CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

OLD YUMA,
PIMA CO
(NOW IN SAGUARO NAT'L PARK)

BUREAU
OF
LAND MANAGEMENT

VALIDITY EXAMINATION OF THE
COMET 1-5 AND 8-11
AND
OLD YUMA #1-#5 AND #8-#11
LODE MINING CLAIMS
AND THE
OLD YUMA PLACER MINING CLAIM

UNITED STATES
DEPARTMENT OF THE INTERIOR

Bradley K Flint
Chief Appraiser, Land Resource Program Center
Intermountain Region
National Park Service
P.O. Box 728 Santa Fe, NM 87505
Email: Bradley_Flint@nps.gov

http://www.nps.gov/sagu/mineral.htm

Form 3060-1
(July 1984)
(formerly 3980-1)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial Number

MINERAL REPORT

VALIDITY EXAMINATION OF THE
COMET 1-5 AND 8-11
AND
OLD YUMA #1-#5 AND #8-#11
LODE MINING CLAIMS
AND THE
OLD YUMA PLACER MINING CLAIM

(Title)

LANDS INVOLVED

SE¼ Section 9 T13S R12E
Gila and Salt River Base Meridian
Pima County, Arizona
Containing 160 Acres, More or Less

BUREAU OF LAND MANAGEMENT CERTIFIED Burrett W. Clay REVIEW 001 MINERAL EXAMINER U.S. DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT CERTIFIED Sidney L. Covington 0072 MINERAL EXAMINER U.S. DEPARTMENT OF THE INTERIOR

Prepared By:

(Signature)	(Signature)	(Signature)
Burrett Clay	Larry Thrasher	Sidney Covington
(Name)	(Name)	(Name)
Geologist	Geologist	Geologist
(Title)	(Title)	(Title)
March 18, 1993	March 18, 1993	March 16, 1993
(Date)	(Date)	(Date)

Technical Approval:

(Signature)

Matthew W. Shumaker

(Name)

Geologist (AZ RG 22228)

(Title)

3/18/93

(Date)

BUREAU OF LAND MANAGEMENT CERTIFIED Matthew W. Shumaker REVIEW 028 MINERAL EXAMINER U.S. DEPARTMENT OF THE INTERIOR

Management Acknowledgement:

(Signature)

(Name)

(Title)

(Date)

Table of Contents

SUMMARY

The SE1/4 of Section 9, T.13S. R.12E. Gila and Salt River Base Meridian, contains 2 groups of lode mining claims; the Comets 1-5 and 8-11 and the Old Yuma #'s 1-5 and 8-11, and one placer mining claim, the Old Yuma. The Comet lode mining claims have been top filed by the Old Yuma lode mining claims. The mining claim boundaries and numbers correspond exactly. As an example the Comet 1 lode mining claim encompasses exactly the same ground as the Old Yuma #1 lode mining claim. The Old Yuma placer mining claim encompasses approximately the same ground as the northern half of the Comet 1/Old Yuma #1 and the Comet 2/Old Yuma #2 (see Figure 5).

ONLY PART OF OLD YUMA PLACER IS VALID (ON TOP OF COMET #1)

Our economic evaluation of these mining claims determined that it would cost about $473,000 to capitalize a mining and milling operation on this property. Of this amount, $227,000 could be recouped through sale of the capitalized equipment at the close of the operations. The remaining approximately $246,000 would be spread over the 20,000 tons of ore at a rate of about $12 per ton. The operating costs are about $42 per ton for a total expenditure of about $54 per ton. The net smelter return for the ore from Breccia Zone 2, on the Comet 1/Old Yuma #1, is about $82 per ton. This gives a profit of approximately $28 per ton. State and Federal taxes will total about $14 per ton leaving the claimants a profit, after taxes, of about $14 per ton or $280,000 for the underground operation. None of the other lode mining claims have values in excess of the $42 operating costs.

The only other mining claim to contain a discovery is the Old Yuma placer mining claim. Since the milling operation can be capitalized by the underground mine, the mill tailings need only pay the operating costs of $17 per ton to mill, $4 per ton for mining and tailings disposal and the $2 per ton transportation costs for a total cost of about $23 per ton. With 84% of their value being recoverable they have a net smelter return of $43 per ton for a profit of $20 per ton. State and Federal taxes will total about $9 per ton leaving the claimants a profit, after taxes, of about $11 per ton or $77,000 for the placer operation. Due to the distribution of the old mill tailings, only the west half of the mining claim is mineral in character, the NW1/4 NW1/4 SE1/4, Sec 9, T.13S., R.12E..

In summary, the following mining claims contain a discovery:

- Comet 1 lode mining claim
- Old Yuma #1 lode mining claim
- Old Yuma placer mining claim (the west half)

All three of these mining claims cover approximately the same area. The total number of acres contained in mining claims with discoveries is about 22.

TOTAL PROFIT UF + TAILS = $357,000

20K TONS U.G. ORE COMET #1 (BX. ZONE #2)

$12/TON CAP COSTS
$42/TON OPER COSTS
− $54 TOTAL COSTS
+ $82 NSR
$28 PROFIT (GROSS)
LESS TAXES (STATE + FED) −14
$14 NET PROFIT
⇒ $280K

OLD YUMA PLACER ≈ 7,000 TONS
TAILS — NO CAP; USE U.G. PLANT
$17/TON MILLING
$4/TON DISPOSAL
$2/TON TRANS. COSTS
− $21/TON COSTS
+ $43/TON NSR
$20/TON GROSS
− 9 TAXES
NET ⇒ $77K

84% RECOVERY

The following mining claims do not contain a discovery:

Comet's 2 through 5 and 8 through 11 lode mining claims
Old Yuma #'s 2 through 5 and 8 through 11 lode mining claims

In addition, the BLM Mining Claim Recordation case file shows that Star Lite Industries (owner of the Old Yuma lode mining claims) has performed geologic mapping and sampling as their assessment work for the past four years. This is in excess of the 2 consecutive years permitted by regulation.

We recommend that a contest for of lack of discovery be brought against the Comet 2 through 5, the Comet 8 through 11, the Old Yuma #2 through #5, the Old Yuma #8 through #11, and the east half of the Old Yuma placer mining claim.

We also recommend that contest for failure to do qualifying assessment work be brought against the Old Yuma #1 through #5 and the Old Yuma #8 through #11.

RICHARD A. BIDEAUX
710 W. BANGALOR DR.
ORO VALLEY, AZ 85737
(520) 297-4862

INTRODUCTION

Purpose

The purpose of this report is to document the validity examination of all mining claims located in the southeast quarter of Sec. 9, T.13S. R.12E. (Gila and Salt River Base Meridian). There are two sets of lode mining claims and one placer mining claim all associated with the Old Yuma Mine, located about 12 miles northwest of Tucson, Arizona. One claimant, the Arizona Exploring and Mining Company, Inc. of Tucson, has a set of nine lode mining claims the Comet claim group. The second locator, Star Lite Industries, Inc. of Cave Creek, Arizona, also has an identical set of nine lode mining claims, the Old Yuma claim group. The Comet lode mining claims have been top filed by the Old Yuma lode mining claims. The claim boundaries and numbers correspond exactly. As an example the Comet 1 lode mining claim encompasses exactly the same ground as the Old Yuma #1 lode mining claim. In addition, the Arizona Exploring and Mining Company, Inc. of Tucson, located a placer mining claim, the Old Yuma. This placer mining claim encompasses approximately the same ground as the northern half of the Comet 1/Old Yuma #1 and the Comet 2/Old Yuma #2 (see Figure 5). On April 24, 1993 Arizona Exploring and Mining Company, Inc. sold this claim, by quitclaim deed to Old Yuma Mining Company, Inc.. Old Yuma Mining Company, Inc. is owned by the same group as Arizona Exploring and Mining Company, Inc..

BIDEAUX ?

JUMPERS

PLACER ONLY HELD BY OLD YUMA MINING

This report should not be used for any purposes other than that for which it was originally intended.

Brief History of the Case

The National Park Service (NPS) became concerned about possible mining activities on the Comet mining claims when a plan of operations was submitted to the Bureau of Land Management (BLM) by Arizona Exploring and Mining on November 5, 1990. The plan of operations called for "underground drifting and stoping for exploration and development of potential reserves." The estimated mine life was five years. Although not stated in the plan, the claimant has also said that the tailings stacked on the Old Yuma placer mining claim would be processed by cyanide leaching to recover gold values.

The proximity of the claims and the Old Yuma mine workings to the boundary of the Tucson Mountain Unit of Saguaro National Monument is the cause of concern to the National Park Service. The Arizona State Director, Bureau of Land Management, requested that a validity examination be performed on the claims with the assistance of the Park Service.

A certified letter dated February 28, 1992 was sent to Mr. Richard A. Bideaux, President of Arizona Exploring and Mining Company, notifying him of the validity examination and providing him the opportunity to be present for the examination to point out discovery points, sampling sites, and any other pertinent features of the claims. A similar certified letter was sent to Star Lite Industries on April 6, 1992. Mr. Bideaux expressed interest in participating in the exam, but we never received a reply from Star Lite Industries.

The initial examination of the mining claims took place the week of April 27 - May 1, 1992. On the morning of April 27, Certified Mineral Examiners Burrett Clay (BLM) and Sidney Covington (NPS), assisted by District Geologist, Larry Thrasher, BLM Safford (Arizona) District, met with Mr. Bideaux and geologist and Vice-President of Arizona Exploring and Mining Joe Shearer at an office in Tucson. This meeting lasted most of the morning. On the afternoon of April 27, the examiners met Mr. Shearer at the mine site for a general tour of the western portion of the claim group.

There was an issue of access. An access road through the Saguaro National Monument was closed and reclaimed several years ago and access to the claims for mining purposes was not allowed through the park. Other access routes are across private land. Mr. Bideaux has been denied access from the east across the Wolfswinkel (Continental Services Corp.) property and from the north across the Phillips and Lefler properties. The examiners were provided access across the Lefler property through a locked gate. It is not known what route Mr. Shearer and Mr. Bideaux used to access the claims.

BIDEAUX COMES IN FROM SOUTH?

On Tuesday, April 28, Mr. Shearer and Mr. Bideaux met us at the workings on the Comet 8 lode claim also known as the Copper Kettle prospect. Mr. Bideaux left after a few hours; Joe Shearer was present on April 28 when we mapped and sampled the main working on the Copper Kettle and on April 29 and 30 during the sampling and mapping of the Old Yuma Mine (the Comet 1 claim). On May 1 in the absence of Mr. Bideaux and Mr. Shearer, the examiners sampled the tailings on the Old Yuma placer claim.

There was not enough time during the initial examination to complete the sampling and surface mapping of the remaining claims. Examiners Clay and Covington, therefore, returned to the field July 27-31, 1992 to map the major geologic structures and to complete the sampling program. Additional underground mapping was conducted by Clay and Thrasher on Feb. 3, 1993.

LANDS INVOLVED

Land Status

The Mining claims are located on an isolated parcel of public lands. The legal description of this parcel is as follows:

SE1/4, Section 9, T.13S., R.12E.
Gila and Salt River Basin Meridian
Containing 160 acres, more or less

The parcel is surrounded by the Saguaro National Monument to the west, state land to the south, and private lands to the east and north.

Other than the mining claims, BLM records show no other encumbrances on the parcel, such as rights-of-ways, mineral leases, or mineral materials disposal sites.

The land was segregated from Mineral entry on May 11, 1990, by a Notice of Realty Action.

Claim Data

The mining claims owned by Arizona Exploring and Mining are as follows:

Claim Name	Type	BLM Serial Number	Location Date
Comet 1	Lode	276660	Sept. 1, 1987
Comet 2	Lode	276661	Sept. 1, 1987
Comet 3	Lode	276662	Sept. 1, 1987
Comet 4	Lode	276663	Sept. 1, 1987
Comet 5	Lode	276664	Sept. 1, 1987
Comet 8	Lode	276665	Sept. 1, 1987
Comet 9	Lode	276666	Sept. 1, 1987
Comet 10	Lode	276667	Sept. 1, 1987
Comet 11	Lode	276668	Sept. 1, 1987

The specific location of each of the claims is shown on our geological map of the claim group, Figure 5.

The mining claim owned by the Old Yuma Mining Company, Inc. is the Old Yuma placer mining claim, BLM Serial No. 282988, located April 1, 1988.

The mining claims (all lode) owned by Star Lite Industries are located exactly over the lode claims of Arizona Exploring and

Mining with corresponding numbers, only the names are different. These claims are:

Name	BLM Serial Number	Location Date
Old Yuma #1	278389	December 31, 1987
Old Yuma #2	278390	December 31, 1987
Old Yuma #3	278391	December 31, 1987
Old Yuma #4	278392	December 31, 1987
Old Yuma #5	278393	December 31, 1987
Old Yuma #8	278394	December 31, 1987
Old Yuma #9	278395	December 31, 1987
Old Yuma #10	278396	December 31, 1987
Old Yuma #11	278397	December 31, 1987

In order to prevent unnecessary confusion in the report we usually refer to a claim only by the name from the Comet group. As an example we would identify a pit as being on the Comet 2, rather than being on the Comet 2 and Old Yuma #2. The exception to this rule is the Old Yuma placer, since there is only one.

PHYSIOGRAPHIC DATA

Location and Access

The claims are located in the northern end of the Tucson Mountains, about 9 miles by road northwest of the Tucson city limits (see Figure 1). The claims are located in Pima County in the southeast quarter of Section 9 - Township 13 South - Range 12 East (Gila and Salt River Base Meridian). Access from Tucson is Interstate Highway 10 north to Ina Road, west on Ina Road, south on Wade Road, west on Picture Rocks Road, and then south and west for about one mile on a dirt road that leads to the Old Yuma mine. Figure 2 is a portion of the Jaynes 7.5 minute quadrangle map published by the U.S. Geological Survey showing the access to the claim site, and roads in the vicinity. As shown on Figure 2, the only other access road into the claim group is a dirt road in the east portion of the group.

Climate and Vegetation

The claim group is in typical Sonoran desert country. Daytime highs commonly reach 110 degrees Fahrenheit in the summer and about 75 degrees in the winter. Night-time temperatures are relatively cool, although they only rarely reach the freezing point in the winter. Precipitation averages about 12 inches per year, with most occurring in the form of brief, intense thunderstorms during the summer and relatively long duration, gentle storms during the winter. The vegetation is characterized

by palo verde trees, brittle bush, mesquite, creosote bush, ocotillo, and prickly pear, barrel, and saguaro cacti.

Cultural Resources

A cultural resources inventory was conducted on 32 acres of the claim group by two BLM archaeologists on August 14, 1991. This inventory included two possible access roads within the claim group, as proposed by Arizona Exploring and Mining in their mining plan of November 5, 1990. The locations of the inventory are shown on Figure 3. One site consisting of pottery shards and lithic scatter was found, as well as three isolated artifacts. None were determined to be eligible for the National Register of Historic Places. The most significant cultural resources found in the general vicinity are pictographs located about one-half mile north of the claim group.

General Topography

The topography of the area is shown on Figure 2. As shown, the topography on the claim group is rough, with elevations ranging from 2400 feet to over 2700 feet. The hills trend west-northwest and the stream beds, all dry except after precipitation, drain to the north and east. The Tucson Mountains as a whole are relatively low, jagged and strongly dissected. Jenkins and Wilkins (1920) wrote of the mountains, "Their outline against the sky is so jagged and tooth-like that the effect is almost uncanny." This mountain range, part of the southern portion of the Basin and Range Physiographic Province, is about 23 miles long, up to seven miles wide, and trends about north 20 degrees west (Mayo, 1968).

GEOLOGIC SETTING

Like virtually all of the mountain ranges of the southern Basin and Range province, the geology of the Tucson Mountains is complex and variable. Keith (1984) described the rocks of the range as consisting mostly of Mesozoic redbeds and arkose (mostly sandstone with some siltstone, shale and conglomerate) intermixed with numerous extrusive and intrusive igneous rocks. The extrusive rocks consist mostly of rhyolite with lesser amounts of andesite and basalt, and the intrusive rocks consist mostly of granite grading to quartz monzonite. Less extensive outcrops of schist, quartzite, and limestone also occur; some of the limestone occurs as exotic blocks found in intrusives, extrusives, and breccias. The sedimentary and metamorphic rocks are mostly Precambrian to Paleozoic in age (Keith, 1984), and the igneous rocks are mostly of late Mesozoic (Cretaceous) age, with many igneous rocks formed during the Laramide orogeny (Mayo, 1968). Keith (1984) wrote of the mountains, "In the Tertiary and Quaternary there appears to have been additional uplift, erosion,

volcanism, and intrusions, as well as block faulting, to present a complex geological setting still not fully understood."

A geologic map of the northern Tucson mountains, as compiled by Knight (1967), showing the area of the Comet claims, is included herein as Figure 4. As shown, the area of the Comet claim group is covered by a rock unit referred to by Knight as "post Cat Mountain Cretaceous rocks". Some of these rocks consist of an andesite that previous workers had considered to be a part of the Cat Mountain Rhyolite Formation. Knight designated this andesite as the Old Yuma andesite, which he said is at least 2000 feet thick. The formation consists of reddish brown to reddish purple andesitic rocks, with flows occurring mostly in the lower part of the formation and grayish-purple porphyritic tuff and agglomerate common in the upper part.

Knight (1967) mapped three sets of faults in the northern Tucson Mountains, one set trending north, one trending northwest, and the most conspicuous set trending northeast. Apparent cross-cutting relations suggested to him that the northeast striking faults are the youngest and the north striking faults are the oldest. Knight stated that the north trending faults are right lateral and that the northeast faults, based on an examination of the northeast striking Old Yuma fault are dip slip (normal) faults with net slips of well over 1000 feet. Knight reported that a previous worker found that the northeast faults do not penetrate nearby Tertiary rocks, suggesting a Laramide (late Cretaceous) age for these faults.

As discussed by Knight (1967), the bedding and foliation in the rocks in the northern Tucson Mountains dip strongly to the north, suggesting the northern side of a collapsed dome; Knight found the results of his thesis seemed to strengthen this concept. He speculated that the dome formed by the emplacement of a pluton either during or after the eruption of the Old Yuma andesite, and the subsequent withdrawal of the pluton caused the dome to collapse. Knight wrote, " . . . in a collapse structure such as this, where normal faulting dominates, . . . the northeast-striking faults may be the oldest ones and the other faults are the result of breaking up of fault blocks between northeast-striking faults. . . . Many of the northwest and north striking faults may have formed by such secondary stresses."

Knight (1967) noted that the fault zones which include the Old Yuma fault provided easy access for either later or contemporaneous intrusions of latite and andesite porphyry.

SITE GEOLOGY

The rock outcrops on the north and western sides of the claim group generally consist of a reddish brown to medium grey andesite porphyry. It appears to be consistent with Knight's description of the Old Yuma Andesite. It is vesicular and generally massive, although some well developed flow structures were seen on the west side of the Comet 3 and 4 claims. Other flow structures, as well as the type and color of the rocks, would suggest they occur in the lower part of Knight's Old Yuma andesite.

The remainder of the claim group can best be described as being covered by undifferentiated volcanics. We observed a number of small flow structures in rocks that appear, in hand specimen, to grade from rhyolite to andesite. Some of these flows contained fragments of the underlying rocks as inclusions. There was even one flow on the Comet 10 that appeared to be a lahar. None of these formations appeared to have any effect on the mineralization. That was, in all cases, related to the fault structures.

Three major fault lines are shown on our geologic map of the claims, Figure 5. These faults tend to be marked by ridges where the breccia has been cemented by silica bearing fluids making the zone more resistant than the surrounding rocks. These faults, especially the Old Yuma fault, have created brecciated shear zones up to about 40 feet thick that show varying degrees of mineralization. This mineralization is strongest in the area of the Old Yuma mine (Comet 1).

The geology of the Comet 1 mining claim was observed underground on the 65, 100, and 200 levels of the Old Yuma mine. Geologic maps of these workings are shown as Figures 6 - 8.

The Old Yuma mine is located on the Old Yuma fault. The fault, in the area of the primary mine workings is a well brecciated shear zone in an andesite porphyry. As shown on Figure 9 we divided the shear zone of the Old Yuma into three separate breccia zones. Evidently, the shear zone has undergone several episodes of shearing and subsequent mineralization. Different episodes have provided different degrees of cementation and types and amounts of mineralization.

Breccia zone 1 is the upper, and generally the thickest (about 20 feet), of the three zones. It is the zone that is generally the least well cemented. It has the most vugs and fracture space and is the primary source of the high value specimen grade wulfenite and vanadinite crystals. It is clearly exposed on the east side of the 200 level, and in the glory hole.

BX SHEAR IN ANDESITE — MULTI EPISODES

UPPER BX (BX 1) MOST VUGS

20'

BX 2

(ADJACENT?)

8'

(ADJACENT?)

BX 3

7'

Breccia zone 2 is a siliceous, well cemented andesite porphyry breccia. It varies in thickness between 6 and 12 feet with an average of about 8 feet. This zone has the highest gold values and contains the least number of wulfenite and vanadinite crystals. The main incline of the mine, dipping at 43 degrees, is driven in the more competent zone 2 for most of its length but it flattens out at the bottom into zone 1.

$Pb_5(VO_4)_3Cl$

Breccia zone 3 is highly fractured and poorly cemented. It is between 6 and 8 feet thick. It contains some wulfenite and vanadinite crystals, but not as many as breccia zone 1.

RED, WELL-FORMED VANADINITE XTLS ON WALLS

The minerals seen underground include wulfenite, vanadinite, mimetite, galena, specular hematite, calcite, anglesite, cerussite and quartz. Often walls were covered with patches of small bright red well formed vanadinite crystals. Yellow to orange wulfenite crystals generally broken or poorly developed occurred as individuals or in small clusters. Perfectly formed wulfenite crystals were rare. On two occasions, during our examination, a fracture would be opened a little and a number of well formed individual wulfenite crystals would be found. On both occasions, about 15 to 20 small (about one-sixteenth to one-eighth of an inch wide) but well formed crystals were found.

YELLOW-ORANGE WULFENITE (NOT WELL FORMED) ON WALLS; GOOD XTLS IN POCKETS

$PbMoO_4$

The only other notable occurrence of wulfenite crystals was on the Comet 8 mining claim at the Copper Kettle prospect (see Figure 10). The Copper Kettle prospect is also found on a shear zone in andesite. The zone is well brecciated and quite thick. The zone is not as well mineralized as the Old Yuma fault. The wulfenite crystals occurring there are small and usually poorly developed.

MINING HISTORY

Mining History of the Area

The area in and around the Tucson Mountains comprises the Amole mining district, one of the first such districts established in Arizona. Keith (1984) wrote,

> Prospecting for mineral in the Tucson Mountains probably dates back to the founding of the San Xavier Mission in the late 1600's and was intensified after the establishment of the Spanish settlement at Tucson in the early 1770's. Small and scattered surface deposits were crudely worked for precious metals by the Spaniards, Mexicans, and early Americans.

Keith (1984) reported that metalliferous mineralization in the district is generally related to Laramide and Tertiary igneous intrusions, as such mineralization generally occurs around stocks, plugs, and dikes. Most of these mineralized deposits, according to Keith, "were too limited in size or too low in grade

to be worked economically except for periods of high metal prices." Keith noted that there are several hundred small mines and prospects scattered around the district, most with little if any production. Most of this work occurred from around the turn of the century up to about 1960. The deposits, according to Keith,

> . . . are mainly scattered, generally narrow, quartz veins or lenses with sulfides; small, irregular replacement sulfide bodies in limestone lenses or exotic limestone blocks; and weak dissemination of sulfides in the intrusives. The major economic product of the district has been limestone for cement manufacture. Some basaltic andesite and rhyolite tuff has been used for construction purposes and a small amount of clay has been extracted.

The Amole district has not been a major metal producer. Keith (1984) estimated that, as of 1972, metallic production from the district comprises 34,000 short tons of ore, producing 529,000 pounds of copper, 670,000 pounds of lead, 375,000 pounds of zinc, 17 tons of molybdenum, 27,200 ounces of silver, and 1,010 ounces of gold for an estimated total worth of $289,000 (1972 prices). There has also been about 12 million tons of limestone produced, and about 17,000 tons of silica smelter flux.

SMALL PRODUCER

AMOLE DIST

34,000 TONS ORE

Cu, Pb, Zn, Ag, Ag, Mo, + LS + SiO_2 FLUX

Mining History of the Lands Involved

The Old Yuma mine is the only working on the Comet claim group to have had past production; and has been the largest metal producer of any mine in the Amole district. This mine has produced a significant portion of the silver, lead, and copper taken from the district, and all the molybdenum (Keith, 1984). The mine has also produced gold and vanadium (Jones, 1983). Mining activity occurred sporadically from the late 1800's to 1954 (Jones).

According to Jones (1983), the deposit was first claimed in 1885, by a C.C. Stephens, who gave the mine its name. Jones (1983) wrote, "The Old Yuma claim was originally filed for gold, but the presence of abundant vanadinite [lead vanadate chloride - $Pb_5(VO_4)_3Cl$], wulfenite [lead molybdate - $PbMoO_4$] and some galena [lead sulfide - PbS] suggested the possibility of producing vanadium, molybdenum, lead and perhaps silver as well."

The main (west) shaft for the mine was sunk around 1913, and a mill was built on site about 1916 for the concentration of gold, molybdenum, and vanadium. Molybdenum was produced during 1917, when the price for the metal was unusually high due to the war. Ownership of the mine changed hands several times. By the 1930's it was owned by the Yuma Mining Company which, through their lessee, "occasionally produced dump ore and surface material from the late 1930's to 1954" (Jones, 1983). Since that time, the mine changed hands a few more times but activity has been limited

WWI

ONLY LITTLE WORK SINCE 1930 → 54

SINCE 1954 ONLY SPECIMEN COLLECTING

to mineral specimen collecting, mostly for wulfenite and vanadinite crystals. The Old Yuma mine has been a world class source of wulfenite and vanadinite crystals. Specimens from this mine are currently on display in such places as the Tucson International Airport, the Arizona Sonora Desert Museum and the Smithsonian Institute in Washington D.C. Color photographs of some of the prize specimens from the mine are in Attachment 1.

The mill was capable of handling 100 tons of ore per day (Jones, 1983). We were unable to locate any accurate records showing how much of each commodity was produced. The crusher and concentrating plant associated with the mill, as well as all other buildings associated with the mine, are completely gone. Only scattered concrete foundation blocks remain on the site.

The other minor workings on the Comet claim group are all shallow trenches, pits, and short shafts. There appears to be no record of exactly who excavated these prospects or when.

MINERAL DEPOSITS

Lode Deposits

As discussed, the mineralized body of the Old Yuma lode occurs as a brecciated andesitic rock occupying the shear zone of the Old Yuma fault. As shown on Figures 4 and 5, this zone strikes east-northeast and dips about 43 degrees southeast. Keith (1984) described the geology of the mine as "Partly oxidized base metal sulfides with spotty wulfenite and vanadinite, and quartz and calcite gangue, in a steeply dipping, lensing, and faulted ore body along a fracture zone cutting Cretaceous andesite and associated with a Laramide porphyritic intrusive."

Jones (1983) reported that the wulfenite and vanadinite crystals occur in the upper, oxidized portion of the vein. Jones (1983) stated that the lead in the wulfenite and vanadinite came from scattered pods of argentiferous galena being altered to anglesite (lead sulfate - $PbSO_4$) and cerussite (lead carbonate - $PbCO_3$), and that the molybdenum and vanadium "were most likely supplied to the deposit by groundwater which had dissolved the metals from weathering igneous rocks." He stated that the wulfenite and vanadinite "will precipitate when solutions bearing molybdenum, vanadium, and chlorine encounter a weathering lead deposit."

XTLS IN UPPER, OXIDIZED PART OF VN.

Our observation was that the crystals occurred most commonly in the upper breccia zone (breccia zone 1) in conjunction with the crossfaults, fractures and associated vugs. The crystals also occurred along fracture walls and in vugs in zones 2 and 3. Arsenic commonly replaces the vanadium in vanadinite; a partial replacement changes the mineral to the variety endlichite, which

43°

RED VANADINITE $Pb_5(VO_4)_3Cl$ → w/ As YELLOW ENDLICHITE $\xrightarrow{\text{TOTAL As}}$ MIMETITE $Pb_5(AsO_4)_3Cl$ COLORLESS TO YL-BROWN TO ORANGE

has a yellow color, and a complete replacement changes it to mimetite [lead arsenate chloride - $Pb_5(AsO_4)_3Cl$], which has a colorless to yellow-brown or orange color (Hurlbut, 1970; Mottana, et al., 1977). This replacement has evidently occurred to a degree at the Old Yuma mine, as yellowish to orange crystals were seen mixed in with the bright red crystals of vanadinite.

ZONING
WULFENITE — VANAD.
WEST EAST

We also noted that the wulfenite and vanadinite are generally zoned in the mine, with the wulfenite occurring mostly in the western side and vanadinite mostly in the eastern side, with some overlapping in the central portion of the mine (see Figures 6 - 8, underground maps). This segregation has been long known; Jones (1983) cited an old, undated and unsigned report regarding milling that said, "The mixing of all the ores from the mine has been inexcusable - the vanadium and molybdenum occur generally separate and can be mined so, and there should be two bins at the top of the mill."

The gold occurs primarily in breccia zone 2, the more silicified portion of the shear zone. We did not observe any similar consistent relationships with the lead or the silver.

Placer Deposits

The placer deposits of concern, on the Old Yuma placer mining claim, consist of old mill tailings from the Old Yuma Mine. They contain significant gold values. The location of these tailings are shown on our geologic map of the claims (Figure 5). The tailings do not contain free gold, it must be liberated by leaching or crushing the rock. The Old Yuma placer mining claim was located for this tailings deposit.

Alluvial sediments in the dry washes on the claim group are not known to contain values of gold or any other locatable mineral. No other economically viable placer deposits are know to exist or were seen during this examination.

Industrial Minerals

There is no known economic potential for industrial minerals on the parcel in question; such potential has not been recorded in the literature and none were observed in this study.

EXPLORATION AND DEVELOPMENT WORK

The initial workings on the mine were done before the turn of the century. There is a stope from the 200 level to near the surface, which collapsed in 1969, creating the big glory hole. The main inclined shaft for the Old Yuma mine, located on the

edge of the big glory hole, was sunk around 1913, with drifts at the 65, 100, 200, and 300 levels. This shaft, which dips at a 43 degree angle, was originally equipped with a small skip used for transporting miners, equipment, and ore. The mine is completely dry. According to Jones (1983) "The main incline (west shaft) was fully timbered, with ladder giving access to all levels as late as 1948, but was later completely burned out." The mine is currently accessible to the 200 foot level; the incline is filled with rubble below that, cutting off access to the 300 foot level. The ladder down the main incline is in very poor shape, with large sections missing.

The west end of the 200 level has had a fire set in it. The draw point is partially burned out and there is a pile of charcoal and ash at the extreme west end of the drift. The back and walls of the drift are coated with a thick layer of soot that conceals the mineralogy in this portion of the mine. We cleaned several small patches of the back and walls sufficient to determine in which portion of the structure the drift was located.

Our maps of the underground workings are shown on Figures 6 - 8. As shown, stopes were developed on the 65, 100, and 200 foot levels, as indicated by the large stopes, with only one stope developed at the 200 level.

We do not know when the east incline was sunk. This incline was not accessible for this investigation due to dangerous conditions.

There are several small exploration workings on the claim group, the largest by far being the Copper Kettle prospect (Comet 8). As shown on Figure 10, this prospect consists of a small adit and a shaft about 30 feet deep. Most of the rest of the smaller workings are less than 20 feet deep. Attachment 2 contains descriptions of a representative number of these workings.

MINING, MILLING AND RELATED OPERATIONS

There are currently no mining or milling operations being conducted on the subject parcel. The claimants have proposed several different mining operations including a heap leach for the old mill tailings pile. In order to evaluate this property we have prepared an operation plan for mining of the vein and surface deposits and processing the ore by conventional flotation methods.

CLAIMANTS THINKING ABOUT PROCESSING THE TAILS

Access:

Access to the property poses a problem, and an additional expense, for the claimants. The National Park Service has denied the claimants access to their claims across the National

Monument. The surrounding private land owners have denied them access across their properties. The claimants will have to condemn access under Arizona state law (see attachment 3 Title 12 Section 12-1202, Right to a private way of necessity) to reach their property . The legal cost for this should be between $5,000 and $10,000 according to the law firm of Stubbs and Schubart in Tucson, Arizona.

The cost of the right of way thus condemned is at fair market value, which in the Tucson area runs about $3,000 per acre, or about $6,000 per mile for an 18 foot wide easement (Nowell, 1993). The most logical access would require condemning just under a mile of easement (see Figure 2). This cost, including the associated legal fees, are shown on attachment 4.1 as Cost of Access - $16,000. In addition a water pipeline would be laid along this access route.

The claimants would need to construct about one mile of road, half of it on the easement and half on the claim group. The estimated cost to construct it including the drainage crossings is $3,100. The detail of this cost is found in attachment 4. Rather than construct permanent crossings on the main drainage we have assumed the use of aircraft landing mats for the soft sand crossings.

Rather than rent a bulldozer, we assumed the purchase of a used one that would be sold when the operation is over. The cost to purchase a used Caterpillar D6d is estimated at $15,000.

Mining operation

The mine was previously operated by shrinkage stoping. The 200 level has draw points already prepared, and one stope has been blasted and mined. The rubble of breccia zone one has collapsed into the void forming the big glory hole on the surface.

We prepared a cost estimate for mining using open stull stoping, which is summarized in the Economic Evaluation section and detailed in Attachment 4. The proposed operation would be conducted by drifting in to the east end of the 200 level from the surface on the north side of the ridge to provide haulage access. The west end of the 200 level would be extended about fifty feet toward the sideline of the claim. This drifting would cost about $48 per foot (see Attachment 4).

Other pre-production work needed includes refurbishing the main incline. The work on the main incline includes replacing the ladder and stabilizing the back with timbering and rock bolts and mats at an estimated cost of about $5,900.

The ore body would then be mined in a series of stopes starting at the west end and then working east. Drilling would be with

air leg (jack leg) drills. Blasting would be with 60% gel at a rate of 0.5 pounds per ton. In those instances where the broken ore does not fall to the draw points by gravity a small slusher would be used. Stulls with lagging between them will be placed in the stope to support the drillers while drilling the next round. Rock bolts and mats would assist the stulls in stabilizing the back. The estimated cost per ton for stoping is about $20 (see attachment 4 for details).

A LHD (Load-Haul-Dump), with a 2 cu.yd. bucket, would be used to muck out the ore and carry it to the broken ore stockpile. The round trip distance is about 1800 feet for the farthest draw point and about 1000 feet to the closest draw point. This gives an average round trip distance of about 1400 feet. The LHD's average speed is 6 mph and the load, spot and dump time is 1.1 min. It can make the round trip in about 4 minutes. This translates to a haul rate of about 70 tons per hour at a cost of about 65 cents per ton. The cost to purchase a LHD is approximately $61,000. The LHD will also be used, in combination with the D6d, to transport the tailings to the mill.

After mining, the stopes would be backfilled with a tailings slurry containing about 3% portland cement. This serves several purposes. First, it provides a place to dispose of the tailings. Second, it fills in the open stopes to assist in the eventual reclamation of the site. Third it stabilizes the stopes and once the cement has set the operator can go back in and pull the pillars between the stopes. Additionally it helps to stabilize any trace elements remaining in the tails. Since there are already mined out stopes, the claimants can start the backfill process as soon as the mill goes into operation. The estimated cost to backfill the stopes is approximately $3 per ton.

Milling operation

For the milling operation we assumed the use of a 100 ton per day capacity Blue Range portable mill. This is a self contained system mounted on a series of three trailers. It includes its own 250 kW generator for power. Attachment 5 is an example flow sheet for this mill. The estimated cost of the arrangement needed for the proposed operation is $250,000. The estimated power needs for milling are 180 kW. This leaves sufficient reserve generating capacity to operate the mine, including ventilation, air compressor, lights, slurry pump, etc. We also assumed using a small (20kW) gasoline powered generator to operate the mine during the pre-development phase, and when the mill isn't being run.

For processing ore from the underground operation the mill will produce an estimated concentration ratio of 20:1. This is less than the theoretical maximum concentration ratio of about 26:1 based on the mineralogy. The milling operation is estimated to

recover about 85% of the contained metal. The concentrates will be shipped by truck to the railroad (approximately 10 miles) and then by rail to the ASARCO smelter at Helena (approximately 1600 rail miles).

Based on smelter schedules and transportation distances the best choice as a destination for shipping of concentrates is the ASARCO smelter at Helena Montana. This smelter pays for the lead, the precious metals, and 40% of the copper contained in the concentrate. The only deleterious element of concern is arsenic. The smelter will reject any concentrates containing more than 1%, the concentrates from this property will contain about 0.4% arsenic. The net smelter return for the concentrates from this operation is $82 per ton of ore (see attachment 9). The cost to transport the concentrates to Helena is estimated at $41 per ton of concentrate or $2.05 per ton of ore.

>1% PENALTY AT ASARCO HELENA

As

The mill arrangement we have assumed allows for the removal of the heavy fraction after the first grind with a jig. If, during actual operations, a significant portion of the gold can be removed at this point, the flotation may be curtailed with an accompanying savings in costs of approximately $2.00-$3.00 per ton.

CLAIMANTS WANT TO HEAP LEACH THE TAILS

The claimants propose processing the mill tailings with a cyanide heap leach operation. Since the cost of capitalizing a floatation mill is borne by the underground operation and due to the environmental sensitivity of the area we felt it would be more appropriate to process the tailings using the floatation mill. The operating costs for this are approximately $17 per ton. Floatation tests run on the tailings by the claimants indicate that 84% of the gold can be recovered using this method (See Attachment 6 Flotation Test Results).

Ancillary facilities

A settling pond will be constructed in the northeast corner of the Comet 1. It will be 100 ft x 55 ft and average about 10 ft deep. It will hold approx 400,000 gal of water. It will be lined with a 50 mil liner and covered with polypropylene netting to protect wildlife. Three monitoring wells will be installed down gradient of the pond. The estimated cost to construct the settling pond is $11,300. At the close of operations the settling pond will be closed by adding 3%-4% portland cement to the fines then pumping them into the mine with the rest of the tails. The liner will then be hauled to an appropriate dump site and the area will be recontoured, covered with topsoil and reseeded.

A office trailer will be brought in to provide onsite office facilities, a first aid room, restroom facilities, etc.

Crystal mining

There are several options for the mining of the wulfenite and vanadinite crystals as specimens. The best appears to be mining them first, after refurbishing main incline and while access/haulage drift is being driven. It would be to selectively follow main fractures using low velocity explosives and jackleg drilling to carefully open up more of the fault/fractures in breccia zone 1. In addition, if more crystals were noted in the back, during the drilling of the rounds in the stopes, they could be mined at that time.

XTLS IN CONJUNCTION W/ BX ORE FOR FLOTATION

SAMPLING PROCEDURES AND ANALYTICAL WORK

Field work consisted essentially of geologic mapping, using pace and Brunton compass methods, and sampling. Claim corners were well staked and for the most part easy to locate. A portion of the Jaynes 7.5 minute quadrangle map was enlarged to a scale of 1:7200 for use as a base map. An aerial photograph at the scale of 1" = 100' was used to correct minor triangulation errors on the base map.

Samples were taken from the Comet 1 and Comet 8 claims at the locations requested by Mr. Shearer. The sample locations on the remainder of the claims were selected based on the geology, workings, and exposed mineralization. Descriptions and photographs of all sample sites are found in Attachment 7.

All of the samples except Yuma 16, Yuma 17, and the Yuma Dump samples were taken in the following manner. The surface to be sampled was first scaled and cleaned to expose a fresh surface. A plastic tarp was then placed beneath the site to catch the material. A consistent channel three to six inches wide and an inch deep was cut across the structure. The sample was then placed in a heavy gage plastic bag, which was placed in a canvas bag which was sealed with nylon straping tape. The samples were then placed in Burrett Clay's back pack until they returned to the government vehicle in which they were locked until they were taken to Phoenix. Upon return to Phoenix they were locked in a storage cabinet until they were shipped to Bondar-Clegg, Inc. in Sparks, Nevada, for assaying.

Samples Yuma 16 and Yuma 17 were grab samples. They were taken by breaking off the weathered surfaces of the outcrop and then knocking off some unweathered pieces which were then bagged and handled as described above. The Yuma Dump samples were taken as channel samples 6 inches wide and 2 or 3 inches deep, from the highwall of the dump, using a garden trowel and a 6 inch plastic container. The material was placed in plastic 5 gallon buckets and sealed. The samples were then placed directly in the vehicle and then handled as above.

The assays performed on the samples by Bondar-Clegg were fire assays for the gold and silver, and atomic absorption analysis for the remaining elements. The results of those assays are shown in the table below. The assay reports are found in Attachment 11.

SAMPLE NUMBER	Gold OPT**	Silver OPT**	As* %	Copper %	Iron %	Mo* %	V* %	Lead %
YUMA 01	0.039	0.43	0.03	0.30	3.07	0.036	<0.01	1.23
YUMA 02	0.003	0.29	0.06	0.27	3.36	0.056	<0.01	2.04
YUMA 03	<0.002	0.16	0.01	0.08	3.81	0.002	<0.01	0.52
YUMA 04	0.009	0.19	0.01	0.04	8.59	0.018	0.01	1.74
YUMA 05	0.025	0.47	0.04	0.19	10.2	0.001	0.01	2.75
YUMA 06	0.008	0.06	0.03	0.05	13.2	0.002	0.48	4.12
YUMA 07	0.354	0.68	0.02	0.13	8.17	0.046	0.01	3.09
YUMA 08	<0.002	0.05	<0.01	0.01	1.42	0.001	<0.01	0.31
YUMA 09	0.075	0.22	0.02	0.10	8.41	0.029	0.01	2.47
YUMA 10	0.020	0.21	0.01	<0.01	6.21	0.029	0.01	2.32
YUMA 11	0.107	1.60	<0.01	0.02	7.89	0.005	0.01	9.66
YUMA 12	0.003	0.30	0.01	0.01	3.14	0.007	0.05	1.94
YUMA 13	0.026	0.04	0.01	0.01	3.77	0.002	0.03	0.76
YUMA 14	<0.001	<0.02	0.01	<0.01	1.53	0.001	0.01	0.01
YUMA 15	<0.001	<0.02	0.01	<0.01	2.69	0.001	0.01	0.01
YUMA 16	<0.001	<0.02	0.01	<0.01	5.23	0.001	0.01	0.02
YUMA 17	<0.001	0.03	0.01	<0.01	1.99	<0.001	0.01	0.10
YUMA 18	<0.001	0.29	0.02	0.56	6.86	0.001	0.02	0.16
YUMA 19	<0.001	0.18	0.01	2.38	4.93	0.002	0.01	0.24
YUMA DUMP 01	0.137	0.54	0.03	0.18	7.69	0.062	<0.01	2.45
YUMA DUMP 02	0.121	0.52	0.04	0.18	7.24	0.083	<0.01	2.42

* As - Arsenic, Mo - Molybdenum, V - Vanadium
** Troy ounces per short ton (2,000 pounds)

2YR MINE LIFE

ONLY LOSE 28% OF EQUIP ?? /YR ?

ECONOMIC EVALUATION

Our proposed plan calls for a 2 year mine life based on the blocked out reserves. If the operator defines reserves below the 200 level, or on the eastern segment of the structure, the mine life could well be extended. Because the operation is a short term small tonnage operation the equipment will far outlive it. Normal depreciation would be about 14% per year based on a 7 year life. Taking this into consideration we have estimated the salvage value of the capitalized equipment at 65% of the original cost.

Calculation of reserves → RESERVES BASED ON WHAT INFO

We have calculated the reserves based on the volume remaining of breccia zone 2, as this is the portion of the system that contains the high gold values. The tonnage available to be recovered from zone 2, above the 200 level is approximately 22,000 tons. This material has an weighted average gold value of .289 ounces per ton. The weighted average grade for the entire block was calculated using the area of influence method from Parks (1957). For detail of the calculations see Attachment 8. Possible reserves below the 200 level are not included in the reserves calculation nor are they discussed in the economic evaluation.

The mined ore is estimated to contain 10% dilution from breccia zone 1, which will lower the mill feed grade to 0.26 oz/ton gold, 0.56 oz/ton silver, 3.2% lead, and 0.13% copper. The milling process should recover 84% of the contained metals. The concentration ratio is 20:1 so the concentrate shipped should assay 4.4 oz/ton gold, 9.4 oz/ton silver, 54% lead, and 2.1% copper. This produces a net smelter return of $1,600 per ton of concentrate or $82 per ton of ore (see attachment 9).

Pre and post production costs

Capitalized equipment

LHD - 2 cu yd	$ 61,000
Jackleg drills (2)- used	$ 5,000
Compressor - 250 cfm used	$ 2,500
Ventilation Fan - 10,000 cfm	$ 2,000
Blue Range Mill - 100 t/day	$250,000
Cat D6d - used	$ 15,000
Slurry pump - 4" - used	$ 2,100
Gasoline Generator 20kW	$ 5,700
Slusher - used	$ 3,500
Fuel storage tank	$ 900
Office trailer	$ 6,500
TOTAL	$354,200

Access

Legal costs	$10,000
Right of way	$ 6,000
Construction	$ 3,100
TOTAL	$19,100

Site preparation
(including settling pond and mill set up)

Settling pond liner	$ 4,500
Monitor wells	$ 4,500
Wildlife netting	$ 500
Septic tank	$ 2,500
Area lighting	$ 500
Water main - 2"	$ 1,700
Misc. supplies	$ 1,000
Fuel and maint. (D6d)	$ 500
Labor	$ 3,200
TOTAL	$18,900

Mine preparation

Drive access drift	$19,200
200 level extension	$ 2,400
Refurbish main incline	$ 5,900
Slurry line	$13,900
Water & air lines -drill feed	$ 900
Ventilation tubing	$ 1,400
TOTAL	$43,700

Site reclamation
(includes reshape site and respread topsoil)

Reclaim settling pond	$ 1,300
Seed and plants	$ 2,500
Misc. supplies	$ 500
Fuel and Maint. (D6d)	$ 500
Labor	$ 2,800
TOTAL	$ 7,600

Total pre and post production costs includes $22,000 contingency fund	$473,000*
less the salvage value of equipment	$226,000*
	$246,000
Divided by the tons of ore	20,000 tons
Pre/post production costs/ton of ore	$12.29

* Figures are rounded to nearest thousand
All others are rounded to the nearest hundred

Operating costs

Mining costs per ton of ore:

Stoping labor	$14.16
Stoping supplies	$ 5.33
Haulage	$ 0.65
Backfill labor	$ 0.71
Backfill power	$ 0.04
Backfill supplies	$ 2.49
Total	$23.38

Milling costs per ton of ore:

Labor	$ 8.96
Supplies	$ 2.60
Fuel	$ 4.63
Water	$ 0.54
Total	$16.73

Transportation costs per ton of ore:

Truck haulage	$ .40
Rail haulage	$1.60
Transhipment charge	$ .05
Total	$2.05

Total operating costs per ton of ore:

Mining costs	$23.38
Milling costs	$16.73
Transportation	$ 2.05
TOTAL	$42.16

Taxes

State severance tax per ton of ore	$ 1.26
State property tax per ton of ore	$ 1.43
State income tax per ton of ore	$ 1.60
Federal income tax per ton of ore	$ 9.28
TOTAL taxes per ton	$13.57

Summary

Net smelter return per ton of ore	$ 82.46
Subtract:	
Capital Costs per ton of ore	$-12.29
Operating Costs per ton of ore	$-42.16
Taxes per ton of ore	$-13.57
Net Profit per ton of ore	**$ 14.43**

Operating costs - Placer operation

Mining costs per ton of ore:

Haulage labor	$ 0.50
Haulage fuel	$ 0.04
Haulage repairs	$ 0.11
Backfill labor	$ 0.71
Backfill power	$ 0.04
Backfill supplies	$ 2.49
Total	$ 3.89

Milling costs per ton of ore:

Labor	$ 8.96
Supplies	$ 2.60
Fuel	$ 4.63
Water	$ 0.54
Total	$16.73

Transportation costs per ton of ore:

Truck haulage	$ .40
Rail haulage	$1.60
Transhipment charge	$ .05
Total	$2.05

Total operating costs per ton of ore:

Mining costs	$ 3.89
Milling costs	$16.73
Transportation	$ 2.05
TOTAL	$22.67

Taxes

State severance tax per ton of ore	$ 0.53
State property tax per ton of ore	$ 0.57
State income tax per ton of ore	$ 1.14
Federal income tax per ton of ore	$ 6.62
TOTAL taxes per ton	$ 8.86

Summary

Net smelter return per ton of ore	$ 42.81
Subtract:	
Operating Costs per ton of ore	$-22.67
Taxes per ton of ore	$- 8.86
Net Profit per ton of ore	**$ 11.28**

Marketing of Wulfenite and Vanadinite Crystals

It is extremely difficult to evaluate the worth of the mine for specimen grade wulfenite and vanadinite crystals. The value of each specimen is dependent upon several things including size, shape, clarity and number of crystals making up the specimen. First class specimens can sell for over $1,000. The value also depends on whether the crystals are sold wholesale or retail, with retail getting between 2 and 10 times the price of wholesale.

The cheapest wulfenite crystals we were able to find at the Tucson Gem and Mineral show in 1992 were $2.00, and the cheapest vanadinite crystals were about $3.00. We found that a wulfenite crystal about 4 mm on a side attached to a little matrix and placed in a box would bring between $2.00 and $3.50. During the sampling process we kept track of any such specimens we found within the area to be sampled (see Attachment 7).

The market is world wide (see Attachment 10) but the easiest market for the claimants is the Tucson Gem and Mineral show. Mr. Bideaux has had a booth there, selling specimens retail, for many years.

The Old Yuma mine (Comet 1 lode mining claim) is a world class source of wulfenite and vanadinite crystals. People have been collecting them there for many years. Mr. Bideaux has been collecting them from this mine for over 30 years.

The volume and value of the crystals remaining on the claim is impossible to determine from the data available. There may be tens of thousands of dollars worth, or hundreds of thousands of dollars worth.

* Although they did show us a number of good specimens, reportedly from the mine, the claimants were unable to prepare, for our inspection, a pocket of crystals in place. This was due primarily to governments refusal to approve either a plan of operations or a notice of intent. In order for the claimants to expose more crystal pockets they need to do some drilling and blasting to open the fracture zones enough to allow access farther along the faults and expose more vugs and fracture surfaces. They can not use explosives on the claim without the government's approval.

MPO IN PLACE NOW?

Also, because the crystals have such a high unit value, and the locality is so well known by mineral collectors, the claimants need to be able to secure the mine site from unauthorized collectors. To open up a pocket of crystals and leave them exposed without security would almost guarantee the loss of the crystals, a loss that could exceed several hundred dollars.

It is almost a certainty, based on the geology of the property and our observations, that there are more pockets of high value specimen grade crystals on the claim.

CONCLUSIONS

Based on our examination of these claims we have determined that there exists a discovery on the Comet 1/Old Yuma #1 lode mining claim. Our economic evaluation of these mining claims determined that it would cost about $473,000 to capitalize a mining and milling operation on this property. Of this amount, $227,000 could be recouped through sale of the capitalized equipment at the close of the operations. The remaining approximately $246,000 would be spread over the 20,000 tons of ore at a rate of about $12 per ton. The operating costs are about $42 per ton for a total expenditure of about $54 per ton. The net smelter return for the ore from Breccia Zone 2, on the Comet 1/Old Yuma #1, is about $82 per ton. This gives a profit of approximately $28 per ton. State and Federal taxes will total about $14 per ton leaving the claimants a profit, after taxes, of about $14 per ton or $280,000 for the underground operation.

Of the remaining claims the highest assay value was found on the Comet 8. The in place whole rock value of this assay was only $28 per ton. The cost to mine and mill this material would be about $42 per ton with out adding the development costs necessary to prepare the mining operation. This would mean a loss of $14 per ton before including mill loss and dilution which would only exacerbate the loss.

The only other claim to contain a discovery is the Old Yuma placer mining claim. Since the milling operation can be capitalized by the underground mine, the mill tailings need only pay the operating costs of $17 per ton to mill, $4 per ton for mining and tailings disposal and the $2 per ton transportation costs for a total cost of about $23 per ton. With 84% of their value being recoverable they have a Net smelter return of $43 per ton (see attachment 9) for a profit of $20 per ton. State and Federal taxes will total about $9 per ton leaving the claimants a profit, after taxes, of about $11 per ton or $77,000 for the placer operation. Due to the distribution of the old mill tailings, only the west half of the claim is mineral in character, the NW1/4 NW1/4 SE1/4, Sec 9, T.13S., R.12E..

In summary the following claims contain a discovery:

Comet 1 lode
Old Yuma #1 lode
Old Yuma placer (the west half)

The following claims do not contain a discovery:

Comet 2 lode
Comet 3 lode
Comet 4 lode
Comet 5 lode
Comet 8 lode
Comet 9 lode
Comet 10 lode
Comet 11 lode
Old Yuma #2 lode
Old Yuma #3 lode
Old Yuma #4 lode
Old Yuma #5 lode
Old Yuma #8 lode
Old Yuma #9 lode
Old Yuma #10 lode
Old Yuma #11 lode

WHO ARE

In addition the Mining Claim Records case file shows that Star Lite Industries has performed geologic mapping and sampling as their assessment work for the past four years. This is in excess of the 2 consecutive years permitted by regulation.

RECOMMENDATIONS

We recommend recognition of valid existing rights on the Comet 1 lode mining claim, the Old Yuma #1 lode mining claim, and the west half of the Old Yuma placer mining claim.

We recommend that contests be brought against the remaining claims based on the following charges:

1. Minerals have not been found within the limits of the Comet 2 through 5 and the Comet 8 through 11 lode mining claims in sufficient quantities and/or qualities to constitute a discovery of a valuable mineral deposit.

2. Minerals have not been found within the limits of the Old Yuma #2 through #5 and Old Yuma #8 through #11 lode mining claims in sufficient quantities and/or qualities to constitute a discovery of a valuable mineral deposit.

3. The NE1/4 NW1/4 SE1/4, Sec 9, T.13S., R.12E. is nonmineral in character and should be excluded from the Old Yuma placer claim .

4. Star Lite Industries has failed to substantially comply with the requirements to do qualifying annual assessment work on the Old Yuma #1 through #5 and Old Yuma #8 through #11.

SELECTED REFERENCES

Caterpillar Performance Handbook 22nd edition, 1991: Caterpillar Inc., Peoria, Illinois.

Church, H. K., 1981, Excavation handbook: MacGraw-Hill Book Co., New York, New York.

Cummins, A. B., and Given, I. A., 1973, SME Mining Engineering Handbook, Volume 1: Society of Mining Engineers of The Americian Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., New York, New York.

Dataquest Inc., 1991, Contractors' Equipment Cost Guide: Dataquest Incorporated, San Jose, California, updated periodically.

Dataquest, 1992, Rental rate blue book for construction equipment: Dataquest, San Jose, California.

Dataquest Inc., 1992, Green Guide Auction Reports for Construction Equipment, Vol. 6, No. 5: Dataquest Incorporated, San Jose, California.

Dataquest Inc., 1992, Green Guide Auction Reports for Construction Equipment, Vol. 6, No. 10: Dataquest Incorporated, San Jose, California.

Denver Equipment Company, 1962, Mineral processing flow sheets: Denver Equipment Co., Denver, Colorado, 315 p.

Hartman, H. L., 1992, SME Mining Engineering Handbook, 2nd Edition, Volume 2: Society for Mining, Metallurgy, and Exploration, Inc., Littleton, Colorado, 2260 p.

Hurlbut, C. S., 1971, Dana's manual of mineralogy, 18th edition: John Wiley & Sons, New York, New York, 579 p.

Jenkins, O. P., and Wilson, E.D., 1920, A geological reconnaissance of the Tucson and Amole Mountains: Arizona Bureau of Mines Bulletin No. 106, Tucson, 18 p.

Jones, Dick, 1983, The Old Yuma mine: The Mineralogical Record, Vol. 14, No. 2, March-April 1983, p. 95-107

Keith, S. B., 1984 (original printing 1974), Index of mining properties in Pima County, Arizona: Arizona Bureau of Geology and Mineral Technology, Geological Survey Branch, Bulletin 189, Tucson, 156 p.

Knight, L. H. Jr., 1967, Structural geology of the Cat Mountain Rhyolite in the northern Tucson Mountains, Pima County, Arizona: unpublished M.S. thesis, University of Arizona, Tucson, 68 p., 2 pl.

Mayo, E. B., 1968, A history of geologic investigation in the Tucson Mountains, Pima County, Arizona: in Southern Arizona Guidebook III, Titley, S.R., ed., Arizona Geological Society, Tucson, p. 155-170.

Mottana, Annibale, Crespi, Rodolfo, and Liborio, Giuseppe, 1977, Simon & Schuster's guide to rocks and minerals: Simon & Schuster, Inc., New York, New York, 607 p.

Newhouse, W. H., 1934, The source of vanadium, molybdenum, tungsten, and chromium in oxidized lead deposits: The American Mineralogist, Vol. 19, p. 209-220.

Nowell, Dan, 1992, Personal communication: BLM Arizona State Office, Phoenix.

Peele, R., editor, 1945, Mining Engineers' Handbook: John Wiley & Sons, Inc., New York, New York, Vol. 1, Sec 10.

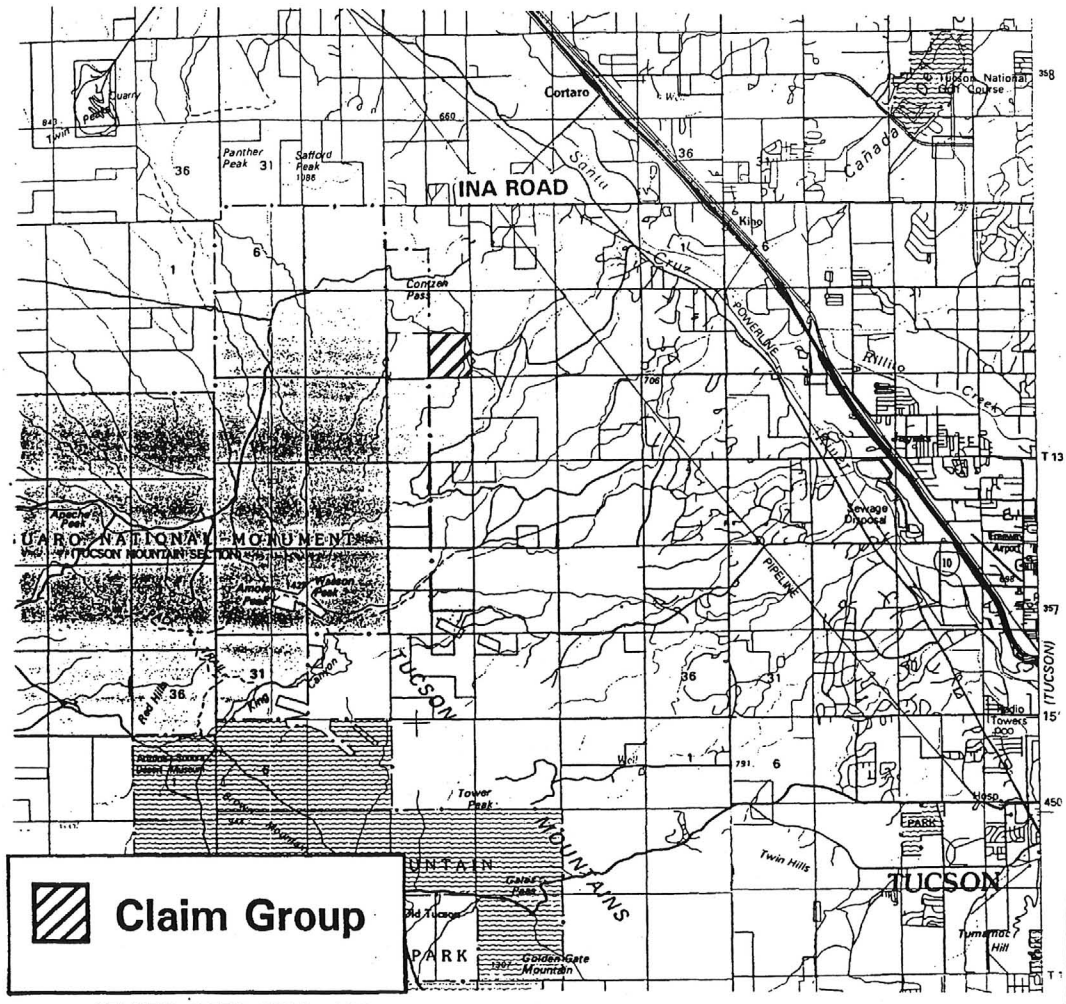
Schumacher, O. L., 1991, Mining cost service (a subscription cost data update service): Western Mine Engineering, Inc., Spokane, Washington.

Stermole, F. J., and Stermole, J. M., 1990, Economic evaluation and investment decision methods: Investment Evaluations Corp., Golden, Colorado, 587 p.

Weiss, N. L., 1985, SME Mineral Processing Handbook, Volume 2: Society of Mining Engineers of The Americian Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., New York, New York.

Figure 1 General Location Map (1:100,00)

Figure 1 General Location Map



SILVER BELL MTS., ARIZ.

SW/4 TUCSON (NI 12-11) 1:250 000-SCALE MAP

N3200—W11100/30X60

SCALE 1:100 000

KILOMETERS

MILES

FEET

SURFACE MANAGEMENT STATUS

ROAD CLASSIFICATION

Primary highway, hard surface

Secondary highway, hard surface

Light-duty road, hard or improved surface

Street or other road

Trail

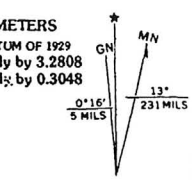
QUADRANGLE LOCATION

ELEVATIONS SHOWN IN METERS

NATIONAL GEODETIC VERTICAL DATUM OF 1929

To convert meters to feet multiply by 3.2808

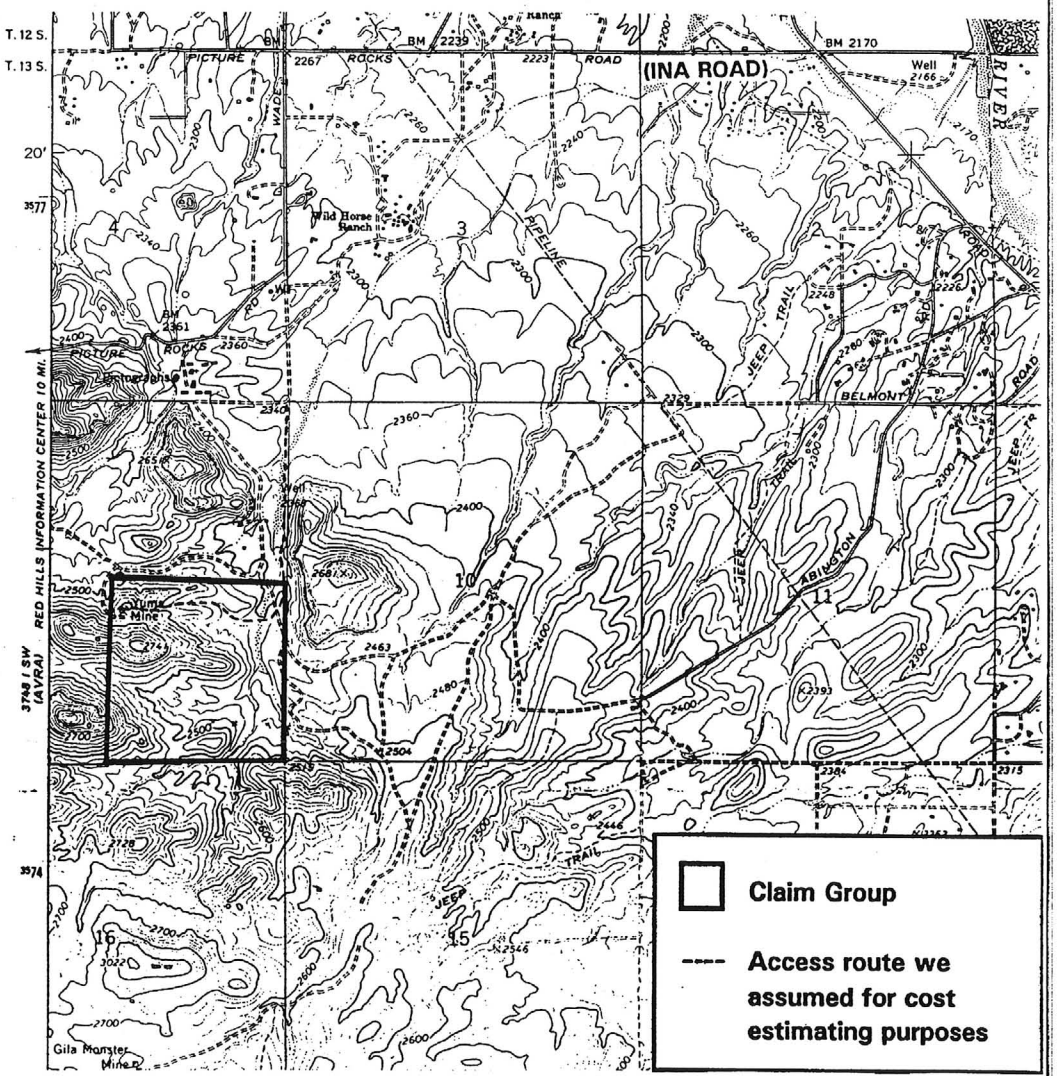
To convert feet to meters multiply by 0.3048



UTM GRID AND 1977 MAGNETIC DECLINATION AT CENTER OF

Figure 2 Access and topography map (1:24,000)

Figure 2 Access and Topography Map



SCALE 1:24000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

GN MN 0°02' 1 MIL 13½° 240 MILS

UTM GRID AND 1968 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

JAYNES, ARIZ.
N3215—W11100/7.5

1968
PHOTOREVISED 1975
DMA 3748 I SE—SERIES V898

ARIZONA

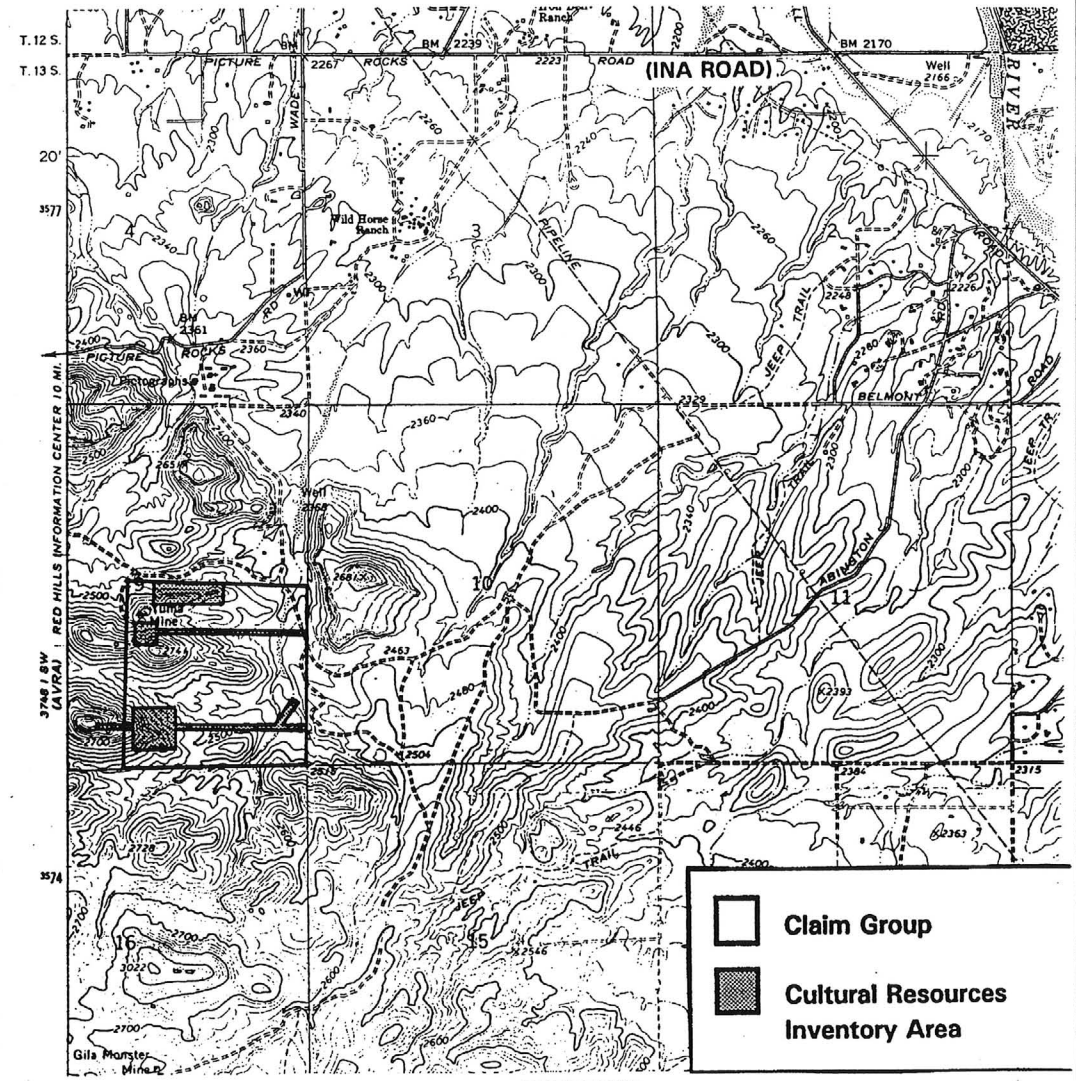
QUADRANGLE LOCATION

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt
Interstate Route — State Route

Figure 3 Cultural Resources inventory map (1":400′)

Figure 3 Cultural Resources Inventory Map



SCALE 1:24000

1 MILE

7000 FEET

1 KILOMETER

CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

GN MN 0°02' 1 MIL 13½° 240 MILS

UTM GRID AND 1968 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

JAYNES, ARIZ.
N3215—W11100/7.5

1968
PHOTOREVISED 1975
DMA 3748 I SE—SERIES V808

ARIZONA

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Heavy-duty
Light-duty
Medium-duty
Unimproved dirt
Interstate Route
State Route

Figure 4 Geology of the Northern Tucson Mountains (from Knight)

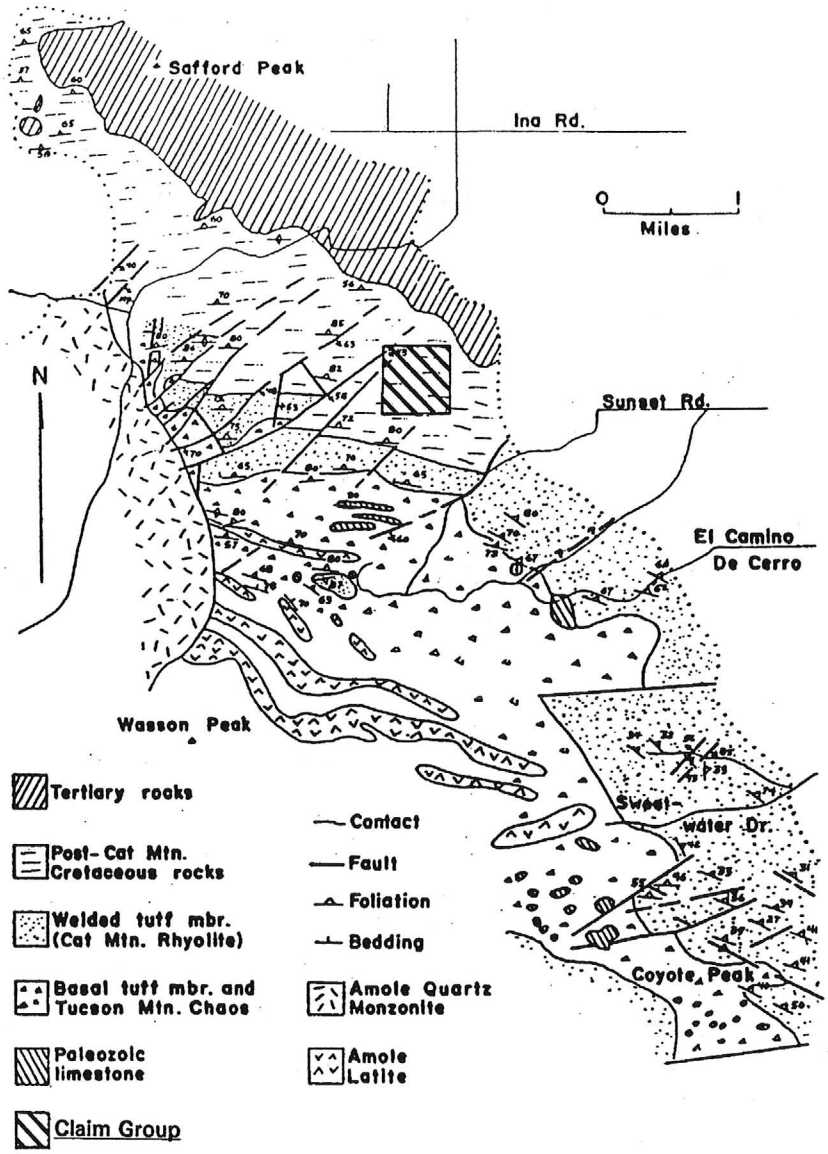
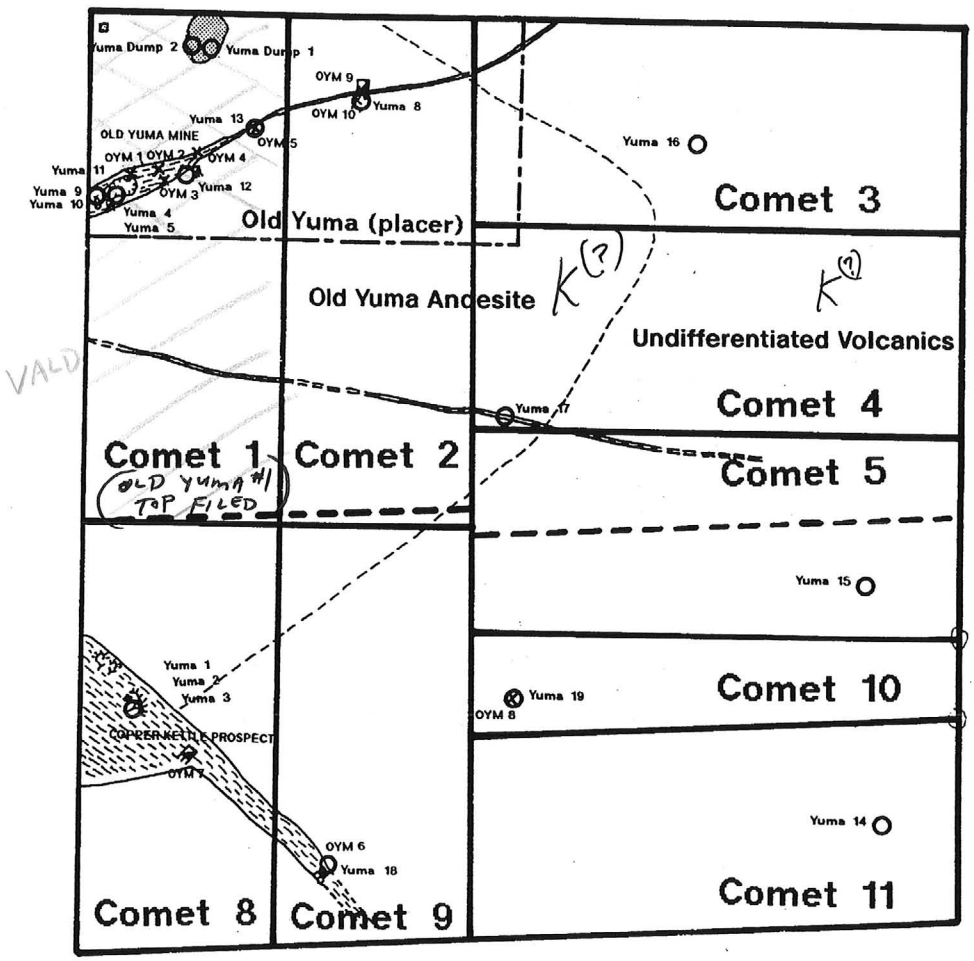


Figure 5 Map of the Claim Group (Clay, Covington, and Thrasher)(1":400')

Figure 5 Map of the Claim Group



Scale: 1" = 400'

0 200' 400'

N

Claim Boundary (Dashed where overlapped)

Placer Claim Boundary

Sample Point

Shear Zone

Formation Boundary (approximate)

Tailings Pile

Prospect Pit

Adit

Shaft

Inclined Shaft

Glory Hole

Mine Dump

Figure 6 Underground map of the 65 level Old Yuma mine (Clay, Covington, and Thrasher)(1":10′)

Figure 6

Underground Map
Old Yuma Mine
65' Level
Comet 1

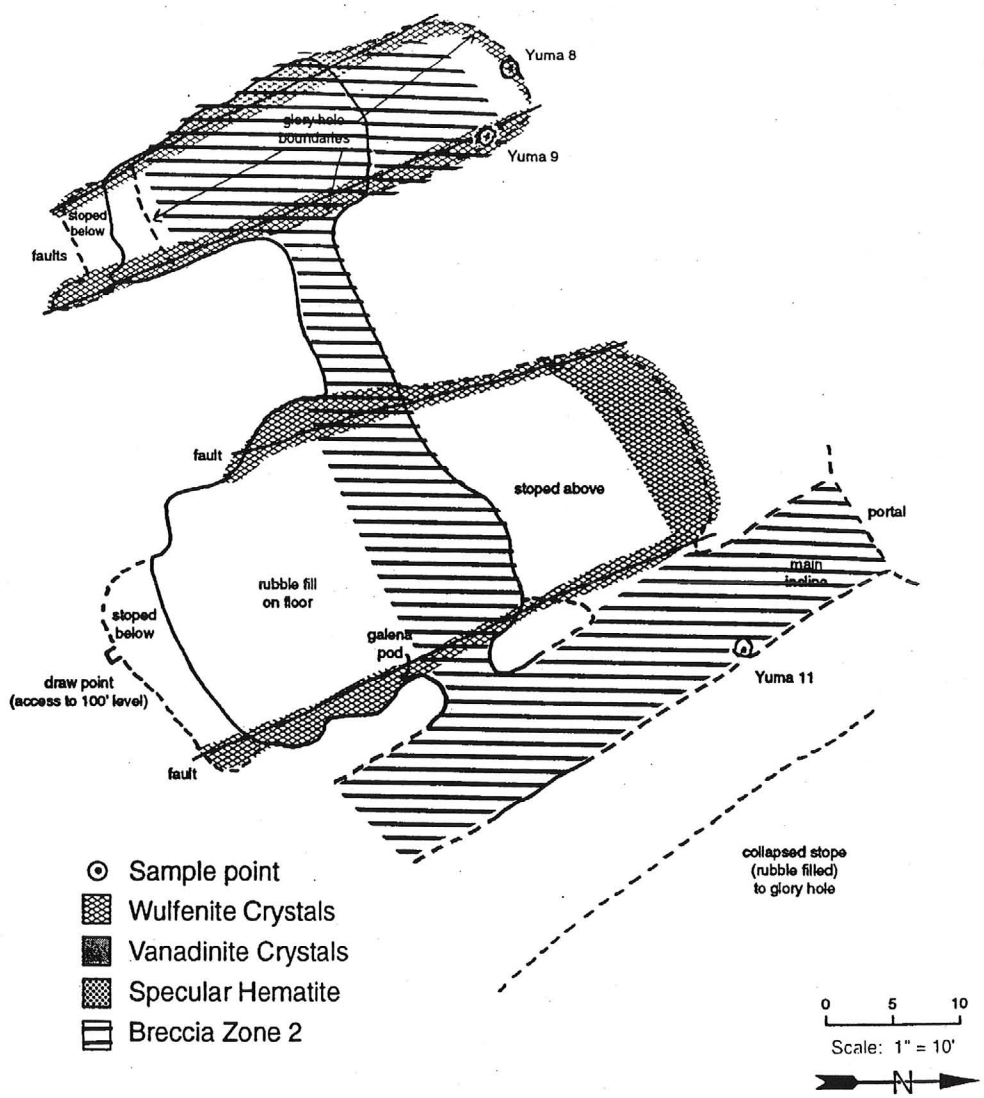


Figure 7 Underground map of the 100 level Old Yuma mine (Clay, Covington, and Thrasher)(1":10')

Figure 7

Underground Map
Old Yuma Mine
100' Level
Comet 1

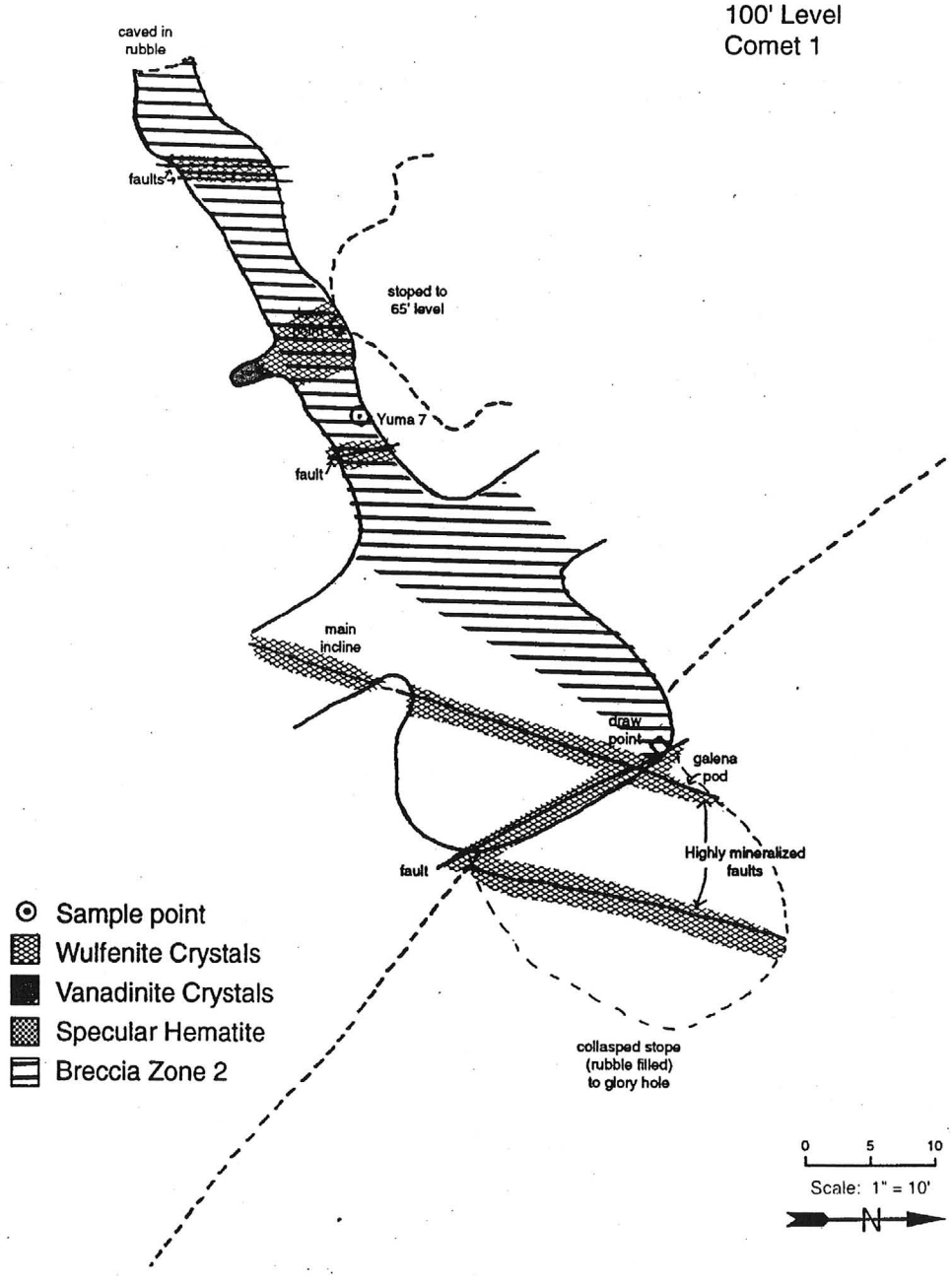
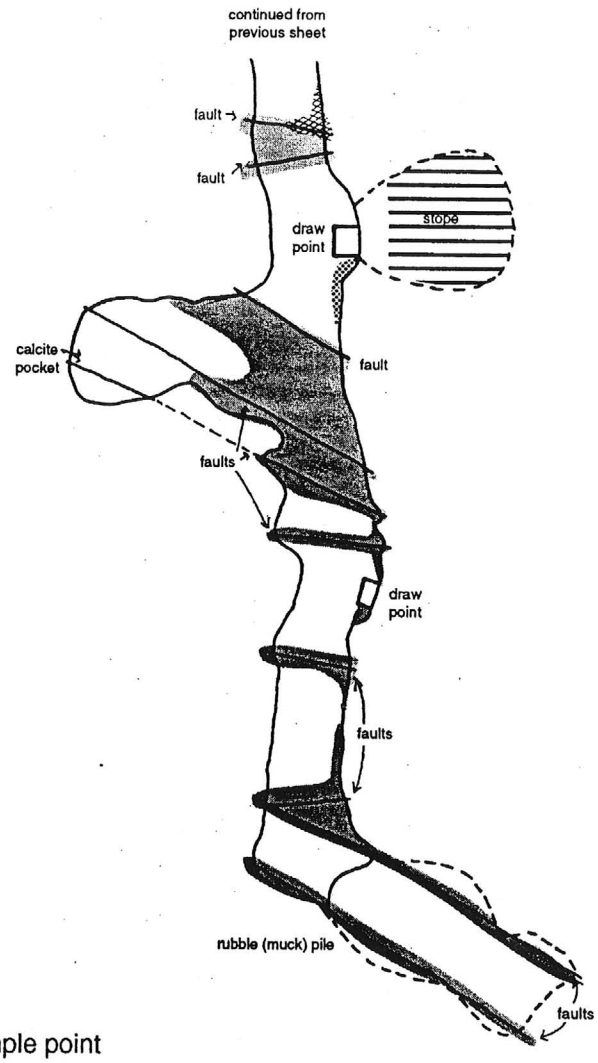


Figure 8 Underground map of the 200 level Old Yuma mine (Clay, Covington, and Thrasher)(1":10′)

Figure 6 Underground map of the 65 level Old Yuma mine (Clay, Covington, and Thrasher)(1":10′)

Figure 8 (b)

Underground Map
Old Yuma Mine
200' Level east continued
Comet 1



Sample point
Wulfenite Crystals
Vanadinite Crystals
Specular Hematite
Breccia Zone 2

0 5 10
Scale: 1" = 10'
N

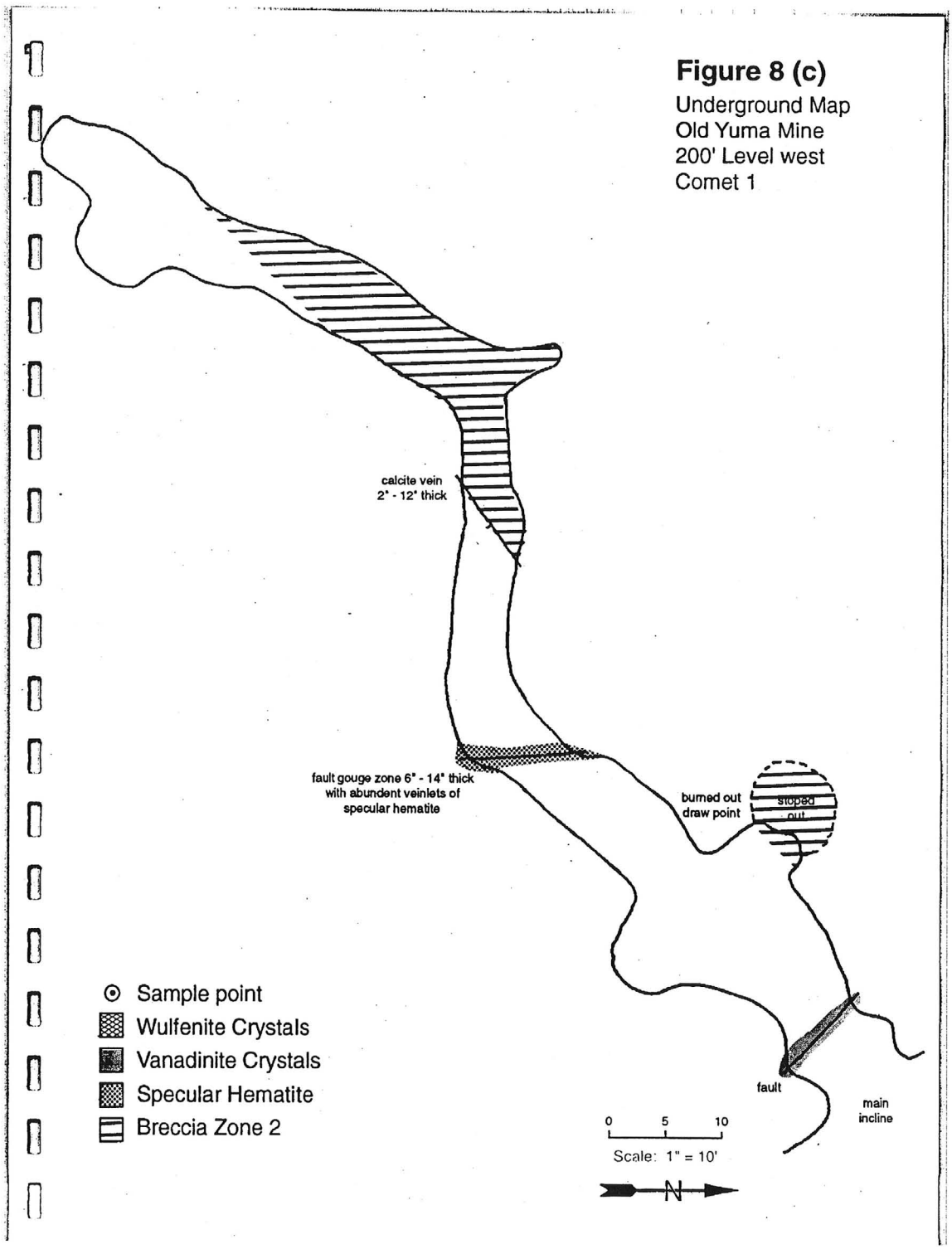
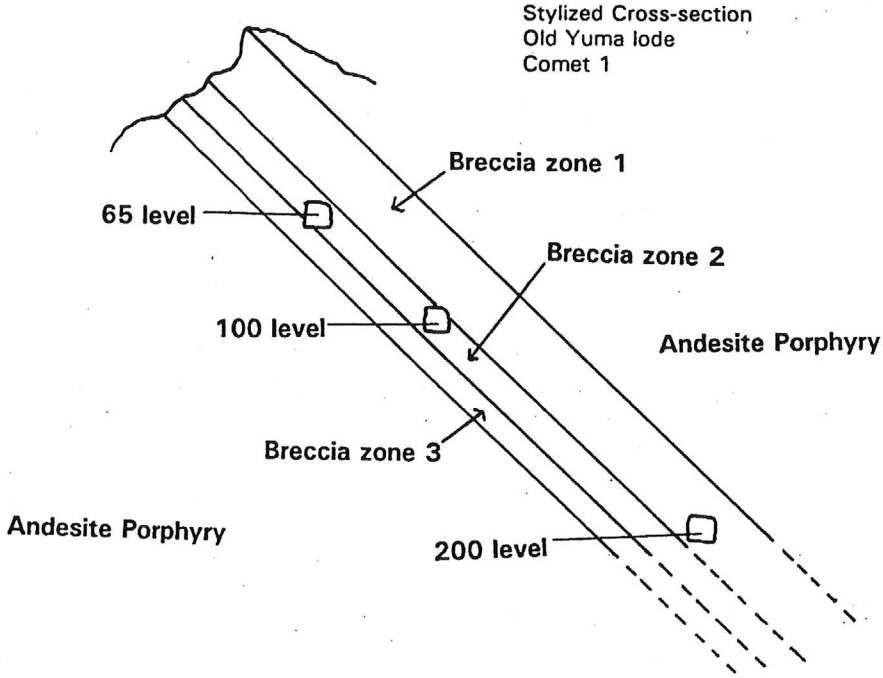


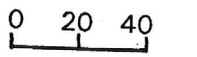
Figure 8 (c)
Underground Map
Old Yuma Mine
200' Level west
Comet 1
calcite vein
2" - 12" thick
fault gouge zone 6" - 14" thick
with abundent veinlets of
specular hematite
burned out
draw point
stoped
out
fault
main
incline
Sample point
Wulfenite Crystals
Vanadinite Crystals
Specular Hematite
Breccia Zone 2
0
5
10
Scale: 1" = 10'
N

Figure 9 Stylized cross-section of the Old Yuma lode at the Main Incline (Clay, Covington, and Thrasher)(1":40′)

Figure 9

Stylized Cross-section
Old Yuma lode
Comet 1





Scale 1" = 40′

Breccia zone 1:

Highly brecciated, poorly cemented, upper of the three zones, generally about 20 feet thick. It has the most vugs and fracture space and is the primary source of the high value specimen grade wulfenite and vanadinite crystals. It is clearly exposed in the east drift on the 200 level and in the glory hole.

Breccia zone 2:

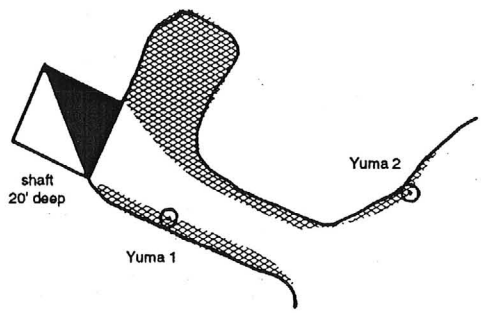
Highly siliceous, well cemented brecciated andesite porphyry. It varies in thickness between 6 and 12 feet with an average of about 8 feet. This zone has the highest gold values and contains the least number of wulfenite and vanadinite crystals. The main incline of the mine, dipping at 43 degrees, is driven in the more competent zone 2 for most of its length but it flattens out at the bottom into zone 1.

Breccia zone 3:

Highly fractured and poorly cemented. It is between 6 and 8 feet thick. It contains some wulfenite and vanadinite crystals, but not as many as breccia zone 1.

Figure 10 Map of the Copper Kettle prospect (Clay, Covington, and Thrasher)(1":10')

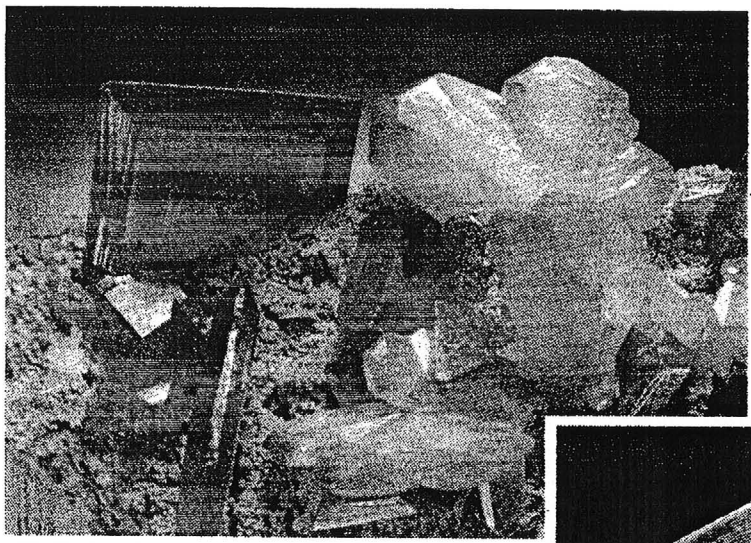
Figure 10
Underground Map
Copper Kettle Prospect
Comet 8



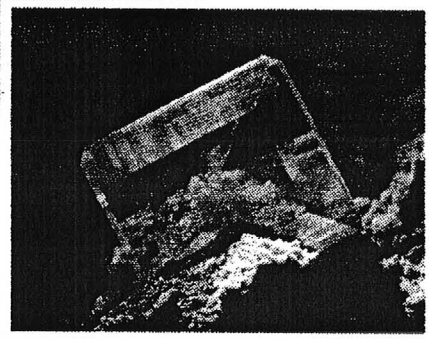
Sample point
Wulfenite Crystals
Vanadinite Crystals
Specular Hematite

0 5 10
Scale: 1" = 10'
N

Attachment 1 **Photographs of Old Yuma Wulfenite and Vanadinite Specimens (The Mineralogical Record, Vol. 14, No. 2)**

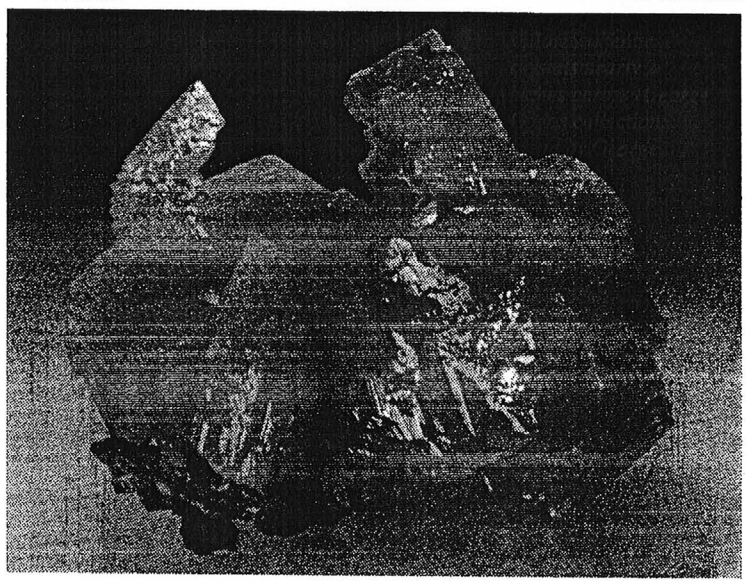


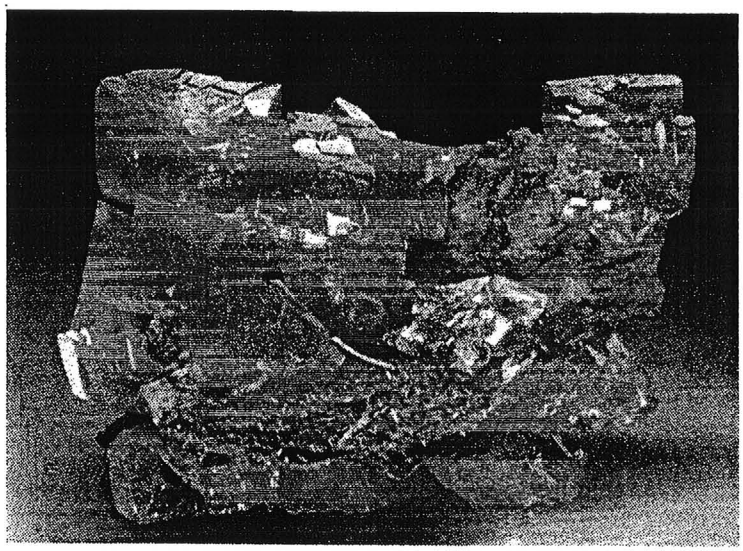
Half-inch, color-zoned wulfenite crystals with white cerussite twins. Gene Schlepp specimen, now in the Arizona-Sonora Desert Museum collection, Tucson.



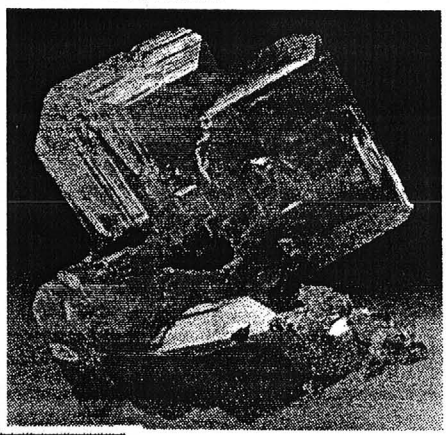
A water-clear wulfenite crystal (1/3 inch) showing refracted spectral colors. George Godas collection

A group of brilliant yellow wulfenite crystals nearly 2 inches across (George Godas collection; found by George Godas).

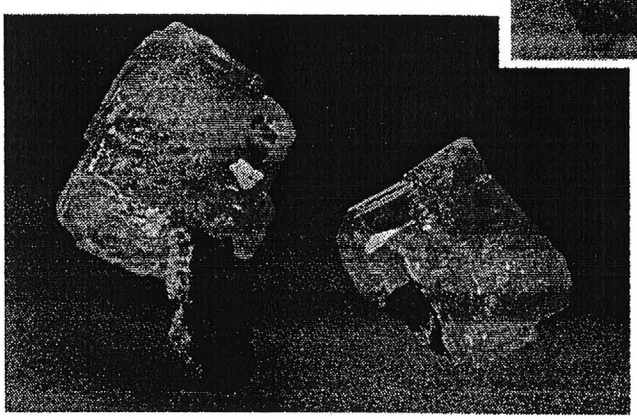




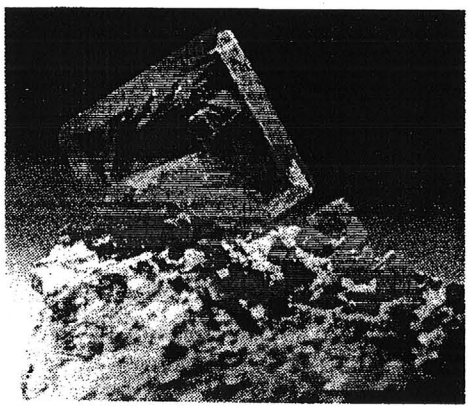
Large wulfenite crystals to 1 inch on matrix. Richard Bideaux collection; collected by Ed Over in 1929.



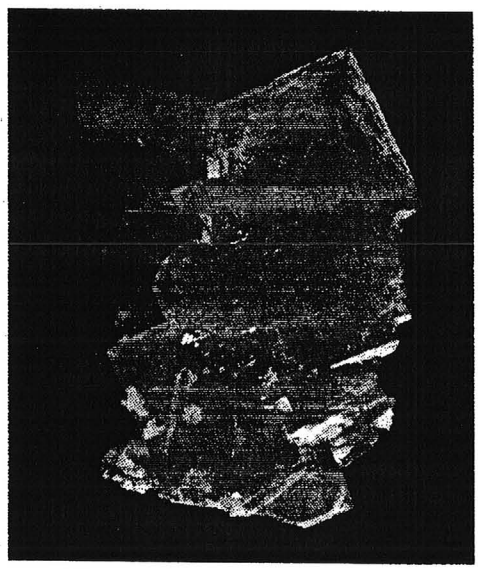
Large, thich wulfenite crystals 1 2/3 by 1 7/8 inches. Wayne and Dona Leicht collection (found by Gene Schlepp)



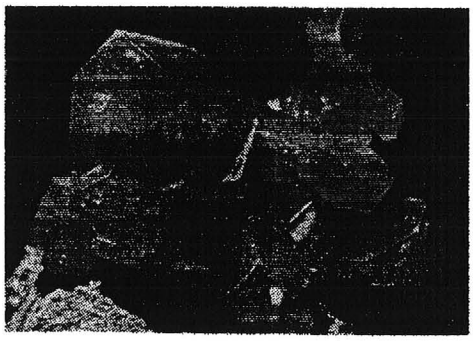
Complexly surfaced wulfenite crystals; the left specimen is 1 1/8 inches tall (George Godas collection; found by George Godas).



A red-orange micromount-size crystal (about 1/8 inch) of wulfenite. George Godas collection.

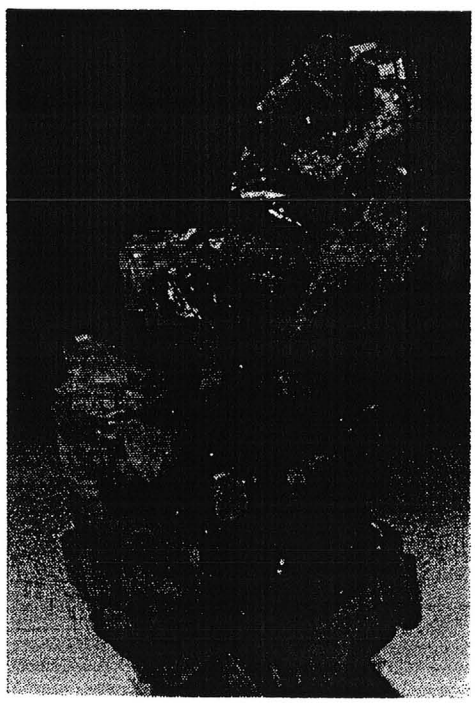


Six-inch crystal of wulfenite from the pocket found in 1979 by Jackie Schlepp. (Bob Jones photo.)



Blocky vanadinite crystals to 1/4 inch. George Godas collection.

Vanadinite crystal groups to 1 inch. George Godas collection (found by George Godas).



Complex, cavernous single crystal (or parallel growth) of vanadinite, 1 1/2 inches tall. Chris Panczner collection (found by Chris Panczner).

Attachment 2 OYM 1 - 10 Descriptions of Workings

WORKINGS - PROSPECT PITS

OYM-1

This prospect pit is above glory hole near the top of the hill. It opens into the glory hole to the south. Palo verde are growing on the sides and inside pit, indicating that the pit has not been worked in a number of years. Dimensions are: 12 feet in a north-south direction, 9 feet in an east-west direction, and about 8 feet deep on the east side. The rock is black to mottled black and white breccia, brittle and hard, but fragments easily. The rock is fractured and contorted in places. Calcite occurs in thin veins and in fractures. Quartz blebs and fragments of quartz are present. There is considerable reddish-brown iron staining on exposed surfaces. The dark gray matrix aphanitic. The rock shows evidence of having been squeezed and contorted from faulting, probably after brecciation.

OYM-2

Prospect pit located about 80 feet N75°E from OYM-1. The dimensions are 9 feet in an east-west direction, 8 feet in a north-south direction and about 6 feet deep at the rock face on the west side. The pit lies on the east end of the ridge above the glory hole. It opens to the east with the high wall on the west. It appears to have been excavated by pulling material away from the face from west to east. The rock here is blocky and more massive than in OYM-1. There is considerable calcite and quartz recrystallization on the exposed surfaces, in fractures, and in veins. Quartz veins appear as white bands alternating with bands of dark groundmass. There is considerable orange to ochre iron staining on the surfaces. The structure strikes N60°E and dips 38°SE.

OYM-3

This is a shallow pit about 40 feet S20°W of OYM-2 and about 100 feet S70°W of OYM-1. The pit dimensions are: 10 feet in a north-south direction, 6 feet in an east-west direction, and 5 feet deep on the north (uphill) side. The pit appears to have been excavated from the north and northwest to the south and southeast (downhill). Large cobbles and boulders in the bottom made it impossible to estimate the original depth. Outcrops on the west, north and part of the east side are of massive, medium-gray andesite porphyry showing little structure or zoning.

OYM-4

This prospect pit is about 60 feet north of the East Incline on the southeast side of the ridge above the Old Yuma Mine. The trend of the pit is N60°W. Dimensions are: 23 feet in a generally east-west direction, 13 feet in a N10°E direction.

Depth is 19 feet on the uphill side. The pit opens to the east or downhill side and the bottom slopes to the east. The slope of the hillside is about 20°. Three sides of the pit are rock outcrops. The highwall consists of andesite porphyry, light-to medium-gray with white phenocrysts (feldspar?). The rock is highly fracture, brittle and breaks easily. Calcite recrystallization thick enough to peel off in layers occurs on the surface and in fractures. Calcite veinlets are prominent. Structure (fracturing) on the southwest wall trends N40°E and dips 43° to the southeast.

OYM-5

Prospect pit is on the west side of the hill east of the Old Yuma Mine, east of OYM-4. The dimensions are: 9 feet along a N50°E line, 6 feet in a generally northwest-southeast direction and about 8 feet deep. Sample Yuma 13 was taken across a vein structure, horizontally across the northeast side of the pit. Rock is fractured brittle, crumbly dark-gray andesite breccia. The attitude of the structure is: strike N60°E, dip 46°SE. This pit follows along the same trend as the other pits. OYM-1 through OYM-5 are all on Comet 1 lode mining claim.

OYM-6

This pit is on the Comet 9 lode mining claim. Dimensions are 5 feet by 6 feet by 10 feet deep on the uphill side. The pit is in hard, dark mineralized andesite. Yuma 18, a chip sample, was taken across a fracture zone in the pit the sample was 3 feet long (horizontally) by 6 inches wide (vertically) by about 1 to 2 inches deep. Some specular hematite was noted.

OYM-7

This pit or short inclined shaft is about 200 feet from the Copper Kettle workings in a S55°E direction. Two signs are posted on the surrounding waste pile stating: "Danger" and "Stay Clear of Area". The "collar" is about 5 feet by 6 feet. The shaft inclines about 60° in a S30°W direction to a depth of about 15 to 18 feet. The rock is andesite breccia with shows of blue-green copper mineralization and also the ubiquitous iron discoloration. The shaft was too steep and deep to sample without a ladder or rope.

OYM-8

This pit is on Comet 10 lode mining claim, just northeast of the northwest corner of Comet 11 and the southwest corner of Comet 10. The pit is more of a trench which trends 15 feet in a N25°W direction and is about 3 to 4 feet wide and 6 feet deep. The rock is mineralized breccia with yellow-ochre iron staining, soft white veins and pockets and some greenish-blue copper

coloration. The rock is fractured and rather friable. Sample Yuma 19 is a chip-channel sample taken from this material. The rock was easily chipped out.

OYM-9

This pit or shallow shaft is located on Comet 2 lode mining claim on the south side of a almost vertical rock outcrop which forms a prominent ridge. The walls are almost vertical. It was estimated to be about 10 feet deep. The walls are about 7 feet (N20°W) by 6 feet (N70°E). A short drift extends to the north (N20°W) under the ridge. The drift did not appear to extend far considering the about of rock piled outside the pit. No structure was apparent. Sample Yuma 8 (C-3-1) is a chip-channel sample taken on the surface along the east side of the pit. The rock is highly fractured andesite with some iron staining on the surface. It fragments rather easily with a tendency to slab in layers. Some of the surfaces have a dark desert varnish-like discoloration.

OYM-10

A second pit was found about 30 feet south of OYM-9 in a S15°E direction. The pit is about 7 feet by 7 feet and 5 feet deep. It is below (downslope) the waste pile from OYM-9. The rock in this pit is less altered and mineralized than that above on the ridge. It is light gray-brown andesite to rhyolite (?) porphyry. There is considerable brownish-orange iron staining along fractures and exposed surfaces with some calcite recrystallization in some fractures. The rock appears to become progressively lighter colored as one proceeds south (uphill).

Attachment 3 **Arizona State Law, Title 12 Section 12-1202, Right to a private way of necessity**

Under the portion of the definition dealing with construction and maintenance, Laws 1953, Ch. 63, § 1, added "shafts" and "tunnels"; following the reference to drains it added "including, but not limited to, embankments, diversion dams, dikes, ditches, canals, flumes and levees for the purpose of removing water from land or preventing the accumulation of water on land"; and following the reference to tramways it added "including, but not limited to, aerial tramways and industrial railroads".

Law Review Commentaries

Eminent domain, judicial review, 15 Ariz.L.Rev. 796 (1973).

Notes of Decisions

1. Spillways

Association of water users which operated irrigation system had power or authority to obtain right-of-ways for needed spillways. Salt River Valley Water Users' Ass'n v. Giglio (1976) 113 Ariz. 190, 549 P.2d 162.

§ 12-1202. Right to private way of necessity; limitation

A. An owner of or a person entitled to the beneficial use of land, mines or mining claims and structures thereon, which is so situated with respect to the land of another that it is necessary for its proper use and enjoyment to have and maintain a private way of necessity over, across, through, and on the premises, may condemn and take lands of another, sufficient in area for the construction and maintenance of the private way of necessity.

B. If the condemnation is upon, over, or affects the range lands of another, the area condemned shall be strictly defined, and livestock driven upon or over the private way shall be accompanied by and under the control of sufficient drivers or herders to confine the livestock to the condemned area, and the livestock shall be so confined to that area and kept moving directly across the property condemned until they have been completely removed from the condemned area.

Historical Note

Source:

Laws 1919, Ch. 139, §§ 1, 2.
Rev.Code 1928, § 1332.
Laws 1929, Ch. 25, § 1.
Laws 1945, Ch. 86, § 1.
Laws 1953, Ch. 63, § 1.
Code 1939, Supp.1953, § 27-904.

The limitation applicable if the condemnation is upon, over, or affects range lands was added to Rev.Code 1928, § 1332 (Code 1939, § 27-904), by Laws 1945, Ch. 86, § 1.

Constitutional Provisions

Article 2, § 17, provides, in part, that "Private property shall not be taken for private use, except private ways of necessity, and for drains, flumes, or ditches, on or across the lands of others for mining, agricultural, domestic, or sanitary purposes."

The section further requires that just compensation shall first have been made, paid into court for the owner, se-

cured by bond as may be fixed by the court or paid into the state treasury for the owner on such terms and conditions as the legislature may provide.

Notes of Decisions

1. Construction and application

Where it appears that a private right of way, though only for direct benefit of a private party, is ultimately for purpose of development of resources of the state as a whole, and tends to prevent a private individual from bottling up and rendering ineffective a portion of state's resources, it is, in effect, promotive of the "public welfare", and thus authorized by Const. art. 2, § 17. Solana Land Co. v. Murphey (1949) 69 Ariz. 117, 210 P.2d 593; Cienega Cattle Co. v. Atkins (1942) 59 Ariz. 287, 126 P.2d 481.

This section giving a landlocked owner the right to a way of necessity over the lands of a stranger is in derogation of the common law and as such is strictly construed. Gulotta v. Triano (App.1980) 125 Ariz. 144, 608 P.2d 81.

Standard for imposing easement of necessity is whether such easement is required in order to provide reasonable access to property; absolute necessity is not required and owner need not show that without easement there is no access whatsoever to property. Chandler Flyers, Inc. v. Stellar Development Corp. (App.1979) 121 Ariz. 553, 592 P.2d 387.

Opinion of supreme court of Washington with respect to condemnation of a private way of necessity, though not controlling on Arizona supreme court, was peculiarly persuasive where it contained sound reasoning, and where provision of Arizona Const. Art. 2, § 17, on eminent domain was obviously copied from the Constitution of Washington. Solana Land Co. v. Murphey (1949) 69 Ariz. 117, 210 P.2d 593.

In determining whether a private way of necessity exists within meaning of §§ 12-1201 to 12-1203, prospective use may be considered, as well as present necessity. Id.

2. Necessity

Although transportation by private plane is becoming more common, property owner is not entitled to aircraft access in order to make reasonable use of his property, and thus where there was access to property by means of public highway and there was no evidence that property could not be effectively used absent air access, showing that property could not be used for desired flight school and airplane sales center without such access was not sufficient to justify imposition of easement of necessity over developer's property for aircraft access to runway and airport facilities. Chandler Flyers, Inc. v. Stellar Development Corp. (App.1979) 121 Ariz. 553, 592 P.2d 387.

Where land of plaintiff was, for all practical purposes, land-locked at time plaintiff instituted action under this section allowing condemnation of a "private way of necessity", because there was no way, without trespassing, that one could have ingress and egress to plaintiff's land by automobile, plaintiff was entitled to a "private way of necessity". Solana Land Co. v. Murphey (1949) 69 Ariz. 117, 210 P.2d 593.

To entitle a landowner to a "private way of necessity" across intervening land to a public road under §§ 12-1201 to 12-1203, he need not show that he has no outlet, but only that he has no adequate and convenient outlet, and he need not show an absolute necessity for the taking, but is required only to show a reasonable necessity. Id.

3. Other remedies or means of access and egress

Plaintiff was not precluded from obtaining a private way of necessity over

defendants' lands on ground that plaintiff had an appropriate and expedient method of obtaining a means of ingress and egress to plaintiff's realty by petitioning board of supervisors for establishment of a county highway, where the lands in question were yet undeveloped and not ready for occupancy. Solana Land Co. v. Murphey (1949) 69 Ariz. 117, 210 P.2d 593.

4. Discretion of court

In determining whether it is necessary to establish a private right of way by necessity over defendant's land, each case must be decided on its own facts, and the decision is left to great extent to judicial discretion of the trial court. Cienega Cattle Co. v. Atkins (1942) 59 Ariz. 287, 126 P.2d 481.

The trial court's decision that it was necessary, for general development of resources of the state or to prevent monopolizing of such resources, to establish right of way over defendant's land for plaintiffs' cattle to enable them to graze on national forest, was not an abuse of discretion under circumstances. Id.

5. Evidence

Mere production of an appraisal on the books of the county assessor's office, by itself, is not admissible evidence in the face of an objection as to its relevancy and competency on the issue of fair market value in a condemnation hearing. Jackson v. Pressnell (1973) 19 Ariz.App. 221, 506 P.2d 261.

Even though tax assessors' records may be prima facie evidence of the facts therein stated, they are not admissible in all cases regardless of their relevancy, competency or materiality. Id.

6. Selection of route

On matter of selection of route of private way of necessity under §§ 12-1201 to 12-1203, the condemner makes the initial selection, and, in absence of bad faith, oppression or abuse of power, condemner's selection of route will be upheld by the courts. Solana Land Co. v. Murphey (1949) 69 Ariz. 117, 210 P.2d 593.

7. Cattle ways

Where plaintiffs obtained grazing permit from federal authorities permitting them to graze cattle on a national forest, plaintiffs had sufficient "beneficial use" of government's land to entitle them to condemn right of way over the defendant's land to secure ingress and egress to the grazing land. Cienega Cattle Co. v. Atkins (1942) 59 Ariz. 287, 126 P.2d 481.

The fact that defendant obtained grazing permit on national forest did not give to defendant the exclusive right to graze cattle on the reserve so as to preclude plaintiffs who also obtained a permit, from condemning defendant's land for purpose of securing ingress and egress to the grazing land. Id.

Where defendant owned approximately one-half of the land in a large portion of national forest, and its lands were so situated, that, if it was permitted to prevent others from securing rights of way across them for passage of cattle, defendant would in effect acquire the sole right of user of a large portion of the public domain, the granting of a private right of way through defendant's lands in order to permit grazing of cattle of another landowner on the lands within the national forest was authorized by §§ 12-1201 to 12-1203, relating to private ways of necessity. Id.

Where owners of land entirely surrounded by privately owned land in Prescott national forest reserve had no permit from forest supervisor to range livestock on public lands, which permit supervisor had withheld until owners could demonstrate that they had sufficient water on their land and that the public lands were accessible to livestock from their land, and owners, therefore, had no grazing rights in the public lands, they were not entitled to condemn a private "way of necessity" over adjoining private property for passage of their livestock onto public lands to graze thereon. Atkins v. Hooker (1940) 56 Ariz. 197, 106 P.2d 485.

8. Persons entitled to maintain action

One who has landlocked his property by voluntary alienation of a means of ingress and egress may not thereafter

acquire a private way of necessity over other land by condemnation. Gulotta v. Triano (App.1980) 125 Ariz. 144, 608 P. 2d 81.

A landowner may not acquire a way of necessity over another's property after he has voluntarily cut off an alternate means of access to his own property. Id.

Only a person owning or having a beneficial use in land that is "land-locked" may bring an action to condemn a private way of necessity across the land of another, and therefore where an easement is granted under this section, it must be appurtenant to plaintiff's land as distinguished from a mere personal privilege. Solana Land Co. v. Murphey (1949) 69 Ariz. 117, 210 P.2d 593.

9. Compensation for taking or for damages

In private condemnation suit brought by property owners against adjoining owners to condemn a 30 by 125-foot area as a private way of necessity or easement for egress and ingress, as well as for public utility easements, damages award of $1,000 had evidentiary support, including plaintiff's testimony that acreage in the area was selling for as high as $4,500 per acre and that it would cost $600 just to move corrals and posts presently on the condemned property. Jackson v. Pressnell (1973) 19 Ariz.App. 221, 506 P.2d 261.

Where plaintiffs obtained permit to graze cattle within national forest and condemned land of defendant for passageway by necessity for plaintiffs' cattle, damages resulting to defendant from loss of grazing as result of trespassing by plaintiffs' cattle on open lands of defendant included within the national forest, and damages caused by an admixture of the herds through the trespassing of plaintiffs' cattle on lands of defendant were "damnum absque injuria" and defendant was not entitled to compensation therefor. Cienega Cattle Co. v. Atkins (1942) 59 Ariz. 287, 126 P. 2d 481.

Where plaintiffs obtained right of way by necessity over defendant's land as passageway for plaintiffs' cattle, defendant was entitled not only to compensation for value of land taken, but to damages to its land as a whole caused by the taking, but the damages recoverable were "legal damages" only. Id.

Where a mine condemns property and lays tracks for its private use, the principles applied to common carriers when acting in their private capacity should be adopted in fixing the liability of the mine for damages to private property. Arizona Hercules Copper Co. v. Protestant Episcopal Church Corporation of Arizona (1920) 21 Ariz. 470, 190 P. 85.

10. Judgment

Judgment granting passageway by necessity for plaintiffs' cattle over the defendant's land was not objectionable because of fact that as an ancillary remedy the defendant was enjoined from obstructing the passageway, and the effect of the judgment would be to compel defendant to remove so much of its fence as would permit the use of the right of way condemned. Cienega Cattle Co. v. Atkins (1942) 59 Ariz. 287, 126 P.2d 481.

11. Title or interest acquired

In action under §§ 12-1201 to 12-1203, allowing condemnation of a private way of necessity, judgment which gave plaintiff an easement over defendants' realty only with respect to part of section of realty owned by plaintiff did not grant plaintiff an "appurtenant easement" to section owned by plaintiff, but merely an "easement in gross", since no dominant tenement existed. Solana Land Co. v. Murphey (1949) 69 Ariz. 117, 210 P.2d 593.

Where plaintiff sought an appurtenant easement across defendants' land under this section, plaintiff was entitled to an appurtenant way of necessity or no appurtenant way of necessity dependent on whether a necessity was established, and should not have been granted merely an easement in gross or a personal privilege. Id.

Where plaintiff in action under this section, established a right to a way of necessity over defendants' land, plaintiff was entitled to have such easement adjudged appurtenant to all of its holdings in section and not merely to a part of its holdings in that section. Id.

Character of private way of necessity was not affected by fact that it might be but little used and was at present mainly convenient for the use of the plaintiff, nor by the fact that total cost of condemnation as well as that of construction and maintenance of highway strip fell on those most immediately concerned instead of on the public at large. Id.

Where plaintiffs condemned defendant's land to secure ingress and egress to land on which plaintiffs obtained grazing permit from federal government, plaintiffs' right secured in the condemnation proceeding was merely a right of "easement", and, if the use of the grazing land should cease, the easement would automatically cease with it. Cienega Cattle Co. v. Atkins (1942) 59 Ariz. 287, 126 P.2d 481.

§ 12-1203. Violation; classification

A person violating the provisions of § 12-1202 is guilty of a petty offense and shall be liable to the injured person for any damages incurred.

Amended by Laws 1978, Ch. 201, § 81, eff. Oct. 1, 1978.

Historical Note

Source:

Laws 1919, Ch. 139, §§ 1, 2.
Rev.Code 1928, § 1332.
Laws 1929, Ch. 25, § 1.
Laws 1945, Ch. 86, § 1.
Laws 1953, Ch. 63, § 1.
Code 1939, Supp.1953, § 27-904.

The subject matter contained in this section was added to Rev.Code 1928, § 1332 (Code 1939, § 27-904), by Laws 1945, Ch. 86, § 1.

The 1978 amendment substituted "petty offense and" for "misdemeanor and shall be punished by a fine of not less than one hundred nor more than five hundred dollars, and in addition thereto".

For application and effective date provision of Laws 1978, Ch. 201, see note following § 1-215.

Cross References

Classification of offenses, see § 13-601 et seq.
Fines, see § 13-801 et seq.

ARTICLE 7. PARTITION

Library References

Partition ⚷34 et seq. C.J.S. Partition § 69.

§ 12-1211. Compelling partition; complaint

A. The owner or claimant of real property or any interest therein may compel a partition of the property between him and other owners or claimants by filing a complaint in the superior court of the county in which the property, or a portion thereof, is situated.

B. The complaint shall state:

1. The names and residences, if known, of each of the owners or claimants.

Attachment 4 Cost Estimate Detail

ATTACHMENT 4 COST ESTIMATE DETAIL

CAPITALIZED COSTS

Capitalized Equipment

	Initial cost	salvage	Net Cost	source
LHD - EIMCO model 60 2cy capacity	$61,000.00	$39,650.00	$21,350.00	1
Jackleg drills (2) - used	$5,000.00	$0.00	$5,000.00	2
Air compressor - used 250 cfm	$2,500.00	$1,625.00	$875.00	3
Ventilation Fan - 10,000 cfm	$2,000.00	$1,300.00	$700.00	2
Blue Range Mill - 100 tons/day	$250,000.00	$162,500.00	$87,500.00	4
Cat D6d - used	$15,000.00	$9,750.00	$5,250.00	3
Gorman-Rupp 4" 20 hp electric pump - use	$2,100.00	$1,365.00	$735.00	3
Gasoline generator	$5,700.00	$3,705.00	$1,995.00	5
Slusher - used	$3,500.00	$2,275.00	$1,225.00	6
Fuel storage tank (diesel) 1000 gal	$900.00	$585.00	$315.00	7
Office trailer 8' x 28' with 1/2 bath	$6,500.00	$4,225.00	$2,275.00	8
Subtotals	$354,200.00	$226,980.00	$127,220.00	

Other Capitalized Items

	# of units	unit price	total $	
Ventilation Tubing 24"dia. - per foot	450	$3.00	$1,350.00	2
Water line - drill feed - per foot	450	$1.30	$585.00	8
Air line - drill feed - per foot	450	$0.60	$270.00	8
Slurry line - backfill- per foot	500	$27.88	$13,940.00	8
Water Main - 2" dia. - per foot	5500	$0.30	$1,650.00	9
Refurbish main incline			$5,870.00	D
Drive haulage drift - per foot	400	$48.00	$19,200.00	D
Extend 200 level - per foot	50	$48.00	$2,400.00	D
Construct settling pond			$11,256.00	D
Costs of access			$16,000.00	R
Construct access road			$3,122.00	D
Site preparation			$5,868.00	D
Site reclamation			$7,651.00	D
Permits			$7,500.00	D
Miscellaneous/Contingency			$22,000.00	
Subtotal			$118,662.00	

Total Capitalized Costs	$245,882.00
Total Capitalized Costs per Ton of Ore *	$12.29

* Assumes 20,000 tons mined, based on the total of Blocks I and II (Attachment 8) and a 10% mining loss.

D Summarized cost, details on pages 4.2 and 4.3
1 Dataquest - Contractor's Equipment Cost Guide
2 American Mine Equipment Co, Peoria Az.
3 Dataquest - Green Guide Auction Reports
4 Blue Range Engineering, Butte, Mt.
5 Southwest Products Corp., Phoenix, Az.
6 Lindco Equipment & Supply Inc., Phoenix, Az.
7 Glendale Welding Co., Glendale, Az.
8 Mining Cost Service, Western Mine Engineering
9 Sedona West, Phoenix, Az.
10 Northwest Linings & Geotextile, Kent, Wa.

R Summarized cost, details on page 12
11 Arizona Portland Cement, Tucson, Az.
12 Buckley Powder Co., Englewood, Co.
13 Caterpillar Performance Handbook 22ed.
14 AZ. Department of Environmental Quality
15 Home Depot, Phoenix, Az.
16 Smith & Edwards War Surplus, Ogden, Ut.

Capitalized Cost Detail

Refurbush main incline

	# of units	unit price	total $	source
Ladder - main incline - $ per foot	200 ft	$4.60	$920.00	8
Rock bolts - main incline - each	80 ea	$5.25	$420.00	8
Mats - main incline - each	20 ea	$10.00	$200.00	8
Timber - main incline	1000 bd ft	$2.00	$2,000.00	8
Fuel	50 gal	$1.20	$60.00	
Misc supplies			$500.00	
Total Supplies			$4,100.00	
Labor	100 hr	$17.70	$1,770.00	
TOTAL COST			$5,870.00	

Construct settling pond

	# of units	unit price	total $	
Pond lining - $/sq ft installed	9000 sq ft	$0.50	$4,500.00	10
Monitor wells - 60 ft deep - each	3 ea	$1,500.00	$4,500.00	
Polypropylene netting 3/4" x 1-1/4" - sq. ft	9000 sq ft	$0.05	$450.00	8
Fuel for D6D at 5 gal./hr.	100 gal	$1.00	$100.00	
Lube, Parts, and Repairs D6D /hr	20 hr	$7.20	$144.00	13
Misc. supplies			$500.00	
Total Supplies			$10,194.00	
Labor	60 hr	$17.70	$1,062.00	
TOTAL COST			$11,256.00	

20 hours of dozer time to construct pond 40 hours to set up netting and monitor system

Construct access road

	# of units	unit price	total $	
Aircraft landing mat 2' x 10' - used - each	60 ea	$16.00	$960.00	16
Fuel for D6D at 5 gal./hr.	150 gal	$1.00	$150.00	
Lube, Parts, and Repairs D6D /hr	30 hr	$7.20	$216.00	13
Misc. supplies			$500.00	
Total Supplies			$1,826.00	
Labor	72 hr	$18.00	$1,296.00	
TOTAL COST			$3,122.00	

30 hours of dozer time to construct road 42 hours labor to install water main and stream crossings

Mill and office site preparation

	# of units	unit price	total $	
Area lighting	1 ea	$500.00	$500.00	15
Septic tank for office - installed	1 ea	$2,500.00	$2,500.00	
Fuel for D6D at 5 gal./hr.	100 gal	$1.00	$100.00	
Lube, Parts, and Repairs D6D /hr	20 hr	$7.20	$144.00	13
Misc. supplies			$500.00	
Total Supplies			$3,744.00	
Labor	120 hr	$17.70	$2,124.00	
TOTAL COST			$5,868.00	

20 hours of dozer time to grade and prepare site including stockpiling of topsoil and preparing pad for mill trailers and ore stockpile

100 hours general layout and site prep time including set up of facilities and area lighting etc.

Site reclamation

	# of units	unit price	total $	source
Cement to stabilize settling pond fines	10 ton	$83.10	$831.00	11
Disposal of pond liner	1	$500.00	$500.00	
Seed and plants			$2,500.00	8
Fuel for D6D at 5 gal./hr.	200 gal	$1.00	$200.00	
Lube, Parts, and Repairs D6D /hr	40 hr	$7.20	$288.00	13
Misc. supplies			$500.00	
Total Supplies			$4,819.00	
Labor	160 hr	$17.70	$2,832.00	
TOTAL COST			$7,651.00	

40 hours of bulldozer time to recontour and grade site including spreading the stockpiled topsoil and preparing the ground for reseeding

120 hours general site cleanup and planting of the recontoured site

Permits

Aquifer Protection Permit			$6,000.00	14
Corps of Engineers 404 permit			$100.00	14
Misc County Permits			$1,400.00	
Total			$7,500.00	

Transportation of concentrates

	# of units	unit price	total $	
Rail miles	1600 mile	$0.02	$32.00	8
Truck miles	10 mile	$0.80	$8.00	8
Transhipment charge per ton			$1.00	
TOTAL COST			$41.00	
Cost per ton of ore			$2.05	

Drifting costs

Old Yuma Mine, Tucson

List of costing assumptions

area of face 8ft x 8ft	64
Holes per round	18
ft hole drilled per round	90
hours to drill round	3
drill rate feet per hour	30
type explosive	60% gel
lbs explosive/foot advanc	9
mucking method	LHD
timbering	minor
ft of advance per round	5
shift/foot of advance	0.16
LHD haul rate tons/hr	71
tons broken per round	28
lbs rock per cubic foot	175
tons per cubic yard	2.4

(estimate based on Cananea, from Peele)

List of mining supplies

Item	unit cost	source	est. life
60% gel/lb	$1.50	12	
caps /ea	$0.50	12	
fuse /ft	$0.10	12	
vent 24" /ft	$3.00	2	
split set /ea (1-1/4" x 5')	$5.25	2	
bolt mats/ea	$10.00	2	
bit 1-1/4" ea	$22.75	8	500ft/bit
steel 8' /ea	$97.05	8	5000ft/steel
timber /bdft	$2.00	8	
diesel /gal	$1.00		
LHD gal/hr	2.6	1	
air pipe/ft	$0.60	8	
water pipe/ft	$1.30	8	
cement /ton (bulk delivered)	$83.10	11	

Labor

	Wages in 1992 $/hr	burden 32%	source
miner	$13.62	$18.00 per hr	8
helper	$12.38	$16.35 per hr	8
mechanic	$14.98	$19.80 per hr	8
shift avg (drifting)		$17.70 per hr	

Costs/round

supplies

	unit cost	used	total item cost
explosive	$1.50 per lb.	45 lbs.	$67.50 per round
caps	$0.50 each	18 each	$9.00 per round
fuse	$0.10 per foot	129 feet	$12.90 per round
bolts	$5.25 each	2 each	$10.50 per round
mats	$10.00 each	0.5 each	$5.00 per round
bit	$22.75 each	0.17 each	$3.79 per round
steel	$97.05 each	0.02 each	$1.76 per round
timber	$2.00 bd. foot	5 bd. feet	$10.00 per round
diesel	$1.00 gallon	1.02 gallons	$1.02 per round
misc. supplies			$3.27 per round
Total supplies			$124.74 per round
Labor	$17.70 per hour	6.4 hours	$113.28 per round

Cost per round $238.02

Supplies	$124.74
Labor	$113.28
TOTAL	$238.02

Cost per foot of drift $48.00

Mining Costs

Stoping

Stope supplies

	unit cost	used	total item cost
explosive	$1.50 lb	0.5 lbs/ton of ore	$0.75 per ton of ore
caps	$0.50 each	0.28 per ton of ore	$0.14 per ton of ore
fuse	$0.10 foot	4.06 ft/ton of ore	$0.42 per ton of ore
bolts	$5.25 each	0.10 per ton of ore	$0.53 per ton of ore
mats	$10.00 each	0.03 per ton of ore	$0.30 per ton of ore
bit	$22.75 each	0.006 per ton of ore	$0.13 per ton of ore
steel	$97.05 each	0.0006 per ton of ore	$0.05 per ton of ore
timber	$2.00 bd ft	1 bd ft/ton of or	$2.00 per ton of ore
Misc.			$1.00 per ton of ore
total			$5.33 per ton of ore

Stope labor	$17.70 hr	0.8 hrs/ton	$14.16 per ton of ore

Stope Total

supplies	$5.33 per ton of ore
labor	$14.16 per ton of ore
Total	$19.49 per ton of ore

Haulage

	unit cost	used	total item cost
Fuel	$1.00 per gal.	0.037 gal per ton	$0.04 per ton of ore
Repairs	$8.16 per hr.	0.014 hrs per ton	$0.11 per ton of ore
Labor	$17.70 per hr.	0.028 hrs per ton	$0.50 per ton of ore
Total			$0.65 per ton of ore

Backfill

	unit cost	used	total item cost
Supplies **	$83.10 per ton	0.03 ton per ton	$2.49 per ton of ore
Power *	$1.00 per gal.	0.04 gal. per ton	$0.04 per ton of ore
Labor	$17.70 per hr.	0.04	$0.71 per ton of ore
Total			$3.24 per ton of ore

* fuel for main generator, additional usage at .08 gal/kWhr
** portland cement for 3% mix

Mine operating cost summary

Stoping	$19.49 per ton of ore
Haulage	$0.65 per ton of ore
Backfill	$3.24 per ton of ore
TOTAL	$23.38 per ton of ore

Milling Costs

Labor		hours per day	$ per day
Mill operator	$18.00 per hr	24	$432.00
Mill assistant	$16.00 per hr	24	$384.00
Mechanic	$20.00 per hr	4	$80.00
Total $ per day			$896.00
Total $ per ton			8.96

Supplies	unit cost	used	total cost
4" balls	$450.00 /ton	3 lbs/ton of ore	$0.68 per ton of ore
Xanthate	$1.05 /lb	0.434 lbs/ton of ore	$0.46 per ton of ore
Areofloat-25	$2.00 /lb	0.16 lbs/ton of ore	$0.32 per ton of ore
frother	$1.16 /lb	0.048 lbs/ton of ore	$0.06 per ton of ore
cuso4	$0.80 /lb	0.1 lbs/ton of ore	$0.08 per ton of ore
na2sio2	$0.28 /lb	2 lbs/ton of ore	$0.56 per ton of ore
LHD maint.			$0.23 per ton of ore
misc. supplies			$0.20 per ton of ore
		TOTAL	$2.59 per ton of ore

Water		
	$2.25 per 1000 gallons	make up water, assumes 20% loss through
usage	240 gal. per ton of ore	evaporation and tailings disposal
cost	$0.54 per ton of ore	

Fuel		
Generator	18 gal per hour	
LHD	1.3 gal per hour	
total usage	19.3 gal per hour	
Cost per hour	$19.30	(Total usage times the cost per gallon)
Mil rate	4.17 tons per hour	(100 tons per day divided by 24 hours)
Cost	$4.63 per ton of ore	(cost per hour divided by mill rate)

Milling operating cost summary

Labor	$8.96 per ton of ore
Supplies	$2.59 per ton of ore
Water	$0.54 per ton of ore
Fuel	$4.63 per ton of ore
TOTAL	$16.72 per ton of ore

Attachment 5 Blue Range Mill Flow Sheet

TYPICAL CRUSHER TRAILER FOR 100 TPD PORTABLE MILL

(CAT 250 kw DIESEL-ELECTRIC SET)

(200 amp ARC WELDER) — 15 hp

8" RAIL GRIZZLY

COARSE ORE BIN

RECIPROCATING FEEDER — 2 hp

CONVEYOR BELT

10 x 20 JAW CRUSHER — 25 hp

(hand sorting deck)

CONVEYOR BELT <---------- (+) -------- 1-1/4" VIBRATING SCREEN — 2 hp

(-) — 2 hp

DUST COLLECTOR — 3 hp

---- 3/8" VIBRATING SCREEN

(+) (-)

2' CONE CRUSHER — 20 hp

CONVEYOR BELT (18") — 2 hp

CRUSHER TRAILER

GRINDING TRAILER

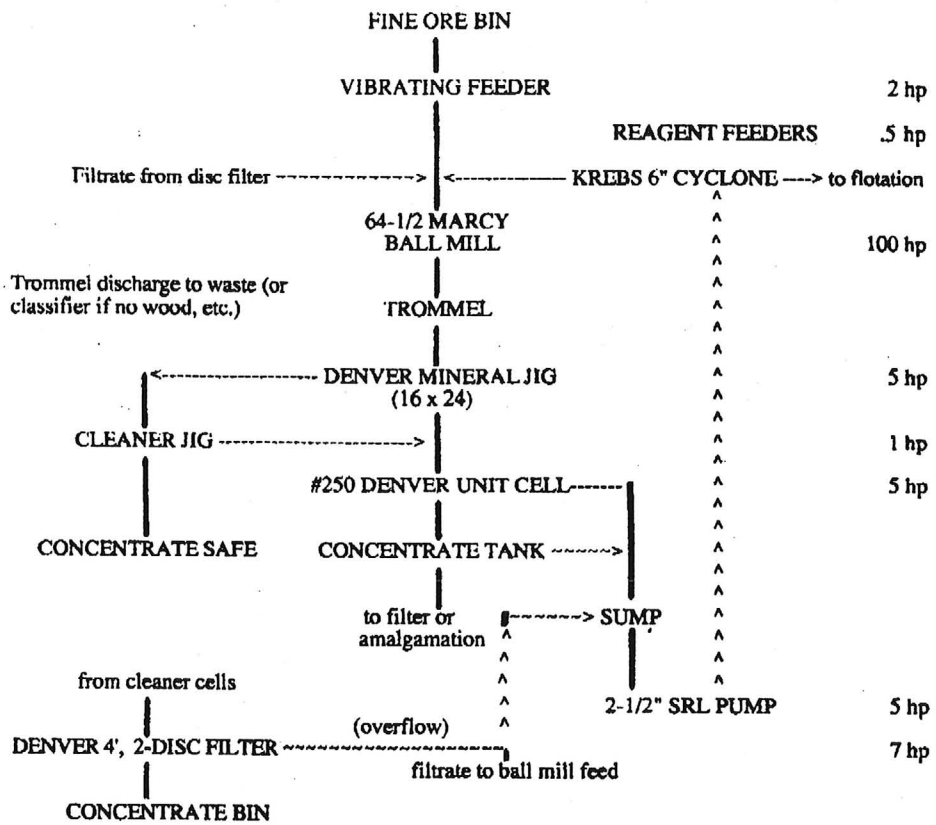
(loader)

AUTOMATIC SAMPLER — .5 hp

FINE ORE BIN ----------> OVERFLOW TO STOCKPILE

Total power connected (including lights) - 76 horespower

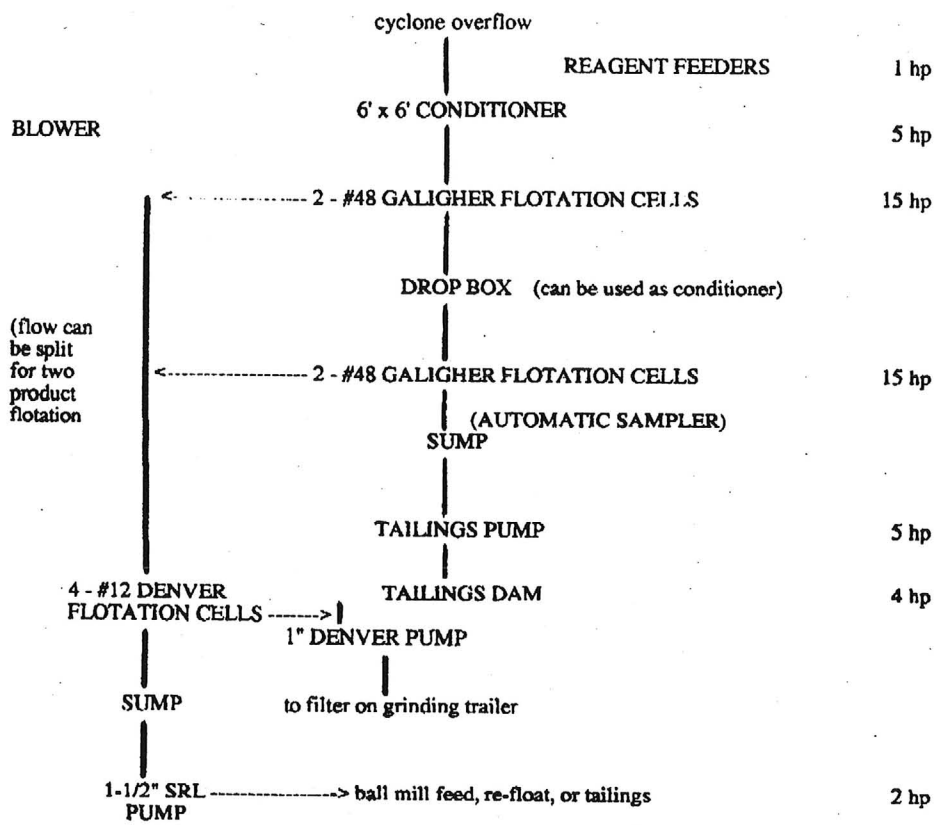
TYPICAL GRINDING TRAILER FOR 100 TPD PORTABLE MILL



Total power connected (including lights) - 130 horsepower

~~~~~ water flow
~~~~~

TYPICAL FLOTATION TRAILER FOR 100 TPD PORTABLE MILL



WATER RETURN PUMP	5 hp
PRESSURE PUMP	5 hp

Total connected horsepower - 62

TOTAL PLANT HORSEPOWER - 274 AVERAGE LOAD - 218 hp

Attachment 6 Floatation test results

Shipping:
13801 E. Benson Highway
Vail, Arizona 85641

Mailing:
P.O. Box 310
Vail, Arizona 85641

Mountain States
R & D International, Inc.
A World Leader in Mineral Technology

Tel. Vail (602) 762-5364
Tel. Tucson (602) 624-7990

Telex 910 250 2482 MSRD
Telefax (602) 762-5717

July 1, 1992

Mr. Richard Bideaux
710 West Bangalor Drive
Oro Valley, Arizona 85704

Subject: Addendum to MSRDI Project Report 5470
Flotation of Old Yuma Mine Tailings

Dear Mr. Bideaux:

Pursuant to our telephone conversation, Mountain States R & D International, Inc. (MSRDI) has completed a flotation test on Old Yuma Mine Tailings ground to 200 mesh. The results of this flotation test are presented below:

	Au Oz/T	Ag Oz/T
Rougher/Scavenger Conc.	2.532	1.30
Rougher/Scavenger Tail	0.018	0.33

A 200 mesh grind increased the gold recovery from 60 percent to 84 percent. Silver recovery remained low at 13 percent.

A flotation test log sheet has been included with this Addendum. A copy of the original report including this Addendum is enclosed.

Thank you for giving MSRDI the opportunity to conduct this flotation study. We look forward to your comments.

Sincerely,

John P. McDonald
Vice President/Manager of Technical Projects

JPMcD/sm
Enclosure

Shipping:
13801 E. Benson Highway
Vail, Arizona 85641

Mailing:
P.O. Box 310
Vail, Arizona 85641

Mountain States
R & D International, Inc.
A World Leader in Mineral Technology

Tel. Vail (602) 762-5364
Tel. Tucson (602) 624-7990

Telex 910 250 2482 MSRD
Telefax (602) 762-5717

June 29, 1992

Mr. Richard Bideaux
710 West Bangalor Drive
Oro Valley, Arizona 85704

Subject: **Flotation of Old Yuma Mine Tailings**

Reference: **MSRDI Project No. 5470**

Dear Mr. Bideaux:

Mountain States R & D International, Inc. (MSRDI) has completed two flotation scoping tests on Old Yuma Mine Tailings. The flotation tests were conducted at a coarse (65 mesh) and at medium fine (100 mesh) grinds. The scoping tests conducted indicate that a portion of the gold contained in the Old Yuma Mine Tailings will float. The limited flotation scoping tests conducted were encouraging because approximately 60 percent of the gold floated. The concentrate generated was high enough in gold content to be accepted by a smelter.

INTRODUCTION

During May 1992, MSRDI received approximately 100 pounds of Old Yuma Mine Tailings. The 1/2-inch material received was crushed to minus ten mesh and a sample was split out for duplicate gold and silver fire assays. The sample was of relatively high grade 0.113 oz/ton Au and 0.55 oz/ton Ag.

The minus 10 mesh ore was ground in a rod mill preparatory to flotation. Two rougher flotation tests were conducted. The results of these tests including materials balances are presented in the Appendix of this report.

SUMMARY

- The Old Yuma Mine Tailings assayed, contained 0.113 and 0.55 oz/ton gold and silver, respectively.
- The number one rougher flotation concentrate contained 1.48 oz/ton gold. The number one rougher flotation tail contained 0.047 oz/ton gold.

- The number three rougher flotation concentrate contained 5.420 oz/ton gold. The number three rougher flotation tail contained 0.047 oz/ton gold.
- The gold recovery from the Old Yuma Mine Tailings was approximately 60 percent for flotation tests number one and three.

RECOMMENDATIONS

- The gold and silver recovery by the initial flotation tests was high enough to merit additional testing.
- If additional flotation tests are conducted, a gold characterization should be run on the tailings to determine the association of the gold with gangue minerals.

DISCUSSION

Two five gallon pails of Old Yuma Mine Tailings were received by MSRDI during May 1992. This material had been crushed to one-half inch. The one-half inch material was cone and quartered and approximately ten kilograms were split out for fire assays and flotation tests. The one-half inch ten kilogram split was reduced to minus ten mesh preparatory to assay and flotation testing. A one kilogram split of the ten mesh material was pulverized and two samples were cut out for duplicate fire assays. The results of the fire assays are presented below:

Au Oz/T	Ag Oz/T
0.112	0.54
0.113	0.55

One thousand gram splits of the remaining minus ten mesh material were prepared for flotation testing.

Three flotation tests were conducted. The first test was conducted on tailings ground for five minutes (65 mesh) the second ten minutes and the third seven minutes (100 mesh). The pulp from the ten minute grind test two was quite slimy. Flotation test number two had to be discontinued because of a flotation machine mechanical failure. The mechanical failure of the flotation machine was not caused by the slimy nature of the pulp.

Mr. Richard Bideaux JUne 29, 1992

The results of flotation tests one and three are presented below.

Flotation Test #1	Au Oz/T	Ag Oz/T
Concentrate	1.480	1.30
Tail	0.047	0.40

Flotation Test #3	Au Oz/T	Ag Oz/T
Concentrate	5.420	1.71
Tail	0.047	0.42

Based upon an assay head of 0.113 oz/ton Au, the gold recovery was approximately 60 percent. One additional flotation test at two hundred mesh will be performed to determine if a finer grind will improve gold recovery.

If you have any questions, please do not hesitate to give me a call.

Sincerely,

John P. McDonald
Vice President/Manager of Technical Projects

JPMcD/sm
Attachments

APPENDIX

MOUNTAIN STATES R & D INTERNATIONAL, INC. (MSRDI)

FLOTATION TEST LOG SHEET

Sample I.D.: Old Yuma Mine Tails
Sample Weight: 1000 Grams
Sample Size: -10 —> 65 Mesh

Project No.: 5470
Date: 5/22/92
Test No.: JMCD-1

CONDITIONS AND REAGENTS:

Point of Addition	Conditions: Time (Min.)	Conditions: Solids (%)	Conditions: pH	Reagent Addition (#/Ton Ore): PAx	AF-25	MIBC	CuSO4
Condition	5	25	7.0	0.248	0.16	0.018	0.24
Float	5	25	7.0				
Condition	2		7.0	0.124	0.04	0.005	
Float	3	25	7.0				
Total Reagents				0.372	0.20	0.023	0.24

METALLURGICAL RESULTS:

Product	Weight (%)	Assays (Oz/T): Au	Assays (Oz/T): Ag	Contents (Oz): Au	Contents (Oz): Ag	Distribution (%): Au	Distribution (%): Ag
Rougher/Scav. Conc.	4.34	1.480	1.30	0.064	0.056	59.26	12.90
Scav. Tail	94.47	0.047	0.40	0.044	0.378	40.74	87.10
CALCULATED HEAD				0.108	0.434	100.00	100.00
HEAD ASSAY				0.112	0.540		

PAx at 1% solution
Grind 5 minutes

MOUNTAIN STATES R & D INTERNATIONAL, INC. (MSRDI)

FLOTATION TEST LOG SHEET

Sample I.D.: Old Yuma Mine Tails
Sample Weight: 1000 Grams
Sample Size: -10 —> 100 Mesh

Project No.: 5470
Date: 6/05/92
Test No.: JMCD-3

CONDITIONS AND REAGENTS:

Point of Addition	Conditions: Time (Min.)	Conditions: Solids (%)	Conditions: pH	Reagent Addition (#/Ton Ore): PAx	AF-25	MIBC	CuSO4	Na2SiO2
Condition	5	25	7.0	0.186	0.12	0.042	0.40	1.0
Float	5	25	7.0					
Condition	3	25	7.0	0.124	0.08	0.018		
Float	4	25	7.0					
Total Reagents				0.310	0.20	0.060	0.40	1.0

METALLURGICAL RESULTS:

Product	Weight (%)	Assays (Oz/T) Au	Assays (Oz/T) Ag	Contents (Oz) Au	Contents (Oz) Ag	Distribution (%) Au	Distribution (%) Ag
Rougher/Scav. Conc.	1.31	5.420	1.71	0.071	0.02	60.68	4.65
Scav. Tail	97.70	0.047	0.42	0.046	0.41	39.32	95.35
CALCULATED HEAD				0.117	0.43	100.00	100.00
HEAD ASSAY				0.113	0.54		

PAx at 1% solution
Grind 7 minutes

MOUNTAIN STATES R & D INTERNATIONAL, INC. (MSRDI)

FLOTATION TEST LOG SHEET

Sample I.D.: Old Yuma Mine Tails
Sample Weight: 1000 Grams
Sample Size: -10 —> 200 Mesh

Project No.: 5470
Date: 6/29/92
Test No.: JMCD-4

CONDITIONS AND REAGENTS:

Point of Addition	Conditions Time (Min.)	Conditions Solids (%)	Conditions pH	Reagent Addition (#/Ton Ore) PAx	AF-25	MIBC	CuSO4	Na2SiO2
Condition	5	25	7.0	0.186	0.080		0.10	2.0
Float	6	25	7.0	0.124	0.040	0.042		
Condition	3	25	7.0	0.124	0.040			
Float	4	25	7.0			0.006		
Total Reagents				0.434	0.160	0.048	0.10	2.0

METALLURGICAL RESULTS:

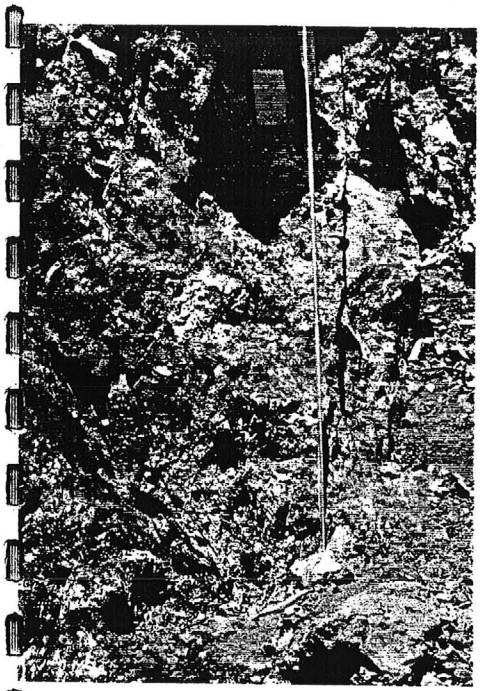
Product	Weight (%)	Assays (Oz/T) Au	Assays (Oz/T) Ag	Contents (Oz) Au	Contents (Oz) Ag	Distribution (%) Au	Distribution (%) Ag
Rougher/Scav. Conc.	3.56	2.532	1.30	0.090	0.05	84.11	13.51
Scav. Tail	954.90	0.018	0.33	0.017	0.32	15.89	86.49
CALCULATED HEAD				0.107	0.37	100.00	100.00
HEAD ASSAY				0.113	0.54		

PAx at a 1% solution
Grind 15 minutes

Attachment 7 Sample site descriptions and photographs

BEFORE AFTER

Yuma 1	6′ x 4" x 1"	17 lbs.	Comet 8	Inside the portal of the Copper Kettle prospect. In the upper portion of the shear zone. Visible wulfenite represents about 0.5% of surface, no $2 crystals.



BEFORE

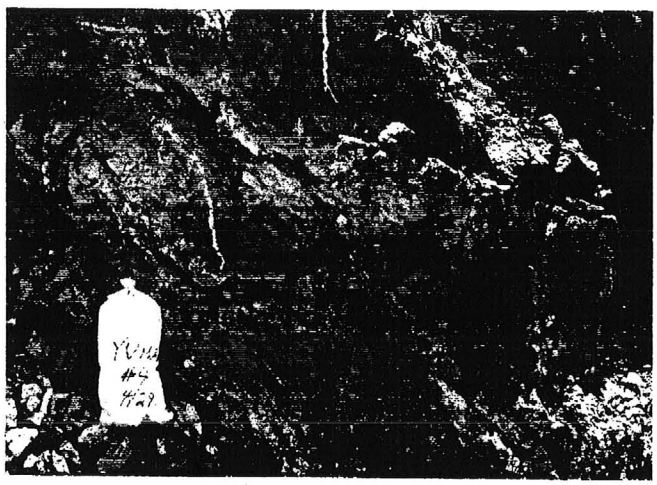
AFTER

Yuma 2	5′ x 4" x 1"	15 lbs.	Comet 8	9 feet west of the portal of the Copper Kettle, apparent hanging wall, visible wulfenite represents >0.5% of surface, no $2 crystals

BEFORE

AFTER

Yuma 3 7′ x 4" x 1" 19 lbs. Comet 8 8′ east of Yuma 2 and lower, taken in the lower portion of the breccia zone, no significant wulfenite noted, no $2 crystals



AFTER

Yuma 4	6′ x 3" x 1"	16 lbs.	Comet 1	Taken from breccia zone 1, just east of the main incline. Visible wulfenite represents <0.5% of surface, no $2 crystals.

BEFORE

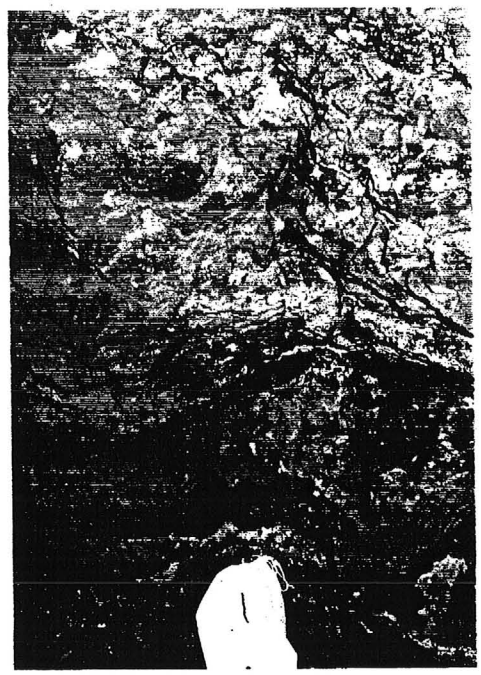
AFTER

Yuma 5 2.5′ x 3" x 1" 7 lbs.

Comet 1 Just west of the main incline, taken from the lower portion of breccia zone 1. Visible wulfenite represents about 0.5% of surface, two $2 crystals

AFTER

Yuma 6	7.5′ x 3" x 1" 21 lbs	Comet 1	200 level, 70 feet east of the main incline. Breccia zone 1, back to argillaceous layer above zone 2. Vanadenite represents 10% of surface, also specular hemitite, and good quality mimetite crystals abundent. Wulfenite was also present, nine $2 crystals.



BEFORE AFTER

Yuma 7	5′ x 3" x 1"	13 lbs.	Comet 1	100 level, 10 feet west of main incline. Breccia zone 2, material very silicous, no vugs, very few visible crystals, no $2 crystals.

BEFORE

AFTER

Yuma 8 3.5′ x 7" x.5" 9 lbs.

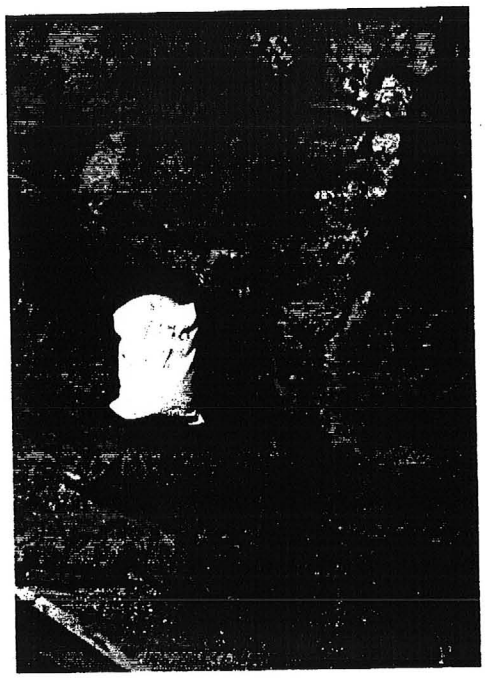
Comet 2 East side of a shallow prospect pit (OYM - 9). The pit is along the Old Yuma Fault in the remanants of Breccia zone 1.

AFTER

Yuma 9	6′ x 3" x 1"	15 lbs.	Comet 1	East side of the small glory hole west of the main incline. The sample includes the lower 4.5 feet of breccia zone 2 and upper 1.5 feet of breccia zone 3. Wulfenite in the lower portion of the sample, galena in lower portion, five $2 crystals and one $10 crystal.

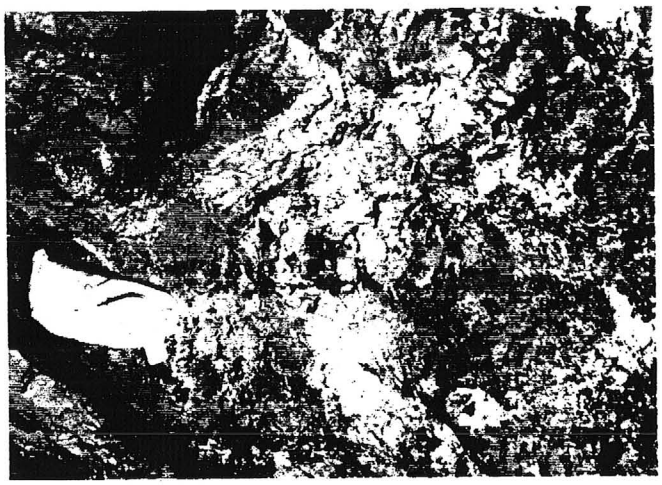
AFTER

Yuma 10	4.5′ x 4" x 1" 12 lbs.	Comet 1	East side of the small glory hole west of the main incline. 4.5 feet of breccia zone 3. Heavy wulfenite and galena in the upper portion, no $2 crystals.



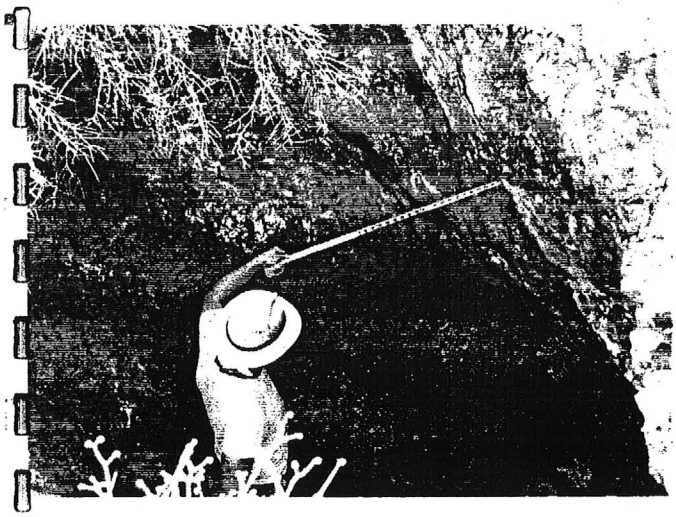
AFTER

Yuma 11	4′ x 3" x 1"	10 lbs.	Comet 1	12 feet down the main incline. The lower 3 feet of breccia zone 2 and upper 1 foot of breccia zone 3. Mimetite crystals in zone 3, no $2 crystals.

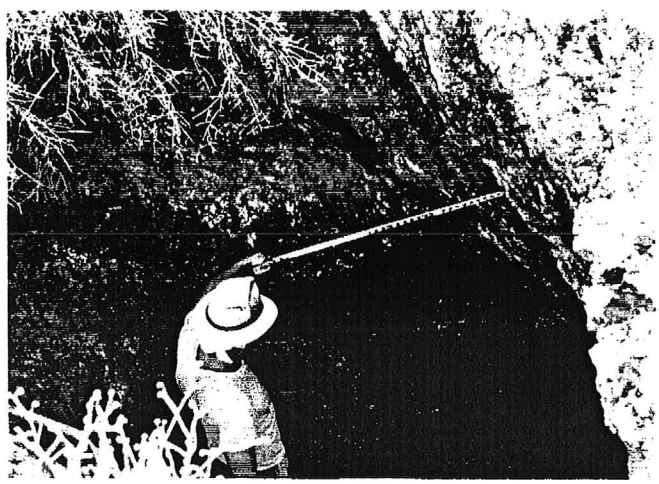


AFTER

Yuma 12	5′ x 4" x .5"	8 lbs.	Comet 1	Portal of the east incline. Upper portion of breccia zone 1. Minor wulfenite, no $2 crystals.



BEFORE



AFTER

Yuma 13 3′ x 6" x 1" 16 lbs. Comet 1

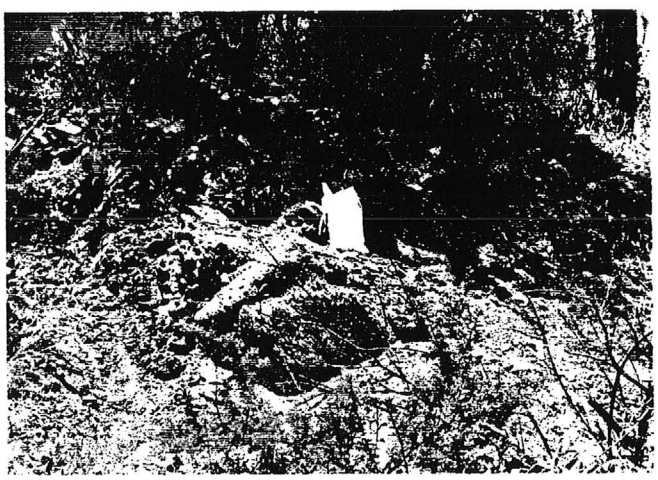
Small exploration pit (OYM - 5) on the main structure (the Old Yuma Fault) near the east side of the claim. Taken on the northeast side of the pit, little visible mineralization. No $2 crystals.

BEFORE

AFTER

Yuma 14	3′ x 3" x 1"	9 lbs.	Comet 11	Sample taken from outcrop near center of the claim. Outcrop was a light grey rhyolite porphyry, no significant mineralization was observed.

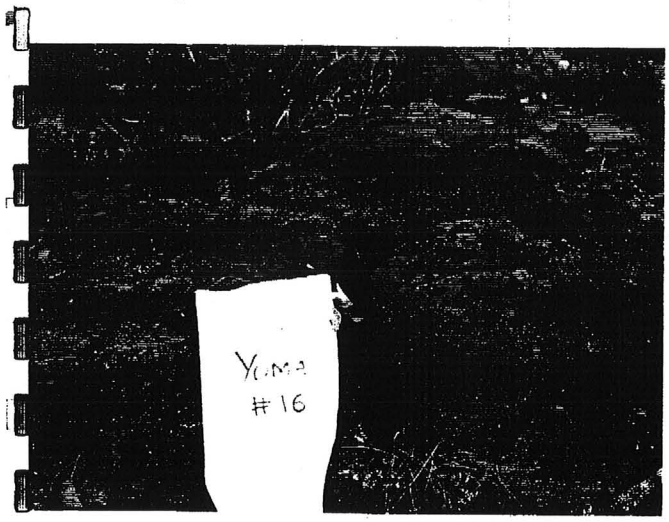
BEFORE



AFTER

Yuma 15 3′ x 3" x 1" 7 lbs. Comet 5

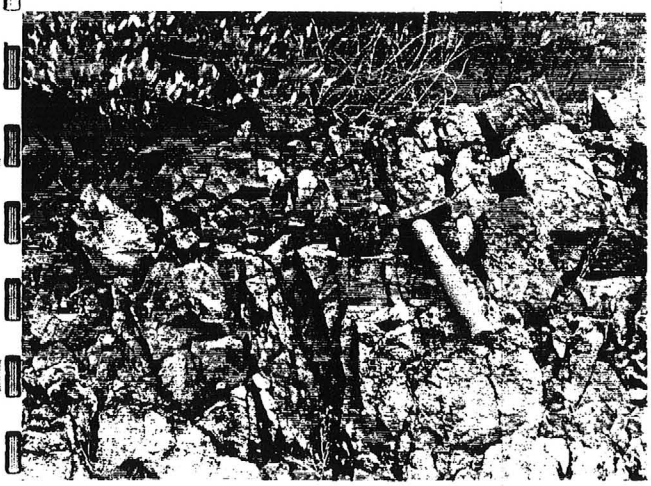
Sample taken from outcrop on the west side of wash, outcrop is pale green to light brownish red. Highly fractured and weathered bounded by dark gray brown andesite. No significant mineralization observed.



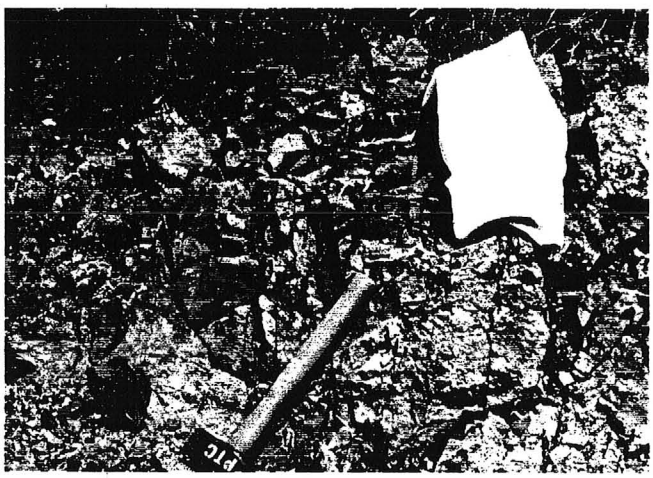
BEFORE

AFTER

Yuma 16 grab 10 lbs. Comet 3 Sample taken from outcrop near center of the claim. Outcrop is dark greyish brown vesicular andesite with elongate vesicles indicating flow. Light colored phenocrists in a dark matrix, no significant mineralization observed.

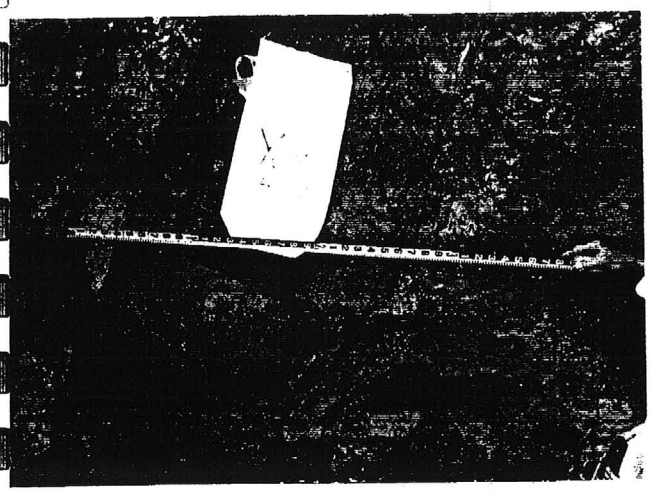


BEFORE



AFTER

Yuma 17 grab 8 lbs. Comet 4 Sampled outcrop of fractured silicified volcanics. Some siliceous replacement but no significant mineralization.



BEFORE

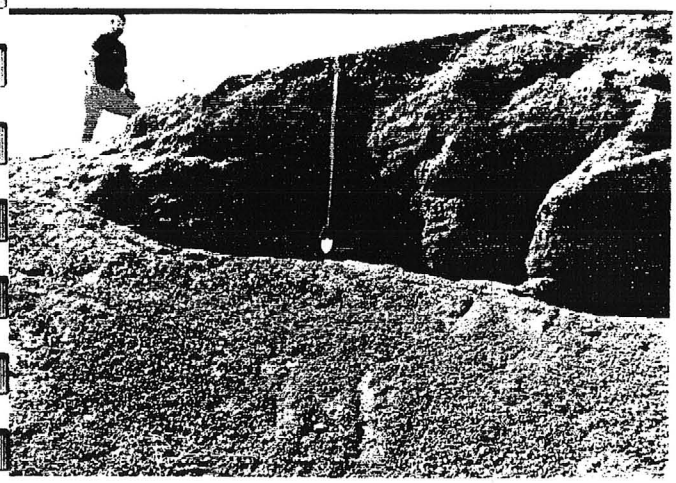
AFTER

Yuma 18	3′ x 6" x 1"	15 lbs.	Comet 9	Sample taken from shallow propsect pit (OYM - 6)

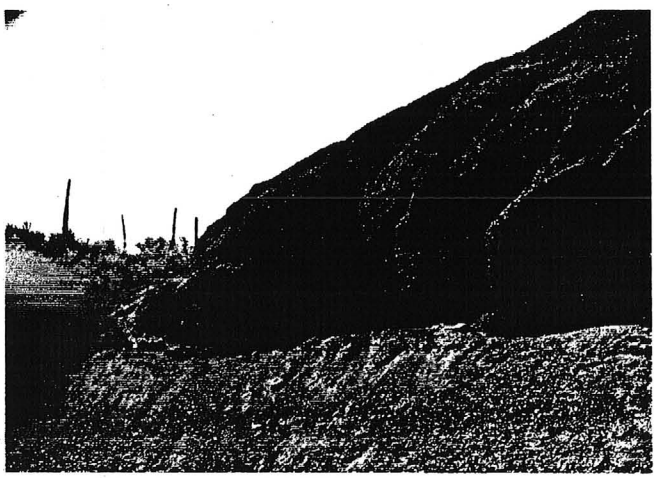
BEFORE

AFTER

Yuma 19	5′ x 3" x 1"	14 lbs.	Comet 10	Sample taken from shallow prospect trench (OYM - 8) just northeast of the southwest corner of the claim, mineralized fault breccia includes iron staining, calcite stringers, and copper oxide staining

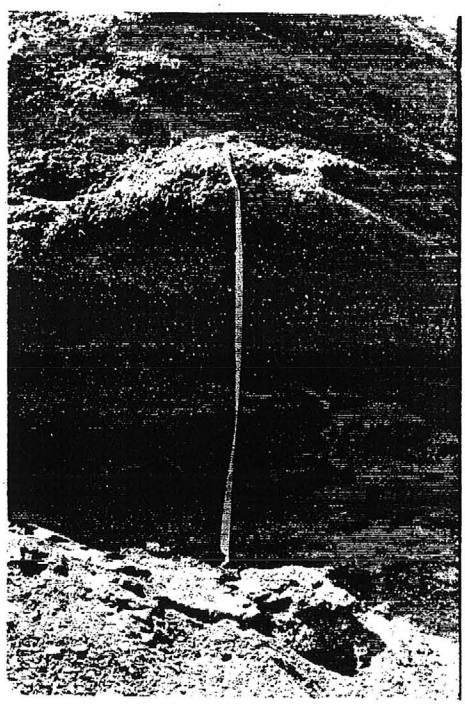


BEFORE

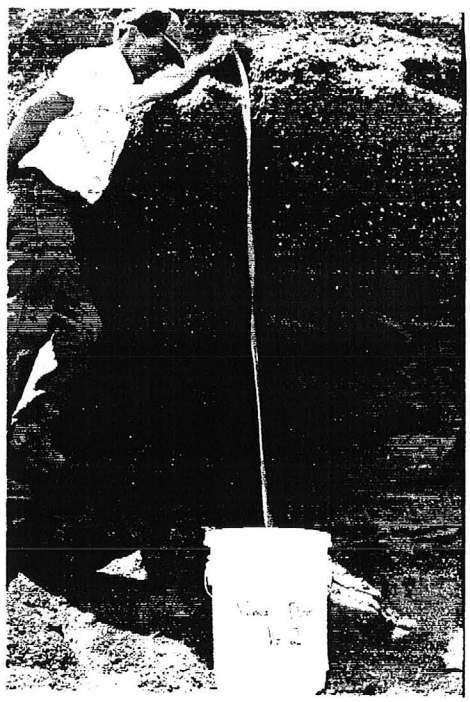


AFTER

Yuma Dump 1 6.5′ x 6" x 3" 70 lbs. Old Yuma placer Upper portion of the mill tailings pile.



BEFORE



AFTER

Yuma Dump 2 7′ x 6" x 2" 45 lbs. Old Yuma placer Lower portion of the mill tailings pile.

Attachment 8 Ore reserve calculations

ATTACHMENT 8 ORE RESERVE CALCULATIONS

Tonnage calculations for Breccia Zone 2

(See diagram page 8.2 for location of ore blocks, sample points, and zones of influence for samples)

Breccia Zone 2

Lbs per cu ft 175

Block I		Block II		Block III	
Avg Thickness	8	Avg Thickness	8	Avg Thickness	8
Area	30,700	Area	4,100	Area	21,000
Void space (area)	2,700	Void space (area)	600	Void space (area)	0
Total cu ft	224,000	Total cu ft	28,000	Total cu ft	168,000
Tons	19,600	Tons	2,400	Tons	14,700

Average grade calculations

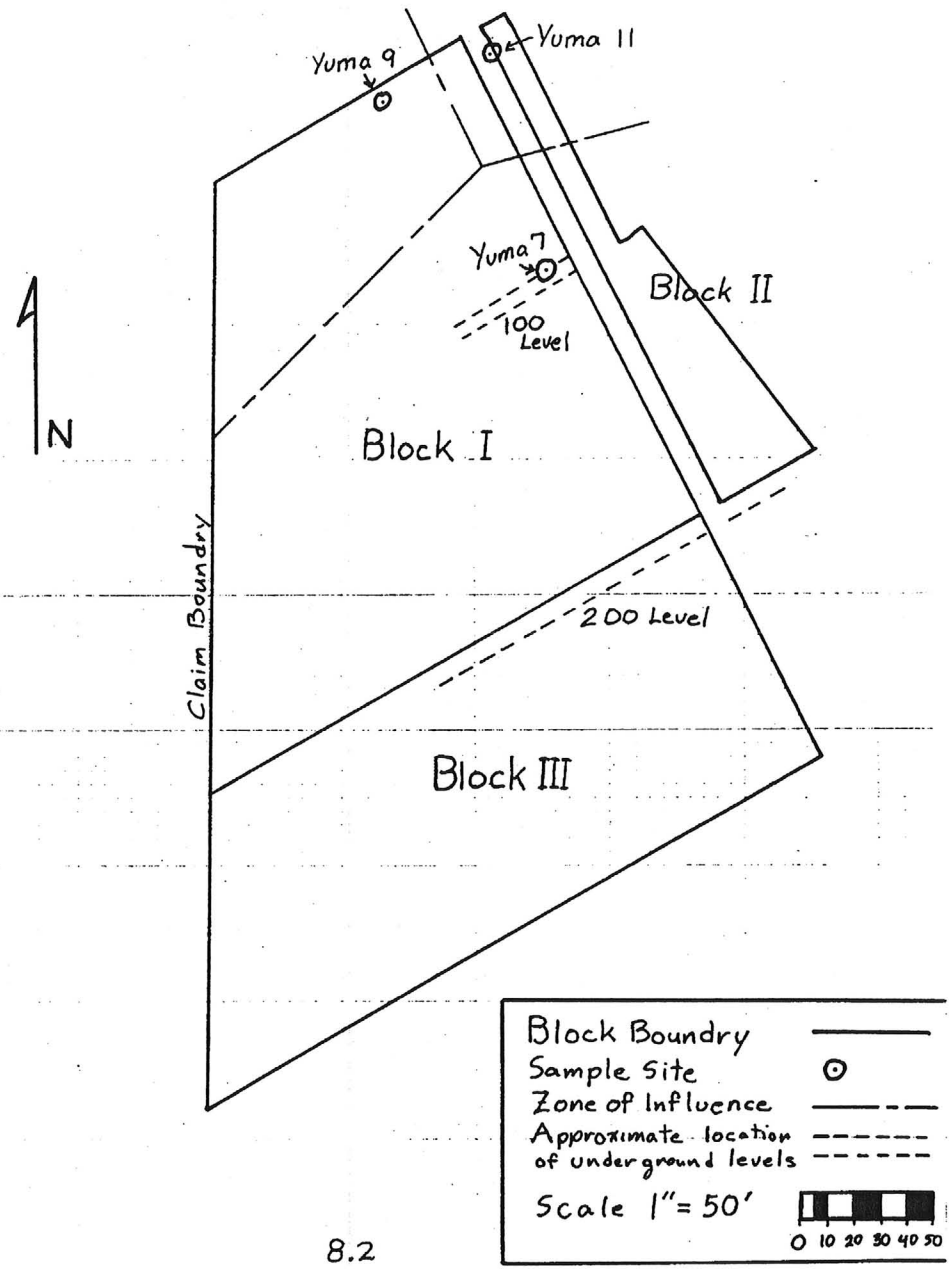
Volume of influence

	Area	Thickness	Volume	Tons
Yuma 7	27450	8	219600	19200
Yuma 9	7050	8	56400	4900
Yuma 11	1625	8	13000	1100

Weighted average calculations

	Yuma 7	represents	Yuma 9	represents	Yuma 11	represents			
	19,200	tons	4,900	tons	1,100	tons		Total	Weighted
	grade in %	oz or units	grade in %	oz or units	grade in %	oz or units		oz or units	Average
metal	or oz/ton	cont metal	or oz/ton	cont metal	or oz/ton	cont metal	Total tons	cont metal	Grade
Au	0.354	6,797	0.075	368	0.107	118	25,200	7,283	0.289
Ag	0.68	13,056	0.22	1,078	0.21	231	25,200	14,365	0.57
As	0.02	384	0.02	98	0	0	25,200	482	0.02
Cu	0.13	2,496	0.1	490	0.02	22	25,200	3,008	0.12
Mo	0.046	883	0.029	142	0.005	6	25,200	1,031	0.04
V	0.01	192	0.01	49	0.01	11	25,200	252	0.01
Pb	3.09	59,328	2.47	12,103	9.66	10,626	25,200	82,057	3.26

Galena is 86% Pb
Ore is 3.8% Galena
Theoretical max
con ratio 26:1
Used 20:1


Yuma 9
Yuma 11
Yuma 7
100 Level
Block II
N
Block I
Claim Boundry
200 Level
Block III
Block Boundry
Sample Site
Zone of Influence
Approximate location of underground levels
Scale 1" = 50'
0 10 20 30 40 50

Attachment 9 Smelter Schedule Calculations

Attachment 9 Smelter Return Calculations

Underground operation Old Yuma Mine, Comet 1/Old Yuma #1lode mining claims

Current Market Price

Copper	$1.00 per lb
Gold	$350.00 per t. oz
Silver	$3.50 per t. oz
Lead	$0.38 per lb

Mill Data

Recovery	Con. Ratio
85%	20 to 1

Mine Data

Mining Dilution
H Wall
10%

Assay data

	Vein per ton	H Wall per ton	F Wall per ton	Mine Run per ton	Mill Run per ton of concentrat
Gold	0.289	0.025	0	0.2626	4.4642 oz/ton
Silver	0.57	0.47	0	0.5600	9.52 oz/ton
Copper	0.12	0.19	0	0.1270	2.159 %
Lead	3.26	2.75	0	3.2090	54.553 %
Zinc	0	0	0	0.0000	0 %
Arsenic	0.02	0.04	0	0.0220	0.374 %
Antimony	0	0	0	0.0000	0 %
Bismuth	0	0	0	0.0000	0 %
Nickel	0	0	0	0.0000	0 %

Smelter Data

Payments

	First deduct	then	Pay for	Less	Totals
Gold	0.02 oz		95%	$5.00 per oz	$1,456.59
Silver	1 oz		95%	$0.25 per oz	$26.31
Copper	1.5 unit		60.0%	$0.40 per pound	$4.74
Lead	1.5 unit		95.0%	$0.05 per pound	$332.64

Total payment per ton of concent $1,820.28

Deductions

Standard smelting deduction $130 per ton of concentrate

Excess gold, silver, copper charge
5% of everything over $1000 per ton of concentrate

$1,820.28	($1,000.00)	$820.28	5%	$41.01

Contaminant deductions

	Mill Run	Allowed	Excess	Excess Penalty	Increase
	----------Units----------				
Arsenic	0.374	0.5	0	$3.00	$0.00 per ton
Antimony	0	0.5	0	$3.00	$0.00 per ton
Bismuth	0	0.05	0	$10.00	$0.00 per ton
Nickel	0	0.3	0	$5.00	$0.00 per ton
Moisture	0	10	0	$0.50	$0.00 per ton
Subtotal					$0.00

Total smelter deduction

Standard smelting deduction	$130.00
Excess gold, silver, copper charge	$41.01
Contaminant deductions	$0.00
TOTAL	$171.01

Net Smelter Return (NSR)

Total smelter payments
Total smelter deductions

Net Smelter Return (NSR)	$1,649.27 per ton of concentrate
Net Smelter Return (NSR)	$82.46 per ton of ore

Attachment 9 Smelter Return Calculations

Placer operation Old Yuma Mine, Old Yuma placer mining claim

Current Market Price

Copper	$1.00 per lb
Gold	$350.00 per t. oz
Silver	$3.50 per t. oz
Lead	$0.38 per lb

Mill Data

Recovery	Con. Ratio
84%	20 to 1

Mine Data

Mining Dilution
H Wall
0%

.1290 X .84 X 20

Assay data

	Vein per ton	H Wall per ton	F Wall per ton	Mine Run per ton	Mill Run per ton of concentrat
Gold	0.129	0	0	0.1290	2.1672 oz/ton
Silver	0.53	0	0	0.5300	8.904 oz/ton
Copper	0.18	0	0	0.1800	3.024 %
Lead	2.44	0	0	2.4400	40.992 %
Zinc	0	0	0	0.0000	0 %
Arsenic	0.04	0	0	0.0400	0.672 %
Antimony	0	0	0	0.0000	0 %
Bismuth	0	0	0	0.0000	0 %
Nickel	0	0	0	0.0000	0 %

Smelter Data

Payments

	First deduct	then Pay for	Less	Totals
Gold	0.02 oz	95%	$5.00 per oz	$703.74
Silver	1 oz	95%	$0.25 per oz	$24.40
Copper	1.5 unit	60.0%	$0.40 per pound	$10.97
Lead	1.5 unit	95.0%	$0.05 per pound	$247.61

Total payment per ton of concent $986.72

Cu 3.024% - 1.5% = (1.524% x 2000 x .60) = 18.288 lbs - (18.288)(.40)

= 18.288 - 7.3152 =

10.9728

Deductions

Standard smelting deduction $130 per ton of concentrate

Excess gold, silver, copper charge
5% of everything over $1000 per ton of concentrate

$986.72	($1,000.00)	$0.00	5%	$0.00

Contaminant deductions

	Mill Run	Allowed	Excess	Excess Penalty	Increase
	----------Units----------				
Arsenic	0.672	0.5	0.172	$3.00	$0.52 per ton
Antimony	0	0.5	0	$3.00	$0.00 per ton
Bismuth	0	0.05	0	$10.00	$0.00 per ton
Nickel	0	0.3	0	$5.00	$0.00 per ton
Moisture	0	10	0	$0.50	$0.00 per ton
Subtotal					$0.52

Total smelter deduction

Standard smelting deduction	$130.00
Excess gold, silver, copper charge	$0.00
Contaminant deductions	$0.52
TOTAL	$130.52

Net Smelter Return (NSR)

Total smelter payments	
Total smelter deductions	
Net Smelter Return (NSR)	$856.20 per ton of concentrate
Net Smelter Return (NSR)	$42.81 per ton of ore

Attachment 10 World Wulfenite Market Article

Letter from Europe

by Michael P. Cooper

In this issue we are pleased to introduce our new European Correspondent, Michael P. Cooper, who will be stepping into Tom Moore's well-worn hiking shoes to report on European shows and museums. Mick has been a regular writer for the UK Journal of Mines and Minerals, *and is now its Managing Editor.* Mineralogical Record *readers will remember his excellent article and photographs on Caldbeck Fells in the March-April 1991 issue. He'll be receiving occasional assistance from other correspondents from time to time, as from Miguel Calvo in this installment. The repatriated Tom Moore is not lost to us, however; his report on the 1992 Tucson Show (it was his* first year *at that event!) appears elsewhere in this issue.Ed.*

Paris Show 1991

Fourteen hours is a long time to spend in an airport departure lounge, especially when you've dragged yourself out of bed at 5 am to get there in time for your 7 am flight to Paris; especially when the Paris mineral show which opened that afternoon was your first assignment as the *Mineralogical Record*'s new European Correspondent. An inauspicious beginning. At least, in contrast to outgoing correspondent Thomas Moore, I didn't have the responsibility of a carful of offspring to placate. Every half an hour the departure board helpfully announced that there would be more information in 30 minutes. Finally a reason was announced: fog in Paris meant our aircraft (which didn't have the relevant fog-landing equipment or crew) couldn't land. Fog in November: whatever next? Somehow this reminded me of British Rail's recent excuse for delayed trains: tree leaves on the track. Leaves! In Autumn!

At midday, my planned lunch—talking minerals in a French *bistro*—was replaced by drinking over-priced coffee in an airport lounge listening to stories of Great Airport Delays I Have Known. Not a worthy substitute. At 8:15 pm, thirteen hours after our scheduled time, our flight—still cynically referred to as the *07.00hrs to Paris*—left the ground to spontaneous applause from its already weary passengers. In Paris, I was one of the lucky ones whose luggage had also been sent to Paris. More delays followed while the less fortunate filled out reams of lost luggage claims. High on coffee I got to bed at about 1 am.

On Saturday morning I found time to savour my morning *croissants* (why don't they taste so good in England?) before rushing off to the *Métro*. The autumn Paris show (or *bourse*) is easy to find; it is held in the large Hotel Pullman Saint Jacques (popularly referred to as the PLM), on the Boulevard St. Jacques a few hundred meters downhill of the Métro St. Jacques, and not far from the center of Paris. On arrival I sought out show organizer Roger Pelloux (9 Square Rouget de Lisle, 95140 Garges-Les-Gonesse, France) who made me very welcome. He had arranged a room for me to use as a photographic studio—a spacious conference room that a whole troop of photographers could have fitted into—where I dropped off my gear before making my way back to the show. This is held twice a year in several upstairs rooms in the hotel: the large main exhibition hall, and several smaller adjoining rooms. The *bourse* was already thronged with visitors. Roger was hoping for 8–10,000 visitors over the two-and-a-half day event, a target I think that was easily achieved. There were 200 exhibitors at this 20th anniversary show, most with well-displayed and well-lit exhibits on glass shelving units. The heat from the lamps and visiting bodies was thankfully dissipated under the high ceiling, otherwise the contrast between the show and the bitter weather outside might have been overpowering.

My first call was French mineral collector Frédéric Escaut (*Ostrea Locations*, Route des Huitres, 17550 Dolus, France), a specialist in Chinese minerals. I had first met Frédéric at the London show many years before when he was studying English over there. He has a refined taste in minerals and usually has something good to see. At the last *bourse* in Sainte-Marie-aux-Mines (France's largest and longest-running show) he unveiled a new find of superb **orpiment** from Hunan. Further specimens had arrived in time for the Paris show: rich orange-brown prisms, some over 10 cm long, in sprays and groups with or without the contrast of lustrous creamy-white scalenohedral calcite crystals to over 7 cm long. The luster and clarity of this orpiment is quite remarkable, and most pieces are surprisingly free from damage considering the fragility and softness of the species. Prices started at about $70 for a small spray to over $3,600* for a large radiating mass of 10-cm crystals about 15 cm across. Not bad for world-class specimens.

Precise locality data for this find is hard to come by. At first thought to be a different mine from that producing the recent fine realgar specimens, latest word is that both minerals are coming from the same place. Fine orpiment from China has been known for decades, and there is even a Chinese postage stamp illustrating a group of orpiment and calcite crystals strikingly similar to these new pieces, but I've not been able to find out much hard data about the source. It is usually known simply as "the arsenic mine."

A conversation developed which was to be repeated throughout the day: I recounted my Great Airport Delay Story and Frédéric responded by telling me about the specimens that had been sold yesterday. Best among these, judging by the number of people who told me about it, was a Chinese **fluorite** in large, flawless, glassy cubes the color of Wagholi cavansite. This, and the many other fine fluorites on the stand, were labeled Fujan, Hunan. We assume, from the variety of material produced, that this is an area rather than a specific mine. The common run of this fluorite consists of two types: large (to 5 cm) glassy cubes with pronounced but frosty dodecahedron faces, either in loose groups or scattered on "saddles" of peach-tinted creamy dolomite; or masses of composite crystals composed of small, stacked cubes. The latter comes in shades of pale to dark sea-green. Matrix pieces reach 30 cm across and prices varied from about $60 for small cabinet pieces to about $900 for the best. The dodecahedrally modified crystals are essentially colorless or bluish with bright purple patches or zones floating inside them. One attractive piece shows a sharp octahedrally modified purple phantom in a large colorless cube. The remaining blue specimens (reminiscent of the classic English specimens from the Florence mine, Cumbria) are rather pale but nonetheless very nice. A further batch of these specimens arrived just after the show, but I had to decline an invitation to assist at the opening of the package.

Fluorite was also available in association with some fine **ferberite** specimens from Gejiu, Hunan. These show lustrous, striated black blades of ferberite up to 3 x 6 cm, some on quartz crystals: they vary in size from attractive miniatures to cabinet groups. One nice small piece consists of a ferberite blade embedded in sharp purple fluorite cubes, as if pushed there by some powerful thumb. Gejui also produces some good **scheelite**. Frédéric had a few miniatures showing very sharp, transparent, pale brown bipyramids 1.5 cm on edge, perched on quartz and colorless fluorite.

The market in Russian minerals is understandably quiet, mineral

* Originally priced in French francs, at about 5.5 to the dollar.

dealing being so trivial in the face of the massive social and political upheaval in what used to be the USSR. But, nonetheless, some good specimens are still available. A popular and prolific source is Dal'negorsk in Primorsky Krai on the eastern seaboard of Russia. The magnificent, lustrous **pyrrhotite** crystals from there reach over 10 cm across and are commonly associated with shiny black sphalerite, galena (some of which has a curious "melted" look), dolomite, and needles of pink-tinted **quartz**. All the big pyrrhotite crystals I have seen have been loose crystals, some of whose goethite(?)-coated broken bases suggest that they were found loose in the vein. François Lietard (*Minerive*, Au Bois, 42520 Roisey, France), one of France's most knowledgeable and well-traveled dealers, has handled some very fine specimens from this site. François's stand is always very colorful, mainly because of his current specialty in pegmatite minerals (kunzite, tourmaline, beryl etc.) especially those from Pakistan and Afghanistan, but also from Africa and Russia. (He also attends Tucson.) Just in from a locality "near Lake Baikal" (well, that cuts it down a bit) were some doubly terminated **tourmalines** (elbaite?) to about 7 cm long, each of a dark smoky gray color with rich purple terminations; small reflective areas within the body of these crystals scatter vivid highlights in blue and purple. At first appearing rather dull, these pieces repay continued viewing. Prices ranged from $540. Another new group of specimens, these from Dzhezkazgan in Kazakhstan, consist of nice singles and tangled groups of wire silver, all off matrix. One piece is somewhat flattened, as if having formed as part of a filling in a narrow vein. Prices started at about $45.

A recent consignment of **tourmaline** from Pakistan was also on display. These are all loose crystals with broken bases but perfect terminations. "Watermelon" color-zoning is their principal feature: a purplish core overgrown by pale to dark green (that shade called "actinic green" which is used for poison bottles). The terminal planes are a deep smoky purple, a very attractive shade that proved difficult to capture on film. Most crystals are about 10 cm long. François also had some fine African material, including a selection of beautiful, transparent single crystals of **scapolite** from Mpwa-Mpwa, Tanzania, at $180–$333. They are 2 to 3 cm long.

My day was already dwindling. I had a lot of catching up to do, and the Saturday crowd didn't help. Progress must be slow and careful when you're ferrying tens of thousands of francs worth of other people's minerals back and forth to an *ad hoc* photographic studio! Conversing in French slows me down too, although many of my French friends would rather use and practice my language than let me stumble on in theirs. But there's no real barrier, and the casual visitor shouldn't feel daunted. When push comes to shove, everybody speaks pocket calculator, so if all you want to do is look or buy there's nothing to stop you. I really enjoy the French collecting scene. It's very vigorous, and much biased in favor of the aesthetic. Systematic mineralogy is eschewed by many private collectors, as one told me: if you can't see it with the naked eye and you can't do anything else with it (like your own analysis) then why collect it? "Chemical curiosity" is regarded by many as the province of the Germans and the British. This bias is much of the attraction of Continental shows for me. Generally much finer material is offered than back home and, although systematic mineralogy is a part of a British collector's make-up (mine included), the unique sculptural beauty of fine minerals is a pleasure as well. But, of course, the predominance of fine display-quality material in Continental European shows is not merely a reflection of the taste of collectors; money enters into the equation too, and there seems to be plenty of it in Paris.

Speaking of money, the most expensive—and one of the most beautiful—pieces I saw in the show was part of the select display of Phillipe Rodier (21 Bis, rue de Toul, 75012 Paris, France), a specialist in gem minerals and spectacular cut stones. Among the former was a small group of excellent Nigerian **emerald** crystals. The best of these, serious money at half a million francs, was a luminous green, doubly terminated, gemmy prism about 5 cm long. It was complemented by a smaller, apparently sceptered, crystal, the head and shaft of which are different shades of green. On the same stand there was also some exceptional pink **apatite** from Stak Nala, Gilgit, Pakistan, fine **spessartine** from Shengus (also in Gilgit), and some large **lazurite** crystals on matrix from Badakhshan, Afghanistan. One of the lazurite specimens seems to consist of a thick hexagonal crystal of mica (phlogopite?), the sides of which are encrusted in bright lazurite while the basal plane is untouched.

Pink **apatite** from Gilgit could be found scattered in small groups of specimens throughout the show. I have a fondness for these pieces, and noticed quite a range of types on different stands. Although one of Rodier's specimens got my vote for the glassiest, pinkest, sharpest crystal, it was difficult to say which was the best specimen. Other contenders included an interesting, loose, milky-pink prism with a doubly terminated **phenacite** embedded in it (Gilles and Françoise Barras-Gauthier, Le Besset, 63880 Olliergues, France), and some glassy prisms implanted in beds of lustrous scales of pearly brown muscovite (Jean-Pierre and Nicole Voilhes, *La Pierrerie*, Rue du Foirail, Plauzat, 63730 Les Martes de Veyre, France). Both of these stands are run by husband-and-wife teams with excellent taste in specimens. But I was disappointed to note that François Lietard had no more of the apatite-sheathed stacks of spessartine crystals that he had shown at Ste-Marie-aux-Mines.

The collector of sulfides and sulfosalts was well served in Paris. From the exotic orpiment and realgar of China already mentioned to humbler central European galena and pyrrhotite. Almost a regular feature of the present collecting scene, **stibnite** specimens were displayed by several dealers. Chinese stibnite graced Frédéric Escaut's stand; clean, bright, striated prisms in singles or small clusters, they reach over 30 cm long, but most are between 5 and 20 cm. They were priced at $90–$400 for good single crystals, often with the added charm of text-book bends and creases. Similar pieces were also available from Kirgizia, but the widest range of material came from various mines in Transylvania, Roumania. Lucien Jean (15 rue Colonel-Roux, 05000 Gap, France), who deals exclusively in Romanian minerals, had a fine display of these stibnites, including specimens from three major finds, two at Herja and one at Suior. From Herja he had a group of specimens collected some 12 years ago that consist of radiating masses of gray blades 2 to 10 cm long, with a stoss-side coating of tiny pinkish barite plates. A 10-cm specimen would set you back $180, and pieces were available in all sizes up to about 30 cm across. From Suior (Sujorbanya) there was a new find of lustrous bladed crystals to 1 x 5 cm, but usually smaller, on matrix. These cost from $270 to $400 for a piece 30 cm across. In common with several other dealers, Lucien also carried stibnite from a relatively new find at Herja. These specimens (also seen at Ste-Marie-aux-Mines in the summer) have small but brilliant stibnite blades intergrown in plumose groups with fibrous **berthierite**. A partial overgrowth of minute, sparkling dolomite (?) crystals gives a perfect finishing touch to some pieces; in the best specimens the stibnite bursts through clouds of dolomite like volcanic eruptions. Almost all the pieces I saw were undamaged and many are very aesthetic, the sprays reaching 15 cm across. Other notable Romanian species included galena, pyrrhotite, sphalerite, and chalcopyrite. Some of the **galenas** form bright, tabular, spinel-law twins 3 to 5 cm across (a habit that is more common in European localities than American and is a particular favorite of mine). Others, having superficially the same appearance, show only cube faces on the flattened face, whereas the true twins show triangular octahedron faces. This second type seems to consist of epitaxial growths of galena on tabular pyrrhotite. Solid plates of both types were available from Lucien Jean priced at $100–$150. The large octahedral galenas from Mistrubanya, Herja, reached 4 cm on edge (a good size for this relatively unusual habit) and cost up to $80. Lustrous **chalcopyrite** in excellent, sharp, striated, 3-cm crystals was available in groups about 10 cm across ($150) and there was plenty of pyrrhotite in books of thin plates 3–4 cm in diameter and as thicker,

tabular hexagonal crystals up to 11 cm across from Kapnic. Pierre and Martine Clavel (4 chemin Vie Borgne, 38460 Crémieu, France) had the larger sizes of pyrrhotite, and some excellent examples of stibnite and berthierite from the new Herja find, left over from the selection they had displayed at Ste-Marie. Pierre and Martine also had a few curious "window **quartz**" crystals from Kapnic. These white prisms are up to 10 cm long and form attractive groups. Other quartz prisms are accompanied by small amounts of bright red powdery cinnabar, an unusual occurrence for the locality.

A note on European specialities shouldn't omit the famous Panasqueira mine in Portugal, still producing superb specimen material: **wolframite** blades, groups of lenticular buff-colored **siderite**, glassy green and purple **apatite** crystals, and large brilliantly lustrous **arsenopyrite**. A limited number of collectible species, it's true, but combined with such style that there is always something new to see. René Daulon (20 rue de Bezou '2161', 92400 Lourbevoie, France) deals exclusively in Panasqueira minerals, a passion he has had for several decades, and had a fine selection available in Paris.

There was much else to be seen in addition to minerals, from gems and jewelry to the huge slabs and table tops of petrified wood and fossil-crammed limestones displayed in a back room. If I may be spared an aside on the subject of fossils, I was excited to note a display of fine *Arucaria* pine cones on one stand. Not just any cones—these were the remarkable agatized cones from Patagonia in which the minutest detail of the external and internal structures has been faithfully preserved by multicolored silica. Unavailable for many years, these amazing fossils were on sale in Paris in sizes up to about 7 cm high, either as complete cones or as polished sections. This deposit was once worked by Franz Mansfeld, a German entrepreneur whose other claim to local fame was for the original (1940's) exploitation of the well-known rhodocrosite deposit as Las Capillitas, also in Argentine. By coincidence, a fine selection of polished rhodocrosite stalactites from this locality has been available on the European market for some months, again after being in short supply for many years. And still on the subject of fossils I should mention the fossil bivalve shells from Kertch in the Crimea, Ukraine. Several dealers carried good specimens of this material, each one broken open to reveal the clusters of superb, transparent **vivianite** blades within. Kertch also produces vivianite sprays on a peculiar brown pisolitic matrix which collectors should be wary of when lifting specimens: it is so lightweight that the force expected to be necessary to lift the piece can easily drive it upwards into any overhanging shelf!

Still in short supply on the European market is **wulfenite**. This is a big problem for a self-confessed wulfenitophile like myself. When I began collecting over 30 years ago it was a plentiful species, but the masses of material from mines in Mexico and Arizona declined along with the flowerings from Tsumeb and Morocco. Now there is almost nothing notable in wulfenite coming from Morocco (the most recent substantial source) except a few high-priced, though nonetheless pretty, orange blades from Mibladen (where it carries a premium for its rarity in the mines) and a few generally unexciting remnants of the great Touissit material. American collectors are probably much better served than their European counterparts; good finds are still being made in old Arizona occurrences, for instance, but only a handful of such pieces finds its way over here (it's nice to see such pieces illustrated in the *Mineralogical Record* from time to time). But in Paris I could at least admire a group of old pieces from Los Lamentos exhibited by *La Pierrerie*. These solid masses of orange cuboids were collected around 1980; they are almost floaters, and very attractive.

Barras-Gauthier Minéraux, whom I mentioned above under apatite, included some good examples of the Kertch vivianites on their stand, and also had some relatively new **azurite** from Touissit. These are not the spectacularly large crystals for which the site is justly famous, but are nonetheless noteworthy for showing encrustations of small, lustrous crystals associated with lustrous, globular aggregates of smithsonite. Several other dealers had similar material. Alongside were a couple of unusual floater groups of snow-white crystals from Gilgit, Pakistan. These were labeled calcite, but look more monoclinic than trigonal, and consist of sheaf-like sprays of blocky crystals with a pronounced "waist" in the center. A scattering of small globular masses of brown siderite enhanced the whiteness of the pieces.

There were many dealers whom I had little or no chance to talk to, no matter how interesting their specimens. I could have spent longer, for instance, over the colorful displays of Gilbert Gauthier and Christian Gobin, both well-known on the international circuit and both of whom specialize in central African copper minerals and their associations. I was very impressed with the huge African malachite crystals shown by Christian. And Gilbert showed me a few English curiosities he had acquired, several with interesting old labels. These included some pieces (caledonite and linarite for instance) which really needed a closer look than I could give them at the time, caledonite especially being not only nice in itself but a good indicator of rare associated species. And for those wanting to buy into one of the most remarkable European finds of recent years, Gilbert also had a couple of loose plates—I could almost say slabs—of **stolzite** from the Ste. Lucie mine, Lozère, France, reported in the *Mineralogical Record* recently (vol. 21, p. 489; vol. 22, p. 214 and 216). These unprecedented specimens reach over 5 cm on edge and make up in importance what they lack in attractiveness. Work proceeds to obtain more, I'm told.

After spending most of Saturday borrowing and photographing specimens and most of Sunday taking backup notes and discussing minerals, collectors, and collections, I made my way out of the *bourse* on Sunday evening to stroll 'round Paris. I got cold and damp but the fresh air was nice and my voice got a rest. I hope to catch up with further dealers and their specimens at next year's shows: Ste-Marie-aux-Mines and Munich are musts, and Lyon and Torino are pencilled in.

As well as the annual *bourses* (there is another in March), Paris is home to three of the best mineral exhibits in Europe: the Natural History Museum, the School of Mines, and the Sorbonne collection, all of which demand to be seen over and over. During the show I met up with Henri-Jean Schubnel, curator of minerals at the Natural History Museum, and was invited over on the Monday after the show to see a new exhibition which had been opened the previous week. I hoped I would also have the opportunity to do a little research in the Museum's archives as part of my project on the history of British mineral dealers.

The **Muséum d'Histoire Naturelle** is the oldest museum in Paris (opened to the public in 1745), and houses the oldest of today's great mineral collections. It began in 1626 as part of a collection of pharmaceutical materials gathered by Guy de la Brosse, the physician to Louis XIII. It was reorganized as a Cabinet of Natural History on the death of Louis XIV in 1715. In its early years the collection was augmented by gifts from many of the Royal Houses in Europe, mineralogy being quite the done thing among the aristocracy at the time. 18th-century specimens from Germany, Austria and Russia still survive in the collection complete with their original labels from the Imperial Cabinet in Austria or the collection of the Empress Catherine of Russia. A particularly spectacular gift was a suite of wire silver from the mines at Kongsberg, given by King Christian VII of Denmark to Louis XVI in 1770. Among these is one of the greatest Kongsberg wires known—a thick hoop of wire rope with calcite. Important collections acquired in the 19th and 20th centuries include tens of thousands of specimens from Louis Vesignié (one of Europe's greatest mineral collectors) and a suite of 610 American minerals gathered together for the Pan American Exhibition in Buffalo in 1901 by Frederick Kunz of Tiffany & Company, New York. This wonderful collection, containing some of the best Californian pegmatite minerals and Arizona azurite specimens ever seen, was donated to the Museum by J. Pierpont Morgan. A relatively recent acquisition is the Ilia Deleff collection of giant crystals. Dramatically displayed in a spotlit but

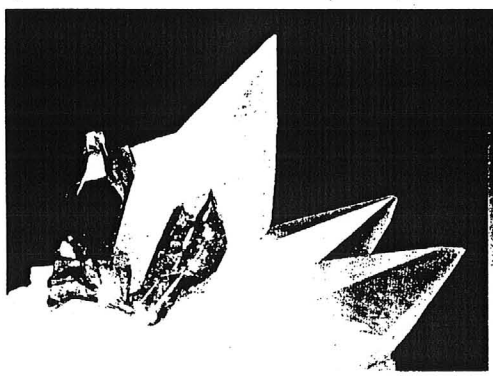


Figure 1. Orpiment crystals to 3 cm, on calcite, from Hunan, China.

Figure 2. Orpiment crystal group, 9.5 cm, from Hunan, China.

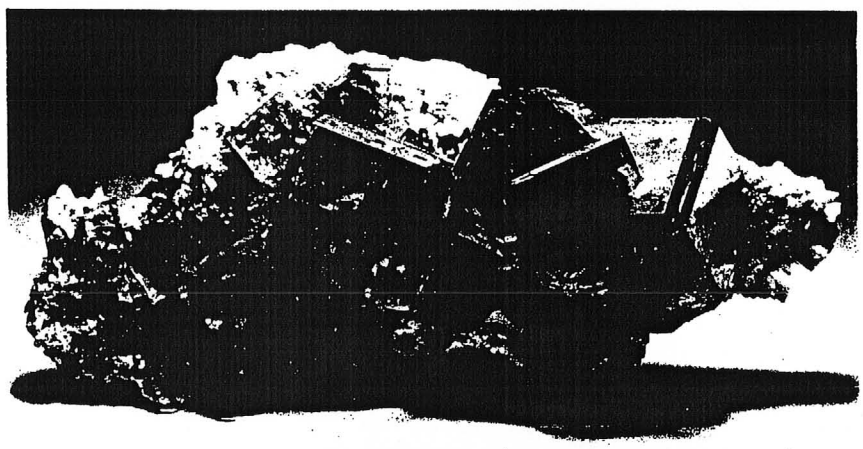
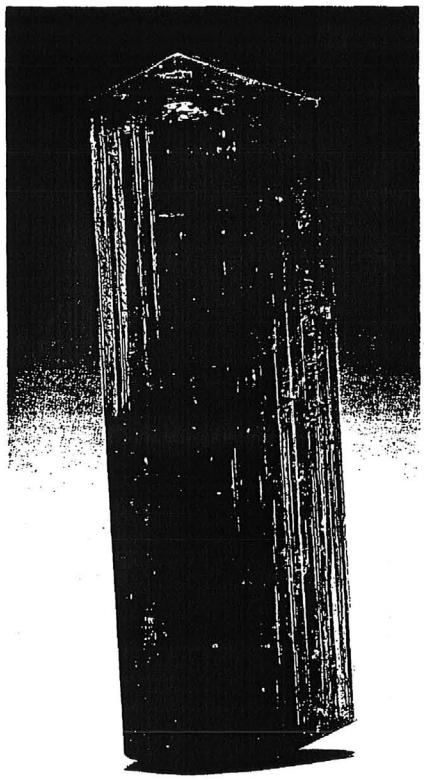


Figure 3. Fluorite from Fuyan, Hunan, in pale purple dodecahedrally modified crystals to 2.2 cm on edge, on dolomite-covered matrix. Frédéric Escaut specimen.

Figure 4. Scheelite from Gejui, China, in pale brown, transparent crystals on quartz and fluorite. The largest crystal is 1.4 cm on edge; the specimen on the right measures 3 cm. Frédéric Escaut specimens.



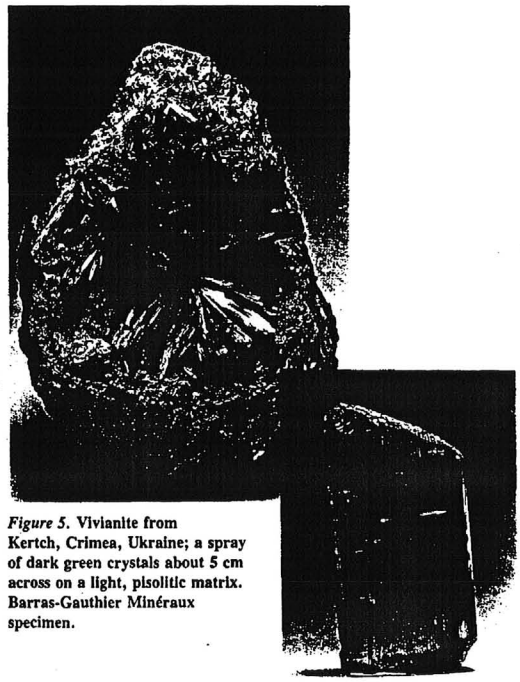


Figure 5. **Vivianite from Kertch, Crimea, Ukraine; a spray of dark green crystals about 5 cm across on a light, pisolitic matrix. Barras-Gauthier Minéraux specimen.**

Figure 7. **Scapolite from Mpwa-Mpwa, Tanzania, 3.5 cm. François Lietard specimen.**

Figure 6. **Tourmaline from "near Lake Baikal," Russia; a double terminated, smoky purple, 7-cm prism. François Lietard specimen.**

otherwise darkened gallery, these huge crystals of quartz, geodes of amethyst, blocky amazonites and other unique specimens are much admired by visitors to the museum. Deleff had rescued many of these crystals from miners who saw in them only their potential for yielding lumps of clear crystal for cutting for the jewelry or electronics industries. Most of the monster crystals discovered are smashed to pieces where they are found. This group of specimens was acquired for the Museum by Schubnel.

The Museum also houses the working collections of many of its past curators; its inventory—which contains some 200,000 entries—reads like a roll-call of the history of European mineralogy: Romé de l'Isle, Haüy, Gillet de Laumont, de Bournon, Dufrénoy, Delafosse, Descloizeaux; their collections contain many early chemical and crystallographical types (characterized long before the advent of X-ray and electron beam techniques); their names are known even to the least historically minded mineral collector through the species named after them.

Since 1837 the collection has been housed in the specially built Museum in the Botanical Gardens in Jussieu in east-central Paris. Access is easy via the Métro at Jussieu (which also serves the Sorbonne collection) or Gare d'Austerlitz. A good time to visit is in the spring or early summer when the gardens are at their loveliest, but even on a bleak winter's day it's a nice setting. Hard by the museum is an excellent bookshop which deals in all manner of natural history books, many on mineralogical subjects. Interested readers are encouraged to buy and read Henri-Jean Schubnel's *Giant Crystals, Precious Minerals,* which describes the collection's history and is illustrated with superb color photographs of many of its treasures. It was published by the Museum in 1987, and is still available in an English edition. (See the review in vol. 20, p. 149–150.)

The latest display in the Museum is *Silicium* ("Silicon"), a demonstration of the vital importance of this element in the history of man, and especially to our modern civilization, truly the silicon age. The display runs from the birth of silicon in stellar fusion reactions to its present dominance of our lives in the microchip. In between, the exhibit shows us flints, stained glass, ceramics, jewelry and other items worked by man; the fragile silica skeletons built by diatoms, and, of course, natural crystals. A special display shows the vital role of silicon in the modern house. Interpretation is good and children and handicapped visitors are well cared for—this is the first display I have seen that incorporates Braille catalogs and information boards, magnifying glasses, and telescopes for the visually handicapped.

Strongly criticized back in 1971 by Paul Desautels and John White (vol. 2, p. 239, 274–275) for their neglected appearance, the museum's

mineral displays are today in good repair and well worth seeing, whether the visitor is inclined to systematics, aesthetics, history or, in the case of the giant crystals, just plain spectacle. The main mineral exhibit is housed in a darkened basement in large, spot-lit, wall showcases. It is a systematic arrangement, mixing the spectacular with the historically and scientifically important. Specimens once belonging to the famous mineralogists who studied them (including many type specimens) are displayed. It's marvellous to be able to see the actual specimens of species like liroconite, olivenite, chalcophyllite and other Cornish specialities once held and characterized by de Bournon and others. Among the spectacular pieces are so many fine specimens that it is difficult to restrict a brief commentary such as this. Of course, as a British collector I recall well such English specimens as a large, doubly terminated Cumbrian barite on matrix (a rich brown, tabular crystal with colorless tips) and a large pyromorphite of a wonderful green from the famous occurrence at Roughton Gill, in the Caldbeck Fells. There are superb morganites from Consilheiro Pena, Brazil; rubellites from California; and superb crystals of Pike's Peak amazonite. Less well-known to me were some remarkable French specimens including superb stibnite (La Lucette, Mayenne; and Le Dahu, Haute-Loire); a huge, almost complete tetrahedrite crystal (over 15 cm!) from Irazein, Ariege; and one cannot ignore the French fluorites, autunites and pyromorphites or, as my guide pointed out, the pretty good schubnelite from Mouanana, Gabon.

Time passed by too quickly. After the tour of the mineral gallery there was just time for a brief examination of the archive—which turned up an 1825 catalog of a Parisian mineral sale by the celebrated English mineral dealer Henry Heuland (a great find!)—before lunch and a hurried return to my hotel for the airport shuttle.

It was a breathless trip, not only because of time lost at the beginning but because French really is a breakneck language! On the flight back I read my Heuland catalog, and Henri-Jean Schubnel's history of the Museum against a background of stories of getting lost on the *Métro*, of being spurned by waiters impatient of *Les Anglais* and their lack of French, or of being stunned by the treasures of the Louvre or by the overindulgence in *Beaujolais nouveau*. High on minerals I got to bed about 1 am.

I'll be back with a review of the British collecting scene in my next letter. Until then, sharing Thomas Moore's lack of a good standard exit line, I'll say Good bye and Happy New Year.

Michael P. Cooper
41 Albany Road
Sherwood Rise
Nottingham NG7 7LX
England

Bilbao, Spain, Show 1991

[The following report was provided by Miguel Calvo, Zaragoza, Spain. Ed.]

Bilbao, a large city in the Basque country of northern Spain, has a long history of mining. Its extensive iron mines, most of them now closed, were the basis for the industrialization of the area in the 19th and 20th centuries. The Bilbao mineral and fossil show (*XIV Bolsa-Exposición Internacional de Minerales y Fósiles*), on October 4–6, is one of the largest in Spain. It is organized by the *Sección de Mineralogía y Paleontología de Iberdrola* (P.O. Box 119, Bilbao 48008, Spain). The show this year filled the main hall of the Feria de Bilbao (Bilbao Fairgrounds), at only a token cost to the dealers, and with free admission for the public, thanks to the sponsorship of the Iberdrola power company. A dozen museums and institutions also have exhibits at the show. The attendance this year was about 35,000 people, including about 15,000 school children guided by their teachers.

Most of the full-time Spanish mineral dealers, as well as dealers from Morocco, France, Portugal, Italy, Austria, Hungary, Poland, Uruguay and the U.S. have booths at the show. In addition are many local part-time dealers and field collectors. The show presents a good opportunity to obtain relatively fine specimens from obscure localities, and to buy from the primary sources.

The most interesting new specimens from Spain are the **datolite** groups from a quarry near Rigoitia, Vizcaya. Iñigo Beascoechea (from Getxo, Vizcaya) had matrix specimens to 15 cm, with individual crystals to 4 cm. The crystals are very lustrous, complex, and colorless to pale yellow-green. The smaller crystals (1 cm) are transparent, and the larger crystals translucent. Associated species include prehnite, pumpellyite and laumontite. Alberto Alvarez, manager of the quarry, is now collaborating with the *Sección de Mineralogía y Paleontología de Iberdrola* to help preserve any additional specimens that might be encountered there.

Several dealers (including Jose Miguel Cavia of Mondragón, Guipuzcoa, among others) had specimens from the Troya mine, Mutiloa, Guipuzcoa. This mine has been worked only in the last few years, producing **dolomite, sphalerite, galena, chalcopyrite** and **siderite** crystals all to about 1 cm. The small, gemmy orange sphalerite crystals are especially nice for micromounting. Fine but rare crystals of colorless **barite** have also come from the mine; an outstanding example owned by the *Sección* won the award for the finest specimen from the Basque country.

Augustín Fernandez, owner of the Aliva mine at Espinama, Santander, had a large lot of the well-known **sphalerite** from that locality. The crystal groups are up to 30 cm in size, with crude, translucent individuals to 10 cm, some with associated small dolomite crystals. Unfortunately the Aliva mine is soon to close, due in part to the high altitude which limits mechanized work. The specimens offered at the show were found last summer by Fernandez and Santiago Jimenez.

I stated in a recent article on the Navajún **pyrite** occurrences (vol. 20, p. 451) that Navajún pyrite is almost exclusively cubic in habit. Well . . . Mother Nature has a sense of humor. Pedro Ansorena, owner of the Navajún mine, recently found a number of pyrite crystals, 2 to 4 cm in size, that show cube and octahedron faces in approximately equal development. The crystals occur isolated in marl, and the faces are less lustrous than the classic cubes from this locality. At the Bilbao show Ansorena was offering these along with the usual pyrites, some in large crystal groups.

Manuel Mesa from Oviedo had some emerald-green **beryl** crystals collected from a roadcut near Franqueira, in Pontevedra. This small mica schist outcrop has been known for several years as a source of fine, translucent green crystals to 5 cm, although none have thus far been gem-grade.

Luis Miguel Fernandez of Zaragoza had a fine selection of **gypsum** crystals from the now-famous Fuentes de Ebro alabaster quarries near Zaragoza. He discovered the specimen potential of these quarries some years ago, and has since recovered many fine specimens. At his booth there was also a 10-cm yellow-orange **anglesite** from Morocco, and a selection of uncommon secondary uranium minerals from Zaire.

The most outstanding specimens to be imported lately into Spain are the Mexican **amethyst** groups being sold by Enrique Kucera (Comte d'Urgell 171, Barcelona 08036). The specimens come from Amatitlan, Zumapango del Río, in Guerrero state. The finest are large, cabinet-size groups with dark purple crystals to 20 cm, priced in the thousands of dollars. (The equivalent in Spanish pesetas is terrifying!) However, these are the finest amethyst specimens ever seen at a Spanish mineral show.

Miguel Calvo
Fdo. El Católico, 24 dup. 6.° dch.
50009 Zaragoza
Spain

Attachment 11 Assay Reports

Bondar-Clegg, Inc.
625 Spice Island Dr.
Building 1, Unit A
Sparks, Nevada 89431
(702) (359-9330)

BONDAR-CLEGG

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

Geochemical Lab Report

DATE PRINTED: 10-JUL-92

REPORT: R92-10695.4 (COMPLETE)

PROJECT: NONE GIVEN

SAMPLE NUMBER	ELEMENT UNITS	Au OPT	Ag OPT	As PCT	Cu PCT	Fe PCT	Mo PCT	V PCT	Pb PCT
R2 YUMA 01		0.039	0.43	0.03	0.30	3.07	0.036	<0.01	1.23
R2 YUMA 02		0.003	0.29	0.06	0.27	3.36	0.056	<0.01	2.04
R2 YUMA 03		<0.002	0.16	0.01	0.08	3.81	0.002	<0.01	0.52
R2 YUMA 04		0.009	0.19	0.01	0.04	8.59	0.018	0.01	1.75
R2 YUMA 05		0.025	0.47	0.04	0.19	10.22	0.001	0.01	2.75
R2 YUMA 06		0.008	0.06	0.03	0.05	13.22	0.002	0.48	4.12
R2 YUMA 07		0.354	0.68	0.02	0.13	8.17	0.046	0.01	3.09
R2 YUMA 08		<0.002	0.05	<0.01	0.01	1.42	0.001	<0.01	0.31
R2 YUMA 09		0.075	0.22	0.02	0.10	8.41	0.029	0.01	2.47
R2 YUMA 10		0.020	0.21	0.01	<0.01	6.21	0.029	0.01	2.32
R2 YUMA 11		0.107	1.60	<0.01	0.02	7.89	0.005	0.01	9.66
R2 YUMA 12		0.003	0.30	0.01	0.01	3.14	0.007	0.05	1.94
R2 YUMA DUMP 01		0.137	0.54	0.03	0.18	7.69	0.062	<0.01	2.45
R2 YUMA DUMP 02		0.121	0.52	0.04	0.18	7.24	0.083	<0.01	2.42

BONDAR-CLEGG

Geochemical Lab Report

Inchcape Testing Services

REPORT: R92-11630.4 (COMPLETE)

DATE PRINTED: 6-OCT-92
PROJECT: NONE GIVEN

SAMPLE NUMBER	ELEMENT UNITS	Au OPT	AG OPT	Cu PCT	Fe PCT	Mo PCT	Pb PCT	As PCT	V PCT
R2 YUMA 13		0.026	0.04	0.01	3.77	0.002	0.76	0.01	0.03
R2 YUMA 14		<0.001	<0.02	<0.01	1.53	0.001	0.01	0.01	0.01
R2 YUMA 15		<0.001	<0.02	<0.01	2.69	0.001	0.01	0.01	0.01
R2 YUMA 16		<0.001	<0.02	<0.01	5.23	0.001	0.02	0.01	0.02
R2 YUMA 17		<0.001	0.03	<0.01	1.99	<0.001	0.10	0.01	0.01
R2 YUMA 18		<0.001	0.29	0.56	6.86	0.001	0.16	0.02	0.01
R2 YUMA 19		<0.001	0.18	2.38	4.93	0.002	0.24	0.01	0.03