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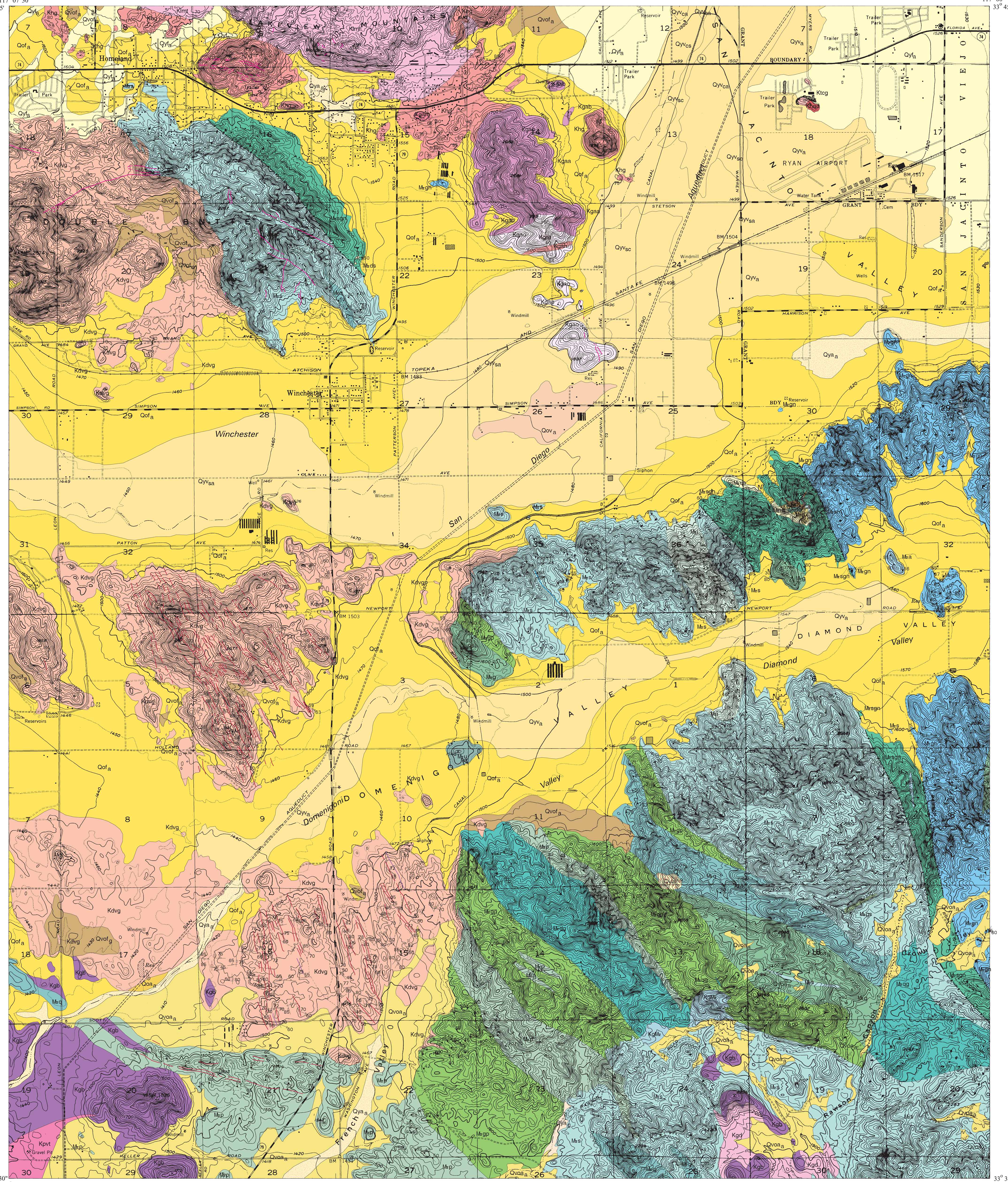
CALIFORNIA GEOLOGICAL SURVEY



Base from U.S. Geological Survey
7.5' Winchester quadrangle, 1973
Polyconic projection

GN
MN
14.5°

SCALE 1:24,000

1 ½ 0 1 MILE

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET

Geology mapped by D.M. Morton, 1991, 1995-99 and 2001

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

Version 1.0

By

Douglas M. Morton[1]

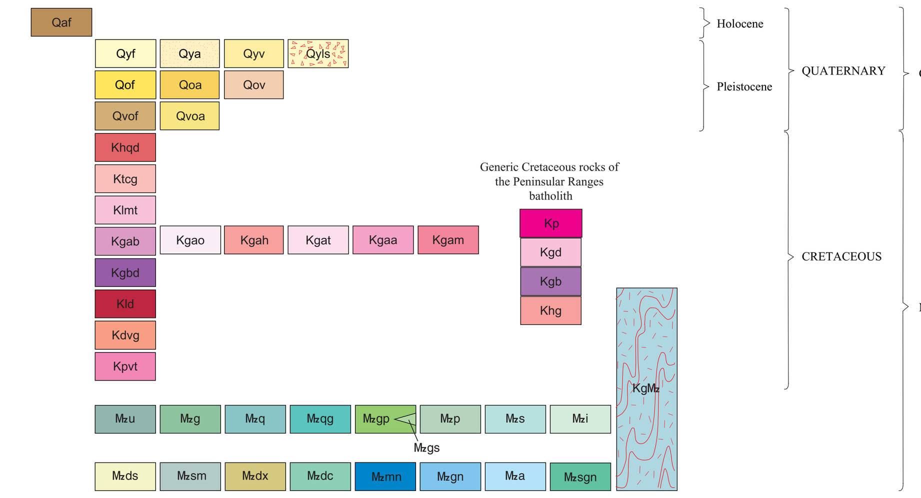
Digital preparation by

Kelly R. Bovard[1] and Gary W. Patt[2]

[1] **U.S. Geological Survey**
Department of Earth Sciences
University of California
Riverside, CA 92521

[2] **Department of Earth Sciences**
University of California
Riverside, CA 92521

CORRELATION OF MAP UNITS



On some SCAMP geologic map plots, including the Winchester 7.5' quadrangle, characteristic grain size information is displayed using subscripted alpha characters (e.g., Qyf_g, Qov_a, after the unit label), where the characters conform to the following definitions:

- a - arenaceous; sand or sand bearing (very coarse sand through very fine sand)
- b - boulders or containing boulders (>25mm)
- g - gravel or containing gravel (cobble through granule gravel)
- s - silt or silty
- c - clay or clay bearing
- m- marl
- p - peat

Where a unit label has more than one subscripted character, in all cases, the first character modified the second (e.g., Qyf_{ag} indicates arenaceous gravel).

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—Solid where located within ±15 meters; dashed where located within ±30 meters

Fault—High angle. Relative slip directions unknown, but probably reflect valley-highland relations. Solid where located within ±15 meters; dashed where located within ±30 meters; dotted where concealed

Suture

Kgbd—Gabbroic dikes

Kld—Quartz latite dikes; arrow and number indicate dip of dike

Kp—Granitic pegmatite dikes

Mzmn—Black manganese-bearing siliceous rock

Strike and dip of igneous foliation

- **Inclined**
- **Vertical**

Strike and dip of metamorphic foliation

- **Inclined**
- **Vertical**

Strike and dip of joints in igneous rocks

- **Inclined**
- **Vertical**

Strike and dip of joints in metamorphic rocks

- **Inclined**

Bearing and plunge of igneous lineations

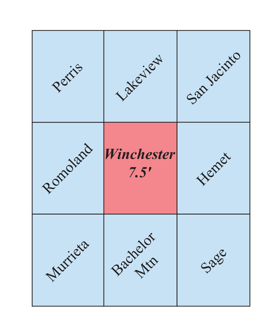
- **Inclined**

Bearing and plunge of metamorphic lineations

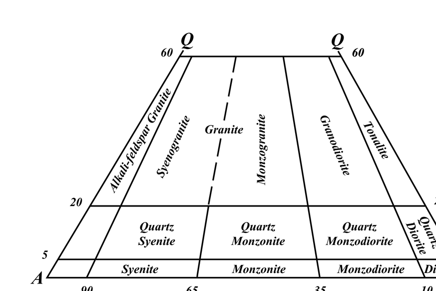
- **Inclined**

Bearing and plunge of minor metamorphic fold axis

- **Inclined**



SURROUNDING 7.5' QUADRANGLES



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

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the North American Stratigraphic Code. Any use of trade, firm, or product names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Government.

This map was printed on an electronic plotter directly from digital files. Dimensional calibration may vary between electronic plotters and between X and Y directions on the same plotter, and paper may change size due to atmospheric conditions; therefore, scale and proportions may not be true on plots of this map.

Digital files available on World Wide Web at http://geopubs.wr.usgs.gov/ open-file/of03-188

DESCRIPTION OF MAP UNITS

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

Qaf **Artificial fill (late Holocene)**—Unconsolidated deposits of fill resulting from mining activities

YOUNG SURFICIAL DEPOSITS—Sedimentary units that are slightly 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). Includes:

Qyf **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. Qyf_a in northeast corner of the quadrangle is the fine-grained distal part of the abandoned alluvial fan of Bautista Creek located in the Hemet quadrangle

Qya **Young alluvial channel deposits (Holocene and late Pleistocene)**—Fluvial deposits consisting of unconsolidated sand, silt, and clay-bearing alluvium

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

Qyls **Young landslide (Holocene and late Pleistocene)**—Highly fragmented to largely coherent landslide deposit. Unconsolidated to consolidated

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). Includes:

Qof **Old alluvial fan deposits (late to middle Pleistocene)**—Reddish brown, gravel and sand alluvial fan deposits; indurated, commonly slightly dissected. In places, includes thin alluvial fan deposits of Holocene age

Qoa **Old alluvial channel deposits (late to middle Pleistocene)**—Fluvial sediments deposited on canyon floors. Restricted to single small exposure in southwestern part of quadrangle. Consists of moderately indurated, generally slightly dissected gravel, sand, silt, and clay-bearing alluvium. May be capped by thin, discontinuous alluvial deposits of Holocene age

Qov **Old alluvial valley deposits (late to middle Pleistocene)**—Fluvial deposits along valley floors. Restricted to small exposure in major drainage 2 km east of winchester. Consists of moderately indurated, commonly slightly dissected sandy alluvium, containing lesser silt, and clay-bearing alluvium. Some deposits may include 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)

Qvof **Very old alluvial fan deposits (middle to early Pleistocene)**—Mostly well-dissected, well-indurated, reddish-brown alluvial fan deposits. Grain size chiefly sand and gravel

Qvoa **Very old alluvial channel deposits (middle to early Pleistocene)**—Fluvial sediments deposited on valley floors. Consists of moderately to well-indurated, reddish-brown, mostly very dissected gravel, sand, silt, and clay-bearing alluvium. In places, includes thin, discontinuous alluvial deposits of Holocene age

Rocks of the Peninsular Ranges batholith

Khqd **Hypersthene quartz diorite (Cretaceous)**—Mafic, hypersthene quartz diorite. Exposed on one small hill between Ryan Airport and State highway 74. Dark-gray, massive, fine- to medium-grained, homogeneous appearing hypersthene-biotite quartz diorite. Distinguished by relatively high color index, small grain size, lack of inclusions, and abundant hypersthene. Intrusive into monzogranite of Tres Cerritos

Ktcg **Monzogranite of Tres Cerritos (Cretaceous)**—Medium- to coarse-grained, leucocratic foliated to subgneissic, subporphyritic biotite monzogranite. Restricted to small hill between Ryan Airport and State highway 74, but more extensive in quadrangle to north. Informally named for exposures in eastern part of Tres Cerritos, Lakeview 7.5' quadrangle. Included within Perris quartz diorite by Dudley (1935) and within Bonsall tonalite by Larsen (1948). Pale tan weathering, leucocratic, containing potassium feldspar crystals up to 2.5 cm in length. Biotite comprises about 5 percent of rock in most of unit; locally as high as 10 percent. Biotite typically forms groups of small plates. In gneissic parts of unit, biotite occurs as coating on s-surfaces. Oligoclase margins are commonly myrmekitic where plagioclase is in contact with potassium feldspar

Lakeview Mountains pluton (Cretaceous)—Composite pluton composed mainly of biotite-hornblende tonalite. Named Lakeview quartz-hornblende diorite by Dudley (1935) and Lakeview Mountain tonalite by Larsen (1948). Larsen's usage of Lakeview Mountain tonalite included much of granitic and metamorphic rocks in Mount Eden area, and a variety of granitic rocks within San Jacinto Mountains and in area south of Hemet. Morton (1969) restricted usage to pluton underlying most of Lakeview Mountains and southern part of the Bernasconi Hills as originally used by Dudley (1935). Zircon age of tonalite is 100 Ma_{id} and 98 Ma_{ip}(Premo, per com, 1998). $^{40}Ar/^{39}Ar$ age of hornblende is 98.6 (Snee, per com, 1998) and conventional K/Ar age of biotite is 92.4 Ma (Miller, per comm, 1980). Includes:

Klmt **Tonalite**—Gray, medium- to coarse-grained, massive to foliated, biotite hornblende tonalite lacking potassium feldspar. Most abundant rock type in Lakeview pluton. Tonalite characterized by presence of ubiquitous schlieren, and in much of body, tonalite is essentially all schlieren. Schlieren renders tonalite extremely heterogeneous at outcrop scale producing rocks that ranges in composition from leucocratic to melanocratic. Schlieren range in shape from relatively tabular to wispy layers and in size from a few centimeters in width to sizes mappable at 1:24,000 (Morton, 1969; 1972; Morton and others, 1969). Mineralogic composition of tonalite without variability introduced by schlieren is, quartz 13 to 32 percent, plagioclase (andesine) 34 to 70 percent, biotite 7 to 22 percent and hornblende 4 to 29 percent. Mafic minerals average about 25 percent of tonalite. Accessory minerals are apatite, zircon, magnetite-ilmenite, and sphene. Colorless small masses of cumingtonite form central parts of some hornblende crystals. Ellipsoidal melanocratic inclusions are common and widespread

Green Acres gabbro complex (Cretaceous)—Medium- to very coarse-grained olivine-bearing gabbro that weathers gray to black. Named for community of Green Acres on southeast side of Lakeview Mountains (Morton, 1969). Included within San Marcos gabbro by Larsen (1948). Most gabbro is hypidiomorphic-granular; poikilitic rock is common and porphyritic rock less common. Weathers to form semi-smooth slopes littered with scattered small boulders. Includes rare orbicular gabbro and protoclastic flaser gabbro. Contains several small septa of quartzofeldspathic, biotite quartz-feldspar, and graphitic schist. In northern part of gabbro complex are a few occurrences of quartzo-feldspathic mylonite. Color of decomposed gabbro and soil derived from gabbro is typically dark red-brown. Includes:

Kgab **Heterogeneous mixture of olivine, pyroxene, and hornblende gabbro**—Northern part of Green Acres gabbro complex is very heterogeneous and includes olivine, pyroxene, and hornblende gabbro intruded by quartz diorite and tonalite. Slopes covered with gabbro rubble generally mask presence of quartz diorite and tonalite

Kgao **Olivine gabbro**—Southern half of Green Acres gabbro is mostly olivine gabbro, which ranges from a few percent to about one-third olivine (Fo_{75} to Fo_{87}). Kelyphitic rims are common around olivine. Anorthite (An_{90}) makes up 30 to 90 percent of gabbro as anhedral to subhedral, complexly twinned crystals. Stubby, anhedral orthopyroxene in thin section is nearly colorless- to very pale-pink, and pleochroic, commonly forming overgrowths of, or intergrowths with, clinopyroxene or hornblende. Augite occurs as anhedral, tabular- to irregular-shaped, colorless crystals, some of which contain schiller-like intergrowths of a violet, platy, nearly opaque mineral. Augite is commonly mantled with brown and (or) green hornblende. Hornblende occurs as both brown hornblende and nearly colorless to very light green hornblende. Latter occurs primarily in reaction rims (kelyphitic rims) intergrown with spinel around olivine; brown hornblende occurs most commonly as interstitial crystals and as subhedral crystals. Opaque minerals, including magnetite, occur adjacent to olivine and as symplektitic intergrowths with amphibole. Colorless- to light-green chlorite is abundant in some protoclastic gabbro. Planar, vein-like hornblende-spinel masses are locally common in gabbro having abundant olivine. Small hornblende gabbro dikes are mineralogically similar to that of enclosing olivine gabbro. Some dikes are fine- to medium-grained, meso- to melanocratic hornblende gabbro; others consist of porphyritic hornblende olivine gabbro

Kgah **Hornblende rich gabbro**—Fine- to medium-grained, melanocratic hornblende gabbro. Restricted to single dike form body 3 km southwest of Ryan airport. In thin section, brown prismatic hornblende imparts a nematoblastic texture to this gabbro. Typically consists of 46 percent brown hornblende, 7 percent green hornblende, 9 percent clinopyroxene, 2 percent olivine, 34 percent calcic plagioclase, and 2 percent opaque minerals

Kgat **Troctolite**—Small elliptical intrusion of distinctive rock composed of about 45 percent anorthite (An_{90}), 36 percent olivine (Fo_{85}), 11 percent clinopyroxene, 3 percent orthopyroxene, 2 percent hornblende, 2 percent spinel, and about 5 percent iddingsite. Restricted to single, very small body 2.8 km southwest of Ryan Airport. Kelyphitic rims mantle most olivine crystals. Large subhedral anorthitic plagioclase crystals impart a slightly porphyritic texture to rock

Kgaa **Anorthositic gabbro**—Pale gray-weathering, leucocratic, labradorite-anorthite gabbro. Restricted to single small body 2 km southeast of intersection of highways 74 and 78. Anorthosite is composed essentially of calcic plagioclase, containing small, variable amounts of olivine and(or) pyroxene

Kgam **Metagabbro**—Metagabbro derived from Green Acres gabbro included within heterogeneous granitic rocks. In quadrangle, restricted to single, small body near intersection of highways 74 and 78. Other bodies found north of quadrangle in southern part of Lakeview Mountains. These bodies contain abundant masses of chlorite and blue-green hornblende

Kgbd **Gabbroic dikes (Cretaceous)**—Relatively fine-grained, massive, black hornblende gabbro occurs as thin (few meters thick) dikes in Domenigoni valley area, east and west of Winchester Road. Dike cuts granodiorite to tonalite (Kdvg) of Domenigoni Valley mostly

Domenigoni Valley pluton (Cretaceous)—Massive, isotropic, gray, medium-grained, biotite hornblende granodiorite and tonalite. Larsen (1948) used name Domenigoni granodiorite for exposures in Domenigoni Valley area, but included western part of pluton in his Bonsall tonalite unit. Erosion exposes only upper part of pluton, which consists of two parts separated by pendant of metasedimentary rock and gabbro. Foliated rock restricted to southeastern part of pluton. Unit contains moderately abundant to abundant, equant-shaped, mesocratic inclusions, which are sparse or lacking around margins of pluton. Two relatively consistent, steeply dipping, joint sets are present throughout pluton; one strikes northeast, other northwest. Possibly comagmatic dacite-quartz latite dike swarm was emplaced along northwest striking joint set. Southeastern part of pluton, coincides with westward deflection of metamorphic foliation to parallel contact of pluton. Subdivisions of unit in quadrangle include:

Kld **Quartz latite dikes**—Light-to dark-gray, fine grained, massive to well-foliated, biotite, biotite-hornblende, and hornblende quartz latite. Some dike rock contains small needle-like hornblende crystals. Swarm of quartz latite dikes occur on both sides of Winchester, in Domenigoni Valley pluton. A few dikes extend into metasedimentary country rock and some occur entirely within metasedimentary rocks. Dikes are more resistant to erosion than the enclosing rock and form conspicuous ribs and walls. Included as part of Domenigoni Valley pluton, because they are largely restricted to pluton. Most are foliated in contrast to typically massive granodiorite. Streaks of biotite, and less commonly, oriented hornblende crystals, give rise to pronounced, regular lineation

Kdvg **Granodiorite to tonalite of Domenigoni Valley**—Relatively uniform, massive to foliated hornblende biotite granodiorite grading into tonalite. Unit is principal rock type of Domenigoni Valley pluton. Contains some mafic rich rocks in southern part of pluton. Common accessory minerals are zircon, sphene, apatite, and magnetite-ilmenite. Minute rutile crystals impart bluish opalescence to quartz. Small masses of epidote and (or) tourmaline rock occur locally and appear to replace granodiorite to tonalite. Contains moderately abundant to abundant equant mafic inclusions. Zircon age is 117.8 Ma_{id} (Premo, per com, 1998) and 112.8 Ma_{ip} (Premo, per com, 1998) and $^{40}Ar/^{39}Ar$ age of 104 Ma (Snee, per com, 1998) for biotite and 95.5 Ma (Snee, per com, 1998) for potassium feldspar

Paloma Valley Ring Complex (Cretaceous)—Composite ring dike intrusion. Named and described by Morton and Baird (1976) for exposures in Paloma Valley area, Murrieta and Romoland quadrangles to the west. 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. Zircon ages of rock from atypical hornblende-bearing granodiorite from western part of older dike is 121 Ma_{id} (Premo, per com, 1998) and 118.5 Ma_{ip} (Premo, per com, 1998) $^{40}Ar/^{39}Ar$ age of hornblende 117.7 Ma (Snee, per com, 1998) and biotite 118.8 Ma (Snee, per com, 1998). Includes:

Kpvt **Tonalite**—Foliated biotite-hornblende tonalite. In Winchester quadrangle, restricted to southwest corner. In eastern part of complex grades into granodiorite

Generic Cretaceous granitic rocks of the Peninsular Ranges batholith

Kp **Granite Pegmatite dikes (Cretaceous)**—Leucocratic, mostly tabular, pegmatitic-textured granitic dikes. Most dikes range in thickness from a few centimeters to over a meter. Larger dikes are typically zoned compositionally and texturally, having a border and wall zone consisting of coarse-grained biotite, quartz, and alkali feldspars

Kgd **Granodiorite, undifferentiated (Cretaceous)**—Biotite and hornblende-biotite granodiorite, undifferentiated. Most is massive and medium grained. In Winchester quadrangle, restricted to limited area near south edge

Kgb **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-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

Khg **Heterogeneous granitic rocks (Cretaceous)**—Variable assemblage of heterogeneous granitic rocks; widely distributed in northern part of Peninsular Ranges batholith. In Winchester quadrangle assemblages include large proportions of schist and gneiss. Average composition is tonalite, but ranges from diorite to monzogranite. Tonalite from unit in Hot Springs Canyon, Cañada Gobernadora 7.5' quadrangle gave zircon age of 119.2 Ma_{id} (Premo, per com, 1998) and 116.5 Ma_{ip} (Premo, per com, 1998)

End rocks of Peninsular Ranges batholith

Mzu **Metasedimentary rocks, undifferentiated (Mesozoic)**—Wide variety of low- to high-metamorphic grade metamorphic rocks. Most occurrences include biotite schist. Mapped as undifferentiated only on isolated hill in Domenigoni Valley

Mzg **Graywacke (Mesozoic)**—Predominately lithic graywacke. Thick layered, massive, commonly contains angular fragments and discontinuous layers of phyllite in low metamorphic grade rocks or biotite schist in higher grade rocks

Mzq **Quartz-rich rocks (Mesozoic)**—Quartzite and quartz-rich metasandstone

Mzqg **Intermixed quartzite and graywacke (Mesozoic)**—Intermixed quartzite and lithic metagraywacke; quartzite may or may not be feldspathic

Mzgp (Mzgs) **Intermixed graywacke and phyllite (Mesozoic)**—Intermixed lithic metagraywacke and phyllite. Other metasedimentary rocks may be present in small amounts. Higher grade rock consists of graywacke and schist; labeled Mzgs

Mzp **Phyllite (Mesozoic)**—Fissile black phyllite. Commonly has sheen produced by very fine-grained white mica on s-surfaces; locally contains small, elongate, multigrain prism-like aggregates of fine-grained white mica, which may be pseudomorphs after chiastolite

Mzs **Schist (Mesozoic)**—Biotite schist, in part gradational with phyllite. In lower metamorphic-grade rocks, consists of andalusite-biotite schist. In higher metamorphic-grade rocks, includes cordierite biotite schist, and in highest metamorphic-grade rocks sillimanite schist, and less commonly garnet bearing schist

Mzi **Interlayered phyllite (or schist) and quartzite (Mesozoic)**—Western part of unit is low metamorphic-grade, consisting of interlayered, well-segregated, relatively pure quartzite and phyllite. Eastern part of unit is higher metamorphic-grade quartzite and biotite schist.

Mzds **Metadunite and serpentinite (Mesozoic)**—Assemblage that includes metadunite, in large part serpentinized, and related metamorphic rocks. Forms several large masses on ridge between Diamond Valley and San Jacinto Valley, locally known as Searls Ridge. Least altered metadunite is composed essentially of olivine and talc. At and near outer margins of some metadunite is a layer consisting of essentially enstatite, and in some places an outer thin zone (few centimeters) of spinel-rich rock. Surrounding metadunite is 0.5 to 6 m wide selvage of massive rock containing large proportion of 2 to 5 cm poikiloblastic cordierite in sillimanite-biotite rock. Cordierite apparently formed during metamorphism from magnesium in dunite during metamorphism. Granitic pegmatite dikes intruding metadunite have outer parts containing andalusite, sillimanite, dumortierite, and cordierite. Metadunite adjacent to pegmatite is altered to an inner layer of hydrobiotite and vermiculite; and an outer layer of chlorite and amphibole

Mzsm **Magnesite-bearing serpentine (Mesozoic)**—Forsteritic dunite and enstatite peridotite altered to serpentine, magnesite, and clay (?) minerals. Restricted to same area as unit Mzds. Magnesite occurs as network of small veins most ranging in width from 4 mm to 5 cm. Some magnesite is replaced by opaline silica. Thoroughly serpentized metadunite contains veinlets of magnesite, which was formerly mined

Mzdx **Amphibole and pyroxene-bearing rocks associated with metadunite-serpentinite (Mesozoic)**—Includes wide variety of amphibole and pyroxene bearing rocks spatially associated with dunite. Ranges from white to green to black amphibolite and pyroxenite and pink anthophylite rock. Includes some carbonate rock and metasomatized schist. Isolated small exposures of these rocks are found to north and south of metadunite and serpentinite (Mzs) occurrence at Double Butte and in vicinity of Rawson Valley, respectively

Mzdc **Marble associated with metadunite (Mesozoic)**—Coarse-grained impure marble adjacent to metadunite, consisting of calcite and variable amounts of olivine, pyroxene, amphibole, spinel, and opaque minerals. Some silicate minerals are concentrated in layers. Marble apparently is metamorphosed silica-carbonate rock associated with serpentinite

Mzmn **Black manganese-bearing siliceous rock (Mesozoic)**—Secondary manganese oxides-hydroxides. Found as dike-form body 3.8 km southeast of Winchester in unit Mzs

KgMz **Intermixed Mesozoic schist and Cretaceous granitic rocks (Mesozoic)**—Wide variety of Mesozoic schist and related metamorphic rocks mixed with Cretaceous granitic rocks ranging in composition from monzogranite to quartz diorite. Most granitic rocks are tonalite composition

Mzsgn **Low metamorphic grade and upper amphibolite grade rocks (Mesozoic)**—Serpentine and related ultramafic rocks and their alteration products. Highly sheared internally and along contacts. Interpreted to be suture zone between Mesozoic and Paleozoic terranes

Mzgn **Biotite Gneiss and Schist (Mesozoic)**—Medium-to dark-gray, coarse-grained biotite gneiss and schist and biotite-quartz-feldspar gneiss and schist. Locally contains sillimanite and cordierite. Commonly includes minor amounts of quartzite and calc-silicate hornfels

Mza **Amphibolite (Mesozoic)**—Black elongate-shaped masses of plagioclase and hornblende. Locally contains garnet in vugs

GEOLOGIC SUMMARY

The Winchester quadrangle is located in the northern part of the Peninsular Ranges Province within the central part of the Perris block, a relatively stable, rectangular in plan view, area located between the Elsinore and San Jacinto fault zones (see location map).

The quadrangle is underlain by Cretaceous and older basement rocks. Cretaceous plutonic rocks are part of the composite Peninsular Ranges batholith, which indicates wide variety of granitic rocks, ranging from granite to gabbro. Parts of three major plutonic complexes are within the quadrangle, the Lakeview Mountains pluton, the Domenigoni Valley pluton and the Paloma Valley ring complex.

In the northern part of the quadrangle is the southern part of the Lakeview Mountains pluton, a large composite body, most of which lies in the quadrangle to the north.

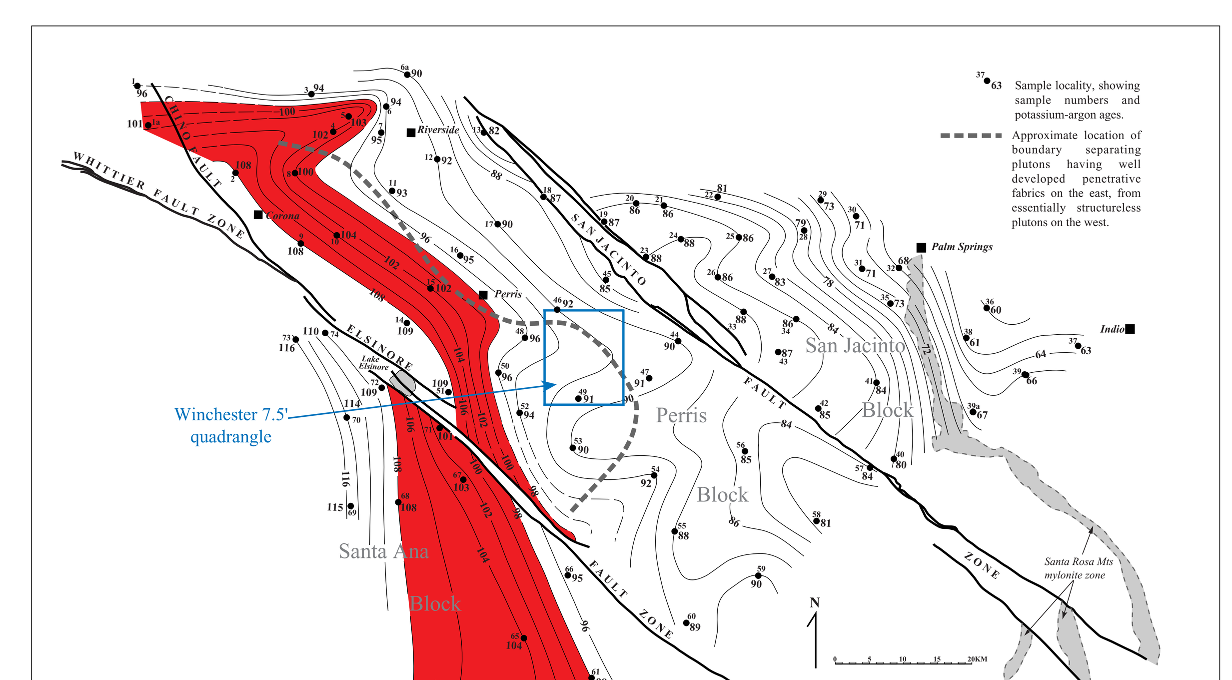
In the center part of the quadrangle is the eastern part of the Domenigoni Valley pluton, which consists of massive biotite-hornblende granodiorite and tonalite; some tonalite in the southern part of the pluton has a relatively pronounced foliation produced by oriented biotite and hornblende. Common to abundant equant-shaped, mafic inclusions occur through out the pluton except in the outermost part where inclusions are absent. The pluton was passively emplaced by piecemeal stoping of a variety of older rocks and the eastern contact is well exposed in the quadrangle.

Associated with the Domenigoni Valley pluton is a swarm of latite dikes; the majority of these dikes occur in the Winchester quadrangle, but they extend into the Romoland quadrangle to the west. The latite dikes intrude both the pluton and adjacent metamorphic rocks, most are foliated, and most have a well developed lineation defined by oriented biotite and/or hornblende crystals. Dikes intruding the pluton were emplaced in northwest striking joints; and dikes intruding the metamorphic rocks were emplaced along foliation planes.

In the eastern part of the quadrangle a Cretaceous age suture juxtaposes low-metamorphic grade Mesozoic rocks against high-metamorphic grade gneissic-textured Mesozoic rocks. Juxtaposition occurred when the high-metamorphic grade rocks were at upper amphibolite grade temperatures, and produced a steep thermal gradient in the low-metamorphic grade Mesozoic rocks. Age of suturing and attendant metamorphism, based on metamorphic mineral ages, is about 100 Ma (L. Snee, personal communication, 2002). The suture zone appears to vary in thickness, and includes within it a number of metadunite bodies and related rocks.

Prebatholithic rocks of Mesozoic age include a wide variety of sedimentary rocks of greenschist or lower metamorphic grade, in the western and central part of the quadrangle, and upper amphibolite grade near the eastern edge of the quadrangle. The metamorphic grade increases from greenschist to upper amphibolite grade over a distance of less than two miles; andalusite and sillimanite isograds are closely spaced near the suture. Metamorphism was Buchan type of relatively high temperature and relatively low pressure (Schwarcz, 1969).

Common lithologies of the low metamorphic grade suite include phyllite, lithic greywacke, impure quartzite, meta-arkose, and interlayered quartzite and phyllite. Most of the layering and foliation in the metamorphic rocks is the result of intense structural transposition. Relic bedding appears to be restricted to very local occurrences in hinges of slip folds. The upper amphibolite grade, gneissic-textured Mesozoic rocks consist of sillimanite-biotite gneiss, black amphibolite, and impure quartzite. Anatectic gneiss containing igneous textured segregations of quartz and feldspar is commonly inter leaved with biotite gneiss.



Location of the Winchester 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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