DIVISION OF MINES AND GEOLOGY Ian Campbell, *State Geologist*	STATE OF CALIFORNIA Ronald Reagan, *Governor* THE RESOURCES AGENCY Norman B. Livermore, *Administrator*	DEPARTMENT OF CONSERVATION James G. Stearns, *Director*

EXPLANATORY DATA

SALTON SEA SHEET

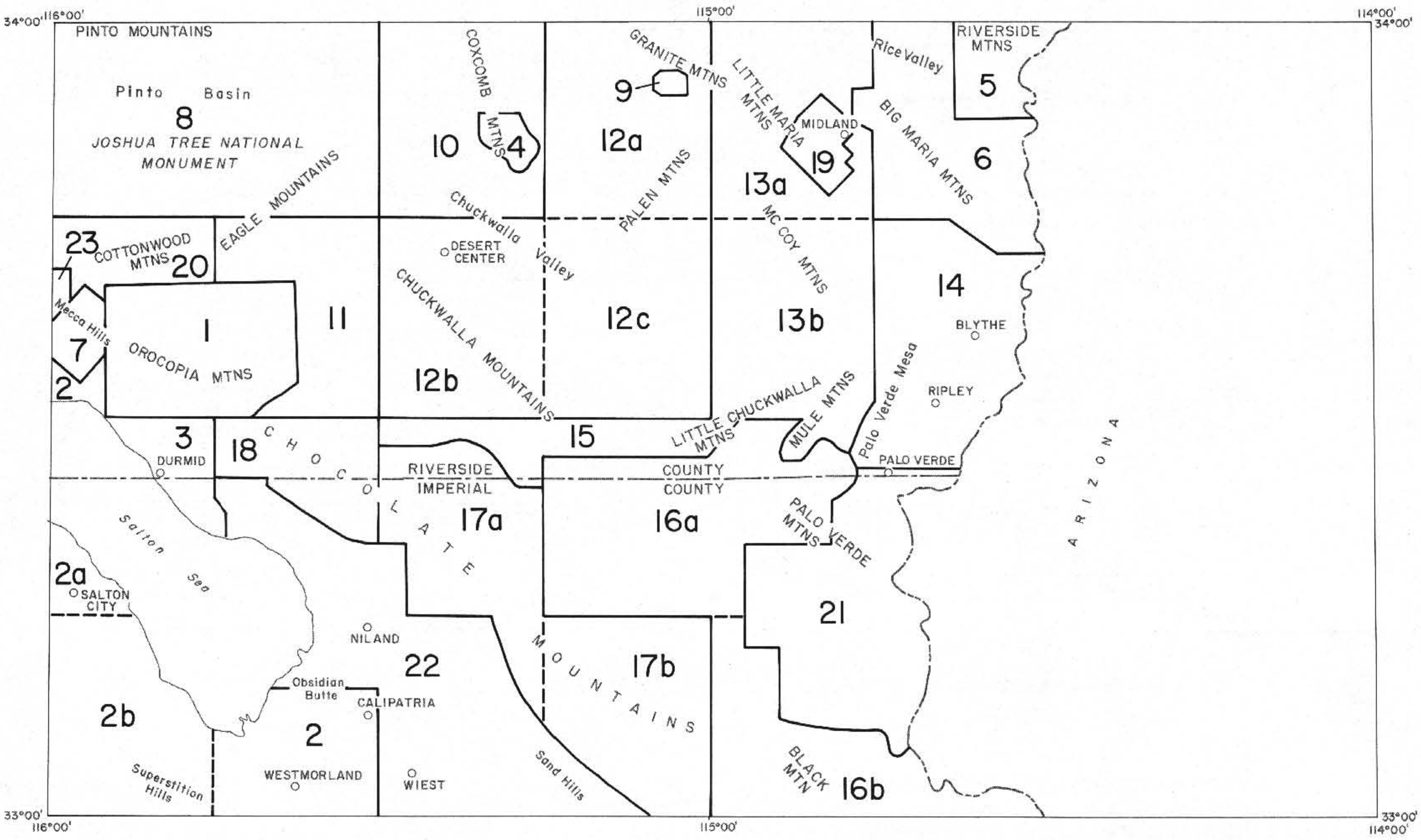
GEOLOGIC MAP OF CALIFORNIA

OLAF P. JENKINS EDITION

Compiled by Charles W. Jennings, 1967

INDEX TO GEOLOGIC MAPPING

USED IN THE COMPILATION OF THE SALTON SEA SHEET



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   Crowell, John C., 1962, Displacement along the San Andreas fault, California: Geol. Soc. America Special Paper 71, 61 p., fig. 3, scale 1 inch = approx. 3 miles.
   Crowell, John C. and Walker, John W. R., 1962, Anorthosite and related rocks along the San Andreas fault southern California: Univ. California Pubs. Geol. Sci. v. 40, no. 4, p. 219–288, Map 1, scale 1 inch = approx. 2 miles.
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*2. Dibblee, Thomas W., Jr., 1954, Geology of the Imperial Valley region, California: California Div. Mines Bull. 170, Chapt. II, Part 2, p. 21–28, Pl. 2, scale 1 inch = 6 miles. Also geologic maps of the following quadrangles:
   a) Durmid, scale 1:62,500, unpublished 1944,
   b) Kane Spring, scale 1:62,500, unpublished 1944.

3. Dibblee, Thomas W., Jr., 1954 (see above).
   Rieben, Hubert, Geology of the Mortmar-Durmid Hills area, scale 1:62,500, unpublished geological study, 1956.

4. Greene, R. Patrick, Metamorphosed McCoy Mountain Formation of the Coxcomb Mountains, California, scale 1:62,500, University California, Santa Barbara, M.A. thesis in progress, 1967.

5. Hamilton, Warren, 1964, Geologic map of the Big Maria Mountains NE quadrangle: U. S. Geol. Survey Geologic Quadrangle Maps of the United States, GQ-350, scale 1:24,000.

6. Hamilton, Warren, Reconnaissance geologic maps of the Big Maria Mountains quadrangle, scale 1:62,500 and the Blythe NE quadrangle, scale 1:24,000, unpublished 1964. (Quaternary units from photo interpretation by C. W. Jennings, California Div. Mines and Geology, 1966.)

7. Hays, William H., Geology of the central Mecca Hills, Riverside County, California, scale 1:14,400, Yale University, PhD thesis 1957.

8. Hope, Roger A., Geology and structural setting of the eastern Transverse Ranges, southern California, scale 1:62,500, University California, Los Angeles, PhD thesis 1966.
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9. Hoppin, Richard A., 1954, Geology of the Palen Mountains gypsum deposit, Riverside County, California: California Div. Mines Special Rept. 36, 25 p., Pl. 1, scale 1 inch = 800 feet.

10. Jennings, Charles W. and Rogers, Thomas H., Reconnaissance geologic mapping and photo interpretation of the Coxcomb Mountains quadrangle, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1964–65. (In part after R. A. Hope, item 8; R. H. Merriam, Reconnaissance geologic map of the Coxcomb Mountains quadrangle, scale 1:62,500, unpublished U.S.C. Faculty Research, 1955; F. L. Ransome, Metropolitan Water District tunnel location maps, scale 1 inch = 100 feet, and 1 inch = 1000 feet, unpublished 1931–32; and E. C. Harder, 1912, Iron ore deposits of the Eagle Mountains, California: U.S. Geol. Survey Bull. 503, 81 p., Pl. 1, scale 1 inch = 1000 feet.)

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12b. Jennings, C. W., Saul, R. B., and Rogers, T. H., Reconnaissance geologic mapping and photo interpretation of the Chuckwalla Mountains quadrangle, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1964. (Entrance Hill area in part after F. L. Ransome, Metropolitan Water District tunnel location map, scale 1 inch = 1000 feet, unpublished, 1931.)

†12c. Jennings, C. W., Saul, R. B., and Rogers, T. H., Reconnaissance geologic mapping and photo interpretation of the Sidewinder Well quadrangle, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1964. (Chuckwalla Mountains in part from Southern Pacific Company, Land Department, Regional geologic mapping program, T7S R17&18E SBB&M by J. Gamble, scale 1:24,000, unpublished, 1961.)

†13a. Jennings, Charles W. and Saul, Richard B., Reconnaissance geologic mapping and photo interpretation of a part of the Midland quadrangle, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1964. (In part after anonymous mining company maps.)

†13b. Jennings, Charles W. and Saul, Richard B., Reconnaissance geologic mapping and photo interpretation of the McCoy Spring quadrangle and N.E. part of the Palo Verde Mountains quadrangle, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1964.

14. Jennings, Charles W., Photogeologic interpretation for the State Geologic Map of parts of the Blythe NE, McCoy Wash, and Ripley quadrangles, scale 1:24,000, and part of the Palo Verde Mtns. quadrangle, scale 1:62,500, California Div. of Mines and Geology, 1966.

15. Jennings, Charles W. and Morton, Paul K., Reconnaissance geologic mapping and photo interpretation of a part of the Iris Pass and Chuckwalla Spring quadrangles, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1964–65.

16a. Morton, Paul K., Reconnaissance geologic mapping and photo interpretation of parts of the Chuckwalla Spring and Palo Verde Mountains qaudrangles, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1961.

16b. Morton, Paul K., Reconnaissance geologic mapping and photo interpretation of parts of the Quartz Peak quadrangle, scale 1:62,500, and parts of the Picacho, and Picacho SW, California-Arizona quadrangles, scale 1:24,000, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1962. (Miocene(?) fanglomerate based on information from D. G. Metzger and F. H. Olmsted, U.S.G.S., Yuma, Arizona, written communication 11/30/66.)

17a. Morton, P. K., Troxel, B. W., Weber, F. H., Jr., and Gray, C. H., Jr., Reconnaissance geologic mapping and photo interpretation of part of the Iris Pass and Iris quadrangle, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1961.

17b. Morton, P. K., Troxel, B. W., Weber, F. H., Jr., and Gray, C. H., Jr., Reconnaissance geologic mapping and photo interpretation of a part of the Acolita quadrangle, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1961.

18. Morton, Paul K. and Jennings, Charles W., Reconnaissance geologic mapping and photo interpretation of part of the Frink quadrangle, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1964 and 1966.

19. Shklanka, Roman, Repeated metamorphism and deformation of evaporite-bearing sediments, Little Maria Mountains, California, scale 1:12,000, Stanford University, PhD thesis 1963.

20. Southern Pacific Company, Land Department, Regional geologic mapping program; geologic map of T5S R10&11E, SBB&M by W. A. Oesterling, scale 1:24,000, unpublished 1958.
   Jennings, Charles W. and Rogers, Thomas H., Reconnaissance geologic mapping and photo interpretation of part of the Cottonwood Spring quadrangle, scale 1:62,500, California Div. of Mines and Geology reconnaissance mapping for the State Geologic Map, 1964.

21. Southern Pacific Company, Land Department, Regional geologic mapping program, geologic maps of T9S R21&22E, T10S R19–22E, T12S R20–22E SBB&M by E. A. Danehy, James Gamble, M. C. Gardner, and W. C. Coonrad, scale 1:24,000 unpublished 1960. (Details in Paymaster Mining District from J. B. Hadley, 1942, Manganese deposits in the Paymaster Mining District, Imperial County, California: U. S. Geol. Survey Bull. 931-S, p. 459–473, Pl. 75, scale 1 inch = 500 feet.) Miocene(?) fanglomerate based on information from D. G. Metzger, U.S.G.S., Yuma, Arizona, written communication 11/30/66.

‡22. Southern Pacific Company, Land Department, Regional geologic mapping program, geologic maps of T9S R13&14E, T10S R13&14E, T11S R13–16E, T12S R15& 16E SBB&M by E. A. Danehy, M. C. Gardner, and James Gamble, scale 1:24,000, unpublished, 1961.
   Jennings, Charles W., Photogeologic interpretation for the State Geologic Map of some Quaternary units and faults in the Amos, Acolita, and Frink NW quadrangles, scale 1:24,000, California Div. of Mines and Geology, 1966.

23. Ware, Glen C., Jr., The geology of a portion of the Mecca Hills, Riverside County, California, scale approx. 1:24,000, University of California, Los Angeles, M.A. thesis 1958.

* Modifications of ancient shoreline Lake Coahuila by George Stanley, Fresno State College, written communication 10/12/66.

† Quaternary alluvial deposits largely after F. W. Giessner, 1963. Data on water wells and springs in the Rice and Vidal Valley areas. Riverside and San Bernardino Counties, California: Fed.-State Coop. Ground Water Investigations. Bull. 91–8. Fig. 2: Map of the Chuckwalla Valley area. California, scale 1:63,360.

‡ Concealed trace of the San Andreas fault zone based on geophysical data from Shawn Biehler. Geophysical study of the Salton Trough of southern California, California Institute of Technology, PhD thesis 1964, scale 1 inch = about 18 miles, and written communication from Shawn Biehler, 12/10/66.

For a complete list of published geologic maps of this area see Division of Mines and Geology Special Reports 52 and 52-A.

STRATIGRAPHIC NOMENCLATURE— SALTON SEA SHEET

AGE	STATE MAP SYMBOL	STATE MAP UNIT State Map Units listed here are not necessarily in stratigraphic sequence; the sequence used has been standardized for all sheets of the Geologic Map of California	STRATIGRAPHIC UNITS AND CHARACTERISTIC LITHOLOGIES Formally named formations grouped in sequence (separated by semicolons) are listed from youngest to oldest.
CENOZOIC — QUATERNARY — Recent	Qs	**RECENT DUNE SAND**	Wind-blown sand, mostly in the form of dunes.
	Qal	**RECENT ALLUVIUM**	Alluvial sand, silt, clay, and gravel, including locally some older alluvium. Recent floodplain silt, sand, and clay of the Colorado River.
		RECENT VOLCANIC ROCKS:	
	Qrv^r	**RHYOLITIC**	Quaternary obsidian, rhyolite, and pumice composing the volcanic domes on the southeast shore of Salton Sea; locally obsidian flows interbedded with Quaternary lake beds; age less than 50,000 years according to Kistler and Obradovich.[1]
	Ql	**QUATERNARY LAKE DEPOSITS**	Playa deposits. Lake Coahuila (Cahuilla) Deposits—*claystone, sand, and beach gravel deposited in former extensive lake in Salton trough (locally undifferentiated from Qal); contains abundant nonmarine fossils.* Older lake beds and alluvial deposits above high shoreline of Lake Coahuila. Pinto Formation of Scharf—*coarse boulder fanglomerate and lacustrine clay underlying basalt flows in the Eagle and Pinto Mountains (contains vertebrate fossils of probable Pleistocene age).*
Pleistocene	Qc	**PLEISTOCENE NONMARINE SEDIMENTARY DEPOSITS**	Qc: older alluvium and fanglomerate, mostly dissected or with well-developed desert pavement and desert varnish. Brawley Formation—*red-gray clay, siltstone, sandstone, and pebble gravel of partly lacustrine and partly terrestrial origin* (shown as Ql where intimately associated with Lake Coahuila Deposits). Silt, sand and clay beds of Pleistocene age exposed in terrace west of Blythe. Qc_0: older folded or uplifted fan deposits, extensively dissected. Ocotillo Conglomerate—*gray boulder conglomerate, grading basinward into pink sand and clay.*
		PLEISTOCENE VOLCANIC ROCKS:	
	Qpv^r	**RHYOLITIC**	Quaternary (?) rhyolite plugs in Salton Wash.
	Qpv^b	**BASALTIC**	Highly vesicular olivine basalt flows in the Eagle, Cottonwood, and Pinto Mountains.
	QP	**PLIOCENE-PLEISTOCENE NONMARINE SEDIMENTARY DEPOSITS**	Conglomerate, schist breccia, arkose, and siltstone in the Mecca Hills area, containing vertebrate fossils of Pliocene or Pleistocene age (correlated by some geologists with the Palm Springs Formation). High alluvial fans with surface clasts much disintegrated (Big Maria Mtns. area). Moderately deformed fanglomerate in the northern Chocolate Mountains consisting of unsorted, poorly consolidated, pale gray-yellow sediments containing mostly angular volcanic clasts.
TERTIARY — Pliocene	Pc	**UNDIVIDED PLIOCENE NONMARINE SEDIMENTARY ROCKS**	Palm Spring Formation (Pc?)—*pink-gray laminated sandstones and red clays containing Pliocene and/or Pleistocene vertebrate fossils (west side Salton Sea).* Mecca Formation (?)[2]—*grayish-red to yellowish-brown basal conglomerate overlain by yellowish-gray arkose and arkosic conglomerate with Pliocene or Pleistocene vertebrate fossils.*
	Pu	**UPPER PLIOCENE MARINE SEDIMENTARY ROCKS**	Travertine containing brackish water fossils of Pliocene or Pleistocene age (Big Maria Mtns. area).[3] Estuarine deposits consisting of interbedded siltstone, fine-grained sandstone, marl, and calcarenite (Palo Verde Mtns. area).[3]
Miocene	Mc	**MIOCENE NONMARINE SEDIMENTARY ROCKS**	Fanglomerate (Miocene?) composed chiefly of cemented gravel, gray where pebbles are from granitic and metamorphic basement rocks, brown or reddish brown where from Tertiary volcanic rocks (southern Chocolate Mtns. and Palo Verde Mtns.).
Oligocene	Φc	**OLIGOCENE NONMARINE SEDIMENTARY ROCKS**	Unnamed nonmarine conglomerate, sandstone, breccia, mudstone and evaporite rocks of probable Oligocene or possible early Miocene age (Orocopia Mtns.).
Eocene	E	**EOCENE MARINE SEDIMENTARY ROCKS**	Maniobra Formation—*marine siltstone, sandstone, conglomerate, and breccia with some sandy limestone; lower and middle Eocene* (Orocopia Mtns.).
Undivided		**TERTIARY VOLCANIC ROCKS:**	
	Tv	**UNDIFFERENTIATED**	Undivided volcanic rocks of various compositions. Age of some uncertain; may be Quaternary in places.
	Tv^r	**RHYOLITIC**	Rhyolite porphyry dikes in the Eagle Mountains Metropolitan Water District aqueduct tunnel route. Rhyolitic rocks (Chocolate Mtns. and Palo Verde Mtns.). Dacite flows (Riverside Mtns.).
	Tv^a	**ANDESITIC**	Andesite flows (So. Chocolate Mtns.).
	Tv^b	**BASALTIC**	Basalt flows of uncertain age in the northern Chocolate Mtns. and Palen Mtns. Vesicular basalt flows forming flat-top ridges in the southern Chocolate Mountains (Oligocene? according to F. H. Olmsted, personal communication 11/30/66).
	Tv^p	**PYROCLASTIC**	Pyroclastic rocks, largely tuff, welded tuff, tuff breccia, agglomerate, and minor interbedded flows (Chocolate Mtns., Palo Verde Mtns.).
		TERTIARY INTRUSIVE (HYPABYSSAL) ROCKS:	
	Ti	**UNDIFFERENTIATED**	Tertiary hypabyssal rocks largely acidic in composition (Chocolate Mtns.). Dike rocks in the Eagle Mtns. Dioritic rocks (hypabyssal?) in the Frink quadrangle (northwestern part of Chocolate Mtns.) with a great number of related diabasic dikes and numerous later (Tertiary?) deuterically altered dikes or flows.
	Ti^r	**RHYOLITIC**	Rhyolitic dikes and other intrusive rocks.
	Ti^a	**ANDESITIC**	Volcanic plugs and intrusive masses, dominantly andesite.
	Tl	**TERTIARY LAKE DEPOSITS**	Borrego Formation (Tl-Ql?)—*lacustrine tan-gray clay shales and buff to gray sandstones, containing lenses of sodium sulfate near Bertram (N.E. side of Salton Sea); contains undiagnostic fossils of presumably Pliocene or Pleistocene age* (considered by T. W. Dibblee, Jr., 1954 to be the lacustrine equivalent of the Palm Spring Formation and also locally to overlie the Palm Spring Formation). Tertiary lacustrine sedimentary rocks, mostly well-bedded, white to gray, flaggy tuffs and thin beds of gray to brown limestone (southern Chocolate Mtns.).
	Tc	**TERTIARY NONMARINE SEDIMENTARY ROCKS**	Tertiary (?) well-indurated red fanglomerate of predominantly volcanic fragments with lesser amounts of schist and gneiss fragments, mineralized with manganese ore deposits along fault fissures and fractures (Paymaster Mining District, easternmost Imperial County). Megaconglomerate containing 10-foot blocks; monolithologic breccia consisting of clasts of marble, metadolomite, metachert or quartzite in solid matrix of their own composition; pink, maroon, gray-green, and yellow-brown clay and siltstone, and brick red sandstone and conglomerate (Riverside Mountains).
MESOZOIC		**MESOZOIC GRANITIC ROCKS:**	
	gr	**UNDIFFERENTIATED**	Granitic rocks of several types and ages, mostly Mesozoic but may include pre-Mesozoic; includes granite, quartz monzonite, alaskite, syenite porphyry, diorite, granodiorite. gr? = granitic porphyry of uncertain age at the north end of the McCoy Mountains containing manganese ore in brecciated zones.
	gr^a	**ADAMELLITE (QUARTZ MONZONITE)**	Quartz monzonite of the Pinto Mtns., Hexie Mtns., and Eagle Mtns. Leucogranite, alaskite and aplite in the Little Maria Mtns.
	gr^g	**GRANODIORITE**	Coxcomb Granodiorite— *granodiorite of the Coxcomb, Hexie, and Eagle Mtns.*
	gr^t	**TONALITE (QUARTZ DIORITE)**	Metadiorite in the Little Maria Mtns. (may be Precambrian). Dioritic rocks in the southern Eagle Mtns.
	bi	**MESOZOIC BASIC INTRUSIVE ROCKS**	Gold Park Gabbro-Diorite—*hornblende diorite porphyry in the Pinto Mountains* (may be Precambrian). Hornblende gabbro, gabbro-diorite, and related basic intrusive rocks.
	gr-m	**PRE-CENOZOIC GRANITIC AND METAMORPHIC ROCKS**	Mixed rocks consisting mostly of Mesozoic (?) granitic rocks which have intruded older (Precambrian?) gneisses and schists.

STRATIGRAPHIC NOMENCLATURE—Continued

AGE	STATE MAP SYMBOL	STATE MAP UNIT State Map Units listed here are not necessarily in stratigraphic sequence; the sequence used has been standardized for all sheets of the Geologic Map of California	STRATIGRAPHIC UNITS AND CHARACTERISTIC LITHOLOGIES Formally named formations grouped in sequence (separated by semicolons) are listed from youngest to oldest.
		PRE-CRETACEOUS METAMORPHIC ROCKS,	
	m	**UNDIFFERENTIATED**	McCoy Mountain Formation (undifferentiated)— *predominantly metasedimentary rocks (slate, schist, phyllite, metaconglomerate), with lesser amounts of metavolcanic rocks (metatuff and other metapyroclastic rocks)*; subdivided into ms and mv in most areas. Metasandstone, metaconglomerate, phyllite, meta-andesite and other volcanic rocks of basic composition in the Chocolate Mtns. (tentatively correlated with McCoy Mountain Formation). Albite-quartz-biotite schist in the Palen Pass area. Metavolcanic and metasedimentary rocks undivided, in the Big Maria Mtns. (age uncertain, although younger than Middle Permian).
	ls	**LIMESTONE AND/OR DOLOMITE**	Dolomite and marble in the Eagle Mtns., locally replaced by iron ore (hematite and magnetite) and in part metamorphosed to rock containing actinolite, tremolite, garnet, serpentine, diopside, and muscovite.
	ms	**PRE-CRETACEOUS METASEDIMENTARY ROCKS**	McCoy Mountains Formation (metasedimentary rocks)—*predominantly metasandstone, phyllite, metaconglomerate, quartzite, argillite with minor amounts of metavolcanic rocks* (areas predominantly metavolcanic shown as mv), age uncertain (possibly Paleozoic or Triassic). Orocopia Schist—*albite-chlorite-sericite schist* (age uncertain, considered to be Mesozoic by some geologists, Precambrian by others).[4] Low grade Upper Permian (?) and Mesozoic metasedimentary rocks in the Riverside Mountains consisting of sandstone and slate, phyllite, white calcareous schist, calcareous metasandstone, metaconglomerate, and some calcite and dolomite marble. Quartzite, hornfels, schist, metaconglomerate, marble and dolomite in the Eagle and Pinto Mountains. ms_s = Metasedimentary rocks in the Chocolate Mountains, predominantly schist, tentatively correlated with the Orocopia schist—includes sericite-albite-schist, quartz-sericite-schist, biotite schist, actinolite schist, phyllite, and quartzite.
	mv	**PRE-CRETACEOUS METAVOLCANIC ROCKS**	McCoy Mountains Formation (metavolcanic rocks)—*greenish gray-brownish gray, well bedded, fine-grained metatuff* (southern parts of the Coxcomb, Palen, and McCoy Mountains. Piemontite metatuff in the central Palen Mountains. Metatuff, greenstone, and greenschist in the Riverside Mountains.
PALEOZOIC	IP	**PALEOZOIC MARINE SEDIMENTARY AND METASEDIMENTARY ROCKS,**	Maria Formation—*quartzite, schist, wollastonite hornfels, and metasandstone with thick beds of gypsum and anhydrite* (Palen Pass area and Little Maria Mountains).[5] Marine metasedimentary rocks including calcite and dolomite marble, quartzite, calc-silicate rocks, and schist (Big Maria Mtns.).[5]
PALEOZOIC	ls	**LIMESTONE AND/OR DOLOMITE**	Marble, siliceous marble, and dolomitic marble (Palen Pass area and Little Maria Mtns.).[5]
PRECAMBRIAN		**UNDIVIDED PRECAMBRIAN METAMORPHIC ROCKS:**	
PRECAMBRIAN	p€g	**GNEISS**	Pinto Gneiss—*quartz biotite gneiss and some quartzite*. Predominantly gneissic parts of the Chuckwalla Complex (shown elsewhere as p€c). Gneiss, augen gneiss, granitic gneiss, some amphibolite, migmatite, hornblendite and quartzite. Precambrian age of these rocks is uncertain and is based largely on lithologic comparison with similar rocks in the Marble Mountains to the north which underlie fossiliferous Cambrian strata, and one radiometric age date of 2,400 million years from a migmatite gneiss in the Orocopia Mountains.[6]
PRECAMBRIAN	p€	**UNDIFFERENTIATED**	White and gray quartzite with minor schist underlying the Pinto Gneiss in the southern Eagle Mountains.
PRECAMBRIAN	p€gr	**UNDIVIDED PRECAMBRIAN GRANITIC ROCKS**	Gabbro, diorite, anorthosite, syenite and related rocks (Orocopia Mtns.). Metagranite and granite gneiss (Big Maria and Riverside Mtns.). Elsewhere foliated granitic rocks, some gneissic. Precambrian age of some of these rocks is uncertain.
PRECAMBRIAN	p€c	**PRECAMBRIAN IGNEOUS AND METAMORPHIC ROCK COMPLEX**	Chuckwalla Complex—*undivided gneiss and schist with intrusive metaigneous rocks*. Gneiss complex in the Riverside and Big Maria Mountains. The Precambrian age of some of these rocks is uncertain.

NOTES

[1] Oral communication, 1964, cited in B. R. Doe, C. E. Hedge, and D. E. White, 1966, Preliminary investigation of the source of lead and strontium in deep geothermal brines underlying the Salton Sea geothermal area: Econ. Geol. v. 61, pp. 462–483.

[2] Mecca Formation as defined and mapped by W. H. Hays (1957, unpublished) in the Mecca Hills area. This differs from the Mecca Formation as defined and mapped by T. W. Dibblee, Jr., 1954.

[3] Hamilton, Warren, 1960, Pliocene(?) sediments of salt water origin near Blythe, southeastern California: U. S. Geol. Survey Prof. Paper 400-B, p. B276–277 and written communication from Patsy Smith, U.S.G.S. 12/12/66.

[4] The Orocopia Schist was considered to be probably Precambrian by W. J. Miller, 1944, Geology of the Palm Springs-Blythe strip, Riverside County, California: California Jour. Mines and Geol., v. 40, no. 1, p. 21, and subsequently by T. W. Dibblee, Jr., 1954, and others. Recently J. C. Crowell and John W. R. Walker, 1962, (map 1) indicated a Mesozoic age for these rocks.

[5] The age of these rocks was considered to be Paleozoic by Miller (1944, p. 28) based on the tentative identification of crinoidal remains. Hamilton (personal communication, 1966), has correlated these rocks lithologically with Permian and older rocks in the Plomosa Mountains, Arizona, 35 miles east of the Big Maria Mountains.

[6] Bushee, Jonathan, and others, 1963, Lead-alpha dates for some basement rocks of southwestern California: Geol. Soc. America Bull. v. 74, no. 6, pp. 803–806.

Crescentic dunes or barchans near the southwest shore of Salton Sea. View toward the north with the edge of Salton Sea in the upper right hand corner of photograph. The horns of these graceful barchan dunes point eastward in the direction of the wind (left to right), while the upwind surface presents a streamlined form to the wind. The dunes are migrating gradually toward Salton Sea. *Photo by R. C. Frampton, 1956.*

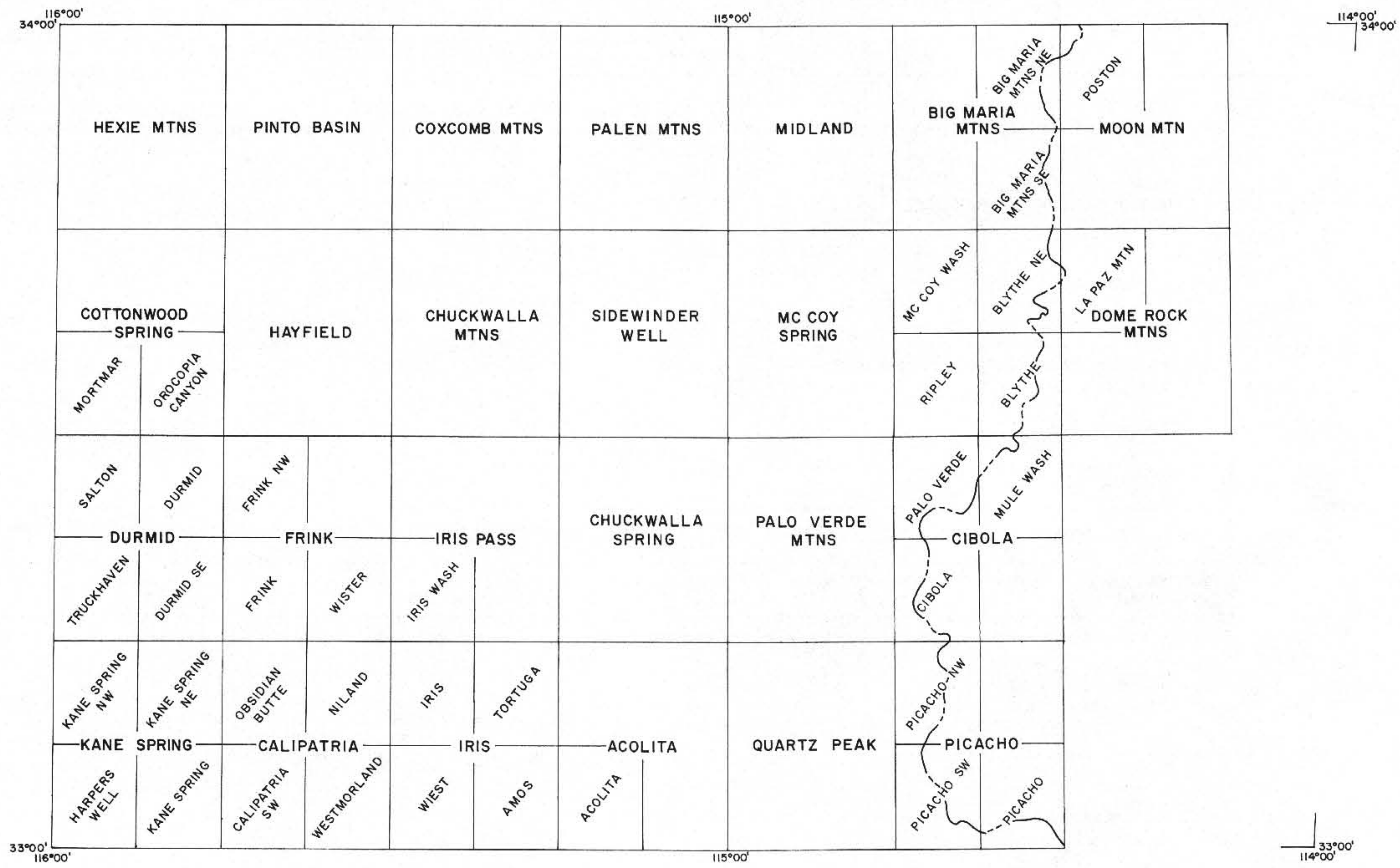
TOPOGRAPHIC QUADRANGLES

WITHIN THE SALTON SEA SHEET

AVAILABLE FROM THE U.S. GEOLOGICAL SURVEY

FEDERAL CENTER, DENVER, COLORADO 80225

1967



View of Salton Sea area from Gemini 5, 100 miles high. Salton Sea, 35 miles long, lies in the Salton trough, bounded by the cultivated fields of Imperial Valley to the south (right) and the Coachella Valley to the northwest (left). L.M. = Little Maria Mountains, P = Palen Mountains, G = Granite Mountains, Cox. = Coxcomb Mountains, Pin. = Pinto Mountains, E = Eagle Mountains, H = Hexie Mountains, C = Chuckwalla Mountains, L.C. = Little Chuckwalla Mountains, C.M. = Chocolate Mountains, O = Orocopia Mountains, S.R. = Santa Rosa Mountains, F.C. = Fish Creek Mountains. *Photo by NASA, 1965.*