

PRELIMINARY BEDROCK TOPOGRAPHY AND DEPTH TO BEDROCK MAPS OF THE SOUTHWEST ARROWHEAD AREA

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August 2018

*Prepared and published with the support of
the St. Louis and Lake County Boards of Commissioners,
and the Minnesota Environment and Natural Resources Trust Fund
as recommended by the Legislative-Citizen Commission on Minnesota Resources*

Bedrock Topography and Depth to Bedrock Southwestern Arrowhead 2018 files:

1. README—this file.
2. PDFs of: Bedrock topography (elevation of the bedrock surface); Drift thickness (depth to bedrock); and the Bedrock topography database showing information density and locations.
3. Map Package (mpk) containing an mxd and the following associated data sets:
 - USGS 7.5-minute quadrangle map outlines and names.
 - PLS, Township and Range outlines
 - Outcrop—approximately 5700 polygons representing bedrock at or near the land surface, including both those visited in the field and those inferred from LiDAR and air photo.
 - Passive Seismic—approximately 450 points representing stations from which data on depth to bedrock were acquired.
 - Conventional Seismic – 16 points representing stations in from which data on depth to bedrock were acquired.
 - Quaternary data locations (QDI)—locations of sites where samples and descriptions of Quaternary materials were collected. Some of the locations were used in the preparation of the bedrock topography map, mostly drill holes such as soil borings, engineering borings, and Giddings drill holes (listed in attribute table as “SA,” “GD,” and “SR” types). A complete index of the QDI sample types is provided in the table below.
 - Locations of approximately 19,000 water wells and other drill holes from the County Well index (CWI) as of August 2018. The map shows those that intersected bedrock (CWI, Bedrock) and those that did not intersect bedrock (CWI, Quaternary).
 - Drift Thickness raster—shows depth to bedrock with 25’ color intervals.
 - Bedrock Topography—contour line file at 50’ intervals. Pre-existing topographic lines at 20’ intervals were modified for this project in the area around the Mesabi Iron Range, but these 20’ contours were used only to make the bedrock topography and drift thickness rasters and were not included in the final line file.
 - Bedrock Topography polygons—polygons of the bedrock surface colored at 50’ intervals.
 - DNR 30m DEM—land surface elevation at 30m, derived from DNR 1m LiDAR data. Contains lake bathymetry where available.
 - Bedrock Topography raster—ESRI raster showing the elevation of the bedrock surface as a continuous gray shade, feet above sea level.

Double click the mpk file after downloading to unpack the referenced files to the local computer and open an mxd.

The coordinate system for the data is UTM, NAD83, Zone 15N.

The BedrockTopography and DriftThickness PDFs and mpk published for the Southwest Arrowhead area in 2018, are included in MGS Open-File Report OFR2016_04 which provides the storage location for information about the geology of Lake and St. Louis Counties until the Atlas products are published. The maps and data presented here are preliminary and should be considered “regional scale.” Site-specific investigations within any of the map areas would require additional data and mapping.

The Southwest Arrowhead study area covers ~2880 mi² in southern and southwestern and western St. Louis County. It is one of several map areas that will be combined into County Geologic Atlases, one for St. Louis County and one for Lake County. The Southwest Arrowhead is an irregularly shaped area adjacent to and extending south and west from the Central Arrowhead area. The western boundary is the border of St. Louis County with Koochiching, Itasca, and Aitkin counties, and stretches from the 7.5 minute quadrangles of Silverdale in the north to Little Prairie Lake in the south. The northern boundary extends from the Silverdale to the Norwegian Bay 7.5 minute quadrangles, with an indent around the Central Arrowhead area. The eastern limit of the Southwest Arrowhead area is the boundary with the Southeast Arrowhead area, stretching from the Palo to Esko Quadrangles. The shore of Lake Superior and the border of St. Louis County with Carlton County form the southern limit of the Southwest Arrowhead area.

The bedrock topography in this study area was largely a new construction with the exception of two areas in which pre-existing bedrock topography was modified to reflect new data— the Esko 7.5 minute quadrangle at the southeast corner of the study area, and parts of ten 7.5 minute quadrangles along the Mesabi Iron Range. Bedrock topography of the Mesabi Iron Range was previously mapped and published as Miscellaneous Map series M-163. The M-163 bedrock topography represents the pre-mining bedrock surface circa 1899 contoured in 20 foot intervals. For the current project, pre-existing bedrock topographic lines in the M-163 area were modified to reflect the current bedrock surface using new data where available; the modified lines were then used to create the bedrock topography raster. Outside of these areas, bedrock topography was a new construct. The bedrock topography lines for the Southwestern Arrowhead Area were drawn at 50 foot intervals based on water well, scientific, municipal, and exploratory drill hole data, outcrop locations, 1 m LiDAR imagery, depth to bedrock at passive seismic stations, and pre-existing topography as mentioned. Note that the CWI and Quaternary data included with this package are static and will change as new data are added to the databases. Check with the County Well Index (CWI) online for updated information. Also note that areas of the bedrock topographic surface with a generalized appearance reflect fewer available data, whereas more intricate contours were developed where there was more abundant data. Additionally, the 50 foot intervals that have been hand-contoured from outcrop and subsurface data are much more generalized than those derived from either the one-meter or the 30 meter LiDAR-based land surface topography. It is important to understand that because of differences in data density and the way the computer algorithm creates a raster, that the bedrock surface generated will never exactly match the land surface,

even where bedrock is very close to or at the land surface.

The Depth to Bedrock (Drift thickness) raster was calculated by subtracting the bedrock topography raster from the land surface 30m DEM and was color-classified for display at 25 foot intervals. Note that some lakes on the DEM contain bathymetric data; in these areas the calculated drift thickness is thinner than in areas without bathymetry, where the water depth is included as drift thickness.

The bedrock topography lines were edited to be topologically correct and used to create bedrock topography polygons representing the 50-foot intervals of bedrock elevation. Some minor discrepancies may exist between the bedrock topography contours that were drawn beginning in early 2018 and the CWI data set sampled in August 2018. Data acquisition is on-going. Modifications of the maps to accommodate these and other new data will occur as the St. Louis and Lake County atlas products are completed.

QDI Sample types:

code	descript
AB	Animal Burrow
BA	Bucket Auger
EX	Excavation
GD	Giddings
HS	Hand Sample
OB	Observation
OC	Outcrop
OP	Point Outcrop
QS	Quaternary Sample
RV	Ravine Exposure
RC	Road Cut
SG	Sand and Gravel Pit (Active)
PI	Sand and Gravel Pit (inactive)
SI	Scientific Investigation
SR	Scientific Rotasonic Hole
SA	Soil Auger
SB	Soil Boring
SC	Stream Cut
TA	Textural Analysis
SE	Sewer Boring