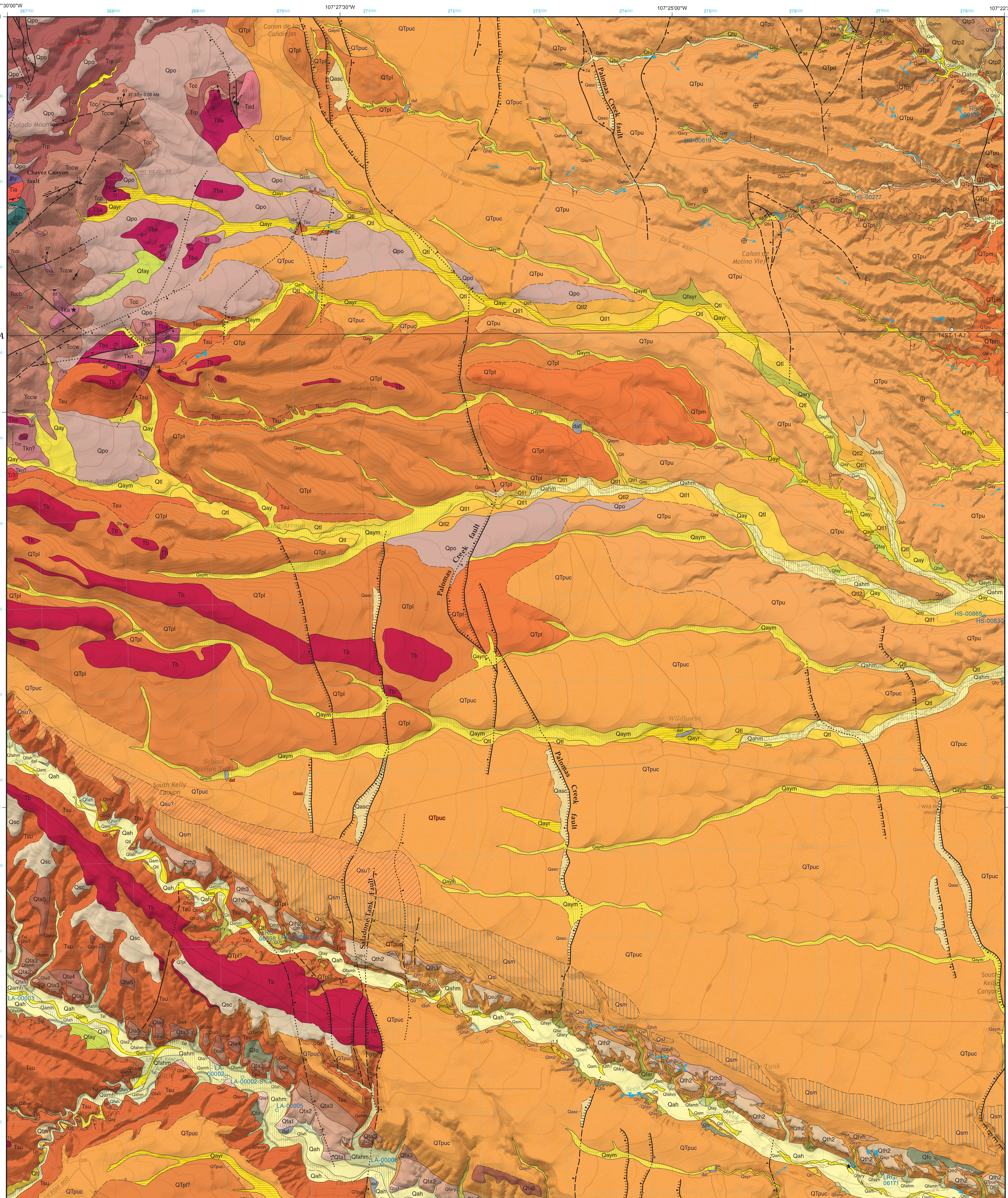
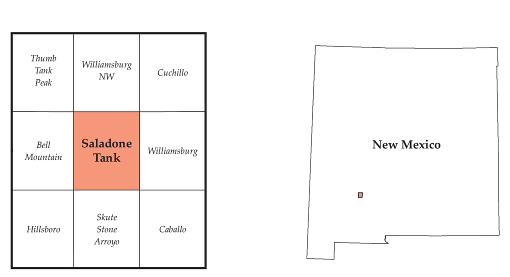
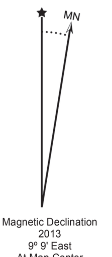


Base map from U.S. Geological Survey 2010.
North American Datum of 1983 (NAD83) World Geodetic System of 1984 (WGS84).
Projection and 1000-meter grid: Universal Transverse Mercator, Zone 13S
10 000-foot ticks: New Mexico Coordinate System of 1983(west zone), shown in blue.

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



Quadrangle Location



Magnetic Declination
2013
9° 9' East
At Map Center

1:24,000

Contour Interval 20 Feet

North American Vertical Datum of 1988

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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New Mexico Bureau of Geology and Mineral Resources
Open-File Geologic Map 259

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Geologic Map of the Saladone Tank 7.5-Minute Quadrangle, Sierra County, New Mexico

June, 2016

by
Andrew P. Jochems and Daniel J. Koning

New Mexico Bureau of Geology and Mineral Resources, 801 Leroy Place, Socorro, NM 87801

Explanation of Map Symbols

- Location of geologic cross section.
- Geologic contact—Identity and existance certain; location accurate where solid, approximate where dashed, concealed where dotted. Where queried, identity and existance questionable; location approximate.
- Gradational contact—Identity and existance certain; location accurate where solid, approximate where dashed
- Key bed—Ledge-forming; probable base of QTpuc.
- Fault (vertical, subvertical, high-angle, or unknown orientation)—Identity and existance certain; location accurate where solid, approximate where dashed, concealed where dotted. Where queried, identity and existance questionable; location approximate where dashed, concealed where dotted.
- Normal fault—Identity and existance certain; location approximate where dashed, concealed where dotted. Where queried, identity and existance questionable; location approximate where dashed, concealed where dotted. Bar and ball on downthrown side.
- Scarp on normal fault—Identity and existence certain, location accurate where solid, approximate where dashed. Where queried, identity and existance questionable; location accurate
- Strike-slip fault, right-lateral offset—Identity and existance certain; location accurate.
- Thrust fault—Identity and existence certain, location approximate.
- Dike—Identity and existence certain, location accurate, tic showing dip.
- 74 Inclined fault—Showing dip value and direction.
- Vertical or near-vertical fault.
- Inclined slickenline, groove, or striation on fault surface—Showing bearing and plunge.
- Horizontal bedding.
- 2 Inclined bedding—Showing strike and dip.
- Gently inclined (between 0° and 30°) bedding, as determined remotely or from aerial photographs—Showing approximate strike and direction of dip.
- Minor vertical or near-vertical joint—Showing strike.
- 44 Minor inclined joint—Showing strike and dip.
- Vertical joint, for multiple observations at one locality—Showing strike.
- Vertical flow banding, lamination, layering, or foliation in igneous rock.
- 35 Inclined flow banding, lamination, layering, or foliation in igneous rock.
- Inclined aligned stretched-object lineation—Showing bearing and plunge.
- Location of radiometric sample.
- Fluvial transport direction.
- Sediment transport direction determined from imbrication.
- LA-00005 Water well, type unspecified.
- Lower Seco Creek geomorphic surface
- Middle Seco Creek geomorphic surface
- Upper Seco Creek geomorphic surface

Description of Map Units

Quaternary

Hillslope and Valley-Floor Units

daf — **Disturbed or artificial fill modern**—Sand and gravel that has been moved by humans to form berms and dams.

Qasc — **Alluvium, slope-wash, and colluvium (upper Pleistocene to Holocene?)**—Unconsolidated deposits of brown to yellowish-brown (7.5-10YR), poorly stratified, pebbly silt and sand found indepressions along fault scarps. Sand is angular to subrounded and very fine to coarse. Fine to medium pebbles are angular to subangular and composed of volcanics with scarce chert and Paleozoic carbonates. Unit may be overprinted by 30-50 cm thick Bt horizons. 1-3 m thick.

Qsc — **Slopewash and colluvium (upper Pleistocene to Holocene?)**—Silt, sand, and gravel in poorly stratified deposits underlying aprons extending off of basalt flows north of Las Animas Creek. Unit not described in field due to restricted access but is readily identified in aerial photography. Likely <3 m thick.

Qam — **Modern alluvium (modern to ~50 years old)**—Unconsolidated deposits of grayish-brown (10YR), sandy pebble-cobble gravel lining valley floors. Gravel is imbricated and subangular to well rounded. Sand is subangular to well rounded and very fine to coarse. Trace amounts of clay may be present. Local surface relief up to 80 cm between channels and bars. Maximum thickness approximately 3 m.

Qamh — **Modern and historical alluvium, undivided (modern to ~600 years old)**—Modern alluvium (**Qam**) and subordinate historical alluvium (**Qah**). See detailed descriptions of each individual unit.

Qah — **Historical alluvium (~50 to ~600 years old)**—Unconsolidated, weakly-calcareous deposits of light-brownish-gray, brown, yellowish-brown, and pale-brown (10YR) sand and pebble-cobble gravel underlying terraces with treads ~1.5 m above modern grade. Deposit is inset into younger alluvium (**Qay**). Gravel is imbricated and subangular to rounded. Sand is subrounded to rounded. Preserves bar-and-swale relief with poor soil development. 3-5 m thick.

Qahm — **Historical and modern alluvium, undivided (modern to ~600 years old)**—Historical alluvium (**Qah**) and subordinate modern alluvium (**Qam**). See detailed descriptions of each individual unit.

Qary — **Recent (historical + modern) and younger alluvium, undivided (modern to lower Holocene)**—Recent alluvium (**Qah** and **Qam**, undivided) and subordinate younger alluvium (**Qay**). See detailed descriptions of each individual unit.

Qay — **Younger alluvium (Holocene)**—Unconsolidated, somewhat calcareous deposits of brown (7.5-10YR) silt, sand, and pebble-cobble gravel underlying terraces with treads 1.7-2 m above modern grade. Deposit is inset into older terraces and inset by historical alluvium (**Qah**). Gravel is clast- to matrix-supported and occasionally imbricated. Illuviated clay and stage I calcic horizons may be observed in upper part. >2-4 m thick.

Qaym — **Younger and modern alluvium, undivided (modern to lower Holocene)**—Younger alluvium (**Qay**) and subordinate modern alluvium (**Qam**). See detailed descriptions of each individual unit.

Qayh — **Younger and historical alluvium, undivided (~50 years old to lower Holocene)**—Younger alluvium (**Qay**) and subordinate historical alluvium (**Qah**). See detailed descriptions of each individual unit.

Qayr — **Younger and recent (historical + modern) alluvium, undivided (modern to lower Holocene)**—Younger alluvium (**Qay**) and subordinate recent alluvium (**Qah** and **Qam**, undivided). See detailed descriptions of each individual unit.

Alluvial Fan and Piedmont Deposits

Qfam — **Modern fan alluvium (modern to ~50 years old)**—Unconsolidated, weakly-calcareous deposits of light-brownish-gray to pale-brown (10YR), sandy pebble and pebble-cobble gravel in small channels and lobes on low-relief fans entering larger arroyos. Gravel is mostly subangular to rounded. Sand is subangular to rounded and fine- to medium-grained; deposit generally lacks clay particles. Thickness likely no more than 2 m.

Qfar — **Recent fan alluvium (modern to ~600 years old)**—Modern fan alluvium (**Qfam**) and historical fan alluvium (**Qfah**) in approximately equal volumetric proportions. See detailed descriptions of each individual unit.

Qfamh — **Modern and historical alluvial fan deposits (modern to ~600 years old)**—Modern fan alluvium (**Qfam**) and subordinate historical fan alluvium (**Qfah**). See detailed descriptions of each individual unit.

Qfah — **Historical fan alluvium (~50 to ~600 years old)**—Unconsolidated, calcareous deposits of brown (7.5YR), normally graded pebble-cobble gravel. Gravel is weakly- to moderately-imbricated and subangular to rounded. Matrix is subangular to rounded silt to medium sand with trace to 2% free-grain argillans. Subordinate beds of massive silt to very fine sand. Deposit surface has 5-20 cm of local relief and little to no soil development. 1.5-3 m thick.

Qfahm — **Historical and modern alluvial fan deposits (modern to ~600 years old)**—Historical fan alluvium (**Qfah**) and subordinate modern fan alluvium (**Qfam**). See detailed descriptions of each individual unit.

Qfahy — **Historical and younger alluvial fan deposits (~50 years old to lower Holocene)**—Historical fan alluvium (**Qfah**) and subordinate younger fan alluvium (**Qfay**). See detailed descriptions of each individual unit.

Qfary — **Recent (historical + modern) and younger alluvial fan deposits, undivided (modern to lower Holocene)**—Recent fan alluvium (**Qfah** and **Qfam**, undivided) and subordinate younger fan alluvium (**Qfay**). See detailed descriptions of each individual unit.

Qfay — **Younger fan alluvium (Holocene)**—Unconsolidated, strongly-calcareous deposits of brown (7.5YR), massive to imbricated pebble-cobble gravel. Gravel is clast- to matrix-supported and subangular to rounded. Matrix is silt to fine sand. Deposit surface has weakly-varnished clasts and a 20-25 cm thick A horizon overlying Bw or Btk (stage I) horizons. Deposit is locally toe-cut <1.5 m where incised by arroyos. >2-3.5 m thick.

Qfayh — **Younger and historical alluvial fan deposits (~50 years old to lower Holocene)**—Younger fan alluvium (**Qfay**) and subordinate historical fan alluvium (**Qfah**). See detailed descriptions of each individual unit.

Qfayr — **Younger and recent (historical + modern) alluvial fan deposits, undivided (modern to lower Holocene)**—Younger fan alluvium (**Qfay**) and subordinate recent fan alluvium (**Qfah** and **Qfam**, undivided). See detailed descriptions of each individual unit.

Qfo — **Older fan alluvium (middle to upper Pleistocene?)**—Weakly- to moderately-consolidated deposits of brown (7.5YR), massive, reverse-graded, silty sand and pebble-cobble-boulder gravel. Deposits graded to **Qtl** have stage I-II calcic horizons, whereas higher deposits have reddish-brown Bw or Bt horizons overlying stage III calcic horizons. Surface may exhibit desert pavement and moderately-varnished clasts. 3-4 m thick.

Qpo — **Piedmont alluvium (middle to upper Pleistocene?)**—Unconsolidated, moderately-calcareous deposits of reddish-brown to brown (5-7.5YR), massive to imbricated pebble-cobble-boulder gravel. Gravel is clast- to matrix-supported, subangular to rounded, and dominated by felsite clasts. Matrix is silt to medium sand. Deposit features A and Bw horizons in upper 30-45 cm. Varnish observed on 15-25% of clasts at surface. >1.7-10 m thick.

Terrace Units

Terrace Deposits of Las Animas Creek

Qta1 — **Lowest terrace deposit of Las Animas Creek (upper Pleistocene)**—Brownish cobble-boulder gravel in basal ~1 m overlain by pebbly sand underlying terraces with treads 5-10 m above the valley floor. Gravel is very poorly-sorted and subrounded. 2 m thick.

Qta2 — **Lower-middle terrace deposit of Las Animas Creek (uppermost middle to upper Pleistocene)**—Loose to moderately-consolidated deposits of reddish-brown, brown, and strong brown (5-7.5YR) pebble-cobble gravel underlying terraces with treads 15-20 m above the valley floor. Gravel is clast-supported, imbricated, poorly-sorted, and subrounded to rounded. Matrix is poorly- to moderately-sorted, subangular to subrounded, medium- to very-coarse sand with <0.5-5% clay. 1-8 m thick.

Qta3 — **Middle terrace deposit of Las Animas Creek (middle Pleistocene)**—Brown, strong brown, and dark brown (7.5YR) sand and pebble-cobble gravel underlying terraces with treads 30-40 m above the valley floor. Gravel is clast-supported, very poorly- to moderately-sorted, and subrounded to rounded. Matrix is poorly- to moderately-sorted, subrounded to subangular, medium to very coarse sand with 1-5% clay. 1.5-3 m thick.

Qta4 — **Upper-middle terrace deposit of Las Animas Creek (middle Pleistocene)**—Well consolidated, weakly-clay-cemented deposits of pinkish-gray to brown (7.5YR), locally cross-stratified pebble-cobble gravel underlying terraces with treads 45-55 m above the valley floor. Gravel is clast- to matrix-supported and subrounded. Matrix is subrounded, fine to very coarse sand with <3% clay. Deposit features argillic and strong (stage III to IV) calcic horizons. 1-4 m thick.

Qta5 — **Uppermost terrace deposit of Las Animas Creek (middle Pleistocene)**—Sandy pebble-cobble-boulder gravel underlying terraces with treads 90-110 m above the valley floor. Gravel is clast-supported, commonly imbricated, and contains 10-20% Tb clasts. Local intervals ~1 m thick are dominated by pinkish-gray to pink (7.5YR) silt and very fine to fine sand with 1-5% scattered pebbles. Topsoil commonly has a strong (stage III+ to IV) calcic horizon. 0.5-3 m thick.

Terrace Deposits of Palomas Creek

Qtp2 — **Lower-middle terrace deposit of Palomas Creek (upper Pleistocene)**—Unconsolidated, weakly- to moderately-calcareous deposits of brown (7.5-10YR) pebble-cobble gravel and occasional sand lenses underlying terraces with treads 12-20 m above the valley floor. Gravel is subrounded to well rounded. Matrix contains up to 5% free-grain argillans. Deposit contains few preserved soils. Varnish on 20-30% of clasts at surface. 2-5 m thick.

Qtp3 — **Middle terrace deposit of Palomas Creek (middle to upper Pleistocene?)**—Unconsolidated, calcareous deposits of brown to light-brown (7.5YR), occasionally cross-stratified pebble-cobble gravel underlying terraces with treads 27-30 m above the valley floor. Gravel is well imbricated and subrounded to well rounded. Deposit features stage I+ calcic horizons. Varnish on 40-50% of clasts at surface. 1.4-3 m thick.

Terrace Deposits in Other Drainages

Qtu — **Terrace deposit, undivided (Pleistocene)**—Unconsolidated deposits of reddish-brown to dark brown (5-7.5YR) pebble-cobble-boulder gravel underlying strath terraces. Gravel is clast-supported and brown (5-7.5YR) pebble-cobble-boulder gravel underlying strath terraces. Gravel is clast-supported and rounded to well rounded. Matrix is subangular to well rounded, very fine to very coarse sand with 5-15% free-grain argillans and flakes. Subordinate beds of brown (7.5YR), strongly calcareous sandy silt. 1-3 m thick. Subunits include:

Qtl — **Lower terrace deposit (upper Pleistocene)**—Brown (7.5YR) or grayish-brown (10YR) pebble-cobble-boulder gravel underlying terraces with treads 5-9 m above the valley floor. Gravel is clast-supported and imbricated. Matrix is medium- to very-coarse-grained sand with <1% clay. Weak- to strong-varnishing of clasts at surface. 1-2 m thick. This subunit can be further divided into two individual terrace deposits separated by 1-2 m:

Qtl1 — **Lower Qtl terrace deposit (upper Pleistocene)**—**Qtl** gravel underlying terraces with treads 5-6 m above the valley floor.

Qtl2 — **Higher Qtl terrace deposit (upper Pleistocene)**—**Qtl** gravel underlying terraces with treads 6-9 m above the valley floor.

Qtm — **Middle terrace deposit (middle to upper Pleistocene)**—Weakly-consolidated deposits of brown (10YR), poorly stratified, sandy pebble-cobble-boulder gravel underlying terraces with treads ~20 m above the valley floor. Deposit is locally overprinted by an illuviated clay horizon. Moderate varnishing of clasts at surface. 1-2 m thick. This subunit can be further divided into three individual terrace deposits separated by 1-2 m:

Qtm1 — **Lowest Qtm terrace deposit (middle to Pleistocene)**—**Qtm** gravel underlying terraces approximately 18-20 m above the valley floor.

Qtm2 — **Middle Qtm terrace deposit (middle to upper Pleistocene)**—**Qtm** gravel underlying terraces approximately 20-23 m above the valley floor.

Qtm3 — **Highest Qtm terrace deposit middle to upper Pleistocene)**—**Qtm** gravel underlying terracesapproximately 23-25 m above the valley floor.

Highest terrace deposit (middle Pleistocene)—Brown (7.5YR), sandy pebble-cobble-boulder gravel underlying terraces with treads ~30 m above the valley floor. Gravel is clast- to matrix-supported, subrounded, and well-graded. 0.5-4 m thick. This subunit can be further divided into three individual terrace deposits separated by 1-2 m:

Qth1 — **Lowest Qth terrace deposit (middle Pleistocene)**—**Qth** gravel underlying terraces approximately 27-30 m above the valley floor. Surfaces exhibit moderate clast varnishing.

Qth2 — **Middle Qth terrace deposit (middle Pleistocene)**—**Qth** gravel underlying terraces approximately30-33 m above the valley floor. Surfaces exhibit moderately-developed desert pavement and weak- to moderate-varnishing of pebbles and cobbles. Deposit may feature moderate Av peds in a surface soil that includes an illuviated clay or cambic horizon (Bt or Bw) underlain by a strong calcic horizon.

Qth3 — **Highest Qth terrace deposit middle Pleistocene)**—**Qth** gravel underlying terraces approximately 33-36 m above the valley floor. Surfaces exhibit a moderate desert pavement with moderately-varnished pebbles. These deposits feature a preserved topsoil with a yellowish-red (5YR) argillic/calcic horizon underlain by a stage III+ calcic horizon (K) that is approximately 1 m thick. Weak to moderate Av peds are found at the surface.

QTvh — **Very high terrace deposit (middle Pleistocene)**—Poorly-exposed, sandy gravel underlying terraces with treads ~40 m above the valley floor. Surface has a moderate- to well-developed desert pavement; surface clasts are pebble-dominated and weakly- to well-varnished. Underlying soil has very poor to poor Av peds. Likely 1-2 m thick.

Quaternary-Tertiary

Basin-Fill

Palomas Formation (Pliocene to lower Pleistocene)—Gravel, sand, silt, and clay deposited on coalesced fan complexes in the west-central Palomas basin. Fossil data, radiometric ages, and magnetostratigraphic data indicate an age range of ~5.5-0.8 Ma for the Palomas Formation (see references in report). Surface soil is commonly marked by a 1-2 m thick stage IV petrocalcic horizon. Total thickness of 0 to >194 m in quadrangle.

QTpuc — **Coarse gravel of the upper piedmont facies of the Palomas Formation (lower Pleistocene)**—Carbonate- to clay-cemented deposits of reddish to brownish (5-7.5YR), cross-stratified pebble-cobble gravel and laminated pebbly sand. Gravel is clast- to matrix-supported and imbricated. Sand is medium to very coarse and lithic-rich. Finer-grained beds contains cambic-argillic paleosols, and a 1.6-3 m thick stage IV petrocalcic horizon caps the unit in most places. 3 to >52 m thick.

QTpu — **Upper piedmont facies of the Palomas Formation (lower Pleistocene)**—Mostly loose deposits of yellowish-red (5YR) to strong or light brown (7.5YR) mud, silt, and pebble-cobble gravel. Clast-supported gravel constitutes 30-40% of unit and contains up to 5% **Tb** clasts. Buried Bk horizons are observed in places. Unit is laterally gradational with **QTpuc** in the northern part of the quadrangle, where it features thicker calcic horizons near its top. 0-28 m thick.

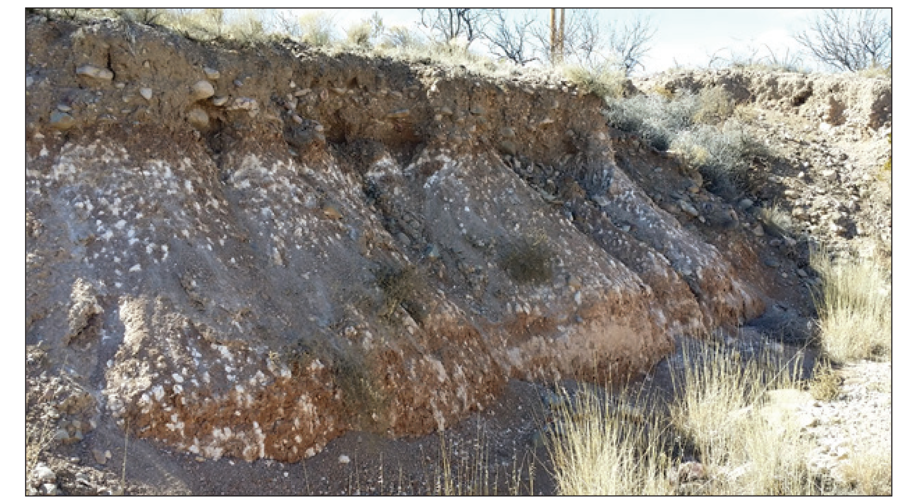


Figure 1. Stage II calcic horizon developed in reddish, muddy parent material in the upper piedmont facies of the Palomas Formation (**QTpu**). Exposure is capped by thin pediment gravel (not mapped) overprinted by ~20 cm-thick A and ~30 cm-thick illuviated clay (Bt) horizons. SE¼ SE¼ section 12, T14S, R6W.

QTpt — **Transitional piedmont faciest of the Palomas Formation (Pliocene to lower Pleistocene)**—Calcite-cemented deposits of light-brown (7.5YR), well imbricated to trough cross-stratified, pebble-cobble conglomerate and pebbly sandstone. Gravel consists of clast-supported, subrounded pebbles with subordinate cobbles. Abundant channel forms are 6-7 m wide. Unit has a laterally gradational, interfingering contact with **QTpm** in the northeast corner of the quadrangle. 6-25 m thick.

Figure 2. Transitional piedmont facies of the Palomas Formation (**QTpt**), characterized by cross-stratified conglomerate (gray ledge) and lighter-colored sandstone. NW¼ SW¼ section 7, T14S, R5W.

QTpm — **Middle piedmont facies of the Palomas Formation (Pliocene to lower Pleistocene)**—Poorly- to moderately-consolidated deposits of reddish-brown (5YR) to pinkish-white or pink (7.5YR), massive to horizontal-planar laminated clay, silt, and very-fine to fine-grained sand. Contains minor light-brown (7.5YR), pebbly channel-fills. Unit has a laterally gradational, interfingering contact with **QTpt** in the northeast corner of the quadrangle. 0-53 m thick (Jochems and Koning, 2015).

QTpl — **Lower piedmont facies of the Palomas Formation (Pliocene)**—Moderately- to strongly-consolidated, silica- or calcite-cemented deposits of light-brownish-gray to light-gray (10YR), granule-pebble conglomerate. Gravel is imbricated and contains 0% **Tccw** clasts increasing to as much as 60% in upper part. Matrix is medium to very coarse, lithic-rich sand. Unit is commonly interbedded with **Tb**. 0-61 m thick (Jochems and Koning, 2015).

Tsu — **Upper Santa Fe Group deposits predating the Palomas Formation (upper Miocene)**—Silica- to calcite-cemented deposits of light-brown to pink (7.5YR), granule to pebble conglomerate. Clast- to matrix-supported gravel lacks **Tb** clasts. Matrix is very fine to coarse, lithic-rich sand. Local red mudstone beds. Upper contact is disconformable to gradational with **QTpt**. Likely correlative to Rincon Valley Formation of Seager and others (1971). 0-326 m thick (Jochems and Koning, 2015).

Tlr — **Love Ranch Formation (Eocene)**—Light-red, bouldery conglomerate, siltstone, and shale. Boulders may be up to 2 m in diameter and consist of sandstone and carbonates from the Bliss and El Paso Formations, respectively. Maximum thickness approximately 100 m [description from Mayer, 1987].

Tertiary

Intrusive Units

Tim — **Mafic dike (upper Eocene)**—Black, aphanitic mafic material in a dike cutting **Tccw** in the western part of the quadrangle. Features 5% total phenocrysts of coarse to very coarse plagioclase and fine hornblende. Also contains rare, gabbroic xenoliths <2 cm (0.8 in) in diameter.

Ti — **Undivided intrusive lithologies (middle Eocene?)**—Dikes, sills, and small stocks or plugs of unknown lithology that form prominent ledges, buttes, or lineaments. Identified using aerial photography due to restricted access.

Tad — **Diorite porphyry stock (middle Eocene)**—Medium- to bluish-gray, porphyritic, very fine- to medium-grained intrusive diorite. Phenocrysts of 8-14% plagioclase, 5-10% hornblende, and 2-7% biotite with trace quartz. Forms small cliffs, ledges, and steep slopes. A sample from the Williamsburg NW 7.5-minute quadrangle to the north yielded an $^{40}Ar/^{39}Ar$ age of 40.35 ± 0.05 Ma (Jochems, 2015). Equivalent to units **Td** and **Tqd** of Mayer (1987).

Tia — **Biotite andesite dike (middle Eocene)**—Light- to dark-gray, porphyritic, fine- to coarse-grained andesite dike. Phenocrysts of 35% plagioclase and ~15-20% biotite with trace hornblende, quartz, and magnetite. Intrudes entire length of Chavez Canyon fault. Biotite separate dated by K-Ar method at 43.7 ± 1.7 Ma (Lamarre, 1974)[description modified from Mayer, 1987].

Volcanic and Volcaniclastic Units

Tb — **Basalt flows (lower Pliocene)**—Black to very dark-gray, dense to strongly vesicular or scoriaceous, aphanitic to aphanitic-porphyritic, fine-grained basalt. Up to 10% of vesicles are filled by calcite in upper parts of flows. Phenocrysts of 3-6% olivine and 2-4% plagioclase. May contain 3-5% disseminated magnetite. Forms ledges capping high mesas. 4.5-5 m thick.

Tr — **Aphanitic-porphyritic rhyolite (upper Oligocene)**—Light-reddish-gray to light-purplish-brown, dense, unwelded, aphanitic-porphyritic, medium-grained rhyolite. Phenocrysts of 3-5% quartz, 2-5% sanidine, and 2-3% pyroxene. Forms gentle to moderate slopes. 0-53 m thick.

Tba — **Basaltic andesite (upper Oligocene)**—Gray, foliated to massive, aphanitic-porphyritic, fine- to medium-grained basaltic andesite. Phenocrysts of 1-12% plagioclase, 2-4% pyroxene, and <4% biotite. Contains <3% disseminated magnetite and trace quartz. Forms ledges, and slopes. Likely correlative to Uvas Basaltic Andesite and Bear Springs Basalt with radiometric ages of 28-26 Ma (Clemons, 1979; Seager et al., 1984). 26-230 m thick.

Figure 3. Strongly foliated basaltic andesite (**Tba**) dipping toward the southwest. Unit is locally overlain by discontinuous rhyolite (**Tr**). SW¼ SE¼ section 8, T14S, R6W.

Tkn — **Kneeling Nun Tuff (upper Eocene)**—Pinkish-gray or tan, unwelded, porphyritic, fine- to coarse-grained, rhyolitic crystal tuff. Phenocrysts of 8-14% quartz, 10-12% biotite, 7-10% sanidine, 5-6% plagioclase, and <2% hornblende. Contains 2-3% lithic fragments of plagioclase- phyric andesite, pumice, and rare fragments of Tccw up to 2.5 cm in diameter. $^{40}Ar/^{39}Ar$-dated at 35.34 ± 0.10 Ma (McIntosh et al., 1991). 5-68 m thick.

Tka — **Tuff of King Arroyo (upper Eocene)**—Red to purplish-brown, unwelded to somewhat-welded, porphyritic, fine- to medium-grained, rhyolitic ash flow tuff. Phenocrysts of 5-6% biotite, 2-4% sanidine, 1-3% quartz, and <1% hornblende. Contains trace lapilli of rhyolite and pumice. Forms small cliffs and ledges. Equivalent to unit **Txl1** of Mayer (1987). 4-24 m thick.

Tcc — **Tuff of Chavez Canyon (middle to upper Eocene)**—Dusky-red, fine- to medium-grained lapilli tuff. Phenocrysts of biotite and hornblende. Lapilli of rhyolite, andesite, and pumice. Includes pinkish-white vitric tuff with biotite phenocrysts, glass shards, and dark pumice. $^{40}Ar/^{39}Ar$-dated at 37.33 ± 0.06 Ma (L. Peters and W. McIntosh, pers. comm., 2016). 21-204 m thick (Mayer, 1987). Locally includes 2 subunits:

Tccw — **Tuff of Chavez Canyon, welded unit (upper Eocene)**—Reddish-brown, moderately to densely welded, porphyritic-aphanitic, fine- to medium-grained lapilli tuff. Phenocrysts of 4-6% biotite, <3% quartz, <2% plagioclase, and 1-2% hornblende. Contains 15-35% lapilli and small bombs of red pumice and gray to dark-purple andesite. Flattening ratios suggested by stretched lapilli and vesicles range from 1:5 to 1:20 (width:length). 61-160 m thick.

Tccb — **Tuff of Chavez Canyon, non-welded unit (upper Eocene)**—Light-bluish-gray, slightly vesicular/axiolitic, unwelded, aphanitic- porphyritic, medium- to coarse-grained lapilli tuff. Phenocrysts of 1-3% biotite and <1% hornblende with trace plagioclase and quartz. Contains 10-25% lapilli to fine blocks of pumice, rhyolite, tuff, and andesite. 12-44 m thick.

Trp — **Rubio Peak Formation (Eocene)**—Clay-cemented deposits of light-gray to yellowish-red, poorly stratified laharic breccia. Clasts are matrix-supported, angular to subrounded pebbles, cobbles, and boulders of red porphyritic tuff, gray andesite, and **Tad**. Matrix consists of angular to subrounded, very fine to coarse sand-sized grains of which ~20% are intact phenocrysts of hornblende and biotite. 0-533 m thick (Mayer, 1987).

Paleozoic

IPb — **Bar-B Formation (Pennsylvanian; Demoinesian to Missourian)**—Limestone and mudstone with subordinate shale and conglomerate. Limestone is typically thin-bedded and nodular with brachiopods, bryozoans, crinoids, and gastropods. Mudstone is red, calcareous, and interbeds with chert to quartz-rich pebble conglomerate in the upper part of the unit. 55 m thick [description from Mayer, 1987].

IPr — **Red House Formation (Pennsylvanian; Morrowan to Atokan)**—Shale and subordinate limestone, siltstone, and conglomerate. Shale is black, red, or green and fissile. Limestone features lacy chert near top of unit and contains forams and phylloid algae among other fossils. Conglomerate in the upper part of the unit is cross-stratified and quartzose. 30-80 m thick [description from Mayer, 1987].

Oep — **El Paso Formation (lower Ordovician)**—Limestone that is locally sandy with minor silicified sandstone near top. Maximum thickness 30-35 m [description from Mayer, 1987].

ЄOb — **Bliss Formation (upper Cambrian to lower Ordovician)**—Arkosic pebble conglomerate grading upward to arkosic, oolitic, or quartzose sandstone. Commonly iron-rich and locally glauconitic. Maximum thickness 20 m [description from Mayer, 1987].

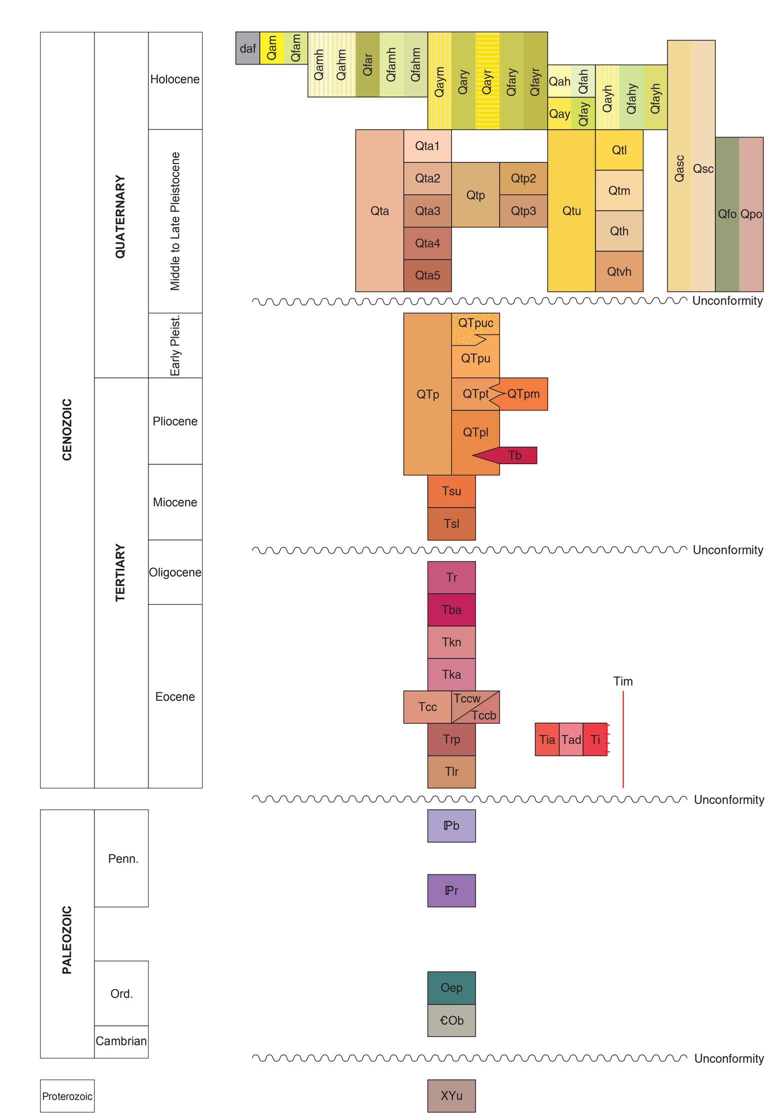
Units in Cross Section Only

Tsl — **Lower Santa Fe Group (Oligocene to middle Miocene)**—Well-cemented volcaniclastic sandstone and conglomerate. Correlative to the Hayner Ranch Formation and possibly to the Thurman Formation (Seager et al., 1971; Seager et al., 1982). Described using exposures on the Skute Stone Arroyo quadrangle (Koning et al., 2015). Estimated to be as much as 1,100 m thick in the southeastern part of the quadrangle (Jochems and Koning, 2015; Koning et al., 2015).

XYu — **Proterozoic rocks, undivided**—Granite, muscovite schist, and metadiorite. Aplitic granite comprises as much as 65% of Proterozoic lithologies exposed southwest of quadrangle [description from Mayer, 1987].

References Cited are located within the Report

Correlation of Map Units



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.

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Geologic Cross Section