RME-138

UNITED STATES ATOMIC ENERGY COMMISSION

GRAND JUNCTION OPERATIONS OFFICE

PRODUCTION EVALUATION DIVISION

FOOTHILLS MINE, IDLEDALE DISTRICT
JEFFERSON COUNTY, COLORADO

By

Jerome D. Schlottmann

March 1961
(Grand Junction, Colorado)

I35

OFFICE MEMORANDUM . UNITED STATES GOVERNMENT

TO : R. D. Nininger, Assistant Director DATE: MAR 28 1961
Geology & Resource Appraisal, DRM, Washington

FROM : Elton A. Youngberg, Assistant Manager
for Operations, GJOO

SUBJECT: TRANSMITTAL OF REPORT RME-138

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FOOTHILLS MINE, IDLEDALE DISTRICT
JEFFERSON COUNTY, COLORADO

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INTRODUCTION

The Foothills mine located one-tenth mile west of Idledale in Jefferson County, Colorado, is owned by Marcus G. Wright and frequently referred to as the Wright Lease (fig. 1). The mine is being operated by the Foothills Mining Company, a subsidiary of the Cotter Corporation, Canon City, Colorado.

As of December 31, 1959, the mine was still in a stage of exploration and development. Production from limited shrinkage stoping and from development work totaled 3,391 tons of 0.31 percent U_3O_8. The ore averaging 13 percent $CaCO_3$, is amenable to a carbonate leach circuit.

The vein is reached by a 470-foot adit and has been explored on the adit level by 385 feet of drift. A 192-foot winze has been sunk from the adit level. Levels have been opened at 86 and 186 feet below the adit level.

GEOLOGIC SETTING

The Idledale district (fig. 1) includes two uranium mines (Foothills and Grapevine) and several uranium prospects in an area of slightly less than one square mile. Rock outcrops in the central part of the district are visibly altered and stained with limonite. The uranium occurrences lie on the outer limits of the altered area.

The area is underlain by the Precambrian Idaho Springs formation which locally consists largely of quartz biotite foliates with some amphibolite beds. Chonolithic masses of quartz monzonite, apparently products of granitization, crop out in and adjacent to the district.

Two Laramide shear zones intersect in the southeast part of the district. The Bear Creek zone trends westerly across the south side of the district, and the Sawmill Gulch zone strikes north-northwest across the east side.

Two types of breccia bodies, apparently pipes, have been observed in the west and west-central parts of the district. One type is characterized by poorly-sized, angular fragments in a vuggy, fine-textured quartz matrix. This type has been observed only in the quartz monzonite, and shows irregular, gradational contacts with the country rock. It is regarded as an early feature, having been displaced by the Foothills vein fracture.

A second type of breccia, not restricted to the quartz monzonite, shows sharp contacts with both quartz monzonite and foliated country rock. It is characterized by fragments of relatively uniform size in a granular carbonate matrix, and contains fragments of the earlier quartz-cemented breccia. The origin of this breccia is not known, but paragenetic similarities with the early mineral suite of the Foothills vein suggest that the breccia may be of the same age as the Foothills vein structure.

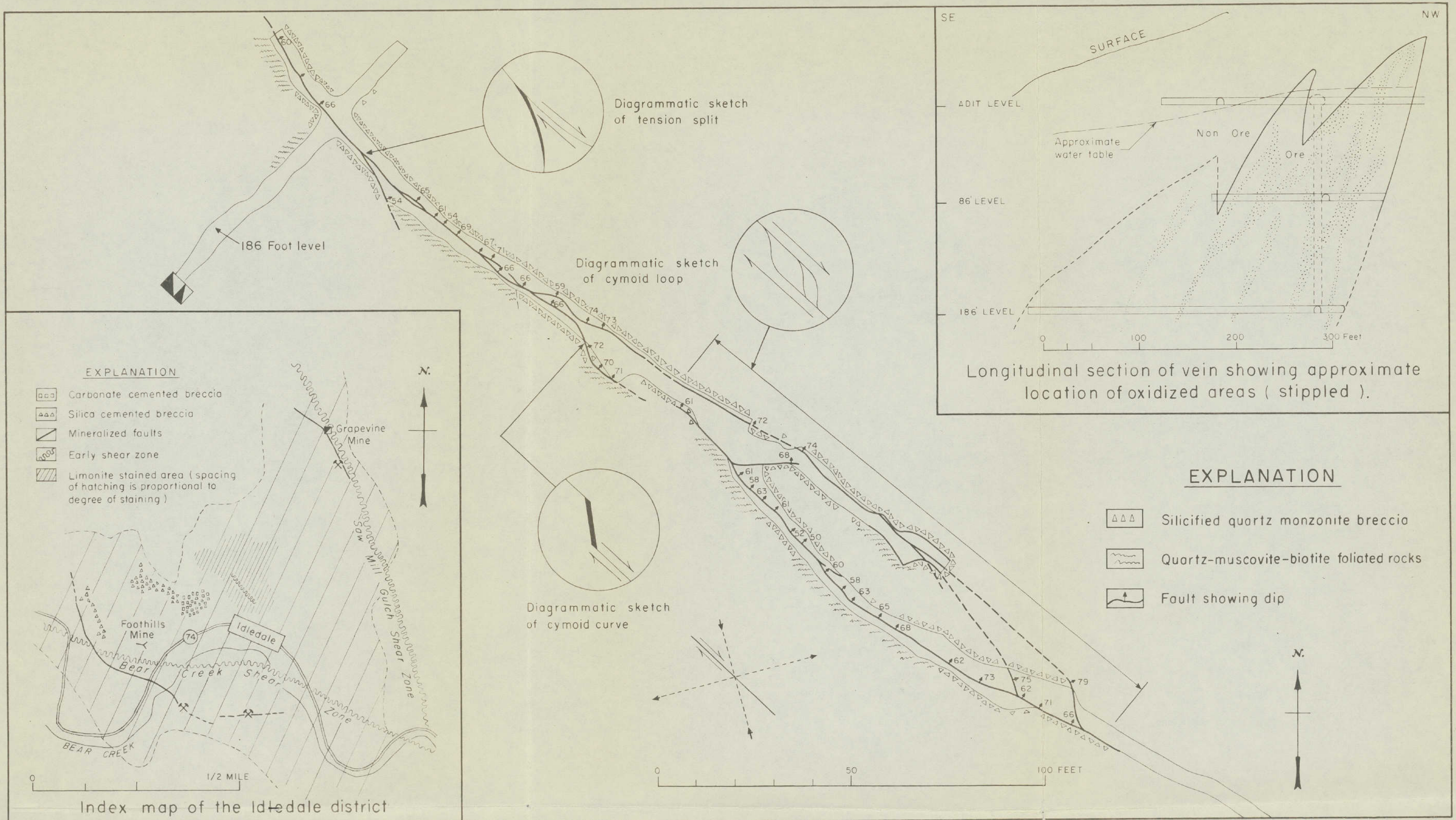

Figure I. Plan and section of the Foothills Mine

THE FOOTHILLS VEIN

The Foothills vein, occupying a fissure fault, forms an arcuate trace for 2,000 feet across the southwest quadrant of the Idledale district (fig. 1) The strike ranges from N. 20° W. in the west part of the district to N. 60° W. in the south part. The dip is easterly, ranging from 50 to 80 degrees.

The vein cuts the quartz monzonite, the quartz biotite foliates, and the silica-cemented quartz monzonite breccia. Commercial ore occurs where this competent breccia forms the hanging wall. The vein deflects to the right and ore grade increases at or shortly beyond contacts where it enters areas where quartz monzonite breccia forms both the hanging wall and footwall.

Dilated zones along the vein have been filled with late rhythmic bands of calcite and pyrite. Where these dilated zones are still open, to widths as great as two or three feet, the surfaces are coated by drusy calcite and pyrite, and by coffinite and sooty uraninite.

Wall Rock Alteration

Two periods of wall rock alteration are evidenced along the vein. The earlier alteration is found only in the brecciated quartz monzonite. This is characterized by silicification, sericitization, and the development of hematite. The Foothills vein fault formed later, cutting both the altered quartz monzonite breccia and unaltered foliates. Solutions moving along the vein subsequently altered all types of wall rock for a width of several feet, with development of minor amounts of chlorite, pyrite and carbonate. Thus the quartz monzonite breccia is more intensely altered because it was subjected to two periods of alteration, as compared to only one stage of alteration for the foliates.

Mineralogy

Ore and metallic vein minerals found in the vein are pitchblende, coffinite, chalcopyrite, galena, sphalerite, marcasite, limonite, and pyrite. Non-metallic gangue minerals are potash feldspar, carbonate, quartz, chlorite, and fluorite.

Paragenesis of the Vein

Vein filling was accomplished in two stages. The first stage consisted of filling of the fracture by granular-textured microcrystalline carbonate, pitchblende, and potash feldspar. The second stage of vein development is manifested by brecciation of minerals of the first stage, and by cementation of the breccia by fluorite, coarse crystalline carbonate and sulfides. During this stage, potash feldspar and pitchblende were partly replaced by carbonate. Subsequent oxidation of the upper part of the vein resulted in deposition of mixtures of coffinite and sooty uraninite thought to be of secondary or supergene origin immediately below the zone of oxidation. Table 1 relates the mineral paragenesis to geologic events in the district.

<u>Major Events in Order of Occurrence</u>

Major Periods of Activity	1st (Early Laramide)	2nd	3rd	4th	5th	Quiescence
Major Events	Formation of Bear Creek and Sawmill Gulch shear zones	Formation of silica cemented breccias	Formation of carbonate-cemented breccias and Foothill vein fault	Brecciation of early vein minerals; carbonate partly replaced pitchblende & potash feldspar	Gravity faulting	Oxidation and supergene enrichment

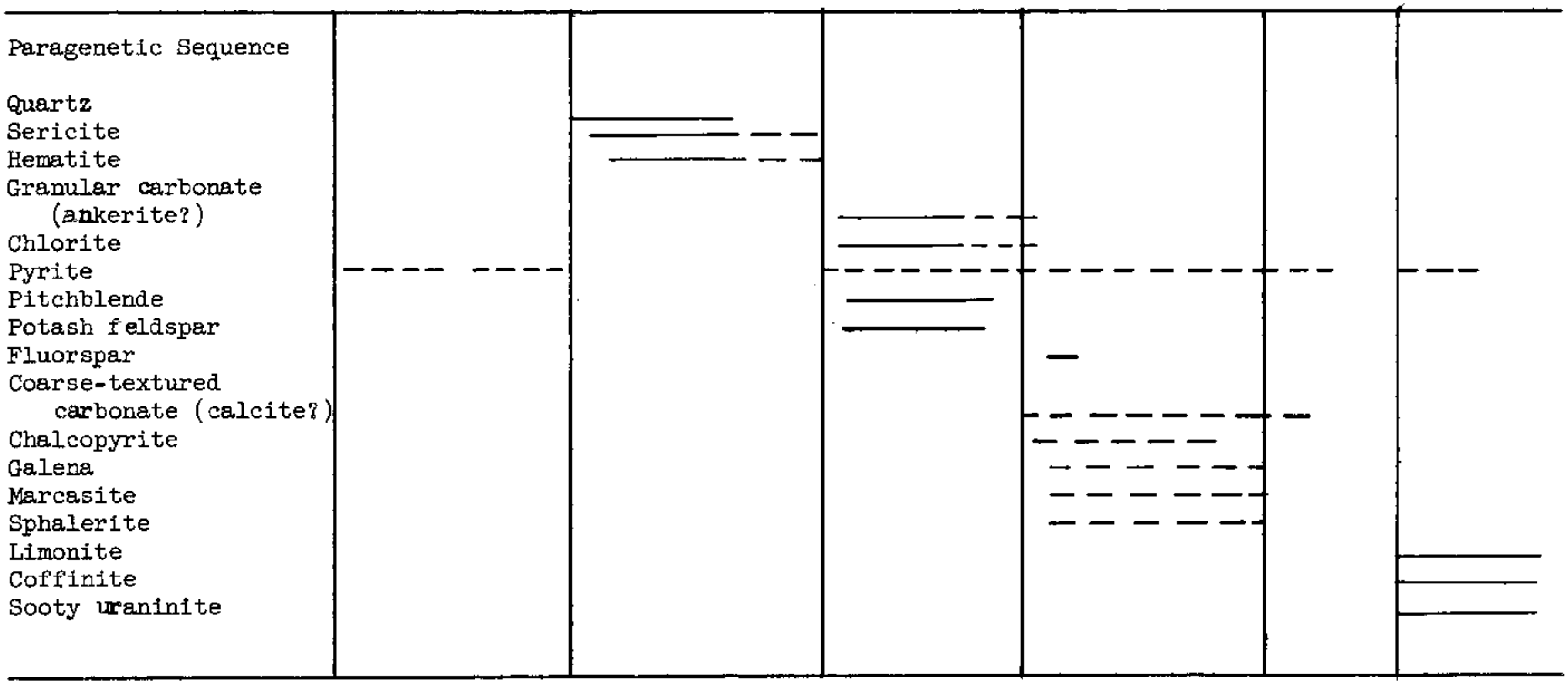

Table 1. Paragenesis as related to major events in the Idledale District.

Ore Shoots

There is one large ore shoot in the mine. The profile of this shoot in longitudinal section, as known in the fall of 1959, resembled that of a cock's comb (fig. 1). The base of the individual teeth of the comb would be represented by the 86 level where the shoot begins to finger out like teeth in a cock's comb; the teeth rake northerly updip at about 60 degrees in the plane of the vein. The northwesternmost tooth tapers out 70 feet above the track of the adit level where its dimensions are 5' x 70'. The next tooth to the southeast is separated from the first tooth by 80 feet of barren vein. Its adit-level dimensions are 3' x 18' and it tapers out upward about 30 feet above the track. Other teeth to the southeast did not reach the adit level. Ore has been developed for a rake length of 300 feet above the 186-level drift and is present in the floor. The average thickness is about 5 feet at 0.31 percent U_3O_8, with dilution included, but in places the vein can be mined to thicknesses of 15 feet.

Ore Control and Localization

Field and laboratory studies suggest that the pitchblende was deposited as the result of a decrease in pressure and temperature of the ore solution.

The chief factor in localization of ore was varying competence of the wall rock. In the more competent rocks, the vein fractures deflect to the right, forming simple tension splits and cymoid curves.

Supergene Enrichment

The vein outcrop is stained by limonite and leached of all soluble sulfide minerals. With the exception of a trace of autunite, all uranium minerals have been leached from the outcrop. Radiometric values of selected specimens are as high as 0.20 percent eU_3O_8, but chemical assays show only a trace of uranium.

Fingerlike oxidized zones, representing watercourses, extend down the dip of the vein; they have been observed as deep as the 186-level. Oxidization generally does not extend across the full width of the vein. Immediately adjacent to the oxidized areas, the vein openings are coated with pyrite. Ten to twenty feet away, a dark uraniferous film develops on the pyrite. This film progressively increases in thickness away from the oxidized areas; it is a dense black coating up to one millimeter in thickness, chiefly on pyrite, at distances of 50 to 60 feet from the oxidized areas. This coating is present in portions of the vein that are devoid of early pitchblende. X-ray analysis of the material shows that it is a mixture of coffinite with a small amount of sooty uraninite. Assays of this material show that it is out of equilibrium by a ratio of 2.25:1, chemical to radiometric. Samples of early pitchblende, taken from breccia fragments imbedded in late calcite an inch or two beneath the coating of supergene coffinite and uraninite, were found to be in equilibrium.

The relationships described above suggest that the thin coating of coffinite and sooty uraninite is the product of supergene enrichment. Regardless of its origin this thin surface coating has greatly increased the grade of the ore body.