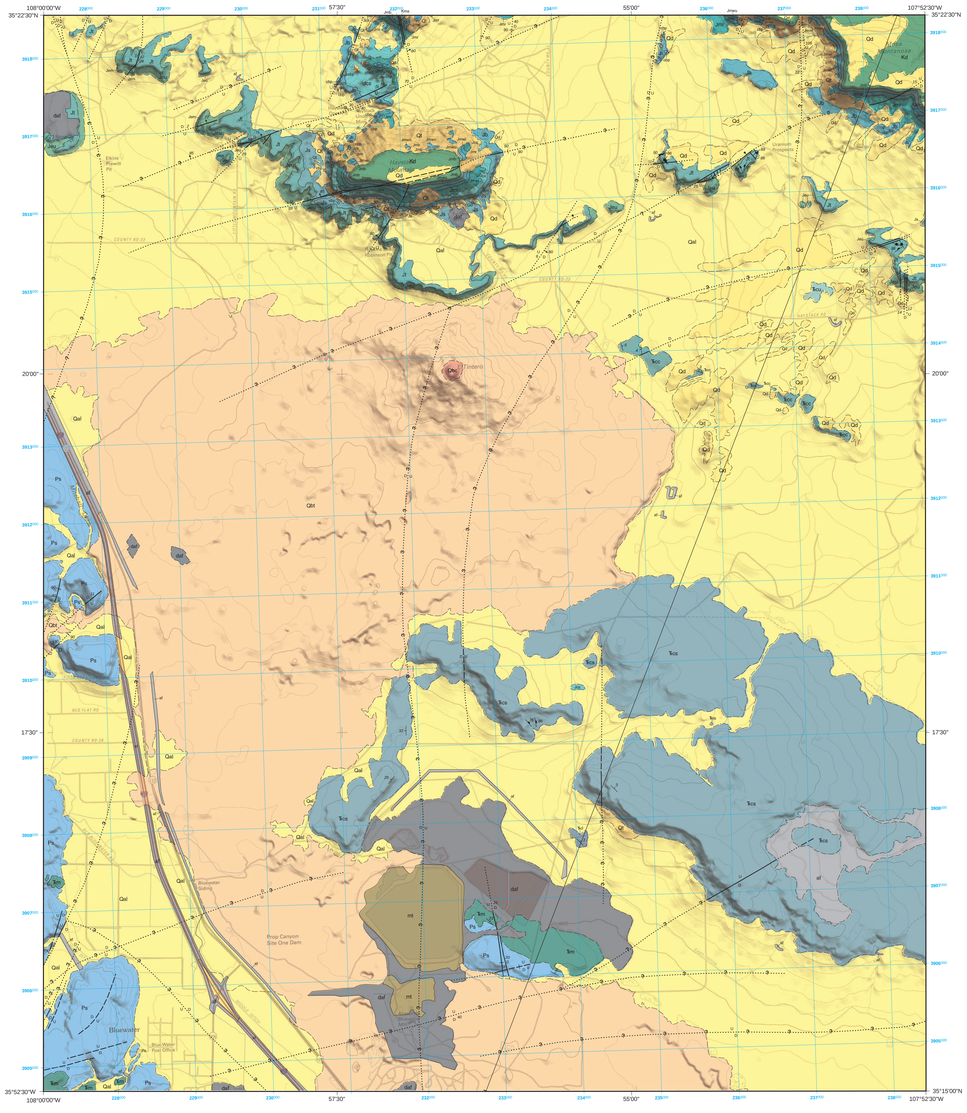

Base map from U.S. Geological Survey 1970, from photographs taken 1965, field checked in 1970, edited in 1993.
1927 North American datum, UTM projection – zone 12N
1000-meter Universal Transverse Mercator grid, zone 13, shown in blue

QUADRANGLE LOCATION

1:24,000

1 0.5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

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This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu

New Mexico Bureau of Geology and Mineral Resources
Open-file Geologic Map 236

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, (L. Greer Price, *Director and State Geologist*, Dr. J. Michael Timmons, *Assoc. Director for Mapping Program*).

Geologic map of the Bluewater quadrangle, McKinley and Cibola Counties, New Mexico

June 2013

by
Geoffrey C. Rawling

New Mexico Bureau of Geology and Mineral Resources, 801 Leroy Place, Socorro, NM 87801

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map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation.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.

Unit Descriptions

Anthropogenic Deposits

af — Artificial fill for roads and cattle tanks

daf — Artificial fill and/or disturbed land

mt — Mounds of reclaimed mine tailings

Pleistocene and Holocene

Qt — Talus and landslide blocks

Qal — Alluvial deposits, undivided

Qd — Eolian sand in small dunes and sheets

El Tintero cinder cone—Source of the Bluewater flow.

Qbc — **Basalt flows from El Tintero**—Data from drill holes indicate at least 5 separate flows aggregating 122 feet (37 m) in thickness are present in the southwestern part of the quadrangle.

Qbt

MESOZOIC ERATHEM

Upper Cretaceous Rocks

Lower part of the Mancos shale—Gray sandy shale. Top eroded; about 20 feet (6m) remaining.

Kma

Dakota Sandstone—Pale yellowish-brown, moderate-orange, and light gray fine- and medium-grained sandstone; interbedded lenticular dark-gray shale and coal beds near base. 50 to 100 feet (15 to 30 m) thick.

Kd

Jurassic Rocks

cbp — **Collapse/breccia pipes (Jurassic?)**

Morrison Formation

Jmb — **Brushy Basin Member of Morrison Formation**—Grayish-green mudstone with minor lenticular light- and yellowish-gray fine- and medium-grained sandstone. 45 to 100 feet (13 to 30 m) thick.

Jmw — **Westwater Canyon Member of Morrison Formation**—Light-, yellowish-, and reddish-gray fine and medium-grained sandstone. Minor light greenish-gray lenticular mudstone. 125 to 185 feet (38 to 56 m) thick.

Jmwu — **Westwater Canyon Member, upper part (Poison Canyon sandstone of economic usage)**—As much as 80 feet (24 m) thick, separated from lower part **(Jmwl)** by mudstone tongues and lenses as much as 25 feet (7 m) thick, which have the same characteristics as the Brushy Basin Member **(Jmb)**. Mudstone mapped with upper part.

Jmwl — **Westwater Canyon Member, lower part**—As much as 115 feet (35 m) thick.

Jmr — **Recapture Member of the Morrison Formation**—Interbedded variegated claystone, pale-green, brown, red, and purple siltstone, and white, pale yellow, green, and brown sandstone. 125 to 245 feet (38 to 74 m) thick. Lower part deposited against wedge of Cow Springs Sandstone **(Jcs)**.

Jcs — **Cow Springs Sandstone**—Moderate orange-brown and pale-pinkish-brown fine-grained cross-bedded eolian sandstone. Wedges out to east in north-central part of quadrangle. 0 to 150 feet (0 to 45 m) thick.

Jb — **Bluff Sandstone**—White and pale-orange, fine-grained cross-bedded sandstone. 110 to 125 feet (33 to 38 m) thick.

Js — **Summerville Formation**—Interbedded variegated mudstone, siltstone, and fine- to very fine-grained sandstone. About 175 feet (53 m) thick.

Jt — **Todilto Limestone**—Pale-olive-gray, dark olive-brown, and pale yellow limestone, thick-bedded, mostly recrystallized in top part, crinkly-bedded in middle part, and platy-bedded at base. 25 to 35 feet (7 to 10 m) thick.

Entrada Sandstone

Jeu — **Entrada Sandstone, upper sandy member**—Moderate brown fine-grained cross-bedded sandstone. 135 – 140 feet (41 to 42 m) thick.

Jem — **Entrada Sandstone, medial silty member**—Grayish red-brown calcareous siltstone. 45 to 50 feet (13 to 15 m) thick.

Triassic Rocks

Trw — **Wingate Sandstone**—Moderate brown to moderate reddish-orange medium-grained crossbedded sandstone. Base not exposed. About 120 feet (36 m) thick.

Chinle Formation

Trcu — **Upper Member**—Dark purplish-red and pale bluish-gray limy siltstone interbedded with olive-gray to dark greenish-gray silty limestone in upper 180 feet (54 m). Reddish-brown even-bedded siltstone in lower 150 feet (45 m).

Trcc — **Correo Sandstone Member**—Pale grayish-red fine-grained cross-bedded arkosic sandstone and minor interbedded gray to pale brown pebble conglomerate. About 75 feet (22 m) thick.

Trcm — **Middle Member**—Reddish-brown even-bedded siltstone. About 400 feet (121 m) thick.

Trcs — **Sonsela Sandstone Bed of Petrified Forest Member**—White, pale yellowish-brown, yellow, and brown conglomeratic sandstone interbedded with white, blue, purple and brown claystone. 290 feet (88 m) thick.

Trcl — **Sonsela Sandstone Bed of Petrified Forest Member, lower Member**—Variegated clayey and sandy siltstone interbedded with lenticular white, yellow, purple, and brown cross-bedded conglomeratic sandstone. About 300 feet (91 m) thick.

Trm — **Moenkopi Formation**—Pale reddish-brown and grayish-red arkosic and micaceous sandstone interbedded with lenticular pebble conglomerate and layers of mudstone galls. Cross-bedded near top, horizontally-bedded near base. About 26 feet (8 m) thick.

PALEOZOIC ERATHEM

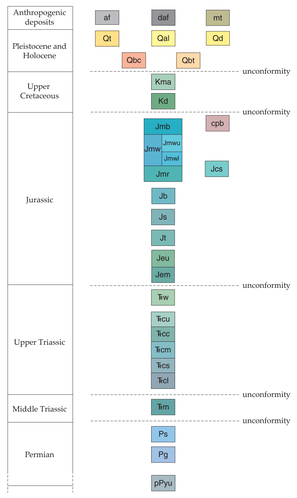
Permian Rocks

Ps — **San Andres Limestone**—Grayish-yellow and brown to red dense limestone interbedded with yellow fine-to medium-grained, cross-bedded to structureless sandstone in upper part, 80 feet (24 m) thick. Yellow sandstone similar to that above in middle part, 15 feet (4.5 m) thick. Dense, gray limestone with streaks and zones of coarse-grained calcite in lower part, 20 feet (6 m) thick. Upper surface is karst. Total thickness 115 feet (35 m).

Pg — **Glorieta Sandstone**—Cross-section only.

pPyu — **Yeso Formation and older rocks**—Cross-section only.

Correlation Diagram



Map Symbols

Geologic contact, solid where exposed, dashed where approximately located.

U / D — Fault, solid where certain, dashed where approximately located, dotted where buried, queried where location or termination is uncertain. U and D indicate sense of throw. Number indicates vertical separation in feet.

20 — Strike and dip of bedding

Strike and dip of joints

Strike of vertical joints

70 — Strike and dip of fault plane

A A' — Location of geologic cross section

FIGURE 1— Regional view of USGS and StateMap mapping projects for the Mount Taylor area, northwest New Mexico. Bluewater quadrangle highlighted in red.

Explanation of Symbols

Active Mines & Mills

National Priority List Superfund Site

Other Superfund Sites Related to Mining/Industry

Active and Requested Mine Permits

Uranium Deposits

Sandstone host rock

Limestone host rock

Geologic Mapping Index

USGS Mapping

Completed STATEMap Mapping

Bluewater quadrangle