**CONTACT INFORMATION**
Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

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Arizona Department of Mines and Mineral Resources Mining Collection

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06/10/97

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES FILE DATA

PRIMARY NAME: GALLAGHER VANADIUM

ALTERNATE NAMES:
BRADSHER
STELLA
VOGEL
BUENA VISTA

COCHISE COUNTY MILS NUMBER: 180

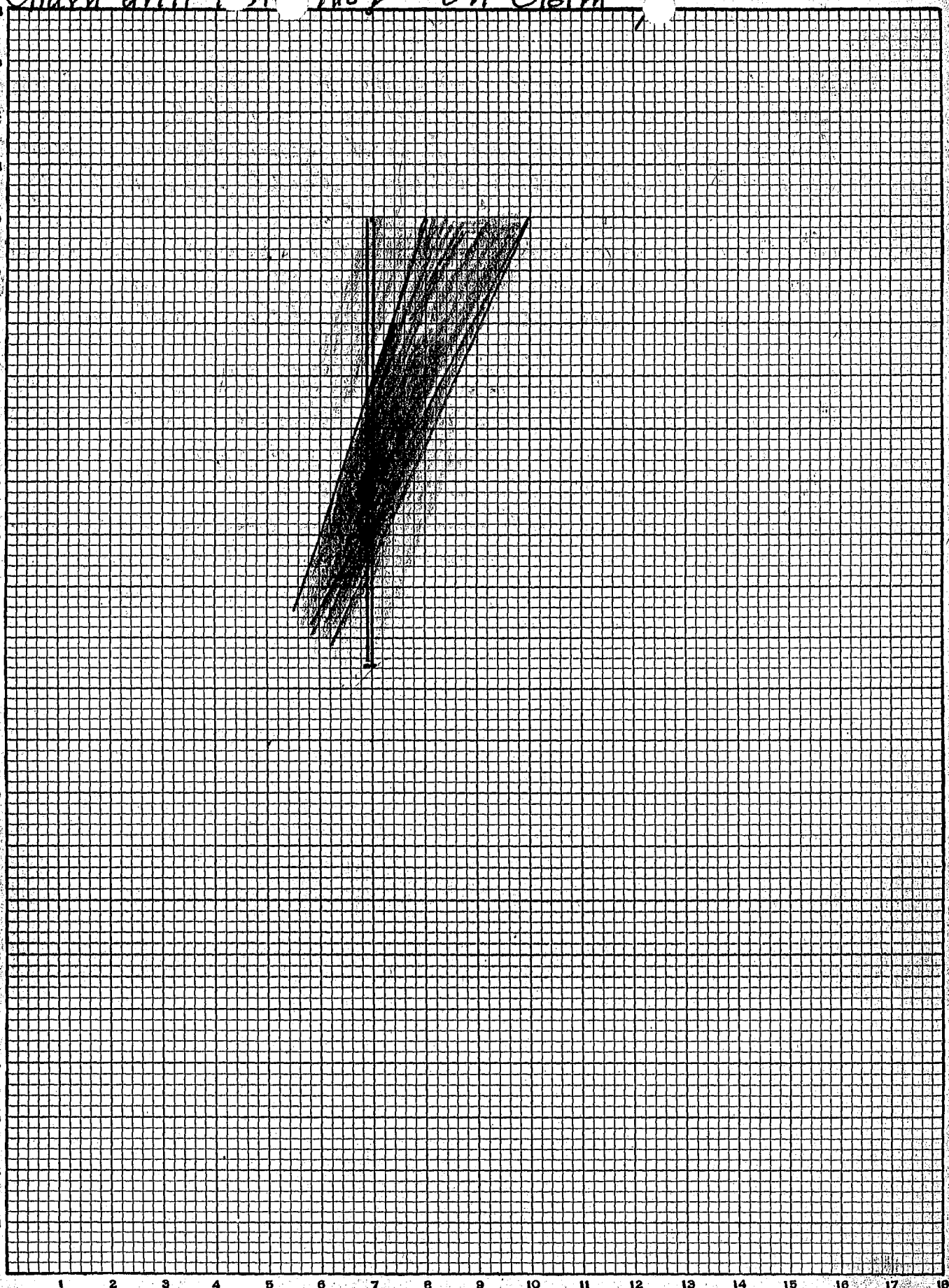
LOCATION: TOWNSHIP 20 S RANGE 21 E SECTION 36 QUARTER SE
LATITUDE: N 31DEG 38MIN 45SEC LONGITUDE: W 110DEG 08MIN 51SEC
TOPO MAP NAME: FAIRBANK - 7.5 MIN

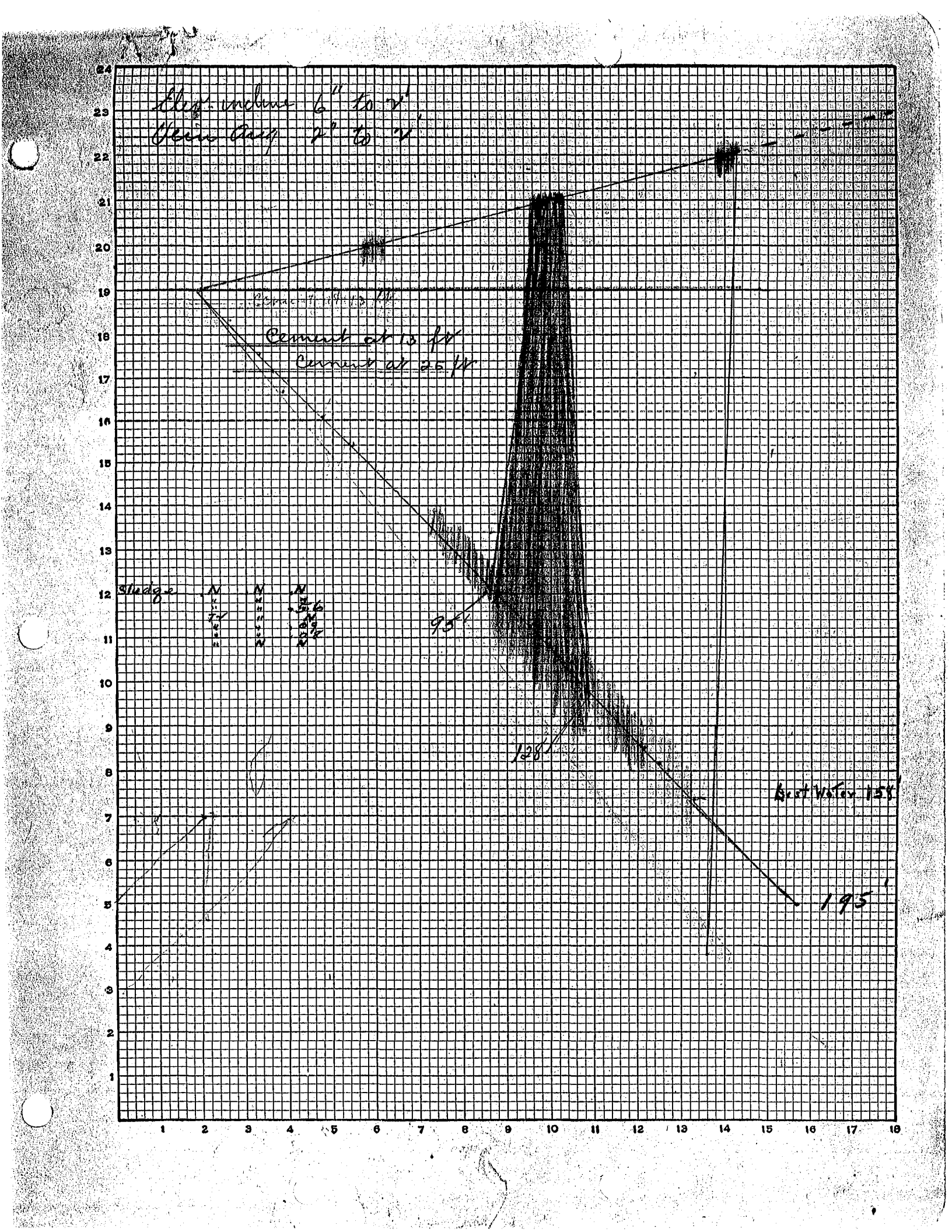
CURRENT STATUS: PAST PRODUCER

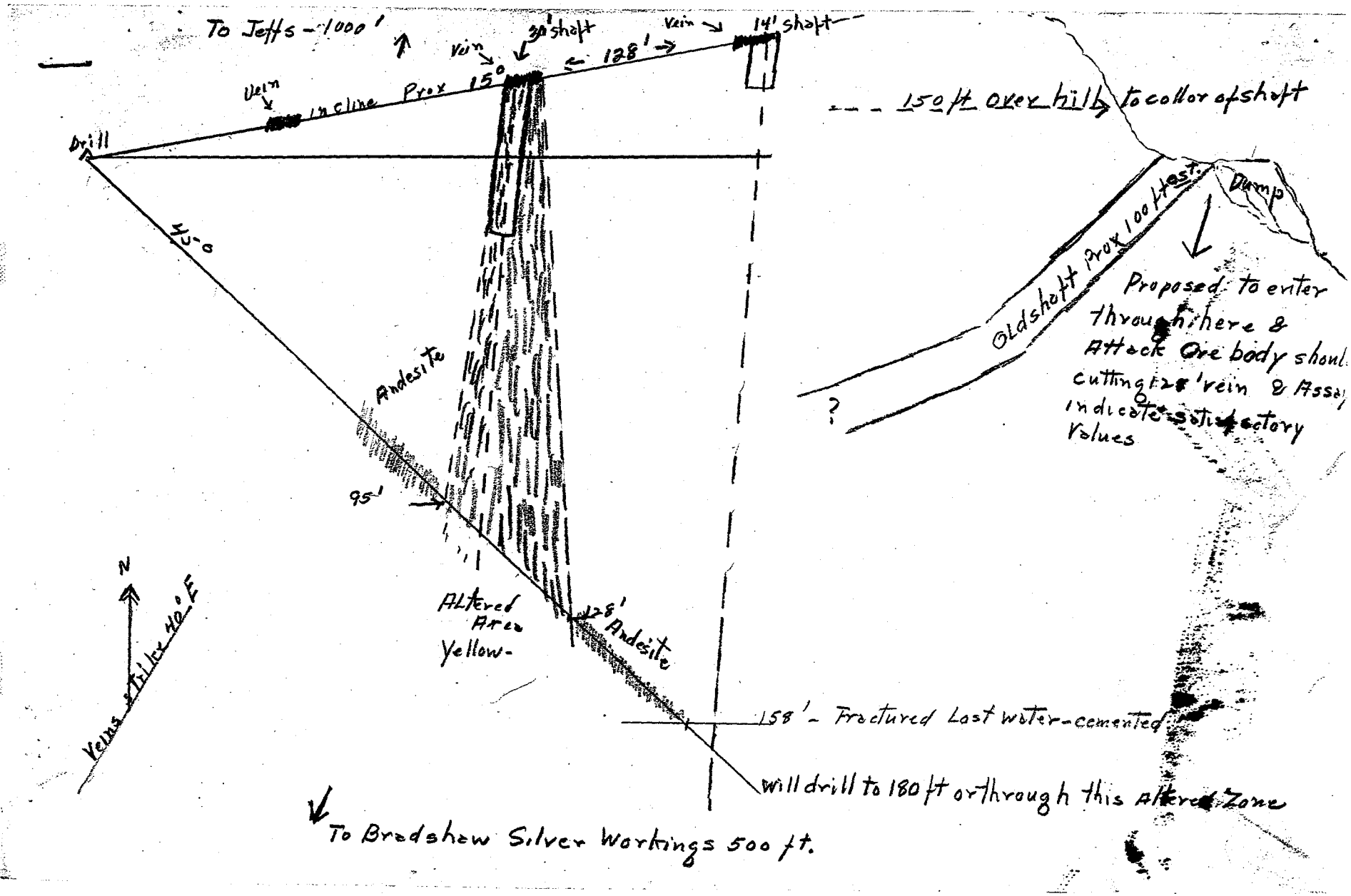
COMMODITY:
LEAD
VANADIUM
SILVER
GOLD LODE
COPPER OXIDES

BIBLIOGRAPHY:
ADMMR GALLAGHER VANADIUM FILE
KEITH, S.B., 1973, AZBM BULL. 187, P. 76
ANTHONY, J.W., ET AL MINERALOGY OF AZ P 158
USAEC PRELIM. REC. RPT. A-P-153, 1953

Churn drill #1 No 2 - on Claim #




Elev. inclines 6" to 1'
Elev. Gallery 2" to 1'
Cement at 13 ft
Cement at 25 ft
Sludge
95'
128'
Best Water 154'
195'


To Jeffs - 1000'
Vein
30' shaft
128'
Vein
14' shaft
Vein
Incline Prox 15°
Drill
45-0
Andesite
95'
Altered Area Yellow-
128' Andesite
158' - Fractured Last water-cemented
will drill to 180 ft or through this Altered Zone
N
Veins strike 40° E
To Bradshaw Silver Workings 500 ft.
150 ft over hill to collar of shaft
Old shaft prox 100 ft west
Dump
Proposed to enter through here & attack Ore body shoul
cutting 128' vein & Assay
indicate satisfactory
values
?

DEPARTMENT MINERAL RESOURCES

News Items

Date Nov. 11, 1940

Mine Gallegher Van & Rare Minerals

Location

Owner Jules B. Gallegher, Mgr.

Address Box 195, Tombstone

Operating Co. Same

Address

Pres. Al Reuter, Box 1015, Austen, Texas

Genl. Mgr. J. B. Gallegher

Mine Supt.

Mill Supt.

Principal Metals Van. (Lead Van) Pb, Ag, Au.

Men Employed None

Production Rate

Mill, Type & Capacity Concentrating mill

Power, Amt. & Type

Signed M. M. C.

(Over)

(Jules B.)
Gallagher, J. B. - Supt. Gen. Del., Ft. Huachuca 6-4-40
c/o Gallagher Vanadium Mine
Tombstone, Arizona

See MG-45 - Re Owners Mine Report (Owner-Gallagher Vanadium & Mineral Corp.-221 Slocum Place, San Antonio, Texas.)

See GALLAGHER VANADIUM - re vanadium investigation 5-19-43
See G file - re meeting with field engineer 1-23-45

MINE- Copper Blossom Mine, Tombstone Dist., Cochise Co.
OWNER- Jules B. Gallagher -(7 unpatented claims)

MINE- Plata Rica Claims(Resurrection Group) Tombstone Dist., Cochise Co. - 8 Mi. SW of Tombstone. 8-14-53

---

**VOGEL, G. Neil (Neil C.)** **Nov 1951**
~~Tombstone, Arizona~~ 1632 N. Harley, Tucson, Ariz.
**and Austin, Texas**

**Operator of: Gallagher Vanadium & Rare Metals (Tombstone)**

**Lessee: Amada Mine, Pima county** 7/5/54 -Also called"Tiger Mine"
**dba Vogel Mining Co.**

~~Tiger - Dogtown Mine, Pima Dist., Pima Co.~~

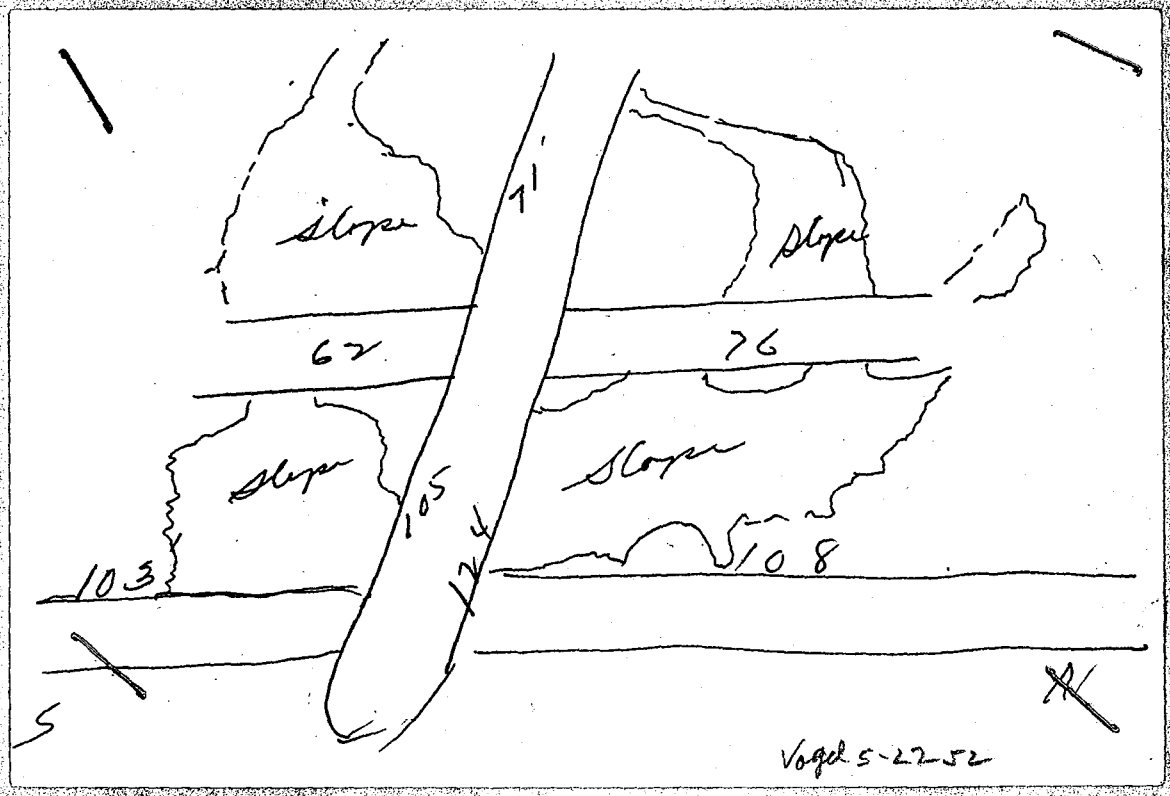
---

**REUTER, Mrs. Louise**
**806 Rosedale Terrace**
**Austin, Texas**

GALLAGHER Mine, Tombstone Dist. Cochise County, 22 claims.

OWNERS - Gallagher Vanadium and Rare Metals Corp.,
Mrs.Louise Reuter,Pres., and R.J.Powell, Secy.

OPERATOR - Neil C. Vogel, Tombstone, Ariz.


slope
71
slope
62
76
slope
105
slope
103
124
108
S
N
Vogel 5-22-52

GALLAGHER VANADIUM COCHISE

A man named Hansen and Tony Lane have joined Larry Higbee and his group who have leased or optioned Neal Vogel's Gallagher Vanadium mine near Charleston, southwest of Tombstone in Cochise Co. VD WR 6/3/76

GALLAGHER MINE COCHISE COUNTY

Book V-III A.L. Flagg vanadium reports
Book V-VII " " "
Book V-VIIII " " "

AEC 172-478 p. 29 - no uranium samples taken

MAPS - Upstairs in the ABM rolled file boxes - 2 maps showing mining claims, and area geology and assay map with drill hole information

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

# INFORMATION FROM MINE CARDS IN MUSEUM

ARIZONA MM 299 Mimetite

COCHISE COUNTY (CHARLESTON)

GALLAGHER ~~MINE~~ Vanadium pb

MILS # 180

4 - AKA's

GALLAGHER VANADIUM AND RARE METALS CORP. COCHISE COUNTY

Mr. Neil C. Vogel is diamond drilling on the Gallagher mine. This work was started on June 6. The first diamond drill hole is drilled at an angle of 50 degrees, so as to intersect one of the larger ore veins on the property. The hole, now down about 60 ft., is expected to intersect the ore vein at about 130 ft. in depth.
5-12-53

# DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Gallagher Mine Date August 14, 1953

District Tombstone District - Cochise County Engineer Axel L. Johnson

Subject: Report of Mining Operations

References: For location and other information on this property see previous reports - Nov. 15, 1951; Nov. 14, 1952; and June 12, 1953.

Recent Developments: The diamond drilling program mentioned in my June 12, 1953 report, was unsuccessful in proving up any ore.

2 drill holes were put down about 300 ft. south of the old mill on the property which is about ½ mile south of the previous workings of the Stella shaft.

The first hole was drilled to a depth of 188 ft. at an angle of about 50 degrees to the north, towards a vein outcropping at the surface with a dip of 85 degrees to the south. The main vein and 3 smaller veins were cut by the drill hole. Best sample obtained in this drill hole was 3% lead and 1 oz. Ag.

The second drill hole was also drilled at an angle towards the same ore veins. This was drilled to a depth of 195 ft. on the angle. The main vein and 2 smaller veins were cut by the drill hole. Samples were all blank.

Summary of Assay Readings ill Hole No. 1
Drilled at 50 degrees tot. 188 feet.
Mc Clelland Claim 175 feet East of Water hole
300 ft S.E. of Mill Site. Very poor Core recovery.

| Sludge Readings Foot Depth | Go. Oz | Sil. Oz | Lead % | Cop. % | Core Readings Foot Depthe | Go. Oz | Sil. Oz | Lead. % | Cop. % |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 10-19 | Tr | N | .01 | .03 |
| | | | | | 19-24 | Tr | N | .02 | .11 |
| | | | | | 24-29 | N | N | 1.2 | .21 |
| | | | | | 29-34 | Tr | N | .12 | .04 |
| | | | | | 34-39 | Tr | N | 1.3 | .24 |
| | | | | | 34-53 | Tr | N | .13 | .10 |
| | | | | | 53-83 | Tr | N | .18 | .04 |
| 83-88 | Tr | N | .04 | .02 | | | | | |
| 88-92 | Tr | N | .03 | .03 | | | | | |
| 92-96 | Tr | N | .04 | .02 | | | | | |
| 96-100 | Tr | N | .07 | .02 | | | | | |
| 100-105 | Tr | N | .05 | .03 | | | | | |
| 105-110 | Tr | N | .05 | .03 | | | | | |
| 110-115 | Tr | N | .04 | .03 | | | | | |
| 115-120 | Tr | N | .05 | .03 | | | | | |
| 120-125 | Tr | N | .09 | .04 | | | | | |
| 125-130 | Tr | N | .08 | .04 | | | | | |
| 130-135 | Tr | .02 | .08 | .05 | | | | | |
| 135-140 | Tr | N | .07 | .06 | | | | | |
| 140-145 | Tr | .02 | .10 | .05 | 140-150 | Tr | Tr | .43 | .05 |
| Sludge 145-150 at hose | Tr | N | .15 | .03 | | | | | |
| Reamer 150-155 | Tr | N | .15 | .07 | | | | | |
| Tailing 150-165 | Tr | N | .07 | .02 | | | | | |
| Chipper 150-165 | Tr | .22 | .07 | .03 | | | | | |
| 155-160 | Tr | .17 | .09 | .02 | | | | | |
| 160-165 | Tr | .23 | .06 | .04 | 155-165 | Tr | .5 | 3.09 | .19 |
| 165-170 | Tr | .25 | .08 | .03 | | | | | |
| 170-175 | Tr | .16 | .06 | .02 | 165-175 | Tr | N | 1.2 | .22 |
| 175-180 | Tr | .21 | .09 | .02 | Andesite @ 175 | Tr | N | 1.1 | .27 |
| 180-185 | Tr | .14 | .08 | .03 | | | | | |

Spectograph on Reverse Side (over)

## Report on Qualitative Spectrographic Examination

### Drill Hole No. 1

| Elements | Approximate Quantity |
|---|---|
| Silicon-Aluminum | Major Constituents |
| Potasium, Sodium, Iron | Intermediate Constituents |
| | Minor Constituents |
| Calcium | 1% |
| Magnesium | 0.5 |
| Manganese | 0.5 |
| Titanium | 0.5 |
| Barium | 0.5 |
| Strntium | 0.05 |
| Zirconium | 0.05 |
| Lead | 0.05 |
| Copper | 0.01 |
| Boron | 0.005 |
| Gallium | 0.005 |
| Vanadium | 0.005 |
| Chromium | 0.001 |

GALLAGHER VANADIUM AND RARE MINERALS CORPORATION

AUSTIN, TEXAS

FEB. 2,1952

Mr. R. I. C. Manning, Director
Department of Mineral Resources,
Mineral Building, Fair Grounds,
Phoenix, Arizona

Dear Sir:

Would it be possible for A. L. Flagg to pay a visit to our property, (Gallagher Mine) near Charleston?

I know it is not in his district but he is thoroughly familiar with the property, having made several inspections in years past. We do not know Mr. Johnson, field engineer, in the southern district. Knowing Mr. Flagg and having confidence in him we would like to have his opinion relative to the work now in progress under lease. Quite naturally we want to see the work done to the best advantage and for the betterment of the property.

Hoping that this request will be granted,

We are yours truly,

Gallagher Vanadium And Rare Minerals Corporation,

Mrs Louise Porter

President

806 Rosedale Terrace
Austin, Texas

San Antonio, Texas,
July 12, 1940.

DEPARTMENT OF MINERAL RESOURCES,
STATE OF ARIZONA,
CAPITAL BUILDING,
PHOENIX, ARIZONA.

Gentlemen:

Thanks for your letter of July 8th which I am very happy to answer, giving you the information you request.

There are at least five parallel veins crossing the main body of claims, traceable for a length of five or more claims. The width of the veins vary from a few inches to well over 200 feet, the average vein width is over four feet. There is a greater variety of vanadium minerals to be found on this property than at any ot other locality in the Southwest.

On one vein system alone with a width of 200 feet- length 4000 feet, I know to carry vanadium in commercial quantities to a depth of more than 80 feet. Assuming that the width of ore is only an average of five feet and that not over half of the vein system in length will prove to be productive, we have a tonnage of possible ore of 61, 194 tons. Assume that this ore has a gross value of only $ 21.60 per ton, which assumption is based on 90 % recovery of 1 % $V_2O_5$, 2 % lead, $ 2.00 ~~mmk~~ gold and silver (which is too low) the gross value of potential ore is $ 1,334,029.20.

Such calculations which are not purely speculative justify the conclusion expressedby many, competent to judge, that the deposit is not only unique but without doubt it is the largest potential deposit of lead vanadate known.

The other four dikes though not as thoroughly prospected show every indication of equal magnitude. The most conservative estimate- which I consider very conservative above the signature of one of your great engineers, of the potential tonnage of indicated ore of an average 1 % vanadic acid cannot be less than 500,000 tons.

It is certain that vanadium values persist( in this district) to a depth of at least 250 feet. For the present the most valuable work, and that which will be made use of in opening up the property, is , only a few feet from a main road, 2 shafts, about 450 feet apart, around 60 or 70 feet deep, with shallow prospecting between them, indicating an area of vanadium values continuos, which bids fare to develop into a single shoot of ore more than five feet in width of very exceptional value . East of this are big indications of another shoot of the same general characteristics and length. These are the shafts for a desirable site for the initial develop- Facts in our reports justify the expectation that the entire mat- will come under the head of commercial ore.

The county road from Tombstone to the military reservation at Fort Huachuca passes through the property and within a few hundred feet of the pilot plant. The Southern Pacific Railroad is only 1.6 miles distant. At Charleston there is ample side-track facility. The Mountain States Telephone and Telephone Company ( Bell System ) lines cross the claims and the pipe line of the Tombstone municipal water system also crosses the property.

Due to the characteristics of the ground this property could be developed with much greater ease and less expense than is common.

Thanks for your prompt reply, and I assure you that the information will be of value to you.

Very truly yours,

Mrs. Louis Reuter, President
Gallagher Vanadium & Rare Minerals Corp.
P.O.Box 1015
Austin, Texas.

P.S.
Att: J.S. Coupal--
******************

This is a copy of a part of a report we have that was sent recently to a party requestion information.

Our Eng. A L. Flagg,29 Holly St. Phx. can further supply you with data that would seem to be a comprehensive whole;including,assay,areal geoloy and develppment maps;and also metallurgical data;reports etc...

Thanking you and with best wishes.

Sincerely,

Am also a member of Small Mine O. A.
Tombstone,Arizona.

Jules B.Gallagher,

Jules B. Gallagher

TRINITY 4791

FORM 80

COPY

**SMITH-EMERY COMPANY**

CHEMICAL ENGINEERS AND CHEMISTS
METALLURGICAL AND TESTING ENGINEERS
920 SANTEE STREET
LOS ANGELES 15
CALIFORNIA

OUR NEW ADDRESS
781 E. WASHINGTON BLVD.
LOS ANGELES 21, CALIFORNIA

*LABORATORY*
*No.* 376355

*Date* November 18, 1953

*Sample* Ore

*Received* 11/10/53 *Marked* "1-500-509"

*Submitted by* Vogel Mining Company,
Box 426,
Tombstone, Arizona.

*REPORT OF QUALITATIVE SPECTROGRAPHIC EXAMINATION*

| *Element* | *Approximate Quantity* |
|---|---|
| **Major Constituents** | |
| Silicon, Aluminum | |
| **Intermediate Constituents** | |
| Iron, Calcium | |
| **Minor Constituents** | |
| Magnesium | 0.5% |
| Potassium | 0.5% |
| Sodium | 0.5% |
| Titanium | 0.1% |
| Manganese | 0.1% |
| Strontium | 0.05% |
| Barium | 0.05% |
| Zirconium | 0.05% |
| Boron | 0.005% |
| Lead | 0.005% |
| Vanadium | 0.005% |
| Copper | 0.005% |
| Chromium | 0.001% |
| Silver | Present |
| Tungsten | None found |

Respectfully submitted,

Smith-Emery Co.

CHEMISTS AND ENGINEERS

EOS



*(See statements on reverse side regarding qualitative spectrographic examination)*

COPY

SMITH-EMERY COMPANY
CHEMICAL ENGINEERS AND CHEMISTS
METALLURGICAL AND TESTING ENGINEERS
920 SANTEE STREET
LOS ANGELES 15
CALIFORNIA

*LABORATORY*

*No.* 375877 *Date* November 7, 1953

*Sample* Pulp

*Received* 10-28-53 *Marked* "Sample Vogel 99-471" Sample ft

*Submitted by* Hawley & Hawley,
Box 1060
Douglas, Arizona

## *REPORT OF QUALITATIVE SPECTROGRAPHIC EXAMINATION*

| *Element* | *Approximate Quantity* |
|---|---|
| Silicon, Aluminum | Major Constituents |
| Iron, Calcium, Potassium Sodium | Intermediate Constituents |
| Magnesium | 1% |
| Titanium | 0.5% |
| Manganese | 0.5% |
| Barium | 0.1% |
| Strontium | 0.05% |
| Zirconium | 0.05% |
| Lead | 0.01% |
| Copper | 0.005% |
| Vanadium | 0.005% |
| Boron | 0.005% |
| Gallium | 0.005% |
| Chromium | 0.005% |

Minor Constituents

Respectfully submitted,
Smith-Emery Co.
CHEMISTS AND ENGINEERS
G.L.E.

Copy to Tombstone



*(See statements on reverse side regarding qualitative spectrographic examination)*

TRINITY 4791 FORM 80

COPY

# SMITH-EMERY COMPANY

CHEMICAL ENGINEERS AND CHEMISTS
METALLURGICAL AND TESTING ENGINEERS
920 SANTEE STREET
LOS ANGELES 15
CALIFORNIA

*LABORATORY*

*No.* 371861 *Date* July 23, 1953.

*Sample* Pulp

*Received* 7/21/53. *Marked* "Vogel"

*Submitted by* Hawley and Hawley
Post Office Box 1060
Douglas, Arizona.

## *REPORT OF QUALITATIVE SPECTROGRAPHIC EXAMINATION*

| *Element* | *Approximate Quantity* |
|---|---|
| **Major Constituents.** | |
| Silicon, Aluminum | |
| **Intermediate Constituents.** | |
| Potassium, Sodium, Iron | |
| **Minor Constituents.** | |
| Calcium | 1% |
| Magnesium | 0.5% |
| Manganese | 0.5% |
| Titanium | 0.5% |
| Barium | 0.5% |
| Strontium | 0.05% |
| Zirconium | 0.05% |
| Lead | 0.05% |
| Copper | 0.01% |
| Boron | 0.005% |
| Gallium | 0.005% |
| Vanadium | 0.005% |
| Chromium | 0.001% |

Respectfully submitted,

Smith-Emery Co.
CHEMISTS AND ENGINEERS.

EOS

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or extracts from or regarding them is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

*(See statements on reverse side regarding qualitative spectrographic examination)*

# SMITH-EMERY COMPANY

CHEMICAL ENGINEERS AND CHEMISTS
METALLURGICAL AND TESTING ENGINEERS
920 SANTEE STREET
LOS ANGELES 15
CALIFORNIA

OUR NEW ADDRESS
781 E. WASHINGTON BLVD.
LOS ANGELES 21, CALIFORNIA


*LABORATORY*

*No.* 376356 *Date* November 18, 1953

*Sample* Ore

*Received* 11/10/53 *Marked* Hole "2-34-44" feet Claim 1

*Submitted by* Vogel Mining Company,
Box 426,
Tombstone, Arizona.

## *REPORT OF QUALITATIVE SPECTROGRAPHIC EXAMINATION*

| *Element* | *Approximate Quantity* |
|---|---|
| **Major Constituents** | |
| Silicon | Major |
| Aluminum | Major |
| **Intermediate Constituent** | |
| Iron | Intermediate |
| **Minor Constituents** | |
| Magnesium | 0.5% |
| Potassium | 0.5% |
| Sodium | 0.1% |
| Calcium | 0.1% |
| Titanium | 0.1% |
| Manganese | 0.05% |
| Zirconium | 0.05% |
| Strontium | 0.05% |
| Barium | 0.05% |
| Lead | 0.01% |
| Boron | 0.005% |
| Vanadium | 0.005% |
| Copper | 0.005% |
| Chromium | 0.001% |
| Gold | Present |
| Silver | Present |
| Tungsten | None found |

Respectfully submitted,

SMITH-EMERY CO.

CHEMISTS AND ENGINEERS



*(See statements on reverse side regarding qualitative spectrographic examination)*

TRINITY 4791

FORM 50

# SMITH-EMERY COMPANY

CHEMICAL ENGINEERS AND CHEMISTS
METALLURGICAL AND TESTING ENGINEERS
920 SANTEE STREET
LOS ANGELES 15
CALIFORNIA

OUR NEW ADDRESS
781 E. WASHINGTON BLVD.
LOS ANGELES 21, CALIFORNIA

*LABORATORY*
*No.* 376357 *Date* November 18, 1953

*Sample* Ore

*Received* 11/10/53 *Marked* "2-84"

*Submitted by* Vogel Mining Company,
Box 426,
Tombstone, Arizona.

## *REPORT OF QUALITATIVE SPECTROGRAPHIC EXAMINATION*

| *Element* | *Approximate Quantity* |
|---|---|
| Silicon, Aluminum | Major Constituents |
| Iron, Calcium, Sodium | Intermediate Constituents |
| **Minor Constituents** | |
| Magnesium | 0.5% |
| Potassium | 0.5% |
| Titanium | 0.1% |
| Lead | 0.05% |
| Manganese | 0.05% |
| Zirconium | 0.05% |
| Strontium | 0.05% |
| Barium | 0.05% |
| Tungsten | 0.01% |
| Boron | 0.005% |
| Vanadium | 0.005% |
| Copper | 0.005% |
| Chromium | 0.001% |
| Gold | Present |
| Silver | Present |

Respectfully submitted,

CHEMISTS AND ENGINEERS



*(See statements on reverse side regarding qualitative spectrographic examination)*

Churn Drill hole 1 on Claim 7.

To prove out 20 foot Rhyolite vein showing on surface. Strike Prox 45° West from South and continuing on a South West direction full length of claim.

A test assessment hole west to arroya showed values to 17% lead and (@ 10-14 ft) narrow black vein within Rhyolite.

Churn drill holes sunk to depth of 84 feet
Change from Andesite to Rhyolite indicated at 36 feet
water encountered at 64 feet
Caving badly from there on.
Drilling discontinued when Andesite continued for 15 feet and no indications of metal on panning.
surface exposure of andesite suggested at least 50 feet of width.

FORM 50

# SMITH-EMERY COMPANY

CHEMICAL ENGINEERS AND CHEMISTS
METALLURGICAL AND TESTING ENGINEERS
920 SANTEE STREET
LOS ANGELES 15
CALIFORNIA

OUR NEW ADDRESS
781 E. WASHINGTON BLVD.
LOS ANGELES 21, CALIFORNIA

*LABORATORY*

*No.* 376358 *Date* November 18, 1953

*Sample* Ore

*Received* 11/10/53 *Marked* "3-120 to 129"

*Submitted by* Vogel Mining Company,
Box 426,
Tombstone, Arizona.

## *REPORT OF QUALITATIVE SPECTROGRAPHIC EXAMINATION*

| *Element* | *Approximate Quantity* |
|---|---|
| Silicon, Aluminum | Major Constituents |
| Iron, Calcium, Sodium | Intermediate Constituents |
| **Minor Constituents** | |
| Magnesium | 0.5% |
| Potassium | 0.5% |
| Titanium | 0.1% |
| Tungsten | 0.1% |
| Manganese | 0.1% |
| Lead | 0.05% |
| Zirconium | 0.05% |
| Strontium | 0.05% |
| Barium | 0.05% |
| Boron | 0.005% |
| Vanadium | 0.005% |
| Copper | 0.005% |
| Chromium | 0.005% |
| Silver | Present |

Respectfully submitted,

SMITH-EMERY COMPANY
CHEMISTS AND ENGINEERS



*(See statements on reverse side regarding qualitative spectrographic examination)*

February 5, 1952

Mrs. Louis Reuter
806 Rosedale Terrace
Austin, Texas

Dear Mrs. Reuter:

We will be more than glad to have our Mr. A. L. Flagg visit your property February 27 and 28 unless we notify you otherwise, and I sincerely hope that he will be able to be of assistance to you.

Very truly yours,

R.I.C.Manning,
Director.

RICM:lp

17 July 1940

Mr. Jules B. Gallagher,
221 Slocum Place,
San Antonio, Texas.

Dear Mr. Gallagher:

Replying to your letter of July 12 enclosing a copy of a part of a report recently submitted on your property. This report is being placed with information now in our files on the Gallagher Vanadium Mine.

Yours very truly,

J. S. Coupal
Director

JSC-jrf

## Spectographic Examination

Pulp Vogel Composite ( ######) ( 175-195 )

| Element | APPROXIMATE QUANTITY |
|---|---|
| **Silicon, Calcium, Aluminum** | **Major Constituents** |
| **Sodium, Iron, Magnesium Potassium, Titanium** | **Intermediate Constituents** |
| | **Minor Constituents** |
| Barium | 1% |
| Manganese | .5 |
| Strontium | .05 |
| Zirconium | .05 |
| Lead | .01 |
| Vanadium | .01 |
| Chromium | .005 |
| Copper | .005 |
| Tin | .005 |
| Gallium | .005 |
| Boron | .005 |
| Rare Earths | Trace |

Pulp Composite 95-120 feet

| Element | Approximate Quantity |
|---|---|
| Silicon, Aluminum | Major constituents |
| Calcium, Titanium, Iron, Sodium, Potassium | Intermediate constituents |
| | Minor Constituents |
| Barium | 1 % |
| Manganese | .5 |
| Magnesium | .5 |
| Strontium | .05 |
| Zirconium | .05 |
| Lead | .05 |
| Boron | .005 |
| Gallium | .005 |
| Vanadium | .005 |
| Copper | .005 |
| Chromium | .005 |
| Rare Earths | Trace |

Churn Drill Hole - 3- 10 inch hole Claim _6-

This area has not been prospected, a few promising shallow holes , a net work of veins and cross veins are visible on the surface. Spudded in on hanging wall of vein.

13 feet ist run of drill , soft , could not get samples
To 20 feet change to brick collor
To 25 feet chnage to Gray

| Number & feet | Alteration | Gold | Silver | Lead | Copper |
|---|---|---|---|---|---|
| 1- 29 | Yellow | | | | |
| 2 x 35 | | | | | |
| 3 x 40 | | | | | |
| 4 x 45 | Caliche , paler | | | | |
| 5 x 50 | Turning yellow, Manganese ind. | Tr | Tr | .5 | .02 |
| 6 x 55 | Darker | | | | |
| 7 x 60 | Metal traces | | | | |
| 8 x 65 | Lighter | | | | |
| 9 x 70 | | | | | |
| 10 x 75 | Gray Pyrite showing | | | | |
| 11 x 80 | Water Pyrite | Tr | Tr | .2 | .01 |
| 12x 85 | Gray " " | | | | |
| 13 x 90 | | | | | |
| 14 x 95 | Softer, Blue Gray Fizzes | Tr | N | .2 | .06 |
| 15 x 100 | Reddish tinge | | | | |
| 16 x 105 | Brick Red Pyrites continue | | | | |
| 17 x 110 | | | | | |
| 18 x 115 | Blue Gray | Tr | N | .3 | .06 |
| 19 x 120 | | | | | |
| 20 x 124 | brown | | | | |
| 21 x 129 | Yellow | | | | |

Discontinued, caving badly, about to loose tools , requires casing Samples sent out for Assay should indicate values, this area looks like it has possibilities.

Diamond Drill Hole - 4- On Peggie Claim , North of Stella Shaft. 10 inch hole

This location in belt showing considerable lime float, a couple small shallow assessment holes showed mineral -- this work to complete the 600 Foot contract New area.

| Number & feet | Alterations | Gold | Silver | Lead | Copper |
|---|---|---|---|---|---|
| 1 x 10 | | | | | |
| 2 x 15 | | | | | |
| 3 x 19 | Turning to yellow | | | | |
| 4 x 24 A | Metal showings , to gray | Tr | Tr | .2 | .05 |
| 5 x 30 | | | | | |
| 6 x 35 | | | | | |
| 7 x 40 | To yellow | | | | |
| 8 x 45 | | | | | |
| 9 x 50 A | | Tr | N | .2 | .06 |
| 10 x 55 | Gray | | | | |
| 11 x 60 | | | | | |
| 12 x 65 | to Brown | | | | |
| 13 x 70 | | | | | |
| 14 x 73 A | Hard Brown | Tr | Tr | .2 | .05 |
| 15 x 77 | " | | | | |
| 16 x 80 | " Water | | | | |
| 17 x 83 | " | | | | |
| 18 x 86 | " | | | | |
| 19 x 89 | " | | | | |
| 20 x 91 | " | | | | |

Discontinued - completed 600 foot contract , no move expense, Area did not show promise, however the assays may reveal something.

arn Drill Hole Number -2- on Claim 7 between road to Bradsher and Arroya, Vein 20 feet wide on surface

Spudded in 10 feet South off vein, est dip 85' anticipated cutting vein from 20 to 30 feet , Indications of change from andesite at 30 feet

| No. and feet | Alteration | Oz. Gold | Oz. Silver | % Lead | % Copper |
|---|---|---|---|---|---|
| 1 x 34 | Change to red | | | | |
| 2 x 39 | Red | | | | |
| 3 x 44 | | | | | |
| 4 x 49 | To brown | | | | |
| 5 x 54 | water | | | | |
| 6 x 59 | Sandy | | | | |
| 7 x 61 | | | | | |
| 8 x 63 | Caving | | | | |
| 9 x 65 | | | | | |
| 10 x 67 | Change to Gray | | | | |
| 11 x 69 | Caving badly | | | | |
| 12 x 72 | | | | | |
| 13 x 75 | Gray in Andesite | | | | |
| 14 x 80 | | | | | |
| 15 x 84 | | | | | |

Discontinued Rhyolite vein came in around 30to 34 feet and went out around 65 to 70 feet , indicating it was getting narrow at depth, a good indication. Andsite formation on surface over a broad area and promised a long program of drilling before cutting through same.

Summary of Assays made from samples taken from Drill Hole No.2 located next to road, 600 feet N.E. from old Bradshaw mine dump. Bradshaw-Gallagher Claims. Drilled at 45 degrees, length of hole 195 feet. Core recovery satisfactory. Mostly Adesite.

| Sludge Readings Foot depth | Go. oz | Sil. oz | Lead. % | Cop. % | Go. oz | Sil. oz | Lead. % | Cop. % | Core Readings Foot depth |
|---|---|---|---|---|---|---|---|---|---|
| 5-13 | Nil | N | .2 | | | | | | |
| 15-20 | N | N | .3 | | | | | | |
| 20-25 | N | N | .3 | | | | | | |
| 25-30 | N | N | .3 | | | | | | |
| 30-35 | N | N | .3 | | Trace | N | N | | 10-35 |
| 40-45 | Tr | N | Tr | | Tr | N | N | | 35-45 |
| 45-50 | Tr | N | Tr | | | | | | |
| | | | | | N | N | | | 56-60 |
| 60-65 | Tr | N | Tr | | | | | | |
| 70-75 | Tr | N | Tr | | N | N | | | 73-77 |
| 75-80 | Tr | N | Tr | | | | | | |
| 80-85 | Tr | N | Tr | | | | | | |
| 90-95 | Tr | N | Tr | | Tr | N | | | 87-95 |
| 95-100 | Tr | N | Tr | | | | | | |
| 100-105 | N | N | .56 | | | | | | |
| 105-110 | Tr | N | N | | | | | | |
| 110-115 | Tr | N | .09 | | | | | | |
| 115-120 | Tr | N | .08 | | Tr | N (Altered zone) | | | 95-120 |
| | | | | | Tr | N | | | 122-134 |
| | | | | | Tr | N | | | 153-158 |
| | | | | | Tr | N | | | 162-170 |
| | | | | | Tr | N | N | .03 | 170-178 |
| | | | | | Tr | N | N | .03 | 186-191 |
| Extreme N.E. end of vein on claim line | | | .005 | | .2 | N | N | | |

Indications of samples of both sludge and core did not justify assaying of all samples taken.

Drill hole was directed to cut three indicated ore veins as seen on surface.

Engineers reports led one to believe that old workings would be encountered at a depth of prox. 100 feet in direct line with drillhole, therefor no consideration was given to set closer to old workings that are reputed to be some 260 feet deep.

( OVER)

Churn Drill Hole Number - 1 - 111 feet S 20'E of San Antonio
42 feetE 30'S of Stella Disc.

Arrived on job September 16,53

Sampling started at 20 feet

| Depth & sample Number. | | Oz. Gold | Oz. Silver | % Lead | % Copper |
|---|---|---|---|---|---|
| 1 x 20 | | | | | |
| 2 x 23 | | | | | |
| 3 x 33 | | | | | |
| 4 x 37 | Struck water | Trace | Nil | 0.15 | 0.15 |
| 5x 42 | | | | | |
| 6 x 47 | Red shale Enough water for drill. | Nil | Nil | 0.15 | 0.20 |
| 7 x 51 | | | | | |
| 8 x 56 | | | | | |
| 9 x 61 | | | | | |
| 10x66 | Caliche,gray , soft. | | | | |
| 11x 71 | | | | | |
| 12x76 | Turning Yellow | Tr | Nil | Tr | 0.17 |
| 13x 81 | Getting reddish - | | | | |
| 14x 83 | Brick red | | | | |
| 15x 88 | Red | 0.005 | Tr | 0.10 | 0.17 |
| 16x 94 | Yellow | | | | |
| 17x 99 | Turning gray | | | | |
| 18 x 104 | Gray | | | | |
| 19 x 109 | | | | | |
| 20 x 113 | Truning dark | | | | |
| 21 x 118 | Dark gray | | | | |
| 22 x 123 | Lighter gray | | | | |
| 23 x 127 | Turning yellow | | | | |
| 24 x 131 | back to gray | | | | |
| 25 x 136 | Harder | | | | |
| 26 x 140 | Darker | | | | |
| 27x 144 | Caved about 3 feet during week end. | | | | |
| 28 x 148 | Andesite | | | | |
| 29 x 152 | | | | | |
| 30 x 157 | | | | | |
| 31 x 161 | | | | | |
| 32 x 167 | Turning yellow | | | | |
| 33 x 172 | | | | | |
| 34x 176 | | | | | |
| 35 x 181 | Getting darker | | | | |
| 36 x 186 | lighterharder | | | | |
| 37 x 189 | | | | | |
| 38 x 191 | Brown , Hard two feet in one hour | Tr | Nil | Tr. | 0.19 |
| 39 x 195 | | | | | |
| 40 x 198 | | | | | |
| 41 x 201 | | | | | |
| 42 x 205 | | | | | |
| 43 x 209 | somewhat softer | | | | |
| 211 | No sample, new bit dragged sides, | | | | |
| 44 x 215 | | | | | |
| 45 x 218 | | | | | |
| 46 x 223 | | Nil | Nil | 0.10 | 0.21 |
| 47x 227 | Looks like Lime, Fizzes | | | | |
| 48 x 232 | | | | | |
| 49 x 236 | | Tr | Nil | Tr. | 0.28 |
| 50 x 240 | | | | | |
| 51 x 244 | | | | | |
| 52 x 248 | | | | | |
| 251 | No sample badly caved | | | | |
| 53 x 259 | Darker | | | | |
| 54 x 260 | | | | | |
| 55 x 265 | | | | | |
| 56 x 269 | Seems to be changing | | | | |
| 57 x 273 | | | | | |
| 58 x 277 | Softer, lighter Sandy | | | | |
| 59 x 282 | Yellow Soft | | | | |
| 60 x 287 | Darker harder | | | | |
| 61 x 292 | softer, darker Fizzes | Nil | Nil | 0.15 | 0.19 |
| 62 x 297 | | | | | |

CHURN DRILL HOLE -1- Cont.

| | | Gold | Silver | Lead | Copper |
|---|---|---|---|---|---|
| 63 x 301 | Gray Lime Indications See Spec. | | | | |
| 64 x 306 | to Brown Caving | | | | |
| 65 x 311 | Caving badly | | | | |
| 66x 315 | | | | | |
| 67 x 319 | | | | | |
| 68 x 324 | Darker | | | | |
| 328 | No sample Badly caved | | | | |
| 69 x 332 | | | | | |
| 70 x 337 | | | | | |
| 71 x 342 | Growing darker Reddish | | | | |
| 72 x 346 | | Nil | Nil | 0.15 | 0.24 |
| 348 | No sample,caving | | | | |
| 355 | | | | | |
| 73 x 360 | | | | | |
| 74 x 363 | | | | | |
| 75 x 368 | | | | | |
| 76 x 372 | Pyrites | Nil | Nil | Nil | 0.04 |
| 77 x 375 | | Nil | Nil | Nil | 0.04 |
| 78 x 380 | | | | | |
| 79 x 385 | | | | | |
| 80 x 389 | | | | | |
| 393 | No Sample | | | | |
| 81 x 398 | | | | | |
| 82 x 403 | Dark Red | Tr. | Nil | Nil | 0.03 |
| 83 x 407 | to brown , Harder less pyrite | | | | |
| 84 x 410 | | | | | |
| 85 x 413 | Hard Fizzes | | | | |
| 86 x 420 | | | | | |
| 87 x 428 | | Tr. | Nil | Tr. | 0.04 |
| 88 x 426 | | | | | |
| 89 x 430 | Poor sample , installed casing , went to 5 inch hole | | | | |
| 90 x 435 | Considerable Pyrite , Gray, | | | | |
| 91 x 439 | | Tr. | Nil | 0.5 | 0.04 |
| 92 x 442 | | | | | |
| 93 x 448 | Brownish gray | Tr | Nil | Tr. | 0.04 |
| 94 x 454 | | | | | |
| 95 x 458 | | | | | |
| 96 x 460 | | Tr | Nil | Tr | 0.03 |
| 97 x 464 | | | | | |
| 98 x 466 | Harder, Fizzes Black plus quartz | | | | |
| 99 x 471 | More quartz Galena Ind. | Tr | Nil | 0.2 | 0.04 |
| 100x 473 | | | | | |
| 101 x 477 | Hard dark Gray | | | | |
| 102 x 479 | | | | | |
| 103 x 481 | | | | | |
| 104 x 483 | | | | | |
| 105 x 486 | | | | | |
| 106 x 489 | Greenish tint, somewhat softer | | | | |
| 107 x 491 | | | | | |
| 108 x 495 | | | | | |
| 109 x 500 | | | | | |
| 110 x 506 | Fizzes More Pyrite | | | | |
| 111 x 509 | Andesite | | | | |

Discontinued hole, extreme difficulty in drilling, Caving from shoulder No indications of change and surface readings indicated wide andesite zone had been encountered.

Churn drill hole to 10 inch from surface to 430 feet , cased down 108 feet. Water most recent reading 20 feet from top. Casing belonged to churn driller , understand he made deal with local rancher for purchase of casing so well could be used to water cattle in accordance with my agreement with rancher that he could use this well so long as we had no use for same and our contract carried on.

# DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
## FIELD ENGINEERS REPORT

Mine Gallagher Mine ✓ Date June 12, 1953

District Tombstone Dist., Cochise County. Engineer Axel L. Johnson

Subject: Report of Mining Operations

Location Sec. 6 --- T 21 S ---- R 22 E
8 miles south-west of Tombstone.

Number of Claims 22 claims---- 1 pat. and 21 unpat.

Owners Gallagher Vanadium and Rare Metals Corporation ✓
Mrs. Louise Reuter, Pres., and Mr. R. J. Powell, Secretary.

Address Mrs. Louise Reuter, Pres., 806 Rosedale Terrace, Austin, Texas. ✓

Operator Mr. Neil C. Vogel, Tombstone, Ariz. ✓

Recent Developments The operator, Mr. Neil C. Vogel closed down operations of the mine last Oct. 10, as stated on my previous mine report of Nov. 14, 1952. Mr. Vogel pumped water from the workings for some time after the closing of the mine. Now, lately, he has allowed the mine workings to fill up with water.

Mr. Vogel is now having diamond drilling done on the property, in order to explore another vein. The diamond drilling work is being done by Nick Gregovich of Nicksville, Ariz., who is drilling with an EX core at an angle of about 50 degrees to the north, towards the vein, which is dipping 85 degrees to the south.

The drilling operations began last Sat., June 6, and the drill hole is down to a depth of 60 ft. (incline dist.) now. So far, the hole has been barren, but it is calculated that they will hit the ore vein at a depth of 120 ft. to 135 ft.

Thelocation of the drill hole is about 300 ft. south of the old mill on the property, which is about 1/2 mile south of the previous workings (Stella Shaft), which is now abandoned.

Surface outcrop of the vein, which the drill hole will intersect, is from 8 to 10 ft. in width, and continues for a length of 1000 ft. or more. Surface outcrop shows lead carbonates and iron capping.

References For "Mine Workings" and "Shipments to Date", see my report of the property under date of Nov. 14, 1952.

For "Geology", "Ore Values", and other information, see report by field engineer under date of Nov. 15, 1951, and also report of A. L. Flagg, Consulting Eng.

May 19, 1943



MEMORANDUM

~~Gallagher~~ Vanadium (Charleston)

To: Director, Dept. Mineral Resources
From: George A. Ballam

Jules Gallagher of the above property has just returned from Washington, D.C. He has been interested in an investigation of what he calls the big vanadium scandal, which is due to break. He says that Emigh and the U.S. Vanadium Corp. were guilty of a great deal of racketeering in Arizona during the past year. He had a number of letters from a senator, the FBI, and others which seemed to imply that something is in the wind. I believe Arthur Flagg is informed on the subject. He seemed to be glad to get away from them. Arthur has had some correspondence lately which he may talk about.

Geo A Ballam

This is the property on which Walter Smith said he might want us to make examination later

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Gallagher Mine Date Nov. 14, 1952

District Tombstone Dist., Cochise County Engineer Axel L. Johnson

Subject: Present Status of the Mine. Personal Inspection & information from Neil C. Vogel

Location Sec. 6 ---- T 21 S ---- R 22 E
8 miles south-west of Tombstone.

Number of Claims 22 claims---- 1 patented and 21 unpatented claims.

Owners Gallagher Vanadium and Rare Metals Corp.,
Mrs. Louise Reuter, Pres., and Mr. R. J. Powell, Secretary.

Address Mrs. Louise Reuter, Pres., 806 Rosedale Terrace, Austin, Texas.

Operator Mr. Neil C. Vogel, Tombstone, Arizona.

Recent Developments The operator, Mr. Neil C. Vogel closed down operations about Oct. 10, and the mine is now idle. Two reasons were given by Mr. Vogel for the closing down of operations:-

(1) The low price of lead, after the recent break in prices.
(2) Negotiations by Mr. Vogel with a company, who may take over the property on some form of purchase, lease, or partnership. Negotiations with this company are now being conducted, according to Mr. Vogel.

Mine Workings to Date One shaft (Stella Shaft) ---- 124 ft. deep. This is a 5' x 9' inclined shaft, inclined 83 deg. to the south.
Drifting on the 71 ft. level---- 68 ft. west and 78 ft. east---- a total of 146 ft.
Drifting on the 105 ft. level ---- 113 ft. west and 128 ft. east ---- a total of 241 ft.
Considerable stoping between the 71 ft. and the 105 ft. levels.

Shipments to Date 530 tons of ore shipped to smelter.
This ore averages Lead 18.6 %
Gold .048 oz.
Silver 2.28 oz.

Signature Axel L. Johnson
Field Engineer,
State Dept. of Mineral Resources.

References For "Geology", "Ore Values", and other information, see report by field engineer under date of Nov. 15, 1951, and also report of A. L. Flagg, Consulting Engineer.

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA

Nov. 15, 1951
By Axel L. Johnson

SOURCE OF INFORMATION --- O. Neil Vogel, Tombstone, Ariz.
MINE --- Gallagher Mine
DISTRICT --- Tombstone District

Location 8 miles south-west of Tombstone

Owners Gallagher Vanadium and Rare Metals Corp.
Mrs. Louise Reuter, Pres, and Mr. R. J. Powell, Secretary.

Operator Mr. O. Neil Vogel, Tombstone, Ariz.---Home Address-- Austin, Texas.

Metals Mined Lead ores. Ores found are galena, cerussite, anglesite, wulfenite, and small amounts of limarite, caledonite, minetite, and descloizite.



Men Employed 9 men--- 5 on day shift and 4 on night shift.

Production Rate 24 tons of material removed per day, which yields 3 ton of lead ore by sorting.

Milling Facilities No milling facilities on the property. Operator is shipping the ore produced to the smelter at El Paso.

Ore Values Lead ore shipped in last carload averaged 29 1/2 % Lead & 3 oz. Silver.

Geology Lead vein is from 5 inches to 12 inches wide, and contains a variety of lead minerals---sulphides, sulphates, carbonates, oxides, and chlorides.

Old Workings and Production Mine has several old workings and considerable old production.

Present Operation Present operation is ~~x~~ drifting. The old Stella Shaft was extended to a depth of 78 feet. This is a 5'x 9' inclined shaft-- inclined 83 deg. to the south. At a depth of 71', drifts were started from the shaft, these drifts running east and west in the ore vein. These drifts are now in 45 feet from the shaft both east and west.

Proposed Plans Sink the shaft to a depth of 125 feet and run two more drifts out from the shaft.

Miscellaneous Notes It might have been a better plan to build a mill and treat the ore, as there is considerable milling ore on both sides of the main vein. Sorting out 1 ton of shipping ore in every 8 tons removed from the mine may not prove to be a very profitable operation.

A. B. FRENZEL,
Consulting Engineer
1540 Sherman St.,Denver, Colo.

Report made at the request of Mr & Mrs Louis Reuter and J.B.Gallagher.

The property of the Gallagher Vanadium and Rare Minerals Corporation is advantageously located about two miles from the So thern Pacific R.R. near Charleston,Cochise county, Arizona,with an easy down-hill haul to a side track already in. There are 19 claims, one of which is patented; the ground covered by patent and locations is approximately 360 acres and the main highway passes through the tract for nearly a mile.The road is in excellent condition for traffic.

In former times several of the claims were producers of silver-lead ores carrying small values in gold and quite a number of shafts were sunk between 12 and 200 ft in depth. This development work will apply when claims are patented and is a valuable asset. It was prior to the time that vanadium and molybdenum came into general use in steel and in other industries,and great credit is due Mr.J.B.Gallagher for having discovered the valuable vanadium and molybdenum ores in evidence and standing by this property for many years as the demand for these rare minerals increased and became permanent.

In my investigations covering three weeks,I find a wide belt,the full length of the property,containing profitable values in vanadium, molybdenum and lead,with associated values in silver and gold;most favorable conditions for actual operating the property;sufficient water already developed for treating at least 100 tons;that yields readily to mining and recovery of the values at reasonable costs and a profitable market ahead of production.

A site for mill and camp,with outside telephone connection;a flowing spring of good water;freedom from floods;twenty minutes from Tombstone for supplies;telegraph,bank, good schools etc are economic advantages.

For business purposes it is not necessary to refer to geology,metallurgical technicalities or vague references. A general description of the ore bodies and their extent,and information regarding treatment of the ore follows.

## THE ORE BODIES

Veins carrying ore vary in width from 4 to 40 feet,some are parallel and cross veins. They are to be seen on every claim in the group.What may be called the main vein extends without a break from NE to SW 4500 ft through three claims 1500 ft long. A continuation of this vein to the SW on adjacent property,has a shaft sunk on the vein 600 ft.This important fact indicates depth and permanency of the vein and assures a large tonnage of ore below in your property.

It is not always possible to gague the width of the vein by surface showings but when vanadium or molybdenum are indicated it will be worth while to prospect the ground by sinking or by surface trenching. The veins are usually vertical or with 80 degrees inclination, and values frequently extend from wall to wall;these values are determined by assaying during the progress of working.

Ore already developed warrants the erection of a small 25 ton mill;that will treat ore from development work on the various claims;this mill will be a working asset and can be enlarged from time to time.Additional water will be developed to supply all needs.

The treatment of the ore is not complicated and compares with good modern practice,now in general use,with lead, zinc and copper.

The proposed mill will not require the services of operators skilled in electricity,

bodies of ore in sight. The assays indicate the following values:

| | | | |
|---|---|---|---|
| Heads | 19.8% lead | 156 lbs at 6¢ | $ 8.16 |
| | 1.875% $V_2O_5$ | 37.51lbs at 75¢ | 28.14 |
| | 1.245% $MoO_3$ | 24.91 lbs at 65¢ | 19.50 |
| | | TOTAL | 55.70 |
| Deduct 15% loss in recovery | | | 8.35 |
| | | | 47.35 |
| Deduct $5.00 ton mining and milling | | | 5.00 |
| Net value per ton composite sample | | | $42.35 |

VALUE OF CONCENTRATES WHICH WILL INCLUDE HEADS AND MIDDLINGS:

| | | |
|---|---|---|
| Lead, 51.6% / 14.5% = 66.1% x 20 = 1322.00 lbs at 6¢ | | 79.32 |
| Vanadium 0.46 / 2.10% = 10.65% x 20 = 214.51 lbs at 75¢ | | 152.37 |
| Molybdenum 8.55 / 2.00% = 10.55 x 20 = 211.00 lbs at 65¢ | | 137.00 |
| Recovered total values per ton | | $375.69 |
| Deduct $5 per ton mining and milling 4½ tons | | 22.50 |
| NET | | $ 353.19 |

## COMMERCIAL ASPECT

From the fact that there are unquestioned large ore bodies on this property, contained in veins that are from 4 to 40 ft wide, proven to various depths, from surface to bottom of shafts varying in depth from a few feet to 200 ft., the outlook is favorable for a substantial, commercial operation, free from mining risks that are often misleading. There are very few Mines with values of approximately $40 per ton profit in sight; in fact, the greatest producers in the world seldom approach this figure. A small 25 ton pilot plant can pay for its cost of installation and maintenance in a few months and will pay a profit on this property under trustworthy and competent management. By developing these ore bodies, as the situation now warrants, there are possibilities of profitable operations on a large scale, principally because there is an increasing demand for vanadium and molybdenum and also on account of a rising stable market that does not fluctuate as is the case in prices of lead, zinc, silver and copper.

## RECOMMENDATIONS.

I suggest that you proceed forthwith to patent your locations, erect the small pilot plant, provide dwellings for your employees and secure a competent, experienced mining engineer and assayer to direct and supervise the usual mining operations incident to this character of work. Also to send one of the 100 lb sacks of ground ore now at the School of Mines in Tucson, together with the results of Mr. Gordon's analysis to Webb City and Carterville Foundry and Machine Works, Webb City, Mo., for their test by jigging This may alter the flow-sheet (plan) of the pilot mill to your advantage. Addresses in the USA and foreign buyers of your products will be given by me to Mr. J. B. Gallagher together with other needful data for future consideration.

An omitted reference is made regarding the lead, which, in your case, should command a premium of about 1% as it is free from arsenic and other deleterious elements and is in demand for making pure "chemical" lead, largely used in the various mechanic arts.

(Signed) A. B. Frenzel, Consulting Engineer,
(Registered in Colorado)
Ex-rare Mineral Commissioner for
Colorado.

Tombstone, Arizona,
February 1928.

GALLAGHER - BRADSHAW GROUP.

The Gallagher-Bradshaw Group, consisting of four unpatented mining claims, is situated in the Tombstone mining district Cochise county, State of Arizona. The property is approximately eight miles from Tombstone, south of the Tombstone Hills, on the gentle slopes overlooking the San Pedro River.

The county road from Tombstone to the military reservation at Fort Huachuca is within a mile of the property. The main line on the Southern Pacific Railroad is not over a mile distant on the south.

The claims lie in an area of low relief at an elevation of approximately 4800 feet above sea level. There is no water developed on the property but it is likely that in sinking enough for all needs will be developed.

Some of the earliest exploratory work in the early days of the Tombstone district was done in this vicinity. There was a considerable production of high grade ore from this property in the early days but authentic records of the amount are lacking. In later years occasional leasing by chloriders yielded quantities of very high grade shipping ore.

The Tombstone Hills to the northeast are capped by sedimentary formation dipping east and forming a conspicuous feature in the landscape. There are no sedimentaries exposed on the Gallagher-Bradshaw Group. The principal rock mass is a Tertiary andesite flow, in a variety of phases, usually dark greenish, dense, fine grained and massive except for jointing. Brecciated and amygdaloidal textures occur but are not prominent. Typical alteration products, epidote, calcite and chlorite have resulted from the breaking down of the ferro-magnesian minerals.

There are fine grained, light grey dikes, weathering to white or yellowish outcrops, provisionally classified as rhyolite. In this district the close association of such dikes with the principal vein systems suggests a probably genetic relationsh ip though this is not yet deffinitely proven. In general such veins parallel the veins and have the same direction of dip though they may vary in the degree of dip.

Faults if present are not indicated on the surface and it is believed that if any are encountered they will not be of a very serious nature or large displacement.

The principal development work on this group is the old Bradshaw shaft which is 240-ft deep. This data as to its depth is obtainable from the records of the General Land Office in Phoenix, and is contained in the notes of the survey made for patent in February 1881. The shaft is not open at the present time but it is believed that it was not sunk any deeper than this record shows. The extent and nature of the lateral development from this shaft is not known definitely. Subsequent work by chloriders have more or less choked up old workings and made it impossible to get any idea of the exact extent of them without doing some cleaning out and probably some timbering.

The Gallagher-Bradshaw Group differes from the properties surrounding it in that it does not show such a conspicuous amount of vanadium minerals. Vanadates occur sparingly in such workings as are accessible. Silver minerals are abundant and in the most sha

shallow workings cerargyrite, horn-silver , of the most abundant silver mineral and some exceptional specimens have been taken out. Galena and tetrahedrite have been found in the dumps which have been culled over more than once for the high-grade.

No systematic sampling of the Gallagher-Bradshaw group has been done by the writer. However, in 1928, from a depth of some thir thirty feet in the old workings about ten pounds of fines were taken from behind a false wall for further study. This material assayed 116oz silver. Later it was screened through ordinary house screen and the resulting fines panned. The concentrate from this operation assayed 800 ounces silver. Other samples taken at various points in the upper parts of the old shaft and the shallow stopes assayed from one half to 18.0 oz silver. The gold content was low. These samples can be considered only in the nature of character samples as it is not likely that any ore of a value sufficient to yield profit would have been left in sight all these years.

There are two distinct veins on the Gallagher-Bradshaw Group with a very limited amount of work done on each. It is well known that there was a considerable and a profitable production from one of these veins and it is though that the other also did produce some ore at a profit in the early days.

Though the amount of work that is accessible is not great, and though the assays of such material as can be reached in the workings that are open are not high, there is sufficient evidence of mineralization to justify prospecting these veins at depths below those reached by the early operations. Much more favorable economic conditions prevail now and the nature of the ore is such that by modern methods a very satisfactory recovery can be made at a cost lower than that prevailing in the near-by mills when the Bradshaw shaft was being sunk. Exploration costs should be low. On the whole the Gallagher-Bradshaw Group presents an attractive development project.

Phoenix, Arizona.
February 20, 1934.

Respectfully submitted,

A L Flagg,

Consulting Engineer.

Gallagher Vanadium & Rare Metals Corp.

FINANCING.

The following brief summary gives the essential features of the proposed plan of financing. The schedules which follow give the details as to capital requirements, operating costs, etc.

In it's present state the project may be described as an industry owning it's source of supply of raw material, having an assured market for its finished product at an attractive price, but requiring additional capital to put it into profitable operation.

The company is an Arizona corporation, having a capital of seven hundred and fifty thousand (750,000) shares of non-assessable stock, of a par value of one dollar ($1.00) per share. There are three hundred ninety thousand seven hundred and nine (390,709) shares outstanding. There are no bonds, notes, preferred stock, mortgages or other forms of indebtedness against the Company. The assets are $521,766.30. Current liabilities are less than $1000

There has been expended on the property in development, equipment and research work up to the present time, approximately $150,000.

Competent authorities, making an unbiased and independent estimate of the intrinsic worth of the properties in the original undeveloped state have placed on them a valuation of $200,000.00.

The purpose of the additional financing is:

To block out and prepare for production the indicated ores disclosed in the present workings.

To remodel and add to the milling equipment, by which the capacity of the mill will be increased and a higher grade, more easily marketed product can be made.

The estimated annual net earnings, based on treating a minimum of 100 tons of crude ore per day is $276,000.00.

Phoenix, Arizona,
October 1929.

## OPERATING COSTS AND EARNINGS: A SUMMARY.

The basis of the following computation of earnings is the daily treatment of 100 tons of crude ore, carrying not less than 1% vanadium pentoxide, from which will be made a concentrate, at the probable ratio of 10 to 1 which will contain the following minimum products: 11% vanadic acid (vanadium pentoxide), 1% molybdic acid, 45% lead, $2.00 in gold and $1.00 in silver.

### COSTS.

The cost of mining and treating 1 ton of crude ore:

| | |
|---|---|
| Mining | 2.875 |
| Milling | 2.143 |
| Marketing | .650 |
| Total | $5.67 |

Ten tons of crude ore yield one ton of concentrates, therefore the cost of one ton of concentrate is $56.70; the cost of 10 tons is $567.00. This ten tons is the estimated output of one day.

### VALUES.

The following tabulation gives the recoverable values in the concentrates, assuming that all metals contained are paid for. In buying vanadi vanadium ores or concentrates payments are usually made for the vanadium only, lead, silver and gold being free to the purchaser.

| | |
|---|---|
| 11% vanadic acid, 85% recovery 187# @42; | 78.54 |
| 45% lead, 80% recovery, 720# @4; | 28.80 |
| Gold | 2.00 |
| Silver | 1.00 |
| Total recovered | $110.34 |

(N.B. Vanadic acid is estimated at 42¢ per pound which is the price usually paid for the contained vanadium in carnotite ores f.o.b. works. There is no steady or regular production and /or sale of the vanadate ores and their concentrates, hence the sale is a matter of bargaining for each individual lot as it comes on the market.

### PROFITS.

The cost of smelting one ton of concentrate is $41.15, which added to the cost of making the concentrate, i.e. $56.70, makes the total cost of handling one ton of concentrate $97.85 or $987.50, the total of one days operating expenses.

The value of the products from this operation is:

| | |
|---|---|
| 1870 lbs Vanadic acid @ 85¢ | 1589.50 |
| Lead, gold, silver | 318.00 |
| Total value of products | 1907.50 |
| Daily operating cost | 987.50 |
| Daily profit | 920.00 |
| Yearly profit | $276,000.00 |

## CAPITAL REQUIREMENTS.

Schedule A

Camp and Miscellaneous Equipment.

| | | |
|---|---|---|
| Office Building and Vault, | 2500.00 | |
| Manager's House;Franklin #101 | 900.00 | |
| Supt's House;Franklin #102 | 750.00 | |
| 4 Dwellings;Fraklin #105 | 2400.00 | |
| Kohler lighting system | 1481.00 | |
| Garage | 1200.00 | |
| Warehouse | 1500.00 | |
| GMC 2½ ton truck | 3000.00 | |
| Side Track lease and spur | 1200.00 | |
| Laboratory:add and equip. | 2500.00 | |
| Contingent | 2569.00 | $20,000.00 |

Schedule B

Mining Equipment.

| | | |
|---|---|---|
| Sullivan Air Compressor | 2800.00 | |
| 100 HP Foos engine | 2200.00 | |
| Freight | 1240.00 | |
| Foundations | 325.00 | |
| Building | 1500.00 | |
| Drill sharpener | 1400.00 | |
| Shop compressor | 350.00 | |
| Engine for compressor | 125.00 | |
| Headframe,Shaft A timber | 285.00 | |
| construction | 600.00 | |
| equipment | 155.00 | |
| Headframes, Shaft B,D,E, Timbers | 915.00 | |
| construction | 1350.00 | |
| equipment | 270.00 | |
| Miscellaneous tools | 1500.00 | |
| 12 mine cars @ $125 | 1500.00 | |
| 4 skips @ $250 | 1000.00 | |
| 2 tons mine rails @ $90 | 180.00 | |
| Track accessories | 250.00 | |
| Air lines;4 in to 1½ in | 5250.00 | |
| 6 Cochise #40W drills | 1170.00 | |
| 6 Mountings #587 | 523.00 | |
| 6 Columns and arms 3x6 | 390.00 | |
| 12 water hose 50-ft | 172.00 | |
| 12 air hose 50-ft | 216.00 | |
| 6 Water connections 10-ft | 43.50 | |
| 12 Water pressure tanks | 324.00 | |
| 6 Cochise W4 drills | 1230.00 | |
| 3 Anaconda air hoists | 1062.00 | |
| Hoisting cable | 1172.00 | |
| Domestic water supply pump | 94.00 | |
| " " " engine | 66.00 | |
| " " " tank | 204.00 | $30,000.00 |

Schedule C

Rehabilitation of mill,additions etc to make concentrates.

Coarse Crushing Unit:

| | | |
|---|---|---|
| Bins, | 3850.00 | |
| Housing | 1250.00 | |
| Grizzly-feeder | 505.00 | |
| Cone Crusher | 2500.00 | |
| Power | 2500.00 | |
| Foundarions-Grading | 3525.00 | |
| Fine Grinding Unit: | | |
| Belt Feeder | 500.00 | |
| Feed box | 117.00 | |
| Installation | 488.00 | |
| Classification: | | |
| Dorr Classifier | 815.00 | |
| Frt and Installation | 105.00 | |
| FlotationFilter and Drier | | |
| Flotation Cells | 8000.00 | |
| American Filter | 2655.00 | |
| Dryer | 1500.00 | |
| Foundations and labor | 2000.00 | |
| Shafting and pulleys | 350.00 | |
| Piping | 500.00 | |
| Misc.,freight and labor | 3840.00 | $35,000.00 |

Schedule D.

Installation of slag-making equipment.

The equipment for converting lead vanadate concentrates into (a) lead bullion, and (b) Sodium Vanadate Slag consists of storage bins for concentrates and fluxes, sintering pots, fans, elevators, water jacketed blast furnace, lead kettles, dust chambers, and similar equipment for a pyro-metallurgical process,the estimated cost of which is,

Schedule E. $23,500.00

Installation of vanadic acid making equipment.

The production of vanadic acid from the sodium vanadate slag which in turn is to be derived from the lead vanadate concentrates is a hydro-metallurgical process, involving the use of storage bins for crushed slag, fine grinding units, solution tanks, centrifugal pumps, leaching tanks, vacuum filters, dryers,vacuum pump pressure pumps, acid filter presses, reverberatory furnace, molds etc, the estimated cost of which, complete, is

$22,500.00

The conversion of vanadic acid to ferro-vanadium is not contemplates because it is believed to be a profitable operation at the present time under the present conditions.

Schedule F.

Funds required for development plan.

| | | |
|---|---|---|
| 600-ft sinking @ $25 | 15,000.00 | |
| 2000-ft drifting @ $18 | 36,000.00 | $51,000.00 |

## COSTS

Schedule AA:

Mining costs; 25, 50, and 100 tons per day.

| | 25 tons | 50 tons | 100 tons |
|---|---|---|---|
| ½ General charges | .420 | .210 | .162 |
| ½ Overhead | 1.000 | .5000 | .326 |
| Labor stoping | .811 | .800 | .791 |
| Materials stoping | .091 | .087 | .076 |
| Tramming | .190 | .190 | .186 |
| Steel sharpening | .021 | .021 | .021 |
| Drill repairs | .100 | .100 | .096 |
| Survey & Samp. | .150 | .150 | .044 |
| Assaying | .252 | .230 | .062 |
| Timber, track, pipe | .511 | .487 | .511 |
| Misc Supplies | .415 | .375 | .331 |
| Power | .301 | .288 | .251 |
| Total per ton | 4.262 | 3.438 | 2.857 |

Schedule BB:

Milling costs: 25, 50 and 100 tons per day.

| | 25 tons | 50 tons | 100 tons |
|---|---|---|---|
| ½ General charges | .420 | .210 | .162 |
| ½ Overhead | 1.000 | .500 | .325 |
| Superintendent | .321 | .204 | .110 |
| Labor | 1.082 | .977 | .841 |
| Repairs | .010 | .088 | .004 |
| Reagents & supplies | .481 | .371 | .334 |
| Power | .511 | .391 | .312 |
| Assay | .190 | .151 | .041 |
| Water | .046 | .029 | .014 |
| Total per ton | 4.061 | 2.841 | 2.143 |

Schedule CC:

Sacking concentrates.

Sax cost 17¢ each, 25 sax of 80 lbs conc to the ton
Twine 1 1¢
Return 2¢

Total 21¢ x 25 or $5.25 per ton. Sax make seven trips on an average, so sax cost 75¢ per ton; labor filling 42¢ making total cost of sacking $1.17 per ton.

Schedule DD:

Production of sodium vanadate slag from concentrates, based on treating 10 to 15 tons concentrates per day.

| | | |
|---|---|---|
| Sintering | 15 tons | 22.50 |
| Labor | | 87.50 |
| Power and water | | 7.50 |
| Chemicals, fuel etc | | 505.50 |
| Total | | 622.50 |
| Per ton concentrates | | 41.50 |

Schedule EE:

Production of vanadic acid from sodium vanadate sla; based on treatment of 15 tons of concentrates daily, recovering 2805 lbs vanadic acid.

| | |
|---|---|
| Labor | 71.50 |
| Chemicals | 20.00 |
| Coal | 6.00 |
| Water | 3.00 |
| Laboratory | 3.00 |
| Oils, grease etc | 8.00 |
| Power | 10.00 |
| Drying and fusing | 20.05 |
| Total | 149.55 |
| Per pound vanadic acid | $ 0.053 |

M6-45

# DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA

## OWNERS MINE REPORT

Date June 4, 1940

1. Mine Gallagher Vanadium Mine
2. Mining District & County Tombstone District, Cochise County, Ariz.
3. Former name Same
4. Location 7½ miles from Tombstone
5. Owner Gallagher Vanadium & Rare Mineral Corp. (An Arizona corporation)
6. Address (Owner) 221 Slocum Place San Antonio, Texas
7. Operator Same
8. Address (Operator) Same
9. President Mrs. Louis Reuter P. O. Box 1915, Austin, Texas
10. Gen. Mgr. J. B. Gallagher
11. Mine Supt. J. B. Gallagher
12. Mill Supt. None
13. Principal Metals Vanadium, molybdenum, lead, silver, gold.
14. Men Employed None regularly
15. Production Rate Intermittent
16. Mill: Type & Cap. 25 ton pilot plant
17. Power: Amt. & Type 100H.P. F
18. Operations: Present Annual labo

GALLAGHER VANADIUM

Vd, Mo, Ag, Pb, Au

Cochise 2 - 4 T 20 S, R 20 E

Gallagher Vanadium & Rare Mineral Corp. '43

19. Operations Planned Exploration of ground in units; construction of a concentrating plant, with chemical plant optional. Concentration of ores and metallurgy of concentrates worked out.

20. Number Claims, Title, etc. Three patented claims and 21 unpatented

21. Description: Topography & Geography Gently rolling country, can drive touring car over almost all of the property. County highway from Tombstone to Fort Huachuca crosses property. 1½ miles from S. P. main line (Charleston station). Mt. States Tel. & Teleg. lines cross property.

22. Mine Workings: Amt. & Condition More than 100 openings on the property, most of them shallow. Probably all accessible at present. Shafts 80, 65,50 and 45 ft. deep with others from 15 to 25 ft.; many long open cuts (trenching) across the ore zones, and some open cuts along the strike.

(over)

23. Geology & Mineralization — Principal rock mass Tertiar[illegible]esit[illegible] in a variety of phas[illegible]. Intruded by rhyolite d[illegible]e wh[illegible]h appears to be related to mineralization and itself carrying considerable vanadinite over great widths. A cross system of basic dikes occurs but not believed important. Vein system strikes NE - SW and dips south at various angles. Individual veins vary from a few inches to six to 10 ft. Av probably 4 ft. Vein systems or breccia zones over 100 ft. wide.

24. Ore: Positive & Probable, Ore Dumps, Tailings — No attempt made to determine ore. From one open cut 400 tons taken out with a fresno and put through pilot mill. Large tonnage indicated.

24-A Vein Width, Length, Value, etc. — Of several hundred samples average might be said to be 10 to 14% lead, 0.80% $V_2O_5$, 0.90 oz Ag, and an appreciable amount of molybdenum. Very few samples ever run for molybdenum. Concentrates have shown 50% lead, 1.4 oz gold and 6.07 silver.

25. Mine, Mill Equipment & Flow Sheet — 100 H.P. Foss engine, jaw crusher, rod mill, Dorr classifier, 4 Diester tables, bins, etc. Suitable for preliminary testing but not for commercial operations.

26. Road Conditions, Route — Good gravel surface road from Tombstone to mine, about 7½ miles.

27. Water Supply — Developed sufficient for mill. Indicated supply undeveloped but probably not very great. Its depth likely to find enough water for large plant.

28. Brief History — Property located about 1913 by Gallagher brothers. Held by them until incorporation. Stock in corporation all owned by members of Gallagher family.

29. Special Problems, Reports Filed — Extensive reports available from owners or engineer.

30. Remarks — Property appears to have a very large potential tonnage of vanadium or with molybdenum, silver and gold in lesser amounts. The lead content is heavy. Development must be by shafts. The mineralized rhyolite dike indicates a possible big tonnage of ore about 0.80% $V_2O_5$.

31. If property for sale: Price, terms and address to negotiate. — Property probably for sale or lease, Address - Gallagher Vanadium & Rare Minerals Corp., 221 Slocum Place, San Antonio, Texas.

32. Signed A. L. Flagg
Cons. Eng.

33. Use additional sheets if necessary.

# Report on Properties of Gallagher Vanadium & Rare Minerals Corporation

# REPORT ON PROPERTIES

# OF

# GALLAGHER VANADIUM & RARE MINERALS CORPORATION.

Contents.

GALLAGHER VANADIUM & RARE MINERALS

CORPORATION.

Summary and Conclusion:

The property of the Gallagher Vanadium and Rare Minerals Corporation, consisting of twenty-one unpatented and one patented lode mining claim, situated in the Tombstone mining district, in Cochise county, State of Arizona, possesses all the indications of an exceptionally large and profitable vanadium deposit. Surrounded by numerous economic advantages the operating costs should be low. The completion of the proposed pilot plant, continuation of the research work and the prosecution of a vigorous development program are recommended.

A. L. Flagg,
Consulting Engineer.

Phoenix, Arizona,
November 20th, 1928

GALLAGHER VANADIUM & RARE MINERALS

CORPORATION.

The property of the Gallagher Vanadium & Rare Minerals Corporation, consists of twenty-one unpatented and one patented mining claim, situated in the Tombstone mining district, Cochise county, State of Arizona.

This particular part of the Tombstone mining district lies west and south of Tombstone Hills, on gentle slopes bordering the San Pedro river. The Company's camp is 7.5 miles from Tombstone, county seat of Cochise county, at an elevation of approximately 4200 feet above sea level.

The county road from Tombstone to the military reservation at Fort Huachuca passes through the property and within a few hundred feet of the pilot plant under construction. The Southern Pacific railroad is only 1.5 miles distant. At Charleston there is ample side-track facility. The Mountain States Telephone & Telegraph Company (Bell System) lines cross the claims and the pipe line of Tombstone municipal water system also crosses the property.

The neighboring camp of Tombstone has always been famous for its wet mines. There is an abundance of water in this particular part of the district but as yet it is not known at what elevation the permanent water stands. Water developed in the present workings does not seem to shed much light on this subject.

The Company owns a well equipped testing and assay laboratory. A twenty-five ton (Per 24-hours) pilot plant is under construction and nearly completed The mining equipment consists of two hoists, a portable and a small stationary compresser, drills and micellaneous tools, a supply of mine timber etc. A small camp which serves for the officers of the Company, a garage and a blacksmith shop complete the equipment. The mining equipment is adequate for the initial prospecting period but must be replaced by more substantial and more powerful equipment later.

The Tombstone district, in which this property is situated, is one of the oldest in Arizona. Undoubtedly these properties figured more or less in the events of the early romantic days of Tombstone about which so much has been written. It is probable that because these locations were somewhat remote from the center of activity that this area did not receive more attention in those stirring days. It is also true that there were no such permanent bodies of high grade ore as were encountered in the main camp. Whatever the causes may have been the property received little attention until somewhat less than twenty years ago. Since then prospecting has been almost continuous, culminating in the present activities.

The claims lie in an area of low relief at an elevation of about 4200-ft above sea level. The terrain slopes gently to the south and west. The drainage is to the San Pedro River.

The surface at best is covered with only a thin layer of soil which supports but little growth.

The Tombstone Hills to the northeast are capped by sedimentary formations dipping east and forming a conspicuous feature in the landscape. There are no sedimentaries exposed on this property. The principal rock mass is fine

grained and massive except for jointing. It is a Tertiary andesite flow, in a variety of phases, usually dark greenish and dense. Brecciated and amygdaloidal textures occur but they are not prominent. The same andesitic breccia or agglomerate noted in other parts of the State where the formation is similar has not been noted here. Typical alteration products, epidote, calcite and chlorite have resulted from the breaking down of the ferro-magnesian minerals.

There are fine grained, light grey dikes which weather to white or yellow outcrops. These have been classified provisionally as rhyolite. The close association of the most prominent dikes with the principal vein system suggests a probable genetic relation which is not definitely proven. Smaller dikes of similar megascopic characteristics are more or less closely associated with the other veins. In general these light colored dikes are parallel to the veins, have the same general direction of dip but vary often in degree.

Another dike system, crossing the vein system, and running more nearly north and south is indicated by isolated but conspicuous outcrops. In texture it is strongly porphyritic. The prevailing color is greenish, especially in weathered exposures, tough fresh specimens are more gray and mottled. In the outcrop the most conspicuous features are the white phenocrysts of feldspar which stand out prominently against the somber background of the fine-grained groundmass. Tentatively this material is classified as quartz-mica-diorite as has been described by Ransome in the Ray, Christmas and other quadrangles in Arizona.

Faults if present are not indicated at the surface and it is believed that if any are encountered they will not be of a serious nature.

The vein system strikes NE-SW and dips south from angles as low as 20 degrees to almost vertical. Unquestionably some of the low lying, flat veins are off-shoots of the main veins which stand at steep angles. There are at least five parallel veins crossing the main body of the claims and these are traceable for the length of three or more claims.

The widths of the veins vary from a few inches for the less conspicuous to well over two hundred feet on the main Blanket vein, a short distance SW of the pilot plant. In all probability the average vein width will be about four feet.

The walls are usually smooth and fairly regular though at times their intersection with normal joint planes in the andesite have caused local variations or have afforded opportunity for the formation of spur veins or rich pockets. The vein filling is principally quartz, sometimes cementing fragments of andesite or rhyplite or both.

The metals of commercial importance are lead, gold, silver, vanadium and molybdenum. Copper occurs sparingly as does zinc. The numerous works show a wide variety of mineral species. There is probably a greater variety of vanadium minerals to be found here than at any other locality in the Southwest.

The earliest prospecting on these claims was a search for the silver-lead or gold ores. Some open cuts and underhand stopes testify to the success of these quests. Later when the presence and value of vanadium became known prospecting was more for the purpose of determining the horizontal limits than for the sake of investigating depths or values. The sum total of the development work is considerable yet its nature and distribution are such that though it affords no opportunity to measure up ore which will satisfy all the critical requirements of the definition of "ore blocked out" there are abundant exposures for sampling. Therefore in evaluating the property one must be governed almost entirely by criteria of a different sort than those used in dealing with developed ore. Such a valuation is serviceable only in proportion as the observed

facts are intelligently analized and interpreted in terms of proven ore bodies of a similar form,nature or occurence.Studied in this manner the property appears to promise a tonnage that will be computed in the hundreds of thousands of tons.As to value it would seem that within certain limits it is simply a question of what will satisfy the requirements of the treatment practice as finally determined by the pilot plant.From this it should not be inferred that the values in vanadium are always phenomenally high.Research in the exploration of this type of deposits has indicated that the most desirable average for mill feed is approximately 1% $V_2O_5$.There is no reason to believe that this value cannot be maintained easily for considerable time to come.While it is impossible to assert with precision that there are a definite number of tons blocked out on the property,experience gained from intimate contact with other deposits warrant the opinion that in point of volume and value of its vanadium content this property will in no wise prove disappointing or unprofitable.

This section has been prospected,located and relocated many times no doubt.The development was stimulated by finding silver-lead ores near the surface and by frequent high gold assays.Some very satisfactory shipments of lead ore have been made in recent years while in the past the silver ores of the Bradshaw Group commanded an attractive price at the collar of the shaft. However,in spite of all this development is limited to shallow workings.

The deepest development in this part of the district is the Manilla shaft which is some 1300 feet west of the McClellan claim.Reports vary as to the depth of this shaft.However,it seems to be quite certain that the shaft is more than 300-ft deep.It is equally certain that vanadium values persist to at least 250-ft in depth.There are good reasons for believing that the values in vanadium may persist to depths below 250-ft but the data is insufficient for making any positive statement.The depth at which vanadium has been found in this shaft has an important bearing on the possibilities of the other properties near by.

The deepest workings on the GVRM property is the Bradshaw shaft which is 240-ft deep according to the notes contained in the survey for patent made in February 1881.This data is available from the U.S.Gen.Land Office in Phoenix.Since the shaft was first sunk very little work has been done on the property and the shaft is out of commission.

It should be noted that the Bradshaw unit alone does not show conspicuous quantities of vanadium minerals.Vanadates occur sparingly.It is well known that in the early days the production of high grade silver ore was considerable.Reports vary as to the total production and authentic records on the subject are no longer available.There are two distinct veins on this group. A small amount of work has been done on each.The principal silver mineral in the more shallow workings is cerargyrite.In the dumps galena,which probably carries some silver,and tetrahedrite have been found.While the values in such workings asare accessible now are low there is sufficient justification for the further prospecting of these veins at depths below those reached by early operations.

The next deepest work is the shaft on the McClellan from which water is pumped to supply the mill and camp.This is a vertical shaft,nearly 90-ft deep.There is a crosscut to the south for over 80-ft from a point near bottom.

The sum total of the openings made on the property amount to between 125 and 150.Some are only shallow prospect pits not exceeding five feet in depth.Others are more pretentious having a depth of from forty to sixty feet, frequently with a drift or crosscut by way of lateral development.No attempt has been made to calculate or even estimate the total footage of such development,principally because the deeper workings are somewhat out of repair now.

It is significant that nearly every opening on any part of the property will show some signs of vanadium. The more important vein system is clearly marked by a series of openings, closely spaced, all of which have abundant indications of vanadium minerals. Many of these openings have produced silver-lead ores of shipping quality as is evidenced by limited amount of material remaining as dumps and by signs of hand sorting and screening.

For the present the most valuable work and that which will be made use of in opening up the property for production is located approximately 2000-ft from the mill on Blanket No. 1 and Stella claims. This work consists of two shafts, formerly known as the San Antonio and Aurora. They are about 450-ft apart. Each is 40-ft deep and shallow prospecting between them indicates an area of vanadium values more or less continuous, which bids fair to develop into a single shoot of ore more than five feet in width and of exceptional value. To the east of the Aurora shaft there are indications of another shoot of the same general characteristics and probable length. These two shafts afford a desirable site for initial development.

That at no distant date the so-called "low-grade, complex" ores will supply the bulk of the vanadium of commerce is hardly to be doubted. The deposits of this type of ore have been ignored consistenly because they presented certain difficultites as to treatment and because vanadium could not be recovered as easily or as cheaply as/from other sources. Conditions which govern the vanadium situation have changed and are changing rapidly. The mechanical and metallurgical difficulties which prevented or at least hindered the exploitation of this type of deposit in the past have been successfully overcome and there is no longer any reason why the utilization of these dormant sources of supply should be delayed.

In conclusion it may be said that as compared with other vanadium deposits of the same general type in the Southwest this property has a greater potential value than any other examined by the writer. There are several features of considerable importance. First of all, the available data ~~data~~ points to a probable greater vertical range of profitable vanadium values than is usual. Second, the horizontal extent of the distribution is of such a nature as would indicate long shoots. The values contained in the other metals are of considerable importance and it is probable that underlying the deepest levels from which vanadium can be recovered economically and profitably there will be profitable bodies of base and precious metals. Taken as a whole this property is of more than usual interest, because it is unquestionably a very large potential source of supply of vanadium and because it has great promise of production of other metals at depth.

Phoenix, Arizona,
November 20th, 1928.

Respectfully submitted,

A. L. Flagg
Consulting Engineer.

GALLAGHER VANADIUM & RARE MINERALS CORPORATION

SUPPLEMENTARY REPORT.

Since the foregoing report was written a considerable amount of work has been done on the property. While the results of this later work are not correlated because the work is still in progress, it is worth while to record and study the data collected to date.

The most interesting discovery is the marked difference between this deposit and others of a similar nature. A great many of the generally accepted rules governing lead vanadate deposits appear to be the exception here and practically every tradition concerning the occurrence of the lead vanadate is violated.

One of the most important features is the lack of altefation in the vanadates. This is indicated in many different ways, the most striking evidence being the finding of loose vanadate crystals in clusters in the soil along the outcrop. These crystals and aggregates of crystals, which have undoubtedly been freed from their original enclosing gangue by erosion are absolutely unaltered and quite as fresh as any taken from underground.

Another feature quite worthy of note is the unusual relation between the vanadinite and the quartz. Wherever vanadinite occurs with the quartz it is not found on pre-existing fractures or joint planes. A fresh break in a fragment of vein quartz, not previously shattered, will show crystals of vanadinite and descloizite embedded deeply in the enclosing quartz.

That vanadinite persists to some depth below the present known water level in the district is quite clear; How far it will extend below this horizon cannot be told with accuracy but it is known that commercial values in vanadium exist at a depth of over eighty feet. In view of the conditions where observations can be made at depths in excess of fifty feet it seems more than probable that the vanadium values can be counted on to a depth of one hundred feet or more.

A detailed study of the material gathered from the outcrops of the rhyolite dikes indicates that fracturing in the rhyolite is very extensive. The whole shattered mass of rhyolite seems to be permeated, on the fracture planes, with vanadium minerals. The fracturing of the rhyolite is very uniform as well as extensive and the deposition of vanadium occurs on practically every fracture plane. These facts justify the expectation that the entire dike material will come under the head of commercial ore. To make possible the utilization of all this material will require an accurate knowledge of the extent and content of each dike. Exploratory work tending to secure this data is in progress but it will require some time to complete. However, the work is justified for it is confidently expected that the results will indicate a large tonnage project rather than the selective mining of high grade shoots.

It is of interest to study the situation from the view-point of possible ore. There are four parallel vein systems ranging in width from four feet to nearly two hundred feet. These are prospected for their entire length by many openings as stated in the report. In the case of the original Blanket vein system which has a maximum width near its west end of two hundred feet, a length of 4000-ft, and is known to carry vanadium in commercial quantities to a depth of 80-ft. Assuming that the width of ore is only an average of 5-ft and that not over half of the vein system in length will prove to be productive, we have a tonnage of possible ore of 61,194 tons. If we assume that

this ore has a gross value of $21.80 per ton, which assumption is based on a 90% recovery of 1% $V_2O_5$, 2% lead and $2.00 combined gold and silver, the gross value of the potential ore is $1,334,029.20. Such calculations which are not purely speculative justify the conclusion expressed by many who are competent to judge that this deposit is not only unique but without doubt it is the largest potential deposit of lead vanadate known in this country. The other three dikes though not as thoroughly prospected show every indication of being equal in magnitude to the original Blanket, therefore a very conservative estimate of the potential tonnage of indicated ore of an average value of 1% vanadic acid cannot be less than 500,000 tons.

The equipment for the pilot plant was selected by the late A.B.Frenzel on the assumption that the vanadium could be recovered by coarse concentration. It was demonstrated soon after starting of the plant that crushing to -20 mesh in the rod mill liberated all of the vanadium values and that 29.14% of the total discharge from the rod mill was -150 mesh and this carried 28.4% of the total vanadium. More than 60% of the total vanadium was to be found in the -100 mesh material. About 15% is in the -40 to plus 60 mesh.

During the short time while the pilot plant was in operation it was demonstrated beyond any possibility of doubt that no method of coarse concentration will be satisfactory for this ore. Fairly high grade concentrates were made by the present equipment but the tailings loss was high, and the recovery low. The maximum recovery was not much over 50% of the total vanadium contained. The highest grade concentrate carried 17.4% vanadic acid. This was made from -100 mesh material. In the coarseer sizes (plus 60 mesh) the highest grade concentrate was 9.19% vanadic acid.

The series of flotation tests made in 1928, and mentioned in the foregoing report is indicative of the higher percentage of recovery to be expected from flotation. Other work at the Company's laboratory has suggested certain lines of investigation in this connection. Though all of the details of operations have not been worked out there is little doubt about the final outcome of these flotation experiments in dressing these particular ores by some system of flotation.

Phoenix, Arizona,
April 12th, 1929.

A.R.C. Flagg
Consulting Engineer.

Early in 1928 a table concentration test was made at the School of Mines, University of Arizona, under the direction of Professors Chapman and Cunningham. The material used for this test was a composite sample which weighed 611 pounds., taken from various dumps on the property, under the supervision of Mr.J.B.Gallagher, the original locator of the greater part of the property Every effort was made to have this sample representative and as near the average of run-of-mine ore as possible. As the dump material in many instances is the result of hand sorting, an average of the dumps cannot be considered an average sample of the mine in the strictest sense of the word. The material so secured was nearly enough representative for the requirements so far as the physical characteristics were concerned. The sample was crushed dry through a crusher and rolls, then passed over and through a twenty mesh screen. The resulting product, all - 20 mesh, was treated on a Deister Plat - O - table with the following results.

| | Au. | Ag | Pb% | $V_2O_5$% | $MoO_3$% |
|---|---|---|---|---|---|
| Heads | Tr | 0.90 | 10.8 | 1.875 | 1.245 |
| Concentrates | .04 | 2.86 | 51.8 | 8.446 | 8.550 |
| Middlings | Tr | 1.46 | 14.4 | 2.162 | |
| Slimes | Tr | 0.52 | 8.0 | 0.955 | |
| Tailings | Tr | 0.58 | 2.3 | | |

FLOTATION TESTS, GVRM ORES OCTOBER 1928.

In October a series of flotation tests on a composite sample of these ores was made at the plant of the Universal Engineering Company, by Mr.C.M.Nokes, Metallurgist. The final test, No.60 (Reconstructed) as given below, is indicative of what may be expected from flotation. There are many details to be worked out but the essentials are known.

| Products | Weight Grams | % Tot. | Gold Oz | Silver Oz | % Met. | Lead %T | % Met | Vanadium %T | % Met. |
|---|---|---|---|---|---|---|---|---|---|
| Heads,(1) | 1000 | | | 1.8 | 100 | 11.3 | 100 | 2.05 | 100 |
| Heads (2) | 979 | 100 | Tr | .84 | 100 | 12.05 | 100 | 1.90 | 100 |
| Tailings | 750 | 76.6 | Tr | Tr | | 1.7 | 10.7 | Tr | |
| Concentrate | 229 | 23.4 | .021 | 4.1 | 100 | 46.0 | 89.3 | 8.10 | 100 |

(1) Assay (2) Computed.

Ratio of concentration:

100 tons of crude ore produce:

23.4 tons of concentrates 76.6 tons of tailings

This concentrate, being a rougher, can be graded up to assay about as follows:

| | |
|---|---|
| Gold, | 0.02 oz |
| Silver | 4.50 oz |
| Lead | 56.0 % |
| $V_2\emptyset_5$ | 10.0% |

REPORT OF ANALYSIS OF CONCENTRATES FROM INITIAL RUN.

(Ledoux & Company, New York)

No.395180 March 16th,1929.

| | |
|---|---|
| Lead 28.72% equivalent to Lead Oxide | 30.94% |
| Vanadium 2.90% equivalent to Vanadium Pentoxide | 5.17% |
| Molybdenum 0.52% equivalent to Molybdenum Trioxide | 0.78% |
| Copper | 0.19% |
| Arsenic | 0.12% |
| Antimony | 0.09% |
| Iron 16.28% Iron Oxide | 23.28% |
| Manganese | 1.69% |
| Silica | 17.37% |
| Alumina | 4.57% |
| Calcium Oxide | 0.90% |
| Sulphur Trioxide | 2.24% |
| Phosphorous Pentoxide | 1.10% |
| Chlorine | 0.74% |
| Ignition Loss | 5.88% |
| Gold, per ton | 1.40 oz |
| Silver, per ton | 6.07 oz |

LIST OF MINING CLAIMS.

| Claim | | Book | Page |
|---|---|---|---|
| Gallagher-Bradshaw | | 69 | 54 |
| Gallagher-Bradshaw No.1 | | 69 | 55 |
| Gallagher-Bradshaw No.2 | | 69 | 56 |
| Gllagher-Bradshaw No.3 | | 69 | 57 |
| Blanket | | 69 | 36 |
| Blanket No.1 | | 69 | 37 |
| Blanket No.3 | | 63 | 523 |
| Blanket No.2 | | 69 | 38 |
| Blanket No.4 | | 63 | 524 |
| Blanket No.5 | | 63 | 525 |
| Blanket No.6 | | 69 | 39 |
| Blanket No.7 | | 63 | 527 |
| Blanket No.8 | | 69 | 9 |
| Blanket No.9 | | 69 | 10 |
| Stella | | 69 | 40 |
| Maggie | | 69 | 41 |
| May Powell | | 62 | 522 |
| Side Shot | | 69 | 58 |
| Necessity | | 67 | 570 |
| Union Flag | | 69 | 9 |
| Buena Vista | Patented | U.S.Min Sur.No. 260 | |
| Richmond | Patented | U.S.Min.Sur.No. 261 | |
| McClellan | Patented | U.S.Min.Sur.No. 262 | |

# GEOLOGICAL NOTES.

The following notes, to accompany a geological map (Sheet I) of a portion of the Gallagher Vanadium & Rare Minerals Corporation properties, in the Tombstone mining district, Cochise county, Arizona, are the results of observations made during June, July and August 1930, when several brief visits were made to the property while annual labor was being performed. The conclusions set forth are by no means final, but are subject to revision when more detailed investigations can be made.

In these notes the current names for the different formations have been adhered to. Petrographic investigations may indicate the desirability of sub-dividing parts of what is now taken as a single formation or may prove that some terms now in use are misnomers. Such refinements of classification are not necessary in a survey which is so much in the nature of a reconnaisance.

The relative ages of the intrusive dikes have not been established definitely. Neither is much light shed upon the suspected genetic relation between certain dikes and veins. Undoubtedly the first question can be answered after a further study of surface conditions, but it is doubtful if any definite conclusions can be reached regarding ore genesis until more development work has been done.

The principal formation over the entire district is andesite. This is cut by two prominent intrusives in the form of dikes, locally known as rhyolite and bird's-eye porphyry. Beyond the limits of the property other dikes occur but the two mentioned are the only ones seen here so far.

The andesite is a fine grained, dense, compact rock, dark green or nearly black in color. On weathered surfaces the bleached lath-shaped feldspar phenocrysts are conspicuous. Other phenocrysts are not prominent at least megascopically, nor have the predominating ferromagnesium minerals yet been determined. The rock breaks into angular fragments with straight, sharp edges. Variations in color and texture occur, some probably due to defferentiation in the original magma, others due to the rate of cooling. At least two prominent sets of joint planes occur, one dipping east, the other practically perpendicular The east dipping set strikes N 25 E (magnetic) while the other strikes N 75 W. Weathering usually follows these planes though there is some pronounced examples of spheroidal weathering where the texture is coarser than the rock which yields angular fragments.

The rhyolite is a light colored, fine-grained rock without any individual grains or crystals which can be recognised even with a hand lense. Everywhere on the property it is greatly altered, whether wholly from weathering or from other causes remains to be determined. Its usual appearance is a white, chalky though rarely vitreous mass, streaked with iron oxide stains on the fractures. Sometimes large masses of the material in place are a soft ocher color. The harder white material is pitted with minute holes filled with iron oxide. No structure of any sort is distinguishable. Beyond the limits of the property to the west brecciation and subsequent silicification are quite unmistakable and there is some distortion resembling flow structure.

The birds-eye porphyry is conspicuous because of bleached feldspar crystals which stand out in sharp contrast to the olive-green groundmass in all outcrops. It weathers to a crumbling surface of rounded forms and because of its lack of resistance to erosion prominent outcrops are lacking. The effects of weathering have penetrated so deeply that no unaltered material has been found.

The rock bears some resemblance to the quartz-diorite porphyry of other localities in Arizona, which also cut andesites.

There is some reason to believe that the mineralization is related genetically to the birds-eye porphyry intrusions. These dikes seem to be the youngest of all the intrusives dikes in the immediate district. Some evidence in support of this theory is to be found outside the limits of the property to the west and northwest. Veins occur within the rhyolite dikes and in the andesite. They are frequently more of the nature of wide zones or complex vein systems than simple, single mineralized fissures. Mineralization extends into the wall rock to a greater or lesser degree, more particularly when the veins lie wholly within or parallel to the rhyolite.

The vein filling consists of mineralized andesite or rhyolite, which ranges from two to eight feet in width. Through this vein quartz runs, sometimes in a single streak, again in parallel streaks. In some instances the vein width is much greater than eight feet. The quartz streaks range in thickness from a few inches to three feet and follow irregular courses along the veins, sometimes in the center but as often crossing from one wall to the other. Conspicuous enlargements of the quartz streaks are to be seen in the veins between andesite walls. Usually at no great distance from such enlargements on one side or the other there is an outcrop of birds-eye porphyry.

The ore minerals in the order of their importance are, the vanadium minerals, lead carbonates, galena, wulfenite and chalcopyrite. Gold and silver occur but not normally in large quantities.

The vanadium group of minerals deserves special mention because of the variety. The most abundant mineral is vanadinite, the lead vanadate, usually found in deep coffee-brown crystals. It occurs sometimes in large aggregates of coarse crystals, but as often in the form of drusy incrustations ranging in thickness from mere films to as much as one eighth inch deep. The next in importance is descloizite. Psittacinite, endlichite, brachbuschite and at least one if not more unidentified varieties complete the list of vanadium minerals which are widely distributed in veins and in rhyolite.

The major vein system is that which runs through the Blanket, Blanket No. 4, Stella, Blanket No. 1 and Aurora claims. These veins occur in close association with a rhyolite dike (or dikes) one of which is over two hundred feet in width at its western end. The course of this dike through the west half of Blanket No. 1 is not definitely established, but it is seen again on the Stella at its eastern end near the Stella shaft and appears agin on the Aurora still farther east. To the southwest the dike continues beyond the limits of the property for more than a mile.

North of this major system through the center of the Stella claim is another prominent vein, also associated with rhyolite. Still to the north on the May Powell claim is another vein in the rhyolite.

To the south, through the Blanket No. 5 and No. 2 is a vein which lies between andesite walls and does not appear to be in any way connected with the rhyolite intrusions. Local enlargements of the quartz streak are prominent in this vein at a number of points.

Still farther south, through Blanket No. 6 and No. 3, is another wide vein system, also in the andesite and so far as is now known not connected with the rhyolite. This is an intricate system of parallel veins, spurs and cross connecting veins.

Beginning at a point about midway between the NE corner and the EE center

of the Necessity claim and running in a northeasterly direction through the entire length of Blanket No.6, and Blanket No.3 claims this vein is in the andesite and, so far as is known, not associated with any rhyolite. The upper portion (on the map, Sheet I) often shows great widths, particularly on the Blanket No.3 claim. This vein follows the course of a prominent wash, the main drainage channel of the area onn Sheet I.

The south (or lower) portion of this vein system has been more extensively opened up, probably because the quartz streak is more prominent. It is reported that this quartz has carried high values in gold. There is more vanadium and lead noted in this portion than is to be seen on that part which follows the wash, though some of the cross veins leading into the north portion have produced some small shipments of galena. The quartz streak in the south vein ranges from a few inches to three feet in width. The vanadium mineralization extends over widths up to ten feet or more.

From the information in hand it would seem that the vein in the wash is a somewhat irregular fault zone having a general trent of about N 20 E along which there has been extensive alteration and (or) mineralization. This alteration has also taken place along the natural joint planes in the andesite, causing cross stringers and the enlargements such as are so conspicuous on the Blanket No.3. There is less regularity to the strike and dip of the north part.

Close to both segments of this vein system the birds-eye porphyry appears sometimes forming one wall, sometimes cutting the main vein or the cross stringers The dike varies in width from a few feet to over twenty feet. Its outcrop is not continuous as it disappears under the soil frequantly but it seems to be close to the veins for at least half their length.

The foregoing notes form an incomplete description of that part of the property covered by Sheet I of the Areal Geology. This is less than one half the total area of the property. The work has been of a purely preliminary nature, but will serve to indicate some of the geological relationships and to point out the areas in which there are specific problems to be solved. Some of these problems depend upon deeper development for their solution, others can be worked out by a continuation of the surface investigations.

Phoenix, Arizona,
August 30th, 1930.

W. L. Flagg
Consulting Engineer.

PROPOSED DEVELOPMENT.

ROADS: The mile and one-half road to Charleston should be put in better repair by the county. In the event that they will no do a satisfactory job of this an estimated expenditure of $2500 will be required to put this road in condition for heavy hauling.

In view of the fact that Fairbank is on the main line of the Southern Pacific, a station at which nearly all trains stop regularly, it would seem advisable to use this as a receiving point for all small freight and express shipments. There is a Western Union office, open every day for a full twenty-four hours. There is also a post-office. The distance from the property to Fairbank is six miles. An old road, the original Benson to Tombstone highway, can be put in condition at an expense not to exceed $5000. It would seem advisable to do this as it is 7.5 miles to Tombstone, which is not on the main line railroad, has but one train a day for six days, and has only eight hour telegraph service for six days a week.

CAMP: Several suitable sites, fairly level, but with good drainage, are available for camp buildings. Unit type construction is recommended, a satisfactory series of buildings being made at Phoenix, Arizona, at prices which range from $318 to $690 (list) f.o.b. Phoenix. Due to the local labor conditions it is believed advisable to erect a few such houses for married white men. This will do away with the necessity for operating a boarding house. A moderate supply of efficient Mexican labor can be had in Tombstone. They would probably continue to live in town and come to work in groups in cars.

An office building, adequate laboratory quarters, a general warehouse, a timber shed, garage and larger blacksmith shop are the new buildings required for operating purposes.

A Kohler lighting plant unit of 2000 Watts should be installed immediately to be added to as more power is required.

SANITATION - WATER SUPPLY: The available camp sites will permit of satisfactory and inexpensive sanitary arrangements until such time as a more elaborate system will be required.

Indications are that a staisfactory water supply of ample quantity for domestic purposes can be developed on the Blanket No. 3 claimm, at a point approximately 2500-ft distant from the present camp. Water from a shallow well would be pumped to a storage tank from which it could flow by gravity to the camp under sufficient pressure to be used for fire protection.

OPERATING EQUIPMENT: There is so little on the property in the way of tools and mining equipment that it is almost a case of starting with nothing. The customary layout of small tools, shop tools, tools for timbermen and miners, will be required in addition to the larger pieces of equipment.

In the following outlined development program it is contemplated to use during the first few months the Foos engine (100 HP) now in the mill to drive a Sullivan Angle-compound compressor of 600 cu ft air capacity. This will operate all the drills, the three small air prospecting hoists, blacksmith's equipment, and, if necessary, a small pump in the sump of Shaft A.

A main air line, 4 inches in diameter, approximately 2500-ft long with suitable expansion joints and condensate drains will be required. The branch

lines to Shafts A-B-C and D, 2½ inches in diameter will total approximately 2000 feet in length. Service lines underground will be 2 inch and 1½ inch, the total requirement depending upon the amount of work done.

In the blacksmith shop an oil-fired forge and power sharpening machine are contemplated.

At least twelve Jackhammer type drills, complete with the mountings and accessories will be required. A supply of parts should be purchased at the beginning to insure against delays. Not less than one ton of suitable steel should be purchased.

At Shaft A a gasoline (or distillate) hoist of not less than 50HP is recommended. At Shaft C a 35 HP hoist of similar type should be installed. At the other three shafts Anaconda type air prospecting hoists will serve for the initial period.

By the time drifting and crosscutting are under way from the several shafts twelve to fifteen 14 cu ft capacity mine cars will be required. Skips will be required at Shafts B, C, D and E.

Headframes at Shafts A and C will be of heavier construction than those at other shafts where simple headframes with dumping chutes will be satisfactory for the initial period.

DEVELOPMENT: The development program is divided into three parts: (1) The major development is planned to explore an area approximately 1200 by 3000 feet. This lies within the boundaries of the Blanket, Blanket No. 4, the Stella, Blanket No. 1 and Aurora claims. (2) The Blanket No. 6 system, and (3) the Bradshaw Group.

The purpose of Shaft A is to develop the rhyolite zone which is referred to in the Geological Notes as extending from a point southwest of the Manilla Shaft (on adjoining ground) northeasterly throughthe Blanket, Blanket No. 1 on into the Aurora. It is contemplated to sink the shaft 200-ft with a station cut at the 100-ft level. From the 200-ft level a crosscut (Crosscut A on plan) should be extended entirely across the rhyolite zone and into the andesite. A drift (Drift B) should be made on the quartz vein within the rhyolite indicated at A-17, A-18 and A-19 on the Geological Map, Sheet I. The continuation of this drift to the west will be determined by the conditions, If the diverging quartz streaks shown on the map (geological) have not united at the depth of 200-ft a crosscut is recommended at C - C'. Drift A should be carried at least 150-ft to the east from the 200-ft level station. It is also desirable to crosscut (Crosscut B) to the first level to the east from shaft B. This crosscut would be approximately 250-ft long.

Shaft B, now bottomed at a depth of 55-ft measured on an incline of 47 degrees, is sunk on the footwall of a vein. This should be carried to a depth of 200-ft or more. At a depth of 100-ft drifts should be driven both east and west. From other levels below a crosscut above referred to, coming from Shaft A, would connect.

Shafts C and D are now 35 and 40 feet deep respectively. Both are sunk on a 77 degree incline. It is contemplated to sink Shaft C to 150-ft or more. At the 100-ft level drifts would be run east and west as indicated on the development plan, Drifts E and F. Drift E would cut the Shaft D at a depth of approximately 112-ft below the collar, and would be about 450-ft in length. From the same level Drift F is to be run westerly a distance of at least 500-ft. A crosscut (D) is proposed to run north to intercept the vein on the Stella about 225-ft distant.

From Shaft D the Drift D, a continuation of the Drift E from Shaft C, should be continued east not less than 200-ft under the very favorable showings on the Aurora claim. At a point not less than 150-ft east of the shaft the rhyolite zone should be crosscut. The Crosscut E should be driven from the shaft across the rhyolite zone and to the north should be carried into the vein which passes through the center of the Stella claim. Drift D may ultimatelymbe more than 500-ft in length,as good vanadium values are to be seen at the surface that far east of the shaft.

Shaft E has a depth of 25-ft now and is sunk on an incline of 55 degrees Surface indications seem to warrant at least 400-ft of drifting from this shaft. It is also desirable to make a connection with the levels from Shaft C, possibly a crosscut (as Crosscut F) to connect with Drift E and to explore all the intervening ground.

The second part of the development program, the exploration of the Blanket No.6 vein system, has not been definitely mapped out. It would consist in the sinking of one shaft,probably near the eastern end of No.6 claim,with drifts and crosscuts. The selection of a site for this work depends in a great measure on a more detailed study of the intricate system of parallel veins and cross fractures.

The third division of the development program,the exploration of the Bradshaw unit,should be carried on at the same time as the first part of the plan is in progress. In the early history of the camp there was a known production in excess of $250,000 from the original Bradshaw claim. Later leasing operations wrecked the original shaft but recently a new one was begun not far to the northwest. This has been sunk to a depth of not less than eighteen feet so far. It is started as a two-compartment,perpendicular shaft. It is now recommended that this be carried to a depth of not less than 200-ft and a cross cut be driven to the vein at that level. Subsequent development would then be governed by circumstances. For this work a separate air compressor unit,hoist cars etc would be required. Tool sharpening sould be done at the main shop.

The above outlined development program is necessarily only a tentative one, "a place from which to start" and must be considered in that light. Modifications will be indicated as the work progresses. As outlined,it would be sufficient to open up enough ground to insure a steady supply of ore to the mill. It could be completed in a years time.

Phoenix, Arizona,
August 30,1930.

A. L. Flagg,
Consulting Engineer.

# REPORT ON PROPERTIES

# OF

# GALLAGHER VANADIUM & RARE MINERALS CORPORATION.

The property of the Gallagher Vanadium & Rare Minerals Corporation, consisting of twenty-one unpatented and three patented mining claims, is situated in the Tombstone mining district, Cochise county, Arizona. This particular part of the Tombstone district lies west and south of Tombstone Hills, on gentle slopes bordering the San Pedro river. The camp is 7.4 miles from Tombstone, at an elevation of approximately 4200 feet above sea level.

The county road from Tombstone to the military reservation at Fort Huachuca passes through the property and within a hundred feet of the pilot plant. The Southern Pacific RR is only 1.5 miles distant. At Charleston, on the railroad, there are ample sidetrack facilities.

The Tombstone Hills are capped by sedimentary formations dipping east and forming a conspicuous feature of the landscape. There are no sedimentaries exposed on this property. The principal rock mass is fine grained and massive except for jointing. It is a Tertiary andesite flow, in a wide variety of phases, usually dark green. Brecciated and amygdaloidal textures occur but they are not prominent. Typical alteration products,-epidote, calcite and chlorite have resulted from surface agencies.

There are fine grained, light grey dikes which weather to white or cream outcrops. These have been classified provisionally as rhyolite. The close association of the most prominent dikes with the principal vein system has suggested a probable genetic relation which is not definitely proven. Smaller dikes of similar megascopic characteristics are more or less closely associated with the other veins. In general these light colored dikes are aprallel to the veins, have the same general direction of dip but differ in degree.

Another dike system, crossing the vein system, and running more nearly N-S is indicated by isolated but conspicuous outxrops. In texture it is strongly porphyritic. The prevailing color in weathered outcrops is greenish but fresh specimens are more gray and mottled. White phenocrysts of feldspar stand out prominently against the somber background of a fine grained groundmass of the outcrop. Tentatively this material is classified as a quartz-mica-diorite.

The vein system strikes NE-SW and dips south from angles as low as 20 degrees to almost vertical. Unquestionably some of the low-lying, or flat veins are off-shoots from veins standing at steeper angles. There are at least five parallel veins crossing the main body of the claims and they are traceable for the length of three or more claims.

The widths of the veins vary from a few inches for the least conspicuous to well over two hundred feet on the main Blanket system, a short distance SW of the pilot plant. In all probability the average width will be about 4 feet.

The walls are usually smooth and fairly regular though at times their intersections with normal joint planes in the andesite have caused local variations or afforded opportunity for the formation of spur veins or rich pockets. The vein filling is principally quartz.

The metals of commercial importance are lead,gold,silver,vanadium and molybdenum.Copper occurs sparingly as does zinc. The numerous workings show a considerable variety of mineral species.There is probably a greater variety of vanadium minerals to be found here than at any other locality in the Southwest.

A fuller,detailed discussion of the geology of the most extensively prospected part of the property,together with an assay map is attached to this report.

The deepest development in this part of the district is the Manila shaft which is some 1300 feet west of the McClellan claim.Reports vary as to the depth of the shaft,but it is certain that it is more than 300-ft deep. It is equally certain that vanadium values persist to at least 250-ft in this shaft. The depth at which vanadium has been found in this shaft has an important bearing on the possibilities on adjoining property.

The deepest working on the GVRM property is the Bradshaw shaft,which is 240-ft deep according to notes in the survey for patent in 1881.Since the shaft was first sunk nothing but stoping has been done.The shaft is caved now.

There is no authentic record of production from the Bradshaw.Old books from the Corbin mill show that there was a considerable production in the 80s but it is not known whether this record is complete.The values in dumps, old workings that are accessible and from outcrops justify further exploration.

The next deepest working is the shaft on the McCllelan from which water is pumped for the pilot plant.This is a vertical shaft,nearly 90-ft deep.A crosscut was driven over 80-ft south from near the bottom. There is an 80-ft shaft in the rhyolite,near the laboratory.

The total number of openings on the property is approximatly 150. Some are only shallow prospect pits (trenching not counted) not exceeding five feet in depth.Others are more pretentious being from forty to sixty feet, with a drift or crosscut by way of lateral development.

It is significant that nearly every opening on the property will show some vanadium.The more important vein system is clearly marked by a series of openings,closely spaced,all of which have an abundance of vanadium minerals.Many of these openings have produced silver-lead ores of shipping quality as is evidenced by limited amount of dump material and signs of hand sorting and screening operations.

Four parallel vein systems ranging from four feet to nearly two hundred feet in width have been prospected by many openings for their entire length. On the Blanket system,which has a maximum width of two hundred feet at its west end and a known length of 4000-ft, vanadium values are known to persist in commercial quantity to a depth of at least 80-ft. Assuming that the width of the ore will average only 5-ft and that not over half the length of this system will be productive there is a tonnage of possible ore of 61,194 tons. If we further assume a 90% recovery of 1% $V_2O_5$, 2% lead and $2.00 combined gold and silver (gold at $20 per ounce),the gross value of the potential ore in this one system is $1,334,029.20.. Such assumptions which are not purely speculative justify the belief there are probably several hundred thousand tons of commerical grade material to be developed on the property

The equipment for the pilot plant was selected by the late A.B.Frenzel on the assumption that the vanadium could be recovered by coarse concentration

using tables only. It was demonstrated soon after starting the plant that crushing to -20 mesh in the rod mill liberated all the vanadium values and that 29.14% of the total discharge from the rod mill was -150 mesh, containing 28.4% of the total vanadium. More than 60% of the total vanadium was in the -100 mesh material, while about 15% is in the -40 to plus 60 mesh.

Tests in the pilot plant indicated beyond any possibility of doubt that no method of coarse concentration will be satisfactory for this ore. A fairley high grade concentrate was made with the present equipment but the tailings loss was high. The maximum recovery was not much over 50%. The best grade of concentrate carried 17.4% $V_2O_5$ and was made from the -100 mesh material. The plus 60 mesh material gave only 9.19% $V_2O_5$ concentrate.

Subsequently a flotation test was made in the plant of the Universal Engineering Company, by C.M.Nokes, Metallurgist. This test indicated that 100 tons of ore would yield a rougher concentrate of 23.4 tons which would assay 0.02 oz gold, 4.50 silver, 56.0% lead and 10.0% $V_2O_5$. The molybdenum was not determined. Other flotation tests indicate a higher vanadium concentrate, and gravity concentration tests in the pilot plant showed 1.4 oz gold in the concentrates. Recent practice on ores of similar nature will yield a much higher vanadium concentrate by flotation.

In conclusion it may be said that as compared with other vanadium deposits of the same general type in the Southwest this property has a greater potential value than any other examined by the writer. The available data points to a probable greater vertical range of profitable vanadium values than is common. The horizontal extent of distribution is of such a nature as to indicate long shoots. The values contained in other metals are of considerable importance. It is not improbable that underlying the deepest levels from which vanadium can be recovered economically there will be bodies of base and precious metals of a profitable nature. It is believed that proper development work will block out a large tonnage of vanadium ore which will justify the construction of suitable reduction works.

Respectfully submitted,

A. L. Flagg

Consulting Engineer.

Phoenix, Arizona,
March 1939.

# GEOLOGICAL NOTES

## GALLAGHER VANADIUM & RARE MINERALS CORPORATION.

The following notes are to accompany a geological map (Sheet I) of a portion of the Gallagher Vanadium & Rare Minerals Corporation properties, in the Tombstone mining district, Cochise county, Arizona. The conclusions set forth are by no means final, but are subject to revision when more detailed investigations can be completed.

In these notes the current names for the different formations have been used. Petrographic investigations may indicate the desirability of sub-dividing parts of what now is taken as a single formation, or may prove that some terms now in use are misnomers. Such refinements of classification are not required in this survey which is in the nature of a reconnaisance.

The relative ages of the intrusive dikes have not been established definitely. Neither is much light shed upon the suspected genetic relation between certain dikes and veins. Undoubtedly the first question can be answered after a further study of surface conditions, but it is doubtful if any definite conclusions can be reached regarding ore genesis until more development work has been done.

The principal formation over the entire district is andesite. This is cut by two prominent intrusives in the form of dikes, locally known as rhyolite and bird's-eye porphyry. Beyond the limits of the property other dikes occur but the two mentioned are the only ones seen here so far.

The andesite is a fine grained, dense, compact rock, dark green or nearly black in color. On weathered surfaces the bleached lath-shaped feldspar phenocrysts are conspicuous. Other phenocrysts are not prominent at least megascopically, neither have the predominating ferromagnesian minerals been determined as yet. The rock breaks into angular fragments with straight, sharp edges. Variations in color and texture occur, some probably due to differentiation in the original magma, others due to the rate of cooling. At least two prominent sets of joint planes occur, one dipping east, the other practically perpendicular. The east dipping set strikes N 25 E (magnetic) while the other set strikes N 75 W. Weathering usually follows these planes though there is some pronounced examples of spheroidal weathering where the texture is coarser than the rock which yields angular fragments.

The rhyolite is a light colored, fine-grained rock without any individual grains or crystals which can be recognised even with a hand lense. Everywhere on the property it is greatly altered, whether wholly from weathering or from other causes remains to be determined. Its usual appearance is a white, chalky though rarely vitreous mass, streaked with iron oxide stains on the fractures. Sometimes large masses of the material in place are a soft ocher color. The harder white material is pitted with minute holes filled with iron oxide. No structure of any sort is distinguishable. Beyond the limits of the property to the west brecciation and subsequent silicification are quite unmistakable and there is some distortion resembling flow structure.

The birds-eye porphyry is conspicuous because of bleached feldspar crystals which stand out in sharp contrast to the olive-green groundmass in all outcrops. It weathers to a crumbling surface of rounded forms and because of its lack of resemblance to erosion prominent outcrops are lacking. The effects of weathering have penetrated so deeply that no unaltered material has been found. The rock bears some resemblance to the quartz-diorite-porphyry

of other localities in Arizona,which also cut andesite.

There is some reason to believe that the mineralization is related genetically to the birds-eye porphyry intrusions. These dikes seem to be the youngest of all the intrusive dikes in the immediate district.Some evidence in support of this theory is to be found outside the limits of the property to the west and northwest.Veins occur within the rhyolite dikes and in the andesite.They are frequently more of the nature of wide zones or complex vein systems than simple,single mineralized fissures.Mineralization extends into the wall rock to a greater or lesser degree,more particularly when the veins lie wholly within or alongside the rhyolite.

The vein filling consists of mineralized andesite or rhyolite,which ranges from two to eight feet in width.Through this vein quartz runs,sometimes in a single streak,again in parallel streaks.In some instances the vein width is much greater than eight feet.The quartz streaks range in thickness from a few inches to three feet and follow irregular courses along the veins, sometimes in the center but as often crossing from one wall to the other. Conspicuous anlargements of the quartz streaks are to be seen in the veins between andesite walls.Usually at no great distance from such enlargements on one side or the other there is an outcrop of birds-eye porphyry.

The ore minerals in the order of their importance are, the vanadium minerals, lead carbonates, galena, wulfenite and chalcopyrite. Gold and silver occur but normally in small quantities.

The vanadium group of minerals deserves special mention because of the variety. The most abundant mineral is vanadinite,the lead vanadate,usually found in deep coffee-brown crystals.It occurs sometimes in large aggregates of coarse crystals,but as often in the form of drusy incrustations ranging in thickness from mere films to as much as one eighth inch deep.The next in importance is descloizite.Psittacinite,endlichite,brackbuschite and at least one if not more unidentified varieties complete the list of vanadium minerals which are widely distributed in veins and in rhyolite.

The major vein system is that which runs through the Blanket,Blanket No. 4,Stella,Blanket No.1 and Aurora claims.These veins occur in close association with a rhyolite dike (or dikes) one of which is over two hundred feet in width at its western end.The course of this dike through the west half of the Blanket No.1 is not definitely established,but it is seen again on the Stella at its eastern end near the Stella shaft and appears agin on the Aurora still farther east.To the southwest the dike continues beyond the limits of the property for more than a mile.

North of this major system through the center of the Stella claim is another prominent vein,also associated with rhyolite.Still to the north on the May Powell claim is another vein in the rhyolâte.

To the south,through the Blanket No.5 and No.2 is a vein which lies between andesite walls and does not appear to be in any way connected with the rhyolite intrusions.Local enlargements of the quartz streaks are prominent in this vein at a number of points.

Still faryher south,through Nlanket No.6 and No.3 is another wide vein system,also in the andesite and so far as is known now not connected with the rhyolite.This is an intricate system of parallel veins,spurs and cross connecting veins.

Beginning at a point about midway between the NE corner and the EE center

of the Necessity claim and running in a northeasterly direction through the entire length of the Blanket No.6 and Blanket No.3 claims this vein is in the andesite and, so far as is known, not associated with any rhyolite. The upper portion (Sheet I) often shows great widths, particularly on the Blanket No.3 claim. This vein follows the course of a prominent wash, the main drainage channel of the area on Sheet I.

The south (or lower) portion of this vein system has been more extensively opened up, probably because the quartz streak is more prominent. It is reported that this quartz has carried high values in gold. There is more vanadium and lead noted in this portion than is to be seen on that part which follows the wash though some of the cross veins leading into the north portion have produced some small shipments of galena. The quartz streak in the south vein ranges from a few inches to three feet in width. The vanadium mineralization extends over widths up to ten feet or more.

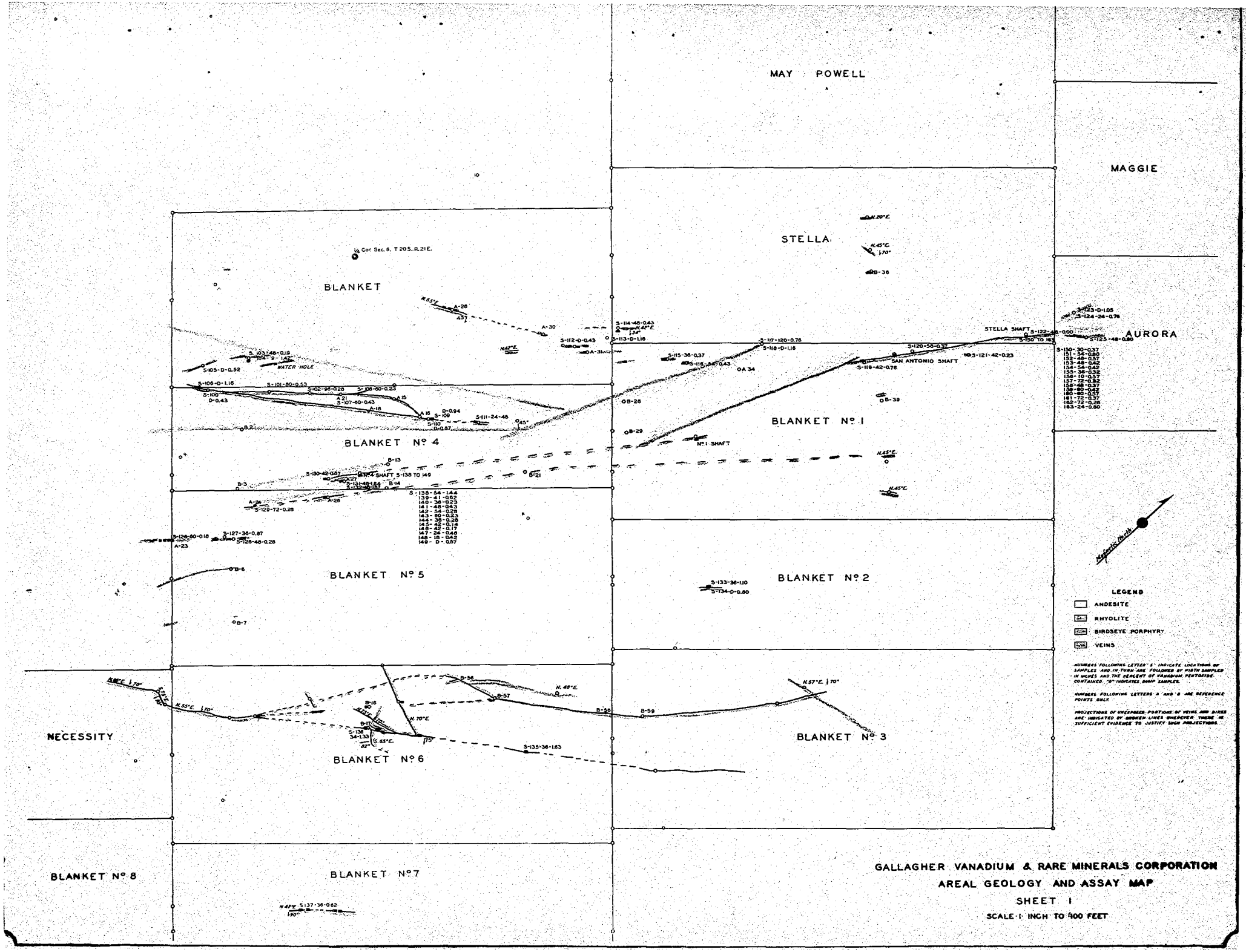
From the information in hand it would seem that the vein in the wash is a somewhat irregular fault zone having a general trend of about N 20° E along which there has been extensive alteration and (or) mineralization. This alteration has also taken place along the natural joint planes in the andesite, causing cross stringers and the enlargements such as are so conspicuous on the Blanket No.3. There is less regularity to the strike and dip of the north part.

Close to both segments of this vein system the birds-eye porphyry appears sometimes forming one wall, sometimes cutting the main vein or cross stringers The dike varies in width from a few feet to over twenty feet. Its outcrop is not continuous as it disappears under the soil covering frequently but it seems to be close to the vein for at least half their length.

The foregoing notes form an incomplete description of that part of the property covered by Sheet I of the Areal Geology. This is less than one half the total area of the property. The work has been purely preliminary in its nature but will serve to indicate some of the geological relationships and to point out the areas in which there are specific problems to be solved. Some of these problems depend upon deeper development for their solution; others can be worked out by a continuation of the surface investigations.

Phoenix, Arizona.
March 1939.

A. L. Flagg
Consulting Engineer.




GALLAGHER VANADIUM & RARE MINERALS CORPORATION

AREAL GEOLOGY AND ASSAY MAP

SHEET I

SCALE-1 INCH TO 400 FEET

ASSAYS

Gallagher Vanadium and Rare Minerals Corporation.

100: From dumps of old shallow hole, 25-ft east of A-19; sample out of piles. 0.43% $V_2O_5$

101: Near tailings dam, on strike of north quartz; about midway between A-13, A-14. Beginning on footwall,- 16-inches brecciated quartz, 24-in mineralized country rock, 16 in brecciated quartz, and 24-in leached country rock. 0.53% $V_2O_5$

102: Shallow pit 10-ft west of A-21; pink altered andesite, with minor quartz streaks and iron stains. 0.28% $V_2O_5$

103: Across 4-ft in shallow pit west of old powder magazine; 3.2 ft soft white rhyolite and 0.8-ft quartz. 0.19% $V_2O_5$

104: Across the quartz streak, 0.8-ft, at each end of the pit where sample No.103 was taken 1.42% $V_2O_5$

105: From the small dump at the west end center monument of the McClellan patented claim. 0.52% $V_2O_5$

106: Sample of dump at A-19; a shaft about 25-ft deep, perpendicular and near SW corner of McClellan claim. Rhyolite 1.16% $V_2O_5$

107: In shallow hole 12-ft west of mill; across 5-ft altered rhyolite with two lean quartz stringers, 8-in and 5-in. 30-ft west of A-21 0.43% $V_2O_5$

108: Across 5-ft of quartz outcrop, showing almost no vanadium or other mineralization; at A-21 0.23% $V_2O_5$

109: North half of dump at A-17; all rhyolite from the 84-foot vertical shaft. 0.94% $V_2O_5$

110: South half of dump at A-17 0.87% $V_2O_5$

111: At A-22, across 4-ft; 2-ft of pink and brown rhyolite and 2-ft of quartz stringers; west side of pit. 0.48% $V_2O_5$

112: Ann. Labor Loc. of 1930 near NE corner of McClellan claim; altered andesite and possibly some rhyolite. 5-ft. 0.43% $V_2O_5$

113: Composite of all dumps around the original Blanket incline; represents an area at least 200 x 200 ft. 1.16% $V_2O_5$

114: From accros 4-ft on east side of original Blanket incline, 18-in lean quartz on bottom. 0.43% $V_2O_5$

115: Shallow hole at A-23 south side of road; decomposed andesite, little value indicated. 0.37% $V_2O_5$

116: Shallow hole, south side of road A-33. Width 4.5-ft with 16-in quartz an andesite only. 0.43% $V_2O_5$

117: At A-35;north side of road at crossing of wash.Across 10-ft without 2-ft horse of andestie in center.All rhyolite and small amount of quartz stringers. 0.76% $V_2O_5$

118: Two shovels full from each of two dumps at location of the above sample No.117 1.16% $V_2O_5$

119: At A-36 across 3.5-ft on east side of hole, 5-ft below surface. Hanginf wall not yet exposed. 0.76% $V_2O_5$

120: At A-37; across east side of shallow hole. 4-ft wide 0.37% $V_2O_5$

121: At A-38 across 32-ft leached rhyolite and quartz. 0.23% $V_2O_5$

122: Across west end shallow pit 10-ft east of Stella shaft, silicified country rock. 0.00

123: From dump A-39 represents 1930 Ann.Labor. Rhyolite 1.05% $V_2O_5$

124: From 14-in quartz streak;locality No.123. 0.76% $V_2O_5$

125: Across 4-ft rhyolite streaked with quartz at A-40; west side of hole about 6-ft from top. 0.80% $V_2O_5$

126: From 8-in quartz streak in shallow hole A-23 0.18% $V_2O_5$

128: From east end of same pit,small quartz streak 0.28% $V_2O_5$

127: From west end 10-ft pit,across 3-ft near B-5 0.87% $V_2O_5$

129: At shallow hole A-24;across 5-ft country rock. 0.28% $V_2O_5$

130: At shallow hole A-25,near No.4 shaft;width 5-ft 0.87% $V_2O_5$

131: At hole A-27 on hanging wall of No.4 vein,taken across 4-ft at each end of the hole. 1.64% $V_2O_5$

132: At location of 131; from west side 1.87% $V_2O_5$

133: Across 3-ft,middle pit Blanket No.2. 1.10% $V_2O_5$

134: Quartz material mostly;a sample of the dump at locality No.133 which is location work Blanket No.2 0.80% $V_2O_5$

135: Across 3-ft in pillar left in No.6 (Blanket) open cut when ore was broken for mill in early 1929. 1.63% $V_2O_5$

136: At B-17 near road in 1930 Ann.Labor hole in Blanket No.6 claims; a 10-in streak quartz and 14-in vein matter on hanging wall 1.33% $V_2O_5$

137: West of road on Blanket No.7;from middle of three holes not far from wash. 0.62% $V_2O_5$

138: About 10-ft below collar No.4 shaft;from west side across 4.5-ft;a 2-in high grade streak in back near hanging wall is not accessible at this point in incline and is not in cluded in sample. 1.44% $V_2O_5$

139: Approximately 5-ft below No.138 but on opposite side of incline;only 38-in next to the foot wall open for sampling. 0.62% $V_2O_5$

140: Approximately 5-ft below No.139 in incline on east side,across 3-ft leavong out 6-inces high grade pocket and lacking about 1-ft of ore in back behind lagging next to hanging wall. 0.23% $V_2O_5$

141: 5-ft below No.140.Across chalky rhyolite on the foot wall and an irregular 4-in of quartz, but without 1-foot or more of the ore next to the hanging wall behind lagging. 0.43% $V_2O_5$

142: Below No.141 about 6-ft. On west side of incline,across 2-ft of vein as exposed.Two feet more behind lagging,on hanging wall. 0.28% $V_2O_5$

143: On west side of incline 9-ft below No.142 across 5-ft on foot wall;the hanging wall material behind lagging. 0.23% $V_2O_5$

144: Below 143 on west side,across 3-ft;very little quartz in foot wall Hanging wall streak not included. 0.28% $V_2O_5$

145: Across,3.5 ft in center of last set timbers;no vanadium minerals in rhyolite;hanging wall streak not taken. 0.14% $V_2O_5$

146: Across 3.5 ft face west druft. 0.71% $V_2O_5$

147: Across 2-ft quartz at Loc.No.146 0.48% $V_2O_5$

148: Across 1.5-ft rhyolite Loc.146 0.42% $V_2O_5$

149: Cone dump at No.4 shaft (Sump and west drift) 0.57% $V_2O_5$

150: Across 2.5-ft Stella shaft,west side just under end plates of collar set;foot wall gouge. 0.37% $V_2O_5$

151: Opposite 150.across 6-ft 4-in,same elevation,mostly white rhyolite some quartz. 0.87% $V_2O_5$

152: Six feet below No.151;across 4-ft of silicified rhyolite on the foot wall. 0.57% $V_2O_5$

153: Four feet below 152: across 4-ft silicified rhyolite. 0.42% $V_2O_5$

154: Across 4.5-ft at bottom Stella shaft on east side. 0.42% $V_2O_5$

155: Across 3-ft west end shaft above drift,crushed quartz. 0.32% $V_2O_5$

156: Across 16-in east end bottom (Loc.154) on foot wall;rhyolite 0.57% $V_2O_5$

157: Across 6-ft of crosscut,bottom Stella shaft. 0.32% $V_2O_5$

158: Across 2-ft face west drift,Stella shaft;no vanadium minerals 0.37% $V_2O_5$

159: East side No.1 shaft across 5ft at 10-ft depth 0.42% $V_2O_5$

160: Opposite No.159,same elevation 0.37% $V_2O_5$

161: Across 6-ft bottom No.1shaft (east) 0.47% $V_2O_5$

162: Across 6-ft bottom No.1 shaft (west) more quartz 0.28% $V_2O_5$
163: Rhyolite at Nos.162 and 161 0.80% $V_2O_5$
164: Across 4-ft at 40-ft depth Maria shaft 1.74% $V_2O_5$

REPORT
On The Properties Of
GALLAGHER VANADIUM & RARE MINERALS COR'P.

The properties are situated near Charleston Station on the Southern Pacific Railway(formerly the E.P.&.S.W.R.R.) 60 miles westerly from the smelters of the Copper Queen and Calumet & Arizona Mining Co's. at Douglas Arizona, and Tombstone Mining district,Cochise County,Arizona,and comprise the Gallagher-Bradshaw & Blanket groupes of mining claims.

GALLAGHER BRADSHAW GROUP;

This groupe of claims lies east south east from Charleston,where it is reached by automobile or truck roads.
The history of this property credits it with a production of $65.000.oo from the first and high grade stope of ore produced,with values up to 2000 ozs. silver per ton; and a further production of $20,000.oo of lower grade ore. These amounts cannot be verified by record,the books having been destroyed a few years ago,but can be considered as authentic.
The depth of the operations are uncertain but it is reputed to be about 200 ft. on an incline of 80 .
The ore occurs in a small rhyolite dike highly altered and kaolinized,which intruded a flow tuff like andesite,covering the paleozoic limestones.
The old workings could not be entered beyond a depth of 65 ft.,but the pillars of unmined parts of the vein showed values of from 0.0I oz. gold,I oz. silver, to 0.02 Oz. gold,I6 ozs. silver; 4% lead, in samples cut across the vein for the width of the pay streak,I5 inches to 4 ft.
The silver mineral is,to the depth of 65 ft.,cerargyrite or horn silver,with a silicious gangue.
The waste dump on this group contains 5000 tons of material,calculated on basis of 22 Cu. ft. to the ton,and gave 0.0I oz. gold,0.30 oz. silver.
Some points of ore left by the former operators show that there was ore in the mine of the high grade mentioned above,but Gambucinos and Chloriders have cleaned any bunches of ore that showed to be worth taking out.

THE BLANKET GROUP:
This group lies about I mile northeast of Charleston,and comprises I0 claims along the south side of the Tombstone road.
A flow of porphryrite has covered the paleozoic limestones leaving some ribs and lenses of those sedimentaries showing on the surface.
A series of andesites dikes with northeast strike and southwest dip at 60 cut the porphyrite flow. The andesite dikes were in turn intruded by dikes of rhyolite having the same strike and dip.
Alterations,kaolinization and mineralization, and the ores found principally replacing the rhyolite.
This zone of mineralization is tracable for 4500 ft. on the Blanket, San Antonio,and Aurora, and parallels zones to the north are found , on No.I,and again on Nos. 2,and 3.
On the southwest side of the Blanket mining claims the ore is principally galena carrying gold,silver,with lenses of vanadate of lead; from the center of the claim to the northeast the ores are prihcipally vanadanite with some galena and cordonates of lead showing.
The Blanket is developed by three shafts;and incline shaft at about the center of the claim,75ft. deep at 30 . From this shaft drifts have been put out northeast and southwest and connect with a vertical shaft of 40 ft. The stopes in this workings have yielded some $4.500.o worth of silver-lead ore as per liquidation sheets from the El Paso smelter.
Another vertical shaft has been sunk 50 ft. for the purpose of cutting the vein on its dip at a point I50 ft. southeast of the incline shaft but not as yet has reached the depth necessary to do so. Another 20ft. should reach the vein and would open a new block of stoping ground.
Along the strike of the Blanket vein to the northeast vanadates of lead are found until we reach the 36 ft. shaft on the San Antonio claim,where a lens of vanadanite is shown with the width of 4 ft. extending to the bottom tho some what broken,and tracable for approximately 50 ft. on each side of the shaft on the surface.
The vanadates here , are in general,fairly large crystals I/I6 to 3/I6

of an inch in diaamter,incrustations up to a square foot I/8 in. in thickness and studded with vanadanite crystals a found in this workings;samples giving 4% vanadic acid for the width of the shaft. Another particularily good showing is found at a point on the Aurora I300 northeast of the San Antonio shaft and 2400 ft. northeast of the Blanket incline shaft, of croppings of 5 ft. in width of highly crystalline vanadanite over a width of 5 ft. across the strike and for 30 ft. in length,yielding 2% of vanadic acid for the width of the shoot of ore,and a picked sample giving I8.5% V205.
Many other points along the line of this vein show interesting occurances of vanadates making 4500 ft. in length of ~~vanadiferous~~ vanadaniferous carrying vein.

The Blanket No. 1 asjoining and to the south of the Blanket shows several occurances of Vanadates.

The Blanket No. 2 adjoining and to the Southeast of Blanket No. 1, has a 25 foot shaft, with 7 feet of vanadium bearing quartzose ore with 1% vanadic acid.

The Blanket No. 3, has a 40 ft incline shaft which shows some interesting features carrying abut 1% vanadic acid. Three other shallow shafts between 15 and 20 feet in depth, show the same characteristics of material and can be expected to become producers of vanadium ore.

The Stella nad May Powell show several outcrops of vanadates, as well as the Maggie which has croppings of vanadates highly crystallize and of good value. The last mentioned claims lie northwest of the Blanket zone and are a distinct but well mineralized line of vein.

In conclusion I find that the Bradshaw-Gallagher group does not offer at the present time, sufficient encouragment for the expenditures of the necessary amount of capital to prove potentalities.

On the Blanket group I find that the properties are of sufficient merit to warrant further operations with view of opening a lead mine and bring into production a vanadium of which it gives great promise. In fact the exposures of vanadates showing at the present time warrant the instillation of a plant for the concentration and reduction of these values as found in the vanadium mineral.

A mill for the benefaction of the vanadtates could be used at other times for the concentration of the lead silver ores --- in other words one mill would serve for both ores.

I Therefore recommend that work be prosecuted on the known and mentioned exposures of vanadates in the form of cuts and shafts to a depth of at least the present water table. As the higher grade of lead ore can be shipped to smelters, it will. without doubt, be in order ti install a milling plant for the recovery and realization on the values contained in the lower grade of ores produced

(Sighed) Jonothan Gordon,M.E.
(Official Seal)
Tombstone, Arizona.
24th. October, 1925

# DEPARTMENT OF MINERAL RESOURCES
## STATE OF ARIZONA
## MINE OWNER'S REPORT

Date June 4th, 1940.

1. Mine Gallagher Vanadium Mine
2. Location 7½ miles from Tombstone
3. Mining District & County Tombstone District, Cochise county, Arizona. T20S R20E
4. Former name Same
5. Owner Gallagher Vanadium & Rare Mineral Corp. (An Arizona corporation)
6. Address (Owner) 221 Slocum Place, San Antonio, Texas.
7. Operator Same
8. Address (Operator) Same
9. President, Owning Co. Mrs. Louis Reuter P.O.Box 1015, Austin, Texas.
9A. President, Operating Co.
10. Gen. Mgr. J.B.Gallagher
11. Mine Supt. J.B.Gallagher
12. Mill Supt. None
13. Men Employed None regularly
14. Principal Minerals Vanadium, molybdenum, lead, silver, gold
15. Production Rate Intermittent
16. Mill: Type & Cap. 25 ton pilot plant
17. Power: Amt. & Type 100 HP Foos
18. Operations: Present Annual labor only
19. Operations: Planned Exploration of ground in units; construction of a concentrating plant, with chemical plant optional. Concentration of ores and metallurgy of concentrates worked out.
20. Number Claims, Title, etc. Three patented claims and 21 unpatented.
21. Description: Topography & Geography Gently rolling country, Can drive touring car over almost all of the property. County highway from Tombstone to Fort Huachuca crosses propeety. 1½ mile from S.P.Main line (Charleston station). Mt.States Tel & Teleg lines cross property.
22. Mine Workings: Amt. & Condition More than 100 openings on the property, most of them shallow. Probably all accessible at present. Shafts 80, 65, 50 and 45 ft deep with others from 15 to 25 ft; many long open cuts, (trenching) across the ore zones, and some open cuts along the strike.

23. Geology & Mineralization Principal rock mass Tertiary andesite, in a variety of phases. Intruded by rhyolite dike which appears to be related to mineralization and itself carrying considerable vanadinite over great widths. A cross system of basic dikes occurs but not believed important. Vein system strikes NE - SW and dips south at various angles. Individual veins vary from a few inches to six to 10-ft. Av probably 4-ft. Vein systems or breccia zones over 100-ft wide

24. Ore: Positive & Probable, Ore Dumps, Tailings

No attempt made to determine ore. From one open cut 400 tons taken out with a fresno and put through pilot mill. Large tonnage indicated.

24A. Dimensions and Value of Ore body

Of several hundred samples average might be said to be 10 to 14% lead, 0.80% $V_2O_5$, 0.90 oz Ag, and an appreciable amount of molybdenum. Very few samples ever run for molybdenum. Concentrates have shown 50% lead, 1.4 oz gold and 6.07 silver

25. Mine, Mill Equipment & Flow-Sheet

100 HP Foss engine, jaw crusher, rod mill, Dorr classifier, 4 Diester tables bins etc. Suitable for preliminary testing but not for commercial operations.

26. Road Conditions, Route

Good gravel surface road from Tombstone to mine, about 7½ miles.

27. Water Supply

Developed sufficient for mill. Indicated supply undeveloped but probably not very great. It depth likely to find enough water for large plant.

28. Brief History Property located about 1913 by Gallagher brothers. Held by them until incorporation. Stock in corporation all owned by members of Gallager family.

29. Special Problems, Reports Filed Extensive reports available from owners or engineer

30. Remarks Propertyappears to have a very large potential tonnage of vanadium ore with molybdenum,, silver and gold in lesser amounts. The lead content is heavy Development must be by shafts. The mineralized rhyolite dike indicates a possible big tonnage of ore about 0.80 % $V_2O_5$

31. If property for sale: Price, terms and address to negotiate.

Property probably for sale or lease, address Gallagher Vanadium & Rare Minerals Corp., 221 Slocum Place, San Antonio, Texas.

32. Signature W. O. Gallagher

Cons. Eng.

33. Use additional sheets if necessary

# DEPARTMENT OF MINERAL RESOURCES
## STATE OF ARIZONA
## MINE OWNER'S REPORT

Date June 4, 1940

1. Mine Gallagher Vanadium Mine
2. Location 7½ miles from Tombstone
3. Mining District & County Tombstone Dist. Cochise Co., Arizona
4. Former name Same
5. Owner Gallagher Vanadium & Rare Mineral Corp. (An Arizona Corporation)
6. Address (Owner) 221 Slocum Place San Antonio, Texas
7. Operator Same
8. Address (Operator) Same
9. President, Owning Co. Mrs. Louis Reuter P. O. Box 1015, Austin Texas
9A. President, Operating Co.
10. Gen. Mgr. J. C. Gallagher
14. Principal Minerals Vanadium, molybdenum, lead silver, gold.
11. Mine Supt. J. B. Gallagher
15. Production Rate Intermittent
12. Mill Supt.
16. Mill: Type & Cap. 25 ton pilot plant
13. Men Employed None regularly
17. Power: Amt. & Type
18. Operations; Present

Annual labor only.

19. Operations; Planned

Exploration of ground in units; construction of a concentrating plant, with chemical plant optional. Concentration of ores and metallurgy of concentrates worked out.

20. Number Claims, Title, etc.

Three patented claims and 21 unpatented.

21. Description: Topography & Geography

Gently rolling country, can drive touring car over almost all of the property. County highway from Tombstone to Fort Huachuca crosses property. 1½ miles from S. P. main line (Charleston Station). Mt. States & Teleg. lines cross property.

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More than 100 openings on the property, most of them shallow, probably all accessable at present. Shafts 80, 65, 50, and 45 ft. deep with others from 15 to 25 ft. Many long open cuts (trenching) across the ore zones, and some open cuts along the strike.

3. Geology & Mineralization

Principal rock mass Tertiary andesite, in a variety of phases. Intruded by rhyolite dike which appears to be realted to mineralization and itself carrying considerable vanadinite over great widths. A cross system of basic dikes occurs but not believed important. Vein system strikes NE--SW and dips south at various angles. Individual veins vary from a few inches to six to 10 ft. Average probably 4 ft. veins, systems or breccia zones over 100 ft. wide.

4. Ore: Positive & Probable, Ore Dumps, Tailings

No attempt made to determine ore. From one open cut 400 tons taken out with a fresno and put through pilot mill. Large tonnage indicated.

4A. Dimensions and Value of Ore body

Of several hundred samples average might be said to be 10 to 14% lead, 0.80% $V_2O_5$, 0.90 oz. silver, and an appreciable amount of molybdenum. Very few samples ever run for molybdenum. Concentrates have shown 50% lead, 1.4 oz gold and 6.0 oz silver.

5. Mine, Mill Equipment & Flow-Sheet

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Good gravel surface road from Tombstone to mine, about 7½ miles.

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28. Brief History

Property located about 1913 by Gallagher Bros. Held by them until incorporation. Stock in corporation all owned by members of Gallager family.

29. Special Problems, Reports Filed

Extensive reports available from owners or engineer.

30. Remarks

Property appears to have a very large potential tonnage of vanadium ore, with molybdenum, silver and gold in lesser amounts. The lead content is heavy. Development must be by shafts. The mineralize rhyolite dike indicates a possible big tonnage of ore about 0.80% $V_2O_5$.

31. If property for sale: Price, terms and address to negotiate.

Property probably for sale or lease, address
Gallagher Vanadium & Rare Minerals Corp.
221 Slocum Place, San Antonio, Texas.

32. Signature.....(Signed) A. I. Flagg.....
Cons. Eng.

33. Use additional sheets if necessary.

ASSAYERS
CHEMISTS

EL PASO, TEXAS
Box 4

# AWLEY & HAWLEY

W. E. HAWLEY, MANAGER
DOUGLAS, ARIZONA
537 TWELFTH STREET
Box 1060

SHIPPERS REPRESENTATIVES
BULLION
ORE

WE HEREBY CERTIFY THAT THE FOLLOWING RESULTS WERE OBTAINED FROM SAMPLES OF Vogel Mining Company

| OFFICE NO. | MARKED | GOLD OZS. | SILVER OZS. | LEAD PER CENT | COPPER PER CENT | ZINC PER CENT | IRON PER CENT |
|---|---|---|---|---|---|---|---|
| 265276 | Sample : 3 - 50 | Trace | Trace | 0.5 | 0.02 | | |
| | 3 - 80 | Trace | Trace | 0.2 | 0.01 | | |
| | 3 - 95 | Trace | Nil | 0.2 | 0.02 | | |
| | 3 - 110 | Trace | Nil | 0.3 | 0.06 | | |
| | 4 - 9 - 50 | Trace | Nil | 0.2 | 0.06 | | |
| | 4 - 4 - 24 | Trace | Trace | 0.2 | 0.05 | | |
| | 4 / 14 - | Trace | Trace | 0.2 | 0.05 | | |

METAL QUOTATIONS:

GOLD $35.00 PER OZ. COPPER ____C PER LB. CHARGES: $ 24.50

SILVER ____PER OZ. ____PER LB. DATE 11/10/53

HAWLEY & HAWLEY

PER

# DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA
CAPITOL BUILDING
PHOENIX, ARIZONA



July 6, 1940.

REPLY TO

Gallagher Vanadium and Rare Mineral Corp.
221 Slaughter Place
San Antonio, Texas

Gentlemen:

I am enclosing herewith a copy of Mine Owners Report which you have filed with the Department of Mineral Resources covering your property.

If you have any additional information on this property, I should suggest that you forward it for filing with this report.

Assuring you of my desire to be helpful, and with best wishes, I am

Yours very truly,

J. S. Coupal

J. S. Coupal
Director

JSC-amh

MAGMA COPPER COMPANY

8/28/95

Dept. of Mines
1502 W. Washington
Phoenix, AZ 85007

Dear Mr. Phillips:

Please keep the enclosed "Report on Properties of Gallagher Vanadium and Rare Minerals Corp." written by Flagg, A.L., published March 1939, for historical interest.

Best regards,
Gina Viviolola

Enclosure

7400 North Oracle Road, Suite 200 ■ Tucson, Arizona 85704 ■ (602) 575-5600

Ruby

LEGEND

Shaft

Pits

60° Direction - Dip of Veins

Sample No — % Pb

11906 — 0.55

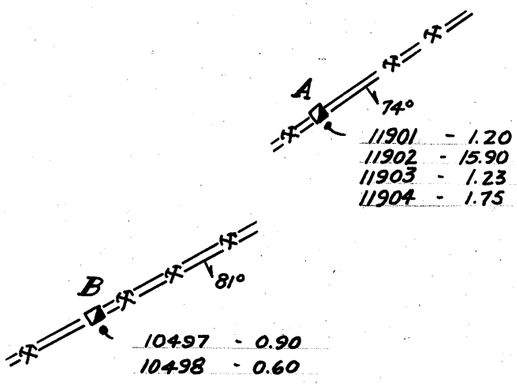



Figure 2.- Sketch of principal workings and sample locations, Gallagher Vanadium and Rare Minerals Corporation, Cochise County, Arizona

MAY POWELL

MAGGIE

STELLA

BLANKET

AURORA

BLANKET Nº 1

BLANKET Nº 4

BLANKET Nº 5

BLANKET Nº 2

BLANKET Nº 3

BLANKET Nº 6

NECESSITY

BLANKET Nº 8

BLANKET Nº 7

10

¼ Cor Sec. 6. T. 20 S., R. 21 E.

N. 20° E.

N. 45° E. | 70°

B-36

N 65° E. A-28 45°

A-30

N. 42° E.

S-112-D-0.43

A-31

S-114-48-0.43 N. 42° E. | 34°

S-113-D-1.16

S-117-120-0.76

S-118-D-1.16

S-115-36-0.37

S-116-54-0.43

A 34

STELLA SHAFT S-122-48-0.00 S-150 TO 163

S-120-58-0.37

SAN ANTONIO SHAFT

S-119-42-0.76

OS-121-42-0.23

S-123-D-1.05

S-124-24-0.76

S-125-48-0.80

S-150-30-0.37
151-54-0.80
152-48-0.57
153-48-0.42
154-54-0.42
155-36-0.32
156-10-0.57
157-72-0.32
158-48-0.37
159-60-0.42
160-60-0.57
161-72-0.37
162-72-0.28
163-24-0.80

S. 103-48-0.19
104-9-1.42
WATER HOLE
S-105-D-0.52

S-106-D-1.16
S-100
D-0.43
S-101-80-0.53
S-102-96-0.28
S-108-60-0.23
A 21
S-107-60-0.043
A 15
A-18
A 16
S-109
D-0.94
S-110
D-0.87
S-111-24-48
45°

B 2

B-28

B-39

B-29

Nº 1 SHAFT

N. 45° E.

N. 45° E.

B-13

S-130-42-0.87

Nº 4 SHAFT S-138 TO 149

A 27
S-131-48-1.64
S-132-48-1.87

B-14

B-21

B-3

A-24
S-129-72-0.28

A-26

S-138-54-1.44
139-41-0.62
140-36-0.23
141-48-0.43
142-54-0.28
143-60-0.23
144-36-0.28
145-42-0.14
146-42-0.17
147-24-0.48
148-18-0.42
149-D-0.57

S-126-60-0.18
A-23

S-127-36-0.87
S-128-48-0.28

B-6

B-7

S-133-36-1.10
S-134-D-0.80

N. 65° E. | 70°

S. 75° E. | 90°

N. 55° E. | 70°

B-16

N. 75° E. | 70°

B-17

S-136
34-1.33
82°

S. 65° E.

N. 70° E.

75°

B-56

B-57

N. 48° E.

B-58

B-59

N. 57° E. | 70°

S-135-36-1.63

N. 42° E. S. 137-36-0.62 | 90°

Magnetic North

LEGEND

- ANDESITE
- RHYOLITE
- BIRDSEYE PORPHYRY
- VEINS

NUMBERS FOLLOWING LETTER "S" INDICATE LOCATIONS OF SAMPLES AND IN TURN ARE FOLLOWED BY WIDTH SAMPLED IN INCHES AND THE PERCENT OF VANADIUM PENTOXIDE CONTAINED. "D" INDICATES DUMP SAMPLES.

NUMBERS FOLLOWING LETTERS "A" AND "B" ARE REFERENCE POINTS ONLY.

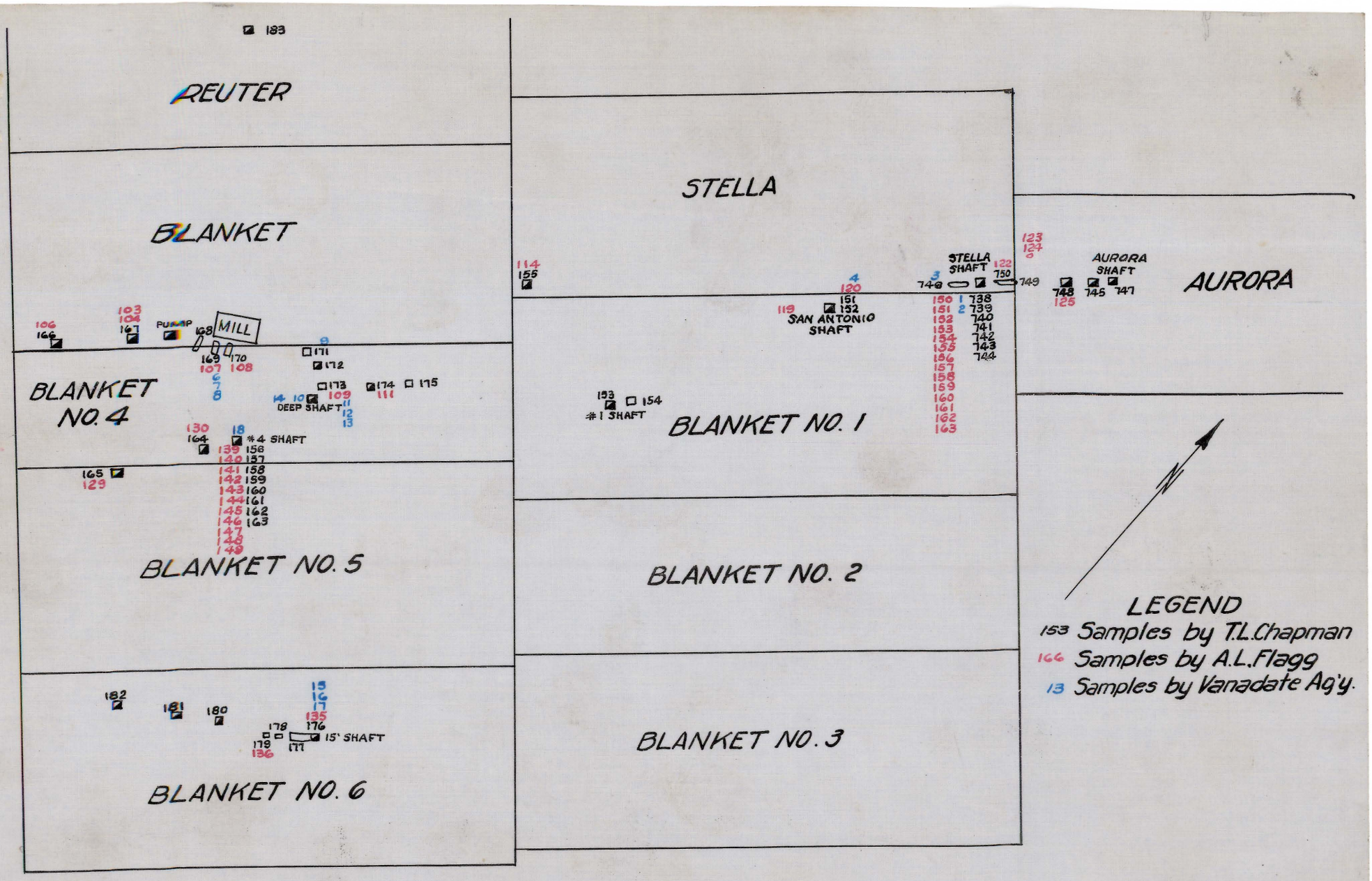
PROJECTIONS OF UNEXPOSED PORTIONS OF VEINS AND DIKES ARE INDICATED BY BROKEN LINES WHEREVER THERE IS SUFFICIENT EVIDENCE TO JUSTIFY SUCH PROJECTIONS.

# GALLAGHER VANADIUM & RARE MINERALS CORPORATION

## AREAL GEOLOGY AND ASSAY MAP

SHEET 1

SCALE 1 INCH TO [redacted] FEET

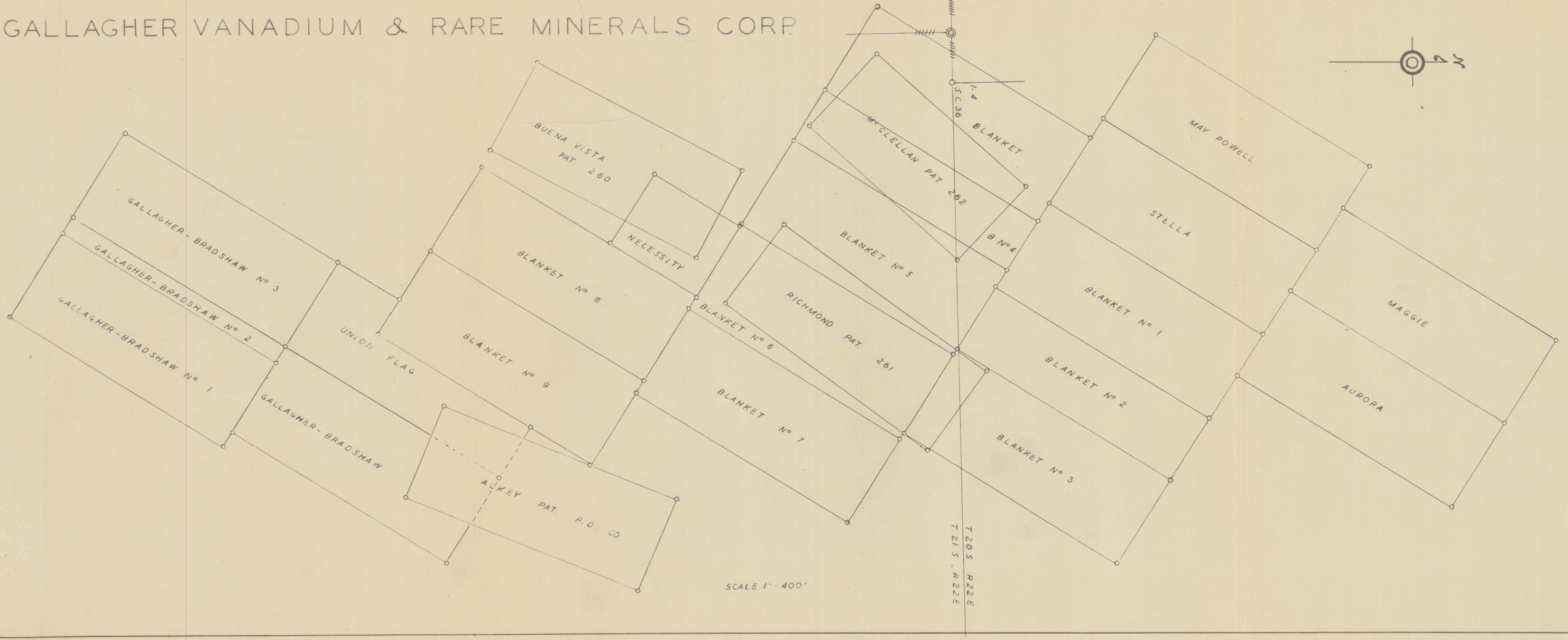



f. 6 GALLAGHER VANADIUM AND RARE MINERALS CORPORATION
TOMBSTONE, ARIZONA

0 100' 200' 400' 800' 1200'

19006

# GALLAGHER VANADIUM & RARE MINERALS CORP.



BLANKET Nº 5

NECESSITY

BLANKET Nº 6

BLANKET Nº 8

BLANKET Nº 7

BLANKET Nº 9

Magnetic North

GALLAGHER BRADSHAW Nº 3

UNION FLAG

ALKEY (PAT.)
BUNKER HILL MINES CO.
(UNIT OF PHELPS DODGE CORP.)

GALLAGHER BRADSHAW Nº 2

GALLAGHER BRADSHAW Nº 1

GALLAGHER BRADSHAW

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- ANDESITE
- RHYOLITE
- BIRDSEYE PORPHYRY
- VEINS

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GALLAGHER VANADIUM & RARE MINERALS CORPORATION
AREAL GEOLOGY AND ASSAY MAP
SHEET 2
SCALE 1 INCH TO 100 FEET