

INTERSTATE 70 BRIDGES F-06-O AND F-06-P OVER ELK CREEK, COLORADO

Bridges F-06-O and F-06-P are located in Garfield County on Interstate 70 ML where the interstate crosses the Elk Creek. Figure 1 shows Bridges F-06-O and F-06-P over Elk Creek.



Figure 1. Bridges F-06-O and F-06-P over Elk Creek

Hydrau-Tech, Inc. began the POA study of Bridges F-06-O and F-06-P by collecting information on the site and structures in question, including hydrologic characteristics of the site, GIS information and original bridge construction plans. Using these parameters, regional regression equations result in a 500-year flood discharge of 3,410 cfs (cubic feet per second). After completing a survey of the reach upstream and downstream of the structures and sediment size analysis, a HEC-RAS hydraulic model was developed. This model was used to estimate the hydraulic conditions during the 500-year flow including: discharge distributions, velocity distributions, and water surface profiles. Figure 2 shows the water surface profile produced by the HEC-RAS hydraulic model. Figure 3 shows the reach geometry plot produced by HEC-RAS.

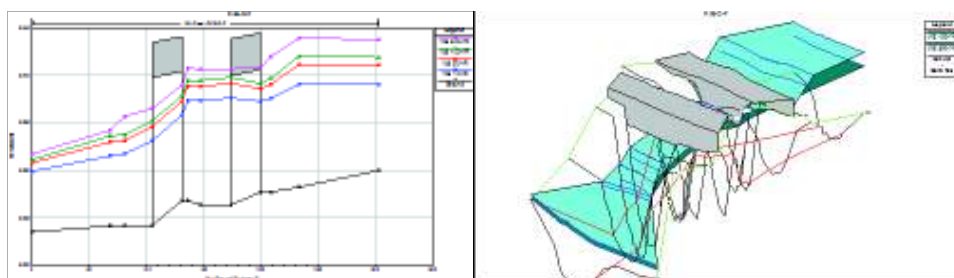


Figure 2 (Left). Water surface profile showing the 10, 50, 100 and 500-year flows
Figure 3 (Right). 3D Plot of the reach around structures F-06-O and F-06-P

Using the results from hydraulic modeling, theoretical scour estimates were calculated with FHWA's HEC-18 scour equations. Updated AutoCAD drawings were produced with adjusted datum elevations and theoretical scour lines in order to determine the stability of the structure under the scour conditions created by flooding. Figure 4 shows a completed theoretical scour plot using AutoCAD showing foundation elevations and potential scour.

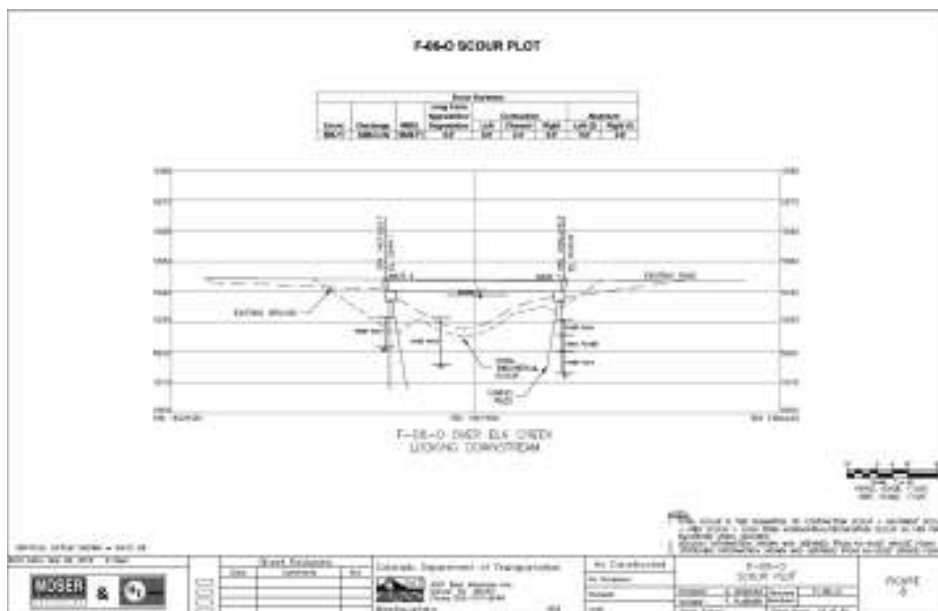


Figure 4. Scour plot generated in AutoCAD showing bridge geometry, foundation elevations, sediment boring hole results and theoretical scour

Based on the theoretical scour and the current site conditions such as foundation depths and existing structure protection, countermeasures were designed by Hydraul-Tech, Inc. Riprap was chosen as the preferred hydraulic scour countermeasure. Pier riprap and abutment riprap sizing were selected by using FHWA's equations. Based on the theoretical velocities, riprap with a median grain size diameter of 3.0 feet was used to design the abutment and channel protection. Using the guidelines in HEC-23 for riprap protection design,

Hydraul-Tech, Inc. developed preliminary riprap countermeasures along with a downstream vertical drop structure to prevent potential head cutting and affects from the Colorado River downstream. Figure 5 shows an aerial image of structures F-06-O and F-06-P with the recommended scour countermeasures. Figure 6 shows a cross-sectional view of the structures with the recommended scour countermeasures and appropriate geometry. As a part of analysis, various cost estimates for alternative countermeasures were complete for comparison.

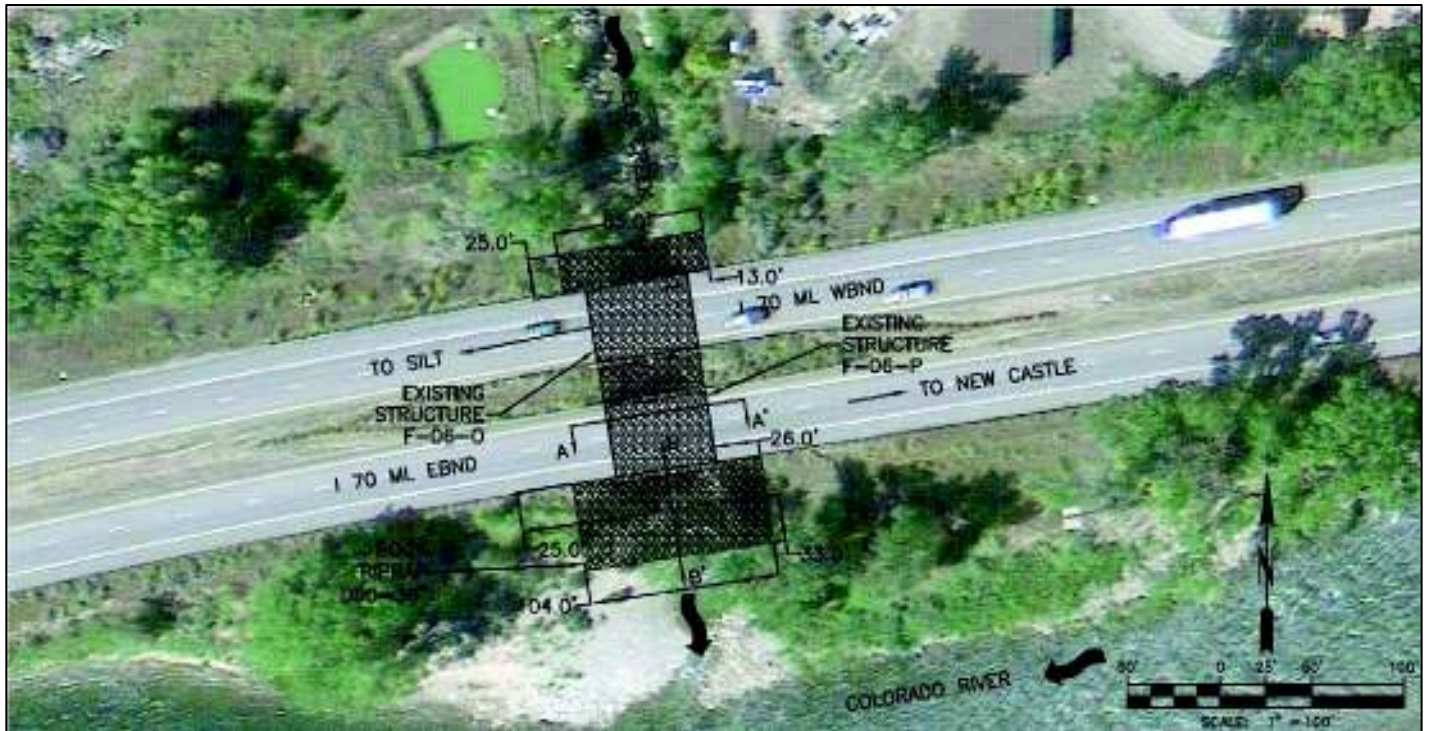


Figure 5. Plan view of Bridges F-06-O and F-06-P with recommended hydraulic scour countermeasure locations

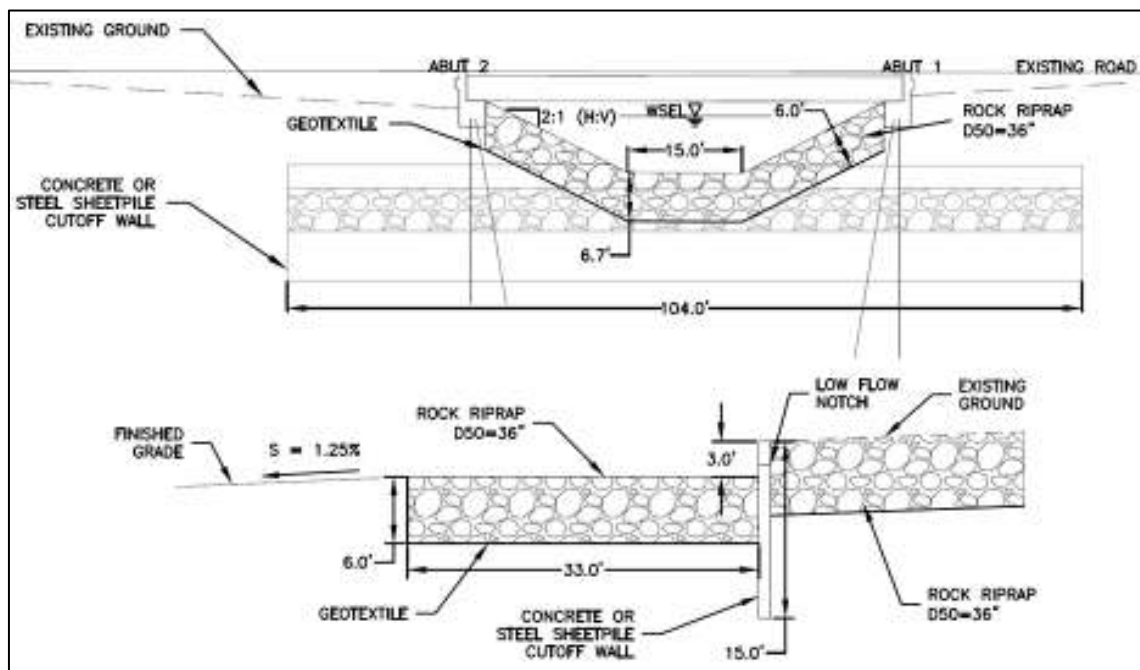


Figure 6. Cross-sectional view of recommended hydraulic scour countermeasures at Bridges F-06-O and F-06-P (above) and a profile view of the downstream drop structure (below)