REPORT ON

ALUM GULCH MOLYBDENUM PROSPECT
ESMERALDA COUNTY,
NEVADA.

ALUM GULCH MOLYBDENUM PROSPECT August 15, 1940

Mr. W. T. Landy

A. A. Gustafson

Dear Mr. Landy:

Herewith you will find our report on the Alum Gulch Molybdenum prospect. Included with the report in the folder you will find the following:

(1) Regional map
(2) General map of property
(3) Geological map of Roper Adit
(4) Assay map of Roper Claims
(5) Assay map of Sorenson Claims
(6) Two pages of photographs

We are sorry this report has been delayed so long, but we have been waiting to get the final costs on this project so that we could compile costs for drilling, driving the Roper Adit, and also include the total cost of the project subdivided into the various operations. We trust this delay has caused no inconvenience.

Yours very truly,

A. A. Gustafson

AAG:JMD
Enc.
CC: Mr. Claiborne
Mr. McIver
Mr. Lee
New York Office

ALUM GULCH MOLYBDENUM PROSPECT

ESMERALDA COUNTY, NEVADA

INTRODUCTION:

The property, consisting of a number of unpatented claims, was called to the attention of Freeport Sulphur Company in November, 1938, by T. C. Healy, a New York broker who aided in financing prospecting work done by Edward W. Brooks, of Los Angeles, during 1936 and 1937. It was represented as having showings of low grade ore with attractive possibilities of developing a large tonnage, and was acquired from the owners on August 5, 1939, through options to purchase for a total price of $450,000.

In order to avoid legal difficulties, as some of the claims were in litigation, no sampling or other prospecting was done until after the options were signed. Prospecting was discontinued April 2, 1940, when it was decided to abandon the property.

During this time, a camp was maintained at an elevation of 6,350 feet in Alum Gulch, 57 miles from Goldfield, Nevada, the supply point. A laboratory was established at Goldfield for running molybdenum analyses.

SUMMARY AND CONCLUSIONS:

The prospecting done by Freeport consisted of sampling the outcrops and the existing workings, a reconnaissance geological survey, 541.5 feet of crosscutting and drifting and 1333 feet of diamond drilling. The soft and caving nature of the ground made the cost of underground development high.

The molybdenite occurs in a northwest trending alaskite porphyry intrusion about a quarter of a mile wide and two miles long. The country rocks are older porphyritic granite and metamorphics, into which the alaskite has been intruded, capped in places by volcanics. Cross sections of the intrusion that are adequate for determining the character and extent of mineralization are provided by the Sorenson Cliff, an exposure a thousand feet in height which crosscuts the northern end of the intrusion, and the development at the Roper Adit and the diamond drill holes.

The mineralization occurs in narrow fissures and veins in the porphyry that show a broad, general northwest trend. Quartz, sericite, and marcasite are associated with the molybdenite. Traces of gold and copper are present in the porphyry; silver and tungsten are found only in the contact rocks.

The molybdenite occurs sparsely disseminated throughout the northern portion of the intrusion but nowhere was it found in commercial quantities, averaging for the most part less than 0.1% MoS_2. Zones of slightly higher values were encountered parallel to the strike of the intrusion, two crossing the Sorenson Cliff and one in the Roper Adit, but these failed to show commercial values even over narrow widths. A possible increase in primary enrichment with depth seems largely discounted by the failure to find a change in values between the top of the Sorenson Cliff and the bottom of the drill hole at the base of the Cliff. Penetration to the unoxidized zone has eliminated the possibility of secondary enrichment. Development work has shown that the extensive quartz veins of the Quartz Adit are a minor feature and do not represent a quartz "plug" like that at Climax.

In view of these findings, therefore, it has been concluded that the Alum Gulch prospect holds little promise for the development of a commercial molybdenum or other metal deposit.

LOCATION AND ACCESSIBILITY:

The Alum Gulch prospect is located in western Esmeralda County, Nevada, at the head of Death Valley (see Regional Map). It is in unsurveyed land that falls in township 7 south, range 39 east (M.D.M.), about two miles east of the California boundary. The mining district in which it is located is known as the Sylvania or Green Mountain district, and produced silver and lead for a short period from about 1870. The Tule Canyon Placer gold district lies to the east.

Two points on the property are accessible by road. One place, the Sorenson Camp, near the northwest end of the prospect, is 48 miles from Goldfield, Nevada, via Lida, Pigeon Springs and Log Springs. The lower or Alum Gulch Camp, where the Freeport Sulphur Company camp was located, is 57 miles from Goldfield via Tule Canyon and Death Valley. The lower road is subject to washouts and slides in several miles of the Alum Gulch portion and is not passable unless given constant attention. The road to Sorenson Camp is usually passable and is the easier means of access.

Goldfield, the nearest rail connection, is served by the Tonopah and Goldfield railroad which connects with the Hazen branch of the Southern Pacific at Mina, Nevada.

Big Pine, California, is 65 miles west of Sorenson Camp via Oasis and Westgard Pass.

OWNERSHIP:

The mining claims that the Freeport Sulphur Company held under option are known as the Roper-Sorenson-Smith group. There are 35 lode claims, a placer claim and a millsite in this group, owned as follows:

Roper Group of five lode claims:

George and Nellie Roper	27.20%
George and E. L. Hampton	24.28%
Cornelia H. Smith	12.00%
Paul and Cora Emanuelson	10.50%
H. R. and Elynor Roper	10.00%
Paul and Florence White	5.70%
Ethelyn Finkelstein	4.38%
Neva Landrum	3.88%
Anna Nelson	1.00%
C. C. Thurston	.50%

Sorenson Group of 24 lode claims:

R. B. and Amy Sorenson, sole owners.

Smith Group of six lode, one placer and one millsite:

Northern Transportation and Supply Company, Lindsay Smith, President, Gordon H. Smith, Secretary-Treasurer.

In addition to these, Freeport located 17 claims and two millsites for the account of the Roper interests and Northern Transportation and Supply Company. These were relocations of claims which had been located by Edward W. Brooks, and the relocations were made in order to clear the titles. Freeport also located 14 placer claims on ground covered by the lode claims as patent protection in case the government should declare the ground to be placer.

Freeport Sulphur Company obtained the property for prospecting and mining through a series of options entered into on August 5, 1939. The options provided four months of free prospecting time to be followed by monthly payments of $250 each to the Sorenson and Roper groups for a period of 12 months, and payment of the purchase price in larger installments to be completed at the end of 58 months. The total purchase price of the property was $450,000 divided as follows:

Roper Group (payment in denominations of $10,000 and $37,000 after 16 months)	$250,000
Sorenson Group (payment in denominations of $10,000, $20,000 and $25,000 after 16 months)	$175,000
Smith Group (Northern Transportation) (full payment after 16 months)	$25,000

Under the option Freeport was required to spend $1,000 per month and was permitted to begin mining at its own discretion, paying the owners ten per cent of the returns from the sale of ore until the purchase price was paid.

Freeport allowed the option to lapse on April 5, 1940.

The water rights at Lida Springs, owned by the Goldfield Consolidated Water Company and formerly used for the town of Goldfield, were obtained under an option dated October 10, 1939. The option was obtained from W. H. Willett, San Francisco, in the name of L. F. Detwiler, Lida, Nevada, formerly employed by the water company, and retained by Freeport as a water consultant. Terms of the option were as follows:

Initial payment	$400
Monthly payments (to be credited to purchase price)	$10
Purchase Price Use of spring water, minimum of six shifts of work per month on springs.	$4,000

This option was arranged by Detwiler and he was to receive ten per cent of $10,000 and half the difference between the actual purchase price and $10,000.

The option was dropped on April 10, 1940.

The buildings and furnishings at the lower camp are owned by Northern Transportation and Supply Company, having been acquired from Brooks through foreclosure for non-payment of bills. These buildings with included furnishings were rented by Freeport. Sorenson owns the buildings at the upper camp.

HISTORY:

The Sylvania mining district was organized in 1872 after the discovery of silver and lead ore in 1870. A 30-ton lead smelter was erected in the district in 1875 and was operated for several years. Mines were operated on some of the ground that was under option to Freeport and the old workings are still visible.

In about 1902, Charles Hines, now of Big Pine, California, had a number of claims in the vicinity of Alum Gulch, located for gold and silver. Hines apparently did little development work and did not hold the property for very long.

The presence of the mineral molybdenite was known as early as 1914, as there is a reference to the locality in bulletin No. 585 of the U. S. Geological Survey, published in that year. In about 1920 the property was examined for Climax Molybdenum Corporation by Hayward and Warren, but no prospecting work was done.

Sorenson became interested in the area in 1916 or 1917 and staked his first claim with a partner named Myers. Sorenson has been the sole owner since 1927. Excepting for the location and assessment work, very little development work has been done on these claims.

George Roper and George Hampton located the original claims of the Roper Group in 1932 at a time when they were looking for a deposit to turn to German interests. It was brought to their attention by Fred Swan, a miner at the Comanche (California) mine. Failing to turn the property to the Germans, they held it and attempted to interest others. Among those examining it were Union Carbide, Lehman Corporation, and Goldfields Consolidated.

In 1936, an option was taken on both the Roper and Sorenson claims by Edward W. Brooks, Los Angeles geologist. Backed at first by R. D. Clarke of Los Angeles, Brooks constructed the Alum Gulch road and the lower camp, and began driving a crosscut tunnel on the Roper property. After this work had been started, Clarke refused to continue financing it and Brooks obtained the support of T. C. Healy, New York. Work was discontinued for lack of funds in the latter part of 1937. Brooks defaulted in his payments to the owners and his option lapsed. A total of about $50,000 had been spent, and an indebtedness of about $5,000 remained.

The physical equipment at the property and claims which had been staked for Brooks were attached by Northern Transportation and Supply Company. This company also did some development work during March, 1938, driving the 90-foot Sorenson Adit, but was unable to bear the cost of much exploration and discontinued work.

The property was brought to the attention of Freeport late in 1938 by Healy who was acting only in the capacity of a broker. Negotiations for an option to prospect and mine were begun soon thereafter and agreements were finally signed on August 5, 1939. Considerable delay resulted from the badly divided status of the Roper fee, and the debts which Brooks had incurred against the property.

The prospecting work was started by Freeport immediately after the options were signed and was discontinued on April 2, 1940.

OPERATING CONDITIONS:

The area is one of rugged mountains and much of it is difficult of access. Trunk line highways are well maintained but the side roads are used very little and consequently are not kept in good condition. The road to the lower camp is very rough in the Alum Gulch portions, being subject to frequent washouts and slides. Although the distance airline from the upper to the lower camp is only about a mile, the distance by road is 29 miles. It would be possible, however, by building about two miles of road in Uncle Sam Canyon to reduce the distance by road between camps to about six miles and also improve the route to the lower camp greatly.

The elevation at the lower camp is 6350 feet and that at the upper or Sorenson Camp is 7300 feet. During prospecting operations, headquarters were maintained at the lower camp and while drilling was in progress at the upper camp, the trip back and forth was made on foot. The drilling locations at the upper camp were beside the road and equipment and supplies could be moved in by truck, excepting during February and March when the road was impassable, because of mud. In order to drill the hole in Alum Gulch, however, it was necessary to skid the drilling rig to the location with the aid of the drilling engine, and to pack in other equipment and supplies by man power.

The region has a mild climate and a rainfall of about five inches. Although cloudbursts are reported to be fairly common, none occurred during the period of prospecting. During the winter a total of about 12 inches of snow fell at the upper camp and 7 inches at the lower camp.

The mountain slopes and valleys support a growth of pine and juniper that is surprisingly heavy for this region. Most of the trees are too small for use as mine timbers, but the wood was used as fuel. Other vegetation consists of typical desert species.

Water for use at the lower camp was hauled from a well in Uncle Sam Canyon, a mile from camp. The stream in Alum Gulch flows about 20 gallons per minute of very acid water which was used for drilling purposes. At the upper camp water for drilling was obtained from Log Springs, three miles distant, although while the roads were very bad, some water was obtained by melting snow. The water at Lida Springs, on Magruder Mountain, which was held under option, is about eight miles from Alum Gulch and could be piped over by gravity flow. This would provide an adequate source for milling purposes, as the flow is rated at 900 gallons per minute, and up to 400,000 gallons a day were used when Goldfield was taking the water.

The Palmetto substation of the Nevada-California Power Company, 15 miles distant, is the nearest source of electric power.

The fuel which was used consisted largely of gasoline, oil, and coal, brought in by the truck. Native wood was also used.

Mining and food supplies were obtained at Goldfield, Tonopah, and Silver Peak. Miners and other workmen from Goldfield, Silver Peak, and Tonopah were employed. The diamond drilling was done by John M. Weller, local contractor. The maximum force consisted of seven miners, three diamond drillers and three helpers,

three mining engineers, a geologist, a truck driver and a cook, a total of 19. The buildings at the lower camp were rented by Freeport. These included six cabins, a mess hall, a small garage, and a compressor house at the Roper Adit. Two of the cabins at the Sorenson Camp were occupied by the diamond drillers. Freeport erected a small sample house at the upper camp and a bath house and powder house at the lower camp.

A laboratory for running molybdenum analyses was established in October at Goldfield and was operated by a chemist of the Freeport staff. Downer Brothers, Goldfield assayers, ground the samples and ran the gold and other fire assays.

PREVIOUS DEVELOPMENT:

The principal development for molybdenite on the property at the time Freeport started prospecting was the adit on the Roper claims driven 473 feet by Brooks and his associates. The first 50 feet of this adit were driven with hand steel while a jack hammer was used for the remainder. Immediately above this adit, a 30-foot adit was driven by Russell Roper using hand steel. Russell Roper also drove a 40-foot adit at the exposure of the extensively developed quartz veins. On the Sorenson property, Northern Transportation and Supply Company drove a 90-foot adit near the top of the cliff. In addition to this work, several small cuts had been made on both properties.

The Alum Gulch road and the numbers one, two, and three trails were constructed by Brooks.

The workings that were dug in the course of prospecting and mining silver in the early days of the district are no longer open.

EXPLORATION:

The prospecting work conducted by Freeport included (1) preliminary sampling, (2) reconnaissance geological mapping, (3) crosscutting and drifting, and (4) diamond drilling.

Preliminary Sampling:

Immediately after the options were signed, August 5, 1939, sampling of outcrops and old workings was begun. Prior to this time, no sampling whatever had been done by Freeport. Before this work could be done, however, trails which Brooks had made had to be reworked and several new ones had to be built.

Chip samples were cut at intervals of five to ten feet across all outcrops showing indications of molybdenum mineralization. Where extensive oxidation had occurred, the surface was cleaned down to the fresh sulphides before samples were cut. The samples weighed five to ten pounds each.

The Roper Adit was sampled from a point 130 feet in from the portal to 473 feet, the position of the breast when Freeport took over the property. The intervals were from five to twenty feet in length and the samples were chipped from the walls. Samples were cut in similar manner from the 30-foot adit above the Roper Adit, the Quartz Adit and the Sorenson 90-foot adit.

Two mineralized zones were outlined on the basis of results from this

sampling and plans were laid to do core drilling in order to determine the extent of these zones. It should be noted here that Black and Deason of Salt Lake City ran these samples and that the Freeport analysts later proved their results to be too high.

In addition to the surface work already noted, discovery pits were dug on the 17 Venture and Enterprise claims which were located by Freeport for the account of the Roper interests and the Northern Transportation and Supply Company.

It was decided that a geological report on the property was desirable before definite plans were formulated for an extensive prospecting program.

Reconnaissance Geological Survey:

On October 18, 1939, Paul Murphy, a Salt Lake City geologist who had worked in the Goldfield district for several years, began a survey of the property using a topographic base map prepared by Freeport. The Brunton Compass and the Paulin Altimeter were used in making the base map and doing the geological surveying.

In the course of the survey, Murphy, assisted by W. F. Kaiser, Freeport, traced the contacts of the mineralized zone and mapped the broader structural and petrographic features, completing the field work on November 7, 1939. The results of this survey were made available on December 1, 1939, in the form of a report, geological map on a scale of one inch to 200 feet, and detailed cross sections. Murphy recommended that the work at the Roper Adit, which Freeport had resumed, be continued, that a diamond drill hole started on the Sorenson Cliff be drilled to depth, and that diamond drill holes be drilled at the Roper Adit and in Alum Gulch below the Quartz Adit.

Crosscutting and Drifting:

On September 17, 1939, Freeport started advancing the Roper Adit with hand steel, beginning at 473 feet, the point at which work had been discontinued by Brooks. The direction of the adit was changed slightly in order that it would more nearly crosscut the intrusion. Intermittent work was done until December 20 by a shift of three men, part of their time being devoted to discovery pits, trails, and other similar jobs. A total of 49 feet was penetrated by hand, advancing the adit to 522 feet.

Mechanical equipment, which included a 105-cubic foot compressor, a mounted 55-pound jack hammer, column, arm, and water pressure tank, a blower, and a crusher, were placed in operation on January 2. The compressor and a bit grinder were rented and the other equipment was purchased. The work was placed on a two-shift basis on January 5, and on a three-shift basis, two men to a shift, on January 24. When the crosscut had been advanced to 766 feet, tunneling work in this direction was discontinued and the ground was further penetrated by diamond drilling. A drift was then started in a southeasterly direction, 447.3 feet in from the portal, in order to follow the best molybdenite showing encountered in the adit. The showing decreased in amount, however, and the drift was stopped at 175 feet. Crosscuts were driven from the end of the drift to the southwest and northeast but failed to encounter appreciable values. As it had been decided that the ground in the breast of the main adit was suitable for diamond drilling and that further drifting did not seem justified, this form of prospecting was discontinued. The last drifting was done on April 1, 1940.

A total of 512.5 feet was driven by machinery, making the entire amount

561.5 feet that Freeport advanced the workings at the Roper Adit. During March work was done on a contract basis and the advance per shift was 3.2 feet, while the figures for January and February, when the work was done on company time were one foot and 1.8 feet, respectively. It should be noted that although the ground penetrated during March required less timbering than that penetrated previously, the difference in footage is due largely to increased efficiency resulting from the added incentive of the contract.

Excepting for the last 50 feet, the ground penetrated by the crosscut was broken and wet and required timbering. The greatest difficulties were experienced where zones of shattered siliceous rock associated with sericite were encountered. In most cases, ground of this type was associated with water and would soon begin to cave if allowed to stand without timbering for any length of time. In the interval from 564 to 576 feet, spiling had to be driven ahead with a boom in order to overcome the caving.

Although the drift followed along the strike of a series of gouge zones, the ground stood better than that in the crosscut and required less timbering. Apparently the crosscut had partially drained it as it carried considerably less water. The shorter crosscuts caved in about the same manner as the main crosscut.

The formation was sampled by saving every twentieth shovelfull, and each round of three to five feet was considered as a sample. The samples, weighing from 500 to 1,000 pounds, were broken down in a jaw crusher to a particle size of less than 3/4 inch and split down in a Jones splitter to a fraction weighing from five to ten pounds.

Diamond Drilling:

As the results of the surface sampling, (using the Black and Deason analyses that later proved to be too high), indicated the presence of zones approaching the tenor of ore, it was decided to test these zones by drilling to them at depth. There was some question, however, about the advisability of attempting to diamond drill the soft, shattered ground, and both diamond drilling and churn drilling were considered. Diamond drilling was finally decided upon after John M. Weller, a local contractor, and Sullivan Drilling Company examined the ground and offered to drill it. Sullivan wanted to drill on a cost plus basis but Weller offered to drill by the foot and his bid was accepted.

The contract with Weller was as follows:

(1) Base price per foot of $3.50. (Underground drilling at $3.50 per foot with Freeport furnishing air power, water).

(2) If sampling interval less than 10 feet, $1.00 per foot additional.

(3) Casing $1.00 per foot for first 100 feet, $2.00 per foot thereafter (revised from original contract).

(4) Cementing at $3.00 per hour, including time for drilling out cement, Freeport to furnish cement.

Drilling was begun on October 24, 1939, and was continued until April 2, 1940, the date on which prospecting was discontinued. A total of 1333 feet was drilled in five holes. This footage was distributed as follows:

Sorenson No. 1, 60° hole drilled at Sorenson camp using Sullivan No. 22 rig, begun on October 14, 1939---completed December 12, 1939. (abandoned due to stuck rods). Total Depth---201 feet.

Sorenson No. 2, vertical hole drilled in Alum Gulch at Survey Station No. 2 using small airdrill adapted to Whippet motor, begun December 10, 1939--completed March 17, 1940. Total Depth--380 feet.

Sorenson No. 3, vertical hole drilled at Sorenson camp using Sullivan No. 22 rig, begun December 15, 1939--completed February 28, 1940. Total Depth--365 feet.

Roper No. 1, horizontal hole drilled in breast of main crosscut using light airdrill, begun March 14, 1940--completed March 25, 1940. Total Depth--217 feet.

Roper No. 2, vertical hole drilled in main crosscut 524 feet from portal using light airdrill, begun March 27, 1940--completed April 2, 1940. Total Depth--170 feet.

Soft ground that caved easily and required continuous cementing or casing was encountered in all of the holes except Roper No. 1. Considerable difficulty was experienced in getting the cement to set sufficiently hard to hold the caving formation, particularly at Sorenson No. 2. Experiments were conducted at the Goldfield laboratory in which various mixes were used, employing Lumnite and Portland cements, lime, and gypsum. The best results were obtained with a neat Lumnite mix, using only enough water to allow pouring, and stirring as little as possible. It was found that the gulch water used in drilling Sorenson No. 2 and also the formation water were strongly acid (P_H of about 3). Treatment of the water with an excess of lime reduced the setting time, although from 24 to 36 hours was required at this location in comparison to 12 hours at Sorenson No. 1 and 3. This difference was ascribed to the fact that Sorenson Nos. 1 and 3 did not make formation water and were drilled with fresh water.

The hole sizes and casing programs varied somewhat for the different holes. It was learned in drilling the first hole that cementing or casing was advisable after each 20 to 40 feet of hole had been drilled in order to avoid caving of the hole, and that 200 feet was the maximum distance which individual strings of casing could be carried. As the first hole was started with a short 2½ inch stand pipe, which proved inadequate, subsequent holes were started with 3 to 5 inch, 2½ inch was set at 15 to 30 feet. AX casing was carried to around 200 feet, and the hole was continued with EX. In drilling the underground holes, L M rod was used in addition to the A and E sizes.

Core recovery amounted to 20 per cent for Roper No. 1, the horizontal hole in the Roper Adit, but was less than five per cent for the others. The drilling sludge, all of which was saved, was caught in metal boxes 4 x 1 x 1 feet in dimensions, with a central baffle plate to facilitate settling and a surface plate near the outlet for catching floating particles. The drilling water was re-circulated through a system of two of these boxes and a tub or barrell sump. The sludge samples were dried by setting the boxes over fire pits, and the dried samples were split to a size of about five pounds with a Jones splitter. Sludge samples were for the most part overweight, in spite of the policy of following the bit closely

with cementing or casing. It would appear that the samples were sufficiently representative, however, from the similarity of the results obtained in cross-cutting and in diamond drilling at the Roper Adit.

In addition to the delay caused by the difficult drilling, much time was lost on account of mechanical trouble. The pumps and engines which the contractor brought to the job were too small and demanded almost continous attention until finally replaced by adequate units (15 horse power). Failure to stock replacement parts was the cause of repeated delay, especially in view of the isolated location.

ANALYSES:

During the early stages of the work, the samples were sent out to commercial laboratories for molybdenum analyses. It is unfortunate that most of these samples were sent to one of the few laboratories whose molybdenum analyses have been found to be unreliable. In the table below are tabulated all of the results received from commercial laboratories that were checked by the Goldfield laboratory and for all the samples that were sent to more than two commercial laboratories. These results show that the molybdenum determinations of the Grande Ecaille laboratory, the Goldfield laboratory, A. A. Hanks, Ledoux, and Parker all check with satisfactory precision. The results from Black and Deason are consistently high and those from Smith-Emery are erratic.

	LABORATORY						
Sample	G.E.	G'field	Hanks	Ledoux	Parker	Smith Emery	Black Deason
21	.06	.06	.05	.07	Trace		.20
34	.07		.13	.13	"		.20
41	.04		.05	.07	"		.14
48	.23	.22	.17	.22	.20		.30
80		.33		.42		.03	
111	.36		.43	.45	.45	.33	.49
112	.26		.30	.33	.30	.23	.45
118		.05				.07	
119		.04				.05	
400		.19	.16	(.16 Herman)		.20*	
163		.09				.91	
320		.06				.33	
3031		.02				.86	

*—checked by flotation test.

As a further check on the accuracy of our analyses, seven samples that are representative cross-section of our samples were analyzed by the Rare and Precious Metals Section of the Bureau of Mines in Reno. This section of the Bureau has charge of the work on rare metals, including molybdenum. Their chemists have worked extensively developing methods of determining molybdenum and in the course of this work cooperated closely with the major producers of molybdenum. The methods developed were checked by the analysts of these companies and further checked by the results of mill and pilot mill tests. A comparison of the results obtained by the Goldfield laboratory with those of the Bureau of Mines is given below.

PER CENT MoS_2

Sample	Goldfield Laboratory	Bureau of Mines
3027	0.03	0.00
2013	.04	.01
320	.06	.02
163	.09	.04
403	.20	.18
"B"	.33	.34*
615	.55	.49

*Average of ten determination run by various Bureau of Mines analysts.

Of these samples, 3027 is from the drill hole on the cliff; 2013 is from the oxidized portion of the drill hole in the gulch; 320 and 163 are from the Roper Adit; "B" is a composite sample taken from the "high grade" portion of the adit; 403 is from drift; and 615 is from a prospect near Campo, California.

The precision with which all analyses are checked by the Bureau of Mines removes any doubt as to the accuracy of our results. That the results reported by most of the commercial laboratories check our results indicates that many of these laboratories, including Hanks, Ledoux, Parker, and probably Herman can be relied on to make accurate molybdenum determinations.

The method used for the determination of molybdenum in the Goldfield Laboratory was the alpha benzoin oxime method taken from Bureau of Standard's Research Paper No. 453. This method was chosen because with it there is no chance of interference by other elements except tungsten.

GEOLOGY:

General:

The molybdenite prospect is located at the head of Alum Gulch, a deeply incised valley opening into the north end of Death Valley. Erosion has cut deeply into the mineralized formation, leaving a distinctive scar that is visible for a considerable distance to the south. Sorenson Cliff, a thousand feet in height, virtually crosscutting the formation, has been formed. The relief in general is rugged, but the smooth outlines characteristic of granite and limestone country are the rule. A pronounced high level bench and a recent conglomerate bed are evidence that the region has undergone rejuvenation through uplift fairly recently.

Alum Gulch creek issues from the cliff region and Roper Adit, flowing ten to twenty gallons per minute down the gulch for several miles until it disappears in the wash. At the point of issue, the water is strongly acid and contains alum.

The Sylvania Mountains, in which the deposit occurs, are composed of granites intruded into Paleozoic sediments, and the whole has been subjected to Tertiary or Quaternary vulcanism. Molybdenite, associated with marcasite and sericite, occurs in the northwestern end of a northwesterly trending zone of aplite, alaskite porphyry, and altered granite about two miles long and a quarter of a mile wide.

MINERALOGY AND PETROGRAPHY:

The minerals and rock types have been discussed by Murphy in his recent report. Briefly, the minerals of interest are as follows:

Molybdenite--MoS_2

Molybdenum sulphide, as flat particles less than a millimeter in width, occurs (1) disseminated, (2) along the borders of quartz veins, (3) along fault plains as a gouge, and (4) as fine grained coloring matter in quartz. The best values in molybdenite, around 0.20% MoS_2, were found in aplite associated with abundant sericite.

Molybdite--MoO_3

A yellow to orange oxidation product of molybdenite, water soluble, occurring widely over the surface of the Sorenson Cliff. Probably contains iron in most occurrences, being in reality a molybdic ocher.

Ilsemannite:

A rare blue or purple molybdenum sulphate of indefinite composition occurring as a stain in old workings on the Sorenson Cliff and in a few places on the open cliff. Very readily soluble in water, being dissolved by rain or snow water, showing most prominently in the late summer months.

Marcasite and Pyrite--FeS_2

Iron sulphide, chiefly in the form of marcasite, occurs disseminated throughout the mineralized zone, in many places, in the absence of molybdenite and sericite.

It comprises from five to ten per cent of the more mineralized formation. In places, bunches of the pure mineral up to six inches in diameter were found. Small cubical crystals of pyrite occur in places in the Roper Adit. Marcasite has altered to sulphur near the Quartz Adit, and commonly alters to form sulphuric acid, alum, and other sulphates.

Chalcopyrite, Bornite, and Sphalerite

The sulphides of copper and zinc were found in the Roper Adit but are not common.

Sericite

This secondary mica, a variety of muscovite, is very common throughout the mineralized zone and occurs in considerable abundance in gouge seams, where pure masses of two or three inches in thickness are formed. Sericite is also abundant where the better shows of molybdenite occur. A mixture of sericite and molybdenite or marcasite coats fault or "slip" surfaces.

Quartz

The mineralized zone in places is well silicified. Wide veins of milky quartz are extensively developed in the vicinity of the Quartz Adit; here large

quartz crystals are present that in places are coated with molybdenite and sericite, and vugs are filled with marcasite. Quartz veins are fairly common in other parts of the mineralized zone. There has been replacement by silica.

In addition to these minerals, there are also the introduced minerals hematite, limonite, epidote, fluorite, and gypsum.

The mineralized zone is composed of an aplite-alaskite porphyry that in a few places has been almost completely silicified. A blocky, silicified, more porphyritic appearing zone in the alaskite that is resistent to erosion has been referred to as cap rock by Murphy and others as it caps the Sorenson Cliff. The rock beneath the cap is shattered and fissured, eroding rapidly. A hard crust of kaolin, molybdite or molybdic ocher and other alteration products cover this surface.

Throughout the alaskite there occur patches of biotite granite varying in width from a few inches to large features referred to by the miners as "horses". The granite contains marcasite, epidote, and traces of disseminated molybdenite, but also contains unaltered biotite and feldspar. This granite occurs at the base of Sorenson Cliff and was found in Sorenson No. 2 drill hole to the total depth of 380 feet. Of the 984 feet penetrated by the crosscut and horizontal drill hole in the Roper Adit, 150 feet on the portal end and 500 feet on the other end were in granite.

The country rocks consist of porphyritic granite and metamorphosed sediments, in places covered by volcanics. The granite is composed of phenocrysts of potash feldspar in a coarsely crystalline ground mass of quartz, feldspar, and biotite. Recrystallized limestone and slates are the chief metamorphics. In places the limestone is almost completely garnetized and carries traces of scheelite.

Flow rocks of andesitic composition are the chief volcanics. There are also small areas of tuffs and breccias.

A well cemented, very coarse textured conglomerate occurs as a filling of an earlier, broader valley on the northern end of the property. A considerable thickness of unconsolidated wash has been deposited in Alum Gulch.

STRUCTURE:

The mineralized zone strikes N-60°-W, and at the contacts dips 60°-N. This zone has been exposed by erosion over a distance of more than 12,000 feet, along which it has an apparent width of 1,000 to 2,000 feet. The contacts are visible in only a few places, but their general courses can be traced excepting where completely obscured by wash and slides or volcanics. Limestone inliers occur along the footwall. Important structural features have the same strike as the zone and include strong fissuring and systems of quartz veins. The strongest development of quartz veins occurs in the vicinity of the Quartz Adit. At this point there is a vein of white quartz that has a maximum width of 100 feet and can be traced for a distance of 600 feet. Zones striking N-60°-W with slightly better molybdenum values than the average were encountered in the Sorenson Cliff and the Roper Adit. At the surface the zones in the Sorenson Cliff appear to dip 60°-N, but the lower or No. 2 zone was not encountered in No. 3 Sorenson diamond drill hole which was carried 75 feet below the depth indicated. The zone in the Roper Adit, which was traced by drifting, was found to be erratic and not over 10 feet in width. Fissures which parallel the strike and which are associated with sericite gouge and slickensides are well developed in the central portion of the mineralized zone. Dips are predominatingly to the north.

While the latest and strongest mineralization appears to have favored the N-50°-W trend, there is a pronounced trend striking E-W and dipping northward. The mineralization along this trend is the same as that along the other, and apparently is very nearly contemporaneous with it.

While there are certain broad structural trends, the smaller structural features are very complex. Minor faulting and mineralization has occurred in all directions. The mineralized zone has been intensively shattered, particularly in the central portion, and mineralization has occurred along the innumerable openings provided. Among the smaller structural features, the E-W pattern seems to be repeated the most often.

The country rocks were not affected by the structural forces that shattered the mineralized zone. In fact, these structural forces are most pronounced in the central portion and die out toward the borders.

MINERALIZATION:

The sulphide mineralization represents a hydrothermal phase, near the end of the intrusion of an acid magma. The iron and molybdenum sulphide mineralizations were probably nearly contemporaneous, although the former, much stronger of the two, was slightly earlier. Quartz and sericite, the other important secondary minerals, both preceded and accompanied the sulphides. Evans has explained the sericite as an introduced mineral, rather than as an alteration product as concluded by Murphy, and this seems justified in view of the large amount of sericite present. Murphy and Evans also differ on the intensity of the mineralization, Evans considering it rather weak whereas Murphy thought it to be very strong. Exploration work that has been done since Murphy studied the occurrence has revealed an extensive development of granitic rock containing unaltered biotite and feldspar. It has also been proved that the quartz veins that are strongly developed at the Quartz Adit are of limited extent, and that there is no evidence of extensive mineral zones. In this connection, it should be noted that the contact rocks show little or no sulphide mineralization. Evans has pointed out also that there is no sericitization or silicification of the contact rocks. The only alteration noted is the garnetization of the limestone in a few places, and this mineralization probably did not accompany the introduction of the sulphides. The lead-silver mineralization in the limestone at the contacts probably also is unrelated.

Copper and gold are present but the amounts are negligible. The highest gold assay was but 0.02 an ounce and copper was reported as less than 0.1 per cent. The following spectrographic analysis, made by the John Herman Laboratory of Los Angeles, was run on a sample from the zone in the Roper Adit showing the highest molybdenum values:

(Quantities are only approximate)

Element	Percentage
Silicon	over 10.0
Aluminum	over 10.0
Iron	1.0
Potassium	0.1
Sodium	0.1
Calcium	0.1
Molybdenum	0.1

Element	Percentage
Manganese	0.01 to 0.1
Copper	0.01 to 0.1
Magnesium	0.01 to 0.1
Titanium	0.01
Strontium	0.01
Chromium	0.01
Barium	0.001 to 0.1
Lead	0.001
Gallium	0.001
Vanadium	0.001
Nickel	0.001

ECONOMIC GEOLOGY:

This property was acquired by Freeport as a molybdenite prospect on the strength of the widespread occurrence of traces of the mineral and the reported results of development work done by Brooks. The results of sampling the outcrops and existing workings, and of underground development at the Roper Adit and in the diamond drill holes on the Sorenson property, however, did not reveal the existence of commercial molybdenite values. The possibility that other minerals or elements might occur in commercial quantities was also given careful consideration. Gold assays were run at regular intervals but no values of interest were obtained. Assays for copper likewise showed no commercial values, and silver and tungsten were found to be not present. In addition, a spectrographic analysis, given above, failed to reveal the presence in quantities of commercial importance of any metallic or other element.

Further exploration of the prospect is considered unjustified, therefore, for the following reasons:

(1) Although the molybdenite occurs over a very extensive area, the grade is much too low to be of commercial value at the present.

(2) The possibility that the Roper Adit when discontinued by Brooks, was entering an ore zone (Murphy Recommendation No. 1) has been eliminated by further development work.

(3) The possibility of increased mineralization at depth is well discounted by the exposure in the Sorenson Cliff and by drilling (for primary enrichment), and by the extension of the Roper Adit into unoxidized ground (for secondary enrichment--Murphy Recommendation No. 2).

(4) Failure to encounter extensions of the prominent quartz vein system of the Quartz Adit either in the Sorenson No. 2 drill hole or the Roper Adit largely removes this feature from consideration as an important center of mineralization (Murphy Recommendation No. 3). Evans noted that this feature is in no way similar to the quartz plug at Climax and that there are no indications that the Alum Gulch occurrence is a pipe or stock (stock work), as in the case of Climax and of the porphyry copper deposits. Evans states (observations of April 4, 1940) that the only character in common with Climax is the abundance of sericite.

(5) Any possibility of the existence of extensive mineralized zones has been largely eliminated by the drilling (even though shallow) on the Sorenson Cliff and the drifting at the Roper Adit. As noted by Evans, even though one of the narrow zones should carry better values at depth, conditions for mining it are unfavorable.

Alum Gulch, Nevada
April 16, 1940
A. A. Gustafson
R. E. Taylor

APPENDIX A

COSTS:

From the best information available, about $50,000 was spent in prospecting this property before Freeport took an active interest.

The total amount expended by the Freeport Sulphur Company was $65,282.91 from July, 1939, to August 1, 1940. Of this amount, $2250 was paid to the owners of the mining property. Legal expense amounted to $12,423.64, most of which was spent before any prospecting was started.

A detailed account of expenditures is as follows:

	Total	% of Total
Supervision, office, and traveling expense	$9,898.01	15
Camp expense	2,704.47	4
Car and truck expense	1,642.12	3
Water expense	2,367.38	4
Engineering, geological, sampling, and analytical expense	9,367.14	14
Legal expense and perfecting titles	12,918.20	20
Payments on property	2,250.00	3
Drilling	7,088.60	11
Surface prospecting and trails	2,745.01	4
Drifting and crosscutting Roper Adit*	8,397.49	13
Payroll overhead and insurance	2,883.27	4
Equipment purchased (Includes full price of both cars)	3,021.22	5
TOTAL	65,282.91	

* Crosscutting in adit with hand drilling penetrated 49 feet at a cost of about $25.00 per foot timbered 4' x 7' in the clear. Crosscutting and drifting with machinery penetrated 512½ feet at a cost of $16.12 per foot timbered 5' x 6' in the clear. A small part of the 512½ feet did not require timbering.

The cost per determination for analyses in our laboratory was $6.00

COST OF DIAMOND DRILLING

	FEET DRILLED	COST PER HOLE	COST PER FOOT
464 Sorenson Hole No. 1	201	$ 963.00	$4.79
470 " " " 2	380	2,318.00	6.10
471 " " " 3	365	1,945.50	5.33
465 Roper " " 1	217	717.50	3.31
474 " " " 2	170	665.00	3.91
	1,333	$6,609.00	$4.96

TOTAL COST OF DIAMOND DRILLING

(Includes labor furnished, air, and moving charges)

FR464 Sorenson Hole No. 1	201	$1,006.60	$5.01
470 " " " 2	380	2,500.44	6.58
471 " " " 3	365	2,075.50	5.69
465 Roper " " 1	217	795.13	3.66
474 " " " 2	170	710.93	4.18
	1,333	$7,088.60	$5.32

COST OF DRIVING ROPER ADIT

WITH MACHINERY

ADVANCE 512½ FT.

	COST	PER FOOT
LABOR	$4,367.86	$8.52
MATERIAL		
Timber	$1,274.89	$2.49
Operating Supplies		
Powder	256.00	.50
Caps & Fuses	81.00	.16
Gasoline & Oils	242.13	.47
Other Supplies	761.54	1.62
	$2,634.56	$5.14
MONTHLY CHARGES		
Compressor and other equipment rentals	$ 642.50	$1.25
Depreciation at 15% per month on capital expenditures, excluding crusher and Wisconsin engine	619.87	1.21
Total	$1,261.37	$2.46
Total Cost	$8,263.79	$16.12
Estimated Cost--Dec. 16, 1939		16.66

APPENDIX B

LOG OF SORENSON HOLE NO. 1

Elevation: 7470 feet

Location: 8202-N 2861-E
Collared: 10/25/39--completed 12/12/39
Total Depth: 201 feet
Casing Record: 0-4 feet 2½ inch surface
0-125 feet AX

Driller: Herman Rutter.

From - To	Formation			MoS_2 in Sludge
0 - 4 ft.	Surface formations	3" special bit		
4 - 10	Brown granitic "caprock"	AX bit, steel	24% core	0.05
10 - 20	Broken alaskite	A bit	No core	.10
20 - 30	" "	"	"	.14
30 - 40	" "	"	"	.11
40 - 50	" "	"	"	.15
50 - 60	" "	"	"	.07
60 - 70	" "	"	"	.21
70 - 75	" "	"	"	.06
75 - 85	" "	"	"	.03
85 - 88	" "	"	"	.05
88 - 90	Gray, pyritic alaskite	"	"	.05
90 - 100	" " "	"	6 inch core	.04
100 - 110	" " "	"	No core	.05
110 - 120	" " " visible moly	A bit	6 inch core	.07
120 - 127	Gray alaskite, less pyrite	A bit	No core	.06
127 - 135	Gray alaskite, pyrite, Rods stuck a little	A bit	2 inch core	.13
135 - 145	Gray alaskite, marcasite	A bit	No core	.19
145 - 155	Light gray alaskite, less marcasite	A bit	No core	.07
155 - 165	" " ", very soft	A bit	No core	.05
165 - 175	" " ", marcasite	A bit	½ inch core	.06
175 - 185	" " ", soft	A bit	No core	.03
185 - 194	Gray alaskite, marcasite, moly	A bit	6 inch core	.17
194 - 201	Sludge, slimy, formation taking mud, increased moly. Rods stuck. Hole abandoned	A bit	No core	.14

LOG OF SORENSON HOLE NO. 2

Elevation: 6555 feet

Location: 6233-N 418-E
Collared: 12/10/39 - completed 3/18/40
Total Depth: 380 feet
Casing Record: 0 - 5 ft. 4 inch surface
0 - 211 ft. AX
0 - 320 ft. EX
0 - 315 ft. EX

Driller: Honeywell, Demmer, Miller, Weller

From - To	Formation			% MoS_2 in Sludge
0 - 5 feet	Surface formations	B Bit		
5 - 10	Alaskite with marcasite	"	2 inch core	0.03
10 - 20	" " " , soft	"	No core	.04
20 - 30	" " "	A Bit	No core	.04
30 - 37	Hard alaskite with quartz	"	1 foot core	.06
37 - 40	" "	"	2 inch core	.07
40 - 47	Soft "	"	No core	
47 - 50	Hard "	"	6 inch core	.05
50 - 60	Soft alaskite, marcasite and moly	"	11 inch core	.04
60 - 70	" " " " "	"	10 inch core	.10
70 - 80	" " " " "	"	No core	.07
80 - 90	Hard, fine grained alaskite	"	1 foot core	.04
90 - 100	Soft, " " "	"	1 inch core	.03
100 - 110	Hard and soft alaskite	"	10 inch core	.04
110 - 120	Soft, oxidized alaskite	"	1½ inch core	.04
120 - 123½	" " " , moly gouge	"	13 inch core	.11
123½ - 127	Broken gray alaskite, trace moly	"	5 inch core	
127 - 138	Gray soft alaskite, hole making water	A Bit	No core	.05
138 - 148	Soft alaskite, oxidized	"	2 inch core	.05
148 - 160	" " with thick zones sericite	"	1 inch core	.07
160 - 170	Gray alaskite and granite, oxidized	"	12 inch core	.04
170 - 180	Gray granodiorite, feldspars oxidized	"	20 inch core	.06
180 - 190	Soft gray granite	"	No core	.05
190 - 200	Soft gray, biotite	"	4 inch core	.07
200 - 210	" " "	"	4 inch core	.05
210 - 220	" " "	"	4 inch core	.09
220 - 230	Gray granite, predominantly green and black ferro-magnesium minerals, large feldspar crystals, oxidized	"	15 inch core	.07
230 - 239	Gray granite	"	No core	.07
239 - 250	Oxidized alaskite with sericite gouge	"	18 inch core	.06
250 - 260	Alaskite with sericite gouge	"	No core	.09
260 - 270	Soft alaskite with sericite gouge	"	No core	.09
270 - 280	Siliceous alaskite	"	4 inch core	.10
280 - 290	Soft alaskite with sericite gouge	"	No core	.06
290 - 291	Soft alaskite, bit blocked	"	No core	.07
291 - 300	Soft granitic alaskite, oxidized	E Bit	10 inch core	.05
300 - 310	Soft oxidized alaskite	"	No core	.04
310 - 320	Very soft oxidized alaskite	"	No core	.02
320 - 330	Soft granite and sericite, kaolinite gouge, abundant ferro-magnesium minerals	"	6 inch core	.03
330 - 340	Continuation above, oxidized	"	10 inch core	.02
340 - 342	Siliceous alaskite and gouge, bit plugged	"	12 inch core	.01
342 - 352	Alaskite and sericite gouge, bit plugged at 348 and was pulled	"	34 inch core	.01
352 - 358	Sericite gouge and alaskite, oxidized. Bit plugged at 358	"	20 inch core	.01
358 - 380	Light gray, oxidized alaskite	"	10 inch core	.04

LOG OF SCHERNSON HOLE NO. 3

Elevation: 7409 feet

Location: 3365-N 3390-E
Collared: 12/15/39--completed: 2/28/40
Total Depth: 365 feet
Casing Record: 0 - 5 feet--3 inch stand pipe
0 - 31 feet--2½ inch
0 - 135 feet--AX

Driller: Herman Rutter

From - To	Formation			% MoS_2 in Sludge
0 - 5 feet	Surface formations	5 inch Bit		
5 - 20	Broken alaskite caprock	BX Bit	2 inch core	.04
20 - 30	Alaskite caprock	AX Bit	No core	.03
30 - 40	Broken alaskite caprock	"	"	.04
40 - 50	Alaskite, quartz and sericite	"	3 inch core	.10
50 - 60	Broken alaskite in sericite and kaolinite, less oxidation	"	No core	.08
60 - 70	Alaskite with traces moly	"	6 inch core	.09
70 - 80	Alaskite in sericite and kaolinite, traces moly	"	No core	.05
80 - 90	Same as previous interval	"	"	.12
90 - 100	"	"	"	.03
100 - 110	"	"	"	.04
110 - 120	"	"	"	.04
120 - 130	" , with hard streak of quartz	A Bit	3 inch core	.04
130 - 140	Soft formation, sludge slimy	"	No core	.02
140 - 150	Soft alaskite, sericite	"	"	.03
150 - 160	" , coarse cuttings	"	"	.04
160 - 170	Alaskite with trace moly	"	2 inch core	.04
170 - 175	Moderately hard alaskite	"	"	.04
175 - 185	Hard and soft alaskite	"	No core	.01
185 - 195	Alaskite	"	"	.06
195 - 205	Oxidized alaskite	"	11 inch core	.03
205 - 215	" " , traces moly	AX Bit	14 inch core	.04
215 - 225	Medium hard alaskite, traces moly, oxidized feldspars, primary mica	"	2 inch core	.01
225 - 235	Like above	"	No core	.02
235 - 245	Medium hard alaskite like above	A Bit	14 inch core	.03
245 - 255	Hard alaskite--granitic	"	24 inch core	.03
255 - 265	Soft granitic alaskite	"	No core	.02
265 - 275	" "	"	"	.03
275 - 285	Same as previous interval	A Bit	No core	.04
285 - 295	" " " , sludge very frothy and slimy. Plugged	"	"	.01
295 - 305	Soft, sugary aplite-poly	" (Borium)	"	.02
305 - 315	" " " , good showing moly	" "	"	.02
315 - 325	Same as above	" "	"	.04
325 - 335	" "	" "	"	.02
335 - 345	Like above, but harder, hole using water	" "	"	.02
345 - 355	Same as above	" "	"	.01
355 - 365	Coarse grained granitic alaskite with biotite and hornblende, very little moly	A Bit Diamond Borium	24 inch core	.01

LOG OF ROPER HOLE NO. 1 Elevation: 6943 feet

Location: Breast Roper Adit (766 feet from Portal)
Collared: 3/14/40--completed: 3/25/40
Total Depth: 217 feet
Casing Record: 0 - 5 feet AX standpipe
0 - 115 feet AX

Driller: Weller, Miller, Wallace
Machine: Air, LM Rods. 105 cubic ft. compressor at surface

From - To	Formation			% MoS_2 in Sludge
0 - 5 feet	Biotite granite, blocky	NX Bit		
5 - 20	Blocky alaskite porphyry and granite with disseminated marcasite and trace molybdenite. Hole making water	LM Bit	5½ ft. core	.01
20 - 30	Hard, blocky alaskite porphyry	"	1½ ft. core	.02
30 - 40	" " "	"	2 ft. core	.07
40 - 50	Soft and seritic to caving somewhat, hard granite to 50	"	2½ ft. core	.06
50 - 60	Soft, gray oxidized granite	"	2 ft. core	.03
60 - 70	" " "	"	1½ ft. core	.03
70 - 80	Fairly blocky gray granite	"	1½ ft. core	.02
80 - 90	" " "	"	5½ ft. core	.03
90 - 100	" " "	"	4 ft. core	.02
100 - 110	" " "	"	1 ft. core	.05
110 - 120	" " "	"	1½ ft. core	.04
120 - 130	" " "	"	1½ ft. core	.03
130 - 140	Soft gray granite with feldspars slightly oxidized, very little if any moly	"	2½ ft. core	.03
140 - 150	Gray granite, very little oxidiation. Blocky	"	3 ft. core	.03
150 - 160	Same	"	6.2 ft. core	.03
160 - 170	Gray, unoxidized granite, no moly	"	6.7 ft. core	.03
170 - 180	Same	"	5.3 ft. core	.02
180 - 190	Same	"	3 ft. core	.02
190 - 200	Soft gray granite and sericite gouge	"	½ ft. core	.02
200 - 210	Broken, siliceous granite, unoxidized. No moly.	"	0.8 ft. core	.02
210 - 217	Same. Drilling abandoned because of caving condition of hole and lack of air pressure.	"		.04

LOG OF ROPER HOLE NO. 2 Elevation: 6488 feet

Location: Bottom Roper Adit
Collared: 3/27/40--completed: 4/2/40
Total Depth: 170 feet
Casing Record: 0 - 9 feet--3 in.
0 - 15 feet--2½ in.

Driller: Weller, Miller, Wallace
Machine: Air, LM Rods. 105 cubic ft. compressor at surface

From - To	Formation			% MoS_2 in Sludge
0 - 3 feet	Broken alaskite in bottom adit	Dug with shovel		
3 - 9	Same	Drove with hammer		.07
9 - 20	Soft granite	AX Bit	No core	.03
20 - 25	Granite and alaskite, moly show	"	6 inch core	.08
25 - 30	Gouge zone with hard streaks	A Bit	No core	.07
30 - 40	"	"	No core	.07
40 - 50	" , moly show	"	6 inch core	.10
50 - 60	" , caving	"	No core	.08
60 - 70	" , caving	"	No core	.03
70 - 80	Broken granite, caving above	"	12 inch core	.06
80 - 90	Same	"	No core	.04
90 - 100	Hard granite and alaskite	E Bit	12 inch core	.06
100 - 110	Same	"	12 inch core	.01
110 - 120	Same	"	12 inch core	.05
120 - 130	Broken granite	"	4 inch core	.06
130 - 140	Broken granite	"	No core	.08
140 - 150	Soft granite and gouge	"	6 inch core	.07
150 - 160	Same	"	No core	.07
160 - 170	Same	"	No core	.03