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REGIONAL GEOLOGIC MAP SERIES
SAN BERNARDINO QUADRANGLE--MAP NO. 3A (GEOLOGY)
SHEET 2 OF 5

SOUTHWEST OF SAN ANDREAS FAULT

CENOZOIC — QUATERNARY — Holocene

Q — ALLUVIUM
Undifferentiated alluvium, including alluvium, colluvium, and some older alluvium, and fanglomerate.

Qw — WASH DEPOSITS
Alluvial deposits occurring in modern washes of rivers and streams and in washes of young alluvial fans.

Qyw — YOUNGER WASH DEPOSITS
Alluvial deposits of abandoned washes or intermittently active alluvium of older washes.

Qya — YOUNGER ALLUVIUM
Slightly dissected alluvial deposits of sand and gravel.

Qyf — YOUNGER FAN DEPOSITS
Fan deposits of sand and gravel; continuous or intermittent deposition (incipient soil development with thin A horizon).[1]

Qf — FAN DEPOSITS
Slightly dissected fan deposits of sand and gravel (soils have A horizons and slight to well developed C_m horizons).[1]

Qs — WIND-BLOWN SAND
Dune sand, including both active and stabilized dunes.

Qls — SELECTED LARGE LANDSLIDE DEPOSITS

CENOZOIC — QUATERNARY — Pleistocene

Qo — OLDER ALLUVIUM
Dissected alluvial deposits.

Qof — OLDER FAN DEPOSITS
Moderately dissected fan deposits of sand and gravel (soils characterized by B horizon, ranging from Cambic B to good textural B).[1]

Qod — WELL DISSECTED ALLUVIAL FANS
Well to very well dissected fan deposits (soils have very mature, thick, textural B horizons).[1]

CENOZOIC — TERTIARY — Pliocene

Pf — FERNANDO FORMATION
Upper member - Upper Pliocene marine siltstone and sandstone; includes rocks commonly called Pico Formation.
Lower member - Middle and lower Pliocene. Marine conglomerate, siltstone, and fine sandstone; includes rocks commonly called Repetto Formation. Also includes nonmarine Duarte Conglomerate.

QTst — SAN TIMOTEO FORMATION
Nonmarine sandstone, siltstone, conglomerate, and shale; forms extensive badlands (near Redlands).

Pj — JUNIPER HILLS FORMATION
Nonmarine sandstone, conglomerate, siltstone, and shale. Formerly included in Punchbowl Formation (Noble, 1954).

Pa — ANAVERDE FORMATION
Nonmarine sandstone and shale with interbeds of gypsiferous shale (San Andreas Fault Zone).

Ppb — PUNCHBOWL FORMATION
Mostly light-buff, well consolidated, cobbly to pebbly sandstone; minor siltstone in upper part. Formerly eastern facies of Punchbowl Formation (Noble, 1954). Nonmarine.

CENOZOIC — TERTIARY — Miocene

Mpe — PUENTE FORMATION
Marine siltstone, sandstone, and shale; minor conglomerate and siliceous shale. Calcareous concretions common in upper part.

Mtp — TOPANGA FORMATION
Marine sandstone and conglomeratic sandstone.
Locally interbedded with upper part of Glendora Volcanics.

Mgv — GLENDORA VOLCANICS
Not necessarily in stratigraphic sequence:
- Mgv[a] - andesite
- Mgv[r] - basalt
- Mgv[f] - rhyolite and dacite

CENOZOIC — TERTIARY — Oligocene

Qm — MOUNTAIN MEADOWS BIOTITE-DACITE PORPHYRY
Lenticular bodies in Dalton Canyon area.

Tgr — TERTIARY GRANITIC ROCKS
Includes Stoddard Canyon Quartz Monzonite and unnamed quartz monzonite porphyry rocks.

Qvz — VASQUEZ FORMATION, VOLCANIC MEMBER
Andesite, dacite, and tuff (south of Punchbowl Fault, near Littlerock).

MESOZOIC — CRETACEOUS

Kgr — GRANITIC ROCKS
Predominantly quartz monzonite and granodiorite in the San Gabriel Mountains; includes "Woodson Mountain Granodiorite" of Larsen (1948) (Jurupa Mountains).

Kqd — QUARTZ DIORITE
Includes "Bonsall Tonalite" of Larsen (1948) (Jurupa Mountains).

Kgb — GABBROIC AND DIORITIC ROCKS
San Marcos Gabbro of Larsen (1948) (Jurupa Mountains). Includes K'gb of Dibblee in San Gabriel Mountains.

ps — PELONA SCHIST
Feldspar-quartz-mica schist; massive amphibolite, minor quartzite. Metamorphic age is Paleozoic; age of parent rock is unknown.

Ksf — SAN FRANCISQUITO FORMATION
Predominantly massive marine sandstone and dark, thin-bedded shale; sandstone contains pebbly and conglomeratic layers with minor limestone lenses (San Gabriel Mountains).

KJqm — QUARTZ MONZONITE OF PLEASANT VIEW RIDGE

MESOZOIC — JURASSIC

Kgd — MOUNT LOWE GRANODIORITE
Light colored, foliated, quartz-poor rocks of monzonitic to dioritic composition, commonly with distinctive porphyritic textures including a variety with distinct hornblende phenocrysts.

gb — GABBRO OF PLEASANT VIEW RIDGE
Mafic dioritic and gabbroic rocks. Age uncertain, but intruded by Triassic Mount Lowe Granodiorite.

m_1 m_2 m_3 m_4 — SHEARED AND DEFORMED METAMORPHIC ROCKS OF UNCERTAIN AGE (PRECAMBRIAN? - MESOZOIC)
- m_1 - Gneissic rocks, in part cataclastically deformed: Locally includes undeformed to slightly deformed plutonic rocks and migmatite. Mesozoic and pre-Mesozoic age.
- m_2 - Mylonitic rock associated with the Vincent thrust; probable Mesozoic age.
- m_3 - "Black Belt" mylonite of Alf (1948) as modified by Morton (1975 and unpublished). Mylonite and cataclasite together with relatively undeformed Cretaceous quartz-dioritic rock. Probable Mesozoic age.
- m_4 - High grade (amphibolite-granulite facies), cataclastically deformed rocks along the southern edge of the San Gabriel Mountains. Locally includes lenticular masses of relatively undeformed quartz diorite. May be Mesozoic, but could be as old as Precambrian; includes charnockite near Dry Canyon.

PALEOZOIC

ms — METASEDIMENTARY ROCKS OF UNCERTAIN AGE
Quartzite, phyllite, and schist; includes San Antonio Canyon Group.
ls = limestone and marble

PRECAMBRIAN

NORTHEAST OF SAN ANDREAS FAULT

CENOZOIC — QUATERNARY — Holocene

Q — ALLUVIUM
Unconsolidated, poorly sorted stream, fan, and basin deposits; clay to boulder size.

Qw — WASH DEPOSITS
Alluvial deposits occurring in modern washes of rivers and streams; may include older wash deposits.

Qs — WIND-BLOWN SAND

Ql — LAKE DEPOSITS
Clay, silt, and fine sand. Minor evaporite lenses; in part interbedded with alluvium.

Qls — SELECTED LARGE LANDSLIDE DEPOSITS

CENOZOIC — QUATERNARY — Pleistocene

Qo — OLDER ALLUVIUM
Dissected alluvial deposits.

Qh — HAROLD FORMATION AND SHOEMAKER GRAVEL
Fine to coarse-grained sediments (north margin San Gabriel Mountains). Nonmarine.

Qod — WELL DISSECTED ALLUVIAL FANS
Well to very well dissected fan deposits.

Qol — OLDER LAKE DEPOSITS
Dissected Pleistocene lake beds in Mojave Desert, includes Manix Lake beds.

Qg — GLACIAL TILL AND OUTWASH
(Mt. San Gorgonio)

Qv — BASALT
Includes basalt of Pisgah and Sunshine Peak craters; also flows in Bristol, Bullion, and Rodman mountains.
- Cinder cone

CENOZOIC — TERTIARY — Pliocene

Pj — JUNIPER HILLS FORMATION
Nonmarine sandstone, conglomerate, siltstone, and shale. Formerly included in Punchbowl Formation (Noble, 1954).

Pcr — CROWDER FORMATION
Nonmarine arkosic sandstone and conglomerate, with minor siltstone, mudstone, and tuff (north margin San Gabriel Mountains).

Pow — OLD WOMAN SANDSTONE
Arkosic sandstone and conglomerate with minor siltstone. Contains abundant basalt clasts. Nonmarine. (north side San Bernardino Mountains).

QT — PLIOCENE - PLEISTOCENE CONTINENTAL DEPOSITS
Unnamed fanglomerate deposits (Cady Mountains and Coachella Valley). Includes "Yermo Formation" of McCulloh - sandstone, conglomeratic sandstone, and conglomerate (Calico Mountains).

CENOZOIC — TERTIARY — Miocene

Mcv — PUNCHBOWL (?) FORMATION OF CAJON VALLEY
Nonmarine arkosic conglomerate and conglomeratic sandstone; interbedded shale, siltstone, lignite, and limestone (Woodburne and Golz, 1972). Nonmarine.

Msa — SANTA ANA SANDSTONE
Nonmarine sandstone, conglomeratic sandstone, and silty sandstone.
Basalt flows near top of section (San Bernardino Mountains).

Mt — TROPICO GROUP
Conglomerate, arkosic sandstone, siltstone, tuff, basalt breccia, shale, limestone, and chert. Includes Bissel and Gem Hill formations (Kramer Hills area). All nonmarine.

Mcf — COACHELLA FANGLOMERATE
Boulder, cobble, and pebble fanglomerate with interbedded sand and silt (southwest of Morongo Valley).

Mb — BARSTOW FORMATION
Mb - Nonmarine sandstone, siltstone, conglomerate, and tuff. Calico Mountains and vicinity.
Mb' - Volcanic flows.
- Mb'

Mc — UNNAMED MIOCENE CONTINENTAL DEPOSITS
Upper Miocene - Sandstone in Joshua Tree and Morongo Valley 15' quadrangles.
Lower Miocene - Sandstone, conglomerate, siltstone, and mudstone; minor limestone; commonly interbedded with volcanic flows and tuff; may include rocks of Oligocene age.
Mcls - Limestone and claystone in Newberry and Daggett 15' quadrangles.
- Mcls

Mp — POTATO SANDSTONE
Sandstone, siltstone, conglomerate, and breccia with subordinate limestone; includes Mill Creek Formation of Gibson (1971). Occurs in San Andreas Fault Zone. Nonmarine.

Mv — MIOCENE VOLCANIC ROCKS
Not necessarily in stratigraphic sequence:
- Mv[a] - Andesite; includes andesite in Barstow and Hector formations.
- Mv[r] - Basalt; includes Red Butte Quartz Basalt, basalt in Hector and Barstow formations, and basalt in Coachella Fanglomerate.
- Mv[d] - Dacite to rhyolite; includes dacite and rhyolite in Hector Formation.
- Mv[p] - Pyroclastic rocks and lahars.

Mv — MIOCENE - PLIOCENE VOLCANIC ROCKS
- Mv[r] - basalt
- Mv[f] - rhyolite tuff

Mh — HECTOR FORMATION
Nonmarine volcaniclastic sandstone, siltstone, conglomerate, and mudstone. Interbedded tuff, limestone, and basalt flows (Cady Mountains).

Mv — VAQUEROS (?) FORMATION
Marine arkosic sandstone, siltstone, and conglomerate with minor limestone (Cajon Valley).

Mf — MIOCENE SHALLOW INTRUSIVE ROCKS
Not necessarily in stratigraphic sequence:
- Mf - andesite
- Mf' - basaltic (Central Bullion Mountains)
- Mf'' - dacitic and rhyolitic

Mph — PICKHANDLE AND JACKHAMMER FORMATIONS
Tuff, tuff breccia, agglomerate, tuffaceous sandstone, dacite flows, and mudflows (Calico Mountains).

MESOZOIC — CRETACEOUS

TKsf — SAN FRANCISQUITO (?) FORMATION
Deltaic sandstone and siltstone with minor marine limestone beds (Cajon Valley).

MESOZOIC — JURASSIC

Mtv — METAVOLCANIC ROCKS
Includes Sidewinder, Hodge, and Ord Mountain volcanics; porphyry complex and unnamed metavolcanic rocks.

JKgr — GRANITE

KJqm — QUARTZ MONZONITE

Jmz — MONZONITE

JKgd — GRANODIORITE

Jqd — QUARTZ DIORITE

Jhd — HORNBLENDE DIORITE AND MINOR GABBRO

Mzq — QUARTZITE
May include Artez Sandstone equivalent; locally conglomeratic (Black Mountain in Apple Valley Quadrangle).

MESOZOIC — TRIASSIC

Ttv — FAIRVIEW VALLEY FORMATION
Limestone, calcareous sandstone and siltstone, and carbonate-cobble conglomerate.

Tmz — MONZONITE

PALEOZOIC

wg — WATERMAN GNEISS
Cataclastically deformed rocks of uncertain age. May include Precambrian to Mesozoic rocks. Occurs in Barstow area.

Pzls — UPPER PALEOZOIC LIMESTONE AND MARBLE
May include Sultan and Monte Cristo limestones, and Bird Spring Formation. Formerly grouped with other limestone units as part of the "Oro Grande Group" or as part of the "Furnace Limestone." Locally contains bodies of chert.

ms — METASEDIMENTARY ROCKS OF UNCERTAIN AGE
Quartzite, phyllite, and schist.
ls = limestone and marble

m_1 — SHEARED AND DEFORMED METAMORPHIC ROCKS
Gneissic rocks, in part cataclastically deformed; locally includes undeformed to slightly deformed plutonic rocks and migmatite. Mesozoic and pre-Mesozoic age.

PRECAMBRIAN

Ꞓls — CAMBRIAN AND UPPERMOST PRECAMBRIAN METASEDIMENTARY ROCKS
Ꞓls - Crystalline limestone. Includes Carrara Formation, Bonanza King Formation, and Nopah Formation. Formerly grouped with other limestone units as part of the "Oro Grande Group" or as part of the "Furnace Limestone."
Ꞓq - Quartzite. Includes Wood Canyon Formation and Zabriski Quartzite. Formerly grouped with other quartzite units as part of the "Oro Grande Group" or part of the "Saragossa Quartzite."
- Ꞓq

pꞒs — LATE PRECAMBRIAN METASEDIMENTARY ROCKS
p Ꞓs - Undivided metasedimentary rocks.
p Ꞓq - Undivided clastic metasedimentary rocks, principally quartzite. These rocks were formerly included in the "Oro Grande Group," "Furnace Limestone," and "Saragossa Quartzite" (Victorville and Big Bear Lake areas). Structurally more deformed than "metasedimentary rocks of uncertain age."
- pꞒq

pꞒb — BALDWIN GNEISS
Predominantly orthogneiss (metaplutonic rocks) with paragneiss (metasedimentary rocks). Minor schist, limestone, and marble.

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FOOTNOTE

[1]Soil-horizon nomenclature from Birkeland, P.W., 1974, Pedology, weathering, and geomorphological research: New York, Oxford University Press, 285 p.

EXPLANATION FOR THE GEOLOGIC MAP OF THE SAN BERNARDINO QUADRANGLE, CALIFORNIA, 1986

(Revised, 1998)