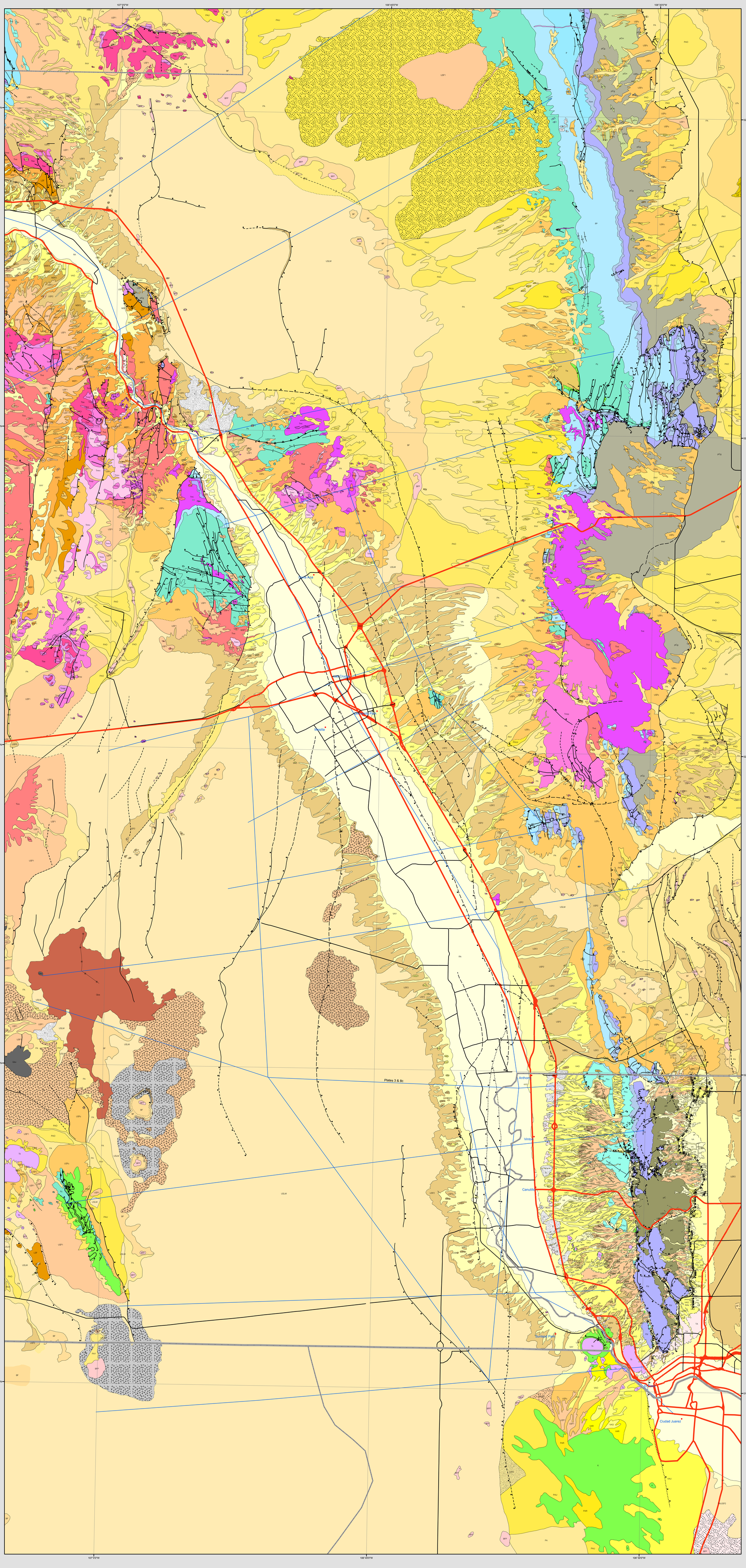
PLATE 1 HYDROGEOLOGY OF THE MESILLA AND JORNADA BASIN REGION AND ADJACENT PARTS OF TEXAS AND CHIHUAHUA, MEXICO



Legend

STRUCTURE
- anticline
- approximate anticline
- approximate fault
- approximate normal fault
- approximate thrust fault
- crater
- fault
- inferred fault
- inferred normal fault
- inferred syncline
- landslide
- line of craterlets
- monocline
- normal fault
- overturned syncline
- syncline
- thrust fault

CONTACTS
- approximate contact
- concealed contact
- contact
- inferred contact

Cross-section lines

Well cores

BORDERS
- COUNTY
- INTERNATIONAL
- STATE

Geology Polygons

INTERMONTANE BASIN HYDROSTRATIGRAPHIC UNITS (HSUs)

E	*Upper Quaternary - Eolian sand deposits. the symbol E/Qb or E/PA etc., shows the rock unit the sand has buried*

Piedmont-Slope HSUs (post-Santa Fe Group); entirely in the vadose zone

PAY	*Younger piedmont- slope deposits of late Quaternary age; mostly facies 5*
PA	*Younger (PAY) and older (PAO) piedmont-slope deposits, undivided, stippeled where up to 10 ft (3 m) of Late Quaternary eolian cover is present; mostly facies 5 and 6*
E/PA	
PAO	*Older piedmont-slope deposits of Middle Quaternary age; mostly facies 5 and 6*
PAU	*Older and younger piedmont-slope deposits and correlative Upper Santa Fe piedmont facies (5 to 8), undivided*
E/PAU	
PAUc	*Quaternary and Tertiary, older and younger course-grained piedmont facies, undifferentited, thin over upper and middle Santa Fe group; mostly facies 6 and 8*
PAR	

Basin-Floor HSUs (post-Santa Fe Group)

LE	*Eolian deposits associated with Tularosa Basin Lakes - mostly inactive, ridge-like dunes of yellowish to tan, gypsiferous quartzose silt and fine quartzose sand with gypsite layers; located on the lee (east) side of lake (Qlg) beds; many have 1-2 ft (0.3-0.6 m) of pedogenic gypsite (gypcrete) capping the deposits; up to 75 ft (23 m) thick and primarily in vadose zone*
LPs	*Gypsiferous lake deposits in the Tularosa Basin - includes deposits of ancestral Lake Otero with highest shoreline near 3,950 ft (1204 m) and several smaller lake beds in the eastern Tularosa Basin; mostly gypsite, gypsiferous red and green clay, and gypsiferous silt, locally covered by thin, loamy to silty, eolian deposits of alluvium; at least 25 ft (8 m) thick and partly in vadose zone*
BF	*Undivided alluvial flat deposits, including fills of small playa depressions; as much as 100 ft (30 m) thick and primarily in vadose zone; mostly facies c*
BFP	*Playa- lake deposits in local depressions on basin- floor alluvial plains (unit BF); as much as 20 ft (6 m) thick and entirely in vadose zone; fine- grained with thin sandy layers; mostly facies c*
BFU	*Early to Middle Quaternary, alluvial flat, channel and floodplain deposits of ancestral fluvial systems, and local playa depression fills; with unmapped inclusions of unit BF in upper part; as much as 130 ft (40 m) thick, and partly in vadose zone; mostly facies c and 3 gradational to and intertonguing laterally with units PA and PAU; and transitional to upper part of HSUs USF2 and USF1*

Rio Grande Valley HSUs (post-Santa Fe Group)

RA	*Channel and floodplain deposits of the Rio Grande; up to 100 ft (30 m) saturated thickness; mostly facies a1 and a2*
VA	*Undifferentiated deposits of (VAY and VAO) of major ephemeral tributaries to the Rio Grande system; facies b (like 5 and 6)*
VAU	
VAY	*Younger valley fill deposits associated with entrenchment and backfilling of major tributaries to the Rio Grande valley; facies b (like 5 and 6)*
VAO	*Older valley fill deposits, associated with graded surface fans and terraces formed during at least two major episodes of entrechment and partial backfilling of major tributaries to the Rio Grande; facies b (like 5 and 6). Includes tongues of ancestral river alluvium; facies a*
VAR	
TA	*Quaternary, terrace deposits of the Rio Grande; mostly facies a1 entirely in the vadose zone*
E/TA	
TA/USF2	

Santa Fe Group HSUs

E/USF1	
USLM	*Middle Pleistocene to Pliocene, Upper Santa Fe HSUs, sandy, fluvial and eolian sediments (with partially indurated clacic paleosols) of the La Mesa geomorphic surface; up to 20 ft (6 m) thick and entirely in the vadose zone; up to 10 ft (3 m) of upper Quaternary eolian cover is locally present*
USF1	*Early Pleistocene to Late Miocene, Upper Santa Fe HSUs, medial to distal piedmont facies, mostly facies 5 and 6; includes Camp Rice Formation; up to 10 ft (3 m) of upper Quaternary eolian cover is locally present*
USF2	*Early to Late Miocene, Upper Santa Fe HSUs, basin- floor facies 1 to 4, undivided; includes Camp Rice Formation subdivisions; up to 10 ft (3 m) of upper Quaternary eolian cover is locally present*
USFc	*Pliocene to Late Miocene, Upper Santa Fe HSUs, mostly proximal piedmont facies 6 and 8; includes Camp Rice Formation subdivisions*
MSF1	*Upper Tertiary, Middle Santa Fe HSUs, primarily conglomeratic piedmont facies 7 and 8; includes Fort Hancock and Rincon Valley Fm subdivisions*
MSF2	*Upper Tertiary, Middle Santa Fe HSUs, basin-floor facies undivided, primarily weakly to moderately indurated pebbley sandstones, sandstones and mudstones of facies 3, 4, and 9 (mostly in the zone of saturation); includes Rincon Valley Fm subdivisions. Note that unit only occurs in the subsurface beneath the central basin areas*
LSF	*Upper Tertiary, Lower Santa Fe HSUs, undivided piedmont and basin-floor facies 4, 7, 8, 9, and 10; fanglomerate, conglomerate, conglomeratic sandstone, siltstone, and mudstone with thin, fresh-water limestone tongues; mostly derived from local volcanic rocks. Basalt fanglomerate correlates with Hayner Ranch Fm. Note that unit is mostly buried in central basin areas and is saturated*

Basalts capping, intruded in, or interbedded with USF and MSF

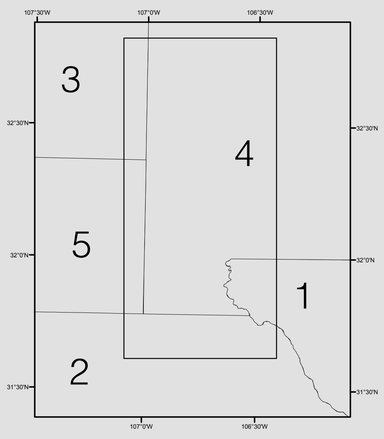
Qba	*Olivine Basalt of Aden Shield Volcano*
Qbac	*Lava-Lake Basalt of Aden Crater*
Qbm	*Maar Complexes*
Qt	*Air-fall and breccia - associated with Potrillo Maar, Kilbourne Hole, and HuntEs Hole maar volcanoes*
Qbc	*Cinder Cones*
Qb	*Olivine basalt - mostly, if not entirely, alkali-olivine basalt; primarily flows, with vent cones*
E/Qb	*Qb with eolian cover*

PRE-SANTA FE GROUP BEDROCK UNITS

Tb	*Basalt Flows and Plugs (Miocene)*
Tba	*Middle-Upper Tertiary: Basaltic-andesite and other intermediate composition flows (including Uvas Basalts)*
Tbai	*Middle-Upper Tertiary: Basaltic Andesite-intrusive masses; Uvas Intrusives*
Tmi	*Intermediate to silicic plutonic rocks (Oligocene) - monzodiorite to cyenite stocks in the Organ and Dona Ana Mountains*
Tmrs	*Middle Tertiary: Silicic pyroclastic and volcaniclastic rocks, mainly rhyolite and latite ash-flow tuffs and tuffaceous sandstones, with some basaltic-andesite flows*
Tmrp	*Middle Tertiary: Undifferentiated ash-flow tuffs, partly to densely welded, mostly rhyolitic; including tuffs of Cox Ranch, Achenback Park, and Cueva Tuff (Seager,1981)*
Tmrv	*Middle Tertiary: Silicic to intermediate composition lavas, mainly rhyolite, latite and dacite domes and flows; with some dacite breccias, silicic ash-flow tuffs and andesite flows. Includes Soledad Rhyolite in Organ Mountains and flow-banded rhyolite dikes and roots of domes in the Dona Ana Mountains and at Picacho Mountain*
Tmsp	*Middle Tertiary: Sedimentary rocks and tuffs*
Tri	*Intrusive rhyolite and breccia*
Tli	*Lower Tertiary: Intermediate-composition volcanic rocks, latite, dacite,and andesite intrusions, flows, and laharic breccia; aphyric to moderately porphyritic; generally fine grained; locally includes epiclastic rocks derived from Tli. Includes intrusions in the Vado Hill to Paso del Norte and Mt. Riley-Cox area; and correlative rocks include Tlvs*
Tlvs	*Lower Tertiary: Volcaniclastic sedimentary rocks and some andesite flows and breccias, including Palm Park and Rubio Peak Formations. Includes Orejon Andesite - interbedded andesitic to dacitic flows, laharic breccia, and other volcaniclastic rocks in the Organ Mountains (Seager, 1981)*
Tls	*Lower Tertiary: Mostly lower Eocene-Paleocene sedimentary rocks, sandstones, mudstones and conglomerates with minor or no volcaniclastic constituents, including Love Ranch Formation*
K	*Upper Cretaceous Sarten/Dakota Sandstone. Soft sandstone, shale, and siltstone and massive, crossbedded, gray quartzite; minor pelecypod coquina; approximately 260 ft (80 m) thick in southern San Andres Mountains*
Kl	*Lower Cretaceous Marine Rocks - Limestone-pebble conglomerate, sandy limestone, calcareous sandstone, pelecypod coquina, and silty, shaly limestone; approximately 1,550 ft exposed in East Potrillo Mountains 1,050 ft (320 m) reported in deep oil test, 15 mi (24 km) northeast of East Potrillo Mountains*
Pz	*Paleozoic Rocks, Undifferentiated*
P	*Permian Rocks, Undifferentiated - Primarily limestone, sandstone and red-bed mudstones*
PP	*Pennsylvanian and Permian Rocks, Undifferentiated-Primarily Limestone and redbeds, sandy mudstone, with shale, sandstone and gypsite*
P	*Pennsylvanian Rocks-Primarily limestone, with shale, sandstone, and gypsite*
Pzu	*Upper Paleozoic Rocks*
Pzm	*Middle Paleozoic Rocks, Devonian and Mississipian, primarily carbonate types, with shale*
Pzl	*Lower Paleozoic Rocks, Cambrian to Silurian, primarily carbonate types*
pC	*Precambrian Rocks (Undifferentiated)*
pCg	*Precambrian Rocks (grantitic) - coarse-grained granite cut by systems of northeast- or east-trending diabase-amphibolite dikes in Organ-southern San Andres Mountains (Seager 1981)*
pCr	*Precambrian Rocks (metarhyolite) of the Franklin Mountains (BEG, 1983)*
pCvs	*Precambrian Rocks (basaltic and metasedimentary) of the Franklin Mountains (BEG, 1983)*
pCm	*Precambrian Rocks (metamorphic, undifferentiated) of the Organ and southern San Andres Mountains (Seager, 1981)*

FEATURE

- fault
- approximate fault
- inferred fault
- concealed fault
- normal fault
- approximate normal fault
- inferred normal fault
- concealed normal fault
- approximate thrust fault
- thrust fault
- inferred thrust fault
- approximate syncline
- approximate anticline
- anticline
- inferred anticline
- overturned anticline
- syncline
- inferred syncline
- overturned syncline
- monocline
- inferred monocline
- low angle normal fault
- crater
- landslide
- line of craterlets



Sources

(1) Bureau of Economic Geology (BEG), 1983, Geologic atlas of Texas, Van-Horn-El Paso Sheet: The University of Texas at Austin, scale 1:250,000.

(2) DGGTN, no date, CD. Juarez H13-1, Cartas Geologica, Escala 1:250,000: Direccion General de Geografia del Territorio Nacional

(3) Seager, W.R., Clemons, R.E., Hawley, J.W., and Kelley, R.E., 1982, Geology of the northwest part of Las Cruces 1x2 degree quadrangle, New Mexico Bureau of Mines and Mineral Resources Geologic Map GM-53, scale 1:125,000

(4) Seager, W.R., Hawley, J.W., Kottlowski, F.E., and Kelley, S.A., 1987, Geology of the east half of Las Cruces and northeast El Paso 1x2 degree sheets, New Mexico: New Mexico Bureau of Mines and Mineral Resources Geologic Map GM-57, scale 1:125,000

(5) Seager, W.R., 1995, Geologic map of the southwest part of Las Cruces and northwest part of El Paso 1x2 degree sheets, New Mexico: New Mexico Bureau of Mines and Mineral Resources Geologic Map GM-60, scale 1:125,000.

1:100,142

0 2.5 5 10 Kilometers

0 2.5 5 10 Miles

N W E S