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DESIGN DEVIATION NO. 1

Supersedes Deviation #1 & #2 Approved on December 18, 2008

Shoulder Width Reduction

SR 99 S. Holgate St to S. King St. Viaduct Replacement Stage 2

MP 29.89 TO MP 30.78

XL-3237 PIN-809936D

July 2009

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Alaskan Way Viaduct and Seawall Replacement Program
Seattle, Washington

Mark Anderson, PE

Project Engineer

Design Approval:

By _____, P.E.
Susan Everett, PE Program Design Engineer

Date _____

By _____, P.E.
Ed Barry, PE WSDOT Assistant State Design
Engineer

Date _____

By _____, P.E.
Randy Everett, PE FHWA Urban Area Engineer

Date _____



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and

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1 **Deviation revision**

2 This document “Design Deviation No. 1 Shoulder Width Reduction” supersedes the project’s Design
3 Deviation #1 & 2 “Horizontal Stopping Sight Distance (HSSD) and Shoulder Width Reduction near S
4 Holgate Curve”, approved Dec. 18, 2008. The original deviation approved the horizontal stopping
5 sight distance for a 50mph design speed in a 55mph corridor. The SR 99 Corridor Analysis (approved
6 July 2009) set the design and posted speed at 50mph in this area, rendering this deviation obsolete.

Comment [KS1]: Briefly document what changes occurred to the original.

7 **Project Overview**

8 The Alaskan Way Viaduct & Seawall Replacement Program (AWVSRP) is located in an urban area
9 within the City of Seattle in King County. The program limits extend along SR 99 from north of the
10 S. Spokane Street Bridge (Milepost [MP] 29.29) to Mercer Street vicinity (MP 32.78) and underneath
11 First Ave in downtown Seattle.

12 SR 99 is functionally classified as an Urban Principal Arterial Highway by Washington State Dept. of
13 Transportation (WSDOT) and is currently classified as an M1 Managed Access Highway from S.
14 Spokane St (MP 28.61) to Thomas St (MP 32.58). Speed limits are posted between 40-50mph.

15 It is also a designated National Highway System (NHS) route and a Highway of Statewide
16 Significance, per WSDOT classification. The project corridor has a WSDOT freight tonnage
17 designation of T-1 (more than 10 million tons per year), and the City of Seattle classifies it as a
18 Major Truck Street.

19 The AWVSRP is partially funded through a combination of state funds from the 2003 Nickel
20 Funding Package and the 2005 Transportation Partnership Account (TPA) Package. It has also
21 received funding from the U.S. Federal Highway Administration (FHWA) and the City of Seattle.

22 On March 14, 2007, the Project Team was directed by WSDOT to advance portions of the project
23 that would contribute to improving safety and mobility, and have fundamental consensus among the
24 project partners. One of the six Moving Forward: Early Safety and Mobility Projects (ESMP) is the
25 South Holgate Street to South King Street Viaduct Replacement Project (H2K). This project has
26 been divided into three stages and each stage will be released as a separate construction contract.
27 Stage one involves relocating existing utilities; stage 2 involves reconstructing SR 99 from S. Holgate
28 to King St; and stage 3 involves demolishing the existing viaduct and roadside restoration.

29 In January 2009, the Governor, King County, and the City of Seattle agreed to recommend replacing
30 the existing Viaduct through downtown Seattle with a 55’ diameter single bore tunnel that will
31 include stacked roadways consisting of two northbound lanes with left and right shoulders, above
32 two southbound lanes with left and right shoulders. The south portal to the tunnel will start at Royal
33 Brougham Way S. (MP 30.32) and travel north under First Ave until reaching Mercer St (MP 32.78)
34 where the north portal will emerge and connect to the existing SR 99 route near Ward St. (MP
35 33.08). There will be fully directional interchanges at the north and south portals (currently in the
36 design phase) that will provide access to the city’s Central Business District (CBD). Once the tunnel
37 has been opened to traffic, and the existing Viaduct and detours are removed, the City of Seattle will
38 construct new surface streets and urban design features along the waterfront.

1 The removal and replacement limits for bridge structures within the H2K Stage 2 Project extend
2 from approximately S. Holgate Street (MP 29.89) to S. Dearborn Street (MP 30.66). Other required
3 improvements for SR 99 and city surface streets extend the project construction work as far north as
4 Lenora Street (MP 31.79 vic.) and as far south as S. Spokane Street (MP 29.20). This project
5 includes demolishing the existing viaduct and reconstructing infrastructure elements, including
6 portions of many local streets and portions of SR 99. Near S. Holgate Street, SR 99 will transition
7 from an at-grade roadway to a bridge structure over the existing railroad tracks and S. Atlantic
8 Street, returning to at-grade near S. Royal Brougham Way. While construction for the Deep Bore
9 Tunnel takes place an interim transition bridge structure, expected to be in place for 4 to 5 years, will
10 be built to connect the ultimate bridge structure spanning S Atlantic Street to the existing Viaduct
11 near the Railroad Way Ramps (MP 30.78). After the tunnel is opened to traffic in 2015, this interim
12 bridge structure and the existing Viaduct will be removed.

13 Design Matrix 3, line 3-7 (*WSDOT Design Manual* Figure 325-5, January 2009) applies to this project.
14 This roadway is being designed to P-1 design class criteria.

15 This document requests deviation approval for Shoulder Width Reduction within the project limits
16 for the SR 99 S. Holgate St. to S. King St Stage 2 project.

17 Existing Conditions though the Project Limits

18 On SR 99 within the program corridor limits, existing Average Daily Traffic (ADT) ranges from
19 approximately 32,400 to 56,100 in the northbound direction and from 31,000 to 55,000 in the
20 southbound direction. Ingress and egress on SR 99 from just north of S. Spokane Street (MP 29.26)
21 to Thomas St. (MP 32.58) is currently limited to on- and off-ramps connecting to First Ave. S,
22 Columbia Street, Seneca Street, Elliot Ave, Western Ave, and Denny Way.

23 The terrain in the S Holgate Street vicinity is mostly level. The posted speed limit is 50 mph in this
24 segment for both the northbound and southbound roadways.

25 Within the project limits (MP 29.26 to 30.78), SR 99 existing lane widths range from 9.5 to 12 feet
26 and shoulder widths range from 0 to 3 feet. Near S Holgate Street (MP 29.89 vic.), the existing lane
27 widths are 12 feet and the shoulder widths are approximately 1 foot. The existing transition between
28 the six-lane surface highway and the viaduct occurs near S. Holgate Street. The existing curve near
29 S. Holgate Street is built on separate elevated structures for both northbound and southbound. The
30 northbound roadway has a radius of 920 feet, and the southbound roadway has a radius of 1040
31 feet, with a superelevation rate of 6% for both roadways. The roadway is currently classified as a
32 Class 1 Managed Access highway within the project limits, and in order to confirm the existing
33 roadway's 50mph design speed, a check was made based upon the current design guidelines for a
34 design class U_{M/A}-1 roadway using existing horizontal geometrics and the 6% maximum
35 superelevation rate table. (*WSDOT Design Manual* Figure 642-4c, November 2007). The vertical
36 curve lengths in this area for both northbound and southbound roadways are 350 feet. The
37 maximum grade for both roadways within the project area is 5 percent. Figure 650-11 from the
38 WSDOT Design Manual (May 2008) indicates these existing sag curves meet 50 mph design criteria.

Comment [KS2]: Please define what the limits are for the project.

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Comment [KS3]: Should there be a note that briefly discusses that this section of SR 99 was originally designed using design criteria for a UMA-1 design classification which allows using the 6% table superelevation rate?

Suggest revising: To confirm the existing roadway design speed of 50 mph, a check was made based upon current design guidelines using existing horizontal geometrics and the 6% maximum superelevation rate table (*WSDOT Design Manual* Figure 642-4c, November 2007).

Deleted: The existing roadway design speed is 50 mph when these existing horizontal geometrics are compared against the 6% maximum superelevation rate table

Comment [KS4]: What are the grades for N & S (can the profiles be included)?

Comment [KS5]: Not sure where the "area" is, and how does this relate to the vertical curves identified in the previous sentence?

Comment [KS6]: Is this the correct reference? LKM Yes

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1 The Seattle International Gateway (SIG) Rail Yard lies immediately east of SR 99 along the entire
 2 length of the SR 99 project limits, and the Whatcom Rail Yard is immediately west of SR 99 in the
 3 vicinity of S. Holgate Street. In some areas the closest rail tracks are within 12 feet of the roadway.

4 Proposed Roadway Configuration in Vicinity of S. Holgate 5 Street

6 The H2K Stage 2 Project will reconstruct the existing SR 99 facility to a new alignment in the south
 7 portion of the project with at-grade, retained fill, and elevated roadways. The new SR 99 alignment
 8 begins major roadwork to the south near S. Walker Street (MP 29.89) with a six-lane, at-grade
 9 roadway that transitions to an elevated structure near S. Holgate Street. SR 99 continues to traverse
 10 over the railroad tracks and South Atlantic Street before returning to an at-grade roadway in the
 11 vicinity of S. Royal Brougham Way, MP???. An interim bridge transition structure will connect
 12 this reconstructed SR 99 to the existing viaduct at S. King St. vicinity.

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- Comment [KS7]: What happens to SR 99 north of RBW?

13 The project team is coordinating with the SR 519/I-90 to SR 99 Intermodal Access Project—I/C
 14 Improvements (SR 519 Phase 2) and the SR 99 Deep Bore Tunnel Project.

Comment [KS8]: This seems out of place in the "existing" section. Suggest moving this to the "Project Overview" section.

15 The roadway lane and shoulder layout consists of a 4-foot left shoulder, three 12-foot lanes, and a
 16 10-foot-wide right shoulder for both the northbound and southbound roadways. The southbound
 17 left shoulder varies along the S. Holgate Curve in order to maximize the horizontal stopping sight
 18 distance and accommodate existing site constraints associated the Whatcom Rail Yard.

19 The SR 99 Corridor Analysis established the design and posted speeds for SR 99 as 50 mph in both
 20 directions from the program's southern limits (MP 29.26) through the northern access of the tunnel
 21 (MP 32.78 (*SR 99 Corridor Analysis*, (July 2009))).

22 The design speed for this project is 50 mph from the southern project limits to the vicinity of S.
 23 Royal Brougham Way. The design speed is reduced to 40 mph north of S. Royal Brougham Way
 24 through the transition section (SR 99 transitions from an at-grade side-by-side roadway to an aerial
 25 stacked structure) to where SR 99 re-connects on to the existing Viaduct structure just north the
 26 Railroad Way ramps, MP??. The 40mph design speed is a temporary feature in place during program
 27 construction (2011-2015); the program's major projects include SR 99 Holgate to King Stage 2, the
 28 SR 99 Deep Bore Tunnel and its associated North and South Accesses. When the tunnel is opened
 29 to traffic in 2015, the posted speed along SR 99 will be 50mph. (*SR 99 Construction Corridor Analysis*,
 30 August 2009)

Comment [b9]: State that this is documented in the approved Construction Corridor Analysis and is only temporary. State that the permanent design speed will be documented in the Corridor Report.

31 Table 1 summarizes those geometric design elements that are proposed for deviations on SR 99 in
 32 the vicinity of S. Holgate Street. The station limits of the deviations are listed in Tables 2 and 3.

33 **Table 1: Proposed Deviated Geometric Elements in Vicinity of S. Holgate St. Curve**

Geometric Element	Standard Design	Proposed SR 99 Design
<u>Deviation #1 - Shoulder Width</u>	<u>10 foot (left)</u> <u>10 foot (right)</u>	<u>NB: varies 1 to 5.5 feet (left)</u> <u>varies 6 to 10 feet (right)</u>

Comment [KS10]: Identify what this value is based upon. Should the standard be for design speed of 60 mph (Figure 440-6)? How was Alternative#2 design speed of 55 mph arrived at found on pg 7, line 6?

(Figure 440-6, May 2008)

SB: varies 1 to 21 feet (left)
varies 6 to 10 feet (left)

1 Deviation Description

2 This document requests deviation for left and right shoulder widths for both the northbound and
3 southbound SR 99 mainline near S. Holgate Street (MP 29.90 vic.). The following sections define
4 the proposed roadway deviations between MP 29.89 and MP 30.78. The requested shoulder
5 deviations are required to match existing conditions at the beginning of the project where the
6 proposed roadway section matches the existing roadway section.

7 Shoulder Width

8 A deviation for shoulder width is proposed along the new SR 99 alignment between the stations as
9 shown in Table 3 and on Figures 1A-D. Table 3 lists the current design standard and proposed left
10 and right shoulder widths for the mainline curves near the beginning and ending of the project, as
11 well as the minimum shoulder width.

12 **Table 3: Shoulder Widths**

Direction	Left Shoulder Width (feet)		Right Shoulder Width (feet)	
	Standard (Design Manual Figure 440-6, May 2008)	Proposed	Standard (Design Manual Figure 440-6, May 2008)	Proposed
Northbound	10	141+94.95 to 177+70 Varies 1 to 5.5	10	141+93 to 146+92 Varies 6 to 10
Southbound	10	141+92.78 to 177+64 Varies 1 to 21	10	141+94 to 149+80 Varies 6 to 10

13 The transition from existing shoulder widths to proposed shoulder width along both the
14 northbound and southbound roadways generally occurs south of the Holgate curve as seen in Figure
15 1A-D. Through the Holgate curve the left and right shoulder widths vary, particularly the left
16 shoulder in the southbound direction of travel, which increases horizontal sight distance without
17 increasing the radius of the preferred curve or traveled way width. Through this area, SR 99
18 generally remains within the existing roadway footprint between the rail yards.

19

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Comment [KS11]: Without the Figures to look at, how does the Stationing and MP correlate?

Comment [KS12]: Please discuss standing water ponding along the shoulder and impacts to the traveled way. State that the hydraulic design will keep water out of the travelled way during the design storm event.

Comment [b13]: Attach the figure

1 **Alternatives Considered**

2 The project team developed and assessed alternate alignments to best meet WSDOT design
3 standards, minimize impacts to adjacent rail facilities, and allow for efficient staging of the
4 construction of the project’s south end. The alignment alternatives for the mainline roadway are
5 summarized in the following sections.

6 **Alternative 1: Preferred alternative – Nonstandard Shoulder
7 Width**

8 The preferred roadway configuration is illustrated in Figures 1A-D with the shoulder widths
9 identified in the previous sections. The following justifications are provided for this deviation.

10 A deviation is necessary for the shoulder widths at the southern project limits because of the
11 required roadway width transitioning between the overall narrower existing SR 99 roadway to the
12 south, and the overall wider proposed roadway to the north.

13 **Alternative 2: Full Design Standards Alternative**

14 Alternative 2 provides 10’ left and right shoulders for a P-1 design class roadway. This alternative
15 does not rel

16 **Justifications**

17 Alternative 1 (Preferred Alternative) proposes nonstandard design elements for the curve near S.
18 Holgate Street which are:

- 19 • Northbound shoulder width: Varies 1 foot to 5.5 feet (left), and varies 6 feet to 10 feet
20 (right)
- 21 • Southbound shoulder width: Varies 1 foot to 21 feet (left), and varies 6 feet to 10 feet (right).

22 The justifications for this recommendation are:

23 1. The proposed shoulder widths must match back into existing shoulder widths at the end of
24 the project limits, which requires that a portion of the shoulder widths within the project
25 limits be tapered down to match the non-standard shoulder widths of the existing roadway.

26 2. This roadway will be continuously illuminated.

27

Comment [KS14]: Please provide more detail on how.

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Comment [KS15]: Was this approved by anyone or was there an agreement of some type reached and who was involved??

Deleted: y on the acquisition of additional right-of-way, however, the project would have to acquire the rights to property that is currently occupied by the Union Pacific and Burlington Northern Santa Fe railroads. The cost and schedule impacts associated with acquisition of these rights are prohibitive. A formal Project Decision process to reject this alternative was conducted and documented in April, 2008 (decision documented in *AWVSR Program Trend Number SS005 for Issues Relating to Lead Railroad Truck for BNSF and UPRR and the Whatcom Yard*).

Comment [b16]: Where is the mitigation? Illumination, signing, delineation, ect???

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