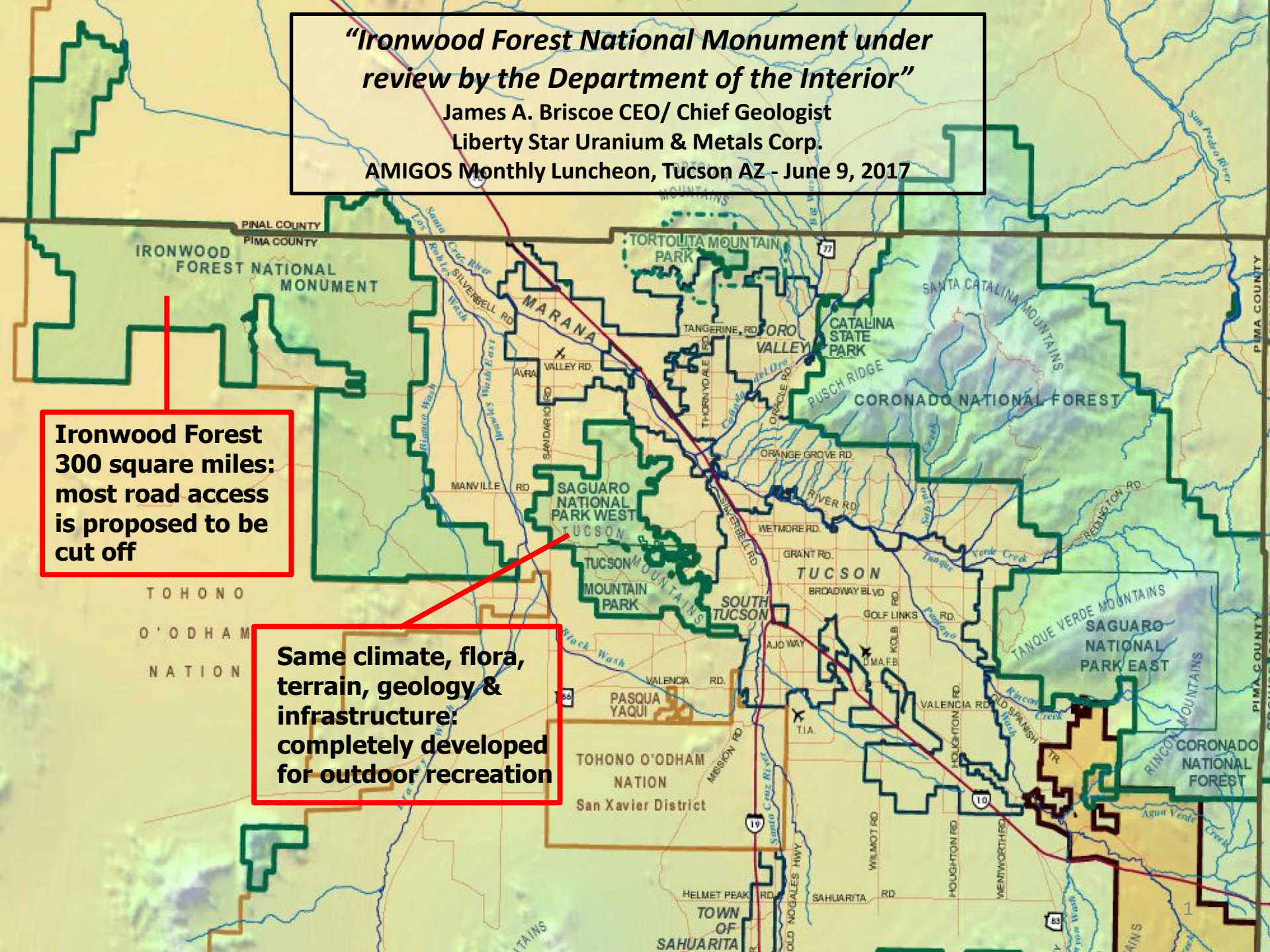

"Ironwood Forest National Monument under review by the Department of the Interior"
James A. Briscoe CEO/ Chief Geologist
Liberty Star Uranium & Metals Corp.
AMIGOS Monthly Luncheon, Tucson AZ - June 9, 2017
Ironwood Forest 300 square miles: most road access is proposed to be cut off
Same climate, flora, terrain, geology & infrastructure: completely developed for outdoor recreation
PINAL COUNTY
PIMA COUNTY
IRONWOOD FOREST NATIONAL MONUMENT
TORTOLITA MOUNTAIN PARK
MARANA
ORO VALLEY
CATALINA STATE PARK
SANTA CATALINA MOUNTAINS
PUSCH RIDGE
CORONADO NATIONAL FOREST
TANGERINE RD.
ORACLE RD.
VALLEY RD.
SILVERBELL RD.
ORANGE GROVE RD.
RIVER RD.
WETMORE RD.
GRANT RD.
SAGUARO NATIONAL PARK WEST
TUCSON MOUNTAIN PARK
TUCSON
SOUTH TUCSON
BROADWAY BLVD
GOLF LINKS RD.
AJO WAY
TUCSON INTERNATIONAL AIRPORT
DMAFB
TANQUE VERDE MOUNTAINS
SAGUARO NATIONAL PARK EAST
VALENCIA RD.
PASQUA YAQUI
TOHONO O'ODHAM NATION
San Xavier District
HOUGHTON RD.
OLD SPANISH TR.
RINCON MOUNTAINS
CORONADO NATIONAL FOREST
MISSION RD.
WILMOT RD.
HELMET PEAK RD.
SAHUARITA RD.
TOWN OF SAHUARITA
OLD NOGALES HWY
MANVILLE RD.
SANDARIO RD.
THORNYDALE RD.
REDINGTON RD.
PIMA COUNTY
1

Geology & Cultural History of Ironwood Forest National Monument-IFNM, Southern Arizona

INFM Parameters

- *Established* 9 June 2000 - Exe. Order President W.J. Clinton
- *Land Mangement*: Bureau of Land Management
- *Footprint*: 188,619 acres (includes 59,922 acres non-federal lands, chiefly State Trust lands, and minor private holdings)
- *Cultural features*: 200+ Hohokam sites; historical mine-related sites
- Current Uses: Recreation, cattle grazing, mining on pre-existing mine sites
- *Threatened Species*: Ferruginous pygmy owl, desert bighorn sheep, lesser long-nosed bat, turk's head cactus

Physiographic Features

Basin & Range Province, Roskruge Mtns., Samaniego Hills, Sawtooth Mtns., Silver Bell Mtns., Sonoran Desert, Western Silver Bell Mtns.

Mining History

- Predominantly in the Silver Bell Mtns.
- Major Ore Deposit(s) type: porphyry copper
- Ore: copper, lead, zinc, molybdenum, gold

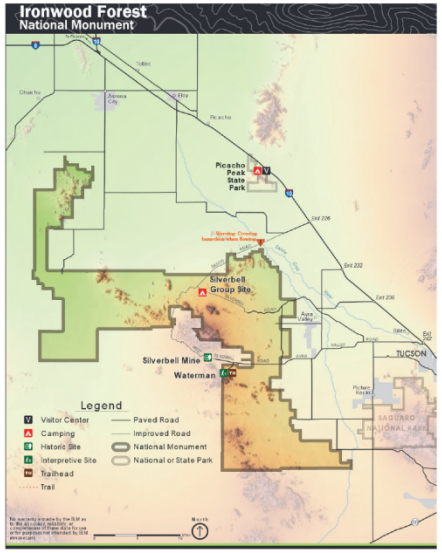
The IFNM surrounds and partially encompasses the Silver Bell metallic mineral district and either covers parts of or encompasses the Waterman, Magonigal and the Roskruge mineral districts. The most productive area has been the Silver Bell Mining District, where active mining continues to this day, immediately southwest of the monument, and by grandfather clause, on the the monument proper.

The Silver Bell Mmining District evolved from a collection of intermittent, poorly financed and managed underground mining operations in the late 1800s to mid-1900s struggling to make a profit from high grade ores; to a small but profitable producer, deploying innovative mining practices and advancements in technology to successfully develop the district's large, low-grade copper resource (D. Briggs, 2017).

Production in the Silver Bell Mining District (Briggs, 2017)

Over the past 130 years, the Silver Bell mining district yielded approximately 2.27 billion pounds of copper, 6.6 million pounds of molybdenum, 3.7 million pounds of lead, 40.8 million pounds of zinc, 2,100 ounces of gold and 5.95 million ounces of silver. Copper mining adjacent to the IFNM continues today, with minor production of Mo, Pb, Zn, Au, and Ag.

Establishing what percent of production stems from the IFNM requires: 1) precise footprinting of mines; 2) assigning production values to properties on IFNM land.



Map of the Ironwood Forest National Monument (BLM).

Mineral Districts of eastern Pima County. Yellow highlighted districts are incorporated in part or entirely in IFNM (AZGS B-196, 1985).

The presence of gold ore in the Ragged Top Wilderness Study Area (WSA) of the Silver Bell Mountains was first announced by the US Geological Survey in Oct. 1988 (Spencer and Sawyer, 1988). A small gold rush ensued with 45 new lode mining claims.

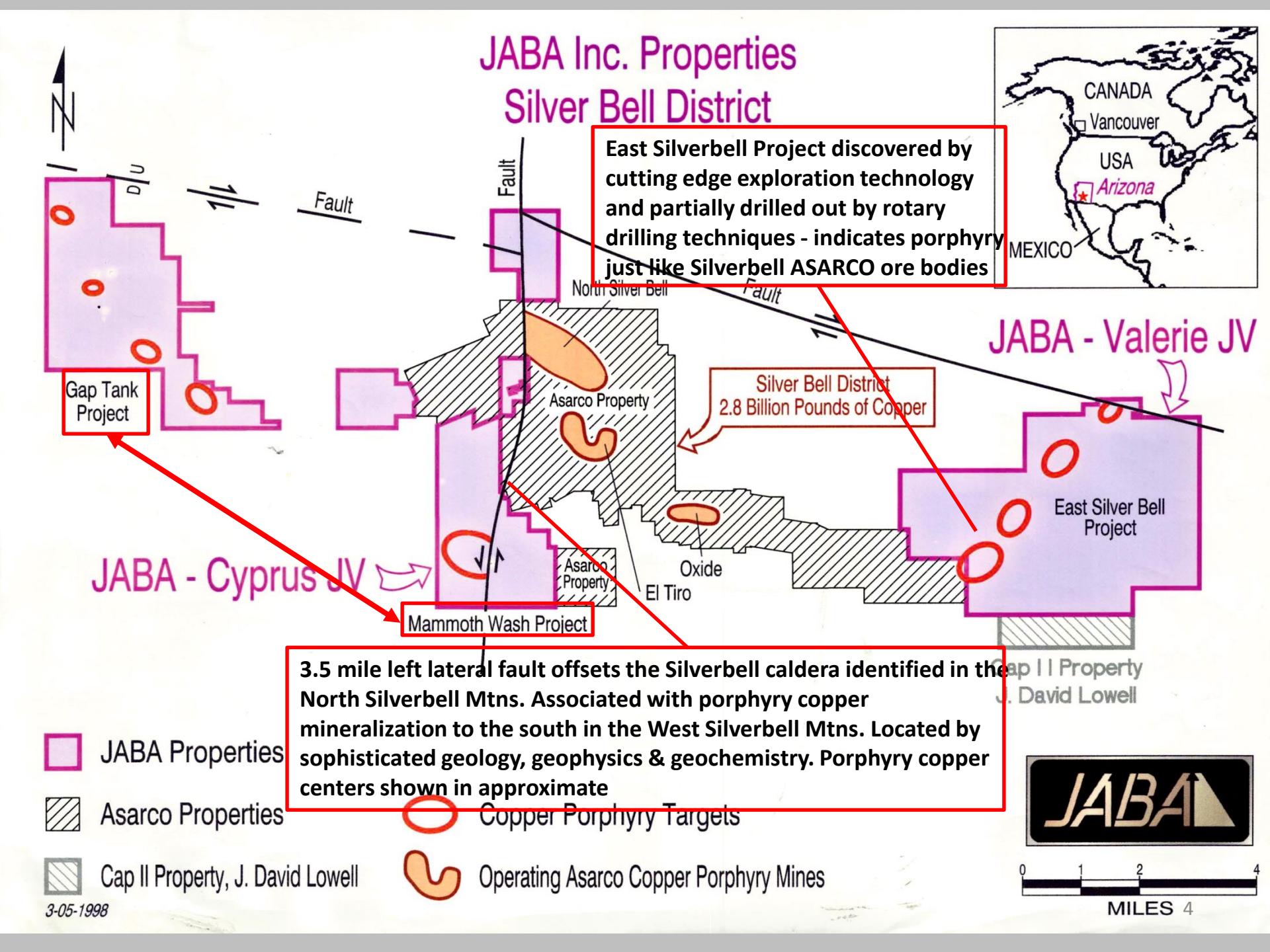
Concluding Statement. With the creation of IFNP in 2000, exploration for additional copper mineralization was discontinued on the monument. Exploration continues to this day on mining claims on BLM lands in the Silver Bell Mtns.

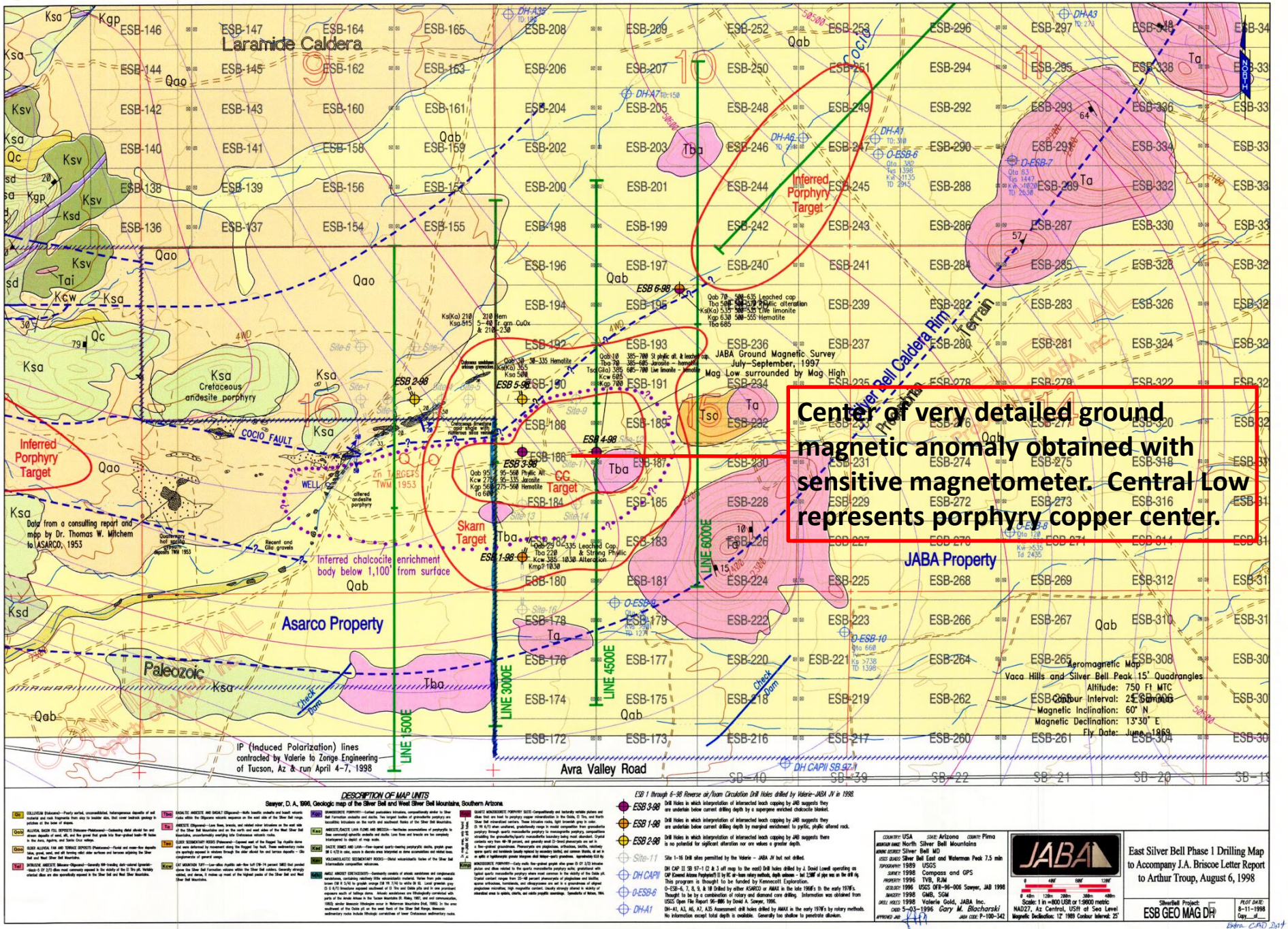
THE UNIVERSITY OF ARIZONA

ARIZONA GEOLOGICAL SURVEY AZGS

Potential for $80 billion in mineral wealth

- Between *Gap Tank* and the *Mammoth Wash* [see next slide, red arrow at left] there are 8 porphyry centers, including targets 3 or more on the Tohono O'Odham Reservation
- Recent very good compilation of past metal production spanning 130 years of the Silverbell mining district allow comparison of the value per porphyry center now known from discoveries from the J.H.Courtright/K. Richard Exploration Geology team. These allow a projection of what might be drilled out from the Briscoe-Guilbert-Smith JABA Inc. (Liberty Star) discoveries using cutting edge exploration technology. Thus it is estimated that the Briscoe team anomalies shown on the following maps in general terms total $80B in potential mineral value of copper, molybdenum, silver, lead, zinc, gold and other metals that with new location techniques might be byproducts or co-products within these geochemically indicated targets of the Silverbell Porphyry Copper Project. However all mining projects have spin off monies from jobs, services, and infrastructure needs, resulting in well-known multiplier factors. For large metal mines this factor is a $7x multiplier. Thus for mine economic production of $80 billion X 7 then a lifetime cash flow to surrounding communities of $560 billion over the lifetime of projected mines results.
- It is quite likely that additional mineral discovery using similar methods that we applied here or even better techniques with better technology in future years, within the boundaries of what is the Ironwood withdrawal area.
- The Silverbell Project known and projected alteration is about 25 miles long and 5 miles wide. It is along the fault disrupted south margin of the Silverbell caldera first recognized in 1988. I think I know where the north half of the circular caldera is but more study will be required to confirm my idea. We are interested now in the shallowly buried remainder of the south half.
- According to geochemist Shea Clark Smith, we mounted one of the largest geochemical if not the largest, geochemical sampling campaigns of the time in North America, or perhaps the world exclusive of Australia."
- All the geochemistry was tested (our sample control) at the ASARCO North Silverbell porphyry copper ore body with ASARCO's blessing and permission., At the time of testing the North Silverbell orebody had been drilled out, but not mined and had no disturbed areas. These control samples showed the same anomalies as the sampling over the target areas. The North Silverbell porphyry center is now mined out.
- The buried indicated targets resulting from our work are depicted in the following slides

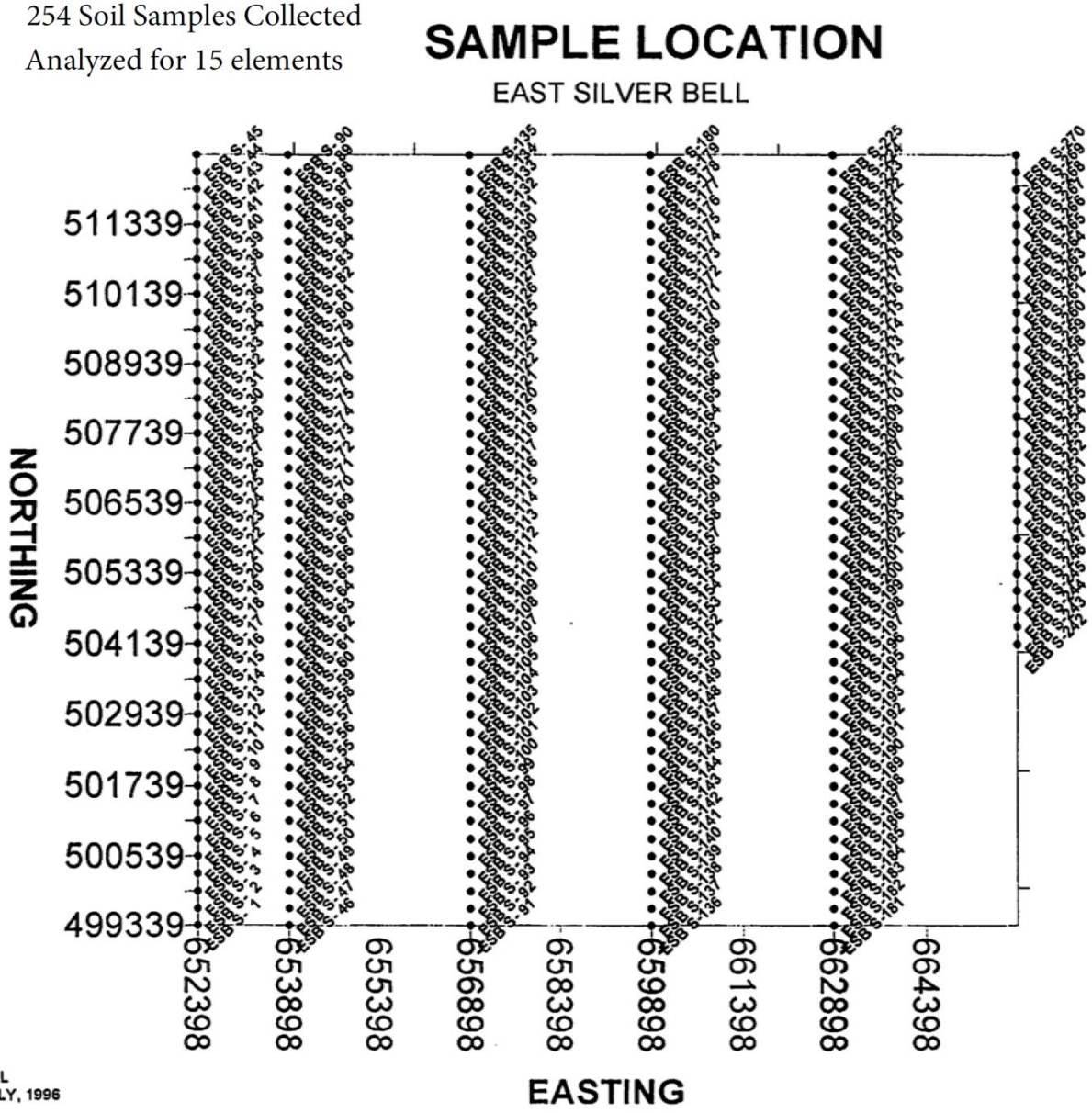

JABA Inc. Properties
Silver Bell District
East Silverbell Project discovered by cutting edge exploration technology and partially drilled out by rotary drilling techniques - indicates porphyry just like Silverbell ASARCO ore bodies
CANADA
Vancouver
USA
Arizona
MEXICO
Fault
Fault
Fault
North Silver Bell
JABA - Valerie JV
Gap Tank Project
Asarco Property
Silver Bell District
2.8 Billion Pounds of Copper
East Silver Bell Project
JABA - Cyprus JV
Asarco Property
Oxide
El Tiro
Mammoth Wash Project
Cap II Property
J. David Lowell
3.5 mile left lateral fault offsets the Silverbell caldera identified in the North Silverbell Mtns. Associated with porphyry copper mineralization to the south in the West Silverbell Mtns. Located by sophisticated geology, geophysics & geochemistry. Porphyry copper centers shown in approximate
JABA Properties
Asarco Properties
Cap II Property, J. David Lowell
Copper Porphyry Targets
Operating Asarco Copper Porphyry Mines
JABA
0 1 2 4
MILES
3-05-1998



Center of very detailed ground magnetic anomaly obtained with sensitive magnetometer. Central Low represents porphyry copper center.

Friends of JABA & Liberty Star

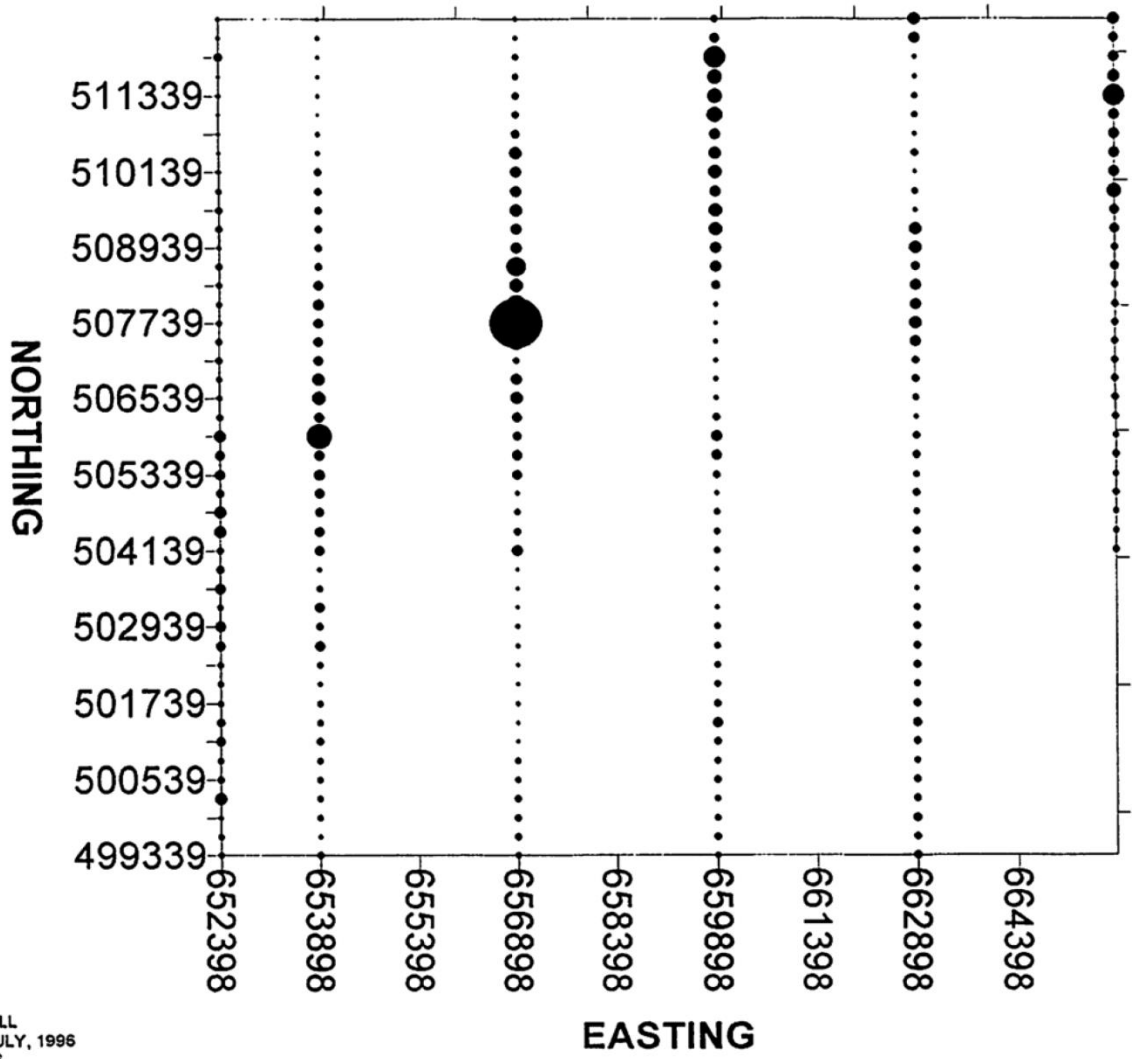
254 Soil Samples Collected
Analyzed for 15 elements



Soil samples taken under the direction of Geochemist *Shea Clark Smith, M.S.* Each sample was analyzed by a Certified Assay Lab and samples will be presented as isometric computer plots.

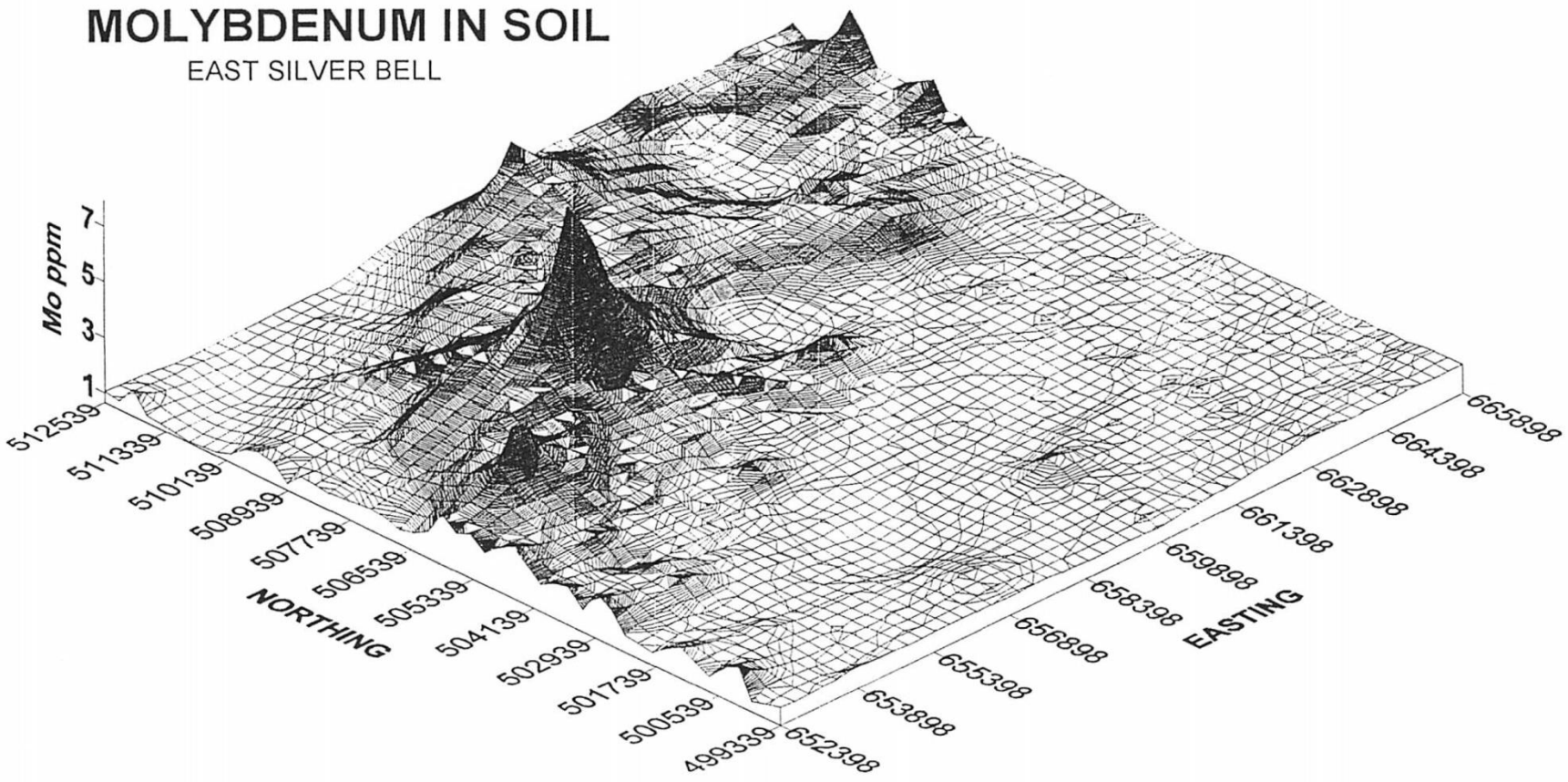
MOLYBDENUM IN SOIL

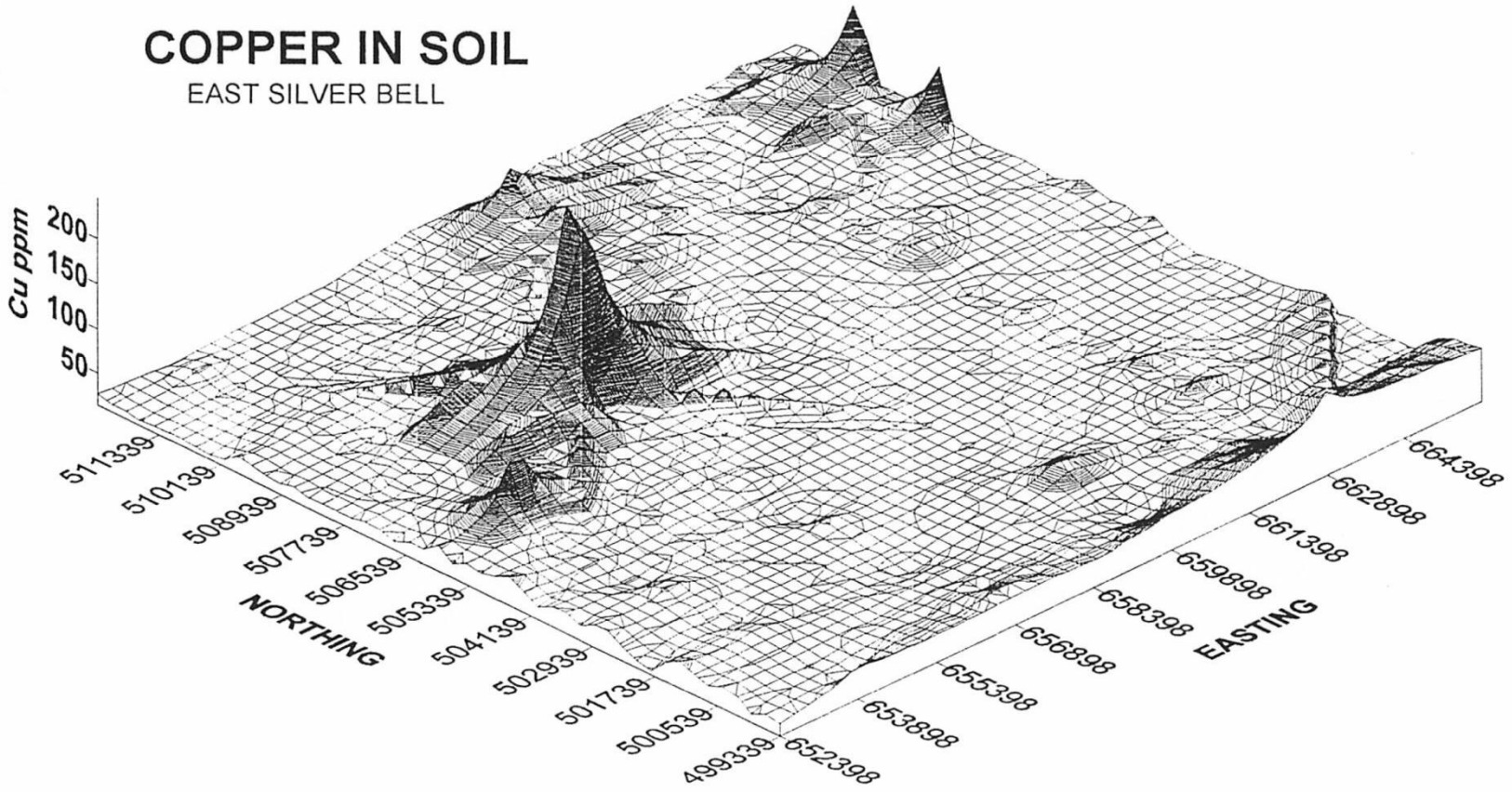
EAST SILVER BELL



JABA (US) INC.
EAST SILVER BELL
SOIL SURVEY: JULY, 1996
AUGUST 26, 1996
SHEA CLARK SMITH

The ensuing plots [slide 9 – 15] of various metals include molybdenum, copper, lead, zinc, silver, gold, and other less well known metals. As shown, these plots are characteristic of all porphyry copper systems at Silverbell, and world wide probably mineable by appropriate methods, potentially including in situ, open pit, or underground. IT IS CLEAR THAT THIS AND OTHER ANOMALIES PRESENTED HERE ARE PORPHYRY COPPER SYSTEMS.





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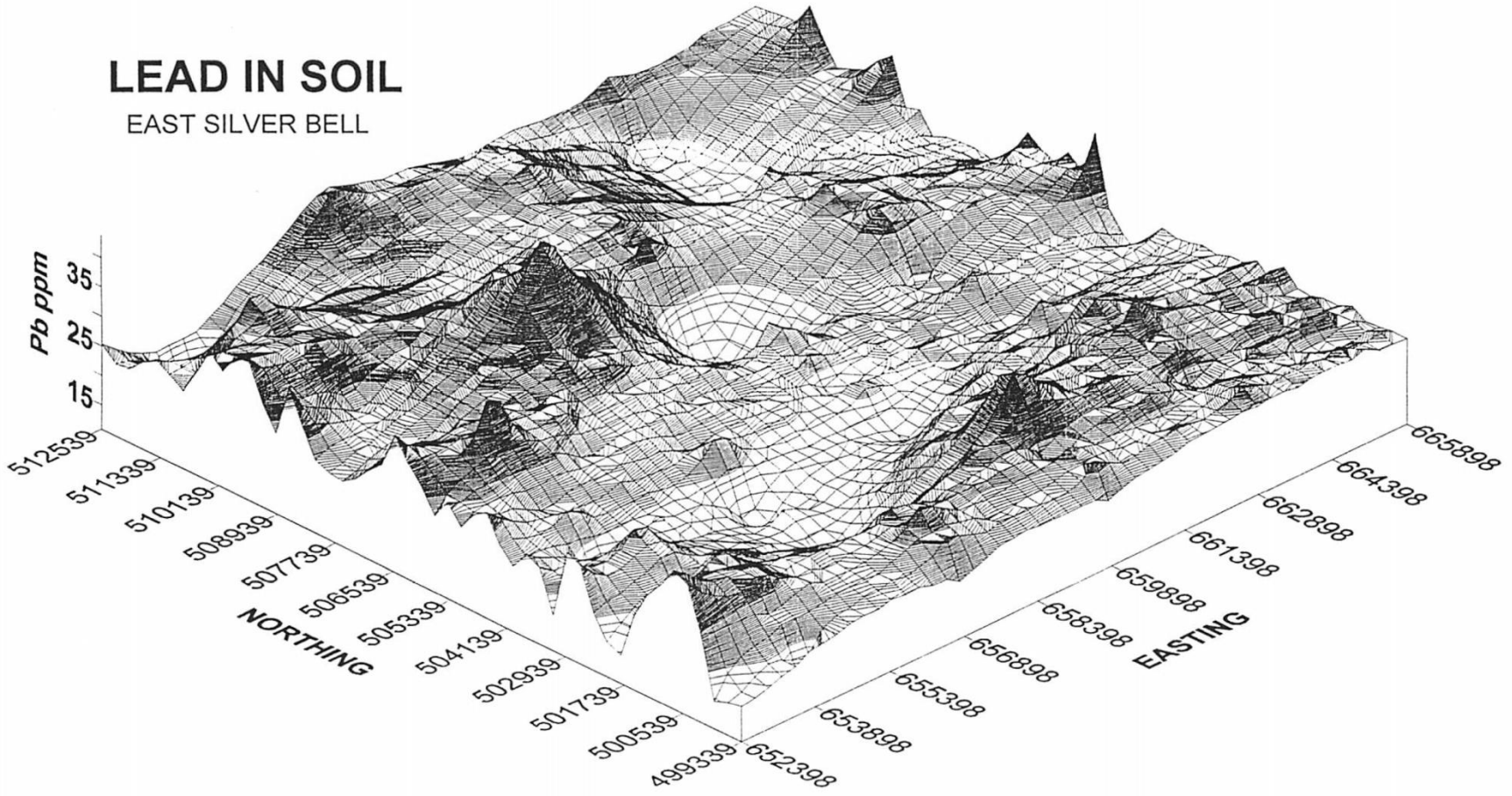
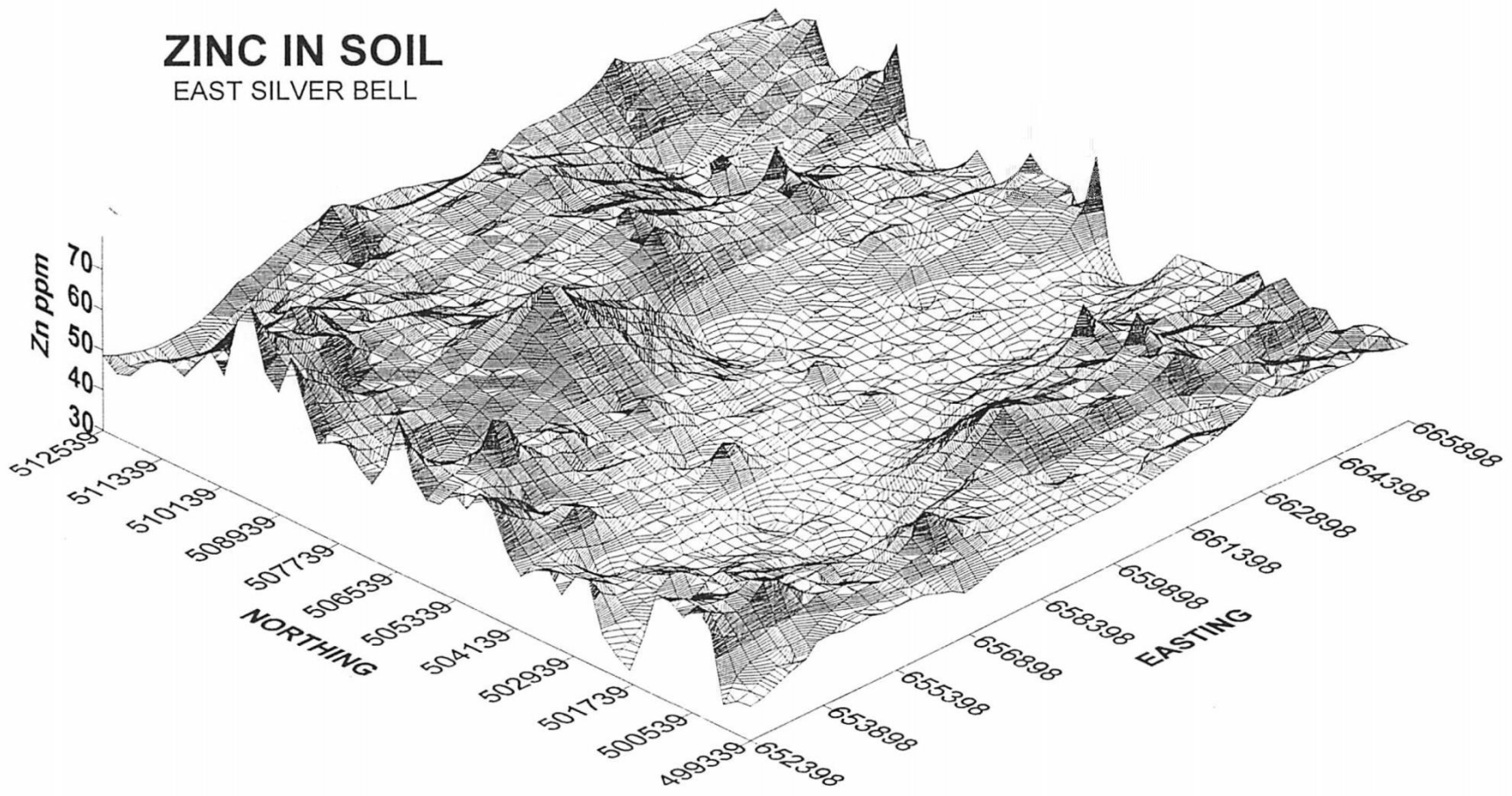
SOIL SURVEY: JULY, 1996
AUGUST 26, 1996
SHEA CLARK SMITH



JABA (US) INC.
EAST SILVER BELL
SOIL SURVEY: JULY, 1996
AUGUST 26, 1996
SHEA CLARK SMITH



JABA (US) INC.
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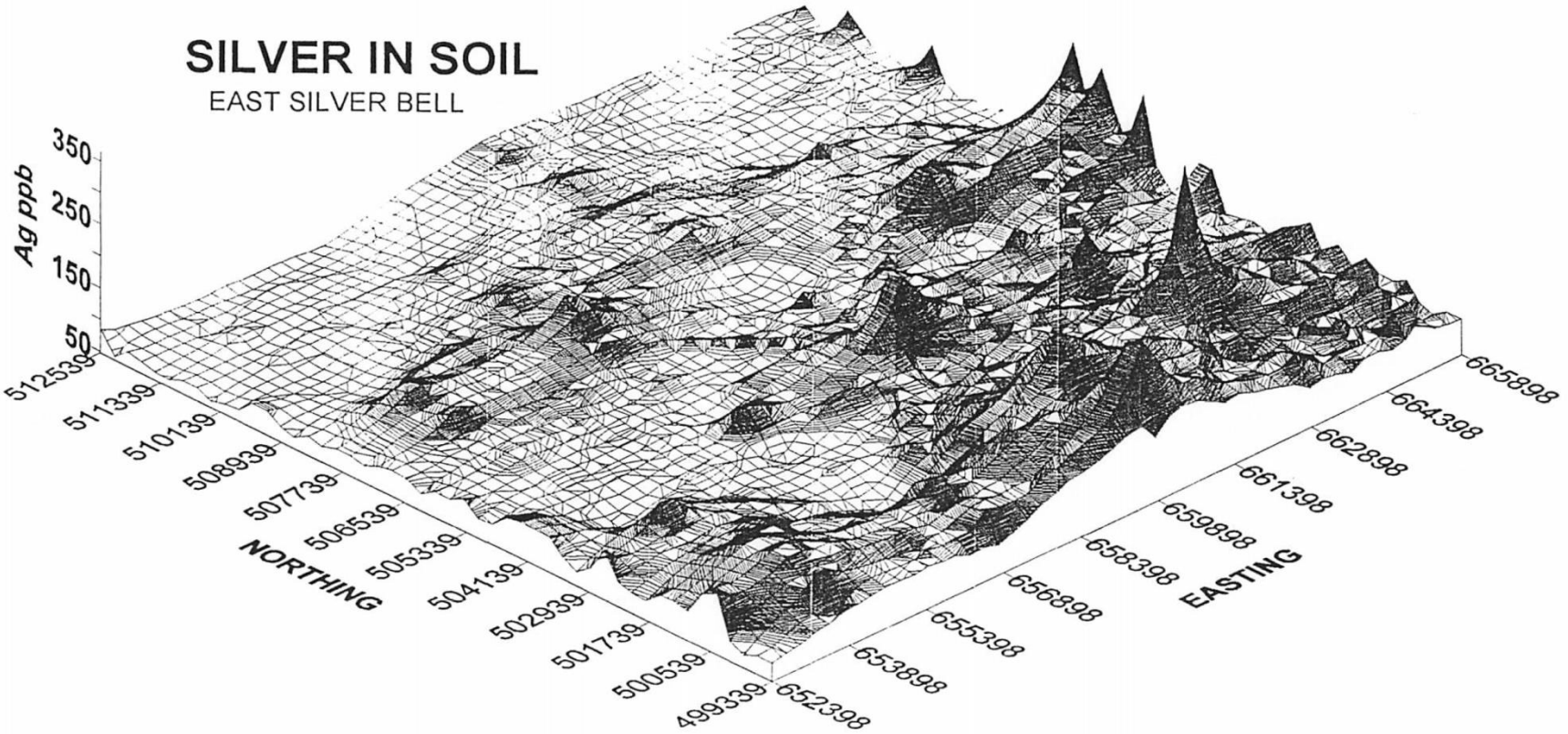
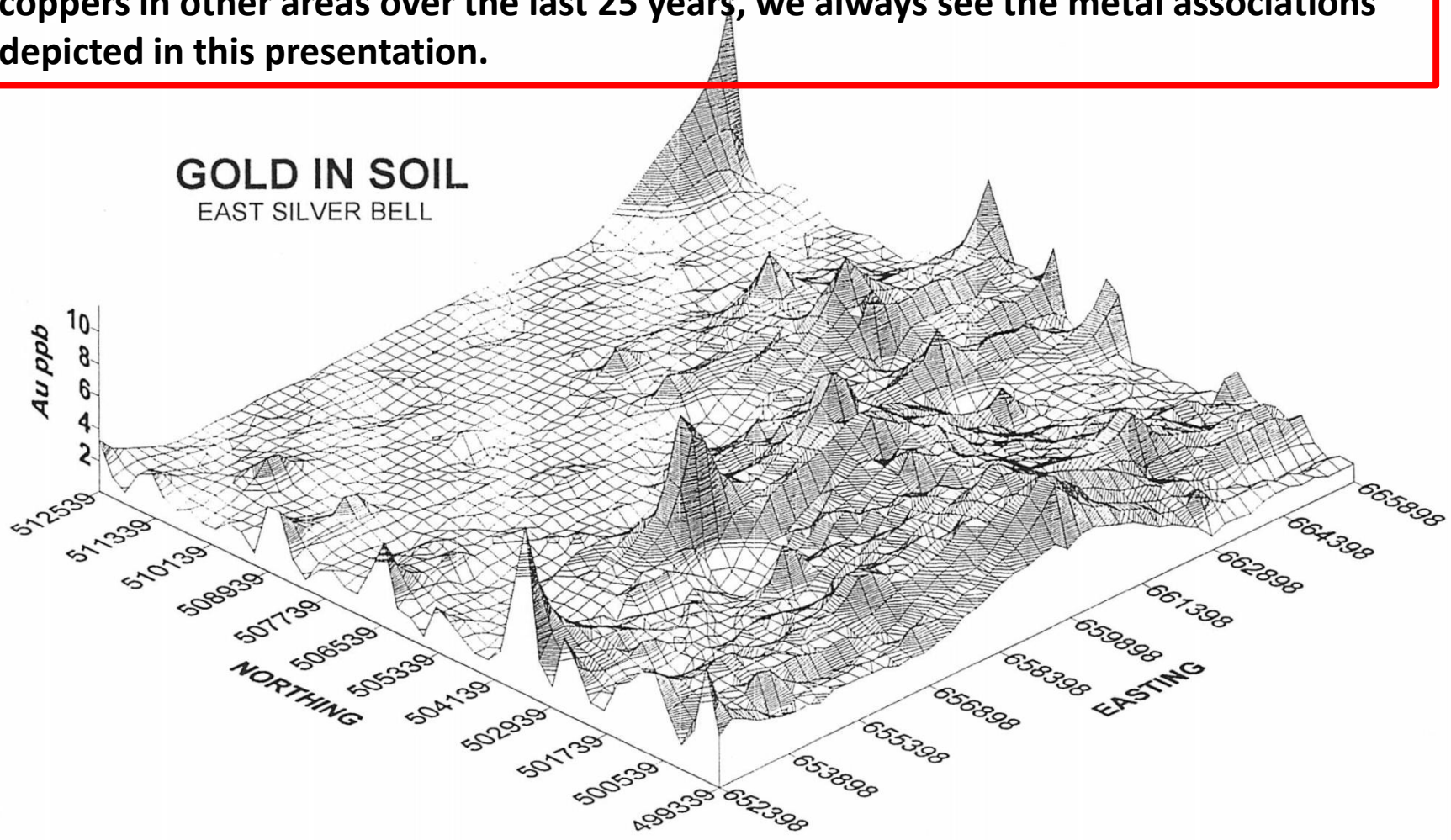
SOIL SURVEY: JULY, 1996
AUGUST 26, 1996
SHEA CLARK SMITH

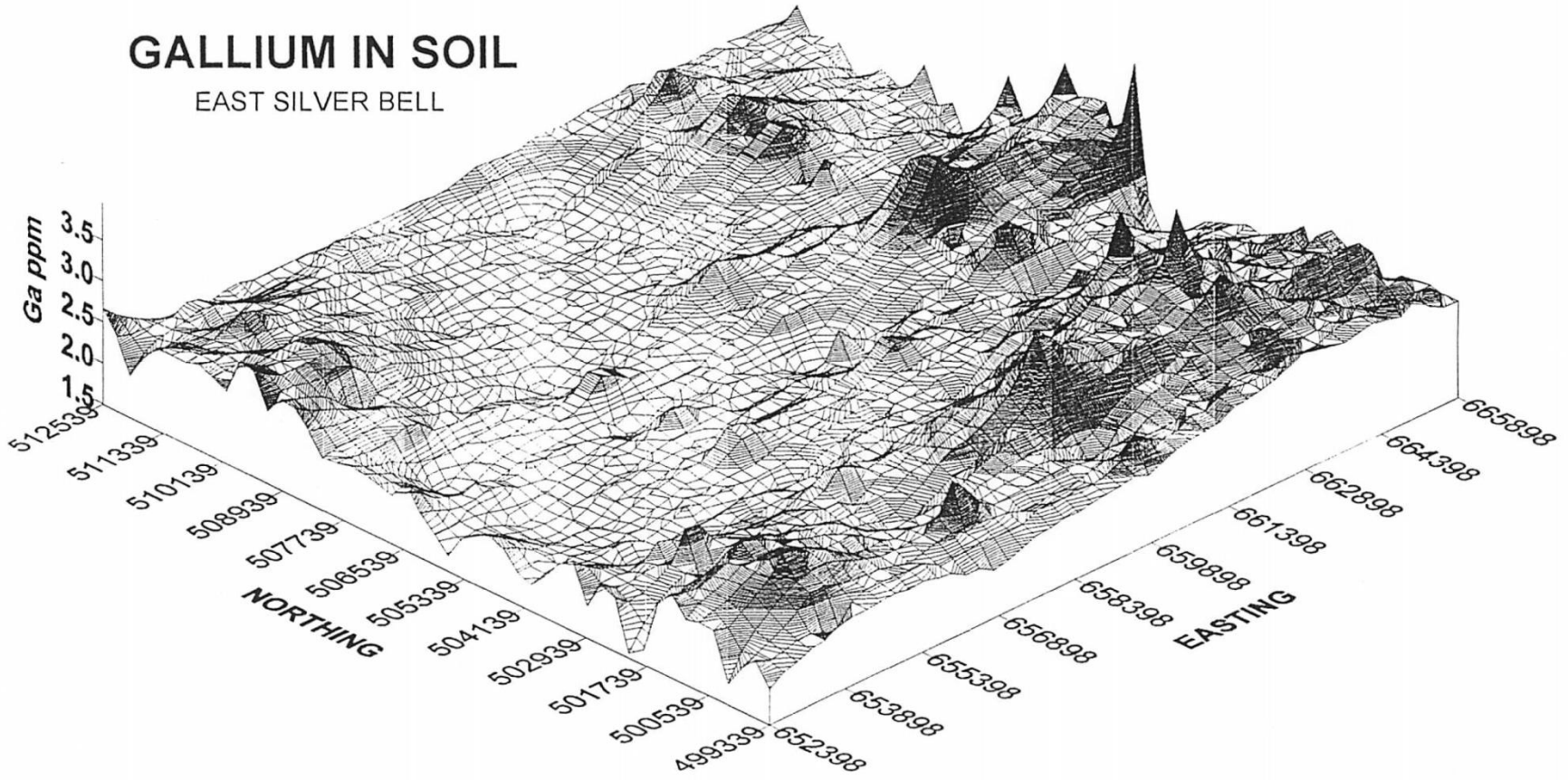
Before this survey, silver was not expected in a different position than copper, but related to control surveys, over the north Silverbell ore body as well as the Lowell/Guilbert porphyry model, this should be expected.



JABA (US) INC.
EAST SILVER BELL
SOIL SURVEY: JULY, 1996
AUGUST 26, 1996
SHEA CLARK SMITH

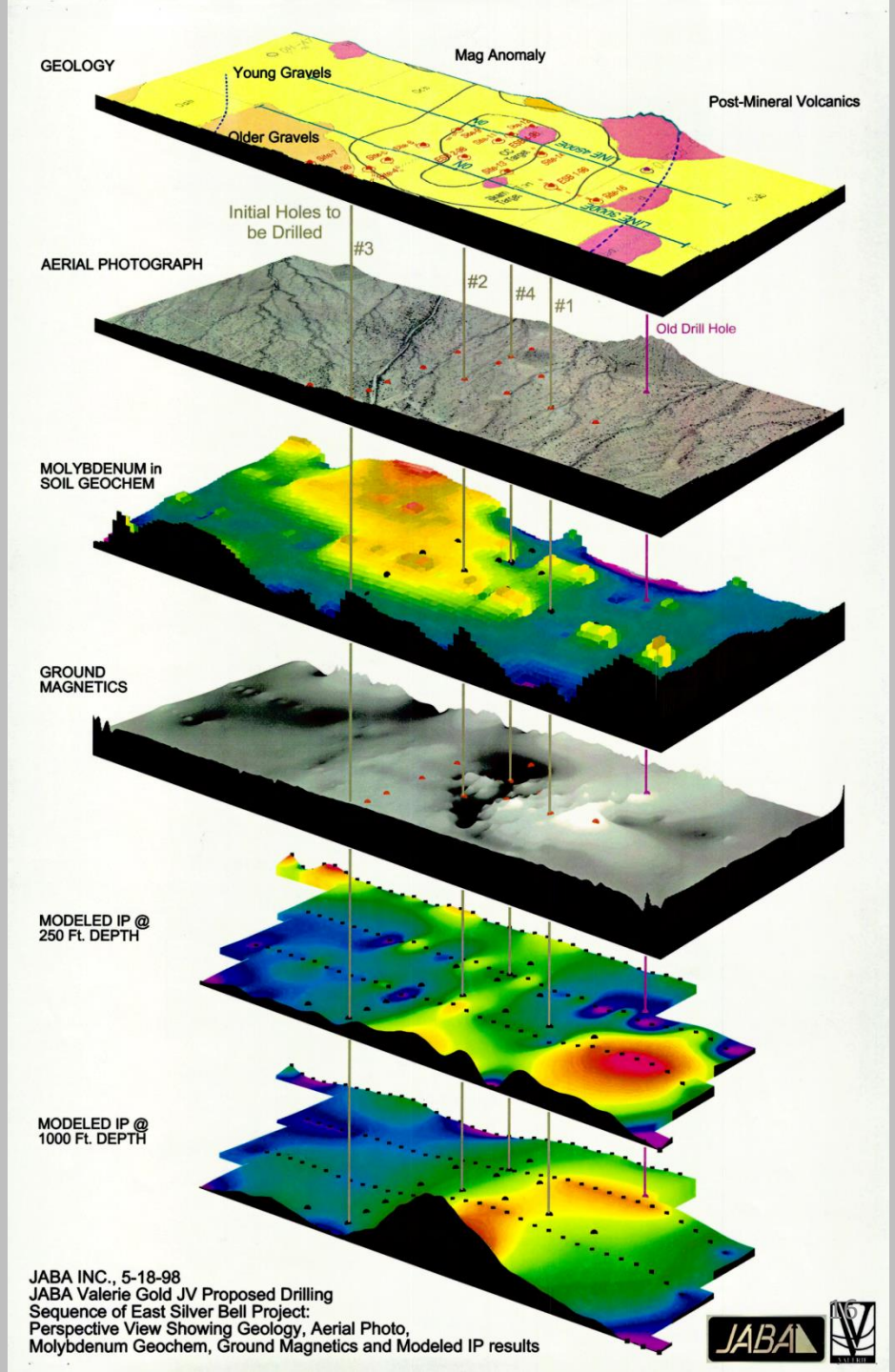
A gold zone is present and shown and in all anomalies within all JABA/LBSR discoveries. Gallium [see next slide] is associated with gold as shown in control samples from the north Silverbell ore body. In our experience in testing porphyry coppers in other areas over the last 25 years, we always see the metal associations depicted in this presentation.



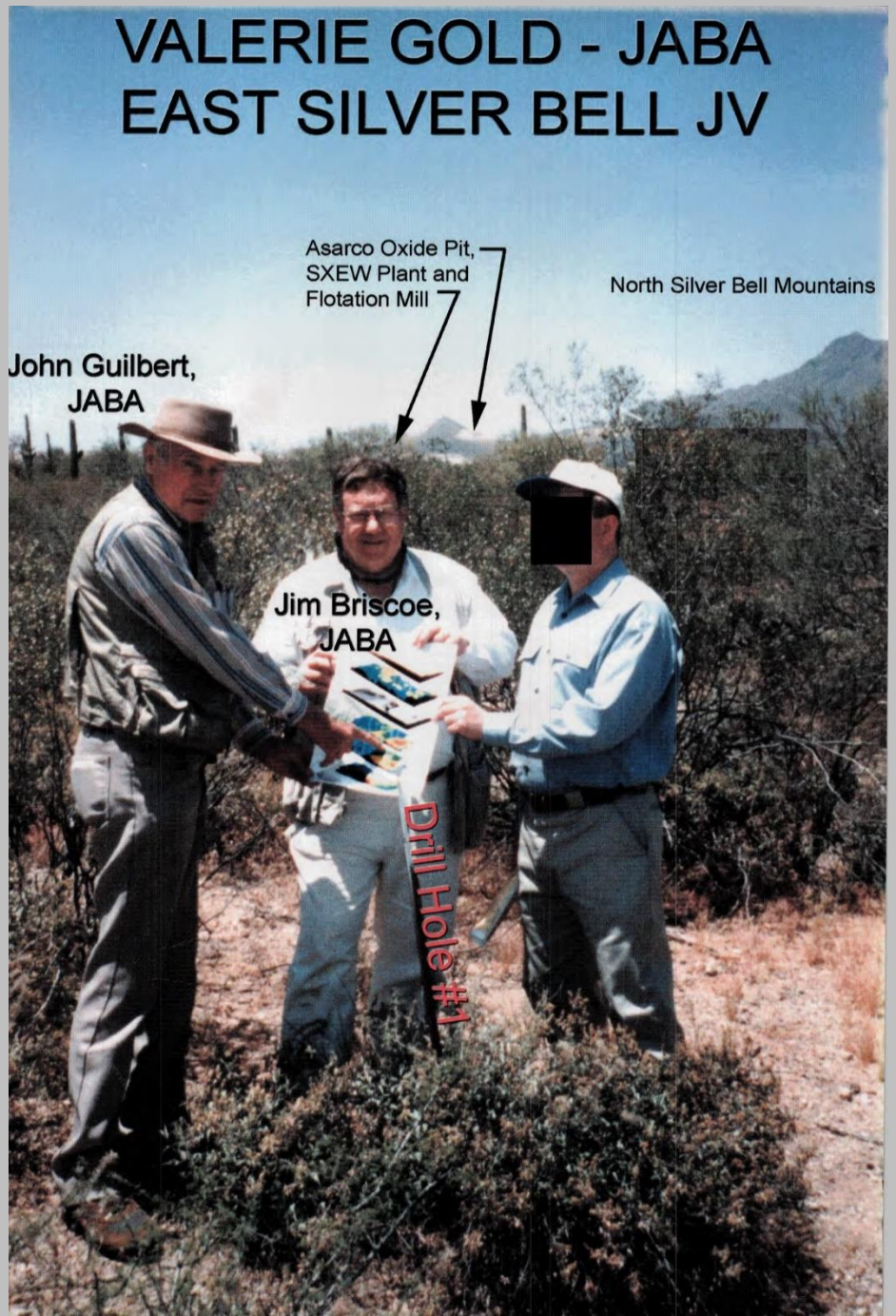


JABA (US) INC.
EAST SILVER BELL
SOIL SURVEY: JULY, 1996
AUGUST 26, 1996
SHEA CLARK SMITH

This is a stacked aeries of 3 dimensional isometric diagrams of the East Silverbell porphyry copper exploration area that shows the graphic representation of the various scientific exploration tools used to pinpoint the porphyry copper center and proposed or completed rotary drill holes.



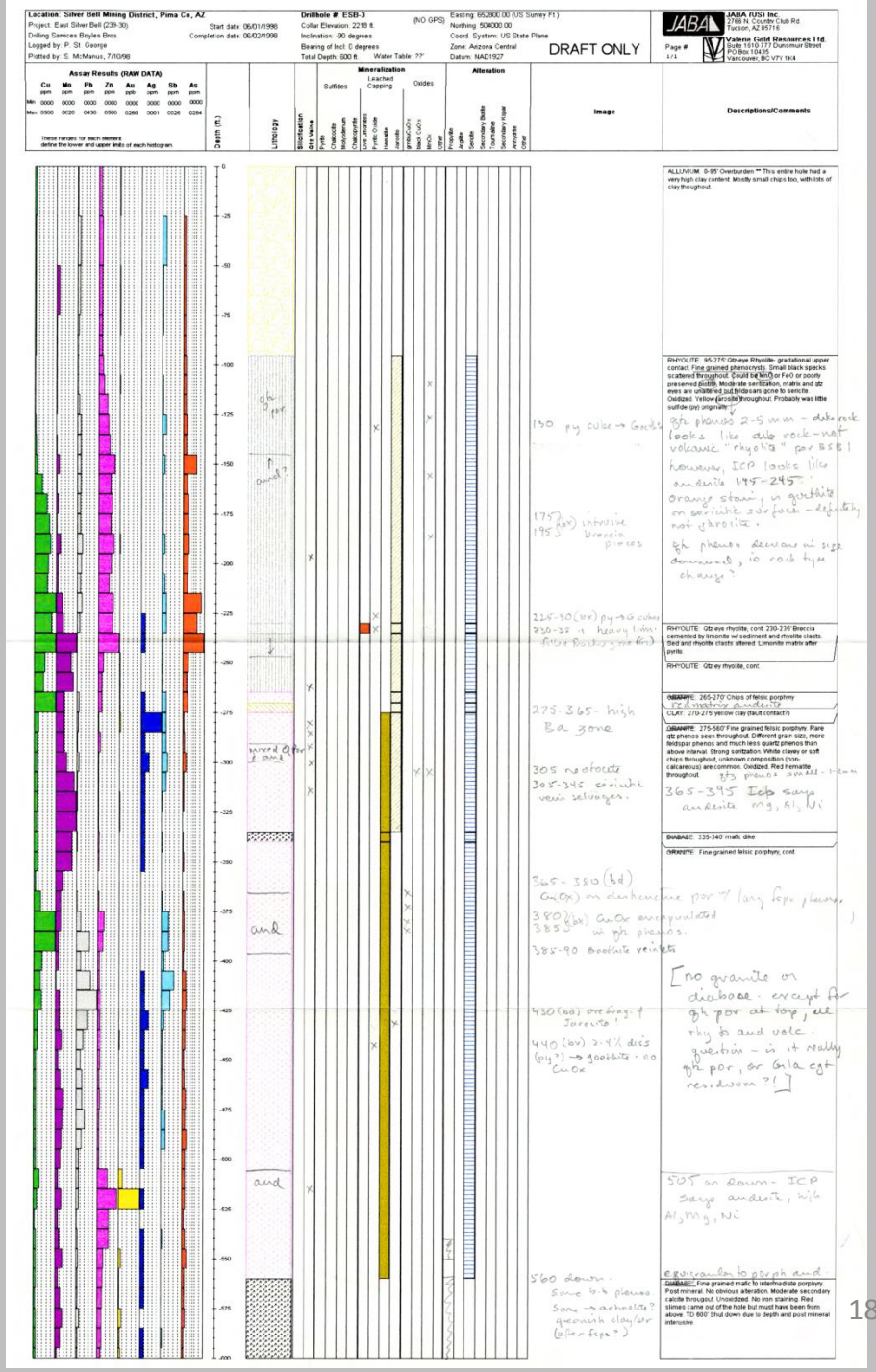
Dr. John Guilbert working with J. David Lowell co-developed the *Lowell/Guilbert Porphyry Copper Model*, still the scientific standard in mining. Dr. Guilbert is the recipient of mining's two most prestigious awards, the R. A. F. Penrose Medal (1998) and the D. C. Jackling Award (2001).



Pictured here:
Dr. Guilbert, Jim Briscoe, and client, at the location of the first drill hole.

These are graphic drill logs with each element represented quantitatively by color and width. The green color is copper as Cu_2S: the mineral chalcocite undergoing enrichment and destruction to be deposited again below as a richer blanket. The purple element to its right is molybdenum, then lead - white and then zinc in lighter purple, then gold, then silver in dark blue, antimony in light blue, and arsenic in orange. All of these elements appear to be undergoing leaching and enrichment.

Unfortunately rotary drilling is subject to poor sample quality for a variety of reasons, so these analyses may suggest a lower quantity of metals than actually present; further exploration is required.



This hole shows similarities to the last. Because the geologist (inexperienced) logged all intervals as oxidized we must assume that the chalcocite zone (Cu) is undergoing destruction to be enriched at a lower level. Again, most metals show enrichment.

At the far right is a *Core Board* in which cuttings including a coarse fraction and a fine fraction and a gold-pan concentrated fraction are glued to a board giving the geologist an overall view of what the rotary drill is cutting. This was invented by J. Harold Courtright and Kenyon Richard - the discoverers of Silverbell, and long time geologists - world wide for ASARCO.

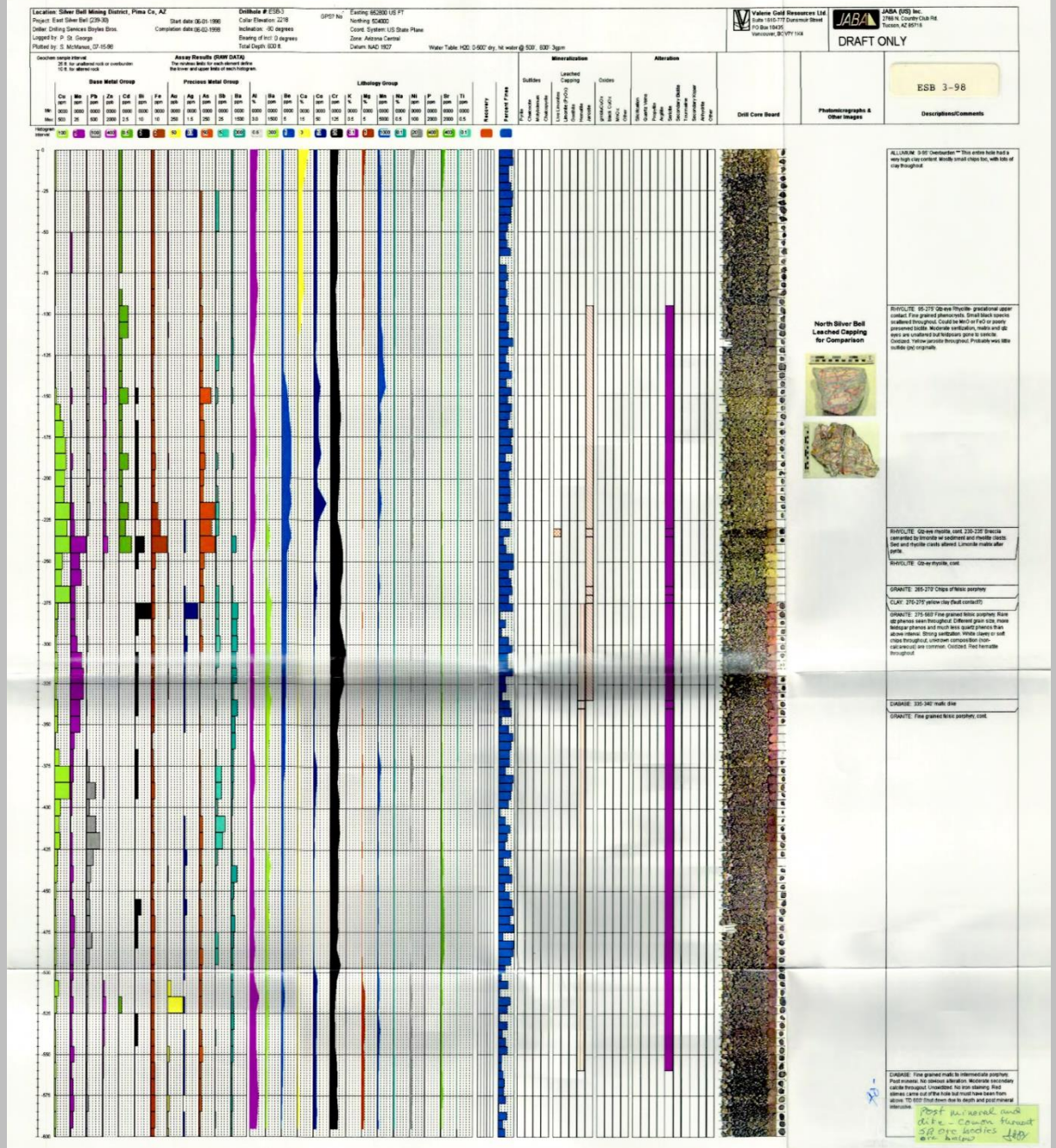


Illustration presented by Dr. Spencer Titley and some of his students. This principle of chalcocite enrichment has been known for many decades, but apparently not by all; a good illustration of what is going on at the East Silverbell Project. A large diameter diamond core drilling project will clarify inconstancies present in the rotary drilling, which indicate copper blanket enrichment but with problematic accuracy.

If we can get rid of the Ironwood Forest National Monument, we can go back to proving exploitable copper deposits by modern means, in the Silverbell mineral zone, and perhaps elsewhere in the current national monument boundary.

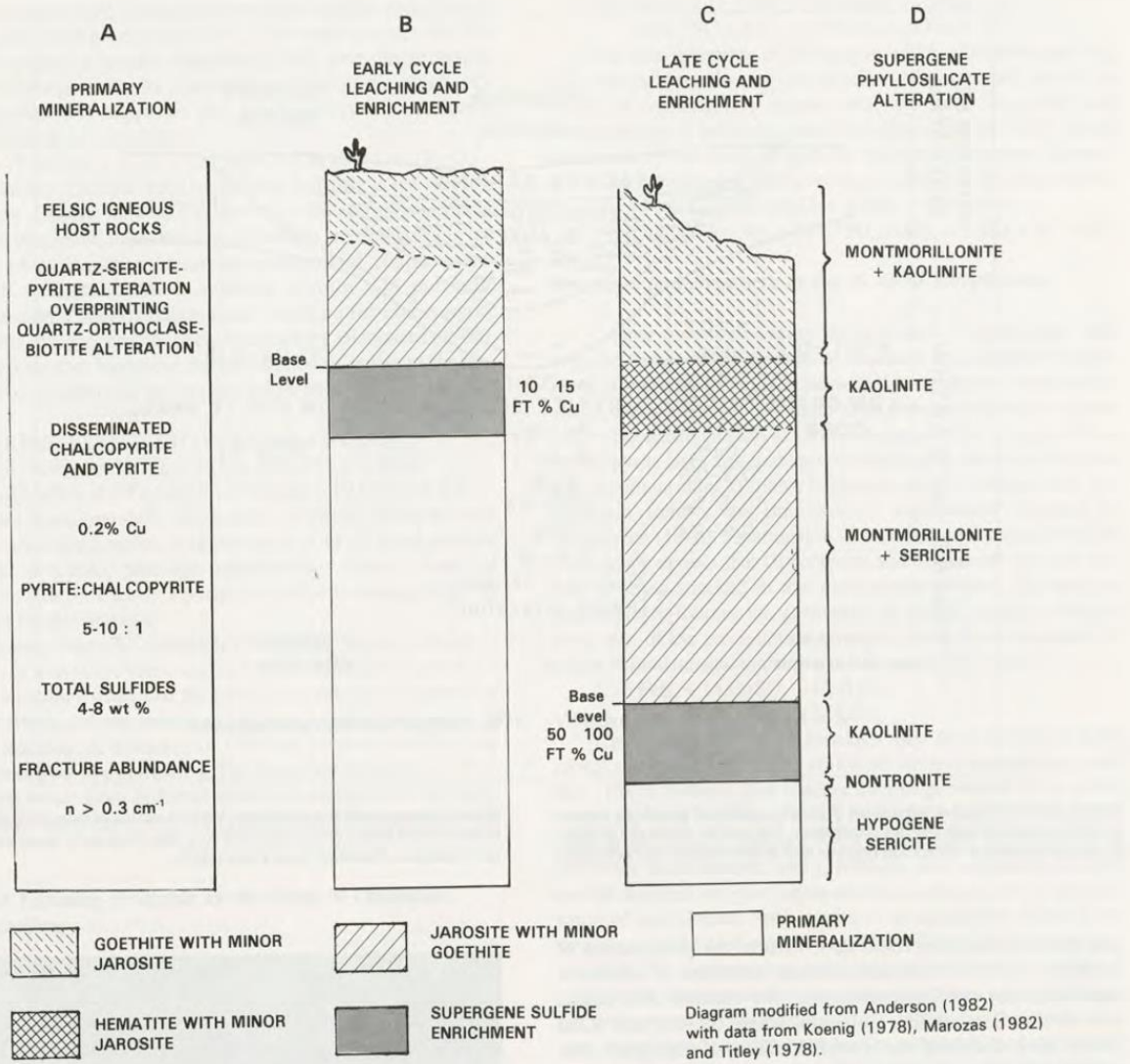


Figure 1. Generalized vertical sections showing relevant characteristics of: (A) a hypogene profile through quartz-sericite-pyrite altered felsic igneous rocks; (B) early stage weathering and development of early cycle enrichment; and (C) late cycle enrichment. Column D shows locations of principal phyllosilicate alteration phases across the profiles. Profiles B and C show the position of early and late supergene blankets with weathering of the first. Data are generalized from the authors' observations, mineralogical data of Koenig (1980), a study at North San Xavier deposit, and the study of Marozas (1982) at Silver Bell. No specific vertical scale is implied. Such profiles may range from 50 meters to several hundreds of meters in thickness.

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