

**About This Map**

The Connecticut and Massachusetts Geological Surveys collaborated on a National Geothermal Data Project funded by the US Department of Energy through the Association of American State Geologists. The goal was to develop information to assist in locating deep geothermal resources and provide data for better design of Enhanced Geothermal Systems in bedrock and unconsolidated sediments. Bedrock units suspected capable of producing radiogenic heat at depth were the primary focus of this study. Additional bedrock units were analyzed to provide a regional view of the geothermal potential across the State. A total of 55 bedrock units were targeted and 242 samples were collected for this study.

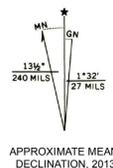
This map shows the location of surface outcrop samples from which heat production values were obtained. The typical sample size is between 0.2 to 1.0 kg. The concentrations of K<sub>2</sub>O, U and Th determined by X-ray Fluorescence Spectroscopy (XRF) following modifications of the methods of *Norrish and Chappell* (1967) outlined in *Rhodes and Vollinger* (2004). The lower limits of detection are 0.001 weight percent for K<sub>2</sub>O and 0.3 ppm for both U and Th. Results for standard rocks are typically within ±0.04 weight percent for K<sub>2</sub>O and ±0.4 ppm for U and Th. Heat production (A) in μW/m<sup>3</sup> is calculated from the density (D) of the samples and from the concentrations in weight percent of Potassium reported as the oxide K<sub>2</sub>O, and the concentrations in parts per million (ppm) of the elements Uranium (U) and Thorium (Th) in the samples.

$$A = ((K_2O) * 0.0297) + (U * 0.0967) + (Th * 0.0263) * D$$

**References**

Norrish, K., and Chappell, B.W., 1967. X-Ray fluorescence spectroscopy. In Zussman, J., ed., *Physical Methods in Determinative Mineralogy*, Academic Press, London, pp. 161-214.

Rhodes, J.M., and Vollinger, M.J., 2004. Composition of basaltic lavas sampled by phase-2 of the Hawaii Scientific Drilling Project: Geochemical stratigraphy and magma types. *Geochemistry, Geophysics, Geosystems*, v.5, Q03G13, doi: 10.1029/2002GC000434.



APPROXIMATE MEAN DECLINATION, 2013

**Sources**

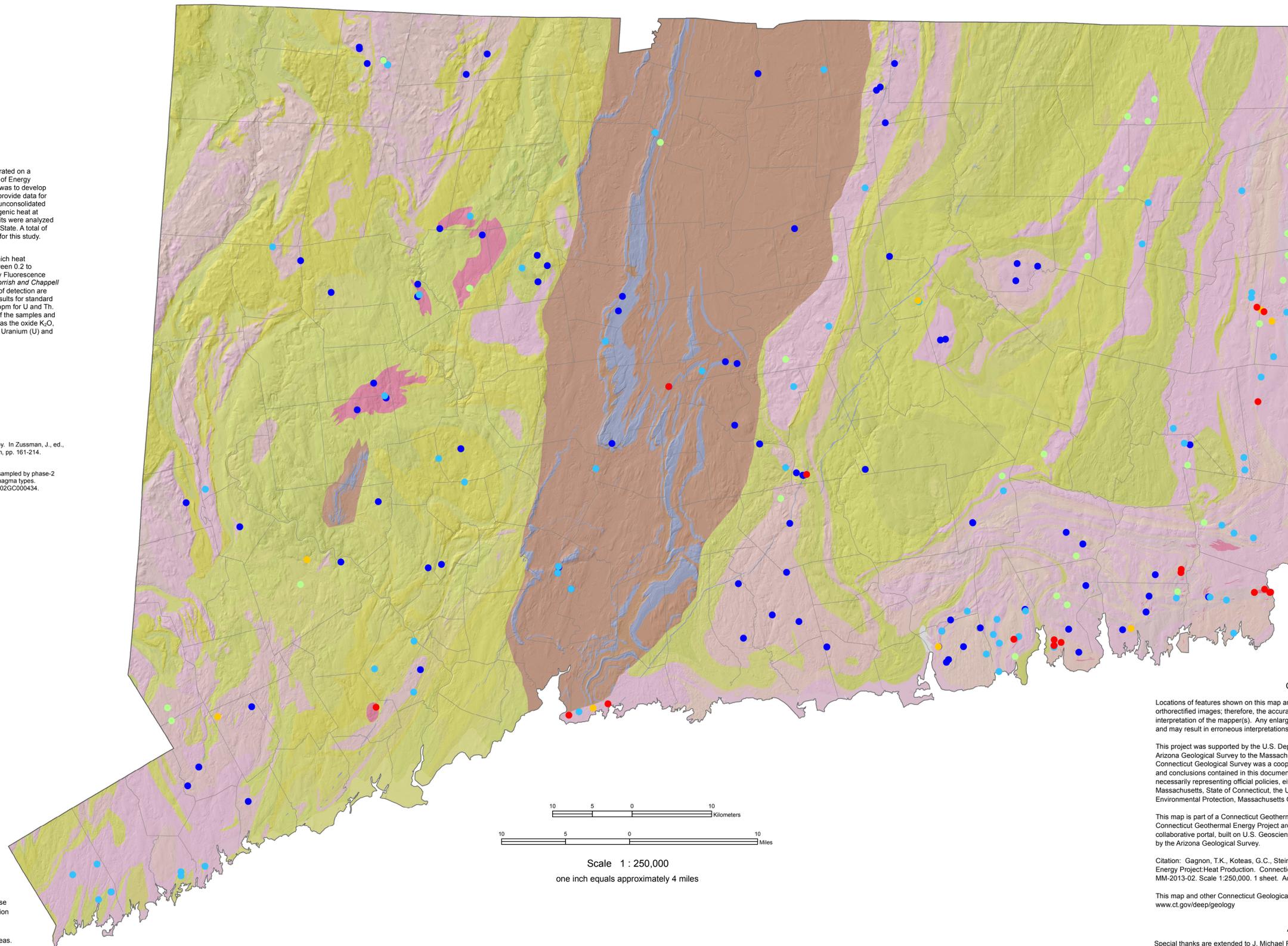
Hillshade base was produced by the University of Connecticut, College of Agriculture and Natural Resources, Center for Land Use Education and Research (CLEAR). It is derived from point elevation data captured during the year 2000 using Light Detection And Ranging (LIDAR) technology. Note, the 2000 LIDAR data for Connecticut is incomplete, necessitating interpolation in some areas. See [http://cteco.uconn.edu/data\\_guides.htm](http://cteco.uconn.edu/data_guides.htm) for further information. This data is available for download at [www.ct.gov/deep/gisdata](http://www.ct.gov/deep/gisdata)

Geologic units are generalized from the Bedrock Geological Map of Connecticut, Rodgers (1985)

Field sampling by T.K. Gagnon, R. Steinen, G.C. Koteas and A. Ryan (2010-2012).

Sample preparation and lab analyses by G.C. Koteas, R. Weiss, S. Adams, C. League, M. Vollinger, M. Mnich and B. Leighton at the University of Massachusetts (2010-2012).

Digital cartography and editing by T.K. Gagnon, M.A. Thomas, J.M. Rhodes, S.B. Mabee, L.C. Belliveau (2013).



**Bedrock Lithology**

- Granite
- Granitic Gneiss
- Mafic Igneous rocks
- Metamorphic rocks (undivided)
- Sedimentary rocks

Heat Production (μW/m <sup>3</sup> )	Number of Samples
<span style="color: red;">●</span> > 4	21
<span style="color: orange;">●</span> 3 - 4	9
<span style="color: lightgreen;">●</span> 2 - 3	34
<span style="color: cyan;">●</span> 1 - 2	75
<span style="color: blue;">●</span> < 1	103
<b>Sample Total</b>	<b>242</b>

**Comments to Map Users**

Locations of features shown on this map are not surveyed, but are determined by GPS and verified using orthorectified images; 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 Connecticut Geological Survey was a cooperative partner in the project for investigations in Connecticut. 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, State of Connecticut, the University of Massachusetts, the Connecticut Department of Energy and Environmental Protection, Massachusetts Geological Survey, or the Connecticut Geological Survey.

This map is part of a Connecticut Geothermal Energy Project Map Series. All data and mapping products of the Connecticut Geothermal Energy Project are available through [www.stategeothermaldata.org](http://www.stategeothermaldata.org), a 50 State collaborative portal, built on U.S. Geosciences Information Network (USGIN) protocols and standards, and hosted by the Arizona Geological Survey.

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This map and other Connecticut Geological and Natural History Survey Publications are available at [www.ct.gov/deep/geology](http://www.ct.gov/deep/geology)

**Acknowledgements**

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# Connecticut Geothermal Energy Project: Heat Production

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