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 29.60 TO MP 30.78

XL-3237 PIN-809936D

September 2009

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WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
Alaskan Way Viaduct and Seawall Replacement Program
Seattle, Washington

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Design Approval:

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

Date _____

By _____ , P.E.
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Date _____

Washington State Department of Transportation

By _____.
Randy Everett, FHWA Seattle Major Projects Oversight Manager

Date _____

Deviation revision

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

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Program Overview—Alaskan Way Viaduct and Seawall Replacement Program

The Alaskan Way Viaduct & Seawall Replacement Program (AWVSRP) is located in an urban area within the City of Seattle in King County. The program limits extend along SR 99 from north of the S. Spokane Street Bridge (Milepost [MP] 29.29) to Mercer Street vicinity (MP 32.78) and underneath First Ave in downtown Seattle. The AWVSRP has been divided into several projects, including the SR 99 S. Holgate to S. King St. Viaduct Replacement Project—Stage 2 (H2KS2), to which this deviation applies.

SR 99 is functionally classified as an Urban Principal Arterial Highway by Washington State Dept. of Transportation (WSDOT) and is currently classified as a Class 1 Managed Access Highway from S. Spokane St (MP 28.61) to Thomas St (MP 32.58). Speed limits are posted between 40-50mph. The AWV program team is acquiring Limited Access rights from the southern limits of the program corridor to Mercer St. Projects within these limits will be designed to P-1 roadway design class.

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

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

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

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In January 2009, the Governor, King County Executive, and the City of Seattle Mayor recommended replacing the existing Viaduct through downtown Seattle with an approximately 54' diameter single bore tunnel that will include stacked roadways consisting of two northbound lanes and shoulders below two southbound lanes and shoulders. If the bored tunnel alternative moves forward, the south portal to the tunnel would start at Royal Brougham Way S. (MP 30.32) and travel north under First Ave until reaching Mercer St (MP 32.78) where the north portal would emerge and connect to the

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existing SR 99 route near Ward St. (MP 33.08). The north and south portals would be fully directional interchanges (currently in the design phase) that would increase access to the city's Central Business District (CBD). As part of the bored tunnel alternative, the City of Seattle would construct new surface streets and urban design features on the waterfront, once the proposed tunnel is open to traffic and the viaduct along the central waterfront is removed.

It is important to note that the bored tunnel alternative is one alternative of three currently being considered within the NEPA process for the Alaskan Way Viaduct Replacement Project. This deviation focuses primarily on how the Holgate to King project interacts with the Executive's recommended bored tunnel alternative. However, all proposed corridor construction associated with the Holgate to King project , both permanent and temporary, would be required by FHWA to function with any of the alternatives being considered within the NEPA process.

The project team is coordinating with the SR 519/I-90 to SR 99 Intermodal Access Project—I/C Improvements (SR 519 Phase 2), the proposed SR 99 Deep Bore Tunnel Project, and proposed SR 99 North and South Access Portal Projects.

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Deleted: In January 2009, the Governor, King County, and the City of Seattle agreed to recommend replacing the existing Viaduct through downtown Seattle with an approximately 54' diameter single bore tunnel that will include stacked roadways consisting of two northbound lanes with left and right shoulders, above two southbound lanes with left and right shoulders. The south portal to the tunnel will start at Royal Brougham Way S. (MP 30.32) and travel north under First Ave until reaching Mercer St (MP 32.78) where the north portal will emerge and connect to the existing SR 99 route near Ward St. (MP 33.08). There will be fully directional interchanges at the north and south portals (currently in the design phase) that will provide access to the city's Central Business District (CBD). Once the tunnel has been opened to traffic, and the existing Viaduct and detours are removed, the City of Seattle will construct new surface streets and urban design features along the waterfront. ¶

Project Overview -- SR 99 S. Holgate to S. King St. Viaduct Replacement—Stage 2

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

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

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

Existing Conditions though the Project Limits

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

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

Within the project limits (MP 29.60 to 30.78), SR 99 existing lane widths range from 9.5 to 12 feet and shoulder widths range from 0 to 3 feet. Near S Holgate Street (MP 29.89 vic.), the existing lane widths are 12 feet and the shoulder widths are approximately 1 foot. The existing transition between the six-lane surface highway and the viaduct occurs near S. Holgate Street. The existing curve near S. Holgate Street is built on separate elevated structures for both northbound and southbound. The northbound roadway has a radius of 920 feet, and the southbound roadway has a radius of 1040 feet, with a superelevation rate of 6% for both roadways. The roadway is currently classified as a Class 1 Managed Access highway within the project limits, and in order to confirm the existing roadway's 50mph design speed, a check was made based upon the current design guidelines for a design class $U_{M/A}$-1 roadway using existing horizontal geometrics and the 6% maximum superelevation rate table. (*WSDOT Design Manual* Figure 642-4c, November 2007). The vertical curve lengths in this area for both northbound and southbound roadways are 350 feet. The maximum grade for both roadways within the project limits is 5 percent. Figure 650-11 from the WSDOT Design Manual (May 2008) indicates these existing sag curves meet 50 mph design criteria.

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

Proposed Roadway Configuration in Vicinity of S. Holgate Street

The H2K Stage 2 Project will reconstruct the existing SR 99 facility to a new alignment in the south portion of the project with at-grade, retained fill, and elevated roadways. The new SR 99 alignment begins major roadwork at MP 29.60 with a six-lane, at-grade roadway that transitions to an elevated structure near S. Holgate Street (MP 29.89). SR 99 continues to traverse over the railroad tracks and S. Atlantic Street and will connect to an interim bridge transition structure (transition structure) will join this reconstructed SR 99 to the existing viaduct at S. King St. vicinity. The transition structure will remain in place until the proposed deep bore tunnel is open to traffic.

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

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

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The design speed for this project is 50 mph from the southern project limits to the vicinity of S. Royal Brougham Way, which are the limits of permanent reconstruction. The design speed is reduced to 40 mph north of S. Royal Brougham Way through the transition section, The 40mph design speed is a temporary feature in place during program construction (2011-2015); the program's major projects include SR 99 Holgate to King Stage 2, the proposed SR 99 Deep Bore Tunnel and its associated North and South Accesses. When the proposed tunnel is opened to traffic in 2015, the

posted speed along SR 99 will be 50mph. (*SR 99 Construction Corridor Analysis*, approved September 2009)

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

Deviation Description –Shoulder Width

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

A deviation for shoulder width is proposed along the new SR 99 alignment between the stations as shown in Table 1 and on the attached plan and roadway sections. Table 1 lists the current design guideline and proposed left and right shoulder widths for the mainline curves near the beginning and ending of the project, as well as the minimum shoulder width.

Table 1: Shoulder Widths Design Criteria for P-1 roadway

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+93 to 177+70 Varies 1 to 5.5	10	141+93 to 150+10 Widens from 6 to 10 176+00 to 177+70 Narrows from 10 to 8
Southbound	10	141+93to 177+64 Varies 1 to 21	10	141+94 to 150+10 Widens from 6 to 10 Narrows from 10 to 8 175+07 to177+64

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

The hydraulic design includes placing the inlets at sufficient distances through the continuous grade to ensure that stormwater on SR 99 mainline is contained on the shoulder (except in superelevation transition areas) for the 10-year design storm event. The gutter analyses for north-and southbound alignments are attached.

Alternatives Considered

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

Alternative 1: Preferred alternative – Nonstandard Shoulder Width

The preferred roadway configuration is illustrated in Figures 1 with the shoulder widths identified in Table 1. The following justifications are provided for this deviation.

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

2. There are sufficient inlets within the shoulders to prevent stormwater from ponding in the traveled way during a 10-year design storm event.

3. The roadway will be continuously illuminated.

4. The narrower shoulders are required to minimize the impacts to the existing rail yard. It would not be possible to build 10' left shoulders within the project limits without having to acquire additional property rights from Union Pacific and Burlington Northern-Santa Fe Railroads.

5. This project was originally designed to $U_{M/A}$-1 design guidelines and met left shoulder width criteria throughout the project except where the shoulders narrowed to match into the existing roadway. After the Deep Bore Tunnel recommendation was announced in January 2009, another decision was made to change the access control with the program limits from the existing Class 1 Managed Access ($U_{M/A}$-1 design class) to Full Limited Access (P-1 design class).

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Alternative 2: Full Design Standards Alternative

Alternative 2 provides 10' left and right shoulders for a P-1 design class roadway. This alternative meets full design guidelines for shoulder width.

This option does not rely on acquiring additional R/W but does require obtaining the rights to property currently occupied by Union Pacific Railroad and Burlington Northern-Santa Fe Railroad. The cost and schedule impacts of acquiring these rights are prohibitive and would prevent this project from meeting it's milestone construction dates set by the Legislature. The AWV Program management team formally rejected this option in April 2008 and documented their decision in *AWVSRP Program Trend SS005 for Issues Relating to Lead Railroad Track for BNSF and UPRR and the Whatcom Yard* (attached).

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Recommendation

The design team recommends Alternative 1 (Preferred Alternative) which proposes nonstandard shoulder width at the locations listed in Table 1:

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