

**PRELIMINARY BEDROCK TOPOGRAPHY AND DEPTH TO BEDROCK MAPS
OF THE CENTRAL ARROWHEAD AREA**

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BedrockTopography and Depth to Bedrock Southeastern 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.
 - Outcrop—approximately 34,400 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 330 points representing stations 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,” “SR,” and “SR” types). A complete index of the QDI sample types is provided in the table below.
 - Locations of approximately 5,700 water wells and other drill holes from the County Well index (CWI) as of February 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.
 - Bedrock Topography polygons—polygons of the bedrock surface colored at 50’ intervals.
 - DNR 30m DEM—land surface elevation at 30m, derived from 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 files, open an mxd, and place the referenced files on the local computer.

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

The BedrockTopography and DriftThickness PDFs and mpk published this year, 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 Southeast Arrowhead study area covers ~2200 mi² in southern and southeastern St. Louis and Lake Counties. 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 Southeast Arrowhead is an irregularly shaped area adjacent to and extending south and east of the Central Arrowhead area. The western boundary stretches from the 7.5 minute quadrangles of West Duluth to Turpela Lake, and the northern boundary stretches from the Mitawan Lake to part of the Wilson Lake 7.5 minute quadrangle, with an indent around the Central Arrowhead area. The Lake-Cook county border is the eastern limit of the Southeastern Arrowhead Area, and the shore of Lake Superior forms the border in the southeast.

For the current project, pre-existing bedrock topography was modified to reflect new data. The bedrock topography lines for the Southeastern Arrowhead Area were drawn at 50 foot intervals based on water well, scientific, municipal, and exploratory drill hole data, pre-existing topography, outcrop locations, 1 m LiDAR imagery, and depth to bedrock at passive seismic stations. 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 generalized areas of the bedrock topographic surface reflect less available data, whereas more intricate contours were developed where there was more abundant data. Additionally, the 50 foot intervals 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 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 in late 2017 and the CWI data set sampled in early 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 Rotosonic Hole
SA	Soil Auger
SB	Soil Boring
SC	Stream Cut
TA	Textural Analysis
SE	Sewer Boring