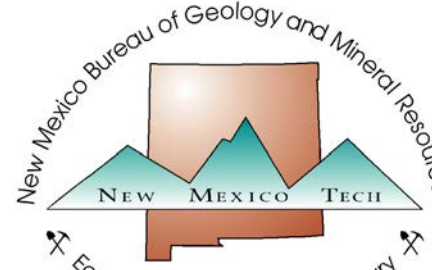


## QUADRANGLE LOCATION

This draft geologic map is preliminary and will undergo revision. It was produced from either scans of hand-drafted originals or from digitally drafted original maps and figures using a wide variety of software, and is currently in cartographic production. It is being distributed in this draft form as part of the bureau's Open-file map series (OFGL), due to high demand for current geologic map data in those areas where STATEMAP quadrangles are located, and it is the bureau's policy to disseminate geologic data to the public as soon as possible.

After this map has undergone scientific peer review, editing, and final cartographic production adhering to bureau map standards, it will be released in our Geologic Map (GM) series. This final version will receive a new GM number and will supercede this preliminary open-file geologic map.

**DRAFT**New Mexico Bureau of Geology and Mineral Resources  
Open-file Geologic Map **20**

Mapping of this quadrangle was funded by a matching-funds grant from the STATEMAP program of the National Cooperative Geologic Mapping Act, administered by the U. S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources. (Dr. Peter A. Scholle, Director and State Geologist; Dr. J. Michael Tabor, Geologic Mapping Program Manager).

New Mexico Bureau of Geology and Mineral Resources  
New Mexico Tech  
801 Leroy Place  
Socorro, New Mexico  
87801-4796  
[505] 835-5490  
<http://geoinfo.nmt.edu>This and other STATEMAP quadrangles are (or soon will be) available  
for free download in both PDF and ArcGIS formats at:<http://geoinfo.nmt.edu/publications/maps/geologic/ofgm/home.html>

May 2007

**Geologic map of the Welty Hill  
quadrangle, Socorro County, New Mexico.**by  
**Ferguson, C. A.<sup>1</sup> and Osburn, G. R.<sup>2</sup>**<sup>1</sup> 119 North Fork Rd., Centennial, WY, 82055  
<sup>2</sup> Campus Box 1169, Washington University, St. Louis, MO, 63130

## DESCRIPTION OF MAP UNITS

**H Human deposits (Holocene)** – Areas of extensive disturbed ground due to human activity, principally earthen dams.**Qv Valley Alluvium (Holocene – Late Pleistocene)** – Valley bottom alluvium including active alluvium and low terraces incised less than 3m.**Qf Alluvial fans (Holocene – Late Pleistocene)** – Discrete fans and coalesced fans overlap and merge locally with valley (**Qv**) and terraced alluvium (**Qtp**).**Qc Colluvium and talus (Holocene – Late Pleistocene)** – Slope colluvium and talus shown in areas of extensive cover or in areas where critical bedrock relationships are concealed.**Qt Terrace surfaces (Holocene – Late Pleistocene)** – The upper, soil-modified surface of alluvial terraces incised more than 3m above active alluvial deposits. Terrace deposits not differentiated from older piedmont alluvium (**Qtp**).**Qtp Piedmont alluvium (Pleistocene – Pliocene)** – Poorly to moderately consolidated sandstone and conglomerate comprising the main mass of piedmont alluvium throughout the map area. In some areas the unit may consist of inset terrace deposits (**Qv**), but most of the unit probably correlates with deeply weathered deposits of the Pliocene-Miocene sandstone and conglomerate unit (**Ts**). Dips locally up to 20 degrees to the west are common.**Ty Sandstone and conglomerate (Pliocene-Miocene)** – Poorly to moderately consolidated sandstone and conglomerate of the Piedmont alluvium unit (**Qtp**) are differentiated locally in areas of good exposure where the unit dips moderately to steeply to the southwest.**Ts Volcaniclastic sedimentary rocks undifferentiated (Miocene-Oligocene)** – Minor areas underlain by strongly consolidated sedimentary rocks whose age is unconstrained with respect to the Turkey Springs, South Canyon, or Vicks Peak Tuff.**Tbt Beartrap Canyon Formation (Miocene)** – Volcaniclastic sandstone, conglomerate with abundant, complexly interleaved, felsic pyroclastic rocks. Medium- to thick-bedded sandstone, pebbly sandstone, and pebble-cobble-boulder conglomerate is locally matrix-supported and/or clast-supported. Some sandstone intervals that display moderate to high-angle, thick-bedded cross-stratified sets suggestive of eolian deposition. Beartrap Canyon Formation is virtually indistinguishable from the Miocene – Oligocene unit of East Red Canyon. The Beartrap contains more non-welded pyroclastic rocks, but the principal difference is that it overlies the Turkey Springs Tuff.**Tru Rhyolite of uncertain age (Miocene-Oligocene)** – Phenocryst-poor rhyolite that either intrudes (making it equivalent to Beartrap rhyolite **Tbr**) or is overlain by the unit of East Red Canyon (making equivalent to the older rhyolite **Tr**).**Tbr Beartrap Canyon Formation, phenocryst-poor rhyolite lava and lava domes (Miocene)** – Rhyolite lava and hypabyssal rhyolite containing less than ~10% phenocrysts of feldspar, biotite, ± quartz.**Tbrx Beartrap Canyon Formation phenocryst-rich rhyolite lava and lava domes (Miocene)** – Rhyolite lava and hypabyssal rhyolite containing greater than ~10% phenocrysts of quartz, feldspar, and biotite.**Tay Younger andesite lava (Miocene)** – Phenocryst-poor, sparsely fine-grained plagioclase and very fine-grained mafic mineral porphyritic andesite lava younger than Turkey Springs Tuff.**Tsu Turkey Springs Tuff, upper non-welded zone (Miocene)** – Non-welded rhyolite ash-flow tuff containing 15-20% quartz-feldspar phenocrysts with biotite. Gradationally overlies the main part of the Turkey Springs in the southeastern part of the map area.**Tts Turkey Springs Tuff (Miocene)** – Welded to non-welded rhyolite ash-flow tuff containing 2-30% quartz-feldspar phenocrysts with biotite. Phenocryst content increases up-section. The tuff is typically light gray to pink. Locally, a relatively thick lower non-welded unit is recognized (**Ttsl**), and in other areas the tuff exists as two distinct flow-units (welded as non-welded) separated by a sedimentary interval (**Ttsu**).**Ttsl Lower Turkey Springs Tuff (Miocene)** – Non-welded, massive rhyolite ash-flow tuff containing 2-5% quartz-feldspar phenocrysts with biotite. Phenocryst content increases up-section.**Ttsu Sedimentary rocks within the Turkey Springs Tuff (Miocene)** – Sandstone and conglomerate with minor non-welded pyroclastic rocks that separate distinct flow-units of the Turkey Springs Tuff.**Tts Turkey Springs Tuff breccia (Miocene)** – Mostly non-welded rhyolite ash-flow tuff with abundant zones of mesobreccia and megabreccia (blocks of rhyolite lava and South Canyon Tuff). Intervals of poorly organized sedimentary breccia, sandstone and conglomerate are also present. The unit may merge down-section into the unit of East Red Canyon in some areas. Unit is confined to an area along the east edge of the map area, north of West Red Canyon.**Tao Older andesite lava (Oligocene)** – Phenocryst-poor, sparsely plagioclase porphyritic andesite lava older than Turkey Springs Tuff.**Ter Unit of East Red Canyon (Miocene – Oligocene)** – Volcaniclastic sandstone, pebbly sandstone, conglomerate with minor felsic pyroclastic rocks. Medium- to thick-bedded sandstone, pebbly sandstone, and pebble-cobble-boulder conglomerate is locally matrix-supported and/or clast-supported. Some sandstone intervals that display moderate to high-angle, thick-bedded cross-stratified sets suggestive of eolian deposition. The unit is virtually indistinguishable from sedimentary dominated portions of the Beartrap Canyon Formation. The unit of East Red Canyon contains lesser amounts of non-welded pyroclastic rocks, but the principal difference is that it underlies the Turkey Springs Tuff. This definition becomes important in the south where the South Canyon Tuff, which underlies the unit of East Red Canyon in its type area, is absent.**Trm Rhyolite (Oligocene)** – Feldspar phenocryst-poor rhyolite that intrudes South Canyon Tuff and is overlain by Turkey Springs Tuff.**Tsc South Canyon Tuff (Oligocene)** – Phenocryst-poor to phenocryst-rich quartz-feldspar-biotite, mostly welded ash-flow tuff. Phenocryst content increases up-section. Most of the South Canyon correlates with informal divisions 1-2 as recognized in northeastern adjacent map areas (Ferguson, 1991, Ferguson and Osburn, 1994). Virtually identical to the Turkey Springs Tuff, it is impossible to determine which unit is which without stratigraphic context or high-precision geochronology.**Tto Non-welded ash-flow tuff (Oligocene)** – A single polygon of non-welded quartz-feldspar moderately phenocryst-rich ash-flow tuff that underlies the South Canyon Tuff (**Tsc**) on the north side of West Red Canyon along the east edge of the map area, possibly non-welded Lemiar Tuff.**Tr Older Rhyolite lavas and lava domes (Oligocene)** – Phenocryst-poor rhyolite lava and lava domes containing feldspar, and sparse mafic (pyroxene, hornblende, biotite) phenocrysts, but no quartz. The lava is complexly interleaved with lesser amounts of non-welded and welded pyroclastic rocks that are locally differentiated (**Ttn**). Unit correlates with the rhyolite of Welty Hill.**Trt Ash-flow tuff associated with older rhyolite lava (Oligocene)** – Phenocryst-poor (2-10%), typically tabular euhedral plagioclase and sanidine-phyric welded to non-welded ash-flow tuff complexly interleaved with the older rhyolite lava and lava dome unit (**Tr**), in some areas (southeast corner), but also present as a discrete flow-unit and locally a pair of flow-units that overlie older rhyolite lavas along Sim Yaten, and West Red Canyon.**Trw Rhyolite of Welty Hill (Oligocene)** – Phenocryst-poor to moderately phenocryst-poor (5-15%) rhyolite lava containing plagioclase, sanidine, and sparse mafic (pyroxene, hornblende, biotite) phenocrysts, but no quartz. The lava is distinguished from the older rhyolite (**Tr**) in that it is more phenocryst-rich, and includes abundant zones of reomorphically flow-foliated welded ash-flow tuff. Only the most obvious ash-flow tuff units are differentiated (**Trwt**). Unit correlates with the older rhyolite (**Tr**).**Trwt Ash-flow tuff associated the rhyolite of Welty Hill (Oligocene)** – Phenocryst-poor (2-10%), typically tabular euhedral plagioclase and sanidine-phyric welded to non-welded ash-flow tuff.**Tpo Granite porphyry (Oligocene)** – Porphyritic medium-grained granitic intrusion in Kelly Canyon, and in the Burnt Peaks area.**Tvp Vicks Peak Tuff (Oligocene)** – Phenocryst-poor (0-15%), euhedral to subhedral tabular (1-5mm) plagioclase-sanidine phenocryst ash-flow tuff with sparse pyroxene and biotite. Typically densely welded, light gray with distinctive, recessively weathering compacted pumice lapilli.

## References

Ferguson, C. A., 1985, Geology of the east-central San Mateo Mountains, Socorro County, New Mexico, New Mexico Bureau of Mines and Mineral Resources Open-file Report 252, 135 pp, 3 sheets, 24,000 scale.

Ferguson, C. A., and Osburn, G. R., 1994, Geologic map of the Mt. Withington 7.5' quadrangle, Socorro County, New Mexico: New Mexico Bureau of Mines and Mineral Resources Open-file Report 403.

Lynch, S. D., 2003, Geologic mapping and Ar/Ar geochronology in the northern Nogal Canyon Caldera, within and adjacent to the southwest corner of the Blue Mountain quadrangle, San Mateo Mountain, New Mexico: unpublished MS thesis, New Mexico Tech, Socorro, 102 pp., 1 sheet, 24,000 scale.

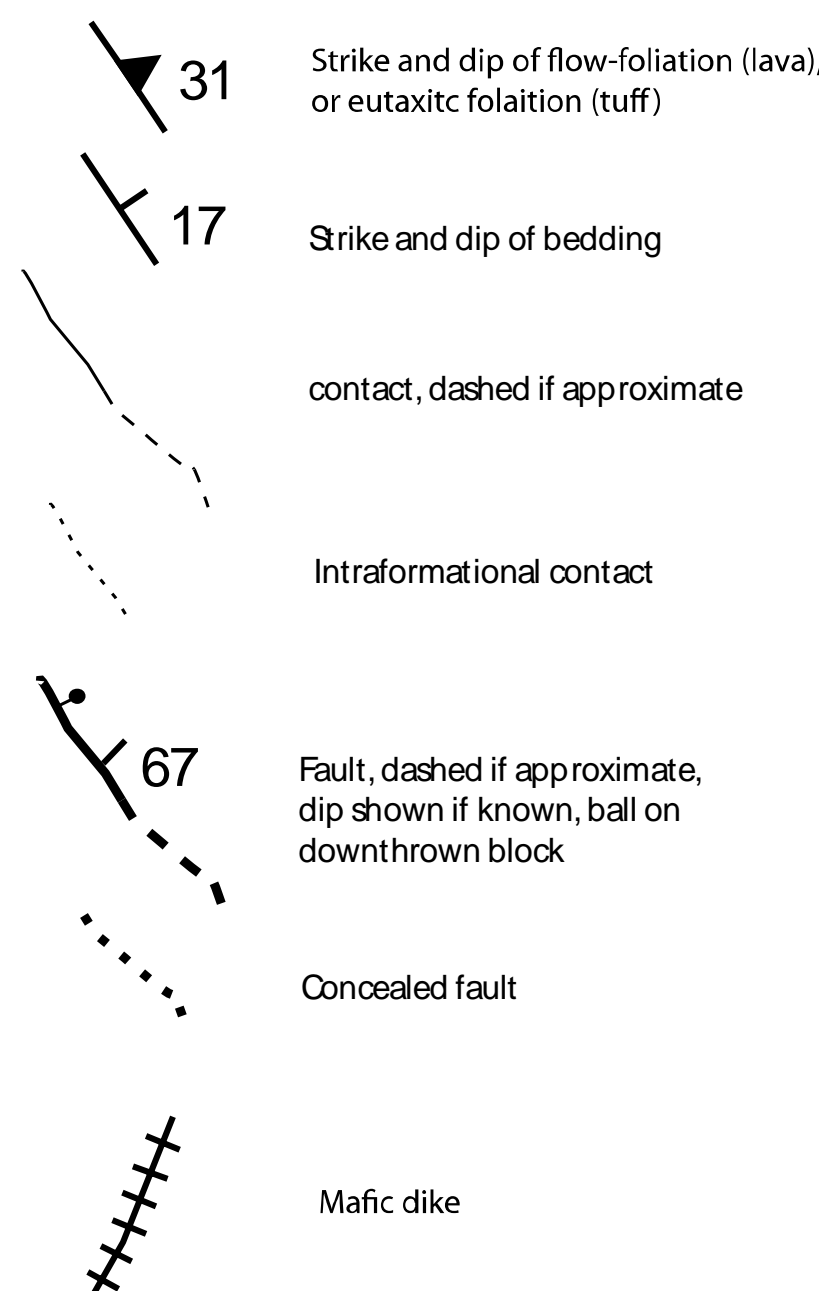
McGraw, D. J., 2003, Quaternary geology of the Welty Hill 7.5' quadrangle: New Mexico Bureau of Geology OF-GM 67-Quartz, one sheet, 24,000 scale.

## Comments to Map Users

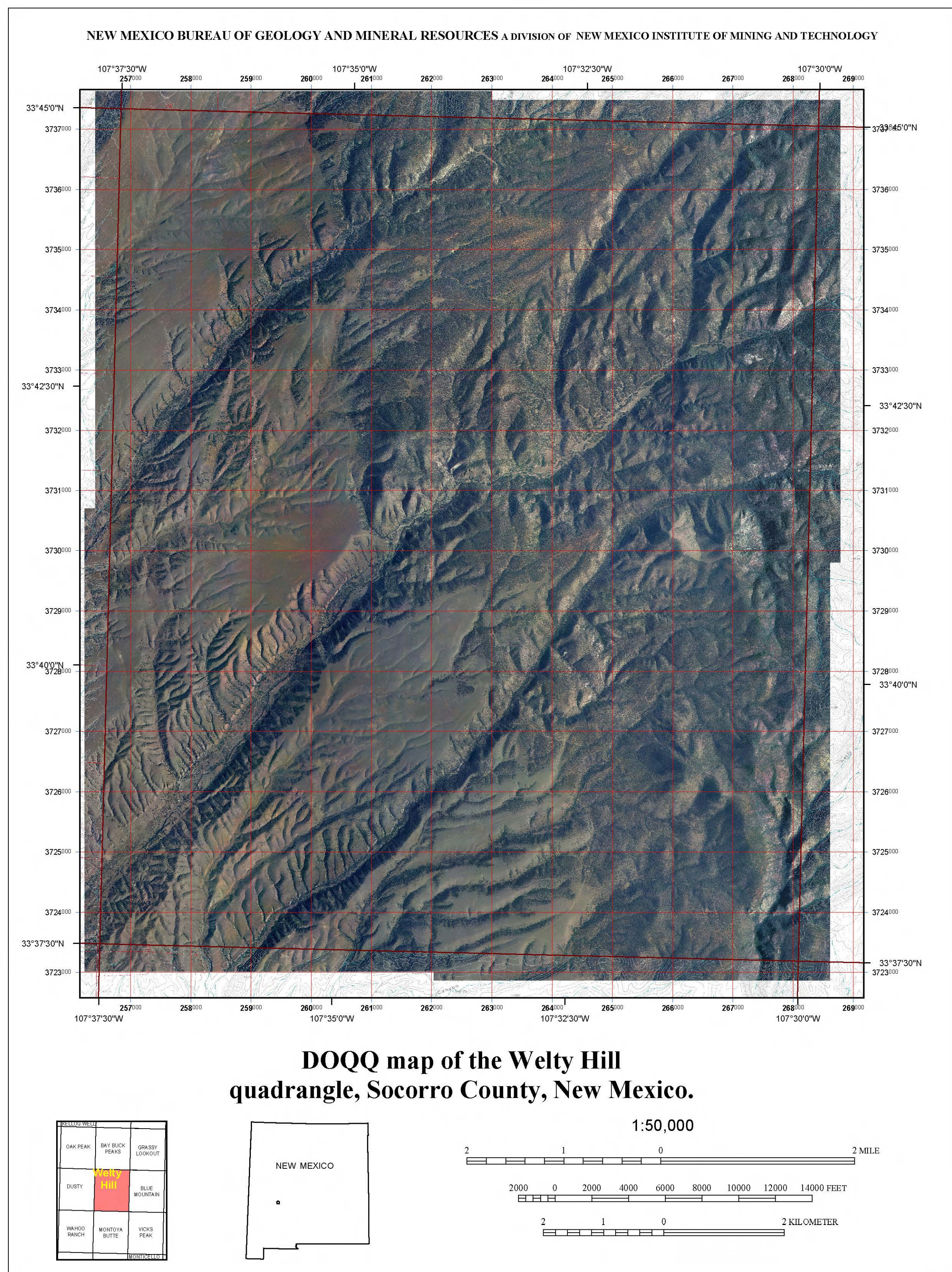
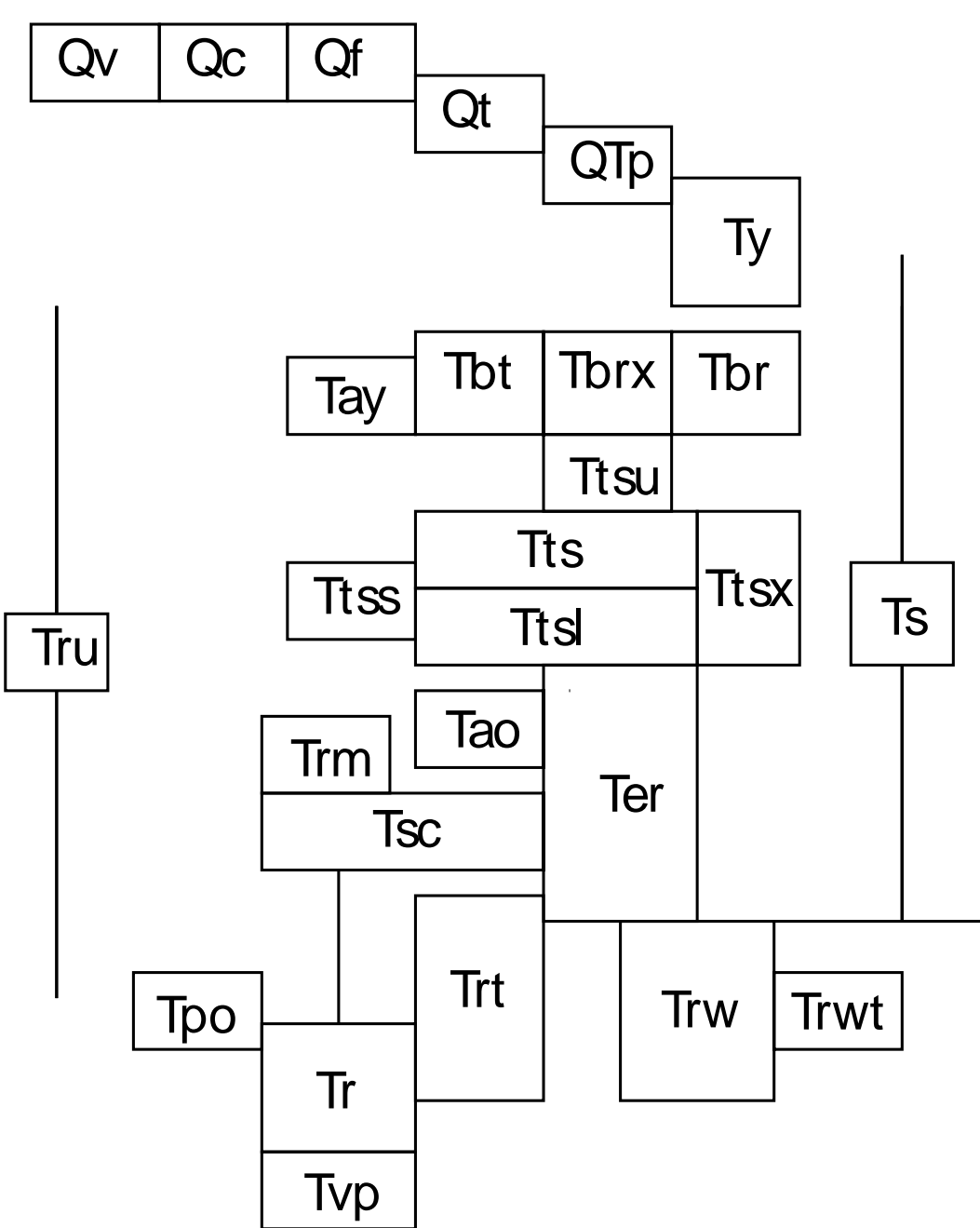
A geologic map displays information on the distribution, nature, orientation, and age relationships of rock and deposits and the occurrence of structural features. Geologic and fault contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic quadrangle map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation. Locations of contacts are not surveyed, but are plotted by interpretation of the position of a given contact onto a topographic base map; therefore, the accuracy of contact locations depends on the scale of mapping and the interpretation of the geologist(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 detailed surface mapping or subsurface exploration. Topographic and cultural changes associated with recent development may not be shown.

Cross sections are constructed based upon the interpretations of the author made from geologic mapping, and available geophysical, and subsurface (drillhole) data. Cross-sections should be used as an aid to understanding the general geologic framework of the map area, and not be the sole source of information for use in locating or designing wells, buildings, roads, or other man-made structures. The map has not been reviewed according to New Mexico Bureau of Geology and Mineral Resources standards. The contents of the report and map should not be considered final and complete until reviewed and published by the New Mexico Bureau of Geology and Mineral Resources. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the State of New Mexico, or the U.S. Government.

## Explanation



## Stratigraphic Correlation Diagram



## Cross-section to accompany geologic map of Welty Hill 7.5' quadrangle

