ○ Maintenance
		  ○ Rehabilitation
		  ○ Reconstruction
		• The selected system must provide the ability to produce reports on estimated and actual costs.
		• The selected system must provide the ability to produce reports on life cycle costs.
		• The selected system must provide the ability to produce GIS compatible output for spatial reporting.
		• The selected system must provide the ability to replicate all current reports used on the PMS process.
		• The selected system must provide the ability to perform ad hoc reporting

3. The Department has no analysis tools currently available that are capable of prioritizing pavement projects and predicting pavement performance.	• Create the ability to prioritize pavements based on objective distress and condition indices leading to optimized investment and	• The selected system must have the ability to update highway inventory at maintenance/ rehabilitation/ construction project conclusion.

There is no tool for quantifying the levels of distress that facilitate the prioritization of pavement segments. Currently, pavements are either distressed or not distressed. Pavement condition needs to cover a great range of conditions (very good, good, fair, poor, very poor) Pavement performance cannot be monitored over time since the same segment is not evaluated each year. The limits vary depending upon on the condition of the pavement in a general vicinity rather than specific limits.	long-term cost avoidance. • Monitor fixed pavement segments over time to see the change in the pavement condition to help optimize the timing of maintenance decisions leading to long-term cost avoidance. • Create predictive models for assisting in optimizing the planning and programming of future projects leading to long-term cost avoidance.	• The selected system must estimate remaining service life for individual projects under preferred and alternative strategies, and for the entire network.

4. The Department has no tools currently available to track the history of pavement projects.
 	
There is no single statewide database or tool for tracking the history of pavement projects. Project history is currently maintained at the district level and this information is collected and managed in a variety of ways. This limits the Departments ability to accurately monitor status of current and past projects as it applies to project limits, strategy, material type, costs, and date constructed. Maintaining a statewide database/tool will allow the Department to monitor the activities across the entire state and provide the necessary history in order to accurately update, monitor, and forecast pavement performance.
	• Provide the ability to centralize and standardize the tracking of history through integration of key data sources to facilitate optimization of the investment in maintenance and rehabilitation activities.
	• Provide pavement performance and history of activities at any project location within the network to facilitate optimization the district level and network-wide investments.
		• The selected system must provide the ability to analyze pavement performance by projects with congruent segment.
		• The selected system must provide the ability to analyze pavement performance by pavement indices.
		• The selected system must provide the ability to analyze pavement performance curves based on historic/actual performance.
		• The selected system must provide the ability to perform what-if analysis on strategies.
		• The selected system must provide the ability to recommend treatment strategies based on defined business rules.
		• The selected system must provide the ability to analyze pavement performance curves in the context of:
		  ○ Pavement Type
		  ○ Construction
		  ○ Strategy
		  ○ Traffic
		  ○ Climate
		• The selected system must provide the ability to analyze costs based on chosen strategies
		• The selected system must provide the ability to analyze costs based on the ability to assign future maintenance.

5. The Department is unable to perform objective budgeting and optimization of pavement projects. Current budgeting of pavement projects is based on a prioritized list developed by the districts and headquarters staff and is cutoff when the funds run out. Everything below the line is moved on to the next annual budget in terms of the major maintenance or the biennial budget in connection with the SHOPP. This leads to uncertainty with regards to whether the right projects, for the right locations were selected at the right time. Optimization will mitigate that by selecting project based on a better defined set of parameters including performance, cost, current pavement condition, life cycle costs, and budget.	• Provide the ability to implement multiple budgeting scenarios based on funding level and a proposed level of service in order to optimize funding leading to long-term cost avoidance. • Provide the ability to determine a budget level that will support a defined pavement performance level focused on extending the service life by applying preservation treatments early instead of having to rehabilitate the pavement later leading to long-term cost avoidance. • Improve budgeting to provide the capability to increase the quantity of fair to excellent pavements to 90%.	• The selected system must provide the ability to produce project priority lists that optimize funding over a multi-year planning horizon at both the statewide and district level. • The selected system must provide the ability to optimize the annual budget process. • The selected system must provide the ability to prioritize projects based on life cycle costs. • The selected system must provide the ability to support what-if analysis of multiple funding scenarios on a district and statewide level. • The selected system must provide the ability to optimize projects based on a variety of cost and priority criteria.

4.0 BASELINE ANALYSIS

4.1 CURRENT METHOD

Existing Processes

As of March 2008, the DPM became responsible for the pavement condition survey annual data collection, processing, and reporting. The program is also responsible for working with the districts to establish a list of potential projects programmed and funded under the annual major maintenance and biennial SHOPP.

Prior to the DPM, the Division of Maintenance oversaw annual pavement data collection. The data was reviewed, validated, and imported into the PCRS. The PCRS is available to all districts by means of uploading from the Department's Intranet. It provides five reporting templates that reflect the condition of the network and can be queried by county, route, post-mile, pavement type, triggered pavements, and recommends project limits based on distresses. District pavement staff review the data and recommend projects within the district for the upcoming programming cycle.

The PCRS data is used for creating reports to the CTC, executive management, and district management. Ad hoc reports are also prepared as needed. It is also the primary source of data for creating the annual State of the Pavement Report. The PCRS database retains data over a number of years to allow for a relative comparison of pavement condition from one year to the next.

Enhanced Processes

Through a recently approved Finance Letter, the Department requested PMP resources to support changes to the data collection methodology in support of enhanced processes. The annual pavement condition survey will be enhanced by adding some new types of distress and eliminating others. One change will be the collection of data based on fixed pavement segments, which will also allow for an easier transition to the automated system and future analysis. This will alleviate the problem with comparing one year to the next by comparing data over the same exact segments.

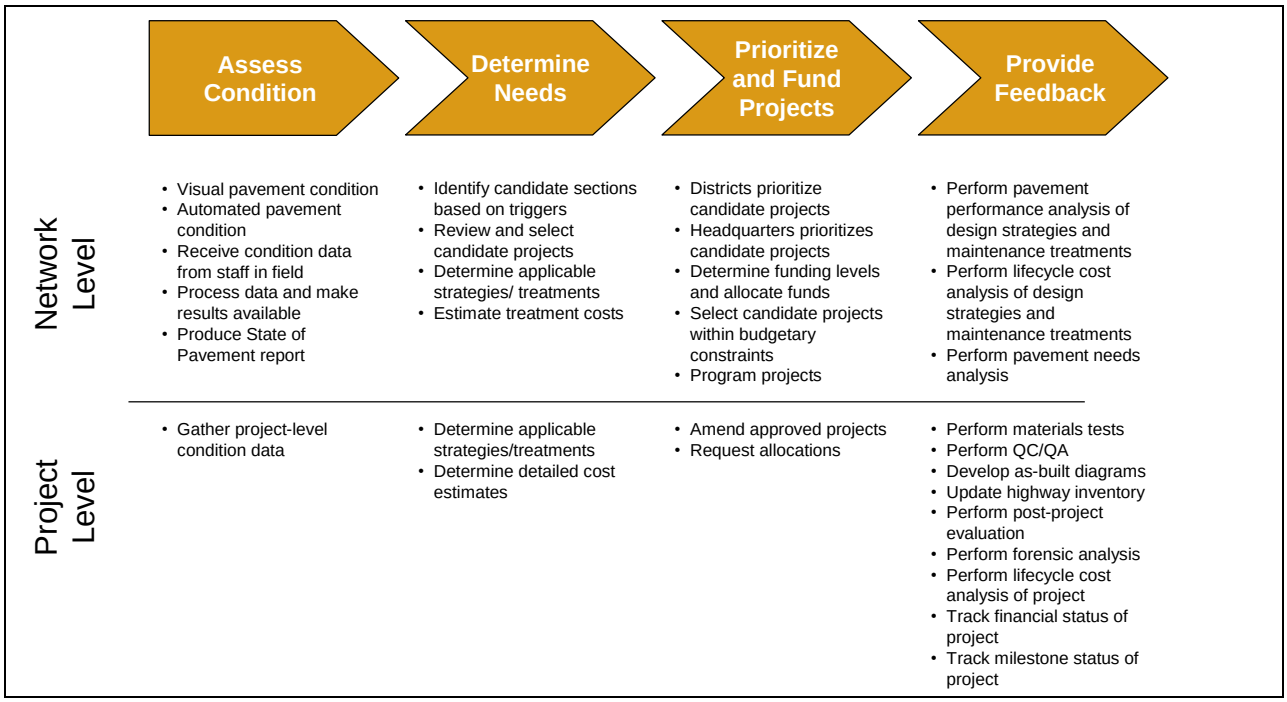
Standard processes to support pavement management have been established by the American Association of State Highway and Transportation Officials (AASHTO) in 2001 and published in the *Pavement Management Guide*, which identifies four major processes in pavement management:

- Assess condition.
- Determine needs.
- Prioritize and fund projects.
- Provide feedback.

The *Pavement Management Guide* also divides pavement management into two levels: the network level and the project level. The relationships between the major processes and levels, as well as the relevant subprocesses, are shown in the diagram below.

During the business process review the Department's processes were identified and are reflected in Figure 1.

Figure 1—Current Pavement Management Processes



The network and project levels of pavement management differ in both their purpose and the data required to evaluate them. The PMS will deal with the network level. Network level pavement management concerns itself with strategic decision-making for the state's highway network as a whole. Network level analysis determines the appropriate project mix within feasible funding options to meet the Department's goals and objectives. Decisions at the network level are generally made at headquarters, with input from the districts.

Under the new DPM, the proposed PMS will address the condition assessment, analysis, prioritization and funding, and feedback aspects of the pavement management process on a network level. Each one can be customized to meet the needs of the Department.

The condition assessment will amount to the data being processed to help rate the network on a segment-by-segment basis. These segments will be assigned a variety of numerical values or indices based on their current condition. The indices can be evaluated separately or in a combined fashion. The indices will be graduated to define a pavement segment as being very good, good, fair, poor, or very poor. The system will automate the way in which these indices are calculated, summarized, and reported.

The analysis will take the collected data and established indices, perform comparisons, and categorize the segments based on individual needs. A district may want to evaluate a certain pavement type (i.e., asphalt concrete) or the condition of a certain corridor (i.e., Interstate 5). The analysis can also determine the overall condition, or level of service, of the network and then prepare for determining what steps can be taken to either maintain or improve upon that condition or level of service. These are just a few of the analysis features that can be accomplished with the PMS.

The prioritization feature will organize the pavements in their appropriate conditions and rate them. This rating can then be used by the Department to decide which locations should be addressed as far as needs on a statewide basis. This would amount to a mix of locations requiring preservation, corrective, rehabilitation, or reconstruction. This optimization will be based on past and future deterioration of the each pavement segment.

The PMP Finance Letter allows the Department to make improvements to the current methods by collecting layer data of the pavement structure for the entire highway network and by enhancing the level of data collection in the annual survey by gathering the most pertinent and more detailed distress data. These two items will facilitate better decision-making by Department staff with regards to identifying network level needs.

The pavement structure inventory will allow the Department to better define the network by pavement type and therefore provide a better monitoring tool leading to reliable models for forecasting pavement performance. This data gives the Department a means of segmenting the network in a more manageable way.

The annual data collection will be done at the same location every year. By doing this the Department can monitor a pavement more accurately in terms of the rate of deterioration. The Department will have annual distress data that will give a better indication of how the pavement is currently performing as well as what can be anticipated as far as future performance. The data will be converted into indices that will categorize the pavements as very good, good, fair, poor and very poor, rather than the current distressed and not distressed categories.

These two items, along with expanding the categories of pavement conditions, will give the Department more accurate, reliable and timely information for deciding how the pavement program should budget the allocation in a current and future fiscal years.

4.2 TECHNICAL ENVIRONMENT

The technical environment currently supporting pavement management involves a single FoxPro database developed by the Division of Maintenance in 1998 to replace a mainframe system. There are also multiple, standalone spreadsheets, PC-based databases, and manual processes that reside in headquarters and the districts.

Several of the systems represent multiple processes that perform similar functions in headquarters and the districts. For instance, there are several project tracking databases used within headquarters and the districts, as well as dozens of spreadsheets used to store duplicate data regarding pavement performance analysis, lifecycle cost analysis, quality control and

quality assurance data, etc. Some of the systems represent a technology solution that is used by one or more districts but other districts still use paper or microfiche for the purpose of storing data such as construction as-builts, daily diaries, and materials tests.

Most of the highway network level systems and processes are currently maintained by the Division of Maintenance. Project level systems and processes span across several divisions, as one would expect in an agency dedicated to highway construction, design, maintenance, and operations.

While there is some connectivity, many of the systems are standalone and do not transfer data to or receive data from other systems. These systems are generally inaccessible to other interested parties.

4.2.1 EXISTING INFRASTRUCTURE

The current PCRS resides on a standalone server and is accessed through the Department's existing wide area network environment using Department standard personal computers. The other systems and tools used in the current pavement management process are primarily PC-based spreadsheets and user developed databases.

The Foxpro environment is not a supported Department standard and cannot be upgraded or modified sufficiently to meet business requirements. Implementation of the PMS will not involve any changes to the existing wide area network infrastructure.

5.0 PROPOSED SYSTEM

As part of ongoing efforts to improve pavement management and in support of the feasibility study process, the Department has performed an industry marketplace survey to identify and assess pavement management applications. In addition, other transportation entities were contacted to identify potential solutions to solve the Department's stated business and technical requirements. The Department review looked at commercial off-the-shelf (COTS), custom development, and modified off-the-shelf (MOTS) systems that were in use at other transportation agencies. These applications were compared to the objectives and functional requirements associated with the PMS.

5.1 SOLUTION DESCRIPTION

The proposed solution is to obtain a COTS solution through a competitive solicitation process. Assessment of multiple COTS products indicated that there are solutions in the marketplace that address all of the defined business needs of the Department.

The new PMS will be able to forecast which pavements will next need attention first, and at what levels, to extend the system's service life most economically.

The system will also provide robust query and reporting capabilities. These reports will replace and supplement existing reports. They will come from a single source and not have to rely on

gathering data from multiple locations. Query tools will give staff the ability to pull data in specific areas that the current PCRS doesn't provide.

5.1.1 HARDWARE

Based on the completed market analysis, it is assumed the selected PMS will be implemented on a dedicated application server, expected to be a dedicated dual processor Intel Xeon 3.0 GHz application server with 2GB of memory running Windows 2003 SR2 with one terabyte of storage. The specific configuration and costs will be determined by the procurement process.

5.1.2 SOFTWARE

The proposed system is to be a Web-based COTS application. The COTS solutions reviewed during the feasibility study typically were based on Windows servers using Oracle database configurations.

5.1.3 TECHNICAL PLATFORM

Diagram 1 provides a high-level overview of the anticipated PMS implementation.

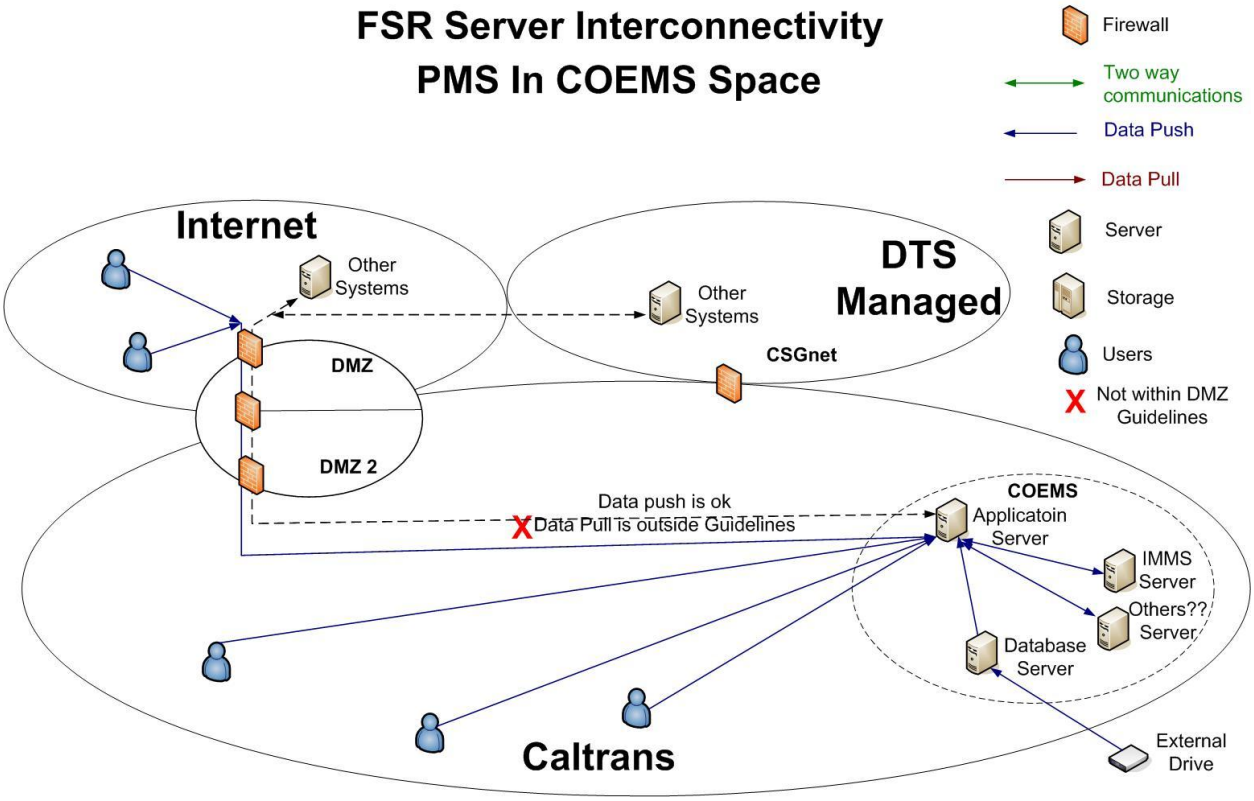


Diagram 1 – PMS Implementation at Caltrans

The database will reside on a department Oracle database server currently housed at the Department of Technology Services (DTS). After technical review, no augmentation of this server is anticipated to meet the needs of the PMS project.

5.1.4 DEVELOPMENT APPROACH

The COTS products reviewed during the feasibility study appear to meet the documented business needs of the Department. It's anticipated that the COTS product will require configuration to meet the Department's standards. The COTS products and vendors reviewed demonstrate experience and solutions which have been developed specifically to meet transportation needs.

The implementation of the COTS solution will be accomplished by a qualified and experienced vendor. The system and business requirements will be used by vendors to design, configure and implement the solution. The vendors will have familiarity with the implementation of their products in transportation agencies of similar size and scope of the Department.

5.1.5 INTEGRATION ISSUES

The PMS will not integrate with any other systems.

5.1.6 PROCUREMENT APPROACH

The PMS project will utilize a competitive procurement approach that will identify the best value business solution. This will be accomplished with assistance and guidance from the Department of General Services. The following tasks represent the expected milestones associated with the PMS procurement:

Develop and Issue an Invitation for Bid (IFB)
In developing the IFB the project will document final business functions and requirements, define interface requirements, specify and describe form and content of responses, and develop an evaluation and selection plan.

Conduct Post-IFB Release Sessions with Vendors
The project team will conduct open dialogue meetings with vendors (bidder's conference and confidential discussions) to promote an unbiased, positive environment, and reduce risk of inadequate responses or lack of responses by clarifying issues.

Evaluate Final Proposals and Select Solution
The project team will evaluate proposals based on an evaluation and selection plan identifying best overall value to the state.

5.1.7 TECHNICAL INTERFACES

Selected data from the following current Department enterprise databases will be imported to the PMS solution by the Department's Information Technology Solutions Division (ITSD) staff. The following existing databases will be addressed by the PMS project.

Existing Database	Data Import Requirements	Type of Data Elements
TDW	Truck traffic data.	Percentage of trucks and axle load.
HPMS	Highway geometry--annually.	Lane and shoulder widths.
Office Engineer Database	Project milestones--quarterly.	Bid opening, advertise dates, and approval dates.
TSN	Highway log--annually.	All highway log data elements.
CAS	Construction costs--quarterly.	Bid amount, final amount, and pavement costs.

In each of the cases it is anticipated the project will use Department Information Technology (IT) resources to establish the initial file extracts from each system, prepare file import processes to the PMS system, and develop ongoing operations for future extracts.

The recent pavement condition survey data collected, as a result of the recent changes in the distress elements to be surveyed, will be converted as part of the PMS project. All preexisting data will not be converted. The initial baseline data inventory will be established through the PMP inventory process.

5.1.8 TESTING PLAN

As part of the IFB, the bidders will be required to submit detailed testing, quality assurance, and system acceptance strategies and plans. For user acceptance and system testing, the selected vendor will be responsible for developing the test scripts. State staff will be responsible for executing the test scripts and validating and documenting the results.

5.1.9 RESOURCE REQUIREMENTS

The PMS will be implemented using existing Department resources and support from the selected PMS vendor. While actual staffing and other resource requirements will not be known until the procurement process is complete, it is estimated that a total of 4.6 PY (2.3 PY per year for two years) of Department resources in addition to vendor resources will be used on the implementation of the PMS.

5.1.10 TRAINING PLAN

A detailed training plan for both users and technical support will be required as part of the final procurement response.

The requirements for this plan will be based on Department program and technical staff working with vendor representatives to train key personnel who in turn will act as trainers for users. An ongoing training program will be developed from provided background

materials. It is anticipated that initially 25 users will require training. Some supplemental training may be required if elements of the selected PMS are not based on existing Department standards.

5.1.11 ONGOING MAINTENANCE

Ongoing operations and maintenance of the PMS will be performed through maintenance contracts with the selected vendor and be augmented by existing IT resources.

5.1.12 INFORMATION SECURITY

The system will comply with the Department's network, application, and data security policies and procedures.

5.1.13 CONFIDENTIALITY

There are no known confidentiality requirements associated with the PMS.

5.1.14 IMPACT ON END USERS

The users will be involved in defining the business requirements, user acceptance testing, training and implementation. The users will receive just-in-time training. A change management plan utilizing best practices will be developed and followed to ensure users are engaged in the project and well-prepared for the transition.

5.1.15 IMPACT ON EXISTING SYSTEMS

Because the initial baseline inventory of the state highway network will provide the data to populate the PMS it is not anticipated that there will be any impact on existing system. The current system (see Section 4.2) will be retired upon implementation of the PMS.

5.1.16 CONSISTENCY WITH OVERALL STRATEGIES

The PMS is consistent with the Department's Agency Information Management Strategy and specifically meets Strategy 2 of the August 2007 version which states "Invest in technology solutions that meet shared business needs and are as integrated as possible."

Based on a review of the solutions in the marketplace, it is assumed that the PMS solution will involve the implementation of an Oracle database to support the PMS requirements. This implementation will bring the PMS environment in line with the overall technology approach of the Department.

5.1.17 IMPACT ON CURRENT INFRASTRUCTURE

The IFB requirements for this procurement will be designed to ensure the implementation of the PMS will not have significant impact on the existing Department technical infrastructure.

5.1.18 IMPACT ON DATA CENTER(S)

The PMS will reside on a dedicated application server housed at DTS in the Customer Owned Equipment Managed Services (COEMS) environment.

The data will reside on an existing Oracle database server located at DTS in the COEMS environment. No augmentation of this server is anticipated to meet the needs of the PMS project.

5.1.19 DATA CENTER CONSOLIDATION

In accordance with Department policy, the PMS will reside at DTS in the COEMS environment.

5.1.20 BACKUP AND OPERATIONAL RECOVERY

The PMS will be available during normal operating hours Monday through Friday, 8:00 AM to 6:00 PM. Backup and operational recovery procedures will follow current practices.

5.1.21 PUBLIC ACCESS

No direct public access will be allowed to the PMS.

5.1.22 COSTS AND BENEFITS

The proposed solution, when populated with pavement structure and continuous pavement condition data, will be able to forecast which pavements will next need attention and at what levels; in effect extending service life.

The system will also provide querying and reporting capabilities. These reports will replace and supplement existing reports and will come from a single source, not relying on gathering data from multiple locations such as southern districts, districts having a single route running through them, or districts maintaining Portland cement concrete pavement. Query tools will give staff the ability to pull data on specific areas that the current PCRS does not provide.

While actual costs will be determined by the competitive procurement, estimated project costs are as follows:

The total project cost is $2,632,000 with a one-time cost of $1,836,000. The annual continuing cost is $531,000 with a 10% annual increase in subsequent years.

5.1.23 SOURCES OF FUNDING

The proposed system will be funded through a Budget Change Proposal for fiscal year 2009-2010 to be submitted in support of this Feasibility Study Report requesting an augmentation to the State Highway Account. There will be a redirection of funds for personal services.

5.2 RATIONALE FOR SELECTION

The Department has completed an assessment of the functionality and processing environment of a variety of COTS solutions. This initial assessment indicates that the marketplace includes products that meet all known Department functional requirements relating to the PMS. Implementing a proven COTS solution provides the lowest risk, lowest cost, and shortest timeframe in meeting the business needs of the Department.

5.3 OTHER ALTERNATIVES CONSIDERED

Other alternatives considered to solve the business problem included:

- 5.3.1. Replace the Current System – Custom Development
- 5.3.2. Update the Current System

Consideration was also given to initiating the Pavement Structure Inventory and Pavement Condition Survey without the implementation of a PMS. While some value will still be obtained by the analysis performed by the UCPRC, in order to fully realize the long-term benefits related to efficient investment in the quality of the State Highway System, it was determined that a fully functional PMS is necessary.

5.3.1 REPLACE THE CURRENT SYSTEM – CUSTOM DEVELOPMENT

Description

The business requirements for a PMS could be met by using a combination of in-house and contracted resources to develop a new system from scratch. This would involve the design and implementation of a custom database and the development and implementation of a set of tools that meet the reporting, analysis, and optimization needs of the PMP.

Costs

The total project cost is $4,510,000 with a one-time cost of $3,480,000. Beginning in FY 2012/13 the continuing cost is $185,000. Thereafter, the annual continuing cost is $845,000.

Benefits
By developing a custom solution the Department would retain complete control over all aspects of initial design and future enhancement. This would result in an environment that could adapt to changes in mandated or desired functionality. This would ensure the level of service provided by the PMP is consistently improved over time assuming development and implementation is done in a timely fashion.

Advantages
Custom development typically results in an environment that meets key functional needs. It also leads to an environment that is easier to support from a technical perspective as there is more control over the technical infrastructure.

Disadvantages
The primary disadvantages to custom development are the extensive time and resources required to develop and support the solution. Due to the complex nature of the functionality inherent in PMS solutions, it is likely that some compromises would have to be made under a custom development approach.

5.3.2 UPDATE THE CURRENT SYSTEM

Description
Analysis determined that modifying the current system is not a viable alternative due to the age and platform of the current applications. It is not possible to update the current database environment to completely support the data collection requirements of the PMP. Resources with the necessary skills to support the current system are becoming more difficult to find and the current systems have limited life remaining. The risk is high that these systems will fail in the future.

Other Transportation Entities – System Reviewed

As part of an earlier business process review of the current pavement management system, the Department contracted with Cambria Solutions in 2004 to survey other state agencies to determine what their pavement management systems were comprised of. There was nearly an even split between agencies who developed their system in-house and those who purchased COTS systems. These in-house systems were all developed as many as 15 years ago. Many of the state agencies that have upgraded systems have replaced in-house systems with COTS or purchased newer versions of existing COTS systems. There was a wide range of costs associated with the implementation of the systems, from $200,000 to $2,500,000. Every state agency had individual business rules and practices for analyzing and reporting. The review concluded that there were many different systems utilized and that it was up to each individual agency to determine what type of system best fit their needs. The Department determined that there was no specific state agency that had a system that warranted any further comparison beyond the survey.

6.0 PROJECT MANAGEMENT PLAN

This section of the FSR describes the project management plan and activities that the Department will use to help make this a successful project. The scope of this project is well defined. Risks that do exist can be mitigated with proper project planning and management.

6.1 PROJECT MANAGER QUALIFICATIONS

The IT project manager has the appropriate skills and knowledge to manage this project through implementation. Specifically, the IT project manager possesses the following:

- Skilled in IT project management policies, procedures, and tools to effectively manage the scope, schedule, and resources for this project.
- Skilled in oral and written communications to ensure appropriate and timely information is provided to all stakeholders.

- Skilled in IT systems development lifecycle to ensure the solution meets the stated business requirements.

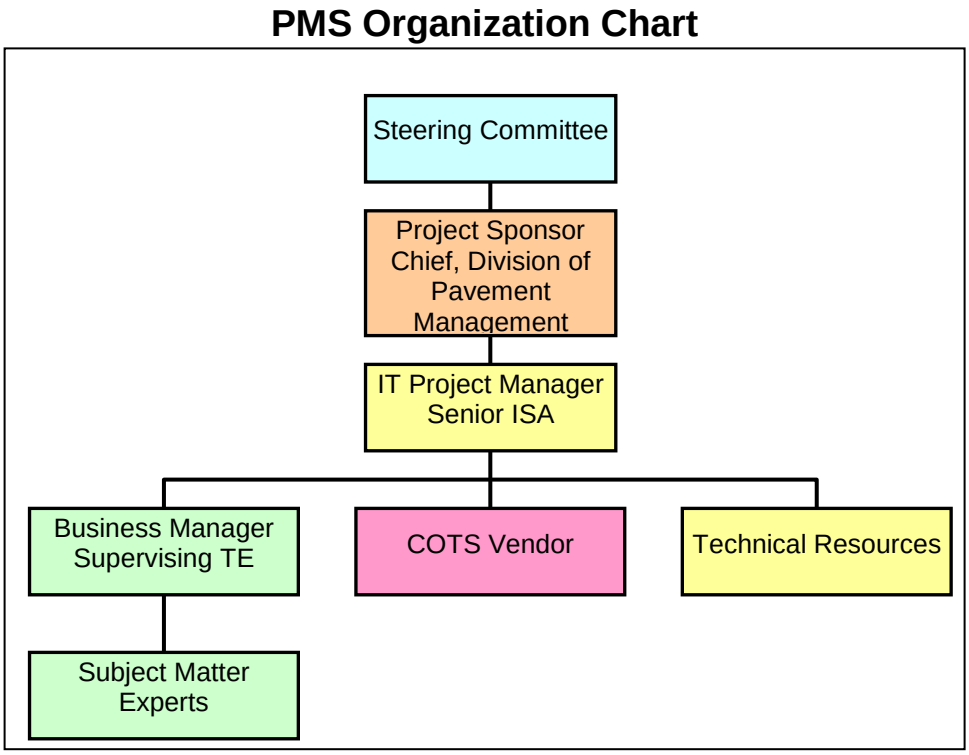
All of these requirements are addressed in this project's management team.

6.2 PROJECT MANAGEMENT METHODOLOGY

This project will utilize the Project Management Methodology defined in the State Information Management Manual (Section 200).

6.3 PROJECT ORGANIZATION

Project Organization Chart



6.4 PROJECT PRIORITIES

All projects have three major components that must be managed: schedule, scope, and resources. The priority of these components is used to guide management decisions during the life of the project. In this case, resources are the most flexible component. The resources assigned to the project can be increased if needed to ensure project success. Therefore, the resources component is categorized as "Improved". The project scope is somewhat flexible in that if certain scope issues are not immediately met, the benefits from the project are not diminished but postponed. Therefore, the scope variable is categorized as "Accepted". Schedule is the least flexible component, as failure to meet the defined project schedule would diminish the value of the project due to the upcoming enhanced pavement inventory effort. As the least flexible component, project schedule is categorized as "Constrained".

Schedule	Scope	Resources
Constrained	*Accepted*	*Improved*

6.5 PROJECT PLAN

6.5.1 PROJECT SCOPE

The purpose of the project is to acquire and implement a PMS which provides the PMP the tools necessary to meet the primary goal of implementing a proactive approach for prioritizing projects to maintain the quality of existing highway pavements.

6.5.2 PROJECT ASSUMPTIONS

The project team has identified the following assumptions, any of which could influence the ultimate success of the project:

- Adequate funding will be approved for the project in a timely fashion.
- The procurement process will result in a successful contract with a COTS solution vendor.
- The state's project management methodology will be utilized.
- The IT Project Management Office (PMO) will provide project support in the area of risk and oversight.

6.5.3 PROJECT PHASING

Because it is anticipated that this project will acquire a COTS solution which will be configured to meet all of the defined technical and functional requirements, project phasing is not appropriate for this effort.

6.5.4 ROLES AND RESPONSIBILITIES

1	Project Manager	Overall responsibility for project success. Manages the project's scope, schedule and resources. Develops and manages the following: Project Plan, Project Activities and Schedule, Quality Assurance Plan, Communications Plan, Risk Management Plan, and Procurement Plan.
2	Business Manager	Support the Project Manager to ensure the success of the project. Lead the development of the business requirements. Lead the quality assurance and testing activities to ensure all business requirements are met. Lead the communications and change management activities to ensure all stakeholders are engaged and prepared for the transition to the new system. Lead the training activities to ensure the users are trained appropriately.
3	Technical Experts	Configure and install hardware, and operating system and database software. Develop and maintain the file extracts to and from other systems. Ensure the proposed solution meets network, application and data security policies and procedures.
5	Project Sponsor	Provides vision for the project. Ensure that required funding is available. Ensure that resources for the project are provided.
6	PMS Steering Committee	Addresses project related risks and issues that cannot be resolved at the project level. Monitors the progress of the project. Guides the project to ensure the project's goals and objectives are met. Advises the project manager.
7	Subject Matter Expert	Identifies business rules and policies that must be enforced by the system. Identifies needed data to be pre-populated in the system. Designs system generated reports and forms. Answers key business questions. Facilitates user group workshops. Participates in business fit gap analysis. Defines user security requirements. Provides input on business-based design issues. Assists in establishing requirements. Provides periodic reviews of project. Address system issues from developers, vendors, or users. Ensure project changes are documented.

6.5.5 PROJECT SCHEDULE

Milestone	Deliverable	Completion Date
Project Initiation		
Develop consultant contracts.		Contract Award
Form project team.		
Develop project management plan.	Project management plan	
Requirements Definition	Final functional requirements.	+ 45 days
Complete Analysis		
Review selected COTS.		+ 30 days
Define PMS model.	User signoff of model.	+ 45 days
Identify configuration.	Sign-off on configuration.	+ 60 days
Project Management Plans		
Create project plan.	Project plan.	+ 45 days
Create acceptance plan.	Acceptance plan.	+ 45 days
Create training plan.	Training plan.	+ 45 days
Create test plan.	Test plan.	+ 45 days
Integration Development		
Secure resources.		+ 30 days
Database setup.	Database	+ 250 days
Database integration.	Database integration.	+ 360 days
Configuration and Implementation		
Procure hardware.	Hardware delivery.	+ 180 days
Customize standard reports.	Reports.	+ 350 days
User review of interfaces.	User signoff.	+ 450 days
Configuration of user interfaces.		+ 570 days
System Test Execution		
Create final acceptance test scripts.	Acceptance test scripts.	+ 500 days
Create acceptance data.	System test files.	+ 500 days
Test system.	User sign-off of test results.	+ 600 days
Install system in production.	System “live.”	+ 615 days
Implementation completion.	Final sign-off.	+ 630 days
Close out		
Accept system.	User sign-off of installed production system.	+ 630 days
Create lessons learned.	Lessons learned documentation.	+ 660 days
Write Post-Implementation Evaluation Report.	Post-Implementation Evaluation Report.	+ 660 days

6.6 PROJECT MONITORING

Each information technology project management team will track the status and monitor the progress of defined project activities against the Project Management Plan and will document variance in terms of scope, schedule, and cost, as required for all IT projects within the Department.

DPM and IT staff will work closely with the project team to monitor project progress. Good communication is essential to the success of the project. Project management tools will aid tracking. The tools will document and track stages of the project, project milestones, activities within stages, tasks within activities, and resources assigned to each task. By combining staff expertise with effective project management, the Department can monitor the project while ensuring effective communication and knowledge transfer relating to the system. Tracking costs on a timely basis will help ensure that the project stays within budget guidelines.

Monthly project status reports will be submitted to the PMO which will perform project oversight.

6.7 PROJECT QUALITY

Caltrans will maintain processes and organizational entities to ensure that quality assurance is performed for information technology products that will include meeting stated business requirements and technology standards.

In order to ensure that the PMS meets identified business and technical objectives and requirements, the project manager will develop a quality assurance plan based on the Project Management Methodology. One of the most important quality assurance measures is the inclusion of users as advisors and reviewers throughout the project. The quality assurance plan will have the following elements:

- Measurable objectives and functional requirements.
- Acceptance testing plan.
- Issue resolution plan.
- Regularly scheduled audits and reviews of key tasks.
- Interface with the Risk Management Plan.

In addition, user participation is critical to determine that the resulting system functions as required. Users will:

- Help define requirements during business process confirmation tasks.
- Participate in design review.
- Help define test procedures.
- Review all project deliverables.
- Take part in periodic acceptance reviews.
- Participate in the final acceptance review process.

Active participation throughout the project lifecycle will help the PMS user community take ownership of the system and recognize it as a critical tool that is needed to effectively and efficiently perform the job.

6.8 CHANGE MANAGEMENT

The project scope will be strictly adhered to. If deviations from the scope become warranted for reasons beyond the control of the project team and the contractor, the Risk Management Plan, detailed is Section 7.0, will be consulted first. The contractor and project manager will agree on any changes to the scope and obtain approval from the project sponsor before processing proposed scope modifications. If the mitigation remedy requires a change in the functionality, completeness, or quality of the delivered system, the project team will ensure that the change does not affect the project budget. The project team will not seek a contract amendment to augment project funds as an acceptable remedy. The project manager will consult with the project sponsor before allowing any changes to the project schedule.

Following the initial implementation of the PMS, the contractor will continue to maintain the system for one year. All problem reports will be submitted to the contractor for resolution. Upon completion of the one year maintenance period the system will be maintained under the auspices of PMS maintenance team. All problem reports and change requests will be submitted electronically to the online change management system for logging and tracking. The problem reports and change requests will be discussed and assessed weekly by the maintenance team. Software changes will be assigned to either an application maintenance contractor or a sustaining engineering contractor. Database changes will be assigned to an application database contractor. System administration and database software maintenance will be assigned to headquarters IT support staff.

6.9 AUTHORIZATION REQUIRED

In addition to internal Caltrans approval, the State Office of the Chief Information Officer's approval is required for this FSR.

7.0 RISK MANAGEMENT PLAN

In order to mitigate the risks involved with implementing the PMS, the project team will create a risk management plan. The plan will focus on four areas:

- Risk identification.
- Risk assessment.
- Risk response.
- Risk documentation.

The project manager will act as the risk manager. The project manager will lead the project team in identifying and evaluating project risk. The project manager will work with the PMO to obtain an independent perspective on the project management and risk management activities of the project. The PMO liaison will oversee risk management for the project and will advise the

project manager regarding risks and mitigation methods. The project sponsor will assume ultimate responsibility for managing project risk.

The initial risk management session involving the project participants will be conducted after the project kickoff. Based on the results of this session, additional risk management activities may be identified for inclusion in the project plan. The project manager will lead the project team in developing and managing appropriate risk mitigation strategies. The project manager will use a risk management worksheet to monitor known risks, chart new risks, and manage mitigation activities.

During the life of the project monthly progress reports will include references to the specific risks relevant to the reporting period. In addition, weekly status meetings will address relevant risks. If new risks are identified between weekly status meetings, the project manager will decide whether or not consideration of the risk can be safely deferred until the next meeting. If not, the project manager will convene the project team and conduct a special risk management session to specifically address emerging risks and define any additional risk mitigation activities that may be required.

7.1 RISK MANAGEMENT WORKSHEET

The following table includes a description of identified risk, information related to the probability of a specific risk, a preventive measure, and contingency plan. As it relates to this table, "Risk to Schedule" is defined as the likelihood of the risk occurring and the impact on the schedule and is represented as Probability/Impact. A value from 0 (low risk) to 10 (high risk) is used to express the risk probability and the second number is the impact on the schedule. For example, 1/7 would mean there is not much chance of this risk occurring, but if it does the impact would be significant. "Preventive Measures" are those steps taken to minimize the effect of the risk event happening or affecting the project.

ID	Risk Event	Risk To Schedule Probability/Impact	Preventive Measures	Contingency Measures
1	Scope creep due to new or changing requirements.	8/5	Manage user expectations and scope of the project by closely monitoring the original work plan and original project objectives.	Modify schedule and budget for increase or remove other functionally from system for new requirements.
2	Inadequate technical knowledge of solution.	8/5	Project team needs to stress training and retention of appropriate resources.	Insure appropriate contract vehicles are available for short-term help.
3	User resistance to change.	6/3	Keep motivated users involved in development and testing and they will sell the system to their peers.	Implement while tracking changes and alternatives desired.

ID	Risk Event	Risk To Schedule Probability/Impact	Preventive Measures	Contingency Measures
4	Funding reduced or lost.	1/5	Develop components in house prior to hiring contractor to finish system. Provide an assessment of the adverse impact of canceling the project to management.	Reduce scope of project to a working deliverable within the existing budget.
5	Project loses management support or visibility.	1/8	Make sure weekly status is up to date, factual and status shows good progress as well as supporting ROI.	Reinvigorate management and obtain approval of subsequent cost and schedule.
6	Project sponsorship inadequate or not visible.	1/7	Engage project sponsor in meetings with the project manager and steering committee.	Review Project Management process and ensure being followed.
7	Lack of user involvement.	1/4	Involve users in requirements, design and testing.	Assign alternative user resources.
8	Late project delivery.	3/6	Utilize detailed planning Implement rigorous scope control.	Create new schedule and assess where bottle necks can be eliminated.
9	Cost overrun	2/3	Implement rigorous scope control through the review of project financials on a weekly basis.	Develop contingency plan for obtaining additional resources or reducing project scope.
10	Loss of key staff	5/7	Cross training, documentation of all processes. Transfer responsibilities to contractor or move to other IT staff.	Assign alternative resources.

7.1.2 Risk Mitigation

This project will utilize a formal issue resolution process to identify, track, and resolve issues on a regular basis. Project risk is often associated with an issue that threatens to impede project progress. If increased resources or funding can negate the risk the team will address this possibility, but in today's state of financial downsizing, this cannot be relied upon to address most risk problems. As dictated by the project's issue resolution process, team leaders and project managers will address issues at the status meetings, and assess the ability

to resolve or limit the risk to the project. The project team will take the following steps to identify, mitigate, track, and communicate actual risks:

- Review each issue to determine associated risk.
- Upon identification, document the risk in the issue database.
- Identify and document the probability of the risk affecting the project. The team will identify the probability of each risk affecting the project, and the project manager will document the mitigation, or action required to reduce impact.
- Determine and document the mitigation measures for each risk. The attendees of the project status meeting will discuss how to mitigate the identified risk. If necessary, the project manager will assign an individual the responsibility of implementing the mitigation procedures. The project manager will document the contingency measures in the issue management database.
- Reassess each outstanding risk weekly. Review of each risk will take place at the project manager meeting, where each risk is updated as needed or the risk is removed from the issue management database.

7.2 RISK TRACKING AND CONTROL

Risk tracking will be handled through weekly status updates showing changes in risk levels and through issue and change control documentation.

8.0 ECONOMIC ANALYSIS WORKSHEETS

EXISTING SYSTEM/BASELINE COST WORKSHEET

Department: Transportation

All costs to be shown in whole (unrounded) dollars.

Date Prepared: 06/24/08

Project: Pavement Management System

	FY 2009/10		FY 2010/11		FY 2011/12		FY 2012/13		FY 2013/14		FY 2014/15		TOTAL	
	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts
Continuing Information Technology Costs														
Staff (salaries & benefits)	1.0	110,000	1.0	110,000	1.0	110,000	1.0	110,000	0.0	0	0.0	0	**4.0**	**440,000**
Hardware Lease/Maintenance		0		0		0		0		0		0		**0**
Software Maintenance/Licenses		0		0		0		0		0		0		**0**
Contract Services		0		0		0		0		0		0		**0**
Data Center Services		0		0		0		0		0		0		**0**
Agency Facilities		0		0		0		0		0		0		**0**
Other		0		0		0		0		0		0		**0**
Total IT Costs	**1.0**	**110,000**	**1.0**	**110,000**	**1.0**	**110,000**	**1.0**	**110,000**	**0.0**	**0**	**0.0**	**0**	**4.0**	**440,000**
Continuing Program Costs:														
Staff*	11.0	1,293,960	11.0	1,293,960	11.0	1,293,960	11.0	1,293,960	0.0	0	0.0	0	**44.0**	**5,175,840**
Other**		5,888,000		8,120,000		4,408,000		4,408,000		0		0		**22,824,000**
Total Program Costs	**11.0**	**7,181,960**	**11.0**	**9,413,960**	**11.0**	**5,701,960**	**11.0**	**5,701,960**	**0.0**	**0**	**0.0**	**0**	**44.0**	**27,999,840**
TOTAL EXISTING SYSTEM COST	**12.0**	**7,291,960**	**12.0**	**9,523,960**	**12.0**	**5,811,960**	**12.0**	**5,811,960**	**0.0**	**0**	**0.0**	**0**	**48.0**	**28,439,840**

* Two full time program staff in Division of Pavement and 9 PY equivalents in other areas

** Pavement Structure Inventory (FY09/10 & FY10/11 only) and Annual Pavement Condition Survey and related UCPRC Analysis

Proposed Alternative Conduct Procurement to select Commercial off-the-shelf (COTS) System

Department: Transportation
Project: Pavement Management System

All Costs Should Be Shown In Whole (Unrounded) Dollars.

Date Prepared: 06/24/08

	FY 2009/10		FY 2010/11		FY 2011/12		FY 2012/13		FY 2013/14		FY 2014/15		TOTAL	
	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts
One-Time IT Project Costs														
Staff (Salaries & Benefits)	2.3	253,000	2.3	253,000	0.0	0	0.0	0	0.0	0	0.0	0	4.6	506,000
Hardware Purchase		50,000		0		0		0		0		0		50,000
Software Purchase/License		530,000		0		0		0		0		0		530,000
Telecommunications		0		0		0		0		0		0		0
Contract Services														
Software Customization		0		0		0		0		0		0		0
Project Management		100,000		100,000		0		0		0		0		200,000
Project Oversight		100,000		50,000		0		0		0		0		150,000
IV&V Services		0		0		0		0		0		0		0
Other Contract Services*		100,000		300,000		0		0		0		0		400,000
TOTAL Contract Services		300,000		450,000		0		0		0		0		750,000
Data Center Services		0		0		0		0		0		0		0
Agency Facilities		0		0		0		0		0		0		0
Other		0		0		0		0		0		0		0
Total One-time IT Costs	**2.3**	**1,133,000**	**2.3**	**703,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**4.6**	**1,836,000**
Continuing IT Project Costs														
Staff (Salaries & Benefits)	0.0	0	1.0	110,000	1.6	176,000	0.0	0	0.0	0	0.0	0		286,000
Hardware Lease/Maintenance		0		0		0		0		0		0		0
Software Maintenance/Licenses		0		110,000		110,000		0		0		0		220,000
Telecommunications		0		0		0		0		0		0		0
Contract Services		0		0		200,000		0		0		0		200,000
Data Center Services		0		45,000		45,000		0		0		0		90,000
Agency Facilities		0		0		0		0		0		0		0
Other		0		0		0		0		0		0		0
Total Continuing IT Costs	**0.0**	**0**	**1.0**	**265,000**	**1.6**	**531,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**2.6**	**796,000**
Total Project Costs	**2.3**	**1,133,000**	**3.3**	**968,000**	**1.6**	**531,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**7.2**	**2,632,000**
Continuing Existing Costs														
Information Technology Staff	1.0	110,000	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	1.0	110,000
Other IT Costs		0		0		0		0		0		0		0
Total Continuing Existing IT Costs	**1.0**	**110,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**1.0**	**110,000**
Program Staff	11.0	1,293,960	11.0	1,293,960	11.0	1,293,960	11.0	1,293,960	0.0	0	0.0	0	44.0	5,175,840
Other Program Costs		5,888,000		8,120,000		4,358,000		4,358,000		0		0		22,724,000
Total Continuing Existing Program Cos	**11.0**	**7,181,960**	**11.0**	**9,413,960**	**11.0**	**5,651,960**	**11.0**	**5,651,960**	**0.0**	**0**	**0.0**	**0**	**44.0**	**27,899,840**
Total Continuing Existing Costs	**12.0**	**7,291,960**	**11.0**	**9,413,960**	**11.0**	**5,651,960**	**11.0**	**5,651,960**	**0.0**	**0**	**0.0**	**0**	**45.0**	**28,009,840**
TOTAL ALTERNATIVE COSTS	**14.3**	**8,424,960**	**14.3**	**10,381,960**	**12.6**	**6,182,960**	**11.0**	**5,651,960**	**0.0**	**0**	**0.0**	**0**	**52.2**	**30,641,840**
INCREASED REVENUES		0		0		0		0		0		0		**0**

* Configuration services, data conversion, and training services provided by selected COTS vendor

ALTERNATIVE #1: Develop Oracle Database and Custom Develop Reporting/Analysis Tools

Date Prepared: 06/24/08

Department: Transportation
Project: Pavement Management System

All Costs Should be shown in whole (unrounded) dollars.

	FY 2009/10		FY 2010/11		FY 2011/12		FY 2012/13		FY 2013/14		FY 2014/15		TOTAL	
	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts
One-Time IT Project Costs														
Staff (Salaries & Benefits)	3.0	360,000	3.0	360,000	3.0	360,000	0.0	0	0.0	0	0.0	0	9.0	1,080,000
Hardware Purchase*		200,000		200,000		0		0		0		0		400,000
Software Purchase/License		0		0		0		0		0		0		0
Telecommunications		0		0		0		0		0		0		0
Contract Services														
Software Customization**		450,000		450,000		450,000		0		0		0		1,350,000
Project Management		100,000		100,000		100,000		0		0		0		300,000
Project Oversight		150,000		150,000		150,000		0		0		0		450,000
IV&V Services		0		0		0		0		0		0		0
Other Contract Services***		0		0		200,000		0		0		0		200,000
TOTAL Contract Services		700,000		700,000		900,000		0		0		0		2,300,000
Data Center Services		0		0		0		0		0		0		0
Agency Facilities		0		0		0		0		0		0		0
Other		0		0		0		0		0		0		0
Total One-time IT Costs	**3.0**	**1,260,000**	**3.0**	**1,260,000**	**3.0**	**1,260,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**9.0**	**3,780,000**
Continuing IT Project Costs														
Staff (Salaries & Benefits)	0.0	0	0.0	0	0.0	0	3.0	360,000	0.0	0	0.0	0	3.0	360,000
Hardware Lease/Maintenance		0		0		75,000		75,000		0		0		150,000
Software Maintenance/Licenses		0		0		0		0		0		0		0
Telecommunications		0		0		0		0		0		0		0
Contract Services		0		0		0		300,000		0		0		300,000
Data Center Services		0		0		110,000		110,000		0		0		220,000
Agency Facilities		0		0		0		0		0		0		0
Other		0		0		0		0		0		0		0
Total Continuing IT Costs	**0.0**	**0**	**0.0**	**0**	**0.0**	**185,000**	**3.0**	**845,000**	**0.0**	**0**	**0.0**	**0**	**3.0**	**1,030,000**
Total Project Costs	**3.0**	**1,260,000**	**3.0**	**1,260,000**	**3.0**	**1,445,000**	**3.0**	**845,000**	**0.0**	**0**	**0.0**	**0**	**12.0**	**4,810,000**
Continuing Existing Costs														
Information Technology Staff	1.0	110,000	1.0	110,000	1.0	110,000	0.0	0	0.0	0	0.0	0	3.0	330,000
Other IT Costs		0		0		0		0		0		0		0
Total Continuing Existing IT Costs	**1.0**	**110,000**	**1.0**	**110,000**	**1.0**	**110,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**3.0**	**330,000**
Program Staff	11.0	1,296,960	11.0	1,296,960	11.0	1,296,960	11.0	1,296,960	0.0	0	0.0	0	44.0	5,187,840
Other Program Costs		5,888,000		8,120,000		4,408,800		4,358,000		0		0		22,774,800
Total Continuing Existing Program Cos	**11.0**	**7,184,960**	**11.0**	**9,416,960**	**11.0**	**5,705,760**	**11.0**	**5,654,960**	**0.0**	**0**	**0.0**	**0**	**44.0**	**27,962,640**
Total Continuing Existing Costs	**12.0**	**7,294,960**	**12.0**	**9,526,960**	**12.0**	**5,815,760**	**11.0**	**5,654,960**	**0.0**	**0**	**0.0**	**0**	**47.0**	**28,292,640**
TOTAL ALTERNATIVE COSTS	**15.0**	**8,554,960**	**15.0**	**10,786,960**	**15.0**	**7,260,760**	**14.0**	**6,499,960**	**0.0**	**0**	**0.0**	**0**	**59.0**	**33,102,640**
INCREASED REVENUES		0		0		0		0		0		0		**0**

*Includes production and development hardware
**Oracle DB development - Custom Reporting/Analysis Tools Development
*** Data conversion and training

ECONOMIC ANALYSIS SUMMARY

Date Prepared: 06/24/08

Department: Transportation

All costs to be shown in whole (unrounded) dollars.

Project: Pavement Management System

	FY 2009/10		FY 2010/11		FY 2011/12		FY 2012/13		FY 2013/14		FY 2014/15		TOTAL	
	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts
EXISTING SYSTEM														
Total IT Costs	1.0	110,000	1.0	110,000	1.0	110,000	1.0	110,000	0.0	0	0.0	0	4.0	440,000
Total Program Costs	11.0	7,181,960	11.0	9,413,960	11.0	5,701,960	11.0	5,701,960	0.0	0	0.0	0	44.0	27,999,840
Total Existing System Costs	12.0	7,291,960	12.0	9,523,960	12.0	5,811,960	12.0	5,811,960	0.0	0	0.0	0	48.0	28,439,840
PROPOSED ALTERNATIVE	**Conduct Procurement to select Commercial off-the-shelf (COTS) System**													
Total Project Costs	2.3	1,133,000	3.3	968,000	1.6	531,000	0.0	0	0.0	0	0.0	0	7.2	2,632,000
Total Cont. Exist. Costs	12.0	7,291,960	11.0	9,413,960	11.0	5,651,960	11.0	5,651,960	0.0	0	0.0	0	45.0	28,009,840
Total Alternative Costs	14.3	8,424,960	14.3	10,381,960	12.6	6,182,960	11.0	5,651,960	0.0	0	0.0	0	52.2	30,641,840
COST SAVINGS/AVOIDANCES	(2.3)	(1,133,000)	(2.3)	(858,000)	(0.6)	(371,000)	1.0	160,000	0.0	0	0.0	0	(4.2)	(2,202,000)
Increased Revenues		0		0		0		0		0		0		0
Net (Cost) or Benefit	(2.3)	(1,133,000)	(2.3)	(858,000)	(0.6)	(371,000)	1.0	160,000	0.0	0	0.0	0	(4.2)	(2,202,000)
Cum. Net (Cost) or Benefit	(2.3)	(1,133,000)	(4.6)	(1,991,000)	(5.2)	(2,362,000)	(4.2)	(2,202,000)	(4.2)	(2,202,000)	(4.2)	(2,202,000)		
ALTERNATIVE #1	**Develop Oracle Database and Custom Develop Reporting/Analysis Tools**													
Total Project Costs	3.0	1,260,000	3.0	1,260,000	3.0	1,445,000	3.0	845,000	0.0	0	0.0	0	12.0	4,810,000
Total Cont. Exist. Costs	12.0	7,294,960	12.0	9,526,960	12.0	5,815,760	11.0	5,654,960	0.0	0	0.0	0	47.0	28,292,640
Total Alternative Costs	15.0	8,554,960	15.0	10,786,960	15.0	7,260,760	14.0	6,499,960	0.0	0	0.0	0	59.0	33,102,640
COST SAVINGS/AVOIDANCES	(3.0)	(1,263,000)	(3.0)	(1,263,000)	(3.0)	(1,448,800)	(2.0)	(688,000)	0.0	0	0.0	0	(11.0)	(4,662,800)
Increased Revenues		0		0		0		0		0		0		0
Net (Cost) or Benefit	(3.0)	(1,263,000)	(3.0)	(1,263,000)	(3.0)	(1,448,800)	(2.0)	(688,000)	0.0	0	0.0	0	(11.0)	(4,662,800)
Cum. Net (Cost) or Benefit	(3.0)	(1,263,000)	(6.0)	(2,526,000)	(9.0)	(3,974,800)	(11.0)	(4,662,800)	(11.0)	(4,662,800)	(11.0)	(4,662,800)		

PROJECT FUNDING PLAN

Department: Transportation

All Costs to be in whole (unrounded) dollars

Date Prepared: 06/24/08

Project: Pavement Management System

	FY 2009/10		FY 2010/11		FY 2011/12		FY 2012/13		FY 2013/14		FY 2014/15		TOTALS	
	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts	PYs	Amts
TOTAL PROJECT COSTS	**2.3**	**1,133,000**	**3.3**	**968,000**	**1.6**	**531,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**7.2**	**2,632,000**
RESOURCES TO BE REDIRECTED														
Staff	2.3	253,000	3.3	363,000	1.6	176,000	0.0	0	0.0	0	0.0	0	**7.2**	**792,000**
Funds:														
Existing System		0		0		0		0		0		0		**0**
Other Fund Sources		0		0		0		0		0		0		**0**
TOTAL REDIRECTED RESOURCES	**2.3**	**253,000**	**3.3**	**363,000**	**1.6**	**176,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**7.2**	**792,000**
ADDITIONAL PROJECT FUNDING NEEDED														
One-Time Project Costs	0.0	880,000	0.0	450,000	0.0	0	0.0	0	0.0	0	0.0	0	**0.0**	**1,330,000**
Continuing Project Costs	0.0	0	0.0	155,000	0.0	355,000	0.0	0	0.0	0	0.0	0	**0.0**	**510,000**
TOTAL ADDITIONAL PROJECT FUNDS NEEDED BY FISCAL YEAR	**0.0**	**880,000**	**0.0**	**605,000**	**0.0**	**355,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**0.0**	**1,840,000**
TOTAL PROJECT FUNDING	**2.3**	**1,133,000**	**3.3**	**968,000**	**1.6**	**531,000**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**	**7.2**	**2,632,000**
Difference: Funding - Costs	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	**0.0**	**0**

Total Estimated Cost Savings	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	**0.0**	**0**

ADJUSTMENTS, SAVINGS AND REVENUES WORKSHEET
(DOF Use Only)

Department: Transportation

Project: Pavement Management System

Date Prepared: 06/24/08

	FY 2009/10		FY 2010/11		FY 2011/12		FY 2012/13		FY 2013/14		FY 2014/15		Net Adjustments	
Annual Project Adjustments	**PYs**	**Amts**	**PYs**	**Amts**	**PYs**	**Amts**	**PYs**	**Amts**	**PYs**	**Amts**	**PYs**	**Amts**	**PYs**	**Amts**
One-time Costs														
Previous Year's Baseline	0.0	0	0.0	880,000	0.0	450,000	0.0	0	0.0	0	0.0	0		
(A) Annual Augmentation /(Reduction	**0.0**	**880,000**	**0.0**	**(430,000)**	**0.0**	**(450,000)**	**0.0**	**0**	**0.0**	**0**	**0.0**	**0**		
(B) Total One-Time Budget Actions	0.0	880,000	0.0	450,000	0.0	0	0.0	0	0.0	0	0.0	0	**0.0**	**1,330,000**
Continuing Costs														
Previous Year's Baseline	0.0	0	0.0	0	0.0	155,000	0.0	355,000	0.0	0	0.0	0		
(C) Annual Augmentation /(Reduction	**0.0**	**0**	**0.0**	**155,000**	**0.0**	**200,000**	**0.0**	**(355,000)**	**0.0**	**0**	**0.0**	**0**		
(D) Total Continuing Budget Actions	0.0	0	0.0	155,000	0.0	355,000	0.0	0	0.0	0	0.0	0	**0.0**	**510,000**
Total Annual Project Budget Augmentation /(Reduction) [A + C]	**0.0**	**880,000**	**0.0**	**(275,000)**	**0.0**	**(250,000)**	**0.0**	**(355,000)**	**0.0**	**0**	**0.0**	**0**		

[A, C] Excludes Redirected Resources

Total Additional Project Funds Needed [B + D]	**0.0**	**1,840,000**

Annual Savings/Revenue Adjustments

Cost Savings	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0		
Increased Program Revenues		0		0		0		0		0		0		