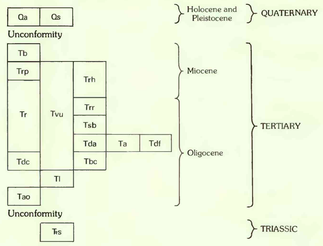
APPROXIMATE BOUNDARY OF THE CLAN ALPINE MOUNTAINS WILDERNESS STUDY AREA (NV–030–102)

EXPLANATION OF MINERAL RESOURCE POTENTIAL

[Entire study area has low mineral resource potential for all metals (except as noted below), at certainty level B, and for geothermal energy, oil, and gas, at certainty level C]

- **H/C** — **Geologic terrane having high mineral resource potential for gold and silver, at certainty level C**
- **M/B** — **Geologic terrane having moderate mineral resource potential for gold and silver, at certainty level B**
- **M/B** — **Geologic terrane having moderate mineral resource potential for molybdenum, at certainty level B**
- **M/B** — **Geologic terrane having moderate mineral resource potential for antimony, at certainty level B**
- **L/C** — **Geologic terrane having low mineral resource potential for zeolites, at certainty level C**

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

[cm, centimeter; mm, millimeter]

Qa **Alluvium (Holocene and Pleistocene)**—Includes fan gravels found along the flanks of the Clan Alpine Mountains and silt, sand, and gravel deposits in stream drainages. May include rocks of Pliocene age

Qs **Landslide deposits (Holocene and Pleistocene)**—May include rocks of Pliocene age

Tb **Basalt flows (Miocene?)**—Dark-gray to greenish-black, vesicular basalt. Commonly found at or near the crest of the Clan Alpine Mountains and locally along the eastern edge of the range

Trp **Porphyritic rhyolite (Miocene?)**—Dark-gray or purple, in places lavender to rusty-red or green, typically dark-brown-weathering, porphyritic-aphanitic to glassy rhyolite containing phenocrysts of plagioclase (as much as 1 cm long), pyroxene (less than 1.5 mm long), and trace amounts of quartz, sanidine, and opaque minerals. Rock is commonly massive and locally shows crudely developed columnar jointing; in some places displays irregular intersertal vesicular cavities and locally is "streaky" in appearance due to smeared-out vesicles or internal flow planes and is platy-weathering. This rhyolite occurs both as small flow lobes and as masses that intrude the tuff of Railroad Ridge (Trr) in the western part of the study area and forms prominent dark, resistant outcrops along the west flank and east-central part of the study area

Tvu **Volcanic rocks, undivided (Miocene and Oligocene)**

Trh **Rhyolite (Miocene)**—Light-gray hornblende-bearing rhyolite intrusions and local flow rock, both having prominent flow foliation. Crops out in War Canyon and south along the eastern edge of the map area, where it intrudes and alters tuff of Railroad Ridge (Trr). K-Ar date of 22.1±0.7 Ma; location given in Riehle and others (1972)

Tr **Rhyolite flows and intrusion (Miocene? and Oligocene)**—Light-gray to white or pale-lavender-gray, pinkish-brown to light-rusty-brown-weathering, crystal-poor, glassy to devitrified rhyolite containing phenocrysts of sanidine (laths as much as 6 mm long), quartz (less than 2 mm in diameter), and rare biotite and plagioclase; locally, quartz phenocrysts are absent. Rock is generally flow laminated, locally crudely columnar jointed and locally autobrecciated or spherulitic or frothy or flow contorted. Locally, this unit contains flattened, stretched gas cavities that can resemble flattened and weathered-out pumice lapilli. This unit is probably composed of more than one intrusive pulse of rhyolite magma. Map unit includes small granitic and quartz monzonitic intrusions in the far northern part of the wilderness study area

Trr **Tuff of Railroad Ridge (Oligocene)**—Light- to medium-gray or medium- to tan-brown, light-gray to medium- or dark-brown-weathering, moderately to densely welded, devitrified, crystal-rich quartz-latitic ash-flow tuff containing white to pale-pinkish-brown pumice lapilli (lighter than matrix) and as much as 10 percent pebble- to cobble-size lithic fragments scattered throughout the unit. Phenocrysts constitute 35–40 percent of the rock and consist of subequal amounts of quartz, sanidine, plagioclase, biotite, hornblende, and traces of pyroxene. This unit grades downward into similar-appearing crystal-rich rhyolite tuff containing smoky to clear quartz, sanidine, and no ferromagnesian minerals (biotite, hornblende, pyroxene). Minimum thickness is 1,000 ft for rhyolitic base, 3,000–4,000 ft for quartz latitic upper part. K-Ar date of 24.5±0.8 Ma; location given in Riehle and others (1972)

Tsb **Rhyolitic sedimentary breccia (Oligocene)**—Coarse pebble to small boulder, angular, clast-supported, unsorted-heterogenous sedimentary breccia dominated by rhyolitic lithic fragments but also containing clasts of intermediate lava and ash-flow tuff. Breccia grades upward into coarse-grained, pebbly epiclastic sandstone and fine-grained gravel deposits. Unit forms discontinuous outcrops unconformably above ash-flow tuffs (Tdf) and is overlain by the rhyolitic basal part of the ash-flow tuff of Railroad Ridge (Trr). This unit is intruded or overlain by rhyolites (Trp) and (Tr). Locally, in the northeastern part of the study area, this unit consists of waterlaid tuffs and intercalated layers of well-sorted pebble conglomerate containing predominantly rhyolitic tuffaceous lithic clasts and intermediate lava clasts. Thickness 200–300 ft

Tda **Intrusive complex (Oligocene)**—Includes andesite and dacite. Spherulitic and increasingly mafic toward margins. Contains plagioclase, hornblende, biotite, and ferromagnesian phenocrysts. Forms a lone outcrop in Deep Canyon

Ta **Younger andesite (Oligocene)**—Unit consists of fine-grained, slightly porphyritic andesitic intrusive rock containing sparse plagioclase phenocrysts in an aphanitic groundmass. Some intrusions are locally autobrecciated. Forms dikes and small plugs near Box Spring (upper North Fork of War Canyon) and in sec. 28, T. 21 N., R. 36 E., in the northwestern part of the study area

Tdf **Delicate-fiamme tuffs (Oligocene)**—Two or three cooling units of dark-brown to dark-olive or chocolate-brown, dark-brown or reddish-brown-weathering, moderately pumice- and lithic-rich, moderately crystal poor, densely welded rhyolitic ash-flow tuff. Olive-green to brown flattened pumice lapilli (less than 1 cm to as much as 8 cm in diameter) constitute 20–30 percent of the tuffs and are typically delicate-fiamme (flame-like ends) textured and weather darker than the rock matrix. Moderately abundant (10–20 percent of rock) pebble- to cobble- (at bases) size lithic fragments occur scattered throughout these tuff units. Phenocrysts (as much as 2 mm) constitute 10–15 percent of the rock units and consist of sanidine, quartz, and minor amounts of plagioclase. Thickness estimated to be at least 250 ft to as much as 800 ft

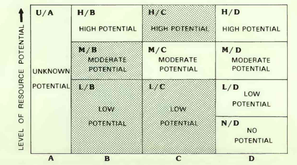
Tdc **Tuff of Deep Canyon (Oligocene)**—Medium-brown to gray, rhyolitic ash-flow tuff. Contains feldspar, biotite, lesser quartz, and rare hornblende. Nonwelded to moderately welded. Compaction foliation commonly indistinct. Pumice lighter than matrix and generally conspicuous. Dark-gray to black lithic fragments of Triassic siltstone (**Trs**?) typically present and less than 0.25 in. in length, but locally as much as several inches. Porphyritic andesite (**Tao**) fragments less common but locally as much as 1.5 in. in length. Crops out exclusively in the northern part of the map area, north of War Canyon. Minimum thickness 1,200 ft

Tbc **Megabreccia (Oligocene)**—Contains blocks of dark-gray to coal-black Triassic siltstone (**Trs**?) and porphyritic andesite (**Tao**?) tens of feet in length within a matrix of tuff of Deep Canyon (**Tdc**). Crops out exclusively in the northern part of the wilderness study area

Tl **Intrusive latite (Oligocene)**—Small intrusive latite plug along the northeast boundary of the wilderness study area. Rock contains phenocrysts of plagioclase, altered hornblende, and biotite, sanidine, and minor quartz

Tao **Older porphyritic andesite (Oligocene)**—Dark-green to black flows commonly found along the northeastern part of the study area and as blocks within Tdc. Commonly stained with copper oxides. K-Ar date of 35.0±1.2 Ma; location in Riehle and others (1972)

Trs **Siltstone (Triassic)**—Dark-gray to black, interbedded with calcareous siltstone, calcareous sandstone, and chert- and quartz-pebble conglomerates. Typically fissile and forms poor outcrops consisting of small chips. Micaceous cleavage locally prominent. Unit may include parts of the Dyer Canyon and Byers Canyon Formations of Speed (1978)



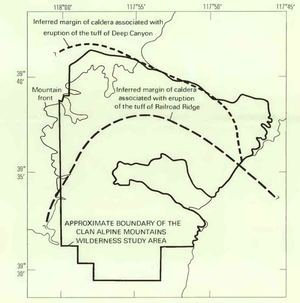
LEVELS OF RESOURCE POTENTIAL

- **H** High mineral resource potential
- **M** Moderate mineral resource potential
- **L** Low mineral resource potential
- **U** Unknown mineral resource potential
- **N** No known mineral resource potential

LEVELS OF CERTAINTY

- **A** Available data not adequate
- **B** Data indicate geologic environment and suggest level of resource potential
- **C** Data indicate geologic environment, give good indication of level of resource potential, but do not establish activity of resource forming processes
- **D** Data clearly define geologic environment and level of resource potential and indicate activity of resource forming processes in all or part of the area

Diagram showing relationships between levels of mineral resource potential and levels of certainty. Shading shows levels that apply to this study area



APPROXIMATE BOUNDARIES OF INFERRED CALDERAS, CLAN ALPINE MOUNTAINS WILDERNESS STUDY AREA

- **Contact**—Dashed where approximately located or inferred
- **Fault**—Dashed where inferred, dotted where concealed; bar and ball on downthrown side
- **Strike and dip of compaction foliation**
  - Inclined
  - Vertical
  - Horizontal
- **Zone of complexly faulted and fractured rock**—Locally contains dike swarms in the area between Willow Springs and Cherry triangulation station. Dikes include rocks of rhyolitic, dacitic, and andesitic composition and are typically porphyritic. Geologic detail in this area is greater than can be shown at the map scale
- **B** **Approximate location of area under historic, recent (since 1983), or active claims**—Letter is at approximate center of claim group, accurate to nearest quarter section
- × **Prospect**

Geochemical sample locality discussed in text and table 1

- •760 **USGS rock samples**
- •CB020 **USGS heavy-mineral concentrate**
- •18 **USBM sample**

MAP SHOWING MINERAL AND ENERGY RESOURCE POTENTIAL, GEOLOGY, SELECTED GEOCHEMICAL SAMPLE LOCALITIES, AND AREAS OF RECENT OR ACTIVE CLAIM ACTIVITY, CLAN ALPINE MOUNTAINS WILDERNESS STUDY AREA, CHURCHILL COUNTY, NEVADA

Base from U.S. Geological Survey, Clan Alpine Ranch, 1966, 1:62,500; Camp Creek Canyon, 1969,; Dixie Valley, Dixie Valley SE, 1972, 1:24,000

APPROXIMATE MEAN DECLINATION, 1986

SCALE 1:50 000

1 ½ 0 1 2 3 MILES

1 .5 0 1 2 3 KILOMETERS

CONTOUR INTERVAL 20, 40, AND 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology mapped in 1986 by R.F. Hardyman, W.E. Brooks, and M.J. Blaskowski; assisted by K. Anthony and M. Welch