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9-15-1958
Report

JOHNSON MINE
(BRIDAL VEIL)

SUPAI CANYON

Visited Mr. Schoeney of Seligman regarding the Johnson Mine (Bridal Veil) in Supai Canyon. He verified that he had sold the property to the National Park Service in June of this year, receiving $15,000.00 cash for same.

TPL

De
s

Phoenix, Arizona,
June 4, 1948.

CHAS. A. DIEHL

Arizona Assay Office

e 3-4001 | 815 North First Street | P. O. Box 1148

FIES *That samples submitted for assay by* Department of Mineral Resources, Mineral Building-Fairgrounds *contain as follows per ton of 2000 lbs. Avo.*

ARKS	SILVER Ozs.	SILVER Tenths	VALUE		GOLD Ozs.	GOLD 100ths	VALUE		TOTAL VALUE of Gold & Silver		PERCENTAGE LEAD %	PERCENTAGE VANADIUM %			REMARKS
	9.	4	$8.	50		.01	$.	35			13.80	0.24			Bridal Veil

7.50

Assayer ARIZONA ASSAY OFFICE

De
JES

CHAS. A. DIEHL

Phoenix, Arizona,
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	9.	4	$8.	50		.01	$.	35			13.80	0.24			Bridal Veil

7, 50

Assayer ARIZONA ASSAY OFFICE

GAD

JOHNSON LEAD MINE

(Owned by Northern Arizona Lead and Zinc Company in 1925)

Mines

They are located in Cataract Canyon, Coconino County, Arizona, 40 miles from Coconino station on the Grand Canyon Railroad, from this point there is a good road most of the way to within a few miles of where we intend to construct the aerial tram. The group of claims consisting of five mining claims and a mill site and water right that has been acknowledged by the government to be valid as those claims were made prior to the extension of the Grand Canyon. National Park over this area.

Water Power

The Cataract Canyon power is the largest natural power site in the State of Arizona, there is seventy-two second feet of water at the minimum flow, and has a fall of fifteen hundred feet in six miles, the water rights were located the same time the locations were made on the mines, and was under option to be sold for one hundred thousand dollars at the time when the park was placed over this area, while the mines have been declared valid that were located at the same time, the water rights (except for the mines) have been taken over for scenic purposes but so far no payments have been made for them, but W. I. Johnson is endeavoring to get a settlement from the government for the rights that he had acquired before any withdrawal by the government.

Lead and Silver Ore

There is approximately thirty thousand tons of this ore that is of good commercial grade and among that amount is at least five thousand tons of ore that will assay 40% lead and 20 ounces of silver to the ton, all of this ore carries vanadium. There has been one hundred tons of the lead-silver ore shipped, we can sort this ore and ship to El Paso but the cost of getting it to the railroad takes most of the profits, with machinery to properly work the five thousand tons of high grade ore for lead, silver and vanadium, ore of this grade will

net more than forty dollars per ton, and we expect to open a great deal more of this grade ore as well as many thousand tons of other commercial ore.

Zinc Ore

The zinc ore in Arizona is generally considered a detriment, but as our deposits are similar to the ores in Missouri and Leadville, Colo., the zinc will be a valuable by-product when we have cheaper transportation and cheap electricity to work it with.

Vanadium Ore

Unless you have a large amount of vanadium ore that will warrant the installation of machinery to work the ore at the mines, it is hard to find a market for low grade ore, and vanadium cannot be concentrated very high by water concentration, but with machinery to reduce the ore to high grade oxide or ferro vanadium there is a market and a growing demand for it.

Development.

There has been about two thousand feet of work done on the five mining claims, most of the work has been done on the "Bridal Veil" and "Seligman" claims, as the deposit is horizontal most of the work is tunnels and side drifts in the ore, but we have several winzes from six to forty feet.

Geology

The ore bodies are metasomatic replacment in limestone and are large size, irregular area and horizontal dimensions. Many of the ore bodies are forty feet thick in plcaes. The geology here is very much like the replacements in the lead mines of Missouri and Leadville, Colo.

Transportation

This has been the only drawback to this property, but we will

solve that by putting in a two-thousand-foot aerial tram. The tram will be installed about one and a half miles from the mines, the tram is for the purpose of overcoming a very near perpendicular wall, this will deliver the ore to where it can be loaded on trucks and we can at a very small cost have a good road to the railroad as there is only a few miles to connect with the road now in use.

Prospective

I have given you some idea of the mines. As far as developed. I will now say something of the prospective value. While it is an impossibility for anyone to tell to a certainty the value of a mine, there are many things which w uld enable an experienced mining man to form some logical idea as to the future value of a mine not yet fully developed. Among them would be the geology and the amount of ore developed by the work done, reasoning from these things I am sure the mines have great prospective value for the work done has produced a large amount of ore and considering the general history of replacemens in limestone, we have every reason to believe that the tunnels can be continued for a great distance and continue to develop ore and possibly larger and richer deposits than has been opened up. Also the outcrop in both walls of Cataract Canyon, where it cuts through the deposits, will warrant the most conservative mining engineer in believing that there can be millions of tons of ore developed in the mines.

NORTHERN ARIZONA LEAD AND ZINC MINING CO.

(by) W. I. Johnson, President
F. C. Bauer, Secretqry

Directors

Geo. Brookshire, W. Curtis Miller
Henry Shucking

(Mines in Coconino County, Arizona)

SUPAI LEAD PROSPECT

(Johnson Mine)

Coconino County, Arizona.

By: Edwin A. Stone July 1946.

SUPAI LEAD PROSPECT
(Johnson Mine)
Coconino County, Arizona.

Location:

The Johnson Mine is located on the Supai Indian Reservation in west Coconino County not far from the Mohave County line. It is reached via 40 miles of poor road from Grand Canyon southwesterly to Hilltop and thence 14 miles by trail, or 67 miles by fair dirt road from Peach Springs and 9 miles by trail.

History and Production:

The ground was apparently located by Johnson many years ago and prior to setting the area aside as a reservation. Johnson developed it in a small way and near the surface encountered some very good vanadium ore. During the 1918-1920 demand for vanadium ores samples of the ore were obtained from Johnson.

The property remained idle from 1920 until the war demand for metals in 1942. It was then again revived by a Mr. Sanford who acquired the property under lease and option from the Johnson associates and heirs. Sanford installed modern equipment and did considerable development.

No record of the Sanford production is available. From local inquiries it appears that he may have shipped one or two cars of ore. All of his equipment was packed in over the 9 mile trail and ore was packed out over the same route.

About 4000 feet of vertical cliffs stand above the mine on the south side of the canyon between it and the plateau near Hilltop. A relatively short tram line would eliminate the pack altogether, landing the material close to the Hilltop road.

Geology:

At the tunnel elevation the limestone is massive gray and finely chrystaline. This stratum is several hundred feet thick above the tunnel and continues below the canyon level to at least the depth of the present workings. Overlying this limestone is several thousand feet of shales and limestones of the younger plateau series. From general sections of the plateau region the limestone at the elevation of the Johnson mine is believed to be Carboniferous in age.

Ore makes along a northwest fissure and beds out into the limestone on minor rolls. The fissure trends along or diverges at only a slight angle from the crest of a large anticlinal structure. The flanks of this structure dip from 10 to 20 degrees. Considerable calcite was in evidence in the ore stratum in the upper tunnel. Lower beds must be mineralized as considerable

part of the production has come from a 50 foot winze below the tunnel level. This winzie was inaccssible due to poor air. The tunnel explores the structure about 300 feet distance southeasterly from it's portal in the bottom of the canyon. Several short branches have been driven on minor structures on both sides of the fissure. Orebodies appeared to occur entirely as replacement along bedding. They were quite small and disconnected, but of very good grade. A sample of the ore taken from several tons lying on the dump gave the following results:

Gold .005, Silver 22.7 oz, Lead 36.5%

The ore is chiefly galena but some sections show oxidation and some lead carbonate.

Remarks:

The property is of no interest. Structures are too gentle and not enough flexing of the limestones to shatter sufficiently to make any large reservoirs.

It is a remote possibility that enough tonnage can be developed in the area to justify the preparation necessary to overcome transportation and other difficulties.

July 1946

Edwin A. Stone

Edwin A. Stone

Had not the miners preceded us by fifty to seventy-five years, only skillful climbers well-equipped with essential rope and hardware could get below. Even with the tunnels, steps, and iron pegs placed by the miners, the loaded backpacker will find the descent troublesome if not impossible.

The first hundred feet of descent offer no problem but a good many who suffer from acrophobia have turned back before venturing down the second hundred. Here the cliff has an angle of about 80 degrees. If your load is light, the miners' steps seem relatively easy. Some, however, require encouragement and assistance. A few have been known to flunk the test after starting. They had to be pushed and hauled back to the top.

After you have reached the lush valley at the bottom of the falls and walked on about a quarter of a mile, you see to your left the reason for the miners' hard work; they needed access to a deposit of molybdenum down the canyon. An even more spectacular and harder job was building an iron and wooden ladder of more than 200 feet up the cliff side to reach the ore. Clearly they had more than a streak of adventure in their make-up too.

Taken from Arizona Highways July 1963

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

~~December 10, 1957~~

February 6, 1958

To the Owner or Operator of the Arizona Mining Property named below:

BRIDAL VEIL, PYRAMID, IRON MASK LEAD SILVER VANADIUM ZINC
(Property) (ore)

We have an old listing of the above property which we would like to have brought up to date.

Please fill out the enclosed Mine Owner's Report form with as complete detail as possible and attach copies of reports, maps, assay returns, shipment returns or other data which you have not sent us before and which might interest a prospective buyer in looking at the property.

FRANK P. KNIGHT,
Director.

Enc: Mine Owner's Report

Seligman Ariz Feb.7-1958

Gentlemen: This property was sold to the U.S. Government in June 1957

Yurs very truly

E.F. Schoeny

E.F.Schoeny

Seligman, Arizona

NAME OF MINE: HAVASU

COUNTY: COCONINO
DISTRICT:
METALS: PB,AG,ZN

W

OPERATOR AND ADDRESS: DATE:		MINE STATUS DATE:	
5/1/44	Leased to: V. C. Riccardi El Portal Hotel, Mesa	5/1/44	Shipping
1/45	I. M. McKinley, 26 Toole Ave., Tucson	4/45	Sampling
4/45	R.M. Sanderson, Supai, via Grand Canyon, Ariz.	4/45	Shipping

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

Date

1. Mine NORTHERN ARIZONA LEAD AND ZINC MINING CO. 2. Location

. Mining District & County Cataract Canyon, Coconino Co. (Grand Canyon Nat'l. Park)

. Former name

. Owner W. I. Johnson 6. Address (Owner) 317 S. Montezuma Prescott, Arizona

. Operator 8. Address (Operator)

. President, Owning Co. 9A. President, Operating Co.

. Gen. Mgr. 14. Principal Minerals Lead & vanadium.

. Mine Supt. 15. Production Rate

. Mill Supt. 16. Mill: Type & Cap.

. Men Employed 17. Power: Amt. & Type

. Operations: Present

. Operations: Planned

. Number Claims, Title, etc. Five unpatented claims and on unpatented millsite, comprising in all 105 acres of mining ground.

. Description: Topography & Geography In the region of the mining claims the canyon is something less than 500 ft. wide with vertical walls cut at intervals by side canyons. The walls are from 300 to 400 ft. high, cut from limestone. (See Report attached)

. Mine Workings: Amt. & Condition See attached report.

Geology & Mineralization

Ore: Positive & Probable, Ore Dumps, Tailings Positive lead ore: Bridal Veil No. 2 level- east areas 44x42 ft. x4.6 ft. thick; 720 tons at 7.7 oz. silver and 34% lead. Same. West area 53 ft. x 55 ft. 5.5 ft. thick, 1340 tons at 10.7 oz. silver 25% lead. Same North areas: 12 ft. x 43 ft x.0 f . thick, 250 tons at 4.5 oz silver 9% lead. Same No. 1 level 250 tons at 10 oz. silver 15% lead. Seligman No. 1 tunnel 600 tons at 4.2 oz silver 7.2% lead. The above listed areas contains about 500 tons of direct shipping ore

A. Dimensions and Value of Ore bed 50% lead. Probable: With ordinary continuity of present ore-beds, there should be further development of ore by stoping which should double above estimate, giving 1000 tons direct shipping ore, 2500 tons of second class shipping ore and 200 tons milling ore.

running 12 oz. silver and/

Mine, Mill Equipment & Flow-Sheet

See attached report.

Road Conditions, Route

The automobile road traverses high mesa country through low rolling hills with nothing but these and gentle slopes to contend with. This is a mail stage road, and well adapted to trucking. The road ends at Hilltop which is the top edge of Grand Canyon at head of Lee Canyon. Thence from Hilltop a pack trail leads down to Lee Canyon for 7 miles to the junction with Cataract Canyon, the first one-half mile being a steep jump down of about 600 ft. after which the trail follows a normal water grade on the floor of the Canyon. Down Cataract Canyon the trail follows the gently sloping floor for 7 miles to the Indian town of Supai where is located the Indian Agency for the Supai Indians, telephone and post office. From Supai the trail follows down Cataract Canyon for 1½ miles to the claims at Carbonate Canyon.

Water Supply

Brief History

Special Problems, Reports Filed

(SEE ATTACHED REPORT)

Remarks

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

Write owner for terms.

32. Signature

MB-78

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

Date: March 10, 1942

1. Mine: Bridal Veil, Pyramid, Iron Mask, Seligman, Cataracte
2. Location: Supai, Ariz.
3. Mining District & County: Cataract, Coconino
4. Former name: Northern Ariz. Lead & Zinc
5. Owner: E. F. Schoeny & Note Holders
6. Address (Owner): E. F. Schoeny, Box 346, Seligman, Ariz.
7. Operator: Not operated, at present
8. Address (Operator) None
9. President, Owning Co: E. F. Schoeny and Note Holders
9A. President, Operating Co.: None
10. Gen. Mgr.: E. F. Schoeny
14. Principal Minerals: Lead, silver, vanadium and zinc.
11. Mine Supt.: None
15. Production Rate: 100 to 300 tons per day possible.
12. Mill Supt.: None
16. Mill - Type & Cap.: No mill
13. Men Employed: None
17. Power - Amt. & Type: About 6000 HP, water.
18. Operations - Present:

NORTHERN ARIZ. LEAD & ZINC MNG. CO.

Pb, Zn

Coconino 3 - 6 T 33 N, R 4 W

W. I. Johnson (Deceased) '42

19. Operations - planned:

20. Number Claims, Title, etc: Five claims. Title clear.

21. Description - Topography & Geography

22. Mine Workings - Amt. & Condition: About 1000 feet of work, tunnels and winz. not timbered, solid rock formation, workings in good safe condition.

(over)

23. Geology & Mineralization: Lead, silver, vanadium and zinc are replacements in limestone formation. Interesting possibilities of developing a good mining property whose present assets are a considerable tonnage of good ore and reasonable expectation of further ore discoveries. The main drawback is inaccessability which can be overcome by a tramway that will cost around $6000.00.

24. Ore - Positive & Probable, Ore Dumps, Tailings: The property consists of 6000 tons of lead, silver, zinc and vanadium ores. Giving about 1000 tons of direct shipping ore, 2500 tons of second class shipping ore and 2000 tons of milling ore. Milled concentrates will carry about 50% lead, about 25 ozs. silver, the silver should carry the cost of milling.

24A. Dimensions and Value of Ore body: 44 ft. x 42 ft. x 4.6 ft. thick, 720 tons at 7.7 ozs. silver, 34% lead. 53 ft. x 55 ft. x 5.5 thick, 1340 tons at 10.7 ozs. silver, 25% lead. 12 ft. x 45 ft. x 4 ft. thick, 250 tons at 4.5 ozs. silver, 9% lead. 250 tons at 10 ozs. silver, 15% lead. 600 tons at 4.2 ozs. silver, 7.2% lead. The above listed areas contain about 500 tons of direct shipping ore running 12 ozs. silver and 50% lead.

25. Mine, Mill Equipment & Flow-Sheet: None

26. Road Conditions, Route: After completing about 2½ miles of tramway this will place the ore at a point 36 miles from Grand Canyon, Arizona, over good regular used highway. Grand Canyon, Arizona is nearest shipping point. Cost of mining about $3.00 per ton, hoisting to rim of canyon about $2.00, trucking to Grand Canyon about $5.00, freight to smelter about $6.00, total expense FOB smelter estimated by engineer's report, $16.00 per ton.

27. Water Supply: Cataract Creek about 72 second feet pure clear water. Will furnish water for all needs including water-power. From Bridal Veil Fall on mine property the water falls perpendicular 164 feet, about 6000 HP available.

28. Brief History: The mines were worked back in around the year 1900, the ore was packed to Hilltop, 10 miles on pack train, hauled with wagons and shipped by railroad to smelter. Since that time the mines have laid idle. About 2 cars of second class ore are on the dump and two cars of first class shipping ore, sorted ready to be sacked and shipped.

29. Special Problems, Reports Filed: Obtaining finance for tramway.

30. Remarks: The above data was taken from a Mining Engineer's report made of the mines in 1928. Anyone interested in the mines can have access to the report which contains complete details on ore bodies, assay survey, geology, etc.

31. If property for sale; price, terms and address to negotiate: Sale price $125,000. $15,000 down, balance 10% royalty on shipments. For further terms inquire manager.

Signed: E. F. Schoeny

COPY

THE L & W DEVELOPMENT COMPANY SUBMITS HEREWITH A REPORT ON THE PROPERTY OF THE NORTHERN ARIZONA LEAD AND ZINC MINING COMPANY

As Taken from the Original Copy of Report made by
L. T. McElvenny, Mining Engineer

For

Mr. W. I. Johnson.

****

Other correspondence where that this document was made in 1928. (EAD - 5/14/56)

Mr. W. I. Johnson
Prescott, Arizona

Dear Mr. Johnson:

Herewith is my report on the property of the Northern Arizona Lead and Zinc Mining Company, the data for which was obtained from an examination of the mines made March 13th to March 18th, 1928.

The report covers 10 pages and contains six maps and two assay sheets.

A resume of the report shows that you have there the possibilities of developing a good mining property whose present assets are a considerable tonnage of good ore and reasonable expectation of further ore discoveries, whose main draw-back lies in its present inaccessibility, and whose present greatest need is an ore development program to create enough reserve ore to determine your future mining and milling practice.

Yours respectfully,

(Signed) L. T. McElvenny

Bridal Veil Mines

NORTHERN ARIZONA LEAD AND ZINC MINING COMPANY.

LOCATION - The NORTHERN ARIZONA LEAD AND ZINC MINING COMPANY properties lie in Cataract Canyon, Coconino County, Arizona at 80 miles east of the Santa Fe railroad station at Grand Canyon from which they are reached by 36 miles of automobile road and 14 miles of horse trail. The location lies within the boundaries of the Grand Canyon National Park.

ROADS - The automobile transverses high mesa country through low rolling hills with nothing but low rolling hills and gentle slopes to contend with. This is a mail stage road and is well adapted to trucking.

The road ends at Hilltop which is the top edge of the Grand Canyon rim at the head of Lee Canyon. The elevation above sea-level at Hilltop is 5415 feet.

Thence from Hilltop a pack trail leads down to Lee Canyon for 7 milesto the junction with Cataract Canyon, the first one-half mile being a steep jump down of about 600 feet after which the trail follows a normal water grade on the floor of the canyon.

Down Cataract Canyon the trail follows the gently sloping floor for 7 miles to the Indian town of Supai where is located the Indian Agency for the Supai Indians, telephone station, and post office.

At 1½ miles above Supai are encountered the headwaters of Cataract Creek which rises from huge springs in the bottom of the canyon and flow down the canyon for about 8 miles to the Colorado river.

From Supai the trail follows down Cataract canyon for 1½ miles tothe claims at Carbonate Canyon, passing Navajo Falls just below Supai and Bridal Veil Falls at the mouth of Carbonate Canyon on the Bridal Veil Mining claim.

The elevation above sea level at Carbonate Canyon is 2900 feet.

MINING CLAIMS - The property consists of 5 unpatented mining claims and one unpatented millsite comprising in all 105 acres of mining ground.

The accompanying sketch map shows their relative positions with regards to each other and to the canyon. The Bridal Vein claim cover the south side of Carbonate Canyon and embraces the Bridal Veil Falls. The other claims lie along Catatect Canyon.

DESCRIPTION OF CATARACT CANYON - In the region of the mining claims the canyon is something less than 500 feet wide with vertical walls cut at intervals by side canyons. The wells are from 300 to 400 feet high, cut from limestone.

On top of the limestone lis beds of sandstone a thousand or more feet thick which have eroded to a normal slope which gives way to a perpendicular capping cliff of limestone 800 feet high at about 2 miles away from the property.

Bridal Veil Falls is a vertical drop of 120 feet. Between Bridal Veil and Mooney Falls is an ordinary mountain stream water-grade, Mooney Falls is a perpendicular drop of 196 feet.

ORES AND THEIR OCCURRENCE - The ores found onthe property are minerals of lead. Cerussite and Galena; Vanadium in the form of Vanadinite and Descloisite; Silver; and gold in small amount.

When pure Cerussite contains 77.5% lead, galena lead, vanadinite contains 19.3% vanadium oxide and descloisite contains 22.7% vanadium oxide and 50%

The ore bodies so far discovered lie in one part .....
Mineralization of Redwell Limestone, a formation of Carboniferous age whose bases are lying almost horizontal. This is the limestone which forms the lower perpendicular cliff walls of the canyon.

The horizon which contains the ore is clearly indicated along the walls of the canyon by a line of demarketion, a jointing plane, about 35 feet above the canyon floor, extending from Carbonate Canyon to far below Mooney Falls and showing on both walls of the canyon.

At intervals along this jointing plane occur what are known as slump areas caused by overhanging limestone breaking down to fill a cave. The caves were produced by shrinkage due to the oxidation of sulphide ore bodies.

What produced the ore bodies is not clearly indicated. There is no igneous rock within this area. The ore is a replacement of the limestone by ascending mineralized solutions which travelled along the jointingplane which is at present a rather open channel until a fractured zone was reached which was favorable to the deposition of the minerals. Such zone of fracturing could lie at any angle, from nearly flat to perpendicular, and the resultant deposition would produce ore bodies lying at corresponding angles. Thus in the Bridal Vein workings the angle seems to have been at about 20 degrees fromthe horizontal; in the Seligman No. 2 the fracture encountered was nearly perpendicular.

Other open jointing planes occur above the one mentioned but have not been prospected for ore.

The principal ore body so far uncovered is on the Bridal Vein claim. Here a tunnel was driven in one the jointing plane, on ore all the way, for about 220 feet. A raise 54 feet high was driven upwards, and a winze was sunk for 85 feet. From this winze two levels were driven, No. 2 level at 34 feet and the No. 3 level at 59 feet below Level No. 1. Water level stands at 77 ft. below Level No. 1

LEAD ORE - Bridal Veil:
Lead ore varying in thickness from nothing to 24 in. and averaging 10 ins. occurs along the main bedding plane in level No.1. At 50 ft. inside the tunnel the ore dips downward on a 20 degree angle, widening and getting better in grade as it goes down until it reaches and passes below No. Level. No commercial ore is found on the No. 3 level but an intermediate drift below the level shows good prospecting possibilities. The main ore undoubtedly passes over this level and will be found by further drifting.

See the accompanying map of this mine for details of the workings, also the assay sheets for samples.

On the opposite wall of Carbonate Canyon is a short tunnel into the cliff which shows some lead values and indicates the continuous lateral extent of the ore zone.

Other Deposites
Following along the bedding plane marker - ore is found near Bridal Veil Falls; in two tunnels on the Seligman Claim; in a tunnel on the Cataract claim; and at other places down the canyon.

Seligman No. 1. -
The ore found in Seligman No. 1 tunnel is milling grade lead ore but carries the highest grade vanadium content of any of the showings. The ore follows the main bedding plane and forms small deposits under the plane similar to Bridal Veil No. 1 level. At the point where Sample S was taken (seemap) the ore streak is dipping sharply to the southeast and should widen to another deposit as on Bridal Veil No. 2 level. The ore streak averages 8 ins. wide across the face and assays 16.6 ozs. silver and 22.4% lead. This point constitutes a very good prospect.

POSITIVE LEAD ORE -

Bridal Veil No. 2 level -	East area 44 ft. x 42 ft. x 4.6 ft. thick 720 tons at 7.7 ozs., 34% lead.
" " " "	West area, 53 ft. x 55 ft. x 5.5 ft. thick 1340 tons at 10.7 ozs., silver, 25% lead
" " " "	North area, 12 ft. x 45 ft. x 4.0 ft. thick 250 tons at 4.5 ozs. Silver, 9% lead
" " No. 1 "	250 tons at 10 oz. Silver, 15% lead.
Seligman No. 1 Tunnel -	600 tons at 4.2 ozs. silver, 7.2% lead

The above listed areas contain about 500 tons of direct shipping ore running 12 ozs. silver, and 50% lead.

PROBABLE LEAD ORE- With ordinary continuity of the present ore-beds there should be a further development of ore by stoping which should double the above estimates, giving 1000 tons direct shipping ore, 2500 tons of second class shipping ore, and 2000 tons of milling ore.

VALUE OF LEAD ORE - The present price of lead is 6¢ per pound and silver is worth 56¢ per ounce.

Figured at these prices and deducting smelter charges and deductions the value to the shipper per ton of ore running 12 ozs. silver and 50R lead is $42.60. From this sum must be deducted a mining cost of about $3.00; hoisting to rim of canyon $2.00; trucking to railroad $8.00; railroad freight to the smelters at Douglas, Arizona, $8.00, leaving a net profit to the producer of about $21.60 per ton.

Milled concentrates will carry about 50% lead about 25 oz. silver, the extra silver should almost carry the cost of milling.

Figured on this basis the total net value of the lead ore is about $60,000. Practically all of this has been developed by a small amount of work at the Bridal Veil Mine.

It is well to note here that the present price of lead is the lowest inthe last ten years and that an advance in price of 1¢ would increase the value of this ore about $8.70 per ton.

VANADIUM ORE - Most of the vanadium in the Bridal Veil Mine occurs at the mineral vanadinite. It occurs both in the lead ore bodies and in leached areas above them where it remained as a resultant of the original lead sulphide ore.

The appended assay sheets give results in percentage of vanadium oxide, V205, which is the form used in market quotations.

Bridal Veil level No. 2,	East Lead Ore body --	1.07%	V205
" " " "	West " " "	2.00%	"
" " " "	North " " "	2.44%	"
" " " No. 1	Joint Plane	1.54%	"
" " " "	10 ins. above plane	1.87%	"

and on the upper extention of the lead ore body between levels No. 2 and No.1 is a large tonnage of ore running better than 1%.

There are in the Bridal Veil workings probably 5600 tons of mixed lead-vanadium ore running 1.75% V205.

In the Seligman No. 1 there are developed 600 tons of ore running 7.2% lead and 6.11% V205.

VALUE OF VANADIUM ORE - The market value of vanadium ore depends on the character of the shipped product and the contract with the purchaser. The ore is readily salable. Ore running 5% V205 sells for 50¢ per pound of V205 and concentrates running from 12 to 18% V205 sell for 65¢ per pound of V205. But when the ore carried both lead and vanadium the problem becomes one of special metallurgical treatment and the product must be sold to some buyer of this particular kind of ore.

When a sufficient tonnage of this class of combination ore has been developed, a lead furnace and leaching plant can be installed at the mine and the two products will be sold separately.

Much of the ore in Bridal Veil No. 1 level and between levels No. 1 and No.2 can be concentrated to a product containing 10% V205 which sells for $100 per ton at the market point.

The Seligman ore can be converted to a high grade concentrate because of its initial high percentage of vanadium and rather low percentage lead. This ore contains much free vanadium oxide besides some lead vanadate. It runs 6.11% V205 and in the crude state is worth $60 per ton at the market point.

Only by actual mill tests can any idea be obtained as to what can be expected from this ore buy suffice it to say that the vanadium is worth many thousands of dollars and is a real mining asset.

PROSPECTING POSSIBILITIES - As before stated, the mineral deposits lie along a horizontal plane in the limestone.

At present, only such places as are indicated on the walls of the canyons have been prospected and there still remain several slump areas to be prospected.

The Bridal Veil is the only area in which work has been done below the actual jointing plane. The 54 ft. raise above No. 1 level is reported to have hit ore but the raise can not be inspected at the present time. This may be an overlying plane which can be seen on the face of the cliff.

TIMBER - Mining and construction timber is plentiful at a few miles from the rim of the canyon.

WATER - Cataract Creek has been calculated to flow 72 second feet at minimum. According to Mr. Johnson, the U. S. Government recognizes the rights of the mining claims to the use of all waters upon them, but the government has cancelled his rights to the use of the water for diversion to power purposes. At one time, before the intervention of the government, the water-power was under lease and bond to an electric power company for $100,000. At the present time Mr. Johnson has a claim against the government for $50,000 damages for such cancellation.

MILLSITE - A concentrating mill can be placed in the bottom of the canyon near the mines, provision being made for retaining the mill-tails from washing down the creek.

CONCLUSION AND RECOMMENDATIONS - I would recommend the immediate inception of a development program under the superintendence of a competent mine foreman, all immediate work to be done in the areas where ore has already been discovered. Such development work should be done below the flat joint plane in order to reach the ore which lies in the bottom of the slump areas and below the erosional effect of the creek waters. Special attention should be paid to any downward dipping of the ore stratum. This property is one of considerable value and one which merits the serious consideration of an investor. I believe that it will eventually become a steady producer of profitable ore.

Respectfully submitted

L. T. McElvenny

Mining Engineer and registered professional engineer of the State of

ASSAY SHEET NO. 1.

No.	Gold ozs. per Ton	Silver ozs. per Ton	Per Cent Lead	Width Inches	Description
A	0.010	14.6	18.2	12	Bridal Veil No. 1 Level
B	0.005	7.6	5.9	10	"
C	0.005	4.4	17.8	10	"
D	0.005	11.2	17.8	24	"
E	0.005	21.2	13.4	14	"
F	0.005	1.5	27.3		" Vanadium hi.grade
G	0.010	5.0	7.3		Vug Area
H	0.005	1.1	8.4	General	No. 2. Level
I	0.005	7.9	9.9	"	"
1	0.005	8.5	37.1	52	"
2	0.003	7.8	44.0	54	2
3	0.004	8.8	26.7	63	"
4	0.004	10.7	33.3	52	"
5	0.005	12.0	37.7	37	"
6	0.004	9.8	56.8	24	"
7	0.004	8.0	25.3	56	"
8	0.004	8.5	30.2	75	"
9	0.003	2.2	26.3	92	"
10	0.004	6.7	34.2	90	"
11	0.005	11.8	49.8	61	"
12	0.005	8.7	49.6	34	"
13	0.005	8.3	15.3	28	"
14	0.004	4.5	14.9	52	"
J	0.005	12.4	22.8	12 along wall	"
15	0.005	8.6	26.9	General	"
17	0.005	8.3	16.7	36	"
18	0.005	10.5	28.7	General Wall	"
19	0.004	4.6	10.6	" "	"
20	0.004	6.4	12.2	" "	"
K	0.005	24.1	24.3	18	"
L	0.004	1.9	0.2	Face	No. 3 Level
M	0.004	5.9	0.2		"
21	0.004	2.2	0.1		"
22	0.004	0.4	0.1		"
23	0.004	0.5	0.1		"
N	0.020	2.4	None		Iron Mask Tunnel
O	0.010	1.8	7.8	24	Seligman No. 2
P	0.005	1.1	None	36	"
Q	0.005	1.5	None	36	"
R.	Trace	1.2	6.8	12	Seligman No. 1
S	0.005	16.6	22.4	8	"
T	0.005	4.4	16.8	24	"
U	Trace	3.8	6.3	General	"
V	Trace	1.1	None	24	"
W	Trace	1.5	None	General	"
X	0.005	8.8	3.8	Cross Fracture	"

ASSAY SHEET NO. 2.

No.	Gold ozs. per Ton	Silver ozs. per Ton	Per Cent Lead	Width Inches	Description
Y	Trace	1.8	7.8	48	Seligman No. 1
Z	0.004	4.1	6.2	General	"
Za	Trace	2.4	7.6	"	"
Zb	0.005	6.0	2.1	"	"
Zc	Trace	4.1	1.8	"	"

A composite of the samples of No. 1 to 14 Bridal Veil ore is as follows:

Gold	0.004 ozs.	Insoluble	19.7%
Silver	7.5 "	Sulphur	0.8%
Lead	34.2 %	Manganese	0.2%
V205	1.07 %	Arsenic)	
Zinc	2.7 %	Antimony)	0.5%
Iron	2.8 %	Bismuch)	
Lime	17.8 %		
Cipper	0.16 %		

A composite of samples taken from Seligman No. 1 is as follows:

Gold	0.005 ozs.	Insoluble	10.3%
Silver	4.2 "	Iron	5.5%
Lead	7.2 %	Lime	27.1%
Sulphur	0.2 %		

Vanadium assays in percentage of oxide - V205

1 - High Grade from Bridal Veil No. 1	7.33%
2 - Composite 10 ins. thick over roof Bridal Veil No. 1. ..	1.87%
3 - Composite samples A, B, C, D, E, G	1.54%
4 - Composite Samples H, I, J, K	2.44%
5 - Sample L	0.02%
6 - Composite Samples O, P, Q	0.65%
7 - Composite Samples R, T, U, V, W, X, Z	6.11%
8 - Composite Samples 1 to 14	1.07%
9 - Composite Samples Za, Zb, Zc	1.38%
10 - Sample S	0.03%

A REPORT ON THE PROPERTY OF THE

NORTHERN ARIZONA LEAD AND ZINC MINING COMPANY

by

L. T. McElvenny, Mining Engineer

Mr. W. I. Johnson,

Prescott, Arizona.

Dear Mr. Johnson:-

Herewith is my report on the property of the Northern Arizona Lead and Zinc Mining Company, the data for which was obtained from an examination of the mines made March 13th. to March 18th. 1928.

The report covers 10 pages and contains six maps and two assay sheets.

A resume' of the report shows that you have there the possibilities of developing a good mining property whose present assets are a considerable tonnage of good ore and reasonable expectation of further ore discoveries; whose main draw-back lies in its present inaccessability; and whose greatest present need is an ore development program to create enough reserve ore to determine your future mining and milling practice

Yours respectfully

L. T. McElvenny

NORTHERN ARIZONA LEAD AND ZINC MINING COMPANY

LOCATION-

The NORTHERN ARIZONA LEAD AND ZINC MINING COMPANY properties lie in Cataract Canyon, Coconino County, Arizona at 50 miles East of the Santa Fe railroad station at Grand Canyon from which they are reached by 36 miles of automobile road and 14 miles of horse trail. The location lies within the boundaries of the Grand Canyon National Park.

ROADS -

The automobile road traverses high mesa country through low rolling hills with nothing but low rolling hills and gentle slopes to contend with. This is a mail stage road and is well adapted to trucking.

The road ends at Hilltop which is the top edge of the Grand Canyon rim at the head of Lee Canyon. The elevation above sea-level at Hilltop is 5415 feet.

Thence from Hilltop a pack trail leadsdown Lee Canyon for 7 miles to its junction with Cataract Canyon, the first one-half mile being a steep jump down of about 600 feet after which the trail follows a normal water grade on the floor of the canyon.

Down Cataract Canyon the trail follows the gently sloping floor for 7 miles to the Indian town of Supai where is located the Indian Agency for the Supai Indians, telephone station, and post office.

At 1½ miles above Supai are encountered the headwaters of Cataract Creek which rise from huge springs in the bottom of the canyon and flow down the canyon for about 8 miles to the Colorado river.

From Supai the trail follows down Cataract Canyon for 1½ miles

to the claims at Carbonate Canyon, passing Navajo Falls just below Supai, and Bridal Veil Falls at the mouth of Carbonate Canyon on the Bridal Veil Mining Claim.

The elevation above sea-level at Carbonate Canyon is 2900 feet, MINING CLAIMS-

The property consists of 5 unpatented mining claims and one unpatented millsite comprising in all 105 acres of mining ground.

The accompanying sketch-map shows their relative positions with regards to each other and to the canyon. The Bridal Veil Claim cover the south side of Carbonate Canyon and embraces the Bridal Veil Falls. The other claims lie along Cataract Canyon.

DESCRIPTION OF CATARACT CANYON-

In the region of the mining claims the canyon is something less than 500 feet wide with vertical walls cut at intervals by side canyons. The walls are from 300 to 400 feet high, cut from limestone.

On top of the limestone lie beds of sandstone a thousand or more feet thick which have eroded to a normal slope which gives way to a perpendicular capping cliff of limestone 800 feet high at about 2 miles away from the property.

Bridal Veil Falls is a vertical drop of 120 feet, Between Bridal Veil and Mooney Falls is an ordinary mountain stream water-grade. Mooney Falls is a perpendicular drop of 196 feet.

ORES AND THEIR OCCURENCE-

The ores found on the property are minerals of lead, Cerussite and Galena; Vanadium in the form of Vanadinite and Descloisite; Silver; and Gold in smallamount.

When pure, Cerussite contains 77.5 % Lead, Galena contains 86.6 % lead, Vanadinite contains 19.3 % Vanadium Oxide and 73.1 % lead, and Descloisite contains 22.7 % Vanadium Oxide and 50 % lead.

The ores bodies so far discovered lie in one particular hor-

izon of Redwall Limestone, a formation of Carboniferous age whose beds are lying almost horizontal. This is the limestone which forms the lower perpendicular cliff walls of the canyon.

The horizon which contains the ore is clearly indicated along the walls of the canyon by a line of demarkation, a jointing plane, about 35 feet above the canyon floor, extending from Carbonate Canyon to far below Mooney Falls and showing on both walls of the canyon,

At intervals along this jointing plane occur what are known as slump areas caused by overhanging limestone breaking down to fill a cave. The caves were produced by shrinkage due to the oxidation of sulphide ore bodies.

What produced the ore-bodies is not clearly indicated. There is no igneous rock within this area. The ore is a replacement of the limestone by ascending mineralized solutions which travelled along the jointing plane which is at present a rather open channel until a fractured zone was reached which was favorable to the deposition of the minerals. Such zone of fracturing could lie at any angle, from nearly flat to perpendicular, and the resultant deposition would produce ore-bodies lying at corresponding angles. Thus in the Bridal Veil workings the angle seems to have been at about 20° from the horizontal; in the Seligman No. 2 the fracture encountered was nearly perpendicular.

Other open jointing planes occur above the one mentioned but have not been prospected for.ore.

The principal ore-body so far uncovered is on the Bridal Veil claim. Here a tunnel was driven in on the jointing plane, on ore all the way, for about 220 ft. A raise 54 feet high was driven upwards, and a winze was sunk for 85 feet. From this winze two levels were driven, No. 2 Level being at 34 feet and No. 3 Level at 59 feet below Level No. 1. Water level stands at 77 ft. below Level No. 1.

LEAD ORE-

Bridal Veil:

Lead ore varying in thickness from nothing to 24 ins. and averaging 10 ins. occurs along the main bedding plane in Level No. 1. At 50 ft. inside the tunnel the ore dips downward on a 20° angle, widening and getting better in grade as it goes down until it reaches and passes below No. 2 Level. No commercial ore is found on the No. 3 Level but an intermediate drift below the level shows good prospecting possibilities. The main ore undoubtedly passes over this level and will be found by further drifting.

See the accompanying map of this mine for details of the workings, also the assay sheets for samples.

On the opposite wall of Carbonate Canyon is a short tunnel into the cliff which shows some lead values and indicates the continuous lateral extend of the ore zone.

Other Deposites -

Following along on the bedding plane marker - ore is found near Bridal Veil Falls; in two tunnels on the Seligman Claim; in a tunnel on the Cataract Claim; and at other places down the canyon.

Seligman No. 1 -

The ore found in Seligman No. 1 tunnel is milling grade lead ore but carries the highest grade Vanadium content of any of the showings. The ore follows the main bedding plane and forms small deposits under the plane similar to Bridal Veil No. 1 Level. At the point where Sample S was taken (see map) the ore-streak is dipping sharply to the South-east and should widen to another deposit as on Bridal Veil No. 2 Level. The ore streak averages 8 ins. wide across the face and assays 16.6 ozs. Silver and 22.4 % Lead. This point constitutes a very good prospect.

POSITIVE LEAD ORE -

POSITIVE LEAD ORE -

Bridal Veil No. 2 - Level- East area, 44 ft. x 32 ft. x 4.6 ft. thick

720 tons at 7.7 ozs. Silver, 34 % Lead.

" " " " West area, 53ft. x 55 ft. x 5.5 thick

1340 tons at 10.7 ozs. Silver, 25 % Lead.

" " " " North area, 12 ft. x 45 ft. x 4.0 ft. thick

250 tons at 4.5 ozs. Silver, 9 % Lead.

" " No. 1 " 250 tons at 10 ozs. Silver, 15 % Lead.

Seligman No. I Tunnel - 600 tons at 4.2 ozs. Silver, 7.2 % Lead.

The above listed areas contain about 500 tons of direct shipping ore running 12 ozs. Silver and 50 % Lead.

PROBABLE LEAD ORE -

With ordinary continuity of the present ore-beds, there should be a further development of ore by stoping which should double the above estimates, giving 1000 tons of direct shipping ore, 2500 tons of second class shipping ore, and 2000 tons of milling ore.

VALUE OF LEAD ORE -

The Present price of Lead is 6 ¢ per pound and Silver is worth 56¢ per ounce. Figured at these prices and deducting smelter charges and deductions, the value to the shipper per ton of ore running 12 ozs Silver and 50 % Lead is $42.60. From this sum must be deducted a mining cost of about $3.00; hoisting to rim of canyon $2.00; trucking to railroad $8.00; railroad freight to the smelters at Douglas, Arizona $8.00, leaving a net profit to the producer of about $21.60 per ton.

Milled concentrates will carry about 50% Lead about 25 ozs. Silver, the extra silver should almost carry the cost of milling.

Figured on this basis the total net value of the lead ores is about $ 60,000.00

Practically all of this has been developed by a small amount of work at the Bridal Veil Mine.

It is well to note here that the present price of lead is the lowest in the last 10 years and that an advance in price of 1¢ would increase the value of this ore about $8.70 per ton.

VANADIUM ORE -

Most of the Vanadium in the Bridal Veil Mine occurs as the mineral Vanadinite. It occurs both in the lead ore-bodies and in leached areas above them where it remained as a resultant of the original lead sulphide ore.

The appended assay sheets give results in percentage of Vandium Oxide, V205, which is the form used in market quotations.

Bridal Veil Level No. 2,	East	Lead	Ore-body	----			1.07 %	V205
"	"	"	"	West	"	"	"	2.00 % "
"	"	"	"	North	"	"	"	2.44 % "
"	"	"	No. 1,	Joint Plane				1.54 % "
"	"	"	"	10 ins. above plane				1.87 % "

and on the upward extention of the lead ore body between Levels No. 2 and No. 1 is a large tonnage of ore running better than 1%

There are in the Bridal Veil workings probably 5600 tons of mixed Lead- Vanadium ore running 1.75% V205.

In the Seligman No. 1 there are developed 600 tons of ore running 7.2% Lead and 6.11% V205.

VALUE OF VANADIUM ORE -

The market value of Vanadium ore depends on the character of the shipped product and the contract with the purchaser. The ore is readily salable.

Ore running 5% V205 sells for 50¢ per pound of V205 and concentrates running from 12 to 18% V205 sell for 65¢ per pound of V205. But when the ore carries both lead and Vanadium the problem becomes one of special metallurgical treatment and the product must be sold to some buyer of this particular kind of ore.

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At present, only such places as are indicated on the walls of the canyon have been prospected and there still remain several slump areas to be prospected.

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I believe that all of these areas will produce as mush ore as the Bridal Veil and that, with further prospecting, other rich areas will be discovered which are not now indicated on the canyon walls.

REQUISITES -

The main need of the project is prospecting for greater ore reserves.

An adequate ore reserve is an essential to the design of a mill and to the construction of transportation facilities.

To date all mining has been done by hand drilling but I would advise the installation of a small air-compressor capable of driving two drilling machines, or one drilling machine and a small hoist.

Such a compressor could be installed for $5000 and $1000 more will place the property on an operating basis.

The second requisite, but not an immediate need, is a road or tramway to the rim of the canyon. This problem is not as difficult as it appears.

There are two feasible methods to be considered and only by an actual survey can the cost be approximated. A direct road would be too expensive.

First: A road following and climbing the upper sandstone beds to the foot of the top limestone cliff which must be ascended by an aerial tramway. Such a road would be about 2½ miles long and thetramway about 2000 ft. long.

Second: An aerial tramway from the mines direct to the rim. This is the cheaper system to construct and maintain. The hoisting engine will be placed on the rim. A 100 H. P. fuel-oil burning engine will be required to hoist 25 tons in 8 hours.

The entire length of this tramway will be about 2 miles and the left about 2800 ft.

TIMBER -

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WATER -

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I believe that it will eventually become a steady producer of profitable ore.

Respectfully submitted

L. T. MvElvenny

Mining Engineer and registered
professional Engineer of the

State of Arizona.

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D	0.005	11.2	17.8	24	"
E	0.005	21.2	13.4	14	"
F	0.005	1.5	27.3		" Vanadium high grade
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H	0.005	1.1	8.4	General	No. 2 level
I	0.008	7.9	9.9	"	"
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18	0.005	10.5	28.7	General wall	"
19	0.004	4.6	10.6	" "	"
20	0.004	6.4	12.2	" "	"
K	0.005	24.1	24.3	18	"
L	0.004	1.9	0.2	Face	No. 3 level
M	0.004	5.9	0.2		"
21	0.004	2.2	0.1		"
22	0.004	0.4	0.1		"
23	0.004	0.5	0.1		"
N	0.020	2.4	None		Iron Mask Tunnel
O	0.010	1.8	7.8	24	Seligman No. 2
P	0.005	1.1	None	36	"
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S	0.005	16.6	22.4	8	"
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V	Trace	1.1	None	24	"
W	Trace	1.5	None	General	"
X	0.005	8.8	3.8	Cross-fracture	"

No.	Gold ozs. per ton	Silver ozs. per ton	% Lead	Width inches	Description
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Z	0.004	4.1	6.2	General	"
Za	Trace	2.4	7.6	"	"
Zb	0.005	6.0	2.1	"	"
Zc	Trace	4.1	1.8	"	"

A composite of the samples of Nos. 1 to 14 Bridal Veil Ore is as follows:

Gold	0.004 ozs.	Insoluble	19.7 %
Silver	7.5 ozs.	Sulphur	0.8 %
Lead	34.2 %	Manganese	0.2 %
V_2O_5	1.07 %	Arsenic)	
Zinc	2.7 %	Antimony)	0.5 %
Iron	2.8 %	Bismuth)	
Lime	17.8 %		
Copper	0.16 %		

Acomposite of samples taken from Seligman No. 1 is as follows:

Gold	0.005 ozs.	Insoluble	10.3 %
Silver	4.2 ozs.	Iron	5.5 %
Lead	7.2 %	Lime	27.1 %
Sulphur	0.2 %		

Vanadium Assays in percentage of oxide - V_2O_5

1 - High grade from Bridal Veil No. 1 ---------- 7.33 %
2 - Composite 10 ins. thick over roof Brid. Veil 1 - 1.87 %
3 - Composite samples A, B, C, D, E, G ---------- 1.54 %
4 - " " H, I, J, K ---------- 2.44 %
5 - " " 1 to 14 ---------- 1.07 %
6 - Sample L ---------- 0.02 %
7 - Composite Samples O, P, Q ---------- 0.65 %
8 - " " R, T, U, V, W, X, Z ---------- 6.11 %
9 - " " Za, Zb, Zc ---------- 1.38 %
10 - Sample S ---------- 0.03 %

BRIDAL VEIL MINES IN CATARACT CANYON

by

H. A. Ferris and J. E. Busch

The claims of the Bridal Veil Mines Association, or as they are perhaps better known, the Johnson claims, lie roughly 40 miles a little north of west of Grand Canyon, Arizona. They are most easily reached by a good automobile road 37 miles from Grand Canyon to Hilltop and from Hilltop to the Supai Indian village, by 13 miles of a rough, precipitous trail down Lee's Canyon. The entire trip can be made in about nine hours. The holdings of the company cover the following nine claims: Bridal Veil, Cataract, Seligman, Pyramid, Iron Mask, Blende, Elania, Home and Road. These make a desirable compact group of claims from a mining standpoint, considering topography, geology and economic conditions.

C. A. Heberlein, as fiscal agent of the Bridal Veil Mines Association, has established his camp about three-quarters of a mile below the Supai Village, on Cataract Creek. It consists of a tent house, tent sleeping quarters, blacksmith shop, mess house and store house. The steep limestone cliffs which surround the camp, rise vertically seven to eight hundred feet.

It is not known when the white man first visited Cataract Canyon, or as it has been renamed, Havasu Canyon, but as far as can be learned it was first prospected for minerals about 1885. A word must here be said on behalf of the early prospectors who first visited this region and conquered its difficulties. It was then in a region 55 miles from the nearest railroad. The intervening country is itself difficult enough and there were no trails, no springs, no water holes, or streams. All of these difficulties were overcome and they were such that they can hardly be appreciated, even by a present day visitor, and not at all by those who have not seen this region of vertical cliffs, deep canyons and towering rock masses of forbidding table lands.

The Bridal Veil claim has within its boundaries the second largest falls in the canyon; namely, Bridal Veil Falls, while the largest falls, Mooney Falls, is located on the Elania. All approach to the latter, either up or down the canyon, is possible only over the Cataract, Iron Mask and Seligman claims.

From the standpoint of scenic beauty, few places can compare with Bridal Veil and Mooney Falls. Mooney Falls, lying three-fourths of a mile northwest of Bridal Veil, perhaps appeals more to the eye, for the drop is about 192 feet, while the drop of Bridal Veil is 100 feet. Both falls are very similar, both in appearance and as to geologic history.

Mooney Falls gains its name from the fact that Mooney, who was an ex-sailor, attempted the first descent of the cliff by means of a rope lowered from the top. He paid for the attempt with his life, the spinning rope causing him to lose his hold when but a few feet over the cliff and fall to the rocks below. Of how his companions finally reached and buried Mo ney's body need not be told. The difficulties cannot be appreciated until the region is seen.

It is said that the first prospectors let themselves down the canyon with ropes. This can well be believed and it is a certain fact that when

It is said that the first prospectors let themselves down the canyon with ropes. This can well be believed and it is a certain fact that when the canyon floor below Bridal Veil Falls was reached, pack animals had to be lowered over the cliffs of Mooney Falls by means of ropes and a derrick.

Both falls have in only recent years been distributed over considerable wider area than at present, and the spray, and mist have formed beautiful "curtains" and frescoes of travertine deposited from the lime-bearing waters.

Floods of only a few years ago have altered the stream channels and cut the top scarf of both falls below their original level, confining the present stream at the top of the falls to a width of 15 to 20 feet.

The travertine frescoes are colored a reddish-brown, except where water keeps them moist and these portions derive delicate yellow and green colors from the lichens and moss growing on the travertine "curtains", giving as a general effect the pure white of the falls with a background of green coated moist travertine, flanked with a reddish-brown dry travertine on either side, all forming a semi-circular wall apparently carved into fantastic shapes and furnishing a pleasing effect to the eye.

The bases of these falls are carved into deep bowls which boil with a turquoise blue water from which arises a delicate mist that wavers with the vagaries of the air currents in the canyon. Winding away from these turquoise bowls are the blue veinlets of the stream seeking its next hazardous fall. The name of the canyon has been correctly chosen,"Land of the Blue Water, Havasu".

The scenic beauty of these falls from a tourist's standpoint, however, is seriously lessened by the arduous trail to reach them and the immense cost of providing a more easy access.

Eventually the prospectors conquered these steep cliffs by inclined tunnels under the travertine formation, supplemented by steps cut in the rock and pieces of steel set alongside such steps for hand holds. These steps and hand irons are still used. Indeed, pages could be used in reciting the great obstacles the early prospectors had to overcome in their efforts to uncover the mineral deposits of the region.

From 1885 to approximately 1901, mining was principally for the lead-silver ores, and about one hundred tons of high-grade ore were shipped to smelters during that period, but the inaccessibility of the region and the long packing and haulage costs made this mining a failure.

About 1902 an Eastern company was formed for the purpose of prospecting the canyon from Bridal Veil Falls to the Colorado River. This company was known as the Grand Canyon Gold and Platinum Company. Platinum was supposed to have been found down the canyon toward the Colorado River. The company tried to gain an outlet by means of a wagon road through Lee's Canyon. The only other outlet was toward Seligman and presented too much difficulty for a pack-animal trail.

Commencing at Hilltop, an attempt was made to build a wagon road to this property through Lee's Canyon, the remnant of which is still visible after 20 years. About $75,000 was expended in building this unsuccessful road. Incidentally, it may be mentioned that, while this road turned out to be a failure, it was sufficiently cleared and marked for a good trail. This trail the Supai Indians have used ever since.

The company also built a trail from Mooney Falls down the Cataract Canyon to the Colorado River, but later cloudbursts have completely obliterated this trail. It may be said that this company and others located claims the whole distance from Bridal Veil Falls to the river and that assessment holes down Cataract Canyon may yet be seen.

In 1906 W. I. Johnson came into this district and made five locations, and in the same year located various water rights on Havasupai, or Cataract Creek. He erected a small concentration plant, consisting of a home-made

and in the same year located various water rights on Havasupai, or Cataract Creek. He erected a small concentration plant, consisting of a home-made jig operated by an overshot water wheel. A ditch from Bridal Veil Falls furnished the water. He ran through this concentrator perhaps several hundred tons of lead ores.

Johnson was not aware at that time that all these ore contained vanadium in the form of vanadate of lead, and he made no attempt to recover

this valuable metal. Also in his concentrator no attempt was made to save the fine slimes, etc. Hence the loss in lead and vanadium was considerable. Johnson was unable to make a commercial success of his properties, but continued to hold the claims by assessment work. In 1919 he located four other claims in order to make a compact group and to cover the better known outcrops upon adjacent areas.

In October, 1919, Johnson interested C. A. Heberlein of Prescott, Ar zona. Mr. Heberlein is a mining engineer, said to have considerable experience in limestone deposits. He became convinced that the property offered possibilities of developing into a mine, but, as he states himself, he recognized the fact that because of the nature of the ore deposits in limestone the extent of the property in area was too limited to invite the capital needful for the assurance of success in this difficult region.

Heberlein asked the nati nal park service for a permit to make preliminary survey of certain other contiguous areas farther down Cataract Canyon, the idea being that such survey would be used as a basis of application for a prospecting permit under the provisions of the Grand Canyon national park act.

In January, 1921, Mr. Heberlein took over a definite option to purchase the Johnson claims. Since that time approximately $15,000 has been expended in actual development work. Mr. Heberlein states he has made a systematic study of the geology and ore deposition and is convinced of the existense of commercial bodies. He states that Vanadium ores show in outcrops and prospect holes for a distance of about three-quarters of a mile along the canyon; that his tests thus far indicate fifteen to twenty-five pounds vanadic acid per ton, in the recovery of which a lead concentrate of 60 to 70 per cent should be secured; that ferro vanadium could be produced on the ground with power and proper reduction process.

Geology of the Region.

The highest formation exposed by the cutting of Cataract Canyon, as shown in the vicinity of these mining claims, consists of twelve to fifteen hundred feet of Supai formation (carboniferous) consisting of alternating red sandstones and shales, with occasional bluish-gray thin limestone members. Near the base of this formati n, at the south boundary of the Supai Indian reservation, considerable water issues, about 65 cubic feet per second. This is the source of Cataract Creek.

Just below the Supai Indian Village this creek cuts into the underlying limestone, developing three beautiful falls--Navajo Falls, which is just below the Supai Village; Bridal Veil, about one-half mile below Navajo, and Mooney Falls, nearly a mile below Bridal Veil. The latter falls has cut into the Mauv limestone for a depth of probably 200 feet.

The Redwall limestone (carboniferous), as shown in this canyon cutting, is about 550 feet thick and developed into perpendicular smooth walls stained red by washings from the overlying Supai Redwall sandstones and shales. The Mauv limestone (Cambrian) underlying the Redwall, with no apparent unconformity, is thin bedded, with the bedding lines showing a wavy or crinkly appearance in contrast to the more uniform bedding lines of the overlying Redwall.

The area examined shows no formation lower than the Mauv limestone.

The waters of Cataract Canyon are heavily laden with carbonate of lime and probably contain considerable carbon dioxide at the point of issue. They freely deposit this lime for a considerable distance down the canyon, forming immense travertine deposits. They are especially noteworthy at Bridal Veil and Mooney Falls. The stream has at various times shifted its channel and cut new ones through the old travertine deposits.

The area between the perpendicular Redwall cliffs along the creek is covered wholly with travertine or sands worn from it.

The zone practically from the base of the Redwall limestone to 200 feet above it has been subjected to strong underground water action which resulted in a series of solution cavities, principally along three main bedding planes, and occasionally along vertical joints and fissures between these.

Mineralization.

The first mineralization after the formation of the solution cavities was a deposit as a cave lining of very large calcite crystals and dog tooth spar. Some of these openings later caved or failed, due to their excessive size, and formed coarse brecciated masses of crystals, boulders, cave mud, etc. One can plainly see the lines of bedding along the canyon walls that are ordinarily horizontal, but in the vicinity of these sink hole actions they are depressed.

Solution carrying lead and silver then permeated through this brecciated cave debris and deposited coarse galena, apparently replacing entire boulders of lime in places with galena and possibly sphalerite.

After the deposition of galena, water, bearing vanadium, traversed these spaces, coating the original large calcite crystals with vanadinite, leaving mirrors or casts of this mineral on the crystal faces. Also they formed crusts bearing more massive vanadinite, surrounding and clearly later than the galena. Certain occurrences suggest that at this time much finely divided matter accompanied the vanadium solutions and formed thin 1/8-inch bedded shaly mud deposits in what open cavities still happened to remain.

It is believed that the next mineral deposit was sphalerite later than the vanadium, but this conclusion is not satisfactory nor were there sufficient observances to make a decision.

Later than the vanadium and encrusting it is a thin coating of calcite and possibly some smithsonite which seems to have ended the mineral deposition stage. After the canyon had cut below these solution cavities and drained these water channels, the action once more reverted to solution, leaching and oxidation of the mineral contents, leaving a loose oxidized mass of limonite, siderite, smithsonite and various lead oxides, with occasional boulders and kernels of galena unaltered. Fifteen to twenty feet back from the canyon walls generally reaches the unaltered sulphides.

Tight fissures and cracks which were entirely closed by the original mineralization have not been leached and oxidized since the canyon cutting, and at these places sulphides are directly exposed at the surface of the cliff walls.

The finding and prospecting of these ores has been guided almost wholly by the slight re-entrants and horizontal and vertical breaks in the smooth perpendicular canyon walls due to the erosion and leaching of the softer mineralized portions, also the depressions in the bedding lines due to "sink hole" phenomena, indicating the position of the larger caves and hence the more important bodies of ore.

No igneous formations appear to be present although sufficient time was not available to make a close examination, and for the same reason no

explanation is ventured as to the original source of these ores. Their occurrence is, however, markedly similar to the Joplin lead-zinc ores.

The following minerals were noted: Calcite, barite, gypsum,(secondary in the oxidized zone near the surface), pyrite, sphalerite, galena, vanadinite, cerussite, anglesite, smithsonite, and possibly calamine. The

galena appears to have replaced entire boulders of limestone. Pyrite and sphalerite occur principally in the tight unleached seams which apparently connect the larger caves. Vanadinite occurs in botryoidal masses lining late solution openings and also mirrors or casts coating the original calcite crystals. Smithsonite occurs as hard crusts and also as soft white friable powder in the oxidized masses. Anglesite and cerussite occur as white powder masses distinguished by their occasional silky luster and weight.

A description of these deposits would perhaps not be complete without a word as to the difficulties of working and prospecting and the extraordinary methods that have been used.

These bedded deposits lie from 50 to 250 feet above the canyon floor and on perpendicular, smooth cliffs. It is stated that the original discovery was made by a prospector, who used his Winchester to shoot off pieces of the croppings along the bedding lines 200 feet above him.

On Cataract claim the cropping is 258 feet above the canyon floor and is reached by a series of ladders supported on pipe wedged in drill holes for the full distance up the cliff.

The work done to even reach these deposits, up the face of the sheer canyon wall, is a monument of courage and perseverance of the early prospectors. These lowering workings consist of one 30-foot tunnel showing sulphides of zinc and iron in rather tight seams both at the tunnel portal and in the breast. The breast shows a ten inch streak of pure white spar containing sphalerite.

Another tunnel sixty feet northwest is reached by a path blasted out of the canyon wall from the mouth of the above mentioned workings. This tunnel is about 30 feet long, in the soft oxidized portion of a broken solution cave that, due to its porous condition, has been leached of sulphides, leaving only a soft iron oxide mass that contains residuals of zinc probably in the form of smithsonite and calamine. Other workings exist on the southeast portion of the claim. Altogether there are about 200 feet of work on this claim. ~~Thesx~~ The extreme difficulties encountered and mastered in opening up these deposits are themselves evidence of good faith as to intent to develop a mine.

The Iron Mask claim lies on the southwest wall of the canyon also, but above Mooney Falls. The vein filling is thoroughlyleached and oxidized, but it undoubtedly once contained sulphides of lead and zinc, and further work beyond the oxidized zone would undoubtedly encounter zinc and lead sulphides. The work consists of three small prospect openings along the bedding plane solution channels, aggregating 30 feet in all.

The workings of the Seligman claim, which also lies on the southwest wall of Cataract Canyon, are reached by a sixty-foot ladder from the canyon floor. Approximately 600 feet of work has been done, most of which is in ore. The sulphides are partially oxidized, but the breast of the tunnel shows considerable galena and smithsonite.

Some valuable lead ores have been sorted out and shipped from this claim and considerable fair grade milling lead ore is blocked out by the work already done.

The Bridal Veil claim, which includes Bridal Veil Falls, lies

the work already done.

The Bridal Veil claim, which includes Bridal Veil Falls, lies principally on the south side of Carbonate Canyon a dry tributary to Cataract Canyon. The principal workings are in the northeast portion. This claim has the best mineral showing and ore exposure of any in the canyon and had received most of the mining development. It shows an immense deposit of partially oxidized lead and zinc sulphides in the debris of an ancient large solution opening that caved, or "failed".

The ores are erratic in occurrence, seemingly the galena has replaced the entire limestone boulders in places which are surrounded by reddish oxides, cave mud and breccias. Beautiful mirrors, casts and crusts of vanadinite are present, apparently of later date and possibly secondary, which formed along what open channels still remained. Oxidation from the canyon wall and along open fissures has formed oxides of lead and carbonates and silicates of zinc.

Several hundred tons of galena have been saved from the exploratory mining operations and are stored in the mine workings. The deposits are unusually interesting. A sample taken from a 20-inch cut in the incline at the bottom of the shaft is representative of a 30-foot length of ore exposed along the incline.

The Pyramid claim lies on the northeast of Cataract Canyon, sidelining the Seligman claim. The workings from two openings into the canyon total about 100 feet. The tunnel near the center of the claim is possibly a continuation of the Seligman lead deposits across the canyon. This tunnel shows considerable galena and development in progress at the time of examination was showing up better ores.

The bedding planes along which mineralization occurs on this group of claims continue on down the canyon, but at increasingly higher and more inaccessible levels from the canyon floor. Whether great horizons are mineral bearing for any great distance down the canyon is questionable and certainly only ascertainable after considerable dead work in building ladders or running up-raises from the canyon level to reach them.

Due to their inaccessibility these ore bodies are not commercially valuable for their lead and silver content alone unless they are developed to a point where large daily tonnage is assured and reduction of these ores to metallic lead and vanadic acid. To develop such tonnage requires considerable area along the ore-bearing outcrop. This is due to the fact that ore occurs in lenses and kidneys of irregular size and occurrence, making the problem of blocking out ore both difficult and costly. For these reasons, it is believed that the greatest value of the property lies in the fact that the ore contains a good percentage of vanadium. Without this metal the project would not be feasible under present conditions.

THE NORTHERN ARIZO" LF AND ZINC MINING COM IY.

CATION:

The Northern Arizona Lead and Zinc Mining Company's properties lie in Cataract Canyon, Coconino County, Arizona, at 80 miles east of the Sante Fe Ry station at Grand Canyon, from which they are reached by 36 miles of automobile road and 14 miles of horse trail. The location lies within the boundaries of the Grand Canyon National Park.

ROADS: The automobile road traverses high mesa country through low rolling hills with nothing but these and gentle slopes to contend with. This is a mail stage road and well adapted to trucking.

The road ends at Hilltop which is the top edge of Grand Canyon rim at the head of Lee Canyon. The elevation above sea level at Hilltop is 5415 feet.

Thence from Hilltop a pack trail leads down to Lee Canyon for 7 miles to the junction with Cataract Canyon, the first one half mile being a steep jump down of about 600 feet after which the trail follows a normal water grade on the floor of the Canyon.

Down Cataract Canyon the trail follows the gently sloping floor for 7 miles to the Indian town of Supai where is located the Indian Agency for the Supai Indians, telephone station and post office.

At 1½ miles above Supai are encountered the headwaters of the Cataract Creek which rises from hugh springs in the bottom of the Canyon and flow down the Canyon for about 8 miles to the Colorado River.

From Supai the trail follows down Cataract Canyon for 1½ miles to the claims at Carbonate Canyon, passing Navajo Falls just below Supai and Bridal Veil Falls at the mouth of Carbonate Canyon on Bridal Veil Mining claims.

The elevation above sea level at Carbonate canyon is 2900 feet.

MINING CLAIMS: The property consists of 5 unpatented mining claims and one unpatented millsite comprising in all 105 acres of mining ground.

The accompanying sketch map shows their relative positions with regards to each other and to the Canyon. The Bridal Veil Claim covers the south side of Carbonate Canyon and embraces the Bridal Veil Falls. The other claims lie along Cataract Canyon.

DESCRIPTION OF CATARACT CANYON. In the region of the mining claims the canyon is something less than 500 feet wide with vertical walls cut at intervals by side canyons. The walls are from 300 to 400 feet high, cut from limestone.

On top the limestone lie beds of sandstone a thousand or more feet thick which have eroded to a normal slope which gives way to a perpendicular slope or capping cliff of limestone 800 feet high at about 2 miles away from the property.

Bridal Veil Falls is a vertical drop of 120 feet. Between Bridal Veil Falls and Mooney Falls is an ordinary mountain stream water-grade. Mooney Falls is a perpendicular drop of 196 feet.

ORES AND THEIR OCCURRENCE: The ores found on the property are minerals of lead. Cerussite and Galena; Vanadium in the form of Vanadinite and Descloizite; Silver and Gold in small amount.

(One paragrapg describing these minerals when pure can not be read, omitted here)

The ore bodies so far discovered lie in one horizon of Redwall Limestone, a formation of Carboniferous age whose strata are lying almost horizontal. This is the limestone which forms the lower perpendicular walls of the canyon.

The horizon which contains the ore is clearly indicated along the walls of the canyon by a line of demarkation, a jointing plane, about 35 feet above the canyon floor, extending from Carbonate canyon to far below Mooney Falls and showing on both walls of the Canyon.

At intervals along this jointing plane occur what is known as slump areas caused by the overhanging limestone breaking down to fill a cave. These caves were produced by shrinkage due to the oxidation of sulphide ore bodies.

What produced the ore bodies is not clearly indicated. There is no igneous rock within this area. This ore is a replacement of the limestone by ascending mineral solutions which traveled along the jointing plane which is at present a rather open channel until a fractured zone was reached which was favorable to the deposition of the minerals. Such zone of fracturing could lie at any angle, from nearly flat to perpendicular, and the resultant deposition would produce ore-bodies lying at corresponding angles. Thus in the Bridal Veil workings the angle seems to have been about 20° from the horizontal; in the Seligman No 2 the fracture encountered was nearly perpendicular.

Other open jointing planes accur above the one mentioned but have not been prospected for ore.

The principal ore body so far uncovered is on the Bridal Veil claim. Here a tunnel was driven in one of the jointing planes, on ore all the way, for about 220 feet. A raise 54 feet high was driven upwards, and a winze was sunk for 86 feet. From this winze two levels were driven, No 1 level at 34 feet and the No 2 level at 59 feet below level No 1 Water level stands at 77 feet below level No 1.

LEAD ORE: BRIDAL VEIL: Lead ore varying in thickness from nothing to 24 in. and averaging 10 ins. occurs along the main bedding plane in level No 1. At 50 ft. inside the tunnel the ore dips downward on a 20° angle, widening and getting

better in grade as it goes down until it reaches and passes below No 2 level. No commercial ore is found on No 3 level but on intermediate drift below the lev shows good prospecting possibilities. The main ore undoubtedly passes over this level and will be found by further drifting.

See the accompanying map for details of the workings, also the assay sheets for samples.

On the opposite wall of Carbonate Canyon is a short tunnel into the cliff whi(shows some lead values and indicates the continuous lateral extent of the ore.

OTHER DEPOSITS: Following along on the bedding plane marker, ore is found near Bridal Veil Falls; in two tunnels on the Seligman claim; in a tunnel on Cataract claim, and at other places down the canyon.

SELIGMAN NO 1. The ore found in Seligman No 1 tunnel is milling grade lead but carries the highest grade Vanadium cantent of any of the showings. The ore follows the main bedding plane and forms small deposits under the plane similar to Bridal Veil No 1 level. At the point where Sample 5 was taken(see map) the ore streak is dipping sharply to the Southeast and should widen to another depos as on Bridal Veil No 2 level. The ore streak averages 8 inches wide across the face and assays 16.6 ozs. silver and 22.4 lead. This point constitutes a very good prospect.

POSITIVE LEAD ORE: Bridal Veil No 2 level- East area 44 ft. x 42 ft. x 4.6 ft. thick;720 tons at 7.7 oz. silver 34% lead.
Same. West Area 53 ft. x 55 ft. x 5.5 ft.thick,1340 tons at 10.7 oz. silver 25% lead. Same North area; 12ft. x 43 ft. x 4.0 ft thick,250 tons at 4.5 oz silver 9% lead. Same No 1 level 250 tons at 10 oz silver 15% lead.
Seligman No 1 tunnel 600 tons at 4.2 oz silver 7.2% lead

The above listed areas contain about 500 tons of direct shipping ore running 12 oz. silver and 50% lead.

PROBABLE LEAD ORE. With ordinary continuity of the present ore-beds, there shoul be a further development of ore by stoping which should double the above estimat giving 1000 tons direct shipping ore,2500 tons of second class shipping ore and 2000 tons milling ore.

VALUE OF THE LEAD ORE: The present price of lead is 6¢ per pound and silver is worth 56¢ per oz. ~~Thexvaluextoxthexshipperxperxtonxofxorexrunningxl2xozxsilver~~
Figured at these prices and deducting smelter charges and deductions the value to the shipper per ton of ore running 12 oz silver and 50% lead is $42.60. From this sum must be deducted a mining cost of about $3.00; Hoisting to rim of Canyon $2.00; trucking to railroad $8.00; railroad freight to the smelters at Douglas Arizona $8.00 leaving a net profit to the producer of about $21.60 per t

Milled concentrates will carry about 50 % lead and about 25 oz. silver, the extra silver should almost carry the cost of milling.

Figured on this basis the total net value of the lead ore is about $60,000.00.

Practically all of this has been developed by a small amount of work at the Bridal Veil Mine.

It is well to note here that the present price of lead is the lowest in the last ten years and that an advance in price of 1¢ would increase the value of this ore about $8.70 per ton.

VANADIUM ORE: Most of the Vanadium in the Bridal Veil Mine occurs as the mineral Vanadinite. It occurs both in the lead ore bodies and in leached areas above them where it remained as a resultant of the original lead sulphide ore.

The appended assay sheets give results in percentages of Vanadium Oxide, V_2O_5, which is the form used in market quotations.

Bridal Veil	Level	No	2 East Lead ore body - -		1.07%	V205
"	"	"	2 West " "	"	2.00%	"
"	"	"	2 North " "	"	2.44%	"
"	"	"	1 Joint plane		1.54%	"
"	"	"	1 10" above plane		1.87%	"

and on the upper extension of the lead ore body between levels No 2 and No 1 is a large tonnage or ore running better than 1%.

There are in the Bridal Veil workings probably 5600 tons of mixed lead-vanadiu ore running 1.75% V_2O_5.

VALUE OF THE VANADIUM ORE: The market value of vanadium ore depends on the char- acter of the shipped product and the contract with the purchaser. The ore ~~xaxlx~~ is readily salable. Ore runnign %5 V205 sells for 50¢ per pound of V205 and concentrates running from 12 to 18% sell for 65 ¢ per pound of V205. But when the ore carried both lead and Vanadium the problem becomes one of special meta lurgical treatment and the product must be sold to some buyer of this particul kind of ore.

When a sufficient tonnage of this class of combination ore has been develope a lead furnace and leaching plant can be installed at the mine and the two pro ducts will be sold separately.

M[illegible]h of the ore in Bridal Veil No 1 level and between levels No 1 and No 2 [illegible] concentrated to a product containing 10% V205 which sells for $100.00 [illegible] ton at the market point.

The Seligman ore can be converted to a high grade concentrate because of its initial high percentage of vanadium and rather low percentage of lead. This ore contains much free Vanadium oxide besides some Lead Vanadate. It runs 6.11% V_2O_5 and in the crude state is worth $60.00 per ton at the market point.

Only by actual mill tests can any idea by obtained as to what can be expected from this ore, suffice it to say that the Vanadium is worth many thousands of dollars and is a real mining asset.

PROSPECTING POSSIBILITIES: As before stated the mineral deposits lie along a horizontal plane in the limestone.

At present only such places as are indicated on the walls of the canyon have been prospected and there still remain several slump areas to be prospected. The Bridal Veil is the only area in which work has been done below the actual jointing plane. The 54 ft. raise above No 1 level is reported to have hit ore but the raise cannot be inspected at the present time. This may be an overlying plane which can be seen on the face of the cliff.

I believe that all these areas will produce as much ore as the Bridal Veil and that, with further prospecting, other rich areas will be discovered which are not now indicated on the canyon walls.

REQUISITES: The main need of the project is prospecting for greater ore reserves. An adequate ore reserve is essential to the design of a mill and to the construction of transportation facilities.

To date all mining has been done by hand drilling but I would advise the installation of a small air-compressor capable of driving two drilling machines, or one drilling machine and a small hoist.

Such a compressor should be installed for $5000.00 and $1000.00 more will place the property on an operating basis.

The second requisite, but not an immediate need, is a road or tramway to the rim of the canyon. This problem is not as difficult as it appears.

There are two feasable methods to be considered and only by an actual survey can the cost be approximated. A direct road would be too expensive.

First: A road following and climbing the upper sandstone beds to the foot of the top limestone cliff which must be ascended by an areial tramway. Such a road would be about 2½ miles long and the tramway about 2000 ft. long.

Second: A aerial tramway from the mine direct to the rim. This is the cheaper system to construct and maintain. The hoisting engine will be placed on the rim. a 100 H.P. fuel-oil burning engine will be required to hoist 25 tons in 8 hours.

The entire length of this tramway will be about 2 miles and the lift about 200 feet.

TIMBER: Mining and construction timber is plentiful at a few miles from the rim.

WATER: Cataract Creek has been calculated to flow 72 second feet at minimum. According to Mr. Johnson, the U.S. Government recognizes the rights of the mining claims to the use of all water upon them, but the government has cancelled his rights to the use of the water for diversion for power purposes. At one time, before the intervention of the government, the water power was under lease and bond to an electric power company for $100,000.00. At the present time Mr. Johnson has a claim against the government for $50,000.00 damages for such cancellation.

MILLSITE: A concentrating mill can be placed in the bottom of the canyon near the mines, provosion being made for retaining the mill tails from washing down the creek.

CONCLUSION AND RECOMMENDATION. I would recommend the immediate inception of a development program under the superintendance of a competant mine forman, all immediate work to be done in the areas already discovered.

Such development work should be done below the flat joint plane in order to reach the ore which lies in the bottom of the slump areas and below the erosional effect of the creek waters. Special attention should be paid to any downward dipping of the ore stratum.

This property is one of considerable and one which merits the serious consideration of an investor.

I believe that it will eventually become a steady producer of profitable ore.

Respectfully submitted,

T.L.McElvenny, Mining engineer and registered professional engineer of the state of Arizona.

NUMBER	ASSAYS. GOLD OZ. PER TON	SILVER OZ PER TON	% LEAD	WIDTH INCHES	DESCRIPTION.
A	0.010	14.6	18.2		Bridal Veil No 1 level
B	0.005	7.6	5.9	10	"
C	0.005	4.4	17.8	10	"
D	0.005	21.2	13.4	14	"
E	0.005	21.2	13.4	14	"
F	0.005	1.5	27 .3		" V.hi-grade.
G	0.010	5.0	7.5		" Vug area
H	0.005	1.1	8.4		General No 2 level

Assays (Cont)

No	Gold oz per ton	Silver Oz per ton	% Lead	Width In.	Description.
I	0.005	7.9	9.9	General	No 2 level
1	0.005	8.6	37.1	52	"
2	0.003	7.8	44.0	54	"
3	0.004	8.6	26.7	63	"
4	0.004	10.7	3.3	52	"
5	o.oo5	12.0	37.7	37	"
6	~~x.xxx~~ 0.004	9.8	56.8	24	"
7	0.004	8.0	25.3	56	"
8	0.004	8.5	30.2	75	"
9	0.003	2.2	26.3	92	"
10	0.004	6.7	34.2	90	"
11	0.005	11.8	49.8	61	"
12	0.005	8.7	49.6	34	"
13	0.005	8.3	15.3	28	"
14	0.004	4.5	14.9	52	"
J	0.005	~~xxx~~ 12.4	~~xxx~~ 22.8	12	" along wall
15	0.005	8.6	26.9	General	"
17	0.005	8.3	16.7	36	"
18	0.005	10.5	28.7	General	" Wall
19	0.004	4.6	10.6	"	" "
20	0.004	6.4	12.2	"	" "
K	0.005	24.1	24.3	18	"
L.	0.004	1.9	0.2	Face	No 3 level
M	0.004	5.9	0.2		"
21	0.004	2.2	0.1		"
22	0.004	2.2	0.1		"
23	0.004	0.5	0.1		"
N	0.020	2.4	none	Iron Mask Tunnel	
O	o.010	1.8	7.8	24	Seligman No 2
P	0.005	1.1	None	36	"
Q	0.005	1.5	None	36	"
R	Trace	1.2	6.8	12	Seligman No 1
S	0.005	16.6	22.4	8	"
T	0.005	4.4	16.8	24	"
U	Trace	3.8	6.3	General	"
V	Trace	1.1	None	24	"
W	"	1.5	"	General	"
X	o.oo5	8.8	3.8	Cross fracture	"
Y	Trace	1.8	7.8	48	
Z	0.004	4.1	6.2	General	Seligman No 1
Za	Trace	2.4	7.6	"	"
zb	o.oo5	6.0	2.1	"	"
Zc	Trace	4.1	1.8	"	"

A composite of the samples No 1-14 Bridal Veil Ore is as follows:

Gold	0.004	Copper	0.16%
Silver	7.5	Insoluble	19.7%
Lead	34.2%	Sulphur	0.8 %
V_2O_5	1.07%	Manganese	0.2%
Zinc	2.7%	Arsenic)	
Iron	2.8%	Antimony)	0.5%
Lime 17.8%		Bismuth)	

A composite of samples taken from the Seligman No 1 is as follows:

Gold	o.oo5 ozs	Insoluble	10.3%
Silver	4.2 oz	Iron	5.5%
L Lead	7.2%	Lime	27.1%
Sulphur	o.2%		

Vavadium Assys in percentage of oxide V_2O_5

1. High Grade from Bridal Veil No 1	7.33%
2. Composit 10" over Bridal Veil Roof No 1	2.44%
3. Composite Samples A,B,C,D,E,G	1.54%
4 " " H,I,J,K,	2.44%
5. Sample L	0.03%
6. Composite Samples O,P,Q	0.65%
7. " " R,T,U,V,W,X,Z	6.11%
8 " " 1-14	1.07%
9. " " Za,Zb,Zc	1.38
10. Sample S	0.03%

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MINING ENGINEER
PHOENIX, ARIZONA

OFFICE
817 W. MADISON ST.
PHONE ALPINE 3-6272

RESIDENCE
1635 W. EARLL DR.
PHONE AMHERST 5-1132

May 29, 1956.

To: The Superintendent,
Grand Canyon National Park,
Grand Canyon, Arizona.

Dear Sir:

Re: Appraisal Report.
Five Mining Claims in Havasu Canyon.

Pursuant to your request and verbal contract I have examined a certain group of mining claims in Havasu Canyon for the purpose of establishing a fair cash value.

Claims and Location.

The group consists of the following named mining claims: Bridal Veil, Seligman, Pyramid, Iron Mask and Cataract. All the claims are unpatented and a search at the General Land Office confirms the fact that no patent has been applied for nor patent survey made. There is also one millsite.

The location of the group is in Havasu Canyon (sometimes called Cataract Canyon, but distinct from a portion of the Grand Canyon known as Cataract Canyon), about two miles below Supai Village and Post Office.

The claims are within the confines of Grand Canyon National Park but were located before this park was extended into that area. Part of the Bridal Veil claim lies within the boundry of Havasupai Indian Reservation.

The attached map shows the general outline of the claims and important features. This map was redrawn by me from existing maps to better accompany this report.

The claims are most easily reached via a nine mile very rough trail which heads out at a point on the rim from whence it is about 65 miles south to highway 66, or east to Grand Canyon Village. These are the nearest rail points.

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History.

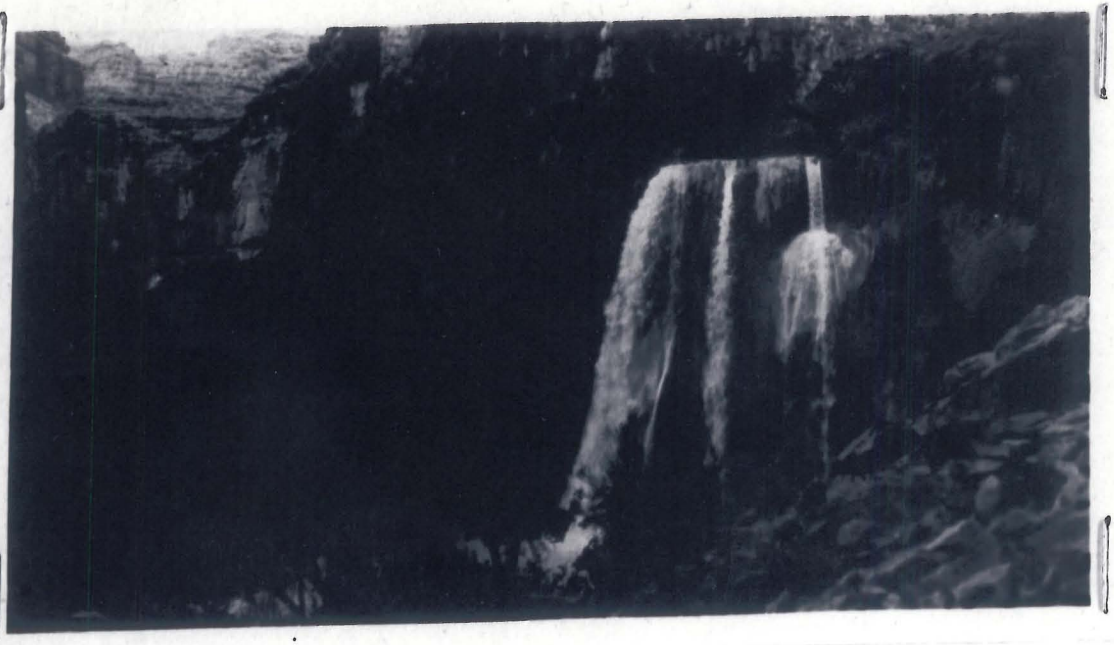
Original locations have not been investigated but it is a well known fact that early pioneers knew of the mineral showings and prospected them to some extent.

Of my own knowledge, I recall that W. I. Johnson (now deceased) of Prescott owned the claims in the early '20s and made sporadic attempts to finance and work them.

Then during the war - about 1942 - a man named Sanderson purchased or leased the claims and started development and mining. This work was confined to the Bridal Veil Claim. Adits there were extended and some 164 tons of selected ore was shipped. (See more details later).

The operation was a failure, even under the wartime bonus price for lead. Indebtedness was created and the claims were finally foreclosed and reached the hands of the present owner.

Some effort toward annual labor (assessment work) has been made each year, although no doubt insufficient to cover all of the claims under the intent or letter of the law.



Navaho Falls in Havasu Canyon

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Geology.

The Grand Canyon Series in this locality consists of the following layers of sedimentary rocks, starting at the top: Kaibab Limestone; Toroweap Limestone; Hermit Shale; Supai Formation (mostly sandstone); Redwall Limestone; and Temple Butte Limestone, below which are older sedimentary, metamorphic and igneous rocks. The series has a total thickness of about 2500 feet down to the Redwall limestone where the mineral zone is located.

The mineral showings consist of deposits of the minerals of lead, zinc, silver and vanadium, lead being the principal value. No igneous intrusives (usual mineralizers) are evident in the vicinity. Origin of the metallic minerals is obscure, but probably they were deposited by solutions ascending through the lower sediments via faults or channels. The solutions then followed a horizontal joint plane as a channel, and deposited in pockets or lenses where there were small caves which had been more or less filled with fallen material. The presence of sulphide minerals indicates the primary origin, but the source is obscure.

The particular joint plane is visible on both sides of Havasu Canyon, some 50 to 250 feet above the present floor, and also around Carbonate Canyon.

Nature did a splendid job of prospecting by cross cutting the joint plane with over a mile of canyon; and the fact that only 8 or 10 showings of ore were thus disclosed, precludes the probability of finding many more orebodies by further development.

Mineral Showings and Development.

As stated above the plane of mineralization lies from 50 to 250 feet above the canyon floor - up a sheer wall. It is said that the original prospectors did much of their prospect sampling with a Winchester. Sighting a favorable spot (a loose area in the joint plane) they would shoot at it with a rifle until they obtained some fragments for mineral determination. (Possibly this is one reason why the lead content has been greatly overrated).

Many of these situations are now inaccessible. At the showing on the Cataract Claim the old timers had put up 200 feet of vertical ladders on the sheer wall. These ladders are now in bad repair and the spot is inaccessible. However, subsequent operators who were able to examine the spot were not induced to work there.

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Looking up Carbonate Canyon from near Bridal Veil Falls. Dark spot at extreme left/lower is Bridal Veil adit. The terrain is rough.

On the Bridal Veil Claim a suspension bridge has washed out; and the stream course changed, so that it is now impossible to reach the workings without the precarious means of swimming one's horse, or himself, across the swift flowing and rough bottomed stream.

It was fortunate that I had made a rather thorough examination of these claims as Director of the Arizona Department of Mineral Resources in 1950. No work has been done since, and the knowledge obtained then, plus a bit of research then, plus the recent examination of the accessable spots, plus the interjection of present day economics, forms the basis of this report.

Each of the claims has some mineral showing developed by short adits. On the Seligman Claim there are several adits as shown on the map. Vanadium occurs in greater proportion in the Seligman ore than elsewhere. (Average about 2.0%).

Except for the Bridal Veil workings all showings are small and meagre; and no attempt has been made to further develop them nor to work them in a commercial manner.

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The Bridal Veil workings are fairly extensive. The ore strata varies from 0" to 36" thick, but with a great lack of continuity, causing dilution and expensive mining.

Bridal Veil (Havasu) Falls
on Bridal Veil Claim

Inside the adit the strata takes a downward dip at about 20 degrees. A winze was sunk 85 feet and two levels run; # 2 at 34 feet; and # 3 at 59 feet. Water stands at 77 feet.

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Number 2 level was the source of most of the production. There is no ore in # 3 but further ore might be found by proper drifting to cut the projection of the strata. Available ore of good grade has been "gutted" from both the adit level and # 2 level.

Altogether there is probably 600 feet of workings at this place. The total amount of ore shipped is unknown. Sanderson shipped 164 tons and perhaps as much more was shipped previously. There is a small tonnage of lower grade ore remaining.

Considering that this is by far the best prospect on the group; and the large amount of work that had to be done to produce a small amount of fair grade ore, the situation is far from inducive for further development - either at this spot or any other.

Present Economic Aspects.

When production was attempted during the war the operators evidentally found that it was impossible to hold up the grade of the ore to that hoped for or suggested in previous estimates. This was because the small size and irregularity of the occurrances caused heavy dilution in mining. Records show that they shipped 164 tons that brought a smelter net return of $8,500.00. This is approximately $50.00 per ton. Assay values are not available but allowing $10.00 per ton for silver, at the then war time price for lead, a lead content of about 20% is indicated. They took the best ore they could get and gutted the mine, but the operation did not pay. Since then all costs, especially labor, have risen sharply, while the price of lead has declined.

Under present conditions I would estimate operating costs per ton as follows:

Development, (more probably $20.00) but call it	$ 5.00
Mining	25.00
Packing to rim	25.00
Hauling to railhead	10.00
	$ 65.00

At present lead has a value of $1.76 per unit (20 lbs.) F.O.B. rail in Arizona. (This figure is arrived at after deducting from the market price; rail freight to smelter; smelter charges, losses, and "deducts"; refining; freight and sales charges on the metal).

After allowing $10.00 per ton for silver value, a lead content of about 30% would be required to meet the above basic costs.

Such is obviously impossible as an examination of the mine shows, and as has been proved by past attempts.

Perhaps careful selective mining or further gutting could produce a carload or two assaying over 30% lead, but the capital cost to produce at all would be far greater than any profit.

Nor is it feasible to consider equipping the property with such items as an areal tram or a mill to reduce costs. Geological conditions and experience do not indicate the presence of orebodies justifying such capital expenditures.

Concentration by milling is impractible. Much of the lead is oxidized, and besides the great initial cost, oxidized lead minerals are usually very difficult to mill, and carry high tailing losses. The mill capital costs, plus tailing losses, plus operating costs, would more than offset the saving in freight.

Any zinc content is worthless. To be marketable at all a shipment must contain nearly 50% zinc and attaining such would not be worth the effort.

Vanadium content is also practically worthless. While the Atomic Energy Commission pays 33¢ per pound for the vanadium content in some uranium ores, such is paid as an inducement for the production of uranium, and a surplus of vanadium is thus being produced. Vanadium per se would be found practically unmarketable.

While uranium might be expected under the existing geological conditions, there is none indicated in any of these showings.

To sum up: The mine has been gutted of nearly all high grade (20% or over) lead ore. It would be impossible to make any operating profit under present conditions. The ore occurrances are small, spotty and irregular. There is no indication that large bodies with good continuity will be found; and the slim chance of finding such does not justify the large capital expenditures that would be required in the attempt.

Legal Aspects and Customs Pertaining to Mining Claims and Millsites.

Basic mining laws merely require a "mineral in place" discovery in order to locate a claim; and give the locater exclusive right to his claim. It is contemplated that he will develop his claim and either proceed to patent or abandon it. There is no time limit as long as he performs his annual labor. It gives him the exclusive use of all natural resources, such as timber, water, and other surface rights

to facilitate his development or production, but does not permit him to sell or remove anything but ore.

To obtain a patent the law does not require that the owner show commercial ore in commercial quantities but adjudications do require that he have sufficient mineral showing to justify further development or production. After patent he may use the claim or resources in any manner without restriction.

These mining laws were made long before (in the 1870s) such things as tourist attractions, hamburger stands and dude ranches were known. Naturally, there has been much abuse of the intrinsic laws which have caused much concern to legitimate miners and to the Government agencies that represent the public. So there has been a general tightening in the interpretation of the laws and in 1955 new laws were passed which are considerably more strict - especially as to surface rights. However; these new laws do not effect previous locations and, therefore, do not pertain to this situation.

The above matters are mentioned here because they have a very important bearing on the appraisal value. May I therefore offer the following opinions.

Under their present dormancy the legitimacy of the claims could probably not be contested. But if intensive efforts were made to use the claims for other than mining purposes such use might well be contested by governmental agencies and such contest won in the courts. After all, if such resources as timber and water are denied the locater for purposes other than mining, why should not other non-mining assets be similarly denied. At least the situation would be sufficiently precarious to preclude the heavy financing that the development of non-mining resources would require. So, therefore, unless the claims are patented there is little real value that can be given them for non-mining purposes.

I do not believe that a patent could be obtained on any of the claims except the Bridal Veil and Millsite. Such a patent application would certainly be contested; and there is insufficient showing to warrant further development; and the obvious reason for patenting would be for non-mining purposes.

Regarding the Bridal Veil claim and its appurtenant Millsite, however, the situation would be different. Here there is sufficient showing, with a record of production, and the preponderance of technical evidence (although I do not concur) would probably show that the claim justified further development. And a patent application, though con-

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tested, could not be denied under the law. And once a patent is obtained, unless fraudulently, the owner may use all surface rights in any manner he wishes - the same as a city lot. (Certain water rights possibly excepted).

Millsites require no mineral discovery nor annual labor, but must be appurtenant to a mining claim. A patent on a mining claim would call for a patent on its appurtenant millsite; and such is the case herewith.

Mine openings in wall on Seligman claim

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Methods of Arriving at Appraisal Value.

No valuation can be given for improvements such as exploration or development work, on a mining claim, when such work neither develops commercial ore, nor gives information leading to its future development.

At the same time it is obviously impracticle to base the valuation of a mining prospect on the net value of proved and measurable ore, as is often done in the case of well developed mines.

In the case of a prospect with speculative chances of success we must consider what a prudent and experienced mining person, with ample capital available, and in the market for prospective mines, might be willing to pay for a property in question. This is the sensible approach.

But there are other values that while seemingly not so sensible are just as real.

Mining prospects are often a lure to persons not so prudent or experienced, who place their own value thereon and are willing to so pay for them. This might be termed a "sucker" value.

Then there are long range future possibilities. In this case the development of helicopters for transporting ore might change the future picture. Or another war could call for a greatly increased price for lead.

Then there are the valuations for other than mining purposes. These pertain mostly to patented mining claims but in varying degree to unpatented claims as they approach patentability.

An appraiser must take all of these features into consideration and render an opinion according to his best judgment.

Appraisal Value.

The value of any or all claims as tentative mineral producers must be considered as nil.

However, in my opinion certain other values do appear and are as follows:

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Bridal Veil Claim: (Portion outside Havasu Reservation) including Bridal Veil Falls - Mostly because of its patentable potential	$ 10,000.00
Millsite: Largely because of its desirable and exquisite flat terrain, and potential patent, including buildings .	5,000.00
Cataract, Iron Mask, Seligman and Pyramid: Nominal or nuisance value $500.00 each	2,000.00
Total Valuation . . .	$ 17,000.00

Havasu Creek and Terrain on Millsite Claim is exquisite

Respectfully submitted,

Chas H Dunning

REGISTERED MINING ENGINEER
CERTIFICATE EXPIRES
CHARLES H. DUNNING
DEC. 31, 1956
ARIZONA, U.S.A.

1921 C.A. Heberlein optioned the claims
1921-24 $15,000 spent on development

Park Mining Rights: Heberlein asked national park service for permit to make a preliminary survey of areas further down canyon, to be used as a basis of application for a prospecting permit under the provisions of the Grand Canyon national park act. Because extent of property in the area was too limited to invite capital.

Geology:

1200'-1500' Supai formation (Carboniferous), alternating red ss. & shales, with occassional blue-grey thin limestone. Cataract Creek has its source in springs, 65 cu ft/sec, near the base, at S. boundary of Supai Indian Reservation

550' Redwall limestone (Carboniferous) massive, red-stained

200'(+) Muav limestone (Cambrian) thin-bedded,

Travertine deposits, at the falls.

<u>Mineralization</u> (1) Solution cavities developed in lower 200 ft of Redwall limestone, mainly along 3 bedding planes, & along some vertical joints & fissures.
(2) Calcite crystals, dog-toothed spar, deposited on cavity walls, in large crystals. Some holes collapsed, filling with breccia & mud.
(3) Lead & silver mineralization. Coarse galena, and some sphalerite, replacing boulders.
4) Vanadinite deposited on galena and calcite crystals as crusts. Also "mud" deposited in openings.
5) Sphalerite ?
6) Calcite, and smithsonite(?) deposited as a thin coating.
7) Oxidation, to limonite, siderite, smithsonite & lead oxides; into cliff walls for 15'.

Ore occurrence similar to Joplin.
<u>Minerals Noted</u>: calcite, barite, gypsum (2ndry) pyrite, sphalerite, galena, vanadinite, cerussite,

anglesite, smithsonite & calamine(?)
Pyrite & sphalerite occur principally in the tight unleached seams.
Vanadinite occurs in botryoidal masses lining late solution openings & as mirrors or crusts coating calcite crystals.
Smithsonite as hard crusts and also as soft white friable powder in the oxidized masses.
Anglesite & cerussite occur as white powder masses, heavy & silky
<u>Mining Methods</u> Outcrops are 50' to 250' above canyon floor, on steep cliffs.
Cataract claim outcrop is 258' up, reached by ladders supported on wedged pipe.
Workings: 30' tunnel with sphalerite & pyrite in tight seams. 30' tunnel 60' N.W. of above, in soft oxidized limonite with smithsonite & calamine. Other workings in S.E. bring total for claim to 200'. S.W. wall of canyon below Mooney Falls
Iron Mask claim, S.W. wall of canyon, above Mooney Falls. Three small adits, 30'

in all, on oxidized material on bedding planes.

Seligman claim, SW wall of Cataract canyon. Workings, reached by 60' ladder, total 600', mostly in ore, partially oxidized. Sorted Pb ore shipped, consid'l milling-grade ore blocked out

Bridal Veil claim, which includes B.V. falls, is on S. side of Carbonate Canyon, a dry tributary to Cataract. Workings, in N.E. part, on best mineral showing & ore exposure, & most developed. Immense deposit partly oxid'd Pb & Zn sulphides in caved solution opening. Ore erratic, some boulders entirely replaced by galena surrounded by reddish oxides, cave mud & breccias. Vanadinite crusts, & oxides of Pb & carbonates & silicates of Zn present. Several hundred tons of galena stored in mine

Pyramid Claim: N.E. of Cataract canyon, side-lining the Seligman. 100' total in

two openings. Tunnel near center a possible continuation of Seligman deposits across the canyon, shows considerable galena.

Bedding planes continue beyond the claims down canyon, at increasingly higher levels. Mineral content not known.

<u>Suggestions</u> - because of inaccessibility Pb-Ag content not commercial, and occurrence in lenses & kidneys prevents blocking-out of large tonnages for large-scale operation. Therefore is believed vanadium content is important for success of project.

B[illegible] al Veil Mines, H[illegible]su Canyon.
Coconi[illegible] Co, A[illegible]z.

Misc. Votes, 953, [illegible] in.

Owner Henry [illegible] chucki[illegible], Seligman, operator of sa[illegible]dstone [illegible]sarry.
E.F. S[illegible]hoeny, [illegible]ligman, merchant.
Ph[illegible]e: c/o [illegible]ligman Drug Store

Lessee: Hava[illegible] Lead-[illegible]ine Co.
Sand[illegible]sen, E.M., Secretary-Manager
Lease [illegible]p in Oc[illegible] 1952; short extension [illegible]ran[illegible]d (6 m[illegible]?)

Access: [illegible]oad leaves [illegible]S. 66 7 miles [illegible]ast of Peach [illegible]prings, runs N by E 7[illegible] miles t[illegible] start of trail; liable to [illegible]ddy unt[illegible] March. Trail is 10± m[illegible] d[illegible]n to S[illegible]i village.
Guide: [illegible]nu[illegible] Paya, a[illegible] Supai, - write him in advance [illegible]n [illegible]il goes twice a week by road a[illegible] [illegible]il from [illegible]rand Canyon village)

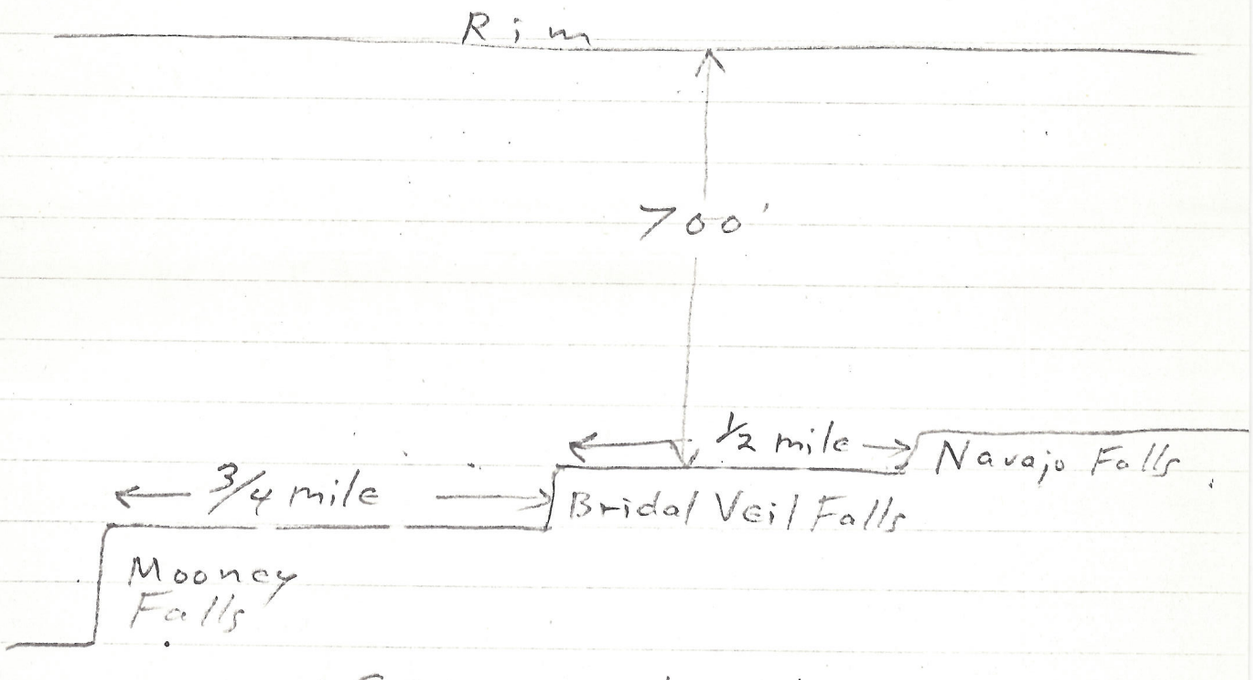
Reservation [illegible]asupai [illegible]dian Reservation [illegible]ce[illegible]ies C[illegible]yon floor. Superintendant: Lado[illegible] at [illegible]alent[illegible]e, E. of Kingman.
Grand Ca[illegible]on N[illegible]l Park covers both sides of [illegible]an [illegible]ervation, Indians are asking for 6[illegible] wid[illegible] grazing strip. Mining will require Park O.K. Possibly Park will allow extension mining.

Production

2,000 tons (by 1943?):
6.7 Ag, 14.8 Pb, 31.9 Zn
Sandersen shipped 3 cars to El Paso:
55-63 % Pb, 14 oz Ag, 1 % Zn, 0.4 % Sb
0.5 % Bi

Misc:

5 Pre-Park claims.
Mill-feed probably 10%, (Pb + Zn)
Last operation in 1943
Bridge Canyon Dam (proposed)
would back water to Mooney Falls
Accomodation: at old mine bldgs.



SECTION, LOOKING EAST.

Ariz Mining Journal, Sept 1, 1934, Vol VIII, No 1.

Bridal Veil Mines in Cataract Canyon (or Havasu,)

H A Ferris & E Burch, Mineral Examiners, General Land Offi Dept. of Interior

Located 40 mil N. of u D Grand Canyon, Ariz. Good road Pra canyon to Hilltop, 37 miles; trail o n Le Canyon, 13 miles to Supai Indian Vill g urs travel time.

Claims Bridal eil, Co road, Seligman, Pyramid, Iron Ma Blend lania, Home & Road. Owned b Bridal il Mines Associn. Known also as Johns claims, C teberlein, fiscal agent

Camp is 3/4 le belo Supai Village on Cataract Cr

History: firs prospector 885.

1885-1901, Pb-Ag ining, 100 s shipped

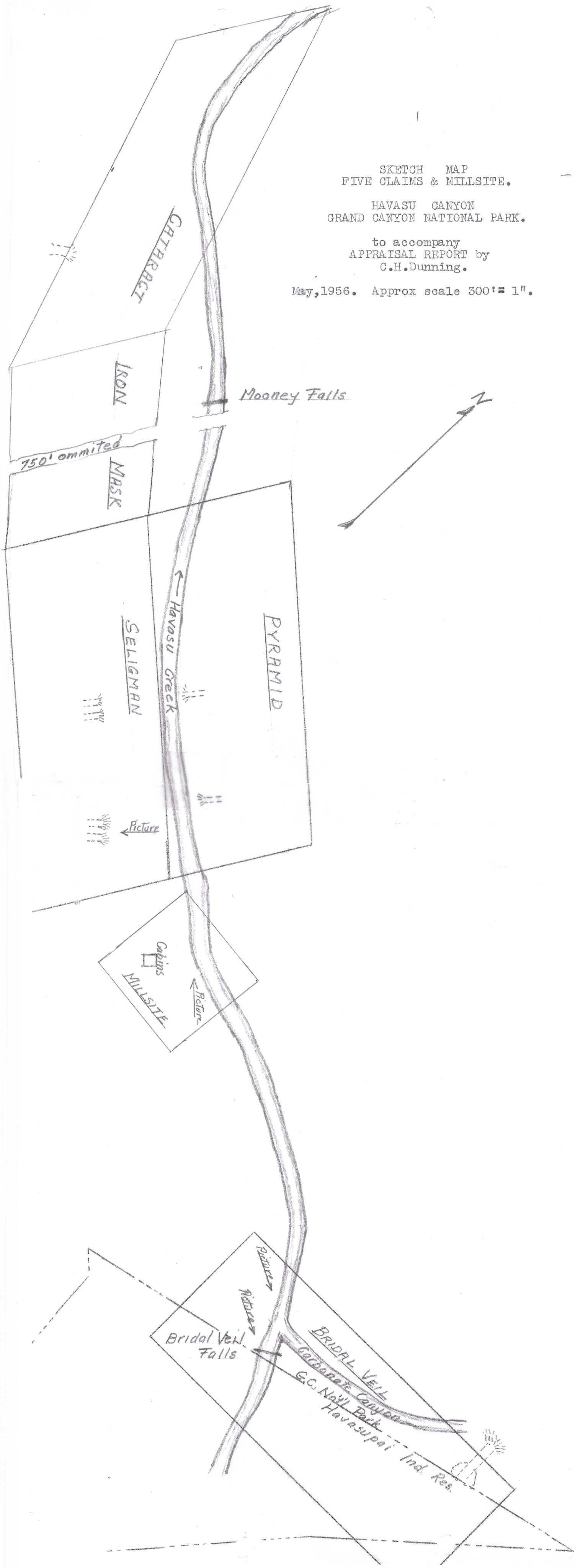
1902 Grand Ca on Gold & P num Co. spent $75,000 on attempt to ild road

1906 W. I. Johnson made locations, also water rights. Erected, p, water driven, & processed several hundred tons Pb; losing lead vanadate, also galena fines.

1919 Johnson added 4 claims to group

SKETCH MAP
FIVE CLAIMS & MILLSITE.

HAVASU CANYON
GRAND CANYON NATIONAL PARK.

to accompany
APPRAISAL REPORT by
C.H.Dunning.

May,1956. Approx scale 300'= 1".