Impacts of 2011 Missouri River Flooding on Secondary Roads in Western Iowa

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Abstract

The 2011 Missouri River flooding caused nearly $60 million damage to the transportation infrastructure on primary and secondary roads in Western Iowa, of which the damage on secondary roads alone is estimated to be about $13 million. The damage was seen in all six counties along the Missouri River basin in Iowa – Woodbury, Monona, Harrison, Pottawattamie, Mills, and Freemont. The flooding resulted in closures on over 60 miles of primary roads and over 100 miles of secondary roads during summer 2011, causing severe inconvenience to residents and losses to local businesses. As the flood waters receded, the Iowa Department of Transportation (DOT) reported that there were cases where the extent of damage was obvious, i.e., where some segments of roadway has been washed away; but in many cases the damage was undetermined, i.e., where the damage was below the road surface layer or around bridges.

A research project was initiated by the Iowa DOT with the Center for Earthworks Engineering Research (CEER) at Iowa State University, to assist County and City Engineers by deploying and using advanced technologies to rapidly assess the damage to secondary roadways, and developing effective repair and mitigation strategies and solutions. This presentation will include information from field reconnaissance and in situ testing conducted by the researchers to assess the damage occurred to various paved and unpaved roads and its foundation layers, bridge approaches, and culverts in Western Iowa.

In situ testing was conducted on 12 test segments varied in length from about 500 ft to 2 miles and type of surfacing, i.e., gravel, thin chipseal coat over emulsified oil stabilized gravel base, portland cement concrete (PCC), and hot mix asphalt (HMA). The test segments were selected with an objective to monitor performance of the flooded versus un-flooded areas by evaluating their subsurface foundation layer performance characteristics over time, i.e., shortly and one month after flood waters receded, and during spring/thaw in 2012. In situ testing involved conducting falling weight deflectometer (FWD),

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dynamic cone penetrometer (DCP) testing, hand auger soil sampling, ground penetrating radar (GPR), and 3D laser scanning. FWD, DCP, hand augers, and GPR was used to evaluate damage of the foundation layers, while 3D laser scanning was utilized to calculate earthwork volumetric quantities at a location where a roadway segment was washed away during the floods.

**Keywords:** Missouri river flooding—low volume roads—in situ testing—falling weight deflectometer—laser scanning