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Territory of Alaska
Department of Mines.

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THE STIBNITE PROSPECT ON BOULDER CREEK, TOK RIVER DISTRICT, ALASKA

By H. R. Joesting

Noted: - Jan 7/42 B.D.S.

During the winter of 1940-41 considerable prospecting was done on the stibnite deposit on Boulder Creek in the Tok River District. In April, 1941 the writer examined and sampled the prospect in order to determine if further development is warranted at the present time. A total of five days, from April 14-19, was spent on Boulder Creek, but because of a heavy snowstorm only one day was available for examination and sampling. Examination of the surrounding area was not possible at the time because of the five-foot cover of snow.

The deposit was visited in 1936 by Fred H. Moffit of the U. S. Geological Survey and is described in Geological Survey Bulletin 904.

Location and History

Boulder Creek is a small left-limit tributary that joins the Tok River about seven miles above the mouth of Dry Tok Creek. The stibnite lode occurs on the eastern, or main branch of Boulder Creek about a mile above its mouth. It is about 30 airline miles north of Slana and 18 airline miles southwest of Tanana Crossing. By foot trail the distances to Slana and Tanana Crossing are about 45 and 50 miles, respectively. Fig. 1, based on the geologic map in Bulletin 904, shows the prospect and the most feasible routes to it.

Boulder Creek is so-called by the local Indians because many large boulders are deposited along its rather steep course, but it was called Stibnite Creek by an earlier prospector, according to an account given by Brooks on p. 63 of U. S. Geological Survey Bulletin ~~643~~ 649 - (Antimony Deposits of Alaska) B.D.S., and Clearwater Creek when the prospect was staked and recorded in 1940.

According to Brooks, the stibnite deposit was discovered in 1914, but according to Mentasta Sam, the chief at Mentasta Indian village, it was discovered by one Frank Caulk about 40 years ago. Caulk is also said to have discovered a gold vein on a nearby ridge. Shortly thereafter he was supposed to have inherited some money upon which he left the country and never returned. An old tunnel, now partly caved, gives evidence of previous prospecting. It is driven diagonally ~~for~~ about ten feet across the strike of the mineralized zone near the footwall and does not cross the higher grade part of the deposit.

Mining Claims

Two lode claims, measuring approximately 600 by 1500 feet, were staked on Boulder Creek by Sam Gamblin on June 20, 1940 and recorded in Chitina on September 24, 1940. The approximate positions of the prospect and of the discovery post are shown in Fig. 2.

Topography

Mt. Kimball, some 30 miles west of the prospect, is the highest peak in the Alaska Range east of the Delta River, with an elevation of over 10,000 feet. In the immediate vicinity of Boulder Creek the mountains are probably not over 7000 feet high, thus the maximum local relief is about 4000 feet. Although the mountains are quite rugged the main valleys are wide and have moderate gradients, so that the area is readily accessible. The larger valleys contain partly reworked glacial deposits with the result that footing is generally good in the summer.

According to the map in Bulletin 904, previously cited, the elevation of Tok River valley at Boulder Creek is about 2800 feet and of the prospect about 3100 feet. Boulder Creek has a grade of about six percent, while that of Tok River is less than one percent.

Timber

Little timber suitable for mining purposes grows on upper Boulder Creek, but an abundance of spruce up to 18 inches in diameter grows in the Tok River valley less than a mile from the prospect. Some stands of small birch also grow on the better-drained slopes.

Water Supply

No water could be found under the ice in the main channel of Boulder Creek on April 15, but it was stated that water was flowing two weeks previously. During the summer a continuous supply is insured by melting snow from the hillsides and ample water for mining and milling would probably be available for at least 10 months each year. Since no glaciers drain into Boulder Creek the water is clear.

Geology

In the vicinity of the prospect the country rock is chiefly quartz-mica schist cut by altered siliceous intrusives. Although the schist is considerably folded and faulted, its general dip is about 40°-50° southwest.

The stibnite occurs in a mineralized zone about 11 feet thick that projects as a spur on the south side of Boulder Creek (Fig. 2). This zone strikes N-S and dips 40°-50° W. It is bounded by faults that are parallel to the schistosity of the wall rock. In general, the deposit consists of banded quartz and stibnite toward the walls and higher grade irregular lenses of stibnite toward the center. In the higher grade portions, which total about two feet thick where exposed, both massive and coarsely crystalline stibnite occur. Even the richest ore contains considerable finely disseminated quartz that is fully evident only on careful examination, but as far as could

be determined at the time of the examination, both the tenor and width of the high-grade ore increase downward and toward the creek.

Stibnite is said to outcrop in several places along the strike of the mineralized zone for a distance of several hundred feet to the south of Boulder Creek. In the creek bed to the north of the prospect a broad zone of high-grade stibnite is said to be exposed for about 25 feet in an overflow channel. Still further north the ore is said to be covered by stream wash. Although the ore could not be traced along its strike because of the heavy snow, there is little doubt that the mineralized zone with its accompanying faulting extends for considerable distances in both directions from the prospect.

Mining Development

During the winter of 1940-41 food and equipment for hand mining were freighted to Boulder Creek by plane and dogteam, and a 10' x 10' blacksmith shop and a 20' x 18' cabin were built. The shop was built just across the creek from the prospect, but the cabin was built nearly a half mile downstream where suitable logs were at hand.

Actual prospecting consisted of removing the richer, central part of the mineralized spur preparatory to driving an adit. This exposed a level, triangular floor, the shape of which was governed by the occurrence of higher grade ore. On both sides of the floor are walls of low-grade stibnite. Because of the danger of flooding it was considered inadvisable to sink a shaft in the overflow channel where the best showings occur. Hand drilling proved to be slow because of the high quartz content of the ore and consequently there was not sufficient time to start the adit.

During the course of the work rock waste was spread upstream and downstream in the overflow channel for the purpose of diverting flood water to the main creek channel. About 20 tons of hand-sorted ore, 15 tons of intermediate grade and 75 tons of low-grade material were also taken out and stacked in three piles. The high-grade ore consisted of apparently pure stibnite, which however, contained finely disseminated quartz. The low-grade material contained, in addition to finely disseminated quartz, larger patches and bands of vein quartz.

Fig. 2 shows the results of the 1940-41 work. It was subsequently learned that the ore piles were carried away by high water sometime after breakup in the summer of 1941.

Sampling

In all, 13 samples were taken, of which eight were from two channels cut in the floor of the recent workings, two were picked samples from the high-grade ore pile, one was from oxidized ore near the footwall fault and two were from the schist near the hanging and foot walls. Fig. 3 shows the positions of the samples cut from the ore body.

Analyses of the samples and widths of the ore zones from which they were obtained are shown in the following table.

Sample No.	Percent Antimony	Percent Arsenic	Percent Lead	Ounces per ton Gold	Ounces per ton Silver	Width of Sample normal to dip, inches.	Weight of sample, pounds.
3	31.88	tr.	nil	tr.	tr.	picked sample	4.0
5	8.88	tr.	nil	nil	nil	8.4	1.5
6	28.90	0.05	nil	tr.	nil	15.4	2.8

Sample No.	Percent Antimony	Arsenic	Lead	Ounces per ton Gold	Silver	Width of sample normal to dip, inches.	Weight of sample, pounds.
7	tr.	0.81	nil	tr.	nil	5.0	1.0
8	23.76	tr.	nil	0.04	tr.	7.0	2.0
9	2.51	0.5	nil	0.02	tr.	17.5	4.3
10	10.42	tr.	nil	0.03	tr.	17.5	3.8
11	19.32	tr.	nil	0.02	tr.	15.4	5.5
12	15.34	tr.	nil	0.02	tr.	19.6	5.8
13	29.94	tr.	nil	0.04	nil	picked sample	3.5

Noteworthy are the relatively small contents of metallic elements other than antimony, as well as the higher arsenic content of the samples containing the least antimony. According to the results of the analyses, even the highest grade ore now exposed contains sufficient quartz to reduce the antimony content below that necessary for a shipping ore. However, comparison of analyses with sample positions as shown in Fig. 3, indicates that the tenor and width of the ore increases northward, toward the creek. This is also apparent from visual examination, as indicated on p. 3 under Geology.

Accessibility, Transportation and Mining Costs.

At present the landing field near the mouth of Boulder Creek is only 700 feet long. With the aid of a bulldozer it could be lengthened to 1800 feet by diverting a small overflow channel of the river. The grade of the field is about one percent. It is said to be sheltered from strong winds.

Two routes exist over which machinery and supplies could be brought in to Boulder Creek and ore shipped out. The first route is down the Tok

River to Timber Creek, across the pass at Bone Lake, down Bone Creek to Mentasta Lake, thence across Indian Pass and to the Nabesna-Gulkana highway near Slana. The second route is down the Tok River valley and across the gravel flats of the Tanana River valley to Tanana Crossing, thence down the Tanana River to the Valdez highway at Big Delta. The two routes are shown in Fig. 1.

On the basis of available information the first route is considered preferable, since it is more direct and avoids the somewhat hazardous water haul down the Tanana River.

Estimated transportation costs follow:

Boulder Creek to Nabesna highway near Slana by tractor and sled.	$20 per ton[1]
Slana to Valdez by truck.....	12 per ton
Valdez to Seattle.....	7 per ton
Seattle to San Francisco.....	5.50 per ton
Total.....	$44.50 per ton

These estimates are based on the assumptions that a tractor route can be readily established from the prospect to Slana, that a relatively large tonnage of ore or concentrates will be available, and that considerable freight will be transported to the prospect in addition to the ore hauled away.

The cost of mining and concentrating the ore is placed at approximately $15 per ton, although this figure could doubtless be reduced if a moderately large tonnage of ore were available. If it is assumed that ore containing 20% antimony can be mined and that the concentrates contain not less than 60% antimony, then the cost per ton of concentrates would be about $45 and the total cost of the concentrates landed at San Francisco would be approximately $90 per ton.[1] Higher tenor would, of course, mean lower mining and concentrating costs.

Conclusions

As indicated in the section headed Sampling, the antimony content of ore mined from a width of two to three feet would not be over about 20 percent. Even if allowance is made for an apparent increase in tenor with depth and to the north of the present prospect, it is doubtful if any worthwhile amount of ore of shipping grade (50-60% Sb) will be encountered.

Although it is unlikely that the deposit contains much shipping-grade ore, nevertheless its large size recommends it for further prospecting. It is probable that a large tonnage could be developed by sinking a relatively shallow shaft and by driving a short tunnel. Because of the compact nature of the ore the deposit could be readily explored by diamond drill.

In April, 1941, 60 percent antimony ore sold for about $150 per ton landed in San Francisco, according to L. C. Doheny, R. F. C. field engineer for Alaska. 60 percent concentrates from Boulder Creek should, then, yield a profit of approximately $60 per ton.

Henry R. Joesting

Assoc. Mining Engineer

Terr. Dept. of Mines

Fig. 1. Map of Slana-Tok District, showing routes to Boulder Creek stibnite deposit. From U. S. G. S. map.

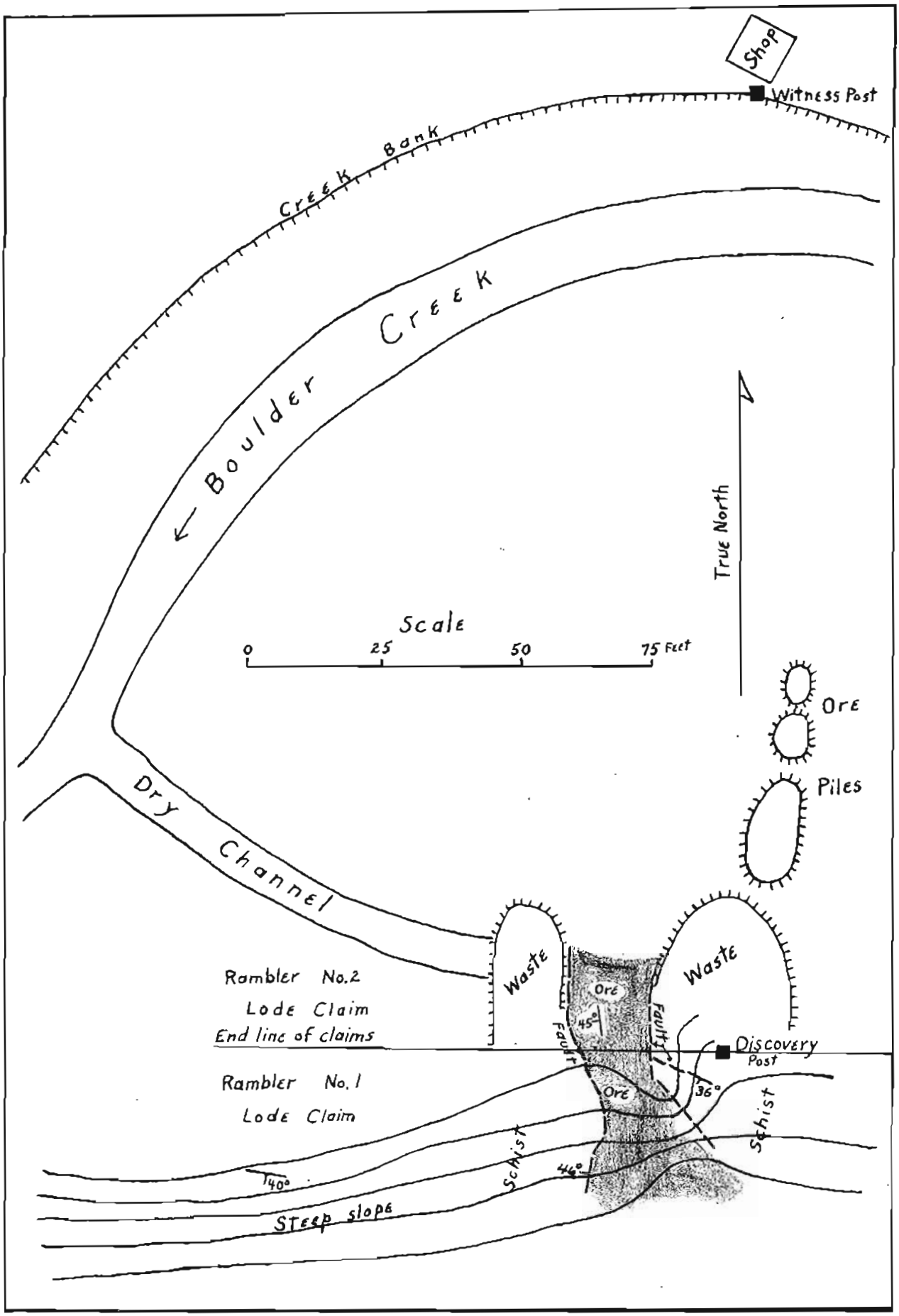

Fig. 2. Sketch map of Boulder Creek stibnite deposit.

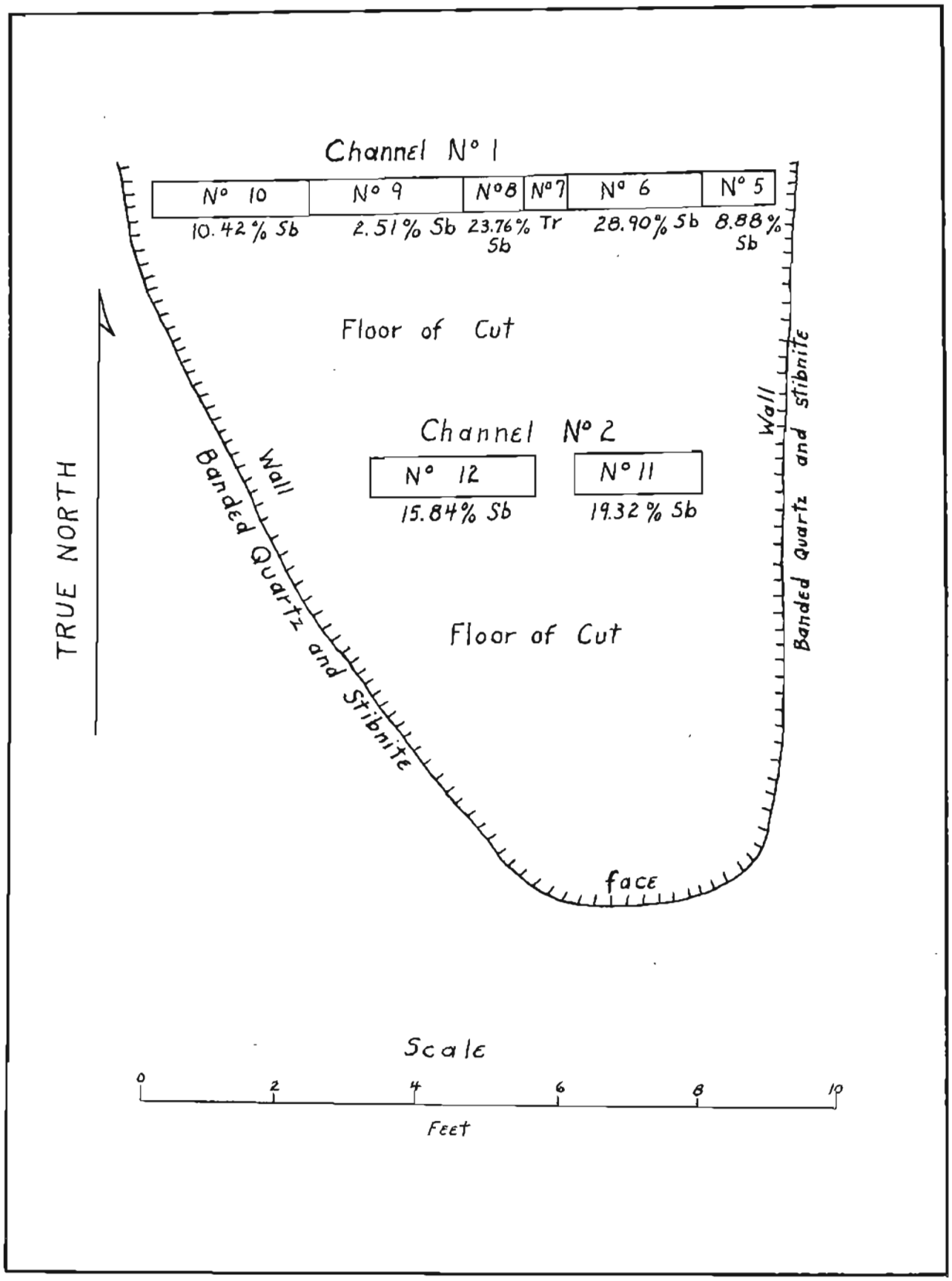

Fig. 3. Sketch map of open-cut in mineralized zone showing antimony content of samples.

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NOV 28 1941
JUNEAU, ALASKA

College, Alaska
Nov. 24, 1941

Mr. R. L. Stewart
Territorial Department of Mines
Juneau, Alaska

Dear R. L.:

The enclosure is to replace the last page of a report called "The Stibnite Prospect on Boulder Creek, Tok River District, Alaska", This report was mailed to Juneau November 3. In a letter written November 19 I mentioned to Mr. Stewart that I had misquoted the price of Antimony ore and would send in a correction to the report. As he is away, I am sending it to you. I hope the directions attached to the correction are clear.

In my letter of Nov. 3, which was sent with the report, I asked for 10 black and white prints each of three figures in the report. These figures are on tracing paper. I don't know how Mr. Stewart's mail in handled in his absence, but if it isn't too irregular could the prints be mailed and returned to me before his return to Juneau ? Several people are waiting for copies of the report.

Noted Jan 31/42 RLS

I have not heard when Mr. Stewart expects to arrive here, but will be looking for him sometime after the latter part of this week.

Sincerely yours

Henry R. Joesting

Henry R. Joesting

Encl.

Report on Paul's Creek Antimony Deposit by Joesting

~~Chitina~~ Prospect

Corrections

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Although it is unlikely that the deposit contains much shipping-grade ore, nevertheless its large size recommends it for further prospecting. It is probable that a large tonnage could be developed by sinking a relatively shallow shaft and by driving a short tunnel. Because of the compact nature of the ore the deposit could be readily explored by diamond drill.

Henry R. Joesting
Assoc. Mining Engineer
Terr. Dept. of Mines.
Oct. 31, 1941

[1]Since this was written a tractor road has been built from Slana to Tanana Crossing, following the route shown in Fig. 1. This road would permit winter freighting between Boulder Creek and Slana with no additional road construction and would reduce freight costs approximately $10 a ton. Total mining costs would, then, be about $80 per ton.