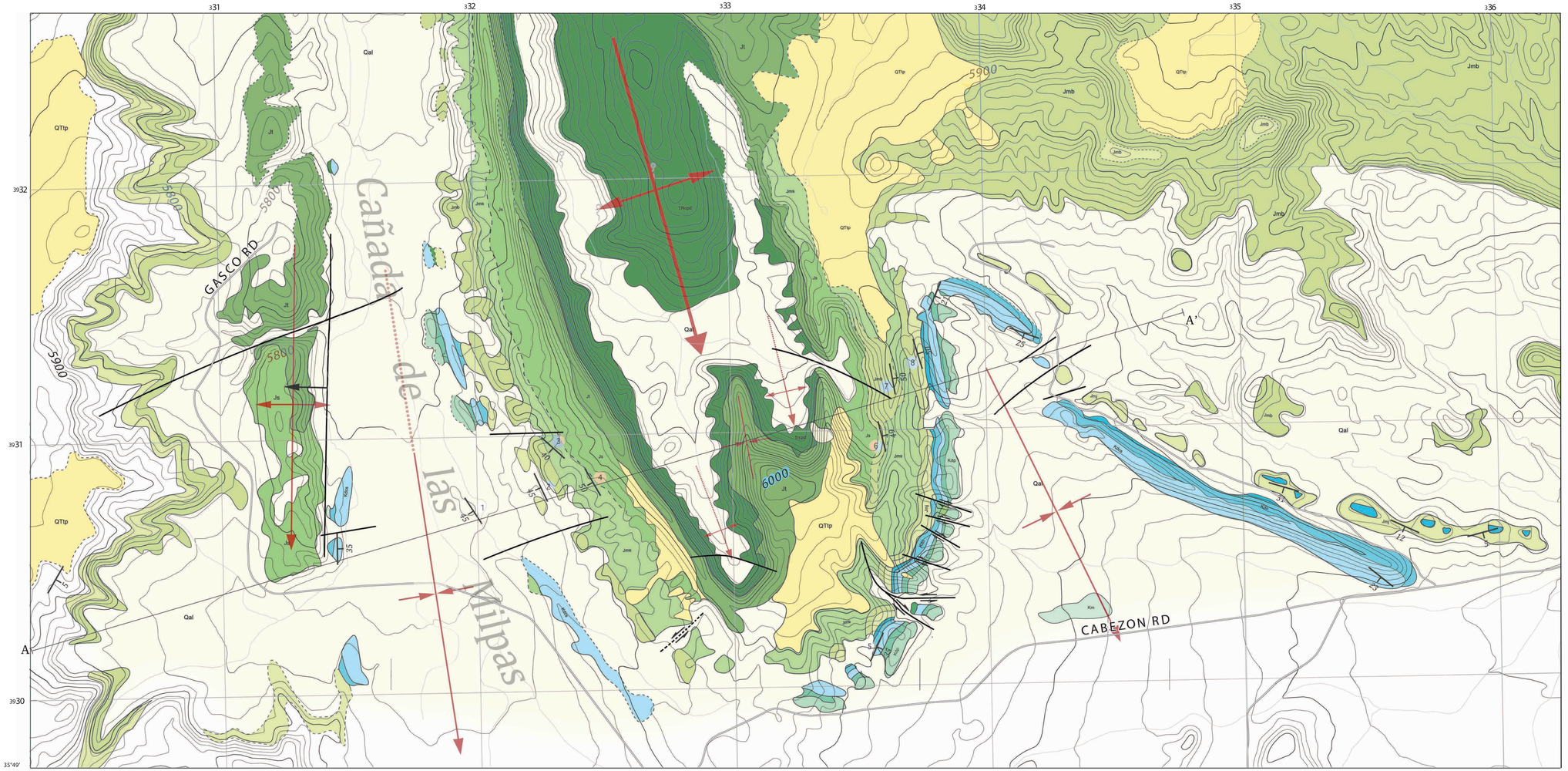


SCALE 1:24 000

1 0.5 0 1 2 KILOMETERS

1000 500 0 METERS 1000 2000

1 0.5 0 1 MILES

1° 3' 19 MILS

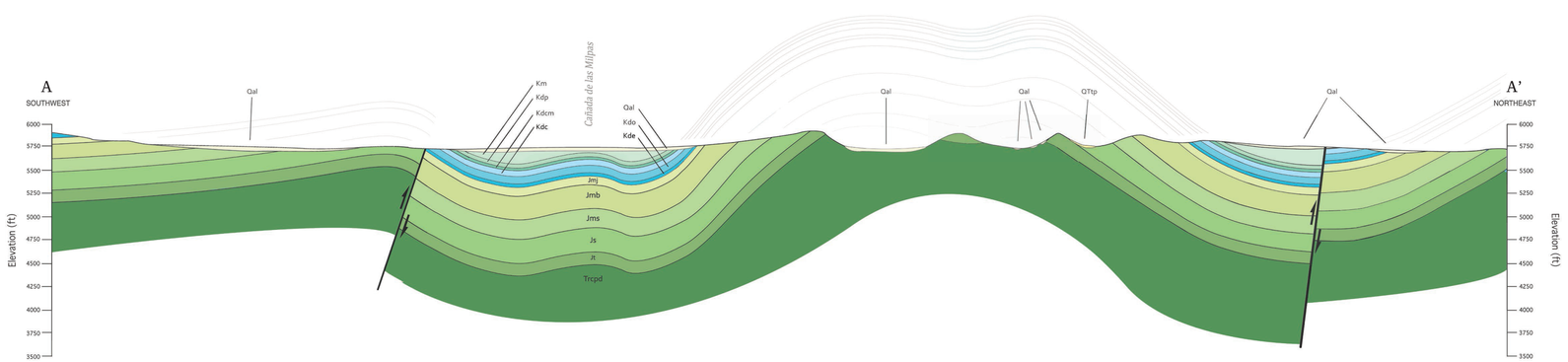
MN 9° 30' 169 MILS GN

UTM GRID AND 2010 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CONTOUR INTERVAL 20 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1988

NEW MEXICO SITE LOCATION



CORRELATION OF MAP UNITS

QTTp, Qal	Holocene	QUATERNARY
Erosional contact		
Km	Late Cretaceous	CRETACEOUS
Kd: Kdp, Km, Kdc, Kdcs, Kdo, Kde	Late Cretaceous / Early Cretaceous	CRETACEOUS
Unconformity		
Jd: Jmj, Jmb, Jms, Js, Jt	Late Jurassic	JURASSIC
Trm		TRIASSIC

LIST OF MAP UNITS

QUATERNARY AND TERTIARY SURFICIAL DEPOSITS

- QTTp — Pediment Terrace Deposits (Holocene)
- Qal — Quaternary Alluvium (Holocene)

CRETACEOUS UNITS

- Km — Mancos Shale (Late Cretaceous)
- Kdp — Paguagte Sandstone (Late Cretaceous)
- Kdc — Clay Mesa (Late Cretaceous)
- Kdcs — Cubero Sandstone (Cretaceous)
- Kdo — Oak Canyon (Cretaceous)
- Kde — Encinal Canyon (Cretaceous)

JURASSIC UNITS

- Jmj — Jackpile Sandstone (Late Jurassic)
- Jmb — Brushy Basin Member (Late Jurassic)
- Jms — Salt Wash Member (Late Jurassic)
- Js — Summerville Formation
- Jt — Todilto Formation

TRIASSIC UNITS

- Rm — Painted Desert

EXPLANATION OF MAP SYMBOLS

- Contact — Dashed where inferred; dotted where concealed; queried where uncertain
- Fault — Bar and ball on downthrown side where relative movement known. Dashed where inferred; dotted where concealed.
- Strike-slip fault — Dashed where approximately located, arrows indicate relative movement.
- Thrust fault — Dashed where inferred; dotted where concealed.
- Antiform — Dotted where concealed
- Synform — Dashed where inferred; dotted where concealed.
- Strike and dip of bedding — Site of measurement at junction of dip line with strike line.

DESCRIPTION OF MAP UNITS

QTTp — Pediment and Terrace Deposits (Holocene) — With Qal, this unit represents the most recent geologic events in the map area. This sediment is a pink arkose (Munsell = 10R, 8/3), formed primarily by the erosion of granitic and feldspathic igneous rock. Specific to our map area, this unit represents deposited sediment that has been eroded from previous topographic highs. Through time, QTTp has been carried from the Sierra Nacimiento mountains, and has gradually formed a draped, curtain shape through the formation of the pediment. This pediment will eventually be eroded into terraces, exposing the original bedrock below.

Km — Mancos Shale (Late Cretaceous) — Lying unconformably beneath recent pediment deposits is the Mancos Shale Formation, which is a dark grey shale consisting of very fine-silt sized grains of marine origin, interbeded with sections of sandstone and limestone. Small grain sizes indicate that the Mancos Shale was deposited in a low-energy, deep water environment, pressumably the Western Interior Seaway, during the early Cretaceous. In our map area, we observed a "Tongue of Mancos", which is not only interbedded with limestones and sandstones, but also with the upper members of the Dakota formation.

Kd — Dakota Formation (Late Cretaceous) — The origins of the Dakota Formation are largely associated with marine deposition in and along the shores of the Western Interior Seaway during the early to late to late Cretaceous. Five memebrs of the Dakota Formation are exposed in the San Ysidro region, from youngest to oldest: the Paguate Sandstone Member, the Clay Mesa Member, the Cubero Sandstone Member, the Oak Canyon Member, and the Encinal Canyon member.aaaa

Kdp — Paguate Sandstone (Late Cretaceous) — The Paguate Sandstone Member is a subarkosic arenite, composed of medium sorted, medium-sized, sub-angular grains. It is very pale brown in color (Munsell = 10YR, 7/3.5). Relatively large grain size indicates that the depositional environment for the Cubero Sandstone was likely high-energy, in a shallow marine environment or along the shores of the Western Interior Seaway.

Kdc — Clay Mesa Siltstone (Cretaceous) — The Clay Mesa Member is a organic-rich siltstone, composed of well sorted, grey (Munsell = 10YR, 6/1) silt-sized grains.

Kdcs — Cubero Sandstone (Late Cretaceous) — The Cubero Sandstone Member is a quartz arenite, composed of well-sorted, medium grained, sub-angular pale yellow sands (Munsell = 2.5Y, 7/3). Relatively large grain size, similar that of the Paguate Sandstone Member, imply a high energy, shallow depositional environment. This member formed distinctive "hogbacks" in the field area, due to its relative resistance to erosion.

Kdo — Oak Canyon Siltstone (Late Cretaceous) — The Oak Canyon Member is a siltstone, composed of well-sorted, silt-sized, dark grey grains (Munsell = 10YR, 4/1). Very-fine grains indicate a low energy system of deposition, possibly a fairly deep marine environment similar to that of the Mancos Shale, in the Western Interior Seaway around the early Cretaceous. However, difficulty of locating a true sample of Oak Canyon in the field limits the accuracy of our observation and estimates of depositional environment.

Kde — Encinal Canyon Sandstone (Late Cretaceous) — The Encinal Canyon Member is a lithic arenite, composed of poorly sorted, medium-grained, sub-angular sand. This member tended to be light yellowish brown (Munsell = 10YR, 6/4), and became quite thin and pinched out in several areas throughout the region. Present in this member was a coal seam, which could be a result of medium energy or swampy depositional environments, which would explain the relatively large grain size and diagenetically altered organic matter within this member.

Jm — Morrison Formation (Late Jurrassic) — Below the Dakota Formation lies the Morrison formation, deposited during the middle to late Jurrassic. This formation contains three main members exposed in the San Ysidro region, from youngest to oldest: the Jackpile Sandstone Member, the Brushy Basin Member, and the Salt Wash Member.

Jmj — Jackpile Sandstone (Late Jurassic) — The Jackpile Sandstone Member is an arkosic arenite, composed of well-sorted, fine-grained, and rounded sands. Although its color varies, the sample collected was white in color (Munsell = 2.5Y, 8/1). The Jackpile Sandstone member was deposited in areas characterized by fluvial deposition, demonstrated by braided channel deposits and cross bedding observed throughout the map area within the Jackpile Sandstone Member. Furthermore, the Jackpile Sandstone contains concretions - small artifacts in the rock that result from incremental pressure differences during diagenesis.

Jmb — Brushy Basin (Late Jurassic) — The Brushy Basin Member lies beneath the Jackpile Sandstone Member, and is a feldspathic wacke, composed of well-sorted, very-fine to silt-sized grains. Probable depositional environment for the Brushy Basin Member was within flood plains during the Late Jurassic. Two characteristic features of this unit include its color and interbedding with the underlying Saltwash Member. The Brushy Basin Member has two distinctive colors, often together termed "pistachio and salmon". These colors are often a good starting point to inform further observation. Secondly, multiple instances of yellow Saltwash and pistachio and salmon Brushy Basin interchanging in outcrops led to the belief that there was a degree of interbedding of the Brushy Basin and Saltwash Members.

Jms — Saltwash (Late Jurassic) — The Saltwash Member is a arkosic arenite, composed of very well sorted, fine to very-fine and rounded grains. It is pale yellow to pale brown in color (Munsell 10YR 6/3 to 6/4).

Js — Summerville Formation (Late Jurassic) — The Summerville Formation is an arkosic arenite, composed of poorly sorted, medium-grained, angular sand. Light redish brown in color (Munsell = 2.5YR, 7/3), the Summerville Formation was deposited in a shallow marine environment due to the medium sized grains.

Jt — Todilto Formation (Late Jurassic) — The Todilto formation consists of a gypsiferous evaporate sequence in contact with limestone sequence. Although Todilto limestone sample was not obtained, gypsum from the Todilto that covered many high-topographic regions in the field area indicate that it is composed of thin, elongated crystals in close packing configuration. Counting of varves (linked to annual evaporation cycles) indicate deposition over the course of some 14ka by cycles of repeated evaporation of saline marine bodies.

Rm — Painted Desert Member of the Chinle Group (Triassic) — As the oldest unit observed in the map area, the Painted Desert Member is part of the larger Petrified Desert formation, which in turn is part of the Chinle Group. The red (Munsell = 10R, 5/6) Painted Desert Member is a siliceous clay composed of very fine to silt-sized grains, likely deposited in shallow marine environment such as distributary channel systems, marshes, or broad alluvial plains.

GEOLOGIC MAP OF THE SAN YSIDRO ANTICLINE, NORTHERN NEW MEXICO

By

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with instruction from: Dr. Helge Gonnermann, Monica Erdman, Andrew Moodie

2015