

# **Final Report**

**RDT REDT01-009**

## **Earthquake Hazard Assessment Along Designated Emergency Vehicle Priority Access Routes**

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The opinions, findings, and conclusions expressed in this publication are those of the principal investigators and the Missouri Department of Transportation, Research, Development and Technology.

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## EXECUTIVE SUMMARY

Southeast Missouri experiences relatively small magnitude earthquakes on a regular basis, and is the site of several of the largest earthquakes to strike North America in recorded history (1811 - 1812). Experts agree that high consequence events are anticipated in the Midwest New Madrid Seismic Zone. Experts also agree that if a very high magnitude earthquake struck southeastern Missouri today the damage to critical lifeline infrastructure would be catastrophic.

Because of the compelling need to reopen vehicular access routes into Sikeston, Cape Girardeau and St. Louis following a devastating earthquake, the Missouri Department of Transportation initiated a study of those portions of US 60 and MO 100 that have been officially designated as emergency vehicle priority access routes.

The goals of this study were twofold. Goal one was to establish a geotechnical database for earthquake design for areas in proximity to designated portions of US 60 and Missouri 100 (includes counties of Butler, Stoddard, New Madrid, Franklin and St. Louis). Goal two was to conduct detailed earthquake assessments at two sites along designated emergency vehicle priority access US 60.

Both goals of the research have been met. Databases have been established for current subsurface and geotechnical data for the US 60 corridor in Butler, Stoddard and New Madrid Counties and for the Missouri 100 corridor in Franklin and St. Louis Counties. These databases serve as the beginning of a larger regional and statewide database for future development and usage by the Missouri Department of Transportation. A discussion of the databases and documentation for their use is contained in *User Instructions for Data Entry and Editing of The Database of Borehole and Geophysical Data for Missouri Highway Structures*.

Detailed earthquake site assessments were conducted for two critical US 60 roadway bridge sites. Both the new and old bridges at the Wahite Ditch and the St. Francis River crossings were analyzed. Liquefaction potential, slope stability, flooding potential, abutment stability, and structure stability analysis were performed at both sites for selected critical synthetic bedrock ground motions based on New Madrid source zone earthquakes with 2% and 10% probabilities of exceedance in fifty years.

The site assessment studies indicate that both the Old Wahite Ditch Bridge and the Old St. Francis River Bridge could be rendered unusable by strong ground motion with a 2% probability of exceedance in the next fifty years. The New St. Francis River Bridge would likely suffer severe damage in the cross frames of the superstructure for a 2% probability of exceedance in the next fifty years earthquake. Studies indicate that the approach structures of all the study bridges would fail as a result of slope instability and liquefaction. Problems could be exacerbated by the localized flooding as a result of levee failure and/or damage to the Wappapello Dam.

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