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Preliminary Geologic Map of the Northeastern Margin of the Caetano Caldera, Lander County, Nevada

by

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DESCRIPTION OF MAP UNITS

Quaternary Deposits

Qa Alluvium

Qf Alluvial fan deposits, undivided

Qfy Younger alluvial fan deposits

Qfi Intermediate age alluvial fan deposits

Qg Coarse alluvial fan shed from Cortez fault

QTal Crescent Valley alluvium in cross-section

Tertiary Rocks

Caetano Tuff

Tc Caetano Tuff Densely welded, crystal-rich, rhyolite ash-flow tuff, containing about 35–50 volume % phenocrysts as much as 5 mm in diameter mostly of variably smoky quartz and sanidine, with lesser plagioclase, biotite, opaques, and trace hornblende. Tc unit is generally devitrified. Total mafic mineral content generally < 4 volume %. Euhedral allanite crystals as much as 1 mm long, apatite, and zircon are common accessory phases. Strongly flattened pumice fragments generally are crystal rich but range to nearly aphyric and contain phenocryst assemblage similar to the matrix. Exposed thickness ~3200 m; total thickness from unexposed base beneath Crescent fault to top of caldera beneath Qg to east is probably between 3600 and 4000 m. All Caetano Tuff in this map area is intracaldera, mostly the lower intracaldera unit of John et al. (2008) and Colgan et al. (in press), but chemical analyses and the presence of distinctive orange-weathering pumice indicate the upper unit is present in easternmost outcrops. Weighted mean of nine sanidine $^{40}Ar/^{39}Ar$ ages from both upper and lower units is 33.80 ± 0.05 Ma (John et al., 2008, and this study).

Tcv Caetano Tuff vitrophyre Densely welded, glassy lenses of Caetano Tuff in intracaldera tuff, commonly surrounding mega- or mesobreccia.

Tcb, Tcp, Tcr, Txp, Txw, Txr Caldera margin mega- and mesobreccia Consists of abundant clasts of upper plate Paleozoic rocks (Tcp), porphyritic rhyolite (Tcr), or a mix of both types (Tcb) in a generally poorly exposed, variably welded, commonly vitrophyric tuffaceous matrix. Where large enough, individual megablocks or clusters of blocks of upper plate Paleozoic rocks (Txp), Wenban Limestone (Txw), or rhyolite (Txr) are mapped separately. Abundance of breccia and individual blocks increases eastward, up section, along the caldera wall.

Tcls Limestone-clast layer Conglomerate, tuff, or mesobreccia containing abundant, mostly rounded clasts of brown Eocene limestone up to 1 m in diameter and some porphyritic dacite in a soft, poorly exposed tuffaceous matrix. Makes ~600 m long layer interbedded with Caetano Tuff (Tc), porphyritic rhyolite mesobreccia (Tcr), and Caetano Tuff vitrophyre (Tcv) in the easternmost part of the caldera.

Tcd Caetano Tuff dike One or more dikes intruded along the Fortress fault that contain the same phenocryst assemblage as Caetano Tuff in an abundantly to sparsely lithic, variably disaggregated (tuffaceous) matrix. Lithic

fragments are various Paleozoic rocks of the Roberts Mountains allochthon and porphyritic rhyolite (Tpr) up to about 25 cm in diameter. Parts near margin of the dike are strongly flow banded, but flow bands break into individual densely welded pumice fragments inward. Interpreted as a feeder dike to erupted Caetano Tuff based on phenocryst assemblage, composition, and age.

Tcdx Clastic dike Several thin dikes, mapped up to 5 m thick by 50 m long, along the Fortress fault that consist mostly of tightly packed, angular to subrounded clasts of Paleozoic siltstone and chert less than 1 cm in diameter in a fine matrix that locally contains sparse phenocrysts of quartz and sanidine. Probably more common and continuous along strike than mapped but rarely crop out. The phenocrysts indicate clastic dikes are related to Caetano Tuff dikes (Tcd), probably an extremely lithic-rich variant, but are mapped separately because they contain so little igneous material.

Tca Aphyric to sparsely porphyritic rhyolite dike One or more dikes along the Fortress fault, locally containing sparse phenocrysts of quartz and sanidine in a fine-grained matrix of quartz and sanidine. Cut by Caetano Tuff dikes (Tcd). Composition and age indicate this rock represents the most evolved part of the Caetano magma chamber.

Porphyritic rhyolite

Tpr Porphyritic rhyolite Dikes and sills of porphyritic rhyolite that contain 10–20% phenocrysts of quartz, sanidine, plagioclase, and biotite, mostly up to about 2 mm in diameter. Form massive to flow-banded, devitrified to vitrophyric intrusions centered around the Cortez Hills gold deposit, as far northeast as Horse Canyon in the Cortez Range, and at least as far south as the caldera margin. Rhyolite is one of the dominant clasts in megabreccia, which suggests that it was formerly abundant as dikes in Paleozoic rocks along what is now the caldera margin. Related porphyritic dacite dikes of the same age are common around Cortez Hills but have been found only as a few clasts in breccia dikes (Tprx) in this map area. Age 35.4–35.5 Ma based on multiple $^{40}Ar/^{39}Ar$ sanidine and U-Pb zircon ages.

Tprx Breccia dikes/sills Breccia or clastic dikes and sills containing abundant, rounded to angular clasts of porphyritic rhyolite (Tpr) up to ~1 m in diameter along with sparse to abundant Paleozoic wall rock in a fine-grained, variably igneous to breccia matrix. Forms poorly exposed, bedding-parallel lenses, probably sills, as much as 300 m long and 20 m wide that cut upper plate Paleozoic rocks north of the caldera margin. Drill core and exposure in the Cortez Hills pit indicate these are the upper, brecciated parts of porphyritic rhyolite dikes; brecciation probably resulted from interaction with groundwater. The northernmost breccia dikes contains at least some clasts of porphyritic dacite.

Tprt Porphyritic rhyolite tuff Variably pumiceous and lithic tuff with similar phenocryst assemblage as, and containing sparse to abundant clasts of, porphyritic rhyolite. Mostly occurs as an irregular, 300 to 400 m wide megabreccia block just south of the caldera margin in its easternmost part. Locally cut by lenses of Caetano Tuff, which demonstrates that Tprt is megabreccia. However, the tuff aspect demonstrates that some porphyritic rhyolite erupted.

Older porphyritic dacite

Tdo Older porphyritic dacite A single dike of porphyritic dacite that contains phenocrysts of plagioclase, biotite, quartz, and hornblende crops out just east of the Crescent fault. Petrographically and compositionally similar to the 35.5 Ma porphyritic dacites but dated at 38.9 Ma ($^{40}Ar/^{39}Ar$ biotite; U-Pb zircon). The dike, which is cut off by the caldera margin, is about 60 m long and as much as 10 m wide. Plagioclase and hornblende phenocrysts are altered to calcite and chalcedony.

Jurassic Rocks

Jd Granodiorite dikes and sills Several thin (≤ 2 m), fine-grained dikes and sills cut the Wenban Limestone just north of the Fortress fault. The matrix of the brown-weathering dikes consists of interlocking plagioclase, interstitial quartz, biotite, minor potassium feldspar, and opaque minerals. Biotite is variably altered to chlorite. Stock or dike of granodiorite in subsurface in cross-sections

Ji Intensely altered dikes and sills Numerous, highly altered, massive to slightly flow-banded dikes and sills cut the upper plate Paleozoic rocks. The rocks range from fine-grained, aphyric to abundantly porphyritic, as shown by rectangular holes that were probably plagioclase. Some fine-grained rocks may be very altered equivalents of the granodiorite dikes and sills (Jd), whereas some other intrusions could be lamprophyres. Chemical analysis of one porphyritic rock indicates it was probably andesite or dacite.

Paleozoic Rocks

Rocks below Roberts Mountains Allochthon

Dw Wenban Limestone Well-stratified micrite and calcisiltite of basin-slope setting. Underlies autochthonous (upper plate) Paleozoic units.

DSrm Roberts Mountains Formation (cross-section only).

Ohc Hanson Creek Formation (cross-section only).

Oe Eureka Quartzite (cross-section only).

Roberts Mountains Allochthon

DSOcm Chert and mudstone Sequences of the Roberts Mountains allochthon consisting of interbedded chert, siliceous mudstone, silty mudstone, and shaly mudstone. The undifferentiated strata overlie or structurally underlie dated Ordovician rocks and Siltstone and fine-grained sandstone (SOs).

DSOch Chert Continuous, resistant chert beds generally in massive beds 1 to 20 cm thick separated by thinly laminated siltstone.

SOs Siltstone and fine-grained sandstone Tan to white, in part calcareous siltstone and fine sandstone. Oxidized, in subcrops and cuts. Strata are in close proximity to dated Ordovician shales, but the rock type resembles Elder Sandstone of Silurian age, and Gilluly and Masursky (1965) report a Silurian graptolite. Two apparent horizons exceed 100 m thickness. A lower overlies greenstone (Og), and an upper occurs between two conglomerate marker beds (Ovcg).

Vinini Formation

Ovcm Chert and mudstone Sequences of chert, mudstone, and shale make up most of the Vinini Formation. Silty shales contain Middle to Late Ordovician graptolites (Gilluly and Masursky, 1965; this study).

Ovst Siltstone Similar to SOs but within apparent Ordovician strata.

Ovcg Conglomerate Conglomerate consisting of well-rounded to locally angular chert clasts, typically 0.5–3 cm in diameter, in a siliceous, fine pebble matrix. Two separate beds evident, each 2–10 m thick. The lower bed is Middle Ordovician based on graptolites in adjacent shales (Gilluly and Masursky, 1965; this study); upper bed is similar in texture and composition but of uncertain age.

Ovl Limestone and marble Variably recrystallized, gray to white limestone and marble make two parallel bands just east of the Crescent fault. Disaggregated conodont elements in the upper band are Middle to Late Ordovician. Formerly mapped as Devonian Wenban Limestone (Gilluly and Masursky, 1965).

Ovg Greenstone Fine-grained, variably altered greenstone. Greenstone along the Crescent fault slightly southwest of the Fortress fault and along the Fortress fault in the footwall of the northeast-striking normal fault is massive and brown-weathering. All mafic minerals are chloritized, and the matrix contains abundant calcite. Greenstone to the southeast is highly silicified, potassically altered, and contains sparse plagioclase phenocrysts to 2 mm in a matrix of interlocking plagioclase and unidentifiable dark material.

REFERENCES

Gilluly, J., and Masursky, H., 1965, Geology of the Cortez Quadrangle, Nevada: U.S. Geological Survey Bulletin 1175, 117 p.

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