234 New Customhouse
Denver, Colorado

June 26, 1951

Memorandum

To: Landon Strobel, Executive Secretary, Defense Minerals Administration

From: DMA Field Team, Region IV

Subject: DMA Docket 61, The Sunshine Mine, Garfield County, Colorado

Herewith is transmitted the original and two copies of the examiners report on the above docket. It is noted that they recommend denial because of the low grade and refractory nature of the ore.

We concur in the conclusions and recommendations.

copy to dma files
koschmann
allsman
traver
metallurgy

P. T. Allsman, Alternate

A. H. Koschmann

Attachments
One copy by air mail
Two copies by regular mail
Original brochure

McMillan
DM A

REGIONAL DIRECTOR'S
OFFICE
REGION IV
JUL 2 0 1951
BUREAU OF MINES
DENVER, COLORADO

July 12, 1951

Memorandum

Re: Docket 0.M-61
Sunshine Mine
Garfield County, Colo.
Zinc

To: Reports and Records Unit
Administrative Management Division

From: Chief, Lead-Zinc Branch, S. M. A.

Subject: Denial of request for loan

The application is a request for $23,500 for development and exploration of the mine.

Report of the field team shows that the reserve tonnage is low and the grade is likewise low. Furthermore, a large percentage of the zinc is oxidized and metallurgical tests made in the study of this application show that a large part of the zinc will be lost in the proposed milling. The deposit is in an isolated location. The field team's study shows that operation will be accomplished at a loss of $1.09 per ton mined.

The field team recommends that the application be denied. The Lead-Zinc Branch concurs with this recommendation.

Returned herewith are a copy of the field team report with transmittal letter from Allaman and Koschmann, dated June 20, 1951; 3 copies of the original application on Form BSRB 146, one of the applications contains 7 assay sheets and a crude sketch of the mine prepared by applicant; also included with the docket material is a 4-page letter of December 9, 1950, from applicant.

Otto Herres

Otto Herres, Chief
Lead-Zinc Branch

Approved:

Director, Supply Division

ETMcKNIGHT:emp
G 7-12-51

Copies to: J. H. East, Jr. Region IV (2)
Chief, Lead-Zinc Br.
E. T. McKnight 4204 GSA
R. H. Mote
L. F. Strobel
Directors r file 4214 GSA
Br. r. file 4214 GSA

RECEIVED IN ZONE
OFFICE
DENVER
JUL 20 1951
BUREAU OF MINES
DENVER

Re: Docket DMA-61

Mr. L. Harmon, Sr.
Box 682
Rifle, Colorado

Dear Mr. Harmon:

Your application for a loan of $23,500 under the Defense Production Act of 1950, to develop your Sunshine mine northeast of Rifle, has been reviewed by the Defense Minerals Administration. We have the report on your property prepared by a field team at the request of the Defense Minerals Administration.

On the basis of this report, we must conclude that your property is not profitably workable at present costs and ore prices. Metallurgical tests on your ore indicate that a large part of the zinc is in oxidized form that will suffer large recovery losses under the milling procedures available for concentration. The reserve tonnage is small and the average grade is too low for an economic operation.

Under these circumstances, I regret that we are unable to approve an expenditure of public funds for the project that you propose.

We wish to thank you for bringing this property to our attention.

Very truly yours,

Tom Lyon

Tom Lyon, Director
Supply Division

ETMcKNIGHT:emp
G 7/12/51
Copies to: J. H. East, Jr. Region IV (2)
Chief, Lead-Zinc Branch
E. T. McKnight 4204 GSA
R. H. Mote
L. F. Strobel
Directors r. file 4214 GSA
Br. r. file 4214 GSA
Files

224 New Customhouse
Denver, Colorado

June 26, 1951

Memorandum

To: Landon Strobel, Executive Secretary, Defense Minerals Administration

From: DMA Field Team, Region IV

Subject: DMA Docket 61, The Sunshine Mine, Garfield County, Colorado

Herewith is transmitted the original and two copies of the examiners report on the above docket. It is noted that they recommend denial because of the low grade and refractory nature of the ore.

We concur in the conclusions and recommendations.

Paul T. Allsman

P. T. Allsman, Alternate

copy to dma files
koschmann
allsman
traver
metallurgy

A. H. Koschmann

A. H. Koschmann

Attachments
One copy by air mail
Two copies by regular mail
Original brochure

Mining Division
Region IV

June 21, 1951

Memorandum

To: DMA Field Team, Region IV

From: Chief, Mining Division

Subject: DMA Docket 61, Bunker-Sunshine Lead-Zinc Mine, Garfield County, Colorado

Due to unsatisfactory metallurgical results, unpromising geologic conditions and small reserves, the examiners recommend denial of the loan request. I concur in their recommendations.

F. T. Allmann

Attachments

STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

Building 2-A, Denver Federal Center

Mining Division
Date Rec'd.
JUN 20 1951
BUREAU OF MINES
Denver, Colorado

TO : Chief, Mining Division, Region IV DATE: June 19, 1951

FROM : W. M. Traver, Jr.

SUBJECT: DMA Docket 61, Harmon-Sunshine Lead-Zinc Mine, Garfield County, Colorado

Enclosed please find the original and seven copies of the report on the above-captioned DMA docket, including the Geological Survey's report which was included with the engineer's report when it was returned for final typing. The geologic, engineering, and metallurgical sections are assembled ready for binding and submission to Washington. Three extra copies of the Survey's report are enclosed and also the original brochure.

I approve Belser's conclusions that, due to the unsatisfactory metallurgical results, unpromising geologic conditions, small reserves, and isolation of the property, the loan request should be denied.

W. M. Traver, Jr.

W. M. Traver, Jr.

enclosures

Mining Division
Region IV

May 25, 1951

Memorandum

To: W. M. Traver, Jr.

From: Chief, Mining Division, Region IV

Subject: DMA Docket 61 - Harmon-Sunshine lead-zinc mine, Garfield County, Colorado.

The subject report has been read in this office and a few minor editoral changes are suggested.

It would appear that some thought should be given to the possibility of condensing the summary to about half the present length. If this can be accomplished, it is suggested that the report be typed in final form and submitted to this office.

W. H. King for
Paul T. Allsman

Enclosures

WHK:ftm

DMA File
Allsman
Chron.

NDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

Building 2-A, Denver Federal Center

TO : Chief, Mining Division, Region IV
ATTENTION: Mr. W. D. McMillan

DATE: May 23, 1951

FROM : W. M. Traver, Jr.

SUBJECT: DMA Docket 61 report

Mining Division
Bureau of Mines
Denver, Colorado

Please find enclosed a rough draft copy of Belser's report on the captioned docket covering the Harmon-Sunshine Lead-Zinc Mine, Garfield County, Colorado, with some few corrections and revisions.

Inasmuch as it is a denial, too much time was not devoted to editing. Under the section SUMMARY; COST OF PROJECT (Indicated Profit or Loss) only the arithmetic has been checked. Perhaps the smelter schedules should be obtained from Belser and the calculations verified in detail.

Please advise if this office should attend any further to the report until you have made your revisions and returned it for typing. We have in the files one copy of the rough draft without the corrections and revisions shown.

W. M. Traver, Jr.

W. M. Traver, Jr.

enclosure

WMT/dd

Building 2-A, Denver Federal Center

Mining Division
Date Rec'd.
MAY 24 1951
BUREAU OF MINES
Denver, Colorado

Chief, Mining Division, Region IV
ATTENTION: Mr. W. D. McMillan
W. M. Traver, Jr.

May 23, 1951

DMA Docket 61 report

Please find enclosed a rough draft copy of Belser's report on the captioned docket covering the Harmon-Sunshine Lead-Zinc Mine, Garfield County, Colorado, with some few corrections and revisions.

Inasmuch as it is a denial, too much time was not devoted to editing. Under the section SUMMARY: COST OF PROJECT (Indicated Profit or Loss) only the arithmetic has been checked. Perhaps the smelter schedules should be obtained from Belser and the calculations varified in detail.

Please advise if this office should attend any further to the report until you have made your revisions and returned it for typing. We have in the files one copy of the rough draft without the corrections and revisions shown.

W. M. Traver, Jr.

enclosure

cc PTAllman
DMA 61
DMA Chron.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
1600 EAST FIRST SOUTH STREET
SALT LAKE CITY 1, UTAH

REGIONAL DIRECTOR'S
OFFICE
REGION IV
APR 23 1951
BUREAU OF MINES
DENVER, COLORADO

April 20, 1951

Memorandum

To: J. H. East, Jr., Denver, Colorado

From: C. H. Schack, Acting for S. R. Zimmerley

Subject: Ore-dressing report on testing composite sample Sunshine Mine, Garfield County, Colorado, DMA Docket No. 61

Attached are seven copies of a metallurgical report on the results of ore-dressing tests made on a composite of forty-seven samples from the Sunshine Mine, Garfield County, Colorado. The individual samples were submitted by Mr. Carl Belser of the Colorado Branch Mining Division, Region IV, and a composite was made on an equal weight basis.

As instructed by Mr. Belser, testing was confined to a study of gravity concentration methods for improving the grade of the ore and making marketable products. However, because of the low grade of the ore and the fact that smithsonite was the chief ore mineral, only moderate recovery of lead and poor recovery of zinc were possible in low-grade products.

We hope the attached metallurgical report proves satisfactory for incorporation into the final report on DMA Docket No. 61.

C. H. Schack

C. H. Schack, Acting for
S. R. Zimmerley

Enclosures 7

Copy to: W. M. Traver, Jr.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
1600 EAST FIRST SOUTH STREET
SALT LAKE CITY 1, UTAH

April 20, 1951

Memorandum

To: J. H. East, Jr., Denver, Colorado

From: C. H. Schack, Acting for S. R. Zimmerley

Subject: Ore-dressing report on testing composite sample Sunshine Mine, Garfield County, Colorado, DMA Docket No. 6.

Attached are seven copies of a metallurgical report on the results of ore-dressing tests made on a composite of forty-seven samples from the Sunshine Mine, Garfield County, Colorado. The individual samples were submitted by Mr. Carl Belser of the Colorado Branch Mining Division, Region IV, and a composite was made on an equal weight basis.

As instructed by Mr. Belser, testing was confined to a study of gravity concentration methods for improving the grade of the ore and making marketable products. However, because of the low grade of the ore and the fact that smithsonite was the chief ore mineral, only moderate recovery of lead and poor recovery of zinc were possible in low-grade products.

We hope the attached metallurgical report proves satisfactory for incorporation into the final report on DMA Docket No. 61.

CHS

C. H. Schack, Acting for
S. R. Zimmerley

Enclosures 7

Copy to: W. M. Traver, Jr.

April 6, 1951

Memorandum

To: S. R. Zimmerley

From: Executive Officer, DMA Field Team, Region IV

Subject: DMA Docket 61, L. Harmon, Sr., Box 682, Rifle, Colorado.

Please advise the status of your metallurgical investigation of the Docket DMA 61. The Geological Survey and Mining Division reports are ready for submittal but we are holding this pending your action.

J. H. East, Jr.

JHE/el

cc-DMA files
Allsman

DMA

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

REGIONAL DIRECTOR'S OFFICE REGION IV
APR 6 - 1951
BUREAU OF MINES
DENVER, COLORADO

April 3, 1951

Mr. L. Harmon, Sr.
Box 682
Rifle, Colorado

Re: DMA Docket 61

Dear Mr. Harmon:

Your letter of March 6, addressed to Charles W. Merrill and requesting information on the status of your application for Government assistance to develop the mining property north of Rifle, Colorado, has been referred to me for reply.

Before your application could be fully processed, it was necessary to obtain certain additional information; and a request was made of the Defense Minerals Administration Regional Field Team, 224 Customhouse, Denver 2, Colorado to examine your property. As no reply has been received from the Field Team with respect to your application, it is presumed that examination of the application is still in progress. When the report of the Field Team is received by the Lead-Zinc Branch, you will be informed promptly whether it will be possible for the Defense Minerals Administration to grant you assistance for the development of your property.

Very truly yours,

Otto Herres

OTTO HERRES, Chief
Lead-Zinc Branch, DMA

2 copies to Region 4

Executive Officer, J. H. East, Jr.
and
A. H. Koschmann
224 New Customhouse
Denver 2, Colorado

gtc

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
1600 EAST FIRST SOUTH STREET
SALT LAKE CITY 1, UTAH

REGIONAL DIRECTOR'S OFFICE
REGION IV
APR 11 1951
BUREAU OF MINES
DENVER, COLORADO

April 9, 1951

Air Mail

Memorandum

To: J. H. East, Jr.

From: C. H. Schack, Acting for S. R. Zimmerley

Subject: DMA Docket 61, Sunshine Mine, Garfield, County, Colorado, L. Harmon, Sr.

A total of 47 hand samples from the Sunshine Mine were received from C. Belser on March 26, 1951. The samples were dried, crushed, and pulverized for assay. The approximately 300 assays are about complete and will be reported this week.

In lieu of definite instructions, an equal weight composite was made of the 47 samples on April 4. Chemical analysis of the composite, which has just been completed, is given in the following table.

Chemical Analysis

	Assay, percent					
	Total		Ox.		Oz./ton	
	Pb	Zn	Pb	Zn	Au	Ag
Sunshine composite	1.0	4.8	0.5	4.1	<.005	1.2

As indicated by the chemical analysis, the material is very low grade and thoroughly oxidized. Microscopic study shows the lead is present as galena and cerussite, whereas the zinc occurs chiefly as smithsonite. The gangue is a dolomitic limestone. Occasional galena crystals as large as 10-mesh occur in the ore, but most of the lead and virtually all the smithsonite are finely crystalline and will require grinding to liberate from the dolomitic gangue.

Copy to: P. T. Allsman

The initial gravity concentration tests made on the ore indicate only a low recovery of lead and poor recovery of zinc in low-grade products. We doubt that this type of low-grade oxidized lead-zinc ore can be effectively concentrated by gravity or other concentration methods.

We will advise you promptly of the results of tests now in progress, but about 1 week will be required before a complete report can be made.

C. H. Schack

C. H. Schack, Acting for
S. R. Zimmerley

6-303
(March 1947)

cc: P. T. Allsman
W. M. Traver, Jr.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
Salt Lake City, Utah

Mining Division
Date Rec'd.
APR 1 1951
BUREAU OF MINES
Denver, Colorado

No. 6

Report to Mr. Carl Belser

Chemical Laboratory Report

Date received Mar. 28, 1951

Date reported Apr. 10, 1951

Serial No.	DESCRIPTION	Lot No.	Au	Ag	Cu	Pb	Zn
	Sunshine Mine, DMA Docket 61 (Harmon). On east fork of Rifle Creek, 15 miles north of Rifle, Garfield County, Colo.						
95231	Winze	B-47	<.005	1.6	<.05	1.5	1.1
32	"	-48	0.005	1.4	<.05	0.75	4.45
33	"	-49	<.005	0.2	<.05	<.1	1.9
34	"	B-50	<.005	1.6	<.05	1.85	7.1
35	"	-51	<.005	1.8	<.05	1.6	1.9

U. S. GOVERNMENT PRINTING OFFICE 16—33553-3

Signed A. E. Oetterson

6-303
(March 1947)

cc: P. T. Allsman
W. M. Traver, Jr.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
Salt Lake City, Utah

No. 5

Report to Mr. Carl Belser

Chemical Laboratory Report

Date received Mar. 28, 1951

Date reported Apr. 10, 1951

Serial No.	DESCRIPTION	Lot No.	Au	Ag	Cu	Pb	Zn
	Sunshine Mine, DMA Docket 61 (Harmon). On east fork of Rifle Creek, 15 miles north of Rifle, Garfield County, Colo.						
95217	L L	B-33	<.005	1.3	<.05	0.8	5.9
18	do.	-34	0.005	2.0	<.05	3.4	6.6
19	"	-35	0.005	1.4	<.05	0.95	6.65
95220	W T	-36	<.005	0.8	<.05	0.3	1.9
21	do.	-37	<.005	0.3	<.05	<.1	0.8
22	"	-38	0.005	0.3	<.05	0.1	0.7
23	F S	-39	<.005	0.9	<.05	0.55	3.25
24	do.	B-40	<.005	1.6	<.05	0.95	8.2
25	"	-41	<.005	1.5	<.05	1.8	6.9
26	"	-42	<.005	1.5	<.05	2.15	5.1
27	"	-43	<.005	2.0	<.05	1.0	5.35
28	"	-44	<.005	2.7	<.05	0.4	10.0
29	"	-45	<0.005	2.7	<.05	1.5	6.75
95230	"	-46	<.005	4.0	<.05	2.9	12.2

U. S. GOVERNMENT PRINTING OFFICE 16—33553-3

Signed H. F. Pettson

6-303
(March 1947)

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
Salt Lake City, Utah

No. 4

cc: P. T. Allsman ✓
W. M. Traver, Jr.

Report to Mr. ~~Carl Belser~~

Chemical Laboratory Report

Date received Mar. 28, 1951

Date reported Apr. 10, 1951

Serial No.	DESCRIPTION	Lot No.	Au	Ag	Cu	Pb	Zn
	Sunshine Mine, DMA Docket 61 (Harmon). On east fork of Rifle Creek, 15 miles north of Rifle, Garfield County, Colo.						
95203	M DR 1	B-19	<.005	0.2	<.05	0.15	1.25
4	do.	B-20	<.005	1.6	<.05	0.35	8.85
5	M DR	-21	<.005	2.8	<.05	0.55	11.5
6	do.	-22	<.005	0.6	<.05	0.05	3.0
7	"	-23	<.005	0.1	<.05	<.1	0.6
8	"	-24	<.005	0.7	<.05	<.1	5.2
9	"	-25	<.005	0.1	<.05	<.1	0.55
95210	M DR 1	-26	<.005	0.4	<.05	0.55	3.6
11	FW DR 1	-27	<.005	0.8	<.05	0.55	5.2
12	FT W DR	-28	<.005	1.0	<.05	0.2	7.05
13	FW DR1	-29	0.01	1.0	<.05	2.35	12.9
14	do.	B-30	<.005	<.01	<.05	<.1	0.35
15	L [illegible]	-31	<.005	0.7	<.05	0.35	2.15
16	do.	-32	<.005	0.6	<.05	1.3	1.05

U. S. GOVERNMENT PRINTING OFFICE 16—33553-3

Signed H. E. Peterson

6-303
(March 1947)

cc: P. T. Allsman
W. M. Traver, Jr.

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
Salt Lake City, Utah

No. 3

Report to Mr. Carl Belser

Chemical Laboratory Report

Date received Mar. 28, 1951

Date reported Apr. 10, 1951

Serial No.	DESCRIPTION	Lot No.	Au	Ag	Cu	Pb	Zn
	Sunshine Mine, DMA Docket 61 (Harmon). On east fork of Rifle Creek, 15 miles north of Rifle, Garfield County, Colo.						
95189	1st stope	B-5	<.005	2.8	<.05	1.0	11.8
95190	do.	-6	0.005	2.0	<.05	0.3	6.45
91	BR 1st DR1	-7	<.005	1.2	<.05	0.6	4.0
92	M DR1	-8	<.005	1.2	<.05	<.1	0.25
93	M D	-9	<.005	0.7	<.05	0.7	3.45
94	M D R	B-10	<.005	0.3	<.05	0.3	1.25
95	M DR1	-11	0.005	1.7	<.05	0.3	6.25
96	M L	-12	<.005	0.9	<.05	0.6	3.75
97	M DR1	-13	<.005	3.0	<.05	6.15	9.0
98	M DR	-14	<.005	2.8	<.05	7.45	9.5
99	MO DR1	-15	<.005	0.4	<.05	0.2	2.1
95200	M DR	-16	<.005	0.3	<.05	0.15	2.0
1	M DR1	-17	<.005	0.5	<.05	0.1	3.3
2	do.	-18	<.005	0.2	<.05	0.3	1.0

U. S. GOVERNMENT PRINTING OFFICE 16—33553-3

Signed H. F. Peterson

6-303
(March 1947)

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
Salt Lake City, Utah

No. 2

cc: P. T. Allsman
W. M. Traver, Jr.

Report to Mr. Carl Belser

Chemical Laboratory Report

Date received Mar. 29, 1951

Date reported Apr. 9, 1951

Serial No.	DESCRIPTION	Lot No.		Au	Ag	Cu	Pb	Zn	Ox. Pb	Ox. Zn			
	Sunshine Mine, Garfield Co., Colorado												
251	Composite (47 samples)	B-5 to B-51 incl.		<.005	1.3	.02	1.0	4.9	0.45	4.1			

U. S. GOVERNMENT PRINTING OFFICE 16—33553-3

Signed

Mining Division
Date Rec'd.
MAR 23 1951

WMT/m

Denver, Colorado

S. R. Hamerley, Chief
Salt Lake Experiment Station
Chief, Colorado Branch, Mining Division

Mar. 22, 1951

Sample Shipment DMA Docket 61

Please find enclosed three copies of Form 7353 covering a shipment by Mining Division truck of 47 samples taken by the examining engineer at the Sunshine Mine, Garfield County, Colorado, DMA Docket 61.

Analyses and tests required are indicated on Form 7353.

It will be appreciated if you will expedite laboratory work on the samples and your report in order that our final report can be submitted as soon as possible.

W. M. Traver, Jr.

Encl.

cc: P. T. Allsman
DMA 61 (2)
Chron. file

STRATEGIC MINERAL PROJECT

Information supplied the Metallurgical Division
regarding samples submitted

Date 3/22/51

Name and location of property: Sunshine Mine, DMA Docket 61 (Harmon).
On east fork of Rifle Creek, 15 miles north of Rifle, Garfield County, Colo.

Sample identification number: B-5 to B-51 Inclusive.

Number of samples in shipment (Estimated if necessary) 47

General nature of ore (type, minerals present, etc.): Mixed oxides and sulfides containing gold, silver, lead, zinc, and copper.

Analyses or assays required: Au., Ag., Pb., Zn., Cu.

Other tests desired: Identify black mineral in sample B-30.
Complete analyses of rejects with determination of oxide lead and zinc.
Gravity concentration test on rejects (especially jigs and tables) for separate lead and zinc concentrates and bulk concentrate. Submit report for Metallurgical Section of DMA report.

Name and address of
Project Engineer
Carl Belser
Colo. Branch
Min. Div.
Bldg. 2-A, D. F. C.
Denver 1b, Colo.

7353

7 Sacks 119 pounds.
To S.L.C. by J. H. Bild 3/22/51
in Panel I-32520

Region IV
Mining Division

February 27, 1951

Memorandum

To: W. M. Traver

From: Chief, Mining Division, Region IV

Subject: DMA Docket 61, L. Harmon, Sr., Box 682, Rifle, Colorado

Attached is the brochure of L. Harmon. In addition to a gelogical investigation, an engineering examination is required, and it is requested that you give this your early attention.

The location of the property is not given in the brochure, so it will be necessary to contact Mr. Harmon.

The brochure (copy of filed team memo to Allsman and Koschmann; Lead-Zinc Branch memo, 2/14/51; Lead-Zinc Committee memo to Harmon, 12/26/50; referral of application form with assay and sketch; copy of NSRB 146; Lead-Zinc Branch memo of 1/29/51, with letter from Harmon, dated December 9, 1950) is to be returned to this office with the report.

P. T. Allsman
P. T. Allsman
by W. D. McMillan

Attachment

WDM/cl
cc-DMA files
Allsman
McMillan

February 23, 1951

Memorandum

To: F. T. Allsman (2)

A. H. Koschmann

From: Field Team, DMA, Region IV

Subject: Docket DMA 61, L. Harmon, Sr., Box 682, Rifle, Colorado

We are enclosing brochure of L. Harmon, Docket DMA 61. Both a geological and engineering examination are required and it is requested that this be given your early attention.

It will be necessary to contact Mr. Harmon and arrange for him to show the property as it is not described in the brochure.

We are sending this brochure (Lead-Zinc Branch memorandum, dated February 14, 1951; Lead-Zinc Committee letter, dated December 26, to Mr. Harmon; Referral of Application form with assay and sketch; copy of NSMB-146; Lead-Zinc Branch memorandum of January 29, with letter from Mr. Harmon, dated December 9, 1950) to Mr. Allsman, with the request that he make the brochure available to Mr. Koschmann.

The brochure is to be returned to the Field Team with your report.

J. H. East, Jr.

A. H. Koschmann

A. H. Koschmann

Enclosure.
Copies to - Allsman (original and one)
Koschmann
DMA files

dr/ol

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

February 14, 1951

FEB 23 1951
BUREAU OF MINES
DENVER, COLORADO

Memorandum

To: Executive Officer of Field Team, Region IV

From: Lead-Zinc Branch, DMA

Subject: Docket DMA-61
Mr. L. Harmon, Sr.
Box 682
Rifle, Colorado

These forms, N.S.R.B. 146, were submitted by the applicant in response to a request by the Lead-Zinc Branch, DMA. This supporting data should be made a part of the original application.

In reply to your letter of February 5, stating that you did not receive the original application on DMA-61, the files have been searched and some material has been found and is enclosed herewith. However, we believe that there was an additional earlier letter from Harmon, dated some time before December 13, which gave some information that may or may not have been repeated in the material transmitted under covering date of January 29. It was the type of material that could be gotten again by the field team if an examination is made of the property.

Otto Herres

OTTO HERRES, Chief
Lead-Zinc Branch, DMA

Approved:
DMA Operating Committee

C O Mittendorf
acting Chairman

J. H. Hedges
J. H. Hedges

T. P. Thayer
for Olaf N. Rove

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

OFFICE OF
REGIONAL DIRECTOR

REGION IV

224 NEW CUSTOMHOUSE
DENVER 2, COLORADO

February 5, 1951

Memorandum

To: Otto Herres, Chief, Lead-Zinc Branch

From: Executive Officer of Field Team, Region IV

Subject: Docket DMA-61 - Additional information
L. Harman, Sr., Box 682, Rifle, Colorado

Referring to your memorandum dated January 29, 1951, above subject:

Your memorandum states that the report attached to the memorandum should be added to the original application. The only information we have regarding this application is a copy of your letter dated December 26, 1951, transmitting to Mr. Harmon Form NSRB-146. Please furnish us with the additional data so that we may start field work.

J. H. East, Jr.

J. H. East, Jr.

cc: AH Koschmann
PT Allsman
DMA files

JHE:lm

pending
2/20

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

REGIONAL DIRECTOR'S OFFICE
REGION IV
FEB 5 - 1951
BUREAU OF MINES
DENVER, COLORADO

Pending 2/20/51

January 29, 1951

Memorandum

To: Executive Officer of Field Team, Region IV
Through: Operating Committee

From: Lead-Zinc Branch, DMA

Subject: Docket DMA-61 - Additional information
L. Harman, Sr.
Box 682
Rifle, Colorado

The attached letter from Mr. Harmon should be made a part of the original application referred to the field team by the Lead-Zinc Branch.

Otto Herres

OTTO HERRES, Chief
Lead-Zinc Branch

Approved:
DMA Operating Committee

C O Mitchell
Acting Chairman

J. H. Hedges

J. H. Hedges

Olaf N. Rove

Olaf N. Rove

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

REGIONAL DIRECTOR'S OFFICE REGION IV MAR 3 - 1951 BUREAU OF MINES DENVER, COLORADO

December 26, 1950

Mr. L. Harmon, Sr.
Box 682
Rifle, Colorado

In replying please refer to DMA Docket No. 61

Dear Mr. Harmon:

Your application for a Government loan under provisions of the Defense Production Act of 1950 has been reviewed by the Lead-Zinc Committee of the Defense Minerals Administration. Before your application can be considered further, certain additional information is required.

Enclosed are five copies of N.S.R.B. form 146, Application for Government Loan. Please supply the data requested and return four of these schedules to Dr. James Boyd, Administrator Defense Minerals Administration, Department of the Interior, Washington 25, D. C. The Bureau of Mines regional office in Denver, Colorado will be pleased to assist you in completing form 146 in case you have any questions regarding the information requested. A prompt return of this form will be appreciated.

Very truly yours

OTTO HERRES, Chairman
Lead-Zinc Committee, DMA

Enclosures 5

RHMote/km

Copy to: Chairman, Commodity Committee
Geological Survey - McKnight
R. H. Mote
2 copies to Executive Officer, Regional Field Team , Region IV
Files
Base Metals Branch

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

MINERAL REPORTS
OFFICE
REGION IV
JAN 2 - 1951
BUREAU OF MINES
DENVER, COLORADO

December 26, 1950

Mr. L. Harmon, Sr.
Box 682
Rifle, Colorado

In replying please refer
to DMA Docket No. 61

Dear Mr. Harmon:

Your application for a Government loan under provisions of the Defense Production Act of 1950 has been reviewed by the Lead-Zinc Committee of the Defense Minerals Administration. Before your application can be considered further, certain additional information is required.

Enclosed are five copies of N.S.R.B. form 146, Application for Government Loan. Please supply the data requested and return four of these schedules to Dr. James Boyd, Administrator Defense Minerals Administration, Department of the Interior, Washington 25, D. C. The Bureau of Mines regional office in Denver, Colorado will be pleased to assist you in completing form 146 in case you have any questions regarding the information requested. A prompt return of this form will be appreciated.

Very truly yours

OTTO HERRES, Chairman
Lead-Zinc Committee, DMA

Enclosures 5

RHMote/km

Copy to: Chairman, Commodity Committee
Geological Survey - McKnight
R. H. Mote
2 copies to Executive Officer, Regional Field Team, Region IV
Base Metals Branch
Files

Mining Division
Region IV

November 1, 1950

DMA

Mr. L. Harmon
Box 682
Rifle, Colorado

Dear Mr. Harmon:

Your sample of manganese was sent to Salt Lake City for analysis.

The results are explained in the copy of a letter we are enclosing from C. H. Schack for S. R. Zimmerley.

Sincerely yours,

Paul T. Allsman, Chief
Mining Division

Enclosure

PTA:vmt

cc: W. M. Traver
Chron File
Subj File

Mining Division
Region IV

file with reports

November 1, 1950

Mr. L. Harmon, Sr.
Box 682
Rifle, Colorado

Dear Mr. Harmon:

This is in reference to your letter of October 26 to Mr. J. H. East submitting a report for a production and development loan on your Sunshine Mine, Rifle, Colorado.

Presumably you have submitted most of the information that is available on your property whereby we may judge whether or not it will qualify for a loan, however, you will find enclosed a form letter which lists pertinent information that we now believe will be needed to determine the merits of the property. If there is any other information available of the type listed we would appreciate obtaining it.

In reading over your letter of application I find there is no mention of the exact funds for which you are applying. This of course would be essential.

No appropriations have yet been made and are not anticipated until after Congress reconvenes. Most of the machinery for processing loans is still being developed in Washington. As soon as we have further information that will be of interest to you regarding mining loans, we will send it.

Sincerely yours,

JHE

Paul T. Allsman, Chief
Mining Division,

Enclosure

PTA:vmt

cc: W. M. Traver
Chron File
Subj File

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
1600 EAST FIRST SOUTH STREET
SALT LAKE CITY 1, UTAH

REGIONAL DIRECTOR'S OFFICE
REGION IV
OCT 30 1950
BUREAU OF MINES
DENVER, COLORADO

October 27, 1950

Memorandum

To: J. H. East, Jr., Denver, Colorado

From: C. H. Schack for S. R. Zimmerley, Salt Lake City, Utah

Subject: A manganese ore sample submitted by Mr. L. Harmon, Box 682, Rifle, Colorado

The sample submitted by Mr. L. Harmon is composed chiefly of limonite and quartz associated with a small amount of earthy manganese oxide. We estimated the manganese content of the sample to be less than 5 percent as it occurs only as a thin filling in cracks and as a film on the limonite. Material of this grade would have no value as an ore of manganese, and we can see little possibility of beneficiating this kind of low-grade rock.

As requested in your letter of October 12, 1950, we are returning Mr. Harmon's letter to you with two copies of this memorandum.

C. H. Schack

C. H. Schack for
S. R. Zimmerley

Collamer
Pls handle
JHE

U. S. B. Mines
Denver Colo.

Box 682
Rifle Colo
Oct 9-50

Dear Sir:

I am sending you a sample of Manganese ore. Will you test it to see if you can use this kind of ore.

I am respectfully

L. Harmon

P. S. Let me know as soon as you can and also all the information you can on manganese ores.

REGIONAL DIRECTOR'S
OFFICE
REGION IV
OCT 10 1950
BUREAU OF MINES
DENVER, COLORADO

Form 6-98

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

U. S. GOVERNMENT PRINTING OFFICE 16—53493-2

224 New Customhouse
Denver 2, Colorado

January 15, 1957

JMR 61

Mr. L. Harmon, Jr.
1400 South Meade Street
Denver, Colorado

Dear Mr. Harmon:

In response to your telephone request of this date for information on the Defense Minerals Exploration Administration program, enclosed are the "General Requirements" for making an application and the enclosures noted therein.

If you have further questions regarding the DMEA program, we will be glad to answer them.

Very truly yours,

Original signed by
W. M. TRAVER

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

Enclosures

WMT:jy

cc: Subject
Chron.

SUNSHINE MINE, GARFIELD COUNTY, COLORADO

METALLURGICAL REPORT UNDER DEFENSE PRODUCTION ACT

DMA-61

By C. H. Schack[1/]

1/ Metallurgist, Salt Lake City Branch, Metallurgical Division, Bureau of Mines, Salt Lake City, Utah.

This report will summarize the pertinent metallurgical facts disclosed by testing of a composite sample of oxidized lead-zinc ore from the Sunshine Mine, Garfield County, Colorado.

The composite sample was made by mixing equal weights of each of the forty-seven project samples submitted by Mr. Carl Belser, Colorado Branch, Mining Division. The chemical analysis of the composite sample follows.

Chemical Analysis

	Assay, percent					Oz./ton	
	Total		Oxide				
	Pb	Zn	Pb	Zn	Cu	Au	Ag
Sunshine composite	1.0	4.8	0.5	4.1	0.02	<.005	1.2

As indicated by the analysis, the ore is oxidized and low grade. The chief metal value is in zinc. Microscopic study showed the gangue of the ore is dolomite, and that the zinc occurs as smithsonite, whereas the lead is present as both galena and cerussite. Most of the lead occurs as relatively coarse crystals; however, much of the smithsonite is closely associated with limonite, cerussite, and the dolomite gangue. No silver mineral could be identified in the ore. The ore is friable and contains an appreciable amount of natural slimes.

First, attempts to concentrate the ore were made by jigging and tabling sized portions of ore crushed to 1/4 inch. The results obtained indicated that in the plus 10-mesh fractions of the ore little lead and no zinc minerals were liberated from the gangue. The

plus 10-mesh jig concentrate assayed only 8 percent Pb and represented a recovery of only 25 percent of the lead. The various jig products assayed about the same in zinc, indicating a lack of liberation of the smithsonite in this portion of the ore. The minus 10-mesh portion of the ore was tabled, and a fair recovery of the lead in this fraction was obtained in a low-grade product.

Since jigging proved ineffective, an attempt was made to recover separate lead and zinc concentrates by tabling hydraulically sized fractions of ore crushed in rolls to minus 10-mesh. The results are summarized in the following table.

Metallurgical Results

Tabling Minus 10-Mesh Ore

Product	Weight, percent	Assay, percent Pb	Zn	Oz./ton Ag	Distribution, percent Pb	Zn	Ag
Lead conc.	4.1	14.4	16.0	5.8	66.2	14.1	21.5
Zinc conc.	6.6	2.0	18.3	4.1	14.8	25.8	23.4
Table tailing	71.4	0.1	3.0	0.6	8.0	49.0	39.6
Slimes	17.9	0.6	3.2	1.1	11.0	11.1	15.5
Calculated heads	100.0	0.9	4.7	1.2	100.0	100.0	100.0

The results given show that a recovery of about 66 percent of the lead and 21.5 percent of the silver can be made in a concentrate assaying 14.4 percent Pb, 16.0 percent Zn, and 5.8 ounces per ton silver. This product might be salable to a lead smelter, particularly a smelter that has a slag-fuming plant in conjunction with the lead blast furnace. Somewhat higher-grade products probably could be made by retabling the concentrate, but only at a sacrifice in recovery

since the considerable dolomite in the concentrate is locked with both the lead and zinc minerals present. The zinc concentrate assayed only 18.3 percent Zn and contained only 25.8 percent of the zinc in the ore. This product also might be retabled to improve its grade and thereby make it marketable at a slag-fuming plant. The fact, however, that about 50 percent of the zinc and 40 percent of the silver were lost in the table tailings as well as an additional 11 percent of the zinc and 15 percent of the silver in slimes, precludes making high recovery of zinc and silver by tabling of this type of low-grade oxidized ore. Finer grinding of the ore to obtain a greater degree of liberation might give higher-grade products, but the recovery probably would not be greatly improved because of increased loss of values in slimes.

Although a complete ore-dressing study of the ore by flotation, sink-float, spiral concentration, and other methods has not been made, it can be concluded that this type of low-grade oxidized lead-zinc ore cannot be effectively concentrated to make marketable products at high recovery.

SUNSHINE MINE, GARFIELD COUNTY, COLORADO

METALLURGICAL REPORT UNDER DEFENSE PRODUCTION ACT

DMA-63

By C. H. Schack[1]

1/ Metallurgist, Salt Lake City Branch, Metallurgical Division, Bureau of Mines, Salt Lake City, Utah.

This report will summarize the pertinent metallurgical facts disclosed by testing of a composite sample of oxidized lead-zinc ore from the Sunshine Mine, Garfield County, Colorado.

The composite sample was made by mixing equal weights of each of the forty-seven project samples submitted by Mr. Carl Belser, Colorado Branch, Mining Division. The chemical analysis of the composite sample follows.

Chemical Analysis

	Assay, percent					Gm./ton	
	Total		Oxide				
	Pb	Zn	Pb	Zn	Cu	Au	Ag
Sunshine composite	1.0	4.8	0.5	4.1	0.02	<.005	1.2

As indicated by the analysis, the ore is oxidized and low grade. The chief metal value is in zinc. Microscopic study showed the gangue of the ore is dolomite, and that the zinc occurs as smithsonite, whereas the lead is present as both galena and cerussite. Most of the lead occurs as relatively coarse crystals; however, much of the smithsonite is closely associated with limonite, cerussite, and the dolomite gangue. No silver mineral could be identified in the ore. The ore is friable and contains an appreciable amount of natural slimes.

First, attempts to concentrate the ore were made by jigging and tabling sized portions of ore crushed to 1/4 inch. The results obtained indicated that in the plus 10-mesh fractions of the ore little lead and no zinc minerals were liberated from the gangue. The

plus 10-mesh jig concentrate assayed only 8 percent Pb and represented a recovery of only 25 percent of the lead. The various jig products assayed about the same in zinc, indicating a lack of liberation of the smithsonite in this portion of the ore. The minus 10-mesh portion of the ore was tabled, and a fair recovery of the lead in this fraction was obtained in a low-grade product.

Since jigging proved ineffective, an attempt was made to recover separate lead and zinc concentrates by tabling hydraulically sized fractions of ore crushed in rolls to minus 10-mesh. The results are summarized in the following table.

Metallurgical Results

Tabling Minus 10-Mesh Ore

Product	Weight, percent	Assay, percent Pb	Zn	Oz./ton Ag	Distribution, percent Pb	Zn	Ag
Lead conc.	4.1	14.4	16.0	5.8	66.2	14.1	21.5
Zinc conc.	6.6	2.0	18.5	4.1	14.8	25.8	23.4
Table tailing	71.4	0.1	5.0	0.6	8.0	48.0	39.6
Slimes	17.9	0.6	5.2	1.1	11.0	11.1	15.5
Calculated heads	100.0	0.9	4.7	1.2	100.0	100.0	100.0

The results given show that a recovery of about 66 percent of the lead and 21.5 percent of the silver can be made in a concentrate assaying 14.4 percent Pb, 16.0 percent Zn, and 5.8 ounces per ton silver. This product might be salable to a lead smelter, particularly a smelter that has a slag-fuming plant in conjunction with the lead blast furnace. Somewhat higher-grade products probably could be made by retabling the concentrate, but only at a sacrifice in recovery

since the considerable dolomite in the concentrate is locked with both the lead and zinc minerals present. The zinc concentrate assayed only 18.5 percent Zn and contained only 25.8 percent of the zinc in the ore. This product also might be retabled to improve its grade and thereby make it marketable at a slag-fuming plant. The fact, however, that about 50 percent of the zinc and 40 percent of the silver were lost in the table tailings as well as an additional 11 percent of the zinc and 15 percent of the silver in slimes, precludes making high recovery of zinc and silver by tabling of this type of low-grade oxidized ore. Finer grinding of the ore to obtain a greater degree of liberation might give higher-grade products, but the recovery probably would not be greatly improved because of increased loss of values in slimes.

Although a complete ore-dressing study of the ore by flotation, sink-float, spiral concentration, and other methods has not been made, it can be concluded that this type of low-grade oxidized lead-zinc ore cannot be effectively concentrated to make marketable products at high recovery.

SUNSHINE MINE, GARFIELD COUNTY, COLORADO

METALLURGICAL REPORT UNDER DEFENSE PRODUCTION ACT

DMA-61

By C. H. Schaak[1]

1/ Metallurgist, Salt Lake City Branch, Metallurgical Division, Bureau of Mines, Salt Lake City, Utah.

This report will summarize the pertinent metallurgical facts disclosed by testing of a composite sample of oxidized lead-zinc ore from the Sunshine Mine, Garfield County, Colorado.

The composite sample was made by mixing equal weights of each of the forty-seven project samples submitted by Mr. Carl Belser, Colorado Branch, Mining Division. The chemical analysis of the composite sample follows.

Chemical Analysis

	Assay, percent					Oz./ton	
	Total		Oxide				
	Pb	Zn	Pb	Zn	Cu	Au	Ag
Sunshine composite	1.0	4.8	0.5	4.1	0.02	<.005	1.2

As indicated by the analysis, the ore is oxidized and low grade. The chief metal value is in zinc. Microscopic study showed the gangue of the ore is dolomite, and that the zinc occurs as smithsonite, whereas the lead is present as both galena and cerussite. Most of the lead occurs as relatively coarse crystals; however, much of the smithsonite is closely associated with limonite, cerussite, and the dolomite gangue. No silver mineral could be identified in the ore. The ore is friable and contains an appreciable amount of natural slimes.

First, attempts to concentrate the ore were made by jigging and tabling sized portions of ore crushed to 1/4 inch. The results obtained indicated that in the plus 10-mesh fractions of the ore little lead and no zinc minerals were liberated from the gangue. The

plus 10-mesh jig concentrate assayed only 8 percent Pb and represented a recovery of only 26 percent of the lead. The various jig products assayed about the same in zinc, indicating a lack of liberation of the sphalerite in this portion of the ore. The minus 10-mesh portion of the ore was tabled, and a fair recovery of the lead in this fraction was obtained in a low-grade product.

Since jigging proved ineffective, an attempt was made to recover separate lead and zinc concentrates by tabling hydraulically sized fractions of ore crushed in rolls to minus 10-mesh. The results are summarized in the following table.

Metallurgical Results

Tabling Minus 10-Mesh Ore

Product	Weight, percent	Assay, percent Pb	Assay, percent Zn	Oz./ton Ag	Distribution, percent Pb	Distribution, percent Zn	Distribution, percent Ag
Lead conc.	4.1	14.4	16.0	5.8	66.2	14.1	21.5
Zinc conc.	8.6	2.0	18.3	4.1	14.8	25.8	23.4
Table tailing	71.4	0.1	5.0	0.8	8.0	49.0	39.8
Slimes	17.9	0.6	3.2	1.1	11.0	11.1	15.3
Calculated heads	100.0	0.9	4.7	1.2	100.0	100.0	100.0

The results given show that a recovery of about 66 percent of the lead and 21.5 percent of the silver can be made in a concentrate assaying 14.4 percent Pb, 16.0 percent Zn, and 5.8 ounces per ton silver. This product might be salable to a lead smelter, particularly a smelter that has a slag-fuming plant in conjunction with the lead blast furnace. Somewhat higher-grade products probably could be made by retabling the concentrate, but only at a sacrifice in recovery

since the considerable dolomite in the concentrate is locked with both the lead and zinc minerals present. The zinc concentrate assayed only 18.5 percent Zn and contained only 25.8 percent of the zinc in the ore. This product also might be retabled to improve its grade and thereby make it marketable at a slag-fuming plant. The fact, however, that about 50 percent of the zinc and 40 percent of the silver were lost in the table tailings as well as an additional 11 percent of the zinc and 15 percent of the silver in slimes, precludes making high recovery of zinc and silver by tabling of this type of low-grade oxidized ore. Finer grinding of the ore to obtain a greater degree of liberation might give higher-grade products, but the recovery probably would not be greatly improved because of increased loss of values in slimes.

Although a complete ore-dressing study of the ore by flotation, sink-float, spiral concentration, and other methods has not been made, it can be concluded that this type of low-grade oxidized lead-zinc ore cannot be effectively concentrated to make marketable products at high recovery.

SUNSHINE MINE, GARFIELD COUNTY, COLORADO

METALLURGICAL REPORT UNDER DEFENSE PRODUCTION ACT

DMA-61

By C. M. Schwab[1]

1/ Metallurgist, Salt Lake City Branch, Metallurgical Division, Bureau of Mines, Salt Lake City, Utah.

This report will summarize the pertinent metallurgical facts disclosed by testing of a composite sample of oxidized lead-zinc ore from the Sunshine Mine, Garfield County, Colorado.

The composite sample was made by mixing equal weights of each of the forty-seven project samples submitted by Mr. Carl Belser, Colorado Branch, Mining Division. The chemical analysis of the composite sample follows.

Chemical Analysis

	Assay, percent						
	Total		Oxide			Oz./ton	
	Pb	Zn	Pb	Zn	Cu	Au	Ag
Sunshine composite	1.0	4.8	0.5	4.1	0.02	<.005	1.2

As indicated by the analysis, the ore is oxidized and low grade. The chief metal value is in zinc. Microscopic study showed the gangue of the ore is dolomite, and that the zinc occurs as smithsonite, whereas the lead is present as both galena and cerussite. Most of the lead occurs as relatively coarse crystals; however, much of the smithsonite is closely associated with limonite, cerussite, and the dolomite gangue. No silver mineral could be identified in the ore. The ore is friable and contains an appreciable amount of natural slimes.

First, attempts to concentrate the ore were made by jigging and tabling sized portions of ore crushed to 1/4 inch. The results obtained indicated that in the plus 10-mesh fractions of the ore little lead and no zinc minerals were liberated from the gangue. The

plus 10-mesh jig concentrate assayed only 8 percent Pb and represented a recovery of only 25 percent of the lead. The various jig products assayed about the same in zinc, indicating a lack of liberation of the smithsonite in this portion of the ore. The minus 10-mesh portion of the ore was tabled, and a fair recovery of the lead in this fraction was obtained in a low-grade product.

Since jigging proved ineffective, an attempt was made to recover separate lead and zinc concentrates by tabling hydraulically sized fractions of ore crushed in rolls to minus 10-mesh. The results are summarized in the following table.

Metallurgical Results

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Table tailing	71.4	0.1	3.0	0.6	8.0	49.0	39.6
Slimes	17.9	0.6	3.2	1.1	11.0	11.1	13.5
Calculated heads	100.0	0.9	4.7	1.2	100.0	100.0	100.0

The results given show that a recovery of about 66 percent of the lead and 21.5 percent of the silver can be made in a concentrate assaying 14.4 percent Pb, 16.0 percent Zn, and 5.8 ounces per ton silver. This product might be salable to a lead smelter, particularly a smelter that has a slag-fuming plant in conjunction with the lead blast furnace. Somewhat higher-grade products probably could be made by retabling the concentrate, but only at a sacrifice in recovery

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Although a complete ore-dressing study of the ore by flotation, sink-float, spiral concentration, and other methods has not been made, it can be concluded that this type of low-grade oxidized lead-zinc ore cannot be effectively concentrated to make marketable products at high recovery.

SUNSHINE MINE, GARFIELD COUNTY, COLORADO

METALLURGICAL REPORT UNDER DEFENSE PRODUCTION ACT

DMA-61

By C. N. Schack[1]

1/ Metallurgist, Salt Lake City Branch, Metallurgical Division, Bureau of Mines, Salt Lake City, Utah.

This report will summarize the pertinent metallurgical facts disclosed by testing of a composite sample of oxidized lead-zinc ore from the Sunshine Mine, Garfield County, Colorado.

The composite sample was made by mixing equal weights of each of the forty-seven project samples submitted by Mr. Carl Ralston, Colorado Branch, Mining Division. The chemical analysis of the composite sample follows.

Chemical Analysis

	Assay, percent					Oz./ton	
	Total		Oxide				
	Pb	Zn	Pb	Zn	Cu	Au	Ag
Sunshine composite	1.0	4.8	0.5	4.1	0.02	<.006	1.2

As indicated by the analysis, the ore is oxidized and low grade. The chief metal value is in zinc. Microscopic study showed the gangue of the ore is dolomite, and that the zinc occurs as smithsonite, whereas the lead is present as both galena and cerussite. Most of the lead occurs as relatively coarse crystals; however, much of the smithsonite is closely associated with limonite, cerussite, and the dolomite gangue. No silver mineral could be identified in the ore. The ore is friable and contains an appreciable amount of natural slimes.

First, attempts to concentrate the ore were made by jigging and tabling sized portions of ore crushed to 1/4 inch. The results obtained indicated that in the plus 10-mesh fractions of the ore little lead and no zinc minerals were liberated from the gangue. The

plus 10-mesh jig concentrate assayed only 8 percent Pb and represented a recovery of only 25 percent of the lead. The various jig products assayed about the same in zinc, indicating a lack of liberation of the smithsonite in this portion of the ore. The minus 10-mesh portion of the ore was tabled, and a fair recovery of the lead in this fraction was obtained in a low-grade product.

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Metallurgical Results

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Product	Weight, percent	Assay, percent Pb	Zn	Oz./ton Ag	Distribution, percent Pb	Zn	Ag
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Table tailing	71.4	0.1	3.0	0.6	8.0	49.0	39.6
Slimes	17.9	0.6	3.2	1.1	11.0	11.1	15.5
Calculated heads	100.0	0.9	4.7	1.2	100.0	100.0	100.0

The results given show that a recovery of about 66 percent of the lead and 21.5 percent of the silver can be made in a concentrate assaying 14.4 percent Pb, 16.0 percent Zn, and 5.8 ounces per ton silver. This product might be salable to a lead smelter, particularly a smelter that has a slag-fuming plant in conjunction with the lead blast furnace. Somewhat higher-grade products probably could be made by retabling the concentrate, but only at a sacrifice in recovery

since the considerable dolomite in the concentrate is locked with both the lead and zinc minerals present. The zinc concentrate assayed only 18.8 percent Zn and contained only 23.8 percent of the zinc in the ore. This product also might be retabled to improve its grade and thereby make it marketable at a slag-fuming plant. The fact, however, that about 50 percent of the zinc and 40 percent of the silver were lost in the table tailings as well as an additional 11 percent of the zinc and 15 percent of the silver in slimes, precludes making high recovery of zinc and silver by tabling of this type of low-grade oxidized ore. Finer grinding of the ore to obtain a greater degree of liberation might give higher-grade products, but the recovery probably would not be greatly improved because of increased loss of values in slimes.

Although a complete ore-dressing study of the ore by flotation, sink-float, spiral concentration, and other methods has not been made, it can be concluded that this type of low-grade oxidized lead-zinc ore cannot be effectively concentrated to make marketable products at high recovery.

SUNSHINE MINE, GARFIELD COUNTY, COLORADO

METALLURGICAL REPORT UNDER DEFENSE PRODUCTION ACT

DMA-61

By C. H. Schaef[1]

1/ Metallurgist, Salt Lake City Branch, Metallurgical Division, Bureau of Mines, Salt Lake City, Utah.

This report will summarize the pertinent metallurgical facts disclosed by testing of a composite sample of oxidized lead-zinc ore from the Sunshine Mine, Garfield County, Colorado.

The composite sample was made by mixing equal weights of each of the forty-seven project samples submitted by Mr. Carl Belser, Colorado Branch, Mining Division. The chemical analysis of the composite sample follows.

Chemical Analysis

	Assay, percent					Oz./ton	
	Total		Oxide				
	Pb	Zn	Pb	Zn	Cu	Au	Ag
Sunshine composite	1.0	4.2	0.5	4.1	0.02	<.005	1.2

As indicated by the analysis, the ore is oxidized and low grade. The bulk of metal value is in zinc. Microscopic study showed the gangue of the ore is dolomite, and that the zinc occurs as smithsonite, whereas the lead is present as both galena and cerussite. Most of the lead occurs as relatively coarse crystals; however, much of the smithsonite is closely associated with limonite, cerussite, and the dolomite gangue. No silver mineral could be identified in the ore. The ore is friable and contains an appreciable amount of natural slimes.

First, attempts to concentrate the ore were made by jigging and tabling sized portions of ore crushed to 1/4 inch. The results obtained indicated that in the plus 10-mesh fractions of the ore little lead and no zinc minerals were liberated from the gangue. The

plus 10-mesh jig concentrate assayed only 8 percent Pb and represented a recovery of only 25 percent of the lead. The various jig products assayed about the same in zinc, indicating a lack of liberation of the smithsonite in this portion of the ore. The minus 10-mesh portion of the ore was tabled, and a fair recovery of the lead in this fraction was obtained in a low-grade product.

Since jigging proved ineffective, an attempt was made to recover separate lead and zinc concentrates by tabling hydraulically sized fractions of ore crushed in rolls to minus 10-mesh. The results are summarized in the following table.

Metallurgical Results

Tabling Minus 10-Mesh Ore

Product	Weight, percent	Assay, percent Pb	Zn	Oz./ton Ag	Distribution, percent Pb	Zn	Ag
Lead conc.	4.1	14.4	16.0	5.8	66.2	14.1	21.5
Zinc conc.	6.6	2.0	18.3	4.1	14.8	25.8	25.4
Table tailing	71.4	0.1	5.0	0.6	8.0	49.0	39.6
Slimes	17.9	0.6	5.2	1.1	11.0	11.1	15.5
Calculated heads	100.0	0.8	4.7	1.2	100.0	100.0	100.0

The results given show that a recovery of about 66 percent of the lead and 21.5 percent of the silver can be made in a concentrate assaying 14.4 percent Pb, 16.0 percent Zn, and 5.8 ounces per ton silver. This product might be salable to a lead smelter, particularly a smelter that has a slag-fuming plant in conjunction with the lead blast furnaces. Somewhat higher-grade products probably could be made by retabling the concentrate, but only at a sacrifice in recovery

since the considerable dolomite in the concentrate is locked with both the lead and zinc minerals present. The zinc concentrate assayed only 18.3 percent Zn and contained only 25.8 percent of the zinc in the ore. This product also might be retabled to improve its grade and thereby make it marketable at a slag-fuming plant. The fact, however, that about 50 percent of the zinc and 40 percent of the silver were lost in the table tailings as well as an additional 11 percent of the zinc and 15 percent of the silver in slimes, precludes making high recovery of zinc and silver by tabling of this type of low-grade oxidized ore. Finer grinding of the ore to obtain a greater degree of liberation might give higher-grade products, but the recovery probably would not be greatly improved because of increased loss of values in slimes.

Although a complete ore-dressing study of the ore by flotation, sink-float, spiral concentration, and other methods has not been made, it can be concluded that this type of low-grade oxidized lead-zinc ore cannot be effectively concentrated to make marketable products at high recovery.

UNITED STATES
DEPARTMENT OF THE INTERIOR
OSCAR L. CHAPMAN, SECRETARY

DEFENSE MINERALS ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMA DOCKET 61, THE SUNSHINE MINE
NEAR RIFLE, COLORADO

Owen D. Evans,
Geologist
U. S. Geological Survey

Carl Balser
Mining Engineer
U. S. Bureau of Mines

C. H. Schack
Metallurgist
U. S. Bureau of Mines

Mining Division
Region IV

June 21, 1951

Memorandum

To: DMA Field Team, Region IV

From: Chief, Mining Division

Subject: DMA Docket 61, Harmon-Sunshine Lead-Zinc Mine, Garfield County, Colorado

Due to unsatisfactory metallurgical results, unpromising geologic conditions and small reserves, the examiners recommend denial of the loan request. I concur in their recommendations.

F. T. Allsman

Attachments

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
200 New Customhouse
Denver 2, Colo.

May 7, 1961

Memorandum

To : Field Team, DMA, Region IV

From : Supervising Geologist, Colorado-Wyoming

Subject: DMA Docket 61 (Harmon) - The Sunshine Mine, near Rifle, Colorado.

Attached is report on the Sunshine Mine, near Rifle, Colorado, Docket DMA 61.

Mr. Evans concludes that it is unlikely that prospecting within the mine area will disclose ore of appreciably higher grade than that already developed. In view of the relatively low grade of the ore, the relatively unfavorable geologic setting, and metallurgical problems involved and results, he recommends that the loan be denied. I concur in these recommendations.

A. H. Koschmann

A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Attachment

DMA DOCKET 61

HARMON-SUNSHINE LEAD-ZINC MINE
GARFIELD COUNTY, COLORADO

Summary, Conclusions, and Recommendations

By Owen D. Evans
Geologist,
U. S. Geological Survey

and

Carl Belser
Mining Engineer,
U. S. Bureau of Mines

and

C. H. Schack
Metallurgist,
U. S. Bureau of Mines

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

By Owen D. Evans, Carl Belser, and C. H. Schack

Following a request by the applicant for a $23,500.00 development and exploitation loan, an examination was made of the Sunshine mine on March 12-16, 1951.

The mine is located 15 miles northeast of Rifle, Garfield County, Colo., at an altitude of 7,382 feet.

The mine was operated from 1925 to 1932 as the Grandview but no shipments were made. The applicant relocated the property as the Sunshine No. 1 claim in 1940 and since that time has shipped 1,197 dry tons of ore containing 5.34 ounces gold, 4,068 ounces silver, 63,935 pounds of lead, 221,838 pounds of zinc, and 150 pounds of copper.

The property consists of two standard 600- by 1500-foot unpatented mining claims. All the workings and the mill site are on the Sunshine No. 1 claim which is properly recorded and on which the assessment work has been kept up. A second claim, the Sunshine No. 2, which has not been recorded, covers a small adjacent vein.

The Sunshine mine is in an up-faulted block of Mississippian Leadville limestone. The zinc deposit is localized within a 60-foot shear zone that trends northwest and dips northeast. The shear zone comprises three 5-inch to 2 1/2-foot wide veins with brecciated limestone between them. The veins and intervening breccia contain abundant white calcite, a little sphalerite, and minor galena and

marcasite. They are partly oxidized at most places and, in addition to the visible sulfide, contain inconspicuous smithsonite and considerable limonite. The mineralized zone has an open, porous texture. The walls are firm and the ore deposits are amenable to shrinkage stope mining.

A total of 47 channel samples were taken underground and the volume of the dump was roughly estimated and sampled. From these results, the measured, indicated, and inferred reserves were calculated.

Estimated reserves are 5,730 tons of measured ore in the dump containing 1.01 ounces silver per ton, 0.80 percent lead and 3.5 percent zinc; 8,380 tons of indicated ore containing 1.9 ounces silver per ton, 1.70 percent lead and 7.50 percent zinc; and 6,450 tons of inferred ore with the same grade as the indicated ore--or a total of 20,560 tons averaging approximately the grade of the composite sample, or a trace of gold and 1.3 ounces silver per ton, 1.0 percent lead, 4.9 percent zinc, and 0.02 percent copper. Forty-five hundredths percent of the lead and 4.1 percent of the zinc is oxide. It is not likely that ore of appreciably higher grade than the above estimates will be found in the mine.

The property is developed by about 920 feet of workings. The small amount of mining equipment available is old and there is very little equipment that can be utilized for a mill.

The applicant requests a loan of $23,500.00 of which $7,500.00 is to be used for development, $4,500.00 for mine equipment, $8,000.00 for building and equipping a 25-ton mill, and $3,500.00 for operating capital.

The trucking charge from the mine to the railroad at Rifle is

$1.25 a ton. Miners are available in the Rifle area and there is sufficient water available to meet the needs of a 25-ton mill. Although the service lines of the Public Service Company of Colorado are only one mile distant, present power needs will be met by the use of internal combustion engines.

The applicant plans to begin work as soon as funds are made available and expects the mill to be in operation within three months. The estimated rate of production is 25 tons of ore a day. After deducting milling losses, 21 ounces of silver, 689 pounds of lead, and 1,494 pounds of zinc should be recovered. Mining costs are estimated at $3.00 a ton and milling costs at $1.50 a ton.

Metallurgical tests indicate a low-grade lead-zinc concentrate will result with a recovery of only 81 percent of the lead, 45 percent of the silver, and 40 percent of the zinc.

The total operating costs, including freight and treatment, are $6.29 per ton of ore mined. The most favorable market for both of the mill products is Tooele, Utah, where total payments are calculated as $5.20 per ton mined. The net loss to the producer is $1.09 per ton mined.

The property is held under possessory rights by the applicant. The only security for the requested $23,500.00 loan would be the approximately $10,000.00 worth of machinery purchased with Government funds. It has been proposed that the loan be repaid by 10 percent of the net smelter returns, or about $0.34 per ton mined, a figure which is not included in the net loss shown above of $1.09 per ton mined.

Profitable operation of the Sunshine mine is not believed feasible under existing conditions.

In view of the poor metallurgical results, unpromising geologic conditions, small reserves, and isolation, it is recommended that the loan be denied.

B.M.A. Docket 61 (Harmon)

The Sunshine Mine

Near Rifle, Colorado

Geology and Reserves

by

Owen D. Evans

U. S. Geological Survey

April 25, 1961

Geology

Geology and Reserves of
The Sunshine Mine, Near Rifle, Colorado

by

Owen D. Evans

Location and Structure

The Sunshine mine is 15 miles north by car from Rifle, Colorado, and approximately 60 miles northwest of the main Colorado mineral belt. No other zinc mines are known to have been productive in this region, although some small prospects exist a few miles to the north. A little zinc is known in the Carbonate district, an old lead-silver district about 10 miles to the east. Vanadium ore is mined three miles to the south, and small bodies of manganese associated with basalt flows are known 4 miles to the north.

Approximately 100 feet south of the mine a strong east-west fault cuts an anticline longitudinally and brings dolomitic Mississippian Leadville limestone on the north up against grits, shale and thin limestone beds of Upper Pennsylvanian age to the south. The massive Leadville limestone, which dips gently north, is cut by a shear zone 60 feet wide that trends northwest and dips steeply northeast. This zone apparently ends to the south against the East-West fault. It continues north an undetermined distance but is covered by talus north of the Upper level of the mine.

Mineralization seems to be confined to the shear zone in limestone. Mine workings have explored this zone horizontally for 270 feet and vertically for 210 feet. The shear zone comprises two main veins

separated by fractured and brecciated limestone, and a lesser vein that branches northwestward into the footwall of the main shear zone near the portal of the main adit. The two main veins are roughly parallel, striking N. 11°- 17° W. and dipping 65°- 76° NE. They range in width from 1 inch to 2½ feet, and are 10 to 15 feet apart. The limestone between them is broken into fragments 1 to 12 inches in diameter. The vein that branches into the footwall at the portal of the main adit strikes N. 30° W. and dips 67° NE. It is 5 to 8 inches wide. Movement on the shear zone was of a normal-fault nature, as shown on the Upper level, where red, distorted shale of Pennsylvanian age forms the east wall of the drift, and Leadville limestone the west wall.

Mineralization

Sphalerite is the chief sulfide but is not abundant. (The Chemical Laboratory of the U. S. Bureau of Mines in Salt Lake City, Utah reports that 84 percent of the zinc is smithsonite.) It occurs as narrow veinlets, typically 1/8 to 1/4 inch wide, lining the walls of the main veins, as filling in irregular fractures in limestone, and as a thin coating on fragments of limestone breccia both in the main veins and between them. Galena and marcasite, the only other sulfides noted, accompany the sphalerite or occur alone in tiny veinlets, but they are scarce and erratically distributed. No silver minerals were seen, and as silver values in general parallel those of lead, silver apparently is in the galena. White, crystalline calcite is abundant and widespread, forming veinlets in the fractures and veins and filling cavities in the breccia. It is later than the sulfide minerals and forms a coating on them. The chief oxide mineral is limonite, which fills pockets and

veinlets in the main veins and small openings in some of the fractured and brecciated limestone. The dolomitic limestone west of the main shear zone in the northern part of the main level contains small specks of black amorphous manganese oxide. In general, the mineralization seems to have been weak. The ore and gangue minerals introduced were insufficient to fill all the available openings, and the ore has an open, porous texture. There was little or no alteration or replacement of the limestone wallrock.

Reserves

The assays of the 47 samples taken throughout the mine show ore of low grade in two shoots. The indicated and inferred ore is shown on the longitudinal section. Blocks 1 and 3 are on the small vein branching northwest into the footwall of the main shear zone. The larger blocks, 2 and 4, are on the main shear zone. In the southern half of the blocks, they include both the East and west veins and intervening ground. North of the Fisher stope they refer only to the West vein, as the East vein and the material between the two veins is mostly barren. The West vein is mineralized to within about 10 feet of the north face of the main level. The north limit of block 2 is placed at this point. Ogden Tweto of the U. S. Geological Survey, examined the Sunshine mine in 1942 and reported a small ore shoot in the bottom of the winze from the Upper level. This ore probably extends to this height, which is 25 feet above the back of the Fisher stope. The samples from above this point were waste. Mineralization continues below the main level, and several samples from the northern one-third of the first shaft level were high enough in grade to warrant the inclusion of this part in block 2. The lower limit of block 2 is placed 20 feet below the first shaft level. Block 4, which is classed

as inferred ore, extends 20 feet below the bottom of the shaft, where an ore-bearing sample was cut, or to a depth of 68 feet below block 2.

Tonnage and grade of estimated ore is as follows:

Block	Class	Tons	Oz.Ag	%Pb	%Zn	Width
1	Indicated	400	1.8	1.0	7.05	8.0
2	Indicated	7980	1.95	1.7	7.5	7.5
Total		8380	1.9	1.7	7.4	
3	Inferred	120	1.8	1.0	7.05	8.0
4	Inferred	6330	1.95	1.7	7.5	7.5
Total		6450	1.9	1.7	7.5	

Summary and Recommendations

As shown by the average tenors given above, and considering the small size and isolation of the deposit, the ore would be marginal at present costs and prices even if all the zinc were in the form of sulfide. With zinc occurring as a mixture of sulfide and carbonate, the value decreases and the problem of concentration becomes greater. The future of the Sunshine mine depends largely on whether the ore can be satisfactorily concentrated. Thus the loan requested by Mr. Harmon hinges in large part on the results of milling tests made by the Bureau of Mines.

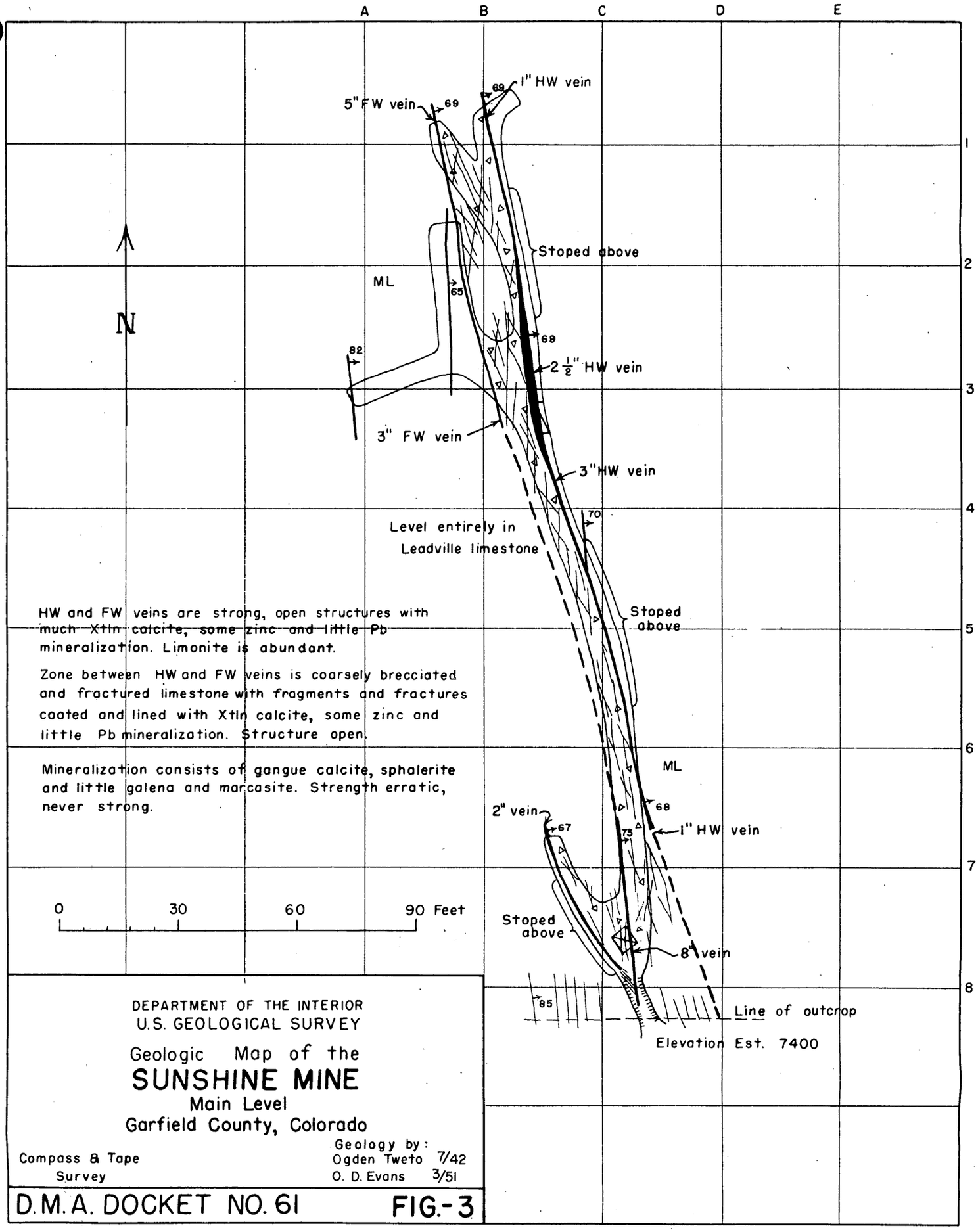
It is not likely that prospecting within the mine area will disclose ore of appreciably higher grade than that already developed. It is possible that the East-West fault to the south of the mine is the parent channel from which the mineralizing solutions spread into the shear zone. This possibility makes the junction of the East-West fault with the shear zone, especially in depth, a natural target for long range prospecting. However, such long-range prospecting would be justified in connection

with the present application, only if concentration of the present ore proves successful to the extent of providing assurance that loans necessary to start the operation could be repaid.

In view of the poor results reported in the metallurgical section of this docket report, together with the not-very-promising geologic factors described above, it is recommended that the loan be denied.

Chemical Laboratory Report, U. S. Bureau of Mines
Salt Lake City, Utah, April [illegible], 1951

Rep. No.	Lab No.	Cu.%	Pb.%	Zn%	Fe%	Mn%	Width
98182	2-3	.005	2.2	.05	1.0	111.6	2.6'
83	6	.005	2.0	.05	0.5	6.45	2.6'
84	7	.005	1.2	.05	0.8	4.0	3.3'
85	8	.005	1.2	.05	0.1	0.25	2.7'
86	9	.005	0.7	.05	0.7	3.45	2.5'
87	10	.005	0.3	.05	0.3	1.35	4.3'
88	11	.005	1.7	.05	0.3	6.25	4.0'
89	12	.005	0.9	.05	0.6	2.75	4.0'
97	13	.005	3.0	.05	6.15	9.0	3.7'
98	14	.005	2.8	.05	7.45	9.5	5.0'
99	15	.005	0.4	.05	0.2	2.1	7.4'
98200	16	.005	0.3	.05	0.15	2.0	7.1'
2	17	.005	0.3	.05	0.1	3.5	12.8'
3	18	.005	0.2	.05	0.2	1.0	2.6'
4	19	.005	1.6	.05	0.35	8.85	4.0'
5	20	.005	2.8	.05	0.55	11.5	2.6'
6	21	.005	0.8	.05	0.05	3.6	4.0'
7	22	.005	0.1	.05	0.1	6.5	7.0'
8	23	.005	0.7	.05	0.1	3.2	4.2'
9	24	.005	0.1	.05	0.1	0.55	4.0'
98210	25	.005	0.4	.05	0.35	3.5	3.4'
11	26	.005	0.8	.05	0.30	5.2	3.9'
12	27	.005	1.0	.05	0.2	7.05	3.9'
13	28	0.01	1.0	.05	2.55	12.3	1.5'
14	29	.005	0.01	.05	0.1	0.35	8.4'
15	30	.005	0.7	.05	0.35	2.15	3.5'
16	31	.005	0.6	.05	1.5	1.05	1.5'
17	32	.005	1.3	.05	0.5	5.9	1.4'
18	33	.005	3.0	.05	3.0	4.6	3.0'
19	34	.005	1.4	.05	0.35	5.45	1.9'
20	35	.005	0.8	.05	0.3	1.9	1.0'
21	36	.005	0.3	.05	0.1	0.6	1.5'
22	37	.005	0.2	.05	0.1	0.7	3.0'
23	38	.005	0.9	.05	0.35	3.25	3.5'
24	39	.005	1.6	.05	0.95	3.2	11.0'
25	40	.005	1.5	.05	1.0	6.0	6.7'
26	41	.005	1.3	.05	2.15	5.1	7.0'
27	42	.005	1.0	.05	1.0	5.55	4.5'
28	43	.005	2.7	.05	0.4	10.0	7.6'
29	44	.005	2.7	.05	1.3	6.75	5.1'
30	45	.005	4.0	.05	2.9	12.2	7.1'
31	46	.005	1.6	.05	1.5	1.1	7.6'
32	47	.005	1.8	.05	0.75	3.45	5.3'
33	48	.005	0.2	.05	0.1	1.9	6.5'
34	49	.005	1.9	.05	1.35	7.1	6.0'
35	50	.005	1.3	.05	1.6	1.9	0.5'
Composite		.005	1.3	.05	1.0	4.9	



HW and FW veins are strong, open structures with much Xtln calcite, some zinc and little Pb mineralization. Limonite is abundant.

Zone between HW and FW veins is coarsely brecciated and fractured limestone with fragments and fractures coated and lined with Xtln calcite, some zinc and little Pb mineralization. Structure open.

Mineralization consists of gangue calcite, sphalerite and little galena and marcasite. Strength erratic, never strong.

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Geologic Map of the

SUNSHINE MINE

Main Level

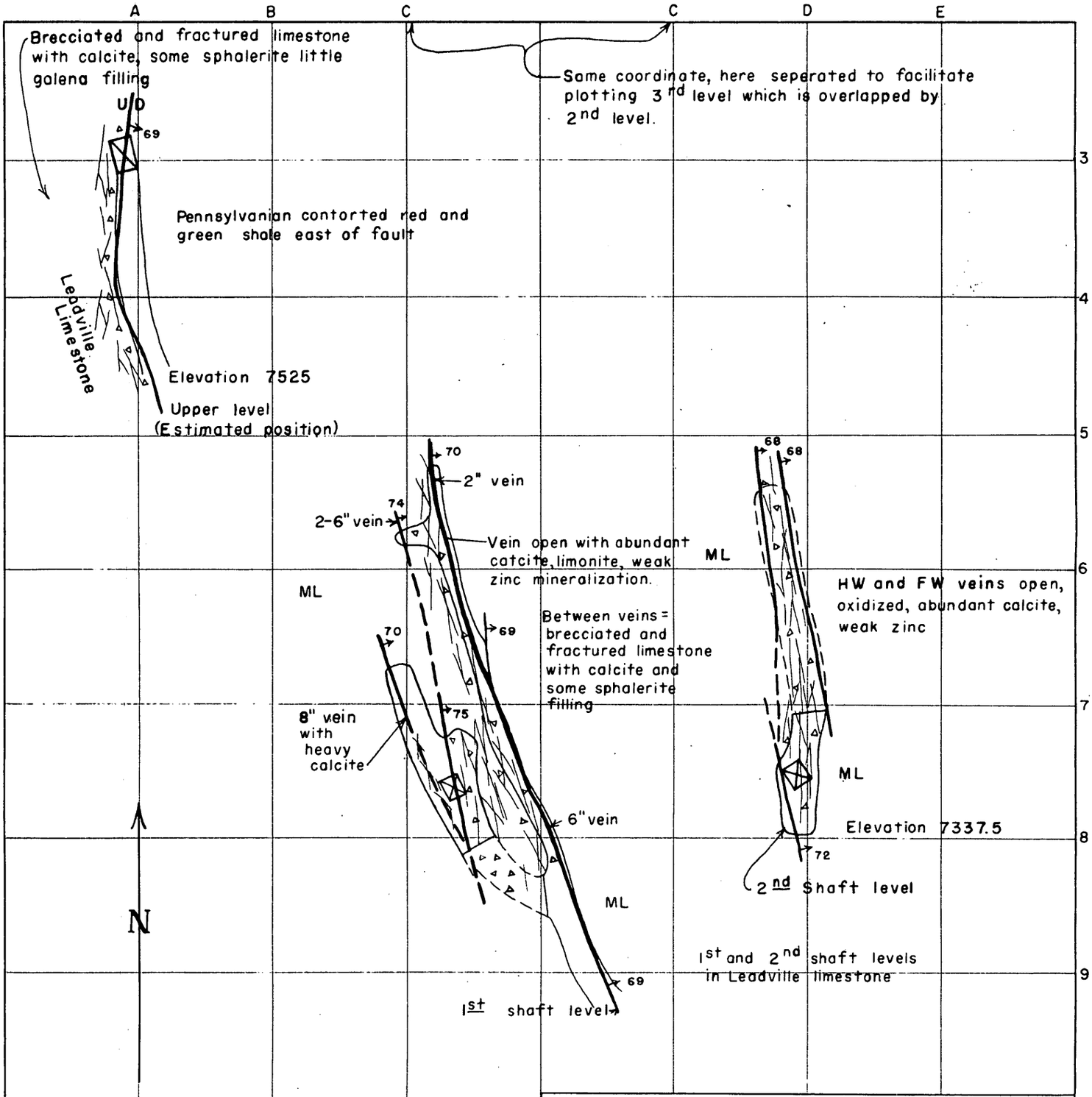
Garfield County, Colorado

Compass & Tape Survey

Geology by:
Ogden Tweto 7/42
O. D. Evans 3/51

D.M.A. DOCKET NO. 61

FIG.-3



DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Geologic Map of the

SUNSHINE MINE

Upper, & 1st & 2nd Shaft Levels
Garfield County, Colorado

Compass & Tape Survey

Geology by:
Ogden Tweto 7/42
O. D. Evans 3/51

D.M.A. DOCKET NO 61 . FIG.-4

DMA DOCKET 61

HARMON-SUNSHINE LEAD-ZINC MINE
GARFIELD COUNTY, COLORADO

Engineering Report

By Carl Belser
Mining Engineer,
U. S. Bureau of Mines

Engrg.

HARMON-SUNSHINE LEAD-ZINC MINE
GARFIELD COUNTY, COLORADO

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*See figures following Geologic Report.

ENGINEERING REPORT

By

Carl Belser
U. S. Bureau of Mines

INTRODUCTION

This report was made at the request of L. Harmon in connection with a proposed development loan of $23,500.00 on the Sunshine mine under the Defense Production Act of 1950, DMA Docket 61. A field examination of the property was made by an engineer of the Bureau of Mines and geologists of the Geological Survey on March 12-16, 1951.

ACKNOWLEDGMENTS

The report was prepared under the direction and with the aid of engineers of the Colorado Branch and Region IV of the Bureau of Mines.

The cooperation of the owner, L. Harmon, throughout the examination is appreciated as is the assistance of Ogden Tweto and O. D. Evans, of the Geological Survey, in the sampling in addition to their geological examination duties.

LOCATION, TOPOGRAPHY, AND PHYSICAL FEATURES

The mine is located in Lime Kiln Gulch about 1,500 feet west of the East Fork of Rifle Creek and about 15 miles northeast of the town of Rifle, Garfield County, Colo. (fig. 1). More specifically, it is situated in the SW 1/4, sec. 15, T. 4 S., R. 92 W., 6 P. M., Rifle Creek Mining District, Garfield County, Colo. The altitude of the main level is 7,382 feet.

The Sunshine mine is far down the south flank of the White River Plateau, a high anticlinal area of gently rounded hills which have been deeply cut by Rifle Creek and other streams.

The climate is delightful during the summer months but somewhat severe in winter. However, year around mining operations are possible.

HISTORY AND PRODUCTION

Little is known of the early history of the property. In 1929 the mine, then known as the Grandview, was under the management of J. M. Brown who reported the vein to be 21 feet wide, with 500 feet of drifting completed, 12,000 tons of mined ore stored on dumps, and that a gravity concentrating mill was being erected. In 1930 Brown reported that the mill had been completed and that it contained the following equipment:

1	7- by 10-inch Blake crusher
10	Fraser & Chalmers 1000-pound stamps
1	trommel screen
1	Fraser & Chalmers 30-inch rolls
2	Fraser & Chalmers 14-foot vanners
3	Fraser & Chalmers 12-inch jigs

He also stated that they concentrated about 200 tons of crude ore, making 60 tons of concentrate of which none was shipped "on account of low metal prices and high freight charges." Later Brown's company discontinued operations, junked the mill building and equipment, and abandoned the property. The mine was relocated in 1940 as the Sunshine No. 1 claim by L. Harmon and the first recorded shipment made in March 1941.

The recorded production follows:

Year	Dry Tons	Ounces Gold	Ounces Silver	Pounds Lead	Pounds Zinc	Pounds Copper
1941	26.501	1.25	91.0	276	7,974	6
1942	10.106	0.35	56.0	404	4,633	69
1946	707.415	2.00	1,944.0	39,300	128,675	75
1947	416.000	1.00	1,819.0	22,900	70,800	not reported
1950	36.814	0.74	158.0	3,055	9,756	Tr.
Total	1,196.836	5.34	4,068.0	65,935	221,838	>150

> more than

The average grade of these shipments is calculated as 0.0045 ounce gold and 3.4 ounces silver per ton, 2.75 percent lead, 9.27 percent zinc, and 0.06 percent copper.

OWNERSHIP AND EXTENT

The property consists of two standard unpatented mining claims, the Sunshine No. 1 and the Sunshine No. 2. The Sunshine No. 1 was located on December 24, 1940, by L. Harmon and is properly recorded on page 201, Location Record Book 2A, in the office of the Clerk and Recorder, Garfield County, Colo. The Sunshine No. 2 claim was located in 1941 but apparently was not recorded at the county seat. The recorded claim covers the Sunshine vein and mine workings while the other claim covers a smaller parallel vein upon which very little work has been done. Assessment work on the Sunshine No. 1 claim has been kept up. An investigation of title has not been made.

DESCRIPTION OF THE DEPOSITS

The vein is a steeply dipping shear zone in flat bedded Leadville Blue limestone (dolomite). The hanging wall, beyond which very little mineralization is found, is well defined and makes a fairly good wall

for shrinkage stoping. The mineralized area can be divided into two parallel veins, each from 2 to 6 feet wide, with good hanging walls. The heaviest mineralization of both veins is mostly in the form of oxides near the hanging walls. Mineralization gradually diminishes toward the poorly defined footwalls. Between the two veins there is a zone 8 to 12 feet wide of slightly mineralized dolomite which, in the area of the Fisher stope, is mineralized in cross fractures. The principal ore minerals are galena, cerussite, sphalerite, and smithsonite. The International Smelting and Refining Company reported the following analysis for a sample of sorted ore:

Oz./Ton		Percent						
Au.	Ag.	Pb.	Zn.	Cu.	Fe.	Insol.	CaO.	S.
0.005	9.0	3.6	32.9	0.10	2.7	2.8	19.6	17.3

Along the footwall and hanging wall veins a large portion of the lead and zinc minerals are in the form of oxides, reported by the Region IV metallurgical laboratory as 0.45 percent and 4.1 percent, respectively. In the Fisher stope the percentages of oxides seem to be somewhat lower.

SAMPLING

A total of 47 channel samples were taken. Their locations are shown on figure 2 and the assays are listed in table 1 of the appendix. A few samples were taken from the shaft. Parts of the shaft levels were blocked by caves, the two winzes were filled with low-grade broken ore, and the backs of the three stopes were inaccessible.

It was impossible to sample the drifts where timbered, and the sampling along the ends of the Fisher stope does not give a true picture as the ore shoot is lenticular.

Eleven samples--B-12, B-13, B-14, B-39, B-40, B-41, B-42, B-43, B-44, B-45, and B-46--taken in the Fisher stope averaged a trace of gold and 2.2 ounces silver per ton, 2.1 percent lead, 7.6 percent zinc, and <0.05 copper over a width of 6.3 feet. As a result of measurements it is calculated that 2,810 tons of ore were removed from this stope and 290 tons from the North stope, or a total of 3,100 tons from the two stopes. Of this mined ore, 1,160 tons shipped to the International Smelting Company averaged 0.003 ounce gold and 3.4 ounces silver per ton, 2.81 percent lead, 9.02 percent zinc, and >0.004 percent copper according to the settlement sheets. Breaking weight against shipments represents hand sorting of 1.7 parts waste to 1 part ore without materially improving the grade.

Eleven samples--B-8, B-9, B-10, B-11, B-15, B-16, B-17, B-18, B-21, B-22, and B-25--taken along the hanging wall of the main level, but not including the stoped areas, averaged <0.005 ounce gold and 0.7 ounce silver per ton, 0.2 percent lead, 2.8 percent zinc, and <0.05 percent copper over a width of 5.7 feet.

Nine samples--B-5, B-6, B-7, B-20, B-24, B-26, B-27, B-28, and B-29--taken on the footwall of the main level, outside of the stoped area, averaged <0.005 ounce gold and 1.6 ounces silver per ton, 0.6 percent lead, 6.8 percent zinc, and <0.05 percent copper over a width of 3.4 feet.

< less than
> more than

Two samples—B-19 and B-23—taken between the footwall and hanging wall veins on the main level, but outside of the stoped area, averaged <0.005 ounce gold and 0.2 ounce silver per ton, 0.1 percent lead, 1.0 percent zinc, and <0.05 percent copper over a width of 8.8 feet.

Five samples—B-31, B-32, B-33, B-34, and B-35— taken on the hanging wall of the first shaft level averaged <0.005 ounce gold and 1.2 ounces silver per ton, 1.4 percent lead, 4.4 percent zinc, and <0.05 percent copper over a width of 1.9 feet.

Two samples—B-50 and B-51—taken on the footwall vein in the first shaft level averaged <0.005 ounce gold and 1.6 ounces silver per ton, 1.8 percent lead, 6.5 percent zinc, and <0.05 percent copper over a width of 2.3 feet.

Three samples—B-36, B-37, and B-38—taken in the Upper Tunnel averaged <0.005 ounce gold and 0.3 ounce silver per ton, 0.1 percent lead, 0.9 percent zinc, and <0.05 percent copper over a width of 1.8 feet.

Four miscellaneous samples—B-30, B-47, B-48, and B-49—averaged <0.005 ounce gold and 0.9 ounce silver per ton, 0.6 percent lead, 1.7 percent zinc, and <0.05 percent copper over a width of 6.0 feet.

The 47 samples taken averaged <0.005 ounce gold and 1.26 ounces silver per ton, 0.97 percent lead, 4.66 percent zinc, and <0.05 percent copper over a width of 4.7 feet.

A composite sample made up from the 47 samples by the Salt Lake City Metallurgical Division assayed <0.005 ounce gold and 1.3 ounces silver per ton, 1.0 percent lead, 4.9 percent zinc, 0.02 percent copper, 0.45 percent lead oxide, and 4.1 percent zinc oxide.

< less than

These samples were weighted as to sample widths but not as to sample intervals.

ORE RESERVES 1/

Measured Ore

The dump at the portal of the Main Tunnel represents the ore taken from the mine that was not shipped. Deducting total shipments from the volume of vein material broken, this dump is estimated to contain 5,730 tons. The reserve should assay about 20 percent less than the average of all the mine samples, or a trace of gold and 1.01 ounces silver per ton, 0.8 percent lead, 3.5 percent zinc, and <0.05 percent copper.

Total measured ore 5,730 tons

Indicated Ore

Block (1) is on the footwall vein near the portal of the main level and surrounds the south stope. This block is 3 feet wide; averages 1.8 ounces silver per ton, 1.0 percent lead and 7.05 percent zinc; and contains 400 tons.

Block (2) encircles the Fisher stope on the footwall vein; is 7.6 feet wide; averages 1.9 ounces silver per ton, 1.7 percent lead and 7.47 percent zinc; and contains 7,980 tons.

Total indicated ore 8,380 tons

Inferred Ore

Block (3) is the downward extension of Block (1). It is 3 feet wide, has the same assay content as Block (1), and contains about 120 tons.

< less than

1/ Refer to figure 2.

Block (4) extends downward below Block (2), is 7.6 feet wide, has the same assay content as Block (2), and contains 6,330 tons.

Total inferred ore 6,450 tons

Measured, indicated, and inferred ore reserves totaling 20,560 tons and averaging approximately the grade of the composite sample are as follows:

Recapitulation of Ore Reserves

		Ounces/ton		Percent				
	Tons	Au.	Ag.	Pb.	Zn.	Cu.	Oxide Pb.	Oxide Zn.
Measured	5,730	tr.	1.01	0.80	3.50			
Indicated	8,380	-	1.90	1.70	7.50			
Inferred	6,450	-	1.90	1.70	7.50			
Total	20,560	tr.	1.30	1.00	4.90	0.02	0.45	4.10

PRESENT STATUS

Exploration and Development

The property has been explored and developed by about 920 feet of workings comprising 700 feet of drifts and crosscuts, a 90-foot shaft, and 130 feet of winzes and raises (fig. 2). A stope 70 feet high and two other small stopes have been mined above the main level. The shaft needs to be retimbered and parts of both shaft levels are caved.

Mining and Milling Equipment

Mining equipment consists of a Model A Ford engine converted to a compressor, powered by a second Model A engine; 1 mine car; 275 feet of 2-inch air pipe; 300 feet of 12-pound track; 1 stoper and 1 jackhammer, both in poor condition.

Milling equipment consists solely of 400 feet of 2-inch water line and an old bumper-type table. There is ample space for tailings disposal near the proposed mill location.

PROJECT REQUIREMENTS AND COSTS

Exploration and Development

The applicant proposes to develop the mine further by driving the main level an additional 500 feet at a cost, including all material and supplies, of about $15.00 a foot, or $7,500.00.

New Equipment and Facilities

New equipment needed for the mine includes a 210-c.f.m. air compressor, stoper, drifter, jackhammer, steel, hose, and 5 mine cars, estimated to cost about $4,500.00.

New equipment needed for a 25-ton concentrating mill includes a mill building, 2 ore bins, crushing plant, rolls, mineral jig, classifier, concentrating table, and water tank, which the applicant estimates will cost $8,000.00.

Operating Capital

The applicant is without sufficient funds to continue operations until smelter returns are received and requests a loan of $3,500.00 for this purpose.

The project requirements comprise the total amount of the loan request, or $23,500.00.

Transportation, including Access Roads

A fair access road extends 1,500 feet from the mine to the county road. The partly-graveled county road follows Rifle Creek 15 miles to the Denver and Rio Grande Western Railroad at Rifle, Colo. It seems probable that only low-grade concentrates can be made

of the oxidized lead-zinc ores and that the most feasible shipping point will be Tooele, Utah. The existing trucking charge from the mine to the railroad is $1.25 a ton and the present freight rates from Rifle to Tooele, Utah, are as follows:

Gross smelter value of ore	Freight per ton	Gross smelter value of ore	Freight per ton
$10.00	$3.30	$50.00	$7.45
12.50	3.45	60.00	8.16
15.00	3.60	70.00	8.80
17.50	3.80	80.00	9.59
20.00	4.05	90.00	10.30
30.00	5.65	100.00	11.02
40.00	6.54	Plus 3 percent tax	

Manpower

Although the labor supply is limited, there are enough skilled miners available in the Rifle district at this time to meet present requirements. The prevailing wage for miners at the Rifle oil shale mine is $1.55 an hour. The men would reside in the town of Rifle, where living conditions are good, and drive to and from the mine.

Power

Electric power can be obtained from the service lines of the Public Service Company of Colorado by building a one-mile connecting line at a cost of about $2,500.00 but probably the present needs could be best met with gasoline or diesel engines.

Water

There is sufficient water at the site of the mill to provide a gravity supply for the 25-ton mill.

PRODUCTION PLAN

Time Schedule for Completion of Project

The applicant plans to begin work as soon as funds are available. Milling ore could be produced and stored within a few days after work is started. It is estimated that 4 to 5 months will be required to drive the main level an additional 500 feet. Allowing for a 6 weeks' delay in delivery of machinery, the applicant estimates that the mill could be completed and in operation in from 8 to 12 weeks.

Rate of Production

The estimated rate of production is 25 tons of ore a day, which, if derived from Block (2), will amount to 49 ounces of silver, 850 pounds of lead, and 3,735 pounds of zinc, of which 21 ounces, 689 pounds, and 1,494 pounds, respectively, are recoverable after milling.

Mining Methods and Costs

Mining would be done by shrinkage stope methods at an estimated cost of about $2.50 a ton. Below the main level this cost would be increased ato about $3.50 a ton.

Milling Methods and Costs

Milling would be done by gravity concentration at an estimated cost of around $1.50 a ton.

Smelting Methods and Costs

Indications are that the mill products will be low-grade bulk zinc-lead concentrates that would be shipped to the International Smelting and Refining Company at Tooele, Utah, where the lead-zinc concentrates would be separated in their mill. The lead concentrate would go to a lead furnace and the zinc concentrate to a zinc recovery plant. Smelter charges vary, but the treatment charge on

a shipment made by the applicant in December 1950 was $10.41 a ton.

The smelter paid for this shipment on the following basis:

Lead: 90% of assay less 1.5% at 2 cents under E. & M. J. quote.

Zinc: 75% of assay at 22% of E. & M. J. quote.

Silver: 95% of assay less 0.5 ounce at 90 cents.

Gold: 91% of assay at $35.00.

Taxes and Insurance

The property is not patented and at the present time has no taxable improvements, and it is not insured.

SUMMARY: COST OF PROJECT

Capital Requirements

Development: driving 500 feet of main level	$ 7,500.00
Mine equipment: 210-c.f.m. air compressor, stoper, drifter, jackhammer, steel, hose, and 5 mine cars	4,500.00
Mill: building, 2 ore bins, crusher, rolls, jig, classifier, concentrating table, and water tank	8,000.00
Operating fund	3,500.00
	$23,500.00

Operating Costs

Mining, per ton	$3.00
Milling, per ton	1.50
Freight (truck and railroad, per ton ore)	.78
Treatment (per ton mined ore)	1.01
	$6.29

Indicated Profit or Loss

The heads used in the metallurgical test contained 1.2 ounces silver per ton, 1.0 percent lead, and 4.8 percent zinc. The ore reserves are calculated to contain 1.9 ounces silver per ton, 1.7 percent lead, and 7.47 percent zinc. In these areas sphalerite was noted by both Tweto and Evans, of the U. S. Geological Survey, so the recovery should be better than in the metallurgical tests. Allowing the same ratios of concentration and recovery, 100 tons of indicated and inferred ore would produce 4.1 tons of lead concentrate containing 9.2 ounces silver, 24.5 percent lead, and 25.0 percent zinc and 6.6 tons of zinc concentrate containing 6.5 ounces silver, 3.4 percent lead, and 28.5 percent zinc.

If these concentrates are shipped to the International Smelting and Refining Company at Tooele, Utah, the settlements would be about as follows:

Lead Concentrate (4.1 tons)

Payments	Per ton	
Silver: 95% of 9.2 oz. less .5 at 90 cents	$ 7.42	
Lead: 90% of 24.5 units less 1.5 units at 15 cents	62.10	
Zinc: 75% of 25.0 units at .22 of 17 1/2 cents	14.44	
Total Payments		$ 83.96

Deductions	Per ton	
Treatment, base charge	$ 6.17	
Lead: 7 units at 10 cents	.70	
Sulfur	2.50	
Freight	9.88	
Hauling	1.25	
Total Deductions		$ 20.50
Net per ton		$ 63.46
Net for 4.1 tons		$260.19

Zinc Concentrate (6.6 tons)

Payments	Per ton	
Silver: 95% of 6.0 oz. at 90 cents	$ 5.13	
Lead: 90% of 38 lbs. at 15 cents	5.13	
Zinc: 75% of 570 lbs. at $3.85	16.46	
Total Payments		$ 26.72
Deductions		
Base charge	$ 6.17	
Lead: 28 units at 10 cents	2.80	
Sulfur: 2 units at 25 cents	.50	
Freight	3.71	
Hauling	1.25	
Total Deductions		14.43
Net per ton		$ 12.29
Net for 6.6 tons		$ 81.11

Total net if shipped to Tooele, Utah	$341.30
Cost of mining and milling 100 tons	450.00
Loss in operation	$108.70
Loss per ton mined and milled	$ 1.09

If the lead concentrate is shipped to the American Smelting and Refining Company at Leadville, Colorado, and the zinc concentrate is shipped to their Amarillo plant the returns are about as follows:

Lead Concentrate (4.1 tons)

		Per ton
Payments		
Silver: 95% of 8.2 oz. at 90 cents	$ 7.01	
Lead: 90% of 460 lbs. at $14.98	62.02	
Total Payments		$ 69.03
Deductions		
Base charge less 4.5 units at 10 cents	$ 8.55	
Zinc: 17 units at 30 cents	5.10	
Sulfur: 2 units at 25 cents	.50	
Freight	5.54	
Trucking	1.25	
Total Deductions		20.94
Net per ton		$ 48.09
Net per 4.1 tons		$ 197.17

Zinc Concentrate (6.6 tons)

		Per ton
Payments		
Silver: 65% of 6.5 oz. at 90 cents	$ 3.80	
Lead: 65% of 38 lbs. at 15 cents	3.71	
Zinc: 82% of 20.5 units at 17 cents	57.15	
Total Payments		$ 64.66
Deductions		
Base charge: $35.00 plus 11.5 at 1.50	$52.25	
Labor clause: 12 at 15 cents	1.80	
Lime and magnesia: 5 units at $1.00	5.00	
Freight	10.07	
Trucking	1.25	
Total Deductions		70.37
Loss per ton		$ 5.71
Loss for 6.6 tons		$ 37.69

Total from both American Smelting and Refining Company smelters	$159.48
Cost of mining and milling	450.00
Loss in operation	$290.52
Loss per ton mined and milled	$ 2.91

The above indicates that by far the best returns will result by shipping to Tooele, Utah, where the net loss would amount to $1.09 per ton mined.

PROPOSED FINANCING

The property is held under possessory rights by the applicant who has requested a loan of $23,500.00 to equip the mine, do 500 feet of drifting, and build a 25-ton gravity concentrating plant. The amount requested for purchasing and installing machinery is low but may be adequate if the applicant is able to purchase good second-hand equipment. The loan could be partly secured by about $10,000.00 worth of machinery purchased with Government funds. The applicant proposes that 10 percent of the net smelter returns be used to pay off the loan.

CONCLUSIONS

Metallurgical tests along the lines of gravity concentration have indicated both a high mill loss and grades of concentrate that will not pay under existing schedules, freight rates, and metal prices. Better concentration methods would place this mine in the potential shipper class.

The mine is not without merit as a future lead-zinc producer, especially if the strong east-west fault about 100 feet south of the portal of the main level, and as yet unexplored, is found to be mineralized.

The applicant has had twenty years' experience in mining, mostly in small mines. He is considered honest and reliable.

RECOMMENDATIONS

It is recommended that the loan request be denied as there is no indication that the mine can be operated at a profit.

APPENDIX

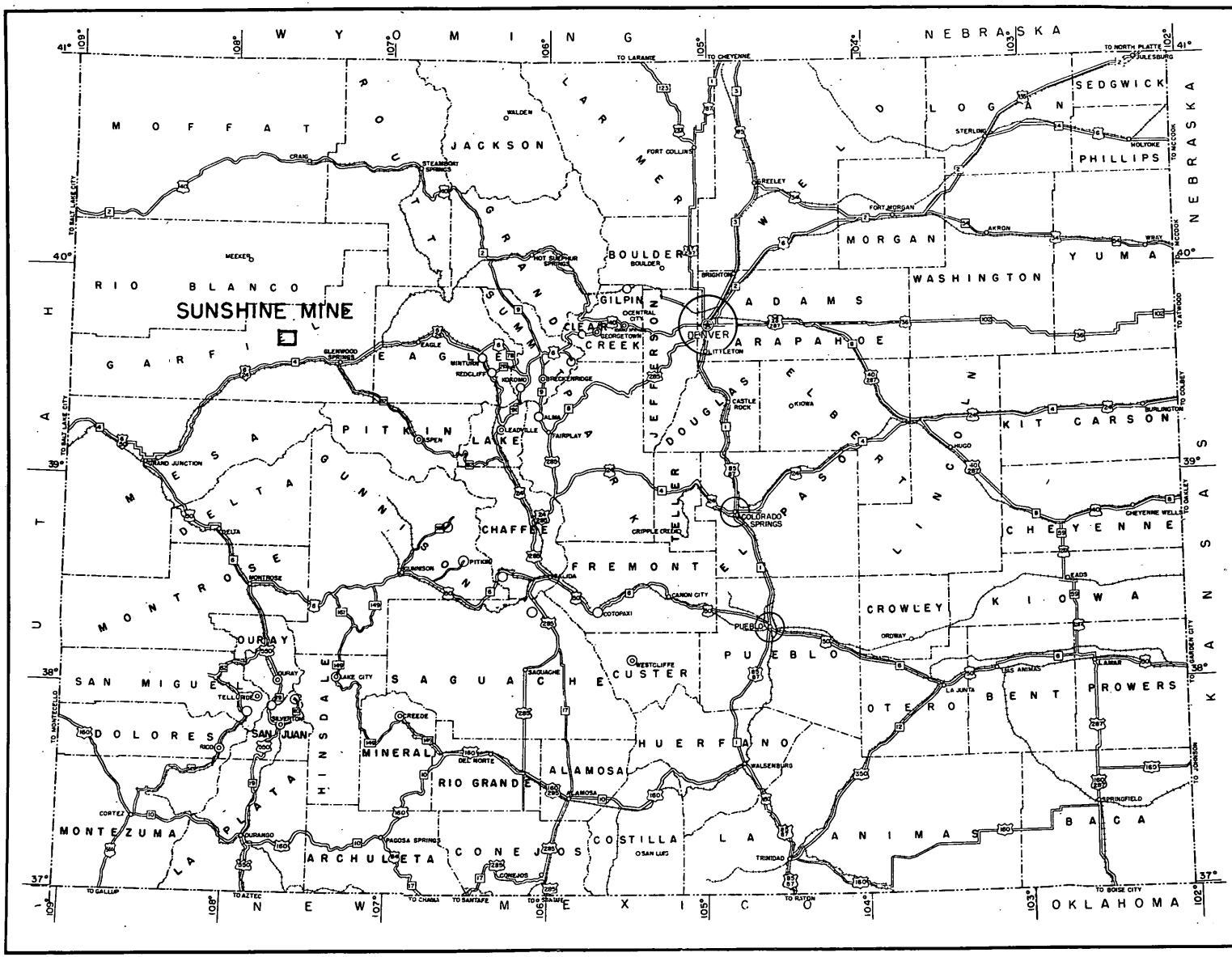
TABLE 1. - Sample Analyses, Sunshine Mine.

Sample No.	Width sampled feet	Ounces / ton Au.	Ounces / ton Ag.	Percent Cu.	Percent Pb.	Percent Zn.	Description
B-12	4.0	<.005	0.9	<.05	0.6	3.75	Fisher stope
B-13	3.7	<.005	3.0	<.05	6.15	9.0	"
B-14	5.0	<.005	2.8	<.05	7.45	9.5	"
B-39	3.5	<.005	0.9	<.05	0.55	3.25	"
B-40	11.0	<.005	1.6	<.05	0.95	8.2	"
B-41	6.7	<.005	1.5	<.05	1.8	6.9	"
B-42	7.0	<.005	1.5	<.05	2.15	5.1	"
B-43	4.5	<.005	2.0	<.05	1.0	5.35	"
B-44	7.6	<.005	2.7	<.05	0.4	10.0	"
B-45	9.1	<.005	2.7	<.05	1.5	6.75	"
B-46	7.1	<.005	4.0	<.05	2.9	12.2	"
B-8	8.7	<.005	1.2	<.05	<.1	0.25	Main level, hanging wall
B-9	2.3	<.005	0.7	<.05	0.7	3.45	" "
B-10	4.5	<.005	0.3	<.05	0.3	1.25	" "
B-11	4.0	0.005	1.7	<.05	0.3	6.25	" "
B-15	7.4	<.005	0.4	<.05	0.2	2.1	" "
B-16	7.1	<.005	0.3	<.05	0.15	2.0	" "
B-17	12.8	<.005	0.5	<.05	0.1	3.3	" "
B-18	2.6	<.005	0.2	<.05	0.3	1.0	" "
B-21	3.6	<.005	2.8	<.05	0.55	11.5	" "
B-22	6.0	<.005	0.6	<.05	0.05	3.0	" "
B-25	4.0	<.005	0.1	<.05	<.1	0.55	" "
B-5	2.4	<.005	2.8	<.05	1.0	11.8	Main level, footwall
B-6	2.5	0.005	2.0	<.05	0.3	6.45	" "
B-7	3.3	<.005	1.2	<.05	0.6	4.0	" "
B-20	4.0	<.005	1.6	<.05	0.35	8.85	" "
B-24	4.2	<.005	0.7	<.05	<.1	5.2	" "
B-26	3.4	<.005	0.4	<.05	0.55	3.6	" "
B-27	2.9	<.005	0.8	<.05	0.55	5.2	" "
B-28	2.9	<.005	1.0	<.05	0.2	7.05	" "
B-29	1.8	0.01	1.0	<.05	2.35	12.9	" "
B-19	10.5	<.005	0.2	<.05	0.15	1.25	Main level, between foot-
B-23	7.0	<.005	0.1	<.05	<.1	0.6	wall and hanging wall

< less than

Sample No.	Width sampled feet	Ounces / ton Au.	Ounces / ton Ag.	Percent Cu.	Percent Pb.	Percent Zn.	Description
B-31	2.5	<.005	0.7	<.05	0.35	2.15	First shaft level, hanging wall
B-32	1.5	<.005	0.6	<.05	1.3	1.05	" "
B-33	1.4	<.005	1.3	<.05	0.8	5.9	" "
B-34	2.0	0.005	2.0	<.05	3.4	6.6	" "
B-35	1.9	0.005	1.4	<.05	0.95	6.65	" "
B-50	4.0	<.005	1.6	<.05	1.85	7.1	First shaft level, footwall
B-51	0.5	<.005	1.8	<.05	1.6	1.9	" "
B-36	1.0	<.005	0.8	<.05	0.3	1.9	Upper tunnel
B-37	1.5	<.005	0.3	<.05	<.1	0.8	"
B-38	3.0	0.005	0.3	<.05	0.1	0.7	"
B-30	6.4	<.005	<.01	<.05	<.1	0.35	Miscellaneous
B-47	7.6	<.005	1.6	<.05	1.5	1.1	"
B-48	5.4	0.005	1.4	<.05	0.75	4.45	"
B-49	4.5	<.005	0.2	<.05	<.1	1.9	"
Average	4.7	<.005	1.26	<.05	0.97	4.66	

	Ounces / ton Au.	Ounces / ton Ag.	Percent Cu.	Percent Pb.	Percent Zn.	Oxide Pb.	Oxide Zn.
Composite (47 samples) B-5 to B-51 inclusive	<.005	1.3	0.2	1.0	4.9	0.45	4.1



LEGEND

- LOCATION OF DEPOSIT
- MAJOR INDUSTRIAL AREAS
- PRINCIPAL MINING CENTERS

NOTE

DATA TAKEN FROM STATE HIGHWAY MAP OF COLORADO. BASIC SURVEY CONDUCTED 1936, FEDERAL AID AND STATE HIGHWAY SYSTEM DATA REVISED AS OF JANUARY 1, 1940.

0 5 10 15 20 25 50
SCALE OF MILES

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Fig. 1, INDEX

COLORADO

Highway and Railroad Map

ENGINEER:	DATE:

DMA DOCKET 61

HARMON-SUNSHINE LEAD-ZINC MINE
GARFIELD COUNTY, COLORADO

Metallurgical Report

By C. H. Schack
Metallurgist
Salt Lake City Branch
Metallurgical Division
U. S. Bureau of Mines

Metallurgical

METALLURGICAL REPORT

By

C. H. Schack
U. S. Bureau of Mines

This report will summarize the pertinent metallurgical facts disclosed by testing of a composite sample of oxidized lead-zinc ore from the Sunshine mine, Garfield County, Colo.

The composite sample was made by mixing equal weights of each of the forty-seven project samples submitted by Mr. Carl Belser, Colorado Branch, Mining Division. The chemical analysis of the composite sample follows.

Chemical Analysis

	Assay, percent					Oz./ton	
	Total		Oxide				
	Pb	Zn	Pb	Zn	Cu	Au	Ag
Sunshine composite	1.0	4.8	0.5	4.1	0.02	<.005	1.2

As indicated by the analysis, the ore is oxidized and low grade. The chief metal value is in zinc. Microscopic study showed the gangue of the ore is dolomite, and that the zinc occurs as smithsonite, whereas the lead is present as both galena and cerussite. Most of the lead occurs as relatively coarse crystals; however, much of the smithsonite is closely associated with limonite, cerussite, and the dolomite gangue. No silver mineral could be identified in the ore. The ore is friable and contains an appreciable amount of natural slimes.

First, attempts to concentrate the ore were made by jigging and tabling sized portions of ore crushed to 1/4 inch. The results obtained indicated that in the plus 10-mesh fractions of the ore little lead and no zinc minerals were liberated from the gangue. The plus 10-mesh jig concentrate assayed only 8 percent Pb and represented a recovery of only 25 percent of the lead. The various jig products assayed about the same in zinc, indicating a lack of liberation of the smithsonite in this portion of the ore. The minus 10-mesh portion of the ore was tabled, and a fair recovery of the lead in this fraction was obtained in a low-grade product.

Since jigging proved ineffective, an attempt was made to recover separate lead and zinc concentrates by tabling hydraulically sized fractions of ore crushed in rolls to minus 10-mesh. The results are summarized in the following table.

Metallurgical Results

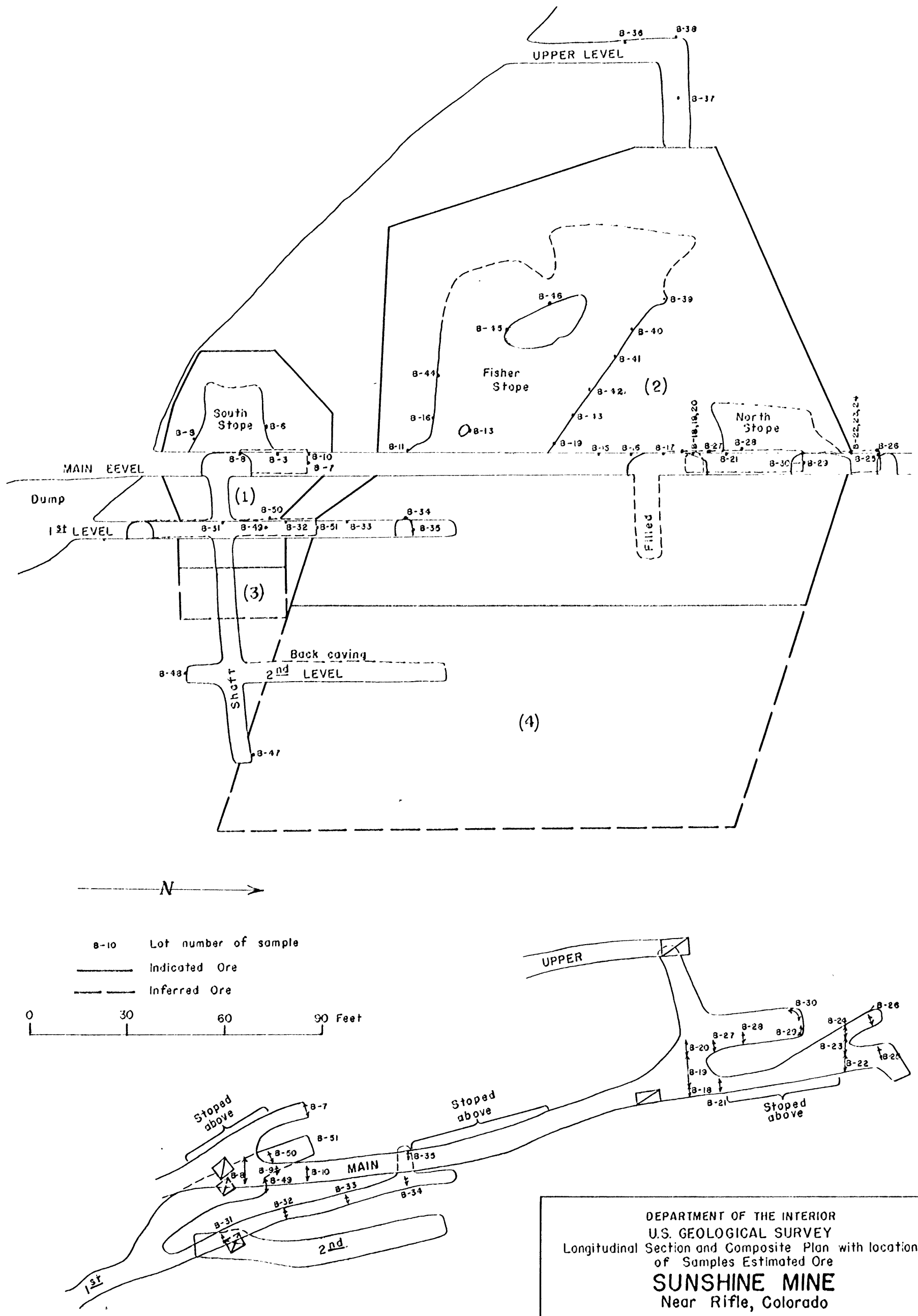
Tabling Minus 10-Mesh Ore

Product	Weight, percent	Assay, percent Pb	Zn	Oz./ton Ag	Distribution, percent Pb	Zn	Ag
Lead conc.	4.1	14.4	16.0	5.8	66.2	14.1	21.5
Zinc conc.	6.6	2.0	18.3	4.1	14.8	25.8	23.4
Table tailing	71.4	0.1	3.0	0.6	8.0	49.0	39.6
Slimes	17.9	0.6	3.2	1.1	11.0	11.1	15.5
Calculated heads	100.0	0.9	4.7	1.2	100.0	100.0	100.0

The results given show that a recovery of about 66 percent of the lead and 21.5 percent of the silver can be made in a concentrate assaying 14.4 percent Pb, 16.0 percent Zn, and 5.8 ounces per ton silver. This product might be salable to a lead smelter, particularly a smelter that has a slag-fuming plant in conjunction with the lead

blast furnace. Somewhat higher-grade products probably could be made by retabling the concentrate, but only at a sacrifice in recovery since the considerable dolomite in the concentrate is locked with both the lead and zinc minerals present. The zinc concentrate assayed only 18.3 percent Zn and contained only 25.8 percent of the zinc in the ore. This product also might be retabled to improve its grade and thereby make it marketable at a slag-fuming plant. The fact, however, that about 50 percent of the zinc and 40 percent of the silver were lost in the table tailings as well as an additional 11 percent of the zinc and 15 percent of the silver in slimes, precludes making high recovery of zinc and silver by tabling of this type of low-grade oxidized ore. Finer grinding of the ore to obtain a greater degree of liberation might give higher-grade products, but the recovery probably would not be greatly improved because of increased loss of values in slimes.

Although a complete ore-dressing study of the ore by flotation, sink-float, spiral concentration, and other methods has not been made, it can be concluded that this type of low-grade oxidized lead-zinc ore cannot be effectively concentrated to make marketable products at high recovery.



DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
Longitudinal Section and Composite Plan with location of Samples Estimated Ore

SUNSHINE MINE

Near Rifle, Colorado

Samples taken March 13-15, 1951 by Carl Belser & O.D. Evans
Ore estimated by O.D. Evans

D.M.A. DOCKET NO. 61 FIG.-2