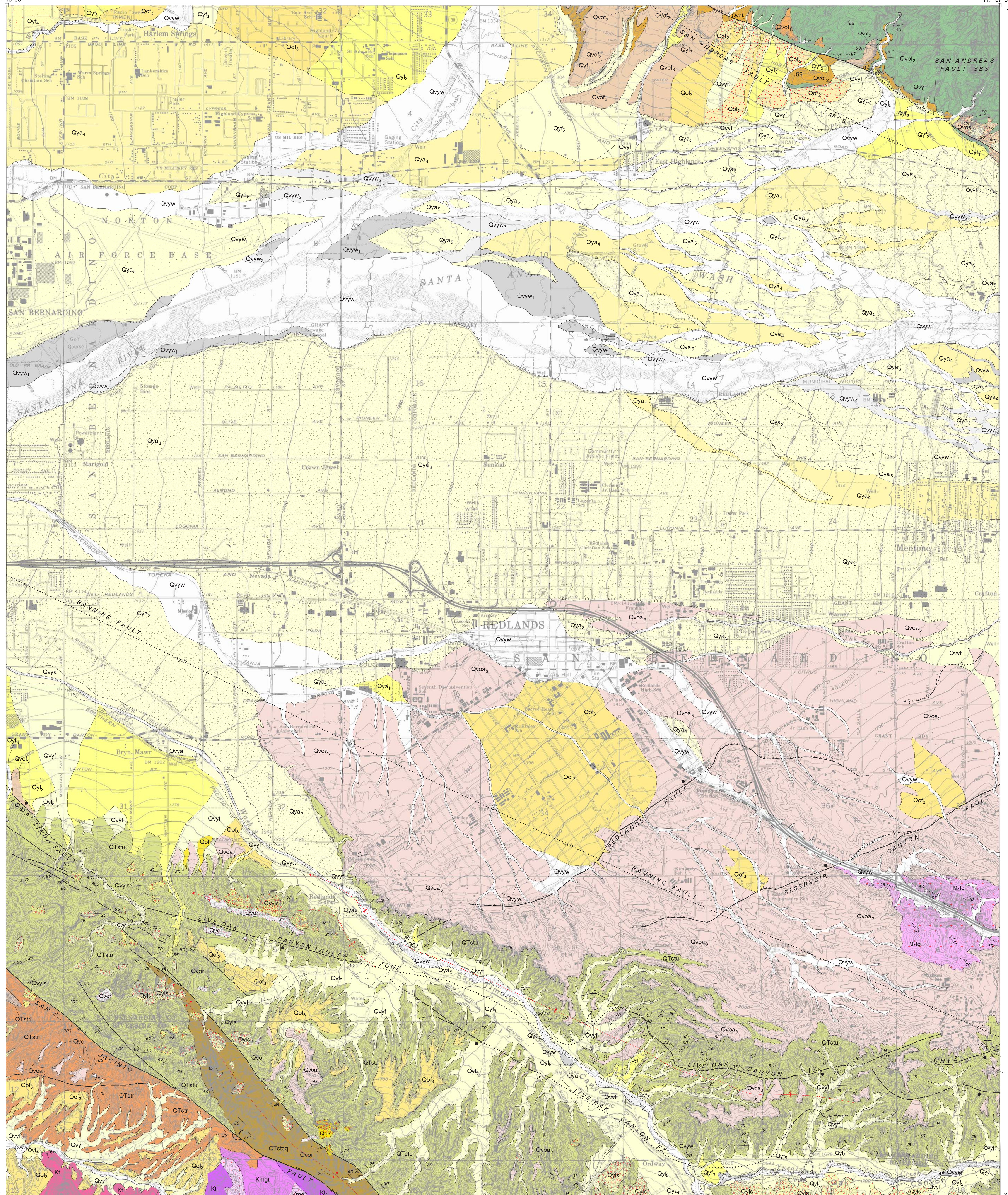

Base from U.S. Geological Survey
Redlands, 1967, photorevised 1980

Polyconic projection

SCALE 1:24,000

CONTOUR INTERVAL 20 FEET

Geologic features that are located with an accuracy and precision of + or - 15 m meet the geologic-map accuracy standard

Geology mapped by J.C. Matti, 1980-1986, 1997; D.M. Morton, 1977; B.F. Cox, 1980; K.J. Kendrick, 1996-1998

Geology of urbanized areas mapped from 1938- and 1953-vintage aerial photographs; in many places, human modifications obscure depicted geology

Updates and revises a previous geologic map of the Redlands 7.5' quadrangle (Morton, 1978)

GEOLOGIC MAP OF THE REDLANDS 7.5' QUADRANGLE, SAN BERNARDINO AND RIVERSIDE COUNTIES, CALIFORNIA

Version 1.0

By

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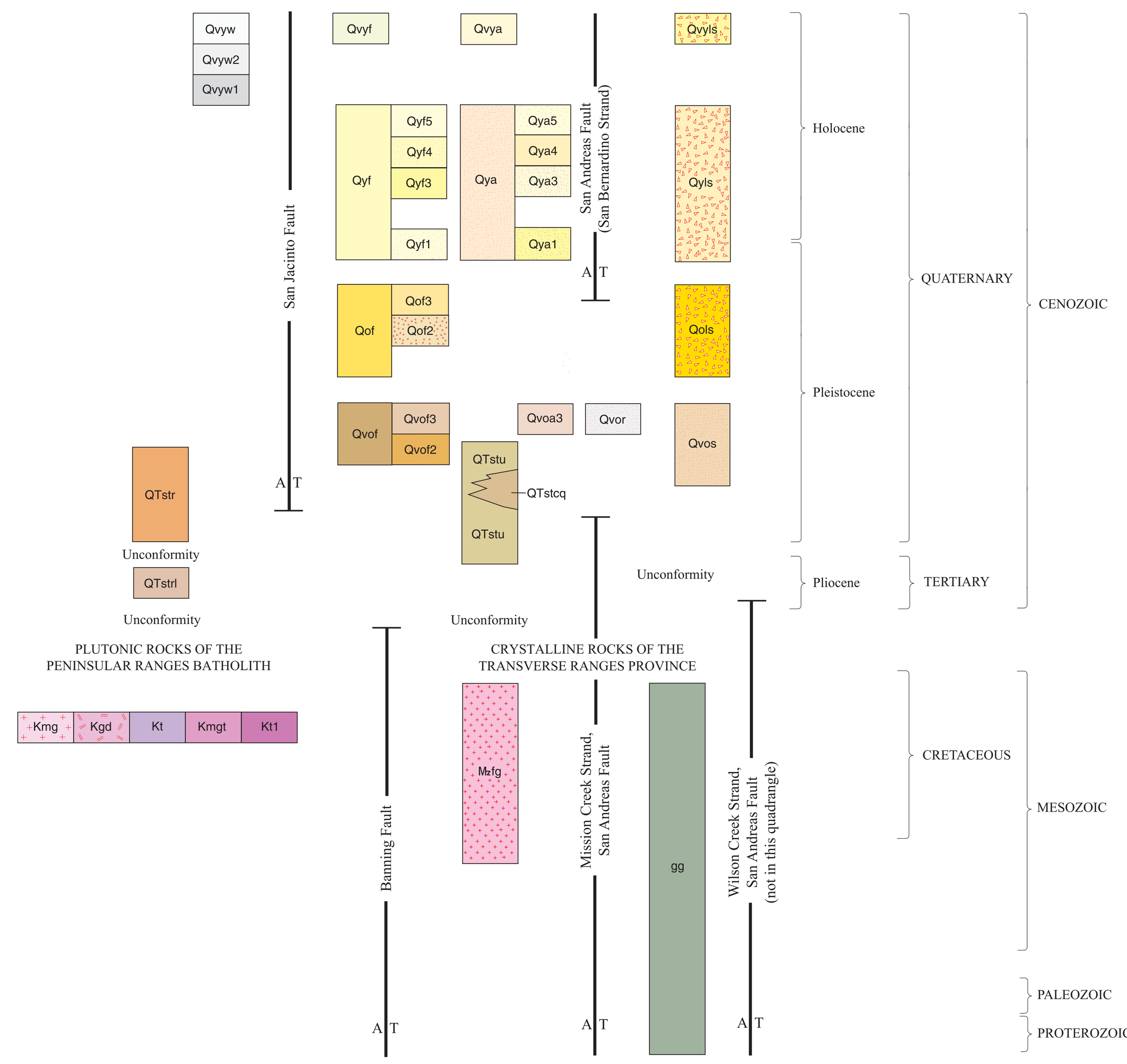
CORRELATION OF MAP UNITS



This Correlation of Map Units has two features that clarify relations among geologic-map units in the Redlands 7.5' quadrangle: (1) To clarify stratigraphic relations among Quaternary surficial units, parent categories for alluvial subunits are shown even though the parent category may not occur in the quadrangle (e.g., the Qof and Qvof parents for subunits Qof2 and Qvof3). The accompanying summary pamphlet provides a discussion of the classification and correlation of surficial deposits in the Redlands quadrangle. (2) To clarify relations among major crystalline and sedimentary map units and strands of the San Andreas Fault system that bound them, the correlation chart uses thick vertical lines to show the position of the fault strands (e.g., the Mission Creek Strand of the San Andreas separates map units gg and Mzfg). On older faults, short horizontal bars indicate the capping age at which major right-lateral strike-slip displacement ended; for the modern traces of the San Jacinto Fault and San Andreas Fault (San Bernardino Strand), the short bar marks the inception of faulting. See index map for regional distribution of faults; Matti and Morton (1993) discuss the faults, their history, and their role in juxtaposing major basement terranes. Matti and others (1992) discuss the tectonic setting of the Redlands region. A, fault movement away from the observer; T, fault movement toward the observer

DESCRIPTION OF MAP UNITS

VERY YOUNG SURFICIAL DEPOSITS—Sediment recently transported and deposited in channels and washes, on surfaces of alluvial fans and alluvial valleys, and on hillslopes. Soil-profile development is non-existant to minimal. Includes:

Qvyw **Very young wash deposits, active (latest Holocene)**—Very slightly consolidated sand and gravel deposits in active washes

Qvyw2 **Very young wash deposits, Unit 2 (latest Holocene)**—Very slightly consolidated sand-and-gravel deposits that are entrained by active stream flows only intermittently

Qvyw1 **Very young wash deposits, Unit 1 (latest Holocene)**—Very slightly consolidated sand-and-gravel deposits that probably are abandoned by active stream flows

Qvyf **Very young alluvial-fan deposits (latest Holocene)**—Very slightly consolidated to slightly consolidated, undissected deposits of sand and gravel that form active parts of alluvial fans. Locally contains unmapped areas of unit Qyf5

Qvya **Very young axial-valley deposits (latest Holocene)**—Very slightly consolidated silty-sand and gravelly sand deposits. Usually not incised or channelized

Qvyls **Very young landslide deposits (latest Holocene)**—Slope-movement deposits of soil and rubble and (or) displaced bedrock blocks. Locally may include inactive landslide material

YOUNG SURFICIAL DEPOSITS—Sedimentary units that are slightly to moderately consolidated and slightly to moderately dissected. Alluvial-fan deposits (Qyf series) typically have high coarse:fine ratios; axial-valley deposits (Qya series) typically have low coarse:fine ratios. Upper surfaces commonly capped by slight to moderately developed pedogenic-soil profiles (A/AC to A/AC/Bcambic profiles with oxidized C horizon). Includes:

Qyf **Young alluvial-fan deposits (Holocene and latest Pleistocene)**—Slightly consolidated to moderately consolidated sand and gravel deposits. Units distinguished from each other on the basis of soil-profile development, relative position in local terrace-riser succession, and degree of erosional dissection. Includes:

Qyf5 **Young alluvial-fan deposits, Unit 5 (latest Holocene)**

Qyf4 **Young alluvial-fan deposits, Unit 4 (late Holocene)**

Qyf3 **Young alluvial-fan deposits, Unit 3 (middle Holocene)**

Qyf1 **Young alluvial-fan deposits, Unit 1 (early Holocene and latest Pleistocene)**

Young axial-valley deposits (Holocene and latest Pleistocene)—Slightly to moderately consolidated silt, sand, and gravel deposits. Units distinguished from each other on the basis of soil-profile development, relative position in local terrace-riser succession, and degree of erosional dissection. Includes:

Qya5 **Young axial-valley deposits, Unit 5 (latest Holocene)**

Qya4 **Young axial-valley deposits, Unit 4 (late Holocene)**

Qya3 **Young axial-valley deposits, Unit 3 (middle Holocene)**

Qya1 **Young axial-valley deposits, Unit 1 (early Holocene and latest Pleistocene)**

Qyls **Young landslide deposits (Holocene and latest Pleistocene)**—Slightly dissected slope-movement deposits of rubble and (or) displaced bedrock blocks. Locally may include old landslide material. Probably inactive under current climatic and tectonic conditions

OLD SURFICIAL DEPOSITS—Sedimentary units that are moderately consolidated and slightly to moderately dissected. Alluvial-fan deposits (Qof series) typically are gravelly, but include sand and silt; valley-filling deposits (Qoa series) are dominated by sand with minor gravel. Older surficial deposits have upper surfaces capped by moderately to well-developed pedogenic soils (A/AB/B/C_{ox} profiles and Bt horizons as much as 1 to 2 m thick and maximum hues typically in the range of 10YR 5/4 and 6/4 [yellowish brown and light yellowish brown] through 7.5YR 6/4 to 4/4 [light brown to dark brown] but reaching 5YR 5/6 [yellowish red]). Includes:

Qof **Old alluvial-fan deposits (late to middle Pleistocene)**—Moderately to well consolidated silt, sand, and gravel. Units distinguished from each other on the basis of soil-profile development and relative position in the local terrace-riser succession. Includes:

Qof3 **Old alluvial-fan deposits, Unit 3 (late to middle Pleistocene)**

Qof2 **Old alluvial-fan deposits, Unit 2 (late to middle Pleistocene)**

Qols **Old landslide deposits (late to middle Pleistocene)**—Moderately dissected slope-movement deposits of rubble and (or) displaced bedrock blocks. Probably inactive under current climatic and tectonic conditions

VERY OLD SURFICIAL DEPOSITS—Units that are moderately to well consolidated to lithified, and moderately to well dissected. Alluvial-fan deposits (Qvof series) typically are gravelly, but include sand and silt; valley-filling deposits (Qvoa series) are dominated by sand with minor gravel. Upper surfaces are capped by moderate to well developed pedogenic soils (A/AB/B/C_{ox} profiles with Bt horizons as much as 2 to 3 m thick and maximum hues in the range of 7.5YR 6/4 to 4/4 [light brown to brown] and 2.5YR 5/6 [red]). Includes:

Very old alluvial-fan deposits (middle to early Pleistocene)—Moderately to well consolidated silt, sand, and gravel. Units distinguished from each other on the basis of soil-profile development and relative position in local terrace-riser succession. Map units include:

Qvof3 **Very old alluvial-fan deposits, Unit 3 (middle to early Pleistocene)**

Qvof2 **Very old alluvial-fan deposits, Unit 2 (middle to early Pleistocene)**

Very old axial-valley deposits (middle to early Pleistocene)—Moderately to well consolidated silt, sand, and gravel. Units are distinguished from each other on the basis of soil-profile development and relative position in local terrace-riser succession. Includes:

Qvoa3 **Very old axial-valley deposits, Unit 3 (middle to early Pleistocene)**—Throughout most of quadrangle unit consists of alluvial deposits, but locally includes residuum or pedogenic-soil profile developed on the San Timoteo beds (of Frick, 1921) (unit QTstu). Where possible, regolith has been broken out into separate map unit (Qvor)

Qvor **Very old residuum and (or) pedogenic soil (middle to early Pleistocene)**—Surficial weathering profile developed on San Timoteo beds (of Frick, 1921)

Qvos **Very old surficial deposits, undifferentiated (middle to early Pleistocene)**—Well dissected, moderately to well consolidated alluvium

CENOZOIC ROCKS SOUTHWEST OF MISSION CREEK AND SAN BERNARDINO STRANDS OF THE SAN ANDREAS FAULT

QTstu **San Timoteo beds of Frick (1921), upper member (Pleistocene and Pliocene)**—Unconsolidated to lithified nonmarine terrigenous-clastic sediment (sandy and gravelly material) and sedimentary rock (arenaceous and conglomeratic material). Forms upper part of sedimentary sequence Frick (1921, p. 314) referred to as Tertiary Deposits of the San Timoteo Badlands—specifically his "San Timoteo beds" or "Upper San Timoteo Deposition" (Frick, 1921, p. 283, 317)

QTstcq **San Timoteo beds of Frick (1921), quartzite-bearing conglomerate member (Pleistocene)**—Nonmarine sandstone and conglomerate containing cobbles and small boulders of bedrock types found in Santa Ana River drainage of the San Bernardino Mountains

CENOZOIC ROCKS SOUTHWEST OF THE SAN JACINTO FAULT

QTstr **San Timoteo beds of Frick (1921), Reche Canyon member (Pleistocene and Pliocene)**—Unconsolidated to lithified nonmarine terrigenous-clastic sediment (sandy and gravelly material) and sedimentary rock (arenaceous and conglomeratic material)

QTstrl **San Timoteo beds of Frick (1921), ripple-laminated member (Pliocene)**—Lithified nonmarine sandstone and mudstone (unit 2 as used by Matti and Morton, 1975, in Mt. Eden area on east side of San Jacinto Fault, 25-30 km to southeast)

MESOZOIC ROCKS NORTHEAST OF THE MISSION CREEK AND SAN BERNARDINO STRANDS OF THE SAN ANDREAS FAULT

gg **Gneissose granitoid rock and gneiss (Mesozoic and older)**—Compositionally and texturally heterogeneous plutonic and metamorphic complex

MESOZOIC ROCKS BETWEEN THE SAN ANDREAS FAULT AND THE BANNING FAULT

Mzfg **Foliated granitoid rock (Mesozoic)**—Heterogeneous granitoid rocks that in adjacent Yucaipa quadrangle form upper plate of Vincent Thrust

MESOZOIC ROCKS SOUTHWEST OF THE BANNING FAULT

Kmg **Monzogranite (Cretaceous)**—Porphyritic biotite monzogranite

Kgd **Granodiorite (Cretaceous)**

Kt **Tonalite (Cretaceous)**—Equigranular biotite-hornblende tonalite

Kt1 **Tonalite, unit 1 (Cretaceous)**—Biotite, hornblende, and biotite-hornblende tonalite

Kmgt **Monzogranite and tonalite, unit 1, undivided (Cretaceous)**

Contact—Separates geologic-map units. Solid where meets map-accuracy standard; dashed where may not meet map-accuracy standard; dotted where concealed

Contact—Separates terraced alluvial units where younger alluvial unit is incised into older alluvial unit; hachures at base of slope, point toward topographically lower surface. Solid where meets map-accuracy standard; dashed where may not meet map-accuracy standard

Landslide crown scarp—Demarcates pull-away zone at head of landslide mass; may not meet map-accuracy standard. May form geologic contact between landslide mass and bedrock, or may separate discrete landslide masses. Hachures point downslope

Fault—Solid where meets map-accuracy standard; dashed where may not meet map-accuracy standard. Dotted where concealed by mapped covering unit; queried where existence uncertain. Hachures indicate scarp, with hachures on down-dropped block. Paired arrows indicate relative movement; single arrow indicates direction and amount of fault-plane dip. Bar and ball on down-thrown block

Fold Axis—Showing direction of plunge. Solid where meets map-accuracy standard; dashed where may not meet map-accuracy standard. Dotted where concealed by mapped covering unit; queried where existence uncertain

Anticline

Syncline

Fault-name abbreviations

Crafton Hills Fault Zone—CHFZ

San Andreas Fault—MiCS, Mission Creek Strand; SBS, San Bernardino Strand

Live Oak Canyon Fault Zone—LOCFZ

Strike and dip of sedimentary layering

50 Inclined

Vertical

Strike and dip of foliation of mineral grains, inclusions, or schlieren in igneous rocks

20 Inclined

Strike and dip of foliation and gneissose compositional layering (origin not determined) in metamorphic and plutonic complex (unit gg)

20 Inclined

Vertical

Mineral foliation and (or) gneissose layering in cataclastic and (or) mylonitic rocks

20 Inclined

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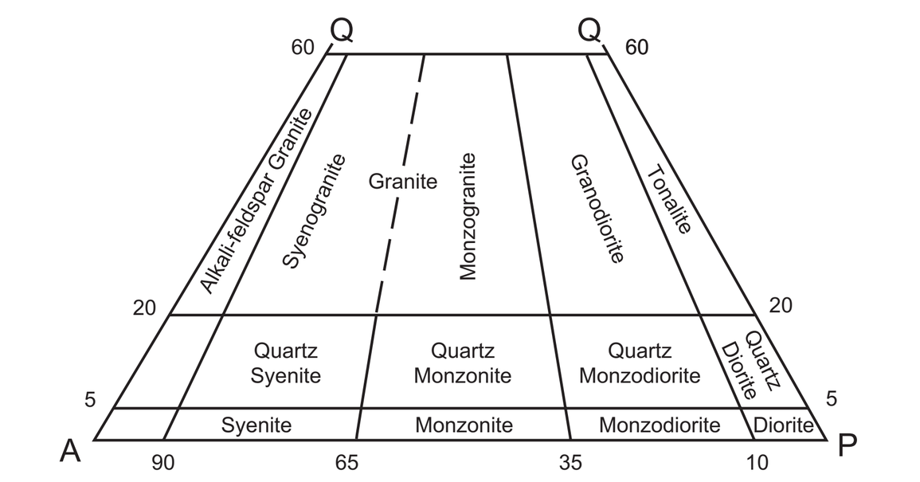
	Induration State	Field Criterion	Relative Density (D_r)[1]
Unconsoldiated Sediment	Very slightly consolidated	Easily indented with fingers	0.00—0.20
	Slightly consolidated	Somewhat less easily indented with fingers; easily shoveled	0.20—0.40
	Moderately consolidated	Shoveled with difficulty	0.40—0.70
Consolidated Rock	Well consolidated	Requires pick to loosen for shoveling	0.70—0.90
	Lithified	Requires blasting or heavy equipment to	0.90—1.00
	Indurated	Rings to the blow of a hammer	1.00

Criteria for distinguishing and classifying various categories of unconsolidated sediment and consolidated rock (modified from Bowles, 1984, Table 5-2)

[1]As translated by Bowles (1984, p. 151-152), relative density is an engineering parameter that relates void space determined in the laboratory to a ratio involving index values of minimum and maximum void space for specified materials under specified conditions. Void space in turn is related to in situ dry unit weight. Also see the Glossary of Geology definition of relative density in Section 3.1.



Classification of plutonic rock types (from IUGS, 1973, and Streckeisen, 1976). A, alkali feldspar; P, plagioclase feldspar; Q, quartz.

Map showing location of Redlands 7.5' quadrangle relative to faults and basement-rock terranes in the region. Faults in red are modern strands of the San Andreas Fault and the San Jacinto Fault; progressively older strands of the San Andreas Fault include the Mill Creek strand (orange), Mission Creek strand (yellow), and Wilson Creek strand (blue). Magenta indicates the late Miocene Banning fault. Paired black arrows indicate movement direction on strike-slip faults; bar-and-ball symbol indicates down-thrown block of normal fault. Modified from Matti and others (1992a) and Matti and Morton (1993). BPF, Beaumont Plain fault zone; CHH, Crafton Hills horst-and-graben complex; GHF, Glen Helen Fault; ICF, Icehouse Canyon Fault; MVF, Morongo Valley Fault; SCF, San Antonio Canyon Fault; SGPF, San Gorgonio Pass Fault zone; VT, Vincent Thrust.