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Item 22

Report on the  
IVANHOE DISTRICT, ELKO CO., NEVADA  
on behalf of  
CORNUCOPIA RESOURCES

V.F. Hollister  
December 19, 1986

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### Summary of Conclusions and Recommendations

The Ivanhoe district in T 38 N, R 48 E, Elko Co., Nevada, contains an epithermal gold deposit below previously mined hot spring mercury (cinnabar) exposures. The district lies at the north end of the Carlin belt of gold deposits. The gold ore is hosted by a typical Upper Tertiary bimodal volcanic sequence, but silicified dacite tuff beds are preferred as a locus for gold mineralization where they are cut by faults. The favorable rock type is altered by silicification and mineralized where it is cut by some feeder faults, but exploration has yet to discern which faults are favorable or which dacites are preferred hosts.

The known mineralization occurs in a bed the top of which is about 180 feet below the surface, and mineralization is about 60 feet thick. An ore reserve has been proposed by Robison that shows 3,939,000 tons of oxide ore to be indicated by 167 U.S. Steel reverse circulation and core holes. The ore averages .043 opt Au, and it is classified as probable. Alternate reserve calculations are shown on Table I.

Metallurgical tests conducted by U.S. Steel suggest that the oxide ore is amenable to heap leach gold extraction, but that sulfide ore requires conventional beneficiation. Testing has not progressed, however, to the point where an outcome can be calculated.

Pilot drilling by six scattered drill holes north of and contiguous to the probable ore reserve has shown oxidized ore grade mineralization to extend to the north for about 4,000 feet. The zone included by the six holes is about 1,000 feet wide. These holes, Nos. 42, 43, 44, 45, 46, and 47, outline an area of oxide gold mineralization that clearly needs followup exploration.

Other areas of untested silicification remain on the property. These occur largely east of the known gold ore and should be explored by drilling. The acquisition of the U.S. Steel ground at Ivanhoe should be followed by an adequate investigation of the silicified areas as well as fill-in exploration of the

area north of ore that is indicated to be mineralized by the six U.S. Steel holes.

No outcome calculation on the Ivanhoe deposit can now be proposed. Operating data are too inexactly known. However, the other deposits in the Carlin trend have been steady, long term producers, and it is likely that Ivanhoe will be an economic source of gold at future gold prices.

### Introduction

Cornucopia Resources requested a report on the gold potential of the Ivanhoe district located in Elko Co., Nevada, (Figure 1). The property was studied on March 25, 26, and 27, 1986, and visited with the U.S. Steel staff on May 3 and 4, 1986 Hollister (1986). It was again visited with Mr. Robison on August 11, 1986. Prior to that the district was studied in November 1963 (Hollister (1963)). All 1986 investigations had the advantage of the Tingley and Benz (1983) geochemical study and the U.S. Steel exploration data (Anon, 1984; Anon, 1985). Robison (1986) later calculated the ore reserves for Cornucopia. His calculation agrees with that of Hollister (1986).

United States Steel entered the district in 1980, and this report summarizes their exploration results through 1985. It is important to note that Cornucopia now has the responsibility to file the annual assessment work on the unpatented claims accumulated by U.S. Steel. U.S. Steel has spent approximately U.S. \$1,700,000 on the district.

Power is available to the Dee mine, six miles south of the U.S. Steel reserves, and a power line crosses the U.S. Steel claims. Water is available in the permanent streams Rock Creek and Antelope Creek.

Topography over ore is gently rolling, with easy access for exploration equipment.

Property, Location and Description

Attached is a title opinion generated by U.S. Steel. The claims were not checked in the Elko Co. Courthouse, but the posts were seen in the field and the claims are believed to be valid.

The U.S. Steel claims lie approximately 50 miles by dirt road north of Battle Mountain (Figure 1). Access is by car from Battle Mountain, although an unimproved dirt road also exists from the Dee Mine (Figures 2 and 3). The road from the Dee Mine fords Soldier Creek, a tributary of Antelope Creek, and during heavy rains the crossing is impaired. The road shown in Figure 1 is the preferred access route.

U.S. Steel owned 574 and had leased 45 unpatented mining claims in T 37 and T 38 N, R 48 E, Elko Co., Nevada. These claims are the property purchased by Cornucopia under the terms of a letter of intent.

The terms under which U.S. Steel leased the 45 claims are included in the attached title opinion.

No conflict has been conveyed to Cornucopia by U.S. Steel with any adjacent property owner. None has been indicated in past work by Kennecott, Homestake, or Placer Amex. Unless a conflict with other unpatented mining claims surfaces soon, it should be assumed that the U.S. Steel unpatented mining claims are held free and clear.

No patented mining claims are known over or near known ore.

The surface is held by the U.S. Bureau of Land Management.

Permits for exploration drilling have been easily obtained by U.S. Steel in the past. There is not likely to be a problem for further permitting for exploration. None of the operating mines in the Ivanhoe-Carlin trend have experienced difficulty in obtaining operating permits, and none are anticipated for Ivanhoe.

### History

Past exploration and mining was instigated by the discovery of cinnabar in 1911. Mercury production began in 1915. However, the district was inactive from 1916 until 1929. From 1929 through 1943, 1,032 flasks of Hg were produced from Butte 1, Butte 2, Velvet and Clementine mines, shown on Figure 4. Other mines in the district have produced under 1,000 flasks.

Since 1963 the district has been investigated for metals other than mercury. Apco unsuccessfully drilled a deep blind porphyry molybdenum target in the SE 1/4 of the SE 1/4 of Section 4, just east of the known gold reserves. Auric Metals also drilled 100 shallow rotary holes seeking mercury in 1968-70. They did not assay for gold. Noranda drilled three holes in 1980 for uranium. Homestake in 1979-80 drilled the northern part of the district not explored by U.S. Steel for gold, and dropped. Placer Amex negatively drilled southwest of the U.S. Steel holdings for gold in 1980. Kennecott drilled eight holes for gold in 1984 north of the U.S. Steel ground and pulled out.

The Ivanhoe district lies on the Carlin trend. Merco and others bound U.S. Steel to the east and their exploration results are not known. The land southeast of Ivanhoe is staked solidly (Figures 2 and 3) through the Dee, Bootstrap, and Gold Strike mines. Through the purchase of the U.S. Steel claims, Cornucopia becomes one of the larger landowners in the Carlin trend. The Ivanhoe is the northernmost of the numerous gold mines found since 1960 that make up the Carlin trend, and that belt is now known as the Ivanhoe-Carlin trend.

### Geologic Setting

The geologic setting of the Ivanhoe district is shown on Figure 4. The district contains a basement of Ordovician age Valmy Formation. Unconformably overlying the Valmy is a thick

section of bimodal continental volcanic rocks that have K-Ar ages of 13 to 14 m.y. The premineral rocks are capped by a siliceous lake bed that is in reality a sinter. This hot spring deposit is generally shown on Figure 4 to be extensively outcropping in Sections 33, 34, and 35 of T 38 N and in Sections 3 and 4 of T 37 N. Cinnabar occurs within this bed, and gold mineralization is believed to be paragenetically related to the mercury, occurring below the sinter. Gold deposits are not likely to occur in rocks overlying the mercury, nor are these rocks extensively altered.

Post-ore dacitic rocks (post lake bed sinter) occur north of and cover the sinter over and around Big Butte. Another post-ore dacite volcanic center occurs covering the southeast part of the sinter. These post-mineral rocks mask about half of what is believed to be the original depositional extent of the sinter.

Alteration: Rocks underlying the sinter (siliceous lake bed) have been variably argillized and locally silicified. The sinter includes opalite and chalcedony together with minor clay (kaolin). All known cinnabar occurs near the base of the sinter in a siliceous chemical lake deposit. However, other areas of silicification are known that cut the rocks, and these are shown in Figure 4. Argillization and silicification is best developed in pre-sinter dacite tuff beds and is least developed in the basalt flows in the bimodal sequence. Gold ore occurs in one dacite tuff and may occur in other tuff beds below the sinter.

Mineralization: Ore occurs in feeder faults and in at least one dacite tuff bed near the feeder faults. The oxidized ore consists of chalcedonic and quartzose silica with sparse limonite and kaolin. Traces of adularia (?) are present. In sulfide, the gold is accompanied by very fine grained pyrite, rare sulfosalts and abundant chalcedonic and quartzose silica. Calcite and kaolin also occurs in the ore zone. The bed mineralized occurs about 180 feet below the surface, which is also

about 180 feet below the sinter. Mineralization averages 60 feet thick in the bed. No other beds have been tested.

Structure: The southern margin of the known ore seems to be controlled by an arcuate, easterly trending, nearly vertical fault. The siliceous lake bed is confined to rocks north of this fault, which seems also to be exposed as a N-S fault in Section 35. The distribution of the lake bed is consistent with the bounding fault being interpreted as a caldera marginal fault. For most of its extent, the circular fault is covered with post-sinter and therefore post-caldera (equating the sinter with caldera subsidence) rocks.

Other faults can also be seen, but alteration seems to be best developed on N-S trending faults. In most deposits in the Carlin trend, ore prefers N-S trending faults as feeders.

Exploration Targets: On the basis of structure and alteration, the N-S fault in Section 4 with its accompanying silicification and argillization is a prime target as a feeder for gold ore. Mercury producers occur spatially distributed close to it. Dacite tuffs adjacent to this fault should be drilled.

Within the known ore, another northerly trending fault has been recognized. The extension of this fault to the north has not been tested, nor has dacite tuff north of the known ore been drilled.

The north trending fault in Section 36 has not been investigated although U.S. Steel has mapped silicification in its walls.

### Past Exploration

Exploration by U.S. Steel has consisted of geologic mapping, IP surveys, magnetics, geochemistry, and the drilling of 228 reverse circulation and core holes. Of these 167 holes were drilled in and near ore in Section 4, and 149 can be used for ore reserve calculations. Many of the remainder randomly



test various geologic features near ore.

Six of the exploration holes, however, are scattered in a belt about 1,000 feet wide and 4,000 feet long, contiguous with and north of ore. These six widely scattered holes found the following oxidized gold ore:

<u>Drill Hole</u>	<u>Interval</u>	<u>Average Grade</u>
42	115 - 165	.031
42	205 - 250	.015
43	205 - 340	.031
44	350 - 380	.023
45	70 - 110	.023
45	225 - 275	.022
45	290 - 440	.034
46	90 - 135	.014
47	90 - 165	.051
Average		.031

The area tested by these six holes includes the projection of the northerly fault found in the orebody, as well as the large northerly trending fault in Section 4. This is clearly a prime target for discovering additional oxide ore.

The projection west of ore from the known orebody is also noteworthy. Drill intercepts cut + 0.1 opt Au at the west limit of ore. Followup drilling along the arcuate fault is also justified.

No drilling has been undertaken in Section 35 in the vicinity of the N-S fault. Alteration in the walls of the fault suggest that exploration is warranted.

Other exploration targets of lesser importance also exist on the U.S. Steel ground.

### Ore Reserves

Robison (1968) used 149 of the 167 holes in and near ore in Section 4 to define a reserve that satisfies the definition of probable. Each hole has at least 10 feet of .015 opt Au, and the holes are drilled on 100 foot centers. Table 1 gives the Hollister (1968) and U.S. Steel reserves for comparison.

The ore is open going north and west.

### Proposed Budget

The area north of known ore in Section 4, including holes 42 through 47, should be tested with 36 holes systematically spread on 400 foot centers. The area west of the known ore in Section 5 west of U.S. Steel hole C-58, should be tested with 4 pilot holes. The northerly trending fault and alteration in Section 35 should be tested with 4 pilot holes.

All holes should be 500 feet deep.

The cost for drilling the holes, including assaying, surveying, supervision and miscellaneous costs is estimated as follows:

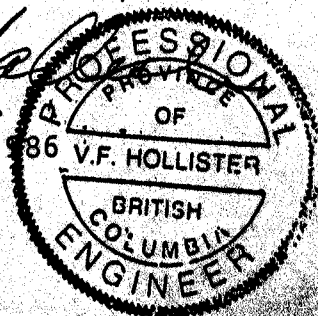
<u>Item</u>	<u>U.S. Cost</u>
44 - 500 foot holes (22,000 feet @ \$10 per foot)	\$220,000
Surveying	20,000
Site Preparation	40,000
Assaying & Sample Prep	50,000
Supervision	20,000
Miscellaneous	50,000
Total	400,000

### Conclusions

Cornucopia's acquisition of the U.S. Steel ground at Ivanhoe in the Ivanhoe-Carling belt permits Cornucopia entry into some of the most prized exploration terrane in the U.S. U.S. Steel developed 3,939,000 tons of oxide ore averaging .043 opt Au, and through pilot drilling, suggested additional mineralized targets that invite testing. An exploration program costing U.S. \$400,000 is recommended to test the Cornucopia targets in the lands acquired from U.S. Steel.

V.F. Hollister

December 19, 1986



References

- Anon, 1984, Ivanhoe Project, 1984 Summary Report, U.S. Steel private staff report, 39 p.
- Anon, 1985, Ivanhoe Project, 1985 Summary Report, U.S. Steel private staff report, 120 p.
- Hollister, V.F., 1963, Ivanhoe Hg District, Elko Co., Nevada, private report for Duval Corp. dated Nov. 1-63, 2 p.
- Hollister, V.F., 1986, The Ivanhoe Mining District, Elko County, Nevada, private report for Cornucopia Resources dated May 5, 1986, 14 p.
- Robison, W., 1986, Ivanhoe Property, Cornucopia Resources private report dated September 3, 1986, 5 p.
- Tingley, J., and Benz, B., 1983, Geochemical Sampling on the Carlin trend; NBNG open-file report 83-10, 210 p.

Table 1

Ore Reserve Estimates (Probable Ore Category)

<u>Report</u>	<u>Oxide</u>		<u>Sulfide</u>		<u>Total</u>	
	<u>Tonsx10<sup>6</sup></u>	<u>OPT Au</u>	<u>Tonsx10<sup>6</sup></u>	<u>OPT Au</u>	<u>Tonsx10<sup>6</sup></u>	<u>OPT Au</u>
Robinson (Uncut)	3,939,000	.043	3,512,000	.048	7,451,000	.045
Hollister (1986)	4,100,000	.042	3,800,000	.049	7,900,000	.046
Anon. (U.S. Steel)	Not broken down				10,000,000	.045

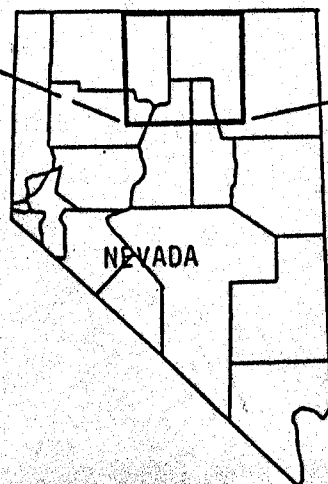
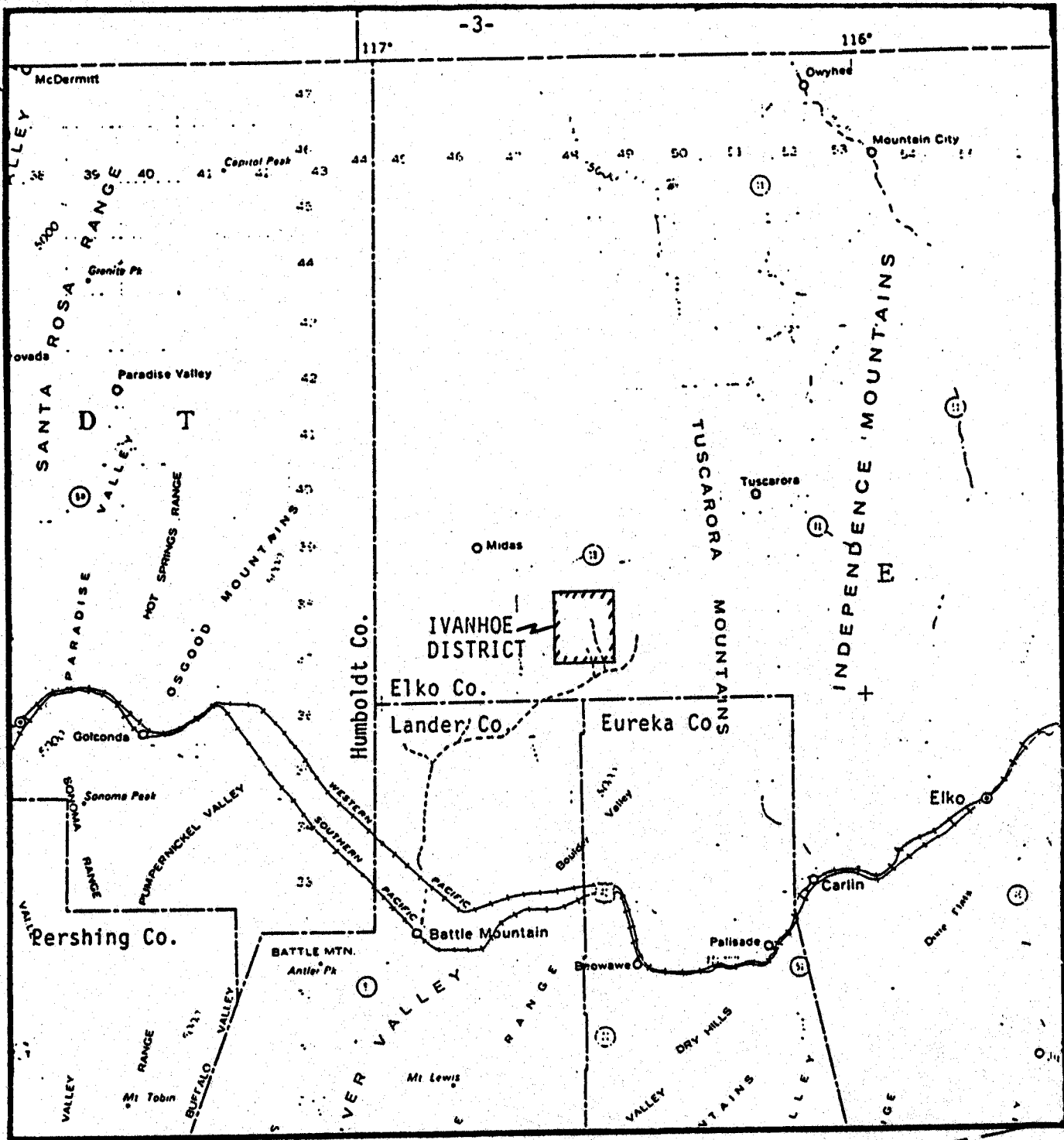


FIGURE 1: Location map

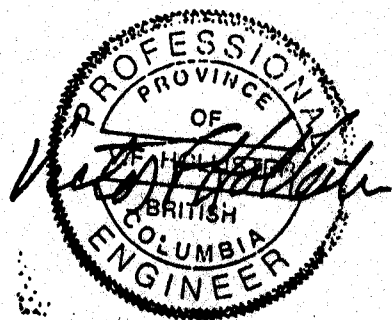
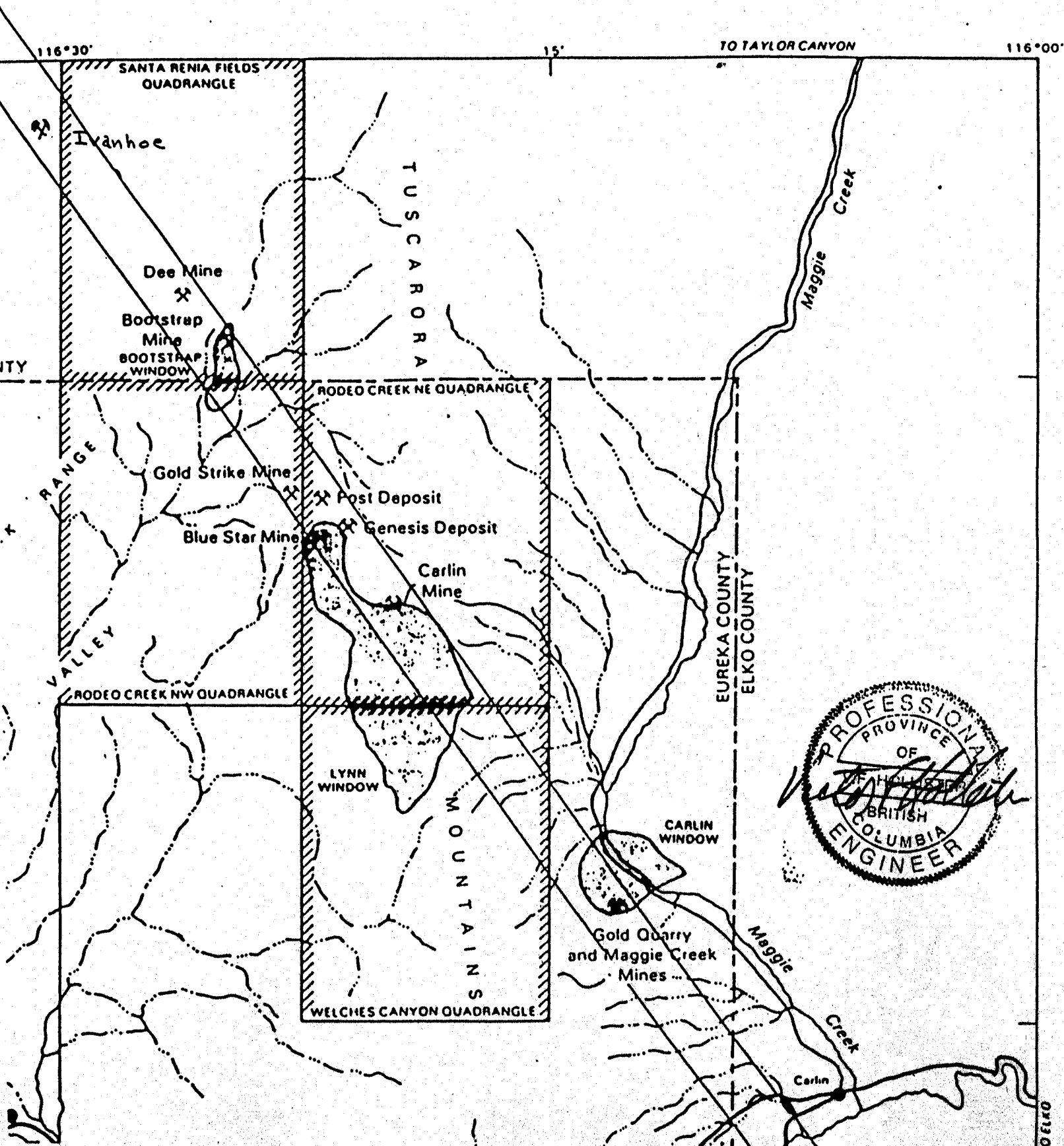


Figure 2  
Ivanhoe-Carlin Belt  
Nevada





Figure 3  
Location of Mines  
Carlin Gold Belt

Scale Miles



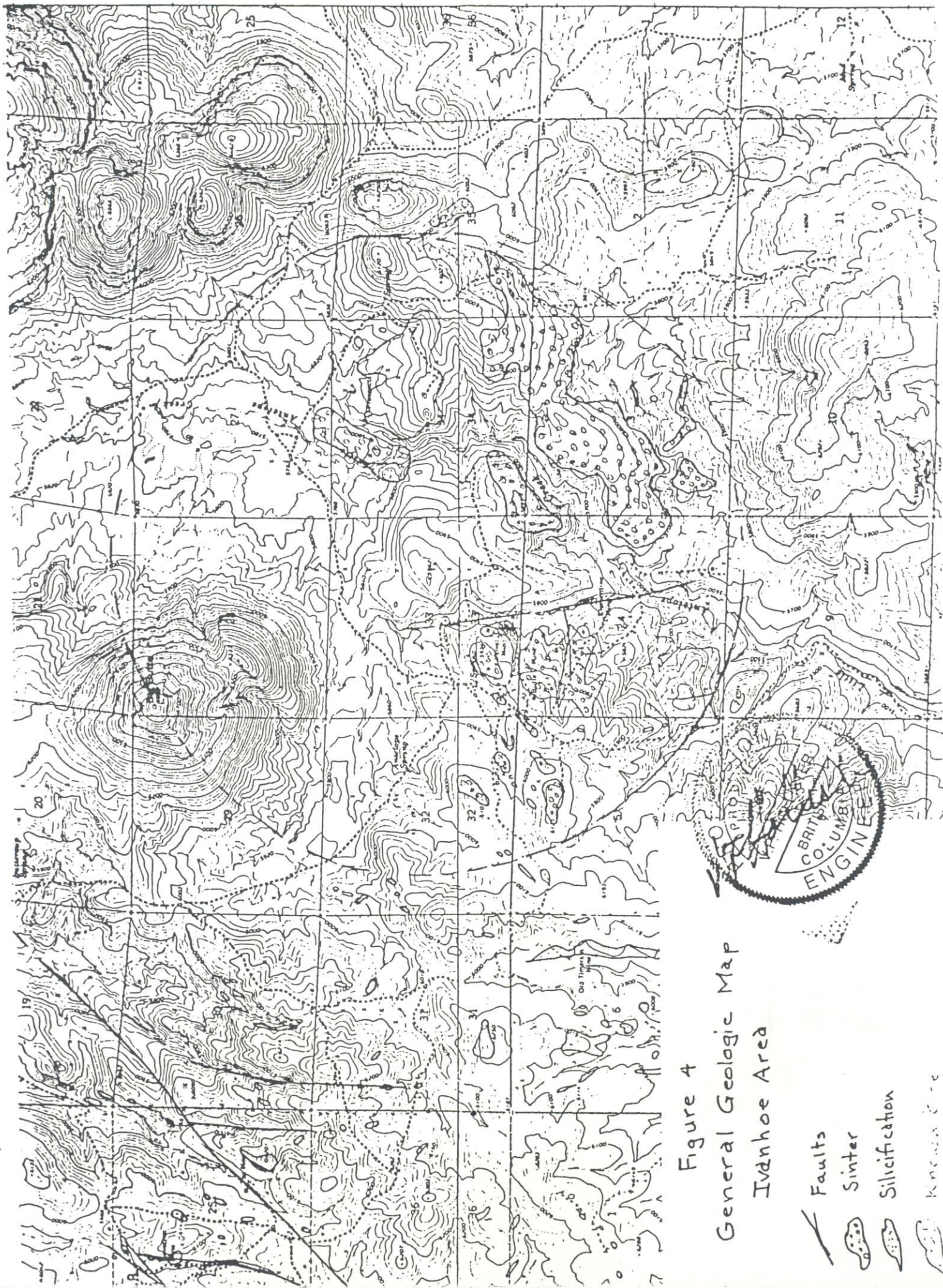






Figure 4  
General Geologic Map  
Ivandhoe Area

-  Faults
-  Sinter
-  Silicification
-  Known Ore



CERTIFICATE

I, Victor Frederick Hollister, of 8069 Philbert Street, Mission, B.C., V2V 3W9, do hereby certify:

(1) I am a consulting geologist residing at 8069 Philbert Street, Mission, with an office at that address.

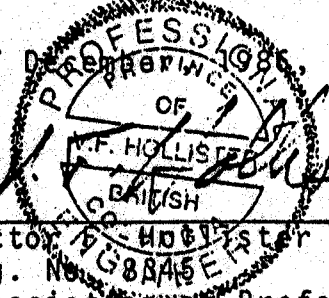
(2) I am a graduate of the College of Engineering at the University of California, Berkeley, with a B. Sc. degree in 1948 and an M. Sc. degree in 1949, and am a Registered Professional Engineer in the Province of British Columbia with Registration No. 8345.

(3) I have no personal interest, directly or indirectly, in the Ivanhoe property or any property in its vicinity, in U.S. Steel, or in the securities of Cornucopia Resources, or in the securities of any other firm or corporation that has an interest in that property, nor do I expect to receive, directly or indirectly, any interest in such property or securities.

(4) The findings in this report are based on data obtained from visits to the property in 1963 and 1986, augmented by recent exploration results obtained by U.S. Steel.

(5) The full text and accompanying maps may be reproduced in the Company's Prospectus or Statement of Material Facts.

Dated this 19th day of December, 1986, in Vancouver,  
B.C.

  
Victor F. Hollister  
Reg. No. 8345  
Association of Professional Engineers  
of the Province of British Columbia