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THE MUDPUPPY-WATERDOG PROSPECT, AN ALKALIC COPPER-GOLD PORPHYRY SYSTEM IN THE NOGAL-BONITO MINING DISTRICT, LINCOLN COUNTY, NEW MEXICO

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Abstract—The Mudpuppy-Waterdog prospect occurs in the Nogal-Bonito district, Lincoln County, New Mexico, within a north-trending belt of mid-Tertiary, gold-bearing alkalalic intrusions and is interpreted as the top of an alkalalic copper-gold porphyry system. It is hosted by a syenite-to-monzonite porphyry stock that is concentrically zoned inward from propylitic-argillic-phyllic alteration to a core of silica-limonite breccias. Rock and soil geochemical anomalies of Cu-Au-Te-Mo are coincident with the phyllic and silica-limonite breccia zones. Limited, shallow drill-hole data indicate increased Cu-Au values at depth compared with surface geochemistry. The broad zone of alteration and geochemical anomalies occurs along a zone of strong north-northeast-trending fractures. We suggest the geochemical anomalies represent leakage halos along fractures from a sulfide-rich potassic core at depth. The Mudpuppy-Waterdog prospect has potential to host a large-tonnage alkalalic copper-gold porphyry deposit.

INTRODUCTION

The Mudpuppy-Waterdog prospect is in secs. 25, 26, 35 and 36, T9S, R12E and secs. 1 and 2, T10S, R12E, Lincoln County, New Mexico, in the Nogal-Bonito mining district. It is within the Lincoln County porphyry belt which also includes the White Oaks, Jicarilla, and Gallinas districts (Griswold, 1959). The Lincoln County porphyry belt constitutes the southern part of the New Mexico alkalalic gold belt, a north-trending zone of alkalalic intrusions and associated base- and precious-metal mineralization that has produced over 1,140,000 oz gold (North and McLemore, 1986) and has present resources of 1,590,000 oz gold (Pegasus Gold, 1991; Mining Record, 1989) (Fig. 1). The Great Western deposit, 4.9 km southwest of the prospect, is presently

in an advanced exploration stage and has a 190,000 oz gold resource in an epithermal breccia system (Mining Record, 1989).

The Nogal-Bonito district has yielded about \$1 million in lead, zinc, copper, gold and silver. Four types of deposits are recognized (Thompson, 1973): (1) Lead-zinc-silver fissure veins; (2) gold-copper breccia pipes and porphyries; (3) copper-molybdenum porphyries; and (4) gold placers. Hydrothermal alteration is extensive in the district. Fissure veins are localized along north- and east-trending major structures. Disseminated porphyry-type mineralization, such as at the Mudpuppy-Waterdog prospect, is associated with fracturing and brecciation in late-stage intrusive phases along the margins of stocks. Griswold (1959) briefly described the prospect and exploration in the area.

GEOLOGY

The Mudpuppy-Waterdog prospect is underlain by Tertiary andesite and trachyte intruded by a syenite-to-monzonite stock (Thompson, 1973) (Fig. 2). Andesite and trachyte occur on the fringes of the property and are part of the Sierra Blanca Volcanics, a composite volcanic pile of regionally propylitized flows and breccias. Most of the area is underlain by the northern margin of the late Oligocene Bonito Lake biotite syenite stock that locally grades into monzonite. This intrusion is pervasively altered to propylitic, argillic, and phyllic zones in a concentric pattern around the Mudpuppy-Waterdog area.

STRUCTURE

A broad zone of intense alteration and north-northeast-trending fractures is present at the Mudpuppy-Waterdog prospect. Numerous small faults, breccias and zones of strong jointing occur within the area.

MINERALIZATION AND ALTERATION

Geologic mapping of the prospect and adjacent areas (Fig. 2) has delineated concentric zones of alteration grading from propylitized andesite and syenite on the margins of the hydrothermal system inward through argillic and phyllic halos. Disseminated pyrite is common in the propylitized rocks and limonite after sulfide accompanies the argillic and phyllic zones. Within the phyllic halo the strongest alteration consists of breccia zones containing silica \pm limonite clasts within a vuggy matrix of earthy iron oxides \pm clay.

Rock geochemical values are generally weakly anomalous in the phyllic and silica-limonite breccia zones (Fig. 3). Highest values include 222 ppb Au, 0.69% Cu and 3.2 ppm Te. Molybdenite occurs locally as fracture coatings with assays up to 0.28–0.90% Mo. Soil geochemical surveys (Fig. 3) show a pronounced Te anomaly ranging from 1.0 to 7.1 ppm that is coincident with the zone of strong alteration. Smaller, more discrete Mo and Cu halos and locally anomalous Au in soil values (12–19 ppb) occur within the zone. Both Te and Mo anomalies exhibit a north-northeast trend along the strong zone of fracturing. The soil

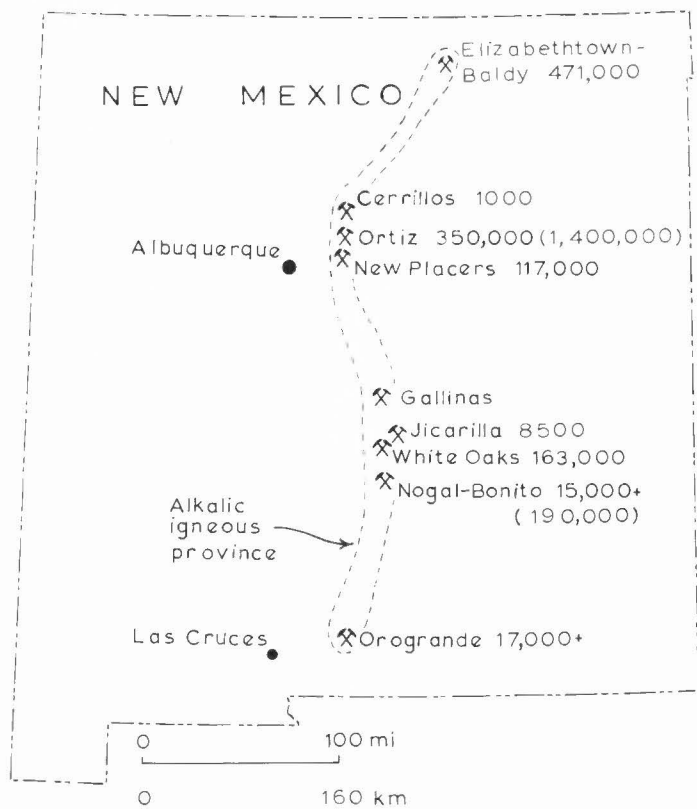


FIGURE 1. Location of Nogal-Bonito District within the New Mexico alkalalic gold belt; gold production in troy ounces and resources in parentheses.

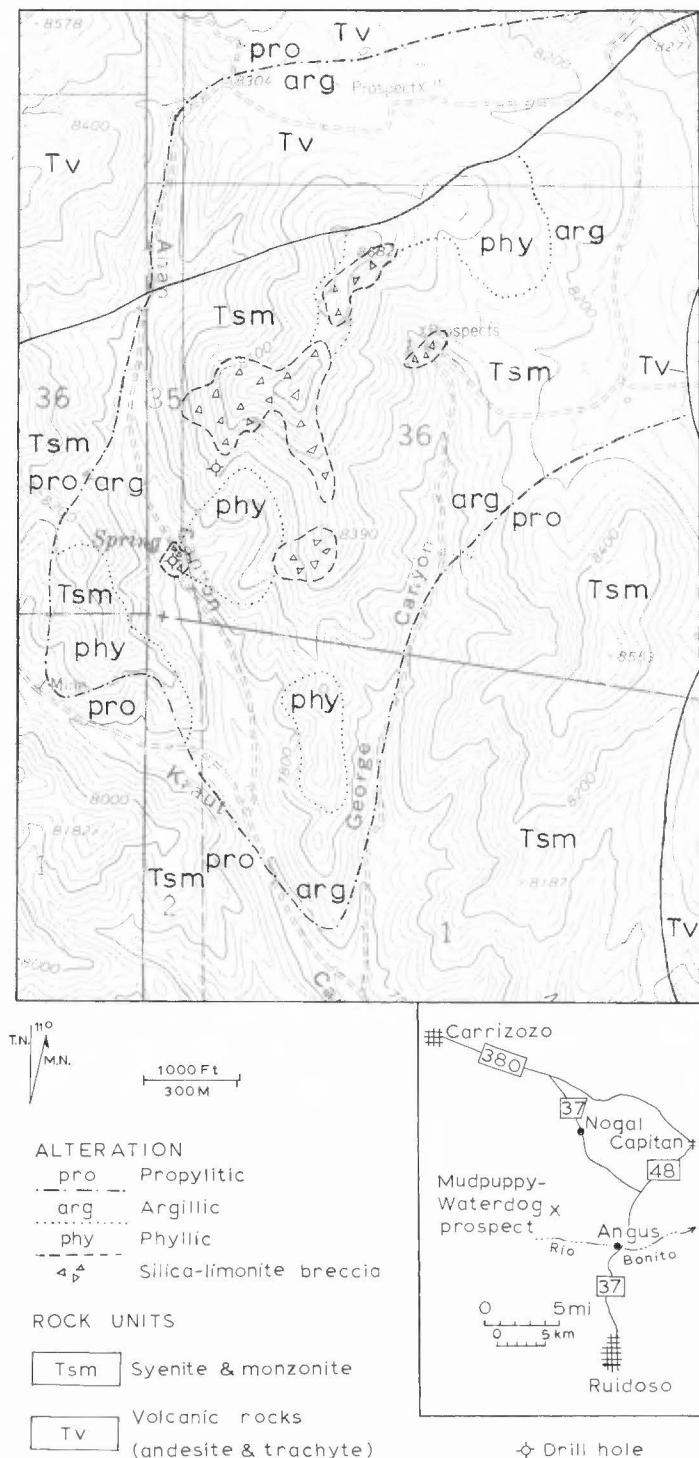


FIGURE 2. Reconnaissance geology-alteration map of Mudpuppy-Waterdog prospect and surrounding area.

and rock geochemical anomalies may represent leakage halos from mineralization at depth.

Phillips Petroleum drilled eight shallow rotary holes (130 to 530 ft) and a deep core hole (1339 ft) in the Mudpuppy-Waterdog area in the mid-1960s. Although partial data are available for only five of these holes, summary logs indicate marked increase of Cu values at shallow depth compared to surface rock geochemistry, including several 20-ft zones of 0.20–0.40% Cu. Only one hole was assayed for gold and values consistently ran 0.003–0.008 opt Au (100–275 ppb). We know of no other drilling on the prospect.

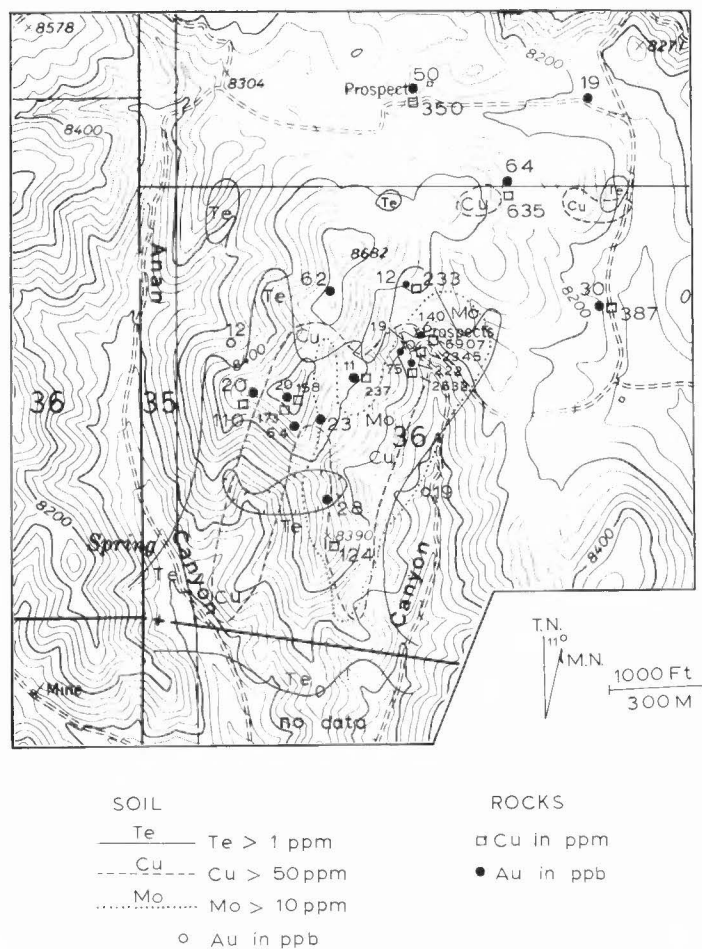


FIGURE 3. Soil and rock geochemical anomalies of the Mudpuppy-Waterdog prospect.

SUMMARY AND CONCLUSIONS

The Mudpuppy-Waterdog prospect is a concentrically zoned porphyry system. Alteration grades inward from a propylitized zone through argillic and phyllic zones to a central core of vuggy silica-limonite breccias. Soil and rock geochemical anomalies are coincident with phyllic and silica-limonite alteration. Limited drill-hole data show increased Cu-Au values at depth compared to surface geochemistry.

We propose that the silica-limonite breccias represent hypogene alteration at the top of a copper-gold alkalic porphyry, and Cu-Au-Te-Mo geochemical anomalies represent leakage halos from depth along a zone of strong fractures. The data suggest a copper-gold, sulfide-rich potassic core may exist at depth below the silica-limonite breccia zones. This prospect has potential to host a large-tonnage deposit.

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