Observations on the Cusihuiriachic district

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Executive Summary

The Cusihuiriachic district is an exciting project following the very successful model that Dia Bras has employed at Bolivar – purchase of an old mining district with known, albeit poorly defined, reserves followed by small scale mining to fund ongoing exploration to turn the entire district into an economically viable mine with long term reserves and cash flow. Cusihuiriachic has even more long term potential than Bolivar to be a "company maker" in that the immediate target of high grade Ag veins has a reasonable chance of overlying a large porphyry/skarn system at depth.

The underlying geologic model is fairly straight forward. Intrusion-centered hydrothermal systems are zoned from a core of disseminated stockwork mineralization and/or skarn (with appropriate wall rocks) outward to base metal veins to precious metal veins. The near-surface exposures at Cusihuiriachic are clearly intermediate between a purely precious metal prospect and a base metal prospect. Although the near-surface supergene weathering accounts for some of the high grades mined historically, the observed mineralogy of acanthite, stromeyerite, and other sulfosalt minerals is a clear indicator that current mining is exploiting the upper part of a major system. A purely epithermal system would not have the abundance of sphalerite and galena observed at Cusihuiriachic.

There are many known examples of linked epithermal-base metal systems. A possible analog is the Central Mining District of New Mexico. This district is cored by the multi-billion ton Santa Rita porphyry Cu system. The district is zoned outward to base metal skarns and veins, and ultimately to precious metal veins. The veins directly overlie base metal skarns that occur ~300 meters beneath the veins and were mined to a depth of ~1 km. Both the veins and skarn occur about 3 km from the Santa Rita porphyry Cu system. Thus, based upon this analogy the prospective target at Cusihuiriachic is within ~1km of the surface and within 3km horizontally.

Introduction

The following report of observations and recommendations is based upon a half day field visit, June 15, to the Cusihuiriachic project which included examination of underground and surface exposures. As required by Canadian Investment Regulations, Dia Bras has my permission to use this report for their own purposes, for their website, and for release to the public. Features described in this report are illustrated in a PowerPoint presentation (Fig. 1) that can be downloaded at:

http://www.science.smith.edu/~lmeinert/MeinertPubs/MeinertCusiPhotos.ppt

This PowerPoint presentation will be removed from the server once Dia Bras has downloaded it for their purposes.

Geologic Setting

The geologic setting of the Cusihuiriachic district is not well known. Historic mining activity exploited a series of planar veins that cut volcanic rocks that appear to be correlative with the volcanic package at Bolivar, with a lower andesitic volcanic unit and an upper rhyolitic unit. These rocks form a topographic high (Fig. 1) that may reflect the resistant nature of the veined rocks (Fig. 2) or it may reflect thermal uplift from igneous activity. The veins occur in northwest and northeast-striking faults that appear to define an overall extensional regime. Examination of the district geologic map did not indicate an obvious radial pattern that could be interpreted as doming due to an underlying intrusion. However, such a pattern should be examined more closely as it is likely that there is igneous activity at depth that served as a source for the heat and fluids responsible for mineralization. Such igneous activity is not necessarily a point source nor close enough to the surface to cause doming, but the possibility needs to be thoroughly tested. On a regional scale maps and aerial photos should be examined for evidence of ring structures indicative of a caldera.

All of the veins contain quartz with a variety of crustiform and banded textures typical of epithermal environments however the veins typically are sulfide-rich (sphalerite>galena>chalcopyrite) which is not typical of epithermal systems. Most historical mining was very shallow, <100m), and appears to have concentrated on supergene-enriched ores including Ag chlorides and native silver. Grades exceeding 1000 oz/t are reported but based upon the size of the old workings, the tonnage must have been small. Apparently, most mining stopped when unoxidized sulfides were encountered.

Observations based upon visit to mines in the Cusihuiriachic District – visited with Luis Madrano, Dia Bras geologist

Stop 1 Mexicana Mine – main adit (Fig. 3), 2 cm quartz vein with 5 mm galena-acanthite selvage on both sides (Fig. 4). Ag_2S - acanthite is stable below 177°C whereas argentite is stable above 177°C, so this mineral could originally have been argentite. Blue color (Fig. 5) may be tarnish on galena-acanthite or it might be stromeyerite (AgCuS). Some samples have green powdery weathering thought to be Ag chloride (Fig. 6). Wall rock is La Bufa rhyolite lithic tuff. This is the upper silicic volcanic formation. Samples from this exposure have been submitted for assay and multi-element geochemistry. In addition, thin sections are being prepared for follow-up work on the mineralogy.

Stop 2 Tunnel between Mexicana Vein and San Antonio Vein. Purple amethyst vein in volcanic wall rock. Amethyst is banded and forms the matrix to a breccia of volcanic rock fragments (Fig. 7).

Stop 3 San Antonio Vein – quartz-sphalerite-galena vein and breccia cement of volcanic wall rock.Vein and breccia zone ranges from 2-50 cm wide. Alteration of volcanic wall rock is minimal, mainly sericitic (Fig. 8). Compared to the Mexicana Vein, the San Antonio Vein is wider and has much more sphalerite (Fig. 9) although galena and acanthite ± stromeyerite are locally abundant.

Stop 4 San Antonio Vein down ramp, cockscomb quartz-sphalerite-galena-stromeyerite (blue mineral). (Fig. 10).

Stop 5 Cusihuiriachic county office (Figs. 11,12)

Stop 6 San Miguel mine – vein-breccia along very planar fault. Vein has been mined from surface and stoped from underground (Fig. 13). Only the surface exposure was examined.

Stop 7 La India –Underground workings (Figs. 14, 15) follow very narrow (1-5 cm) oxidized quartz veins (Fig. 16). Dump samples with AgCl (yellow-green powdery supergene mineral, Fig. 17).

Discussion and comparison with other districts

The Cusihuiriachic district is an exciting project following the very successful model that Dia Bras has employed at Bolivar – purchase of an old mining district with known, albeit poorly defined, reserves followed by small scale mining to fund ongoing exploration to turn the entire district into an economically viable mine with long term reserves and cash flow. Cusihuiriachic has even more long term potential than Bolivar to be a "company maker" in that the immediate target of high grade Ag veins has a reasonable chance of overlying a large porphyry/skarn system at depth. Mining of high grade veins is always a risky proposition as their high grade nature makes them a "hit or miss" proposition. But the Cusihuiriachic district spreads that risk because there are multiple vein systems such that if one does not meet expectations another may exceed them.

The underlying geologic model is fairly straight forward. Intrusion-centered hydrothermal systems are zoned from a core of disseminated stockwork mineralization and/or skarn (with appropriate wall rocks) outward to base metal veins to precious metal veins. The near-surface exposures at Cusihuiriachic are clearly intermediate between a purely precious metal prospect and a base metal prospect. Although the near-surface supergene weathering accounts for some of the high grades mined historically, the observed mineralogy of acanthite, stromeyerite, and other sulfosalt minerals is a clear indicator that current mining is exploiting the upper part of a major system. A purely epithermal system would not have the abundance of sphalerite and galena observed at Cusihuiriachic. Thus, it seems almost certain that the precious metal-enriched base metal veins will transition downward to a large base metal system, probably cored by Cu ± Mo. Of course, there is no guarantee that this transition will occur at economic depths but it is very likely that there is mineralization at depth.

The next question is how to locate this deep exploration target? There are several lines of attack that may each, and more likely collectively, yield positive results. The multiple veins in the Cusihuiriachic district have a systematic structural orientation. Analysis of the regional and detailed structural setting may yield vectors towards fluid sources and underlying mineralization. Another line of attack is mineralogical and geochemical. Most vein systems are zoned. Mining of individual veins allows acquisition of bulk geochemical data such that it is easy to contour metal ratios on long sections and across vein sets. In most districts, Pb + Zn will increase outwards and Cu will increase towards the source. Such zoning is difficult to establish with small samples such as drill core but yields quite systematic results from bulk samples such as mine block assays or production. Another version of this geochemical zonation is expressed in the ore mineralogy. A first step in analyzing this zonation is the accurate identification of the ore minerals. The minerals described in this report have been identified based upon hand specimen characteristics. A more detailed analysis of the ore minerals is ongoing with the preparation of thin sections, XRD identification, and geochemical assays of selected samples. It is likely that particular minerals such as stromeyerite will have a specific location within the district setting. Thus, the presence or absence of particular minerals will have direct significance for exploration targeting and can be evaluated from drill core samples rather than requiring a bulk sample to even out irregularities.

There are many known examples of linked epithermal-base metal systems. One of the most detailed studies is on the Lepanto-Far Southeast system in the Philippines (Arribas et al., 1995; Hedenquist et al., 1998). This is a Cu-Au system so it is not directly applicable to Cusihuiriachic, but the general principles are the same. A more appropriate analog is the Central Mining District of New Mexico. This district is cored by the multi-billion ton Santa Rita porphyry Cu system. The district is zoned outward to base metal skarns and veins, and ultimately to precious metal veins. The best-studied part of this peripheral zone at Santa Rita is the Groundhog skarn and vein system. The Groundhog veins are a close analog to the Cusihuiriachic veins. The Groundhog veins were mined for Ag, Pb, Zn, and Cu. They are planar, vertical veins cutting through ~andesitic volcanic/intrusive wall rocks similar to Cusihuiriachic. These veins have been described by Hawksworth and Meinert (1990). The veins directly overlie base metal skarns that occur ~300 meters beneath the veins and were mined to a depth of ~1 km (Meinert, 1987). Both the veins and skarn occur about 3 km from the Santa Rita porphyry Cu system. Thus, based upon this analogy the prospective target at Cusihuiriachic is within ~1km of the surface and within 3km horizontally. That is a large target to be evaluated and small scale mining of known veins is an economically feasible way of attacking this large but potentially very attractive exploration target. Much more information is necessary to start this exploration project but Dia Bras has been prescient in acquiring this property and the prospects for future discovery are excellent.

References:

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