

GEOLOGY OF THE PUERTECITO GAP QUADRANGLE
EXPLANATION

Extrusive and Sedimentary Rocks

- [Qa] Quaternary alluvium undivided
- [Qvy] Valley Alluvium, young (essentially no soil). Deposits in arroyo channels and upland valleys.
- [Qpg]
 - [Qpgs] Piedmont Slope Deposits. Geomorphic landforms include steep talus slopes, steep alluvial fans along scarps and gentler coalesced fans in Mulligan Gulch and in the Cienega Ranch Quadrangle to east. Deposits vary from talus and boulder alluvium to interlayered red mud and siltstones and conglomerate layers in Mulligan gulch. Steep fans and talus along west side of Devils' Backbone mapped separately as [Qpgs]. Deposits along east part of map separated by geomorphic position and degree of dissection into [Qpo] oldest, [Qpg1], and [Qpg2] youngest.
 - [Qpg2]
 - [Qpg1]
 - [Qpo]
- [Qtc] Talus and colluvium
- [QTsf] Upper Santa Fe Gravels undivided. Volcaniclastic conglomerates and sandstones. Equivalent in lower part to [Tpu]. Poorly exposed. Geomorphically expressed as low, rounded gray ridges which may be heavily dissected remnants of an old high-level alluvial fan. Age of youngest deposits and whether these continuous with older deposits unknown.
- [Tp] Popotosa Formation undivided. Volcaniclastic rocks. Debris - flow deposits, conglomerates, sandstones. Locally contains interlayered pyroclastic rocks and other volcanic units. Usually divided into upper and lower parts; mapped undivided where correlation uncertain.
- [Tpu] Popotosa Formation, upper member. Buff to lt. brown, moderately to poorly endurated volcaniclastic conglomerates, and sandstones. Separated from Tpl by enduration and color in eastern part of map. In western part of area, rhyolite dome [Trpw] and tuffaceous breccias [Trt] lie between the two.
- [Tb] Mafic lavas. Dark gray or black highly porphyritic lavas. Contains approximately 20-30 percent phenocrysts (xenocrysts) of black pyroxene and feldspar as long as 3 cm. Coarse grained plutonic fragments are also present but no olivine-rich mantle xenoliths were observed. Stippled area consists of scoriaceous material of similar lithology.
- [Tprw] Rhyolite lava near Puertecito Well. Lt. gray to pink, [Trt] flow-banded, crystal-poor rhyolite dome. Commonly brecciated and locally white and altered. Black vitrophyre border around western intrusive margin. Locally contains concentrations of large spherulites.

Contains 2-4 percent phenocrysts consisting of subequal amounts of quartz and feldspar. In addition, small tabular holes suggest a second variety of feldspar (probably plagioclase) was removed by alteration. Appears to have associated breccia and pyroclastic apron [Trt] which is interlayered in Popotosa sedimentary rocks.

- [Tpt] Popotosa Formation, tuffaceous interval. Interlayered red highly endurated volcanoclastic sedimentary and pyroclastic rocks. Sedimentary rocks are a continuation of [Tpl] sedimentation. Pyroclastic rocks consist of several thin pyroclastic flows separated by bedded tuffaceous layers, probably air-fall and surge deposits and sedimentary interlayers. The ash-flow tuffs contain a few percent quartz and Kspar(?) phenocrysts in roughly equal proportions. Coarse debris-flow usually makes up top layer of unit.
- [Tpl] Popotosa Formation, lower member. Dark-red, highly endurated volcanoclastic sedimentary rocks. Contain debris-flow deposits, conglomerates, and sandstones with minor amounts of finer grained layers.
- [Tcw] Tuff of Chocle Well? [Ferguson, 1985] 0-300 ft (0-90m); ash-flow tuffs. Pinkish gray, densely welded, moderately crystal-poor ash-flow tuff. Contains 5 to 10 percent phenocrysts consisting of subequal amounts of Kspar and quartz. Correlation based only on position above [Tsc] and general lithologic similarity. Tuff somewhat brecciated and silicified. Mapped only on main ridge north of Puertecito Gap.
- [Tba] La Jara Peak Basaltic Andesite [Tonking, 1957]--400 ft (130m); basalt to basaltic andesite lavas. Occur only in extreme northwestern part of bedrock outcrop. Several mafic lava flows separated by flow breccia. Contain a few percent altered ferromag phenocrysts. Some flows also contain a few percent plagioclase phenocrysts.
- [Tsc] South Canyon Tuff [Osburn, 1978]--0-400 ft (0-130m); ash-flow tuffs. Lt. gray to brownish-gray in color. Crystal-poor lower interval (2-4%) grades sharply upward near middle of unit to moderately crystal-rich upper interval which contains 20-25 percent phenocryst. Both intervals contain subequal quartz and sanidine, minor plagioclase and biotite, and trace amounts of sphene. Locally, as in northwesternmost exposure, unit contains an upper interval, a few tens of feet thick, with markedly less quartz and more biotite. This interval was not observed in any of the eastern exposures making correlation between these two areas somewhat uncertain. Eastern exposures commonly exhibit a marked welding break about the middle of the unit somewhat below the increase in phenocryst content.
- [Tl] Lemitar Tuff [Osburn, 1978; Chamberlin, 1980]--150-1000
[Tlu] ft (50-300m); ash-flow tuff. Simple cooling unit of
[Tll] densely welded tuff showing strong compositional zoning.

Divided into lower, lt-gray to pale-red, crystal-poor (10-15%), rhyolitic member [T11] and an upper medium-red to light yellowish-gray, crystal-rich member. The upper member is zoned from a lower, plagioclase-rich, quartz-poor, quartz latite at the base to a quartz-rich rhyolite at the top. Unit very thick toward the north part of the map area and thins dramatically toward the south.

- [Tx] Sawmill Canyon Formation. Caldera fill of Sawmill Canyon-Magdalena cauldron (Osburn and Chapin, 1983). Divided into several members within this map area.
- [Txc] Tuff of Caronita Canyon [Petty, 1979]--0-1200 ft (0-350m); ash-flow tuffs. Multiple flow, complex cooling [Txcl] unit showing strong compositional and textural variations. Where thicker, divided into phenocryst-poor brown to reddish, lower member [Txcl] and phenocryst-rich white to medium-gray upper member [Txcu]. Lower member contains 10-20 percent phenocrysts of plagioclase, biotite, magnetite and traces of clinopyroxene, quartz and sanidine, and often has black basal vitrophyre. The lower member is welded to and gradational with (usually over a few feet) an upper phenocryst-rich member which contains 30-50 percent phenocrysts of sanidine, quartz, biotite and minor magnetite. Quartz is often conspicuously large and dipyrimal. Locally, in this area, both members contain numerous interlayers of bedded tuffaceous material. In some exposures this interlayering is so pronounced that the unit has a bedded appearance when viewed from a distance.
- [Txa] Mafic lavas--0-300 ft (0-100m). Dense, aphanitic to slightly porphyritic, brownish-gray mafic lavas. Some flows contain a few percent plagioclase and altered ferromagnesian phenocrysts and most are highly vesicular. Rocks are probably basaltic andesite or basalt chemically.
- [Txs] Volcaniclastic sedimentary rocks. Exposed only in northeastern part of map area. Dominantly consist of coarse debris-flow deposits with minor interlayers of sandstone. Overlies and is gradational with breccias of rhyolite dome [Txrl].
- [Txrl] Rhyolite dome complex. Pale-red, aphanitic to slightly porphyritic, sometimes sugary in texture flow-banded rhyolite lavas. Contain sparse quartz phenocrysts if porphyritic. Typically contain abundant spherulitic textures and stand as resistant cliffs and ridges.
- [Tvp] Vicks Peak Tuff [Deal and Rhodes, 1976]--0-800 ft (0-250m); ash-flow tuffs moderately to densely welded, crystal-poor, ash-flow tuff. Lower very crystal poor commonly lithophysal interval grades upward in top half of unit to less crystal poor interval containing large

pumice. Pumice, in this interval, may be gray with a white rim and largely filled with vapor phase minerals or dark chocolate brown and fine grained. Top few feet of unit usually pale red with dark pumice; perhaps a high temperature oxidation effect. Second cooling unit a few 10's of feet thick common above main unit along west face of Devils Backbone. This interval very fine grained and crystal-poor similar to lowest part of unit. Lower parts of major unit contain pronounced lineation in south half of area. Entire unit punky, poorly welded and thin to absent in north part of area.

[Tj] La Jencia Tuff [Osburn and Chapin, 1983]--0-900 ft(0-275m); ash-flow tuffs. Thick sequence of densely welded, crystal-poor, ash flow tuff. Commonly reddish to reddish brown in lower part with gray highly vapor phase altered upper part which resembles Vicks Peak Tuff. Top 30-40 ft of unit pale-red with dark pumice similar to top of Vicks Peak. Contains 5-10% total phenocrysts consisting mainly of Kspar with minor (1-2%) quartz, and biotite and a trace of clinopyroxene. Within this area usually crops out as two resistant intervals separated by a bench. The lower cliff forming interval is usually reddish with large light-colored pumice and the upper is gray and altered by vapor phase recrystallization. Pumice in the upper interval are often filled with coarse vapor phase minerals and pumice boundaries are often indistinct. Strongly lineated in north part of map area but lineation obscure and indistinct in southwest.

[Tz] Luis Lopez Formation. Heterolithic fill of Socorro
[Tzr1] cauldron. Consists mostly of intermediate to mafic
[Tza] lavas [Tza] in this map area. These lavas are highly
[Tza2] variable in texture. Most are aphanitic to slightly
[Tzal] plagioclase and pyroxene porphyritic [Tzal Roth's area].
One distinctive highly porphyritic lava containing 15-20 percent plagioclase phenocrysts to 1 cm in length was separated by Roth as [Tsa2]. In other areas the lavas were mapped undivided. A highly porphyritic variety with feldspar phenocrysts to 3 cm is common in all outcrop areas but was not separated due to poor exposures. Mafic lavas overlain, in the extreme northeast part of map area, by gray and moderate-red flow-banded, phenocryst-poor rhyolitic lavas. Rhyolite contains trace amounts of biotite and plagioclase phenocrysts and commonly has abundant spherulites. These lavas are thicker and more widespread toward the east.

[Thm] Hells Mesa Tuff [Deal, 1973; Simon, 1973]-->650 ft
[Thmm] (200m); ash-flow tuffs. Thick, massive crystal-rich 20-50%, quartz-rich ash-flow tuff. Commonly lithic-rich with lithic's weathering out to a vuggy appearing outcrop. Pumice locally, especially in eastern outcrop, also weather out preferentially. Lithic fragments

include mafic to intermediate lavas, pE granites and schists, and an abundance of rhyolitic fragments, some large enough to show of map scale [Thmm]. The top of the unit locally contains much fewer phenocrysts than normal (~20%) and weathers recessively. In total, the unit here is lithic-rich and variable and much more similar to the intra-cauldron Hells Mesa than to the consistently lithic-poor monotonously uniform outflow of the Hells Mesa.

[Td] Datil Group [Osburn and Chapin, 1983]. Shown only on cross section.

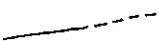
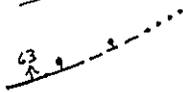
Intrusive Rocks

[Tria] Rhyolite near Antelope Well [New Name] -- intrusive; rhyolitic lavas. Lt. tan phenocryst-poor rhyolite intrusion. Stratigraphic position uncertain but clearly older than La Jencia Tuff which overlies rhyolite on surface of considerable relief.

[Tri] Rhyolite intrusion. Lt. gray to brown, phenocryst-free to phenocryst-poor. Cross-cuts units as young as upper Caronita Canyon Tuff; minimum age unconstrained. Found only in north central part of map.

[Tr3] Rhyolite intrusions. Flow-banded phenocryst-poor rhyolitic lavas. Contain trace to 2% quartz phenocrysts. Tr4 intrudes Tr3 but otherwise very similar lithologically. Contain large blocks xenoliths of other rock types mainly phenocryst-poor ash-flow tuffs. [Trx]

Symbols

	Geologic contact
	Contact inferred from aerial photography
	Fault, bar and ball on downthrown side, dashed where approximately located or uncertain, dotted under covering unit. Dip direction and angle noted where obscured
	Strike and dip of bedding and compaction
	Foliation in ash-flow tuffs
	Foliation in rhyolite lavas
	Enlongation direction of lincated pumice in ash-flow tuffs



Transport direction in sedimentary rocks



Brecciated area

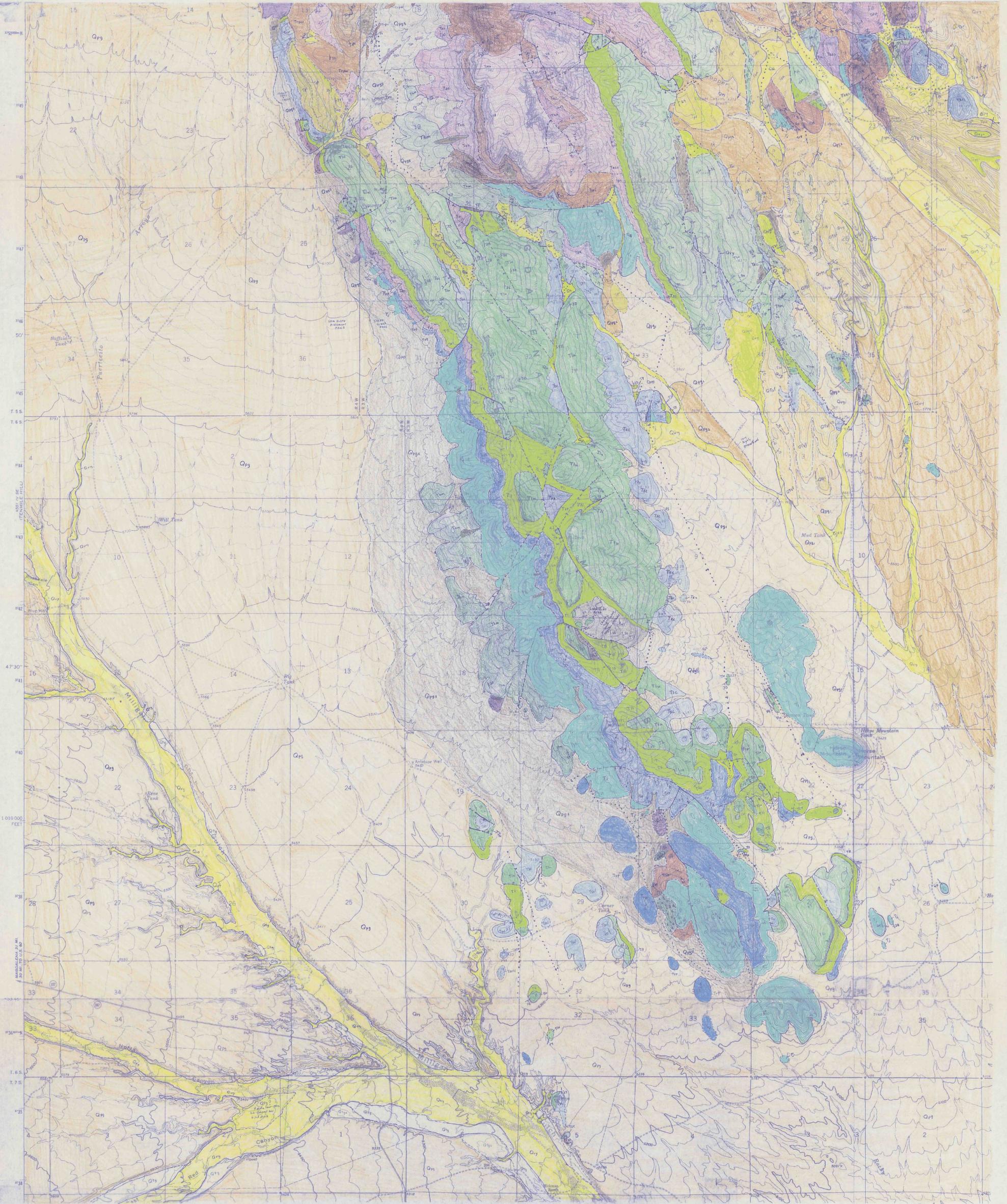
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GEOLOGIC MAP OF THE PUERTECITO GAP QUADRANGLE AND VICINITY

by

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1985



Mapped, edited, and published by the Geological Survey
Control by USGS and USC&GS
Topography by photogrammetric methods from aerial
photographs taken 1964. Field checked 1965
Polyconic projection, 1927 North American datum
10,000-foot grid based on New Mexico coordinate system,
central zone
1000-meter Universal Transverse Mercator grid ticks,
zone 13, shown in blue
Fine red dashed lines indicate selected fence lines

U.T.M. GRID AND 1983 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SCALE 1:24,000
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D.C. 20242
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