U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Geologic Map of the Telegraph Peak 7.5-minute Quadrangle, San Bernardino County, California

by

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U.S. Geological Survey

Open-file Report 90-693

Prepared in cooperation with The State of California, Division of Mines and Geology

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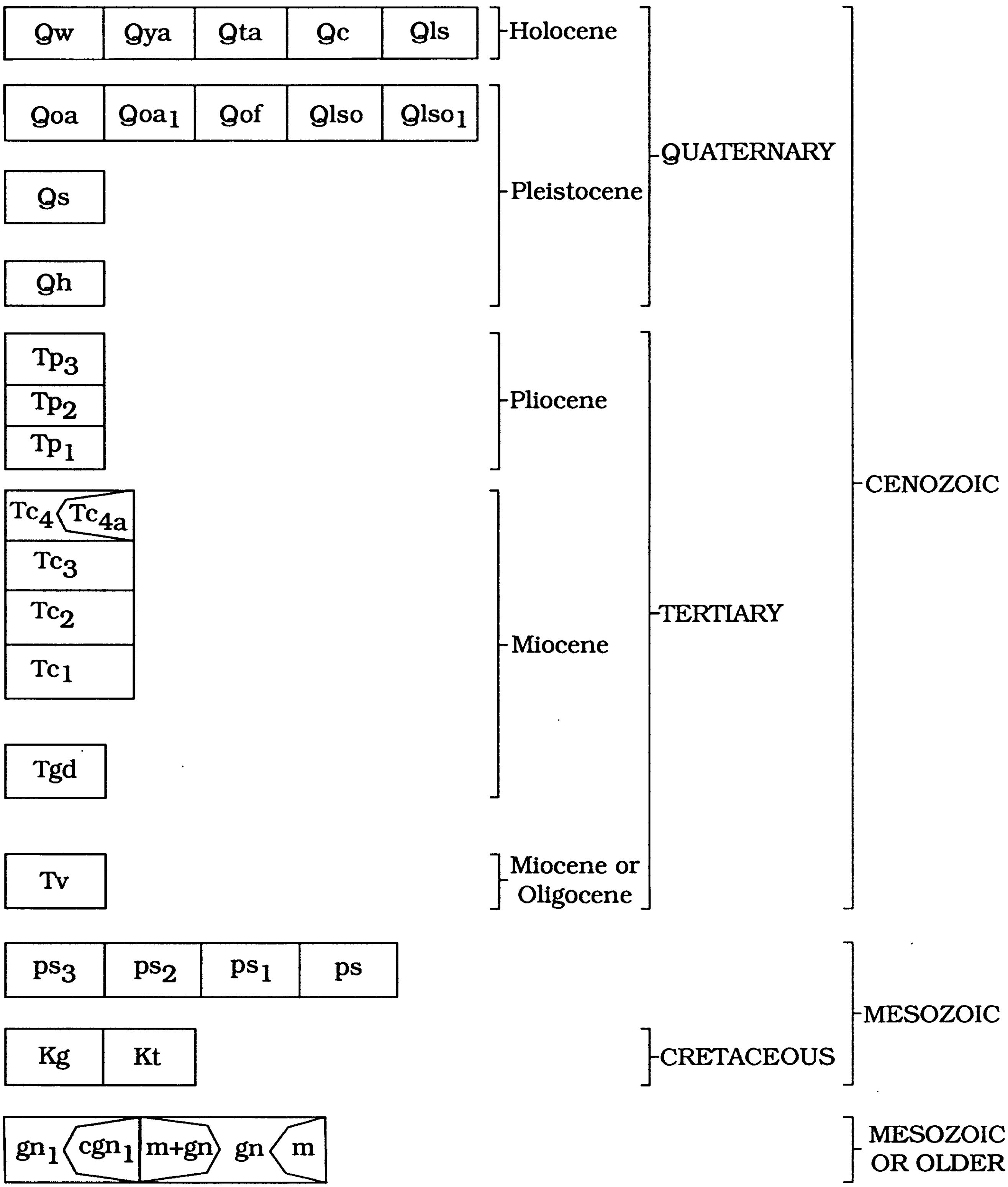
1991

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qw — **Alluvium of active and channels and washes (Holocene)** -- Unconsolidated coarse-grained sand to boulderly alluvium of active channels and washes flooring drainage bottoms within the mountains and on valley floors. Most alluvium is, or recently was, subject to active stream flow. Contains some low-lying terrace deposits along alluviated canyon floors and areas underlain by colluvium along base of some slopes

Qya — **Alluvium of canyon bottoms and valley floor (Holocene)** -- Unconsolidated deposits of coarse-grained sand to bouldery alluvium of canyon and valley floors. Has been abandoned by active stream flow or are entrained only by the highest flood waters

Qta — **Talus (Holocene)** -- Unconsolidated deposits of angular rock fragments on and at the base of steep slopes within the mountains

Qc — **Colluvium (Holocene)** -- Unconsolidated deposits of soil and angular rock debris ranging from almost wholly rock fragments to soil and humus-rich material

Qls — **Landslides (Holocene)** -- Landslides generally consisting of a crown area and landslide deposit. Most landslide deposits are composed of massive unconsolidated rock debris. The direction of principal landslide movement shown by arrows. Many of the landslides along Blue Ridge are sackungen or posses sackungen-like morphology. Many of the side ridges underlain by the Pelona Schist on the north side of Blue Ridge have ridge-top depressions. Sackungen or sackungen-like features also occur southeast of Circle Mountain and northwest of Mt. Baldy Notch. In Lone Pine Canyon southeast of the Clyde Ranch are several scarps in the alluvium south of the San Andreas fault; these appear to be a result of downslope movement within the alluvium adjacent to a small graben-like feature of the San Andreas fault

Qoa — **Older alluvium (Pleistocene)** -- Deposits of older alluvium. Unconsolidated to well consolidated deposits of coarse-grained sand to boulderly stream alluvium

Qoa_1 — **Older alluvium comprised of the Pelona Schist (Pleistocene)** -- Deposits of older alluvium comprised entirely of the Pelona Schist. Dissected deposits of elevated unconsolidated cobbly alluvium consisting entirely of Pelona Schist in the southern part of Swarthout Valley. Also included is a lower-lying alluvial deposit in Lone Pine Valley northwest of the Sharpless Ranch

Qof — **Older alluvial fan alluvium (Pleistocene)** -- Deposits of older alluvial fans. Unconsolidated to moderately consolidated deposits of coarse-grained sand to bouldery alluvium of older alluvial fans in the northeastern corner of the quadrangle

Qlso — **Older landslide deposits (Pleistocene)** -- Dissected older landslide deposits consisting of unsorted, unconsolidated to moderately consolidated, massive to crudely stratified angular rock debris largely of gneissic composition

$Qlso_1$ — **Older landslide deposits comprised of tonalite (Pleistocene)** -- Dissected older landslide deposits consisting of unsorted, unconsolidated to moderately consolidated, massive angular tonalite debris in Cedar Canyon

Qs — **Shoemaker Gravel (Pleistocene)** -- Moderately to well consolidated, very pale orange arkosic conglomerate containing abundant Pelona Schist clasts

Qh — **Harold Formation (Pleistocene)** -- Mostly unconsolidated to moderately consolidated, grayish orange arkosic sandstone and siltstone

Rocks of Phelan Peak (Pliocene) -- **Unit of Meisling and Weldon (1989). Divided into:**

Tp_3 — **Conglomeratic wacke** -- Unconsolidated to slightly indurated, very pale orange arkosic conglomeratic wacke with numerous light brown weathered beds

Tp_2 — **Arkosic conglomerate** -- Moderately well to well indurated, pinkish gray arkosic conglomerate with abundant marble clasts

Tp_1 — **Arkosic wacke** -- Unconsolidated to slightly indurated, light brown and very pale orange arkosic wacke with thin beds of fine-grained sand and clay

Rocks of Cajon Valley (Miocene) -- Divided into:

Tc_4 — **Arkosic conglomerate and congomeratic sandstone** -- Well indurated, buff and yellow arkosic conglomerate and conglomeratic sandstone interbedded with drab brown and green fine-grained sandstone and siltstone. Local beds of limestone and lignite. Locally includes:

Tc_{4a} — Arkosic conglomerate with abundant marble clasts; well indurated, red brown and light brown arkosic conglomerate and conglomeratic sandstone. Contains abundant clasts of gneiss and marble apparently derived from exposed gneissic complex (gn) to the west. Interfingers with unit Tc_4

Tc_3 **Arkosic conglomerate with volcanic clasts** -- Well indurated, mottled maroon and gray arkosic conglomerate and conglomeratic sandstone with abundant variously colored volcanic clasts

Tc_2 **Arkosic conglomerate and sandstone** -- Well indurated, buff to light gray arkosic conglomerate and sandstone interbedded with abundant red to redish brown fine-grained sandstone and siltstone

Tc_1 **Arkosic conglomerate** -- Very well indurated and resistant, buff to light gray arkosic conglomerate and conglomeratic sandstone with minor red interbeds of siltstone. Forms prominent hogbacks

Tgd **Granodiorite and granite (Miocene)** -- Medium-to coarse-grained, mostly massive haupautomorphic-granular, white weathering biotite granodiorite and granite Marginal parts consist of hypabyssal porphyritic-textured rock, some containing abundant inclusions of Pelona Schist. Dikes of this rock cut Pelona Schist. Mostly thoroughly fractured; deeply weathered along ridge tops. Intrusive into the Pelona Schist and the Vincent thrust northeast of Telegraph Peak. Biotite from this rock yielded K/Ar ages of about 14 Ma (Miller and Morton, 1977)

Tv **Vaqueros(?) Formation (Miocene or Oligiocene)** -- A fossiliferous marine unit consisting of mostly white to off-white, coarse-grained arkosic sandstone and yellowish-brown, flaggy, and concretionary sandstone and siltstone. The Vaqueros Formation mapped elsewhere has been considered of late Oligocene and early Miocene age, Zemorrian foraminiferal stage, on the basis of foraminifers

Pelona Schist (Mesozoic) -- Divided into:

ps_3 **Muscovite schist** -- Mostly medium-to coarse-grained muscovite schist with local masses of garnet-bearing greenstone; local tightly folded quartz rich and quartz-carbonate layers, sparse masses of talc and/or actinolite rocks. Located between the San Andreas fault and the Punchbowl fault zone these Pelona exposures are of higher metamorphic grade than those south of the Punchbowl fault zone

ps_2 **Muscovite-albite-quartz schist** -- Mostly spotted muscovite-albite-quartz schist. Most of the schist is uniform appearing, regularly layered, very fissile dark gray schist with local quartz-rich layers and very sparse masses of talc and/or tremolite rock. Spotted appearance is produced by small porphyroblasts of dark gray albite

ps_1 **Greenstone** -- Greenstone, mainly dark greenish colored, nearly massive to foliated, and indistinctly layered. Greenstone consists of chlorite, epidote, and albite ps — **Siliceous schist** -- Siliceous tan-to gray muscovite schist, quartzite, spotted albite schist, greenstone, and biotite-bearing schist with rare masses of carbonate-tremolite rocks and talc-rich rocks. Spotted schist and biotite-bearing schist are fissile. Quartzite occurs inter-layered within siliceous schist

Kg — **Granite and granodiorite (Cretaceous)** -- Tanish weathering relatively massive granitic rocks consisting of mixtures of granite, quartz monzonite, and granodiorite. Some rocks have a gneissic texture. Located in the central part of the east side of the quadrangle

Kt — **Tonalitic rocks (Cretaceous) -- Mainly a heterogeneous and foliated, medium** grained, biotite-hornblende tonalite. Exposed south of the Middle Fork of Lytle Creek

gn_1 — **Gneiss and schist (Mesozoic or older)** -- Heterogeneous assemblage of amphibolite-grade biotite, biotite-hornblende, and garnet bearing gneiss and schist. Locally contains quartz-feldspar rich rock, calc-silicate rock, and discontinuous masses of coarse-grained marble. Commonly is in part cataclastically deformed. Locally includes:

cgn_1 — In the vicinity of the Vincent thrust the gneiss and schist is thoroughly recrystallized and cataclastically deformed

gn — **Gneiss (Mesozoic or older)** -- Heterogeneous assemblage of hornblende and biotite hornblende gneiss and leucocratic quartz-feldspar rich layers with local masses of marble and calcsilicate-marble lenses, all intruded in a complex fashion by variable amounts of heterogeneous foliated biotite-hornblende tonalitic rocks. Locally includes:

m+gn — Some of this assemblage consists of admixed marble and gneiss occur in mappable-sized units

m — Bodies of relatively pure coarse grained marble occur within the gneiss

CONTACT - Dashed where approximately located; dotted where concealed

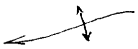
FAULT - Showing dip. Long dashed where well located; short dashed where approximately located; dotted where concealed; arrows indicate sense of relative movement

FAULT ZONE - Fault with mappable width of crushed and brecciated rock.

THRUST FAULT - Showing dip. Dashed where approximately located; dotted where concealed. Sawteeth on upper plate

SEDIMENTARY ROCKS:

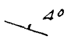
Fold axis - Showing direction of plunge. Dashed where approximately located



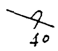
Anticline

Syncline

Strike and dip of beds



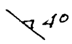
Inclined



Overturned

METAMORPHIC AND PLUTONIC ROCKS:

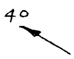
Strike and dip of foliation



Inclined

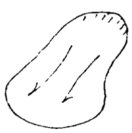
Horizontal

Bearing and plunge of minor fold axis



Bearing and plunge of lineation

Horizontal lineation



Landslide - Arrows indicate direction of principal movement

Closed depression

Scarp - Landslide scarp, mostly scarps of sackungen-like landslides. Tics at head of downthrown block

GEOLOGIC SUMMARY

The Telegraph Peak quadrangle is located in the northeast part of the San Gabriel Mountains in the central part of the Transverse Ranges of southern California. The eastern San Gabriel Mountains are a tectonically active, rapidly elevating mountain range. Dominating the structure is the San Andreas fault zone which diagonally crosses the quadrangle. The San Andreas fault is located within a linear "rift valley", Lone Pine Valley (also marked on the quadrangle as "San Andreas Rift Zone"). The San Andreas fault separates two distinctly different rock types. North of the fault is a complex of gneiss and marble, of undetermined age, intimately intermixed with intrusive tonalitic rocks of probable Cretaceous age; this complex is bounded on the north by the Cajon Valley fault (Woodburne and Golz, 1972). To the south of the San Andreas fault is a domain of greenschist to lower amphibolite grade schist; the Pelona Schist of probably Late Cretaceous or earliest Tertiary age (Conrad and Davis, 1977; Ehlig, 1981). The protolith of the Pelona Schist was predominantly dirty sandstone and graywacke with some basalt, chert, and limestone. In most places the Pelona Schist is well layered, however the schist has been pervasively deformed and most of the layering is tectonic rather than relic bedding. The Pelona Schist is structurally overlain by a complex of largely cataclastically deformed intermediate composition Cretaceous plutonic rocks and gneiss of unknown age. Separating the Pelona Schist from the structurally overlying rocks is the Vincent thrust, a major regional thrust thought to be active about 60 Ma. The Vincent thrust is well exposed in the lower part of Coldwater Canyon. The cataclastic deformation is generally thought to be related to movement on the Vincent thrust. Intrusive into the cataclastic rocks and the Pelona Schist is a late Oligocene or Miocene pluton of granodioritic composition (Miller and Morton, 1977).

The Cajon Valley fault was active in middle Miocene time (Woodburne and Golz, 1972). North of the Cajon Valley fault is a sequence of sedimentary rocks. The basal part of the sequence is marine sedimentary rocks tentatively correlated with the Vaqueros Formation of late Oligocene and early Miocene age. Above the Vaqueros Formation(?) is a thick section of continental Miocene clastic rocks, the rocks of Cajon Valley. The rocks of Cajon Valley are thought to have had a source area to the north (Woodburne and Golz, 1972). The rocks of Cajon Valley are overlain by a Pleistocene alluvial fan sequence, the rocks of Phelan Peak. This alluvial fan sequence was derived from the San Gabriel Mountains to the south (e.g., Yerkes, 1951; Weldon, 1986). The alluvial fan deposits were elevated and subsequently segmented by erosion in the past 700,000 years (Weldon,. 1986).

South of the San Andreas fault within the Pelona Schist is an ancestral San Andreas fault, the Punchbowl fault zone. The Punchbowl fault zone, deformed to produce a sinuous surface trace, consists of two closely spaced faults separated one from the other by sheared and brecciated basement unlike the Pelona Schist. Along much of the fault zone the parentage of the included rocks is uncertain; locally it is clearly recognizable gneiss and tonalite. The Punchbowl fault zone separates two distinct types of Pelona exposures. North of the Punchbowl fault zone the schist is amphibolite grade and to the south greenschist grade. In the west central part of the quadrangle the Punchbowl fault zone is offset by a northeast-striking left-lateral strike-slip fault.

Within the mountains south of the Punchbowl fault zone a complex of northwest-to northeast-striking faults constitute the northern part of an apparently anticlinal shuppen-like structure which has developed as result of compression within and uplift of the eastern San Gabriel Mountains (Morton, 1975). Most of these faults are probably active.

Landslides abound throughout the quadrangle. Catastrophic-type of avalanche deposits appear to be localized to terrain of older plutonic rocks and gneiss and cataclastic gneiss, excluding the Pelona Schist (Morton, et al., 1989) Examples of dissected large Pleistocene avalanche landslides are in Cedar Canyon, Coldwater Canyon, and Cajon Valley. The latter landslide consist of gneiss, marble and tonalitic rock deposits on sedimentary rocks of Cajon Valley. Landslides, excluding avalanche type of deposits, are pervasive in the Pelona Schist and especially abundant in the Pelona Schist located between the San Andreas fault zone and the Punchbowl fault zone. Most of the landslides located within the Pelona Schist lack classic landslide morphology. Many of the landslides are produced by slowly spreading snouts of ridges. Sackungen and sackungen-like features, such as side-hill and ridge-top trenches, are common (Morton and Sadler, 1989). Many of sackungen-like ridge-top trenches lack any readily visible deformed material below the trenches. Sackungen-like scarps occur in rock other than the Pelona Schist, such as the scarps south east of Circle Mountain on the north side of Lone Pine Canyon.

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