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The Prospector Newspaper presents

The Prospector Daily Mining News

Adrian Leonard, Editor

FINAL News for January 17, 1996:

Royal Oak Drilling Probes Copperstone's High-Grade Shoots

Royal Oak Mines Inc's (RYO:TSE,AMEX) wholly owned subsidiary, Royal Oak Mines USA Inc, has reported promising drill results and a 420,000 ounce gold resource from a drilling program on its Copperstone gold property located in La Paz County, southwestern Arizona.

The drill program was designed to investigate the underground potential of a former open pit operation where in excess of 500,000 ounces of gold were extracted between 1987 and 1992. The down dip extension of this mineralization was drilled to delineate high grade shoots suitable for underground mining. In June, Royal Oak USA entered into a lease agreement with the owner of the Copperstone property which consists of 284 unpatented mining claims totalling 5,680 acres and two state leases totalling 1,300 acres.

The Phase I drill program consisted of 13 holes totalling 10,600 feet at a cost of US$225,000. Gold mineralization is controlled along a series of north-plunging shoots related to the Copperstone Fault, hosted within quartz latite porphyry and limestone. Previous drilling encountered high gold values of 0.225 opt gold over a core length of 50 feet; and 0.458 opt gold over 40 feet. Several high grade gold values were intersected during the 1995 drill program, including 21.0 opt over 10 feet at the intersection of a high angle quartz vein structure containing visible gold and the Main Zone; 0.334 opt over 25 feet related to a prospective limestone unit which has been identified as the ore host at the north extremity of the pit; 0.22 opt over 31 feet; 0.191 opt over 15 feet; and 0.22 opt over 10 feet.

Royal Oak has generated a drill indicated mineral resource totalling 2,423,514 tons with a gold content of approximately 420,000 ounces using a cut-off grade of 0.10 opt gold. A US$250,000 Phase II follow up exploration program is planned for this year with an objective to further delineate the underground potential of the Copperstone deposit.

Santa Cruz Links With Aussies for Mexican Gold

Santa Cruz Gold Inc (SCGI:CDN) has entered into an agreement to form a joint venture on the

ARIZONA GOLD MINES

And Other Minerals

DAN AND ANGIE PATCH
Owners
PHONE 602-~~[illegible]~~
483 8367
Fax#6024832391

~~P.O. BOX 1897~~
~~QUARTZSITE, ARIZONA 85346~~
6850 N. 86th St.
Scottsdale, Az 85250

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Copperstone Gold Mine - History

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February 14, 1993

The Copperstone gold mine was discovered and located in 1979 by Dan and Angie Patch who are the sole owners. The Copperstone gold mine is located in La Paz County, Arizona, about 95 miles North of Yuma, Arizona and about 12 miles East of the Colorado River and encompasses 481 twenty acre mining claims for a total area of about 9,620 acres. The sections, townships, and ranges are as follows: Sections 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, and 22, Township 6 North, Range 19 West; Sections 1, 2, 10, 11, 12, 13, 14, 22, 23, 24, 25, 26, and 27, Township 6 North, Range 20 West; Sections 24, 25, and 36, Township 7 North, Range 20 West; Section 19, Township 7 North, Range 19 West, Gila and Salt River Principal Meridian, and Plomosa Mining District. The mine is 5 miles West of highway 95 with excellent access, electric power, and water supply.

The Copperstone property was leased to Cyprus Mines Corporation May, 1980 and went into production November, 1987. The mine is operated by Cyprus Mines Corporation and their subsidiary, Cyprus Copperstone Gold Corporation, whose address is 9100 East Mineral Circle, Post Office Box 3299, Englewood, Colorado 80155.

So far, as of this date, about 1/2 million ounces of gold and over 16,000 ounces of silver has been produced from approx. 6,500,000 tons of ore by open pit methods. The mill on the claims is Vat agitation cyanide leach and a heap leach process into the mill circuit. The mill capacity is 3,000+ tons per day. Approximately 60,000 tons of ore suitable for leaching is mined and stockpiled near the leach pad and will be available.

At present the mining has stopped. Cyprus has notified the owners that they intend to terminate their lease within a few months and return the mining properties, although ore exists below the pit floor and in the down dip wall of the pit. Some calculations have been made of possible reserves. The owners are aware of some data that indicates the quite real possibilities (in the owner's opinion) of much more ore to be found on the Copperstone properties. The data is available at the data room at the Copperstone mine.

Cyprus has provided a data room at the owners request so that any reliable mining company or their agents can view the data for the purpose of negotiating a contract with the owners subject to the Cyprus lease termination. The owners will make the arrangements upon 24 hour notice to the Mine Manager for access to the data room and mine facilities for the benefit of a prospective lessee or purchaser of the Copperstone mine.

Any prospective lessee should examine the mine, mill and data at their earliest convenience with an eye toward retaining some or all of the facilities by negotiation.

Owners, Dan & Angie Patch, also have other excellent properties with gold, silver, copper, lead, zinc, and barite available in the same general area. They can be contacted by telephone number (602)483-8367 or by writing to 6850 North 86th Street, Scottsdale, Arizona 85250.

PATCH ROYALTY CALCULATION
FOR THE QUARTER ENDED DECEMBER 31, 1992

	BEGINNING CUMULATIVE	OCT	NOV	DEC	QUARTER TOTAL	ENDING CUMULATIVE
TONS ORE MINED	5,985,559	139,348	83,507	38,305	261,160	6,246,719
TONS ORE PROCESSED	5,995,943	123,740	94,839	98,033	316,612	6,312,555
GRADE	0.098	0.125	0.154	0.127	0.134	0.100
RECOVERY (%)	88.9	83.2	88.9	88.2	86.5	88.8
OZ. PRODUCTION (AU):						
MILL-IN-PROCESS--BEGIN.	0.0	2,350.000	3,666.000	5,204.000	2,350.000	0.0
INDICATED PRODUCTION	452,981.8	11,636.092	13,980.415	11,629.959	37,246.466	490,225.7
ADJ BASED ON OUT-TURNS	(2.6)					
ADJ PRODUCTION	452,979.2					
POURED	450,631.8	10,320.092	12,442.415	14,207.959	36,970.466	487,599.7
ADJ BASED ON OUT-TURNS	(2.6)					
ADJUSTED POURED	450,629.2					
MILL-IN-PROCESS--ENDING	2,350.0	3,666.000	5,204.000	2,626.000	2,626.000	2,626.0
GOLD:						
OZ. SHIPPED	444,920.9	11,089.426	12,638.025	13,233.722	36,961.173	481,879.5
ADJ BASED ON OUT-TURNS	(2.6)					
ADJUSTED SHIPMENTS	444,918.3					
OZS POURED NOT SHIPPED		1,263.000	953.000	2,053.000	2,053.000	
LAST MO OZS SETTLED		n/a	11,089.426	7,429.985	18,519.411	
CURR MO OZS SETTLED		0.000	5,208.040	7,832.582	13,040.622	
OZS SHIPPED NOT SETTLED		11,089.426	7,429.985	5,401.140	5,401.140	
TOTAL OZS ROYALTY PAID ON		0.000	16,297.466	20,663.707	36,961.173	
LONDON FINAL AVERAGE AU PRICE		344.380	335.017	334.803	338.067	
SILVER:						
OZS SHIPPED	14,953.6	254.468	416.761	302.875	974.104	15,962.0
ADJ BASED ON OUT-TURNS	34.3					
ADJUSTED SHIPMENTS	14,987.9					
LAST MO OZS SETTLED		n/a	254.468	274.315	528.783	
CURR MO OZS SETTLED		0.000	142.446	302.875	445.321	
OZS SHIPPED NOT SETTLED		254.468	274.315	0.000	0.000	
TOTAL OZS SETTLED		0.000	396.914	577.190	974.104	
ENGLEHARD SETTLEMENT PRICE		3.757	3.686	3.648	3.693	

Cyprus Copperstone Gold Corporation
An Affiliate of Cyprus Gold Company

Post Office Box Al
Parker, Arizona 85344
619-665-9261
Facsimile : 619-665-8636

CONFIDENTIALITY AGREEMENT

This CONFIDENTIALITY AGREEMENT is dated ______________________ ,1993 between CYPRUS COPPERSTONE GOLD CORPORATION ("Discloser"), with an address of 9100 East Mineral Circle, P.O. Box 3299, Englewood, Colorado 80155, and ,a ("Recipient"), with an address of

WHEREAS, Recipient wishes to receive from Discloser geological, technical, financial and other information pertaining to Discloser's Copperstone Mine located near Parker, Arizona, which information Discloser considers to be confidential and proprietary ("information"), and

WHEREAS, Recipient wishes to examine, review, and use information for the sole purpose of determining whether it desires to make a proposal or proposals relative to the future operation or ownership of the Copperstone Mine.

NOW THEREFORE, in consideration of Discloser providing Recipient with information and the Recipient's obligations set forth below, Recipient and Discloser agree to the following:

1. All information of whatsoever nature, including but not limited to information that is oral, written, depicted on computer files, maps, charts, or graphs or is in the form of core or rock samples that is given by Discloser to Recipient shall be governed by this Agreement.

2. Recipient shall keep all information confidential from the date first written above for a period of two years, during which period information shall not be disclosed to any third party without the prior written consent of Discloser, except as required by law.

3. Discloser of information by Recipient shall be limited to its employees or consultants whose duties require them to know the information.

CYPRUS

4. Recipient shall be under no obligation with respect to any information which(s) Recipient can demonstrate was in Recipient's possession prior to the time that the information was disclosed to Recipient by Discloser, (b) is or becomes available to the general public through no fault of Recipient, (c) is disclosed to Recipient without any restriction on disclosure by a third party who has the lawful right to make such disclosure, or (d) Recipient can demonstrate was developed without benefit or use of the information.

5. Unless sooner terminated by mutual agreement by the Parties hereto, this Agreement will terminate and be of no further force and affect two years from the date first written above.

6. The terms of this Agreement and the obligations imposed hereby shall be governed by the laws of the State of Colorado, and the parties shall submit themselves and all legal actions arising under this Agreement to the jurisdiction of the courts of such State.

7. This Agreement constitutes the entire understanding between the parties hereto with respect to the subject matter indicated above and its terms may not be changed or amended except by an instrument in writing. No agreement as to the future operation of or for the purchase of any interest in the Discloser's Copperstone Mine shall be binding on either party until such an agreement is reduced to a writing signed by both parties.

IN WITNESS WHEREOF, the parties enter into this Agreement effective the date first written above.

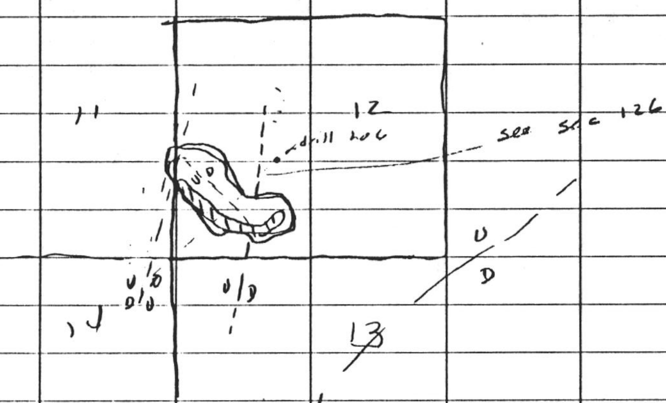
CYPRUS COPPERSTONE GOLD CORPORATION

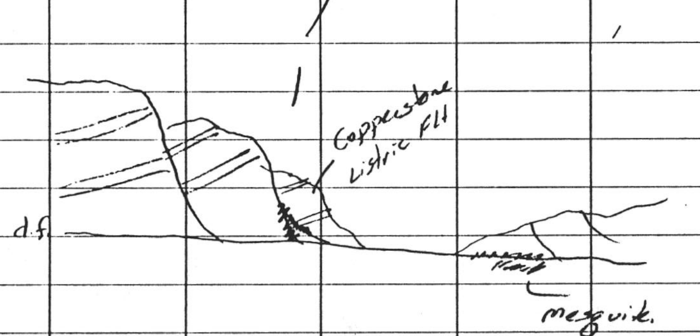
____

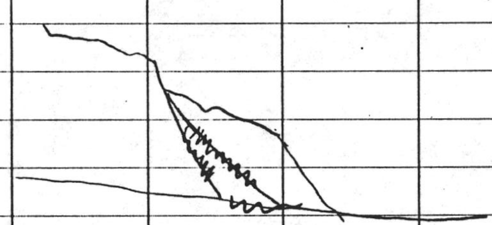
________________________ ________________________

By its:________________ By its:________________

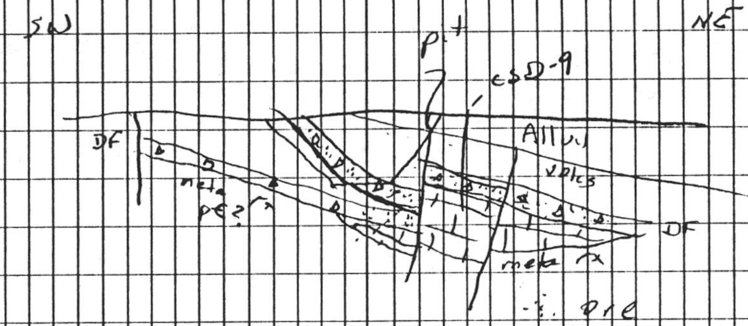
23 Mar. 86
Copperstone







sand is up to 120' deep



4 mt .08 opt 6:1 strip
.025 cutoff
Total 8 mt .086 opt - can't get to 4 mt of this
They believe there is potential for more minzation along d.f. 2

Au assoc w/ qtz - spec

Cu to 1% as ox-mal
bar & fl present

Intriguing variety of Ax textures.

Only 1% of dep contains silica?.

Zon is confident of prod? - once this is done will look for root zones.

see to cpy - basically no sulfides

Bx textures well-dev. some w/ crse, white bar blades.

One of the core samples showed what looked like epithermal vn, Cockscomb ~~qtz~~, banded, amethyst

Bx frags include volc bx, fol^{c} mylonitic rock frags, frags w/ qtz vns truncated at frag margins. Volc bx are original textures

K-Ar dates at 55 my, ser 48 my feels at assoc w/ Au

Recoveries avg 71 to 75%

In conc, see Au assoc w/ py

Total sulf v. low.

Ultimately the dep may produce 500,000 oz Au.

The dep does show a CO_2 gas anomaly.

to get wk minzation in HW & FW along fol in volc rx adj to the bx

Minzation is clearly ~~to~~ offset by younger flts.

Much of the volcs are welded, ash-flow tuffs

v. low As-Sb-Ag, Randy White says overall Cu v low.

Cu decreases in drilling down dip - locally to 1%, next interval may have none. Fl assoc w/ bar

Ron thinks the amethyst vns are late & post-Au (?) (low Au).

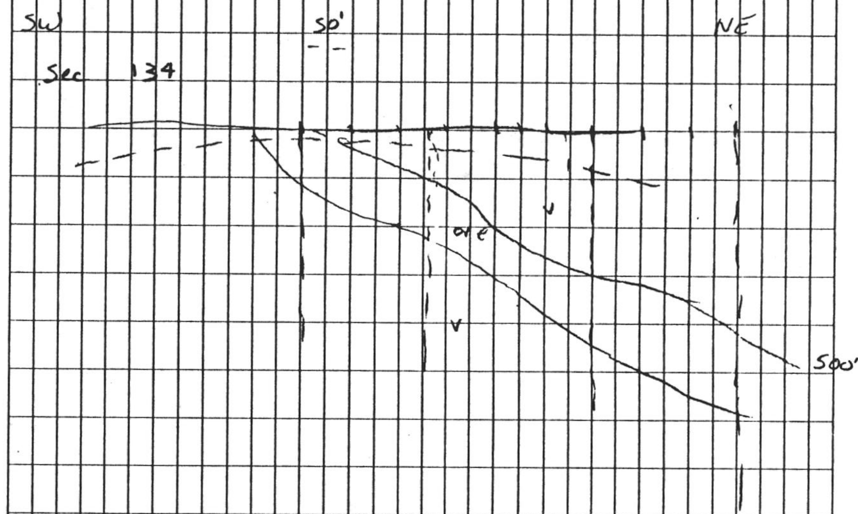
Hem^{c} samples from pit running .095

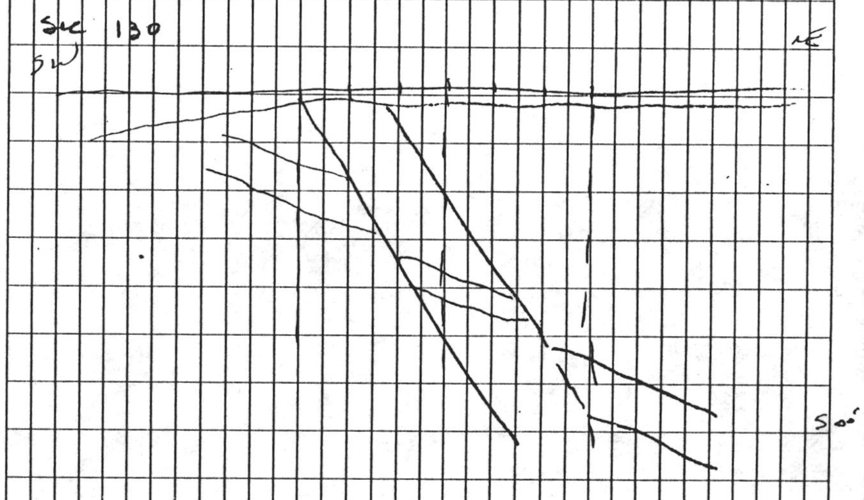
shattered zone. Au does exist in the system but its lateral continuity is unknown.

Much of the zone of shattering is covered. If ~~there~~ continuity of minzation can be established, some reserves may be present.

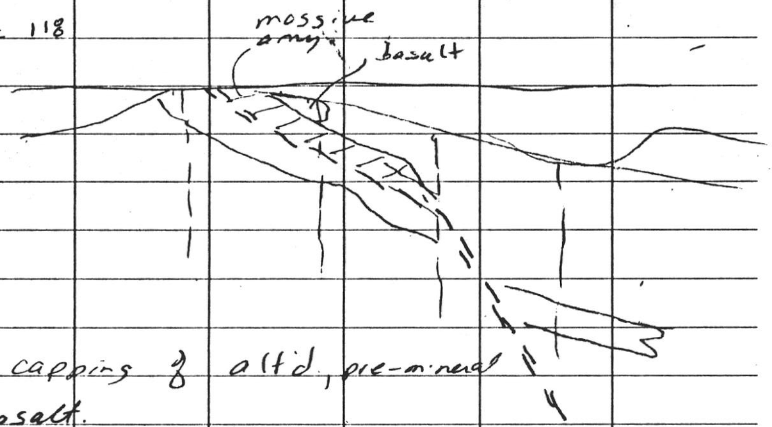
10 Apr 86

Copperstone Tour w/ Ron Graichen



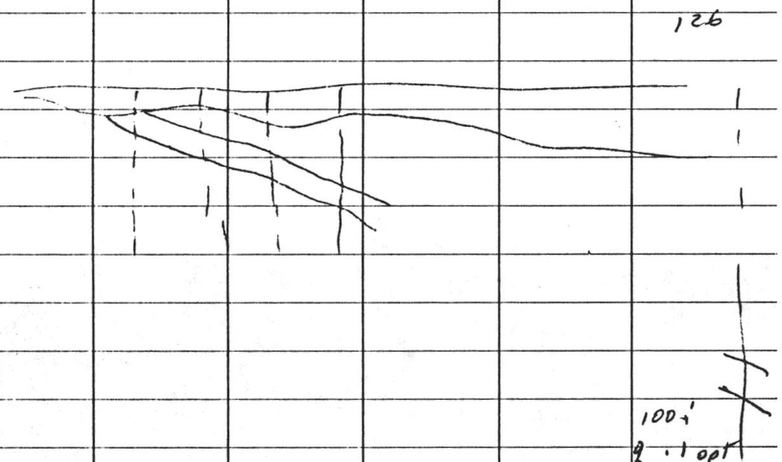


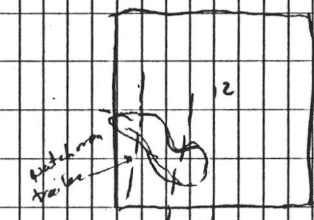
sec 118



capping of alt'd, pre-mineral basalt.

* Overall amy is late & barren
Amy occurs in updip & SW portions of dep



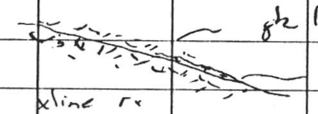


qtz-spec → spec → qtz-spec →
no Au   Au

Alt'n typically wk - patchy fn gr silic'n, wk argil'n, wispy chl veining.

Det flt near Copperstone - at Cu Pk

Look W toward Riverside Mtns



qtz alt'n occurs near the d.f.
Shattering is well-dev, some chl'n.
At Cu Pk there are qtz bx
cemented w/ silica & w/ spec-Fe.

5/28/85

TO: Mines files, & JES

FROM: John W. Welty

RE: Copperstone Property, Moon Mountains

The following notes are the result of a phone conversation with Mr. Bill Burton of AMOCO Minerals Co., Englewood, CO (303-740-5638).

The property is on the block for sale as of July, 1985. Established reservese are set at 4 million tons of 0.08 oz/T Au. AMOCO feels that the orebody is too small for exploitation and therefore attempting to sell the reserves. Bureau personnel have been invited to attend the field trip to the property in July,1985 conducted for the benefit of potential buyers.

The deposit consists of a tabular ore zone dipping 30o averaging 30′ in thickness, locally as thin as 20′ and as thick as 130′. The ore zone is brecciated, fractured and well quartz veined. The ore zone has the same dip as hosting Mesozoic ash-flows. The brecciated zone is also spatially associated with listric normal fault structures. 1.5 to 2 miles to the south of the property a detachment fault(?) is visible at Copper Peak at the north end of the Dome Rock Mountains. NE-trending high-angle structures cut the orebody and displace it locally; they are thought to be Basin and Range structures. Specular hematite is found along the listric faults, but not occurring with the ore. A moderatley well-developed seritic alteration envelope is associated with the ore zone. Adualria is also found in some of the quartz veining (see dates below).

AMOCO drilling consisted mostly of rotary holes, so that lithologic identification was difficult. The drilling never encountered identifiable lower plate lithologies, although the deepest hole (no depth given) encountered a 300-400′ thick section of carbonates beneath the ore zone. No intrusive rocks were recognized in the drilling or surficial mapping.

Two dates by Geochron give equivocable results. An adularia K-Ar date gave 48 mybp, and a K-Ar sericite date yielded a 52 mybp age.

Several modes of genesis are possible: 1) gold ores developed in response to detachment faulting; 2) gold-rich breccia pipe occurrence of early Tertiary age possibly related to a pluton at depth; or 3) a Jurrassic hot springs occurrence given the conformable nature of the ore zone. Possibility two seems most likely at present considering the age dates.

Arizona Bureau of Geology and Mineral Technology
FIELDNOTES
Vol. 18, No. 2 Summer 1988

by Jon E. Spencer
and John T. Duncan
Arizona Geological Survey

and William D. Burton
Cyprus Minerals Company
P.O. Box 3299
Englewood, CO 80155

The Copperstone Mine: Arizona's New Gold Producer

Arizona's annual gold output will almost double in 1988 as a result of production from Cyprus Minerals Company's Copperstone gold deposit in La Paz County, west-central Arizona. During 6 years of expected mine life, the deposit is predicted to yield approximately 510,000 troy ounces of gold worth $230 million, based on a value of $450 per ounce. Unlike many recent gold discoveries in the Southwest, Copperstone is a new discovery in an area not previously identified as a mineral district. In this article, the geology and regional setting of the Copperstone deposit are described. Although the deposit is still not completely understood, enough is known to warrant reassessment of estimates of mineral-resource potential in west-central Arizona.

Regional Geologic Setting

West-central Arizona and adjacent areas of California and southern Nevada contain some of the most spectacularly exposed detachment faults in the world. The term "detachment fault" is commonly applied to large-displacement, gently dipping (inclined) normal faults. In this region, hanging-wall rocks, or rocks overlying the detachment faults, were displaced northeastward relative to footwall rocks, rocks that underlie the faults. The faults originally dipped to the northeast, but are now rotated and warped to form undulating surfaces that are nearly horizontal over large areas.

The north- to northeast-dipping Moon Mountains detachment fault, exposed at the northern tip of the eastern Moon Mountains, separates two large, geologically distinct areas: to the northeast lie numerous detachment faults, such as those in the Buckskin, Rawhide, and northern Plomosa Mountains; to the south, in the Dome Rock, southern Plomosa, and most of the Moon Mountains, detachment faults are absent. The Copperstone gold deposit lies within the hanging wall of the Moon Mountains detachment fault and flanks the area of pervasive faulting.

Miocene (5- to 24-million-year [m.y.]-old) detachment faults in west-central Arizona are associated with numerous copper, iron, and gold deposits, especially in the Buckskin and Rawhide Mountains, that have yielded metals worth many millions of dollars (Figure 1; Table 1; Wilkins and Heidrick, 1982; Spencer and Welty, 1986). Copper-gold deposits associated with detachment faults typically lie along or within a few tens of meters of the faults; a few, however, are hundreds of meters above the faults. Detachment-fault deposits contain fractures and thick, irregular zones that are commonly filled with the minerals specular hematite, chrysocolla, quartz, barite, fluorite, calcite, and manganese oxides. Pyrite and chalcopyrite, which are commonly oxidized, are also present in many deposits.

The northeastern tip of the Moon Mountains is primarily composed of Mesozoic (63- to 240-m.y.-old) granitic rocks that form the footwall of the Moon Mountains detachment fault. Hanging-wall rocks are mostly metamorphosed Jurassic (138- to 205-m.y.-old) volcanic rocks. Older (Paleozoic; 240- to 570-m.y.-old) metamorphosed sedimentary rocks that are brecciated (composed of

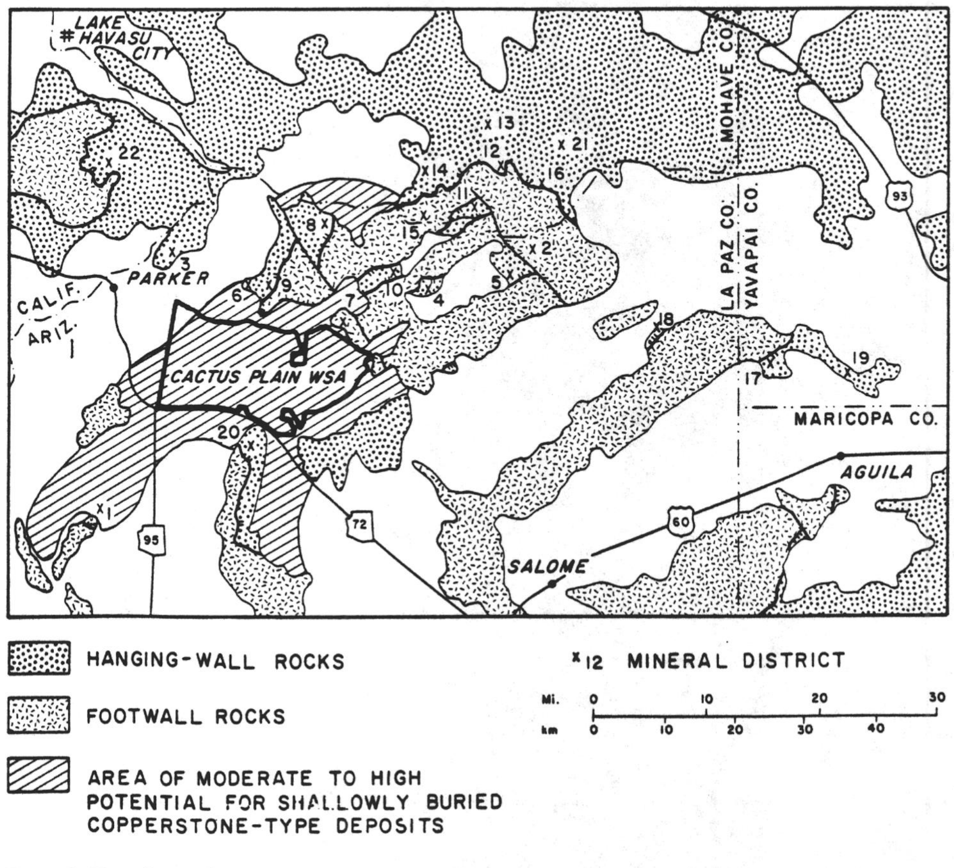


Figure 1. Map of part of west-central Arizona showing mineral districts where mineral deposits are known or suspected to be related to detachment faults. Middle Tertiary and older rocks are divided into hanging wall and footwall rocks, which lie above and below, respectively, regionally northeast-dipping detachment faults. Also shown is the outline of the Cactus Plain and Cactus Plain East Wilderness Study Areas. Numbers refer to mineral districts listed in Table 1.

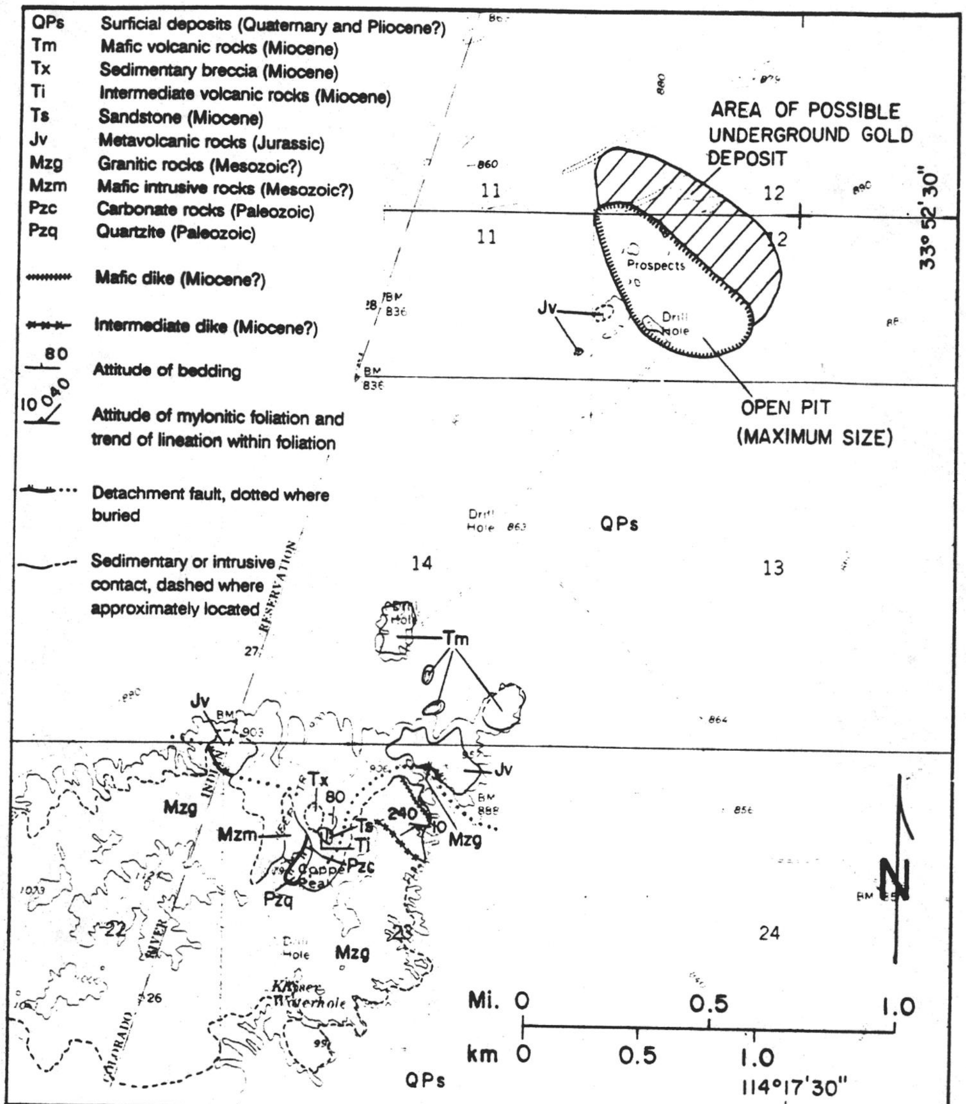


Figure 2. Geologic map of northeastern Moon Mountains showing location of Copperstone mine.

broken rock fragments) underlie Copper Peak; steeply dipping, younger (Miocene) volcanic and sedimentary rocks, including sedimentary breccias derived from the Jurassic volcanic rocks, are also present adjacent to Copper Peak (Figure 2). The copper-iron mineralization that characterizes detachment-fault deposits elsewhere in west-central Arizona is also evident in brecciated rocks along the Moon Mountains detachment fault at Copper Peak and at the edge of the Colorado River Indian Reservation.

Geology

The Copperstone mine is approximately 1½ miles northeast of exposed bedrock in the northeastern Moon Mountains (Figure 2). Bedrock exposures in several very small hills surrounded by alluvium contain evidence of gold mineralization and led to the discovery of the Copperstone deposit. Mineral deposits are present above and along a gently dipping contact that is probably a fault; the contact separates Jurassic metamorphosed volcanic rocks and overlying sedimentary breccias derived from them. The mineralized contact zone dips approximately 30° to the northeast, extends horizontally for 3,000 feet and at least 1,000 feet down dip, and is generally several tens of feet thick. The sedimentary breccia and a volcanic rock that contains vesicles (relict gas bubbles) are almost certainly Miocene in age and are mineralized, indicating that mineralization is Miocene or younger.

Drill-core samples reveal that some brecciation occurred after quartz veins were formed; however, numerous northwest-trending quartz-amethyst veins exposed in the mine pit are not brecciated. Steeply dipping, northwest-striking fractures and narrow shear zones exposed in the mine pit locally cut quartz-amethyst veins and contain subhorizontal slickenside lineations, which are smooth and polished striations that result from friction along a fault plane.

Gold is present where quartz and specular hematite are abundant in the breccia zone and locally within veins in the metamorphosed volcanic rocks. Chrysocolla, barite, earthy red hematite, and malachite are also common in the gold-mineralized zone. Fluorite, adularia, magnetite, calcite, chalcopyrite, pyrite, and manganese oxides are present in smaller quantities. Gold, however, is rarely visible. The presence of quartz, hematite, and chrysocolla is a good indicator of gold mineralization.

Fluid-Inclusion Characteristics

Fluid inclusions are bubbles of liquid and gas that are commonly trapped inside minerals during mineral formation. The composition of fluid inclusions in mineral deposits reflects the composition of the aqueous fluids that formed the deposits. One can determine the salinity of the inclusions by determining the freezing temperature of the fluid within them. The minimum temperature of the fluid at the time it was trapped can be determined by heating the sample until the two phases (liquid and gas) in the inclusion become one. Fluid inclusions in quartz-amethyst from the Copperstone mine contain between 16 and 22 percent sodium-chloride equivalent (by weight) and were trapped at minimum temperatures between 200° and 260° C. These characteristics are similar to those of other mineral deposits along Miocene detachment faults in west-central Arizona, but are substantially different from those of most other types of deposits, such as epithermal-vein gold deposits (Figure 3; Wilkins and others, 1986).

Origin

The following characteristics of the Copperstone deposit suggest that it originated from the same processes that formed mineral deposits along numerous other Miocene detachment faults: (1) fluid-inclusion salinities and temperatures of entrapment; (2) abundant specular hematite with less abundant copper minerals such as chrysocolla, malachite, and chalcopyrite; (3) geographic proximity to a detachment fault; and (4) probable Miocene age. Two characteristics of the Copperstone deposit, however, differ from those of other detachment-fault deposits: abundance of quartz-amethyst veins and abundance of gold. These authors believe that most evidence at the Copperstone deposit supports a relationship between mineralization and detachment faulting.

A working model for the origin of the Copperstone deposit is as follows: hot, saline, aqueous fluids containing dissolved gold, copper, iron, and other elements moved updip along the north- to northeast-dipping Moon Mountain detachment fault. These fluids encountered highly porous and permeable sedimentary breccias in the hanging wall of the detachment fault and began ascending through the breccia zone. As a result of cooling or mixing with more oxygen-rich, shallow-level ground water, largely within the sedimentary breccias, gold and

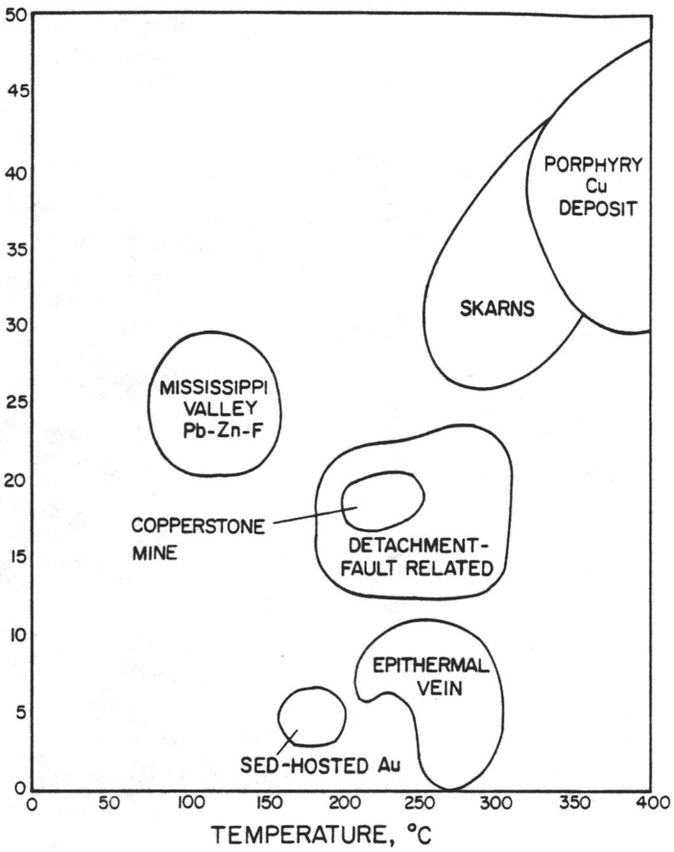


Figure 3. Diagram of salinity and homogenization temperature fields for fluid inclusions from several major mineral deposits, including those associated with detachment faults. Fluid inclusions from the Copperstone deposit clearly fall within the field of other detachment-fault-related deposits. Many geologists suspected that the Copperstone deposit was an epithermal-vein deposit, as are many other gold deposits in the Southwest; fluid-inclusion data, however, strongly suggest otherwise. Modified from Wilkins and others (1986), with additional data from the Copperstone mine.

Table 1. *Value of production for commodities from mineral districts in west-central Arizona that are known or suspected to be related to detachment faults. Manganese mineral deposits, although not clearly understood, are suspected to be related to detachment faults. District locations are shown on Figure 1.*

District	Commodities*	1986 Value**
1. Copperstone	Au (reserves)	$189,306,900
2. Alamo	Cu, Pb, Ag, Au	72,303
3. Cienega	Cu, Ag, Au	5,571,167
4. Clara	Cu, Ag, Au	3,066,661
5. Lincoln Ranch	Mn	18,960,000
6. Mammon	Cu, Ag, Au	93,913
7. Midway	Cu, Ag, Au	43,743
8. Planet	Cu, Ag, Au	12,771,828
9. Pride	Cu, Ag, Au	37,679
10. Swansea	Cu, Ag, Au	17,471,085
11. Black Burro	Mn	261,490
12. Cleopatra	Cu, Pb, Ag, Au	1,118,459
13. Lead Pill	Cu, Pb, Ag, Au	303,365
14. Mesa	Mn	47,400
15. Owen	Cu, Pb, Zn, Ag	107,561
16. Rawhide	Cu, Pb, Zn, Ag	116,573
17. Bullard	Cu, Ag, Au	1,763,481
18. Burnt Well	(unknown)	(minor)
19. Harris	Mn	79,395
20. Northern Plomosa	Cu, Pb, Ag, Au	2,123,413
21. Artillery	Mn	75,135,320
22. Whipple	Cu, Pb, Zn, Ag, Au	683,550
TOTAL		$329,135,287

* Ag = silver; Au = gold; Cu = copper; Mn = manganese; Pb = lead; Zn = zinc.

** Values do not add to total because of rounding.

other elements precipitated from the fluids to form the Copperstone deposit.

Implications for Land-Use Planning and Management

The presence of the Copperstone gold deposit in a geologic setting that is characteristic of large areas of west-central Arizona indicates that the mineral-resource potential of this area in the State is greater than previously suspected.

The Copperstone deposit was probably not discovered until recently because it was almost entirely concealed by young surficial deposits. Undiscovered mineral deposits similar to Copperstone may also be concealed beneath other surficial deposits, such as those covering nearby Cactus Plain (Figure 1). Application of more sophisticated geophysical techniques may eventually result in discovery of such deposits. Many areas in west-central Arizona, such as the Cactus Plain and Cactus Plain East Wilderness Study Areas, are presently under consideration for Federal wilderness-area status. If designated to be managed as wilderness, these areas would no longer be open to mineral exploration or mining activity.

Mineral deposits associated with detachment faults have only been recognized as a distinct deposit type during the past 10 years. The recent discovery of the Copperstone deposit and recognition of its association with a detachment fault are generating renewed interest in detachment-fault-related deposits and in areas where such deposits might be located. Future improvements in our understanding of Arizona geology and future mineral-deposit discoveries will undoubtedly lead to renewed interest in areas that presently receive little attention from research or exploration geologists.

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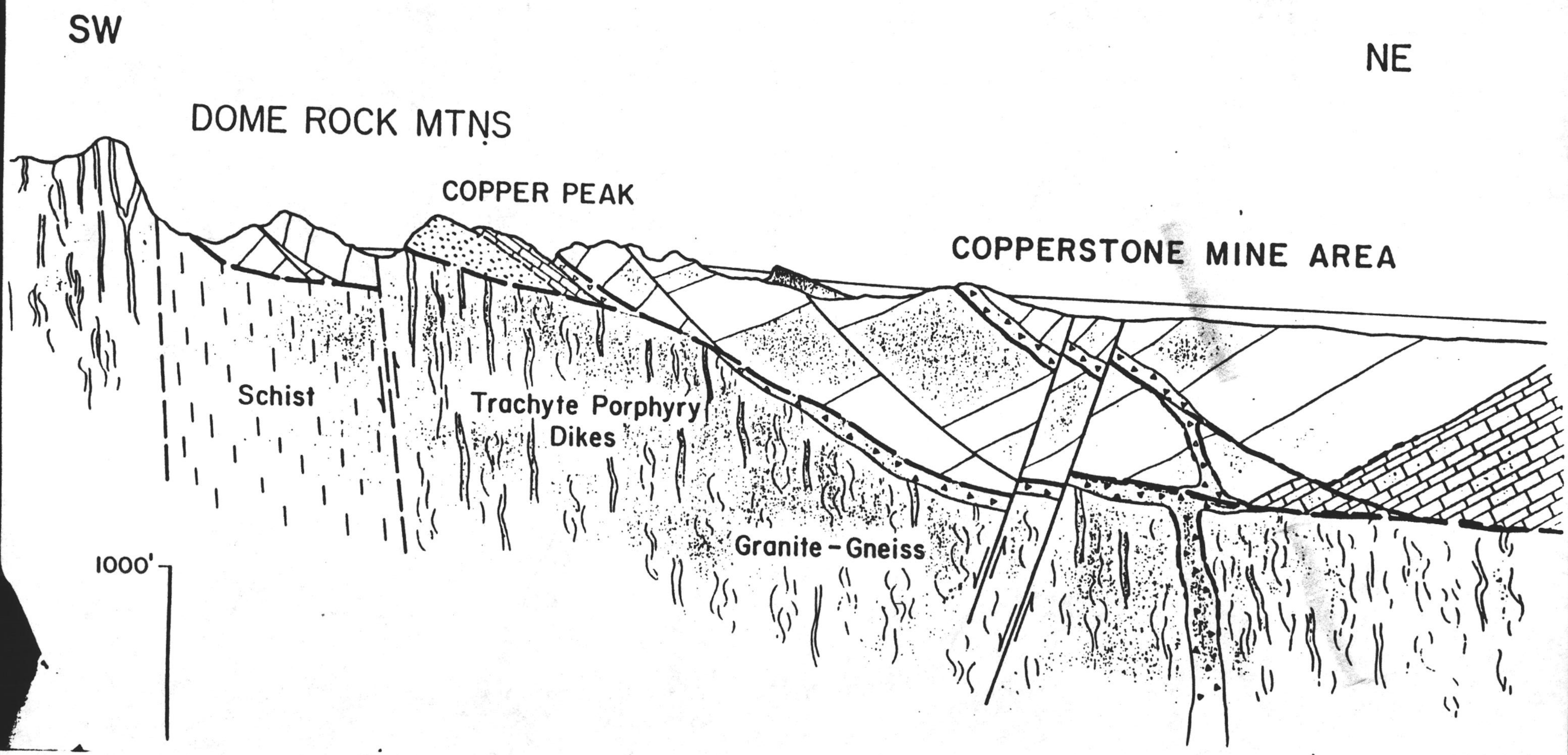
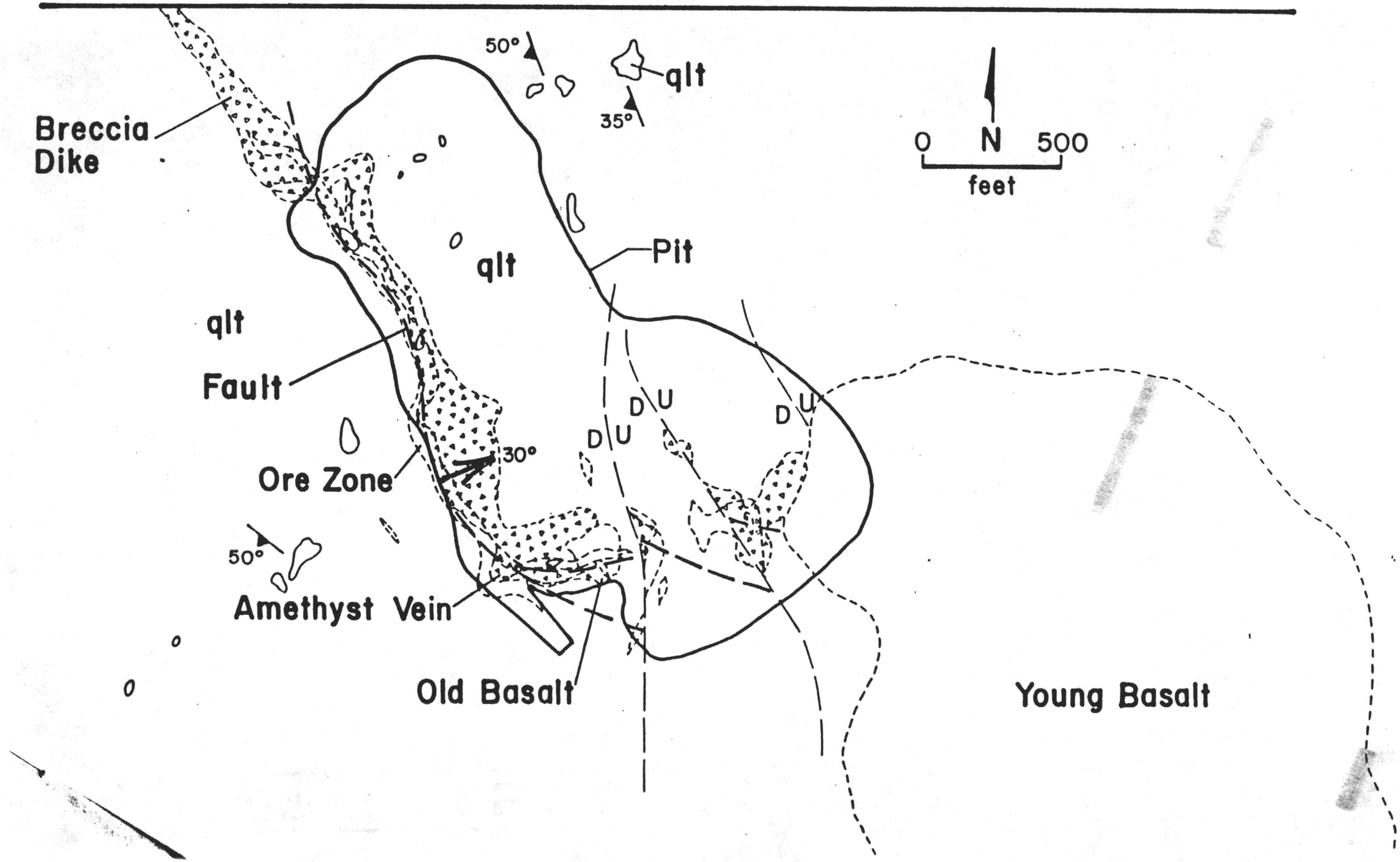
GSA Centennial Field Guides

The Geological Society of America (GSA) has published two Centennial Field Guides that include areas in Arizona: the Cordilleran Section and the Rocky Mountain Section (volumes 1 and 2, respectively). The first volume contains field-guide articles and maps to 100 outstanding geologic locations in Alaska, British Columbia, California, Hawaii, Nevada, Oregon, and Washington, as well as Arizona. The second volume contains 100 guides for Alberta, Arizona, Colorado, Idaho, Montana, New Mexico, South Dakota, Utah, and Wyoming. These two volumes are part of the 71-item GSA publishing project, the Decade of North American Geology (DNAG). To obtain copies, send $43.50 for each volume to The Geological Society of America, Publication Sales, P.O. Box 9140, Boulder, CO 80301; tel: (800) 472-1988.

SCHEMATIC GEOLOGIC SECTION



SUBSURFACE GEOLOGY



chalcopyrite and pyrite. Multiple episodes of mineralizing hydrothermal events and brecciation occurred at Copperstone.

Mineralizing solutions also formed local zones of alteration in and near the ore zones. Bleaching effects are caused by argillization and sericitization. Local secondary gray-green chlorite as wispy veining and minor chalcedonic silicification with small patches of chalcopyrite, pyrite and native gold have been seen. Microscopic examination of a gravity concentrate was made from a floatation concentrate of the ore. About 80 percent of the gold occurs in small flakes ranging between 4 and 40 microns. Coarse gold plates range from 50 to 150 microns. Most gold is free, but a small amount is locked within quartz and iron hydroxides.

The few mineralized outcrops at Copperstone contain highly anomalous gold, silver and copper. Initial sampling found subore and ore grade gold values that led directly to drilling. Several early core holes and a large suite of surface samples were analyzed for a broad spectrum of trace elements in an effort to characterize the deposit.

Copperstone is characterized by high barium, manganese, uranium and low arsenic, antimony, thallium and mercury. Barite and flourite are most abundant in the extreme southeastern end of the deposit where they occur in massive 4-5 foot veins.

Generally, gold mineralization is sharply defined within the mineralized breccia zone. It markedly decreases over a few tens of feet into hanging wall and footwall rocks where often no gold is detected by atomic absorption analysis. In higher gold grade zones within the deposit, silver values are higher and may provide some recoverable value. Copper ranges up to several percent within the gold zone, mostly as chrysocolla.

COPPERSTONE
GEOLOGIC SUMMARY

The Copperstone gold deposit is located in an area of flat, dry, sandy terrain with several small knolls about 40 feet high and prominent longitudinal sand dunes. Only 17 outcrops with a total surface area of approximately one acre are exposed. At the southern end of the Copperstone claim block and beyond is exposed an igneous and metamorphic outlier of the Dome Rock Mountains. These rocks include granite, gneiss, schist, quartzite and amphibolite of uncertain age - Precambrian to Jurassic. A low angle fault (detachment?) separates these rocks from an upper plate consisting of a thick sequence of Jurassic age quartz latite welded tuffs (qlt). The upper plate sequence has been affected by weak green schist facics metamorphism in Cretaceous time. This fault probably extends beneath the Copperstone gold deposit, but drilling failed to confirm its presence.

No early prospect pits, shafts or adits were found at Copperstone. Prospecting began in 1968 with bulldozer trenching by a prospector to better expose weak copper mineralization. The property was submitted to Cyprus in 1980, and a lease was signed after initial field evaluation and sampling indicated 0.02 to 0.09 ounce per ton gold in a few small breccia outcrops. During 1981 through 1983 conventional percussion drilling in a 140 foot grid by Cyprus (Amoco Mineral Company) tested the limits of the Copperstone mineralization. Extensive induced polarization and ground magnetic surveys were run. Anomalous frequency effects outlined the gold deposit with considerable accuracy. Drilling from 1984 through 1986 further defined the deposit.

The Copperstone gold deposit is hosted by a thick sequence of foliated to massive and brecciated quartz latite tuffs. These rocks are correlated regionally with the Jurassic volcanics exposed in the Dome Rock Mountains to the south and throughout west-central Arizona. In the deposit area the quartz latite tuffs are at least 900 feet thick based on drilling formation. The tuffs are characterized by variable degrees of foliation defined by segregated bands of quartz - feldspar and sericite, probably developed along original primary laminations in the tuff. The foliations exposed in surface outcrops in the deposit area all dip 30-50° to the southwest. The indurated breccia dike that hosts the main gold zone within the deposit strikes approximately N45W and dips on an average of 30° to the northeast. These breccias continue along strike at least 2,500 feet and down-dip 1,500 feet. The breccias range in thickness from 50 to 200 feet and contain variably altered fragments of quartz latite in a hematite matrix. The main ore zone within the deposit generally occurs along the basal contact of these breccias with the underlying foliated quartz latite tuff. This mineralized zone is defined by an extensive multi-stage hydrothermal breccia zone. Fragments of quartz vein material, quartz latite tuff and earlier developed breccia are contained within a hematite - specularite matrix. Gold mineralization occurs primarily within this hydrothermal breccia zone and in quartz - amethyst veins cutting through the adjacent latite tuffs. Specular hematite, chrysocolla, minor malachite, and barite are the most common accessory minerals with lesser amounts of calcite, siderite, manganese oxide, flourite, adularia, magnetite,

Cyprus Minerals Company
1987

Copperstone

Outlook for 1988

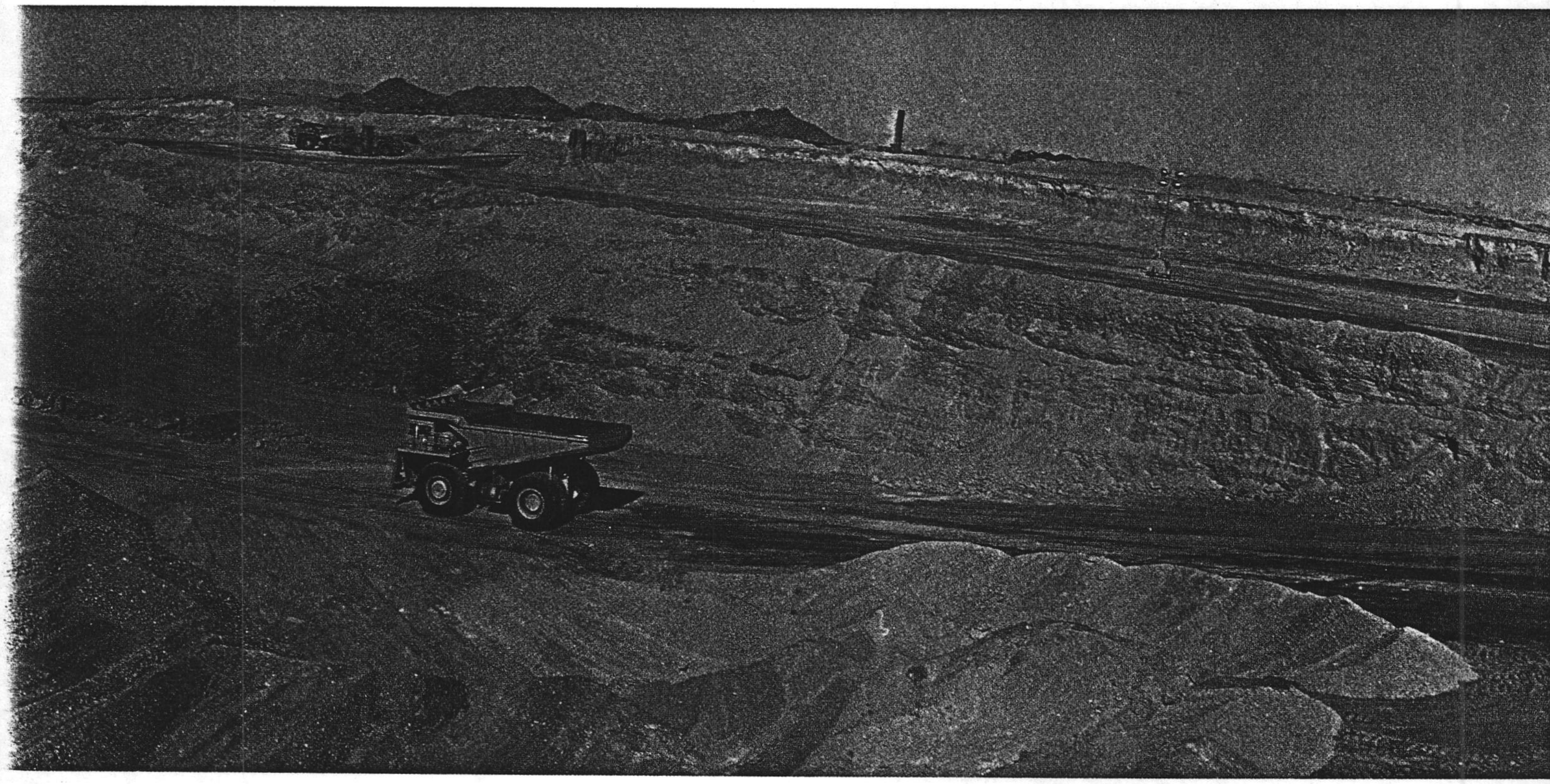
Our gold production was marginally profitable in 1987 after exploration and other expenses, and it is expected to contribute substantially to earnings in 1988, as planned gold production increases to 110,000 ounces.

The growing output of our gold operations in the U.S. and the South Pacific is one of the more important developments since Cyprus became an independent company in 1985.

Cyprus Gold Properties—1988

	Estimated Recoverable Ozs./Grade	Cyprus % Ownership	Cyprus Net Ounces	Estimated Mine Life	Manager/ Operator	Orebody Identified By Cyprus
Mines in Operation						
Gidgee (Australia)	193,000/0.090	26.5	51,000	5 years	Cyprus	Yes
Copperstone (U.S.A.)	446,000/0.083	100.0	446,000	7 years	Cyprus	Yes
Sheahan-Grants (Australia)	110,000/0.080	25.0	28,000	4 years	Other	Yes
1988 "Startups"						
Selwyn (Australia)—March	580,000/0.131	37.5	218,000	6 years	Cyprus	Yes
Moline (Australia)—Dec.	190,000/0.091	25.0	47,000	4 years	Cyprus	Yes
1989 "Possibles"						
Copperstone Underground (U.S.A.)	–	100.0	–	–	Cyprus	Yes
Carlton "Gandy's Hill" (Australia)	–	50.0	–	–	Cyprus	Yes
Forrestania (Australia)	–	22.5	–	–	Other	No
1990-1991 Future Production						
Golden Cross (New Zealand)	840,000/0.167	80.0	605,000	9 years	Cyprus	Yes
Promising Prospects						
German Well (Australia)	–	25.5	–	–	Cyprus	Yes
Mt. McClure (Australia)	–	25.5	–	–	Cyprus	Yes
Gold Ridge (Solomon Islands)	–	40.0	–	–	Cyprus	Yes
Karangahake (New Zealand)	–	Up to 52%	–	–	Cyprus	No

Cyprus' Copperstone gold mine, located near Quartzsite, in western Arizona, is expected to produce 60,000 ounces of gold this year, its first full year of production.



Property	Ownership	Location	Reserves (Mt ore)	Grade gold (g/t Au)	Milling Rate (t/y)	Output (kg/y Au)	Completion date	Capital cost (millions)	Type	Remarks
U.S.A. (continued)										
Castle Mountain	Viceroy Resources Co./Hemlo Gold Mines Inc.	California	26.0	1.9	2.8	4,660	88	$12	P	Comprises Jumbo South, One Belle and Leslie Ann orebodies.
Cathroy-Larder	Golden Shield	Ontario	—	7.0	—	—	—	—	—	Project on Mother Lode strike extension, Metallurgical testing and mine design plans underway.
Chimney Creek	Gold Fields Mining Corp. (Cons. Gold Fields)	Winnemucca, Nevada	20.5	2.1	1.8M	4,976	88	$80	P	Predicted to be one of North America's lowest cost producers ($150/oz).
Copperstone	Cyprus Minerals	Arizona	6.0	2.9	—	1,860	88	$13.9	P	For commencing phase due to need full rate of 1,860 kg/y Au by 1988.
Cove	Echo Bay Mines	Nevada	—	—	—	7,000	89	—	P	Major discovery being evaluated, containing 4 Moz gold and 250 Moz silver. Heap leach operation to begin this year, with higher grade ore to be treated at McCoy.
Crofoot	Hycroft Resources/ Goldbelt Mines/ Granges	Nevada	23.5	0.9	2.0M	1,700	88	$10.4	P/Cn	Capital cost of $US10.4 million to bring first 2 Mt of leachable ore into production.
Empire	Nevada Goldfields	Colorado	10.00	2.5	—	1,930	89	—	P	Advanced exploration stage.
Friday	Normine Resources	Idaho	3.0	1.4	2.0M	—	89	—	P	Bulk leaching tests started in 1987. Production start-up envisaged for mid-1988 at 2 Mt/y.
Getchell	First Mississippi Gold	Winnemucca, Nevada	8.2	5.3	—	5,280	89	$77	P	Project to exploit non-leachable ore with autogenous milling autoclave oxidation and CIL recovery methods. Processing heap leach only. (466 kg Au in 1987).
Gilt Edge	Brohm Resources	Lead, S. Dakota	3.4	1.8	—	—	—	—	P	Potential additional reserves of 9 Mt (1.7 g/t Au).
Golden Reward	Moruya Gold	Black Hills, S. Dakota	1.93	2.9	—	—	—	—	—	Seeking development finance.
Goldstrike (Post)	American Barrick Resources/ Newmont Gold	Carlin Gold Belt, Nevada	45.2	2.0	—	5,000	88/89	—	P/U/ Cn	Joint venture plan with to develop the surface oxide and deep ore in the Post & Betze deposits. A 3,500 t/d mill under construction for higher grade oxide material and shaft system for u/g. Reserves and grade recently expanded and exploration continues.
Granny	Echo Bay Mines Ltd./ Crown Resource Corp.Gold Texas Resource Ltd.	Ferry County, Washington	4.0	4.8	365,000	1,500	92	$10	P/U	Four deposits under delineation programme: Key East, Key West, Overlook and Granny. Feasibility study should be completed by mid-1988.
Green Springs	U.S. Minerals Exploration Company (USMX)	White Pine County, Nevada	1.25	2.1	360,000	750	89	$3	P	Subject to state/federal permits and weather conditions construction could begin in late 1987. Mine life, 3-4 years.
Hollister (Ivanhoe)	Cornucopia Resources/Galactic	Nevada	43.00	1.2	5M	—	88	—	P	Possible heap leach operation. Exploration continuing.
Kensington	Coeur d'Alene Mines/ Echo Bay Mines	North of Juneau, Alaska	1.77	8.2	—	—	90	—	—	Deposit still open horizontally and vertically. Present owners believe site may be in production by 1990, with indicated resource of 1 Moz.
Kensington	Echo Bay/Coeur d'Alene	Alaska	—	—	—	—	90	—	p	Around 1 Moz of drill indicated reserves.
Kramer Hills	Beaver Resources/ Aegan International	San Bernadino Co., California	0.503	—	540,000	—	—	—	P	Considering new mine venture. Also evaluating 3 new areas of mineralization up to 1.5 km west of present pit.
London	Chrome Corp. Intl.	Fairplay, Colorado	0.32	4.1	1.7M	—	88	—	U	Proceeding with 2nd phase, U development programme where grade could be about 15 g/t (+ stockpiled ore).
Margarita	Newfield Minerals	Tucson, Arizona	0.440	2.5	—	466	—	$1.4	P	Heap leaching. Mine life about 3 years.
McCoy	Echo Bay Mines	Nevada	9.67	1.85	1.8M	2,800	89	—	Cn	A 5,000 t/d mill is expected to be commissioned mid-1989 to treat high grade ore from McCoy and nearby Cove.
McLaughlin	Homestake	S. Dakota	25.02	6.55	—	7,000	89	$A15	P/Cn	Expansion to process low grade oxides.

Shearson Lehman 1988

In spite of the development of the big McLaughlin mine the historic **Homestake** mine in South Dakota remains the cornerstone of **Homestake Mining Company**. After more than 110 years of operation this mine is still one of the largest gold producers in North America. Underground workings now extend down to 8,000 feet but development of new ore reserves is regularly replacing ore mined and reserves are currently sufficient for ten years' mining at the current rate. Not surprisingly however, for such an old and deep mine, operating costs are relatively high at over $300/ounce. In addition to the underground workings the company has reactivated an old area of surface workings known as the "open cut" which was last mined in 1945. A reassessment of the area's potential in the light of modern techniques and the higher gold price has led to the identification of reserves containing 750,000 ounces of gold. Production started in 1987 and the reserve is planned to mined over the next 15 years, approximately ten years by open pit, and five years underground. The ore will be treated in the existing Homestake mill. In total, underground reserves in 1986 were 18.9m tons grading 0.212 ounces/ton and open cut reserves were 6.2m tons grading 0.127 ounces/ton giving a total gold content of 4.8m ounces. Homestake's other US gold production comes from its 25% stake in the **Round Mountain** mine operated by Echo Bay. The company has recently announced plans to develop a mine on the **Jardine** property in Montana in 50/50 partnership with Inco. Inco will be the operator. Projected output is 42,000 ounces annually starting in mid-1989.

A revival of interest in the Lead area of South Dakota where the Homestake mine is situated, has been led by the establishment of the **Foley Ridge** mine by **Wharf Resources**. This heap leach project started up in 1983 but only recently has started to realise its full potential. Substantial operating improvements have been made over the last year which should provide a further increase in the gold output in 1988 to 55,000 ounces. Foley Ridge has a good reserve position with approximately 500,000 ounces of recoverable gold at the end of 1986. **Dickenson Mines** has recently acquired a 26.8% shareholding and has taken over management of the company.

In the same area, Brohm Resources hopes to have the 40,000 ounce/annum heap leach phase of its **Gilt Edge** project in production by mid-1988. Work is also proceeding towards the much larger second phase of the project which will include the construction of a mill to treat sulphide ores with a production in excess of 100,000 ounces/annum.

Another orebody in this area is the **Richmond Hill** deposit which was outlined by St Joe Gold, now part of Dallhold Resources. Estimated reserves are 8m tons grading 0.044 ounces/ton. A heap leach operation in the order of 50,000 ounces/year could be in production before the end of 1988.

Gold mining is also making a comeback in Arizona. During 1987 the copper/molybdenum/coal producer **Cyprus Minerals** brought the **Copperstone** property into operation. This is the company's first US gold mine. 1988 production is expected to be 60,000 ounces from reserves of 4.5m tons grading 0.08 ounces/ton.

Towards the end of 1988, **Stan West Mining** will be commissioning its **McCabe** underground mine, 70 miles north of Phoenix. Planned production is 50,000 ounces of gold and 140,000 ounces of silver per year. Proven reserves are 754,000 tons grading 0.332 ounces/ton of gold and 1.73 ounces/ton of silver and the deposit is open along strike and at depth.

The major gold mining event in **Montana** last year was the opening of the big **Montana Tunnels** mine by **Pegasus Gold**. This large polymetallic orebody is expected to produce 90,000 ounces of gold in 1988 along with about 1.7m ounces of silver, 5.8m lb of lead in concentrate and 26m lb of zinc in concentrate. The complex flow sheet of the mill has not yet performed completely up to specification and 1988 gold output will probably not match original targets of over 100,000 ounces. Ore reserves at the end of 1986 were 52.5m tons at a gold equivalent grade of 0.036 ounces/ton. Denver based **USMX Inc** has a 5% net profit interest, increasing to 50% interest after payback, which at current metal prices is expected to occur in mid to late-1991. Reserve life is about ten years. Pegasus also operates the well established **Zortman/Landusky** mine in north central Montana, a heap leach operation working to a very low grade of 0.02 ounces/ton. Reserves of 40m tons at a grade of 0.019 ounces/ton indicate a life of around seven

3

Mining Record, Oct. 12, 1988

E &MJ, Nov. 1988

EVALUATION REPORT

COPPERSTONE GOLD-COPPER DEPOSIT

PARKER, ARIZONA

Prepared for: The Patch Living Trust
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March 31, 1995
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STATE OF IDAHO
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EXECUTIVE SUMMARY

Recently completed open pit mining and CIP processing at the Copperstone mine near Parker, Arizona by Cyprus Mines Corporation produced over 0.5 million ounces of gold from about 6 million tons of ore grading about 0.1 ounces per ton. Reserves amenable to underground mining are present, but open pittable reserves are all depleted.

The gold occurs in a northeasterly dipping breccia zone in volcanic rocks. The mineralized zone contains abundant specular hematite and some copper. The level of oxidation extends to 1,000 feet of depth so all of the ore in the 560-foot deep pit was oxidized.

The open pit has very steep slopes, and the average stripping ratio was 10:1. The ore zone can be seen dipping into the northeast pit wall and on the northwest end of the pit, and bench maps show that the ore extends into the southeast pit wall.

Cyprus conducted considerable drilling and there are many ore intercepts outside and below the pit surface. Cyprus also drove an adit in the ore zone in the northwest end of the pit. Assays of bench blastholes show the grade of ore where the ore zone disappears into the pit walls. From this data the probable reserves can be estimated to be 1,078,000 tons grading 0.18 ounces per ton gold and containing 194,500 ounces.

An underground development program is required to prove up these probable reserves. It is likely based on the high number of drillhole intercepts that 0.5 million ounces of gold can be developed for underground mining at Copperstone. A 1984 Cyprus feasibility study further substantiates that the potential of 0.5 million ounces is reasonable.

Copper values could add significantly to the value of the ore because copper increases with depth. The grade of underground reserves should be in the range of 0.2 to 0.3 ounces per ton gold equivalent.

Exploration potential is excellent. A steeply dipping feeder vein system has not been explored even though the presence of the feeder vein system was known to Cyprus.

The water table is just beneath the bottom of the pit and underground mining will involve mine dewatering estimated to be about 1,000 gallons per minute.

All of the Copperstone operating permits will expire with the completion of reclamation by Cyprus. New permits will be needed with a new operation. Permitting difficulty should not be abnormal.

A Phase 1 underground development plan is needed to prove up the estimated probable reserves and to add more confidence to the potential reserves. A program involving 6,000 linear feet of ramping/drifting and 35,000 feet of short range definition drilling is recommended. The cost of the program is about $4 million [USD] and the time required is about 1 year.

Cyprus operated a carbon-in-pulp cyanidation process to recover gold, and some low grade ore was heap leached. Overall gold recovery was 89% which is low for a typical CIP process. Visible gold is present in the ore, and insufficient retention time may have been available for complete gold dissolution. No metallurgical data was available for this study.

Atomic absorption assaying of blasthole samples used for ore control produced low estimates compared to actual results. Also, reverse circulation drilling instead of diamond drilling led to understated reserve grades.

Assuming successful reserve development, the metallurgical process to be designed and built at Copperstone should include gravity recovery of visible gold, CIP gold leaching with extended retention time, and acid leaching of oxide copper. Copper would be recovered with solvent extraction and electrowinning.

The economics of an underground mine producing ore grading 0.2 to 0.3 ounces per ton must be determined after reserve development is completed. However, several underground mines in North America operate within this grade range. Copperstone should be a medium cost gold producer, producing over 50,000 ounces per year.

Two other prospects owned by Arizona Gold Mines were evaluated during this study. Neither the Jackpot placer nor Goodman prospects near Quartzsite, Arizona appear to have significant potential compared to Copperstone; however, exploration work could result in finding enough reserves for small mining operations. The Jodi Hill area of the Goodman prospect appears to warrant exploration work including induced polarization surveys and drilling to locate a stockwork of gold-bearing pyrite veinlets which may exist in the area. Gold-bearing pyrite stringers also may extend to the north from Jodi Hill to the main Goodman mine.

1.0 INTRODUCTION

The Copperstone mine is a recently completed open pit operation located between Quartzsite and Parker, Arizona. Cyprus Mines Corporation recovered about 500,000 ounces of gold during the six year operation. Currently, the mine is in the final reclamation stage by Cyprus in order to meet the conditions of permitting. The claims have been returned to Dan and Angie Patch, the unpatented claim owners, and the mining lease has been terminated. Roads, the power system, the water system, and several buildings have been conveyed to the Patches along with reclamation responsibilities for those facilities.

Cyprus mined about 6 million tons of ore and 60 million tons of waste. Approximately 5.1 million tons of ore grading 0.115 ounces per ton Au was treated with a carbon-in-pulp process, and 1.2 million tons grading approximately 0.03 ounces per ton Au was heap leached.

Santa Fe Pacific Gold Company recently completed an exploration program after the conclusion of open pit mining. The goal was to locate large tonnages of open pittable reserves, but the project was not successful. However, one high grade intercept was made beneath the pit, which is probably a feeder vein for the orebody mined.

Fred W. Brackebusch, P.E. spent several days examining the geological data at Copperstone and also examined the Jackpot and Goodman prospects which are also owned by Dan Patch through Arizona Gold Mines. All of the geological data, including that generated by Cyprus and Santa Fe., is located in a data room at the Copperstone site. Cyprus is currently winding up the reclamation of the waste dumps and tailings impoundment, thus there are Cyprus employees on the site. Gary Eastham is the Cyprus resident manager.

The purpose of this report is to describe the potential for further operations at Copperstone and to recommend a development plan. Recommendations are also made for the Jackpot and Goodman prospects.

2.0 RESERVES/RESOURCES

2.1 Copperstone

2.11 Reserve Estimations

Graham Kelsey, Cyprus Geologist, described the Copperstone mineralization in a 1984 report:

> "Gold mineralization occurs mostly within the main mineralized breccia zone and averages about 38 feet thick. Gold grades range between 0.01 and 0.28 ounce per ton, and average about 0.086 ounce per ton.
>
> Gold bearing hydrothermal solutions in-filled volcanic breccia depositing principally quartz and specular hematite. Some ore grade mineralization occurs as veining in the footwall and hanging wall of the main breccia zone. Veins cross-cut welded tuff laminations and in-fill parting planes in the laminations. Chrysocolla, barite and minor malachite are the most obvious accessory minerals. Other minerals observed within the ore zones are amethyst, sidero-calcite, mangano-geothite, light green fluorite, wad, adularia, magnetite, chalcopyrite, pyrite and very rarely visible gold."

The main breccia zone strikes northwest-southeast and dips 30-40° northeasterly. See appendix for more detailed description of local and regional geology.

All of the open pittable reserves developed by Cyprus have been mined and processed except about 60,000 tons of stockpile grading about 0.03 ounces per ton Au. The final pit walls are very steep, and, in fact, unstable with slides occurring. No further potential exists for open pit mining in the existing Copperstone pit.. In fact, the average stripping ratio for the entire pit was 10:1, thus any additional open pit mining would bear a much higher stripping ratio. The main ore zone is a moderately dipping breccia zone about 50 feet in thickness with a northeasterly dip of 35-40°, thus it disappears into the ends, bottom, and northeast pit walls. Ore grade mineralization is readily visible in the pit.

As far as known, Cyprus did not publish any reserves for underground mining, but the records indicate that underground mining was considered. Plans for underground stoping down dip of the open pit in the northeast wall were made. A decline ramp was started and was to be driven beneath the pit to access the underground reserves. However, it appears that a decision was made to deepen the pit and to steepen the pit slopes to the maximum while at the same time abandoning the underground mining plans. Thus some of the reserves originally planned for underground mining were mined with the expanded pit operation. Cyprus experimented with a road header to drive the ramp, and costs were high.

While there are several drill holes in the area northeast and northwest of the pit where underground mining can be considered, there are not sufficiently enough holes to enable proven reserve blocks to be defined. There is certainty that the main breccia zone, which hosted the ore mined, does extend down dip into the northeast pit wall and also on strike into the northwest wall. An adit was driven into the northwest pit wall at 660 elevation [about 250 feet below surface] following ore on strike for about 200 feet. The ore explored by the adit is 10-15 feet in thickness and averages about 0.25 ounces per ton Au. This block of ore has not been mined by open pit operations.

An estimate of probable reserves was made during this study. It was assumed that ore can be followed down dip to the northeast from the pit bottom for an average of 150 feet slope distance.. While the thickness of the main breccia zone mined during the open pit operation was 50 feet, underground mining is more selective so a 25 foot thickness is estimated. The strike length is about 2,000 feet, thus the estimate of probable reserves for this block is 750,000 tons. The grade of bench blastholes in the pit where the zone dips into the wall is 0.12 ounces per ton Au [see comments in section 6.2 on bench assays]. The grade for underground mining should be somewhat higher than this because of increased selectivity and a high cutoff. A grade of 0.15 is estimated for these underground reserves. Also, the grade of the perimeter bench blastholes in the pit bottom [350 to 420 elevation] increases to about 0.14 ounces per ton Au.

A block of probable reserves extends on strike into the northwest pit wall. The adit on 660 level explored this block. The block is at least 200 feet long on strike at the 660 level and would be 400 feet long on 360 level [the pit bottom]. It is also assumed that this block can be followed down dip 150 feet. The block dimensions would be 200 feet long on top, 500 feet long on the bottom, 750 long on dip, and 12.5 feet thick. This block contains 328,000 tons grading 0.25 ounces per ton Au.

The tonnage factor of 10.0 cubic feet per ton is estimated based on the high content of dense minerals including barite and specular hematite.

The estimated probable reserves for these two blocks would be:

Block	Tons	Grade, ounces per ton Au	Contained ounces
NE down dip	750,000	0.15	112,500
NW on strike	328,000	0.25	82,000
Total Probable	1,078,000	0.18	194,500

It is recommended that an underground reserve development program be pursued in order to increase the reserve base. More surface drilling, in my opinion, is wasting money because the presence of the mineralized zones is already known, and underground drifting with short range definition drilling will be required to prove reserves.

It appears likely, in view of the surface drill intercepts in ore down dip to the northeast and on strike to the northwest and southeast, that underground development could increase the reserve base to greater than 0.5 million ounces of ore grading between 0.15 and 0.25 ounces per ton Au.

Mary Lou Patch compiled a list of all drill intercepts greater than 0.10 ounces per ton Au from the Cyprus drill logs. Her list shows only the intercepts outside or under the pit surface, thus it represents the potential for underground reserve development. The average of 188 five-foot assay intervals from 59 drill holes is 0.237 ounces per ton Au. If one assumes 25% dilution for underground mining, the minable grade would be 0.19 ounces per ton Au. This great number of ore intercepts is good evidence for the potential to develop 0.5 million ounces of reserves.

As further substantiation of the potential of Copperstone, Cyprus projected in their 1984 feasibility study that the geologic reserves were 1.28 million ounces of gold. They projected 569,000 ounces as minable. The actual ounces mined comes very close to this 1984 projection. It can be inferred with reasonable confidence that the difference between the 1984 geologic reserves and the 1984 minable reserves, which is about 700,000 ounces, is a good measure of the remaining reserves.

2.12 Copper

Copper could add an important component to the value of the underground reserves. It appears that copper grades increase with depth; however, there has been only a passing study of this. Higher copper grades appear to exist down dip to the east from the pit. Some chalcocite was observed indicating the possibility of finding a secondary enrichment zone. The copper would be acid soluble because it is in the oxidized or supergene zones. Copper could be recovered with solvent extraction/electrowinning. If the copper grade is 1.0%, the gold equivalent grade would increase, due to copper, by about 0.04 ounces per ton Au equivalent thus increasing the reserve grade to the range of 0.2 to 0.3 ounces per ton Au equivalent.

2.13 Exploration Potential

Graham Kelsey, Cyprus Geologist, in a 1984 report describes exploration potential down dip of the open pit:

> "Obvious potential for discovery of additional ore grade mineralization occurs down dip within the mineralized breccia horizon. Several holes penetrating to over 800 feet have encountered gold grades of greater than 0.15 ounce per ton over 100 fee. Scattered 10-foot assay intervals in several holes intersected gold grades of about 0.25 and 0.35 ounce per ton. Detailed drilling to follow up these high grade intercepts has not been done. Potential exists to find economic underground tonnage that could be mined by ramping from the bottom of .... [the] Copperstone open pit."

The quote by Kelsey above about visible gold being "very rare" deserves some comment. In my observation, it is not very difficult to find visible gold when breaking rocks in the ore zone. In fact, visible gold is quite easily found. The entire process of sampling and assaying must be quite sophisticated to avoid misleading results when significant visible gold occurs. Atomic absorption will probably yield low results for samples containing visible gold. Reverse circulation drilling is probably also a questionable way to sample high grade zones. It is noted that comments in the files refer to diamond drilling as yielding much higher gold values than reverse circulation drilling. Also, fire check assays are higher than atomic absorption assays.

It appears likely that steeply dipping feeder veins were conduits for gold mineralization rising from a deeper source and intersecting the pre-existing main breccia zone. In fact, this theory is accepted by Cyprus geologists. There has been no exploration program to explore the steeply dipping feeder veins which are visible in the northeast pit wall. Many of the high grade intercepts made in holes northeast of the pit or under the pit may in fact be ore mineralization in feeder veins. One such intersection was made by Santa Fe in drillhole DCU-8 with a 10-foot intersection grading 0.92 ounces per ton Au. An observed concentration of feeder veins in the northeast wall of the pit could explain why it has been difficult to project the main breccia zone down dip to the northeast. Almost all drillholes are vertical, thus exploration of the feeder veins has not been accomplished because most holes would parallel the veins. Exploration from underground openings will solve this problem because drillholes can be drilled on a flat angle to test the feeder vein structures. Also the underground openings can be driven on feeder veins to determine their potential. It is ironic that exploration at Copperstone has not tested the accepted theory of a feeder vein source of gold to the main breccia zone.

2.2 Jackpot Placer

This prospect consists of two unpatented placer claims covering 180 acres. It is located several miles east of Quartzsite at the western edge of the Plumosa mountains.

The Jackpot placer deposit has been worked sporadically on a small basis by several ventures going back as far as 1909. The placer is described in U.S. Geol. Survey Bull 620, 1915. Auriferous gravels containing "cement rock" [caliche] were to be worked using mills, but results of the failed operation are not available. The U.S.G.S. bulletin states that the placer grade "is said to run 50 cents per cubic yard" [approximately 0.025 ounces per cubic yard].

Thomssen (1990) states that "recent drilling on the placer has been inconclusive with respect to grade." There are no records indicating past sampling results or recovered gold from the many attempted operations. Thomssen's opinion that about 5 million cubic yards of gravel and conglomerate [caliche] on the claims may contain a minimum of 60,000 ounces of gold [0.012 ounces per yard] thus cannot be verified by examining pit sampling or operating results.

A pilot scale placer gold recovery plant will be necessary to evaluate this prospect. The caliche has to be comminuted in order to recover gold locked in the calcium carbonate matrix. Gold recovered by the pilot plant would help defray the costs of conducting the sampling program. Pits should be excavated on a grid pattern to bedrock, and the excavated material would be processed to determine the gold content.

Water is quite scarce at the Jackpot. Arizona Gold Mines has two wells which yield a total of 45 gallons per minute. This would service only a small placer operation but could be sufficient for a test plant. It may be possible to use a dry method, but the SME Mining Engineering Handbook states that there have been no successful dry recovery methods. Thus development of a water source would be required for commercial scale mining at Jackpot.

2.3 Goodman Prospects

The Goodman prospects are located west of Quartzite in the Dome Rock Mountains. The property consists of 24 unpatented mining claims located along a wide shear zone in granitic rocks. Production has occurred since 1862, but records are sketchy. Arizona Gold Mines has produced over 100 ounces of nuggets located with metal detectors near the ground surface, some of which weighed more than 2 ounces. Thomssen repeats an estimate of gold production from nearby placers of 100,000 ounces. A 1915 Bureau of Mines report lists production from lode mines at over 2,000 ounces.

AMOCO drilled three holes near the west end of the Goodman shear zone in 1983 as well as completing surface and underground mapping and a geochemical survey. Two of the holes were drilled through the Goodman shear zone which dips variably to the northeast. Only one of the holes intercepted mineralization which consisted of 10 feet grading 0.126 ounces per ton Au. AMOCO also prospected a mineralized area just south of the Goodman mine called Jodi Hill. Narrow limonite veinlets [after pyrite] in granitic rocks contain visible gold. AMOCO drilled one hole on Jodi Hill which intersected only minor gold mineralization in granitic rocks. The drill hole may have been parallel to a zone of veinlets, but more work is necessary to determine if the veinlets occur in oriented zones are randomly scattered in a stockwork system. The mineralization at Jodi Hill could extend to the north to the main Goodman mine area where limonite veinlets have also been observed. Induced polarization surveys could be useful to locate concentrations of pyrite in the fractured intrusive.

Breakwater explored about 2.5 miles of the length of the Goodman shear zone in 1988, drilling over 3,000 feet of reverse circulation holes most of which intersected the entire width of the shear zone. No drill hole logs are available, only notes from the Breakwater geologist [Krishnan]. Krishnan estimated reserves along the Goodman zone as follows:

Goodman mine area	328,000 tons @ 0.075 ounces per ton Au
Quartz Valley area	1,300,000 tons @ 0.04 ounces per ton Au

Because gold occurs as free grains in quartz and limonite, heap leaching may not be feasible. Grades are quite low to consider CIP/CIL particularly if underground mining is required. The stripping ratio for open pit mining in the central and southeast end of the property [the area explored by Breakwater] would be high because the shear zone is situated in a valley. Open pit mining may be feasible to the northwest end of the property in the Jodi Hill and Goodman mine area if large mineralized stockwork zones are discovered.

3.0 HYDROLOGY

3.1 Copperstone

The water table is present at an average of 600 feet below surface based on the many drill holes penetrating to that depth. Most drill holes produced about 25 gallons per minute [gpm] when tested. One hole reportedly produced 400 gpm. There is no evidence of thermal water at the site.

Oxidation of sulfide minerals extends to 1000 feet depth. The water table has probably fluctuated in height during geologic history.

When developing the Copperstone operation in the late 1980's, there was considerable concern that sufficient ground water could be located to provide water to the leaching process. Water was successfully located in the deep alluvium to the east of the mine.

Pumping would be required in an underground mine which extends below 600 feet in depth; however the quantity of water should not be great, perhaps about 1,000 gpm as long as underground openings are not extended to intercept the deep alluvium.

3.2 Jackpot and Goodman Prospects

As mentioned, water is scarce at Jackpot even though the origin of the placer deposit is related to desert flooding processes. Patch's two wells are over 700 feet deep and yield on about 20-25 gallons per minute each.

There are 3 wells on the Goodman property. One well in the "Quartz Valley" area is 240 feet in depth and yields 80 gallons per minute. Two wells near the Goodman mine on the northeast end of the shear zone are 645 feet in depth and yield 15 and 9 gallons per minute.

4.0 ENVIRONMENTAL PERMITTING

4.1 Copperstone

All of the Cyprus permits will expire, and the new operator will need new permits. The area is entirely Federal land [Bureau of Land Management]. The BLM requires a detailed Plan of Operations [POO]. If the area of disturbance is more than 5 acres, and Environmental Assessment [EA] or Environmental Impact Statement [EIS] will be required. An EIS is the most difficult of the two possibilities. However, BLM permitting at Copperstone may not be very difficult, especially if no more land is disturbed. It seems likely that an underground operation could be entirely confined to the inside of the existing pit. A new tailings impoundment will be needed, but it can be located on top of the large area of open pit waste. The BLM office in Yuma confirmed that if no new area is disturbed, only an administrative decision may be necessary to approve the POO.

The State of Arizona requires an Aquifer Protection Permit which governs water quality and water discharges. Lined impoundments are required for tailings containing traces of cyanide. The disposal of mine water will need to be addressed. Cyprus did not have a permit to pump water from the pit and discharge it somewhere. Excess water probably will have to be disposed in evaporation ponds and not discharged.

Other minor permits will be needed such as for mine safety, planning and zoning, building permits etc.

The permitting process for a full scale operation could take as long as 2 years, however, underground development work can probably be started with only 2 months time allowance for permitting.

4.1 Jackpot and Goodman

The Bureau of Land Management was contacted about permitting a placer operation at

Jackpot. For a full scale operation, a "big EA" [Environmental Assessment] would be required. Existing disturbancefrom placer operations has to be reclaimed. This could be termed a medium difficulty permitting effort.

Permitting at the Jodi Hill area should not pose any unusual problems. As with Copperstone, major permits include the BLM Plan of Operations and the Arizona Department of Environmental Quality Aquifer Protection Permit.

5.0 MINING

5.1 Cyprus Open Pit Mining

Open pit mining was conducted using 10 ft benches in ore and waste was mined using 20 ft or greater benches. The average stripping ratio for the mine life was 10:1. Morrison Knudsen, a mining contractor, performed the mining, and Cyprus did the ore control and geology.

Originally, a shallower pit was planned, and underground mining was to be used to extract the deeper reserves. During the operational period of the mine a decision was made to abandon underground mining plans and deepen the pit the maximum with very steep slopes on the hangingwall side of the ore. In fact, underground development was commenced fairly early in the project. A decline ramp was driven in the footwall a distance of about 2,400 feet from the surface. The decline portal has subsequently been covered with a pile of open pit waste.

5.2 Proposed Underground Development

As a first phase, underground development should be concentrated on verifying and expanding the two probable ore blocks listed in section 2.11.

More detailed planning is required to locate the underground ramps and drifts, which is beyond the scope of this study. However, it seems logical that two separate underground headings could be commenced from inside the pit, one in the northwest wall and one in the existing ramp area. The existing ramp portal does not have to be uncovered [it was covered with a mine waste dump]. A ramp heading can be driven southerly from the main pit ramp and then spiraled under the pit to the northeast probable block. The one heading could be driven easterly and one westerly to provide access for detailed drilling. The westerly heading could be connected to a ramp driven into the northwest wall of the pit thus completing a ventilation circuit and secondary route of escape, required by mine safety regulations. The total length of ramps and drifts in this first phase is estimated to be 6,000 feet. Approximately 35,000 feet of diamond drilling would be completed from the underground workings.

Phase 1 drifts and ramps should be driven in the hanging wall to provide good access for detailed drilling. Crosscuts should be driven into the ore in several places, and drifts driven in ore to validate drilling results and to obtain bulk samples.

After completion of Phase 1 underground development, a feasibility study should be performed for further work at the property.

6.0 METALLURGY AND ASSAYING

6.1 Description of Cyprus Metallurgy

Most of the ore mined from Copperstone was processing using a conventional carbon-in-pulp cyanidation process [CIP]. Ore is crushed and then ground in ball mills to produce a fine slurry for cyanidation. Normally, the grind for CIP is 75% passing 200 mesh. Lime and cyanide are added, and the slurry, normally at 45% solids, is leached in agitated tanks. Air or oxygen is injected because oxygen is needed for the dissolution of gold. The ore slurry is routed through 5 or 6 tanks in series, all of which are agitated. Activated carbon granules are present in the tanks to absorb gold which is dissolved by cyanide. Loaded carbon is screened from the slurry for gold recovery.

Some of the lower grade ore at Copperstone was heap leached. Ore is crushed, agglomerated with lime or cement and placed on impermeable pads. Cyanide solution is sprinkled on the surface or distributed using drip irrigation technology. Pregnant solution is collected from the pad runoff and processed in carbon columns for gold absorption.

No attempt was made by Cyprus to recover copper. Metallurgical testwork may have been done on copper recovery methods, but no information was available.

Unfortunately, no metallurgical data is present in the Patch data room at Copperstone. According to Gary Eastham, all of the metallurgical records were collected and sent to the Cyprus offices in Colorado. Overall recovery of gold is shown to be about 89% in the royalty reports submitted to the Patches. This is rather poor recovery for CIP processes, but heap leach recovery in included in the figures. Normally, heap leach recovery is 60-70%. These metallurgical records should be examined before acquisition of the property. Daily metallurgical balances, testwork reports and any special study reports should be examined.

Visible gold is generally difficult to recover with a CIP process because there is not sufficient time to dissolve the gold as the slurry flows through the process tanks. Gary Eastham said that the retention time for the leaching tanks was 16 hours. By comparison, the David Bell mill at Hemlo has 36 hours retention time in the leaching tanks plus the additional time in the absorption tanks [there is no visible gold at David Bell]. Eastham reported also that the milling rate was reduced from 150 tons/hr to 100 tons/hr if high grade ore was being processed thus increasing the retention time to 24 hours. If the visible gold is primarily in the form of thin flakes, recovery would be greater than if the gold is in equi-dimensional grains because of higher surface area. There is a remaining question about gold recovery at Copperstone.

6.2 Assaying at Copperstone

Most of the assaying done for ore control at Copperstone was by atomic absorption. Some check assaying was done using the traditional fire assay method. A quick comparison of the check assays shows that the fire assays were more than 10% higher than the atomic absorption assays. This should be kept in mind when examining blasthole assay results. It appears that check assays were only done if the atomic absorption grade was above a certain point, say 0.25 ounces per ton.

Assaying for exploration drillholes was done at other Cyprus labs or outside labs using fire assaying for ore zones. Many geochemical assays [normally atomic absorption] for gold are shown in the drillhole logs.

6.3 Recommendations for Process Design at Copperstone

If seems clear that visible gold is quite common in the Copperstone deposit. Future milling should include gravity concentration in the grinding circuit for quicker recovery of gold grains. CIP/CIL is the appropriate process for recovery of the finely-dispersed gold in the ore. However, increased retention time from the 16 hours used by Cyprus is recommended. Ore grades will be higher from underground mining, thus even more retention time will be required. Probably, 36 hours retention time is a good estimate pending metallurgical tests with underground ore.

Flotation would only be considered if permitting of a cyanidation process becomes impossible, which is unlikely. Flotation would result in lower recoveries than cyanidation.

Copper recovery could add significantly to the economics of the project. Copper grades are not known at this time but could be about 1% Cu. According to Kelsey, oxidation extends to 1,000 feet depth. Thus copper minerals should be acid soluble including chrysocolla, malachite, cuprite, and chalcocite. Chalcopyrite is not acid soluble. The slurry could be acidified as it leaves the CIP process. Cyprus developed a process for cyanide recovery called Cyanosorb. Coeur d'Alene Mines purchased the process with the Golden Cross mine in New Zealand. The Cyanosorb process could be used to recover and recycle cyanide to the CIP process. Copper would be dissolved with sulfuric acid and recovered with solvent extraction. Electrowinning would be used to produce pure copper for sale. Interestingly, if this process is feasible, there would be no cyanide in the tailings which could be favorable to quick permitting of the milling process.

7.0 ECONOMICS

No economic data for the Cyprus Copperstone operation was made available for this study. The data is probably confidential to Cyprus.

Assuming a reserve of 500,000 ounces of gold can be developed by the underground program, can gold be produced at a low enough cost in order to justify capital costs for process development, permitting, and mine development? No certain answer is available to this question at this time because detailed engineering work would be required to make accurate estimates of capital and operating costs. However, to get an idea if such an underground operation [600 tons per day] is feasible to produce about 50,000 ounces of gold per year, plus by-product copper, it is useful to list existing mines which approximate the assumptions for Copperstone. It is assumed that the grade of the ore will be in the range from 0.20 to 0.30 ounces per ton Au including by-product copper credits.

Successful operating mines in this grade range in North America include Lupin [Echo Bay, Northwest Territories], Kettle River [Echo Bay, Washington], Mineral Hill [TVX Gold, Montana], Casa Berardi [TVX Gold, Quebec], Williams [Teck, Hemlo]. Most of the deep South African mines are in this grade range. Most of these mines produce more than 50,000 ounces of gold per year because the milling rate is higher than 600 tons per day. The one exception in the list is the Mineral Hill mine which produces about 500 tons per day.

Copperstone has many advantages over new mines including a reasonable permitting environment, existing roads and infrastructure, and proven metallurgy.

As a general statement regarding the economics of mining underground at Copperstone, the operation should be a medium cost producer, under existing assumptions listed above. Of course, successful underground development could improve the economics substantially.

A estimation of the cost of the underground development in Phase 1 including 6,000 feet

of ramps and drifts and 35,000 feet of short diamond drillholes is \$3.5 to \$4.0 million USD. The work could be completed in about 1 year. It may be feasible to build a pilot mill in conjunction with the underground development program, say 100 tons per day. Such a mill could help defray development costs and verify underground reserve grade.

APPENDIX

Graham Kelsey Geological Report

Cyprus Pre-production Feasibility Studies

Arizona Gold Mines Package

List of Copperstone Drillhole Intercepts Outside of Open Pit

3.1 Geology

3.1.1 Regional Geology

The oldest rocks in west-central Arizona are Precambrian metamorphics, approximately 1.7 billion years before present, which have been deformed and intruded by several generations of plutons. These rocks are unconformably overlain by a sequence of Paleozoic carbonate and clastic strata. Mesozoic rocks include volcanic and plutonic rocks of Jurassic age and thick sections of clastic rocks which are intruded by late Cretaceous plutons. Metamorphism affected the region after deposition of the Mesozoic volcanics and sediments. Precious metal mineralization occurred before and after mid-Tertiary structural dislocation by low angle detachment faults of upper plate rocks from metamorphic core complexes. Basin and range faulting occurred in late Tertiary time.

3.1.2 Local Geology

At the southern end of the Copperstone claim block and beyond is exposed an igneous and metamorphic outlier of the Dome Rock Mountains. These rocks include Precambrian through Mesozoic age granite gneiss, schist, quartzite and amphibolite. A low angle detachment fault separates these core complex rocks from an upper plate consisting of minor limestone and quartzite overlain by a thick sequence of Jurassic age quartz latite welded tuffs and breccias. The upper plate sequence has been affected by weak greenschist facies metamorphism in Mesozoic time. The major low angle fault probably lies beneath the Copperstone gold deposit, but drilling failed to confirm its presence.

The Copperstone gold deposit is located on flat, dry, sandy terrain with several small knolls about 40 feet high and prominent longitudinal sand dunes. Only 17 outcrops with a total area of about one acre are exposed on the knolls. Broader areas of caliche cemented rubble occur around the outcrops. Unconsolidated sands and some gravels thicken to several hundred feet in all directions away from outcrop areas. The alluvium is old river channel sediment displaying cut-and-fill channel structures where exposed in bulldozer cuts. Trenches up to 20 feet deep have maintained vertical side walls over several years of exposure.

Three small outcrops of mineralized breccia are exposed at the deposit. The leading edge of the ore zone within the mineralized breccia subcrops beneath shallow alluvium. The ore horizon and breccia strike northwest-southeast and dips about 30 degrees northeast beneath thickening alluvial cover and hanging wall volcanic rocks. The mineralized breccia extends 3,000 feet in strike length, at least 1,000 feet down dip, and is generally about 50 feet thick. Overburden alluvium accounts for about 30 percent of the waste in a 300-foot deep open pit. Subcrop ore zones, hanging wall volcanics and some alluvium are cemented by caliche generally less than 5 feet thick.

The Copperstone gold deposit occurs in quartz latite welded tuff breccias and laminated welded tuff. Primary lamination features within the quartz latite welded tuff were created soon after deposition of the unit and are still evident. Within some parts of the welded tuff units welding compaction has resulted in a homogeneous, densely welded ash flow tuff. Local zones of strong sericite developed during metamorphism show schistosity parallel to the original laminations. Formational breccias within the welded tuffs appear to be formed as surface flow agglomerates. Other breccia textures are attributed to later hydrothermal mineralization.

Cross-sectional geologic compilation from surface outcrop, diamond core holes and rotary percussion holes show laminated and massive welded tuff units folded into an anticline along a north-south fold axis. Although formational breccias are common within the laminated welded tuff, the thickest, most extensive breccia zone has been mineralized to form the bulk of the Copperstone gold deposit. This main breccia zone was developed during deposition of a basal tuff unit. Later ash flow tuffs of identical composition covered these rock units. Time of the folding is uncertain. The entire pile of ash flow tuffs was weakly metamorphosed prior to mineralization. Metamorphism and hydrothermal overprinting at the time of mineralization obscure original formational breccia textures.

After metamorphism and prior to mineralization a vesicular basalt flow covered at least part of the Copperstone deposit area. Only a small subcrop remains. It is severly altered and cut by quartz veining. Tilted basalt flow units, outcropping south of the gold deposit, are unaltered and may or may not be related to the mineralized basalt subcrop. A large unaltered basalt mass subcrops beneath thick alluvium at the southeastern end of the Copperstone deposit and cuts off subcore grade gold mineralization at depth. Pyritized dikes of quartz latite to rhyodacitic composition were found in three drill holes within the deposit.

Severe faulting affects the Copperstone deposit area. Over 60 diamond core holes all show fault zones ranging from a few inches up to 50 feet thick. Much of the faulting is probably low angle listric faulting formed during flexing of the upper plate volcanics as movement occurred on the detachment fault. Later high angle faulting is Basin and Range type. A major north-south high angle fault cuts the gold horizon, uplifting a down-dip portion of the deposit to within open pit depth. Buried beneath alluvium east of the deposit is a major high angle range front fault which separates subcrop rocks covered by up to a few hundred feet of alluvium from a deep basin filled with over 2,000 feet of alluvium.

3.1.3 Mineralization

Gold mineralization mostly is contained within formational breccias and to a lesser extent within adjacent quartz latite welded tuff. Core drilling and bulldozer trenching intersected and exposed numerous tabular mineralized breccia zones ranging from 5 to 20 feet thick and a main breccia zone averaging about 50 feet in thickness. The main breccia extends over 2,800 feet in a northwest-southeast direction and dips about 30 degrees northeast. Drill holes have encountered down-dip mineralized breccia to a depth of 780 feet. Thin parallel breccias occur both in the footwall and hanging wall of the main breccia zone.

Gold mineralization occurs mostly within the main mineralized breccia zone and averages about 38 feet thick. Gold grades range between 0.01 and 0.28 ounce per ton, and average about 0.086 ounce per ton.

Gold bearing hydrothermal solutions in-filled volcanic breccia depositing principally quartz and specular hematite. Some ore grade mineralization occurs as veining in the footwall and hanging wall of the main breccia zone . Veins cross-cut welded tuff laminations and in-fill parting planes in the laminations. Chrysocolla, barite and minor malachite are the most obvious accessory minerals. Other minerals observed within the ore zones are amethyst, sidero-calcite, magano-geothite, light green fluorite, wad, adularia, magnetite, chalcopyrite, pyrite and very rarely visible gold.

Multiple episodes of mineralizing hydrothermal events and brecciation occurred at Copperstone. Earliest quartz - specular hematite veining and latest quartz mineralization in the form of amethyst is barren of gold. Most of the gold is associated with an intermediate stage of quartz-chalcopyrite-gold mineralization and brecciation. The amethyst veining is prominent in the southern part of the deposit and is responsible for creating low relief erosionally resistant hills that are the discovery outcrops. High angle fractures in the hanging wall host several prominent amethystine quartz veins. The largest of these is also contained within the gold zone. This veining is responsible for some gold encapsulation.

Mineralizing solutions also formed local zones of alteration in and near the ore zones. Bleaching effects are caused by argillization and sericitization. Local secondary gray-green chlorite as wispy veining and minor chalcedonic silicification with small patches of chalcopyrite, pyrite and native gold have been seen.

Late stage hydrothermal activity and supergene processes oxidized the Copperstone deposit to depths below current drilling - about 1,000 feet. Earthy red hematite is characteristic of Copperstone ore. The association of quartz-specularite-hematite and chrysocolla is a good predictor of gold mineralization.

Microscopic examination of the gravity concentrate was made from a floatation concentrate of the ore. About 80 percent of the gold occurs in small flakes ranging between 4 and 40 microns. Coarse gold plates range from 50 to 150 microns. Most gold is free, but a small amount is locked with quartz and iron hydroxides.

Gold mineralization is of very latest Laramide age. Potassium-argon age dates give 55 million years from adularia and 48 million years from sericite. Copperstone is therefore twice the age of detachment fault hosted gold deposits in western Arizona and California.

3.1.4 Ore Controls

Principal ore control at Copperstone is the main formational breccia zone. It forms a generally tabular ore horizon striking northwest-southeast and dipping about 30 degrees northeast. Gold bearing quartz-specular hematite occurs as veins and in-fillings within the breccia and also to a lesser extent within adjacent laminated welded tuff. A secondary ore control may be the fold axis within the welded tuff units which lies coincident with the deposit. Fracturing along the fold axis superimposed on the breccia zone would provide increased porosity for mineral deposition. Regional tilting may have occurred before or after mineralization, but hydrothermal activity utilized the fractured main breccia zone as a favorable locus for mineralization and brecciation.

The distribution of gold grades from drill holes throughout the deposit indicates somewhat higher than average values in the northwestern and southeastern parts of the deposit. No explanation for this distribution has been identified.

3.2 Exploration

3.2.1 Exploration History

No early prospect pits, shafts or adits were found at Copperstone. Prospecting began in 1968 with bulldozer trenching by a prospector to better expose weak copper mineralization. Newmont Mining company leased the property in 1975 and drilled a single 765-foot hole after running induced polarization, gravity and ground magnetics surveys. The unsuccessful hole, located at the southern end of the current Copperstone claim group, was designed to test a porphyry copper target.

The property was submitted to Cyprus in 1980, and a lease was signed after initial field evaluation and sampling indicated up to several hundredths ounce gold per ton in a few small outcrops. Additional claims were staked. During 1981 and 1982 conventional rotary percussion drilling on a 140-foot grid by Cyprus (Amoco

Minerals Company) tested for limits of the Copperstone mineralization. The down dip limit was quickly established and considerable drilling effort was concentrated along strike to the northwest where narrow high grade gold-magnetite mineralization was found at depth in limestones beneath the welded tuff units. To the southeast, exploration drilling found spotty mineralization extending to a large basalt subcrop. Extensive induced polarization and ground magnetic surveys were run. Anomalous frequency effects outlined the gold deposit with considerable accuracy.

The Spring of 1983 involved exploration of the entire claim block for additional Copperstone type mineralization following a detachment-hosted gold deposit model. Outcropping shallow detachment plate areas were drill tested without success. Additional geochemical gas anomaly targets were also drilled without success.

In the Fall of 1984 a core drilling program obtained assay data on a closer drill hole spacing within the proposed open pit area and provided engineering and geological information that could not be obtained from rotary drilling percussion chips. Early 1986 in-fill grid drilling under the new Cyprus Gold Division was performed with reverse circulation rotary percussion. This work combined with all earlier drilling provided a 100-foot drilling grid over the entire proposed open pit area and is considered adequate for this feasibility study.

3.2.2 Drilling

With only about an acre of outcrop exposed at Copperstone, most of the knowledge about the deposit has been developed by vertical drilling. About 250 holes totalling approximately 75,000 feet were required to provide sufficient assay data for confident ore-grade-tonnage calculations and to define the economic limits of the proposed open pit. The following table lists the drilling activity and type chronologically:

TABLE 1.

Drilling Method	Period	No. Holes	Footage
Rotary percussion, 5 1/4-inch	1981-1984	119	54,591
Diamond Core 1.875, 2.40, 3.345-inch	1984	15	6,740
Diamond Core 2.40-inch	1985	53	14,419
Rotary percussion 5 1/4-inch	1985	7	2,815
Rotary percussion Reverse Circ. 5 1/4-inch	1986	105	29,325
Diamond core 2.40-inch	1986	2	600
Rotary 6-inch core	1986	10	540
		311	108,930

1981-1984 drilling was done by Stevens and Harris Drilling Company with Midway 1500 drills using a conventional rotary percussion hammer. Some work was also done by Airo Drilling (Tonto Drilling Company) using the same system and a TH-60 Ingersol drill. Twelve widely-spaced vertical and angle NX, NC and PQ wireline core holes were drilled by several companies including Longyear, Boyles Bros., Joy Manufacturing and Tonto. Three of these provided bulk samples for initial metallurgical testing at the Cyprus CYMET Laboratory in Tucson.

In the Fall of 1984 a vertical core drilling program was begun in the main deposit area after analysis of early core and rotary hole assay data from twinned holes suggested the early conventional rotary drilling may have not properly tested the gold zone. Later statistical studies showed no bias between drilling companies. Detailed core logging and assaying provided necessary information to establish current knowledge of the deposit genesis and defined some engineering parameters including ore controls, rock density, rock competency, faulting, brecciation and veining.

Core recovery was generally over 90 percent with occasional poor recovery from severely faulted rock intercepts. Four core holes were drilled at a -45 degree angle to test high-angle fault zones that might carry gold mineralization. These holes showed no gold in the high angle fault, but do verify the presence of a 30-degree dipping gold zone that is defined by mostly vertical drilling.

The final drilling effort, designed to completely drill out the area of a potential Copperstone open pit was begun in early January of 1986. Tonto Drilling Company (formerly Airo) was contracted to provide rotary percussion-reverse circulation services to drill in-fill positions resulting in a 100-foot drill hole spacing grid. Using the T-60 Ingersol drill, Tonto also drilled 6-inch diameter core for metallurgical testing purposes.

Nearly all Copperstone drilling required casing of unconsolidated overburden. Rotary and core holes utilized mostly 1/4 by 6-inch and some 1/8 by 8-inch welded-joint steel casing for overburden penetration. Even the core drilling sites were drill-cased by a rotary machine just short of a projected mineralized zone. The coring penetrated the potential ore horizon and bottomed in the footwall rock.

Drilling costs at Copperstone were generally higher than average because of casing installation and retrieval costs. Total reverse circulation and rotary percussion drilling costs were about $12.00 per foot. The Tonto 1985 core drilling was over $40.00 per foot and the recent rotary 6-inch core drilling was $167.00 per foot. Casing cost was about $5.50 per foot. Casing was re-used until ultimately lost in a drill hole. Overburden stripping of the unconsolidated sediments at Copperstone will involve encountering some steel casing lost in drill holes.

3.2.2.1 Sample Preparation

Conventional rotary drilling sample collection used a typical open top cyclone system that generated an obvious red dust plume. Questions of possible gold fines being lost were raised and resulted in the final rotary drilling effort being done by the reverse circulation method. With rotary drilling both 5-foot and 10-foot intervals were sampled using 1/8 and 1/16 splits respectively. The resulting 10- to 15-pound samples were shipped to the assay laboratory. A second identical split was retained at the property. Also, a small plastic vial of washed chips was saved for a rock character log.

Drill core was also sampled on 5-foot and 10-foot intervals. Whole core was shipped for assay after logging, weighing and caliper measurement of core diameter for density calculations. Only a small, 2-inch piece was kept from each 20 feet of drilling for a rock character log.

Preparation of samples for assay was done initially at the Cyprus facility in Phillipsburg, Montana. Pulps were then shipped to various laboratories for analysis. In 1984 sample preparation and initial atomic absorption analysis were done at the Cyprus CYMET Laboratory in Tucson, Arizona. A flow chart for preparation of samples for assay is shown on Table 2.

3.2.3 Assaying

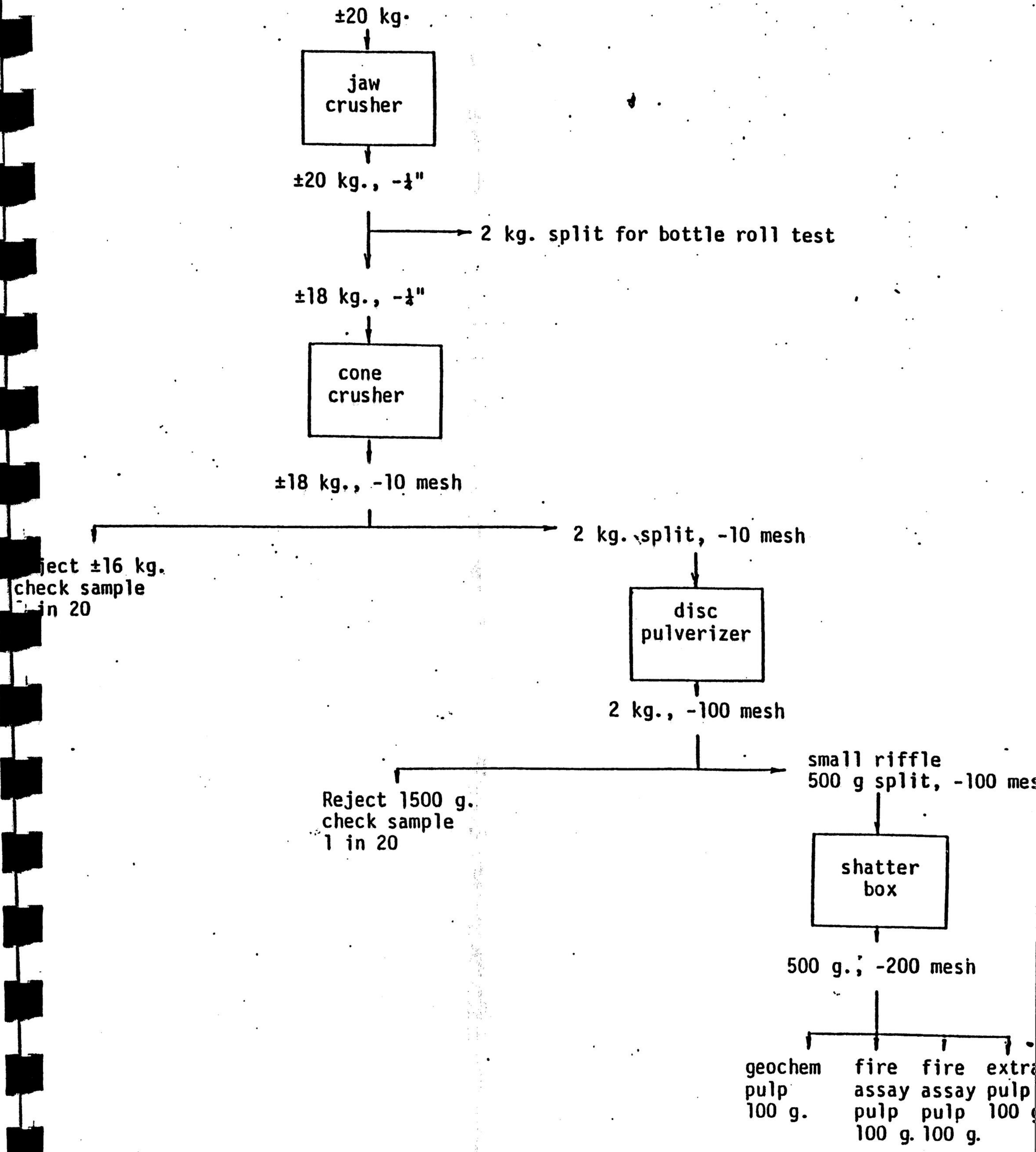
Only fire assay data was used for ore reserve calculations at the Coperstone gold deposit. Two laboratories provided the largest proportion of the fire assay data: CONE Geochemical, Inc. of Lakewood, Colorado and Chemex Labs Inc., Vancouver, B.C. Two smaller Nevada laboratories also were used in the first 2 years of Copperstone work.

All prepared assay pulps were first run by atomic absorption. Any value equal to or greater than 0.30 parts per million gold required fire assay of the pulp using a one-assay-ton subsample. The sample pulp was then sent to another laboratory for a second fire assay. If comparison of the two fire assay values showed a difference greater than 20 percent, particularly with values ranging between 0.015 and 0.080 ounce gold per ton, then a third fire assay was run, and occasionally a fourth until a pair agreed within the 20-percent limit. This was done because in the lower-to-average grade, a 20-percent variation has dramatic impact on cut-off grade in ore zoning.

Some geochemical assay work was done for other metals. In general silver values were found to be very low. Copper was analyzed in some drill holes as a measure for cyanide consumption during gold extraction. Other elements were also analzyed for geologic purposes.

TABLE 2.

COPPERSTONE SAMPLE PREP FLOW CHART



3.2.4 Geophysics

Five geophysical methods were tried at Copperstone. Ground magnetics and Induced Polarization proved most useful. Ground magnetics were run over a large area with lines 300 feet apart oriented generally parallel to the down-dip direction of the mineralized horizon. Station spacings were 100 feet, but were shortened where anomalous readings were seen.' A follow-up re-reading of the entire grid was done with 100-foot in-fill lines and 10-foot station spacings in area of positive response. Using 5-gamma intervals, a computer generated contour map of magnetic data was made. The known breccia zone shows a broad magnetic low with a 20-gamma amplitude in areas of shallow cover of less than 50 feet. Spikey highs within the broad low are probably due to magnetite associated with the specular hematite mineralization.

Resistivity coupled with induced polarization tested directly for mineralized subcrops. The IP response over the deposit was anomalously high with readings ranging 18 to 25 milliseconds outlining the proposed pit. Gold areas responded as a resistivity high. Presumably IP responded to specular hematite and resistivity to quartz veining. These IP and magnetic data were used to position several geophysical drill holes. Targets were identified which had low magnetics, high resistivity and high IP associated with them. However results of the drilling were not favorable, and no significant new gold intercepts were discovered.

MAXMIN electro magnetics tested for electrical conductivity contact between the mineralized breccia zone and surrounding volcanic rocks. Responses observed appeared to have no relation to known geology or gold mineralization, and the method was discarded. VLF electromagnetics was tried and it too provided indefinite results.

Gravity was employed to determine the thickness of overburden in the project area. The survey had two objectives: (1.) determine depth-to-bedrock in the main drilling area in order to exclude regions which were too deep for open pit mining, and (2.) locate range front faults and shallow pediment areas for further gold exploration. Four east-west traverses were made from the CRIT Indian reservation fence on the west to the mountain range about 10 miles to the east. North-south traverses consisted of lines along the reservation fence and near the deposit. Some data was acquired from an old Newmont survey. Interpretation of the data indicates two deep basins in the area - one east and one south of the deposit. A large range front fault lies just east of the gold zone. Overburden depths increase to more than 400 feet north of the main zone and to the south. A thin cover exists between the deposit area and the Dome Rock Mountains to the southwest.

3.2.5 Geochemistry

The few mineralized outcrops at Copperstone contain highly anomalous gold, silver and copper. Initial sampling found subore and ore grade gold values that led directly to drilling. Several early core holes and a large suite of surface samples were analyzed for a broad spectrum of trace elements in an effort to characterize the deposit.

Generally gold mineralization is sharply defined within the mineralized breccia zone. It markedly decreases over a few tens of feet into hanging wall and footwall rocks where often no gold is detected by atomic absorption analysis. In higher gold grade zones within the deposit, silver values are higher and may provide some recoverable value. Copper ranges up to several percent within the gold zone, mostly as chrysocolla. Copper will not provide economic benefit nor will it greatly consume cyanide.

Copperstone is a classic quartz alkaline gold deposit with associated base metals. Low arsenic, antimony, thallium and mercury distinguish it from the Nevada calc-alkalic deposits. High barium, manganese and uranium at Copperstone distinguish it from calcic gold deposits that have low antimony, uranium, barium and mercury contents, but locally high arsenic. Several elements vary systematically as a function of gold-silver ratios and fall into two main groups. The more gold rich parts of the deposit contain anomalously high levels of copper, lead, zinc, cadmium, antimony and, at very low levels, chromium and uranium. The second group of elements also systematically increase with the gold-silver ratio, but dramatically decrease in the most gold-rich part of the deposit. These are tellurium, barium, manganese, bismuth and iron. Arsenic, mercury, tin, tungsten, selenium, molybdenum, nickel and cobalt were not anomalous and show no variation as a function of gold-silver ratio within the deposit. Flourine occurring in the flourite, occurs within the deposit and may occur within the more silver-rich parts of the system.

Because of extensive alluvial cover at Copperstone, two other remote sensing techniques were tried to assist in target identification. Geophysics and carbon dioxide gas sampling were used. Large quantities of volatile compounds are present in rocks and minerals associated with hydrothermal ore deposits and in most cases the gases are hypogene in origin. In an initial test, significantly anomalous CO-2 values were found over Copperstone gold mineralization. A larger gas survey was run over 2 square miles within the claim block, and several targets were identified. Drill testing of these targets failed to find mineralization and the technique was abandoned.

Plant geochemistry also was tried at Copperstone. Desert plants are known to absorb gold when their deep tap roots reach mineralized rock. Three test lines were run over known gold zones using greasewood brush and very weakly anomalous gold was found in plant ash residue. However, the plant sampling was done after all of the drilling was completed. Though plant clippings were thoroughly washed, the anomalies observed could have been generated from air borne drill dust. Therefore, the test was inconclusive.

3.2.6 Additional Exploration Potential

Immediately west of the leading edge of gold mineralization at Copperstone is a possible large fault zone that may have down dropped and preserved a portion of the ore horizon. Previous drilling in this area is very wide-spaced and a large area adjacent to subcropping gold-bearing breccia remains untested. Additionally, a broad induced polarization chargeability response associated with the known deposit, extends to this untested area.

Further south on a broad knoll lying west of the central part of the deposit, several drill holes encountered scattered gold intervals. One 30-foot intercept assaying about 0.3 ounces gold per ton was found in a deep core hole. The gold is contained in a high angle vein that may represent an undiscovered feeder vent for Copperstone mineralization. Little is known about this area and additional drilling is needed.

Obvious potential for discovery of additional ore grade mineralization occurs down dip within the mineralized breccia horizon. Several holes penetrating to over 800 feet have encountered gold grades of greater than 0.15 ounce per ton over 100 feet. Scattered 10-foot assay intervals in several holes intersected gold grades of about 0.25 and 0.35 ounce per ton. Detailed drilling to follow up these high grade intercepts has not been done. Potential exists to find economic underground tonnage that could be mined by ramping from the bottom of a 300-foot deep Copperstone open pit.

Along strike northwest of the Copperstone deposit, a few deep drill holes intersected meta-limestone beneath quartz latite welded tuffs. One core hole encountered 18 feet of 0.26 ounce gold per ton, and a twin rotary hole cut 60 feet of 0.182 ounce gold per ton. Additional drilling is needed around these holes to further define this gold occurrance.

Just beyond the eastern edge of the Copperstone claim block, Goldfields Mining Company completed two rotary holes that encoutered bedrock between 300 and 400 feet. One hole intersected a 5-foot thick interval assaying 0.05 ounce gold per ton. Several exploration holes are needed to follow up this easternmost gold show.

Cyprus Pre-production Feasibility Studies

Copperstone Project Review
September 7, 1984

A. Summary and Recommendations

Limited exploration to date indicates that Copperstone is a medium-size, surface-mineable gold deposit having good potential. Compared to other gold deposits developed in the U.S. in the past decade, Copperstone is of average tonnage and grade and has a number of favorable operational features which should permit low operating costs.

Three development scenarios (agitation leach, 3-stage crush-heap leach, ROM-heap leach) were scoped with the resulting PI's ranging from 13 to 15. These calculations are based on tonnage and grade estimates which still are fairly uncertain due to the limited sample data available for the deposit. If these data prove to be accurate, Copperstone is judged to have a marginal but relatively low-risk rate of return under currently depressed market conditions, but could produce a very attractive PI with a modest recovery in gold prices.

However, even with no price recovery, Copperstone has good upside potential because of two factors. First, a statistical study comparing rotary hole assays with core hole assays indicates that the grade of the deposit may have been underestimated; and, second, by using Northumberland equipment and facilities, it appears that capital costs at Northumberland might be reduced by as much as 25%. If these preliminary conclusions are confirmed, the base case PI could rise to the 20 to 25 range.

Based upon the good potential of Copperstone, the next stage of exploration, costing $500,000, is recommended. This program is designed to test the hypothesis of grade bias from rotary drill samples and to reduce drill hole spacing to 140' which, when combined with a revised geologic block model, will produce a more reliable reserve estimate. This work is part of a coordinated exploration - development plan which, if favorable results persist, would require a total of roughly $4.8MM to reach a final development decision.

B. Description and General History

Copperstone, a wholly-owned Amoco gold project in western Arizona, currently comprises 290 claims totaling roughly 5800 acres. The project is located in a comparatively flat desert environment at the northern edge of the Dome Rock Mountains, 20 miles south of Parker, Arizona. The facing page shows the location of the project at an elevation of about 900 feet along the eastern boundary of the Colorado River Indian Reservation. Negotiations with the tribe are continuing in regard to leasing adjacent favorable Reservation lands.

Amoco acquired a 100% working interest in the 65 original Copperstone claims from a local prospector in 1980. Acquisition terms included a modest annual advance royalty and a 5% net smelter return production royalty. Earlier exploration by Newmont Mining Company and others focused on the site as a porphyry copper target. Amoco was the first to recognize the gold potential of the area.

Amoco has spent roughly $2MM in exploration on the Copperstone project, drilling 156 holes totaling more than 71,000'. Exploration drilling efforts to date in 1984 focused on the southern part of the project area where highly anomalous gold values had been found on surface. This drilling was unsuccessful, but additional favorable geology exists on adjacent Indian lands.

C. Geology and Geography

The project area covers the northeastern part of the Dome Rock Mountains which consist of Precambrian (?) schist and gneiss intruded by several generations of plutonic rocks. Unconformably overlying these rocks are a pile of Paleozoic carbonate and clastic strata. Deposits of quartz latite welded tuff were extruded onto the Precambrian (?) and Paleozoic units during the Mesozoic era. By the late Cretaceous more plutonic rocks were intruded into the region.

The Dome Rock Mountains are part of a group of north-south linear mountain ranges which are separated one from another by Basin and Range-type normal faults and broad alluvial-filled valleys. Low angle detachment faults predate the Basin and Range faulting and have placed Mesozoic quartz latite welded tuff into contact with Paleozoic strate by gravity sliding. Quaternary-Tertiary basalt flows and cinder cones occur in scattered outcrops flanking the main part of the range, and presumably covered the area prior to uplift.

In the central discovery area of the claim group a section of Mesozoic quartz latite welded tuff is exposed on several low relief knolls. The gold mineralization at Copperstone is contained within moderately-dipping fault breccias and high angle quartz-amethyst-specularite veins exposed in these knolls. The fault breccias were probably generated at the base of rotating slump blocks associated with low angle detachment faults. These moderately dipping fault breccias cross-cutting the quartz latite welded tuff have been described and named in the literature as listric faults. The high angle quartz-amethyst-specularite veins are thought to be feeder channels for ascending mineralizing solutions. Observations of diamond drill core suggest multiple phases of fluid introduction and fracturing formed the complex gold-bearing vein system that transects and parallels the fault breccias.

Copperstone derives its name from its earlier classification as a copper prospect due to the existence of copper oxide staining in outcrops. The oxidation appears to extend to a considerable depth, certainly below the bottom of proposed 400'-deep open pit. Very few sulfides or carbonaceous materials which would adversely impact metallurgical recovery have been identified in the ore horizon. Values occur as micron-sized free gold.

D. Exploration

Intense gold exploration interest has developed along the lower Colorado River basin in Arizona and California, due to several recent discoveries based upon the recently-developed detachment listric fault depositional model. Amoco was one of the first companies to use this model in its exploration program which has led to a major land position and an important discovery in a new gold district.

The detachment fault model is illustrated on the facing page. Large displacement, low angle detachment faults resulted from uplift and warping of the crust during mid-Tertiary crustal extension. This isostatic uplift of metamorphic and crystalline core complexes generated the migration of brittle upper plate rocks away from the ductile basement rocks causing extensive brecciation at the contact. As the upper plate moved away from the uplift a series of downward curving shears and resultant breccias known as listric faults formed during the sliding event. At the Copperstone deposit these listric fault breccias have been overprinted by multistage gold-bearing hydrothermal fluids which permeate the tectonically prepared rock.

Amoco's land position as a result of this early knowledge of detachment fault structures adequately covers potential gold occurrences and has directed current exploration efforts toward the Colorado River Indian Reservation. All non-Indian lands surrounding the project have been staked, principally by Gold Fields, and are being explored. There is also the potential for higher grade and repetitive gold occurrences below and/or adjacent to the currently outlined Copperstone deposit. Such repetitive gold occurrences might occur at the intersection of the gold-bearing listric fault breccia and the extensively brecciated detachment fault. Some of the exploration drill holes have penetrated the underlying detachment fault and have intersected gold mineralization exceeding 0.20 ounce per ton.

The total exploration expenditure to date is approximately $2.16 million for the discovery of 12.7MM tons of known ore grading 0.068 ounces gold per ton. This yields a low exploration cost of 0.17 dollars per ton of ore.

E. Reserves

Exploration drill hole spacing at Copperstone presently ranges from 140 ft. to 400 ft. in the area of the prospective open pit mine. This drilling intensity is insufficient to produce a reliable ore reserve estimate from a gold deposit where continuity of mineralization commonly changes abruptly over short distances. Nonetheless, rough estimates of mineable ore reserves have been prepared by two groups as follows:

1. Amoco Metals Exploration. This is a manually calculated reserve using the method of transverse cross sections on 140' centers. The resulting estimate was 7.3mmt at an average grade of 0.078 oz/ton Au. This assumed a cutoff grade of 0.025 oz/ton Au and produced a stripping ratio of 8.90. Geologic reserves at the same cutoff were estimated at 16.8MM tons @ 0.076 oz/ton Au.

2. Steffen, Robertson, and Kirsten (SRK) Consulting Engineers. SRK produced a computerized block model and mineable reserve

for Copperstone as a brief case study as part of SRK's attempt to sell its computer mine planning package to Amoco. The SRK reserve at a 0.025 oz/ton Au cutoff was 12.6mmt at an average grade of 0.068 oz/ton Au. The overall stripping ratio was 4.5. Using the same cutoff, in situ geologic reserves were estimated at 13.6MM tons grading 0.070 oz/t Au.

Both reserve estimates contain bold assumptions regarding ore continuity due to the sparse sample data that were available from many parts of the deposit. Furthermore, assays derived from the few core drilling samples at Copperstone have been considerably higher than average assays from rotary drilling samples which formed the basis of the preceding reserve estimates. A rigorous analysis of variance statistical evaluation has suggested that rotary drilling may have introduced a significant negative bias into the ore reserve grade.

Until more assays from fill-in drilling are available and the possible bias of samples from rotary drilling is examined further, the independent SRK reserve has been retained for economic scoping.

A recent study of 19 gold deposits developed in the U.S. in the past eight years determined the average published reserves to be 12.7mmt at a grade of 0.076 oz/ton Au. Thus, Copperstone is a medium-size deposit relative to other domestic gold producers.

F. Mining and Processing Alternatives

Due to the fact that the Copperstone deposit requires substantial additional exploration, no detailed plans have yet been developed for mining or processing. As a consequence, the following comments are very general.

The relatively shallow depth and the attitude of the tabular ore horizon suggest conventional open pit mining at Copperstone.

Because the orebody outcrops, preproduction stripping would be modest (roughly 5MM tons), and one pit slope would be the footwall of the 20-25° dipping deposit. In transverse cross section the mine would resemble a coal strip mine, and mining would continue downdip until the economic stripping ratio is reached. It appears that some ore grade material (+0.1 oz/ton Au) would then be exposed in the bottom of the pit, suggesting that additional ore could be economically mined by underground methods. However, more drilling is needed to confirm these deeper reserves.

An estimated 25% of the deposit overburden is in the form of unconsolidated, or loosely consolidated, sand and gravel. This material could be removed directly by scrapers, as it would not require drilling or blasting. Mining economics would also be enhanced by the use of large mining equipment on the barren overburden. This is in contrast to many gold deposits where the greater selectivity of smaller equipment is required due to a high percentage of internal waste.

With regard to processing, both heap leaching and agitation leaching are being considered. The Copperstone orebody appears thoroughly oxidized to a depth which is considerably below the likely pit bottom, and no significant amount of carbonaceous material or clay is apparent in the drill core. Thus, early indications are that the ore will respond well to leaching, and reagent consumption should not be excessive. Limited leach tests at Cymet have yielded simulated heap leach recoveries in excess of 70% for crushed ore and over 60% for ROM ore. Additional testing is required, but results to date are encouraging.

Scoping economics have been prepared for three development alternatives.

1. Agitation leach, the principal advantage of which is relatively high gold recovery.

2. Heap leach with three-stage crushing. This is similar to Northumberland, but using an Ortiz-type, multiple use leach pad and gantry crane to ensure good heap permeability.

3. Heap leach with run-of-mine (ROM) ore, which avoids the cost of secondary and tertiary crushing.

In each case, removal of unconsolidated overburden is assumed to be accomplished by a contractor, with all other mining performed by Amoco. Additional capital savings - and perhaps, improved project economics - can be achieved by employing a contractor for all mining. This is done by Gold Fields - Ortiz, Pegasus and other gold mines, but the required trade-off study has been deferred to a later point in Copperstone's development.

Although ore deposit geometry and petrology are markedly different at Copperstone, Northumberland technical expertise, design data, and equipment in many areas will be valuable, particularly with the heap leach alternatives. A preliminary assessment indicates that capital costs at Copperstone might be reduced by about 25% by using equipment and facilities from Northumberland.

G. <u>Infrastructure</u>

The Copperstone deposit benefits from a highly favorable location with respect to utilities, transportation, housing, labor force, climate and environmental factors.

The deposit is located roughly six miles west across flat, sandy desert, from state route 95, and a main line of the Santa Fe railroad passes within 15 miles of the property. Exploration drilling at Copperstone has not been encouraging with respect to locating adequate process water for the project. However, the Colorado River is roughly 12 miles from the project site, and the ground water potential has not yet been thoroughly assessed.

The project site lies in a hot, dry desert environment. Average daily high temperatures are roughly 105°F in the summer and 70°F in the winter. Freezing weather is very rare, and annual precipitation averages about 4". The site possesses no scenic value nor any other obvious environmental resources; although due to the arid climate and proximity to Indian lands, ground water questions are certain to arise.

The Colorado River corridor is a rapidly growing region. The population residing within a one hour drive from the proposed mine site is estimated at roughly 40,000. Parker, Blythe, California, and Lake Havasu City are pleasant communities having a wide variety of services. The project site is bordered on the west by the Colorado River Indian Reservation having a population of roughly 2500 and a 30% unemployment rate.

Having a large mining industry, Arizona has well-developed permitting procedures and a reasonably positive attitude toward mining. There is also expected to be a continuing high rate of unemployment in the Arizona mining industry, so that attracting a high quality, non-union labor force should be possible.

In summary, the Copperstone project enjoys a number of favorable features which would minimize infrastructure investment and supplemental employee benefits which are often necessary to attract and retain labor in a remote location like Northumberland.

H. Scoping Economics

A revised economic scoping of Copperstone was completed by Planning and Economics on August 29, 1984. Base case statistics for three possible project configurations are listed below. Each alternative assumes production of 3600 tpd of ore.

Case I - Agitation leach

Case II - Heap leach, 3 stage crushing, Ortiz-type reusable leach pad and gantry loading

Case III - Heap leach with ROM ore on single use pad. Primary crushing only.

	Case I	Case II	Case III
Capital (MM of 1984$)	42.6	36.6	32.6
PI	15	15	13
PV15	(1)	0	(2)
Avg. Cash Cost/oz Au	$291	$277	$287

The above production costs appear to be slightly above the mid-point of free world gold producers. The economic results are based upon our current crude estimates of tonnage and grade as well as reasonable but not notably aggressive operating cost estimates.

Of particular interest are project sensitivities on grade and capital costs.

Case II Sensitivities	PI
+ 10% grade	18
+ 20% grade	22
+ 30% grade	25
- 10% capital	16

If the estimated capital savings of 25% can be achieved by using Northumberland equipment and facilities, and if only part of the apparent negative grade bias due to rotary drilling is realized, the indicated PI could rise to 25, and cash costs of production would fall to the $225/oz Au range.

It is premature to further massage the values employed in the economic scoping. In general, however, we can conclude that although the base case economics are marginal, there is evidence to suggest that a significant improvement in project economics can be attained.

I. Comparison to Northumberland

Copperstone is often casually described as "another Northumberland". casting the project in a negative light due to the many difficulties encountered at Northumberland. Copperstone is similar to Northumberland in two respects; both are medium-sized gold properties, and both employ similar technology (i.e., open pit mining, cyanide leaching, ADR extraction). However, the principal problems at Northumberland were attributable neither to the basic technology employed nor to the size of the project. Furthermore, the dissimilarities between the properties, in regard to the following factors, are more commercially meaningful.

1. Grade. Average open pit ore grade at Copperstone is roughly 40% higher than at Northumberland.

2. Ore tonnage. Although neither deposit is large, preliminary estimates indicate open pit reserves are at least 25% greater at Copperstone. Furthermore, important underground potential exists at Copperstone.

3. Ore haul. Crushed ore is hauled 9 miles to leach pads at Northumberland, a significant cost element which will not be incurred at Copperstone.

4. Climate. The harsh winter climate at Northumberland created operating difficulties, particularly in the crushing plant. This problem would be eliminated by the hot, desert climate at Copperstone.

5. Leach recovery. Leach recovery at Northumberland has been hampered by poor heap permeability due to clayey ores, and to pregnant robbing sulfides and carbonaceious materials. Preliminary studies of Copperstone ores have identified very

little sulfide or carbon, the clay content appears to be low, and the host rock does not significantly decrepitate under leach. Leach tests imply recoveries at least equal to Northumberland ores, and recoveries in tests using uncrushed ore have been encouraging.

6. Infrastructure. The shortage of housing, services, and other amenities has been troublesome at Northumberland. Copperstone is much more favorably located with respect to infrastructure.

In comparison to Northumberland, Copperstone has a higher overall stripping ratio and seems to have a more difficult water supply situation. However, most of the waste is overburden, with roughly 25% being unconsolidated sands and gravels; and is, therefore, amenable to high productivity, low-cost mining. In contrast, much of the waste at Northumberland is internal, requiring selective mining by smaller mining equipment.

Water supply at Copperstone is presently an open question. A satisfactory source has not yet been identified, but efforts in this area have been limited.

In summary, if our limited knowledge of Copperstone proves to be accurate, the deposit compares favorably to Northumberland in most areas that affect commercial viability. Clearly, however, our inferences on Copperstone are based upon fairly sketchy data so that unconditional conclusions are not yet appropriate.

J. Decision Alternatives

Although there are a wide variety of possible futures for the Copperstone project, they can be categorized into three general alternatives which are discussed below.

1. Dispose. As indicated on Attachment 1, a large number of companies have inquired about the availability of Copperstone.

These were unsolicited inquiries and, therefore, do not represent an exhaustive list of prospects. A variety of deals were suggested by these firms, including joint ventures with Amoco. Irrespective of the specific arrangements, however, it is clear that there is widespread interest in the Copperstone discovery, and Amoco's interest should be easily marketed. Nonetheless, the value received from such a sale would be heavily discounted due to the significant amount of exploration and testing which remains to develop proven ore reserves at Copperstone.

2. Hold. If markets do not favor development immediately, the alternative always exists of holding a project at minimum cost in anticipation of improved markets in the future. Although this is generally not an optimal strategy, gold is a unique commodity subject to dramatic swings in value. A "hold" strategy might include reactivation in time to commence production when the Northumberland deposit is exhausted. Annual holding costs at Copperstone currently total $84,000 in advance royalties rising to $150,000 in 1987, plus $10,000 in other property payments.

3. Continue to pre-development stage. Although exploration results at Copperstone have been very encouraging, considerable additional work is required before development should be seriously considered. In particular, the drilling to date is too widely spaced to yield proven resources, more metallurgical testing is required, and potential sources of process water should be tested. Favorable results from this work would lead to a formal feasibility study, and a project which could be brought on stream very rapidly.

K. Recommendation

Copperstone is a medium-size gold deposit and has the potential to be a low cost producer. Although it would not be a large contributor of earnings to Amoco under gold prices that presently prevail, the project is compatible with existing expertise in the company and could be a consistent cash generator.

These conclusions are, however, based upon a very thin data base. Our level of comfort with the current ore reserve estimate is relatively low due to the present inadequate drill hole density, the apparent negative bias of rotary drill sample assays, and questionable assumptions in the SRK geologic block model.

Because the upside potential for the project is very good, the next phase of the exploration program is recommended to resolve some of the issues identified above. The proposed $500,000 exploration expenditure is designed to test the hypothesis of negative bias in rotary drill samples, to reduce drill hole spacing to a 140' in the near-surface portion of the deposit, and to produce a good geological block model which will in turn provide a more reliable estimate of mineable reserves. The limited metallurgical testing currently under way at the Tucson Lab will also be completed.

If the results of the above work confirm the upside potential of the project, the final stage of exploration will be proposed to provide additional fill-in drilling to bring the reserve estimate to a level of confidence sufficient to support a development decision. This final stage of drilling is currently estimated to cost roughly $800,000. This could be accomplished concurrently with bulk sampling and pilot plant testing if favorable results persist. The scope of these tasks is yet to be determined, but an expenditure of less than $3MM is anticipated. Scoping economics include $3.5MM for this work as well as the final feasibility study. Thus, total pre-development expenditures have been estimated roughly at $4.8MM.

COMPARISONS AND BRIEF DESCRIPTIONS OF VARIOUS MINING RESERVES STUDIES COMPLETED AT COPPERSTONE, SINCE JULY 1983

STUDY DATE	STUDY PREPARER	STUDY METHOD	ASSUMED MINIMUM MINING DEPTH	GRADE (Au)	AVERAGE TONS	W:O GRADE (Au)	RATIO
07/83	Exploration	U.S.A. Cross-Section	400-foot pit	0.02 opt	9.40 MM	0.071 opt	6.9
10/83	SRK	Computer Inverse-Distance	340-foot pit	0.025 pit	12.60 MM	0.068 opt	4.5
07/84	U.S.A. Exploration	Cross-Section	400-foot pit	0.025 opt	7.34 MM	0.078 opt	N.D.
02/85	U.S.A. Exploration	Computer Polygon	360-foot pit	0.025 opt	6.50 MM	0.096 opt	6.7 (1)
		Computer Polygon	300-foot pit	0.025 opt	5.70 MM	0.093 opt	5.4
		Computer Polygon	160-foot pit	0.025 opt	2.90 MM	0.092 opt	3.6 (2)

Footnotes:

(1) 35% of waste material is composed of sand and gravel.

(2) 80% of waste material is composed of alluvial sand and gravel.

Attachment 1

Inquiries Received on Copperstone

Anaconda
Asamera
Centennial Silver
Cominco
Condor Minerals
Crown Resources
Duval
Dynasty Exploration
Getty Mining
Glamis Gold
Gold Fields
Inspiration Resources
Lacana
Longlad Minerals
Meridian (Burlington Northern)
Nerco
Newmont
Pegasus
Queen Stake
Rayrock
Rio Algom
Ruddock Resources
St. Joe Minerals
Tenneco
United Mining

PROJECT AUTHORIZATION PROPOSAL
COPPERSTONE PROJECT (D-80-79)
LA PAZ COUNTY, ARIZONA

SUMMARY

The 1985 Copperstone project authorization proposal is for completion of ore reserve studies and necessary holding costs for the Copperstone gold deposit. ~~Ore reserve studies both in-house and by contractor Pincock, Allen and Holt are currently underway. Results of these~~ Economic evaluation of recently completed ore reserve studies will determine the direction of future planning at Copperstone.

The project area is covered by 314 unpatented mining claims located in west-central Arizona about 135 miles west of Phoenix. The drilling of over 89,000 feet in 223 holes during the past 5 years has outlined a ~~preliminary polygon~~ cross section calculated open pit reserve of 4.4 million tons of oxide gold mineralization grading 0.095 ounce gold per ton at a 0.025 ounce cutoff grade and a stripping ratio of 4.5 to 1.0. This reserve is generated from a partially completed 142-foot drilling grid, and is contained within a proposed 360-foot pit. The delineated gold deposit is approximately 1,000 feet wide by 4,000 feet long. No additional exploration work is planned for the project except for two assessment holes to be drilled on State lands.

Copperstone gold mineralization is associated with Tertiary-aged veining and disseminations within several types of tabular, low angle breccia zones. Much of the veining is specular hematite and quartz-amethyst, and is partly contained within the breccias. The host rock is a weakly metamorphosed Jurassic welded tuff. Some of the breccias and veining represent a hydrothermal center for which a source vent may lie beneath the Copperstone deposit.

INTRODUCTION

The 1985 proposed budget authorization proposed for the Copperstone project is only for necessary holding costs and ore reserve calculation work. Expenditures are required to do the following: 1) complete ore reserve studies currently underway, 2) complete on-going metallurgical studies, 3) perform assessment drilling on State lands, and 4) maintain property payments.

LOCATION AND ACCESS

General History

The Copperstone claim area has no early mining history. Local legend records a tale from the late 1880's of a mule and its inebriated rider collecting a high grade sample from the desert near the northern part of the Dome Rock Mountains.

During 1968 to 1975 the area now covered by the Copperstone claims was held by Charles Ellis of the Southwest Silver Company. The property was then known as the Continental Silver claim group. Six rotary holes were drilled at widely scattered locations from 1968 to 1969, but data for only one of these holes is available. Cuttings from this 710-foot rotary drill hole located in the SE 1/4 section 12, T6N, R20W were panned and a nonprofessional log prepared. Chryscolla-amethyst-quartz-barite-specularite mineralization was noted intermittently to the bottom of the hole.

Newmont Mining Corporation leased the Continental Silver claim group in 1975 and carried out several geophysical surveys including induced polarization, gravity and ground magnetics. Based on the geophysical data, a 765-foot rotary hole was drilled 13,500 feet south of the currently known mineralization. Their drilling was aimed at discovery of a hidden porphyry copper deposit, and negative results caused them to drop the lease. Ellis let his claims lapse in 1980 for lack of assessment work. The claims were then restaked by local prospector Dan Patch.

Amoco Program

Amoco acquired 64 unpatented claims at Copperstone from Dan Patch in early 1980 and initiated a drilling program shortly after land acquisition. All but 2 of the first 20 holes encountered gold intercepts from 10 to 150 feet thick with gold grades from 0.05 to 0.10 ounce per ton. Intensive drilling over a 5-year period from 1980 to 1984 has resulted in over 89,000 feet of core and rotary drilling in 223 holes for a total project expenditure of $2,250,000. This drilling effort developed the Copperstone deposit and explored for potential nearby additional gold mineralization. Drilling expenditures were a large part of each annual budget. Work on the Copperstone deposit prior to 1984 involved mostly rotary drilling to outline the limits of gold mineralization. The 1984 program was two-phased. Early in the year a step-out rotary drilling program of 25 holes was completed to test for gold mineralization that might lie west of the known Copperstone deposit. The effort was unsuccessful.

The late fall program involved developmental in-fill drilling of the Copperstone deposit utilizing diamond core drilling. The more expensive coring technique was used because early drilling results showed good probability that a substantial increase in the gold grade might be expected with this method. Preliminary mining reserve calculations do show a significant increase in the grade of the deposit, but not an increase in tonnage.

A 142-foot grid drilling pattern has been largely completed at the Copperstone deposit using a combination of rotary and diamond core drilling. About 80 percent of the grid drilling has been completed for a 400-foot pit depth. Additional grid drilling down-dip and along strike of the deposit is warranted dependent upon the economics of gold mining. Cheaper rotary drilling penetrated overburden gravels and barren hanging wall volcanic rocks. A core drill then moved onto the cased hole to test the known mineralized zone with the drilling depth limited by a potential 400-foot open pit.

Fifteen of the earliest rotary drilled holes at Copperstone were twinned by core drilling to recheck the value of the known gold zone. Sample collection during the drilling of the early rotary holes was suspect and the twin work provided data to establish a confidence factor for all of the early rotary drill work. Statistical results of this part of the program showed that there is no reason to suspect the early rotary drill hole results. The 15 twin core holes and remaining 45 fill-in core holes drilled last year provide much better assay and geological control at Copperstone than the previous rotary holes.

GEOLOGIC SETTING

Regional Geology

The oldest rocks of west-central Arizona are Precambrian in age (approximately 1.7 billion years before the present), and are composed of gneiss, schist, quartzite and amphibolite. Several generations of plutonic rocks intruded this metamorphic sequence. Unconformably overlying these rocks are Paleozoic carbonate and clastic strata. The middle Mesozoic era involved instrusion of intermediate to felsic rocks with extrusion of fine-grained equivalents. Thick sections of clastic rocks were generated at this time also. By the late Cretaceous, more plutonic rocks were intruded into the region. Possibly three episodes of deformation and metamorphism affected all of these rocks in the late Cretaceous and early Tertiary.

Western Arizona is a region of dramatic geologic structure that is related to gold mineralization. Large displacement along low-angle faults resulted from isostatic uplift of metamorphic and crystalline core-complex rocks. The antiformal uplifts formed mountain ranges in the Southwestern United States where conditions were favorable for warping during mid-Tertiary crustal extension. With uplift and warping of the crust, low angle detachment faults separated upper plate rocks from core complex rocks.

As the upper plate began a migration away from the uplift, a series of subsidiary normal, rotated faults termed listric faults formed during the sliding and flexing of the upper plate.

Geology of the Project Area

The project area covers a portion of the northeastern Dome Rock Mountains which consist of Mesozoic metasedimentary, metavolcanic and igneous rocks. The Dome Rock Mountains are part of a group of north-south linear mountain ranges which are separated one from another by Basin and Range type normal faults and broad alluvial-filled valleys. Low angle detachment faults predate the Basin and Range faulting in the Dome Rock Mountains and elsewhere in Arizona. Quarternary-Tertiary(?) basalt flows appear in scattered outcrops flanking the main part of the range, and presumably covered the area prior to uplift.

In the area of principal interest within the central portion of the claim group, a section of weakly metamorphosed Mesozoic quartz latite porphyry welded tuff is exposed on several low relief knolls. This small outcrop area also displays a large quartz-amethyst vein which was the focus of early mineral exploration. An apron of recent gravel beds cemented by gypsum, caliche and blow sand deposits surrounds the low relief knolls and covers more than 95 percent of this area of the claims.

The Copperstone gold deposit occurs within a regional detachment terrane of strongly to weakly laminated quartz latite welded tuff. None of the drilling was deep enough to confirm the presence of a basal low-angle detachment fault and underlying core complex rocks. A single drill hole penetrated biotite-quartz gneiss, but evidence for encountering a detachment fault is lacking. The relationship between mineralization and detachment or associated listric faulting remains unclear. Gold mineralization is contained partly within moderately dipping tabular breccia zones, and is associated with veining. The gold zone strikes generally northwest-southeast, dips about 30 degrees to the northeast, and averages about 70 feet thick. For a 400-foot deep pit, the deposit is 500 feet wide and 2,000 feet long.

Gold mineralization is contained within the tabular breccias and in quartz-amethyst-specularite veins that also contain magnetite (geothite), barite, carbonate and chrysocolla. These veins may be feeder channels for ascending mineralizing solutions. Observations of diamond drill core suggest multiple phases of fluid introduction and fracturing formed the complex vein system that cross-cuts and parallels the breccias. Breccia hosted gold occurs in altered quartz latite porphyry and in massive specularite fragments in the breccia. Gold bearing and non-gold bearing breccias are earthy hematitic red colored. The hematite-specularite content probably reflects multiple mineralizing events by ascending hydrothermal fluids. Three kinds of breccias are observed in core: volcanic formational breccias, hydrothermal breccias and possibly listric fault breccias all overprinted by veining. Most of the breccia zones appear to be tabular and parallel to laminations in the welded tuff host rock.

Two age dates obtained from drill core samples are 48.6 $\pm$ 1.9 m.y. on a hydrothermal sericite concentrate and 55.6 $\pm$ 20 m.y. on an adularia concentrate. Adularia and sericite as seen in thin sections are associated with gold mineralization. These earliest Eocene age dates differ from the ages of most gold deposits in the Mojave area which are 25 to 13 m.y. or early Miocene in age.

Post-mineral faulting is abundant at Copperstone. Arcuate, gently dipping fault zones having minor displacement generally parallel the strike and dip of the gold zone. High angle north-south striking faults cut through the deposit. One divides the deposit into two terranes. The northwest half consists of a single dipping mineralized zone. The southeast half contains multiple mineralized zones as separated segments distributed over a much wider area. The largest mineralized zone displays a broad folded attitude cross-cut by multiple offsetting high angle faults.

Drilling also defined the presence of post mineral basaltic plugs and flows at Copperstone hidden beneath desert sands and gravels. Ultimately ground magnetics clearly defined all of the basaltic units in the area and permitted subsurface mapping of these rock units.

Ore Reserves

The late 1984 fill-in core and rotary drilling at Copperstone substantially improved confidence in the mineable gold reserve. The core drilling provided greater geologic control to the mineralization and complex faulting than was known before. Since 1983, four ore reserve studies have been completed on the Copperstone deposit and are listed chronologically as follows:

The most deviant results were obtained by the May 1983 study of Steffan, Robertson and Kirsten (SRK) who used Copperstone data for Amoco's evaluation of their DMIPS computer software package. Two grade models were constructed for gold and silver using the inverse-distance-squared method. SRK did not obtain variograms for the data and concluded that a krieging method was not warranted. SRK engineers indicated their test work was intended only as an examination of their DMIP system. They did not optimize their work and the results are valid only for the assumptions made.

A detailed, computer generated block model ore reserve study is currently underway by consultants Pincock, Allen and Holt. Their final results are due by mid-April. An in-house cross-section ore reserve calculation is also in progress.

Metallurgy

Flotation and cyanidation testing of Copperstone mineralized rock was done by Cymet in Tucson on two composites obtained from drill core. One composite graded 0.175 ounce gold per ton and the second graded 0.085 ounce gold per ton. This study (September 1982) showed flotation gold recoveries of 85.7 percent and 86.4 percent in the two samples obtained by flotation using a 100-mesh grind. Cyanide testing of the same samples showed gold extractions of 94 percent and 100 percent respectively on the two samples using a 65-mesh grind and a 16-hour leach.

Several laboratory column leach tests have been done or are in progress, but no final reports have been received regarding this work. Bottle roll tests have been performed by Cymet on 18 samples from 10 of the 60 drill holes completed late last year. Preliminary results show diverse recovery from a low of about 35 percent to greater than 80 percent of the gold in the sample.

Target Concept and Exploration Potential

Copperstone is a hydrothermal Tertiary gold deposit lying within a regional geologic setting of detachment faulting. Fault breccias, volcanic formational breccias and explosive hydrothermal breccias are all closely associated with gold mineralization. Veining also hosts much of the Copperstone gold. Discovery of Copperstone was aided by the outcrop occurrence of gold-bearing quartz-amethyst veins that are assumed to be feeder systems from the gold source located at