Element dispersion in alluvium covering gold deposits east of the Osgood Mountains, Getchell Trend, Humboldt County, Nevada; Slides and text of a talk given at the Association of Exploration Geochemists' 15th International Geochemical Exploration Symposium, Reno, Nevada

By

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Open File Report 91-599

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1991

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PREFACE

This report is a release of the slides and oral presentation that was given at the Association of Exploration Geochemists' 15th International Geochemical Exploration Symposium in Reno, Nevada, April 29 - May 1, 1991. The abstract for this talk (Smith and others, 1991) is published in the Symposium's Abstracts with Program volume. The interpretations and models given in this talk are preliminary since the data is incomplete. The authors reserve the right to change these models and interpretations based upon a completed data set of drill hole analyses.

The written text of the talk is divided into sections that are based upon the slides used to illustrate the point. The slides are numbered 1 - 19 (Table 1) and are identified at the beginning of the corresponding section. Since the talk was presented using two slide projectors, several of the sections have two separate slides showing the model from a different perspective (labeled on the slide as a and b). Text displayed in *italics* refers to features that were identified on the slides during the talk.

REFERENCES CITED


Table 1: Slides used to illustrate the talk.

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INTRODUCTION
The current trend in mineral exploration is to search for covered deposits. In the Great Basin, this translates into searching for ore bodies buried by alluvial cover. The exploration techniques used range from random drilling to the use of new and exciting geochemical sampling media and analytical methods. But we have a problem. Many of our geochemical techniques lack a conceptual basis (We tried it and it worked) or the original conceptual basis is now suspect (The method also works when it shouldn’t). What we need is a basic understanding of what is going on in the alluvium – the third dimension.

The discovery and development of the alluvium-covered, disseminated gold deposits at Rabbit Creek, Chimney Creek, and Pinson provides us with an opportunity to gain some knowledge of the dispersion of elements in the third dimension.

The work presented here is one part of a larger multi-disciplinary study of the Kelly Creek Valley by the U.S. Geological Survey in cooperation with FirstMiss Gold, Inc., Gold Fields Mining Corporation, Pinson Mining Company, and Santa Fe Pacific Mining, Inc.

STUDY AREA

SLIDE 1: Location Map - Getchell District
The Rabbit Creek, Chimney Creek and Pinson deposits are situated in North Central Nevada (about 200 miles or 320 kilometers northeast of Reno) within an area known as the Getchell Trend. The alluvium-filled valley of Kelly Creek is bounded on the west by the Osgood Mountains and on the northeast by the Snowstorm Range.

SLIDE 2: Location Map - Kelly Creek Valley
Our study area consists of about 70 square kilometers of the Kelly Creek valley along the east flank of the Osgood Mountains and the Dry Hills. Note the township and range lines as well as the numbered, 1 mile square sections for scale. The Chimney Creek South Pit, the Rabbit Creek pit, the Getchell pits and the Pinson ‘A’ pit are also shown for reference.

SAMPLE COLLECTION

SLIDE 3: Drill hole site map
All four of the mining companies with mineral property in the Kelly Creek valley have been engaged in exploration drilling through the alluvium and into the bedrock below. Each of these companies has allowed us to take representative samples of drill cuttings in the alluvial section for this study. A 2 kg representative split of the cuttings was collected at intervals of 20’ (6 m) down 60 holes in the basin. (The distribution of drill holes is shown here).

The samples were sieved to -20/+100 mesh and one-half was ground to < -100 mesh for analysis.

ANALYTICAL METHODS

SLIDE 4: List of Analyses
The ground split was analyzed for 35 elements by direct-current-arc Atomic Emission Spectroscopy. The unground split was subjected to an oxalic acid leach and the resultant leachate was also analyzed by the same method. Additional analyses were requested for low level Au (at 2 ppb-lower detection limit by a graphite furnace technique) and thallium (by a flame atomic absorption spectrometry method).

Although both the total and partial analyses generally give similar results, the oxalic acid partial leach method gives a much better contrast in element ranges. The remaining discussion will be limited to the results of the oxalic acid leach analysis. Unfortunately, at this time, the Au analyses are only one third completed and we have even less Tl data.

3-D DISPLAY FORMAT

SLIDE 5a: Bedrock Surface
In order to model the dispersion of elements, we needed to produce 3-dimensional views of the valley. These slides show a 3-dimensional representation of the bedrock surface in the Kelly Creek Valley as it would appear if the alluvium was removed. [Note the valley between Osgood Mountains and the Dry Hills and the paleovalley below Rabbit Creek Mine.]
In all of these slides - the box is the field area shown in a previous slide (Slide 3); the top is north unless otherwise stated; and the Z dimension (depth) is exaggerated about 8 times. The yellow lines that you will see in some of the slides are drill holes.

A 3-dimensional grid of the entire box was created from our drill hole data using the Interactive Volume Modeling software from Dynamic Graphics, Inc. The bottom of that grid was then truncated by this bedrock surface.

**As MODEL OF KELLY CREEK BASIN**

**SLIDE 6: As model (All shells, bedrock surface)**

We also truncated the top of the grid with a representation of the actual ground surface of the valley and constrained our display to that part of the basin where we have sufficient data.

The model which I have displayed here is As. Our raw data for As (from oxalic acid leach analyses) ranged from not detected at 500 ppm to >2% As. Since this As data was gridded in 3-dimensions, each contour level is actually represented by a shell of similar As values. We can then peel these shells off like the skin of an onion to see what is happening inside our model.

**SLIDE 7a: As model (>500 ppm with Bedrock surface)**

If we remove all of the As that is less than 500 ppm, we get this result. This model allows us to make some observations about the source and distribution of As in the basin. At shallow levels, we see As associated with the exposed Chimney Creek and Pinson deposits as well as the region along the Osgood Mountains near the recently developed Summer Camp Deposit.

Even more striking is the large plume of As enrichment in the alluvium that is moving down gradient from the valley separating the Dry Hills from the Osgood Mountains. The As-rich Getchell deposits are located marginal to this valley. This As body swings north up the Kelly Creek Valley in the vicinity of Rabbit Creek and we also see additional As at depth near Pinson.

**SLIDE 8a: As model (>2000 ppm with Bedrock surface)**

If we peel off more As shells, we see the >2000 ppm As body. At this level, the shape suggests that sources for enriched As can be found just south of Rabbit Creek and at depth below Pinson. If we would continue to peel away As shells, the highest values are centered in a paleovalley south of and below the level of the Rabbit Creek deposit.

The next slide will be a north-south cross-section over the Chimney Creek South Pit and the Rabbit Creek deposits.

**SLIDE 9a: As cross section with bedrock**

The view is to the west with north to the right. Our model shows a bedrock source for As below Rabbit Creek at a depth of about 300 feet in the alluvium. Note that the As anomaly extends laterally and down gradient from this source.

**W MODEL OF KELLY CREEK BASIN**

**SLIDE 10a: W model (>100 ppm)**

If we look at W, we see that its distribution has a similar pattern to that of As. There appears to be a W source from the valley between the Osgood Mountains and the Dry Hills, another near Rabbit Creek and a third source near Pinson. This latter is not surprising considering that there are several W-bearing skarns exposed in the Osgood Mountains.

**SLIDE 11a: W model (>300 ppm)**

At higher levels of W, the anomaly again shows the Rabbit Creek and Pinson areas. And like As, the highest values of W are found in the paleovalley below Rabbit Creek.

**Ge MODEL OF KELLY CREEK BASIN**

**SLIDE 12a: Ge model (>20 ppm)**

One unexpected element emerged from this study. Here we see the distribution of low level Ge that mimics the As and W distribution down valley from the Getchell area.
And at higher levels, we see the same pattern as before near the Rabbit Creek deposit.

Sb MODEL OF KELLY CREEK BASIN

The Sb model also behaves like As and should be included in this suite of elements. Since the oxalic acid leach primarily attacks Fe and Mn oxide coatings within the alluvium, we should also look at the distribution Mn and Fe.

Mn MODEL OF KELLY CREEK BASIN

Note that in this slide, we have reversed our display. Whereas before, the displays showed a body of enriched concentration, here we are emphasizing the depleted end of the scale. This body represents the area in the basin with a value of <4000 ppm Mn.

Again, note the similar distribution pattern. Where we had high As, W, Ge, and Sb values, we have low Mn. The highest Mn values (not shown) were found primarily at shallow depths within the alluvium.

Fe MODEL OF KELLY CREEK BASIN

If we look at Fe, we see the inverse of Mn and a close spatial correlation with the As, W, Ge, Sb suite. We call this distribution pattern, the Fe "blanket".

This series of 3-D models suggests that the Fe "blanket" represents an environment within the alluvium that was favorable for the precipitation of Fe oxide. As, W, Ge, and Sb were co-deposited within the same environment forming a body of alluvium with higher background levels of these elements than in the surrounding alluvium.

Within this favorable environment, local sources or processes then produced anomalous metal concentrations in the alluvium as shown here in these north-south cross sections for W and Ge over the Rabbit Creek and Chimney Creek deposits.

Au - As I mentioned earlier, we do not have enough data to produce a model of Au dispersion in the alluvium of the basin. Our "early returns" suggests that the gold is extremely fine-grained and disseminated in the alluvium with values ranging from < 2 ppb to 30 ppb. There appears to be no coherent distribution or migration patterns for Au in the alluvium.

Fossil Anomaly vs. Equilibrium State - At the moment, we don't know if the Fe blanket is a static fossil anomaly, created sometime earlier in the basin's history or if it is in equilibrium with the present ground water of the basin. Some comparisons with water data suggest the possibility of an equilibrium with a present-day stratified ground water system. However, the existence of normal faults in the alluvium that apparently offsets the "blanket", suggests that it is a fossil anomaly that is unrelated to the current ground water regime.

ACKNOWLEDGMENTS

In closing, I would like to thank the following companies for drill cuttings and other sample media, for mine tours, and for access to the respective properties. Specifically, I would like to thank...

... Dick Nanna, Mark Gingrich and Eric Berentsen of FirstMiss Gold, Inc.;
... Alan Wright, Ron Deichman, and Bill Feyerabend of Gold Fields Mining Corporation;
... Ed Kretschmer and Rob Dennis of the Pinson Mining Company; and
... Dean Peltonen and Roy Owens of Santa Fe Pacific Mining, Inc.
TOTAL ANALYSES
DC-Arc Atomic Emission Spectrography - 35 elements
Ag As Au B Ba Be Bi Ca Cd Co Cu Fe Ga Ge La Mg Mn
Mo Na Nb Ni P Pb Sb Sc Sn Sr Th Ti V W Y Zn Zr

PARTIAL ANALYSES - Oxalic Acid Leach
DC-Arc Atomic Emission Spectrography - 35 elements
Ag As Au B Ba Be Bi Ca Cd Co Cu Fe Ga Ge La Mg Mn
Mo Na Nb Ni P Pb Sb Sc Sn Sr Th Ti V W Y Zn Zr

OTHER ANALYTICAL METHODS
Graphite Furnace - low level Au (≥ 2 ppb)
Flame Atomic Absorption Spectrometry - TI
Kelly Creek Valley
As
Ge
GENERAL DISCUSSION

• Au distribution
• Fe "blanket" with source to the west
• Spatial correlation of As, W, Ge, Sb with Fe
• Sources of As, W, Ge, Sb in the Basin
• Fossil Anomaly vs. Equilibrium State
FirstMiss Gold, Inc.

Gold Fields Mining Corporation

Pinson Mining Company

Santa Fe Pacific Mining, Inc.