7/18/55

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

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224 New Customhouse
Denver 2, Colorado

July 14, 1955

Memorandum

To: Secretary to the Operating Committee, DMEA

From: DMEA Field Team, Region III

Subject: Joint Report of Examination, DMEA Docket 3735 (Uranium), Joel L. Starnes, Silver Cliff mine, Niobrara County, Wyoming

Enclosed are the original and three copies of the report pertaining to the above application.

We concur in the recommendation of the field examiners that the application be denied.

DMEA Field Team, Region III

W. M. Traver

W. M. Traver

E. N. Harshman

E. N. Harshman

Enclosures

DMEA
Date Rec'd

JUL 13 1955

BUREAU OF MINES
Denver, Colorado

TRANSMITTED
JUL 14 1955

Region III

Building 20, Room 137
Denver Federal Center
Denver 2, Colorado
July 8, 1955

RECEIVED
JUL 12 1955

Memorandum

To: Executive Officer, DMEA Field Team, Region III

From: E. N. Harshman and John F. Shaw

Subject: DMEA 3735, (Uranium) Silver Cliff mine, Niobrara County, Wyoming, Joel L. Starnes

Enclosed are the original and eleven copies of a joint engineering and geologic report by R. L. Belmer, mining engineer, Bureau of Mines and D. R. MacLaren, geologist, Geological Survey, covering docket DMEA 3735.

The applicant requested exploration assistance in the amount of $27,818.70 to explore the Silver Cliff mine. A field examination was made by D. R. MacLaren of the Geological Survey and R. L. Belmer of the Bureau of Mines on March 17 and 18, 1955.

The examining team concluded that the deposit had already been extensively explored and developed and that any additional exploration would not result in a significant discovery of uranium.

It is recommended that the application for exploration assistance be denied.

E. N. Harshman

E. N. Harshman
Member, Field Team

John F. Shaw

John F. Shaw
Supervising Mining Engineer

Enclosures

cc 11
DMEA 3735
Chron

JFS/ph

RECEIVED
JUL 13 1955

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION XII

DMEA 3735

Silver Cliff Mine

Joel L. Starnes

Niobrara County, Wyoming

Uranium

Joint Engineering and Geologic Report

by

R. L. Bolmer, Mining Engineer
Bureau of Mines

D. R. MacLaren, Geologist
Geological Survey

June 29, 1955

DMEA 3735

SILVER CLIFF MINE
JOEL L. STARNES
NIOBRARA COUNTY, WYOMING

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Geologic map, underground workings, and sections of the Silver Cliff Mine, Lusk, Niobrara County, Wyoming..... at end of report

DMEA 3735

SILVER CLIFF MINE
JOEL L. STARNES
NIOBRARA COUNTY, WYOMING

INTRODUCTION

Joel L. Starnes, P. O. Box 151, Lusk, Wyoming, made application for aid in an exploration project, pursuant to DMEA Order 1, under the Defense Production Act of 1950, as amended. The applicant proposed a two-stage project of exploration for uranium at the Silver Cliff Mine near Lusk, Niobrara County, Wyoming, which he estimated would cost a total of $27,818.70.

The property, which the applicant has under lease, covers only the northernmost sections of the Silver Cliff fault and includes only part of the old surface and underground workings along that structure. As a first stage of the project, the applicant proposes to explore the contact of the Cambrian quartzite with the underlaying pre-Cambrian schist along the footwall side of the fault by means of a 200-foot inclined adit. As a second stage, he proposes to explore the fault at greater depth in the schist by means of 4,000 feet of core-drilling from a lower tunnel level of the mine. The proposed second stage drilling would entail the reopening and rehabilitation of some 600-feet of the lower tunnel level.

The application, dated March 15, 1955, was received by the Defense Minerals Exploration Administration, Washington, D.C., on March 23, 1955. The application was reviewed, assigned Docket No. DMEA 3735, and, on April 21, 1955, was referred to the DMEA Field Team, Region III for

investigation, for field examination if warranted, and for recommendations. The property was examined by D. R. MacLaren of the Geological Survey and R. L. Bolmer of the Bureau of Mines on March 17 and 18, 1955. The examination was made with the applicant.

This report is based on the results of the field examination and is prepared for the purpose of aiding the Field Team, and others concerned, in evaluating the applicant's request for exploration assistance.

LOCATION, TOPOGRAPHIC, AND PHYSICAL FEATURES

The Silver Cliff Mine is located one-half mile west of Lusk, in section 7, T. 32 N., R. 63 W., sixth principal meridian, Niobrara County, Wyoming, (fig. 1). Lusk, a town of 2,000 population in east-central Wyoming, is the county seat and the center of the local oil production and refining industry. The town is at the junction of U. S. Highways 20 and 87 and is a shipping point on the Chicago and Northwestern Railroad.

The elevation of the mines is about 5,200 feet above sea level. It is located near the top of Silver Cliff Hill, a prominent topographic feature that rises nearly 300 feet above the surrounding plains. The rangeland surrounding the property contains no timber suitable for mining purposes. Sufficient water for most exploration and production operations is available from Niobrara Creek, a small permanent stream on the northern boundary of the property. The mine workings are accessible via a steep unimproved road that extends from the western outskirts of Lusk. The nearest uranium ore purchasing depot is located some 70 miles northeast of the mine, at Edgemont, South Dakota.

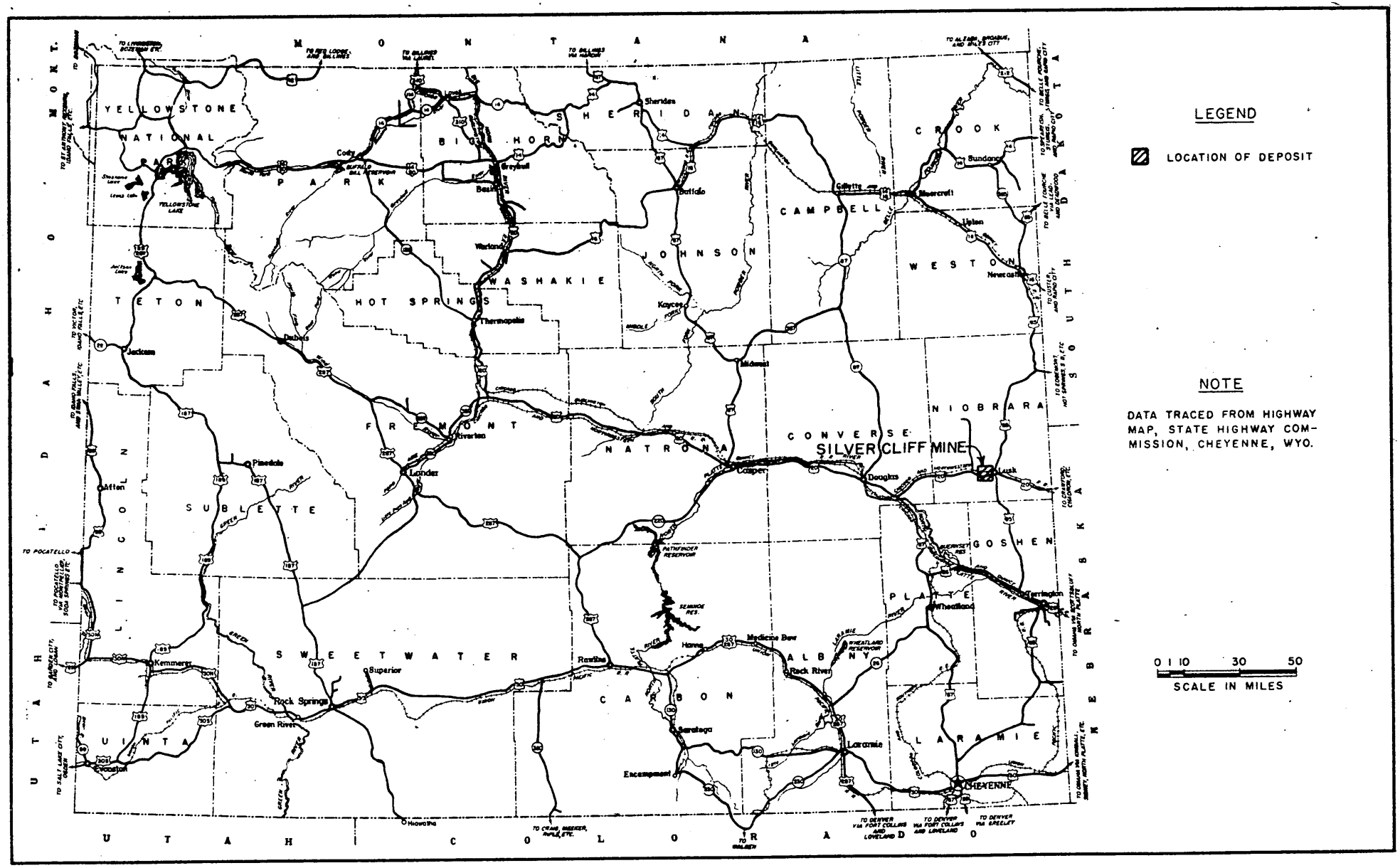

FIGURE 1 - LOCATION MAP, SILVER CLIFF MINE, NIOBRARA COUNTY, WYO. (JOEL L. STARNES DMEA 3735)

HISTORY AND PRODUCTION

High grade silver-copper ore was discovered along the Silver Cliff fault in 1879 and, in 1880, the Great Wyoming Mining and Milling Company was organized to develop and mine the indicated deposit. The company built a 400-ton amalgamation mill on the property which operated only intermittently as the grade of the ore proved lower than anticipated. Between 1880 and 1884, a 285-foot shaft was sunk from the top of Silver Cliff Hill and the 1,200-foot creek level tunnel was driven from the north side of the hill to intersect with the bottom of the shaft. A winze from the tunnel was abandoned because of excessive water. Intermediate and upper level tunnels were extended into and through the hill. The copper-silver production during this period mainly was from surface pits and small underground stopes along the fault. The mine was abandoned in 1884 and the mill dismantled in 1886.

Between 1918 and 1922, the property was leased by E. D. Lorimer, who constructed a small mill and reworked the old mine dumps for their radium content. Some selective mining along and above the upper tunnel was performed. From 4 to 6 carloads of ore containing about 3 percent uranium oxide reportedly were shipped from the property during this period.

The property was idle until 1950 when the Wyoming Uranium Company leased the ground and began hand sorting the old dumps. Seven carloads of uranium ore, reportedly averaging better than 0.3 percent U_3O_8, were shipped to the Vitro Chemical Company, Salt Lake City, Utah, during 1951-52. The company was dissolved in May 1952 due to difficulties

arising with the landowner and lessee of the south portion of the property. Joel L. Starnes, one of the officials of the former company and the applicant for exploration assistance, later the same year obtained a lease on the north end of the property and organized the Uranium Development Corporation. Since that time, spasmodic operations have been carried out on the north end of the deposit. About 250 tons of ore ranging from 0.15 to 0.68 percent U_3O_8 were shipped to the buying station at Edgemont. Part of this ore was mined from the old open cut at the north side of the hill; the remainder was hand sorted from old dump material and mill tailings. The applicant leased the north end of the deposit under his own name in January 1955 and continued spasmodic work at the mine. Application for Government assistance in an exploration project at the property was submitted to the Defense Minerals Exploration Administration in March 1955.

OWNERSHIP AND EXTENT

The property leased by the applicant comprises an area of some 25 acres located in the SW1/4NE1/4 section 7, T. 32 N., R. 63 W., sixth principal meridian, Niobrara County, Wyoming. The property extends north of the east-west fence line that crosses the crown of Silver Cliff Hill (Plate 1, U.S.G.S. Bul. 1009-A). Only about one-fourth of the developed length of the Silver Cliff fault lies north of the fence line on the applicant's lease.

The surface rights to the property and one-half the mineral rights are owned by Helen F. Lincoln. The remaining mineral rights are owned by the Butler Corporation, a defunct Wyoming corporation.

The owners have leased the property to the applicant for a period of one year beginning January 10, 1955. The lease is renewable yearly upon an annual payment to the lessors of $500.00. The lease provides for royalty payments to the lessors in the amount of 10 percent of the sale price of the ores extracted and sold from the property.

The railroad right-of-way crosses the northernmost end of the applicant's lease. Although the fault may extend into this area, the upper ore horizons have been eroded and are not present on the northern sections of the lease.

The applicant was to have submitted a map showing the extent of his holdings. Such a map had not been submitted to the date of this report. A rather confusing and incomplete description of the extent of the property is given in the copy of the lease which is included with the application.

The major portion of the deposit occurs south of the east-west fence line on property owned by Mrs. Jannsetta Hale, who reportedly will not lease the ground to this particular applicant.

GEOLOGY AND DESCRIPTION OF THE DEPOSIT

The geology of the Silver Cliff Mine has been described in U. S. Geological Survey Bulletin 1009-A by Verl R. Wilmarth and D. H. Johnson (1954), and in U. S. Atomic Energy Commission RME-1068 by Charles F. Bromley (1953). These two papers have been freely drawn upon in preparing this report. A reproduction of Plate 1 of Bulletin 1009-A (Geologic map, underground workings,

and sections of the Silver Cliff Mine, Lusk, Niobrara County, Wyoming.) has been included with this report.

Rocks in the area of the Silver Cliff Mine are steeply dipping schists of Precambrian age, unconformably overlain by gently dipping Cambrian quartzite. The schist is essentially quartz-biotite with some muscovite and plagioclase. Below the zone of oxidation the schist contains graphite, hematite, specularite, and pyrite as masses and blebs along the planes of schistosity. Within the schist there are a few small lenses of pegmatite also Precambrian in age. The quartzite is light buff to dark reddish brown in color, and massive with only slightly noticeable bedding. For the most part the grains are water worn fragments of quartz and feldspar that have been cemented by silica and calcite. Within the quartzite there are intermittent lenses of conglomerate and siltstone.

Both the schist and the quartzite have been displaced by the Silver Cliff fault, a high angle reverse fault that strikes N. 20° E. and dips 65° to 70° SE. Movement along the fault has placed schist on the hanging wall side adjacent to quartzite on the foot wall side, the stratigraphic throw being about 70 feet.

Minerals of silver, copper, and uranium occur in the quartzite within 25 to 30 feet of the fault, and to some extent along and near the fault in the schist as coatings along fractures, fillings in calcite veins, and irregular replacement bodies. Of four uranium minerals, pitchblende, gummite, uranophane, and metatorbernite that have been identified from the Silver Cliff Mine, uranophane is by far the most abundant. The uranium minerals are associated with

Native copper and silver, chalcocite, malachite, azurite, cuprite, and chrysocolla, in a gangue of calcite, limonite and clinozoisite (1954).

At the time of the examination the only accessible workings on the Starnes property were the upper tunnel and an open cut from which the tunnel enters the hill. The open cut represents the first 80 feet of the original upper tunnel which has been mined to the surface. About 80 feet from the present portal, the upper tunnel is connected by a break-through to a tunnel driven from the south side of the hill about 10 feet below the upper level. Although the south boundary of the Starnes lease is only 40 feet south of the break-through, radiometric readings were made throughout the length of both tunnels. Only within 5 feet of the ends of an old stope above the south tunnel and south of Starnes' lease was radioactivity appreciably above background recorded. Within the area of the stope radioactivity as much as 4 times background was recorded. Wilmarth (1954) reports the following assays of 6 samples he took from the walls around the stoped area:

Sample No.	U_3O_8 (percent)	Description
W-13	0.039	6-foot vertical channel in quartzite (s.s.)
W-14	0.034	" " " " " "
W-15	0.005	4-foot channel in quartzite (sandstone)
W-52	0.72	Chip sample radioactive quartzite (sandstone)
W-53	1.75	" " " " "
W-54	1.66	" " " " "

Of 22 other samples taken by Wilmarth in the quartzite, one assayed 0.11 percent U_3O_8 and the others ranged from 0.001 to 0.03 percent U_3O_8. Of 9 samples taken in the fault zone, one assayed 0.24 percent U_3O_8, while the others ranged from 0.001 to 0.009 percent U_3O_8. Only 2 samples were taken in the schist, and they assayed 0.001 and 0.007 percent U_3O_8, respectively.

PRESENT STATUS OF THE PROPERTY

Exploration and development

The existing development of the deposit, both north and south of the fence line, is shown on Plate 1 of U.S.G.S. Bulletin 1009-A. The underground workings essentially are unchanged since their mapping in 1950. A few pods of ore have been mined from Pit 1 since that time.

In 1952-53, 9 holes aggregating 2,677.5 feet were drilled on the property by the Bureau of Mines on behalf of the Atomic Energy Commission. The Silver Cliff fault was intersected at depths between 100 and 400 feet below the lowest accessible underground workings. Minor radiometric anomalies were detected in five of the holes, but none were of commercial size and grade. The details of this drilling are described in the Commission's report RME-1002.

The south portion of the deposit was leased during 1952-53 by the Edmund Key interests who drilled 504 6-to-9-foot jackhammer exploration holes from the surface trenches and the accessible underground working in the footwall of the fault. Small amounts of ore were blocked out in the south pit, in a pillar just inside the main south portal, and in a stope north of the shaft.

Pit 1 is at the north portal of the upper tunnel. The floor of this open cut is at an elevation of 5,243 feet. The cut is on the fault; it exposes the pre-Cambrian schist on the east, or upthrow side of the fault and the Cambrian quartzite on the west, or downthrow side. The quartzite-schist contact of the downthrow block outcrops on the north slope of the hill at an elevation of about 5,230 feet or some 13 feet below the floor of the cut. The contact dips 4° southeast and, therefore, is at slightly greater depth below the pit level (approximately 25 feet) near the face of the cut. An intermediate level adit was driven into the north slope of the hill at an elevation of 5,190 feet, or approximately 53 feet below the floor of the pit and between 30 to 40 feet below the schist-quartzite contact. A raise along the fault from the adit level holed into the floor of the cut. The connecting raise presently is full of broken rock from the surface operations. The adit level is uncaved; its portal, however, has been blocked by a large boulder.

Mining and milling equipment and other facilities.

There are no existing facilities on the property. The applicant's bulldozer, which was broken down and in need of repairs, was the only equipment observed on the ground during the inspection. The applicant owns a truck, with which he has been hauling the ore produced recently from the property, a core drill, a jackhammer, and certain other smaller equipment and tools. The other equipment that would be needed to perform the proposed project work presumably would be rented.

PROJECT PROPOSALS WITH COSTS

The applicant proposes to drive an inclined adit from the north slope of the hillside for a distance of 200 feet along the schist-quartzite contact in the downthrow, or western, side of the fault. The heading apparently would be driven either along the fault zone or parallel to and only a few feet west of the fault. The 200 feet of adit are estimated to cost a total of $7,094.70, or $35.47 per foot. Upon the completion of this work, the applicant, at his own expense, will perform up to 1,000 feet of necessary or recommended diamond drilling from the adit for the purpose of radiometric probing.

The applicant also proposes a second stage of work which involves the reopening of the lower or creek level tunnel for the purpose of examination and to conduct deeper core-drilling from that level. The applicant estimates that some 600 feet of the tunnel can be reopened and rehabilitated for a total cost of $7,964.00, or $13.27 per foot. The applicant also proposes 4,000 feet of core-drilling from the lower tunnel at an estimated cost of $3.19 per foot, or a total of $12,760.00. The proposed holes would be collared in or near the fault and be drilled in or parallel to the strike and dip of that structure.

The total estimated cost of the two-stage exploration project proposed by the applicant is $27,818.20. The applicant states that the proposed work could commence within 10 days.

TRANSMITTED
JUL 14 1955

CONCLUSIONS AND RECOMMENDATIONS

The past production of uranium from the deposit has been derived from a zone in the Cambrian-quartzite which lies adjacent to, and extends up to 25 feet into, the footwall of the Silver Cliff fault. The upthrow erosional remnant of the quartzite horizon on the hanging wall of the fault was not mineralized. Uranium was not deposited to any extent in the underlaying pre-Cambrian schist. The fault itself at lower depths in the schist, as evidenced by previous drilling on the property, apparently contains only minor uranium mineralization.

The uranium ore zone in the quartzite extends for some 230 feet north onto the ground leased to the applicant. Within the applicant's property, the depth of the zone along the dip of the fault, from its surface outcrop to its contact with the underlaying schist, ranges from 90 to 0 feet. This favorable zone for the occurrence of uranium ore is limited in extent and already has been extensively explored and developed. The zone may yet contain a certain number of undiscovered pockets of uranium ore but such bodies are expected to vary small in size and to be widely dispersed.

The quartzite-schist contact, which the applicant proposes to explore, occurs only a few feet below the floor of the main surface pit and only a few feet above the intermediate adit level. This contact also has been cut at one point by a raise from the adit level.

The same information, as would result from the initial stage of the proposed project, could be obtained at only a nominal cost by (1) cleaning out the raise and exposing the quartzite-schist contact; (2) uncovering the surface outcrop of this contact by hand or with a bulldozer; and (3) drilling a few jackhammer holes from the floor of the pit. The exploration potential of this section does not justify more work or greater expense. The small amount of work and expense that is warranted for the deposit could be performed by the applicant. The amount of work and expense, which would be involved, does not justify Government assistance.

It is concluded that the favorable sections for the occurrence of uranium in the Silver Cliff deposit already have been extensively explored and developed and that any additional exploration of the deposit would not result in a significant discovery. The project proposed by the applicant is not considered the most feasible method of exploring the remaining favorable but untested sections of the deposit. There remains some doubt as to the experience and ability of the applicant and as to whether he could financially undertake his share of the cost of the proposed project.

A denial of the application for exploration assistance at the Silver Cliff Mine is recommended.

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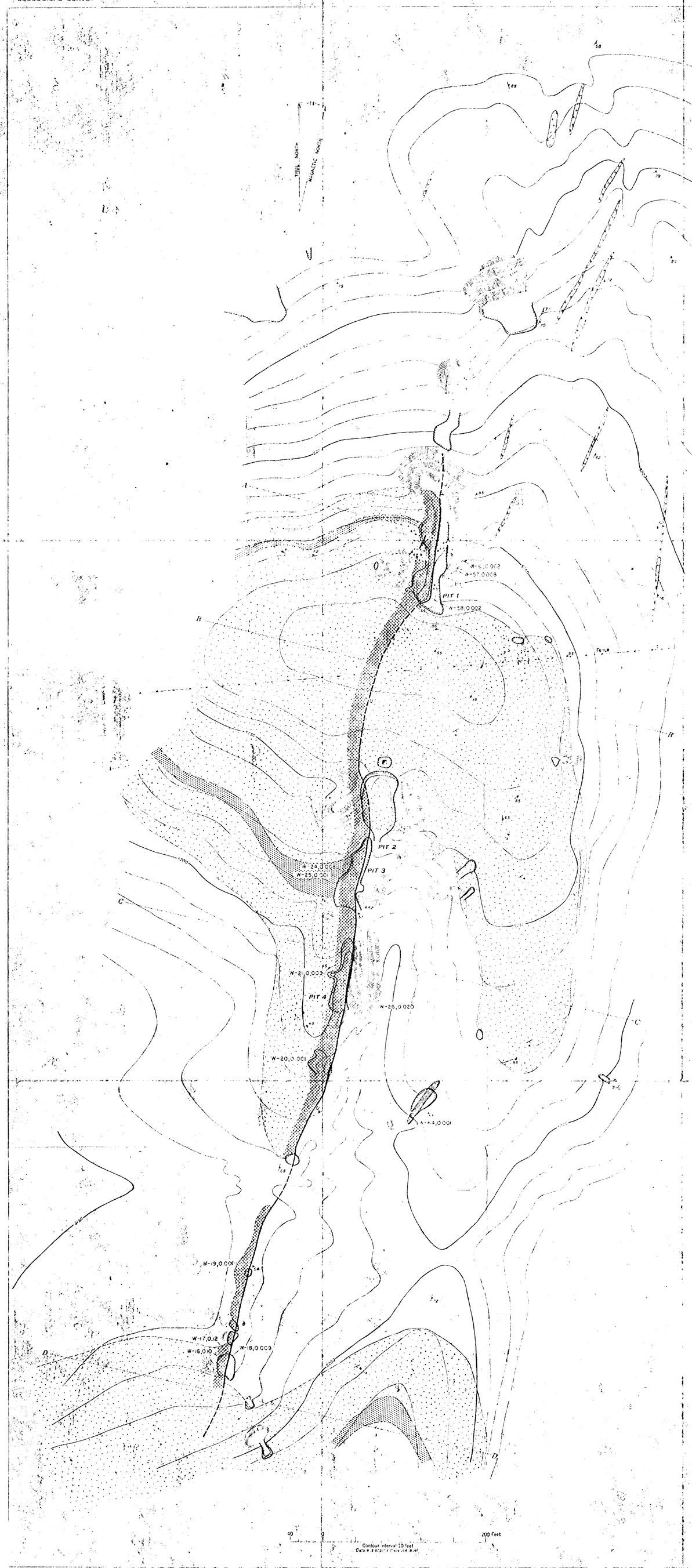

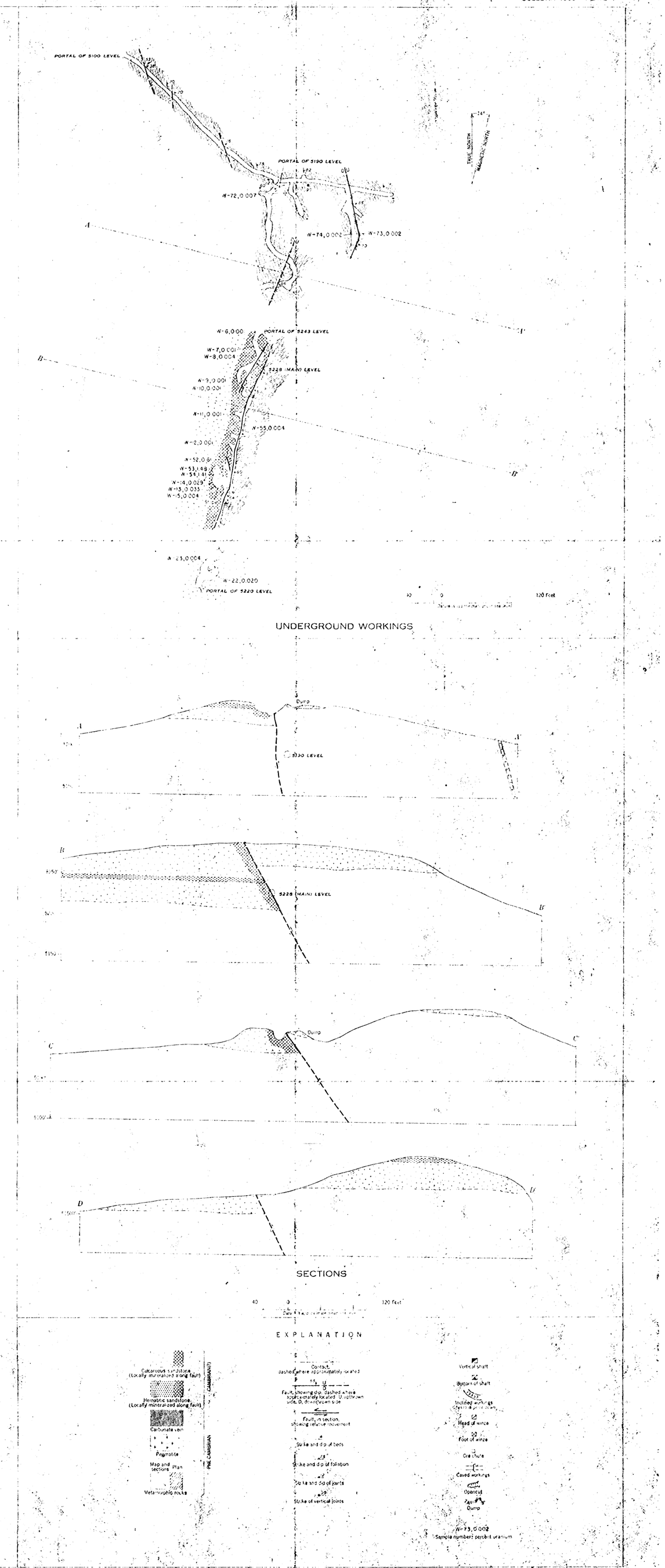

GEOLOGIC MAP, UNDERGROUND WORKINGS, AND SECTIONS OF THE SILVER CLIFF MINE, LUSK, NIOBRARA COUNTY, WYOMING

Geology and topography by R. W. Swanson and D. H. Johnson, August 1951

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