Estimates of temperature at a depth of 4 km are based on measurements of thermal conductivity and heat production for various surface samples, together with determinations for heat flow. Strictly speaking, surface temperature \(T_z\) is a function of temperature \(T_0\), heat production \(Q\), thermal conductivity \(K\), and heat flow \(Q\), i.e., \(T_z = T_0 + \frac{Q}{K} (z - z_0) - \frac{A}{2} \frac{K}{(z - z_0)^2}\). In the absence of surface temperature measurements, temperatures at depth may be calculated from the heat production and thermal history of the bedrock.

\[ T_z = T_0 + \frac{Q}{K} (z - z_0) - \frac{A}{2} \frac{K}{(z - z_0)^2} \]

The thermal conductivity of the bedrock is measured directly on polished slabs of the sample using a 25-mm TGC Thermal Conductivity meter, which allows for multiple parallel measurements. The thermal conductivity is then used to calculate the temperature at depth using the appropriate geothermal heat flow. Since the thermal conductivity of a finite sample is derived from thermally treated composite rock, heat production is calculated from the chemical composition and/or average density of the samples.

\[ A = \frac{\sigma_0}{1 - 0.2 \times 10^{-6}} \times [\frac{1}{2} + 0.2 \times 10^{-6}] \]

The temperature at any depth \(T_z\) can be estimated using the following equation:

\[ T_z = T_0 + \frac{Q}{K} (z - z_0) - \frac{A}{2} \frac{K}{(z - z_0)^2} \]

The standard errors of \(K\), \(Q\), and \(T_0\) are typically within ±0.4 W/m/°K (~15%), ±0.04 weight percent for K2O and ±0.4 ppm for U and Th. Heat flow is estimated from heat production, which for New England rocks is estimated to be 0.04 W/m2. Heat flow values for standard rocks are typically within ±0.04 weight percent for K2O and ±0.1 ppm for U and Th. Results from standard rocks are typically within ±0.1 ±0.1 weight percent for K2O and ±0.1 ±0.1 ppm for U and Th. These values are determined from heat flow measurements, which are typically within ±0.1 ±0.1 weight percent for K2O and ±0.1 ±0.1 ppm for U and Th.

Sample locations are determined from field sampling by C. Koteas, A. Ryan, N. Goodhue, F. Iwanik, R. Weiss, S. Adams, S. Lyons and J. Schmidt. Model predictions are made using the HeatFlow program, which is available on the Internet. The temperature at any depth \(T_z\) can be estimated using the following equation:

\[ T_z = T_0 + \frac{Q}{K} (z - z_0) - \frac{A}{2} \frac{K}{(z - z_0)^2} \]

The standard errors of \(K\), \(Q\), and \(T_0\) are typically within ±0.4 W/m/°K (~15%), ±0.04 weight percent for K2O and ±0.4 ppm for U and Th. Heat flow values for standard rocks are typically within ±0.04 weight percent for K2O and ±0.1 ppm for U and Th. Results from standard rocks are typically within ±0.1 ±0.1 weight percent for K2O and ±0.1 ±0.1 ppm for U and Th. These values are determined from heat flow measurements, which are typically within ±0.1 ±0.1 weight percent for K2O and ±0.1 ±0.1 ppm for U and Th.