400

JUL 19 1955

Mr. Frank C. Cummings
Hub Basin Mining Company
542 Staples Avenue
San Francisco 12, California

Re: Docket No. DMEA-3650, Tungsten
Hub Basin Mining Claims
White Pine County, Nevada

Dear Mr. Cummings:

Your application for aid for an exploration project and other data available to us in Washington relating to the above-noted property have been carefully reviewed.

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

Careful study of all our information indicates to us that, although the property in the past has produced a moderate tonnage of tungsten ore of a fair grade, the probability of disclosing minable ore reserves by your proposed program is not sufficiently promising to justify Government participation. We regret to advise you, therefore, that your application for exploration assistance is denied.

We wish to thank you for your interest in the Defense Minerals Exploration Administration program and for bringing your property to our attention.

Sincerely yours,

C. O. Mittendorf

Administrator

cc: Docket
Code 400
Oper. Comm.
Adm. Reading File
T. Kiilsgaard, USGS
R. Holliday, USBM
FT, Region 2-Reno

TLChapman/ls
7/15/55

July 15, 1955

MEMORANDUM

To: Administrator, DMEA

From: Iron and Ferro-Alloys Division, DMEA

Subject: Denial of application for exploration assistance to the amount of $222,000.00
Docket No. DMEA-3650, Tungsten
Hub Basin Mining Company
Hub Basin Claims
White Pine County, Nevada

Denial of the subject application is recommended by this Division and is based on the following information:

1. The applicant, the Hub Basin Mining Company, Frank C. Cummings, 542 Staples Avenue, San Francisco 12, California, requested exploration assistance to the amount of $222,000.00 for road construction, camp buildings, bulldozer trenching, 1,400 feet of drifting and raising, 12,000 feet of diamond drilling, 20 test pits for placer ground, sampling and assaying.

2. The owner of the property, Laine T. Tilford, Lessor, on June 5, 1954, leased to Frank C. Cummings, Lessee, the following lode and placer mining claims:

Lode Claims

Name	Book No.	Page No.
Paycheck	128	436
Fairplay	148	152
Push Over	128	436
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Special Attention	166	207
Dead End	158	497
Apple Jack	158	497
Ebony Babe	166	207
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Water Supply No. 1	187	61
North Border	187	57
North Border No. 1	187	58
Extreme East	187	56

Lode Claims (continued)

Name	Book No.	Page No.
Spring Creek Lode	187	59
The Anvil	187	56
Basin No. 1	128	461

Placer Claims

Basin No. 2 to No. 8, inclusive, Book 171, Page 310, all recorded in Court House at Ely, White Pine County, Nevada.

The property is about 2 miles east of Sec. 25, T. 13 N., R. 67 E.

3. Cambrian quartzite in this area has been cut by granite and many aplite dikes and quartz veins cut the granite. Fluorite and hubnerite occur locally in the quartz veins. Through erosion some placer ground has been formed below this area.

4. The property was first discovered in 1899, and attempts made to work the property for tungsten in 1900, 1907, and 1911 were unsuccessful because of low prices. With better prices in 1915, a mill was constructed and 8,683 tons of ore were mined, concentrated, and sold for $655,828.00, equivalent to $76.68 per ton. Price drops in 1916 again forced the closing of the property and little work has been done since that time. Water was flumed in to wash the placer ground, but only a few tons of lean ore were produced.

5. The main or Hub vein was worked through a 1,700 foot adit and stoped over a vertical range of 500 feet. Evidently no commercial ore was found in the other veins.

6. Of thirteen samples taken by the Field Team, only two picked samples showed any ore grade values. These were 0.52 and 0.69 percent WO_3.

7. The Field Team concludes that there is little probability of developing any significant ore tonnage of an economic grade that would materially help the National Supply Program and recommends denial of the project. The Commodity Divisions of the Geological Survey and the Bureau of Mines concur in the denial.

cc: Docket
Code 400 ✓
Oper. Comm.
Adm. Read. File

W. S. Martin, Chief
Iron and Ferro-Alloys Division

TLChapman/ls 7/15/55

IN REPLY REFER TO:

400

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

RECEIVED
JUL - 6 1955

July 5, 1955

Re: DMEA 3650
Rub Basin Tungsten Co.
Rub Basin Claims
White Pine Co., Nevada
$222,000 - Tungsten

Copy retained 400

Memorandum

To: W. S. Martin, Defense Minerals Exploration Administration

From: E. E. Nelson, U. S. Geological Survey

Subject: Review of Field Team report.

The sampling of the examiners and the history of the Rub Basin camp tend to establish the conclusions of the Field Team as opposed to those of the writer of the report which accompanies the application.

I concur with the recommendation of denial.

E. E. Nelson

E. E. Nelson

NENelson:iml
G-7/5/55

cc: Director's reading, 4212
Branch reading, 4212
DMEA (3)
Docket file
R. Holliday, 3513

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

400 RECEIVED JUN 24 1955

1605 Evans Avenue
Reno, Nevada

June 23, 1955

WSM

Memorandum

To: Operating Committee, DMEA, Interior Building, Washington 25, D. C.

From: Executive Officer, DMEA Field Team, Region II

Subject: Docket No. DMEA-3650 - Tungsten
Hub Basin Tungsten Company
Hub Basin Claims
White Pine County, Nevada

Reference is made to your letter of February 7, 1955 requesting a field examination on above subject property.

Attached are four copies of a report by Earl H. Pampeyan, Geological Survey and Glenn G. Gentry, Bureau of Mines in which it is recommended that the application for exploration aid be denied. Roscoe Smith and I concur in the recommendations.

S. Ricker

Attach.

SRicker:gh
cc: R. M. Smith
File

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION II

APPLICATION REPORT

DMEA 3650 (Tungsten)
Hub Basin Tungsten Company
Hub Basin Claims, White Pine County, Nevada

by

Glenn C. Gentry
Mining Engineer
U. S. Bureau of Mines

Earl H. Pampeyan
Geologist
U. S. Geological Survey

June 16, 1955

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ILLUSTRATIONS

Figure 1. Location map of Hub Basin, Nevada

2. Hub Basin area, White Pine County, Nevada

INTRODUCTION

Under date of January 15, 1955 Mr. F. J. Dowling; Mr. Frank C. Cummings, 542 Staples Avenue, San Francisco 12, California; and Mr. A. F. Daily on behalf of the Hub Basin Tungsten Company to be organized under the laws of the State of Nevada, applied to the Defense Minerals Exploration Administration for financial assistance in a $222,000 program to explore for tungsten on the Hub Basin mining claims in White Pine County, Nevada.

The claims were examined on April 21-22, 1955 by Earl Pampeyan, Geologist, U. S. Geological Survey, and Glenn Gentry, Mining Engineer, U. S. Bureau of Mines, accompanied by Messrs. F. J. Dowling and Frank C. Cummings, two of the applicants and Mr. L. T. Tilford, owner of the mining claims.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Hubnerite occurs sporadically in quartz veins in granite. One of these, the Hub vein, has yielded about 12,000 tons of ore prior to 1917 but is considered to be worked out. Other veins have had little or no exploration.

The applicants proposed an extensive program to explore these other veins and also to explore for placer hubnerite in the alluvium down the slope from the veins.

The exposures of hubnerite-bearing rock seen on the property do not warrant exploration for either vein or placer deposits. The narrow widths and sporadic occurrences of hubnerite in the main Hub vein as well as in other veins indicate there is little probability of producing any significant tonnage of tungsten ore. It appears doubtful

that the grade of ore mined would exceed about 0.5 percent WO_3, which would not be economical unless a milling plant were constructed at the property. This would necessitate an adequate supply of water, not presently available.

In the placer area the operators have conducted no exploration or development and there is no evidence of tungsten minerals in the soil on the surface. The wash, or gulch, is full of large boulders which would be difficult and expensive to handle and the limited yardage does not indicate an economical operation.

It is recommended, therefore, that this application for DMEA assistance be denied.

LOCATION, ACCESSIBILITY, LOCAL RESOURCES

The Hub Basin mine is approximately 41.4 miles southeast of Ely, Nevada, and is accessible by automobile by traveling south from Ely, Nevada on U.S. Highway No. 93, an all weather road, for a distance of 27.8 miles, thence in a southeasterly direction via a graded County road for a distance of 8.7 miles, thence eastward via a very rough and steep unimproved mountain road for a distance of 4.9 miles.

The mine is in the southeasterly portion of White Pine County, Nevada and is reported to be in the U. S. Tungsten mining district, and is further designated as being two miles east of sec. 25, T. 13 N., R. 67 E.

It is usually possible to recruit experienced miners in Ely, Nevada and to purchase necessary mining supplies and equipment in that city. There is no transmitted electric power in the area. The water supply at the mine is limited, though a small quantity could probably

be secured by repairing the present pipe line. It would be necessary to haul or pump water for exploration work.

HISTORY AND PRODUCTION

The applicants report that the property was discovered in 1899 and that intermittent operations were conducted by various mining companies up to and including the year 1916. A small milling plant was erected and the known tonnage of ore mined amounted to approximately 12,000 tons having a gross value of $837,195.00. Apparently only a few tons of selected material have been mined since the year 1916 and the milling plant and all machinery were removed many years ago. The applicants also report that the crude ore mined contained 1.0 percent to 1.25 percent WO_3.

Probably most of the ore mined came from the Hub vein, which had been explored for a horizontal distance of about 1,700 feet and having various levels at various elevations above the floor of the basin.

From the amount of prospecting conducted by the early day miners it is evident that they had explored numerous other quartz exposures on the property and from the limited work decided that the Hub vein was the only one to show commercial values.

PROPERTY AND OWNERSHIP

The applicants report that the property consists of sixteen lode and eight placer claims, all unpatented and held by Right of Location; that all assessment work has been done; that no debts have accrued against the property; and that "Owner's Consent to Lien" can be obtained.

Mr. Frank C. Cummings states that he is in the real estate business in San Francisco, California and that his mining experience has been limited to a small amount of prospecting in the Hub Basin mine area during several summer vacation trips. Mr. F. J. Dowling states that he a retired construction contractor and has had only a limited amount of mining experience. Mr. A. F. Daily, presently reported to reside in South America, is reported to be an experienced placer mine engineer and operator.

Mr. Cummings and Mr. Dowling state they would expect to supervise any exploration mining project. Based upon their experience record, it appears evident that any mining operations should be under the direct supervision of a competent mining engineer.

DEVELOPMENT

The old roads from the main camp area leading to the various adits have been partly destroyed by weather and to a large extent would have to be rebuilt. The main road from the floor of the valley to the mine camp, a distance of 4.9 miles would require widening, considerable gravel and grading prior to the transportation of heavy machinery.

The camp buildings consist of one small cabin in need of considerable repairs, and would accommodate only one man. There is no mining machinery or equipment of any type on the property.

The main vein on the property, designated as the Hub vein, was developed and explored for approximately 1,700 feet along the strike and at various levels prior to 1917. The greater part of these adits and old workings are not accessible for examination and the amount

of and quality of ore left in the bottom of the old workings cannot be ascertained without a considerable amount of rehabilitation.

GEOLOGY

The Hub Basin, on the west slope of the Snake Range, is underlain by biotite granite. Beyond the eastern edge of the property Cambrian quartzite has been intruded by this granite. Many steeply-dipping aplite dikes and quartz veins, along joints which strike N. 60°-70° E. (fig. 2), cut the granite. The quartz veins, some of which are in the aplite dikes, pinch and swell considerably over short distances. Fluorite and hubnerite occur locally in the quartz veins.

ORE DEPOSITS

Quartz lenses containing hubnerite, and traces of scheelite, were mined from the Hub vein (3E on fig. 2). This vein ranged from eight inches to ten feet in width and was mined for a strike length of about 1,700 feet and a vertical distance of about 520 feet. It has been prospected for 100 feet on the Haulage level, about 80 feet below the main level, but little or no ore was found. Only small pillars of the Hub vein can be seen at the surface and the main level is inaccessible. One pillar six feet thick contained hubnerite-bearing rock which constituted one-sixth of the vein.

Fluorite and traces of hubnerite were seen in vein 7E where the quartz was two feet thick, but these minerals were seen only within the limits of the small prospect hole.

Vein 1W, one foot thick, is exposed for less than 50 feet. Thin seams of hubnerite and manganese oxides up to 4 mm thick and

aggregating a total thickness of less than 10 mm cut irregular lenses of fluorite in the quartz over a distance of 25 feet. Vein 1W contains the best showing of tungsten on the applicants' property. A sample, BM 1572, assayed 0.52 percent WO_3.

The placer ground as described by the applicants is approximately as shown on figure 2. Estimated depth to bedrock in the area ranges from 25 feet at the upper end to 150 feet at the lower end. The alluvial material in this area consists primarily (about 75%) of quartzite and granite boulders one to ten feet in diameter; the remainder is soil and cobbles. Inasmuch as the applicants have done no prospecting in the alluvial material, it is impossible to estimate the amount of hubnerite which exists therein. The aplite dikes contain abundant limonite pseudomorphs of pyrite which weather out of the dike rock and resemble hubnerite. A sample of concentrates obtained by the applicants from a previous small placer operation on the property consisted principally of limonite, and only a few of the grains in the sample were tentatively identified as hubnerite.

SAMPLING

Thirteen samples were taken from areas which would indicate a general average assay evaluation of accessible workings:

Sample No.	Width Ft.	% WO_3	Description
BM 1559	1.0	*0.01	Qtz. vein in face of old Haulage tunnel (Hub vein).
BM 1560	4.0	*0.01	Qtz. vein in face of NW crosscut off Haulage level.
BM 1562	Chip	*0.01	Qtz. boulder near top of hill on the No. 1 vein, is exposed for approximately 2 ft. on surface.
BM 1563	2.0	*0.01	Qtz. vein No. 1 in adit at top of hill. Across back. 55.6 ft. in from portal.
BM 1564	1.0	*0.01	Qtz. vein No. 1 in same adit as No. 1563. Across back. 92 ft. NE of No. 1563.
BM 1565	1.2	*0.01	Qtz. vein 16 ft. NE of portal of adit on Hub vein at top of hill. This drift joins old stopes.
BM 1566	Selected Pcs.	0.69	Selected pieces of ore from old dump at portal of adit where No. 1565 was taken.
BM 1567	1.5	0.01	Qtz. vein No. 5 in short tunnel. Strikes N 80° E - Dip 67° S.
BM 1568	2.0	*0.01	No. 7 qtz. vein. East face of open cut at top of hill. To be DD target from where 1567 taken.
BM 1569	Grab	0.03	Partially filled placer test hole. About 500 ft. due south of cabin. Loose soil - no gravel (Hole 18" deep).
BM 1570	Grab	0.03	Partially filled placer test hole 4 ft. deep. 100 ft. due south of cabin. Loose soil - no gravel.
BM 1571	0.7	*0.01	Small qtz. outcrop or boulder at proposed portal of adit on No. 1 vein. (Same vein as No. 1562).
BM 1572	0.7	0.52	Small surface exposure of qtz. at west end of No. 1 west vein. Selected material.

*Less than

ORE RESERVES

A few tons of low grade measured ore remains in pillars in the Hub workings. Not more than two tons of low grade ore averaging about 0.5 percent WO_3 is indicated in veins 1W and 7E. There are no inferred reserves in these or in the remaining quartz veins.

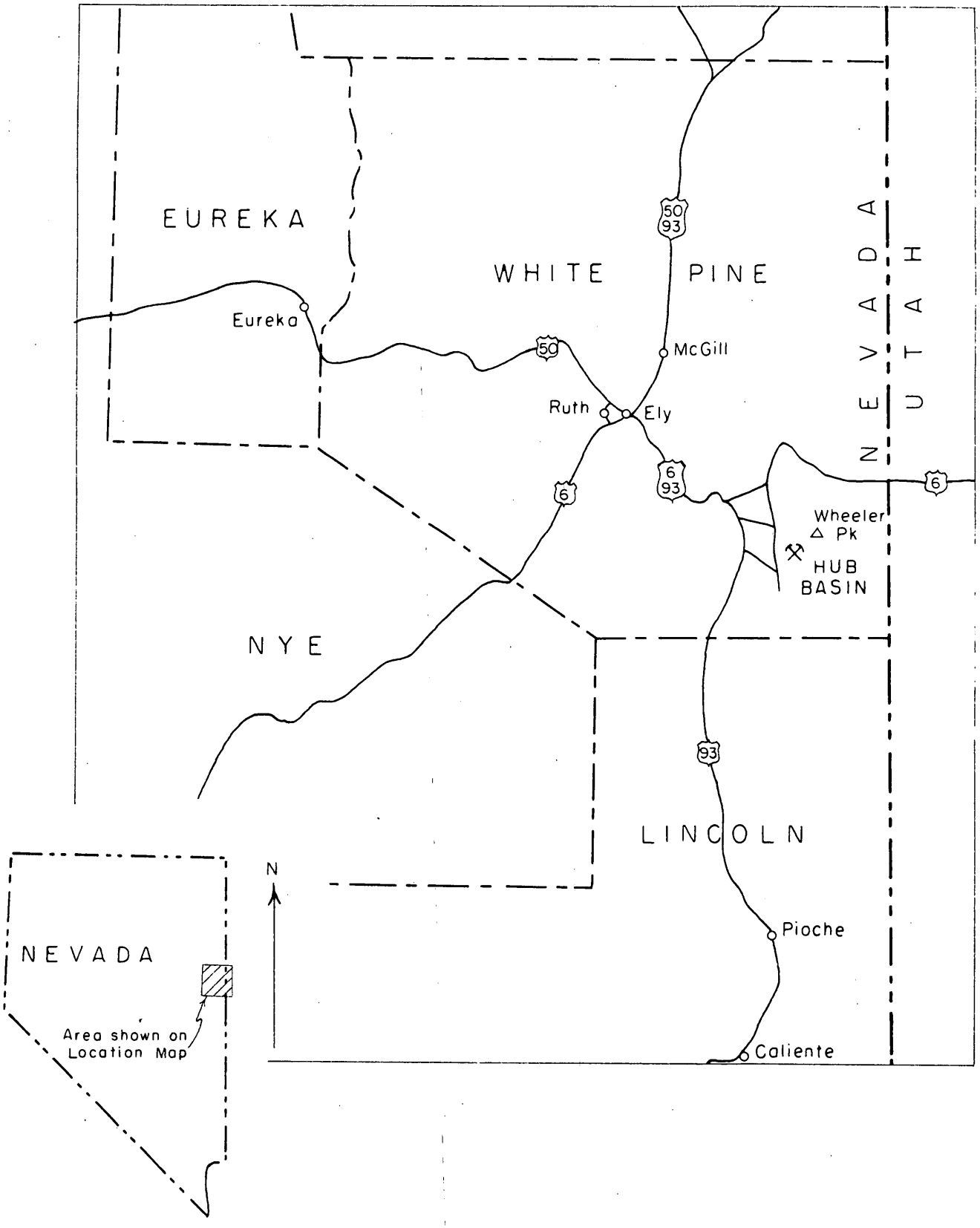
Reserves in the placer ground are confined to inferred ore. Possibly a few tons of hubnerite-bearing gravel exist in the alluvial material.

APPLICANTS' PROPOSAL

The applicants propose to explore quartz veins 1E, 2E, 5E, 6E, and 1W (fig. 2) with 1,400 feet of drifts and raises and about 12,500 feet of diamond drilling. They also propose to prospect the Hub Basin placer area by means of 20 small prospect shafts to a depth of 20 feet each, and to further prospect the placer area and adjoining areas with a 6-inch placer drill. The total cost estimate was $222,000.

The designation of veins on figure 2 is different from the application and has been changed slightly to match the applicants' latest map.

There is no geological evidence to justify any of the proposed program.

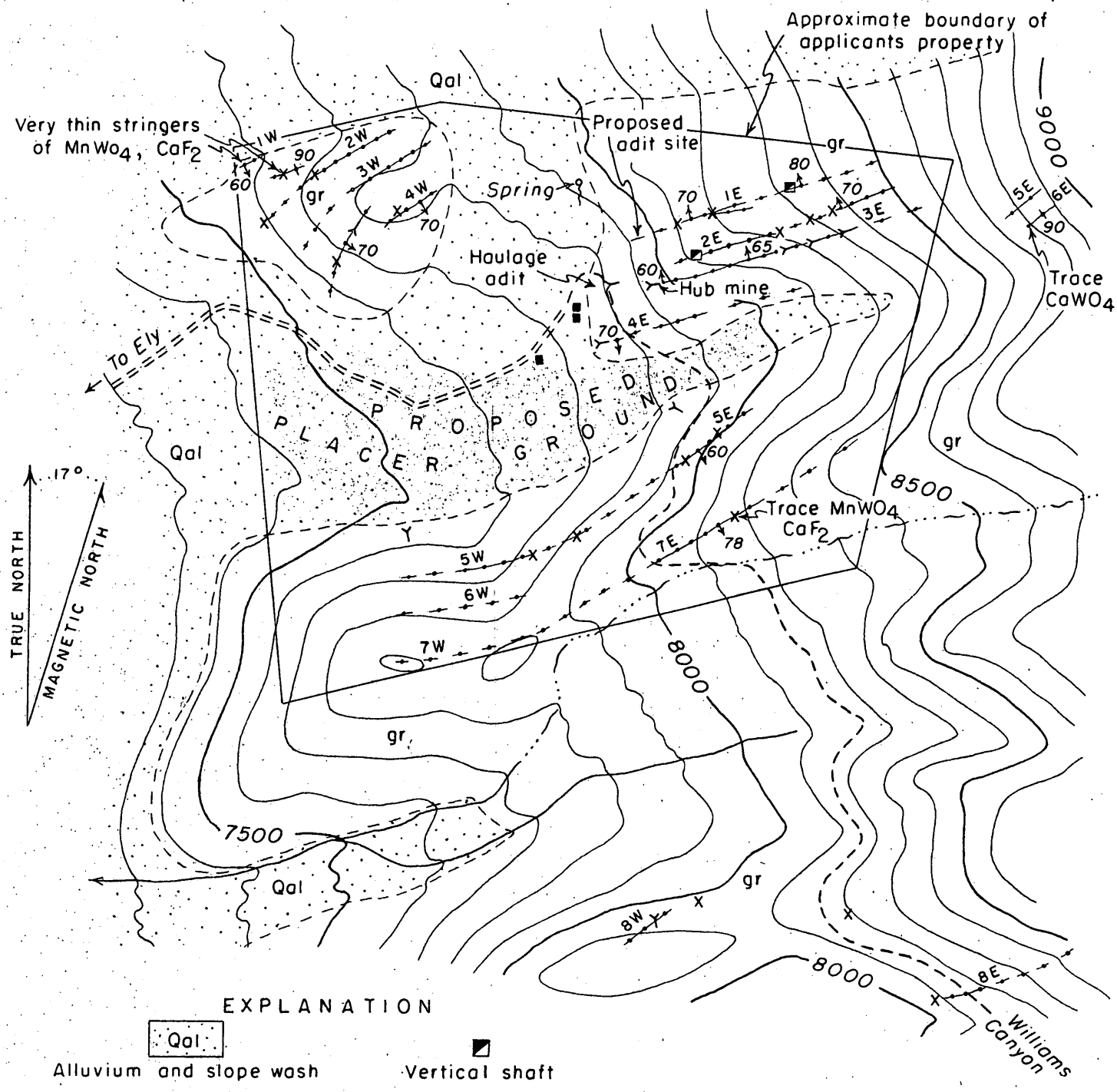


LOCATION MAP OF HUB BASIN, NEVADA

Figure 1

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DMEA 3650
(TUNGSTEN)



EXPLANATION

Qal — Alluvium and slope wash

gr — Biotite granite

Approximate contact

70 — Quartz vein, showing dip

Vertical shaft

Portal of adit

x — Prospect pit

Base from an enlargment of the Wheeler Pk., Nevada Quad.

1000 0 1000 2000 FEET

HUB BASIN AREA, WHITE PINE COUNTY, NEVADA

Figure 2

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FEB 7 1955

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Hub Basin Tungsten Company
c/o Frank C. Cummings
542 Staples Avenue
San Francisco 12, California

Re: Docket No. DMEA 3650 - Tungsten
Hub Basin claims
White Pine County, Nevada

Gentlemen:

The above-docketed application for exploration assistance for tungsten has been reviewed by the Iron and Ferro-Alloys Division of the Defense Minerals Exploration Administration and is being referred to Mr. Spangler Ricker, Executive Officer, DMEA Field Team, Region II, 420 Custom House, 555 Battery Street, San Francisco 11, California, for further consideration and possibly a field examination of the property.

Should a field examination be required, any assistance that you can give the examining engineers will be appreciated.

Sincerely yours,

G. O. Mittendorf

Administrator

TLChapman/ls
2/2/55

cc: Docket
Code 400
Adm. Read. File
Oper. Committee
FT, Reg. II-San Francisco
W. McInnis, USBM
T. Kiilsgaard, USGS

FEB 7 1955

400

Mr. Spangler Ricker, Executive Officer
DMEA Field Team, Region II
420 Custom House, 555 Battery Street
San Francisco 11, California

Re: Docket No. DMEA 3650 - Tungsten
Hub Basin Tungsten Company
Hub Basin claims
White Pine County, Nevada

Dear Mr. Ricker:

The above-docketed application for exploration assistance is being referred to your office for a field examination of the property.

Two copies of a relevant memorandum dated January 27, 1955, by E. L. Newcomb, Geological Survey, are enclosed for your information.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee

Enclosure

APPROVED:

J. H. Hedges

Member, Bureau of Mines

Thor H. Kiilsgaard

Member, Geological Survey

cc: Docket
FT, Reg. II - San Francisco
Code 400
Adm. Read. File
Oper. Committee
W. McInnis, ~~XXXX~~ USBM
T. Kiilsgaard, USGS

~~FARuklndgx/lx~~
TLChapman/ls
2/2/55

400

IN REPLY REFER TO:

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

January 27, 1955

Re: DMEA-3690
Hub Basin Tungsten Co.
(Hub Basin)
White Pine Co., Nev.
$222,000 - Tungsten

Memorandum

To: W. S. Martin, Defense Minerals Exploration Administration

From: E. L. Newcomb, U. S. Geological Survey

Subject: Review of application

The operator has proposed a very extensive program which involves trenching, drilling, raising and drifting to explore several tungsten veins and an associated alluvial deposit.

The project consists of the following items of work:

1.) 600 feet of drift -- Vein 2E.
2.) 150 feet of raises -- Vein 2E.
3.) 5,040 feet (24 holes) of drilling -- Vein 2E drift.
4.) Trenches along Veins 1E, 2E, 3E and 1W.
5.) 3 holes from Vein 5E tunnel to intersect Vein 6E.
6.) Up-hole drilling from 2E drift to further test Veins 1E and 3E.
7.) Drift on Vein 1E or 3E, if drilling results warrant additional work.
8.) Drift 300 feet on Vein 1W, if trenching results are favorable.
9.) Sink 20 prospect shafts and placer drill the Hub Basin alluvial deposits.

Past production from the property may have totaled about 10,000 tons of ore, but this record cannot be substantiated. Most of the production was obtained prior to 1917. A small amount of selectively mined ore and some alluvial material have been mined in recent years.

The old workings consist of a 1700 foot tunnel and several short tunnels on the Hub (4E) vein, and a number of short tunnels and crosscuts on a number of other veins in the area. The operator reports that most of the old workings are accessible.

The Rob deposits occur in a group of parallel quartz veins which strike N. 55° E. to N. 80° E. and are nearly vertical in dip. All of the veins strike at about right angles to the northeast trend of a large alaskite dike which has intruded quartz monzonite. Post-mineral faulting, parallel to the dike, is reported to have offset the veins about 600 feet which accounts for the vein designations as 1E, 1W, 2E, 2W, etc.

Tungsten mineralization occurs as huebnerite in a predominantly quartz gangue with small amounts of associated fluorite and pyrite. The ore bodies are characterized as small ore shoots which frequently contain high grade ore over very narrow widths. However, for a mining width of 4 feet, many of the ore bodies probably would be reduced to ore grades which are non-economic.

The map submitted with the application does not show very satisfactorily the geology in the Rob Basin area. Much of the proposed program does not appear to be warranted, but a limited amount of work on Veins 1E, 2E, and 3E may be justified, if the project is properly staged.

I recommend a field referral for an examination of the property. Some trenching and drilling may be warranted on a part of the vein system.

E. L. Newcomb

ELNewcomb:hlm
G-1/27/55

Copy to: Director's reading, 4212
Branch reading, 4212
DMEA (3)
Docket file
R. W. Geehan, 3513 Interior

400

DOCKET
Surname:
Chapman
Martin
Leehan
Kilgaard
Johnson

JUL 19 1955

Mr. Frank C. Cummings
Hub Basin Mining Company
542 Staples Avenue
San Francisco 12, California

Re: Docket No. DMEA-3650, Tungsten
Hub Basin Mining Claims
White Pine County, Nevada

Dear Mr. Cummings:

Your application for aid for an exploration project and other data available to us in Washington relating to the above-noted property have been carefully reviewed.

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

Careful study of all our information indicates to us that, although the property in the past has produced a moderate tonnage of tungsten ore of a fair grade, the probability of disclosing minable ore reserves by your proposed program is not sufficiently promising to justify Government participation. We regret to advise you, therefore, that your application for exploration assistance is denied.

We wish to thank you for your interest in the Defense Minerals Exploration Administration program and for bringing your property to our attention.

Sincerely yours,

C. O. Mittendorf

Administrator

cc: Docket
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R. Holliday, USBM
FT, Region 2-Reno

TLChapman/ls
7/15/55

R.C.H.

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

July 15, 1955

MEMORANDUM

To: Administrator, DMEA

From: Iron and Ferro-Alloys Division, DMEA

Subject: Denial of application for exploration assistance to the amount of $222,000.00
Docket No. DMEA-3650, Tungsten
Hub Basin Mining Company
Hub Basin Claims
White Pine County, Nevada

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2. The owner of the property, Laine T. Tilford, Lessor, on June 5, 1954, leased to Frank C. Cummings, Lessee, the following lode and placer mining claims:

Lode Claims

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The property is about 2 miles east of Sec. 25, T. 13 N., R. 67 E.

3. Cambrian quartzite in this area has been cut by granite and many aplite dikes and quartz veins cut the granite. Fluorite and hubnerite occur locally in the quartz veins. Through erosion some placer ground has been formed below this area.

4. The property was first discovered in 1899, and attempts made to work the property for tungsten in 1900, 1907, and 1911 were unsuccessful because of low prices. With better prices in 1915, a mill was constructed and 8,683 tons of ore were mined, concentrated, and sold for $655,828.00, equivalent to $76.68 per ton. Price drops in 1916 again forced the closing of the property and little work has been done since that time. Water was flumed in to wash the placer ground, but only a few tons of lean ore were produced.

5. The main or Hub vein was worked through a 1,700 foot adit and stoped over a vertical range of 500 feet. Evidently no commercial ore was found in the other veins.

6. Of thirteen samples taken by the Field Team, only two picked samples showed any ore grade values. These were 0.52 and 0.69 percent WO_3.

7. The Field Team concludes that there is little probability of developing any significant ore tonnage of an economic grade that would materially help the National Supply Program and recommends denial of the project. The Commodity Divisions of the Geological Survey and the Bureau of Mines concur in the denial.

W S Martin
W. S. Martin, Chief
Iron and Ferro-Alloys Division

DOCKET
Surname:
Chapman
Martin

July 15, 1955

MEMORANDUM

To: Administrator, DMEA

From: Iron and Ferro-Alloys Division, DMEA

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Name	Book No.	Page No.
Paycheck	128	436
Fairplay	148	152
Push Over	128	436
West End	158	21
Top Hand	158	21
Special Attention	166	207
Dead End	158	497
Apple Jack	158	497
Ebony Babe	166	207
Water Supply	187	60
Water Supply No. 1	187	61
North Border	187	57
North Border No. 1	187	58
Extreme East	187	56

Lode Claims (continued)

Name	Book No.	Page No.
Spring Creek Lode	187	59
The Anvil	187	56
Basin No. 1	128	461

Placer Claims

Basin No. 2 to No. 8, inclusive, Book 171, Page 310, all recorded in Court House at Ely, White Pine County, Nevada.

The property is about 2 miles east of Sec. 25, T. 13 N., R. 67 E.

3. Cambrian quartzite in this area has been cut by granite and many aplite dikes and quartz veins cut the granite. Fluorite and hubnerite occur locally in the quartz veins. Through erosion some placer ground has been formed below this area.

4. The property was first discovered in 1899, and attempts made to work the property for tungsten in 1900, 1907, and 1911 were unsuccessful because of low prices. With better prices in 1915, a mill was constructed and 8,683 tons of ore were mined, concentrated, and sold for $655,828.00, equivalent to $76.68 per ton. Price drops in 1916 again forced the closing of the property and little work has been done since that time. Water was flumed in to wash the placer ground, but only a few tons of lean ore were produced.

5. The main or Hub vein was worked through a 1,700 foot adit and stoped over a vertical range of 500 feet. Evidently no commercial ore was found in the other veins.

6. Of thirteen samples taken by the Field Team, only two picked samples showed any ore grade values. These were 0.52 and 0.69 percent WO_3.

7. The Field Team concludes that there is little probability of developing any significant ore tonnage of an economic grade that would materially help the National Supply Program and recommends denial of the project. The Commodity Divisions of the Geological Survey and the Bureau of Mines concur in the denial.

cc: Docket
Code 400
Oper. Comm.
Adm. Read. File

W. S. Martin, Chief
Iron and Ferro-Alloys Division

TLChapman/ls 7/15/55

IN REPLY REFER TO:

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

RECEIVED
JUL - 6 1955

July 5, 1955

Re: DMEA 3650
Hub Basin Tungsten Co.
Hub Basin Claims
White Pine Co., Nevada
$222,000 - Tungsten

Memorandum

Copy [illegible]

To: W. S. Martin, Defense Minerals Exploration Administration

From: N. E. Nelson, U. S. Geological Survey

Subject: Review of Field Team report.

The sampling of the examiners and the history of the Hub Basin camp tend to establish the conclusions of the Field Team as opposed to those of the writer of the report which accompanies the application.

I concur with the recommendation of denial.

N. E. Nelson

N. E. Nelson

RMEA

Docket

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

1605 Evans Avenue
Reno, Nevada

June 23, 1955

WSM

Memorandum

To: Operating Committee, DMEA, Interior Building, Washington 25, D. C.

From: Executive Officer, DMEA Field Team, Region II

Subject: Docket No. DMEA-3650 - Tungsten
Hub Basin Tungsten Company
Hub Basin Claims
White Pine County, Nevada

Reference is made to your letter of February 7, 1955 requesting a field examination on above subject property.

Attached are four copies of a report by Earl H. Pampeyan, Geological Survey and Glenn G. Gentry, Bureau of Mines in which it is recommended that the application for exploration aid be denied. Roscoe Smith and I concur in the recommendations.

S. Ricker

Attach.

Reviewed by
DMEA OPERATING COMMITTEE
7-1-55
(date)

UNITED STATES
DEPARTMENT OF THE INTERIOR
DOUGLAS McKAY, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION II

APPLICATION REPORT

DMEA 3650 (Tungsten)
Hub Basin Tungsten Company
Hub Basin Claims, White Pine County, Nevada

by

Glenn G. Gentry
Mining Engineer
U. S. Bureau of Mines

Earl H. Pampeyan
Geologist
U. S. Geological Survey

June 16, 1955

Reviewed by
DMEA OPERATING COMMITTEE
7-1-55
(date)

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ILLUSTRATIONS

Figure 1. Location map of Hub Basin, Nevada

2. Hub Basin area, White Pine County, Nevada

INTRODUCTION

Under date of January 15, 1955 Mr. F. J. Dowling; Mr. Frank C. Cummings, 542 Staples Avenue, San Francisco 12, California; and Mr. A. F. Daily on behalf of the Hub Basin Tungsten Company to be organized under the laws of the State of Nevada, applied to the Defense Minerals Exploration Administration for financial assistance in a $222,000 program to explore for tungsten on the Hub Basin mining claims in White Pine County, Nevada.

The claims were examined on April 21-22, 1955 by Earl Pampeyan, Geologist, U. S. Geological Survey, and Glenn Gentry, Mining Engineer, U. S. Bureau of Mines, accompanied by Messrs. F. J. Dowling and Frank C. Cummings, two of the applicants and Mr. L. T. Tilford, owner of the mining claims.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Hubnerite occurs sporadically in quartz veins in granite. One of these, the Hub vein, has yielded about 12,000 tons of ore prior to 1917 but is considered to be worked out. Other veins have had little or no exploration.

The applicants proposed an extensive program to explore these other veins and also to explore for placer hubnerite in the alluvium down the slope from the veins.

The exposures of hubnerite-bearing rock seen on the property do not warrant exploration for either vein or placer deposits. The narrow widths and sporadic occurrences of hubnerite in the main Hub vein as well as in other veins indicate there is little probability of producing any significant tonnage of tungsten ore. It appears doubtful

that the grade of ore mined would exceed about 0.5 percent WO_3, which would not be economical unless a milling plant were constructed at the property. This would necessitate an adequate supply of water, not presently available.

In the placer area the operators have conducted no exploration or development and there is no evidence of tungsten minerals in the soil on the surface. The wash, or gulch, is full of large boulders which would be difficult and expensive to handle and the limited yardage does not indicate an economical operation.

It is recommended, therefore, that this application for DMEA assistance be denied.

LOCATION, ACCESSIBILITY, LOCAL RESOURCES

The Hub Basin mine is approximately 41.4 miles southeast of Ely, Nevada, and is accessible by automobile by traveling south from Ely, Nevada on U.S. Highway No. 93, an all weather road, for a distance of 27.8 miles, thence in a southeasterly direction via a graded County road for a distance of 8.7 miles, thence eastward via a very rough and steep unimproved mountain road for a distance of 4.9 miles.

The mine is in the southeasterly portion of White Pine County, Nevada and is reported to be in the U. S. Tungsten mining district, and is further designated as being two miles east of sec. 25, T. 13 N., R. 67 E.

It is usually possible to recruit experienced miners in Ely, Nevada and to purchase necessary mining supplies and equipment in that city. There is no transmitted electric power in the area. The water supply at the mine is limited, though a small quantity could probably

be secured by repairing the present pipe line. It would be necessary to haul or pump water for exploration work.

HISTORY AND PRODUCTION

The applicants report that the property was discovered in 1899 and that intermittent operations were conducted by various mining companies up to and including the year 1916. A small milling plant was erected and the known tonnage of ore mined amounted to approximately 12,000 tons having a gross value of $837,195.00. Apparently only a few tons of selected material have been mined since the year 1916 and the milling plant and all machinery were removed many years ago. The applicants also report that the crude ore mined contained 1.0 percent to 1.25 percent WO_3.

Probably most of the ore mined came from the Hub vein, which had been explored for a horizontal distance of about 1,700 feet and having various levels at various elevations above the floor of the basin.

From the amount of prospecting conducted by the early day miners it is evident that they had explored numerous other quartz exposures on the property and from the limited work decided that the Hub vein was the only one to show commercial values.

PROPERTY AND OWNERSHIP

The applicants report that the property consists of sixteen lode and eight placer claims, all unpatented and held by Right of Location; that all assessment work has been done; that no debts have accrued against the property; and that "Owner's Consent to Lien" can be obtained.

Mr. Frank C. Cummings states that he is in the real estate business in San Francisco, California and that his mining experience has been limited to a small amount of prospecting in the Hub Basin mine area during several summer vacation trips. Mr. F. J. Dowling states that he a retired construction contractor and has had only a limited amount of mining experience. Mr. A. F. Daily, presently reported to reside in South America, is reported to be an experienced placer mine engineer and operator.

Mr. Cummings and Mr. Dowling state they would expect to supervise any exploration mining project. Based upon their experience record, it appears evident that any mining operations should be under the direct supervision of a competent mining engineer.

DEVELOPMENT

The old roads from the main camp area leading to the various adits have been partly destroyed by weather and to a large extent would have to be rebuilt. The main road from the floor of the valley to the mine camp, a distance of 4.9 miles would require widening, considerable gravel and grading prior to the transportation of heavy machinery.

The camp buildings consist of one small cabin in need of considerable repairs, and would accommodate only one man. There is no mining machinery or equipment of any type on the property.

The main vein on the property, designated as the Hub vein, was developed and explored for approximately 1,700 feet along the strike and at various levels prior to 1917. The greater part of these adits and old workings are not accessible for examination and the amount

of and quality of ore left in the bottom of the old workings cannot be ascertained without a considerable amount of rehabilitation.

GEOLOGY

The Hub Basin, on the west slope of the Snake Range, is underlain by biotite granite. Beyond the eastern edge of the property Cambrian quartzite has been intruded by this granite. Many steeply-dipping aplite dikes and quartz veins, along joints which strike N. 60°-70° E. (fig. 2), cut the granite. The quartz veins, some of which are in the aplite dikes, pinch and swell considerably over short distances. Fluorite and hubnerite occur locally in the quartz veins.

ORE DEPOSITS

Quartz lenses containing hubnerite, and traces of scheelite, were mined from the Hub vein (3E on fig. 2). This vein ranged from eight inches to ten feet in width and was mined for a strike length of about 1,700 feet and a vertical distance of about 520 feet. It has been prospected for 100 feet on the Haulage level, about 80 feet below the main level, but little or no ore was found. Only small pillars of the Hub vein can be seen at the surface and the main level is inaccessible. One pillar six feet thick contained hubnerite-bearing rock which constituted one-sixth of the vein.

Fluorite and traces of hubnerite were seen in vein 7E where the quartz was two feet thick, but these minerals were seen only within the limits of the small prospect hole.

Vein 1W, one foot thick, is exposed for less than 50 feet. Thin seams of hubnerite and manganese oxides up to 4 mm thick and

aggregating a total thickness of less than 10 mm cut irregular lenses of fluorite in the quartz over a distance of 25 feet. Vein 1W contains the best showing of tungsten on the applicants' property. A sample, BM 1572, assayed 0.52 percent WO_3.

The placer ground as described by the applicants is approximately as shown on figure 2. Estimated depth to bedrock in the area ranges from 25 feet at the upper end to 150 feet at the lower end. The alluvial material in this area consists primarily (about 75%) of quartzite and granite boulders one to ten feet in diameter; the remainder is soil and cobbles. Inasmuch as the applicants have done no prospecting in the alluvial material, it is impossible to estimate the amount of hubnerite which exists therein. The aplite dikes contain abundant limonite pseudomorphs of pyrite which weather out of the dike rock and resemble hubnerite. A sample of concentrates obtained by the applicants from a previous small placer operation on the property consisted principally of limonite, and only a few of the grains in the sample were tentatively identified as hubnerite.

SAMPLING

Thirteen samples were taken from areas which would indicate a general average assay evaluation of accessible workings:

Sample No.	Width Ft.	% WO_3	Description
BM 1559	1.0	*0.01	Qtz. vein in face of old Haulage tunnel (Hub vein).
BM 1560	4.0	*0.01	Qtz. vein in face of NW crosscut off Haulage level.
BM 1562	Chip	*0.01	Qtz. boulder near top of hill on the No. 1 vein, is exposed for approximately 2 ft. on surface.
BM 1563	2.0	*0.01	Qtz. vein No. 1 in adit at top of hill. Across back. 55.6 ft. in from portal.
BM 1564	1.0	*0.01	Qtz. vein No. 1 in same adit as No. 1563. Across back. 92 ft. NE of No. 1563.
BM 1565	1.2	*0.01	Qtz. vein 16 ft. NE of portal of adit on Hub vein at top of hill. This drift joins old stopes.
BM 1566	Selected Pcs.	0.69	Selected pieces of ore from old dump at portal of adit where No. 1565 was taken.
BM 1567	1.5	0.01	Qtz. vein No. 5 in short tunnel. Strikes N 80° E - Dip 67° S.
BM 1568	2.0	*0.01	No. 7 qtz. vein. East face of open cut at top of hill. To be DD target from where 1567 taken.
BM 1569	Grab	0.03	Partially filled placer test hole. About 500 ft. due south of cabin. Loose soil - no gravel (Hole 18" deep).
BM 1570	Grab	0.03	Partially filled placer test hole 4 ft. deep. 100 ft. due south of cabin. Loose soil - no gravel.
BM 1571	0.7	*0.01	Small qtz. outcrop or boulder at proposed portal of adit on No. 1 vein. (Same vein as No. 1562).
BM 1572	0.7	0.52	Small surface exposure of qtz. at west end of No. 1 west vein. Selected material.

*Less than

ORE RESERVES

A few tons of low grade measured ore remains in pillars in the Hub workings. Not more than two tons of low grade ore averaging about 0.5 percent WO_3 is indicated in veins 1W and 7E. There are no inferred reserves in these or in the remaining quartz veins.

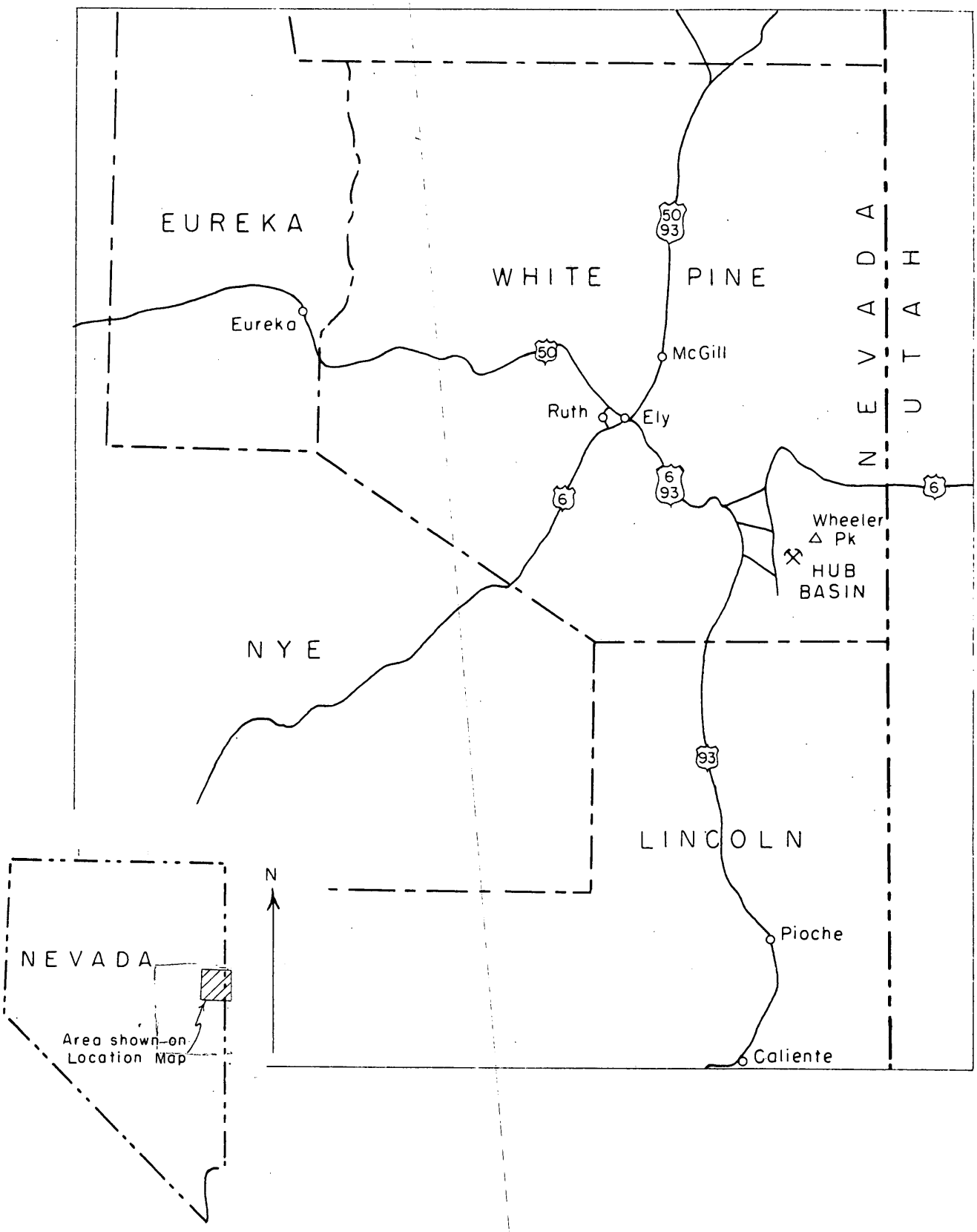
Reserves in the placer ground are confined to inferred ore. Possibly a few tons of hubnerite-bearing gravel exist in the alluvial material.

APPLICANTS' PROPOSAL

The applicants propose to explore quartz veins 1E, 2E, 5E, 6E, and 1W (fig. 2) with 1,400 feet of drifts and raises and about 12,500 feet of diamond drilling. They also propose to prospect the Hub Basin placer area by means of 20 small prospect shafts to a depth of 20 feet each, and to further prospect the placer area and adjoining areas with a 6-inch placer drill. The total cost estimate was $222,000.

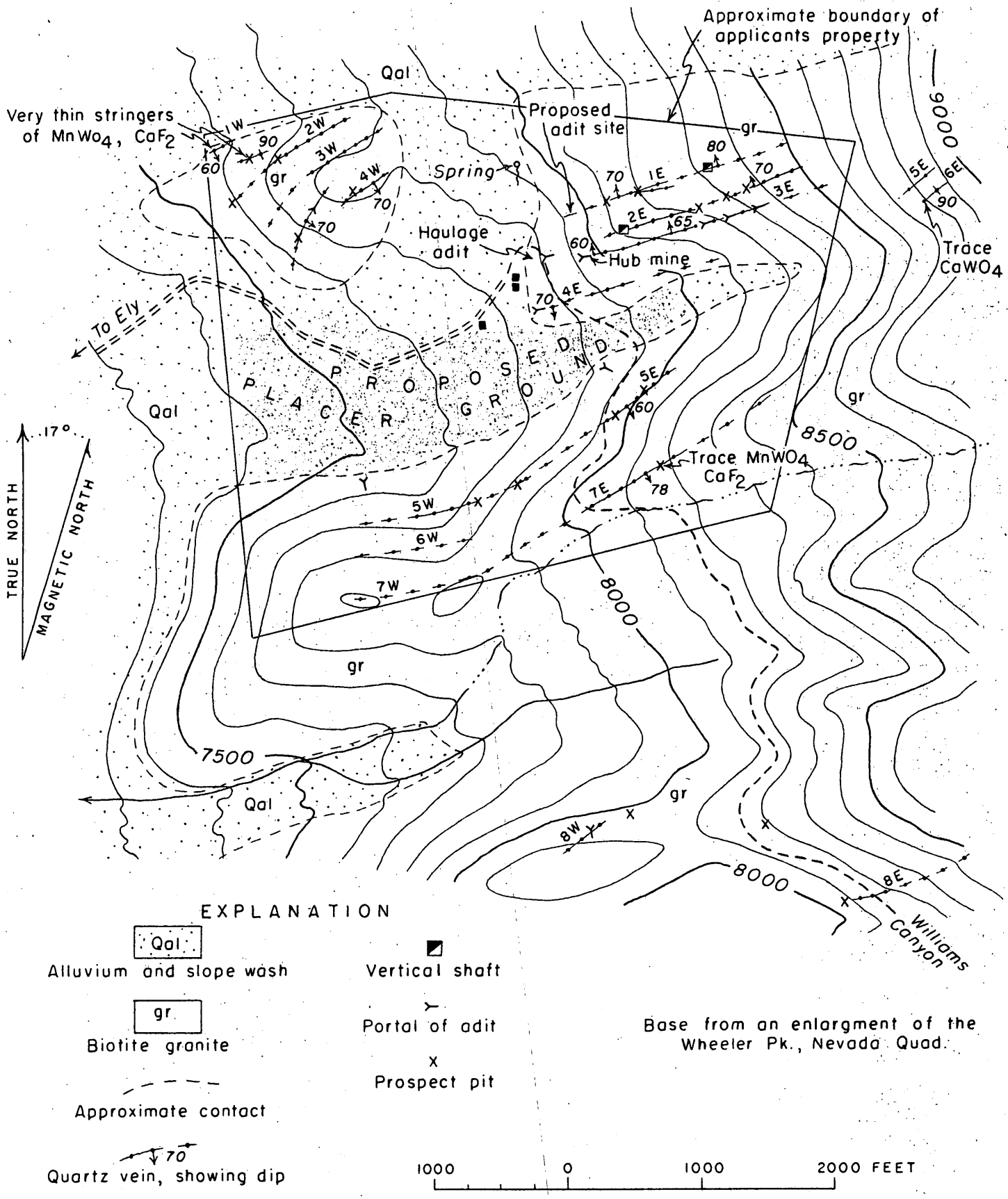
The designation of veins on figure 2 is different from the application and has been changed slightly to match the applicants' latest map.

There is no geological evidence to justify any of the proposed program.



LOCATION MAP OF HUB BASIN, NEVADA

Figure 1



Base from an enlargment of the Wheeler Pk., Nevada Quad.

HUB BASIN AREA, WHITE PINE COUNTY, NEVADA

Figure 2

400

DOCKET
Surname:

Chapman
Martin
McInnis
Hedger
Kiilsgaard
Selfridge
Johnson

FEB 7 1955

Hub Basin Tungsten Company
c/o Frank C. Cummings
542 Staples Avenue
San Francisco 12, California

Re: Docket No. DMEA 3650 - Tungsten
Hub Basin claims
White Pine County, Nevada

Gentlemen:

The above-docketed application for exploration assistance for tungsten has been reviewed by the Iron and Ferro-Alloys Division of the Defense Minerals Exploration Administration and is being referred to Mr. Spangler Rieker, Executive Officer, DMEA Field Team, Region II, 420 Custom House, 555 Battery Street, San Francisco 11, California, for further consideration and possibly a field examination of the property.

Should a field examination be required, any assistance that you can give the examining engineers will be appreciated.

Sincerely yours,

C. O. Mittendorf

Administrator

TLChapman/ls
2/2/55

cc: Docket
Code 400
Adm. Read. File
Oper. Committee
FT, Reg. II-San Francisco
W. McInnis, USBM
T. Kiilsgaard, USGS

DOCKET
Surname:
Chapman
Martin,
McInnis
Selfridge
Johnson

FEB 7 1955

Mr. Spangler Ricker, Executive Officer
DMEA Field Team, Region II
420 Custom House, 555 Battery Street
San Francisco 11, California

Re: Docket No. DMEA 3650 - Tungsten
Hub Basin Tungsten Company
Hub Basin claims
White Pine County, Nevada

Dear Mr. Ricker:

The above-docketed application for exploration assistance is being referred to your office for a field examination of the property.

Two copies of a relevant memorandum dated January 27, 1955, by E. L. Newcomb, Geological Survey, are enclosed for your information.

Sincerely yours,

George C. Selfridge

Chairman, Operating Committee

Enclosure

APPROVED:

J. H. Hedges

Member, Bureau of Mines

Thor H. Kiilsgaard

Member, Geological Survey

cc: Docket
FT, Reg. II - San Francisco
Code 400
Adm. Read. File
Oper. Committee
W. McInnis, USBM
T. Kiilsgaard, USGS

~~FARutledge/ls~~
TLChapman/ls
2/2/55

Docket

IN REPLY REFER TO:

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

Received

January 27, 1955

WSM

Re: DMEA-3650
Hub Basin Tungsten Co.
(Hub Basin)
White Pine Co., Nev.
$222,000 - Tungsten

Memorandum

To: W. S. Martin, Defense Minerals Exploration Administration

From: E. L. Newcomb, U. S. Geological Survey

Subject: Review of application

The operator has proposed a very extensive program which involves trenching, drilling, raising and drifting to explore several tungsten veins and an associated alluvial deposit.

The project consists of the following items of work:

1.) 600 feet of drift -- Vein 2E.
2.) 150 feet of raises -- Vein 2E.
3.) 5,040 feet (24 holes) of drilling -- Vein 2E drift.
4.) Trenches along Veins 1E, 2E, 3E and 1W.
5.) 3 holes from Vein 5E tunnel to intersect Vein 6E.
6.) Up-hole drilling from 2E drift to further test Veins 1E and 3E.
7.) Drift on Vein 1E or 3E, if drilling results warrant additional work.
8.) Drift 300 feet on Vein 1W, if trenching results are favorable.
9.) Sink 20 prospect shafts and placer drill the Hub Basin alluvial deposits.

Past production from the property may have totaled about 10,000 tons of ore, but this record cannot be substantiated. Most of the production was obtained prior to 1917. A small amount of selectively mined ore and some alluvial material have been mined in recent years.

The old workings consist of a 1700 foot tunnel and several short tunnels on the Hub (4E) vein, and a number of short tunnels and crosscuts on a number of other veins in the area. The operator reports that most of the old workings are accessible.

The Hub deposits occur in a group of parallel quartz veins which strike N. 55° E. to N. 80° E. and are nearly vertical in dip. All of the veins strike at about right angles to the northwest trend of a large alaskite dike which has intruded quartz monzonite. Post-mineral faulting, parallel to the dike, is reported to have offset the veins about 600 feet which accounts for the vein designations as 1E, 1W, 2E, 2W, etc.

Tungsten mineralization occurs as hubnerite in a predominantly quartz gangue with small amounts of associated fluorite and pyrite. The ore bodies are characterized as small ore shoots which frequently contain high grade ore over very narrow widths. However, for a mining width of 4 feet, many of the ore bodies probably would be reduced to ore grades which are non-economic.

The map submitted with the application does not show very satisfactorily the geology in the Hub Basin area. Much of the proposed program does not appear to be warranted, but a limited amount of work on Veins 1E, 2E, and 3E may be justified, if the project is properly staged.

I recommend a field referral for an examination of the property. Some trenching and drilling may be warranted on a part of the vein system.

E. L. Newcomb

E. L. Newcomb

January 25, 1955
Subject: DMEA 3650
Re: Exploration Assistance
Hub Basin

Hub Basin Tungsten Company
C/o Frank C. Cummings
542 Staples Avenue
San Francisco 12, California

Gentlemen:

The receipt of your application dated January 15, 1955 for exploration assistance under the Defense Production Act of 1950, as amended, is hereby acknowledged.

Your application has been assigned Docket Number DMEA 3650 and referred to the Iron and Ferro-Alloys 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

60932

January 15, 1955.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
JAN 24 1955

Defense Minerals Exploration Administration,
Department of the Interior
Washington 25, D. C.

Sirs:

There is transmitted herewith in quadruplicate an Application on DMEA Form MF-103 for Government aid in financing a Defense Exploration Project for tungsten in the Hub Basin Property near Ely, Nevada.

The production history of the property, though limited from economic causes, as well as the geologic study made for the Applicant indicate, in our opinion, that an exploration project as proposed in our Application is likely to result in justifying development of a property that will produce a significant amount of the strategic mineral tungsten.

In addition to conducting successful lode mining, the operators of this property in 1915-16 constructed about two miles of wooden flume with accessories to conduct alluvial mining in the valley basin, using a simple sluice box to concentrate the heavy products of erosion processes and thus obtain a commercial ore for mill treatment. An expenditure of this sort would hardly have been made without prior assurance of successful operation. According to local reports, similar methods have been used at other times on a small scale, using only local spring run-off water.

Because of the great improvements during recent years in methods of concentrating heavy minerals in deposits of this type, the Applicant considers exploration of the alluvial deposit equally as important as that of the lode possibilities.

It is respectfully requested that the assistance requested be granted at as early a date as possible, so preparations can be made for starting the field program as soon as weather conditions will permit in the spring of 1955.

Very truly yours,

F. J. Lawling
Frank C. Cummings
A. F. Dailey

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

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

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

Not to be filled in by applicant

Docket No. 3650
Metal or Mineral Tungsten
Date Received 1-24-55
Estimated Cost $222,000
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: It is desired to contract in the name of "Hub Basin Tungsten Company", which will be organized as a Corporation under the laws of the State of Nevada. Mailing address C/O Frank C. Cummings, 542 Staples Avenue, San Francisco 12, California

(*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

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

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

(*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.

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

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

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.

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

.....

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

(*c*) The work will start within ..... days and be completed within ..... 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)?

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

[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 15, 1955

F. J. Fowling
(Applicant)

By Frank C. Cummings

For and in behalf of Hub Basin Tungsten Company, a corporation to be organized under the laws of the State of Nevada.

A. F. Daily

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

HUB BASIN TUNGSTEN PROPERTY

Draft for DMEA Form MF-103

1. Name of Applicant

It is desired to contract in the name of Hub Basin Tungsten Company which will be organized as a Corporation under the laws of the State of Nevada. The proposed officers of such corporation will be Frank J. Dowling, 870 Junipero Serra Blvd., Frank C. Cummings, 542 Staples Avenue of San Francisco 12, California and Arthur F. Daily, 488 Fairbanks Avenue, Oakland 10, California, who will sign this application in behalf of such proposed Corporation. The exact titles of these individuals as officers cannot be given since the corporation has not yet been organized.

For mailing address C/O Frank C. Cummings, 542 Staples Avenue, San Francisco 12, California.

2. (Contains instructions only).

3.(a). Legal Description of Land.

The property consists of sixteen lode and eight placer claims, all unpatented. Data on claim names, recording of location notices, and recording of annual labor is given below.

	Location Notice				Annual Labor 1954*			
	Doc. No.	Book No.	Page No.	Date Recorded	Doc. No.	Book No.	Page No.	Date Recorded
Lode Claims								
Paycheck	64042	128	436	10-10-40	94275	171	310	6-12-54
Fairplay	83171	148	152	7-5-49	”	”	”	”
Push Over	64041	128	436	10-10-40	”	”	”	”
West End	86178	158	21	2-6-51	”	”	”	”
Top Hand	86179	158	21	2-6-51	”	”	”	”
Spec.Attention	88481	166	207	12-10-51	”	”	”	”
Dead End	87855	158	497	8-29-51	”	”	”	”
Apple Jack	87856	158	497	8-29-51	”	”	”	”
Ebony Babe	88480	166	207	12-10-51	”	”	”	”
Water Supply	95922	187	60	11-15-54		None		
Water Sup.#1	95923	187	61	”		”		
North Border	95919	187	57	”				
” ” #1	95920	187	58	”				
Extreme East	95918	187	56	”				
Spring Cr.Lode	95921	187	59	”				
The Anvil	95917	187	55	”				
Basin No. 1	64186	128	461	11-9-40	94275	171	310	6-12-54

Basin No. 2 to 8 inclusive recorded as Basin Eight Association Placer.

* Note: Applies to claims located prior to 30 June 1954

Recorded in the office of the County Recorder, White Pine Co., Nev.

(b) The property is known as the Hub Basin.

(c) The corporation (applicant) is the lessee of the mining claims and other rights.

(d) A copy of the Lease Agreement from the Owner, Laine T. Tilford to Lessee Frank C. Cummings dated 5 June 1954 is attached as Exhibit 1. (This lease will be assigned to Hub Basin Tungsten Company, a corporation to be organized, prior to execution of Exploration Contract.)

(e) Not applicable.

(f) Recording Data on Claims. (Included in 3.(a) above.)

4.(a) Description of Previous Mining and Exploration Operations.

Applicant had no interest in any of this work.

According to various sources of information, tungsten bearing float rock and at least one vein in which the principal mineral was identified as huebnerite was discovered on this property by Charles Gaby in 1899. The Tungsten Mining District, in which the claims are situated, was formed in 1900. It is reported that about four tons of 70% concentrate were produced and sold at that time but the price was too low ($5.20 per unit) to justify further production.

During the next few years some development work was done, and in 1907 considerable work was done, a small mill constructed, and a few cars of concentrate produced and sold, by E. L. Fletcher of Ely and Oscar Turner of Philadelphia, but again the operation was unprofitable at the prevailing price. A few years later work was resumed on the property by the Tonopah Mining Co., and some concentrate shipped, but the returns were unsatisfactory so it was closed down. In the Univ. of Nevada Geology and Mining Series Bull. No. 38 (1 Nov. 1943) production of 375 tons of ore having a value of $6,525. is reported for the year 1911, but no report is given for 1907.

During the summer of 1915, when the price of tungsten was increasing rapidly, the U. S. Tungsten Co. (successor in interest to Tonopah Mining Co.) reopened the property and rapidly expanded operations until about 125 men were employed by the late spring of 1916. Development work both underground and surface was prosecuted vigorously and ore from several surface outcrops and tunnels was treated in the mill, which had been expanded to a capacity of about 50 tons per day. In addition, an hydraulic operation was also started in March 1916, using water brought from Williams Creek in a wooden flume about two miles in length, which is said to have provided a pressure of 150 to 175 psi at the camp. It is reported that about fifteen veins were known, but the principal production came from about three of them, and mostly from one. It appears that the production from alluvial mining was small, though comparatively high grade.

It is reported that, from a point a short distance above the mill, a horizontal tunnel at least 1700' in length was driven along the main or Hub Vein, and that the face was about 700' below the surface. Higher on the same vein other shorter tunnels were

also driven. Near vertical raises were driven in places for stoping and to connect the higher level with the main haulage level. Short tunnels were driven along other veins in a few places, and a cross-cut about 175' in length into the hillside near the toe of hill on the south side of the Hub Basin, which crossed one vein at 150' from the portal.

Most of the tunnels are still open and accessible, though there is a little water on the floor in places. From the small number of cross-cuts it is concluded that the underground work was planned to produce commercial ore for immediate mining as the tunnels or raises were advanced, rather than to develop proven reserves for a long term operation. No evidence has been found of development work below the floor of the main tunnel.

Most of the tonnage from lodes was extracted from stopes opened from raises along and in the quartz veins, which were near vertical. Where caving into the stopes has extended to the surface, it appears that they were mined from two to five feet in width, and that the walls were well defined at the quartz-granite contacts. In places where the quartz veins narrowed to a few inches in width or split into several narrow veins, wall rock was mined to provide a workable width of tunnel, and probably stopes, of about four feet. It is said that in places quartz veins up to 30' in width were found.

The operations of U. S. Tungsten were short-lived and terminated probably in the latter part of 1916 when the price of tungsten suddenly dropped to a low level. The official report of production (op.cit) is 8,683 tons of ore mined in 1916, having a total value of $665,828, or an average of $76.68 per ton. A newspaper report for the quarter ending 30 June 1916 states that 3,212 tons of ore were mined, producing a gross yield of $171,367, or an average of $53.35 per ton. It is reported that the ore mined assayed 1.0 to 1.25% WO_3 but the surface material treated in the mill, part of which was merely picked up and part concentrated in a sluice box, was higher grade.

No record has been found of any exploration or extractive operations since 1916 except that a few truck loads of selected material and alluvial concentrate were removed by the present Lessor during the past year or two. The mill and all other structures used by U. S. Tungsten were removed long ago and the flume has rotted away.

Selected Bibliography:

21st Ann. Report U.S.G.S. pt. 6, 1901, pp. 319-320.
U.S.G.S. Bull. No. 340. 1907 pp. 263-270. (Concerning this property only).
Min. Res. U.S. for 1900, U.S.G.S. 1901,pp. 257-259.
U.S.G.S. Bull. 652, 1917, p.26 et al.

4.(b) Data on past production.

All data that has been found with respect to past production is reported above, and there is no current production. It cannot be considered that any proven ore reserves exist on the property.

(c) Description of Geologic Features, etc.

A geologists and engineer's report by Wayne A. Fox of Wayne Fox Mineral Surveys, Berkeley, California, dated 1 September 1954 is transmitted herewith as Exhibit No. 2. This report contains a description of the geologic features, mineralization, type of deposit, known veins, and other pertinent information. Enclosed with it is a photostat enlargement of a portion of the Wheeler Peak Quadrangle Map, Nevada, U.S.G.S. 15 minute series, Topographic, on which Mr. Fox has marked the approximate location of veins he observed, and of old workings. This Exhibit does not have to be returned.

(d) Accessibility of Property, etc.

The Hub Basin Property is situated about 50 miles south-easterly from Ely, Nevada, in White Pine County, Tungsten Recording District. Access from Ely is via 36 miles of paved, two-lane highway (US 6-50), thence over about 9 miles of improved, dry weather, dirt road (County), thence over 5.3 miles of unimproved track in which there is a climb from an elevation of about 6000' to 7750' above sea level in a distance of about four miles, an average grade of about 14%. Passenger cars can, with care be driven to the old mill site except during wet or snowy weather, but a pickup truck is more suitable. Chains may be required at times. About 4 miles of the direct access road is very rough and steep, and would have to be improved for more than a bare minimum of travel. Another route of access from the County Road should be constructed or improved for regular use. A narrow and very steep wagon road extends from the old mill site to the top of a ridge about 500' higher. During the 1916 and earlier operations, ore from points higher than the main haulage tunnel a few feet above the mill was sacked and hauled to the mill on burros or mules.

Ely is the nearest shipping, supply and residence point. There is a tungsten mill at Ely which is expected to be able and willing to beneficiate ore of the type known on the Hub Property.

(e) Availability of Manpower, etc.

Experienced miners are usually available in the district. Materials, supplies and equipment can be obtained at Ely, or ordered from Salt Lake City or other places as necessary. Contract hauling service can be arranged in Ely.

A small quantity of water, estimated to be sufficient for domestic camp use, can be developed from a spring on a hillside above the camp. An old pipeline consisting of 3", 2" and 1 1/2" pipe in poor condition has been rehabilitated and used at times during the past two summers. It has not been determined whether or not this supply could be economically developed for use during the winter months. Additional water for other uses, probably including the proposed exploration program, would have to be obtained from Williams Creek as in 1916 or, by pumping from wells. No data is available concerning the underground water table; at least preliminary information would be obtained from the proposed placer exploration program.

As the nearest electric power lines are many miles away, all power will have to be provided at the site by diesel generator plant.

5. The Exploration Project

(a) Minerals to be Explored for.

It is proposed to explore for deposits of tungsten ore that can be commercially developed. The principal tungsten mineral known to exist in the property is huebnerite, but a little scheelite has been associated with it in places.

(b) Description of Proposed Exploration Work.

Consisting of three phases to be conducted concurrently.

Phase 1. Lode Exploration (For Vein numbers refer to Fox Report.)
Introductory note: Because there are a number of outcrops all of which show high grade mineralization, and several old workings of limited extent from which commercial ore was removed, all of which indicate a continuous ore-bearing vein upwards of 1500' in length, and because of its accessibility, Vein 2E has been selected as a primary initial location for lode exploration.

i. From a surface exposure at about the elevation of the portal to the long tunnel on the Hub Vein (Fox Vein 4E), drive a horizontal tunnel about 4' x 6.5' in section, following Vein 2E easterly for a distance of about 600'. At suitable points drive at least 3 raises about 50' in height. At intervals of about 50', diamond drill a pair of holes (size EX) in opposite directions, normal to the plane of the vein, to intersect Veins 1E to the north and 3E to the south (estimated average distances 300' and 120' respectively).

ii. Excavate surface trenches along Veins 1E, 2E, 3E, 1W, and at other likely locations in these vicinities to ascertain their surface position and continuity, and to expose vein material for sampling.

iii. Clean out the old tunnel which crosses Vein 5E, then from the end of the tunnel diamond drill 3 holes to intersect Vein 6E; (estimated total drilling 700').

iv. If the results of the drifting and diamond drilling along Vein 2E (as per i. above) are encouraging, as expected, at intervals of about 100' drill additional holes diagonally upward from the normal lines to intersect Veins 1E and 3E or both at points about 50' above the normal line.

v. If the prospects along the first 300' to 400' of the tunnel on Vein 2E are definitely discouraging, and the surface trenching and diamond drilling (including supplementary holes) indicate favorable prospects on Vein 1E or 3E, drive at least 500' of tunnel and one or two raises along one of the other veins commencing at the surface or from a cross-cut from Vein 2E, whichever may be best.

vi. If the results of the surface trenching along Vein 1W are encouraging, drive about 300' of tunnel along the vein, commencing at a suitable point on the surface.

The lode program outlined above involves an estimated 1050' of tunnel work plus 8000' of diamond drilling, to 1400' of tunnel work plus 4500' of diamond drilling. The lode prospecting program must be considered as flexible, and subject to change in accordance with the results of the work as it progresses.

Phase 2. Alluvial Deposit Exploration

i. In the floor of the Hub Basin, excavate at least 20 small prospect shafts to a depth of at least 20' each, with the holes spaced about 200' apart on lines that cross the valley. Separate the excavated material into suitable fractions by screening, for testing of the smaller sized fractions.

ii. Prospect the same and adjoining areas using a standard placer drill with nominal 6'' diameter casing, to check shaft results and to ascertain the character of formation and tenor of material at depth. This program is intended to produce data on the shape and cross-section of the deposit which is believed to extend over an area in excess of 30 acres. An essential objective of this work is to obtain data on the underground water table.

Phase 3. Testing

i. Select typical samples of material from prospect trenches, tunnels, diamond drill cores and alluvial concentrate, using accepted methods, and have assays made at the project site. Finer fractions of alluvial material to be concentrated by gravity methods (jigging) at the site. Select typical samples of ore and concentrate, as determined by assay, and have mill tests run to ascertain the milling characteristics, efficiency of beneficiation, and grade of concentrate obtainable from the ore. If ore grade material happens to incidentally result from the exploration work it will be shipped for treatment subject to disposition of proceeds in compliance with DMEA regulations.

ii. Available information indicates that the width of the quartz veins with which the ore is associated is very irregular indeed, and that the width and grade of the ore chutes in the veins, or in the wall rock, is extremely irregular, which is typical of tungsten ore deposits in fissure veins. Therefore drifting along the veins, supplemented with diamond drilling, is considered the best method for exploring the lodes.

iii. Exploration of the alluvial deposit is considered to be of equal or greater importance to the exploration project, particularly because of the great improvements in placer concentrating methods that have been made in very recent years.

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5.(c) After the date of an exploration project contract, work will start as soon as weather conditions will permit and the required materials and equipment can be assembled. As the prerequisites to actual exploration are road improvements, surface facilities, water and power supply, starting of work would not be economical or feasible during the period from about 15 December to 15 March unless winter conditions happen to be exceptionally favorable. However, any time available during this period would be constructively used for assembly of material and equipment, arrangement of contracts, etc., so construction and other pre-exploration work could be started at the earliest practicable date.

It is estimated that the exploration project outlined above can be completed within six and one half months after construction of the camp, provided that no unusual or unexpected weather or other conditions interfere. If the results of the lode, or placer, or both exploration phases should be very fortunate and lead to issuance of a Certificate of Discovery prior to completion of the exploration program outlined above, then it would be unnecessary to proceed with the uncompleted portion of the program.

We'll have to tell F to set him straight

5.(d) Respecting the Applicants, Mr. Frank J. Dowling has been actively engaged in heavy construction work for about 30 years, and he and Mr. Frank C. Cummings have been associated with small scale mining ventures in other than technical capacities. Mr. A. F. Daily has been engaged primarily in placer dredging during the past 25 years, as engineer for U.S.S.R. & M. Co. at Fairbanks, Alaska, assistant general manager of Yukon Consolidated Gold Corp. (10 dredges) at Dawson, Y.T., and on consulting work for various interests in the U.S., Canada, Alaska, Colombia, Brazil and New Zealand. Both Mr. Dowling and Mr. Daily have been managers of Government cost-plus-a-fixed-fee types of contracts, and are familiar with the requirements for maintaining cost records for reimbursement.

6. <u>Estimate of Costs</u>

Lode: Based on equivalent of 1050 lin. ft. of tunnel and raises, or 1050 C.Y. of material to be excavated from tunnels, raises and drilling stations, at an average rate of 8' advance per day in two shifts; diamond drilling an average of 30' per machine per shift; estimated total working time 26 weeks after construction of camp.

Placer: Based on excavating about 20 prospect shafts to a depth of at least 20' each at a rate of one shaft per week, and use of placer drill for six weeks.

Facilities: Camp to house and feed 40 men including transients, with necessary operational and service buildings and utilities.

a. Independent Contractors:	Quant.	Unit	Unit Rate	Amount
Hauling - all items (except f. below) from and to Ely or other points	14000	TonMi	$0.07	$ 980.00
D-8 Dozer and driver	300	Hrs.	14.00	4,200.00
Station contractors - lode (Includes labor, explosives, supplies, compressor and fan operation and maintenance, tunneling equipment maint., Workmen's Compensation, payroll taxes). (Excludes Cost and depreciation of equipment, transportation of explosives and supplies from Ely, cost of providing quarters, loss on subsistence if any, cost of electric power).	1050	lin.ft.	30.00	31,500.00
Diamond drilling, including labor, material, air and water lines	8000	lin.ft.	5.50	44,000.00
Road Improvements	lot			8,320.00
Total				$89,000.00

6.(b). Labor, Supervision and Consultants
(Rates shown are estimated only)

	No.	Duration	Unit $ mo.	Amount
Consultants (if required)		lot		$ 1,500.
Class A- Exempt Classifications - Monthly rates				
Engineer in charge	1	8 mo.	$650.	$ 5,200.
Engineer - surveys, plans, samples	1	8 "	550.	4,400.
Assayer	1	7 "	400.	2,800.
Total	3			$12,400.
Class B - Non-Manual Occupations - Hourly Rates				
Cook	1	7 mo.	$425.	$ 2,975.
Cook helper	1	7 "	$375.	2,625.
Waiter - bull cook	1	6 "	$350.	2,100.
Accountant	1	8 "	$425.	2,975.
Total	4			$10,675.
Less: Est. recovery from charge for meals				3,675.
Total - net				$ 7,000.
Class C - Manual Occupations - Hourly Rates				
Maint. Mechanic - genl.	1	7 mo.	$400.	$ 2,800.
Electrician - (Generator oper.)	1	7 "	450.	3,150.
Tractor driver - D-4	1	7 "	450.	3,150.

	No.	Duration	Unit Rate	Amount
Class C - Manual Occupations - Hourly Rates (Cont'd)				
Laborers - surface work	4	3 mo.	$350.	$ 4,200.
Shaft crew	3	5 "	375.	5,625.
Driller	1	2 "	450.	900.
Panner	1	2 "	400.	800.
Helper	1	2 "	375.	750.
Total	13			$21,375.
Grand total 6.(b)				$42,275.
Contingencies				$ 4,725.
Total 6.(b)				$47,000.

6.(c) Operating Materials and Supplies

	Amount
Fuel oil (generator, range, etc.)	$ 1,000.
Lub. and miscl. oils	150.
Drill steel and bits	500.
Tram track and fittings 9 T	1,100.
Air and water hose and fittings	450.
Ventilating system materials	500.
Timber, ties, miscl. lumber	2,500.
Mess house - utensils	400.
Mess house - oper. supplies	300.
Mess house - food (recovered by charge for meals)	-
Quarters - fixtures and supplies	750.
Miscl. valves, pipe, fittings	400.
Miscl. hardware, nails, bolts, etc.	300.
Tarps, canvas, etc.	300.
Miscl. hand tools	500.
Assay lab. equipt. and supplies	350.
Engr. field and office items	100.
Safety equipt. and supplies	200.
Miscl. fuels, gasoline	400.
Snall fans	100.
Placer prospecting supplies	300.
Camp Maint. items	400.
Genl. office supplies	300.
Office machines, rental	200.
Fire extinguishers	150.
Gas cutting and welding outfit and supplies	800.
Office furniture	250.
Total	$12,700.
Contingencies	1,300.
Total 6.(c)	$14,000.

6.(d) Operating Equipment

D-4 tractor	$ 4,000.
Drills and accessories	1,000.
Air trammer - used	2,000.

6.(d) Operating Equipment (Cont'd)

	Amount
Air compressor = diesel - used	$ 4,000.
Ventilating fan - used	250.
Mine cars - used	600.
Transit and level - rental	100.
Placer sample concentrator	2,000.
Refrigerators	900.
Blacksmith shop equipt.	300.
Drill press - used	300.
Diesel generator set - used	2,000.
Assay lab equipment	250.
Oil-fired range - used	250.
Typewriter	100.
1/2 ton pick up truck	2,000.
Placer drilling outfit - rental and transpt.	1,800.
Total	$21,850.
Contingencies	2,650.
Total 6 (d)	$24,500.

6.(e) Rehabilitation and Repair of items Owned by Applicant.

Structures on the property consist only of two very small wooden shacks of no use or value. Applicant does not propose to use any owner equipment.

No cost.

6.(f) New Buildings, Improvements, Installations

(Note: Estimated costs shown below are for erected at the site, (exclusive of site preparation), complete and ready for use, including all labor and transportation of material. Dimensions are approximate and most costs are based on price of used structures expected to be available for dismantling and moving; type of construction for summer occupance only.)

	Amount
1 - 20' x 48' mess building	$ 5,000.
1 - " bunk house	4,500.
3 - 24' x 28' bunk house	5,200.
1 - " office and lab bldg.	3,000.
1 - 20' x 48' quonset, shop, whse., garage	2,100.
1 - 14' x 20' shower and laundry house	1,200.
2 - 10' x 12' compressor and generator houses	800.
Water supply and storage system	2,000.
" distribution system	2,000.
Sanitary facilities	1,000.
Power distribution system (ex generator)	2,100
Total	$28,900.
Contingencies	3,600.
Total 6.(f)	$32,500.

6.(g) Miscellaneous

	Amount
Equipment repair parts (labor included above)	$ 2,500.
Workmen's Compensation (ex. station contractor)	4,200.
Payroll taxes - employer "	1,300.
Employer's liability insurance - comprehensive	500.
Fire insurance	1,500.
Total	$10,000.

6.(h) Contingencies (Not included above)

Development of additional water supply from well in the event that the spring will not supply sufficient water. Not expected to be necessary for exploration program, but might be.	$ 5,000.

6.(a) to (h) inclusive - Summary

	Amount
(a) Independent Contracts	$ 89,000.
(b) Labor	47,000.
(c) Operating Materials and Supplies	14,000.
(d) Operating Equipment	24,500.
(e) Rehabilitation and Repairs	-
(f) New Buildings, etc.	32,500.
(g) Miscellaneous	10,000.
(h) Contingencies	5,000.
	$222,000.

7.(a) Financing

The Applicant is prepared to furnish his share of the cost of the proposed program upon receipt of approval of the Application by the Government and execution of the Exploration Contract, provided that Applicant's share of the cost does not exceed 25%. An actual cost form of contract is proposed as the project is not suited to unit cost estimating, or performance. Proper and adequate records of actual cost are proposed to be kept as a part of the cost of performance of the work, and vouchers submitted in proper forms at monthly intervals to obtain reimbursement from the Government for its proportion of the cost.

(b) The Applicant proposes to furnish his share of the cost in cash.

END

EXHIBIT 1

LEASE AGREEMENT

THIS LEASE AGREEMENT, made and entered into this 5th day of June, 1954, by and between LAINE T. TILFORD, a single man, party of the first part, hereinafter referred to as "Lessor", and FRANK CUMMINGS, party of the second part, hereinafter referred to as "Lessee";

WITNESSETH:

I

That the said Lessor, for and in consideration of the sum of Ten dollars ($10.00), lawful money of the United States, to him in hand paid by Lessee, and other good and valuable considerations, the receipt of which is hereby acknowledged, does hereby remise, lease and let unto said Lessee all those certain lode and placer mining claims situate in U. S. Tungsten Mining District, County of White Pine, State of Nevada, and known and more particularly described as follows, to-wit:

LODE CLAIMS

Paycheck	Ebony Babe
Fairplay	Water Supply
Push Over	Water Supply No. 1
West End	North Border
Top Hand	North Border No. 1
Special Attention	Extreme East
Dead End	Spring Creek Lode
Apple Jack	The Anvil

PLACER CLAIMS

Basin No. 1	Basin No. 5
Basin No. 2	Basin No. 6
Basin No. 3	Basin No. 7
Basin No. 4	Basin No. 8

The Certificates of Location of which are or will be recorded in the Office of the County Recorder, White Pine County, Nevada, together with all water and water rights appurtenant thereto or heretofore used in connection therewith.

Said Lessee to have and hold said above described mining claims for the term of ten (10) years from and after the date hereof.

II

For and in consideration of the demise, letting and lease of said above described mining claims, which said consideration is in addition to the hereinabove stated consideration, said Lessee hereby agrees to pay said Lessor a royalty of ten per cent (10%) as hereinafter set forth, until the total sum of Ninety Five Thousand Dollars ($95,000.00) is paid in full.

III

Said royalties shall be calculated in the following manner, to-wit: Royalties in the sum of ten per cent (10%) to be paid on all ore mined, hauled and treated after deducting the cost of hauling and treatment. Royalty payments to be made to the credit of the said Lessor in The Ely National Bank, Ely, Nevada, on the following claims, namely, Paycheck, Fairplay, Push Over, West End, Top Hand, Special Attention, Dead End, Apple Jack, Ebony Babe, Basin No. 1, Basin No. 2, Basin No. 3, Basin No. 4, Basin No. 5, Basin No. 6, Basin No. 7, and Basin No. 8.

All royalties payments to be made by said Lessee on the following described claims shall be made to the credit of said Lessor in the First National Bank, Ely, Nevada; Water Supply, Water Supply No. 1, North Border, North Border No. 1, Extreme East, Spring Creek Lode and The Anvil.

IV

It is mutually covenated and agreed by and between the parties hereto that the said Lessee shall have the right of and be entitled to the possession of all of the said mining claims above named and described from the date hereof and during the life of this Agreement.

V

In consideration of the covenants and agreements made by said Lessor, the said Lessee hereby covenants and agrees as follows:

A. To keep at Ely, Nevada, and/or the mine, a full, true and correct record of all ores mined, shipped and treated, and to permit said Lessor, his agent or agents, to examine such record at any time.

B. To perform all of the annual assessment work required under the laws of the United States, which is necessary to prevent the above described mining claims, and each of them, from becoming subject to forfeiture, said work to be completed on or before the first day of June of each year, and to make and file an affidavit of the performance of the annual work, said affidavit to be recorded in the office of the County Recorder, White Pine County, State of Nevada, on or before the said first day of June of each year; provided, however, that Lessee shall not be obligated to perform assessment work or file affidavits of the completion thereof for the assessment year ending June 30, 1954.

C. That during the life of this Agreement, he will not do any act or thing which would cause mechanic's or other liens to be placed upon said property or any part thereof, and said Lessee further agrees to post and keep

posted in a conspicuous place or places on said mining premises a notice in writing signed by said Lessor, reading to the effect that work of development and mining the said premises, and the construction of improvements thereon are being done wholly and solely at the expense of said Lessee, and that said Lessor will not be responsible for any indebtedness for labor made or at all created by said Lessee; said Lessee further agrees to cause a duplicate original of said Notice of Non-responsibility to be recorded in the office of the Dounty Recorder of White Pine County, and that said notice will be posted and recorded within the time provided for by law.

D. To permit the said Lessor, his agent or agents, to inspect the said premises and the workings thereon at any time during the life of this Agreement.

E. To well and sufficiently timber said mine at all points where proper and to perform all work upon said premises in a minerlike manner, keeping at all times the working drifts, shafts, tunnels, and other passages in working of said above described premises fairly clear of loose rocks and rubbish of all kinds.

F. To perform not less than three hundred (300) man shifts per annum, weather conditions, act of God, public enemy or war not preventing; provided, however, that said man shifts per annum shall not be required for the balance of the calendar year 1954.

G. To insure and keep insured with the Nevada Industrial Insurance Commission all employees employed and working said demise premises and to save harmless Lessor from any liability for the injury of any persons employed or working upon said claims.

VI

It is mutually covenanted and agreed by and between the parties hereto that all machinery, equipment and tools placed on said premises by said Lessee may be removed by said Lessee within sixty (60) days after the date of the expiration of this Agreement, or of forfeiture in the event that it is forfeited prior to the expiration hereof, provided however, that all such machinery, equipment or tools which are not so removed within the sixty-day period shall be left upon said premises for the benefit of said Lessor.

VII

It is further mutually covenanted and agreed by and between the parties hereto that the said Lessee will pay or cause to be paid all bullion taxes upon the net proceeds of said above described premises, which bullion taxes are levied by the State of Nevada, and/or the County of White Pine.

VIII

Said Lessee agrees to promptly pay any and all Social Security taxes levied by the United States Government or unemployment compensation taxes levied by the Unemployment Compensation Division of the State of Nevada, upon him as employer, and to permit no delinquencies to be created therein.

IX

In case of any default or violation on the part of said Lessee, under the terms hereof, said Lessor agrees to give said Lessee thirty (30) days written notice, by registered mail, of such default or violation, and that the said Lessee shall have thirty (30) days from the date of the receipt of such written notice within which time to correct or remedy such default or violation.

X

It is further mutually covenanted and agreed by and between the parties hereto that Lessee shall have the right to sublet said demised premises or to assign this lease or any rights thereunder, provided, however, that any sub-lessee or assignee of Lessee shall agree to comply with the same terms and conditions as are herein stated, nor shall such subletting or assignment release said Lessee from his obligations herein.

XI

It is further mutually covenanted and agreed that Lessor, who has filed Notices of Location on the following described claims, namely, Water Supply, Water Supply No. 1, North Border, North Border No. 1, Extreme East, Spring Creek Lode and The Anvil, will within the time required by law complete the location work on said claims in order to perfect the location thereof and to file and record all necessary affidavits required by law.

XII

It is further mutually covenanted and agreed by and between the parties hereto that this Agreement shall extend to and be enforceable against and binding upon the heirs, executors, administrators and assigns of the parties hereto.

IN WITNESS WHEREOF, the parties have hereunto signed their names the day and year first above written.

Lain T. Tilford
Lessor

(signed)

Frank C. Cummings
Lessee

State of Nevada,)
) ss.
County of White Pine)

On this 5th day of June, 1954, personally appeared before me, a Notary Public in and for said County and State, LAINE T. TILFORD and FRANK CUMMINGS, known to me to be the persons described in and who executed the foregoing instrument; who duly acknowledged to me that they executed the same freely and voluntarily and for the uses and purposes therein mentioned.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year last above written.

(signed) Jon R. Collins
Notary Public

My Commission Expires: 9/28/54

94049

Recorded June 7, 1954 at 9:35 a.m.
Book 157, Page 369-373, Lease Record
J.B. Geraghty Recorder of White Pine County, Nevada

EXHIBIT 2

Report on

HUB TUNGSTEN MINE

Letterhead of

Wayne Fox Mineral Surveys
Licensed Engineers - Geologists
Mineral Exploration
2726 Dwight Way
Berkeley 4, California

Wayne A. Fox, M.M.E.
Manager
Mineral Surveys
Soil Analysis
Appraisals
Reports

August 31, 1954.

Mr. Frank C. Cummings
542 Staples Avenue
San Francisco 12, Calif.

Dear Mr. Cummings:

During the days August 11th to August 16th, I visited the property known as the Hub Tungsten Mine situated in the Snake Range 42 miles south-east of Ely, Nevada.

The examination was personal, first hand, and as exhaustive as possible in view of the present condition, and state of development, and any additional days would not have effectively altered my opinion.

It included a thorough examination of the entire surface, the outcrops of each of the nine veins, the vein material, the wall rocks where exposed, and the nature and extent of mineralization.

Where appropriate, shafts, adits, tunnels, and cross-cuts were examined and their dumps studied. Likewise open pits, prospect holes and trenches were examined and samples taken when necessary.

The examination disclosed mineralization along the outcrop of several veins and high grade huebnerite was found in a number of ore shoots in several of the veins.

As a result of this investigation and related studies, I recommend the property for future development along the lines mentioned in the accompanying Geologists and Engineers Report.

Very truly yours,

(signed) Wayne A. Fox

Wayne A. Fox, M.M.E.

Geologists and Engineers Report

on

Hub Mining Claims

Snake Range, Nevada

White Pine County

Nevada

Wayne A. Fox, B.S., M.M.E.
Berkeley, Calif.
August 31, 1954

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Introduction

During the period August 10th to August 17th, inclusive, I accompanied Mr. Julian R. Sanchez, to the tungsten property known as the Hub Mine, for the purpose of making a mineral survey, analysis and report. Five full days were actually spent in making a detailed examination of the property and an additional five days were spent in analysing specimens, making calculations, and writing this report.

The property is located at the base of the Snake Range in east-central Nevada not far from the Utah line, at an elevation of 8,000 feet. The claims are located within the Nevada National Forest two miles east of Sec. 25, T 13 N, R 67 E., or latitude 38 58', longitude 114 21'.

The mine is reached by automobile from Ely, Nev.,42 miles distant over 34 miles of Class A hard-surface all weather highway, 4 miles of improved dirt road, and 4 miles of unimproved dirt and gravel road. It is 13 miles from U. S. Highway 6, and Nevada 14, and 12.8 mi. from U.S. 93, and Nevada 7.

The property consists of 30 unpatented mining claims, of which 8 are placer and 22 are lode comprising 600 acres, or approximately an area 5,000 feet square.[1]

1 Practically one sq. mi.

Geology

The tungsten deposits of the United States are distributed roughly in three arcs. The central and eastern arcs surround the Colorado Plateau, and the western arc lies to the west of the central arc. A barren zone 100 miles in width coursing through central Nevada separates the western zone from the central zone.

The central zone contains the deposits of the Snake Range, those or Boriana just east of Needles, Calif., and the Ima Mine of north-central Idaho. The outstanding tungsten deposits in eastern Nevada all lie in the central portion of the Snake Range.

The mines within the central arc are of the quartz vein type as contrasted with the contact metamorphic types so typical of the western arc.[1] The contact metamorphic type deposits produce scheelite[2] primarily, while the quartz veins produce mostly huebnerite.[3] The Minerva and Asceola are notable exceptions having most of their production in the form of scheelite. The reason for this is easily explained after a consideration of the local geology.

1 Illustrated by Atolia, Bishop, Pine Creek, Silver dyke, Oreana, Mill City, Yellow Pine (ore), Germania, (Wash).

2 Calcium tungstate, $CaWO_4$, with 80% WO_3 .

3 Manganese tungstate, $MnWO_4$, with 76% WO_3 .

The Snake Range consists of paleozoic limestones and quartzites which have been intruded during the Cretaceous[1] by a biotite quartz monzonite[2] of batholithic proportions.[3]

However, only in the central portion has the granitic intrusion been extensively exposed by erosion, revealing the fact that the tungsten bearing quartz veins lie wholly within the igneous intrusives and not in the limestones or quartzites. More fancy than fact

In the central portion of the Snake Range, particularly that portion containing Baker Peak just east of the Hub Mine, the intrusive quartz monzonite is overlain only by the quartzites, the younger limestones having been stripped away by erosion.

The forceful intrusion of the quartz monzonite within the central portion of the Snake Range has been responsible for the uplift of the underlying quartzites to a higher elevation than the overlying limestones so prominant to the north and south. I got the idea from Lamon that there was extensive overthrust faulting.

Consequently, the mines of the central portion of the range rest within the exposed quartz monzonite[4] while the mines to the north[5] and south[6] occur in the limestone, the quartzite, or along their contacts.

1 Larimide revolution
2 Grading to a granodiorite and quartz diorite in places
3 However, only a stock or cupola is apparent
4 Or the Alaskite dike and associated aplites
5 Osceola
6 Minerva

Origin of Tungsten Deposits

Statistically it can be shown that tungsten deposits are genetically related to acid or intermediate type igneous intrusions. Most authorities agree that tungsten emanations originate from the cores of batholiths, predominately of Quartz monzonite composition, and that segregation brought about by means of magmatic differentiation results in the formation of a highly specialized acidic magma bearing tungsten vapors and solutions.

The differentiation process within the parent batholith giving rise to the generation of granodioritic and aplitic phases at the same time produces concentrations of tungstic acid which permeates the replaceable overlying rocks[1], particularly along quartz filled fractures or fissures.

These conditions have been met at the Hub Mine in a high degree. The batholithic intrusion is Quartz Monzonite. The intrusive dike which created the fracture (vein) system is an Alaskite and an aplitic phase is present.[2] The aplitic phase was determined to be both intrusive within the alaskite dike and the overlying quartzite, the age relationship being such that the aplite accompanied or just preceeded the mineralization.[3]

1 Limestones and quartzites in the Snake Range

2 Granitic rocks high in silica and low in Fe & Mg

3 Deposition of tungsten minerals

The volatile substances which resulted during the formation of the progressively acidic residual rest magma, consisted of water, chlorine, fluorine, sulphur and boron, familiar as the so-called ''mineralizers'', or'metallizers'.

These mineralizers, together with the acidic constituents, silicon, sodium, potassium and aluminum acted as powerful solvents and fluxes to bring about the segregation, extraction and transportation of tungsten in gaseous or vapor form.

Thus it may be observed that in tungsten deposits in particular[1], there is a progressive change from igneous magmas undergoing differentiation to the formation of mineralized quartz veins.

During the process of differentiation the parent Quartz monzonite carrying a high percentage of biotite generates gradually the Alaskite phase containing an equally high percentage of muscovite.[2] This familiar conversion present in the leading tungsten deposits is also present in the deposits of the Snake Range.

1 Also true of tin mineralization

2 Characterized by an increase in potassium and a decrease in iron and magnesium.

Significance of Alaskite Dike

During the period of uplift and intrusion,[1] the quartz monzonite[2] was cut by an Alaskite dike of major proportions.[3]

Contemporaneously[4], with the intrusion of the dike an aplitic phase directly associated with the formation of the quartz veins and their subsequent mineralization was injected.

Aplite dikes are end stage products of granitic intrusion consequently they are injected while the veins are forming and the metals are being deposited.

Nearly all of the tungsten deposits of Nevada contain late intrusions of alaskite and aplite, altho the association is more common for the scheelite quartz veins than the Hubnerite quartz veins.

During the period of folding, uplift and intrusion, and at all times subsequently, the Snake Range has been disturbed by fault movements. Present evidence[5] shows that movement has continued on these faults during the period of mineralization and up to the present time. This is an important observation because it is through these fault fissures (veins) that solutions

1 Or at the end of
2 and the overlying quartzite
3 500 feet wide and 10,000 feet in length
4 and continuing after the intrusion of the dike
5 dislocations, off-sets and slickensides

bearing tungsten percolated until they became deposited in the upper reaches of the vein system.

Continued movement on the faults kept the avenues open for mineralization so that when a favorable period occurred, additions to the metallization took place.

The mechanics of the forceful intrusion of the Alaskite dike determined the attitude[1] of the quartz vein system, the fractures formed being everywhere normal[2] to the strike of the dike.[3]

The arrangement of fractures normal to igneous intrusions is a common feature in mineral deposits and this structural control obviously assists the mining geologist in the location of faulted segments or those covered by overburden, debris or sediments. The fact that all veins at the Hub Mine deviate less than 13 degrees from the mean is of major importance when planning mining operations.[4]

1 dip and strike
2 From N 55 E to N 80 E .
3 N 20 W .
4 Particularly when driving cross-cuts to intersect veins at depth when considerable distances are involved.

The Vein System

The vein system at the Hub Mine is strong, extensive and widespread. Nine quartz veins were examined to determine their length, thickness, depth, extent, strike and dip, degree of faulting, and type and amount of mineralization.

All of the quartz veins had bold outcrops since they have resulted from the filling of fissures in the quartz monzonite which readily decomposes, leaving the quartz in relief. The thickness of each vein was variable both along the strike and down the dip, pinching and swelling from a few inches to a maximum of 30 feet. Such variations are naturally hard to average but it would appear that 4 feet is the best average that could be applied over their entire length.

All of the veins trend nearly at right angles to the Alaskite dike which strikes N 20 W and dips about 60 degrees west. The entire system of veins for two miles from north to south has a remarkably constant strike, each lying between N 55 E and N 80 E, with an average of N 67 1/2 E. In this regard it is interesting to note that the Hub Vein[1] which was extensively mined in 1916 for about 1,500 feet along the strike and for several hundred

1 To be designated 4E later in this report

feet down dip, has a strike of N 68 E, but 1/2 degree off the average. Thus it is seen that the strike of no vein deviates more than 12 1/2 degrees from the mean[1] and that the dips also are quite constant varying from N 60 to vertical, and from vertical to S 65 degrees. However, the strongest veins and those most highly mineralized are more nearly vertical along most of their strike.

Major Faulting

Each of the veins to the west of the dike has been dislocated from its corresponding segment[1] a distance of approximately 750 feet in a northerly direction[2] approximately normal to the strike of the veins[3].

Thus a post-mineral fault, parallelling the dike, has separated the veins lying to the west of the dike from those lying to the east of it. All mining to date has been confined to the segments to the east of the dike and no serious attempt has been made to mine the faulted segments lying to the west (and north), although they have been prospected by open pits on the outcrops in a number of places.

1 to the east of the dike
2 distance and direction is variable over one mile
3 Using the average vein strike of N 68 E
4 Also the average in this case, i.e., N 67 1/2 E

Description of Veins

For the purpose of explanation and analysis the veins will be arbitrarily numbered as follows, each number corresponding to the sketch accompanying this report, together with indications on photos.

The veins to the west of the dike will be designated with the letter W and those to the east of the dike will be designated E. The vein furthest north shall bear the number 1, and the vein furthest south shall be number 8. If west of the fault 1W, and if east of the fault or dyke, 1E. Thus, 1W and 1E have been determined to be faulted segments of the same vein. It will be noted that vein QE to the extreme north-east has no western segment on the property. Perhaps this segment lies to the north-west off the property.

Veins 1W and 1E are well mineralized with outcrops showing high grade[1] ore shoots at several places. The high grade is confined to 2'' of the hanging wall in the prospect trench on vein 1W. Four inches of vein 1E, 2,500 feet distant, also showed high grade at places along the outcrop. The 2'' ore contained approximately 10% Huebernite by volume, or 30% by weight. The 4'' ore appeared to be only one-half as rich, and the 6'' ore only 1/3, thus establishing arithmetic proportionality.

1 High grade is defined herein as that percentage of Huebernite that will average better than 1% $MnWO_4$ when distributed equally over a 48'' stoping width.

Vein 2W appeared to be unmineralized, however, no extensive work had been done on the outcrops. Its counterpart 2E was mineralized and collapse of the surface at places showed that it has no doubt been worked out in 1916. This would indicate that vein 2W is also mineralized, elsewhere than in the exposures.

Vein 3W was likewise unmineralized. This is the vein that outcrops on the brow of Hill A. Extensive work along the outcrop failed to show any evidence of metallization.[1]

Vein 3E was mineralized extensively along the strike as evidenced by the fact that the surface had collapsed along the strike at several places due to stoping from beneath.

Vein 4W downslope to the south from vein 3W, while strong with several bold outcrops appeared to be unmineralized. Some work had been done to prospect these exposures, but no depth had been attained and hence the vein could still be mineralized at places where the vein is not exposed.[2]

Vein 4E is known as the Hub Vein. This strong vein with a strike of N 64-68 E, and a dip of 65 to 75 north, supplied most of the ore for the operation in 1916.

1 Used synonomous with mineralization, but otherwise in reference to ore minerals

2 Particularly <u>between</u> exposures along the outcrop.

The nature of the material remaining on the dump as well as the unmined outcrops prove that the vein contained considerable high grade ore in several shoots along the footwall for 1,500 feet along the strike. The mineralized portion was confined to a brecciated zone from 4'' to one foot in width. Fragments of ore left on the dump establish the fact that this zone contained 5 to 15% Huebnerite, or 3 to 10% WO_3.

From comparative widths of vein (48'') and ore zone (6'' average), it is calculated that this vein contained an average Huebnerite content of 1.2% when distributed over the entire stoping width of 4 feet. Calculated in terms of WO_3 content this would be .8%, the figure utilized in this report for all calculations.

Vein 5W with a strike of N 84 E and dip of 68N at the base of north slope of Hill D has been prospected by means of a drift for approximately 30 feet. The only metallization consists of manganese and iron oxide starns in a fracture zone on the hanging wall.

Vein 5E, a bold outcrop high on the hill above the Hub Mine Basin (see Wheeler Peak Quadrangle Map), is assumed to be the faulted segment of vein 5W, even tho the strike is N 54 E instead of N 84 E. This discrepancy can be explained by the faulting which at this point had considerable lateral movement.

Vein 6W is revealed by a bold outcrop on the south slope of Hill D, but further up the slope than vein 5W. The outcrop showed no metallization, not even oxide stains, however, it is again suggested that perhaps the ore shoots formed along that portion of the vein where the amount of quartz was less.

Vein 6E high on the slope to the east above Hub Basin contained the most prominent of the mineralized outcrops. It stands as a vertical wall ten feet high and from 2 to 3 feet in thickness for a distance of 60 feet or more. Its strike of N 54 E is the same as veins 5E and 7E (Homestake Vein). Likewise the dip is vertical for 5E, 6E and 7E.

The metallization in 6E was confined to a 2'' zone on the north side, and a 2'' stringer within the vein. The minerals were Huebernite with an estimate of 5% $MnWO_4$, fluorite and sericite mica. The importance of this mineralization lies in the fact that it is about one mile from the high grade prospect hole on vein 1W, thus establishing the fact that some of the veins are mineralized on either side of the dike (and fault) for a strike distance of 2,000 feet, and that the difference in elevation between highest and lowest points of mineralization is about 1,000 feet. These of course are limits of metallization along the same vein, not to be confused with continuity.

Vein 6E contains a strong outcrop within the dike to the west of the 175 foot cross-cut driven from the floor of Hub Mine Basin southward in an effort to intercept veins 5E and 6E. Vein 5E was picked up at 150 feet from the portal, but the cross-cut lacks some 250 feet of making contact with 6E which should be encountered before penetrating the Homestake vein, 7E, an additional 500 feet, or 1,000 feet in all.

The Homestake vein (7E) with strike of N 54 E, and dip 75 S outcrops along Ridge E for about 1,000 ft. It has been estensively prospected by means of pits and trenches at several places along the Homestake claim along Ridge E. The metallization is confined to a zone 6" to 8" in width with Huebernite running about 3%. This would not be ore inasmuch as the average WO_3 content when distributed over a 48" stoping width would fall below the .4% minimum figure for this region. However, the presence of Huebernite, fluorite, coarse sericite, and oxides of manganese and iron indicate that the vein is mineralized so it is entirely possible that the horizon tested might point the way to the source of the mineralizing vapors.[1] The assemblage of minerals within the Homestake vein is exactly the same as the minerals contained in the Hub vein 2,000 ft. to the north.

1 For origin of tungsten deposits See: Kerr, Paul F. "Tungsten Mineralization in the United States", Memoir 15, G.S.A. 1946, p. page 19.

Vein 7W on Hill D with a strike of N 84 E, while in line with the Homestake Vein (7E) may or may not be a continuation of it. Its strike of N 84 E is the same as 5W and 6W as would be expected, but its discrepancy in strike from its assumed counterpart can only be explained by means of the north-south fault movement used to explain the variations of strike in veins 5E & 5W.

Vein 8 has been thoroughly prospected only on the western side of the fault (and dike).[1] No signs of metallization could be seen, however, upon examination of the dumps. Vein 8E is wide and strong and extends for a distance of about 2,000 feet east of the dike where it enters the granite beneath the quartzite capping at an elevation of about 9,000 feet, about 1,000 feet above the present upper surface of the dike.[2] It has been prospected only at one place close to the eastern face of the dike, but no mineral was found.

Inasmuch as mineralizing solutions and vapors course upwards there is a strong possibility that this uppermost outcrop on vein 8E is mineralized in spite of the fact that it is 2,000 ft. from the dike, the source of the metallizing vapors.

1 Where it is designated 8W
2 As exposed by erosion to its present condition, but the top surface of the dike may have once stood 500 ft. higher than its present outcrop at the time of its intrusion and metallization.

Faulted segment 8W with strike N 54 E has been thoroughly prospected along its outcrop for nearly 500 feet. At its western extremity it has been prospected down its dip (60 N) for about 30 feet. It is here that the vein system reaches its maximum width of 30 feet as it splits up on entering the overlying quartzite capping to the west. The granite-quartzite contact adjacent to the vein was examined for possible metallization, but none was apparent. Inasmuch as this contact was structurally below the dike at the time of intrusion (and metallization) the writer considers that this contact is unfavorable for the formation of ore and hence recommends against further prospecting in a westerly direction from this point.

The displacement of vein 8W from its segment 8E shows quite well and was determined to be about 660 feet horizontally at this point.[1] Whether or not there was a significant vertical component could not be determined. The quartite capping to the east and west of the dike appeared to be in fair alignment so the vertical movement could not have been great.[2]

Thus it may be seen that the vein system consists of nine strong quartz veins striking NE separated by a dike and that the western ends have been displaced about 600 feet northward by a fault movement along the western margin of the dike.

1 At point H on ridge north of Williams Canyon
2 Not more than 100 feet

Milling and Ore Dressing

Each type of tungsten deposit presents its own milling and ore dressing problems. The proper selection of the method of crushing, screening, separation and concentration is dependent upon the type of tungsten mineral, associated ores and accompanying gangue.

The problem to be solved requires a consideration of the chemical and physical characteristics of the ore minerals as well as the impurities and the gangue. The specific gravity, hardness, friability, size of particles, and degree of aggregation all have an intimate bearing on the choice of method and machinery to be used in the preparation of the concentrate for shipment.

The presence of other minerals besides the tungsten is doubly important because certain deleterious elements acting as impurities bring penalties, while other elements such as tin, bismuth, or molybdenum have value as ore and hence demand recovery as such.

At the Hub Mine, the problem is relatively simple inasmuch as the major ore mineral is Huebernite and the gangue is quartz, mica, or calcite, or fluorite.

The minerals when hard are brittle and hence easily crushed. The ore mineral Huebnerite has physical characteristics distinctly different from the gange and the presence of other ore minerals or impurities with metallic characteristics is negligible.[1]

1 Iron and manganese oxides are impurities but are not considered to be deleterious.

Gravity Concentration

Present milling practice for tungsten ores of the simple Huebnerite type is characterized by stage crushing and sizing. The fundamental principle to guide the design of the mill is that the reduction in particle size be so controlled that the removal of values is accomplished as soon as they are released from the quartz so as to prevent further reduction in size by continued grinding. Failure to do so causes sliming. High recovery is thus conditioned by the successful application of this procedure.

Stamps are now considered to be obsolete for the crushing of tungsten ores. Blake type crushers are now universally adopted for the primary crushing. The crushed product which may or may not be screened then goes to rolls for fine grinding. Ball or rod mills are inferior because they produce more sliming than do rolls, when reducing to the same mesh.

Classification is obtained by means of screens and hydraulic classifiers and settlers. Jigs are used for separation and are usually of two types; coarse and fine. In the absence of "fine" jigs, tailings from the "coarse" jigs are reground by rolls, and after screening are treated on "coarse" tables.

Tabling and Slime Treatment

Various types of tables such as the Card, James, Isbell, Deister, Overstrom and Wilfley have been adopted for the concentration of middlings or tailings from the jigs, after grinding, with or without classification.

The sand tables make three products; concentrate, middling, and tailing. The middling is circuited for separate treatment, or reground. The "coarse" from the tailing, after being passed through the hydraulic classifier, or settler, may be reground in rolls, or ball mills, and re-treated on tables, and the slime may be treated on slime tables, after thickening.

In general, concentrates from slime tables are low grade. The tailings and slimes are then treated by flotation in order to raise the grade and quantity of the final concentrate, and mechanical thickeners are used for dewatering the pulp. Dewatering serves two purposes: one is to enable the pulp to be handled more efficiently, and the other is to reclaim the mill water for further use. Since water is scarce at the Hub Mine during a large part of the year its conservation will be an absolute necessity and hence all methods and devices for saving water must be resorted to..

At the outset it is recommended that this ore might best be beneficiated by hand-picking so as to improve the grade and reduce the tonnage to be milled, followed by gravity concentration utilizing jigging and tabling. These operations are of certain application in a simple ore because the difference in specific gravity of the Huebnerite (7.3) and the quartz gangue (2.7) is sufficient to effect a 70-80% recovery without resorting to flotation.

When it is possible to liberate the Huebnerite by coarse grinding its separation from quartz by gravity methods often reaches 80-90%. However, when the ore is finely divided in the vein, fine grinding becomes necessary in order to liberate the Huebnerite from the quartz and consequently the recovery is low due to a loss in the fines, hence a recovery of only 60-70%.

To eliminate the difficulties arising from fine grinding, or from slight differences in specific gravity between the ores, flotation is resorted to in order to increase recovery and to improve the grade of the concentrate, as well as to eliminate other ores and minerals containing deleterious elements.

Utilization makes possible a recovery of 90% in complex tungsten ores and a concentrate containing 60-70% WO_3 whereas straight gravity concentration of complex ores usually gives only 50-60% WO_3 concentrates.

Fortunately the veins on the Hub Claims contain only the simple "wolframite type" tungsten ores. The amount of tungsten present as scheelite the calcium tungstate is negligible, estimated as being less than 1% of the total values.

The only impurities present in the ore is a small amount of sulphur as pyrite. The other impurities so familiar to the contact type tungsten ores such as phosphorous, arsenic, antimony, zinc, copper and molybdenum are notably absent.

After a study of the tungsten ores from Boriana, Arizona; Mill City, Nevada; Ima, Idaho; and Pine Creek, California; the writer is of the opinion that the Hub ore containing huebnerite, pyrite, quartz, fluorite, sericite, hematite and psilomelane is the simplest of the lot, and can be resolved into its components to produce a high grade concentrate of $MnWO_4$ with the least trouble provided the best practice is followed and the usual precautions are taken.

The complex ores of the major tungsten producers containing considerable amounts of sulphur, phosphorus, arsenic, antimony, copper, lead and zinc as impurities require expensive, complex flotation plants to remove the various constituents. And none of the above are present in large amounts, and consequently cannot be regarded as ore.

Generally speaking large tonnages of low grade tungsten ores are more valuable than smaller tonnages of high grade ores, particularly if the ore is a simple "wolframite type" rather than a complex ore, because they are easier to concentrate and the concentrate is of higher grade. However, this generality is only true when the ores can be liberated without fine grinding, and when sliming can be prevented.

Attempts to recover in excess of 90% for wolframite type ores usually result in concentrates yielding less than 60% WO_3, consequently, small gains in recovery only result in corresponding losses in grade.

In the event the pyrite content of the ore becomes troublesome, it shall be necessary to employ a flash roasting to remove the sulphur, followed by a magnetic separation of the permeable iron oxide.

The method usually adopted for a simple ore as found at the Hub is gravity concentration of the high grade followed by flotation of the low grade rejects from the jigs and tables. Other methods such as leaching, pneumatic, float and sink, or electrostatic need not be employed as these techniques are use only for the recovery of tin, copper, bismuth and molybdenum from the complex contact type ores, or for the elimination of sulphur, phosphorus, lead, antimony, or zinc as deleterious elements as previously explained.

Indicated Ore

A survey of this property would not be complete from a geological point of view without making an estimate of the amount of ore indicated if observations are borne out and predictions fulfilled.

In the event that the veins traceable along their outcrops for some 2,000 feet, and downt heir dips for some 200 feet maintain their average widths of 4 ft., and their possible yield of .5% WO_3 [1], the total value of the ore thus contained in a vein of said dimensions at the present price of $63 per unit would be about $4,000,000. if the ore shoots are continuous.

However, a careful examination of the outcrop and caved portions of the Hub Vein (4E) which was extensively mined in 1916 [2], established the fact that the volume of the ore shoots [3] could not have been more than 25% of the total vein material. Therefore the value of the ore shoots would be about $1,000,000 per mineralized vein.

Since three of the veins (1W), (6E), and (7E) contain high grade ore shoots exposed in the outcrops an estimate of the total ore would be $3,000,000. [4]

1 Based on 60% recovery of .8% WO_3 ore content
2 When price averaged $40 per unit
3 Equal to volume of vein material stoped
4 Assuming that veins 1E, 2E, 3E and 4E have been worked out to a depth of 200 feet below their outcrops.

Summary of Evidence

1. The vein system at the Hub Mine is strong, extensive and widespread.

2. Mineralization is present in places for 2,000 feet on either side of the alaskite dike, the source of the metallization.

3. It is safe to assume that veins 1E, 2E, 3E and 4E were well mineralized to a depth of 200 feet below their outcrops and that they have been worked out.

4. The east side of the dike, within the quartz monzonite is the much more heavily mineralized than west of the dike (and fault). Exception vein 1W.

5. The area nearest the dike or within it is more favorable than further from it. Exceptions, vein 6E and 1W.

6. The north half of the property is more favorable for development than the southern half. Exception - vein 8E extreme east end.

7. The ore is a simple "wolframite type" easy to concentrate by gravity methods.

8. The source of metallization is the alaskite and aplite dikes.

9. The fault is post-mineral therefore has no bearing on the character of vein mineralization. It acts only to dislocate the west segments to the NW.

Recommendations

1. Development designed to prove ore bodies on vein 1W.

2. Development to prove ore bodies on veins 1E, 2E, 3E and 4E below old workings.

3. Development to prove ore bodies on veins 6E and 7E by means of the continuation of present cross-cut from Hub Basin south, within the dike.

4. Prospecting of extreme eastern end of vein 8E, for evidences of metallization.

5. Trenching on 2W, 3W and 4W between outcrops if other development is successful.

6. Recommend drifting on extreme western edge of 1E. If located then cross-cut south to penetrate 2E, 3E and 4E below level of old workings.

7. Attention to the development of additional water.

8. Assay of vein material on dumps from veins 1E, 2E, 3E and 4E.

10. Mill test of several hundred pounds of mine-run ore running 1% Huebnerite containing oxides of manganese and iron, pyrite, fluorite and sericite to determine the effect of these minerals on gravity concentration and grade of concentrate obtained.

(signed) Wayne A. Fox
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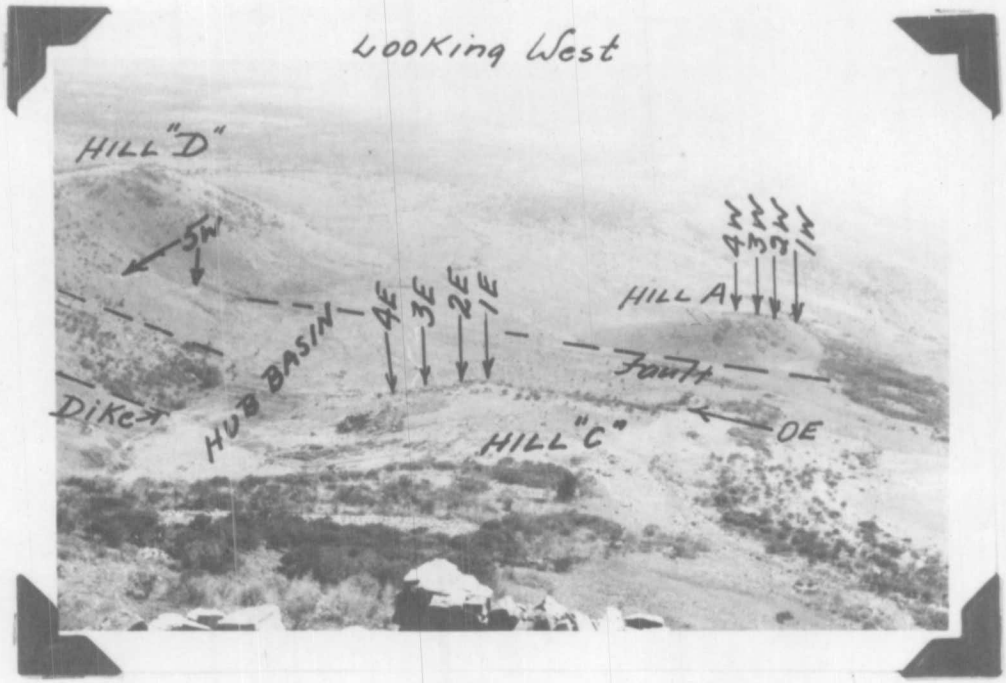

Looking West
HILL "D"
5W
4W
3W
2W
1W
HILL A
4E
3E
2E
1E
HUB BASIN
Fault
Dike
HILL "C"
0E

Fig. 1

Looking East
from old mill site
HILL "C"
1E
2E
3E
4E

Fig. 2

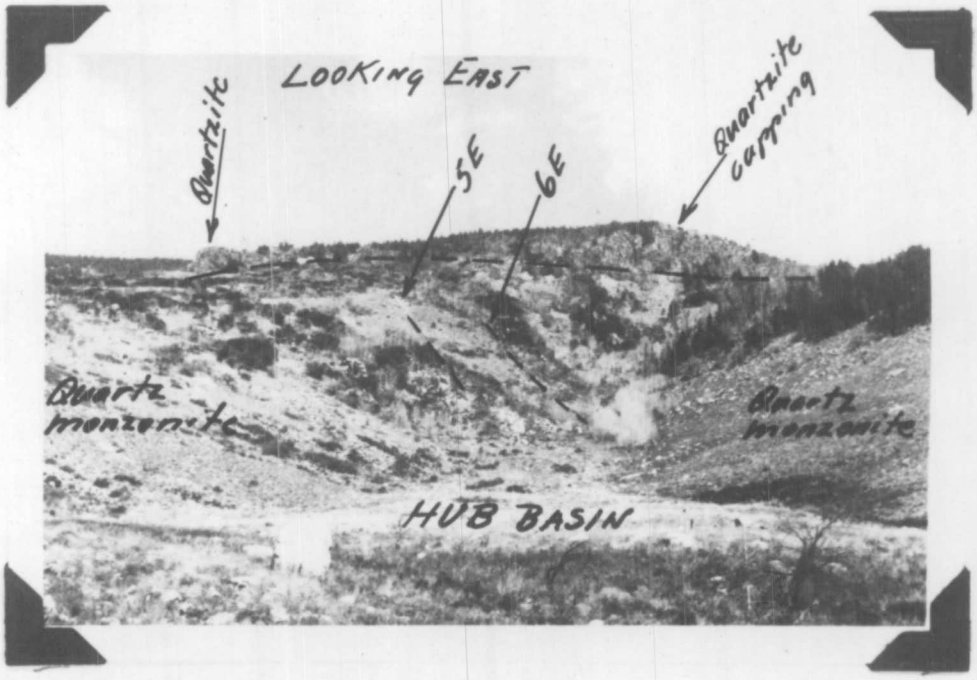

LOOKING EAST
Quartzite
5E
6E
Quartzite capping
Quartz monzonite
Quartz monzonite
HUB BASIN

Fig. 3

ALASKITE DIKE
(LOOKING South)
Ridge "E"
7E
Homestake Claim
7E

Fig. 4

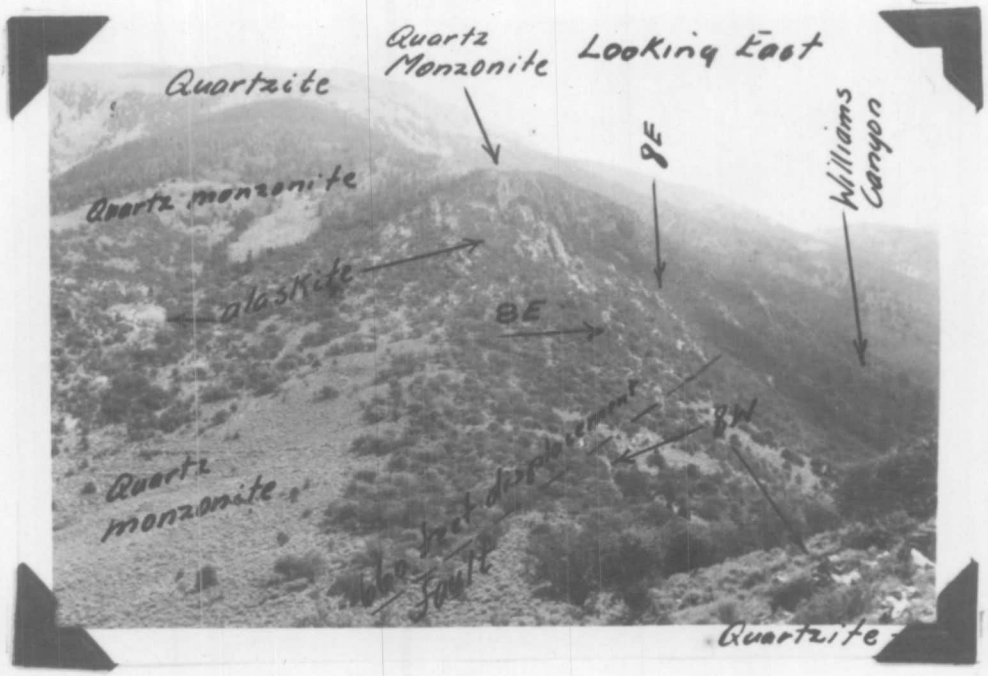

Quartz Monzonite
Looking East
Quartzite
Quartz monzonite
8E
Williams Canyon
alaskite
8E
8W
Quartz monzonite
Quartzite

Fig. 5

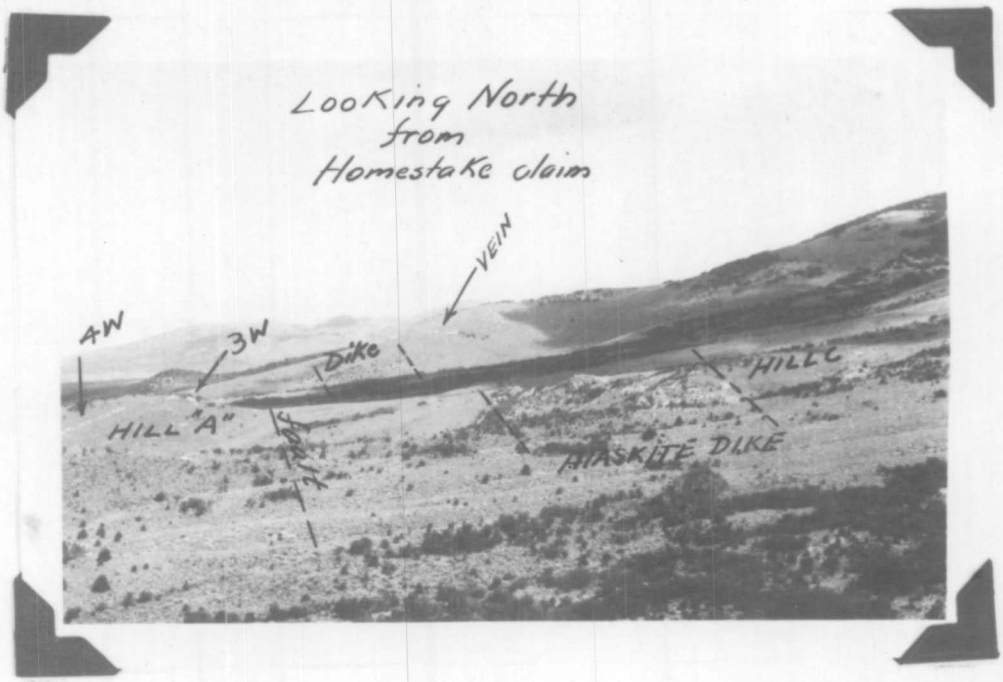
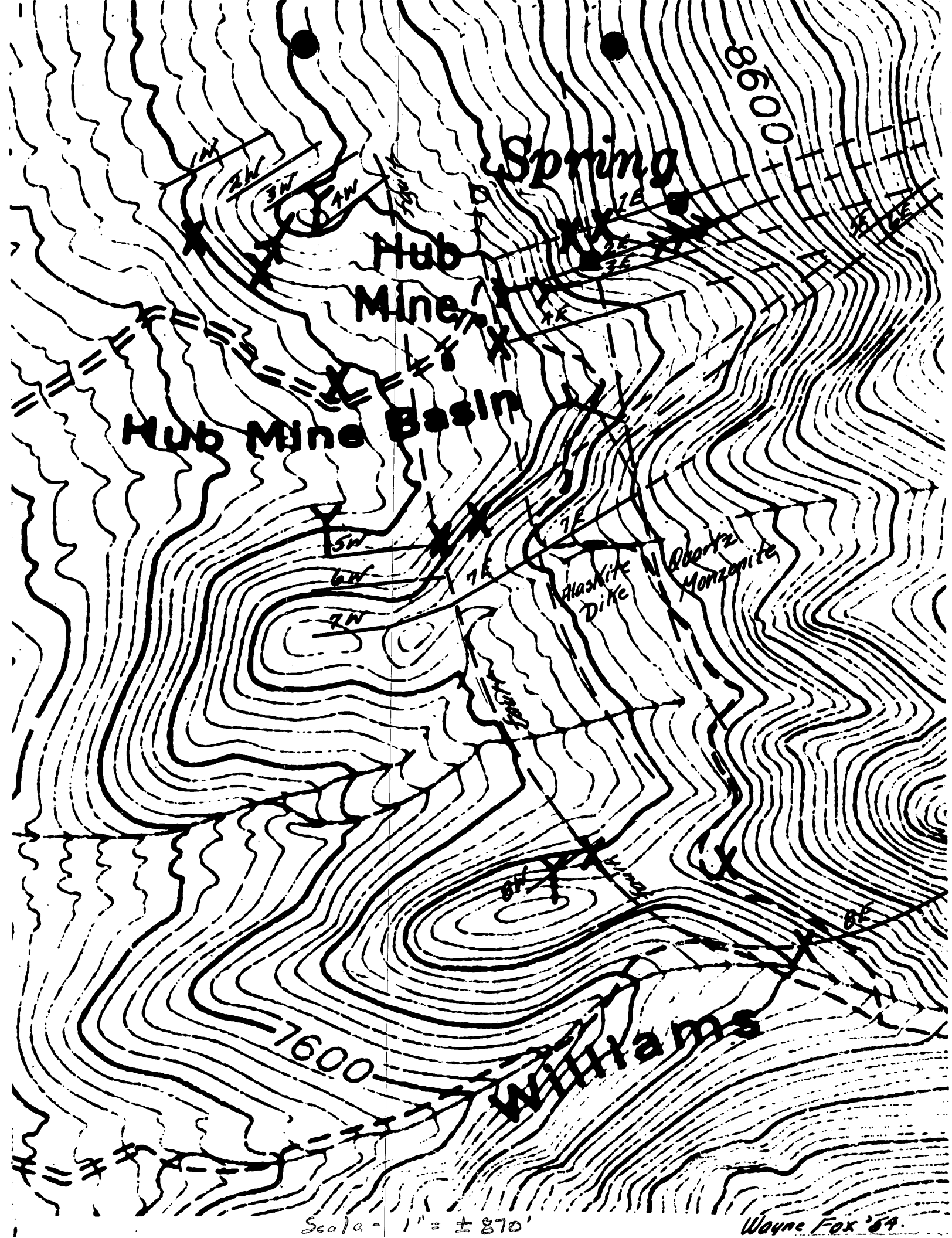

Looking North
from
Homestake claim
VEIN
4W
3W
Dike
HILL C
HILL "A"
ALASKITE DIKE

Fig. 6


Spring
Hub Mine
Hub Mine Basin
8600
7600
Williams
1W
2W
3W
4W
5W
6W
7W
8W
7E
8E
Alaskite Dike
Quartz Monzonite
Scale - 1" = ± 870'
Wayne Fox '54.