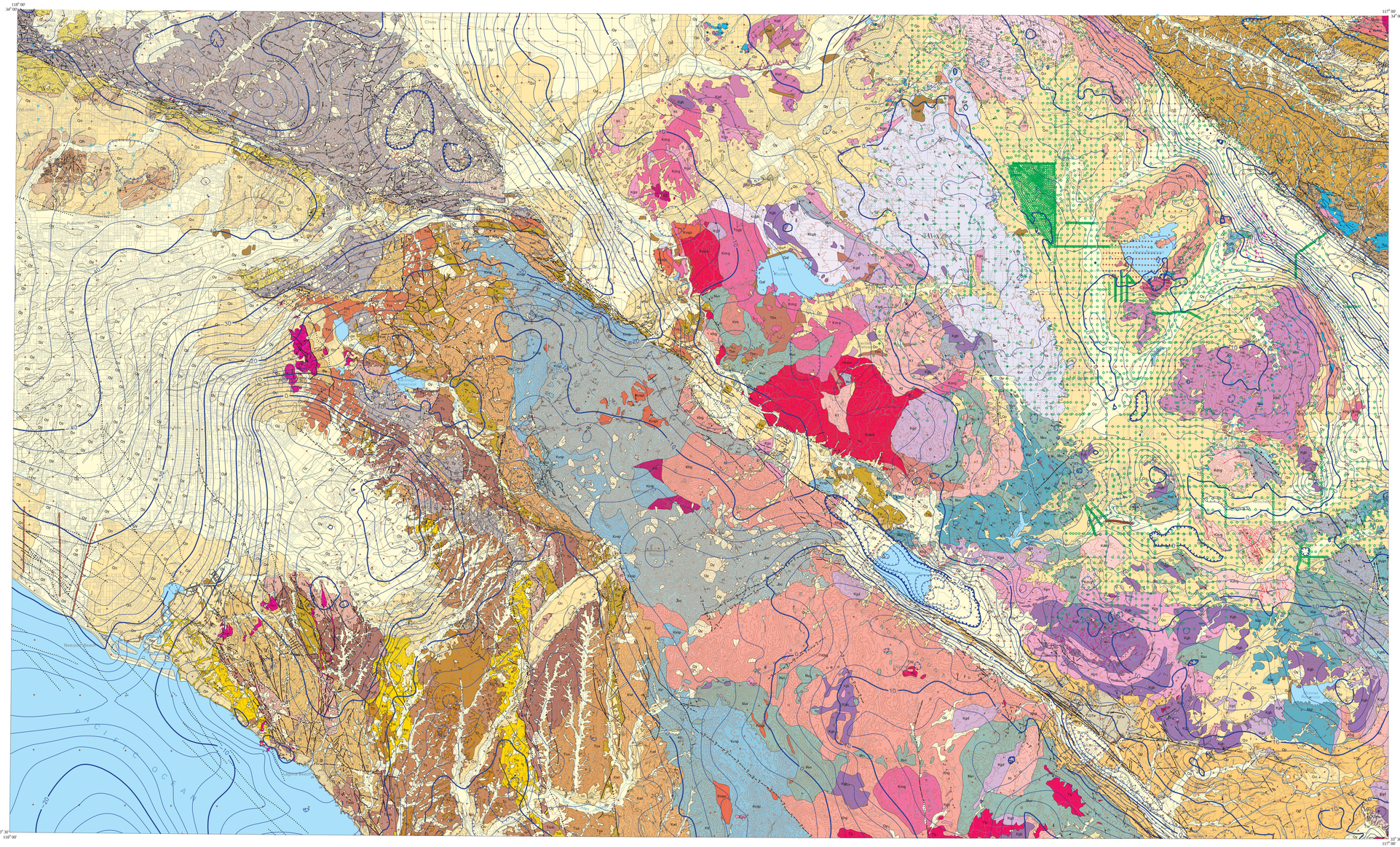
Scientific Investigations Map 2951
Pamphlet accompanies map

U.S. Department of the Interior
U.S. Geological Survey



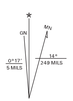
Base map digital layers (roads, topographic contours, and hydrography) were prepared from publicly available digital line graph (DLG) data, Santa Ana 1:100,000 metric quadrangle. Universal Transverse Mercator projection, zone 11

SCALE 1:100 000

1 0 1 2 3 4 5 6 7 8 MILES

1 0 1 2 3 4 5 6 7 8 9 10 KILOMETERS

CONTOUR INTERVAL 50 METERS



Edited by Carolyn A. Donlin
Manuscript approved for publication October 2, 2006

Isostatic Gravity Map with Geology of the Santa Ana 30' x 60' Quadrangle, Southern California

Geology compiled by
D.M. Morton[1]

2006

V.E. Langenheim[1], Tien-Chang Lee[2], Shawn Biehler[2],
R.C. Jachens[1], and D.M. Morton[1]

[1]U.S. Geological Survey **[2]University of California, Riverside**

EXPLANATION

- Contact—Accuracy of location ranges from well-located to approximately located
- Fault—Solid where accurately located; dashed where approximately located or inferred; dotted where concealed; queried where location or existence uncertain. Includes strike-slip, normal and reverse dip-slip, oblique-slip, and thrust faults. Arrow and number indicate measured dip of fault plane
- Fault scarp—Solid where accurately located; dashed where approximately located. Hachures on upthrown block
- Anticline—Solid where accurately located; dotted where concealed. Arrowhead on axis shows direction of plunge
- Syncline—Solid where accurately located; dotted where concealed. Arrowhead on axis shows direction of plunge
- Overturned anticline—Solid where accurately located. Arrowhead on axis shows direction of plunge
- Suture—Location approximate
- Ground fissures—San Jacinto Valley area

Strike and dip of beds
- Inclined
- Vertical
- Overturned
- Horizontal

Strike and dip of metamorphic foliation
- Inclined
- Vertical

Strike and dip of primary igneous foliation
- Inclined
- Vertical

Bearing and plunge of linear features
- Inclined

Dike and dike-like bodies
- granitic pegmatite dike
- quartz latite dike

ABBREVIATED LIST OF MAP UNITS

[See Morton (2004) for detailed description of map units. Note that units have been simplified but internal contacts from Morton (2004) have been retained]

Qaf	Artificial fill (Holocene)
Qy	Young Quaternary deposits (late Holocene to late Pleistocene)
Qo	Old Quaternary deposits (late to early Pleistocene)
Qp	Pauba Formation (Pleistocene)
Qlh	La Habra Formation (Pleistocene)
QTw	Sandstone and conglomerate of Wildomar area (Pleistocene and late Pliocene)
Qch	Coyote Hills Formation (Pleistocene)
Qsp	San Pedro Formation (Pleistocene)
QTst	San Timoteo beds of Frick (1921) (Pleistocene and Pliocene)
Tf	Fernando Formation (Pliocene to Pleistocene)
QTs	Unnamed late Cenozoic sedimentary rocks in Riverside, Corona, Temescal and Norco areas (early Pleistocene to late Pliocene?)
Tta	Temecula Arkose (Pliocene)
Tn	Niguel Formation (Pliocene)
Tc	Capistrano Formation (Pliocene and Miocene)
Tm	Monterey Formation (Pliocene to Miocene)
Tma	Mount Eden formation of Fraser (1931) (early Pliocene and Miocene)
Tch	Sandstone and conglomerate in southeastern Chino Hills (early Pliocene and Miocene)
Tp	Puente Formation (Miocene)
Tlm	Lake Mathews Formation (Miocene)
Tb	Basalt (Miocene)
Tscb	San Onofre Breccia (middle Miocene)
Tt	Topanga Group (middle Miocene)
Tvsm	El Modeno Volcanics and associated intrusive rocks (Miocene)
Tv	Vaqueros Formation (Miocene and Oligocene)
Ts	Sespe Formation (Miocene, Oligocene, and Eocene)
Tvs	Vaqueros and Sespe Formations, undifferentiated (Miocene, Oligocene, and Eocene)
Toga	Conglomerate of Arlington Mountain (Paleogene?)
Tep	Sandstone of Elsinore Peak (Paleogene?)
Tsa	Santiago Formation (Eocene)
Tsi	Silverado Formation (Paleocene)
Kwl	Williams and Ladd Formations, undifferentiated (Late Cretaceous)
Ktr	Trabuco Formation (Late Cretaceous)
Klm	Lakeview Mountains pluton of Morton (1969), mostly tonalite (Cretaceous)
Kb	Box Springs plutonic complex of Morton (2004) (Cretaceous)
Kvt	Val Verde pluton of Osborn (1939), mostly tonalite (Cretaceous)
Kpv	Paloma Valley ring complex of Morton and Baird (1976), monzogranite to gabbro (Cretaceous)
Kdvg	Granodiorite to tonalite of Domenigoni Valley (Cretaceous)
Kmg	Monzogranite (Cretaceous)
Kggb	Granodiorite and gabbro, undifferentiated (Cretaceous)
Kgu	Granite, undifferentiated (Cretaceous)
Kmgt	Monzogranite and tonalite, undifferentiated (Cretaceous)
Kgd	Granodiorite, undifferentiated (Cretaceous)
Kt	Tonalite, undifferentiated (Cretaceous)
Kqd	Quartz diorite and diorite, undifferentiated (Cretaceous)
Kd	Diorite, undifferentiated (Cretaceous)
Kgb	Gabbro, undifferentiated (Cretaceous)
Khg	Heterogeneous granitic rocks (Cretaceous)

End rocks of the Peninsular Ranges batholith

Kvsp	Santiago Peak Volcanics (Cretaceous)
Kvspi	Intrusive rocks associated with Santiago Peak Volcanics (Cretaceous)
Kvsm	Estelle Mountain volcanics of Herzig (1991) (Cretaceous)
Kvs	Intermixed Estelle Mountain volcanics of Herzig (1991) and Cretaceous or Mesozoic sedimentary rocks (Mesozoic)
Mvmg	Mylonitic and cataclastic granitic rocks (Mesozoic)
Mdd	Diorite, Yucaipa area (Mesozoic)
Jbc	Bedrock Canyon Formation (Triassic, Jurassic, and Cretaceous)
Mzu	Mesozoic metasedimentary rocks, undifferentiated (Mesozoic)
Mzp	Phyllite (Mesozoic)
Mzs	Schist (Mesozoic)
Mzsgn	Mixed low metamorphic grade and upper amphibolite grade rocks (Mesozoic)
Mzgn	Biotite gneiss and schist (Mesozoic)
KgMs	Intermixed Mesozoic schist and Cretaceous granitic rocks (Mesozoic)
KgPs	Intermixed Paleozoic (?) schist and Cretaceous granitic rocks (Cretaceous and Paleozoic?)
Pzu	Paleozoic(?) rocks, undifferentiated (Paleozoic?)



Isostatic gravity anomaly contours. Contour interval, 2 mGal. Hachures indicate gravity low. Contours were computer generated based on a 250-m grid. Although data have been edited, caution should be exercised when interpreting anomalies controlled by only a single station.

Gravity Station locations

- pre-1991 station from Langenheim and others (1991)
- post-1991 University of California, Riverside station
- post-1991 U.S. Geological Survey station
- National Geodetic Survey station

Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

For sale by U.S. Geological Survey, Information Services, Box 25286, Federal Center, Denver, CO 80225, 1-888-ASK-USGS

Digital files available on World Web at http://pubs.usgs.gov/sim/2006/2951