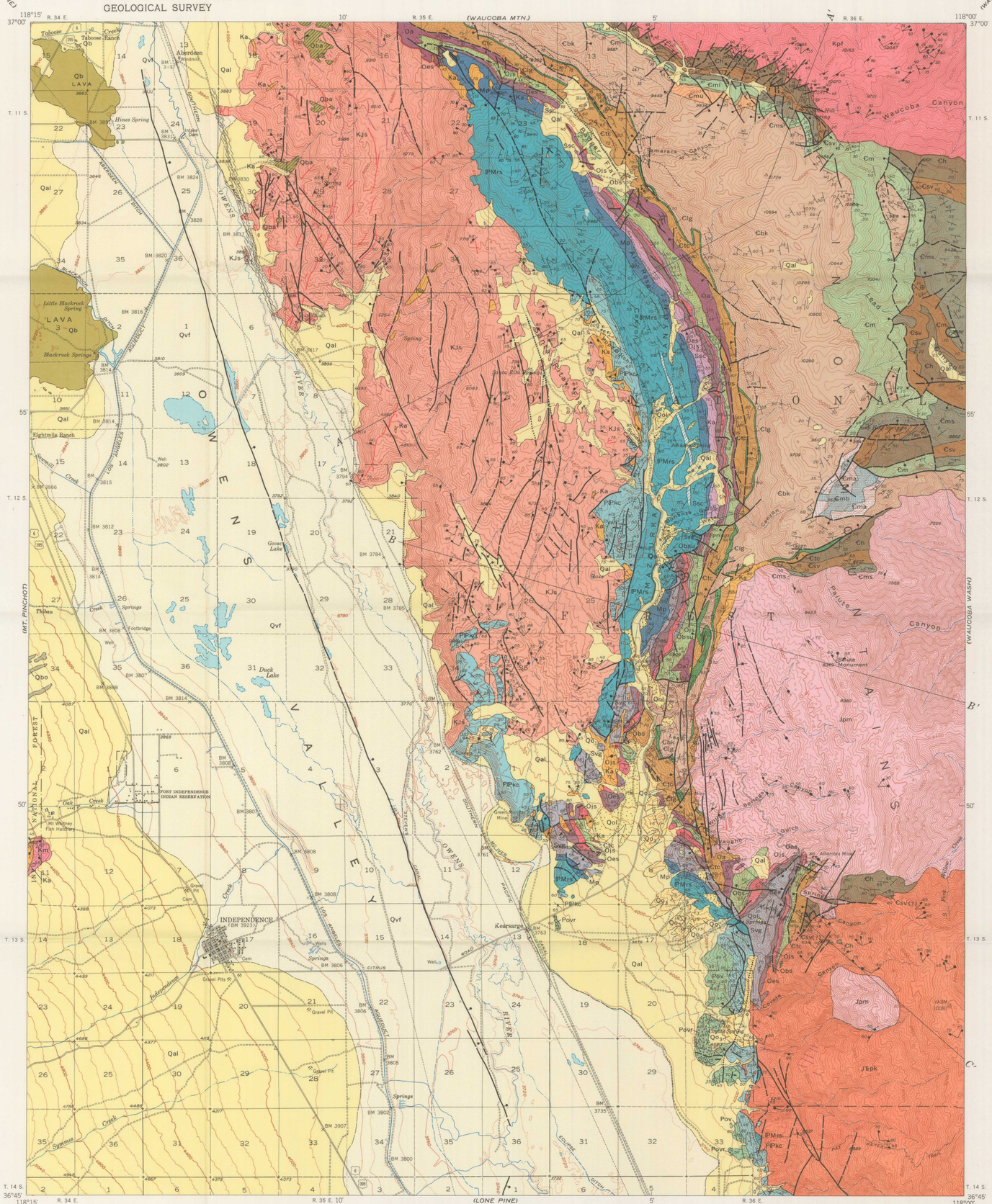


Base map by Topographic Division, U.S. Geological Survey, 1958

SCALE 1:62 500

1 ½ 0 1 2 3 4 5 MILES

1 .5 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 80 FEET
DASHED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION, 1964

Geology mapped by Donald C. Ross in 1959–1961. Assisted by R. J. Pickering in 1960 and F. K. Miller in 1961

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1964—G64112

EXPLANATION

QUATERNARY

Qvf — **Valley fill**
Sand, silt, and clay in Owens Valley

Qal — **Alluvium**
Alluvium in fans and stream deposits; also, alluviated upland areas

Qol (Qo$_3$, Qo$_2$, Qo$_1$) — **Older alluvium**
Elevated and dissected alluvial material. Locally subdivided into:
Qo$_3$, *crudely bedded partly consolidated layers rich in granitic fragments ranging in size from sand to boulders*
Qo$_2$, *dark-colored poorly consolidated unit, rich in dark hornfels fragments*
Qo$_1$, *white layers rich in rhyolitic ash and pumice*

Qb (Qba) — **Basalt**
Qb, *black olivine basalt extruded from vents and fissures along the Sierra Nevada front*
Qba, *basalt ash and cinders, in part originating from volcanic area north of quadrangle along Inyo Mountains front*

Qbo — **Older basalt**

CRETACEOUS

Dark-colored dikes, showing dip — Light-colored dikes, showing dip

Ka — **Aplite, alaskite, and pegmatite**
Small masses and dikes; most commonly peripheral to the Santa Rita Flat pluton

Km — **McGann pluton**
Medium-grained quartz monzonite in the Sierra Nevada. Age relative to granitic rocks in the Inyo Mountains unknown

Kpf — **Papoose Flat pluton**
Light-colored coarse-grained porphyritic quartz monzonite; locally highly foliated

JURASSIC OR CRETACEOUS

KJs — **Santa Rita Flat pluton of the Tinemaha Granodiorite**
Medium-grained, nonfoliated; in part, composed of porphyritic quartz monzonite

JURASSIC

Jpm — **Paiute Monument pluton**
Coarse-grained nonfoliated seriate quartz monzonite

TRIASSIC OR JURASSIC

J̶Ꞓpk — **Pat Keyes pluton of the Hunter Mountain Quartz Monzonite**
Medium-grained; in part, ranging in composition from dark-colored quartz monzonite to granodiorite

PERMIAN

Povr (Pov) — **Owens Valley Formation**
Povr, *Reward Conglomerate Member*
Pov, *varied gray; weathers reddish brown; composed of dense hornfels*

PENNSYLVANIAN AND PERMIAN

PP̶kc — **Keeler Canyon Formation**
Thinly bedded, varied gray limestone and dark-gray siltstone. Dashed line denotes zone of spheroidal black chert nodules ("golf ball" zone)

MISSISSIPPIAN AND PENNSYLVANIAN(?)

P̶Mrs — **Rest Spring Shale**
Dark-gray siltstone, shale, and mudstone; commonly metamorphosed to andalusite hornfels. Pattern shows locally mapped zone of carbon-rich beds that contains cravenoceras goniatites

MISSISSIPPIAN

Mp — **Perdido Formation**
Mixed clastic sequence of sandstone, conglomerate, calcarenite, and shale; chert clasts are abundant

Upper Mississippian and Pennsylvanian(?)

UNCONFORMITY

SILURIAN

Svg (Ssc) — **Vaughn Gulch Limestone and Sunday Canyon Formation**
Svg, *Vaughn Gulch Limestone; bioclastic limestone facies; thinly bedded limestone, and argillaceous limestone; rich in coral and sponge fragments*
Ssc, *Sunday Canyon Formation; graptolitic limy shale facies; limy shale, shale, and lesser amounts of limestone*

ORDOVICIAN

Upper Ordovician

Oes — **Ely Springs Dolomite**
Light- to dark-gray thin- to thick-bedded dolomite containing abundant black chert

Middle Ordovician

Ojs — **Johnson Spring Formation**
Mixed sequence of quartzite, dolomite, limestone (in part coral-bearing), and lesser amounts of siltstone and shale

Obs (Obsu, Obsl) — **Barrel Spring Formation**
Obs, *Barrel Spring Formation, undifferentiated. Mapped with Johnson Spring Formation on Badger Flat and to the northwest*
Obsu, *reddish-gray weathering shale, mudstone, and siltstone*
Obsl, *limestone, impure quartzite, and siltstone*

Lower Ordovician — Mazourka Group

Obf — **Badger Flat Limestone**
Blue-gray silty limestone and calcarenite and yellowish-gray siltstone; black chert abundant in lower part

Oa — **Al Rose Formation**
Brown-weathering siltstone, shale, and mudstone; limestone subordinate. Mapped with Badger Flat Limestone east of Bee Springs

CAMBRIAN

Upper Cambrian

Ꞓtc — **Tamarack Canyon Dolomite**
Uniformly gray-weathering thin-bedded dolomite; black chert nodules locally abundant

Ꞓlg — **Lead Gulch Formation**
Thin-bedded interlayered sequence of limestone, siltstone, dolomite, chert, and shale

Middle and Upper Cambrian

Ꞓbk — **Bonanza King Dolomite**
Laminated to thick-bedded dolomite color banded in varied shades of gray to give diagnostic "zebra striping" to most outcrops. Dashed line denotes locally mapped prominent black dolomite band

Middle Cambrian

Ꞓm (Ꞓmu, Ꞓma, Ꞓmb, Ꞓmm, Ꞓml) — **Monola Formation**
Thin-bedded red brown weathering siltstone and gray limestone. Locally subdivided into:
Ꞓmu, *upper member; siltstone dominant, except near top where blue limestone and orangish-brown siltstone occur together. South of Seep Hole Spring this member has been further subdivided into the limestone-rich upper unit (Ꞓma) and the dominantly siltstone part (Ꞓmb)*
Ꞓmm, *middle member; bluish-gray limestone dominant; commonly forms a somewhat resistant rib*
Ꞓml, *lower member; red brown weathering siltstone dominant*

Lower Cambrian

Ꞓms — **Mule Spring Limestone**
White to gray thinly bedded limestone

Ꞓsv — **Saline Valley Formation**
Intermixed sequence of gray limestone, brownish-gray shale, siltstone, argillaceous limestone, white quartzite, and calcareous quartz sandstone

Ꞓh — **Harkless Formation**
Red-brown stained quartzite, interbedded with siltstone and shale. Includes a few feet of the underlying Poleta Formation along the north boundary of the quadrangle

Contact, showing dip
Dashed where approximately located; all alluvial contacts dashed

Fault, showing dip
Dashed where approximately located, dotted where concealed; ball indicates downthrown side

Shear zone

Anticline
Showing trace of axial plane

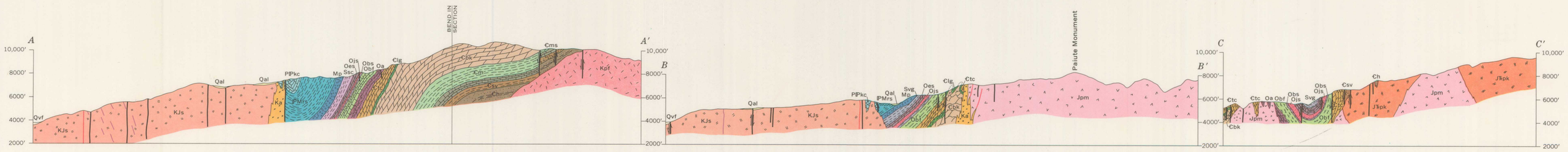
Syncline
Showing trace of axial plane

Inclined — *Overturned* — *Vertical* — *Horizontal*
Strike and dip of beds

Strike and dip of foliation

Strike and dip of cleavage

Inclined — *Vertical* — *Multiple joints at one station*
Strike and dip of joints in granitic rocks



GEOLOGIC MAP AND SECTIONS OF THE INDEPENDENCE QUADRANGLE, INYO COUNTY, CALIFORNIA