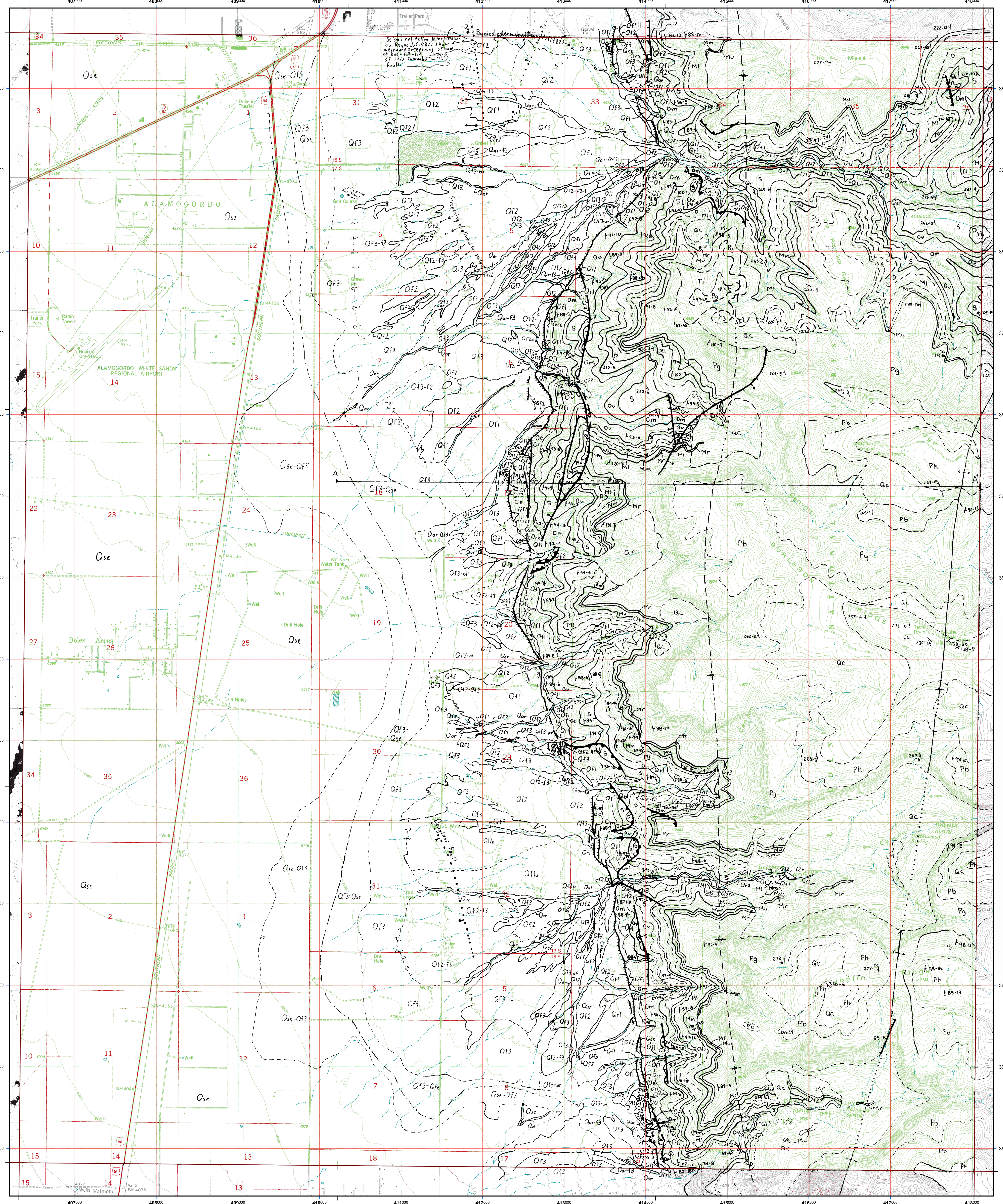
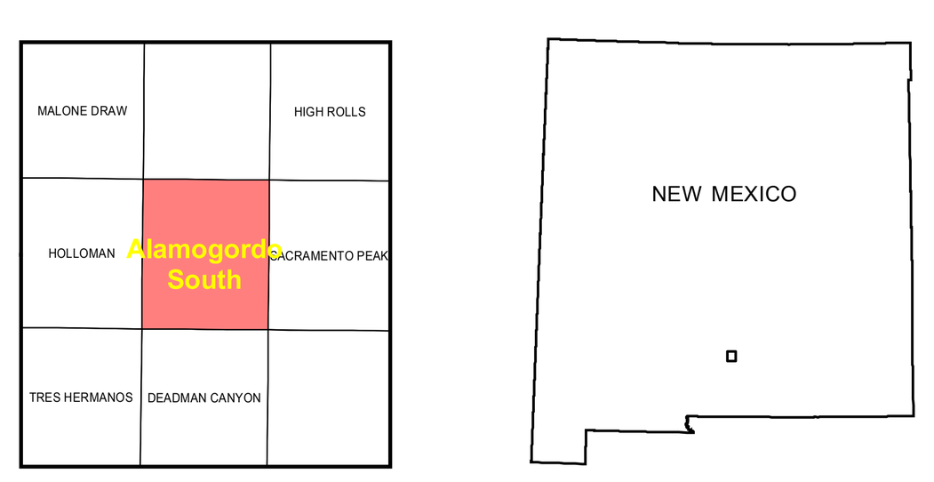
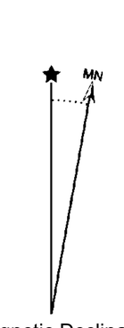


Base map from U.S. Geological Survey1984, from photographs taken 1976, field checked in 1976, edited in 1984.
1927 North American datum, UTM projection -- zone 13N
1000-meter Universal Transverse Mercator grid, zone 13, shown in red



QUADRANGLE LOCATION



Magnetic Declination
March, 2005
9º 23' East
At Map Center

1:24,000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

New Mexico Bureau of Geology and Mineral Resources
Open-file Map Series
OFGM 133

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, (Dr. Peter A. Scholle, *Director and State Geologist*, Dr. J. Michael Timmons, *Geologic Mapping Program Manager*).

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This and other STATEMAP quadrangles are (or soon will be) available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu/publications/maps/geologic/ofgm/home.html

Geologic map of the Alamogordo South quadrangle, Otero County, New Mexico.

May 2006

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map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation.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

ORDOVICIAN UNITS

Oe El Paso Formation

Dolomites, sporadic sandy dolomites and dolomitic quartz sandstones in thin to medium beds. Mostly light olive gray to light gray very fine to medium crystalline dolomite. Dolomitic quartz sandstone is common in the upper half of the lower third as well as in the upper 30 meters of the section. Thin beds of sandy dolomites and dolomitic quartz sandstones are sporadically present in other parts of the section. Thin to medium light to medium gray chert lenses, seams and nodules are common in the middle part. 131 meters thick(430feet).

Om Montoya Formation

Almost entirely crystalline dolomite and cherty dolomite. A few feet of thick and massive beds of quartz sandstone and sandy dolomite marks the base of the section. Thick beds of chert (1-3 feet) mark the upper part of the unit. The dolomite ranges in color from medium dark gray to light olive gray. 57 to 69 meters thick (190-225 feet)

Ov Valmont Formation

Sharply defined thin to medium (1 inch to 2 feet) beds of light to very light gray, finely crystalline sublitographic dolomite, and minor chert. Its typical very light colored dolomite is consistent throughout the area. The lower contact with the cherty member of the Montoya formation is lithologically transitional. However, it could be identified based on the difference in color of alteration, texture and the character of the bedding. The Montoya formation is darker in color, coarser in texture and its bedding is obscure contrasting with the Valmont formation.
Two argillaceous and shaly zones 2-5 feet thick can be traced along the area about 25 meters from the base of the unit, and represents the basal part of the upper member of the two in which the Valmont formation is divided. Chert is more common in the lower member, where it is present in large nodules up to 10-15 centimeters thick (4-7 inches) light gray in color. In the upper part of the upper member chert is also present in 2-6 inches thick light brown masses.

SILURIAN UNITS

Sf Fusselman Formation

Dark colored cherty dolomite and very minor silisiclastics. Fresh samples vary in color from light gray to dark gray or olive and brown gray. Fine to medium crystalline. Bedding is obscure. Chert is abundant and it is present as irregular nodules. Locally medium to thick (inches to a few feet) sandy to conglomeratic units are found close to the basal contact (Pray, 1961). These units contain phosphatic nodules, dolomite, quartz and chert particles that vary in size from sand to pebbles. The Fusselman formation is very resistant to erosion which has allowed for the formation of steep cliffs, wide ledges and dip slopes that are laterally continuous and easily recognizable along the front and canyons of the escarpment. Both, the lower and upper contacts are sharp disconformities. The nature of the contacts is reflected in the variation of thickness of the unit. 22-30 meters thick (70-100 feet).

DEVONIAN UNITS

D Onate, Sly Gap and Percha Shale Formations

Dark gray to brown gray silty dolomite, dolomitic siltstones and very fine grain quartz sandstones. Light gray calcareous shales towards the base and black non-calcareous shales at the top of the section. Pebbly sandstones occur locally in basal levels. Gray calcareous shale and nodular medium gray limestones, interbedded with minor black shale layers in the middle part. Limestones increase towards the upper part interbedded with layers of black shales. Locally the black shales contain pyrite. Some beds present a distinctive reddish and yellowish color of alteration. Mostly medium bedded, shales are in layers not very resistant to erosion. It is poorly exposed, commonly covered by slope and wash. <30 meters thick (<100 feet) in some places goes down to 15 meters in thickness (50 feet). The upper contact is a disconformity.

MISSISSIPPIAN UNITS

Ml Caballero Formation and Lower Lake Valley Formation (Andrecito Member)

The lower interval, 20 meters (65 feet) in the north and less than 10 m in the south (Caballero formation) consist of interbedded, gray, very nodular argillaceous limestone and gray calcareous shale at the base grading to evenly bedded crinoidal grainstones to packstones. The upper 6 to 10 meters (20-35 feet, Andrecito member of Lake Valley formation) above an angular unconformity with the underlying interval are made of calcareous shale, mudstones to wackstones, thin bedded argillaceous limestone, some well sorted crinoidal grainstones and minor quartzose siltstone. Basal bed in the north contains abundant quartz silt and some sand grains. Basal contact is sharply defined and interpreted as an unconformity. 20-30 meters thick (65-100 feet).

Mm Middle Lake Valley Formation (Alamogordo, Nunn and Tierra Members)

The lower interval (Alamogordo member) consists of medium-gray cherty calcareous siltstones and shales developed in massive beds a few inches to several feet in thickness. Beds are hard and resistant to erosion forming a ledge or scarp. Above these ledges unit Mm changes to (Nunn member) interbedded friable or poorly cemented crinoidal grainstones, and minor amounts of crinoidal wackstones. Crinoidal grainstones and wackestones with large nodules of light colored chert are abundant in the upper part of this unit represent the Arcente member. Graisntones and packstones are normally well cemented. The middle interval (Nunn member) is the most problematic of the members of the Lake Valley formation to attempt to trace laterally. Lateral changes in thickness and facies besides poor exposures in many areas made of this mapping unit the most challenging to separate into individual laterally traceable and/or correlative members. Thickness varies dramatically depending on position with respect to the mounds. It varies from a maximum of nearly 80 meters (250) feet (Mule shoe mound) to a more prevalent 50 meters (160) feet in areas where it is near to mounds, and becomes considerably thinner 15-20 meters, (48-65 feet) away from this areas.

Mu Upper Lake Valley Formation (Arcente and Dona Ana Members)

Dark calcareous shale and thin bedded (<1 foot) medium-gray argillaceous limestones represent the lower part of the unit (Arcente member). It becomes thinner, shaly and lighter in color towards the south. The Arcente member seems to level out some of the topographic relief caused by mound development. The upper 45 meters (150 feet) above the Arcente member (Dona Ana member) consist of cherty, light gray, irregularly bedded crinoidal grainstones to packstones very similar to the Tierra Blanca Member. Approaching the mounds this unit (Mu) shows abrupt thinning and local pinch out. This unit thins out towards the north where it was probably removed by pre-Pennsylvanian erosion.

Mr Rancheria Formation

Dark gray, thin bedded , argillaceous and silty limestone or similar calcareous siltstone, that contains some porous chert. A minor, though significant rock type is medium-gray, silty or sandy, crinoidal grainstone with brachiopods, shark teeth (Pray, 1961) and other fossils. Basal contact is a clearly marked unconformity of low angular disconformity. 90 meters thick (300 feet) in the south and pinch out northward as a thinning wedge.

PENNSYLVANIAN FORMATIONS

Pg Gobbler Formation

Minor coarse grain and fine pebbly sandstones, chert cobble conglomerate with sandstone matrix, interbedded with abundant dark gray to black shales and dark gray cherty limestones in the lower few hundred meters . The middle part (Bug scuffle member) is almost entirely calcarenitas and calcilutitas that make most of the thickness of the Gobbler formation. This member also forms the highest and steepest cliff of the western escarpment of the Sacramento Mountains. Shales and quartz sandstones predominate towards the top of the unit. 400-500 meters thick (1200-1400 feet).

Pb Beeman Formation

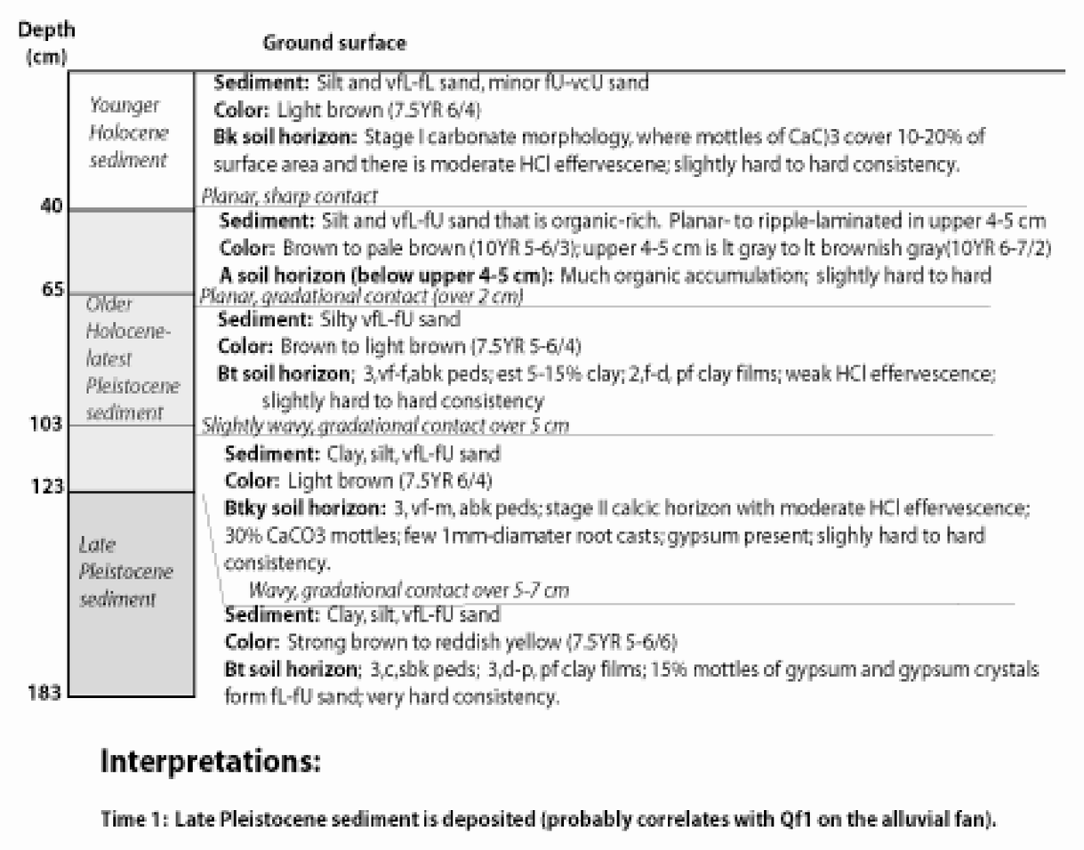
Thin beds of argillaceous limestone interbedded with calcareous shale. Locally sporadic olive gray feldespathic sandstones are found towards the base. The change between quartzose sandstone to feldespathic sandstones shows the transition into the Holder formation.

Ph Holder Formation

Dark shale and Sandstones. Algal bioherms are evident in the basal part of the formation towards the east. The base of the bioherms marks the base of the unit. The lower contact of the Holder is transitional. The upper contact was not observed in this quadrangle.

Qse sediment and soil exposure

Location: 1 km NE of northeast-end of runway of Alamogordo-White Sands Regional Airport (UTM coordinates of 3,635,264 N; 408,722 E; NAD 27)



Interpretations:

Time 1: Late Pleistocene sediment is deposited (probably correlates with Qf1 on the alluvial fan).

Time 2: A soil develops on the Late Pleistocene deposit.

Time 3: Older Holocene-latest Pleistocene sediment is deposited (probably correlates in part with Qf2 on the alluvial fan).

Time 4: A soil develops with a stage II carbonate morphology on the Older Holocene-latest Pleistocene sediment ; gypsum precipitation extends down into the late Pleistocene sediment.

Time 5: Upper 4-5 cm of the older Holocene sediment is deposited

Time 6: Younger Holocene sediment is deposited (probably correlates with Qf3 on the alluvial fan)

BASIN FLOOR DEPOSITS

Qse Sheetwash and eolian deposits (middle to upper Holocene)

Silt and very fine- to fine-grained sand that has a color of pale brown (10YR 6/3) to light yellowish brown (10YR 6/4) to brown (7.5YR 5/4 and 10YR 5/3) to light brown (7.5YR 6/4). Locally, there is minor medium- to very coarse-grained sand. Sediment is generally in thick, tabular beds and commonly overprinted by soil development. Locally, there are minor very thin to medium lenses of pebbly, very fine- to very coarse-grained sand. Within these tabular beds, sediment is locally planar- to ripple-laminated and bioturbation is common. The medium to very coarse sand (in the pebble lenses) is subrounded and dominated by limestone and dolomite lithic grains. The very fine to fine sand is subrounded to subangular and more arkosic. Weakly to moderately consolidated. Buried soils are common in this deposit (see Figure ____ for illustration of soils at one localitiy). These are marked by stage I to II calcic horizon(s) underlain by gypsic horizon(s). Locally, A soil horizons on top of the calcic and gypsic horizons are preserved. The calcic and gypsic horizons may have a very hard dry consistency.

The soil preserved on the upper ~0.5 m of this deposit has a stage I or less calcic horizon.

Coppice dunes cover a subordinate area on the surface of this unit and are generally less than 1 meter in height. Coppice dunes consist of silty very fine- to fine-grained sand that is pale brown to brown (7.5-10YR 6/3), subrounded to subangular, and well sorted. The surface between the dunes is locally incised by gullies less than 2 ft deep, and locally there is a sparse cover of lag pebbles. Mesquite is the dominant vegetation type.

Qse-Qf3 Both Qse and Qf3 deposits are present in the gradation between the alluvial fan and basin floor depositional environments; Qse deposits are more common than Qf3 deposits

Qce Colluvium incorporating reworked eolian sediment (Holocene) –

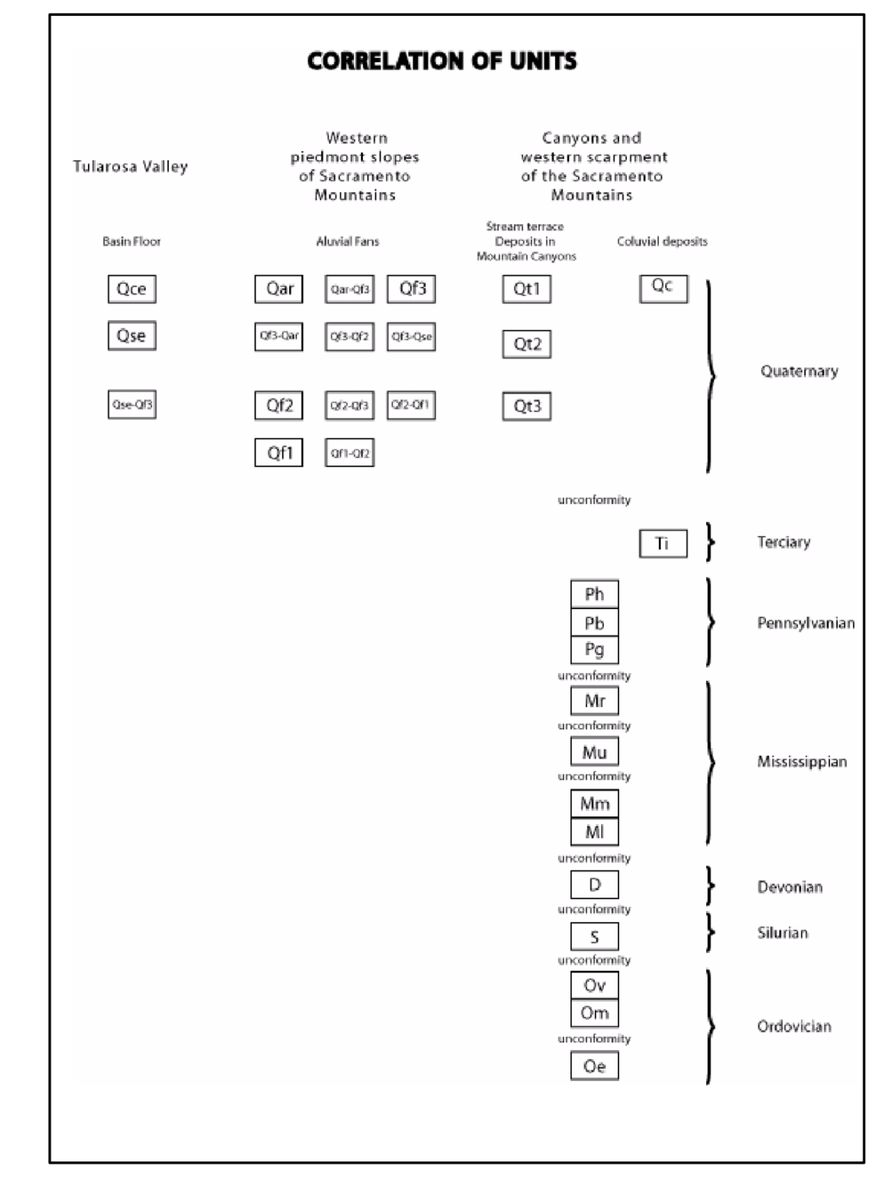
Very poorly sorted diamicton of silty sand plus gravel. Gravel are pebble to boulder-size (mostly pebble-size), subangular (mostly) to angular, and composed predominately of limestone. Coats of calcium carbonate cover the clasts in various proportions. Clasts are matrix-supported. The matrix is very pale brown to light yellowish brown (10YR 6-7/4), silty sand. Estimate 10-40% silt. The sand is very fine- to very coarse-grained (mostly very fine- to fine-grianed); fine sand is subangular to angular and arkosic; medium to very coarse sand is mostly composed of carbonate detritus and is subrounded. Loose.

ALLUVIAL FAN DEPOSITS

Qar Recent gravel and sand deposits (0-300(?) years old)
Sandy gravel that underlie recent channels on the alluvial fans. Gravel is predominately limestone and dolomite, very poorly sorted, commonly bouldery, and subrounded. The sand is generally coarse, poorly sorted, and composed predominately of limestone-dolomite detritus. Loose.

The typical surface developed on this unit is very rough because of abundant boulders and recent scours. No soil development is present. There is commonly sparse to moderate vegetation growth.
This unit typically is inset into the older fan units of **Qf1**, **Qf2**, and **Qf3**; however, there are local areas of aggradation of this unit over these older units.

Qar-Qf3 Both Qf3 and Qar deposits are present; Qar deposits are more common and Qf3 deposits exceed 10% by area.



Qf3 Gravel, sand, and silty very fine to medium sand deposits (middle to upper Holocene)
Channel fills of sandy gravel and gravelly sand with minor matrix-supported debris flow deposits. There are medium to thick interbeds of sheetwash deposits of silty very fine to lower-medium sand (mostly in the medial and distal alluvial fan regions); this fine sediment may be mixed with coarser sand and pebbles. The fine-grained sheetwash deposits are very pale brown (10YR 7/3) to pale brown (10YR 6/3) to light brown (7.5YR 6/4) in color, are preserved in the medial to distal portions of the alluvial fans, and generally powdery and loose. These fine deposits become increasingly more abundant and gypsiferous to the north of the quadrangle. Coarse channel-fills are light brownish gray (10YR 6/2) to pale brown (10YR 6/3) to brown (10YR 5/3), thin- to thick-bedded, and lenticular, broadly lenticular, or U-channel-shaped with a concave-up lower contact. Gravel consists of clast-supported (matrix-supported in debris flows), rounded to subangular (mostly subrounded), very poorly to poorly sorted (mostly poorly sorted) pebbles through boulders (generally greater pebbles than either cobbles or boulders). Gravel is composed of Paleozoic limestone and dolomite with 1-10% Paleozoic siltstone, 1-5% Paleozoic sandstone, and trace to 1% igneous intrusive rocks. The matrix in the clast-supported, coarse channel-fills consists of poorly sorted, very fine- to very coarse-grained sand. Medium to very coarse sand is dominated by Paleozoic lithic grains that are subangular-rounded. Very fine to fine sand is subangular to subrounded and more arkosic in composition than the coarser sand. Loose to weakly consolidated. Considering our interpreted ages for deposits **Qar** and **Qf2**, this deposit has an age range of 6 to 0.3 ka. 1-3 m-thick.

The typical surface developed on this unit is marked by bar-and-swale topography (up to 0.9 m relief), much boulders in the medial and proximal part of the fan (although not as much as unit **Qf2**), moderately dense to no clast armor, generally no to weak clast varnish (locally there is strong varnish on the older surfaces of this unit), and a soil possessing a calcic horizon of stage I to stage I+ carbonate morphology and gypsum accumulation. Calcium carbonate rinds on surface and subsurface clasts are non-existent or less than 0.2 mm-thick (commonly only a "dusting") and discontinuous. Ocotillo and yucca may grow on this surface where it is bouldery or cobbly.

This deposit is inset into (generally by up to 0.8 m but locally >0.8 m), overlies, or is about the same relative height as the older deposits of **Qf1** and **Qf2**.

Qf3-Qar Both Qf3 and Qar deposits are present; Qf3 deposits are more common and Qar deposits exceed 10% by area.

Qf3-Qf2 Both Qf3 and Qf2 deposits are present; Qf3 deposits are more common and Qf2 deposits exceed 10% by area.

Qf3-Qse Both Qf3 and Qse deposits are present in the gradation between the alluvial fan and basin floor depositional environments; Qf3 deposits are more common than Qse deposits

Qf2 Gravel, sand, and silty very fine to medium sand deposits (lower to middle Holocene)
This unit includes two deposits, whose age difference is probably slight, which generally cannot be differentiated because of their similar surface characteristics. One place where they can be differentiated is at the mouth of Mule Canyon (UTM coordinates of: 3,633,680 N, 412,580 E, NAD 27); here, one can observe the younger deposit inset into the older deposit (the older deposit has yielded charcoal with a radiocarbon age of 8750??70 radiocarbon years (9520 – 9915 calendar years before present); Koning, 1999). Both deposits consist of channel fills of sandy gravel and gravelly sand in addition to significant debris flows. There are also medium to thick interbeds of sheetwash deposits of silty very fine to lower-medium sand (mostly in the medial and distal fan regions); the fine sediment may be mixed with coarser sand and pebbles. In the proximal to medial portions of the alluvial fans, a noteworthy lithologic feature of the older deposit is that it commonly coarsens upwards from a clast-supported, stream-laid deposit to a bouldery debris flow deposit. The fine-grained sheetwash deposits are very pale brown (10YR 7/3) to pale brown (10YR 6/3) to light brown (7.5YR 6/3-4), are preserved in the medial to distal portions of the alluvial fans, and generally powdery and loose. These fine deposits become increasingly common and gypsiferous to the north of the quadrangle. Coarse channel-fills are pale brown (10YR 6/3) to light brownish gray (2.5Y-10YR 6/2), thin- to thick-bedded, and lenticular, broadly lenticular, or U-channel-shaped with a concave-up lower contact. Gravel consists of clast- to matrix-supported, rounded to subangular (mostly subrounded), very poorly to poorly sorted (mostly poorly sorted) pebbles through boulders (generally more pebbles than cobbles or boulders) that are subrounded to subangular. Gravel is composed of Paleozoic limestone and dolomite with 1-10% Paleozoic siltstone, 1-5% Paleozoic sandstone, and trace to 1% igneous intrusive rocks. The matrix in the coarse channel-fills consists of poorly sorted, very fine- to very coarse-grained sand. Medium to very coarse sand is dominated by Paleozoic lithic grains that are subangular-rounded. Very fine to fine sand is subangular to subrounded and more arkosic in composition than the coarser sand. Prominent buried soils (i.e. soils with carbonate morphology greater than a weak stage I) have not been observed in Qf2. Loose to weakly consolidated. Generally 1-3 m-thick, but locally as much as 5 m-thick.
In the proximal and medial portions of the alluvial fans, erosion of the debris flow-dominated, coarser upper part of this unit results in a bouldery-cobbly surface and bar and swale relief (up to 0.8 m); soil development here is marked by a calcic horizon having a stage I+ to II carbonate morphology. In areas that lack debris flows, particularly the distal part of the alluvial fan, the typical surface of this unit lacks bar and swale relief, has a moderate- to well-varnished, moderate to dense clast armor, and its soil possesses a calcic horizon of stage II carbonate morphology (locally stage I+ where its surface has been eroded). Gypsic soil horizons are typical under the calcic horizons, particularly in the northern part of the quadrangle. Calcium carbonate rinds on surface and subsurface clasts are generally up to 0.2 mm-thick (locally there are minor patches of calcium carbonate up to 2.0 mm-thick) and discontinuous. Ocotillo may grow on this surface where it is bouldery-cobbly, and yucca may be abundant.

This deposit is inset into, overlies, or is about the same relative height as **Qf1** (generally up to 0.8 m of relative height difference of the two surfaces, although locally the **Qf2** surface may be inset into **Qf1** by up to 2 m or rise above the **Qf1** surface by 1 m). **Qf2** is inset below **Qf1** upstream of large fault scarps. Unit correlates to Qf2 and Qf3u of Koning (1999), and is interpreted to have an age range of 10-6 ka.

Qf2-Qf3 Both Qf2 and Qf3 deposits are present; Qf2 deposits are more common and Qf3 deposits exceed 10% by area

Qf2-Qf1 Both Qf2 and Qf1 deposits are present; Qf2 deposits are more common and Qf1 deposits exceed 10% by area

Qf1 Gravel, sand, and silty very fine to medium sand deposits (upper Pleistocene)
Several stacked allostratigraphic subunits (commonly 1-2 m-thick) which are bounded by buried soils. These subunits are typically composed of intercalated grayish, clast-supported pebbles and cobbles (generally interpreted as stream-flow deposits) and slightly reddish, matrix- to clast-supported pebbles, cobbles, and boulders (generally interpreted as debris flow deposits). Buried soils developed on an allostratigraphic subunit usually contain a distinct reddish Bw or Bt horizon overlying white Bk or Bky horizon(s) with Stage I+ to III+ carbonate morphology. There are also subordinate medium to thick interbeds of sheetwash deposits of silty very fine to lower-medium sand. This fine sediment is more common to the north and in the distal and medial alluvial fan regions. The fine-grained sheetwash deposits are very pale brown (10YR 7/3) to pale brown (10YR 6/3) to pink (7.5YR 7/3) to light yellowish brown (10YR 6/4), and generally powdery and loose. The amount of gypsum in these fine deposits increases to the north. Coarse channel-fills of the stream-flow deposits are pale brown to light brown in color (10YR 6/3; 7.5YR 6/3), thin- to thick-bedded, and lenticular, broadly lenticular, or U-channel-shaped with a concave-up lower contact. Gravel consists of clast-supported (local matrix-supported), rounded to subangular (mostly subrounded), very poorly to moderately sorted (mostly poorly sorted) pebbles through boulders (generally greater pebbles than either cobbles or boulders). Gravel may be imbricated as to give a southwest to northwest paleoflow direction. Gravel is composed of Paleozoic limestone and dolomite with 1-10% Paleozoic siltstone, 1-5% Paleozoic sandstone, and trace to 1% igneous intrusive rocks. The matrix in the coarse channel-fills consists of poorly sorted, very fine- to very coarse-grained sand. Medium to very coarse sand is dominated by Paleozoic lithic grains that are rounded to subangular (mostly subrounded). Very fine to fine sand is subangular to subrounded, moderately sorted, and more arkosic in composition than the coarser sand. Debris flow deposits consist of slightly reddish, matrix- to clast-supported pebbles, cobbles, and boulders. Loose to weakly consolidated. Koning et al. (2002) have assigned a late to late middle(?) Pleistocene age for this deposit. Greater than 10 m thick.
Except where it has undergone erosion, the surface of this unit is marked by a lack of bar and swale relief, varnished clasts in a dense surface armor, and a top soil having calcic horizon(s) possessing stage II+ to stage IV carbonate morphology underlain and/or overprinted by gypsic horizons (gypsum becomes progressively more abundant northwards across this quadrangle). Under the calcic horizon(s) are gypsic horizon(s). Locally overlying the calcic horizons are reddish Bt or Bw soil horizon(s). Calcium carbonate rinds on surface and subsurface clasts are 0.1-1.0 mm-thick (minor 2 mm-thick) and discontinuous. This unit seems to possess a less bouldery surface compared to nearby units **Qf2** and **Qf3** in a given location on the alluvial fan. Ocotillo plants are generally not found on this surface, and creosote may be of a smaller size and sparser than on units **Qf2** and **Qf3**.
Locally, two surfaces have developed in Qf1. We cannot determine if there are unique deposits underlain by these two respective surfaces. The surface characteristics of these two surface are relatively similar.

Qf1a: Slightly above the Qf1b surface (by up to 1 m) in the proximal to medial part of the alluvial fan, but lower than the Qf1b surface in the distal to medial part of the alluvial fan.
Qf1b: Inset slightly below the Qf1a surface (by up to1 m) in the proximal to medial part of the alluvial fan, but higher than the Qf1a surface in the distal to medial part of the alluvial fan. Creosote appears to be larger than creosote growing on Qf1a, suggesting a less-developed calcic horizon.

Qf1-Qf2 Both Qf1 and Qf2 deposits are present; Qf1 deposits are more common and Qf2 deposits exceed 10% by area

STREAM TERRACE DEPOSITS IN MOUNTAIN CANYONS

Sandy gravel (pebbles through cobbles) terrace deposits are present in the mountain canyons. The gravel in these deposits are clast- to matrix-supported, subrounded to angular, and poorly to very poorly sorted. Three terrace deposits were differentiated based on their relative heights, which may vary from canyon to canyon and may or may not correlate to the three alluvial fan deposits downstream:

Qt1: Highest stream terrace deposit in a given canyon, 3 to 15 m-thick

Qt2: Intermediate level of stream terrace deposit in a given canyon, 2 to 9 m-thick

Qt3 Lowest stream terrace deposit in a given canyon, less than 6 m-thick

STRUCTURE

The general structure of the Sacramento Mountains in the Alamogordo South Quadrangle corresponds to a tilted fault block dipping gently to the east. These mountains represent the local eastern border of the Basin and Range Province and exhibit many of the features typical of this province (Pray, 1961). The deformation in the area can be divided in two groups, one related to the Cenozoic uplift of the Range and the other including structures that predate and have been slightly modified by the uplift.

With the exception of the normal faults and thrust fault in the front of the escarpment, most structures appear to have been formed before the uplift of the Sacramento Mountains block. Most of such deformation occurred during late Paleozoic time (Pray, 1961), and the timing is relatively well constrained through the sedimentary record. The two main structures in the quadrangle corresponding to the pre-uplift history of the range are a broad very gentle syncline (Steamboat syncline; Pray, 1961) and a slightly more sharply folded and narrow anticline (Mule Peak syncline; Pray, 1961). These structures trend north-south. Stratigraphic relationships documented by Pray (1961) in other areas of the Sacramento Mountains, offer a far better constraint on the deformational history of the Sacramento Mountains.

The present topography was likely formed by uplift with respect to the Tularosa basin along a normal fault system that lies along the base of the escarpment. This fault zone is characterized by steep dips to the west. Faulting affecting the alluvial fan and some other Quaternary units in the piedmont suggest that these are still active faults at the present time.

Acknowledgments
Ben Hallet provided assistance in the field during the Quaternary mapping. William Seager and Greg Mack provided valuable comments during the edition of the final map. Funding for this project was provided through the STATEMAP program to Jeff Amato, who reviewed the report, map, and associated materials.

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