OREGON DEPARTMENT OF TRANSPORTATION
HYDRAULIC DESIGN DEVIATION REQUEST

<table>
<thead>
<tr>
<th>Section:</th>
<th>Pudding River (Whiskey Hill Road) Bridge #01559</th>
<th>Route No:</th>
<th>C.R. 42036</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway Name:</td>
<td>Whiskey Hill Road</td>
<td>Hwy. No:</td>
<td>N/A</td>
</tr>
<tr>
<td>County:</td>
<td>Clackamas &amp; Marion</td>
<td>Milepost:</td>
<td>2.6</td>
</tr>
<tr>
<td>Region:</td>
<td>1 &amp; 2</td>
<td>Key No:</td>
<td>17408</td>
</tr>
<tr>
<td>Bridge #:</td>
<td>01559</td>
<td>EA No:</td>
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</tbody>
</table>

PROJECT DATA

<table>
<thead>
<tr>
<th>Design Frequency</th>
<th>50 Year</th>
<th>Design Precipitation</th>
<th>Design Flow</th>
<th>32,600 cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Life</td>
<td>75 Years</td>
<td>Current ADT (2007)</td>
<td>1750</td>
<td></td>
</tr>
<tr>
<td>DAP Date (Final)</td>
<td>08/08/13</td>
<td>Bid Date</td>
<td>12/2014</td>
<td></td>
</tr>
</tbody>
</table>

HYDRAULIC DESIGN DEVIATIONS

<table>
<thead>
<tr>
<th>Documentation (Reference Ch. 4)</th>
<th>Culverts (Reference Ch. 9)</th>
<th>Bridges (Reference Ch. 10)</th>
<th>Energy Dissipators (Reference Ch. 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce documentation requirements</td>
<td>Replace “in-kind” (replace w/calculations</td>
<td>Reduce opening clearance</td>
<td>Reduce design storm</td>
</tr>
<tr>
<td></td>
<td>Reduce design storm</td>
<td>Reduce design storm</td>
<td>Eliminate protection</td>
</tr>
<tr>
<td></td>
<td>Reduce barrel material design life (ref. Ch. 15)</td>
<td></td>
<td>Reduce protection</td>
</tr>
<tr>
<td></td>
<td>Exceed allowable headwater</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use or remove tidegate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Storage Facilities (Reference Ch. 12)</th>
<th>Storm Drainage (Reference Ch. 13)</th>
<th>Water Quality (Reference water quality tech. bulletin)</th>
<th>Bank Protection (Reference Ch. 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Freeboard</td>
<td>Exceed water spread on pavement</td>
<td>Reduce freeboard</td>
<td>Reduce design storm</td>
</tr>
<tr>
<td>Eliminate Soil Amendment</td>
<td>Allow pressure flow- storm drains</td>
<td>Eliminate Soil Amendment</td>
<td>Eliminate protection</td>
</tr>
<tr>
<td>Reduce design storm</td>
<td>Reduce design storm</td>
<td>Reduce design storm</td>
<td>Reduce protection</td>
</tr>
</tbody>
</table>

Other

- Use an experimental or new technology or material
OREGON DEPARTMENT OF TRANSPORTATION  
HYDRAULIC DESIGN DEVIAITION REQUEST

Description of Hydraulic Design Exception:
For the proposed bridge, it is desired to provide 1 foot vertical clearance from the bottom of the bridge to the design surface water during the design flood and 3 feet of clearance if the stream is subject to heavy debris flows. The 50 year design storm for this location results in a water surface elevation of 117.1. The following bottom of beam elevations do not provide the desired minimum clearance:

<table>
<thead>
<tr>
<th>Bent</th>
<th>Girder</th>
<th>Elev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B</td>
<td>117.33</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>116.15</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>114.87</td>
</tr>
<tr>
<td>2</td>
<td>D</td>
<td>117.99</td>
</tr>
<tr>
<td>5</td>
<td>D</td>
<td>117.87</td>
</tr>
</tbody>
</table>

Description of Project:
The Pudding River (Whiskey Hill Road) Bridge #1559 is located on the county line of Whiskey Hill Road in Marion and Clackamas Counties, approximately 0.4 miles to the west of the Meridian Road intersection, and near the City of Hubbard. Whiskey Hill Road is a rural major collector per ODOT functional class mapping connecting OR 99E to the west and Barlow Road, Canby-Marquam Highway, and OR 213 to the east.

The bridge, built in 1931, is rapidly deteriorating with cracking and spalling throughout. There are also patches of exposed rebar and scour related issues. Inspectors have deemed the bridge as structurally deficient with critical scour and have rated the deck as intolerable, giving the bridge an overall sufficiency rating of 4.5.

The new Pudding River (Whiskey Hill Road) bridge is a four-span steel plate girder structure spanning the Pudding River, slightly south of the existing bridge. The new bridge will improve the alignment, minimize scour concerns, and provide two (2) 12-foot lanes and two (2) 8-foot shoulders. The travel lanes will be striped so the final outside shoulder will be 6 feet and the inside shoulder will be 10 feet to improve sight distance on the inside of the curve alignment.

Location of Feature:
Bent 1, 2, and 5 of new crossing of the Pudding River

Hydraulic/Hydrologic History:
It is anticipated that flooding from the Pudding River may encroach onto the Whiskey Hill Road with incipient overtopping flow that has a recurrence interval of approximately 33 years and a high water elevation 116.3 at the upstream face of the bridge. This is approximately the elevation of the existing inside edge of pavement on the westerly approach at the low point of the sag vertical curve. The 50-year design flood is at elevation 117.1. The proposed west and east approach roadway profile is about elevation 117.3 and 118.7, respectively. The replacement structure has been designed to avoid additional backwater during the 100-year base flood. This has been achieved by balancing an increase in both the bridge length and hydraulic opening with a reduction in conveyance of floodwaters that currently overtop the roadway. For the 100-year flood, water will overtop the road by as much as 2.3 feet on the west approach and about 0.9 feet on the east approach. See attached 3-line profile for additional information.
**OREGON DEPARTMENT OF TRANSPORTATION**  
**HYDRAULIC DESIGN DEVIATION REQUEST**

### Reasons for Not Attaining Standard:

- The west approach to the bridge would need to be raised 3.23 feet to provide the 1 foot minimum requirement. Overall, the design of the replacement bridge provides 2.3 ft. of freeboard at the crest of the vertical curve to allow for debris passage. The increased length and opening of the new bridge will improve the conveyance of flood water and resulting in a no net-rise for the backwater elevation. The backwater elevation is expected to reduce from 2.05 ft. from the existing bridge to 1.52 ft. for the new bridge meeting the 50-year design flood.

- It would require a much longer continuous structure to offset the loss of conveyance of floodwaters that would otherwise overtop the roadway in order to achieve a no-rise condition during the 100-year base flood. This would also necessitate replacement of the existing overflow structure immediately to the west. The planning level estimated cost to replace the overflow structure is approximately $2 million. The following is a breakdown of this cost:
  - Overflow Bridge – 105 ft x 42.75 ft x $200/sf = $897,750
  - Additional Bridge Length of Proposed Bridge – 20 ft x 42.75 ft x $400/sf = $342,000
  - Retaining walls at road approach to minimize EFU impacts – 2 walls x 150 ft x 5 ft x $40/sf = $60,000
  - Roadway items = $100,000
  - Contingencies at 20% = $279,950
  - Design/redesign = $400,000

- Furthermore, the existing overflow bridge is approximately 105 feet long. The bridge length cannot be increased to provide additional conveyance of the Pudding River because it is adjacent to private property (zone exclusive farm use). Additional conveyance is required to offset raising the elevation of the road approaches in the floodplain to meet the increased bridge elevation. Therefore, the length of the proposed bridge would need to be increased to provide adequate conveyance of the river. In conversations with adjacent property owners, the owners are supportive of the project but very concerned about river/hydraulic impacts to their properties with the potential changes in the overflow pattern. In summary, the proposed roadway and bridge elevations provide the best balance within this section of the Pudding River floodplain.

- The proposed design will essentially maintain the current condition for overtopping of the Whiskey Hill Road on the west approach to the bridge. The frequency of overtopping will be slightly increased to a 35-year recurrence interval from the existing of 33 year recurrence interval.

### Effect on Other Standards:

Substandard sag vertical curves have been incorporated on either end of the new bridge to provide maximum roadway overtopping area to help achieve a no-rise condition.

### Compatibility with Adjacent Sections:

Other sections of Whiskey Hill Road are not subject to flooding as is this section. This is a localized flooding issue not affecting adjacent sections.

### Probable Time before Reconstruction:

Unknown at this time, anticipate only preservation type work on this road for the foreseeable future.

### Mitigation for Design Deviation Included in the Design:

Slope armoring up to the abutments is included on both ends of the bridge to minimize scour near the bridge abutments. The abutments are founded on concrete drilled shafts to be further protected from scour concerns.

### Supporting Documentation:
Attachments:

☐ Plan sheet 3
☐ 3-Line Profile of Proposed Roadway
Note:
See Dwg. WH109 for Detail Reference Numbers.

Deck elevations shown are finish grade at top of deck at the intersection of bent and roadway and an offset 20'-0" Lt and 20'-0" Rt.

* Measured for the Lt Bent-Ton. Lt Roadway
Pay limit for Conc. Bridge Rail Type 5" = 482'-0"± Lt.

440'-0" Ctr.-ctr. and bents
4-Steel Plate Girders

PLAN

Scale: 1/8" = 1'-0"

Notes:

Deck elevations shown are finish grade at top of deck at the intersection of each bent and roadways on an offset 20'-0" Lt. and 20'-0" Rt.
*Measured for bent-70m, roadway
90% REVIEW PLANS
Feb 14, 2014

PUDDING RIVER BRIDGE
WHISKEY HILL ROAD, M.F. 8.05
CLACKAMAS AND MARION COUNTIES

TYPICAL DECK SECTION

SCALE: 1/12" = 1'-0"

DECK BUILDUP

SCALE: 1/12" = 1'-0"

HANGER WIRE DETAIL

SCALE: 1/12" = 1'-0"

TYPICAL DECK REINFORCEMENT

Top mat (Transverse bars on bottom)
Transverse bars: 6 @ 35" W/ std. 180°.K. ea. end
Longitudinal bars: 6 @ 55"

Bottom mat (Transverse bars on bottom)
Transverse bars: 6 @ 75"
Longitudinal bars: 6 @ 75"
Place transverse bars perpendicular to girder

Concrete Bridge Rail
Type 3", see Deg. 8R200 for details.
TYPICAL DECK SECTION

SCALE: 1/12" = 1'-0"

See Wrench Wire detail, this sheet

Hanger ASTM A496 deformed wire size 4-5, typ.

Use tie wire to wrap length of bridge, typ.

9/16" Charmer, typ.

#4 Typ.

#4 Typ.

40'-0" Roadway

3 spaces @ 11'-3" = 33'-0"

4'-0" Roadway

Sl. Hanger

Structural steel plate girder, typ.

Girder A

Quotations for the following are required:

- Reinforcement
- Bridge Rail

J. Cutlapper
Alex Lim

Calc. Book