Apparent MVT Lead Mineralization Trends in SE Missouri As Defined by a Linear Regression Sulfate Reduction Geochemical Model Calculated from Lead Production and Reserve Records, and from NURE Program Stream Sediment Geochemical Analyses

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Introduction

DIR showed (Turner and Turner, 2016) that by combining the semi-quantitative ore resource estimation method of Miesch et al (1959,1960) with the qualitative lithogeochemical interpretation techniques of Beus and Grigorian (1977), it was possible to statistically model the MVT mineralization system (Wenrich 1985) of uranium-mineralized collapse breccia pipes of northern Arizona. The resulting statistical model makes it possible to detect and predict the magnitude of blind uranium mineralization in northern Arizona from the chemical analyses of surface geochemical samples with accuracy sufficient to guide greenfields reconnaissance and project scale exploration work.

DIR has just completed the same work for Mississippi Valley Type ("MVT") lead deposits in Missouri using published average lead ore grades and maps of orebody surface projections for the Old Lead Belt, the Fredericktown area, the Indian Creek area, and the Viburnum Trend. Under the guidance of the same MVT sulfate reduction mineralization model employed in Turner and Turner (2016), these production/reserves data were regressed against stream sediment geochemical analyses from the late 1970s National Uranium Resource Evaluation (NURE) stream sediment sampling program to generate an algorithm that predicts magnitude of MVT lead mineralization in SE Missouri with about 87% accuracy. Excepting arsenic and uranium analytical determinations, the production function and the controlling or independent geochemical parameters used in the Missouri geochemical modelling case were identical to those applied in northern Arizona (*ibid.*).

Results

Figure 1 shows the results of applying the MVT lead resource algorithm to NURE stream sediment geochemical data covering SE Missouri.

Aside from the very poorly sample-represented Old Lead Belt area, all known lead mineralization trends in SE Missouri are very accurately marked by algorithm-transformed contoured stream sediment data. In addition to this result, the transformed NURE data indicate the presence of a number of other MVT lead mineralization trends within the same exploration and mining province. Most of these trends follow the N-S orientation of the Viburnum Trend, very evidently reflecting the basic structural control of province lead-zinc mineralization by compression (Hagni 1989) of ground marginated by the left-lateral, SE-striking Central Missouri, Grand River, and NE Missouri tectonic zones (Kisvarsányi 2007). See the inset stress ellipsoid provided on Figure 1.

At the scale of the Missouri state map view (not provided here), the Joplin Pb-Zn MVT mining district in SW Missouri shows up as clearly in the algorithm-transformed NURE stream sediment geochemical data as the SE Missouri MVT district does.

Among other things, Figure 1 suggests that higher density stream sediment sampling might constrain the subsurface locations of MVT lead deposit mineralization to a degree sufficient to guide early exploration drilling. Figure 1 also indicates that the Pb-Zn mineralization potential of southeast Missouri has not yet been exhausted.

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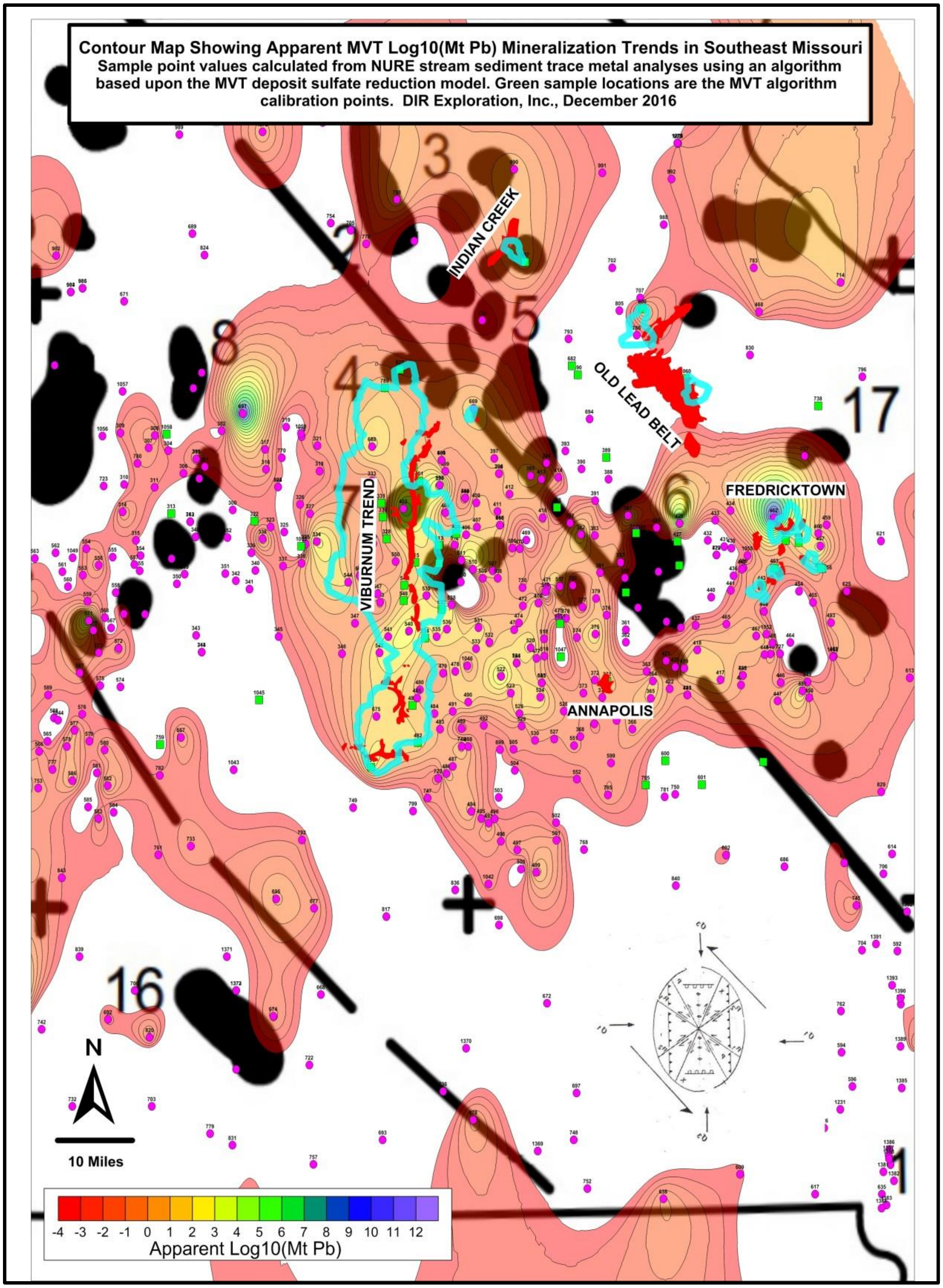

Figure 1. Contoured stream catchment Log10(Mt Pb) values calculated using an algorithm relating historical Pb reserves/production to NURE stream sediment trace metal analyses under the constraints of the MVT sulfate reduction mineralization model. Base map is after Kisvarsányi 2007 (Figure 3) and Leach et al., 2010 (Figure 4). Dark 'blobs' represent magnetic highs. Red solids show ore body projections while turquoise lines marks outer boundaries of drainage cells covering the ore deposit projections.