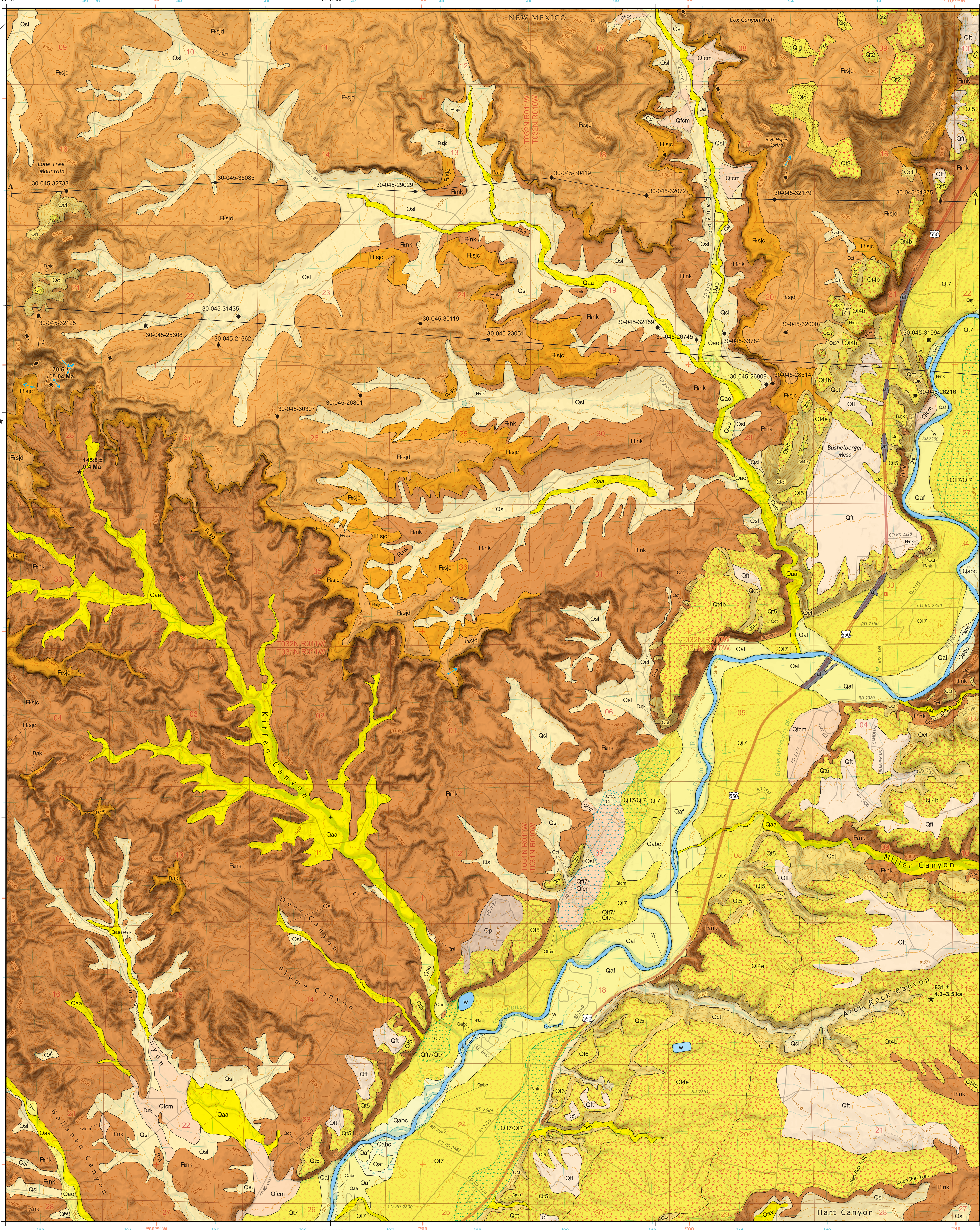


North American Datum of 1983 (NAD83)
Projection and 1,000-meter grid: Universal Transverse Mercator, Zone 13S, shown in blue.
10,000-foot ticks: New Mexico Coordinate System of 1983 (West Zone), shown in red.

Digital base map data..........U.S. Geological Survey, 2019
Contours and hillshade..........IFSAR 4.5 m Digital Terrain Model, 2007

1:24,000

1 0.5 0 1 Mile

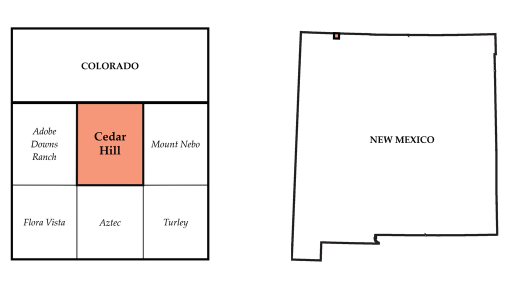
1,000 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 Feet

1 0.5 0 1 Kilometer

Contour Interval 20 Feet

North American Vertical Datum of 1988

Magnetic Declination
September 2024
8° 38' East
At Map Center



Quadrangle Location

New Mexico Bureau of Geology and Mineral Resources
New Mexico Tech
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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:

https://geoinfo.nmt.edu

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New Mexico Bureau of Geology and Mineral Resources
Geologic Map 83

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Geologic Map of the Cedar Hill 7.5-Minute Quadrangle, San Juan County, New Mexico; and Southern Ute Reservation and La Plata County, Colorado

April 2026

by
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Comments to Map Users

A geologic map displays information on the distribution, nature, orientation, and age relationships of rocks and deposits, and the occurrence of structural features. Lithologic and fault contacts are irregular surfaces that form boundaries between different ages or types of units. Data depicted on this geologic map may be based on any of the following: field geologic mapping, a compilation of published and unpublished work, and/or photogeologic interpretation. Locations of contacts are not surveyed but are plotted by relative position on a topographic ororthophotographic base map; therefore, the accuracy of contact locations depends on the scale of mapping and the geologist's interpretation.

Resizing this map would cause the details of the map to be misrepresented and result in erroneous interpretations.Using this product at a scale different than originally intended requires verification of site-specific conditions with detailed surface mapping or subsurface exploration. Topographic and cultural changes may not be shown due to recent development.

Cross sections are constructed based on the author's interpretations of geologic mapping and available geophysical and subsurface (drill hole) data. Cross sections should be used to understand the map area's general geologic framework and not be the sole source of information for locating or designing wells, buildings, roads, or other human-made structures.

Point symbols can be set to rotate around a point of observation using their azimuth values. The point of observation can be one of three possibilities: the trailing end—or tail—opposite the arrowhead or other ornamentation of the symbol; the midpoint—or center of the symbol; or the head of the symbol. See the symbol codes described in theGIS data (FGDC_Symbols nonspatial table) for attributes that describe the azimuth measurement convention and the location of the point of observation for each symbol.

Each publication carries the original date of publication and the latest revision date. Occasionally updates are required and in many cases these updates are only made to the GIS data in the Geodatabase, not the PDF. It is beneficial to compare the GIS data with the PDF to review any changes. While maps are created, updated, and produced as a GIS geodatabase, even if updates are carried out on the GIS data files, citations to these maps should reflect this original publication date with the revisions date and the original authors listed. If required, the updated data as digital products are available for download from the map's publication webpage.

The views and conclusions in these map documents are those of the authors and should not be interpreted as necessarily representing the official policies, expressed or implied, of the State of New Mexico or the U.S.Government.

Correlation of Map Units

Explanation of Map Symbols

Contact—The identity and existence are certain; where questionable or unspecified, features will be queried. The location is accurate where solid, approximate where dashed, and concealed where dotted.

Gradational contact—The identity and existence are certain. The location is accurate where solid and approximate where dashed.

Klhb — Key bed—The identity and existence are certain. The location is accurate.

30-045-25833 — Oil and gas well showing API number.

13 ± 5 Ma — Radiometric sample locality—Showing age.

14 — Inclined bedding—Showing strike and dip.

Small, minor vertical or near-vertical joint—Showing strike.

Paleocurrent direction determined from imbrication.

Paleocurrent direction determined from cross-beds.

Anthropologically Modified Topography.

A—A' — Cross section line and label.

ANTHROPOGENIC UNITS

af — **Artificial fill (Quaternary)**—Clay, silt, sand, and pebbles used for the construction of highway grades along U.S. Route 550.

QUATERNARY

Geomorphic Surface Deposits

Qp — **Pediment deposits (Pleistocene to Holocene?)**—Sand and lag gravels that discontinuously cover a graded bedrock surface above the **Qt5** terrace tread approximately 1 km (3,281 mi) north of the mouth of Kiffen Canyon on the west side of the Animas River Valley. The unit is thin and discontinuous; however, the lack of public access in this area prevented deeper investigation.

Qlg — **Lag gravels (Holocene)**—Unconsolidated pebbles through boulders (primarily cobbles and boulders) derived from terrace deposit **Qt2** in the northeast map area. These sediments have been moved downslope from their original positions and form contiguous areas of loose clasts up to 1 m (3.28 ft) thick.

Arroyo Alluvium

Qaa — **Active arroyo alluvium (Quaternary)**—Clay, silt, sand, and gravel within channels of active ephemeral and intermittent streams. Occupies the lowest geomorphic position in any alluvially-active valley. Does not effervesce in 10% HCl. Primarily unvegetated; primary successional grasses, forbs, cocklebur, tamarisk, and annual forbs are present. Observed thickness is 3.1 m (10.2 ft); total thickness unknown.

Qao — **Inactive arroyo alluvium (Quaternary)**— Loose to weakly consolidated silty sand, sand, and pebbly sand with trace pebbles and cobbles. The lack of outcrop exposures precludes a detailed description of internal structure and total thickness. The deposit has very weak effervescence in 10% HCl at 10 cm (4 in) depth. No active avulsion or deposition observed in aerial photographs, and the deposit thickness is likely <10 m (32.8 ft).

Hillslope Deposits

Qct — **Colluvium derived from Animas River terrace gravels (Quaternary)**—Pebbles through boulders on steep slopes immediately beneath gravel-capped terraces. Material is loose to very poorly consolidated, with no noticeable soil development, and ranges in thickness from 0.1–4 m (0.33–13.12 ft).

Qsl — **Slopewash deposits (Quaternary)**—Silt, sand, and gravel in alluvial-colluvial aprons around steep outcrops of mesas. Bedding not observed. Differentiated from fan and alluvial units by its lack of bedding, geomorphic position at the foot of steep landforms, and steeper slopes (typically 2° or greater, as opposed to <1° for alluvial fans in this map area). Thickness unknown.

Fan Deposits

Qft7 — **Fan deposits covering the Qt7 terrace deposit (Quaternary)**—Deposit of unknown thickness, similar in composition and setting to **Qft** deposit, but split out as a separate deposit and illustrated as a pattern so as not to obscure details and interpretations of what underlies it. The deposit is easily visible in LiDAR-derived hillshade images and topographic maps.

Qfcm — **Canyon-mouth fan deposits (Quaternary)**—Canyon-mouth fan deposits overlying alluvium with unknown thickness.

Qft — **Alluvial fan deposits capping terraces of the Animas River (recent to Pleistocene)**— Sand-dominated fan alluvium covering terrace deposits, up to 18 m (59 ft) thick and generally sloping toward the Animas River.

Description of Map Units

Recent Animas River Fluvial Deposits

w — **Water (Quaternary)**—Surface water in the channel of the Animas River is visible in aerial imagery. This deposit includes water in a few small reservoirs and sewage treatment facilities near the Animas River.

Qaf — **Floodplain alluvium of the Animas River (Holocene)**—Clay through cobbles deposited by the Animas River.

Qabc — **Bar and channel deposits of the Animas River (Holocene)**—Pebbles through boulders deposited by the Animas River and exhibiting bar-and-swale topography at the surface.

Animas River Terrace Deposits

Qt7 — **Terrace deposit 7 (Quaternary)**—Clast-supported pebbles through boulders with lenses of sand. Thickness unknown. Found at heights of approximately 3–10 m (10–33 ft) above the modern Animas River.

Qt6 — **Terrace deposit 6 (Pleistocene)**—Clast-supported pebbles through boulders (predominantly cobbles) that are subangular to rounded and poorly sorted with lenses of sand. Gravels make up 50–70% of the deposit.

Qt5 — **Terrace deposit 5 (Pleistocene)**—Clast-supported pebbles through boulders with lenses of sand. Gravels make up 50–70% of the deposit. Appears to rest upon a bedrock strath developed on the Nacimiento Formation. Observed thickness is 3–8 m (1.8–5 ft). Found at heights of approximately 50 m (165 ft) above the modern Animas River.

Terrace deposit 4 (Pleistocene)
Clast-supported pebbles through boulders with sand lenses. Gravels make up 50–70% of the deposit. Appears to rest upon a bedrock strath developed on the Nacimiento Formation. Observed thickness is 4–11 m (13–36 ft). Found at heights of approximately 76–94 m (250–310 ft) above the modern Animas River.

Qt4e — **Terrace deposit 4e (Pleistocene)**—A 4–8 m (13–26 ft) thick terrace that formed late in the episode of the fluvial system—interpreted by Gillam (1998) as a strath terrace based on exposures outside of the map area—and produced all Terrace Group 4 deposits (only one other Terrace Group 4 deposit is present on the map (Gillam 1998)).

Qt4b — **Terrace deposit 4b (Pleistocene)**—A 4–11 m (13–36 ft) thick cut terrace that formed after maximum aggradation of the fluvial system that produced Terrace Group 4 deposits (the oldest Terrace Group 4 deposit, Qt4a, is not present in this map area but was mapped and defined by Gillam (1998)). The surface of this deposit is typically ≈20 m (≈65 ft) higher than that of the immediately adjacent deposit **Qt4e**.

Qt3 — **Terrace deposit 3 (Pleistocene)**—Clast-supported pebbles through boulders with sand lenses. Gravels make up 50–70% of the deposit. Appears to rest upon a bedrock strath developed on the San Jose Formation. Observed thickness is 3–7 m (9.8–23 ft). Found at heights of approximately 107–135 m (350–450 ft) above the Animas River. Age inferred to be middle Pleistocene by Gillam (1998).

Qt2 — **Terrace deposit 2 (Pleistocene?)**—Pebbles through boulders. Not observed in outcrop. Observed thickness is 2–6 m (6.6–20 ft); Gillam (1998) reports a thickness of up to 8 m (26 ft) nearby. Found at heights of approximately 270–300 m (880–980 ft) above the Animas River. Age inferred to be Pliocene or early Pleistocene by Gillam (1998).

Qt1 — **Terrace deposit 1 (Pleistocene?)**—Clast-supported pebbles through boulders with sand lenses. Gravels make up 50–70% of the deposit. Observed thickness is 2–6 m (6.5–19.6 ft). Found at heights of approximately 370 m (1,220 ft) above the modern Animas River. Age inferred to be Pliocene by Gillam (1998).

BEDROCK UNITS

Paleogene

Pesjd — **Ditch Canyon Member of the San Jose Formation (Paleogene)**—Sandstones and mudstones with minor conglomerate. Sandstones comprise approximately 67% of the Ditch Canyon Member, with mudstone making up 33% (Smith, 1992). Upper contact not observed in the map area. The maximum observed thickness is 189 m (620 ft) in the map area.

Pesjc — **Cuba Mesa Member of the San Jose Formation (Eocene or Paleocene)**—Sandstones with minor conglomerate and mudstones. The upper contact is placed at the base of the lowest overlying, laterally continuous, recessive siltstone or mudstone and is rarely well-expressed in outcrop. The unit appears to be paraconformable, and its thickness in the map area is 12–50 m (39.4–164 ft).

Penk — **Kutz Member of the Nacimiento Formation (Paleocene)**—Sandstones, mudstones, and rare conglomerates. Individual sandstone packages are 1–17 m (3.3–55.7 ft) thick and discontinuous over hundreds of meters. The unit's thickness was reported by Cather et al. (2019) to be up to 300 m (984 ft); however, the maximum observed thickness in the map area is 160 m (525 ft).

Pen — **Nacimiento Formation, undivided (cross section only) (Paleocene)**—Terrestrial mudstones, sandstones, and rare conglomerates. Only the upper member, the Kutz Member of Cather et al. (2019), is exposed on the map. Approximately 424 m (1,391 ft) thick in the map area based on logs of the Aztec #201A well (30-045-32179) in the southeastern map area.

Peoa — **Ojo Alamo Formation (cross section only) (Paleocene)**—Used here in the sense of Baltz (1967) to exclude the Maastrichtian-aged Naashoibito Member, the unit is not exposed on the map. However, well logs in the map area provide a thickness of approximately 13–46 m (43–151 ft).

Cretaceous

Kk — **Kirtland and Fruitland Formations, combined (cross section only) (Cretaceous)**—Terrestrial mudstones and sandstones. The unit is not exposed on the map and is approximately 190–450 m (623.4–1,476.4 ft) thick according to well logs in the map area.

Kf — **Fruitland Formation (cross section only) (Late Cretaceous)**—Terrestrial mudstones and sandstones. Not exposed on the map. Approximately 120 to 240 m (394–787.4 ft) thick according to well logs in the map area.

Ku — **Cretaceous units, undivided (cross section only) (Late Cretaceous)**—Sandstones, siltstones, and mudstones. Capped with the Pictured Cliffs Sandstone, in which most wells in the map area are set. The units are not exposed on the map, and their total thickness is variable; the bottom contact is not illustrated on the cross sections.

Klhb — **Huerfanito bentonite bed of the Lewis Shale (cross section only) (Late Cretaceous)**—An altered volcanic ash-fall deposit widely used as a stratigraphic marker in the subsurface of the San Juan basin, and not exposed on the map. Unit age of 75.76 ± 0.34 Ma reported by Fassett et al. (1997).

Geologic Cross Section A–A'

(vertical exaggeration 5x)