NEVADA BUREAU OF MINES AND GEOLOGY
RENO AREA

PREPARED IN COOPERATION WITH THE U.S. GEOLOGICAL SURVEY

STEAMBOAT QUADRANGLE
MAP 4Fg GEOLOGIC MAP

STEAMBOAT QUAD

GEOLOGY

Harold F. Bonham, Jr. and John W. Bell, 1993

Fieldwork in support of the U.S. Geological Survey COGEOMAP program

Scale 1:24,000

CONTOUR INTERVAL 20 FEET
DOTTED LINES ARE 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

0 0.5 1 kilometer

0 0.5 1 mile

0 1000 2000 3000 4000 5000 feet

Contact Dashed where approximately located; queried where uncertain.

Quaternary fault Dashed where approximately located; dotted where concealed; queried where uncertain; ball on downthrown side.

Pre-Quaternary fault Dashed where approximately located; ball on downthrown side; Quaternary movement not precluded; arrows indicate relative movement.

Fissures Possible faults.

30 **Strike and dip of beds**

90 **Strike of vertical beds**

Horizontal beds

35 **Strike and dip of flow layering**

NEVADA BUREAU OF MINES AND GEOLOGY
MACKAY SCHOOL OF MINES
Base map: U.S. Geological Survey Steamboat 7.5' Quadrangle, 1967
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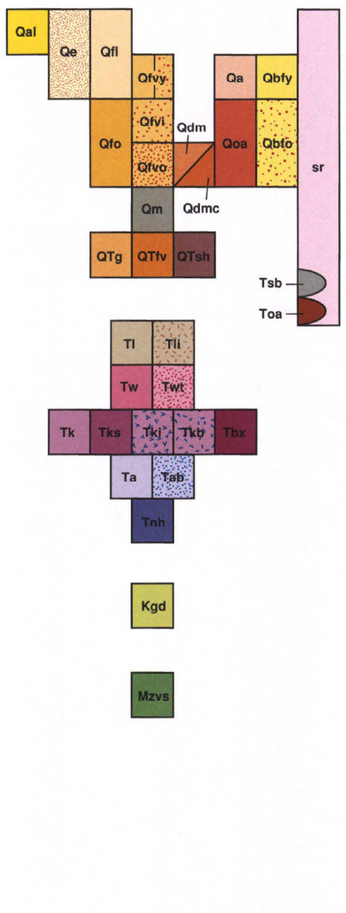

Qal **Recent channel deposits** Light-brown, pebbly, sandy mud deposited by recent waterfloods in major fan drainages. Associated with historic flashfloods and mudflows in the Hidden Valley area.

Qfl **Floodplain deposits of the Truckee River and Steamboat Creek** Gray, dark-gray-brown, and light-brown sand and sandy mud; locally may contain interbeds of pebble-cobble fluvial gravel and peat. Just north of the quadrangle, a ^{14}C date of 2130±165 years was obtained on a peat interbed (Bell and Bonham, 1987). Little to no soil (A-C profiles). Has been subject to large-scale historic flooding near Steamboat Springs. May be cemented by secondary SiO_2.

Qa **Alluvial bajada deposits of the Mt. Rose fan** Light-brown to gray muddy sand and mud containing minor pebble-cobble gravel interbeds. Contact with **Qfl** is gradational. Little to no soil (A-C profiles).

Qe **Eolian sand deposits** Light-brown, well-sorted, medium sand; only major dunes and sheets mapped. Dominantly inactive, although modern local reworking is common. Many deposits exhibit a moderately to strongly developed reddish cambic (Bw) soil.

Qbfy **Young basin-fill deposits** Light-brown to brown sandy mud and pebbly muddy medium sand. Derived from low-gradient deposition in small fault-controlled basins within the Virginia Range. Little to no soil (A-C profiles).

Qfvy **Qfvi** **Qfvo** **Alluvial-fan deposits of the Virginia Range** Composed dominantly of subangular to subrounded clasts of gray to dark-gray andesite with varying proportions of white to red altered andesite clasts depending upon source area; poorly to moderately stratified; poorly to very poorly sorted. From oldest to youngest, units comprise a descending set of successively inset and nested fans and stream terraces typically having little vertical separation. Similar geomorphic characteristics make differentiation very difficult without the use of pedologic data. **Qfvy**: light-brown to brown muddy, sandy, pebble gravel; locally cobble to boulder gravel. Soils have A-C to cambic (Bw) profiles. Stippled where deposit is dominantly a pebbly sand derived from reworking of older **Qe** deposits. Where bouldery, commonly displays bar-and-channel microtopography. **Qfvi**: light-brown to brown muddy, sandy, cobble to boulder gravel; maximum boulder diameter >1 m. Typically contains a well-developed argillic (Bt) soil about 30 cm thick. **Qfvo**: light-brown to brown muddy, sandy, cobble to boulder gravel; maximum boulder diameter >1 m. Surface clasts are strongly weathered. Soils contain a well-developed argillic (Bt) horizon ranging from 1/2 to 1 m thick, locally underlain by a carbonate- and silica-cemented duripan as much as 1 m thick. East of Steamboat Creek in the Steamboat Springs area, unit forms a prominent terrace which is stratigraphically equivalent to **Qdm**.

Qoa **Older alluvium of the Steamboat Hills** Brown sandy, pebble to cobble gravel composed of angular metasedimentary and metavolcanic clasts in the Steamboat Hills area. Soil contains argillic (Bt) horizon 30 to 60 cm thick.

Qbfo **Old basin-fill deposits** Gray-brown to reddish-brown pebbly, muddy, medium sand. Derived from low-gradient deposition in small fault-controlled basins within the Virginia Range. Soils have argillic (Bt) horizons as much as 1 m thick.

Qfo **Older floodplain alluvium** Gray to brown muddy sand and mud. Soils have argillic (Bt) horizons 30 to 60 cm thick, locally underlain by a silica- and carbonate-cemented duripan. Occupies terrace remnants standing slightly higher than **Qfl** north of Huffaker Hills.

Qdm **Qdmc** **Donner Lake outwash-Mt. Rose fan complex** **Qdm**: Brown muddy, sandy, cobble to boulder gravel; near Huffaker Hills consists of brown to gray, well-rounded, small pebble gravel and coarse sand; poorly to moderately stratified, locally crossbedded; generally poorly to very poorly sorted. Composed dominantly of andesite clasts with subordinate granite clasts. Where present, granite clasts are deeply weathered and generally nonexistent on the surface. Deposit is derived from major streams draining the Carson Range; near Steamboat Hills, unit is locally overlain by unmapped veneer (1 to 2 m) of Tahoe-age alluvium containing unweathered granitic clasts; near Huffaker Hills, unit consists of scattered eroded fan remnants. Soils typically have a strongly developed argillic (Bt) horizon 60 cm thick, locally underlain by a silica- and carbonate-cemented duripan 1 m thick. Deposit is locally well cemented by sinter and/or is hydrothermally altered in the Steamboat Hills area (**Qdmc**).

Qm **McClellan Peak Olivine Basalt** Flow of black to dark-gray basalt with prominent green olivine phenocrysts. Age approximately 1.5 Ma (Morton and others, 1980).

QTfv **Fanglomerate of Lagomarsino Canyon** Light- to dark-gray, well-cemented, cobble to boulder gravel and sandstone; underlies McClellan Peak Olivine Basalt. Deposit consists of subangular to well-rounded volcanic clasts derived from the Virginia Range. Soil has an argillic (Bt) horizon more than 1.5 m thick.

QTg **Old alluvium of Geiger Grade** Dark-gray pebble to cobble sandy gravel; subangular to rounded porphyritic andesite and altered andesite clasts.

QTsh **Steamboat Hills Rhyolite** Rhyolite domes. The rhyolite is light gray and contains small (1-3 mm) phenocysts of sanidine, sodic plagioclase, quartz, and minor biotite in a matrix of pumiceous, perlitic glass. The rhyolite domes have been dated by K-Ar methods from 1.14 to 1.51 Ma (Silberman and others, 1979).

Tsb **Basaltic andesite of Steamboat Hills** Dark-gray flows of basaltic andesite containing abundant phenocrysts of plagioclase, common olivine, and sparse pyroxene in a fine-grained groundmass of microlites. Plagioclase phenocrysts typically contain partially resorbed, sieve-textured cores. K-Ar age 2.52 to 2.55 Ma (Silberman and others, 1979).

Toa **Old alluvium of Steamboat Hills** Light-brown pebble to cobble gravelly sandstone; well cemented; hydrothermally altered. Composed of arkosic sand with scattered andesite clasts.

sr **Hot-spring sinter** Siliceous sinter ranging in age from late Pliocene to present. Older sinter is white to gray chalcedony; locally contains mercury sulfides; younger sinter is light-gray to tan porous opal.

Tl **Tli** **Lousetown Formation** **Tl**: flows of platy basaltic andesite and basalt. Flows range from pyroxene andesite to olivine-pyroxene basalt. Flows are typically dark gray to black, dark brown on weathered surfaces. **Tli**: intrusive plugs and dikes of basalt and basaltic andesite, petrographically identical to **Tl**. Age 7.4-9.7 Ma (Dalrymple and others, 1967; Morton and others, 1980).

Tw **Twt** **Washington Hill Rhyolite** **Tw**: rhyolite flow domes, margins locally composed of pumiceous glass, perlite, and minor obsidian; sparsely porphyritic with glomero-porphyritic, sodic plagioclase and biotite. **Twt**: rhyolite air-fall tuff, minor pyroclastic flows, waterlaid tuff and tuffaceous mudstone. Equivalent in part to rocks of the Truckee and Coal Valley formations and to the sandstone of Hunter Creek. K-Ar age 9.7-10.9 Ma (Vikre and others, 1988).

Tk **Tks** **Tki** **Tkb** **Tbx** **Kate Peak Formation** **Tk**: flows, domes, lahars, pyroclastic flows, plugs and dikes. **Tks**: air-fall tuff, tuffaceous and diatomaceous sedimentary rocks. **Tki**: mapped intrusive phases of the Kate Peak Formation; undifferentiated intrusions are present in unit **Tkb**, particularly in areas of intense hydrothermal alteration. **Tkb**: hydrothermally altered rocks of high-sulfidation type; includes extensive areas of surficial oxidation of pyritized, propylitically altered rock, producing supergene argillic alteration (bleached rock). May contain small unmapped areas of **Ta** or **Tab**. Rocks of the Kate Peak Formation range in composition from andesite to rhyolite, but are chiefly dacite and rhyodacite. They typically contain prominent phenocrysts of sodic plagioclase, clino- and orthopyroxene, hornblende, and biotite in a felsitic matrix. Flow rocks commonly are microvesicular and exhibit spheroidal weathering. Ages range from 12.4 to 16.9 Ma and ages of high sulfidation alteration range about 9.5 to 16.3 Ma based upon K-Ar dating (Vikre and others, 1988). **Tbx**: bedded hydrothermal eruption breccia, composed of silicified and opalized pebble to boulder-sized fragments of Kate Peak volcanic rocks in a bright-red, hematitic matrix; some native sulfur present in vugs. Formed by hydrothermal explosions at paleosurface.

Ta **Tab** **Ta?** **Alta Formation** **Ta**: pyroxene, pyroxene-hornblende, and hornblende andesite flows, lahars, and pyroclastic flows. Phenocrysts of plagioclase (An40-60), clinopyroxene, and/or basaltic hornblende in a fine-grained matrix of plagioclase, pyroxene, hornblende, apatite, and magnetite. Flow rocks are typically medium to dark gray on fresh surfaces, weathering to brown shades. **Tab**: hydrothermally altered Alta Formation. Areas of hypogene advanced argillic and argillic alteration of high-sulfidation type and bleached areas of argillic rocks related to shallow supergene oxidation of pyritized, propylitically altered andesite. Argillized rocks typically are composed of montmorillonite and/or kaolinite. Extensive zones of quartz-alunite alteration producing resistant ledges composed of quartz, alunite, iron oxides, and lesser amounts of zunyite, diaspore, and barite. Ledges contain abundant sulfides, principally pyrite, below zone of surficial oxidation. Hydrothermal alteration is time equivalent to **Tkb** and areas mapped as **Tab** may contain small unmapped areas of **Tkb**. K-Ar ages on hornblendes from Alta Formation andesites are 16.6, 18.1, and 20.1 Ma. Plagioclase ages are 14.4 and 16.5 Ma (Vikre and others, 1988). The older two hornblende ages are the ones that we believe are the most accurate. **Ta?**: pyroxene-hornblende andesite flows and breccias in the Washington Hill area that are probably correlative with the Alta Formation but may represent a new formation.

Tnh **Nine Hill Tuff** Densely welded, rheomorphic, rhyolite ash-flow tuff containing phenocrysts of alkali feldspar, minor quartz and thoroughly oxidized hornblende(?). Pumice has been replaced by aggregates of tridymite and alkali feldspar. Hydrothermally altered and bleached in outcrops near Castle Peak. K-Ar age approximately 24 Ma (Bingler, 1978).

Kgd **Granodiorite** Medium-grained plutonic rocks containing sodic plagioclase, microcline, quartz, hornblende, biotite, and accessory sphene, magnetite, apatite, and zircon. Argillized and acid-leached in Steamboat Springs area. Late Cretaceous in age.

Mzvs **Gardnerville Formation(?)** Metavolcanic and metasedimentary rocks near Castle Peak and in the Steamboat Hills. The metavolcanic rocks in the Castle Peak area are rhyodacitic tuff. The metasedimentary rocks are dark-gray to black tuffaceous argillite, minor dark-gray to black limestone, and volcaniclastic sandstone and conglomerate. Tuffaceous argillite locally contains abundant impressions of wood, possibly *Araucarioxylon*, a conifer of Triassic age (Thompson, 1956).

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