SBR-28

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~~U. M. C. 1770~~

Uranium Co. of America

[redacted]000

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EXPLORATION

Mr. John J. O'Connell
437 North Oakhurst Drive
Beverly Hills, California

Re: Docket No. DMEA 2322 - Iron
Palen Mountain iron ore
Riverside County, California

Dear Mr. O'Connell:

Your application for exploration assistance and other information relating to your application available to us in Washington, have been carefully reviewed.

This information, while noting a relatively small tonnage of an impure iron ore, indicates that geologically there is little probability of making a significant discovery of iron ore. I regret, therefore, to inform you that your application is denied.

We wish to thank you for your interest in the Defense Minerals Program and for bringing this property to our attention.

Sincerely yours,

C. O. Mittendorf

Acting Administrator
Defense Minerals Exploration
Administration

NJHurley:ls
5/14/52

cc: Docket
Admn. Reading File
Operating Committee
N. J. Hurley
G. C. Selfridge
Field Team, Region 3
J. W. Forbes, USBM
Mrs. Martha Carr, USGS

Acting Administrator, DMEA May 14, 1952

Iron and Ferro-Alloy Division, DMEA

Denial of exploration project in the amount of $10,000
Docket No. DMEA 2322 - Iron
John J. O'Connell
Palen Mountain iron ore deposit
Riverside County, California

The subject application was denied by this Division for the following reasons:

(1) Superficial observations in the region reveal a series of steeply dipping ten- to twenty-foot outcrops of medium grade ferrous minerals, principally hematite and magnetite, extending some 300 feet along the strike and then disappearing beneath the alluvial gravels. Except for size, these deposits are similar to and genetically related to the contact-metamorphic deposits exploited on a limited scale by the Kaiser interests in the Eagle Mountain area about 25 miles to the northwest.

Exploratory work on the property to date has been limited to a few small trenches along the outcrops, exposing the ore in small randomly-oriented pods of iron oxide interbanded with hard siliceous country rock. An unfortunate feature of the deposit is the occurrence of apatite and gypsum in both the ore and gangue rock, thus causing the phosphorous content of the ore to exceed the acceptable commercial limits in this impurity.

Therefore, because of the small tonnage attributable to the deposit, the poor over-all grade of iron in the exposed portions, the awkward attitude of the formation, and the high phosphorous content of the product, it does not appear that the projected exploration will lead to a significant discovery of iron ore.

(2) The Field Team reports that the property does not merit further consideration.

(3) The Commodity Division of the U. S. Geological Survey recommends the Government's participation in the exploration project be denied.

George C. Selfridge

NJHurley:ls 5/14/52

G. C. Selfridge, Chief
Iron and Ferro-Alloy Division

cc: Docket
Admn. Reading File
N. J. Hurley
G. C. Selfridge

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

400

May 9, 1952

To: George E. Selfridge, DMEA

From: Martha S. Carr, USGS

dmea 2322

Subject: Field report
John J. O'Connell
Palen Mountains iron ore deposit
Riverside County, California

The memorandum from the Field Team transmits a report of the examining geologist, Lorin D. Clark, dated April 23, 1952 and expresses the opinion given in it—that the exploration is not recommended because of the probable small size of the ore body and its low iron and very high phosphorous content.

I concur with the recommendation of the Field Team.

cc: Director's Reading File (4212)
Branch
DMEA File (3)
Ferrous Metals File

Martha Carr:bbk
G 5/9/52

Copy Rec'd
400

400

C O P Y

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Office of
Executive Officer
DMEA Field Team
Region III

1012 Flood Building
870 Market Street
San Francisco 2, Calif.

April 25, 1952

Memorandum

To: Frank E. Johnson, Chairman, Operating Commiettee, Defense Minerals Exploration Administration, Washington, D. C.

From: Executive Officer, DMEA Field Team, Region III

Subject: Docket DMEA-2322 (Iron Ore) - Palen Mountains Iron Ore Deposit, Riverside County, California

Reference is made to your subject "Review of Application for Exploration Assistance", dated February 15, 1952.

Attached are four copies of a report, "DMEA-2322, Palen Mountains Iron Deposit, Riverside County, California", by Lorin D. Clark, Geologist, U. S. Geological Survey, dated April 23, 1952.

Exploration of the O'Connell claims is not recommended by the examining geologist because of the probable small size of the ore body and its low iron and very high phosphorous content. The geologist reports that there is some possibility that a dip needle survey might indicate the existence of a concealed deposit large enough for open pit mining, but in view of the low quality of the exposed ore, the expense of exploration based on dip needle data is felt to be unjustified.

The subject docket is being returned herewith.

H. C. Miller,
Executive Officer
DMEA Field Team, Region III

Attachments

Copy to E. H. Bailey, U.S.G.S.

400.

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

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION III

DMEA 2322, Palen Mountains Iron Deposit

Riverside County, California

Lorin D. Clark, Geologist
U. S. Geological Survey

April 23, 1952

Reviewed by
DMEA OPERATING COMMITTEE
5-7-52
(WG) (date)

Summary and Conclusions

The largest iron deposit on the O'Connell claims consists of massive hematite and magnetite with admixed country rock and vein quartz; the mass crops out for a distance of about 300 feet, and is 10 to 20 feet wide. The west end of the deposit is exposed, but the east end is buried under alluvial gravel. The iron oxides contain more than 1 percent phosphorous, well over tolerable limit, and it is estimated that little of the material contains more than 55 percent iron. Low-cost open pit mining is precluded by the attitude and topographic position of the deposit as well as its small size. Other showings of iron oxide on the O'Connell claims are very small and low grade -- they merit no further consideration.

Exploration on the O'Connell claims is not recommended because of the low iron content and the high phosphorous content of the exposed part of the deposit.

Introduction

The Palen Mountains Iron Deposit is also known as the Iron King Mine. It is in sec. 22, T. 5 S., R. 18 E (projected) on the south edge of the Palen Mountains (see index map, Figure 1). The largest showing of iron oxides is on the steep east slope of a promontory extending south from the main group of hills. (See fig. 2). A graded desert road 8 miles long leads to the deposit from a point 19.9 miles east of Desert Center on U. S. Highway 60-70.

Iron Deposits

The showings of iron oxide are in an area underlain by massive, fine-grained, dark-green metamorphic rock consisting largely of quartz and sodic plagioclase with minor epidote and green biotite. The largest mass of iron oxide, which is 10 to 20 feet wide, crops out for a distance of about 300 feet. The west end of the deposit is in an area of well-exposed bedrock, but the east end is buried under coarse alluvial gravels. Exposures in two trenches show that banding in the deposit strikes east and dips about 60° south. Presumably, the attitude of the deposit as a whole is parallel to the banding.

Other showings of iron oxide mentioned in the report by Chiapella and indicated on the claims map, both accompanying the docket, consist of small, randomly-oriented pods. The pods consist of interbanded iron oxide and country rock, with iron oxide comprising less than 50 percent of the material in the pods. The largest pod is about 15 feet thick and 50 feet long. These showings merit no further consideration.

Description of largest deposit

The iron oxides consist of hematite and magnetite. Individual specimens show high magnetic permeability, and some show magnetic polarization, indicating the feasibility of a dip needle survey to determine the extent of the deposit. The iron oxide is contaminated by thin interbanded layers of

country rock and by vein quartz which is abundant locally, apparently filling closely-spaced fractures in the iron oxide. Apatite crystals are abundant in the iron oxide; some crystals are as much as 3 mm in diameter and 15 mm long.

Grade of Ore

The deposit can be roughly divided into two zones on the basis of the amount of admixed country rock. A zone about 10 feet thick in the north side of the deposit is the less contaminated but it is estimated that little of this zone contains more than 55 percent iron. The phosphorous content of the iron oxide is more than 1 percent, well above the tolerable limit.

The sample represented by the analyses below consisted of specimens of hard, massive iron oxide collected from the lower trench for rough determinations of magnetic permeability. The sample is "high-graded" in that the intermixed country rock is not adequately represented.

Fe	59.65	Percent
Mn	0.07	"
P	1.18	"
S	0.012	"
SiO_2	2.08	"
TiO_2	0.42	"
Al_2O_3	2.55	"
CaO	3.56	"
MgO	1.80	"

Reserves

The exposed part of the deposit is estimated to contain a total of 75,000 tons of ore, using the following assumptions: thickness, 10 feet; length, 300 feet, depth equal to 1/2 the exposed length or 150 feet; and 6 cubic feet per ton of ore.

Market

The specifications and prices for iron ore being shipped to Japan are given below:

Specifications

Fe	over 50%; reject less than 55%
$SiO_2 + Al_2O_3$	less than 10%
S	less than 0.3%
P	less than 0.3%
Heavy elements (Cu,Pb,Zn,etc.)	less than 1.0%

Price

Base, 58%	$8.85 San Francisco, FOB car at dock
	8.35 Los Angeles, FOB car at dock
Over base	$0.15/unit premium
Under base	$0.30/unit subtracted

Producers must guarantee shipment of 10,000 tons per week in order to avoid expensive delay in loading ships.

Hard lump ore shipped to eastern steel mills is sold for $25 to $30 per ton with the Ford Motor Company reportedly paying the highest price. The standard freight rate for ore valued at $25 per ton shipped from Blythe, California (the railroad point nearest the deposit) to Detroit, Michigan, is $22.05 including surtax.

Specifications for ore sold to eastern steel mills or to the Kaiser steel plant at Fontana, California are not known, but it is unlikely that either would be interested in very high phosphorous ore.

Conclusions and Recommendations

The ore in the exposed part of the deposit is too low in iron and too high in phosphorous to be marketable. In view of the low quality of the ore, underground exploration of the exposed part of the deposit is not warranted, nor is exploration for a persumed extension of the deposit under alluvial gravels.

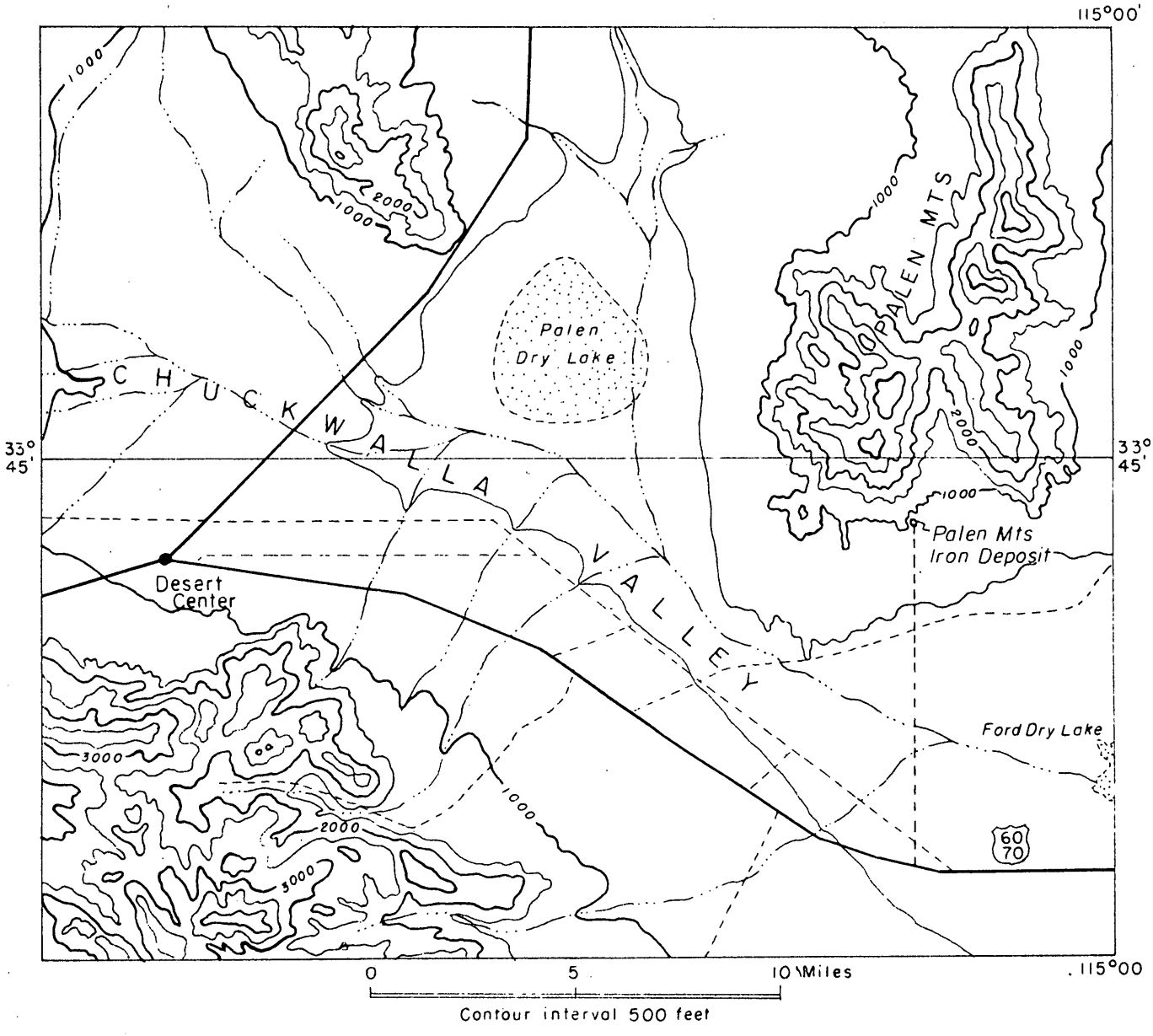

Figure 1. Index map showing location of Palen Mountains Iron Deposit, Riverside County, California

Figure 2. Photograph looking west at Palen Mountains Iron Deposit, showing banding. The banding in the iron ranges approximately the depth of the deposit as a whole and runs about 30° under the highest part of the hill.

Mr. John J. O'Connell
437 N. Oakhurst Drive
Beverly Hills, California

Re: Docket No. DMEA 2322X - Iron Ore
Palen Mountains Iron Ore Deposit
Riverside County, California

Dear Mr. O'Connell:

Your application for assistance in exploring the Palen Mountains Iron Ore Deposit in Riverside County, California, Docket No. DMEA 2322X, has been referred to Mr. H. C. Miller, Executive Officer, DMEA Field Team, Region III, 1012 Flood Building, 870 Market Street, San Francisco 2, California, for a field examination.

The Regional Office will contact you at an early date in regard to your project. Any assistance that you can offer the field team during the examination will be appreciated.

Sincerely yours,

C. O. Mittendorf

Acting Administrator
Defense Minerals Exploration
Administration

GGGentry:lm
2/12/52

cc: Admn. Reading File
Docket
H. B. Melcher, USBM
T. P. Thayer, USGS
Field Team Reg. III
G. C. Selfridge
G. G. Gentry

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

1 & 7 A

2/15/52

Mr. H. C. Miller
Executive Officer, Region III
1012 Flood Building
870 Market Street
San Francisco 2, California

Dear Sir:

We attach "Review of Application for Exploration Assistance" on:

Applicant John J. O'Connell

Docket No. 2322

Commodity Iron Ore

Amount $ 10,000.00

Please expedite consideration of the application with particular reference to the points raised in the attached "Review".

Sincerely yours,

Chairman, Operating Committee
Defense Minerals Exploration
Administration

APPROVED:

Member, Bureau of Mines

Member, Geological Survey

Defense Minerals Administration

Review of Application for Exploration Assistance

Docket No. DMEA 2322

Commodity IRON ORE

Total Amount $10,000.00

Govt. Participation 50%

1. Name and Address of Applicant John J. O'Connell
437 N. Oakhurst Drive, Beverly Hills, Calif.

2. Location of Property Palen Mountains Iron Ore Deposit
Sect. 22, T 5.S, R. 18E - Riverside County, Calif.

3. Mineral or metal Iron Ore Is it listed in Section 9 of MO-5? Yes

If not, application will be rejected.

4. Geologic probability of discovery—based on data in application (question #16, 17, 18, 20 and 22)*

Mines or Survey reports, etc., do you rate chances:

a) Good

b) Poor

c) None

d) Don't know—needs field examination Requires Field Examination

e) Is there an alternative and favorable project? Unknown
(If so, attach an explanation)

5. Is the applicant's right to the property clearly stated? Yes
(question 5, 6, 7)*

6. If applicant is a lessee, is a copy of the lease attached? Owner

Does the lease have sufficient time to run to cover a future productive period? Has Sufficient Time

*question numbers are those of MF-103

7. Are subordination agreements necessary? No

a) MF-201? _____

b) MF-202? _____

8. From the data presented, does the proposed project appear feasible from the point of view of:

a) Available manpower Unknown

b) Equipment and supplies "
(question 14 plus general knowledge of availability)*

c) Accessibility (question 12)* Unknown

d) Water (question 13)* "

e) Power (question 13)* "

Is a field check needed on any of these points? Yes

9. Does the experience of the applicant appear to be adequate to assure that he can properly conduct the proposed project? (question 4)* Unknown

_____

Is a field check needed on this point? Yes

10. Exhibit A. (question 21 and 22)*

a) Is the project adequately described? No

If not, are there sufficient data given so that you can describe the project? No If so, attach a draft.

b) Is there an adequate map or sketch of the proposed work? NO

_____

c) Is the proposed work "exploration" under the definition of Section 8, MO-5? Yes

If not, what part of it is? _____

_____

_____

_____

Is this part a worthwhile exploration project? Yes

d) Are the cost estimates detailed? No

Can they be summarized, as on page 2 of Procedural Instruction 5-A, from the available data? No If so, attach a draft.

e) Are the cost estimates reasonable? Unknown

f) Should more information be requested from applicant? Yes

g) Is a field examination necessary to complete Exhibit A? Yes

11. Exhibit B (question 23-d)*

a) Is it applicable? Yes

b) If so, are sufficient data furnished? No If so, attach a draft.

c) Is a field check needed? Yes

12. Exhibit C (question 23-e, f and g)*

a) Is it applicable? Yes

b) Sufficient data? No If so, attach a draft.

c) Are rents and charges reasonable? Unknown

d) Is a field check needed? Yes

13. Exhibit D (question 23-a, b)*

a) Are there sufficient data? No

b) Is the schedule adequate for the work proposed? Unknown

c) Is the schedule excessive for the work proposed? "

d) Are the proposed wages and salaries reasonable? "

e) Is a field check needed? Yes

14. Exhibit E (question 23-c)*

a) Is it applicable? Yes

b) Sufficient data? NO

c) Reasonable? unknown

d) Field check needed? Yes

15. In your judgment, can the proposed work be done in the proposed time? Requires Study of Field Team

(All exploration must be completed within two years)

16. If field examination is not needed, attach your recommendation.

17. If field examination is needed, do you have any special instructions for the field team not indicated by your answers to the foregoing question? Prepare Geological map and Cross Section of the deposit. Sample and assay for evaluation of the deposit. Discuss with Applicant and Let us have your Recommendations and Costs Covering the diamond drilling program. investigate Conditions of Roads, Water Supply and transportation, Labor and Supply problems. Can the Applicant furnish his portion of monies if the program exceeds the $10,000 figure. investigate Applicants Competence. investigate market for the ore.

Reviewed by [illegible]

Date Feb. 11, 1952

HEMPSTEAD 6626

S. E. CHIAPELLA
MINING ENGINEER
1625 NORTH LAS PALMAS AVENUE
HOLLYWOOD 28, CALIFORNIA

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
FEB 25 1952

February, 21, 1952.

Mr. C. O. Mittendorf, Acting Administrator
Defense Minerals Exploration Admn.
Washington, 25, D.C.

Re: Docket No. DMEA 2322X
Palen Mountains Iron Ore
Deposit, Riverside County,
California.

Dear Mr. Mittendorf:

This will acknowledge your letter under date of February, 15th., past, informing Mr. John J. O'Connell of 437 Oakhurst Drive, Beverly Hills. California, that the above Docket No. DMEA 2322X has been referred to Mr. H. C. Miller, Executive Officer, DMEA Field Team, Region 111, 1012 Flood Building, 870 Market St. San Francisco, 2, California. for a field examination of the above named properties.

Under another cover, I have written Mr. Miller, offering him any assistance he desires during the examination.

SEC.-jc.

Yours truly,

S. E. Chiapella

NOTE.
This letter is written for and at the request of Mr. J. J. O'Connell.

SEC.

DMA Form 1

DEFENSE MINERALS ADMINISTRATION
Control Slip

(72)

CONTROLLED DOCUMENT

DMEA ~~DMA~~ Docket No. 2322

DO NOT DETACH THIS SLIP

Action on this document is recorded and controlled in Reports and Records Branch. Any movement of this document between divisions or offices of DMA or movement outside DMA must be reported to the Reports and Records Branch. Actions taken that affect status of the case must also be reported.

This document has been recorded as

EXPLORATION PROJECT

Any action taken to change the type of request for assistance must be promptly reported to the Reports and Records Branch. Use DMA Form 2 for submitting these reports.

Routing Slip
(ONE COPY TO USGS & ONE TO USBM)

To:	CODE 400, Rm. 3538	Date	1-11-52
To:	Op Con	Date	5-16-52
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FILE COPY
SURNAME:

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

Surley
Selfridge
Forbes
Kedzie
Rampton
Fehlmann

MAY 19 1952

Mr. John J. O'Connell
437 North Oakhurst Drive
Beverly Hills, California

Re: Docket No. DMEA 2322 - Iron
Palen Mountain iron ore
Riverside County, California

Dear Mr. O'Connell:

Your application for exploration assistance and other information relating to your application available to us in Washington, have been carefully reviewed.

This information, while noting a relatively small tonnage of an impure iron ore, indicates that geologically there is little probability of making a significant discovery of iron ore. I regret, therefore, to inform you that your application is denied.

We wish to thank you for your interest in the Defense Minerals Program and for bringing this property to our attention.

Sincerely yours,

C. D. Mitten (for) 5/19

Acting Administrator
Defense Minerals Exploration
Administration

NJHurley:ls
5/14/52

cc: Docket
Admn. Reading File
Operating Committee
N. J. Hurley
G. C. Selfridge
Field Team, Region 3
J. M. Forbes, USBM
Mrs. Martha Carr, USGS

STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : Acting Administrator, DMEA DATE: May 14, 1952

FROM : Iron and Ferro-Alloy Division, DMEA

SUBJECT: Denial of exploration project in the amount of $10,000
Docket No. DMEA 2322 - Iron
John J. O'Connell
Palen Mountain iron ore deposit
Riverside County, California

The subject application was denied by this Division for the following reasons:

(1) Superficial observations in the region reveal a series of steeply dipping ten- to twenty-foot outcrops of medium grade ferrous minerals, principally hematite and magnetite, extending some 300 feet along the strike and then disappearing beneath the alluvial gravels. Except for size, these deposits are similar to and genetically related to the contact-metamorphic deposits exploited on a limited scale by the Kaiser interests in the Eagle Mountain area about 25 miles to the northwest.

Exploratory work on the property to date has been limited to a few small trenches along the outcrops, exposing the ore in small randomly-oriented pods of iron oxide interbanded with hard siliceous country rock. An unfortunate feature of the deposit is the occurrence of apatite and gypsum in both the ore and gangue rock, thus causing the phosphorous content of the ore to exceed the acceptable commercial limits in this impurity.

Therefore, because of the small tonnage attributable to the deposit, the poor over-all grade of iron in the exposed portions, the awkward attitude of the formation, and the high phosphorous content of the product, it does not appear that the projected exploration will lead to a significant discovery of iron ore.

(2) The Field Team reports that the property does not merit further consideration.

(3) The Commodity Division of the U. S. Geological Survey recommends the Government's participation in the exploration project be denied.

G. C. Selfridge.

G. C. Selfridge, Chief
Iron and Ferro-Alloy Division

FILE COPY
SURNAME:

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

Acting Administrator, DMEA

May 14, 1952

Iron and Ferro-Alloy Division, DMEA

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George C. Selfridge

G. C. Selfridge, Chief
Iron and Ferro-Alloy Division

NJHurley:ls 5/14/52

cc: Docket
Admn. Reading File
N. J. Hurley
G. C. Selfridge

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

May 9, 1952

To: George E. Selfridge, DMEA

From: Martha S. Carr, USGS

DMEA 2322 Iron

Subject: Field report
John J. O'Connell
Palen Mountains iron ore deposit
Riverside County, California

The memorandum from the Field Team transmits a report of the examining geologist, Lorin D. Clark, dated April 23, 1952 and expresses the opinion given in it--that the exploration is not recommended because of the probable small size of the ore body and its low iron and very high phosphorous content.

I concur with the recommendation of the Field Team.

Martha Carr

DEPARTMENT OF THE INTERIOR Copy retained 400
Defense Minerals Administration
RECEIVED
MAY 12 1952

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

May 9, 1952

To: George E. Selfridge, DMEA

From: Martha S. Carr, USGS

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John J. O'Connell
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Riverside County, California

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cc: Director's Reading File (4212)
Branch
DMEA File (3)
Ferrous Metals File

Martha Carr:bbk
0 5/9/52

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

May 9, 1952

To: George A. Selfridge, DMEA

From: Martha S. Carr, USGS

Subject: Field report
John J. O'Connell
Palen Mountains iron ore deposit
Riverside County, California

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I concur with the recommendation of the Field Team.

cc: Director's Reading File (4212)
Branch
DMEA File (3)
Ferrous Metals File

Martha Carr:bbk
0 5/9/52

437 No.Oakhurst Dr.
Beverly Hills,Calif.
May,6,1952.

Mr.C.O.Mittendorf,Acting Administrator
Defense Minerals Exploration Administration
Washington,D.C.

Re: Docket No.DMEA 2322X
Palen Mts. Iron Ore Deposit
Riverside County,California,

Dear Mr. Mittendorf:

Mr. Samuel Kornfeld was in Los Angeles recently and consulted with me in regard to the Palen Mts., Iron Deposit in which I am interested.

He continued his trip to San Francisco,with the objective to see Mr. Miller,your Executive Officer for Region 111,San Francisco,California.

He,later informed us by mail that Mr. Miller's DMEA Team had examined the ~~the~~ properties and submitted their findings to your office.

Based on the above information will you please follow up this information and advise us what your decision will be in the matter.

Thanking you for this service in advance,I am pleased to remain,

sec/jc.

Sincerely yours

J.J.O'Connell

J.J.O'Connell sec.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAY 12 1952

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

Office of
Executive Officer
DMEA Field Team
Region III

1012 Flood Building
870 Market Street
San Francisco 2, Calif.

April 25, 1952

Memorandum

To: Frank E. Johnson, Chairman, Operating Committee, Defense Minerals Exploration Administration, Washington, D. C.

From: Executive Officer, DMEA Field Team, Region III

Subject: Docket DMEA-2322 (Iron Ore) - Palen Mountains Iron Ore Deposit, Riverside County, California

Reference is made to your subject "Review of Application for Exploration Assistance", dated February 15, 1952.

Attached are four copies of a report, "DMEA-2322, Palen Mountains Iron Deposit, Riverside County, California", by Lorin D. Clark, Geologist, U. S. Geological Survey, dated April 23, 1952.

Exploration of the O'Connell claims is not recommended by the examining geologist because of the probable small size of the ore body and its low iron and very high phosphorous content. The geologist reports that there is some possibility that a dip needle survey might indicate the existence of a concealed deposit large enough for open pit mining, but in view of the low quality of the exposed ore, the expense of exploration based on dip needle data is felt to be unjustified.

The subject docket is being returned herewith.

H. C. Miller
Executive Officer
DMEA Field Team, Region III

Attachments

Copy to E. H. Bailey, USGS

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration

APR 29 1952

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

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION III

DMEA 2322, Palen Mountains Iron Deposit

Riverside County, California

Lorin D. Clark, Geologist
U. S. Geological Survey

April 23, 1952

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
APR 28 1952

Reviewed by
DMEA OPERATING COMMITTEE
5-7-52
(HB) (date)

Summary and Conclusions

The largest iron deposit on the O'Connell claims consists of massive hematite and magnetite with admixed country rock and vein quartz; the mass crops out for a distance of about 300 feet, and is 10 to 20 feet wide. The west end of the deposit is exposed, but the east end is buried under alluvial gravel. The iron oxides contain more than 1 percent phosphorous, well over tolerable limit, and it is estimated that little of the material contains more than 55 percent iron. Low-cost open pit mining is precluded by the attitude and topographic position of the deposit as well as its small size. Other showings of iron oxide on the O'Connell claims are very small and low grade -- they merit no further consideration.

Exploration on the O'Connell claims is not recommended because of the low iron content and the high phosphorous content of the exposed part of the deposit.

Introduction

The Palen Mountains Iron Deposit is also known as the Iron King Mine. It is in sec. 22, T. 5 S., R. 18 E. (projected) on the south edge of the Palen Mountains (see index map, Figure 1). The largest showing of iron oxides is on the steep east slope of a promontory extending south from the main group of hills. (See fig. 2). A graded desert road 8 miles long leads to the deposit from a point 19.9 miles east of Desert Center on U. S. Highway 60-70.

Iron Deposits

The showings of iron oxide are in an area underlain by massive, fine-grained, dark-green metamorphic rock consisting largely of quartz and sodic plagioclase with minor epidote and green biotite. The largest mass of iron oxide, which is 10 to 20 feet wide, crops out for a distance of about 300 feet. The west end of the deposit is in an area of well-exposed bedrock, but the east end is buried under coarse alluvial gravels. Exposures in two trenches show that banding in the deposit strikes east and dips about 60° south. Presumably, the attitude of the deposit as a whole is parallel to the banding.

Other showings of iron oxide mentioned in the report by Chiapella and indicated on the claims map, both accompanying the docket, consist of small, randomly-oriented pods. The pods consist of interbanded iron oxide and country rock, with iron oxide comprising less than 50 percent of the material in the pods. The largest pod is about 15 feet thick and 50 feet long. These showings merit no further consideration.

Description of largest deposit

The iron oxides consist of hematite and magnetite. Individual specimens show high magnetic permeability, and some show magnetic polarization, indicating the feasibility of a dip needle survey to determine the extent of the deposit. The iron oxide is contaminated by thin interbanded layers of

country rock and by vein quartz which is abundant locally, apparently filling closely-spaced fractures in the iron oxide. Apatite crystals are abundant in the iron oxide; some crystals are as much as 3 mm in diameter and 15 mm long.

Grade of Ore

The deposit can be roughly divided into two zones on the basis of the amount of admixed country rock. A zone about 10 feet thick in the north side of the deposit is the less contaminated but it is estimated that little of this zone contains more than 55 percent iron. The phosphorous content of the iron oxide is more than 1 percent, well above the tolerable limit.

The sample represented by the analyses below consisted of specimens of hard, massive iron oxide collected from the lower trench for rough determinations of magnetic permeability. The sample is "high-graded" in that the intermixed country rock is not adequately represented.

Fe	59.65	Percent
Mn	0.07	"
P	1.18	"
S	0.012	"
SiO_2	2.08	"
TiO_2	0.42	"
Al_2O_3	2.55	"
CaO	3.56	"
MgO	1.80	"

Reserves

The exposed part of the deposit is estimated to contain a total of 75,000 tons of ore, using the following assumptions: thickness, 10 feet; length, 300 feet, depth equal to 1/2 the exposed length or 150 feet; and 6 cubic feet per ton of ore.

Market

The specifications and prices for iron ore being shipped to Japan are given below:

Specifications

Fe	over 58%; reject less than 55%
$SiO_2 + Al_2O_3$	less than 10%
S	less than 0.3%
P	less than 0.3%
Heavy elements (Cu,Pb,Zn,etc.)	less than 1.0%

Price

Base, 58%	$8.85 San Francisco, FOB car at dock
	8.35 Los Angeles, FOB car at dock
Over base	$0.15/unit premium
Under base	$0.30/unit subtracted

Producers must guarantee shipment of 10,000 tons per week in order to avoid expensive delay in loading ships.

Hard lump ore shipped to eastern steel mills is sold for $25 to $30 per ton with the Ford Motor Company reportedly paying the highest price. The standard freight rate for ore valued at $25 per ton shipped from Blythe, California (the railroad point nearest the deposit) to Detroit, Michigan, is $22.05 including surtax.

Specifications for ore sold to eastern steel mills or to the Kaiser steel plant at Fontana, California are not known, but it is unlikely that either would be interested in very high phosphorous ore.

Conclusions and Recommendations

The ore in the exposed part of the deposit is too low in iron and too high in phosphorous to be marketable. In view of the low quality of the ore, underground exploration of the exposed part of the deposit is not warranted, nor is exploration for a persumed extension of the deposit under alluvial gravels.

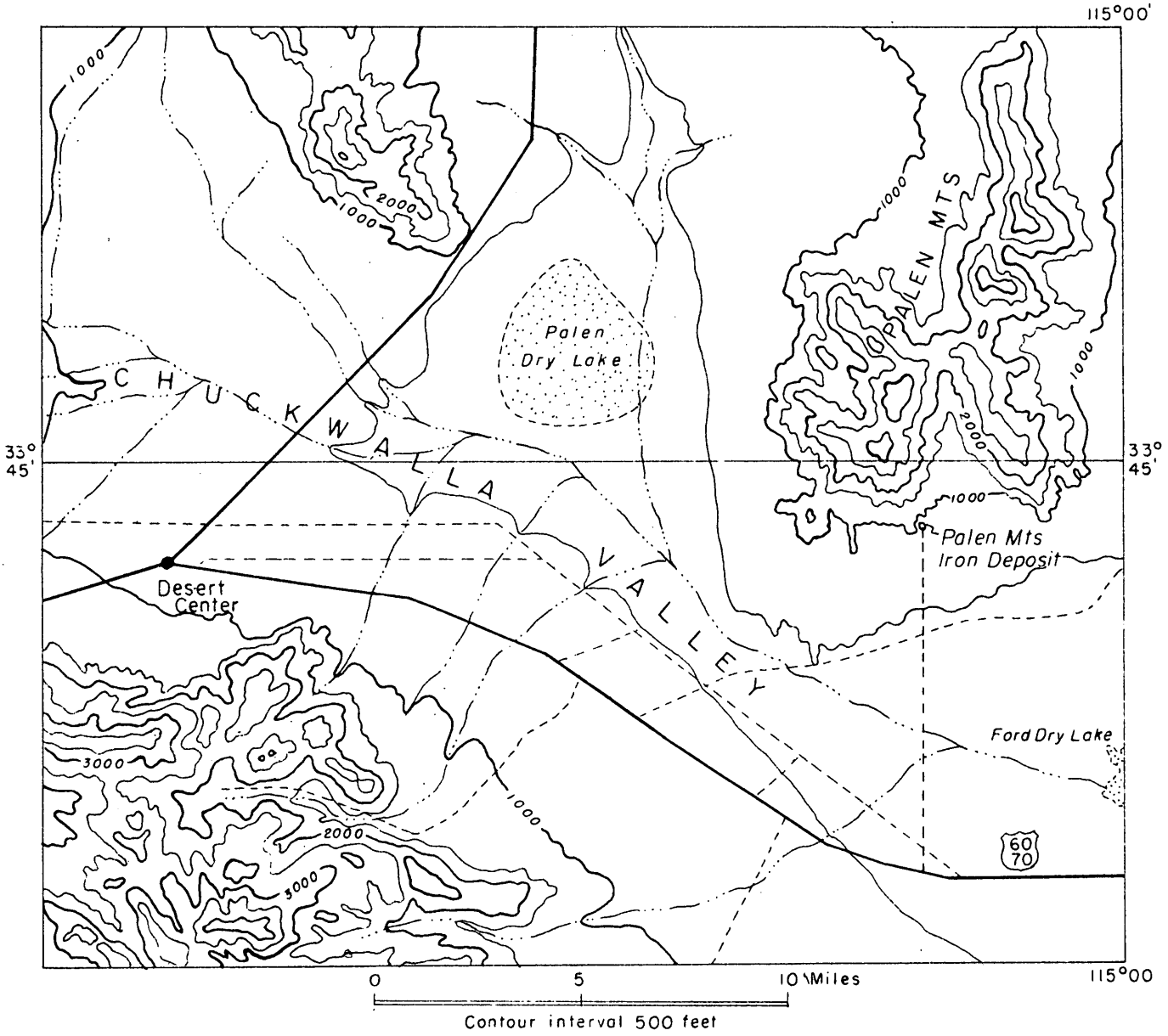

Figure 1. Index map showing location of Palen Mountains Iron Deposit, Riverside County, California

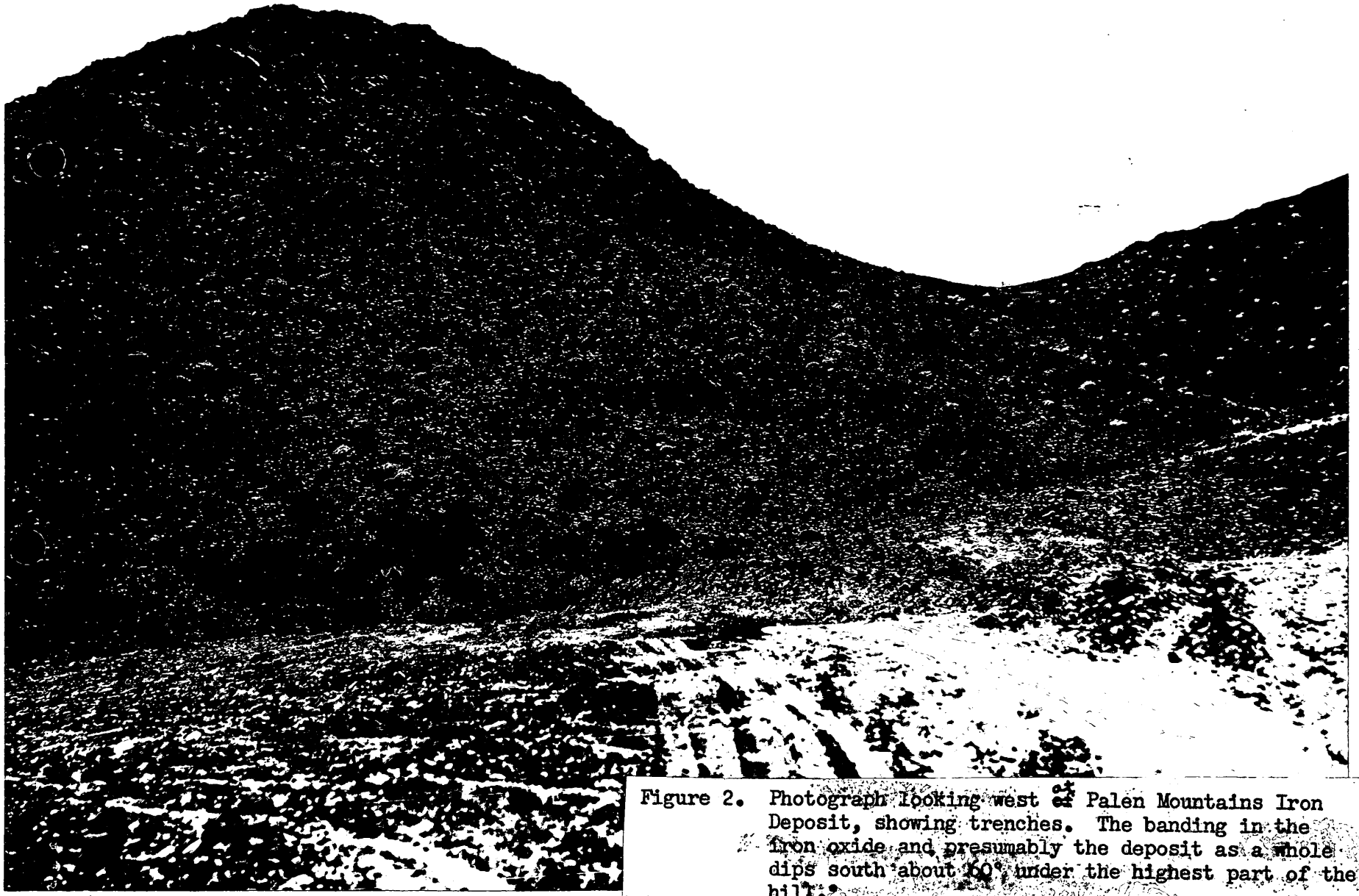

Figure 2. Photograph looking west of Palen Mountains Iron Deposit, showing trenches. The banding in the iron oxide and presumably the deposit as a whole dips south about 60°, under the highest part of the hill.

FILE COPY
SURNAME:

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

Gentry
Selfridge
Hedges
Thayer
Johnson

FEB 15 1952

Mr. John J. O'Connell
437 N. Oakhurst Drive
Beverly Hills, California

Re: Docket No. DMEA 2322X - Iron Ore
Palen Mountains Iron Ore Deposit
Riverside County, California

Dear Mr. O'Connell:

Your application for assistance in exploring the Palen Mountains Iron Ore Deposit in Riverside County, California, Docket No. DMEA 2322X, has been referred to Mr. H. C. Miller, Executive Officer, DMEA Field Team, Region III, 1012 Flood Building, 870 Market Street, San Francisco 2, California, for a field examination.

The Regional Office will contact you at an early date in regard to your project. Any assistance that you can offer the field team during the examination will be appreciated.

Sincerely yours,

C. O. Mittendorf (for) cc 2/15

Acting Administrator
Defense Minerals Exploration
Administration

GGGentry'lm
2/12/52

cc: Admn. Reading File
Docket
N. B. Melcher, USBM
T. P. Thayer, USGS
Field Team Reg. III
G. C. Selfridge
G. G. Gentry

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

Mr. H. C. Miller
Executive Officer, Region III
1012 Flood Building
870 Market Street
San Francisco 2, California

Dear Sir:

We attach "Review of Application for Exploration Assistance" on:

Applicant John J. O'Connell

Docket No. 2322

Commodity Iron Ore

Amount $ 10,000.00

Please expedite consideration of the application with particular reference to the points raised in the attached "Review".

Sincerely yours,

Frank E. Johnson
Chairman, Operating Committee
Defense Minerals Exploration
Administration

APPROVED:

R. W. Hedges
Member, Bureau of Mines

T. P. Thayer
Member, Geological Survey

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

Original surnamed by Bentry Selfridge

2-15-52

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(signed) FRANK E. JOHNSON (GHB)

Chairman, Operating Committee
Defense Minerals Exploration
Administration

APPROVED:

J. H. Hedges (GHB)
Member, Bureau of Mines

J. P. Thayer (GHB)
Member, Geological Survey

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APPROVED:

J. H. Hedges
Member, Bureau of Mines

J. P. Thayer
Member, Geological Survey

DEPARTMENT OF INTERIOR
BUREAU OF MINES
REGION III
RECEIVED

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SAN FRANCISCO, CALIFORNIA

Defense Minerals Administration 2-11-52

Review of Application for Exploration Assistance

Docket No. DMEA 2322

Commodity Iron Ore

Total Amount $10,000.00

Govt. Participation 50%

1. Name and Address of Applicant John J. O'Connell
437 N. Oakhurst Drive
Beverly Hills, California

2. Location of Property Palen Mountains Iron Ore Deposit
Section 22; T5S; R18E
Riverside County, California

3. Mineral or metal Iron Ore Is it listed in Section 9 of MO-5? Yes

If not, application will be rejected.

4. Geologic probability of discovery--based on data in application (question #16, 17, 18, 20 and 22)*

Mines or Survey reports, etc., do you rate chances:

a) Good

b) Poor

c) None

d) Don't know--needs field examination Requires field examination

e) Is there an alternative and favorable project? Unknown
(If so, attach an explanation)

5. Is the applicant's right to the property clearly stated? Yes
(question 5, 6, 7)*

6. If applicant is a lessee, is a copy of the lease attached? Owner

Does the lease have sufficient time to run to cover a future

productive period? Has sufficient time

*question numbers are those of MF-103

7. Are subordination agreements necessary? No

a) MF-201? _____

b) MF-202? _____

8. From the data presented, does the proposed project appear feasible from the point of view of:

a) Available manpower Unknown

b) Equipment and supplies Unknown
(question 14 plus general knowledge of availability)*

c) Accessibility (question 12)* Unknown

d) Water (question 13)* Unknown

e) Power (question 13)* Unknown

Is a field check needed on any of these points? Yes

9. Does the experience of the applicant appear to be adequate to assure that he can properly conduct the proposed project? (question 4)* Unknown

_____

Is a field check needed on this point? Yes

10. Exhibit A. (question 21 and 22)*

a) Is the project adequately described? No

If not, are there sufficient data given so that you can describe the project? No If so, attach a draft.

b) Is there an adequate map or sketch of the proposed work? No

_____

c) Is the proposed work "exploration" under the definition of Section 8, MO-5? Yes

If not, what part of it is? _____

_____

_____

_____

Is this part a worthwhile exploration project? Yes

d) Are the cost estimates detailed? No

Can they be summarized, as on page 2 of Procedural Instruction 5-A, from the available data? No If so, attach a draft.

e) Are the cost estimates reasonable? Unknown

f) Should more information be requested from applicant? Yes

g) Is a field examination necessary to complete Exhibit A? Yes

11. Exhibit B (question 23-d)*

a) Is it applicable? Yes

b) If so, are sufficient data furnished? No If so, attach a draft.

c) Is a field check needed? Yes

12. Exhibit C (question 23-e, f and g)*

a) Is it applicable? Yes

b) Sufficient data? No If so, attach a draft.

c) Are rents and charges reasonable? Unknown

d) Is a field check needed? Yes

13. Exhibit D (question 23-a, b)*

a) Are there sufficient data? No

b) Is the schedule adequate for the work proposed? Unknown

c) Is the schedule excessive for the work proposed? Unknown

d) Are the proposed wages and salaries reasonable? Unknown

e) Is a field check needed? Yes

14. Exhibit E (question 23-c)*

a) Is it applicable? Yes

b) Sufficient data? No

c) Reasonable? Unknown

d) Field check needed? Yes

15. In your judgment, can the proposed work be done in the proposed time? Requires study of field team

(All exploration must be completed within two years)

16. If field examination is not needed, attach your recommendation.

17. If field examination is needed, do you have any special instructions for the field team not indicated by your answers to the foregoing question? Prepare geological map and cross section of the deposit. Sample and assay for evaluation of the deposit. Discuss with applicant and let us have your recommendations and costs covering the diamond drilling program. Investigate conditions of roads, water supply and transportation, labor and supply problems. Can the applicant furnish his portion of monies if the program exceeds the $10,000 figure. Investigate applicant's competence. Investigate market for the ore.

Reviewed by: Glenn G. Gentry

Date Feb. 11, 1952

DEPARTMENT OF INTERIOR
BUREAU OF MINES
REGION III
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SAN FRANCISCO, CALIFORNIA

Defense Minerals Administration

2-11-52

Review of Application for Exploration Assistance

Docket No. DMRA 2322

Commodity Iron Ore

Total Amount $10,000.00

Govt. Participation 50%

1. Name and Address of Applicant John J. O'Connell
437 N. Oakhurst Drive
Beverly Hills, California

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Section 22; T5S; R18E

Riverside County, California

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Reviewed by: Glenn G. Gentry

Date Feb. 11, 1952

Defense Minerals Administration 2-11-52

Review of Application for Exploration Assistance

Docket No. DMEA 2322

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Total Amount $10,000.00

Govt. Participation 50%

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g) Is a field examination necessary to complete Exhibit A? Yes

11. Exhibit B (question 23-d)*

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c) Is a field check needed? Yes

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Reviewed by: Glenn G. Gentry

Date Feb. 11, 1952

FILE COPY
Surname:

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

February 5, 1952

Memorandum

To: Mr. George Selfridge, Chief, Iron and Ferro Alloys Division, DMEA

From: Jachin M. Forbes, Commodity Committee Member for Iron Ore, DMEA

Subject: Docket 2322, Application for exploration lean, Palen Mountains Iron Ore Deposit, Riverside County, California

I concur with Miss Carr's recommendation and add the following comments:

The applicant apparently is aware of the transportation difficulties and the fact that substantial reserves will be required to justify exploitation. However, he believes that the possibility of finding these reserves is sufficient to warrant the expense, private and public. The information submitted with this application is not presented in an impressive manner, but with the exceptions noted by Miss Carr, it seems to constitute all that is available. I am inclined to consider Mr. O'Connell a man of fair judgment if somewhat optimistic in this instance.

Notwithstanding the unfavorable aspects of this application, I suggest that it would be desirable to have on record reliable information as to whether or not this deposit is of significant proportions. It is recommended that a dip needle or similar preliminary survey be approved with further exploration subject to a new application based upon the results thus obtained. If drilling is indicated, I agree with Miss Carr that the expense will be greater than the estimated $10,000.

Jachin M. Forbes

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

February 5, 1952

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JMF

Jachin M. Forbes

STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : George Selfridge, DMEA DATE: January 17, 1952

FROM : Martha Carr, U. S. G. S.

SUBJECT: Exploration application $10,000 DMEA 2322 Iron ore
John J. O'Connell
437 N. Oakhurst Dr.
Beverly Hills, Calif.

Property: Seven claims in sec. 22, T. 5 S., R. 18 E., Riverside County, Calif.
Southern slope of Palen Mountains (800-3500 ft.)
42 miles from Blythe Station on A. T. & S. F. RR.

Proposal: That "said agency (U. S. Bureau of Mines) perform this explorative work,"—that a dip-needle survey be made of the claims, and if indications justify, drilling of not less than 200 ft. in depth and for a distance of not over 600 ft. in length be carried out.

Estimated cost is given as $10,000.

Geology: The area outlined is underlain by metamorphosed sedimentary rocks consisting mostly of schists, quartzites, slates, and crystalline limestones which have been intruded by diorites and granites.

Most of the iron ore deposits in California are deposits of small to moderate size that have replaced limestone or dolomite, and this one would appear to be in that class.

A report that covers the general area, entitled the "Geology of Palm Springs-Blythe strip, Riverside County, Calif.," by William J. Miller, in Calif. Div. of Mines Journal of Mines and Geology, vol. 40, pp. 11-73, 1944, states (on p. 51) that the southern part of the Palen Mountains are very difficult to reach and study.

Recommendation: It is recommended that the applicant be advised that the Government can participate only in furnishing 50 percent of the estimated cost, if the application is approved, and applicant would have to provide the staff to do the work. The applicant states that he has the finances to meet his share of the cost, but there is some question as to whether $10,000 would be enough capital to explore an iron ore deposit that would be of sufficient size to warrant development. The extent of iron-ore outcrops and assay data should be shown on the claim map. Also additional information with regard to the accessibility of the deposit, including its elevation, should be obtained.

Martha Carr

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

George Selfridge, DMWA

January 17, 1952

Martha Carr, U. S. G. S.

Exploration application $10,000 DMWA 2322 Iron ore
John J. McConnell
437 N. Oakhurst Dr.
Beverly Hills, Calif.

Property: Seven claims in sec. 22, T. 5 S., R. 18 E., Riverside County, Calif. Southern slope of Palen Mountains (800-3500 ft.) 42 miles from Blythe Station on A. T. & S. F. RR.

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Recommendation: It is recommended that the applicant be advised that the Government can participate only in furnishing 50 percent of the estimated cost, if the application is approved, and applicant would have to provide the staff to do the work. The applicant states that he has the finances to meet his share of the cost, but there is some question as to whether $10,000 would be enough capital to explore an iron ore deposit that would be of sufficient size to warrant development. The extent of iron-ore outcrops and assay data should be shown on the claim map. Also additional information with regard to the accessibility of the deposit, including its elevation, should be obtained.

cc: Director's Reading File (4212)
Branch
DMWA File (3)
Ferrous Metals File

Martha Carr:bbk
0 1/17/52

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

George Selfridge, DMEA

January 17, 1952

Martha Carr, U. S. G. S.

Exploration application $10,000 DMEA 2322 Iron ore
John J. O'Connell
437 N. Oakhurst Dr.
Beverly Hills, Calif.

Property: Seven claims in sec. 22, T. 5 S., R. 18 E., Riverside County, Calif.
Southern slope of Palen Mountains (800-3500 ft.)
42 miles from Blythe Station on A. T. & S. F. RR.

Proposal: That "said agency (U. S. Bureau of Mines) perform this explorative work,"—that a dip-needle survey be made of the claims, and if indications justify, drilling of not less than 200 ft. in depth and for a distance of not over 600 ft. in length be carried out.

Estimated cost is given as $10,000.

Geology: The area outlined is underlain by metamorphosed sedimentary rocks consisting mostly of schists, quartzites, slates, and crystalline limestones which have been intruded by diorites and granites.

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cc: Director's Reading File (4212)
Branch
DMEA File (3)
Ferrous Metals File

Martha Carr:bbk
G 1/17/52

George Selfridge, DMEA January 17, 1952

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cc: Director's Reading File (1212)
Branch
M & A File (3)
Ferrous Metals File

Martha Carr:hbk
1/17/52

Iron
Magnetite
at
Polen Mts
Riverside Co
Calif

Subject: DMEA-2322
Re: Exploration Loan

Mr. John J. O'Connell
437 N. Oakhurst Drive
Beverly Hills, California

My dear Mr. O'Connell:

This will acknowledge receipt of your application dated September 24, 1951 for a loan under the Defense Production Act of 1950.

Your application was assigned Docket Number DMEA-2322 and referred to the Iron & Ferro-Alloys Division.

Kindly refer to DMEA-2322 in any future correspondence relating to your application.

Sincerely yours,

ROBERT E. ADAMS

Robert E. Adams
Acting Administrative Officer

7862

2322

PALEN MTS. IRON DEPOSITS.

LOCALE.

Properties are located on the southerly slope of the Palen Mts., about 16 miles northeasterly of Desert Center Riverside County, State of California.

They are accessible from U.S.-California HighwayNo.60 to Desert Center, thence via the Parker-Los Angeles-Colorado river aquaduct paved highway for about 4 miles and the balance of the 16 miles distance over the desert dirt roads of which there are several, these various roads were built by the U.S.Army Tank Corps for their field maneuvers, during the late World War II.

The nearest railroad connections is Cox or Blythe on the A.T. & Santa Fe R.R., each approximately 30 miles distant.

Distance, via Desert Center from Los Angeles, is 196 miles.

Claims are in section 22, Twp.5, South, Range 18 East San Bernardino Base & Meridian, as far as can be determined. California State Division of Mines shows the area as an unsurveyed portion of the Great Colorado Desert. Notation. (This area has been surveyed, the survey was made about 1942 for the U.S.Army but for military reasons, has not been released for public use).

TOPOGRAPHY.

The Palen Mts., is a series of low lying ranges of mountains, characteristic of the many small ranges of mountains found within that area comprising the eastern part of the Great Colorado Desert in eastern Riverside County, California and are almost barren of vegetation, trend of the ranges is northwesterly to southeasterly, relatively rough and the mean

extreme elevation is from about 800 ft.low to 3500 ft high.

GEOLOGY.

After a search thru the various mediums available,no evidence was found that there exist a geological survey by the U.S.G.S. or the California Division of Mines, of the Palen Mts.Quadrangle, and only a cursory determination of the rock formation of the area was possible,suffice to state,it is sufficient to serve the requirements of this report.

The greater part of the mass rock formation is of granitic(igneous) origin,the iron outcrops occur along a line of replacement in a calcium-silicate intrusion,probably of the epidote series,evidence of any of the sedimentaries,notably limestone or dolomite was lacking in the immediate vicinity of the claims ,more time would be required to make a more complete study of the area comprising the southern end of the Palen Mts.,for a more detailed description of the geology.

CLIME.

As a part of the southwest Colorado Desert area,the climate is extremely hot and dry in the summer and cool and bracing in the winter.

Rainfall is limited to occasional rains of cloudburst proportions in the summer and an exceptional light drizzle at intervals in the winter.

Water is available from pumping wells on Palen Dry Lake,adjacent to the southerly rim of the Palen Mts.,,other sources of water supply are available for domestic use,by transportation,from Mc.Coy Springs,about 12 miles easterly and Cox-

comb Springs, about ten miles northwesterly of claims.

Fuel is limited quantities, is obtainable at various short distances, for household or camp purposes only, from the native trees, such as mesquite, palo-verde, smoke-tree and desert willows.

CLAIMS AREA.

Properties are held by location or possessory rights, as lode locations, and consist of 7 lode claims, each of 20.60 acres more or less, or a total of 103.30 acres more or less, forming a contiguous unit, joining each other, either on the end or side lines as a homogeneous group of claims for economical operations. Reference is made to claims map attached.

All the legal procedures required by the U.S. Mining laws and the California State Mining Laws, pertaining to the locations, annual assessments and the Federal Moratorium Acts, have been complied with, to assure a valid possessory right to each location.

IRON OUTCROPS.

Surface indications are evident at various intervals along the strike of the iron bearing outcrops, which strikes easterly to westerly and dips from 60 to 70 degrees south, or against the angle of repose of of the hill in which the ore bearing deposit occurs.

Four open-cuts have been made on the iron outcrops, as of September 1st, 1946, the width of these outcrops are from 15 to 20 feet wide and are traceable for several hundred feet on the surface, along the outcrops. The ores are to a greater percentage magnetite, with an intermixture of small percentages of hematite, limonite and iron-lime silicates of the epidote series. Analyses show as high as 70% Iron.

See reference on page 146, Californis State Mineralogist Report, Vol.41, No.3, July, 1945.

Resume:

Although the iron ore outcrops are small in comparison to some of the outstanding iron deposits of the Southwest, viz; The Iron- Chief-Eagle Mts., Cave Springs, C. F. and I-Silver Lake and Bessemer-Lucerne Valley groups, nevertheless the high quality of the magnetite iron outcrops warrants consideration of these holdings, and basing my opinion on past experiences and citing as an example The Iron Chief-Eagle Mts. and Lucerne Valley Bessemer Core drill findings, as a result of the work performed on these two properties by the U. S. Bureau of Mines during the late World War II, in there hunt for strategic war minerals, there is sufficient justification to believe that these possibilities are probable to to these holdings and until such geological work of this nature is performed the claims can be considered as a potential source of high grade iron ores, which are so essential in the making of high grade steel .

Recommendations:

That a thorough physical examination be made of the area covered by these claims, particularly that a test be made with the dip-needle as was done on the Bessemer-Lucerne Valley group and if indications justify an exploratory drilling campaign be carried out to walidate the worth of the properties.

Sincerely submitted,

S. E. Chiapella,
Member of the American
Institute of Mining and
Metallurgical Engineers.

SEC/jcp

Form MF-103
(April 1951)

U. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

WASHINGTON, D. C.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

JAN 10 3 16 PM '52

DO NOT FILL IN THIS BLOCK

Docket No. DMEA-2322

Date received 1-10-52

Participation

Mr. John J. O'Connell
437 N. Oakhurst Dr.
Beverly Hills, Calif.

Name and address of applicant

Date Sept. 24,1951

FILL IN THIS BLOCK

Date of application Sept. 24, 1951

Estimated cost 10,000.00

Mineral or metal Iron Ore

Percentage of Government participation 50%

Location of mine Palen Mts.
Riverside County, Calif.

Date of filing MF-100

DMA Docket Number, if available

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four signed copies of the application to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive officer thereof, with your name and address on each sheet of the application and all accompanying papers. If any question is inapplicable, or if you cannot answer it, so state on the form. Where the space provided for answer is insufficient, answer on a separate sheet, annex it to the application form, and refer to it in space for answer. If the application is approved, you will be presented with an exploration project contract on Form MF-200, for your signature.

THE APPLICANT

*1. Is applicant an individual, partnership, or corporation?
*2. If a partnership, state names and addresses of partners.
*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
*4. Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who will manage the project.
*5. Are you the owner or the lessee of the property?
6. If owner, state what claims, liens, or encumbrances, if any, are against the property.
7. If lessee, attach a copy of the lease and state if it is in good standing.

NOTE.—It will be necessary to procure and attach to the exploration project contract agreements of claimants, lienors, encumbrances and lessors subordinating their interests in the property to the interest of the Government under the contract.

8. Furnish current financial statement, showing assets and liabilities, and a profit and loss statement.
9. How much money is applicant prepared to invest in proposed project? Is it sufficient to pay your part of the cost of the project as detailed in question 23 of this application form, in accordance with the regulations on Government participation (Section 9 of Mineral Order 5)?

*If you have already answered these questions on MF-100, you are not required to answer the questions for this application.

16—64067-1

THE PROPERTY

10. (*a*) Give a description of the real property that will be in any way involved in the exploration project, including any existing mine or operating property.
    (*b*) Give the legal description of the exact parcel, plot, or area upon which the exploration is to be conducted.

    NOTE.—If both areas are the same, so state. The only obligation to repay the Government is from the net earnings from any commercial discovery made in the area specified in (*b*) above in which the exploration is to be conducted, and the expenditure of funds which may be charged as costs of the project must be limited to that area or to work necessary to perform the exploration in that area.

*11. State the present and former names of the property, if any.

*12. State, in detail, the location of the property with reference to towns, railroads, roads, shipping points, including distances and directions and kinds and conditions of roads.

*13. State source and quantity of water available for operations and its sufficiency at all seasons.
State amount of power to be used, rate per hour or other cost, and source.

*14. Describe any existing useable facilities, equipment, buildings, or structure now on the property that will be devoted to the exploration work.

15. State in detail how the ore could be shipped and how and where milled.

*16. History:
    (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for any past suspensions of operations.
    (*b*) State briefly the known history and production of adjoining and neighboring properties.
    (*c*) Furnish any available (private) reports that may apply to this application, including results of mine examinations, recommended exploration and development, and metallurgical investigations.

*17. Production:
    (*a*) If mine is in production, furnish the following information:

	Tons per day	*Grade or analysis*	*Cost per ton*	*Net value per ton*
(1) Mining				
(2) Milling				
(3) Shipped or sold				

*18. Ore or mineral reserves: (If property is or has been operating.)
    (*a*) Describe the ore or mineral deposits briefly.
    (*b*) Submit available maps and assay data.
    (*c*) Give estimated tonnage and grade of each class of ore reserves.

19. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

THE EXPLORATION

20. For what mineral or minerals and for what types of deposits and ores will the exploration be conducted?

21. Describe briefly, but concisely, the proposed work and the estimated time required to complete it.

    NOTE.—The Government will not participate in a project that will require more than 2 years to complete.

22. Furnish statement of the geological basis of the project with particular emphasis on factors leading the operator to expect the finding of commercial ore bodies. This statement should be accompanied by supporting maps such as geological maps, maps of the proposed openings and assay maps, sample lists, and other pertinent data.

THE REQUIREMENTS AND COSTS

23. Tabulate in the form of an itemized statement with a sum for each item the estimated requirements and costs of the project so that the total will give the estimated cost of the project in which the Government will participate, as follows:
    (*a*) Labor, by numbers and classes (miners, muckers, millmen, etc.), with wages of each.
    (*b*) Supervisors, by numbers and positions, with salaries of each.
    (*c*) Cost of necessary repairs to existing facilities, structures, and buildings.
    (*d*) Cost of necessary installation or construction of additional facilities, structures, and buildings.
    (*e*) Cost of items of equipment, not now owned by the applicant which must be purchased for operations at a cost of $50 or more each.
    (*f*) Cost of rental for equipment which the operator proposes to rent.
    (*g*) Rental value of items of equipment which the operator now owns and which will be devoted to the work.
    (*h*) Cost of materials and supplies, including items of equipment costing less than $50 each.
    (*i*) Cost of power, water, utilities, and any other items not provided for above.

24. Furnish a time schedule of the project, stated in terms of months after project is approved, showing progress expected to be accomplished and the money expected to be spent.

CERTIFICATION

The undersigned company, and the official executing this certification on its behalf, hereby certify that the information contained in this form and accompanying papers is correct and complete to the best of their knowledge and belief.

(Name of company)

By Jack J. O'Connell
(Signature of authorized official)

Sept 24 1951
(Date)

Owner
(Title)

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

*Same as footnote on page 1.

16—64067-1 U. S. GOVERNMENT PRINTING OFFICE

1. It is a mineral location partnership.

2. J. J. O'Connell, 437 N. Oakhurst, Beverly Hills, California.
   S. E. Chiapella, Sr., 1625 N. Las Palmas, Hollywood, California.

3. No. 2 answers this question.

4. J. J. O'Connell has had no experience in mining; his business experience has been entirely as a salesman.

   S. E. Chiapella, Sr., has been a mining man for over forty years and would act in an advisory capacity.

5. Owners.

6. No liens or encumbrances exist against properties.

7. No. 5 answers this question.

8. As this is a new project, no financial set-up exists.

9. The amount agreed upon, if government funds are made available, but not less than $10,000.00.

10. There exists no real property on said claims; as yet they are undeveloped except for assessment work.

    b) Consists of seven full-lode claims, located in an unsurveyed area in the Palen Mountains, Riverside County, California; see attached map.

11. No other names, as far as we have been able to find by searching records, except names of Thomas O'Connell, deceased father of J. J. O'Connell. Present names are J. J. O'Connell, and S. E. Chiapella, Sr., as owners, Samuel Kornfeld of the California Overall Cleaning Company, 959 E. 31st, Los Angeles, California, who will participate in the benefits from production, if, provided after the drilling program, results justify the operation of the properties.

12. Attached report covers this information.

13. Water can be made available from Palen (Dry) Lake, from well or wells. There is a well on the lake pumping water with a windmill, that has been in use for some years.

    Any production of iron ores will require a minimum supply of water for operations, as no milling is required on this type of iron ores, if worse comes to worse, ores could be milled in transit at some convenient point en route, of which there are several, of which Barstow, California, is one.

14. (a) Impossible to answer at this writing; suffice to say, no power lines exist near properties, therefore Deisel power will have to be utilized.

    (b) No facilities exist at this writing that could be utilized.

15. First find the ore, and that is the primary reason for our request for an examination and drilling program, under government supervision.

    The ore is a high-grade hematite, and the market exists in California, or for exporting to other countries for this quality of ores.

16. (a) Answered under No. 10.

    (b) The nearest production is the Kaiser-Eagle Mountains operations, approximately 30 miles westerly therefrom, as far as can be estimated.

17. No production; again it is stated that this property is virgin, no work except annual assessments having been performed.

18. Answered in No. 17.

19. Report attached we trust will answer this question.

20. Iron ores.

21. To core-drill at definite intervals along the outcrops; core drill holes of not less than 200 feet in depth, and a distance of not over 600 feet in length, and if a sufficient tonnage is proven to exist in this block, further exploratory work can be discontinued until properties have been developed to the production stage.

22. Attached maps, assays and report will answer information requested.

23. (a) As this work is exploratory and based on core-drilling only, at the present time, the only requirement will be a driller and his assistant, and a log-man (an engineer-supervisor) with the proper background to record all drill-cores.

    (b) It is proposed (if possible) to contract the core-drilling at cost per foot. The Continental Drilling Company quoted a price of $5.00 a foot, subject to change at any date in the future.

    (c), (d), (e), (f), (g), (h) - All answered under (b).

232

A RESUME OF THE PALEN MOUNTAINS IRON DEPOSIT:

The above-named properties are located in the Palen Mountains, in the U.S.G.S. Quadrangle of the same name, in Riverside County, California, about 42 miles from Blythe Station, on the A.T. & S.F. R.R. It is distant 12 miles over desert road, to Highway 60-70, which passes through Blythe Station, a total distance of approximately 42 miles. Distance from Blythe Station to Los Angeles Harbor (San Pedro) is 335 miles, present freight rate based on a U.S. ton of 2,000 lbs. is $3.69, plus the Federal surtax of 3%.

Note: Japan purchases Iron Ore, Manganese Ore, etc. on the basis of the 2,240 lbs. British long ton.

The holdings comprise seven (7) Lode Mining Claims of approximately twenty (20) acres each, or a total of approximately one-hundred-forty (140) acres.

The Palen Mountains is a parallel range, lying in a northeasterly direction from the Eagle Mountains, in which are located the Iron Ore deposits of the Kaiser Co.

Iron Ore outcrops are evident in several places on the holdings. This evidence is of sufficient import to warrant core-drilling the holdings, which the owners, due to lack of capital, have been unable to have performed. However, under the present emergency program of the Federal Government, under the supervision of the Bureau of Mines of the Interior Department, it is desired by the owners, through proper channels, that said agency perform this explorative work.

The limited work so far performed gives evidence of promising possibilities. The ores so far uncovered are of high quality, consisting of high-grade Hematite and Magnetic Iron Ores, analysis as high as 62% to 70% Metallic Iron have been obtained.

It is difficult to give exact figures of cost, as the picture changes from time to time, but a tentative cost analysis is as follows:

Mining: $3.00 a ton, including crushing to minus 12" and handling charges.
Hauling to Blythe: $2.50 per ton.
R.R. Freight to Long Beach, where belt-conveyor loading facilities are available, $3.69.
Surtax $0.11.
Total: $9.30.
Overhead charges: $0.10.
Grand total cost: $9.40.

Selling Price:	$12.50
Cost:	$ 9.40
Profit:	3.10

Based on a large volume production, the mining and freight could be reduced to a possible 15%, at least. This contention of the fright rate reduction is predicated on the rate now enjoyed by the Kaiser Co. of $70.00 a carload of 60 tons of $1.17 a ton. This rate is contingent on the movement of not less than thirty-one (31) cars a day, or an average equivalent per month.

Note: It is the usual railroad procedure that, based on the volume of movement of any commodity, a lower freight rate is conceded to the shipper.

Figures used in this Resume have been obtained from reliable sources, considered to be correct.

Respectfully submitted:

John J. O'Connell

437 North Oakhurst Drive,
Beverly Hills, California.

Form MF-103
(April 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

DEFENSE MINERALS ADMINISTRATION
WASHINGTON, D. C.
JAN 10 3 16 PM '52

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

DO NOT FILL IN THIS BLOCK

Docket No. DMEA-2322

Date received 1-10-52

Participation

Mr. John J. O'Connell
437 N. Oakhurst Dr.
Beverly Hills, Calif.

Name and address of applicant

Date Sept. 24, 1951

FILL IN THIS BLOCK

Date of application Sept. 24, 1951

Estimated cost 10,000.00

Mineral or metal Iron Ore

Percentage of Government participation

Location of mine Palen Mts.
Riverside County, Calif.

Date of filing MF-100

DMA Docket Number, if available

INSTRUCTIONS

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THE APPLICANT

*1. Is applicant an individual, partnership, or corporation?
*2. If a partnership, state names and addresses of partners.
*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
*4. Describe the mining and general business experience of (*a*) the applicant, and (*b*) the person or persons who will manage the project.
*5. Are you the owner or the lessee of the property?
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*13. State source and quantity of water available for operations and its sufficiency at all seasons.
State amount of power to be used, rate per hour or other cost, and source.
*14. Describe any existing useable facilities, equipment, buildings, or structure now on the property that will be devoted to the exploration work.
15. State in detail how the ore could be shipped and how and where milled.
*16. History:
    (*a*) Give a statement, as complete as possible, of previous exploration, development, operation, and production of property, with reasons for any past suspensions of operations.
    (*b*) State briefly the known history and production of adjoining and neighboring properties.
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	Tons per day	*Grade or analysis*	*Cost per ton*	*Net value per ton*
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(2) Milling				
(3) Shipped or sold				

*18. Ore or mineral reserves: (If property is or has been operating.)
    (*a*) Describe the ore or mineral deposits briefly.
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19. State any conditions or circumstances regarding the property not sufficiently brought out by the foregoing questions.

THE EXPLORATION

20. For what mineral or minerals and for what types of deposits and ores will the exploration be conducted?
21. Describe briefly, but concisely, the proposed work and the estimated time required to complete it.

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(Name of company)	By Jack J. O'Connelly (Signature of authorized official)
Sept 24 1951 (Date)	Owner (Title)

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Form MF-103
(April 1951)

U. S. DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

DEFENSE MINERALS ADMINISTRATION
WASHINGTON, D. C.
JAN 10 8 18 PM '52

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

DO NOT FILL IN THIS BLOCK

Docket No. DMEA - 2322

Date received 1-10-52

Participation

Mr. John J. O'Connell
437 N. Oakhurst Dr.
Beverly Hills, Calif.

Name and address of applicant

Date Sept. 24, 1951

FILL IN THIS BLOCK

Date of application Sept. 24, 1951

Estimated cost 10,000.00

Mineral or metal Iron Ore

Percentage of Government participation

Location of mine Palen Mts.
Riverside County, Calif.

Date of filing MF-100

DMA Docket Number, if available

INSTRUCTIONS

Read Mineral Order 5, Regulations Governing Government Aid in Defense Projects, before completing this application. Submit four signed copies of the application to Defense Minerals Administration, Department of the Interior, Washington 25, D. C., or to the nearest field executive officer thereof, with your name and address on each sheet of the application and all accompanying papers. If any question is inapplicable, or if you cannot answer it, so state on the form. Where the space provided for answer is insufficient, answer on a separate sheet, annex it to the application form, and refer to it in space for answer. If the application is approved, you will be presented with an exploration project contract on Form MF-200, for your signature.

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*1. Is applicant an individual, partnership, or corporation?
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*3. If a corporation, state names and addresses of officers, directors, and five largest stockholders.
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*5. Are you the owner or the lessee of the property?
6. If owner, state what claims, liens, or encumbrances, if any, are against the property.
7. If lessee, attach a copy of the lease and state if it is in good standing.

NOTE.—It will be necessary to procure and attach to the exploration project contract agreements of claimants, lienors, encumbrances and lessors subordinating their interests in the property to the interest of the Government under the contract.

8. Furnish current financial statement, showing assets and liabilities, and a profit and loss statement.
9. How much money is applicant prepared to invest in proposed project? Is it sufficient to pay your part of the cost of the project as detailed in question 23 of this application form, in accordance with the regulations on Government participation (Section 9 of Mineral Order 5)?

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16—64067-1

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10. (*a*) Give a description of the real property that will be in any way involved in the exploration project, including any existing mine or operating property.
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*12. State, in detail, the location of the property with reference to towns, railroads, roads, shipping points, including distances and directions and kinds and conditions of roads.

*13. State source and quantity of water available for operations and its sufficiency at all seasons.
State amount of power to be used, rate per hour or other cost, and source.

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15. State in detail how the ore could be shipped and how and where milled.

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	Tons per day	*Grade or analysis*	*Cost per ton*	*Net value per ton*
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(April 1951)

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DEFENSE MINERALS ADMINISTRATION

DEFENSE MINERALS ADMINISTRATION
WASHINGTON, D. C.

Budget Bureau No. 42-R1035.
Approval expires 6-30-51.

APPLICATION FOR AID FOR AN EXPLORATION PROJECT PURSUANT TO MINERAL ORDER 5, UNDER DEFENSE PRODUCTION ACT OF 1950

JAN 10 3 16 PM '52

DO NOT FILL IN THIS BLOCK

Docket No. DMEA-2322

Date received 1-10-52

Participation

Mr. John J. O'Connell
437 N. Oakhurst Dr.
Beverly Hills, Calif.

Name and address of applicant

Date Sept. 24, 1951

FILL IN THIS BLOCK

Date of application Sept. 24, 1951

Estimated cost 10,000.00

Mineral or metal Iron Ore

Percentage of Government participation

Location of mine Palen Mts.
Riverside County, Calif.

Date of filing MF-100

DMA Docket Number, if available

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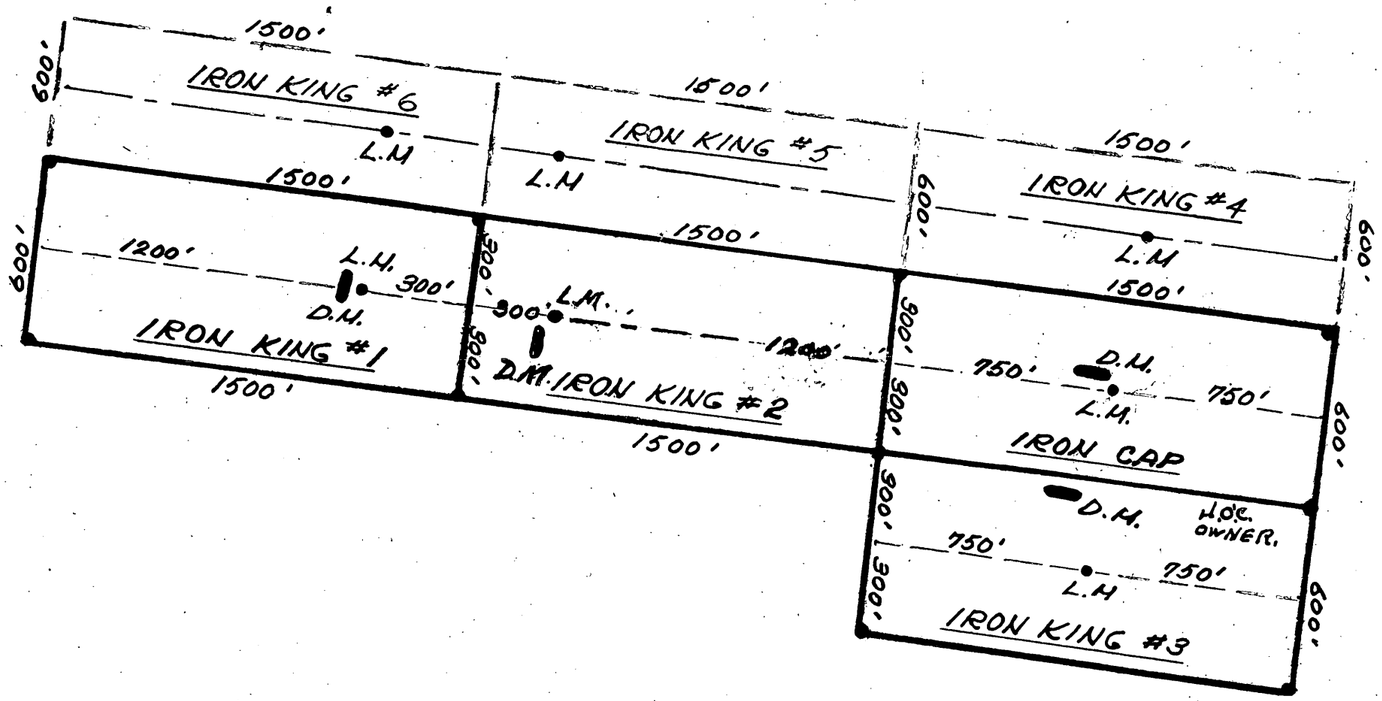
DMEA - 2322
J. J. O'CONNELL

2322 IRONWOOD CLAIMS
IRONWOOD DISTRICT — PALEN MTS.
RIVERSIDE COUNTY — CALIFORNIA



SCALE - 1" - 500'

ORIGINAL LOCATIONS — FEBRUARY 1 & 3, 1930
AMENDED " — APRIL 6 - 1946

LEGEND:-
L.M. - LOCATION MONUMENT
D.M. - DISCOVERY "
• - CORNER "

OWNER: JACK O'CONNELL
437 NO. OAKHURST DR.,
BEVERLY HILLS, CALIF.

BY: S.E. CHIAPELLA - MINING ENG.
HOLLYWOOD — CALIFORNIA

STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES
WARREN T. HANNUM, DIRECTOR

DIVISION OF MINES
WALTER W. BRADLEY, STATE MINERALOGIST

GEOLOGIC BRANCH
FERRY BUILDING, SAN FRANCISCO

OLAF P. JENKINS
CHIEF GEOLOGIST

SAN FRANCISCO] BULLETIN No. 129—PART A [JUNE 1945

Iron Resources of California
Bulletin No. 129

PART A

Iron-Ore Deposits in the Eastern Part of the Eagle Mountains Riverside County, California

By JARVIS B. HADLEY
GEOLOGICAL SURVEY, U. S. DEPARTMENT OF THE INTERIOR

Issued by the
STATE DIVISION OF MINES

41420

IRON ORE DEPOSITS IN THE EASTERN PART OF THE EAGLE MOUNTAINS, RIVERSIDE COUNTY, CALIFORNIA *

By Jarvis B. Hadley * *

United States Department of the Interior, Geological Survey and Bureau of Mines (Project 902)

OUTLINE OF REPORT

	Page
Abstract	3
Introduction	4
Geology	4
Rocks	4
Structure	6
Ore deposits	7
Origin of the ore	7
Character and grade of ore	7
Changes due to oxidation and weathering	9
Orebodies	9
North (Main) deposit	9
South deposit	10
Bald Eagle deposit	11
Reserves	14
Bibliography	16

ABSTRACT

In 1941-42 iron-ore deposits in the northeast part of the Eagle Mountains, Riverside County, California, were examined and mapped in detail by the Geological Survey and explored by the Bureau of Mines, both of the United States Department of the Interior, as part of a general investigation of raw material resources for western steel production.

The iron ore is associated with dolomite, quartzite, and lime-silicate rocks of igneous-metamorphic origin, which have been invaded by quartz monzonite. Two beds, one 80 feet thick, the other 30 to 300 feet thick, are ore-bearing for more than 8,000 feet along their strike. The stratified rocks dip 20° to 60° and are broken by normal faults.

Magnetite and hard red hematite mixed with various amounts of tremolite, serpentine, talc, and micas constitute the ore. Its specific gravity ranges from 3.5 for granular ore estimated to contain 50 percent iron oxide to 4.5 for massive hematite and to nearly 5.0 for magnetite. Pyrite is widely disseminated in fresh ore in the lower part of the deposits, where it averages about 3 percent, equivalent to 1.5 percent sulfur. It has generally been removed by oxidation within 150 or 250 feet of the surface. One-half to three percent gypsum, equivalent to 0.1 to 0.6 percent sulfur, is generally found in ore in the oxidized zone.

The iron content of the ore ranges from 30 percent to 65 percent. The average ore contains 50 percent iron, 11 percent silica, 5 percent magnesia, 2.5 percent lime, 2.5 percent alumina, and 0.085 percent phosphorus. Sulfur generally averages less than 0.2 percent in oxidized ore (0.4 percent in one deposit) and 1.5 percent in fresh ore. Phosphorus, presumably in apatite, is associated with gangue minerals rather than with ore minerals.

Five major orebodies containing 2 to 16 million tons each and one smaller body have been sampled by trenching and diamond drilling. They are 600 to 1500 feet long, 70 to 300 feet thick, and extend 200 to 750 feet down dip. Measurable ore in these bodies totals 28 million long tons containing more than 30 percent iron, with an average grade of 50 percent iron and 0.4 percent sulfur. In addition about 15 million tons of inferred ore estimated to contain 45 to 55 percent iron is believed to exist in smaller or less accessible bodies within the area investigated.

About 75 percent, or 20 million tons, of the measurable ore could probably be mined from surface pits, and about 30 percent of this amount, or 7 million tons, is estimated to be shipping ore containing more than 50 percent iron and less than 0.2 percent sulfur.

* Published by permission of the Director, Geological Survey, Department of the Interior. Manuscript prepared August 1942; submitted for publication August 23, 1944.

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INTRODUCTION

Iron-ore deposits in a district 6 miles long and 1½ to 2 miles wide in the northeast part of the Eagle Mountains, Riverside County, California, were described by E. C. Harder (12). The deposits are covered by more than 100 patented claims, most of which are now held by the Southern Pacific Company of San Francisco and the remainder by the Iron Queen Mining Company of Los Angeles. The present geologic investigation of a part of this district was conducted in the fall of 1941 and the spring of 1942 by the Geological Survey, United States Department of the Interior, in cooperation with an extensive program of trenching and diamond drilling by the Bureau of Mines of the Department of the Interior, as part of an investigation of raw material resources for the production of iron and steel in the Western States. (Bureau of Mines Project No. 902.)

The area investigated covers 1½ miles by half a mile at the east end of the iron-ore district, in secs. 34, 35, and 36, T. 3 S., R. 14 E., San Bernardino base and meridian (see fig. 2). The area is 15 miles by paved road from Desert Center, California, a town on U. S. Highway No. 70. The nearest railroad points are Mecca, California, 43 miles distant, on the Union Pacific Railroad, and Rice, California, 52 miles distant, on the Santa Fe Railroad. Blythe and Indio, the nearest sources of most supplies, are each about 60 miles by paved roads from the deposits. The Colorado River aqueduct of the Metropolitan Water District of Southern California passes within 2 miles of the deposits, and the settlement and pump-lift station of Eagle Mountain are 5 miles away.

No commercial production of iron ore has been made from the district, although several hundred prospect shafts and adits have been dug. Gold was formerly mined at the Iron Chief mine in the western part, and lead and zinc were mined at the Black Eagle, or Scott mine, which was abandoned in 1941.

Robert T. Littleton of the Geological Survey, United States Department of the Interior, ably assisted throughout the field work. The writer also wishes to acknowledge with thanks the hospitality of the staff of the Metropolitan Water District at Eagle Mountain, and the cooperation of W. D. McMillan and F. A. Rutledge, engineers in charge for the Bureau of Mines, Interior Department. All assay data used in this report were furnished by the Bureau of Mines.

GEOLOGY

The iron-ore deposits are in contact-metamorphosed sedimentary rocks which have been folded, faulted, invaded by irregular, sill-like bodies of quartz monzonite, and cut by dikes of fine-grained igneous rocks. These rocks are summarized in Table 1 and their distribution is shown on Plate I.

Rocks

Vitreous quartzite and feldspathic quartzite constitute the "vitreous quartzite series" of Harder (12, pp. 30-35). Vitreous quartzite is among the most resistant rocks in the region and forms bluffs of brownish white outcrops. Its maximum exposed thickness is 150 feet, although the base is generally cut out by quartz monzonite. Schistose, feldspathic quartzite is one of the least resistant rocks and forms smooth slopes and

Table 1—Rock units in the eastern part of the Eagle Mountains iron district.

Rock units in order of age	*Lithology*	*Approximate thickness, feet*
Slope wash and alluvium	Coarse sand and gravel, commonly cemented by caliche. Locally contains abundant boulders of iron ore.	0 to 100+
Dike rocks	Syenite porphyry, diabase, granite.	
Quartz monzonite	Coarse-grained and porphyritic quartz monzonite with biotite and hornblende.	
Conglomerate	Metamorphosed limestone conglomerate.	400+
Lime-silicate rocks	Contact-metamorphic rocks composed of mica, actinolite, diopside, feldspar, and quartz.	100
Upper ore bed	Iron ore with lenses composed dominantly of lime-magnesia silicates.	30 to 300
Quartzite	White to dark-gray glassy quartzite; sporadic bodies of iron ore.	200 to 300
Lower ore bed	Iron ore with lenses composed dominantly of lime-magnesia silicates.	40 to 140
Feldspathic quartzite	Coarse- to fine-grained feldspathic quartzite and schist.	50 to 150
Vitreous quartzite	Pure, coarsely recrystallized quartzite.	150+
	Total average thickness of metamorphic rocks	1250

saddles. It is most easily recognized by its tendency to break parallel to bedding into small angular slabs, and by red, yellow, and gray colors in some weathered outcrops. Beds of relatively pure quartzite several feet thick appear locally within the schistose quartzite, and a zone of mica schist or pale-green quartz-feldspar rock a few tens of feet thick commonly lies at the top.

The lower ore bed conformably overlies the feldspathic quartzite and consists of iron ore and related lime-silicate rocks, although to the west it passes into coarsely crystalline dolomite with sporadic iron ore. The ore bed is 50 to 90 feet thick in the eastern part of the area and is as much as 140 feet thick in the western part. The variation in thickness is due in part to interfingering with the overlying beds, a feature especially noticeable northwest of Briest Hill.

The rock immediately above the lower ore bed is dominantly quartzite, which contains more quartz and is less schistose than the feldspathic quartzite and finer-grained than the vitreous quartzite. On Briest Hill the lower part of the quartzite that overlies the lower ore bed is dark gray and distinctively banded with closely-spaced discontinuous layers a half inch or less wide containing disseminated iron oxides and lime-silicate minerals. The upper part is generally white, has a sugary texture, and is closely fractured. West of Bald Eagle Canyon, the quartzite is more massive than elsewhere and much of it resembles the vitreous quartzite. It also contains much light-colored granite and dioritic rock in irregular bodies which have obscure boundaries. Similar vitreous quartzite beds and granitic bodies occur near the top of the quartzite on North Hill. Lenses rich in diopside or tremolite are present locally in the quartzite, and several small bodies of iron ore occur in it.

The upper ore bed, like the lower one, is composed of iron ore and silicates and passes westward into dolomite. The base of the ore bed is commonly marked by a zone 10 or more feet wide consisting of serpentine

and tremolite, or alternating layers of iron ore and greenish feldspathic quartzite.

Stratigraphically above the upper ore bed in the vicinity of North Hill are well-bedded rocks composed of quartz, feldspar, mica, actinolite, and diopside in various proportions. They are so severely folded that an accurate determination of thickness is not possible.

Metamorphosed conglomerate composed of quartz, feldspar, tremolite, and diopside forms the upper parts of the hills north of the orebodies and is the highest known stratigraphic unit, although it is everywhere separated from the lower beds by quartz monzonite.

The metamorphic rocks are cut by quartz monzonite and associated aplite, granite, syenite, and diorite, to which the metamorphism and mineralization are probably related. Coarse-grained and commonly porphyritic quartz monzonite forms interconnected elongate bodies ranging from 100 to more than 1,000 feet in width and from half a mile to several miles in length. At the margins of these bodies many smaller sills and tongues have penetrated the metamorphosed rocks and contain many inclusions of them. The quartz monzonite is partly in contact with ore, but is more commonly separated from it by an irregular zone of lime-silicate rocks. The marginal part of the quartz monzonite commonly differs considerably from the normal rock; such marginal rocks, as seen at the surface and in drill cores, are recognized by coarseness of grain and absence of dark minerals and quartz, or by abundance of biotite or hornblende or both, with or without quartz.

A fine-grained pale-green rock marked by small feldspar phenocrysts and identified in the field as syenite, appears in dikes 1 to 50 feet wide, which are especially abundant in the eastern part of the upper ore bed. One such dike extends more than 3,000 feet from east to west and was found in drill holes as much as 450 feet below the surface. The dikes follow two sets of fractures, one at considerable angles to the bedding and the other nearly parallel to it, giving the dikes irregular and disjointed shapes. The dikes are not mineralized, but locally contain inclusions of ore. Other dikes, largely confined to the Bald Eagle deposits, are dark greenish-gray diabase and are 1 to 20 feet wide. They commonly lie along southwest-dipping faults and are younger than the ore.

Structure

The stratified rocks are on the north limb of a broad anticline which trends west-northwest. They have been further deformed by local folding so that at some places their strike departs widely from the regional trend. The dip generally ranges from 20° N. to nearly vertical but near the quartz monzonite on North Hill the well-bedded rocks above the upper ore bed have been compressed into a series of small folds a few feet across, so that reverse (southward) dips are common. On the west end of North Hill, the upper ore bed is involved in a syncline which plunges 35° to 45° NE. Quartz monzonite, in the trough of this syncline, has deeply embayed the ore bed. (See section B-B′, on Pl. II.)

High-angle normal faults with vertical separations which range from a few feet to more than 300 feet displace the ore beds at many places. They trend north to northwest and dip generally southwestward, though a few are vertical or dip steeply to the east.

Although the larger quartz monzonite bodies follow the strike of the stratified rocks for several miles to the west of the area, they cut

across the beds in many places and are believed to be more or less discordant downward. Drilling in the upper ore bed on North Hill has shown that the quartz monzonite that limits the bed on the north has a steep cross-cutting contact with many offshoots into the bed and the adjacent metamorphic rocks. (See section A-A′, Pl. II.)

ORE DEPOSITS

Origin of the Ore

The great quantity of iron in these deposits is believed to have resulted from the action of the quartz-monzonite magma on calcareous beds in the invaded rocks. The stages in the metamorphism and associated deposition of iron oxides can be indicated here only generally and tentatively pending further mineralogical and chemical study. An earlier thermal phase of metamorphism seems to have formed diopside, actinolite, grossularite, wollastonite, scapolite, and labradorite in impure calcareous rocks containing sufficient silica and alumina, but did not materially change the purer dolomite beds. In a somewhat later hydrothermal phase dolomite was extensively altered, first to tremolite, then to serpentine. Magnetite and pyrite were deposited along with these minerals, not only in the dolomite beds, but also in veins in the adjacent quartzite. Elsewhere the quartzose and feldspathic rocks were sericitized. Sometime after the magnetite was deposited, much of it was altered to pseudomorphous hematite, but it is not known to what extent this alteration resulted from supergene processes.

The possibility has been considered that the magnetite was formed by metamorphism of beds of sedimentary iron. This is believed to be not true for the following reasons: (1) no evidence of iron-bearing beds of sedimentary origin is found in the unaltered dolomite or in other beds of the metamorphosed sediments; (2) the magnetite bodies generally do not occur as beds in the dolomite, nor is stratification well preserved in the iron deposits; (3) metamorphism of iron deposits known to be of sedimentary origin tends to produce hematite rather than magnetite; all of the hematite seen in the Eagle Mountains deposits is pseudomorphous after magnetite or pyrite; (4) the constant association of pyrite with the ore suggests a hypogene origin for the iron.

Character and Grade of Ore

The highest-grade ore is hematite or magnetite with less than 5 percent impurities and contains as much as 65 percent iron. The hematite is generally more abundant than the magnetite but a large part of the ore contains both. Bodies composed wholly or largely of magnetite are lenticular and have a maximum known width of about 40 feet. Their downward extent is illustrated by figure 4. The magnetite occurs in tightly interlocking grains one-fourth inch or less across and at some places has moderate polarity. The hematite is red, hard, and dense. It has resulted from alteration of magnetite and generally contains pseudomorphs and unreplaced remnants of magnetite. The hard hematite ore has a specific gravity of about 4.5, which with increasing amounts of magnetite, approaches 5.0.

Some of the ore is a mixture of granular hematite or magnetite with tremolite, serpentine, talc, mica or chlorite, in which the proportion of

gangue ranges from 5 to 50 percent. The size of the mineral grains ranges from 0.1 millimeter to 2 millimeters, and averages somewhat less than 1 millimeter. Other ore contains gangue minerals in irregular bunches with dimensions ranging from a few inches to a foot. Part of the ore is tremolite and serpentine with minor amounts of irregularly disseminated magnetite or less commonly hematite. The iron content of this ore is generally less than 40 percent; the specific gravity ranges between 3.0 and 3.5.

Veins of silicified magnesite or sepiolite, a few inches to 2 feet wide, commonly follow the bedding and fracture planes in the ore. Seams of oxidized copper minerals are similarly distributed at several places, and suggest the presence of chalcopyrite in the fresh ore.

Bedding has generally been obliterated in the ore deposits, except near the base of the ore beds, but locally bands of granular ore in more massive ore indicate original bedding; large lenses of lime silicates also tend to lie parallel to the bedding in the better ore. At some places ore appears to follow fractures at considerable angles to the bedding.

The ore is jointed and tends to break into irregular blocks ranging from an inch to 3 feet across. There is little tendency for the ore to break in any consistent direction, except at the base of the beds, where it tends to break parallel to the bedding. Much of the ore is cavernous; open spaces several feet long were found in tunnels in the upper ore bed.

Pyrite, the only sulfide observed in the ore, is present chiefly in fresh ore in the lower parts of the deposits. It is unevenly distributed and may amount to as much as 10 percent in a few samples. Exploration has not been sufficient to determine the shape or extent of individual pyritiferous bodies, but the average amount of pyrite in fresh pyritiferous ore ranges from about 3 to 4 percent, equivalent to 1.5 or 2 percent of sulfur. Pyrite occurs in irregular grains 5 millimeters to less than 0.1 millimeter across, in thin tablets 0.5 millimeter by 5 millimeters or less, and in veinlets less than 0.5 millimeter wide and as much as several centimeters long.

According to Bureau of Mines assays, average ore above a 30 percent cut-off contains 50 percent iron, 11 percent silica, 5 percent magnesia, 2.5 percent lime, 2.5 percent alumina, 0.085 percent phosphorus, and 0.4 percent sulfur. Average amounts of silica, magnesia, and lime as determined in composite sludge samples, each representing 40 to 80 feet of drill hole, are shown plotted against iron content in figure 5. Alumina, determined in relatively few samples, ranges between 2.0 and 3.5 percent. The curves for silica, magnesia, and lime are nearly parallel in the range below 50 percent iron and represent approximately the same proportion of these oxides that is found in tremolite. The tendency for the CaO curve to become level at about 2 percent in ore containing 50 percent or more iron is probably due to the presence of gypsum and calcium carbonate.

The amount of phosphorus determined from composite sludge samples ranges from 0.02 percent to 0.20 percent with the exception of two samples with 0.26 and 0.46 percent; equivalent core assays of phosphorus were not made. Assays made for phosphorus on cores from drill holes 1 and 2 (sludges not sampled) yielded an average of about 0.1 percent; but individual 4-foot samples carried as high as 1.1 percent. Phosphorus appears to be associated more abundantly with the gangue

minerals than with the iron oxides, for cores low in iron are proportionally high in phosphorus. Sink-and-float tests made by the Bureau of Mines verify this conclusion. Phosphorus is more abundant in the North orebody than elsewhere, probably because of the proximity of the quartz monzonite.

Other minor substances in the ore, determined from composite sludge samples, include 0.7 percent manganese, 0.12 percent titanium dioxide, TiO_2, 0.10 percent copper, and traces of arsenic, chromium, and nickel. Assays for TiO_2 were obtained from only two sludge samples from the South orebody and the amount is probably higher in the North orebody, because of the proximity of igneous rocks containing considerable sphene.

Changes Due to Oxidation and Weathering

Pyrite has been largely removed by oxidation at most places within 200 feet of the surface, and locally to greater depths, although pyrite was encountered in the oxidized zone in several drill holes and at one place on the surface.

The gangue in the oxidized ore is generally altered to soft, clay-like minerals; thus, oxidized granular ore is soft, crumbly, and stained with limonite. At the surface such soft ore may be hardened again by deposition of opaline silica.

Gypsum is irregularly distributed but generally present in the oxidized zone and extends to the lowest depth explored. It fills seams ranging from one-fiftieth of an inch to 1 inch in width, lines cavities, and is disseminated in the ore. The average amount in the oxidized zone varies with different orebodies and ranges from less than 0.5 percent to 3 percent, equivalent to 0.1 to 0.6 percent sulfur.

Abnormally large amounts of gypsum, concentrated in bodies of decomposed gangue minerals, were encountered in some of the trenches. This gypsiferous soil fills cracks in the ore as much as 10 feet below the surface and contaminates the ore with much sulfur. Samples from these trenches contain as much as 5 percent sulfur, equivalent to 26 percent of gypsum.

Figure 6 illustrates changes, with increasing depth, in the iron and sulfur content of ore above 40 percent iron. Ore at or near the surface has been enriched by as much as 5 percent iron as a result of removal of pyrite and leaching of gangue minerals. The sulfur content also abruptly increases at about 250 feet depth, as the deeper holes are chiefly in the unoxidized zone.

Orebodies

Six orebodies were sampled by trenching and drilling. These are the North deposit, the South deposit, which includes three distinct bodies separated by faults, and the Bald Eagle deposit in which two orebodies are separated by a fault. Two-thirds of the ore in the area is in these bodies. Several other bodies, mapped but not sampled, are parts of the upper and lower ore beds which are separated from the principal deposits by faults or by intervening areas of essentially barren material.

North Deposit. The North deposit has been trenched and drilled over a strike-length of 1400 feet. (See Pl. II.) In this distance the orebody is 200 to 300 feet thick and extends down dip more than 350 feet

at the west end and more than 500 feet at the east end. It is probably cut off by quartz monzonite 400 to 850 feet down dip from the outcrop. (See section A-A′, Pl. II.)

The footwall is fairly uniform, though somewhat warped so that its dip ranges from 30° to 65° N. The hanging wall on the contrary is much complicated by folding and by tongues of quartz monzonite partly enveloped by haloes of lime-silicate rock. A mass of such tongues forms a considerable embayment in the hanging wall in the vicinity of trench C, and in successive sections eastward from trench C the upper part of this embayment appears in drill holes at lower levels as far as trench A. West of trench C the embayment appears to occupy a synclinal trough in the upper part of the ore bed almost as far as trench D. The hanging wall is further complicated, in the west end of the orebody, by tongues of ore projecting into the overlying lime-silicate rocks.

Lenses of gangue, some of them 30 to 40 feet wide and 200 to 300 feet long, occupy a considerable part of the ore bed. (See Pl. II.) The amount of these lenses in different explored sections of the orebody ranges from less than 10 percent in a section along trench D to 40 percent along trench C, the proportion increasing generally down dip and toward the ends of the orebody. The larger lenses could probably be avoided in mining, but it might be difficult to segregate many of the smaller ones. The amount of the smaller lenses in the drilled part of the North deposit is believed to be about 1,000,000 tons.

No key beds were found in the North deposit that would permit correlation from hole to hole or from section to section. The internal structure of the ore was interpreted from the attitude of the base of the ore bed as determined by drilling, from meager observations of poorly preserved bedding at the surface, and on the basis of the lithologic character of the cores modified by assay data. This tends to exaggerate somewhat the continuity of low-grade bodies, but it is the best that could be done under the circumstances.

In the North deposit, the zone of oxidation extends to an average depth of about 200 feet, but tongues of oxidized ore are found at lower levels and pyrite is found locally at higher levels. About 65 percent of the orebody is believed to lie within the oxidized zone. Six or eight percent of the ore in the oxidized zone is estimated to be pyritiferous, and the average sulfur content of all ore in the zone is about 0.4 percent. The distribution of sulfur and pyrite in the oxidized and unoxidized zones is illustrated by figure 8.

South Deposit. The South deposit (Pl. II) has been explored over a strike-length of 2,200 feet. The ore bed is 25 to 90 feet thick and extends in places at least 650 feet down dip from the outcrop. The bed dips northward or northeastward 25° to 30° in the western part and northward 40° to 50° in the eastern part. About 10 percent of the explored part of the deposit consists of lenses of lime-silicate rock and serpentine.

At the east end of the South deposit, the lower ore bed is buried under 70 feet of alluvium. For 500 feet west of the explored area the ore bed, which is 70 to 100 feet thick, is poorly exposed and contains a large proportion of low-grade or barren material. The downward limit of the ore bed in the South deposit is not known. The bed is 40 to 80 feet thick in the lowest drill holes and lies 210 feet stratigraphically

below the base of the upper ore bed at the south end of trench A (Pl. II). The bed probably extends several hundred feet below the drill holes, and possibly 1,000 feet if it is cut off by the same body of quartz monzonite that forms the lower limit of the North deposit.

About 90 percent of the measurable ore in the South deposit lies in the oxidized zone and is essentially free from sulfides. Sulfur in this ore averages 0.13 percent. Pyrite appears only in the lower parts of the deposit, more than 100 feet below the surface and the sulfur content of the unoxidized ore is about 1.4 percent.

The South deposit is broken by two faults into three separate orebodies. The western orebody, about 600 feet by 800 feet, 70 feet thick, contains half of the measurable ore in the deposit. About two-fifths of this ore is covered by quartzite with an average thickness of 70 feet and a maximum thickness of 100 feet. The eastern block contains about 40 percent of the deposit in a tabular body about 1200 by 300 by 60 feet, most of which is covered by 100 feet or more of quartzite and alluvium. The central block, containing less than 10 percent of the deposit, is a wedge-shaped body about 450 by 200 by 60 feet exposed on a dip slope and is partly covered by a remnant of quartzite not more than 10 feet thick.

Bald Eagle Deposit. The Bald Eagle deposit (Pl. III) occupies the same stratigraphic position as the South deposit. It consists of two principal orebodies and several smaller bodies, separated from each other by high-angle faults. The principal fault trends northwest, midway through the deposit, dips 85° SW., and has a maximum throw of about 300 feet.

The ore bed has been explored for 600 feet northwest of this fault, and 1,000 feet to the southeast. The western part is 80 to 140 feet thick and extends down dip at least 600 feet. The well-defined footwall dips about 35° near the surface but steepens down dip to 55°. The hanging wall is irregular and the quartzite in it is erratically folded. One aspect of this irregularity is seen in the prong of ore that extends into the overlying quartzite between trench V and trench W where the ore seems to have followed a set of fractures trending northeast. The ore bed itself has apparently been displaced along similar fractures near the east end of trench U.

The eastern block extends at least 150 to 250 feet down dip. The thickness decreases downward and eastward from 80 to 45 feet, and the average dip decreases eastward from 55° to 40°. At a depth of 170 feet, the eastern block is cut in the vicinity of trenches R and S by diabase dikes and small bodies of diorite, most of which are not exposed at the surface.

Lenses of low-grade or barren rock are erratically distributed, principally in the western block, where they amount to about 15 percent of the orebody. Pyrite is present only in the deeper parts of the western block, most of it more than 200 feet below the surface. About 80 percent of the measurable ore in the deposit is believed to lie in the oxidized zone, and to contain 0.08 percent sulfur. Ore below the oxidized zone contains about 1.5 percent sulfur.

East of the explored area, the ore bed is deeply covered by alluvium; to the west, both grade and accessibility of the ore bed diminish. The downward limit of the ore bed in the Bald Eagle area is not known. The deepest drill holes everywhere indicate a markedly

Table 2—Iron-ore reserves, east end, Eagle Mountains district
Based on sample data obtained by U. S. Bureau of Mines

MEASURABLE ORE

	Maximum depth inferred, in feet		Ore containing								Total ore having an Fe content of 30 percent and over							
			30 percent or less Fe		30 to 40 percent Fe		40 to 50 percent Fe		Over 50 percent Fe			Fe	S	P[1]	SiO_2[1]	MgO[1]	CaO[1]	Al_2O_3[1]
	Below surface	Down dip	Millions of long tons	Average percent Fe	Millions of long tons	Average percent Fe	Millions of long tons	Average percent Fe	Millions of long tons	Average percent Fe	Millions of long tons	Average percent						
North deposit	600	600	2.0	23	2.0	34	7.0	46	7.0	56	16	49	[4]0.7	0.124	12.3	4.5	2.5	------
South deposit	300	750	0.1	22	0.5	36	1.6	45	4.8	55	6.9	51	[5]0.20	0.027	11.0	4.5	2.1	2.8
Bald Eagle deposit	450	650	0.1	16	0.2	36	1.6	45	3.3	55	5.1	51	[6]0.36	0.056	12.0	5.8	2.7	2.6
Total measurable ore	600	750	2.2	23	2.7	35	10.2	46	15.1	55	28.0	50	0.40	0.085	[2]12.	[2]4.8	[2]2.5	------
INFERRED ORE[3]																		
Class A:																		
West extension, North deposit	150	150	------								1.0	52	0.15					
East extension, North deposit	300	200	------								2.5	50	0.20					
Bald Eagle deposit	100	100	------								0.5	52	0.10					
Total Class A ore			------								4.0	51	0.2					

Class B:						
West extension, South deposit	550	400		2.0	45-50	0.5
West extension, Bald Eagle deposit	350	250		1.5	45-55	0.5
East side Bald Eagle Canyon	250	250		0.5	50-55	0.3
Total Class B ore				4.0	47	0.5
Class C:						
North deposit	750	850		2	45	1.5
South deposit	400	1000		3	45-50	1.5
Bald Eagle deposit	650	1000		2	45-50	1.5
Total Class C ore				7	45-50	1.5
Total inferred ore				15	45-50	
Total reserves				43	49	

[1] From assays of composite sludge samples.
[2] Assays from one hole only.
[3] Grades of iron and sulfur estimated.
[4] 11,000,000 tons oxidized, 0.4 percent S; 5,000,000 tons unoxidized 1.3 percent S.
[5] 6,500,000 tons oxidized, 0.13 percent S; 400,000 tons unoxidized 1.1 percent S.
[6] 4,000,000 tons oxidized, 0.08 percent S; 1,000,000 tons unoxidized 1.5 percent S.

reduced thickness of the ore bed, or an increase in the amount of waste material in it. The nearest quartz-monzonite outcrops in the direction of the dip are 1,000 feet distant; thus the bed may extend several hundred feet below drill holes.

RESERVES

About 43 million long tons of iron ore, containing 30 percent or more of iron, are estimated to be present in the area investigated. Of this 28 million tons contain more than 30 percent of iron in sampled bodies and can be said to be measurable ore; the rest, amounting to 15 million tons, is inferred ore in bodies of various sizes and degrees of accessibility.

Measurable ore is largely within blocks bounded by trenches and drill holes. At some places, ore that extends 20 to 100 feet beyond trenches and drill holes is included where geologic factors indicate there is a small margin of error relative to the accuracy of sampling within the explored blocks. Inferred ore includes ore below drill holes and ore that has not been sampled either by trenching or drilling. It has been divided into three classes depending upon accessibility and the extent of information available:

Class A—Well-exposed with good geologic control; grade judged to be similar to measurable ore but margin of error greater, principally because of lack of precise information as to downward extent.

Class B—Poorly exposed and geologic information less complete than for class A; over-all grade probably less than for measurable ore.

Class C—Below explored orebodies; estimates of grade and quantity subject to considerable error.

Classification of ore according to iron content was made as follows: assays from trenches and drill holes were divided into sections 15 or more feet long, each considered to represent a minable unit with an average iron content falling within one of four classes: below 30 percent, 30 to 40 percent, 40 to 50 percent, and above 50 percent. A very small part of the reserves contain more than 60 percent iron. Most of the assays in each unit fall within the appropriate grade limits, but the iron content of the ore is so variable that some individual assays of 5-foot samples are lower or higher than the average of the unit by as much as 15 percent. The proportions of the different classes of ore as represented in drill holes and trenches were computed by sections in each orebody, the sections then weighted according to their areas and combined to give the grade-percent curves shown in figure 7. The total tonnage of measurable ore in the North, South, and Bald Eagle deposits was calculated separately, at 8.5 cubic feet per long ton. Tonnages of classified ore (table 2) represent the total tonnage multiplied by the proportions of different classes of ore for each orebody.

The amount of sulfur in the measurable ore in the oxidized and unoxidized zones was calculated statistically for each orebody, and the overall averages as computed were increased slightly in some instances to allow for the inclusion of unoxidized, high-sulfur ore below drill holes.

Owing to the widely spaced sampling and the difficulty of making adequate correlations between sections, the accuracy with which ore can be classified according to blocks does not seem to support much refinement of reserve figures. It also appears unlikely that accurate detailed corre-

lations between sulfur and iron content can be made at this stage of exploration.

About 30 percent of the reserves of measurable ore of all grades is estimated to contain more than 50 percent iron and less than 0.2 percent sulfur and thus could be shipped directly to blast furnaces without beneficiation. About half of this shipping ore is in the South deposit, as shown in table 3.

Table 3—Estimated proportions of direct shipping ore and mill ore

Deposit	*Direct-shipping ore*		*Mill ore*	
	Millions of long tons	*Percent of deposit*	*Millions of long tons*	*Percent of deposit*
North deposit	2.5	15	13.5	85
South deposit	4.2	65	2.5	35
Bald Eagle deposit	2.0	40	3.0	60
Totals	8.7	31	19.0	69

Mill ore as estimated in the above table would have to be treated to remove sulfur, or to increase the iron content, or both. Sink-and-float tests conducted by the metallurgical division of the Bureau of Mines, United States Department of the Interior, on oxidized middle-grade ore from the Eagle Mountains produced an efficient concentration of iron and a marked reduction in sulfur and phosphorous content.

Should mining be done in open pits with walls becoming ultimately as steep as 45 degrees, it is estimated that about 30 percent of measurable reserves, or about 8 million tons, could be mined without removal of any overburden, and about 75 percent, or 20 million tons, could be mined before the ratio of overburden to ore reached 2 to 1. Under the same assumptions, 3 to 4 million tons of inferred ore might be mined from open pits.

Reserve figures obtained by the Bureau of Mines, United States Department of the Interior, agree on the whole with those given in table 2. Bureau estimates as of July 1, 1942, give 21.6 million tons of ore above drill holes and between trenches, and 13 million tons of "geologic" (inferred) ore as compared with 28 million tons of measurable ore and 15 million tons of inferred ore in this report. The chief points of difference are explained as follows:

(1) Bureau estimates of ore indicated by trenching and drilling exclude 2.7 million tons of ore between 30 percent and 40 percent iron and about 3.5 million tons of ore of all grades below drill holes and beyond trenches. The writer has included this ore, amounting to 6.2 million tons, in his estimates of measurable ore.

(2) Because ore of lower grade is included, the average iron content of the principal deposits given in this report is lower than that of the Bureau by 1 or 2 percent Fe.

(3) "Geologic" ore estimated by the Bureau includes the 3.5 million tons below and beyond drill holes and trenches mentioned under (1) as well as most of classes A and B of inferred ore in table 2, altogether about 11 million tons.

(4) Most of the 7 million tons of inferred ore, class C, was not included in Bureau estimates.

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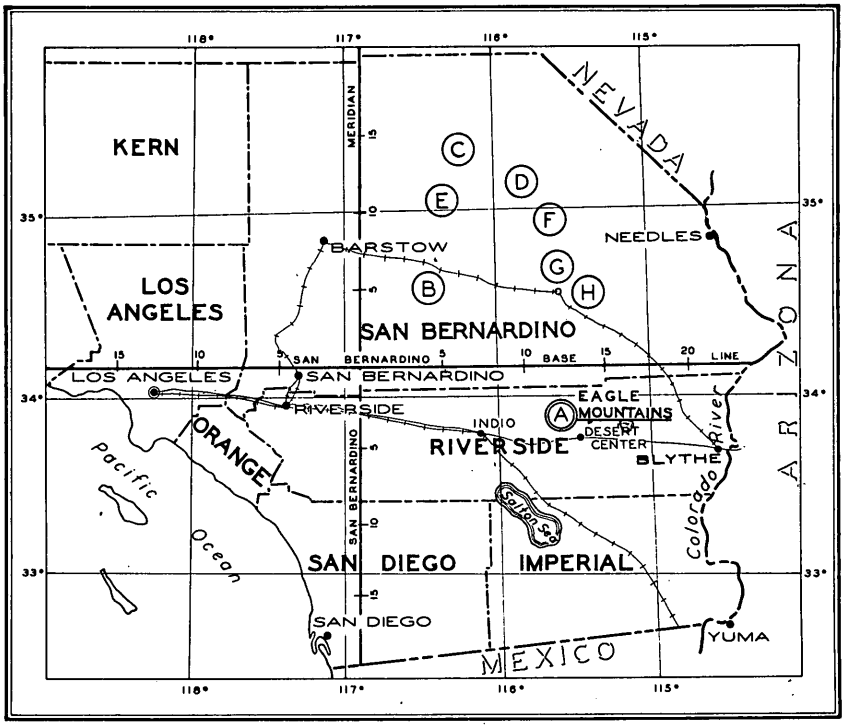


FIG. 1. Index map of southern California iron-ore deposits showing (A) EAGLE MOUNTAINS (described in this report); (B) Iron Mountain (Lava Bed); (C) Iron Mountain (Silver Lake); (D) Old Dad Mountain; (E) Cave Canyon; (F) Vulcan; (G) Iron Hat; (H) Ship Mountains.

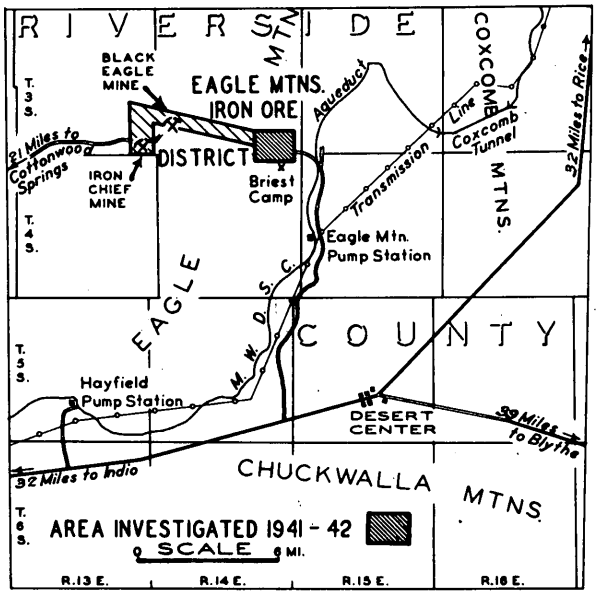


FIG. 2. Index map of a part of Riverside County showing location of Eagle Mountains iron-ore district.

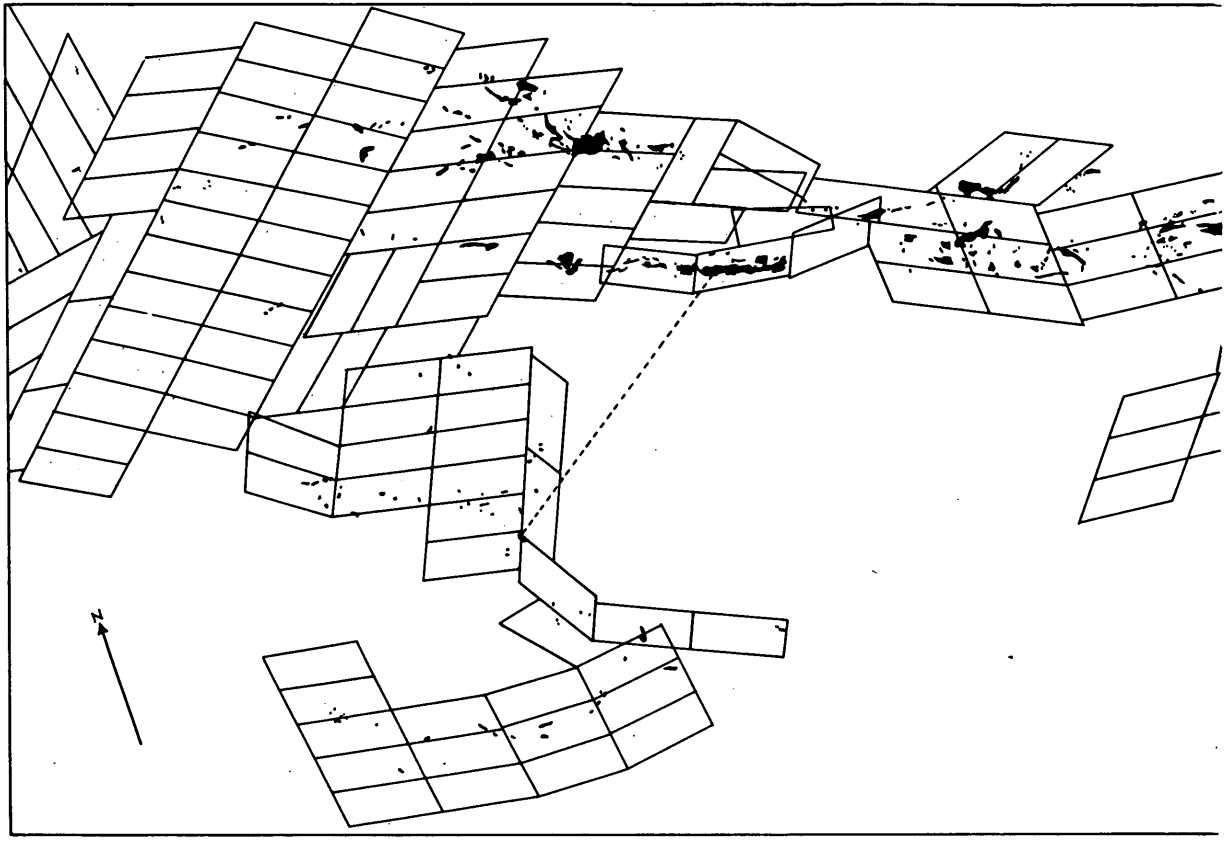


Illustration continued on page 19. Read from left to right.

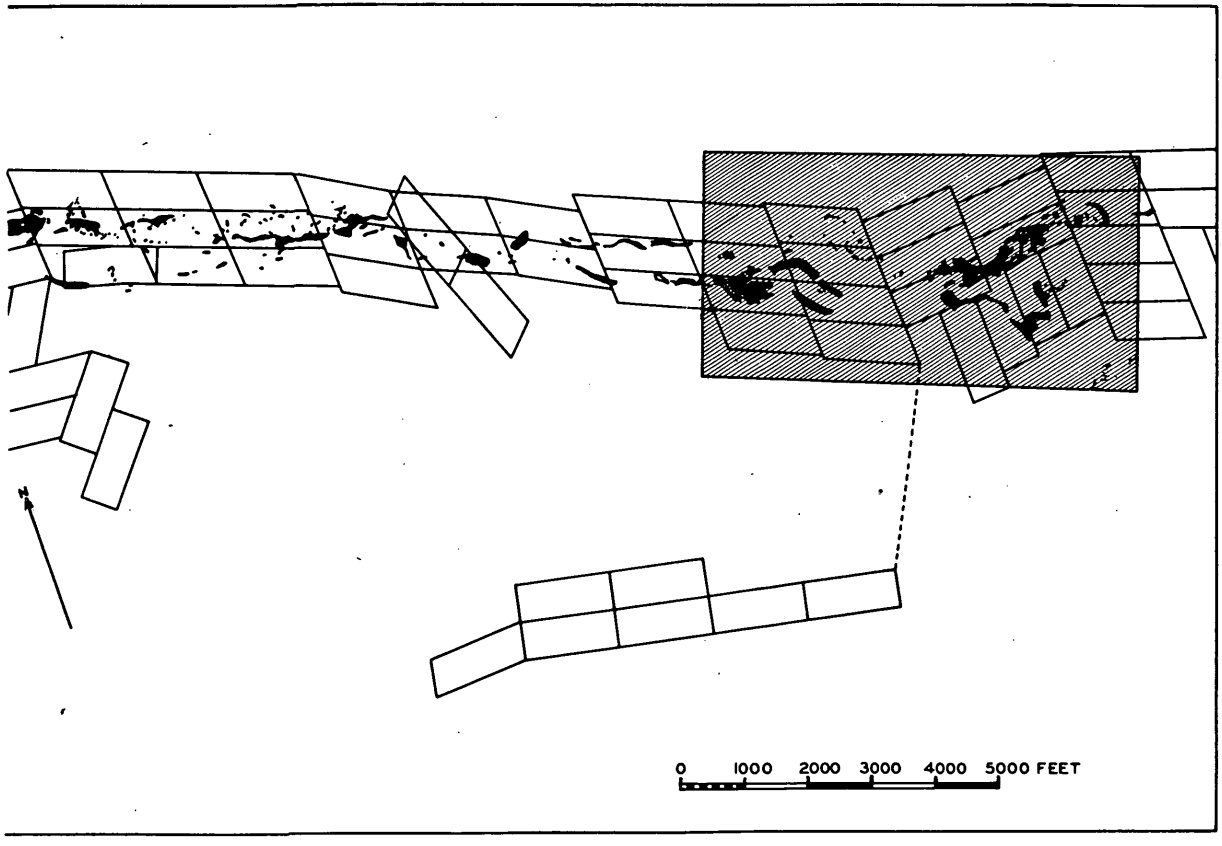


FIG. 3. Map showing the distribution of iron-ore deposits on mining claims of the Eagle Mountain district, by E. C. Harder and J. L. Rich (U. S. Geol. Survey Bull. 503, Pl. 8), 1912. (The eastern 25 claims, which occupy about one-fifth of the length of the entire range, comprise the area described in the present report.)

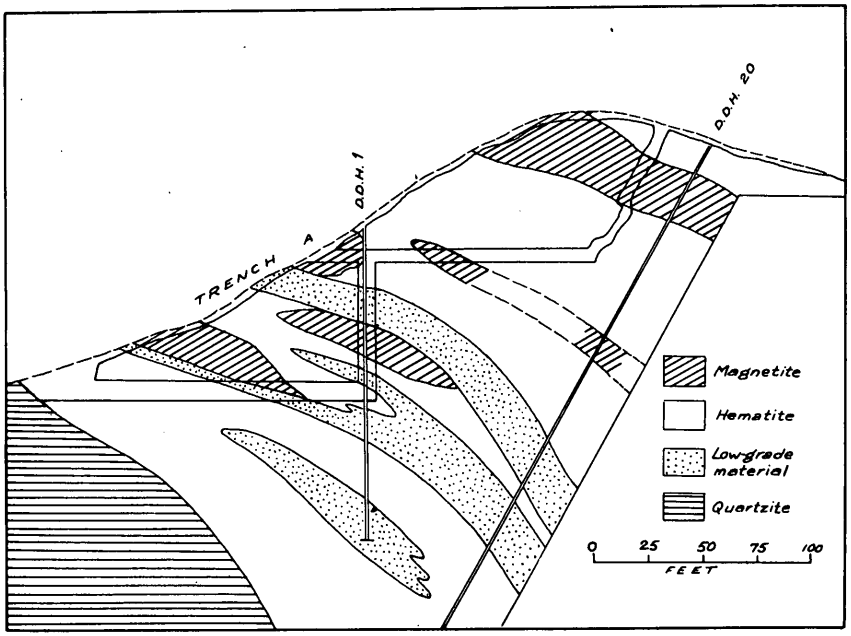


FIG. 4. Distribution of magnetite and hematite in part of structure section A-A', North deposit.

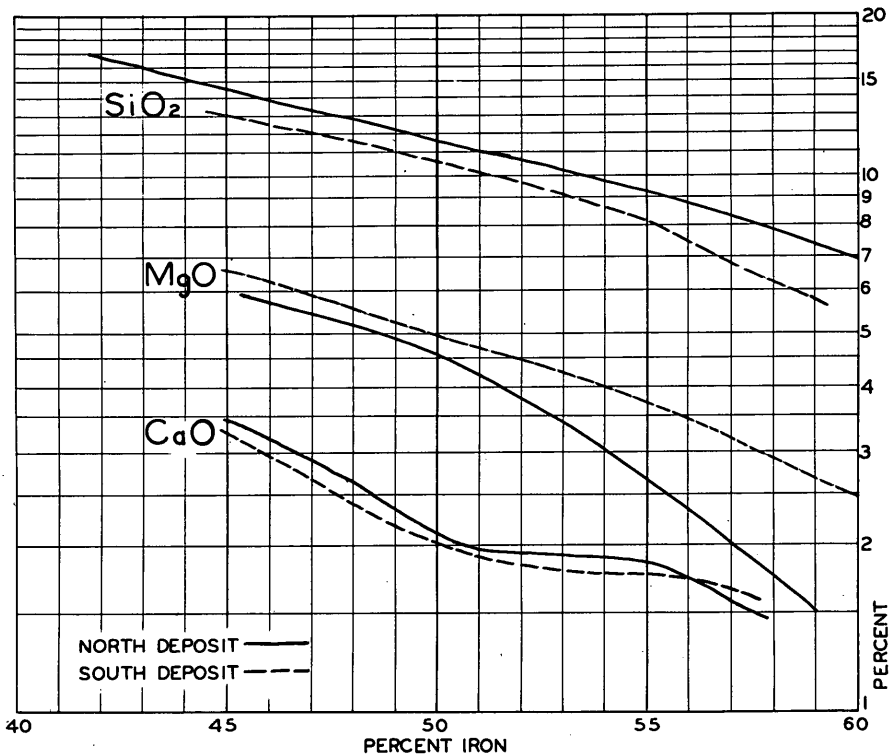


FIG. 5. Graph showing silica, magnesia, and lime in Eagle Mountains iron-ore deposits, based on 19 composite sludge samples from North deposit, 11 from South deposit, in relation to percentage of iron.

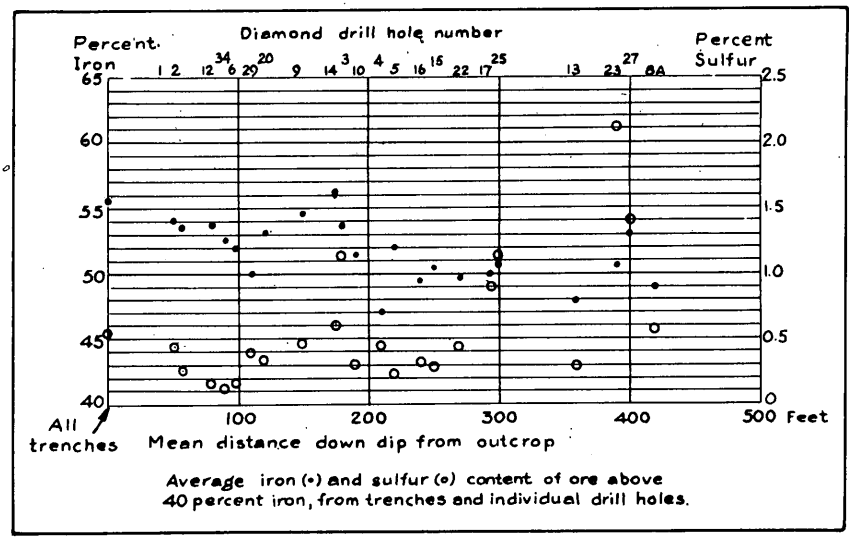


FIG. 6. Graph showing changes in iron and sulfur content with depth, in ore containing more than 40 percent iron, North deposit.

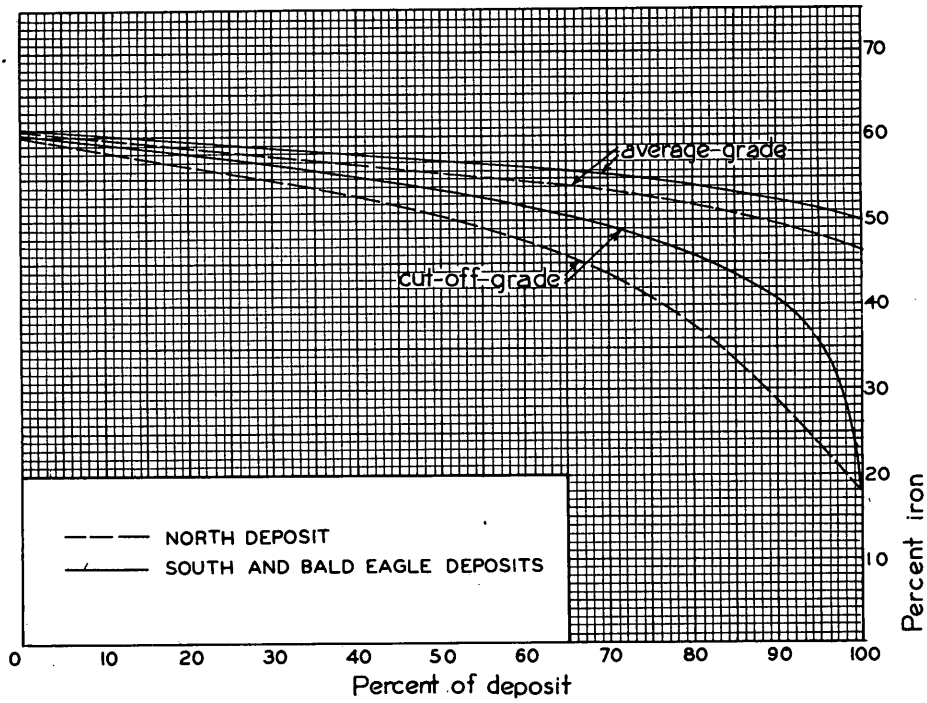


FIG. 7. Graph showing relation of reserves to average grades and cut-off grades of iron in Eagle Mountains deposits. For example: Ore containing more than 45 percent iron constitutes 67 percent of the North deposit and averages 50 percent iron; ore containing more than 45 percent iron constitutes 82 percent of the South and Bald Eagle deposits and averages 54 percent iron.

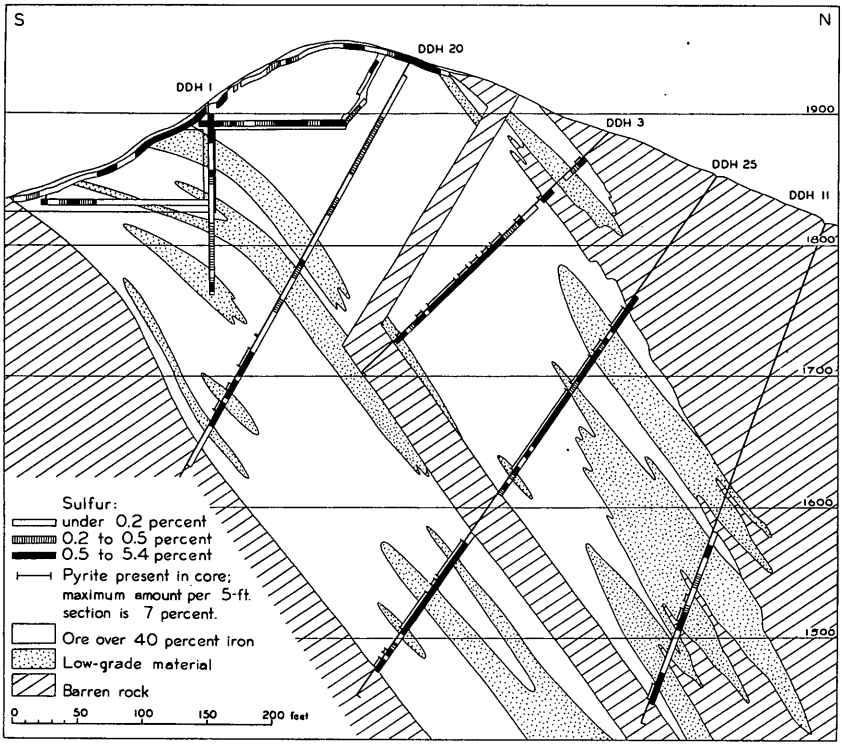


FIG. 8. Distribution of sulfur and pyrite in part of structure section A-A', North deposit.

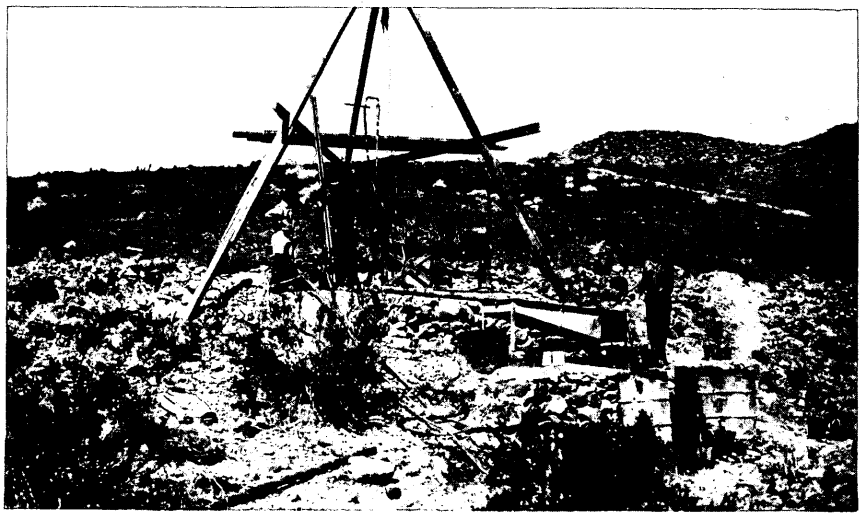


FIG. 9. Diamond-drill rig at hole 57, at east end of Bald Eagle deposits. The ore here is covered by 27 feet of bouldery gravel.

FIG. 10. Bald Eagle deposits seen from the east. Short white lines are trenches—lower group, left to right: P, Q, R, S, T, and U; upper group, bottom to top: U, V, and W. Bald Eagle Canyon in foreground, Big Dry Wash at left. Iron-ore-bearing area extends westward through the saddle just left of the center of picture.

2322

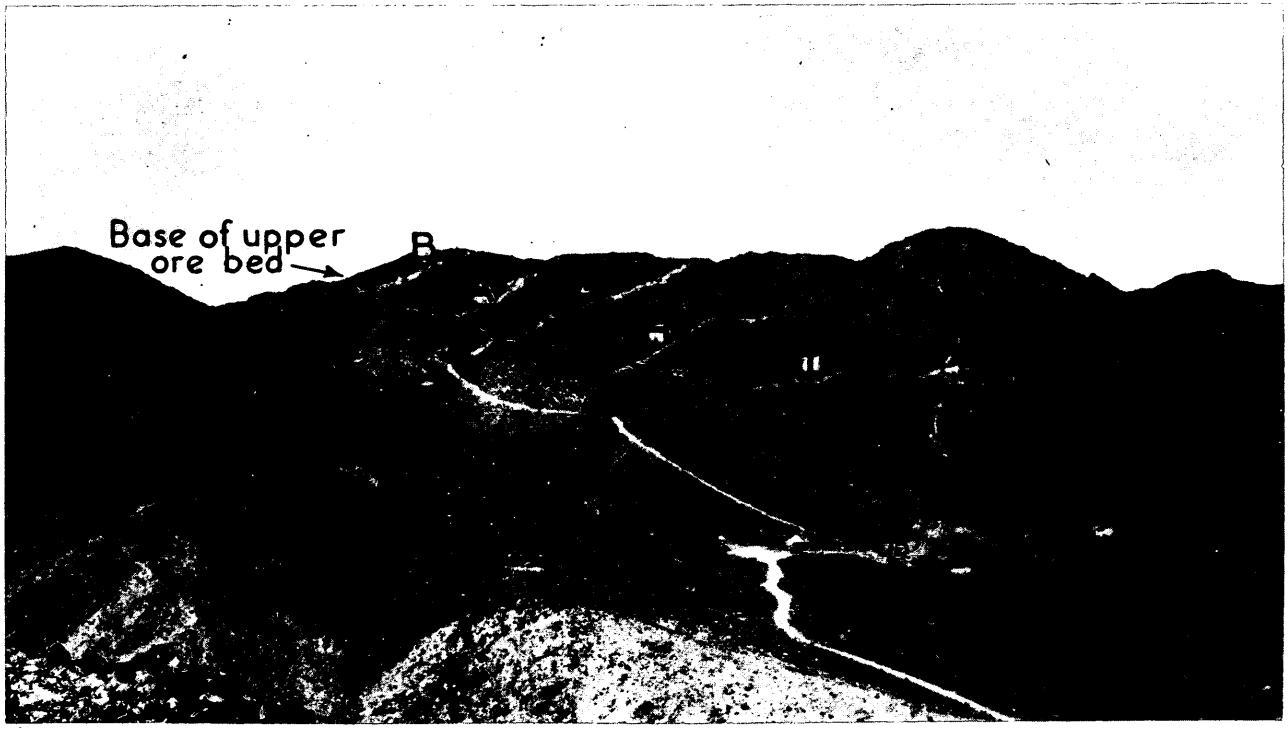


FIG. 11. North deposit on North Hill, seen from the southeast. Irregular white lines across the hill in the center of the picture are trenches (left to right, B, A, G, H, and I). Other white lines are trails. U. S. Bureau of Mines field buildings and road to Desert Center at lower right.

TOPOGRAPHIC AND CLAIM MAP
OF THE EASTERN PART OF
EAGLE MOUNTAINS IRON-ORE DISTRICT
RIVERSIDE COUNTY CALIFORNIA

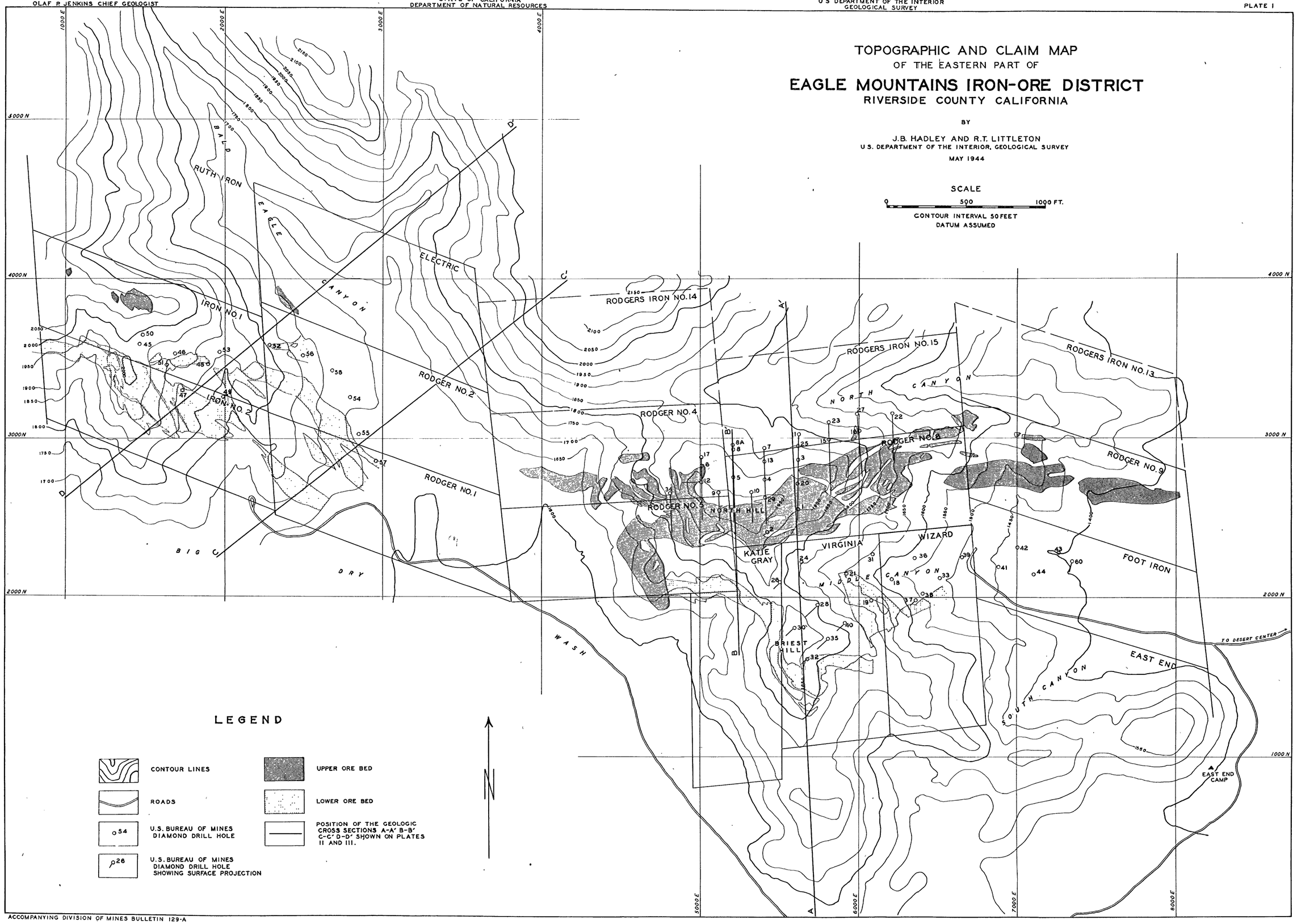
BY

J.B. HADLEY AND R.T. LITTLETON
U.S. DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY

MAY 1944

SCALE
0 500 1000 FT.

CONTOUR INTERVAL 50 FEET
DATUM ASSUMED



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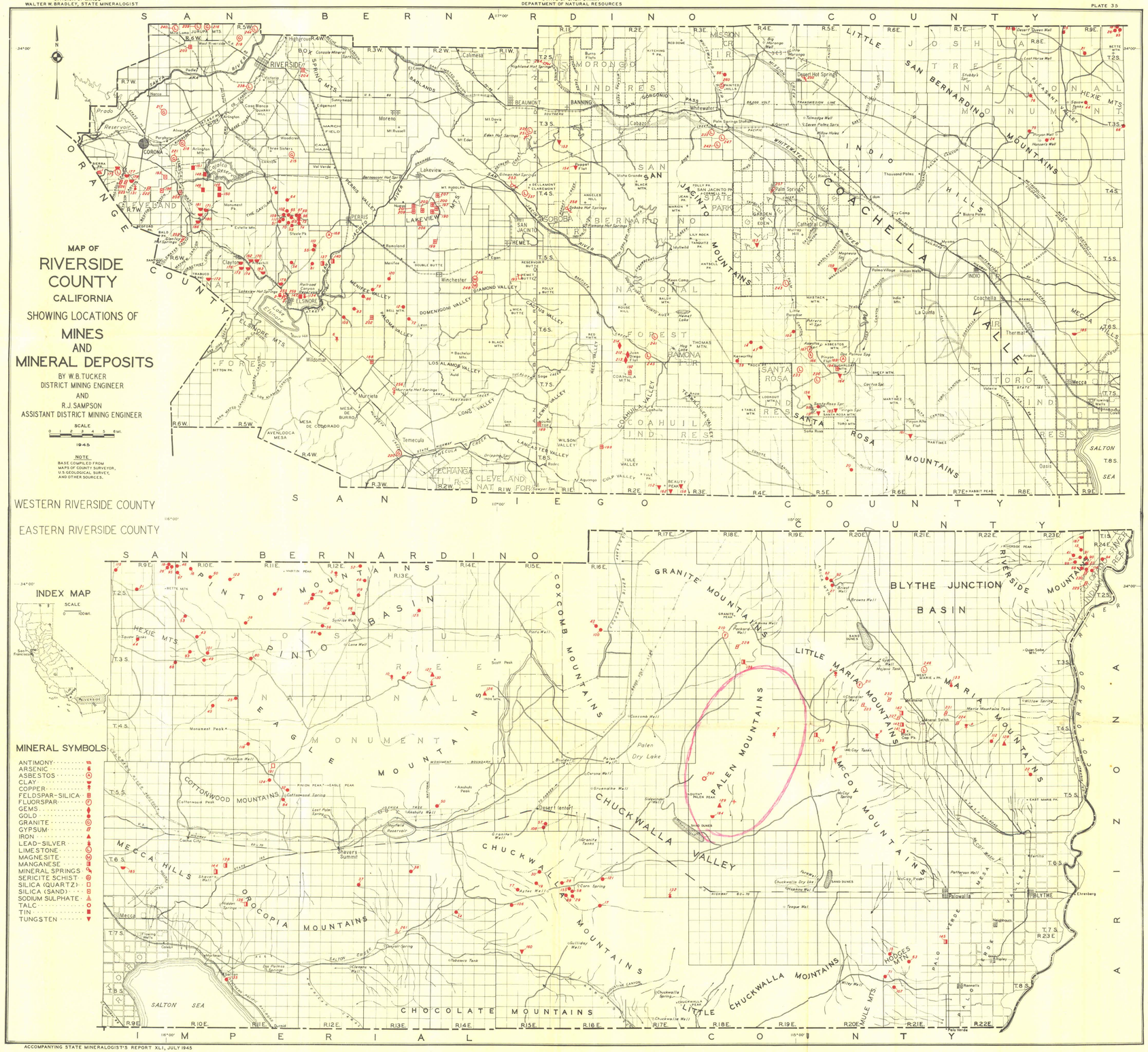


ACCOMPANYING STATE MINERALOGIST'S REPORT XLI, JULY 1945

LIST OF MINES AND PROSPECTS

METALS

ANTIMONY

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
1	Mountain Group (Mabey Canyon Deposit)	8	4 S.	7 W.	S.B.

ARSENIC

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
2	Shining Star Group	6	6 S.	4 W.	S.B.

COPPER

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
3	Anderson Group	9	2 S.	12 E.	S.B.
4	Big Horn Group	19 & 20	3 S.	20 E.	S.B.
	Black Warrior (see under gold)	7	5 S.	23 E.	S.B.
5	Eagle's Nest	29 & 30	4 S.	20 E.	S.B.
6	Electric Copper & Gold	25	6 S.	4 W.	S.B.
	Fluor-Spar Group (see under fluorspar)	4	3 S.	18 E.	S.B.
7	Homestake	20	4 S.	19 E.	S.B.
8	Lion's Den Claim	17 & 18	4 S.	22 E.	S.B.
9	Mountain King	23	4 S.	20 E.	S.B.
10	Nancy	28 (?)	3 S.	13 E.	S.B.
11	St. John	32	4 S.	20 E.	S.B.

GOLD

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
12	Alice	12	6 S.	3 W.	S.B.
13	Alice	25	1 S.	23 E.	S.B.
14	Alveston	29	6 S.	4 E.	S.B.
15	American Flag	30 & 31	7 S.	21 E.	S.B.
16	Anaheim Group	5 (?)	2 S.	10 E.	S.B.
17	Ardenella Claim	2 & 3	7 S.	16 E.	S.B.
18	Atlanta (North Star)	1	2 S.	9 E.	S.B.
19	Bankers Group	27	6 S.	(?) 15 E.	S.B.
	Black Eagle (see under Lead-Silver)				
20	Black Eagle Placer	24	8 S.	5 E.	S.B.
21	Black Warrior	16	2 S.	9 E.	S.B.
22	Black Warrior	5	5 S.	23 E.	S.B.
23	Blue Bell Consolidated	6	2 S.	24 E.	S.B.
24	Bonanza Lode	26	3 S.	8 E.	S.B.
25	Bonanza Crater Group	1	4 S.	10 E.	S.B.
26	Boss (Goat Mine)	1	2 S.	9 E.	S.B.
27	Brown	7	2 S.	20 E.	S.B.
28	Bryan	30	6 S.	16 E.	S.B.
	Calzona (see Mountaineer Mines)				
29	Chuckawalla Group	32	6 S.	16 E.	S.B.
30	Coffee	23	6 S.	15 E.	S.B.
31	Colorado	36	1 S.	23 E.	S.B.
	Colorado (see Justice)				
32	Cottonwood Springs Mill	14	5 S.	11 E.	S.B.
33	Desert Queen	5	2 S.	8 E.	S.B.
34	Dos Palmas Group	9	7 S.	14 E.	S.B.
35	Fish	12	8 S.	10 E.	S.B.
36	Frank Hill	32	3 S.	12 E.	S.B.
37	Free Coinage & Charity Mines	25	6 S.	12 E.	S.B.
	Gavilan Mines (see Ida-Leona)	11 & 20	4 S.	4 E.	S.B.
38	Gold Cup	23	6 S.	13 E.	S.B.
39	Gold Coin	31	2 S.	11 E.	S.B.
40	Gold Crown	11 & 16	2 S.	12 E.	S.B.
41	Gold Dollar	31 & 36	1 S.	23 E.	S.B.
42	Gold Flake	33	2 S.	16 E.	S.B.
43	Gold Fields	4	3 S.	10 E.	S.B.
44	Gold Galena	4 S. & 9	3 S.	9 E.	S.B.
45	Gold Hill	3	4 S.	10 E.	S.B.
46	Gold Park Consolidated	6	2 S.	9 E.	S.B.
47	Gold Shot	21 & 29	6 S.	4 E.	S.B.
48	Gold Standard	12	2 S.	12 E.	S.B.
49	Golden Bee	11 & 16	3 S.	10 E.	S.B.
50	Golden Eagle	19	5 S.	14 E.	S.B.
51	Golden Chariot	31	4 S.	4 W.	S.B.
52	Golden Rod	1	2 S.	12 E.	S.B.
53	Golden Rule Group	30	2 S.	12 E.	S.B.
54	Golton Group	20	5 S.	4 W.	S.B.
55	Good Hope	NW. ¼ 15	5 S.	4 W.	S.B.
56	Good Hope Group	25	2 S.	3 E.	S.B.
57	Granite	35	5 S.	15 E.	S.B.
58	Happy Jack	32	6 S.	16 E.	S.B.
59	Hemet Belle	31	6 S.	4 E.	S.B.
60	Hightedon	10	2 S.	10 E.	S.B.
61	Hidden Canyon	23	6 S.	9 E.	S.B.
62	Hoag	24	4 S.	5 W.	S.B.
63	Hodges	33	7 S.	21 E.	S.B.
	Huff & Lane Group (see Mission)	5	3 S.	12 E.	S.B.
64	Ida-Leona (Gavilan)	11 & 20	4 S.	4 W.	S.B.
65	Indian Queen	NW. ¼ 32	4 S.	4 W.	S.B.
66	Ingersoll (Ramona)	24	3 S.	9 E.	S.B.
		19	3 S.	10 E.	S.B.
67	Iron Chief	2 & 27	3 S.	13 E.	S.B.
68	Jacknife Group	1	2 S.	23 E.	S.B.
		6	2 S.	24 E.	
69	Jumbo	33	4 S.	4 W.	S.B.
70	Justice or Colorado	32	4 S.	4 W.	S.B.
71	La Rica	7	8 S.	21 E.	S.B.
72	Lean	12	6 S.	2 W.	S.B.
73	Little Maggie	33	4 S.	4 W.	S.B.
74	Little Pete	33	4 S.	4 W.	S.B.
	Lone Star (see Mission or Huff Lane)				
75	Lost Angel	22	3 S.	8 E.	S.B.
76	Lost Horse	3 (?)	3 S.	8 E.	S.B.
77	Lost Pony (Liberty Group)	33	6 S.	15 E.	S.B.
78	Louise	17 & 18	2 S.	12 E.	S.B.
79	Lucky Boy (Walker)	33	5 S.	3 W.	S.B.
80	Lucky Lady Group	17	3 S.	11 E.	S.B.
81	Lucky Strike	22	5 S.	4 W.	S.B.
82	Lum Gray (Priest)	7	2 S.	20 E.	S.B.
83	Mammoth	8	6 S.	3 W.	S.B.
84	Mastadon	23	5 S.	11 E.	S.B.
85	Meek Group	15	2 S.	11 E.	S.B.
86	Menifee	4 & 5	6 S.	3 W.	S.B.
	Messenger (part of Iron Chief)				
87	Missing Link (Virginia-Shay)	N.E. ¼ 32	4 S.	4 W.	S.B.
88	Mission (Huff-Lane)	5	3 S.	12 E.	S.B.
89	Morning Star	31	6 S.	16 E.	S.B.
90	Morning Star Mining Co.	31	1 S.	24 E.	S.B.
		6	2 S.	24 E.	
91	Mountaineer	31	1 S.	24 E.	S.B.
92	Mountain Queen	7	2 S.	20 E.	S.B.
93	New El Dorado	8 & 17	3 S.	10 E.	S.B.
94	Nicolite	32	1 S.	24 E.	S.B.
95	North Star	1	2 S.	9 E.	S.B.
96	North Star	33	4 S.	4 W.	S.B.
	Ophir (see Lucky Strike)	22	5 S.	4 W.	S.B.
97	Oro Copia	6	2 S.	10 E.	S.B.
98	Oro Vista	28	7 S.	5 E.	S.B.
99	Oxbow Group	36	1 S.	23 E.	S.B.
100	Patches	34	2 S.	16 E.	S.B.
101	Paymaster	15	3 S.	10 E.	S.B.
102	Perris	29 & 30	4 S.	4 W.	S.B.
103	Pinto Lode	24	6 S.	4 E.	S.B.
104	Pinto Placers	21	2 S.	12 E.	S.B.
105	Ragged Top Group	NW. ¼ 18	3 S.	3 W.	S.B.
106	Red Cloud	5	7 S.	15 E.	S.B.
	Red Head Group (Great Western) See Red Cloud	1	2 S.	9 E.	S.B.
107	Roosevelt	17 & 18	8 S.	21 E.	S.B.
108	San Diego	35	5 S.	15 E.	S.B.
109	Santa Fe	31	4 S.	4 W.	S.B.
110	San Jacinto	10	5 S.	4 W.	S.B.
111	Santa Rosa (Rosalia)	31	4 S.	4 W.	S.B.
112	Schellenger Gold Group	22	4 S.	22 E.	S.B.
113	Stanford	5	5 S.	4 W.	S.B.
114	Steece	6	2 S.	24 E.	S.B.
115	Sunny Boy	6	2 S.	9 E.	S.B.
116	Sunrise	26	2 S.	12 E.	S.B.
117	Summit	20	2 S.	12 E.	S.B.
118	Sunset Group	29 & 30	4 S.	11 E.	S.B.
119	Thelma & Desert Gold Group	13	2 S.	12 E.	S.B.
120	Thurman Group	19 & 26	6 S.	3 W.	S.B.
121	Triangle (Pilot)	26	6 S.	16 E.	S.B.
122	White Star	12	2 S.	10 E.	S.B.
123	Victor (La Pomo)	32	4 S.	3 W.	S.B.
124	Yucca Buttes Group	10	5 S.	11 E.	S.B.
125	Zulu Group	26	2 S.	13 E.	S.B.

IRON

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
126	Eagle Mountain & Iron Chief	13, 14, 22, 23, 24, 25, 26, 19, 30, 31, 32, 1, 2, 3,	35 & 36 / 33 & 34 / 4, & 5	3 S. / 3 S. / 4 S.	13 E. / 14 E. / 15 E. / 13 E.) / 13 S. 14 E.)	S.B. / S.B. / S.B. / S.B. / S.B.
127	Iron Chief					
128	Maria Mountains	23 & 26		4 S.	22 E.	S.B.
129	Palen Mountains	22		5 S.	18 E.	S.B.

LEAD-SILVER

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
130	Black Eagle	25	3 S.	13 E.	S.B.
131	Corona Lead & Zinc Co.	14	4 S.	7 W.	S.B.
132	Desert Center	35 (?)	6 S.	17 E.	S.B.
133	Neal Group	25 (?)	3 S.	21 E.	S.B.
134	Palisades Group	4	6 S.	4 W.	S.B.

MANGANESE

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
135	Arlington (Black Jack)	13–24	4 S.	19 E.	S.B.
136	Big Bullet	5	7 S.	11 E.	S.B.
137	Black Eagle & Newport Claims	W. ½ 23	5 S.	4 W.	S.B.
138	Box Canyon	24	6 S.	10 E.	S.B.
139	Doran Claims	16 (?)	3 S.	18 E.	S.B.
140	Eleinore	23 & 24	5 S.	4 W.	S.B.
141	Hauser et. al. Claims	17	4 S.	21 E.	S.B.
142	Langdon	8	4 S.	21 E.	S.B.
143	Mabery and Brown (Dioxide)	17	4 S.	21 E.	S.B.
144	Noblett Manganese	22	6 S.	10 E.	S.B.
145	Palo Verde Claims	24	7 S.	(?) 21 E.	S.B.
146	Black Rock	18 & 19	4 S.	5 W.	S.B.
147	Chief of the Hills Group	4	6 S.	4 W.	S.B.
148	Holmes Ranch	12	4 S.	6 W.	S.B.
149	Moore	13, 14,	23 & 24	4 S.	6 W.	S.B.
150	South Black Rock	19	4 S.	5 W.	S.B.
151	Temescal Tin (Cajalco)	2, 3,	10 & 11	4 S.	6 W.	S.B.

TUNGSTEN

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
152	Beauty Mountain	36	8 S.	2 E.	S.B.
153	Blue Bird and Eagle	29	3 S.	1 E.	S.B.
154	Blue Boy and Black Mountain	3	4 S.	1 E.	S.B.
155	Chuckawalla	32	6 S.	16 E.	S.B.
156	Garnet Queen	20	7 S.	5 E.	S.B.
157	Indian	28	7 S.	5 E.	S.B.
158	Lucky Strike	32	8 S.	3 E.	S.B.
159	Magnesium Canyon	22	5 S.	5 E.	S.B.
160	Matilda	28	7 S.	15 E.	S.B.
161	Miller Ranch	2	8 S.	6 E.	S.B.
	Oro Vista (see under gold)	28	7 S.	5 E.	S.B.
162	Pawnee (Carr)	31	8 S.	3 E.	S.B.
163	Phoenix (Murray Canyon)	9	5 S.	4 E.	S.B.
164	Pidgeon Creek	11	7 S.	5 E.	S.B.
	Red Cloud (see under gold)	5	7 S.	15 E.	S.B.
165	Ribbonwood (Santa Rosa Mt.)	26	7 S.	5 E.	S.B.

NONMETALLICS

ASBESTOS

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
166	Dunn Asbestos	32	6 S.	5 E.	S.B.
167	Percival	29	6 S.	4 E.	S.B.
168	Perris	2	5 S.	4 W.	S.B.
169	Serpentine Hill	35	6 S.	5 E.	S.B.

CLAY

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
170	Alberhill Coal & Clay Co., Inc.	15, 21 & 23	5 S.	5 W.	S.B.
171	Emsco Clay Co. (Harrington)	25	4 S.	6 W.	S.B.
172	Emsco Clay Co.	25	5 S.	5 W.	S.B.
173	Gladding McBean & Co.	21 & 22	5 S.	5 W.	S.B.
	Hancock	In city limits of Riverside—not plotted			
174	Huff Ganister Fire Brick Co.	22	5 S.	5 W.	S.B.
	Jones (see feldspar & silica)	17 & 19	4 S.	6 W.	S.B.
175	Kroonen	4, 9 & 10	4 S.	7 W.	S.B.
176	Los Angeles Brick Co.	21 (and others)	5 S.	5 W.	S.B.
177	McKnight Clay Pit	3, 9 & 10	4 S.	7 W.	S.B.
178	Middlesworth Clay Deposit	NW. ¼ 14	4 S.	7 W.	S.B.
179	Morton	3 & 31	5 S.	4 W.	S.B.
180	Pacific Clay Products Co.	35	4 S.	6 W.	S.B.
181	Pacific Clay Products Co.	26	4 S.	6 W.	S.B.
182	Pacific Clay Products Co.	22	5 S.	5 W.	S.B.
183	Pacific Clay Products Co.	26	5 S.	5 W.	S.B.
184	Palen Mountains	28	5 S.	18 E.	S.B.
185	Red Top	20, 21	6 S.	9 E.	S.B.
186	Temescal Clay	35	4 S.	6 W.	S.B.
187	Wilson Clay	24 (?)	1 S.	23 E.	S.B.

FELDSPAR AND SILICA

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
188	American Encaustic Tiling Co. (taken over by Gladding McBean & Co.)	4	7 S.	3 W.	S.B.
189	Anita Louise (Buena Vista)	31	7 S.	1 E.	S.B.
190	Brown Feldspar and Silica	28	4 S.	2 W.	S.B.
191	Brown Silica	3	5 S.	11 E.	S.B.
192	Coahuila Brave	9	7 S.	2 E.	S.B.
193	Corona Sand	8	4 S.	6 W.	S.B.
194	Dunn	2	7 S.	5 E.	S.B.
195	Hemet Silica	26	5 S.	1 W.	S.B.
196	Jones Sand	17 & 19	4 S.	6 W.	S.B.
197	La Borde	28	4 S.	2 W.	S.B.
198	Lang	12	8 S.	1 E.	S.B.
		7	8 S.	2 E.	
199	Machado	9	5 S.	2 W.	S.B.
200	Morgan Ranch	28	4 S.	2 W.	S.B.
201	Patterson	30	4 S.	2 W.	S.B.
202	Perris Mining Co.	16	6 S.	3 W.	S.B.
203	Riverside Cement Co.	E. ½ 29	4 S.	2 W.	S.B.
204	Spicer	28 (?)	2 S.	4 W.	S.B.
205	Stone	15 (?)	2 S.	6 W.	S.B.
206	Tully	32	4 S.	2 W.	S.B.
207	Warren	21	4 S.	2 W.	S.B.
208	Weisel Sand	21	4 S.	6 W.	S.B.
209	Wier Feldspar	30	4 S.	2 W.	S.B.

FLUORSPAR

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
210	Fluorspar Group (see under copper also)	4	3 S.	18 E.	S.B.
211	Red Bluff	27	3 S.	20 E.	S.B.

GEMS

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
212	Fano	33	6 S.	2 E.	S.B.
213	Schindler Beryl	32 & 33	6 S.	2 E.	S.B.
214	Silica Beryl Group	29	6 S.	2 E.	S.B.

GRANITE

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
215	Blue-Gray Quarry	32 (?)	3 S.	4 W.	S.B.
216	Bly Bros. & McGilliard	1	2 S.	6 W.	S.B.
217	Corona Rock Co.	8 & 17	3 S.	6 W.	S.B.
218	Lane Brothers	27 (?)	3 S.	6 W.	S.B.
219	Ormand Quarry	9	2 S.	5 W.	S.B.
220	Temecula Quarries	13 & 14	8 S.	3 W.	S.B.
221	Temescal Rock Quarry	4	4 S.	6 W.	S.B.

GYPSUM

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
222	Frazer	13 & 24	4 S.	7 W.	S.B.
223	Garbutt & Orcutt (U. S. Gypsum)	2, 3 & 10	4 S.	20 E.	S.B.
224	Garland (U. S. Gypsum)	18	4 S.	22 E.	S.B.
225	Gypsum Canyon	15	4 S.	7 W.	S.B.
226	Hagador Canyon	15	4 S.	7 W.	S.B.
227	Langdon (U. S. Gypsum)	8	4 S.	21 E.	S.B.
228	Palen Mountain Gypsum	9, 10, 11	3 S.	18 E.	S.B.
229	Parkford (Indian Reservation)	NW. ¼ of SW. ¼ 7	2 S.	24 E.	S.B.
230	Riverside Mountain	6	2 S.	24 E.	S.B.
231	Savage (U. S. Gypsum)	12	4 S.	21 E.	S.B.
232	*U. S. Gypsum Co.	5, 6, 7, 8	4 S.	21 E.	S.B.
		1, 2, 3, 10, 11, 12	4 S.	20 E.	S.B.
		35 & 36	3 S.	20 E.	S.B.
		12 & 18	4 S.	22 E.	S.B.
		7	4 S.	21 E.	S.B.

*Operating property is in

LIMESTONE

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
233	Big Hill	6	7 S.	5 E.	S.B.
234	Eden Hot Springs	23	3 S.	1 W.	S.B.
235	Guiberson	SE. ¼ 22 & SW. ¼ of 23	3 S.	3 E.	S.B.
236	Harris	9	7 S.	5 E.	S.B.
237	Hubbard	23	4 S.	1 W.	S.B.
	Kroonen (see under clay)	9 & 10	4 S.	7 W.	S.B.
238	Magstone Products	34	2 S.	5 W.	S.B.
239	Matthews	2 (?)	2 S.	6 W.	S.B.
240	Mira Loma	4	2 S.	6 W.	S.B.
241	Moore	23 (?)	4 S.	2 E.	S.B.
242	Novell	26	3 S.	3 E.	S.B.
243	Palm Springs Canyon	25 & 36	5 S.	4 E.	S.B.
244	Riverside Cement Co.	3, 5 & 6	2 S.	5 W.	S.B.
245	San Jacinto Rock Products Co.	35 (?)	6 S.	2 E.	S.B.
246	Schellinger	22	3 S.	21 E.	S.B.
247	Southern Pacific	23 & 25	3 S.	3 E.	S.B.

MAGNESITE

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
248	Hemet	NW. ¼ 31	5 S.	1 W.	S.B.
249	Nichols	SW. ¼ 30	5 S.	1 W.	S.B.

MINERAL SPRINGS

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
250	Desert Hot Springs	30	2 S.	5 E.	S.B.
251	Eden Hot Springs	23	3 S.	1 W.	S.B.
252	Glen Ivy Hot Springs	10	5 S.	4 W.	S.B.
253	Gilman (Relief) Hot Springs	15	4 S.	1 W.	S.B.
254	Highland Hot Springs	19	2 S.	1 E.	S.B.
255	Lakeview Hot Springs	6	6 S.	4 W.	S.B.
256	Murrieta Hot Springs	14	7 S.	3 W.	S.B.
257	Palm Springs	14 & 15	4 S.	4 E.	S.B.
258	Soboba (Richey) Hot Springs	28 (?)	4 S.	1 E.	S.B.
259	Wrenden Hot Springs	6	6 S.	4 W.	S.B.

SERICITE SCHIST

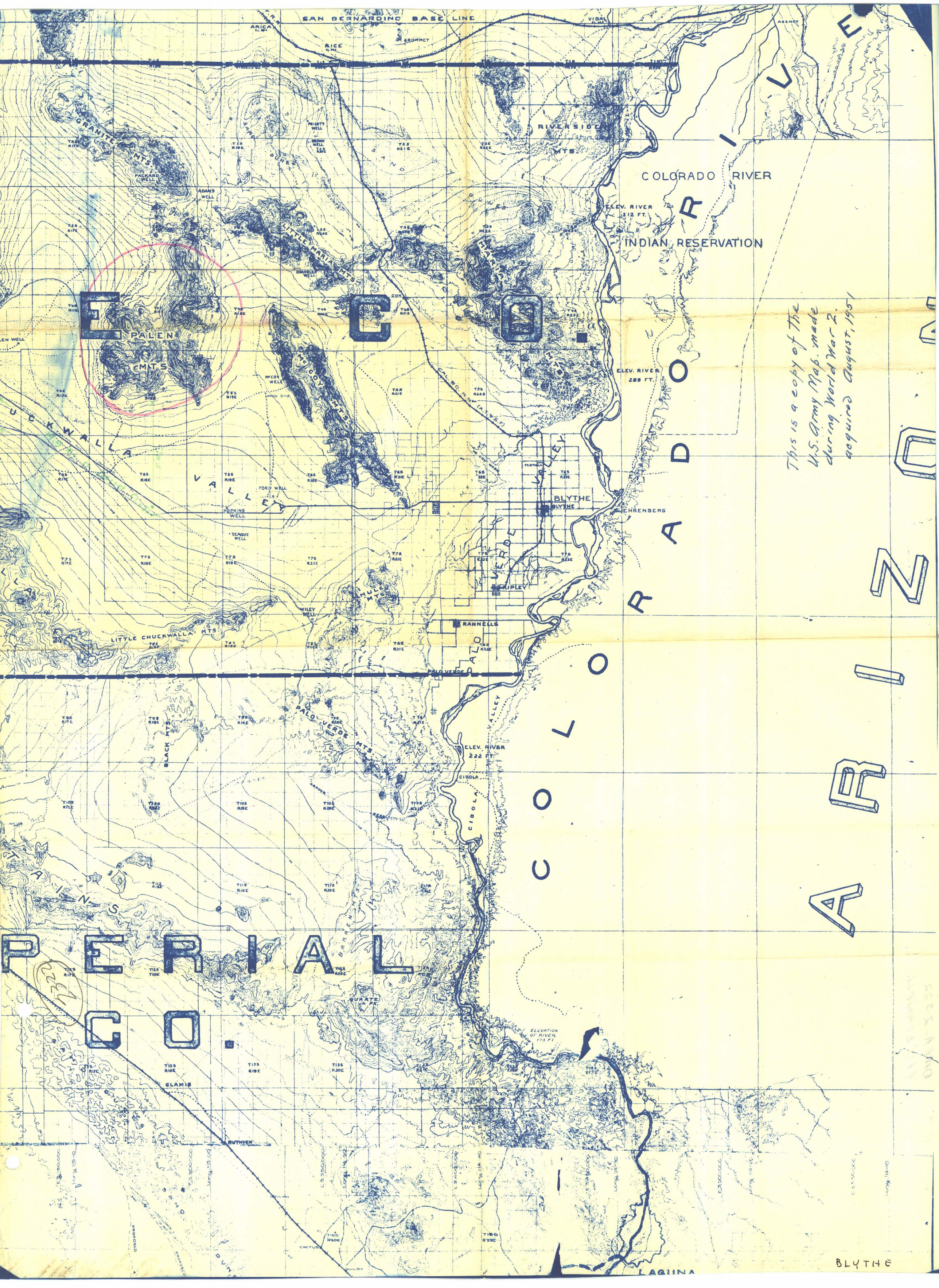
MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
260	Whitewater Canyon	35, 36	2 S.	3 E.	S.B.

SODIUM SULPHATE

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
261	Bloom	15 & 21	7 S.	13 E.	S.B.

TALC

MAP NUMBER	NAME OF PROPERTY	SEC.	T.	R.	M.
262	Palen Mountain	8	5 S.	18 E.	S.B.


SAN BERNARDINO BASE LINE
ARICA
RICE
GROMMET
VIDAL
AGENCY
GRANITE MTS.
PACKARD WELL
ADAMS WELL
PRIEST'S WELL
BROWN WELL
SAND DUNES
RIVERSIDE MTS.
COLORADO RIVER
ELEV. RIVER 312 FT.
INDIAN RESERVATION
LITTLE MARIA MTS.
CHANDLER WELL
MARIA MTS.
COX
PALEN MTS.
McCOY MTS.
McCOY WELL
CAL. & ARIZ. (A.T.&S.F.)
ELEV. RIVER 289 FT.
CHUCKWALLA VALLEY
FORD WELL
HOPKINS WELL
TEAGUE WELL
BLYTHE
EHRENBERG
PALO VERDE VALLEY
RIPLEY
MULE MTS.
WILEY WELL
RANNELLS
LITTLE CHUCKWALLA MTS.
PALO VERDE
BLACK MTS.
PALO VERDE MTS.
ELEV. RIVER 222 FT.
CIBOLA
CIBOLA VALLEY
ARROYO
SEEP
BARREN
QUARTZ PK.
ELEVATION OF RIVER 175 FT
GLAMIS
RUTHVEN
CACTUS
QUILBY
LAGUNA
BLYTHE
This is a copy of the U.S. Army Map made during World War 2. acquired August, 1951
IMPERIAL CO.
COLORADO
ARIZONA

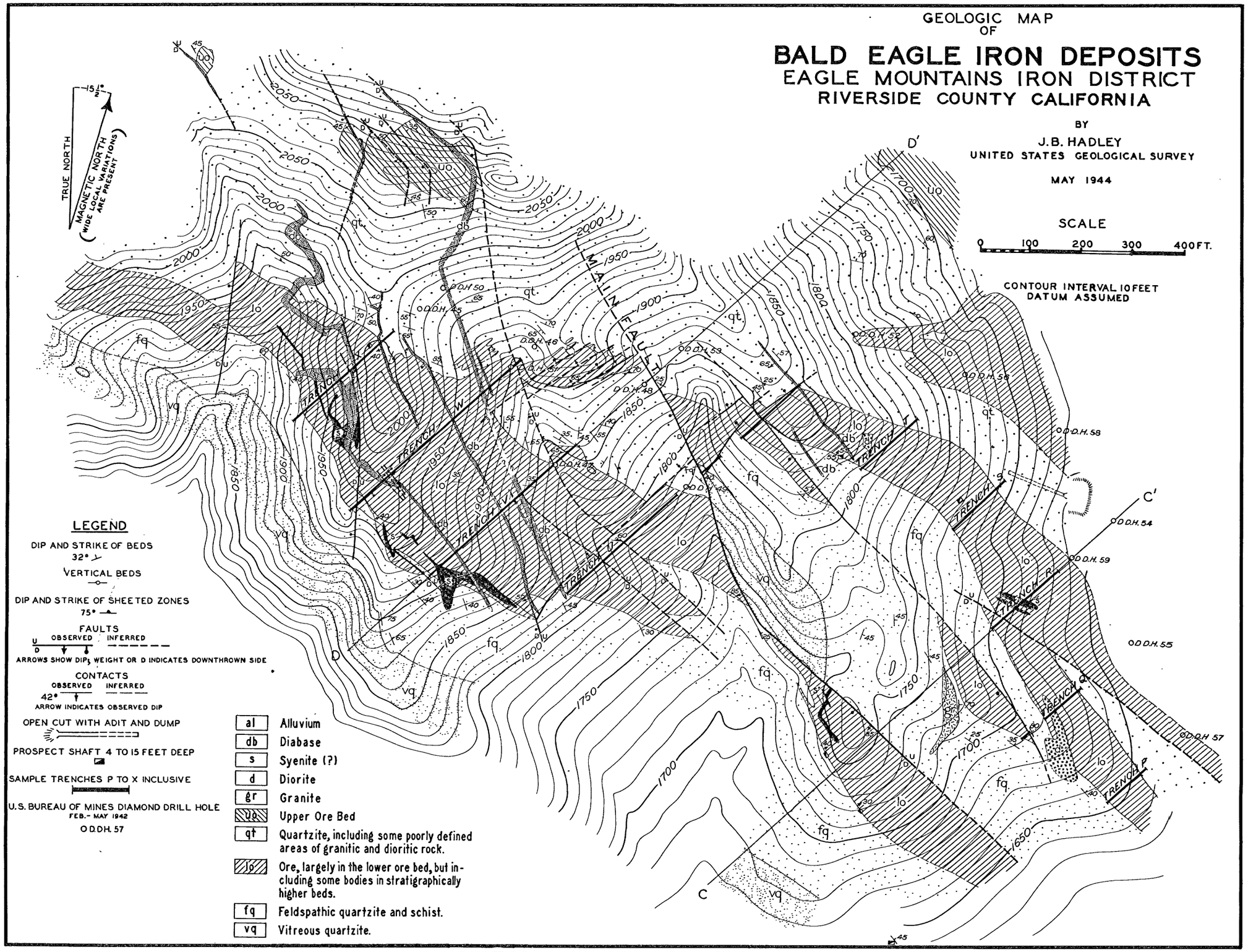
GEOLOGIC MAP
OF

BALD EAGLE IRON DEPOSITS

EAGLE MOUNTAINS IRON DISTRICT
RIVERSIDE COUNTY CALIFORNIA

BY
J.B. HADLEY
UNITED STATES GEOLOGICAL SURVEY

MAY 1944



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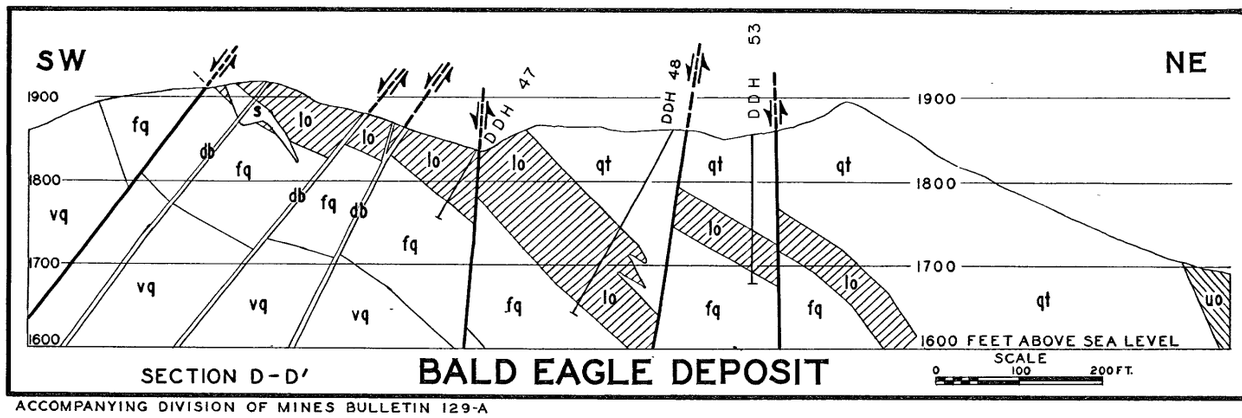
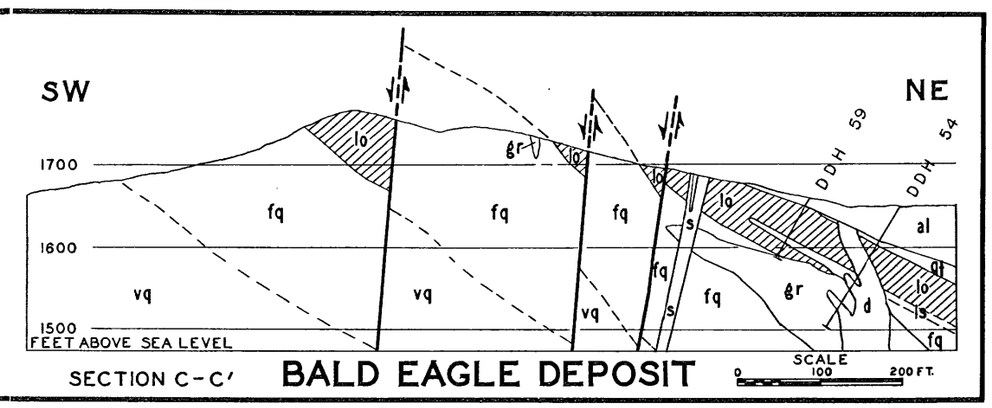


SECTION D-D' BALD EAGLE DEPOSIT



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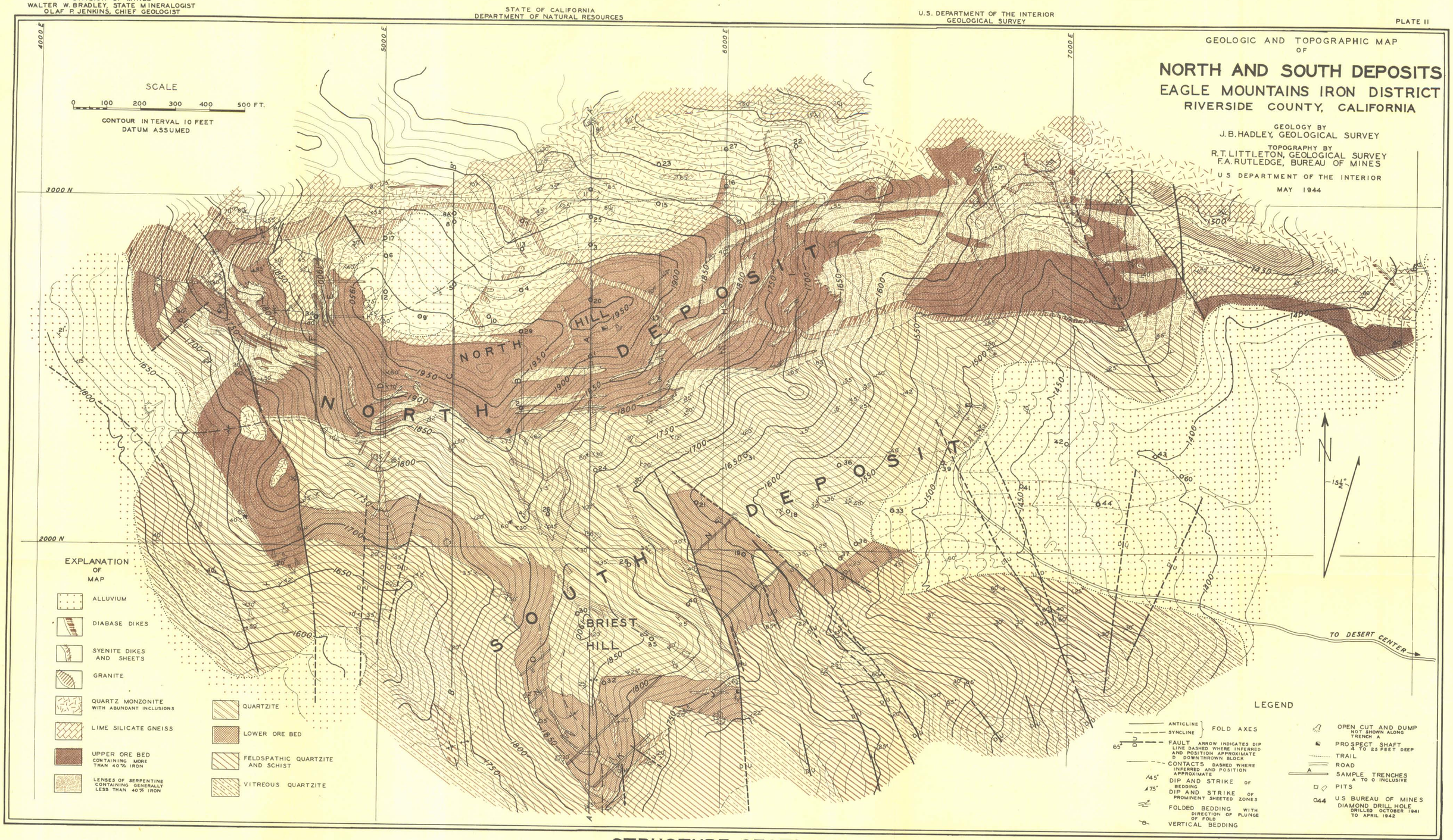

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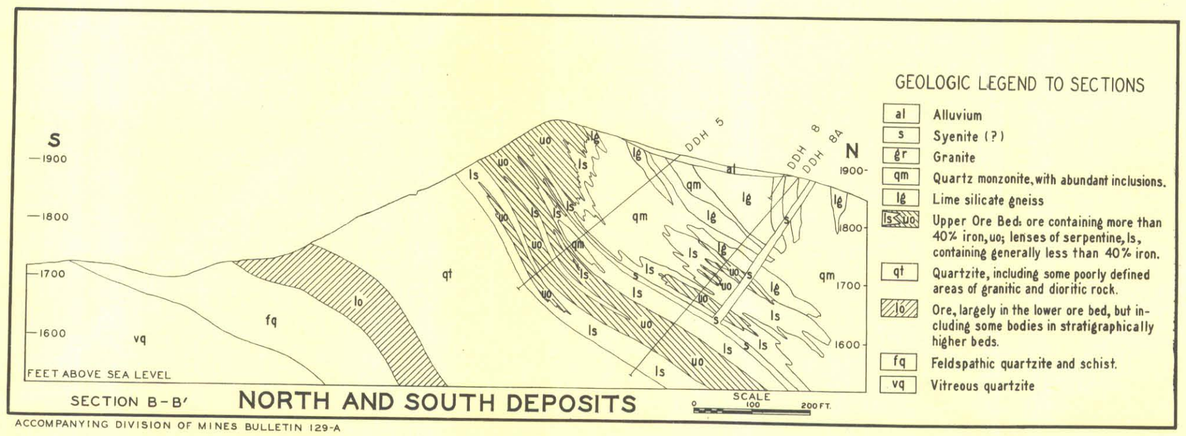
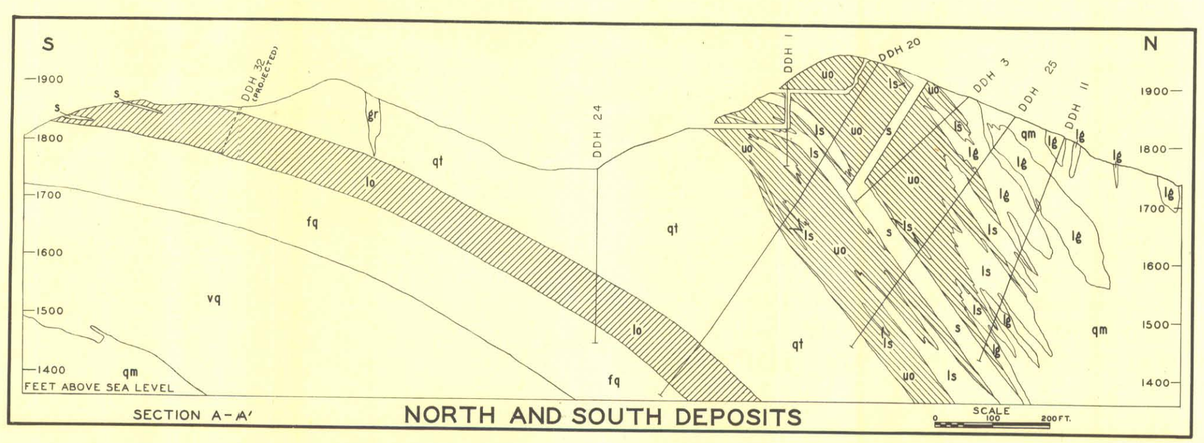


SECTION B-B′ NORTH AND SOUTH DEPOSITS



SECTION A-A′ NORTH AND SOUTH DEPOSITS

ACCOMPANYING DIVISION OF MINES BULLETIN 129-A