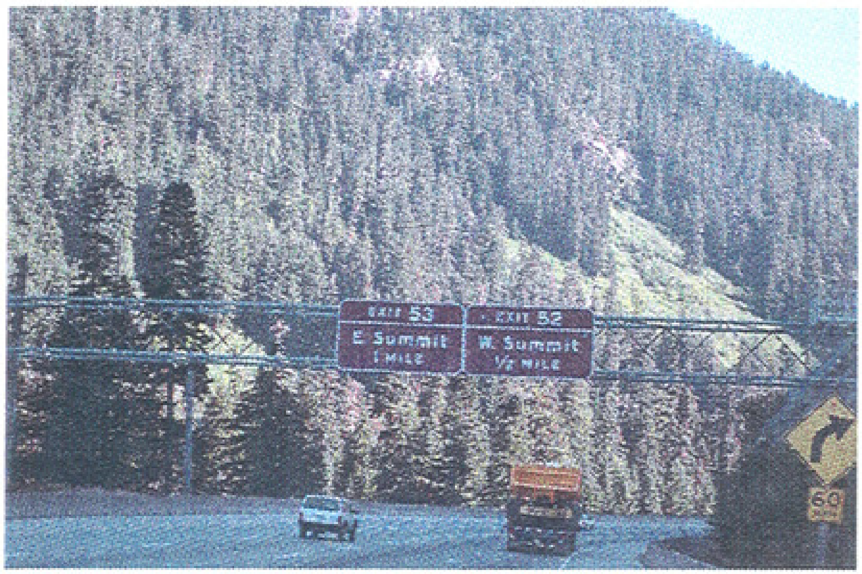
MOUNTAINS TO SOUND GREENWAY

IMPLEMENTATION PLAN

Volume 2



Route Development Plan

MOUNTAINS TO·SOUND GREENWAY MTSGREENWAY.ORG

Washington State
Department of Transportation

Return to MTS Greenway

Route Development Plan

Mountains to Sound Greenway
Puget Sound to Elk Heights
Interstate 90: MP 1.94 to MP 93.62

Volume 2

of the
Mountains to Sound Greenway Implementation Plan

May 1997
WSDOT Northwest Region Planning Office

John Okamoto, Regional Administrator

TABLE OF CONTENTS

SECTION 4: PRESENT OPERATING CONDITIONS

SECTION 5: ROUTE DEVELOPMENT PLAN

LIST OF FIGURES

LIST OF TABLES

SECTION 1: SECTION LOCATION

Section Description

The route being studied covers the Interstate 90 corridor from Seattle to Elk Heights, just west of Ellensburg. From west to east it first travels through the urban areas of the Puget Sound region between Seattle and Issaquah. East of Issaquah it enters heavily forested scenic areas connecting the towns of North Bend and Cle Elum while crossing Snoqualmie Pass. The section terminates at Elk Heights just west of Ellensburg, and has been chosen because it matches the limits of the Mountains to Sound Greenway. Figure 1, Vicinity Map, illustrate the location of Interstate 90 in the Northwest and South Central Regions of WSDOT.

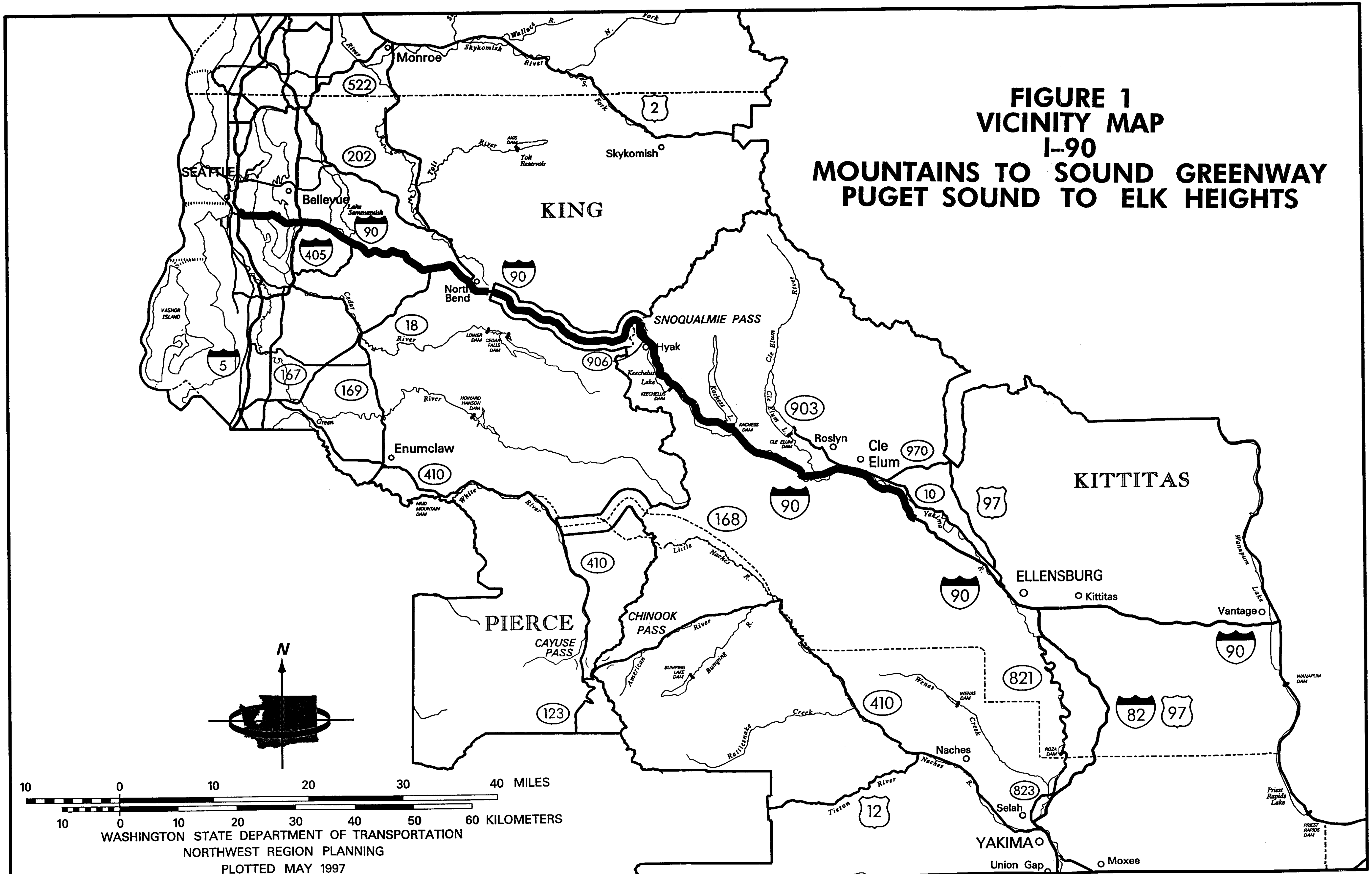


FIGURE 1
VICINITY MAP
I-90
MOUNTAINS TO SOUND GREENWAY
PUGET SOUND TO ELK HEIGHTS
KING
KITTITAS
PIERCE
SEATTLE
Bellevue
Monroe
Skykomish
North Bend
SNOQUALMIE PASS
Hyak
Roslyn
Cle Elum
Enumclaw
ELLENSBURG
Kittitas
Vantage
CHINOOK PASS
CAYUSE PASS
Naches
Selah
YAKIMA
Union Gap
Moxee
N
10 0 10 20 30 40 MILES
10 0 10 20 30 40 50 60 KILOMETERS
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
NORTHWEST REGION PLANNING
PLOTTED MAY 1997

SECTION 2: PURPOSE AND FUNCTION OF HIGHWAY

Purpose

Interstate Route 90 is an important segment of the National System of Interstate and Defense Highways extending from Seattle, Washington to Boston, Massachusetts. This transportation corridor is of vital importance to the shipment of goods and as a transportation connection across the United States of America. As the route traverses the State of Washington, it passes through Seattle, Bellevue, Issaquah, North Bend, Cle Elum, Ellensburg, and Spokane. It also goes through the Snoqualmie and Wenatchee National Forests, the Moses Lake area and crosses the Columbia River.[1] This highway is the major east-west passage within Washington. Only four other transportation corridors exist that extend east-west across the North American Continent; Interstate 70, Interstate 80, Interstate 40 and Interstate 10, none of which are located within Washington state.

Functional Classification and Level of Development

Interstate 90 is classified as an Interstate Highway according to the Functional Classification of the Washington State Highways, 1990.[2] The Level of Development[3] of an Interstate Highway is Design Standards. The Level of Development and Functional Classification is consistent with the National System of Interstate and Defense Highway use.

Access Classification

The access control classification of this Interstate Highway is full access control. Fully controlled access highways provide almost complete freedom from disruption by permitting access connections only through interchanges at selected public roads, rest areas, viewpoints, or weigh stations, and by prohibiting all crossings and private connections at grade.[4]

SECTION 3: DESCRIPTION OF EXISTING FACILITY

Route History

The paved highway that now crosses Snoqualmie Pass once provided passage through the Cascade Mountains of Washington as an Indian Trail, and then as a wagon road.[5] King County officials, Kittitas Valley ranchers and farmers, and gold miners made many early attempts at repairing and improving the footpath and turning it into a wagon road.

In August 1884 the Seattle and Walla Walla Railroad and Transportation Company completed an extensive effort to bridge creeks and improve the wagon road. Tolls were charged through 1887 according to the number of animals crossing. In 1888 the Northern Pacific Railroad was completed across Stampede Pass to Tacoma. Traffic was accordingly diverted to rail use and the wagon road became less important to commerce. By the late 1880's the wagon road over Snoqualmie Pass was falling into disuse and the road was given no official maintenance.[6]

The first automobile crossed in 1905. In 1909 the Alaska-Yukon-Pacific Exposition was held in Seattle. When it was learned that a transcontinental car race was planned from New York to Seattle in connection with the exposition, King, Kittitas, Yakima, and Walla Walla county commissioners quickly appropriated funds to improve the wagon road through their counties and over the summit.[7] Unofficial records indicate that 105 cars crossed Snoqualmie Pass in 1909. From 1909 on, settlements on both sides of Snoqualmie Pass yearned for permanent roads that would not be closed by mud and snow in winter. By 1912, there were enough cars in Kittitas County to form an automobile club, which planned to cooperate with similar clubs on Puget Sound to get a good route over the pass.

That same year, the state Good Roads Association recommended that three trunk highways be built: a Sunset Highway from Idaho through Spokane, Davenport, Wilbur, Wenatchee, Ellensburg and Snoqualmie Pass to link up with the proposed Pacific Highway from Blaine to Vancouver and the Inland Empire Highway from Spokane through Rosalia, Walla Walla, Pasco, North Yakima and Ellensburg.[8] In July 1912, the State began to take an interest in the road. And in September, State Highway Commissioner W.J. Roberts, King County Engineer James Morrison, Kittitas County Engineer Charles Jordon, and others had decided that Snoqualmie Pass should have a permanent highway. They recommended a 18 meters (60 foot) right of way and a 6.1 meters (20 foot) roadbed.[9]

About the same time that plans for a permanent road were announced, the state legislature, taking the advice of the Good Roads Association and farmers' organizations, voted $2 million to begin the State Highway Department. Bids were opened in 1914 for thirty-five kilometers (twenty-two miles) of construction on the Sunset Highway. It was another seven years before gravel surfacing was finished all the way to Ellensburg.[10]

The route became known as the Sunset Highway and included highways that are now known as State Route 900 and State Route 202. Subsequent improvements have been made in localized areas as the need occurred. A series of piecemeal improvements were accomplished until 1954 when the highway began to be widened to four lanes. In the mid 1960s work was started on the reconstruction of the highway into a median divided full access control Interstate Highway.[11]

In 1940, the original Lacey V. Murrow Memorial Bridge, the first concrete-pontoon bridge in the world, was opened to traffic, linking Seattle to Mercer Island where there had only been ferry service before. When the repaired Lacey V. Murrow Memorial Bridge opened to traffic on September 12, 1993, it marked the completion of Interstate 90, a transcontinental link from Seattle to Boston.[12]

State Designation

The route first received designation as a state route in 1914 as Primary State Highway 2.[13]

Revised Code of Washington Description

State Law RCW 47.17.140 designates Interstate 90 as the American Veterans Memorial Highway. The State Law is as follows:

> **State Route No. 90 - American Veterans Memorial Highway.** A State highway to be known as State Route Number 90 and designated as the American Veterans Memorial Highway is establishes as follows:
>
> Beginning at a junction with State Route 5, thence, via the west approach to the Lake Washington Bridge in Seattle, in an easterly direction by way of Mercer Island, North Bend, Snoqualmie Pass, Ellensburg, Vantage, Moses Lake, Ritzville, Sprague and Spokane to the Washington-Idaho boundary line. [1991 c 56 & 2; 1971 ex.s. c 73 & 2; 1970 ex.s. c 51 & 29.]

> Purpose-1991 c 56: "in order to create a great memorial and tribute to American Veterans, it is proposed that the Washington State portion of Interstate 90 be renamed in their honor, to become the westernmost portion of a memorial highway reaching across the United States.[14]

Scenic and Recreation Highway

A total of 120.7 kilometers (75 miles) of Interstate 90 are designated as State Scenic and Recreational Highway. In 1967, the 83.7 kilometers (52 miles) from North Bend to Cle Elum were designated as Scenic and Recreational Highway. In 1993, segments from Issaquah

KP 29.49 (MP 18.33) to North Bend KP 49.67 (MP 30.87, 20.1 kilometers) and Cle Elum KP 133.47 (MP 82.95) to Elk Heights KP 150.63 (MP 93.62, 16.9 kilometers) were added to the Scenic and Recreational Highway designation when the State Law defining State Scenic Routes was revised.

Urban Network Significance

King County and the City of Issaquah have established an urban growth boundary in accordance with the State's Growth Management Act. The boundary that is part of the contiguous central Puget Sound urban growth area crosses I-90 at the city of Issaquah east city limits . The portion of I-90 included in this study, to the west of this point is all within the urban area and the area east of this point is all rural (with the exception of the sections within the incorporated limits of rural cities).

Interstate 90 connects Seattle to Bellevue across Lake Washington and Mercer Island. This route is the major commuter route for south Bellevue and Issaquah residents and rural residential areas further east. State Route 520 is a parallel route, starting from State Route 202 in Redmond and continuing to Interstate 5 across Lake Washington. These two routes create a common travel corridor serving similar trips. Without them development patterns in the central Puget Sound region would be quite different.

Interstate 90 connects with Interstate 5, the most heavily traveled highway in Washington State. Interstate 405 connects to I-5 to the north and south but is generally a parallel north-south highway which was originally built as a Seattle bypass route. The growth and subsequent congestion along Interstate 405 has largely negated the benefits of the route as a bypass. Interstate 405 connects to Interstate 5 at Tukwilla (south of Seattle). Interstate 90 at Bellevue (east of Seattle), and Interstate 5 at Lynnwood (north of Seattle).

Port of Seattle

The Port of Seattle, a major world export and import shipping facility on Puget Sound is situated near the western terminus of Interstate 90. The Port of Seattle also operates SEA-TAC International Airport just 15.3 kilometers (9.5 miles) south of Interstate 90 via Interstate 5. However, the primary SEA-TAC I-90 connection is by way of SR-518 and I-405.

Railroads

A major railroad yard for north-south freight travel is located near the beginning of Interstate 90 in Seattle (Port of Seattle).

There are two east-west railroads within our study limits. The abandoned Milwaukee Wisconsin railbed enters the Mountains to Sound Greenway area at Rattlesnake Lake just southeast of North Bend and remains within the study area to the Eastern Study Limits at Elk Heights. This abandoned railroad bed has been converted to a linear trail and is now the Iron Horse State Park. The other east-west railroad is owned by Burlington Northern. This railroad is currently operating and runs through the study area beginning at Stampede Pass, just east of Keechelas Lake, and diverts to the north side of the Yakima River just east of Cle Elum. Both railroads follow the Yakima River at this point near State Route 10.

High Speed Ground Surface Transportation Study

In 1991, the Washington State Legislature directed a comprehensive assessment be made of the feasibility of developing a high speed ground transportation (HSGT) system in the State of Washington.[15] As justification, the Legislature stated their recognition that major transportation corridors in the state were reaching unacceptable levels of congestion, that most improvements were at best only temporary and that in addition to congestion in large metropolitan areas, intercity travel between the state's major cities was becoming increasingly difficult".[16]

Initially, a search for all possible candidate corridors for the HSGT system was made. Six potential corridors (3 north-south and 3 east-west directions) were identified based on a number of criteria. However, the steering committee does not recommend exact routes or station locations. Since this is a feasibility study, these corridors are viewed like broad bands that can be analyzed in more detail when further studies are conducted.[17] The three candidates for the East-West corridor were:

1. Seattle to Mosses Lake to Spokane (Interstate 90 Corridor)
2. Seattle to Yakima to Pasco to Spokane (I-90, I-82 and US-395 Corridors)
3. Seattle to Yakima to Pasco to Walla Walla (I-90, I-82 and US-12 Corridors)

Alternate corridor #1, the Seattle to Moses Lake to Spokane Corridor was recommended as the best East-West corridor. A HSGT system in this corridor was rated to provide "high" support for the State Growth Management program because it passes through five counties that are developing growth management plans, with three of them required to develop plans.[18]

The team study chose 30 meters (100 feet) as the standard width for the HSGT right-of-way. This width allows space for HSGT technology, as well as design features needed for changes in topography.[19]

The findings of the study indicate:

- "Improved transportation in the North-South Corridor would support the international northwest economy in reaching its full potential. The East-West Corridor offers long term opportunities for supporting increased economic activity and diversity east of the Cascades.

- "Environmentally, there are no "fatal flaws" to HSGT implementation.

- "There is significant HSGT ridership potential even under the assumption that existing levels of highway and air congestion would not change through 2020.

- "The HSGT is compatible with regional Transportation Plans, and has the potential to support growth management objectives in the counties it serves. With proper planning, HSGT stations can be part of regional intermodal networks by interfacing with urban high capacity transit, commuter rail, and local bus service.

- "HSGT implementation will require major public support of the capital cost. Passenger revenues would cover annual operation and maintenance costs within 12 to 15 years after start of operations, and generate a surplus from that point.

- "At this time, the marginal ridership gains (13.6%) do not justify the 37% cost increase of implementing a Magnetic Levitation system (one of the available HSGT technologies)."[20]

It is recommended that a phased approach to implementation be used. True HSGT (240+ km/h, 150+ mph) service is affordable only through a major state funding commitment. However, a staged program using the best of modern rail technology should be pursued now with true HSGT service as the ultimate goal. The State of Washington, in concert with Oregon and British Columbia, should upgrade Amtrak and make a commitment to build support for a true HSGT program with the following goals:

- "Everett to Portland: High quality rail passenger service up to a speed of 110 mph by the year 2000 with a Portland/Seattle travel time down to 2 hours 30 minutes (vs. 3 hours 55 minutes at present) and up to a speed of 125 mph by 2010, bring the Portland/Seattle travel time down to 2 hours; continued upgrading of this initial segment to achieve truly high speed service by 2020.

- "Everett to Vancouver, BC: implementation of HSGT service, with the time frame for construction subject to additional study.

- "King County to Spokane: implementation of HSGT service, with the time frame for construction subject to additional study."[21]

Proposed Grand Ridge Development

A model urban village that will contribute substantial public open space, infrastructure funds, affordable housing and other public benefits is progressing as of this writing. The proposed development area is just inside Urban Growth Boundary in King County. The developers assert this proposal is intended as a model for processing and for implementing desired development under the Growth Management Act, the Countywide Planning Policies and the

County's Comprehensive Plan. King County and the development partnership support the goals and implementation of these plans and policies. [22]

Proposed Snoqualmie Ridge Parkway and Development Project

In February, 1990, King County , the City of Snoqualmie and the Weyerhaeuser Real Estate Company (WRECO) executed an Interlocal Agreement. This agreement was intended to confirm and implement the policies of King County's community plan and the City's Comprehensive Plan by setting forth guidelines and procedures for annexation of the Lake Alice Plateau property, for development of a mixed use community known as Snoqualmie Ridge.[23] Policies were adopted for numerous components of the future mixed-use community, including: transportation systems (including Snoqualmie Ridge Parkway); housing/affordable housing; commercial development; golf course development; parks, trails and open space; services and utilities; landscaping, design and buffering; view protection and several other elements.

The Snoqualmie Ridge Parkway would connect State Route 202 in the City of Snoqualmie to the I-90/SR-18 Interchange. This parkway would provide direct access to I-90 and the regional road system from the City of Snoqualmie.

The Greenway Trust has been coordinating with the City of Snoqualmie, WRECO and other property owners regarding the development of the properties to the north of the SR-18 intersection with I-90.[24] The proposed parkway would not be visible from I-90 due to topographic separation (an off-site ridge lies between the point where the new Parkway would begin and I-90).

Geometric Description

Interstate 90 is a median divided highway with full access control. From the beginning of the route (KP 3.12/MP 1.94) to Gold Creek Bridge in Kittitas County (KP 89.28/MP 55.49), the number of lanes vary from 5 to 8 lanes. From Gold Creek Bridge to the eastern terminus of the Mountain to Sound Greenway (Elk Heights, KP 150.63/MP 93.62), it is 4 lanes except for a truck climbing lane westbound (KP 106.5/MP 66.20 to KP 111.27/MP 69.15).

Median Widths and Variations

Within our study limits, the median widths vary from 1.2 meters (4 feet) to 302 meters (990 feet). Table 1 lists the median widths variations for specific sections of I-90. According to the WSDOT's Design Standards, median widths for Interstate Highways are 4.8 meters (16 feet) for 4 lanes and 6.6 meters (22 feet) for 6 or more lanes in the urban areas . In the rural areas, median widths should be 12 meters (40 feet) for 4 lanes and 15 meters (48 feet) for 6 or more lanes.[25] There are deviations from these Interstate Design Standards as listed in Table 2.

These deviations are mainly due to geometric constraints and significant environmental impacts to the adjacent land.

TABLE 1
Median Widths and Variations

Location	Kilometer Post(Milepost)	Median Width in Meter(Feet)
4th Ave. to I-5	3.12-3.38(1.94-2.10)	1.2-3.0(4-10)
I-5 to 76th Ave. SE	3.38-10.78(2.10-6.70)	12-15.2(40-50)
76th Ave. SE to Bellevue Way SE	10.78-15.64(6.70-9.72)	30-35.7(100-117)
Bellevue Way SE to E. Fork Issaquah Cr.	15.64-29.77(9.72-18.50)	15-27.4(48-90)
E. Fork Issaquah Cr. to City of Issaquah	29.77-30.64(18.50-19.04)	30.5-61(100-200)
City of Issaquah to SR 18 Vicinity	30.64-39.39(19.04-24.48)	15-26(48-85)
SR 18 Vicinity	39.39-41.28(24.48-25.65)	134.1(440)
SR 18 Vicinity to S. Fork Snoqualmie River.	41.28-58.92(25.65-36.62)	22-76.2(72-250)
S. Fork Snoqualmie River. to Garcia Rd.Vic.	58.92-66.27(36.62-41.19)	6.1-21.3(20-70)
Garcia Rd. Vic. to Denny Creek Rd. Vic.	66.27-77.07(41.19-47.90)	17-61(56-200)
Denny Cr. Rd. Vic. to W. Summit Rd.Vic.	77.07-83.75(47.90-52.05)	45-304.5(150-999)
W. Summit Rd. Vic. to Gold Creek	83.75-89.28(52.05-55.49)	6.6-8.5(22-28)
Gold Creek to Lake Keechelus Vic.	89.28-92.37(55.49-57.41)	27.4-91(90-300)
Lake Keechelus Vic.	92.37-96.09(57.41-59.72)	1.2-6.1(4-20)
Lake Keechelus Vic. to Cabin Cr. Rd. Vic.	96.09-103.02(59.72-64.03)	30-54.81(100-180)
Cabin Creek Road Vicinity	103.02-108.80(64.03-67.62)	2.4-10.8(8-36)
Kachess River Vicinity	108.80-111.70(67.6.2-69.42)	304.5(999)
Kachess River Vic. to E. Nelson Rd. Vic.	111.70-125.87(69.42-78.23)	23.77-42.67(78-140)
E. Nelson Road Vicinity	125.87-127.48(78.23-79.23)	4.8-9.14(16-30)
E. Nelson Road Vic. to Elk Heights	127.48-150.63(79.23-93.62)	12-23.77(40-78)

TABLE 2
Substandard Median Widths

Location	Kilometer Post(Milepost)	Median Widths in Meter(Feet)
4th Ave. to I-5	3.12-3.38(1.94-2.10)	1.2-3.0(4-10)
S. Fork Snoqualmie River Vicinity	58.92-59.23(36.62-36.81)	6.1-9.6(20-32)
E. Summit Rd. Vic. to Gold Creek	83.75-89.28/(2.05-55.49)	6.1-8.5(20-28)
Lake Keechelus Snowshed Vicinity	92.37-96.10(57.41-59.72)	1.2-6.1(14-20)
Cabin Creek Road Vicinity	103.02-108.80(64.03-67.62)	2.4-10.8(8 to 36)
E. Nelson Rd. Vic. to Yakima River Vic.	125.87-127.48(78.23-79.23)	4.8-9.1(16 to 30)

Different roadway alignments/elevations and dense trees in the median area have visually separated the eastbound and westbound lanes at certain locations along the highway. These visually separated locations are listed in Table 3.

TABLE 3
Visually Separated Locations

Location	Kilometer Post/SR Milepost
4th Ave. S. to Rainier Ave. Vic.	3.12-5.05/1.94-3.14
Rainier Ave. off-ramp to LK. WA Floating Br.	5.70-7.22/3.54-4.49
First Hill LID Tunnel	9.67-11.65/6.01-7.24
SR-405 Vicinity	14.50-14.98/9.01-9.31
Leave City of Bellevue to W. LK Sammamish PKWY Vicinity	20.53-21.79/12.76-13.54
Enter City of Issaquah Vicinity	23.44-24.17/14.57-15.02
228th Ave. SE to Issaquah Creek Vicinity	28.48-29.32/17.70-18.22
E. Fork Issaquah Creek Vicinity	29.72-30.38/18.47-18.88
E. Fork Issaquah Creek	30.62-31.20/19.03-19.39
High Point Road Vicinity	32.37-32.79/20.12-20.38
High Point Rd. to E. Fork Issaquah Creek	32.97-34.16/20.49-21.23
Jones Road Vicinity	35.32-35.93/21.95-22.33
Jones Road	36.33-36.64/22.58-22.77
Raging River Vicinity to SR-18	38.00-41.22/23.62-25.62
W. Snoqualmie Road Vicinity	42.85-43.17/26.63-26.83
W. Snoqualmie Road Vicinity to SR 202	43.38-48.82/26.96-30.34
SR 202 to 436th Ave. SE.	49.17-52.89/30.56-32.87
Edgewick Road Vicinity	54.71-55.70/34.00-34.62
Garcia Rest Area Vicinity	57.60-58.73/35.80-36.50
Tinkham Road Vicinity	66.82-67.03/41.53-41.66
Bandera Road Vicinity	70.84-71.70/44.03-44.56
Bandera Road	73.89-75.17/45.92-46.72
Denny Creek Road to SR-906 Vicinity	77.07-83.70/47.90-52.02
Rocky Run Creek	91.29-91.55/56.74-56.90
Price Creek Rest Area Vicinity	97.59-97.91/60.65-60.85
Stampede Road to Cabin Creek Rd.	101.79-102.43/63.26-63.66
Cabin Creek Road Vicinity	108.29-111.50/67.30-69.30
Yakima River Br. to Peoh Road Vicinity	138.97-139.31/86.37-86.58
Peoh Road Vicinity	141.25-142.24/87.79-88.40
Highline Canal Vicinity	145.41-146.90/90.37-91.30
Elk Heights Vicinity	148.53-148.86/92.31-92.52
Elk Heights	149.41-150.63/92.86-93.86

Interchanges

There are 39 Interchanges along Interstate 90 within the Mountains to Sound Greenway study limits. Tables 4 and 5 list the location of these Interchanges.

TABLE 4
Interchange Locations in the Northwest Region

Exit #	Location
1	Interstate 90 begins (4th Ave. S., Seattle)
2	Interstate 5 (Seattle)
3	Junction Rainier Ave. S. (Seattle)
6	Jct. W. Mercer Way / 76th Ave. SE (Mercer Island)
7	Jct. Island Crest Way (Mercer Island)
8	Jct. E. Mercer Way (Mercer Island)
9	Jct. Bellevue Way SE (Bellevue)
10	Jct. I-405 / Richards Rd.(Bellevue)
11	Jct. Eastgate Way (Bellevue)
13	Jct. W LK. Sammamish PKWY (King County)
15	Jct. SR 900 / Renton Rd (Issaquah)
17	Jct. 228th Ave. SE (Issaquah)
18	Jct. E Sunset Way (Issaquah)
20	Jct. SE High Point Way (Issaquah)
22	Jct. SE 82nd St. / Jones Rd (King County)
25	Jct. SR 18 / Echo Glen Rd. (King County)
27	Jct. Snoqualmie Road (Snoqualmie)
31	Jct. SR 202 / South Fork Rd (North Bend)
32	Jct. 436th Ave. SE (King County)

TABLE 5
Interchange Locations in the South Central Region

Exit #	Location
34	Edgewick Rd. (King Co.)
38A	Homestead Valley Interchange (King Co.), KP 60.76 (MP 37.76)
38B	Garcia Interchange (King Co.), KP 63.68 (MP 39.58)
42	Tinkham Road Interchange (King Co.)
45	Bandera Rd. Interchange (King Co.)
47	Asahel Curtis Interchange (King Co.)
52	Jct. SR 906 / Alpental Rd. (King Co.)
Entering Kittitas County KP 84.65 (MP 52.61)	
53	Jct. SR 906 / Snoqualmie Summit I/C (Kittitas Co.)
54	Hyak Interchange (Kittitas Co.) *KP 99.19 (MP 61.65) Price Creek Rest Area (Not Operational)*
62	Jct. Kachess Lake Rd. (Kittitas Co.)
63	Cabin Creek Rd. (Kittitas Co.)
70	W Easton Rd. (Kittitas Co.)
71	E Easton Rd. (Kittitas Co.)
74	W Nelson Siding Rd. (Kittitas Co.)
78	E Nelson Rd. (Kittitas Co.) *KP 127.92 (MP 79.50) EB & WB Weigh Stations*
80	Bullfrog Rd. (Kittitas Co.)
84A	W Cle Elum I/C (Kittitas Co.), KP 133.31 (MP 82.85)
84B	Oakes Ave. I/C (Kittitas Co.)
85	Jct. East Cle Elum/SR 970 I/C (Kittitas Co.) *KP 142.88 (MP 88.8) Indian John Hill Rest Area*
93	Elk Heights Rd. (Kittitas Co.)

Shoulder Width Deviation Areas

Shoulder widths are 1.2 meters (4 feet) on the inside of the lanes and 3 meters (10 feet) on the outside according to the Design Standards criteria for a 4-lane Interstate Highway.[26] Interstate highways with six or more lanes require a 3 meter (10 foot) inside shoulder.[27] There are deviations from these Interstate Design Standards in places as listed in Table 6.

TABLE 6
Substandard Shoulder Areas

Location KP (MP)	Direction (Increasing or Decreasing)
KP 3.80-4.22 (MP 2.36-2.62)	D
KP 3.99-4.31 (MP 2.48-2.68)	I
KP 5.31-13.02 (MP 3.30-8.09)	D
KP 5.74-6.79 (MP 3.57-4.22)	I
KP 9.48-13.64 (MP 5.89-8.48)	I
KP 14.29-14.51 (MP 8.88-9.02)	D
KP 14.32-14.80 (MP 8.90-9.20)	I
KP 27.11-30.38 (MP 16.85-18.88)	D
KP 30.72-31.31 (MP 19.09-19.46)	D
KP 26.77-27.14 (MP 16.64-16.87)	I
KP 27.29-29.36 (MP 16.96-18.25)	I
KP 29.41-29.57 (MP 18.28-18.38)	I
KP 31.31-41.27 (MP 19.46-25.65)	D
KP 32.87-36.78 (MP 20.43-22.86)	I
KP 48.64-60.47 (MP 30.23-37.58)	D
KP 42.82-58.92 (MP 26.61-36.62)	I
KP 58.95-60.47 (MP 36.64-37.58)	I
KP 60.55-64.12 (MP 37.63-39.85)	D
KP 62.45-64.12 (MP 38.81-39.85)	I
KP 64.17-83.56 (MP 39.88-51.93)	D
KP 64.04-65.05 (MP 39.88-40.43)	I
KP 65.57-76.77 (MP 40.75-47.71)	I
KP 77.12-77.14 (MP 47.93-47.94)	I
KP 83.64-84.65 (MP 51.98-52.61)	D
KP 84.65-89.32 (MP 52.61-55.51)	I & D
KP 92.37-96.10 (MP 57.41-59.72)	I & D
KP 103.02-108.54 (MP 64.03-67.46)	I
KP 103.22-108.54 (MP 64.15-67.46)	D
KP 134.40-134.42 (MP 83.53-83.54)	I & D

High Occupancy Vehicle Lanes

High Occupancy Vehicle (HOV) lanes (2 or more persons) have been constructed or designated along Interstate 90 from the beginning of the route in Seattle to State Route 900 in Issaquah. These HOV lanes are configured as follows:

- from Airport Way South (KP 3.12/MP 1.95) to Interstate 5 (KP 4.15/MP 2.58) there are two reversible lanes
- from Interstate 5 (KP 4.15/MP 2.58) there is one reversible lane to Rainier Avenue (KP 5.62/MP3.49)
- at Mt. Baker Ridge Tunnel (KP 5.62/MP 3.49) to the East Channel Lake Washington Bridge (KP13.79/MP 8.57) there are 2 reversible lanes
- at the East Channel lake Washington Bridge (KP 13.79/MP 8.57) to the Bellevue Way Interchange (KP 15.41/MP 9.58) there is only one reversible HOV lane
- and from Bellevue Way Interchange (KP 15.41/MP 9.58) to SR 900 (KP 29.14/MP 18.11) there is one HOV lane in each direction

The reversible center lanes (HOV lanes) are exclusively used by buses or other high-occupancy vehicles, motorcycles and Mercer Island residents (1 or more persons). The reverse flow-roadways offer motorists a high level of service due to uncongested conditions. The I-90 Center Roadway schedule is as follows:

Monday Through Thursday
Westbound: 5:30 a.m. - 11 a.m.
Eastbound: noon - 4:30 a.m. Monday

Fridays, Saturdays, Sundays
Westbound: 5:30 a.m. - 11 a.m. Friday
Eastbound: noon Friday - 4:30 a.m.

Priority Entrances

Priority entrances (ramp meters and HOV Bypass lanes) for carpools, vanpools, buses and motorcycles are located at:

Westbound:
West Mercer Way, Mercer Island
East Mercer Way, Mercer Island
Bellevue Way, Bellevue Way
Eastgate On-Ramps, Bellevue
West Lake Sammamish Parkway, King County
Northbound SR 900, Issaquah
Front Street, Issaquah

Eastbound:
Dearborn Ave. South, Seattle
Rainier Ave. South, Seattle
East Mercer Way, Mercer Island
80th Ave. SE, Mercer Island

One "priority exit" for carpools, vanpools, buses and motorcycles is located going eastbound at 77th Avenue, SE on Mercer Island.

Ramp metering is a system in which the entry of vehicles onto a limited access facility from a ramp is metered by a traffic signal; the signal allows one vehicle to enter on each green indication. This would allow the full capacity of downstream sections to be effectively utilized by avoiding upstream bottlenecks which would prevent demand from reaching capacity levels. Ramp meters can be set to allow desired level of service to be obtained and maintained on the facility within certain limits..

Ramp Extensions

Ramp extensions are used to allow extra time to merge into the mainline traffic, they are located at:

KP 24.23 (MP 15.06) to SR-900 Off Ramp (KP 24.91/MP 15.48), EB.
KP 83.14 (MP 51.67) to SR-906 Off Ramp (KP 83.64/MP 51.98), EB.

Truck Climbing Lanes

There are designated truck climbing lanes at two locations within the study limits. The first runs for 1.6 kilometer (1 mile) starting from a point 4.8 meters (3 miles) east of Cabin Creek Road Interchange (KP 106.52/MP 66.20 to KP 107.85/MP 67.03) in the eastbound direction and from the top of the Easton Hill to the bottom of the Easton Hill (KP 108.54/MP 67.46 to KP 111.26/MP 69.15) in the westbound direction.[28]

Chain-on/off Areas

Chain-on/off areas, adjacent to Lake Keechelus, KP 89.33/MP 55.52 to KP 104.70/MP 65.07 vicinity.
Chain-off area, eastbound at Easton, KP 112.92/MP 70.18 to KP 114.30/MP 71.04 vicinity.
Chain-on area, westbound at Easton, KP113.66/MP 70.64 to KP 114.46/MP 71.14 vicinity.
Chain-on area, westbound at Easton, KP 115.67/MP 71.89 to KP 116.38/MP 72.33.[29]

Right of Way

Interstate standards require 19 meters (63 feet) of right of way from the edge of pavement in rural areas. In urban areas, right of way widths should not be less than those required for the necessary cross sectional elements.[30]

Right of way widths along I-90 are highly variable. In the Northwest Region, the right of way widths vary from 61 meters (200 feet) to 526 meters (1725 feet). In the South Central Region, the right of way widths vary from 49 meters (160 feet) to 274 meters (900 feet). Table 5 lists the approximate range of existing right of way widths within our study limits. The listed widths are greater for certain design features, such as interchanges and slopes.

TABLE 7
Right of Way Widths and Variations

Location	KP/MP	Width Variation in Meter/Feet
4th Ave. S. to Lake WA Br.	3.12-6.89/1.94-4.28	300 to 370
Lake WA. Floating Br.	6.89-9.48/4.28-5.89	1725
End Lake. WA Br. to SR-405	9.48-14.98/5.89-9.31	200 to 370
SR 405 to Leave City of Issaquah	14.98-31.97/9.31-19.87	250 to 670
Leave City of Issaquah to Edgewick Road	31.97-55.75/19.87-34.65	285 to 950
Edgewick Road to Bandera Road	55.75-72.57/34.65-45.10	160 to 900
Bandera Road to Enter Kittitas Co.	72.57-84.65/45.10-52.61	290 to 900
Enter Kittitas Co. to Price Creek Rest Area	84.65-98.70/52.61-61.34	180 to 570
Price Creek Rest Area to E. Easton Road	98.70-115.90/61.34-72.03	200 to 780
E. Easton Road to Cle Elum	115.90-133.10/72.03-82.72	170 to 380
Cle Elum to Elk Heights	133.10-150.63/82.72-93.62	220 to 400

Structure Data

Table 8 lists the location, length and width of deficient structures in the Northwest Region.[31]

TABLE 8
Substandard Bridges in the Northwest Region

Bridge #	Location	KP (MP)	Length*	Width*	Rating
90/10WB	SR 5 Overcrossing	3.86 (2.40)	573 (1881')	10 (33')	FO
90/10WCD	Dearborn Oxing-W-NBCD	3.86 (2.40)	264 (865')	8 (26')	FO
90/25S	LK. Wash-Lacey V. Murrow	6.82 (4.24)	2616 (8583')	14 (45')	SD
90/43S	Mercer Slough	14.87 (9.24)	814 (2669')	18 (60')	FO
90/43N	Mercer Slough	14.87 (9.24)	857 (2812')	25 (82.5')	FO
90/43ECD	EBCD Mercer Slough	14.87 (9.24)	525 (1723')	7 (23')	FO
90/43WCD	WBCD Mercer Slough	14.87 (9.24)	570 (1871')	10 (33')	FO
90/50S	Richards Road	15.90 (9.88)	65 (214')	28 (92')	FO
90/50N	Richards Road	15.90 (9.88)	61 (200')	28 (92')	FO
90/50W-S	W-S Ramp	15.90 (9.88)	56 (184')	10 (33')	FO
90/54E-N	E. 148th St. Ramp	22.01 (13.68)	531 (1742')	8.5 (28')	SD
90/59N	SR 901 OC	22.01 (13.68)	104 (342')	21 (68')	SD
90/65S	BN RR OC (NP)	27.22 (16.92)	135 (444')	17.5 (57.4')	SD
90/65N	BN RR OC (NP)	27.22 (16.92)	130 (426')	15 (48')	SD
90/66S	228th Ave. SE OC	27.55 (17.12)	70 (230')	16 (52')	SD
90/74S	High Point Rd OC	32.36 (20.11)	43 (140')	21 (68')	SD
90/77N	Raging River	37.36 (23.22)	120 (393')	16 (52')	FO

* - Length and width are in meter (feet).
FO - Bridge is functionally obsolete.
SD - Bridge is structurally deficient.

A Functionally Obsolete (FO) bridge does not meet the current geometric design standards, (usually narrow shoulder widths). It is possible some of these structures can be widened. A Structurally Deficient (SD) bridge does not meet the current structural design standards.

There are 10 functionally obsolete and 7 structurally deficient bridges in the Northwest Region portion of Interstate 90.

Table 9 lists the location, length and width of deficient structures in the South Central Region.

TABLE 9
Substandard Bridges in the South Central Region

Bridge #	Location	KP (MP)	Length*	Width*	Rating
90/91.5S	Homestead Valley Rd OC	60.74 (37.75)	32 (104')	21 (68')	FO
90/91.5N	Homestead Valley Rd OC	60.74 (37.75)	32 (104')	16 (52')	FO
90/92.5S	Garcia Interchange OC	63.67 (39.57)	35 (116')	16 (52')	FO
90/92.5N	Garcia Interchange OC	63.67 (39.57)	35 (116')	16 (52')	FO
90/94	SR 90 OC Camp Mason Rd.	68.09 (42.32)	109 (358')	8 (26')	SD
90/94A	Snoqualmie River	68.11 (42.33)	55 (181')	8 (26')	SD
90/94S	Bandera Rd. OC	73.29 (45.55)	34 (112')	16 (52')	SD
90/95N	Bandera Rd. OC	73.29 (45.55)	38 (124')	16 (52')	SD
90/96A	S. Fk. Snoqualmie R. Upper	77.15 (47.95)	64 (210')	6.6 (22')	FO
90/117S	Access Rd. OC	111.23 (69.13)	9.4 (31')	12 (39.6')	SD
90/117N	Access Rd. OC	111.33 (69.19)	9.4 (31')	15.4 (50.4')	FO
90/119	SR 90 UC W Easton Rd.	113.08 (70.28)	62.8 (206')	10 (34')	SD
90/130S	Nelson Rd. OC	125.60 (78.06)	31.7 (104')	11.6 (38')	FO
90/130N	Nelson Rd. OC	125.60 (78.06)	31.7 (104')	11.6 (38')	FO
90/132S	Yakima R	126.81 (78.81)	63 (206')	12.5 (41')	SD
90/134S	Cle Elum R	129.99 (80.79)	90.5 (297')	8.6 (28.2')	FO
90/135E-N	E-N Ramp SR 90 OC	133.74 (83.12)	87 (285')	6.4 (21')	SD
90/137	SR 90 OC Oakes Ave.	135.48 (84.20)	68.6 (225')	8 (26')	FO
90/141S	Peoh Rd. OC	139.39 (86.63)	114 (375')	9 (30')	FO
90/141N	Peoh Rd. OC	139.39 (86.63)	114 (375')	9 (30')	FO

* - Length and width are in meter (feet).
FO - Bridge is functionally obsolete.
SD - Bridge is structurally deficient.

There are 12 functionally obsolete and 8 structurally deficient bridges in the South Central Region portion of I-90.

SECTION 4: PRESENT OPERATING CONDITIONS

Current Traffic Data

Traffic volumes along I-90 corridor vary according to the location, day of the week and time of day and season. Heaviest traffic volumes occur from the beginning of the route to the city of Issaquah (urban area). Table 10 below lists the 1993 Annual Average Daily Traffic (AADT) by location and kilometer post (milepost).

TABLE 10
Annual Average Daily Traffic

Mainline Location	KP (MP)	1993
BEFORE RAMP W MERCER WAY	9.25 (5.75)	105,092
AFTER RAMP W MERCER WAY	9.49 (5.90)	109,043
AFTER RAMP E MERCER WAY	13.82 (8.59)	128,355
AFTER RAMP SR 405	16.64 (10.34)	116,000
AT PTR 825 (TRAFFIC RECORDER)	23.57 (14.65)	78,000 *
AT PTR 826 (TRAFFIC RECORDER)	37.88 (23.54)	31,350
AT SR 18 O'XING	41.34 (25.69)	31,000
AT PTR 39	54.00 (33.56)	26,637
AT EDGEWICK ROAD O'XING	55.78 (34.67)	32,656
AFTER RAMP EDGEWICK ROAD	56.32 (35.00)	24,000 *
AFTER RAMP GARICA ROAD	64.41 (40.03)	21,064
BEFORE RAMP TINKHAM ROAD	75.93 (47.19)	20,000
AFTER RAMP TINKHAM ROAD	77.20 (47.98)	24,079
BEFORE RAMP SR 906	83.64 (51.98)	22,073
AFTER RAMP SR 906	83.64 (51.98)	20,000
BEFORE RAMP E SUMMIT ROAD	84.65 (52.61)	24,000
BEFORE PRIVE CREEK REST AREA	98.70 (61.34)	23,000
BEFORE RAMP W EASTON ROAD	112.26 (69.77)	19,745
BEFORE RAMP E EASTON ROAD	114.69 (71.28)	21,000 *
BEFORE RAMP W NELSON ROAD	118.49 (73.64)	20,000
AFTER RAMP W NELSON ROAD	119.68 (74.38)	21,000
AT E NELSON ROAD O'XING	125.60 (78.06)	19,745
AFTER RAMP E NELSON ROAD	126.24 (78.46)	22,759
BEFORE WEIGH STATION	127.79 (79.42)	22,759
AFTER RAMP BULLFROG ROAD	129.80 (80.67)	21,000 *
AT BO4 0 (TRAFFIC RECORDER)	133.06 (82.70)	21,000 *
BEFORE RAMP OAKES AVENUE	135.77 (84.38)	20,000 *
AT PTR 6	136.86 (85.06)	18,000 *
AFTER RAMP SR 970	138.66 (86.18)	21,000 *
AFTER RAMP ELK HEIGHTS	151.28 (94.02)	17,273

* Based on actual counts[32]

The Peak Hour Truck percentages of total traffic (T%) used for Level of Service (LOS) calculations are shown in Table 11.[33] The T% for the mainline was obtained from the (1994) TRIPS data report and the T% for the ramps was provided by the WSDOT's South Central Region Planning Office.

TABLE 11
Mainline Peak Hour Truck Percentage

Mainline KP (MP)	(T%)	Ramps Exit #	(T%)
3.12 - 16.62 (1.94 - 10.33)	2.9	71, 74, 78	5
16.64 - 27.08 (10.34 - 16.83)	3.1	34 - 70	10
27.10 - 40.23 (16.84 - 25.00)	17.6	80, 84	10
40.24 - 60.58 (25.01-37.65)	14.4	85	15
60.59 - 150.63 (37.66 - 93.62)	15		

Level of Service is a description of how a roadway is operating. There are six levels of service: A, which describes a roadway that is freely flowing and without obstacles, through F, which describes a roadway that is stopped and congested. (For a more complete explanation of what Level of Service is on an interstate highway, see Appendix B).

Peak and Off-Peak Operating Conditions

Northwest Region

Urban Area

During rush hour in Seattle the traffic slows down from the beginning of the highway, KP 3.12 (MP 1.94) to the Bellevue Way Interchange at Exit 9, KP 14.80 (MP 9.2). After this point traffic attains a speed close to the speed limit. In the westbound lanes the heaviest traffic volumes tend to occur from SR-900 to the SR-405 interchange. Here it is typical to see LOS in the "F" range during the AM peak hours, indicating very poor operating conditions. In the section from Rainier Avenue to the SR-900 interchange, various ramps have peak traffic LOS ratings of "E" and "F".

Rural Area

The posted speed limit changes from 90 km/h (55mph) to 105 km/h (65 mph) east of the SE High Point Way Interchange Exit 20 (beginning of the rural area). The posted speed limit remains 105 km/h (65 mph) throughout the remaining portion of the study limits. The LOS is "C" or better in the rural area, indicating good operating conditions.

The peak travel time is during the months of July and August, indicating an increased amount of tourism, recreational use and cross-mountain travel. During these months, traffic volumes can reach unsatisfactory levels due to heavy peaking at specific times. There is a significantly high ADT on the first and last days of 3 day weekends. A noticeably high amount of vehicles (including motorhomes, travel trailers, etc.) leave Seattle on Thursday night or Friday and return on Sunday evening. During the months of November, December, January, and February, a high percentage of motorists on the highway are traveling to the ski resorts at Snoqualmie Summit, however, during these months the overall daily traffic is lower than the rest of the year. Tables 12-15 display existing AM and PM peak hour traffic and LOS at mainline locations and selected ramps for eastbound and westbound directions within the Northwest Region.

TABLE 12
I-90 Eastbound Mainline LOS (1994)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
1. I-5 to Rainier Avenue S.	3.12-5.55 (1.94-3.45)	1392	3684	A	B
2. Rainier Avenue S to 76th Avenue SE	5.57-10.52 (3.46-6.54)	5050	5921	E	F
3. 76th Avenue SE to E Mercer Way	10.54-13.77 (6.55-8.56)	4762	5705	D	F
4. E Mercer Way to Richards Road	13.79-16.62(8.57-10.33)	5310	6088	C	D
5. Richards Road to SR 900 *	16.64-24.89 (10.34-15.47)	2164	4357	B	D
6. SR 900 to Front Street	24.91-27.08 (15.48-16.83)	1345	3071	A	C
7. Front Street to E Sunset Way	27.10-29.30 (16.84-18.21)	990	1825	A	B
8. E Sunset Way to SR 18	29.32-40.23 (18.22-25.00)	839	1400	A	A
9 SR 18 to SR 202	40.24-48.62 (25.01-30.22)	1510	2223	B	C
10. SR 202 to Edgewick Road	48.64-52.89 (30.23-32.87)	1420	2025	B	B

* Assuming only 10% of traffic uses HOV lane.

TABLE 13
I-90 Westbound Mainline LOS (1994)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
1. I-5 to Rainier Avenue S	3.12-5.55 (1.94-3.45)	6157	3905	D	C
2. Rainier Avenue S to 76th Avenue SE	5.57-10.52 (3.46-6.54)	3671	5018	F	E
3. 76th Avenue SE to E Mercer Way	10.54-13.77 (6.55-8.56)	6184	3946	F	C
4. E Mercer Way to Richards Road	13.79-16.62 (8.57-10.33)	N/A	N/A	N/A	N/A
5. Richards Road to SR 900 *	16.64-24.89 (10.34-15.47)	5330	2364	F	B
6. SR 900 to Front Street	24.91-27.08 (15.48-16.83)	3711	1518	C	A
7. Front Street to E Sunset Way	27.10-29.30 (16.84-18.21)	1734	1279	B	A
8. E Sunset Way to SR 18	29.32-40.23 (18.22-25.00)	1325	932	B	A
9. SR 18 to SR 202	40.24-48.62 (25.01-30.22)	804	1187	A	A
10. SR 202 to Edgewick Road	48.64-52.89 (30.23-32.87)	692	1083	A	A

* Assuming only 10% of traffic uses HOV lane.

TABLE 14
I-90 Eastbound Ramps LOS (1994)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
On-ramp from Rainier Avenue S *	5.74 (3.57)	724	723	E	F
Off-ramp to W Mercer Way	9.49 (5.90)	230	598	D	F
Off-ramp to 77th Avenue SE	10.56 (6.56)	219	253	D	E
Off-ramp to Island Crest Highway	11.02 (6.85)	218	204	C	D
On-ramp from Island Crest Highway	12.10 (7.52)	735	929	D	F
Off-ramp to E Mercer Way	13.07 (8.12)	110	144	D	E
On-ramp from E Mercer Way *	13.58 (8.44)	658	527	F	E
Off-ramp to SB I 405	16.25 (10.10)	1956	2361	C	C
Off-ramp to NB I 405	16.25 (10.10)	N/A	N/A	N/A	N/A
On-ramp from SB I-405	16.25 (10.10)	N/A	N/A	N/A	N/A
On-ramp from NB I-405	16.25 (10.10)	N/A	N/A	N/A	N/A
Off-ramp to 150th Avenue SE	17.52 (10.89)	870	1030	D	C
Off-ramp to 148th Avenue SE	17.86 (11.10)	N/A	N/A	N/A	N/A
On-ramp from 150th Avenue SE	19.02 (11.82)	683	1480	B	E
Off-ramp to W Lake Sammamish Parkway	21.40 (13.30)	206	698	A	C
On-ramp from W Lake Sammamish Parkway	22.61 (14.05)	169	289	A	B
Off-ramp to SR 900	24.91 (15.48)	1025	1989	C	F
On-ramp from SR 900	25.78 (16.02)	141	307	A	B
Off-ramp to Front Street	27.11 (16.85)	640	1617	B	D
On-ramp from Front Street -228th Avenue SE	27.92 (17.35)	214	330	A	A
On-ramp from E Sunset Way	29.32 (18.22)	82	123	A	A
Off-ramp to High Point Road/SE 270th Avenue	32.13 (19.97)	54	90	A	B
On-ramp from High Point Road/SE 270th Avenue	32.90 (20.45)	12	15	A	B
Off-ramp to Preston Fall City Road	35.75 (22.22)	214	502	A	C
On-ramp from Preston Fall City Road	36.51 (22.69)	96	155	A	A
Off-ramp to SR 18	40.82 (25.37)	105	189	A	A
On-ramp from SR 18	41.67 (25.90)	513	534	B	B
Off-ramp to SE North Bend Way	43.67 (27.14)	264	478	B	C
Off-ramp to SR 202	48.66 (30.24)	245	434	B	C
On-ramp from SR 202	49.40 (30.70)	155	236	A	B
Off-ramp to 436th Avenue SE	51.87 (32.24)	103	385	B	C
On-ramp from 436th Avenue SE	52.68 (32.74)	40	47	A	A

* Metered Ramp

TABLE 15
I-90 Westbound Ramps LOS (1994)

Location	MP	Volume		LOS	
		AM	PM	AM	PM
Off-ramp to Rainier Avenue S	5.62 (3.49)	864	475	C	C
On-ramp from W Mercer Way *	9.49 (5.90)	531	164	F	C
On-ramp from 76th Avenue SE *	10.54 (6.55)	417	430	F	D
Off-ramp to Island Crest Highway	11.89 (7.39)	721	868	F	D
On-ramp from E Mercer Way *	13.19 (8.20)	N/A	N/A	N/A	N/A
Off-ramp to E Mercer Way	13.79 (8.57)	450	714	A	B
On-ramp from Bellevue Way SE *	14.53 (9.03)	594	1492	B	D
On-ramp from I-405	15.04 (9.35)	N/A	N/A	N/A	N/A
On-ramp from Richards Road	15.96 (9.92)	835	1000	D	C
Off-ramp to NB I-405	16.64 (10.34)	1380	1351	C	C
Off-ramp to SB I-405	16.33 (10.15)	1544	1444	F	D
On-ramp from 148th Avenue SE	17.75 (11.03)	N/A	N/A	N/A	N/A
Off-ramp to 161st Avenue SE	19.97 (12.41)	N/A	N/A	N/A	N/A
Off-ramp to W Lake Sammamish Parkway	22.51 (13.99)	396	236	C	AA
On-ramp from W Lake Sammamish Parkway *	21.59 (13.42)	298	118	B	C
On-ramp from SR 900 *	25.21 (15.67)	1927	1207	F	A
Off-ramp to SR 900	26.03 (16.18)	217	142	C	A
On-ramp from Front Street *	27.10 (16.84)	695	355	B	A
Off-ramp to Front Street	28.03 (17.42)	220	232	B	B
Off-ramp to E Sunset Way	29.54 (18.36)	75	127	C	A
On-ramp from High Point Road-SE 270th Avenue	32.37 (20.12)	48	56	A	A
Off-ramp to High Point Road-SE 270th Avenue	33.02 (20.52)	9	14	A	B
On-ramp from Preston Fall City Road	36.06 (22.41)	565	302	C	B
Off-ramp to Preston Fall City Road	36.62 (22.76)	120	124	B	A
On-ramp from SR 18	40.77 (25.34)	300	231	A	A
Off-ramp to SR 18	41.79 (25.97)	446	657	B	C
On-ramp from SE North Bend Way	43.65 (27.13)	450	278	B	B
On-ramp from SR 202	48.90 (30.39)	246	293	A	B
Off-ramp to SR 202	49.73 (30.91)	134	189	A	A
On-ramp from 436th Avenue SE	52.12 (32.39)	513	148	B	A
Off-ramp to 436th Avenue SE	52.89 (32.87)	35	47	A	A

* Metered Ramp

South Central Region

With the exception of the off-ramp to West Easton Road (EB), which is operating at LOS "D" during PM peak hour traffic, all other ramps and the mainline are operating at LOS "C" or better. Tables 16-19 display the existing AM and PM peak hour traffic and LOS at mainline locations and selected ramps for both eastbound and westbound directions within the South Central Region.

TABLE 16
I-90 Eastbound Mainline LOS (1993)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
11-a. Edgewick Rd. to Coal Creek	52.89-88.77 (32.87-55.17)	N/A	N/A	N/A	N/A
11-b. Coal Creek to Cabin Creek Rd.	88.78-103.33 (55.18-64.22)	1071	1174	C	C
12. Cabin Creek Rd. to East Nelson Rd.	103.35-124.95 (64.23-77.66)	1091	1175	B	B
13. East Nelson Rd. to Bullfrog Rd.	124.97-129.78 (77.67-80.66)	1116	1191	B	B
14. Bullfrog Rd. to Leave City Cle Elum	129.80-135.98 (80.67-84.51)	1053	1118	B	B
15. Leave City Cle Elum to Thorp HWY	135.99-163.28 (84.52-101.48)	819	875	A	A

TABLE 17
I-90 Eastbound Ramps LOS (1993)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
Off-ramp to Edgewick Road	55.24 (34.33)	174	196	B	B
On-ramp from Edgewick Road	56.17 (34.91)	119	138	A	B
Off-ramp to Stampede Road	100.95 (62.74)	41	62	C	C
On-ramp from Stampede Road	101.87 (63.31)	33	38	C	C
Off-ramp to West Easton Road	112.63 (70.00)	61	77	C	D
On-ramp from West Easton Road	113.92 (70.80)	45	46	C	C
Off-ramp to East Easton Road	114.75 (71.32)	19	21	A	B
On-ramp from East Easton Road	115.90 (72.03)	55	56	B	C
Off-ramp to East Nelson Siding Road	125.28 (77.86)	28	39	A	B
On-ramp from East Nelson Siding Road	126.24 (78.46)	63	66	B	C
Off-ramp to Bullfrog Road	128.82 (80.06)	100	124	B	C
On-ramp from Bullfrog Road	129.80 (80.67)	37	51	B	B
Off-ramp to West First Street	133.14 (82.75)	221	255	C	C
On-ramp from Oakes Avenue	136.14 (84.61)	42	46	F	B
Off-ramp to SR 970	137.81 (85.65)	147	149	B	B
On-ramp from SR 970	138.66 (86.18)	91	115	B	B
Off-ramp to Thorp Highway	162.33(100.89)	27	30	A	A
On-ramp from Thorp Highway	163.28 (101.48)	48	54	A	B

TABLE 18
I-90 Westbound Mainline LOS (1993)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
11-a. Edgewick Rd. to Coal Creek	52.89-88.77 (32.87-55.17)	N/A	N/A	N/A	N/A
11-b. Coal Creek to Cabin Creek Rd.	88.78-103.33 (55.18-64.22)	810	985	B	B
12. Cabin Creek Rd. to East Nelson Rd.	103.35-124.95 (64.23-77.66)	823	1015	A	B
13. East Nelson Rd. to Bullfrog Rd.	124.97-129.78 (77.67-80.66)	852	1056	A	B
14. Bullfrog Rd. to Leave City Cle Elum	129.80-135.98 (80.67-84.51)	823	1011	A	B
15. Leave City Cle Elum to Thorp HWY	135.99-163.28 (84.52-101.48)	696	842	A	A

TABLE 19
I-90 Westbound Ramps LOS (1993)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
On-ramp from Edgewick Road	55.48 (34.48)	153	125	A	A
Off-ramp to Edgewick Road	56.32 (35.00)	70	91	A	A
Off-ramp to Stampede Road	101.72 (63.22)	23	25	B	B
On-ramp from Stampede Road	100.58 (62.51)	28	37	B	C
Off-ramp to West Easton Road	113.64 (70.63)	39	53	B	C
On-ramp from West Easton Road	112.26 (69.77)	45	54	B	C
Off-ramp to East Easton Road	115.45 (71.75)	36	52	A	B
On-ramp from East Easton Road	114.69 (71.28)	15	22	A	A
Off-ramp to East Nelson Siding Road	125.97 (78.29)	57	70	B	B
On-ramp from East Nelson Siding Road	124.97 (77.67)	21	24	A	B
Off-ramp to Bullfrog Road	129.65 (80.58)	40	56	A	B
On-ramp from Bullfrog Road	128.58 (79.91)	69	101	A	B
Off-ramp to West First Street	135.77 (84.38)	37	46	A	A
On-ramp from Oakes Avenue	133.56 (83.01)	155	192	B	C
Off-ramp to SR 970	138.47 (86.06)	95	115	B	B
On-ramp from SR 970	137.54 (85.48)	104	137	B	B
Off-ramp to Thorp Highway	162.93 (101.26)	63	89	B	B
On-ramp from Thorp Highway	161.96 (100.66)	46	62	A	B

Mountain Pass Operations

Closures of the highway due to snow occur routinely during the winter months. WSDOT Maintenance Division performs avalanche control to prevent emergency situations during these periods. Temporary closures of one to two weeks have occurred when the snowmass and avalanche dangers cannot be removed safely.

Two snow sheds were built in the 1950's. The eastbound snowshed was removed in 1983 when the eastbound lanes were widened. The westbound snowshed is still in place along the Lake Keechelas section, KP 93.45 to KP 93.61 (MP 58.08 to MP 58.18).

Signs that alert drivers to special situations such as; "Approved Traction Devices Required" and "Approved Traction Devices Recommended" are presently located just east of Hyak Road (KP 88.50/MP 55) in the westbound direction and another just west of the Summit at the Asahel Curtis Interchange (KP 75.62/MP 47) in the eastbound direction.

Intelligent Vehicle Highway System (IVHS)
In Yakima, the WSDOT's South Central Region Office has nearly completed the design of a project that will provide an Intelligent Vehicle Highway System (IVHS) adding in-vehicle signing and variable speed limits on I-90. This project will design a radio-communications system and roadside transmitter units for the in-vehicle units that will give drivers graphic and text information. The in-vehicle radio system will then be studied to determine the level of driver attention required for the in-vehicle system. This project also incorporates 13 variable message signs that will alert drivers that do not have in-vehicle transmitters.

Operation of Intermodal System

King County is developing a transportation system that provides alternative ways to travel. Some of the regional transportation strategies are: to complete the core High Occupancy Vehicle (HOV) lanes on the area's freeways for ridesharing and buses; to implement Transportation Demand Management (TDM); to employ Transportation Systems Management (TSM) programs; and to provide facilities and programs for pedestrians, bicycles and equestrians.

The State's 1991 Commute Trip Reduction Law requires major employers to institute programs to reduce commute trips 35 percent by 1999 to help maintain air quality.[34] Transportation Demand Management strategies are being used in the Puget Sound Region to reduce the proportion of person-trips traveling by Single Occupancy Vehicle (SOV). TDM measures can include car and vanpool formation assistance, transit subsidies, non-motorized travel, telecommuting, parking management, public information, and park and ride and other intermodal transfer facilities. The King County Comprehensive Plan encourages mixed land uses at transit centers and park and ride lots to meet passenger and commuter needs and reduce vehicle trips.

Park & Ride Lots and Transit Service

METRO TRANSIT serves the Interstate 90 corridor between Seattle and North Bend. Existing Park & Ride facilities and Bus Route numbers within the Northwest Region are listed in Table 20.[35]

TABLE 20
Park & Ride Locations and Bus Route Numbers

Location, Address and Route Numbers	# Stalls	%Utilization*
#45; Mercer Island, 80th Ave. SE & N. Mercer Way Bus #: 202, 203, 205, 210, 220, 226, 228, 235, 246 & 942 Bicycle facilities are available.	244	98
#39; South Bellevue, Bellevue Way SE & 112th Ave. SE. Bus #: 213, 220, 226, 226E, 228, 235, 240, 245, 340 & 942 Bicycle facilities are available.	470	76
#43; Eastgate, SE Eastgate Way & 136th Ave. SE. Bus #: 211, 212, 221, 225, 227, 228, 229, 238, 246, 247, 272, 921 & 942 Bicycle facilities are available.	678	81
#51; Issaquah, SR 900 & Newport Way Bus #: 210, 211, 213, 246, 269, 274 & 927 Bicycle facilities are available.	394	109
#52; Preston, I-90 & Preston-Fall City Rd. Bus #: 210, 211 & 213	24	71

* Based on September 1993 report.

Proposed Park & Ride Facilities are planned to be located at:[36]

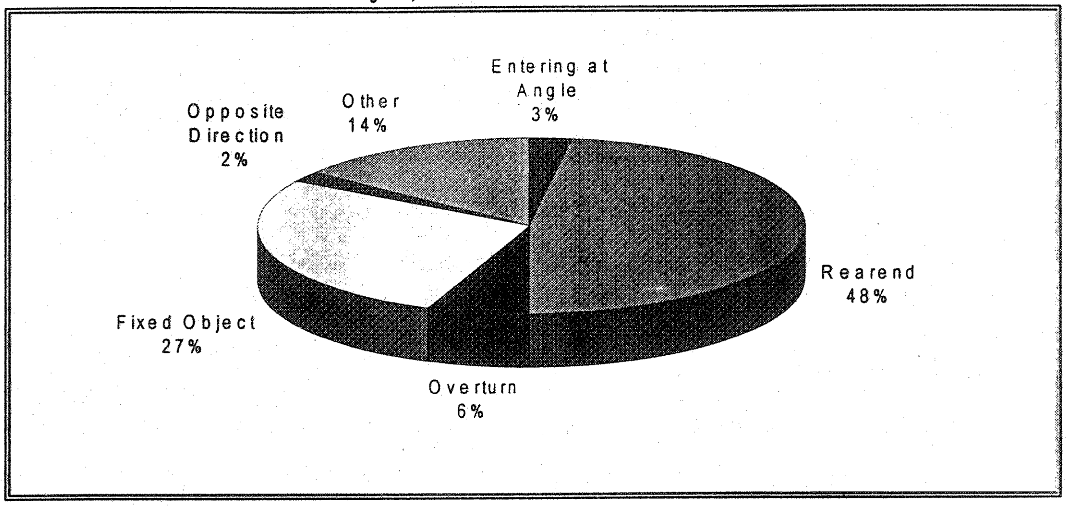
WSDOTExit 30	North Bend Gateway
WSDOTExit 25	State Route 18 Interchange

Accident Analysis

Northwest Region

From January 1, 1991 to December 31, 1992 there have been 1154 reported accidents. Of these accidents there were 481 injuries and 4 fatalities. Rearend accidents were the predominant accident type at 48% of the total. Vehicles hitting a fixed object was the second most prevalent accident type with 27% of the total accidents belonging to this group. Figure 2 shows the accidents by type.

FIGURE 2
Accidents by Type
January 1, 1991–December 31, 1992



As shown by the following figure, accidents are mostly occurring during the AM and PM peak hours (7:00-8:00 AM and 4:00-5:00 PM).

FIGURE 3
Accident Frequency by Time of Day
January 1, 1991–December 31, 1992

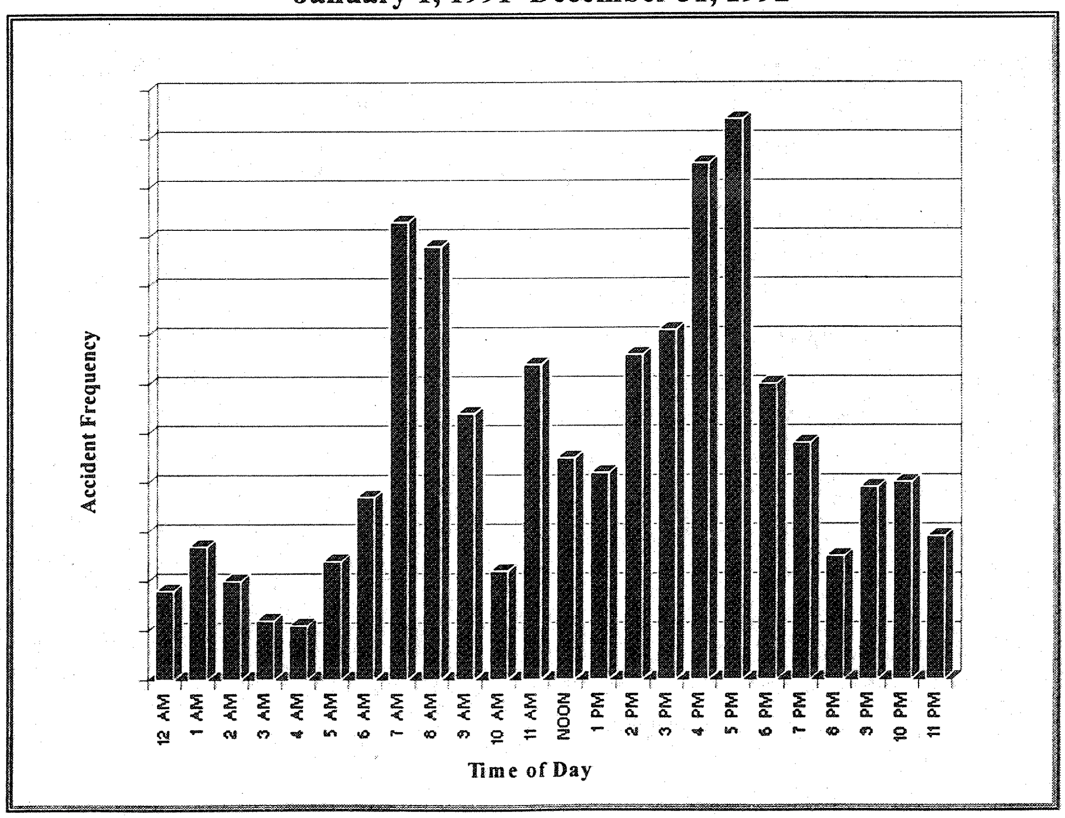


Table 21 gives a summary of the 1994 WSDOT High Accident Locations (HAL), High Accident Miles (HAM), and High Accident Corridor (HAC) Report.

TABLE 21
HAL, HAM and HAC Locations

I-90 (HAL Locations)	KP (MP)
1. Westbound, SR 405 I/C Vic.	15.77-16.25 (9.80-10.10)
2. Eastbound, SR 405/Richards Road I/C Vic.	15.96-16.57 (9.92-10.30)
3. Westbound, SR 405/Richards Road I/C Vic.	16.30-16.49 (10.13-10.25)
4. Eastbound , SR 900 Off-Ramp Vic.	25.26-25.45 (15.70-15.82)
5. Westbound, SR 900 I/C Vic.	25.21-25.55 (15.67-15.88)
6. Eastbound, Front Street I/C Vic.	27.43-27.59 (17.05-17.15)
I-90 (HAM Locations)	
Issaquah Creek Bridge vicinity	29.77-31.38 (18.50-19.50)
I-90 (HAC Locations)	
Issaquah Creek Bridge to SR 202	34.59-49.88 (21.50-31.00)

HAL Locations

The first location, Westbound, SR-405 I/C vicinity, had a total of 30 accidents (11 injuries, no fatalities), 50 percent of them were rearend with the primary causes being exceeding safe speeds and following too closely.

The second location, eastbound SR-405/Richards Road I/C vicinity, had a total of 36 accidents (12 injuries, no fatalities), 33 percent of which were rearend, and 31 percent hitting fixed object. Exceeding the safe speed was a primary cause of this type of accidents at this location. The I-90/I-405 interchange ramps accounted for 50 percent of the accidents, with ten accidents involving hitting fixed objects on the ramps' horizontal curves.

The third location, westbound SR-405/Richards Road I/C vicinity, had a total of 25 accidents (nine injuries, no fatalities), 60 percent of which were rearend, and 24 percent hitting fixed object. The primary cause of this type of accident at this location was exceeding safe speeds and following too closely. During rush hours, traffic from I-405 often backs up onto the westbound I-90 Off-Ramp which has resulted in a total of nine accidents.

The fourth location, eastbound SR-900 Off-Ramp vicinity, had a total of 20 accidents (nine injuries, no fatalities), 60 percent of which were rearend. The intersection of SR-900 and the eastbound I-90 off and on-ramps accounted for 8 of the total accidents. All 8 of these accidents involved driver citations, including disregarding the traffic signal.(3) and inattention (2). The I-90 eastbound mainline and the eastbound SR-900 off and on-ramps accounted for 12 of the total accidents (8 rearend type accidents).

The fifth location, westbound SR-900 I/C vicinity, had a total of 13 accidents (seven injuries, one fatality), five accidents were rearend, three accidents were overturns caused by drivers under the influence of drugs, and four accidents of different types were primarily caused by drivers failing to yield the right of way.

The sixth location, eastbound Front Street I/C vicinity, had a total of 16 accidents (eight injuries, no fatalities), 44 percent of which were rearend and 25 percent left-turn opposite direction. The current alignment and signing for the Front Street off-ramp should be changed to slow down right turning vehicles. Also, the southbound Front Street to eastbound I-90 left turn pocket needs a protected phase due to the heavy opposing traffic.[37]

HAM Locations

Issaquah Creek Bridge vicinity (KP 29.77-31.38/MP 18.50-19.50) is the only location in the study area that is identified in the 1994 High Accident Miles (HAM'S) Report. This location had a total of 25 accidents (ten injuries, no fatalities). The primary causes of these accidents was exceeding safe speeds and driving during icy or snowy conditions.

HAC Locations

The section from Issaquah Creek Bridge to SR-202 (KP 34.59-49.88/MP 21.50–31.00) is the only location in the study area that is identified in the 1994 High Accident Corridor (HAC) Report. A total of 397 (168 injuries, five fatalities) accidents occurred within the subject mileposts for the time period January 1, 1988 to December 31, 1992. Most of the accidents were caused by exceeding safe speed and driving when the road surface was wet, icy, or snowy.

One of the 5 fatal accidents through this section (1 death) was caused by a DWI (driving while intoxicated). Another fatal accident (1 death) was caused by a driver under the influence of drugs.

A fatal accident (3 deaths) occurred at KP 37.73 (MP 23.45) when a driver exceeded the safe speed under wet conditions and hit the median guardrail. A fatal overturn accident (1 death) at KP 48.85 (MP 30.36) was caused by inattention. A fatal accident (4 deaths) occurred at a chain-up area at KP 44.13 (MP 27.43) under snowy conditions when a car driven by an elderly driver rear-ended a semi whose driver was putting chains on his truck.

Accident Rates

The 1992 state highway average accident rate [38]for urban Interstates was 0.74 and the fatal accident rate was 1.29. In the rural areas, the state average accident rate was 1.26 and the fatal accident rate was 0.31. Table 22 shows the state highway average accident and fatality rates. In the Northwest region, the only location that had higher total accident (1.87) and fatal accident (2.92) rates than the state highway average rates, was the HAC location at Issaquah Creek Bridge to SR-202 (KP 34.59-49.88/MP 21.50-31.00, rural area). During the period from January 1, 1992 to December 31,1992, only one fatal accident (4 deaths) occurred at KP 44.13 (MP 27.43). This fatal accident has raised the fatal accident rate to 2.92 for this section. Table 21 displays the total accident rates and fatal accident rates for the HAL, HAM and HAC locations.

TABLE 22
1992 Highway Accident Report Summary

	NW Region State Routes	All Rural Interstates (R5)	All Urban Interstates (U5)	All State Routes
Total Accidents	2,903	2,686	10,328	41,492
Total Accident Rate +	**1.20**	**0.74**	**1.26**	**1.67**
Fatal Accidents	45	47	25	293
Fatal Accidents Rate *	**1.90**	**1.29**	**0.31**	**1.18**

\+ Per Million Vehicle Miles of Travel
* Per 100 Million Vehicle Miles of Travel

TABLE 23
I-90 Accident Rates For HAL, HAM and HAC Locations
January 1, 1992–December 31, 1992

KP (MP) (From-To)	Direction	Section Length Meter (mile)	AADT	Total Accidents	Accident Rate	Fatal Accidents	Fatal Accidents Rate
HAL Locations							
15.77-16.25 (9.80-10.10)	WB	0.48 (0.30)	63,910	17	**0.73**	0	**0**
16.30-16.49 (10.13-10.25)	WB	0.19 (0.12)	58,450	11	**0.52**	0	**0**
25.21-25.55 (15.67-15.88)	WB	0.34 (0.21)	38,995	4	**0.28**	0	**0**
15.96-16.57 (9.92-10.30)	EB	0.61 (0.38)	52,260	18	**0.94**	0	**0**
25.26-25.45 (15.70-15.82)	EB	0.19 (0.12)	37,200	9	**0.66**	0	**0**
27.43-27.59 (17.05-17.15)	EB	0.20 (0.10)	23,980	6	**0.69**	0	**0**
HAM Locations							
29.77-31.38 (18.50-19.50)	EB & WB	1.60 (1.00)	15730	1	**0.17**	0	**0**
HAC Locations							
34.59-49.88 (21.50-31.00)	EB & WB	15.29 (9.50)	9880	64	**1.87**	1	**2.92**

South Central Region

The latest three year accident history report indicates that a total of 1,864 accidents occurred on I-90 between KP 53.56 (MP 33.29) and KP 160.90 (MP 100.00). The predominate types of accidents were: alcohol related; overturn type accidents; and vehicles leaving roadway and coming in contact with concrete barrier, guardrail, and other objects. Of the 712 fixed object accidents, the objects struck included; 243 concrete barriers, 223 guardrails, 63 parked vehicles, 41 tree or stump, 41 snow banks, 18 bridge rails, 16 luminaire poles, and 67 other objects. Tables 24 and 25 list the accidents by severity, location, and type.

TABLE 24
Accidents by Severity
April 1, 1991-March 31, 1994

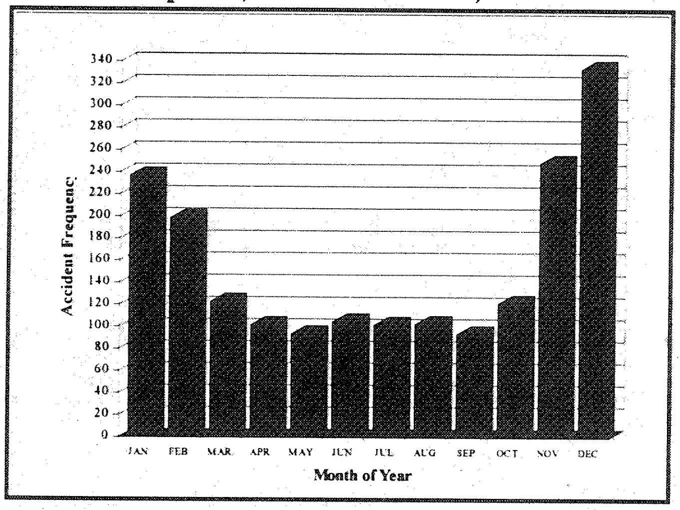
Location	KP (MP)	Total Accidents	Property Damage Accidents	Injury Accidents	Fatal Accidents
Edgewick Rd. to Cabin Creek Rd.	53.56-103.33 (33.29-64.22)	912	596	313	3
Cabin Creek Rd. to East Nelson Rd.	103.35-124.95 (64.23-77.66)	345	234	108	3
East Nelson Rd. to Bullfrog Rd.	124.97-129.78 (77.67-80.66)	110	71	39	0
Bullfrog Rd. to Leave City Cle Elum	129.80-135.98 (80.67-84.51)	104	76	28	0
Leave City Cle Elum to Thorp HWY	135.99-160.90 (84.52 101.48)	396	269	118	9

TABLE 25
Accidents by Location and Type
April 1, 1991-March 31, 1994

Location	KP (MP)	Alcohol Related	Fixed Object	Rear End	Over Turn	Other
Edgewick Rd. to Cabin Creek Rd.	53.56-103.33 (33.29-64.22)	198	400	72	105	137
Cabin Creek Rd. to East Nelson Rd.	103.35-124.95 (64.23-77.66)	70	112	36	91	36
East Nelson Rd. to Bullfrog Rd.	124.97-129.78 (77.67-80.66)	29	26	22	28	5
Bullfrog Rd. to Leave City Cle Elum	129.80-135.98 (80.67-84.51)	20	24	17	33	10
Leave City Cle Elum to Thorp HWY	135.99-160.90 (84.52 100.00)	83	150	35	117	11

The highest percentage of the accidents occurred during inclement (snow, ice, wet) weather conditions. Figure 4 below shows that the maximum number of accidents have occurred during the month of December. Accident frequency gradually drops between January and April, then it remains constant at an average of 34 accidents per month per year between the month of April and September. Finally, accident frequency gradually increases between the month of September and December when it reaches the maximum of 78 accidents per year in December.

FIGURE 4
Accident Frequency by Month of Year
April 1, 1991–March 31, 1994



In the South Central Region, the accident rate for the analyzed period (1/1/92-12/31/92) was 1.19 accidents per million vehicle miles of travel, which was higher than the statewide average for all rural interstates (0.74 accidents per million vehicle miles). This can be attributed to driver inattention due to the combination of severe weather conditions and substandard geometrics of the highway. During the same period, the fatality rate (0.81) was lower than the statewide average (1.29). Tables 26 and 27 list the statewide average accident rates and I-90 average accident rates.

TABLE 26
1992 Highway Accident Report Summary

	SC Region State Routes	All Rural Interstates (R5)	All State Routes
Total Accidents	21,164	2,686	41,492
Total Accident Rate +	**1.90**	**0.74**	**1.67**
Fatal Accidents	81	47	293
Fatal Accidents Rate *	**0.70**	**1.29**	**1.18**

+ Per Million Vehicle Miles of Travel
* Per 100 Million Vehicle Miles of Travel

TABLE 27
I-90 Accident Rates
Jan. 1, 1992-December 31, 1992

KP (MP) (From-To)	Direction	Section Length Meter (mile)	AADT	Total Accidents	Accident Rate	Fatal Accidents	Fatal Accidents Rate
53.56-160.90 (33.29 -100.00)	EB & WB	107.20 (66.71)	20,300	586	**1.19**	4	**0.81**

State Highway Systems Plan

The WSDOT's Systems Plan is a comprehensive, long-range plan that outlines transportation needs for the next 20 years, with the focus on maintaining, preserving, and improving the state's transportation system. The recommendations are developed in partnership with the regional transportation planning organizations. Table 28 and 29 list the projects that have been identified in the Northwest and South Central Region's State Highway Systems Plan. Future state transportation programs, projects, and budgets will be developed from these lists.

TABLE 28
Northwest Region State Highway Systems Plan (20 Year List)*

Location MP (KP)	Sub-Program.	Description
15.64-15.64 (9.72-9.72)	Mobility	Add stalls to S. Bellevue, Mercer Island United Methodist Church, Mercer Island and Mercer Island Presbyterian Church Park & Ride lots.
(10.00) Vicinity	Mobility	Provide bike/ped. facility in Eastgate vic. S. 136th St. Tunnel.
(11.00 to 13.77)	Mobility	Add stalls to Eastgate P&R lot, construct new P&R lot at Lakemont Blvd. SE I/C
3.12-53.56 (1.94-33.29)	Safety	Improve to Design Standards.
29.77-30.57 (18.50-19.00)	Safety	Install guardrail.
34.59-37.00 (21.50-23.00)	Safety	Install guardrail end treatment, signing, and clear zone.
37.01-48.27 (23.00-30.00)	Safety	New signals, signing, guardrail, guardrail end treatments and construct deceleration lane.
48.27-49.88 (30.00-31.00)	Safety	New signals, extend ramp tapers near bridges.
53.26-84.65 (33.10-52.61)	Safety	Install IVHS System and variable speed limit signing, install rumble strips.

* As of January 1995. Revised on March 17th, 1995.

TABLE 29
South Central Region State Highway Systems Plan (20 Year List)*

Location KP (MP)	Sub-Program.	Description
53.26-84.65 (33.10-52.61)	Safety	Install IVHS System and variable speed limit signing, install rumble strips; install durable striping and slotted drains.
53.56-221.51(33.29-137.67)	Safety	Improve I-90 Corridor to Design Standards.
84.65-114.56 (52.61-71.20)	Safety	Install IVHS System and variable speed limit signing; add durable markings, rumble strips and slotted drains.
88.75-133.14 (55.16-82.75)	Mobility/Safety	Widen to 6 lanes.
N/A	Economic	Proposed new rest area within vicinity of Mileposts 28.95-60.00.
101.32-101.32 (62.97-62.97)	Economic	Replace bridge with less than 15'6" on trunk system (Stampede Rd. UC 90/113).
107.80-176.99 (67.00-110.00)	Safety	Update guardrail, rumble strips & durable lane striping, flatten slopes, widen median shoulders, retrofit Br. rails with thrie beam.
127.11-127.58 (79.00-79.29)	Safety	Realign roadway, flatten slopes.
144.81-150.60 (90.00-93.60)	Mobility	Construct truck climbing lane.
152.86-156.07 (95.00-97.00)	Mobility	Construct truck climbing lane.

* As of January 1995.

The State Highway Systems Plan is constrained to a financial level that can reasonably be expected over the next 20 years. Since revenues projected for the next 20 years will not meet all the needs, trade-off decisions had to be made Table 30 lists the identified mobility projects that did not rank high enough to fit within the financially constrained plan.

TABLE 30
Mobility Needs List
Financially Excluded

Location KP (MP)	Description
Northwest Region	
0.58-9.43 (0.36-16.64)	Regional Rail System.
24.73-24.73 (15.37-15.37)	NFS - SR-900 Interchange reconfiguration.
29.57-29.57 (18.38-18.38)	Sunset Interchange improvements.
29.57-33.02 (18.38-20.52)	No action, King County GMA and County Comp Plan to manage growth.
36.23-36.23 (22.52-22.52)	NFS - Preston P&R lot needs multi-agency approach to increase 20-year capacity? (Expansion?)
South Central Region	
53.56-178.60 (33.29-111.00)	Further study needed.

* As of January 1995.

The Systems Plan will be updated every two years and transportation needs will be re-evaluated and ranked according to the greatest needs.

Capital Construction Program

The 1995 - 1997 Capital Construction Program rates contains information on projects that will be included in the program budget for the biennium. This program contains two program objectives for Highway Transportation; Program I - Improvements and Program P - Preservation. Interstate 90/Northwest Region projects include:

- Erosion control and landscaping on "The I-90 Project" Seattle and Mercer Island ongoing through 1998 (MP 3.22 to 6.01);
- Transit access to I-90 From I-405 for buses and carpools ongoing through 1998 (MP 6.5 to 6.5);
- Improve existing tunnel to provide better bicycle/pedestrian use at SE 136th Street Tunnel near Bellevue, design starting in 1996 (MP 11.45 to 11.45);
- Construct an eastbound chain-up area along the shoulder and install other safety features, construction starting in 1996 (MP 17.5 to 33.24);
- Improve wall drainage on the Coal Mine wall , design completed in 1996 (MP 19.00 to 19.00; and
- Stabilize slope near Raging River Bridge 90/77, design starting 1996 (MP 23.3 to 23.4).

Existing Wildlife Crossings

There are two existing crossings specifically constructed for wildlife crossings within the study area of I-90. They are located as follows:

- Bridges West of W. Snoqualmie Road, Bridge 90/79S & N, KP 43.41(MP 26.98); and
- Arch Culvert East of W. Snoqualmie Road, Bridge 90/80CS & CN KP 46.44(MP 28.86).

Wildlife also pass under the highways with the stream crossings that have been constructed with fencing intending to funnel the wildlife under the crossing. These wildlife crossings are located at:

- Mercer Slough, Bridge 90/43N & S, KP 14.87(MP 9.24);
- E. Fork Issaquah Creek, Bridge 90/72N, KP 30.02(MP 18.66) & 90/72S, KP 30.14(MP 18.73);
- E. Fork Issaquah Creek, Bridge 90/73N & S, KP 30.49(MP 18.95);
- E. Fork Issaquah Creek, Bridge 90/75N & S, KP 34.29(MP 21.31);
- Raging River, Bridge 90/77N & S, KP 37.36(MP 23.22);
- S. Fork Snoqualmie River, Bridge 90/82N & S, KP 51.04(MP 31.72);

Some of the structures, both overcrossings and undercrossings, are used by wildlife but were not specifically designed for these purposes. Additional wildlife crossing locations will be proposed in the Roadside Master Plan, Volume 3 of this study.

SECTION 5: ROUTE DEVELOPMENT PLAN

Traffic Analysis Comparison

Northwest Region

In the Northwest Region the compounded annual growth rates were provided by the Puget Sound Regional Council (PSRC) to project future 2015 volumes. These growth rates are listed in table 31. According to the 1993 Statewide Systems Plan the targeted level of service is "C" or better in the rural areas and "D" or better in the urban areas. This report assumes that all eastbound and westbound on-ramps will be metered and treated with HOV bypass lanes from KP 5.74 (MP 3.57) to KP 52.68 (MP 32.74) for year 2015 conditions.

TABLE 31
PSRC Growth Rates as of April, 1993

Location	Growth Rate (%)
Jct. Rainier Avenue S	1.09
Jct. West Mercer Street	1.09
Jct. E Mercer Way	1.22
Jct. Bellevue Way	1.01
Jct. I-405	2.25
Vic. 160th Avenue SE	3.13
Newport Way\W Lake Sammamish Parkway	2.87
Jct. SR 900	2.15
Jct. Front Street	5.34
Jct. E Sunset Way	2.83
Jct. Preston-Fall City Road	2.36
Jct. SR 18	2.32
Jct. North Bend Way	2.19
Jct. 436th Avenue SE	2.85

Upon the examination of the existing and projected 2015 traffic volumes for I-90 it was found that the mainline section from Rainier Avenue South to Front Street would operate at a low level of service E-F during the AM & PM peak hours in the year 2015 if no capacity improvements are undertaken. This LOS is below the acceptable LOS identified in the Systems Plan. Tables 32-35 show the projected eastbound and westbound ramps and mainline traffic conditions for the year 2015.

TABLE 32
I-90 Eastbound Mainline LOS (2015)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
1. I-5 to Rainier Avenue S	3.12-5.55 (1.94-3.45)	1991	5271	A	C
2. Rainier Avenue S to 76th Avenue SE	5.57-10.52 (3.46-6.54)	6341	7435	F	F
3. 76th Avenue SE to E Mercer Way	10.54-13.77 (6.55-8.56)	6143	7360	F	F
4. E Mercer Way to Richards Road	13.79-16.62 (8.57-10.33)	6850	7854	E	F
5. Richards Road to SR 900 *	16.64-24.89 (10.34-15.47)	3382	6810	C	F
6. SR 900 to Front Street	24.91-27.08 (15.48-16.83)	4041	9157	C	F
7. Front Street to E Sunset Way	27.10-29.30 (16.84-18.21)	1516	2795	B	C
8. E Sunset Way to SR 18	29.32-40.23 (18.22-25.00)	1358	2266	A	B
9. SR 18 to SR 202	40.24-48.62 (25.01-30.22)	2724	4011	C	E
10. SR 202 to Edgewick Road	48.64-52.89 (30.23-32.87)	2562	3652	C	D

* Assuming only 10 % of traffic uses HOV lane.

TABLE 33
I-90 Westbound Mainline LOS (2015)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
1. I-5 to Rainier Avenue S	3.12-5.55 (1.94-3.45)	8809	5587	F	D
2. Rainier Avenue S to 76th Avenue SE	5.57-10.52 (3.46-6.54)	8000	6301	F	F
3. 76th Avenue SE to E Mercer Way	10.54-13.77 (6.55-8.56)	7977	5090	F	E
4. E Mercer Way to Richards Road	13.79-16.62 (8.57-10.33)	N/A	N/A	N/A	N/A
5. Richards Road to SR 900 *	16.64-24.89 (10.34-15.47)	9692	4290	F	D
6. SR 900 to Front Street	24.91-27.08 (15.48-16.83)	11065	4526	F	D
7. Front Street to E Sunset Way	27.10-29.30 (16.84-18.21)	2655	1959	C	B
8. E Sunset Way to SR 18	29.32-40.23 (18.22-25.00)	2145	1509	C	B
9. SR 18 to SR 202	40.24-48.62 (25.01-30.22)	1451	2142	A	B
10. SR 202 to Edgewick Road	48.64-52.89 (30.23-32.87)	1249	1954	A	B

TABLE 34
I-90 Eastbound Ramps LOS (2015)

Location	KP (MP)	Volume		LOS	
		AM	PM	AM	PM
On-ramp from Rainier Avenue S *	5.74 (3.57)	897	906	F	F
Off-ramp to W Mercer Way	9.49 (5.90)	289	751	E	F
Off-ramp to 77th Avenue SE	10.56 (6.56)	283	326	F	F
Off-ramp to Island Crest Highway	11.02 (6.85)	281	263	E	E
On-ramp from Island Crest Highway	12.10 (7.52)	948	1198	F	F
Off-ramp to E Mercer Way	13.07 (8.12)	142	186	F	F
On-ramp from E Mercer Way *	13.58 (8.44)	849	650	F	F
Off-ramp to SB I 405	16.25 (10.10)	3121	3767	C	E
Off-ramp to NB I 405	16.25 (10.10)	N/A	N/A	N/A	N/A
On-ramp from SB I-405	16.25 (10.10)	N/A	N/A	N/A	N/A
On-ramp from NB I-405	16.25 (10.10)	N/A	N/A	N/A	N/A
Off-ramp to 150th Avenue SE	17.52 (10.89)	3005	2663	F	F
Off-ramp to 148th Avenue SE	17.86 (11.10)	N/A	N/A	N/A	N/A
On-ramp from 150th Avenue SE	19.02 (11.82)	1324	2827	D	F
Off-ramp to W Lake Sammamish Parkway	21.40 (13.30)	273	1265	B	F
On-ramp from W Lake Sammamish Parkway	22.61 (14.05)	306	524	B	F
Off-ramp to SR 900	24.91 (15.48)	1600	3110	E	F
On-ramp from SR 900	25.78 (16.02)	220	480	A	C
Off-ramp to Front Street	27.11 (16.85)	1908	4821	F	F
On-ramp from Front Street -228th Avenue SE	27.92 (17.35)	638	948	B	E
On-ramp from E Sunset Way	29.32 (18.22)	130	188	A	A
Off-ramp to High Point Road/SE 270th Avenue	32.13 (19.97)	88	147	A	B
On-ramp from High Point Road/SE 270th Ave.	32.90 (20.45)	20	24	B	C
Off-ramp to Preston Fall City Road	35.75 (22.22)	349	819	C	F
On-ramp from Preston Fall City Road	36.51 (22.69)	157	253	A	A
Off-ramp to SR 18	40.82 (25.37)	170	306	A	B
On-ramp from SR 18	41.67 (25.90)	830	864	C	D
Off-ramp to SE North Bend Way	43.67 (27.14)	416	753	B	C
Off-ramp to SR 202	48.66 (30.24)	442	483	D	F
On-ramp from SR 202	49.40 (30.70)	280	426	B	E
Off-ramp to 436th Avenue SE	51.87 (32.24)	186	695	C	F
On-ramp from 436th Avenue SE	52.68 (32.74)	72	85	B	B

* Metered Ramp

TABLE 35
I-90 Westbound Ramps LOS (2015)

Location	MP	Volume		LOS	
		AM	PM	AM	PM
Off-ramp to Rainier Avenue S	5.62 (3.49)	1085	596	E	D
On-ramp from W Mercer Way *	9.49 (5.90)	667	206	F	E
On-ramp from 76th Avenue SE *	10.54 (6.55)	538	555	F	F
Off-ramp to Island Crest Highway	11.89 (7.39)	930	1120	F	F
On-ramp from E Mercer Way *	13.19 (8.20)	N/A	N/A	N/A	N/A
Off-ramp to E Mercer Way	13.79 (8.57)	581	921	A	B
On-ramp from Bellevue Way SE *	14.53 (9.03)	767	922	B	E
On-ramp from I-405	15.04 (9.35)	N/A	N/A	N/A	N/A
On-ramp from Richards Road	15.96 (9.92)	1332	1596	F	E
Off-ramp to NB I-405	16.64(10.34)	2202	2156	F	F
Off-ramp to SB I-405	16.33(10.15)	2464	2304	F	F
On-ramp from 148th Avenue SE	17.75 (11.03)	N/A	N/A	N/A	N/A
Off-ramp to 161st Avenue SE	19.97 (12.41)	N/A	N/A	N/A	N/A
Off-ramp to W Lake Sammamish Parkway	22.51 (13.99)	717	428	F	B
On-ramp from W Lake Sammamish Parkway *	21.59 (13.42)	540	214	E	B
On-ramp from SR 900 *	25.21 (15.67)	3013	1887	F	E
Off-ramp to SR 900	26.03 (16.18)	339	222	F	D
On-ramp from Front Street *	27.10 (16.84)	2072	1058	F	C
Off-ramp to Front Street	28.03 (17.42)	656	692	C	B
Off-ramp to E Sunset Way	29.54 (18.36)	115	194	D	C
On-ramp from High Point Road-SE 270th Avenue	32.37 (20.12)	78	91	B	B
Off-ramp to High Point Road-SE 270th Avenue	33.02 (20.52)	15	23	B	A
On-ramp from Preston Fall City Road	36.06 (22.41)	922	493	D	C
Off-ramp to Preston Fall City Road	36.62 (22.76)	196	202	C	C
On-ramp from SR 18	40.77 (25.34)	486	374	B	B
Off-ramp to SR 18	41.79 (25.97)	722	1063	C	D
On-ramp from SE North Bend Way	43.65 (27.13)	709	438	C	C
On-ramp from SR 202	48.90 (30.39)	444	529	B	B
Off-ramp to SR 202	49.73 (30.91)	242	341	B	B
On-ramp from 436th Avenue SE	52.12 (32.39)	926	267	C	B
Off-ramp to 436th Avenue SE	52.89 (32.87)	63	85	B	B

* Metered Ramp

South Central Region

In the South Central Region future traffic volumes were projected by using a 2.7% compounded annual growth rate (provided by WSDOT's Service Center Planning Department). In looking at the existing and 2015 traffic volumes for the highway, it was found that if no improvements are made the eastbound section of I-90 between Cabin Creek Rd. and Bullfrog Road and the westbound section of I-90 between Coal Creek and Cabin Creek Road will experience low levels of service (D-E) in the AM and PM peak hours. Therefore, this plan recommends that the highway be widened to 6 lanes-3 lanes each direction-from Hyak KP 88.77 (MP 55.17) to Elk Heights KP 150.63 (MP 93.62) by the year 2015. The existing roadway will be unable to accommodate future traffic demands without major reconstruction to provide additional lanes. Tables 36-39 display the projected eastbound and westbound mainline and ramps traffic conditions for the year 2015 respectively.

TABLE 36
I-90 Eastbound Mainline LOS (2015)

Location	KP (MP)	Volume		LOS No-Build		LOS 6-Lane	
		AM	PM	AM	PM	AM	PM
11-a. Edgewick Rd. to Coal Creek	52.89-88.77 (32.87-55.17)	N/A	N/A	N/A	N/A	N/A	N/A
11-b.Coal Creek to Cabin Creek Rd.	88.78-103.33 (55.18-64.22)	1925	2110	C	C	B	B
12. Cabin Creek Rd. to East Nelson Rd.	103.35-124.95 (64.23-77.66)	1961	2111	C	D	B	B
13. East Nelson Rd. to Bullfrog Rd.	124.97-129.78 (77.67-80.66)	2005	2140	C	D	B	C
14. Bullfrog Rd. to Leave City Cle Elum	129.80-135.98 (80.67-84.51)	1892	2009	C	C	B	B
15. Leave City Cle Elum to Thorp HWY	135.99-163.28 (84.52-101.48)	1472	1572	C	C	B	B

TABLE 37
I-90 Westbound Mainline LOS (2015)

Location	KP (MP)	Volume		LOS No-Build		LOS 6-Lane	
		AM	PM	AM	PM	AM	PM
11-a. Edgewick Rd. to Coal Creek	52.89-88.77 (32.87-55.17)	N/A	N/A	N/A	N/A	N/A	N/A
11-b.Coal Creek to Cabin Creek Rd.	88.78-103.33 (55.18-64.22)	1456	1770	D	E	B	C
12. Cabin Creek Rd. to East Nelson Rd.	103.35-124.95 (64.23-77.66)	1479	1824	C	C	B	B
13. East Nelson Rd. to Bullfrog Rd.	124.97-129.78 (77.67-80.66)	1531	1898	C	C	B	B
14. Bullfrog Rd. to Leave City Cle Elum	129.80-135.98 (80.67-84.51)	1479	1717	C	C	B	B
15. Leave City Cle Elum to Thorp HWY	135.99-163.28 (84.52-101.48)	1251	1513	B	C	A	B

TABLE 38
I-90 Eastbound Ramps LOS (2015)

Location	KP (MP)	Volume		LOS No-Build		LOS 6-Lane	
		AM	PM	AM	PM	AM	PM
Off-ramp to Edgewick Rd.	55.24 (34.33)	314	354	C	D	N/A	N/A
On-ramp from Edgewick Rd.	56.17 (34.91)	215	249	B	C	N/A	N/A
Off-ramp to Stampede Road	100.95 (62.74)	73	111	E	F	C	C
On-ramp from Stampede Rd.	101.87 (63.31)	59	68	F	F	D	D
Off-ramp to West Easton Rd.	112.63 (70.00)	109	138	F	F	C	C
On-ramp from West Easton Rd.	113.92 (70.80)	81	82	F	F	C	C
Off-ramp to East Easton Rd.	114.75 (71.32)	34	38	C	C	C	C
On-ramp from East Easton Rd.	115.90 (72.03)	98	100	D	D	B	B
Off-ramp to East Nelson Siding Rd.	125.28 (77.86)	50	113	D	D	C	C
On-ramp from East Nelson Siding Rd.	126.24 (78.46)	70	118	D	D	B	B
Off-ramp to Bullfrog Rd.	128.82 (80.06)	179	222	D	D	C	C
On-ramp from Bullfrog Rd.	129.80 (80.67)	66	91	D	D	B	B
Off-ramp to West First Rd.	133.14 (82.75)	395	456	D	D	C	C
On-ramp from Oakes Avenue	136.14 (84.61)	75	82	D	D	B	B
Off-ramp to SR 970	137.81 (85.65)	263	267	C	C	B	C
On-ramp from SR 970	138.66 (86.18)	163	206	C	C	B	B
Off-ramp to Thorp Highway	162.33 (100.89)	48	86	B	C	N/A	N/A
On-ramp from Thorp Highway	163.28 (101.48)	54	97	C	C	N/A	N/A

TABLE 39
I-90 Westbound Ramps LOS (2015)

Location	KP (MP)	Volume		LOS No-Build		LOS 6-Lane	
		AM	PM	AM	PM	AM	PM
On-ramp from Edgewick Rd.	55.48 (34.48)	276	226	B	B	N/A	N/A
Off-ramp to Edgewick Rd.	56.32 (35.00)	126	164	B	B	N/A	N/A
Off-ramp to Stampede Rd.	101.72 (63.22)	41	45	C	D	C	D
On-ramp from Stampede Rd.	100.58 (62.51)	50	66	E	F	C	C
Off-ramp to West Easton Rd.	113.64 (70.63)	70	95	E	F	C	D
On-ramp from West Easton Rd.	112.26 (69.77)	81	97	E	F	C	C
Off-ramp to East Easton Rd.	115.45 (71.75)	64	93	C	C	B	B
On-ramp from East Easton Rd.	114.69 (71.28)	27	39	B	C	A	A
Off-ramp to East Nelson Siding Rd.	125.97 (78.29)	102	125	C	D	B	C
On-ramp from East Nelson Siding Rd.	124.97 (77.67)	38	43	A	C	B	B
Off-ramp to Bullfrog Rd.	129.65 (80.58)	72	100	C	C	B	C
On-ramp from Bullfrog Rd.	128.58 (79.91)	123	181	C	D	B	B
Off-ramp to West First Street	135.77 (84.38)	66	82	C	C	B	B
On-ramp from Oakes Avenue	133.56 (83.01)	277	345	C	D	B	B
Off-ramp to SR 970	138.47 (86.06)	30	41	C	C	B	B
On-ramp from SR 970	137.54 (85.48)	45	43	C	C	B	B
Off-ramp to Thorp Highway	162.93 (101.26)	113	159	C	C	N/A	N/A
On-ramp from Thorp Highway	161.96 (100.66)	82	111	C	C	N/A	N/A

Future Land Use

King County

King County's total population is expected to grow from its 1990 population of 1,507,300 to 1,833,000 by 2010, an increase of 22 percent. This population increase means an additional 195,000 new households and 350,000 new jobs over the next 20 years.[39]

The King County Comprehensive Plan emphasizes the importance of growth within the designated Urban Growth Areas (UGA) and protection of the rural lands. A low growth rate is desired for rural areas to ensure that rural character is maintained. The UGA will help to concentrate growth into specific areas and therefore limit urban sprawl, enhance open space, protect rural areas and more efficiently use human services, transportation and utilities.

The Mountains to Sound Greenway Trust is working with cities, counties and towns along I-90 to add landscape buffers and develop away from the Interstate so the motorist can not see the structures and advertisements from the highway. The Mountains to Sound Greenway

Trust's purpose is to preserve and enhance the scenic and cultural values of the Interstate 90 Corridor between Puget Sound and Elk Heights.

King County will focus on developing linked regional open space corridors of greenways and waterways along the major river systems, shorelines and the Mountain-to-Sound Greenway.[40]

Kittitas County

Kittitas County is encouraging economic growth and broader employment opportunities. They are directing the growth and development to those areas where land capability, public roads and services can support such growth. Kittitas County's goal is to protect arterial routes from random business zoning or development by limiting the location and number of highway oriented business districts.[41] The Kittitas County Comprehensive Plan has listed the following I-90 exits as unsuitable business sites:[42]

East Nelson - Exit 78
West Nelson - Exit 74
Lake Kachess/Cabin Creek - Exit 63
Stampede Pass/Lake Kachess - Exit 62
Bullfrog - Exit 81

Kittitas County has recognized the need for the development of a year-round recreational community at the Snoqualmie Pass area. A few of the recommended policies are as follows:[43]

- "Landscape management and restoration should be a primary concern in all future land development.
- "Protection of valuable scenic and wildland resources should be an integral part of the total land use plan."
- "Land development and building construction should be fitted to maintain and enhance the alpine character of the area."
- "Whenever possible auto-oriented businesses should be separated from pedestrian-oriented shopping and recreation areas. This can best be achieved by confining auto services to areas near freeway exits and approaches."
- "The likelihood of view obstruction problems should be a matter for concern in developing a zoning plan."

Design Alternatives Considered in Developing the Plan and Recommended Design Alternatives

Northwest Region

There are three identified highway design alternatives:
1. No Build
2. Ramp Meters and HOV bypass lanes on the on-ramps
3. Adding more lanes

Alternative 1 would result in the greatest amount of congestion. Presently the LOS is "F" in the AM peak hours on the westbound mainline from SR-900 to Rainier Avenue South. Due to the traffic growth projected the congestion level of the Interstate will increase. This alternative includes only currently programmed projects with no further improvements made.

Alternative 2 would add capacity to the highway, but would cause delay for the SOVs trying to access the highway during peak periods. The mainline traffic would be able to flow faster due to the spacing on entering traffic created by the ramp metering. This on-ramp delay will encourage the peak time motorists who want to travel a short distance to use the city and county roads, thus reducing the highway traffic volumes.

Alternative 3 would increase the capacity of the highway, however there is a point at which adding more lanes is no longer a solution to the diminishing level of service for a number of reasons . At least two things can start to happen at higher traffic densities. The first is that the major connecting roads are filled to capacity and the traffic in the new lanes has nowhere to go. For I-90 this would be true of both I-5 and I-405 for much of the peak periods. The second factor involves latent demand. When the entire system is experiencing poor levels of service, new capacity will result in both the shift of traffic from parallel facilities and the creation of trips that would not otherwise have been made. This results in a rapid loss of improved level of service. It means that improvements must either be made system wide or other alternatives considered.

The above phenomena have resulted in the regional policy makers concluding that the problem of congestion cannot be solved solely by providing vehicular capacity. To do so would mean committing more and more land to roads and parking as urban core areas become denser. Instead, capacity for vehicles is to be restrained for general purpose vehicles, while capacity for HOVs is enhanced.

Vision 2020, the regional transportation plan and development strategy proposes multiple centers of development (cities) that would concentrate jobs and encourage HOVs during the peak commute periods.

Recommended Alternative

The projected 2015 level of service indicates a need for additional person carrying capacity on I-90. If approved by the voters that capacity could come in the form of a regional rail system. While a rail system would provide additional capacity, it is not forecast to reduce congestion on the highway. Instead, congestion is expected to become a fact of life for the foreseeable future, providing an incentive for mode shift. Meanwhile, Alternate 2 is recommended as the best alternate from the three proposed. Ramp Meters and HOV bypasses on the on-ramps will increase the capacity of the highway by allowing the mainline traffic to flow faster. A mode shift from a majority of single occupancy vehicles to high occupancy vehicles will be necessary for the most efficient use of available infrastructure. The incentives to mode-shift will be a time savings in the average commute and less expensive operating and parking costs for each individual user. Employers should participate in various transportation demand management strategies including not providing the extensive parking areas that are required for each single occupancy vehicle.

South Central Region

A Draft Route Feasibility Report on SR90, KP 88.85 (MP 55.22) to KP 178.60 (MP 111.00), was completed by WSDOT South Central Region Traffic Section in May of 1993. This study identifies a need for 10 lanes between Hyak and Cle Elum for the year 2020 but also claims that providing more than 6 lanes may not be practical due to cost, environmental impacts, and geometric constraints.

Two improvement concepts have been developed. Concept A would improve the horizontal alignment to a 110 km/h (70 mph) design speed where the realignment would not have significant impacts on surrounding forest lands. Concept B would improve both the horizontal and vertical alignments to a 110 km/h (70 mph) design speed, and as a result, impact 4 to 16 hectares (10 to 40 acres) of forest land. Both concepts include adding the following truck climbing lanes:

Eastbound, KP 141.40 to 143.86 (MP 87.88 to 89.41)
Eastbound, KP 145.73 to 148.88 (MP 90.57 to 92.53)
Westbound, KP 152.95 to 155.64 (MP 95.06 to 96.73)[44]

Based on this Draft Route Feasibility Report it is recommended that Interstate 90 be reconstructed to provide six lanes. The scope of the improvements should be determined during the design phase where a more in-depth analysis of existing conditions and impacts can be conducted. The construction impacts a total of 140 to 241 hectares (345 to 595 acres) of adjacent right of way. One of the most important issues to the Greenway involves where future widening will occur. This issue will not be resolved until an EIS is done on the specific projects or a programmatic EIS is used to make some system wide decisions. Issues involved include widening to the inside versus outside of the existing lanes and current alignment versus a new alignment for the additional lanes. Appendix C contains a copy of this draft preliminary study.

Changes in the Functional Classification and Level of Development

The functional classification and level of development should remain as Interstate and Design Standards, respectively.

Level of Access Control

The level of access control should remain full access control for this Interstate Highway.

Geometrical Recommendations

The Traffic Analysis recommends the addition of HOV bypass lanes and ramp meters on all on-ramps to KP 52.39 (MP 32.56). Recently HOV lane markers were added to an existing general purpose lane in the eastbound direction.

Shoulder widths should be updated, when possible, to current design standards. This will include widening existing structures in addition to roadway embankment widening. There are numerous locations along I-90 where widening should occur (please see the Shoulder Widths paragraph in the Existing Conditions (Section 3 of this report, pages 15-16).

Interchanges & Intersections, Channelization and Signalization Needs

Table 39 lists the intersections that are identified in the June 6, 1994, Regional Signal Priority List Report for future signalization and with their rank out of 277 total.

TABLE 40
Proposed Signal Locations

Intersection Location	KP (MP)	Rank*
SE 35TH PLACE AT EASTGATE WAY	15.80 (9.82)	186
EAST GATE WAY AT SHOPPING CENTER	18.63 (11.58)	53
WB RAMP W LAKE SAMMAMISH PARKWAY	22.11 (13.74)	94
EB ON/OFF RAMPS AT SR 18	41.27 (25.65)	255
WB ON/OFF RAMPS AT SR 18	41.32 (25.68)	108
EB ON/OFF RAMPS AT SR 202	49.20 (30.58)	221
WB ON/OFF RAMPS AT SR 202	49.22 (30.59)	254

* Priority ranking is updated regularly. Rankings often change greatly, both upwards and downwards.

Pavement Life

The cement concrete pavement near Cle Elum, constructed in 1964, has outlived it's expected life of 20 years. Fifteen more years can be expected from this pavement due to the 1994 dowel bar retrofit contract on a 48 kilometer (30 mile) stretch of I-90 (KP 113.02/MP 70.24 to KP 164.91/MP 102.49) in the Cle Elum area and future preservation projects.[45]

Non-motorized Traffic Requirements

Interstate 90 is a designated bicycle touring route according to the 1993 State Systems Plan. The route starts as an exclusive multiple-use trail at 12th Avenue South and Sturgus Avenue South, goes through the Mt. Baker Tunnel in it's own tunnel section, crosses Lake Washington, Mercer Island, and Bellevue at Richard's Road. Local roads must then be used between Richards Road, where the traffic separated bike trail ends, and the Eastgate Interchange where shoulder usage of Interstate 90 is permitted eastward for the remainder of the study limits.

The Iron Horse State Park parallels Interstate 90, sometimes at quite a distance, from Rattlesnake Lake just southeast of North Bend to State Route 10. This linear state park follows the old abandoned Chicago Milwaukee St. Paul and Pacific railroad bed. This unpaved trail is also called the John Wayne Trail. Because it is unpaved it is only suitable for some non-motorized uses.

When the railroad was abandoned all ties and rails were salvaged. In the process the girders and decking where removed from two of the trestles, all that remains is the piers. A flash flood washed out one mid span support on a third trestle at Hall Creek east of North Bend near Twin Falls State Park. Efforts are being made to obtain funding to reconstruct all three trestles at a combined estimated cost of $1.8 million in January 1994 dollars.

It is recommended that the east end of the existing trail at Richards Road be connected to the west end of the Iron Horse Trail near North Bend. It is also recommended that a portion of the roadway section of the Iron Horse Trail be paved for its entire length.

Weigh Stations

A weigh station exists at the State Route 18 and I-90 Interchange (one facility serves both directions of traffic) and a pair of facilities are located west of Cle Elum at KP 127.98 (MP 79.54). These weigh stations only operate part-time. The Cle Elum facilities were in the 1994 Capital Construction Program to be upgraded to full geometric standards and full-time operations.

Rest Areas

There is a set public rest areas located at Indian John Hill, between Cle Elum and the Elk Heights Interchange at KP 143.36 (MP 89.10). The Indian John Rest Areas have recently been rehabilitated. New sewage lagoons and bathroom facility buildings were constructed at both sites in 1986.

There is also a public/private rest area called the "Traveler's Rest" at the Snoqualmie Pass. This facility contains a convenience store and restrooms. The building is owned by WSDOT, but operated and maintained by the tenant. The generated revenue (lease payments) is used to help fund other state transportation projects and offset highway maintenance costs. In recent years, the federal government has been increasingly lenient towards public/private partnership projects. Through using various types of arrangements between the state and businesses, more commercialized rest areas could be built along interstate highways in the future.

The WSDOT 1994 Statewide Systems Plan (Interim Final Plan) identifies a proposed rest area at Price Creek, KP 96.54 (MP 60.00). The Price Creek site is currently operating as a snow park area using the ramps intended for the rest area. The rest area has not been completed due to inadequate drainage at the site for a septic system and since potable water has not been obtained. After drilling two wells with no results the rest area plan was abandoned.

Other possible rest area sites are explained in Greenway Projects and Land Use, Volume 4, of this implementation plan.

Right of Way Required

Right of way will be required for the followings:

- additional lanes from Hyak to Easton
- HOV bypass lanes on on-ramps from SR-405 to North Bend

Additional right of way may also be necessary for the future rest area site.

Roadside Conditions and Development

The roadside conditions and development will be addressed in the Roadside Master Plan, Volume 3, of this implementation plan.

PUBLIC INVOLVEMENT

An agency scoping meeting was held on January 26th, 1994 at the WSDOT Northwest Region Office. People from WSDNR, City of Seattle, City of Bellevue, City of Issaquah, City of Snoqualmie, City of North Bend, USFS, Dept. of Wildlife & Fisheries, Snoqualmie Pass, City of Ellensburg, King County, Kittitas County and WSDOT South Central Region were invited. Everyone was asked to state their opinion or concerns during the meeting. The general concerns were about the locations of the wildlife corridors and how each one of them would be involved in the planning process. Involvement Questionnaires were sent out with the Scoping meeting minutes. These Questionnaires asked for specific information and contacts for further information on the various types of Greenway projects, like: trails, wildlife corridors, signs, trailheads, historical sites, scenic viewpoints and planting areas.

On May 17th, 1994, a public meeting was held on the east side in Ellensburg. Jerry Schutz presented an overview of the Route Development Plan process, Bob Josephson talked about funding, and Gayle Jovanovich talked about the scope of work for the study, the accomplishments to date, and the schedule. Officials from the WSDOT South Central Region were present to answer questions specific to their region.

Public announcements were released for both the Northwest Region and the South Central Region. Invitations were mailed out to everyone that was invited to the scoping meeting, everyone who was included on the MTSG mailing list, State Legislators from the legislative districts along I-90, and to everyone on the Mountains to Sound Greenway Board of Directors. Newspaper ads were issued twice in the Ellensburg Daily Record and the Cle Elum Newspaper. Flyers were handed out at two places at Snoqualmie Summit, one place at Easton, one place in Cle Elum and two places in Ellensburg. The meeting was held at the Best Western in Ellensburg.

A technical workshop was held at the North Bend Railroad Depot on March 7th, 1995. The Draft Route Development Plan (Volume 2) and Draft Roadside Master Plan (Volume 3) were presented and discussed at this workshop. Greenway issues and project ideas were gathered and included into the Greenway Projects and Land Use, Volume 4, of the Mountains to Sound Greenway Implementation Plan.

NOTES

1 Sverdrup & Parcel and Associates, Inc. and Hammond, Collier and Isaac, Advance Planning Study Interstate 90 Issaquah to North Bend, Washington State Highway Commission Department of Highways and US Department of Commerce Bureau of Public Roads, July 1966.

2 The Functional Classification defines appropriate purposes of various highways in providing service and influencing development. The state highway system is classified into 4 functional classes: Interstate, Principal Arterial, Minor Arterial and collector. WSDOT Planning, Research, and Public Transportation Division, 1990 State Highways System Level of Development Plan, Olympia, WA.

3 The Level of Development defines the type of improvements that are needed on each highway. The state highways are categorized into three improvement levels: Design Standards (this is the highest level), 3-R Standards (resurfacing, restoration, and rehabilitation), and Maintain Structural Integrity and Operational Safety. The most important highways should be designed to the highest level to provide the highest level of traffic service and operational safety and efficiency.
WSDOT Planning, Research, and Public Transportation Division, 1990 State Highways System Level of Development Plan, Olympia, WA.

4 WSDOT Design Manual 1420.02 (1)

5 Prater, Yvonne, Snoqualmie Pass : From Indian Trail to Interstate, Seattle: Mountaineers, c1981.

6 Ibid., p. 38.

7 Ibid., p. 44.

8 Ibid., p. 48.

9 Ibid., p. 48.

10 Ibid., p. 49.

11 Ibid., p. 49.

12 New Lacey V. Murrow Bridge named outstanding engineering achievement, Washington State Department of Transportation, All In One: District 1 Employee Newsletter, Feb./Mar. 1994, p. 5.

13 Prater, Yvonne, Snoqualmie Pass : From Indian Trail to Interstate, Seattle: Mountaineers, c1981.

14 Revised Code of Washington.

15 Chapter 231, Laws of 1991, Substitute House Bill 1452.

16 Highspeed Ground Transportation Steering Committee, High Speed Ground Transportation Study, Oct. 1992 pp.I-1.

17 Ibid.

18 Ibid

19 Highspeed Ground Transportation Steering Committee, A Project Newsletter, Nov. 1992 Final Edition.

[20] Ibid., P. 2.

[21] Ibid.

[22] Letter from King County Executive Gary Locke's office to Judd Kirk President Port Blakely Community, Issaquah dated May 19, 1994, signed by Charles N. Earl and Judd Kirk.

[23] Snoqualmie Ridge Parkway, Final Environmental Impact Statement, City of Snoqualmie, Sept. 1994.

[24] Ibid.

[25] WSDOT Design Manual, Figure 440-1a, March 1994. Independent alignment and grade is desirable in all rural areas and where terrain and development permits in urban areas.

[26] Ibid.

[27] WSDOT Design Manual, Figure 440-1a, March 1994.

[28] WSDOT TRIPS System, State Highway Log, May 19, 1994.

[29] WSDOT South Central Region, SR 90 Route Feasibility Report, May 1994.

[30] Washington State Department of Transportation, Design Manual, Sept. 1992.

[31] Washington State Department of Transportation; District 1 Bridge Deck List, March 8th, 1993.

[32] Traffic Analysis for Route Development Plan, Northwest Region Transportation Planning Office, July 21, 1994.

[33] Ibid.

[34] PSRC. Vision 2020 Update Progress Report, May 1994.

[35] PSRC Park-and-Ride Lot Inventory, Puget Sound Region, Sept. 1993.

[36] Bob Caldwell, WSDOT Northwest Region, Public Transportation Facility Planner.

[37] 1994 Review of HAL'S, HAM'S & HAC'S, WSDOT-Northwest Region.

[38] WSDOT, Planning, Research and Public Transportation Division, Washington State Highway Accident Report, Olympia, WA 1992. These reports report accident and fatal rates for different types of state facilities as statewide average. The averages used here are for Interstate Highways, in both urban and rural areas.

[39] King County Comprehensive Plan, Executive Proposed Plan, June 1994. The growth target assumptions for each community planning area are shown in the following table:

Land Use Growth Targets Summary Assumptions

Community Planning Areas in King County; includes both cities & unincorporated areas*	1990 Households	1990 Employment	2010 Households	2010 Employment
Green River Valley	33,199	114,000	49,300	147,600
Vashon Island	4,058	1,795	4,200	2,000
Snoqualmie	10,177	5,445	18,500	14,300
Shoreline	25,212	17,183	30,100	22,700
Enumclaw	6,066	4,418	8,800	5,200
Highline	57,986	91,495	73,100	119,100
Federal Way	38,950	29,544	60,600	44,900
Tahoma/Raven Heights	13,506	2,458	19,600	7,200
Northshore	36,852	28,929	47,000	38,500
Soos Creek	45,244	24,753	64,800	39,400
Bear Creek	5,596	5,263	11,500	7,300
East Sammamish	11,420	3,215	20,600	7,700
Newcastle	30,019	22,843	41,800	32,600
Seattle	248,890	488,855	308,900	635,500
Eastside cities	79,042	128,164	102,000	184,600
TOTALS	**646,217**	**968,360**	**860,800**	**1,308,600**

*Unincorporated King County's growth targets of 50,000 new households and 29,000 new jobs are included within the number shown.

40 Ibid.
41 Kittitas County Comprehensive Plan, 1993.
42 Kittitas County Comprehensive Plan, 1993, Page 20.
43 Ibid., Page 34.
44 SR 90 Preliminary Route Feasibility Report, WSDOT, May 1994.
45 Express, Washington State Department of Transportation, July 1994.

APPENDIX A

Traffic and Accident Report

Date: October 6, 1994

From: Pani Saleh/Raid Tirhi
Phone: 440-4721/440-4722

Subject: SR 90 CS 1798 (MP 0.00 to MP 101.48)
Traffic Analysis for Route Development Plan (RDP)

To: Jerry Schutz/Chris Picard, MS 123

This letter is in response to your request to prepare traffic data and accident analysis for the entire SR 90 length within the Northwest and the South Central Regions. The traffic data analysis includes existing (1993/1994) and design year (2015) volumes. Level of Service (LOS) calculations for selected ramps and all mainline segments within the milepost limits of the project for both A.M. and P.M. peak hour periods are also summarized. Accident analysis includes a listing of High Accident Locations (HAL), High Accident Corridor (HAC), and High Accident Mile (HAM), in addition to a summary history sorted by location, type, and date. Finally, accident rates are summarized.

TRAFFIC DATA ANALYSIS

A. <u>SR 90–Northwest Region, (MP 0.00–MP 33.29)</u>

II. Existing Traffic Conditions (1994)

Existing traffic volumes and Average Daily Traffic counts within the Northwest Region were collected by the Traffic Studies Group.

Mainline Peak Hour Truck percentages of total traffic (T%) obtained from the (1994) TRIPS data report used for LOS calculations is shown below:

TABLE 1

MP From–To	(T%)
0.00–10.33	2.9
10.34–16.83	3.1
16.84–25.00	17.6
25.01–33.29	14.4

The 1992 Annual Traffic Report and the 1993 Traffic Count Report provide a traffic summary history in terms of the Annual Average Daily Traffic (AADT) listed below:

TABLE 2

Mainline Location	MP	1990	1991	1992	1993
Before Ramp W Mercer Way	5.75	94,400 *	101,300	101,400*	105,092
After Ramp W Mercer Way	5.90	91,900 *	98,600	103,000*	109,043
After Ramp E Mercer Way	8.59	112,400*	120,600	122,800*	128,355
After Ramp SR 405	10.34	110,900*	119,000	111,400*	116,000
At PTR 825 (Traffic Recorder)	14.65	66,660 *	71,535	75,003 *	78,000 *
At PTR 826 (Traffic Recorder)	23.54	27,595 *	29,369 *	30,688 *	31,350
At SR 18 O'xing	25.69	25,300 *	28,200 *	29,700 *	31,000

* Based on actual counts

The existing (1994) Level of Service (LOS) at mainline locations and selected ramps for both eastbound and westbound directions within the Northwest Region are shown below. These were calculated using Highway Capacity Manual (HCM) methodology (Special Report 209) for Ramps and Basic Freeway Segments.

TABLE 3
I-90 (EB) Mainline (LOS) (1994)

Location	MP	AM	PM
1. I-5 to Rainier Avenue S	0.00–3.46	A	B
2. Rainier Avenue S to 76th Avenue SE	3.46–6.54	E	F
3. 76th Avenue SE to E Mercer Way	6.55–8.56	D	F
4. E Mercer Way to Richards Road (Weaving area)	8.57–10.33	C	D
5. Richards Road to SR 900 *	10.34–15.47	B	D
6. SR 900 to Front Street	15.48–16.83	A	C
7. Front Street to E Sunset Way	16.84–18.21	A	B
8. E Sunset Way to SR 18	18.22–25.00	A	A
9. SR 18 to SR 202	25.01–30.22	B	C
10. SR 202 to Edgewick Road	30.23–32.87	B	B

* assuming only 10 % of traffic uses HOV lane.

TABLE 4

I-90 (EB) Ramps (LOS) (1994)

Location	MP	AM	PM
On-ramp from Rainier Avenue S *	3.57	E	F
Off-ramp to W Mercer Way	5.90	D	F
Off-ramp to 77th Avenue SE	6.56	D	E
Off-ramp to Island Crest Highway	6.85	C	D
On-ramp from Island Crest Highway	7.52	D	F
Off-ramp to E Mercer Way	8.12	D	E
On-ramp from E Mercer Way *	8.44	F	E
Off-ramp to SB I 405	10.10	C	C
Off-ramp to NB I 405	10.10	N/A	N/A
On-ramp from SB I-405	10.10	N/A	N/A
On-ramp from NB I-405	10.10	N/A	N/A
Off-ramp to 150th Avenue SE	10.89	D	C
Off-ramp to 148th Avenue SE	11.10	N/A	N/A
On-ramp from 150th Avenue SE	11.82	B	E
Off-ramp to W Lake Sammamish Parkway	13.30	A	C
On-ramp from W Lake Sammamish Parkway	14.05	A	B
Off-ramp to SR 900	15.48	C	F
On-ramp from SR 900	16.02	A	B
Off-ramp to Front Street	16.85	B	D
On-ramp from Front Street -228th Avenue SE	17.35	A	A
On-ramp from E Sunset Way	18.22	A	A
Off-ramp to High Point Road/SE 270th Avenue	19.97	A	B
On-ramp from High Point Road/SE 270th Avenue	20.45	A	B
Off-ramp to Preston Fall City Road	22.22	A	C
On-ramp from Preston Fall City Road	22.69	A	A
Off-ramp to SR 18	25.37	A	A
On-ramp from SR 18	25.90	B	B
Off-ramp to SE North Bend Way	27.14	B	C
Off-ramp to SR 202	30.24	B	C
On-ramp from SR 202	30.70	A	B
Off-ramp to 436th Avenue SE	32.24	B	C
On-ramp from 436th Avenue SE	32.74	A	A

* Metered Ramp

TABLE 5
I-90 (WB) Mainline (LOS) (1994)

Location	MP	AM	PM
1. I-5 to Rainier Avenue S	0.00–3.46	D	C
2. Rainier Avenue S to 76th Avenue SE	3.46–6.54	F	E
3. 76th Avenue SE to E Mercer Way	6.55–8.56	F	C
4. E Mercer Way to Richards Road (Weaving area)	8.57–10.33	N/A	N/A
5. Richards Road to SR 900	10.34–15.47	F	B
6. SR 900 to Front Street	15.48–16.83	C	A
7. Front Street to E Sunset Way	16.84–18.21	B	A
8. E Sunset Way to SR 18	18.22–25.00	B	A
9. SR 18 to SR 202	25.01–30.22	A	A
10. SR 202 to Edgewick Road	30.23–32.87	A	A

TABLE 6
I-90 (WB) Ramps (LOS) (1994)

Location	MP	AM	PM
Off-ramp to Rainier Avenue S	3.49	C	C
On-ramp from W Mercer Way *	5.90	F	C
On-ramp from 76th Avenue SE *	6.55	F	D
Off-ramp to Island Crest Highway	7.39	F	D
On-ramp from E Mercer Way *	8.20	N/A	N/A
Off-ramp to E Mercer Way	8.57	A	B
On-ramp from Bellevue Way SE *	9.03	B	D
On-ramp from I-405	9.35	N/A	N/A
On-ramp from Richards Road	9.92	D	C
Off-ramp to NB I-405	10.34	C	C
Off-ramp to SB I-405	10.15	F	D
On-ramp from 148th Avenue SE	11.03	N/A	N/A
Off-ramp to 161st Avenue SE	12.41	N/A	N/A
Off-ramp to W Lake Sammamish Parkway	13.99	C	AA
On-ramp from W Lake Sammamish Parkway *	13.42	B	C
On-ramp from SR 900 *	15.67	F	A
Off-ramp to SR 900	16.18	C	A
On-ramp from Front Street *	16.84	B	A
Off-ramp to Front Street	17.42	B	B
Off-ramp to E Sunset Way	18.36	C	A
On-ramp from High Point Road-SE 270th Avenue	20.12	A	A
Off-ramp to High Point Road-SE 270th Avenue	20.52	A	B
On-ramp from Preston Fall City Road	22.41	C	B
Off-ramp to Preston Fall City Road	22.76	B	A
On-ramp from SR 18	25.34	A	A
Off-ramp to SR 18	25.97	B	C
On-ramp from SE North Bend Way	27.13	B	B
On-ramp from SR 202	30.39	A	B
Off-ramp to SR 202	30.91	A	A
On-ramp from 436th Avenue SE	32.39	B	A
Off-ramp to 436th Avenue SE	32.87	A	A

* Metered Ramp

II. Future Traffic Conditions

Compounded annual growth rates provided by the Puget Sound Regional Council (PSRC) were used to project future 2015 volumes. The following is a list of the growth rates used for both ramp and mainline LOS calculations:

TABLE 7
PSRC Growth Rates as of April, 1993

Location	Growth Rate (%)
Jct. Rainier Avenue S	1.09
Jct. West Mercer Street	1.09
Jct. E Mercer Way	1.22
Jct. Bellevue Way	1.01
Jct. I-405	2.25
Vic 160th Avenue SE	3.13
Newport Way\W Lake Sammamish Parkway	2.87
Jct. SR 900	2.15
Jct. Front Road	5.34
Jct. E Sunset Way	2.83
Jct. Preston-Fall City Road	2.36
Jct. SR 18	2.32
Jct. North Bend Way	2.19
Jct. 436th Avenue SE	2.85

This report assumes all eastbound and westbound on-ramps will be metered and treated with HOV bypass lanes for 2015 conditions. The following summarizes mainline and ramps LOS results:

TABLE 8
I-90 (EB) Mainline (LOS) (2015)

Location	MP	AM	PM
1. I-5 to Rainier Avenue S	0.00–3.46	A	C
2. Rainier Avenue S to 76th Avenue SE	3.46–6.54	F	F
3. 76th Avenue SE to E Mercer Way	6.55–8.56	F	F
4. E Mercer Way to Richards Road	8.57–10.33	E	F
5. Richards Road to SR 900 *	10.34–15.47	C	F
6. SR 900 to Front Street	15.48–16.83	C	F
7. Front Street to E Sunset Way	16.84–18.21	B	C
8. E Sunset Way to SR 18	18.22–25.00	A	B
9. SR 18 to SR 202	25.01–30.22	C	E
10. SR 202 to Edgewick Road	30.23–32.87	C	D

* assuming only 10 % of traffic uses HOV lane.

TABLE 9
I-90 (EB) Ramps (LOS) (2015)

Location	MP	AM	PM
On-ramp from Rainier Avenue S	3.57	F	F
Off-ramp to W Mercer Way	5.90	E	F
Off-ramp to 77th Avenue SE	6.56	F	F
Off-ramp to Island Crest Highway	6.85	E	E
On-ramp from Island Crest Highway	7.52	F	F
Off-ramp to E Mercer Way	8.12	F	F
On-ramp from E Mercer Way	8.44	F	F
Off-ramp to SB I-405	10.10	C	E
Off-ramp to NB I-405	10.10	N/A	N/A
On-ramp from SB I-405	10.10	N/A	N/A
On-ramp from NB I-405	10.10	N/A	N/A
Off-ramp to 150th Avenue SE	10.89	F	F
Off-ramp to 148th Avenue SE	11.10	N/A	N/A
On-ramp from 150th Avenue SE	11.82	D	F
Off-ramp to W Lake Sammamish Parkway/Newport Way	13.30	B	F
On-ramp from W Lake Sammamish Parkway/Newport Way	14.05	B	F
Off-ramp to SR 900	15.48	E	F
On-ramp from SR 900	16.02	A	C
Off-ramp to Front Street	16.85	F	F
On-ramp from Front Street -228th Avenue SE	17.35	B	E
On-ramp from E Sunset Way	18.22	A	A
Off-ramp to High Point Road/SE 270th Avenue	19.97	A	B
On-ramp from High Point Road/SE 270th Avenue	20.45	B	C
Off-ramp to Preston Fall City Road	22.22	C	F
On-ramp from Preston Fall City Road	22.69	A	A
Off-ramp to SR 18	25.37	A	B
On-ramp from SR 18	25.90	C	D
Off-ramp to SE North Bend Way	27.14	B	C
Off-ramp to SR 202	30.24	D	F
On-ramp from SR 202	30.70	B	E
Off-ramp to 436th Avenue SE	32.24	C	F
On-ramp from 436th Avenue SE	32.74	B	B

TABLE 10
I-90 (WB) Mainline (LOS) (2015)

Location		MP	AM	PM
1.	I-5 to Rainier Avenue S	0.00–3.46	F	D
2.	Rainier Avenue S to 76th Avenue SE	3.46–6.54	F	F
3.	76th Avenue SE to E Mercer Way	6.55–8.56	F	E
4.	E Mercer Way to Richards Road **(Weaving area)**	8.57–10.33	N/A	N/A
5.	Richards Road to SR 900	10.34–15.47	F	D
6.	SR 900 to Front Street	15.48–16.83	F	D
7.	Front Street to E Sunset Way	16.84–18.21	C	B
8.	E Sunset Way to SR 18	18.22–25.00	C	B
9.	SR 18 to SR 202	25.01–30.22	A	B
10.	SR 202 to Edgewick Road	30.23–32.87	A	B

TABLE 11
I-90 (WB) Ramps (LOS) (2015)

Ramp Location	MP	AM	PM
Off-ramp to Rainier Avenue S	3.49	E	D
On-ramp from W Mercer Way	5.90	F	E
On-ramp from 76th Avenue SE	6.55	F	F
Off-ramp to Island Crest Highway	7.39	F	F
On-ramp from E Mercer Way	8.20	N/A	N/A
Off-ramp to E Mercer Way	8.57	A	B
On-ramp from Bellevue Way SE	9.03	B	E
On-ramp from I-405	9.35	N/A	N/A
On-ramp from Richards Road	9.92	F	E
Off-ramp to NB I-405	10.34	F	F
Off-ramp to SB I-405	10.15	F	F
On-ramp from 148th Avenue SE	11.03	N/A	N/A
Off-ramp to 161st Avenue SE	12.41	N/A	N/A
Off-ramp to W Lake Sammamish Parkway	13.99	F	B
On-ramp from W Lake Sammamish Parkway	13.42	E	B
On-ramp from SR 900	15.67	F	E
Off-ramp to SR 900	16.18	F	D
On-ramp from Front Street	16.84	F	C
Off-ramp to Front Street	17.42	C	B
Off-ramp to E Sunset Way	18.36	D	C
On-ramp from High Point Road-SE 270th Avenue	20.12	B	B
Off-ramp to High Point Road-SE 270th Avenue	20.52	B	A
On-ramp from Preston Fall City Road	22.41	D	C
Off-ramp to Preston Fall City Road	22.76	C	C
On-ramp from SR 18	25.34	B	B
Off-ramp to SR 18	25.97	C	D
On-ramp from SE North Bend Way	27.13	C	C
On-ramp from SR 202	30.39	B	B
Off-ramp to SR 202	30.91	B	B
On-ramp from 436th Avenue SE	32.39	C	B
Off-ramp to 436th Avenue SE	32.87	B	B

Future Projects:

The following projects are listed in the 1994 Northwest Region Project Development Status Report:

- BELLEVUE ACCESS TRAIL STAGE 2 (MP 6.50–MP 6.50), WBS 936 PROJ TO REBUILD BICYCLE TUNNEL UNDER RAMP SR 405 TO I-90 PIN NO. 109046A, AD DATE 03-11-1996

- I-90/SR 405 TO ISSAQUAH (MP 10.00-MP 17.00), CONSTRUCT HOV LANES EB & WB, PIN NO. 109050C, AD DATE 10-02-2000

- NORTH BEND EB WEIGH STATION (MP 32.00-MP 33.00), PROJ TO CONSTRUCT NEW WEIGH STATION, PIN NO. 109075A, AD DATE 10-13-1997 (CANCELLED)

The following intersections are identified in the June 6, 1994, Northwest Region Signal Priority List Report for future signalization and rank out of 277 total:

TABLE 12

Intersection Location	MP	Rank
SE 35th Place at Eastgate Way	9.82	186
Eastgate Way at Shopping Center	11.58	53
WB Ramp W Lake Sammamish Parkway	13.74	94
EB On/Off-ramps at SR 18	25.65	255
WB On/Off-ramps at SR 18	25.68	108
EB On/Off-ramps at SR 202	30.58	221
WB On/Off-ramps at SR 202	30.59	254

B. SR 90–South Central Region (MP 33.30–MP 101.48)

The 1992 Annual Traffic Report and the 1993 Traffic Count Report provides a traffic summary history in terms of the Annual Average Daily Traffic (AADT) listed below:

TABLE 13

Mainline Location	MP	1990	1991	1992	1993
At PTR 39	33.56	21,900	23,559 *	24,954 *	26,637
At Edgewick Road O'xing	34.67	N/A	17,200 *	23,700 *	32,656
After Ramp Edgewick Road	35.00	N/A	19,500 *	26,300 *	24,000 *
After Ramp Garica Road	40.03	N/A	18,800 *	19,900 *	21,064
Before Ramp Tinkham Road	47.19	N/A	18,500 *	19,600	20,000
After Ramp Tinkham Road	47.98	21,400	22,700	20,000 *	24,079
Before Ramp SR 906	51.98	N/A	19,600 *	20,800	22,073
After Ramp SR 906	51.98	N/A	18,800 *	19,700	20,000
Before Ramp E Summit Road	52.61	21,100	22,400	23,500	24,000
Before Prive Creek Rest Area	61.34	N/A	N/A	22,200 *	23,000
Before Ramp W Easton Road	69.77	N/A	17,900	18,800	19,745
Before Ramp E Easton Road	71.28	15,600	17,100 *	18,000	21,000 *
Before Ramp W Nelson Road	73.64	14,800	15,700	19,500 *	20,000
After Ramp W Nelson Road	74.38	15,200	19,200	20,200	21,000
At E Nelson Road O'xing	78.06	N/A	17,900	18,800	19,745
After Ramp E Nelson Road	78.46	16,300 *	20,500 *	21,600	22,759
Before Weigh Station	79.42	16,300 *	20,500	21,600	22,759
After Ramp Bullfrog Road	80.67	14,700	17,600	20,200	21,000 *
At BO4 0 (Traffic Recorder)	82.70	N/A	N/A	20,213 *	21,000 *
Before Ramp Oakes Avenue	84.38	13,300	15,200	15,900	20,000 *
At PTR 6	85.06	16,179 *	17,241 *	18,121 *	18,000 *
After Ramp SR 970	86.18	12,600	13,400	17,100 *	21,000 *
After Ramp Elk Heights	94.02	16,600	17,700	16,200	17,273

* Based on actual counts

There are three Permanent Traffic Recorder (PTR) Locations within the South Central Region. Peak hour traffic volumes have been analyzed for the month of August, 1993. It is observed that the Weekend Peak Hour volumes are generally higher than the Weekday Peak Hour volumes on the mainline. Specific information about this matter are available upon request.

Based on the 1994 TRIPS data report, Peak Hour Truck percentage (T %) used for mainline LOS calculations is 15%. According to South Central Region office, T % for ramps were as follows:

- 5% for Exits: 71,74,78
- 10% for Exits: 34-70, 80, 84
- 15% for Exit: 85

The existing (1993) Level of Service (LOS) at mainline locations and selected ramps for both eastbound and westbound directions within the South Central Region are shown below:

TABLE 14
I-90 (EB) Mainline (LOS) (1993)

Location	MP	AM	PM
11. Edgewick Road to Cabin Creek Road	32.87-64.23	C	C
12. Cabin Creek Road to East Nelson Road	64.23-77.67	B	B
13. East Nelson Road to Bullfrog Road	77.67-80.67	B	B
14. Bullfrog Road to Leave City Cle Elum	80.67-84.52	B	B
15. Leave City Cle Elum to Thorp Highway	84.52-101.48	A	A

TABLE 15
I-90 (EB) Ramps (LOS) (1993)

Location	MP	AM	PM
Off-ramp to Edgewick Road	34.33	B	B
On-ramp from Edgewick Road	34.91	A	B
Off-ramp to Stampedo Road	62.74	C	C
On-ramp from Stampedo Road	63.31	C	C
Off-ramp to West Easton Road	70.00	C	D
On-ramp from West Easton Road	70.80	C	C
Off-ramp to East Easton Road	71.32	A	B
On-ramp from East Easton Road	72.03	B	C
Off-ramp to East Nelson Siding Road	77.86	A	B
On-ramp from East Nelson Siding Road	78.46	B	C
Off-ramp to Bullfrog Road	80.06	B	C
On-ramp from Bullfrog Road	80.67	B	B
Off-ramp to West First Street	82.75	C	C
On-ramp from Oakes Avenue	84.61	F	B
Off-ramp to SR 970	85.65	B	B
On-ramp from SR 970	86.18	B	B
Off-ramp to Thorp Highway	100.89	A	A
On-ramp from Thorp Highway	101.48	A	B

TABLE 16
I-90 (WB) Mainline (LOS) (1993)

Location	MP	AM	PM
11. Edgewick Road to Cabin Creek Road	32.87-64.23	B	B
12. Cabin Creek Road to East Nelson Road	64.23-77.67	A	B
13. East Nelson Road to Bullfrog Road	77.67-80.67	A	B
14. Bullfrog Road to Leave City Cle Elum	80.67-84.52	A	B
15. Leave City Cle Elum to Thorp Highway	84.52-101.48	A	A

TABLE 17
I-90 (WB) Ramps (LOS) (1993)

Location	MP	AM	PM
On-ramp from Edgewick Road	34.48	A	A
Off-ramp to Edgewick Road	35.00	A	A
Off-ramp to Stampedo Road	63.22	B	B
On-ramp from Stampedo Road	62.51	B	C
Off-ramp to West Easton Road	70.63	B	C
On-ramp from West Easton Road	69.77	B	C
Off-ramp to East Easton Road	71.75	A	B
On-ramp from East Easton Road	71.28	A	A
Off-ramp to East Nelson Siding Road	78.29	B	B
On-ramp from East Nelson Siding Road	77.67	A	B
Off-ramp to Bullfrog Road	80.58	A	B
On-ramp from Bullfrog Road	79.91	A	B
Off-ramp to West First Street	84.38	A	A
On-ramp from Oakes Avenue	83.01	B	C
Off-ramp to SR 970	86.06	B	B
On-ramp from SR 970	85.48	B	B
Off-ramp to Thorp Highway	101.26	B	B
On-ramp from Thorp Highway	100.66	A	B

II. Future Traffic Conditions

Compounded annual growth rates provided by South Central Region were used to project future 2015 volume. These rates are 2.68 % for ramps and 5 % for mainline. Based on these growth rates, LOS results are summarized in the following tables:

TABLE 18
I-90 (EB) Mainline (LOS) (2015)

Location	MP	AM	PM
11. Edgewick Road to Cabin Creek Road	32.87-64.23	F	F
12. Cabin Creek Road to East Nelson Road	64.23-77.67	F	F
13. East Nelson Road to Bullfrog Road	77.67-80.67	F	F
14. Bullfrog Road to Leave City Cle Elum	80.67-84.52	F	F
15. Leave City Cle Elum to Thorp Highway	84.52-101.48	D	E

TABLE 19
I-90 (EB) Ramps (LOS) (2015)

Location	MP	AM	PM
Off-ramp to Edgewick Road	34.33	C	D
On-ramp from Edgewick Road	34.91	B	C
Off-ramp to Stampedo Road	62.74	F	F
On-ramp from Stampedo Road	63.31	F	F
Off-ramp to West Easton Road	70.00	F	F
On-ramp from West Easton Road	70.80	F	F
Off-ramp to East Easton Road	71.32	F	F
On-ramp from East Easton Road	72.03	F	F
Off-ramp to East Nelson Siding Road	77.86	F	F
On-ramp from East Nelson Siding Road	78.46	F	F
Off-ramp to Bullfrog Road	80.06	F	F
On-ramp from Bullfrog Road	80.67	F	F
Off-ramp to West First Street	82.75	F	F
On-ramp from Oakes Avenue	84.61	B	F
Off-ramp to SR 970	85.65	F	F
On-ramp from SR 970	86.18	E	F
Off-ramp to Thorp Highway	100.89	D	E
On-ramp from Thorp Highway	101.48	E	E

TABLE 20
I-90 (WB) Mainline (LOS) (2015)

Location	MP	AM	PM
11. Edgewick Road to Cabin Creek Road	32.87-64.23	F	E
12. Cabin Creek Road to East Nelson Road	64.23-77.67	D	F
13. East Nelson Road to Bullfrog Road	77.67-80.67	E	F
14. Bullfrog Road to Leave City Cle Elum	80.67-84.52	D	F
15. Leave City Cle Elum to Thorp Highway	84.52-101.48	D	E

TABLE 21
I-90 (WB) Ramps (LOS) (2015)

Location	MP	AM	PM
On-ramp from Edgewick Road	34.48	B	B
Off-ramp to Edgewick Road	35.00	B	B
Off-ramp to Stampedo Road	63.22	F	F
On-ramp from Stampedo Road	62.51	F	F
Off-ramp to West Easton Road	70.63	F	F
On-ramp from West Easton Road	69.77	F	F
Off-ramp to East Easton Road	71.75	E	F
On-ramp from East Easton Road	71.28	D	F
Off-ramp to East Nelson Siding Road	78.29	E	F
On-ramp from East Nelson Siding Road	77.67	D	F
Off-ramp to Bullfrog Road	80.58	E	F
On-ramp from Bullfrog Road	79.91	E	F
Off-ramp to West First Street	84.38	D	E
On-ramp from Oakes Avenue	83.01	E	F
Off-ramp to SR 970	86.06	D	E
On-ramp from SR 970	85.48	D	F
Off-ramp to Thorp Highway	101.26	D	F
On-ramp from Thorp Highway	100.66	D	E

ACCIDENT ANALYSIS

A. SR 90–Northwest Region Limits (MP 0.00–MP 33.29)

I. HAL, HAM, HAC Locations

The following is a summary of the 1994 WSDOT High Accident Locations (HAL), High Accident Miles (HAM), and High Accident Corridor (HAC) Report. The time period of the analysis was: January 1, 1991 to December 31, 1992 for all HAL locations, and January 1, 1988 to December 31, 1992 for all HAM and HAC locations.

TABLE 23

I-90 (HAL Locations)	**MP (From–To)**
1. Westbound, SR 405 I/C Vic.	9.80-10.10
2. Eastbound, SR 405/Richards Road I/C Vic.	9.92-10.30
3. Westbound, SR 405/Richards Road I/C Vic.	10.13-10.25
4. Eastbound , SR 900 Off-Ramp Vic.	15.70-15.82
5. Westbound, SR 900 I/C Vic.	15.67-15.88
6. Eastbound, Front Street I/C Vic.	17.05-17.15
I-90 (HAM Locations)	
Issaquah Creek Bridge vicinity	(18.50-19.50)
I-90 (HAC Locations)	
Issaquah Creek Bridge to SR 202	(21.50-31.00)

The first HAL location had a total of 30 accidents (11 injuries, no fatalities) including 50 percent rearend accidents primarily due to exceeding safe speeds and following too closely.

The second HAL location had a total of 36 accidents (12 injuries, no fatalities), Including 12 (33 percent) rearend, and 11 (31 percent) fixed object. Exceeding the safe speed is a primary cause for this location. The I-90/ I-405 interchange ramps accounted for 18 accidents (50 percent of the total accidents), 10 of these accidents involved hitting fixed objects on the ramp horizontal curves.

The third HAL location had a total of 25 accidents (9 injuries, no fatalities) including 60 percent rearend accidents, and 24 percent fixed object. The primary cause was exceeding safe speeds and following too closely. During rush hours, traffic from I-405 often backs up onto the westbound I-90 Off-ramp which has caused a total of nine accidents.

The fourth HAL location had a total of 20 accidents (nine injuries, no fatalities) including 60 percent rearend accidents. A total of eight accidents occurred on the ramps and 12 on the mainline.

The fifth HAL location had a total of 13 accidents (seven injuries, one fatality) including five rearend accidents, three overturn accidents caused by drivers under the influence of drugs, and four accidents of different types primarily caused by drivers failing to yield the right of way.

The sixth HAL location had a total of 16 accidents (eight injuries, no fatalities) including 44 percent rearend accidents and 25 percent left-turn opposite direction accidents. The current alignment and signing for the Front Street Off-ramp should be changed to slow down right turning vehicles. Also, the Southbound Front Street to Eastbound I-90 left turn pocket needs a protected phase due to the heavy opposing traffic.

Issaquah Creek Bridge vicinity (18.50–19.50) is the only location in the study area that is identified in the 1994 High Accident Miles (HAM'S) Report. This location had a total of 25 accidents (ten injuries, no fatalities) the primary cause of these accidents was exceeding safe speeds and due to icy or snowy surface conditions.

Issaquah Creek Bridge to SR 202 (21.50–31.00) is the only location in the study area that is identified in the 1994 High Accident Corridor (HAC) Report. A total of 397 (168 injuries, five fatalities) accidents occurred within the subject mileposts for the time period January 1, 1988 to December 31, 1992.

II. Accidents by Type and Date

A listing of the total I-90 accidents within the project limits including mainline and ramps for the time period January 1, 1991 to December 31, 1992, are summarized in the following tables and charts:

TABLE 24
I-90 Mainline and Ramps Total Accidents

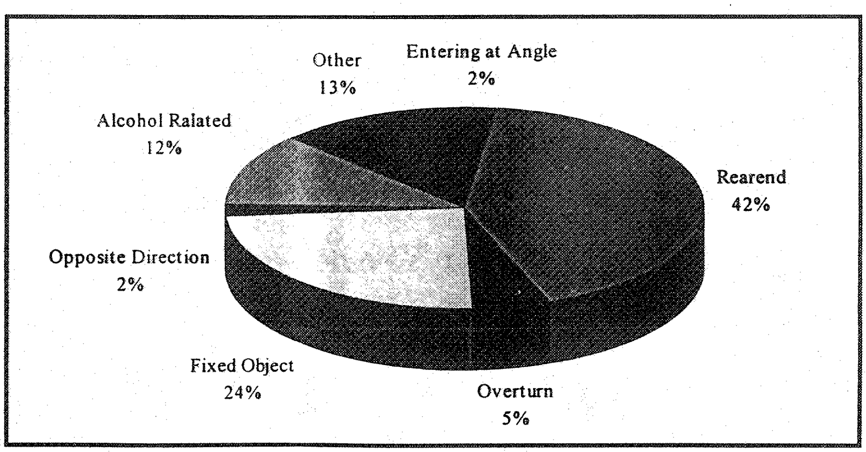
Type	Frequency	Percentage
Property Damage Only (PDO)	669	58%
Injury	481	42%
Fatality	4	0%
Total	**1154**	**100%**

As shown below, the majority of the accidents were rearend (42 percent) and fixed object (24 percent).

TABLE 25
I-90 Mainline and Ramps Accidents by type

Circumstances	Frequency	Percentage
Entering at Angle	27	2.3%
Rearend	483	41.9%
Overturn	62	5.4%
Fixed Object	279	24.1%
Opposite Direction	21	1.8%
Alcohol Related	137	11.9%
Other	145	12.6%
TOTAL	**1154**	**100%**

FIGURE 1
Accidents by Type
January 1, 1991–December 31, 1992



As shown from the following figures, accidents are mostly occurring in October on Wednesdays at 5:00 P.M., and the least number of accidents are occurring in May on Sundays at 4:00 A.M.

FIGURE 2
Accident Frequency by Month of Year
January 1, 1991–December 31, 1992

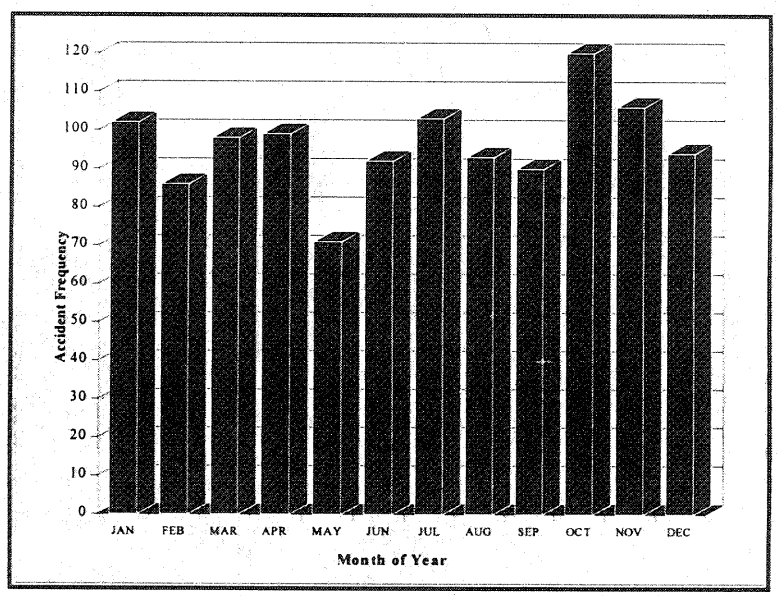


FIGURE 3
Accident Frequency by Day of Week
January 1, 1991–December 31, 1992

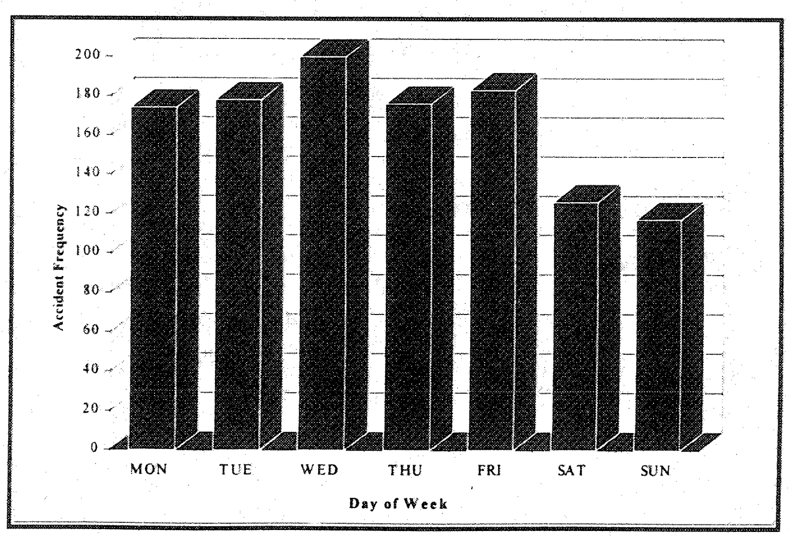
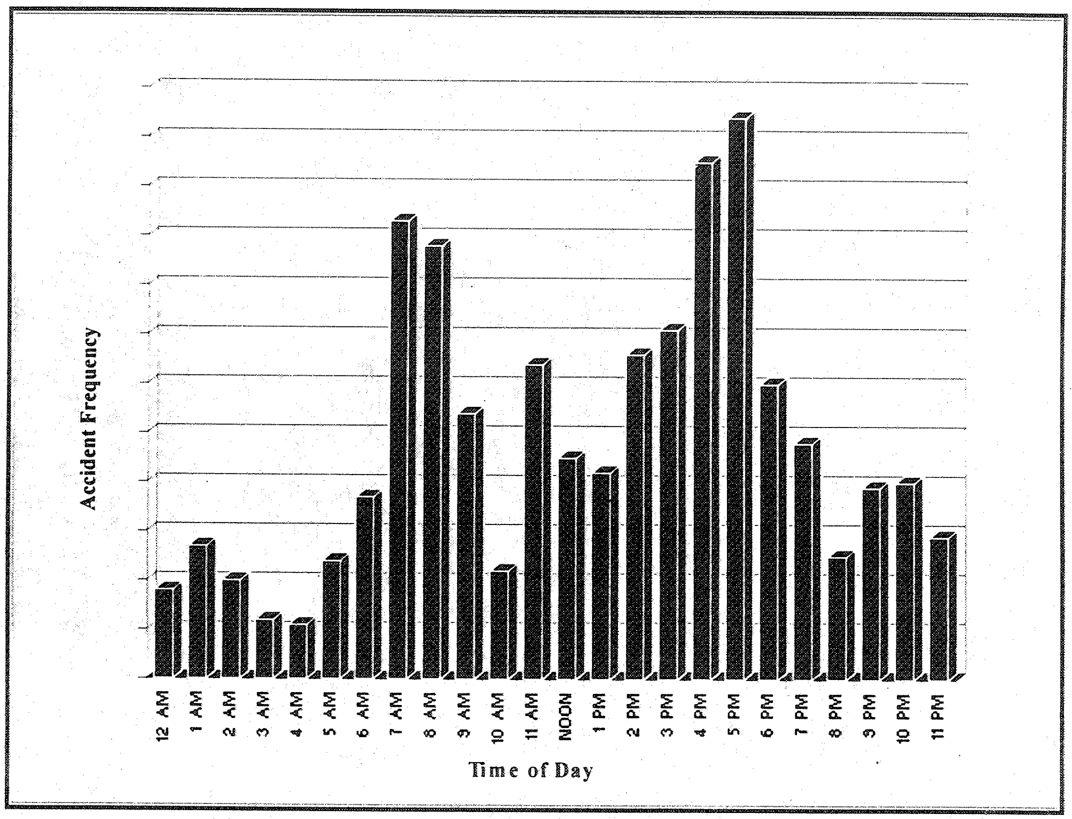


FIGURE 4
Accident Frequency by Time of Day
January 1, 1991–December 31, 1992



The figure above clearly shows how accidents are spread during the time of the day. The greatest number of accidents occur during the PM (4:00–5:00) and the AM (7:00–9:00) peak hours due to congested traffic conditions.

III. Accident Rates

The following table is a summary of the 1992 Washington State Highway Accident Report, (based on the average accident rates by functional class).

TABLE 26
1992 Highway Accident Report Summary

	NW Region State Routes	All Urban Interstates (U5)	All State Routes
Total Accidents	2,903	10,328	41,492
Total Accident Rate +	**1.20**	**1.26**	**1.67**
Fatal Accidents	45	25	293
Fatal Accidents Rate *	**1.90**	**0.31**	**1.18**

\+ Per Million Vehicle Miles of Travel
* Per 100 Million Vehicle Miles of Travel

$$\text{Accident Rate} = \frac{\text{(Number of Accidents)} \times \text{(1 Million)}}{\text{(Section Length**)} \times \text{(AADT)} \times \text{(365 Days)}}$$

$$\text{Fatal Accident Rate} = \frac{\text{(Number of Fatal Accidents)} \times \text{(100 Million)}}{\text{(Section Length**)} \times \text{(AADT)} \times \text{(365 Days)}}$$

** If the section length is less than one mile, it is excluded from the formula and the length is set equal to one mile.

Based on HAL, HAM, HAC Locations summery Table 23 and using the above formulas, the following tables has been constructed:

TABLE 27
SR 90 Accident Rates
For HAL Locations
January 1, 1992–December 31, 1992

MP (From-To)	Direction	Section Length (mile)	AADT	Total Accidents	Accident Rate	Fatal Accidents	Fatal Accidents Rate
9.80-10.10	WB	0.30	63,910	17	**0.73**	0	**0**
10.13-10.25	WB	0.12	58,450	11	**0.52**	0	**0**
15.67-15.88	WB	0.21	38,995	4	**0.28**	0	**0**
9.92-10.30	EB	0.38	52,260	18	**0.94**	0	**0**
15.70-15.82	EB	0.12	37,200	9	**0.66**	0	**0**
17.05-17.15	EB	0.10	23,980	6	**0.69**	0	**0**

TABLE 28
SR 90 Accident Rates
For HAM Locations
Jan. 1, 1992-December 31, 1992

MP (From-To)	Direction	Section Length (mile)	AADT	Total Accidents	Accident Rate	Fatal Accidents	Fatal Accidents Rate
18.50-19.50	EB & WB	1	15730	1	**0.17**	0	**0**

TABLE 29
SR 90 Accident Rates
For HAC Locations
Jan. 1, 1992-December 31, 1992

MP (From-To)	Direction	Section Length (mile)	AADT	Total Accidents	Accident Rate	Fatal Accidents	Fatal Accidents Rate
21.50-31.00	EB & WB	9.50	9880	64	**1.87**	1	**2.92**

It is clear that SR-90 within the Northwest Region has a lower accident rate than other District 1 State Routes. This is also lower than other urban interstates of similar class and than the average accident rate for all state routes. There is only one fatal accident at (MP 27.34). This accident has raised the Fatal Accident Rate to 2.92. The HAC Location mentioned above has higher accident and fatal accident rates than the average. It is important to note that all HAL Location section lengths analyzed were less than one mile long.

B. <u>SR 90–South Central Region Limits (MP 33.29–MP 100.00)</u>

The latest three year accident history report indicates that a total of 1,864 accidents occurred on I-90 between MP 33.29 and MP 100.00. The figure below shows that the total number of accidents has increased since 1992 at an average rate of 10 percent.

FIGURE 5
Accident Frequency by Year
April 1, 1991–March 31, 1994

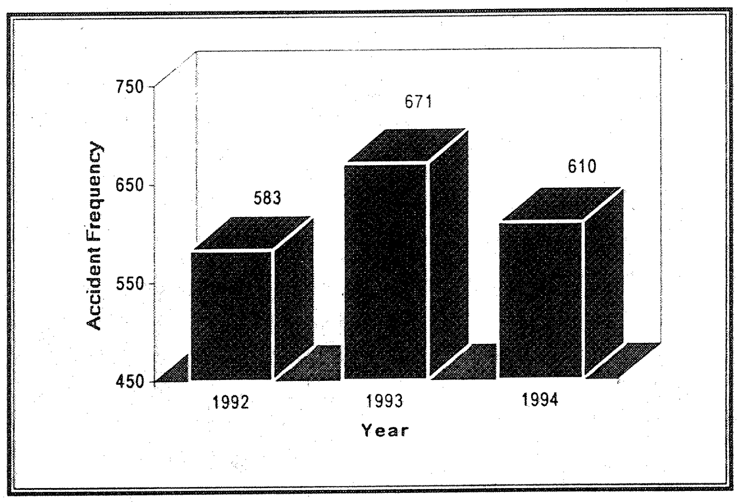
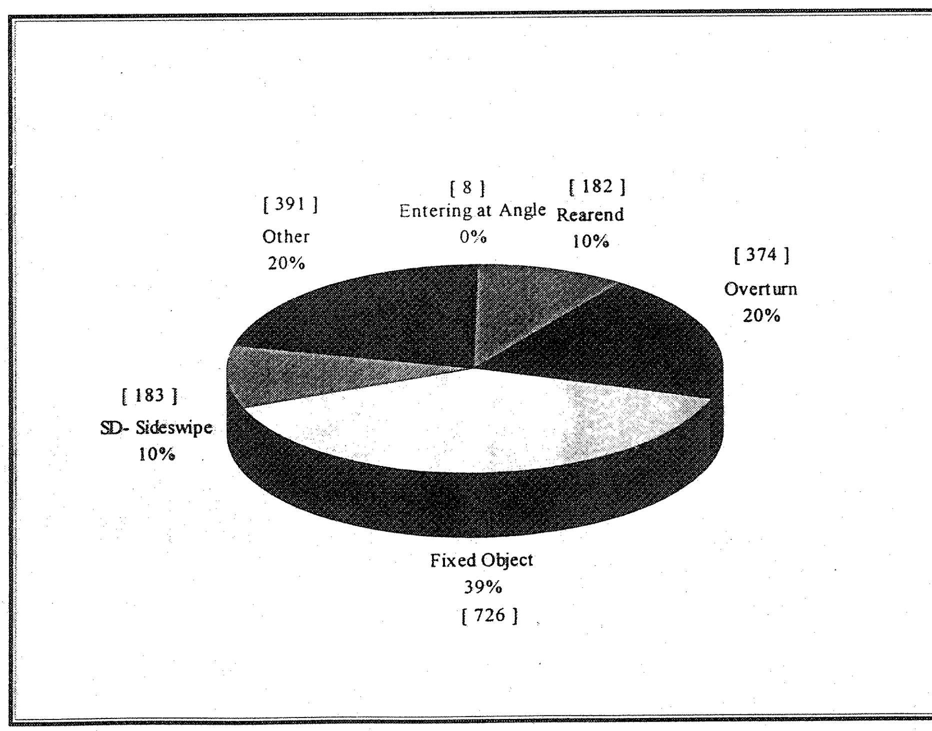


FIGURE 6
Accident Frequency by type
April 1, 1991–March 31, 1994



Off the 726 fixed object accidents the objects struck included: 243 concrete barriers, 223 guardrails, 63 parked vehicles, 41 tree or stump, 41 snow banks, 18 bridge rails, 16 luminaire poles, and 81 other objects.

The severity of the accidents is summarized in the figure below:

FIGURE 7
Accident Frequency by Severity
April 1, 1991–March 31, 1994

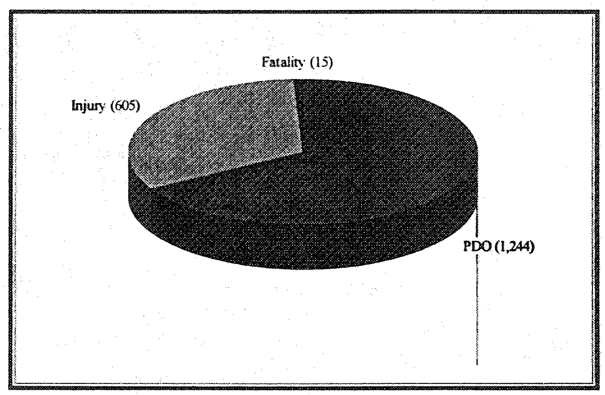
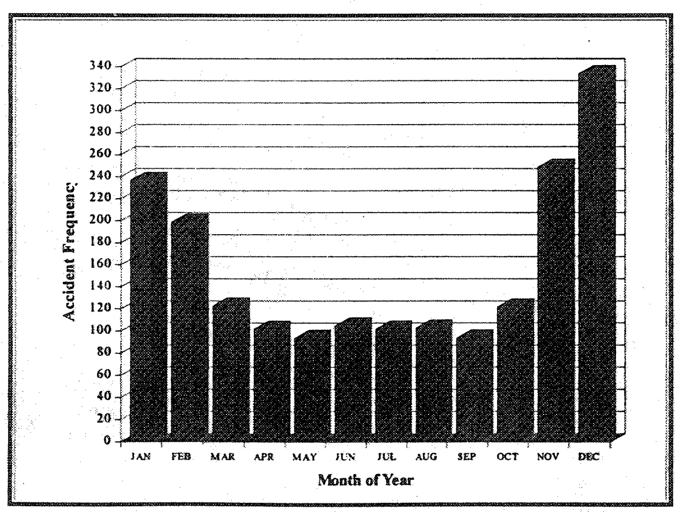


FIGURE 8
Accident Frequency by Month of Year
April 1, 1991–March 31, 1994



Taking the total number of accidents for the past three years and plotting it against the month of the year, the above figure shows that the maximum number of accidents has occurred in December. Accident frequency gradually drops between January and April, then it remains constant at an average of 34 accidents per month per year between the month of April and September. Finally Accident frequency gradually increases between the months of September and December when it reaches the maximum of 78 accidents per year in December.

Accident Rates

The following table is a summary of the 1992 Washington State Highway Accident Report, (based on the average accident rates by functional class).

TABLE 30
1992 Highway Accident Report Summary

	District 5 State Routes	All Urban Interstates (U5)	All State Routes
Total Accidents	21,164	10,328	41,492
Total Accident Rate +	**1.90**	**1.26**	**1.67**
Fatal Accidents	81	25	293
Fatal Accidents Rate *	**0.70**	**0.31**	**1.18**

+ Per Million Vehicle Miles of Travel
* Per 100 Million Vehicle Miles of Travel

TABLE 31
SR 90 Accident Rates
Jan. 1, 1992-December 31, 1992

MP (From-To)	Direction	Section Length (mile)	AADT	Total Accidents	Accident Rate	Fatal Accidents	Fatal Accidents Rate
33.29 - 100.00	EB & WB	66.71	20,300	586	**1.19**	4	**0.81**

Conclusion and Recommendations

For the portion of SR 90 within the Northwest Region for 2015 condition, we recommend the provisions mentioned in future projects section. In the year 2015, all on-ramps are expected to be metered with HOV bypass treatment. This treatment will improve mainline LOS. At the same time, ramp LOS will drop. Highway Capacity Software does not account for this treatment, so the LOS will be better than shown in the mainline LOS tables and possibly worse than shown in the ramp LOS tables.

Based on our preliminary calculations for the portion of SR 90 within the South Central Region for 2015 condition, we recommend the provision of additional general purpose (GP) lane for both eastbound and westbound directions (MP 33.29 MP 84.52). This improvement will enhance mainline and ramps LOS from "F" to "E-D."

Please contact Pani or Raid for any questions. Thank you.

file: \I90RDPTA.DOC

APPENDIX B

Level of Service Definitions

(From Highway Capacity Manual, Special Report 209, 1985, Pages 3-8 to 3-10.)

II. METHODOLOGY

This section describes the general structure of the capacity analysis procedures for basic freeway segments. Detailed instructions for the application of these procedures in operational analysis, design, and planning are presented in a subsequent section.

LEVELS OF SERVICE

Measures of Effectiveness

Freeway operating characteristics include a wide range of rates of flow over which speed is relatively constant. This means that speed alone is not adequate as a performance measure by which to define levels of service.

Although speed is a major concern of drivers with respect to service quality, freedom to maneuver and proximity to other vehicles are equally important parameters. These other qualities are directly related to the *density* of the freeway traffic stream. Further, rate of flow increases with increasing density throughout the full range of stable flows (see Figure 3-3).

For these reasons, density is the parameter used to define levels of service for basic freeway segments. The densities used to define the various levels of service (LOS) are as follows:

Level of Service	*Density (pc/mi/ln)*
A	12
B	20
C	30
D	42
E	67

These values are boundary conditions representing the maximum allowable densities for the associated level of service. The LOS-E boundary of 67 pc/mi/ln has been generally found to be the *critical density* at which capacity most often occurs. This corresponds to an average travel speed of 30 mph and a capacity of 2,000 pcphpl for 60-mph and 70-mph design speeds. The exact speed and density, however, at which capacity occurs may vary somewhat from location to location.

Level-of-Service Criteria

Level-of-service criteria for basic freeway segments are given in Table 3-1 for 70-mph, 60-mph, and 50-mph design speed elements. To be within a given level of service, the *density* criterion must be met. The average travel speeds and maximum service flow rates indicated in the table are expected to exist under *ideal* conditions for the given densities. Actual average travel speeds for traffic streams under non-ideal conditions may be somewhat lower than the values shown.

Design speed depends on the combination of horizontal and vertical alignment. Other influences on driver behavior, such as the development environment, local driving habits, and other factors, may cause the relationship among density, speed, and flow to differ from the typical values of Table 3-1. Where local speed-flow-density data are available, they may be used as a guide in determining which design speed best represents local conditions.

DESCRIPTION OF LEVELS OF SERVICE

Operational characteristics for the six levels of service are shown in Illustrations 3-5 to 3-10.

The levels of service have been defined to represent reasonable ranges in the three critical variables: average travel speed, density, and flow rate. The basic shape of the typical speed-density-flow curves requires that as level of service moves from A to F, the range of densities and speeds covered by each level becomes larger, while the corresponding range of service flow rates becomes smaller.

The values in Table 3-1 reflect the influence of the 55-mph speed limit. Even with this speed limit clearly signed and reasonably enforced, average travel speeds for the better levels of service are still expected to be slightly higher than the 55-mph limit. Where enforcement is particularly stringent, or where lower speed limits are posted, speeds may be somewhat lower than those given in Table 3-1.

TABLE 3-1. LEVELS OF SERVICE FOR BASIC FREEWAY SECTIONS

LOS	DENSITY (PC/MI/LN)	70 MPH DESIGN SPEED			60 MPH DESIGN SPEED			50 MPH DESIGN SPEED		
		SPEED[b] (MPH)	v/c	MSF[a] (PCPHPL)	SPEED[b] (MPH)	v/c	MSF[a] (PCPHPL)	SPEED[b] (MPH)	v/c	MSF[a] (PCPHPL)
A	≤ 12	≥ 60	0.35	700	—	—	—	—	—	—
B	≤ 20	≥ 57	0.54	1,100	≥ 50	0.49	1,000	—	—	—
C	≤ 30	≥ 54	0.77	1,550	≥ 47	0.69	1,400	≥ 43	0.67	1,300
D	≤ 42	≥ 46	0.93	1,850	≥ 42	0.84	1,700	≥ 40	0.83	1,600
E	≤ 67	≥ 30	1.00	2,000	≥ 30	1.00	2,000	≥ 28	1.00	1,900
F	> 67	< 30	c	c	< 30	c	c	< 28	c	c

[a] Maximum service flow rate per lane under ideal conditions.
[b] Average travel speed.
[c] Highly variable, unstable.
NOTE: All values of *MSF* Rounded to the nearest 50 pcph.

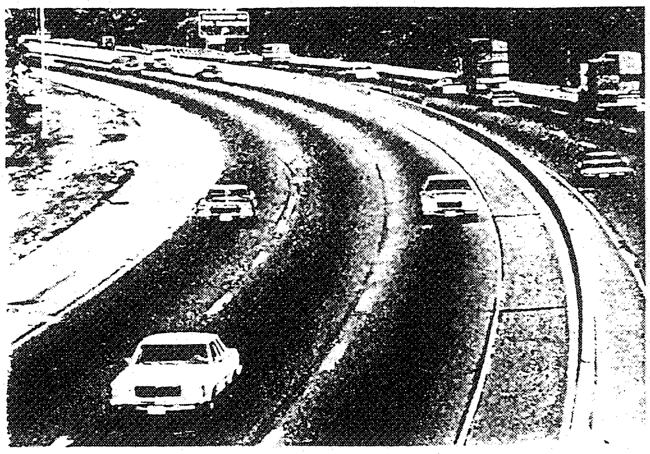


Illustration 3-5. Level-of-service A.

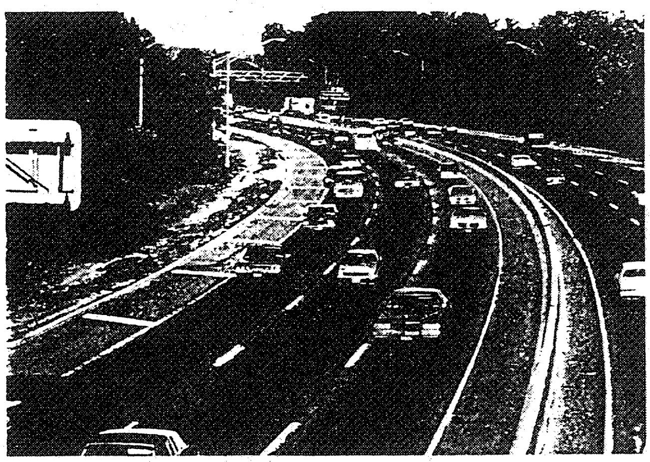


Illustration 3-6. Level-of-service B.

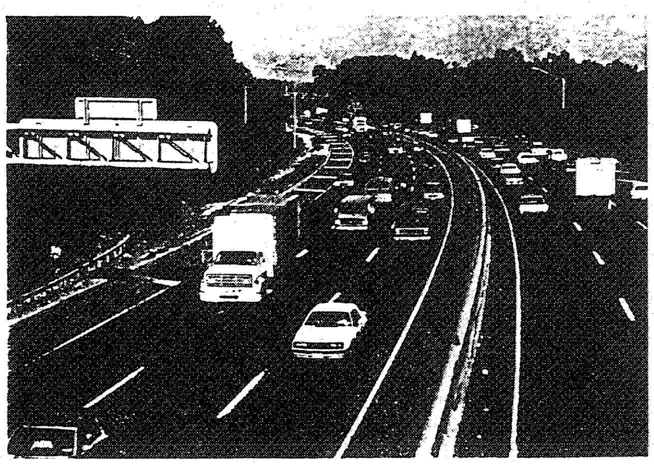


Illustration 3-7. Level-of-service C.

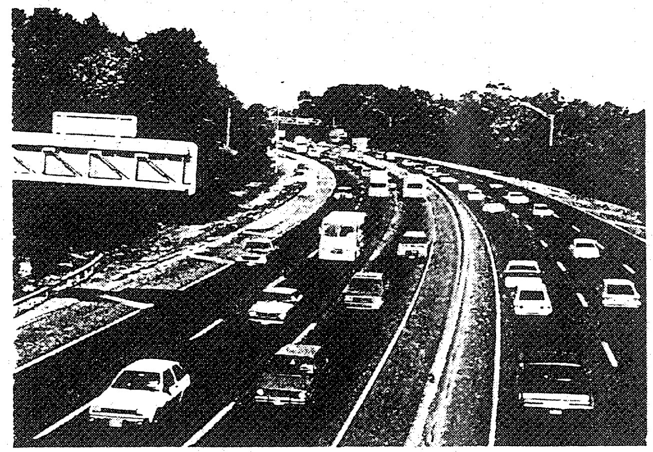


Illustration 3-8. Level-of-service D.

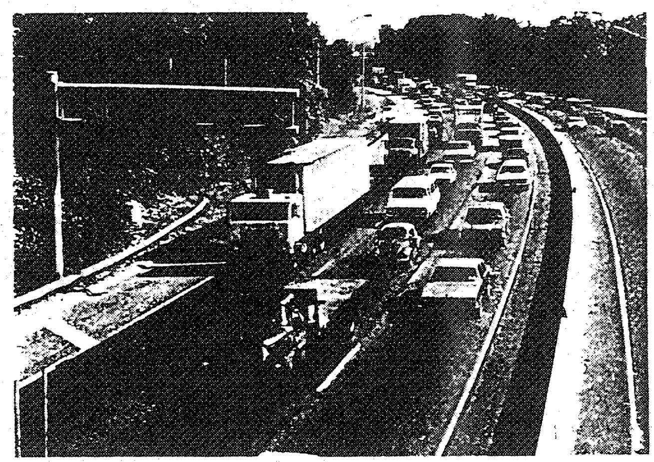


Illustration 3-9. Level-of-service E.

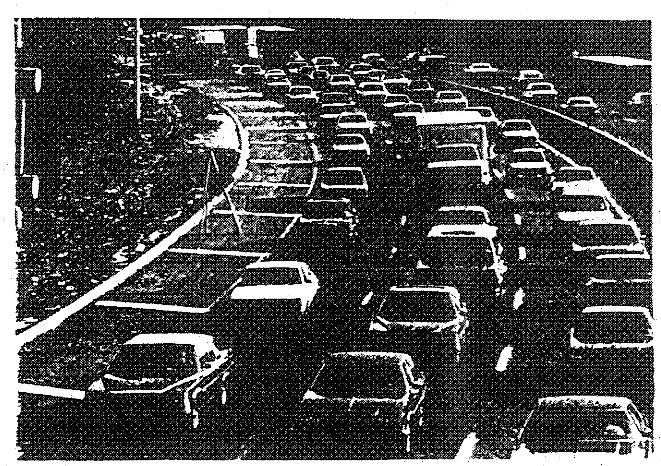


Illustration 3-10. Level-of-service F.

General descriptions of operating conditions for each of the levels of service are as follows:

1. *Level-of-service A*—Level A describes primarily free flow operations. Average travel speeds near 60 mph generally prevail on 70-mph freeway elements. Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. The average spacing between vehicles is about 440 ft, or 22 car-lengths, with a maximum density of 12 pc/mi/ln. This affords the motorist a high level of physical and psychological comfort. The effects of minor incidents or breakdowns are easily absorbed at this level. Although they may cause a deterioration in LOS in the vicinity of the incident, standing queues will not form, and traffic quickly returns to LOS A on passing the disruption.

2. *Level-of-service B*—Level B also represents reasonably free-flow conditions, and speeds of over 57 mph are maintained on 70-mph freeway elements. The average spacing between vehicles is about 260 ft, or 13 car-lengths, with a maximum density of 20 pc/mi/ln. The ability to maneuver within the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents and breakdowns are still easily absorbed, though local deterioration in service would be more severe than for LOS A.

3. *Level-of-service C*—Level C provides for stable operations, but flows approach the range in which small increases in flow will cause substantial deterioration in service. Average travel speeds are still over 54 mph. Freedom to maneuver within the traffic stream is noticeably restricted at LOS C, and lane changes require additional care and vigilance by the driver. Average spacings are in the range of 175 ft, or 9 car-lengths, with a maximum density of 30 pc/mi/ln. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage. The driver now experiences a noticeable increase in tension due to the additional vigilance required for safe operation.

4. *Level-of-service D*—Level D borders on unstable flow. In this range, small increases in flow cause substantial deterioration in service. Average travel speeds of 46 mph or more can still be maintained on 70-mph freeway elements. Freedom to maneuver within the traffic stream is severely limited, and the driver experiences drastically reduced physical and psychological comfort levels. Even minor incidents can be expected to create substantial queuing, because the traffic stream has little space to absorb disruptions. Average spacings are about 125 ft, or 6 car-lengths, with a maximum density of 42 pc/mi/ln.

5. *Level-of-service E*—The boundary between LOS D and LOS E describes operation at capacity. Operations in this level are extremely unstable, because there are virtually no usable gaps in the traffic stream. Vehicles are spaced at approximately 80 ft, or 4 car-lengths, at relatively uniform headways. This, however, represents the minimum spacing at which stable flow can be accommodated. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or a vehicle changing lanes, causes following vehicles to give way to admit the vehicle. This condition establishes a disruption wave which propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate even the most minor disruptions. Any incident can be expected to produce a serious breakdown with extensive queuing. The range of flows encompassed by LOS E is relatively small compared to other levels, but reflects a substantial deterioration in service. Maneuverability within the traffic stream is extremely limited, and the level of physical and psychological comfort afforded to the driver is extremely poor. Average travel speeds at capacity are approximately 30 mph.

6. *Level-of-service F*—Level F describes forced or breakdown flow. Such conditions generally exist within queues forming behind breakdown points. Such breakdowns occur for a number of reasons:

a. Traffic incidents cause a temporary reduction in the capacity of a short segment, such that the number of vehicles arriving at the point is greater than the number of vehicles that can traverse it.

b. Recurring points of congestion exist, such as merge or weaving areas and lane drops, where the number of vehicles arriving is greater than the number of vehicles traversing the point.

c. In forecasting situations, any location presents a problem when the projected peak hour (or other) flow rate exceeds the estimated capacity of the location.

It is noted that in all cases, breakdown occurs when the ratio of actual arrival flow rate to actual capacity or the forecasted flow rate to estimated capacity exceeds 1.00. Operations at such a point will generally be at or near capacity, and downstream operations may be better as vehicles pass the bottleneck (assuming that there are no additional downstream problems). The LOS F operations observed within a queue are the result of a breakdown or bottleneck at a downstream point. The designation "LOS F" is used, therefore, to identify the point of the breakdown or bottleneck, as well as the operations within the queue which forms behind it.

The extent of queuing, and the delays caused by queuing, are of great interest in the analysis of congested freeway segments. Chapter 6 contains a methodology for estimating the queue length and delays behind a bottleneck with known arrival and discharge rates. The procedure allows a rough quantification of the extent of congestion created by a LOS F situation.

APPENDIX C

Draft I-90 Route Feasibility Report

PRELIMINARY ONLY

ROUTE FEASIBILITY REPORT

SR 90

MP 55.17 TO MP 111.00

MAY 1994

CONTENTS

PRELIMINARY ONLY

EXECUTIVE SUMMARY

Traffic growth projections for SR-90 between Hyak and Ellensburg indicate that the existing roadway will be unable to accommodate future traffic demands without major reconstruction to provide additional lanes.

Traffic projections, at the current rate of 5% annual growth, indicate that a nominal ten lanes will be required by the year 2020. The section will operate at a Level of Service (LOS) F in the design year, with existing conditions and LOS ______ for reconstruction to provide six lanes, nominal.

Similarly, using the 2.7% growth rate furnished by HQ, ______ lanes will be required for the design year. Without any improvement in capacity the design year LOS will be ______, and six year LOS _____.

Providing more than six lanes, plus the necessary truck climbing lanes for the portions designated mountainous terrain, is probably not practical due to geometric restraints, costs, and environmental impacts.

Two improvements concepts were developed. The first concept would improve the vertical alignment to a 70 miles per hour design speed throughout the study section. The horizontal alignment would be improved to a 70 mph design speed where such improvements would not have a significant impact on surrounding Forest Service land. The second concept would improve both the horizontal and vertical alignments to a 70 mph design speed throughout the study section.

Most land adjacent to SR 90 from MP 55.17 to MP 70.00 lies within the Wenatchee National Forest. Ten to forty acres of forest land would be impacted under a six-lane reconstruction.

Reconstruction could have a significant impact on the following locations:

- MP 55.17 to 60.75, Lake Keechelus vicinity: impacts of fill to adjacent lake; impacts of realignment to existing roadway; probable traffic restrictions during construction

- Stampede Road interchange vicinity, Exit 62: impacts to local roads and ramps

- Cabin Creek Road interchange vicinity, Exit 63: impacts to local roads and ramps

- MP 64.50 to MP 67.45: impacts to adjacent land due to significant earthwork; impacts of realignment to existing roadway; probable traffic restrictions during construction

- East Nelson and West Nelson Interchanges, Exits 74 and 78: impacts to local roads, ramps, and existing I-90 roadway

- MP 79.10 vicinity, "Dead Man's Curve": significant earthwork; probable traffic restrictions during construction

- MP 83.60 to 83.90, Cle Elum vicinity: impacts on widening to adjacent Yakima River

- MP 92.50 to 97.10, Elk Heights vicinity: significant earthwork and impacts to existing roadway; probable traffic restrictions during construction

- Three waterway crossings, MP 102.3 to 105.0: environmental impacts to waterways

- South Ellensburg Interchange, Exit 109: impacts to ramps and existing I-90 roadway; probable traffic restrictions during construction

Portions of SR 90 in the area of the study area fail to meet minimum design requirements.

Based on the depth of this study, we recommend that SR 90 be reconstructed to provide six lanes in the study area. The scope of improvements should be determined during the design phase, where a more in-depth analysis of existing conditions and impacts can be conducted.

The construction costs of widening to six lanes are estimated to be 618 to 715 million dollars, and would impact a total of 156 to 234 acres of adjacent right of way.

The construction costs of widening to eight lanes are estimated to be 953 million to 1.133 billion dollars, and would impact a total of 345 to 595 acres of adjacent right of way.

It should be noted that the public and outside agencies have not yet been involved in this study. If we are to continue with the study, especially significant realignment adjacent to Lake Keechelus, we will need to involve the public, the U.S. Forest Service, Kittitas County, the Bureau of Reclamation, the Mountains to Sound Greenway Trust, and other outside agencies in the planning process.

Comments from District personnel concerning an October, 1991 draft of this report are included in the Appendix.

INTRODUCTION

The goal of this study 0L0808, Hyak to Ellensburg - Design Analysis (MP 55.22 to 102.49) is to determine the feasibility of building a six-lane facility through the existing I-90 corridor from Hyak to the Ellensburg vicinity. If this study shows that it is feasible, then this report, and the supporting data, will be used as a guide in preparing an environmental impact statement and a design report.

Three decisions need to be made and documented based on the material presented in this report. First, the acceptability of the concepts shown in the report should be determined. Second, that the study should be restricted to exploring alternate alignments within the existing corridor only. Third, that the study should remain in-house, provided that adequate staffing is available.

EXISTING CONDITIONS

SR 90 is currently a four-lane access controlled roadway. There are four 12' lanes with 10' shoulders on the outside and 4' to 6' shoulders on the inside of the traveled way. The median width varies from 10' to 1400'. The elevation difference between the eastbound and westbound lanes varies from 0' to 32'. Horizontal curve radii vary from 1146' to 11,560' with an associated design speed from 55 to 80 mph. Vertical curve lengths vary from 200' to 3600' with an associated design speed from 45 to 80 mph.

A few bridges currently have substandard width.

Many horizontal and vertical curves do not meet current design standards. A listing of these curves is included in the Appendix.

The current roadway pavement is well beyond its pavement life. The present horizontal alignment is substandard at many locations in design speed and in superelevation runoff and transition lengths. The present vertical alignment is also substandard in design speed, offering insufficient stopping sight distance at many locations and insufficient decision sight distance at interchange areas. Additionally, the coordination of the vertical and horizontal alignment needs to be improved. Where these conditions occur it will be necessary to construct a new roadbed and pavement rather than rehabilitating the existing pavement and constructing only the additional lanes.

TRAFFIC

Traffic counts were analyzed and projected to determine the necessary future capacity of the corridor. These calculations were then reviewed by Headquarters Traffic. A growth rate of 2.7% was recommended by Headquarters. However, review of recent traffic counts indicate a growth rate of approximately 5%.

Table 1a
Traffic Data

1989 ADT (vehicles)	15,000
Design Year	2020
(Anticipated Const. Start: 2000)	
ADT Growth Factor	5%
Projected ADT, 2020 (vehicles)	38,250
K Factor (from TRIPS)	11.9%
D Factor (from TRIPS)	63.3%
DDHV (vehicles/hour)	2880
ADT Volume Trucks	20%
Level of Service (rolling terrain)	B
Service Flow Rate (vehicles/hour/lane)	700
Number of Lanes (directional)	4.1

Table 1b
Traffic Data

1989 ADT (vehicles)	15,000
Design Year	2020
(Anticipated Const. Start: 2000)	
ADT Growth Factor	2.7%
Projected ADT, 2020 (vehicles)	27,500
K Factor (from TRIPS)	11.9%
D Factor (from TRIPS)	63.3%
DDHV (vehicles/hour)	2070
ADT Volume Trucks	20%
Level of Service (rolling terrain)	B
Service Flow Rate (vehicles/hour/lane)	700
Number of Lanes (directional)	3.0

According to this data, a ten-lane facility will maintain a Level of Service (LOS) of B, necessary by Figure 610-1 (Design Manual) for this type of highway, through the design year. Using a 2.7% growth rate results in about 8 lanes. In either case, providing such a facility is probably not practical due to geometric restraints, the prohibitive cost of construction, and the resulting significant environmental impacts.

Geometric constraints limit the ability to widen SR 90 in several areas: These constraints are detailed under "Discussion of the Improvements".

If reconstructed to provide a six lane roadway, SR 90 will operate at LOS C (?) in level and rolling terrain, based on the traffic data in Table 1. Such LOS can also be provided in mountainous terrain with the addition of climbing lanes. SR 90 will operate at LOS F if no improvements are made.

A letter was sent to Headquarters on January 22, 1992, indicating that widening to provide more than six lanes may not be feasible. The letter recommended that SR 90 be developed to six lanes and that cross-Cascade future capacity needs be addressed in other corridors or by other means. There has not yet been a reply to this request.

Given the above, it appears that a six-lane facility should be constructed and that capacity needs beyond six lanes could be addressed by alternate crossings of the Cascades by highway or other transportation modes.

ACCIDENT DATA

Accident reports from December 31, 1987, to December 31, 1990, were examined as part of this study. A review of the reports is listed in Table 2.

Table 2
Accident Data

Section	No. of Accidents	No. of Vehicles	Injuries	Fatalities	Property Damage	Accident Rate
MP 55.17 to 63.60	300	475	133	5	$1,100,000	2.18
MP 63.60 to 71.00	228	312	92	0	$925,000	1.87
MP 71.00 to 90.00	509	678	227	4	$2,000,000	1.63
MP 90.00 to 102.00	314	397	153	3	$1,300,000	1.71
MP 102.00 to 111.00	144	197	90	2	$525,000	0.88
Totals	1495	2059	695	14	$5,850,000	1.56

The statewide accident rate for such roadways in 1991 was 0.71. The combination of severe weather conditions and substandard geometrics of the highway no doubt contribute to this high accident rate.

Locations within the study section that experienced a significant number of accidents are listed in the Appendix.

ENVIRONMENTAL REVIEW

Most of the land potentially impacted by construction lies within the Wenatchee National Forest. A biological assessment and NEPA report will likely be required, as well as either a documented Categorical Exclusion or a Declaration of Non Significance. A wetlands review may be needed due to impacts and construction adjacent to Lake Keechelus and Lake Easton, and the Kachess, Cle Elum, and Yakima Rivers. Lake Keechelus and Lake Easton provide storage of water to be used for irrigation downstream along the Yakima River.

Letters were sent to the Washington State Departments of Natural Resources and Wildlife and the U.S. Department of Interior on November 9, 1992 requesting information concerning any known threatened or endangered species located in the study area. The Department of Natural Resources indicated in a December 8, 1992 letter that they have no records of rare plants, high quality native wetlands, or high quality native plant communities within 500 feet of SR 90 in the vicinity. The Department of Interior indicated in a December 14, 1992 letter that the bald eagle, gray wolf, grizzly bear, marbled murrelet, and northern spotted owl may be present in the study area. Ten other species that may be present are currently candidates to be listed as threatened or endangered.

Most adjacent land from MP 55.17 to MP 70.00 adjacent to SR 90 lies within the Wenatchee National Forest. The proposed improvements would affect the vertical and possibly the horizontal alignments in the vicinity. Ten to forty acres of forest land would be impacted.

Construction adjacent to Lake Keechelus may result in loss of storage capacity in the lake. The Bureau of Reclamation will likely require replacement of the lost storage.

In 1991, the Mountains to Sound Greenway Trust was organized "to protect the scenic, historic, recreational, and natural resources that give the region its traditions and distinction". A goal of the Greenway is to achieve a "balance between the needs of the environment and the pressures of development, while protecting the needs of all living things. The Greenway includes anything visible while driving along I-90." [1] This organization should be included in discussions regarding future projects on SR 90 which may have significant environmental impacts.

The environmental impacts of the proposed improvements and required mitigation have not been determined at this time. Costs of such mitigation have not been estimated. If this study is continued, environmental considerations will need to be evaluated in greater detail.

IMPROVEMENTS CONSIDERED

There are two general concepts being considered:

Concept A

This includes upgrading the existing vertical alignment to a 70 mph design speed while maintaining the existing horizontal alignment.

1.) Design Speed (Design Manual)

   a.) Vertical - 70 mph (stopping sight distance, Figs. 630-2 and 630-3)

   b.) Horizontal - 55 to 70 mph (super rate = 0.06'/ft. 0.06'/ft. max. super rate table)
   - 60 to 75 mph (super rate = 0.08'/ft. 0.08'/ft. max. super rate table)

2.) Right of Way needs - Minimal additional R/W required.

Concept B

This includes upgrading both the horizontal and vertical alignments to a 70 mph design speed.

1.) Design Speed

---

[1] Yakima Herald-Republic, August 15, 1993.

a.) Vertical - 70 mph (stopping sight distance)

b.) Horizontal - 70 mph (super rate = 0.06'/ft.
0.06'/ft. max. super rate table)
- 70 mph (super rate = 0.10'/ft.
0.10'/ft. max. super rate table)

2.) Right of Way needs - 60 to 140 additional acres required

Concept B was considered through the entire study area. In some areas, the amount of reconstruction to provide the design speeds and superelevation rates indicated may be prohibitive. For that reason, Concept A was considered from MP 55.17 to MP 71.00 (Hyak to Easton).

Listed in Table 3 on the following page are the improvements proposed under Concepts A and B. Roadway sections indicated in the table are included in the Appendix. The retaining wall and reinforced earth wall lengths given were determined based on a six-lane roadway and widening to the existing median wherever possible.

Impacts to structures are similar under Concepts A and B. A list of the bridges requiring replacement or modification is included in the Appendix. Also, reconstruction in the Lake Keechelus vicinity will require demolition and replacement of the existing snowshed from MP 58.08 to 58.18.

The following culverts will require replacement or modification:

LW Rocky Run Creek double culvert - MP 56.80
LE Box Culvert - MP 72.56
LE and LW Fowler Creek Box Culverts, MP 72.96
LE Box Culvert - MP 96.88

All concepts include the construction of a new roadbed, pavement, and the necessary roadside and traffic safety improvements. Such major reconstruction is necessary since the existing pavement is well beyond its expected life, new alignments will be needed in some areas, and there appears to be no acceptable rehabilitation alternatives.

Table 3
Concept Improvements

	CONCEPT A		CONCEPT B	
	LENGTH	RDWY. SEC'S.	LENGTH	RDWY. SEC'S.
WIDEN AND RECONSTRUCT ROADWAY WITHIN MEDIAN AND EXISTING ROADWAY PRISM	70,300 L.F.	A - H	286,500 L.F.	A - H
WIDEN AND RECONSTRUCT ROADWAY WITHIN MEDIAN, EXISTING ROADWAY PRISM, AND ADJACENT AREA SOUTH OF EXISTING ROADWAY	13,300 L.F.	A,B,D,E,G,H	8300 L.F.	A,B,D,E,G,H
RETAINING WALL	27,000 L.F.	D,E,G,H,I	41,500 L.F.	D,E,G,H,I
REINFORCED EARTH WALL	21,800 L.F.	D,E,G,H,I	30,100 L.F.	D,E,G,H,I
RECONSTRUCT SUBSTANDARD VERTICAL CURVES TO 70 MPH DESIGN SPEED	YES		YES	
RECONSTRUCT SUBSTANDARD HORIZONTAL CURVES TO 70 MPH DESIGN SPEED	NO		YES	

Problems that have not been addressed include standard superelevation runoff lengths between curves, superelevation transition on bridges, vertical curves on bridges, and coordination of vertical and horizontal curves.

IMPROVEMENT COSTS

Concept A is the least expensive of the concepts to construct and requires minimal right-of-way acquisition. Additionally, it causes the least amount of impact on Lake Keechelus and other environmentally sensitive areas. This concept fails to bring the roadway's horizontal alignment up to present desirable design standards. Some minimum design standards will have to be used, and some design deviations will be necessary. Listed below are Concept A relative construction costs and right of way needs for widening I-90 to six lanes:

MP 55.17 to 63.60	91 to 101 million dollars	31 to 41 acres
MP 63.60 to 71.00	88 to 98 million dollars	29 to 39 acres

Concept B brings the roadway up to the minimum design standards for this class of roadway. This concept brings the roadway up to the desirable design standards, according to AASHTO, for this class of roadway. Listed below are the relative construction costs and right of way requirements for Concept B for widening I-90 to six lanes:

MP 55.17 to 63.60	108 to 141 million dollars	41 to 59 acres
MP 63.60 to 71.00	95 to 105 million dollars	39 to 49 acres
MP 71.00 to 90.00	193 to 203 million dollars	62 to 72 acres
MP 90.00 to 102.00	140 to 150 million dollars	22 to 32 acres
MP 102.00 to 111.00	106 to 116 million dollars	12 to 22 acres

If improvements under Concept B are implemented throughout the corridor, the construction costs are estimated to be 435 to 530 million dollars, and would impact a total of 70 to 180 acres of adjacent right of way. Implementing Concept A in sensitive areas and Concept B in the remainder of the corridor would result in construction costs of 360 to 455 million dollars, and would impact a total of 45 to 135 acres of adjacent right of way.

Widening to eight lanes is practical along most of the existing corridor. Listed below are the relative construction costs and right of way requirements for eight-laning I-90. These estimates assume construction of Concept B along the entire corridor.

MP 55.17 to 63.60	162 to 226 million dollars	67 to 117 acres
MP 63.60 to 71.00	143 to 168 million dollars	61 to 111 acres
MP 71.00 to 90.00	290 to 325 million dollars	120 to 170 acres
MP 90.00 to 102.00	210 to 240 million dollars	58 to 108 acres
MP 102.00 to 111.00	148 to 174 million dollars	39 to 89 acres

If such improvements are implemented throughout the corridor, the construction costs are estimated to be 953 million to 1.133 billion dollars, and would impact a total of 345 to 595 acres of adjacent right of way. Based on the figures above, it appears that eight-laning may be cost and impact prohibitive. An alternate corridor should be considered to address demand above that serviceable by a six-lane facility.

DISCUSSION OF THE IMPROVEMENTS

Existing Corridor

Improvements under Concepts A and B were designed using a maximum superelevation rate of 0.06'/ft. on the 0.06'/ft. maximum superelevation rate table from MP 55.17 to 97.10 due to icing during winter conditions. From MP 97.10 to 111.00, a maximum rate of 0.06'/ft. on the 0.10'/ft. maximum superelevation rate table was used. A rate of 0.08'/ft. on the 0.08'/ft. max. super rate table, if allowable, could be utilized at some locations to reduce construction costs and impacts.

All concepts include perpetuating the following:

Chain-off and -on areas, adjacent to Lake Keechelus, MP 55.52 to 56.07 vicinity.
Truck climbing lanes, both directions, MP 66.47 to 69.25 vicinity
Chain-off areas, eastbound at Easton, MP 70.18 to 71.04 vicinity
Chain-on areas westbound at Easton, MP 70.64 to 71.14 vicinity
Chain-on area, westbound at Easton, MP 71.89 to 72.33 vicinity

All concepts include adding the following truck climbing lanes:

Eastbound, MP 87.88 to 89.41
Eastbound, MP 90.57 to 92.53
Westbound, MP 95.06 to 96.73

The truck climbing lanes listed on the previous page meet the warrants discussed in the Design Manual, section 1010.03.

A viable alternative is to utilize Concept B where practical and Concept A within the high cost areas of Concept B, minimizing the number of design deviations necessary while keeping the costs reasonable.

Reconstruction in the vicinity of Lake Keechelus (MP 55.17 to 60.75) will have significant impacts. Widening to six lanes will require rock cuts to the north with an average height of approximately 25 feet, or construction of fill or retaining wall in the lake. Blasting in the "Slide Curve" vicinity, MP 59.00, should be done with caution. The length of the snowshed near MP 58.00 should be increased and the width should be sufficient to accommodate four lanes of traffic during avalanche conditions. A double-deck viaduct would be needed for widening to eight lanes from MP 57.5 to MP 60.2, with the bridge being constructed above the existing roadway. This study did not determine if the existing soil could support such a structure.

Improving I-90 in the Lake Keechelus vicinity will require replacement of the existing snowshed (MP 58.08 to 58.18). This structure has been nominated for the National Register of Historic Structures. Accommodating additional lanes in this area may be done by:

- Widening the existing roadway to six lanes, with a new snowshed covering the westbound lanes
- Constructing a bridge for the eastbound lanes and leaving the westbound lanes on the existing grade
- Abandoning the existing grade for a six or eight lane bridge.

The first option appears to the be the most practical and was used to develop construction cost estimates. For an eight-lane section, a snowshed may not be necessary since the viaduct structure would shelter the existing roadway from snowfall.

Consideration was given to construction of a tunnel between MP 58.5 and 59.4 and abandonment of the existing slide curve alignment. A tunnel would address avalanche concerns in the slide curve vicinity, would shorten the total length of roadway, and would improve the horizontal alignment. However, it was determined that the cost of such a tunnel would be prohibitive. Construction of a pair of three-lane 3,500-foot tunnels would cost 63 million dollars for excavation, plus 20 to 30 million for lining, paving, and ventilation. Given this, it appears that construction of a tunnel at this location is not practical. *Editorial by Tom Lyon: We should not be so quick to dismiss the tunnel concept. The advantages of at least a westbound tunnel during the construction phase and as an investment toward the long term operational efficiency of he highway are considerable.*

Consideration was also given to construction of a longer tunnel and abandoning a greater section of I-90, MP 57.0 to 59.4. The total cost of such a six-lane 12,000-foot tunnel would be in excess of $300 million dollars, which makes such an option cost prohibitive. *Editorial by Tom Lyon: We should not be so quick to dismiss the tunnel concept. The advantages of at least a westbound tunnel during the construction phase and as an investment toward the long term operational efficiency of he highway are considerable.*

Concept B involves significant amounts of construction within Lake Keechelus and the adjacent Forest Service land to the north of the roadway. Most of the improvements under Concept A can be accommodated within existing right of way in this area.

The span widths of the undercrossings listed below are not sufficient to accommodate a six- or eight-lane roadway and shoulders. Replacement of these structures could have a significant impact on local roads and ramps in the respective vicinities.

Stampede Road interchange, Exit 62
Cabin Creek Road interchange, Exit 63
Easton interchange, Exit 71

The existing Stampede Road structure does not provide adequate vertical clearance.

Widening to six lanes will be difficult between the Cabin Creek Road undercrossing (MP 63.98) and the Easton Hill summit (MP 67.45). Much of this area has fill slopes steeper than 2:1 to the south and rock cuts steeper than 1:1 to the north. The impacts of such widening may be reduced if the westbound lanes are constructed ten to fifteen feet above the eastbound lanes. This would reduce the amount of additional cut and fill needed while holding the amount of necessary median retaining wall to a reasonable cost. A double-deck viaduct would be needed for widening to eight lanes from MP 64.5 to MP 67.45, with the bridge being constructed above the existing roadway. This study did not determine if the existing soil could support such a structure.

The horizontal alignment at the East Nelson and West Nelson interchanges, Exits 74 and 78, are not desirable and do not provide adequate superelevation runoff for six or eight lane roadways between the existing "S" curves. The vertical alignments at these locations do not provide adequate sight distance. Improvements at these locations may be limited by the adjacent Washington Central railroad right of way. Improving the vertical alignments will require new bridges at both locations in both directions.

Improving the horizontal curve at MP 79.00, known as "Dead Man's Curve", will require significant excavation into the hillside to the north.

To minimize impacts to the Yakima River near Cle Elum, widening should be done to the north between the South Cle Elum Road overcrossing and the Oakes Avenue undercrossing (MP 83.50 to 84.00). This will require realignment of SR 90 to the north in the vicinity. Such a realignment would require the existing South Cle Elum Road bridges be replaced. Replacement of these bridges may be likely under any improvement scenario, since they have a history of requiring frequent deck repair and widening of the structures, while possible, may not be practical.

Currently, the West Cle Elum (Exit 83) interchange has ramps to and from the west, while the Oakes Avenue interchange (Exit 84) has ramps to and from the east. During the design phase of widening project in the Cle Elum vicinity, consideration should be given to providing full access to SR 90 in both directions at each of these interchanges.

Climbing lanes will be needed in both directions approaching the Elk Heights summit (MP 92.45). Realignment of an "S" curve immediately west of the summit to provide adequate superelevation runoff between the curves will result in significant earthwork. Realignment between the Elk Heights interchange and the Taneum Creek Road undercrossing to provide such runoff between four closely spaced horizontal curves will also result in significant earthwork.

Operational problems currently exist on westbound SR 90 between the SR 82 (Exit 110) on-ramp and the South Ellensburg Interchange (Exit 109) off-ramp due to a short weaving section. Currently, the on-ramp has two lanes. These lanes are merged together in the weaving section, then dropped at Exit 109 as the off-ramp. Growing traffic volumes may require that one of the SR 82 on-ramp lanes become a third through lane on westbound SR 90 and that the other on-ramp lane be used for the Exit 109 off-ramp. This would require SR 90 traffic desiring to use Exit 109 to weave two lanes to the right to exit, instead of the one-lane weave which currently exists. This could increase congestion and the number of accidents at this location. It appears that improved alignments should be provided for these ramps.

The South Ellensburg interchange, Exit 109, will be significantly impacted by reconstruction. The existing vertical alignment does not provide adequate sight distance. Realignment will include new bridges crossing the Washington Central Railroad and Canyon Road and will impact the interchange ramps and surrounding properties.

Alternate Corridors

Traffic growth will eventually require a corridor of greater than six lanes across the central Cascades. This would impact not only the study area, but would also require a commitment from the Department to widen SR 90 from Issaquah (MP 16 vicinity) to Hyak (MP 55.17) beyond the existing six lanes. The costs, impacts, and geometric constraints to widening beyond six lanes are likely prohibitive in three areas. Each of these areas would require significant earthwork and retaining wall, or possibly a double-deck viaduct, in areas which may not have adequate stability for significant change.

- Tinkham Road to West Summit Interchange (MP 48 to 52): the Denny Creek Bridge (MP 50.50 to 51.32 westbound) would have to be widened or replaced
- Lake Keechelus vicinity (MP 55.17 to 60.50)
- Cabin Creek to Easton Hill (MP 64.20 to 67.50)

To address the constraints in the above areas, several preliminary alternate corridors were evaluated. All alternates would require new right of way and roadway. All new corridors were assumed to involve four-lane limited access roadways that would be either Interstate or State highways. All constraints on the existing corridor, both east and west of the Cascades, should be considered during future evaluation of alternate corridors.

Several alternate corridors were determined to have potential feasibility for addressing SR 90 capacity needs. These corridors are shown on the attached "Alternate Corridors" mapping. Some are limited in length to address only the critical areas noted above, while others would create an entirely new corridor from the Puget Sound area to Ellensburg. For purposes of this study, each of these corridors was assumed to begin east of Tacoma, running eastward along the existing SR 410 corridor to the Greenwater vicinity. From there, the corridors would:

- Cross the Cascades at Stampede Pass and end at I-90 near Easton (MP 72 vicinity)

- Cross the Cascades at Naches Pass and end at I-90 near Thorpe (MP 102 vicinity) *Impractical?*

- Cross the Cascades at Naches Pass, then follow SR 410 and SR 12 to Naches and Yakima, ending at the existing I-82/SR 12 interchange.

A detailed evaluation of alternate corridors, especially for a new roadway from the Puget Sound area to Ellensburg, is beyond the scope of this study. Such alternates would require a Statewide study to further define need, location, and impacts.

RECOMMENDATIONS

If this study is to continue, a decision needs to be made if it will be done in house or put out to consultant. The following is recommended if the study continues:

1.) We will meet with Headquarters Bridge and Structures Section and request their help in developing cost estimates, type and length of structures, including retaining walls, bridges, and tunnels.

2.) We will meet with Headquarters Materials Section and request them to do a preliminary geotechnical report, requiring drilling, to determine foundation requirements for roadway and structures.

3.) Request Headquarters Hydraulics Section's recommendations on design of major drainage structures, erosion control, etc.

4.) We will meet with Headquarters Environmental Section and request their recommendations for developing this project.

5.) Hold several scoping meetings with the following outside agencies: U.S. Forest Service, Dept. of Fisheries, Bureau of Reclamation, Dept. of Wildlife, Dept. of Natural Resources, FHWA, etc.

6.) Meet with officials of Kittitas County to discuss future land uses within the corridor.

7.) Meet with officials from Washington Central Railroad, WSDOT, etc. to discuss future rail use within the corridor.

8.) We will develop horizontal and vertical alignments that meet design standards and recommend a preferred alternate. The design standards to be used will be those for interstate highways.

9.) Request traffic counts for the study area, including interchanges.

10.) Request aerial photos, mapping, and cross-sections.

11.) Provide construction cost estimates and Right-of-Way area for the preferred alternate.

12.) Request Right-of-Way cost estimates and other data from District Right-of-Way Section.

13.) Look at constructability of alternates while maintaining current traffic flows.

14.) Develop a cost/manpower estimate and schedule to perform the above items as a first order of work.

15.) Meet with maintenance superintendents, avalanche crews, and staff to identify major maintenance operational problems.

16.) Include design concepts that minimize/eliminate closures due to avalanche conditions.

APPENDIX A

COMMENTS FROM DISTRICT TO BE CONSIDERED IN FUTURE

The comments below were based on a district wide circulation of a draft report covering MP 55.17 to 63.60. Some of the comments may be applicable to other portions of the study area.

Are there any fatal flaws with any of the proposed alignments?

> The primary issue at this point is constructibility - can we build and maintain acceptable LOS.
>
> Constructability and phases or conditions we leave the roadway in during winter shutdown once construction begins. Avalanche damage to partially completed work.
>
> Accommodation of traffic during the construction may prove to be a fatal flaw. The tunnel, or using the Old Milwaukee grades, would considerably reduce conflicts, but each has its own problems. The local geological conditions will have a large influence on what is possible. The Bureau of Reclamation will almost surely want any loss of storage in the lake from embankment to be mitigated by excavation to create equal storage volume.
>
> Traffic control will be a nightmare.
>
> Foundation problems in the slide curve and Keechelus Lake, as addressed in 1970's studies, may eliminate use of most alignments.
>
> Traffic control doesn't have to be a nightmare if we do our homework up front and earmark enough dollars to handle the problems. District 1 seemed to survive on I-90, I-5, I-405, but they spent lots of dollars to do it!

Is there an alignment or alternate corridor that should be investigated?

> Any deviation from present corridor to the north would require a 3800 foot or better summit.

How about a continuous overhead structure from Wolf Creek to Resort Creek? Have we investigated the possibilities of the other side of Lake Keechelus? Is it certain that State Parks is unmovable from the Old Milwaukee grade? Operation of the BN Railway through Stampede Pass has the potential to reduce the freight trucking on SR 90. Is there any way to encourage that use?

I like the idea of a double deck viaduct structure along the lake. Don't forget growth management and comprehensive plans!

Are there any known problems with the way the existing highway is functioning?

Avalanche problem at east snow shed, continued movement at slide curve. Winter water problem between Rocky Run Creek and Resort Creek.

May need snow storage area in specific areas.

Avalanche control methods and facilities are rapidly becoming inadequate, especially at the snow shed. We now need to be able to put both directions of traffic, at least 2 lanes in each direction, through a structure that is longer than the current shed. We also need more facilities at slide curve and below Rampart Ridge, MP 56.5 vicinity. Solid rock jointing planes on hillside from snow shed to slide curve makes further excavation hazardous and also makes the foundation for the Concept C structure questionable.[1]

Headlight glare problems in narrow median areas, slush splash. Construction joints vary from lane lines in places causing wintertime confusion. Openings for re-routing traffic at snow shed aren't up to current safety standards.

Providing safe and continuous four lane flow of traffic.

Projected ADT looks at little low when looking at current peaks![2]

Lack of chainup areas and traffic turn around during closures. Need to look at possibilities to re-route traffic to ski facilities.

Any comments on the presentation of the material?

Relative cost of alternatives are only valuable if constructible - some may not be.

---

[1]Concept C would have included reconstruction to provide an 80 mph design speed both vertically and horizontally. This concept was dropped when it was determined that 70 mph was the design speed for interstate highways.

[2]Original traffic projects used a 2.7% growth rate and a design year ADT of 27,600 vehicles. This has been revised to 5% and 38,250 vehicles based on new information.

This is an excellent idea - especially if we end up going to a consultant. It gives a good basis to begin drafting an agreement.

This will be a greater challenge than the original construction.

APPENDIX B

High Accident Frequency Locations

December 31, 1987 to December 31, 1990

MP 55.49 - 55.50	6 accidents
MP 56.00 - 56.02	8 accidents
MP 57.00 - 57.01	20 accidents
MP 57.50 - 57.52	11 accidents
MP 57.61 - 57.62	8 accidents
MP 57.98 - 58.02	8 accidents
MP 58.50 - 58.52	7 accidents
MP 58.98 - 59.05	17 accidents
MP 61.50 - 61.51	7 accidents
MP 62.78 - 62.82	7 accidents
MP 65.30	6 accidents
MP 65.48 - 65.50	6 accidents
MP 66.50 - 66.52	8 accidents
MP 66.80 - 66.82	6 accidents
MP 66.91 - 66.92	8 accidents
MP 67.00 - 67.02	10 accidents
MP 67.58 - 67.62	7 accidents
MP 67.81 - 67.82	6 accidents
MP 68.00 - 68.01	8 accidents
MP 68.50 - 68.51	8 accidents
MP 72.90 - 73.01	11 accidents
MP 77.93 - 77.96	7 accidents
MP 78.08 - 78.10	6 accidents
MP 79.00 - 79.04	8 accidents
MP 79.09 - 79.10	7 accidents
MP 79.29 - 79.33	6 accidents
MP 80.90	7 accidents
MP 81.00 - 81.11	10 accidents
MP 82.99 83.03	7 accidents
MP 83.10 - 83.13	7 accidents
MP 83.47 - 83.53	9 accidents
MP 87.49 - 87.54	7 accidents
MP 87.99 - 88.01	9 accidents
MP 88.18 - 88.20	9 accidents
MP 88.26 - 88.29	10 accidents
MP 88.39 - 88.42	7 accidents
MP 88.49 - 88.52	12 accidents
MP 88.49 - 88.52	8 accidents
MP 90.62 - 90.67	7 accidents
MP 92.09 - 92.12	7 accidents
MP 92.29 - 92.30	21 accidents
MP 92.49 - 92.50	9 accidents
MP 95.99 - 96.00	7 accidents
MP 96.49 - 96.50	6 accidents
MP 109.30 - 109.60	49 accidents

The predominate types of accidents in the I-90 corridor involved rear-end and overturn type accidents and vehicles leaving roadway and coming in contact with concrete barrier, guardrail, and other objects. The table below summarizes the number and percentage of accidents occurring during wet, snow, or icy conditions along the corridor.

MP 55.17 to 63.60	235 (78%)
MP 63.60 to 71.00	158 (70%)
MP 71.00 to 90.00	291 (57%)
MP 90.00 to 102.00	196 (62%)
MP 102.00 to 111.00	47 (33%)
Totals	927 (62%)

Thirteen of the twenty accidents at MP 57.00 - 57.01 occurred on January 29, 1988 during inclement weather. Six of the eleven accidents at MP 57.50 - 57.52 were sideswipe-type accidents involving vehicles traveling in the same direction. Five of the seven accidents at MP 58.50 - 58.52 involved vehicles coming in contact with concrete barrier, guardrail, or embankments.

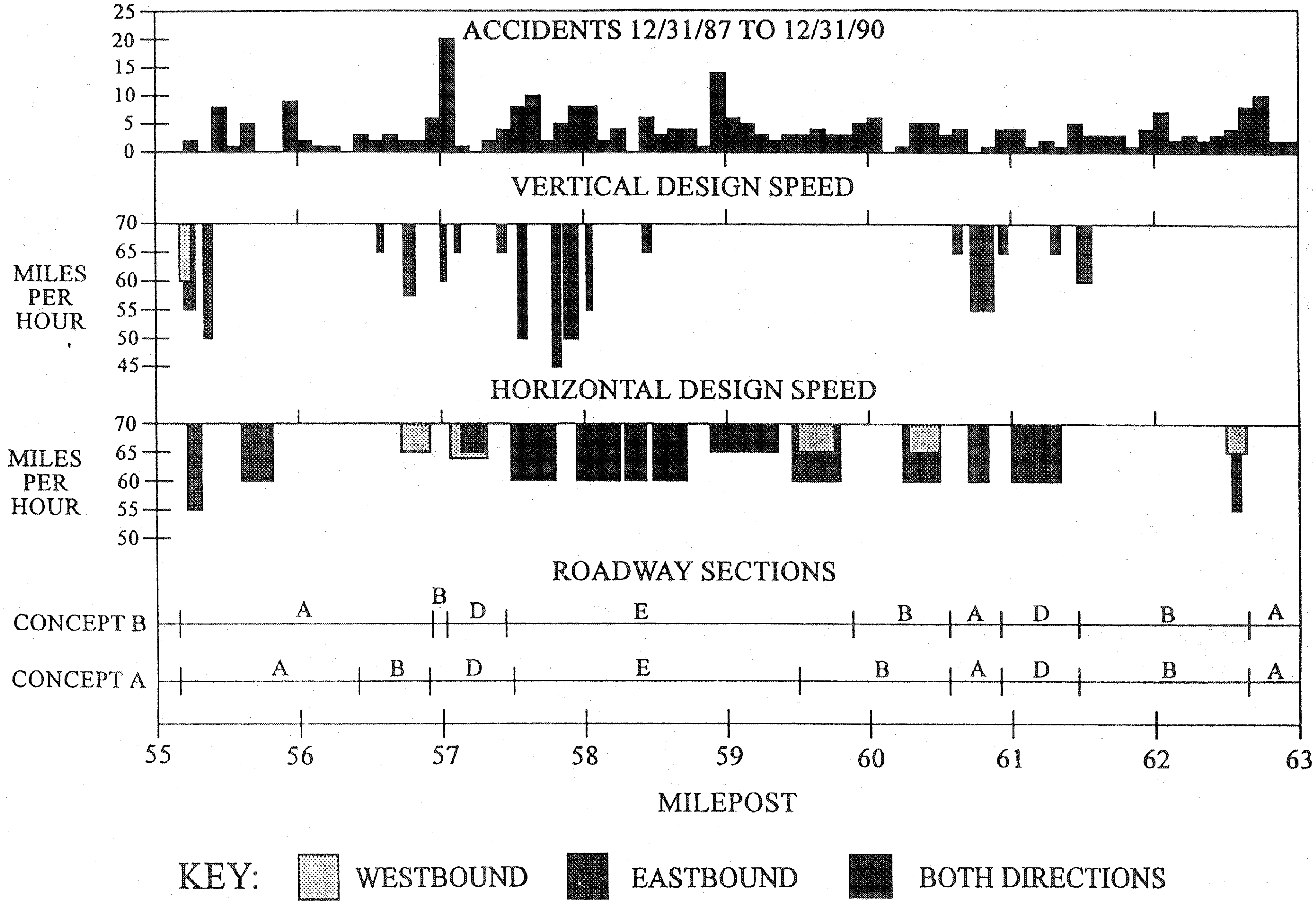
Six of the nine accidents from MP 66.50 to 66.52 and seven of the ten accidents from MP 67.00 to 67.02 involved vehicles coming in contact with concrete barrier or guardrail.

Four of the six accidents from MP 79.29 to 79.33 and five of the ten accidents from MP 81.00 to 81.11 involved vehicles overturning. Five of the nine accidents from MP 83.47 to 83.53 involved vehicles coming in contact with concrete barrier or guardrail. Between MP 87.99 and 88.52, 53 accidents occurred, primarily overturn and contact with barrier or guardrail type accidents. The accident rate for this half-mile segment of roadway was 6.09 accidents per million vehicle miles, significantly greater than the overall rate for MP 71.00 to 90.00, which was 1.63.

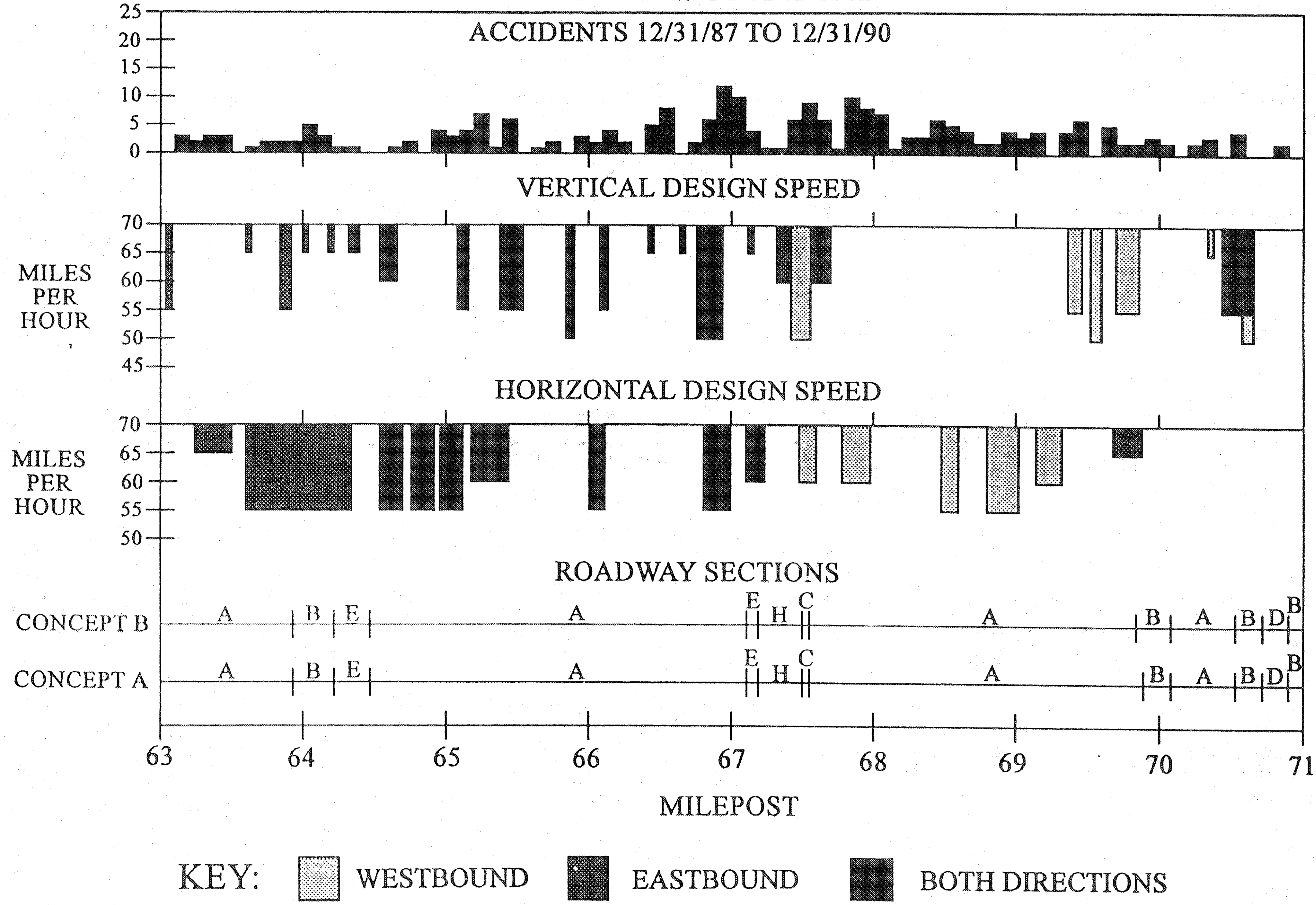
Of the 21 accidents between MP 92.29 and 92.30, eight involved vehicles coming in contact with guardrail and five involved vehicles overturning.

Of the 49 accidents between MP 109.30 and 109.60, 17 involved vehicles leaving the roadway and coming in contact with various fixed objects. These objects included guardrail, concrete barrier, bridge rail, and luminaires. Also, 10 accidents involved rear-end type accidents at the intersections of the ramps and Canyon Road, 7 involved vehicles overturning, and 6 involved southbound Canyon Road traffic turning left onto the on-ramps coming in contact with northbound through traffic. Of the 49 accidents, 11 occurred during icy conditions, and 8 occurred during wet conditions.

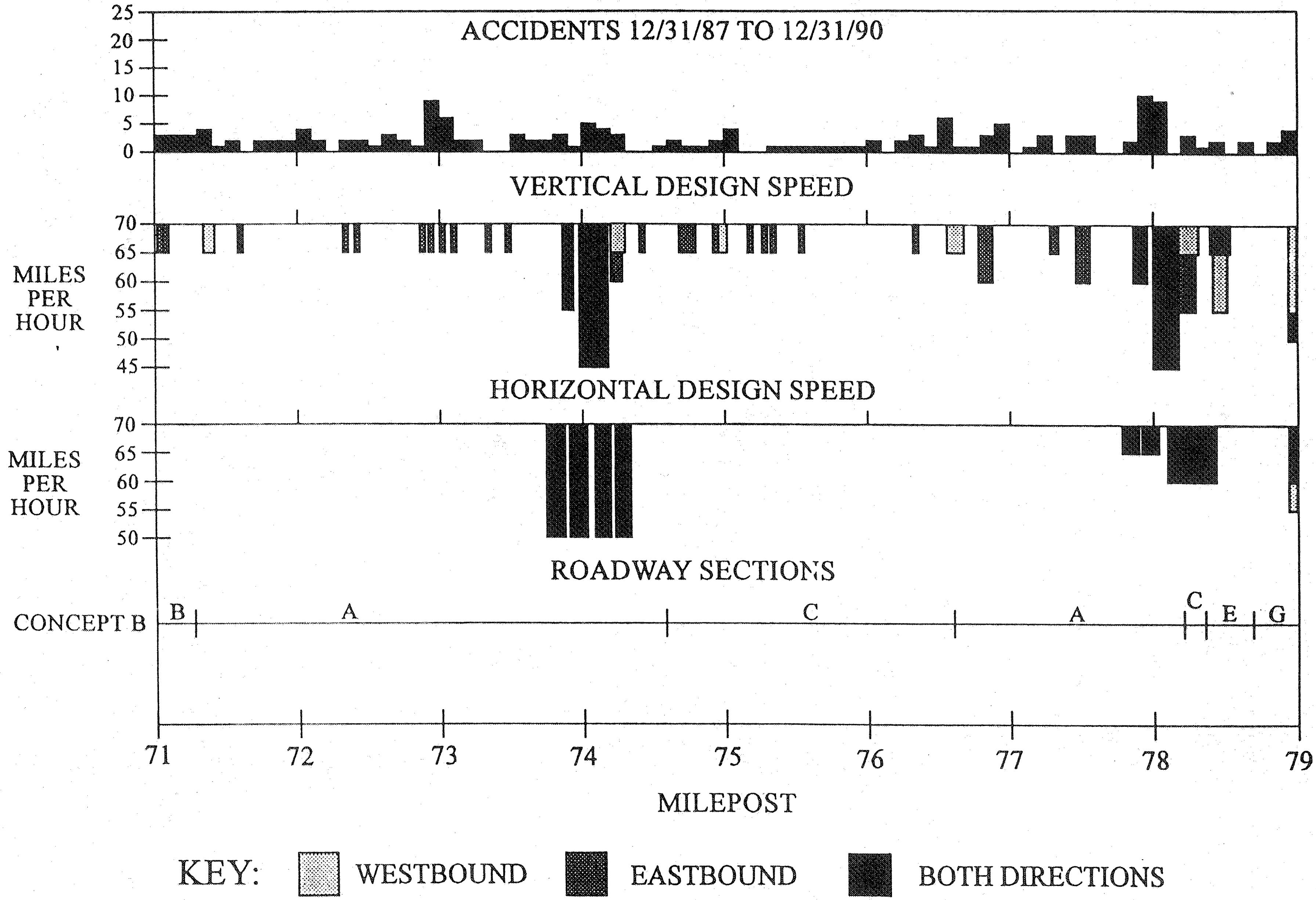
I-90 DATA SUMMARY



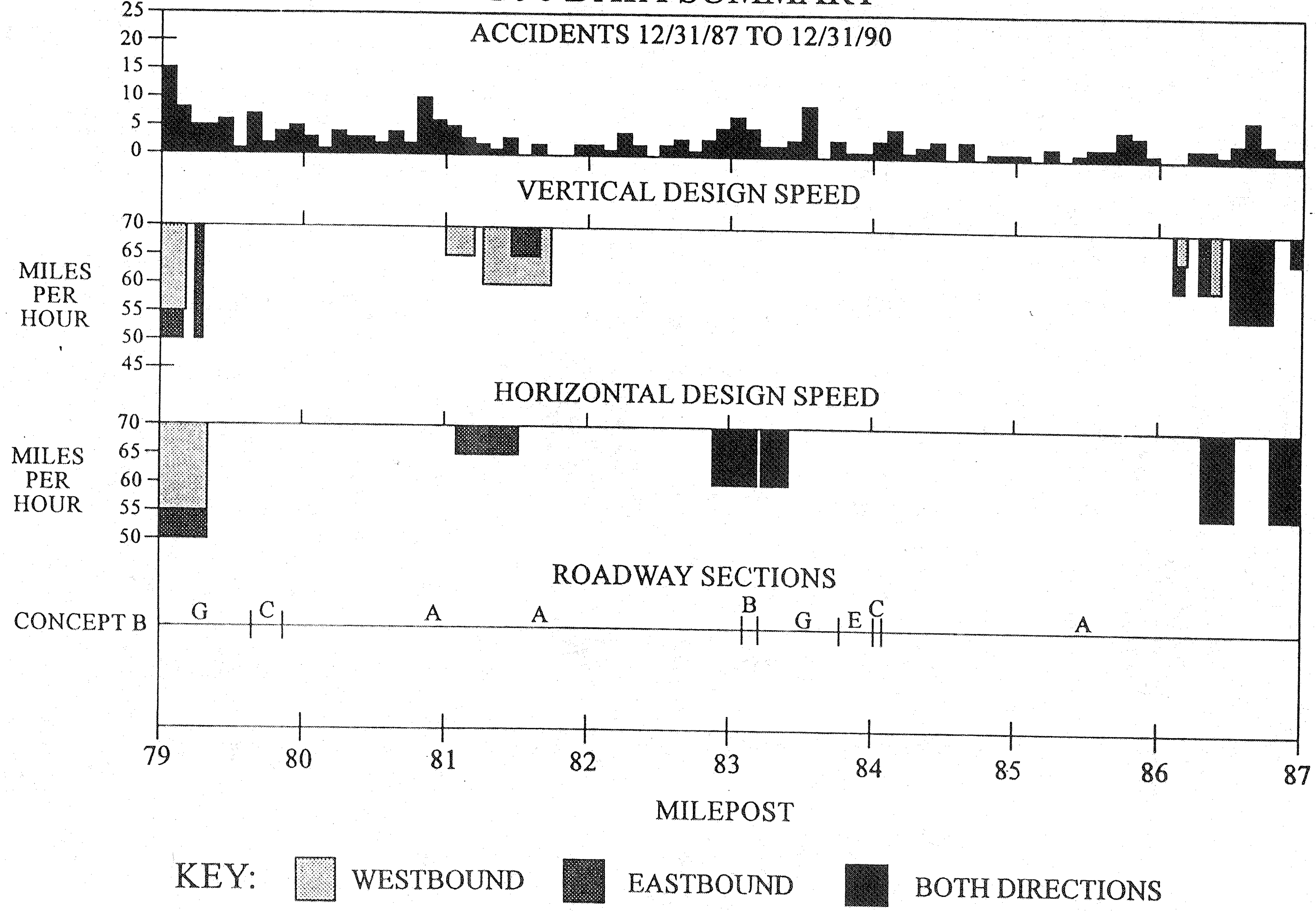
I-90 DATA SUMMARY

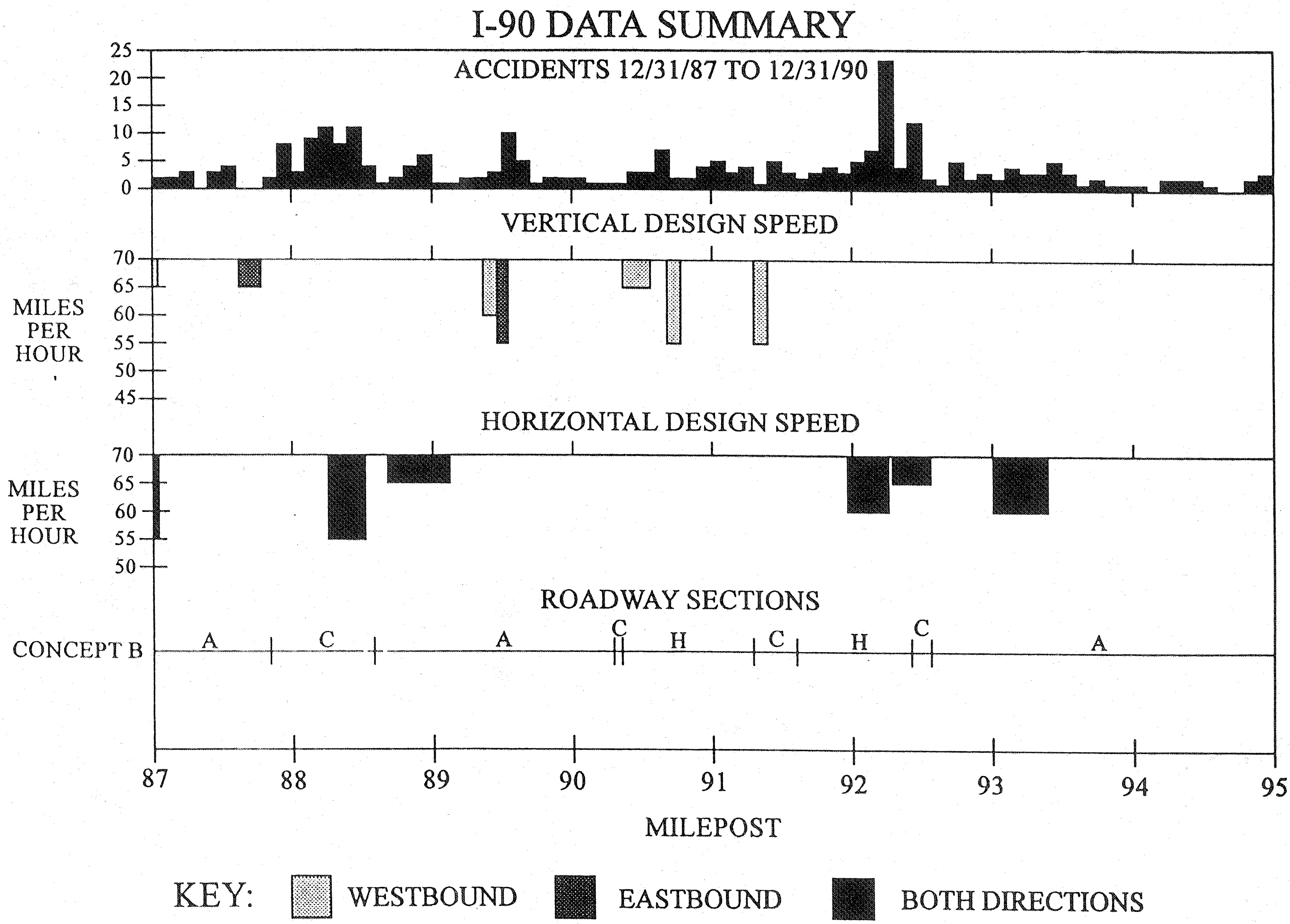


I-90 DATA SUMMARY

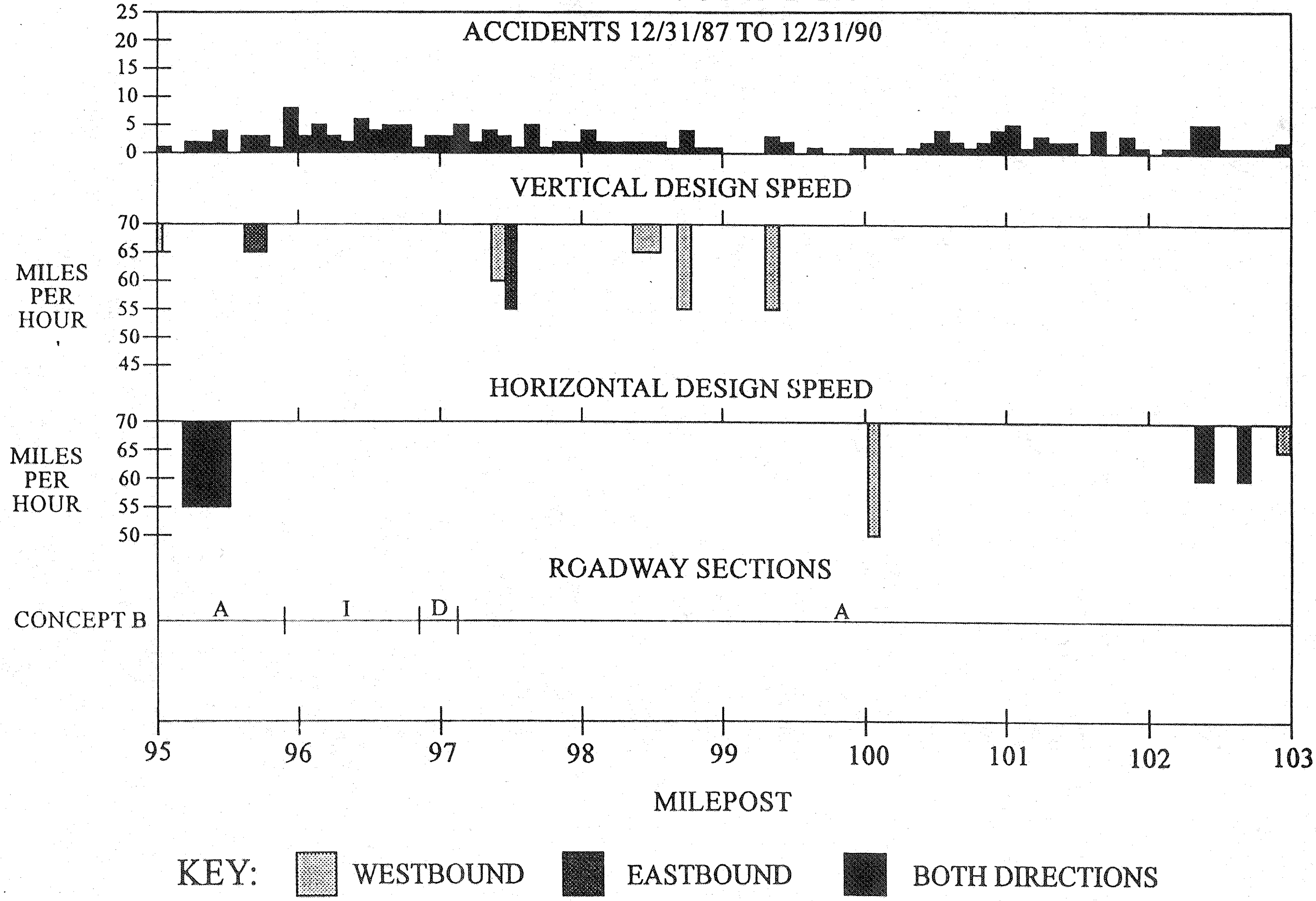


I-90 DATA SUMMARY

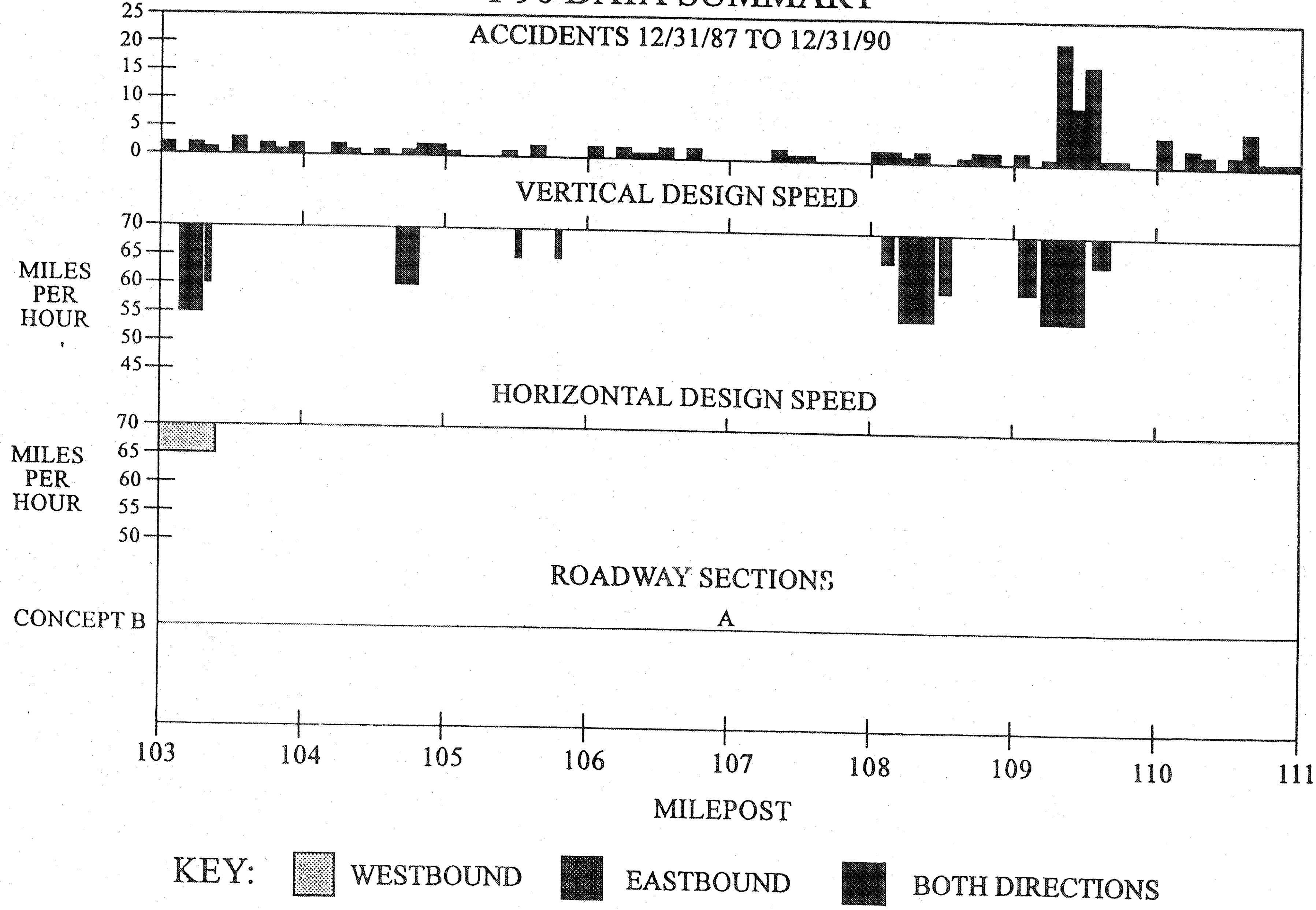



I-90 DATA SUMMARY
ACCIDENTS 12/31/87 TO 12/31/90
25
20
15
10
5
0
VERTICAL DESIGN SPEED
MILES PER HOUR
70
65
60
55
50
45
HORIZONTAL DESIGN SPEED
MILES PER HOUR
70
65
60
55
50
ROADWAY SECTIONS
CONCEPT B
A
C
A
C
H
C
H
C
A
87
88
89
90
91
92
93
94
95
MILEPOST
KEY:
WESTBOUND
EASTBOUND
BOTH DIRECTIONS

I-90 DATA SUMMARY



I-90 DATA SUMMARY



APPENDIX C

SR 90 Substandard Alignment
Horizontal Curves

MP	Station	Direction	Radius	Ex. Des. Speed	Notes
55.27	135+98	E	3820.0	55	1
55.42	142+62	W	2907.0	70	2
55.49	146+70	W	2797.0	70	2
55.61	154+73	W	2820.5	70	2
55.71	155+98	E	1637.1	60	
56.82	216+92	W	2000.0	65	2
56.85	218+95	E	1146.0	50	
57.15	235+00	E	1790.6	65	
57.19	236+46	W	2000.0	65	2
57.64	261+43	E&W	1432.5	60	
58.09	280+89	E&W	2046.0	60	
58.36	295+24	E&W	2292.0	60	3
58.59	306+39	E&W	1432.5	60	3
59.12	339+97	E&W	1500.0	65	2
59.62	362+19	E	1432.5	60	
59.63	363+43	W	1500.0	65	2
60.37	401+17	E	1432.5	60	
60.38	414+35	W	1500.0	65	
60.76	421+72	E	2865.0	60	1
61.16	441+90	E	2865.0	60	1
62.58	530+98	E	1146.0	55	
62.58	515+38	W	2000.0	65	2
63.31	553+88	W	2300.0	70	2
63.36	572+17	E	1910.0	65	
63.97	604+74	E	3820.0	55	4
64.63	639+71	E&W	1910.0	55	
64.84	650+36	E&W	1910.0	55	
65.04	661+38	E&W	1910.0	55	
65.31	675+48	E&W	1507.9	60	

---

1 - Design speed may be improved by increasing superelevation rate.

2 - Superelevation rate exceeds 0.06'/ft.

3 - Superelevation runoff between these curves does not appear to be adequate for a six-lane roadway.

4 - Design speed may be improved by increasing superelevation rate.

66.07	717+12	E&W	1146.0	55	
66.90	760+20	E&W	1146.0	55	
67.16	774+32	E&W	1432.5	60	
67.54	794+19	W	1432.5	60	
67.87	811+86	W	1432.5	60	
68.53	847+01	W	2865.0	55	5
68.91	867+43	W	2865.0	55	5
69.24	891+36	W	1637.1	60	
69.75	918+28	W	1637.1	70	6
69.78	913+30	E	2600.0	65	6
73.82	130+75	W	2865.0	50	7
73.82	130+84	E	2865.0	50	8
73.97	139+07	W	2865.0	50	7
73.97	139+08	E	2865.0	50	8
74.14	148+00	E	2865.0	50	9
74.14	148+10	W	2865.0	50	10
74.30	156+24	E	2865.0	50	9
74.30	156+34	W	2865.0	50	10
77.84	341+71	W	2865.0	65	11
77.84	342+31	E	2865.0	65	12
77.99	349+95	W	2865.0	65	11
77.99	350+55	E	2865.0	65	12
78.26	363+83	W	2122.2	60	5,13
78.27	365+02	E	2292.0	60	5,13
79.13	410+94	W	1307.2	55	
79.13	411+87	E	1514.5	60	
81.30	525+53	E	5730.0	60	5
83.04	617+01	E	1910.0	60	14
83.04	617+03	W	1910.0	60	15
83.32	632+09	E	1910.0	60	14
83.32	632+78	W	1910.0	60	15
86.41	63+94	E	2292.0	55	5
86.41	64+15	W	2392.0	55	5

---

5 - Design speed may be improved by increasing superelevation rate.

6 - Superelevation rate exceeds 0.06'/ft.

7,8,9,10,11,12 - Superelevation runoff between the curves in each set does not appear to be adequate for a six-lane roadway.

13 - These curves may be impacted due to realignment of adjacent curves at MP 77.84 and MP 77.99.

14,15 - Superelevation runoff between the curves in each set does not appear to be adequate for a six-lane roadway.

86.90	90+19	W	2765.0	55	16
86.90	90+35	E	2865.0	55	16
88.38	168+01	E	1910.0	55	17
88.40	168+79	W	1637.1	55	17
88.88	194+12	W	3820.0	65	16
88.94	198+10	E	3820.0	65	16
92.11	364+82	W	1910.0	60	17,18
92.11	364+84	E	1910.0	60	17,19
92.41	380+63	E	1637.1	65	17,19
92.41	380+70	W	1637.1	65	17,18
93.21	423+17	E&W	1910.0	60	17
95.63	551+23	E	1910.0	60	17
93.64	552+34	W	1910.0	55	17
96.04	572+89	E	1910.0	65	17,20
96.04	573+13	W	1910.0	65	17,21
96.48	597+54	W	2546.7	70	17,21
96.48	597+68	E	2387.0	60	17,20
96.98	622+58	E	1910.0	65	17,20
96.98	622+78	W	1810.0	65	17,21
103.14	947+67	E	2865.0	70	22
103.14	947+99	W	2965.0	65	16,23
103.59	972+88	W	5630.0	70	23
103.59	973+05	E	5730.0	70	22

16 - Design speed may be improved by increasing superelevation rate.

17 - Superelevation rate exceeds 0.06'/ft.

18,19,20,21,22,23 - Superelevation runoff between the curves in each set does not appear to be adequate for a six-lane roadway.

SR 90 Substandard Alignment
Vertical Curves

MP	Station	Direction	Length	Ex. Des. Speed	Notes
55.22	132+00	W	700	60	
55.23	133+50	E	700	55	24
55.35	140+00	E	400	50	24
56.58	205+00	E	200	65	
56.77	215+75	E	400	55	
57.01	227+00	E	200	60	
57.12	233+00	E	200	65	
57.43	249+50	E	500	65	
57.45	251+00	W	UNK.	UNK.	
57.66	262+00	E&W	200	50	25
57.81	270+00	E&W	270	45	25
57.93	272+50(AH)	E&W	800	50	25
58.06	279+50	E&W	200	55	25
58.45	300+00	E&W	400	65	
60.63	415+00	E	200	65	26
60.79	423+00	E	900	55	26
60.94	430+00	E	400	65	26
61.30	449+00	E	200	65	
61.47	456+63	W	UNK.	UNK.	
61.51	475+00	E	600	60	
61.90	479+67	W	AP	N/A	
62.12	491+00	W	AP	N/A	
62.29	500+00	W	AP	N/A	
62.60	532+37	E	300	70	27
63.05	556+00	E	200	55	
63.43	560+50	W	2000	70	27
63.63	586+56	E	200	65	
63.88	599+85	E	400	55	27
63.88	584+50	W	900	70	27
64.02	607+00	E	200	65	

24,25,26 - New vertical alignments will be needed to correct deficiencies due to the proximity of curves in each set.

27 - These vertical curves are located within ramp merge/diverge areas. Design speeds shown are for stopping sight distance. At these locations, decision sight distance should be provided.

64.20	617+00	E	200	65	28
64.30	622+20	E&W	AP	N/A	
64.36	625+00	E&W	400	65	28
64.55	635+00	E&W	600	70	29
64.70	643+00	E&W	600	60	29
65.11	665+00	E&W	400	55	
65.47	685+00	E&W	800	55	
65.88	707+00	E&W	400	50	
66.10	718+41	E&W	400	55	
66.43	736+00	E&W	200	65	
66.68	749+00	E&W	200	65	30
66.85	758+39	E&W	900	50	30
67.14	773+71	E&W	200	65	30
67.48	791+00	W	750	50	30
67.50	793+00	E	2000	60	30
67.59	797+00	W	AP	N/A	30
67.66	800+50	W	AP	N/A	30
67.79	807+50	W	AP	N/A	
67.89	812+50	W	AP	N/A	
68.01	819+50	E	AP	N/A	
68.05	822+00	E	AP	N/A	
68.09	824+00	W	AP	N/A	
68.17	828+00	W	AP	N/A	
68.38	839+00	W	AP	N/A	
68.67	860+00	W	AP	N/A	
68.79	861+00	E	AP	N/A	
68.84	863+50	E	AP	N/A	
68.85	869+50	W	AP	/A	
69.06	875+00	E	AP	/A	
69.14	885+00	W	AP	/A	
69.15	880+00	E	AP	N/A	
69.41	899+00	W	600	55	31
69.57	907+37	W	400	50	31
69.78	918+50	W	900	55	31
69.95	925+00(AH)	W	AP	N/A	31
70.35	946+00	W	200	65	

28 - These vertical curves are located within ramp merge/diverge areas. Design speeds shown are for stopping sight distance. At these locations, decision sight distance should be provided.

29,30,31 - New vertical alignments will be needed to correct deficiencies due to the proximity of curves in each set.

70.55	954+00	E	1200	55	
70.62	960+00	W	400	50	
71.01	981+00	E	200	65	32
71.05	983+00	E	200	65	32
71.38	998+00	W	400	65	33
71.38	998+00	E	400	70	33
71.60	1010+00	E&W	200	65	
72.14	1038+50	E	AP	N/A	
72.33	52+00	E	200	65	34
72.40	56+00	E	200	65	34
72.47	59+50	E	AP	N/A	34
72.87	81+00	W	AP	N/A	
72.88	81+25	E	200	65	35
72.95	85+00	E	200	65	35
73.02	88+75	E	200	65	35
73.10	93+00	E	200	65	35
73.31	104+00	E	300	70	36
73.34	107+00	E	200	65	36
73.42	110+00	E	AP	N/A	36
73.48	112+75	E	200	65	36
73.70	124+50	E	300	70	37
73.72	125+50	W	200	70	37
73.92	136+00	E&W	500	55	37,33
74.07	144+00	E&W	1000	45	37
74.21	151+50	E	500	60	37,33
74.21	151+75	W	600	65	37,33
74.39	160+83	E	AP	N/A	37
74.41	162+00	E	200	65	37
74.48	166+00	E	AP	N/A	
74.75	179+75	E	650	65	
74.93	189+50	E	200	65	
74.98	192+00	W	400	65	
75.18	203+00	E	200	65	

32,34,36,37 - New vertical alignments will be needed to correct deficiencies due to the proximity of curves in each set.

33 - These vertical curves are located within ramp merge/diverge areas. Design speeds shown are for stopping sight distance. At these locations, decision sight distance should be provided.

35 - While each of these curves can likely be improved without impacting adjacent curves, it may be prudent to consider a new vertical alignment in the vicinity due to the proximity of the curves.

75.27	207+50	E	200	65	
75.34	210+75	E	200	65	
75.54	217+50	E	200	65	
75.61	225+50	E	AP	N/A	
75.97	244+50	E	AP	N/A	
76.33	263+50	E	200	65	
76.51	273+00	E	AP	N/A	
76.59	277+00	E	AP	N/A	
76.64	279+50	W	400	65	
76.71	283+50	E	AP	N/A	
76.82	289+00	E	550	60	
77.30	314+50	E	AP	N/A	
77.39	319+50	EAP	N/A		
77.50	326+50	EAP	N/A		
77.64	332+50	EAP	N/A		
77.75	338+36	EAP	N/A		
77.92	346+50	W	500	60	38,39
77.92	346+75	E	500	60	38,40
78.07	354+40	W	1000	45	39
78.08	354+91	E	100045	40	
78.22	362+50	W	600	65	38,39
78.23	363+00	E	500	55	38,40
78.47	375+50	W	400	55	38,39
78.48	376+00	E	600	60	38,40
78.59	382+00	E	AP	N/A	
78.74	390+00	E	AP	N/A	41
78.78	392+00	W	400	70	42
78.80	393+00	E	200	65	41
78.86	396+50	W	400	70	42
78.89	397+84	E	300	70	41
79.05	406+50	E	1100	50	41
79.06	407+00	W	1200	55	42
79.27	417+92	W	500	70	42
79.28	418+50	E	1000	70	41
79.35	422+69	W	AP	N/A	42
79.41	425+50	W	200	65	42

38 - These vertical curves are located within ramp merge/diverge areas. Design speeds shown are for stopping sight distance. At these locations, decision sight distance should be provided.

39,40,41,42, - New vertical alignment will be needed to correct deficiencies due to the proximity of curves in each set.

79.49	430+00	E	200	55	
79.51	431+00	W	200	65	
79.58	434+50	W	200	65	
79.78	445+00	E	200	65	
79.94	453+50	W	AP	N/A	
80.07	460+50	W	200	65	43
80.15	464+50	W	AP	N/A	
80.48	482+00	W	200	65	
80.61	489+25	W	200	65	44
80.66	491+75	W	300	70	44
81.09	514+50	W	1000	65	45
81.49	535+00	W	2400	60	45
81.58	540+00	1100	55		
81.82	552+50	W	AP	N/A	
81.92	558+00	W	AP	N/A	
82.07	566+00	W	AP	N/A	
82.21	573+50	W	AP	N/A	
82.27	576+50	W	AP	N/A	
82.45	586+00	W	AP	N/A	
82.62	595+00	W	200	65	43 46
82.66	597+00	W	200	65	43,46
82.93	611+50	E&W	800	65	
85.21	0+00	E&W	AP	N/A	
86.14	49+50	E	400	60	43,47
86.16	51+00	W	400	65	43,48
86.35	60+60	E	700	60	47
86.40	63+75	W	700	60	48
86.63	76+00	E	1400	55	47
86.67	78+00	W	1500	55	48
86.95	93+00	E	400	70	47
86.98	94+00	W	400	65	48
87.69	132+00	E	700	65	
88.66	183+00	W	2000	65	43
88.70	185+00	E	1800	70	43
89.40	222+00	W	500	60	43
89.45	225+00	E	400	55	43

43 - These vertical curves are located within ramp merge/diverge areas. Design speeds shown are for stopping sight distance. At these locations, decision sight distance should be provided.

44,45,46,47,48 - New vertical alignment will be needed to correct deficiencies due to the proximity of curves in each set.

90.47	278+50(AH)	W	1000	65	
90.73	292+50	W	500	55	
91.16	315+00	E	700	55	
91.34	325+00	W	500	55	
92.54	388+00	W	1200	55	
94.95	515+00	W	1200	70	49
94.95	515+00	E	600	70	50
95.32	535+00	W	1700	55	49
95.37	537+50	E	1700	55	50
98.87	722+00	E	1400	70	51
99.35	747+50	W	1400	70	51
99.63	762+00	W	400	70	51
100.06	785+00	W	400	50	
100.38	802+00	W	400	70	52
100.48	807+00	E	AP	N/A	
100.50	808+00	W	800	70	51,52
100.54	810+00	E	AP	N/A	
102.28	902+00	E	400	70	53
102.28	902+00	W	400	70	54
102.39	908+00	E	600	55	53
102.39	908+00	W	500	55	54
102.65	921+50	W	400	55	55
102.66	922+00	E	400	55	56
102.75	927+00	W	400	70	55
102.76	927+00	E	400	70	56
103.08	944+50	E	400	70	57
103.09	945+00	W	400	70	58
103.21	951+00	E	800	55	57
103.23	952+00	W	800	55	58
103.32	957+00	E	200	60	57
103.33	957+50	W	200	60	58
103.91	990+00	E&W	AP	N/A	
104.29	010+00	E&W	AP	N/A	
104.62	1027+50	E&W	400	70	59
104.74	1034+00	E&W	800	60	59
104.90	1042+00	E&W	400	70	59
105.24	1060+00	E&W	AP	N/A	

49,50,52,53,54,55,56,57,58,59 - New vertical alignment will be needed to correct deficiencies due to the proximity of curves in each set.

51 - Non-standard vertical curve.

105.52	1075+00	E&W	200	65	60
105.80	1090+00	E&W	200	65	60
108.13	1213+00	E&W	400	65	61
108.31	1222+50	E	1300	55	61
108.32	1223+00	W	1300	55	61
108.51	1233+00	E	400	60	61
108.52	1233+50	W	400	60	61
109.10	1263+00	W	600	60	62,63
109.12	1264+00	E	600	60	62,64
109.34	1275+50	W	1500	55	62,63
109.36	1276+50	E	500	55	62,64
109.63	1291+00	W	600	65	62,63
109.65	1292+00	E	600	65	62,64

---

60 - These vertical curves are located within ramp merge/diverge areas. Design speeds shown are for stopping sight distance. At these locations, decision sight distance should be provided.

61,63,64 - New vertical alignment will be needed to correct deficiencies due to the proximity of curves in each set.

62 - These vertical curves are located within ramp merge/diverge areas. Design speeds shown are for stopping sight distance. At these locations, decision sight distance should be provided.

APPENDIX F

Bridge Summary (65)

Bridges Requiring Replacement

Bridge No.	Milepost	Crossing Name	Notes
90/107S	56.80	Rocky Run Creek	66
90/113	62.97	Stampede Road Uxing	67
90/114	63.98	Cabin Creek Road Uxing	68
90/117N	69.19	Access Road Oxing	66
90/118N	69.56	Kachess River	66
90/121	71.56	Easton Uxing	68
90/124S	74.05	Lake Valley Road Oxing	66
90/124N	74.05	Lake Valley Road Oxing	66
90/130S	78.06	Nelson Road Oxing	66
90/130N	78.06	Nelson Road Oxing	66
90/132S	78.81	Yakima River	66
90/132N	78.81	Yakima River	66
90/134S	80.79	Cle Elum River	69
90/134N	80.79	Cle Elum River	69
90/136S	83.53	S Cle Elum Rd Oc/NP RY	70
90/136N	83.53	S Cle Elum Rd Oc/NP RY	70
90/141S	86.63	Peoh Road Oxing	71
90/141N	86.63	Peoh Road Oxing	71
90/149	96.87	Taneum Creek Road Uxing	70
90/155S	103.19	Cascade Canal Overflow	71,72
90/155N	103.19	Cascade Canal Overflow	71,72

---

65 - Based on evaluation of existing vertical and horizontal alignment and 5/10/93 memo from M Lwin to R. Larson.

66 - A new bridge is required due to horizontal and vertical realignment in vicinity.

67 - A new bridge is required due to inadequate vertical clearance and insufficient clearance between piers for widening on SR 90.

68 - A new bridge is required due to insufficient clearance between piers for widening on SR 90.

69 - A new bridge is required since the existing truss bridge can not be widened to accommodate a third through lane and shoulders that meet design standards.

70 - A new bridge is required due to horizontal realignment in vicinity.

71 - A new bridge is required due to vertical realignment in vicinity.

72 - Horizontal realignment may be required to provide adequate super runoff for closely spaced curves.

90/156S	104.71	Dry Creek	73
90/156N	104.71	Dry Creek	73
90/161N	108.30	Damman Road Oxing	73
90/161S	108.31	Damman Road Oxing	73
90/162S	109.13	Wilson Creek	73
90/162N	109.13	Wilson Creek	73
90/163N	109.34	BN RR(NP) & Canyon Road Oxing	73
90/163S	109.36	BN RR(NP) & Canyon Road Oxing	73

Bridges Requiring Widening or Modification

Bridge No.	Milepost	Crossing Name	Notes
90/106S	55.49	Gold Creek	74
90/106N	55.50	Gold Creek	75
90/117S	69.13	Access Road Oxing	
90/118S	69.56	Kachess River	76
90/120S	71.26	Yakima River	77
90/120N	71.26	Yakima River	77
90/126S	75.36	Big Creek	
90/126N	75.36	Big Creek	
90/128S	76.60	Little Creek	
90/128N	76.60	Little Creek	78
90/140S	86.20	Yakima River	
90/140N	86.20	Yakima River	
90/145S	90.64	Highline Canal	79
90/145N	90.64	Highline Canal	79

---

73 - A new bridge is required due to vertical realignment in vicinity.

74 - The bridge has 0.01 crown and may be impacted by super runoff from adjacent horizontal curve which may be realigned.

75 - The bridge has 0.07 super.

76 - The bridge has 0.02 superelevation downward right and is on a tangent section of roadway.

77 - If the Easton Interchange ramps are realigned, widening may be required to provide adequate ramp tapers. The bridge has 0.01 crown.

78 - The bridge has 0.01 superelevation downward right and is on a tangent section of roadway.

79 - Widening for a third lane should not be done in the median; otherwise, relocation of a section of the Highline Canal or raising the bridge would be required.

90/150N	97.27	Taneum Creek
90/150S	97.27	Taneum Creek
90/152S	100.55	West Side Canal
90/152N	100.55	West Side Canal
90/154S	102.49	Yakima River
90/154N	102.49	Yakima River
90/160S	107.43	Reeser Creek
90/160N	107.43	Reeser Creek
82/1S	110.87	SR 82 Uxing
82/1N	110.87	SR 82 Uxing

Bridges Requiring No Work

Bridge No.	Milepost	Crossing Name	Notes
90/119	70.28	West Easton Uxing	
90/133	80.31	Bullfrog Road Uxing	
90/135E-N	83.12	E-N Ramp Uxing	
90/137	84.20	Oakes Avenue Uxing	
970/1	85.36	SR 970 Uxing East Cle Elum	
90/144	89.77	Thorp Prairie Road Uxing	
90/147	93.62	Elk Heights Uxing	
90/153	101.07	Thorp Road Uxing	
97/200	106.06	SR 97 Uxing West Ellensburg	

APPENDIX G

INTERIM IMPROVEMENTS AND REHABILITATION

It is recognized that portions of the current roadway complex are worn out, functionally obsolete, substandard, or otherwise inadequate to accommodate the present or near future needs. It will be a number of years before any long term improvements are started and many years before sizable portions may be completed. Conditions needing interim improvement are listed:

a) Pavement Condition
b) Traffic Capacity and Safety
c) Substandard Designs and Safety
d) Maintenance Resources

Pavement Condition
Numerous sections of the portland cement concrete pavement and adjacent asphalt concrete shoulders are well beyond the expected design life. A plan for interim pavement rehabilitation is included in correspondence titled *SR 90, MP 55 to MP 102, PCC Rehabilitation Plan.* As experience is gained in rehabilitation techniques, the strategies may be modified.

Traffic Capacity and Safety
The traffic capacity of the highway, especially Hyak to Cle Elum, is exceeded on a number of weekends of the year by westbound traffic and occasionally by eastbound traffic. The safety of highway users is compromised by operation in the overload mode, especially with the substandard design elements.

A number of actions have been identified to improve traffic flow at peak use times. These actions include:

a) Changeable Message Signing
b) Variable Speed Limit Signing
c) Increased Use of Highway Advisory Radio and Other Public Information Methods
d) Increased Coverage by State Patrol
e) Improve Critical Deficiencies

These and other strategies need to be implemented to achieve the maximum possible traffic volume with the available facility.

Substandard Designs and Safety

Some of the substandard features may need to be improved, at an early date, to improve the traffic safety or volume capacity of the highway. It is felt that most features can wait for the ultimate design to be implemented but an analysis may determine that some improvements could add to the capacity and/or safety of the highway.

Examples of substandard features are:

a) Interchange Ramp Tapers and Lengths
b) Bridge Widths
c) Pavement Condition
d) High Accident Rate Locations
e) Traffic Barriers, Guard Rail, Impact Attenuators
f) Horizontal and Vertical Curves

Maintenance Resources

As the traffic volume grows and the existing facility ages, the needs of our Maintenance forces grow at a rate greater than the inflation rate increases that are used in present budgeting. This is especially true of the snow and ice removal activities.

APPENDIX H

OPERATIONS AND MAINTENANCE

None of the modifications and improvements contemplated in this report can be undertaken without recognizing the effects upon the operation and maintenance of the roadway complex. Snow and ice control is a particular concern in this area. Not only would the volume of work be increased, but the nature and complexity would also be changed.

The views and needs of our Maintenance forces must be considered in the designs.

When the construction is accomplished, Maintenance must be provided with the resources to operate and maintain the entire complex. Planning for this increase in Maintenance personnel, equipment, and other resources is an integral part of planning for this improvement.

ATTACHMENT A

VICINITY MAP

ATTACHMENT B

ALTERNATE CORRIDORS MAP

ATTACHMENT C

ALTERNATIVE ROUTES FOR SR 90 EXCESS

I. DO NOTHING BEYOND CONSTRUCT 6 LANE HIGHWAY

A. ADVANTAGES

1. Reasonable cost for new construction.
2. Permits more construction to standards/user cost, better safety.
3. Minimizes adverse ecological impacts.
4. Market place should adjust to absorb unmet demands to move freight and passengers..
5. Potential safer operation when not overloaded.
6. Permits planning for predictable growth of the highway facility and highway uses.

B. DISADVANTAGES

1. Beyond ability or desire of market place to adjust to needs, the regional economy may be restricted.
2. Planning for growth of traffic at other locations and other modes may be beyond government control.
3. May put undesirable burden on other transportation corridors and modes.
4. Potential increased hazard and cost to users as the highway functions on "overload mode".
5. Might require some kind of restrictions to prevent highway from becoming overloaded.

II. EXPAND STEVENS PASS HIGHWAY SR 2

A. ADVANTAGES

1. Existing highway route.
2. Reasonably close to SR 90 corridor.

B. DISADVANTAGES

1. Severe environmental impacts.
2. Cost to construct probably greater than SR 90 for same number of lanes.
3. Cost to operate.
   a. Snow and ice
   b. Avalanche control
4. More potential closures than Snoqualmie Pass due to winter conditions, especially avalanche hazard.
5. Potential substandard design due to geometric restraints.

6. Some local residents may resist development.
7. May violate local zoning and land use planning.
8. Does not truly serve desired geographic area.
9. More costly for users due to higher elevation and steeper grades.

III. NACHES PASS NEW HIGHWAY

A. ADVANTAGES

1. It is a route that has been previously considered as a new highway but never authorized by the legislature.
2. Direct route from south Puget Sound to Yakima vicinity.
3. Offers a tunnel route crossing of Cascades and resulting reduction of snow and ice encounter in winter time.
4. Tunnel may offer long-term operational advantages over a surface crossing.
5. Attractive operating costs for many uses due to location and favorable grades.

B. DISADVANTAGES

1. Severe environmental impacts.
2. Potential substandard design due to geographic restraints.
3. Local residents will resist.
4. May violate local zoning and land use planning.
5. Does not truly serve desired geographic area, but it is better than Stevens Pass route.
6. Not an existing highway.
7. Tunnel is costly to construct.

IV. STAMPEDE PASS NEW HIGHWAY

A. ADVANTAGES

1. Serves SR 90 corridor to the east and has west end in the highly developed and industrial area vicinity of Seattle to Auburn.
2. Potential tunnel crossing of Cascades and reduction of winter time snow and ice encounters.
3. Tunnel may offer long term operational advantages over surface crossing.
4. Attractive operating costs for many users due to location and potential favorable grades.

B. DISADVANTAGES

1. Traverses City of Tacoma watershed.
2. Potential conflicts with existing railroad that may again become operational.
3. Severe environmental impacts.
4. Cost to construct unknown, but tunnel cost is high.
5. Potential substandard design due to geometric restraints.
6. May violate local zoning and land use planning.

V. OLD MILWAUKEE ROUTE HIGHWAY

A. ADVANTAGES

1. From Hyak to Easton the route is close to existing SR 90. A west connection could be made at Hyak and an east connection between Keechelus Dam and Easton vicinity. The grades would be attractive.
2. Highways on both sides of Lake Keechelus would enhance artillery type avalanche control by permitting access to shoot across the lake. It is hoped that artillery control of avalanches will be replaced by other methods, so this may be a moot advantage.
3. Maintenance and operation of the roadway could be accomplished within the existing supervision framework, just more resources would be necessary.

B. DISADVANTAGES

1. The subject portion, Hyak to Easton, is now a linear State Park and is operated as a recreational trail. Acquisition of the land would be difficult because of the current recreational use.
2. The State Parks have permitted placing of a large fiber optic cable in the old roadbed.
3. The former railroad right of way would have inadequate width for a highway, either two or four lanes wide.
4. There would be numerous environmental conflicts involved with construction in the river valley and along the lake.
5. The route along Lake Keechelus is narrow and the hillside steep. The railroad had a considerable length of snowshed. A wider roadway would make the snow sliding situation worse.
6. Logging has created a larger avalanche path north of the former snowsheds.
7. Potential substandard design due to geographic restraints.
8. Difficult to manage snow and ice control on widely separated roadways. Lots of cross-overs to the existing highway would be necessary to efficiently use maintenance forces.

VI. REACTIVATE EXISTING STAMPEDE PASS RAILWAY

A. ADVANTAGES

1. Serves the right places on both ends with good potential to reduce freight and passengers on SR 90.
2. Attractive shipping costs are possible.
3. The railroad exists today.
4. Has the potential to take much heavy freight from highway, reducing some volume but greatly extending pavement life. Passenger capacity by train would reduce vehicles on SR 90.
5. Rehabilitation, only, of existing railroad facility could greatly effect SR 90 traffic. Potential for low cost is good.
6. Possible that reactivation of railroad may happen due to market place conditions,

as well as a conscious action to supplement SR 90.

7. Potential for relatively few ecological impacts.
8. Freight can move more easily in and out of metropolitan area.

B. DISADVANTAGES

1. Difficult for government to control decision by owners to reactivate railroad.
2. May require channeling of some funding to railroad rehabilitation.
3. Difficult for government to control decisions regarding future operations that may affect SR 90 traffic.
4. May require new freight terminals and inter modal facilities not now existing in local area and far away.
5. May be difficult to change old habit of shipping by truck even if railroad advantages are attractive.

VII. STEVENS PASS RAILROAD CAPACITY EXPANSION

A. ADVANTAGES

1. An operating railroad exists now and some increase may be possible with existing facility.
2. Potential for relatively low cost to expand capacity.
3. Relatively few potential ecological impacts.
4. Some improvement may develop due to market place conditions without a conscious action to supplement SR 90.
5. Freight can move more easily in and out of metropolitan area.

B. DISADVANTAGES

1. Does not directly serve freight or passenger traffic with origin/destination Kittitas and Yakima Valleys.
2. Difficult for government planning and control.
3. Difficult to change old habits.

VIII. COLUMBIA RIVER GORGE RAILROAD CAPACITY IMPROVEMENT

A. ADVANTAGES

1. An operating railroad exists now and some increase may be possible with existing facility.
2. Potential for relatively low cost to expand capacity.
3. Relatively few potential ecological impacts.
4. Some improvement may develop due to market place conditions without a conscious action to supplement SR 90.
5. Freight can move more easily in and out of metropolitan area.
6. May better serve local freight service than Stevens Pass Railroad.

B. DISADVANTAGES

1. Does not directly serve freight or passenger traffic with origin/destination

Kittitas and Yakima Valleys.
2. Difficult for government planning and control.
3. Difficult to change old habits.
4. Railroad route passes through Columbia River Gorge Scenic Area that is subject to a high degree of regulation based on environmental preservation.

IX. NACHES PASS TO THORP HIGHWAY

This route was dismissed without further thought because of long tunnel length and invasion into the Taneum Creek valley that is too small to accommodate a large highway without massive earthwork and environmental impacts.