R. I. 4345

September 1948

UNITED STATES
DEPARTMENT OF THE INTERIOR
J. A. KRUG, SECRETARY

BUREAU OF MINES
JAMES BOYD, DIRECTOR

REPORT OF INVESTIGATIONS

CHURN DRILLING AT CAPE MOUNTAIN TIN PLACER DEPOSITS
SEWARD PENINSULA, ALASKA

BY

HAROLD E. HEIDE AND ROBERT S. SANFORD

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INTRODUCTION & SUMMARY

The United States is the world's largest consumer of tin and depends entirely upon foreign imports for its major source of supply. Only a small quantity of tin is produced on the North America continent. The advent of the war in Europe in 1939 brought a threat to our foreign sources of supply,

1/ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used, "Reprinted from Bureau of Mines Report of Investigations 4345."
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3/ Senior mining engineer, College Park, Md.

and the Congress took steps to forestall shortages of tin and other metals. By authority of the Strategic Minerals Act, passed by Congress in 1939, and subsequent legislation, the Bureau of Mines and Geological Survey conducted investigations of domestic tin deposits. Most of the tin that has been produced in North America came from the Seward Peninsula, Alaska.

The Cape Mountain placer district produced approximately 700 tons of tin concentrate from 1933 to 1941, inclusive. Since then no tin has been produced in the district. Reports that there were more tin deposits in the area led to an examination of the district by Harold E. Heide in September 1942, which was followed in 1943 and 1944 by a program of churn drilling in the placer area and trenching and sampling the lode-tin deposits.4/

The Cape Mountain area was examined in 1939 by J. B. Mertie, Jr., of the Geological Survey. During the period in 1943 in which the Bureau of Mines conducted its churn-drilling program, a Geological Survey party (Robert Coats, chief) made plane table maps showing the location of the drill holes.

Exploration was begun, using two airplane-type churn drills, in June 1943 and continued until the latter part of September of the same year. All the principal creeks of the district were prospected by the Bureau of Mines.

Owing to uncertainty concerning the exact location and extent of the placer deposits, the work was laid out first to explore the district as a whole. This method permitted a preliminary appraisal of total resources from which the most favorable deposits could be selected. The original plan for closer drilling of any possible exploitable blocks found during the preliminary phase could not be undertaken because of the limited working season.

ACKNOWLEDGMENTS

Acknowledgment is made to the Geological Survey for the use of geologic maps and reports of the Cape Mountain area. Special acknowledgment is made to Robert Coats, geologist of the Geological Survey, for his detailed study and mapping in the area, and to James H. Hulbert, Bureau of Mines project foreman, from whose field notes many data in this report were obtained.

LOCATION AND ACCESSIBILITY

The Cape Mountain placer district encompasses the larger creeks heading in the slopes of Cape Mountain. This district is on the westernmost tip of the North American continent at approximately 65° 35' north latitude and 179° 59' west longitude. The district is about 107 miles northwest of Nome, Alaska, and within a radius of 6 miles of Wales, Alaska, the nearest inhabited Eskimo village. The location of the district is shown on figure 1.

4/ Heide, H. E., Wright, W. S., and Sanford, R. S., Exploration of Cape Mountain Lode-Tin Deposits, Seward Peninsula, Alaska: Bureau of Mines Report of Investigations 3978, 1946, 16 pp.

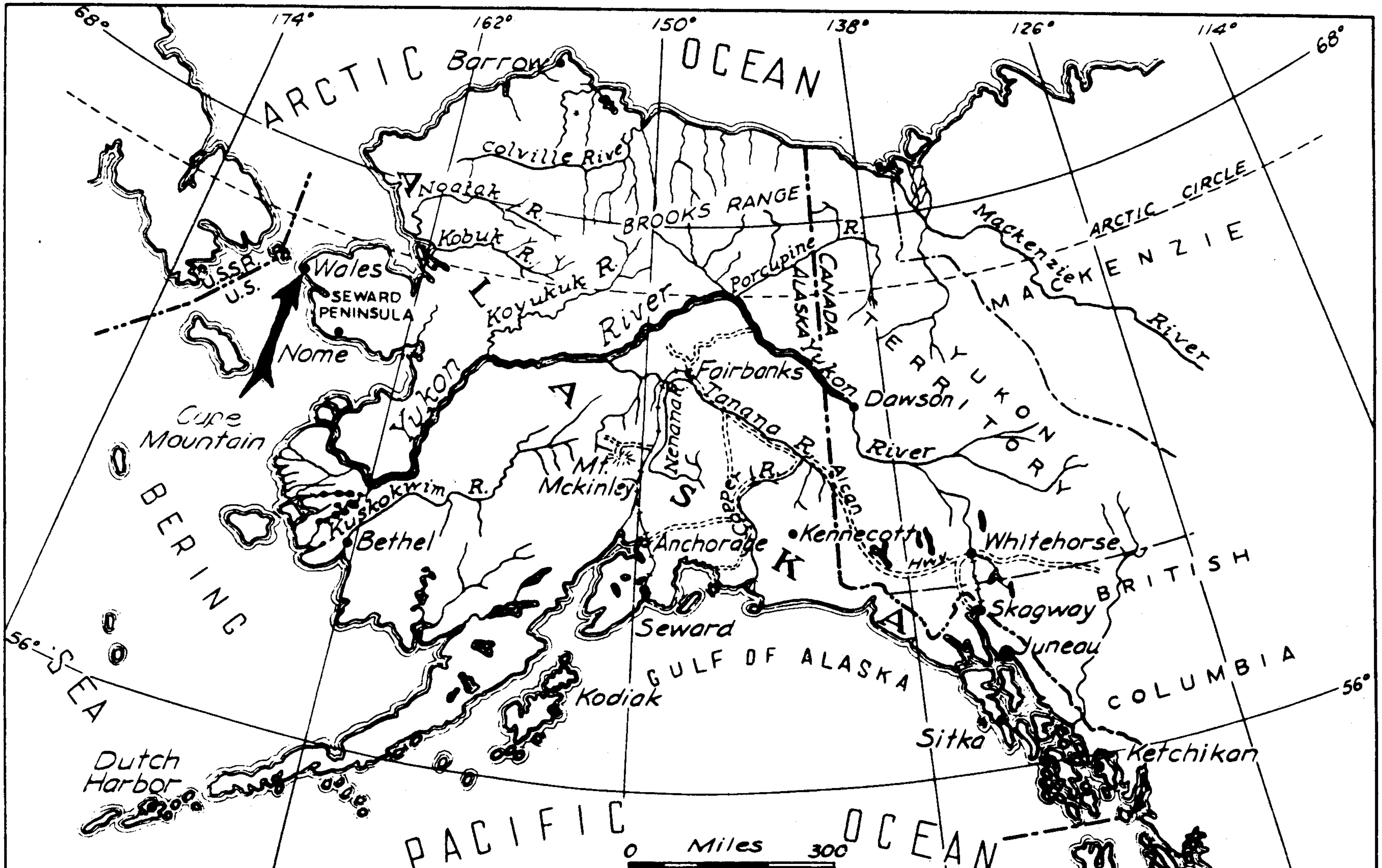

Figure 1. - Index map of Alaska.

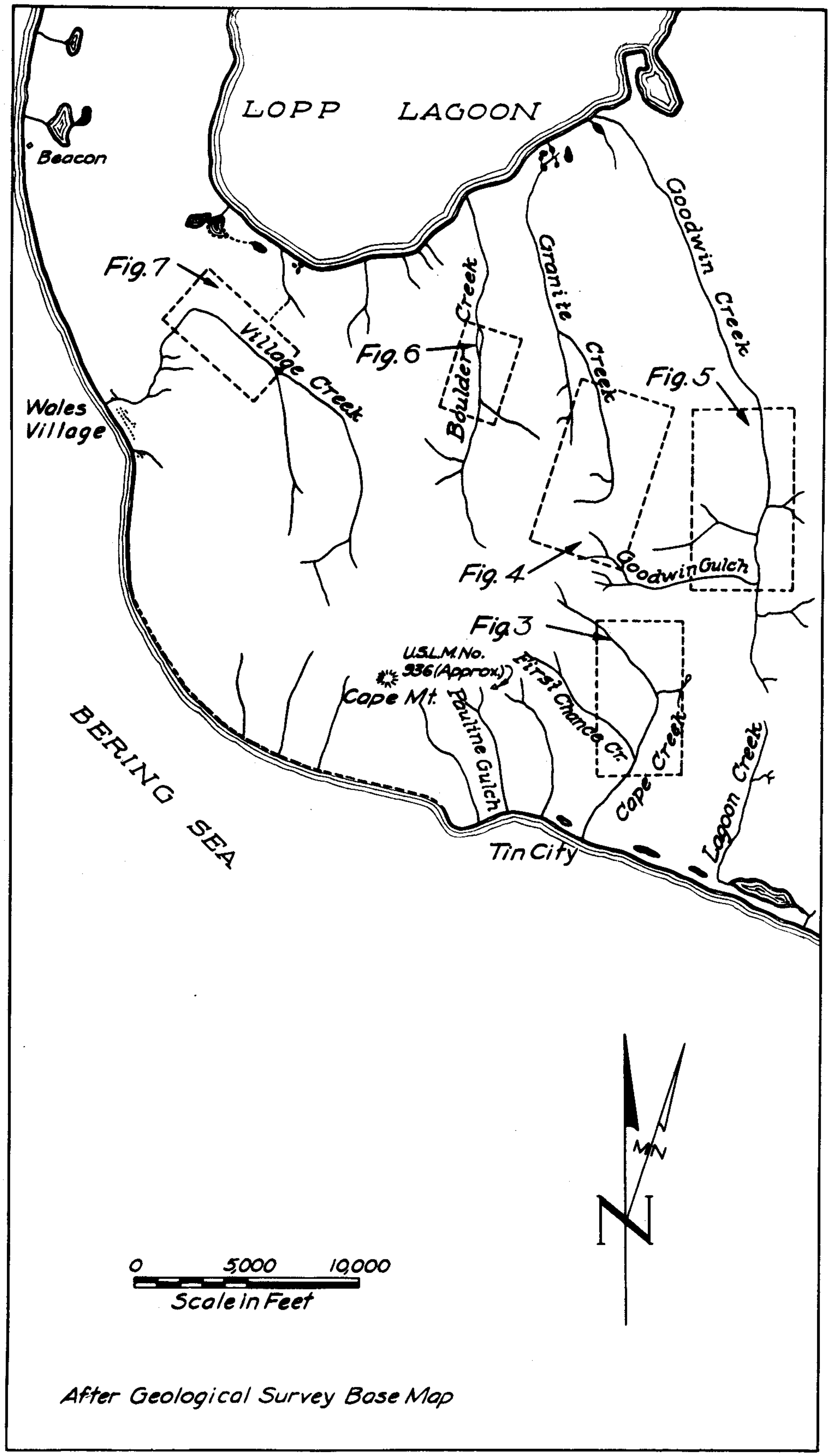

Figure 2. - Cape Mountain tin placer district.

Nome is the distributing center for the Seward Peninsula. Tin City, on the shore of the Bering Sea, is now deserted but would provide a suitable base for starting operations in the district. Wales has a post office, a small trading post, a radio station, and a population of about 50 Eskimos. An airplane landing field suitable for small planes has been constructed just east of Tin City. A larger air field was built by the Civil Aeronautics Authority at Wales soon after the field work for this project was completed. Weather conditions make flying an uncertain means of transportation.

Steamships make two or three trips between Seattle and Nome and a like number of trips between Seattle and Kotzebue during the season when the Bering Sea is open to navigation. The first ship leaves Seattle about May 20 and the last about September 1. All ships are scheduled to depart from the Bering Sea and Arctic Ocean before October 6, as the ocean may freeze and close navigation shortly after that date. There are no harbors at Nome, Tin City, or Wales, and vessels must anchor off shore. All freight has to be lightered from ship to shore. A tug boat and barge must be chartered and come from Teller to handle heavy freight. Eskimos with umiaks, or skin boats, can be hired to lighter articles weighing less than 1,000 pounds at about $10.00 a ton.

The freight rate on general cargo from Seattle, Wash., to Nome, Alaska, is 71 cents a cubic foot, divided as follows: Seattle wharfage 3-1/2 cents; to ship's anchorage, Nome, 45 cents; and Nome lighterage, 22-1/2 cents. An additional 16-percent surcharge is still in effect.

A small motorship carries mail and light cargo from St. Michael to Kotzebue every 2 weeks during the open season. The ship will tow a barge on request. Stops are made at Nome, Teller, Tin City, Wales, and other wayside ports. Freight rates from Nome to Tin City are about $30.00 a ton shore-to-shore.

Equipment and supplies can be transported from Tin City to the head of Cape Creek and Goodwin Gulch on a road that follows these creeks.

PHYSICAL FEATURES AND CLIMATE

Cape Mountain is a prominent peak towering over 2,300 feet above Bering Strait. Five major creeks - Village, Boulder, Granite, Goodwin, and Cape - compose the drainage system. These creeks are steep at their heads, narrow and shallow, and flow only a few miles to the Bering Sea or Lopp Lagoon. A map of the Cape Mountain area is shown on figure 2.

No timber is available in the region. The tundra furnishes an abundant supply of moss, which is suitable feed for reindeer but of little value to other stock.

Land animals were once plentiful, but at present the numbers have been greatly reduced. The partly domesticated herds of reindeer have been greatly depleted in recent years. Whale, seal, walrus, and fish are caught in the Bering Sea and form a large part of the Eskimos' diet.

High winds from the north or south bring much fog and rain during the summer. Weather conditions at Cape Mountain are somewhat similar to those at Nome, where the closest weather station is located and where the records show an average annual precipitation of 12.29 inches. Over half of the rain falls during the four summer months, or from June to September, inclusive. The annual mean temperature is 30.2° F. The winters are severe, and temperatures of minus 50° F. are frequently recorded.

The working season is confined to June, July, August and September of each year. The ice pack in the Bering Sea stops navigation from early November to late May.

Much of the unconsolidated material underlying the tundra is frozen during the entire year. These permanently frozen areas must be thawed during mining operations.

HISTORY, PRODUCTION, AND OWNERSHIP

The first tin discoveries on Cape Mountain were lode deposits, and prospecting was largely confined to them for many years. Later, placer tin aroused interest, and in 1933 sporadic attempts were made to hand-mine on Cape Creek and Goodwin Gulch. Probably 200 tons of tin was produced by hand mining up to 1935, when American Tinfields, Inc., began operating. An estimated 500 tons of tin was produced between 1935 and 1941. American Tinfields ceased operations owing to exhaustion of economically minable tin-bearing gravel on Cape Creek and Goodwin Gulch.

Claim titles were not rigidly investigated in 1943; but it is believed that title to claims on Cape Creek was held by Mrs. A. T. Peterson and associates of Teller, Alaska, and those on Goodwin Creek by Thomas J. Christensen of Fairbanks, Alaska, and the Bering Straits Tin Mining Co. The claims on Granite, Boulder, and Village Creeks were held by the Bering Straits Tin Mining Co.

WATER SUPPLY

One of the chief obstacles to mining in the Cape Mountain area is the scarcity of water. The water supply depends on early seasonal thaws and light rains. All the creeks, except Goodwin Creek, have a highly fluctuating, undependable, intermittant flow.

The American Tinfields, Inc., hauled the gravels from Cape Creek and Goodwin Gulch to a washing plant at Tin City. This washing plant was supplied with water pumped from the Bering Sea. However, it is believed that sea water can be pumped to the deposits on First Chance and Cape Creeks and the sea water recirculated in a washing plant.

Water conditions on Boulder Creek are analogous to those on First Chance and Cape Creeks.

OCCURRENCE OF DEPOSITS

The main mass of Cape Mountain is chiefly a granite which has intruded limestone. This limestone borders the foot of the mountain. Lode - tin mineralization occurs along the granite limestone contact. It is believed that the placer tin, in the form of cassiterite, came from this mineralized cone.

CHARACTER OF DEPOSITS

The tin-bearing portions of the creek gravels in the Cape Mountain area are too small to represent a large reserve of tin and were left by previous operators for economic reasons. A few remaining bench deposits, covered by a deep overburden, invariably contain lower values than the main channels mined. Other deposits, occurring in low-grade portions of the channels, were classified as unprofitable at the time of mining operations.

Bedrock gradients in the mining sections are 4 percent and over. Granite bedrock was encountered on line 1 at Boulder Creek, but bedrock in all other places is limestone. It is reported that the limestone bedrock is decomposed enough to permit clean mining.

Placer tin, occurring as the mineral cassiterite, ranges in size from a small fraction of an inch up to nuggets a foot in diameter. Near the heads of creeks much of the cassiterite is coarse, angular, and associated with quartz, limestone, or granite gangue. Smaller grains and nuggets are found on the lower deposits; less gangue adheres to the cassiterite, and the crystals are more worn, although still subangular.

Variable amounts of impurities are recovered in the concentrates. Pyrite, magnetite, garnet, and other heavy contact minerals often constitute an appreciable part of the volume. However, American Tinfields, Inc., demonstrated that, by using jigs and tables, a 60-percent tin concentrate could be produced without serious loss.

The deposits on First Chance Creek and lower Cape Creek contain a high percentage of clay, associated with the pay streak. This clay could cause a serious loss of tin unless adequate wash water was available.

On Boulder Creek many boulders up to 3 feet diameter were encountered. These often constitute 20 to 40 percent of the volume, the remainder being clean sand and gravel. Mining operations would require equipment heavy enough to handle boulders of this size. In all instances the gravels were found to be unconsolidated. They contained some ice but may be readily thawed by stripping.

PLACER WORKINGS

Cape Creek was worked from near the beach to a point approximately 500 feet below First Chance Creek. About 2,000 feet of ground above the bend was also worked on Cape Creek.

Goodwin Gulch was also mined a length of 4,500 feet upstream from its junction with Goodwin Creek. Most of the mining was done by American Tinfields, Inc., with power shovel and trucks hauling gravel to the mills. Practically all mining was in a narrow strip following the main channels, although some recovery was made from shallow benches on the left limit of Goodwin Gulch.

Operations of American Tinfields, Inc., on Cape Creek and Goodwin Gulch utilized power shovel, trucks, and a mill first located at Tin City, later at Goodwin Creek. With the light equipment used, only a small yardage was mined - 9,000 to 10,000 cubic yards each working season - and total costs are reported to have been about $2.50 a cubic yard.

The tin-bearing gravel can be concentrated in movable plants using washers, jigs, and sluices. A variable amount of impurities, such as pyrite, magnetite, garnet, and other contact minerals, occurs in the concentrate.

Specifications as to type and size of equipment must be determined by the character of the deposits.

INVESTIGATIONS BY BUREAU OF MINES

Bureau of Mines investigations were conducted on First Chance, Cape, Goodwin, Granite, Boulder, and Village Creeks, the principal tin-bearing creeks of the district. A bulldozer trench and numerous test pits were excavated on the beach at Tin City. Only traces of tin were found in these excavations.

Two airplane churn drills mounted on skids and moved with a tractor were used for drilling. One hundred thirty-eight holes were drilled, totaling 1,739.85 feet. The location of drill holes is shown in figures 3 to 7, inclusive.

Originally it was planned to accomplish part of the exploration by means of bulldozer trenches. This proved impractical, as in most cases the ground was either too soft or bedrock too deep.

The drill bits used had 3-5/8-inch cutting edges. Area represented by cutting edge of drive shoe, using 4-inch casing, was 0.150 square foot.

Length of core was measured before and after each pumping. Loose volumes from each pumping were measured in calibrated buckets. Water measurements were taken in holes drilled in frozen ground. Logs were kept at the drill by the drillers, frequent checks being made by the sample foreman.

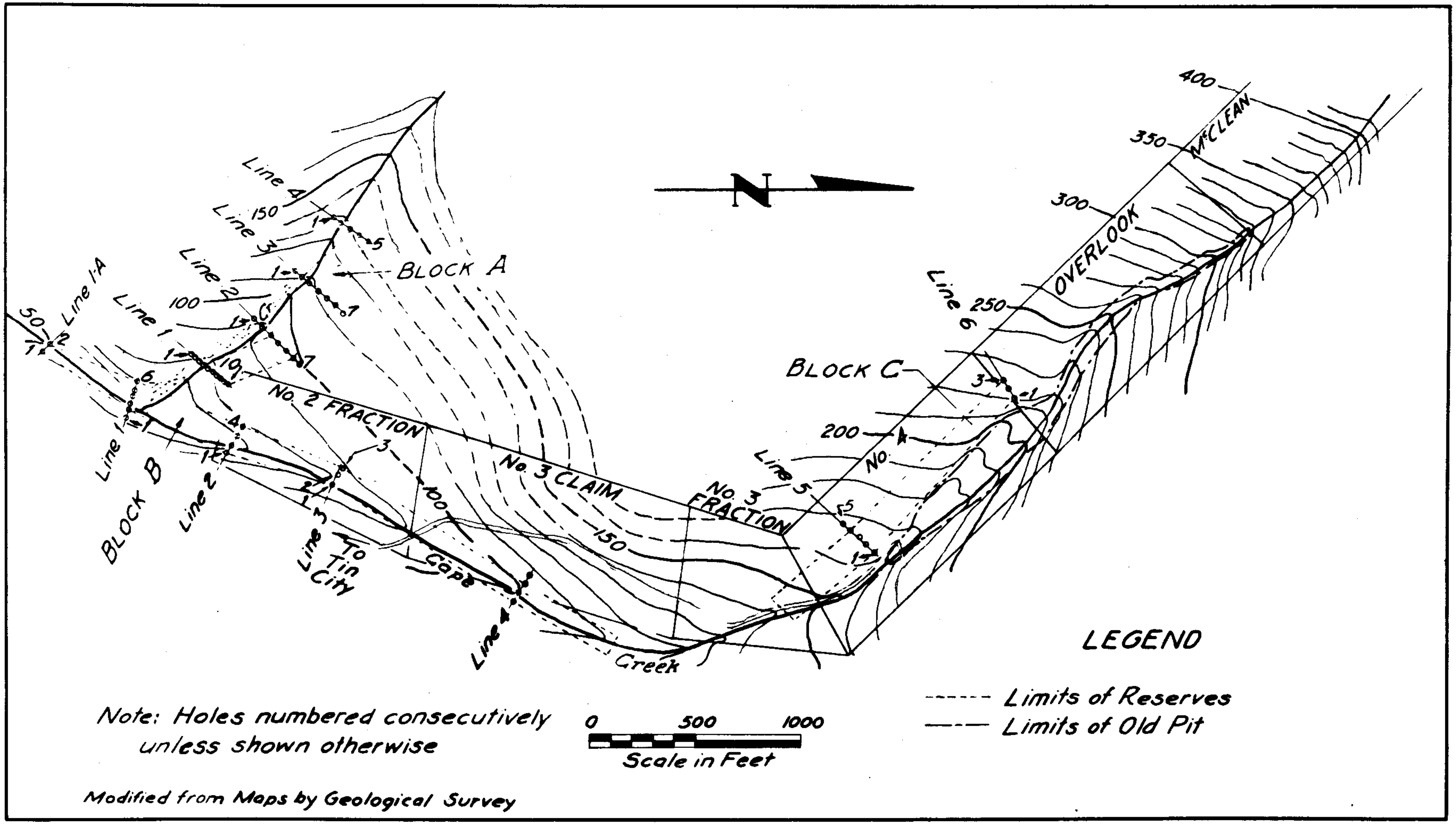

Figure 3. Drill map of First Chance and Cape Creeks.

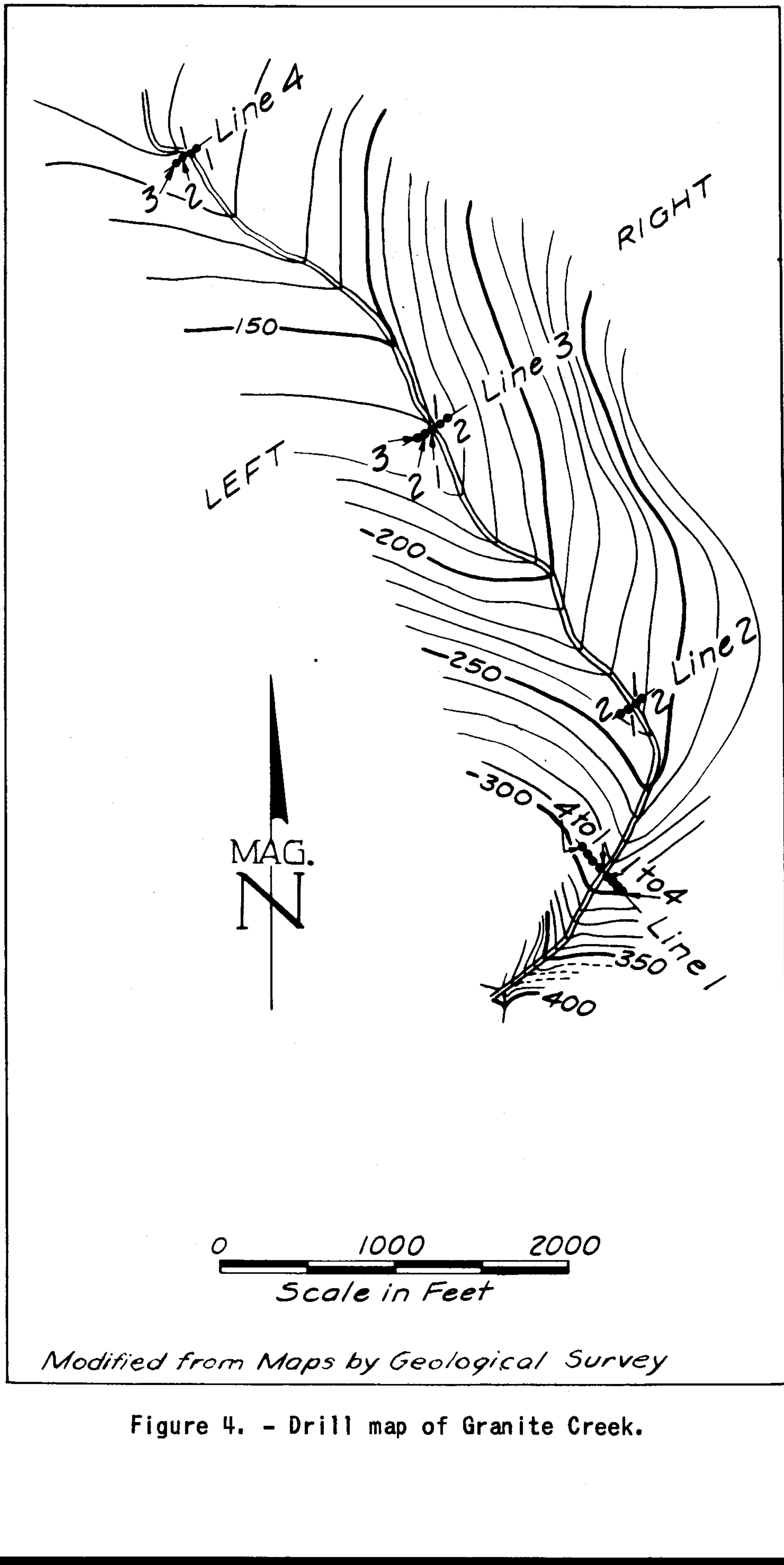

Figure 4. - Drill map of Granite Creek.

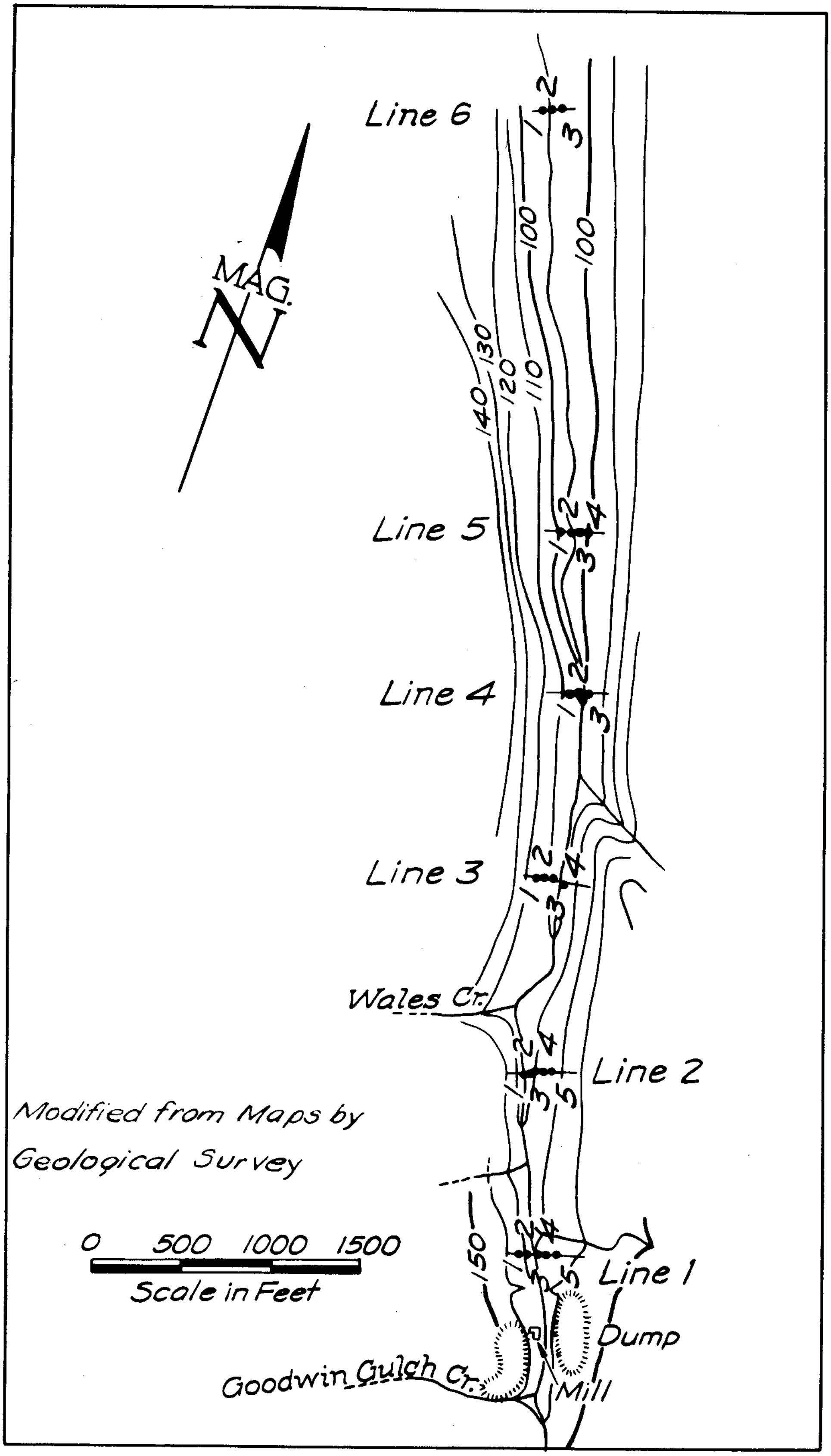

Figure 5. - Drill map of Goodwin Creek.

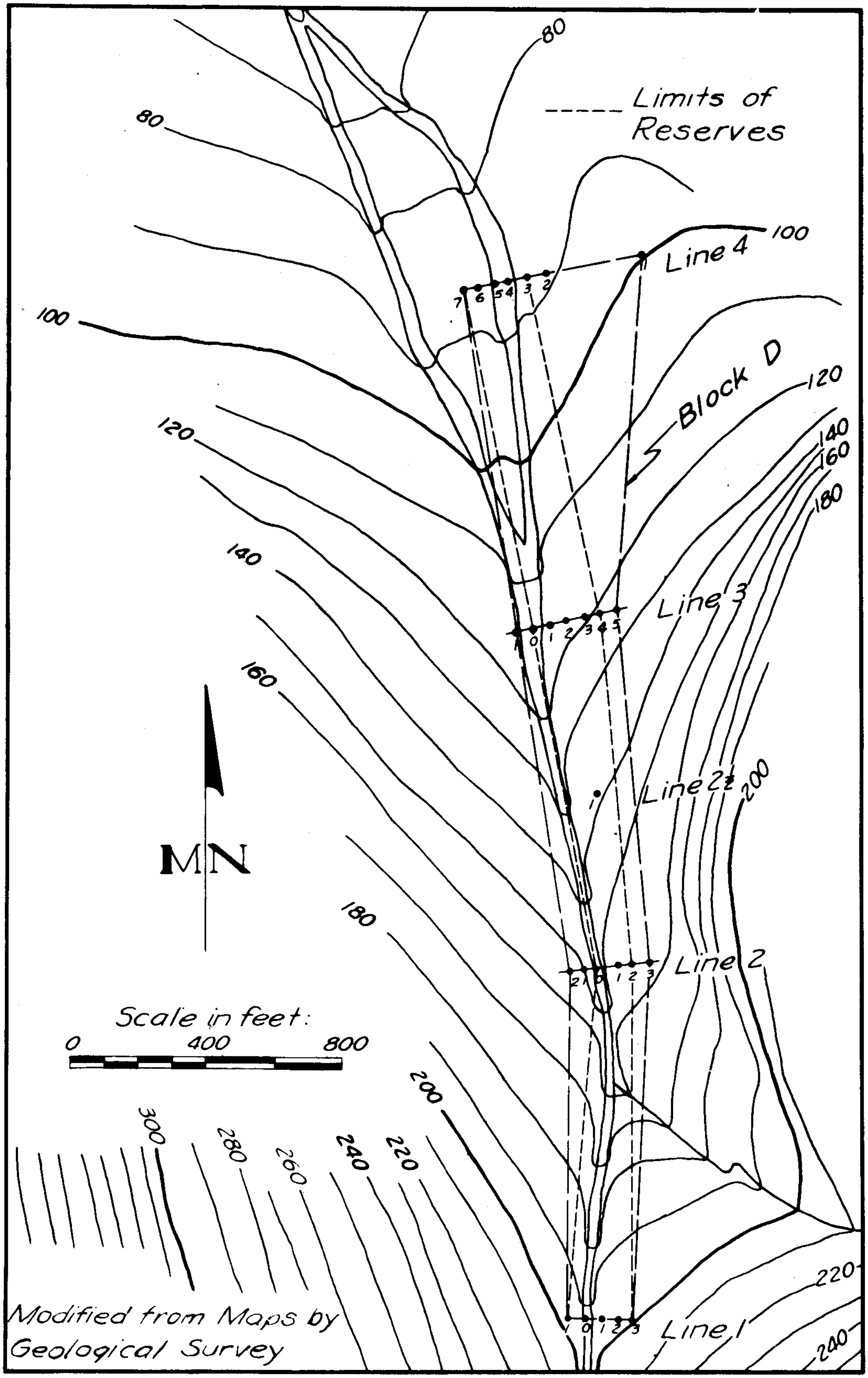

Figure 6. - Drill map of Boulder Creek.

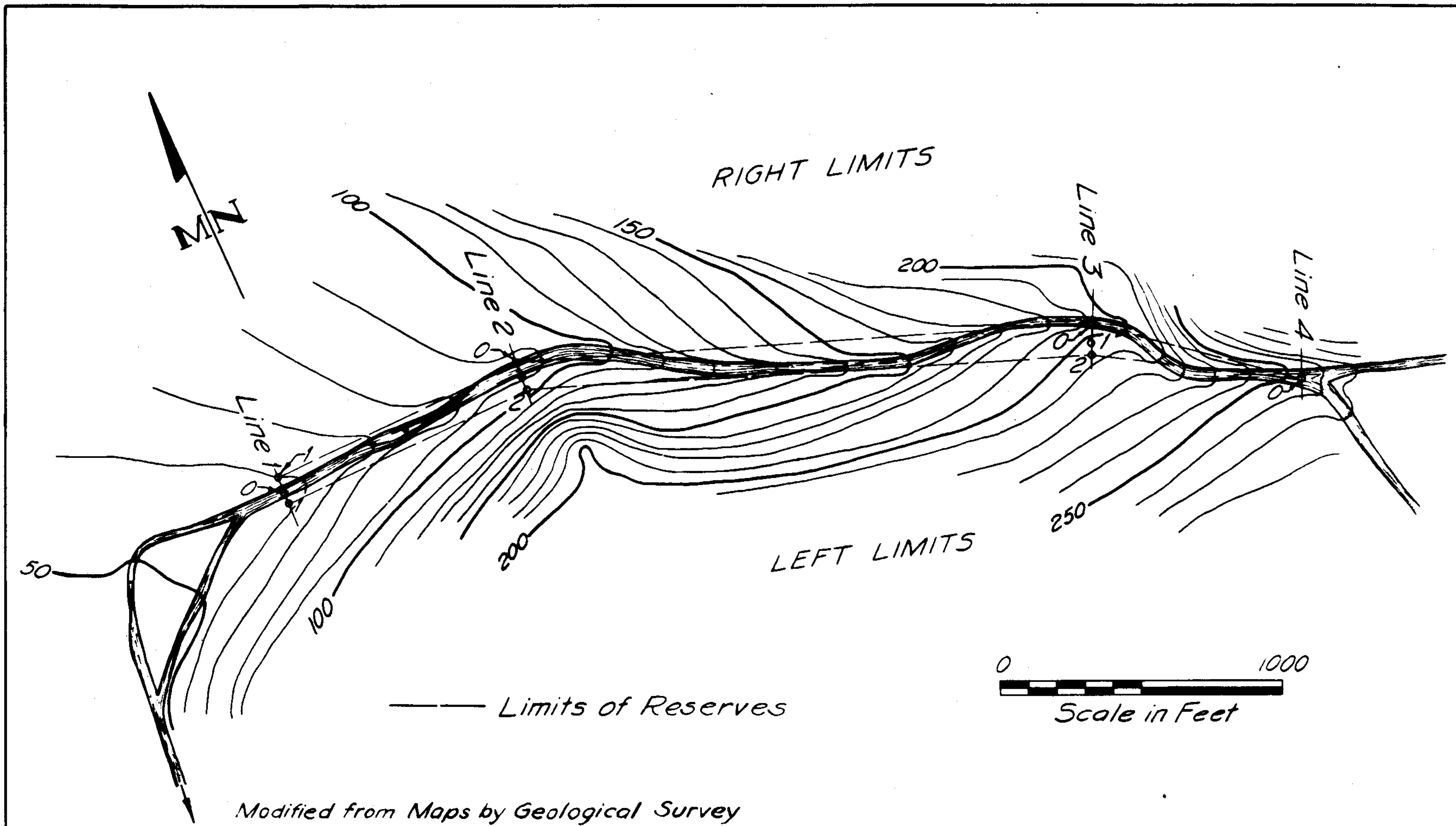

Figure 7. - Drill map of Village Creek, Cape Mountain placer district.

Preliminary panning was done at the drills by skilled Eskimo panners. High recovery was obtained on a low-grade concentrate. Final cleaning of the concentrate was done by the sample foreman, who panned the rejected portions of the tailing to see that no tin was lost. Two composite samples of all concentrates above and below average weights were made for each creek. Tin analyses for the two composite samples were used for reducing weights of concentrates to weights of tin. Table 1 summarizes the results of concentrate analyses.

TABLE 1. - Tin Analyses of Composite Placer Samples

(Analysis at Bureau of Mines Laboratory, Rolla, Mo.)

Source of sample	Tin, percent
Boulder Creek composite of samples under 1.50 oz.	46.45
Boulder Creek composite of samples over 1.50 oz.	59.77
First Chance Creek composite of samples under 0.45 oz. (under average)	56.60
First Chance Creek composite of samples over 0.45 oz. (above average)	62.25
Cape Creek composite of samples under 0.90 oz. (under average)	54.95
Cape Creek composite of samples over 0.90 oz. (above average).	62.75
Goodwin Creek composite of samples above average	59.80
Goodwin Creek composite of samples below average	57.25

Formulas as used in calculating the churn-drill holes are as follows:

$$\frac{(\text{Wt. of concentrate, grams})(27)\ \text{tin in conc., percent}}{(\text{Volume of P.H.})\ (453.6)} = \text{lb. of tin a cu. yd.}$$

Where, $\frac{27}{453.6} = 0.0595$,

27 = number of cubic feet in a cubic yard,

453.6 = number of grams in 1 pound avoidupois.

The term "pay horizon" (P.H.) used herein is the vertical section of each drill hole in which concentratable tin was found.

The term "mining section" (M.S.) is used herein to designate the material in the vertical section of each drill hole that would be sluiced to obtain an efficient recovery of tin concentrate. The mining section, in this case, includes all the gravel and a minimum of 1-foot of bedrock.

The value of the mining section for each drill hole was calculated as follows:

$$\frac{(\text{Depth of P.H.})(\text{lb. of tin a cu. yd. in pay horizon})}{(\text{Depth of M.S.})} = \text{lb. of tin a cu. yd. M.S.}$$

Where casing was used, the area of the drive shoe was used to calculate volumes. No adjustments of thawed volumes to frozen volumes were made. Water measured volumes were used for calculating frozen holes.

APPENDIX I

TABLE 3. - Summary of Drilling Results

CAPE CREEK
(Fig. 2)

Line number	Hole number	Total depth, feet	Over-burden, feet	Gravel, feet	P.H., feet	Bedrock M.S., feet	M.S., feet	Tin in conc., percent	Conc. a cu. yd., lb.	Tin a cu. yd., lb.	Thawed or frozen
1A	1	8.5	5.0	2.0	1.0	1.0	3.0	54.95	0.19	0.10	Th.
	2	11.0	.0	9.5	10.0	1.0	10.5	62.75	1.11	.70	Th.
1	1	7.75	5.0	.0	.0	.0	.0	.00	.00	.00	Fr.
	2	5.0	.0	3.0	3.0	1.0	4.0	54.95	.23	.13	Th.
	3	7.5	.0	4.5	3.0	1.0	5.5	54.95	.55	.30	Th.
	4	10.0	.0	8.5	8.0	1.0	9.5	62.75	1.80	1.13	Th.
	5	18.0	2.5	14.5	14.0	1.0	15.5	62.75	3.74	2.35	Th.
	6	20.5	2.5	17.0	13.5	1.0	18.0	54.95	.39	.21	Th.
2	1	13.0	3.0	8.0	9.0	1.0	9.0	54.95	.23	.13	Th.
	2	17.5	8.5	7.5	5.5	1.0	8.5	62.75	24.82	15.57	Th.
	3	19.5	12.5	4.5	4.5	1.0	5.5	62.75	6.69	4.20	Th.
	4	20.0	3.0	16.0	9.0	1.0	17.0	54.95	.38	.21	Th.
3	1	25.0	3.0	21.0	17.0	1.0	22.0	54.95	.42	.23	Th.
	2	24.0	4.0	18.5	18.0	1.0	19.5	54.95	.37	.20	Th.
	3	24.2	2.0	22.0	16.0	1.0	23.0	62.75	.53	.33	Th.
4	4	35.0	3.5	7.0	6.0	1.0 clay	8.0	62.75	2.87	1.80	Th.
	5	22.0	1.0	5.0	5.5	1.0 clay	6.5	54.95	.83	.46	Th.
	6	14.5	3.0	3.0	3.0	1.0 clay	4.0	54.95	.44	.24	Th.
	7	12.0	6.0	5.0	.0	.0	.0		Trace	.00	Fr.

TABLE 3. - Summary of Drilling Results (Cont'd.)

CAPE CREEK
(Fig. 2 - cont'd.)

Line number	Hole number	Total depth, feet	Over-burdern, feet	Gravel, feet	P.H., feet	Bedrock M.S., feet	M.S., feet	Tin in conc., percent	Conc. a cu. yd., lb.	Tin a cu. yd., lb.	Thawed or frozen
5	1	16.5	.0	15.5	11.0	1.0	16.5	54.95	.42	.23	Fr.
	2	14.5	4.5	7.5	7.5	1.0	8.5	62.75	1.99	1.25	Fr.
	3	14.0	3.0	9.5	7.0	1.0	10.5	62.75	1.04	.65	Th.
	4	16.5	3.5	8.5	12.0	3.5	12.0	62.75	1.11	.70	Fr.
	5	13.0	4.0	8.0	7.0	1.0	9.0	54.95	.27	.15	Th.
6	1	20.0	4.5	14.0	14.5	1.0	15.0	62.75	2.64	1.65	Th.
	2	23.2	3.5	17.5	17.25	1.0	18.5	62.75	3.28	2.06	Fr.
	3	13.5	7.0	5.5	5.5	1.0	6.5	54.95	.33	.18	Th.

TABLE 4. - Summary of Drilling Results

GRANITE CREEK
(Fig. 3)

Line number	Hole number	Total depth, feet	Over-burden feet	Gravel, feet	P.H., feet	Bedrock M.S., feet	M.S., feet	Tin in conc., percent	Conc. a cu. yd., lb.	Tin a cu. yd., lb.	Thawed or frozen
1	1 RL	8.0	0.0	7.0	0.0	0.0	0.0		0.0	0.0	Th.
	2 RL	9.0	.0	8.0	.0	.0	.0		.0	.0	Th.
	3 RL	8.5	.0	5.0	.0	.0	.0		.0	.0	Fr.
	4 RL	6.5	5.0	.0	.0	.0	.0		.0	.0	Th.
	1 LL	10.5	.0	10.0	.0	.0	.0		Tr.	.0	Th.
	2 LL	8.5	.0	8.0	.0	.0	.0		Tr.	.0	Th.
	3 LL	7.0	.0	6.5	.0	.0	.0		.0	.0	Th.
	4 LL	6.5	3.0	2.0	.0	.0	.0		.0	.0	Th.
2	1 LL	10.5	.0	8.5	.0	.0	.0		Tr.	.0	Fr.
	2 LL	9.0	5.0	3.0	.0	.0	.0		Tr.	.0	Th.
	1 RL	18.0	4.0	3.0	.0	.0	.0		.0	.0	Fr.
	2 RL	6.5	6.0	.0	.0	.0	.0		.0	.0	Fr.
3	1 RL	6.5	4.0	2.0	.0	.0	.0		.0	.0	Fr.
	2 RL	10.0	5.5	4.0	.0	.0	.0		Tr.	.0	Fr.
	1 LL	9.5	4.5	4.0	.0	.0	.0		Tr.	.0	Fr.
	2 LL	10.0	5.0	4.0	.0	.0	.0		Tr.	.0	Fr.
	3 LL	11.0	7.0	3.0	.0	.0	.0		.0	.0	Fr.
4	1 RL	11.0	2.0	7.0	.0	.0	.0		Tr.	.0	Fr.
	1 LL	8.0	.0	7.0	.0	.0	.0		Tr.	.0	Fr.
	2 LL	14.5	4.0	3.0	.0	.0	.0		.0	.0	Fr.
	3 LL	9.0	4.0	4.0	.0	.0	.0		.0	.0	Fr.

TABLE 5. - Summary of Drilling Results

GOODWIN CREEK
(Fig. 4)

Line number	Hole number	Total depth, feet	Over-burden, feet	Gravel, feet	Bedrock P.H., feet	Bedrock M.S., feet	M.S., feet	Tin in conc., percent	Conc. a cu. yd., lb.	Tin a cu. yd., lb.	Thawed or frozen
1	1	6.5	4.5	0.0	1.0	1.0	5.5	57.25	0.05	0.03	Th.
	2	7.6	3.0	.0							Fr.
	3	6.5	3.0	2.0	2.5	1.0	3.0	59.80	12.95	7.74	Th.
	4	6.0	3.0	.0	.0	.0	.0		Tr.	.00	Fr.
	5	4.0	3.0	.0	.0	.0	.0		Tr.	.00	Th.
2	1	5.0	.0	4.0	4.0	1.0	5.0	57.25	.16	.09	Th.
	1.5	6.0	3.0	2.0	.0	.0	.0		Tr.	.00	Fr.
	2	9.0	3.0	4.0	.0	.0	.0		Tr.	.00	Fr.
	3	9.2	6.0	2.0	.0	.0	.0		.00	.00	Fr.
	4	11.0	10.0	.0	.0	.0	.0		.00	.00	Fr.
3	1	12.0	9.0	1.0	.0	.0	.0		Tr.	.00	Fr.
	2	11.5	7.0	4.0	2.0	1.0	5.0	57.25	1.60	.92	Fr.
	3	7.0	.0	4.0	4.0	1.0	5.0	59.80	4.24	2.54	Fr.
	4	7.5	2.0	3.0	3.0	1.0	4.0	57.25	.23	.13	Th.
4	1	10.0	2.5	.0	.0	.0	.0		Tr.	.00	Fr.
	2	7.5	3.5	2.0	.0	.0	.0		Tr.	.00	Fr.
	3	7.5	3.5	2.0	.0	.0	.0		Tr.	.00	Th.
5	1	7.5	3.5	2.0							Fr.
	2	9.0	4.0	3.0	.0	.0	.0		Tr.	.00	Fr.
	3	9.0	.0	7.0	.0	.0	.0		Tr.	.00	Th.
	4	7.0	4.0	2.0	.0	.0	.0		Tr.	.00	Th.
6	1	7.0	2.0	3.0	3.0	1.0	4.0	57.25	.45	.26	Th.
	2	10.0	2.5	5.5	.0	.0	.0		Tr.	.00	Th.
	3	9.0	5.0	3.0	2.0	1.0	4.0	57.25	.73	.42	Fr.

TABLE 6. - Summary of Drilling Results

BOULDER CREEK
(Fig. 5)

Line number	Hole number	Total depth, feet	Over-burden, feet	Gravel, feet	P.H., feet	Bedrock M.S., feet	M.S., feet	Tin in conc., percent	Conc. a cu. yd., lb.	Tin a cu. yd., lb.	Thawed or frozen
1	3 RL	13.8	4.0	8.2	6.5	1.2	9.5	46.45	0.91	0.42	Th.
	2 RL	14.5	3.5	9.5	6.5	1.0	10.5	59.77	3.30	1.98	Th.
	1 RL	13.5	3.0	8.0	6.2	1.0	9.0	59.77	2.19	1.31	Th.
	0	8.0	.0	4.5							
	1 LL	9.6	2.0	6.0	4.0	1.0	7.0	46.45	.85	.39	Th.
2	3 RL	16.6	9.0	6.6	6.6	1.0	7.6	46.45	.65	.30	Th.
	2 RL	17.5	5.0	10.0	9.5	1.0	11.0	59.77	4.84	2.89	Th.
	1 RL	18.3	2.5	13.0	12.8	1.0	14.0	59.77	1.88	1.12	Th.
	0	16.0	.0	15.0	12.00	1.0	16.0	59.77	1.33	.79	Th.
	1 LL	14.8	3.0	10.0	9.5	1.0	11.0	46.45	.12	.05	Th.
	2 LL	9.2	3.0	5.6	3.2	1.0	6.6	46.45	.22	.10	Th.
2-1/2	1	16.3	2.5	12.5	10.0	1.0	13.5	46.45	1.17	.54	Th.
3	5 RL	19.5	10.5	7.0	7.0	1.0	8.0	46.45	.93	.43	Th.
	4 RL	21.5	6.0	14.0	12.0	1.0	15.0	59.77	1.40	.84	Th.
	3 RL	19.2	3.0	15.0	15.0	1.0	16.0	59.77	1.56	.93	Th.
	2 RL	24.0	3.5	19.5	18.5	1.0	20.5	46.45	.47	.22	Th.
	1 RL	16.3	2.0	13.0	14.0	1.0	14.0	46.45	1.07	.50	Th.
	0	16.5	.0	14.5	14.5	1.0	15.5	59.77	1.58	.94	Th.
	1 LL	16.0	.0	13.0	13.0	1.0	14.0	46.45	.64	.30	Th.
4	1	20.2	5.0	14.2	4.5	1.0	15.0	46.45	.42	.20	Th.
	2	22.3	6.0	15.6	13.6	1.0	17.0	46.45	.60	.29	Th.
	3	27.0	4.0	23.0	18.0		23.0	59.77	.84	.50	Th.
	4	23.5	.0	21.0	22.0	1.0	22.0	59.77	2.35	1.40	Th.
	5	21.5	.0	21.5	21.5	1.0	22.5	59.77	1.70	1.02	Th.
	6	19.5	2.0	17.5	17.5	1.0	18.5	59.77	1.59	.95	Th.
	7	18.6	4.0	14.0	10.0	1.0	15.0	59.77	1.59	.95	Th.

TABLE 7. - Summary of Drilling Results

VILLAGE CREEK
(Fig. 6)

Line number	Hole number	Total depth, feet	Over burden, feet	Gravel, feet	P.H., feet	Bedrock M.S., feet	M.S., feet	Tin in conc., percent	Conc. a cu. yd., lb.	Tin a cu. yd., lb.	Thawed or frozen
1	1 RL	24.0	3.0	20.0	18.0	1.0	21.0		0.18		Th.
	0	22.5	.0	21.5	21.5	1.0	22.5		.24		Th.
	1 LL	22.5	5.0	16.0	17.0	1.0	17.0		.33		Th.
2	0	16.0	.0	15.5	9.0	1.0	16.5		.10		Th.
	1 LL	15.0	.0	13.0	12.0	1.0	14.0		.12		Th.
	2 LL	14.0	4.0	8.0	9.0	1.0	9.0		.35		Th.
3	0	12.0	.0	11.0	11.0	1.0	12.0		.16		Th.
	1 LL	18.0	7.0	10.0	10.0	1.0	11.0		.20		Th.
	2 LL	15.0	14.0	.0	.0	.0	.0		.00		Fr.
4	0	13.0	.0	12.0	12.0	1.0	13.0		.09		Th.

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