GEOLOGIC MAP
OF THE
KETTLEMAN HILLS, CALIFORNIA
AND
GENERALIZED STRATIGRAPHIC SECTIONS OF EXPOSED FORMATIONS

Geology by W. P. Woodring and Ralph Stewart, assisted by J. C. Miller and G. F. Taylor. Tulare formation, upper *Mya* zone, and strata between upper *Mya* and *Acila* zones mapped by J. C. Miller
Acila zone, *Trachycardium* zone, and *Pecten* zone by Ralph Stewart; *Neverita* zone by W. P. Woodring; interior of North Dome below *Neverita* zone by Ralph Stewart
interior of Middle Dome and South Dome below *Pecten* zone by W. P. Woodring

Surveyed in 1930-32

Scale 31680
1 0 1 Mile
5000 2500 0 5000 Feet
1 0 1 Kilometer

Contour intervals 5 and 25 feet
Datum is mean sea level

1940

EXPLANATION

NORTH DOME, MIDDLE DOME, AND SOUTH DOME

QUATERNARY

Pleistocene and Recent

Qe — Eolian deposits
(Sand)

Qaly — Younger alluvium
(Silt, silty sand)

Qalo — Older alluvium
(Silt, sand, gravel; in North Dome includes small areas of eolian deposits)

Pleistocene (?)

Tt — Tulare formation
(Sand, sandstone, gravel, conglomerate, silt, clay, limestone)

TERTIARY

Upper Pliocene — San Joaquin formation

Tsju — Upper part; top of upper *Mya* zone to base of *Pecten* zone
(Silt, clay, sand, sandstone, gravel, conglomerate)

Tsjl — Lower part; strata immediately underlying *Pecten* zone to base of Cascajo conglomerate member (or in North Dome to base of first blue sandstone above *Littorina* zone of Etchegoin formation)
(Silt, clay, sand, sandstone, gravel, conglomerate)

Middle Pliocene — Etchegoin formation

NORTH DOME	MIDDLE DOME	SOUTH DOME
Te 1 — Strata underlying Cascajo conglomerate member of San Joaquin formation (or underlying first blue sandstone above *Littorina* zone) to base of *Littorina* zone *(Silty sand, sandy silt, blue tuffaceous sandstone, brown sandstone, calitic limestone)*	Teu 1 — Strata underlying Cascajo conglomerate member of San Joaquin formation to base of *Pseudocardium–Anadara* zone *(Sandy silt, silty clay, lenticular sandstone)*	
Te 2 — Strata underlying *Littorina* zone to base of upper *Pseudocardium* zone (upper *Malinia* zone) *(Silt, sand, silty sand, local blue sandstone)*	Teu 2 — Strata underlying *Pseudocardium–Anadara* zone to base of *Pseudocardium*–bearing conglomerate *(Sandy silt, silty clay, blue sandstone, blue conglomerate)*	Teu — Upper part; including *Pseudocardium–Anadara* zone *(Sandy silt, silty clay, silty sandstone)*
Te 3-4 / Te 3 / Te 4 — Te 3, strata underlying upper *Pseudocardium* zone (upper *Malinia* zone) to base of blue conglomerate overlying *Siphonalia* zone *(Sandy silt, local blue conglomerate)*; Te 4, strata between top of *Siphonalia* zone and base of *Macoma* zone *(Sandy silt, light-colored tuffaceous sand)*; Te 3-4, strata Te 3 and Te 4, where not separately mapped	Teu 3 — Strata underlying *Pseudocardium*–bearing conglomerate *(Sandy silt, silty clay, silty sandstone)*	
Te 5 — *Patinopecten* zone *(Sandy silt, silty sand)*	Te — Lower part *(Soft sandstone; near top light-colored tuffaceous silt)*	Cc — Lower part *(Soft sandstone, hard sandstone, conglomeratic sandstone)*
Te 6 — Strata underlying *Patinopecten* zone *(Silt, sand, lenticular blue sandstone)*		

OTHER MAPPED UNITS
FOR STRATIGRAPHIC POSITION SEE GENERALIZED STRATIGRAPHIC SECTIONS

- am. Base of *Acila* zone of upper part of San Joaquin formation
- am. *Amnicola*-bearing sandstone near base of Tulare formation
- am. Fossiliferous layers in lower *Amnicola* zone of Tulare formation
- amu. Fossiliferous layers in upper *Amnicola* zone of Tulare formation
- cg. Base of Cascajo conglomerate member at base of San Joaquin formation
  Labeled only in North Dome where boundary between San Joaquin and Etchegoin formations is for convenience drawn at base of first blue sandstone of Etchegoin formation
- cg. Conglomerate and gravel in Tulare formation
- cgs. Conglomerate and sandstone in lower part of Etchegoin formation of South Dome
- cgs. Conglomerate in upper part of San Joaquin formation
- cl. Clay in lower part of San Joaquin formation
- cp. *Crepidula*-bearing sandstone in lower part of Etchegoin formation of South Dome
- fo. *Forreria*-bearing sandstone in lower part of Etchegoin formation of South Dome
- gc. Greenish silty clay in lower part of San Joaquin formation
- ls. Limestone in upper part of San Joaquin formation
- my. *Mya* layer in lower part of San Joaquin formation
- my 2. Second *Mya* layer (above *Littorina* zone of Etchegoin formation) in Etchegoin formation of North Dome
- my 3. Third *Mya* layer (above *Littorina* zone of Etchegoin formation) in lower part of San Joaquin formation
- my 4. Fourth *Mya* layer (above *Littorina* zone of Etchegoin formation) in lower part of San Joaquin formation
- ne. Base of *Neverita* zone of lower part of San Joaquin formation
- oy. Oyster-bearing sandstone in upper part of San Joaquin formation
- pas. *Patinopecten*-bearing sandstone in lower part of Etchegoin formation of South Dome
- pe. Base of *Pecten* zone of upper part of San Joaquin formation
  Labeled only on east flank of Middle Dome where boundary between upper and lower parts of San Joaquin formation is for convenience drawn at base of *Trachycardium* zone
- pef. Fossiliferous layers in *Pecten* zone of upper part of San Joaquin formation
- pels. Limestone in *Pecten* zone of upper part of San Joaquin formation
- psa. *Pseudocardium–Anadara* zone of upper part of Etchegoin formation. Labeled only in South Dome
- pss. *Pseudocardium*-bearing sandstone in upper part of Etchegoin formation of South Dome
- s 1. Fossiliferous sandstone beds in *Siphonalia* zone. Beds designated by the same symbol occupy the same relative position in zone but do not represent the same bed in all cases
- s 2.
- s 3.
- ss. Sandstone in lower part of San Joaquin formation
- ss 1. Hard tuffaceous sandstone in lower part of
- ss 2. Etchegoin formation of South Dome
- ss 3. Soft gray sandstone in lower part of Etchegoin formation of South Dome
- ty. *Trachycardium* zone of upper part of San Joaquin formation
- tss. Tuffaceous sandstone in lower part of San Joaquin formation
- tu. Tuff in lower part of San Joaquin formation
- oo. Oolite (upper oolite) in lower part of San Joaquin formation
- vo. *Volsella*-bearing sandstone in lower part of Etchegoin formation of South Dome

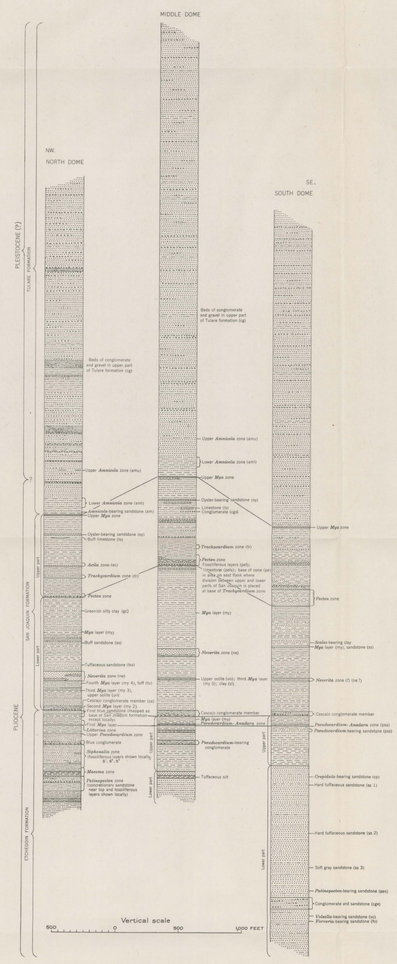
GEOLOGIC BOUNDARIES AND MAPPED UNITS

- Boundary or outcrop determined by exposures of mapped bed
- Boundary or outcrop determined by scattered exposures and float
- Boundary or outcrop inferred
- Boundary or outcrop doubtful

FAULTS

- Trace of exposed fault
- Trace of imperfectly exposed fault
- Trace of inferred fault
- Trace of doubtful fault

- Strike and dip of beds
- Approximate dip of beds, strike undetermined
- Horizontal beds
- Fossil locality



GENERALIZED STRATIGRAPHIC SECTIONS OF EXPOSED FORMATIONS
(Lithology of Tulare formation in Middle and South Domes not based on measured sections)

Base from U. S. Geological Survey topographic sheets