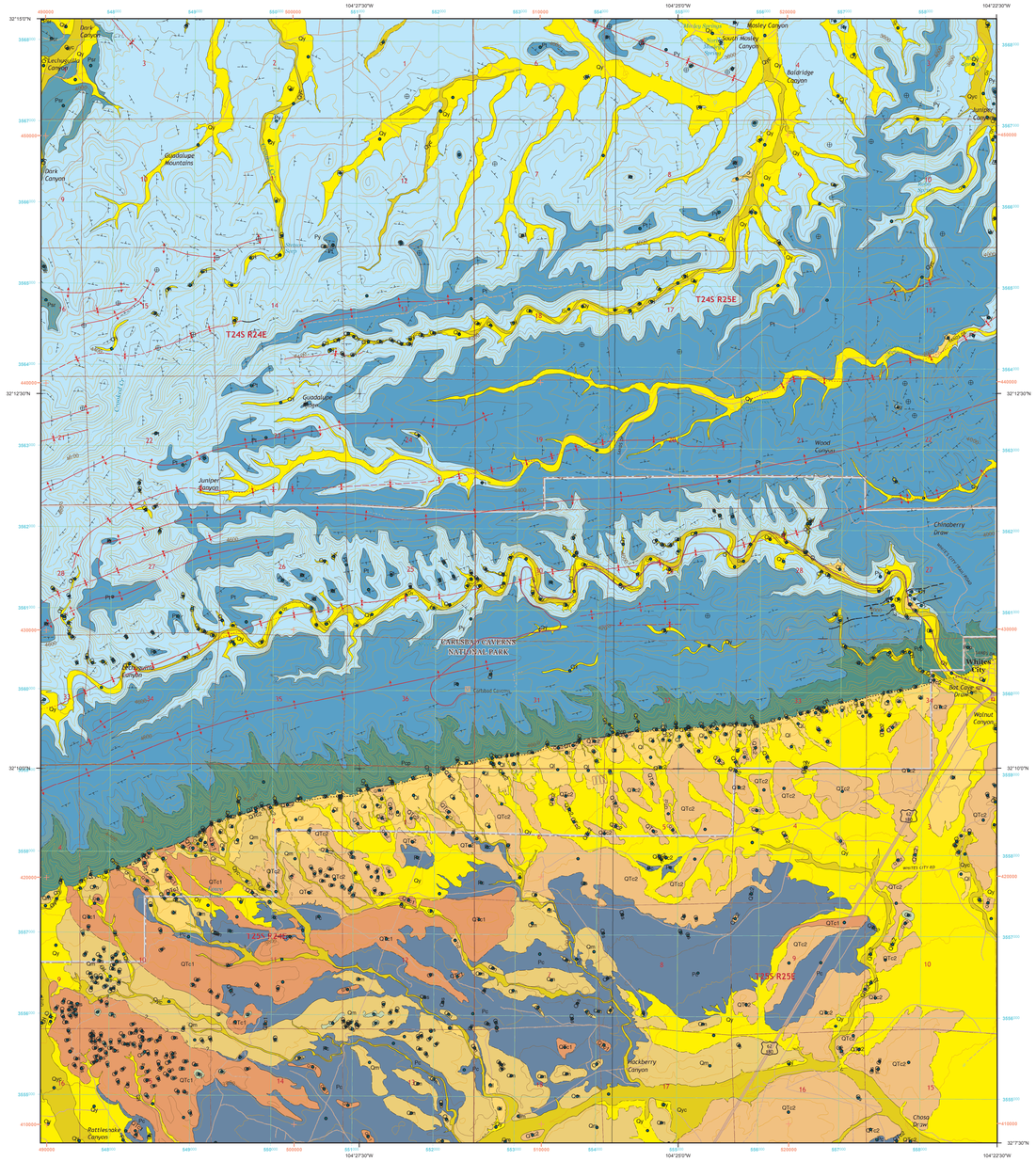
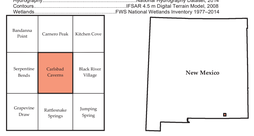


Base map from U.S. Geological Survey 2017.
North American Datum of 1983 (NAD83)
Projection and 1,000-meter grid: Universal Transverse Mercator, Zone 13S, shown in blue.
10,000-foot ticks: New Mexico Coordinate System of 1983(east zone), shown in red.

Roads ..... U.S. Census Bureau, 2015–2016
Names ..... GNIS, 2016
Hydrography ..... National Hydrography Dataset, 2014
Contours ..... IFSAR 4.5 m Digital Terrain Model, 2008
Wetlands ..... FWS National Wetlands Inventory 1977–2014



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 40 Feet
North American Vertical Datum of 1988

Magnetic Declination
July, 2011
7° 12' East
At Map Center

New Mexico Bureau of Geology and Mineral Resources
Open-File Geologic Map 285

Mapping of this quadrangle was funded by a matching-funds grant from the STATEMAP program of the National Cooperative Geologic Mapping Act (Fund Number: G19AC00226), administered by the U. S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources, (Dr. Nelia W. Dunbar, *Director and State Geologist*; Dr. J. Michael Timmons, *Assoc. Director for Mapping Programs*).

Geologic Map of the Carlsbad Caverns 7.5-Minute Quadrangle, Eddy County, New Mexico

December 2021

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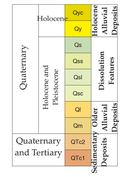
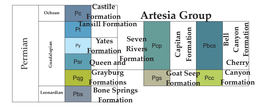
This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu

Digital layout and cartography by the NMBGMR Map Production Group:
Phil L. Miller and Amy L. Dunn

Correlation of Map Units





Explanation of Map Symbols

31.08 Map boundary

1.1.1 Contact—Identity and existence certain, location

1.3.3 Contact—Identity and existence certain, location

1.1.4 Contact—Identity or existence questionable, location

2.1.1 Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence certain, location accurate

2.1.3 Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence certain, location approximate

2.1.7 Fault (generic; vertical, subvertical, or high-angle; or unknown or unspecified orientation or sense of slip)—Identity and existence certain, location concealed

2.2.1 Normal fault—Identity and existence certain, location

2.2.3 Normal fault—Identity and existence certain, location

5.1.1 Anticline (1st option)—Identity and existence certain, location

5.1.3 Anticline (1st option)—Identity and existence certain, location approximate

5.1.7 Anticline (1st option)—Identity and existence certain, location

5.2.7 Antiform (1st option)—Identity and existence certain, location

5.5.1 Syncline (1st option)—Identity and existence certain, location

5.5.3 Syncline (1st option)—Identity and existence certain, location approximate

5.5.7 Syncline (1st option)—Identity and existence certain, location

6.1 Horizontal

6.2 Inclined bedding

6.40 Gently inclined (between 0° and 30°) bedding, as determined remotely or from aerial photographs

31.10 Cross section

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 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 (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 New Mexico Bureau of Geology and Mineral Resources created the Open-file Geologic Map Series to expedite 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 as well as the latest revision date in the upper right corner. In most cases, the original date of publication coincides with the date of the map product delivered 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 prior to 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

Description of Map Units

00-00-00-00-00—Heading02—Quaternary—Quaternary—Quaternary

00-01-00-00-00—Heading03—Holocene—Holocene—Holocene

00-01-01-00-00—Heading04—Holocene Sedimentary Deposits—Holocene Sedimentary Deposits—Holocene Sedimentary Deposits

00-01-01-01-00—unit—Qyc—Active channel deposits—Predominantly unconsolidated sand and gravel dominated by clasts of carbonate surrounded by a silty to sandy carbonaceous matrix. Mostly devoid of vegetation though some low terraces typically less than 1 m above the active channel contain weak soil horizons and thicker vegetation. Thickness unknown but probably less than several meters.

00-01-01-02-00—unit—Qy—Older Holocene sedimentary deposits—These deposits are composed of weakly to strongly indurated sand and gravel in a silty to sandy carbonaceous matrix. They form terraces typically between 1-3 meters above the active channel deposits. Most terraces have well developed silty soil that supports abundant vegetation, particularly grasses. Estimated thickness up to 5 meters.

00-02-00-00-00—Heading03—Holocene and Pleistocene—Holocene and Pleistocene—Holocene and Pleistocene

00-02-01-00-00—Heading04—Dissolution Features—Dissolution Features—Dissolution Features

00-02-01-01-00—unit—Qs—Sinkholes—Most of these features form shallow depressions filled with fine-grained silt and clay that supports the growth of grasses and other vegetation. Most of these features are sub-circular are range from several meters across to tens of meters across. The majority of these features occur in the older sedimentary deposits (QTc1 and QTc2) that overlie the anyhydrite of the Castile Formation (Pc) where they probably represent the surface expression of collapsed dissolved caverns that have filled with sediment.

00-02-01-02-00—unit—Qss—Disappearing streams—These features are near-vertical caverns in the anhydrite of the Castile Formation (Pc) into which local streams drain and disappear without apparent external drainage locations.

00-02-01-03-00—unit—Qsl—Externally drained collapse features—These few features are larger than unit Qs. They are circular in shape and form depressions that have been breached by external drainage. These features are typically much deeper than the smaller sinkhole depressions of Qs and are found in the southeast corner of the map within unit QTc2 and in the northern portion of the map within dolomite.

00-02-01-04-00—unit—Qsc—Cave—Only one feature contains this map label—the opening to Carlsbad Caverns. It was given its own map label because of its size and significance.

00-02-02-00-00—Heading04—Older Alluvial Deposits—Older Alluvial Deposits—Older Alluvial Deposits

00-02-02-01-00—unit—Ql—Late Pleistocene sedimentary deposits—Contains poorly sorted, angular to subrounded material from boulders to sand and silt composed dominantly of dolomite locally derived from the nearby bedrock and strongly cemented by carbonate. This unit forms small terrace remnants between the younger Holocene deposits (Qy) and older alluvial deposits (Qm).

00-02-02-02-00—unit—Qm—Middle Pleistocene sedimentary deposits—Contains poorly sorted, angular to subrounded material from boulders to sand and silt composed dominantly of carbonate and is strongly cemented by carbonate. North of the reef front (unit Pcp) the unit is mapped as small remnants of alluvial that mantle steep slopes. South of the reef front the unit forms irregularly shaped mesas that are lower in elevation than QTc1 or QTc2, suggesting they are younger than the later two units.

01-00-00-00-00—Heading02—Quaternary or Tertiary—Quaternary or Tertiary—Quaternary or Tertiary

01-01-00-00-00—Heading03—Sedimentary Deposits—Quaternary or Tertiary Sedimentary Deposits—Quaternary or Tertiary Sedimentary Deposits

01-01-01-00-00—unit—QTc2—Quaternary or Tertiary sedimentary deposits, younger unit—Composed of poorly sorted, subrounded to rounded clasts of carbonate from silt and sand size to large cobbles. Exposures are poor except where exposed in stream cuts. Top surfaces are commonly mantled with fine-grained eolian deposits a few cm thick. Slopes are mantled with regolith. Stream-cut exposures are strongly cemented by carbonate. This younger unit is slightly lower in the landscape than QTc1 and tends to form mostly rather flat constructional surfaces and rounded ridges.

01-01-02-00-00—unit—QTc1—Quaternary or Tertiary sedimentary deposits, older unit—Composed of poorly sorted, subrounded to rounded clasts of carbonate from silt and sand size to large cobbles. Exposures are poor except where exposed in stream cuts. Top surfaces are commonly mantled with fine-grained eolian deposits a few cm thick. Slopes are mantled with regolith. Stream-cut exposures are strongly cemented by carbonate. This older unit is slightly higher in the landscape than QTc2 and forms rounded ridges and locally rather flat constructional surfaces.

02-00-00-00-00—Heading02—Permian—Permian—Permian

02-01-00-00-00—Heading03—Ochoan—Ochoan—Ochoan

02-01-01-01-00—Heading04—Castile Formation—Castile Formation—Castile Formation

02-01-01-01-01—unit—Pc—Castile Formation—Composed of alternating regular laminae and thin beds of dark-colored and light-colored anhydrite. Layering is mostly contorted and is rarely consistent for more than a few meters. Both stream-cut exposures and upper surface exposures show abundant brittle deformation cracks, many of which on the surface are filled with fine sediment. As mapped, many areas underlain by anhydrite are extensively mantled by a thin layer of alluvial and eolian deposits a few cm thick. Low widely spaced dunes are visible on some of these surfaces.

02-02-00-00-00—Heading03—Guadalupian—Guadalupian—Guadalupian Heading

02-02-01-00-00—Heading04—Artesia Group—Artesia Group—This group probably contains the Tansill Formation, the Yates Formation, and the Seven Rivers Formation, but the merging and pinch-out of these formations against the Capitan Formation does not allow for these units to be easily distinguished from one another. The Artesia Group here forms the well bedded dolomite and interbedded siltstone/fine- grained sandstone layers that overlie the Capitan Formation. The siliciclastic layers thin and pinch out to the southeast against the Capitan Formation. Bedding merges gradually with the underlying massive Capitan Formation. Fossils are rare. Beds locally show faint subhorizontal fenestrae that may have been originated as algal matts. Locally contains thin beds of pisoliths.

02-02-01-01-00—Heading05—Tansill Formation—Tansill Formation—Tansill Formation

02-02-01-01-01—unit—Pt—Tansill Formation—Mostly light gray dolomite and minor thin dark tan siltstone beds. Dolomite beds are mostly thick-bedded and massive though locally faint layering within beds is defined by sub-horizontal fenestrae. No fossils are obvious. The lower portion of this unit forms a prominent cliff that overlies the uppermost slope-forming thick siltstone layer of the underlying Yates Formation. Close to the reef front (unit Pcp) the unit contains some teepee structures, but fewer than in the immediately underlying Yates Formation. Some beds contain abundant pisoids (or pisoliths), but overall pisoids are less abundant in the Tansill Formation in the quadrangle than within the Yates Formation.

02-02-01-02-00—Heading05—Yates Formation—Yates Formation—Yates Formation

02-02-01-02-01—unit—Py—Yates Formation—Interbedded dolomite and siltstone/fine-grained sandstone. Characteristically contains many more interbeds of dark yellow-weathering siltstone and fine-grained sandstone than does the overlying Tansill Formation. Dolomite is typically massive and fenestrate, and commonly weathers a dark tan color compared to the lighter gray weathering of the Tansill Formation. In Walnut Canyon the unit contains abundant beds of pisoids (or pisoliths) interbedded with dolomite. Teepee structures are locally abundant, particularly within a few hundred meters of the Capitan Formation.

02-02-01-03-00—Heading05—Seven Rivers Formation—Seven Rivers Formation—Seven Rivers Formation

02-02-01-03-01—unit—Psr—Seven Rivers Formation—Exposed only in the far northwest corner of the map. Thick-bedded gray dolomite occurs in rather massive beds between 1-3 meters thick separated by thin partings. From a distance, the formation appears regularly bedded and conspicuously contains very few siltstone/fine-grained sandstone beds up to a few tens of centimeters thick, mostly in the lower portion of the exposed outcrops. Forms cliffs and steep ledgy slopes.

02-02-02-00-00—Heading04—Capitan Formation—Capitan Formation—Capitan Formation

02-02-02-01-00—unit—Pcp—Capitan Formation—From a distance this unit exhibits a weekly developed inclined layering that dips southeastward between ~15 and 30 degrees. This layering is more pronounced closer to the Delaware basin. In outcrop, most exposures appear massive and structureless. A faint brecciated texture is visible locally where angular clasts of dolomite of all sizes are strongly cemented by different generations of carbonate. Coarse-grained light yellow palisade calcite spar 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 fragmented debris shed from the ancient reef down into the Delaware basin.

02-02-03-00-00—Heading04—Bell Canyon Formation—Bell Canyon Formation—Bell Canyon Formation

02-02-03-01-00—unit—Pbcs—Fine-grained sandstone/siltstone member of the Bell Canyon Formation—Thin-bedded to laminated planar beds of siltstone and fine-grained sandstone. Typically erodes into smooth slopes. Fresh surfaces are commonly light-mustard yellow in color. This unit is present in the cross section only.

02-02-04-00-00—Heading04—Queen and Grayburg Formation—Queen and Grayburg Formations—Queen and Grayburg Formations, undivided

02-02-04-01-00—unit—Pgg—Queen and Grayburg Formations, undivided—Queen and Grayburg Formations, undivided. This unit is present in the cross section only.

02-02-05-00-00—Heading04—Goat Seep Formation—Goat Seep Formation—Goat Seep Formation

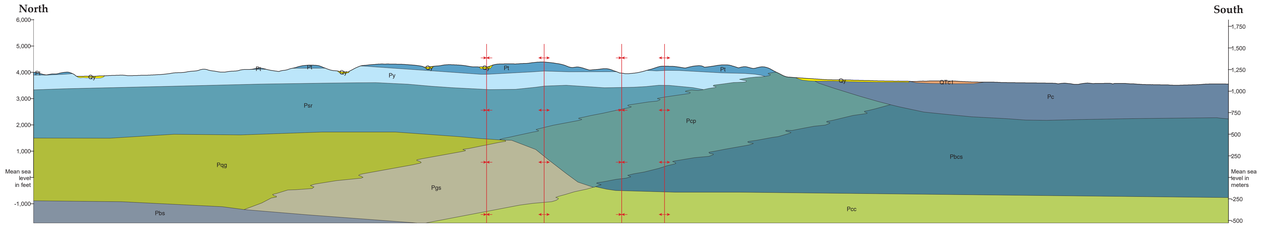
02-02-05-01-00—unit—Pgs—Goat Seep Formation—Upper unit: mostly limestone, in part dolomitic, in part sandy, mostly thick bedded, massive, light gray to brownish yellow; sandstone interbeds more abundant downward; poorly preserved marine fossils; thickness 200+ to 1,200 ft. Lower unit: mostly sandstone, very fine to fine grained, soft, brownish yellow to pink; sone units of limestone, cherty, sandy, thin bedded, brown, limestone more abundant in Guadalupe Mtns; forms moderate slope; silicified marine fossils; thickness 150 to 300 ft. This unit is present in the cross section only.

02-02-06-00-00—Heading04—Cherry Canyon Formation—Cherry Canyon Formation—Cherry Canyon Formation

02-02-06-01-00—unit—Pcc—Cherry Canyon Formation—Sandstone, siltstone, and limestone. Mostly very fine-grained quartz sandstone and siltstone, mostly noncalcareous, in part shaly, mostly thin bedded, some varvelike bedding and ripple marks, irregularly bedded channel fillings common in lower two-thirds. Locally persistent thin quartzite beds in lower part. Sandy limestone in thin beds, lenses, and nodules in a few places. Limestone, thin to thick bedded, some sandstone interbeds. Western Apache Mountains--interbedded dolomite, limestone, and fine to very fine-grained dolomitic sandstone; basal 50 ft. exposed. Thickness 1,000 ft. This unit is present in the cross section only.

02-03-00-00-00—Heading03—Leonardian—Leonardian—Leonardian

02-03-01-00-00—Heading04—Bone Spring Formation—Bone Spring Formation—Bone Spring Formation

02-03-01-01-00—unit—Pbs—Bone Spring Formation—Bone Spring Formation, this unit is present in the cross section only.

Geologic Cross Section A–A'