STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL SURVEY

PE-044-03

PROPERTY EXAMINATION

#44 - 3

Tundra Exploration

Kugruk Project

Bendeleben Quadrangle

1971

by

Cleland N. Conwell
Mining Engineer

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GENERAL

A cursory examination was made of the Tundra Exploration Kugruk Project on June 22 and 23, 1971 by Cleland N. Conwell, Mining Engineer. The purpose of the examination was to appraise the apparent mineral potential of the deposits, recommend possible methods of future exploration and to record the work completed to date.

CONCLUSION

Mineral deposits of silver bearing lead zinc minerals are present north and south of the Kugruk River. The best pods in the deposit are approximately two feet wide and are exposed both on the surface and in the top surface areas of the tunnel. Principal sulphide minerals are galena and sphalerite. First grade class ore may contain 30 to 35% combined lead and zinc with 23 to 30 ounces of silver per ton. Second class ore may contain better than 4 ounces of silver per ton having a combined lead zinc assay of 10 percent.

INTRODUCTION

The following report covers briefly the results of an examination made at the Tundra Exploration Kugruk Project. The mine, its location, fold in limestone, the tunnel and aerial view are clearly illustrated in figures 1 through 5 and the Plate contained at the rear of this report. Also complete laboratory analysis reports numbers 2658, 2660, and 2666 are included.

LOCATION

The deposit is located in the Bendeleben quadrangle in the northern part of the Seward Peninsula, Fairhaven mining district. It is 28 miles south of Deering, Alaska, or 22 miles south of the Kugruk Lagoon and about 1/4 of a mile southwest of the confluence of the Kugruk River and Independence Creek. Figure 1 shows the location within the State of Alaska, and figure 2 the location on a topographic map of the local area.

TOPOGRAPHY - CLIMATE - ACCESSIBILITY

The general area is one of low smooth hills covered with tundra. There are very few trees even along the rivers. The climate is arctic with severe cold winters, temperatures dropping at times to 60° below zero. There is a short warm summer season with temperatures above 80°F. The mine is accessible by aircraft. A good airstrip has been constructed near the camp. The nearest shipping point would be Deering, Alaska on Kotzebue Sound. Kotzebue Sound is shallow and the ocean floor dips very gently from land, so material transported from this area has to be lightered to an ocean going vessel in the Sound.

GEOLOGY

Tundra covers the area. Rock outcrops are rare. Bedrock has been exposed by trenching and a road has been cut on the south bank of the Kugruk River from Independence Creek to the tunnel and continues about 240 feet in a southwest direction from the tunnel.

There are two dominant rock types, the oldest rock is a white quartz-chlorite-mica schist. The foliation of the schist is well developed into uniform bands which are readily broken in to thin plate like pieces. The second rock type is a blue limestone. This limestone is usually massive with a highly developed fracture pattern. In some areas such as a fold near the road cut, the bedding and folding are quite distinct. Figure 3 shows the folding and also how the schist has been faulted into the limestone.

The dominant structural feature shown in figure 4 is a north-south trending fault. The schist on the east is the upthrown side of the fault. The limestone with schist inclusions is the down thrown side. The mineralization is related to this fault. The largest area of mineralization appear to be associated as brecciated alteration zone. This alteration zone is exposed in the first 150 feet of the tunnel and on the surface then stops. Its disappearance is possibly caused by an east-west fault. The tunnel has been timbered for 150 feet. This has partially obscured the wall rock. Reference figure 5.

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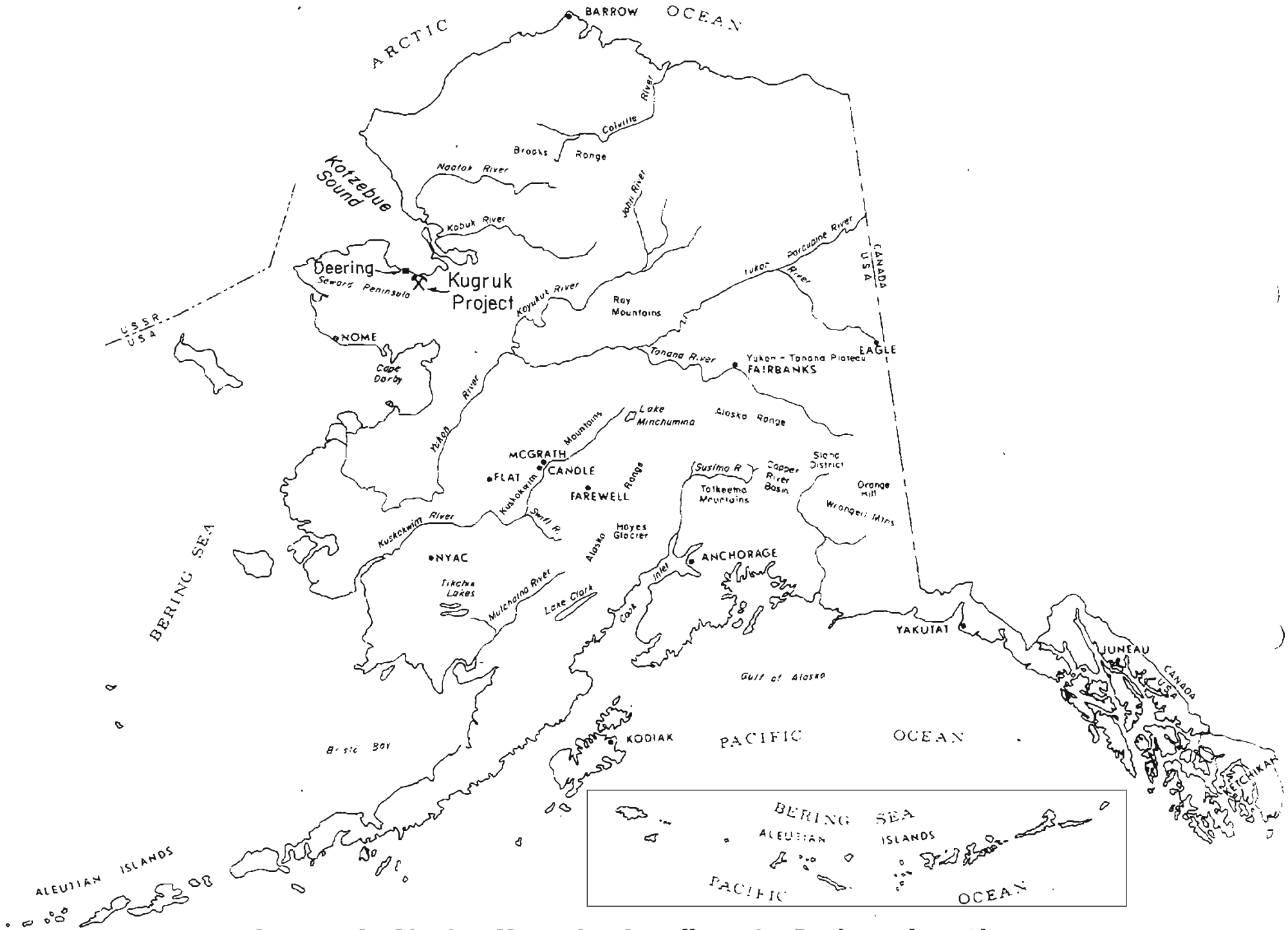
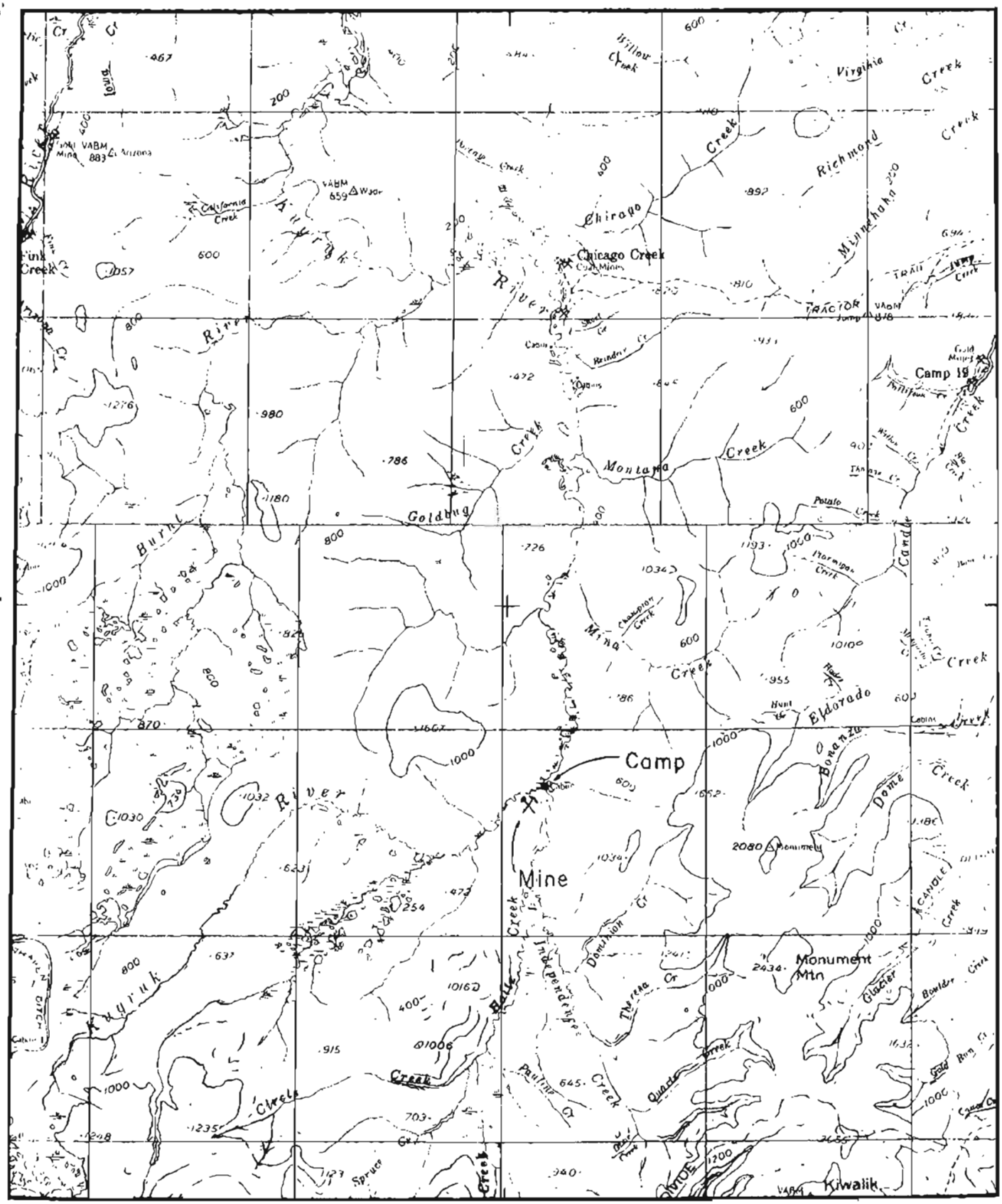
by

Cleland N. Conwell
Mining Engineer



State of Alaska Map showing Kugruk Project Location

Figure . 1



Bendeleben Quadrangle Map Showing Camp & Mine on Kugruk River

Figure 2

Figure 3. Fold In Limestone

The orogeny and mineral deposition that has taken place over the years may have been:

1. Gentle folding.

2. Overthrust pressure from the east thrusting the older schist over the limestone.

3. A near vertical fault cutting the overthrust plane and bringing the schist as the upthrown side.

4. Unequal compressional forces causing vertical openings and breccia zones along the north-south fault.

5. Introduction of the metal bearing solutions.

6. Continued compressional pressure causing small faults diagonal to the north-south fault.

Assuming this hypothesis to be correct, mineralization will be irregular along the major structural feature and controlled by open fractures and breccia zones along the main north-south fault. The possibility exists of a replacement deposit within the limestone although indications for such a deposit were not located during the visit.

The host rock appears to play a very important role in the mineral concentration. The most favorable area is a fault breccia along the fault contact and the least favorable area within the schist. In fact, no commercial metallic minerals were found entirely within the schist.

The work by Mr. Berg and previous operators indicates that there is mineralization for more than a mile and a quarter along the fault zone. The brecciated zone near the tunnel may be as much as 40 feet in width.

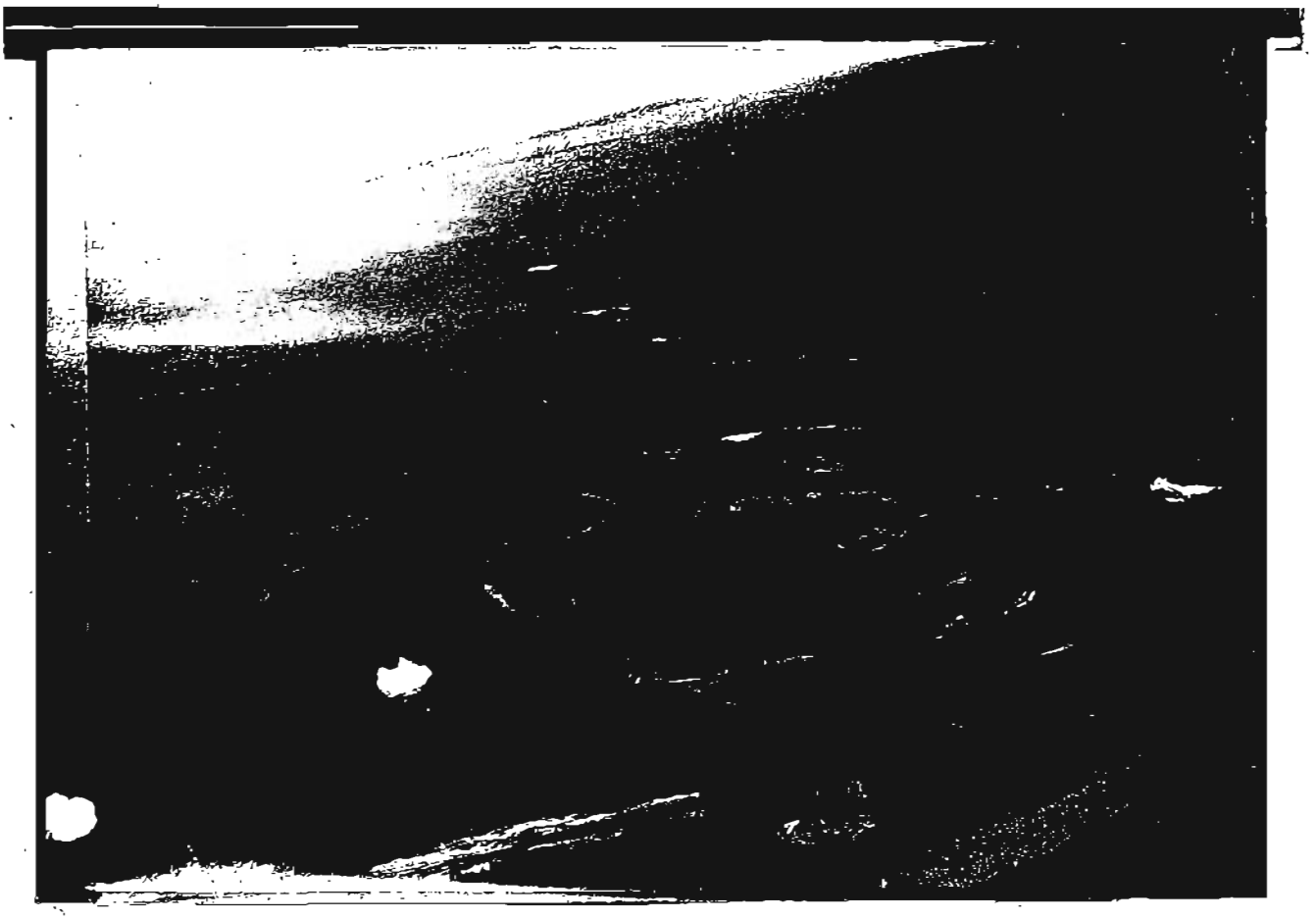


Figure 4. Aerial view of Kugruk Project

MINERALS

The one readily identified sulfide mineral is galena. The zinc mineral is identified as sphalerite but it has a dull luster, a dark yellow streak, and chemical analysis may well determine that the mineral is marmatite, an iron rich variety of sphalerite. Smithsonite and cerussite are identified by their association with the sulfide minerals.

SAMPLES

No systematic sampling in the tunnel was attempted because the tunnel is timbered for approximately 150 feet. Table 1 identifies various samples, figure locations, and associated Laboratory Analysis Reports. Table 2 shows the first shipment of ore to Selby, California and Table 3 shows the second shipment to Kellogg, Idaho. Table 4 is a summary of Berg and Associate's samples, taken from the Kugruk Project.

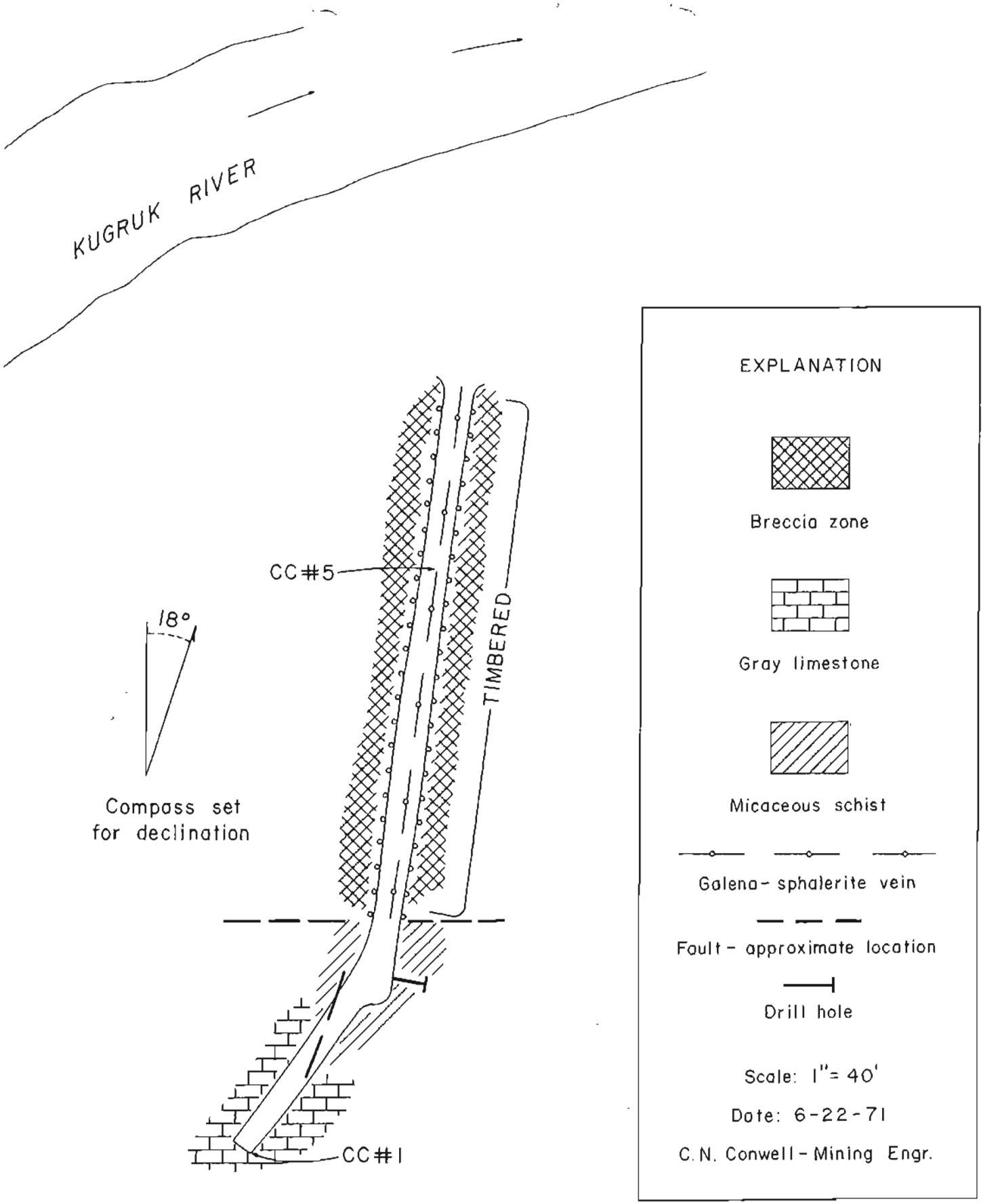
TABLE 1. SAMPLE IDENTIFICATION CHART

Report No.	Laboratory No.	Code Identification	Figure No.	Plate No.
2658	33906	CC #1	5	-
	33907	CC #3	-	1
	33908	CC #2	-	1
	33909	CC #4	-	1
2660	33902	CC #5	5	-
	33903			
		(drill hole)		
2666	39894	0 to 2'	5	-
	39895	2' to 4'	5	-
	39896	4' to 6'	5	-
	39897	6' to 8'	5	-

Sample CC #5, a better grade of material was obtained through an opening between the timbers at the top of the tunnel where it was possible to gain access to a mineralized pod. (Lab Analysis 33902). Galena was selected from sample CC #5 to determine a lead-silver ratio. (Lab Analysis 33903).

A hole 8 feet in horizontal distance, bearing east, was drilled and sampled. The drill hole was an attempt to find an extension of the ore which appeared to be faulted to the east (figure 5). No commercial values were found in the sample. (Lab Analysis 33894 to 39897 inclusive).

A limestone sample CC #1 was removed from the breast of the drift. (Lab Analysis 33906). Two samples were taken of limonitic zones one east and one west of the main fault. East sample CC #3 (Lab Analysis 33907) and west sample CC #2 (Lab Analysis 33908). Another sample CC #4 was taken over a five foot width in the cut on the surface. (Lab Analysis 33909).



Geologic Map of Tundra Exploration - Kugruk Tunnel

Figure 5

Conclusions from this sampling are:

1. There are pods of minerals with sufficient value to be commercially important if a concentration of sufficient tonnage can be found.

2. The metallic mineral concentrations are confined to the fault zone.

3. The breccia zone may contain mill grade ore.

HISTORY

The Kugruk Project is the old Independence Mine. This mine was discovered prior to 1917. Between the years 1918 and 1922 inclusive, Perkypile and Ford worked the mine with most of the work being completed between 1920 and 1921. (USGS 712, 714, 722, 739, and 755). The prospect was apparently dormant after 1922. A certain amount of interest was generated during the years 1944 to 1947 and again in 1954, however, the mine remained dormant until the prospect was obtained by Mr. Berg in 1964.

Perkypile and Ford sunk a 140 foot shaft immediately north of Mr. Berg's tunnel. From this shaft, they drove approximately 600' of drifts on two levels (figure 6). The assays would indicate that analyses were run only on silver and lead (figure 7 and 8).

The following information was obtained from a private report by Levensaler. Known shipments of ore from the mine totaled 34 3/4 tons. The first shipment of ore was 33 tons and was received at a smelter in Selby, California on October 28, 1921, see Table 2. The second shipment of ore was one and 3/4 tons and it was received at the Bunker Hill Smelter in Kellogg, Idaho on December 6, 1922, see Table 3.

TABLE 2. SELBY ORE SHIPMENT

Symbol	Ore	Assay
Ag	Silver	33.25 oz/pt
Pb	Lead	29.9 %
Si	Silica	5.8 %
Fe	Iron	20.8 %
Zn	Zinc	4.8 %
S	Sulfur	7.7 %
As	Arsenic	-0-
Sb	Antimony	-0-

NOTE: oz = ounces
pt = per ton

PRESENT DEVELOPMENT

Mr. Berg and associates claimed the ground in 1964. Since then Mr. Berg has completed several hundred feet of stripping with a bulldozer, drilled 21 holes with a diamond bit and completed approximately 245 feet of drifting. Holes 1 through 11 are indicated on plate 1 and assays listed in table 4.

TABLE 3. KELLOGG ORE SHIPMENT

Symbol	Ore	Assay
Ag	Silver	29.4 oz/pt
Pb	Lead	33.5 %
Fe	Iron	12.3 %
Zn	Zinc	6.3 %
S	Sulfur	8.7 %
	Insol	10.2 %

NOTE: oz = ounces pt = per ton

TABLE 4. SUMMARY OF BERG'S SAMPLES

Location	Width	Cu %	Pb %	Zn %	Ag oz/ton
Entrance of Tunnel In Tunnel back	9	-	8	3.5	7.5
80' south of entrance	5	-	5.25	2.25	5.5
110' south of entrance	5	-	5.25	2.75	4.75
210' south of entrance	5	-	0.75	7.25	1.25
DH 1 - 66 to 72'	-	0.28	-	TR	2.5
72 to 77'	-	0.23	-	-	3.0
77 to 83'	-	0.28	1.0	1.4	3.4
83 to 89'	-	0.42	0.05	0.1	7.4
DH 3 - 76 to 82'	-	-	4.0	0.29	-
DH 4 - Angle 65° E	-	-	-	-	-
111 to 116'	-	-	0.5	1.5	-
116 to 121'	-	-	2.2	3.0	-
121 to 127'	-	-	2.25	1.5	-
127 to 132'	-	-	4.00	2.8	-
132 to 138'	-	-	8.2	3.5	-
DH 10 - 126 to 134'	-	-	0.29	4.25	0.457
DH 13 - 40 to 45'	-	-	3.9	2.40	2.3
DH 16 - 36 to 42'	-	-	3.2	2.6	2.2

NOTE: 1. DH 16 is 6,700± feet south of the tunnel entrance.
2. Location drill hole are shown on plate 1.

KUGRUK GALENA MINES

Fairhaven Mining District

Seward Peninsula, Alaska

NOTE: This copy obtained from Division of Geological Survey files

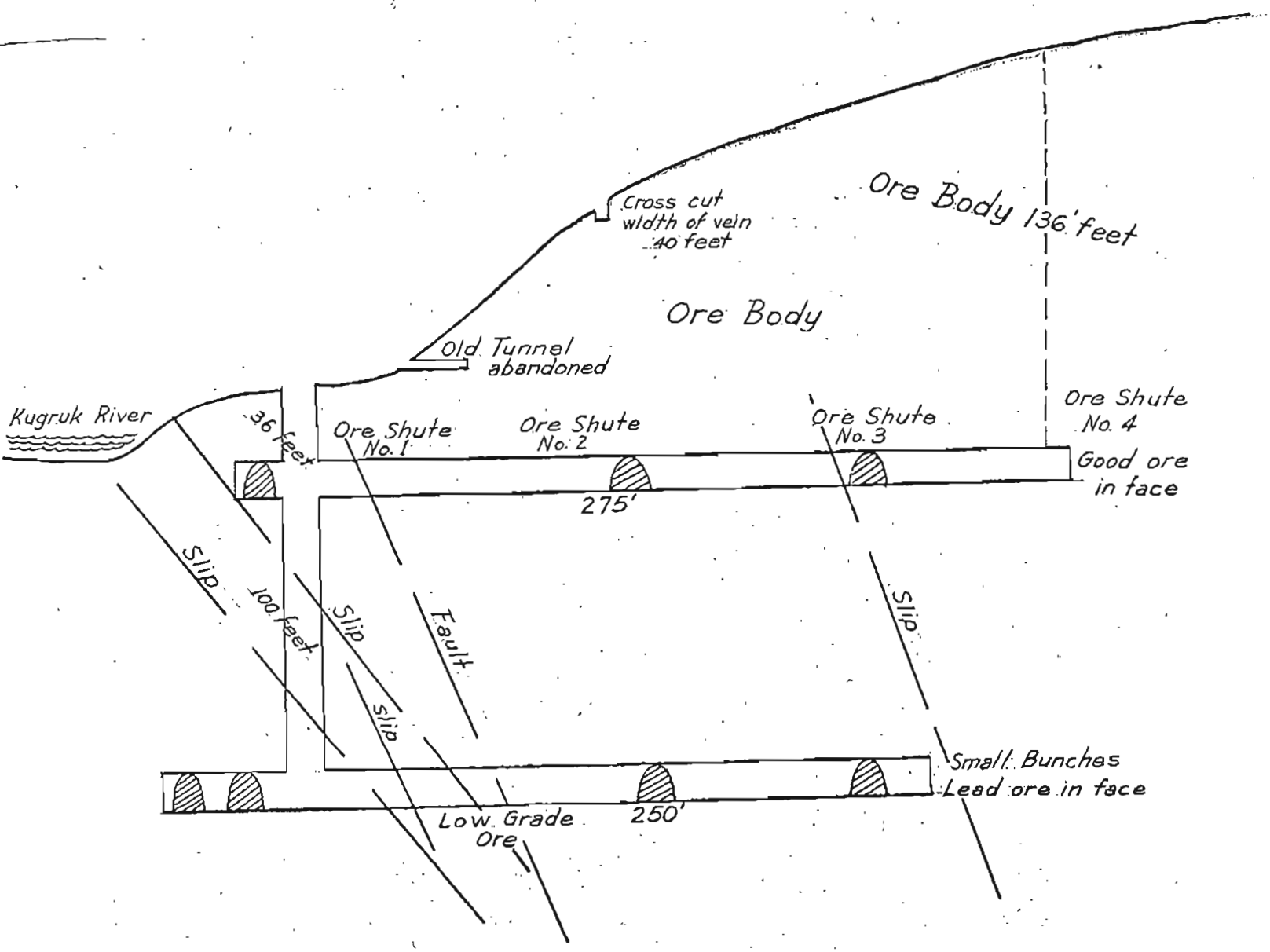


Figure 6. Cross section, Kugruk Galena Mines

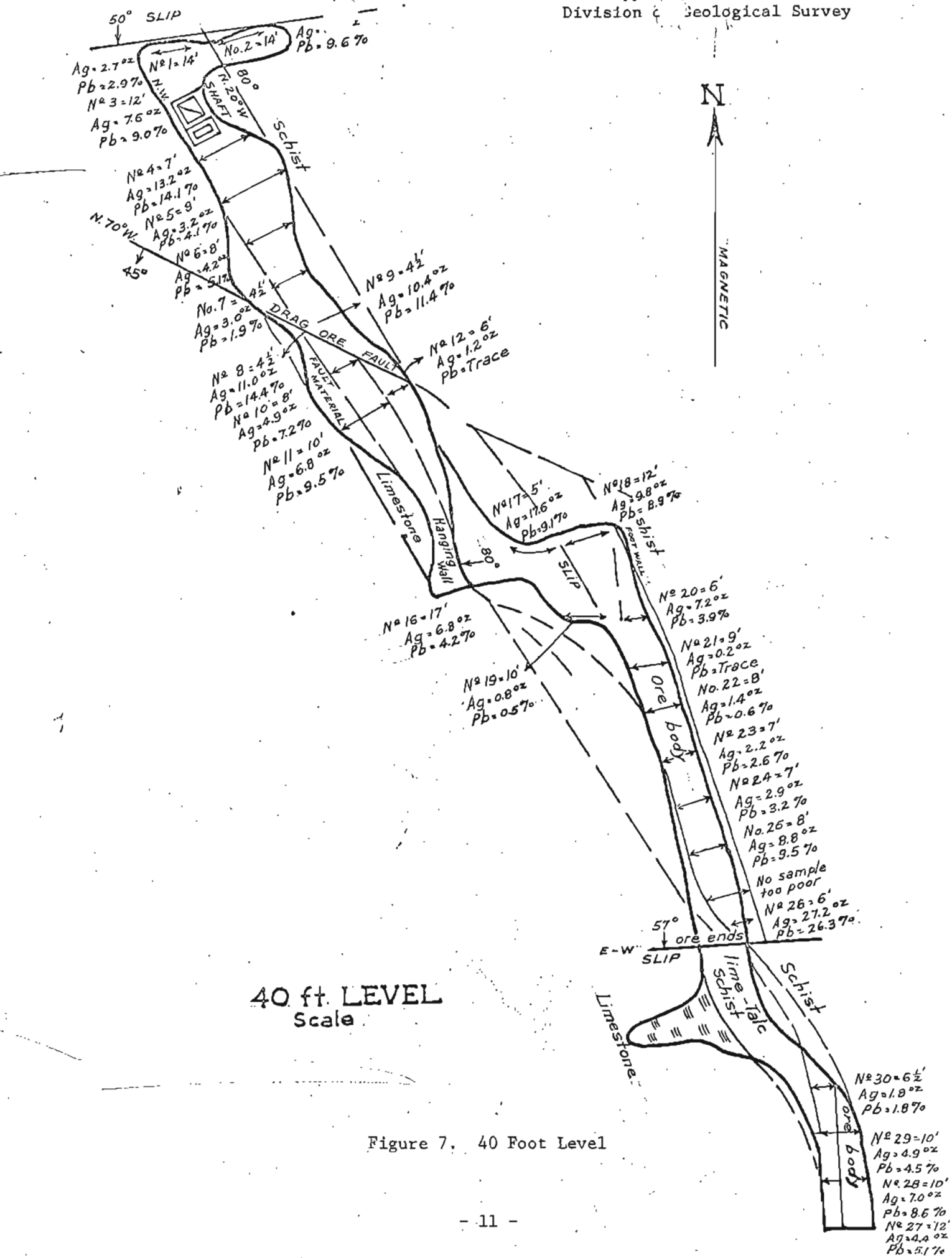


Figure 7. 40 Foot Level

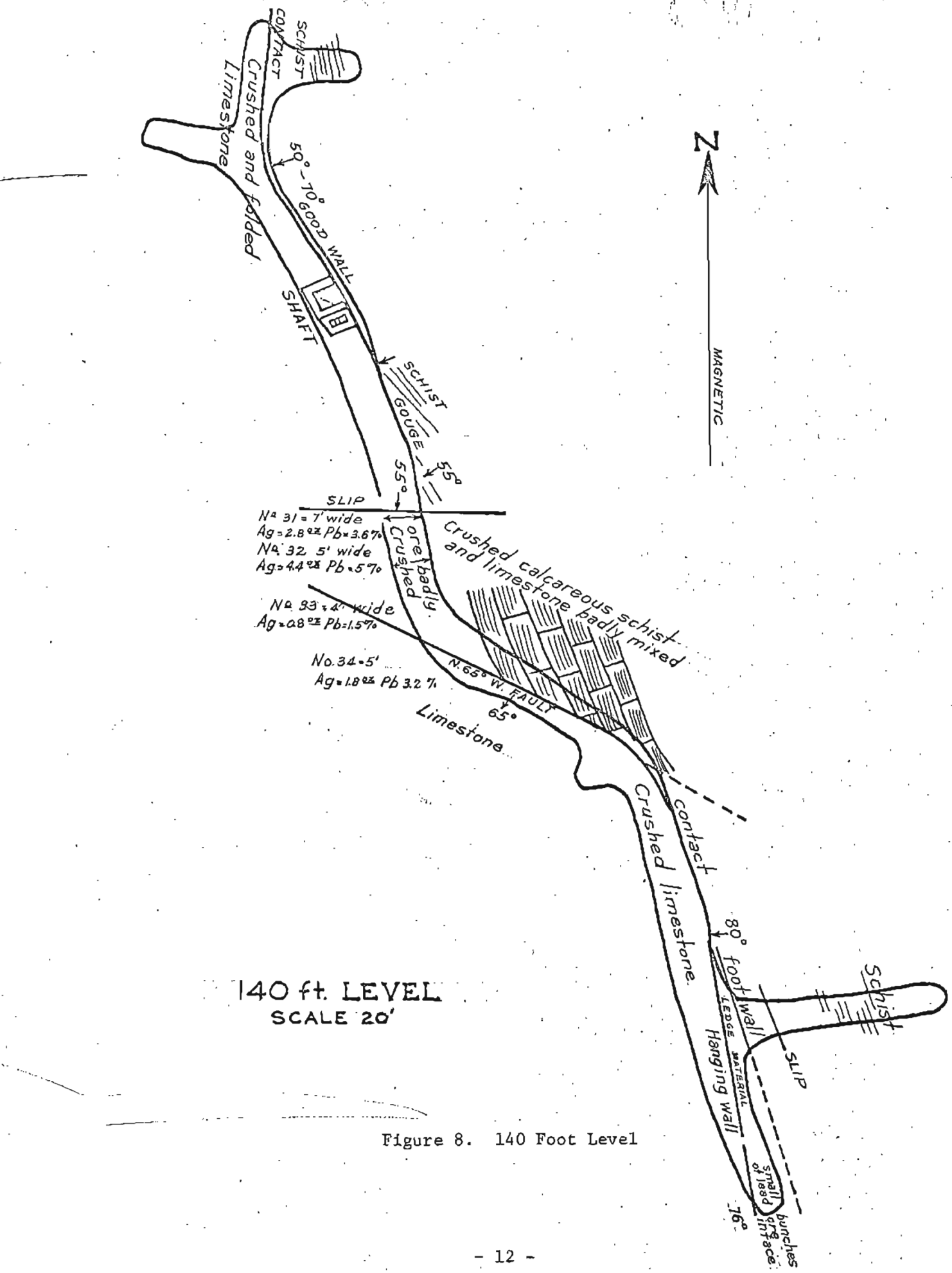


Figure 8. 140 Foot Level

DISCUSSION

The Kugruk Project has a certain amount of merit. Some hand picked ore has been shipped from the property. Silver is present to increase the value of the concentrate. Additional exploration will be required to find additional ore zones and establish ore reserves.

The question is what type of future exploration will provide the best information at the lowest cost. Core drilling is quite expensive. Sample and geological information can be obtained using a percussion drill. The percussion drill is limited in depth to 100-120 feet. Long hole percussion drilling has been used extensively and effectively for blocking out ore reserves in underground mines rather than the more costly diamond drilling. Percussion drilling costs may be less than $1.50 per foot in contrast to diamond drilling where the cost may exceed $15.00 per foot.

This area is completely covered by tundra, stripping is required to expose the bedrock. Geophysical methods should provide better information at a lower cost. Geophysical methods are indirect and must be tried to determine if they will work. There are several methods that I believe could be used to an advantage.

First, is a surface magnetic survey. A magnetometer is a fairly simple instrument to use and if profile lines are run it should be quite easy to determine the north and south extent of this fault zone and possibly areas of increased mineralization or major breccia zones within the fault. A magnetic survey with stations at 50' intervals east and west for 500' on either side of the fault and with a 200' spacing between traverse lines should be quite adequate to delineate geological features by magnetic work.

Second, is an electrical survey. There are two electrical methods that I suggest. There definitely is the alteration or break down of the sulfides in the ore bodies which might very well make a minor electrical current. The equipment necessary for a self potential survey is relatively inexpensive and it would not take a great deal of time to determine if this is a feasible method. The second type survey which has been proven quite effective in northern areas and might very well be effective here is the induced polarization, or I.P. survey. These indicate concentrations of sulfides. There does not seem to be any appreciable amount of pyrite, therefore any anomalies should directly relate to an increase in the amount of galena and sphalerite present.

Another indirect method that might be tried would be a close spaced grid of geochemical sampling. This would require an earth auger to penetrate the tundra, and sample the soil above bedrock.

All of these methods require interpretation by the geologist. The survey should start with a careful and accurately controlled planimetric map with good horizontal and vertical control so that the geologist has an accurate sheet from which he can plot and assemble all of the data.

RECOMMENDATIONS

The recommendations are based on the hypothesis that the mineral concentration is very closely associated with the north-south trending fault, and that the west or downthrown side will be the most receptive to concentrations of ore minerals.

1. Complete an accurate planimetric survey with either a plane table or a transit accurately locating all drill holes, surface cuts, tunnels, and any other work that has been completed. Keep careful control of all elevations. This survey will provide the base for plotting geology, geophysics and for cross-sections.

2. Carefully log all of the core that is stored in the building at the mine camp. Transfer this information to geological cross-sections.

3. Employ a percussion drill with jointed steel to outline a proven ore reserve in the tunnel area. This can be evaluated by cutting a station at 0 + 25' - 0 + 75'; and 1 + 25' to drill horizontal hole perpendicular to the drift. Samples should be taken at 2 foot intervals. If the cutting from the drill holes indicates sufficient values and width, then intermediate stations should be cut at sta. 0 + 50'; and 1 + 00 for horizontal drill holes and angle holes. The angle holes should be drilled plus and minus 45° from the horizontal.

4. A ground magnetic survey with stations at 50' intervals on lines east and west across the fault on 200 foot intervals, at least 500 feet each side of the major fault. The area should extend at least 1 mile north of the Kugruk River and 2 miles south.

5. Evaluate the magnetic survey anomalies by drilling.

6. A self potential survey and an induced polarization survey to locate sulphide concentrations for additional drilling targets.

7. Assay all samples for copper, lead, zinc, and silver.

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Brooks, A. H., and others, 1921, Mineral resources of Alaska, report on progress of investigations in 1919: U. S. Geol. Survey Bull. 714, 236 p.

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Levensaler, L. A., Independence Mine private report (date unknown).

DM-11
Rev. 10/67

Report 2658

STATE OF ALASKA
Department of Natural Resources
DIVISION OF MINES AND GEOLOGY
Box C, College, Alaska 99701

Date of Report July 21, 1971

LABORATORY ANALYSIS REPORT

For Cleland Conwell Address Division of Geological Survey -- College

Number of Samples 4 Date Sample Received 6/30/71

Work Done: (for Analyst see below)
A. X-ray flourescence quant. ☐ semi-quant. ☐
B. X-ray diffraction ☐
C. Spectrographic quant. ☐ semi-quant. ☐
D. Spectroscopic ☐
E. Atomic absorption quant. ☐ semi-quant. ☐
F. Fire assay ☐ G. Microscopic examination ☐
H. Other (Specify) ☐
I. Ultraviolet light ☐

LABORATORY NUMBER	SAMPLE MARKED	ANALYSIS OR IDENTIFICATION				
		E. Ounces Per Ton		E. Weight Per Cent		
		Gold	Silver	Copper	Lead	Zinc
39906	B 1	Nil	0.09	0.001	0.013	0.044
39907	B 2	0.006	0.09	0.020	0.014	0.024
39908	B 3	Nil	0.15	0.020	0.061	0.058
39909	B 4	0.0251	14.58	0.090	2.35	9.15

E. Nil gold means less than 0.001 troy ounces per ton.

Accuracy of the atomic absorption analysis for gold and silver is ±10% of the reported value.

Accuracy of the atomic absorption analysis for copper, lead, and zinc is ±5% of the reported value.

Your sample(s) was tested for radioactivity; no significant radioactivity was detected.

E. Donald R. Stein Donald R. Stein
ANALYST & WORK DONE

ANALYST & WORK DONE

ANALYST & WORK DONE

APPROVED:
LABORATORY SUPERVISOR
Thomas C. Mowatt

NOTE: Samples discarded after 60 days and pulps after 6 months unless instructed otherwise.

DM-11
Rev. 10/67

STATE OF ALASKA
Department of Natural Resources
DIVISION OF MINES AND GEOLOGY
Box C, College, Alaska 99701

Report No. 2660

Date of Report July 22, 1971

LABORATORY ANALYSIS REPORT

For Cleland Conwell

Address Division of Geological Survey -- College

Number of Samples 2

Date Sample Received 6/29/71

Work Done: (for Analyst see below)
A. X-ray flourescence quant. ☐ semi-quant. ☐
B. X-ray diffraction ☐
C. Spectrographic quant. ☐ semi-quant. ☐
D. Spectroscopic ☒
E. Atomic absorption quant. ☐ semi-quant. ☒
F. Fire assay ☐
G. Microscopic examination ☐
H. Other (Specify) ☐
I. Ultraviolet light ☐

LABORATORY NUMBER	SAMPLE MARKED	ANALYSIS OR IDENTIFICATION
39902	R. Berg norm sample	E. Ounces Per Ton: Gold: Nil; Silver: 23.33 E. Weight Per Cent: Copper: 0.060; Lead: 18.5; Zinc: 18.5 D. Spectroscopic Examination: Major: Lead, Zinc, Silicon, Calcium; Minor: Iron, Magnesium, Manganese, Aluminum; Trace: Sodium, Titanium, Cadmium 0.1%, Silver, Copper, Barium, Lithium
39903	R. Berg Hi Grade Lead - Silver Ratio	E. Ounces Per Ton: Silver: 68.55 E. Weight Per Cent: Lead: 67.5; Zinc: 4.60

E. Nil gold means less than 0.001 troy ounces per ton.

Accuracy of the atomic absorption analysis for gold and silver is ±10% of the reported value.

Accuracy of the atomic absorption analysis for copper, lead and zinc is ±5% of the reported value.

D. Major - over 10% Minor - 1% to 10% Trace - under 1%

Your sample(s) was tested for radioactivity; no significant radioactivity was detected.

D.E. Donald R. Stein
ANALYST & WORK DONE

ANALYST & WORK DONE

ANALYST & WORK DONE

APPROVED:
LABORATORY SUPERVISOR
Thomas C. Mowatt

NOTE: Samples discarded after 60 days and pulps after 6 months unless instructed otherwise.

MOORE BUSINESS FORMS, INC. M...

DM-11
Rev. 10/67

Report No. 2666

STATE OF ALASKA
Department of Natural Resources
DIVISION OF MINES AND GEOLOGY
Box C, College, Alaska 99701

Date of Report July 22, 1971

LABORATORY ANALYSIS REPORT

For Cleland Conwell Address Division of Geological Survey -- College

Number of Samples 4 Date Sample Received 6/28/71

Work Done: (for Analyst see below)
A. X-ray flourescence quant. ☐ semi-quant. ☐
B. X-ray diffraction ☐
C. Spectrographic quant. ☐ semi-quant. ☐
D. Spectroscopic ☐
E. Atomic absorption quant. ☐ semi-quant. ☑
F. Fire assay ☐ G. Microscopic examination ☐
H. Other (Specify) ☐
I. Ultraviolet light ☐

LABORATORY NUMBER	SAMPLE MARKED	ANALYSIS OR IDENTIFICATION				
		E. Ounces Per Ton		E. Weight Per Cent		
		Gold	Silver	Copper	Lead	Zinc
39894	S#1 0 to 2'	Nil	0.47	0.009	0.100	0.145
39895	S#2 2' to 4'	0.006	0.15	0.009	0.100	0.50
39896	S#3 4' to 6'	Nil	0.20	0.006	0.041	0.095
39897	S#4 6' to 8'	Nil	0.09	0.005	0.019	0.045

E. Nil gold means less than 0.001 troy ounces per ton.

Accuracy of the atomic absorption analysis for gold and silver is ±10% of the reported value.

Accuracy of the atomic absorption analysis for copper, lead and zinc is ±5% of the reported value.

Your sample(s) was tested for radioactivity; no significant radioactivity was detected.

E. Donald R. Stein Donald R. Stein
ANALYST & WORK DONE

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APPROVED:
LABORATORY SUPERVISOR
Thomas C. Mowatt

NOTE: Samples discarded after 60 days and pulps after 6 months unless instructed otherwise.