File Copy
Surname

all. Trawell
FEJohnson

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

SEP - 7 1956

Mr. W. E. Remmers
Wee Burn Lane
Darien, Connecticut

Dear Mr. Remmers:

This is with reference to the letter, dated August 30, 1956, that Mr. W. M. Traver, Executive Officer, DMEA Field Team, Region III, wrote to you regarding the submission of an application for Government exploration assistance.

We cannot transfer the application of the Mountain States Metals Company (Copper World mine), Docket No. DMEA-3064, to your Company, the Bobcat Mining Company.

In order to apply for exploration assistance it will be necessary for you to complete in quadruplicate Form MF-103. For your convenience we are enclosing five copies of this form, one to be retained for your files, and the others to be submitted to:

Mr. W. M. Traver
Executive Officer
DMEA Field Team, Region III
224 New Customhouse Building
Denver 2, Colorado

We are also enclosing a copy of DMEA Order-1, Amended, with Amendments Nos. 1, 2, and 3, and a pamphlet entitled "The Defense Minerals Exploration Program".

Sincerely yours,

Frank E. Johnson
ACTING Administrator

JWAlt/er 9/7/56
Copy to: Docket
Admr & File
Op. Committee
Base Metals
Mr. Bishop, USBM
Mr. Kiilsgaard, USGS
Region III (2)
Chron.

Enclosures

P.C.S.

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

RECEIVED
SEP - 4 1956

224 New Customhouse
Denver 2, Colorado

August 30, 1956

Memorandum

To: Secretary to the Operating Committee, DMEA

From: Executive Officer, DMEA Field Team, Region III

Subject: Docket DMEA 3064 (Copper-Zinc), Mountain States Metals Company (Copper World mine), Mohave County, Arizona

Enclosed are two photostatic copies of a letter addressed to the Executive Officer, DMEA Field Team, Region III, regarding the submission of a new application on the subject docket, and two copies of the reply referring the writer to the Administrator.

Please furnish this office with copies of the Administrator's reply to make our files on the docket complete.

W. M. Traver

W. M. Traver

Enclosures

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

RECEIVED
SEP - 4 1956

224 New Customhouse
Denver 2, Colorado

August 30, 1956

Mr. W. E. Remmers
Wee Burn Lane
Darien, Connecticut

Re: Docket DMEA 3064 (Copper-Zinc)
Mountain States Metals Company
(Copper World mine)
Mohave County, Arizona

Dear Mr. Remmers:

Receipt of your letter of August 28, 1956 concerning the captioned DMEA docket is acknowledged.

An application for Government aid in an exploration project was submitted on the Copper World mine under date of May 20, 1953 by the Mountain States Metals Company, G. A. Freeman, Manager. A field examination of the property was made on June 24, 1953 and resulting Reports of Examination submitted to the DMEA Washington Office on July 23, 1953. Subsequently, the Applicant failed to present copies of his Sales Agreement with the owners or Consent to Lien forms, and the application was placed in the inactive files.

Your letter is being referred to C. O. Mittendorf, Administrator, DMEA, Department of the Interior, Interior Building, Washington 25, D. C. He will inform you directly concerning submission of a new application, which will be required in this case.

Very truly yours,

W. M. Traver

W. M. Traver
Executive Officer, DMEA
Field Team, Region III

WMT:prl
cc: Secretary to the Oper. Comm. (2) - w/copy of Remmer's letter.
Docket 3064
Harshman - w/copy of Remmer's letter
Chron.

RECEIVED
SEP - 4 1956

Wee Burn Lane
Darien, Connecticut
August 28, 1956

Mr. W. M. Traver
Executive Officer, DMEA Field Team
224 New Customhouse
Denver 2, Colorado

DMEA
DEPARTMENT OF THE INTERIOR
AUG 30 1956
REGION III
DENVER, COLORADO

Dear Mr. Traver:

The Bobcat Mining Company is completing negotiations for a permit to explore, with an option to lease, the copper-zinc property east of Yucca, Arizona, known heretofore as the Copper World Mine. These negotiations will be complete by September 1, 1956. The prior operator, the Mountain States Metals Company, had applied for a DMEA loan for exploration of the ore body at a lower level, by sinking a shaft, cross-cutting and drifting. The reference is DMEA DOCKET #3064.

We understand that the loan was approved, but the work was never done. I am writing to inquire what procedure is necessary for us to request reactivation and transfer of the loan approval to the Bobcat Mining Company. The mine is in the same condition as when it was examined by the Bureau engineers, and Bobcat Company intends to do the same amount of work, involving the same expenditure as proposed in the original application.

Our Arizona address is:

Bobcat Mining Company
c/o Alexander Grant & Company
First National Bank Building
411 North Central Avenue
Phoenix, Arizona
Attention: Mr. Richard Burgess

For the convenience of the Partners, will you please forward to me, at Wee Burn Lane, Darien, Connecticut, the forms or instructions for applying for the transfer mentioned above?

Yours very truly,

W. E. Remmers, Partner

W. E. Remmers, Partner

wer/mcr

(3)

224 New Customhouse
Denver 2, Colorado

July 23, 1954

Mr. B. T. Whitaker, President
Whitaker Construction Company
315 East 36th Street
Tucson, Arizona

Re: Docket No. DMEA 3064

Dear Mr. Whitaker:

This will acknowledge receipt of your letter dated July 19, 1954 requesting that we make information available on application Docket No. DMEA 3064 to Mr. J. C. Carlile.

On July 22, 1953 and on September 23, 1953, we requested the applicant to submit Owner's Consent to Lien and a copy of his sales agreement with Dye and Bathrik. In our letter to Mr. Freeman dated September 23, we informed him that if this information was not received within thirty days, we would assume that the applicant was no longer interested in the project, and we would close the docket. On October 29, the information has not been received and the docket was closed.

Information assembled by the Bureau of Mines and the Geological Survey during their examinations is of confidential nature for use of the Government only. This information can not be made available by this office to anyone, including the applicant.

In case you wish to do so, you might write Mr. C. O. Mittendorf, Administrator, DMEA, Department of Interior, Interior Building, Washington 25, D. C, and request information from that office.

Very truly yours,

W H King

W. H. King, Executive Officer
DMEA Field Team, Region IV

WHK:es

cc: Subject
Chron.
Mittendorf, w/enc.
Storms w/enc.

WHITAKER
SWIMMING
POOLS

TELEPHONES—OFFICE 3-0245 YARD 3-5553

July 19, 1954

WHITAKER CONSTRUCTION COMPANY
315 EAST 36TH STREET
TUCSON, ARIZONA

U. S. Bureau of Mines
Denver, Colorado

Dear Sirs:

Please extend to Mr. J. C. Carlile any information or records that you have on the Copper World Mine, Mohave County, Arizona.

Mr. Carlile is representing our interests in the Copper World Mine at this time and we would appreciate any and all courtesies you might be able to extend to him.

Yours very truly,

Mountain States Metals Co.

B. T. Whitaker

B. T. Whitaker, Pres.

btw/ryg
copy to J. C. Carlile

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

224 New Customhouse
Denver 2, Colorado

October 29, 1953.

Memorandum

To: Administrator, Defense Minerals Exploration Administration
Attention: 200

From: Field Team, Region IV

Subject: Report of Examination - DMEA Docket 3064 (Copper-Zinc), Copper World Mine, Mohave County, Arizona.

Enclosed are four copies of the Report of Examination on the subject docket.

The applicant has failed to submit Owner's Consent to Lien and a copy of his sales agreement with Dye and Bathrick which we requested July 22, 1953 and September 23, 1953.

We assume that the applicant has lost interest in the exploration work so the docket has been closed.

W. H. King
W. H. King

E. N. Hackman
for A. H. Koschmann

Enclosures

Reviewed by
DMEA OPERATING COMMITTEE
11-6-53
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Mining Division
Region IV

July 23, 1953.

Memorandum

To: Field Team, Region IV

From: Chief, Mining Division, Region IV

Subject: Final Report, DMEA Docket 3064 (Copper-Zinc), Mountain States Metals Company, Copper World Mine, Mohave County, Arizona.

Enclosed are nine copies of the final engineering report on the subject docket.

The applicant requested $29,745.00 for sinking 165 feet of winze and 400 feet of drifting.

The engineer examiner recommends the applicant's exploration proposal and estimated costs.

We concur in this recommendation.

W. H. King
W. H. King

Enclosures

Reviewed by
DMEA OPERATING COMMITTEE
11-6-53
(date)

MINING DIVISION
REGION IV

July 15, 1953

Memorandum

To : W. H. King, Chief, Mining Division, Region IV

From : Chief, Mining Methods Br., Mining Div., Region IV

Subject : Report on Docket DMEA-3064, Mountain States Metals Co.'s Copper World Copper-Zinc Mine, Cedar Valley Mining District, Mohave County, Ariz.

Enclosed are original and 8 copies of the section on Summary, Conclusions and Recommendations by R. F. Robinson of the Geological Survey, and M. J. Elsing and J. H. Soule' of the Bureau of Mines, and the section on Engineering by Elsing and Soule' for the above report. A separate section on Geology already has been submitted by the Geological Survey.

The applicant proposes to sink a 165-foot winze below the 500-foot adit level, then drift for 400 feet along the vein for a total cost of $29,745.00. The examiners believe that a substantial quantity of new ore will be discovered by this work, so recommend a loan to the company. I concur with this recommendation.

Brochure is enclosed.

Walter R. Storms

Walter R. Storms

CC W. H. King (8)
R. F. Robinson
DMEA-3064
DF

WRStorms:frj

Reviewed by
DMEA OPERATING COMMITTEE
11-6-53
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.
200 New Customhouse
Denver, Colorado

July 6, 1953

Memorandum

To: DMEA Field Team, Region IV

From: A. H. Koschmann

Subject: DMEA Docket 3064 (Copper-Zinc), Mountain States Metals Company, Copper World Mine, Mohave County, Arizona

Enclosed are the original and eight copies of the geologic report by Raymond F. Robinson of the U. S. Geological Survey covering the above docket.

It has been recommended that the loan be approved.

A. H. Koschmann
A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures (9)

RECEIVED BY
DMEA GEOLOGIC DIVISION
11-6-53
(Date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P.O. Box 4126, University Station
Tucson 5, Arizona

July 2, 1953

Memorandum

To: A. M. Koschmann, Denver, Colorado

From: R. F. Robinson, Tucson, Arizona

Subject: Docket M-4 3071, (Copper-Zinc), Mountain States Metals Co., Copper World Mine, Mohave County, Arizona

Enclosed please find the original and eight copies of the geologic report on the subject docket. The writer is of the opinion that the majority of the geologic and economic factors involved with this property indicate that a DMEA loan is warranted.

It is suggested that consideration be given to increasing the applicant's program to insure exploration of a new ore shoot recently disclosed which may be beyond the limits of his proposed program of drifting.

Raymond F. Robinson

Raymond F. Robinson
Acting Minerals Supervisor
Arizona - New Mexico

Enclosures 9

Reviewed by
DMEA OPERATING COMMITTEE
11-6-53
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMEA-3064, Mountain States Metals Co.'s Copper World Copper-Zinc Mine

Cedar Valley Mining District

Mohave County, Arizona

R. F. Robinson, Geologist
U. S. Geological Survey

M. J. Elsing, Consulting Mining Engineer
U. S. Bureau of Mines

J. H. Soule', Mining Engineer
U. S. Bureau of Mines

July 1953

Reviewed by
DMEA OPERATING COMMITT
11-6-53
(date)

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

R. F. Robinson,[1] M. J. Elsing,[2] and J. H. Seule'[3]

On June 16, 1953, the Field Team, Region IV, Defense Minerals Exploration Administration, requested that an examination and report be made on the feasibility of an exploration project at the Copper World mine, Cedar Valley Mining District, Mohave County, Ariz. The project is for the exploration of copper and zinc and is estimated to cost $29,745, of which the Government's share will be $14,872.50. The property is owned by Dye and Bathrick of Kingman, Ariz. and is under lease and bond to the Mountain States Metals Co., G. A. Freeman, manager.

On June 23, 1953, M. J. Elsing, J. H. Seule' and R. F. Robinson went to Kingman, Ariz. where they met G. A. Freeman, examined the mine on June 24, 1953, and thoroughly discussed the proposed project with him. The present examination and report supplement a report entitled "DMPA-2352, Mountain States Metals Co.'s Copper World Mine" made by M. J. Elsing and T. M. Hemslo in April 1952.

If the application is approved Freeman states that he would be able to get the "Owners Consent to Lien" agreement from Dye and Bathrick. Furthermore, he agreed to make the entire production of the mine subject to royalty instead of that portion actually covered by the exploration.

The mine is reached from Kingman by following U. S. Highway 66 southwesterly to Yucca, which is located on the Santa Fe Railroad.

1/ Geologist, U. S. Geological Survey
2/ Consulting Mining Engineer, U. S. Bureau of Mines
3/ Mining Engineer, U. S. Bureau of Mines

At Yucca the paved highway is left by turning to the southeast and following a desert road easterly for nearly 17 miles. This road is well signed and is good for the first 15 miles. The last 2 miles is over a mountain road with sharp turns and steep grades.

The accessible workings consist of the 250, 300, 350, 400, and 500 levels. The 500 level is the bottom level of the mine, is an adit, and is the haulage level to the mill.

The ore is localized within a strongly sheared biotite schist which is contained between thick massive bands of gneiss. The formations and the veins stand nearly vertical and strike N. 35° E. The veins have been formed primarily by replacement of the schist by the ore minerals which consist of chalcopyrite, sphalerite with minor amounts of bornite, chalcocite, galena and a little scheelite. Gangue is pyrite, pyrrhotite, quartz, and wall rock.

The ore occurs in several distinct shoots which differ from each other in the tenor of the ore and the ratio of the copper to zinc. In the main shoot the ore has shown remarkable continuity of grade from the surface to the 500 level, and averaged close to 3.0 percent copper and 10.0 percent zinc. Diamond drilling indicated that both the copper and zinc content increases below the 500 level.

Post-mineral movement along a major fault has interrupted the continuity of the oreshoots. The amount of displacement is not known, but appears not to be too excessive. Exploration work below the fault has not been extensive enough to locate the faulted segments of all the oreshoots known above the fault so a number of good targets exist other than those contemplated by the operator under the proposed development plan.

Since the April 1952 DMPA examination, the drift on the 500 level has been extended 250 feet to the northeast. A new oreshoot has been discovered in the vein. This shoot is 100 feet long and approximately 4.5 feet wide. The grade of the ore as shown by mill shipments averages 4.8 percent copper and 6.0 percent zinc. Recent exploration on the 350 level to the northeast has opened 70 feet of ore of a similar width and grade. It may be too soon to say that the new shoot on the 500 level is the downward extension of the 350 level shoot. However, both showings occur in and along a pegmatite dike which is believed to extend from the 500 level to a point above the 250 level. The ore is very similar in appearance and grade on both levels. If the tentative correlation between the levels is correct this shoot exhibits a flat northeasterly rake. This may bring the downward extension of the shoot beyond the limits of the exploration work contemplated on the 650 level and additional drifting may be warranted to explore it.

Another recent development is the drilling of 3 diamond drill holes from the main crosscut adit. One of these holes is directly below the adit. It intersects the vein, which is nearly vertical, at 100 feet below the adit. Holes on each side of this first hole intersect the vein 100 feet below the adit and 100 feet either side of the first hole. Good ore was found in each of these holes which makes it rather certain the main oreshoot extends for at least 100 feet below the 500 adit level.

On the basis of geologic evidence, past development of the mine and production records, it is estimated that about 29,900 tons of indicated ore exists in the main vein and in the new oreshoot above the 650 level. This total tonnage probably will average about 3.9 percent copper and 8.1 percent zinc. It is expected that the oresheets will extend well beyond the limits of the proposed exploration.

In order to explore this downward extension of the vein the applicant proposes to sink a 2-compartment winze from the adit to a depth of 165 feet. At a depth of 150 feet below the level it is proposed to do 400 feet of drifting along the vein. The applicant will expend approximately $10,000 of its funds in preparing for sinking and also will supply the equipment and other facilities. A crosscut from the winze at the 650 level to the vein is included in the company performed work.

The applicant proposes to do the winking at $93.00 per foot and the drifting at $36.00 per foot. These prices are fair and might be low if appreciable amounts of water are encountered.

According to data supplied by the operator, the Mountain States Metals Co. from September 1951 to June 15, 1953 had mined and milled 17,434 tons of ore from the Copper World mine averaging approximately 3.5 percent copper and 8.5 percent zinc. The past operation of the Copper World mine has shown very little profit. This is due to numerous reasons, including the excessive cost of starting the project, the breaking in of a new mill, the drop in the price of zinc, and the shutdown period for diamond drilling and drifting.

Freeman estimates that the present ore reserves and those that will be found by the proposed work will be approximately as follows:

	Tons	Copper, percent	Zinc, Percent
Old workings above the 500 level	18,000	3.0	10.0
New 500 level oreshoot	5,400	4.5	4.5
Section between the 500-650 levels	14,700	4.5	4.5
Total and average	38,100	3.8	7.1

The new 500 level oreshoot and the diamond drilling below the 500 level indicate that the amount of copper and zinc in the ore is increasing. The new ore body to the northeast shows an increase in the quantity of copper and a decrease in the quantity of zinc. The higher grade copper and a steadier production will contribute to a more profitable operation. The profit probably will continue to be small but it should be sufficient to permit continuous operation and the repayment of the loan.

Therefore, it is recommended that the project of the Mountain States Metals Co. be approved on the basis of 165 feet of 2-compartment winze from the 500 adit level, and 400 feet of drifting from the winze on the 650 level. The unit costs of this work will be $93.00 per foot of winze and $36.00 per foot of drifting. The total expenditure will be $29,745.00, of which the Government's share will be $14,872.50.

MOUNTAIN STATES METALS CO.
COPPER-WORLD MINE
MOHAVE COUNTY
ARIZONA
DMEA 3064

COPPER-ZINC

Geology

By
Raymond F. Robinson
Geologist, U. S. Geological Survey

Reviewed by
DMEA OPERATING COMMITTEE

11-6-53
(date)

MOUNTAIN STATES METALS CO.
COPPER WORLD MINE
MOHAVE COUNTY
ARIZONA
DMMA 3064

COPPER-ZINC

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INTRODUCTION

The Copper World Mine (DMEA 3064) was visited on June 24 by the writer and Messrs. M. J. Elsing and J. Soulé of the U. S. Bureau of Mines in order to process the Company's application for a DMEA exploration loan. Mr. George Freeman, general superintendent, conducted the examiners about the property and was very cooperative in providing information pertinent to the processing of the application. Due to the late date at which the application was submitted and received by the examiners, only a brief examination of the mine was feasible in order to allow a report to be submitted to the Field Team by June 30. A more detailed examination would have been desirable. This mine had been examined previously by Mr. Elsing and Mr. Romslo on March 13, 1952, in connection with the owners' application for a DMPA loan. A loan of $15,000 was recommended by the examiners. Workings which had been previously examined by Mr. Elsing were not inspected during the present examination.

LOCATION AND ACCESSIBILITY

The Copper World Mine is located in the Cedar Valley mining district of Mohave County, Arizona, and in section 25, T. 18 N., R. 16 W. It lies in the canyon of an intermittent stream on the west slope of the rugged Hualapai Mountains, at an elevation of about 4600 feet. It lies approximately 17 miles east of U. S. Highway 66 and Yucca, Arizona, a station on the Atchison, Topeka, and Santa Fe Railroad. It is accessible by means of a fair trucking road from Highway 66 to the mine.

GEOLOGY

The country rock at the mine is a thick schist-gneiss complex which trends obliquely at a low angle to the strike of the vein systems of the mine. The complex stands on edge, nearly vertical. The principle vein is localized within a biotite schist zone which is 4 to 10 feet thick and is contained between two massive thick quartzitic gneiss bands.

On the south side of the mine a band of amphibolite has been particularly amenable to mineralization. It appears to consist largely of crystalline amphibole of the actinolite-tremolite series.

On the north end of the mine a fairly large pegmatite dike crosses the schist zone and gneissic banding at a large angle. The dike appears to have continuity along its dip through the 250, 350, and 500 levels as shown on figure 1. When the dike was seen on freshly broken surfaces, Mr. Freeman said that it appeared to cut across the vein shear and to have been emplaced after vein fracturing but prior to sulfide mineralization. The dike does contain a portion of an ore shoot on the 350 and 500 levels where the ore occurs as massive replacement of the dike. If the vein shear occurred in the dike, it was not apparent to the examiner. The dike does not offset the vein fracture. The dike on the 500 level also contains some ore. This dike may be closely associated with ore emplacement.

The rock is strongly jointed in several systems. Flat joints are particularly well formed and facilitate sloughing of the wall rock along the vein. This is an undesirable feature which may cause considerable dilution of the ore, especially where the vein

is narrow. It is believed that wall bolting, which is being initiated, will do much to eliminate or at least minimize extensive sloughing with mining.

Faulting

A strong fault extends through the mine workings and in effect divides the mine into two sections as shown by its trace on the longitudinal section figure 1. The fault strikes N. 55° to 60° W. and dips generally 45° northeast. Above the 400 level it loops and branches as shown. Below the 400 level it consists of one main strand and several feet of shear and shattering. The fault appears to have a small right throw on the vein shear of about 10-30 feet (maximum). The amount of dip slip is not apparent and it may be larger than the throw. The fault may have been pre-mineral in origin but the latest movement has been post-mineral. Good mineralization occurs right up the main fault gouge on the 350,400, and 500 levels. Rotational movement on the fault is suggested by the fact that the vein on the hanging wall dips steeply SE while the footwall dips steeply NW.

Mineralization

The principle ore minerals in the mine are chalcopyrite and sphalerite. Minor amounts of bornite, chalcocite, and galena are sporadically present. Small amounts of fine grained scheelite are present in some of the ore but its importance is insignificant and its occurrence was not investigated at this time. Gangue consists of pyrite, pyrrhotite, and quartz together with considerable amounts of wall rock and biotite.

Veins

The largest and principle vein in the mine strikes North 35-40 degrees east. It dips steeply and irregularly to the southeast in the hanging wall of the fault and steeply NW in the footwall of the fault. It varies in width from a few inches to ten feet and probably averages about 4 to 5 feet. While it is spoken of as a vein, it is in reality a series of replacement zones in the biotite schist. Several lean to barren zones occur in the schist and separate the ore shoots on the "vein." It maintains a rather constant appearance above and below the fault although the copper ratio to zinc is larger above than below.

On the south side of the mine, the northwest wall of the vein is intersected by a series of east-westerly mineralized fractures which occur in the amphibolite band which has been previously mentioned. The area of intersection is the loci of a pipe-like replacement ore shoot which was one of the best in the mine. The location of this shoot is shown on the longitudinal section figure 1. It extended from above the 250 level down to the fault between the 300 and 350 levels and exhibited a steep plunge to the southwest. It has not yet been disclosed below this fault to date. On the lower levels exploration has partially opened up the area which is on the projection of the shoot along its plunge from the upper levels. Since the fault has had post-mineral movement of unknown magnitude, it is quite probable that the scattered high grade stringers and low grade disseminated

mineralization found as the result of this work do not represent the downward extension of the pipe. Supporting evidence for this is the fact that the amphibolite band in which the pipe occurred above the fault has not been found below it.

ORE SHOOTS

Several separate and distinct ore shoots occur in the mine and are shown on figure 1. These have not been explored, developed, or mined to the same extent and some of them are relatively unimportant at the present stage of mine development. Little attention has been paid to the search for faulted segments of some of the ore shoots disclosed on the upper levels. Naturally, most recent work has been done on the number two and the new number five shoot; however, much deserving work could be done on the southwest end of the mine where it is probable that more ore will be found when exploration is done there.

Ore shoots #1 and #2 are faulted segments of the same shoot. They are very similar in appearance and grade of ore. They appear to plunge steeply northeast. Number 1 shoot is bottomed by the major fault and #2 shoot is topped by the same fault. Three diamond drill holes were drilled from the main crosscut on the 500 level and intersected the #2 shoot in three places at 100 feet below the level as shown on figure 1. Ore was thus indicated down to this level. Ore shoot #3, the "pipe" described above, has been mined as indicated on figure 1. It exhibits a southwest plunge and is cut off by the major fault between the 300 and 350 levels. It has not been located below the fault to date.

Ore shoot #4 has not been mined below the 200 level. Although it was small, it contained some of the richest copper ore in the mine and, according to Mr. Freeman, averaged 8.25% copper. It has been partially exposed on the 250 level but has not been found below the major fault as yet.

Work on the #5 ore shoot has not progressed to a stage where the size and shape or trend can be actually determined. The tentative boundaries shown on figure 1 are based on available information. The flat northeasterly plunge of the southwest side appears to be controlled by the pegmatite dike which dips flatly to the northeast. The northeast side is defined only by the barren faces of the 350 and 500 drifts which may represent local barren blocks of unknown size within the vein structure.

PRODUCTION AND GRADE

According to the available data, ore shoots 1, 3, and 4 have produced a total of 34,318 tons of ore from the major fault to the surface as follows:

	Tons	% Cu	% Zn	Year
Dye-Battrick	13,990	3.6	11.2	1943-46
Mountain States Metal Co.	8,920	3.1	11.2	1951-52
Mountain States Metal Co.	11,408	3.5	8.5	To present
Total	34,318	3.4	10.3	

The production from ore shoot #2 according to available data is as follows:

Omega Metals	2500	3.0	10.5	1948-49

Dye-Battrick	1200	Unknown grade	1949-51
Total	3700	Estimated 3.0 Cu and 10.5 Zn	

Diamond drilling beneath the 500 level intersected the vein and #2 ore shoot at 100 feet below the level. Actual intersection widths must be corrected to true widths because the intersections were not made at right angles to the vein which dips steeply to the north below the faults instead of steeply to the southeast as above the fault.

No.	Intersection	T.W.	% Cu	% Zn
DDH A-1	7.0'	4.0'	5.3	13.0
" A-4	6.5'	4.5'	5.1	25.4
" A-3	14.0'	11.0'	3.2	3.8

Ore shoot #5 has produced 1070 tons of ore between the 500 and 350 levels and this production is all development ore. This averaged 4.8% copper and 6.0% zinc.

In general the grade of the ore from the 1, 2, 3, and 4 ore shoots has been very constant from the surface to the 500 level. It appears to have averaged very close to 3.0% copper and 10% zinc. Diamond drilling indicates that both the copper content and especially the zinc content will increase with depth in the main or #2 shoot. In contrast to this, the #5 shoot has shown an increase of copper content over zinc.

ORE RESERVES

The operator has given the following estimate of measured ore above the 500 level on the main vein or #1 and 2 ore shoots:

18,000 tons of 3.0% copper, 10.0% zinc.

This tonnage is contained in the unstoped areas as shown on figure 1. He estimates that he has 5400 tons of indicated ore averaging 4.5% copper and 4.5% zinc between the 350 and 500 levels on the #5 shoot. He also estimates 14,700 tons of indicated ore below the 500 level on the #2 shoot which will average about the same.

The writer is of the opinion that there is a larger tonnage of about average grade ore (3.0% Cu-10.0% Zn) above the 500 level than the operator has estimated. Some of this is not considered by the operator to be mineable by the present methods and it is indicated on figure 1. The operator said that he would not desire to mine this ore which is in the vicinity of the major fault because the broken character of the ground creates excessive dilution. One attempt to mine in this area resulted in a mine grade of only 2.9% copper and 2.6% zinc. It is possible that better mining methods will make this tonnage of ore available in the future. It is estimated that about 4800 tons are in the operator's category of unmineable ore. The writer is of the opinion that the indicated ore on the #2 shoot from the 500 level to the 650 level is 16,200 tons, which will average between 3.0% copper and 10.5% zinc (past production) and 4.1% copper and 10.6% zinc (diamond drill core assay). This is indicated on figure 1.

It is estimated that about 6300 tons of ore are conservatively indicated between the 300 and 500 levels on the number 5 shoot which will average 4.8% copper and 6.0% zinc (the grade of development ore).

This ore shoot should easily extend to the 650 level and an additional 7425 tons of ore are indicated which will probably be of about the same grade as above.

No estimates of inferred ore are made at this time because of the limited time spent on the property. It is, however, believed that the ore on this property will extend well below the 650 level and that there are good potential ore-bearing areas along the vein structure and in the walls both to the northeast and southwest of the present mine workings.

PROPOSED EXPLORATION

The applicant's exploration plan is shown on figure 1. He proposes to sink a two compartment vertical shaft from the footwall of the vein on the 500 level at distance of 165 feet, allowing 15 feet for sump and pocket. On the 650 level he proposes to drift 290 feet northeast and 110 feet southwest. Crosscutting and station cutting will be done at his own expense.

This work is designed to explore the main vein below the intersections which diamond drilling secured and which are shown on figure 1. It is also intended to get beneath the new number 5 shoot. This work is well conceived to explore the main vein shoot (number 2) but it is very likely inadequate to penetrate the downward extension of the number 5 shoot. The indicated plunge of this is much flatter than the operator considered when planning his exploration and the throw of the fault on this shoot is not known. It is also very possible

that the barren interval between the two shoots will materially increase at depth. It is quite possible that the operator could stand the expense of this additional work but in view of the barren interval through which he will have to advance and the uncertainty of the fault relationship to the ore, governmental participation in the risks would be encouraging to the operation and, in view of the conditions described in this report, quite warranted.

CONCLUSIONS

Conditions, both geologic and economic, at the Copper World Mine indicate that a significant amount of ore will be found by exploration. The ore which has been mined, according to available records, has created a margin of profit for the operators although it has not been large.

The ore on the new ore shoot (number 5) and on the extension of the main vein ore shoot below the 500 level is higher in copper than that previously mined. The zinc increases with depth on the latter and the overall zinc content of the former is lower than the mine average. Thus the overall value of the indicated ore is greater than that which has been produced in the past.

The nature of the ore shoots in this mine is that the vertical extent has been at least twice that of the strike length. It is practically assured that the ore shoots will extend to the exploration horizon, or 650 level.

The operator has not adequately explored below the major fault for faulted segments of all ore shoots known to exist above it. Therefore, a number of exploration targets exist in the mine area

other than those contemplated by the operator in the proposed program. This further increases the chances for repayment of the exploration loan since the operator has agreed to subordinate all mine production if the loan is granted.

The operator's plan for exploration should be expanded to allow for sufficient drifting to the northeast to cut the downward extension of the new number 5 shoot. The indicated plunge of this shoot is much less than he considered in planning the program.

RECOMMENDATIONS

The Copper World Mine is well deserving of a EMFA exploration loan and it is recommended that it be granted along the lines suggested by the operator, except that some consideration be given to increasing the amount of drifting to the northeast to allow for a plunge of the number five ore shoot. The indicated plunge is flatter than the operator considered in planning his program.

DMEA-3064, MOUNTAIN STATES METALS CO.'S COPPER WORLD COPPER-ZINC MINE
CEDAR VALLEY MINING DISTRICT
MOHAVE COUNTY, ARIZONA

Engineering Report

By M. J. Elsing, Consulting Mining Engineer
U. S. Bureau of Mines

J. H. Seule', Mining Engineer
U. S. Bureau of Mines

July 1953

DMEA-3064, MOUNTAIN STATES METALS CO.'S COPPER WORLD COPPER-ZINC MINE
CEDAR VALLEY MINING DISTRICT
MOHAVE COUNTY, ARIZONA

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INTRODUCTION

On June 16, 1953, the Field Team of Region IV, Defense Minerals Exploration Administration, requested that an examination and report be made on the feasibility of an exploration project at the Copper World mine, Cedar Valley Mining District, Mohave County, Ariz. The project is for the exploration of copper and zinc and is estimated to cost $29,745 of which the Government's share will be $14,872.50. The property is owned by Dye and Bathrick of Kingman, Ariz. and is under lease and bond to the Mountain States Metals Co., G. A. Freeman, manager.

On June 23, 1953, M. J. Elsing and J. H. Soule' of the Bureau of Mines and R. F. Robinson of the Geological Survey went to Kingman where they met G. A. Freeman. Together with him they examined the mine on June 24, 1953 and thoroughly discussed the proposed project with him. The present examination and report supplement a report entitled "DMPA-2352, Mountain States Metals Co.'s Copper World Mine" made by M. J. Elsing and T. M. Romslo in April 1952.

ACKNOWLEDGMENTS

Acknowledgments are due George A. Freeman, president and general manager of the Mountain States Metals Co., for his courtesy in showing the examining team through the Copper World mine and for furnishing records of production and other data pertinent to the property and the proposed project.

LOCATION, TOPOGRAPHY AND PHYSICAL FEATURES

The Copper World mine is situated in sec. 25, T. 18 N., R. 16 W. in the Cedar Valley Mining District, Mohave County, Ariz. as shown in figure 1. The mine is 16.2 miles by good to fair dirt road east of the town of Yucca, Ariz., a pumping station on the Atchison, Topeka and Santa Fe Railroad. Yucca also in the nearest rail loading and unloading point for the mine.

The mine is reached by travelling westerly, thence southerly from Kingman, Ariz. on U. S. Highway 66 for 23.8 miles to Yucca. At Yucca, turn off the paved highway to the left or southwest on a dirt road for 2 miles, take the left branch and continue easterly, then northeasterly for 14.2 miles to the mine. The road forks are well marked by signs.

The property is situated in a rugged area of the Hualpai Mountains at an altitude of about 5,200 feet. The mine workings vary from an altitude of a little over 5,000 feet on the lowest level to more than 5,400 feet in the upper workings. Steep rocky slopes are characteristic of the terrain. There are no permanent streams in the area and all water for mine, mill, and camp use is pumped from a well within 2 miles of the mine. The mine make a very small amount of water. The average annual precipitation is about 12 inches of which nearly one half falls during the winter months and about one third as summer thunder showers that create flash floods. Winter snowfall usually is light.

The vegetation is typical of the higher altitudes of the desert, and is abundant. There is no timber suitable for mine use at the property. Temperatures range from hot in the summer to cool in the winters. The hot weather usually is not uncomfortable at the altitude of the mine, and winters and freezing temperatures rarely are severe.

Primitive accommodations exist at the mine to care for the operating personnel. Ordinary mine supplies and communication services are available at Kingman, some 40 miles by road to the north. Phoenix, Ariz. is the nearest supply point for major mining equipment and is about 240 miles southeast of the mine by the shortest good road. The mine is serviced by a power line that can supply 750 KVA at 44,000 volts.

HISTORY AND PRODUCTION

The Copper World claim was located in 1882. The property was acquired some time later by James Douglas for the Phelps Dodge Corp. Some prospect work was done and the claim patented in 1889. In the early nineties, several hundred feet of exploration was done and a few cars of high grade sorted ore were packed out and shipped. During World War 1, lessees shipped one lot of ore. In April 1943, Dye and Bathrick acquired a lease from Phelps Dodge Corp. With the aid of a Class "C" loan from the Reconstruction Finance Corporation, the mine was reopened and sampled. Following this an additional loan was obtained for equipping and developing the mine.

From 1943 through 1946, Dye and Bathrick mined 13,990 tons of ore with an average grade of 3.62 percent copper and 11.2 percent zinc. After the expiration of the premium price plan the property was shut down. The Reconstruction Finance Corporation loans were repaid in full.

In 1948 the Omega Metals Co. obtained a lease and bond from Dye and Bathrick by the payment of $10,000 in cash. This payment was turned over to the Phelps Dodge Corp. as the purchase price of the mine. Dye and Bathrick then took title to the property. Omega Metals Co. operated until some time in 1949 when the drop in the price of metals forced the company to suspend operations and relinquish its option after having spent $115,000.

Dye and Bathrick operated the property for a short time, then gave a bond and lease to the Mountain States Metals Co. The price of the property was $100,000. For this bond and lease, the Mountain States Metals Co. paid $15,000 in cash and an interest-bearing note for $5,000. The balance of the $100,000 is to be paid by 10 percent royalty on the net smelter returns. The minimum royalty is $700 per month. In the event that the price of metals drops so that profitable operations are impossible, the option can be kept in good standing by the payment of $350 per month. Royalties are paid directly to Dye and Bathrick by the smelter.

In early 1952, the Mountain States Metals Co. applied to the Defense Materials Procurement Agency for a loan, totalling $75,000 which was to have been repaid from production. About $60,000 of this sum was to be used to retire notes and other indebtedness against the property. The remaining nearly $15,000 was to be used to purchase necessary equipment, rehabilitate the camp, and repair parts of the road. The examining team recommended denial of the $60,000 to repay indebtedness and approved the

sum of $15,000 for equipment and rehabilitation. They also recommended that a floor price of 24.5 cents per pound of copper and 19.5 cents per pound of zinc be established.

The Mountain States Metals Co. constructed a mill in 1951 and operated almost continuously until December 1952. Development work, consisting of drifting and diamond drilling, was started in December 1952, and more or less regular mill operation started in March 1953 and continued to the present time (July 1953).

The production of the Copper World mine prior to the Dye and Bahtrick operation is unknown but it was small. A few cars of ore were shipped from the gossan outcrop. This was a direct smelting oxidized copper ore with little or no zinc.

The production of the Copper World mine from 1943 to date by the various operators is as follows:

TABLE I. Total Recorded Copper World Production 1943 to June 15, 1953.

Operator	Tons	Grade, percent Copper	Grade, percent Zinc	Remarks
Dye and Bathrick	13,990	3.62	11.2	Above 250 level, 1943-46
Omega Metals Co.	2,500	3.0	10.5	400-500 levels, 1948-49
Dye and Bathrick	1,200	?	?	400-500 levels, milled at Antler mill.
Mountain States Metals Co.	17,434	3.5	8.5	Copper World Mill, 1951 to June 15, 1953
Total and average	35,124	3.5	9.8	

Erection of the Copper World mill was started in January 1951 and milling was started in September of the same year. Milling has been fairly continuous since that date except for the period of December 1952 to March 1953. The following tonnages have been milled in the Copper World mill. Data were furnished by George A. Freeman, manager:

TABLE II. Ore Milled in the Copper World Mill September 1951 to June 15, 1953.

Date	Tons	Grade, percent Copper	Zinc
1951			
September to November 30.	4,100	3.7	9.2
December	400	?	?
Total and average, 1951	4,500	3.7	9.2
1952			
January	1,268	?	?
February	1,609	3.2	11.2
March	1,543	2.8	9.4
April	1,042	3.1	7.9
May	980	3.2	8.8
June	870	3.4	9.1
July	990	3.2	10.6
August	792	4.3	6.3
September	603	5.1	7.1
October	491	4.1	11.2
November	250	3.2	7.9
December	---		
Total and average, 1952	10,438	3.4	9.2
1953			
January and February	---		
March	290	4.6	5.2
April	780	4.8	6.1
May	970	2.9	2.6
June 1 to June 15	456	2.9	3.8
Total and average to June 15, 1953	2,496	3.7	4.7
Grand total and average	17,434	3.5	8.5

OWNERSHIP AND EXTENT

The Copper World mining property consists of 1 patented mining claim, 3 unpatented mining claims, and 71.28 acres of grazing land leased from the owner. The patented claim, the Copper World, Mineral Survey No. 203, Certificate No. 903, was located in 1882. The patent was recorded in the office of the County Recorder of Mohave County, Ariz., on July 22, 1892, in book 10 of Deeds on page 733 (affixed to this real property are rail, air and water lines in place and approximately 25,000 feet of timber and ties.).

Two of the unpatented claims, known as Copper World No. 1 and Copper World No. 2, have their location notices recorded in Book 3-X of Mines on pages 400, 401 and 402 in the office of the County Recorder of Mohave County, Ariz. The location notice of the third unpatented mining claim, known as the Helen Ruth, is recorded in Book 3H of Mines on page 431, and Book YY of Mines on page 707 (affixed to this real property is certain well equipment used to pump water from the "Boriana Wells").

The mining claims are owned by Dye and Bathrick of Kingman, Ariz. and now are under lease to the Mountain States Metals Co.

Dye and Bathrick have a lease on 71.28 acres of grazing land adjoining the Copper World claim from the owner, J. H. Herridge. This lease has 10 years to run from October 26, 1950 and has been transferred to the Mountain States Metals Co.

The manager of the applicant company stated that the "Owners Consent to Lien" would be obtainable from the owners should the proposed project be approved.

DESCRIPTION OF THE DEPOSITS

The ore is localized within a strongly sheared biotite schist which is contained between thick massive bands of gneiss. The formations and the veins stand nearly vertical and strike N. 35° E. The veins have been formed primarily by replacement of the schist by the ore minerals which consist of chalcopyrite, sphalerite, and minor amounts of bornite, chalcocite, galena, and a little scheelite.

The ore occurs in several distinct shoots which differ from each other in the tenor of the ore and the ratio of the copper to zinc. In the main shoot the ore has shown remarkable continuity of grade from the surface to the 500 level, and averaged close to 3.0 percent copper and 10.0 percent zinc. Diamond drilling indicated that both the copper and the zinc content increased below the 500 level.

Post-mineral movement along a major fault has interrupted the continuity of the oreshoots. The amount of displacement is not known but appears not to be too excessive. Exploration work below the fault has not been extensive enough to locate the faulted segments of all the oreshoots known above the fault so a number of good targets exist other than those contemplated by the operator under the proposed development plan.

MINABLE ORE RESERVES

The applicant has estimated ore reserves slightly in excess of 38,000 tons. This approximates tonnage estimates made in early 1952 and indicates that the discovery of new ore is equaling the depletion of the reserves. The recent ore reserves are shown in the following table and include reserves expected to be found by the proposed exploration.

TABLE III. Copper World Ore Estimates
June 24, 1953

Description	Tons	Grade, percent Copper	Zinc
Old workings above the 500 level	18,000	3.0	10.0
New 500 level ore shoot	5,400	4.5	4.5
Section between 500 and 650 levels	14,700	4.5	4.5
Total and average	38,100	3.8	7.1

Most of the above reserves can be classified as indicated and the remainder as inferred. There is very little measured ore in the mine. Success of the proposed project would convert most of the inferred ore into the indicated category, and possibly add to the reserves an appreciable tonnage of inferred ore below the 650 level. A rough check of the reserves indicates that they are reasonable. R. F. Robinson, the Geological Survey member of the examining team, estimates indicated reserves on the order of 29,900 tons (see figure 1, Geologic report).

Because of the erratic nature of the oreshoots, channel sampling does not seem reliable. Mined ore sent to the mill evidently is a more accurate gauge of the quality of the ore. That the above grade estimates are reasonable is shown by past production of the mine. Ore mined from above the 500 level during 1952 averaged 3.4 percent copper and 9.2 percent zinc. The remaining ore in the same part of the mine is estimated to contain 3.0 percent copper and 10.0 percent zinc as noted in table III. That the grade estimates of 4.5 percent copper and 4.5 percent zinc are reasonable is shown for the months of March and April 1953 when ore from the development of the new oreshoots was sent to the mill. The ore for March contained 4.6 percent copper and 5.2 percent zinc while that of April contained 4.8 percent copper and 6.1 percent zinc.

The applicant's manager has agreed to subject all ore mined after the date of the contract to a royalty to repay the Government's share of the proposed exploratory project. During 1951 and 1952, the ore returned a little over $20.00 per ton based on the net smelter returns.

Assuming a similar price schedule in the future, the Government would realize slightly over $1.00 royalty per ton of ore and the 38,100 tons of ore would more than repay the Government's share of the $14,872.50 of the proposed project.

PRESENT STATUS

The upper workings of the mine were developed by adit levels with some intermediate work. A winze was sunk from the 200 level to the 250 level. From the 250 level a diamond drill hole was drilled in the vein for a depth of 213 feet. There was sufficient ore in this hole to warrant driving a new crosscut adit which cut the vein on the 500 level. This adit is 703 feet in length and serves as the main haulageway to the mill bins. Exploration and development includes 350 feet of shafts and winzes, over 1,200 feet of drifts and crosscuts, 1,030 feet of adits, and over 250 feet of raises (see figures 2 and 3).

The mine is depleted above the 250 level, excepting any unknown oreshoots. Some ore remains between the 250 and 500 levels in the developed part of the mine. Additional ore is suggested below the developed zone, and new ore has been found by drifting to the northeast on the 500 level. The pipe oreshoot mined above the flat fault and above the 350 level has not been found beneath the fault, probably because of insufficient exploration.

The mine is completely equipped with sufficient machinery for the modest operation being performed. A few additional items such as a small battery locomotive for tramming the ore on the 500 adit level would assist in operations. The mill is a complete and seemingly well-designed plant having a rated capacity of 25 tons per 8-hour shift.

The Mountain States Metals Co. has operated the Copper World mine almost continuously since milling started in September 1951. No ore was produced during December 1952, and January and February 1953, but development work consisting of drifting and diamond drilling was done. The drifting consisted of driving northeasterly on the 250, 350, and 500 levels. Ore was found in each of the drift extensions.

Three important diamond drill holes were completed. These were drilled from a station in the 500 level adit and intersected the ore-bearing structure at 3 points approximately 100 feet below the 500 adit level. One hole was directly beneath the intersection of the adit and the 500 level drift. The other 2 holes flanked this one, approximately 100 feet on each side. Each of the holes intercepted interesting mineralization (see figure 3).

TABLE IV. Diamond Drilling Results.

Description	Interval, ft. From	Interval, ft. To	Core or Sludge	Assay, Oz. Silver	Assays, Percent Copper	Assays, Percent Zinc
A4, Under Adit	128	133	2.5 ft.C	0.20	4.5	6.10
Ditto	128	133	Sludge	0.20	3.5	5.70
Ditto	133	138	4.5 ft.C	0.20	5.85	16.80
A3,100 ft. NE	143	149.5	Good,Core	1.4	3.50	1.90
Ditto	149.5	157	Good Core	1.6	2.9	5.50
A4, 100 ft. SW	145	147	Good Core	0.60	6.25	3.1
Ditto	147	151.5	Good Core	0.60	4.6	35.4

The above results indicate an extension of the ore zone below the 500 level. It must be noted that the drill intervals given above do not represent the true thickness of the ore zone. The actual thicknesses will be somewhat less when the corrections for dip and lateral angular intersections are applied. The proposed project will explore this inferred

extension of the ore zone to the 650 level and laterally for 400 feet. It might be mentioned in passing that other places remain in the mine where exploration also could be done to good advantage.

PROJECT PROPOSALS WITH COSTS

The applicant has proposed an exploration project consisting of sinking a winze to a depth of 165 feet below the 500 adit level, then to do 400 feet of drifting on the 650 level 150 feet below the 500 adit, as shown on figures 2 and 3. The crosscut extension of the 500 adit to prepare for the winze collar, the furnishing and installing a hoist, the headworks and dumping arrangement, and the short crosscut on the 650 level from the winze to the vein will be done at company expense. This work is estimated to cost $10,000.

For the part of the project in which Government participation is desired, only the 165 feet of winze and the 400 feet of drifting on the 650 level would be considered. The winze is to be 2 compartments and will be timbered throughout. The drift, judging by the 500 level, will be timbered for most, if not all of its length. The applicant estimates the costs to be $93.00 per foot of winze and $36.00 per foot of drifting. These costs are very reasonable, and therefore acceptable to the Government. It is believed that these costs probably will be exceeded a little unless water or other unfavorable condition is encountered which would tend to greatly increase the estimated costs.

TABLE V. Estimated Costs of Proposed Project Copper World Mine.

Work	Feet	Unit Cost	Total Cost
Winze	165	$93.00	$15,345.00
Drifting	400	36.00	14,400.00
		Total	$29,745.00

As previously mentioned, the manager of the applicant company stated that they were willing that royalties be taken from all ore mined after the date of the contract until the Government's share in the participation in the project was repaid.

All equipment necessary for the project is on hand or readily available. Sufficient water for the mine and mill is available from the company leased Boriana well. During pretracted periods of drouth, the supply of water may be curtailed. Sufficient manpower is available and it may be that additional labor would not be employed for the project.

PRODUCTION PLAN

The mine, and therefore the mill, wax not operated during the first 2 months of 1953 when attention was concentrated on development work. At the present time the mill, after starting operations in March 1953, has milled nearly 1,000 tons of ore per month. This is below its rated capacity and below the maximum milled in February 1952, when 1,609 tons was milled. It is likely that the reason for the reduced capacity lies in the mine, where although ore is available, stoping methods seem unable to fulfill the mill requirements of ore.

The company plans to mine the new ore body to the northeast on the 500 level by shrinkage methods, using roof bolts and headboards to hold the walls. It is doubted that this method will be successful for the following reasons. The first, and probably the most serious, would be in the tying up of large quantities of ore in the stopes which could be ill afforded in a small operation of this type. Secondly, oxidation of the ore held in the stopes could adversely affect the metallurgy. Thirdly, it seems that sorting of the ore in the stopes and more selective mining would be advantageous to the operation of the property. This cannot be done by the suggested mining method. Lastly, it is felt that the use of roof bolts in such narrow stopes would result in no economy. A rough calculation indicated that stulls and headboards would be cheaper and possibly more satisfactory in the shrinkage stopes. Some method of wall support is mandatory to prevent excessive dilution of the ore with the slabby walls. It is probable that top-slicing, or cut-and-fill stoping would be the least expensive in the long run. Although the cost per ton of stoping might be higher, the greater selectivity of the method, the higher grade of ore resulting from less dilution, and the greater recovery of ore would result in a lower cost per pound of metal produced.

The Copper World mill has a rated capacity of approximately 75 tons per 24 hours. The mill seems well designed and constructed. It probably is efficient. Although it does not contain some refinements that would be an aid to the operation, it does contain all of the necessary equipment. Mill costs seem reasonable, and together with mining costs, are tabulated as follows. There are not sufficient data to analyze these costs fully (these costs were supplied by the company manager).

TABLE VI. Operating Costs. Per ton of Ore
Mountain States Metals Co. Copper World Mine.

Year	Mining	Milling	Development	Overhead	Total	Tons Mined
1951	$8.95	$3.81	$3.10	$2.23	$18.09	4,120 1/
1952	8.21	3.86	2.60	1.90	16.57	9,236 1/
1953, to June	6.85	3.12	2.00	1.91	13.88	2,040 2/
Average	$8.23	$3.75	$2.65	$1.99	$16.62	

1/ Does not agree with total in Table II
2/ Does not contain 456 tons mined after June 1 as shown in Table II.

A rough analysis of the costs indicates that a small profit is being made, and barring a slump in the price of copper, a profit should continue to be shown. It could be increased with an increase in the efficiency of operations. A large profit is not likely unless bonanza ore is encountered, or the prices of copper and zinc greatly increase without an increase in the costs of labor and supplies. The small profit being made at the present time should encourage the operators to continue with operations, barring an economic slump.

CONCLUSIONS

The following conclusions were derived from an examination of the Copper World mine and from an analysis of the data pertaining thereto:

(1) The Copper World mine is a small mine and in the last 10 years has produced appreciable copper and zinc ores. Total production exceeds 35,000 tons that contained approximately 3.5 percent copper and 9.8 percent zinc, plus a little silver.

(2) The mine contains estimated ore reserves, both indicated and inferred, of approximate 38,000 tons. The royalty on this ore, based on past production and assuming a similar price schedule for

the future, would be more than enough to repay the Government for its share in the project participation. The company manager has agreed to make all of the ore mined after the date of the contract subject to royalty.

(3) A significant discover of copper-zinc ore by the proposed project is highly probable. In addition, it will open up a new level where additional exploration by the operators is likely to result in still larger reserves of important copper and zinc ores.

(4) The Mountain States Metals Co. has operated the mine, with only short periods of nonproductiveness, since 1950. Although the management may be criticized for not conducting its operations in the most efficient manner, the efficiency is acceptable considering the isolated location of the mine, the relative inefficiency of labor available for small operations of this type, and the youth of the operation. The applicant has the necessary personnel, both as labor and supervisory, to capably conduct the project in which the Government is asked to contribute.

(5) The project proposed by the applicant company is to consist of 165 feet of winze and 400 feet of drifting from the 650 level. All preparatory work and equipment is to be furnished by the operator. Costs were estimated to be $93.00 per foot of winze and $36.00 per foot of drift. The whole project is reasonable and the costs are deemed very fair.

(6) All of the labor, supplies, and equipment are available or on hand for the use of the project.

(7) Although the mine is relatively isolated, it is readily accessible by a good to fair road from Kingman, Ariz., some 40 miles by road to the north.

RECOMMENDATIONS

Based on the foregoing conclusions, it is recommended that the application for Government aid in exploring the Copper World mine by the Mountain States Metals Co., Docket DMEA-3064, be approved. The work will consist of 165 feet of 2-compartment winze from near the face of the 500 level adit, and 400 feet of drifting from the winze on or near the 650 level, or 150 feet below the collar of the winze. The drift will extend both northeasterly and southwesterly from the winze and on the vein. The drift will be timbered where necessary. All preparatory work, consisting of preparation of the hoisting station, installation of the hoist, preparation of the dumping and loading pockets, and the crosscut from the 650 level of the winze to the vein, will be done by the applicant without Government assistance. The costs are estimated to be $93.00 per foot of winze and $36.00 per foot of drift. These costs are acceptable and are tabulated as follows:

Winze, 165 feet at $93.00 per foot[1/] ————	$15,345.00
Drifting, 400 feet at $36.00 per foot ————	14,400.00
Total	$29,745.00

It is recommended that these costs be applied to the project work.

1/ Winze will be vertical.

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

RECEIVED
NOV 2 1953

224 New Customhouse
Denver 2, Colorado

October 29, 1953.

Memorandum

To: Administrator, Defense Minerals Exploration Administration
Attention: 200

From: Field Team, Region IV

Subject: Report of Examination - DMEA Docket 3064 (Copper-Zinc), Copper World Mine, Mohave County, Arizona.

Enclosed are four copies of the Report of Examination on the subject docket.

The applicant has failed to submit Owner's Consent to Lien and a copy of his sales agreement with Dye and Bathrick which we requested July 22, 1953 and September 23, 1953.

We assume that the applicant has lost interest in the exploration work so the docket has been closed.

W. H. King
W. H. King

E. N. Harchman
for A. H. Koschmann

Enclosures

WITHDRAWN

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Mining Division
Region IV

July 23, 1953.

Memorandum

To: Field Team, Region IV

From: Chief, Mining Division, Region IV

Subject: Final Report, DMEA Docket 3064 (Copper-Zinc), Mountain States Metals Company, Copper World Mine, Mohave County, Arizona.

Enclosed are nine copies of the final engineering report on the subject docket.

The applicant requested $29,745.00 for sinking 165 feet of winze and 400 feet of drifting.

The engineer examiner recommends the applicant's exploration proposal and estimated costs.

We concur in this recommendation.

W. H. King
W. H. King

Enclosures

MINING DIVISION
REGION IV

July 15, 1953

Memorandum

To : W. H. King, Chief, Mining Division, Region IV

From : Chief, Mining Methods Br., Mining Div., Region IV

Subject : Report on Docket DMEA-3064, Mountain States Metals Co.'s Copper World Copper-Zinc Mine, Cedar Valley Mining District, Mohave County, Ariz.

Enclosed are original and 8 copies of the section on Summary, Conclusions and Recommendations by R. F. Robinson of the Geological Survey, and M. J. Elsing and J. H. Soule' of the Bureau of Mines, and the section on Engineering by Elsing and Soule' for the above report. A separate section on Geology already has been submitted by the Geological Survey.

The applicant proposes to sink a 165-foot winze below the 500-foot adit level, then drift for 400 feet along the vein for a total cost of $29,745.00. The examiners believe that a substantial quantity of new ore will be discovered by this work, so recommend a loan to the company. I concur with this recommendation.

Brochure is enclosed.

Walter R. Storms

Walter R. Storms

CC W. H. King (8)
R. F. Robinson
DMEA-3064
DF

WRStorms:frj

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

200 New Customhouse
Denver, Colorado

July 6, 1953

Memorandum

To: DMEA Field Team, Region IV

From: A. H. Koschmann

Subject: DMEA Docket 3064 (Copper-Zinc), Mountain States Metals Company, Copper World Mine, Mohave County, Arizona

Enclosed are the original and eight copies of the geologic report by Raymond F. Robinson of the U. S. Geological Survey covering the above docket.

It has been recommended that the loan be approved.

A. H. Koschmann

A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures (9)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P.O. Box 4126, University Station
Tucson 5, Arizona

July 2, 1953

Memorandum

To: A. H. Koschmann, Denver, Colorado

From: R. F. Robinson, Tucson, Arizona

Subject: Docket MMA 3064 (Copper-Zinc), Mountain States Metals Co., Copper World Mine, Mohave County, Arizona

Enclosed please find the original and eight copies of the geologic report on the subject docket. The writer is of the opinion that the majority of the geologic and economic factors involved with this property indicate that a DMEA loan is warranted.

It is suggested that consideration be given to increasing the applicant's program to insure exploration of a new ore shoot recently disclosed which may be beyond the limits of his proposed program of drifting.

Raymond F. Robinson

Raymond F. Robinson
Acting District Supervisor
Arizona - New Mexico

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UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMEA-3064, Mountain States Metals Co.'s Copper World Copper-Zinc Mine

Cedar Valley Mining District

Mohave County, Arizona

R. F. Robinson, Geologist
U. S. Geological Survey

M. J. Elsing, Consulting Mining Engineer
U. S. Bureau of Mines

J. H. Soule', Mining Engineer
U. S. Bureau of Mines

July 1953

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

R. F. Robinson[1], M. J. Elsing[2], and J. H. Soule'[3]

On June 16, 1953, the Field Team, Region IV, Defense Minerals Exploration Administration, requested that an examination and report be made on the feasibility of an exploration project at the Copper World mine, Cedar Valley Mining District, Mohave County, Ariz. The project is for the exploration of copper and zinc and is estimated to cost $29,745, of which the Government's share will be $14,872.50. The property is owned by Dye and Bathrick of Kingman, Ariz. and is under lease and bond to the Mountain States Metals Co., G. A. Freeman, manager.

On June 23, 1953, M. J. Elsing, J. H. Soule' and R. F. Robinson went to Kingman, Ariz. where they met G. A. Freeman, examined the mine on June 24, 1953, and thoroughly discussed the proposed project with him. The present examination and report supplement a report entitled "DMPA-2352, Mountain States Metals Co.'s Copper World Mine" made by M. J. Elsing and T. M. Romslo in April 1952.

If the application is approved Freeman states that he would be able to get the "Owners Consent to Lien" agreement from Dye and Bathrick. Furthermore, he agreed to make the entire production of the mine subject to royalty instead of that portion actually covered by the exploration.

The mine is reached from Kingman by following U. S. Highway 66 southwesterly to Yucca, which is located on the Santa Fe Railroad.

1/ Geologist, U. S. Geological Survey
2/ Consulting Mining Engineer, U. S. Bureau of Mines
3/ Mining Engineer, U. S. Bureau of Mines

At Yucca the paved highway is left by turning to the southeast and following a desert road easterly for nearly 17 miles. This road is well signed and is good for the first 15 miles. The last 2 miles is over a mountain road with sharp turns and steep grades.

The accessible workings consist of the 250, 300, 350, 400, and 500 levels. The 500 level is the bottom level of the mine, is an adit, and is the haulage level to the mill.

The ore is localized within a strongly sheared biotite schist which is contained between thick massive bands of gneiss. The formations and the veins stand nearly vertical and strike N. 35° E. The veins have been formed primarily by replacement of the schist by the ore minerals which consist of chalcopyrite, sphalerite with minor amounts of bornite, chalcocite, galena and a little scheelite. Gangue is pyrite, pyrrhotite, quartz, and wall rock.

The ore occurs in several distinct shoots which differ from each other in the tenor of the ore and the ratio of the copper to zinc. In the main shoot the ore has shown remarkable continuity of grade from the surface to the 500 level, and averaged close to 3.0 percent copper and 10.0 percent zinc. Diamond drilling indicated that both the copper and zinc content increases below the 500 level.

Post-mineral movement along a major fault has interrupted the continuity of the oreshoots. The amount of displacement is not known, but appears not to be too excessive. Exploration work below the fault has not been extensive enough to locate the faulted segments of all the oreshoots known above the fault so a number of good targets exist other than those contemplated by the operator under the proposed development plan.

Since the April 1952 DMPA examination, the drift on the 500 level has been extended 250 feet to the northeast. A new oreshoot has been discovered in the vein. This shoot is 100 feet long and approximately 4.5 feet wide. The grade of the ore as shown by mill shipments averages 4.8 percent copper and 6.0 percent zinc. Recent exploration on the 350 level to the northeast has opened 70 feet of ore of a similar width and grade. It may be too soon to say that the new shoot on the 500 level is the downward extension of the 350 level shoot. However, both showings occur in and along a pegmatite dike which is believed to extend from the 500 level to a point above the 250 level. The ore is very similar in appearance and grade on both levels. If the tentative correlation between the levels is correct this shoot exhibits a flat northeasterly rake. This may bring the downward extension of the shoot beyond the limits of the exploration work contemplated on the 650 level and additional drifting may be warranted to explore it.

Another recent development is the drilling of 3 diamond drill holes from the main crowscut adit. One of these holes is directly below the adit. It intersects the vein, which is nearly vertical, at 100 feet below the adit. Holes on each side of this first hole intersect the vein 100 feet below the adit and 100 feet either side of the first hole. Good ore was found in each of these holes which makes it rather certain the main oreshoot extends for at least 100 feet below the 500 adit level.

On the basis of geologic evidence, past development of the mine and production records, it is estimated that about 29,900 tons of indicated ore exists in the main vein and in the new oreshoot above the 650 level. This total tonnage probably will average about 3.9 percent copper and 8.1 percent zinc. It is expected that the oreshoots will extend well beyond the limits of the proposed exploration.

In order to explore this downward extension of the vein the applicant proposes to sink a 2-compartment winze from the adit to a depth of 165 feet. At a depth of 150 feet below the level it is proposed to do 400 feet of drifting along the vein. The applicant will expend approximately $10,000 of its funds in preparing for sinking and also will supply the equipment and other facilities. A crosscut from the winze at the 650 level to the vein is included in the company performed work.

The applicant proposes to do the winking at $93.00 per foot and the drifting at $36.00 per foot. These prices are fair and might be low if appreciable amounts of water are encountered.

According to data supplied by the operator, the Mountain States Metals Co. from September 1951 to June 15, 1953 had mined and milled 17,434 tons of ore from the Copper World mine averaging approximately 3.5 percent copper and 8.5 percent zinc. The past operation of the Copper World mine has shown very little profit. This is due to numerous reasons, including the excessive cost of starting the project, the breaking in of a new mill, the drop in the price of zinc, and the shutdown period for diamond drilling and drifting.

Freeman estimates that the present ore reserves and those that will be found by the proposed work will be approximately as follows:

	Tons	Copper, percent	Zinc, Percent
Old workings above the 500 level	18,000	3.0	10.0
New 500 level oreshoot	5,400	4.5	4.5
Section between the 500-650 levels	14,700	4.5	4.5
Total and average	38,100	3.8	7.1

The new 500 level oreshoot and the diamond drilling below the 500 level indicate that the amount of copper and zinc in the ore is increasing. The new ore body to the northeast shows an increase in the quantity of copper and a decrease in the quantity of zinc. The higher grade copper and a steadier production will contribute to a more profitable operation. The profit probably will continue to be small but it should be sufficient to permit continuous operation and the repayment of the loan.

Therefore, it is recommended that the project of the Mountain States Metals Co. be approved on the basis of 165 feet of 2-compartment winze from the 500 adit level, and 400 feet of drifting from the winze on the 650 level. The unit costs of this work will be $93.00 per foot of winze and $36.00 per foot of drifting. The total expenditure will be $29,745.00, of which the Government's share will be $14,872.50.

MOUNTAIN STATES METALS CO.
COPPER-WORLD MINE
MOHAVE COUNTY
ARIZONA
DMEA 3064

COPPER-ZINC

Geology

By
Raymond F. Robinson
Geologist, U. S. Geological Survey

MOUNTAIN STATES METALS CO.
COPPER WORLD MINE
MOHAVE COUNTY
ARIZONA
DMEA 3064

COPPER-ZINC

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INTRODUCTION

The Copper World Mine (DMEA 3064) was visited on June 24 by the writer and Messrs. M. J. Elsing and J. Soulé of the U. S. Bureau of Mines in order to process the Company's application for a DMEA exploration loan. Mr. George Freeman, general superintendent, conducted the examiners about the property and was very cooperative in providing information pertinent to the processing of the application. Due to the late date at which the application was submitted and received by the examiners, only a brief examination of the mine was feasible in order to allow a report to be submitted to the Field Team by June 30. A more detailed examination would have been desirable. This mine had been examined previously by Mr. Elsing and Mr. Romslo on March 13, 1952, in connection with the owners' application for a DMPA loan. A loan of $15,000 was recommended by the examiners. Workings which had been previously examined by Mr. Elsing were not inspected during the present examination.

LOCATION AND ACCESSIBILITY

The Copper World Mine is located in the Cedar Valley mining district of Mohave County, Arizona, and in section 25, T. 18 N., R. 16 W. It lies in the canyon of an intermittent stream on the west slope of the rugged Hualapai Mountains, at an elevation of about 4600 feet. It lies approximately 17 miles east of U. S. Highway 66 and Yucca, Arizona, a station on the Atchison, Topeka, and Santa Fe Railroad. It is accessible by means of a fair trucking road from Highway 66 to the mine.

GEOLOGY

The country rock at the mine is a thick schist-gneiss complex which trends obliquely at a low angle to the strike of the vein systems of the mine. The complex stands on edge, nearly vertical. The principle vein is localized within a biotite schist zone which is 4 to 10 feet thick and is contained between two massive thick quartzitic gneiss bands.

On the south side of the mine a band of amphibolite has been particularly amenable to mineralization. It appears to consist largely of crystalline amphibole of the actinolite-tremolite series.

On the north end of the mine a fairly large pegmatite dike crosses the schist zone and gneissic banding at a large angle. The dike appears to have continuity along its dip through the 250, 350, and 500 levels as shown on figure 1. When the dike was seen on freshly broken surfaces, Mr. Freeman said that it appeared to cut across the vein shear and to have been emplaced after vein fracturing but prior to sulfide mineralization. The dike does contain a portion of an ore shoot on the 350 and 500 levels where the ore occurs as massive replacement of the dike. If the vein shear occurred in the dike, it was not apparent to the examiner. The dike does not offset the vein fracture. The dike on the 500 level also contains some ore. This dike may be closely associated with ore emplacement.

The rock is strongly jointed in several systems. Flat joints are particularly well formed and facilitate sloughing of the wall rock along the vein. This is an undesirable feature which may cause considerable dilution of the ore, especially where the vein

Veins

The largest and principle vein in the mine strikes North 35-40 degrees east. It dips steeply and irregularly to the southeast in the hanging wall of the fault and steeply NW in the footwall of the fault. It varies in width from a few inches to ten feet and probably averages about 4 to 5 feet. While it is spoken of as a vein, it is in reality a series of replacement zones in the biotite schist. Several lean to barren zones occur in the schist and separate the ore shoots on the "vein." It maintains a rather constant appearance above and below the fault although the copper ratio to zinc is larger above than below.

On the south side of the mine, the northwest wall of the vein is intersected by a series of east-westerly mineralized fractures which occur in the amphibolite band which has been previously mentioned. The area of intersection is the loci of a pipe-like replacement ore shoot which was one of the best in the mine. The location of this shoot is shown on the longitudinal section figure 1. It extended from above the 250 level down to the fault between the 300 and 350 levels and exhibited a steep plunge to the southwest. It has not yet been disclosed below this fault to date. On the lower levels exploration has partially opened up the area which is on the projection of the shoot along its plunge from the upper levels. Since the fault has had post-mineral movement of unknown magnitude, it is quite probable that the scattered high grade stringers and low grade disseminated

mineralization found as the result of this work do not represent the downward extension of the pipe. Supporting evidence for this is the fact that the amphibolite band in which the pipe occurred above the fault has not been found below it.

ORE SHOOTS

Several separate and distinct ore shoots occur in the mine and are shown on figure 1. These have not been explored, developed, or mined to the same extent and some of them are relatively unimportant at the present stage of mine development. Little attention has been paid to the search for faulted segments of some of the ore shoots disclosed on the upper levels. Naturally, most recent work has been done on the number two and the new number five shoot; however, much deserving work could be done on the southwest end of the mine where it is probable that more ore will be found when exploration is done there.

Ore shoots #1 and #2 are faulted segments of the same shoot. They are very similar in appearance and grade of ore. They appear to plunge steeply northeast. Number 1 shoot is bottomed by the major fault and #2 shoot is topped by the same fault. Three diamond drill holes were drilled from the main crosscut on the 500 level and intersected the #2 shoot in three places at 100 feet below the level as shown on figure 1. Ore was thus indicated down to this level. Ore shoot #3, the "pipe" described above, has been mined as indicated on figure 1. It exhibits a southwest plunge and is cut off by the major fault between the 300 and 350 levels. It has not been located below the fault to date.

Ore shoot #4 has not been mined below the 200 level. Although it was small, it contained some of the richest copper ore in the mine and, according to Mr. Freeman, averaged 8.25% copper. It has been partially exposed on the 250 level but has not been found below the major fault as yet.

Work on the #5 ore shoot has not progressed to a stage where the size and shape or trend can be actually determined. The tentative boundaries shown on figure 1 are based on available information. The flat northeasterly plunge of the southwest side appears to be controlled by the pegmatite dike which dips flatly to the northeast. The northeast side is defined only by the barren faces of the 350 and 500 drifts which may represent local barren blocks of unknown size within the vein structure.

PRODUCTION AND GRADE

According to the available data, ore shoots 1, 3, and 4 have produced a total of 34,318 tons of ore from the major fault to the surface as follows:

	Tons	% Cu	% Zn	Year
Dye-Battrick	13,990	3.6	11.2	1943-46
Mountain States Metal Co.	8,920	3.1	11.2	1951-52
Mountain States Metal Co.	11,408	3.5	8.5	To present
Total	34,318	3.4	10.3	

The production from ore shoot #2 according to available data is as follows:

Omega Metals	2500	3.0	10.5	1948-49

Dye-Battrick	1200	Unknown grade	1949-51
Total	3700	Estimated 3.0 Cu and 10.5 Zn	

Diamond drilling beneath the 500 level intersected the vein and #2 ore shoot at 100 feet below the level. Actual intersection widths must be corrected to true widths because the intersections were not made at right angles to the vein which dips steeply to the north below the faults instead of steeply to the southeast as above the fault.

No.	Intersection	T.W.	% Cu	% Zn
DDH A-1	7.0'	4.0'.	5.3	13.0
" A-4	6.5'	4.5'	5.1	25.4
" A-3	14.0'	11.0'	3.2	3.8

Ore shoot #5 has produced 1070 tons of ore between the 500 and 350 levels and this production is all development ore. This averaged 4.8% copper and 6.0% zinc.

In general the grade of the ore from the 1, 2, 3, and 4 ore shoots has been very constant from the surface to the 500 level. It appears to have averaged very close to 3.0% copper and 10% zinc. Diamond drilling indicates that both the copper content and especially the zinc content will increase with depth in the main or #2 shoot. In contrast to this, the #5 shoot has shown an increase of copper content over zinc.

ORE RESERVES

The operator has given the following estimate of measured ore above the 500 level on the main vein or #1 and 2 ore shoots:

18,000 tons of 3.0% copper, 10.0% zinc.

This tonnage is contained in the unstoped areas as shown on figure 1. He estimates that he has 5400 tons of indicated ore averaging 4.5% copper and 4.5% zinc between the 350 and 500 levels on the #5 shoot. He also estimates 14,700 tons of indicated ore below the 500 level on the #2 shoot which will average about the same.

The writer is of the opinion that there is a larger tonnage of about average grade ore (3.0% Cu-10.0% Zn) above the 500 level than the operator has estimated. Some of this is not considered by the operator to be mineable by the present methods and it is indicated on figure 1. The operator said that he would not desire to mine this ore which is in the vicinity of the major fault because the broken character of the ground creates excessive dilution. One attempt to mine in this area resulted in a mine grade of only 2.9% copper and 2.6% zinc. It is possible that better mining methods will make this tonnage of ore available in the future. It is estimated that about 4800 tons are in the operator's category of unmineable ore. The writer is of the opinion that the indicated ore on the #2 shoot from the 500 level to the 650 level is 16,200 tons, which will average between 3.0% copper and 10.5% zinc (past production) and 4.1% copper and 10.6% zinc (diamond drill core assay). This is indicated on figure 1.

It is estimated that about 6300 tons of ore are conservatively indicated between the 300 and 500 levels on the number 5 shoot which will average 4.8% copper and 6.0% zinc (the grade of development ore).

This ore shoot should easily extend to the 650 level and an additional 7425 tons of ore are indicated which will probably be of about the same grade as above.

No estimates of inferred ore are made at this time because of the limited time spent on the property. It is, however, believed that the ore on this property will extend well below the 650 level and that there are good potential ore-bearing areas along the vein structure and in the walls both to the northeast and southwest of the present mine workings.

PROPOSED EXPLORATION

The applicant's exploration plan is shown on figure 1. He proposes to sink a two compartment vertical shaft from the footwall of the vein on the 500 level at distance of 165 feet, allowing 15 feet for sump and pocket. On the 650 level he proposes to drift 290 feet northeast and 110 feet southwest. Crosscutting and station cutting will be done at his own expense.

This work is designed to explore the main vein below the intersections which diamond drilling secured and which are shown on figure 1. It is also intended to get beneath the new number 5 shoot. This work is well conceived to explore the main vein shoot (number 2) but it is very likely inadequate to penetrate the downward extension of the number 5 shoot. The indicated plunge of this is much flatter than the operator considered when planning his exploration and the throw of the fault on this shoot is not known. It is also very possible

that the barren interval between the two shoots will materially increase at depth. It is quite possible that the operator could stand the expense of this additional work but in view of the barren interval through which he will have to advance and the uncertainty of the fault relationship to the ore, governmental participation in the risks would be encouraging to the operation and, in view of the conditions described in this report, quite warranted.

CONCLUSIONS

Conditions, both geologic and economic, at the Copper World Mine indicate that a significant amount of ore will be found by exploration. The ore which has been mined, according to available records, has created a margin of profit for the operators although it has not been large.

The ore on the new ore shoot (number 5) and on the extension of the main vein ore shoot below the 500 level is higher in copper than that previously mined. The zinc increases with depth on the latter and the overall zinc content of the former is lower than the mine average. Thus the overall value of the indicated ore is greater than that which has been produced in the past.

The nature of the ore shoots in this mine is that the vertical extent has been at least twice that of the strike length. It is practically assured that the ore shoots will extend to the exploration horizon, or 650 level.

The operator has not adequately explored below the major fault for faulted segments of all ore shoots known to exist above it. Therefore, a number of exploration targets exist in the mine area

other than those contemplated by the operator in the proposed program. This further increases the chances for repayment of the exploration loan since the operator has agreed to subordinate all mine production if the loan is granted.

The operator's plan for exploration should be expanded to allow for sufficient drifting to the northeast to cut the downward extension of the new number 5 shoot. The indicated plunge of this shoot is much less than he considered in planning the program.

RECOMMENDATIONS

The Copper World Mine is well deserving of a DMEA exploration loan and it is recommended that it be granted along the lines suggested by the operator, except that some consideration be given to increasing the amount of drifting to the northeast to allow for a plunge of the number five ore shoot. The indicated plunge is flatter than the operator considered in planning his program.

DMEA-3064, MOUNTAIN STATES METALS CO.'S COPPER WORLD COPPER-ZINC MINE
CEDAR VALLEY MINING DISTRICT
MOHAVE COUNTY, ARIZONA

Engineering Report

By M. J. Elsing, Consulting Mining Engineer
U. S. Bureau of Mines

J. H. Soule', Mining Engineer
U. S. Bureau of Mines

July 1953

DMEA-3064, MOUNTAIN STATES METALS CO.'S COPPER WORLD COPPER-ZINC MINE
CEDAR VALLEY MINING DISTRICT
MOHAVE COUNTY, ARIZONA

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INTRODUCTION

On June 16, 1953, the Field Team of Region IV, Defense Minerals Exploration Administration, requested that an examination and report be made on the feasibility of an exploration project at the Copper World mine, Cedar Valley Mining District, Mohave County, Ariz. The project is for the exploration of copper and zinc and is estimated to cost $29,745 of which the Government's share will be $14,872.50. The property is owned by Dye and Bathrick of Kingman, Ariz. and is under lease and bond to the Mountain States Metals Co., G. A. Freeman, manager.

On June 23, 1953, M. J. Elsing and J. H. Soule' of the Bureau of Mines and R. F. Robinson of the Geological Survey went to Kingman where they met G. A. Freeman. Together with him they examined the mine on June 24, 1953 and thoroughly discussed the proposed project with him. The present examination and report supplement a report entitled "DMPA-2352, Mountain States Metals Co.'s Copper World Mine" made by M. J. Elsing and T. M. Romslo in April 1952.

ACKNOWLEDGMENTS

Acknowledgments are due George A. Freeman, president and general manager of the Mountain States Metals Co., for his courtesy in showing the examining team through the Copper World mine and for furnishing records of production and other data pertinent to the property and the proposed project.

LOCATION, TOPOGRAPHY AND PHYSICAL FEATURES

The Copper World mine is situated in sec. 25, T. 18 N., R. 16 W. in the Cedar Valley Mining District, Mohave County, Ariz. as shown in figure 1. The mine is 16.2 miles by good to fair dirt road east of the town of Yucca, Ariz., a pumping station on the Atchison, Topeka and Santa Fe Railroad. Yucca also in the nearest rail loading and unloading point for the mine.

The mine is reached by travelling westerly, thence southerly from Kingman, Ariz. on U. S. Highway 66 for 23.8 miles to Yucca. At Yucca, turn off the paved highway to the left or southwest on a dirt road for 2 miles, take the left branch and continue easterly, then northeasterly for 14.2 miles to the mine. The road forks are well marked by signs.

The property is situated in a rugged area of the Hualpai Mountains at an altitude of about 5,200 feet. The mine workings vary from an altitude of a little over 5,000 feet on the lowest level to more than 5,400 feet in the upper workings. Steep rocky slopes are characteristic of the terrain. There are no permanent streams in the area and all water for mine, mill, and camp use is pumped from a well within 2 miles of the mine. The mine make a very small amount of water. The average annual precipitation is about 12 inches of which nearly one half falls during the winter months and about one third as summer thunder showers that create flash floods. Winter snowfall usually is light.

The vegetation is typical of the higher altitudes of the desert, and is abundant. There is no timber suitable for mine use at the property. Temperatures range from hot in the summer to cool in the winters. The hot weather usually is not uncomfortable at the altitude of the mine, and winters and freezing temperatures rarely are severe.

Primitive accommodations exist at the mine to care for the operating personnel. Ordinary mine supplies and communication services are available at Kingman, some 40 miles by road to the north. Phoenix, Ariz. is the nearest supply point for major mining equipment and is about 240 miles southeast of the mine by the shortest good road. The mine is serviced by a power line that can supply 750 KVA at 44,000 volts.

HISTORY AND PRODUCTION

The Copper World claim was located in 1882. The property was acquired some time later by James Douglas for the Phelps Dodge Corp. Some prospect work was done and the claim patented in 1889. In the early nineties, several hundred feet of exploration was done and a few cars of high grade sorted ore were packed out and shipped. During World War 1, lessees shipped one lot of ore. In April 1943, Dye and Bathrick acquired a lease from Phelps Dodge Corp. With the aid of a Class "C" loan from the Reconstruction Finance Corporation, the mine was reopened and sampled. Following this an additional loan was obtained for equipping and developing the mine.

From 1943 through 1946, Dye and Bathrick mined 13,990 tons of ore with an average grade of 3.62 percent copper and 11.2 percent zinc. After the expiration of the premium price plan the property was shut down. The Reconstruction Finance Corporation loans were repaid in full.

In 1948 the Omega Metals Co. obtained a lease and bond from Dye and Bathrick by the payment of $10,000 in cash. This payment was turned over to the Phelps Dodge Corp. as the purchase price of the mine. Dye and Bathrick then took title to the property. Omega Metals Co. operated until some time in 1949 when the drop in the price of metals forced the company to suspend operations and relinquish its option after having spent $115,000.

Dye and Bathrick operated the property for a short time, then gave a bond and lease to the Mountain States Metals Co. The price of the property was $100,000. For this bond and lease, the Mountain States Metals Co. paid $15,000 in cash and an interest-bearing note for $5,000. The balance of the $100,000 is to be paid by 10 percent royalty on the net smelter returns. The minimum royalty is $700 per month. In the event that the price of metals drops so that profitable operations are impossible, the option can be kept in good standing by the payment of $350 per month. Royalties are paid directly to Dye and Bathrick by the smelter.

In early 1952, the Mountain States Metals Co. applied to the Defense Materials Procurement Agency for a loan, totalling $75,000 which was to have been repaid from production. About $60,000 of this sum was to be used to retire notes and other indebtedness against the property. The remaining nearly $15,000 was to be used to purchase necessary equipment, rehabilitate the camp, and repair parts of the road. The examining team recommended denial of the $60,000 to repay indebtedness and approved the

sum of $15,000 for equipment and rehabilitation. They also recommended that a floor price of 24.5 cents per pound of copper and 19.5 cents per pound of zinc be established.

The Mountain States Metals Co. constructed a mill in 1951 and operated almost continuously until December 1952. Development work, consisting of drifting and diamond drilling, was started in December 1952, and more or less regular mill operation started in March 1953 and continued to the present time (July 1953).

The production of the Copper World mine prior to the Dye and Bahtrick operation is unknown but it was small. A few cars of ore were shipped from the gossan outcrop. This was a direct smelting oxidized copper ore with little or no zinc.

The production of the Copper World mine from 1943 to date by the various operators is as follows:

TABLE I. Total Recorded Copper World Production 1943 to June 15, 1953.

Operator	Tons	Grade, percent Copper	Grade, percent Zinc	Remarks
Dye and Bathrick	13,990	3.62	11.2	Above 250 level, 1943-46
Omega Metals Co.	2,500	3.0	10.5	400-500 levels, 1948-49
Dye and Bathrick	1,200	?	?	400-500 levels, milled at Antler mill.
Mountain States Metals Co.	17,434	3.5	8.5	Copper World Mill, 1951 to June 15, 1953
Total and average	35,124	3.5	9.8	

Erection of the Copper World mill was started in January 1951 and milling was started in September of the same year. Milling has been fairly continuous since that date except for the period of December 1952 to March 1953. The following tonnages have been milled in the Copper World mill. Data were furnished by George A. Freeman, manager:

TABLE II. Ore Milled in the Copper World Mill September 1951 to June 15, 1953.

Date	Tons	Grade, percent Copper	Grade, percent Zinc
1951			
September to November 30.	4,100	3.7	9.2
December	400	?	?
Total and average, 1951	4,500	3.7	9.2
1952			
January	1,268	?	?
February	1,609	3.2	11.2
March	1,543	2.8	9.4
April	1,042	3.1	7.9
May	980	3.2	8.8
June	870	3.4	9.1
July	990	3.2	10.6
August	792	4.3	6.3
September	603	5.1	7.1
October	491	4.1	11.2
November	250	3.2	7.9
December	---		
Total and average, 1952	10,438	3.4	9.2
1953			
Januaryand February	---		
March	290	4.6	5.2
April	780	4.8	6.1
May	970	2.9	2.6
June 1 to June 15	456	2.9	3.8
Total and average to June 15, 1953	2,496	3.7	4.7
Grand total and average	17,434	3.5	8.5

OWNERSHIP AND EXTENT

The Copper World mining property consists of 1 patented mining claim, 3 unpatented mining claims, and 71.28 acres of grazing land leased from the owner. The patented claim, the Copper World, Mineral Survey No. 203, Certificate No. 903, was located in 1882. The patent was recorded in the office of the County Recorder of Mohave County, Ariz., on July 22, 1892, in book 10 of Deeds on page 733 (affixed to this real property are rail, air and water lines in place and approximately 25,000 feet of timber and ties.).

Two of the unpatented claims, known as Copper World No. 1 and Copper World No. 2, have their location notices recorded in Book 3-X of Mines on pages 400, 401 and 402 in the office of the County Recorder of Mohave County, Ariz. The location notice of the third unpatented mining claim, known as the Helen Ruth, is recorded in Book 3M of Mines on page 431, and Book YY of Mines on page 707 (affixed to this real property is certain well equipment used to pump water from the "Boriana Wells").

The mining claims are owned by Dye and Bathrick of Kingman, Ariz. and now are under lease to the Mountain States Metals Co.

Dye and Bathrick have a lease on 71.28 acres of grazing land adjoining the Copper World claim from the owner, J. H. Herridge. This lease has 10 years to run from October 26, 1950 and has been transferred to the Mountain States Metals Co.

The manager of the applicant company stated that the "Owners Consent to Lien" would be obtainable from the owners should the proposed project be approved.

DESCRIPTION OF THE DEPOSITS

The ore is localized within a strongly sheared biotite schist which is contained between thick massive bands of gneiss. The formations and the veins stand nearly vertical and strike N. 35° E. The veins have been formed primarily by replacement of the schist by the ore minerals which consist of chalcopyrite, sphalerite, and minor amounts of bornite, chalcocite, galena, and a little scheelite.

The ore occurs in several distinct shoots which differ from each other in the tenor of the ore and the ratio of the copper to zinc. In the main shoot the ore has shown remarkable continuity of grade from the surface to the 500 level, and averaged close to 3.0 percent copper and 10.0 percent zinc. Diamond drilling indicated that both the copper and the zinc content increased below the 500 level.

Post-mineral movement along a major fault has interrupted the continuity of the oreshoots. The amount of displacement is not known but appears not to be too excessive. Exploration work below the fault has not been extensive enough to locate the faulted segments of all the oreshoots known above the fault so a number of good targets exist other than those contemplated by the operator under the proposed development plan.

MINABLE ORE RESERVES

The applicant has estimated ore reserves slightly in excess of 38,000 tons. This approximates tonnage estimates made in early 1952 and indicates that the discovery of new ore is equaling the depletion of the reserves. The recent ore reserves are shown in the following table and include reserves expected to be found by the proposed exploration.

TABLE III. Copper World Ore Estimates
June 24, 1953

Description	Tons	Grade, percent Copper	Grade, percent Zinc
Old workings above the 500 level	18,000	3.0	10.0
New 500 level ore shoot	5,400	4.5	4.5
Section between 500 and 650 levels	14,700	4.5	4.5
Total and average	38,100	3.8	7.1

Most of the above reserves can be classified as indicated and the remainder as inferred. There is very little measured ore in the mine. Success of the proposed project would convert most of the inferred ore into the indicated category, and possibly add to the reserves an appreciable tonnage of inferred ore below the 650 level. A rough check of the reserves indicates that they are reasonable. R. F. Robinson, the Geological Survey member of the examining team, estimates indicated reserves on the order of 29,900 tons (see figure 1, Geologic report).

Because of the erratic nature of the oreshoots, channel sampling does not seem reliable. Mined ore sent to the mill evidently is a more accurate gauge of the quality of the ore. That the above grade estimates are reasonable is shown by past production of the mine. Ore mined from above the 500 level during 1952 averaged 3.4 percent copper and 9.2 percent zinc. The remaining ore in the same part of the mine is estimated to contain 3.0 percent copper and 10.0 percent zinc as noted in table III. That the grade estimates of 4.5 percent copper and 4.5 percent zinc are reasonable is shown for the months of March and April 1953 when ore from the development of the new oreshoots was sent to the mill. The ore for March contained 4.6 percent copper and 5.2 percent zinc while that of April contained 4.8 percent copper and 6.1 percent zinc.

The applicant's manager has agreed to subject all ore mined after the date of the contract to a royalty to repay the Government's share of the proposed exploratory project. During 1951 and 1952, the ore returned a little over $20.00 per ton based on the net smelter returns.

Assuming a similar price schedule in the future, the Government would realize slightly over $1.00 royalty per ton of ore and the 38,100 tons of ore would more than repay the Government's share of the $14,872.50 of the proposed project.

PRESENT STATUS

The upper workings of the mine were developed by adit levels with some intermediate work. A winze was sunk from the 200 level to the 250 level. From the 250 level a diamond drill hole was drilled in the vein for a depth of 213 feet. There was sufficient ore in this hole to warrant driving a new crosscut adit which cut the vein on the 500 level. This adit is 703 feet in length and serves as the main haulageway to the mill bins. Exploration and development includes 350 feet of shafts and winzes, over 1,200 feet of drifts and crosscuts, 1,030 feet of adits, and over 250 feet of raises (see figures 2 and 3).

The mine is depleted above the 250 level, excepting any unknown oreshoots. Some ore remains between the 250 and 500 levels in the developed part of the mine. Additional ore is suggested below the developed zone, and new ore has been found by drifting to the northeast on the 500 level. The pipe oreshoot mined above the flat fault and above the 350 level has not been found beneath the fault, probably because of insufficient exploration.

The mine is completely equipped with sufficient machinery for the modest operation being performed. A few additional items such as a small battery locomotive for tramming the ore on the 500 adit level would assist in operations. The mill is a complete and seemingly well-designed plant having a rated capacity of 25 tons per 8-hour shift.

The Mountain States Metals Co. has operated the Copper World mine almost continuously since milling started in September 1951. No ore was produced during December 1952, and January and February 1953, but development work consisting of drifting and diamond drilling was done. The drifting consisted of driving northeasterly on the 250, 350, and 500 levels. Ore was found in each of the drift extensions.

Three important diamond drill holes were completed. These were drilled from a station in the 500 level adit and intersected the ore-bearing structure at 3 points approximately 100 feet below the 500 adit level. One hole was directly beneath the intersection of the adit and the 500 level drift. The other 2 holes flanked this one, approximately 100 feet on each side. Each of the holes intercepted interesting mineralization (see figure 3).

TABLE IV. Diamond Drilling Results.

Description	Interval, ft. From	Interval, ft. To	Core or Sludge	Assay, Oz. Silver	Assays, Percent Copper	Assays, Percent Zinc
A4, Under Adit	128	133	2.5 ft.C	0.20	4.5	6.10
Ditto	128	133	Sludge	0.20	3.5	5.70
Ditto	133	138	4.5 ft.C	0.20	5.85	16.80
A3,100 ft. NE	143	149.5	Good,Core	1.4	3.50	1.90
Ditto	149.5	157	Good Core	1.6	2.9	5.50
A4, 100 ft. SW	145	147	Good Core	0.60	6.25	3.1
Ditto	147	151.5	Good Core	0.60	4.6	35.4

The above results indicate an extension of the ore zone below the 500 level. It must be noted that the drill intervals given above do not represent the true thickness of the ore zone. The actual thicknesses will be somewhat less when the corrections for dip and lateral angular intersections are applied. The proposed project will explore this inferred

extension of the ore zone to the 650 level and laterally for 400 feet. It might be mentioned in passing that other places remain in the mine where exploration also could be done to good advantage.

PROJECT PROPOSALS WITH COSTS

The applicant has proposed an exploration project consisting of sinking a winze to a depth of 165 feet below the 500 adit level, them to do 400 feet of drifting on the 650 level 150 feet below the 500 adit, as shown on figures 2 and 3. The crosscut extension of the 500 adit to prepare for the winze collar, the furnishing and installing a hoist, the headworks and dumping arrangement, and the short crosscut on the 650 level from the winze to the vein will be done at company expense. This work is estimated to cost $10,000.

For the part of the project in which Government participation is desired, only the 165 feet of winze and the 400 feet of drifting on the 650 level would be considered. The winze is to be 2 compartments and will be timbered throughout. The drift, judging by the 500 level, will be timbered for most, if not all of its length. The applicant estimates the costs to be $93.00 per foot of winze and $36.00 per foot of drifting. These costs are very reasonable, and therefore acceptable to the Government. It is believed that these costs probably will be exceeded a little unless water or other unfavorable condition is encountered which would tend to greatly increase the estimated costs.

TABLE V. Estimated Costs of Proposed Project Copper World Mine.

Work	Feet	Unit Cost		Total Cost
Winze	165	$93.00		$15,345.00
Drifting	400	36.00		14,400.00
			Total	$29,745.00

As previously mentioned, the manager of the applicant company stated that they were willing that royalties be taken from all ore mined after the date of the contract until the Government's share in the participation in the project was repaid.

All equipment necessary for the project is on hand or readily available. Sufficient water for the mine and mill is available from the company leased Boriana well. During protracted periods of drouth, the supply of water may be curtailed. Sufficient manpower is available and it may be that additional labor would not be employed for the project.

PRODUCTION PLAN

The mine, and therefore the mill, was not operated during the first 2 months of 1953 when attention was concentrated on development work. At the present time the mill, after starting operations in March 1953, has milled nearly 1,000 tons of ore per month. This is below its rated capacity and below the maximum milled in February 1952, when 1,609 tons was milled. It is likely that the reason for the reduced capacity lies in the mine, where although one is available, stoping methods seem unable to fulfill the mill requirements of ore.

The company plans to mine the new ore body to the northeast on the 500 level by shrinkage methods, using roof bolts and headboards to hold the walls. It is doubted that this method will be successful for the following reasons. The first, and probably the most serious, would be in the tying up of large quantities of ore in the stopes which could be ill afforded in a small operation of this type. Secondly, oxidation of the ore held in the stopes could adversely affect the metallurgy. Thirdly, it seems that sorting of the ore in the stopes and more selective mining would be advantageous to the operation of the property. This cannot be done by the suggested mining method. Lastly, it is felt that the use of roof bolts in such narrow stopes would result in no economy. A rough calculation indicated that stulls and headboards would be cheaper and possibly more satisfactory in the shrinkage stopes. Some method of wall support is mandatory to prevent excessive dilution of the ore with the slabby walls. It is probable that top-slicing, or cut-and-fill stoping would be the least expensive in the long run. Although the cost per ton of stoping might be higher, the greater selectivity of the method, the higher grade of ore resulting from less dilution, and the greater recovery of ore would result in a lower cost per pound of metal produced.

The Copper World mill has a rated capacity of approximately 75 tons per 24 hours. The mill seems well designed and constructed. It probably is efficient. Although it does not contain some refinements that would be an aid to the operation, it does contain all of the necessary equipment. Mill costs seem reasonable, and together with mining costs, are tabulated as follows. There are not sufficient data to analyse these costs fully (these costs were supplied by the company manager).

TABLE VI. Operating Costs, Per ton of Ore
Mountain States Metals Co. Copper World Mine.

Year	Mining	Milling	Development	Overhead	Total	Tons Mined
1951	$8.95	$3.81	$3.10	$2.23	$18.09	4,120 1/
1952	8.21	3.86	2.60	1.90	16.57	9,236 1/
1953, to June	6.85	3.12	2.00	1.91	13.88	2,040 2/
Average	$8.23	$3.75	$2.65	$1.99	$16.62	

1/ Does not agree with total in Table II
2/ Does not contain 456 tons mined after June 1 as shown in Table II.

A rough analysis of the costs indicates that a small profit is being made, and barring a slump in the price of copper, a profit should continue to be shown. It could be increased with an increase in the efficiency of operations. A large profit is not likely unless bonanza ore is encountered, or the prices of copper and zinc greatly increase without an increase in the costs of labor and supplies. The small profit being made at the present time should encourage the operators to continue with operations, barring an economic slump.

CONCLUSIONS

The following conclusions were derived from an examination of the Copper World mine and from an analysis of the data pertaining thereto:

(1) The Copper World mine is a small mine and in the last 10 years has produced appreciable copper and zinc ores. Total production exceeds 35,000 tons that contained approximately 3.5 percent copper and 9.8 percent zinc, plus a little silver.

(2) The mine contains estimated ore reserves, both indicated and inferred, of approximate 38,000 tons. The royalty on this ore, based on past production and assuming a similar price schedule for

the future, would be more than enough to repay the Government for its share in the project participation. The company manager has agreed to make all of the ore mined after the date of the contract subject to royalty.

(3) A significant discover of copper-zinc ore by the proposed project is highly probable. In addition, it will open up a new level where additional exploration by the operators is likely to result in still larger reserves of important copper and zinc ores.

(4) The Mountain States Metals Co. has operated the mine, with only short periods of nonproductiveness, since 1950. Although the management may be criticized for not conducting its operations in the most efficient manner, the efficiency is acceptable considering the isolated location of the mine, the relative inefficiency of labor available for small operations of this type, and the youth of the operation. The applicant has the necessary personnel, both as labor and supervisory, to capably conduct the project in which the Government is asked to contribute.

(5) The project proposed by the applicant company is to consist of 165 feet of winze and 400 feet of drifting from the 650 level. All preparatory work and equipment is to be furnished by the operator. Costs were estimated to be $93.00 per foot of winze and $36.00 per foot of drift. The whole project is reasonable and the costs are deemed very fair.

(6) All of the labor, supplies, and equipment are available or on hand for the use of the project.

(7) Although the mine is relatively isolated, it is readily accessible by a good to fair road from Kingman, Ariz., some 40 miles by road to the north.

RECOMMENDATIONS

Based on the foregoing conclusions, it is recommended that the application for Government aid in exploring the Copper World mine by the Mountain States Metals Co., Docket DMEA-3064, be approved. The work will consist of 165 feet of 2-compartment winze from near the face of the 500 level adit, and 400 feet of drifting from the winze on or near the 650 level, or 150 feet below the collar of the winze. The drift will extend both northeasterly and southwesterly from the winze and on the vein. The drift will be timbered where necessary. All preparatory work, consisting of preparation of the hoisting station, installation of the hoist, preparation of the dumping and loading pockets, and the crosscut from the 650 level of the winze to the vein, will be done by the applicant without Government assistance. The costs are estimated to be $93.00 per foot of winze and $36.00 per foot of drift. These costs are acceptable and are tabulated as follows:

Winze, 165 feet at $93.00 per foot 1/	$15,345.00
Drifting, 400 feet at $36.00 per foot	14,400.00
Total	$29,745.00

It is recommended that these costs be applied to the project work.

1/ Winze will be vertical.

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

224 New Customhouse
Denver 2, Colorado

October 19, 1953.

Memorandum

To: Administrator, Defense Minerals Exploration Administration
Attention: 200

From: Field Team, Region IV

Subject: Report of Examination - DMEA Docket 3164 (Uranium), Midland Uranium, Inc., Blue Chief Mesa Claims, Grand County, Utah.

Enclosed are four copies of the Report of Examination on the subject docket, a copy of the letter of denial to the applicant, and two copies of Form 3b.

John F. Shaw
For W. H. King

E. N. Hanschmann
for A. H. Koschmann

Enclosures

DENIED

COPY

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

224 New Customhouse
Denver 2, Colorado

October 19, 1953

Mr. Thomas A. Short, President
Midland Uranium, Inc.
504 Felt Building
Salt Lake City, Utah

RE: Docket DMEA-3164

Dear Mr. Short:

Reference is made to your application for Government aid on the Blue Chief Mesa Claims.

Projects approved by the Defense Minerals Exploration Administration must, in its judgement, show definite promise of yielding material of acceptable grade, and in quantities that will significantly improve the mineral supply position for the National Defense Program.

A careful study of your property and data available to this agency reveals that the probability of disclosing mineable reserves of Uranium is not considered sufficiently promising to justify Government participation. Under these circumstances, we regret to advise that your application for exploration aid is denied.

Very truly yours,

s/ John F. Shaw
John F. Shaw
For W. H. King
Field Team, Region IV

s/ E. N. Harshman
E. N. Harshman
For A. H. Koschmann
Field Team, Region IV

HMC:cmm
cc: Docket
Admin. DMEA
WMTraver
AHKoschmann
ERGordon
RPFischer

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Mining Division
Region IV

October 19, 1953.

Memorandum

To: Field Team, Region IV

From: Chief, Mining Division, Region IV

Subject: Engineering Report of Examination - DMEA Docket 3164 (Uranium), Midland Uranium, Inc., Blue Chief Mesa Claims, Grand County, Utah.

Enclosed are eleven copies of the Engineering Report of Examination on the subject docket.

The applicant requested $24,802.34 to explore the Blue Chief Mesa claims by 18,000 feet of wagon drilling.

The examining team does not believe that the property has enough merit to justify Government participation in an exploration project and recommends denial of the application.

We concur in this recommendation.

John F. Shaw
John F. Shaw
For W. H. King

Enclosures

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Region IV

Building 20, Room 137
Denver Federal Center
Denver 14, Colorado
October 7, 1953

Memorandum

To: Executive Officer, Field Team, Region IV

From: Chief, Mineral Resources Branch, Mining Division, Region IV

Subject: DMEA 3164 (Uranium) Blue Chief Mesa claims, Midland Uranium, Inc., Grand County, Utah

Enclosed are the original and ten copies of the "Summary, Conclusions, and Recommendations," by Carl Balser and C. H. Mobley, and of Balser's engineering report on the subject docket.

Balser concludes that the Blue Chief Mesa claims are in a not too favorable area where production has been limited and from small lenses. Their discovery would require drilling on a very closely spaced drill pattern with results unlikely to justify the costs. He recommends denial of the loan application and I approve.

The applicants' request was poorly drawn up, the maps inaccurate, the exploration proposal vague, and unsupported by designation of sites for drill holes or drifting.

The brochure furnished by the Region IV Field Team, with their memorandum of September 11, 1953, instructing that a suitable report be prepared, is returned.

W. M. Traver

W. M. Traver

enclosures

cc AD
DMEA 3164
DMEA Chron.

WMT/pam

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.
200 New Customhouse
Denver 2, Colorado

October 13, 1953

Memorandum

To: DMEA Field Team, Region IV

From: A. H. Koschmann

Subject: DMEA Docket 3164, Midland Uranium, Inc., Blue Chief Mesa group, Grand County, Utah

Enclosed are 11 copies of the geologic report by C. M. Mobley of the U. S. Geological Survey covering the above docket.

It has been recommended that the loan be denied.

A. H. Koschmann

A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures (11)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
P. O. Box 360
GRAND JUNCTION, COLORADO

October 9, 1953

Memorandum

To: A. H. Koschmann, DMEA Field Team, Region IV

From: R. P. Fischer, Acting Supervisor, Colorado Plateau District

Subject: DMEA 3164, Midland Uranium, Inc., Blue Chief Mesa group, Grand County, Utah

Transmitted herewith are eleven copies of a geologic report on the Blue Chief Mesa group of claims, Grand County, Utah. Midland Uranium, Inc., lessee, applied for government assistance to do 18,000 feet of drilling, at an estimated cost of $24,800, to explore for uranium ore.

The attached report was prepared by C.M. Mobley and is based on a joint field examination on September 23 and 24 with Carl Belser, USBM, and I. R. Johnston, representing the applicant. AEC personnel could not be present at the examination, but the application was discussed with the Grand Junction office, which is in general concurrence with the conclusions and recommendation.

On the basis of the field examination and the small production record of the general area, it is concluded that the chances of finding significant deposits of uranium are negligible, and it is recommended that the application be denied. I concur.

R. P. Fischer

R. P. Fischer
Acting District Supervisor

Enclosures 11

RPF/mlr

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMEA 3164, Blue Chief Mesa Claims

Midland Uranium, Inc.

Grand County, Utah

Uranium

Carl Belser, Mining Engineer
Bureau of Mines

Coy M. Mobley, Geologist
Geological Survey

October 1, 1953

DMRA 3164

KLONE CHIEF MESA CLAIMS
MIDLAND URANIUM, INC.
GRAND COUNTY, UTAH

Summary, Conclusions, and Recommendations

By Carl Belser
Mining Engineer
Bureau of Mines

Coy M. Mobley
Geologist
Geological Survey

DMEA 3164

BLUE CHIEF MESA CLAIMS
MIDLAND URANIUM, INC.
GRAND COUNTY, UTAH

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

By Carl Belser and Coy M. Mobley

Midland Uranium, Inc., Thomas A. Short, president, 2662 Imperial Avenue, Salt Lake City, Utah, has applied for a Defense Minerals Exploration Administration loan of $24,802.34 to explore the Blue Chief Mesa claims by 18,000 feet of wagon drilling, 400 feet of core drilling, and 100 feet of drifting.

A field investigation was made on September 23-24, 1953, by an examining team from the Geological Survey and the Bureau of Mines. Ivan R. Johnston, vice-president of Midland Uranium, Inc., accompanied the examining team and the findings of the examining team were discussed with him.

The exposed rocks on the Blue Chief Mesa claims are essentially flat-dipping (about 7° to the northeast) and consist chiefly of shales, mudstones, and sandstones of the lower three "rims" of the Salt Wash member of the Morrison (Upper Jurassic) formation. The mesa drops off abruptly on all sides, over cliffs of Entrada sandstone to the canyons below. On top of the mesa the surface is cut by several ravines which cut through the Morrison formation into the underlying Summerville. Locally the uranium ore generally occurs in the sandstones of all three "rims" of the Salt Wash member.

The sandstones vary from a few feet to 30 or more feet in thickness and in the vicinity of uranium mineralization are light brown in color

and heavily stained with limonite in contact with varying thicknesses of gray-green mudstone. The sandstones in barren or unfavorable ground are commonly white or have a pronounced reddish cast, and the contacting mudstones are red to red-brown. Fossil plant material is relatively abundant in both the barren and uranium mineralized sandstones and is not expected to be a reliable guide to ore deposits.

Ore shipments have not been made from the property and total known production amounts to only about 300 pounds which was produced in mining out a small "trap." Production from the entire mesa has been small.

The applicant drilled 14 wagon-drill holes in two of the more promising areas and the best showing was 18 inches thick and contained only 0.08 percent U_3O_8. Several miles of barren sandstone "rims" are exposed along the sides of the ravines. Ore deposits appear to be small, and, in general, low-grade. The applicants' proposed project was vague and the maps submitted were inaccurate.

The examining team does not believe that the property has enough merit to justify Government participation in an exploration project and recommends denial of the application.

UNITED STATES DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMEA 3164, Midland Uranium, Inc., Blue Chief Mesa group of claims,

Thompsons district,

Grand County, Utah

Uranium

Geologic report

C. M. Mobley, Geologist
U. S. Geological Survey

October 9, 1953

DMEA 3164
MIDLAND URANIUM, INC., BLUE CHIEF MESA GROUP OF CLAIMS
THOMPSONS DISTRICT, GRAND COUNTY, UTAH

INTRODUCTION AND SUMMARY

Midland Uranium, Inc., of Salt Lake City, Utah, has a lease and option on the Blue Chief Mesa group of claims, Thompsons district, Grand County, Utah (fig. 1). They have applied (Docket 3164) to the Defense Minerals Exploration Administration for a loan to explore for uranium.

The claims were examined on September 23 and 24, 1953, in company with Carl Belser, engineer, U. S. Bureau of Mines, and I.R. Johnston, Vice-President of Midland Uranium, Inc. Mr. L. E. Busey, one of the lessors, of the Blue Chief Mesa group of claims, accompanied the party on September 24, 1953.

Midland Uranium, Inc., proposed to do 18,000 feet of wagon drilling and 400 feet of diamond drilling, 100 feet of drifting, and a small amount of bulldozer work to prepare drill sites and to repair the roads. No definite plan of drilling was proposed by the applicant. Page 5, item 5(b) of the application states, "We propose to explore by drilling all likely ore-bearing formations found on the Blue Chief Mesa group of claims". Total cost was estimated to be $24,800.

As a result of the field examination, it is recommended that the Government not enter into a contract with the applicant to do the proposed exploration. This was agreed upon by Carl Belser, and was acceptable to I. R. Johnston.

Only isolated remnants of the ore-bearing sandstone are present on the Blue Chief Mesa group of claims. Of the three small favorable areas, two have been wagon drilled without finding any minable ore. The ore bodies to be expected in this area are probably less than 5 tons each.

GEOLOGY

The exposed rocks on the Blue Chief Mesa group of claims consist of the Salt Wash member of the Jurassic Morrison formation. The Salt Wash member here is about 125 feet thick, and consists of three or more massive light-brown to light-gray sandstone beds or lenses, which range from a few feet to more than 40 feet in thickness and are more than 400 feet wide. These lenses are separated by red-brown mudstone beds up to 50 feet thick. The gray-green mudstone present under some of the sandstone lenses ranges from a few inches to more than 3 feet in thickness. The exposed rocks strike about N. 60° W., and dip 5° to 7° NE. Numerous joints in the area strike about N. 55° to 65° W. and dip almost vertically.

In this area, all of the known deposits of minable grades are in the next to lowest sandstone bed of the Salt Wash member, but no deposits of minable thickness have yet been found on the applicant's claims. This bed is called the "ore-bearing sandstone".

The ore-bearing sandstone is present only as remnants, erosion having removed it from most of the area. There is no recorded production in AEC files from the Blue Chief Mesa group of claims.

According to the criteria developed by the U. S. Geological Survey _/, only small particles of the remnants of the ore-bearing

---

_/ Weir, D. B., Geologic guides to prospecting for carnotite deposits on the Colorado Plateau: U. S. Geol. Survey Bull. 988-B, 1952.

---

sandstone on Blue Chief Mesa can be classed as favorable for uranium deposits. On the basis of outcrop examination, favorable sandstone lies on the southeastern part of the Holiday No. 6 claim and the central parts of the Crescent and Holiday No. 1 claims. The remaining sandstone is classed as unfavorable.

The favorable sandstone consists of a lens of light-brown sandstone, 10 to 40 feet thick and a bout 300 feet wide, underlain in places by gray-green mudstone more than 3 feet thick. Abundant carbonaceous material and limonite stain are present in the sandstone. The unfavorable sandstone consists of beds of light-gray sandstone, 2 to 10 feet thick, underlain by red-brown mudstone.

ORE DEPOSITS

Two deposits were noted on the Crescent claim (fig. 2). One deposit consists of a fossil log, trending NW, about 12 inches in diameter. The center 6 inches is silicified. Abundant calcite, limonite stain, and carbonaceous material are present. The log has been mined for about 10 feet and about 100 pounds of ore has been stockpiled nearby. The grade of the ore is estimated to average about 0.50 percent U_3O_8 and 3.0 percent V_2O_5. The other deposit is on the surface in gray-green mudstone. No ore has been mined from this deposit. The ore was sampled by Midland Uranium, Inc., and assayed 0.116 percent U_3O_8 and 0.21 percent V_2O_5. A fossil log similar to that on the Crescent claims was observed on the Holiday No. 6 claim.

Wagon drilling has been done on the favorable ground on the Crescent and Holiday No. 1 claims. Some mineralized material was found, but it was too low in grade or too thin to be considered economic.

Three small surface showings of ore were examined on ground not controlled by the applicant, but near the Blue Chief Mesa claims. All these deposits contain abundant calcite, limonite stain, carbonaceous material, and silicified fossil logs. Probably no ore has been shipped from these deposits. The grade of the ore is estimated to average about 0.20 percent U_3O_8 and 2.0 percent V_2O_5.

PROPOSED EXPLORATION

The applicant has proposed exploration by both wagon and diamond drilling. No definite plan of drilling was submitted. Page 5, item 5(b) of application states, "We propose to explore by drilling all likely ore-bearing formations found on the Blue Chief Mesa group of claims".

Numerous errors were noted on both maps submitted by the applicant. None of the claim corners found in the field were marked, so it was almost impossible to locate the deposits and favorable ground on the maps.

CONCLUSIONS AND RECOMMENDATIONS

The uranium deposits on the Blue Chief Mesa group of claims are in the next to the lowest sandstone bed of the Salt Wash member of the Jurassic Morrison formation. This bed is called the ore-bearing sandstone. On the Holiday No. 6 and Crescent claims the mineralized material is associated with partly silicified fossil logs. Approximately 100 pounds of ore have been mined from this fossil log. This material is estimated to average 0.50 percent U_3O_8 and 3.0 percent V_2O_5. A surface showing on the Crescent claim is in gray-green mudstone. No reserves are present in any of the workings. The ore bodies to be expected in this area are probably less than 5 tons each.

Only isolated remnants of the ore-bearing sandstone are present in the area. Of the three small favorable areas, two have been wagon-drilled without finding any minable ore.

Therefore, it is recommended that the Government not enter into a contract with the applicant to do the proposed exploration.

DMEA 3164

BLUE CHIEF MESA CLAIMS
MIDLAND URANIUM, INC.
GRAND COUNTY, UTAH

Engineering Report

By Carl Baiser
Mining Engineer
Bureau of Mines

DMRA 3164

BLUE CHIEF MESA CLAIMS
MIDLAND URANIUM, INC.
GRAND COUNTY, UTAH

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ILLUSTRATIONS

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DMEA 3164

BLUE CHIEF MESA CLAIMS
MIDLAND URANIUM, INC.
GRAND COUNTY, UTAH

ENGINEERING REPORT

By Carl Belser

INTRODUCTION

Midland Uranium, Inc., W. J. Kinick, Jr., chairman of the board, 1961 Temple Street, Salt Lake City, Utah; Thomas A. Short, president, 2662 Imperial Avenue, Salt Lake City, Utah; and Ivan R. Johnston, vice-president, Moab, Utah; submitted an application to the Defense Minerals Exploration Administration for aid in an exploration project on the Blue Chief Mesa claims located in Grand County, Utah. The application, DMEA 3164, requested aid in completing 18,000 lineal feet of wagon drilling, 400 lineal feet of core drilling, and 100 feet of drifting at an estimated cost of $24,802.34, of which the Government's participation (90 percent for uranium) would be $22,322.11. This proposed exploration was to test the ore horizons in the Morrison formation. A definite drilling program was not submitted with the application.

A joint field investigation was made of the Blue Chief Mesa claims by a Geological Survey-Bureau of Mines examining team on September 23-24, 1953.

ACKNOWLEDGMENTS

Ivan R. Johnston, vice-president of Midland Uranium, Inc., was present during the examination and L. E. Busey, who located the claims, was present during the last day of the examination and gave valuable aid in clarifying an inaccurate claim map.

R. P. Fischer, Acting District Supervisor, Geological Survey, Grand Junction, Colo., assigned Coy M. Mobley, geologist, to make the examination as the Geological Survey member of the examining team.

LOCATION, TOPOGRAPHY, AND PHYSICAL FEATURES

The Blue Chief Mesa claims are in sec. 25, T. 23 S., R. 24 E., Salt Lake principal meridian, and secs. 30 and 31, T. 23 S., R. 25 E., Salt Lake principal meridian, Grand County, Utah (fig. 1).

The claims cover most of the middle portion of Blue Chief Mesa. The mesa drops off abruptly on all sides, over cliffs of Entrada sandstone, to the canyons below. The top of the mesa slopes about 7° to the northeast and is cut by several steep-sided ravines. The altitude at the claims averages about 6,000 feet. Annual rainfall is low and the climate is semi-arid. Winters are somewhat rugged, but mining operations can be carried on the year around with short interruptions during the more severe storms. Water suitable for mining purposes can be hauled 2 miles from a point near the canyon road. Water for domestic purposes can be obtained from Moab or Grand Junction.

Native timber, in the immediate vicinity of the mine, is small but could be used for mine timbers. Native timber and lumber can be purchased at Moab. A poor secondary road, 14 miles in length, connects with State Highway 128, 30 miles northeast of Moab and 12 miles south of Cisco, Utah, on U. S. Highway 50.

The nearest supply point and railhead is Cisco. An ore purchase depot is located at Thompsons, Utah, 45 miles from Blue Chief Mesa. Labor is obtainable from Moab and from Grand Junction, Colo., 82 miles away.

At the present time there are no accommodations for miners near the property.

HISTORY AND PRODUCTION

On the southmost tip of Blue Chief Mesa and about 1 mile from the applicants' claims is the Blue Chief copper mine which was operated intermittently over a long period of time and is said to have produced over $5,000.00 in high-grade copper-silver ore. One-half mile southwest of the claims, the Shoeman tunnel in sec. 36 is reported to have produced several thousand dollars worth of uranium from a "tree" during World War I. A little high-grade radium-bearing ore was packed off the mesa during the early 1900's. In sec. 25, where most of the Blue Chief Mesa claims are situated, the Sand Flat claim was located in 1939 and relocated in 1940. The Blue Chief Mesa claims were located by L. E. Busey and O. B. Douglas in December 1952. In the spring of 1953, an access road was completed to the top of the mesa from the canyon below. As far as can be ascertained no shipments of uranium ore have been made from any of the three sections in which the Blue Chief Mesa claims are located.

OWNERSHIP AND EXTENT

The property consists of 26 unpatented mining claims comprising approximately 500 acres. These claims, shown on figure 2, are situated in an unorganized mining district and are recorded in the records of the County Recorder of Grand County, Utah, as follows:

Claim	Book	Page	Claim	Book	Page
Crescent	9-N	171	Holiday No. 5	9-N	179
Crescent No. 1	9-N	172	Holiday No. 6	9-N	-
Crescent No. 2	9-N	173	Holiday No. 7	9-N	180
Crescent No. 3	9-N	193	Holiday No. 10	3-P	181
Crescent No. 4	9-N	194	Holiday No. 11	9-N	182
Crescent No. 5	9-N	195	Holiday No. 12	9-N	198
Crescent No. 6	9-N	196	Holiday No. 13	9-N	199
Crescent No. 7	9-N	197	Holiday No. 14	9-N	200
Holiday	9-N	174	Holiday No. 15	9-N	201
Holiday No. 1	9-N	175	Holiday No. 16	9-N	202
Holiday No. 2	9-N	176	Holiday No. 17	9-N	203
Holiday No. 3	9-N	177	Blue Dot	-	-
Holiday No. 4	9-N	178	Blue Dot No. 1	-	-

The eight Crescent claims are owned by O. B. Douglas and L. E. Busey, the sixteen Holiday claims by L. E. Busey, and the two Blue Dot claims were taken up later by Midland Uranium, Inc.

A lease and option on 69 mining claims were granted to Midland Uranium, Inc., in August 1953, by John A. Johnson, Dora McCarty, M. E. Busey, L. A. Busey, L. E. Busey, L. I. Branon, Hazel Branon, O. G. Roberts, Wilma Roberts, M. W. DeMoss, Mrs. M. W. DeMoss, Ted Dowell, Mrs. Ted Dowell, O. B. Douglas, Ollie Fluke, and Heath Fluke. Among the 69 claims were the Crescent and Holiday groups. The agreement called for a $2,000.00 down payment and ten additional payments totaling $87,250.00 to be paid by July 1, 1954.

Forty-five of the 69 claims are in the applicants' Squaw Park, Seven Mile Mesa, or Cisco groups and do not apply to this application.

The Blue Chief Mesa claims need to be resurveyed, as conflicts were noted with the Red Bird No. 1, Red Bird No. 2, Big Tree, and possibly the Sun Down claims. The applicants state that there are no liens or encumbrances on the property.

DESCRIPTION OF DEPOSITS

A strong east-west fault cuts through the mesa a short distance to the south of the claims. The north side of the fault has been raised. The formations dip about 7° to the northeast. South of the fault the Brushy Basin or Upper member of the Morrison formation is exposed and all four rims of the Salt Wash member are present. North of the fault, in the vicinity of the Blue Chief Mesa claims, the highest exposure is the third rim of the Salt Wash formation. This exposure occurs on the Crescent, Holiday, and Holiday No. 1, 2, 3, 4, 6, 12, 13, and 17 claims (fig. 2). The Salt Wash formation is cut by a number of north-easterly striking ravines which expose the Summerville and, in places, the Entrada formation.

North of the fault small surface deposits showing uranium mineralization have been prospected presumably in the second rim on the Sand Flat claim and in the School Section near the north line of sec. 26 (fig. 2). Surface deposits in the third rim occur on the Crescent and on the Sun Down (not shown on map) claims. Some wagon drilling has been done in the vicinity of each of these surface deposits but the uranium mineralization appears to be small and no ore has been shipped. The third rim on the Holiday No. 1 claim contains sandstones and mudstones of the type generally associated with uranium mineralization.

A small mineralized "tree" has been mined from the third rim of the Salt Wash member where it was exposed by a ravine on the west side of the Crescent claim. The ore, about 300 pounds countering from 0.40 to 2.0 percent, has been piled near the portal of a 10-foot-long adit which was driven on the "tree." Directly across the ravine from this "tree" is a small partly mineralized tree. All other "trees" noticed

were silicified but did not contain uranium ore. The largest of these is at the discovery on the Big Tree claim and, as exposed, is 4 feet in diameter and 40 feet long (fig. 2).

MINEABLE ORE RESERVES

There are no measureble ore reserves. The small "tree" on the Crescent claim appears to be completely mined out and the drilling on the Crescent surface deposit and on the Holiday No. 1 claim did not disclose uranium ore of a shipping grade, the best showing being only 18 inches of 0.08 percent U_3O_8.

No estimate can be made of inferred ore, which may exist, probably in small lenses, on any of the 26 claims.

PRESENT STATUS

Exploration and Development

The property has been explored only by 700 feet of wagon drilling on the Crescent and Holiday No. 1 claims and a 10-feet-long adit on the Crescent claim. No discovery shafts or adits have been made and the property has not been adequately surveyed or mapped.

Mining and Milling Equipment and Other Facilities

There is no mining or milling equipment on the property. The nearest mill site is at Dewey and the nearest ore depot at Thompsons.

PROPOSED EXPLORATION

The applicant proposed to explore the claims by 18,000 feet of wagon drilling, 400 feet of core drilling, and 100 feet of drifting at the following stated costs:

Estimate of Costs

(a)	18,000 lineal feet wagon drilling at $0.75	$13,500.00
	400 lineal feet core drilling at $3.00	1,200.00
	14 days D-6 bulldozer at $80.00	1,120.00
	100 lineal feet drifting at $17.00	1,700.00
(b)	18 days supervision - operating vice-president at $25.00, plus $6.00 living expense	558.00
	75 days supervising engineer at $25.00, plus $6.00 living expense	2,325.00
	5 days consulting geologist at $50.00, plus $8.00 living expense	320.00
	50 assays at $4.00	200.00
(c)	Fuel for Jeep vehicle - estimate, 3,000 miles travel, consumption 10 miles per gallon - 300 gallons at $0.32	96.00
	Oil changes, grease, etc.	10.00
(d)	Detectron Geiger counter and probes	385.00
	Brunton compass	28.34
	Transit, Philadelphia rod, chain stakes, and miscellaneous surveying equipment - 1 month rental at $50.00	50.00
	4-wheel drive Willys Jeep	850.00
(f)	Trailer having quarters for Midland personnel	500.00
(g)	Employer's Liability Insurance	300.00 ?
	Health-Accident Insurance Policies	120.00 ?
	Ivan R. Johnston and John E. Gonyer accounting costs - 8 months at $50.00 per month	400.00
(h)	Estimate contingency allowance	1,200.00
		$24,802.34

On the Blue Chief Mesa claims the only feasible drilling sites appear to be in the areas where the third rim has not been eroded and also in the lower rims on the Crescent No. 4, Holiday No. 16, and Blue Dot claims. Accurate mapping would be necessary before an intelligent drilling

program could be proposed and, because little is known of the area, any preliminary project contemplated should include less wagon drilling and no drifting.

The applicants' estimates of costs are not realistic nor do they indicate where they proposed to do the exploratory drilling. It is the examining engineer's opinion that if drilling were justified, the claims could be adequately tested for about half the amount requested in the loan application.

CONCLUSIONS

The Blue Chief Mesa claims are in an unproven area where production has been very limited and known ore lenses small. The Salt Wash member of the Morrison formation is exposed for several miles by the ravines traversing the property. With the exception of the one small tree, mentioned under "Description of Deposits," no uranium mineralization of shipping grade has been found to date. All available information indicates that any ore lenses found would be small and, in general, low grade. Unless drill holes were placed on close centers, ore lenses would probably be missed entirely. The examining team does not believe the property has enough potential merit to justify Government participation in an exploration project.

RECOMMENDATIONS

It is recommended that the application be denied.

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

224 New Customhouse
Denver 2, Colorado

September 15, 1953

Mr. George A. Freeman
Mountain States Metals Company
Box 851
Kingman, Arizona

Re: Docket No. DMEA 3064
Copper World Mine

Dear Mr. Freeman

On August 12, 1953, information was requested from you concerning the ownership of land where the portal of your 500 feet level haulage adit is located. We also need to know the land which is railroad land, and the land which is owned by Herridge, in order to prepare a contract.

This information has not been received in this office and we presume that you are no longer interested in this exploration project, therefore we will close this docket in 30 days if the requested information has not been received by that time.

Very truly yours,

W. H. KING

W. H. King
Executive Officer, DMEA
Field Team, Region IV

HMC:jp
cc Subject
Chron
WRStorms
AHKoschmann
COMittendorf (2)
HMConnors

pc

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

224 New Customhouse
Denver 2, Colorado

July 23, 1953.

Memorandum

To: Administrator, Defense Minerals Exploration Administration

From: Field Team, Region IV

Subject: Final Report, DMEA Docket 3064 (Copper-Zinc), Mountain States Metals Company, Copper World Mine, Mohave County, Arizona.

The application for Government assistance in exploration work estimated to cost $29,745.00 has been approved by us and a contract is being prepared.

Government participation will be 50 percent, or $14,872.50.

Four copies of the Final Report will be forwarded when the contract is executed. Two copies of Form 3b are attached.

W. H. King
W. H. King

A. H. Koschmann
A. H. Koschmann

Enclosures

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

224 New Customhouse
Denver 2, Colorado

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W. H. King
W. H. King

A. H. Koschmann
A. H. Koschmann

Enclosures

DMEA Form 3b
(Revised)

DEFENSE MINERALS EXPLORATION ADMINISTRATION

CONTROLLED DOCUMENT
Revised Abstract

DMEA Docket No. 3064

Name of Applicant Mountain States Metals Company

Change:	From		To	
	III 1	[ ]	III 1	[x] 7-22-53
	III 2	[ ]	III 2	[ ]
	III 3	[ ]	III 3	[ ]
	III 4	[x]	III 4	[ ]
	III 5	[ ]	III 5	[ ]
			III 6	[ ]
			III 7	[ ]

Add:

II 7 $ 29,745.00

II 8 $ 29,745.00

II 8a % 50

II 9 $

Remarks:

Initials of person preparing sheet HMC

Date sheet prepared 7-22-53

33978

DMEA Form 3b
(Revised)

DEFENSE MINERALS EXPLORATION ADMINISTRATION

CONTROLLED DOCUMENT
Revised Abstract

DMEA Docket No. 3064

Name of Applicant Mountain States Metals Company

Change:	From		To	
	III 1	☐	III 1	☒ 7-22-53
	III 2	☐	III 2	☐
	III 3	☐	III 3	☐
	III 4	☒	III 4	☐
	III 5	☐	III 5	☐
			III 6	☐
			III 7	☐

Add:

II 7 $ 29,745.00

II 8 $ 29,745.00

II 8a % 50

II 9 $

Remarks:

Initials of person preparing sheet EMC

Date sheet prepared 7-22-53

33978

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

Not to be filled in by applicant

Docket No. 3064
Metal or Mineral
Date Received 6/8/53
Estimated Cost
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Mountain States Metals Co., Box 651, Kingman, Arizona
Incorporated in Arizona in 1951
President - B. T. Whitaker, 315 E. 38th St., Tucson, Arizona
V. Pres. - M. Winter " " " " " "
Sec.-Treas.- J. Ainsler " " " " " "

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract The Copper World (a patented claim) Copper World 1(an unpatented mining claim) and Copper World 2 (an unpatented mining claim)
Mohave Co., Ariz.

(*b*) State any mine name by which the property is known. Copper World Mine

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise Purchaser under "Sales Agreement" with Dye and Bathrick, a partnership

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. A copy of the agreement between Mt. States Metals Co. and Dye & Bathrick was sent to your office with application for loan in Dec., 1951. The copy has not been returned. We will have another made if you don't have it.

(*e*) If you own the land, describe any liens or encumbrances on it

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice. A full description of claims is shown in contract mentioned above

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes. (See attached sheet)

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

5. *The exploration project.* (*a*) State the mineral or minerals for which you wish to explore Copper and Zinc

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contacts, veins, ore-bearing beds, etc.

(*c*) The work will start within 120 days and be completed within 18 months from the date of an exploration project contract.

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations (See attached sheet)

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)?

(*b*) How do you propose to furnish your share of the costs? (see attached sheet)

☐ Money ☐ Use of equipment owned by you ☐ Other

Explain in detail on acompanying paper.

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated Aug 20, 1953

Mountain States Metals Co.
(Applicant)

By G. A. Freeman, Mgr.

G. A. Freeman

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

Mountain States Metals Company

BOX 851
~~XXXXX~~ ARIZONA
Kingman, Arizona

May 20, 1953

ATTACHED SHEET TO APPLICATION (form MF-103)

4. (a) This mine was worked from 1942-1946 by Dye and Bathrick, a partnership. Their mining was done between the 190'-250' level. The 60 foot vertical distance that they mined produced a total tonnage of 13,990 tons of crude ore that averaged 3.62% Cu and 11.2% Zn. Since they did not have a mill, this tonnage was shipped to custom mills. Most of it was shipped to Shattuck Denn in Bisbee, Arizona.

The mine was under lease and option to Omega Metals Co. from 1948-1949. They did considerable development work on the property and had just gotten into operation when metal prices dropped in 1949. When Omega Metals Co. took over the property, the lowest level was the 250 foot. Most of the known ore was stoped out above this level. A 250 foot vertical diamond drill hole was drilled, starting in the ore, on the 250 foot level and it remained in ore to the 500 foot level. Due to a steep side hill slope, the ore zone on 500 foot level could be reached by a 730 foot crosscut adit. During the time that Omega Metalls Co. held the property, they run this crosscut to the ore zone and drifted 120 feet each way on the ore. They also started a vertical raise from the 500 foot level to the 250 foot level. This was started on the diamond drill hole. The ore from this development plus a small tonnage from stoping was milled at Boriana Mill. They milled about 2500 tons of ore from the development that averaged 3.0% Cu and 10.5% Zn.

When the present company, Mt. States Metals Co., took over, they completed the main #1 raise to the 250 foot level and developed two main sub-levels between the 250' -500' level. They have drifted a total of 290 feet to the northeast from the main crosscut and haulage on the 500' level and 145 ft to the southwest from crosscut. There were two main ore chutes encountered in this drifting (see colored maps for ore zones) The ore chute over the main cross-cut is the only one that any mining has been done on to date. The ore zone to the NE is being developed at this time for mining. The sub-level development is also shown on maps.

The mine is in good shape and all workings are accessible for examination purposes.

All of the development below the 250 foot level shown on maps has been done by Mt.States Metals Co., other than that mentioned above done by Omega Metals Co.. They also extended the 250 foot level 182' feet to the NE.

Mt. States Metals Co.
Box [illegible]
Kingman, Arizona

4.(cont.)
(b)

Through Dec. 31, 1952 there has been mined and milled 28,240 tons of crude ore, averaging 3.47% Cu and 9.8% Zn. From ore zones shown on maps we have calculated a remaining ore reserve above 500 level of 22,000 tons averaging 3.9% Cu and 6.1% Zn. The reason for the higher copper average is that the NE ore body, from development work, has averaged higher in Cu.. To date, this ore body has averaged 4.4% Cu and 4.7% Zn.

(c) The ore occurs in the weaker schist zones. This schist, for the main part has gneiss as a footwall and pegmatite and gneiss as hanging wall. The vein, however, dips nearly vertical.

The ore zone on the 500 foot level has been as large as the zones on the upper levels and the grades nearly the same. The copper values have increased in proportion at lower levels. Geologically, there is no reason why the ore will not continue to a depth of the proposed 150 foot shaft and further.

Mr. Romslo and Mr. Elsing of the Bureau of Mines, at the Univ. of Ariz. in Tucson have examined the property previously and the proposed work was discussed briefly with them. However, we have developed more ore to the NE than we had at the time of their examination.

(d) The mine and mill is 16 miles from Yucca, Arizona and shipping point. There is a good graded road to the property. The camp and boarding house is located at the mine and mill.

(e) There is a 44,000 volts power line to the property and we have 750 KVA available at the mine and mill.
We have the Boriana Wells that supplies water for the 100 ton selective flotation plant.

5. (b) The Exploration Project we would like to participate in is to sink a shaft 165 feet vertically below the 500 ft level on the footwall side of the ore, 15 foot of this to be for a sump and pocket. Then drift 290 feet to the Northeast and 110 feet to the Southwest from this shaft. (see enclosed maps showing proposed shaft and drifting).

In addition to the above work it will be necessary to run a short ~~cross~~ crosscut to the start of the shaft and we would also have to build an ore pocket on the 500 ft level and at the bottom of proposed shaft. We are prepared to do this work ourselves and also furnish the hoist and install it. All other equipment is available at the property.

(d) The writer, G. A, Freeman, will be in charge of such exploration work. I worked for E. I. DuPont between 1937-1940 incharge of magnotometer survey doing geophysical work on Titanium. From 1941-1949 I was employed by Coronado Copper and Zinc Co.(Harvey Mudd interests) as chief chemist and mill supt.. Since that time I have been employed by Mt. States Metals Co. as General Manager . Member A.I.M.E.

Mt. States Metals Co.
Box 851
Kingman, Arizona

6. We would like to enter into a contract at a cost per foot of sinkingand cost per foot of drifting and Mt. States Metals Co.. furnish all necessary equipment, supplies, etc..

Our cost per foot for drifting, to date, has been $36.00 and our estimated cost for shaft sinking is $93.00.

The part of the project that we would like to have assistance on is the actual drifting and sinking footage. As mentioned above, we would do the necessary preparatory work and furnish equipment.

As per drawing, there would be 165 feet of shaft and 400 feet of drift. The drift to be 5'x 7'. The shaft to be a 2 compartment (2 - 5'x 5') one compartment for a skip and one for ladders and pipe.

I am sending,under separate cover, two copies of maps indicating the proposed exploration work and also showing the ore zones and detail above the 500 level. If you need extra copies of these I will have some made up. The Bureau of Mines office in Tucson, Arizona have a complete set also.

Total cost of DMEA participation:

400 feet of drifting	at $36.00 per ft -	$ 14,400.00
165 feet of shaft	at 93.00 " " -	15,345.00
	TOTAL --	$ 29,745.00

If you wish to make inquiry as to the merit of the property, please call Mr. Romslo of the Bureau of Mines in Tucson, Arizona.

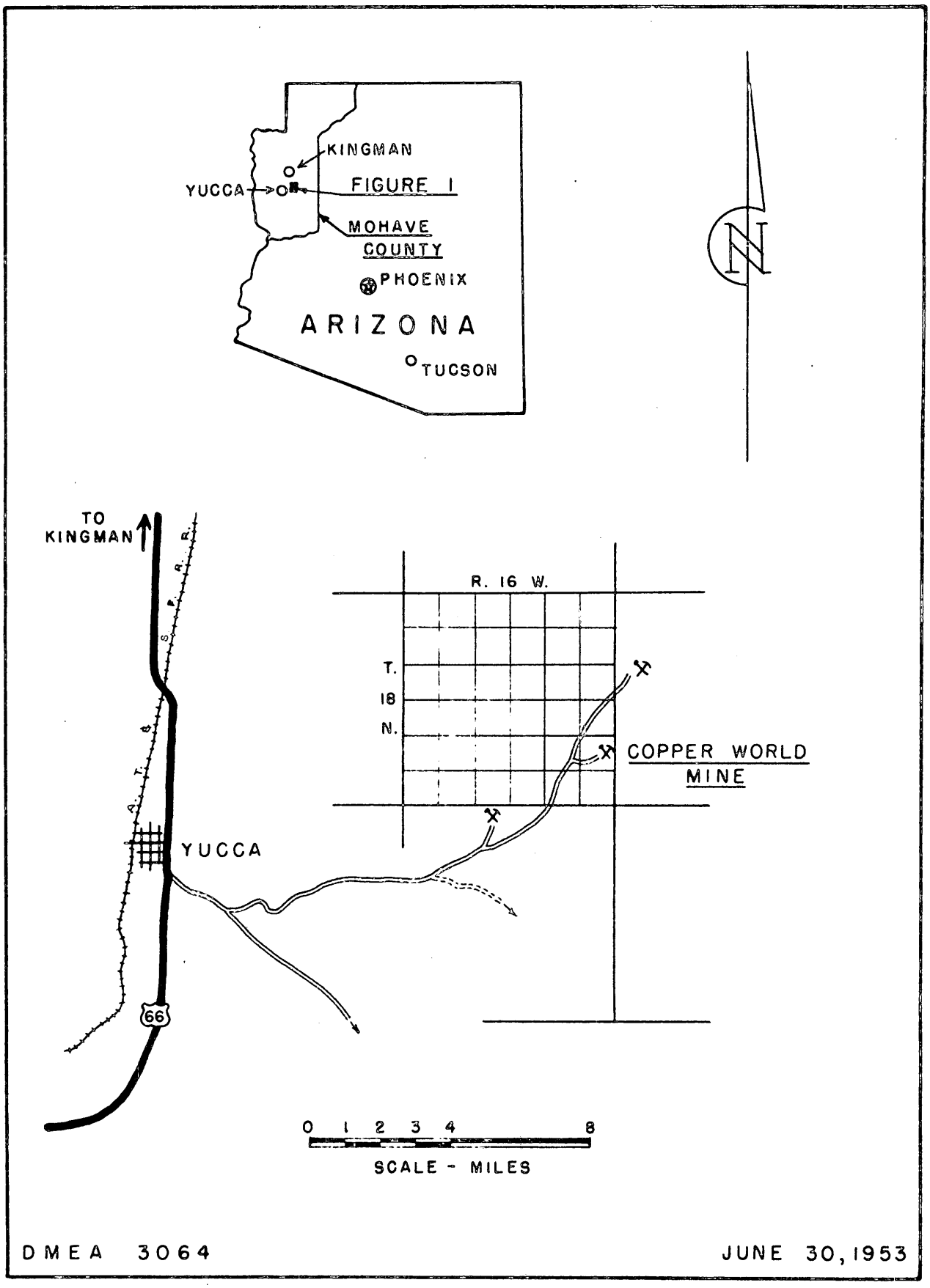


FIGURE 1. - LOCATION MAP - COPPER WORLD MINE
MOHAVE COUNTY, ARIZONA

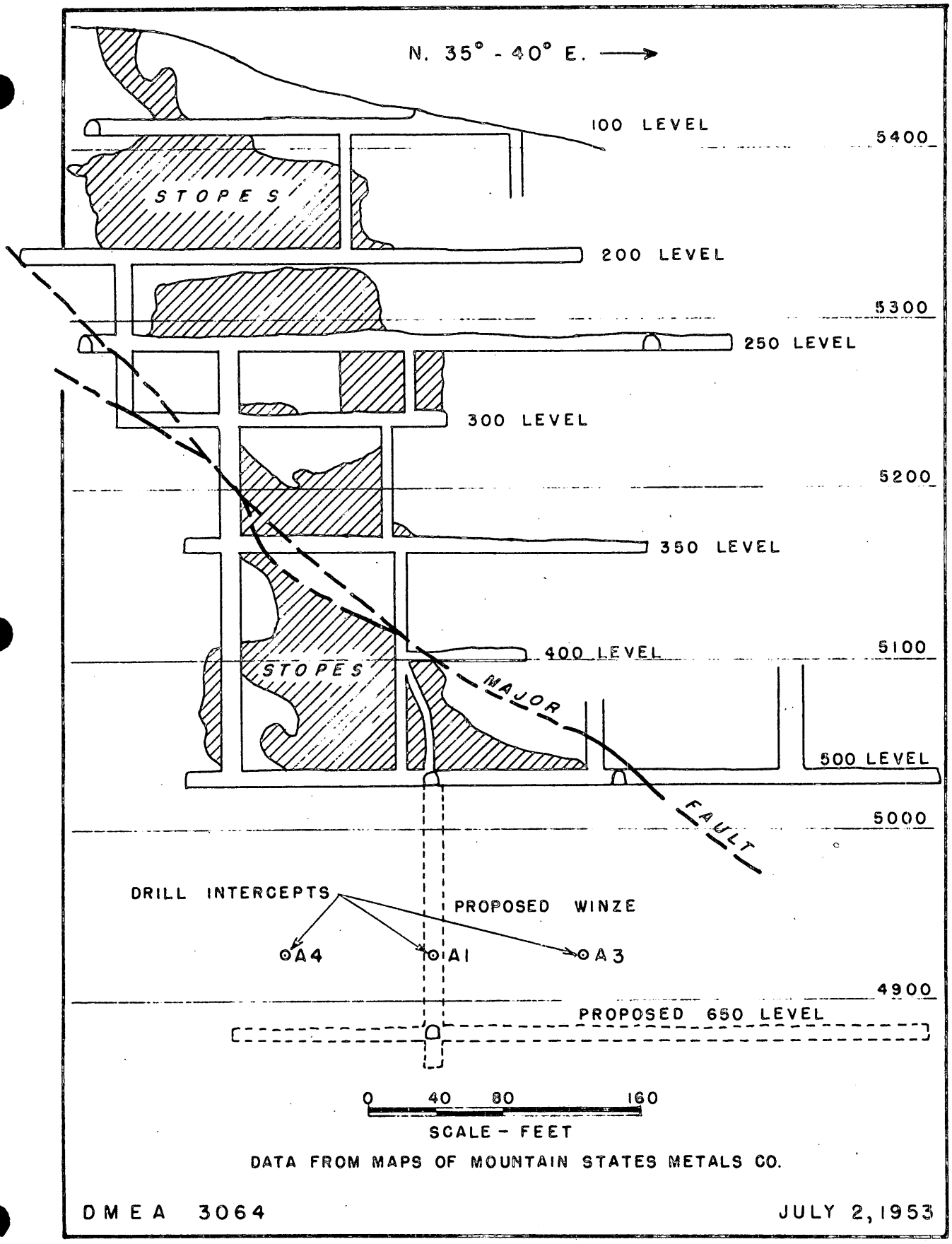


FIGURE 2.- LONGITUDINAL PROJECTION OF WORKINGS COPPER WORLD MINE

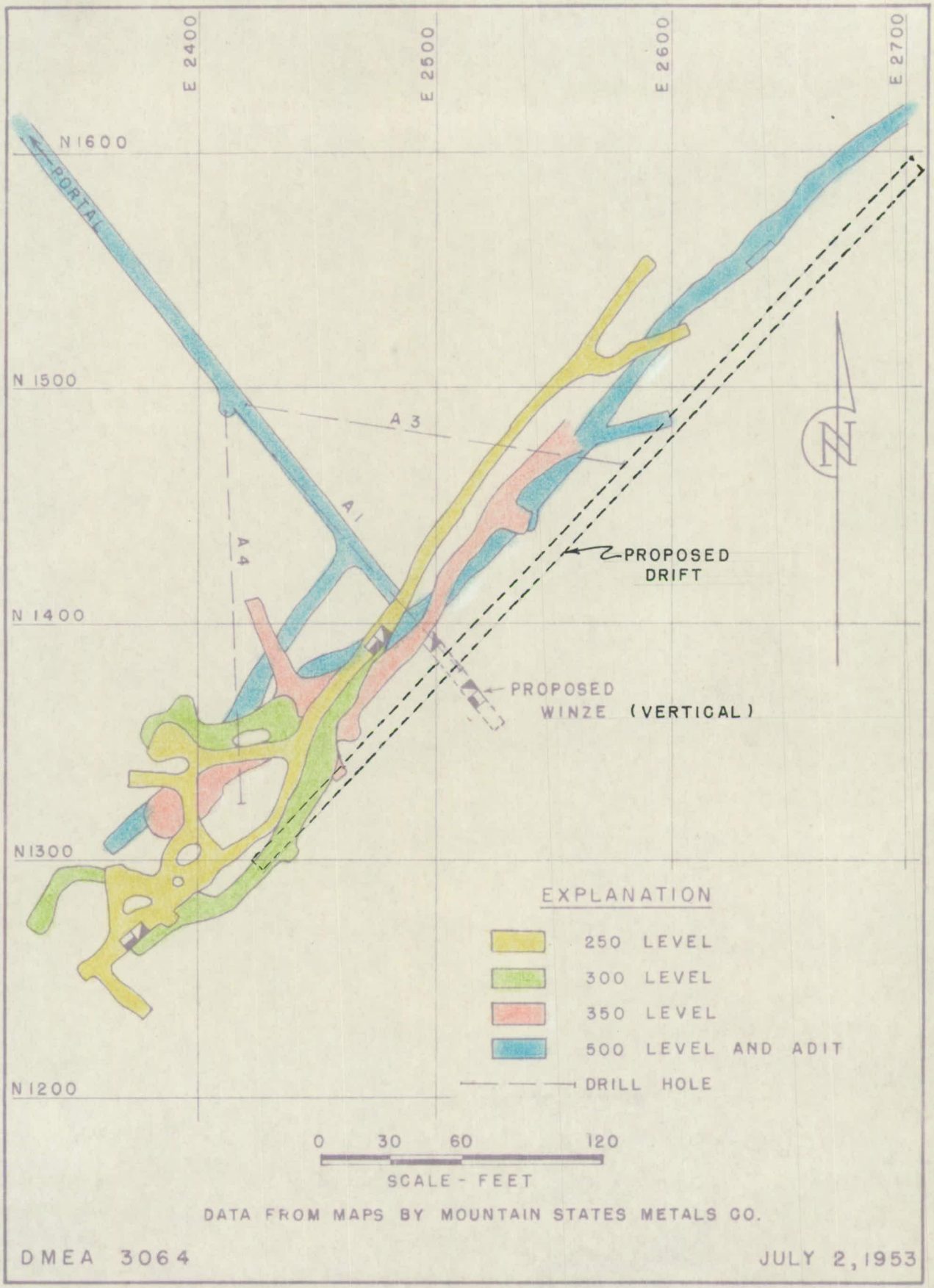


FIGURE 3. - LEVEL PLAN, COPPER WORLD MINE

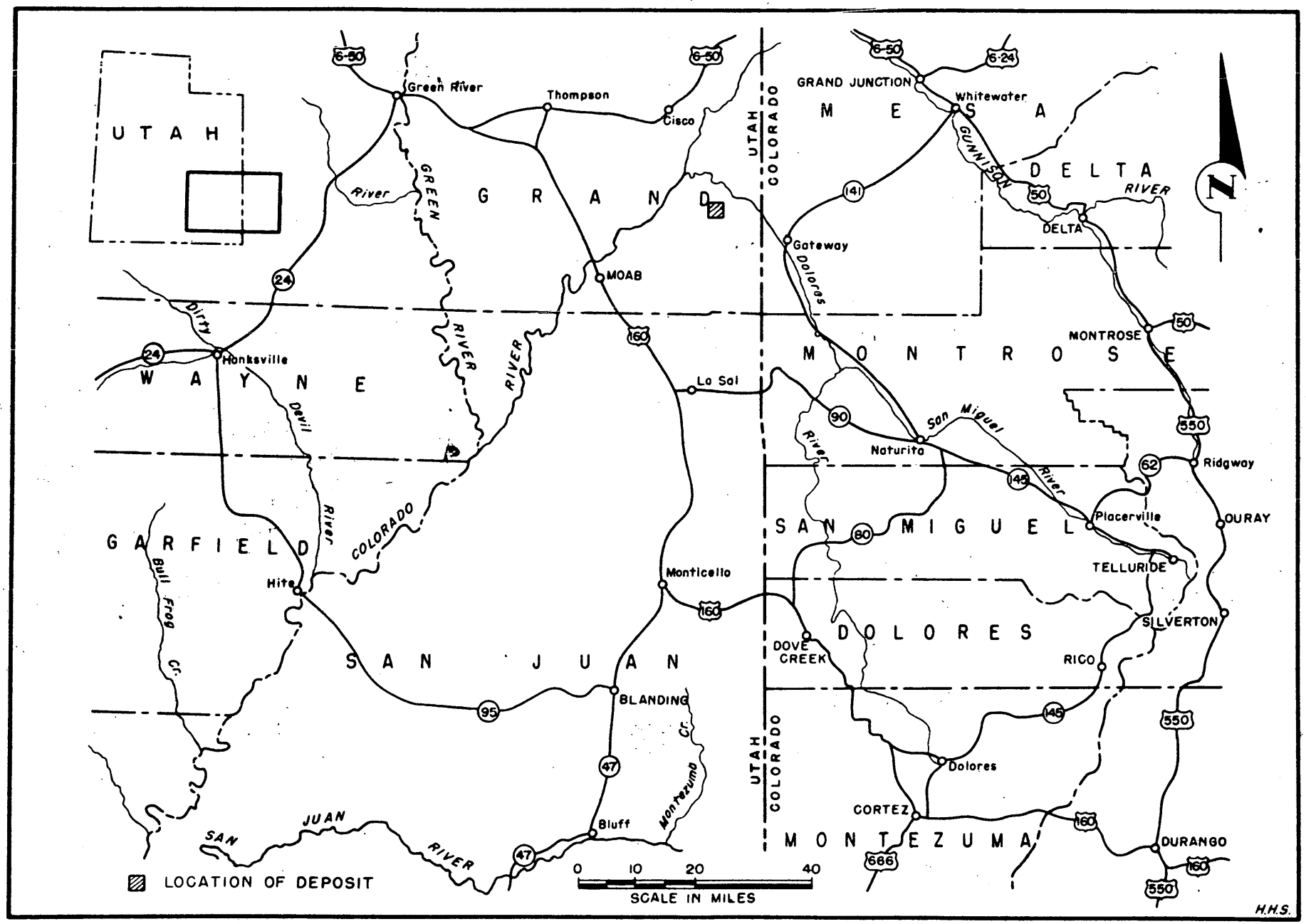


FIGURE 1. - LOCATION MAP, BLUE CHIEF MESA CLAIMS, MIDLAND URANIUM, INC., GRAND COUNTY, UTAH (DMEA 3164)

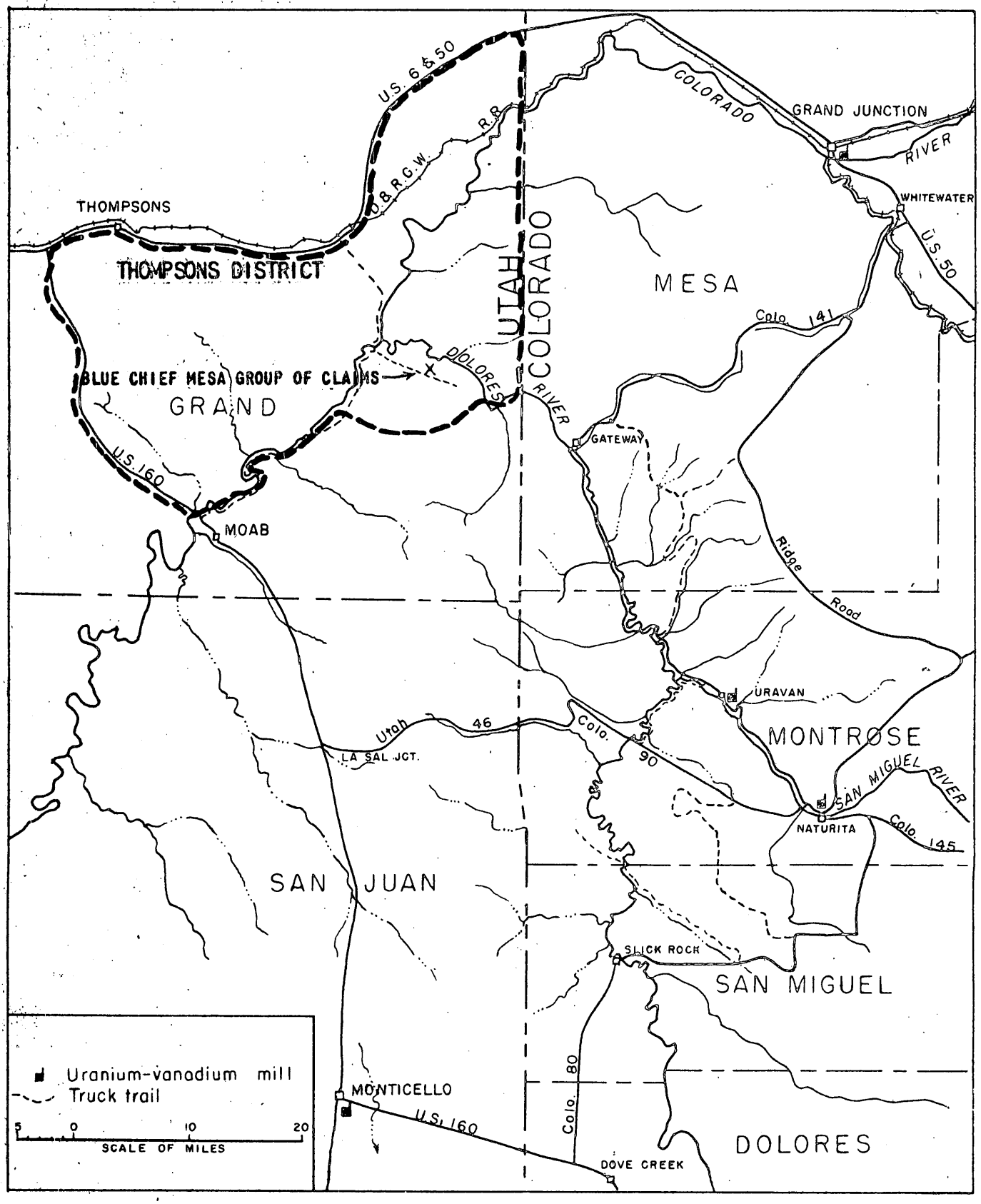


Figure 1. INDEX MAP OF PART OF THE COLORADO PLATEAU SHOWING THE APPROXIMATE LOCATION OF THE BLUE CHIEF MESA GROUP OF CLAIMS, THOMPSONS DISTRICT, GRAND COUNTY, UTAH

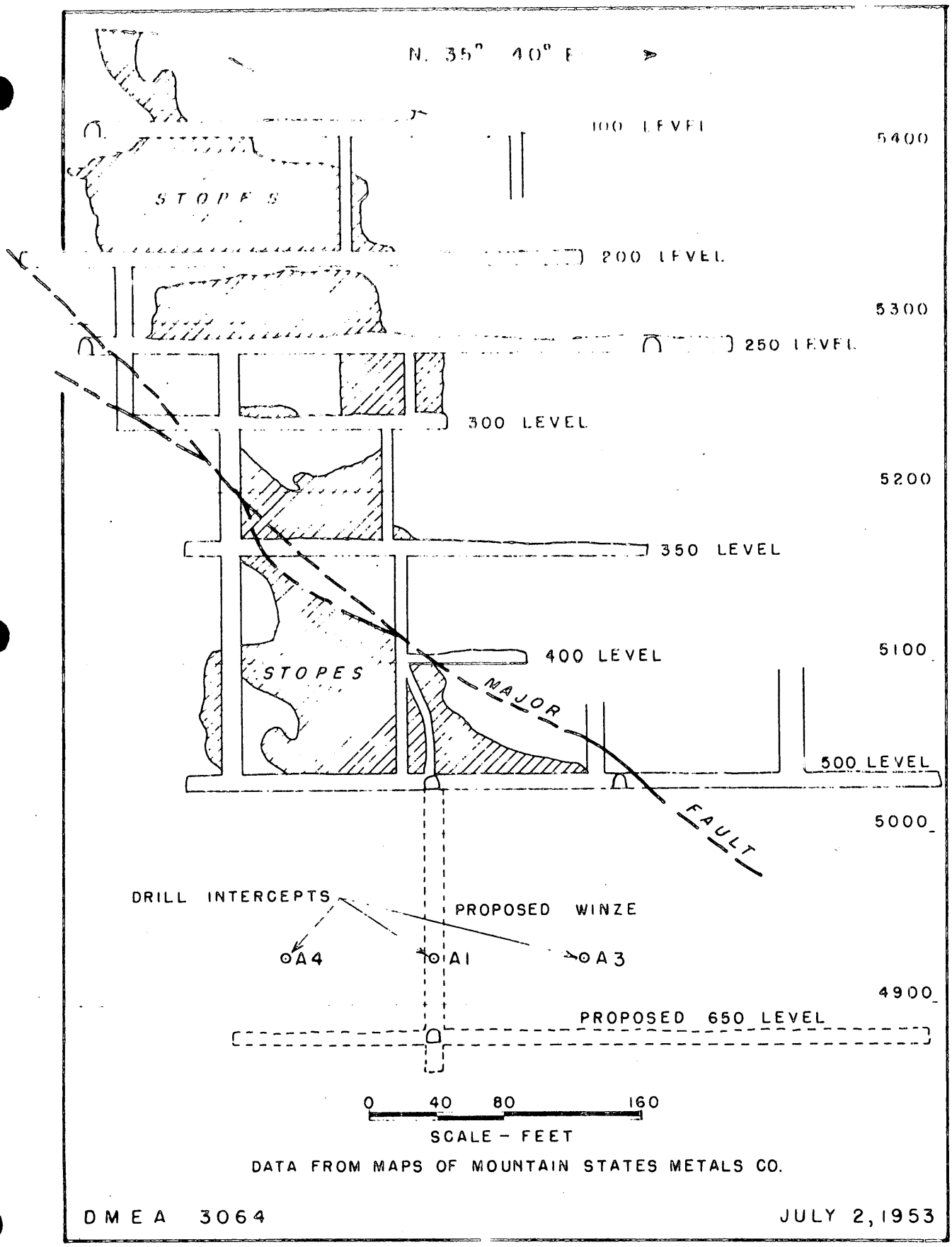


FIGURE 2.- LONGITUDINAL PROJECTION OF WORKINGS COPPER WORLD MINE

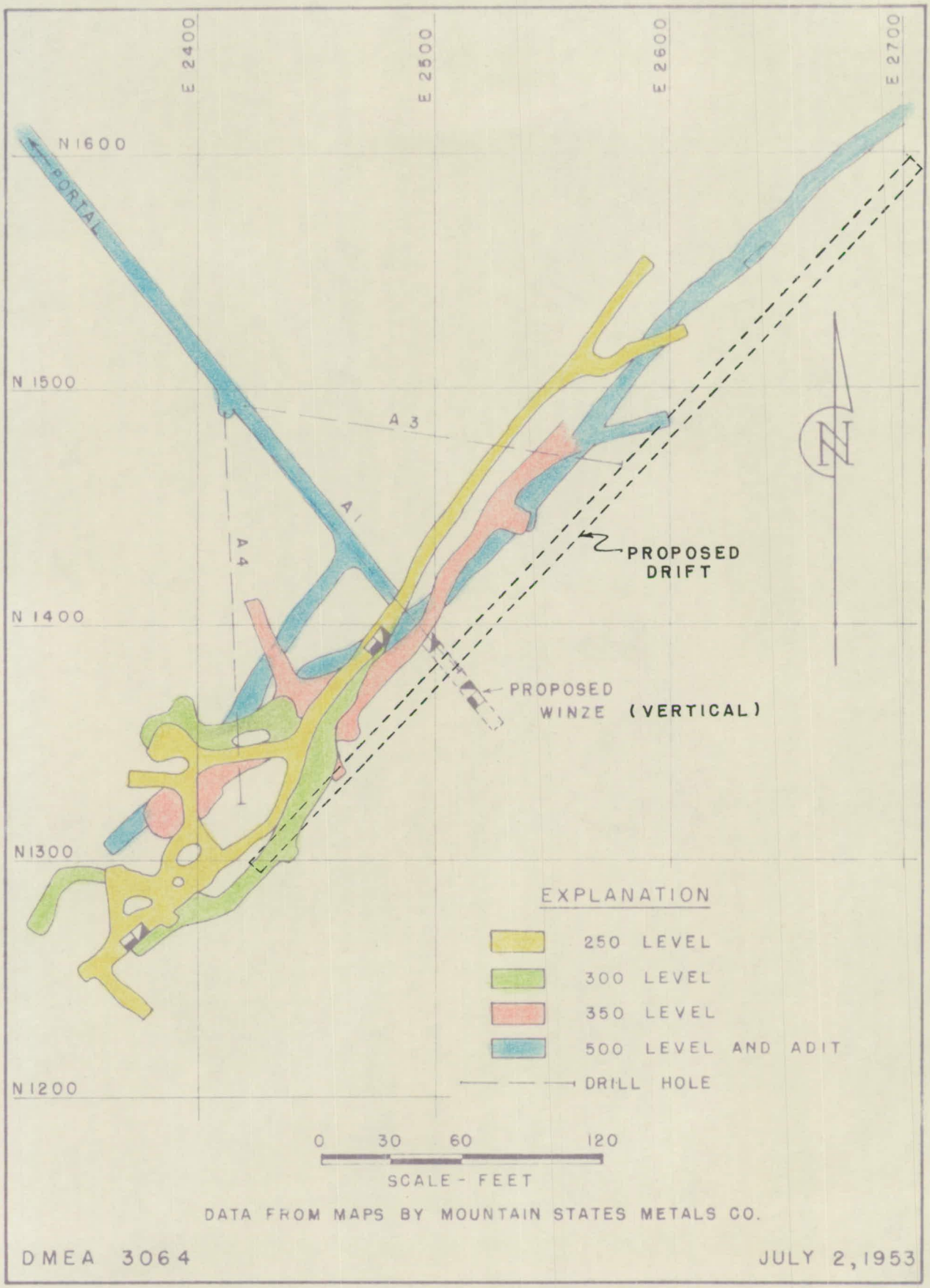


FIGURE 3. - LEVEL PLAN, COPPER WORLD MINE

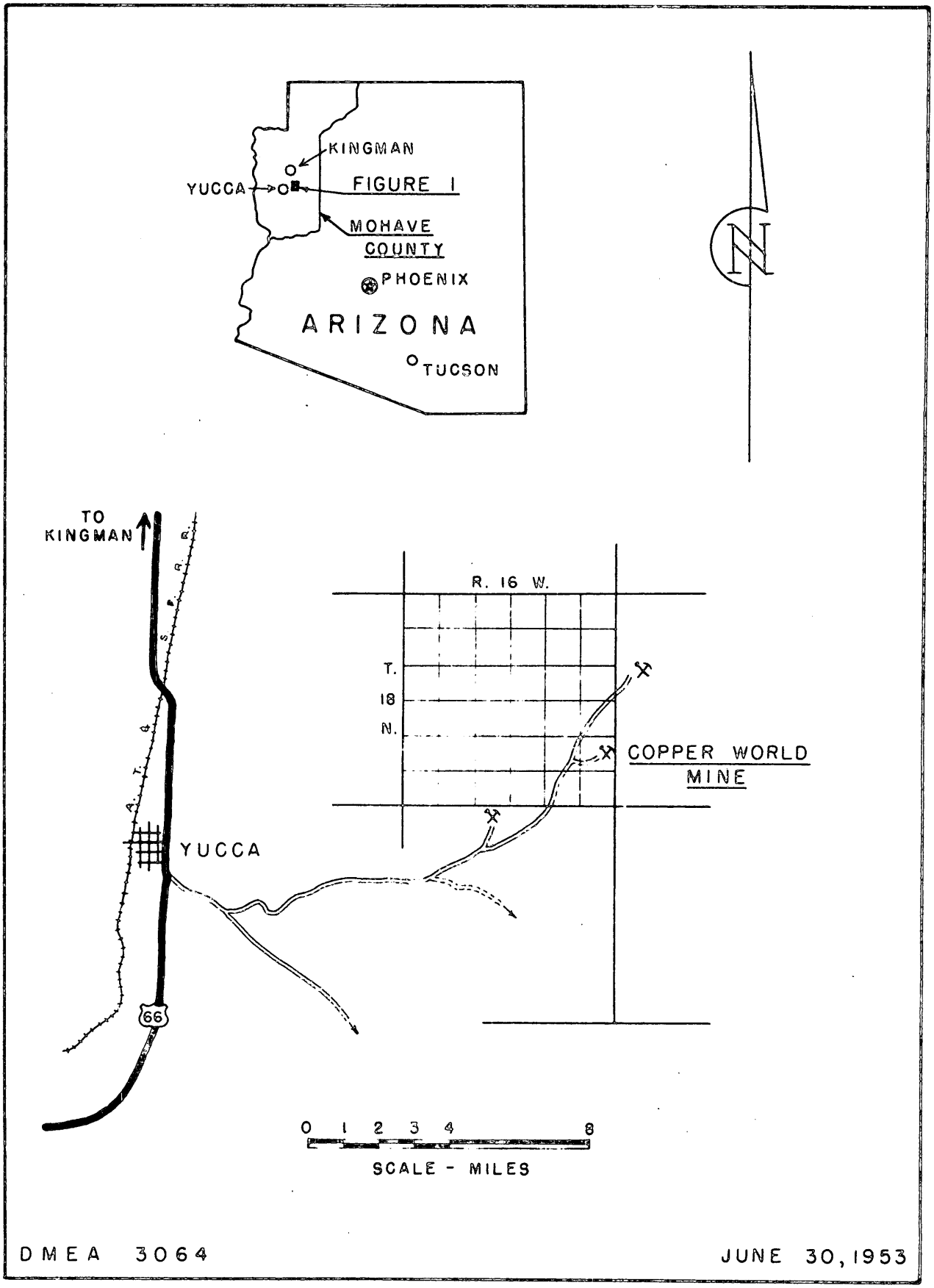


FIGURE 1. - LOCATION MAP - COPPER WORLD MINE
MOHAVE COUNTY, ARIZONA

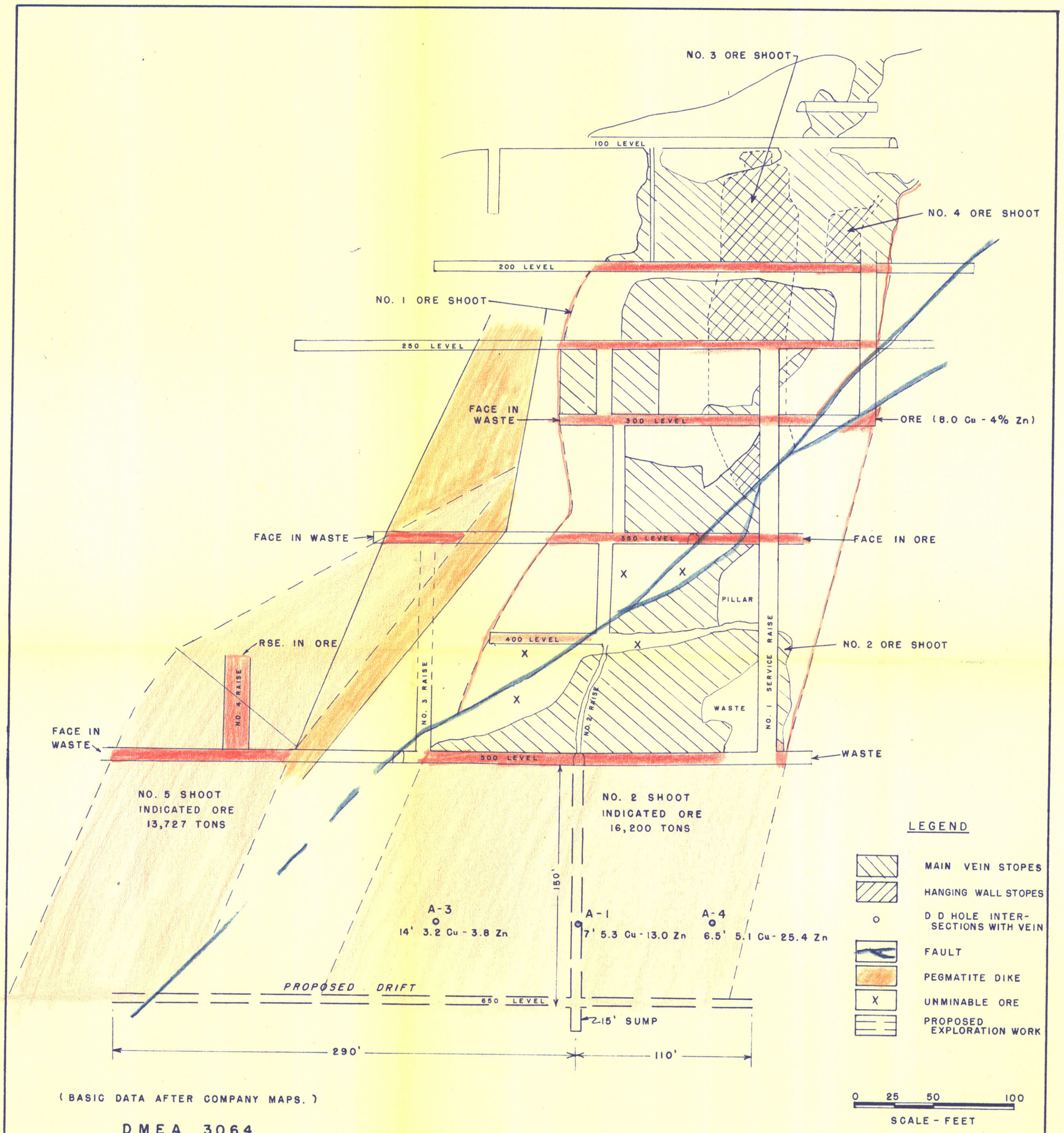
is narrow. It is believed that wall bolting, which is being initiated, will do much to eliminate or at least minimize extensive sloughing with mining.

Faulting

A strong fault extends through the mine workings and in effect divides the mine into two sections as shown by its trace on the longitudinal section figure 1. The fault strikes N. 55° to 60° W. and dips generally 45° northeast. Above the 400 level it loops and branches as shown. Below the 400 level it consists of one main strand and several feet of shear and shattering. The fault appears to have a small right throw on the vein shear of about 10-30 feet (maximum). The amount of dip slip is not apparent and it may be larger than the throw. The fault may have been pre-mineral in origin but the latest movement has been post-mineral. Good mineralization occurs right up the main fault gouge on the 350,400, and 500 levels. Rotational movement on the fault is suggested by the fact that the vein on the hanging wall dips steeply SE while the footwall dips steeply NW.

Mineralization

The principle ore minerals in the mine are chalcopyrite and sphalerite. Minor amounts of bornite, chalcocite, and galena are sporadically present. Small amounts of fine grained scheelite are present in some of the ore but its importance is insignificant and its occurrence was not investigated at this time. Gangue consists of pyrite, pyrrhotite, and quartz together with considerable amounts of wall rock and biotite.

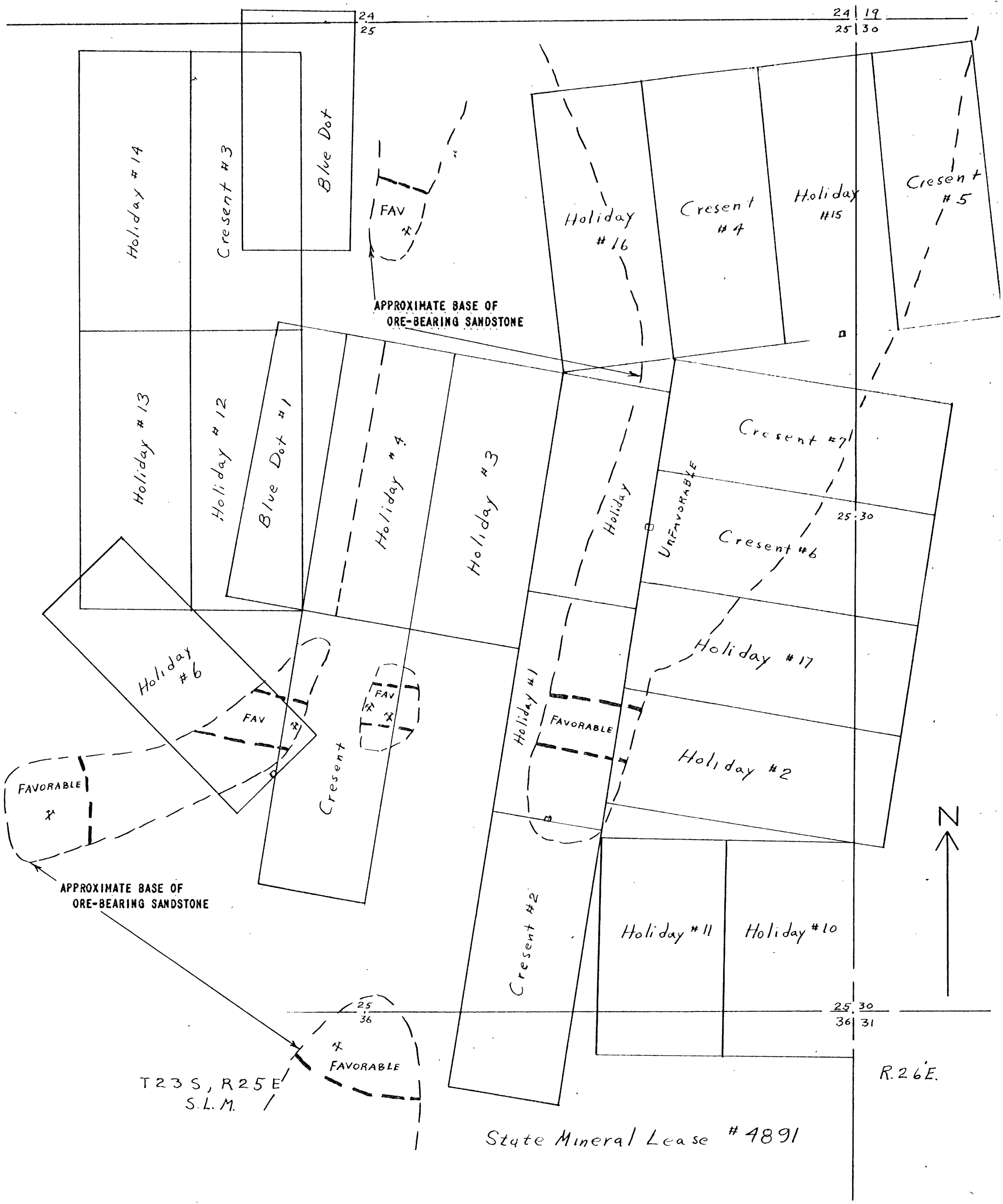


(BASIC DATA AFTER COMPANY MAPS.)

DMEA 3064

FIGURE I. - LONGITUDINAL SECTION IN PLANE OF VEIN (LOOKING S. 45° E.)

COPPER WORLD MINE — CEDAR VALLEY MINING DISTRICT — MOHAVE COUNTY, ARIZONA



EXPLANATION

— — —	APPROXIMATE BASE OF ORE-BEARING SANDSTONE
▬ ▬ ▬	BOUNDARY OF FAVORABLE AND UNFAVORABLE GROUND
⚒	PROSPECT PIT
24 19 / 25 30	LAND SECTION CORNER FOUND IN FIELD
25 30	LAND ¼ CORNER FOUND IN FIELD
□	DISCOVERY MONUMENT FOUND IN FIELD

500 0 500 1000 FEET

BASE FROM APPLICANTS CLAIM MAP (NUMEROUS ERRORS WHICH HAVE NOT BEEN CORRECTED, WERE NOTED ON THIS MAP DURING THE FIELD EXAMINATION)

Figure 2. SKETCH MAP OF THE BLUE CHIEF MESA GROUP OF CLAIMS, THOMPSONS DISTRICT, GRAND COUNTY, UTAH

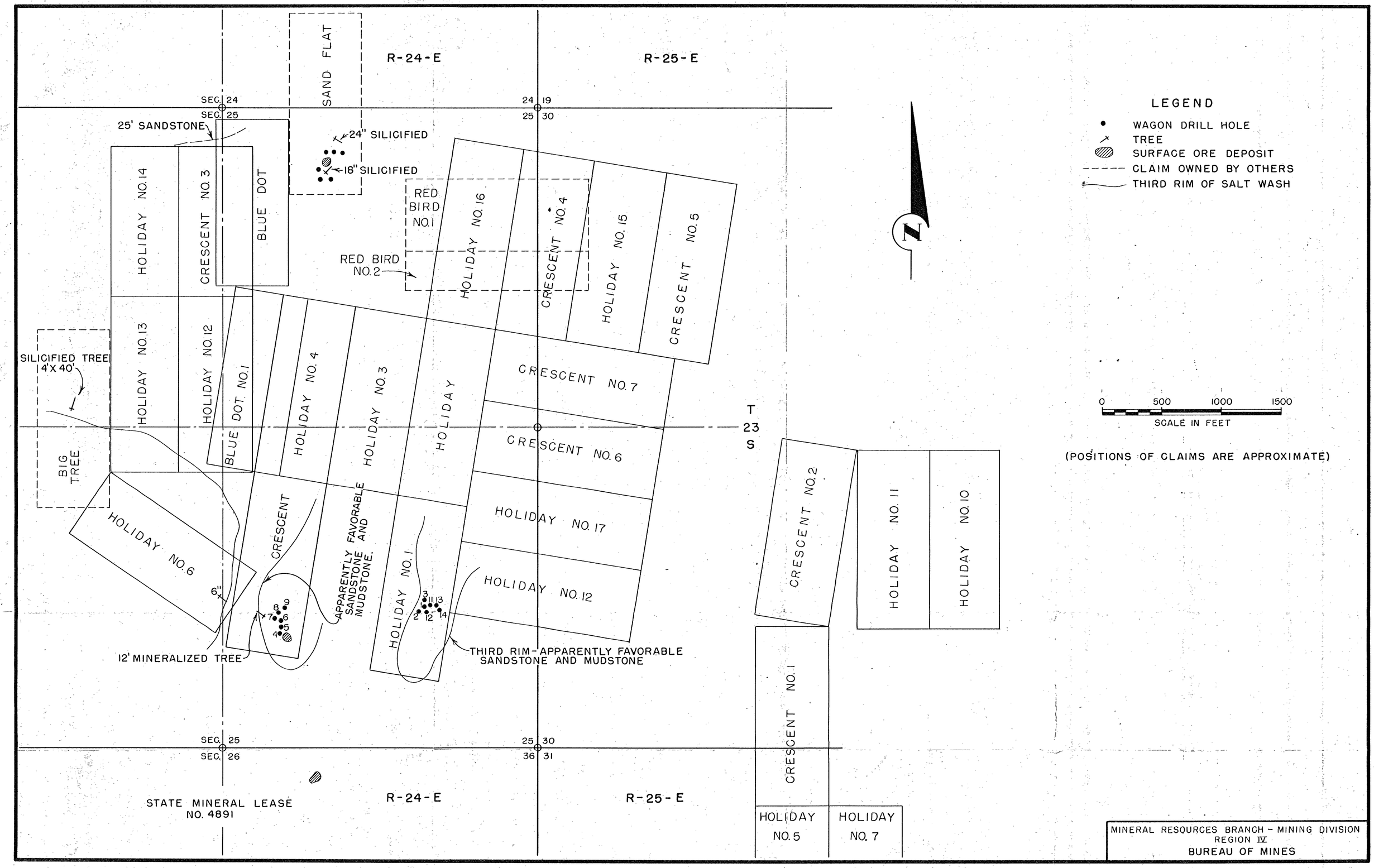
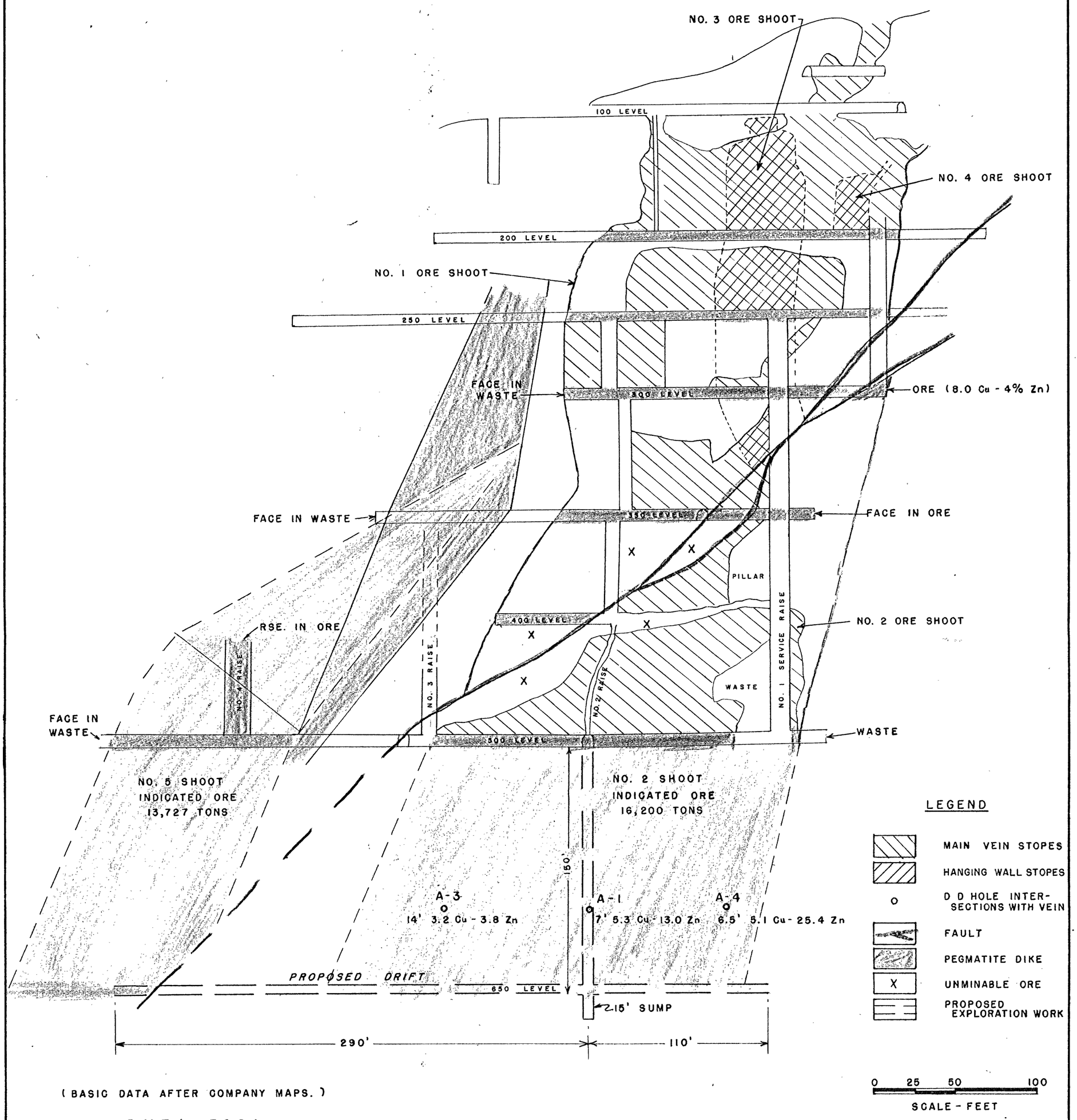


FIGURE 2 - MAP OF BLUE CHIEF MESA CLAIMS, MIDLAND URANIUM INC., GRAND COUNTY, UTAH (DMEA 3164)



(BASIC DATA AFTER COMPANY MAPS.)

DMEA 3064

FIGURE I. - LONGITUDINAL SECTION IN PLANE OF VEIN (LOOKING S. 45° E.)

COPPER WORLD MINE — CEDAR VALLEY MINING DISTRICT — MOHAVE COUNTY, ARIZONA