DMA Form 1

DEFENSE MINERALS ADMINISTRATION
Control Slip

CONTROLLED DOCUMENT

DMA Docket No. 4166

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

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.

Cys. BM, GS
Routing Slip

To:	700	Date	2/10/56
To:	Mr. Mittendorf	Date	3/6/56
To:	H	Date	4-20-56
To:	Oper. Com	Date	5-18-56
To:	F. E. Johnson	Date	5-21-56
To:	Son	Date	5-21-56
To:	Mr. Mittendorf	Date	6-27-56
To:	Mr. Mittendorf	Date	7-30-56
To:	Mr. Johnson	Date	8-31-56
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	

DO NOT DETACH

CONTROLLED DOCUMENT

DMEA Form 7
(12-56)

OFFICIAL FILE COPY

Date	Surname	Code
5-15	Murphy	700
5-15	Ellis	700
	Butterdorf	100
5/16	C O	220
		~~220~~

MAY 16 1957

AIR MAIL

Mr. John M. Sherman, President
Uranium Exploration Company of California
Suite 212, California Bank Building
Pasadena, California

Re: Docket No. DMEA-4166 (Uranium)
Ridenour Mine, Hualapai Indian Lands
Coconino County, Arizona

Dear Mr. Sherman:

This is in response to your telegram of May 14, 1957.

Only one copy of each exhibit was submitted with the above-referenced application. A search through the docket shows no report by J. H. Sampson as having been received with the application. However, the following list of exhibits are herewith returned:

1. Mineral prospecting permit, dated March 5, 1955 with covering letter, dated October 20, 1955 from Bureau of Indian Affairs;

2. Modification and amendment of above permit, dated July 7, 1955;

3. Indenture of Lease. (undated, unsigned) Stamped "Bureau of Indian Affairs, received April 25, 1955 - 5354, Washington, D. C.";

4. A report, dated October 31, 1955, on Ridenour Mine by Harrison Schmitt, with copy of his letter November 6, 1955;

5. Your letter, dated May 10, 1956, with a copy of letter, dated March 18, 1956, by A. R. Kingaard;

6. Your letter, dated December 14, 1955, to DMEA re A. R. Kingaard's position; and

7. Letter, dated December 30, 1955, from Gulf Minerals Co., to A. R. Kingaard.

Sincerely yours,

STEPHENS

Ernest Wm. Ellis, Chief
Rare and Miscellaneous Metals Division

Enclosures

FMMurphy/izm 5-15-57
cc to: Mr. Murphy
Admr.'s Reading File
THKiilsgaard, 5224
DMEA FT Reg. 3 (2)

623

CLASS OF SERVICE

This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION TELEGRAM

W. P. MARSHALL, PRESIDENT

1201

SYMBOLS

DL=Day Letter

NL=Night Letter

LT=International Letter Telegram

The filing time shown in the date line on domestic telegrams is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

OA515

1957 MAY 14 PM 11 19

O PNA637 NL PD=PASADENA CALIF 14=

DEFENSE MINERALS, EXPLORATION ADMINISTRATION

DEPT OF INTERIOR ATTN ERNEST ELLIS=WASHDC=

INRE ROCKET #4166 RIDENOUR MINE REQUEST YOU RETURN VIA AIR MAIL ALL DATA SUBMITTED INRE APPLICATION. DUPLICATE COPIES APPARENTLY LOST IF IMPOSSIBLE PLEASE PHOTOSTAT AND RETURN OUR EXPENSE REPORT BY J H SAMPSON=

=URANIUM EXPLORATION CO OF CALIF

212 CALIFORNIA BANK BLDG PASADENA CALIF=.

(SEE OTHER SIDE)

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

OFFICIAL FILE COPY
DMEA
RECEIVED MAY 15 1957

DATE	INITIALS	CODE
5 15	C	220
"	Murphy	700
		225

Surname copy

700

Murphy Files

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

AUG 31 1956

Mr. John M. Sherman, President
Uranium Exploration Company of California
Suite 212, California Bank Building
Pasadena, California

Re: Docket No. DMEA-4166 (Uranium)
Ridemour Mine, Havalapai Indian Lands
Coconino County, Arizona

Dear Mr. Sherman:

This is with reference to our letters of May 22, June 27, and July 30, 1956, requesting additional information needed to process the subject application.

As we have not received any reply to our letters, we are considering your application as having been withdrawn and are placing it in our inactive files.

We regret the necessity of taking such action, however, it is taken without prejudice to your proposed project. If at some future time you desire to reopen this case, you may do so by filing a new application, referring to the subject application by the DMEA docket number, and furnishing the information previously requested, together with any other information that you think might be helpful.

Sincerely yours,

Frank E. Johnson

ACTING Administrator

FMMurphy/gla
8-31-56
cc to: Admr.'s Reading File
Docket
Messrs. JECrawford, Rm. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA
Code 700, Mr. Murphy
DMEA Field Team, Region III (2)

Surname copy

700

Murphy

Mittendorf

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

JUL 30 1956

Mr. John M. Sherman, President
Uranium Exploration Company of California
Suite 212, California Bank Building
Pasadena, California

Re: Docket No. DMEA-4166 (Uranium)
Ridenour Mine, Hualapai Indian Lands
Coconino County, Arizona

Dear Mr. Sherman:

Reference is made to our letters, dated May 22 and June 27, 1956, relating to the captioned docket.

Inasmuch as we have received no reply, we assume that you no longer desire to proceed with the application. We wish to cooperate with you in the matter of allowing ample time, but if the needed data have not been received within thirty days from the date of this letter, we will then consider the docket closed.

Sincerely yours,

Ernest Wm. Ellis, Chief
Rare and Miscellaneous
Metals Division

FMMurphy/gla
7-27-56
cc to: Admr.'s Reading File
Docket
Messrs. JECrawford, Rm. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA
Code 700, Mr. Murphy
DMEA Field Team, Region III (2)

R.C.J.

700

FILE COPY
Surname: Murphy

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

JUN 27 1956

Mr. John M. Sherman, President
Uranium Exploration Company of California
Suite 212, California Bank Building
Pasadena, California

Re: Docket No. DMEA-4166 (Uranium)
Ridenour Mine, Hualapai Indian Lands
Coconino County, Arizona

Dear Mr. Sherman:

Reference is made to your letter of May 10, 1956, and the reply of F. L. Knouse, of this Division, dated May 22, 1956, relating to the captioned docket.

Action on your application is pending receipt of the information requested in Mr. Knouse's letter. If you are no longer interested in the processing of this application, please advise us.

Sincerely yours,

Ernest Wm. Ellis, Chief
Rare and Miscellaneous
Metals Division

F.M. MURPHY
~~FLKnouse~~/izm 6-27-56
cc to: Docket
Code 700
Admr.'s Reading File
DMEA Field Team, Reg. III (2)
Messrs. JECrawford, Rm. 3643
THKiilsgaard, Rm. 5224
TDHosted, Rm. 3210, GSA
Mr. Knoused

R.S.S.

700

FILE COPY
Surname:

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

MAY 22 1956

Mr. John M. Sherman, President
Uranium Exploration Company of California
Suite 212, California Bank Building
Pasadena, California

Re: Docket No. DMEA-4166 (Uranium)
Ridenour Mine, Hualapai Indian Lands
Coconino County, Arizona

Dear Mr. Sherman:

This is to acknowledge receipt of your letter of May 10, and also the enclosed letter, dated March 18, 1956, by Mr. Alexander R. Kingaard.

The type of investigation for ore occurrences proposed in the subject application and mentioned by Mr. Kingaard is considered by this Agency to be a prospecting venture rather than exploration based upon favorable geologic criteria.

Information presently available indicates that the aerial and various ground reconnaissance surveys, made by the U. S. Geological Survey throughout the subject area, did not succeed in finding any favorable indications of possible significant uranium occurrences except possibly at the Ridenour mine. Therefore, there appears to be no justification in your proposal to initiate another reconnaissance survey of the same area with Government participation.

In order to recommend Government aid in an exploration project, we must have specific data, compiled by the applicant, which indicate the geologic probability of making a discovery of significant quantities of the minerals or metals concerned. Also, we require a definite outline of the proposed exploration and the estimated cost.

In view of the above-mentioned requirements of this Agency in regard to exploration projects, it is suggested that you review the application and, if you so desire, submit an amended proposal for exploration of a possible target area.

We will hold the subject application in abeyance for thirty days from the date of this letter pending receipt of your reply.

Sincerely yours,

SIGNED
F. L. Inouse, Acting Chief
Rare and Miscellaneous
Metals Division

FMMurphy/izm 5-18-56
cc to: Docket
Code 700
Admr.'s Reading File
Mr. Murphy
Messrs. JECrawford, Rm. 3643
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA
DMEA Field Team, Rm III (2)

700

FILE COPY
Surname:

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

MAY 22 1956

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

Re: Docket No. DMEA-4166 (Uranium)
Uranium Exploration Company of California
Ridenour Mine, Hualapai Indian Lands
Coconino County, Arizona

Dear Mr. Traver:

For your information, we are enclosing copies of memoranda dated February 24 and 29, 1956, by J. E. Crawford, USBM, and W. P. Williams, USGS, respectively, relating to the subject application. Also enclosed are copies of letters exchanged with the Applicant as follows:

1. A letter, dated May 10, 1956, from John M. Sherman to DMEA;

2. A letter, dated March 18, 1956, from Alexander M. Kingsaard to Mr. Ellis; and

3. Two copies of our reply, of even date, to Mr. Sherman.

You will note that we are holding the subject application in abeyance for the present.

Sincerely yours,

W. S. Martin
ACTING Chairman, Operating Committee

Enclosures

FMMurphy/izm 5-18-56
cc to: Docket
Code 700
Mr. Murphy
Admr.'s Reading File
Operating Committee
Messrs. JECrawford, Rm. 3643
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA

APPROVED:

/s/ Robert W. Geehan
Member, Bureau of Mines

Thor H. Kiilsgaard
Member, Geological Survey

JOHN M. SHERMAN
ATTORNEY AT LAW
SUITE 410 CALIFORNIA BANK BUILDING
FRESNO, CALIFORNIA
BYRAMOND 8-1188 BYRAM 8-1188

May 10, 1956

United States Department of the Interior
Bureau Mineral Exploration Administration
Washington 25, D.C.

In re: Docket No. MMEA-4108

Gentlemen:

You will please find enclosed letter from Alexander R. Kingsford, Mining Engineer, under date of March 18th, 1956, which I believe answers the question set forth in your letter of March 6th, 1956.

Through some oversight and inadvertence this letter was filed in my office, it being assumed that it was a copy of the original previously forwarded to you on March 18th, 1956.

In the event that you have any additional questions regarding the above set forth application, kindly advise me at your earliest convenience.

Very truly yours,

John M. Sherman

JMS:rbm
enc. letter

ALEXANDER R. KINGAARD
MINING ENGINEER
MEMBER, A. I. M. E., C. I. M.
435 AVENIDA PRIMAVERA
Post Office Box 1168 Telephone Skylane 9-4
DEL MAR CALIFORNIA

March 18 1956

Robert Wadlin
Chief, Rare and Miscellaneous Metals Section
United States Department of the Interior
Defense Minerals Exploration Administration
Washington 25 D.C.

Dear Sir:

Your letter of March 6 to Uranium Exploration Company of California relative to their DMEA-185 Application for Aid in an Exploration Project dated January 26 1956 Docket No.DMEA-185 suggesting that additional information be submitted to indicate the 324 square mile subject area as more favorable than presently appears cannot be presented on the basis of positive criteria without the participation and authority of the Defense Production Act of 1950,as amended,in a designed, systematic, and paid exploration procedure for obtaining the pertinent,geological,geophysical, and geochemical information you request.

The subject application was submitted for DMEA consideration as an exploration project of the Dunning Springs area of the Colorado Plateau and consisting stratigraphic units of the Triassic to Tertiary sediments providing continental geologic environment and envelopes strategic and critical minerals as well. (Western Mineral Belt Area,Cameron Area:Hacks Canyon Mine)

The subject application provides for multiple drilling procedure for appraising the potential evidence and established sandstone type uranium mineral deposits associated with the known thorium-sublimate vanadium/uranium copper/uranium occurrence in the stoped and unstoped vertical range of the Hidaway Mine. Previous conditions of Uranium Exploration Company of California having been pushed to the limits of $50,000 and available time for radiometric airborne and ground interpretations has to attest or having terminated in successes but no minerable inventory.

The submitted exploration project has estimate in the amount of $174,662 for the proposed 7 stage investigation of the area of interest is established upon a sound working program of geologic principles. Surface and concealed ore contents as observed will be interpreted by competent authority.

ALEXANDER R. KINGAARD
MINING ENGINEER
MEMBER, A. I. M. E., C. I. M.
435 AVENIDA PRIMAVERA
POSTOFFICE BOX 1168 TELEPHONE SKYLINE 5-2432
DEL MAR CALIFORNIA

March 18 1956

The type of exploration which will receive attention in the systematic exploration of the sizeable Fualapai Indian Reservation as well as the Ridenour Mine, where possibilities below depleted stopes have not been exhausted, calls for application of the principles of ore hunting in reverse; namely, the prompt rejection of unpromising sections of the area via initial reconnaissance and selective classification of ground(Wanna Concession Northern Rhodesia 1927-1929 Porter and Gray: West Province of Uganda East Africa: Wilson).

Progressive cost inversion from regional to select area investigation substantiates the most probable values estimated in the exploration budget.

Reference is made to the following paragraphs of your March 5 letter:

In regard to the proposed diamond drilling and access roads, are these to be pertinent to further exploration of the Ridenour Mine, or are they part of the proposed exploration of the general area of your land lease?

Access roads are not pertinent to further exploration of the Ridenour Mine. Access roads are pertinent to the proposed exploration of the general area of the land lease. Diamond drilling is pertinent to both the exploration of the Ridenour Mine and the general area of land lease.

If the holes are planned to explore a specific area, you should submit maps or sketches showing the approximate location, elevation and depth of the holes and the target area. Also, a narrative justifying the drilling program should be submitted.

Ridenour Mine: As a specific area for dimensional [illegible] drilling, caved and inaccessibility circumstances of the old workings prevent underground mapping for projected ore intercepts.

General Area of Interest: No specific area. Physical exploration unwarranted in the absence of geologic, geophysical, geochemical, or airborne-ground radiometric gamma line investigative procedures.

Justification of drilling program: indeterminate relative to the general area of interest because of lack of promising prospects or until exploration funds are available. Determinate relative to the Ridenour Mine because of definite genetic implications.

Respectfully submitted

Alexander R. Kingaard

700

FILE COPY
Surname: Murphy
Initials: Mitchell

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

APR 20 1956

Uranium Exploration Company
of California
212 Union National Bank Building
Pasadena, California

Re: Docket No. DMEA-4166 (Uranium)
Ridenour Mine, Hualapai Indian lands
Coconino County, Arizona

Gentlemen:

Reference is made to our letter of March 6, 1956, relating to the captioned application.

Action on your application is pending receipt of the additional information requested in the above-mentioned letter. If you are no longer interested in the processing of the application, please advise us.

Sincerely yours,

Ernest Wm. Ellis, Chief
Rare and Miscellaneous
Metals Division

FMMurphy/izm 4-20-56

cc to: Docket
Code 700-Mr. Murphy
Admr.'s Reading File
DMEA Field Team, Region III (2)
Messrs. JECrawford, Rm. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA

R.C.S.

700

FILE COPY
Surname:

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

MAR - 6 1956

Uranium Exploration Company
of California
212 ~~Union National Bank Building~~ California Bank Bldg
Pasadena, California

Suite

Re: Docket No. DMEA-4166 (Uranium)
Ridenour Mine, Hualapai Indian lands
Coconino County, Arizona

Gentlemen:

Your application for Government aid to explore the mine and other lands, under the captioned docket number, has been reviewed. Form MF-103 was submitted in quadruplicate; however, only one copy of the exhibits were enclosed with the application. This has caused a delay in processing it here in Washington as all uranium applications are reviewed by this Division as well as the U. S. Bureau of Mines and the U. S. Geological Survey.

Information available to this Agency shows that the previous airborne and ground radiometric surveys made of part of the subject area have given negative results as far as uranium is concerned. Moreover, it is noted that in one airborne survey anomalous radioactivity was not detectable over the Ridenour Mine, where some small uranium deposits are known to exist. Therefore, in our opinion, an airborne survey of the subject area could not be considered final, as negative results would not rule out the possibility of finding radioactive material on the ground. Without indicated anomalies, the ground reconnaissance survey proposed in the application would be considered prospecting. However, if you have additional information that indicates the subject area is more favorable than presently appears, we will be pleased to receive and consider it.

In regard to the proposed diamond drilling and access roads, are these items pertinent to further exploration of the Ridenour Mine, or are they part of the proposed exploration of the general area of your land lease?

If the holes are planned to explore a specific area, you should submit maps or sketches showing the approximate location, elevation and depth of the holes and the target area. Also, a narrative justifying the drilling program should be submitted.

We shall hold the application in abeyance for a reasonable length of time in order that you can submit the above-mentioned additional information.

R.C.S.

To expedite processing of your application, kindly submit four (4) copies of each exhibit.

Sincerely yours,

Ernest Wm. Ellis, Chief
Rare and Miscellaneous
Metals Division

FMMurphy/gla/izm 3-6-56
cc to: Docket
Code 700
Mr. Murphy
Admr.'s Reading File
DMEA Field Team, Region III (2)
Messrs. JECrawford, Rm. 3641
THKiilsgaard, Rm. 5224
JOHosted, Rm. 3210, GSA

3/2/56 lgm

IN REPLY REFER TO:

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

RECEIVED
FEB 29 1956

February 29, 1956

Memorandum

To: E. W. Ellis, Defense Minerals Exploration Administration

From: W. P. Williams, U. S. Geological Survey

Subject: Review of application, DMEA 4166, (uranium-copper) Uranium Exploration Company of California, Hualapai Indian Reservation, Ridenour Mine, Coconino County, Arizona.

The applicant, in rather vague terms, proposes to explore for uranium on the Hualapai Indian Reservation in northeastern Arizona by means of airborne radiometric reconnaissance methods and by core and percussion drilling. Total estimated cost of the project is $174,662.

The area proposed for exploration contains the old Ridenour copper mine. Copper, uranium, and vanadium mineralization is found at the mine in the Supai formation of Permian age. The Supai formation at the mine is altered from its usual red and buff color to gray. Other favorable characteristics, such as those in the Salt Wash member of the Morrison, have been noted. Assays of samples taken by the AEC, RME-2014, gave values as high as 1.84 percent U_3O_8 and 14.15 percent copper.

Searching for anomalous radioactivity through use of airborne radiation detecting instruments appears to be prospecting and reconnaissance. The applicant does not state where the proposed drill holes are to be placed nor what their objective would be. A drilling project in, or near, the Ridenour Mine might constitute a justifiable project inasmuch as favorable geologic conditions and significant mineralization are present. The isolated location of the mine and the rough terrain are disadvantageous.

I recommend that the applicant be asked to clarify his drilling proposals. After that it seems advisable to ask the Field Team for review and recommendations.

W P Williams

W. P. Williams

IN REPLY REFER TO:

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

RECEIVED
FEB 29 1956

February 29, 1956

Memorandum

To: R. W. Allis, Defense Minerals Exploration Administration

From: W. F. Williams, U. S. Geological Survey

Subject: Review of application, DMEA 4166, (uranium-copper) Uranium Exploration Company of California, Hualapai Indian Reservation, Ridenour Mine, Coconino County, Arizona.

The applicant, in rather vague terms, proposes to explore for uranium on the Hualapai Indian Reservation in northeastern Arizona by means of airborne radiometric reconnaissance methods and by core and percussion drilling. Total estimated cost of the project is $174,462.

The area proposed for exploration contains the old Ridenour copper mine. Copper, uranium, and vanadium mineralization is found at the mine in the Supai formation of Permian age. The Supai formation at the mine is altered from its usual red and buff color to gray. Other favorable characteristics, such as those in the Salt Wash member of the Morrison, have been noted. Assays of samples taken by the AEC, RMK-2014, gave values as high as 1.84 percent U_3O_8 and 14.15 percent copper.

Searching for anomalous radioactivity through use of airborne radiation detecting instruments appears to be prospecting and reconnaissance. The applicant does not state where the proposed drill holes are to be placed nor what their objective would be. A drilling project in, or near, the Ridenour Mine might constitute a justifiable project inasmuch as favorable geologic conditions and significant mineralization are present. The isolated location of the mine and the rough terrain are disadvantageous.

I recommend that the applicant be asked to clarify his drilling proposals. After that it seems advisable to ask the Field Team for review and recommendations.

WFWilliams:bed
G-2/29/56

W. F. Williams

cc: Director's reading, 4212
Branch reading, 4212
DMEA (3)
Docket file

2/27/56 gla

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

February 24, 1956

Memorandum

RECEIVED
FEB 24 1956

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee, Room 4445

From: John E. Crawford, Bureau of Mines Member
Uranium Commodity Committee

Subject: Application for assistance, DMEA Docket 4166, Uranium Exploration Company of California, Ridenour Mine, Hualapai Indian Reservation, Coconino County, Arizona

I have reviewed the attached application of the Uranium Exploration Company of California, DMEA Docket 4166, dated January 28 and received in this office February 10. I have also discussed it with Joseph O. Hosted, Washington representative of the Atomic Energy Commission.

The data supplied by Alexander R. Kingaard, Mining Engineer, of the Uranium Exploration Company of California, on Form MF-103 are insufficient to properly evaluate the application. However, supplemental information supplied by Fred M. Murphy of the DMEA indicates that mineralization in the Ridenour Mine, Hualapai Indian Reservation, Coconino County, Arizona, is confined to a compound vein associated with a breccia pipe of probable volcanic origin. The mine has produced about 1,000 tons of copper ore and some high-grade gold and silver.

A yellow uranium mineral, probably carnotite, has been found in the mine, its presence having been noted by investigations of Atomic Energy Commission geologists whose reports are contained in RME-2007 and RME-2014. Samples taken from mineralized areas assayed from trace amounts to 1.84 percent U_3O_8. It is doubtful that the uranium mineralization is of significance. Little or no radioactivity was noted in the lower level of the mine. Because mine costs would be relatively high, a large deposit of better-than-average grade uranium would have to be mined in order to make its recovery economical.

The applicant has submitted no definite exploration program, and inasmuch as the project appears to be a prospecting venture, we recommend its denial.

John E. Crawford

John E. Crawford

Attachment

February 9, 1956
Subject: DMEA-4166
Re: Exploration Assistance
Ridenour Mine

Uranium Exploration Company of
California
212 Union National Bank Building
Pasadena, California

Gentlemen:

The receipt of your application dated January 28, 1956, for exploration assistance under the Defense Production Act of 1950, as amended, is hereby acknowledged.

Your application has been assigned Docket Number DMEA-4166 and referred to the Rare & Misc. Metals Division.

Kindly identify all future correspondence relating to your application by this docket number.

Sincerely yours,

Robert E. Adams, Chief
Operations Control and
Statistics Division

February 9, 1956

Memorandum

To: Executive Officer, DMEA Field Team, Region III

From: Chief, Operation's Control and Statistics Division

Subject: Assignment of Docket Number

There is listed below the assigned docket number to an application recently received from Region III.

DMEA - 4166 Uranium Exploration Company of California

Robert E. Adams
Chief, Operation's Control
and Statistics Division

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

RECEIVED
FEB - 9 1956

February 6, 1956

224 New Customhouse
Denver 2, Colorado

Memorandum

To: Chairman, Operating Committee, DMEA

From: Field Team, Region III

Subject: Application for DMEA Aid (Uranium-Copper), Uranium Exploration Company of California, Ridenour Mine, Hualapai Indian Tribe lands, Coconino County, Arizona

Enclosed are three copies of Form MF-103 and the only copy of supplemental data submitted by the applicant. One copy of form MF-103 has been retained in this office.

The essence of the application is for DMEA aid to prospect approximately 200,000 acres (312 square miles) on the Hualapai Indian Reservation, Arizona at a total estimated cost of $174,662.00.

This application is on land which is properly in the Plateau Area, but since the applicant only supplied one copy of the required information, we did not have one to send to the Grand Junction office for review.

DMEA Field Team, Region III

By W. M. Traver
Executive Officer

Enclosures

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

RECEIVED
FEB - 9 1956

February 6, 1956

224 New Customhouse
Denver 2, Colorado

Memorandum

To: Chairman, Operating Committee, DMEA

From: Field Team, Region III

Subject: Application for DMEA Aid (Uranium-Copper), Uranium Exploration Company of California, Ridenour Mine, Hualapai Indian Tribe lands, Coconino County, Arizona

Enclosed are three copies of Form MF-103 and the only copy of supplemental data submitted by the applicant. One copy of form MF-103 has been retained in this office.

The essence of the application is for DMEA aid to prospect approximately 200,000 acres (312 square miles) on the Hualapai Indian Reservation, Arizona at a total estimated cost of $174,662.00.

This application is on land which is properly in the Plateau Area, but since the applicant only supplied one copy of the required information, we did not have one to send to the Grand Junction office for review.

DMEA Field Team, Region III

W. M. TRAVER,

By W. M. Traver
Executive Officer

Enclosures

Date Rec'd

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

RECEIVED
FEB - 9 1956
BUREAU OF MINES
Denver, Colorado

Form Approved.
Budget Bureau No. 45-R1038.2

FEB 1 1956

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

Not to be filled in by applicant

Docket No. DMEA-4166
Metal or Mineral Uranium-Copper
Date Received 2-9-56
Estimated Cost $174,662.00
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Uranium Exploration Company of California (a Calif. corporation) 212 Union National Bank Building Pasadena California President: John M. Sherman Officers: C. Fanderlik : A. Locke

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

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

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

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

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract Refer to: Mineral Prospecting Permit (enclosed) United States Dept. of The Interior, Bureau of Indian Affairs April 25 1955

(*b*) State any mine name by which the property is known. partial: Ridenour Mine

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise Permittees and Lessees

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. enclosed

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

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice. x

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

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

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

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

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

16—66551-1

ENCLOSED: Report of Harrison Schmitt: Ridenour Mine
RME-2007 USAEC : Hualapai Indian Reservation

5. *The exploration project.*—(a) State the mineral or minerals for which you wish to explore Uranium, Vanadium, and Copper ore/minerals

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

(c) The work will start within 30 days and be completed within 9 months from the date of an exploration project contract.

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

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

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

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

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

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

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

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

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

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

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

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

(b) How do you propose to furnish your share of the costs? cash participation

[x] Money [ ] Use of equipment owned by you [ ] Other

Explain in detail on acompanying paper.

CERTIFICATION

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

Dated January 28, 1956

URANIUM EXPLORATION COMPANY OF CALIFORNIA
(Applicant)

By Alexander R. Kingaard

Alexander R. Kingaard, Mining Engineer

Member, American Institute of Mining and Metallurgical Engineers

~~*Member, Canadian Institute of Mining and Metallurgy*~~

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

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

ALEXANDER R. KINGAARD
MINING ENGINEER
MEMBER, A. I. M. E., C. I. M.
435 AVENIDA PRIMAVERA
POSTOFFICE BOX 1168 TELEPHONE SKYLINE 5-2432
DEL MAR CALIFORNIA

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FEB - 9 1956

January 16 1956

COPY

H.C.Miller
Executive Officer
DMEA Field Team Region 3
United States Department of The Interior
Defense Minerals Exploration Administration
1012 Flood Building 870 Market Street
San Francisco California

Dear Mr.Miller:

Uranium Exploration Company of California,212 Union National Building, Pasadena California, are permittees to the exclusive mineral prospecting rights on the 200,000 acre Hualapai Indian Reservation Arizona granted them,in consideration of $25,000,by the Tribal Council acting for the Hualapai Indian Tribe peach Springs,Arizona.

Accomplishments to date have been 1) negative opinion of Harrison Schmitt relative to the depleted breccia-pipe Rideneur Mine(Cu:4.0% V_2O_5:3.9% U_3O_8:1.15%) and his recommendation that similar ore environments be investigated in the area of interest. 2) Rejection by Gulf Minerals Company of a venture proposal. Excerpt:"we agree that the venture is feasable and would be an interesting one. But we are skeptical as to-large scale ore possibilities there and feel that the expense involved in outfitting what might be an expedition would be out of line with the potentialities of the district."

DMEA participation is respectfully requested in an exploration budget to systematically evaluate the Hualapai Indian Reservation by standard ground and air-borne uranium ore-finding techniques.

Very truly yours
Alexander R.Kingaard
Alexander R.Kingaard

ALEXANDER R. KINGAARD
MINING ENGINEER
MEMBER, A. I. M. E., C. I. M.
435 AVENIDA PRIMAVERA
POSTOFFICE BOX 1168 TELEPHONE SKYLINE 5-2432
DEL MAR CALIFORNIA

RECEIVED
FEB - 9 1956

COPY

January 29 1956

Defense Minerals Exploration Administration
Bureau of Mines 224 New Customhouse Building
Denver 2 Colorado

Gentlemen:

Request of Uranium Exploration Company of California for DMEA exploration cost participation has been referred by Mr.S.Ricker Executive Officer DMEA Field Team Region II to your Denver Office.

Supplementing MF-103(in quadruplicate)reference is made to the following enclosed items:

1 letter from S.Ricker Region II to A.R.Kingaard 1-19-56
1 letter from A.R.Kingaard to H.C.Miller Region III 1-16-56
1 cost estimate sheet (6 a-h MF-103)
1 letter from F.M.Haverland to John M.Sherman October 20 1955
1 letter from F.M.Haverland approving March 5 Permit 10-20-55
1 mimeographed Mining Lease pages 1-8 4-25-55 #5354
1 Mineral Prospecting Permit United States Dept.of The Interior Bureau of Indian Affairs Colorado River Agency Truxton Canon Subagency Valentine Arizona received April 25 1955 #5354 Bur. of Indian Affairs Wash.,D.C. entered into March 5 1955 and signed: Modification and Ammendment received July 11 1955 by Bur.of Indian Affairs Phoenix Arizona(2 pages) signatures affixed July 7 1955
1 letter from John M.Sherman to DMEA 12-14-55
1 letter from John M.Sherman to AEC 12-14-55
1 AEC Report RME-2007 by Richard D.Miller - In docket envelope
1 Report by Harrison Schmitt
1 letter from Gulf Minerals Company to A.R.Kingaard
1 Geologic map of Hualapai Indian Reservation (after D.Koons)
1 Topographic map: General Area of Interest.

Respectfully submitted
URANIUM EXPLORATION COMPANY OF CALIFORNIA
by Alexander R. Kingaard
Alexander R.Kingaard

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

RECEIVED FEB - 9 1956

DMEA Date Rec'd. FEB 1 1956
BUREAU OF MINES Denver, Colorado

1605 Evans Avenue
Reno, Nevada

January 19, 1956

Alexander R. Kingaard
435 Avenida Primavera
Del Mar, California

Dear Mr. Kingaard:

Reference is made to your letter of January 16, 1956 regarding DMEA participation in an exploration project in Arizona.

Inasmuch as your proposed project is in Arizona, you should address future correspondence to the Defense Minerals Exploration Administration, c/o Bureau of Mines, 224 New Customhouse Building, Denver 2, Colo. We are in the meantime sending a copy of your letter to that office and enclosing the booklet entitled "The Defense Minerals Exploration Program", DMEA Order 1 Amended, and one set of Application for Aid forms, MF-103.

We believe these dockets are self explanatory, but are sure that the Denver office will be pleased to help you if any questions arise.

Very truly yours,

S. Ricker
Executive Officer
DMEA Field Team, Region II

Encl.

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FEB - 9 1956

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
Phoenix Area Office
Phoenix, Arizona

This Mineral Prospecting Permit dated 5th day of March 1955, granted to the Uranium Exploration Company of California, consisting of pages numbered 1 through 9 inclusive, of which this is page 9, together with an amendment thereto, executed on the 7th day of July 1955, is hereby approved, pursuant to authority delegated by Central Office letter of May 13, 1955 "Minerals 5354-55."

(SIGNED) F.M. HAVERLAND

Area Director

Date: OCT 2 0 1955

JOHN M. SHERMAN
ATTORNEY AT LAW
SUITE 212 CALIFORNIA BANK BUILDING
PASADENA, CALIFORNIA
SYCAMORE 2-1125 RYAN. 1-7582

RECEIVED
FEB - 9 1956

December 14, 1955

Atomic Energy Commission

This is to advise you that Mr. Alexander Kingaard is officially representing the Uranium Exploration Company of California who holds the exclusive prospecting permit on the Hualapai Indian Reservation in the northern part of Arizona.

Mr. Kingaard is our consulting mining engineer and is authorized in all respects to represent our company.

Very truly yours,

URANIUM EXPLORATION COMPANY
OF CALIFORNIA

By John M. Sherman, President

jms;mjb

Only one copy of supplemental data submitted by applicant. Please contact DMEA, Rare & Misc. Metals Division for additional information.

2-10

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

RECEIVED
FEB - 9 1956

DMEA
Date Rec'd. FEB 1 1956
Form Approved.
Budget Bureau No. 42-R1035.2

BUREAU OF MINES
Denver, Colorado

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

Not to be filled in by applicant.

Docket No. DMEA-4166
Metal or Mineral Uranium-Copper
Date Received 2-9-56
Estimated Cost $174,662.00
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Uranium Exploration Company of California (a Calif. corporation)
212 Union National Bank Building Pasadena California
President: John E. Sherman Officers: O. Pandelik & A. Locke
300 new address on Applicants letter of May 10, 1956

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

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

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

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

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract Refer to: Mineral Prospecting Permit (enclosed) United States Dept. of The Interior, Bureau of Indian Affairs April 25 1955

(*b*) State any mine name by which the property is known. partial: Ridenour Mine

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise Permittees and Lessees

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. enclosed

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

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice. X

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

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

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

16—66551-1

ENCLOSED Report of Harrison Schmitt: Ridenour Mine
RME-2007 USAEC : Gualapai Indian Reservation

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

Uranium, Vanadium, and Copper ore/minerals

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

(*c*) The work will start within 30 days and be completed within 9 months from the date of an exploration project contract.

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

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

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

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

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

(*b*) How do you propose to furnish your share of the costs? Cash participation

☒ Money ☐ Use of equipment owned by you ☐ Other

Explain in detail on acompanying paper.

CERTIFICATION

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

Dated January 20, 1956

URANIUM EXPLORATION COMPANY OF CALIFORNIA
(Applicant)

By Alexander R. Wagner

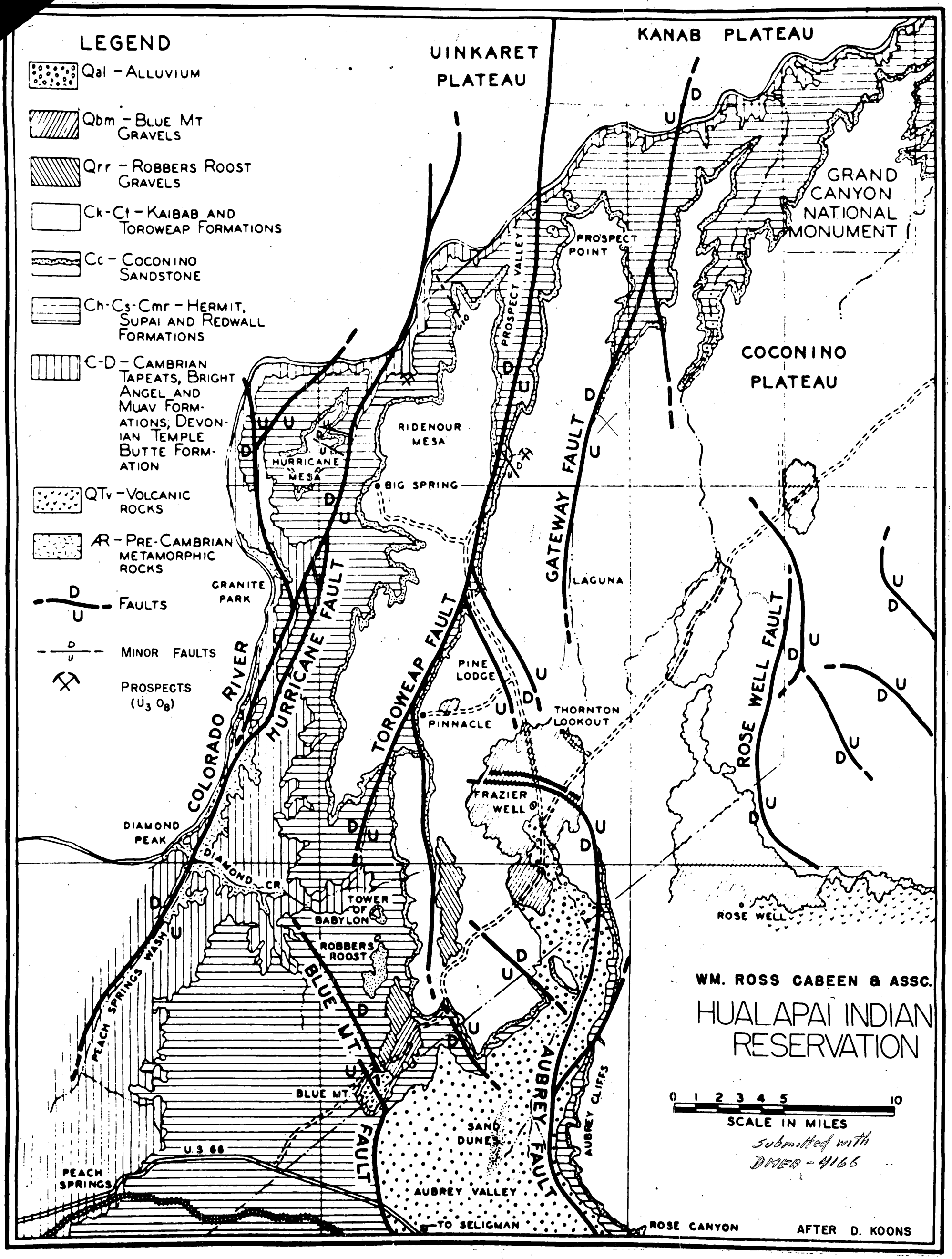
Alexander R. Wagner, Mining Engineer

Member, American Institute of Mining and Metallurgical Engineers

Member, Canadian Institute of Mining and Metallurgy

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

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


LEGEND
Qal - ALLUVIUM
Qbm - BLUE MT GRAVELS
Qrr - ROBBERS ROOST GRAVELS
Ck-Ct - KAIBAB AND TOROWEAP FORMATIONS
Cc - COCONINO SANDSTONE
Ch-Cs-Cmr - HERMIT, SUPAI AND REDWALL FORMATIONS
€-D - CAMBRIAN TAPEATS, BRIGHT ANGEL AND MUAV FORMATIONS, DEVONIAN TEMPLE BUTTE FORMATION
QTv - VOLCANIC ROCKS
AR - PRE-CAMBRIAN METAMORPHIC ROCKS
FAULTS
MINOR FAULTS
PROSPECTS (U_3O_8)
UINKARET PLATEAU
KANAB PLATEAU
GRAND CANYON NATIONAL MONUMENT
COCONINO PLATEAU
PROSPECT POINT
PROSPECT VALLEY
RIDENOUR MESA
HURRICANE MESA
BIG SPRING
GATEWAY FAULT
LAGUNA
GRANITE PARK
HURRICANE FAULT
TOROWEAP FAULT
PINE LODGE
PINNACLE
THORNTON LOOKOUT
ROSE WELL FAULT
FRAZIER WELL
COLORADO RIVER
DIAMOND PEAK
DIAMOND CR.
TOWER OF BABYLON
ROBBERS ROOST
ROSE WELL
PEACH SPRINGS WASH
BLUE MT. FAULT
BLUE MT.
AUBREY FAULT
AUBREY CLIFFS
SAND DUNES
U.S. 66
PEACH SPRINGS
AUBREY VALLEY
TO SELIGMAN
ROSE CANYON
WM. ROSS CABEEN & ASSC.
HUALAPAI INDIAN RESERVATION
0 1 2 3 4 5 10
SCALE IN MILES
Submitted with DMEB - 4166
AFTER D. KOONS

RECEIVED
FEB - 9 1956

UNITED STATES ATOMIC ENERGY COMMISSION

RME-2007 - submitted with application DMEA-4166
Murphy

RECONNAISSANCE FOR URANIUM IN THE HUALAPAI INDIAN RESERVATION AREA, MOHAVE AND COCONINO COUNTIES, ARIZONA

Also see RME-2014 in Ellis' office - supplements above

By
Richard D. Miller

April 1954

Salt Lake Exploration Branch
Division of Raw Materials
Salt Lake City, Utah

Technical Information Service, Oak Ridge, Tennessee

Subject Category, GEOLOGY AND MINERALOGY.

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RECONNAISSANCE FOR URANIUM IN THE HUALAPAI INDIAN RESERVATION AREA, MOHAVE AND COCONING COUNTIES, ARIZONA

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RECONNAISSANCE FOR URANIUM IN THE HUALAPAI INDIAN RESERVATION AREA, MOHAVE AND COCONINO COUNTIES, ARIZONA

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RECONNAISSANCE FOR URANIUM IN THE HUALAPAI INDIAN RESERVATION AREA, MOHAVE AND COCONINO COUNTIES, ARIZONA

ABSTRACT

The Hualapai Indian Reservation and contiguous areas just south of the Colorado River in northwestern Arizona were investigated for uranium by reconnaissance methods. The rugged topography, large extent of the area within a sparsely populated Indian reservation, and absence of recent mining activity are factors which substantially contribute to lack of interest in uranium prospecting in the area.

Paleozoic sediments ranging in age from Cambrian to Permian (Ordovician and Silurian missing) are exposed by deep canyons. Pre-Cambrian basement rocks consisting of granite and metamorphic rocks underlie the sediments; Quaternary and Tertiary volcanic rocks and late Tertiary gravels overlie small areas of the Paleozoic rocks. Major faults are a conspicuous feature of the eastern part of the area.

The Ridenour mine in the northeastern part of the reservation is near similar prospects north of the Colorado River. This old copper deposit in Supai sandstone contains carnotite and other vanadium minerals in the hanging wall of the mineralized vein and breccia zone of copper sulphides and carbonates. Mine workings closely follow geologic structure which appears to have controlled an ore body resembling part of a hollowed-out, truncated cone.

Copper deposits in the Kaibab limestone and miscellaneous deposits and outcrops were investigated without finding significant radioactivity.

The Permian Supai formation and the lower Hermit shale appear to be the most favorable rocks for uranium deposits localized by stratigraphic control. The proximity of known uranium occurrences to major faults indicates that the northeastern part of the reservation where faults are extensive may be a favorable area for prospecting.

RECONNAISSANCE FOR URANIUM IN THE HUALAPAI INDIAN RESERVATION AREA, MOHAVE AND COCONINO COUNTIES, ARIZONA

INTRODUCTION

Location and Access

The Hualapai Indian Reservation is in the northwestern part of Arizona and occupies 1,600 square miles, just south of the Colorado River (Figure 1). Peach Springs is the only town on the reservation, and Seligman lies a short distance southeast of the reservation boundary. The Atchison, Topeka, and Santa Fe Railroad and U. S. Highway 66 serve Seligman and Peach Springs. A graveled road constructed by the Bureau of Indian Affairs starts from a point seven miles east of Peach Springs and crosses the reservation near the southeastern and eastern boundaries connecting with Hill Top, which overlooks the trail to the Supai Indian Reservation. A similar road has been constructed along the southwestern boundary to New Water Tank near the canyon rim in the northwest corner of the reservation. Other roads in the reservation are unimproved; large areas are inaccessible by vehicle.

Object and Methods of Investigation

The area was investigated to obtain preliminary information on regional uranium possibilities and to determine the type and extent of necessary additional work. Reconnaissance methods were used during intermittent field work from May to October 1953. A Scintillometer was kept in operation in a four-wheel drive vehicle when traveling over dirt roads. Local residents were contacted concerning prospects and mine workings, most of which have not been active since World War I or before. An attempt was made to interest the Hualapai Indians in prospecting for uranium. Reconnaissance on foot was done where necessary to reach isolated mineral occurrences and to examine outcrops exposed in canyons and along rims.

The Ridenour mine in the northeastern part of the reservation, previously known to contain uranium, was examined in a somewhat more detailed manner, and a short description is included. This

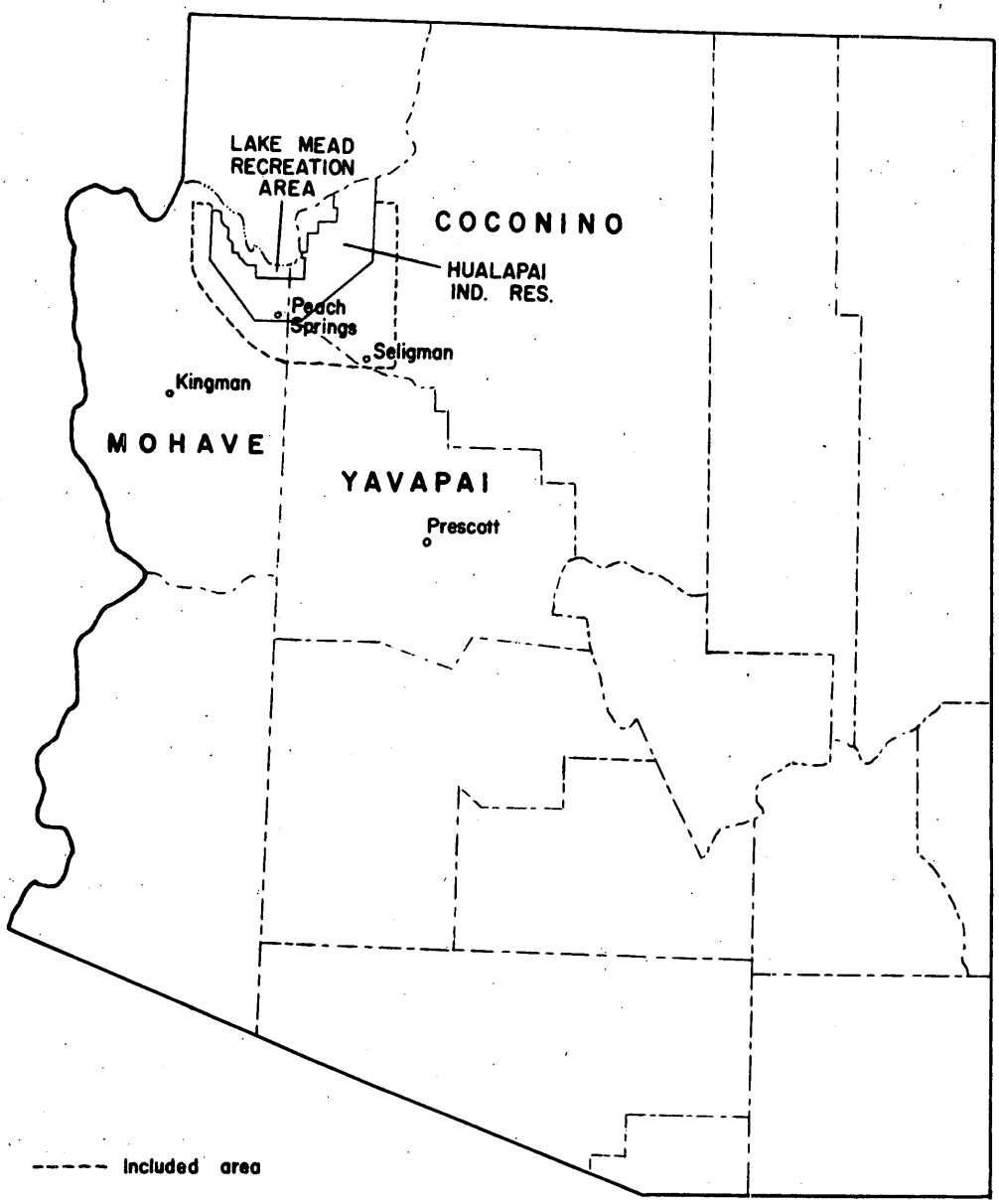


Fig. 1

INDEX MAP OF ARIZONA SHOWING AREA
INCLUDED IN REPORT

0 50 100 miles

deposit is described in more detail in a separate report. The Copper Mountain mine and the Chapel claims, just north of the Colorado River from the Ridenour mine are in similar geologic settings and also contain uranium. They were not visited, but knowledge of their existence contributed to the desirability of conducting reconnaissance in this area.

Acknowledgments

Members of the Hualapai Indian Tribe were cooperative in furnishing information. The writer wishes to thank Mr. Frank Beecher and Mr. Grant Tapija for guide service and other assistance during the investigation.

Inhabitants

The majority of the Hualapai Indians live in the immediate vicinity of Peach Springs with only a few families living on ranches in the interior of the reservation. Cattle raising is the chief tribal industry; lumbering has been important as a source of tribal income in recent years until the closing of the sawmill during the past summer. All mining has been dormant for several years and only a few members of the tribe appear to be interested in prospecting for mineral deposits. The Truxton Canyon Indian Agency is in Valentine, 18 miles southwest of Peach Springs, but the Tribal Council of the Hualapai Indians meets in Peach Springs.

The land adjacent to the reservation included in this investigation supports a few non-Indian ranchers.

Topography

The area forms the southwestern corner of the Colorado Plateau physiographic province and is part of the Coconino Plateau subdivision. The Colorado River cuts through several thousand feet of Paleozoic sediments in a deep curving canyon which is a downstream extension of the Grand Canyon, although not included in Grand Canyon National Park or Grand Canyon National Monument. A series of deep canyons drains toward the river from the reservation, and elevations range from 1,100 to a little over 7,000 feet. Numerous branches with

steep walls form a drainage pattern which varies in character from dendritic to trellis. Principal canyons within the area investigated include from east to west: National, Mohawk, Prospect, Diamond Creek, Peach Springs, Spencer, and Quartermaster. Meriwhitica, Milkweed, and Hindu Canyons drain into Spencer Canyon.

Erosion remnants ranging in magnitude from sharp buttes to large mesas and long ridges are isolated from easy access by the canyon barriers. Prospect Valley, Laguna, and uppermost Peach Springs Draw (all fault-controlled) form comparatively wide valleys. The Aubrey Valley is a large closed alluvial basin extending south of the eastern part of the reservation and is bounded on the east by a long fault escarpment forming the Aubrey Cliffs. The barren Grand Wash Cliffs form an abrupt southwestern and western boundary to the Colorado Plateau. Vegetation in the western part of the area consists of sagebrush and other semi-arid shrubbery with occasional stands of juniper and pinon trees. Most of the eastern part of the reservation is timbered with juniper, oak, and pinon, with pine forests at the higher elevations. The Aubrey Valley and the northeastern part of the area is covered with grass and scanty shrubbery.

Climate

The climate of the region is semi-arid and typical of the Colorado Plateau. Temperatures range from more than 20° below zero during winter to over 105° in the summer. A moderate amount of snow falls during winter months and the greatest amount of rain normally falls during July and August. Precipitation and temperatures vary greatly with the extremes in elevation, and there is considerable variation from year to year. Surface water is very scarce, except for a few springs in the deeper canyons.

GEOLOGY

Stratigraphy

Pre-Cambrian basement rocks are exposed along the Grand Wash Cliffs, in the Colorado River gorge, and in Meriwhitica, Spencer, Diamond Creek, and Peach Springs canyons near junctions with the river. Paleozoic sediments ranging in age from Cambrian to Permian overlie the basement rocks to a maximum

thickness of over 5,000 feet. The Ordovician and Silurian periods are not represented. Late Tertiary gravels mantle some of the higher mountains in the eastern part of the reservation. Volcanic rocks cover sediments over a small area of the Grand Wash Cliffs and occur as isolated cinder cones in the canyon of the Colorado River to the northeast. Quaternary volcanic rocks also overlie gravels at Blue Mountain along the southeastern reservation boundary. The large lava fields of Mount Floyd northeast of Seligman are mostly outside of the area investigated, except for rhyolite and pumice outcrops in the Bishop Mountain area along the western edge of the flow. Table I gives a brief description of rock units encountered during reconnaissance.

Structure (Figure 2)

Rocks in the western part of the area have a gentle regional dip to the northeast. Beds of the eastern part of the area are almost horizontal on a regional scale, although local folding of small magnitude and minor crinulations were noted. A monocline is conspicuous on the west rim of Meriwhitica Canyon; this sharp fold changes to a minor fault on the eastern rim of the same canyon.

Major faults are a prominent feature of this region. The Hurricane fault extends into this area from southern Utah where it forms the Hurricane Cliffs. At the Colorado River the fault has a reported displacement of 1,500 feet with the eastern side upthrown. In the Granite Park area along the river, the fault becomes complex with several branches. The main branch extends south with decreasing displacement into Peach Springs Draw. The Toroweap fault also enters the area from north of the Colorado River and extends southward to form Prospect Valley. It has a displacement of about 600 feet at the river, which increases to 1,000 feet at Pinnacle. Near Pinnacle the Toroweap fault splits with the main branch trending south toward the Robber's Roost area, and thence into the alluvium of Aubrey Valley. The Gateway fault has a much smaller displacement than the Hurricane and Toroweap faults, but roughly parallels them. This fault enters the area through Gateway Canyon (just east of Mohawk Canyon) and extends to the closed drainage area formed at Laguna. The Aubrey fault is the fourth major structure in the area and forms the Aubrey Cliffs. It follows a curving northern course to

Table I

SUMMARY OF ROCK UNITS - HUALAPAI INDIAN RESERVATION AREA, ARIZONA

Age	Formation	Approx. Thickness	Description
Quaternary and Tertiary	Unconformity		Alluvial fans, sand dunes, and floodplain deposits in Aubrey Valley. Pleistocene (?) basalt overlies Blue Mountain gravel. Robber's Roost gravels derived from Kaibab and Toroweap limestones. Tertiary volcanic rocks (west of Mt. Floyd) are largely basalt with some rhyolite, pitchstone, and pumice.
Permian	Kaibab fm.	340	Massive cherty magnesian limestone, very fossiliferous, at top (50 ft.). Underlain by alternating beds of chert, sandy limestone, and calcareous sandstone. Forms cliffs.
Permian	Toroweap fm.	260	Irregular bedded, fluvial buff and red sandstone (130 ft.). Underlain by massive magnesian limestone with alternating beds of sandstone and limestone at base. Middle member forms cliff.
Permian	Coconino ss.	100-300	Light yellow to white sandstone composed of uniform, medium-fine grains of quartz with siliceous cement. Conspicuously cross-stratified. Persistently forms cliff.
Permian	Hermit sh.	400	Red sandy shale or mudstone and fine-grained sandstones. Forms slope.
Permian (may be Pennsylvanian at base)	Supai fm.	900	Upper 300 ft: Buff to red, fine to medium-grained cross-stratified sandstone with thin red mudstone partings. Forms ledges and cliffs. Middle 400 ft.: Alternating beds of sandy mudstone, thick cross-stratified sandstone, and thin sandy limestone. Forms ledges in upper part and cliff at bottom. Lower 200 ft.: Alternating beds of red shale, purple-gray limestone, and buff to red calcareous sandstone. Forms ledgy slope.
Mississippian	Unconformity Redwall ls.	600	Massive blue-gray, crystalline limestone. Forms sheer, red-stained cliff.
Devonian	Temple Butte ls.	0-75	Thin bedded, mottled, buff and light purple, sandy limestone.
Cambrian	Unconformity Muav ls.	450	Massive buff dolomite at top, underlain by buff calcareous sandstone. Lower 300 ft. consists of alternating beds of limestone and sandstone with shale partings. Cliffs at top and bottom.
Cambrian	Bright Angel sh.	375	Thin bedded micaceous shale and fine-grained sandstone with 3 or more interbedded layers of yellow-brown glauconitic dolomite. Forms slope broken by dolomites.
Cambrian	Tapeats ss.	325	White to light gray cross-stratified sandstone at top; very coarse-grained in Grand Wash Cliffs area. Underlain by brown cross-stratified sandstone, massive and coarse-grained at base. Middle members are quartzite in Grand Wash Cliffs area. Forms ledges near top with steep cliff at base.
Pre-Cambrian	Unconformity		Metamorphic rocks. Chiefly gneissic granite with large orthoclase phenocrysts. Some quartz-biotite schist, quartz veins, and pegmatites.

the Frazier Wells area. Other prominent faults with smaller displacements are shown by Figure 2. All of the larger faults influence the topography of the area. Every mineralized area is within two miles of one of these faults.

MINERAL DEPOSITS AND LOCALITIES INVESTIGATED

Ridenour Mine

The Ridenour mine is in the northeastern part of the reservation on a northern promontory formed by a lower bench of Ridenour Mesa. This mesa is an elongated fault block between the Toroweap and Hurricane faults. Final access to the mine is by a winding trail about four miles in length. The difference in elevation is about 1,500 feet from the top of the rim to the mine.

The mine was worked intermittently for copper between 1870 and 1919. Local reports indicate that about 1,000 tons of hand-sorted high-grade copper ore were carried out by burro during World War I.

The deposit is in bleached fine-grained sandstone members of the normally red Supai formation. Interbedded thin mudstone beds in the mine workings are altered to greenish grey. The ore minerals occur in veins and brecciated zones structurally controlled by shears and fractures following a semi-circular course in plan view. The shape of the ore body resembles part of a hollowed-out, truncated cone.

The mine workings closely follow the geologic structure. Ore has been mined from curving narrow stopes to the 80-foot level, with no evidence of deeper workings. Means of access to the workings include two inclined shafts and two lower haulage adits.

Copper minerals include chalcocite, malachite, and azurite, with smaller amounts of bornite, chalcopyrite, and chrysocolla. Pyrite and limonite are the chief gangue minerals. Vein quartz and other minerals usually associated with typical hydrothermal veins are notably absent.

Uranium and vanadium minerals are found in three stopes with spotty occurrences elsewhere in the workings. Carnotite is the chief uranium mineral; other vanadium minerals include volborthite (a yellow-to-dull-green basic copper vanadate) and dark vanadium oxides. Uranium-vanadium form a separate thin zone on the outside or hanging

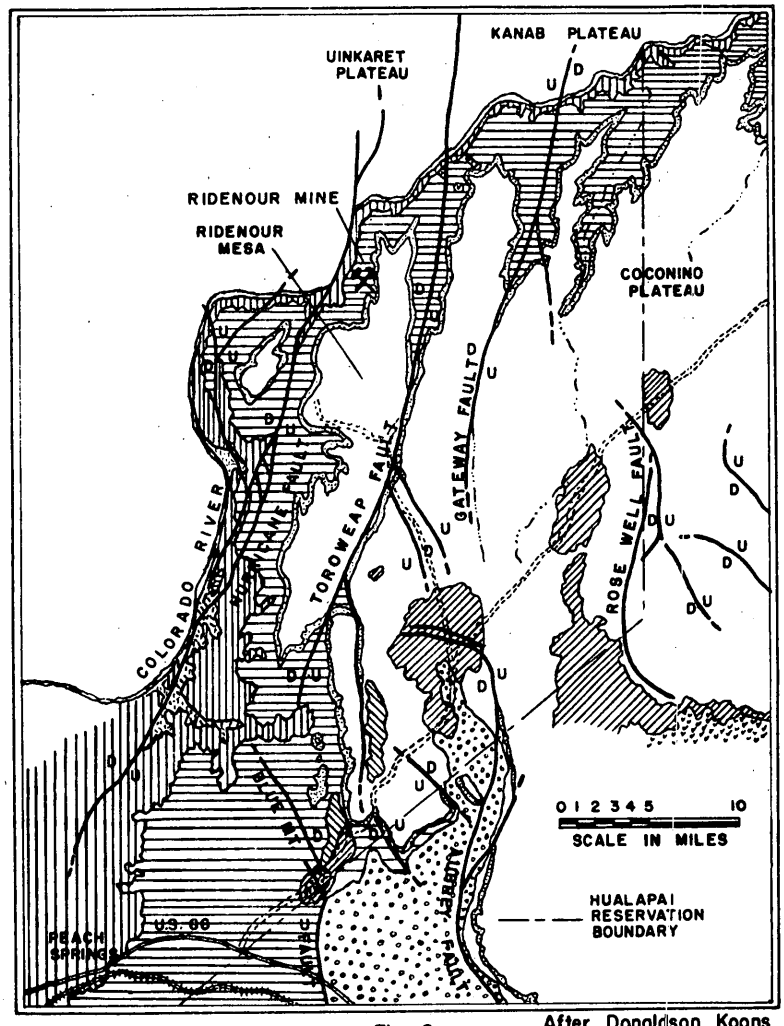
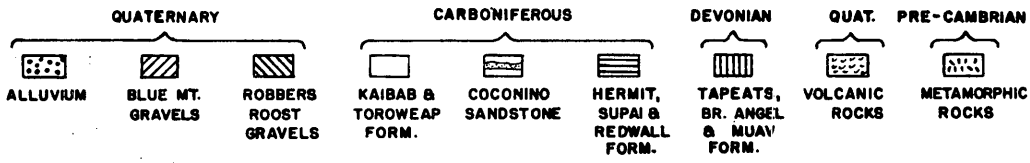


Fig. 2 After Donaldson Koons



MAP OF THE EASTERN PART OF THE HUALAPAI INDIAN RESERVATION SHOWING GEOLOGICAL FORMATIONS & FAULTING

wall side of the main copper zone where exposed in workings to the north and west. Carnotite is found in a very thin vein about 12 feet back of the main ore zone in one short crosscut. Elsewhere, workings do not penetrate the hanging wall into radioactive areas. Incomplete sampling from carnotite-bearing zones now exposed by the workings gave chemical analyses ranging from less than 0.1 percent to over one percent U_3O_8. Vanadium assays from the mineralized zone average about six percent V_2O_5.

The dumps contain appreciable quantities of vanadium (from minerals other than carnotite) and copper with apparently little uranium.

Copper Deposits in Kaibab Limestone

Inquiry among the Hualapai Indians established the existence of several small abandoned copper deposits in Kaibab limestone on the reservation. Examination showed a similarity to deposits found at or near the top of the Kaibab limestone north of Williams, Arizona.

The National group of claims (no longer valid as mining claims) are near National Tank at the head of National Canyon in the northeastern part of the reservation. Workings consist of pits, trenches, and shallow shafts. A small amount of copper is believed to have been shipped during World War I, the last period of activity. The deposits are on a low hill in fractured cherty limestone. Copper minerals are associated with pyrite, hematite, and abundant limonite along joints, fractures, and bedding planes. In addition to carbonates, the copper minerals include chalcocite, bornite, and chalcopyrite. A shallow trench cut in a small limonite gossan gave weak radioactive readings of about two and one-half times background localized along fractures filled with azurite and malachite. No other radioactive anomalies were noted in the workings or elsewhere in this locality. Exposures of Kaibab limestone and Coconino sandstone were examined in the upper three miles of National Canyon. No significant radioactivity was noted.

The Laguna deposits are just west of Laguna Lake (usually dry) near the Gateway fault. Pits and shallow trenches expose copper minerals similar to those of the National deposits in undulating sandy limestone beds at the top of the Kaibab limestone. The mineralized zone appears to be very shallow and largely follows bedding planes. No significant radioactivity was noted.

An unnamed shaft was examined on the flat-topped ridge overlooking Mexican Tank in Prospect Valley. Oxidized copper minerals are associated with limonite and hematite in horizontal beds which are also near the top of the Kaibab limestone. The small amount of copper is confined to the upper six feet as shown by the shaft and radioactivity was not above the background reading. This prospect lies about midway between the Toroweap and Gateway faults.

The Twin Tanks deposit is on the steep slope formed by the Toroweap fault on the east side of Prospect Valley. It overlooks a double stock tank (Twin Tanks) on the valley floor. Azurite and malachite occur with abundant hematite in small veinlets along fractures as shown by a small open cut. Radioactivity amounted to a little more than twice the background count. This deposit is different from all others observed to date in the Kaibab limestone as it is in cherty beds near the base of the formation.

Elsewhere in the northeastern part of the area the Kaibab limestone was examined in some detail without success for copper minerals and radioactivity in roadcuts and outcrops on small knolls. A rather thick soil cover limits exposures in much of this area and extends eastward beyond the area studied.

Miscellaneous Deposits

The only known copper occurrence in the Coconino sandstone of this area is in a small canyon near the road in the vicinity of Robber's Roost. A small pit exposes azurite, malachite, and chrysocolla filling interstices of cross-stratified, coarse-grained sandstone. The mineralized outcrops are confined to a small area near a branch of the Toroweap fault. An examination of the pit and surrounding areas showed no abnormal radioactivity.

An outcrop of altered Coconino sandstone was found near the head of a canyon draining into Diamond Creek. It forms a small but conspicuous pinnacle protruding from the canyon floor, although the cross-stratified sandstone on each side is unaltered with apparently undisturbed bedding. The silicified sandstone is characterized by contorted bedding which is alternately banded with iron and manganese oxides. Radioactivity was not above normal.

A reconnaissance trip was taken into Meriwhitica Canyon, the site of an old Indian village and a large spring. The hike was made into this deep canyon to check an exposed section of sediments from the top of the Redwall limestone to pre-Cambrian schist with particular attention to Cambrian and Devonian rocks poorly exposed elsewhere in the reservation. Two minor faults and several fracture zones with minor occurrences of limonite and hematite were found, but radioactivity was not above background anywhere along the route traversed.

A brief visit was made to Hindu Canyon and vicinity. This is a relatively shallow canyon cutting into Redwall limestone and draining westward into Spencer Canyon. Outcrops of the limestone and outliers of the Supai formation were found to be barren. About 1,500 feet of diamond drill core (obtained by the Bureau of Reclamation and now stored in Hindu Canyon) was checked with a Geiger counter without finding abnormal radioactivity. The core consists of Redwall limestone and underlying Devonian and Cambrian rocks. The holes were drilled on the narrow ridge between Hindu Canyon and Bridge Canyon to investigate a highway tunnel site.

A manganese prospect was examined in a small canyon cut into the Aubrey Cliffs near Rose Canyon east of the reservation. Psilomelane and "wad" occur as a near-vertical vein and replacement deposit in Kaibab limestone. A radiometric traverse was also made along Rose Canyon, which is formed by a minor fault (not shown on map). Radioactivity in both instances was negligible. The remainder of the Aubrey Cliffs was not checked.

Volcanic rocks in the Bishop Mountain area north of Seligman were briefly examined with scintillation and Geiger type counters. A Tertiary rhyolitic bed containing some pumice near the base of Bishop Mountain is overlain by more basic volcanic rocks. This layer consistently shows radioactivity of about one and one-half times background. However, no higher readings could be obtained.

The Grand Wash Cliffs were visited where crossed by steep roads in the vicinities of Clay Springs and the Diamond Bar Ranch. Both localities are just outside the western reservation boundary. Rocks of the Cambrian Tapeats sandstone overlie pre-Cambrian gneissic granite near the bottom of irregular cliffs probably formed by a major fault. This formation consists of permeable, medium to coarse-grained sandstone which is locally altered to quartzite. No uranium was found

in the small areas visited and the remainder of these extensive outcrops were not examined. However, in a separate investigation, uranium was found associated with galena in a fault block of pre-Cambrian metamorphic rocks just west of the Grand Wash Cliffs (Corley, Lind & Ellington Mine No. 3, owned by James Corley, Chloride, Arizona).

CONCLUSIONS

1. The Ridenour mine is the only uranium occurrence worthy of further attention discovered to date in the area. This deposit is discussed in a separate report.

2. The area has not been well-prospected for uranium. The rugged topography, very sparse population, large extent of the area within an Indian reservation, and lack of any recent mining activity all contribute to a general remoteness and lack of knowledge concerning the area. Only a small part of the area was closely examined during the present investigation.

3. The occurrence of uranium at the Ridenour mine (together with the geologically similar Copper Mountain mine and Chapel prospect just north of the area) and extensive major faults indicates that the northeastern part of the reservation is a favorable area for prospecting.

4. The Permian Supai formation and lower Hermit shale, both containing permeable sandstone beds of continental origin, appear to be the most likely rocks in which to prospect for uranium deposits influenced by stratigraphic features.

5. Grand Wash Cliffs, Aubrey Cliffs, and northeastern Hualapai Indian Reservation areas are amenable to reconnaissance by airborne radiometric methods.

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EXPLORATION BUDGET

Uranium Exploration Company of California 212 Union National Bank Bldg., Pasadena California

AREA OF INTEREST: Lat 36° North Long 112° West (approximate) 200,000 acres (312 square miles)
Hualapai Indian Reservation, Arizona

COST ESTIMATE
9 MONTH PROGRAM

		Unit	Quantity	Labor	Material	Plant	Contracts	Lump Sum	Total	TOTAL UNIT OF WORK COST	
	% OF TOTAL COST			46.05	7.26	16.82	13.82	16.06			
1	REGIONAL AERIAL PHOTO-GEOLOGIC MAPPING: CONTINUOUS 1":2000' SCALE: 60% OVERLAP: STEREO REDUCTION	sq.miles	312				$4,124		4,124	$13.22	per sq.mile
2	SELECT " " " " 1":500' " " "	sq.miles	66				2,640		2,640	40.00	per " "
3	AIRBORNE RADIOMETRIC RECONNAISSANCE:										
	INITIAL: PLANE: PIPER SUPER-CUB	sq.miles	312				9,360		9,360	30.00	per " "
	DETAIL : " " " "	sq.miles	100				3,200		3,200	32.00	per " "
	DIRECTIONAL: HELICOPTER: HILLER	sq.miles	40				4,800		4,800	120.00	per " "
4	GROUND RADIOMETRIC RECONNAISSANCE:										
	FOOT	man/hrs.	4300	9,460	950				10,410	2.42	per hour
	HORSEBACK	man/hrs.	1600	3,520	350				3,870	2.42	per "
	CAR-MOUNTED	man/hrs.	6500	14,300	1,400	6,100			21,800	3.35	per "
5	DIAMOND DRILLING: EX-AX EXPLORATION HOLE	lin.ft.	4300	16,125	6,800	12,878			35,803	8.33	per lin.ft.
6	DRY HAMMER DRILLING:										
	SHALLOW HOLE (MINUS 20')	lin.ft.	1500	1,780	650	2,800			5,230	3.49	per " "
	DEEP HOLE (PLUS 20')	lin.ft.	2200	2,200	850	2,800			5,850	2.66	per " "
7	SAMPLING:										
	CHANNEL (HAND)	man/hrs.	400	1,100	175				1,275	3.19	per hour
	TRENCHING (CRAWLER MOUNTED MACHINE)	machine/ man/hrs.	750	2,250	1,500	4,800			8,550	11.40	per "
8	LABORATORY ANALYSIS: QUALITATIVE AND QUANTITATIVE (WET): SPECTOGRAPHIC:										
	FIELD	lump sum						2,100	2,100		
	COMMERCIAL	lump sum						1,200	1,200		
9	ACCESS ROADS	lump sum						11,500	11,500		
10	CAMP:										
	BASE	lump sum						3,750	3,750		
	OTHERS	lump sum						1,200	1,200		
11	PROFESSIONAL RESPONSIBILITY:										
	EXPLORATION PROJECT SUPERINTENDENT	month	9	6,750					6,750	750.00	per month
	GEOLOGIST	month	9	8,100					8,100	900.00	per " ?
	CHEMIST	month	9	5,850					5,850	650.00	per "
	AUDITOR	hours	180	900					900	5.00	per hour
	MINING ENGINEER	month	9	8,100					8,100	900.00	per month ?
12	CONTINGENCIES	lump sum						8,300	8,300		
	TOTAL			80,435	12,675	29,378	24,124	28,050	174,662		

Alexander R. Kingsland
Mining Engineer
Member, American Institute of Mining and Metallurgical Engineers
Member, Canadian Institute of Mining and Metallurgy

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	RUN STOP		RUN STOP
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~~Secretary's Files~~	RUN STOP		RUN STOP
~~Territories~~	RUN STOP		RUN STOP
~~Mr. Abbey~~ ~~Rm 2651~~	RUN STOP		RUN STOP
Mr. Adams DMEA	RUN STOP		RUN STOP
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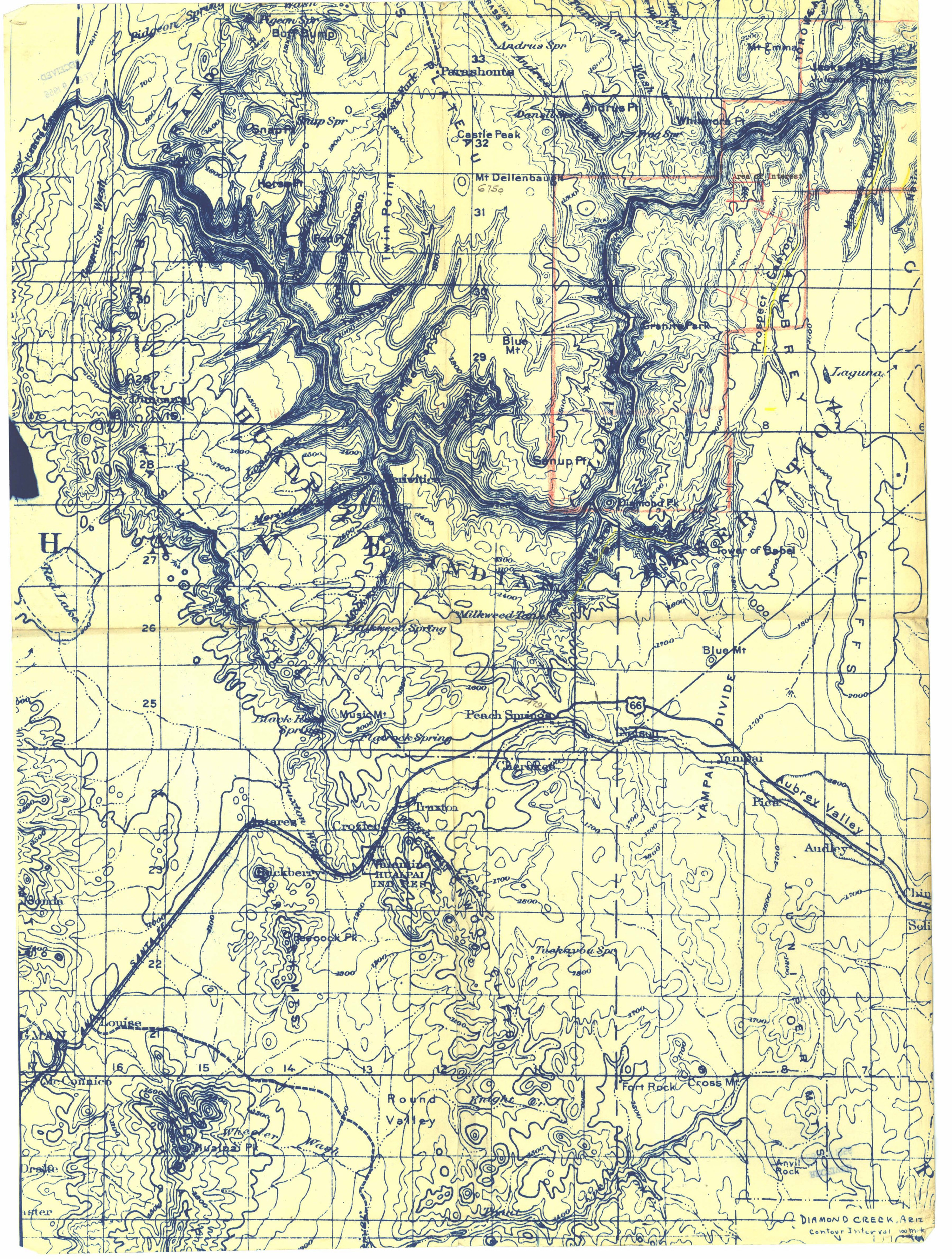
Pigeon Spr
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Buff Pump
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Parashonts
Andrus Pt
Whitmore Pt
Mt Emma
Snap Pt
Snup Spr
Castle Peak
Mt Dellenbaugh
6750
Area of Interest
Horse Pt
Twin Point
Granite Park
Blue Mt
Prospect
Laguna
Senup Pt
Diamond Pk
Tower of Babel
Red Lake
Milkweed Tank
Milkweed Spring
Blue Mt
Music Mt
Black Rock Spring
Peach Springs
Nelson
Cherokee
Yampai
Aubrey Valley
Pica
Truxton
Crozier
Valentine
HUALPAI INDIANS
Audley
Bonda
Peacock Pk
Tuckaybo Spr
Louise
McConnico
Round Valley
Knight Cr
Fort Rock
Cross Mt
Wheeler Wash
Hualpai Pk
Anvil Rock
DIAMOND CREEK, ARIZ
Contour Interval 100 feet