205

JJan 34

TUNGSTEN DEPOSITS IN THE PILOT MOUNTAINS
MINERAL COUNTY, NEVADA

by

Paul C. Bateman and Max P. Erickson

U. S. Geological Survey

June 27, 1943

Contents

Illustrations

TUNGSTEN DEPOSITS IN THE PILOT MOUNTAINS
Mineral County, Nevada

by
Paul C. Bateman and Max P. Erickson

Abstract

Scheelite in contact deposits occurs in a small district, covering about 4 square miles, near the eastern base of the Pilot Mountains, Mineral County, Nevada.

Granite sills, dikes, and small stocks intrude a thin-bedded white limestone member of the Upper Triassic Luning formation and alter adjacent beds to marble. Except at the Desert Scheelite property, the beds dip gently, generally to the west or northwest. Favorable beds are replaced by tactite distances up to 100 feet from the granite intrusives.

With the possible exception of the Garnet Mine, which is the only property now operating, the content of scheelite is too low, at present costs of labor and materials and a price of $30.00 per unit of WO_3, to permit mining without a financial loss. The average grade of all ore is about 0.3% WO_3. We saw no appreciable tonnage of ore anywhere in the district that contains more than 0.5% WO_3.

With careful management the Garnet Mine might operate at a small profit if adequate milling facilities were available. We do not believe the dry mill now in use recovers sufficient WO_3 for a successful operation.

We recommend no additional work by the Geological Survey or by the Bureau of Mines.

Introduction

Scheelite in contact deposits occurs near the eastern base of the Pilot Mountains, Mineral County, Nevada. All of the known occurrences are in an area of about 4 square miles that includes portions of both the lower foothills and the pediment that flanks the range on the east side. The district is accessible from Mina by 25 miles of well graded road that passes around the north end of the range. Roads to the various properties are adequate.

Most of the properties in the district have been located during the last ten years, but the Gunmetal mine was operated for scheelite during the World War I. Other properties, especially the Desert Scheelite and

the Silver-Tungsten King, were originally prospected for copper more than 30 years ago. The Garnet Mine is the only property operating at present.

We spent about 20 days in May 1943 examining the tungsten occurrences and mapping and sampling the principal properties. We took 26 chip samples of ore from selected localities that, in combination with visual examinations using ultra-violet light, we used in making estimates of the WO_3 content. All assays were by the Bishop Assay and Engineering Office of Bishop, California.

The ore is generally of low grade and contains an average of about 0.3% WO_3. We saw no shoots or blocks of ore large enough to be mined that contain more than 0.5% WO_3. With the possible exception of the Garnet Mine there is little chance, at the present cost of labor and material and at the current price of $30.00 per unit of WO_3, that any of the properties could be operated without financial loss.

General Geology

The Pilot Mountains are composed of complexly faulted Jurassic and Triassic sediments which near the tungsten district are flanked by Tertiary volcanic rocks. According to Muller and Ferguson[1], thrust faulting is common.

The tungsten deposits occur in a thin-bedded white limestone member of the Upper Triassic Luning formation, adjacent to granite stocks, dikes, and sills. The apparent local stratigraphic sequence in and near the tungsten district, premised on the absence of important thrust faulting,

---

1 S. W. Muller and H. G. Ferguson - Mesozoic Stratigraphy of the Hawthorne and Tonopah Quadrangles, Nevada (p-1580), Bull. G.S.A. Vol. 50, 1939

is as follows:

	Approximate Thickness
White and grey limestone	---
Slate and conglomerate	200 feet
Blue limestone	1500 feet
Blue slate	200 feet
White limestone	1000 feet plus

The base of the lower white limestone, in which the scheelite deposits occur, is not exposed. Throughout most of the district dips are gentle, usually to the west or northwest, but near the Desert Scheelite property dips are steeply to the north.

The "granite" appears, more accurately, to be a biotite-hornblende quartz monzonite. It is medium-grained, light-colored, and usually contains prominent phenocrysts of pink orthoclase. Quartz is fairly abundant. The larger feldspars are unmistakably orthoclase or microcline, but the smaller feldspars of the groundmass exhibit fine twin lines. Biotite and hornblende are present in about equal amounts. Abundant small grains of pyrite are often present near contacts.

Tactite, composed essentially of garnet, but containing calcite, quartz, and various sulfides, replaces favorable beds near the intrusives. The absence of apparent reason for lithologic control and the localization of some small tactite bands along cross structures lead us to conclude that porosity, developed by structural movements, controlled the distribution of mineralization.

There is considerable evidence to indicate the tactites were formed by solutions from deeper magmatic sources, rather than from the immediately adjacent intrusives. These solutions accompanied the intrusives and in at least some instances continued after their consolidation. Evidence

consists of the following observations. (1) Scheelite occurs in the Gunmetal Mine in granite adjacent tactites. (2) Unbroken scheelite crystals in an outlying adit on the Gunmetal property are imbedded in the quartz of a silicified gouge between tactite and granite. (3) Little or no tactite is developed along many contacts. (4) Relatively thick tactite zones occur at the Garnet Mine where only small sills of granite are exposed.

The localization of small, non-commercial shoots of scheelite along structures in the tactite suggests the period of scheelite formation continued after the cessation of garnet formation.

The mineralized district is limited to the south by an important fault that cuts off the Luning formation. The fault, where we examined it, dips south at a high angle, but its trace westward across rugged topography indicates that throughout most of its length it dips to the north. Obscure thrusting that closely follows bedding planes is indicated by the frequent cutting out of prominent beds. Other faults that strike northwest cross through the area.

We have speculated on the possibility that these larger faults are analogous to the system of faults of much less displacement exposed in the underground workings of the Gunmetal Mine. We have interpreted this system as a complex mechanism that has shortened the crustal prism in a north or northeasterly direction. Additional regional mapping is necessary before adequate evidence can be brought to bear on this hypothesis.

The topographic surface near the Desert Scheelite claims slopes eastward much more steeply than does the pediment surface farther north. We believe it is a stripped surface formerly covered by volcanic flows. Evidence for this conclusion can be seen in the low, volcanic-capped hills near the Silver-Tungsten King property. Here the surface on

which the volcanics rest, which slopes at approximately the same angle as the surface near the Desert Scheelite claims, slopes much more steeply than does that of the pediment. We regard this pre-volcanic surface as a Tertiary forerunner of the present pediment. Its steep slope indicates diastrophism and eastward tilting since it was formed.

The Gunmetal Mine

The Gunmetal Mine, which is the only extensive underground development in the district, is owned by E. W. Esson of Los Angeles, Sam Spratt of Reno, the Elges estate and the Sommerfield estate. The property comprises 14 unpatented claims. Marsman Company of California is reported to hold a lease on the property, but they have done no work since April 1943.

The main adits, the raise that now connects with the upper stope, and the winze that connects with the lower stope were dug during the last war, reportedly by a man named Osburne. The ore was run through a dry mill located near the mine portal.

The stopes were not dug until 1938 and 1939 when Broken Hills Company (Fred Volmer, president) operated the property. Apparently they did no development work and stopped work when the easily mined ore was nearly gone. Their mill was located about ½ mile east of the mine.

In addition to the mine workings there are several shallow shafts, pits, trenches and short adits on the property.

Geology

Granite in dikes or elongated stocks has invaded gently dipping limestone beds and altered them to marble and light colored calc-hornfels. Contacts are generally blocky and the intrusions appear to have come up

along steeply dipping fractures, dislocating and separating the limestone blocks, but causing little distortion of the adjacent beds. Tactite replaces favorable beds for distances up to 100 feet from the granite contact. The tactites maintain their thicknesses outward from the granite contact and end abruptly against marble.

In the mine, 3 tactite beds, each from 3 to 10 feet thick, have been worked. Other thinner tactites lie above and below these beds. Exposed on the surface south and southwest of the mine workings are thicker tactite zones. These are the marginal portions of small marble blocks surrounded by granite. The ends of the blocks, which have granite on 3 sides, are the most highly metamorphosed parts. Smaller blocks are completely converted to tactite.

Garnetized beds also occur in outlying areas adjacent to small granite sills and dikes, but are of little interest because of the small tonnages indicated. Small pods of tactite in the marble are presumably localized along structures that affected the flow of mineralizing solutions.

An interesting system of steeply dipping faults, all of which exhibit well developed horizontal slickensides, cuts across the area. Stratigraphic displacements are generally small, and little difficulty arises in following the tactite beds.

The most prominent fault, exposed both on the surface and in the mine workings, is marked by a thick zone of gouge that contains a large amount of both quartz and limonite as cementing material. This fault extends westerly across the area, partly coinciding with the main contact between granite and marble but frequently lying wholly within the granite. In Section B - B' (See fig. 3) it dips south at a high angle, but elsewhere it dips vertically or to the north. The distribution of granite and

limestone, both to the east and west beyond the limits of our map, suggests the north side of the fault has been shifted west, possibly 200 feet.

In the mine, cutting both marble and granite, are numerous reverse faults that strike N. 70° E. and dip north at high angles. Stratigraphic offsets in the marble, which in the mine area dips gently west, are usually less than 3 feet. At least one fault has normal stratigraphic displacement for a short distance, although it is a reverse fault through most of its exposed length.

Several normal faults that strike N. 20° W. and dip steeply to the south terminate against the reverse faults in curved and splintered junctions that suggest essential contemporaneousness.

All of these faults are cut by a west-trending fault that is exposed along the main adit. This fault dips 75° N. at the portal, is vertical for a considerable distance, and dips 43° S. at the face of the adit and appears to be passing into a bedding plane fault.

There is abundant evidence in the underground workings of movement along bedding planes. The limestone and hornfels between the tactites appear to have been particularly favorable for such movement. Slabs of rock are peeling from the roofs of the stopes along gouge and slickensided surfaces. Steeply dipping faults of small displacement have been observed to terminate against these planes; the stronger ones cut across them. Many beds are cut out abruptly and at least part of the eastward thinning of section suggested in Section A - A' is probably due to these flat thrusts.

Both the steeply dipping faults and the flat bedding thrusts are

reconcilable into a single pattern of rock failure if a compressional stress from the north or northeast is assumed and the essential movement on the steeply dipping faults is admitted to have been horizontal. Strike-slip movement is indicated by slickensiding, by reversals of the dip on the fault planes, and by quick reversals of the upthrown and downthrown sides of faults. The high-angle reverse faults, among which should be included both the main silicified zone and the fault exposed along the main adit, can then be considered a result of clockwise rotation of fault blocks; the normal faults a result of counter-clockwise rotation. Both actions shorten the crustal prism in a north or northeast direction with corresponding elongation east and west. The flat thrusts shorten the section in the same direction by upward relief.

Many of the blocky contacts of the granite are parallel to the system of reverse faults, which here is the principal system. This circumstance suggests the same stresses existed prior to the granite intrusions as have since. Faults within the granite prove later movement.

Mineralization

The tactite is composed essentially of garnet, with some quartz and calcite and occasional sulfides. Scheelite is disseminated throughout the tactite in small pin point size grains that fluoresce yellow, but there are also richer bands in which the grains are somewhat larger. In the mine higher grade streaks occur near the top of the lower tactite in a band from a few inches to a foot wide. We also saw a richer streak (assay 0.828%) in a surface pit, but no appreciable tonnage of ore of this grade is indicated.

We took 16 samples, 12 from the beds exposed in the underground workings and 4 surface samples from the tactites south and southwest of

the mine workings. The average WO_3 content of all samples is 0.3%. In the underground workings the beds appear to contain up to 0.6% WO_3 near the granite; this diminishes to 0 near the outer limits of the tactite. Both assay data and visual comparison of the ore under ultra-violet light indicate that, of the 3 beds worked underground, the lowest is of somewhat higher grade than the others; the upper bed contains the least amount of WO_3.

The large blocks of tactite south and southwest of the mine are somewhat lower grade than the average of ore in the mine. The average content of WO_3 is about 0.15%. We observed no gradation of values such as we saw in the mine workings.

Scattered particles of scheelite occur in the granite adjacent to the tactite. In an outlying adit we saw scheelite crystals in a silicified fault gouge between granite and tactite. The scheelite crystals in the gouge are much larger than any we observed in the tactites and fluoresce blue-white. Several euhedral crystals of nearly transparent scheelite occur in open cavities in the silicified gouge.

Both the tactites worked in the mine and those exposed on the surface appear to occupy nearly the same stratigraphic positions. We examined the sedimentary rocks associated with the tactite but found no reason to suspect lithologic control of mineralization. There are numerous thin beds of light colored calc-hornfels interbedded with the tactities and marbles, but such beds occur elsewhere in the section.

A more probable explanation of the localization of the tactite is that flat, bedding plane thrusts, localized at this horizon, controlled the distribution of mineralizing solutions.

Reserves

We calculate that a total of 9500 tons of ore that contained 3000 units of WO_3 have been mined from the 3 beds explored in the underground workings. Of this amount, 3800 tons are from the lower tactite, 3500 tons are from the middle tactite, and 2200 tons are from the upper tactite.

Reserves in the mine workings are as follows:

Upper bed: Between the upper stope and the surface outcrop is a block of 2000 tons of indicated ore, 100 feet long, 40 feet wide and 5 feet thick. On the same bed, between the upper stope and the small stope opposite the long cross-cut are another 1260 tons of indicated ore in a block 45 feet long, 40 feet wide and 7 feet thick. The content of WO_3 in these two blocks probably does not average more than 0.15%, and the total of 3260 tons of indicated ore contains less than 500 units of WO_3.

Ore of the same grade may be inferred to continue west of the small stope.

Middle bed: A block of 1600 tons of indicated ore, 80 feet long, 40 feet wide, and 5 feet thick, remains between the stopes and the surface. The ore probably has an average WO_3 content of 0.4%, and the block contains 720 units. If any ore is mined at a greater distance than 40 feet from the granite, it will be of much lower grade.

About 800 additional tons of inferred ore containing 400 units can probably be mined between the main part of the lower stope and the main stope.

The western end of the bed thins to about 3 feet, and the percentage content of WO_3 decreases to 0.3% or less; so continued mining in this direction would probably result in the recovery of

only a small amount of WO_3.

Lower bed: No indicated ore remains on the lower bed. However, of the 3 beds, this one offers the greatest promise for further development. It is generally thicker than the upper beds, contained 0.4 to 0.5% of WO_3 in the part mined, and has not been worked so far west as the upper beds. The western extension of the bed can be readily explored by sinking the winze a few feet deeper that now connects with the lower stope.

The tactites south and southwest of the mine are the most promising from the standpoint of large tonnage, but our assays and visual examination indicate the ore contains only about 0.15% of WO_3. We estimate the largest block contains 90,000 tons of inferred ore in beds above the lowest surface exposure of tactite. This block contains 13,500 units of WO_3. The cross-cut from the mine workings explores the block for a few feet 125 feet below the surface, but at approximately the same stratigraphic horizon as the lowest surface exposure. We saw only a trace of scheelite in the cross-cut.

This tactite can be most easily explored underground by driving the cross-cut ahead for 100 feet across the tactite.

The other tactites nearby are of the same average grade.

Desert Scheelite Property

The Desert Scheelite group of 3 unpatented claims, held by G. F. Thompson of Mina and C. W. Taylor of Tonopah, was located by Thompson 8 years ago. The largest tonnage of tactite in the district is exposed here, but it contains very little scheelite. The property is on a pediment surface about one-half mile east of the base of the range. Development consists of 2 open cuts, a 30-foot inclined shaft with a small stope

1935

at the bottom, a 65-foot vertical shaft which was dug many years ago when the area was prospected for copper, and several trenches, small pits and short adits. The eastern open-cut and the 50-foot shaft were dug in 1940 by the Smith Brothers of Silver Peak. In 1941 J. W. Warner dug the western pit. About 1000 tons of ore are reported to have been milled in the Oromonte mill.

Geology and mineralization.

The main tactite mass, which averages 50 feet wide, is exposed for 700 feet along the bottom of a shallow draw. Narrower and apparently less continuous tactites lie north of the main mass 100 to 200 feet. The tactite is largely confined to specific beds in the limestone host rock, but cross fractures in the limestone are also mineralized. Beds and tactite strike west and dip steeply north except near the 50-foot inclined shaft which is 500 feet west of the area of exposures. There, beds strike east of north and dip 50° west. (See fig. 6).

Granite exposures are limited to 2 small areas in the bottom of the draw near the east end of the tactite, but it is probable that granite lies south of the tactite throughout its length.

We estimate from an examination by ultra violet light the tactite contains an average of 0.1 to 0.2% WO_3. The scheelite is evenly distributed through the tactite in small grains that fluoresce yellow. Occasional richer streaks occur that cover only a few square feet, localized apparently along fracture planes in the tactite. We saw no higher grade shoots within the low grade mass that are of sufficient size to mine separately.

We took 3 samples, one from each of the 2 open-cuts and one from

the stope at the bottom of the 50-foot shaft. (See fig. 6 and table I). The average of the samples, 0.163% WO_3, compares well with our estimate from examination under ultra violet light.

Reserves

For each foot of depth, underlying the exposed tactite, 50 x 700 feet in area, are 3500 tons of ore containing 560 units of WO_3, assuming an average WO_3 content of 0.16%. We believe the ore continues to a depth of at least 100 feet, comprising a total of 350,000 tons of inferred ore containing 56,000 units. Probably the tactite continues west from the exposed area at least 500 feet to the 50-foot inclined shaft. This block, which is somewhat less assured, will include 2500 tons per foot of depth containing 400 units of WO_3; to a depth of 100 feet, 250,000 tons containing 40,000 units. The total of all inferred ore is 600,000 tons containing 96,000 units of WO_3.

Garnet Mine

The Garnet group of 6 unpatented claims, owned by G. F. Thompson and the Sommerfield estate, is leased to the Victory Tungsten Company, comprising I. Foster Smith, Gertrude Smith, and W. A. Schmidt. The property has been operated intermittently during the last 2 years, making a small production of scheelite concentrate.

The ore is milled in an elaborate dry-mill that Smith moved from Oak Springs, Nevada, 2 years ago. This mill, which is immediately adjacent to the mine workings, is powered by two 30-kilowatt Palmer generators run by International diesel truck motors. Many of the mill units are products of Sutton, Steele and Steele Inc. ofDallas, manufacturers of air separators for flour mills and for grading seeds. Other equipment includes 2 elevators,

one 15-inch jaw crusher, a ball mill, 2 belt conveyors and a large number of electric motors which power individual units. Most of the equipment appears nearly new. The mill is enclosed in a 32 x 36-foot sheet metal building.

Mine developments consist of an open pit and an inclined shaft that extends from the face of the pit 40 feet down the dip of the principal tactite bed. Several small open-cuts prospect the area north and west of the pit. In the pit are two 1-yard mine cars, a Fairbanks-Morse compressor, and a dragline unit.

Geology and mineralization

Small granite sills intrude gently-dipping, thin-bedded limestone. Beds adjacent to the sills are altered to garnet tactite. We observed considerable sphalerite and pyrite in the tactite. Masses of limonite indicate that some of the pyrite has been leached.

About 450 tons of ore have been mined from the open pit, about 400 tons from the shaft, and possibly 200 tons from outlying workings; a total of 1050 tons.

Smith reports a total production of 129 units of WO_3. Our sample from the tailings pile assayed 0.280% WO_3. These figures suggest a 30% recovery from heads that contained about 0.4% of WO_3.

Under ultra violet light the tactites appear to contain from 0 to 0.5% WO_3. We saw one small area covering a few square feet that we estimate contains 1% WO_3. The best ore is in the tactite bed explored by the open pit and the inclined shaft. We took 4 samples from this bed and one from the tactite north of the shaft and above the granite sill.

Reserves

A block of 2000 tons of indicated ore containing an estimated 1100

units of WO_3 is reasonably assured between the inclined shaft and a fault that limits the mineralized area on the east. This block, which is exposed on two sides, in the shaft (assay 0.630%) and along the face of the pit (assay 0.502%), averages 12 feet thick, is 40 feet from north to south and averages 40 feet wide. West of the inclined shaft on the same bed, also exposed on two sides, in the shaft (assay 0.630%) and along the face of the pit (assay 0.220%), is another 2000-ton block of indicated ore of similar dimensions but containing only 840 units of WO_3.

We infer blocks of ore of the same size and grade north of the indicated ore on the same bed.

Other tactites have small ore shoots that are not thick enough to mine.

Silver-Tungsten King Property

The Silver-Tungsten King property is owned by G. G. Thompson and George Zark of Gabbs Valley, who located the property 6 years ago. There are several old adits and stopes on the property, now partially watered and caved, that were dug for copper about 30 years ago. Recent workings consist of a few shallow shafts and open-cuts.

Copper-stained tactite that contains traces of scheelite occurs at the contact of granite and limestone. Lack of exposures and the poor condition of the old workings prevented us from making a tonnage estimate, except to conclude that it is small. The very low WO_3 content of the tactite (estimated at 0.1%) makes the property of little interest as a scheelite prospect.

Hussar-Smith Property (Marvel Group)

P. E. Hussar and Dr. D. A. Smith, both of Mina, hold 8 unpatented claims that adjoin the Gunmetal group on the southeast. The claims are

Eunice #1, #2, #3, #4, Marvel #1, #2, #3, #4, and Alta. The claims were located about 6 years ago.

Small open-cuts and trenches, many of which are in slightly metamorphosed limestone that contains little or no scheelite, prospect the property. A few small tactites adjacent to granite sills contain up to 0.5% WO_3, and one tactite appears to contain 0.5 to 1.0% WO_3. The small tonnages of ore indicated make this property of interest only as a possible auxiliary producer of ore should one of the larger properties in the district be operated.

Hussar-Baker Property

Hussar and B. F. Baker of Mina hold 5 unpatented claims, Lucky #1, #2, #3, and #4, that adjoin the Hussar-Smith claims on the east. The claims were located in 1941. Scattered open-cuts expose tactites that contain small percentages of scheelite. No appreciable tonnage is indicated.

McNamara-O'Mohoney Claims

Mrs. Elizabeth McNamara and a Dr. O'Mohoney, both of San Francisco, are reported to hold 14 claims that adjoin the Gunmetal group on the west and south. The claims have been explored by small open-cuts that expose occasional tactites adjacent to granite sills and dikes. No appreciable tonnage is indicated from the exposures. The scheelite content of the tactites is variable, but we saw no occurrence that we estimate contains more than 0.5% of WO_3.

Smith Claims

Dr. D. A. Smith holds several claims that lie between the Desert Scheelite property and the Hussar-Baker and Hussar-Smith claims. Small open-cuts expose tactites of limited extent that contain small percentages of WO_3.

Oromonte Mill (Desert Scheelite Mill)

The Oromonte or Desert Scheelite mill is owned by J. Granger Keeler

of Los Angeles and Frank and Fayette Hill of Silver Peak. Gordon Smith of Gabbs Valley is reported to own the tables. Marsman Company holds a lease on the mill and maintains a watchman there. The mill was built in 1941 to mill ore from the Desert Scheelite property. It has not been operated for some time and needs repairs before it can be run.

The mill is powered by a Norton and Norton 50 H.P. generator which is run by a Caterpillar diesel power unit. Equipment includes a 15-inch jaw crusher, a ball mill, an Akins classifier, and 5 Wilfley tables. A giratory crusher that appears to be in good condition is not hooked up in the mill circuit. The mill is housed in a sheet metal building.

Abundant water piped from Mitchel Spring is available. The water rights are owned by Frank Baker and T. O. McKennon of Mina and are leased to Marsman Company.

Conclusions

A summary of ore reserves in the 3 larger properties is given in the following table.

	Indicated Ore			Inferred Ore		
	Tons	$\%WO_3$	Units	Tons	$\%WO_3$	Units
Gunmetal Mine						
Upper bed	3260	0.15	500			
Middle bed	1600	0.40	720			
	800	0.50	400			
Surface block				90,000	0.15	13,500
Desert Scheelite				350,000	0.16	56,000
				250,000	0.16	40,000
Garnet Mine	2000	0.55	1100	4,000	0.50	2,000
	2000	0.45	840			
Total	9660		3560	694,000		111,500

It is probable that exploration would increase the reserves several times these figures, but ore of higher grade, except in small quantities,

is not likely to be found.

We do not believe that any of the properties, with the possible exception of the Garnet mine, can be operated at a profit at present costs of labor and material and at a price of $20.00 per unit of WO_3. The fine-grained scheelite probably cannot be economically recovered without resorting to flotation.

The Garnet mine contains the highest grade ore in any appreciable quantity that we saw in the district. Possibly with a suitable mill and careful management the ore could be mined at a profit, but we do not believe this can be accomplished with the dry-mill now on the property.

We do not recommend additional work by either the Geological Survey or by the Bureau of Mines.

Table No. 1

Analyses of Samples

Bishop Assay and Engineering Office
Bishop, California

Lab. No.	Identification		% WO_3
6754-D	Gunsetal	#1	0.600
6755-D	"	#2	0.162
6756-D	"	#3	0.500
6757-D	"	#4	0.516
6758-D	"	#5	0.114
6759-D	"	#6	0.112
6760-D	"	#7	0.250
6761-D	"	#8	0.112
6762-D	"	#9	0.332
6763-D	"	#10	0.216
6764-D	"	#11	0.544
6765-D	"	#12	0.164
6766-D	"	#13	0.100
6767-D	"	#14	0.148
6768-D	"	#15	0.828
6769-D	"	#16	0.176
6748-D	Garnet	#1	0.502
6749-D	"	#2	0.220
6750-D	"	#3	0.172
6751-D	"	#4	0.630
6752-D	"	#5	0.304
6753-D	"	#6	0.280
6745-D	Desert Scheelite	#1	0.324
6746-D	" "	#2	0.108
6747-D	" "	#3	0.054

MEMORANDUM

THE GOLDFIELD CONSOLIDATED MINES COMPANY

SAN FRANCISCO, CALIFORNIA

SUBJECT GUN METAL OR SUMMERFIELD MINE, PILOT MOUNTAIN DISTRICT, MINERAL COUNTY, NEVADA

DATE October 19, 1937

TO E. A. JULIAN

FROM H. N. WITT

This property was examined following the completion of the Desert Scheelite examination. The property is an old one, having considerable underground development work and a small concentrating plant. The extent of the workings is shown on the attached map. The ore bearing zones lie along an intrusive granite contact in limestones, the limestones being nearly horizontal or dipping gently westward. Within a vertical distance of fifty feet above the portal of the tunnel, at least five limestone beds had been garnetized and a distance of 50 to 100 feet northerly from the granite contact. These beds were reported to carry 1% tungsten ore for widths of from four to eight feet. Approximately twenty samples were cut from the tunnels workings as shown on the attached sketch, seven of which were assayed at our local laboratory and showed only low values. These samples were typical of the balance of the ore and indicated an average of possibly 3/10 of 1% scheelite. In view of the high costs of mining these flat lying limestone beds, it is obvious that ore of this grade could not be profitably mined on this property. Scattered higher grade assays were found in some outlying workings but all lacked continuity and gave no promise of any volume of ore.

hhn

MEMORANDUM

THE GOLDFIELD CONSOLIDATED MINES COMPANY

SAN FRANCISCO, CALIFORNIA

2851

SUBJECT SILVER KING TUNGSTEN GROUP, PILOT MOUNTAIN DISTRICT, MINERAL COUNTY, NEVADA

DATE October 11, 1937

TO E. A. JULIAN

FROM H. N. WITT

This property, owned by Mr. George Thompson of Mina, and others, is about one half mile northeast of the Summerfield camp on the east side of Pilot Mountains.

It was visited with Mr. Thompson during the progress of the Desert Scheelite and Gun Metal examinations.

One sample of reported high grade was assayed and found to contain .25% WO_3.

There is no indication that this property has any higher grade mineralization than that prevailing in the local district and was, therefore, not considered worthy of further examination.

H. N. W.

MEMORANDUM

THE GOLDFIELD CONSOLIDATED MINES COMPANY

SAN FRANCISCO, CALIFORNIA

SUBJECT DESERT SCHEELITE, PILOT MOUNTAIN DISTRICT, MINERAL COUNTY, NEVADA DATE October 19, 1937

TO E. A. JULIAN

FROM H. N. WITT

This property presented by Messrs. W. D. O'Brien and Herbert Hamlin, Jr., was examined during parts of September and October 1937. The property included three claims: Desert Scheelite, Desert Scheelite #1 and Desert Scheelite #2, located by Thompson and Whittacre of Mina.

This group lies about 1½ miles southeast of the old Summerfield, or Gun Metal Camp in the east foothills of the Pilot Mountains at an elevation of about 6,000 feet. Both camp and property can be reached from Mina by 23 miles of fair desert road via Bettle's Well.

The ore exposure lies in a gully in the frontal wash apron about one mile east of the base of the main Pilot Mountains. Erosion has exposed small area of granite in contact with white limestone with a wide garnet zone extending along the contact. This zone is exposed in the gully bottom for a distance of nearly 700 feet and for a width of 30 to 60 feet. It is again found in trench and out crop about 500 feet further west, near the west end line of the Desert Scheelite claim. (See attached sketch.) This region is underlain by thick series of white and black limestones with interbedded slates dipping in gently west but with numerous local folds. In the vicinity of the Desert Scheelite, however, the limestones have been tilted to a nearly vertical position, striking roughly parallel to the granite contact. Four small areas of intrusive granite exist in this general region,on all of which there are garnet zones carrying tungsten ore. In most cases the garnetization is limited to particular beds of the limestone and extends for variable distances from the contacts along these beds. On the Desert Scheelite, due to the vertical position of the limestones, the garnet zone is continuous along the granite contact and has greater length and width than any other garnet zone in the region.

Development on this property, originally done in search of copper-silver ores, consisted of two short tunnels, one 65-foot shaft, one 20-foot shaft and a few open cuts. The out crop had been extensively panned by Messrs. O'Brien and Hamlin

MEMORANDUM

THE GOLDFIELD CONSOLIDATED MINES COMPANY

SAN FRANCISCO, CALIFORNIA

SUBJECT Desert Scheelite #2 DATE October 18, 1937

TO E. A. Julian

FROM H. N. Witt

and was reported to contain consistent scheelite values. My own preliminary panning indicated interesting scheelite values but subsequent investigation proved that the scheelite was very finely divided and made a deceptively large showing in the pan.

Our work on the property consisted of the digging of six trenches across the garnet zone at approximately 100-foot intervals and the lengthening and deepening of the trench on the west end of the Desert Scheelite claim. These trenches, together with two of the old tunnels, were then sampled with continuous five-foot horizontal cuts, each sample weighing approximately fifty pounds. These were hauled to the camp established at the old Summerfield Camp and assayed in our laboratory set up at camp. The first samples from trench #1 on the west end of the property were decidedly disappointing, the highest being .52. The samples in the next trench east, approximately 500 feet eastward, showed only three low grade samples, the balance running a trace. Thereafter, individual samples were not assayed but composite samples from all or portions of the trenches were assayed. These showed consistently low values, rarely exceeding .2% WO_3. All of these trenches and the location of the individual cuts are shown on the attached sketch.

It is apparent from local panning during the progress of the job and study of the exposures made in the various trenches, that the scheelite occurs not distributed uniformly in the garnet zone but on cracks in shear zones and crevices within the garnet. It is very finely divided and might be difficult to concentrate.

The massive flinty garnet is apparently barren. The trenches also disclosed that the so-called garnet zone contains numerous large horses of barren white limestone which would preclude any scheme of large scale open pit mining. Furthermore, the average value was too low to permit even this type of mining. The property was, therefore, abandoned.

H.N.W.

P.S. Check assays were made by Hanks on composites from trenches #1, #6 and #7. In trench #1 our assaying indicated an average of .14, Hanks .17; trench #6, our assaying .10, Hanks .11; trench #7, our assaying .07, Hanks nothing.

CERTIFICATE OF ASSAY

ABBOT A. HANKS, INC.

ASSAYERS. CHEMISTS. ENGINEERS

624 SACRAMENTO STREET

SAN FRANCISCO. October 1, 1937

SAMPLE OF ORE

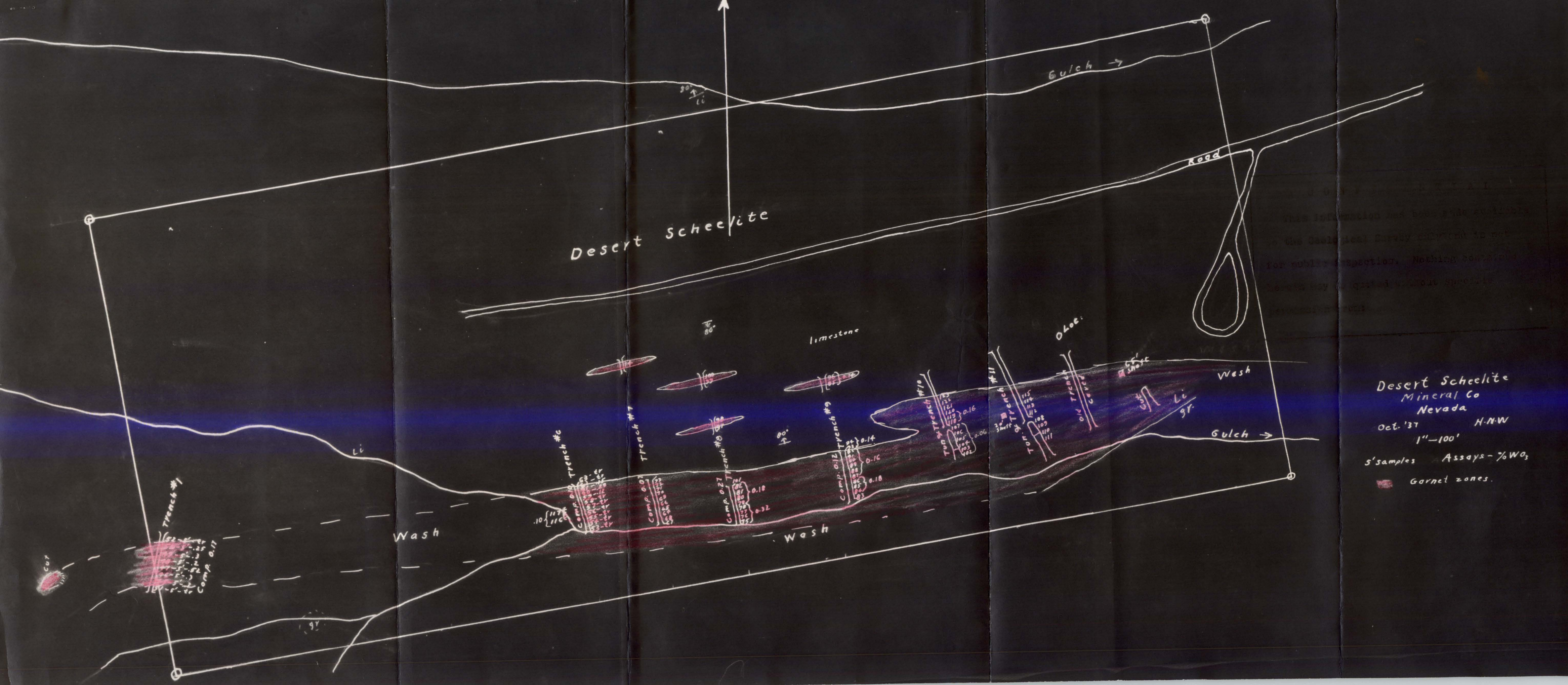
DEPOSITED BY Goldfield Cons. Mines Expl.Co.

Labty. No.	Mark	GOLD, per ton of 2,000 lbs. Troy Ounces	GOLD, Value @ $35.00 oz. $	SILVER, per ton of 2,000 lbs. Troy Ounces	SILVER, Value @ $	Percentages
Composite Samples - Shipped 9/28/37 From Desert Scheelite Property near Mina, Nevada.						
74600	#1 - Trench #1 - Composed of 8 - 5ft. Cuts - -					Tungstic Oxide 0.17
01	#6 - " #6 - " " 11 - 5ft " - -					" 0.11
02	#7 - " #7 - " " 11 - 5ft " - -					" None Found

ABBOT A. HANKS, INC.

Abbot A. Hanks

VE



Gulch →
Road
Desert Scheelite
limestone
Trench #1
Trench #6
Trench #7
Trench #8
Trench #9
Trench #10
Trench #11
Old Trench
Wash
Wash
Wash
Gulch →
Desert Scheelite
Mineral Co
Nevada
Oct. '37
H.N.W
1"—100'
5' samples
Assays - % WO_3
Garnet zones.


N
garnet
tion near tunnel portal
1"-50'

Mill
EL.0'
Road
B.S.
Portal
Portal
Li
gr
gge
gtz
25'
50'
75'
N
Gulley
limestone
granite
tight
Shaft
150
175
200
Gun Metal
or
Summerfield Mine
Pilot Mtn. Dist.
Mineral Co. Nevada
Oct. '37 1"-50'
H.N.W.
Samples shown by No.-width - %WO3

May 24, 1943.

Preliminary Memorandum

GARNET TUNGSTEN CLAIMS
Pilot Mountains, Mineral County, Nevada

by
Paul C. Bateman and Max Erickson

The Garnet claims of the Victory Tungsten Company, I. Foster Smith, operator, are on the east flank of the Pilot Range, Mineral County, Nevada. The claims are accessible from Mina by 23 miles of graded road that passes around the north end of the range. Mr. Smith is prospecting for tungsten near Tonopah, Nevada, and the garnet property is now idle.

Development consists of an open pit and an inclined shaft that extends from the face of the pit 40 feet down the dip of the tactite bed. Several small open-cuts prospect the area north and west of the pit.

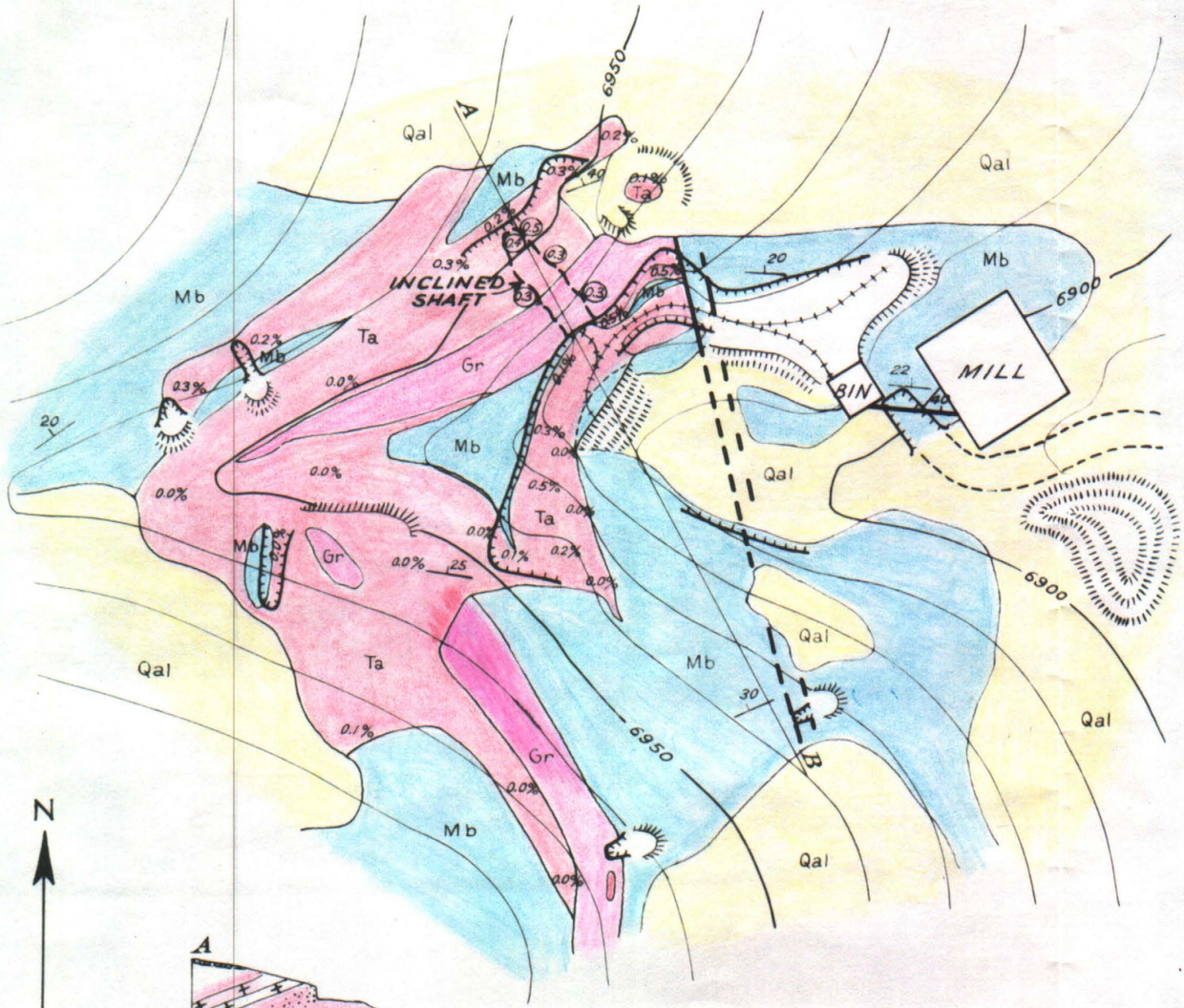
An elaborate dry-mill, powered by two 30-kilowatt Palmer generators run by International diesel truck motors, is immediately adjacent to the pit. Most of the mill units are not recognizable to me, but among the equipment are 2 elevators, one 15-inch jaw crusher, a modified ball mill, 2 belt conveyors and a number of electric motors which power individual units. Most of the equipment appears nearly new. The mill is enclosed in a 32 x 36-foot sheet metal building.

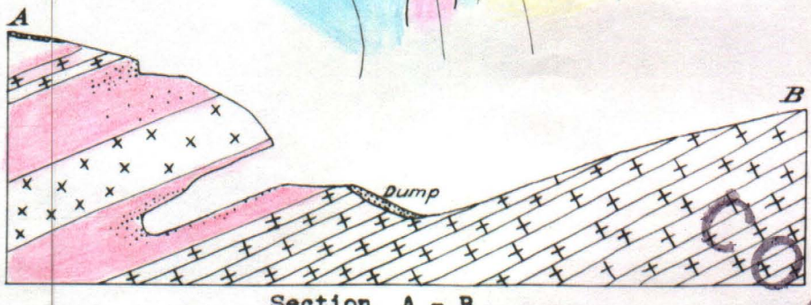
In the pit are two 1-yard mine cars, a Fairbanks-Morse compressor, and a dragline unit.

Small granite sills intrude gently-dipping, thin-bedded limestone. Beds adjacent to the sills are altered to garnet tactite which contains scheelite. Under ultra-violet light the tactite appears to contain from 0 to 0.5% WO_3. We saw one small area that we estimate contains 1% WO_3.

A block of 2000 tons of indicated ore containing an estimated 600 units of WO_3 is reasonably assured between the inclined shaft and a fault that limits the mineralized area on the east. This block, which is exposed on two sides, in the shaft and along the face of the pit, averages 12 feet thick, is 40 feet wide. On the same bed west of the shaft and north of the block of indicated ore are an additional 3500 tons of inferred ore containing 1000 units of WO_3.

Other tactites, especially that exposed north of the shaft and immediately above the granite sill, contain small ore shoots that are not thick enough to mine.





Section A - B

GARNET MINE AND SECTION
Pilot Mountains, Mineral County, Nevada

50 0 100 FEET

Contour Interval - 10 feet

EXPLANATION

Alluvium — Tactite

Granite — Marble

0.2% Estimated content WO_3 — (0.2) Sub-surface estimate

WO_3 mineralization

By Paul C. Bateman and Max Erickson
May 23, 1943.

MEMORANDUM

THE GOLDFIELD CONSOLIDATED MINES COMPANY

SAN FRANCISCO, CALIFORNIA

SUBJECT GARNET GROUP, PILOT MOUNTAIN DISTRICT, MINERAL COUNTY, NEVADA

DATE October 11, 1937

TO E. A. JULIAN

FROM H. N. WITT

This group of six claims adjoins the Gun Metal, or Summerfield Group, on the north. It was visited with Mr. George Thompson of Mina, one of the owners, during the progress of the Desert Scheelite and Gun Metal examination while we were occupying the Gun Metal camp in September 1937.

The property contains two rather large contact metamorphic deposits consisting largely of massive garnet zones near a granitic intrusion in lime stone. The deposit is similar in many respects to the adjoining Summerfield, the mineralization being in the same horizons, or apparently the same as those at Summerfield.

It is reported that these massive garnet zones would average about one half of 1%.

Following preliminary sampling of Summerfield, which showed much lower values, it was decided that further investigation of this garnet group was not warranted.

H. N. W.

Pilot Mountains DIST.

205

Item 34

Contact metamopphic deposits containing scheelite occur in the lower, eastern foothills of the Pilot Mountains and in the pediment at the east base, about 25 miles by road east of Mina, Tonopah quadrangle. Tungsten was first found in the district in World War I, when the Gunmetal mine was worked for scheelite. Most of the other properties were discovered since 1933, although some of them had been prospected for copper long before. Total production from the district

up to 1944 is estimated at about 4,000 units of WO_3 from 12,000 tons of ore treated.

The Pilot Mountains consist of Triassic and Jurassic sedimentary rocks that are complexly deformed by thrust faulting[1] and are invaded

---

[1] Muller, S. W., and Ferguson, H. G., Mesozoic stratigraphy of the Hawthorne and Tonopah quadrangles, Nevada: Geol. Soc. Bull., vol. 50, (no. 10,) p. 1580, 1939.

---

by several small granitic stocks, dikes, and sills. The tungsten occurrences are in tactite adjacent to the igneous rocks where they are in contact with a thin-bedded, white limestone member of the Upper Triassic Luning formation, which is here more than 1,000 feet thick (fig. 125). The limestone strikes northeast and dips gently

---

Fig. 125. Geologic sketch map showing location of tungsten deposits in the Pilot Range, Mineral County, Nevada.

---

northwest at most of the mines, but near the Desert Scheelite property, it strikes east and dips steeply north.

The granitic rock is a light-colored, biotite-hornblende quartz monzonite containing prominent phenocrysts of pink orthoclase. The medium-grained groundmass is composed of quartz, plagioclase, biotite, and hornblende.

The tactite is composed predominantly of garnet, but also contains calcite, quartz, sulfides, and scheelite; it replaces certain beds in the limestone or marble in preference to others, although the lithology appears identical in replaced and unreplaced beds. Perhaps some of the beds were more porous than others, and hence more favorable for replacement.

Only a small part of the tactite in the district, possibly 10,000 tons, contains 0.4 to 0.5 percent of WO_3. Approximately 700,000 tons of material containing 0.1 to 0.2 percent of WO_3 are available at shallow depths, and several times as much might be found by exploration.

Gunmetal

The Gunmetal mine, consisting of 14 unpatented claims, was owned in 1943 by E. W. Esson, Sam Spratt, the Elges estate, and the Summerfield estate. The main workings were dug during the first World War, and the ore extracted was treated in a dry mill near the mine portal. In 1938-39, the Broken Hills Co. (Fred Volmer, president) opened the upper and lower stopes through the old workings and treated some ore in a mill about half a mile east of the mine; no new development work was done. In 1943, the Marsman Co. of California held the property under lease.

The mine is opened by an adit that extends 520 feet east along the contact (fig. 126). A flat stope borders part of the adit. From

---

✓ Fig. 126. Geologic maps and sections of the Gunmetal mine, Mineral County, Nevada.

---

a north crosscut, a winze was sunk 50 feet to a lower stope. Several

raises from the adit lead to an upper stope 20 feet higher. About 9,500 tons of ore estimated to contain 5,000 units of WO_3 were mined from the 3 stopes.

The tungsten occurs in gently-dipping, bedded layers of tactite that extend as far as 100 feet from the quartz monzonite contact. The intrusive cuts steeply across the beds nearly at right angles to them. In a vertical interval of 50 feet, 8 tactite beds 3 to 10 feet thick were worked in the mine. Thinner tactite beds lie above and below these. Away from the mine, exposed south and southwest of the workings, are thick tactite bodies on the margins of marble blocks partially surrounded by granite. Tactite occurs elsewhere in the vicinity in small bodies adjacent to granite dikes and sills.

A prominent, steep fault extends westerly across the area, and in part makes the contact between marble and intrusive, in part lies wholly within the intrusive. The fault is marked by gouge cemented by quartz and limonite in a zone 10 to 40 feet thick. Movement on

the fault is believed to have been essentially horizontal with the north side moving west, possibly 200 feet. Many minor faults with displacements of 3 feet or less are present in the mine. None of them appear to control tungsten mineralization.

The tactite bands are of low grade. The average of 12 samples from the beds exposed underground and 4 from the surface outcrops southwest of the mine is 0.8 percent of WO_3. In the underground workings, the beds contain up to 0.6 percent near the granite contact, but are leaner away from the contact and are nearly barren at the outer limit of tactite. Higher grade streaks were found near the top of the lowest bed in the mine; this bed in general is of better grade than the other 2 beds. A streak assaying 0.82 percent was found in a pit at the surface southwest of the mine, but the large tactite masses southwest of the mine contain an estimated 0.15 percent of WO_3, somewhat lower than the mine average.

In 1945, it was estimated that the middle bed in the Gunmetal

mine still contained 2,400 tons of indicated ore with a grade of 0.4 to 0.5 percent. Undeveloped portions of the lower bed appeared to offer the best chance for finding additional ore of this grade. The large mass of tactite southwest of the mine was estimated to contain 90,000 tons of inferred ore above the lowest exposure, but the grade was only 0.15 percent.

Desert Scheelite

The Desert Scheelite property, on a pediment half a mile east of the base of the range, consists of 8 unpatented claims located by G. F. Thompson of Mina in 1935, and held in 1943 by him and C. W. Taylor of Tonopah. Workings consist of 2 open pits, a 50-foot inclined shaft with a small stope at the bottom, a 65-foot vertical shaft, and several trenches, pits, and short adits. The eastern open pit and the 50-foot shaft were dug in 1940 by the Smith Brothers of Silver Peak. The western pit was opened in 1941 by J. W. Warner. It is reported that about 1,000 tons of ore were treated in the

Desert Scheelite mill, also known as the Oromonte, about 3 miles northeast of the mine.

Tactite, in a large, tabular body 50 feet wide and 700 feet long with a steep north dip, is exposed along the bottom of a shallow draw (fig. 127). Thinner, less continuous tactite beds are found 100 to

---

Fig. 127. Geologic map and sections of the Desert Scheelite mine, Mineral County, Nevada.

---

200 feet north of the main mass. The tactite is largely confined to a few limestone beds, but it also occurs in fractures that cut across the limestone.

The tactite exposures on the Desert Scheelite claims are the largest in the district, but they contain only 0.1 to 0.2 percent of WO_3. The scheelite is evenly distributed through the tactite in small grains that fluoresce yellow. Richer streaks, only a few square feet in area, are occasionally found along fracture planes, but they do not form shoots of sufficient size for selective mining.

To a depth of 100 feet, the main tactite bed with its inferred extension west to the 50-foot shaft is estimated to contain 600,000 tons of rock with an average of 0.16 percent of WO_3. The grade is estimated on the basis of 3 selected samples taken for assay, and a careful examination of all exposures in ultraviolet light. The depth to which mineralization extends is not known.

Garnet

The Garnet group of 6 unpatented claims was owned in 1943 by G. F. Thompson and the Summerfield estate, and was leased to the Victory Tungsten Co., a partnership among I. Foster Smith, Gertrude Smith, and W. A. Schmidt. The property was operated intermittently from 1941 to 1943 by the Victory Tungsten Co., and the ore was treated in a dry mill moved to the Garnet mine from Oak Spring, Nevada, in 1941. Production was 129 units of WO_3 from an estimated 1,050 tons of ore treated.

Workings consist of an open pit and an inclined shaft 40 feet

deep sunk from the pit down the dip of the principal tactite layer. There are several small prospect cuts north and west of the pit.

Garnet tactite with considerable sphalerite and pyrite borders a dike and a sill in thin-bedded limestone (fig. 128). The 2 principal tactite layers, bordering the sill, are about 20 feet thick and range in grade from nothing to 1.0 percent of WO_3. The richer material is beneath the sill. Only a few square feet of the exposed tactite contain as much as 1.0 percent, and the best ore that could be mined contains about 0.5 percent. The ore milled probably contained about 0.4 percent, for the recovery amounted to 0.12 percent and a sample from the tailings assayed 0.28 percent.

Fig. 128. Geologic map and sections of the Garnet mine, Mineral County, Nevada.

In 1943, it was estimated that the lower layer of tactite, to the bottom of the shaft, contained nearly 4,000 tons of indicated ore,

with a grade of 0.5 percent, in a block 80 feet long, 12 feet thick, and 40 feet deep. Inferred ore below this block was estimated at 100 tons per foot of depth. The rest of the tactite on the property is of lower grade.

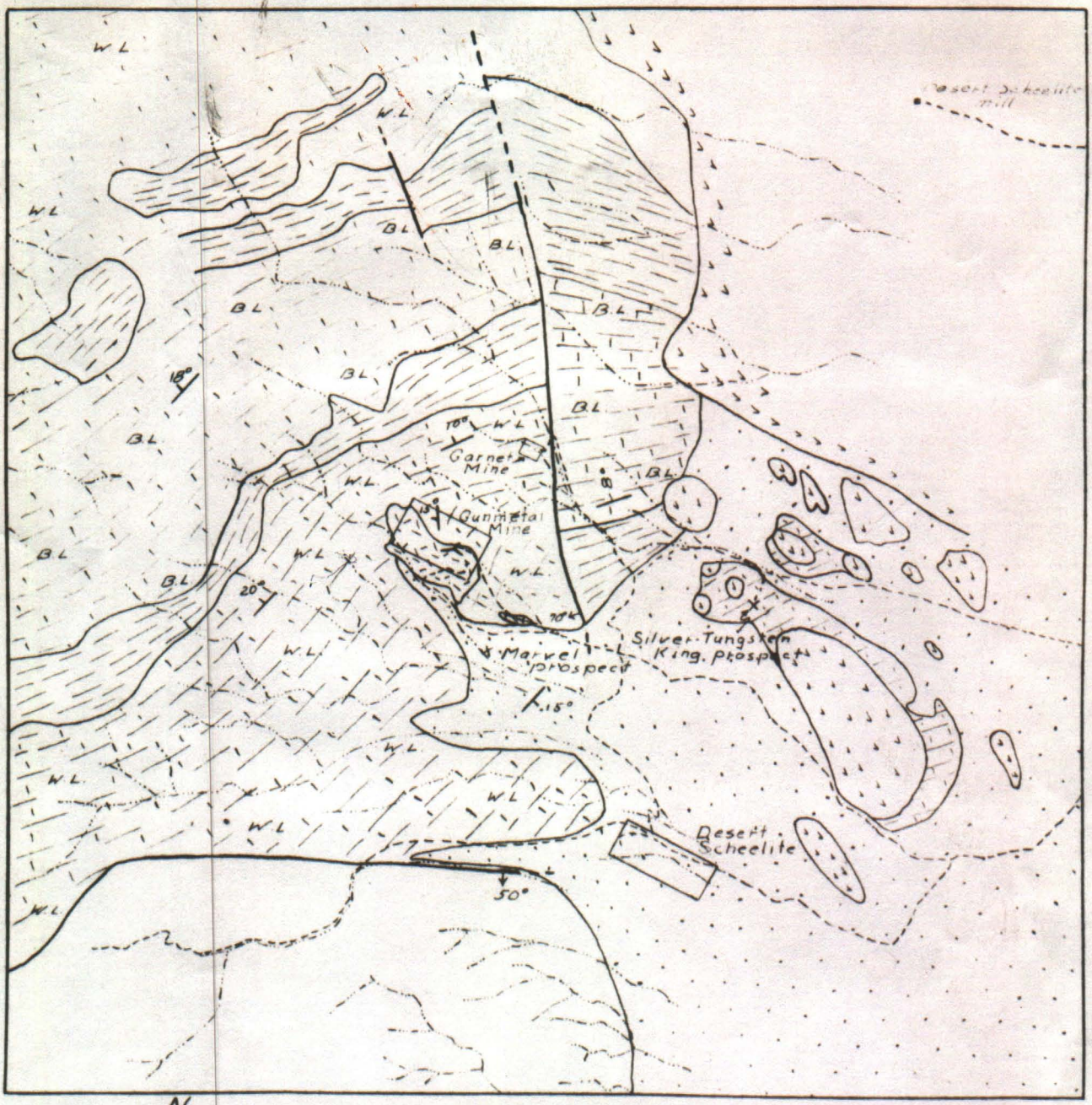
Silver-tungsten King

The Silver-tungsten King property was owned in 1943 by G. F. Thompson and George Zark. Traces of scheelite, estimated at 0.1 percent of WO_3, are found in copper-stained tactite along a contact between limestone and quartz monzonite. Old workings, dug in search of copper, were partially watered and caved in 1943.

Other occurrences

A number of poorly exposed occurrences of tungsten-bearing tactite are found between the Desert Scheelite and Gunmetal mines. The tactite bodies all appear small, with a grade in general less than 0.5 percent of WO_3. In 1943, P. E. Hussar and Dr. D. A. Smith held the Marvel group of 9 unpatented claims adjoining the Gunmetal

group in the southeast. P. E. Hussar and B. F. Baker held the Lucky group of 4 claims. Other claims were held by Mrs. Elizabeth McNamara and Dr. O'Mahoney, and by Dr. D. A. Smith.



N

Fig 1

PILOT TUNGSTEN DISTRICT

PILOT RANGE MINERAL COUNTY NEVADA

0 3000 6000 9000 feet

(approximate)

Limestone

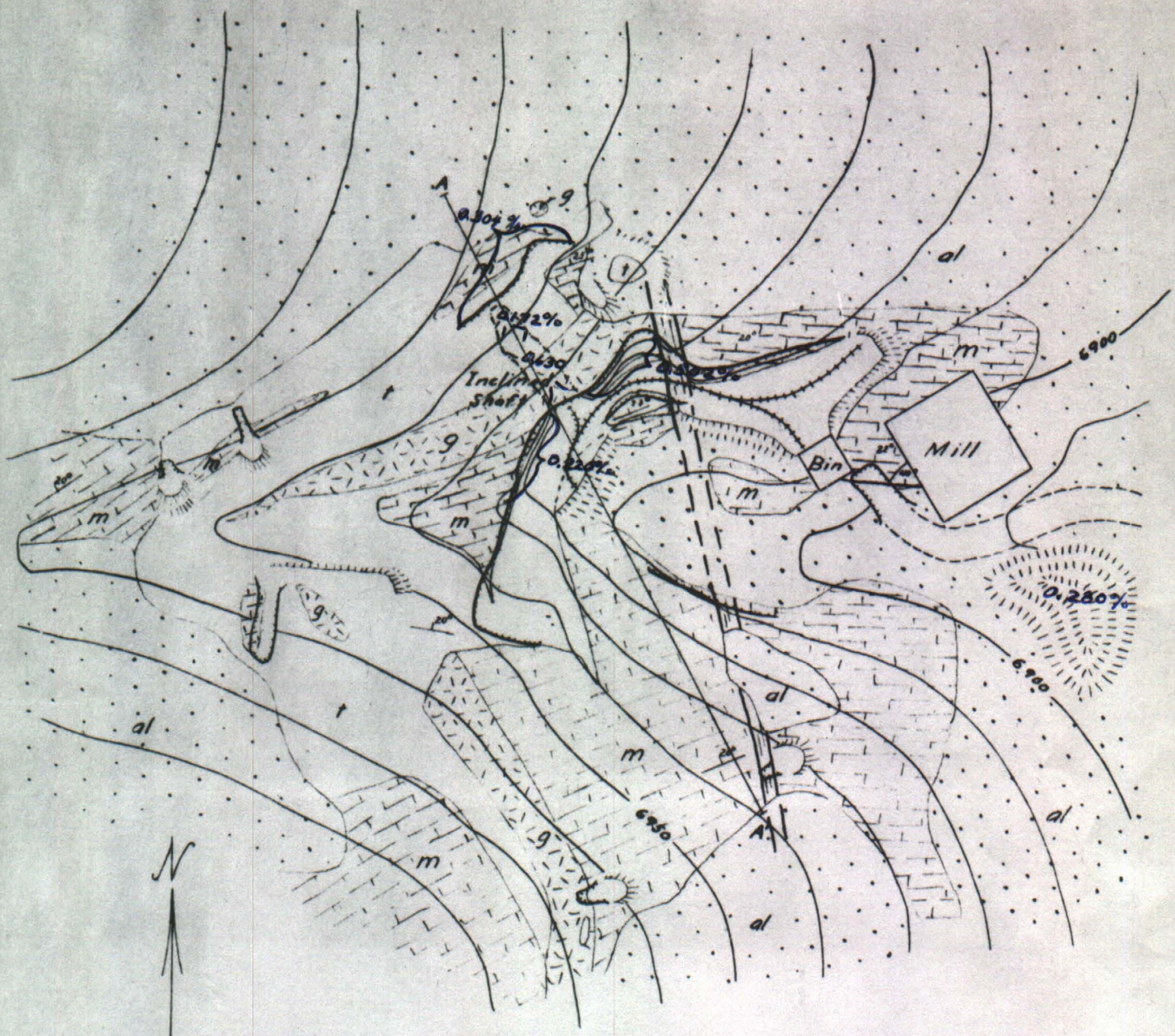
Alluvium

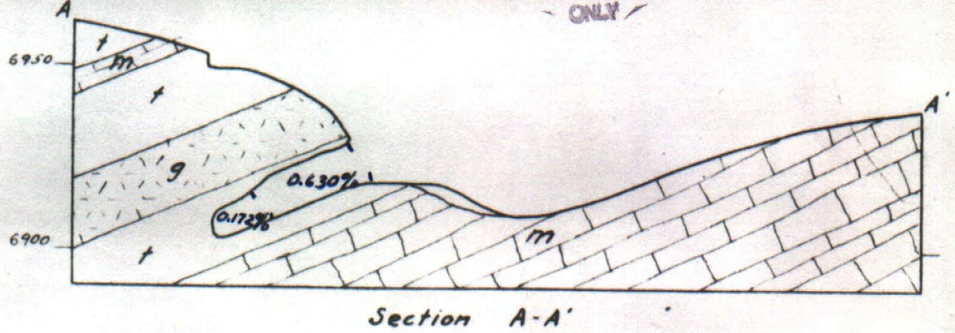
Hornfels

Granite

P C Bateman · M P Erickson
U.S. Geological Survey

5-27-43





Section A-A'

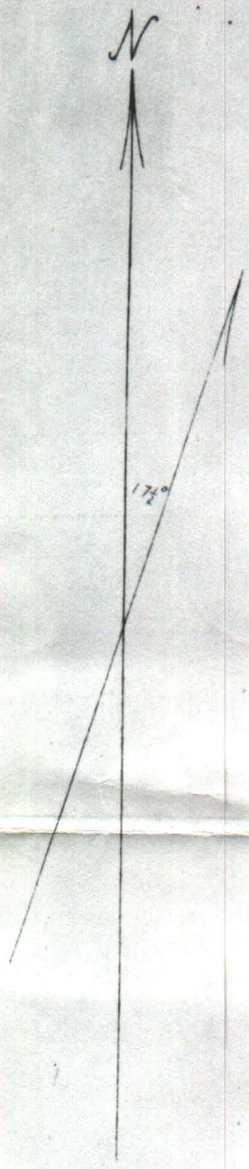


Fig. 5

GARNET MINE

Pilot Range, Mineral County, Nevada

0 50 100 150 feet

Contour Interval 10 feet

al. Alluvium
m. Marble
g. Granite
t. Tactite

Rim of open cut

0.316% Content of WO_3

P C Bateman and M P Erickson
U S Geological Survey
5-27-43

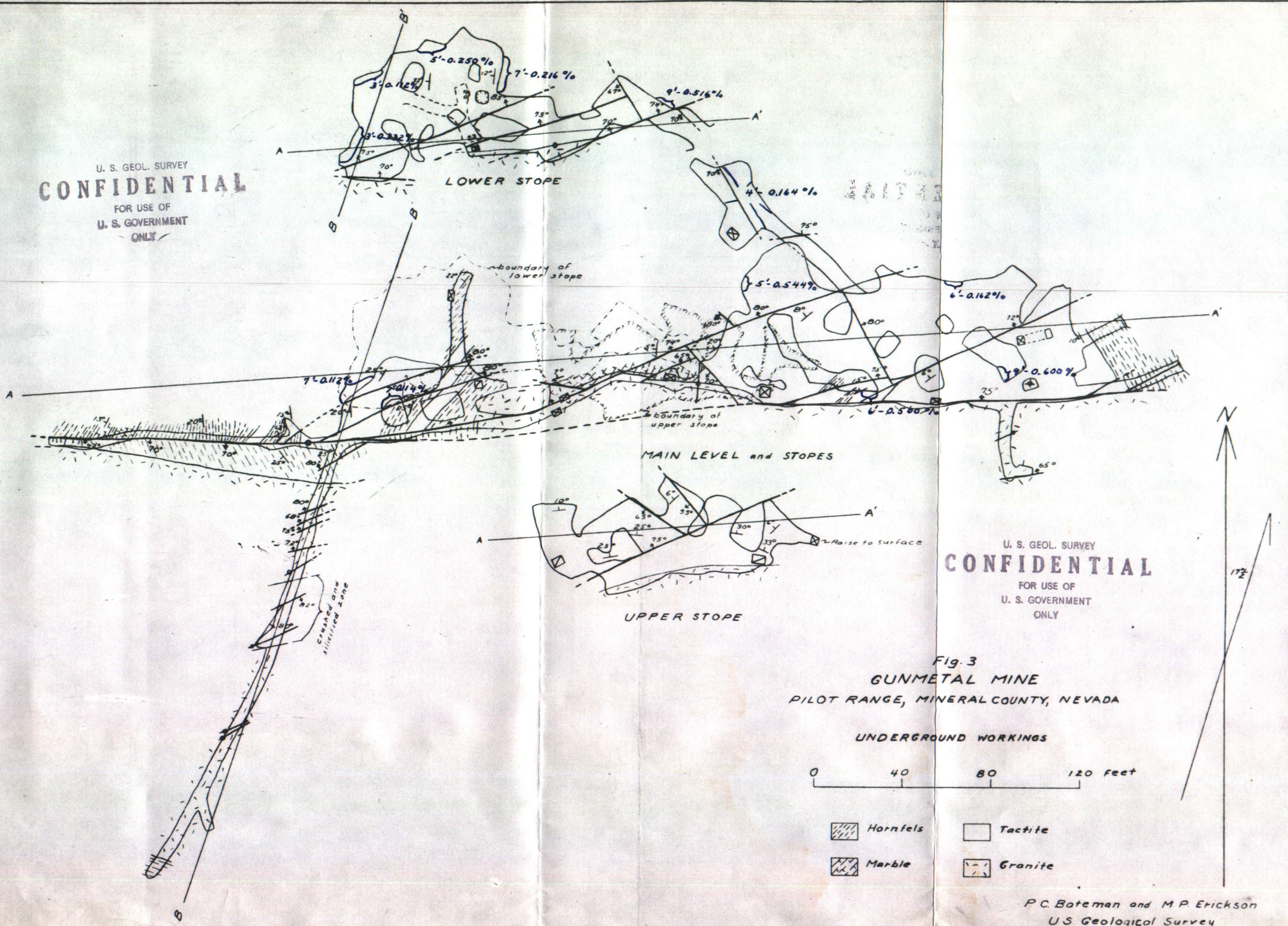


Fig. 3

GUNMETAL MINE

PILOT RANGE, MINERAL COUNTY, NEVADA

UNDERGROUND WORKINGS

0 40 80 120 feet

Hornfels
Tactite
Marble
Granite

P C. Bateman and M P. Erickson
US Geological Survey
6-3-43

7'-0.316% Thickness of bed- Content of WO_3

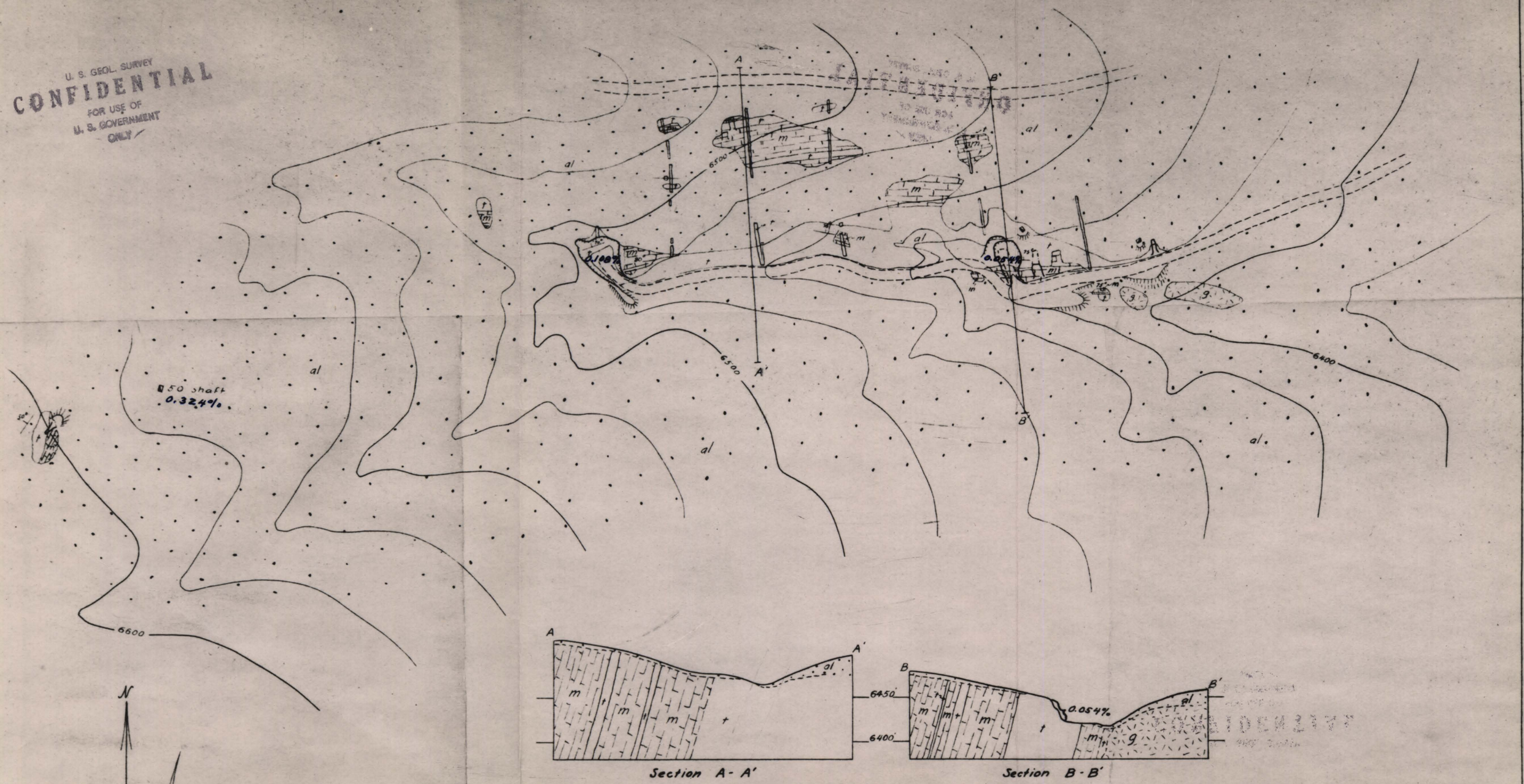


Fig. 6
DESERT SCHEELITE MINE
Pilot Range, Mineral County, Nevada

0 100 200 300 feet

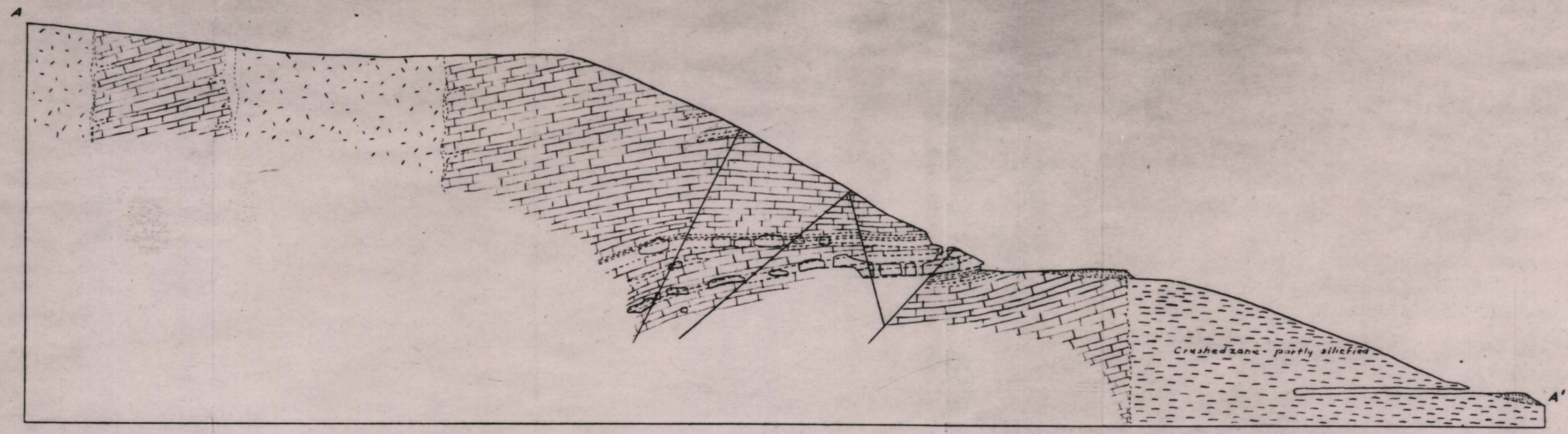
Contour Interval 20 feet

al Alluvium
m Marble
g Granite
t Tactite

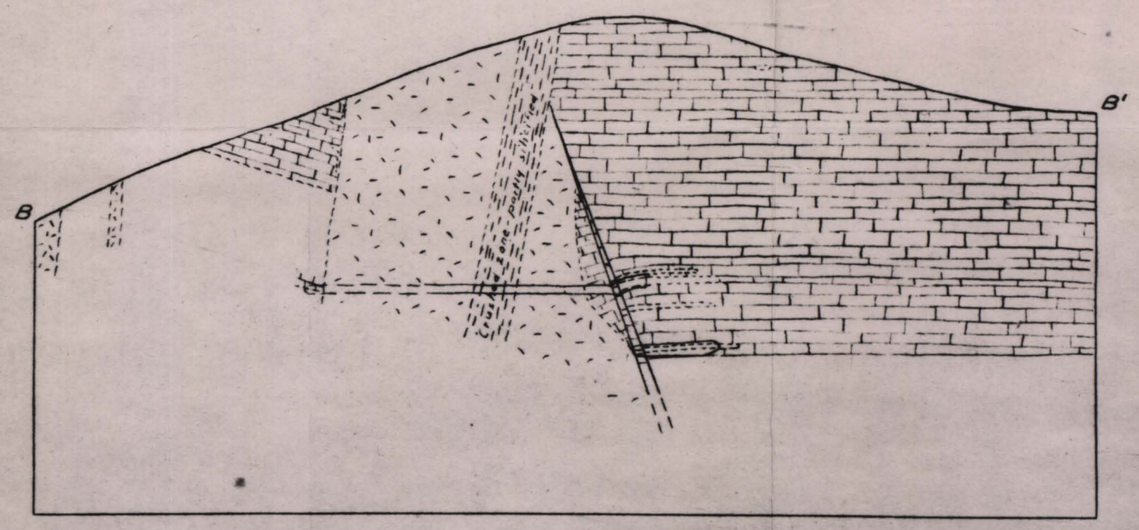
Open cut

0.316 Content of WO_3

P. C. Bateman and M. P. Erickson
U.S. Geological Survey
5-29-43



Section A - A'



Section B - B'

Fig. 4
GUNMETAL MINE

SECTIONS

0 100 200 300 feet

Tactite
Granite
Marble

P C Bateman and M P Erickson
U S. Geological Survey
6 - 3 - 43

U. S. GEOL. SURVEY
CONFIDENTIAL
FOR USE OF
U. S. GOVERNMENT
ONLY

Fig. 2

GUNMETAL MINE

Pilot Range, Mineral County, Nevada

0 100 200 300 feet

Contour Interval 20 feet

m Marble — Silicified zone

t Tactite — g Granite

Open cut

0.316% Content of WO_3

P C Bateman and M P Erickson
U S Geological Survey
5-29-43