COATS
TECHNICAL MEMORANDUM ONE
Volume Two
CONDITIONS AND PERFORMANCE

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New Technology and Research Program

and

State of Oregon
Department of Transportation
Traffic Management Section

in cooperation with the

U.S. Department of Transportation
Federal Highway Administration

November, 1998

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ACKNOWLEDGEMENTS

Grateful appreciation is extended to the following agencies for their support, guidance and advice that facilitated the successful completion of this report. Specifically appreciated are the COATS Steering Committee; the various programs, divisions and districts/regions in the Oregon Department of Transportation and Caltrans; the California Highway Patrol; the Southern Oregon Visitors Association; and the USDOT Federal Highway Administration (Office of Hazardous Materials Safety and Michael Griffith, Highway Safety Information Systems). In addition, thanks to all who took time from their busy schedules to gather, organize and send the necessary data.

LIST OF ABBREVIATIONS

ADT	Average Daily Traffic
ADTT	Average Daily Truck Traffic
CALTRANS	California Department of Transportation
CHP	California Highway Patrol
Co.	County
COATS	California/Oregon Advanced Transportation Systems
DOT	Department of Transportation
GIS	Geographic Information Systems
HAL	High Accident Locations
HAZMAT	Hazardous Materials
ITS	Intelligent Transportation Systems
LOS	Level of Service
LRS	See Appendix A
MP	Milepost/Postmile
MSU	Montana State University
ODOT	Oregon Department of Transportation
Rt.	Highway Route Number
USDOT	United States Department of Transportation
WTI	Western Transportation Institute

COUNTY ABBREVIATIONS

State	County	Abbreviation
CA	Colusa	Col
CA	Del Norte	DN
CA	Glenn	Gle
CA	Humboldt	Hum
CA	Lake	Lak
CA	Lassen	Las
CA	Mendocino	Men
CA	Modoc	Mod
CA	Plumas	Plu
CA	Shasta	Sha
CA	Siskiyou	Sis
CA	Tehama	Teh
CA	Trinity	Tri
OR	Coos	Coo
OR	Curry	Cur
OR	Deschutes	Des
OR	Douglas	Dou
OR	Harney	Har
OR	Jackson	Jac
OR	Josephine	Jos
OR	Klamath	Kla
OR	Lake	Lak
OR	Lane	Lan
OR	Linn	Lin
OR	Malheur	Mal

ABSTRACT

This document summarizes the efforts to evaluate the conditions and performance of the transportation systems within the Northern California / Southern Oregon Rural Intelligent Transportation Systems Areawide Travel and Safety Improvement Project (COATS). The goal of this report is to develop a comprehensive list of challenges, their estimated magnitude and their geographic area of focus. In order to accomplish this the Western Transportation Institute, Montana State University:

- Identified challenges based on literature, data analysis, the Technical Memorandum Two: Traveler Needs Survey, and steering committee input;
- Collected and analyzed data; and
- Estimated the magnitude and potential geographic area of focus.

This report details the challenges identified, data collected, analysis procedures, and results. Table i shows the challenges identified and geographic areas of focus (see Appendix A for OR Route number conversion). The geographic areas of focus relate to locations where each challenge appears to be more prevalent and, thus, represents good areas for deployment of potential solutions. By definition, some of the geographic areas noted in Table i represent the *only* appropriate locations for countermeasure deployment. Railroad grade crossing collisions or other safety issues, for example, can only be addressed at existing grade crossings. However, attempts will be made to subsequently identify any specific crossings that are over-represented in terms of crash frequency or severity so that these locations are given higher priority in deployment decisions.

Table i: Summary of Challenges

Transportation Challenges	**Potential Geographic Areas**
Safety	
Poor horizontal and vertical alignment	TBD
Railroad grade crossing	• Existing crossings
Inclement weather (road surface)	• CA Rt. 36, LAS Co., MP 10.6-11.5 • CA Rt. 36, TEH Co., MP 76.6-78.7 • OR Rt. 18, MP 54.6-56.5, 60.5-61.4, & 64-64.5 • OR Rt. 16, MP 79.5-81.3
Inclement weather (poor visibility)	• OR Rt. 35, MP 10.8-12.2, & 75.3-76.2 • OR Rt. 22, MP 5.9-6.5 • OR Rt. 18, MP 54.6-56.5 • OR Rt. 16, MP 79.5-81.3 • OR Rt. 15, MP 6-6.9 • OR Rt. 9, MP 211.6-213.0, 234.6-235.9, 237.9-239.8, & 356.4-357.9 • CA Rt. 199, DN Co., MP 0.6-1.9 • CA Rt. 101, HUM Co., MP 1.2-2.9 • CA Rt. 101, DN Co., MP 20.1-22.2 • CA Rt. 299, HUM Co., MP 29.9-31.1 • CA Rt. 101, MEN Co., MP 50.7-51.23
Intersection safety	• CA Rt. 101, Crescent City • OR Rt. 35, Coquille, Myrtle Point, & Winston • OR Rt. 22, White City • OR Rt. 15, Eugene • OR Rt. 9, Reedsport, Wedderburn, & Brookings • OR Rt. 7, Bend & Burns • OR Rt. 4, Bend
Narrow shoulder/clear zone	• CA Rt. 199, DN Co., MP 0.6-1.9 • CA Rt. 101, HUM Co., MP1.2-2.9 & 121.8-122.7 • CA Rt. 101, DN Co., MP 20.1-22.2 • CA Rt. 199, DN Co., MP 26.3-27.8 • CA Rt. 299, HUM Co., MP 29.9-32.8 • CA Rt. 299, TRI Co., MP 47.7-48.6 • CA Rt. 101, MEN Co., MP 50.7-51.2 • CA Rt. 36, TEH Co., MP 76.6-78.7 • OR Rt. 18, MP 54.6-56.5 • OR Rt. 16, MP 79.5-81.3

Transportation Challenges	**Potential Geographic Areas**
Animal collision	• OR Rt. 16, MP 79.5-81.3
Slow moving farm vehicles	Remove from consideration
Speed Related Crashes	Locations incorporated with weather-road surface
Passing Maneuvers	TBD
Construction zone	• Planned construction sites (see Volume One)
Alcohol	Corridor wide
Driver fell asleep	• Throughout the following routes • OR I-5 • CA I-5 (TEH, SHA, & SIS Co.) • CA Rt. 101 (MEN & HUM Co.) • CA Rt. 299 (SHA Co.) • CA Rt. 20 (LAK Co.)
Lack of seat belt use	Corridor wide
Non-Recurring Congestion	• Common road closures (see Figures 6, 7)
Freight Movement	
Lack of intermodal facilities	TBD
Truck inspection/high truck traffic	• Existing weigh stations (see Figure 4)
Incident Response	
Multi-jurisdictional incident	• Slides: Humboldt Co. Routes 96 and 36 • Trinity Co. Route 299 • Mendocino Routes 1, 101, 20 • Vehicle crashes: All of I-5, Routes 299, 101 • OR, TBD
Long emergency notification and response times	• OR, Routes 395 and 20 Burns/Riley area • CA, Eastern Counties
Mobility	
Bicycle and pedestrian traffic (safety)	• All of Route 101 (touring bicycles) • Within city limits (see Table 4)
Transit availability	• Lake County, CA • Josephine County, OR
Tourism	
High recreation traffic	• All of Route 101 • National Parks and Monuments
Economic sustainability	Corridor wide
Lack of information	TBD
Environmental Impacts	Corridor wide

White challenges: validated by stakeholder input
Lt. gray challenges: additional stakeholder input regarding magnitude and focus area
Dk. gray challenges: omit from further consideration

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INTRODUCTION

The Northern California / Southern Oregon Rural Intelligent Transportation Systems Areawide Travel and Safety Improvement Project (COATS) was initiated through a joint effort between the Oregon Department of Transportation (ODOT), the California Department of Transportation (Caltrans) and the U. S. Department of Transportation (USDOT), Federal Highway Administration. Because the California/Oregon bi-state area encompasses a variety of transportation components and considerations, including: vital commercial traffic routes, varied weather conditions, and numerous tourist destinations, the area poses multiple transportation challenges. Accordingly, the purpose of the project is to address these challenges and to investigate the feasibility of implementing Intelligent Transportation Systems (ITS) technologies throughout the bi-state area to improve safety, facilitate the movement of people and products, and potentially expedite the economic development of the region.

Report Objectives

This document, which represents Volume Two of Technical Memorandum One, reports on the conditions and performance review of the Northern California / Southern Oregon Rural Intelligent Transportation Systems Areawide Travel and Safety Improvement Project limits. The goal of this document was to provide an overview of the regional challenges and to define areas of geographical focus. The data presented in this report will be subsequently used to define potential projects for implementation. Relevant findings in this report reflect subjective interpretation by the principal investigator and may not reflect sponsor interpretation. Specifically, this document is intended to fulfill the requirements of the following tasks in the scope of work:

- Task 2.3 Identify Transportation and Safety Related Problems; and
- Task 2.5 Establish Geographic Areas of Focus.

Volume One, the Legacy Systems Report, summarizes existing transportation systems and planned transportation improvements within the COATS study area and include them in GIS maps, thereby completing Tasks 2.1, 2.2 and 2.5. These tasks, as defined in Volume One, are to review local and statewide ITS plans and programs (Task 2.1), inventory ITS and Other Local Systems (Task 2.2) and establish geographic areas of focus (Task 2.5). By reviewing and documenting local and statewide efforts, redundancy among the various projects can be reduced. It should be noted that Volumes One and Two have been prepared as stand alone documents, however, the two reports are very interrelated and both are needed to fulfill the requirements of Technical Memorandum One.

Methodology

As shown in Figure 1, the process for evaluating the existing conditions and performance of the transportation system entailed (1) identifying transportation challenges/needs, (2) collecting data relating to these challenges, (3) analyzing these data to estimate the magnitude of the problems, and to identify the geographic areas in which the given challenges are most prevalent.

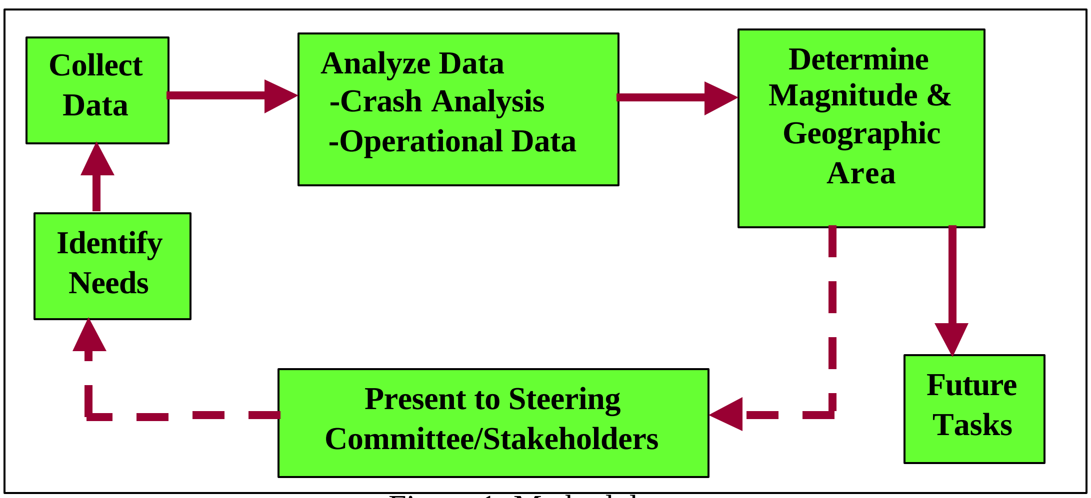

Figure 1: Methodology

Challenges were identified from a number of sources. First, a review was conducted of documents, including: planning documents, transportation studies, needs assessments, and many others. This literature review was conducted to develop a list of transportation challenges in the COATS area. Second, the results of Task 2.4, Traveler Needs Survey, were reviewed for additional challenges. Other transportation issues and concerns were identified through crash analysis or were incorporated into the analysis based on comments made at the October 8, 1998 Steering Committee Meeting in Eureka, CA. For each challenge identified, an attempt was made to collect data to determine the magnitude of the problem and identify appropriate geographic areas of focus.

It should be noted that the list of challenges developed in this report may not necessarily have an appropriate ITS countermeasure. It was important during this task not to exclude any challenges based on the availability of suitable ITS countermeasures without an in depth review of all ITS countermeasures, which is intended to be accomplished during future project tasks.

DATA COLLECTION

The potential challenges identified, as described in the methodology section as well as the types of data collected, are listed in Table 1. As stated, for each of the challenges, data were collected in order to determine the magnitude and identify the potential geographic areas of focus. The descriptions and type of the data are provided in the following section.

Table 1: Challenges Identified and Data Collected

Transportation Challenge	**Data Collected**
Safety/Crashes Involving:	
Poor horizontal and vertical alignment	Literature review*
Railroad grade crossing	Crashes and traffic volumes
Inclement weather (road surface)	Crashes and traffic volumes
Inclement weather (poor visibility)	Crashes and traffic volumes
Intersection safety	Crashes and traffic volumes
Narrow shoulder/clear zone	Crashes and traffic volumes
Animal collision	Crashes and traffic volumes
Slow moving farm vehicles	Crashes and traffic volumes
Excessive speed	Crashes and traffic volumes
Passing Maneuvers	Crashes and traffic volumes
Construction zone	Crashes and traffic volumes
Alcohol	Crashes and traffic volumes
Driver fell asleep	Crashes and traffic volumes
Unrestrained occupants	Crashes and traffic volumes
Non-Recurring Congestion	Road Closures
Freight Movement	
Lack of intermodal facilities	Locations of existing intermodal facilities
Truck inspection/high truck traffic	Truck traffic volumes and weigh station locations
Incident Response	
Multi-jurisdictional incident	Locations and durations of road closures
Long emergency notification and Response times	Emergency notification and response times
Mobility	
Bicycle and pedestrian traffic (safety)	Literature review and crashes
Transit availability	Census data (transit dependant populations)
Tourism	
High recreation traffic	Recreational destinations and annual visitor counts
Economic sustainability	Tourist expenditures
Lack of information	Literature review*
Environmental Impacts	Hazmat incidents

*Literature includes plans reviewed in Volume One, Legacy Systems.

Crash Data

Because a large number of the concerns are safety-related issues that result in vehicle crashes, a considerable effort was put into crash data collection and analysis. Crash records (i.e., law enforcement traffic crash reports) were collected for the three most current years available. For California, data were collected from January 1, 1994 through December 31, 1996 from the Highway Safety Information System (1). Oregon crash data were collected for the same time period from the Oregon Department of Transportation (2). These data contained information on each crash, including date, time, weather, road surface condition, contributing factors, objects hit, severity, vehicle types, and many other variables.

Traffic Volumes

Average daily traffic (ADT) and average daily truck traffic (ADTT) data were collected for California and Oregon. This information was used not only to determine where the major traffic volumes were located, but also in the crash data analysis, as described in the Crash Analysis Section. ADT for 1996-1997 and 1996 ADTT for California were downloaded from the Internet site http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/index.htm. ADT and ADTT were identified for a segment ahead of or behind a specific milepost (usually at a major intersection). It was assumed that the traffic volumes were consistent throughout each designated segment. Oregon ADT counts were collected for 1995-1997 and also downloaded from the Internet from http://www.odot.state.or.us/tdb/traffic_monitoring/tvtable.htm. ADTT data were not readily available from Oregon. In order to determine ADTT for Oregon, 1996 Transportation Volume Tables (3) were used. Specifically, for each segment for which ADT data were available, the nearest automatic traffic recorder was located, and the percentage of trucks was determined for that recorder. This percentage was multiplied by the ADT figures for 1996 to determine ADTT.

Road Closure Locations

Locations of road closures were obtained to determine challenges regarding delay and incident management. Road closures relating to slides, flooding, vehicle crashes, weather, and so forth were provided for California by Districts One and Two of Caltrans. The road closure information was in hard copy format providing (1) time and date of closure, (2) time and date of opening, (3) one-way traffic or full closure, and (3) a description of the cause of the closure. Data were provided for the time period from January, 1995 to September, 1998. These data were manually entered into an electronic database by WTI staff and incorporated into Geographic Information Systems (GIS). For ease of data manipulation, two simplifications were made. First, the causes were grouped into a few common types. Second, instances when a road was closed in the morning and opened in the evening for several days in a row (e.g., construction closures), were combined into one closure for the duration of the construction period. No specific data were found for Oregon road closures.

Existing Intermodal Facilities, Transit Agencies and Weigh Stations

For a description of data relating to the locations of existing intermodal facilities, transit agencies and weigh stations, refer to *Volume One, Legacy Systems Report*

Emergency Notification and Response Times to Crashes

In order to examine response times to motor vehicle crashes and identify potential geographic areas for improvement, data were collected for both notification and response times. Notification times refer to the time elapsed between the occurrence of a crash and the notification of emergency services. Response times refer to the time elapsed between the notification of emergency services and the arrival of the agency at the crash site. Data were obtained only for fatal crashes due to limited availability of data for non-fatal crashes. The Oregon data were acquired from the Oregon Department of Transportation's Fatal Accident Reporting System files (2). These data were collected for fatal crashes for 1994, 1995 and 1996. California data were not as readily available; the data were hand-tabulated by Caltrans and California Highway Patrol (CHP) staff from hard copy CHP records, for 1995, 1996 and 1997 fatal crashes.

County Population Totals

In order to examine mobility-related challenges, county population data were collected, including population totals for persons who tend to have transportation limitations. Such population groups typically may be thought to include persons with restricted physical mobility (such as wheelchair bound individuals), persons over the age of 65 and persons below the poverty level. As these are not necessarily mutually exclusive groups, overlap was determined by identifying the populations that were (1) both over 65 and below the poverty level and (2) both over 65 and having limited physical mobility. No data were available regarding populations that were both below the poverty level and had restricted physical mobility. Data were obtained from the US Census Bureau 1990 census data at http://www.census.gov/.

Additionally, population projections were collected for the aging populations as these population segments are expected to dramatically increase. These data were collected from the California Department of Finance (4). Projections were based on 1993 data and projected out to 2030.

Tourist Characteristics

In order to estimate the amount of tourist traffic in the study area, data were collected on both total tourist expenditures and the locations of common recreational destinations with annual visitor counts. Tourist expenditures were obtained from the Southern Oregon Regional Services Institute for 1995-1996 (5) and the California Division of Tourism web Page at http://gocalif.ca.gov/research for 1996 (6). Both sources contained data broken down by county. From this information, totals were developed for the study area, based on the counties included in the project limits.

Oregon recreational destinations were obtained from Southern Oregon Regional Services Institute with visitor counts for 1995-1996 (7). Joe Hunkins of the Southern Oregon Visitors Association (SOVA) provided additional visitor counts for 1994-1997. Some of the counts provided by SOVA were from their records and some were estimates by Mr. Hunkins. California recreational destinations were provided by the California Department of Parks and Recreation (8). These data included total attendance for state parks, historic points and recreation areas for July 1995 – June 1996. Additionally, data were provided by Lava Beds National Monument and Lassen Volcanic National Park for their respective locations. For the data provided, the average number of annual visitors was determined. It should be noted that some of these data may be inconsistent (i.e., number of vehicles visiting vs. number of persons) and the figures do not include all recreational destinations. The information is simply intended to provide a general picture of the major tourist traffic generators within the study region.

Hazardous Materials Incidents

Information regarding the locations of hazardous materials incidents was collected. In addition to the location, data were requested on the specifics of each spill, such as the amount and type of material spilled and the cost of clean up. The Oregon data were supplied by the Fire Marshall's Office for 1994-1998. California data were supplied by the Department of Transportation for 1995-1998 (District 1) and 1992-1996 (District 2). Difference in the incidence of hazardous material spills in Oregon and California created some concerns about the reliability and validity of the data. Therefore, additional data were collected from the U.S. Department of Transportation Office of Hazardous Materials for 1994-1997. The data were downloaded from their web page at http://hazmat.dot.gov. Milepost and, occasionally, route number were not included in this information; therefore, locations were estimated from the given information (city, cross street, description).

DATA ANALYSIS

The data collected were analyzed in a number of different ways, depending on the type of data and the type of challenge being examined. For most challenges, the data were summarized and analyzed through GIS. The analysis is described along with the results in the Finding section. Crash analysis is described here because it relates to several of the challenges identified, and it required a specific approach.

Crash Analysis

In addition to analyzing data for each challenge, crash records were analyzed for the entire corridor. This was done for two reasons: (1) to quantify safety challenges already identified through a literature review and (2) to identify any other prevalent safety challenges.

Crash data was collected for three years (1994-1996) which included over 16,000 crashes. The data provided specific information about each crash, including: collision type, first harmful event, object hit, vehicle type, weather conditions, road surface conditions, contributing factors and driver violations.

High accident locations were identified based on the equation shown in Figure 2. Crash rates were determined for half-mile segments. Any segments having a crash rate greater than two standard deviations above the mean were determined to be high accident locations (HAL's) for the purposes of this analysis.

$$Rate = \frac{(\#Accident) * 1{,}000{,}000}{ADT * 365 * 3 * 0.5}$$

Figure 2: Accident Rate Equation

For each HAL, crash records were analyzed in order to determine what, if any, crash characteristics were over-represented. The term over-represented suggests a greater than expected occurrence compared to other observed variables. In this analysis, the term represents a subjective assessment, rather than a statistically significant result, and simply offers a relative comparison to other variables being examined. Imagine, for example, that crash characteristics at a given location were tabulated and the following four variables were found to be the most frequently cited on the police crash reports as a contributing factor to the crash:

• Speeding of the posted limit	50%
• Alcohol impaired driver	15%
• Driver inattentiveness	15%
• Wet road surface	10%

No other single variable was cited as a contributing factor in more than ten percent of the crashes at this location. In this example, speeding over the posted limit would be considered over-represented, relative to the other contributing factors. Although alcohol related crashes and driver inattentiveness were cited more often than any other factors, the differences are less pronounced. The difficulty arises when establishing a cutoff for determining geographic focus areas for a crash attribute, especially when comparing different attribute types (e.g., road surface condition, contributing cause, driver error, etc.). As a general rule of thumb, crash characteristics that were observed in over 20 percent of the crashes at a given HAL were given greater consideration as transportation challenges in this analysis. A list of these characteristics was developed and added to the list of safety challenges already identified in the literature review. For each of these safety challenges, a macro analysis of all crashes in the corridor was done in order to determine the magnitude of these challenges.

The severity of each crash is identified as the most severe injury resulting from the crash according to the standard K-A-B-C scale, where:

- K relates to a fatal injury;
- A relates to an incapacitating/severe injury;
- B relates to an evident injury;
- C relates to a possible injury; and
- PDO relates to no injuries or property damage only.

Throughout this report, the severity of a HAL or particular crash characteristic is analyzed, often discussing the percentage of fatal or severe injuries. This refers to the percentage of crashes where at least one person sustained a fatal injury (K) or a severe injury (A). As a benchmark, for all crashes within the project limits six percent involved a fatal or severe injury.

Identification of Geographic Areas

Data plotted using GIS enabled the identification of geographic challenge areas, although this process was fairly subjective, it should be noted that some safety challenges, by their nature, occur throughout the area and are not amenable to countermeasure deployment at spot locations. These challenges are so identified in the Findings Section.

FINDINGS

This section (1) describes each transportation challenge, (2) discusses results of the data analysis that provides an estimate of the magnitude of the challenge, (3) and identifies where possible, feasible geographic areas of focus. These issues are grouped into major problem areas of safety, non-recurring congestion, freight movement, incident response, mobility/multi-modal issues, tourism, environmental challenges and deteriorating infrastructure.

Safety Challenges

Figure 3 shows both the total number of crashes for which a given variable was cited as a contributing factor and the percentage of these crashes that resulted in a fatality or severe injury. As multiple characteristics are typically used to describe a crash, one crash may be shown in more than one category in Figure 3. A description and discussion of crash analysis results for each of these safety challenges follows Figure 3.

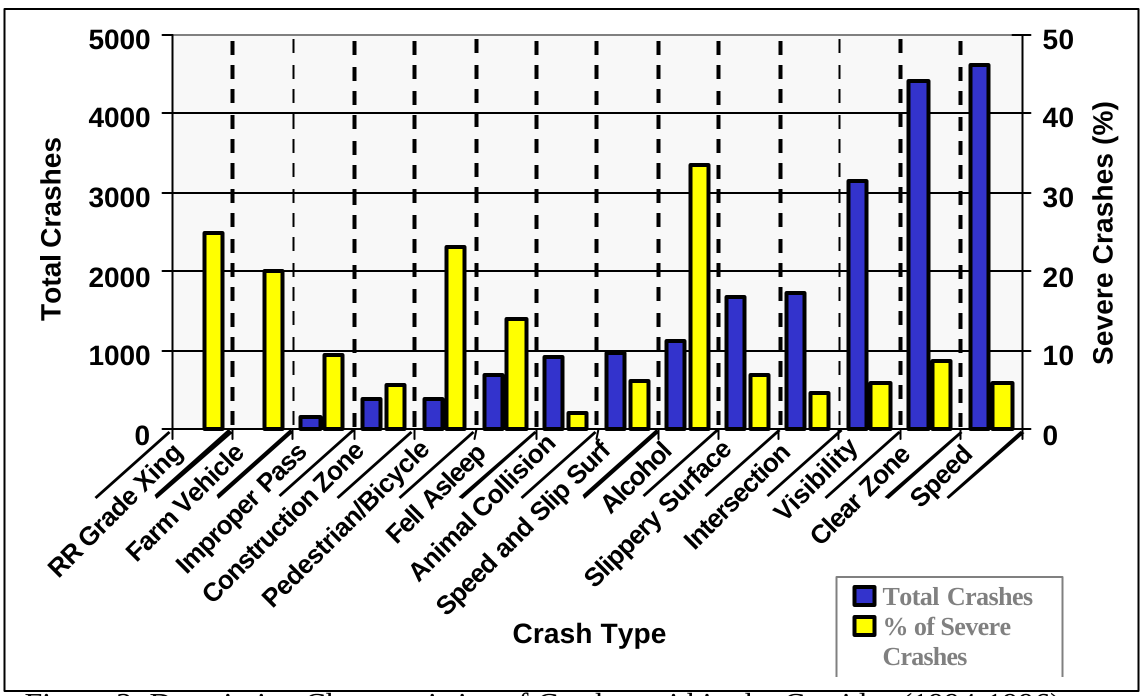

Figure 3: Descriptive Characteristics of Crashes within the Corridor (1994-1996)

Poor Horizontal and Vertical Alignment

Poor alignment typically occurs in areas of limited right-of-way and/or rugged terrain. Roadways with poor horizontal alignment refer to sharp curves with inadequate superelevation; roadways with poor vertical alignment refer to steep grades. These situations can reduce the level-of-service and also be a potential hazard. Ice, snow, and slow moving larger vehicles, such as heavy trucks, recreational vehicles, and vehicles pulling trailers, compound this issue.

Current crash records do not provide data referring to the roadway alignment. Therefore the magnitude and geographic area of focus will be determined on the basis of Steering Committee and stakeholder recommendations.

Railroad Grade Crossing

At locations where rail lines cross highways there are concerns about potential vehicle collisions with the trains. Methods of traffic control at grade crossing locations range from no traffic control, to advisory signing, to mechanical cross arms that block the travel lane when a train is approaching.

Crash analysis revealed that only four crashes occurred in the corridor during a three-year period; one of these four crashes involved a fatality. Any countermeasure deployment would have to occur at existing grade crossings. As the magnitude of this challenge amounts to only four crashes, this issue should be revisited when solutions are discussed.

Ice and Snow Related to Speed

Winter weather conditions can cause potential hazards due to slick roads and limited visibility. Crashes were identified that occurred on icy or snowy road surfaces. As shown in Figure 3, these amounted to a large number of crashes with seven percent causing a severe or fatal injury. Although ice and snow were recorded as being present on the road surface, there is no way to determine if icy or snowy roads actually caused these crashes.

A large number of crashes were attributed to the driver's speed being too fast for conditions. In many states this is a common "catch-all" for the investigating officer to cite as a contributing factor to the crash. Because of this common reporting tendency it is difficult to say with any certainty that any given crash was truly caused by speeding vehicles. However, there is a strong correlation between crashes that were attributed to speed and those that occurred on icy and snowy roads.

The challenge of slippery road surfaces due to inclement weather does seem to be significant. Geographic areas of focus were identified based on high accident locations with a relatively large number of crashes occurring on icy or snowy roads in combination with the contributing factor of *speed too fast for conditions*. These locations include:

- CA Rt. 36, LAS Co., MP 10.6-11.5;
- CA Rt. 36, TEH Co., MP 76.6-78.7;
- OR Rt. 18, MP 54.6-56.5, 60.5-61.4, & 64-64.5; and
- OR Rt. 16, MP 79.5-81.3 (see Appendix A for OR Route number conversion).

Visibility

In addition to slippery road surfaces, inclement weather can be a safety issue from the standpoint of limited visibility due to fog or precipitation. These conditions were reported in 3130 crashes (233 fog, 2112 rain, and 785 snow). Of the Crashes in foggy conditions six percent caused a fatal or severe injury. It is not known to what extent the crashes that occurred in rainy and snowy conditions were affected by limited visibility or other factors, such as road surface and speed.

Visibility may represent a significant challenge in terms of crash frequencies. Geographic areas of focus were identified based on high accident locations with an over-representation of crashes in which the presence of snow, rain or fog was noted. These locations include:

- OR Rt. 35, MP 10.8-12.2, & 75.3-76.2;
- OR Rt. 22, MP 5.9-6.5;
- OR Rt. 18, MP 54.6-56.5;
- OR Rt. 16, MP 79.5-81.3;
- OR Rt. 15, MP 6-6.9;
- OR Rt. 9, MP 211.6-213.0, 234.6-235.9, 237.9-239.8, & 356.4-357.9;
- CA Rt. 199, DN Co., MP 0.6-1.9;
- CA Rt. 101, HUM Co., MP 1.2-2.9;

- CA Rt. 101, DN Co., MP 20.1-22.2;
- CA Rt. 299, HUM Co., MP 29.9-31.1; and
- CA Rt. 101, MEN Co., MP 50.7-51.23.

Intersection Safety Challenges

Intersections typically have high proportions of crashes that are angle or rear-end collisions and are often attributed to a driver failing to yield the right the way.

The crashes shown in Figure 3 include those crashes where a driver failed to yield the right-of-way. Five percent of these crashes resulted in a fatal or serious injury, compared to the six percent for all crashes.

Based on the crash analysis, intersection safety does appear to be a challenge. Geographical areas of focus include high accident locations with over-representations of intersection related crashes. These locations include:

- CA Rt. 101, DN Co., MP 25.9-26.9 (Crescent City);
- OR Rt. 35, MP 10.8-12.2 (Coquille), 20.1-21.5 (Myrtle Point), & 72.6-73.7 (Winston);
- OR Rt. 22, MP 5.9-6.5 (White City);
- OR Rt. 15, MP 6-6.9, & 7.1-8.0 (Eugene);
- OR Rt. 9, MP 211.6-213.0 (Reedsport), 328.4-329.5 (Wedderburn), & 356.4-357-9 (Brookings);
- OR Rt. 7, MP 0.2-1.4 (Bend), 130.8-132.0 (Burns); and
- OR Rt. 4, MP 137.3-139.2, 139.6-141.1 (Bend).

Narrow Shoulder Width and/or Clear Zone

The clear zone is the distance perpendicular to travel, measured from the edge of the travel lane to the nearest obstruction. The shoulder width is included in the clear zone measurement. Although narrow clear zones may not typically contribute to crashes, they are a safety concern. When a driver loses control of the vehicle, smaller clear zones decrease the time and space within which the driver has a chance to recover and may result in a more severe crash. Another safety issue with narrow shoulder widths results from vehicles that break down and cannot pull completely off the travel lane to park. This is especially a problem with heavy trucks.

Clear zone crashes (i.e., fixed object collisions) shown in Figure 3 include those crashes where a vehicle struck a fixed object. Nine percent of these crashes caused a fatal or severe injury, slightly higher than six percent for all crashes. Narrow clear zones and the resulting collisions with fixed objects, do seem to be a significant challenge. Geographic areas of focus, based on high accident locations with an over-representation of fixed object collisions include:

- CA Rt. 199, DN Co., MP 0.6-1.9;
- CA Rt. 101, HUM Co., MP1.2-2.9 & 121.8-122.7;
- CA Rt. 101, DN Co., MP 20.1-22.2;
- CA Rt. 199, DN Co., MP 26.3-27.8;
- CA Rt. 299, HUM Co., MP 29.9-32.8;
- CA Rt. 299, TRI Co., MP 47.7-48.6;
- CA Rt. 101, MEN Co., MP 50.7-51.2;
- CA Rt. 36, TEH Co., MP 76.6-78.7;
- OR Rt. 18, MP 54.6-56.5; and
- OR Rt. 16, MP 79.5-81.3.

Animal Collisions

When animals encroach on the roadway there are obvious potential hazards. Not only does this situation increase the number of crashes and the potential for human injuries, but also harms wildlife and results in higher maintenance costs for animal carcass removal.

Two percent of the 912 animal collisions resulted in a severe or fatal injury to vehicle occupants (Figure 3). Although a potentially significant challenge based on crash frequency, this issue should be reconsidered if and when specific countermeasures and locations are determined to be feasible to ensure potential benefits. Possible deployment locations based on crash analysis include:

- OR Rt. 16, MP 79.5-81.3.

Slow Moving Vehicles (Farm Vehicles)

Typically during harvest season, there is a large number of slow moving heavy equipment on the highways that may result in a potential hazard. Although identified as a safety challenge in the literature, this did not appear to be a significant challenge based on the crash analysis. The total crashes involving farm vehicles in Oregon (California crash data did not specify farm vehicles) numbered only five over the three-year period in the corridor, with one severe injury. It is recommended that this challenge be omitted from future consideration.

Passing Maneuvers

Combinations of heavy trucks, steep grades, recreational vehicles, limited passing zones and other factors can lead to situations where drivers attempt to pass unsafely. This situation can result in a head-on collision that typically involves high injury severity levels. The crashes involving an improper passing maneuver (Figure 3) totaled 167 with ten percent resulting in severe or fatal injuries. Although a potentially significant challenge, the limited number of crashes led to no specific geographic areas of focus being identified. This challenge could be re-examined if specific countermeasures to address the problem are developed and appropriate locations for deployment of these countermeasures can be determined.

Construction Zone Safety

Crashes in construction zones are a common concern. Construction workers are frequently exposed to traffic, thereby reducing their safety. Six percent of construction zone crashes in the area resulted in severe or fatal injuries. Compared to other crash factors, crashes in construction zones occur relatively less frequently; however, like railroad grade crossing crashes, construction crashes only occur at specific locations (current construction zones) and not the entire area, so the crash rate (calculated on a per mile basis) may be assumed to be much greater.

No geographic locations were identified, as locations of construction projects change from year to year. Refer to *Volume One, Legacy System Report* for a listing of planned construction projects within the study area.

Alcohol-Related Crashes

The negative effects of alcohol on driving abilities are well documented, as are the serious consequences of crashes involving alcohol-impaired drivers. Over three years within the project limits, the influence of alcohol was reported in 1116 crashes, 34 percent of which involved fatal or severe injuries (Figure 3). This issue represents a major challenge throughout the corridor; however, no specific high accident locations were identified as being over-represented in terms of alcohol-related crashes.

Driver Fatigue

The frequency and severity of crashes in which the driver fell asleep are shown in Figure 3. There were 689 such crashes in the corridor during the three years data were collected. Approximately 15 percent of the crashes in this category resulted in severe or fatal injuries. Relative to a number of the other crash attributes collected, this issue is a potentially significant crash challenge. No specific spot locations were identified for these types of crashes, as they did not tend to cluster at specific spots. Instead they were spread (one to five miles between each) throughout certain routes including:

- OR I-5 (CA state line to Eugene);
- CA I-5 (TEH, SHA, & SIS Co.);
- CA Rt. 101 (MEN & HUM Co.);
- CA Rt. 299 (SHA Co.); and
- CA Rt. 20 (LAK Co.).

Seat Belt Use

Seat belts have been shown to greatly reduce the severity of injuries to crash-involved occupants when used correctly. Still, a number of drivers or other vehicle occupants choose not to use them. In the area, there were 2474 people (7.2%) involved in crashes during 1994-1996 who were unrestrained. Of those who did not use a seat belt, 22 percent had a fatal or severe injury, compared to four percent of those who used seat belts. Table 2 shows the difference in seat belt usage, based on where the driver lives in relation to the location of the crash. Based on the crash reports collected, there does not appear to be a significant difference in seatbelt use based on residency. Because the reporting of seat belt use is often based on what the driver or passenger tells the investigating officer, it is commonly acknowledged that the number of seat belt users may be grossly over-reported. Particularly in states with safety belt and child restraint laws, drivers may erroneously report restraint use to avoid penalties. (Table 2).

Table 2: Seat Belt Use vs. Residency (Oregon Only)

Residency	Total	% Not Belted
25-mile radius from crash	7386	2.2%
Oregon resident (outside 25 miles)	1835	2.9%
Non-residents	968	3.1%

Non-Recurring Congestion

Congestion is a major issue typically identified in route concept reports in terms of level of service (LOS). Existing and forecasted LOS determined to be D, E or F is identified as potential challenge areas. LOS refers to measures of operational conditions of transportation facilities in terms of such factors as speed, travel time, freedom to maneuver, etc. LOS is rated by letters A through F, A being the best operating conditions and F being the worst. LOS D usually refers high traffic volumes with some delay, however, not unstable traffic flows. LOS E refers to traffic volumes at the maximum capacity of the facility and is very unstable. LOS F is usually consistent stop and go traffic.

Based on the resources available, calculating the LOS for all the highways in the corridor was determined to not be feasible for this study. However, nonrecurring congestion caused by road closures can be identified. Road closures are discussed in more detail under the issue of multi-jurisdictional incidents.

Freight Movement

Intermodal Issues

One concern with freight movement relates to the lack of intermodal transfer facilities, specifically rail to truck transfers. It is beyond the scope of this report to determine freight movements and where transfer facilities are lacking. Therefore, challenge areas will be determined based on stakeholder and Steering Committee input. (The reader is referred to *Volume One*, *Legacy System Report*, for locations of existing intermodal facilities.)

High Truck Traffic

In order to ensure that commercial trucks are operating safely, with the proper permits, and under specified weight restrictions, they are inspected both at stationary locations (weigh/inspection stations and ports of entry) and on the roadside by remote officers. Many existing weigh/inspection station facilities have difficulty keeping up with current truck traffic volumes. Several efforts commonly made to address this problem include improving the facility geometry (i.e., on and off ramps) or automating portions of the inspection process. Many of the existing facilities are already equipped or have plans to be equipped with automated systems, such as the PrePass System from Heavy Vehicle Electronic License Plate, Inc. or the Oregon Department of Transportation's Greenlight System. Figure 4 shows existing weigh stations within the area. Figure 5 provides truck traffic data (ADTT) obtained from ODOT and Caltrans.

Weigh stations have been prioritized for automation improvements as part of Oregon's and California's respective statewide ITS/CVO planning process. Therefore, it is unnecessary to duplicate efforts to identify or prioritize weigh stations for automation improvements in this phase of the study. However, we must coordinate and integrate deployments resulting from this project with existing and planned ITS/CVO systems. Refer to *Volume One, Legacy System Report* for information regarding these plans and existing weigh station automation activities.

Figure 4

Figure 5

Incident Response Challenges

Multi-Jurisdictional Incidents

Incidents that occur on the roadway, such as avalanches, landslides, and crashes, require the coordination of the many agencies involved (e.g., law enforcement, emergency services, DOT maintenance personnel, and so forth). Accomplishing this coordination in a timely manner can be difficult. Figures 6 and 7 shows locations of road closures in California over a period from January, 1995 to July, 1998. No data were available for Oregon.

Table 3 shows the average and longest duration for the road closures shown in Figures 6 and 7. Based on the Figures and Table, the following focus areas and corresponding geographic areas are identified:

- Slides account for a major portion of road closures and are focussed around Routes 96 and 36 in Humboldt County, Route 299 in Trinity County, and Routes 1, 101 and 20 in Mendocino County.
- Road closures caused by vehicle collisions, although having shorter durations, still account for a large number of closures. These closures are typically focussed along the routes with larger amounts of traffic, such as Interstate 5, Route 299, and Route 101.

Table 3: Durations of Road Closures (California Only)

	Partial Closure			Total Closure		
Type	**Total Number**	**Average Duration (days)**	**Longest Duration**	**Total**	**Average Duration (days)**	**Longest Duration**
Figure 6						
Fire	6	0.4	1.7	5	1.4	7.0
Flood	7	1.5	4.7	7	0.7	2.1
Slide	126	11.3	301.3	32	10.8	206.0
Weather	3	0.2	0.5	13	0.8	3.9
Figure 7						
Object	9	1.3	10.0	29	0.2	0.9
Vehicle Crash	82	0.2	1.1	42	0.1	1.2
Other	6	20.6	123.4	8	0.2	0.6

Figure 6

Figure 7

Long Emergency Response Times

When a vehicle crash occurs and someone is seriously injured, a fast response time by emergency service may reduce the severity of the injury. Discussions of the relationship between response time and injury mitigation typically refer to the "golden hour" immediately following the crash in which the chances of reducing the severity of certain types of injuries may be greatly enhanced if critical care can be administered. It should be noted that attempts to detect any effect on injury patterns from the limited data available on emergency response times within the area would be extremely difficult and, therefore, not recommended.

Figures 8 and 9 show the emergency notification and emergency response times for fatal crashes in Oregon and California. As previously mentioned, notification times refer to the time elapsed between when a crash occurs and when emergency services are notified. Response times refer to the time elapsed between when emergency services are notified and when they arrive at the crash site. As shown in Figures 8 and 9, notification and response times in Oregon are typically longer than average along most of U.S. Route 395 and along U.S. Route 20 between its junction with U.S. Route 97 and U.S. Route 395. In California there are no obvious areas of longer response times. However, it is the researcher's opinion that a potential area of focus includes the counties and routes east of Interstate 5.

[Figure 8]

Figure 9

Mobility Challenges

Bicycle and Pedestrian Traffic

Many areas in the corridor have a significant volume of both commuter bicycle traffic (500 per week between Eureka and Humboldt State University) and recreation touring traffic (100 per day in summer months along Route 101) (9). Pedestrian and bicycle traffic is a safety concern because of the number of crashes and their severity (Figure 3). Where feasible, facilities should be made bicycle- and pedestrian-friendly (wider shoulders, bike lanes, etc.). In addition to improving safety, bicycle and pedestrian facilities will promote the use of those modes, potentially reducing the number of automobiles and their negative effects.

The magnitude of the safety challenge is determined through crash analysis. Crashes involving pedestrians and bicycles accounted for 391 crashes over the three-year period, 23 percent of which caused a severe or fatal injury. These crashes are focussed along all of Route 101 and within cities and towns. The towns with relatively high frequencies of bicycle/pedestrian crashes are shown in Table 4. The town populations are also shown in this Table, as rural areas may be a desired focus area.

Table 4: Bicycle/ Pedestrian Crash Clusters

State	Town	Population	# Crashes
CA	Crescent City	6,866	5
CA	Eureka	26,202	47
CA	Arcata	16,261	4
CA	Susanville	13,089	10
CA	Willits	4,953	17
CA	Redding	76,616	9
CA	Yreka	6,934	4
CA	Red Bluff	13,290	7
OR	Creswell / Goshen	2,721	4
OR	Eugene	123,718	10
OR	Bend	31,733	27
OR	North Bend / Coos Bay	9,927 / 15,448	10
OR	Florence / Reedsport / Lakeside	6,124 / 4,891 / 1,560	11
OR	Gold Beach	1,555	6
OR	Brookings	5,001	6
OR	Oakridge	3,121	3
OR	Grants Pass	20,894	4
OR	Coquille	4,063	5
OR	Winston	3,894	4
OR	Klamath Falls	18,580	6

Transit Availability

Transit typically serves two functions: to reduce traffic volumes and to provide mobility for those individuals with physical or financial limitation that makes it difficult for them to drive. In the first function, transit reduces congestion by transporting people with multi-passenger busses instead of single-occupancy vehicles, thus reducing the total number of vehicles on the road. Concerning the second function, specialized busses and standard public transit alternatives supply mobility impaired persons with transportation. The first function exists typically within urban centers and, in keeping with the rural nature of this study, will not be considered as a challenge.

Over the entire area, approximately 29 percent of the population (over 450,000 people) are within a population group that may require public transportation to maintain their quality of life (Figure 10). For purposes of this study, potentially transportation dependent populations include those who are:

- over 65;
- below the poverty level; and
- physical mobility limited.

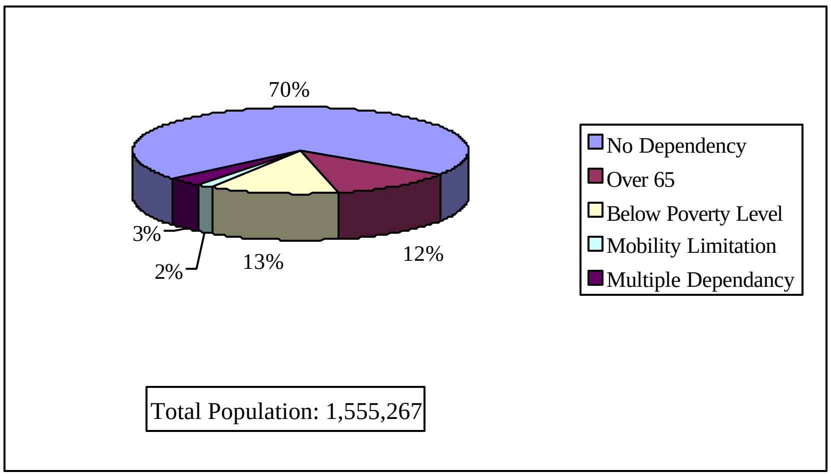

Figure 10: Potential Transportation Dependant Populations In The Corridor

Not only are total populations expected to increase, but the proportion of elderly persons is also expected to increase. One source estimates the percentage of persons in California over 60 years of age is expected to increase from 14 percent in 1990 to 23 percent in 2030 (4).

The potentially transportation dependant proportions are fairly consistent across states and counties within the area with two exceptions. Both Lake County, California and Josephine County, Oregon have a transportation dependant population of over 37 percent. (Figures 11 and 12). Average populations for these counties are 48,069 people and 77,530 people, respectively.

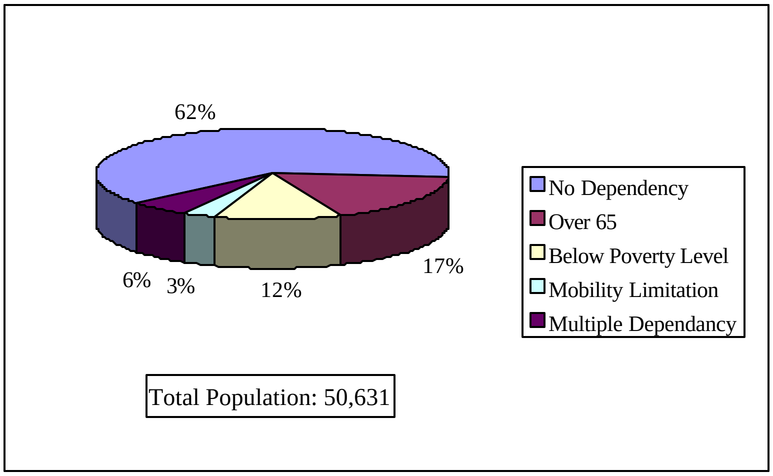

Figure 11: Potential Transportation Dependant Populations for Lake County

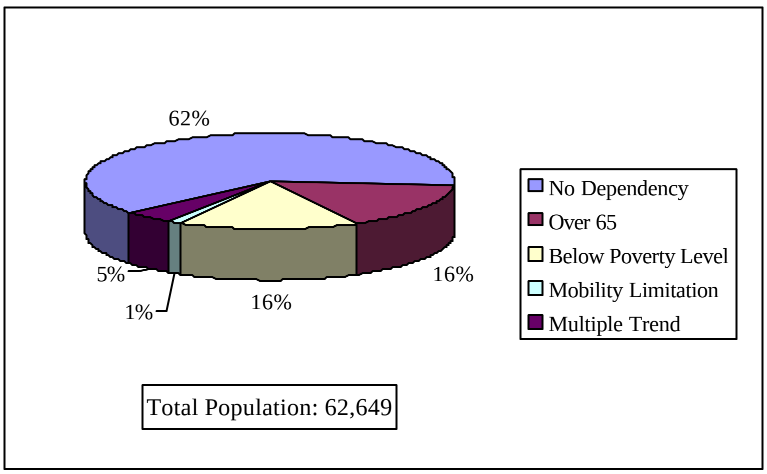

Figure 12: Potential Transportation Dependant Populations for Josephine County

Lake County has two transportation systems that together provide 10,000 passenger trips per month. This combined service may not be adequate for the 21,766 transportation dependent people in the county. Josephine County on the other hand, poses a different situation. With six transportation systems existing within the county, it is able to provide 53,901 passenger trips per month for a transportation dependent population of 26,468. There may be potential for coordination of services. Table 5 lists the transit services in these two counties.

Table 5: Transit Agencies in Lake Co., CA and Josephine Co., OR

County	Transit System	Type	Passengers	Pass. Trips	Service Area
Lake	Lake Transit Authority	Fixed Route	General Public	6,400	Lake County
Lake	Lake Transit Authority	Dial-a-Ride	General Public, Elderly, Disabled	3,600	Lakeport, Clearlake/Lower Lake
Josephine	Handicap Awareness & Support League	Dial-a-Ride	Disabled, Elderly	2,216	Josephine County
Josephine	Josephine County				
Josephine	Josephine County Community Services	Dial-a-Ride, Fixed Route	Disabled, Elderly	17,791	Josephine County
Josephine	Josephine County Mental Health	Dial-a-Ride	Client	24,669	Josephine County
Josephine	Options for Southern Oregon	Dial-a-Ride		5,992	Josephine County
Josephine	Sparc Enterprises	Dial-a-Ride	Client	3,233	Grants Pass

Tourism Challenges

High Recreational Traffic

Large volumes of recreational traffic may create potential challenges related to unfamiliar motorists and high traffic volumes leading to seasonal congestion. Figure 13 shows some common recreational destinations. Route 101 has a large number of these recreational destinations and is a potential area of focus. Additionally, the national parks and monuments are potential areas of focus.

[Figure 13]

Economic Sustainability

Although the economic vitality of a region is not the direct concern of the transportation community, it is directly affected by the transportation system. Weaknesses in the transportation system make it more difficult for recreational travelers to visit an area thus reducing the tourism industry, which many communities rely on. Traveler expenditures within the counties in the study area in 1996 amounted to $3,480,550 ($2,103,240 for California, $1,377,310 for Oregon). Table 6 shows the county totals of tourist dollars spent in 1996.

Table 6: County Travel Expenditures

State	County	Travel Expenditures ($)
OR	Coos	$82,490
OR	Curry	$82,080
OR	Deschutes	$278,430
OR	Douglas	$126,520
OR	Harney	$19,750
OR	Jackson	$181,790
OR	Josephine	$65,250
OR	Klamath	$88,920
OR	Lake	$9,930
OR	Lane	$339,170
OR	Linn	$62,740
OR	Malheur	$40,240
OR	**Corridor**	**$1,377,310**
OR	**Statewide**	**$4,483,200**

State	County	Travel Expenditures ($)
CA	Colusa	$42,550
CA	Del Norte	$130,850
CA	Glenn	$48,690
CA	Humboldt	$318,490
CA	Lake	$222,040
CA	Lassen	$72,460
CA	Mendocino	$365,280
CA	Modoc	$28,760
CA	Plumas	$158,100
CA	Shasta	$363,590
CA	Siskiyou	$160,340
CA	Tehama	$105,600
CA	Trinity	$86,490
CA	**Corridor**	**$2,103,240**
CA	**Statewide**	**$56,736,550**

Lack of Information

The Traveler Needs Survey conducted during Task 2.4 identified the issue of “lack of information from signs along the roadway” as a major concern.

Environmental Challenges

There are two major concerns when dealing with environmental impacts. The first concern deals with right-of-way constraints that limit reconstruction options. Such constraints typically occur at locations that border wetlands, wild and scenic waterways, areas containing rare and sensitive plant and animal species, known areas of archeological sensitivity, coastal areas, and state and national parks, especially those with old growth redwood forests. The negative impact to such locations generally makes many reconstruction options such as widening a 2-lane highway to 4 lanes, problematic, if not infeasible.

The second concern deals with pollution and hazardous materials (hazmat) spills and their impact on environmentally sensitive areas. Hazmat spills are shown in Figure 14. These data, provided by the USDOT Office of Hazardous Materials Safety, includes incidents for the years of 1994, 1995, 1996 and 1997 that were reported as per requirements set by regulation 49 CFR 171.15 and 171.16. The requirements include reporting those incidents where "during the course of transportation:

- as a direct result of hazardous materials:
  - a person is killed;
  - a person receives injuries requiring his or her hospitalization;
  - estimated carrier or other property damage exceeds $50,000;
  - an evacuation of the general public occurs lasting one or more hours;
  - one or more major transportation arteries or facilities are closed or shut down for one hour or more; or
  - the operational flight pattern or routine of an aircraft is altered;
- fire, breakage, spillage or suspected radioactive contamination occurs involving shipment of radioactive material;
- fire, breakage, spillage, or suspected contamination occurs involving shipment of infectious substances;
- there has been a release of marine pollutant in a quantity exceeding 450 liters for liquids or 400 kilograms for solids; or
- a substance exists of such a nature (e.g., a continuing danger to life exists at the scene of the incident) that, in the judgement of the carrier, it should be reported to the Department even though it does not meet the criteria of [these requirements]." (10)

Data regarding hazmat incidents were also collected from state sources. Some incident records did not match up between the various data sources. Due to schedule constraints the accuracy of the various sources was not evaluated. The national database was used in order to provide continuity between the states. The general feeling of most personnel involved with hazardous materials that were interviewed by research staff was that these incidents were underreported. Additionally, the reporting requirements mentioned above were believed to under-represent the hazmat incident issue. Because of the questions regarding the data, no geographic area of focus is identified in this report.

Figure 14

CONCLUSIONS

In order to develop this report (1) challenges were identified, (2) data were collected, (3) crash and other data were analyzed and (4) results were summarized. For the challenges identified, it is the recommendation of WTI research staff that:

- the challenges listed in Table 7 move forward for consideration and be validated through stakeholder input;
- the challenge of "slow moving farm vehicles" be eliminated from further consideration; and
- the issues of (1) railroad grade crossings, (2) unsafe passing situations, (3) animal conflicts, (4) intermodal issues, and (5) lack of information, be revisited during outreach to stakeholders and when solutions are identified to ensure the magnitude of the challenge is large enough to generate potential benefits.

The results of this document, along with the Legacy System Report and Traveler Needs Survey, will be used in future tasks to identify solutions that (1) fulfill a need, (2) have a good potential for realizing benefits, (3) are desired by the traveling public, and (4) integrate with and add value to existing systems.

Table 7: Summary of Challenges

Transportation Challenges	Potential Geographic Areas
Safety	
Poor horizontal and vertical alignment	TBD
Railroad grade crossing	• Existing crossings
Inclement weather (road surface)	• CA Rt. 36, LAS Co., MP 10.6-11.5 • CA Rt. 36, TEH Co., MP 76.6-78.7 • OR Rt. 18, MP 54.6-56.5, 60.5-61.4, & 64-64.5 • OR Rt. 16, MP 79.5-81.3
Inclement weather (poor visibility)	• OR Rt. 35, MP 10.8-12.2, & 75.3-76.2 • OR Rt. 22, MP 5.9-6.5 • OR Rt. 18, MP 54.6-56.5 • OR Rt. 16, MP 79.5-81.3 • OR Rt. 15, MP 6-6.9 • OR Rt. 9, MP 211.6-213.0, 234.6-235.9, 237.9-239.8, & 356.4-357.9 • CA Rt. 199, DN Co., MP 0.6-1.9 • CA Rt. 101, HUM Co., MP 1.2-2.9 • CA Rt. 101, DN Co., MP 20.1-22.2 • CA Rt. 299, HUM Co., MP 29.9-31.1 • CA Rt. 101, MEN Co., MP 50.7-51.23
Intersection safety	• CA Rt. 101, Crescent City • OR Rt. 35, Coquille, Myrtle Point, & Winston • OR Rt. 22, White City • OR Rt. 15, Eugene • OR Rt. 9, Reedsport, Wedderburn, & Brookings • OR Rt. 7, Bend & Burns • OR Rt. 4, Bend
Narrow shoulder/clear zone	• CA Rt. 199, DN Co., MP 0.6-1.9 • CA Rt. 101, HUM Co., MP1.2-2.9 & 121.8-122.7 • CA Rt. 101, DN Co., MP 20.1-22.2 • CA Rt. 199, DN Co., MP 26.3-27.8 • CA Rt. 299, HUM Co., MP 29.9-32.8 • CA Rt. 299, TRI Co., MP 47.7-48.6 • CA Rt. 101, MEN Co., MP 50.7-51.2 • CA Rt. 36, TEH Co., MP 76.6-78.7 • OR Rt. 18, MP 54.6-56.5 • OR Rt. 16, MP 79.5-81.3

Transportation Challenges	Potential Geographic Areas
Animal collision	• OR Rt. 16, MP 79.5-81.3
Slow moving farm vehicles	Remove from consideration
Speed Related Crashes	Locations incorporated with weather-road surface
Passing Maneuvers	TBD
Construction zone	• Planned construction sites (see Volume One)
Alcohol	Corridor wide
Driver fell asleep	• Throughout the following routes • OR I-5 • CA I-5 (TEH, SHA, & SIS Co.) • CA Rt. 101 (MEN & HUM Co.) • CA Rt. 299 (SHA Co.) • CA Rt. 20 (LAK Co.)
Lack of seat belt use	Corridor wide
Non-Recurring Congestion	• Common road closures (see Figures 6, 7)
Freight Movement	
Lack of intermodal facilities	TBD
Truck inspection/high truck traffic	• Existing weigh stations (see Figure 4)
Incident Response	
Multi-jurisdictional incident	• Slides: Humboldt Co. Routes 96 and 36 Trinity Co. Route 299 Mendocino Routes 1, 101, 20 • Vehicle crashes: All of I-5, Routes 299, 101 • OR, TBD
Long emergency notification and response times	• OR, Routes 395 and 20 Burns/Riley area • CA, Eastern Counties
Mobility	
Bicycle and pedestrian traffic (safety)	• All of Route 101 (touring bicycles) • Within city limits (see Table 4)
Transit availability	• Lake County, CA • Josephine County, OR
Tourism	
High recreation traffic	• All of Route 101 • National Parks and Monuments
Economic sustainability	Corridor wide
Lack of information	TBD
Environmental Impacts	Corridor wide

White challenges: validated by stakeholder input
Lt. gray challenges: additional stakeholder input regarding magnitude and focus area
Dk. gray challenges: omit from further consideration

APPENDIX A: OR ROUTE CONVERSION TABLE

When referring to locations by milepost and route number within this report, Oregon routes numbers are based on the route numbers used by the ODOT (LRS) which do not necessarily match the posted route numbers. A conversion table is listed here for the routes in the corridor.

ODOT Highway Numbers (LRS)	Highway Name	Posted Route Number
1	Pacific Highway	I-5
4	Dallas-California	US 97
7	Central Oregon	US 20
9	Oregon Coast	US 101
15	McKenzie	ORE 126, ORE 242
16	Santiam	US 20
17	McKenzie-Bend	US 20
18	Willamette	ORE 58
19	Fremont	US 395, ORE 31
20	Klamath Falls-Lakeview	ORE 140
21	Green Springs	ORE 66
22	Crater Lake	ORE 62
25	Redwood	US 199
35	Coos Bay – Roseburg	ORE 42
45	Umpqua	ORE 38
49	Lakeview-Burns	US 395
50	Klamath Falls-Malin	ORE 39
62	Florence Eugene	ORE 126
73	North Umpqua	ORE 138
215	Crater Lake-Belknap Springs	ORE 126
231	Elkton-Sutherlin	ORE 138
233	West Diamond Lake	ORE 230
244	Coquille-Bandon	ORE 42S
270	Lake of the Woods	ORE 140
272	Jacksonville	ORE 238
425	East Diamond Lake	ORE 138
431	Warner	ORE 140
440	Frenchglen	ORE 205
442	Steens	ORE 78
456	I.O.N.	US 95

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