ABBREVIATED EXPLANATION

Approximate stratigraphic relationships only;
see pamphlet and CMU (Plate 2) for more detailed information

MODERN SURFICIAL DEPOSITS

QUATERNARY — Holocene

- af — Artificial fill (late Holocene)
- Qw — Wash deposits (late Holocene)
- Qls — Landslide deposits, undivided (Holocene and Pleistocene)
- Qmb — Marine beach deposits (late Holocene)
- Qpe — Paralic estuarine deposits (late Holocene)
- Qmo — Undivided marine deposits in offshore region (late Holocene)
- Qcf — Canyon fill deposits in offshore region (late Holocene)

YOUNG SURFICIAL DEPOSITS

- Qya — Young alluvial flood-plain deposits (Holocene and late Pleistocene)
- Qyc — Young colluvial deposits (Holocene and late Pleistocene)
- Qct — Undivided canyon terrace deposits in offshore region (Holocene and Pleistocene)

OLD SURFICIAL DEPOSITS

- Qoa — Old alluvial flood-plain deposits, undivided (late to middle Pleistocene)
- Qop — Old paralic deposits, undivided (late to middle Pleistocene)
  - Qop_7 — Unit 7
  - Qop_6 — Unit 6
  - Qop_{2-4} — Units 2-4, undivided

VERY OLD SURFICIAL UNITS

CENOZOIC — Pleistocene

- Qvoa — Very old alluvial flood-plain deposits, undivided (middle to early Pleistocene)
- Qvop — Very old paralic deposits, undivided (middle to early Pleistocene)
  - $Qvop_7$ — Unit 7
  - $Qvop_6$ — Unit 6
  - $Qvop_5$ — Unit 5
  - $Qvop_4$ — Unit 4
  - $Qvop_3$ — Unit 3
  - $Qvop_2$ — Unit 2
  - $Qvop_1$ — Unit 1
  - $Qvop_{13}$ — Unit 13
  - $Qvop_{12}$ — Unit 12
  - $Qvop_{11}$ — Unit 11
  - $Qvop_{10}$ — Unit 10
  - $Qvop_9$ — Unit 9
  - $Qvop_8$ — Unit 8
  - $Qvop_{11a}$ — Unit 11a
  - $Qvop_{10a}$ — Unit 10a
  - $Qvop_{9a}$ — Unit 9a
  - $Qvop_{8a}$ — Unit 8a

SEDIMENTARY AND VOLCANIC BEDROCK UNITS

CENOZOIC — TERTIARY

- QTso — Undivided sediments and sedimentary rocks in offshore region (Holocene, Pleistocene, Pliocene and Miocene)

Pliocene

- Tsdcg, Tsdss, Tsd — San Diego Formation (early Pleistocene and late Pliocene)
  - Tsd - undivided
  - Tsdcg - transitional marine and nonmarine pebble and cobble conglomerate
  - Tsdss - marine sandstone

Miocene

- Tba — Basaltic-andesite dike (Miocene)
- Tmo — Undivided sedimentary rocks in offshore region (Miocene)
- Tmvo — Undivided volcanic rocks in offshore region (Miocene)
- Tmuo — Undivided volcanic and sedimentary rocks in offshore region (Miocene)

Oligocene

- To — Otay Formation (late Oligocene)

Eocene

- Tp, Tpm — Pomerado Conglomerate (middle Eocene)
  - Tpm - Miramar Sandstone Member
- Tmv — Mission Valley Formation (middle Eocene)
- Tst — Stadium Conglomerate (middle Eocene)
- Tf — Friars Formation (middle Eocene)
- Tsc, Tscu — Scripps Formation (middle Eocene)
  - Tscu - upper unit
- Ta — Ardath Shale (middle Eocene)
- Tt — Torrey Sandstone (middle Eocene)
- Td — Delmar Formation (middle Eocene)
- Td+Tf — Delmar Formation and Friars Formation, undivided (middle Eocene)
- Tmss, Tmsc — Mount Soledad Formation (middle Eocene)
  - Tmss - sandstone
  - Tmsc - cobble conglomerate
- Teo — Undivided Eocene rocks in offshore region (Eocene)

MESOZOIC — CRETACEOUS — Upper Cretaceous

- Kcs, Kccg — Cabrillo Formation (Upper Cretaceous)
  - Kcs - sandstone
  - Kccg - cobble conglomerate
- Kp — Point Loma Formation (Upper Cretaceous)
- Kl — Lusardi Formation (Upper Cretaceous)
- Kuo — Undivided rocks of the Rosario Group in the offshore area (Upper Cretaceous)

UNNAMED CRETACEOUS ROCKS OF THE PENINSULAR RANGES BATHOLITH

mid-Cretaceous

- Kgu — Granodiorite and tonalite, undivided (mid-Cretaceous)
- Kgd — Granodiorite, undivided (mid-Cretaceous)
- Kt — Tonalite, undivided (mid-Cretaceous)
- Kd — Diorite, undivided (mid-Cretaceous)
- Kgh — Hypabyssal rocks, undivided (mid-Cretaceous)

JURASSIC AND CRETACEOUS METAMORPHOSED AND UNMETAMORPHOSED VOLCANIC AND SEDIMENTARY ROCKS

JURASSIC

- Mzu — Metamorphosed and unmetamorphosed volcanic and sedimentary rocks, undivided (Mesozoic)
- Mzo — Undivided metamorphic rocks in offshore region (Mesozoic)

ONSHORE MAP SYMBOLS

Contact - Contact between geologic units; dotted where concealed.

Fault - Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.

Anticline - Solid where accurately located; dashed where approximately located; dotted where concealed. Arrow indicates direction of axial plunge.

Syncline - Solid where accurately located; dotted where concealed. Arrow indicates direction of axial plunge.

Landslide - Arrows indicate principal direction of movement. Queried where existence is questionable.

Strike and dip of beds

- Inclined

Strike and dip of igneous joints

- Inclined
- Vertical

Strike and dip of metamorphic foliation

- Inclined

OFFSHORE MAP SYMBOLS

Contacts

Contact - All contacts are extrapolated from a combination of seismic reflection data, seafloor samples and bathymetry, and are approximate in location.

Faults

Fault - Solid where well defined; dashed where approximately located; short dash where inferred; dotted where concealed; queried where uncertain. Where fault offsets sea floor, age symbol is shown on bar on downthrown side. Where age was determined, age symbol is shown astride fault and relative offset, if known, is shown by "D" and "U" on downthrown and upthrown sides. Ages of faults are indicated as follows:

- ⊠ cuts strata of Holocene age
- ■ cuts strata of late Quaternary age
- ◪ cuts strata of Quaternary age
- △ cuts Miocene or older strata

Fault zone - Area of extensively sheared rock within a zone defined by multiple faults.

Folds

Anticline - Solid where well defined; short dash where inferred.

Syncline - Solid where well defined; short dash where inferred.

Channels

Active - Dash-dot line marks axis, arrow indicates direction of sediment transport.

Levees

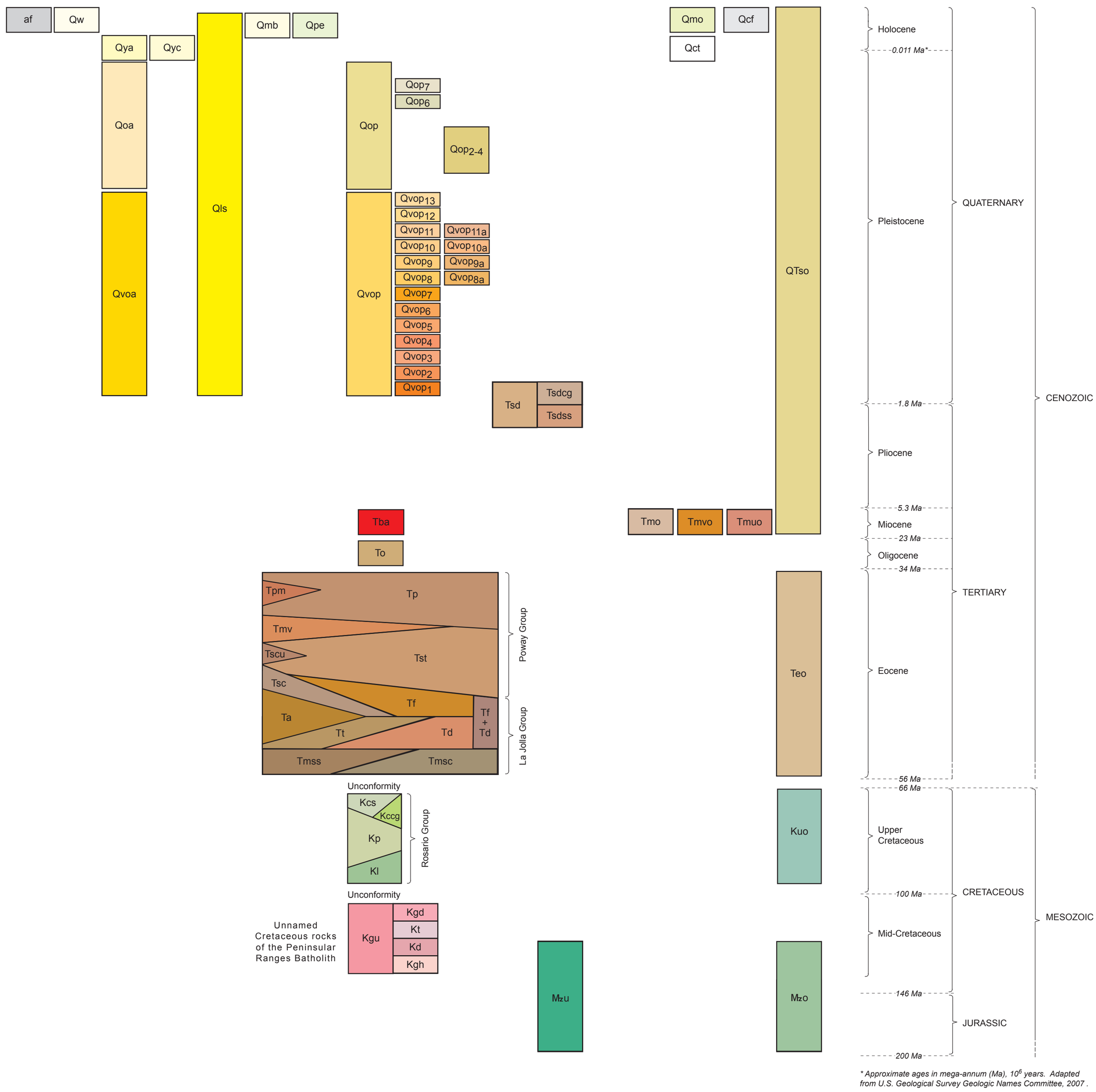
Levees - Dashed where inferred.

Landslides

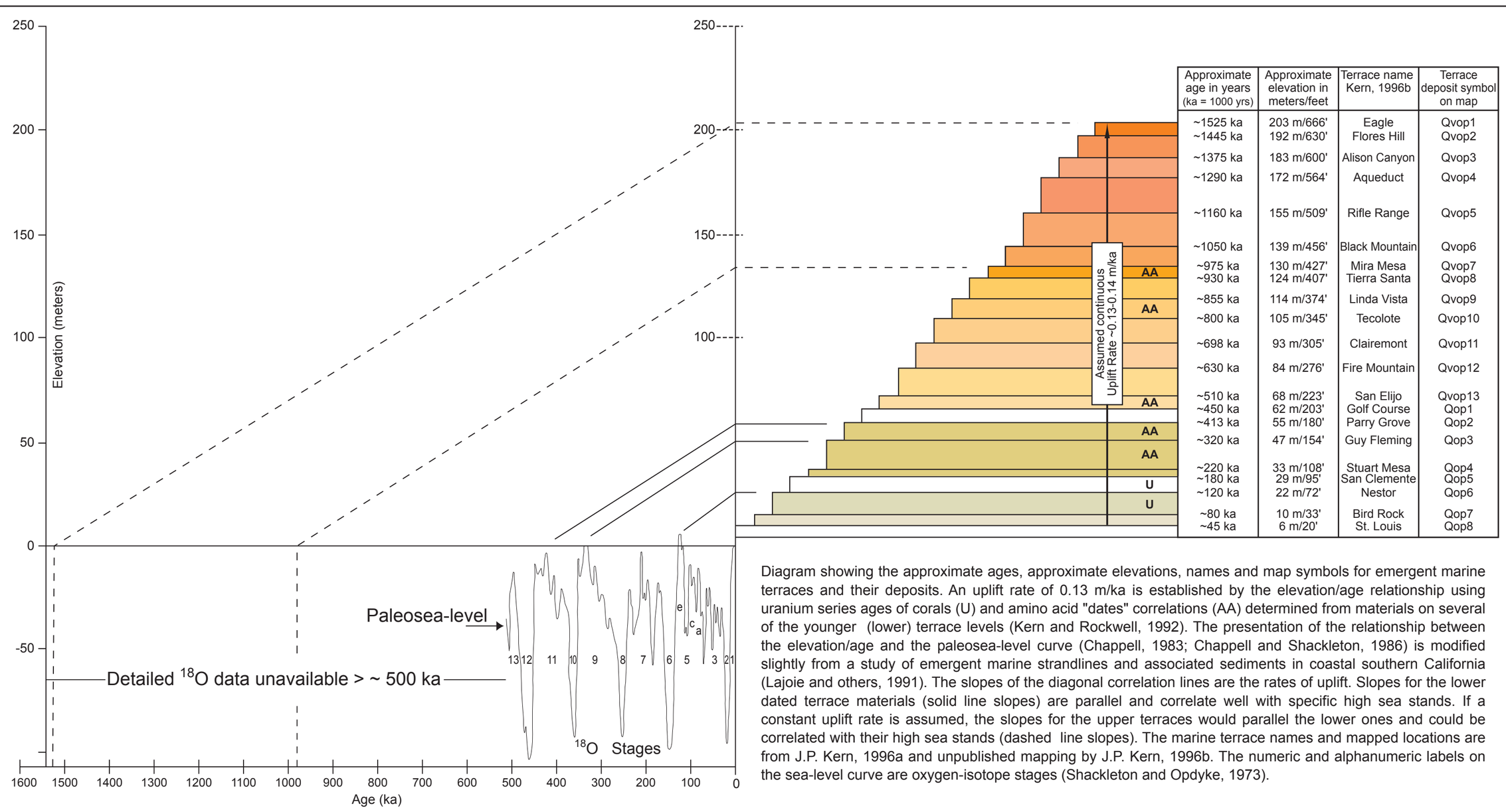
Creep - Dashed where inferred.

Creep (noted on single survey line) - Arrow indicates apparent direction of sediment movement.

Slump - Dashed where inferred, queried where uncertain. Arrows indicate direction of movement.



CORRELATION OF MAP UNITS FOR THE GEOLOGIC MAP OF THE SAN DIEGO 30'X60' QUADRANGLE, CALIFORNIA



Approximate age in years (ka = 1000 yrs)	Approximate elevation in meters/feet	Terrace name Kern, 1996b	Terrace deposit symbol on map
~1525 ka	203 m/666'	Eagle	Qvop1
~1445 ka	192 m/630'	Flores Hill	Qvop2
~1375 ka	183 m/600'	Alison Canyon	Qvop3
~1290 ka	172 m/564'	Aqueduct	Qvop4
~1160 ka	155 m/509'	Rifle Range	Qvop5
~1050 ka	139 m/456'	Black Mountain	Qvop6
~975 ka	130 m/427'	Mira Mesa	Qvop7
~930 ka	124 m/407'	Tierra Santa	Qvop8
~855 ka	114 m/374'	Linda Vista	Qvop9
~800 ka	105 m/345'	Tecolote	Qvop10
~698 ka	93 m/305'	Clairemont	Qvop11
~630 ka	84 m/276'	Fire Mountain	Qvop12
~510 ka	68 m/223'	San Elijo	Qvop13
~450 ka	62 m/203'	Golf Course	Qop1
~413 ka	55 m/180'	Parry Grove	Qop2
~320 ka	47 m/154'	Guy Fleming	Qop3
~220 ka	33 m/108'	Stuart Mesa	Qop4
~180 ka	29 m/95'	San Clemente	Qop5
~120 ka	22 m/72'	Nestor	Qop6
~80 ka	10 m/33'	Bird Rock	Qop7
~45 ka	6 m/20'	St. Louis	Qop8

Diagram showing the approximate ages, approximate elevations, names and map symbols for emergent marine terraces and their deposits. An uplift rate of 0.13 m/ka is established by the elevation/age relationship using uranium series ages of corals (U) and amino acid "dates" correlations (AA) determined from materials on several of the younger (lower) terrace levels (Kern and Rockwell, 1992). The presentation of the relationship between the elevation/age and the paleosea-level curve (Chappell, 1983; Chappell and Shackleton, 1986) is modified slightly from a study of emergent marine strandlines and associated sediments in coastal southern California (Lajoie and others, 1991). The slopes of the diagonal correlation lines are the rates of uplift. Slopes for the lower dated terrace materials (solid line slopes) are parallel and correlate well with specific high sea stands. If a constant uplift rate is assumed, the slopes for the upper terraces would parallel the lower ones and could be correlated with their high sea stands (dashed line slopes). The marine terrace names and mapped locations are from J.P. Kern, 1996a and unpublished mapping by J.P. Kern, 1996b. The numeric and alphanumeric labels on the sea-level curve are oxygen-isotope stages (Shackleton and Opdyke, 1973).

CHRONOLOGY OF MARINE TERRACES AND THEIR DEPOSITS