DUP ok-RaT

SCOUR ANALYSIS AND REPORTING FORM

Bridge Structure No. 53240235 Date 9-17-12 Initials RFT Region (A(B)C D)

Site ____________ Location 5.5 mi N. Bison on White Butte Rd

Q_{100} = 116900 by: drainage area ratio ✓ flood freq. anal. ____ regional regression eq. ____

Bridge discharge (Q_2) = ____________ (should be Q_{100} unless there is a relief bridge, road overflow, or bridge overtopping)

PGRM: "RegionA", "RegionB", "RegionC", or "RegionD"

Analytical Procedure for Estimating Hydraulic Variables Needed to Apply Method

Bridge Width = ______ft. Flow angle at bridge = ______° Abut. Skew = ______° Effective Skew = ______°

Width (W_2) iteration = ______ ______ ______ ______

Avg. flow depth at bridge, y_2 iteration = ______ ______ ______ ______

Corrected channel width at bridge Section = W_2 times cos of flow angle = ______ft* $q_2 = Q_2/W_2$ = ______ft^2/s

Bridge Vel, V_2 = ______ft/s Final $y_2 = q_2/V_2$ = ______ft Δh = ______ft

Average main channel depth at approach section, $y_1 = \Delta h + y_2$ = ______ft

* *NOTE: repeat above calculations until y_2 changes by less than 0.2* *Effective pier width = L sin(q) + a cos(q)*

If y_2 is above LS, then account for Road Overflow using PRGM: RDOVREGA, RDOVREGB, RDOVREGC, or RDOVREGD.

Water Surface Elev. = ______ ft

Low Steel Elev. = ______ ft

n (Channel) = ______

n (LOB) = ______

n (ROB) = ______

Pier Width = ______ ft

Pier Length = ______ ft

Piers for 100 yr = ______ ft

New Bridge under construction?!

See photo 5: Str. no.
const. Site

PGRM: Contract

CONTRACTION SCOUR

Width of main channel at approach section W_1 = ______ft

Width of left overbank flow at approach, W_{lob} = ______ft Average left overbank flow depth, y_{lob} = ______ft

Width of right overbank flow at approach, W_{rob} = ______ft Average right overbank flow depth, y_{rob} = ______ft

Live Bed Contraction Scour (use if bed material is small cobbles or finer)

x= ______ From Figure 9 W_2 (effective) = ______ft y_{cs} = ______ft

PGRM: CWCSNEW

Clear Water Contraction Scour (use if bed material is larger than small cobbles)

Estimated bed material D_{50} = ______ ft Average approach velocity, $V_1 = Q_{100}/(y_1W_1)$ = ______ft/s

Critical approach velocity, $Vc = 11.17y_1^{1/6}D_{50}^{1/3}$ = ______ ft/s

If $V_1<V_c$ and D_{50} >= 0.2 ft, use clear water equation below, otherwise use live bed scour equation above.

$D_{c50} = 0.0006(q_2/y_1^{7/6})^3$ = ______ft If $D_{50} >= D_{c50}$, $\chi = 0.0$

Otherwise, $\chi = 0.122y_1[q_2/(D_{50}^{1/3}y_1^{7/6})]^{6/7} - y_1$ = ______ From Figure 10, y_{cs} = ______ft

PGRM: Pier

PIER SCOUR CALCULATIONS

L/a ratio = ______ Correction factor for flow angle of attack (from Table 1), K2 = ______

Froude # at bridge = ______ Using pier width a on Figure 11, ξ = ______ Pier scour y_{ps} = ______ft

PGRM: Abutment

ABUTMENT SCOUR CALCULATIONS

Average flow depth blocked by: left abutment, y_{aLT} = ______ft right abutment, y_{aRT} = ______ft

Shape coefficient K_1= 1.00 for vertical-wall, 0.82 for vertical-wall with wingwalls, 0.55 for spill-through

Using values for y_{aLT} and y_{aRT} on figure 12, ψ_{LT} = ______ and ψ_{RT} = ______

Left abutment scour, $y_{as} = \psi_{LT}(K_1/0.55)$ = ______ft Right abutment scour $y_{as} = \psi_{RT}(K_1/0.55)$ = ______ft

SCOUR ANALYSIS AND REPORTING FORM

Bridge Structure No. 53240235 Date ________ Initials ________ Region (A (B) C D)

Site ________ Location ________

Q_{500} = 30400 by: drainage area ratio ✓ flood freq. anal. ____ regional regression eq. ____

Bridge discharge (Q_2) = ________ (should be Q_{500} unless there is a relief bridge, road overflow, or bridge overtopping)

PGRM: "RegionA", "RegionB", "RegionC", or "RegionD"

Analytical Procedure for Estimating Hydraulic Variables Needed to Apply Method

Bridge Width = ______ft. Flow angle at bridge = ______° Abut. Skew = ______° Effective Skew = ______°

Width (W_2) iteration = ______ ______ ______ ______

Avg. flow depth at bridge, y_2 iteration = ______ ______ ______ ______

Corrected channel width at bridge Section = W_2 times cos of flow angle = ______ft* $q_2 = Q_2/W_2$ = ______ft^2/s

Bridge Vel, V_2 = ______ft/s Final $y_2 = q_2/V_2$ = ______ft Δh = ______ft

Average main channel depth at approach section, $y_1 = \Delta h + y_2$ = ______ft

** NOTE: repeat above calculations until y_2 changes by less than 0.2* *Effective pier width = L sin(q) + a cos(q)*

If y_2 is above LS, then account for Road Overflow using PRGM: RDOVREGA, RDOVREGB, RDOVREGC, or RDOVREGD.

Water Surface Elev. = ______ ft

Low Steel Elev. = ______ ft

n (Channel) = ______

n (LOB) = ______

n (ROB) = ______

Pier Width = ______ ft

Pier Length = ______ ft

Piers for 500 yr = ______ ft

CONTRACTION SCOUR

PGRM: Contract

Width of main channel at approach section W_1 = ______ft

Width of left overbank flow at approach, W_{lob} = ______ft Average left overbank flow depth, y_{lob} = ______ft

Width of right overbank flow at approach, W_{rob} = ______ft Average right overbank flow depth, y_{rob} = ______ft

Live Bed Contraction Scour (use if bed material is small cobbles or finer)

x = ______ From Figure 9 W_2 (effective) = ______ft y_{cs} = ______ft

PGRM: CWCSNEW

Clear Water Contraction Scour (use if bed material is larger than small cobbles)

Estimated bed material D_{50} = ______ ft Average approach velocity, $V_1 = Q_{500}/(y_1 W_1)$ = ______ft/s

Critical approach velocity, $Vc = 11.17 y_1^{1/6} D_{50}^{1/3}$ = ______ ft/s

If $V_1 < V_c$ and $D_{50} >= 0.2$ ft, use clear water equation below, otherwise use live bed scour equation above.

$D_{c50} = 0.0006(q_2/y_1^{7/6})^3$ = ______ft If $D_{50} >= D_{c50}$, $\chi = 0.0$

Otherwise, $\chi = 0.122 y_1 [q_2/(D_{50}^{1/3} y_1^{7/6})]^{6/7} - y_1$ = ______ From Figure 10, y_{cs} = ______ft

PIER SCOUR CALCULATIONS

PGRM: Pie

L/a ratio = ______ Correction factor for flow angle of attack (from Table 1), K2 = ______

Froude # at bridge = ______ Using pier width a on Figure 11, ξ = ______ Pier scour y_{ps} = ______ft

ABUTMENT SCOUR CALCULATIONS

PGRM: Abutment

Average flow depth blocked by: left abutment, y_{aLT} = ______ft right abutment, y_{aRT} = ______ft

Shape coefficient K_1= 1.00 for vertical-wall, 0.82 for vertical-wall with wingwalls, 0.55 for spill-through

Using values for y_{aLT} and y_{aRT} on figure 12, ψ_{LT} = ______ and ψ_{RT} = ______

Left abutment scour, $y_{as} = \psi_{LT}(K_1/0.55)$ = ______ft Right abutment scour $y_{as} = \psi_{RT}(K_1/0.55)$ = ______ft

Route White Butte Rd Stream S. Fork Grand R MRM________ Date__________ Initials________

Bridge Structure No. 53240235 Location 5.5 mi. N Bison on White Butte Rd

GPS coordinates: ________________ taken from: USL abutment____ centerline of ⇑ MRM end _____

________________ Datum of coordinates: WGS84_____ NAD27_____

Drainage area = 1422.5 sq. mi.

The average bottom of the main channel was ________ft below top of guardrail at a point _________ft from left abutment.

Method used to determine flood flows: ____Freq. Anal. ✓ drainage area ratio ____regional regression equations.

MISCELLANEOUS CONSIDERATIONS

Flows	Q_{100} = 16900			Q_{500} = 30400		
Estimated flow passing through bridge						
Estimated road overflow & overtopping						
Consideration	Yes	No	Possibly	Yes	No	Possibly
Chance of overtopping						
Chance of Pressure flow						
Armored appearance to channel						
Lateral instability of channel						

Riprap at abutments? _____Yes _____No _____Marginal

Evidence of past Scour? _____Yes _____No _____Don't know

Debris Potential? _____High _____Med _____Low

Does scour countermeasure(s) appear to have been designed?

Riprap _____Yes _____No _____Don't know _____NA

Spur Dike _____Yes _____No _____Don't know _____NA

Other ________________ _____Yes _____No _____Don't know _____NA

Bed Material Classification Based on Median Particle Size (D_{50})

Material	Silt/Clay_____	Sand_____	Gravel_____	Cobbles_____	Boulders_____
Size range, in mm	<0.062	0.062-2.00	2.00-64	64-250	>250

Comments, Diagrams & orientation of digital photos

Summary of Results

	Q100	Q500
Bridge flow evaluated		
Flow depth at left abutment (yaLT), in feet		
Flow depth at right abutment (yaRT), in feet		
Contraction scour depth (ycs), in feet		
Pier scour depth (yps), in feet		
Left abutment scour depth (yas), in feet		
Right abutment scour depth (yas), in feet		
1Flow angle of attack		

See Comments/Diagram for justification where required