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

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224 New Customhouse
Denver 2, Colorado

Date Rec'd
SEP 8 1952
BUREAU OF MINES
Denver, Colorado

September 4, 1952

Memorandum

To: Acting Administrator, Defense Minerals Exploration Administration
Attention: Code 210

From: Field Team, Region IV

Subject: Final Report, DMEA Docket 2604, (Lead-Zinc) S. E. and W. E. Burleson, Antero Mine, Saguache County, Colorado

The application for Government assistance in exploration work estimated to cost $37,400, has been approved by us and a contract is being prepared.

Government participation will be 50 percent, or $18,700.

Four copies of the Final Report will be forwarded when the contract is signed.

The original and one copy of Form 3b is attached.

W. H. King
W. H. King

A. H. Koschmann
A. H. Koschmann

Encl.

cc: WMTraver w/copy of final report
AHKoschmann " " " "
Mining Div. " " " "
DMA Final Report

Mining Division
Region IV

September 4, 1952

Memorandum

To: Field Team, Region IV

From: Acting Chief, Mining Division, Region IV

Subject: Final Report, DMEA Docket 2604, (Lead-Zinc) S. E. & W. E. Burleson, Antero Mine, Saguache County, Colorado

Enclosed are eight copies of the engineering report on DMEA-2604 by M. H. Salsbury of the Bureau of Mines.

The examining engineer concludes that the applicants are experienced and able mine operators and that the project has outstanding possibilities. He recommends that the loan be granted.

We concur in this recommendation.

W. H. King

W. H. King

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Region IV

Building 20
Denver Federal Center
Denver 14, Colorado
August 20, 1952

Mining Division
Date Rec'd
AUG 21 1952
BUREAU OF MINES
Denver, Colorado

Memorandum

To: Executive Officer, Field Team, Region IV

From: Chief, Colorado Branch, Mining Division, Region IV

Subject: DMEA 2604 (Lead-zinc), S. N. and W. E. Burleson, Antero mine, Saguache County, Colorado

Please find enclosed the original and eight copies of the "Summary, Conclusions, and Recommendations", by M. H. Salsbury and N. N. Marshman, and of Salsbury's engineering report on the above docket.

The applicants' proposal was for an expenditure of $39,747.50 for exploration requiring a 74-foot extension of an existing crosscut, preparation of a hoist station with bins, and repairing 400 feet of track on the Antero tunnel level from which an inclined winze was to be sunk 140 feet, including a sump. At a depth of 125 feet a winze station was to be excavated and from it a crosscut driven 80 feet to the Antero vein and drifts run 200 feet on the vein.

The examiners revised the proposal by changing only the size of bin capacity on the tunnel level, resulting in a slight change in the cost estimates, making a total over-all project cost of $37,400.00.

Salsbury concludes the applicants are experienced and able mine operators and the project has outstanding possibilities for proving lead-zinc reserves similar to those now being mined profitably. He recommends approval of a loan for $37,400.00--Government participation, 50 percent or $18,700.00--and, in addition, suggests all mine production be subject to royalty. This presumably will be agreeable to the applicants and will make more secure the Government's recovery of its share of the loan.

I am in agreement with the conclusions and recommendations.

The brochure furnished with the Region IV Field Team's memorandum of instruction to make the examination is also enclosed.

W. M. Traver, Jr.

W. M. Traver, Jr.

enclosures
WMT:dd
cc 8
DMEA 2604, Chron.

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

200 New Customhouse
Denver 2, Colorado

September 2, 1952

Memorandum

To: DMEA Field Team, Region IV

From: A. H. Koschmann

Subject: DMEA Docket 2604, Antoro Mine, Saguache County, Colorado.

Attached are 8 copies of the geological report by E. N. Hershman covering DMEA Docket 2604, Antoro Mine, Saguache County, Colorado.

S. E. and W. E. Burleson, applicants, propose to explore 4 veins in the Antoro mine for lead-zinc ore by sinking a 5 by 10 foot inclined winze to an inclined depth of 140 feet, crosscut about 80 feet to reach the Antoro vein and drift about 200 feet on the vein.

The Antoro vein is in the Tertiary Rawley andesite, a series of flows 1000 to 2000 feet thick. The vein is 1 to 3 feet wide and carries galena, sphalerite, and chalcopyrite. The ore shoot now being mined apexes near the surface and extends downward to a point about 75 feet above the adit level. Ore shoots in the mine in general are lenticular bodies 1 to 3 feet thick and 10 to 50 feet long. The Antoro vein and the Poverty vein, another vein found in the mine, probably junction below the adit level in the area proposed for exploration. A diamond drill hole by the applicants proved the presence of 4 feet of lead-zinc ore in this area. Because of these favorable conditions, Hershman recommends that the loan be approved.

I concur in this recommendation.

A. H. Koschmann
A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures (8)

UNITED STATES
DEPARTMENT OF THE INTERIOR
OSCAR L. CHAPMAN, SECRETARY

DEFENSE MINERALS EXPLORATION ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMEA 2604, S. E. and W. E. Burleson

Antoro Mine

Saguache County, Colorado

Lead-zinc

M. H. Salsbury, Mining Engineer
Bureau of Mines

E. N. Harshman, Geologist
U. S. Geological Survey

August 8, 1952

DMEA 2604

S. E. AND W. E. BURIESON
ANTORO MINE
SAGUACHE COUNTY, COLORADO

Summary, Conclusions, and Recommendations

By M. H. Salsbury
Mining Engineer
Bureau of Mines

and

E. N. Harshman
Geologist
U. S. Geological Survey

DMEA 2604

S. E. AND W. E. BURLESON
ANTORO MINE
SAGUACHE COUNTY, COLORADO

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

By M. H. Salsbury and E. N. Harshman

An examination of the Antoro mine near Bonanza, Saguache County, Colo., was made July 16-17, 1952, by a Region IV examining team to check the application of S. E. and W. E. Burleson, P. O. Box 209, Salida, Colo., for exploration assistance under Defense Minerals Exploration Administration docket 2604, calling for the expenditure of $39,747.50, Government participation - 50 percent or $19,873.75.

The Antoro mine workings are in the Rawley andesite, the lower member of a thick series of volcanic flows and tufts which overlie pre-Cambrian granite, gneiss, and schist. In the vicinity of the mine, the flows strike N. 10° - 20° W. and dip about 20° west. They have been broken by many faults with small to moderate displacements, all of which appear to be premineral.

Almost without exception the faults at the area show some mineralization, and in the Antoro mine four fault fissures were sufficiently well mineralized to warrant exploration, development, and stoping. Ore bodies on the Antoro, Poverty, Northeast, and Zinc veins contain pyrite, galena, sphalerite, and some chalcopyrite, gold, and silver. Gangue minerals are quartz, barite, calcite, and rhodonite. Ore occurs in small to moderate sized lenses, deposition having been controlled by vein

structure and premineral cross faults. A vuggy structure and considerable clay gouge are characteristic of the veins at the Antoro mine. Rock alteration is intense and resulted in silicification and sericitization of both the hanging and footwalls.

The applicants have been operating the property since 1947 and have produced 12,000 tons of lead-zinc-silver ore with a gross value of $408,219.80, or $34.12 per ton. The average net return to the operators was $21.28 per ton. This production came from two of the three known ore-bearing veins of the mine, the Northeast and the Antoro. Of these, the Northeast vein produced probably 80 percent of the above tonnage. The production from the Antoro vein has been something over 1,700 tons but the exact amount is unknown because the operators ceased segregating the ore from other production in January 1951.

The other vein known to have been productive is the Poverty which lies west of the Antoro and probably intersects it to the south and also at depth. Prior to 1927, one stope on the Poverty vein was mined out above the tunnel level a distance of 50 feet, and there is still an 18-inch streak of galena and sphalerite in the floor of the tunnel level beneath the stope, assaying a trace gold and 6.7 ounces silver per ton, 24.3 percent lead, 1.0 percent zinc, and 0.2 percent copper.

While the Antoro vein ore bodies are smaller than the Northeast vein occurrences, they can still be mined profitably at present metal prices (lead, $0.16 per pound, and zinc, $0.15 per pound). They average about 20 percent combined lead and zinc with the lead content running a little more than half. The vein is as much as 2 feet wide and can be mined profitably where only 1 foot wide. The Antoro vein is barren at

the tunnel level and the first ore mined occurred 60 feet above the tunnel. Because of the erratic occurrence of the ore there are no reserves blocked out as exploration was not carried on in advance of stoping requirements.

During early 1952 the applicants did some diamond drilling at several locations in the mine, and one hole directed to cut the Antoro vein below the tunnel level where it had never been explored intersected at 91 feet heavy lead-zinc sulfide mineralization over an indicated width of 4 feet of vein which assayed around 12 percent lead and 6 percent zinc. Core recovery in the vein was poor but several pieces showing galena and sphalerite were shown to the examining team.

Basing an exploration project on this diamond drill hole as well as on the possibility that the Antoro and Poverty veins may intersect at a reasonable depth below the tunnel level, the applicants have planned a project including two crosscuts, a 140-foot winze in the hanging wall of the Antoro vein, and drifting on the Antoro vein on the 125-foot winze level. They expect to continue current ore production from the Northeast vein at the same time. In any operation below the Antoro tunnel level, a small water flow must be pumped, but, based on the applicant's experience in the winze on the Northeast vein, a maximum flow of no more than 50 gallons per minute should be expected.

The examining team considers the proposed exploration project to be a good prospect. There is an excellent possibility of finding ore bodies on the Antoro and Poverty veins similar in size and grade to those mined above the tunnel level. On this basis the minimum tonnage from the block between the 125-foot winze level and the tunnel level is

estimated at 2,500 to 3,000 tons. The grade or ore is estimated at 20 percent combined lead and zinc with the lead predominating. The net return on this ore is estimated at $20.00 per ton at present metal prices (lead, $0.16 per pound, and zinc, $0.15 per pound). Mining costs would be $15.00 per ton, leaving about $5.00 per ton operating gain. The shipment of the estimated minimum tonnage, 3,000 tons, would return to the applicants their half of the cost of exploration. The Government's royalty at an estimated $1.00 per ton on the minimum tonnage would amount to less than one fourth of the Government's expenditure.

The applicants are experienced operators and competent to carry out the program.

The examining team recommends approval of an exploration loan for $37,400.00, Government participation--$18,700.00, with provision that all mine production will be subject to royalty, making more secure the Government's chance for recovery of its part of the loan.

ANTORO MINE

SAGUACHE COUNTY, COLORADO

DMEA DOCKET 2604

Geologic Report

By E. N. Harshman
U. S. Geological Survey

ANTORO MINE
SAGUACHE COUNTY, COLORADO

INTRODUCTION

S. E. and W. E. Burleson, P. O. Box 209, Salida, Colorado, have applied for assistance in exploring for lead-zinc ore below the present workings in the Antoro mine. They have under lease, from the Noams Weaver Mining Company, New York City, N. Y., 80 patented claims in secs. 7, 8, 17, and 18, T. 47 N., R. 8 E., Kerber mining district, Saguache County, Colorado.

The property was examined on July 16 and 17, 1952, in company with M. W. Salsbury of the U. S. Bureau of Mines. W. E. Burleson, one of the applicants, accompanied the examining team; his assistance is acknowledged.

The Antoro mine is developed by about 4600 feet of drifts and cross cuts on the adit or main tunnel level, 430 feet of drift from the bottom of the Copper winze (-125 level), and about 700 feet of drifts on various levels above the adit level (fig. 2).

Early in 1952 the operators contracted 4 diamond drill holes in the Antoro mine. Hole No. 1 was directed to cut the Antoro vein below its intersection with the flat dipping Poverty vein (fig. 2). At a depth of about 90 feet vertically below the adit level, Drill hole No. 1 cut ore as follows:

Inclined Depth	oz. Au	oz. Ag	% Pb	% Zn	% Cu
91 to 96 feet	0.03	8.1	18.2	6.1	0.35
96 to 101 feet	0.02	5.6	15.5	5.8	0.20

Core recovery was poor and the above assays were made on sludge samples. The hole was drilled to an inclined depth of 172 feet; no other mineralized zone was encountered. The other 3 holes were drilled elsewhere in the mine and did not intersect ore.

The applicants propose to crosscut 75 feet farther into the hanging wall of the Antoro vein, excavate for 2 underground ore bins and a hoist-room, sink a five by ten foot inclined winze to an inclined depth of 140 feet (15 feet to be used as a sump), crosscut about 80 feet to reach the Antoro vein and drift about 200 feet on the vein (fig. 2). The applicants estimate the cost of the project to be $39,747.50.

GEOLOGY

W. S. Burbank (1932) has described the geology and ore deposits of the Bonanza mining district, and in this publication includes a description of the Antoro mine as well as other mines in the area. Free use has been made of the data contained in this publication.

The Bonanza mining district lies at the northeastern edge of the San Juan volcanic region of Colorado. The rocks of the area are principally lavas of Tertiary age, probably Oligocene, resting on pre-Cambrian metamorphic rocks and Paleozoic sedimentary rocks. Exposures of metamorphic and sedimentary rocks are not common. The pre-Cambrian rocks consist of gneisses, schists, granites, and pegmatite dikes. Shales, sandstones, conglomerates, limestones, and quartzites are exposed several miles southeast of the mineralized area. These rocks rest unconformably upon the pre-Cambrian complex.

The pre-Tertiary geologic history of the area is not well known, but includes long erosional and depositional periods, folding, and thrust faulting. Ore deposits are closely related to the Tertiary volcanic activity which includes the extrusion of large volumes of lava flows and tuffs, and intrusion of dikes. According to Burbank (1932) the volcanic activity resulted in the formation of a high plateau, which subsequently collapsed. Two periods of mineralization, along faults caused by the collapse, have been recognized. The early period consisted of silicification of the wall rock and the late period included deposition of sulfide and gangue minerals and sericitization of the wall rock.

Burbank concludes that the wall rocks have had no differential influence on the chemical processes affecting ore deposition. However, some mechanical influence was noted These rocks in which fractures remained open, such as the andesites, were the most favorable for ore deposition.

The Antoro mine workings are in the Rawley andesite, a 1000 to 2000 foot thick series of flows at the base of the Tertiary volcanics. The flows strike northwest and dip 15° to 20° SW. The andesite is broken by many pre-mineral faults of small to moderate displacement, most of which are mineralized. Four major veins, the Antoro, Poverty, Northeast, and Zinc veins, occupy the more prominent fault fissures. Lead-zinc ore has been mined on all but the Zinc vein.

The Antoro vein is exposed in the north end of the mine workings where it strikes N 25° to 30° W. and dips 60° to 80° E. (fig. 2). The vein is 1 to 3 foot wide and contains galena, sphalerite, chalcopyrite, pyrite, quartz barite and calcite. On the adit level the Antoro fissure contains altered gangue, siliceous material, and sparse sulfides. The ore shoot

now being mined apexes near the surface and extends downward to a point about 75 feet above the adit level. The sulfide ore occurs in small lenticular bodies from 1 to 3 feet thick and 10 to 50 feet in length and height. This ore averages about 20% combined lead and zinc. The lead content is slightly greater than the zinc content.

Ore deposition in the Antoro vein was, to a major degree, controlled by the physical character of the openings. Portions of the fissure that contained considerable gouge, or areas where changes of dip or strike produced a "tight" condition, contain little or no ore. Also, pre-mineral cross faults may terminate or offset the ore.

The Poverty vein lies to the south of the Antoro vein and occupies a low-angle fault dipping northeastward (fig. 2). On the adit level, the 2 veins intersect to the east of the main crosscut, but the intersection has not been explored. Old workings on the 2 veins are not accessible, but it is reported that both veins, where exposed near the intersection, are only weakly mineralized.

The Poverty vein strikes N. 60°-65° W. and dips 29° to 35° N. The vein is characterized by thick gouge and breccia zones and small, lenticular, high grade sulfide ore bodies. The strongest mineralization on the Poverty vein is to the northwest of the main adit level and one small body of high grade galena ore was taken from the stope shown on fig. 2. A sample of the ore in the vein immediately below this stope assayed as follows:

Sample No.	Width	% Pb	% Zn	% Cu	oz. Ag
S-12	18"	24.3	1.0	0.2	6.7

The Zinc vein, which is by far the weakest and most narrow of the 4 principal veins in the mine, lies to the east of the adit level, strikes almost due north and dips 70° E. (fig. 2). It contains some gouge and

breccia and is poorly mineralized by pyrite, sphalerite, and galena. The Zinc vein is developed by about 160 feet of drifting on the adit level and by some raising. The results of this development work were not encouraging and additional work on the Zinc vein is not contemplated.

The Northeast vein is developed by the 125 foot Copper winze and by about 350 feet of drifting on the minus 125 foot level (fig. 2). The vein which occupies a strong fault zone in the Rawley andesite, strikes N. 20° E. and dips 80°-85° E. In contrast to the other veins in the mine, the ore on the Northeast vein occurs in a continuous shoot that has been mined, both horizontally and vertically, for a distance of over 180 feet. The vein width ranges from 1 to 8 feet and averages about 4 feet. Ore minerals are galena, sphalerite, chalcopyrite, and pyrite in a gangue of dense, white quartz.

There is little or no alteration of the wall rock and open stopes stand well with only occasional stull support. The ore now being mined contains about 20% combined zinc and lead, zinc accounting for slightly over half the metal content. The Northeast vein is by far the best yet developed in the Antoro mine and most of the ore produced in the last few years has come from it.

PRODUCTION AND ORE RESERVES

Since 1947, when the present operators began mining, production has been as follows:

Dry tons	oz Au	oz Ag	% Pb	% Zn	% Cu	Gross Value
12,000	0.02	5.75	9.79	11.82	1.25	$408,220

Development work has not been carried on in advance of mining operations and ore reserves thus cannot be estimated with any degree of certainty.

Considerable ore probably remains to the north of the present workings on the Northeast vein, above the workings on the Antoro vein, and below the adit level on the Poverty and Antoro veins.

CONCLUSIONS AND RECOMMENDATIONS

The exploration program proposed by S. E. and W. E. Burleson, in DNEA Docket 2604, appears justified for the following reasons:

1. Considerable direct shipping, lead-zinc ore has been and is being mined on the Antoro vein above the adit level.

2. Some high grade lead ore has been mined from the Poverty vein above the adit level, and ore is exposed now along the floor of the drift on this vein

3. A projection of the dips of the Antoro and Poverty veins indicates an intersection or junction of the two veins in the area proposed for exploration in the program under consideration. A diamond drill hole proved the presence of 4 feet of lead-zinc ore in this area.

4. Burbank (1932) concludes that although little ore is exposed on the adit level, there is no reason to believe that the bottom of the horizon favorable to ore deposition has been reached by the present workings. The examining team agrees with this conclusion.

It is recommended that the exploration program, with the slight changes suggested in the engineering report, be approved and that a loan of $37,400 (Government participation 50%) be granted. It is further recommended, for the reasons given in the engineering report, that the contract be written to include royalties on ore produced from the Northeast vein as well as from the Antoro and Poverty veins.

REFERENCE

Burbank, W S., Geology and ore deposits of the Bonanza Mining District, Colorado: U. S Geological Survey Professional Paper 169, 1932.

DMEA 2604

S. E. AND W. E. BURLESON
ANTORO MINE
SAGUACHE COUNTY, COLORADO

Engineering Report

By M. H. Salsbury
Mining Engineer
Bureau of Mines

DMRA 2604

S. E. AND W. E. BURLESON
ANTORO MINE
SAGUACHE COUNTY, COLORADO

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ILLUSTRATIONS

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2. Proposed exploration, Antoro mine, Saguache County, Colorado	*

* See figure following Geologic Report.

DMEA 2604

S. E. AND W. E. BURLESON
ANTORO MINE
SAGUACHE COUNTY, COLORADO

ENGINEERING REPORT

By

M. H. Salsbury

INTRODUCTION

An examination of the Antoro mine near Bonanza, Saguache County, Colo., was made by E. N. Harshman, of the U. S. Geological Survey, and M. H. Salsbury, of the Bureau of Mines, for the purpose of checking the information in an application of S. E. and W. E. Burleson, P. O. Box 209, Salida, Colo., for exploration assistance under Defense Minerals Exploration Administration docket 2604 calling for the expenditure of $39,747.50, Government participation - 50 percent or $19,873.75.

ACKNOWLEDGMENTS

Information on the property was obtained from W. E. Burleson, one of the applicants, and from the mine foreman. Geological data was obtained from U. S. Geological Survey Professional Paper 169, "Geology and Ore Deposits of the Bonanza Mining District, Colo.", by W. S. Burbank.

LOCATION, TOPOGRAPHY, AND PHYSICAL FEATURES

The Antoro mine, originally developed by a shaft, is now served by an adit tunnel, portal elevation 11,273 feet, on the precipitous west slope of Kerber Creek. The Rawley mine adjoins on the South. The mine is 3 miles from the town of Bonanza and 45 miles from Salida, the nearest railhead (fig. 1). Twenty-seven miles of this distance is paved highway from Salida to Villagrove in the San Luis Valley and the balance, good dirt road.

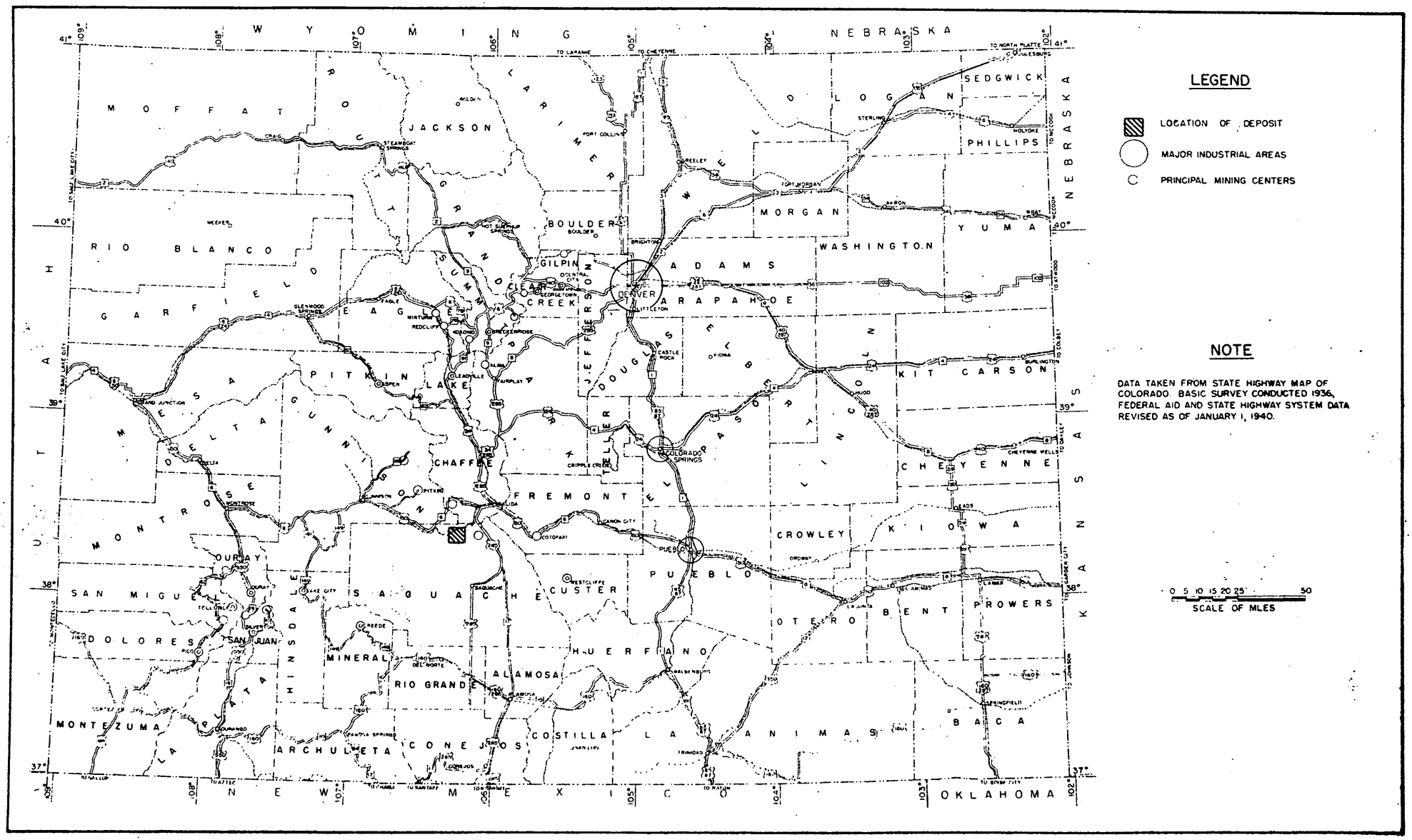


Figure 1. S. E. and W. E. Burleson, Antoro Mine, Saguache County, Colorado. DMEA 2604.

The region is one of short summers and long severe winters with heavy snowfall. Operation throughout the year is possible. During the past winter, one of unusually heavy snowfall, only 3 workings days were lost even though part of the crew traveled from Salida daily. Saguache County road crews do an excellent job of maintenance.

The mine is served by power lines of the Public Service Company of Colorado. Water for drilling purposes is obtained from pumping operations in the mine. Timber is obtained locally or in Salida, and other mining supplies come from Salida or Denver.

Lead-zinc ores from the Bonanza district are marketed at Leadville, Colo., a distance of 105 miles. Smelting ores go to the Arkansas Valley smelter of the American Smelting and Refining Company; sulfide milling ores of the type produced are accepted by the custom plant of the Resurrection Mining Company. The current contract hauling rate from the Antoro mine to Leadville is $5.75 per ton.

HISTORY AND PRODUCTION

The Antoro mine was worked as early as 1882 but the first reported production was in 1891 and consisted of lead-silver ore from shallow workings. The reported production from 1881 to 1900 was 1,000 tons of lead-silver-zinc ore. The property was operated intermittently from 1908 to 1927 with a production of about 1,400 tons of lead-zinc ore. The last operator of this period was the American Smelting and Refining Company which did considerable exploration on the Antoro vein. After 1927 or 1928, the mine was idle until 1947 when the present operations started.

Since 1947, the mine has produced approximately 12,000 tons of lead-zinc ore with an average assay of 0.02 ounce gold and 5.75 ounces silver per ton, 9.79 percent lead, 11.82 percent zinc, and about 1.25 percent copper. The copper is not paid for at the mill. These figures include production through May 1952 and are verified by settlement sheets. The gross value of the total production for the period 1947-1952 is $408,219.85. The total metal content was 2,349,600 pounds of lead and 2,836,800 pounds of zinc.

The gross value of this ore per ton was $34.12 and the net value to the shipper, after treatment, freight, royalty and production tax deductions were made, was $21.28 per ton.

All of this production came from the Northeast and Antoro veins, the largest part coming from the Northeast vein. In the period 1947-50, 1,700 tons were mined from the Antoro vein. Since January 1951, ores from the two veins have not been segregated and the applicant has no records to indicate what proportion came from either vein.

OWNERSHIP AND EXTENT

The Antoro property, comprising 80 patented claims in secs. 7, 8, 17 and 18, T. 47 N., R. 8 E., Karber Mining District, Saguache County, Colo., is owned by the Weems Weaver Mining Corporation - Joseph H. Murray, Ernest and Cranmer Building, Denver, Colo., local representative.

The entire property is under lease by assignment from George R. Cassidy, Leadville, Colo., to whom the lease was issued originally, to S. E. Burleson and W. E. Burleson, a partnership. The lease is dated May 20, 1946, to run for 5 years, expiring May 20, 1951. By amendment, the life of the lease was extended to November 1, 1953, with an additional

provision applying all royalties, less production taxes, to an option to purchase at a price of $75,000.00. By letter dated April 16, 1952, the Burlesons have applied for a 5-year extension on the lease and option.

The royalty rates run from 10 percent of the value of ore not exceeding $30.00 per ton net value to 25 percent of the value of ore over $75.00 per ton. Both the amount and rate of royalty are computed on the net value of ore after freight (hauling), treatment, and a production tax of 2 percent have been deducted. Under this schedule, the operators have never paid a royalty of more than 15 percent and most of the ore has been shipped under a 10 percent royalty.

The property covers considerably more ground than is being worked. The Antoro claim - survey number 937, the Poverty - survey number 938, and the Orphan Belle - survey number 14183 amply cover the proposed exploration project.

The applicants have requested subordination agreements from the owners and do not anticipate any difficulty although it is likely to take some time.

DESCRIPTION OF THE DEPOSITS

The ore deposits of the Bonanza district are lenticular bodies in veins occupying premineral faults in the Tertiary lava flows of the San Juan volcanic series which have a thickness of several thousand feet. The veins of the Antoro mine - the Northeast, Zinc, Poverty, and Antoro - are, where being worked, in the Rawley andesite flow at the northeast edge of the San Juan volcanics. The Northeast, Zinc, and Antoro veins strike north to northwest and dip 70 to 80 degrees to the east. The Poverty vein is very flat where exposed at the tunnel level, dipping 40 to 60 degrees to the northeast and striking north 30 to 45 degrees west.

The ore bodies are in small to medium size lenses which are discontinuous. The mineralization is apparently controlled by structural conditions within the veins and by premineral cross faults. Ore shoots sometimes end against cross faults and may or may not continue on the offset fissure on the opposite side of the fault. Stringers of ore often extend into both walls of the stopes a few feet along tension fractures. The cross faults merely affect and limit ore deposition and do not displace ore bodies already formed.

The ore minerals are sphalerite, galena, silver-bearing tennantite, chalcopyrite, and other copper minerals in a gangue of quartz, barite, manganiferous calcite, and rhodonite. Tellurides of gold and silver have been reported. The gangue often contains much premineral gouge which is probably a factor in governing ore deposition.

The ore at the level of present Antoro mining operations consists of unaltered lead and zinc sulfides. There is evidently a slight amount of corrosion as evidenced by a small percentage of nonsulfides shown in the mill settlement sheets. The ore width varies from a few inches to over 7 feet. In general, it cannot be profitably worked unless it is at least 1 foot wide although narrower widths from exploration or development work are often saved by blasting separately.

To date, ore bodies have been found in the Northeast, Poverty and Antoro veins and the mine workings are shown on figure 2 with the geologic report. The Northeast vein ore shoot is the largest and widest worked by the present operators. It is from 1 to 7 feet wide and assays about 20 percent combined lead and zinc with the zinc content usually being a little over half of the total. The ore shoot on the Poverty vein was mined prior

to 1927. It was stoped out above the tunnel level about 40 feet high and 50 feet long. The stope is 4 feet or more wide, probably on account of the flat dip of the vein rather than the width of the ore. The ore is still continuing downward below the tunnel level. An 18-inch cut taken across heavy sulfide vein matter below the stope assayed a trace gold and 6.7 ounces silver per ton, 24.3 percent lead, 1.0 percent zinc, and 0.2 percent copper.

The Antoro vein is the most extensively developed. It is barren at tunnel level but there are a number of small ore bodies in the upper levels. This ore would not have been profitable in the earlier periods of operation, and former operators did not explore it extensively. The current operators have done considerable exploration on several of the levels above the tunnel and made substantial shipments of lead-zinc ore from this work. The ore width seldom exceeds 2 feet. The combined lead-zinc content is also about 20 percent with the lead usually assaying higher than the zinc.

The walls of the veins vary greatly in character; in the Northeast vein they are generally hard and stand well. Only an occasional stull is required for support. In the Poverty and Antoro veins the walls are not good and must be supported by back filling.

On the Northeast vein the ore can be mined by shrinkage stoping or by open stopes with stull support. On the Antoro vein the ore is mined in filled stopes with cribbed ore passes and manways. The fill is composed of low-grade ore which is shot down after the ore streak is mined out. This material would be low-grade mill dirt but will probably never be recovered because of the condition of the walls. Even if the walls were firm, there is so much clay in the fill that it would have to practically be remined.

MINEABLE ORE RESERVES

Because of the erratic nature of the ore bodies, and because development is rarely carried on very far ahead of stoping operations, no ore reserves can be blocked out. There is ore left at the north end of the Northeast vein stope below the tunnel level and there is ore left on the Antoro vein above the 225 level. Mineable ore on the Antoro vein probably extends to within 125 to 150 feet of surface at the bottom of the zone of oxidation.

PRESENT STATUS

The Antoro was originally developed by a shaft sunk on the Antoro vein from a collar elevation of about 11,800 feet. Later, the present adit tunnel was driven and connected to the shaft by a raise. Thereafter, all operations were carried on through the tunnel. Lateral work totaling 700 feet was done at five levels above the tunnel on the Antoro vein, but very little ore was mined except in the early days from near surface.

On the tunnel level the Poverty vein and Antoro vein have been explored by drifting, and one stope has been mined on the Poverty vein. Several crosscuts driven to explore the area west of the Antoro vein were unproductive.

Near the tunnel portal the Northeast vein was explored by raising, crosscutting, and winzing. Previous to the current operation no ore was found. The present operators found ore in the wall of the original workings above the tunnel level and, later, working through the old winze which they call the "Copper Winze", they found the continuation of the ore body 125 feet below the tunnel level. This ore body has furnished the larger part

of the mine production to date. The applicants state that the ore shoot is still present in the bottom of the winze level but no effort has been made to explore it as yet.

The "Copper Winze" workings are the only workings in the Antoro mine below the tunnel level. A drift from the fourth level of the neighboring Rawley mine extends just underneath this winze but was never extended farther north.

In the winter of 1952 the applicants undertook a diamond drilling program under which they drilled four holes at various points. The only one of interest was a hole drilled downward from a crosscut in the hanging wall of the Antoro vein at tunnel level which cut a vein some 90 feet below the tunnel level. Excellent values were obtained from the sludge from 93 to 101 feet. The hole started to cave and was cased to 87 feet where the bit was deflected and a new hole drilled through the ore zone. Good values were again obtained from 91 to 101 feet. The sludge from 101 to 106 feet also assayed well but was disregarded in estimating the ore width because a fairly good core recovery made in this interval did not check the sludge. The material in the ore zone generally did not core well and the only recovery was a few fragments of rock containing heavy galena and sphalerite which were shown to the examining team. The hole was continued to a depth of 172 feet without encountering further mineralization.

Disregarding the sludge assay from the section from 101 to 106 feet in the deflected hole, the 10-foot length of hole from 91 to 101 feet and the angle of the hole and of the vein indicate an ore width of about 4 feet.

Assay Results From Sludge Samples

Hole	Footage From	Footage To	Footage Feet	Analyses: Ounces per ton Au	Ag	Percent Pb	Zn	Cu
First	93	101	8	0.02	4.1	8.9	6.3	-
Second	91	96	5	.03	8.1	18.2	6.1	0.35
Second	96	101	5	.02	5.6	15.5	5.8	.20
Second*	101	106	5	.02	5.0	16.2	16.1	1.3

* Disregard

None of the other holes, which were in different parts of the mine, encountered mineralization of interest.

The veins carry a small amount of water which necessitates pumping in any operation below tunnel level. In the "Copper Winze" there is a flow of about 35 gallons per minute which is handled by a small electric pump. The flow is somewhat more in the spring and decreases in the fall and winter. A similar flow can be expected in any winze operation on the Antoro vein.

The mine is fully equipped for a production of 20 to 30 tons per day although current production is not over 10 tons daily.

Surface buildings consist of a change room, compressor room, blacksmith shop, storeroom, and two 75-ton ore bins, one of which is arranged for ore sorting.

A forge and drill sharpener are available for fabricating steel. A ventilating fan is in place but not in use at present. Compressed air for drilling or pumping is furnished by an electrically driven 420 c.f.m. Gardner-Denver compressor which would be adequate for the proposed project.

Tramming on the tunnel level is handled by a compressed air locomotive and eight cars. The "Copper Winze" is equipped with an electric hoist and ore bucket. Tramming on the winze level is done with the bucket on a dolly.

Present production is a little over 200 tons per month with a crew of eight including a foreman and one man employed on surface.

PROJECT PROPOSALS, WITH COSTS

The applicants propose to:

(1) Extend an existing crosscut on the tunnel level 74 feet farther into the hanging wall of the Antoro vein.

(2) Excavate for a hoist station and bins and repair some 400 feet of track on the tunnel level for which they already have the rail on hand.

(3) Sink an inclined winze 140 feet deep, including a sump, in the hanging wall of the Antoro vein approximately parallel to the dip of the vein.

(4) Cut a station at the 125-foot winze level, drive a crosscut 80 feet to the Antoro vein, and explore the vein by 200 feet of drifting.

This program (fig. 2 with the geologic report) is based on the excellent showing in the diamond drill hole and the fact that the Antoro and Poverty veins should intersect at a reasonable distance below the tunnel level. The winze is being located in country rock which is solid and will require a minimum of timbering. In addition, by sinking parallel to the vein, the winze can be sunk another lift at a later date without approaching too close to the vein.

Equipment for the project as listed in the cost estimate can be obtained secondhand except for the electric pump. The operators have located most of it at a very reasonable figure.

Transformer capacity at the mine is ample and no new power facilities are needed other than the underground power cable which the applicants have located secondhand.

All other equipment is on hand and will be furnished by the applicants on a depreciation basis.

The mine employs eight men at present. Three of these the applicants propose to use on the exploration project. Presumably, this would reduce production although the applicants state they intend to maintain production at the present rate, if possible.

The present mine foreman would supervise the exploration project on a part time basis.

COST ESTIMATE

Contract Proposals

Applicants' Estimate		Bureau of Mines Estimate	
Initial Rehabilitation and Repairs (Surface)			
None			
New Buildings, Improvements			
None			
Rehabilitation (Underground)*			
Replace 400 feet rail in tunnel (labor only)	$ 192.00	Replace 400 feet of rail in main haulageway between portal and site of winze Estimated labor only	$ 210.00

*Underground labor rate on both estimates: $1.50 per hour, time and one half over 40 hours, 6-day operation.

Contract Work

(To be performed under subcontract which is to include labor, explosives, compensation insurance, and social security)

Tunnel level crosscut 5 feet by 7 feet, 74 feet long - 74 feet at $18.00 per foot	$ 1,332.00	Crosscut 74 feet for car and trammer space to handle rock from winze Estimated contract cost per foot—$18.00	$ 1,332.00
	Cubic feet		Cubic feet
Excavation for bins 8 feet by 16 feet by 20 feet	2,048	Excavation for loading bins above winze 8 feet by 10 feet by 20 feet	1,600
Excavation for hoistroom 8 feet by 10 feet by 40 feet	3,200	Excavation for hoistroom 8-1/2 feet by 8 feet by 20 feet; 10 feet by 8 feet by 20 feet	2,960
Excavation for sheave 4 feet by 5 feet by 15 feet	360	Excavation for sheave 4 feet by 5 feet by 12 feet	240
Excavation from winze collar to bins 7-1/2 feet by 8 feet by 20 feet	1,200	Excavation from winze collar to bins 8 feet by 10 feet by 20 feet	1,600
Excavation at 125-foot level in winze 10 feet by 12 feet by 7 feet	840	Excavation of winze station at 125-foot level 10 feet by 12 feet by 7 feet	840
Excavation total	7,648	Excavation total	7,240
7,648 cubic feet = 283 cubic yards at $12.00 per cubic yard	3,399.60	7,240 cubic feet = 268 cubic yards at $12.00 per cubic yard	3,216.00
Sinking winze 5 feet by 10 feet by 140 feet deep, at $35.00 per foot	4,900.00	Sinking 5-foot by 10-foot winze, 140 feet Estimated contract cost per foot—$40.00	5,600.00
Crosscut to vein on 125-foot level 80 feet at $30.00 per foot	2,400.00	Crosscut to vein on 125-foot winze level, approximately 80 feet Estimated contract cost per foot—$20.00	1,600.00
Exploration drift on the Antore vein 200 feet at $35.00 per foot	7,000.00	Exploration drift on the Antore vein, 200 feet Estimated contract cost per foot—$25.00	5,000.00
Total estimated cost of contract work	$19,031.60	Total estimated cost of contract work	$16,748.00

Hourly Rate Labor Supplementing Contract Work*

Laying 74 feet rail in crosscut 3 men, 3 shifts	$ 108.00	Install 74 feet of track, fan line, and air line in crosscut Estimated labor cost	$ 120.00
Install hoist and electric power cable 3 men, 5 shifts at $12.00 per shift	180.00	Install hoist and electric power cable Estimated labor cost	200.00
Install sheave 3 men, 2 shifts, at $12.00 per shift	72.00	Install sheave Estimated labor cost	80.00
Install electric pump, power cable, and pump column in winze 3 men, 5 shifts, at $12.00 per shift	180.00	Install electric pump, power cable, and pump column in winze Estimated labor cost	200.00
Install rail, ladders, and skip in winze 3 men, 13 shifts, at $12.00 per shift	468.00	Install rail, ladders, and skip in winze Estimated labor cost	525.00
Place rail, pipe line, and vent pipe on 125-foot winze level 3 men, 10 shifts, at $12.00 per shift	360.00	Install rail, pipe line, and vent pipe on 125-foot winze level Estimated labor cost	390.00
Timbering bins and hoist-room 3 men, 12 shifts, at $12.00 per shift	432.00	Timbering bins and hoist-room Estimated labor cost	390.00
		Timbering 125-foot level crosscut Estimated labor cost	200.00
		Timbering 125-foot level drift Estimated labor cost	1,000.00
Total hourly labor supplementing contract work	$ 1,800.00	Total hourly labor supplementing contract work	$ 3,105.00

*Underground labor rate on both estimated: $1.50 per hour, time and one half over 40 hours, 6-day operation.

Labor, Supervision, and Technical Services

Labor
(surface and tunnel level)

Air locomotive operator Charge 3/4 of time to project - 3/4 of 228 shifts at $12.00	$ 2,223.00	One air locomotive operator 1/2 time for 10 months, at $12.00 per day plus overtime	$ 1,710.00
Surface labor, 1 man Charge 1/2 time to project - 1/2 of 228 shifts at $10.00	1,235.00	One surface laborer 1/2 time for 10 months, at $10.00 per day plus overtime	1,425.00
Hoistman (after winze is sunk) 110 shifts at $12.00	1,428.00	One hoistman (after winze is sunk) 1/2 time for 4 months, at $12.00 per day plus overtime	1,368.00
	$ 4,886.00		$ 4,503.00

Supervision

Foreman $400.00 per month, 2/3 to project for 9.12 months	$ 2,431.94	Foreman 1/2 time for 10 months, at $400.00 per month	$ 2,000.00

Technical Services

Engineering, part time, at $150.00 per month (salary rate not given)	$ 1,368.00	Engineering Part time for 10 months at actual cost of $100.00 per month	$ 1,000.00
Total labor, supervision, and technical services	$ 8,685.94	Total labor, supervision, and technical services	$ 7,503.00

Operating Materials and Supplies

Timber	$ 644.50	Timber	$ 644.50
Explosives	—	Explosives	—
Pipe	483.70	Pipe	700.00
Track	739.70	Track	738.70
Ventilating pipe	275.00	Ventilating pipe	275.00
Gasoline, oil, tires, etc. for bus	456.00		
Miscellaneous (nails, bolts, etc.)	178.00	Miscellaneous	180.00
Drill bits and rods	150.00	Drill bits and steel	150.00
Power (1/2 of $240.00 per month estimated charge)	1,094.44	Power (1/2 of $240.00 per month estimated charge)	1,200.00
Total operating materials and supplies	$ 4,021.34	Total operating materials and supplies	$ 3,888.20

Operating Equipment

Purchase

1-car skip, used	$ 100.00	1-car skip, used	$ 100.00
1,300 feet 3-conductor, 440-volt cable, used	975.00	1,300 feet 3-conductor, 440-volt cable, used	975.00
Hendrie and Bolthoff electric hoist and cable, used	650.00	Hendrie and Bolthoff electric hoist and cable, used	650.00
24- to 30-inch sheave	75.00	24- to 30-inch sheave	75.00
Hoist motor, 20 horsepower, used	250.00	Hoist motor, 20 horsepower, used	250.00
Switches, controller, etc.	350.00	Switches, controller, etc.	350.00
Allis Chalmers size 2 pump with motor	450.00	Allis Chalmers size 2 pump with motor	450.00
Drill hoses, new, 2 sets	110.00	Drill hoses, new, 2 sets	110.00
2 Hoist buckets, used	150.00	2 Hoist buckets, used	150.00
	$ 3,110.00		$ 3,110.00

Operating Equipment (continued)

Depreciation

420 c.f.m. compressor	$ 364.80	420 c.f.m. compressor, pro rata (1/2) 10 months at $30.00	$ 300.00
Mucking machine, 3 months at $40.00	120.00	Mucking machine, 3 months at $40.00	120.00
Air slusher, complete, 4 months at $20.00	80.00	Air slusher, complete, 4 months at $20.00	80.00
Air trammer at $30.00 per month	205.20	Air trammer, 1/2 of 10 months at $30.00 per month	150.00
8 Mine cars at $3.00 each per month	164.16	8 Mine cars at $3.00 each per month	165.00
1 Drill, 9.12 months at $20.00	182.40	Drill, 10 months at $20.00	200.00
Chicago-Pneumatic sump pump, 3-1/2 months at $10.00	35.00	Chicago-Pneumatic sump pump, 4 months at $10.00	40.00
Water tank for drilling, 10 months at $1.00	10.00	Water tank for drilling, 10 months at $1.00	10.00
Shop equipment, 1/2 of $40.00 per month	182.40	Shop equipment, 1/2 of $40.00 per month for 10 months	200.00
Electric mine lamps, 9.12 months	34.20	Electric mine lamps, 10 months	37.50
Rental on bus, 1/2 of $39.00 per month for 9.12 months	177.84		
	$ 1,556.00		$ 1,302.50
Total operating equipment	$ 4,666.00	Total operating equipment	$ 4,412.50

Miscellaneous

Repairs to equipment, 9 months at $2.00 per day	$ 456.00	Repairs to equipment, 10 months at $2.00 per day	$ 500.00
Office expense 9.12 months at $20.00 per month	182.40	Office expense 10 months at $20.00 per month	200.00
Workmen's compensation insurance on payroll of $10,677.94 at $2.47 per $100.00	263.75	Workmen's compensation insurance on payroll of $10,818.00 at $2.47 per $100.00	267.20
Employer's social security tax, at 1.5 percent	160.17	Employer's social security tax, at 1.5 percent	162.27
Employer's Colorado unemployment tax, at 2.7 percent	288.30	Employer's Colorado unemployment tax, at 2.7 percent	292.09
		Assaying	100.00
Total miscellaneous	$ 1,350.62	Total miscellaneous	$ 1,521.56

COST RECAPITULATION

	Applicants' estimate		Bureau of Mines estimate	
Rehabilitation (underground)		$ 192.00		$ 210.00
Contract work		19,031.60		16,748.00
Hourly rate labor supplementing contract work		1,800.00		3,105.00
Labor and supervision				
Labor	$4,886.00		$4,503.00	
Supervision	2,431.94		2,000.00	
Technical services	1,368.00	8,685.94	1,000.00	7,503.00
Operating materials and supplies		4,021.34		3,888.20
Operating equipment				
Purchase	$3,110.00		$3,110.00	
Depreciation	1,556.00	4,666.00	1,302.50	4,412.50
Miscellaneous		1,350.62		1,521.56
Totals		$39,747.50		$37,388.26

Rounded to $37,400.00

TIME SCHEDULE

	Applicants' estimate		Bureau of Mines estimate	
	shifts	days	shifts	days
Replace rail on tunnel level	16	8	16	8
Crosscut on tunnel level 75 feet	75	25	75	25
Laying rail, pipe, etc. in tunnel crosscut	9	3	9	3
Excavating bins, hoistroom, etc.	153	51	90	30
Installing cable hoist, sheave, etc.	30	10	21	7
Timbering bins and hoistroom	36	12	30	10
Sinking winze 2 feet per shift	210	70	210	70
Installing pump column, skip rails, and skip	54	18	45	15
Excavation, 125-foot winze station			15	5
Crosscutting on 125-foot winze level 80 feet	96	32	54	27
Exploration drift on 125-foot level 200 feet	150	50	100	50
Installation of rail, pipe line, fan line on 125-foot level	30	10		
Totals	859	289	665	250
			10 months	

Some of the items included in the applicant's estimate are questionable so far as being justified by the requirements of the project. The relaying of 400 feet of track on the tunnel level is not absolutely necessary. However, inasmuch as the rail will be furnished without cost to the project, the improvement of the track may eliminate trouble later when the traffic load is increased. It is, therefore, recommended at a maximum cost of $192.00.

The excavation of two bins at the winze collar is not necessary for the exploration project, and the Bureau recommends limiting this work to the excavation of one bin or hopper large enough to hold one winze round. The operator can add another bin later if he desires.

The planned use of a skip in the winze, after sinking is completed, is not absolutely essential but can be justified in that it will probably facilitate the exploration work on the winze level with a possible saving in time and money. At any rate the cost of the skip which the applicants have located is only $100.00 and is recommended.

An air pump which is to be used for sinking would still be usable during operations on the winze level. The applicants plan to borrow another pump for emergency service. However, because the repairs to the air pumps are likely to be frequent and expensive and because of the possibility of encountering more water in drifting on the Antoro vein than is anticipated, the purchase of an electric pump is recommended.

Inclusion of a pro rata share of the cost of running a daily bus service from Salida to the mine in the exploration cost is not standard practice although it seems to be accepted in Bonanza as a necessary service to keep men. However, it is a service which will be continued by the applicants whether or not the exploration project is approved, and is not recommended or included as a project cost. If it should be decided by the Regional Field Team to allow this as a project cost, it should be written into the contract as stated in DMEA Circular 19, Supplement I, Paragraph A.

The cost estimate compares the applicants' estimate with that of the Bureau engineer. The pro rata distribution of the cost of some items, particularily labor and supervision which is shared with regular mine operations, is questioned by the Bureau. A distribution which seems more equitable is suggested in the Bureau estimate.

Contract driving rates quoted by the applicants do not show a differential between sinking operations and level operations through the winze. A more logical rate is suggested in the Bureau estimate. If a crosscut on the tunnel level costs $18.00 per foot, contract labor price, crosscuts and drifts on the 125-foot winze level should cost but little more, particularily as the applicants propose to furnish the hoist operator. The applicants' rate of $35.00 per foot, contract labor price, for sinking the winze, including a hoist operator, appears low, and a price of $40.00 is suggested. These prices include power, compensation insurance and social security costs, which seems to have been the accepted procedure in this district in the past.

The time shedule proposed by the applicants agrees very well with that of the Bureau.

PRODUCTION PLAN

If the proposed exploration is successful, the operation could, as equipped, produce 25 to 30 tons per day with a crew of twelve to fifteen men. However, the operators are more likely to continue on a smaller scale, producing up to 15 tons daily. The system of cribbed manways and ore passes and back-filled stopes, as now practiced on the Antero vein above the tunnel level, would probably be used.

The underground operations are being currently carried on by sub-lessees who furnish all underground labor and explosives and receive 50 percent of the net mill returns after freight, treatment, royalty and production tax are deducted. The applicants plan to mine any ore found during the proposed exploration under the same arrangement. Thus, the underground labor and explosive cost becomes 50 percent of the net returns on ore, about $10.00 per ton on current ore which has an average

gross value of about $33.00 or $20.00 per ton net value (lead at $0.16 per pound and zinc at $0.15 per pound). The operators' overhead costs, including foreman, surface labor, supplies, and repairs, are about $5.00 per ton, making a total mining cost of $15.00 per ton. This leaves an operating gain of $5.00 per ton which should cover other costs, including Government royalty of $1.00 per ton, and leave a reasonable profit. Any ore found during the exploration is likely to be of a grade similar to that presently being mined.

The applicants propose to furnish their share of the exploration costs from rental on equipment they will furnish, profit from current production, and capital.

CONCLUSIONS

The proposed exploration project has an excellent chance of opening up a good grade of lead-zinc ore similar to that now being mined. Quoting W. S. Burbank on page 130 of U. S. Geological Survey Professional Paper 169:

> "Although the fissure is tight on the main adit, the mineralogical character of the ore just above the level does not indicate the bottom of mineralization has been reached. Should the vein widen below the adit level within the next few hundred feet, there might be additional bodies of zinc-lead or silver-copper ore."

The results of the diamond drill hole indicate that the vein has widened and a zinc-lead ore body may have been cut. The strikes and dips of the Antoro and Poverty veins indicate that the diamond drill hole has cut the possible intersection of the two veins. There are two other possibilities: the Poverty vein may have steepened below the adit level and there is no intersection, or the Poverty vein may join the Antoro vein and continue downward with it.

There is a possible intersection of the two veins along the strikes going southeast on the tunnel level. A map in U. S. Geological Survey Professional Paper 169 shows a crosscut near this point. The map furnished by the applicants shows only the start of this crosscut and it is now inaccessible. The intersection here is of no great interest, however, because the Antoro vein is barren on the tunnel level.

On the basis of present knowledge, no good estimate of the tonnage of ore which might be found between the tunnel level and the proposed 125-foot winze level is possible. A similar block on the Antoro vein above the tunnel level has probably produced between 2,500 and 3,000 tons of ore. This compares with 17,000 tons of ore, gross value $33.00 per ton, the estimated grade which must be mined to return the Government its share of the exploration cost. This tonnage is not likely to be produced from the winze operation. If the applicants would agree to pay a royalty on all production from the mine after a contract is signed, the Government would have a much better chance to recover its expenditure.

The Antoro mine is well managed. The operators have a long record of reliability and successful mine operation. They have paid back in full three Reconstruction Finance Corporation loans obtained during World War II.

The proposed exploration project is well planned and the applicants are competent to carry it through.

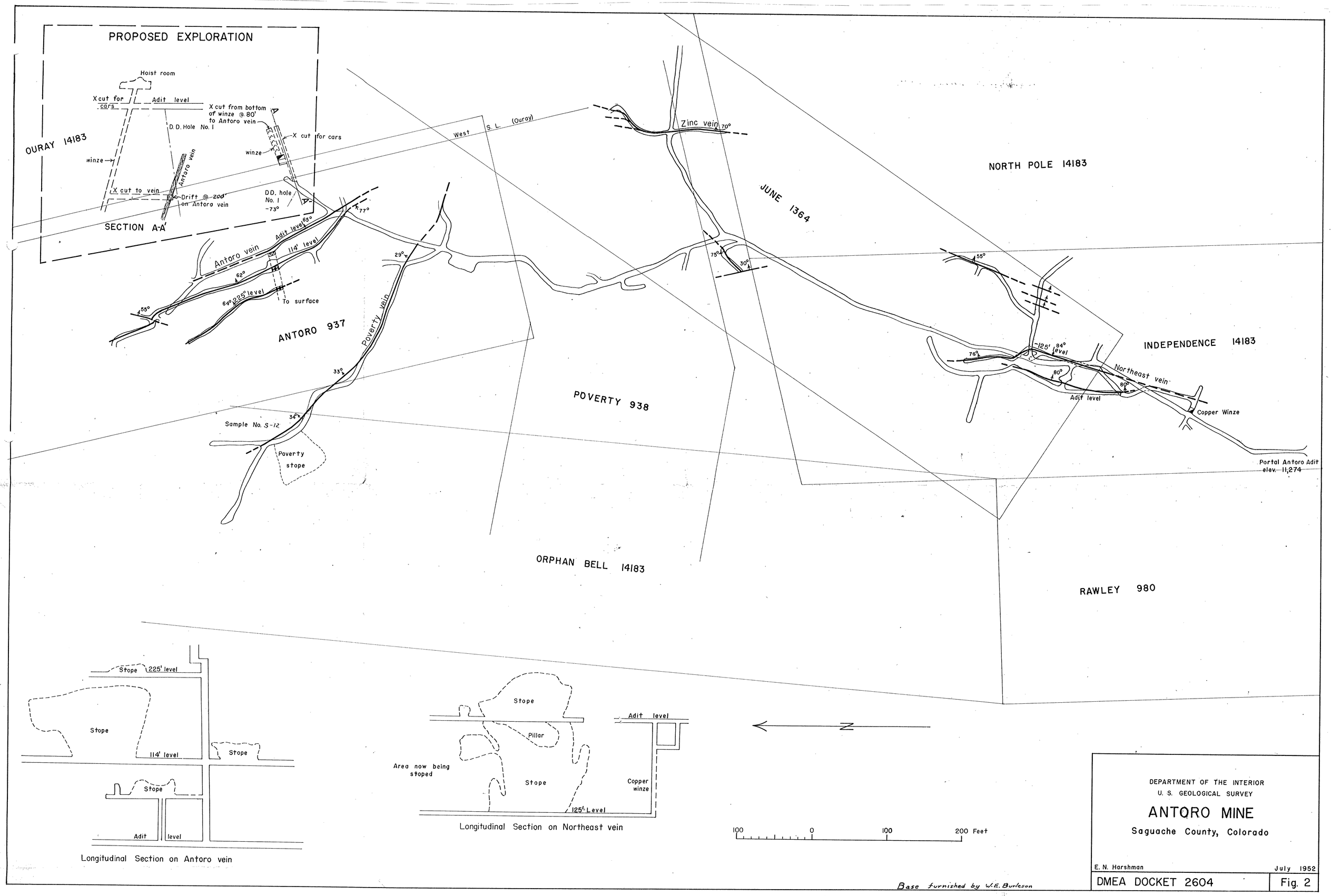
On an estimated production of 375 tons of ore per month, which is possible after exploration is completed, there would be a production of 70,000 pounds of lead and 60,000 pounds of zinc per month.

RECOMMENDATIONS

It is recommended that an exploration contract rounded to $37,400.00, Government participation 50 percent or $18,700.00, be approved with the provision that production from the entire mine will be subject to a Government royalty. The Bureau engineer believes this would be advisable because the prospective production from the block to be explored will probably furnish less than one fourth of the tonnage necessary to return the Government its expenditure in royalties.

The total approved above is about $2,350.00 less than the applicants' estimate. The difference is in the distribution of some costs which are charged jointly to the exploration project and to regular mine operations. The cost of running a bus from Salida to the mine is also omitted in the Bureau estimate.

bam


PROPOSED EXPLORATION
Hoist room
X cut for cars
Adit level
X cut from bottom of winze @ 80' to Antoro vein
D.D. Hole No. 1
X cut for cars
winze
winze
Antoro vein
X cut to vein
Drift @ 200' on Antoro vein
D.D. hole No. 1 -73°
SECTION A-A'
OURAY 14183
West S. L. (Ouray)
Zinc vein 70°
NORTH POLE 14183
JUNE 1364
Antoro vein
Adit level 65°
114' level
77°
29°
62°
64°
225' level
To surface
55°
ANTORO 937
Poverty vein
33°
34°
Sample No. S-12
Poverty stope
POVERTY 938
75°
30°
55°
-125' 84° level
76°
80°
80°
Northeast vein
Adit level
INDEPENDENCE 14183
Copper Winze
Portal Antoro Adit elev. 11,274
ORPHAN BELL 14183
RAWLEY 980
Stope
225' level
Stope
114' level
Stope
Stope
Adit level
Longitudinal Section on Antoro vein
Stope
Pillar
Adit level
Area now being stoped
Stope
Copper winze
125' Level
Longitudinal Section on Northeast vein
N
100 0 100 200 Feet
Base furnished by W.E. Burleson
DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY
ANTORO MINE
Saguache County, Colorado
E. N. Harshman
July 1952
DMEA DOCKET 2604
Fig. 2