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ILLIPAH, A DISSEMINATED GOLD DEPOSIT

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INTRODUCTION

The Illipah Mine is located in White Pine County at the extreme northern end of the White Pine Range. Current reserves are exhausted, however; heap leach operations will continue through the spring of 1989. There remains a small deeper resource which may be mined at some future date. The mine is a joint venture between Alta Gold Company (60%) and Echo Bay Mines (40%).

HISTORY

Tenneco Minerals Corporation acquired the Illipah prospect from Earth Resources in 1980, and in 1981 a 5,360 foot drilling program intersected the southern end of the Illipah orebody. By the end of 1985 the orebody was defined after completing 413 drill holes and geologic reserves stood at 1.9 million st assaying 0.048 ozs Au/st.

Echo Bay Mines Ltd. purchased Tenneco Minerals Corporation in 1986 and began Illipah site preparation in the spring of 1987. Mining commenced in July and was completed in November of 1988. During this period, 1,130,711 st were mined at a grade of 0.033 ozs Au/st, along with 5,205,397 tons of waste for a 4.6:1 strip ratio.

STRATIGRAPHY

The oldest rock and also the host for the majority of Illipah gold is the Devonian Devils Gate Limestone. From drill hole data, we know it is at least 700 feet thick in the mine area. The upper 50 feet is a thin bedded dirty, silty limestone with shaley partings. Below 50 feet the Devils Gate Limestone becomes a medium to dark grey, medium bedded micritic limestone that weathers to a light grey. Few fossils can be found.

The Devils Gate Limestone is overlain by a section of interbedded dark grey to black, carbonaceous claystones and siltstones tentatively assigned to the Mississippian-Devonian Pilot Shale. The rock is fissile but more massive or blocky than the typical Pilot Shale in other localities. Also, the section is non-calcareous except for minor patch reefs near the base. Minor sandstone lenses occur in the lower 50 feet of the unit. At the basal contact, marcasite concretions or nodules often form a distinct marker bed.

The Mississippian Joana Limestone and Chainman Shale appear to be absent in the Illipah stratigraphic section. The Mississippian Diamond Peak Formation seems to lie unconformably upon Pilot Shale.

The Diamond Peak is a siliciclastic sequence composed of interbedded sandstone and conglomerate rocks. Though often silicified in the Illipah area, the unit has never been anomalous in gold.

STRUCTURE

Compressional forces during the Antler Orogeny formed the Illipah Anticline and generated numerous northeast, northwest and north trending faults. A northwest reverse fault juxtaposed Pilot Shale against Devils Gate Limestone on the eastern limb of the Illipah Anticline (east side of North Hill, see Figures 1 and 2). During this period differential movement along the Pilot Shale and Devils Gate Limestone contact created a major north-south shear zone which parallels the stratigraphy of the western limb. The shear dips to the west at approximately 30 to 60 degrees. The differential movement along shaley partings in the upper 50 feet of the Devils Gate Limestone created tension fractures in the silty limestone which gives the ore a distinctly hackly texture.

During the extensional Basin and Range tectonics, the older faults were reactivated and show oblique strike-slip striations. The post ore heave and throw components are less than 50 feet.

ALTERATION AND MINERALIZATION

The majority of the ore mined at Illipah was from the upper 50 feet of the Devonian Devils gate Limestone.

The alteration associated with the deposit consists of decalcification, oxidation, decarbonization (?), argillization and silicification. The ore has a distinct butterscotch color and has a low specific gravity due to decalcification. An early hypogene phase removed carbonate, deposited silica and removed carbon (?). Gold was introduced as a late phase occupying areas of increased porosity.

The fluid flow was along bedding planes below the Pilot Shale which acted as a cap or aquaclude. The red-ox boundary is very sharp and in most places changes within a matter of centimeters. Sampling conducted during mining showed an equally sharp ore-waste boundary passing from barren reduced shale to decalcified limestone assaying as high as 0.10 ozs Au/st.

The only ore encountered in the Pilot Shale was associated with either faults or crackle zones in troughs of tight synformal folds. In either case this ore was restricted to within 10 feet of the limestone contact.

Supergene alteration produced iron oxides in the surface environment. Chalcanthite was noted along with gypsum at the base of the zone of weathering in the Pilot Shale. A blast hole composite showed 500 ppm copper in Illipah ore which was perhaps due to supergene mineralization.

The most commonly observed minerals are hematite and goethite, often as a wash on fracture surfaces or as a pervasive constituent of the hanging wall rusty jasperoids. Silica is restricted to replaçement, rather than fracture filling, with no obvious cross-cutting relationships.

CONCLUSIONS

The genesis of the Illipah deposit is rather speculative. Deformation during the Antler Orogeny may have structurally prepared the favorable stratigraphic horizon. Since none of the high angle Basin and Range faults seem to be mineralized, ore deposition may be older than 17 m.y.b.p., perhaps coeval with local volcanic activity at 33 m.y.b.p. Late multi-phase hydrothermal solutions rose below impervious Pilot Shale where they encountered oxygenated ground water. Gold was precipitated in a narrow vertical range, following silica deposition. In a general sense, there is a weak zonation downward from silicification, argillization, decalcification through gold mineralization.

The majority of the data collected seems to suggest Illipah is a manto-like disseminated gold deposit. It does have significant differences from many Nevada counterparts: 1) poor correlation between gold and silicification, 2) poor correlation of gold mineralization with high angle Basin and Range faults, 3) low arsenic and antimony geochemical values.

On the other hand, it demonstrates similarities: 1) high gold/silver ratio of about 20:1, 2) gold deposition is both related to structural and a favorable stratigraphic horizon, 3) associated mercury anomaly distal to gold mineralization.

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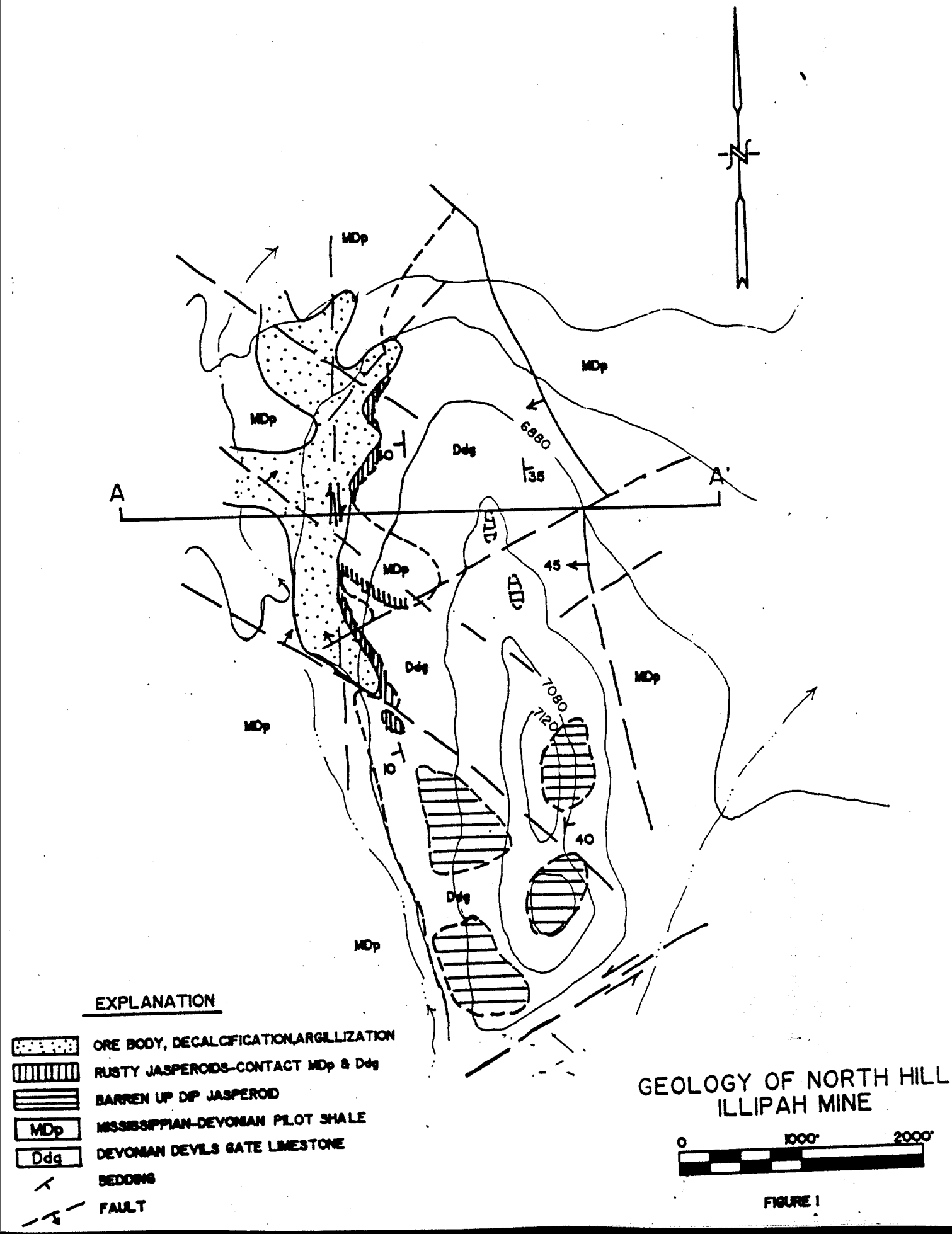
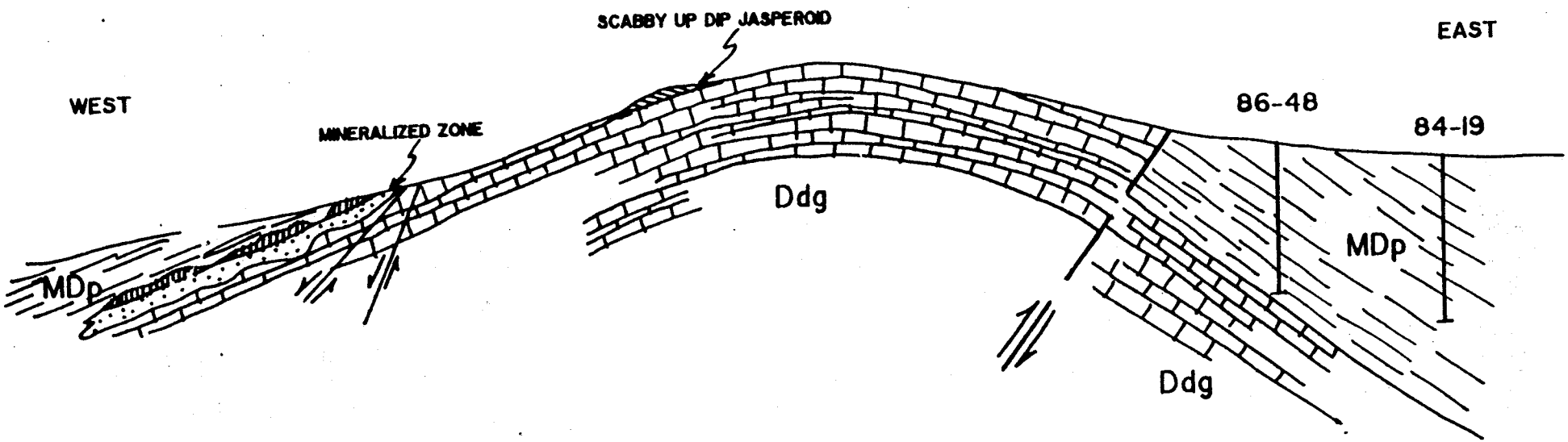

MDp
MDp
MDp
MDp
MDp
MDp
Ddg
Ddg
Ddg
A
A'
6880
7080
7120
35
45
40
10
EXPLANATION
ORE BODY, DECALCIFICATION,ARGILLIZATION
RUSTY JASPEROIDS-CONTACT MDp & Ddg
BARREN UP DIP JASPEROID
MDp
MISSISSIPPIAN-DEVONIAN PILOT SHALE
Ddg
DEVONIAN DEVILS GATE LIMESTONE
BEDDING
FAULT
GEOLOGY OF NORTH HILL
ILLIPAH MINE
0
1000'
2000'

FIGURE 1



EXPLANATION

- ORE ZONE, DECALCIFIGATION, ARGILLIZATION
- RUSTY JASPEROID
- BARREN UP DIP JASPEROID
- MDp — MISSISSIPPIAN DEVONIAN PILOT SHALE
- Ddg — DEVILS GATE LIMESTONE
- FAULT

NORTH HILL ILLIPAH MINE
SECTION A-A'
AT 14,800'

0 500' 1000'

FIGURE 9