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# Caltrans Maintenance Program

## Module 1: The Purpose of Evaluation

### Learning Objectives

By reading and comprehending the information in this training module, you should:

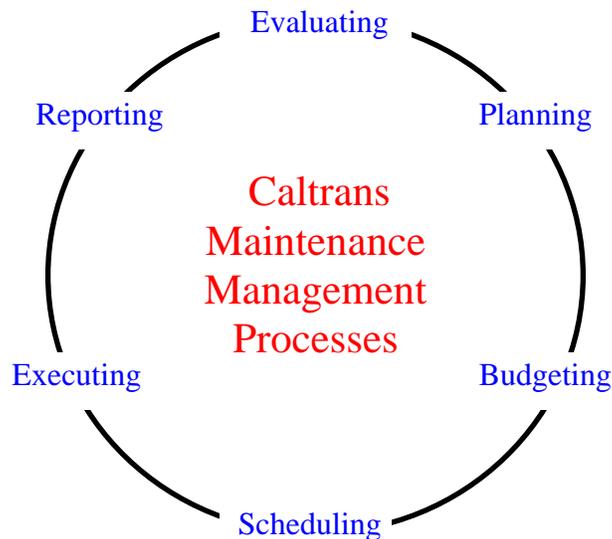
- Understand the basic components of Caltrans integrated management process;
- Appreciate the critical role evaluation plays in supporting maintenance planning and budgeting;
- Understand how planning must influence action to be of value; and
- Understand how the degree to which plans influence action is measured through expenditures and evaluation results.

### Section A: The Integrated Management Process

As a member of an important corps of professional evaluators, you should know and understand the fundamental management principles upon which your work is based. You should also gain a profound appreciation for the way your work will support Caltrans' use of management information. This module focuses on these fundamentals.

The principles outlined in this module apply to all private and public organizations, which, like Caltrans, must meet the expectations of internal and external stakeholders. Exhibit 1-1 below presents the core components of a new, more formal, management process recently adopted by the Caltrans Maintenance Program. As you can see, the process is a continuum; each component is accomplished as part of a continuing cycle. The timing for each component is most influenced by California's legislative budget cycle.

## Exhibit 1-1



Consciously or subconsciously, everyone follows this cycle. We all assess our current position, envision desired changes/improvements, set goals, take action, and periodically review our progress. Formally or informally, managers in organizations such as Caltrans do the same thing. You would be hard pressed to find any Area Superintendent who does not know the problems in his/her assigned highway inventory and he/she would be the first to tell you that they and their crews are working hard to solve them. However, very few would be able to show you a prioritized list of the problems, a schedule of action, and mechanisms to measure progress. Such documentation is essential in a professionally managed organization for many reasons.

It is essential that thorough and accurate management information is available to estimate and present resource needs to funding authorities. There must also be mechanisms in place to assure the funding authorities that expenditures are spent as planned. Such planning, budgeting, and implementation requires a formal process like the one presented above. Each component is briefly described in the following paragraphs.

- **Evaluating:** The Caltrans management process starts with an honest assessment of needs. For a highway maintenance organization, the source of all workload is the inventory. Therefore, it is appropriate that periodic snapshots of conditions be taken to 1) identify the degree to which existing resources are able to keep up with the demands of the inventory and 2) assess the overall short and mid-term maintenance needs of inventory elements. This is what the LOS2000 evaluation process is designed to accomplish. District managers will use evaluation information to address immediate needs you bring to their attention. They will also use LOS2000 evaluation information, along with their own knowledge, existing workload backlogs and data

from other evaluation programs to estimate maintenance required during the next funding cycle. Finally, District and headquarters management will use the evaluation data to set strategic and tactical priorities for the Maintenance Program.

- **Planning:** Plans are generally expressions of how managers closest to and most familiar with highway maintenance needs propose to meet those needs. In transportation agencies, these managers are usually district staff and managers who are dealing daily with the maintenance demands of their assigned highway inventory and its users. Plans typically reflect priorities set based on the evaluation and describe the workloads and associated resource requirements that will produce desired results. For Caltrans' Maintenance Program, results include; 1) changes in customer satisfaction and 2) changes in asset life.
- **Budgeting:** What the Maintenance Program can accomplish is sometimes limited by the resources approved through California's annual legislative budget process. This process has traditionally yielded incremental changes in appropriations that are based on average historical costs being applied to assets, which have been added to the State's highway inventory. In the future, Caltrans' budget process will be improved to assure that documented needs (from evaluations) drive formal plans; formal plans drive budget requests; authorized funding is translated into revised expenditure plans; and actual spending reflects planned spending.
- **Scheduling:** Although some maintenance work is in response to urgent needs, and therefore difficult to plan or schedule, much of the work can be managed more proactively. Advanced scheduling can be accomplished for routine maintenance and work required to respond to an observed non-urgent need. Although less easily schedulable, other work can be anticipated so that appropriate resources are available when needed. Caltrans is currently implementing a work order system that will enhance the district's ability to log and schedule maintenance work. The system will also enable districts to quantify backlogs of work scheduled but not yet accomplished.
- **Executing:** This is where plans are validated through management action and decisions. Schedulable resources are directed conscientiously toward addressing the needs identified in formal plans. Expenditures to address unscheduled needs are carefully monitored to assess how well the plan has anticipated contingencies. Mid-course changes are implemented to assure that overall expenditures reflect plan priorities or, if variances are required, they are documented and explained.

- **Reporting:** Caltrans management process envisions that performance and financial data will be available to allow managers to compare planned against actual performance. Performance data will come from the work order system, LOS2000 evaluations; the LOS2000 automated Data Review and Analysis computer application, customer satisfaction surveys and other evaluation programs. Financial data will show planned against actual expenditures so that managers can monitor whether or not their actions are in line with their plans. Adjustments can be made where variances are noted or reasons for variances can be documented for consideration in the next planning cycle.

## **Section B: Evaluation, a Critical Component in the Management Process**

The management process presented earlier in Exhibit 1-1 begins with evaluation. Without good, objective evaluation information that can be used to define need, there is no basis for planning or budgeting. Scheduling and executing becomes ad hoc and reporting is of no value. All other components of the management process focus on addressing the needs identified by your evaluation and the evaluations of others. As an LOS2000 evaluator you will be gathering and reporting data which will help management address short-term and mid-term maintenance needs. Your findings will help manager's set statewide and district-level priorities for future maintenance activities. Finally, your work will be used to measure changes in inventory levels of service and the ability of maintenance staff to keep up with maintenance demands.

## **Section C: How Evaluation Supports Intelligent Management**

Intelligent management is simply plan and data driven management. Management actions and decisions should always be cognizant of the goals and desired outcomes spelled out in plans and implied in budgets. These plans and budgets are formulated on the basis of needs identified through evaluation processes. Thus, without evaluation there can be no intelligent management.

## **Section D: Correlating Plans with Action (The Proof of the Pudding)**

One important objective of the LOS2000 evaluation process is to create profiles of regional, district, and statewide maintenance level of service and needs. In addition to the specific actionable conditions you will identify and define through your evaluations, the results can be compiled to prepare composite pictures. A sufficient number of randomly selected highway segments will be evaluated so that managers can be confident that the resulting profiles accurately reflect what would be found if all

segments were evaluated. Thus, managers can use these profiles, in conjunction with their own knowledge and other evaluation data, to develop plans and set priorities.

Once developed, plans must influence action. If not, the plan has no value and the planning process is an empty exercise. Although day-to-day maintenance activities are often in response to seemingly unrelated urgent demands, it is very important that managers put these ad hoc events in the context of larger goals and objectives set out in plans and adjust other work accordingly. If they do not, then pure chance will rule in determining whether or not there is a direct relationship between what is planned and what is done. If there is no measurable correlation between what is planned and what is done, the entire management process is invalidated.

If, however, the evaluation drives the plan and the plan drives action, then there will be a measurable correlation between evaluation results and expenditures. **Your accurate and objective evaluations will yield data to drive action in all components of Caltrans Maintenance Management Process.**



# Caltrans Maintenance Program

## Module 2: The Role of Evaluators

### Learning Objectives

By reading and comprehending the information in this training module, you should:

- Learn the multidimensional role of evaluators;
- Understand the responsibilities of acting as a technical evaluator - What does it mean to be a “Content Expert”?;
- Understand the responsibilities of acting as a headquarters representative; and
- Understand the responsibilities of acting as an adviser to district management.

### Section A: A Description of LOS2000 Evaluator Duties and Responsibilities

LOS2000 Evaluators work under the general direction of the Caltrans LOS2000 Coordinator in your district or Headquarters. Your primary responsibility will be to perform technical work evaluating randomly selected one-mile segments of the State’s highways for the purpose of determining the degree to which maintenance staff have been able to keep up with the demands of travel ways, roadsides, drainage, and traffic guidance. Evaluations will include direct observation of defined highway attributes to 1) determine if conditions exist which exceed established maintenance deficiency thresholds and 2) determine the overall maintenance needs of the segment. You will record your observations on evaluation forms provided by the Caltrans LOS2000 Coordinator (discussed in Module 4 of this reference manual). Examples of work you will perform include:

- Planning and scheduling the evaluation of assigned highway inventory segments.

- Reviewing available information on each highway segment's attributes and history of maintenance in preparation for the evaluation.
- Working closely with designated district liaisons to keep them informed of your schedule and progress in completing evaluations.
- Conducting LOS2000 evaluations in strict compliance with established policies and procedures.
- Recording results of each evaluation and making comments regarding conditions observed in order to assist the districts in prioritizing and responding to observed maintenance needs.
- Validating the existence of selected inventory items.

LOS2000 Evaluators will require a specific set of knowledge, skills and abilities including:

- a general knowledge of highway construction methods and techniques;
- a working knowledge of Caltrans maintenance standards outlined in the Maintenance Manual Volume II;
- knowledge of work methods, equipment and materials required to address identified maintenance needs of roadway, roadside, drainage, and traffic guidance;
- knowledge of appropriate safety precautions and procedures required when working on the state's highways;
- skill in identifying and evaluating deficient conditions observed on highways;
- skill in interpreting conditions observed to recommend reasonable and appropriate maintenance intervention;
- verbal and written communication skills in working with district and headquarters representatives and conveying needs observed and suggested remedies;
- ability to work effectively as a team member;
- ability to walk up to eight miles per day on roadside which may be steep and uneven;
- ability to carry required light tools and evaluation recording materials

while conducting evaluations; and

- ability to operate still and video camera equipment required to document evaluation findings.

In addition, evaluators must possess a valid California driver's license.

## **Section B: Serving Many Masters as a LOS98 Evaluator - Success Depends on You!**

Your role as a LOS2000 Evaluator will require wearing many hats including:

### **Team Member**

Two-member evaluation teams will conduct LOS2000 evaluations. You must be able to work effectively with your assigned teammate.

### **Technical Evaluator (Content Expert)**

Much of your time will be spent directly observing highway inventory conditions. Since your work experience has required that you understand the fundamentals of roadway construction and maintenance, you are considered a "content expert" for the purposes of maintenance evaluation. This responsibility will require you to compare observations of maintenance conditions to LOS2000 measurement criteria, make rating judgments, suggest specific remedies, and clarify your findings with comments sufficient to satisfy the needs of district staff who may act on your suggestions. The litmus test of your team's evaluations will be the quality of your work. Quality will be measured by independent inspections of a sample portion of your assigned segments by the LOS2000 Coordinator, headquarters liaisons, and district representatives. The observations and conclusions of your team and the quality inspection teams for the same one-mile segment of highway inventory should be generally consistent.

### **District Liaison and Adviser**

As an LOS2000 evaluator, you will be acting on behalf of both headquarters and the districts in which you work. The LOS2000 evaluation process is an open process, not an audit. First and foremost, it is designed to provide actionable information about specific conditions and general maintenance needs. The front-line users of the data you will collect are district managers responsible for the assigned highway inventory. The most critical aspect of your work will be to earn and protect the respect and confidence of your assigned district representatives and other district staff you may work with during the course of your evaluations. They must value your opinions and feel confident that they can act on your suggestions without verifying the integrity of every

suggestion you make. This level of trust will require time and experience to build. You should meet formally with district managers to kick off the evaluation process and invite them to join and observe the team's effort at any time.

## **Section C: Protocols of the Technical Evaluation**

Evaluation teams will be comprised of two evaluators. The team should mutually agree on a member who will act as Team Leader. The Team Leader will act as the primary spokesperson in meetings/discussions with district representatives and the LOS2000 Coordinator. The lead will also be responsible for controlling all evaluation materials, ensuring that all assigned evaluations are completed, and safe evaluation procedures are followed.

The LOS2000 Coordinator will provide each team a list of the segments to be evaluated, a district map showing segment locations, and background material on each segment if required for the evaluation.

Each evaluation team will be responsible for preparing an evaluation plan and schedule which outlines expected dates for the district evaluation kick off meeting, dates of field work, and estimated costs for travel, per diem and out-of-pocket expenses.

Prior to beginning work in a district, each team, in consultation with the Headquarters LOS2000 Coordinator, should schedule an evaluation kick off meeting. This meeting will generally be held in district offices. The purpose of the kick off meeting will be to share the team's evaluation plan and schedule with district management staff; discuss the sample highway segments to be evaluated; and provide an opportunity for the district to raise any special requests or concerns.

The team should follow evaluation procedures carefully and complete all rating forms for the LOS2000 evaluations. Each team should have access to a camera. When an observed condition is on the margins of the criteria and team members have difficulty agreeing on the appropriate rating, you should photograph the condition(s) and provide explanatory comments on the rating forms. The number of the photograph(s) depicting the condition should be noted on the form.

## **Section D: The Sensitivity of Representing Headquarters**

LOS2000 is an evaluation program. Just the word "evaluation" can instill fear in some managers, particularly if headquarters centrally administers the evaluation. Typical district fears are that headquarters doesn't understand the complexity or uniqueness of our environment and, thus, evaluation information will be misunderstood or misapplied.

As an evaluator working for and in the districts, you will be in the best position to dispel some of these fears.

The evaluation kick off meeting will provide an opportunity for district managers to express some of their concerns. It is important for the LOS2000 Coordinator and you to use this opportunity to share and emphasize some of the following facts about the evaluation process:

- LOS2000 has been designed to support district actions and decisions;
- There should be no surprises. Information from LOS2000 evaluations should confirm managers' own observations or suspicions about their inventory, if not, managers should check the results closely;
- As envisioned by the new Caltrans Maintenance Management Process, LOS2000 data can be used by districts to identify needs, set priorities, and plan to address short and mid-term maintenance;
- LOS2000 data will be used by headquarters to set strategic priorities for maintenance services which should be reflected in district-level plans, final budget allocations and district expenditure patterns;
- LOS2000 data can be used by district managers to establish a baseline of maintenance level of service information from which improvement objectives can be set and, through future evaluations, progress can be measured (this is where pay-for-performance may be applicable);
- LOS2000 data will enable headquarters management to set expectations for desired improvements and manage resource allocations to assure that money is spent in accordance with strategic initiatives;
- LOS2000 data can be used to create work requests to inform districts of needed work;
- LOS2000 data will produce performance profiles of the current state of maintenance which should identify gaps in service levels; and
- in addition to LOS2000 data, maintenance level of service reports will incorporate information from customer satisfaction surveys, pavement condition surveys, bridge inspections, rest area inspections, landscape evaluations, K Family assessments and others.

## Section E: The Bottom Line - You are a District Adviser!

As you learned in Module 1 of this training material, the source of all work of the maintenance program is the highway inventory. Maintenance serves its customers by serving the needs of the inventory. Serving the needs of the inventory is the responsibility of district maintenance managers and staff. The information you provide through your evaluation of highway segments represents one source of information about those needs, a status report on the inventory. Whether districts respond immediately to your findings by preparing a work order to remedy specific conditions or consider the overall conditions reflected by your ratings in their planning and budgeting decisions, **your work is made relevant through district action and decisions.**

As an evaluation team member, you can have a real and significant impact on how well the Maintenance Program responds to the maintenance needs of California's state highways.

# LOS2000

## Caltrans Maintenance Program

### Module 3: Preparing for the Evaluation

#### Learning Objectives

By reading and comprehending the information in this training module, you should:

- Learn what information is required to support the LOS2000 evaluation process;
- Learn what preparation should be completed before conducting any evaluation; and
- Understand the importance of pre-evaluation activities.

#### Section A: Evaluation Data Requirements

Drawing a random sample of center-line miles from each district's inventory and gathering background information on each sample segment selected will be the responsibility of the LOS2000 Coordinator. This will be done a few weeks prior to beginning the evaluation.

The samples selected will be posted on district maps so that the distribution of sample segments and the general coverage of geographic areas and routes can be visually assessed. Additional samples may be drawn if serious deficiencies are noted from this analysis. Once the sampling process is complete, the LOS2000 Coordinator will gather specific data on each sample segment. This data will include information on each segment's location and characteristics.

## **Section B: Preparing the Evaluation Plan**

Each evaluation team will be asked to prepare a formal evaluation plan. This plan should indicate how the team expects to complete the evaluation, including complete timing and logistical information. Teams should review the background data on each segment and determine if special circumstances exist which will affect when or how the segment should be evaluated. Your review may require consultation with selected district representatives to clarify preliminary issues identified. To assist in your planning, you should make notes regarding any expected contingencies on the segment cover sheet to assist in your planning. Contingencies that require special vehicles or district assistance should be worked out well in advance.

As described in Module 2, each team's evaluation plan should be submitted to the LOS2000 Coordinator for review and discussion. The LOS2000 Coordinator should approve each plan prior to starting the evaluation process.

## **Section C: Preparing for Each Segment Evaluation**

Shortly before a segment evaluation, the team should jointly review all available segment background information. The purpose of this preparatory step is to help the team know what attributes you should find in the segment. Of particular interest should be the segment's inventory attributes, pavement type, terrain, traffic volume, and historical maintenance expenditures. Look for signals in the data that might predict or indicate patterns of deterioration you might expect to find. This will help you make more informed and considered decisions about what strategies to suggest if maintenance deficiencies are identified.

## **Section D: Evaluating the Adjacent Highway Segments**

As your evaluation team approaches the target segment, you should carefully observe the general condition of the preceding adjacent one-mile segment. Upon completing the evaluation, you should also observe the general condition of the proceeding one-mile segment. You should note on the bottom of the LOS2000 Field Survey Evaluation Checklist (discussed in Module 4 of this reference material) whether the preceding segment was better than, worse than or about the same as the sample segment. Likewise, you should make a similar notation for the proceeding segment.

## **Section E: Following Safety Policies and Procedures**

All Caltrans and district policies and procedures regarding safe work practices must be adhered to at all times during the survey. Special care should be exercised whenever a survey team member is required to physically inspect inventory items on or adjacent to

the traveled way. It may be necessary to survey heavily traveled route segments during off-peak hours and/or utilize an inspection vehicle with warning lights or a shadow truck.

Evaluation team leaders should hold frequent briefings to discuss appropriate safety precautions for upcoming evaluations. Caltrans' official published safety policies must be followed at all times.

# LOS2000

## Caltrans Maintenance Program

### Module 4: Conducting the LOS2000 Evaluation

#### Overview

This training module is designed to accompany and be a companion guide to the LOS2000 Reference Material. The purpose of this module is to aid you, as an LOS2000 Evaluator, in understanding how the LOS2000 evaluations of one-mile segments of state highway should be conducted. The results of your work on the LOS2000 evaluations will be incorporated into an Annual Report of Maintenance Level of Service. In addition, the results of your evaluations will provide information to support short and mid-term maintenance actions and planning.

#### Learning Objectives

By reading and comprehending the information in this training module, you should:

- Understand the purposes of the LOS2000 Evaluation.
- Learn how to conduct the LOS2000 evaluations.
- Learn how to complete forms, worksheets and checklists included in the LOS2000 Field Survey Evaluation Packet.

#### Section A: Introduction to the LOS2000 Maintenance Evaluation Process

The LOS2000 is designed to collect data on specific maintenance conditions and to assess the overall maintenance needs of the state's highways. The LOS2000 evaluation will be accomplished through a visual inspection of a randomly selected sample of one-

mile highway segments.

A list of highway segments to be evaluated, along with background information on each segment, will be provided to each two-person evaluation team. In the event that a survey segment cannot be reviewed due to construction or some other unusual circumstance, alternative segments must be authorized by the LOS2000 Coordinator. Replacement of a primary segment should not be requested because the segment normally experiences heavy traffic, is maintained by local agencies, or is currently in a state of poor maintenance.

### **LOS2000 Field Survey Evaluation Packets**

Your evaluation team will be provided an LOS2000 Field Survey Evaluation Packet for each sample highway segment assigned. Each three-page packet will include:

- an LOS2000 Field Survey Cover Sheet;
- an LOS2000 Field Survey Evaluation Checklist; and
- an LOS2000 Segment Data Sheet and Comments Form.

Each of these components of the evaluation is discussed in the following sections of this training module. Completed LOS2000 Field Survey Evaluation Packets will be sent to headquarters for data entry and scoring. Results will be incorporated, along with data from other sources, in the Annual Report of Maintenance Level of Service.

## **Section B: Field Survey Cover Sheet**

Exhibit 4-1 presents the Field Survey Cover Sheet. The cover sheet asks for information about the evaluators, time spent on the evaluation, and any special circumstances experienced by the evaluation team. The following provides a description of the steps to follow in completing this important information.

### Just before you begin the evaluation

- Step 1 Enter your assigned Evaluation Team ID number.
- Step 2 Enter the date of the actual field review for that segment.
- Step 3 Enter the Caltrans identification number or name for the region responsible for maintaining the segment.
- Step 4 Enter the estimated elevation of the sample segment (within 500 feet).
- Step 5 Enter each evaluating team member's ID number, name, classification, and phone number in the space provided.

Step 6 Check the box indicating whether or not a safety meeting was held on the day of this evaluation (a safety discussion meeting should be held at least once a week during the evaluation).

Step 7 Enter the names, job titles and any comments regarding other observers/advisers who were present during the evaluation.

After you have finished the evaluation

Step 8 In the space provided, enter the estimated hours spent by each team member to evaluate the segment (include time in the field and in the office).

Step 9 Enter any unique situations or circumstances which may have affected the field survey or evaluation of any inventory item contained in the sample segment.

## Exhibit 4-1 Field Survey Segment Evaluation Cover Sheet



### LOS2000: Caltrans Level of Service Evaluation 2001, Spring *Field Survey Cover Sheet*

Sample ID	District	Region	Elevation	County	Route	From Post Mile	To Post Mile
20010521	7	710	500	Ventura	1	8.0	9.0

Team ID	Date of Field Work (mm/dd/yy)	Region	Estimated Elevation

Reviewers (please print)

ID Number	Name	Classification	Phone	Hrs in field	Hrs in office
1					
2					

Safety meeting:  Yes, see attached       Not required

Others (please print)

Name	Classification	Comments

Special Circumstances or Problems Encountered


20010521      075200100080

Rev: 6/00

## Section C: The LOS2000 Field Survey Evaluation Checklist

There are three fundamental philosophies behind the LOS2000 system. These include:

- **Let the highway speak for itself.**
- **Learn all you can during the inspection.**
- **Share what you learn with those who can act.**

The information contained in this chapter describes the specific evaluation requirements of the LOS2000. Included are descriptions of the steps to be followed in conducting a LOS2000 inspection of a sample segment of highway inventory. Sections included in this chapter include general instructions, a description of the LOS2000 Field Survey Evaluation Checklist, and detailed instructions for evaluating and recording observations for each inventory attribute.

The LOS2000 evaluation has three key components:

- 1) What, if any, conditions exceed established deficiency thresholds?**
- 2) What type and level of maintenance, if any, are needed?**
- 3) What overall level of maintenance is anticipated during the next 12 months for each maintenance element (travelway, drainage, roadside, and traffic guidance)?**

All rating information will generally be entered onto a LOS2000 Field Survey Evaluation Checklist attached to a clipboard for ease of pencil entry or directly into the Evaluators Application. The checklist is the instrument used by evaluation teams to collect and record evaluation results. A checklist is prepared for each one-mile highway segment included in the review sample. The evaluation of each sample highway segment requires the rating team to observe conditions for four key Maintenance Elements including:

- **Travelway**
- **Drainage**
- **Roadside**
- **Traffic Guidance**

A color-coded copy of the LOS2000 Field Survey Evaluation Checklist is shown on the following page (Exhibit 4-2). Evaluations to answer the three questions above are denoted by the sections of the LOS2000 Field Survey Evaluation Checklist, which are colored blue, yellow, and green. In the following sections, the purposes of each evaluation are described.

## Exhibit 4-2 LOS2000 Field Survey Evaluation Checklist

Sample ID	District	Region	Elevation	County	Route	From Post Mile	To Post Mile										
010110100050	1	1	1200	Del Norte	101	5	6										
								Suggested Level of Maintenance L1=Light M1=Medium H1=Heavy									
Maintenance Attribute	Pass	Need	N/A	Crack/ Joint Seal	Patch	Base Repair	Thin Blanket	Seal Coat	Chip/ Slurry Seal	Edge Repair	Rehab/ Reconst	Shldr. Repair	Other				
<b>A Family:</b> Flexible Travelway	X	1 X	2 X	X													
Rideability		X			L1												
Cracks			X		M1												
Alligator Cracking				X													
Potholes	X																
Wheel Rutting	X																
Coarse Raveling	X																
Bleeding	X																
Pavement Edge	X																
Paved Shoulders				X													
Unpaved Shoulders		X										M1					
Ramps				X													
<b>B Family:</b> Rigid Travelway				Crack/ Joint Seal	Patch	Base Repair	Level	Seal Coat	Replace Slab	AC Overlay	Rehab/ Reconst	Shldr. Repair	Other				
Joint Separation				X													
Slab Failure				X													
Cracks	X																
Spalls	X																
Paved Shoulders				X													
Unpaved Shoulders				X													
Ramps				X													
<b>C Family:</b> Drainage				Clean Drain	Clean Ditch	Repair Drain	Repair Ditch	Repair Slope		Other							
Surface Drains	X							Cut	Fill								
Cross Drains	X																
Ditches			X		L1												
Slope		X						M1									
Ramps				X													
<b>C/D Family:</b> Roadside				Litter/ Debris	Clean Graffiti	Sweep	Mow	Fence Repair	Trees/ Brush	"E" Family Inspect	Weed Control	Prune	Other				
Roadside Vegetation	X																
Fences				X													
Tree/Brush Encroach	X																
Roadside Litter/Debris		X			L1												
Graffiti	X																
Ramps				X													
<b>M Family: Traffic Guidance</b>				Pvmt. Stripe	Rep. Mark.	Pvmt. Marking	Repair Signs	Guide Mark.	Guard- rail	Barrier Repair	Clean Signs	Other					
Striping	X																
Pavement Marking	X																
Raised Markers			X		M1												
Guide Markers	X																
Signs	X																
Guardrail			X						M1								
Barriers				X													
Attenuators				X													
Ramps				X													
Maintenance Need Index: (Use 0, 1, 2, 3 or 4 only)	Travelway:			2	Adopt-a- Highway			X	Maintenance Continuity Rating								
	Slope/Drainage:			3	Delegated				Segment	Same	Worse	Better					
	Roadside:			4	Maint. Area				Previous Mile	X							
	Traffic Guidance:			2					Next Mile			X					

## Level of Service Rating

The blue shaded area (  ) of the LOS2000 Field Survey Evaluation Checklist is where level of service results are recorded. Raters look for specific conditions that may exceed established Maintenance Deficiency Thresholds. Pass/Need threshold criteria have been established for thirty-nine Maintenance Attributes. Attributes are characteristic or inventory item that requires periodic maintenance and are listed along the left margin of the LOS2000 Field Survey Evaluation Checklist.

The LOS2000 Evaluation Team will answer the following question about each attribute:

**Does any condition exist which exceeds the established maintenance deficiency threshold for the attribute?**

This is the Pass/Need component of the LOS2000. Thresholds have been set at levels where **travelers** would generally agree that 1) conditions exist below Caltrans standards, 2) preservation of facilities is jeopardized, and/or 3) drivers/riders' satisfaction is adversely affected. For example, when cracks have reached a width of ½ inch or more, degradation to the roadbed is accelerated. Cracks should have been sealed at or before they reached ¼ inch in width. For the same reason and issues of rideability, potholes should have been filled before they reach the threshold size (6"x 6" wide and 1½" deep).

When conditions are observed which exceed defined thresholds for an attribute, raters record either a partial (1) or full (2) level "Need" on the checklist. If the sample segment does not contain an attribute, i.e., ramps, the "Not Apply" box is checked. If no conditions exceeding deficiency thresholds are observed for attributes that are applicable to the segment, the "Pass" box is checked. See Chapter 4 for all attribute criteria.

**Pass/Need results are combined for each sample segment using weighted values for each attribute to derive a Maintenance LOS Rating. This level of service rating component of the LOS2000 expresses the sample segment's level of service (the degree to which local Maintenance forces have been able to keep up with the segment's maintenance demands). This important measure, when combined with other segments' results, is used to derive the overall (district-wide, statewide) level of service.**

## Maintenance Mapping

The yellow shaded area (  ) of the LOS2000 Field Survey Evaluation Checklist shows the Maintenance Map component of the evaluation. The Maintenance Mapping component of the LOS2000 Evaluation takes advantage of the fact that maintenance experts are conducting the evaluation. These experts can and should act as "highway maintenance physicians", applying all of their expertise to evaluate the segment's condition. Since at least two evaluators make up each team, each highway segment evaluated benefits from two professional opinions. Upon reaching consensus, the team's

diagnosis should result in a written “prescription” to address the short-term (within 12 months) corrective maintenance needs of each segment evaluated.

The responsibility of the LOS2000 Evaluation Team will be to answer the following question:

**What level of corrective maintenance will the sample segment likely require?**

Answering this question will require the Evaluation Team to assess each maintenance attribute found in the segment to estimate the need for corrective maintenance. **The team must consider both conditions observed during the Pass/Need evaluation that exceed maintenance deficiency thresholds as well as other needs which will likely require corrective maintenance action.**

Based on the conditions observed in a sample segment, the LOS2000 evaluation team suggests the level of needed maintenance. This is done by entering an “**L1**” (Light), “**M1**” (Medium), or “**H1**” (Heavy), in the block under the appropriate level of maintenance. As an example, say a LOS2000 Evaluation Team estimates that observed pothole conditions require a small crew with minimal equipment to complete. They would likely enter “**L1**” in the box (matrix cell) under “Patch” in the “Suggested Level of Maintenance” section of the checklist corresponding with the “Potholes” attribute.

Due to the potentially limitless variations of conditions evaluation teams will encounter, the definitions for each level of suggested maintenance have not been specifically defined. Generally, however, Light Maintenance (**L1**) may be the suggested level of maintenance if conditions that require or will likely require maintenance attention are localized within the segment, requiring a small crew with commonly available tools and limited materials. Problems requiring a Light Maintenance (**L1**) response have relatively low cost solutions. Medium Maintenance (**M1**) may be the suggested level of maintenance if conditions that require or will likely require maintenance are found throughout the segment and will require substantial effort, materials, and/or some specialized equipment. Problems requiring a Medium Maintenance (**M1**) response have moderate cost solutions. Heavy Maintenance (**H1**) may be the suggested level of maintenance if conditions that require or will likely require maintenance will demand scheduling several crews and/or special heavy equipment. Problems requiring a Heavy Maintenance (**H1**) response have relatively high cost solutions.

In addition to the two-character codes, the LOS2000 Evaluation Team should include comments to clarify the nature, scope, and location of the problem on the Segment Data Sheet and Comments Form included in the LOS Field Survey Evaluation Packet.

## Maintenance Need Index

After the LOS2000 Evaluation Team has completed the pass/need assessment and coded the checklist with suggested levels of maintenance, the team should assign an overall **Maintenance Need Index (4, 3, 2, 1 or 0)** to each of the four maintenance elements.

The green shaded area (  ) of the LOS2000 Field Survey Evaluation Checklist is the Maintenance Need Index component. The overall Maintenance Need Index assignment should reflect the Evaluation Team's summary assessment of **all** needs observed in light of the corrective maintenance suggestions made in the Maintenance Map portion of the evaluation.

The summary index assignment is an expression of the estimated level of corrective maintenance that will be required during the next 12 months. An index of “4” through “0” will be entered on the bottom of the checklist in the space provided. Index assignments should be generally consistent with the following conventions:

- “4” Level Need Index** -- Highway element attributes will likely require no corrective maintenance in the next 12 months.
- “3” Level Need Index** -- Highway element attributes will likely require light corrective maintenance in the next 12 months.
- “2” Level Need Index** -- Highway element attributes will likely require medium corrective maintenance in the next 12 months.
- “1” Level Need Index** -- Highway element attributes will likely require heavy corrective maintenance in the next 12 months.
- “0” Level Need Index** -- Highway element attributes will likely require rehabilitation/reconstruction in the next 12 months.

### Section D: The LOS2000 Field Survey Evaluation Comment Sheet

The comment sheet is to help validate the evaluations or to note any unusual circumstances found during the evaluation. An example of a completed for is shown in Exhibit 4-3.

**Exhibit 4-3**  
**Example of Completed LOS2000 Segment Data Sheet and Comments Form**



**LOS2000: Caltrans Level of Service Evaluation**  
**2001, Spring**  
*Segment Data Sheet and Comments Form*

Sample ID	District	Region	Elevation	County	Route	From Post Mile	To Post Mile
20010521	7	710	500	Ventura	1	8.0	9.0
Segment Characteristics							
MSL Road Class	Facility Type	Urban/Rural	Terrain	Average Daily Traffic (ADT)	Truck Traffic (Percent of ADT)		
2	3CU	R	C	10.5	4%		
Segment Contains (check all that apply):							Number of parking slots:
<input checked="" type="checkbox"/> Leased Property	<input checked="" type="checkbox"/> Rest Area	<input checked="" type="checkbox"/> Vista Point	<input checked="" type="checkbox"/> Park & Ride Lot	0			
Eco Province	Landscape Age	Landscape Classification	Landscape Accessibility				
Reviewer Comments							
Travelway				Drainage/Slope			
Roadside				Traffic Guidance			
Landscaping				Rest Area			
Vista Point				Park & Ride			

20010521      075200100080
Rev: 6/00

# LOS 2000

## Caltrans Maintenance Program

### Module 5: Detailed Instructions

#### Introduction

Instructions for evaluating each maintenance attribute and recording the results are provided in the following sections. Generally, a single question must be answered to evaluate whether or not the maintenance deficiency threshold for an attribute of the segment passes or needs.

All sample segments will be evaluated following the same procedures. Since districts are responsible for all inventory within their geographic area, the evaluation criteria for determining whether or not maintenance deficiency thresholds have been exceeded should apply to the entire segment, right-of-way line to right-of-way line. Therefore, LOS2000 inspections for all inventory attributes will include all lanes, shoulders, and rights-of-way in both directions.

M Family - Traffic Guidance				Pvmt. Stripe	Rep. Mark.	Pvmt. Marking	Repair Signs	Guide Mark.	Guard-rail	Barrier Repair	Clean Signs	Other
Striping	X											
Pavement Marking	X											
Raised Markers			X		M1							
Guide Markers	X											
Signs	X											
Guardrail			X						L1			
Barriers												
Attenuators												
Ramps												
Maintenance Need Index: (Use 4,3, 2, 1, or 0 only - 4 being the best to 0 being the worst)	Travelway:			3	Adopt-a-Highway		(x)	Maintenance Continuity Rating				
	Roadside:			3	Delegated Maint. Area		x	Segment	Same	Worse	Better	
	Slope/Drainage:			4				Previous Mile	(x)	x	x	
	Traffic Guidance:			2				Next Mile	x	x	(x)	

Enter continuity rating here

Upon approaching and departing the target sample segment, the evaluation team should observe and note the general condition of the adjacent post miles. Upon completing the segment evaluation, impressions obtained for the adjacent post miles should be recorded in the space provided on the bottom of the LOS2000 Field Survey Evaluation Checklist (See Example above).

As a first step, the LOS2000 Evaluation Team should drive the segment in both directions before beginning the detailed evaluation. During this drive through, the team should look for maintenance conditions of concern to the evaluation. Next, wherever possible, the segment should be walked by the LOS2000 Evaluation Team. However, in those cases where it is not feasible to walk, driving slowly on the shoulder or in the right lane will suffice. It will be necessary to stop and exit the vehicle to evaluate some attributes such as cross drain inlets and outlets, fences, etc.

## Section A: Evaluation Criteria

In the following section, each maintenance deficiency threshold is described for all LOS2000 attributes relating to the field evaluation checklist (Exhibit 4-2). **All criteria should be applied to bridge decks and ramps found in any sample segment.** Notations for deficiencies found in ramps should be recorded on the “Ramps” section of the LOS2000 Field Survey Evaluation Checklist. Exhibit 5-1 is a chart that represents the Maintenance Program’s family structure.

Exhibit 5-1

						
<b><u>HM1</u></b> <b>ROADBED</b> (2080.010)	<b><u>HM2</u></b> <b>ROADSIDE</b> (2080.020)	<b><u>HM3</u></b> <b>STRUCTURE</b> (2080.030)	<b><u>HM4</u></b> <b>TRAFFIC CONTROL &amp; SERVICE FACILITIES</b> (2080.040)	<b><u>HM5</u></b> <b>MTCE AUXILIARY</b> (2080.050)	<b><u>HM6</u></b> <b>SNOW &amp; MAJOR DAMAGE</b> (2080.060)	<b><u>HM7</u></b> <b>RADIO</b> (2080.070)
<b><u>FAMILIES</u></b>	<b><u>FAMILIES</u></b>	<b><u>FAMILIES</u></b>	<b><u>FAMILIES</u></b>	<b><u>FAMILIES</u></b>	<b><u>FAMILIES</u></b>	<b><u>FAMILIES</u></b>
A. Flexible Pavement B. Rigid Pavement	C. Slopes, Drainage, Vegetation D. Litter, Debris E. Landscaping F. Environmental G. Public Facilities	H. Bridges J. Other Structure	K. Electrical M. Traffic Control (Signs, Stripes, & Markings)	T. Support W. Training, Field Auxiliary Services	R. Snow/Ice Control S. Storm Maintenance	U. Radio Support

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (A-Family):

#### Rideability

*Using the evaluation tool provided, did any 1/10-mile sections receive ride quality scores of “2” or “3”?*

This was chosen as a criterion for evaluation because of the importance of rideability to the driving public. It is the criterion which has the greatest influence in setting priorities for “Now Needs” in Caltrans’ Pavement Management System.

**If no 1/10-mile section received above a “1” rating on the LOS Review “A Family-Flexible Pavement Worksheet”, then the LOS2000 Field Survey Evaluation Checklist entry should be a checkmark in the Pass column. If only one 1/10-mile section received a “2” rating on the LOS Review with no other sections receiving above a “1” rating, then the LOS2000 Field Survey Evaluation Checklist entry should be a “1” in the Need column. If two or more 1/10-mile sections received a “2” rating or if any section received a “3” rating on the LOS Review, then the LOS2000 Field Survey Evaluation Checklist entry should be a “2” in the Need column.**

	Segment	Sample Segment Tenths:										Need				
		0.0	0.5					1.0					0'	1'	2'	3'
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th					
1	56-121-28.0	0	0	1	1	2	0	0	0	1	0	6	3	1	0	
2	56-235-27.0	0	0	0	1	1	1	0	0	0	1	6	4	0	0	
3																
	<b>1/10 (0.1) mile sections</b>	<b>0.0</b>	<b>0.5</b>					<b>1.0</b>					<b>Pass</b>			

Place a "0", "1", "2", or "3" in the block corresponding to the 0.1 (1/10th) mile being evaluated:

- 0 = no discomfort
- 1 = little discomfort
- 2 = moderate discomfort
- 3 = severe discomfort

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (A-Family):

### Cracking

*Have pavement cracks 1/2 inch wide or wider been properly filled and sealed?*

This was chosen as a criterion for evaluation because filling and sealing cracks has been acknowledged as the first line of defense against pavement deterioration. The Maintenance Manual guidelines call for cracks exceeding 1/4 inch wide to be scheduled for filling. Cracks reaching 1/2 wide should have been repaired.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of pavement cracking exceeding the threshold is observed and “2” if more than one instance is observed.



✓ Pass



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (A-Family):

#### **Alligator Cracking**

*Have alligator cracks been properly filled, sealed or maintained?*

This was chosen as a criterion for evaluation because alligator cracking is a severe or advanced form of pavement cracking where the surface has separated into a series of interconnected and interlaced load associated cracks in the wheel path.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of alligator cracking exceeding 50 feet is observed and “2” if more than one instance is observed with a cumulative distance of over 75 feet.



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (A-Family):

#### **Potholes**

*Have potholes with a depth of more than 1½ inches and surface area of more than 6 inches square been filled?*

When potholes form, they allow water and non-compressible material to penetrate and undermine the underlying roadway base. The two most significant results are accelerated degradation of the roadway and, if allowed to grow, a hazard to safe driving.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of a pothole exceeding the threshold is observed and “2” if more than one instance is observed.



× Need



√ Pass

# LOS<sub>2000</sub> Caltrans Maintenance Program

## Travelway (A-Family):

### Wheel Rutting

*Is there wheel track rutting greater than 1 inch deep anywhere within the sample segment?*

Wheel rutting indicates wear or load related distress which can compromise the facility's structural integrity. The Maintenance Manual calls for repair when rutting reaches 1 inch deep. Rutting greater than 1 inch deep should have been corrected.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be "1" if only one localized instance of rutting (less than 500 continuous feet) exceeding the threshold is observed and "2" if more than one instance is observed.



× Need



× Need

# LOS<sub>2000</sub> Caltrans Maintenance Program

## Travelway (A-Family):

### **Bleeding**

*Is there asphalt bleeding covering most of the wheel track for more than 100 continuous feet in the sample segment?*

Bleeding effects the friction and appearance of the roadway.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of bleeding (more than 100 continuous feet covering the wheel track) exceeding the threshold is observed and “2” if extensive bleeding is found or more than are observed.



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (A-Family):

#### **Coarse Raveling**

*Is coarse raveling evident for more than 500 cumulative feet in the sample segment?*

Raveling is the gradual weathering of the pavement surface. Over time, raveling advances to the point that ride quality and skid resistance is affected. This is typically evidenced by loose coarse aggregate on the roadway and shoulders. At this stage, roadway degradation is accelerated. When coarse raveling is evident for more than 500 cumulative feet in the sample segment, the condition has exceeded the maintenance deficiency threshold.

**The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of coarse raveling observed and “2” if more than 500 cumulative feet are observed.**



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (A-Family):

#### **Paved Shoulders**

*Do paved shoulders throughout the segment have any deficiencies that exceed the maintenance deficiency thresholds for the pavement type?*

Shoulders in poor repair contribute to the eventual deterioration of the travelway. If any conditions of the shoulders exceed those outlined for pavement, i.e., cracking, pothole, joint, raveling, rutting, etc., this criteria has exceeded the maintenance deficiency threshold.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of shoulders exceeding the threshold for any criteria is observed and “2” if more than one instance is observed. Pass/Need entries should be made in the “Paved Shoulder” section corresponding to the type of pavement being evaluated, i.e., ACC or PCC.



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (A-Family):

#### **Ramps**

*Do ramps in the segment have any deficiencies that exceed maintenance deficiency thresholds established for the pavement type or maintenance element?*

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if any ramp fails on only one type of deficiency exceeding the threshold is observed and “2” if any ramp fails on more than one type of deficiency. **Pass/Need entries should be made in the “Ramps” section for each maintenance element including Travelway, Drainage, Roadside and Traffic Guidance.** See below for ramp evaluation rating example.

If “Cracks” and “Paved Shoulders” fail on the ramp (2 travelway attributes), then the ramp receives a Need 2.

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (B-Family):

#### **Joint Separation**

*Is there slab and/or shoulder joint separation exceeding ½ inch which has not been sealed sufficiently to restrict the intrusion of water and non-compressible material?*

This was chosen as a criterion for evaluation because filling and sealing joints is included in Caltrans' Maintenance Manual guidelines. This maintenance work has been acknowledged as the first line of defense against pavement deterioration. The Maintenance Manual guidelines call for joints exceeding ¼ inch wide to be scheduled for filling. Joint separation reaching ½ wide should have been repaired.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be "1" if only one localized instance of joint separation exceeding the threshold is observed and "2" if more than one instance is observed.



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (B-Family):

#### Slab Failure

*Do any slabs show evidence of excessive slab movement or pumping? Evidence of excessive slab movement or pumping would include faulting exceeding ¾ inch, corner cracks, joint/edge spalling >6 inches, shoulder vertical displacement more than 1 inch, and other signs of slab failure. (This criterion includes ramp and bridge approaches and departures.)*

Slab failures contribute to the accelerated deterioration of the travelway. It is important to intervene with appropriate maintenance efforts early in order to add life to the pavement and postpone costly rehabilitation or reconstruction.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of slab failure exceeding the threshold is observed and “2” if more than one instance is observed.



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (B-Family):

#### Cracking

*Have pavement cracks 1/2 inch wide or wider been properly filled?*

Filling and sealing cracks is maintenance work that has been acknowledged as the first line of defense against pavement deterioration. The Maintenance Manual guidelines call for cracks exceeding 1/4 inch wide to be scheduled for filling. Cracks reaching 1/2 wide should have been repaired.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of cracking exceeding the threshold is observed and “2” if more than one instance is observed.



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (B-Family):

#### Spalls

*Have spalls with a depth of more than 1½ inches and surface area of at least 6 inches square been filled?*

When spalls form, they allow water and non-compressible material to penetrate and undermine the underlying roadway base. The two most significant results are accelerated degradation of the roadway and, if allowed to grow, a hazard to safe driving.

**The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one instance of a spall exceeding the threshold is observed and “2” if more than one instance is observed.**



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Travelway (B-Family):

#### **Paved Shoulders**

*Do paved shoulders throughout the segment have any deficiencies that exceed the maintenance deficiency thresholds for the pavement type?*

Shoulders in poor repair contribute to the eventual deterioration of the travelway. If any conditions of the shoulders exceed those outlined for pavement, i.e., cracking, pothole, joint, raveling, rutting, etc., this criteria has exceeded the maintenance deficiency threshold.

**The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of shoulders exceeding the threshold for any criteria is observed and “2” if more than one instance is observed. Pass/Need entries should be made in the “Paved Shoulder” section corresponding to the type of pavement being evaluated, i.e., ACC or PCC.**



× Need



× Need

# LOS<sub>2000</sub> Caltrans Maintenance Program

## Drainage (C Family):

### Surface Drainage

*Does surface drainage channel water away from the travelway?*

Drainage facilities that are not maintained may create a safety hazard by allowing water and debris over the travelway and by allowing water to undermine roadway and shoulder integrity.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one drainage area is observed which exceeds the threshold and “2” if more than one drainage area exceeds the threshold.



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Drainage (C Family):

#### **Cross Drains**

*Does the condition of any drain inlet, outlet or invert appears to restrict the drain from functioning as it was designed?*

Drainage facilities that are not maintained may create a safety hazard by allowing water and debris over the travelway and by allowing water to undermine roadway and shoulder integrity.

**The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “2” if any drain exceeds the threshold.**



√ Pass



× Need

# LOS<sup>2000</sup> Caltrans Maintenance Program

## Drainage (C Family):

### Ditches

*Does any ditch in the sample segment have scour, siltation, vegetation, and/or other debris that may severely obstruct the flow of runoff?*

A ditch must have a front slope and at least a 6-inch back slope to be considered a ditch. Ditches that are not maintained may create a safety hazard by allowing water and debris over the travelway and by allowing water to undermine roadway and shoulder integrity.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “2” if any ditch exceeds the threshold.



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Drainage (C Family):

#### Slopes

*Are there any locations where the cut slope's erosion or debris settled onto the shoulder or travelway and may severely obstruct the flow of runoff or become hazardous to travelers? .Or, are there any fill slope locations that are undermining the roadway or reducing the integrity of the roadbed.*

Cut slopes that are not maintained properly may create a safety hazard by allowing debris or even erosion to settle onto the travelway or shoulder. Also, improperly maintained fill slopes can also create safety hazards by allowing sideslopes to undermine roadway and shoulder integrity.

**The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be "1" if a fill or cut slope is found to have a single incident which exceeds the established maintenance deficiency threshold and "2" if more than one incident is observed that exceeds the threshold.**



√ Pass



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

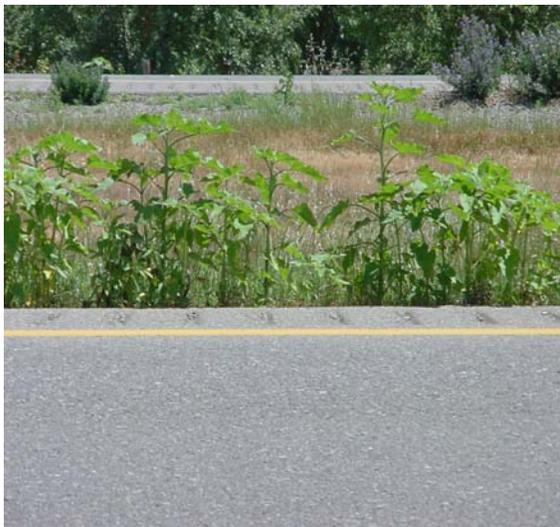
### Roadside (C/D/E Family):

#### **Roadside Vegetation**

*Has the roadside and slope vegetation in any of the unlandscaped areas of the segment been maintained in accordance with Caltrans policy and/or local regulations?*

Typically, LOS2000 evaluators will be able to identify these deficiencies from evident circumstances that denote a fire hazard, impairment of vision or undermining of paved surfaces. Since these circumstances vary according to highway class, undesirable vegetation growth patterns, etc., evaluators should use the most recent program guidelines in determining whether or not a deficiency exceeds the desired maintenance threshold.

**The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if only one localized instance of roadside vegetation exceeding the threshold is observed and “2” if more than one instance is observed.**



× Need



× Need

# LOS<sub>2000</sub> Caltrans Maintenance Program

## Roadside (C/D/E Family):

### Fences

*Is unrestrained entry allowed in any state-owned fenced area of the sample segment?*

Fences in a state of repair that allow unrestricted access may present a hazard to pedestrians and/or the traveling public.

**(Low Priority Fence Breaks)** The LOS2000 Field Survey Evaluation Checklist entry for segments that fail to meet this criteria should be “1” if only one instance exceeding the threshold is observed and “2” if more than one instance of broken fence exceeding the threshold is observed.

**(High Priority Fence Breaks)** A single instance of fence exceeding the threshold should result in an evaluation checklist entry of “2”.



× Need



× Need

# LOS<sub>2000</sub> Caltrans Maintenance Program

## Roadside (C/D/E Family):

### **Tree and Brush Trimming**

*Is there any limb or brush encroachment into the travelway or below 17 feet over the travelway which impede vehicle clearance or motorists view of road conditions/signs?*

Trees and brush that encroach upon the travelway, restrict adequate clearance, or impede motorists' vision or awareness of road conditions and/or signing may present a safety hazard.

**The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be "2" if any instance of tree/brush encroachment exceeding the threshold is observed.**



✓ Pass



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Roadside (C/D/E Family):

#### **Roadside Litter and Debris**

*Does the sample segment contain sufficient litter and/or debris to be offensive?*

The nature of this maintenance attribute is such that the best measure of deficiency is the judgment of the LOS2000 Evaluation Team members. Highway segments determined to exceed the maintenance deficiency threshold can be documented with photographs and/or explanations for future training sessions.

**The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be “1” if there is only one small area of roadside litter exceeding the threshold is observed and “2” if more than one area of litter which exceeds the threshold.**



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Roadside (C/D/E Family):

#### Graffiti

*Do any surfaces within the right-of-way contain graffiti visible from the travelway?*

Since graffiti detracts from motorists' perception of Caltrans performance, the threshold for this attribute is zero tolerance.

The LOS2000 Field Survey Evaluation Checklist entry for segments which fail to meet this criteria should be "1" if only one localized instance of graffiti exceeding the threshold is observed and "2" if more than one instance is observed.



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Traffic Guidance (M Family):

#### **Pavement Striping**

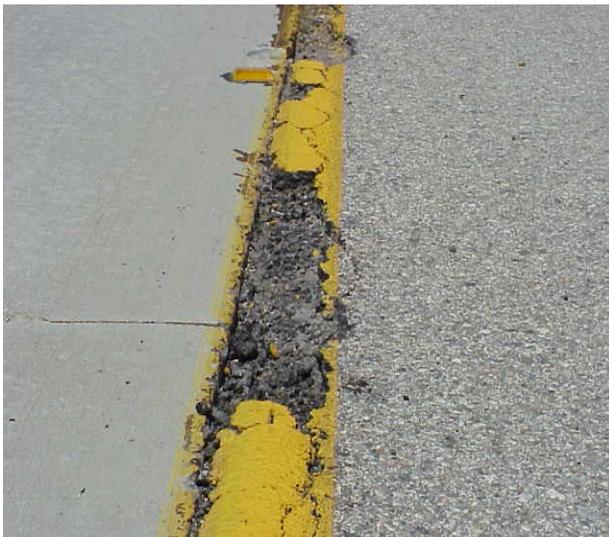
*Has the district provided evidence that a night inspection was conducted in accordance with policy?*

Regular night inspections are included in maintenance policies. Therefore, it is appropriate that LOS2000 Evaluation Teams evaluate how well problems identified by these inspections have been addressed.

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “1” if the District has not provided night inspection documentation.**

*Is there evidence that maintenance action has been taken to correct pavement striping problems noted in the most recent night inspection report or, if not, does pavement striping in the sample segment need to be replaced?*

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “2” if action has not been taken to correct problems identified in the night inspections and deficiencies are found to exceed the threshold.**



× Need



× Need

# LOS<sup>2000</sup> Caltrans Maintenance Program

## Traffic Guidance (M Family):

### **Pavement Marking**

*Has the district provided evidence that a night inspection was conducted in accordance with policy?*

Regular night inspections are included in maintenance policies. Therefore, it is appropriate that LOS2000 Evaluation Teams evaluate how well problems identified by these inspections have been addressed.

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “1” if the District has not provided night inspection documentation.**

*Is there evidence that maintenance action has been taken to correct pavement marking problems noted in the most recent night inspection report or, if not, does pavement marking in the sample segment need to be replaced?*

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “2” if action has not been taken to correct problems identified in the night inspections and deficiencies are found to exceed the threshold.**



× Need



× Need

# LOS<sub>2000</sub> Caltrans Maintenance Program

## Traffic Guidance (M Family):

### **Pavement Markers**

*If the segment contains raised or recessed reflective markers, has the district provided evidence that a night inspection was conducted in accordance with policy?*

Regular night inspections are included in maintenance policies. Therefore, it is appropriate that LOS2000 Evaluation Teams evaluate how well problems identified by these inspections have been addressed.

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “1” if the segment contains raised or recessed reflective markers and the District has not provided night inspection documentation.**

*If the segment contains reflective markers, is there evidence that maintenance action has been taken to correct problems noted in the most recent night inspection report?*

*Are more than 30% (estimated) of the pavement markers missing or is there any instance where more than 120 feet of continuous centerline or lane line that should contain markers are without a reflective marker?* Regular night inspections are included in maintenance policies. Therefore, it is appropriate that LOS2000 Evaluation Teams evaluate how well problems identified by these inspections have been addressed. Raised markers are important tools for assuring that drivers understand road delineation. Deficiencies exceeding those outlined for this criterion may create a safety hazard.

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “2” if action has not been taken to correct problems identified in the night inspections and deficiencies are found which exceed the threshold.**

# LOS<sub>2000</sub> Caltrans Maintenance Program

## Traffic Guidance (M Family):

### Roadside Guide Markers and Delineators

*Has the district provided evidence that a night inspection was conducted in accordance with policy?*

Regular night inspections are included in maintenance policies. Therefore, it is appropriate that LOS2000 Evaluation Teams evaluate how well problems identified by these inspections have been addressed.

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “1” if the District has not provided night inspection documentation.**

*Is there evidence that maintenance action has been taken to correct roadside guide marker problems noted in the most recent night inspection report?*

*Are more than 10% (estimated) of the roadside guide markers or delineators missing or not functioning as intended?*

Regular night inspections are included in maintenance policies. Therefore, it is appropriate that LOS2000 Evaluation Teams evaluate how well problems identified by these inspections have been addressed. Roadside guide markers and delineators are important for motorist guidance in adverse weather conditions. Deficiencies exceeding those outlined for this criterion may create a safety hazard.

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “2” if action has not been taken to correct problems identified in the night inspections and deficiencies are found which exceed the threshold.**



× Need



× Need

# LOS<sub>2000</sub> Caltrans Maintenance Program

## Traffic Guidance (M Family):

### Signs

*Has the district provided evidence that a night inspection was conducted in accordance with policy?*

Regular night inspections are included in maintenance policies. Therefore, it is appropriate that LOS2000 Evaluation Teams evaluate how well problems identified by these inspections have been addressed.

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “1” if the District has not provided night inspection documentation.**

*Are all warning and regulatory signs functioning as intended and are at least 80% of the guide signs functioning as intended?*

Warning and regulatory signs protect travelers’ safety. It is important that none are missing or not functioning as intended. Since guide signs inform the public of important facilities and other information, it is important for most of these signs to be there and in good condition.

**The LOS2000 Field Survey Evaluation Checklist entry for segments should be “2” if action has not been taken to correct problems identified in the night inspections and deficiencies are found to exceed the threshold.**



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Traffic Guidance (M Family):

#### **Guardrail**

*Are all guardrail posts or sections securely in place and free from damage or deterioration that prevents functioning as intended?*

Guardrail is critical to the safety of travelers. Therefore all should be maintained to be fully functional at all times.

The LOS2000 Field Survey Evaluation Checklist entry for segments should be “2” if deficiencies are found to exceed the threshold.



× **Need**

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Traffic Guidance (M Family):

#### **Barriers**

*Are all barriers securely in place and free from damage or deterioration that prevents functioning as intended?*

Like guardrail and impact Attenuators, barriers are critical to the safety of travelers. Therefore, all should be maintained to be fully functional at all times.

The LOS2000 Field Survey Evaluation Checklist entry for segments should be “2” if deficiencies are found to exceed the threshold.



× **Need**

# LOS<sub>2000</sub> Caltrans Maintenance Program

## Traffic Guidance (M Family):

### Impact Attenuators

*Are all impact Attenuators' posts or sections securely in place and free from damage or deterioration that prevents functioning as intended?*

Like guardrail and barriers, vehicle attenuators are critical to the safety of travelers. Therefore, all should be maintained to be fully functional at all times.

The LOS2000 Field Survey Evaluation Checklist entry for segments should be "2" if deficiencies are found to exceed the threshold.



× Need



× Need

# LOS<sub>2000</sub>

## Caltrans Maintenance Program

### Module 6: LOS2000 Computer Applications

#### Section A: Database Applications

Consistent with our vision to be innovative, the LOS2000 program has developed three computer applications to support LOS2000. Unlike any other state, the evaluation data is entered into a Microsoft Access database application that is designed specifically to support the process. Applications include:

##### **LOS2000 Manager's Application**

- Maintains Highway Population/Characteristics Data and other database control tables.
- Draws evaluation and quality assurance samples from the highway population.
- Compiles and edits evaluation data.

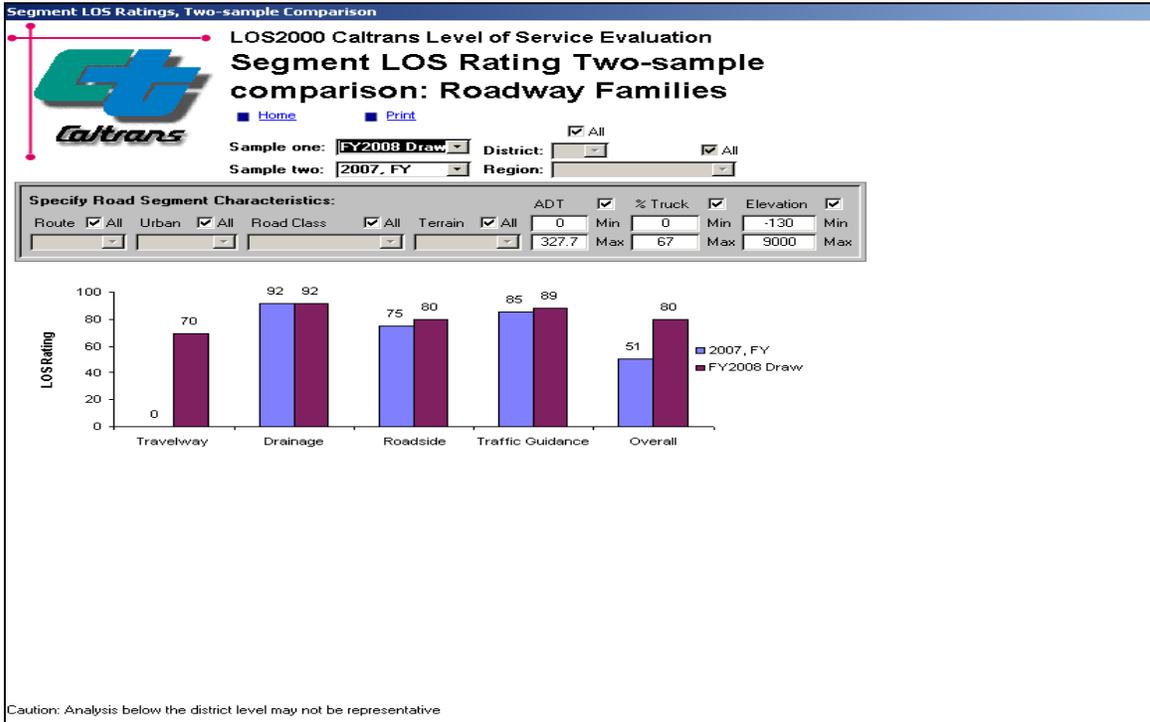
##### **LOS2000 Evaluators' Application**

- Review sample segment data in preparation for the evaluation.
- Allows evaluators to enter LOS2000 segment evaluation results and comments.

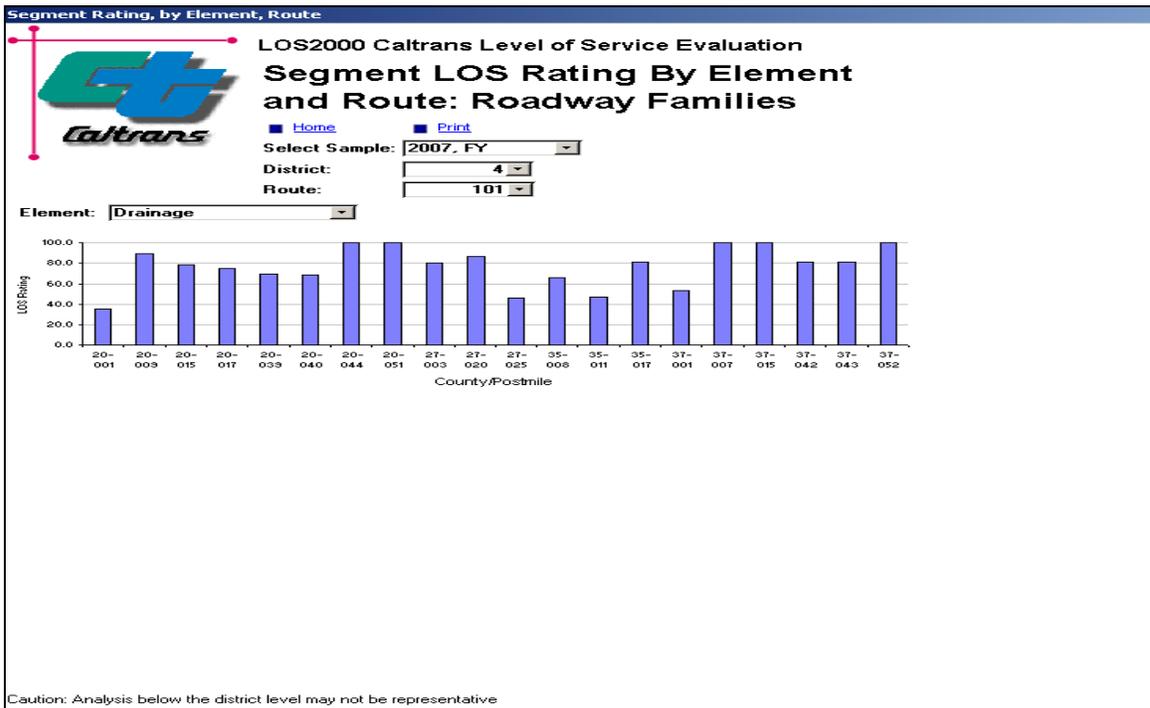
##### **LOS2000 Data Review and Analysis/Management Reports Application**

- Sort LOS2000 evaluation results by one or more user-defined criteria and prints reports, i.e., District, Region, road class, terrain, elevation, and ADT.
- Compare different LOS2000 sample evaluation results, i.e., FY2007 / FY2008 (Exhibit 6-1) or obtain a LOS rating for a specific route in a district (Exhibit 6-2).

## Exhibit 6-1 LOS2000: Data Analysis Application Example, Two-sample comparison



## Exhibit 6-2 LOS2000: Data Analysis Application Example, LOS Rating by Element and Route



Among other things, the database application will do the following:

- Provide standard Region, District and Statewide reports from the evaluation data including: Level of Service Rating Summaries, Attribute Summary Analysis, Element Rating Histograms, Maintenance needs Profiles, and Overall Needs Index Analysis.
- Help managers to view and use data in the database to access maintenance needs, analyze trends and plan work by providing data including: county/route/post mile, Level of Service summaries, and lists of post miles requiring similar types and or urgency levels of maintenance.

Defining maintenance requirements, however, must not only include identifying needs but also estimating the resource requirements to address those needs. Tying LOS2000 results to budget development and resource allocation processes is essential to the LOS2000 System's usefulness and viability. The LOS2000 evaluation process is a bottom-up approach designed to have relevance from the crew level to the highest agency official. LOS2000 is designed to yield data to support strategic planning, associated budget development, resource allocation decisions and to encourage management accountability at all levels.

One of the most important goals of the LOS2000 program and its supporting applications is to encourage the use of data stored in the database for analysis and support for managers and decision makers. To accomplish this goal, the use of LOS2000 computer applications must be institutionalized. Users' guides and tutorials for each of the three applications have been developed to aid in formalized training sessions that will range from Supervisors to District Division Chiefs. These sessions will provide step-by-step instructions and information about each application. Standard conventions will be explained and followed in all documents to ensure uniformity and consistency.

Regardless of the changes implemented, LOS2000 will continue to stress incorporation and coordination with district management as well as input from supervisor and crew level personnel to ensure validity, efficiency and accuracy for protecting the public's investment and preserving California's highway system by doing the right thing, at the right time, for the right reason.