

Geologic Map of the San Antonio Quadrangle, Socorro County, New Mexico

By

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June, 2002

**New Mexico Bureau of Geology and Mineral Resources
*Open-file Digital Geologic Map OF-GM 058***

Scale 1:24,000

This work was supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program (STATEMAP) under USGS Cooperative Agreement 06HQPA0003 and the New Mexico Bureau of Geology and Mineral Resources.



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DESCRIPTION OF UNITS

(Middle Pleistocene–Holocene)

- af** artificial fill
- Qsg** Sand and gravel (Holocene). Sand, gravel, and minor mud in modern active arroyo channels and in the channel of the Rio Grande. 0-30 m thick.
- Qal** Alluvium (Holocene). Sand, gravel, and mud adjacent to modern arroyo and river channels. Alluvium is typically at or near grade of modern channels, except in local areas where cutting of toes of piedmont slopes by the Rio Grande has caused arroyos to incise deeply (1-3 m). 0-30 m thick.
- Qf** Mud and sand (Holocene). Deposits on the modern floodplain of the Rio Grande.
- Qe** Eolian deposits (upper Pleistocene-Holocene). Eolian sands and loessic silts; deposits are stabilized by vegetation in most areas, but active dunes are present on lee sides of hills in some areas. Includes thin, discontinuous eolian veneers on stable upland surfaces that are intimately intertongued with alluvium. 0-10 m thick.
- Qpy** Younger piedmont alluvium (upper Pleistocene). Gravel, sand, and mud deposited at low elevations

(less than about 30 m) above modern stream grade, east of the Rio Grande. Alluvium is representative of deposition in a variety of piedmont environments, including alluvial fans, paleovalley and arroyo fills, strath terraces, fill terraces, and pediments. At least two aggradational episodes are represented by **Qpy**. 0-25 m thick.

Qpo Older piedmont alluvium (middle to lower(?) Pleistocene). Gravel, sand, and mud deposited at higher elevations (more than about 30 m) above modern stream grade east of the Rio Grande. Range of depositional environments is similar to **Qpy**. At least two aggradational episodes are represented by **Qpo**. 0-40 m thick.

Qp₁₋₅ Volcaniclastics gravels, sands, and minor muds (middle to late Pleistocene). Paleovalley and strath fills fill terraces, and alluvial fan deposits inset beneath upper aggradational surface of Santa Fe Group west of the Rio Grande. Deposits are classified by their relative landscape position (**Qp₁** oldest and least inset, **Qp₅** youngest and most deeply inset). 0-30 m thick.

SANTA FE GROUP

(lower Miocene–middle Pleistocene)

Sierra Ladrones Formation (Pliocene to middle Pleistocene) (thickness unknown, facies subdivisions after Cather, 1997)

QTspc_(s) Conglomeratic piedmont facies. Characterized by conglomerate/sandstone ratio greater than 2/1. Conglomerate is typically nonvolcaniclastic, poorly sorted and clast supported. Sandstone is typically medium to very coarse and crossbedded or horizontally stratified. Matrix-supported debris-flow deposits are common. Mudstone is rare. **QTspc** includes gravelly veneers on pediment

surfaces.

QTsps(s) Conglomerate-sandstone piedmont facies. Characterized by conglomerate/sandstone ratio between 2/1 and 1/2; this is the volumetrically dominant piedmont facies within the Sierra Ladrone Formation. Conglomerate is mostly nonvolcaniclastic and is mostly clast-supported and poorly sorted. Sandstone is typically medium to very coarse-grained, commonly pebbly, and exhibits crossbedding or horizontal stratification. Mudstone is minor.

QTsps(s) Sandstone-dominated piedmont facies. Characterized by conglomerate/sandstone ratio of less than 1/2. Conglomerate is clast-supported and occurs in tabular or lenticular units <2 m thick. Sandstone is very fine to very coarse grained and exhibits a dominance of horizontal stratification. Mudstone is common and occurs as tabular units which locally compose as much as 20% of the unit. Calcareous paleosols are locally well-developed.

QTsa Axial-river facies. Channel and floodplain deposits of ancestral Rio Grande consisting of variable proportions of sandstone, mudstone, and conglomerate. Sandstone is typically crossbedded and poorly indurated. Clasts in conglomerate consist of well-rounded to sub-rounded pebbles of quartzite, chert, granite, gneiss, sandstone, volcanic lithics, siltstone, schist, phyllite, limestone, obsidian, and pumice. Mudstone ranges in color from reddish brown to greenish gray. Paleoflow was to the south. *Crosses* (x) on map indicate selected exposures of axial sandstone and conglomerate used to delineate areal extent of axial-river facies (**QTsa**) and transitional axial-piedmont facies (**QTst**).

QTst Transitional axial-piedmont facies. Intertongued axial river deposits and piedmont deposits. Transitional deposits are defined as the zone of overlap between the *basinward* extent of piedmont

sand and gravel and the *mountainward* extent of axial river sand and gravel. Mudstone is commonly ambiguous as to its former position within the facies tract (i.e. piedmont vs. axial), and thus is not a factor in delineating the transitional facies.

QTsap Volcanic ash and pumice. Water-reworked rhyolitic pumice and ash derived from Otowi Member of Bandelier Tuff (1.61 Ma).

CRETACEOUS

Kmd D-Cross Tongue of Mancos Shale (Upper Cretaceous)—Dark gray to black marine shale and sandy shale. Forms slopes and valleys. About 300 ft thick.

Khd Tres Hermanas Formation (Upper Cretaceous)—Consist of basal regressive shoreface-related sandstone and mudstone (**Atarque Member**), medial continental mudstone, sandstone, and coal (**Carthage Member**), and upper, transgressive, shoreface-related sandstone and mudstone (**Fite Ranch Member**). Forms ridges. Total thickness 265 ft.

Kml Lower Mancos Shale (Upper Cretaceous)—Dark gray marine shale with rare sandstone and limestone beds. Forms slopes and valleys. About 440 ft thick.

Kd Dakota Sandstone (Upper Cretaceous)—White to yellowish-gray, shoreface-related sandstone, pebbly sandstone, and minor mudstone. Sandstone is commonly crossbedded. Forms ridges. Thickness about 65 ft.

TRc Chinle Formation (Upper Triassic)—Red, gray and maroon fluvial mudstone with subordinate sandstone and limestone-pebble conglomerate. Forms slopes and valleys. About 540 ft thick.

TRs Santa Rosa Sandstone (Upper Triassic)—Brown, maroon, and gray fluvial sandstone, siliceous conglomerate and mudstone. About 235 ft thick.

TRm Moenkopi Formation (Middle and Lower Triassic)—Red-brown, brown, and buff continental mudstone, sandstone and siltstone-cobble conglomerate. Lower part of unit may contain beds correlative with the Permian Artesia Formation (e.g. Fagrelus, 1982). Forms slopes and valleys. About 100 ft thick.

PALEOZOIC ERATHEM

Permian System

Psa San Andres Formation (Upper Permian)—Gray marine limestone, minor sandstone and mudstone in lower part totalling about 220 ft thick. Forms prominent ridges. Upper part is white, bedded gypsum and subordinate buff mudstone about 50 ft thick.

Pg Glorieta Sandstone (Upper Permian)—White to orangish-gray quartzose sandstone, commonly crossbedded. 130 ft thick.

Pyj Joyita Member of the Yeso Formation—Brown, buff, gray, and pink sandstone and minor mudstone. Forms a slope. About 155 ft thick.

Pyc Las Cañas Member of Yeso Formation (Upper Permian)—Limestone, mudstone, gypsum, and minor sandstone, commonly brecciated due to karst development. Less than about 100 ft thick due

to truncation of top of unit by low-angle normal faulting.

Pyt **Torres Member of Yeso Formation (Upper Permian)**—Red brown to buff calcareous sandstone and mudstone and gray marine limestone. About 455 ft thick.

Pym **Meseta Blanca Member of Yeso Formation (Upper Permian)**—Red brown, maroon, and gray sandstone and mudstone. About 295 ft thick.


Pa **Abo Formation (Upper Permian)**—Red and maroon fluvial mudstone, sandstone, and minor conglomerate. Forms slopes and valleys. About 370 ft thick.

Pb **Bursum Formation (Upper Permian)**—Purplish-red and maroon mudstone, arkosic sandstone and conglomerate, and thin marine limestone beds. About 195 ft thick.

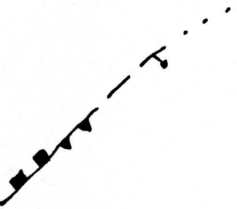
Pennsylvanian System

Pm **Atrasado Formation of Madera Group (Upper Pennsylvanian)**—Gray marine limestone with subordinate calcareous mudstone and arkosic sandstone. Forms cuestas and ridges. At least 190 ft in thickness.


EXPLANATION OF MAP SYMBOLS




Contact between geologic units or facies within Santa Fe Group. Dashed where approximately located. Dotted where concealed (Santa Fe lithofacies only).



Fault showing direction and dip of fault plane. Dashed where approximately located; dotted where concealed. Bar and ball on downthrown block. Square teeth on upper plate of low-angle normal fault; triangular teeth on upper plate of reverse fault.



Anticline showing trace of axial plane and plunge direction. Dashed where approximately located, dotted where concealed.



Syncline showing trace of axial plane and plunge direction. Dashed where approximately located, dotted where concealed.



14

Strike and dip of bedding.



†

Vertical bedding.



⊕

Horizontal bedding.



×

Selected exposure of axial sand or gravel in Sierra Ladrones Formation used to delineate

areal extent of QTsa or QTst.



Paleocurrent direction in piedmont deposit based on pebble imbrication or crossbedding.



Paleocurrent direction in axial river deposit based on pebble imbrication or crossbedding.



Erosional remnants of aggradational surface at top of Santa Fe Group (Las Cañas surface and Sedillo Hill surface of McGrath and Hawley, 1987). Characterized by well-developed calcareous paleosols.