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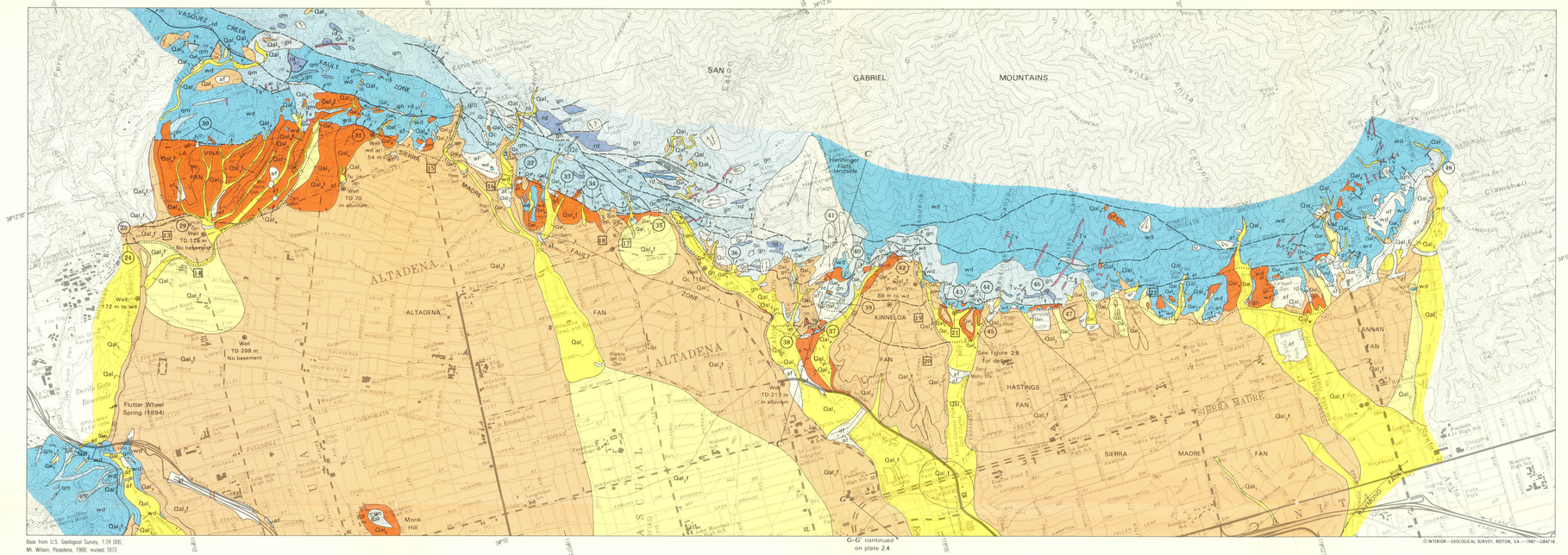
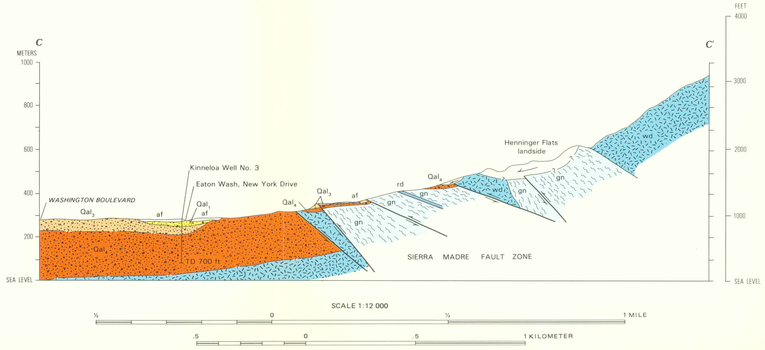
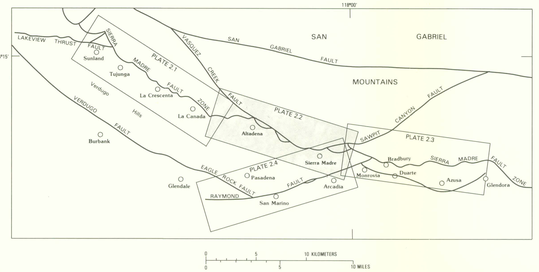
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PROFESSIONAL PAPER 1339
PLATE 2.2



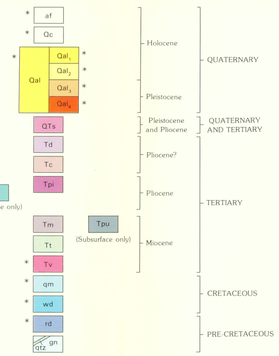




GEOLOGIC MAP OF THE SIERRA MADRE FAULT ZONE, THE ARROYO SECO TO SANTA ANITA CANYON

CORRELATION OF MAP UNITS

* Units on map and section indicated by asterisk



DESCRIPTION OF MAP UNITS

* af — ARTIFICIAL FILL—Includes housing development, flood-control dams, flood-debris storage, and road fill

* Qc — COLLUVIUM (HOLOCENE)—Talus and slopewash, generally brown to reddish-brown poorly sorted heterogeneous deposits of locally derived debris. These deposits are more abundant than indicated on the map but are generally too small to show

* Qal — ALLUVIUM (HOLOCENE AND PLEISTOCENE)

* Qal1 — UNIT 1 (Holocene)—White to light-gray unconsolidated fine to coarse sand and gravel containing abundant cobbles and boulders; includes deposits of present stream channels, flood plains, and alluvial fans (now mostly controlled by flood-control channels and dams). Qal1 f, alluvial-fan surface

* Qal2 — UNIT 2 (Holocene)—Gray to pale-brown unconsolidated fine to coarse sand and gravel containing abundant cobbles and boulders; includes deposits of stream terraces, recently abandoned flood plains, and alluvial fans with incipient soil. Qal2 f, alluvial-fan surface

* Qal3 — UNIT 3 (Pleistocene)—Yellow to yellowish-pale-brown unconsolidated fine to medium sand and gravel containing abundant cobbles and boulders and highly weathered diorite clasts; includes stream terraces and moderately dissected alluvial fans with poorly to moderately developed soils. Qal3 f, alluvial-fan surface

* Qal4 — UNIT 4 (Pleistocene)—Red to reddish-brown or yellow unconsolidated to well-consolidated fine to medium sand and gravel containing few to many cobbles and boulders; all clasts are highly weathered, and deposits have moderate to moderately high clay content and are commonly fractured or jointed; includes terraces and highly dissected and (or) buried fan deposits with highly developed soils. Qal4 f, alluvial-fan surface

QTs — SAUGUS FORMATION (PLEISTOCENE AND PLIOCENE)—Tan to reddish-brown interbedded siltstone and moderately well sorted sandstone

Td — DUARTE CONGLOMERATE (PLIOCENE?)—Tan moderately consolidated boulder conglomerate with well-rounded clasts and a clayey sandy matrix

Tc — CONGLOMERATE (PLIOCENE?)—Purple to gray moderately consolidated conglomerate composed mainly of volcanic clasts with a silty to sandy matrix

Tpi — "PICO" FORMATION (PLIOCENE)—Tan to gray well-consolidated sandstone and conglomerate containing minor shale and siltstone commonly called the Pico Formation by some workers

Tf — FERNANDO FORMATION (PLIOCENE)—Subsurface only

Tpu — PUENTE FORMATION (MIOCENE)—Subsurface only

Tm — MODELO FORMATION (MIOCENE)—Tan to gray diatomaceous to cherty shale and siltstone

Tt — TOPANGA FORMATION (MIOCENE)—Tan to brown or reddish-brown interbedded conglomeratic sandstone, sandstone, and shale. Tv, intercalated volcanic flows

* Tv — VOLCANIC ROCKS (MIOCENE)—Extensive flows and dikes of black dense basalt and andesite. As mapped, includes outcrops of intrusive rocks, most too small to differentiate

* qm — QUARTZ MONZONITE AND GRANODIORITE (CRETACEOUS)—Gray to tan fine to medium-grained intrusive rocks

* wd — WILSON DIORITE OF MILLER (1934) (CRETACEOUS)—Gray hornblende-biotite-quartz diorite

* rd — RUBIO DIORITE OF MILLER (1934) (PRE-CRETACEOUS)—Black to black-and-white hornblende-rich diorite

* gn, qtz — GNEISS (PRE-CRETACEOUS)—Tan to gray or black banded quartzofeldspathic gneiss and local schist and calc-silicate gneiss and hornfels. qtz, quartzite beds

CONTACT

FAULT—Showing dip. Dashed where approximately located; dotted where concealed; queried where inferred. Arrows show direction of relative movement

STRIKE AND DIP OF BEDS

HORIZONTAL BEDS

LANDSLIDE—Showing direction of movement

32 — LOCALITY OF DIRECT EVIDENCE FOR QUATERNARY FAULTING

13 — LOCALITY OF INDIRECT EVIDENCE FOR QUATERNARY FAULTING

WATER WELL OR EXPLORATORY BOREHOLE—Showing pertinent data. TD, total depth

C — C' — LINE OF CROSS SECTION

DIRECT EVIDENCE FOR QUATERNARY FAULTING

Locality	Fault feature
24	Quartz monzonite thrust over unit 3 alluvium (dip, 43° N.). JPL bridge across Arroyo Seco (trench 2).
25	Quartz monzonite thrust over unit 3 alluvium (dip, 30° N.). Arroyo Seco access road at mouth of canyon.
29	Two fault scarps (Buwalda, 1940, p. 29, pl. 1). One ~100 ft high, other 30 ft high, Lincoln Avenue north of Loma Alta Drive, Altadena. Apparent on 1935 Fairchild airphotos, flight 3758.
30	Basement thrust over unit 4 alluvium (dip, 20°–80° N.). East of La Vina Hospital, Altadena.
31	1/2 km discontinuous exposure, diorite thrust over unit 4 alluvium (dip, avg 30° N. and E.). Zorthian to Arp property, north of Loma Alta, Altadena.
32	Quartz monzonite thrust over unit 4 alluvium (dip, 49° N.). Rubio Canyon, east side of debris basin and east side of Loma Alta Drive, Altadena.
33	Quartz monzonite thrust over unit 4 alluvium (dip, 40° N.). Canyon east of Dry Canyon, Altadena.
34	Crushed quartz monzonite thrust over unit 4 alluvium (dip, 18° N.). Skyview Drive, Altadena.
35	Granite thrust over unit 3 alluvium (dip, 45° N.). Eaton Canyon at mouth, west side of Toll Road bridge (trench 3).
36	Gneiss thrust over unit 3 alluvium (dip, 45° N.). Eaton Canyon north of bench mark 1152.
37	Diorite thrust over unit 4 alluvium (dip, 40°–50° N.); Eaton Canyon, north of Civil Defense Center.
38	Gneiss thrust over unit 3 alluvium; two fault surfaces (dip, 30°and 50° N.); 8 to 12 cm of crush and gouge. Eaton Canyon, north of Civil Defense Center
39	Gneiss thrust over unit 3 alluvium (dip, 25° N.). End of Glen Springs Road, Kinneloa.
40	Diorite thrust over unit 4 alluvium (dip, 20° N.). West Kinneloa Mesa.
41	Fault in gneiss extends upward into and is affected by large Quaternary landslide. Two fault surfaces (dip, 20°, 70° N.); several meters of crush and gouge.
42	Gneiss thrust over unit 4 alluvium (dip, 45° N.). Top of Kinneloa fan.
43	Gneiss thrust over unit 3 alluvium; two fault surfaces (dip, 15°, 20° N.); 16 cm of gouge and crush. Between Pasadena Glen and Hastings Canyon (trench 20C, figs. 2.9,2.10).
44	Gneiss thrust over unit 4 alluvium (dip, 15°–20° N.). West of Hastings Canyon (trench 4).
45	Diorite thrust over unit 4 alluvium (dip, 20° N.). West of Hastings Canyon.
46	Gneiss thrust over unit 4 alluvium (dip, 55° N.). Very large complex fault zone.
47	Rubio Diorite thrust over unit 4 alluvium (dip, 50° N.); diorite very highly crushed, unit 4 alluvium slightly sheared. East of Sunnyside Dam, northwest of Passionist Fathers Monastery, Sierra Madre (trench 11).
48	Gneiss thrust over unit 3 alluvium (dip, 35° N.). Arcadia Wilderness Park.

INDIRECT EVIDENCE FOR QUATERNARY FAULTING

Locality	Feature
13	Possible scarp across fan. Also apparent on 1935 Fairchild airphoto, flight 3758.
14	Possible scarp north of Audubon School.
15	Granite penetrated at 23 m in shaft (Buwalda, 1940, pl. 1) indicates that buried fault trace should be south of here.
16	Possible scarp before subdivision at mouth of Rubio Canyon.
17	Buried fault should be south of MWD borehole F–3A, which penetrated diorite at 38 m. Deeper boreholes south of here did not penetrate basement.
18	Beheaded streambed may indicate lateral movement on fault.
19	Possible scarp on fan surface.
20	Possible scarp on fan surface. Fault should exist between two water wells because of discrepancy in depths to basement.
21	Diorite penetrated at 60 m in MWD borehole D–75A, adjacent to diorite outcrop. See map and cross section of Hastings Canyon area.
22	Beheaded streambeds may indicate lateral movement on fault.