CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

The following file is part of the Grover Heinrichs Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

Johnson - Moffet Mine
Madison Co., Mont.
Moor

RIVERSIDE 7-2378

FRANK J. FRANKOVICH
CONSULTING GEOLOGIST
EAST 34 HIGH DRIVE
SPOKANE, WA. 99203

MAY 13 1971
RECEIVED

May 10, 1971

Dear Kenneth:

I will phone you regarding a verbal commitment I have made today on Nancy Lee.

Enclosed is a copy of a stockholders report you might find of general interest. If this kind of situation interests you, please let me know. I hope you can still plan a trip up this way because there is another copper property I know of that merits a look. I don't know much about it, but I do have an interest in it.

Sincerely,

F. Frankovich

RIVERSIDE 7-2378

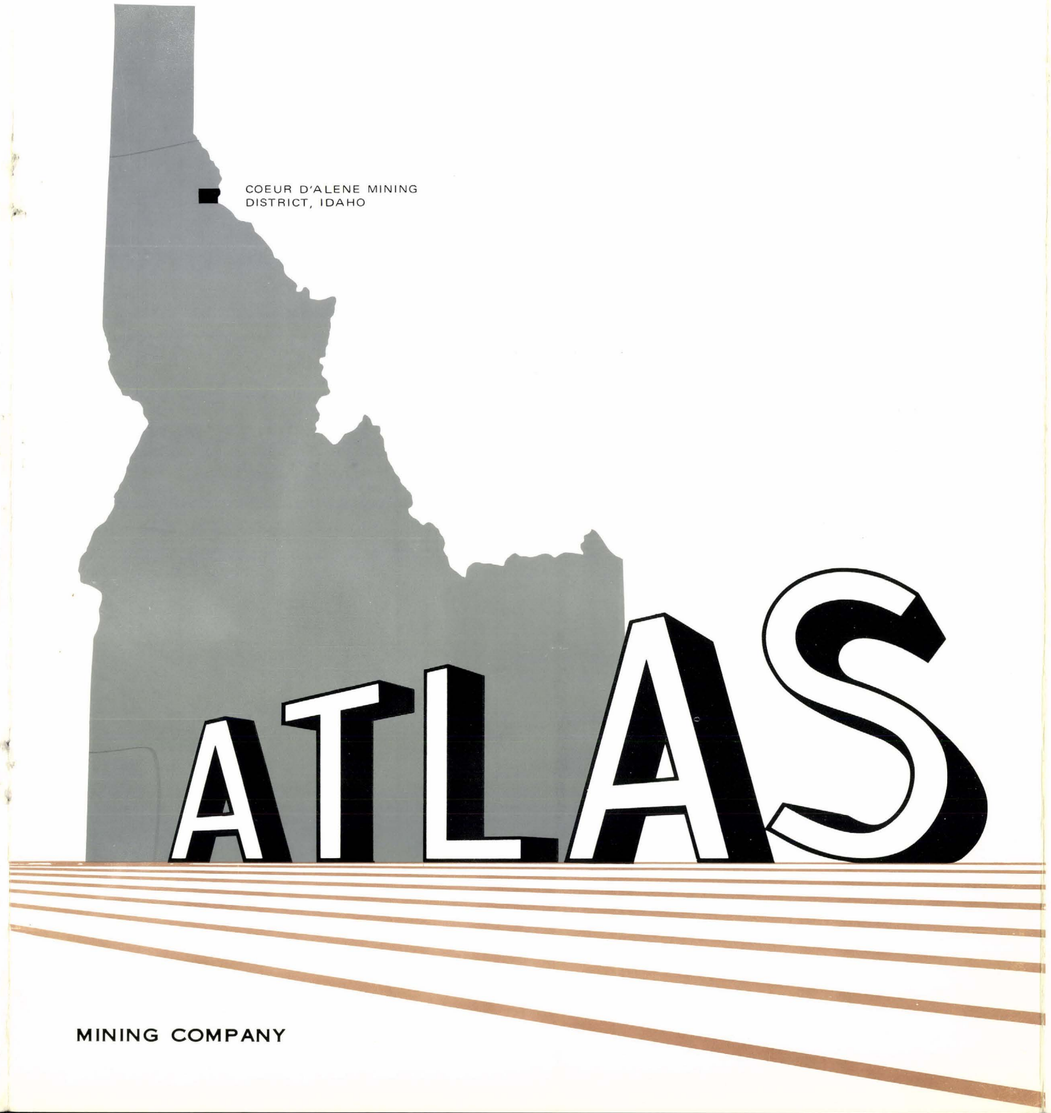
FRANK J. FRANKOVICH
CONSULTING GEOLOGIST

EAST 34 HIGH DRIVE
SPOKANE, WA. 99203

ATLAS

STOCKHOLDERS REPORT

JANUARY 1971



MINING COMPANY

CONTENTS

President's Letter

PART I – GENERAL REPORT

Management
Financial
Review
Summary
Future Work – Objectives
Boulder Creek Vein Potential
Plans for Financing

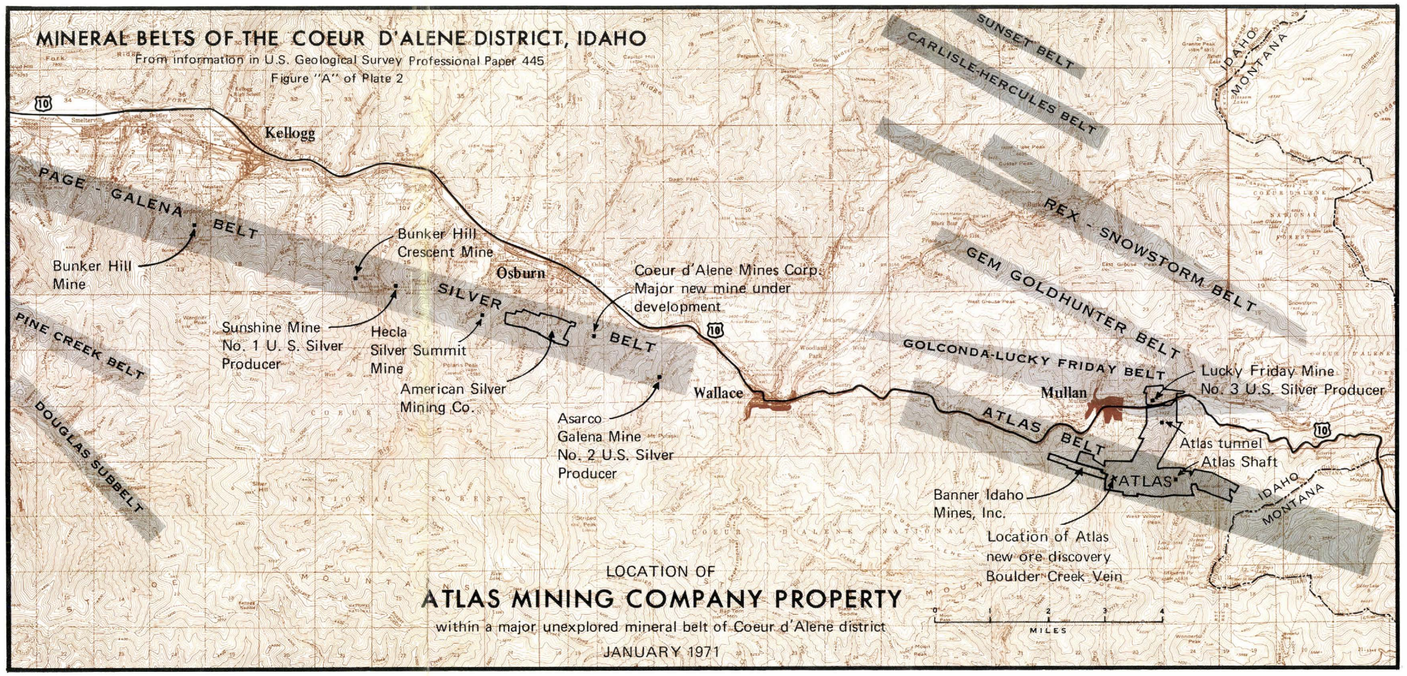
PART II – GENERAL GEOLOGY

General Statement
Historical Geology of the North Idaho Region
Origin of the rock strata
Rock formations and mineral favorability
Deformation of the rock strata

Geology of the Coeur d'Alene District
Further deformation of strata, mineralization
Hidden ore bodies and surface mineral
Mineral belts

PART III – GEOLOGY OF ATLAS

Summary of Potential
The Atlas Property—Location, Size, History
Rock Strata and Structure
Mineralization, Veins and Ore
Exploration Plans
Conclusions



MINERAL BELTS OF THE COEUR D'ALENE DISTRICT, IDAHO. The above is a composite of two maps by the U.S. Geological Survey. The area is about 23 miles east-west. The principal towns are Kellogg, Wallace, and Mullan located on U.S. Highway No. 10. The topographic base map has superimposed on it, in silver, the mineral belts of the district as outlined by the U.S. Geological Survey. All of the belts have been intensively explored and are productive except the Atlas belt which is now being explored by Atlas. Atlas is the key to the development of this major, and only undeveloped mineral belt. Geologically it holds promise of being as productive as the richest part of the district.

OFFICERS AND DIRECTORS

Frank J. Frankovich, President. Consulting mining geologist, Spokane, Washington. Has extensive experience in many parts of the world, and in the Coeur d'Alene district since 1963. His work as consultant for Coeur d'Alene Mines Corporation resulted in its agreement with American Smelting and Refining Company under which a major new silver mine is being developed in the Silver Belt. As Managing Director for Nancy Lee Mines (Montana) set up the operating agreement and made the geological interpretation which resulted in a substantial new discovery of silver ore and start-up of new silver production. President of American Silver Mining Company located in the center of the Silver Belt.

Joseph W. Greenough, Vice President. Ph.D. degree in Quantitative Science. In charge of Biometrics Divison, U.S. Bureau of Commercial Fisheries, Auke Bay, Alaska.

John S. Pehar, Treasurer. Civil engineer, Pasadena, California. Construction contractor in the southwest states since 1945.

John F. Harvey, Second Vice President. Mining engineer 21 years with the Anaconda Company. Has thorough working knowledge of all types of underground vein-type and block-caving mining operations. Designed Anaconda's huge open pit at Butte and was chief engineer of the operation for seven years. In addition to mining, he has broad experience in construction equipment, purchase, and evaluation of mining and milling equipment. Presently Special Assistant to Western General Purchasing Agent for Anaconda's Montana operations.

Thomas E. Groce, Secretary. Chief Metallurgist at Kaiser Aluminum's Reduction Plant in Spokane. Has had considerable operational experience in mining at Butte and also in the copper smelter in Anaconda, Montana. Experienced in metallurgical research and development, and application of metallurgical techniques to production processes and problems.

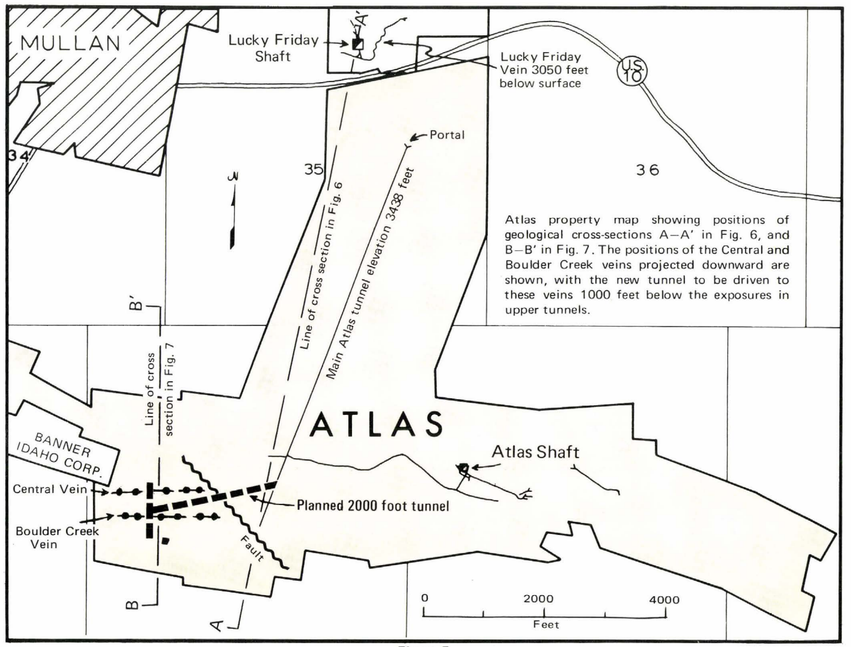


Figure 5

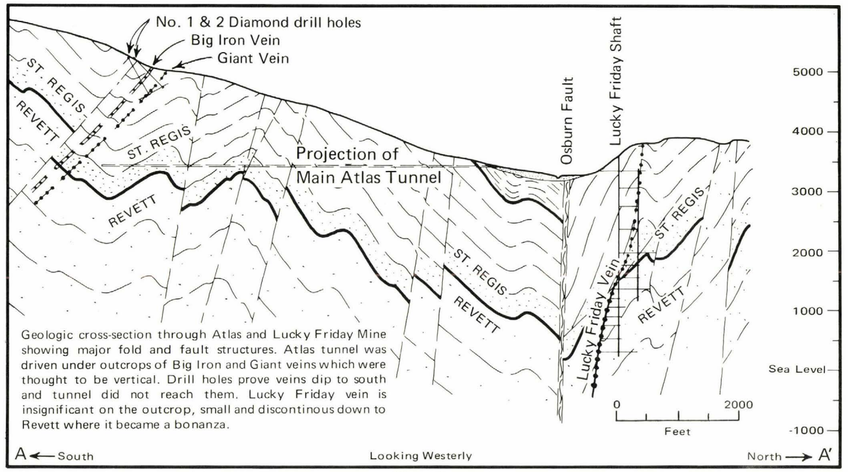


Figure 6

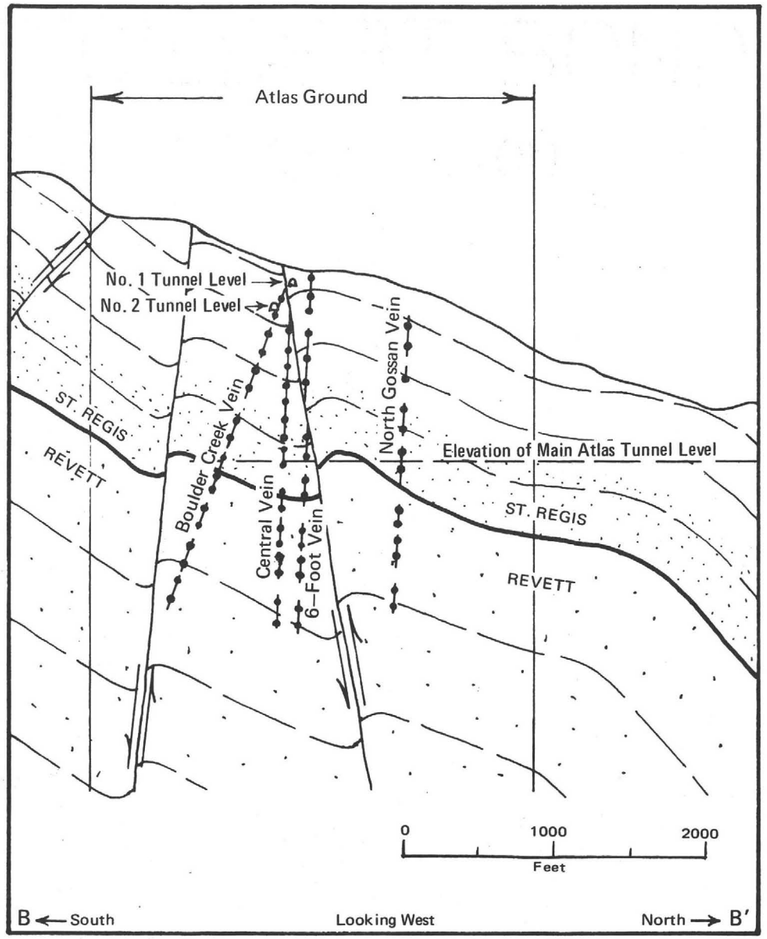


Figure 7

North-South Geologic cross section through west end of Atlas' **Boulder Creek Area.** See Figure 5 for location of section. This Figure shows relation of veins to rock formations and structures. The planned exploration tunnel west from the present Main Atlas Tunnel will explore the veins in the favorable St. Regis-Revett transition zone.

ATLAS MINING COMPANY

Coeur d'Alene District
Mullan, Idaho

Frank J. Frankovich, President
E. 34 High Drive
Spokane, Washington 99203
(509) 747-2378

January 1971

W. H. Schroeder
Transfer Agent
P. O. Box 48
Spokane, Washington 99214

Dear Shareholder:

In this report we will try to present the full picture of Atlas, in depth, so that you may better appreciate the worth of your shares as a valuable long-term investment.

First, for perspective, a few facts should be stated regarding the Coeur d'Alene mining district in which Atlas is located. The Coeur d'Alene district is the greatest silver-producing district in the world. Its mines have produced over 5 billion dollars worth of metal (calculated at current prices) and their recorded dividend payments are over $327,000,000. All of these dividends were paid by companies which were locally incorporated with shares of nominal value, usually 10¢ par value. Seven of these local stocks now have nationally recognized value: Hecla, Sunshine, Lucky Friday (now merged into Hecla), Bunker Hill (now part of Gulf Resources), Coeur d'Alene Mines Corporation, Callahan and Day Mines. A number of other mining companies in the district produced great fortunes, worked out their mines and are now dormant.

The history of the Coeur d'Alene district is outstanding among the major mining districts of the world because of the recurrent, major new discoveries throughout its entire ninety-year history. These discoveries were the result of courage, faith, and sustained effort. They occurred in new extensions of the district, and always unexpectedly. One discovery, in a then "unpromising" area, yielded a great silver bonanza in 1933. This was the Sunshine mine which brought prosperity to the district when silver was 35 cents per ounce and all other mining districts suffered deeply during the depression. It is still the largest silver mine in the U.S.

The geology and history of the district virtually assure that there will be additional major discoveries in the Coeur d'Alene district, and a few more apparently insignificant stocks will become valuable blue chips. Successes will be achieved by those few companies that have three important elements: ownership of geologically good ground, competent management, and stockholder support.

We will show in the following report how we know that the geology of Atlas is exceptionally good, and what your management is doing now to develop your property. All we need is a moderate amount of additional work to make Atlas a major producer of silver, lead, and copper ores.

Sincerely yours,

F J Frankovich

Frank J. Frankovich
President

ATLAS MINING COMPANY
STOCKHOLDERS' REPORT

This is the first detailed report on Atlas Mining Company and it is presented in three parts. The purpose is to present not only the usual financial and management picture (Part I), but far more important (in Parts II and III) to try and explain how and why the geology of Atlas clearly indicates it is an exceptionally good mining investment. To do this we must present a considerable amount of geological detail. It is necessary to review the basic features of the district geology that have developed as empirical* guides to ore, and show how these same features are present in, and are guides to, ore in Atlas. This will show why it is possible to predict with reasonable certainty that Atlas will be a major producer of silver, lead and copper.

PART I—GENERAL REPORT

MANAGEMENT

Mineral prospects are found, and often by luck alone, *but mines are not found, they are made* from prospects with hard, persistent work that is financed and guided by capable management. In successful mining exploration and development, management capability is second only to the ground itself, and without it, no mining company can hope to prosper. The members of the Board of Directors make available to Atlas exceptional experience and talents in exploration and mining geology, underground engineering, mineral processing, metallurgy, and construction. All the talents of this Board have not been needed to date, but they will be as Atlas progresses. A brief management profile is inside the front cover of this report.

FINANCIAL

On October 23, 1969, the stockholders voted almost unanimously to make Atlas shares non-assessable and to increase the capitalization from 2 million to 3 million shares. This was done to permit Atlas to continue to finance its own development through a public offering of stock. At this date 2,000,000 shares have been issued, and of these about 44,000 have been re-acquired and are held in the treasury.

Engineering and geological studies are in progress to determine the best procedure and the cost of driving deep underground headings under the known ore and into several of the very promising target areas in Atlas. When this engineering work is completed, management will be in a position to determine what is the most desirable method of financing the next phase of the development program.

The financial statement, through October 31, 1970 as prepared by certified public accountant Jack H. Bell, is appended to this report.

REVIEW OF ATLAS' PAST SITUATION

Because a comprehensive stockholders' report has never been issued, and because of the many new stockholders in Atlas, a brief review of the past and a summary of recent years' work and development is essential for many to understand Atlas' present situation and worth as an investment.

In 1966, when the present management became active in Atlas, the investing public generally was unaware of the company, no work was being done on the property, and those who were aware of it, thought it had been adequately tested without encouraging results.

The surface of the property was inaccessible by vehicle, making examination of the surface extremely difficult, and therefore, modern-day geologists were unaware of its favorable geology and many veins. Only two of the ten tunnels to underground

*Empirical—founded upon experience and observation alone, without due regard to science and theory. (From Webster)

workings were open. Just a small part of the underground geology could be seen, and then only with considerable difficulty and risk.

In short, because the property was thought to have been explored without encouraging results, and because it was dormant and inaccessible, Atlas was thought to be a poor investment *even though broad geological aspects indicated otherwise.*

SUMMARY OF DEVELOPMENT WORK

Work was started in 1966 with the objectives of making the property accessible on the surface and underground, to expose the geology, and to obtain data that would permit broad, and accurate geologic inference as to the location of ore targets. This was to be followed by diamond drilling and underground work to prove, if possible, the validity of the geologic inferences.

During the past four years work has progressed steadily and successfully and the initial objectives have been achieved. The surface is entirely accessible by vehicle and vitally important geological features have been exposed for the first time in the course of road building and bulldozer trenching. All but two of the tunnels have been opened and most of the underground workings have been rehabilitated. Diamond drilling and underground tunneling have yielded information which proved the validity of the original, guiding geologic inferences. The first target area was selected, additional underground work followed, and *new lead-silver ore was found* where none was previously known nor suspected. Thus, the original objectives of Atlas' work have been achieved.

Shipments totaling about 400 tons have been made from the new Boulder Creek vein from two levels and are enough to prove the commercial character of the ore. Production in quantity, however, must await development of the vein on lower levels, which is the top priority objective of future work.

In addition to the new lead-silver ore in the Boulder Creek vein, there are now ten other veins known on the surface or underground. Each of these veins is a strong, significant structure with reasonable possibilities of becoming a producer with additional work. Part III of this report contains more detail on this subject.

FUTURE WORK—OBJECTIVES

The new objectives in Atlas' development work are:

1. Development of access into the known ore in the Boulder Creek vein at a lower level.
2. Preliminary exploration of at least two of the other ten known veins to learn more about their commercial possibilities.
3. Preliminary exploration of several favorable areas in Atlas where no exploration has been done in the past. These areas appear to hold as much promise as any area in the Coeur d'Alene district.

The major effort will be on the first objective because commercial production from the Boulder Creek vein is virtually assured. The lessor effort on objectives two and three is designed to yield information for planning substantial programs in those areas at a later date.

About $300,000 will be required to open the known ore 1000 feet beneath the present Boulder Creek level from the main Atlas tunnel, and to complete the other work outlined in the objectives above. This will pay for about 2000 feet of tunneling, about 7000 feet of diamond drilling plus substantial set-up costs. A flexible program is necessary so that the kind and direction of work can be varied with the geology as it is exposed. About one year will be required to complete this next phase of work after financing is available. Completion of this work should permit production to begin.

BOULDER CREEK VEIN POTENTIAL

The discovery of the Boulder Creek vein is of major significance. A valid evaluation of the ore discovery in the Boulder Creek vein can only be made by comparing it with the other productive vein in the district which it most closely resembles. The Boulder Creek vein very closely resembles the famous and richly productive Lucky Friday vein, adjacent to Atlas on the north (see map inside of front cover). It resembles the Lucky Friday vein in virtually all important geologic features, but particularly in: ore minerals, vein minerals associated with the ore, metal values in the upper levels, wall rock, configuration of the vein in plain view, and in associated minor and major fault structures.

The only reason which makes one pause in comparing the Boulder Creek vein with the Lucky Friday vein is the latter's great productivity and profitability. The Lucky Friday vein is now the backbone of the Hecla Mining Company, and in 1969 the Lucky Friday yielded a net profit over $6,500,000. It has been productive many years and will continue for many more years. It seems far too much to expect the Boulder Creek vein to be as productive, but there is no geologic reason evident to contradict such a conclusion.

PLANS FOR FINANCING

The type of financing arrangement which can be completed at any given time varies with the general prevailing economic climate and inevitably affects our planning. During 1970 it was not timely to make a public offering of stock. Because the general investment climate seems to be changing, it now appears that a public offering of stock will be a desirable method of financing future development work. "Private placement" of stock, or taking in an operating partner are alternate means of continuing work that will be carefully considered. A final decision on this matter has not been made.

ATLAS MINING COMPANY

(AN IDAHO CORPORATION)
SPOKANE, WASHINGTON

BALANCE SHEET — AS AT — OCTOBER 31, 1970

ASSETS

CURRENT ASSETS:			
Cash on Hand and in Bank		1,915.20	
PROPERTY, PLANT AND EQUIPMENT (NOTE 1):			
Land—1143 Acres		27,900.00	
Tunnels	371,737.00		
Mining Equipment	17,950.00		
Atlas House	6,000.00		
	395,687.00		
Less:			
Accumulated Depreciation	--	395,687.00	
			423,587.00
MINING PROPERTIES (NOTE 2):			
Value assigned to 59,495 shares issued since 10/1/69 for Exploration		59,086.75	
Value assigned to 890 shares issued since 10/1/69 for Engineering		712.00	
Cash Cost of Exploration		42,986.14	
Cash Cost of Engineering		3,370.31	
			106,155.20
Total Assets			$531,657.40

LIABILITIES AND STOCKHOLDERS' EQUITY

CURRENT LIABILITIES:			
Accounts Payable		1,097.27	
Note Payable—Bank at 8½% due 11/28/70 (Note 3)		8,115.00	
Note Payable—Stockholder at 8% due on demand (Note 4)		8,950.00	
Total Current Liabilities			18,162.27
STOCKHOLDERS' EQUITY:			
Capital Stock Authorized 3,000,000 common shares with a par value of $.10 of which 2,000,000 are issued		200,000.00	
Capital Surplus:			
Excess of value assigned to property interest over par value of 1,654,727 shares	317,913.03		
Less: Treasury Stock at cost 44,179 shares	4,417.90		
		313,495.13	
Total Stockholders' Equity			513,495.13
Total Liabilities and Stockholders' Equity			$531,657.40

Note 1: Property, Plant and Equipment

As at September 30, 1969, an Assessment of the Atlas Mining Company holdings at Mullan, Idaho, was made by Donald C. Springer, an independent Geologic Consultant. The present day valuations set by him on the Land, Tunnels, Equipment and Atlas House was $423,587.00.

This appraisal represents a reduction in Asset carrying values of $719,746.28 since the last financial statement as at December 31, 1968. Of this amount $713,990.90 has been used to reduce the Contributed Capital Account (now called Surplus) at September 30, 1969, to $240,377.78.

Note 2: Mining Properties

The Company has followed a consistent method of capitalizing all exploration and engineering costs until proven ore reserves are found. Because all mining properties were appraised at September 30, 1969 (See Note 1) only the costs subsequent to that date have been capitalized.

Note 3: Note Payable—Bank

10,000 shares of Capital Stock issued to Wallace Diamond Drill Company in November 1969 has been pledged by them to secure the Note Payable—Bank of $8,000.00 at 8½%, due November 28, 1970, plus accrued interest to October 31, 1970, of $115.00.

Note 4:

On June 1, 1968, the Company borrowed $7,500.00 from Anne Greenough, a stockholder, on a demand note. Accrued interest at 8% from June 2, 1968, to October 31, 1968, amounts to $1,450.00.

AUDITOR'S CERTIFICATE

To: The Board of Directors, Atlas Mining Company — December 2, 1970

We have examined the Balance Sheet of Atlas Mining Company (An Idaho Corporation) as of October 31, 1970. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

Certain costs incurred during the non-productive stages have been capitalized on the records of the Company to be recovered as ores are extracted, if and when commercial ore bodies are developed and mined. As of the date of this report, the Company was in a non-productive stage.

In our opinion, the accompanying Balance Sheet presents fairly the financial position of Atlas Mining Company at October 31, 1970, in conformity with generally accepted accounting principles, except as stated above, applied on a basis consistent with that of the preceding year.

P.O. Box 2124, West 1005 Ninth
Spokane, Washington 99210

Jack H. Bell
Certified Public Accountant

PART II—GENERAL GEOLOGY

GENERAL STATEMENT

The value of all mining properties lies ultimately in the metal values found in rock. The amount of metal in the rock and its distribution is controlled by the physical and chemical character of the rock and the forces which have altered it. The acquisition and systematic assembly of the data on basic rock character is the function of geology. The determination of the amount and distribution of metal values in rocks is economic geology. Therefore, a simple, but fundamental understanding of economic geology is vital to a stockholder's evaluation of a mining stock.

Not every stockholder will find this part of the report interesting, but it has been prepared for the many stockholders who have expressed an interest in, and have asked questions about the geology of Atlas. The material is not easy reading and it requires attention and effort. The effort, however, will probably be rewarding to those interested in making an intelligent investment in a mining stock which holds real possibilities of bringing returns many times the invested dollar.

Virtually no competent, informed, and expert advice is available to the average investor regarding mining company stocks which have real value potential *before* they become major producers. Many brokerage firms have reliable technical appraisals available only on the major, long-established mining companies which offer little opportunity for great capital appreciation. Because investors generally have no source of expert advice on mining stocks, it is hoped the following material will help to fill that gap for the Atlas investor—that it will not only give him a measure of the risk he is taking, but also help him appreciate the possibilities of great return.

The worth of Atlas will be demonstrated by showing in simple terms the important ore-controlling and ore-indicating geological features of the Coeur d'Alene mining district as a whole, and then show that Atlas has the same features in every respect. The Atlas area differs from the richly productive Silver Belt a few miles to the west in one respect—it has not been explored and developed to the extent that was necessary to bring the Silver Belt into production. Geology indicates that when the Atlas area is adequately explored and developed, it will be as productive as any other part of the district.

HISTORICAL GEOLOGY OF THE REGION

Origin of the Rock Strata

The rocks of the Coeur d'Alene district were deposited more than two billion years ago as sediments on the bottom of a very shallow inland sea that covered the whole interior northwest United States region. The sediments were deposited as mud, clay, silt, and very fine sand on the shallow sea bottom. During eons of time the rate of erosion and sedimentation varied, which produced a layering in the sediments. As in all seas, there were periods of accumulation of dissolved minerals in the water which occasionally caused an extensive chemical precipitation of carbonate on the sea bottom in addition to the other sediments. At times when erosion slowed or ceased, only carbonate was deposited. At other times the carbonate was precipitated simultaneously with the deposition of the eroded sediments, resulting in carbonate-rich mud, clay, silt, and sand. During times when no carbonate was precipitated, the composition of the sediments was nearly pure silica.

Thus, in the very earliest history of the origin of the rocks, varying conditions of erosion and deposition produced layers of sediments of varied chemical character, from nearly pure silica to nearly pure carbonate, with all degrees of mixture in various layers. This variation in chemical character of the layers of rock ultimately played an important role in the formation of veins and in the deposition of ore minerals.

Because of its physical and chemical character, a zone including the lower St. Regis and upper Revett formations has proven to be the most favorable for the occurrence of large ore bodies. All rock formations have produced some ore, however, and much has yet to be learned before a complete understanding of the ore-forming process is possible.

The sequence of sediment deposition is shown in the following generalized cross section in Figure 1. The sediments were hardened in time by heat and pressure into rock layers that have been given locality

(that is, non-geologic) names for convenience in mapping and geologic reference.

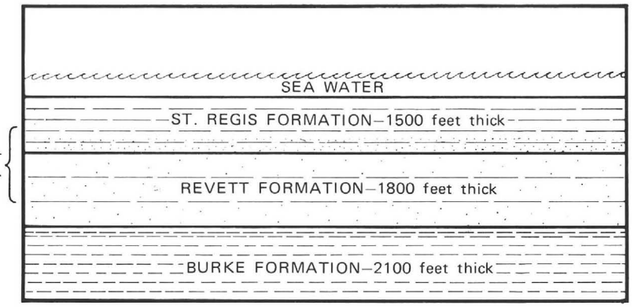


Figure 1

Generalized cross section showing sequence of deposition of sediments which were metamorphosed to form the bedrock strata of the Coeur d'Alene district.

The *St. Regis formation* consisted mainly of muds, silts, and thick fine sands with high carbonate content at the bottom.

The *Revett formation* sediments were thick sands with minor, thin mud layers. Carbonate content is relatively high in the upper part.

The *Burke formation* consisted of thin-bedded muds and fine sand throughout.

Rock Formations and Mineral Favorability

The soft sediments gradually became very deeply buried and subjected to intense heat and pressure. This caused "metamorphism," completely changing the physical characteristics of the sediments–converting them into hard rock. The muds hardened into a rock called "argillite," the sands into "quartzites" and the carbonate into limestone. Bending stresses caused by deformation of the earth's crust resulted in faulting, and in a fault, argillite and quartzite behave differently. The argillites, because of their original mud character, will not "open up" when faulted, but will develop tight slippery fractures through which mineralizing solutions cannot penetrate. The quartzites react very differently to faulting because of their rigid and brittle character. The quartzites will break and shatter into wide open fractures along fault planes through which mineralizing solutions can pass, and can then react with the wall rock according to its chemical composition, depositing vein and ore minerals in the fractures. In general, therefore, argillites are unfavorable for mineralization and quartzites are favorable.

The *St. Regis formation* is largely argillite, but has a high percentage of quartzite towards the bottom. The *Revett formation* is almost entirely massive quartzites. But it is only in the *transition zone* in the lower St. Regis formation and in the upper Revett formation that the quartzites also have an appreciable *carbonate* content–an important chemical characteristic. The hard brittle character of the quartzites is not enough in itself to create a favorable environment for the formation of ore. The right chemistry in the form of carbonate is also necessary. The rock layers having all the favorable factors best developed is found in the lower St. Regis and upper Revett formations as noted in Figure 1.

The Burke formation, underlying the Revett, is generally unfavorable for large ore deposits because of its high argillite content and thin-bedded character.

Deformation of the Rock Strata

After the deposition of the St. Regis formation, many tens of thousands of feet of additional sediments were deposited above it, causing metamorphism through heat and pressure. Eventually in ancient geologic times, the land surface in the northwestern U.S. began to rise due to compressional forces in the earth's crust. As the land emerged from the seas, erosion started on the surface, and the rock strata began to gently fold, buckle, and finally yield to the compressional forces by faulting (see Figure 2).

GEOLOGY OF THE COEUR D'ALENE DISTRICT

Further Deformation of Strata, Mineralization

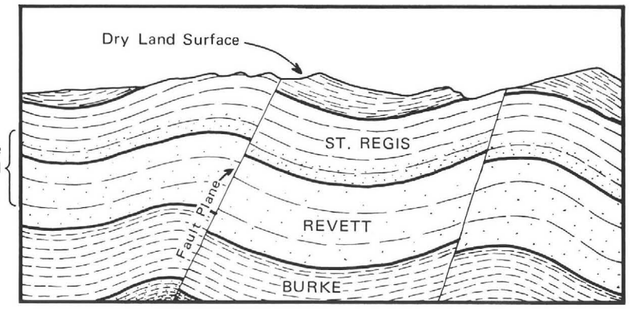


Figure 2

Generalized cross section after up-lift, and early stages of folding and faulting of bedrock strata.

Compressional forces continued over a long period of time, continuing to fold, and fault the rock strata into complex structures as shown in Figure 3.

Fracturing and faulting of the rock strata became extensive. Then new forces developed from deep within the earth. In places molten rock was pushed up into the rock strata as large, irregular "plugs," and also other phases of the molten rock were injected up into some of the fractures.

It is generally believed that the deep molten rock masses were the source of the mineralizing solutions

content of about 0.3 ounces of silver and 1% lead. This is low grade, but, nevertheless, important mineralization which is likely to become ore grade with additional depth. The Central vein is an important objective in the future lower level work.

Little is known of the other veins shown in Figure 7, but they are promising enough to justify further work. It is likely that more non-outcropping veins, like the Boulder Creek vein, will be discovered with additional work.

EXPLORATION PLANS

Carney Copper and Carbonate Hill Areas: More surface work such as trenching, soil sampling and diamond drilling is planned in the east half of Atlas in preparation for planning major underground projects for the future.

Big Iron Area: Driving the main Atlas tunnel south would appear to be a very simple and worthy project. There is evidence, however, that an important fault exists which may interrupt the downward projection of the Big Iron and Giant veins. There is no question that they continue down, but where and how is in question. Additional surface work and drilling will be done to resolve certain questions before more underground work is done in this area.

Boulder Creek Area. This is the best area in which to achieve production at an early date and it will be given top priority. The work can be accomplished with a nominal amount of financing–approximately $300,000.

A new tunnel (shown as a heavy dashed line in Figure 5) will be driven from the present main Atlas tunnel westerly about 2000 feet to a point midway between the downward projection of the Central and Boulder Creek veins. Then tunnels will be driven north and south (see Figures 5) to crosscut the ore-bearing Boulder Creek vein and others (See Figure 7) in the favorable geologic environment near the top of the Revett. The operation at this stage will be in a position to profitably go into production.

From the time the tunnel is started, six to ten months will be required to reach the Boulder Creek vein and do other work, depending on the number of shifts per day the contractor operates.

CONCLUSIONS

Of the two veins that have produced ore and of the many large mineralized veins in Atlas, *not one has been tested* in the geologically most favorable rock strata, that is, in the lower St. Regis and upper Revett formations. When this is done adequately, there is little doubt that Atlas will be a substantial producer of silver, lead and copper.

Hidden ore potential is as great, if not greater, than the visible ore potential, and work is planned to reveal it.

The whole geologic picture, and the total quantity of mineralization justifies the conclusion that each of the four parts of Atlas has an excellent probability of becoming a major mine, when judged against the geology and early histories of the producing mines in the Coeur d'Alene district.

FRANK J. FRANKOVICH
PRESIDENT AND
MANAGING DIRECTOR

The best assay obtained underground in the unoxidized vein was 7 feet of 0.3 ounces of silver and 5.5% copper. The vein overall is not commercial, in this near surface tunnel, but it has exceptionally promising values in terms of what it indicates below in the lower St. Regis and upper Revett rocks.

An early-day tunnel driven to intersect the veins at a lower elevation failed to find them. Recent geological mapping of the tunnel now shows that post-mineral faulting (of the type labeled A, B and C in Figure 3) displaced the veins from the expected position. The veins can be located with additional work and adequate geological control.

Carbonate Hill Area. This area of Atlas has had the most work done in it. It has produced ore, and has ore exposed in it. The "Bird" vein was discovered in the Carbonate Hill tunnel about 1910. Intermittent efforts over the years have followed it down a vertical distance of 1500 feet. The best assay on record in the Bird vein shows 8.2 feet of 3.2 ounces of silver, 7.5% lead, and 0.17% copper. The last effort (1950 to 1953) to intersect this vein 1600 feet deeper in the Revett did not allow for the existence of a post-mineral fault, and it failed. This vein still has mineable ore in it below the Atlas tunnel level and additional work will find it in the Revett.

Another vein was found in the Carbonate Hill area in 1936. The vein was opened for a distance of 110 feet exposing widths of 8 to 12 feet. The vein consists of a non-valuable "carbonate" mineral with stringers and lenses of silver-bearing lead. In 1936 the mineral type and geology meant nothing and the effort was abandoned. When examined now, in the light of recent developments, this vein has the characteristics of a big producer from the lower St. Regis and Revett rocks below. Other veins in this area are known.

Big Iron Area. The vein outcrops exposed in this area of Atlas by bulldozer work in 1966 are the biggest in the Coeur d'Alene district. A number of parallel and "en echelon" veins are known to extend from the middle of the property west to Boulder Creek. (The east half of the property has had little surface exploration.) The Big Iron vein itself varies from 20 to 60 feet in width and is exposed by trenching for a length of 2000 feet with the ends of the vein covered. The parallel Giant vein is 7 feet thick and its length has not been determined beyond 200 feet.

The gossan outcrops of these veins are thoroughly oxidized and leached of values, but traces up to one-half ounce of silver per ton are present with recognizable lead minerals. These are important values when found in a gossan.

In considering the potential of these veins, one should remember the statement in the U.S. Geological Survey Professional Paper No. 445 (on the Coeur d'Alene district), page 61, that, ". . .if a large barren vein is discovered, *the chances are better than even* that an ore shoot is present somewhere along it." The *very high probability of finding ore* in this area with additional work is indicated by the number of veins, the large size, and the fact that they *are not barren.*

In the past this area was regarded as having been tested by the main Atlas tunnel because the veins were thought to be vertical. The bulldozing work in 1966 indicated that the veins were not vertical, but inclined to the south (See Figure 6 inside back cover). Later two diamond drill holes confirmed the inclination to be 55°to the south.

This conclusive determination of the south inclination of the veins has great significance. It means that the main Atlas tunnel did not test the outcropping veins at depth as it was intended, but that it was stopped short of its target in 1927. It means also, that all the work done east from the main Atlas tunnel is too far north to have tested the most favorable rocks and structures at depth. It means finally, that despite the appearance of having been tested underground, Atlas remains unexplored in the favorable areas, except for the recent surface and shallow subsurface work.

Boulder Creek Area (Figure 7.) After the first phase of surface work was completed, it was decided to do underground work in the Central vein in 1968 because it is 15 feet wide and has near-commercial values in silver and lead. The central vein was followed on the Boulder Creek No. 1 tunnel level a short distance and was found to be cut off by a fault. Underground drilling for the faulted extension accidentally discovered the Boulder Creek vein which does have commercial values in silver and lead. Development work exposed an ore shoot 86 feet long.

Development work on the lower No. 2 tunnel level was undertaken and ore was exposed again in the Boulder Creek vein. On the second level the ore shoot is 100 feet long and varies from one to 8 feet in width. The best assay obtained was 8 feet of 5 ounces of silver per ton with 13% lead, which is good ore. It is most encouraging that the ore shoot generally was bigger and better on the second level.

Four hundred tons of ore were mined and shipped to prove the commercial character of the ore, but further development was impractical because of the high elevation and difficult access. Discovery of the Boulder Creek vein was an exceedingly favorable development. When good ore of this type is found in the upper St. Regis rocks, it is highly probable it will be bigger and much higher in grade below in the lower St. Regis and upper Revett. This near-surface development of ore compares favorably with the early stages in the development of the Lucky Friday and other mines in the district. Every geologic factor of importance indicates that this one vein alone in Atlas is likely to make a mine.

The Central vein has features indicating a great potential. Three hundred feet of it is exposed on the second level having a width of 15 feet and a metal

that rose up through the fractured rock strata and deposited the ore in certain, geologically favorable sites, and non-ore vein minerals in other areas. The most promising sites exist where deep-seated fractures cross the highly favorable quartzites of the lower St. Regis-upper Revett, or the "favorable zone."

By the time ore mineralization was introduced into the rocks the structure was complex and the "favorable zone" was severely contorted and faulted. For this reason it is difficult to predict where

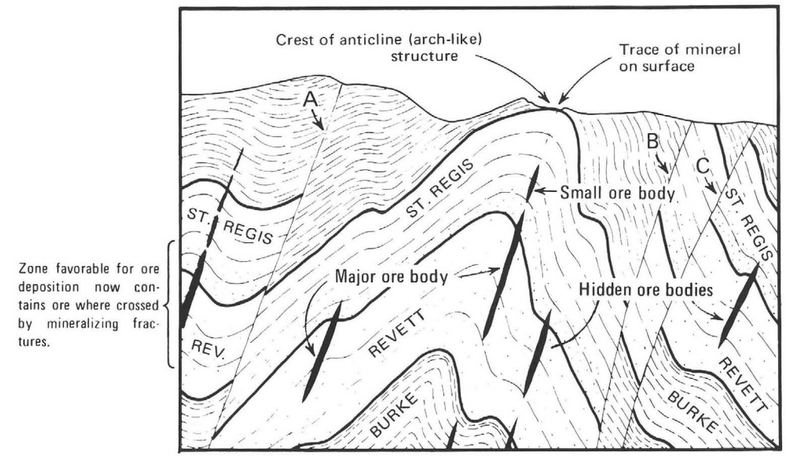


Figure 3

Generalized cross section across a mineral belt after further deformation of bedrock strata and mineralization introduced along fractures. Ore bodies shown as black replacements along fractures crossing lower St. Regis and upper Revett quartzite strata. Main faults (labeled A, B and C) developed after the emplacement of mineral and did not control its deposition, but they do seriously complicate the search for ore.

intersections of fractures with the "favorable zone" are located. Fortunately, anticlinal (arch-like) structures brought the "favorable zone" close to the surface where the rocks could be prospected (see Figure 3).

The search for ore bodies is seriously complicated by a great number of faults which occurred after the ore was in place. These post-mineral faults have held up development of certain parts of the district because their nature was not understood. This obstacle is being overcome.

In a very few of the fractures, which were channels for mineralizing solutions, the solutions "leaked" up above the quartzites and deposited small ore bodies or just traces of mineralization in the argillites above the "favorable zone" in the St. Regis formation. These traces of mineralization on the surface provided the incentive to the old-time prospectors who eventually followed the stringers of mineral down to the "favorable zone" and there found major ore bodies. They then explored laterally at depth and found more hidden ore bodies. This has been going on more than seventy years and is gradually extending the productive areas.

Hidden Ore Bodies and Surface Mineral

Almost 100% of the Silver Belt production today comes from hidden ore bodies that have no surface indication of their existence (Figure 3). Only rarely today is surface mineralization found which indicates ore in the "favorable zone" below.

Profitable exploration for hidden ore bodies is carried on by tunneling from moderate to great depths (in excess of 5,000 feet deep) in the "favorable zone." The almost random encounter of good ore bodies in the "favorable zone" has proven to be so profitable and so widespread that it is certain production will continue for very many decades.

A unique feature of the Coeur d'Alene district is the barren character on the outcrop of many richly productive veins. Many veins were totally barren for hundreds to thousands of feet beneath the surface before becoming high grade ore. The U.S. Geological Survey has made a very comprehensive study of the district, and in Professional Paper No. 445 (page 65) is it stated, ". . .the outcrop of some ore bodies gave little indication of their great size at depth, there are also ore bodies on these veins that apexed below present erosion levels; in addition, there are entire veins and vein systems that apex a thousand feet or more below the surface."

Appreciation of the last statement has prompted district operators to undertake projects of sinking deep shafts in areas where no surface mineralization exists. Such projects are truly unique in the mining world—requiring exceptional geologic conviction and courage on the part of the operators. But it is this type of work and conviction that have been successful in making the Coeur d'Alene district this country's greatest silver producer, in addition to great quantities of other metals.

Mineral Belts

Inside the front cover of this report is a reproduction (over a topographic base) of the Mineral Belt map of the Coeur d'Alene district published by the U.S. Geological Survey in Professional Paper No. 445. Company names and property lines have been added.

Professional Paper No. 445 states, "The mineral belts are structural features. They consist of veins, productive and nonproductive, that formed along fracture systems or shear zones, and their positions and attitudes are not greatly affected by local geology. Exploration over the years has shown that

the belts have limited widths, though they may be wider than the outcropping veins indicate."

The Silver Belt has been the most productive belt to date. Its position is marked by productive silver mines along the axis of an anticline which brought the favorable rocks up within prospecting reach. This accounts for production along its length. Figure 3 is a highly generalized cross section across the Silver Belt, which is figuratively representative of the geology and ore occurrences.

The favorable rocks "sag" deeply beneath the town of Wallace where they have not been prospected and there is no production in the area. This accounts for the gap between the Silver Belt and the Atlas Belt. The Atlas Belt is another anticline which brings the favorable rocks up within prospecting reach.

PART III—GEOLOGY OF ATLAS

SUMMARY OF POTENTIAL

Atlas has the largest outcropping vein system in the Coeur d'Alene district. Most of its surface is covered and the underground is essentially unexplored, therefore, it must have also, in addition, the greatest possibilities for the occurrence of non-outcropping vein systems of the type described in the U.S. Geological Survey Professional Paper No. 445.

The known veins and geology in Atlas ground strongly indicates that it contains the best unexplored mineral potential in the Coeur d'Alene district. Despite the existence of known ore, and a number of big mineralized veins, *no exploration has ever been done* where these veins cut through the favorable rocks of the lower St. Regis-upper Revett quartzites. This is a result of the history of ownership of Atlas ground, lack of money, and the several erroneous geologic concepts of the past which guided exploration efforts. The simple, empirical guides to ore, now evident in the district, were not used in past exploration efforts in Atlas. When the empirical guides are used, and sufficient exploration work is done, Atlas will be as productive as any property in the district.

The property outline of Atlas is shown in the following Figure 4 with circles showing the areas that originally were separate mining companies before consolidation into Atlas in 1922. North of Atlas is the Lucky Friday mine property with the position of its vein shown on the level 3050 feet below the surface. Only one vein is known in the Lucky Friday mine, and it had little, if any surface expression. Considerable depth was reached before it became commercial in 1942. It has been productive ever since, and last year it netted $6,500,000.

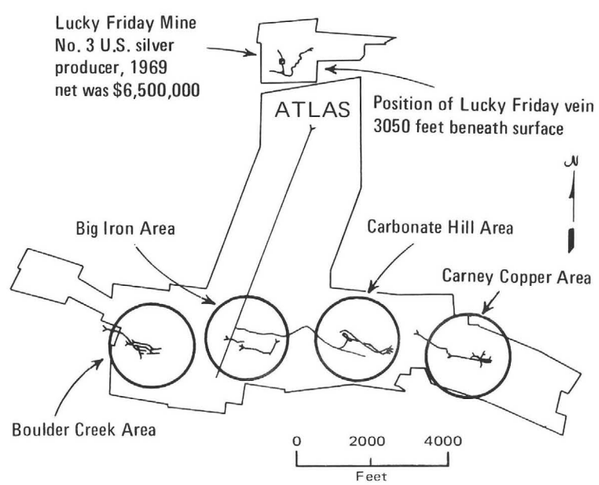


Figure 4

Outline of Atlas property with its near-surface underground tunnels. Circles indicate the four areas within Atlas which were originally separate mining companies. North of Atlas is the Lucky Friday mine with the position of its vein on a level 3050 feet below the surface.

Each of the four areas in Atlas contains far more surface and subsurface evidence of veins and mineralization than did the Lucky Friday. It seems probable, therefore, that with depth *each of the four areas in Atlas* should have an ore potential comparable to the Lucky Friday mine.

THE ATLAS PROPERTY—Location, Size, History

Figure 5 (inside back cover) shows the location of Atlas near Mullan, Idaho, and just south of U.S. Highway No. 10 which will be a completed freeway in two years. Atlas' property consists of 1143 acres of patented and unpatented mining claims. The main east-west body of the property covers about 2.5 miles of a wide mineralized zone containing numerous veins.

The existence of veins in this area was known as early as 1900 when the first claims were staked and four companies were organized to do surface prospect work and tunneling. Although results of the work were encouraging by today's standards, work in the area ceased after a great forest fire burned out all the surface installations in 1910. Brush grew quickly after the fire and covered all the outcrops and concealed the pits and tunnels. Thereafter the number, large size, and continuity of the veins were forgotten. The properties lay dormant until the four companies were incorporated into Atlas Mining Company in 1922. The main effort thereafter was to drive a 7000-foot tunnel under the large vein outcrops in the central part of the property. Because of a misinterpretation of the geology the tunnel was stopped short of its objective. Subsequent work was sporadic and not based on a comprehensive exploration plan, nor done with a knowledge of the extensive mineralization present in Atlas.

ROCK STRATA AND STRUCTURE

The Atlas Belt is a long complex anticlinal structure of the same type as the anticline which forms the core of the Silver Belt. In broad configuration, both belts have cross-sections which are similar in essential features to the generalized cross section shown in Figure 3. They contain the same rock strata, namely, outcropping St. Regis rocks underlain by the Revett formation with the ore-favorable transition zone between.

The broad anticlinal structure, which extends generally east-west through Atlas, is modified by several lesser folds. Extensive faulting of all types and in many directions complicates the whole geologic picture substantially.

The geology in the central area of Atlas is shown in the geologic cross-section in Figure 6 (inside back cover). The geology as it is now known in the west end of the property is shown in the geologic cross-section in Figure 7 (on back of last page). To conserve space geologic sections through the Carbonate Hill and Carney Copper areas are not included, but they also show mineralized anticlinal structures which bring the Revett up within prospecting reach.

Within Atlas Mining Company property the rocks of the favorable zone are found closer to the surface than at any other place in the Atlas Belt, or any place east of the Galena mine. For this reason Atlas ground is the easiest and the most promising place in which to start the development of the whole area south and east of present production in the Coeur d'Alene district.

MINERALIZATION, VEINS AND ORE

It appears that the best way to convey some idea of the extensive mineralization in Atlas ground is to very generally describe the mineral occurances in each of the four major areas of Atlas. While reading this it is important to remember that almost all of the ore now mined in the Coeur d'Alene district *has no surface indication of its existence.* It is also important to remember the point illustrated in Figure 3 – that *only traces of mineralization* found in the upper St. Regis rocks can, in the right geologic environment, be indicative of large ore bodies in the underlying Revett formation.

The Yankee Girl vein in the Sunshine mine serves as an excellent example. The outcrop of the Yankee Girl vein consists of short lenses of gossan (leached vein outcrop) having widths from zero to 18 inches and containing little more than trace amounts of silver. At depth the values became ore grade, and it has yielded to date almost 10,000,000 ounces of silver and it will produce much more. Another example of non-outcropping veins is the Chester vein. Ore was first found in this vein abour 2300 feet below the surface. To date it has produced about 70,000,000 ounces of silver with much more in reserve.

Figure 4 shows the locations of the four areas described in the following. Each of the areas described covers a mineralized area greater than the Lucky Friday mine, and has basically the same type of geology. The intervening ground, and all of that east of the Carney Copper, is equally well mineralized, constituting a very impressive mineral potential.

Carney Copper Area. Outcropping copper mineralization prompted work in this area about 1905 and shipments of copper ore were reported by early-day state mine inspectors. Until recent times the Coeur d'Alene district never had any facility for milling copper ore and consequently this area did not receive any attention. Atlas opened two of the old tunnels and did some trenching in 1966.

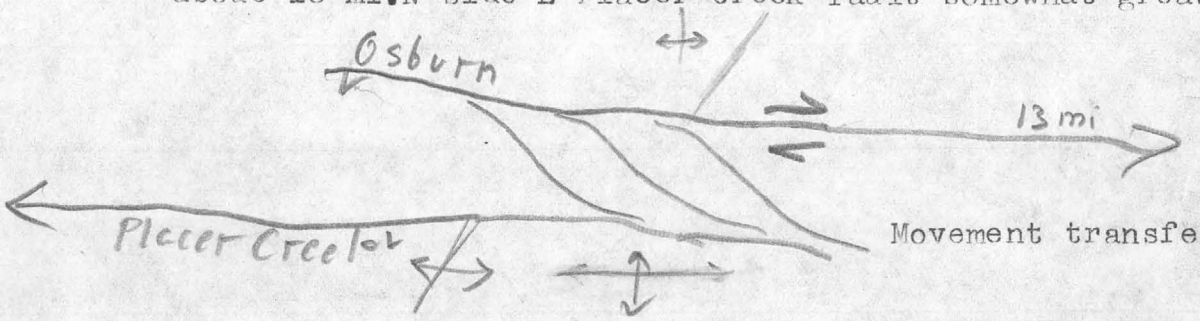
On the surface a well-mineralized zone 150 feet wide was exposed, containing a 25-foot wide outcrop of gossan. ("Gossan" is a vein completely leached of the valuable metals.) Visible copper minerals were found in the wall rock. In the upper tunnel a good unoxidized vein was found in addition to the gossan.

GEOL.ENGR. 122 b'4.COEUR D'ALENE

Altho evidence accumulates that metallization here is Precambrian, and same age as Sullivan (1250 m.y.), the district will be described under Mid-K w th the lame excuse that there was some remobilization at that time.

Ref.p.11,Nos. 4,5,6'.(Under Laramide metallization). P.F.Kerr,R.F.Robinson,1953,Uranium mineralization in the Sunshine mine,Idaho,AIME Trans.vol.196,p.495-511.

Country rock Beltian,mainly qtzite,19,000' plus.Folding N of Osburn fault roughly N-S,S of fault zone, E-W. Since metallization closely associated with Osburn fault zone,if metallization is Precambrian so is the fault zone. What is probably post-mid-K displacement on Osburn fault is about 13 mi.N side E Placer Creek fault somewhat greater.



Movement transferred to P.C.flt.

But divergence of 90 in direction of folding N and S of fault zone cannot be explained by such displacements. Suggestion that fault zone was locus of very extensive right-lateral movement at intervals from Precambrian time. Same has been suggested for San Andreas.

Where the movement was transferred from Placer Creek fault to Osburn is a series of "lacers",both faults and veins. Double feather joints. Explain. E-W folds also rotated as shown,between the 2 faults. Tabular Pb-Zn-Ag ore deposits as composite veins or lodes,formed partly by open-spzce filling but largely by replacement of sericitic Burke and Revett qtzites,along faults and sheeted zones NW. Lacers. Not however along the fault lacers but in fissures of little or no displacement.All lacers formed during shearing strain (artgum) and before ground disrupted along

Osburn and Placer Creek faults.(I refer to 13 mi.disruption,long after the feather joint fissures were formed). Strain ceased when the ground broke along these faults,but thatwas probably in Mid-K time,when some ore was remobolized,as shown by ore stringers in 100 m.y.old stocks on NE anticline.

Main gangue siderite,pre-sulfides.PbS,ZnS.Ore bodies great lenses extending thousands of feet down dip. Strain during ore deposition shown by later minerals in seams cutting across older minerals.

Factors localizing district: (1)On same geanticline as Sullivan.Can't prove this originated in Prec but seems likely. (2) On great trancurrent fault zone,part of Coeur d'Alene lineament,channel for ascending solutions. Continued stress along fault zone to keep open ore channels.
(3) Possibly the NE lineament,invaded by stocks in Mid-K,was present at the time.

I have stressed the fact that ore deposits in this northern region are areally associated with major and minor intrusion.But neither at Coeur d'Alwne nor at the Sullivan mine are there intrusions invading the Beltian, although there are Prec basic sills in the Sullivan region.

10-6-3

GEOL.ENGR. 102: ~~12b~~. Coeur d'Alenes ~~and Butte.~~

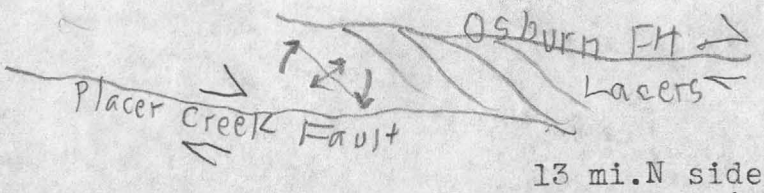
General: Emphasis so far has been on vertical uplift localizing intrusions and ore districts. However, horizontal movements have been mentioned: S Nevada, same sense as San Andreas rift; Garlock fault; Osburn fault. Two of the great mining districts, Coeur d'Alene and Butte, and a lesser district, Lordsburg, N.M., seem associated with horizontal shear or compression.

Coeur d'Alenes Pb-Zn-Ag.- Ref. P.15, Metallization 4,5,6,7. Also P.F.Kerr & R.F.Robinson(1953): Uranium mineralization in the Sunshine Mine, Idaho, AIME Trans. vol.196, p.495-511.

B.Stringham, & F.M.Galbraith & Garth M.Crosby(1953): Mineralization and hydrothermal alteration in the Hercules Mine, Burke, Idaho, Ibidem.p. 1278-1282.

CR Beltian chiefly qtzite, aggregating 19,000'. Folding complex: N of Osburn fault, main structural feature, roughly N-S; S of fault zone, E-W. Probably by bifurcation of one of the N-S folds, an economically important N-E anticline carries a string of monzonite-syenite stocks along its SE flank. Anticline is older than movement on Osburn fault zone and has been displaced by it

11/22/57



Osburn fault an en echelon structure: Osburn fault dies out about at Kellogg(going W) and Placer Creek fault takes up the movement from there W. Osburn displacment 13 mi. N side E, Placer Creek displacement, same sens sense, even greater. Where movement is thus transferred is a series of NW lacers, both faults and veins. Main production of district-locus of intense disruption and strain, Artgum model.

Stocks mentioned have been dated by isotopes: 100,000,000 years, same as Idaho batholith. Mid-K, see Time Chart. Pb ore dated, 80 mm mo yrs

Ore deposits in composite veins or lodes, formed partly by open space filling but largely by replacement of sericitic Burke and Revett qtzites, along sheeted zones trending NW. Considerable production from such NW

lodes crossing NE antcline at right angles,and associated with the stocks there;but major present production from the lacers in the Osburn fault zon zone.Main ore at intersection of NE anticline & Osburn fault zone.

The lacers are double feather joints: could form with dufferential movement on either Osburn or Placer Creek fault;but with such movements on each,feather joints doubly strong.Originally tension joints,regional shear turned many into tight gougy faults.(After disruption).

~~Main ore area at intersection of NE anticline with Osburn fault~~ zone.

OBs in Osbuen fault zone not along the main fault lacers but in fissures of little or no displacement.All lacers formed during shearing st strain (artgum) and before ground broke along Osburn and Placer Creek faults. Diabase dikes came in along feather joints formed during the plastic strain and before disruption.Diabasic magma lies deep, fissures tapped it. After disruption,lamprophyre dikes alogg major faults at depth. Ore deposits however formed before disruption,shown by the fact tha the NE ore belt and anticline is displaced about 14 miles by the fault zone(Ore area N of Mullan and Osburn fault lies 14 mi.E of similar ore at Wardner, S of fault zone).

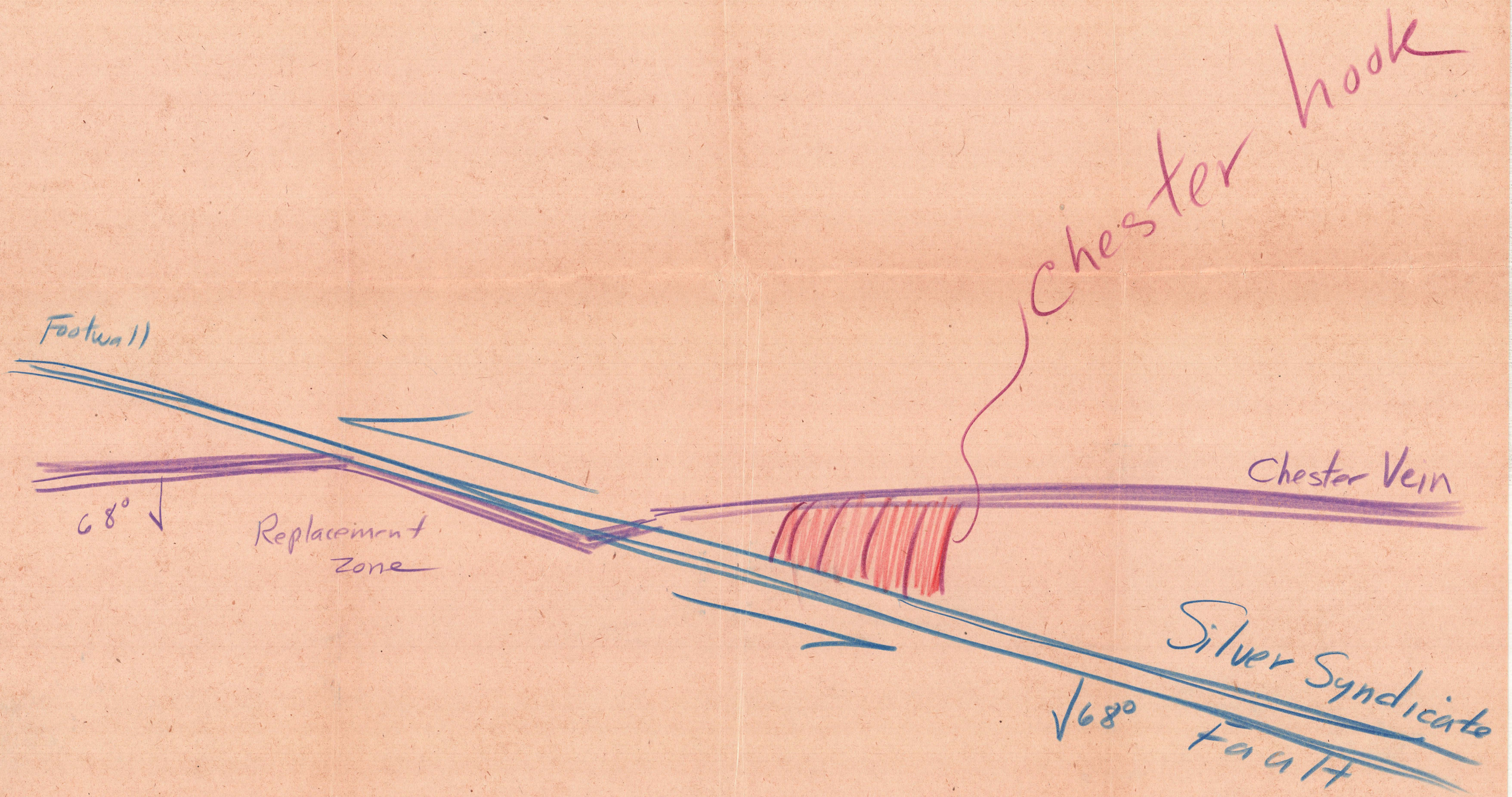
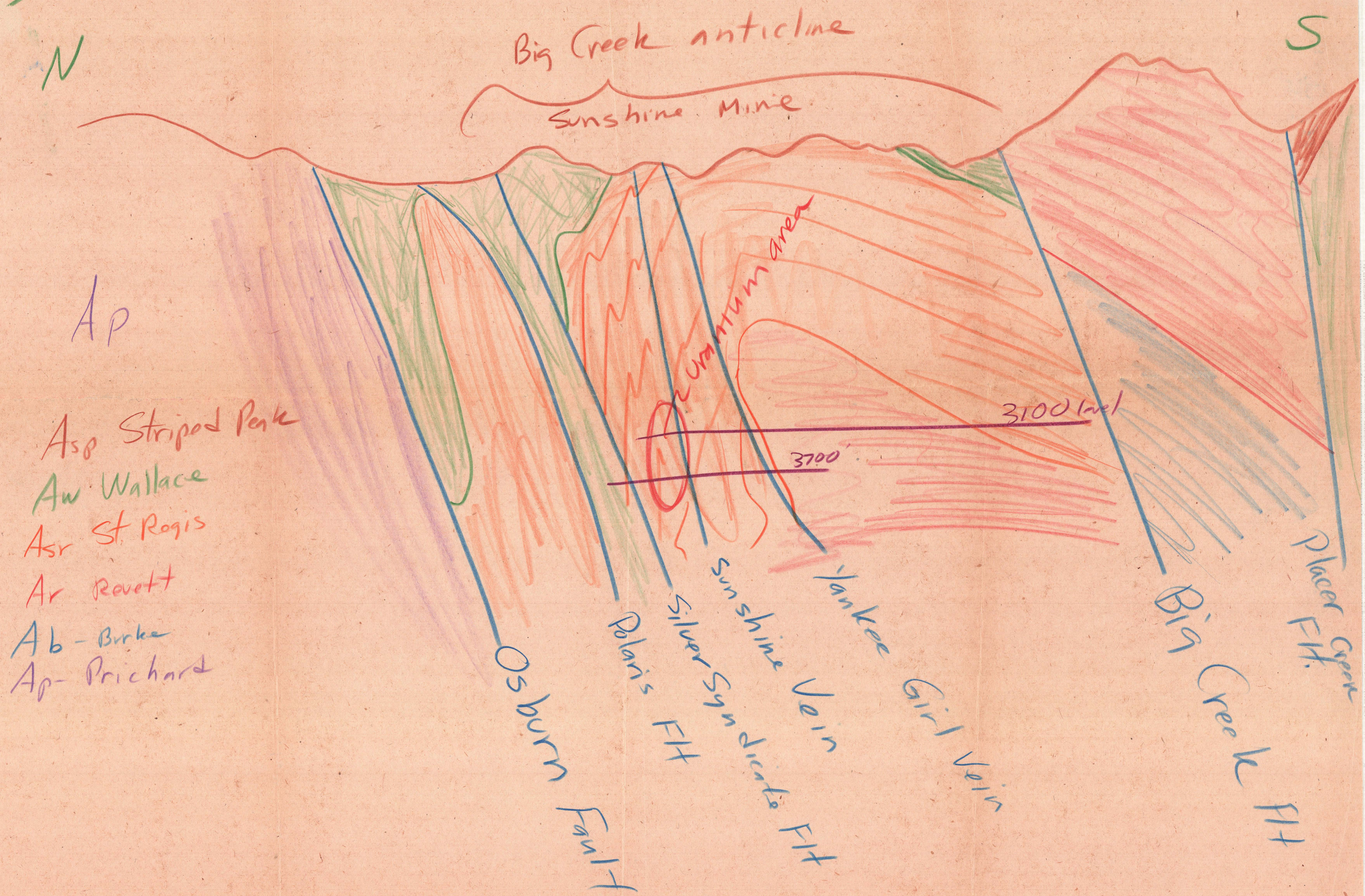
Main gangue is siderite,pre-sulphides.PbS,ZnS. Ore bodies are great lenses,extending thousands of feet down the dip. That country under strain during ore deposition shown by fact that later minerals occur i n seams cutting across earlier minerals.

Production to end of 1920 $487,000,000. Now over 1 billion.

Factors localizing district: 1.Presence of a great transgressive fissure zone, part of Coeur d'Alene lineament channel for ascending solutions. 2. Continued stress along this channel to keep open tensional zones for vein formation. 3. Presence of ~~an intersection~~ transverse deformation: NE anticline;stocks.

VII

Chester Hook



VI Sunshine X-Section