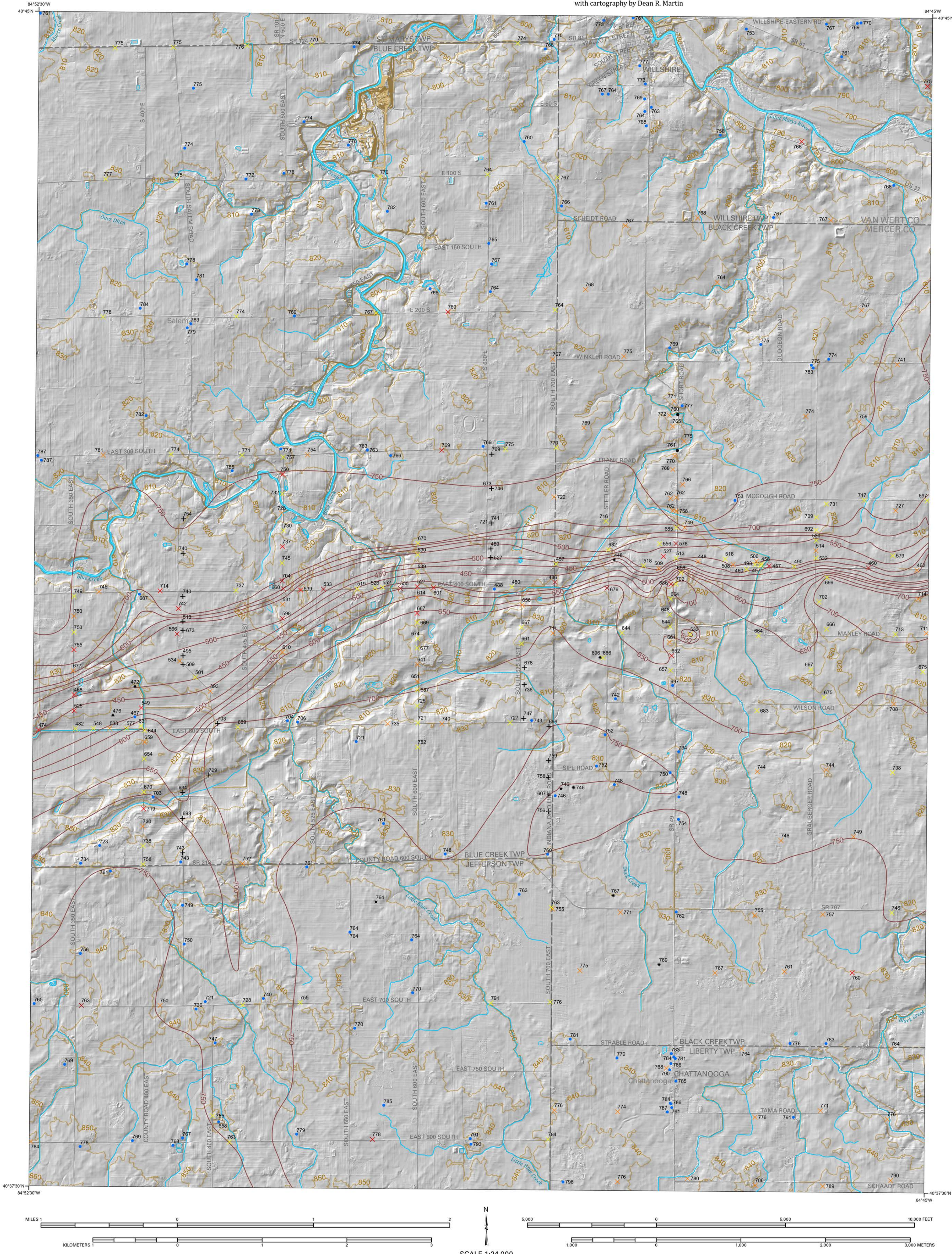


BEDROCK TOPOGRAPHY OF THE WILLSHIRE 7.5-MINUTE QUADRANGLE, OHIO-INDIANA

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Mapping Conventions

This map details the subsurface contact between the consolidated Paleozoic bedrock surface and the overlying unconsolidated Quaternary-aged sediments. This contact is expressed by elevation contours with a 50-foot contour interval. These contours were drawn in ArcGIS® software using expert knowledge of the surrounding geology and preglacial drainage history. Bedrock elevation points from a variety of different verified sources were used during the contouring process. These data point sources include bedrock outcrop exposure observations, water well logs, oil-and-gas drilling logs, geotechnical boring logs, internal borings records, refraction seismic data, and Horizontal-to-Vertical Spectral Ratio (HVSr) passive seismic measurements.

HVSr passive seismic data points were collected using MoHo Tromino® 3G Digital Tomographs with the intent of filling in spatial gaps between traditional bedrock elevation data points. This geophysical method is used to estimate depth to bedrock at a point by analyzing the Earth's near-surface resonance frequency. Areas that are dominated by agriculture and are less populated contain sparse data with only traditional bedrock topography datasets. Areas with thick glacial sediments, such as buried bedrock valleys where shallow drilling does not typically penetrate bedrock, also represent typical areas with sparse traditional bedrock topography data. After collecting passive seismic data points at nearby locations with known depths to bedrock for calibration (fig. 1), geophysical surveys were designed to provide higher data resolution in locations with low data density. Passive seismic data were collected approximately every 0.5 miles where necessary in the mapping area, which were then further supplemented with even higher resolution 0.1-mile-spaced stations perpendicular to the long axis of the deep valley as needed. Data collection times varied from 16–20 minutes, as thicker unconsolidated sediment packages required a longer Tromino® operating time to quantify the depth to bedrock.

As a geophysical method, passive seismic data does have some uncertainty (fig. 2). Each data point has some error in the peak resonance frequency, which is established during the post-processing. This error is propagated through the data along with uncertainty inherent to the calibration function (fig. 1). The total uncertainty is calculated within the 95% confidence level. Uncertainties were not considered during the hand contouring process as equal weight was put to each HVSr passive seismic data point. However, data points with relatively high uncertainty indicate areas where future studies could further refine the bedrock topography.

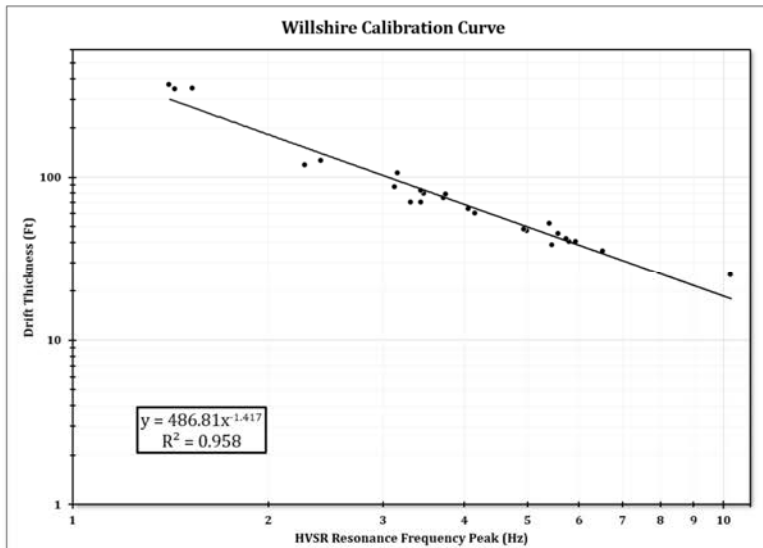


FIGURE 1. Localized HVSr power-law regression plot of calibration points.

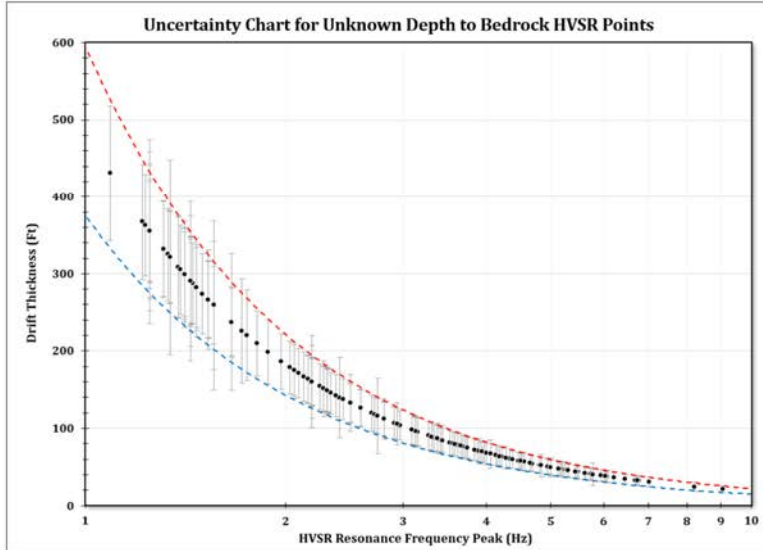


FIGURE 2. Uncertainty plot displaying the total uncertainty of each HVSr data point used to calculate the depth to bedrock at noncalibration point locations. Red and blue trend lines display approximate maximum and minimum thickness for a specific frequency, respectively.

Bedrock Elevation Data Points

- Geotechnical borehole
 - Oil-&-gas well
 - Refraction seismic data
 - Water well
- Elevation Lines (above m.s.l.)
- 50-ft bedrock topography contour
 - 10-ft ground elevation contour

HVSr points

- Percent uncertainty
- 18.1–19.5
 - 19.6–21.8
 - 21.9–25.8
 - 25.9–32.0
 - 32.1–42.2



Location of Willshire 7.5-minute quadrangle in Ohio and Indiana

DECATUR	WREN	GLENMORE
BERNE	WILLSHIRE	ROCKFORD
GENEVA	NEW CORYDON	ERASTUS

Indiana Ohio
Adjacent 7.5-minute quadrangles

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Basemap derived from various State of Ohio and State of Indiana datasets.
Hydrography based off NHD, USGS datasets.
Projection of map is Ohio coordinate system, south zone
North American Datum 1983



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