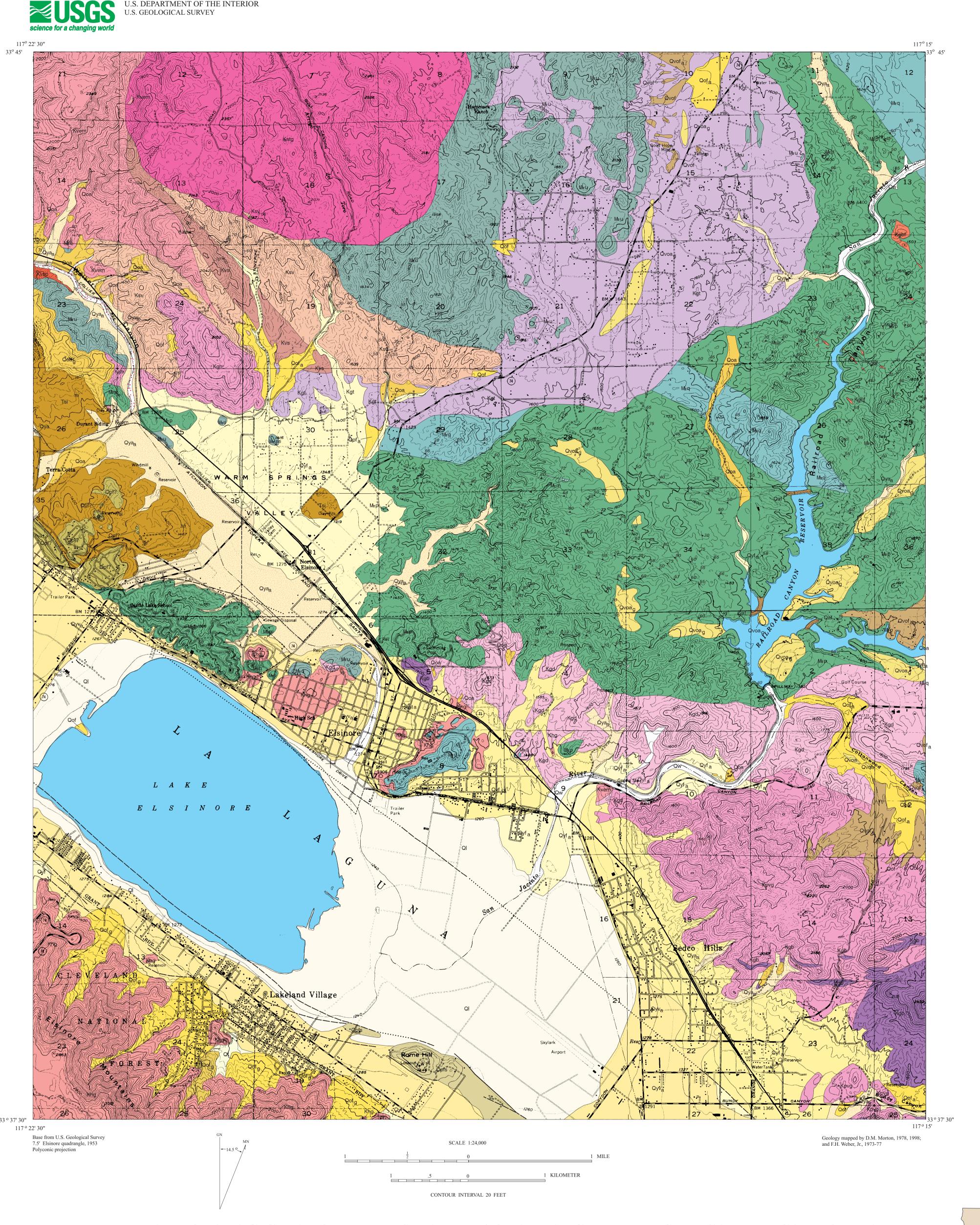
CALIFORNIA GEOLOGICAL SURVEY



PRELIMINARY GEOLOGIC MAP OF THE ELSINORE 7.5' QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA

Version 1.0

Douglas M. Morton¹ and F. Harold Weber, Jr.²

Digital preparation by

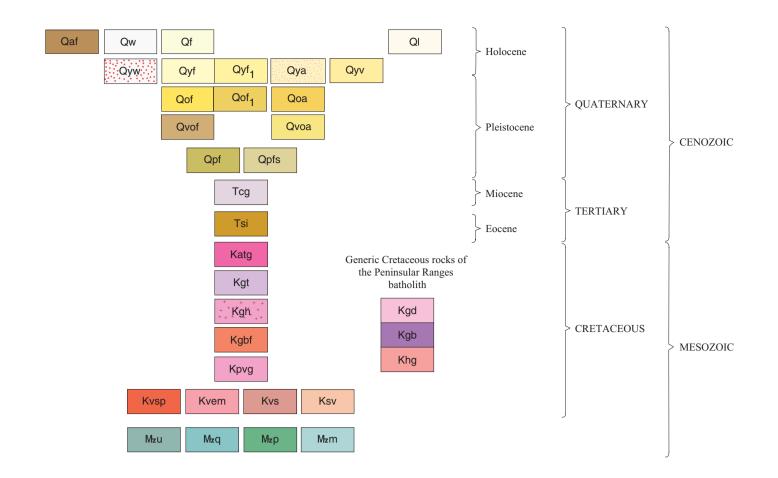
Rachel M. Alvarez¹ and Diane Burns³

²California Geological Survey ¹U.S. Geological Survey **Department of Earth Sciences** 655 South Hope St. University of California Los Angeles, CA 90017

Riverside, CA 92521

³California Geological Survey **Department of Earth Sciences** University of California Riverside, CA 92521

DESCRIPTION OF MAP UNITS CORRELATION OF MAP UNITS



On some SCAMP geologic map plots, including the Elsinore 7.5' quadrangle, characteristic grain size information is displayed using subscripted alpha characters (e.g. Qyfg, Qova), where the characters conform to the following

a - arenaceous (very coarse sand through very fine sand) b - boulder gravel (>25mm) g - gravel (cobble through granule gravel) c - clayey

Prepared in cooperation with the

In the **Description of Map Units**, the Ma following U/Pb ages has an attached subscript; Ma_{id} for isotope dilution analyses, and Ma_{ip} for ion probe analyses.

Contact—Generally located within ± 15 meters

______Fault—High angle. Strike-slip component on all faults is right-lateral; dip-slip component is unknown, but probably reflects valley-highland relations. Solid where located within ± 15 meters; dashed where located within ± 30 meters; dotted where concealed. Arrow and number indicate measured dip of fault plane that was exposed in trench.

Strike and dip of beds

Inclined

Strike and dip of igneous foliation

Strike and dip of metamorphic foliation

→ Vertical

______Inclined

engineered and non-compacted non-engineered fill. Most large deposits are mapped, but in some areas, small deposits are not shown Qw Very young wash deposits (late Holocene)—Unconsolidated bouldery to sandy alluvium of active and recently active washes Very young alluvial-fan deposits (late Holocene)—Active and recently active alluvial fans. Consists of unconsolidated, bouldery, cobbley,

gravelly, sandy, or silty alluvial fan deposits, and headward channel parts of alluvial fans. Trunk drainages and proximal parts of fans contain greater percentage of coarse-grained sediment than distal parts Very young lacustrine deposits (late Holocene)—Dominantly gray, clayey, silty, and fine-grained sandy lacustrine deposits YOUNG SURFICIAL DEPOSITS—Sedimentary units that are slightly

VERY YOUNG SURFICIAL DEPOSITS—Sediment recently transported

alluvial plains, and on hillslopes. Soil-profile development is non-existent

and deposited in channels and washes, on surfaces of alluvial fans and

Artificial fill (late Holocene)—Deposits of fill resulting from human

construction, mining, or quarrying activities; includes compacted

consolidated to cemented and slightly to moderately dissected. Alluvial fan deposits (Qyf series) typically have high coarse: fine clast ratios. Younger surficial units have upper surfaces that are capped by slight to moderately developed pedogenic-soil profiles (A/C to A/AC/B_{cambric}C_{ox} profiles) Young alluvial-wash deposits (Holocene and late **Pleistocene**)—Unconsolidated bouldery to sandy alluvium marginal to active and recently active washes Young alluvial-fan deposits (Holocene and late

Pleistocene)—Unconsolidated deposits of alluvial fans and headward

drainages of fans. Consists predominately of gravel, sand, and silt. Trunk drainages and proximal parts of fans contain higher percentage of coarse-grained sediment than distal parts. Includes: Young alluvial-fan deposits, Unit 1 (early Holocene and late Kgt Pleistocene)—Unconsolidated alluvial fan deposits. Consists of gravel, sand, and silt; old part of Qyf. In part distinguished on basis of relative

Young alluvial-channel deposits (Holocene and late Pleistocene)—Fluvial deposits along canyon floors. Consists of unconsolidated sand, silt, and Kgh clay-bearing alluvium Young alluvial-valley deposits (Holocene and late Pleistocene)—Fluvial

clay-bearing alluvium **OLD SURFICIAL DEPOSITS**—Sedimentary units that are moderately consolidated and slightly to moderately dissected. Older surficial deposits have upper surfaces that are 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 in the range of 10YR 5/4 and 6/4 through 7.5YR 6/4 to 4/4 and mature Bt horizons reaching 5YR 5/6) Old alluvial-fan deposits (late to middle Pleistocene)—Reddish-brown,

deposits along valley floors. Consists of unconsolidated sand, silt, and Kgbf

gravel and sand, alluvial-fan deposits; indurated, commonly slightly dissected. In places includes thin alluvial-fan deposits of Holocene age. Old alluvial-fan deposits, Unit 1 (middle Pleistocene)—Indurated, gravely alluvial-fan deposits. Most are slightly to moderately dissected;

of Holocene alluvial-fan material

reddish-brown. Some deposits include thin, discontinuous surface layer

Old alluvial-channel deposits (late to middle Pleistocene)—Fluvial

sediments deposited on canyon floors, but much of unit now elevated. Consists of moderately indurated, commonly slightly dissected gravel, sand, silt, and clay-bearing alluvium. Locally capped by thin, discontinuous alluvial deposits of Holocene age VERY OLD SURFICIAL DEPOSITS—Sediments that are slightly to well consolidated to indurated, and moderately to well dissected. Upper surfaces are capped by moderate to well developed pedogenic soils (A/AB/B/C_{OX}

profiles having Bt horizons as much as 2 to 3 m thick and maximum hues in the range 7.5YR 6/4 and 4/4 to 2.5YR 5/6) Very old alluvial-fan deposits (middle to early Pleistocene)—Mostly welldissected, well-indurated, reddish-brown alluvial-fan deposits. Grain size chiefly sand and gravel

Very old alluvial-channel deposits (middle to early Pleistocene)—Fluvial sediments deposited on canyon floors. Consists of moderately to wellindurated, reddish-brown, mostly very dissected gravel, sand, silt, and clay-bearing alluvium. In places, includes thin, discontinuous alluvial deposits of Holocene age. Deposits in Quail Valley and Railroad Canyon Kgd Granodiorite, undifferentiated (Cretaceous)—Biotite and hornblendearea contain rounded cobbles

Pauba Formation (Pleistocene)—Siltstone, sandstone, and conglomerate Named by Mann (1955) for exposures in Rancho Pauba area about 3.2 km southeast of Temecula. Vertebrate fauna from Pauba Formation are of late Irvingtonian and early Rancholabrean ages (Reynolds and Reynolds, 1990a; 1990b). In type area, subdivided into two informal members; only the sandstone member is exposed in the quadrangle

Sandstone member—Brown, moderately well-indurated, cross-bedded sandstone containing sparse cobble- to boulder-conglomerate beds. Restricted to Rome Hill area southeast of Lake Elsinore Conglomerate (Paleogene?)—Monolithic cobble conglomerate. Underlies a Railroad Canyon Reservoir dam. Conglomerate fills depression in

very small area (about 100m wide) on ridge crest 1.8 km west of metamorphic rock. Conglomerate is composed of exotic welded tuff

Kvsp clasts, some of which contain piemontite, characteristic mineral in welded tuff clasts in conglomerates of Poway Group (Woodford and others, 1968) (Kennedy, 1977). Welded tuff clasts appear identical to those common in early Miocene to late Eocene Sespe Formation and in conglomerate of Eocene Poway Group. Reworked tuff clasts occur in older alluvial deposits bordering Railroad Canyon Reservoir (Qvoag) and in northern part of the quadrangle (Qvoag) in Goodhope area. Distribution of reworked clasts within Elsinore quadrangle and quadrangles to north suggests occurrence here is small remnant of a very

Silverado Formation (Paleocene)—Nonmarine and marine sandstone, siltstone, and conglomerate. Dickerson (1914) first recognized Paleocene rocks in Santa Ana Mountains to west, and based on faunal similarities, correlated strata with Martinez Formation of central California. Woodring and Popenoe (1945) described unit in detail and named it Silverado Formation. Formation was deposited on deeply weathered erosional surface. Rocks underlying Silverado are characteristically saprolitic. Silverado Formation consists of basal Kvs conglomerate overlain by relatively thin sequence of sandstone and siltstone. Distinctive Claymont clay bed overlies sandstone and siltstone sequence, and is overlain by thick sequence of sandstone, siltstone, and conglomerate that includes second clay bed, the Serrano clay bed. Basal Ksv conglomerate is thoroughly weathered, 2- to 25-m-thick, massive, pale gray to reddish-brown, pebble conglomerate. Very locally is boulder conglomerate. Overlying this conglomerate is sandstone and siltstone which is also thoroughly weathered, consisting largely of quartz and clay. Claymont clay bed is 1- to 3-m thick, brown, green, and gray clay that weathers to distinctive brownish-red. Bed is mostly clay, partly pisolitic, and has scattered quartz grains in it. Locally, supports large-scale clay operation. Upper part of unit above Claymont clay bed is diverse section of marine and nonmarine sandstone, siltstone, and conglomerate, and includes Serrano clay bed. Latter is about 1 m thick, pale gray to white, and composed of nearly equal amounts plastic clay and quartz. In addition to clay, upper part of section contains carbonaceous shale and

lignite beds. Thicker lignite beds were locally mined for fuel. Upper

exposures of formation contain distinctive and diagnostic Paleocene

Turritella pachecoensis

part of unit also contains abundant marine mollusks. Some eastern Mzm

Rocks of the Peninsular Ranges batholith

Granodiorite of Arroyo del Toro pluton (Cretaceous)—Light gray, medium-grained, massive, very homogeneous, and inclusion-free biotitehornblende granodiorite. Some of the rock in the western part of the pluton is slightly porphyritic. Informally named for Arroyo del Toro, located in center part of pluton (Morton, 1999). Termed Steele Valley granodiorite by Dudley(1935) and included by Larsen(1948) within Woodson Mountain granodiorite. Near circular Arroyo del Toro is located in center of Gavilan ring complex, but apparently is not part of complex. Zircon ages of the pluton are 108.6 Ma_{id} and 111 Ma_{in}. 40Ar/39Ar biotite age is 104.3 Ma and potassium feldspar 98.5 Ma

Gavilan ring complex (Cretaceous)—Composite ring structure consisting of a variety of granitic rocks that range from monzogranite to tonalite. Informally named for exposures in Gavilan Plateau area. In this quadrangle, western part of complex was termed Estelle quartz diorite and eastern part was included in Perris quartz diorite by Dudley (1935). Western part of complex was termed Estelle tonalite and eastern part was included within Bonsall tonalite by Larsen (1948). Hypersthene is characteristic mineral of many rocks in complex. Based on texture, depth of erosion is greater in eastern part of complex than in western part. Rocks on west side of complex commonly have hypabyssal texture and appear to grade into volcanic textured rock. Several gold mines (e.g., Good Hope, Gavilan, and Santa Rosa mines), which constituted Pinacate mining district (Sampson, 1935), are located within complex in this quadrangle and the Steele Peak quadrangle. Gold apparently occurred in arsenopyrite bearing quartz veins. Located in center of ring complex, but not part of it, is near-circular Arroyo del Toro pluton.

Massive textured tonalite—Brown-weathering, massive, relatively heterogeneous, hypersthene-bearing biotite-hornblende tonalite. Most abundant rock type in complex. Equant-shaped mesocratic to melanocratic inclusions are common. Zircon age is 112.9 Ma_{id} and

Fine grained hornblende gabbro, Railroad Canyon area (Cretaceous)—

Fine-grained hornblende gabbro constituting dikes, sills, and small

Hypabyssal tonalite—Massive, hypabyssal-textured tonalite and lesser granodiorite in southwestern part of complex. Contains small, equant

shaped mesocratic inclusions

elongate plutons. Emplaced in phyllite in Railroad Canyon area Paloma Valley Ring Complex (Cretaceous)—Composite ring dike intrusion. Named and described by Morton and Baird (1976) for exposures in Paloma Valley area. Included within Woodson Mountain granodiorite and San Marcos gabbro by Larsen (1948). Ring complex consists of older, elliptical in plan, single ring-dike and two subsidiary short-arced dikes. A younger ring-set of thin dikes is largely within older ring dike. Older dike consists of granodiorite and monzogranite with vertical walls emplaced into gabbro by ring fracturing and magmatic stoping of gabbro. Younger ring-dike consists of hundreds of granitic pegmatite dikes. Most pegmatite dikes are 30 cm to over 1 m in thickness, and define a domal ring-dike geometry in which outer dikes are moderately to steeply outward dipping and pass inward to near horizontal dikes in center. Spatially associated with younger dikes in center of complex, are bodies of granophyre that contain stringers of

part of older dike near the mouth of the San Jacinto River is 121 Majd and 118.5 Main. 40Ar/39Ar age of hornblende 117.7 Ma and biotite 118.8 Ma. Includes: Monzogranite to granodiorite—Pale gray, massive, medium-grained hypidiomorphic-granular biotite monzogranite, and less abundant hornblende-biotite granodiorite forming older ring dike. Plagioclase is

An₂₀ to An₃₅, subhedral, tabular crystals. Contains inclusions of small

granitic pegmatite. Younger dikes are interpreted as products of volatile-

rich magma that filled a domal set of fractures resulting from cauldron

subsidence. Granophyre is interpreted as a product of pressure

quenching of pegmatite magma and attendant loss of volatiles. Zircon

ages of rock from atypical hornblende-bearing granodiorite from western

Generic Cretaceous granitic rocks of the Peninsular Ranges batholith

to large stoped blocks of gabbro

biotite granodiorite, undifferentiated. Most is massive and medium Gabbro (Cretaceous)—Mainly hornblende gabbro. Includes Virginia quartz-norite and gabbro of Dudley (1935), and San Marcos gabbro of Larsen (1948). Typically brown-weathering, medium-to very coarse-

heterogeneous granitic rocks. Some heterogeneous assemblages include

grained hornblende gabbro; very large poikilitic hornblende crystals are common, and very locally gabbro is pegmatitic. Much is quite heterogeneous in composition and texture. Includes noritic and dioritic composition rocks Heterogeneous granitic rocks (Cretaceous)—Includes wide variety of

large proportions of schist and gneiss. Tonalite composition rock is most abundant rock type. Santiago Peak Volcanics (Cretaceous)—Basaltic andesite, andesite, dacite, rhyolite, volcaniclastic breccia, welded tuff, and epiclastic rocks (Herzig, 1991). Originally named Black Mountain volcanics by Hanna (1926), but name was pre-empted. Larsen (1948) renamed unit Santiago Peak Volcanics for exposures in vicinity of Santiago Peak, northern Santa Ana Mountains. Rocks are very heterogeneous, discontinuous, and poorly exposed. Most of unit is hydrothermally altered; alteration was contemporaneous with volcanism. Zircon ages of Santiago Peak Volcanics range from 123 to 134 Ma (Anderson, 1991), making it coeval

with older part of Peninsular Ranges batholith

Estelle Mountain volcanics of Herzig (1991) (Cretaceous)—Heterogeneous mixture of rhyolite flows, shallow intrusive rocks, and volcaniclastic rocks; andesite is rare. Informally named by Herzig (1991) for exposures in vicinity of Estelle Mountain, Lake Mathews 7.5' quadrangle. These rocks were termed Temescal dacite-porphyry by Dudley (1935) and Temescal Wash quartz latite porphyry by Larsen (1948). Zircon age of rock from unit collected west of Lake Mathews, Lake Mathews 7.5' quadrangle, is 125.8 Ma (Anderson, 1991)

Intermixed Estelle Mountain volcanics of Herzig (1991) and Cretaceous(?) sedimentary rocks (Cretaceous?)—Complexly intermixed volcanic and sedimentary rocks, which appear to be coeval; sedimentary rocks predominate Intermixed Estelle Mountain volcanics of Herzig (1991) and Mesozoic sedimentary rocks (Mesozoic)—Complexly intermixed volcanic and sedimentary rocks; volcanic rocks predominate. West of Lake Mathews

much of sedimentary rocks predates volcanic rocks. In Elsinore

quadrangle, much of sedimentary rocks appears coeval with volcanics Metasedimentary rocks, undifferentiated (Mesozoic)—Wide variety of low-to high-metamorphic grade metamorphic rocks. Most occurrences include biotite schist **Quartz-rich rocks (Mesozoic)**—Quartzite and quartz-rich metasandstone

Phyllite (Mesozoic)—Fissile black phyllite. Commonly has sheen produced by very fine-grained white mica on s-surface; locally contains small elongate prisms of fine-grained white mica, which may be pseudomorphs

Marble (Mesozoic)—Pod-like masses and elongate layers of relatively finegrained, off-white to gray marble and calculicate rocks. Commonly contains massed radiating blades of white tremolite. In the Romoland quadrangle to the east, small mass of fine-grained dark gray to black marble and calcsilicate rock in hills east of Sun City contains deformed and poorly preserved pelycepods and crinoids

Geologic Summary

The Elsinore quadrangle is located in the northern part of the Peninsular Ranges Province and includes parts of two structural blocks, or structural subdivisions of the province (Fig. 1). The active Elsinore Fault Zone diagonally crosses the southwest corner of the quadrangle, and is a major element of the right-lateral strike-slip San Andreas Fault system. The Elsinore Fault Zone separates the Santa Ana Mountains block west of the fault zone from the Perris block to the east. Internally both blocks are relatively stable and within the quadrangle are characterized by the presence of widespread erosional surfaces of low relief.

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Within the quadrangle the Santa Ana Mountains block is underlain by undifferentiated granitic rocks of the Cretaceous Peninsular Ranges batholith, but to the west, includes widespread pre-batholithic Mesozoic rocks. The Perris block is underlain by a combination of batholithic and

prebatholithic rocks, the latter consisting of metasedimentary rocks of low metamorphic grade; sub-greenschist grade. The most abundant lithology is phyllite but includes locally thick sections of impure quartzite. Minor sills, dikes, and small elongate plutons of fine-grained hornblende gabbro intrude the phyllite. Thin layers of tremolite-bearing marble occur locally. Also local are thin layers of manganese-bearing rocks. Both rhodonite and manganese oxides occur in these layers. The phyllite has a regular northwest strike throughout the main body of metamorphic rock giving rise to a homoclinal section over 25,000 feet thick. The layering-schistocity of these rocks is transposed bedding and is not stratigraphic

In the northwest corner of the quadrangle is a series of Cretaceous volcanic and associated sedimentary rocks in the northwest corner of the quadrangle contain widespread primary sedimentary structures and appear to post date the metamorphism of the phyllite. The volcanic rocks are part of the Estelle Mountain volcanics of primarily rhyolitic composition. The sedimentary rocks are well indurated, perhaps incipiently metamorphosed, siliceous rocks containing local conglomerate beds

Parts of three plutonic complexes are included within the quadrangle, all part of the composite Peninsular Ranges batholith. In the southeast corner is the northwest part of the Paloma Valley ring complex, which is elliptical in plan and consists of an older ring-dike and two subsidiary short-arced dikes that were emplaced into gabbro by magmatic stoping. Small to large stoped blocks of gabbro are common within the ring-dikes. A younger ring-set, made up of hundreds of thin pegmatite dikes, occur largely within the central part of the complex. Only the northern part of the older ring dike occurs within the quadrangle. Stoped gabbro masses occur near the southeast margin of the quadrangle.

composite Gavilan ring complex of mostly tonalite composition. Hypersthene, although not usual in tonalite in the batholith, is a characteristic mineral of most of the rock of this complex. The Gavilan ring complex is a shallow intrusive that appears to be tilted up to the northeast. Fabric of the rocks changes in texture from hypauthomorphic-granular in the east to semiporphyritic in the west. The main part of the complex appears to have been emplaced by magmatic stoping. Several inactive gold mines, Goodhope, Gavilan, and Santa Rosa, are located within the complex.

In the northern part of the quadrangle is the southern part of the

Within the Gavilan ring complex is the south-half of the Arroyo del Toro pluton. This near circular-in-plan pluton consists of massive-textured granodiorite that is essentially devoid of inclusions, and at one time was quarried for building stone. The Elsinore Fault Zone forms a complex series of pull-apart

basins. The largest and most pronounced of these pull-apart basins forms a flat-floored closed depression, La Laguna, which is partly filled by Lake Elsinore. This basin forms the terminus for the San Jacinto River. During excessively wet periods the La Laguna fills and the overflow passes through Warm Springs Valley into Temescal Wash which joins the Santa Ana River at Corona. La Laguna, bounded by active faults, is flanked by both Pleistocene and Holocene alluvial fans emanating from both the Perris block and the Santa Ana Mountains. North of La Laguna are exposures of the Paleocene Silverado Formation. Clay beds of the Silverado Formation have been an important source of clay. Overlying the Silverado Formation are discontinuous exposures of conglomeratic younger Tertiary sedimentary rocks that are tentatively correlated

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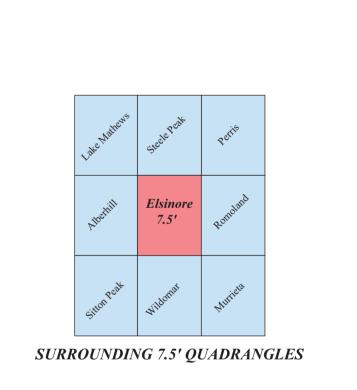
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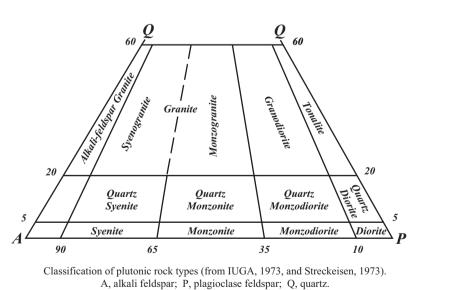
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Prelim. Chart OC 12.

63 Sample locality, showing potassium-argon ages. **— — — —** Approximate location of boundary separating plutons having well developed penetrative fabrics on the east, from essentially structureless plutons on the west. Figure 1. Location of Elsinore quadrangle relative to major structural blocks of the northern Peninsular Ranges batholith. Conventional potassium-argon biotite ages of Cretaceous granitic rocks are hand contoured, and are considered to reflect the cooling history of the batholith rather than representing ages of emplacement. Contouring of ages in each of the three structural blocks separated by the Elsinore and San Jacinto fault zones, was done independently of ages in adjacent blocks. Red band shows offset of 98 to 108 contours across Elsinore fault zone. Faults as shown are simplified from Rogers, 1965.





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LOCATION MAP