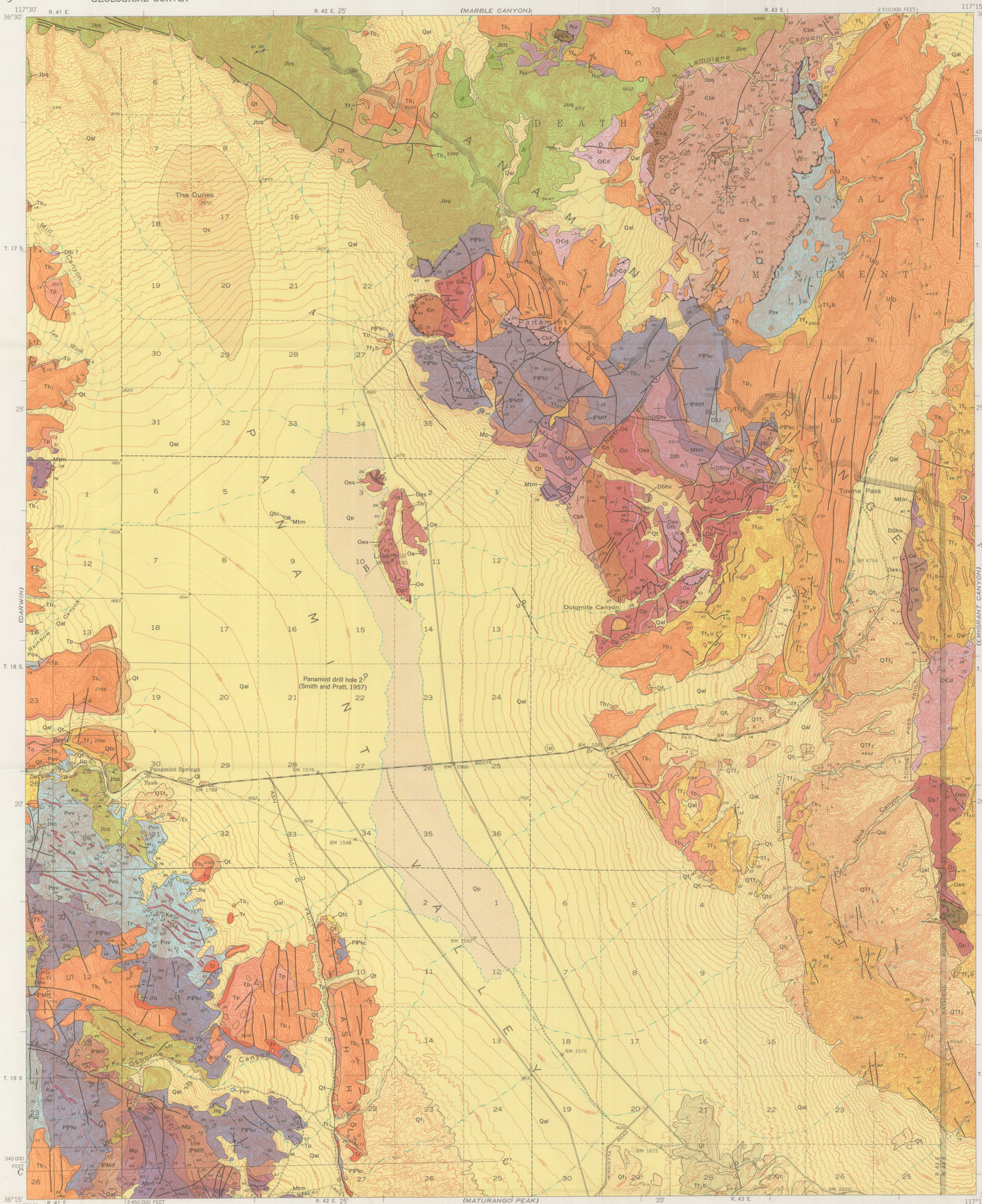
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND GEOLOGY

BULLETIN 1299
PLATE 1



Base from U.S. Geological Survey in cooperation with the State of California
10,000-foot grid based on California coordinate system, zone 4

APPROXIMATE MEAN DECLINATION, 1971

SCALE 1:48 000

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT HALF-INTERVAL CONTOURS
DATUM IS MEAN SEA LEVEL

Mapped by W. E. Hall and Hal G. Stephens during 1955–58

EXPLANATION

QUATERNARY (Holocene; Pleistocene)

- **Qp** — Playa deposits. *In Panamint Valley*
- **Qt** — Talus deposits
- **Qs** — Sand dunes. *Wind-deposited sediments at the north end of Panamint Valley*
- **Qal** — Alluvium. *Includes fans, stream gravels, washes, and thin veneers on slopes. Includes some high, untilted, dissected fans*
- **Qtc** — Tufa and caliche. *Along old shorelines in Panamint Valley*
- **Qf₁** — Fan No. 1. *Elevated, dissected, unconsolidated fan that is slightly tilted*
- **Ql** — Lacustrine deposits. *Elevated, dissected lake beds in Panamint Valley. Diatoms dated as middle and late Pleistocene by K. E. Lohman*

ANGULAR UNCONFORMITY

TERTIARY OR QUATERNARY (Pliocene or Pleistocene)

- **QTf₂** — Fanglomerate No. 2. *Tilted, moderately consolidated fanglomerate and, locally, lacustrine deposits that include some fresh-water limestone*

TERTIARY (Pliocene)

- **Tb₁** — Olivine basalt. *Extensive flows that cap many of the ridges and form dip slopes on east side of Argus and Panamint Ranges*

ANGULAR UNCONFORMITY

- **Tf₃ / Tf₃b / Tf₃u** — Fanglomerate No. 3. *Tf₃, well-cemented tilted fanglomerate containing pebbles and cobbles of subrounded Precambrian and Paleozoic rocks in a red clayey matrix; Tf₃b, monolithologic breccia; Tf₃u, undifferentiated fanglomerate, monolithologic breccia, and some ponded fine-grained sediments that are commonly pumiceous*
- **Tr** — Rhyolitic tuff
- **Tb₂** — Quartz-olivine basalt. *Greenish-gray and purplish quartz-olivine basalt and olivine basalt flows and interbedded basaltic pyroclastics. Interbedded in upper part of Tf₃. Differentiated only in Panamint Range*
- **Tp** — Basaltic pyroclastic rocks. *Predominantly reddish basaltic tuff-breccia, lapilli-tuff, and agglomerate, but include some olivine basalt flows. Differentiated only in Argus Range*

MAJOR UNCONFORMITY

CRETACEOUS(?)

- **Ka** — Andesite porphyry dikes. *Greenish-gray porphyritic dikes containing phenocrysts of altered plagioclase in an aphanitic groundmass*

JURASSIC (Lower Jurassic)

- **Jbq / Jl** — Biotite-hornblende-quartz monzonite. *Jbq, biotite-hornblende-quartz monzonite. Includes southward extension of Hunter Mountain Quartz Monzonite mapped by McAllister (1956) in Ubehebe Peak quadrangle; Jl, leucocratic differentiates*
- **Jlq** — Leucocratic quartz monzonite

MAJOR UNCONFORMITY

PERMIAN

- **Pov** — Owens Valley Formation. *Thin- to medium-bedded bluish-gray limestone, shaly and silty limestone, siltstone, and lenses of pure limestone and limestone breccia. Basal siltstone unit 100 feet thick in Argus Range. Most of the formation is contact metamorphosed to brown-stained calc-hornfels in Argus Range*

PENNSYLVANIAN AND PERMIAN (Middle Pennsylvanian to Lower Permian)

- **IPPkc** — Keeler Canyon Formation. *Interbedded thin- to medium-bedded bluish-gray limestone, shaly limestone, black siliceous shale, pink fissile shale, and limestone breccia. Limestone in Panamint Range much cleaner than that in Argus Range*

MISSISSIPPIAN AND PENNSYLVANIAN(?)

- **IPMlf** — Lee Flat Limestone. *White- to light-gray marble, locally dolomitized*

MISSISSIPPIAN (Lower Mississippian)

- **Mp** — Perdido Formation. *Dark-brown cliff-forming unit of bluish-gray thin-bedded limestone; thin brown-weathering beds, lenses, and anastomosing veinlets of chert*
- **Mtm** — Tin Mountain Limestone. *Thin- to medium-bedded fine-grained limestone; locally contains thin chert lenses and nodules*

DEVONIAN (Middle and Upper Devonian)

- **Dlb** — Lost Burro Formation. *Lower part consists of interbedded light- and dark-gray dolomite. Dark-gray dolomite is commonly mottled with light-gray dolomite. The middle and upper parts are banded light-gray marble and bluish-gray thin- to medium-bedded limestone. Bluish-gray limestone beds contain stromatoporoids and Amphipora*

SILURIAN AND DEVONIAN (Silurian and Lower Devonian)

- **DShv** — Hidden Valley Dolomite. *Light-gray thick-bedded dolomite*

ORDOVICIAN (Upper Ordovician; Middle Ordovician; Lower and Middle Ordovician)

- **Oes** — Ely Springs Dolomite. *Dark-gray cherty dolomite in lower part; light-gray dolomite in upper part*
- **Oe** — Eureka Quartzite. *Includes an upper unit of white, light and dark gray, and reddish-gray vitreous quartzite and a lower unit of sandy and silty dolomite, limestone, and argillaceous quartzite*
- **Op** — Pogonip Group. *Light- and medium-gray dolomite and limestone; weather to light-brown tint. Upper part contains brown-weathering cherty beds that are prominent horizon markers; the cherty beds are overlain by sandy dolomite containing large gastropods (Palliseria)*

CAMBRIAN (Upper Cambrian; Middle and Upper Cambrian; Lower and Middle Cambrian)

- **Ꞓn** — Nopah Formation. *Interbedded dark- and light-gray dolomite that gives striped appearance to formation. Conspicuous dark-brown basal unit of thin-bedded olive-green shale, brown siltstone, and brownish-gray limestone (basal unit is equivalent of Dunderberg Shale)*
- **Ꞓbk** — Bonanza King Formation. *Predominantly medium- to thick-bedded dolomite but includes thin- to thick-bedded dark-gray limestone and greenish-gray shale. Limestone beds mottled by light-gray dolomitized parts*
- **Ꞓc / Ꞓcg** — Carrara Formation. *Ꞓc, interstratified reddish-brown thin-bedded limy shale, siltstone, and bluish-gray limestone with yellow and brown silty lenses; Ꞓcg, rocks contact metamorphosed to quartz-mica schist, garnet gneiss, and dolomitic marble*

PRECAMBRIAN(?) (Upper Precambrian(?))

- **pꞒs** — Schist. *Includes quartz-mica schist, micaceous quartzite, and biotite-hornblende gneiss*

- **Pu** — Undifferentiated metamorphosed Paleozoic rocks. *Chiefly marble, quartzite, and calc-silicate rock*
- **OꞒd** — Undifferentiated Ordovician and Cambrian dolomite. *Dolomite generally metamorphosed so faunal evidence of age and original lithologic appearance are destroyed*

Contact
Dashed where approximately located

Indefinite contact
Includes gradational contacts and indefinite boundaries of surficial deposits

Vertical fault

Fault
Showing dip and direction and plunge of striations; dashed where approximately located; dotted where concealed; U, upthrown side; D, downthrown side; arrows show relative movement

Thrust fault
Showing dip; dashed where approximately located; sawteeth on upper plate

Anticline
Showing trace of axial plane and direction of plunge

Syncline
Showing trace of axial plane and plunge of axis

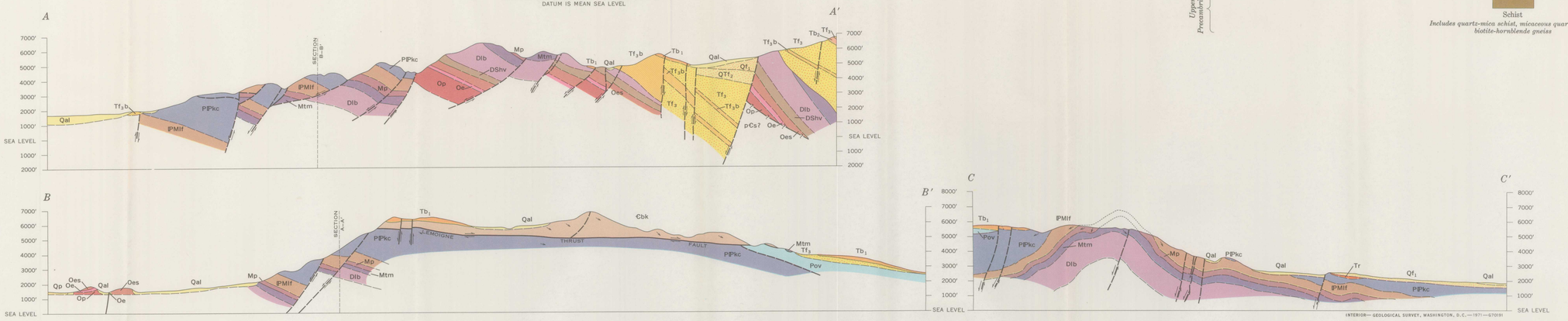
Inclined — Vertical — Overturned
Strike and dip of beds

Inclined
Strike and dip of fracture cleavage

Strike and dip of flow layering

Strike and dip of joints

Mine or prospect



INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1971—G70191

GEOLOGIC MAP AND SECTIONS OF THE PANAMINT BUTTE QUADRANGLE, INYO COUNTY, CALIFORNIA