TECHNICAL MEMORANDA
ITS EARLY DEPLOYMENT PROGRAM
I-90 SEATTLE TO SPOKANE

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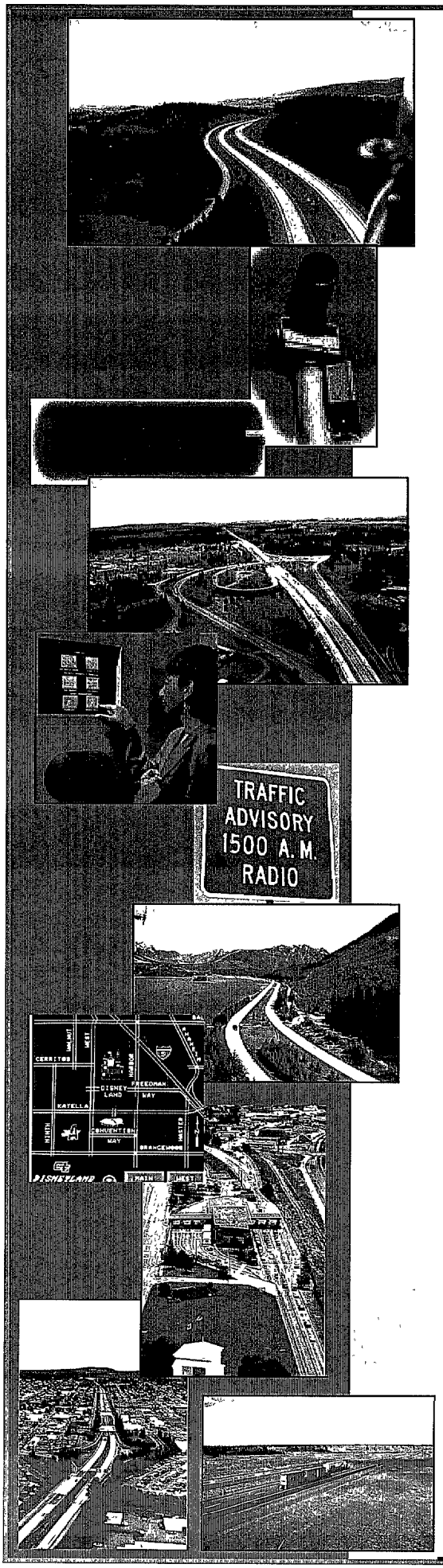

TECHNICAL MEMORANDA

ITS EARLY DEPLOYMENT PROGRAM

I-90 SEATTLE TO SPOKANE

PREPARED FOR
WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

PREPARED BY
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February 24,1998

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Mr. Eldon L. Jacobson, P.E.
Advanced Technology Engineer
Washington State Department of Transportation
Washington State Transportation Center
1107 N.E. 45th Street, Suite 535
Seattle, WA 981054631

Subject: Seattle to Vancouver, B.C. & Seattle to Spokane: Intercity/Rural ITS Corridor Study Final Report
Reference: Consultant Agreement (Y-6276)

Dear Mr. Jacobson:

Please find enclosed 1 copy of the final reports for the I-5 and I-90 ITS Early Deployment Program. We appreciate the opportunity to have worked on this exciting project. We feel that the project prospectuses developed for these corridors present WSDOT with genuine opportunities to address many of the needs of the corridors. The deployment of intelligent transportation infrastructure in specific targeted areas as outlined in Section 4 will greatly enhance safety and operations for all corridor stakehold rs.

would like to personally thank you for you commitment to this project and your leadership throughout the duration of the project. We would be happy to assist you as may be required in developing these projects further.

Please call me at (301) 998-6627 if you have any questions. Ron Atherley can be reached at (206) 382-5214 and Ron Lewis can be reached at (206) 689-4905 for specific questions concerning the I-90 and the I-5 corridors, respectfully.

Sincerely,
PARSONS QUADE & DOUGLAS, INC.

Kern L.. Jacobson, P.E.
Project Manager

Ron Atherley, I-90 Corridor Manager
Ron Lewis, I-5 Corridor Manager
KLJ/sjm

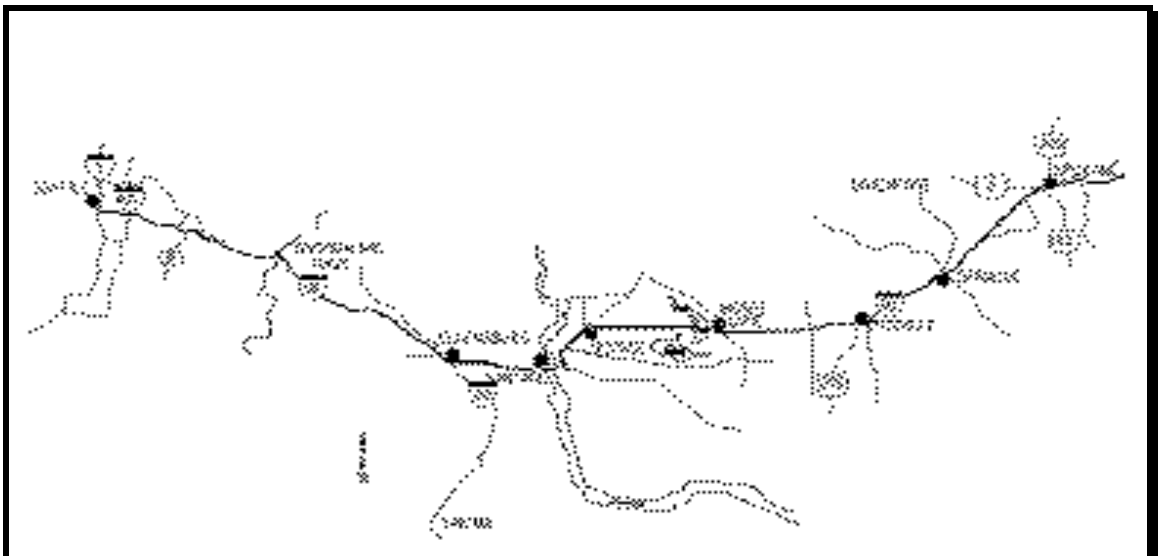
Executive Summary

This executive summary presents the final recommendations and a brief description of the Interstate 90 (I-90) Seattle to Spokane Intelligent Transportation system (ITS) Early Deployment Program. The study was performed by Parsons Brinckerhoff, PB Farradyne Inc., and their subconsultants.

Project Description

The I-90 Seattle to Spokane study is intended to provide the Washington State Department of Transportation (WSDOT) with an implementation plan for the deployment of ITS technologies along I-90 from Seattle to Spokane. The study follows the guidance set forth by the WSDOT "Venture" program in providing a fully integrated state-wide transportation system on the roadways within WSDOT's jurisdiction. The study focused on specific applications in the areas of traffic management, traveler information, emergency management, and commercial vehicle operations (CVO) with the emphasis on providing specific projects to be deployed throughout the corridor. As a result of this study, fourteen project prospectuses that address the corridor transportation needs have been prepared. Each prospectus includes a project description, cost estimate, and an implementation schedule

The corridor study included the seven project tasks summarized below.



Corridor Limits: Issaquah (MP 18) to Washington/Idaho Border (MP 299)

Work Element 1 - Assess Transportation Needs
Work element 1 consisted of corridor tours and interviews with key stakeholders and officials from the WSDOT (northwest, northeast, southwest and eastern regions), Washington State Patrol (WSP), cities, counties, and others. Data was gathered relating to the transportation needs along the I-90 corridor with emphasis given to safety, congestion management, and commercial vehicle operations.

Work Element 2 - Identify Corridor ITS Opportunities
Based on the findings of the needs assessment, work element 2 identified specific ITS applications to address the corridor needs.

Work Element 3 - Recommend Corridor Strategies
Based on an assessment of appropriate ITS applications and project steering committee input, work element 3 finalized and prioritized the specific ITS applications considered for implementation.

Work Element 4 - Develop Corridor Plan
Work element 4 consisted of the preparation of specific project prospectuses recommended for the corridor by the steering committee. Both cost estimates and benefit and cost analyses were conducted for each of the proposed projects.

Work Element 5 - Develop Corridor Communication Plan
Work element 5 identified the existing communication infrastructure along the corridor. Specific recommendations on the communication infrastructure to be utilized for the ITS elements along the corridor was included as part of the corridor plan developed in work element 4.

Work Element 6 - ITS Coordination and Outreach Effort
Work element 6 established the project steering committee which provided input, direction, and participative decision-making for the project. The steering committee included members from WSDOT, WSP, Federal Highway Administration, cities, counties and metropolitan planning organizations (MPO). In addition, the coordination and outreach efforts for the project were initiated during this work element. This effort was intended to stimulate interest and deepen the understanding of the ITS efforts for the corridor through a variety of media.

Work Element 7 - Final Report
Work element 7 consolidated the results of the previous work elements and developed the executive summary.

Corridor Synopsis

I-90 is an east-west interstate highway that stretches across Washington, connecting the cites of Seattle, Bellevue, Issaquah, North Bend, Cle Elum, Ellensburg, Moses Lake, Ritzville, and Spokane. I-90 passes through the Cascade Mountains via Snoqualmie Pass, and is a vital economic link between eastern and western Washington. This route is primarily a four-lane corridor, with the exception of urbanized areas, and serves regional and national transport, tourism and commuters. The focus of this study is on the portion of I-90 east of Issaquah (MP 18) to the Washington/Idaho border (MP 299), a total length of 281 miles or 452 kilometers. This section of corridor passes through King, Kittitas, Grant, Adams, Linclon and Spokane Counties.

The WSDOT operates a surveillance, control, and driver information (SC&DI)

system along the corridor from MP 0 to MP 25 as part of the Northwest Region's Transportation Systems Management Center (TSMC). The SC&DI infrastructure includes ITS field devices such as ramp meters, closed circuit television (CCTV) cameras, data stations, variable message signs (VMS), and highway advisory radio (HAR). The system utilizes a fiber optic cable infrastructure for the transmission of analog video, while Synchronous Optical Network (SONET) technology is utilized for the transmission of data. This infrastructure provides tremendous benefits for the WSDOT, including improved freeway efficiency through maintaining freeway capacity, reduction in merging and congestion related incidents, reduction in time needed to clear incidents, and improved traffic information available to motorists.

The SC&DI infrastructure along the I-90 corridor also includes the TravelAid project currently extending from MP 33 to MP 73. This system involves the use of variable speed limit and message signs and in-vehicle display units that provide mountain pass closure status information as well as road, weather, and traffic conditions. Work is also underway in the eastern region to develop a traffic management system including CCTV, vehicle detector stations, and HAR as part of a cooperative effort between the Spokane Regional Transportation Council, City of Spokane, Spokane County, WSDOT and Spokane Transit.

System Architecture

The northwest region of WSDOT has an extensive regional architecture currently in place along the I-90 corridor in accordance with the tenets of the ITS national architecture. The SC&DI program has developed installation, operations, and maintenance standards for this ITS infrastructure. This study recommends the expansion of SC&DI field devices and the communications infrastructure east of the greater central Puget Sound region, in the Spokane urban area, and in other strategic locations along the corridor.

The recommended expansion is highlighted by two specific projects recommended as part of this study. The northwest region TSMC Expansion project would extend the SC&DI infrastructure east to the Edgewick Road interchange (MP 34). The eastern region traffic management system would further this SC&DI infrastructure in the Spokane Area. The initial phases of these two projects would focus on the installation of the communications infrastructure and field devices at priority corridor locations, followed by the final build-out of the ITS field devices and communication infrastructure in future phases. Other recommended projects would be deployed throughout the corridor utilizing the ITS field devices when applicable and introducing new technologies to address the identified corridor needs such as rest area security, weather related warning systems, and traveler information. Certain project elements would utilize leased communication lines for both field device and control center communications in the short-term followed by the possible long-term integration with the WSDOT-owned fiber optic communication links as this infrastructure expands throughout the corridor.

It is important that each of the recommended projects allow for the exchange of data with the WSDOT Smart Trek ITS backbone currently being developed under the U.S. DOT Model Deployment Initiative (MDI) Program. Each effort must emphasize the utilization of consistent communication protocols and data exchange schemes. The data exchange would benefit the individual projects along the corridor by providing access to corresponding

traffic information. It would also benefit the ITS backbone system itself by adding valuable data to this integrated traveler information network.

Project Summaries

The corridor study resulted in fourteen specific project recommendations. The following is a summary of the recommended deployment for the corridor.

Broadcast Radio Dissemination System
Develop a system that allows route, weather, and traffic condition information to be sent to local broadcast radio stations. Each station would then have the capability to broadcast this information to its listeners.

Ice Detection Weather Warning System
Develop an ice detection and warning system at selected locations. Sensors will detect when bridge and road conditions become icy and a warning system will disseminate real-time, site-specific information to travelers, WSDOT maintenance personnel, and the WSP.

Internet Pre-Trip Traveler Information
Expand WSDOT's existing capabilities to provide weather, travel, and traffic information on the World Wide Web (WWW).

Rest Area Information Kiosks
Install traveler information kiosks at rest stops along the corridor. Traveler information will include both static and real-time data applicable for the corridor.

TravelAid Advance Information System
Provide pre-trip and en-route information regarding pass closure status and road, weather, and traffic conditions to travelers. Information will be disseminated via roadside VMS and communication beacons to participating drivers equipped with in-vehicle devices.

Columbia River Bridge Information System
Plan, develop, and implement a system that detects road, weather, and traffic conditions on and near the Columbia River bridges to provide advanced warning of hazardous conditions to motorists. These conditions would include high wind, low visibility, ice, congestion, and overspeed vehicles.

Chain-up Area Parking Management System
Develop a traffic management system to provide travelers with information on chain-up area parking space availability. This would maximize the utilization of existing roadside facilities and enhance safety.

Speed Detection/Warning System
Install a speed detection/warning system at steep upgrade and downgrade locations as well as areas of known recurrent speeding. The warning system would be activated upon sensing a potentially hazardous condition.

Variable Speed Limit Signing and Weather Warning System
Implement a variable speed limit signing and weather warning system near Easton Hill between MP 72.5 and 74.5 and expand coverage of the existing TravelAid variable speed limit signing and weather warning system through in-fill of devices between MP 33 and MP 72.5. The system would be integrated with the existing TravelAid system and would detect changing weather conditions and provide motorists with information, weather-related warnings, and variable speed limits.

Northwest Region TSMC Geographic Expansion

Expand the WSDOT SC&DI network along I-90 from Issaquah (MP 18) to Edgewick Road interchange (MP 34). This would expand the geographic coverage of the northwest region's Transportation Systems Management System (TSMC) eastward and would provide additional traffic field devices along this heavily traveled corridor. The expanded coverage along this stretch of roadway would provide better traffic management capabilities and increased motorist safety.

Eastern Region Traffic Management System
Develop a Traffic Management System (TMS) in the Spokane Area (I-90 MP 276 to MP 292) consisting of traffic field devices connected through communications infrastructure to a local Traffic Operations Center (TOC). WSDOT and WSP personnel at the TOC would be able to monitor and control the TMS field devices and thus effectively manage traffic operations and incidents along this corridor.

Traffic Data Management System
Develop a corridor-wide traffic data management system that would utilize the existing permanent data station program currently located along the I-90 corridor. This data would be readily available to local cities, counties, and planning agencies in the region for their use.

Rest Area Security System
Enhance public security at rest areas along the corridor through the establishment of safe areas with enhanced lighting and improved surveillance and communication to emergency services.

Portable License Plate Optical Reader
Deploy portable license optical reader technologies to assist the WSP in streamlining inspection efforts at weigh stations, assist in enforcement, and provide WSDOT personnel with the means to conduct origin and destination studies.

Deployment Costs

The following is a budgetary estimate for the fourteen projects recommended for the corridor. These costs reflect initial project developments and deployment. In many cases, the detailed prospectus recommends limited application such as prototype and spot deployments during phase one, followed by expanded application during subsequent phases. It is widely recognized that the costs of implementation beyond phase one will be significantly affected by the availability of rapidly developing technology and thus are not included in these estimates.

ITS Project	Estimated Capital Cost
Broadcast Radio Dissemination System	$182,000
Ice Detection Weather Warning System	$768,000
Internet Pre-Trip Traveler Information	$204,000
Rest Area Information Kiosks	$310,000
TravelAid Advance Information System	$948,000
Columbia River Bridge Information System	$828,000
Chain-Up Area Parking Management System	$413,000
Speed Detection/Warning System	$1,005,000
Variable Speed Limit Signing and Weather Warning System	$935,000
Northwest Region TSMC Geographic Expansion	$2,860,000
Eastern Region Traffic Management System	$4,710,000
Traffic Data Management System	$325,000
Rest Area Security System	$228,000
Portable License Plate Optical Reader	$22,000
Total Deployment Costs	**$13,738,000**

ITS EARLY DEPLOYMENT PLAN

I-90 SEATTLE TO SPOKANE

Technical Memorandum 1

CORRIDOR NEEDS ASSESSMENT

prepared for the

Washington State Department of Transportation

prepared by

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1.0 INTRODUCTION

1.1 OVERVIEW

This report has been prepared as part of the I-5 Seattle to Vancouver B.C. & I-90 Seattle to Spokane Inter-City Urban/Rural Corridors ITS Early Deployment Project. This is the first technical memorandum for the ITS Early Deployment Plan for the I-90 Corridor and is submitted in fulfillment of Work Element 1.5: Data Assessment/Corridor Needs Summary. The I-5 Data Assessment/Corridor Needs Summary is provided under separate cover. Revisions based on the review of this document will be presented in the I-90 ITS Corridor Study - Final Report, Work Element 7, which will be composed of subsequent memoranda in their final form from the other five ITS Study work elements.

This scope of this Work Element reads as follows:

> The CONSULTANT shall analyze the compiled data prepared by the Washington State Department of Transportation (WSDOT) to determine short-term, mid-term, and long-term transportation needs in the corridor. The CONSULTANT shall identity specific problems, and estimate their magnitude. Special attention shall be given to safety, congestion, and commercial vehicle operations. This analysis shall serve as a baseline for gauging the impact of recommended ITS solutions. The results of this assessment shall be compiled in a graphic format using charts and maps in a technical memorandum to be submitted to WSDOT for review.

This report summarizes findings and presents the current transportation needs of the I-90 corridor based on the physical assessment of existing and planned corridor conditions conducted under Work Elements 1 .1: Corridor Tours; 1.2: Non-Accident Data Summary; and 1.3: Accident Data Summary. Tasks 1.2 and 1.3 were the responsibilities of WSDOT. These previous tasks involved physical characteristic assessment of the transportation infrastructure, an assessment of existing operational characteristics, current progress on Intelligent Transportation Systems (ITS) infrastructure, and proposed planned improvements. These findings were collected in both anecdotal format from minutes of the Corridor Tours and through existing conditions documentation provided by the WSDOT, and are presented in the appendices.

1.2 ORGANIZATION OF THE TECHNICAL MEMORANDUM

Section 1 .O of this technical memorandum provides an overview of the technical memorandum and presents the organizational structure for the memo. Section 2.0 summarizes the transportation needs of the corridor by five different categories: Safety; Traffic Operations, Congestion, and Traffic Management; Traveler Information; Commercial Vehicle Operations; Enforcement and Motorist Assistance; and Other Transportation Needs. Section 3.0, the Summary of Results, will conclude this report through presentation of findings, summarizing corridor-wide transportation needs as determined through this investigation. Transportation needs are presented without regard to ITS solution potential, but rather in a time frame reference based on short-, mid- and long-range needs listing. Supporting information is

contained in each of the appendices. The content of each of the appendices is described below:

Appendix A presents a map of I-90, which is a straight line illustration of the corridor.

Appendix B presents minutes developed based on the Corridor Tours, Work Element 1.1, which were conducted with WSDOT and Washington State Patrol (WSP) personnel.

Appendix C presents the results of the Non-Accident Data Summary, Work Element 1.2. This appendix includes a Corridor Description; a review of Current and Future Transportation Infrastructure, including geometric characteristics and planned improvements, motorist information signing, transit systems, rail, marine and airport facilities, and pipelines; existing and forecasted Traffic Conditions; and Other Existing Conditions including unstable slopes, weather data, assistance calls and citations, and a listing of ITS devices along the corridor.

Appendix D presents the results of the Accident Analysis Summary, Work Element 1.3. This appendix presents a variety of findings related to the location and causes of traffic accidents along the corridor as prepared by WSDOT.

Appendix E is the Group Participation Plan completed under Work Element 0.5. This is presented here as background to the group participation process.

2.0 SUMMARY OF CORRIDOR TRANSPORTATION NEEDS

Transportation needs are defined as the physical and operational improvements that have been identified for this corridor. These needs are areas of concern in which improvements should increase the efficiency of the movement of traffic and goods, reduce maintenance and operational costs, or improve corridor safety. Many of these needs have already been identified by WSDOT in their five year plan, and are therefore not identified as needs since they have already been addressed. Planned improvements as proposed by WSDOT are shown in the appendices.

The following sections discuss these needs in terms of their primary functional enhancement.

2.1 SAFETY

From the results of Work Element 1.3, Accident Data Summary, and through information obtained during the corridor tours, several observations were made with regard to corridor safety. There were several basic safety concerns that were the focus of this study, including: high accident spot locations, accidents related to specific environmental conditions (snow, ice, fog, dust, rock falls, and animal crossings), heavy vehicle accidents, and accidents by type of accident and severity. From the analysis presented in Appendix D, several noteworthy safety needs emerged. These are briefly described below.

2.1 .1 General

- Run-off-the-road accidents: Run-off-the-road accidents (due primarily to the driver falling asleep) were determined to be a safety problem throughout much of the corridor. This was determined to be more of a problem in eastern portions of the corridor where the terrain is flat and there are long distances between interchanges. WSP officers stated that many of these accidents are not reported, as many are driver-recovered. A program of rumble strip upgrades is currently nearing completion for all of the rural eastern portions of the I-90 corridor. WSP officials and WSDOT Maintenance personnel have indicated that this has been an effective treatment for these types of accidents in the locations where they have been installed.

  It is also interesting to note where accidents do not appear to be a problem, but where the statistics may be misleading. There are relatively few accidents that occur between I-82 (MP 110) and US 395 (MP 220). This may be partially due to the drop in traffic volumes through this section which would reduce the likelihood of multiple car collisions. Due to the landscape, there are few obstacles to hit if a driver were to run off the road, and a driver is therefore more likely to be able to recovered unaided. An accident report is not likely to be filed where a single vehicle accident occurs and where no injury or significant property damage is encountered.

- Low Bridges: There were several low bridge areas that contributed to overheight accidents. All of these locations have been identified by WSDOT and are programmed for replacement in WSDOT's 5-year plan; however, not all are currently funded.

2.1.2 Northwest Region

- SR 18, MP 25: There is a high number of accidents near this heavily traveled interchange. SR 18 is also a primary truck route.

- South Fork Snoqualmie River Bridge, MP 36.62 to MP 36.64: An eastbound section of I-90 near MP 37 is the location for a high number of accidents due to an upgrade condition.

- Franklin Falls Bridge/Denny Creek Bridge, MP 50.50 to MP 51.32: Franklin Falls Bridge was noted to have greater potential for icing than the surrounding area.

2.1.3 South Central Region

- Snoqualmie Pass Area, MP 50 - MP 68: There is a high frequency of accidents in this area due to snow, ice, grades and curvature. Many of these accidents are associated with icy or wet pavement conditions. Wet pavement accidents are prominent west of the mountains due to the climatic differences between eastern and western Washington. Not surprisingly, the majority of wet road accidents occurred in western Washington. Over 75 percent of the wet pavement rural accidents on I-90 occurred in the 18 mile stretch between MP 50 and 68.

- Stampede Pass area, MP 62.5 - MP 67: A high number of accidents occur in this area, probably due to substandard horizontal alignment.

- Slope Instability, MP 69: There were a couple of areas noted where rock and tree falls occur near MP 69.

- Easton Hill, MP 71: There are many westbound rear-end/slow moving vehicle accidents here due to the long upgrade.

- Bull Frog Road Weigh Station, MP 80: A high frequency of accidents occur in this spot caused by a combination of merging traffic and horizontal curve.

- SR 970/Indian John Hill Rest Area, MP 85-88: This is an area of frequent accidents.

- Spot Locations, MP 92 through MP 109: Areas indicated as having a high accident potential were the reverse curves near MP 92.5, curves between MP 95 and MP 97, and Exit 109 where roll-overs are caused by a sharp horizontal curse on the exit.

- Animal Crossings, MP 95: Animal crossings are a concern near the Elk Heights area of I-90. A high fence is currently installed in this area to prevent elk and other large animals from crossing the highway.

- East of I-82, MP 110: Run-off-the-road accidents were identified as a problem. This area near MP 115 does not currently have rumble strips.

2.1.4 North Central Region

- Traffic Glare, MP 137 to MP 192: The majority of this stretch of I-90 is within a narrow section of right-of-way. The close proximity of a parallel adjacent county road is of concern due to glare from head lamps and the absence of a barrier. A glare screen is currently placed along a curved section near MP 148 eastbound between I-90 and the frontage road.

- Vantage Hill, MP 138: This hill, east of the Vantage Bridge, experiences a high number of accidents. These accidents are attributable to a variety of factors including speeding, frequent compact snow and ice conditions, a high volume of concert goers, and a long steep westbound decline towards the Vantage Bridge curve.

2.1.5 Eastern Region

- West Spokane, MP 260 to MP 264: There is severe rutting in the road east of Four Lakes, Exit 270, where traffic volumes increase. Icing problems near MP 273 and MP 274 are exacerbated from this rutting condition since the ruts prevent proper drainage and plowing of the roadway surface.

- Sunset Hill, MP 280: There are a high number of accidents along Sunset Hill, which are attributed to the long steep upgrade.

- Liberty Park interchange area - SR 290 (Perry Curves), MP 282: The interchange located at Exit 282 has a high accident frequency. This condition is due to a combination of several factors, including horizontal alignment, weaving, merging, and icing on elevated structures.

- Thorp Street/Freya Street, MP 283: The Thorp-Freya undercrossing is a high accident area. I-90 has an undulating vertical alignment in this area which affects drivers' reaction time, especially when encountering slower moving vehicles.

2.2 TRAFFIC OPERATIONS, CONGESTION AND TRAFFIC MANAGEMENT

From the results of Work Element 1.2, Non-Accident Data Summary, and through information obtained during the corridor tours, several observations were made with regard to traffic operations and traffic management. There are several operational concerns throughout the corridor, including capacity, geometrics, climbing lanes, traffic data collection, traffic control, and maintenance. From the analysis presented in Appendix C, there were several noteworthy operations related needs. These are briefly described below:

2.2.1 General

- Permanent Traffic Data Recorders: There is a need to expand the permanent data recorder system in terms of both location and capabilities. Real time traffic information could assist both WSDOT Traffic Operations and WSP. This traffic data currently is sent to

Olympia where it is processed and then returned in a historic format to the originating District for their use.

- Hazardous Materials/Incident Management Response Plan: There is a need to provide a more responsive incident management and hazardous materials management plan. This **should** include the reexamination of roles and responsibilities of various agencies including WSDOT, WSP and local fire departments.

2.2.2 Northwest Region

- Continued geographic expansion of the reach of the Northwest Region Traffic Management Center: WSDOT's Northwest Region maintains a regional Traffic System Management Center (TSMC) in its Shoreline-Dayton Avenue headquarters. This TSMC is the central depository for traffic information. Traffic and other data are made available to the WSP District office in Bellevue through the WSDOT TSMC, including a real-time video feed from the I-90 surveillance system. CCTV coverage, ramp metering, and traffic data stations currently extend to the Front Street interchange in Issaquah at MP 17. This system has profound operational benefits for both WSDOT and WSP personnel and a need exists to expand its current coverage area east on I-90.

2.2.3 South Central Region

- Snoqualmie Pass Closure Procedures: The current system consists of a series of manually operated gates placed at strategic freeway ramps for use during Pass closures. Traffic is directed by temporary signage and WSP personnel, and a gate on the westbound on-ramp to I-90 at Exit 106 assists in early diversion of traffic. The current Pass closure response plans should be reviewed to determine the efficiency of the operation and to suggest more cost effective solutions.

- Preventive Winter Maintenance, Snoqualmie Pass: The Hyak Maintenance Area is responsible for monitoring weather systems for preventive de-icing procedures and avalanche control. Improvements in this area would assist in optimum utilization of manpower and machinery, and provide safer driving conditions.

- Travel Aid, Snoqualmie Pass: Development of the Travel Aid project should continue. This project consists of providing speed detection, ice detection, weather stations, and variable speed limit signs along I-90 in advance of and over Snoqualmie Pass. This variable speed limit system is intended to address the high accident problems encountered in this area due to bad weather and other factors. This project, currently under construction, should be monitored for effectiveness and expanded as necessary to areas not covered within the current project limits.

2.2.4 North Central Region

- Traffic detour options in the Columbia Hill Area: The current geometric configuration of the east side of the Columbia River Bridge includes a Jersey barrier. This does not allow median crossing, limiting emergency vehicle traffic and traffic control options during incidents or partial bridge closures. Options to manage incidents in this area need to be

considered, including the possibility of a movable barrier or other means to detour traffic to the opposite side of the bridge.

- The Columbia River Gorge Amphitheater, MP 143, 149, 151, 281: Amphitheater exits experiences peak traffic during special events at the Gorge, and traffic may back up onto the freeway from the eastbound off-ramp. A traffic management contractor is provided during these events and funded by MCA Productions, the sponsor of the concerts. One of the roles of this contractor is to assure that freeway traffic is not affected by the congestion that routinely occurs at Exits 143 and 281 during these events. Ramps at Exit 143 are typically at capacity before and after major Gorge Amphitheater events, and a higher than average number of calls for assistance occur during these periods. A permanent solution to this operational need should be examined.

9 Lane Striping: Lane striping and delineation in much of the NC Region is in poor condition and offers limited delineation during night operations. The restriping of the lane lines with paint is done twice every year, but is quickly worn away. Reflective pavement markers are not used due to the use of snowplow blades. The life-cycle and performance of delineation through this area may have potential for improvement.

= Improved Inclement Weather Maintenance Response: There is a limited number of gravel trucks/snowplows for the NC Region's 700 lane-miles of state highways, and only 18 permanent maintenance staff. The resulting reduced response time during poor weather conditions can be a problem, impacting WSP investigations into accidents. A means to better predict icing conditions may also help in better utilizing existing limited resources.

2.2.5 Eastern Region

0 Spokane Area Traffic Management: There is a need for expansion of the traffic management and incident management capabilities on I-90 within the Spokane urban boundaries. Real-time traffic information capabilities would assist in managing both recurrent and non-recurrent congestion problems, and in providing quick response and clean-up during incidents. This traffic management system should address the following:

1. Central Traffic Management System: A centralized traffic management system should be provided for a clearinghouse of data collection and dissemination.

2. Real Time Data Collection: There are existing permanent count/traffic data collection sites along I-90. Currently this data is received, reduced, and disseminated from the Olympia Service Center. Data from these local readers may not be available to the Eastern Region office until months later. These traffic data stations need to have the ability to provide real time data to the Eastern Region's traffic operations for use in incident detection and traffic management.

3. Video Surveillance and Detection: Video surveillance and detection for the Sunset Hill Area would assist in early detection of westbound accidents on this steep upgrade. Camera sites along this stretch would allow real time video feedback for incident management.

4. Driver Information: Highway Advisory Radio and additional VMS would assist in incident and traffic management.

5. 24 Hour Coverage for Incident Management: The Eastern Region currently does not have 24 hour traffic operations coverage. WSP handles incidents during the off-peak hours of the day.

6. Additional Weather Station Information: In addition to expanded weather station coverage within the Eastern Region, stations located in the west could give advance warning of approaching storms.

- Local Traffic Congestion: There are several areas that require additional review of congestion management. These include:

  - Heavy traffic on the SR 195 eastbound on-ramp.
  - Eastbound Pine Street off-ramp traffic backing onto the freeway during peak hours.
  - Heavy AM congestion between Exits 281 and 288.

2.3 TRAVELER INFORMATION NEEDS

2.3.1 General

- Advanced Snoqualmie Pass Information: Existing Highway Advisory Radio (HAR) sites are located near Exit 31 and in the Ellensburg vicinity. HAR sites operate at 1610 kHz frequency and transmit updated Snoqualmie Pass conditions. Additional sources of pass closure information need to made available as far in advance as practical. The TravelAid Project, once complete, will assist in this regard. Real-time information at the rest areas would assist drivers in planning their trips. Pass information should be made available as far east as Spokane so that travelers can make informed pre-trip decisions.

- Vehicle Service Areas: There are several areas throughout the corridor with limited services, or services by time of day. The lack of service areas presents an additional demand on WSP personnel in responding to stranded motorists. 24 hour service would be beneficial.

- Rest Area Traveler Information: A need exists for information about travel conditions, weather information, event information, and other services for travelers at rest areas. Kiosks at the rest areas should be explored as a means to disseminate information to travelers.

2.3.2 Northwest Region

- Rest Area west of Snoqualmie Pass: There is a need for a rest area to be located on I-90 west of Snoqualmie Pass. Service in this area would provide a needed resting point for travelers while serving eastbound travelers and officials with a logical staging point for Snoqualmie Pass closures. The development of commercial services along I-90 at North Bend may eliminate the need for this rest area.

2.3.3 South Central Region

- Vantage Bridge Advisory: There is a need for traveler information to be available in advance of the Vantage Bridge. This information would be available in order to advise motorists of high wind conditions, icing on bridge, accident advisories, and Gorge Amphitheater traffic/event information.

- Interchange Advisory: Traveler information should be provided at the I-82 interchange in order to provide advance information of roadway conditions and diversions as necessary.

- Fog Condition Warning: An area of recurrent fog conditions lies between MP 93 - MP 127. Real time warning of fog would assist drivers in preparing for this condition.

2.3.4 North Central Region

- Vantage Bridge Advisory: There is a need for traveler information to be available in advance of the Vantage Bridge. This information would be available in order to advise motorists of high wind conditions, curve warning, speed too fast for conditions, icing on bridge, and accident advisories.

2.3.5 Eastern Region

- Weather Advisory Information: There are several areas along the corridor that would benefit from advance weather advisory. MP 203 to 297 experiences poor visibility from dust and snow during windy conditions. Recurrent fog conditions are experienced between MP 257 and 279.

2.4 COMMERCIAL VEHICLE OPERATIONS NEEDS

2.4.1 General

- Weigh Station Design Problems: The weigh stations along I-90 are of an older standard design and do not adequately provide for current traffic volumes. These facilities have a short ramp design, resulting-in queues that sometimes back up onto the freeway mainline. When these queues develop, the scale crew must close the station and allow trucks to bypass the scales until the queue dissipates. Long queues effecting I-90 through-traffic and are a safety concern. Commercial vehicle ingress back into the mainstream I-90 traffic is also a problem, resulting in a high accident rate at these merge points.

- Motor Carrier Regulatory Procedures: There is a redundancy of weigh stations along I-90, whereby commercial carrier through-traffic is required to stop at multiple locations. A preclearance system to track and identify commercial vehicles should be examined.

- Motor Carrier Enforcement and Inspection: There are several motor carrier enforcement and inspection activities that are currently performed at weigh stations, including measurement for overweight and overheight vehicles, enforcement against weigh station avoidance by truck operators, inspection of vehicles for transport of hazardous materials and contraband, and equipment safety enforcement checks. These enforcement issues

are time consuming processes that contribute to weigh station delay and require adequate staffing levels. Methods such as weigh-in-motion and surveillance systems should be explored as a means to improve enforcement and efficiency of these weigh stations.

2.5 ENFORCEMENT AND MOTORIST ASSISTANCE NEEDS

Interviews with the WSP were extremely informative, as shown in the results of Work Element 1 .1: Corridor Tours. Information obtained in the Non-Accident Data Summary included the number of citations issued and motorist assistance calls, verifying much of what had been indicated during the interviews. Information related to the Accident Data summary contained in appendix D was also useful. There are several enforcement issues that were identified, including enforcement, surveillance, motorist assistance, pursuits, coordination with WSDOT, staffing levels, and incident response. Of these issues, several were found to be noteworthy, and are briefly described below:

2.5.1 General

- WSP & WSDOT Coordination: WSP is emphasizing public safety as well as law enforcement, which has resulted in expanded opportunities for coordination between WSP and WSDOT. There are continuing needs for coordination between WSP and WSDOT in areas such as incident management, Snoqualmie Pass closure coordination, and the purchasing and use of equipment. Currently, the WSP has the only State-wide emergency communication system.

- Surveillance: There are needs for additional surveillance at locations throughout the corridor. These include the need for video cameras to aid in HOV enforcement, traffic management, surveillance at rest areas, and the need to address problems associated with pursuits. There is a need to enhance the tools available for WSP to identify and prosecute perpetrators for a wide variety of crimes. As WSDOT considers expanding the use of video surveillance for highways and rest areas, the system could also conceivably record major accidents, enforcement actions, vandalism or theft of property, and crimes against persons.

- HOV Enforcement: The use of video cameras and fixed location monitors for HOV enforcement is the subject of current research at TTI If proven successful, this technique may provide a strong incentive for the public to adhere to the required number of occupants per vehicle. WSP troopers currently have very limited ability to see into vehicles, especially during darkness and inclement weather. They also have difficulty seeing into sports utility vehicles that are taller than patrol vehicles. The WSP has reduced the number of motorcycle officers which further reduces the tools usually associated with HOV enforcement. There is a general need for cameras strategically mounted on existing structures such as overpasses to provide a better view of a vehicle's interior. Such an application may also serve as a deterrent to HOV violators, as would the use of "decoy" or replica cameras.

- Vehicular Pursuits: The continuing problems associated with vehicular pursuits, such as injuries to innocent motorists, may make this a priority for consideration of ITS technology applications. Installation of devices with the capability to electronically track or disrupt a

fleeing driver, while reducing risk to officers and bystanders, would give the WSP a strong tool to reduce danger to the public.

- Motorist Assistance/Motorist Aid: There is a need to provide additional services for potentially stranded motorists in remote areas. There are several locations prone to vehicular break down, including the Ritzville area, where there is a marked absence of gas stations, and the ten mile upgrade west of the Columbia River where vehicles frequently overheat in the summer. These areas also experience more accidents due to slow moving vehicles. Conditions are compounded by the fact of this portion of I-90 laying in a cellular shadow area. Devices such as call boxes or other means to detect and respond to disabled vehicles should be examined. WSP would be able to provide a listing of these physical assists.

- Staffing Levels: WSP District 6 has low staffing levels for the number of freeway miles they cover. WSP's coverage area extends through both WSDOT's South Central and North Central Regions, covering from the King/Kittitas County line (MP 52) to Grant/Adams County line (MP 192).

2.6 OTHER TRANSPORTATION NEEDS

There are several other transportation needs that were identified through this Work Element and are shown in the following paragraphs.

2.6.1 Weather Data Needs

- Since meteorological sensors are not needed in the immediate areas served by airport weather sensors, it is recommended that areas near these airports incorporate pavement temperature sensors. Road temperature sensor data gathered from these pavement sensors should be integrated into airport weather data so that WSDOT road maintenance, emergency management (WSP), and weather forecast service agencies may have routine access to these data.

- The following additional locations are recommended for a full road weather information system (RWIS) sensor suite incorporating both atmospheric and pavement sensors:

  a) The Columbia River Bridge near the SR 26 interchange, MP 137.5: An RWIS installation in this location would fill the first large gap in weather data coverage from Ellensburg eastward to Moses Lake. This location has a higher than average number of rural injury and fatality accidents.

  b) The I-9O/US 395 interchange, MP 221: An RWIS installation in this location would fill in the remaining gap in weather data coverage between the Moses Lake Airport and the present WSDOT RWIS site at MP 257.9. This interchange is also a key commercial route junction, as US 395 carries a considerable amount of commercial domestic and international truck traffic to/from the Tri-Cities area and beyond.

- The following additional locations are recommended for pavement temperature sensors integrated with traffic signals, call boxes, and/or variable message signs. In these areas, we believe no atmospheric sensors are needed due to nearby weather installations which

can provide representative weather data for these locations. Where the location recommended is a bridge, pavement sensors should be placed both on the bridge and at one approach end to provide contrasting pavement temperature data for the bridge deck and highway pavement.

a) The I-90/SR 281 interchange at George (MP 150): This is a lower priority location for a pavement sensor but would provide valuable contrasting pavement condition information between the recommended RWIS site at the Columbia River Bridge and Moses Lake. A second reason to place a pavement sensor in this location is the varied topography in this region, which can create a markedly different pavement temperature profile over area roads.

b) The SR 17 interchange **at** Moses **Lake:** A pavement temperature sensor at this location is also a lower priority. However, sensor data here would fill a large gap in pavement temperature information between the recommended site at SR 281 (George) and the recommended RWIS site at the I-90/US 395 interchange.

c) The Sprague Rest Area near MP 242: A pavement temperature sensor at this location is a higher priority than the previous two recommendations above, since this is the area where accident frequency begins to increase toward Spokane due to road icing. A sensor here would also fill in the gap in road temperature information between the recommended RWIS site at the I-90/US 395 interchange and the present WSDOT RWIS site at MP 257.9.

2.6.2 Other Needs

- Chain-Up/Pull-Off Information: Chain-up areas are provided east and west of Snoqualmie Pass. Information indicating whether there is available space ahead of the queue would be beneficial.

3.0 SUMMARY OF RESULTS

Table 1 summarizes the results of the corridor needs for I-90.

TABLE 1

CORRIDOR NEEDS ASSESSMENT SUMMAR TABLE

LEGEND

Low ○ Medium ◐ High ●

CORRIDOR NEEDS	Source Of Information: Maintenance	Traffic Operations	WSP	Analysis Results	Observations	Frequency	Magnitude/Benefits	Overall Need	Comments
2.1 SAFETY AND ENFORCEMENT									
2.1.1 General									
Run off the Road Accident	X	X	X			○	○		
Low Bridge Accidents	X	X	X	X		○	●		
2.1.2 NW Region									
High Accident Area - SR 18, MP 25			X	X		◐	◐		
High Accident Area - Franklin Falls Bridge, MP 37	X		X	X		○	◐		
2.1.3 SC Region									
High Accidents - Snoqualmie Pass, MP 50 to MP 68	X	X	X	X		●	●		
High Accident Area - Stampede Pass, MP 62.5 to 67	X	X	X	X		●	●		
High Accident Area - Easton Hill Area, MP 71	X	X	X	X		◐	◐		
High Accident Area - Bull Frog Weigh Station, MP 80	X	X	X	X		○	◐		
High Accident Area - SR 970/Indian John Hill Rest Area, MP 85 to MP 88	X	X	X	X		○	◐		
Run off the Road accidents, East of I-82	X	X	X			○	○		
Spot location accidents, MP 92.5, 95 to 97, and Exit 109		X		X		◐	◐		
Slope Instability, MP 69	X					○	◐		
Animal Crossing, MP 95	X					○	◐		
2.1.4 NC Region									
High Accident Area, Vantage Hill - MP 138	X	X		X		◐	◐		
Traffic Glare, MP 137 to MP 138	X				X	◐	○		
2.1.5 Eastern Region									
High Accidents, Thorp Street/Freya Street - MP 283	X	X	X	X		●	◐		
High Accidents,Liberty Park Interchange-SR 290(Perry Curves),MP 282	X	X	X	X		●	◐		
High Accident , Sunset Hill, MP 280	X	X	X	X		●	◐		
Icy Condtion Accidents, West Spokane, MP 260 to MP 264	X	X	X	X	X	◐	○		

CORRIDOR NEEDS ASSESSMENT SUMMAR TABLE

LEGEND

Low ○ Medium ◐ High ●

CORRIDOR NEEDS	Source Of Information: Maintenance	Traffic Operations	WSP	Analysis Results	Observations	Frequency	Magnitude/Benefits	Overall Need	Comments
2.2 TRAFFIC OPERATIONS, CONGESTION & TRAFFIC MANAGEMENT									
2.2.1 General									
Install Permanent Traffic Data Recorders		X			X	●	◐		
Hazardous Material/Incident Response	X			X		○	●		
2.2.2 NW Region									
Expand Pass Closure Procedures		X	X		X	●	●		
2.2.3 SC Region									
Snoqualmie Pass Closure Procedures	X		X		X	◐	●		
Preventative Winter Maintenance	X		X		X	◐	●		
Travel Aid Snoqualmie Pass	X	X	X		X	◐	●		
2.2.4 NC Region									
Gorge Amphitheater Traffic Management	X	X	X			○	◐		
Lane Striping and Delineation	X	X			X	●	◐		
Improved Inclement Weather Maintenance Response	X				X	◐	◐		
Vantage River Bridge Detours	X		X	X	X	◐	◐		
2.2.5 Eastern Region									
Spokane Area Traffic Management		X	X	X		●	●		
Local Traffic Congestion		X	X		X	◐	◐		

CORRIDOR NEEDS ASSESSMENT SUMMAR TABLE

LEGEND

Low ○ Medium ◐ High ●

CORRIDOR NEEDS	Source Of Information: Maintenance	Traffic Operations	WSP	Analysis Results	Observations	Frequency	Magnitude/Benefits	Overall Need	Comments
2.3 TRAVELER INFORMATION NEEDS									
2.3.1 General									
Advanced Snoqualmie Pass Information	X	X	X	X		◐	●		
Vehicle Service Areas	X		X	X					
Rest Area Traveler Information					X	●	◐		
2.3.2 NW Region									
Rest Area west of Snoqualmie Pass		X			X	●	◐		
2.3.3 SC Region									
Vantage Bridge Advisory	X	X	X	X		◐	●		
I-82 Interchange Advisory		X		X					
Fog Condition Warning	X		X	X		○	●		
2.3.4 NC Region									
Vantage Bridge Advisory	X	X	X	X		◐	◐		
2.3.5 Eastern Region									
Local Traffic Congestion	X	X	X			○	◐		
2.4 COMMERCIAL VEHICLE OPERATIONS									
2.4.1 General									
Weight Station Design Problems		X		X	X	◐	◐		
Motor Carrier Regulatory Procedure		X	X	X	X	●	●		
Motor Carrier Enforcement and Inspection		X	X	X	X	●	●		

CORRIDOR NEEDS ASSESSMENT SUMMAR TABLE

LEGEND

Low ○ Medium ◐ High ●

CORRIDOR NEEDS	Source Of Information					Frequency	Magnitude/Benefits	Overall Need	Comments
	Maintenance	Traffic Operations	WSP	Analysis Results	Observations				
2.5 ENFORCEMENT AND MOTORIST ASSISTANCE NEEDS									
2.5.1 General									
WSP & WSDOT Coordination	X	X	X		X	●	●		
Surveillance		X	X		X	●	◐		
HOV Enforcement (NW Region)		X	X		X	◐	◐		
Vehicular Pursuits			X			○	●		
Motorist Assistance/Motorist Aid	X		X	X		◐	◐		
Staffing Levels			X			◐	◐		
2.6 OTHER CORRIDOR NEEDS									
2.6.1 Weather Data Needs									
2.6.1.1 SC Regions									
RWIS Columbia River Bridge	X	X		X		◐	◐		
2.6.1.2 NC Region									
RWIS Columbia River Bridge	X	X		X		◐	◐		
Pavement sensor SR 281 Interchange/George	X	X		X		◐	◐		
Road sensors near Moses Lake Airport	X	X		X		◐	◐		
2.6.1.3 Eastern Region									
Road sensors near Spokane Airport	X	X		X		◐	◐		
2.6.2 Other Needs									
2.6.2.1 NW/SC Regions									
Chain-up Pull-off Information	X		X		X	○	◐		

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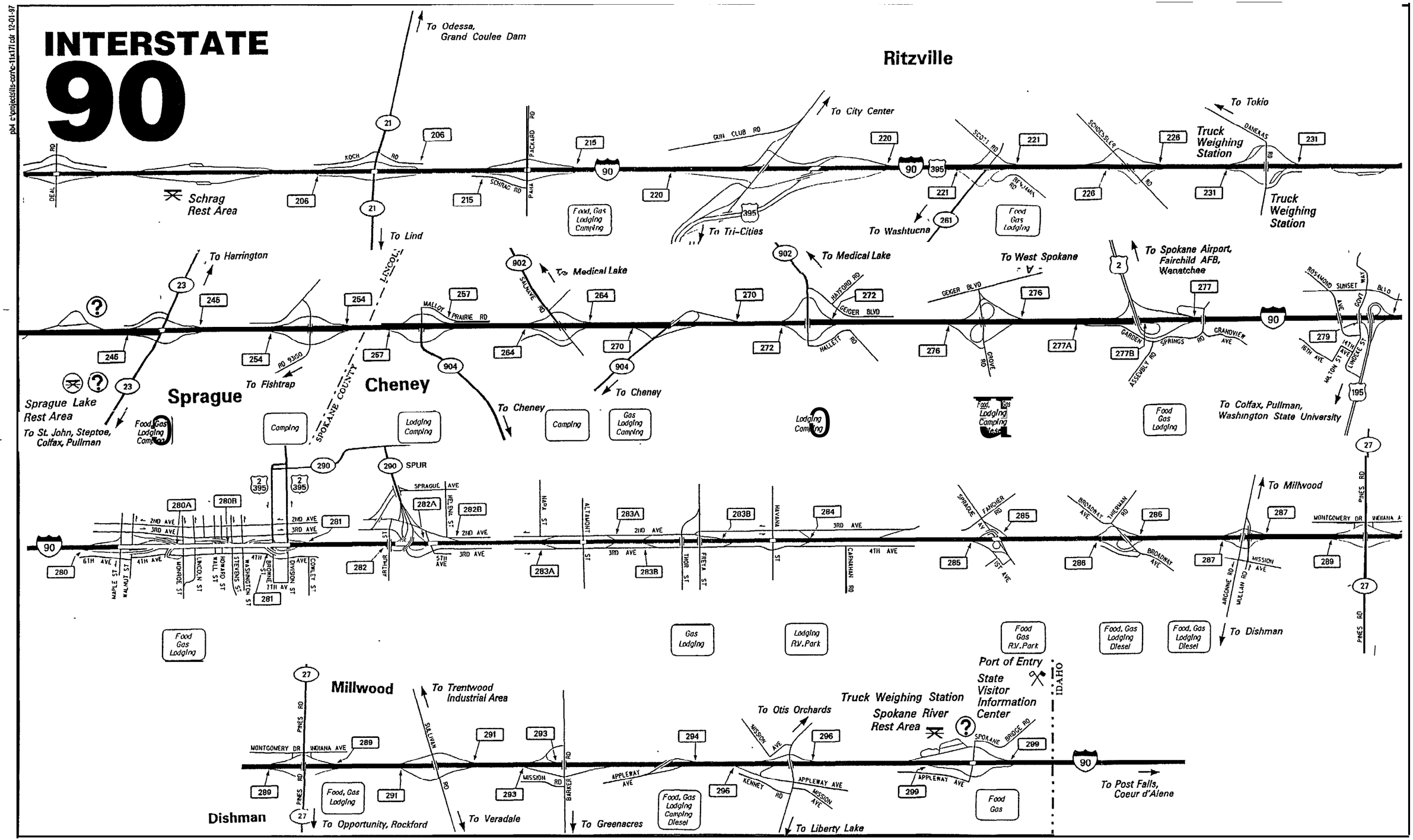
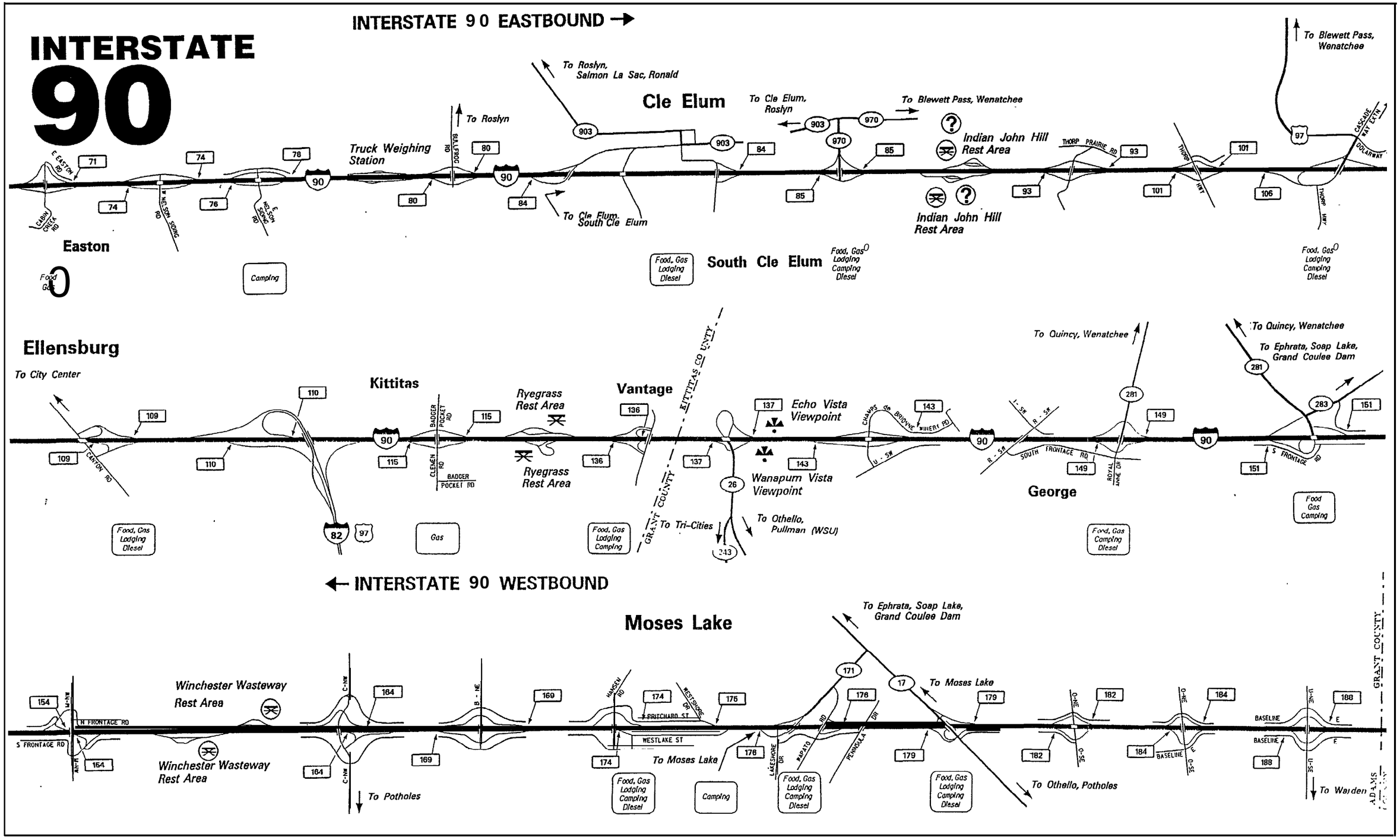
APPENDIX A: STRAIGHT LINE MAPS OF CORRIDOR

Appendix A contains a reproduction of the Washington State Interstate Guide, produced by the Washington State Department of Transportation. Shown on this set of schematic maps are rest areas, motorist information service sign locations, exit numbers, cross street names, parallel bike trails, state parks, visitor information centers, and other points of interest. This map represents conditions as of 1991, the last year in which WSDOT produced this map.

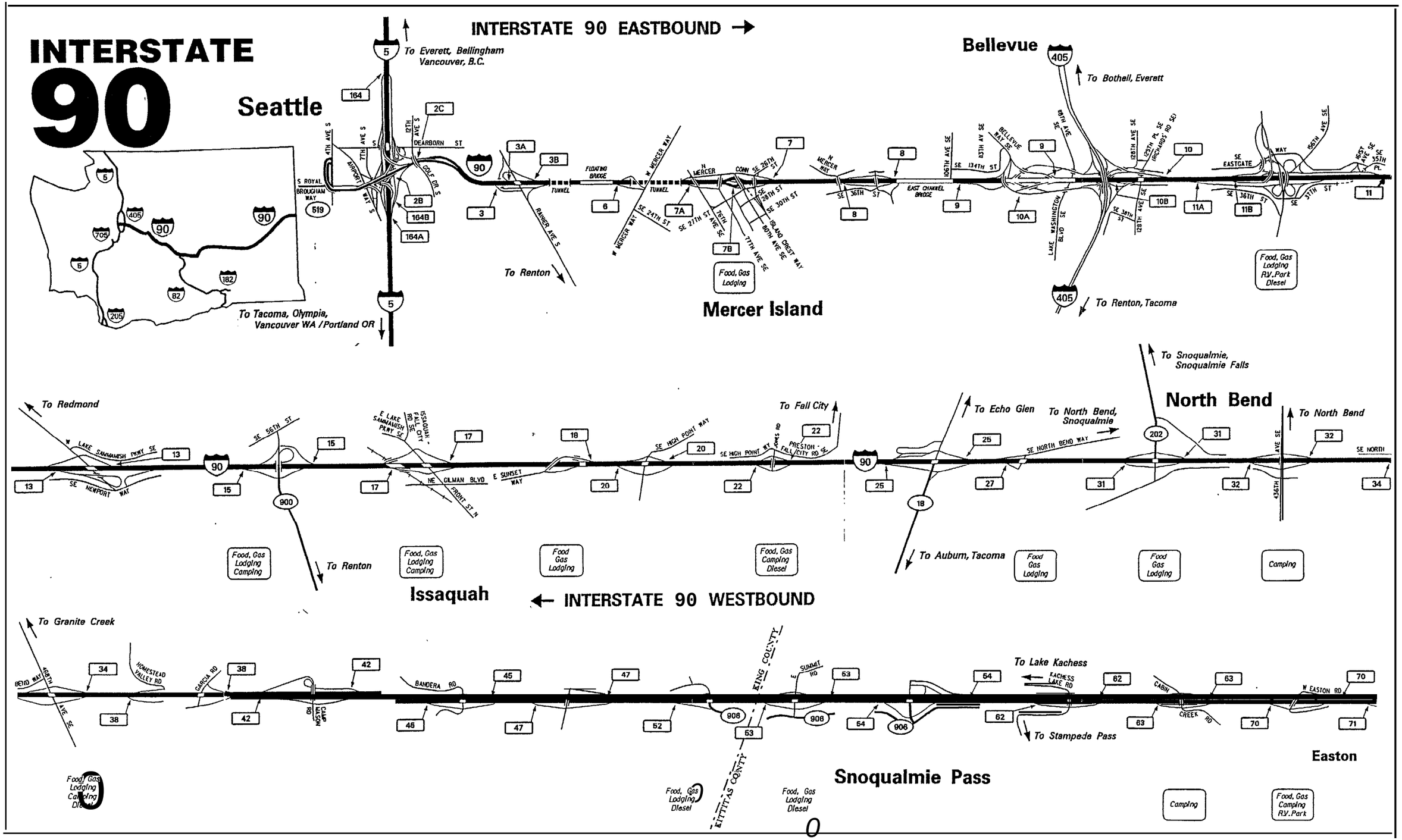


I-90 Corridor - 3 of 3

Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE A-1c



I-90 Corridor - 2 of 3
Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE A-1b



I-90 Corridor - 1 of 3
Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE A-1a

APPENDIX B: CORRIDOR TOUR MINUTES

SCOPE 1.1: CORRIDOR TOURS

Corridor tours will be conducted by the CONSULTANT's Project Manager and the appropriate members of the study team. These tours will consist of joint tours of each Region's area of jurisdiction, including the Regional Traffic Engineer, Maintenance Area Superintendent and the Washington State Patrol. An interview with Regional Administrators for the I-90 corridor east of the mountains will also be conducted under this work element. Video tapes, road logs films and road inventory listings will be provided by WSDOT and be reviewed under this work element. The entire corridor will be driven and reviewed by the appropriate members of the CONSULTANT team. Information obtained through these corridor tours will be collected in a series of meeting minutes, corridor notes and photo logs. This work element is the forerunner to the formal outreach effort in that it will assist in identifying participants for stakeholder meetings. Results will be included in Corridor Needs Assessment technical memorandum.

B.1 INTRODUCTION

A tour of the I-90 corridor was conducted on January 22nd and 23rd by key members of the study team. Regional field personnel who were familiar with the I-90 corridor from the four WSDOT regions and three WSP districts attended these tours, sharing their local knowledge with the study team. Study team members included Eldon L. Jacobson, WSDOT Project Manager; Kern L. Jacobson, Parsons Brinckerhoff (PB) Project Manager; Ron Atherley, PB I-90 Corridor Manager; and John O'Laughlin, PB Enforcement Specialist. Sergeant Dan Pemerl from the WSP Research and Development branch office also accompanied the team to offer insight into State Patrol efforts in this arena. Also attending this tour and providing local insight were WSDOT Regional Traffic Engineers, WSDOT Maintenance Area Superintendents, and Washington State Patrol officers. Each jurisdiction was driven and reviewed by these team members. Information obtained through this corridor tour is shown in the following sections and subdivided by WSDOT and WSP jurisdictional coverage areas.

These results have been discussed with each of the appropriate jurisdictions to assure a reasonable assessment of observed conditions. The issues stated in these minutes will assist the team in focusing their efforts on what local officials view as their primary concerns. The intent of these minutes is not to be inclusive of all problems, but rather to be used as a snapshot from which to gather a general understanding of issues facing the Regions. Statistics obtained through the accident analyses and the non-accident data summary and will be used in many cases to confirm and/or pinpoint trouble spots. This analysis is presented in the main body of the technical memorandum.

The tour minutes are divided into four WSDOT Regions: the Northwest, South Central, North Central, and Eastern Regions.

B.2 NORTHWEST REGION - SHORELINE

I-90 Corridor Tour Minutes
January 22,1996
WSDOT Northwest Region - Shoreline
WSP District 2 - Bellevue

Attendees:
Lt. J. J. Williams - WSP
Phil George - WSDOT Maintenance and Operations Superintendent
Dave McCormick - WSDOT Regional Traffic Engineer
Eldon L. Jacobson - WSDOT Advanced Technology Engineer
Sgt. Dan Pemerl - WSP Research & Development
John O'Laughlin - PB
Ron Atherley - PB

Coverage Area

The WSDOT Northwest Region (formerly District 1) coverage area along I-90 begins at MP 0 (Downtown Seattle) and extends to MP 33, east of North Bend, and applies to both Maintenance and Traffic Operations. The WSP District 2 headquarters **is** in Bellevue and covers a section that overlaps the WSDOT NW Region, covering from MP 0 to MP 53, the King County line. A detachment of the WSP District 2 is located in North Bend, and has coverage of I-90 east to Snoqualmie Pass. Typically, the North Bend Detachment has a greater presence near the summit due to better availability of staff than the adjacent WSP District 6 east of the mountains. In general, cooperation exists between the various WSDOT and WSP districts in the Snoqualmie Pass area.

During the tour, a focus was placed on the rural areas of I-90 east of Bellevue rather than the western portion of the corridor. Due to recent reconstruction and ITS enhancements to the west, the western end of I-90 currently has a proliferation of ITS technologies including Variable Message Signs (VMSs) Highway Advisory Radio (HAR), ramp meters, tunnel air quality sensors, and Closed Circuit TV (CCTV) that currently meet the needs of WSDOT and WSP.

Weather Related Issues

Winter weather conditions in Snoqualmie Pass are of primary seasonal concern along I-90. In WSDOT's NW Region, it is at times necessary to turn eastbound traffic around due to Pass closures. This is accomplished through close coordination between WSDOT and WSP personnel. The experience of WSP and WSDOT suggests that it is difficult to turn high volumes of eastbound traffic around at the last possible exit. VMSs or HAR were suggested as possible means to notify travelers in advance, giving as many opportunities as possible to travelers to choose alternate routes. High Point (Exit 20) was one location that was noted to be used for turn-arounds during these events. It was suggested that interchanges west of Exit 45 be considered for VMS. Edgewick Road (Exit 34) was also identified as a location that is often used to route traffic back west during Pass closures.

Snoqualmie Pass freeway conditions are available to WSP via the Traffic System Management Center (TSMC), the Airport, and the NW Weather Service. WSDOT maintains a I-900 number for Pass conditions whereas the WSP has a toll-free number for motorists to call for information. WSP does not promote its number due to staffing and capacity problems.

Several areas along the corridor were noted as having above-average accident potential. An eastbound section of I-90 near MP 37 was cited as having accident problems due to an upgrade condition. Franklin Falls bridge was noted to have greater potential for icing than the surrounding area.

Traffic Issues

The Northwest Region of WSDOT maintains a regional TSMC in its Shoreline-Dayton Avenue headquarters, which is the central depository for traffic information. Traffic and other data is made available to the WSP District office in Bellevue through the WSDOT TSMC, including a real-time video feed from the I-90 surveillance system. This system is capable of expansion and of incorporating additional devices if required.

The section of I-90 within the Puget Sound urban boundary is approaching capacity. There are some recurrent pockets of congestion near ramps during peak periods. Congestion at 145th and 4th Avenues were given as examples where problems occur. It was noted that traffic problems can build rapidly during incidents, but response time has been substantially reduced through the existing surveillance and detection system. Enhanced coordination capabilities between WSP and WSDOT to quickly confirm and manage traffic during incidents has considerably improved. A truck climbing lane east of exit 47 currently exists and has been beneficial in reducing rearend accidents and improving eastbound traffic flow.

Variable speed signs were suggested as a potentially useful application during inclement weather. Questions concerning the enforceability of these signs was discussed. Generally, this was not thought to be a problem since WSP already has the authority to issue citations for unsafe driving during periods of poor visibility and roadway conditions.

Maintenance Issues

Deicing chemicals (CMA) and sand and gravel (3/8 -1/2 inch) are used for winter road surface treatment. The WSDOT does not use much salt for ice control due to environmental side effects and rebar corrosion in bridge decks. It was reported that there are claims against WSDOT for broken windshields caused by flying rocks.

Traveler and Tourist Information Issues

There are no rest areas located on I-90 within the WSDOT NW Regional Coverage Area. An existing HAR site is located near Exit 31. It operates at 1610 kHz frequency and transmits updated Snoqualmie Pass conditions.

Enforcement/Motorist Assistance Issues

WSP has several locations where they house “spike strips” along I-90. These are currently manually operated by troopers when highway pursuits are in progress. These devices are

stretched across the road and, when hit, slowly release air in the tires until the vehicle is forced to stop. As these are used quite successfully, it was suggested that permanent locations could be introduced where the WSP officer would not be required to cross traffic, reducing setup time and increasing officer personal safety.

In general, the freeway video system was considered useful by the WSP for verification of calls and reducing the number of false reports.

Communications Issues

WSDOT Communication uses 800 MHz. There is some indication that this will be converted to a digital system. Redundancy of this is not there yet. Ross Morris at WSDOT should be contacted for more detailed information regarding communications.

WSP has a microwave backbone communication system. WSP vehicles have access to some WSDOT radio frequencies in their vehicles. The WSP communications center is located in the Bellevue District office. Cellular phone coverage for most of I-90 is via US West and Cellular One.

ITS Issues

There is an existing weather detection system in place that is manufactured by SSI (Surface Systems Incorporated). A number of remote weather stations are located on I-90; many use leased phone lines for data transfer.

The Travel Aid weather system, which is to be completed soon, is located just to the east. This demonstration project is anticipated to assist in reducing accidents by providing accurate information to motorists.

There are many ITS applications on the newer section of I-90 between Bellevue and Seattle, including VMS, video surveillance systems, and tunnel monitoring systems. WSP is connected to the WSDOT TSMC for regional traffic information. Questions concerning WSDOT use of call boxes should be referred to Bill Legg, Assistant ITS Program Engineer for WSDOT.

Changeable message signs are currently located near dedicated chain-up areas. There is concern about overflow of vehicles from these areas onto the mainline freeway lanes when chains are advised. It was suggested that a device be installed to notify motorists of available space ahead in order to avoid spill-over of queues waiting to chain up.

B.3 SOUTH CENTRAL REGION - YAKIMA

I-90 Corridor Tour Minutes
January 22, 1996
WSDOT South Central Region - Yakima
WSP District 6 - Wenatchee

Attendees:
Sgt. Gene Dana - WSP
Jim Henderson - WSDOT Maintenance and Operations Superintendent
George Hilsinger - WSDOT Regional Traffic Engineer
Eldon L. Jacobson - WSDOT Advanced Technology Engineer
Sgt. Dan Pemerl - WSP Research & Development
Kern Jacobson - PB
John O'Laughlin - PB
Ron Atherley - PB

Coverage Area

The WSDOT South Central Region (formerly District 5) coverage area along I-90 begins at MP 33 (North Bend) and extends to MP 137 (Vantage). This jurisdictional coverage area includes approximately 20 miles in King County, all of Kittitas County, and the Vantage Bridge crossing of the Columbia River Gorge. Both Maintenance and Traffic Operations share this coverage area. The main Maintenance Facility is located in Cle Elum, whereas the WSDOT Traffic Operations is centered in Yakima. The WSP District 6 headquarters is located in Wenatchee, with detachments located in Ellensburg and Moses Lake. WSP's coverage area extends through both WSDOT's South Central and North Central Regions, covering from MP 52, the King/Kittitas County line, to MP 192, the Grant/Adams County line. WSP District 2 in Bellevue covers from MP 33 to 52. WSDOT regional maintenance facilities along the I-90 corridor are located at Bull Frog (MP SO), and Hyak (MP 54). In general, cooperation exists between the adjacent WSDOT and WSP districts in patrolling the summit area due to its unique environment.

Weather Related Issues

Several locations were noted as having an above average accident experience due to weather related issues, including: Snoqualmie Pass, Elk Heights (MP 93), Indian John Hill (MP 89), icy bridge conditions near MP 102, and icy curves near MP 121 (near the Milwaukee Road Railroad overcrossing). An area of recurrent fog conditions lies between MP 93 and MP 127.

High winds towards the eastern limits of the region create occasional visibility problems due to drifting snow and dust. The Vantage River bridge can also experience high winds. A wind sock is currently mounted on top of the structure; a device that could advise motorists of high wind/gusty conditions was suggested.

There were several areas that are prone to snow avalanches. Permanent stands are set up where an explosive charge is released into a standing snow bank to cause a controlled avalanche. This is done by WSDOT maintenance as a preventive measure.

A weather detection system is currently operated from the Hyak Maintenance facility (SSI). Sensors are located along I-90, and two additional weather sensors are located on I-82. There are three stations near the Summit, with three more planned for installation this year. This will extend coverage to both sides, including one in the Elk Heights vicinity.

In general, cut areas of the freeway were observed as being more susceptible to freezing than fill areas. Reverse curve areas were noted as a problem due to sheet flow across superelevation transition areas.

Noticeable variations in weather and related road conditions exist over relatively short distances due to weather patterns experienced in the mountainous terrain.

Traffic/Safety Issues

Several areas were noted as having accident experience not related to weather, as follows:

- a low bridge near MP 62 (currently has no over height detection warning system)
- a low bridge near Exit 80 - Bull Frog Road (bridge has a 16'-5" clearance but cannot accommodate large overheight loads like boats, forcing a detour onto county roads)
- curves near MP 67
- westbound Easton Hill near MP 71 (rearend/slow moving vehicle accidents)
- reverse curves near MP 92.5
- curves near MP 95 to 97
- Taneum curves and Rocky Canyon area
- Exit 109 (sharp exit experiences roll-overs)
- East of I-82: run-off-the-road (driver falling asleep) accidents (roadway section near MP 1 15 does not have rumble strips; rumble strips are planned to be installed within the next year or so)
- curve near MP 79

Gates are located on the westbound on-ramps to I-90 at Exits 80 and 106, and are operated during Pass closures to assist in early diversions of traffic.

I-90 experiences a significant drop in traffic volume east of the I-82 interchange (Exit 110).

Traffic data is available through Olympia from several permanent traffic data locations located along I-90.

A new interchange is proposed near MP 121-123 to access US Military Reserve Yakima Firing Center property.

Truck climbing lanes are planned for eastbound MP 91 near the Elk Heights area, westbound MP 97 in the vicinity of Rocky Canyon, and westbound MP 136 on Vantage Hill.

Maintenance Issues

The Hyak Maintenance is responsible for monitoring weather systems and preventive deicing procedures.

Security/vandalism in rest areas is of concern. Video surveillance was suggested as a means to counter this.

There were a couple of areas noted where rock and tree falls (MP 69) occur. Suggested means to warn against this were an electric fence system that would signal when circuitry was interrupted. This device is apparently used in the railroad industry. Some concern was raised as to how false calls could be handled.

Along I-90 a higher fence was installed due to Elk in the area of Elk Heights. A reflector system which creates a visual barrier to deer through the use of reflected headlamp lights was discussed as a possible solution.

Traveler and Tourist Information Issues

Rest Areas are located at MP 89 (Indian John Hill) and MP 126 (Ryegrass Rest Area). These rest areas have emergency call boxes, rest rooms, and telephones.

Kiosks at the rest areas were discussed as a means to disseminate information to travelers.

A HAR site is located at MP 84 near Cle Elum. It transmits at a frequency of 1610 kHz.

A HAR site located near the Vantage Bridge was suggested as a potential location from which to advise motorists of high wind conditions and to provide Gorge Amphitheater traffic/event information.

It was suggested that traveler information, including HAR, should be provided at strategic locations to notify drivers of roadway conditions and diversions. Two locations mentioned for this application were near the I-82 interchange, and at Yakima.

Enforcement/Commercial Vehicle Operations/Motorist Assistance

Chain-up areas are provided west of the Pass; information indicating whether there is available space ahead of the queue would be beneficial. Advisory VMSs are located on either side of the pass indicating road conditions and whether chains or traction tires are advised. Chain-off areas are provided down slope at MP 56 & 71 eastbound, and MP 47 westbound. These are located on both sides of Snoqualmie Pass but are not signed. It is left to the driver to determine whether chains should be removed.

Video surveillance in rest areas was suggested as a means to reduce vandalism and promote safety.

The westbound portion of I-90 from Vantage is an upgrade for about 10 miles, ending at the Ryegrass Rest Area. During the summer there are many overheated vehicles that require

assistance. This area also experiences more accidents due to slow moving vehicles. WSP would be able to provide a listing of the number of motorist assist calls.

There are several areas of speed limit violation along this stretch of I-90. The potential use of video and speed loops was discussed.

Weigh stations are located at Bull Frog Road, Exit 80, for both eastbound and westbound vehicles. These weigh stations are considered obsolete and are currently under review to determine possible new sites for these facilities.

Communication Issues

Troopers have access to WSDOT radio frequencies.

A microwave tower is located at MP 125, north of the freeway near Ryegrass Rest Area. Ryegrass rest area has telephone service.

An HAR system is located near MP 108, and transmits at the 1610 kHz frequency.

An HAR site located at MP 84, "1610," does not have capacity for enough information regarding Snoqualmie Pass, Blewett Pass and the Elk Heights vicinity.

B.4 NORTH CENTRAL REGION - WENATCHEE

I-90 Corridor Tour Minutes
January 23,1996
WSDOT North Central Region - Wenatchee
WSP District 6 - Wenatchee

Attendees:
Sgt. Phil Liggins - WSP
Lionel Heinold - WSDOT Maintenance and Operations Superintendent
Jennene Ring - WSDOT Regional Traffic Engineer
Eldon L. Jacobson - WSDOT Advanced Technology Engineer
Sgt. Dan Pemerl - WSP Research & Development
Kern Jacobson- PB
John O'Laughlin - PB
Ron Atherley - PB

Coverage Area

The WSDOT North Central Region (formerly District 2) coverage area along I-90 begins at MP 137 in Vantage and extends to the Grant/Adams County line at MP 192. This jurisdictional coverage area includes all of Grant County but does not include the Vantage Bridge at the Columbia River Gorge. Both Maintenance and Traffic Operations share this coverage area. The main Maintenance Facility is located in Ephrata, whereas the WSDOT Traffic Operations is centered in Wenatchee.

The WSP District 6 headquarters is located in Wenatchee with detachments located in Ellensburg and Moses Lake. WSP's coverage area extends through both WSDOT's South Central and North Central Regions, covering from the King/Kittitas County line (MP 52) to Grant/Adams County line (MP 192). The Moses Lake Detachment covers much of the same section of I-90 **as** does the WSDOT's North Central Region. WSDOT regional maintenance facilities along the I-90 corridor are located at Moses Lake and George.

Weather Related Issues

The Vantage Hill area was noted as having a high number of accidents due to snow and ice conditions. Other specific sites were not specifically mentioned, however, this region experiences typical icing problems at bridges, along curves, and in low shaded areas.

There are no existing weather stations within the region.

Traffic/Safety Issues

Of major concern in this region are the traffic effects of concerts that are held in the Gorge Amphitheater, occurring generally on Fridays and weekend nights. Currently a traffic management contractor is provided during these events, funded by MCA productions who is the sponsor of these concerts. One of the roles of this contractor is to assure that freeway traffic is not affected by the congestion which routinely occurs at Exit 137 during these events. Ramps at Exit 137 are typically at capacity before and after major Gorge Amphitheater events.

The Vantage Hill area near MP 138, east of the Vantage Bridge, experiences a high number of accidents. These accidents are attributed to a variety of factors including overspeed, frequent compact snow and ice conditions, high volume of concert goers, and the long steep westbound decline towards the Vantage Bridge curve.

The majority of this stretch of I-90 is within a narrow stretch of right-of-way. The close proximity of a parallel adjacent county road is of concern due to glare from head lamps and the absence of a barrier. A glare screen is currently placed near MP 148, eastbound, between 1-90 and a curve on the frontage road.

There are several narrow and low bridges in the Moses Lake area. Many of these locations have a high accident experience; MP 177 was one narrow bridge location specifically mentioned. Several of the low bridges are to be replaced soon, and are funded. There currently is an over height detection system that helps to prevent some accidents, although over height accidents still frequently occur. Many of these bridges are listed in the State plan for replacement to current standards.

Rumble strips have been added over the last few years to address the frequently occurring run-off-the-road (fall asleep) accidents. The application of rumble strips was noted as having a good effect on these accident types. The last remaining section (Lake to Dodson) is scheduled for completion late in 1996. As a historical note, Dodson Road to Moses Lake (SR 17) was completed approximately a year ago, Beverly Road (MP 137) to Dodson Road (MP 164) two years ago, and Moses Lake/SR 17 (MP 179) to the Grant Adams County line (MP 192) was completed the years ago. The section from Vantage (MP 136) to Beverly Road (MP

137) was one of the first sections to have this treatment, and was completed between five and six years ago.

Maintenance Issues

There are a limited number of gravel trucks/snowplows for the Region's 700 lane miles of state highways, and only 18 permanent maintenance staff. This reduces the response time during poor weather conditions.

The fire department is responsible for hazardous material spills; WSDOT Maintenance is responsible for cleanup afterward.

Restriping of the lane lines using paint is done every year, but is quickly worn away. Reflective pavement markers (RPMs) are not used due to the use of carbide tip snowplow blades. The possible use of inlaid methanol-methaculate for striping **was** discussed as a means to increase performance and life cycle of striping.

Traveler and Tourist Information Issues

The Winchester Rest Area is located at MP 161 and provides phones and rest rooms. It was suggested that Pass information would be helpful at the westbound rest areas.

A VMS or other device prior to the Vantage River Bridge (near MP 141) was discussed as a potential countermeasure to provide warning of the long steep decline, high number of accidents, and overall roadway conditions.

A movable barrier or other means to develop one way traffic over the Vantage Bridge was discussed. The current configuration does not allow median crossing due to the existing Jersey barrier. This limits emergency vehicle traffic and traffic control options during incidents or partial bridge closures. A scenic lookout is located at MP 139 with views of the Columbia River Gorge.

Enforcement/Motorist Assistance Issues

Speeding is the most prevalent enforcement issue in the area. WSP has minimal staff to patrol this area. Vandalism and overall security at rest areas was also mentioned as an area of concern.

Communications Issues

An existing HAR site, transmitting at 530 kHz, is located near Moses Lake. This HAR is used exclusively for Tourist Information (similar to Ritzville) and does not currently broadcast traffic information.

WSDOT uses the 800 MHz band for radio communication, and has sites located at WSDOT's Maintenance yards at Moses Lake and George. These facilities expect to be on the WSDOT e-mail system sometime in 1996.

B.5 EASTERN REGION - SPOKANE

I-90 Corridor Tour Minutes
January 23,1996
WSDOT Eastern Region - Spokane
WSP District 4 - Spokane

Attendees:
Lt. Bruce Clark - WSP
Sgt. Lee Boling - WSP
Sgt. Jeff Brumley - WSP
Trooper Martin Finan - WSP
Dale Ellard - WSDOT Maintenance and Operations Superintendent - Spokane
Dale Luiten - WSDOT Maintenance and Operations - Spokane
Richard Schroll - WSDOT Maintenance and Operations Superintendent - Rural
Bob Earnest - WSDOT Regional Traffic Engineer
Eldon L. Jacobson - WSDOT Advanced Technology Engineer
Sgt. Dan Pemerl - WSP Research & Development
Kern Jacobson - PB
John O'Laughlin - PB
Ron Atherley - PB

Coverage Area

The WSDOT Eastern Region (formerly District 6) coverage area along I-90 begins at MP 192 at the Grant/Adams County line and extends to the Washington/Idaho border, MP 300. This jurisdictional coverage area includes all of Adams and Spokane Counties as well as a small portion which traverses Lincoln County. Both Maintenance and Traffic Operations share this coverage area and have headquarters in Spokane. An additional maintenance facility is located in Davenport which services the section of I-90 within Adams County (MP 192 - 255). The WSP District 4 headquarters is located in Spokane with a detachment located in Ritzville. WSP's coverage area is the same as WSDOT's Eastern Region, sharing the same jurisdictionalboundaries.

The Spokane urban limits extend from approximately MP 275 to MP 291.

The Centennial bike trail runs parallel and north of the freeway from the Spokane Central Business District (CBD), Exit 280, to the Idaho state line.

Weather Related Issues

Fog and ice problems exist near the airport at Exit 276, Geiger Road. These problems were thought to have been caused by airport seeding of the clouds to increase visibility during foggy days, although this was not substantiated.

There are two distinct weather systems along the corridor. It has been observed that a natural dividing point of weather patterns falls near Exit 254 at Fishtrap Road. This may be due to the

terrain, which is flat and treeless with large areas of volcanic ash to the west, compared to the terrain to the east towards Spokane, where there is a gradual rise in elevation and the soil conditions change, supporting more vegetation and trees.

Near MP 227 eastbound, an upgrade exists that has a tendency to ice up.

WSDOT expressed a need for additional weather sensors near George and Moses Lake that could provide advance warning of Pass conditions to drivers leaving the Spokane area.

Traffic/Safety Issues

A report was provided by Bob Earnest which outlines a proposed Traffic Management System for the Spokane area. Several issues were discussed and are summarized below:

- There are existing permanent count/traffic data collection sites along I-90. Currently these data are received, reduced, and disseminated from the Olympia Regional office. Data from these local readers may not be available to the Eastern Region office until months later. The desire to have real-time data at these and other locations for traffic management was suggested in this report. A centralized system was discussed as a means to provide a clearinghouse for data collection and dissemination, including data from loops, CCTV, VMS, and weather stations.
- Real time data collection by automated video detection for traffic volumes, speeds, and classifications was discussed as a proposed means of data collection.
- A priority was placed on video surveillance and detection for the Sunset Hill Area due to a disproportionate number of accidents westbound on I-90 on the 3.5% upgrade. Six cameras sites were suggested, to be connected to a remote processor using short range microwave detection. Expansion of the video detection system, once established, should be constructed on I-90 through the CBD.
- The central microwave tower for the Eastern Region communication facility is located at the Eastern Region Headquarters.
- Joint use poles for HAR and CCTV cameras was suggested as a means to reduce costs.
- The Eastern Region has conducted evaluation tests for a low power FM broadcast HAR.
- A Traffic Operations Center (TOC) should be constructed and located adjacent to the Eastern Region communication facility. The TOC should be staffed for 24 hour coverage.
- Several locations along I-90 were identified for installation of VMSs, solar powered cellular phone call boxes, and video cameras.
- Access to traffic information via the TOC public inquiry lines was suggested.
- The SR 195 eastbound on-ramp was suggested as a possible ramp meter candidate.

Rumble strips are located throughout the region and have apparently had a positive affect on safety. Rumble strips do not extend through the urban area from approximately MP 275 to MP 289.

There is a significant drop in traffic west of US 2 (Exit 278). The Spokane urban limit ends at approximately MP 275. Much of the heavy truck traffic to the area comes from the Port of Pasco via US 395 (Exit 220).

Most of the Eastern Region experiences poor visibility from dust and snow during windy conditions. Snow and dust is a concern from the Grant County line (MP 192) to MP 276. This is due primarily to a lack of trees and non-agricultural use. MP 290 to MP 300 experiences snow and drifting conditions due to its route through the Spokane River Valley.

Recurrent fog conditions are experienced between MP 257 and 279.

The off-ramp at eastbound Pines Road/SR 27, Exit 289, backs up onto the freeway during peak hours. It was suggested that this condition could be remedied through the use of video surveillance, VMS and/or a more responsive traffic signal operation using queue detection.

MP 283, the Thor-Freya undercrossings, is seen as a high accident area. I-90 has an undulating vertical alignment in this area which affects driver reaction time, especially when encountering slower moving vehicles.

The Liberty Park interchange area/SR 290 (Perry Curves), Exit 282, also has a higher than average accident history. This condition is due to a combination of several factors, including horizontal alignment, weaving, merging, and icing on elevated structures.

Westbound Hills Road (MP 229) overcrossing near Ritzville was noted as having an icing problem.

Westbound I-90 was thought to have icing problems east of the Sprague Lake rest area due to a concrete bridge located prior to this rest area. The bridge is located on a slight upgrade.

Incident response plans as well as incident response vehicles are available in the Eastern Region. The response vehicles operate on a stand-by basis and are staffed between March and November. During the winter months snowplow crews assist in incident response duties.

Moderately heavy AM congestion occurs from Exit 281 through Exit 289.

Maintenance Issues

There is severe rutting in the road east of Four Lakes, Exit 270, where traffic volumes increase. Icing problems near MP 273 and MP 274 are exacerbated by this rutting condition since the ruts prevent proper drainage and plowing of the roadway surface.

Coker Road interchange bridge (MP 226) has minimal posted vertical clearance and is hit several times a year.

The Regal Street pedestrian overpass (MP 283) has minimal posted vertical clearance and is also hit several times a year.

The reconstruction of the SR 395 interchange bridge (Exit 220) is funded and is under construction.

The Hills Road bridge, located at approximately MP 229 westbound, experiences many hits on its guardrail and is thought to be caused by the transition from asphalt to concrete pavement. The bridge is known to develop ice before the adjacent roadway.

Between the Coker Road and Tokio Road interchanges (MP 226 to MP 231) there is an abundance of run-off-the-road problems associated with winter ice conditions and sleepy drivers. The installation of rumble strips throughout the region have assisted in reducing this problem, especially in the Sprague vicinity.

An older section of freeway that had an “open graded” friction course was notably clearer from ice and snow.

Trees and shady areas contribute to early freezing conditions between MP 255 and 269. This is especially true in the eastbound direction, where the lower angle of the sun in the winter prevents thawing. *** Move to weather or safety?**

Sections of freeway on till material have historically washed out more easily.

Continuous illumination begins at US 2 (top of Sunset Hill), MP 278, and ends near the Park Road overcrossing to the east, at approximately MP 287.

There are standing water problems in the Thor-Freya area, (near MP 283) due to several low spots created by the existing undulating vertical alignment.

Traveler and Tourist Information Issues

The WSP has been approved to have access to the existing VMS system. This was decided due to WSP having 24 hour coverage while not having the use of these boards during off-hour incidents.

There are five rest areas along I-90, the eastbound and westbound Schrag Rest Areas (MP 198), the eastbound and westbound Sprague Lake Rest Areas (MP 243), and the westbound Spokane River Rest Area (MP 299). The Spokane River Rest Area has a Tourist Information Center that is staffed between May and September by the Spokane Convention and Visitor Bureau (509-624-I 341).

The interchanges of US 395 and US 195 were discussed as potential locations for VMS/HAR applications since these are major points of diversion. A VMS was also suggested to be located westbound, east of the Idaho border, through mutual agreement between WSDOT and the Idaho Transportation Department.

Advance notification of Snoqualmie Pass conditions west of Spokane was considered beneficial. VMS and HAR was discussed as potential methods to disseminate this information. Information kiosks at rest areas were also considered as a secondary information source.

Enforcement/Motorist Assistance Issues

WSP and WSDOT have joint access to several emergency response storage containers located in five locations: Tyler, Geiger, Maple, Pines, and the State line. These are standard shipping containers that house a variety of materials that could be used during an incident. These tools include cones, barricades and other traffic control devices and materials. These containers are keyed for sharing, providing WSP and WSDOT access. Emergency response

is on a stand-by basis, and no WSDOT personnel are assigned regular shift work, although personnel have emergency response vehicles readily available.

In the rural area west of Spokane, the WSP receives many false calls for "occupied disabled vehicles" via cellular phone. Often drivers stop for other reasons than mechanical problems and do not require assistance.

There is an "Assistance Van" for motorists which patrols the Spokane Urban area.

WSP has agreements with Idaho State Police (ISP) regarding travel outside of their respective jurisdictions during pursuits. In general, WSP has been pleased with the assistance received from ISP.

All Sergeants and above have portable spike strips that they carry in their vehicles.

A dial ● 800 program was discussed that would allow motorists to call in road conditions or emergency reports through their cellular phone.

Video coverage of the Spokane urban area was discussed as a means to verify incidents and to assist in monitoring traffic conditions. This would also help to alleviate false calls

There is a marked absence of gas stations between Spokane and Ritzville, and between Ritzville and Moses Lake. A limited number of fueling locations increases the number of disabled vehicle calls. Many of the gas stations that are located are not 24 hour facilities. The potential of posting signs to note fuel availability by time of day was discussed.

A program for speed enforcement using license plate recognition technology coupled with a non-ticketing program modeled after the HERO approach in Seattle was discussed.

The feasibility of automatically determining the location of 911 cellular calls was also discussed.

Communications Issues

The Spokane area currently does not have a HAR system; the Ritzville Area maintains a Chamber of Commerce private HAR site on the 530 AM band for Ritzville Tourist Information located near US 395 Exit 220 (Route 261). This HAR serves both I-90 and US 395 traffic.

There are apparently some dead spots or weak areas for cellular communication signal. Near MP 251 there is a break in the signal.

ITS **Issues**

Tokio weigh station (MP 231) and the Idaho/Washington border port of entry weigh station may propose future weigh-in-motion applications.

The weather system (SSI) with hub at the Spokane International Airport is a direct dial-up line to the Wandermere Maintenance Facility, located eight miles north of the I-9O/US 2 interchange. This system currently has nine remote processing units (RPUs), with six on I-90

and three off of I-90. Two of the RPU use a radio link for data transfer rather than a land line connection. A new station is proposed to be installed near the Sprague Avenue interchange (Exit 285).

The westbound Sprague Lake Rest Area has a weather phone tied into the Spokane International Weather Service public broadcast radio station, but does not give specific I-90 weather information. This weather reporting station is of limited value to motorists traveling westbound, as its source of information is to the east.

There is an existing bridge heating system on three pedestrian overcrossings of I-90 that are controlled by radio.

A 20 year plan has been identified to have CCTV along I-90, with Sullivan Road (MP 289) as the eastern limit.

There is an existing permanent news camera placed on top off the Deaconess Medical Center building (MP 281) which captures views of I-90 and is broadcast on television.

A logical location for a Traffic Operations Center would be adjacent to the WSP facility on Geiger Road. This would permit 24 hour monitoring of the system as well as encourage communication between WSP and WSDOT staff.

APPENDIX C: NON-ACCIDENT DATA SUMMARY

SCOPE i.2: NON-ACCIDENT DATA SUMMARY

During this work element, the STATE shall gather and present existing information on transportation conditions in the corridor that identify and estimate the magnitude of transportation problems in the corridor. This assessment shall serve as a baseline for determining ITS needs and estimating the potential benefit of any recommended ITS applications.

Information, provided by the State, includes the following (unless unavailable):

- Forecasted Person Trips;
- Forecasted Intercity Person Trip Origins and Destinations;
- Current and Forecasted Commercial Trips;
- Current and Forecasted Vehicle Volumes;
- Current and Forecasted Vehicle Classification;
- Roadside Assistance Calls;
- Number of Freeway Lanes (as an indicator of capacity);
- Current and Predicted Levels of Congestion;
- Weather Conditions;
- Programmed and Planned Highway Improvements;
- Planned Intercity Transit and Passenger Railroad Improvements;
- Current and Planned ITS Programs and Projects; and
- Numerical and other data shall be summarized on a series of maps and charts to illustrate potential problem areas and transportation needs. For purposes of presentation, the I-90 corridor will be segmented by WSDOT Region.

The STATE will summarize data into a base map or other means that provides the CONSULTANT a format that is readily interpretable and suitable for presentation. This format will be collaboratively developed with the CONSULTANT. The base map will include such features as state routes, rivers, rest stops, weigh stations, information centers, WSDOT facilities, WSP facilities, train stations, transit facilities, ports, automated volume counting stations, and WSDOT District Boundaries. Base maps will be provided on II by 17 inch paper,

C.1 CORRIDOR DESCRIPTION

Interstate 90 stretches from the Puget Sound Region in Washington State to Boston Massachusetts. Nationally, this route is a primary east west corridor, serving cross country transport, tourism and commuters in cities such as Seattle/Bellevue, Spokane, Chicago, Buffalo and Boston.

The focus of this study is on the portion of I-90 within Washington State, from its terminus in Seattle to approximately 20 miles east of Spokane at the Idaho State line. The I-90 corridor traverses Washington State from Seattle (MP 1.94) to the Idaho border east of Spokane (MP 299.82) for a total length of 297.88 miles (479.4 kilometers). The I-90 corridor passes through or by the cities of Seattle, Bellevue, Issaquah, North Bend, Cle Elum, Ellensburg, Kittitas, George, Moses Lake, Ritzville, Sprague, Spokane, and Millwood. The highway crosses six counties including King, Kittitas, Grant , Adams, Lincoln and Spokane. This is the only limited access crossing the Cascade Range within the state of Washington and is the primary route for national, statewide and inter-regional commerce.

The I-90 corridor has the largest population in King County at the west end of the corridor, followed by Spokane County at the east end of the corridor. Table C-I below indicates the corridor county populations based on the 1990 census figures. The estimated 1995 and projected 2020 population is also shown in the table. Anticipated population growth over the 30 year period from 1990 to 2020 ranges from 35% in King County to 70% in Grant County, with a statewide average of 56%.

Table C-1

County Population Statistics for the I-90 Seattle to Spokane ITS Corridor

County.	1990 US Census	1995 Estimated	2020 Projected
King	1,507,305	1,613,600	2,030,700
Kittitas	26,725	30,100	42,200
Grant	54,798	64,500	92,900
Adams	13,603	15,200	21,000
Lincoln	8,864	9,700	12,400
Spokane	361,333	401,200	548,000
Statewide Total	4.866.663	5.429.900	7.610.100

1990 and 1995 data courtesy of Washington State Association of Counties.
2020 data courtesy of Washington State Office of Financial Management.

C.2 CURRENT AND FUTURE TRANSPORTATION INFRASTRUCTURE

The locations of WSDOT district boundaries and facility sites including regional headquarters and maintenance sites are illustrated in Figures C-la and C-lb. WSP detachment locations are also illustrated in these two figures.

The locations of transportation facilities located along the corridor, including airport, train, bus, shipping, and pipeline facilities, are illustrated in Figures C-2a and C-2b. Further description of these facilities follows in Sections C.2.3 - C.2.7.

C.2.l Highway System

The majority of l-90 consists of two lanes in each direction, with added lanes in the Seattle and Spokane areas. Table C-2 describes the geometric characteristics of l-90. The speed limits listed in Table C-2 have since increased in the rural areas to 70 MPH. Figures C-3a and C-3b illustrate the locations of rest areas, weigh stations, and traveler information locations along the corridor.

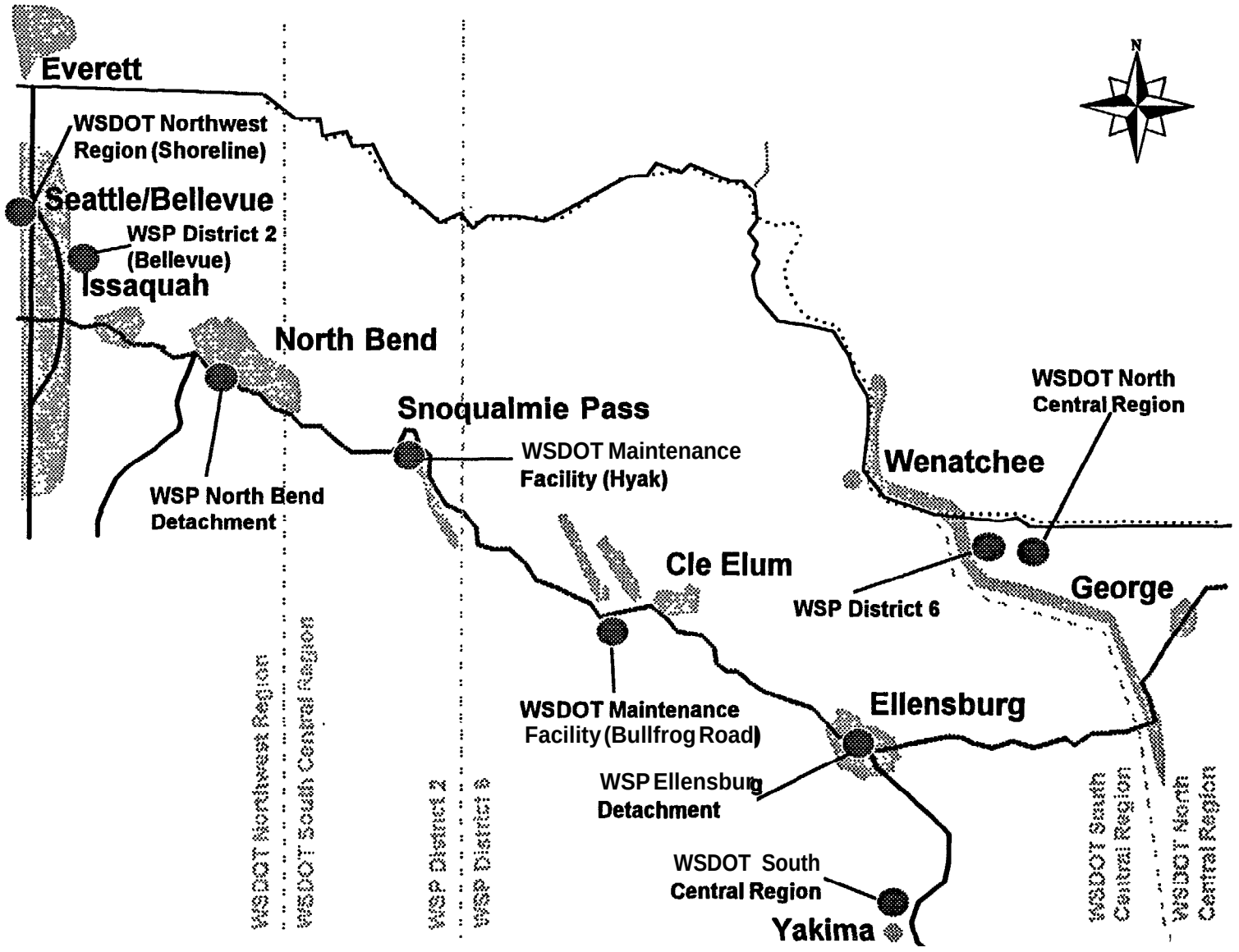
Tables C-3 through C-6 are a listing of the planned improvements for each of the four WSDOT Regions and are categorized by service objectives. The three primary service objectives listed are: Mobility, Safety, and Economic Initiatives.

Mobility solution types fall into several strategies including: System expansion, HOV/TSM/Transit & HCT, Further Study Needed, No Action, Other Efficiency Improvements, Core HOV System, Urban Bicycle Connection. These mobility solutions are shown as either Included in Financially Constrained Plan or Excluded from the Financially Constrained plan.

Safety Improvement solution types fall into the categories of Collision Reduction - High Accident Corridor, three Collision Prevention types including Risk reduction (run-off-road accidents), At Grade Intersection improvements, and bringing facilities up to current Interstate Standards. Many of these safety improvement are also intertwined with mobility programs.

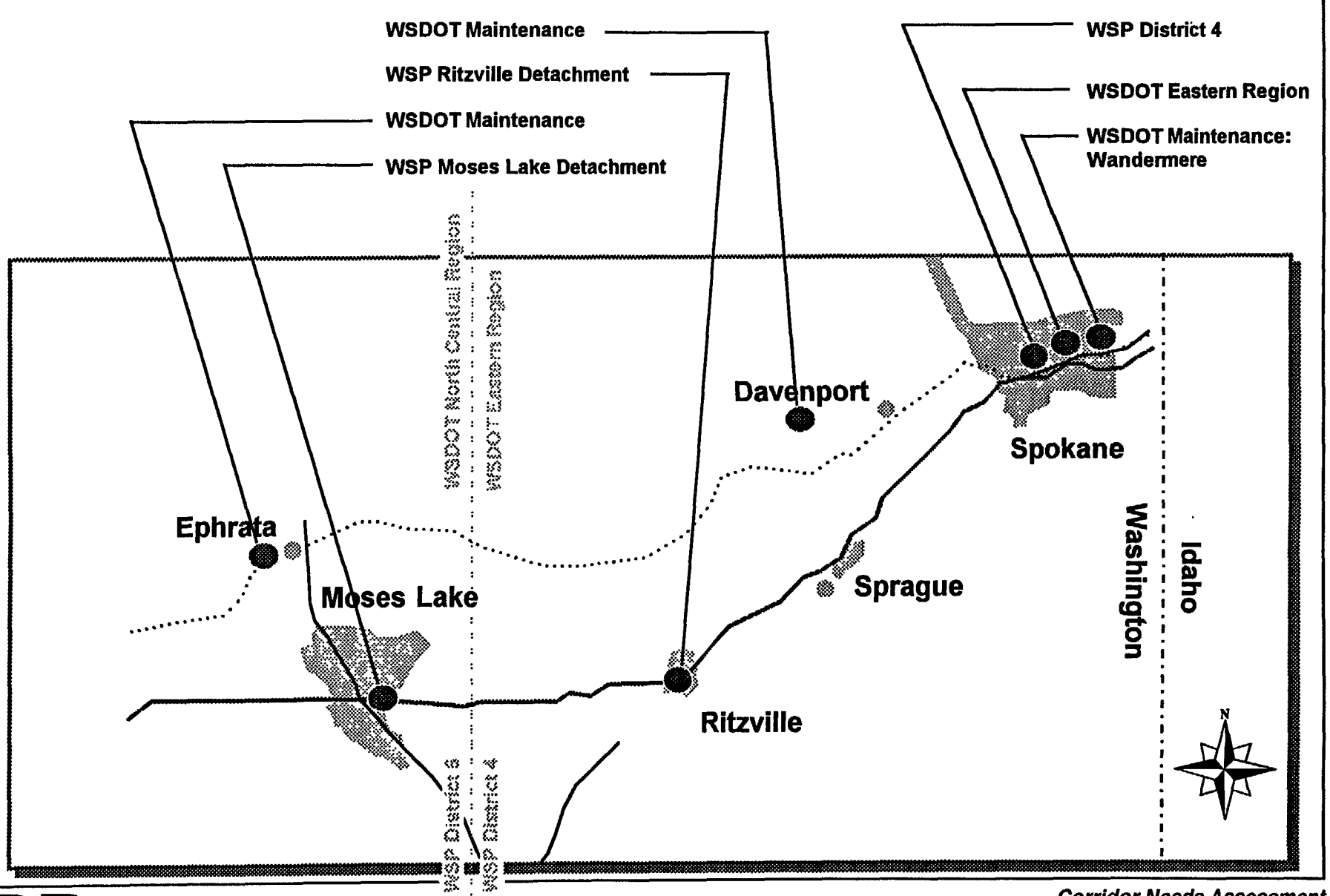
Economic Initiatives include strategies such as All weather road improvements, Truck System Completion, Vertical Clearance Restricted Interstate Bridge improvements, Load Restricted' Bridge Improvements, Bicycle Touring Route Improvements, and Proposed new rest areas.

I-90 WSDOT AND WSP FACILITY SITES



Corridor Needs Assessment
1-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-f a

I-90 WSDOT & WSP FACILITY SITES



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-1b

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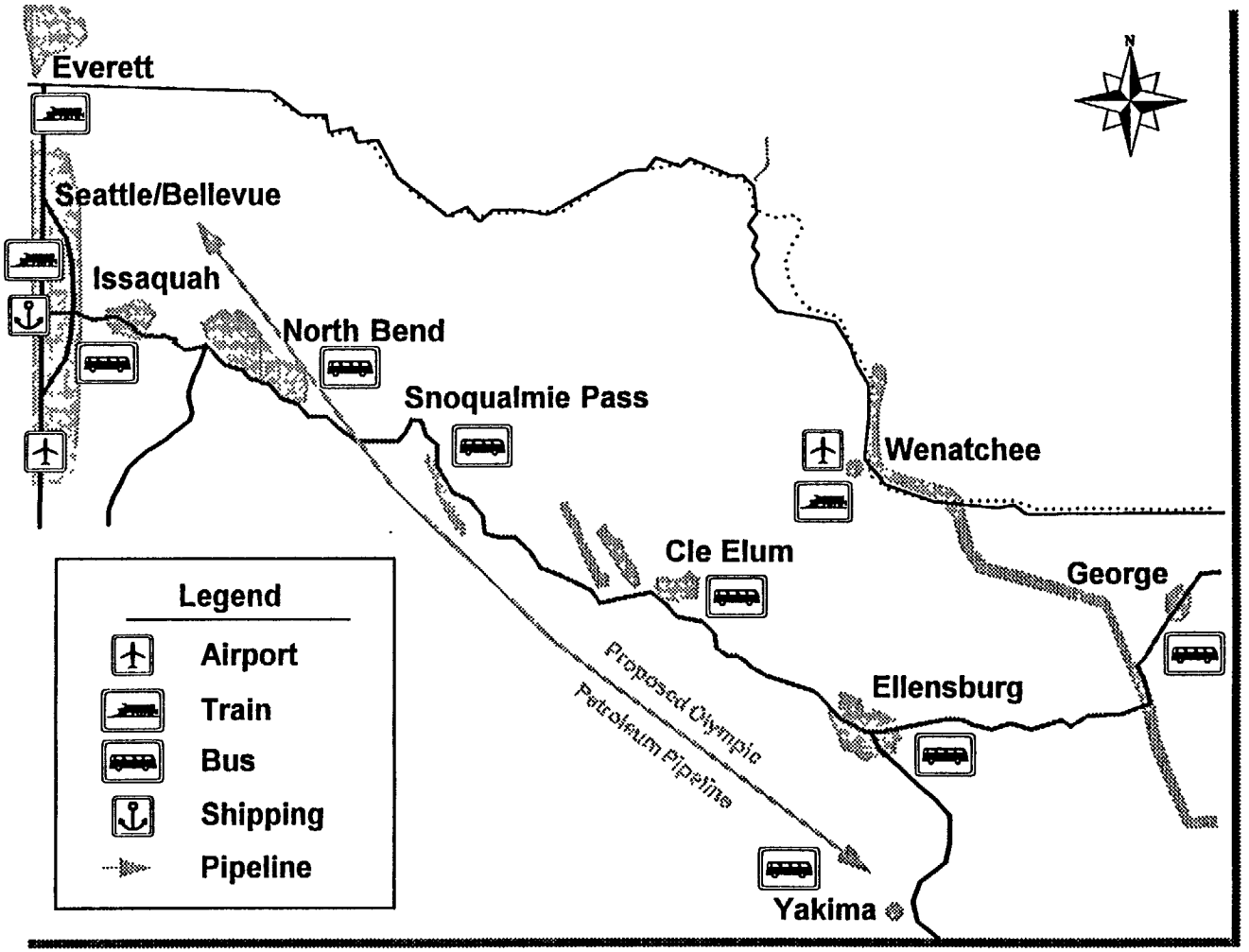
I-90 TRANSPORTATION FACILITIES



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-2a

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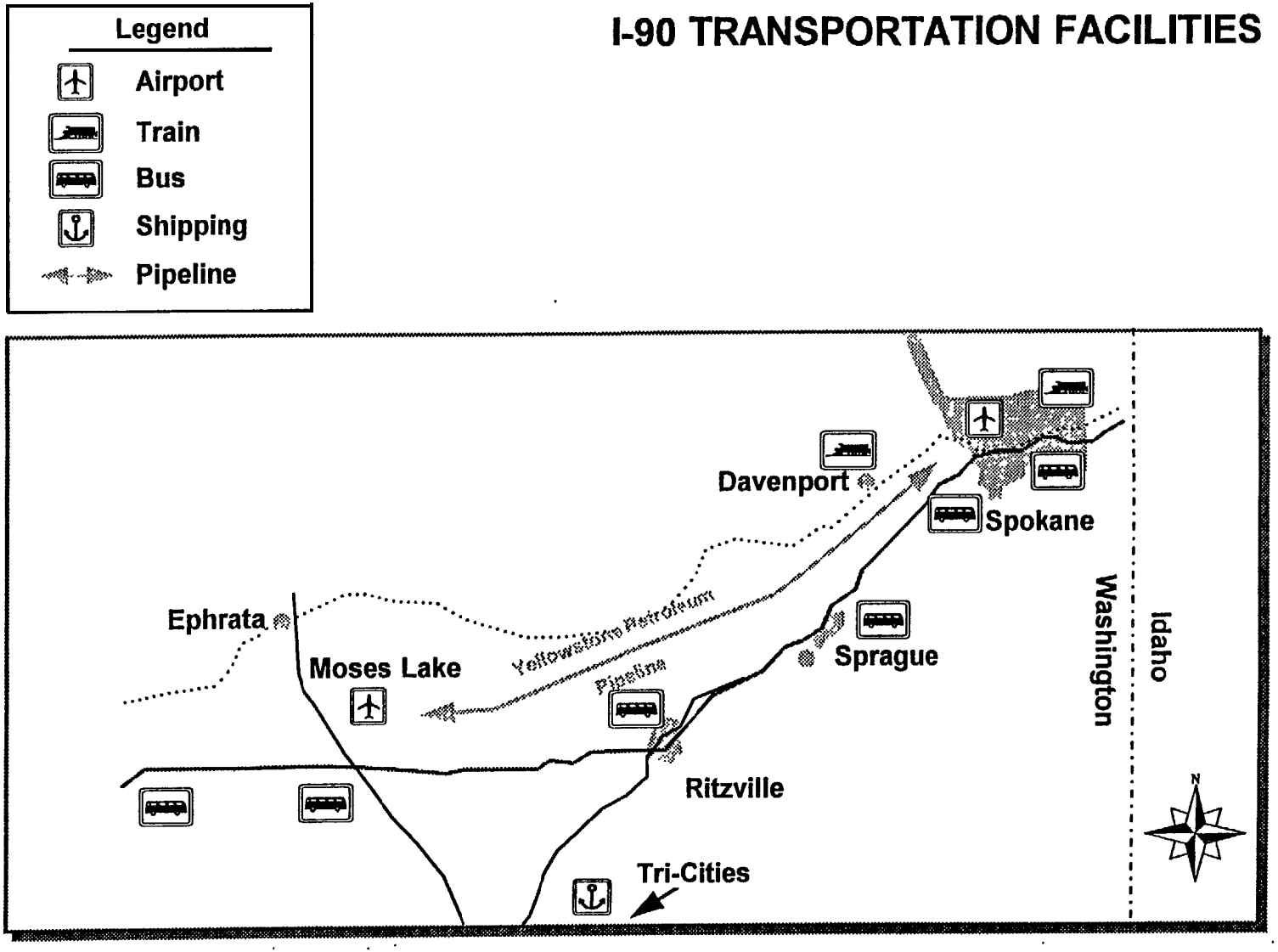
I-90 TRANSPORTATION FACILITIES



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-2b

Table C-2

I-90 Basic Geometry

I-90 Milepost (MP)		Description		Number of Lanes		Width of lanes (feet)		Median Width	Median Barrier	Class.	Speed Limit
Begin	End	From	To	WB	EB	WB	EB	(feet)	Type		(MPH)
1.97	15.82	4th Ave. S. Seattle	SR-900 Issaquah	2-5	2-4			Varies	Jersey	U5	55
15.82	18.38	Issaquah SR-900	E. Sunset Way	3	3	36	36	48	No	U5	55
18.38	19.87	E. Sunset Way	Issaquah City Limits	3	4	36	48'	60-200	No	U5	55
19.87	20.28	Issaquah City Limits	High Point Road	3	4	36	48	85	No	R5	65
20.28	22.86	High Point Road	Jones Road	3	3	38	36	48-85	No	R5	65
22.86	25.65	Jones Road	SR 18	4	3	48	36	48+	None	R5	65
25.65	26.38	SR 18	SR 18 Ramp	4	4	48	48	72+	None	R5	65
26.38	30.23	SR 18 Ramp	SR 202	4	3	48	36	72+	None	R5	65
30.23	34.97	SR 202	Edgewick Road Rmp.	3	3	36	36	70+	None	R5	85
34.97	38.81	Edgewick Road Rmp.	End EB Truck Lane	3	4	36	48	20-70	None	R5	65
38.81	47.98	End EB Truck Lane	Denny Creek	3	3	36	36	48+	None	R5	65
47.98	52.24	Denny Creek	SR 906	3	4	36	48	24+	Jersey	R5	65
52.24	52.61	SR 906	County Line	4	4	48	48	22-24	Jersey	R5	65
52.61	54.93	County Line	Begin WB Truck Ln.	3	3	36	36	22-28	Jersey	R5	65
54.93	55.38	Begin WB Truck Ln.	Near Gold Creek	2	2	24	24	20-28	Jersey	R5	65
55.38	109.33	Near Gold Creek	Ellensburg City Limit	2	2	24	24	20-300	Varies	R5	65
109.33	110.00	Ellensburg City Limit	MP 110-Urban Limit	2	2	24	24	76	None	U5	65
110.00	174.73	MP 1 10-Urban Limit	Moses Lake (west)	2	2	24	24	Varies	Varies	R5	85
174.73	179.80	Moses Lake (west)	SR 17 Vicinity	2	2	24	24	16-40	GR	U5	65
179.80	273.02	SR 17 Vicinity	SR 902 Vicinity	2	2	24	24	36+	None	R5	65
273.02	275.75	SR 902 Vicinity	Speed Limit Change	2	2	24	24	60-76	None	U5	65
275.75	277.86	Speed Limit Change	SR 2 Vicinity	2	2	24	24	40	Varies	U5	55
277.86	278.20	SR 2 Vicinity	Garden Springs Rd.	3	2	36	24	40	Jersey	U5	55
278.20	280.55	Garden Springs Rd.	Monroe St. EB Ramp	3	3	36	36	10-22	Jersey	U5	55
280.55	281.18	Monroe St. EB Ramp	Vicinity Viaduct End	3	4	36	48	4	Jersey	U5	55
281.18	285.4	Vicinity Viaduct End	Sprague Avenue	2	2	24	24	4-12	Jersey	U5	55
285.4	294.5	Sprague Avenue	Vic. Barker Road	2	2	24	24	12-40	Varies	R5	65
294.5	299.82	Vic. Barker Road	Idaho State Line	2	2	24	24	40-76	None	R5	65

Notes: Data *derived from State Highway Log, Planning Report 1995. Short sections of median barrier or median guard rail or changes in median width are not included. New high occupancy vehicle (HOV) lanes being built in South Snohomish County are not included. GR = Guard Rail Jersey = Jersey shape Barrier*

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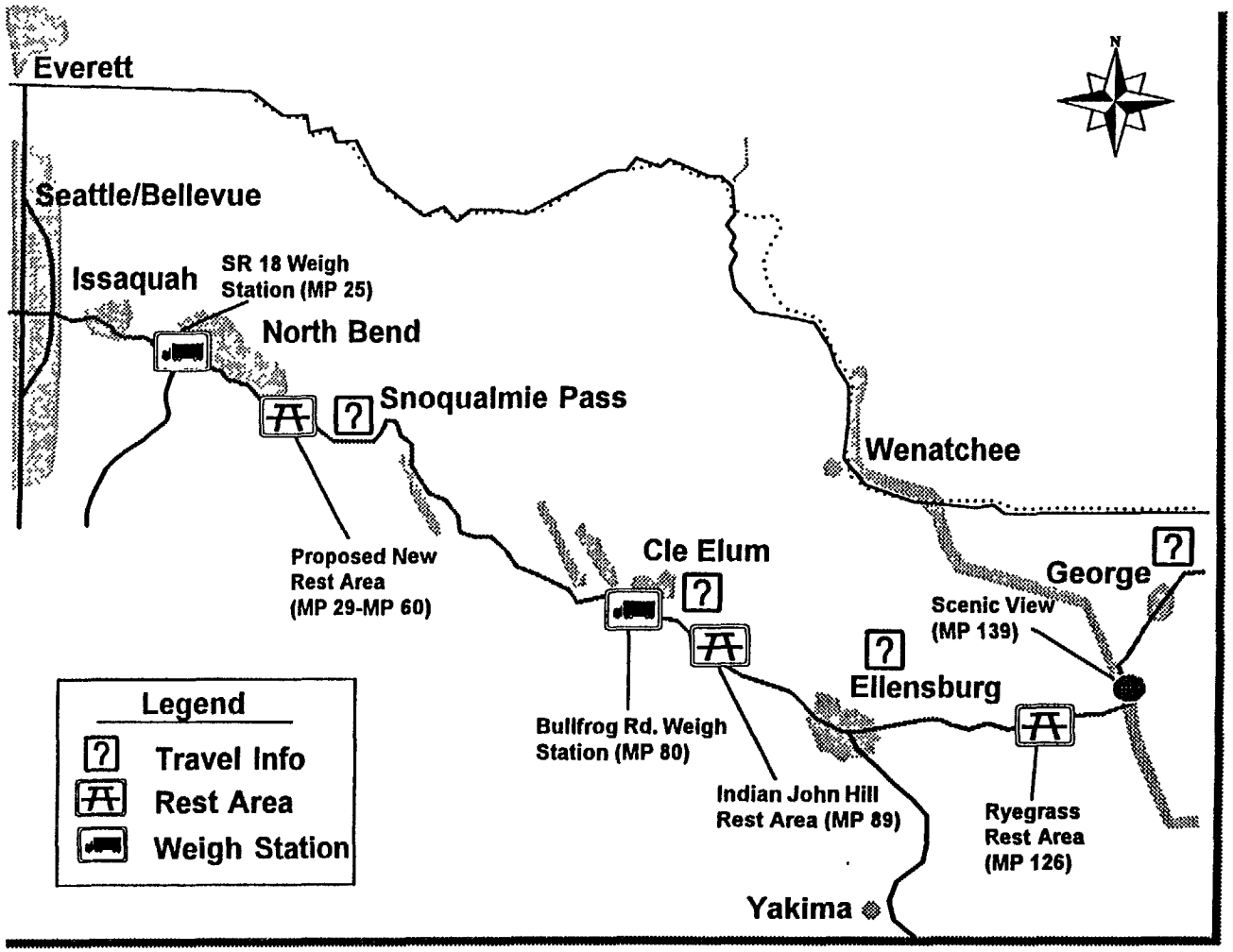
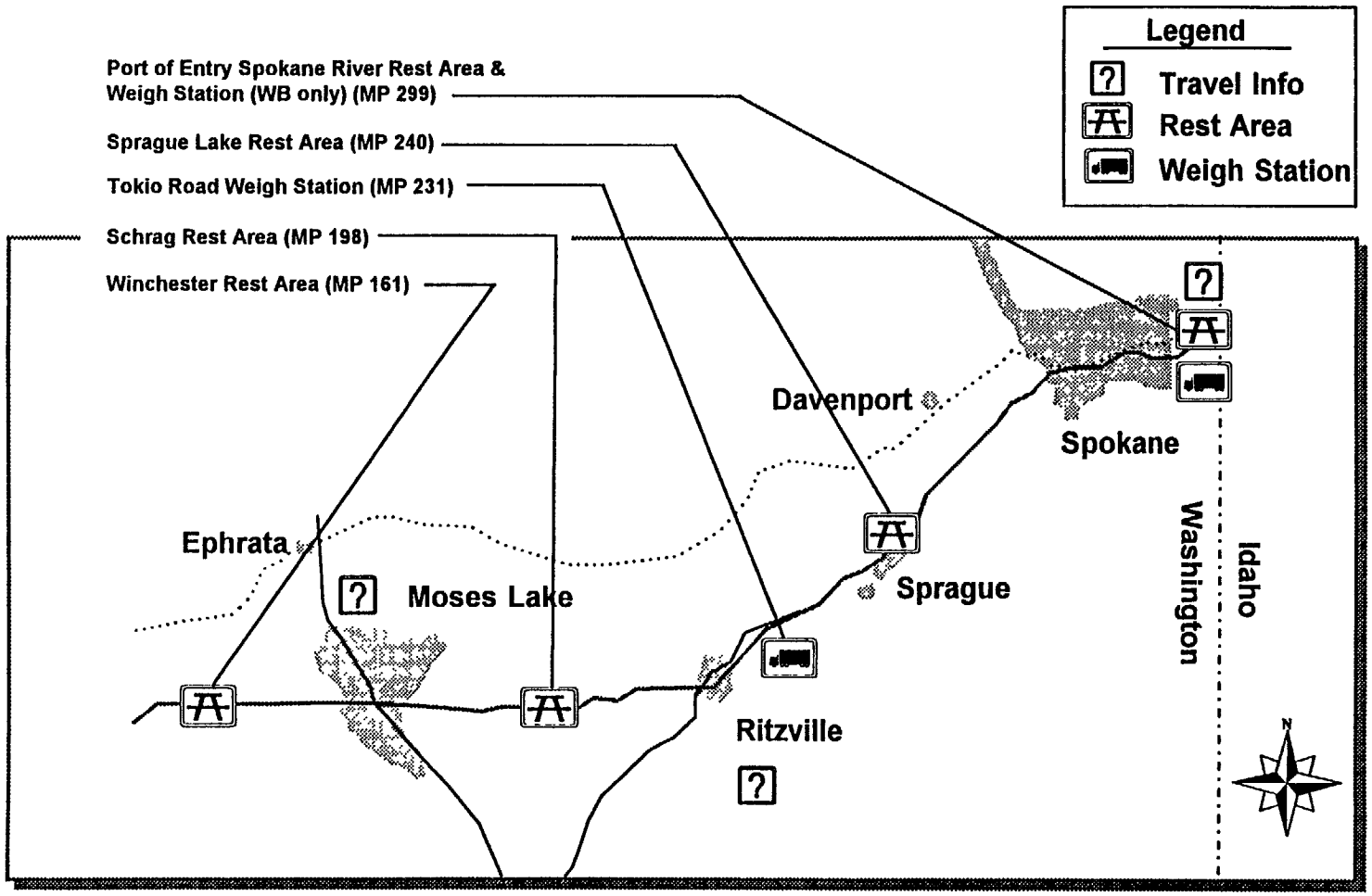
I-90 REST AREA, WEIGH STATION, AND TRAVELER INFORMATION LOCATIONS



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-3a

I-90 REST AREA, WEIGH STATION, AND TRAVELER INFORMATION LOCATIONS



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-3b

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Table C-3

Summary of Planned Corridor Improvements

I-90 Northwest Region

IMPROVEMENT TYPE	DESCRIPTION	LOCATION
Mobilitv Improvements (Included in Financially Constrained Plan)	Add stalls to South Bellevue. Mercer Island United Methodist Church, Mercer Island Presbyterian Church Park Ride lots.	MP 9.72
	Add stalls to Eastgate Park & Ride lot, construct 2 new park and ride lots at Lakemont Blvd. SE interchange and in Issaquah?	MP 12.35 to MP 16.64
Mobility Improvements (Excluded from Financially Constrained Plan)	Regional Rail system	MP 0.36 to MP 5.86
	NFS - SR 900 Interchange Reconfiguration	MP 15.37
	Sunset Interchange Improvements	MP 18.38
Mobility Core HOV Mobility Strategy	HOV lanes I-405 to Issaquah Regional Rail System	
	HOV lanes Regional Rail system	
Mobility Urban Bicycle Strategies	Provide bike/ped facility at SR 90 Eastgate in vicinity of 136th St. Tunnel	
Safety Improvements	All of I-90 to design standards	MP 1.94 to MP 33.29
	Included in the Interstate safety estimates	MP 2.79 to MP 3.06
	Included in the Interstate safety estimates	MP 3.13 to MP 3.33
	Included in the Interstate safety estimates	MP 5.89 to MP 5.93
	Guardrail end treatment, extend guardrail and install guardrail	MP 18.50 to MP 19.00
	Guardrail end treatment, signing and clear zones (trees)	MP 21.50 to MP 23.00
	New signals. Signing. Construct deceleration lane	MP 23.00 to MP 26.00
	Guardrail end treatment and signing	MP 26.00 to MP 27.00
	Signing	MP 27.00 to MP 29.00
	Guardrail end treatment and extend guard rail	MP 29.00 to MP 30.00
	New signal, extend tapers near & Ride	MP 30.00 to MP 31.00

Source: January 1995 State Highway System Plan

Table C-4

Summary of Planned Corridor Improvements

I-90 South Central Region

IMPROVEMENT TYPE	DESCRIPTION	LOCATION
Mobility Improvements (Included in Financially Constrained) Plan	Hyak to Resort Cr. - Widen to six lanes	MP 55.16 to MP 59.79
	Resort Cr. to Cabin Road -Widen to six lanes	MP 59.79 to MP 63.53
	Cabin Creek to Easton Hill -Widen to six lanes	MP 63.53 to MP 67.17
	Easton to Cle Elum - Widen to six lanes	MP 67.17 to MP 82.75
	Highline Canal to Elk Heights - Construct Truck Climbing lane	MP 90.00 to MP 93.60
	Elk Heights interchange vicinity to Taneum Cr. Road - Construct Truck Climbing lane	MP 95.00 to MP 97.00
	Construct eastbound truck climbing lane	MP 124.02 to MP 125.87
	Construct westbound truck climbing lane	MP 125.87 to MP 137.64
Mobility Improvements (Excluded from Financially Constrained Plan)	Add eastbound lane at the I-90/I-82 interchange	MP 0.63 of I-82
	Further study needed on I-90	MP 33.29 to MP 111.00
Safety Improvements	tnstall IVHS system and variable speed limit signing, install rumble strips westbound and eastbound; install durable striping and slotted drains	MP 33.1 to MP 52.61
	Improve I-90 corridor to design standards	MP 33.29 to MP 137.67
	Included in Mobility solution cost estimate	MP 48.66 to MP 62.61
	Install IVHS system and variable speed limit signing, add durable markings, rumble strips and slotted drains	MP 52.61 to MP 71.20
	Update guardrail, rumble strips & durable lane striping, flatten slopes, widen median shoulders, retrofit bridge rails with thrie beam	MP 67.00 to MP 110.00
	Realign roadway, flatten slopes	MP 79.00 to MP 79.29
	Realign roadway	MP 133.69 to MP 136.64
	Flatten slopes	MP 61.41 to MP 61.44
Economic Initiatives	Replace bridge with less than 15'6' on Trunk System (Stampede Rd. UC)	Varies
	Proposed new rest area within vicinity of MP 28.95 to MP 60	MP 28.95 to MP 60

Source: January 7995 State Highway System Plan

Table C-5

Summary of Planned Corridor Improvements

I-90 North Central Region

IMPROVEMENT TYPE	DESCRIPTION	LOCATION
Mobility Improvements (Included in Financially Constrained Plan)	Widen SR 90 U'xings and modify interchanges at Central Ave., Peninsula Dr. and Potato Hill Road	MP 176.15 to MP 177.77
Safety Improvements	Curve revision, rock blasting e tend ramps -	MP 137.74 to MP 138.24
	Ramp improvements at ista Point -	MP 139.56 to MP 149.85
	Extend existing westbound ramps at six i terchanges -	MP 149.85 to MP 150.07
Economic Initiatives	Replace bridge with less than 15'6" on Trunk System (SR 171 UC)	Varies
	Replace bridge with less than 15'6" on Trunk System (Central Ave UC)	
	Replace bridge with less than 15'6' on Trunk System (Peninsula Dr UC)	
	Replace bridge with less than 15'6" on Trunk System (CMSTPP RR UC)	
	Replace bridge with less than 15'6' on Trunk System (Potato Hill Rd UC)	

Sour January 1995 State Highway System Plan

Table C-6

Summary of Planned Corridor Improvements
I-90 Eastern Region

IMPROVEMENT TYPE	DESCRIPTION	LOCATION
Mobility Improvements (Included in Financially Constrained Plan)	Add lanes - Hamilton Street to Sprague Ave	MP 282.20 to MP 285.31
	Add lanes and Interchange - Sprague to Argonne Stage 1	MP 285.31 to MP 285.87
	Add lanes - Sprague to Argonne Stage 2	MP 285.31 to MP 285.87
	Add lanes, Further study to determine General Purpose or HOV	MP 288.12 to MP 290.00
	Construct new University Interchange	MP 288.85
	Reconstruct Harvard Road/Liberty Lake Interchange	MP 296.19
Mobility Improvements (Excluded from Financially Constrained Plan)	Add lanes, Further study to determine HOV or GP- Four Lakes to Airport Rd	MP 270.55 to MP 278.2
	Further study of I-90 from Division Street to Hamilton Street	MP 281.56 to 282.24
	Add lanes, Further study to determine HOV or general purpose lanes	MP 290 to MP 299.82
Safety Improvements	Flatten slopes	MP 222.00 to MP 230.67
	Rumble strips, Salnave to Geiger - (partially already installed)	MP 265.00 to MP 275.00
	Ramp Improvements Geiger Field Interchange - (completed)	MP 276.32
	Ramp Improvements Garden Springs Interchange - (completed)	MP 277.26
	Ramp Improvements at SR 2 Interchange - (completed)	MP 277.73
	Interchange -Ramp modification - Pines Rd (may include a partial clover leaf)	MP 290.00
	Additional analysis required Pines Road to Idaho	MP 292.00 to MP 299.82
Economic Initiatives	Replace bridge with less than 15'6" on Trunk System (BNRR UC)	MP 220.28
	Replace bridge with less than 15'6" on Trunk System (SR 395 UC)	MP 220.49
	Replace bridge less than 15'6" on Trunk System (Wellsandt Rd. UC)	MP 222.82
	Replace bridge with less than 15,6" on Trunk System (Cora Rd. UC)	MP 226.39
	Replace bridge with less than 15'6' on Trunk System (E. Tokio Rd. UC)	MP 231.23
	Replace bridge with less than 15'6' on Trunk System (Ped. UC at Regal St.)	MP 283.36
	Replace bridge with less than 15'6" on Trunk System (Flora Rd. UC)	MP 292.96
	Replace bridge with less than 15'6" on Trunk System (Barker Rd. UC)	MP 293.95
	Replace bridge with less than 15'6' on Trunk System (Greenacres UC)	MP 294.92
	Add lanes and Interchange - Sprague to Argonne Stage 1 (Good chance of being built within next 4 years)	
	Reconstruct Harvard Road/Liberty Lake Interchange - (May have some developer funding)	

Source: January 1995 State *Highway System Plan*

C.2.2 Highway Motorist Information Signing

WSDOT is involved in installing signs along the roadsides that advertise services provided by businesses at locations near the freeway interchanges. Businesses like gas stations, motels and hotels, restaurants, and camping parks participate in the program. Table C-7 indicates how many motorist information signs (MIS) are present in each WSDOT region.

Table C-7

Number of MIS Signs on I-90 by WSDOT Region			
Highway	**MP Limits**	**SDOT Region**	**Number of MIS**
I-90	1.94 to 33.29	Northwest	65
I-90	33.29 to 137.67	South Central	79
I-90	137.67 to 189.05	North Central	37
I-90	189.05 to 299.82	Eastern	155

Appendix A contains a reproduction of the Washington State Interstate Guide, produced by the Washington Department of Transportation. Shown on this set of schematic maps are rest areas, motorist information service signs locations, exit numbers, cross street names, parallel bike trails, state parks, visitor information centers, and points of interest .

C.2.3 Transit Systems

Two local transit agencies utilize the I-90 corridor; Metro Transit in King County and Spokane Transit in Spokane. Metro Transit's range along I-90 extends to Issaquah and has several park & ride facilities adjacent to the highway. Metro Transit service is also enhanced through a system of reversible HOV lanes along the corridor in the greater Seattle metropolitan area.

Spokane Transit's service area covers Spokane County and the City. Spokane Transit operates routes along I-90 from approximately which serve eastern suburbs of Spokane. Currently west side suburban bus routes do not access the freeway. Spokane Transit is currently investigating the potential use of transit signal priority at critical intersections for Spokane County and State signals. Other commercial bus service carriers operate along I-90 including Trailways, Greyhound, and a variety of charter services. Inter-city bus service uses I-90 with stops at regional city destinations including; Seattle, Issaquah, North Bend, Ellensburg, George, Moses Lake, Cheney and Spokane.

C.2.4 Rail Systems

The Burlington Northern Sante Fe Railroad Company has a single-track main line with passing sidings from Port of Everett east to Spokane, crossing Stevens Pass (Stevens Pass is north of I-90). This line parallels I-90 but is usually quite a distance north of I-90. The east-west line is considered to be close to maximum capacity due to the bottleneck at the Cascade tunnel.

About 24 trains per day can use the tunnel due to the use of diesel locomotives and the requirement to ventilate the tunnel after each train crossing.

A recent bill passed by the 1996 Legislature and signed into law establishes a new freight rail corridor along the alignment of the old Milwaukee Railroad line. This law allows for the franchising of the State's portion of the Milwaukee right-of-way for freight rail use and includes a cross-state recreational trail. This new route would include the Stampede Pass line from Auburn to Cle Elum and the Milwaukee Road segment from Ellensburg through Othello to Lind. This third corridor would relieve congestion that already exists on the Stevens Pass route connecting Spokane and Everett and the Columbia River Gorge route connecting the Tri-Cities with Vancouver, Washington. This route will provide additional options to local shippers, manufactures and producers in transporting products to domestic and international markets, while keeping Washington ports competitive in the international market.

Passenger rail service along the I-90 corridor includes four weekly Amtrac runs along the Burlington Northern Route. (North of I-90) Amtrac stations are located in Edmonds, Everett, Wenatchee, Ephrata and Spokane. Total trip length from Seattle to Spokane is approximately eight hours.

A study entitled "High Speed Ground Transportation Study" was completed in October of 1992. This study examined both north-south and east-west corridors to determine potential feasibility of High Speed Ground Transportation (HSGT) by the year 2020. Three alternative routes where considered that would utilize the existing I-90 corridor to some extent, including:

- Seattle to Moses Lake to Spokane;
- Seattle to Yakima to Pasco (Tri-Cities) to Spokane; and
- Seattle to Yakima to Walla Walla.

Of these east-west corridors, the Seattle to Moses Lake to Spokane corridor, which parallels the I-90 alignment in its entirety, was considered for possible further study. This corridor was considered the most economically feasible of the east-west corridors studied and would have the greatest potential benefit for statewide intercity travel. The potential for HSGT service to Eastern Washington, however, are well off into the future since numerous institutional, legislative, funding and technology issues must be overcome before serious planning can begin.

C.2.5 Marine Facilities

There is no waterborne commerce directly along the I-90 corridor. There is recreational boat traffic on the Columbia River (I-90 crosses the Columbia River at Vantage) and on some of the lakes in the corridor (Moses Lake, Potholes Reservoir, Spokane River).

However, shallow draft ports on the Columbia River are located in the Tri-Cities area (Pasco-Richland-Kennewick). These ports handle cargo volumes that would otherwise be handled on surface transportation including roads and rail. This major inland port, however, does generate traffic along US 395 to the north and east to I-90 from Ritzville to Spokane. Trucks traveling these routes in support of this marine facility carry dry bulk and breakbulk cargo to coastal ports for export.

As stated in the “1991 Washington Ports and Transportation Systems Study”, the impact of salmon preservation could drastically impact navigation on the entire Columbia-Snake River system. Salmon habitat preservation measures such as draw down of reservoirs reduces available navigational draft on the system, reducing marine transport capabilities. Thus, road and rail would need to be improved to counter these effects. Direct intermodal access to and from these ports remains a critical element in their economic viability.

I-90 terminates in the west near the Port of Seattle. Port commerce is facilitated by the I-90 corridor. As an example, the “1995 Marine Cargo Forecast” estimates that the Wenatchee Apple Growers, who supply about 65% of apple exports at terminal 91, use I-90 as a primary route to transport their produce.

C.2.6 Airport Facilities

Two Airports are accessed directly from I-90, Moses Lake and Spokane International. Both of these airports handle passenger traffic and cargo. Based on the 1991 Washington Ports and Transportation Systems Study, Spokane Airport has more than doubled its aircargo tonnage from 1986 to 1990 while Moses Lake Airport has had an increase in air cargo of 7.7 percent over the same time period. Continued growth at these facilities will place more demand on the supporting highway transportation system. During adverse weather conditions in the Puget Sound region, the Moses Lake Airport functions as an alternative landing site. Passengers would then bused along I-90 west to their original destination.

C.2.7 Pipelines

The Yellowstone Pipeline with its origin in Billings Montana, parallels the I-90 corridor from Spokane to Moses Lake. This is a privately owned pipeline that carries refined petroleum products including gasoline and diesel. Olympic Pipeline Co. has applied to construct a 227 mile petroleum pipeline crossing northern and eastern King County from Woodinville to Pasco via Snoqualmie Pass.

C.3 TRAFFIC CONDITIONS

C.3.1 Existing Traffic Conditions

Table C-8 shows the daily volumes on I-90 for 1990 from I-5 to the King County border. The two-way volumes are split into general purpose (GP) and high-occupancy vehicle (HOV). Volumes are heaviest between the I-405 and Bellevue Way interchanges. Volumes go down slightly to the west, and drop off significantly to the east of SR 18. HOV volumes show a similar pattern, with volumes building slowing from I-5 to the east, peaking around I-405 and Bellevue Way.

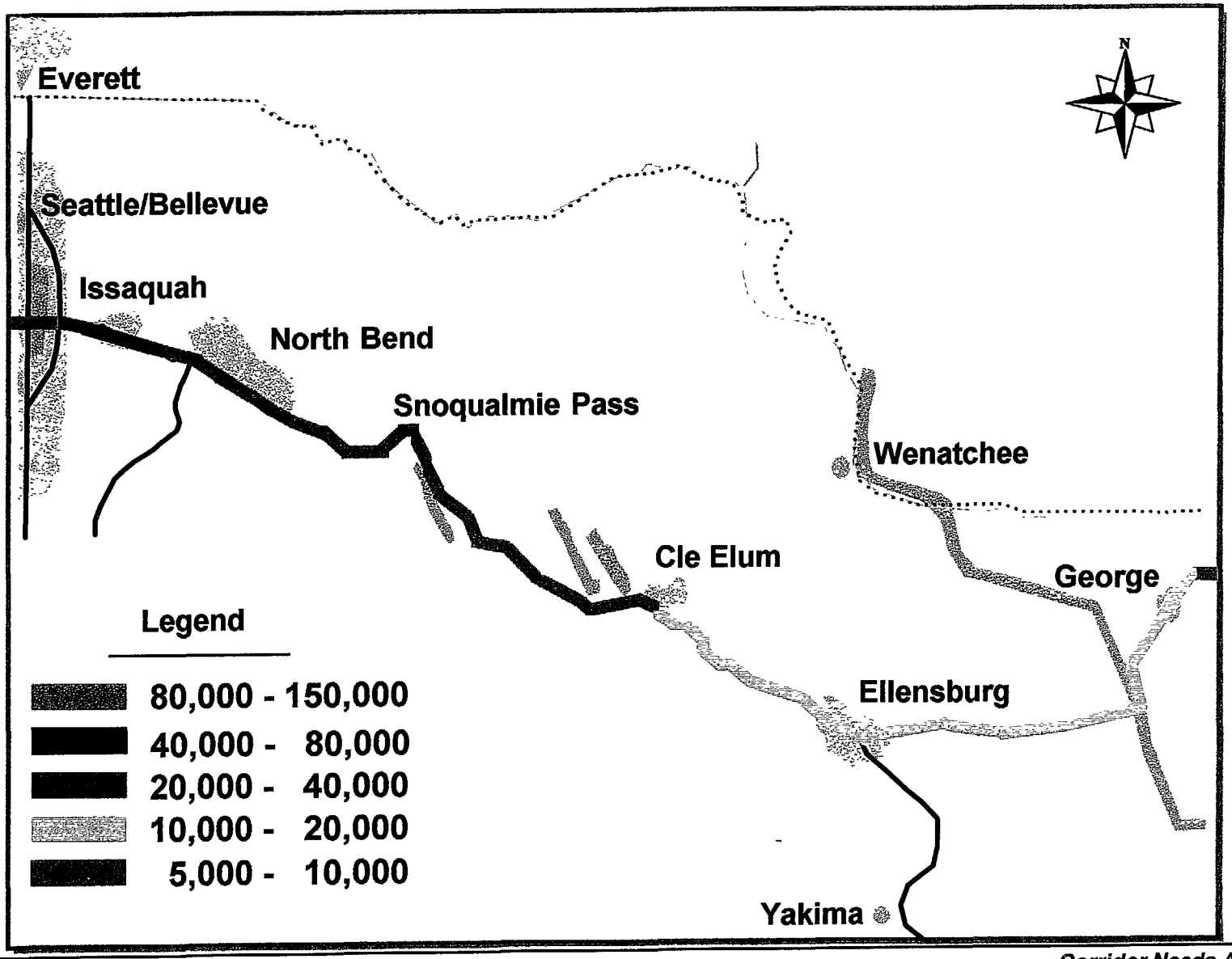
Table C-8

1990 Daily Volumes on I-90				
Location 1	Location 2	GP	HOV	TOTAL
I-90 Around I-5				
East of I-5	I-5	N/A	N/A	***N/A***
I-5	East of I-5	N/A	N/A	N/A
I-5	West of I-5	32,376	110	32,488
West of I-5	I-5	32,877	117	32,994
West of I-5	Ranier Ave S	36,277	114	36,391
Ranier Ave S	West of I-5	35,668	120	35,788
I-90 East and West of I-405 Interchange				
Bellevue Way	I-405	55,271	151	55,422
I-405	Bellevue Way	55,425	160	55,585
I-405		42,733	105	42,838
	I-405	46,957	133	47,090
I-90 East and West of SR 18				
Preston-Fall Cty	SR 18	9,320	N/A	9,320
SRI8	Preston-Fall Cty	9,296	N/A	9,296
SR 18		14,438	N/A	14,438
	SR 18	14,591	N/A	14,591
I-90 Around the King County Border				
Around King Cty		9,231	N/A	9,231
		9,384	N/A	9,384
		9,231	N/A	9,231
		9,384	N/A	9,384

Source: WSDOT, 1996

Figures C-4a and C-4b illustrate the average daily traffic volumes for 1994 for the rest of the corridor. These figures show a drop in traffic between I-82 in Ellensburg and U.S. 395 in Ritzville, as well as higher urban traffic in the Spokane area.

I-90 AVERAGE DAILY TRAFFIC VOLUMES (1994)



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
RE C-4a

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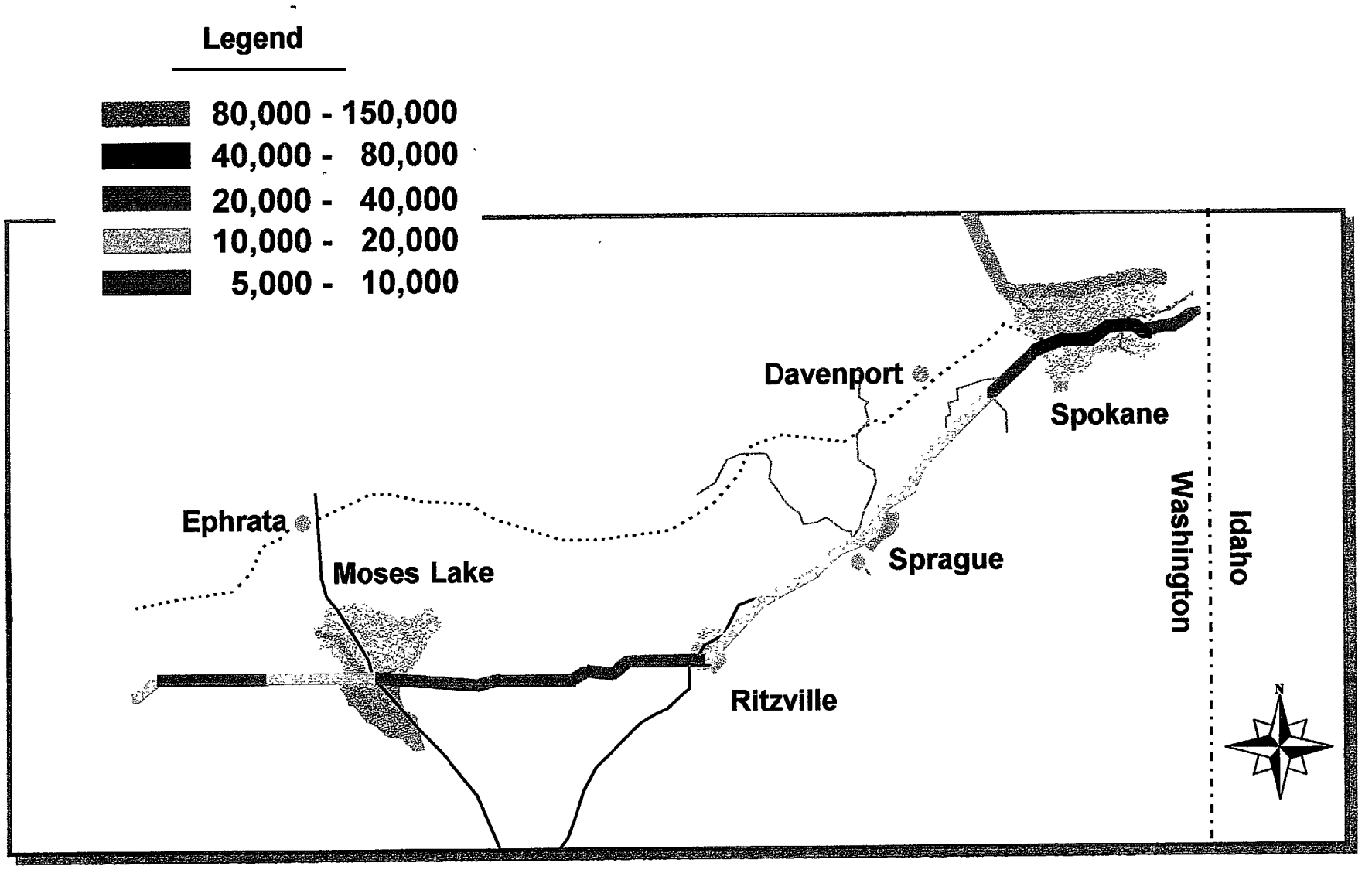
I-90 AVERAGE DAILY TRAFFIC VOLUMES (1994)



Corridor Needs Assessment
I-90 Seattle to Spokane
TS Early Deployment Program
FIGURE C-4b

C.3.2 Future Travel Demand

Table C-9 shows the forecasted daily volumes on I-90 for 2010 from I-5 to the King County Border. The volumes are split into GP and HOV, and also show the percentage increase from 1990 volumes. Volume characteristics are similar to those of 1990, with the addition of a third peak area. The highest GP volumes are between the I-405 and Bellevue Way interchanges. Volumes go down slightly to the west, and drop off significantly to the east of SR 18. HOV volumes show a similar pattern, with volumes building slowing from I-5 to the east, peaking around I-405 and Bellevue Way.

The forecasted 20-year increase in GP volumes ranges between 0.4 percent to 2.8 percent, with the highest rates near the King County border. Forecasted rates of growth range from 10.4 percent to 12.8 percent, reflecting an anticipated mode shift due to growing congestion and improved transit services. The highest rates of HOV growth are between the I-5 and Rainier interchanges.

Table C-9

2010 Forecasted Daily Volumes on I-90

Location 1	Location 2	GP	HOV	TOTAL	*GP Increase* From 7990	*HOV Increase* From 7990
I-90 Around I-5						
East of I-5	I-5	27,033	111	27,144	N/A	N/A
I-5	East of I-5	23,561	14	23,575	*N/A*	*N/A*
I-5	West of I-5	45,843	1,136	46,979	*1.75%*	12.38%
West of I-5	I-5	44,524	1,249	45,773	1.53%	12.57%
West of I-5	Ranier Ave S	40,388	1,136	41,524	0.54%	12.18%
Ranier Ave S	West of I-5	41,066	1,249	*42,315*	0.71%	12.43%
I-90 East and West of I-405 Interchange						
Bellevue Way	I-405	59,359	1,407	60,766	0.36%	11.81%
I-405	Bellevue Way	61,723	1,476	63,199	0.54%	11.75%
I-405		53,482	934	54,416	*f. 13%*	11.55%
	I-405	59,941	953	60,894	1.23%	10.35%
I-90 East and West of SR 18						
Preston-Fall Cty	SR18	14,361	439	14,800	2.19%	*N/A*
SR18	Preston-Fall Cty	14,363	439	*14,802*	2.20%	*N/A*
SR18		21,554	456	22,010	2.02%	*N/A*
	SRI8	21,684	456	22,140	2.00%	*N/A*
I-90 Around the King County Border						
Around King Cty		16,136	0	16,136	2.83%	N/A
		16,289	0	16,289	2.80%	N/A
		16,136	0	16,736	2.83%	*N/A*
		16,289	0	16,289	2.80%	*N/A*

Source: WSDOT, 1996

Table C-10 illustrates forecasted volumes for the Moses Lake area.

Table C-10

I-90 Forecasted Volumes for the Moses Lake Area

I-90 Location	Current Est. 1993 ADT	Future Est. 2016 ADT	Prorated 2010 ADT	Rounded 2010 ADT
West of Dodson Road, MP 164.59	10100 (93)	19400 (16)	16974	17,000
East of Dodson Road, MP 164.59	11100 (93)	20800 (16)	18270	18,000
West of Mae Valley Rd, MP 174.60	10600 (93)	22550 (17)	19562	20,000
Between Mae Valley Rd, MP 174.60, & SR 171, MP 175.94	15600 (93)	35050 (17)	30188	30,000
Between Wapato, MP 176.15, and SR 17, MP 179.45	9700 (93)	21350 (17)	18438	18,000
Between SR 17, MP 179.45, and Wheeler Road, MP 182.83	8800 (93)	19350 (17)	16712	17,000
East of Wheeler Road, MP 128.83	8500 (93)	16350 (17)	14388	14,000

ADT = Average Daily Traffic

Table C-l 1 shows Spokane County forecasted volumes, provided by the Spokane Regional Transportation Council.

Table C-11

I-90 Forecasted Volumes for Spokane County

	2010 PM peak hour traffic volumes				
-90 Location	**WB**	**EB**	**Total**	**ADT**	**Use**
West end of I-90 in Spokane County	513	609	1122	12,398	12,000
West of Four Lakes interchange	648	674	1322	14,608	15,000
East of Four Lakes interchange	1733	2768	4501	49,736	50,000
Between SR 2 and SR 195	3754	4992	8746	96,643	97,000
East of SR 195	4924	5169	10093	111,528	112,000
West of Division Street (SR 2/395)	5602	5588	11190	123,650	124,000
East of Division Street (SR 2/395)	5520	6506	12026	132,887	133,000
West of Pines Road (SR 27)	4160	4865	9025	99,726	100,000
East of Pines Road (SR 27)	3656	3861	7517	83,063	83,000
Idaho border	1403	1399	2802	30,962	31,000

EB = Eastbound, WB = Westbound, ADT = Average Daily Traffic

Table C-12 shows Kittitas County forecasted traffic volumes, provided by the WSDOT North Central Region.

Table C-12

I-90 Forecasted Volumes for Kittitas County

I-90 Location	1985 AADT	1994 AADT	Computed Annual Growth Rate	2010 AADT	Rounded Volumes
R006 MP 85.06 W/O SR 970~Cle Elum	11,887	19,205	**0.0547**	**45,061**	**45,000**
R042 MP 136.58 W/O SR 26-Vantage	**7,764**	**12,344**	**0.0528**	**28,148**	**28,000**

AADT = Average Annual Daily Traffic. C.2 Current and Future Transportation Infrastructure

C.4 OTHER EXISTING CONDITIONS

C.4.1 Unstable Slopes

The WSDOT Geology Branch maintains a list of unstable slopes that sometimes impact a roadway. The slopes are either above the roadway or below the roadway. Slopes that are above the roadway can slide onto the roadway, or can deposit loose rocks onto the roadway. Slopes that are below the roadway can settle, or erode.

The major freeways in Washington State have generally been located in areas where unstable slopes are not normally a problem, compared to older, narrower roads in mountainous terrain. However, there are a few locations that have unstable slope problems along I-90.

Table C-l 3 lists the currently known unstable slope problems in increasing mileposts while Table C-14 lists the same areas in order of "score." A high 'score," or total points, indicates a greater potential problem area. The Unstable Slope Numerical Rating System has 12 scoring categories which include: Problem Type (soil, rock), Average Daily Traffic, Impact of Failure on Roadway, Failure Frequency, and Economic Factor. Scoring ranges from 3-81 points. For example, under Impact of Failure on Roadway, the potential that a landslide would extend only 50 feet gets 3 points. If a local evaluator feels a particular slope could slide 500 feet, it gets 81 points.

Figures C-5a and C-5b illustrate unstable slope locations.

Table C-13

I-90 Unstable Slopes In Milepost Order

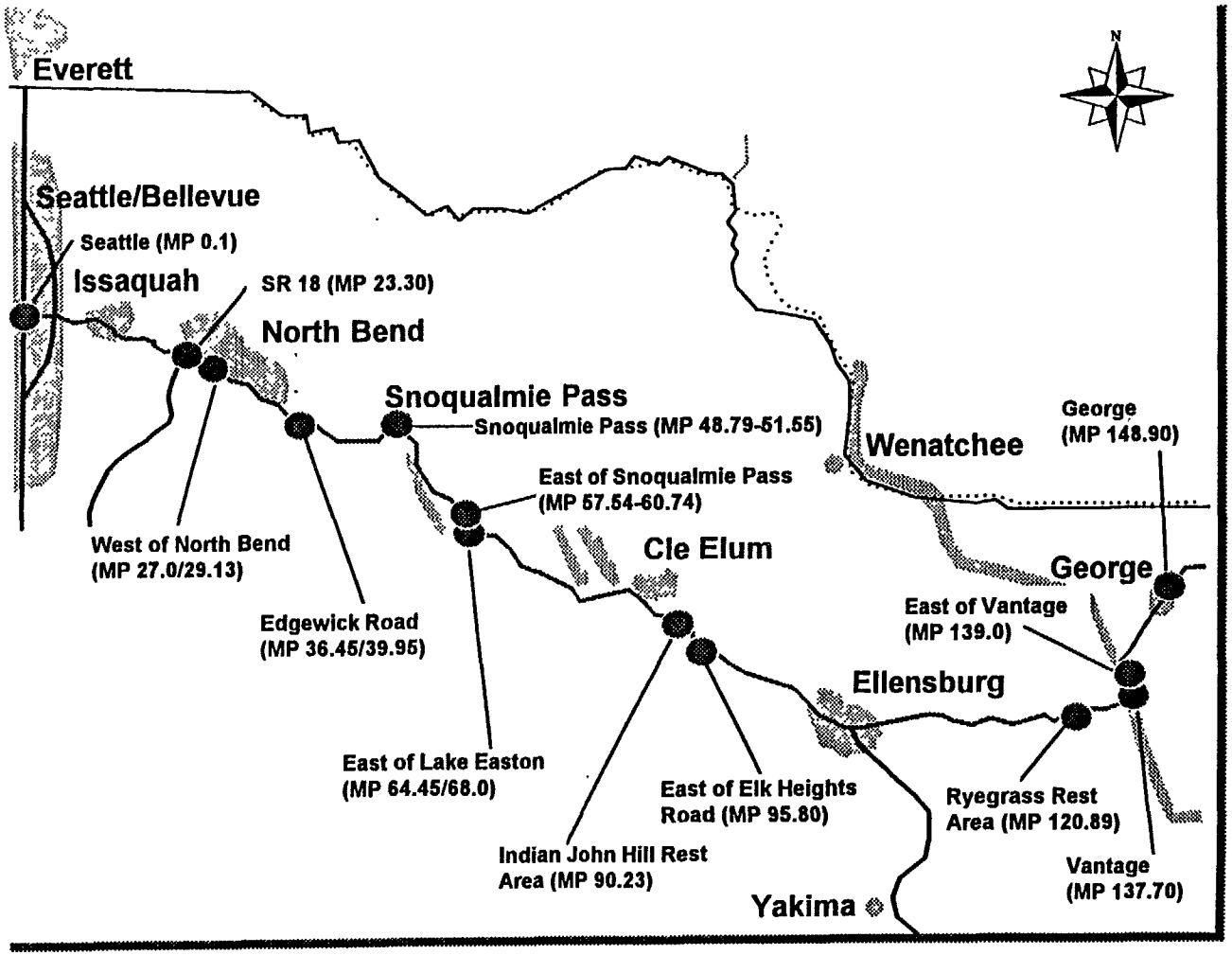
STATE ROUTE	BEGIN MILEPOST	END MILEPOST	PROBLEM TYPE	TOTAL POINTS
90	0.10	0.30	EROSION	0
90	23.30	23.40	LANDSLIDE	384
90	23.30	23.31	LANDSLIDE	0
90	27.00	27.20	LANDSLIDE	0
90	29.13	29.24	ROCKFALL	216
90	36.45	36.60	ROCKFALL	276
90	39.95	40.17	ROCKFALL	276
90	48.79	48.92	ROCKFALL	270
90	48.88	48.92	ROCKFALL	198
90	49.30	49.90	ROCKFALL	0
90	49.70	50.20	ROCKFALL	276
90	50.16	50.42	ROCKFALL	270
90	50.50	51.00	ROCKFALL	0
90	51.30	51.57	ROCKFALL	342
90	51.36	50.56	ROCKFALL	285
90	51.55	51.77	ROCKFALL	276
90	57.54	57.76	ROCKFALL	318
90	57.87	58.10	ROCKFALL	300
90	58.01	58.49	ROCKFALL	321
90	58.19	58.35	ROCKFALL	270
90	58.61	59.08	ROCKFALL	276
90	59.08	59.16	ROCKFALL	240
90	60.28	60.41	ROCKFALL	270
90	60.74	60.82	ROCKFALL	276
90	64.45	64.55	SETTLEMENT	396
90	64.76	64.89	ROCKFALL	273
90	64.89	65.00	ROCKFALL	273
90	65.20	65.25	ROCKFALL	228
90	66.06	66.14	ROCKFALL	258
90	66.27	66.31	ROCKFALL	150
90	66.50	66.58	ROCKFALL	168
90	67.60	67.67	ROCKFALL	144
90	68.00	68.12	ROCKFALL	192
90	90.23	90.34	ROCKFALL	276
90	95.80	95.95	LANDSLIDE	228
90	120.89	120.91	ROCKFALL	0
90	137.70	137.80	ROCKFALL	0
90	139.00	139.25	ROCKFALL	51
90	148.90	149.00	LANDSLIDE	0
90	164.33	164.59	DEBRIS FLOW	276
90	168.50	169.10	DEBRIS FLOW	294
90	169.46	169.98	DEBRIS FLOW	294
90	174.35	174.69	DEBRIS FLOW	294
90	181.71	182.00	DEBRIS FLOW	294
90	191.79	191.89	ROCKFALL	45

Table C-14

I-90 Unstable Slopes In "Score" Order

STATE ROUTE	BEGIN MILEPOST	END MILEPOST	PROBLEM TYPE	TOTAL POINTS
90	64.45	64.55	SETTLEMENT	396
90	23.30	23.40	LANDSLIDE	384
90	51.30	51.57	ROCKFALL	342
90	58.01	58.49	ROCKFALL	321
90	57.54	57.76	ROCKFALL	318
90	57.87	58.10	ROCKFALL	300
90	168.50	169.10	DEBRIS FLOW	294
90	169.46	169.98	DEBRIS FLOW	294
90	174.35	174.69	DEBRIS FLOW	294
90	181.71	182.00	DEBRIS FLOW	294
90	51.36	50.56	ROCKFALL	285
90	36.45	36.60	ROCKFALL	276
90	39.95	40.17	ROCKFALL	276
90	49.70	50.20	ROCKFALL	276
90	51.55	51.77	ROCKFALL	276
90	58.61	59.08	ROCKFALL	276
90	60.74	60.82	ROCKFALL	276
90	90.23	90.34	ROCKFALL	276
90	164.33	164.59	DEBRIS FLOW	276
90	64.76	64.89	ROCKFALL	273
90	64.89	65.00	ROCKFALL	273
90	48.79	48.92	ROCKFALL	270
90	50.16	50.42	ROCKFALL	270
90	58.19	58.35	ROCKFALL	270
90	60.28	60.41	ROCKFALL	270
90	66.06	66.14	ROCKFALL	258
90	59.08	59.16	ROCKFALL	240
90	65.20	65.25	ROCKFALL	228
90	95.80	95.95	LANDSLIDE	228
90	29.13	29.24	ROCKFALL	216
90	48.88	48.92	ROCKFALL	198
90	68.00	68.12	ROCKFALL	192
90	66.50	66.58	ROCKFALL	168
90	66.27	66.31	ROCKFALL	150
90	67.60	67.67	ROCKFALL	144
90	139.00	139.10	ROCKFALL	51
90	191.79	191.89	ROCKFALL	45
90	0.10	0.30	EROSION	0
90	23.30	23.31	LANDSLIDE	0
90	27.00	27.20	LANDSLIDE	0
90	49.30	49.90	ROCKFALL	0
90	50.50	51 .00	ROCKFALL	0
90	120.89	120.91	ROCKFALL	0
90	137.70	137.80	ROCKFALL	0
90	148.90	149.00	LANDSLIDE	0

I-90 UNSTABLE SLOPE LOCATIONS



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-5a

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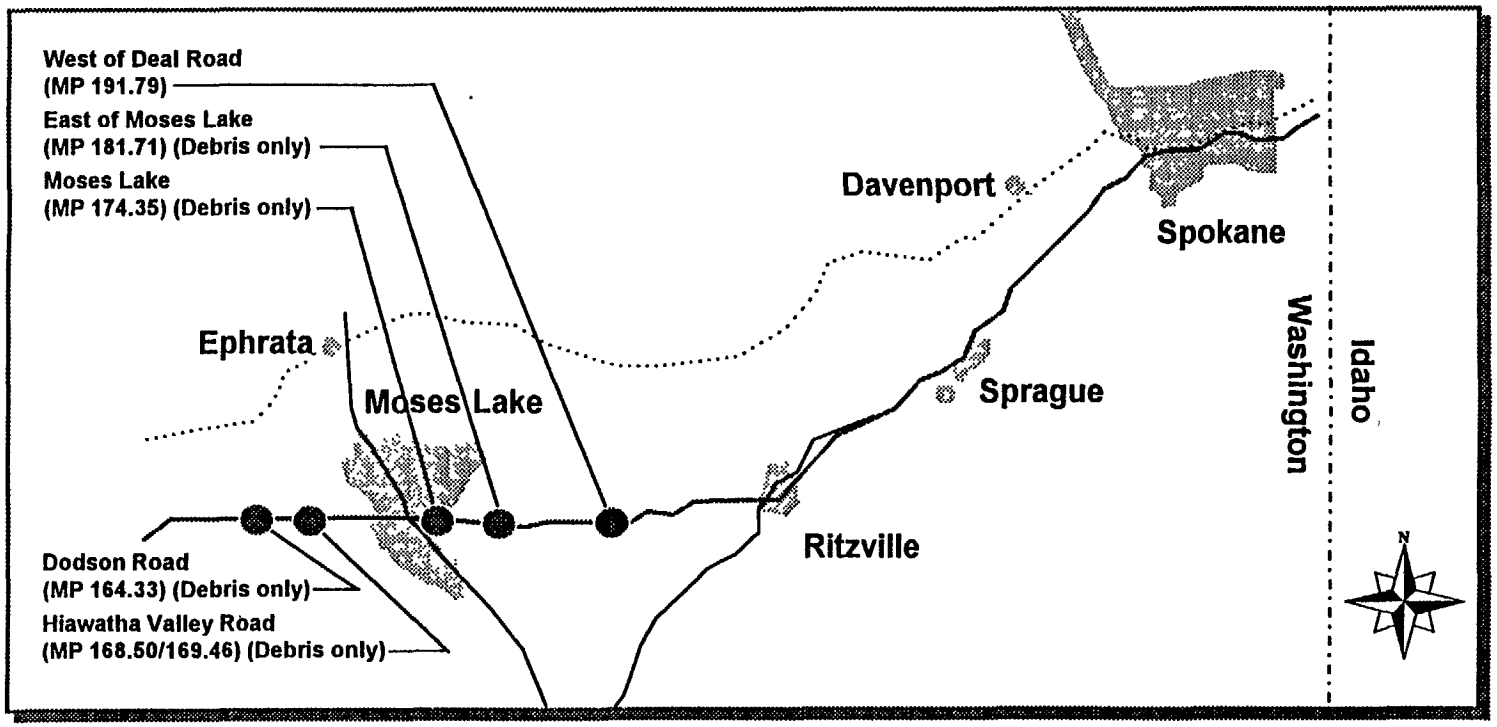
I-90 UNSTABLE SLOPE LOCATIONS



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-5b

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C.4.2 Weather Data

C.4.2.1 WEATHER DATA EXISTING CONDITIONS

Current and programmed weather observing systems are defined below in Table C-l 5, which provides a summary of the 16 agencies which maintain and manage weather observing sites/systems within Washington State.

The TOTAL WX (weather) OBS (observations) category refers to aviation weather observations. They are more complete than other categories of observations and include the taking, recording, and archiving of visibility; air temperature and dew point/humidity; wind speed and direction; atmospheric pressure; cloud cover; and precipitation amount, type, and intensity to include measurement of snow depth. At larger observing sites, such as major airports, these observations also include significant comments such as “fog bank 3 miles NW”, etc. Data from these sites is also taken hourly or more often, except at smaller airports where observations may be limited (e.g., daylight hours, etc.).

The LIMITED WX OBS category refers to observations which normally report air temperature and dew point/humidity, wind speed and direction, and precipitation amount and/or type. Most also include snow depth. Information from these sites is normally received on an hourly basis, but site data is usually limited to specific hours of the day. Data in some cases is also seasonal (such as for the NW Avalanche Center which operates most of its sites during winter months).

The SNOWTEL, or snow telemetry, sites report snowpack, air temperature and precipitation. These are primarily managed by the Natural Resources Conservation Service (formerly the Soil Conservation Service), but a few Corps of Engineer locations can also be considered SNOWTEL sites.

Table C-16 shows the number of weather observing sites operated by each agency. There are a large number of sites from which some form of weather data is received, but very few sites provide weather data directly on or within the I-90 corridor. The number of sites within 5 miles of the corridors is also shown by the table.

A number of other organizations use the data of the agencies depicted in Tables C-15 and C-16. For example, the Environmental Protection Agency (EPA) has its own mobile weather observing equipment, but uses the fixed-site observations from other agencies in its day-to-day operations.

TABLE C-15

I-90: Current and Programmed Weather Observation Systems

AGENCY	TOTAL WX OBS	LIMITE DWX OBS	SNOTEL SITES	WINDSAND TEMPS	WINDS	PAVE - MENT TEMP
Army Corps of Engineers		X	X			
Bureau of Indian Affairs		X				
Bureau of Land Mgmt.		X				
City Seattle		X				
City Spokane		X				X
Dept. of Nat'l. Resources		X				
Dept. of Ecol.				X	X	
National Park Service		X				
Natural Resou. Con. Service			X			
NW Avalanche Center		X				
National Weather Svc.	X					
Puget Snd. Air Poll. Con. Auth					X	
TV Stations		X				
US Military (AF, NV, AR)	X					
US Coast Gd.		X				
US Forest Svc.		X				
WA State DOT		X				X

TABLE C-16

I-90: Number of Weather Observation Sites by Agency

AGENCY	TOTAL SITES	I-90 SITES
Army Corps of Engineers	63	5
Bureau of Indian Affairs	7	0
Bureau of Land Management	5	0
City of Seattle	2	0
City of Spokane	2	2
Department of Natural Resources	30	1
Department o Ecology	20	3
National Park Service	11 (seasonal)	0
Natural Resoures Conservation Service	50	3
NW Avalanche Center	16 (seasonal)	0
Natinal Weather Service	29	3
Puget Sound Air Pollution Control Authority	16	0
TV Stations	39 (seasonal)	17,5 planned
US Military (AF, etc.)	4	1
US Coast Guard	11	0
US Forest Service	51 (seasonal)	1
Washington State Department of Transportation	21	12,4 planned

There are more than three times the number of weather reporting sites along the I-90 corridor as compared to the I-5 corridor. The i-90 sites from its junction with I-5 eastward to the Idaho border are listed below:

Location	Type of Data	Data Source	Remarks
1. Lake Washington Bridge	Limited Wx Obs	WSDOT	
2. Beacon Hill Reservoir	Winds & Temps	Ecology	
3. I-90 @ SR-18	Limited Wx Obs & Pavement Temp	WSDOT	
4. I-90 @ North Bend	Limited Wx Obs	US Forest Service	
5. I-90 @ Tanner	Limited Wx Obs & Pavement Temp	WSDOT	
6. I-90 @ Snoqualmie River Bridge (MP 37.63)	Limited Wx Obs & Pavement Temp	WSDOT	Planned site
7. Mount Washington	Limited Wx Obs	City of Seattle	
8. I-90 @ Denny Creek (MP 47.93)	Limited Wx Obs & Pavement Temp	WSDOT	
9. I-90 @ Franklin Falls (MP 51.19)	Limited Wx Obs & Pavement Temp	WSDOT	
IO. I-90 @ Alpental	Limited Wx Obs & Pavement Temp	WSDOT	
1 I. Approx. 2 mi. N of Snoqualmie Pass	SNOTEL Site		NRCS
12. Approx. 2 mi. NE of Lake Keechelus	SNOTEL Site		NRCS
13. Lake Keechelus	Limited Wx Obs	Corps of Eng.	
14.1-90 @ Price Creek (MP 61.08)	Limited Wx Obs	WSDOT	Planned site
15. Stampede Pass	Total Wx Obs		NWS
16. Kachess Dam	Limited Wx Obs	Corps. of Eng.	
17. Easton Hill (MP 67.4)	Limited Wx Obs & Pavement Temp	WSDOT	Planned site
18. Cle Elum Dam	Limited Wx Obs	Corps of Eng.	
19. 2 mi. S of I-90 at approx. MP 78	SNOTEL Site		NRCS
20. Cle Elum	Limited Wx Obs	Corps of Eng.	
21. I-90 @ Elk Heights (MP 90)	Limited Wx Obs	WSDOT	Planned site
22. Ellensburg	Limited Wx Obs	DNR	
23. Ellensburg	Limited Wx Obs	Corps of Eng.	
24. I-82, 3.8 mi. S of I-90	Limited Wx Obs & Pavement Temp	WSDOT	
25. Moses Lake Airport	Total Wx Obs		NWS
26. I-90 @ MP 257.9	Limited Wx Obs & Pavement Temp	WSDOT	
27. I-90 @ MP 273	Limited Wx Obs & Pavement Temp	WSDOT	
28. Fairchild AFB	Total Wx Obs		USAF

Location	Type of Data	Data Source	Remarks
29. Spokane Airport	Total Wx Obs		NWS
30. Wheelabrator Plant (Near MP 276)	Limited Wx Obs	City of Spokane	
31. I-90 @ MP 277.7	Limited Wx Obs & Pavement Temp	WSDOT	
32. TJ Meenach Bridge (approx. 2-3 mi. NW of I-90/US 2 Interchange)	Limited Wx Obs & Pavement Temp	City of Spokane	
33. I-90 @ MP 282.3	Limited Wx Obs & Pavement Temp	WSDOT	
34. US 395/SR-291	Limited Wx Obs & Pavement Temp	WSDOT	
35. N 4601 Monroe St., Spokane	Winds & Temps	Ecology	
36. E 3530 Ferry, Spokane	Winds & Temps	Ecology	
37. I-90 @ MP 295.3	Limited Wx Obs & Pavement Temp	WSDOT	
38. Spokane Area Schools	Limited Wx Obs	KREM TV 2	16 schools- "school wx net"
39. Spokane	Limited Wx Obs	KHQ TV 6	5 sites sponsors

This listing shows what might at first glance be considered a good coverage of weather observations for the I-90 corridor. However, there are only four total weather observation sites along this corridor (and two are side by side at Fairchild AFB and Spokane International Airport). The Washington State DOT has a number of good reporting sites in this corridor. Other sites provide limited weather information. Additionally, there are two large gaps in weather data availability, one between Ellensburg and Moses Lake, and another between Moses Lake and the WSDOT site at MP 257.9 west of Spokane.

The location of weather observation sites along the corridor are illustrated in Figures C-6a and C-6b. The location of road surface weather sensors, called out as "field sites," are illustrated in Figure C-7.

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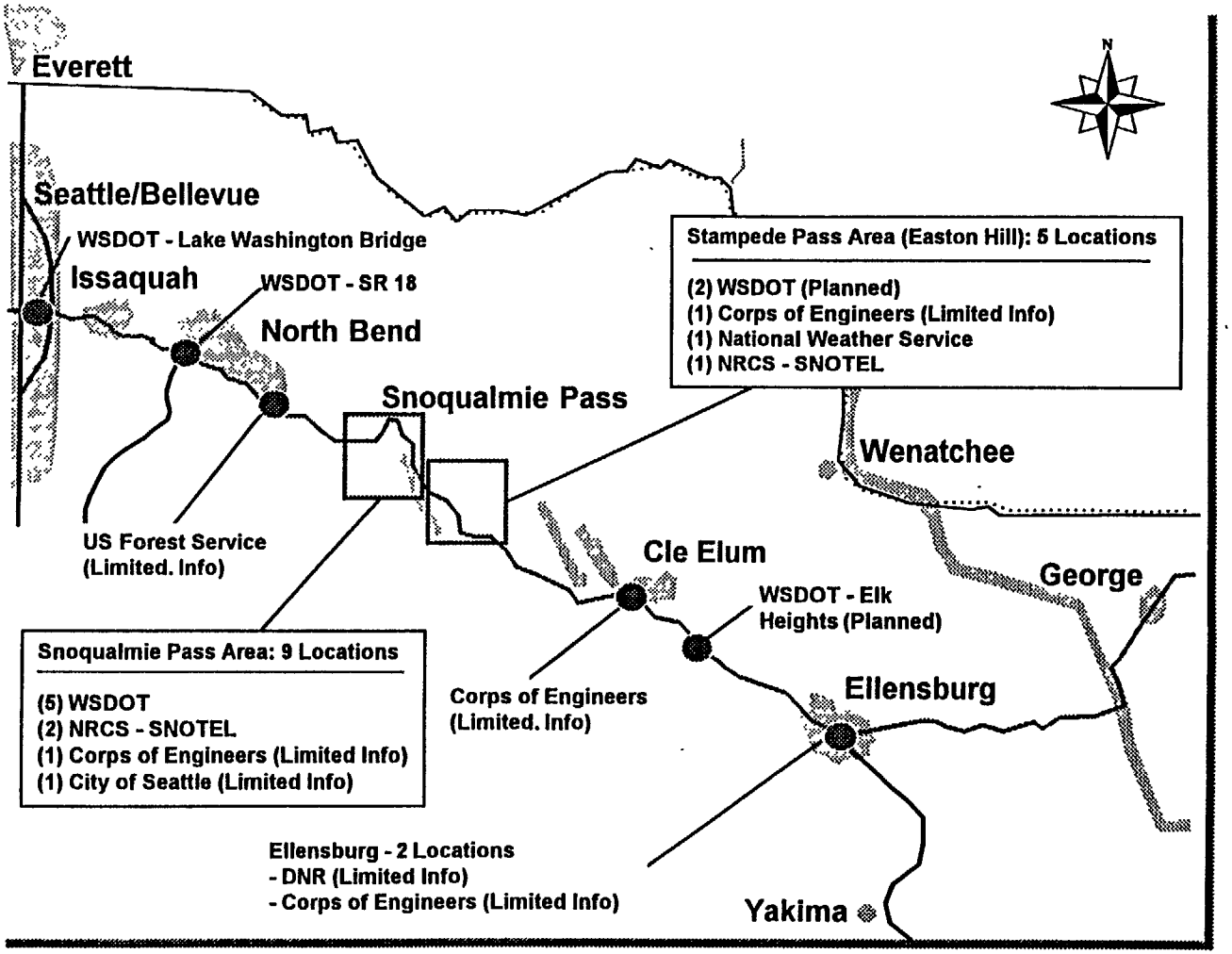
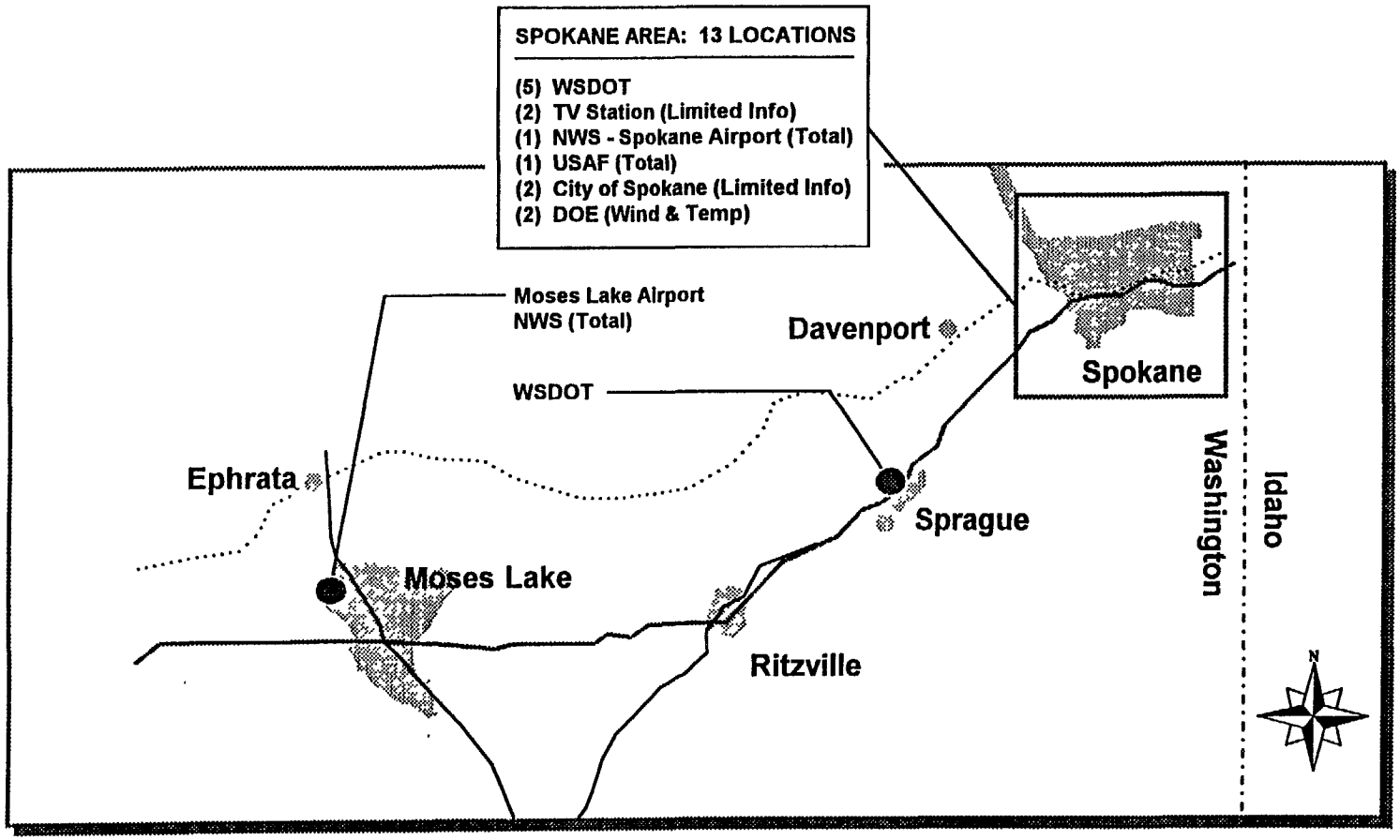
I-90 WEATHER OBSERVATION SITES



PB 100 YEARS

Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-6a

I-90 WEATHER OBSERVATION SITES



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-6b

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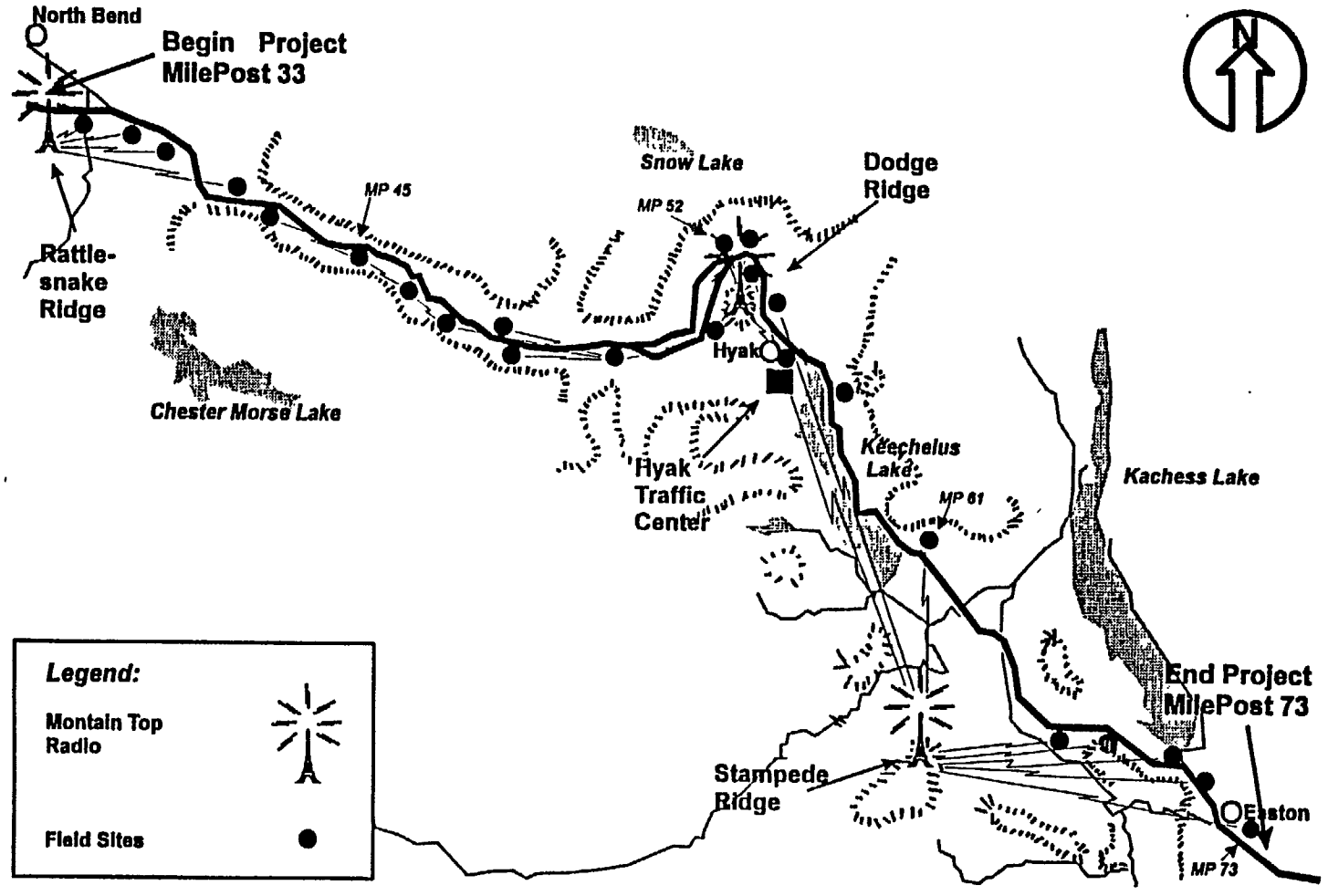


Travel Aid Project - Communications to Field Sites

PB 100 YEARS

Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE C-7

C.4.2.2 WEATHER DATA NEEDS

Heavy snow can shut down I-90 in the vicinity of Snoqualmie Pass, and snow with blowing snow can seriously hinder travel east of the Pass to Spokane. The heavy snow events occur between November through March, with November through February being the months of worst weather. The most serious weather situation occurs with a strong, moist westerly airflow that provides extensive moisture from the Pacific. This is then followed by cold air to bring freezing levels down to at or below 2,500 feet Strong orographic effects of the westerly winds against the Cascade Range can contribute to very heavy snow amounts in a short period of time.

The most serious problems for I-90 east of the Cascades include ice on the roadway, dense fog restricting driver visibility, and dust due to high winds Icy roads can occur anytime after freezing temperatures set in Black ice creates a similar problem as that described for the I-5 corridor. Also, due to the greater number of days with snow, icy roads are a particular problem in the fall and spring due to daytime melting and nighttime refreezing of water from snow runoff .Dense fog occurs throughout the Spokane River Valley and surrounding approaches during the winter months, and when it occurs, often decreases driver visibility to less than I/4 mile. High surface winds, especially in the transition months, can raise dense clouds of dust in farming communities flanking the I-90 corridor.

Many weather reporting installations exist or are planned for the I-90 corridor Some of these . installations are located or planned for areas where a higher than normal number of accidents occur. These installations are summarized below. Marginally useful weather sites have been omitted, such as those for snow depth (SNOTEL) reporting in mountains bordering I-90, and school-net television stations which are tied to radio or television broadcasts.

Location	Accident Analysis Results (from 1/1/90-6/30/95)
1. I-90 at Third Lake Washington Bridge	A WSDOT RWIS site exists here. It is within two miles of the third highest urban accident total at the Rainier Avenue Interchange.
2. I-90 and SR 18 Interchange	A WSDOT RWIS site, this location has the fourth highest total of rural accidents.
3. North Bend	A US Forest Service site takes limited weather observations.
4. I-90 at MP 33.6	A WSDOT RWIS installation will soon be commissioned at this location. It will provide useful weather and pavement temperature data for this section of I-90.
5. I-90 at Snoqualmie River Bridge (MP 37.63)	A planned WSDOT RWIS installation, this will be connected to the "Travel Aid" network.
6. Mt. Washington near MP 40	This is a limited weather observation site operated by the City of Seattle.
7. I-90 at Denny Creek (MP 47.93)	Another WSDOT 'Travel Aid RWIS installation, it provides key weather and pavement condition data where rural accidents begin increasing toward Snoqualmie Pass.
8. I-90 at Franklin Falls	This WSDOT "Travel Aid RWIS installation

(MP 51.19)	provides important weather and pavement condition data on the steep grade just west of Snoqualmie Pass.
9. I-90 at Alpental (MP 51.23)	A WSDOT "Travel Aid" RWIS site which provides key data for Snoqualmie Pass. Area of highest total of rural accidents.
IO. I-90 at Lake Keechelus (near MP 61)	This Corps of Engineers (COE) site provides limited weather observations.
11. I-90 at Price Creek (MP 61.08)	A planned WSDOT 'Travel Aid" RWIS installation for an area where icy and wet roadways contribute to a higher than average number of rural accidents.
12. Stampede Pass (MP 62)	This National Weather Service (NWS) site provides total weather observations 24 hours per day but is at an elevation approximately 1,500 feet above the nearby I-5 roadway.
13. Kachess Dam (near MP 66)	A COE site which provides limited weather observations.
14.1-90 at Easton Hill (MP 67.4)	This planned WSDOT "Travel Aid" RWIS installation will provide important weather and pavement temperature data for the east approach to Snoqualmie Pass in an ice/frost formation area.
15. Cle Elum Dam (near MP 80)	A COE site which provides limited weather observations.
16. Cle Elum (MP 84)	Another COE site providing limited weather observations.
17. I-90 at Elk Heights (MP 90)	This site is a planned WSDOT RWIS installation which will provide critical data for an area with the highest number of rural accidents involving ice on the roadway.
18. Ellensburg (MP 109)	The COE and Department of Natural Resources operate limited weather observing sites here.
19.1-82 3.8 miles S of I-90	This WSDOT RWIS site provides key weather and pavement data for the I-82/1-90 Interchange area.
20. Grant County Airport (Moses Lake)	This site provides limited weather observations taken by FAA tower personnel. A large area otherwise devoid of representative weather data.
21. I-90 at MP 257.9	A WSDOT RWIS site, it provides key weather and pavement data for the approach to the Spokane area.
22.1-90 at MP 273	This WSDOT RWIS installation provides key weather and pavement data for the area just west of Spokane.
23. Fairchild AFB, NW of MP 74	A 24-hour/day Air Force Base total weather observing site.
24. Spokane Airport NW of MP 276	A NWS 24-hour/day total weather observing site.
25. Wheelabrator Plant near MP 276.5	This limited weather observation site is operated by the City of Spokane and sits atop the Wheelabrator Plant just east of Spokane Airport.

26.1-90 at MP 277.7	This WSDOT RWIS installation provides weather and pavement data for the west side of Spokane, an area of increasing urban accidents involving ice on the roadway.
27. TJ Menach Bridge, approx. 3 miles NW of I-9O/US 2	An RWIS site operated by the City of Spokane, it provides valuable weather and pavement data at the northwest boundary of Spokane.
28. US 395/SR 291 Interchange, (approx. 4.2 mi. N of MP 281)	This RWIS installation is operated by WSDOT and provides critical weather and pavement data for north-central Spokane.
29.1-90 at MP 282.3	Another WSDOT RWIS site which provides key weather and pavement data for central Spokane in an area with the highest total of urban accidents involving ice on the roadway.
30. I-90 at MP 295.3	A key WSDOT RWIS installation providing weather and pavement data to the east of Spokane.

The above weather observing sites represent locations where the most complete weather reports are (or will be) available. Although there is a high number of sites, the sites are often grouped in clusters. As a result, there is a large gap in needed weather and pavement data between various geographic locations. The following recommendations for weather and pavement sensors are recommended to fill these gaps.

Recommendations

- Since meteorological sensors are not needed in the immediate areas served by airport weather sensors, recommend selected traffic signals and/or variable message signs planned for I-90 areas near these airports incorporate pavement temperature sensors. Additionally, recommend integration of airport weather data with road temperature sensor data so that traffic, WSDOT road maintenance, emergency management (WA State Patrol), and weather forecast service agencies can have routine access to these data.

- Recommend the following additional locations for a full road weather information system (RWIS) sensor suite incorporating both atmospheric and pavement sensors:

  - The Columbia River Bridge near the SR 28 Interchange, MP 137.5: An RWIS installation in this location would fill the first large gap in weather data coverage from Ellensburg eastward to Moses Lake. This location has a higher than average number of rural injury and fatality accidents.

  - The I-9O/US 395 Interchange, MP 221: An RWIS installation in this location would fill in the remaining gap in weather data coverage between the Moses Lake Airport and the present WSDOT RWIS site at MP 257.9. This interchange is also a key commercial route junction, as US 395 carries considerable commercial domestic and international truck traffic to/from the Tri-Cities area and beyond.

- Recommend the following additional locations for only pavement temperature sensors integrated with traffic signals, call boxes, and/or variable message signs. In these areas, we believe no atmospheric sensors are needed due to nearby weather installations which can provide representative weather data for these locations. Where the location

recommended is a bridge, pavement sensors should be placed both on the bridge and at one approach end to provide contrasting pavement temperature data for the bridge deck and highway pavement.

- The I-90/SR 281 Interchange at George (MP 150): This is a lower priority location for a pavement sensor but would provide valuable contrasting pavement condition information between the recommended RWIS site at the Columbia River Bridge and Moses Lake. A second reason to place a pavement sensor in this location is the varied topography in this region, which can create a markedly different pavement temperature profile over area roads.

- The SR 17 Interchange at Moses Lake: A pavement temperature sensor at this location is also a lower priority. However, sensor data here would fill a large gap in pavement temperature information between the recommended site at SR 281 (George) and the recommended RWIS site at the I-90/US 395 interchange.

- The Sprague Rest Area near MP 242: A pavement temperature sensor at this location is a higher priority than the previous two recommendations above, since this is the area where accident frequency begins to increase toward Spokane due to road icing. A sensor here would also fill in the gap in road temperature information between the recommended RWIS site at the I-90/US 395 Interchange and the present WSDOT RWIS site at MP 257.9.

The above analysis and recommendations for the I-90 corridor was based on similar work for other state departments of transportation, climatological records, application of current knowledge of weather patterns throughout the corridors, and the accident trend analysis completed for this project.

C.4.3 Assistance Calls and Citations

Two tables showing the number of calls for assistance and number of citations given between April 1995 and March 1996 are presented below. In Table C-17, the highest number of calls for assistance occurred east of North Bend at milepost 36, just north of the Granite Creek/ Edgewick Road/Twin Falls interchange. Other locations with a high number of calls were on Mercer Island and in Bellevue, at the Island Crest Way, the I-405/Richards Road, and the 148th/1 50th Avenues SE interchanges.

In Table C-18 the highest number of citations also occurred at the Granite Creek/Edgewick Road/Twin Falls interchange. Other locations with a high number of calls were at the Island Crest Way interchange on Mercer Island, and the Sullivan Road interchange in east Spokane.

Table C-17

I-90 Assistance Calls											
MP	Number of Calls	MP	Number of Calls	MP	Number of Calls	MP	Number of Calls	MP	Number of Calls	MP	Number of Calls
2	472	52	397	102	341	152	65	202	47	252	110
3	779	53	336	103	311	153	55	203	49	253	67
4	668	54	308	104	265	154	120	204	94	254	293
5	812	55	100	105	433	155	50	205	461	255	73
6	943	56	163	106	924	156	43	206	1,538	256	78
7	2,390	57	113	107	429	157	56	207	353	257	149
8	1,447	56	96	108	768	158	56	206	291	258	82
9	866	59	91	109	817	159	51	209	1,030	259	66
10	2,147	60	134	110	464	160	189	210	82	260	181
11	2,235	61	150	111	236	161	591	211	82	261	96
12	1,069	62	134	112	446	162	288	212	136	262	130
13	1,264	63	155	113	422	163	94	213	82	263	137
14	1,249	64	54	114	326	164	86	214	99	264	193
15	1,764	65	87	115	1,523	165	85	215	208	265	101
16	981	66	101	116	224	166	55	216	88	266	103
17	1,787	67	111	117	270	167	60	217	74	267	169
18	1,492	68	852	118	437	168	81	218	96	268	181
19	361	69	230	119	113	169	128	219	467	269	196
20	455	70	761	120	121	170	69	220	214	270	636
21	242	71	141	121	128	171	87	221	136	271	230
22	469	72	164	122	103	172	68	222	92	272	287
23	285	73	108	123	157	173	59	223	80	273	189
24	378	74	167	124	156	174	118	224	90	274	176
25	662	75	98	125	213	175	108	225	394	275	189
26	280	76	68	126	479	176	97	226	247	276	747
27	648	77	64	127	179	177	60	227	140	277	631
28	243	78	162	128	238	178	66	228	92	278	449
29	167	79	66	129	163	179	103	229	106	279	549
30	234	80	278	130	138	180	59	230	310	280	805
31	634	81	67	131	132	181	85	231	155	281	516
32	775	82	63	132	106	182	155	232	80	282	647
33	669	83	125	133	87	183	178	233	44	283	653
34	1,297	84	179	134	131	184	205	234	67	284	527
35	467	85	182	135	135	185	116	235	122	285	773
36	4,635	86	102	136	202	186	108	236	86	286	933
37	228	87	76	137	123	187	104	237	75	287	981
38	364	88	49	138	94	188	161	238	80	288	560
39	245	89	207	139	83	189	221	239	98	289	976
40	264	90	188	140	175	190	126	240	57	290	799
41	190	91	117	141	62	191	251	241	118	291	1,312
42	552	92	107	142	77	192	225	242	114	292	1,918
43	189	93	203	143	137	193	427	243	226	293	468
44	161	94	102	144	459	194	78	244	84	294	232
45	340	95	118	145	188	195	36	245	130	295	163
46	228	96	184	146	210	196	70	246	50	296	324
47	555	97	147	147	232	197	22	247	59	297	261
48	282	98	172	148	208	198	67	248	57	298	263
49	377	99	104	149	166	199	63	249	125	299	676
50	332	100	563	150	115	200	64	250	89	300	6
51	323	101	1.037	151	119	201	57	251	62		

Table C-18

I-90 Citations											
MP	Number Given	MP	Number Given	MP	Number Given	MP	Number Given	MP	Number Given	MP	Number Given
2	125	52	62	102	129	152	19	202	13	252	20
3	212	53	30	103	121	153	28	203	12	253	33
4	171	54	46	104	86	154	60	204	27	254	63
5	308	55	23	105	168	155	25	205	247	255	9
6	456	56	36	106	257	156	18	206	719	256	25
7	1,411	57	20	107	205	157	22	207	121	257	52
8	611	58	14	108	322	158	19	208	120	258	35
9	279	59	5	109	305	159	31	209	482	259	30
10	630	60	16	110	158	160	103	210	25	260	67
11	773	61	20	111	114	161	313	211	19	261	27
12	287	62	21	112	181	162	178	212	40	262	50
13	651	63	19	113	192	163	53	213	18	263	39
14	555	64	8	114	142	164	34	214	16	264	58
15	649	65	8	115	930	165	37	215	74	265	28
16	415	66	19	116	124	166	28	216	30	266	31
17	877	67	17	117	154	167	49	217	23	267	60
18	979	68	298	118	199	168	47	218	28	268	47
19	95	69	110	119	38	169	65	219	190	269	92
20	76	70	380	120	37	170	30	220	42	270	388
21	25	71	18	121	35	171	51	221	82	271	77
22	126	72	47	122	27	172	34	222	35	272	40
23	58	73	30	123	47	173	25	223	22	273	48
24	112	74	33	124	53	174	46	224	30	274	28
25	179	75	24	125	77	175	35	225	174	275	41
26	59	76	10	126	107	176	26	226	99	276	304
27	106	77	9	127	58	177	17	227	57	277	256
28	50	78	40	128	76	178	25	228	42	278	157
29	22	79	18	129	43	179	23	229	40	279	188
30	63	80	54	130	37	180	33	230	131	280	243
31	134	81	14	131	52	181	53	231	46	281	165
32	289	82	23	132	23	182	95	232	46	282	249
33	263	83	42	133	30	183	91	233	12	283	252
34	722	84	43	134	50	184	97	234	18	264	198
35	239	85	50	135	60	185	79	235	66	285	307
36	4,013	86	25	136	29	186	51	236	27	286	412
37	37	87	11	137	16	187	56	237	23	287	436
38	36	88	16	138	21	188	77	238	32	288	228
39	21	89	17	139	12	189	113	239	22	289	380
40	36	90	21	140	39	190	71	240	11	290	327
41	28	91	18	141	9	191	114	241	47	291	598
42	80	92	29	142	27	192	87	242	46	292	1,253
43	29	93	56	143	37	193	182	243	68	293	191
44	29	94	40	144	269	194	37	244	22	294	51
45	38	95	40	145	64	195	10	245	55	295	50
46	75	96	47	146	98	196	16	246	8	296	105
47	142	97	35	147	127	197	10	247	17	297	86
48	95	98	71	148	98	198	8	248	17	298	60
49	86	99	25	149	85	199	21	249	37	299	203
50	95	100	354	150	60	200	23	250	24		
51	62	101	712	151	46	201	19	251	14		

C.4.4 Northwest Region ITS Devices

The Northwest Region's TSMC, located in Shoreline, maintains a variety of ITS devices along the I-90 corridor. They are listed by milepost in Table C-19.

Table C-19
WSDOT NW Region TSMC Devices, I-90

Device Name	Device ID (New)	Device ID (Old)	Status E=Existing P= proposed	Mile Post	Location
VMS	VMS-180	n/a	E	-0.13	EB@Airport Way S
CCTV	CCTV-808	CC808	E	-0.13	Airport Way S
HUB	DBN	HUB-809	E	0	I-5 (Dearborn Hub)
RC	ES-810R	RC 810	E	0	NB SR 5-EB
CCTV	CCTV-812	CC 812	E	0.03	8th Ave S
RC	ES-812R	RC 812	E	0.07	4th Ave S-EB; RT
RC	ES-813R	RC 813	E	0.07	4th Ave S-EB; LT
RC	ES-815R	RC 815	E	0.08	SB SR 5-EB; RT
RC	ES-816R	RC 816	E	0.08	SB SR 5-EB; LT
CCTV	CCTV-816	CC 816	E	0.19	12th Ave S; WB
CCTV	CCTV-818	CC 818	E	0.2	12th Ave S; EB
DS	ES-818D	RC 818	E	0.2	12th Ave S
CMS	CMS-820	CMS 1	E	0.38	EB @ Corwin Pl S
CCTV	CCTV-820	CC 820	E	0.38	Corwin Pl S
DS	ES-820D	DS 820	E	0.46	S Norman St
CCTV	CCTV-821	CC-821	E	0.58	18th Ave S
CMS	CMS-821	CMS 2	E	0.63	ED @ 19th Ave S
VMS	VMS-821	VMS 821	E	0.66	ED (REV) @ 19th Ave S
RC	ES-822R	RC 822	E	0.7	SB Rainier Ave-EB
VMS	VMS-823	VMS 823	E	0.72	EB @ Rainier Ave S
CMS	CMS-822	CMS 5	E	0.8	WB @ Rainier Ave S
CMS	CMS-823	CMS 3	E	0.82	EB @ Rainier Ave S
CMS	CMS-825	CMS 7	E	0.92	EB @ 21st Ave S; LT
CMS	CMS-824	CMS 8	E	0.92	EB @ 21st Ave S, RT
RC	ES-825R	RC 825	E	0.96	NB Rainier Ave - EB
CCTV	CCTV-825	CC-825	E	0.96	23rd Ave S
CMS	CMS-826	CMS 6	E	0.98	WB @ 22nd Ave S
DS	ES-826D	DS 830	E	0.99	23rd Ave S
CMS	CMS-827	CMS 4	E	1	EB @ 22nd Ave S
DS	ES-827D	RC 827	E	1.01	EB 90 - REV
CCTV	CCTV-S01	TCA-S01	E	1.04	WB MBT 1
DS	ES-833D	CP 9	E	1.06	MBT
CCTV	CCTV-S02	TCA-S02	E	1.1	WB MBT
CCTV	CCTV-S11	TCA-S11	E	1.13	REV MBT 11
CCTV	CCTV-S12	TCA-S21	E	1.14	EB MBT 21

Device Name	Device ID (New)	Device ID (Old)	status E = existing P= proposed	Mile Post	Location
CCTV	CCTV-SO3	TCA-SO3	E	1.14	WB MBT 3
DS	ES-836D	CP10	E	1.16	MBT
CCTV	CCTV-S12	TCA-S12	E	1.22	REV MBT 12
CCTV	CCTV-S04	TCA-S04	E	1.25	WD MBT 22
CCTV	CCTV-S22	TCA -S22	E	1.25	EB MBT 22
DS	ES-839D	CP11	E	1.25	MBT
CCTV	CCTV-S13	TCA-S13	E	1.33	REVMBT 13
CCTV	CCTV-SO5	TCA-SO5	E	1.35	WBMBT5
DS	ES-842D	CP12	E	1.36	MBT
CCTV	CCTV-S23	TCA-S23	E	1.37	EB MBT 23; LT
CCTV	CCTV-S24	TCA-S24	E	1.37	EB MBT 23; RT
DS	ES-844D	CP 18	E	1. 39	EB MBT.
CCTV	CCTV-S35	TCA-S35		1.41	MBT Bike Path 1
CCTV	CCTV-S14	TCA-S14	E	1.44	REV MBT 14
CCTV	CCTV-S06	TCA-S06	E	1.46	WB MBT 6
CCTV	CCTV-S29	TCA-S29	E	1.46	EB MBT 29; LT
CCTV	CCTV-S25	TCA-S25	E	1.46	EB MBT 25; RT
DS	ES-845D	CP13	E	1.46	REVIWB MBT
HUB	MBT	HUB-845	E	1.5	MBT Control Rm (MBT Hub)
CCTV	CCTV-S36	TCA-S36	E	1.53	MBT Bike Path 2
CCTV	CCTV-S37	TCA-S37	E	1.53	MBT Bike Path 3
DS	ES-848D	CP 14	E	1.56	REV/ WB MBT
CCTV	CCTV-S30	TCA-S30	E	1.57	EB MBT 30; LT
CCTV	CCTV-S26	TCA-S26	E	1.57	EB MBT 26; RT
CCTV	CCTV-S07	TCA-S07	E	1.57	WB MBT 7
CCTV	CCTV-S15	TCA-S15	E	1.57	REV MBT 15
CCTV	CCTV-S16	TCA-S16	E	1.58	REV MBT 16
CCTV	CCTV-S31	TCA-S31	E	1.62	EB MBT 31; LT
CCTV	CCTV-S27	TCA-S27	E	1.62	EB MBT 27; RT
CCTV	CCTV-S38	TCA-S38	E	1.66	MBT Bike Path 4
DS	ES-849D	CP 15	E	1.66	REV/ WB MBT
CCTV	CCTV-S17	TCA-S17	E	1.67	REV MBT 17
CCTV	CCTV-S18	TCA-S18	E	1.67	REV MBT 18
CCTV	CCTV-S32	TCA-S32	E	1.67	EB MBT 32; LT
CCTV	CCTV-S28	TCA-S28	E	1.67	EB MBT 28; RT
DS	ES-850D	CP 19	E	1.69	35th Ave S
DS	ES-852D	ES 926	E	1.7	35th Ave S
VMS	VMS-852	VMS 908	E	1.74	WB @ West Highrise
VMS	VMS-854	VMS910	E	1.86	WB(REV) @ West Highrise
CCTV	CCTV-852	CCTV 908	E	1.9	West Highrise
DS	ES-855D	ES 929	E	1.99	West Highrise; EB
DS	ES-854D	ES 928	E	2	West Highrise; WB
DS	ES-857D	ES 930	E	2.01	Midspan; WB
DS	ES-858D	ES 931	E	2.01	Midspan; EB

Device Name	Device ID (New)	Device ID (Old)	Status E = existing P = proposed	Mile Post	Location
CCTV	CCTV-859	CCTV 910	E	2.56	Midspan
WS	WSTA 859	WEATHER	E	2.8	Midspan
DS	ES-860D	ES 932	E	3.08	East Highrise; WB
DS	ES-861D	ES 933	E	3.09	East Highrise; EB
CCTV	CCTV-862	TCA-M41	E	3.23	East Highrise
VMS	VMS-864	VMS 914	E	3.39	EB @ 61st Ave SE
VMS	VMS-863	VMS 912	E	3.39	EB(REV) @ 60th Ave SE
DS	ES-863D	CP 8	E	3.4	West Mercer Way - WB
CCTV	CCTV-M01	TCA-M01	E	3.5	WB MIL 1
DS	ES-866D	CP 9	E	3.51	MIL
CCTV	CCTV-M02	TCA-M02	E	3.57	WB MIL 2
CCTV	CCTV-M11	TCA-M11	E	3.59	REV MIL 11
CCTV	CCTV-M03	TCA-M03	E	3.59	WB MIL 3
CCTV	CCTV-M21	TCA-M21	E	3.61	EB MIL 21
CCTV	CCTV-M04	TCA-M04	E	3.62	WB MIL 4
DS	ES-867D	CP 10	E	3.63	MIL
CCTV	CCTV-M12	TCA-M12	E	3.67	REV MIL 12
CCTV	CCTV-M05	TCA-M05	E	3.68	WB MIL 5
CCTV	CCTV-M22	TCA-M22	E	3.68	EB MIL 22
DS	ES-868D	CP 11	E	3.72	MIL
CCTV	CCTV-M13	TCA-M13	E	3.73	REV MIL 13
CCTV	CCTV-M23	TCA-M23	E	3.73	EB MIL 23
CCTV	CCTV-M06	TCA-M06	E	3.75	WB MIL 6
CCTV	CCTV-M14	TCA-M14	E	3.79	REV MIL 14
CCTV	CCTV-M07	TCA-M07	E	3.79	WB MIL 7
CCTV	CCTV-M24	TCA-M24	E	3.8	EB MIL 24
DS	ES-869D	CP 12	E	3.82	MIL
CCTV	CCTV-M25	TCA-M25	E	3.85	EB MIL 25
CCTV	CCTV-M15	TCA-M15	E	3.85	REV MIL 15
CCTV	CCTV-M08	TCA-M08	E	3.85	WB MIL 8
CCTV	CCTV-M09	TCA-M09	E	3.89	WB MIL 9
HUB	MIL	HUB-870	E	3.9	MIL Control Rm (MIL Hub)
CCTV	CCTV-M16	TCA-M16	E	3.91	REV MIL 16
CCTV	CCTV-M26	TCA-M26	E	3.91	EB MIL 26
CCTV	CCTV-M27	TCA-M27	E	3.93	EB MIL 27
DS	ES-870D	CP 13	E	3.93	MIL
CCTV	CCTV-M10	TCA-M10	E	3.94	WB MIL 10
CCTV	CCTV-M17	TCA-M17	E	3.95	REV MIL 17
CCTV	CCTV-M28	TCA-M28	E	3.96	EB MIL 28
CCTV	CCTV-M18	TCA-M18	E	3.97	REV MIL 18
DS	ES-871D	CP 14	E	4	MIL
CCTV	CCTV-M29	TCA-M29	E	4.02	EB MIL 29
CCTV	CCTV-M19	TCA-M19	E	4.03	REV MIL 19
CCTV	CCTV-876	TCA-M42	E	4.12	76th Ave SE

Device Name	Device ID (New)	Device ID (Old)	Status E = existing P= proposed	Mile Post	Location
RC	ES-876R	ES940	E	4.12	76th Ave SE-WB
VMS	VMS-876	VMS 916	E	4.19	WB(REV) @ 76th Ave SE
VMS	VMS-877	VMS 918	E	4.19	WB @ 76th Ave SE
CCTV	CCTV-877	TCA-M43	E	4.32	77th Ave SE
RC	ES-878R	ES 942	E	4.4	Island Crest Way-REV
RC	ES-879R	ES 944	E	4.41	Island Crest Way-WB
CCTV	CCTV-880	n/a	E	4.5	ICW-Tunnel
CCTV	CCTV-881	TCA-M44	E	4.58	Island Crest Way
RC	ES-881R	ES 946	E	4.6	Island Crest Way-EB
VMS	VMS-881	VMS 881	E	4.61	WB @ Island Crest Way
CCTV	CCTV-882	CC 882	E	4.81	Luther Burbank
DS	ES-883D	ES 948	E	5.1	Shorewood Drive
CCTV	CCTV-885	CC 885	E	5.37	Shorewood
DS	ES-885D	ES 950	E	5.49	North Mercer Way
RC	ES-887R	ES 952	E	5.76	East Mercer Way-WB
CCTV	CCTV-887	CC 887	E	5.79	East Mercer Way
RC	ES-889R	ES 954	E	5.84	East Mercer Way-EB
DS	ES-891D	ES 956	E	6.35	East Channel Bridge
VMS	VMS-893	n/a	E	6.58	WB(REV) @ Bellevue Way
RC	ES-893R	ES 958	E	6.58	Bellevue Way-WB
CCTV	CCTV-893	CC693	E	6.58	Bellevue Way SE
DS	ES-896D	ES 963	P	9.7	118th Ave SE
HUB	FAC	HUB-900	E	9.95	I-405 (Factoria Hub)
CCTV	CCTV-900	CC900	E	9.95	Richards Road
CCTV	CCN-901	CC 901	E	9.95	Factoria
RC	ES-901 R	ES 968	P	10	SB SR 405-EB
RC	ES-900R	ES 966	P	10.03	Richards Rd - WB
DS	ES-903D	PNB 10	E	10.82	136th PI SE
HARS	HARS-904	n/a	E	10.94	EB @ 136th PI SE
VMS	VMS-905	VMS 10	E	11.03	WB@136th Ave SE
CCTV	CCTV-905	CCTV 905	E	11.03	136th Ave SE
RC	ES-908R	ES908	E	11.45	Eastgate - WB
HUB	WSP	HUB-908	E	11.5	Washington State Patrol
HART	HART-908	n/a	E	11.54	Eastgate
CCTV	CCTV-908	CCTV 908	E	11.55	150thAveSE
DS	ES-910D	ES 910	E	11.94	161st Ave SE
CCTV	CCTV-912	CCTV 912	E	12.44	164th Ave SE
DS	ES-912D	PNB 11	E	12.44	164th Ave SE
HARS	HARS-912	n/a	E	12.44	WB @ 164th Ave SE
DS	ES-916D	ES 916	E	12.91	169th Ave SE
CCTV	CCTV-920	CCTV 920	E	13.5	W Lake Sammamish Pkwy
RC	ES-920R	ES 920	E	13.51	W Lake Sammamish Pkwy - WB
DS	ES-924D	ES 924	E	14.04	182nd Ave SE
CCTV	CCTV-926	CCTV926	E	14.47	188th Ave SE

Device Name	Device ID (New)	Device ID (Old)	Status E = existing P = proposed	Mile Post	Location
DS	ES-928D	PNB 14	E	14.7	188th Ave SE
DS	ES-932D	ES-932D	E	14.87	200th Ave SE
DS	ES-932D	ES 932	F	15.18	200th Ave SE
RC	ES-935R	ES-935R	E	15.37	SR 900 - WB
CCTV	CCTV-936	CCTV 936	E	15.48	SR 900
RC	ES-935R	ES 935	F	15.77	SB 900 - WB 90
RC	ES-936R	ES936	F	15.78	NB 900 - WB 90
CCTV	CCTV-936	CCTV936	F	15.83	SR 900
DS	ES-940D	ES940	F	16.34	12th Ave NW
DS	ES-940D	ES-940D	E	16.64	12th Ave NW
HUB	ISQ	HUB-945	E	16.9	228th St SE (Issaquah Hub)
RC	ES-944R	ES944	F	17.04	228th SE - WB 90
CCTV	CCTW945	CCTV945	F	17.05	228th Ave SE
RC	ES-945R	ES-945R	E	17.05	Front St-WL
CCTV	CCTV-945	CCTV945	E	17.05	Front St
VMS	VMS-988	n/a	P	25.1	Weigh Station
WS	WSTA-988	WEATHER	E	25.1	Weiah Station
DS	ES-989D	n/a	P	25.65	SR 18
HUB	PRS	HUB-989	P	25.7	SR 18 (Preston Hub)
VMS	VMS-990	VMS30	E	26.3	WB @ SR 18

SCOPE 1.3: ACCIDENT ANALYSIS

The STATE will provide accident data sorted and plotted in a manner developed collaboratively with the CONSULTANT, and within the STATE's readily available format, for the most recently available three years. The STATE will also provide other reference material necessary to interpret the data including Milepost/Node references, high accident listings, accident rates, and accident cost data.

The collection, summary and presentation of accident data will be the responsibility of the STATE. The presentation of this data is the responsibility of the STATE. It will be the responsibility of the STATE to investigate and query the data in a manner that will provide meaningful results readily available for interpretation. The STATE will be responsible for the interpretation of the data.

The preparation of corridor base maps and other graphic presentation material will be produced by the STATE under this work element. A clear presentation of this data will assist in understanding trends, critical regions or other "hot spots". High accident spot locations and segments that experience particular accident trends will be documented. High frequency accidents areas will be analyzed as to the effect of adverse roadway conditions such as night-time visibility, inclement weather, pavement condition, or for other specific criteria. Other patterns including high number of truck roll-over, rear-end, head-on, or fatal collisions will also be examined as these typically have a high cost associated with them in terms of delay, liability and property damage. These areas that could be enhanced through ITS strategies will be identified and examined thoroughly in later work elements.

D.1 INTRODUCTION

Various types of accidents were investigated for the stretch of I-90 being studied in this project. The accident data base can generate reports based on whether the accident location is within an urban or rural area. Generally, since traffic volumes tend to be higher in urban locations, total traffic accidents are higher in urban areas than in rural areas.

When looking at accident data, it is good to keep in mind that the data is based on reported accidents. Almost all serious accidents are reported, but many minor accidents are not reported, and thus do not get recorded in the accident data base.

The following tables reference data in either half mile or mile segments. When a milepost (MP) location is indicated, the reader must understand it covers the following half mile or full mile section of freeway. For example, if MP 206.0 is listed, it is actually referring to the stretch of highway from MP 206.00 to MP 206.49. If MP 204 is listed, it is actually referring to the stretch of highway from MP 204.00 to MP 204.99.

Each table lists the freeway segments that have the highest number of accidents in the corridor for the type of accident feature indicated. Each accident feature is split into two tables based on whether the accidents are in a rural or urban location.

Comments: The injury and fatality accidents tend to parallel the total accidents. So the higher the total number of accidents, the higher the number of injury and fatality accidents.

The following I-90 data is based on 7,320 reported accidents between January 1, 1990, and June 30, 1995 (five and a half years) for the entire length of I-90 in Washington State, MP 0.00 to MP 299.82 (excluding the reversible lanes at the west end of I-90).

D.2 TOTAL ACCIDENTS

Total number of rural and urban accidents are illustrated in Tables D-I and D-2. High accident locations are illustrated in Figures D-la and D-lb.

Table D-1

I-90 Rural Accidents

MP	Count	Location Description
25.5	37	SR 18 Interchange vicinity
48.0	27	Just east of Denny Creek Road interchange
49.5	28	Steep grade west of Snoqualmie Pass
50.0	30	Steep grade west of Snoqualmie Pass
50.5	30	Steep grade west of Snoqualmie Pass
51.0	38	Steep grade west of Snoqualmie Pass
51.5	44	Steep grade west of Snoqualmie Pass
52.0	34	SR 906 Interchange vicinity
52.5	26	Snoqualmie Pass
53.0	40	Snoqualmie Pass
53.5	36	Steep grade east of Snoqualmie Pass
54.0	34	Steep grade east of Snoqualmie Pass
57.5	28	West of Lake Keechelus snowshed
59.5	28	
62.5	31	Stampede Road Interchange vicinity
77.5	26	Golf Course Road Interchange vicinity
79.0	28	Weigh Station vicinity, sharp curve
79.5	32	Weigh Station vicinity
80.5	28	Bullfrog Road Interchange vicinity
85.5	30	SR 970 Interchange vicinity
88.0	32	Indian John Hill rest area vicinity
109.0	25	S. Main Street Interchange vicinity, Ellensburg
137.5	30	Columbia River bridge and SR 26 Inter-

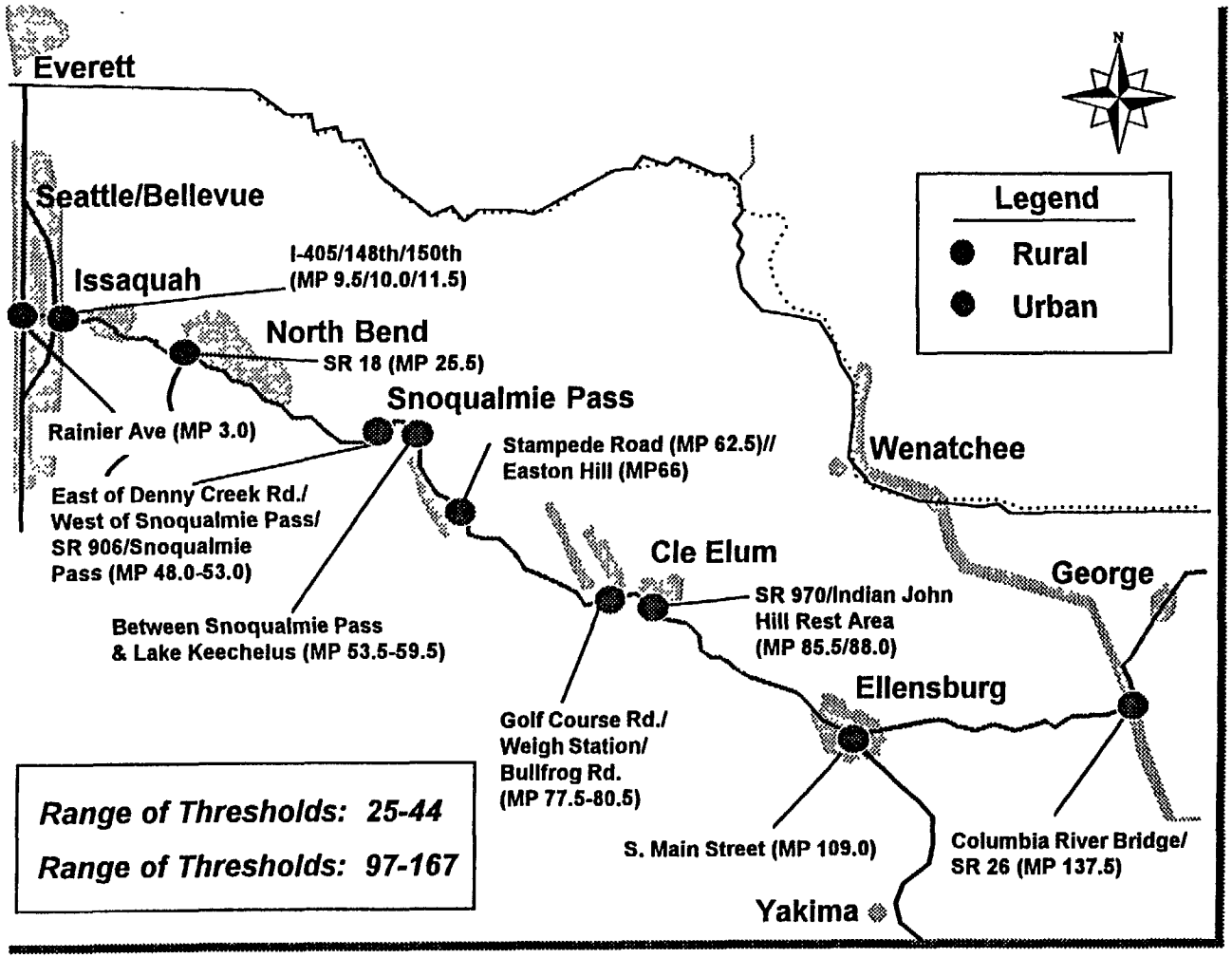
N=3, 966 Average reported accidents *per* half mile segment = 8.03

Table D-2

I-90 Urban Accidents		
MP	Count	Location Description
3.0	122	Rainier Avenue Interchange vicinity
9.5	167	West half I-405 Interchange vicinity
10.0	126	East half I-405 Interchange vicinity
11.5	115	148th & 150th Avenue SE Interchange vicinity
280.0	105	West half of Spokane viaduct vicinity
283.0	99	Altamont Street Interchange vicinity
283.5	107	Thor and Freya Streets vicinity
285.5	102	Sprague Avenue Interchange vicinity. (includes 2 RR bridges)
287.5	97	Argonne Road Interchange vicinity

N=3,354 Average* reported accidents *per* half *mile segment = 34.22

I-90 HIGH ACCIDENT LOCATIONS



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE D-1a

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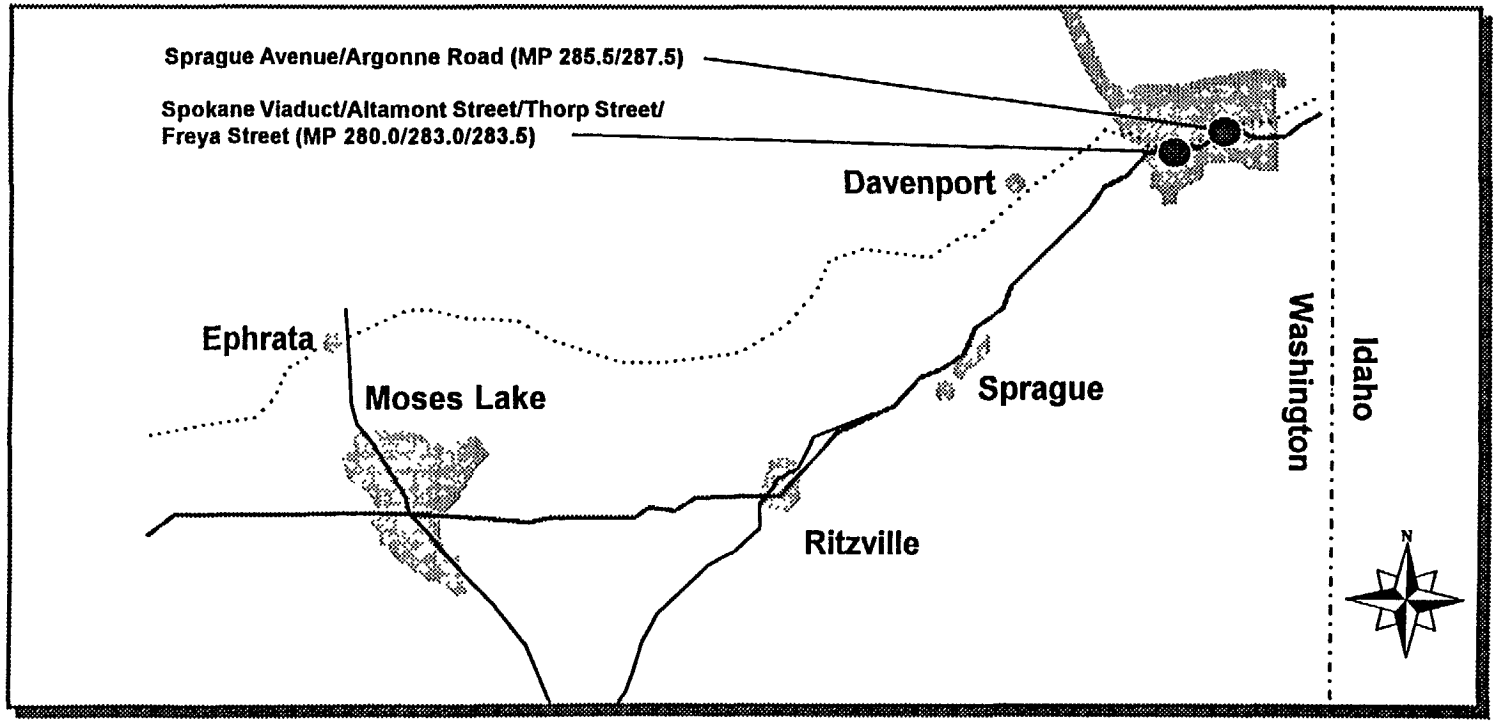
I-90 HIGH ACCIDENT LOCATIONS

Legend

- Rural
- Urban

Range of Thresholds: 25-44

Range of Thresholds: 97-167



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE D1-b

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D.3 INJURY AND FATALITY ACCIDENTS

Rural and urban injury and fatality accidents are shown by milepost in Tables D-3 and D-4. Injury and fatality accident locations are illustrated in Figures D-2a and D-2b.

Table D-3

I-90 Rural Injury and Fatality Accidents

MP	Count	MP	Count	MP	Count
23.0	***10***	50.0	12	**79.0**	8
25.5	13	50.5	10	**79.5**	11
27.0	10	51.0	17	80.5	16
30.5	9	51.5	16	88.0	15
31.0	10	53.0	15	90.5	10
31.5	10	53.5	13	92.0	8
35.5	8	54.0	16	109.0	9
36.0	9	57.5	10	137.5	14
36.5	9	61.5	8	229.0	9
37.5	I I	62.0	8	249.0	8
40.0	9	62.5	10	264.0	10
47.5	9	66.0	8	296.0	10
48.0	9	71.0	8		
49.5	11	72.5	8		

N=1, 563

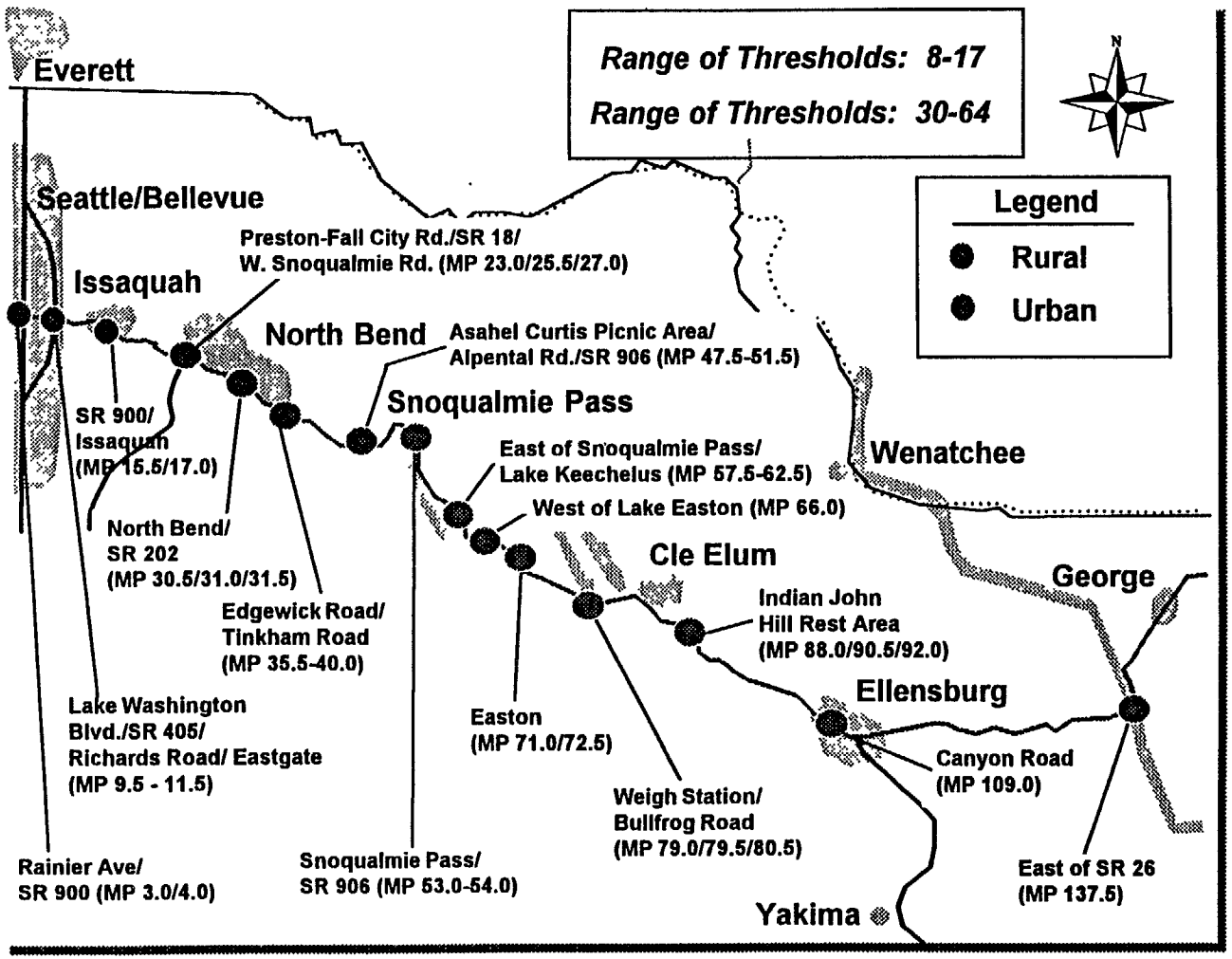
Table D-4

I-90 Urban Injury and Fatality Accidents

MP	Count	MP	Count	MP	Count
3.0	48	15.5	30	283.0	54
4.0	40	17.0	36	283.5	44
9.5	64	280.0	48	285.5	57
10.0	54	281 .O	40	287.5	49
11.0	30	282.0	37		
11.5	43	282.5	43		

N=1,448

I-90 INJURY & FATALITY ACCIDENT LOCATIONS



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE D-2a

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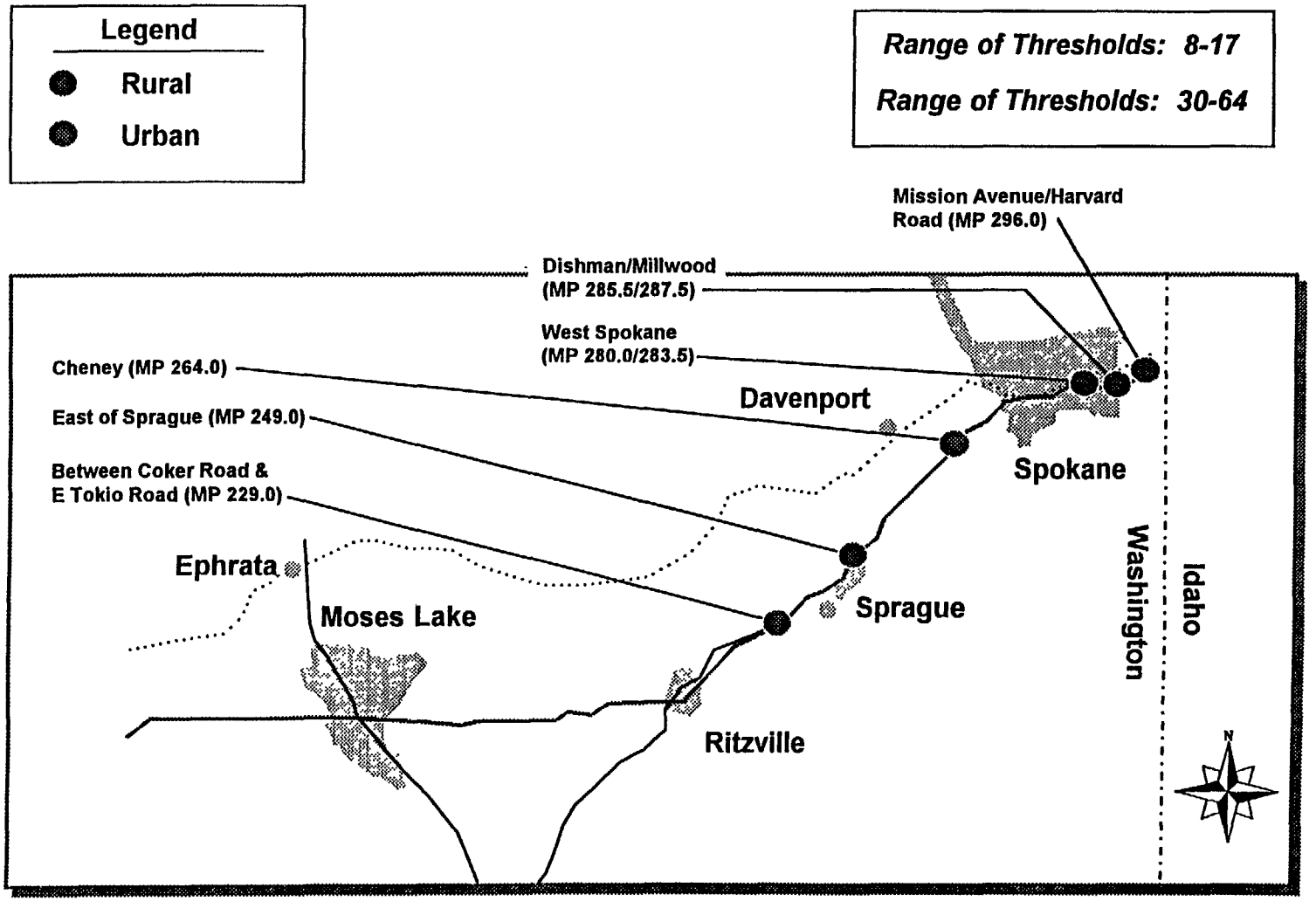
I-90 INJURY & FATALITY ACCIDENT LOCATIONS



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE D-2b

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D.4 ACCIDENTS INVOLVING HAZARDOUS MATERIALS

Rural and urban accidents involving hazardous materials are shown by milepost in Tables D-5 and D-6.

Table D-5

I-90 Rural Accidents Involving Hazardous Materials					
MP	**Count**	**MP**	**Count**	**MP**	**Count**
53	***2***	91	1	***103***	1
70	1	***102***	***2***	***244***	1

N=8

Table D-6

I-90 Urban Accidents Involving Hazardous Materials
None Reported

N=O

Comments: Reported accidents involving hazardous materials are very infrequent.

D.5 ACCIDENTS INVOLVING ICE ON ROADWAY

Rural and urban accidents involving ice on the roadway are shown by milepost in Tables D-7 and D-8, and located in Figures D-3a and D-3b.

Table D-7

I-90 Rural Accidents Involving ice on Roadway					
MP	Count	MP	Count	MP	Count
42	9	66	10	92	21
49	8	67	9	93	11
50	13	73	10	96	8
51	14	77	9	104	9
52	14	79	24	261	8
53	13	88	21	264	10
54	8	90	12		
59	10	91	8		

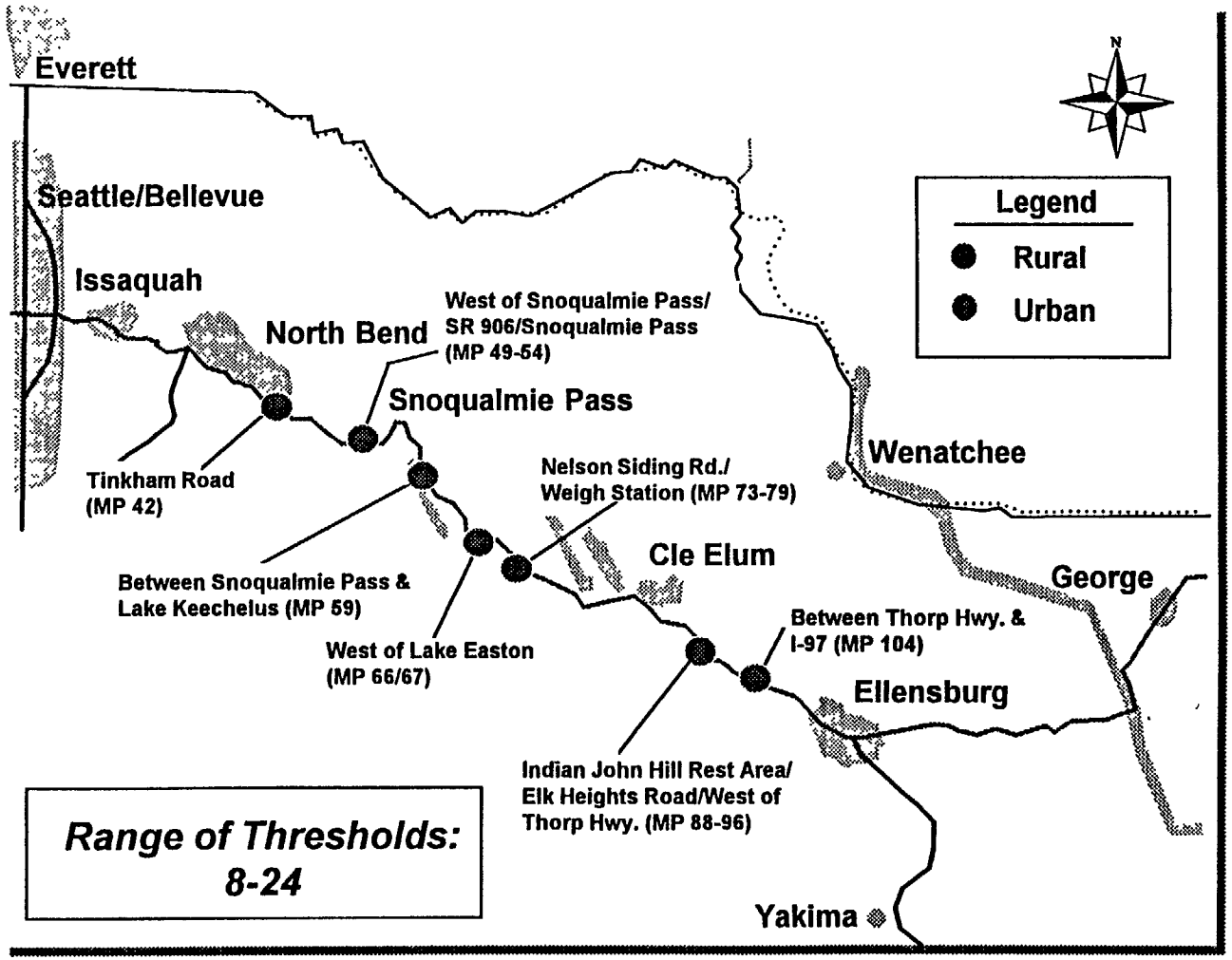
N=767

Table D-8

I-90 Urban Accidents Involving Ice on Roadway					
MP	Count	MP	Count	MP	Count
276	15	280	17	283	39
277	14	281	20	284	17
279	14	282	32		

N-280

I-90 ACCIDENTS INVOLVING ICE ON ROADWAY LOCATIONS



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE D-3a

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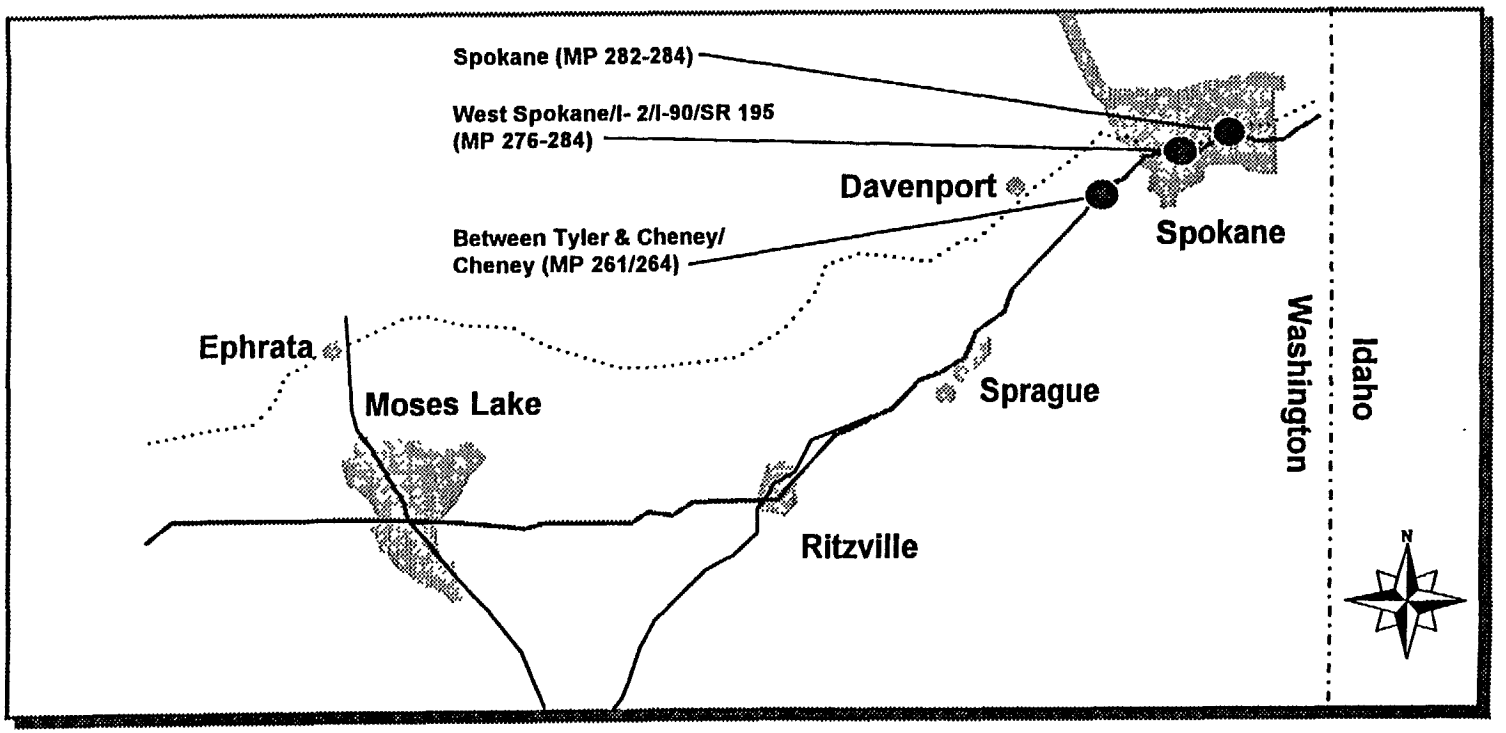
I-90 ACCIDENTS INVOLVING ICE ON ROADWAY LOCATIONS

Legend

- Rural
- Urban

Range of Thresholds: 8-24

Range of Thresholds: 14-36



Corridor Needs Assessment
I-90 Seattle to Spokane
ITS Early Deployment Program
FIGURE D-3b

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D.6 ACCIDENTS INVOLVING WET ROADWAY

Rural and urban accidents involving wet roadways are shown by milepost in Tables D-9 and D-10.

Table D-9

I-90 Rural Accidents Involving Wet Roadway					
MP	Count	MP	Count	MP	Count
25	11	51	12	58	12
28	9	52	12	59	8
31	10	53	20	62	12
36	9	54	17	66	9
50	8	57	9	68	8

N=464

Table D-10

I-90 Urban Accidents Involving Wet Roadway					
MP	Count	MP	Count	MP	Count
2	36	7	26	11	60
3	68	9	77	15	27
6	27	10	57	282	25

N=681

D.7 ACCIDENTS IN CONSTRUCTION ZONES

Rural and urban accidents in construction zones are shown by milepost in Tables D-11 and D-12.

Table D-l 1

I-90 Rural Accidents in Construction Zones

MP	Count	MP	Count	MP	Count
31	5	86	5	241	5
85	9	91	5		

N-157

Table D-12

I-90 Urban Accidents in Construction Zones

MP	Count	MP	Count	MP	Count
3	29	11	22	282	34
9	89	279	28	283	37
10	25	280	48		

N=481

D.8 COMMERCIAL TRUCK ACCIDENTS

Commercial truck accidents comprised 12.51% of all accidents on the I-90 corridor for the period January 1, 1990 through June 30, 1995. Following are various commercial truck accident summary statistics. All of these accidents involve commercial trucks with a gross vehicle weight of over 10,000 pounds.

Table D-13

I-90 Commercial Truck Accidents by Roadway Surface Conditions

Roadway Surface	Number of Accidents	Percentage
dry	751	49.21
wet	238	15.60
snow	286	18.74
ice	251	16.45
other	0	0.00
TOTAL	1.526	100.00

Table D-14

I-90 Commercial Truck Accidents by Weather Conditions

Weather	Number of Accidents	Percentage
clear/cloudy	983	64.42
raining	181	11.86
snowing	326	21.36
foggy	36	2.36
TOTAL	1,526	**100.00**

Table D-15

I-90 Commercial Truck Accidents by Light Conditions

Light	Number of Accidents	Percentage
daylight	978	64.09
dawn	30	1.97
dusk	30	1.97
dark, street lights on	157	10.29
dark, street lights off	13	0.85
dark, no street lights	318	20.84
TOTAL	**1,526**	**100.00**

Table D-16

I-90 Commercial Truck Accidents by Diagram Accident Type

Code	Description	Number of Accidents	Percentage
0	code typo	6	0.39
	strikes other vehicle head on	0	0.00
	strikes left side of other vehicle at angle	230	15.07
	strikes right side of other vehicle at angle	128	8.39
	sideswipes left side of other vehicle		0.13
	sideswipes right side of other vehicle		0.13
6	strikes rear end of other vehicle	223	14.61
7	strikes front end of other vehicle. not head on	34	2.23
11	was struck by other vehicle head on	0	0.00
12	was struck on left side at angle by other vehicle	113	7.40
13	was struck on right side at angle by other vehicle	87	5.70
14	was sideswiped on left side by other vehicle	3	0.20
15	was sideswiped on right side by other vehicle	0	0.00
16	was struck in rear end by other vehicle	127	8.32
17	was struck in front end by other vehicle, not head on	34	2.23
27	code typo	1	0.07
29	all other multi-vehicle involvements	35	2.29
32	collision with animal or bird	23	1.51
33	highway appurtenance	197	12.91
34	other object	33	2.16
40	strikes railroad train	0	0.00
41	struck by railroad train	0	0.00
50	overturn	123	8.06
54	non-collision fire	12	**0.79**
60	ran into roadway ditch	7	0.46
61	ran into river, lake, slough, etc.	0	0.00
62	ran over embankment. no guardrial	6	0.39
71	oedestrian struck bv vehicle	5	0.33
72	pedestrian strikes vehicle	0	0.00
73	pedalcyclist struck by vehicle	0	0.00
74	pedalcyclist strikes vehicle	0	0.00
98	jackknife trailer	49	3.21
99	all other single vehicle involvements	46	3.01
	TOTAL	1,526	**100.00**

Table D-17

I-90 Commercial Truck Accident by Driver's First Contributing Cause

Code	Description	Number of Accidents	Percentage
1	under influence of alcohol	33	2.16
2	under influence of drugs	0	0.00
3	exceeded stated speed limit	22	1.44
4	exceeded reasonable safe speed for conditions	492	32.24
5	did not grant right-of-way to vehicle	175	11.47
6	improper passing	4	0.26
7	following too closely	65	4.26
8	following too closely	0	0.00
9	over centerline	0	0.00
10	failing to signal	14	0.92
11	improper turning	2	0.13
12	disregarded stop and go light	8	0.52
13	disregarded stop sign or red flashing light	14	**0.92**
14	disregarded warning signal -	57	3.74
15	apparently asleep	10	0.66
16	improper parking location	78	5.11
17	operating defective equipment	24	1.57
18	other cause	271	17.76
19	no violation	0	0.00
20	improper u-turn	4	0.26
21	headlight violation (no lights or failed to dim)	0	0.00
22	did not grant right-of-way to pedestrian or pedalcyclist	1	0.07
23	inattention	113	7.40
24	undefined	8	0.52
	code typo	131	8.58
	TOTAL	1.526	**100.00**

Introduction

Over the past few years, the WSDOT has embarked an a ambitious venture – to implement a fully integrated state-wide transportation system an the roadways within the WSDOTs jurisdiction. Aptly named "Venture ", this all-encompassing umbrella program seeks to implement projects which will improve highway safety, operating efficiency, environmental quality, and personal mobility through enhanced interaction between roadway, vehicles and travelers.

Venture projects may fall into any of the six ITS strategies -- Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Advanced Public Tronsportatian Systems (ATPS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), and Advanced Rural Transportation Systems (ARTS) . The focus of this study – the ITS Early Deployment Program for the I-5 Corridor between Seattle and Vancouver and the I-90 Corridor between Seattle and Spokane -- will be to recommend ITS projects which can be implemented over the short term (1997 - 2002), medium term (2003 - 2007) and long term (2008 - 2017).

From a broader-based perspective, however, ITS is still relatively unknown. For this reason it is especially important to involve key stakeholders in the selection and prioritization of ITS strategies being considered along I-5 and I-90. This participative decision making will have many positive outcomes, including deepening understanding of ITS strategies os well as stimulating interest in specific projects being considered for the corridors. It is hoped that the outcome of this understanding and interest will be strong support at the local and regional levels for specific ITS strategies. The following Group Participation Plan is designed as a mechanism in which will help to secure this support.

Building A Common Vision through a Steering Committee

The Steering Committee Structure

Because of the unique characteristics and needs of the two corridors -- the I-90 Corridor and the I-5 Corridor -- two distinct Steering Committee, one for each corridor, will be formed. While the roles and responsibilities for these two Steering Committees will be similar – to provide input and direction to the study team -- it is possible that the types ITS treatments put forth for consideration by the Steering Committees will vary significantly between the two corridors.

Steering Committee Roles and Responsibilities

The multi-disciplinary nature if the ITS Early Deployment Program and its policy ramifications calls for a process in which senior staff representing a variety of organizations have clearly-defined roles in a collaborative decision making process. This decision making is most effectively secured through a "Steering Committee" process.

Steering Committee members serving on the ITS Early Deployment Program for the two corridors are charged with the following:

1) Overseeing the process and progress of the Study
2) Attending Steering Committee meetings (total of three far each corridor)
3) Reviewing and commenting on reports
4) Sharing reports with their colleagues as appropriate and gathering this "outside" input
5) Approving/rejecting/modifying recommendations

Steering Committee Members

I-90 Seattle to Spokane

Washington State Patrol
Captain Timothy Quenzer
Captain Tom Robbins
Captain James LaMunyon
Dan Permerl

Federal Highway Administration
Mike Morrow

Spokane Regional Transportation Council
Glenn Miles

WSDOT - Northwest Region
Dave McCormick
Hank Peters

WSDOT - Eastern Region
Bob Earnest
Mike Frucci

WSDOT - South Central Region
George Hilsinger
Bob MacNeil

WSDOT - North Central Region
Jennene Ring
John Baker

I-5 Seattle to Vancouver

Washington State Patrol
Captain Steve Seibert
Dan Permerl

Federal Highway Administration
Mike Morrow

WSDOT - Northwest Region
Dave McCormick
Hank Peters

Whatcom County Council of Governments
Gordon Rogers

Whatcom County
Nasser Mansour

Skagit County Public Works
Jan Keiser

Skagit Council of Governments
Eric Irelan

Steering Committee Input Process

Steering Committee members will be sent draft technical memorandum for their review throughout the project. Specific input will be sought at the three scheduled Steering Committees. Because of the minimal number of scheduled Steering Committee meetings, it will be important thot input on technical memorandum from Steering Committee members be provided in addition to discussions at meetings. It is desirable that this input be in the form of actual written comments, either noted on the report itself or put on a separate comments form.

In addition, face-to-face meetings between individual Steering Committee members and Study Team members will be held as needed. At the onset of the project, corridor tours and one-on-one meetings with selected agency representatives will be undertaken. Information gathered at these meetings will be integrated into the evaluations process of potential ITS treatments.

Interface with Elected Officials

Elected Officials are not part of the Steering Committee. Elected officials will stay apprised of the study through actions coordinated jointly by the Study Team and the Steering Committee. Elected officials will also be included in the Venture Washington newsletter database. Steering Committee members may elect for the

Intetface with Elected Officials (continued)

Study Team to communicate with elected officials in one or more ways -- including but not necessarily limited to -- periodic or one-time-only distribution(s) of written information; individual briefings; committee/sub-committee briefings and full council/board briefings. For example, a WSDOT Steering Committee member could request the Study Team to brief the Transportation Commission; the Washington State Patrol Steering Committee members could request a briefing to their Safety Committee, etc. Appropriate Steering Committee members are encouraged to attend those briefings to provide additional local or specialized insights and information.

Steering Committee Input Opportunities

The Steering Committee(s) will meet at key decision-making milestones throughout the project. Meetings will be scheduled when input is required or approval is necessary for the Study Team to move forward to the next stage of the study. At these meetings, the Steering Committee will discuss the information previously sent to them for their review, ond approve or reject recommendations based on this information. In addition, Steering Committee members are expected to review and comment on technical memorandum developed during key milestones throughout the project.

According to the project schedule of activities, these key dates are:

Steering Committee Meeting #1

Project Kick Off/ Assess Corridor Transportation Needs **April ,1996**

Items: Present Study Goals and Objectives
Present on Corridor Tour findings
Present Existing Conditions Technical Memorandum

Action: Approve/Reject/Modify Study Goals and Objectives

Steering Committee Input Opportunity

Corridor Transportation Needs Technical Memorandum **June, 1996**

Action: Review and comment on technical memorandum

Steering Committee Input Opportunity

Corridor ITS Opportunities Technical Memorandum **July, 1996**

Action: Review and comment on technical memorandum

Steering Committee Meeting #2

Project/Program Profile Review **July, 1996**

Items: Informotional presentation ITS Corridor Opportunities

- Weather Systems Technology Assessment
- Traveler/Tourist Information Opportunities
- Enforcement Enhancement Opportunities Assessment
- Benefits/Costs Assessment
- Commercial Vehicle Operations Enhancement
- Border Gossing Technologies Assessment (I-5 Corridor)
- Additional User Services Potential

Present Recommended Project/Program Profiles

Action: Approve/Reject/Modify Project/Program Profiles

Steering Committee Input Opportunity

Corridor ITS Opportunities Technical Memorandum **July, 1996**

Action: Review and comment on technical memorandum

Steering Committee Input Opportunity

Corridor Development Plan Technical Memorandum **September, 1996**

Action: Review and comment on technical memorandum

Steering Committee Input Opportunity

Communications Plan Technical Memorandum **November, 1996**

Action: Review and comment on technical memorandum

Steering Committee Meeting #3

Corridor Implementation Plan **November, 1996**

Items: Informational presentation ITS Corridor implementation Issues

- Existing Communications Systems
- Alternatives Development
- Develop & Prioritize Recommendations
- Benefit/Cost Assessment
- Corridor Communication Needs
- Assessment of Cost/Benefits
- Implementation Plan

Present Recommended Project/Program Profiles

Action: Approve/Reject/Modify Project Implementation Plan and Schedule

Media Relations

Media kits will be distributed to local and regionol media. These kits will contain information about the process and findings of the early deployment programs. Kits will be distributed following the finalization of the ITS Opportunities technical memorandum (July, 1996) , the Corridor Development Plan technical memorandum (September, 1996) and the Corridor Implementation Plan finalization (November, 1996). Courtesy media kits will also be sent to selected elected officials and other key stakeholders to facilitate awareness and understanding of ITS projects.

Articles about the process and findings of the I-90 and I-5 ITS Early Deployment Programs will also appear in the August, October and December issues of the Venture Washington newsletter sponsored by TRAC and the WSDOT. The maiiing list used to distribute this ITS news-related newsletter will be expanded to ensure that stakeholders in the I-90 and I-5 corridor are newsletter recipients.

World Wide Web

Information about the I-90 and I-5 ITS Early Deployment Programs will be developed for use on the World Wide Web. This information will detail information by technology and region and provide a response mechanism to the project monager via E-mail.

Outreach through Presentations

Presentations with key stakeholders groups will be undertaken throughout the life of the project. The purpose of these presentations is to familiarize audiences with ITS technologies and to solicit audience feed back regarding specific treatments being considered for their particular region.

ITS EARLY DEPLOYMENT PLAN

I-90 SEATTLE TO SPOKANE

Technical Memorandum 2

CORRIDOR ITS OPPORTUNITIES

prepared for the

Washington State Department of Transportation

prepared by

Parsons Brinckerhoff
PB Farradyne Inc.

in association with
JHK & Associates
IBI Group
David Evans & Associates
Pacific Rim Resources
K2 & Associates
Rajappan Meyer
ICON
Matrix Management Group

February 1998

ITS EARLY DEPLOYMENT PLAN

I-90 SEATTLE TO SPOKANE

Technical Memorandum 3

CORRIDOR STRATEGIES

prepared for the

Washington State Department of Transportation

prepared by

Parsons Brinckerhoff
PB Farradyne Inc.

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February 1998

ITS EARLY DEPLOYMENT PLAN

I-90 SEATTLE TO SPOKANE

Technical Memorandum 4

CORRIDOR DEVELOPMENT PLAN

prepared for the

Washington State Department of Transportation

prepared by

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February 1998

ITS EARLY DEPLOYMENT PLAN

I-90 SEATTLE TO SPOKANE

Technical Memorandum 5

COMMUNICATIONS PLAN

prepared for the

Washington State Department of Transportation

prepared by

Parsons Brinckerhoff
PB Farradyne Inc.

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IBI Group
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