

Award Number 07HQAG0135

Proposal to Develop Detailed Surficial Geological Maps for the
Granite City and Columbia Bottom 7.5' Quadrangles as a Portion of the
St. Louis Area Earthquake Hazard Mapping Project (SLAEHMP)

Collaborative Research with:
United States Geological Survey; Earthquake Hazards Program Office
and
Missouri Department of Natural Resources; Division of Geology and Land Survey

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Abstract

The Missouri Division of Geology and Land Survey (DGLS) proposed to complete surficial geologic mapping for the Missouri portion of two maps within the St. Louis Area Earthquake Hazard Mapping Project (SLAEHMP), the Granite City and Columbia Bottom 7.5' quadrangles. No consistent large-scale surficial geologic mapping existed for these quadrangles. The work completed brings the geologic mapping to the level available on the Illinois side of the project and in the Wentzville, MO quadrangle to the west. It also reduces the level of uncertainty in the three-dimensional distribution of surficial material units and their related physical properties. In the St. Louis Surficial Material Database, a NEHRP project formerly completed by DGLS, geotechnical log data from 4,115 borings were collected and entered. The boring logs contain considerable details about subsurface materials encountered. Most of these borings were completed for site-specific design or construction purposes and not as a source of data for stratigraphic analysis and geologic mapping.

The goal of the project for FY07 was to complete new detailed surficial geologic maps for the Granite City and Columbia Bottom 7.5' quadrangles. The mapping was completed using available subsurface data and stratigraphic profiles developed for the St. Louis Surficial Materials Database and comparison with published small-scale surficial material maps (Goodfield, 1965; Lutzen and Rockaway, 1971; Allen and Ward, 1977). DGLS collected 836 geotechnical logs from MODOT and the St. Louis Metropolitan Sewer District (MSD) for the Missouri portion of these two quadrangles alone. Existing small-scale maps and reports indicate that these areas have surficial material units that vary from bedrock regolith; early Quaternary till; loess; alluvium, with wide ranges in grain sizes; and large areas of artificial fill. The boring data was incorporated to develop three-dimensional spatial variation of surficial material unit properties. This analysis will be used to assess the response of the soil column and liquefaction potential in response to different magnitude earthquakes and potential for site amplification, and improve the accuracy and precision of earthquake hazard maps being prepared by the SLAEHMP TWG.

Body of Report

The surficial material geologic maps for the Missouri portion of the Granite City and Columbia Bottom 7.5' quadrangles have been completed as deliverables in fulfillment of award number 07HQAG0135. These maps were compiled using existing data derived from the St. Louis Surficial Material Database (formerly compiled by DGLS) and from various sources listed in the bibliography. Considerations were given to small scale maps in the region produced by former DGLS staff in addition to large scale map produced by the Illinois Geological Survey and Lettis and Associates.

Surficial material maps were compiled by comparing geotechnical boring data from the St. Louis Surficial Material Database to lithographic descriptions made in bibliography referenced research. Specific age of mapped units was not determined or depicted, only their age in respect to other mapped units. Considerations were given to the slope of the topography and the lithology of the bedrock (shale vs. limestone) and surficial material (clay, silt, sand, gravel, etc.) . The unconsolidated materials overlying shale bedrock, or ancient paleosols, were noted to have a higher potential for slope failure during an earthquake.

Inset contour maps were developed using data from the St. Louis Surficial Material Database in conjunction with well logs from the Illinois Geological Survey. Points across the 22 quadrangle SLAEHMP project site (fig 1) were used to generate contours based on the surficial material thickness and elevation of the top of bedrock. Contours were generated using a 20 foot contour interval and clipped to the specific quadrangle boundary. Inset maps were generated and added to the final map product.

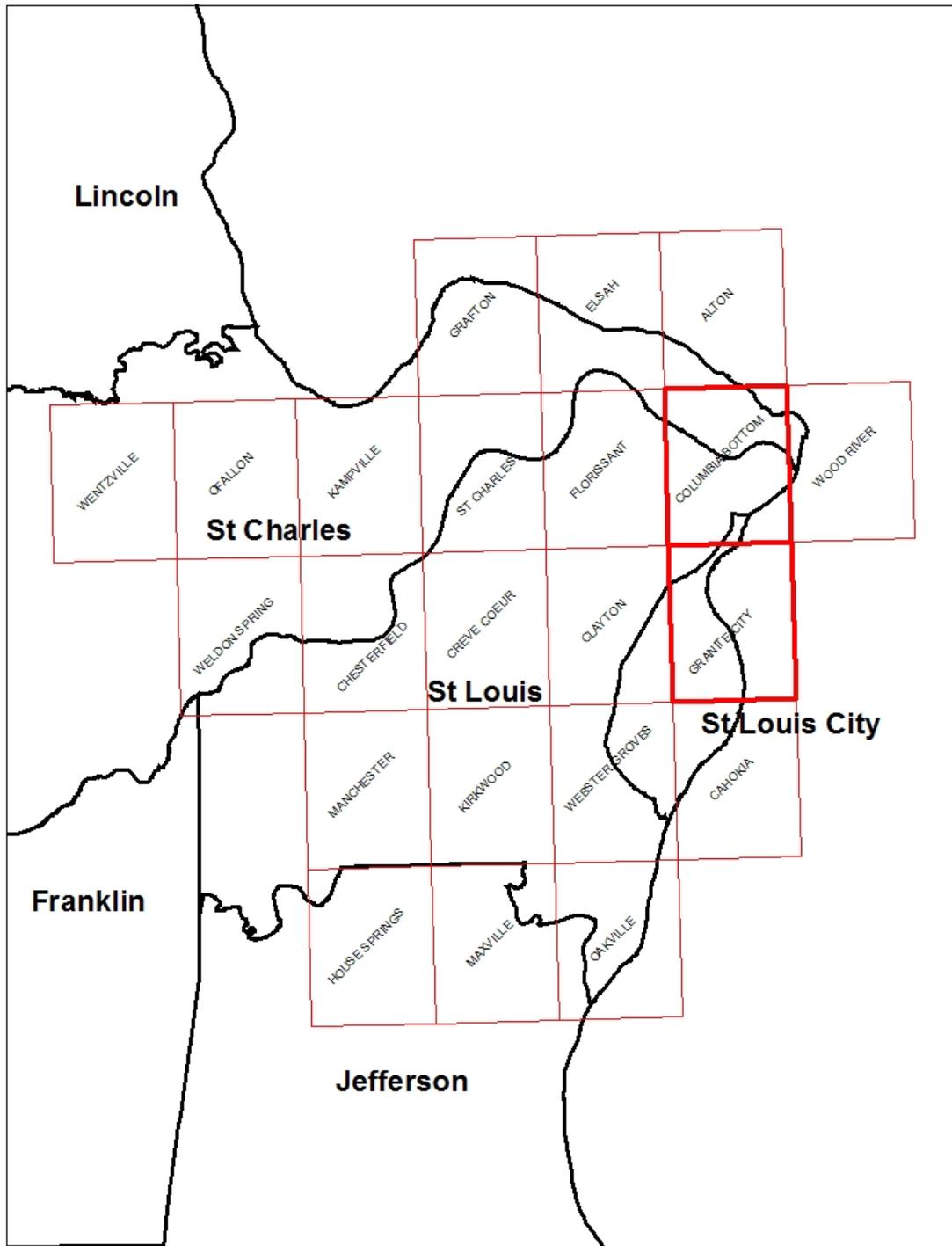


Figure 1: St. Louis Area Earthquake Hazard Mapping Project 22 quadrangle area with Granite City and Columbia Bottom quadrangles in bold

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