



Massachusetts Geological Survey
University of Massachusetts Amherst

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MGS Miscellaneous Map M-13-08
Massachusetts Geothermal Energy Project:
Saturated Soil Thermal Conductivity Map
2013

About This Map

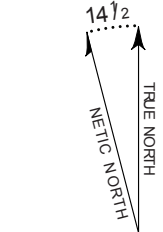
This map shows the location of soil samples from which thermal conductivity measurements in W/m²K were obtained. The samples were acquired in different surficial materials by augering 0.5 to 1.2 m through the A and B soil horizons and driving a 20 cm long by 5 cm wide (4.7 cm inside diameter) cylindrical core with a polycarbonate plastic sleeve into the parent material with a slide hammer. Cores were extracted, capped and brought back to the lab where they were weighed and measured to determine bulk density. Grab samples from each location were also acquired and used to determine organic matter and gravimetric moisture content. In the lab, caps were replaced with filter paper and cores immersed in buckets of water for up to 1 week to allow them to saturate. Saturated thermal conductivity was determined using a Decagon KD2 Pro thermal conductivity meter affixed with a 10 cm long TR-1 probe. The instrument uses the transient line source method for thermal conductivity measurements. Measurement procedure follows ASTM Standard D5334-08. Generally 5 to 6 measurements were made on each core to obtain an overall average and only those measurements with an instrumental error of <1% were retained. The standard error for this overall average is typically within ±0.14 W/m²K (~7%). Replicate measurements on the reference standard DB2412, using thermal grease as a contact agent, gave a thermal conductivity of 0.366±0.014 W/m²K compared with the standard value provided by the manufacturer of 0.369 W/m²K.

Shaded relief (5-m resolution) is a mosaic of digital terrain models (DTMs) derived from digital orthoimages available from the Massachusetts Office of Geographic Information (MassGIS; www.mass.gov/mgis); surficial geology modified from MassGIS data layers as interpreted by Stone (1992).

Field sampling by C. Koteas, A. Ryan, F. Iwanik, S. Mabee, J. Gilbert, S. Lyons and J. Schmidt (2010-2012).

Lab measurements of thermal conductivity by C. Koteas, A. Ryan, F. Iwanik, J. Gilbert and S. Mabee (2010-2012).

Digital cartography and editing by M. Isaacson and S. Mabee (2013)



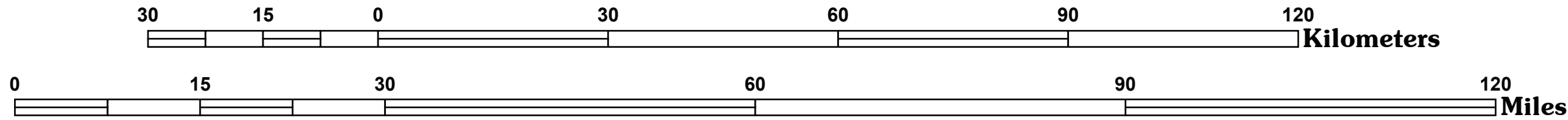
APPROXIMATE MEAN DECLINATION, 2013

Surficial Geology

- Alluvium
- Fine grained deposits
- Sand deposits
- Sand and gravel
- Moraines
- Till and/or bedrock

Saturated Soil Thermal Conductivity (W/m²K)

- >3.0
- 2.5 - 3.0
- 2.0 - 2.5
- 1.5 - 2.0
- 1.0 - 1.5
- <1.0



Scale: 1:6,000,000

Comments to Map Users

Locations of features shown on this map are not surveyed, but are plotted by GPS and interpretation of a given feature on to an orthorectified image or topographic base map; therefore, the accuracy of feature locations depends on the scale of the mapping and the interpretation of the mapper(s). Any enlargement of this map could cause misunderstanding in the detail of mapping and may result in erroneous interpretations. Site specific conditions should be verified by field checking.

This project was supported by the U.S. Department of Energy through a subcontract award granted by the Arizona Geological Survey to the Massachusetts Geological Survey under award number MA-EE0002850. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing official policies, either expressed or implied, of the U.S. Government, Commonwealth of Massachusetts, the University of Massachusetts or Massachusetts Geological Survey.

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This map was produced on request directly from digital files (PDF format) on an electronic plotter.

A digital copy of this map (PDF format) is available at <http://www.geo.umass.edu/stategeologist>.

Massachusetts Geothermal Energy Project: Soil Thermal Conductivity

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