U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Geologic Map of the Elsinore 7.5-minute Quadrangle, Riverside County, California

by

D.M. Morton[1] and F.H. Weber, Jr.[2]

U.S. Geological Survey

Open-file Report 90-700

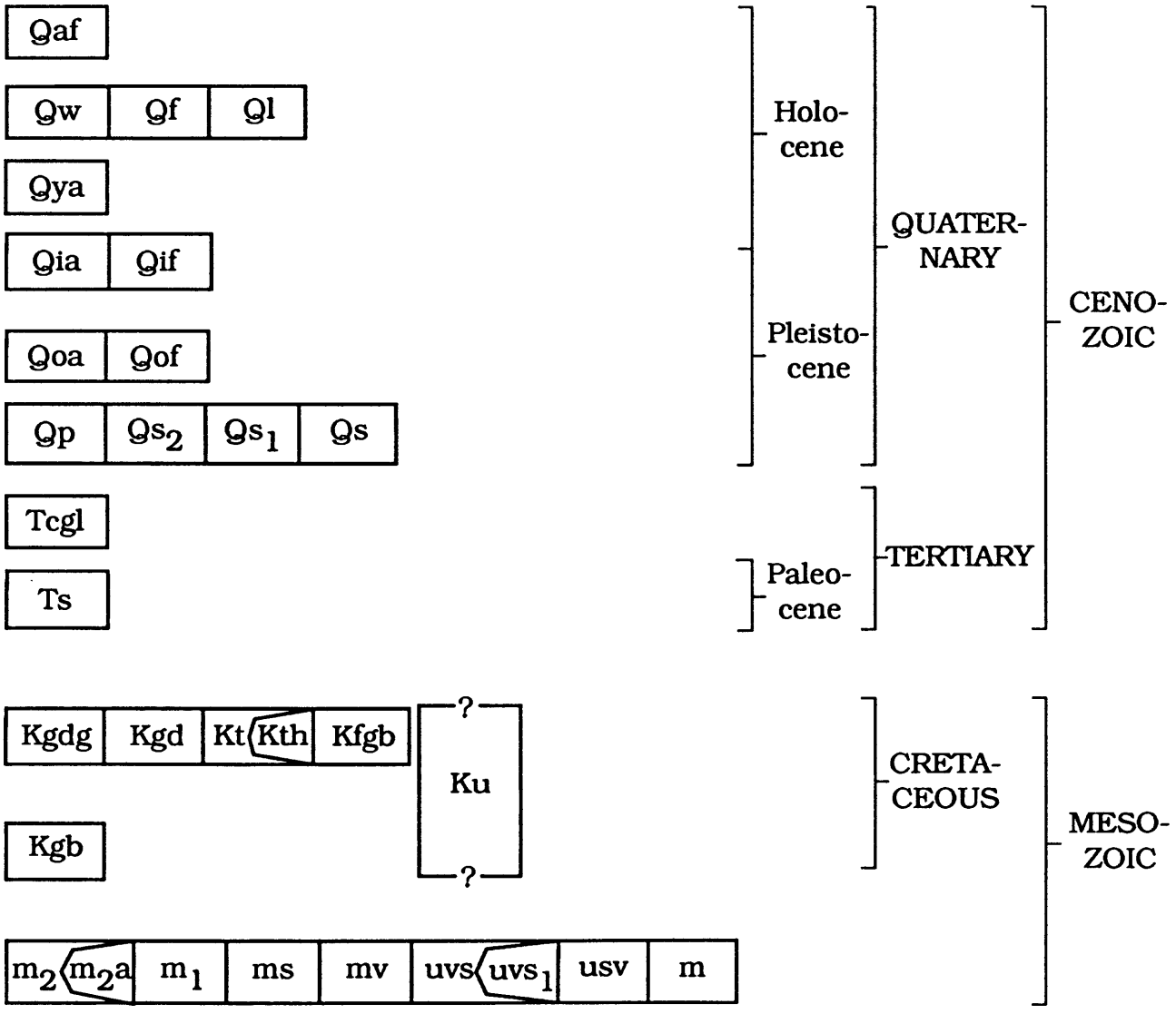
Prepared in cooperation with The State of California, Division of Mines and Geology

[1] Riverside, California

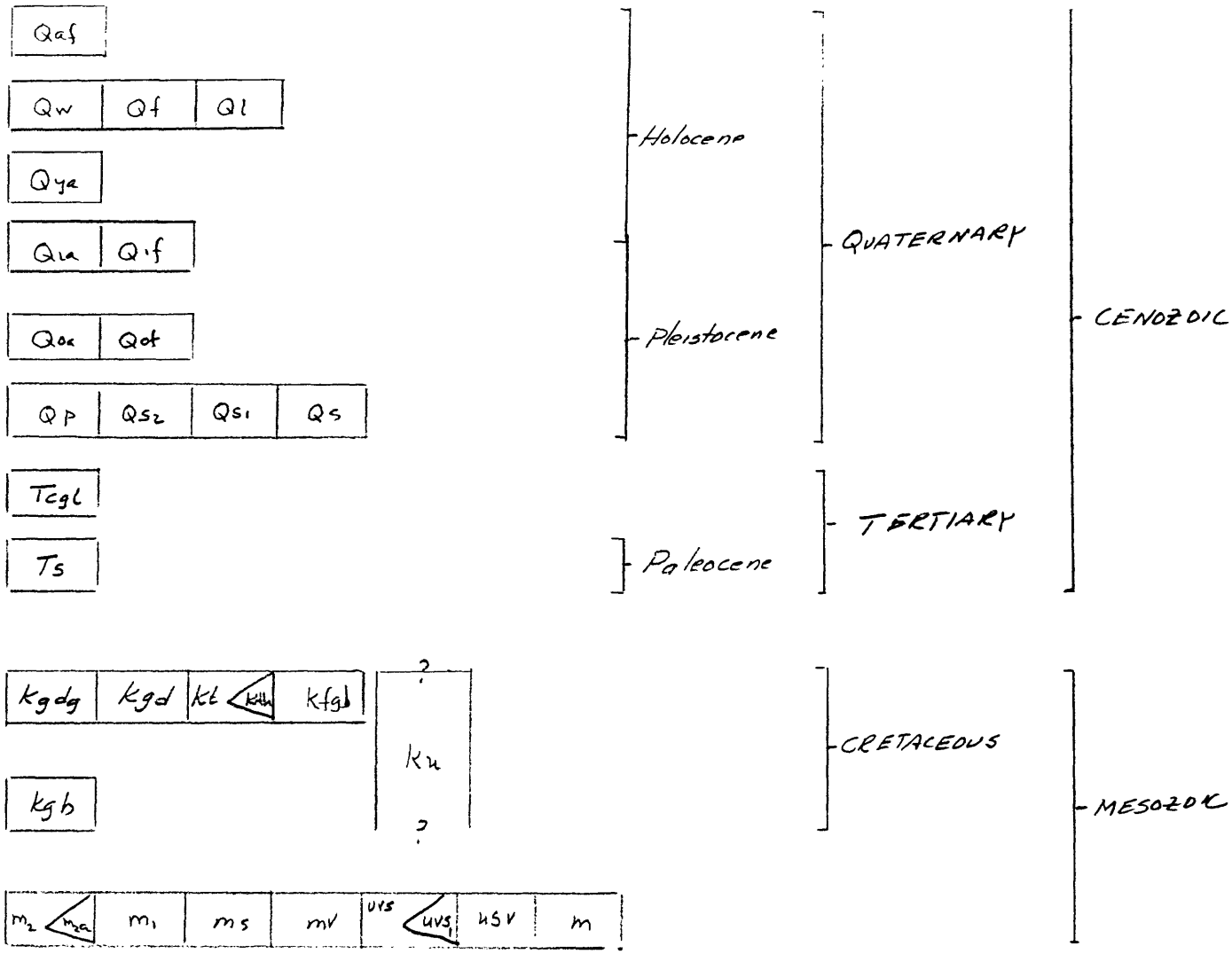
[2] State of California, Division of Mines and Geology, Los Angeles, California

1991

CORRELATION OF MAP UNITS



CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qaf — **Artificial fill (Holocene)** -- Includes engineered artificial fill on the north margin of Lake Elsinore and at Railroad Canyon Reservoir and dumps and tailings from mining related activities at the Good Hope mine in the northeast part of the quadrangle and from clay mining west of Walker Canyon on the west edge of the quadrangle

Qw — **Alluvium of most recently active stream channels and washes (Holocene)** -- Unconsolidated deposits of coarse-grained sand to bouldery alluvium of active stream channels and washes. Most alluvium is, or recently was, subject to active stream flow. Contains some low-lying terrace deposits along alluviated canyon floor's and areas underlain by colluvium along base of some slopes

Qf — **Modern alluvial fan deposits (Holocene)** -- Unconsolidated deposits of coarse-grained sand to bouldery alluvium of modern alluvial fans with undissected surfaces. Deposits are intermittently subject to inundation and reworking by high-water stream flows

Ql — **Lacustrine deposits of La Laguna (Holocene)** -- Unconsolidated lacustrine deposits of sand and silt underlying the floor of La Laguna surrounding Lake Elsinore. Deposits are generally coarser grained around the margins of the deposits than in the axial parts. Deposits are intermittently subject to inundation

Qya — **Younger alluvium (Holocene)** -- Unconsolidated grayish to brownish, medium-to coarse-grained, sandy alluvium on the west side of Warm Springs Valley and in the marginal parts of La Laguna

Qia — **Alluvium of intermediate age (Holocene and Pleistocene)** -- Unconsolidated to well indurated, brownish sandy alluvium. Gradational with and intermediate in age between Qya and Qoa. Locally includes areas underlain by Qya and Qoa

Qif — **Intermediate age Alluvial fan deposits (Pleistocene?)** -- Unconsolidated to consolidated deposits of coarse-grained sand to bouldery alluvium of intermediate age alluvial fans with moderately-to well-dissected surfaces

Qoa — **Older Alluvium (Pleistocene)** -- Mostly dissected, moderately-to well-indurated brownish coarse-grained sandy alluvium

Qof — **Alluvium of older alluvial fans (Pleistocene)** -- Mostly thoroughly dissected older alluvial fan deposits commonly topographically above adjacent Qoa deposits. Consists of well indurated, brownish, coarse-grained sandy to conglomeratic alluvial fan deposits adjacent to or on the flanks of basement hills

Qp — **Pauba Formation (?) (Pleistocene)** -- Granitic boulder conglomerate; matrix of clasts is medium-to coarse-grained sand. Exposed at Rome Hill and an adjacent small hill to the northwest on the southwest edge of La Laguna

Qs_2 — **Conglomeratic sediments (Pleistocene?)** -- Patches of granite cobble-to boulder-size conglomerate, in a medium to very coarse-grained sand matrix, exposed north of La Laguna and west of Warm Springs Valley. May be equivalent to the Pauba Formation

Qs_1 — **Conglomeratic sediments (Pleistocene?)** -- Patches of a cobble-to boulder-size conglomerate in a medium-to very coarse-grained gravel matrix adjacent to Railroad Canyon Reservoir. Clasts are of granitic composition. Overlain by older alluvium near east margin of quadrangle

Qs — Conglomeratic sediments (Pleistocene?) -- Patches of conglomerate in a medium-to very coarse-grained gravel matrix located at an elevation of about 1,600 feet west and northwest of Railroad Canyon Reservoir. Cobble and boulder clasts of granitic rocks with widespread cobbles of exotic red rhyolitic volcanic clasts

Tcgl — **Conglomerate (Tertiary)** -- Isolated patch of cobble conglomerate on a ridge top with an elevation of about 1,900 feet east of La Laguna. Conglomerate is composed of mainly reddish rhyolitic volcanic clasts and uncommon quartzite clasts. The red rhyolitic clasts, exotic to this area, appear to be the same as clasts reported from the Sespe (Oligocene-Miocene) Poway (Eocene) Formations elsewhere in southern California

Ts — **Silverado Formation (Paleocene)** -- Non-marine sandstone, conglomerate, siltstone and shale west of Warm Springs Valley. The lower part of the Silverdo Formation contains micaceous sandstone, lignite, and clay

Rocks of the Paloma Valley Ring Complex (Cretaceous)

Kgdg — **Granodiorite and granite** -- Light gray, medium grained granite and granodiorite. Most of the rock is biotite granite with less

common hornblende-biotite granodiorite. Plagioclase, oligoclase-andesine, occurs as subhedral tabular crystals. Quartz and K-feldspar, largely microcline, occur as anhedral masses. Subhedral to irregular sheaves of biotite and ragged hornblende crystals make up less than 10 percent of the rock, with biotite much more abundant than hornblende. Common masses of hornblende gabbro are included with the granodiorite and granite

Kgd **Granodiorite of the Arroyo del Toro pluton (Cretaceous)** -- Light gray, medium grained, massive, very homogeneous, inclusion free hypidiomorphic-granular biotite-hornblende granodiorite. Weathers to produce abundant large boulders

Kt **Tonalitic rock of the Gavilan pluton (Cretaceous)** -- Heterogeneous tonalitic rock. Mostly massive, dark gray, medium grained, hypidiomorphic-granular hornblende-biotite-hypersthene tonalite. Locally with common to abundant mesocratic to melanocratic inclusions. Some particularly inclusion-rich tonalite occurs north of Warm Springs Valley east of mouth of Arroyo del Toro. Locally includes:

Kth Rocks in the western most exposures of the Gavilan pluton, west of mouth of Arroyo del Toro, are fine grained with a hypabyssal texture

Kfgb **Fine grained gabbro (Cretaceous)** -- Series of dikes and small bodies of fine-grained gabbro cutting quartz rich metasediments north of Railroad Canyon Reservoir

Ku **Mixed granitic rocks and included metamorphic rocks (Cretaceous and older Mesozoic?)** -- Granitic rocks with variable amounts of included metasedimentary rocks. In most areas granitic rock is present in much larger amounts than the included metasedimentary rock. Most of the granitic rock is granodiorite with lesser amounts of granite, tonalite, and diorite. Most of the metasedimentary rock is phyllite

Kgb **Gabbro (Cretaceous)** -- Medium-to coarse-grained hornblende gabbro consisting of plagioclase (andesine-labadorite) and green-brown hornblende, with accessory epidote, sphene, chlorite, opaque minerals, and, in some rock, minor quartz

Metamorphic Rocks of Menifee Valley (Mesozoic)

m_2 **Phyllite** -- Mostly phyllite with lesser amounts of metaquartz sandstone and quartz-rich metasediments; locally some rock is slatey. Extremely fined grained white mica is commonly megascopically

visible imparting a lustrous sheen to the phyllite. Locally contains rare, small chiastolite crystals or aggregates of white mica pseudomorph after chiastolite. Most bedding is transposed, but locally cross-bedding is preserved in the more sandy parts of this unit. Widespread occurrences of discontinuous layers of rhodonite bearing siliceous rock; much of the rhodonite is altered to manganese oxides. Locally includes:

m_{2a} Within the phyllite are sparse layers and pods of marble, tremolite bearing marble, and tremolite-quartz rock

m_1 **Quartzite** -- Mostly metaquartz sandstone with smaller amounts of quartz-rich metasediments, metagrawacke, and phyllite. Most of the metaquartz sandstone is impure, off white massive to indistinctly layered

ms **Quartz-rich metasediments** -- Mostly quartz-rich metasandstones with common impure quartzite and phyllite. Flaggy layering common in the metaquartzite

Metamorphic Rocks Between Gavilan and Arroyo del Toro Plutons (Mesozoic)

mv **Metavolcanic rocks** -- Quartz latite, dacite and andesite metavolcanic rocks. Volcanic breccia is a common constituent. In the north-

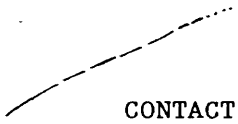
western part of the quadrangle black porphyritic latite-dacite predominates

uvs — **Undivided volcanic and metasedimentary rocks** -- Mixed silicic volcanic rocks and silicic metasedimentary rocks. Includes volcanic breccia and metasedimentary breccia and conglomerate. Locally includes:

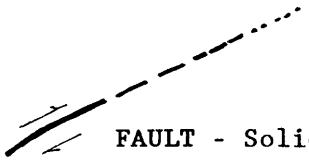
uvs_1 — Some rocks are predominatly a well layered dark siliceous metasediment

usv — **Undivided metasedimentary and volcanic rocks** -- Heterogeneous sequence of mostly metasedimentary rocks with scattered layers of blackish silicic (rhyolitic) volcanic rock. The metasediments (metamudstone ?) are mostly hackle fracturing and very fine grained. Some metasandstone contain relic crossbedding

m — **Quartzite and quartz-rich metasediments** -- Mostly impure, off white to tannish massive to indistinctly layered fine to medium grained quartzite with lesser amounts of quartz rich metasediments. Most of the quartzite is massive but flaggy layering is common. Gives rise to rubblely slopes covered with angular fragments of quartzite



CONTACT - Solid where accurately located; long dashed where well located; short dashed where approximately located; dotted where gradational



FAULT - Solid where accurately located; long dashed where well located; short dashed where approximately located; dotted where concealed; arrows indicate sense of relative movement

Strike and dip of beds

Horizontal

Inclined

Strike and dip of foliation

Inclined

Vertical

GEOLOGIC SUMMARY

The Elsinore quadrangle spans the western part of the Perris block, includes a length of the Elsinore fault zone, and in the southwest, includes a small part of the Santa Ana structural block, all part of the northern Peninsular Ranges of southern California. The Perris block is a stable structural block bounded on the west by the Elsinore fault zone and on the east by the San Jacinto fault zone. It is underlain by rocks of the Peninsular Ranges batholith of Cretaceous age and prebatholithic metasedimentary and metavolcanic rocks of probable Mesozoic age (Todd, and others, 1988). The right-lateral strike-slip Elsinore fault zone consists of a series of en echelon fault strands. La Laguna is the surface expression of a closed depression formed as a pull-apart basin at a major right-step between the Wildomar and Willard faults on the west side of La Laguna and the Glen Ivy North fault on the east. Lake Elsinore, a historically ephemeral lake and the terminous of the San Jacinto River drainage, fills the topographic lower part of the La Laguna depression. Rome Hill, on the south edge of La Laguna, is a small pressure ridge located at a left step within the Wildomar fault zone.

Metasedimentary rocks occur in northwest-trending pendants and septa within and between plutons. The metasedimentary rock is predominatly greenschist or subgreenschist

grade. These rocks have been penetratively deformed with the bedding transposed into a well developed foliation in all but quartzites. Relic bedding occurs in isolated occurrences, especially in metasandstone lenses within phyllite. This structural transposition results in a near orthogonal relationship between foliation and a lithologic contact between phyllite and quartzite east of Warm Springs Valley. Phyllitic rocks are most abundant in the quadrangle constituting a structural section over 9,000 m thick with some interlayered quartzite. Lenses of manganese-bearing siliceous layers are widespread in the phyllite. Most of these lenses consist of quartz and rhodonite, partly altered to manganese oxides, have been propected. Tremolite-bearing marble occurs as rare discontinuous lenses intercalated within phyllite.

Metavolcanic rocks occur between the Arroyo del Toro pluton and the Gavilan pluton in the northwest part of the quadrangle. Most of the volcanic rock is quartz latite, dacite, and rhyolite. The most abundant type is a black aphanitic to fine grained porphyritic quartz latitic rock, the Temescal Wash quartz latite of Larsen (1948). East of the quartz latite is a series of intermingled silicic volcanic rocks and metasedments.

The batholithic rocks range in composition from gabbro to granite. Hypersthene-bearing tonalitic rocks of the Gavilan pluton occur in the northern part of the quadrangle. This forms the southern part of a discontinuous plutonic ring complex. Much of the tonalite is of variable composition, reflected in color ranging from light to dark gray. Hypabyssal rock predominates in the western extent of this pluton northwest of Warm Springs Valley and typical hypidiomorphic textures occur to the northeast. Gold-bearing mineralized rock (Engel, and others, 1959) appears to be spatially related to the outcrop distribution of the Gavilan pluton.

Located along the northern edge of the quadrangle is the south half of the Arroyo del Toro pluton. This pluton consists of a very uniform light gray, massive, medium grained, hypidiomorphic-granular, hornblende-biotite granodiorite. Rock of most of the pluton is devoid of inclusions. Parts of the pluton have been quarried for building stone.

In the southeast corner of the quadrangle is the northwest part of the Paloma Valley ring complex (Morton and Baird, 1976). This ring complex consists of a ring structure consisting of granite and granodiorite emplaced within hornblende gabbro and contains large amounts of stoped gabbro fragments. This ring structure is interpreted to have been magmatically emplaced in an elliptical zone of ring fracturing in gabbro.

Sedimentary rocks of the Paleocene Silverado Formation are located in the Terra Cotta area north of La Laguna. The Silverado Formation consists of a series of sandstone, conglomerate, siltstone and shale. The lower part of the formation is micaeous sandstone, lignite, and clay. The clay-rich parts of the formation have been mined for clay used for production of heavy clay products.

Patches of a granitic-clast cobble to boulder conglomerate occur at elevations of 1,400 to 1,600 feet in the vicinity of Railroad Resevoir. This conglomerate consist of granitic rocks apparently derived from the Perris block. Patches of another conglomerate occur west and north of Railroad Reservoir at evlevations opf 1,600 to 1,640 feet. This is also a granitic clast cobble to boulder conglomerate, but contains cobbles of exotic red rhylolite and quartzite.

Menifee and Paloma Valleys are floored with Holocene and Pleistocene alluvium at an elevation of 1,400 to 1,500 feet. The interconnected valley floor surface has been termed the Paloma surface (Woodford, and others, 1971).

REFERENCES CITED

Engel, Rene, 1959, Geology of the Lake Elsinore quadrangle, California: State of California, Division of Mines Bulletin 146, p.9 - 58.

Larsen, E.S., Jr., 1948, Batholith and associated rocks of Corona, Elsinore, and San Luis Rey quadrangles southern California: Geological Society of America Memoir 29, 182 p.

Morton, D. M., and Baird, A. K., 1976, Petrology of the Paloma valley ring complex, southern California batholith: Jour. Research U. S. Geological Survey, v. 4, p. 83-89.

Todd, V.R., Erskine, B.G., and Morton, D.M., 1988, Metamorphic and tectonic evolution of the northern Peninsular Ranges batholith, southern California; in Ernst, W.G., ed., Metamorphism and crustal evolution of the western United States: Rubey Volume VII, Englewood Cliffsm New Jersey, Prentice-Hall, p. 894-937.