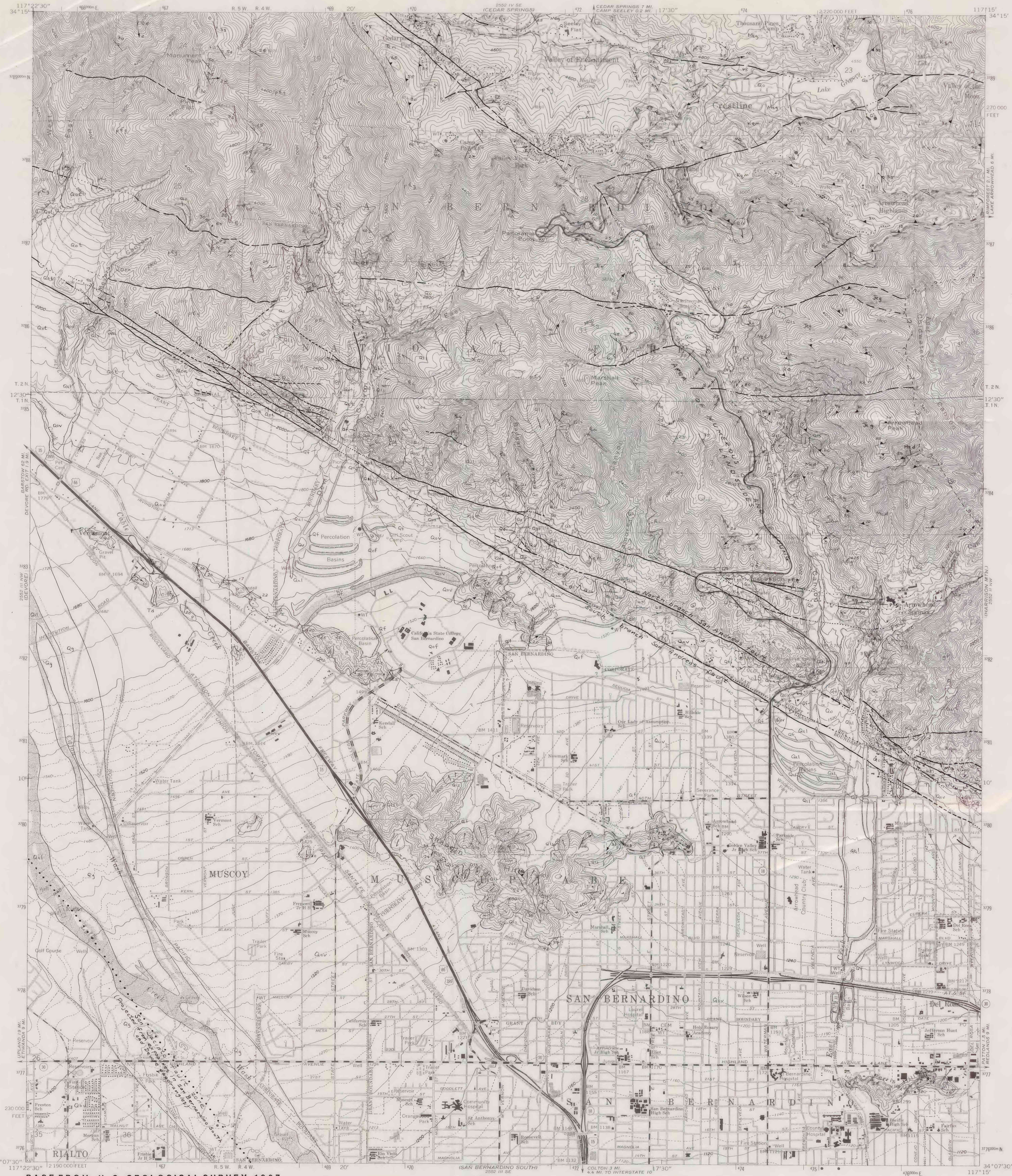
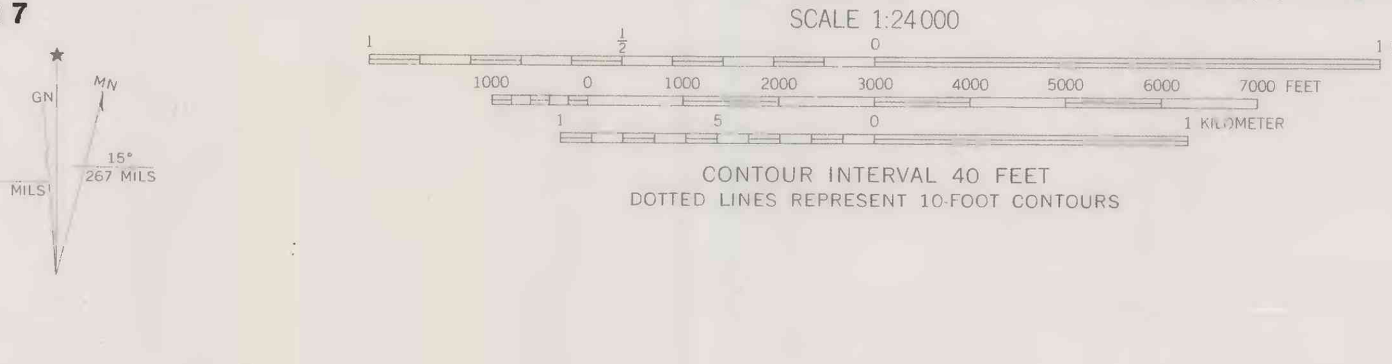
UNITED STATES GEOLOGICAL SURVEY

79-770



BASE FROM U.S. GEOLOGICAL SURVEY 1967



CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS

QUADRANGLE LOCATION

GEOLOGY MAPPED IN 1974 AND 1978

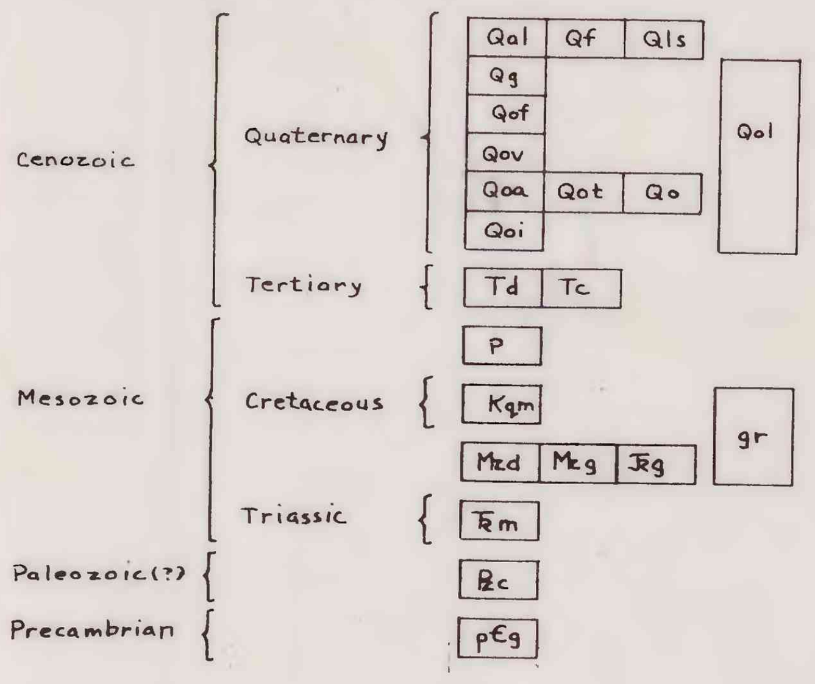
This report is preliminary and has not been edited or reviewed for conformity with Geological Survey standards and nomenclature.

Geologic map of the San Bernardino North quadrangle, California

by Fred K. Miller

1979

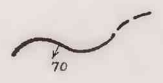
CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qls	Landslides. Relatively young landslides, geomorphic form of the slide is preserved.
Qf	Artificial fill. Mainly levees for percolation basins, and spoil from large road cuts.
Qal	Modern alluvium in active stream channels. Ponded alluvium in man made percolation basins may include some Qov.
Qol	Older landslide material. Angular breccia composed of silt to house size clasts. Geomorphic form of slide may or may not be preserved. Many have forms altered by erosion. Probably many more of these older landslides exist than are shown on map, especially in Devil and Waterman Cayon areas.
Qg	Older gravel along Lytle Creek. Tan to gray alluvium, made up chiefly of cobbles and boulders in sand matrix. Locally consolidated enough to support steep stream-cut banks. Most clasts coated with tan silt; in contrast to clean clasts of Qal in Lytle Creek.
Qof	Older alluvium, alluvial fan material presumably originating from Devil and Badger Canyons. Unconsolidated light tan to gray alluvium made up of silt to boulder size particles. Clasts are all of rock types found in Devil and Badger Canyons. Differs from Qov in that Qof contains almost no brown silt.
Qov	Older alluvium, valley filling. Alluvium filling the valley occupied by San Bernardino may be in part derived from erosion of other alluvial units. Boulder-bearing alluvium at base of mountains, progressively grading to finer grained sediments away from mountain front. Surface exposures of this unit typically contain a large component of brown silt. Size and proportion of largest clasts decrease, and degree of rounding increases away from mountain front. All of the alluvium is unconsolidated.
Qo	Older alluvium, perched valley-filling deposits; may include some old and some active colluvium. Differentiated chiefly on geomorphic setting of the occurrence. Most of this unit is unconsolidated to weakly consolidated alluvium made up of silt to boulder size clasts. The alluvium is perched on the sides of present day steep canyon walls and occurs in the bottom of some canyons. More than one generation of alluvium may be represented by this unit. All clast material is locally derived. Differentiated from Qot on the basis that Qo does not occur as broad extensive terraces.
Qoa	Older alluvium, oxidized may include some colluvium. Arkosic sand to boulders. Larger clasts are subangular to rounded. Both sand matrix and surface of clasts are stained orange to red-orange. Coloration probably formed from in situ oxidization; deposits included in this unit could be reworked from older oxidized deposits. Geomorphic form of deposits shows slight correlation with present geomorphology.
Qot	Older alluvium, terrace forming. Weakly coherent alluvium consisting of locally derived material that ranges in size from silt to boulders. Forms large, conspicuous surfaces that slope gently toward the valley area. May include more than one generation of alluvium.
Qoi	Older alluvium, well consolidated. Composed mainly of deeply weathered, subangular to rounded granitic clasts, ranging in size from pebbles to boulders. Indurated enough to support vertical fan morphology preserved. Clasts appear to be locally derived.
Tc	Conglomerate and conglomeratic arkose. Pink, gray and greenish-brown. Conglomerate clasts range in size from less than 1 cm to about 20 cm, poorly sorted, subangular to well rounded. Moderately well to well indurated, but friable matrix. Most common clast types are granitic and gneissic rocks, with subordinate amounts of quartzite, vein quartz, calc-silicate hornfels, and silicic volcanic rocks. Locally well bedded, but mostly lacks conspicuous bedding. Many include more than one unit separated by unconformities, especially north of Crestline and in the Cedarpines Park area.
Td	Hypabyssal dikes intruding the Pelona Schist. In Shandin Hill area consists of medium grained hornblende-biotite granodiorite. Some hornblends is acicular and actinolitic; biotite is red-brown. In Perris Hill area dikes are leucocratic biotite-quartz-plagioclase porphyry. Presumed to be Tertiary because all rocks intruding the Pelona Schist have yielded only Tertiary isotopic ages (Haxel and Dillon, 1978).
P	Pelona Schist. Muscovite-chlorite-albite-quartz schist. Contains minor quartzite and greenstone. Generally fine-grained; green, gray and brown. Layering is probably all secondary, but locally could represent primary bedding; it ranges from fine laminations to internally massive layers several meters thick. Most is deformed and landslides are common almost everywhere the unit occurs. Age is unknown, but presumed to be Paleocene or late Mesozoic (Haxel and Dillon, 1978).
gr	Granitic rocks undivided. Southeast of Arrowhead Springs, includes intimate mixture of Mzd, Jrg , and Kqm. In Coldwater Canyon area, includes Mzd, Jrg , and Kqm, but in discrete units.
Kqm	Biotite quartz monzonite. Medium-grained, has subtle foliation at many places. Contains 1 to 2 cm pink potassium feldspar phenocrysts. Concentration of phenocrysts is variable, and locally they are absent. Color index ranges from about 5 to 15, averages about 10. More than one pluton may be included in this unit, or alternatively, some of the lithologic variations may be due to assimilation of host rock, especially in the western part of the main body. The main mass of rock is probably the western part of a large biotite quartz monzonite pluton, several hundred square kilometers in area, that underlies the central part of the San Bernardino Mountains west of Big Bear Lake. Six K-Ar apparent ages on biotite range from 66 m.y. to 74 m.y., but all probably represent cooling ages rather than emplacement ages. This unit appears to be the youngest plutonic type in the quadrangle, with the exception of hypabyssal dikes in the Pelona Schist.
Jrg	Biotite-hornblende granodiorite. Medium to coarse grained; very prphyritic with potassium feldspar phenocrysts to 5 cm in length, average length about 3 cm. Rock is foliate, and commonly lineate. Foliation is irregular on a small scale, and in many places has a swirled appearance. Color index averages 15 to 20. Horblende generally, but not everywhere, more abundant than biotite. This rock type occurs in a belt that extends from near Cajon pass, almost to the east end of the San Bernardino Mountains. A similar and probably correlative rock in the southern Mojave Desert gives K-Ar apparent ages of 183 m.y. and 149 m.y., respectively, on hornblende and biotite (Miller and Morton, in press).
Mzg	Hornblende-biotite granodiorite. Medium-to coarse-grained, locally contains sparse 2 cm potassium feldspar phenocrysts. Has poorly developed foliation in places. Contains abundant lenticular inclusions of gneiss and schist, some over 100 m in length, and numerous leucocratic dikes. Color index averages about 15. Biotite more abundant than hornblende, and locally the rock contains no hornblende. Resembles Mzd, but noticeably more leucocratic most places. Intrudes p€g and intruded by Kqm. Relationship with Jrg not certain.
Mzd	Biotite-hornblende quartz diorite or granodiorite. Medium- to coarse-grained, generally foliate, in some places lineate, non-porphyritic. Color index averages about 20. Horblende generally more abundant than biotite. Contains abundant sphene. Intruded by Kqm, but intrusive relationship with Jrg is uncertain.
Trm	Biotite-hornblende monzonite. Medium-grained, in part foliate and lineate. Foliation is locally irregular, giving the rock a swirled or folded appearance. Quartz-bearing, and locally contains pyroxene in cores of hornblende crystals. Color index averages about 20. Hornblende:biotite ratio everywhere greater than 10.1. C. F. Miller (1976) obtained a Pb-U age of 220 m.y. on zircon from a sample of this rock type collected about 32 km to the east.
Pzc	Paleozoic(?) carbonate rock. Coarse- to medium-grained marble and dolomitic marble. Includes some diopside-actinolite-quartz-plagioclase-calcite hornfels, especially in the Devil Canyon-Bailey Canyon area. Most is thickly layered to masive, white to gray, and contains almost no primary sdimentary structures that survived metamorphism, other than traces of bedding. Highly deformed and tectonically mixed with the Precambrian rocks.
p€g	Gneiss, schist, migmatite, and minor granitic rock. Includes some marble and dolomitic marble of possible Paleozoic age in Devil Canyon area. Most rock is layered biotite-quartz-plagioclase gneiss. Muscovite, garnet and hornblende-rich zones are present locally. In part, probably equivalent to the Baldwin Gneiss. Much of this unit was probably remobilized and partially melted during the Mesozoic, as it is tectonically mixed with Paleozoic(?) rocks and Jurassic granodiorite.

Contact - approximately located, queried where location uncertain.



Fault - dashed where approximately located; arrow indicates amount and direction of dip.

Strike and dip of beds

inclined

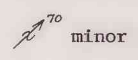
overturned

Strike and dip of foliation

metamorphic rocks - includes attitude of oriented inclusions in igneous rocks.

Igneous rocks

Bearing and plunge of linear features



minor fold axes

crenulations in schist

mineral streaking