DIGITAL MAPPING TECHNIQUES 2024

The following was presented at DMT '24
May 13 - 16, 2024

The contents of this document are provisional

See Presentations and Proceedings
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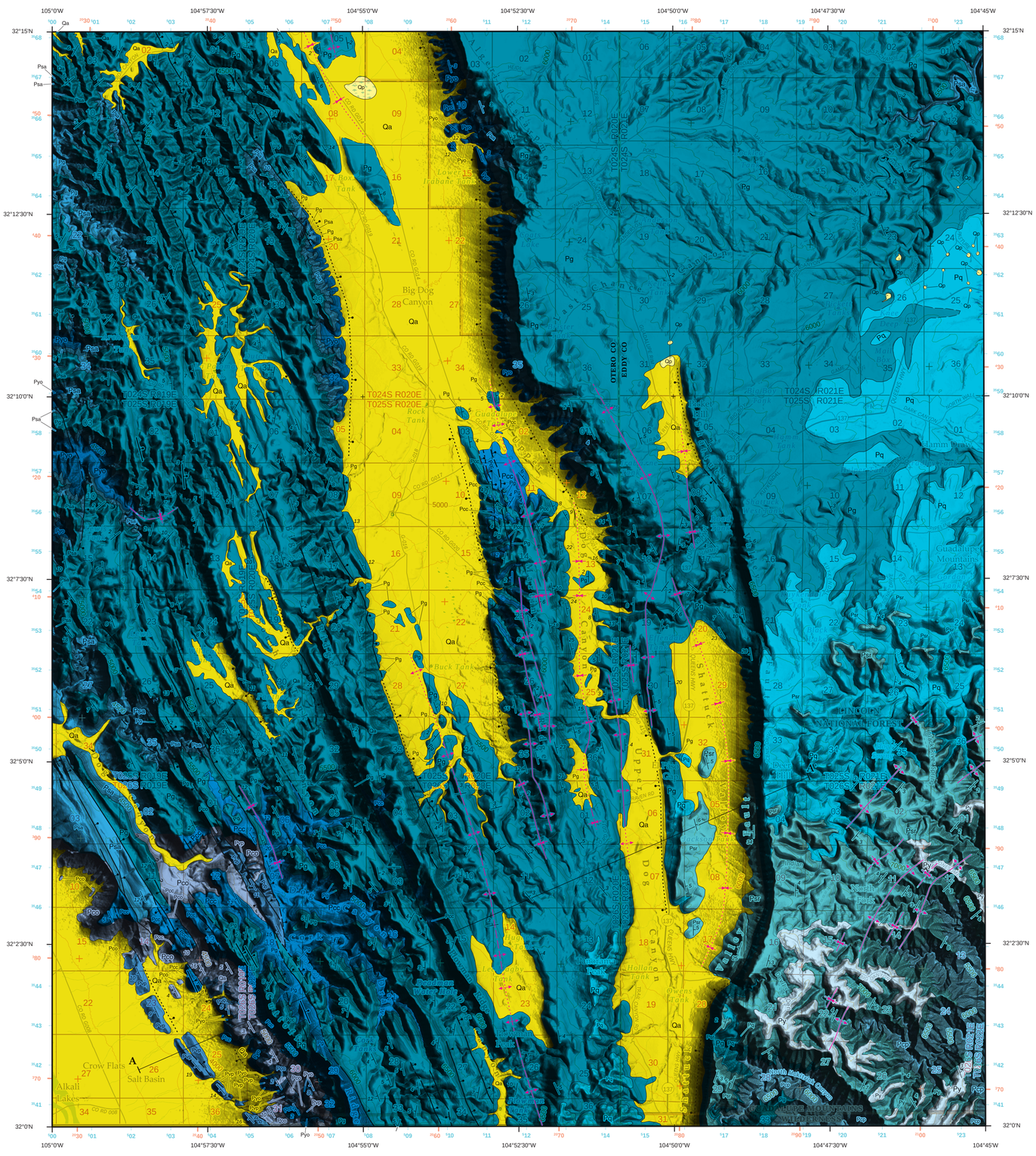
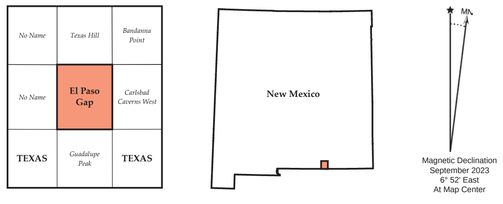
http://ngmdb.usgs.gov/info/dmt/



Base map from U.S. Geological Survey 2020.
North American Datum of 1983 (NAD83)
Projection and 1,000-meter grid: Universal Transverse Mercator, Zone 13S, shown in blue.
10,000-foot ticks: New Mexico Coordinate System of 1983 (Central Zone), shown in red.
Roads.....U.S. Census Bureau, 2015–2016
Names.....GNIS, 2016
Hydrography.....National Hydrography Dataset, 2014
Contours.....IFSAR 4.5 m Digital Terrain Model, 2007
Wetlands.....FWS National Wetlands Inventory 1977–2014
Public Land Survey System.....BLM, 2019

1:62,500

2 1 0 2 Mile
2000 0 2000 4000 6000 8000 10000 12000 14000 Feet
2 1 0 2 Kilometer
Contour Interval 100 Feet
North American Vertical Datum of 1988



Quadrangle Location

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

87801-4796

[575] 835-5490

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

http://geoinfo.nmt.edu

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Digital layout and cartography by the NMBGMR Map Production Group:
Phil L. Miller, Amy L. Dunn, Ann D. Knight, Tyler Askin, and Hannah N. Hunt

New Mexico Bureau of Geology and Mineral Resources
Open-File Geologic Map 315

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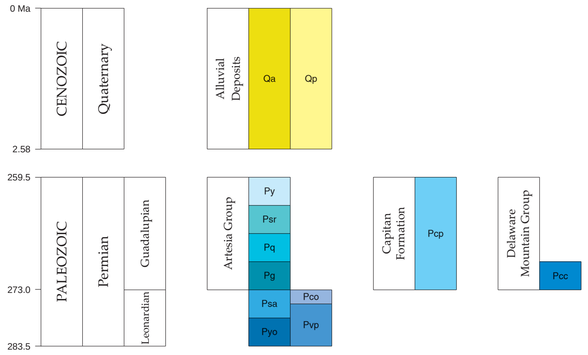
Geologic Map of the El Paso Gap 15-Minute Quadrangle, Eddy and Otero Counties, New Mexico, and Culberson and Hudspeth Counties, Texas

September 2024

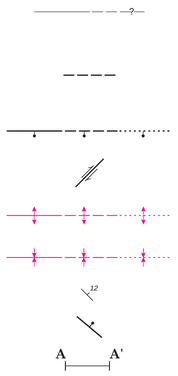
by
Steven J. Skotnicki

281 West Amoroso Drive, Gilbert, Arizona 85233

Correlation of Map Units



Explanation of Map Symbols



Contact—The identity and existence are certain, and questionable where queried. The location is accurate where solid, approximate where dashed, and concealed where dotted.

Fault (generic; vertical, subvertical, or high-angle; unknown or unspecified orientation or sense of slip)—The identity and existence are certain. The location is approximate.

Normal fault—The identity and existence are certain. The location is accurate where solid, approximate where dashed, and concealed where dotted. Bar and ball are on the downthrown block.

Fault in cross section showing local up/down offset—The arrows show the relative motion along the fault plane.

Anticline—The identity and existence are certain. The location is accurate where solid, approximate where dashed, and concealed where dotted.

Syncline—The identity and existence are certain. The location is accurate where solid, approximate where dashed, and concealed where dotted.

Inclined bedding—Showing strike and dip.

Minor fault showing local normal offset—Ball and bar on downthrown block.

Cross section line and label.

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, a 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 may not be shown due to recent development.

Cross sections are constructed based upon the interpretations of the author made from geologic mapping and available geophysical and subsurface (drill hole) 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 human-made structures.

The New Mexico Bureau of Geology and Mineral Resources created the Open-File Geologic Map Series to expedite the dissemination of these geologic maps and map data to the public as rapidly as possible while allowing for map revision as geologists continued to work in map areas. Each map sheet carries the original date of publication below the map and the latest revision date in the upper right corner. In most cases, the original publication date coincides with the date of delivery of the map product to the National Cooperative Geologic Mapping Program (NCGMP) as part of New Mexico's STATEMAP agreement. While maps are produced, maintained, and updated in an ArcGIS geodatabase, at the time of the STATEMAP deliverable, each map goes through cartographic production and internal review before uploading to the Internet. Even if additional updates are carried out on the ArcGIS map data files, citations to these maps should reflect this original publication date and the original authors listed. The views and conclusions contained in these map documents 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.

Description of Map Units

CENOZOIC ERATHEM

Quaternary System

Qp **Playa deposits (Holocene and Pleistocene)**—Silt, fine-grained sand, and some clay. Forms flat, featureless deposits that fill sinkholes in the northwestern portion of the map, and one larger playa in the low valley near the north-central portion of the map. Mostly devoid of vegetation though the borders of the deposits filling the sinkholes are bordered by piñon and juniper. The thickness of these deposits is unknown.

Qa **Alluvial deposits (Holocene and Pleistocene)**—As mapped, these deposits are composed of weakly to strongly indurated sand and gravel in a silty to sandy carbonaceous matrix. The older deposits form terraces typically between 1–3 m above the active channel deposits and are lighter gray in color than younger deposits because erosion has exposed more of the carbonate pedogenic cements. The younger deposits typically exhibit well-developed silty soil that supports abundant vegetation, particularly grasses and creosote. Estimated thickness of deposits are up to 5 m.

PALEOZOIC ERATHEM

Permian System

Guadalupian Series

Artesia Group

Py **Yates Formation (Permian, Guadalupian)**—Interbedded dolomite and siltstone/fine-grained sandstone. Characteristically contains many interbeds of dark-yellow-weathering siltstone and fine-grained sandstone that tend to form vegetated slopes. Dolomite is typically light-gray, massive and fenestrated, and commonly weathers a darker tan. In the southeast portion of the map, particularly closer to the Capitan Formation, the dolomite beds locally contain abundant beds of pisoids (or pisoliths) interbedded with wavy-laminated dolomite. No teepee structures were obvious within the map area. The Yates Formation was recognized only in the far southeast portion of the map. The top has been eroded. Exposed thickness is ≈30 m.

Psr **Seven Rivers Formation (Permian, Guadalupian)**—Thick-bedded, gray dolomite occurs in rather massive beds between 1–3 m thick, separated by thin partings. From a distance, the formation contains very few siltstone/fine-grained sandstone beds up to tens of centimeters thick, mostly in the lower portion of the exposed outcrops. Forms cliffs and steep ledgy slopes. The best exposures are along the steep cliffs in the southeastern potion of the map. Elsewhere, the unit is mostly covered with vegetation and forms slopes covered with soil and debris. The contact with the underlying Queen Formation is drawn above a thick interval of sandstone within the Queen Formation. Thickness of the formation is up to 180 m.

Pq **Queen Formation (Permian, Guadalupian)**—Quartz siltstone and fine-grained quartz sandstone. Grains are subangular to subrounded. Typically contains very planar, thin to thick beds that commonly erode recessively and form slopes. Locally contains very minor thin beds of light-gray dolomite approximately 10–30 cm thick, that typically form small resistant ledges. The uppermost 20 m or so contains several thin to thick interbedded light–gray dolomite layers up to several meters thick. The unit commonly forms deep-rusty-orange soils. As mapped west of Upper Dog Canyon, the unit appears to contain siltier dolomite near the south side of the map. Formation thickness is up to 105 m.

Pg **Grayburg Formation (Permian, Guadalupian)**—Light-gray to very pale-yellowish-gray, laminated, fine-grained dolomite, interbedded with pale-orange siltstone and very fine-grained sandstone. Most beds are massive to weakly laminated and locally fenestrate. As mapped, this unit forms a thick sequence of layers that comprises most of the Paleozoic outcrops in the map. The unit is typically slightly light-gray and forms smoother, more gently sloping hills than does the underlying San Andres Formation. Commonly distinguished from the overlying Queen Formation by its lighter-gray color and steeper slopes and cliffs. Formation thickness is between 100 and 150 m.

Capitan Formation

Pcp **Capitan Formation (Permian, Guadalupian)**—Massive limestone, dolomite, and limestone/dolomite breccia. From a distance, the top of this unit exhibits a weakly developed inclined layering that dips southeastward between ≈15 and 30°. This layering is more pronounced up-section where it merges with the bedding in the lower part of the Seven Rivers Formation. Because of this, the contact as drawn, is dashed and is somewhat arbitrary. In outcrop, most exposures appear massive and structureless. A faint brecciated texture is visible locally where angular clasts of all sizes are strongly cemented by different generations of carbonate. Coarse-grained, light-yellow sparite commonly fills dissolution fissures and cracks. Fossils of sponge and brachiopod fragments are locally visible. Forms steep slopes and imposing cliffs. This unit represents the Capitan Reef itself and the fragmented debris shed from the ancient reef into the Delaware Basin. Typically forms very steep slopes and cliffs. Thickness up to 400 m.

Delaware Mountain Group

Pcc **Cherry Canyon Tongue (Permian, Guadalupian)**—Mostly thin- to medium-bedded, light-orange, quartz siltstone and fine-grained sandstone, interbedded with less abundant layers of typically medium- to thick-bedded, gray dolomite. From a distance, the sandstone and dolomite layers commonly appear very similar in color, but can be distinguished fairly easily up close. The unit typically forms slopes that are mostly covered with debris and are poorly exposed. In the southwest corner of the map, along the western escarpment, the unit forms imposing cliffs and steep slopes up to 200 m thick. In the center of the map ,approximately 60 m of the unit is sandwiched between thicker layers of dolomite of the Grayburg Formation.

Leonardian Series

Psa **San Andres Formation (Permian, Leonardian)**—Planar-bedded dolomite mostly in beds between 10–30 cm thick with minor, thicker beds up to 1–2 m thick. All beds are massive and show no internal layering and rare laminae. The medium-gray color is similar on both fresh and weathered surfaces. Rocks emit a fetid odor when broken. With a hand lens, the rock is very fine-grained micrite. Where exposed, lower portions of the unit contain light-gray chert that weathers rusty-orange. No visible fossils in the rocks. Locally, the unit contains abundant cavernous pores 1–10 cm in diameter, lined by rims of botryoidal calcite that give outcrops a very porous appearance. Shallow caves are also abundant on some cliff exposures. Thickness varies from approximately 140 m in the southwest to 170 m in the north-central area of the map.

Pco **Cuttoff Formation (Permian, Leonardian)**—Medium-gray, thin- to medium-bedded limestone. Featureless and massive micrite. Fresh surfaces are very dark-gray and exhibit a fetid odor; weathered surfaces are typically much lighter gray in color. The lower third contains abundant black chert. The uppermost 30 m is light gray dolomite. This unit mostly forms slopes along the western escarpment in the southwestern corner of the map. Bedding is best seen from a distance. Erodes into platy fragments up to ≈20 cm across. Formation thickness is up to 90 m.

Pvp **Victorio Peak Formation (Permian, Leonardian)**—Thick-bedded limestone (effervesces strongly with hydrochloric acid). Contains abundant fossil debris, particularly crinoid-stem plates and shell fragments. Brachiopod moulds (both productid and spirifer) are locally as large as 6 cm across. Beds are massive and show almost no internal layering. Many beds do not contain chert. In those beds that do, it is abundant, light-gray, and forms small irregularly shaped nodules that weather rusty-orange. This unit forms a steep resistant cliff along the western escarpment in the southwest corner of the map. Formation thickness is approximately 85 m.

Pyo **Yeso Formation (Permian, Leonardian)**—Light-gray to dark-gray, medium-bedded dolomite exhibiting a sucrosic, microcrystalline texture. No visible fossils and rare chert. Everywhere, the unit forms slopes and is poorly exposed. Layering can be discerned easily from a distance but becomes more cryptic and indistinct up close. The best exposures are in the north, at the base of the Algerita Escarpment. Although Kerans and others (1993) described the Yeso and the Victorio Peak Formations as partly coeval, within the map area the Yeso is below the Victorio Peak. Only a portion of the unit is exposed. In the southwest the visible thickness is 105 m. Along the Algerita Escarpment, the formation thickness is up to 170 m.

U **Unmapped**—Cross section only. Deeper regions in the subsurface where no confidence exists for placing contacts or unit names.

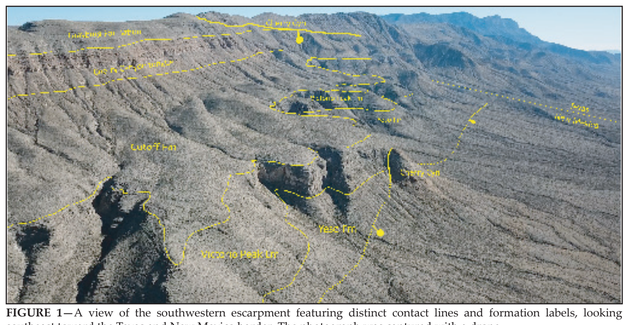


FIGURE 1—A view of the southwestern escarpment featuring distinct contact lines and formation labels, looking southeast toward the Texas and New Mexico border. The photograph was captured with a drone.

Geologic Cross Section A–A'
No vertical exaggeration