Project Analysis

US 97 / Satus Creek Bridge -
Bridge Replacement

MP 44.50 to MP 46.45

XL-1043

Project Analysis Approval Recommended

Jeff McMinnick
Development Branch Project Engineer

7-27-11

Project Analysis Approval Recommended

Brian White
Assistant Regional Administrator for Project Development, and
I-90 Construction

8/1/11

Project Analysis Approved

Terry Berends
Assistant State Design Engineer for South Central Region

8/3/11
# Project Analysis

US 97 / Satus Creek Bridge -  
*Bridge Replacement*  
MP 44.50 to MP 46.45

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Project Analysis

US 97 / Satus Creek Bridge -
Bridge Replacement

MP 44.50 to MP 46.45

Shoulder Width & Shy Distance Variance

PROJECT OVERVIEW
The US 97 / Satus Creek Bridge - Bridge Replacement project combines three PINs, (509703L) bridge replacement, (509702N) paving, and (5097020) safety to form one project. The combined project will be funded through the following programs: (P2) Structure Preservation, (I2) Safety Improvements, and (P1) Roadway Preservation.

Satus Creek Bridge #97/106, built in 1942 with steel-rolled beams and creosote-treated timbers, is ranked number 2 in the 2011-2013 Bridge Preservation – Replacement / Rehabilitation program. The bridge is considered Functionally Obsolete by the Bridge and Structures Office, and has a Sufficiency Rating of 44.48 out of 100.

The project will be designed to full WSDOT Design Manual (DM) December 2009 standards as shown in Design Matrix 3: Main Line NHS Routes (Except Interstate), Row 4. See Appendix A, WSDOT Design Manual Exhibit 1100-6, Design Matrix 3: Main Line NHS Routes (Except Interstate). US 97 is a 2 lane highway that runs through a fairly flat rural area. The highway classification for this section of US 97 is rural, principal arterial. The design classification is P-3, Rural. See Appendix B, WSDOT Design Manual Exhibit 1140-6, Geometric Design Data: Principle Arterial, December 2009. The current ADT is 3300 with 25% trucks and an ADT of 4107 with 25% trucks for the design year.

The Route Development Plan titled “SR 97, MP 33.52 to MP 61.34, Klickitat County Line to Jet. SR22” approved July 1, 1992 encompasses this section of US 97. The Route Development Plan’s recommendation is to construct 12 ft. lanes and 6 ft. shoulders. The planned improvements of the Route Development plan have been realized with the exception of the Satus Creek Bridge Replacement project limits. See Appendix C, Route Development Plan.

Bridge: Satus Creek Bridge will be replaced with a wider bridge. Existing Bridge lane widths will be increased from 11 ft. to 12 ft. Existing Bridge shoulder widths will be increased from 2 ft. to 6 ft. The Bridge height will be increased to provide adequate freeboard for the 100-year event and improve maintenance access.

Roadway: US 97 safety improvements extending from each end of Satus Creek Bridge to the project limits will widen the roadway from existing 11ft. lanes and 4 ft. shoulders to 12 ft. lanes and 6 ft. shoulders. Additional safety improvements will be realized throughout the project by adding guardrail, and flattening slopes where possible. Four horizontal curves located within
the project limits will be improved by increasing the radius of each. The result will be increased sight distance and longer superelevation transitions.

ROUTE DESCRIPTION
The US 97 / Satus Creek Bridge - Bridge Replacement project is located within the confines of the Yakama Nation in Yakima County on US 97 between MP 44.50, and MP 46.45. The route lies within a fairly flat rural area.

The Freight and Goods Transportation System rates US 97 as a T-2 Route Classification based on the annual freight tonnage carried per year. US 97 averages over 4 million freight tons transported annually.

The project area travels through property managed by the Bureau of Indian Affairs, the Yakama Nation, and several private property owners. This route roughly parallels Satus Creek and contains wetlands and culturally sensitive areas within the project limits.

The posted speed is 65 mph, however, an advisory speed of 55 mph is posted on the horizontal curve encompassing the bridge.

COLLISIONS
There were 15 collisions within the project limits between 2004 and 2009. Seven of the 15 collisions were attributed to driver inattention. Of the remaining eight collisions, contributing circumstances ranged from exceeding reasonable speed to driver impairment due to alcohol consumption and falling asleep at the wheel. Three of the collisions occurred within the horizontal curve containing the bridge. Contributing circumstances were drunk driving, speeding in inclement weather, and no cause. Notes in the collision report indicate that the
safety improvements planned, for example adding guardrail, will likely decrease the severity of collisions in the future. 55 mph advisory speed limit signs are currently posted on either side of the horizontal curve located at the bridge (MP 45.86) based on ball-banking, and traffic information.

**DESIGN LEVEL CHANGE JUSTIFICATION**

**Shoulder Width:** Currently, there is minimal shoulder width throughout the project; existing roadway shoulder widths vary from 2 ft. to 4 ft. The shoulder width of the existing bridge is approximately 2 ft.

The P-3, Full Design Level standard, indicates 8 ft. shoulders are appropriate for both the proposed roadway and replacement bridge. See Appendix B, WSDOT Design Manual Exhibit 1140-6, Geometric Design Data: Principle Arterial, December 2009.

Design Matrix 3: Main Line NHS Routes (Except Interstate), DM Exhibit 1100-6, Row 4, note #2 for shoulder width states; Modified Design Level may apply based on a corridor or project analysis. Based on current ADT a Modified Design Level of MDL-13 could be used which requires 11 ft. lanes and 3 ft. shoulders. See Appendix D, WSDOT Design Manual Exhibit 1130-11, Geometric Design Data: Principle Arterial, June 2009.

Based on the “SR 97, MP 33.52 to MP 61.34, Klickitat County Line to Jct. SR22” Route Development Plan, right-of-way constraints, impacts to Satus Creek, impacts to wet lands, and increased potential of an unanticipated discovery of cultural resources we recommend the use of 12 ft. lanes and 6 ft. shoulders for both the roadway and replacement structure.

**Shy Distance:** Within the project limits shy distance is not provided for existing guardrail. Full Design Level standards indicate 2 ft. of additional widening for shy distance when barrier is to be installed in areas where the roadway is widened and the shoulder width will be less than 8 feet. See Appendix E, WSDOT Design Manual, December 2009, Section 1610.05(1) Shy Distance, page 1610-6.

Achieving full design standards is made challenging due to unavailability of right-of-way, increased risk of unanticipated discovery of cultural resources, wetland impacts, and impacts to the Satus Creek riparian environment. The SC Region recommends the use of 6 ft. roadway shoulders with out 2 ft. of additional widening for shy distance at the following guardrail locations:

MP 44.88 to MP 45.08 (LT.)
MP 45.04 to MP 45.86 (RT.)
MP 45.53 to MP 45.64 (LT.)
MP 45.82 to MP 45.86 (LT.)
MP 45.91 to MP 46.10 (LT.)
MP 45.91 to MP 45.97 (RT.).
WSDOT Design Manual, Section 1140.14 Structure Width, does not recommend additional width for shy to barrier on structures. A constant roadway width is desirable. See Appendix F, Section 1140.14 Structure Width, page 1140-13 of the WSDOT Design Manual, December 2009.

SUMMARY
The following table summarizes the geometric differences of the four conditions discussed.

<table>
<thead>
<tr>
<th></th>
<th>Lane Width</th>
<th>Shoulder Width</th>
<th>Shy to Barrier</th>
<th>Total Width</th>
</tr>
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<tbody>
<tr>
<td>Existing</td>
<td>11 ft.</td>
<td>2 ft. – 4 ft.</td>
<td>0 ft.</td>
<td>26 ft. – 30 ft.</td>
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<tr>
<td>Modified Design Standards</td>
<td>11 ft.</td>
<td>3 ft.</td>
<td>2 ft.</td>
<td>32 ft.</td>
</tr>
<tr>
<td>Proposed</td>
<td>12 ft.</td>
<td>6 ft.</td>
<td>0 ft.</td>
<td>36 ft.</td>
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<tr>
<td>Full Design Standards</td>
<td>12 ft.</td>
<td>8 ft.</td>
<td>0 ft.</td>
<td>40 ft.</td>
</tr>
</tbody>
</table>

Full Design Standards are impractical due to project constraints. The Proposed geometry provides 2 ft. less shoulder width than Full Design Standards, fits within the existing easement, and, improves the existing condition and geometrics.

CONCLUSION
Reduced shoulder widths, and not providing shy distance to roadside barrier is recommended due to right-of-way availability issues, increased risk of unanticipated discovery of cultural resources, wetland impacts, and impacts to the Satus Creek riparian environment.

The Route Development Plan titled “SR 97, MP 33.52 to MP 61.34, Klickitat County Line to Jct. SR22” approved July 1, 1992 addressed these project delivery issues and made the following recommendations as stated in the Executive Summary. SC Region projects programmed to improve SR 97 after July 1, 1992 have followed these recommendations.

“The current practice of constructing 12 foot lanes and 6 foot shoulders should be continued.”

“The vertical and horizontal alignments should be improved where possible in the 17.67 mile segment.”

“The recommendations, and their implementation, are limited by the environmentally and culturally sensitive areas along Satus Creek.”

The SC Region recommends approval of this Project Analysis. 12 ft. lanes and 6 ft. shoulders without shy distance accomplish the Regions planned improvement for this 2 mile section of US97.
Appendix A

Design Matrix 3
<table>
<thead>
<tr>
<th>Project Type</th>
<th>Main Line</th>
<th>Bridges</th>
<th>Intersections</th>
<th>Barriers</th>
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<td><strong>Design Elements</strong></td>
<td>Horizontal Alignment</td>
<td>Vertical Alignment</td>
<td>Lane Width</td>
<td>Shoulder Width</td>
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<td>DEF</td>
<td>DEF</td>
<td>DEF</td>
</tr>
<tr>
<td><strong>Structures</strong></td>
<td>DEF</td>
<td>DEF</td>
<td>DEF</td>
<td>DEF</td>
</tr>
<tr>
<td><strong>Improvements</strong></td>
<td>DEF</td>
<td>DEF</td>
<td>DEF</td>
<td>DEF</td>
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<td>DEF</td>
<td>DEF</td>
<td>DEF</td>
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<tr>
<td><strong>Safety</strong></td>
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<td>DEF</td>
<td>DEF</td>
<td>DEF</td>
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<tr>
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<td>DEF</td>
<td>DEF</td>
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</table>

**Design Elements determined based on Project Analysis**

**Design Matrix 3: Main Line NHS Routes (Except Interstate)**

**Exhibit 1100-6**
Appendix B

P-3, Full Design Level Data
### Full Design Level

#### Chapter 1140

**Design Class**

<table>
<thead>
<tr>
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<th>Undivided Multilane</th>
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<tr>
<td></td>
<td>P-1</td>
<td>P-2</td>
<td>P-3</td>
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<td>DHV in Design Year*(2)</td>
<td>NHS</td>
<td>Non-NHS</td>
<td>Over 1,500</td>
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<tr>
<td>Access Control*(5)</td>
<td>Full</td>
<td>Partial</td>
<td>All</td>
</tr>
<tr>
<td>Design Speed (mph)**(9)</td>
<td>60*(10)</td>
<td>50*(14)</td>
<td>70</td>
</tr>
<tr>
<td>Traffic Lanes</td>
<td>4 or more divided</td>
<td>4 or 6 divided</td>
<td>2</td>
</tr>
<tr>
<td>Shoulder Width (ft)**(16)</td>
<td>10*(17)</td>
<td>10 Variable*(19)(20)</td>
<td>6</td>
</tr>
<tr>
<td>Median Width (ft)</td>
<td>Minimum width is as required for shoulders and barrier (including shy distance) or ditch (see 1140.10)</td>
<td>Variable*(19)(20)</td>
<td>(See 1140.10)</td>
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<tr>
<td>Parking Lanes Width (ft) - Minimum</td>
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<td>Right of Way Width (ft)**(23)</td>
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<td>120</td>
</tr>
<tr>
<td>Structures Width (ft)**(29)</td>
<td>Full Roadway Width**(27)</td>
<td>Full Rdwy Width</td>
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</table>

**Type of Terrain**

<table>
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<tr>
<th></th>
<th>Rural Design Speed (mph)</th>
<th>Urban Design Speed (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40</td>
<td>45</td>
</tr>
<tr>
<td>Level</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Rolling</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Mountainous</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

**Grades (%)***(30)
Appendix C

Route Development Plan
Date: July 1, 1992
From: James P. Toohey
To: Richard L. Larson

Subject: SR 97, MP 33.52 to MP 61.34
Klickitat County Line to Jct SR 22
Route Development Plan

Attached is the approved route development plan for the subject area. It was approved without comment. Please commend your staff for a job well done.

CEH: dn
Attachments
cc: C. Howard
Date: April 16, 1992

From: Richard L. Larson

RE: SR 97, MP 33.52 to MP 61.34
Klickitat County Line to Jct
SR 22. Route Development
Plan

To: James P. Toohey
Mail Stop: KF-01

Attached for your review and approval is the Route Development plan for SR 97 from the Klickitat County Line to the junction of SR 22, near the City of Toppenish.

This Route Development Plan is intended to identify the improvements needed for this section of US 97 to provide the necessary capacity until the year 2012. The plan encompasses a myriad of factors distilled into a recommended highway design. When it is approved, this long range plan will provide guidance for the development of the Districts program of projects as well as guiding the District Planning Office in defining developer impact mitigation measures.

The Technical Advisory Committee of the Yakima Valley Conference of Governments concurs that this plan is consistent with the zoning, land use, and comprehensive plans within Yakima County. Yakima County does not have a Regional Transportation Plan that we could review this RDP against for concurrence.

This RDP has been reviewed by the Yakima Indian Agency, and their comments have been incorporated into the plan.

We recommend approval of this plan. It accomplishes the Districts goals of maintaining the current LOS on SR 97 and providing a reasonable facility for future use. The recommendations made are consistent with any improvements that might be necessary beyond the 20 year design frame of this plan.
Route Development Plan

SR 97
Klickitat County Line to Jct. SR 22
Milepost 33.52 to 61.34

April 1992

Washington State
Department of Transportation
District 5
2809 Main Street
Post Office Box 12560
Yakima, Washington

R. L. Larson, P.E.
District Administrator
Washington State Department of Transportation
Route Development Plan

SR 97 MP 33.52 to MP 61.34

Klickitat County Line to Jct. SR 22

TITLE

APPROVED BY:

[Signature]
District Administrator, District 5

5/15/92
Date

APPROVED BY:

[Signature]
Assistant Secretary
Planning, Research and Public Transportation

7/1/92
Date

CONCURRENCE:

[Signature]
State Design Engineer

6/24/92
Date

REVIEWED:

[Signature]
Assistant Secretary for Operations

6/29/92
Date
EXECUTIVE SUMMARY

U.S. 97 is a two lane principal arterial that runs north/south from the Oregon State Line, near Goldendale in Klickitat County, to the Canadian Border, near Osoyoos Lake in Okanogan County.

This report covers a section of SR 97 that lies within Yakima County, beginning at the Klickitat County Line, MP 33.52, District 5 Boundary, and ending at the junction of SR 22, MP 61.34, near the City of Toppenish. The primary user of SR 97 through the report section is interstate traffic from Oregon and Southwest Washington going to Central Washington. The traffic includes 23% trucks and 4% recreational vehicles. The current Level of Service (LOS) is A (5.66 miles) and C (22.16 miles) for the report section. The LOS by year 2012 will be A (5.66 miles), C (4.49 miles), and D (17.67 miles) if no improvements are made.

The report recommends the following:
1. An acceptable LOS for SR 97 is "C".
2. The current practice of constructing 12 foot lanes and 6 foot shoulders should be continued.
3. Partial access control should be established throughout the report section.
4. The vertical and horizontal alignments should be improved where possible in the 17.67 mile segment.
5. At least 6 - 2 mile long passing lanes (3 per each direction of travel) should be added to the 17.67 mile segment.

These recommendations will maintain a LOS of C or better through the design year (2012). The recommendations, and their implementation, are limited by the environmentally and culturally sensitive areas along Satus Creek.
PRESENT PURPOSE AND FUNCTION

SR 97 is a north/south U.S. Route that traverses Washington State entering at the Columbia River, in Klickitat County, near the town of Goldendale, and leaving Washington State at Osoyoos Lake in Okanogan County. This report applies to the section of SR 97 that begins at the Klickitat County line (M.P. 33.52) and ends at the City of Toppenish (M.P. 61.34). The report section lies within Yakima County and the Yakima Indian Reservation. The roadway serves interstate movements from western and central Oregon to central Washington and intrastate movement between southwest Washington and central Washington.

This section of roadway has a functional classification of Principal Arterial, and is categorized as "Design Standards" in the 1990 State Highways Level of Development Plan. The design hourly volume (DHV) count of 523 vehicles places this section within the P-3 design class. The functional classification is consistent with the origin, nature, and amount of traffic that use this road.

A prior Route Development Plan (attached) for this section sought and received approval for 12 foot lanes and 6 foot shoulders, rather than 12 foot lanes and 8 foot shoulders as required for the P-3 design class. The reasons sited for the request were the close proximity of sensitive archaeological and environmental areas to the roadway, and restricted funds and budgetary constraints.

WSDOT has planned Partial Access Control from the Klickitat County line (M.P. 33.52) to Dry Creek (M.P. 50.52), has established Partial Access Control from Dry Creek (M.P. 50.52) to Toppenish Creek (M.P. 57.06), and has planned Modified Access Control from Toppenish Creek (M.P. 57.06) to the City of Toppenish (M.P. 61.34). Current WSDOT design standards recommend no more than 2 property access points per side per mile and 1 mile crossroad spacing for the segments from Klickitat County to Toppenish Creek. Access from Toppenish Creek to the City of Toppenish should be limited to one access per property and joint use of access approaches where feasible.

DESCRIPTION OF EXISTING FACILITIES

U.S. 97, from M.P. 33.52 to M.P. 61.34, is a two lane highway. Travel lanes, auxiliary lanes, and shoulder widths are tabulated below:
M.P. to M.P. | Lanes | Shoulders
--- | --- | ---
33.52 to 35.36 | 11' ACP | 6'-8' Gravel
35.36 to 41.28 | 12' ACP | 6' ACP
41.28 to 50.72 | 11' ACP | 6'-8' Gravel
50.72 to 51.19 | 12' ACP | 6' ACP
51.19 to 53.41 | 11' ACP with 10' Climbing Lane right | 3' ACP right
53.41 to 53.73 | 11' ACP with 10' Climbing Lanes left and right | 3' ACP left
53.73 to 56.85 | 11' ACP with 10' Climbing Lane left | 6' ACP right
56.85 to 61.34 | 12' ACP | 7' ACP

SR 97 has 15 at-grade intersections with County Roads or Yakima Indian Nation Roads. Additionally, there is a rest stop pull out at M.P. 45.90 and a Weigh Station exit and entrance at M.P. 56.83 and 56.98, respectively. The present Average Daily Traffic (ADT) for crossroad traffic is well below 2000 vehicles at all intersections within this report. This report terminates just prior to a signalized intersection at the junction of SR 97 and SR 22 (M.P. 61.44).

The number of private road approaches per mile exceed the guideline for road approaches set forth in the WSDOT Design Manual for the partial access control segment from Klickitat County line to Dry Creek. There are no road approaches on the section from Dry Creek to Toppenish Creek.

The bridges included within this report are:

<table>
<thead>
<tr>
<th>Bridge Title</th>
<th>Bridge Number</th>
<th>M.P.</th>
<th>Width</th>
<th>Useful Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satus Cr. 4th Xing</td>
<td>97/102</td>
<td>35.89</td>
<td>36'</td>
<td>2042</td>
</tr>
<tr>
<td>Satus Cr. 3rd Xing</td>
<td>97/103</td>
<td>37.46</td>
<td>40'</td>
<td>2050</td>
</tr>
<tr>
<td>Satus Cr. 2nd Xing</td>
<td>97/106</td>
<td>45.84</td>
<td>28'</td>
<td>1999</td>
</tr>
<tr>
<td>Trestle #3</td>
<td>97/108</td>
<td>47.02</td>
<td>28'</td>
<td>1999</td>
</tr>
<tr>
<td>Trestle #2</td>
<td>97/109</td>
<td>48.00</td>
<td>28'</td>
<td>1998</td>
</tr>
<tr>
<td>Trestle #1</td>
<td>97/110</td>
<td>49.16</td>
<td>28'</td>
<td>1998</td>
</tr>
<tr>
<td>Satus Cr. 1st Xing</td>
<td>97/111</td>
<td>49.56</td>
<td>28'</td>
<td>1993</td>
</tr>
<tr>
<td>Dry Creek</td>
<td>97/112</td>
<td>50.93</td>
<td>36'</td>
<td>2040</td>
</tr>
<tr>
<td>Toppenish Creek</td>
<td>97/116</td>
<td>57.06</td>
<td>24'</td>
<td>2006</td>
</tr>
<tr>
<td>Drain Canal</td>
<td>97/118</td>
<td>58.26</td>
<td>33'</td>
<td>2006</td>
</tr>
<tr>
<td>Canal Drain Ditch</td>
<td>97/120</td>
<td>60.82</td>
<td>40'</td>
<td>2006</td>
</tr>
</tbody>
</table>
The general terrain is mountainous from the Klickitat County Line to Toppenish Creek and level from Toppenish Creek to the City of Toppenish. The vertical profile grade of SR 97 from Klickitat County Line is generally less than 2% with short sections up to 4%. The average profile grade from Dry Creek to Toppenish Ridge is 3.16%, and from Toppenish Ridge to Toppenish Creek is 3.80%. The profile grade from Toppenish Creek to the City of Toppenish averages 0.5%.

The land use within the section from Klickitat County Line to Toppenish Creek is primarily range land grazing. The land use from Toppenish Creek to the City of Toppenish is primarily agricultural with secondary small retail and recreational uses. There is a wildlife refuge located between M.P. 56.75 and M.P. 57.70 on the left. Houses within the report section are sparsely distributed. Yakima County does not expect this area to have any significant changes in land use patterns for the next 20 years.

**PRESENT OPERATING CONDITIONS**

The base year for this report is 1992. The traffic conditions for this year are as follows:

<table>
<thead>
<tr>
<th>M.P. to M.P.</th>
<th>1992 ADT</th>
<th>V/c Ratio</th>
<th>LOS</th>
<th>Accident Rate</th>
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<td>33.52</td>
<td>35.36</td>
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<td>0.46</td>
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<td>35.36</td>
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<td>41.28</td>
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<td>0.31</td>
<td>C</td>
</tr>
</tbody>
</table>

The volume/capacity (V/c) Ratio and Level of Service (LOS) were determined using the Washington State Design Manual and the Highway Capacity Manual (Transportation Research Board, Special Report 209). Because of the rural setting and the low population density of the study area, there is not a well-defined AM or PM peak operating condition. The peak traffic flows are due to weekend vacation traffic and usually occur either Sunday PM or Monday AM.

The 1990 statewide accident rate for all highways was 1.9, the 1990 statewide accident rate for principal arterials was 1.44, and the 1990 accident rate for District 5 was 1.1. The accident rate for this section of SR 97 is below the state average and district average accident rates. There
are no locations where the number of accidents indicate there is an accident problem, however, this entire section has been designated a daylight headlight driving area at the request of Yakima County.

The following projects have been identified on the 1992 to 1997 6-year Transportation Improvement Program (TIP).

SR 97/220 Paving - M.P. 58.28 to M.P. 59.26 - ACP overlay and safety improvements.

Vic. Br. 97/106 to Br. 97/111 - M.P. 46.40 to M.P. 49.00 - Reconstruct existing roadway and replace bridges 97/108 and 97/109.

Br. 97/111 to Dry Creek Br. - M.P. 49.00 to M.P. 50.71 - Reconstruct existing roadway and replace bridge 97/111.

M.P. 41.28 to Vic. Br. 97/106 - M.P. 41.28 to M.P. 46.40 - Reconstruct existing roadway and replace bridge 97/106.

These projects will improve the v/c ratio slightly.

ROUTE DEVELOPMENT PLAN

This section of U.S. 97 currently operates at a Level of Service (LOS) C with the exception of the segment from Dry Creek to Toppenish Creek which is at LOS A. By the year 2012 (20 year hence) the LOS will have dropped to D in the section from Klickitat County to Dry Creek, B in the section from Dry Creek to Toppenish Creek, and will remain C from Toppenish Creek to the City of Toppenish. The 2012 ADT is based on an estimated growth rate of 3%. The 2012 ADT will be 5500 except in the immediate vicinity of the City of Toppenish where it will be 6880.

The WSDOT Design Manual suggests that an appropriate LOS for a Principal Arterial is "B". However, because the expansion of U.S. 97 is constrained by sensitive archaeological and environmental areas and U.S. 97 is currently operating at an acceptable level of service, we feel the appropriate LOS should be lowered to C. Steps should be taken to maintain or increase the capacity of this section of SR 97. These steps should include:
Klickitat County line to Dry Creek (M.P. 33.52 to M.P. 51.19)

1. Add passing lane sections where feasible.

2. Improve the vertical and horizontal alignment to decrease the number of no passing zones.

Item number one, adding 6 passing lane sections (3 for each direction of travel) improves the 2012 LOS to C by allowing more passing opportunities and separating truck traffic from passenger cars. Item number 2, would improve the v/c ratio but not enough to raise the LOS. It would make the congestion seem more tolerable.

Klickitat County line to Dry Creek (M.P. 33.52 to M.P. 51.19) and Toppenish Creek to the City of Toppenish (M.P. 56.85 to M.P. 61.34).

1. Limit the number of private road approaches

2. Reduce the number of County road intersections

3. Purchase access rights to establish access control, and fence the right of way.

Items #1, #2, and #3 will help to preserve the LOS but will not change it. These should make any future congestion improvements easier to accomplish and will help to delay the need for those improvements.

There are 15 at-grade intersections within the report section.

<table>
<thead>
<tr>
<th>M.P.</th>
<th>Name</th>
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<tbody>
<tr>
<td>33.54</td>
<td>Right</td>
</tr>
<tr>
<td>40.14</td>
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</tr>
<tr>
<td>44.29</td>
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<td>45.91</td>
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<td>51.04</td>
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</tr>
<tr>
<td>51.04</td>
<td>Left</td>
</tr>
<tr>
<td>54.18</td>
<td>Right</td>
</tr>
<tr>
<td>56.74</td>
<td>Left &amp; Right</td>
</tr>
<tr>
<td></td>
<td>Tomith Road</td>
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<tr>
<td></td>
<td>Lizzy Road</td>
</tr>
<tr>
<td></td>
<td>Cemetery Road</td>
</tr>
<tr>
<td></td>
<td>Pine Springs Road</td>
</tr>
<tr>
<td></td>
<td>Poisell Butte Road</td>
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<tr>
<td></td>
<td>Smina Indian Cemetery Road</td>
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<tr>
<td></td>
<td>Dry Creek Road</td>
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<tr>
<td></td>
<td>Indian Service Road</td>
</tr>
<tr>
<td></td>
<td>Oak Springs Road</td>
</tr>
<tr>
<td></td>
<td>Tule Road</td>
</tr>
<tr>
<td></td>
<td>Pumphouse Road</td>
</tr>
</tbody>
</table>
58.76  Left  Jensen Road
59.26  Right  Rocky / Ford Road
59.75  Left  Yost Road
60.77  Left & Right  Larue Road

The crossroads are proposed to remain as at-grade crossings under stop sign controls.

SUMMARY

The probable operating conditions for year 2012 is

Level of Service  B, C, D
Average Travel Speed  55, 45, 40

The route development projects should include:

Short Range (1991 - 1997)

3. Br. 97/111 to Dry Creek Br. - M.P. 49.00 to M.P. 50.71 - Reconstruct existing roadway and replace bridge 97/111.


ACP overlays and safety improvements

Long Range (2004 - 2011)

1. Improve the horizontal and vertical alignments to decrease the no passing zones (M.P. 33.52 to M.P. 51.19).
2. Add passing lane sections (M.P. 33.52 to M.P. 51.19), needs to be accomplished by year 2005.
DATE: July 5, 1988

FROM: T. E. Lyon/J. R. Buss

PHONE: SUBJECT:

√ CC: L8472 (Design File) to: Sam Moon

This IDC is a Route Development Plan for the above referenced portion of SR 97. The Design Standard Roadway width is 40 ft., consisting of 12 ft. lanes and 8 ft. shoulders under the P-3 designation. We are proposing a roadway width of 36 ft., consisting of 12 ft. lanes and 6 ft. shoulders. This is to include any bridges that are to be replaced. Justification for this request is as follows.

Two complex issues face the W.S.D.O.T. when trying to reconstruct or upgrade this portion of SR 97. First, all of this section of SR 97 lies within the boundaries of the expansive Yakima Indian Reservation, crossing and running next to the Satus Creek at various locations. Secondly, there is a definite need to upgrade this primary arterial in a time of restricted funds and budget cutbacks.

In negotiating with the Yakima Indian Nation, there are many sensitive archeological and environmental issues that will have to be dealt with. In the past, we have found this to be very time consuming and costly. Attempting to widen the roadway and flatten slopes to full Design Standards not only increases the problems with the sensitive areas mentioned, but also requires the purchase of a much larger amount of right of way within the Reservation. This means not only dealing with the Yakima Indian Nation as a whole, but also individual tribal members who have been allotted land. In many cases there are 20 or more allotee’s per parcel of land. Our right-of-way agents have found in previous dealings that this is very time consuming and costly, or simply not possible to obtain; since we don’t have the right of eminent domain over the Yakima Indian Nation.

The existing roadway consists of 11 ft. lanes, with shoulders ranging from 3 ft. to 8 ft. Thirty-Seven percent of the roadway from the county line to Dry Creek is only 28 ft. wide. For the most part, the roadway has been widened adequately to accommodate a 36 ft. width, but not a 40 ft. width. In general, much of the existing shoulder has only a partial bituminous surface treatment. The outer 2 ft. to 6 ft. being untreated surfacing.
July 5, 1988
S. A. Moon
Page 2

Thus, the actual usable, year around width of the roadway is considerably less than that shown in the road log. Also, the slopes into the roadway ditches often are 3:1 or steeper adjacent to a rough rock backslope. Where the Satus Creek is in close proximity to the roadway, additional problems arise in any widening for additional shoulder width or for guardrail placement.

We have estimated that the costs involved in attaining the full Design Standard roadway from Klickitat Cty. Line to M.P. 41.28 to be in excess of one-million dollars more than for a 36 ft. roadway.

The existing roadway, both north and south of this project, is also less than 40 ft. in width, and is not likely to be widened in the foreseeable future. District 4 just recently completed construction on contract 2997, Biggs Rapids to Yakima County Line. All roadway sections being constructed north of the Satus Pass Summit to the Yakima County Line are 36 ft. wide, using a 6 ft. shoulder, except where deviations were necessary. To the north of Dry Creek (M.P. 50.95), SR 97 passes over Toppenish Ridge. This section has truck climbing lanes, with the downhill shoulder being 6 ft. wide. Therefore, the predominate shoulder width from Satus Pass to the edge of the valley floor, near M.P. 56.7, is 6 ft. for the reconstructed portions.

Therefore: it is this District’s proposal that any reconstruction of SR 97 between Klickitat County Line and the edge of the Yakima Valley floor be done to a width of 36 ft., including bridges. We feel this would accomplish two objectives. One, it would lessen the impact on the sensitive areas and decrease the need for a large amount of R/W within the Yakima Indian Reservation. Secondly, we will be able to provide a much safer roadway at an earlier time than we could accomplish by trying to upgrade this portion of SR 97 to a 40 ft. Design Std.

It is our intention to use Design Standards on slopes and vertical and horizontal alignment whenever practical (see Plan of Development request sent earlier). Also, due to the high percentage of truck and R.V. traffic on this roadway, we propose to build turnouts for parking where practical for us, and permitted by the Indians.

Your approval of this Route Development Plan is requested.

RAH/eth
DATE: July 25, 1988
FROM: S. A. Moon
PHONE: 

TO: J. R. Buss, Dist. 5

SUBJECT: SR 97
Klickitat County Line to Toppenish
Route Development Plan
MP 33.52 to MP 61.44

Your route development plan as presented by yourself and L. D. Pittman in memorandums dated June 30 and July 5, 1988, has been reviewed and is approved for the reasons furnished in these memos. The principal reasons are route continuity and Yakima Indian sensitivities.

We have prepared the attached typical roadway section. This approved drawing complies with your route continuity plan.

SAM: gv/A54
CSM (DR)

Attachment

cc: T. L. McLain, Program Dev., w/attachment
K. E. Ahola, Dist. 4, w/attachment
ROUTE DEVELOPMENT PLAN

TYPICAL ROADWAY SECTION

SR 97

Klickitat C/L to Junction with SR 22

MP 33.52 to MPG 1.44

NOTE:

Existing channelization and/or intersection widening and truck climbing lanes are not depicted on this general roadway section. Future needs for additional intersection channelization, truck climbing lane or other types of widening will be addressed in design reports for projects being developed.

NOTE: Where “New” is superimposed over “Existing” delineation relationship.

ROUTE DEVELOPMENT PLAN

ROADWAY SECTION

Klickitat C/L to Jct. W/SR 22

MP 33.52 to MPG 1.44

Signature: J. A. Moore

Date: 7/22/88

APPROVED BY:

STATE LOCATION DESIGN ENGINEER
DISTRICT ADMINISTRATOR
DISTRICT PROJECT DEVELOPMENT ENGINEER

PROJECT NO.

DATE: 7/13/88

DISTRICT NO.

SHR 1

DPT OF TRANSPORTATION
Appendix D

MDL-13, Modified Design Level Data
## Two-Lane Highways

<table>
<thead>
<tr>
<th>Design Class</th>
<th>Trucks Under 10%</th>
<th>Trucks 10% and Over</th>
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<tbody>
<tr>
<td></td>
<td>MDL-9</td>
<td>MDL-10</td>
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<tr>
<td><strong>Current ADT</strong>[1]</td>
<td>Under 1000</td>
<td>1000-4000</td>
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<td><strong>Design Speed</strong></td>
<td>See Exhibit 1130-1</td>
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<tr>
<td><strong>Traffic Lane Width</strong>[2]</td>
<td>11 ft</td>
<td>11 ft</td>
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<td><strong>Parking Lanes</strong></td>
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<tr>
<td><strong>Urban</strong></td>
<td>8 ft</td>
<td>8 ft</td>
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<tr>
<td><strong>Minimum Width for Bridges</strong></td>
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</tr>
<tr>
<td><strong>Minimum Width for</strong></td>
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<td></td>
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<tr>
<td><strong>Rehabilitation of Bridges</strong></td>
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<tr>
<td><strong>Minimum Width for</strong></td>
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</tr>
<tr>
<td><strong>Replacement Bridges</strong></td>
<td>Full Design Level Applies[11]</td>
<td></td>
</tr>
</tbody>
</table>

**Access Control**

For limited access highways, see Chapters 530 and 540 and the Limited Access and Managed Access Master Plan, or WAC 468-52 and the region’s Highway Management Classification Report.

**Notes:**

[1] If current ADT is approaching a borderline condition, consider designing for the higher classification.

[2] For turning roadways, see Exhibits 1130-12a and 1130-12b.

[3] Parking restrictions are desirable when ADT exceeds 7500.

[4] When a curb section is used, the minimum shoulder width from the edge of traveled way to the face of curb is 4 ft. In urban areas, see Chapter 1140. On a route identified as a local, state, or regional significant bicycle route, the minimum shoulder width is 4 ft (see Chapter 1520).

[5] For design speeds of 50 mph or less on roads of 2000 ADT or less, width may be reduced by 1 ft, with justification.

[6] Use these widths for bridge deck treatment or thrie beam retrofit only.

[7] Width is the clear distance between curbs or rails, whichever is less.

[8] 20 ft when ADT is 250 or less.

[9] Use these widths when a for any bridge work beyond the treatment of the deck, such as bridge rail replacement, deck replacement, or widening.

[10] 26 ft when ADT is 250 or less.

[11] Modified design level lane and shoulder widths may be used, when justified, with a corridor or project analysis.

### Two-Lane Highways and Bridges: Modified Design Level

*Exhibit 1130-11*
Appendix E

Shy Distance, Design Criteria
Maintenance costs for concrete barrier are lower than for other barrier types. In addition, deterioration due to weather and vehicle impacts is less than most other barrier systems. Unanchored precast concrete barrier can usually be realigned or repaired when moved from its alignment. However, heavy equipment may be necessary to reposition or replace barrier segments. Therefore, in medians, consider the shoulder width and the traffic volume when determining the acceptability of unanchored precast concrete barrier versus rigid concrete barrier.

Drainage, alignment, and drifting snow or sand are considerations that can influence the selection of barrier type. Beam guardrail and concrete barrier can contribute to snow drifts. Consider long-term maintenance costs associated with snow removal at locations prone to snow drifting. Slope flattening is recommended when the safety benefit justifies the additional cost to eliminate the need for the barrier. Cable barrier is not an obstruction to drifting snow and can be used if slope flattening is not feasible.

With some systems, such as concrete and beam guardrail, additional shoulder widening or slope flattening is common. However, selection of these types of barriers is sometimes limited due to the substantial environmental permitting and highway reconstruction needs. Permits issued under the SEPA and NEPA processes may lead to the use of a barrier design such as cable barrier, which has fewer potential environmental impacts and costs.

When designing a barrier for use on a Scenic Byway, consider barriers that are consistent with the recommendations in the associated corridor management plan (if one is available). Contact the region Landscape Architect or the Scenic Byways Coordinator in the HQ Highways and Local Programs Office to determine whether the project is on such a designated route. Low-cost options, such as using weathering steel beam guardrail (see 1610.06) or cable barrier (see 1610.07), might be feasible on many projects. Higher-cost options, such as steel-backed timber rail and stone guardwalls (see 1610.09), might necessitate a partnering effort to fund the additional costs. Grants might be available for this purpose if the need is identified early in the project definition phase (see Chapter 120).

(1) Shy Distance

Provide 2 feet of additional widening for shy distance when a barrier is to be installed in areas where the roadway is to be widened and the shoulder width will be less than 8 feet. This shy distance is not needed when the section of roadway is not being widened or the shoulders are at least 8 feet wide. (See criteria in Chapter 1140 for exceptions.)

(2) Barrier Deflections

Expect all barriers except rigid barriers (such as concrete bridge rails) to deflect when hit by an errant vehicle. The amount of deflection is primarily dependent on the stiffness of the system. However, vehicle speed, angle of impact, and weight also affect the amount of barrier deflection. For flexible and semirigid roadside barriers, the deflection distance is designed to help prevent the impacting vehicle from striking the object being shielded. For unrestrained rigid systems (unanchored precast concrete barrier), the deflection distance is designed to help prevent the barrier from being knocked over the side of a drop-off or steep fill slope (2H:1V or steeper).
Appendix F

Structures, Shy to Barrier
1140.12 Parking

In urban design areas and rural communities, land use might make parking along the highway desirable. In general, on-street parking decreases capacity, increases accidents, and impedes traffic flow; therefore, it is desirable to prohibit parking.

Although design data for parking lanes are included in Exhibits 1140-6 through 1140-9, consider them only in cooperation with the municipality involved. The lane widths given are the minimum for parking; provide wider widths when feasible.

Angle parking is not permitted on any state route without WSDOT approval (RCW 46.61.575). This approval is delegated to the State Traffic Engineer. Angle parking approval is to be requested through the Headquarters (HQ) Design Office. Provide an engineering study, approved by the region Traffic Engineer, with the request documenting that the parking will not unduly reduce safety and that the roadway is of sufficient width that parking will not interfere with the normal movement of traffic.

1140.13 Pavement Type

The pavement types given in Exhibits 1140-5 through 1140-8 are those recommended for each design class. (See Chapter 620 for information on pavement type selection.) When a roadway is to be widened and the existing pavement will remain, the new pavement type may be the same as the existing without a pavement type determination.

1140.14 Structure Width

Provide a clear width between curbs or barrier on a structure not less than the approach roadway width (lanes plus shoulders). The structure widths given in Exhibits 1140-5 through 1140-9 are the minimum structure widths for each design class.

Additional width for shy to barriers is not normally added to the roadway width on structures. When a structure is in a run of roadside barrier with the added width, consider adding the width on shorter structures to keep a constant roadway width.

1140.15 Right of Way Width

Provide right of way width sufficient to accommodate roadway elements and appurtenances for the current design and known future improvements. To allow for construction and maintenance activities, provide 10 feet desirable, 5 feet minimum, wider than the slope stake for fill and slope treatment for cut. For slope treatment information, see Chapter 1230 and the Standard Plans.

The right of way widths given in Exhibits 1140-5 through 1140-8 are desirable minimums for new alignment requiring purchase of new right of way. For additional information on right of way acquisition, see Chapter 510.