URANIUM DEPOSITS

THE HAPPY JACK MINE, WHITE CANYON, UTAH

by

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Names and Addresses of Property Owners:

Joe E. Cooper
Monticello
Utah

Grant and Fletcher Bronson
Monticello
Utah

White Canyon Mining Company
Cortez
Colorado

Vanadium Corporation of America
Durango
Colorado
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ABSTRACT

Detailed geologic mapping of the Happy Jack uranium mine and the adjacent outcrops on either side has shown that the channel which appears to control ore deposition in the Happy Jack comes from the southeast and extends to the southwest. The three places where the unexplored portion of this channel is exposed are mineralized over several feet of thickness, with uranium values from 0.05% to 0.15% U₃O₈.

It is recommended in this report that a minimum of 6,000 feet and an approximate maximum of 10,000 feet of core drilling be done to explore the 2,400 feet of unexplored channel behind the rim.

INTRODUCTION

Purpose and Scope of Investigation

A brief examination of the Shinarump rim southeast of the Happy Jack mine indicated that it may be part of the same ancient channel from which ore is being mined. It was decided, therefore, to map the area in detail to determine whether there is such a channel in the area and whether it is mineralized. Any channel that could be definitely associated with the Happy Jack mine would be an excellent drilling prospect. Furthermore, this is an unusually good place to study the relationships between a known ore body and regional and local structural features.

The present rate of mining and development of the Happy Jack mine (30 tons per day) will require many years before the reserves are known and hence only assessment work is being done by the operators on the nearby claims. Therefore, to determine the extent of mineralisation and the tonnage of ore reserves, exploration drilling is suggested.

Location and Accessibility

The area is located in San Juan County, southeastern Utah, on the south rim of White Canyon, about 2 miles south of Utah State Highway No. 95. Blanding, Utah, is 76 miles to the northeast and Hite,
Utah, on the Colorado River, is 14 miles to the west (fig. 1). These towns are the nearest sources of supply. An often used airstrip, in fair condition, is located near the Happy Jack mine along the State Highway. The area is readily accessible during the summer and with little difficulty in winter. During winter months, rain and snow hamper traffic from the east, but not from the west.

Method of Investigation

It was decided that detailed mapping of the area might indicate channel locations and trends and, therefore, the area to be considered for drilling. The plane table was used for horizontal and vertical control with elevations accurate to a few tenths of a foot. Underground and surface exposures of the ore-bearing sandstone were examined and described in detail, surveyed with a Detectron counter, and where necessary, sampled for chemical analysis.

In order to facilitate interpretation of the accumulated data, it was compiled in the form of four structure contour maps; one on the top of the Cutler formation (pl. I), two on the base of the Shinarump conglomerate (pls. II and III) (one corrected for regional dip and post-deposition structural deformation), and one structure contour map corrected for regional dip on the base of the Shinarump conglomerate in the Happy Jack mine (pl. V); and one cross section (pl. IV).

Owners and Operators

The names and addresses of the claim and mine owners in the area are as follows: Joe E. Cooper, Monticello, Utah; Grant and Fletcher Bronson, Monticello, Utah; White Canyon Mining Company, Cortez, Colorado; Vanadium Corporation of America, Durango, Colorado. These owners have staked overlapping claims and legal opinions will have to be rendered to decide ownership.

Map and Photo Coverage

Aerial photographs were made of the area by the U. S. Soil Conservation Service in 1940. Data from these photographs were recently compiled by the U. S. Atomic Energy Commission in the form of a planimetric map to the scale one inch equals 2,640 feet.

Previous Work

Several examinations have been made and reports written on the Happy Jack mine, but no work has been done on the Shinarump conglomerate on either side of the mine. The following have reported on

HISTORY OF OPERATIONS

The only production in the area has been from the Happy Jack mine. It started producing in 1949 and through March 1951 has yielded 6,875 tons of ore assaying 0.45% U₃O₈. Currently, the Happy Jack production is about 30 tons per day. Only assessment work has been done on the other claims in the area with the exception of two claims where two 60-foot crosscuts were driven into the outcrop by Vanadium Corporation of America.

The U. S. Atomic Energy Commission drilled three holes and started a fourth into the Shinarump as part of an investigational drilling program. (See pl. III.) Of the three completed holes, all cut weak copper mineralization and one yielded weakly radioactive core.

GEOLOGY

Sedimentary rocks exposed in the Happy Jack mine area range from the Permian Cedar Mesa formation through the Jurassic Wingate formation. See Figure 2 for the generalized geologic column. The uranium-bearing sandstone is the mid-Triassic Shinarump, a lenticular, channel deposited, conglomeratic sandstone. In several Atomic Energy Commission reports, this sandstone has been termed Moenkopi formation, but the U. S. Geological Survey has recently concluded from regional evidence that the formation should properly be correlated with the Shinarump.

The regional structure is one of gently dipping beds, the strike and dip being N. 15° W., 2° SW. Locally, however, the strike and dip of the beds are N. 31° W., 5° SW. The beds are warped into very slight folds, imperceptible to the eye. It would appear that the mineralization in the Happy Jack has not been controlled by these minor features, since the deposit occurs off the crest of one of the highs, as shown by the structure contours on Plate I. The regional structure of this area was mapped with the plane table on top of the Cutler formation, which is marked in White Canyon by a rather conspicuous white, sandy, cherty lime pebble conglomerate. A few miles northeast of the Happy Jack mine and across White Canyon is a synclinal feature which appears to have its axis oriented toward the
Happy Jack mine. If this is actually the structural picture, it may have an important bearing on the localization of ore in the Happy Jack. However, to establish this possibility as a fact would require detailed mapping an area of about 40 square miles in the vicinity of the Happy Jack mine.

Geology of the Deposit

The mineralization in this area, as elsewhere in White Canyon, occurs only in a well-defined channel. The existence of this channel is indicated by the lithology of the Shinarump where it outcrops southeast of the Happy Jack mine. Mapping with the plane table, however, was necessary to precisely locate its position and indicate its trend. Contours drawn on the base of the uranium-bearing Shinarump conglomerate, using relative elevations, do not clearly outline the channel picture (pl. II). It was necessary, therefore, to correct the contours for regional dip and post-deposition structural deformation (pl. III). These corrections, when applied, assume that the top of the Cutler formation was a plane at the time of the Shinarump deposition. This assumption, while not precisely correct, is not so unreasonable as to materially alter the true channel picture.

It can be seen from the structure contours on Plate III and Plate IV that a well-defined channel enters the rim 3,600 feet east of the Happy Jack mine on a bearing about N. 15° W. It can be followed northward about 2,400 feet to a point where it swings to the west, and loops to a nearly due south bearing where it enters the rim at the Happy Jack mine. Observations of cross-bedding, both in outcrop and in mine workings, suggest that the direction of current flow was to the south in the Happy Jack portion.

The Happy Jack mine was mapped with close elevation control on the base of the Shinarump in order to determine how the ore occurs in relation to the channel structure. After the elevations are corrected for regional dip, it can be seen that the ore occurs practically in the bottom of the channel, but underground observations suggest no particular relationship to the minor bottom features (pl. V). High-grade ore occurred most often in the lower portions, but often enough on the highs to indicate that only the larger channel feature was of significance in the localization of ore.

Mineralization is confined to the lower portions of the channel as shown by the sample values (taken from the best mineralized outcrops) and the position of the Happy Jack mine as shown on Plate III. Similarly, alteration of the red Moenkopi sandstone beneath the Shinarump contact is more intense under the lower parts of the channel, and
nearly absent high on the sides of the channel. This fact is illustrated in Plate IV and also on Plate III where the thickness of alteration is plotted along the line of outcrop. The alteration is only occasionally exposed, but often enough, so that in itself, it is a clue to the position of the bottom of the channel.

The mineralogy of the Happy Jack mine has been rather thoroughly studied. Perhaps the most comprehensive work has been done by J. W. Gruner and L. Gardiner (Annual Progress Report for 1950). The most important uranium minerals found are: pitchblende, johannite, torbernite, uranophane and zippeite. The principal primary copper minerals are: chalcocite, bornite, covellite, and chalcopyrite. Pyrite and erythrite (hydrous, cobalt arsenate) are also present. The oxidized copper minerals present are: malachite, azurite, antlerite, chalcantite, and brochantite. Along the outcrop southeast of the Happy Jack mine are found uranium and copper minerals which are the same as the oxidized minerals in the Happy Jack.

SUMMARY AND CONCLUSIONS

After the field work and map making were completed on this project, several conclusions can be drawn:

1. The channel feature in the rim southeast of the Happy Jack mine is part of the same channel as that in the mine. The channel width is variable, but attains a maximum of 2,400 feet in this area.

2. The grade of uranium mineralization in the unexplored channel bottom on the outcrop is nearly as high as that on the outcrop of the Happy Jack mine, therefore, it is reasonable to suspect that very good mineralization exists in the rest of the channel.

3. Alteration is most intense at or near the bottom of the channel and is a guide to the position of the bottom of the channel.

4. There is no apparent relationship between the occurrence of the ore and the regional structure in this area.

5. In many localities in the White Canyon area, channel structures cannot be discerned by mere inspection. In order to outline the channel at the Happy Jack mine, it was necessary to map the outcrops by plane table and correct the structure contour map for regional dip. (Compare pl. II with pl. III.)
6. Drilling in this area of comparatively high dip may yield evidence on the secondary movement of uranium after the regional dip was imposed on the structure. Such information may have an important influence in future drilling recommendations.

RECOMMENDATIONS

It is recommended that the channel, as outlined by the structure contours on Plate III, be explored for mineralization by diamond bit core drilling. Further, it is recommended that the drilling be conducted in accordance with the pattern indicated on Plate III.

Drilling Program

The drilling of this area should be undertaken as a two-stage program:

1. Preliminary - 6,000 feet in a pattern of widely spaced holes to outline the structure, with one line of closely spaced holes to evaluate the intensity, continuity, and extent of mineralization. (See Plate III where 10,000 feet of hole is indicated)

2. Final - 4,000 feet of offset drilling to explore in detail favorable areas indicated by holes of the first stage.

Although the locations of holes totaling 10,000 feet are indicated on Plate III, it is recognized that the pattern will necessarily be changed as drilling information is outlined.

It is suggested that this area be explored with the core drill. The depths of the holes and the need for accurate data on the lithology and mineralization of channels in the White Canyon area make coring the only desirable method. Depths of holes will range from 50 to 250 feet.

Water can be obtained from the Colorado River which is 14 miles distant. It is probable, however that with the exception of the months of June and July, water may be obtained from nearby dams and reservoirs which might be constructed.

Roads will have to be constructed to each drill site, a total of 2 miles. Nine-tenths of the road can be easily dozed out, while the remainder will require the occasional blasting of large boulders.
BIBLIOGRAPHY


FIG. 1
INDEX MAP OF
COLORADO PLATEAU
July 1951

--- Paved roads
--- Unimproved roads

40 20 0 40 MILES
Fig. 2

GENERALIZED GEOLOGIC COLUMN
OF SAN JUAN COUNTY, UTAH
TAKEN FROM U.S.G.S. P.P. 138
Plate I - Structure Contour Map of Happy Jack Mine Vicinity, White Canyon, Utah.
Plate II - Structure Contour Map of Happy Jack Mine Vicinity, White Canyon, Utah.
EXPLANATION

Copper mineralization

Feet and Detreck counter reading in Survey:

Average bearing N W E

Dashed outcrop lines are those projected to plane of section.

NOTE: Position of section shown on PLATE II

Plate IV - Section in Happy Jack Vicinity, White Canyon, Utah.
Plate V - Happy Jack Mine, White Canyon and Red Canyon, Utah.