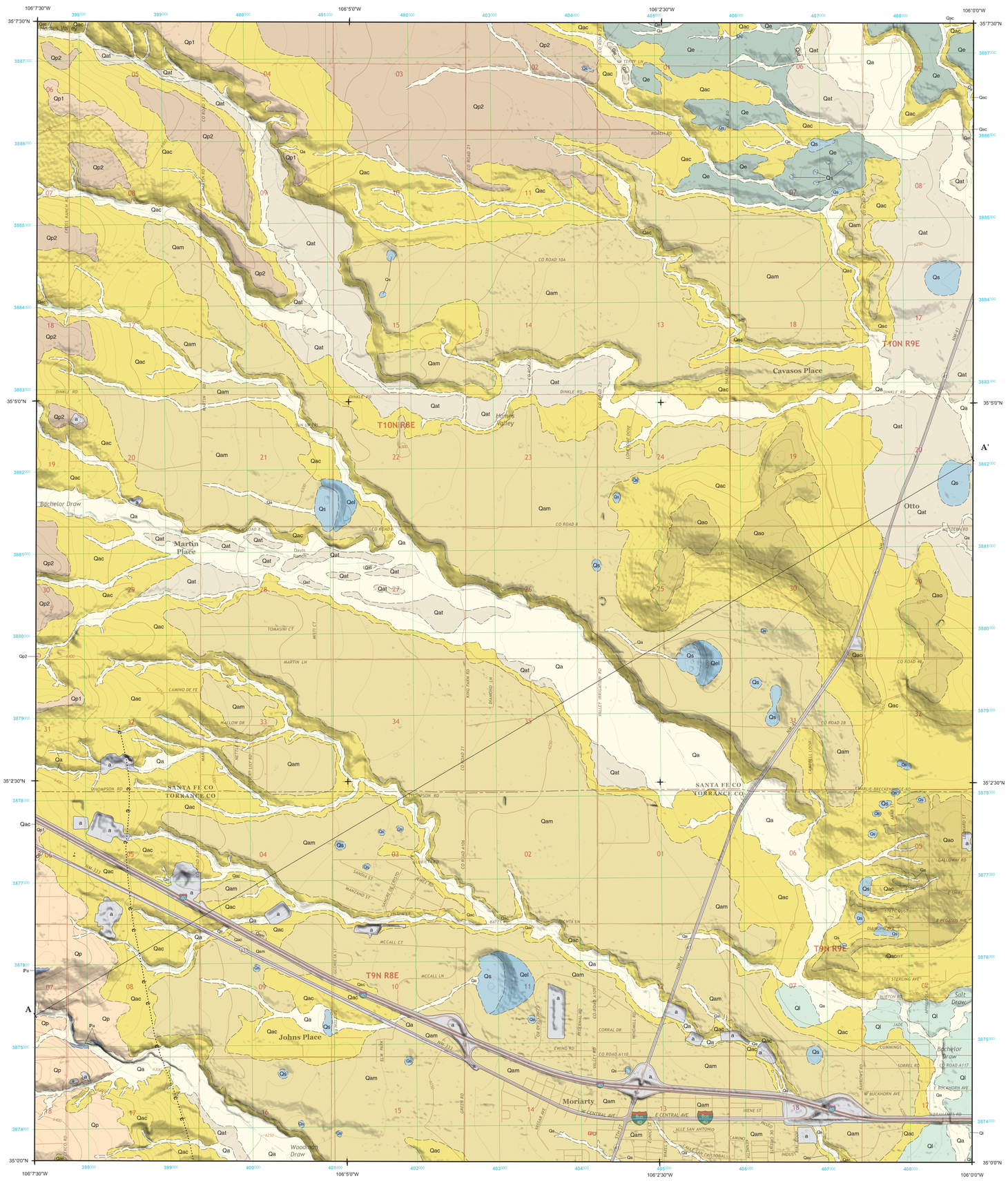


Base map from U.S. Geological Survey 2010.
North American Datum of 1983 (NAD83) World Geodetic System of 1984 (WGS84).
Projection and 1000-meter grid: Universal Transverse Mercator, Zone 13S
10 000-foot ticks: New Mexico Coordinate System of 1983(west zone), shown in blue.

Roads.....©2006-2010 Tele Atlas
Names.....GNIS, 2008
Hydrography.....National Hydrography Dataset, 2005
Contours.....National Elevation Dataset, 2000

Magnetic Declination
July, 2011
8° 37' East
At Map Center

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 10 Feet
North American Vertical Datum of 1988

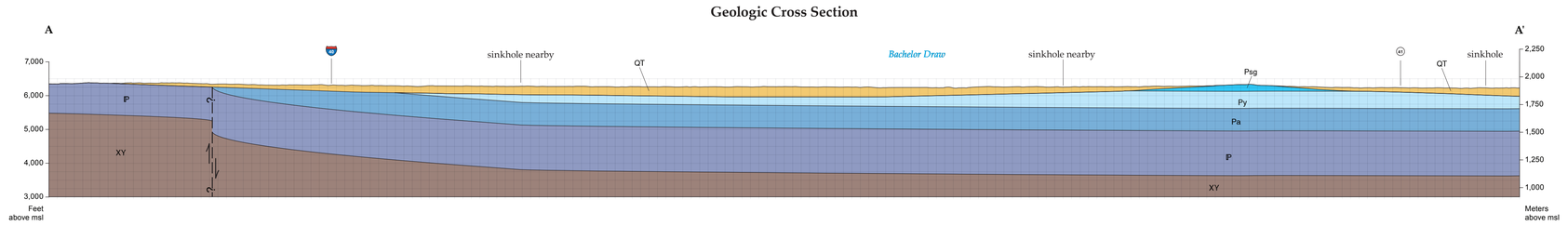
Explanation of Map Symbols

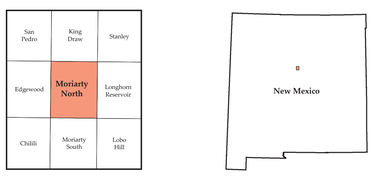
Contact—Identity and existence certain, location accurate where solid, dashed where approximate, and dotted where concealed.

Fault—Identity or existence questionable, location concealed.

Cross section line

Geologic Cross Section





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

New Mexico Bureau of Geology and Mineral Resources
Open-File Geologic Map 258

Mapping of this quadrangle was funded by a matching-funds grant from the STATEMAP program of the National Cooperative Geologic Mapping Act (Fund Number: G15AC00243), administered by the U. S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources. (Matthew J. Rhoades, Director and State Geologist, Dr. J. Michael Timmons, Assoc. Director for Mapping Programs).

Geologic Map of the Moriarty North 7.5-Minute Quadrangle, Santa Fe and Torrance Counties, New Mexico

June, 2016

by
Bruce Allen

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 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 necessarily representing the official policies, either expressed or implied, of the State of New Mexico, or the U.S. Government.

Description of Map Units

Geomorphic/Man-Made Features

a — **Disturbed Area** [Historic] — Artificially disturbed areas including major roads, borrow pits, and quarries.

Qel — **Eolian Lunette** [Holocene] — Eolian silt and sand accumulations on the leeward side of sinkholes, forming typical (parabolic) lunettes. The three lunettes indicated on the map rise several meters above the surrounding landscape.

Qs — **Sinkhole Deposits** [Upper Pleistocene to Holocene] — Topographically closed swale likely resulting from subsurface dissolution of Paleozoic sulfate (**Py**—Yeso Group, gypsum) and carbonate. Relatively young deposits filling depressions probably range in age from Late Pleistocene to Present, and may be several meters thick or more. Investigation of the stratigraphy of sinkhole-fill deposits may provide interesting information concerning late Quaternary climatic changes.

Unconsolidated Deposits

Qa — **Channel and Floodplain Alluvium** [Holocene] — Sand, gravel, silt, and clay underlying active drainages and flood plains. Deposits occupy drainage floors and are generally inset into older-alluvial deposits (units **Qp** and **Qam**), and are present within incised channels (arroyos) or broad flood plains. Unit may be inset or interfinger with other young deposits (e.g., units **Qac** and **Qe**) at low levels above active channels. Generally, less than a few meters thick.

Qat — **Low Terrace Alluvium** [Upper Pleistocene(?) to Holocene] — Sand, gravel, silt, and clay underlying relatively low terraces in larger drainages. Sediments may have been deposited during waning flow following large, relatively recent flood events; or during periods of increased fluvial discharge, enhanced delivery of sediment and episodes of wetter climate in the past. Generally less than 5 m thick.

Ql — **Lake Deposits** [Upper Pleistocene] — Nearshore lacustrine deposits associated with pluvial Lake Estancia. Sand, silt, gravel, and clay deposited and re-worked by lake-margin processes during highstands and alluvial/fluvial processes during lowstands of the latest Pleistocene lake. Gravel pit exposures in similar settings to the south of the Moriarty North quadrangle commonly exhibit centimeter- to meter-scale bedding defined by grain-size variations (clay to gravel). Some sand and gravel beds exhibit planar, shoreward-dipping cross beds; and, in the vicinity of larger drainages, meter-scale, planar cross beds (probably deltaic foreset beds) that are commonly ripple laminated in thin, finer-grained layers. Aquatic fossils including mollusks and ostracodes are common in some (typically finer-grained) interbeds. Unit is not well-exposed where it is mapped in the southeastern corner of the map, and is probably covered by a veneer of younger loessal and alluvial sediment. The deposits in the map area likely received fluvial sediment from the large drainages that converge on the southeastern corner of the quadrangle. In similar highstand depositional settings (i.e., close to 6200 ft [1900 m] in elevation) elsewhere in the lake basin, the deposits of the littoral zone of the lake are commonly several meters thick, but thickness varies.

Qac — **Hillslope Alluvium and Colluvium** [Upper Pleistocene(?) to Holocene] — Undivided alluvial, colluvial, and eolian deposits. Sand, silt, clay, and gravel mantling side slopes of drainages and stripped older deposits on interfluvial summits. Deposited in association with erosion and downslope transport of older deposits, with contributions of wind-blown silt and fine sand. Includes areas of unmapped alluvial deposits (e.g., units **Qao**, **Qp**, **Qam**) and may be incised by active drainages or interfinger with young, valley-floor alluvium (**Qa**). Estimated thickness is 5 m or less.

Qe — **Eolian Silt and Sand** [Upper Pleistocene(?) to Holocene] — Mixed eolian/alluvial deposits, in northeastern part of map area. Wind-deposited silt and sand, augmented and modified by alluvial processes. Deposits are typically a distinctive reddish-brown color and soils are weakly developed. In some areas these deposits underlie a hummocky land surface that may represent past eolian dune activity (presently stabilized with grasses). Generally less than 5 m thick.

Qam — **Valley Alluvium** (Intermediate Levels) [Middle(?) Pleistocene to Holocene] — Undivided, valley alluvium at low to intermediate levels above modern drainages. Sand, silt, gravel, and clay deposited over broad, low-gradient areas above an elevation of ~6200 ft (~1900 m) (the floor of the Estancia basin—to the south of the map area—is covered by lacustrine deposits and a complex of younger, superimposed playas and eolian lunettes that occupy the landscape below an elevation of ~6200 ft, [~1900 m]). Thickness of **Qam** is estimated to range from a few meters to a few tens of meters.

Qp — **Piedmont-Slope Alluvium, Undivided** [Middle(?) Pleistocene to Holocene] — Predominantly sand and silt, with significant amounts of gravel along paleo-drainages and bedrock uplands to the west. Undivided unit is depicted in southwestern part of map area where it forms are latively thin cover over Paleozoic sedimentary rocks. Subdivided map units include surficial deposits underlying interfluvial summits (unit **Qp1**), and inset deposits (**Qp2**) at intermediate levels above modern drainages (some areas mapped as **Qp2** may be straths, with little accumulation of associated fill). Up to a few tens of meters thick.

Qp1 — **Piedmont Alluvium, Unit Qp1** [Middle to Upper(?) Pleistocene] — Piedmont deposits underlying interfluvial summits (see description for map unit **Qp**).

Qp2 — **Piedmont Alluvium, Unit Qp2** [Middle(?) Pleistocene to Holocene] — Piedmont deposits at intermediate levels (see description for map unit **Qp**).

Qao — **Older Alluvium**, Eastern Part of Map Area [Lower to Middle(?) Pleistocene] — Alluvium (sand, silt, clay, and gravel) and residuum on weathered bedrock exhibiting substantial, pedogenic carbonate development. Unit at crests of small hills and ridges has been stripped, exposing pedogenic calcrete near the land surface, and is covered by a thin veneer of alluvial and loessal deposits downslope and in swales. The position of **Qao** deposits on the landscape suggests a source from the east, rather than from the north, although study of the provenance of gravel clasts in the deposit may indicate otherwise. Bedrock (Permian Yeso-Glorieta-San Andres rock-stratigraphic units) may be present beneath the unit at a depth of only a few meters in some areas, as suggested by large (boulder-size) fragments of limestone, sandstone, and gypsiferous, red mudstone observed in the vicinity of some excavations. Depth to bedrock suggested by the few water-well driller's logs that were available varies from a few meters to several 10's of meters, but precise locality information and definitive lithologic descriptions are lacking in these reports. At least two previous smaller-scale geologic maps depict bedrock outcrops variously assigned to the Glorieta or San Andres formations in the area mapped here as **Qao**, and these units may indeed be present at shallow depth beneath the surface in some areas (as suggested on the accompanying cross section).

Bedrock Map Units

IPa — **Atrasado Formation** [Middle(?) to Upper Pennsylvanian] — Interbedded marine and marginal-marine sandstone, siliciclastic mud, and limestone. Sandstones are typically red to yellow, fine- to coarse-grained (with some pebbly beds), and range from quartzose to arkosic. Some fine-grained sandstone to siltstone beds are a greenish color and micaceous. Siliciclastic mud is present as meter-scale shale, calcareous shale intervals, and as thin interbeds within carbonate-dominated intervals. Limestone beds are commonly fossiliferous (normal marine) mudstones and wackestones to packstones; coarser-grained accumulations of skeletal fragments comprise some beds. Echinoderm fragments, bryozoans, and brachiopods are commonly present, and fusulinids are abundant in some beds. The Atrasado is underlain by the Gray Mesa Formation, and is overlain by the Bursum Formation in this part of New Mexico. Approximately 200 m thick to the east of the map area at Cedro Peak on the Sedillo quadrangle. The small exposures in the southwestern part of the map area are approximately midway up from the base of the formation.

Cross Section Lithologic Units

QT — **Estancia Valley/Basin Fill** [Neogene to Recent] — Includes unconsolidated surface units described above as well as older, buried deposits (some of which may locally be cemented by carbonate). Up to ~120 m thick along the north-south axis of the basin, thinning toward the margins.

Psg — **San Andres-Glorieta Formations** [Lower Permian] — The Glorieta Sandstone is crossbedded, laminated, and structureless quartzose sandstone, generally thought to represent an eolianite. The marine to restricted-marine San Andres Formation is mostly limestone, but contains significant amounts of sandstone and gypsum in some areas.

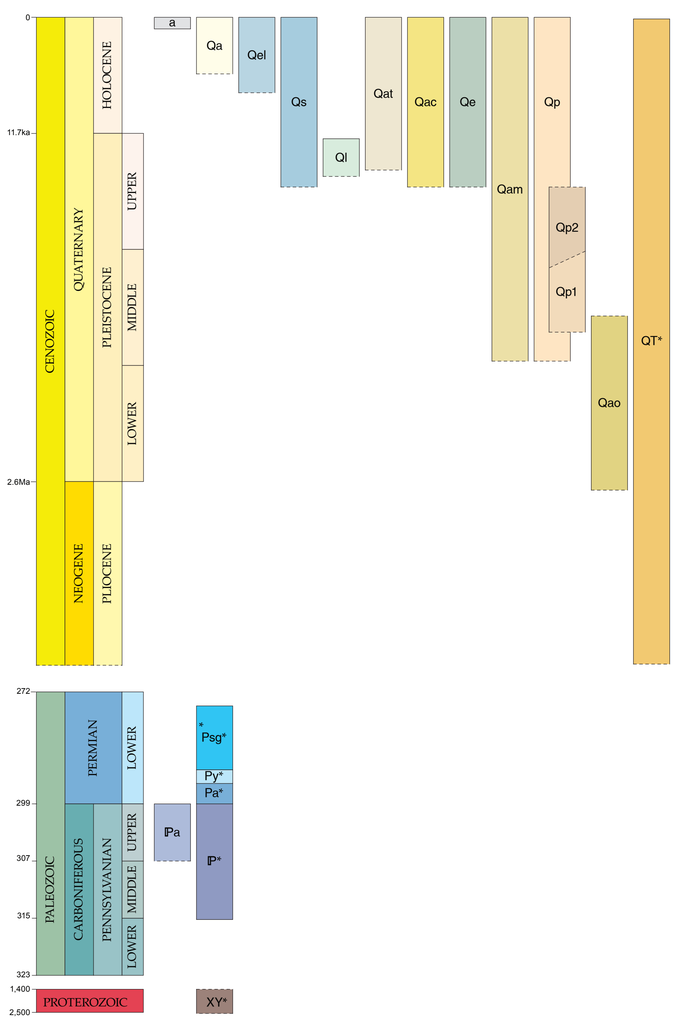
Py — **Yeso Group** [Lower Permian] — Red-bed sandstone, siltstone, and mudstone, carbonate (dolomite-limestone), and sulfate (gypsum-anhydrite). A wide variety of depositional environments for Yeso Group stratigraphic units are inferred, including fluvial, coastal plain and restricted marine. 150 m thick on cross section.

Pa — **Abo Formation** [Lower Permian] — Siliciclastic red beds, predominantly mudstone and siltstone, with many thin-sandstone beds and sandstone and conglomerate filling channels. Terrestrial (overbank mud and sand, and coarser-grained channel fill). 190 m thick on cross section.

IP — **Pennsylvanian Subsystem, Undivided** — Pennsylvanian-age rocks underlying Estancia basin consist of four formations, as follows (descending order). 1)Bursum Formation—Upper Pennsylvanian to Permian (Virgilian-Wolfcampian). Interbedded red-bed siliciclastics (mudstone, sandstone and conglomerate) and marine limestone and shale. Age-diagnostic fossils in the northern Manzano-Sandia uplifts to the west suggest a Pennsylvanian (Virgilian) age assignment in this area. 2)Atrasado Formation (see map unit description above). 3)Gray Mesa Formation—Middle Pennsylvanian (Atokan(?)–Desmoinesian). Thick intervals of cherty limestone, with beds of non-cherty limestone, shale, and lesser amounts of sandstone and conglomerate. Mostly normal marine. 4)Sandia Formation—Middle Pennsylvanian (Atokan). Siliciclastic mud, sand, and conglomerate, with beds of calcareous shale and limestone. Marine to marginal marine. Pennsylvanian rocks are 410 m thick on the cross section.

XY — **Crystalline Basement** [Paleo- to Meso-Proterozoic] — Metamorphic and plutonic rocks are exposed in the Manzano-Sandia uplift to the west. Felsic schists and amphibolite schists are exposed ~5 km southeast of the map area (Lobo Hill) in a rock quarry on the Lobo Hill quadrangle.

Correlation of Map Units



Timescale not linear due to the relative age of units represented in this quadrangle.

*Units displayed in Cross section

Digital layout and cartography by the NMBGMR Map Production Group:
Phil L. Miller, David J. McCraw, Elizabeth H. Tysor