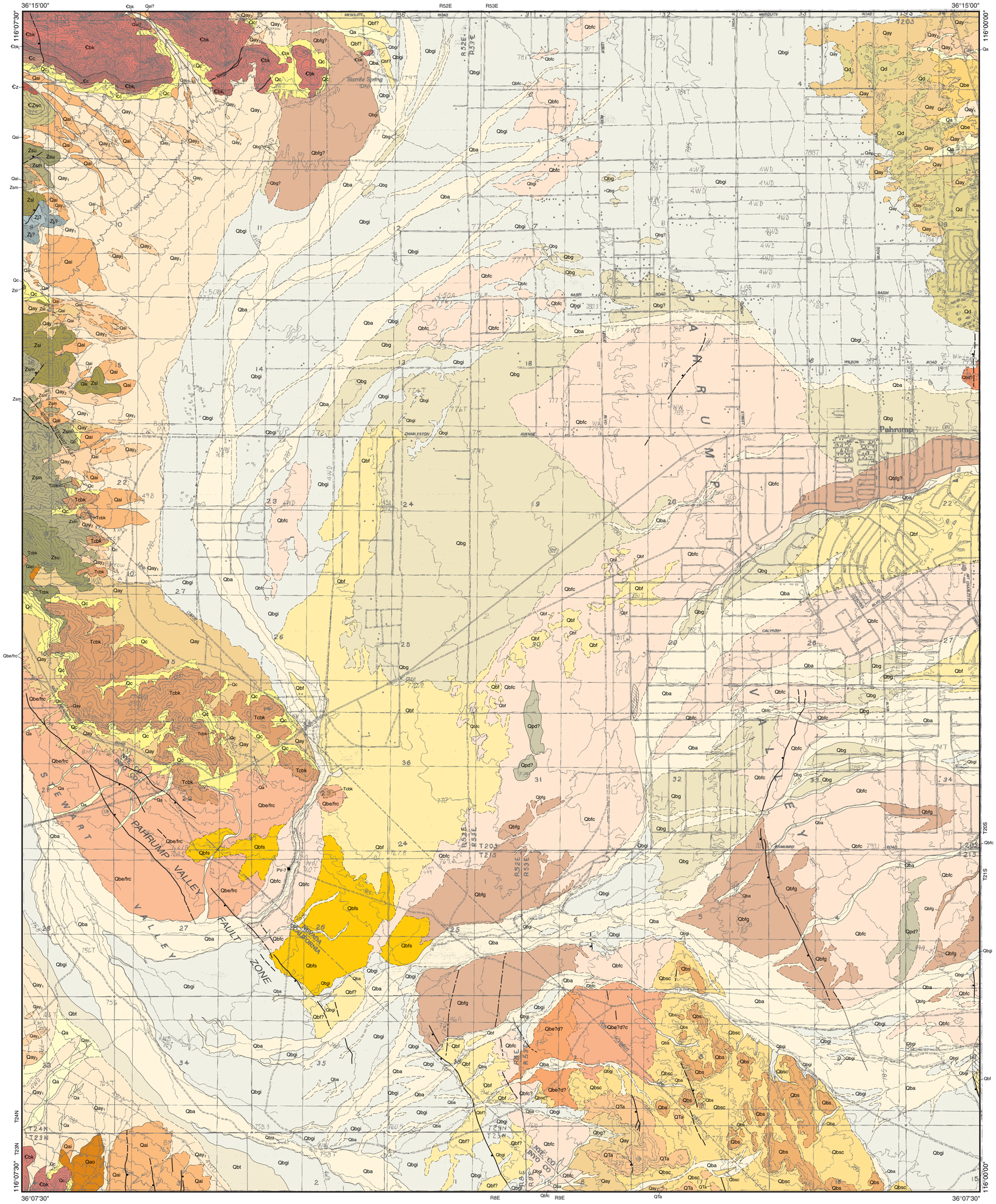
Nevada Bureau of Mines and Geology

Prepared as part of the STATEMAP component of the National Cooperative Geologic Mapping Program in cooperation with the U.S. Geological Survey and in cooperation with the Nye County Department of Natural Resources and Federal Facilities



Scale 1:24,000

0 0.5 1 kilometer

0 0.5 1 mile

0 1000 2000 3000 4000 5000 feet

CONTOUR INTERVAL 10 METERS
Supplementary Contour Interval 2.5 meters

Base map: U.S. Geological Survey Sixmile Spring 7.5' Quadrangle, 1984 Digital Raster Graphic (DRG)

PRELIMINARY GEOLOGIC MAP OF THE SIXMILE SPRING QUADRANGLE, NYE COUNTY, NEVADA, AND INYO COUNTY, CALIFORNIA,

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2003

Basin Deposits

Fluvial, eolian, spring, and paludal deposits that make up the valley-bottom fill in northern Pahrump Valley. Settings range from active deposition to terraced and isolated deposits. Deposits are characteristically fine grained ranging from medium sands to clays, and ranging in consistency from loose to being indurated with gypsum or calcite. The basin floor is subject nearly daily to eolian processes, including deposition of clays and silts from local and distant sources. These are incorporated and moved by localized rains. Floods from the Spring Mountains also occasionally sweep across large portions of the valley bottom in broad sheets, modifying the landscape and depositing layers of fluvial sands and silts. The ages of basin deposits range from modern, active units to late Pleistocene deposits that are tilted and exposed in the south-central part of the quadrangle.

Qba **Qbgi** **Active and intermittently active basin alluvium** **Qba** Active fluvial and eolian deposits on the floor of Pahrump Valley. Light-brown fluvial silts and muds, much of this reworked from older basin deposits. Thin bedded to massive, unit ranges from surficial to 0.5 m thick. Active to late Holocene age. Subject to occasional flooding. **Qbgi** deposits are similar to Qba, but are only intermittently active during large floods, and dominantly contain overbank and eolian sediments.

Qbt **Transitional basin-piedmont deposits** Fine-grained fluvial and eolian silts and sands that form a transition zone between distal alluvial fans from the Nopah Range and fluvial deposits on the floor of Pahrump Valley.

Qd **Qpd?** **Eolian dunes and deposits Qd** Light-brown, well-sorted, angular to rounded, non-cemented fine sands in active and partly stabilized dunes. Dunes up to 5 m high. Latest Holocene age. **Qpd?** Deposits are elongate landforms of clay; may be parna dunes.

Qbsc **Colluvial deposits of the basin deposits of Browns Spring** Generally clays, silts, and carbonate clasts, with some gravels near outcrops of QTa. These deposits are made up of colluvium eroded from the Basin deposits of Browns Spring (Qbs), but may include deposits of the lower part of Qbs that erode easily and are difficult to discern from colluvium.

Qbg **Unit G** Light-brown eolian silt, alluvial silts and muds, light-brown to light-gray alluvial sands. Most of the alluvial units are reworked from older basin deposits. Late Holocene deposits are up to 1 m thick.

Qbf **Qbfc** **Qbfg** **Qbfs** **Qbe/frc** **Unit F** Light-brown eolian silt, alluvial silts and muds, alluvial light-brown to light-gray sands. Much of the alluvial silts and muds are reworked from older basin deposits. Thin bedded to massive, deposits are friable and loose, and lack soil development. Deposits are as much as 1 to 2 m thick. Mid to late Holocene age. Radiocarbon dated at 5570±40 ybp on the adjacent Pahrump Quadrangle (dePolo and others, 1999). Four other subdivisions have been indicated based on the upper part of the deposit. Qbfc, Qbeg, Qbfs, Qberc. **Qbfc** indicates the upper part of the deposit is a brown clay or silt. **Qbfg** indicates the upper part is greenish tan silts of probable wet meadows origin. **Qbfs** indicates the upper part is light-brown silts, possibly local playa deposits. **Qbe/frc** indicates the upper part is a red-brown clay, derived from the breccia of Bonanza King Formation at the southernmost end of the Montgomery Mountains.

Qbe **Unit E** Light-brown to yellowish-brown silt, light-brown to light-gray fine sandy silt, and locally light-green clayey silt or dark-brown silty clay. Thin bedded to massive. Typically 0.5 to 2 m thick, consisting of fluvial, eolian, and occasional paleospring deposits. Sediments are typically slightly indurated from compaction and light cementation of gypsum or calcite. Latest Pleistocene to Holocene in age, correlative deposits have been radiocarbon dated at 10,270±270 ybp on the adjacent Pahrump Quadrangle (dePolo and others, 1999). The uppermost parts of these deposits are Holocene. Units labeled **Qbe** are undifferentiated Unit E deposits that are usually light-brown, fluvial or eolian, fine sandy silts.

Qbd **Unit D** Light-gray to gray organic muds, light-brown to light-green clay, silt, fine sandy silt, marl, limestone, and locally brown clay. Interbeds and lenses of well sorted, cross bedded, pebble gravel are common. Exposed thickness is typically 3 to 4 m, with a maximum of 6+ m exposed in quarry walls in the Pahrump Quadrangle to the east. Generally consists of massive to thick bedded mud deposits; where consisting of predominantly silts and fine sands, unit is thinly bedded and fissile. The upper 1 to 2 m of this unit is characteristically light gray, calcareous mud that is partially cemented with calcite which weathers to curving and branching platy nodules. Top of the unit is commonly capped by a 30- to 50-cm-thick paludal limestone, that locally contains small molluscs, clams, and snails. Radiocarbon dated at 19,930±50 and 24,150±80 ybp on the Pahrump Quadrangle (dePolo and others, 1999).

Qbe?d? **Unit E or Unit D** Deposits overlain by colluvium.

Qbe?d? **Unit E or Unit D** Fine-grained basin deposit with a brown clay upper part that is similar to Unit Qbec, but with small chunks of carbonate and marl littering the surface, which is more akin to Unit D.

Qbs **Basin deposits of Browns Spring** Fine-grained, dark brown to light brown and white clays, silts, fine sands, marls, and limestones, with minor interbedded gravel. Thin to medium bedding. The deposits appear to be faulted or warped upwards along the Pahrump Valley fault zone in the south central part of the quadrangle exposing them. A prominent, 0.5- to 1-m-thick paludal limestone caps many of the hills formed on the unit. These deposits are middle Pleistocene in age as constrained by thermoluminescence and U-series dating on the Mound Spring Quadrangle, indicating the unit is about 200 to 400 ka (Lundstrom and others, in prep.). Rancholabrean fossils have reportedly been found in this unit in the Stump Springs Quadrangle (Lundstrom and others, in prep.).

Alluvial Fan Deposits

Sandy, coarse-pebble gravel alluvial fan deposits originating from the small set of hills projecting southward from the Montgomery Mountains and the northeastern flank of the Nopah Range. Includes poorly sorted, weakly to moderately imbricated, generally clasts supported with minor matrix supported angular to subrounded gravel deposits. Thinly bedded to massive, with gravel lenses ranging from a few centimeters to 70 cm thick, and commonly 10 to 30 cm thick. Clasts are dominated by either limestones or quartzites depending on the source deposits. Some deposits, especially in the proximal areas, are thin beds (<0.5 m thick) overlying significantly older alluvial deposits. Deposits are middle Quaternary to late Holocene in age.

Qa **Active alluvium** Cobbly, pebbly, sandy gravel within active washes within fans. Surface made up of anastomosing bar-and-swale microtopography, with no pavement or soil development. Subject to intermittent flooding.

Qc **Colluvial deposits** Talus, debris, and fan surfaces in aprons around steep bedrock escarpments, that are not part of the piedmont. Composed of boulders, cobbles, sands, and silts, and appears to span a large range in age, from latest Holocene to early Quaternary.

Qay **Younger alluvium (undifferentiated)** Fans and fan remnants characterized by surfaces ranging from subdued bar and channel to fully smoothed with moderately well developed desert pavements. Commonly includes earlier younger alluvium (Qay_1) with interspersed, later younger alluvium (Qay_2) making delineation difficult. Latest Pleistocene to Holocene in age. Subject to intermittent flooding in places.

Qay_1 **Later younger alluvium** Fan remnants characterized by subdued bar-and-swale microtopography, incipient desert pavement, weak rock varnish, and none to slight etching of limestone and dolomitic surface clasts. Soils typically A-C and A-Bk-C profiles with a 1- to 5-cm-thick, light-brown silt eolian epipedon (Av), a 5- to 20-cm-thick, weak to non-existent calcic horizon (Bk) with Stage I carbonate development. Mid to late Holocene in age.

Qay_2 **Earlier younger alluvium** Fan remnants characterized by well-developed, moderately to tightly packed desert pavement, weakly to moderately developed rock varnish, incipient to moderate etching of surficial limestone and dolomitic clasts. Soils are typically A-Bw-Bk-C profiles with a 2- to 15-cm-thick, light brown eolian epipedon (Av), a 10- to 20-cm-thick, slightly reddened, silt infiltrated, cambic horizon (Bw), and a 30+ cm thick, calcic horizon with Stage I and II carbonate development. Latest Pleistocene to early Holocene in age.

Qai **Intermediate age alluvium** Fan-terrace remnants characterized by tightly packed desert pavement, dark rock varnish on non-carbonate clasts, and very strongly etched carbonate clasts. Flat-topped surfaces are quite prominent in this unit that is commonly well dissected, and elevated above surrounding fan surfaces. Unit typically contains a soil exhibiting a 5- to 10-cm-thick, light brown, eolian silt epipedon (Av), 10- to 30-cm-thick, reddened and well-structured argillic horizon (Bt), and 100- to 150-cm-thick calcic horizon (Bk) with up to Stage IV carbonate. Upper soil horizons may be erosional stripped in some areas. Late Pleistocene in age.

Qao **Older alluvium** Fan-terrace remnants characterized by deep dissection and discordant rounded remnants (ballenas), moderately to well-developed pavement with whitish calcrete litter abundant, and deeply etched carbonate clasts. Outcrops of massive calcic cementation common. Unit has been thoroughly infiltrated by silt and carbonate. Calcic horizons are several meters thick with development of Stage V (massive) carbonate, with horizontal layers of calcic deposits near the upper parts of the deposits. Other upper soil horizons have been stripped. Early to middle Pleistocene in age.

Quaternary Alluvium or Late Tertiary

Gravel channel that is relatively resistant in Pahrump Valley and caps the tops of small hills (inverted topography), and a landslide(?) breccia that covers the southernmost Montgomery Mountains.

QTa **Quaternary alluvium or late Tertiary** Calcite-cemented gravels, sands, and ash that make up a northwest alignment of hills that are typically capped by the gravels. Gravels are dominantly composed of limestone clasts, with some volcanic and granitic clasts. These deposits appear to be derived from the south based on clast lithology and underlie the basin fill of Browns Spring in the southern part of Pahrump Valley (Lundstrom and others, in prep.). The alignment of these hills is traverse to local drainages, and some drainages crossing Pahrump Valley are deflected around the hills of QTa and Qbs. The hills are aligned subparallel to the Pahrump Valley fault zone, and may be tectonic upwarps. An ash was found below the cemented gravels on one hill that is presumably the ash mentioned by Malmberg (1967). An $^{40}Ar/^{39}Ar$ date is pending.

Tcbk **Breccia of the southern Montgomery Mountains** Monolithic breccia deposit made up of clasts predominantly derived from Bonanza King Formation, with some rare clasts of the underlying Stirling Quartzite incorporated into the lower part of the deposit. The unit appears to be deposited on hillslopes eroded on bedrock, and may be a landslide deposit. The source area has been tectonically removed in the Neogene.

Cambrian and Precambrian Sedimentary Rocks

Cambrian and Precambrian sedimentary rocks were compiled and modified from Burchfiel and others (1982). They include a faulted and broadly folded sequence of siliciclastic and carbonate rocks, principally quartzites and limestones.

Ccbk **Ccbk$_l$** **Bonanza King Formation** The Bonanza King Formation is a limestone sequence that can be divided into a lower, massive limestone unit, the Papoose Flat Member **(Ccbk$_l$)**, and an upper group **(Ccbk)** of bedded, banded limestone, the Banded Mountain Member (Barnes and Palmer, 1961). Both members are beautifully exposed on the Sixmile Springs Quadrangle. The Papoose Flat Member **(Ccbk$_l$)** consists of gray and dark gray mottled limestone minor dolomite. The member forms a steep, cliff-like bottom to the hills of Bonanza King Formation. A nonconformity occurs between the Papoose Flat and Banded Mountain Members. The Banded Mountain Member **(Ccbk)** consists of interbedded dark-gray to black and white limestone and dolomite that gives the formation its conspicuous banded appearance. The basal 27 to 40 m of the upper member is composed of red-brown-weathering silty and sandy limestones, and the base of this unit is the contact between the two members. The Banded Mountain Member is about 860 m thick at the northwestern part of the quadrangle.

Cc **Carrara Formation** The Carrara Formation is a transitional unit from the terrigenous sequence below and the carbonate sequence below. It crops out at the base of a set of large hills that are largely made up of Bonanza King Formation, immediately above the alluvial apron. Thinly to very thinly bedded deposits of reddish-brown to gray siltstone, limey siltstone, and silty limestone. Erodes out into paper-like layers in places. Generally transitional and gradational contact with the overlying massive limestones of the Bonanza King Formation. Thickness of the Carrara Formation is up to 446 m immediately west of the quadrangle (Burchfiel and others, 1982); the lower part of the Carrara Formation is buried by alluvium on the Sixmile Spring Quadrangle.

Cz **Zabriskie Quartzite** White, pink, red, and maroon vitreous quartzite. The formation is 80 to 90 m thick immediately to the west of the quadrangle (Burchfiel and others, 1982).

CZwc **Wood Canyon Formation** Dark-weathering sandstone; green, gray, and red shale; and siltstone with beds of brown-weathering sandy dolomite. This is the upper member of the Wood Canyon Formation as mapped by Burchfiel and others (1982). The Wood Canyon locally is 640 m thick (Burchfiel and others, 1982).

Zsu **Zsm** **Zsl** **Stirling Quartzite** The Stirling Quartzite has been divided into three members locally following Burchfiel and others (1982), a lower, middle, and upper member. The upper member **(Zsu)** consists of medium- to very coarse-grained and conglomeratic pink, gray, and white quartzite. Rare beds of light-brown sandy dolomite are present locally south of the Stewart fault. The middle member **(Zsm)** consists of purple, maroon, and green shale and siltstone, interbedded with pink and red fine-grained quartzite. The middle member tends to form recessive slopes between the bounding, more resistant upper and lower members. The lower member **(Zsl)** consists pre-dominantly of fine- to coarse-grained and conglomeratic quartzite of white, gray, pink, maroon, and purple colors.

Zj? **Zj$_l$?** **Johnny Formation(?)** Shattered and brecciated light-brown quartzite that has a dolomitic matrix or cement and rarer pinkish conglomeratic arkosic quartzite. The quartzite with dolomitic cement weathers to a distinctively black "varnish." These rocks crop out in the core of a highly faulted anticline, and may be shattered parts of the lower member of Stirling quartzite that has been cemented by dolomite. These rocks are not similar to other descriptions of the Johnny Formation elsewhere and correlation is uncertain. **Zj$_l$?** More easily eroded quartzites in the core of anticline that lack the dark varnish.

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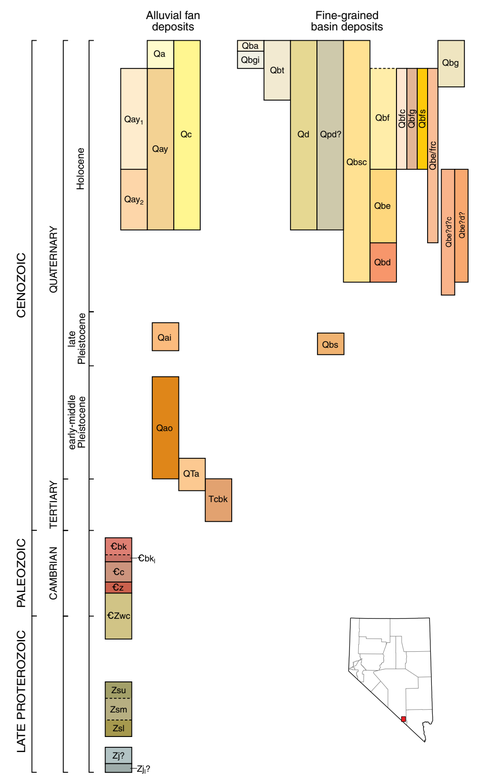

Lithologic contact Dashed where inferred or approximately located; queried where uncertain.

Normal-slip fault Ball on downthrown side; dashed where inferred or approximately located; dotted where concealed.

Strike-slip fault Dashed where inferred or approximately located; dotted where concealed.

Lineament Determined from aerial photography; dotted where concealed.

Fissure zone Discontinous ground cracks, sinkholes and/or subsurface tunnels associated with groundwater-induced subsidence. Boundaries are approximate and enclose mapped and inferred fissure extent.

Sample location for radiocarbon analysis
Organic sediment 3140±100 GX-28563.
PV-7

Field work done in 2001.

DRAFT

Preliminary geologic map.
Has not undergone office or field review.
May be revised before publication.

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