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BUREAU OF MINES
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REPORT OF INVESTIGATIONS

INVESTIGATION OF THE TOZIMORAN CREEK TIN PLACER
DEPOSITS, FORT GIBBON DISTRICT, ALASKA



BY

BRUCE I. THOMAS AND W. S. WRIGHT

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By Bruce I. Thomas^{2/} and W. S. Wright^{3/}

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INTRODUCTION AND SUMMARY

The occurrence of tin-bearing gravels along Tozimoran Creek in central Alaska has been known for a number of years.

^{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 Investigation 4323."

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In September 1944 the Bureau of Mines investigated an area approximately 1,000 feet long and 200 feet wide along Tozimoran Creek to determine the cassiterite content of the stream gravels, which are about 4 feet deep and covered by 3 feet of overburden. Nine trenches and two shafts were excavated, from which samples of the underlying gravels were taken.

This report contains a discussion of sampling methods and tables giving the results of analyses.

ACKNOWLEDGMENTS

Special acknowledgment is extended to Martin Webories and I. W. Purkeypille, the owners, who contributed their services and furnished housing and various small tools to expedite the exploratory work.

LOCATION AND ACCESSIBILITY

Tozimoran Creek is in central Alaska at approximately 65° 20' north latitude and 153° west longitude. (See fig. 1.) The headwaters of Tozimoran Creek are accessible from the mouth of Grant Creek, a tributary on the north side of the Yukon River 30 miles downstream from Tanana. A tractor trail extends 4 miles up Grant Creek to the Fisher and Fisher mine; from there, a pack trail about 12 miles long follows a ridge into the headwaters of Tozimoran Creek, as shown in figure 2. With some relocation and a considerable amount of work, this trail could be made into a passable tractor road.

The closest settlement is Tanana, which is approximately 40 airline miles southeast of Tozimoran. Tanana has a population of about 150 people - 50 whites and 100 Indians. It has two general stores, a roadhouse, an airfield capable of accommodating large airplanes, a Territorial school, a government-operated hospital, and a church.

Freight is brought in from the coast by railroad to Nenana, thence by river boat to Tanana, and thence to Grant Creek. In winter travel is dog team or airplane. Planes land on the ice on Yukon River at the mouth of Grant Creek. In summer pontoon-equipped airplanes land on the river, or wheel-equipped planes land on a gravel bar in the center of the river 3 miles below the mouth of Grant Creek.

PHYSICAL FEATURES AND CLIMATE

Tozimoran Creek is a northeast-flowing tributary of the Tozitna River about 12 miles long, and in its upper bed flows in a narrow alluvium-filled valley. The region is one of considerable relief; most of the ridges attain an altitude of more than 2,000 feet, whereas the domes rise to more than 3,000 feet. The tin deposit lies near the headwaters of the creek at an altitude of approximately 800 feet.

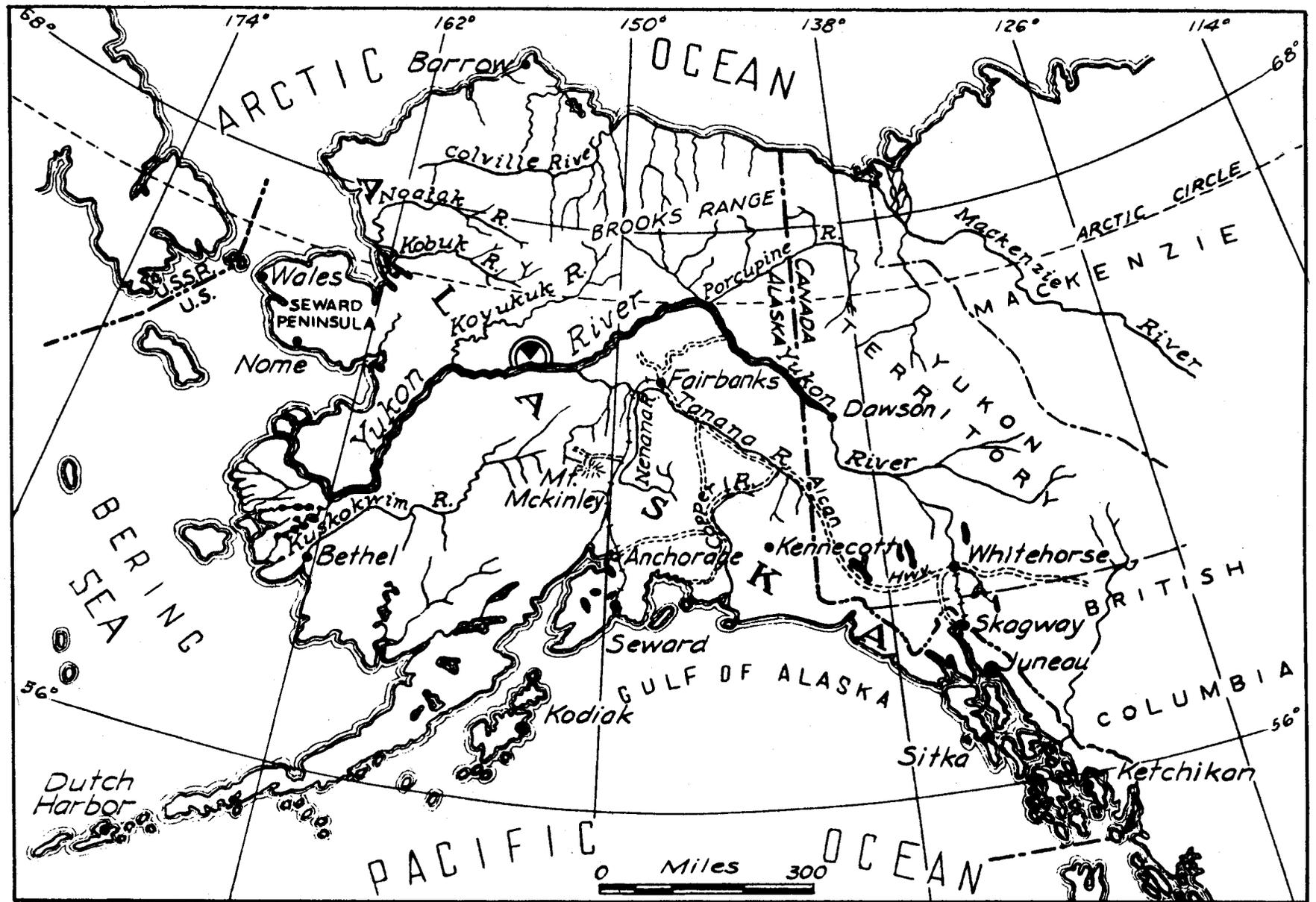


Figure 1. - Index map showing location of Tozimoran Creek.

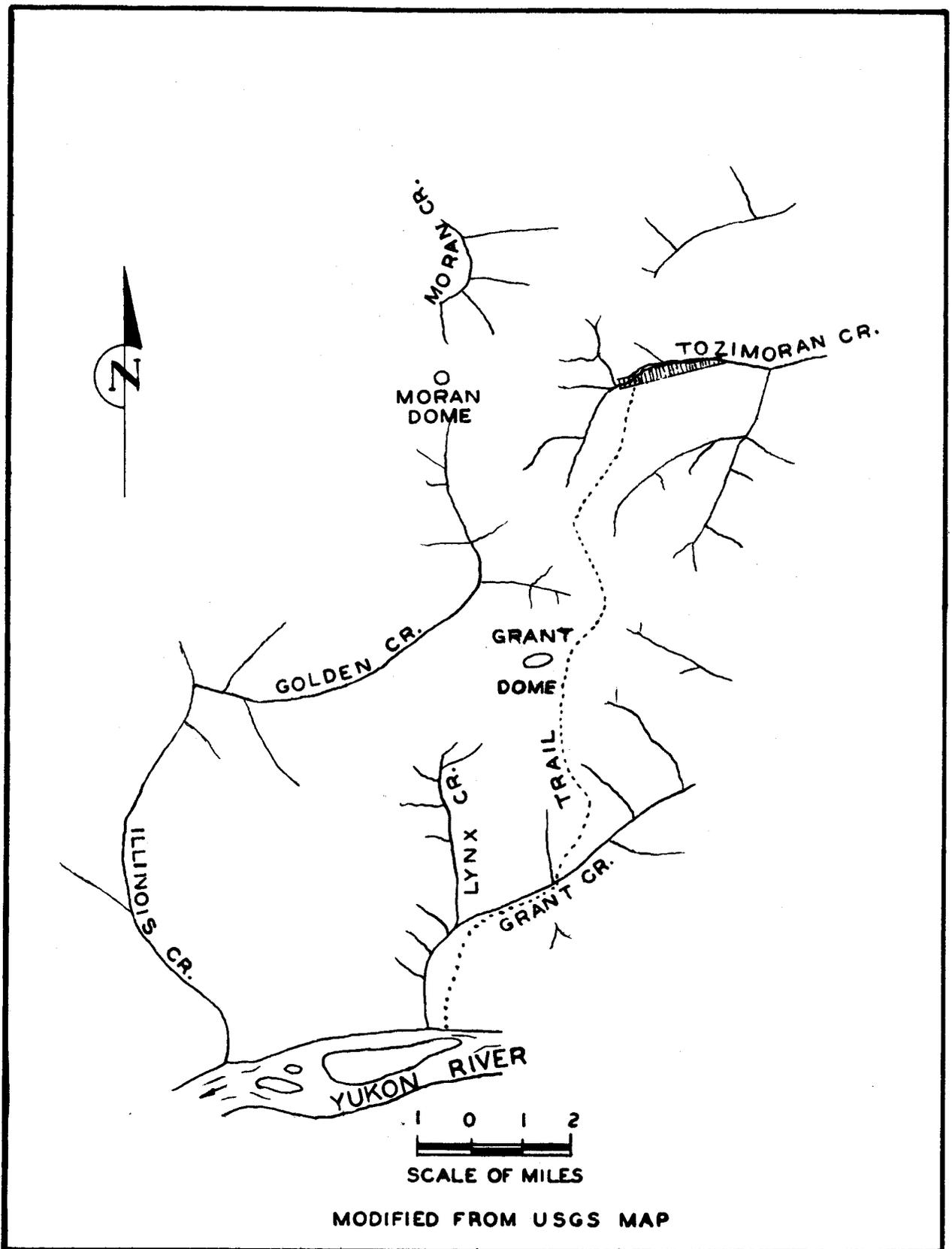


Figure 2. - Tozimoran Creek area, Alaska.

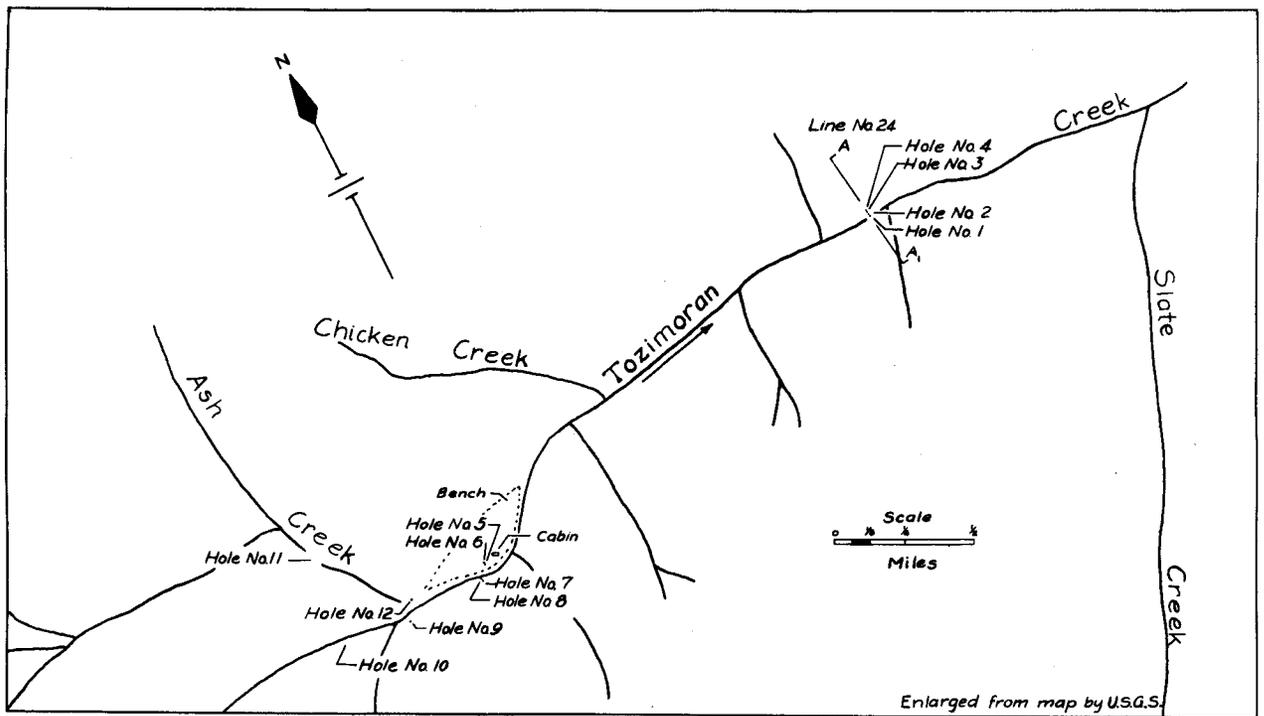


Figure 3. - Shaft holes, Tozimoran Creek, Alaska.

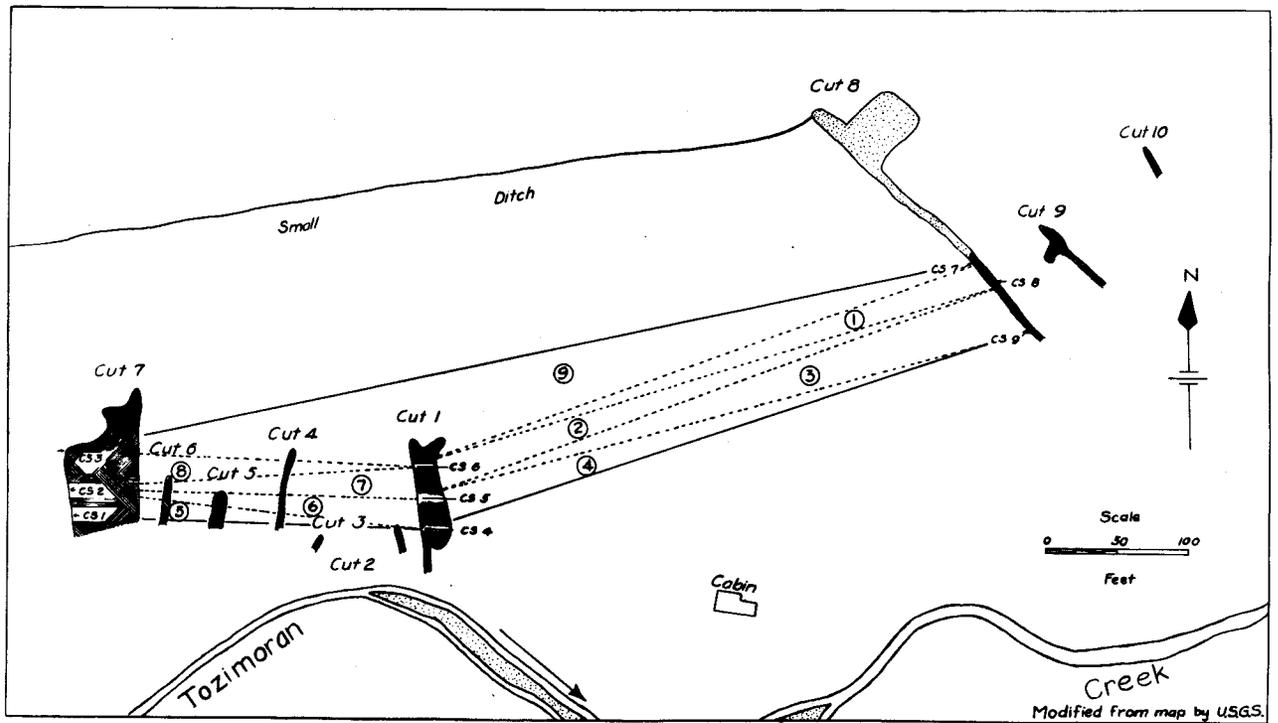


Figure 4. - Old open cut workings on bench, Tozimoran Creek, Alaska.

The climate of the region is typical of central Alaska; winters are long and cold and summers short and relatively warm. The temperature ranges from minus 70° F. in winter to 90° F. or higher in summer, and the annual mean is about 23° F. A large portion of the alluvial deposits is permanently frozen, as the surface thaws only a few feet during the summer. However, in places on Tozimoran Creek circulating ground water has thawed the ground for a considerable distance from the present stream banks.

The valley floor is covered by brush and an occasional stand of small spruce suitable for mine and camp use. The ridges rise well above timber line and are barren except for scattered patches of scrubby brush.

HISTORY AND PRODUCTION

Placer gold was discovered on Tozimoran Creek in 1902; many prospectors and miners visited the district since the discovery of gold, but not enough of this metal was found to warrant mechanized mining. Up until 1938, prospecting in the area was intermittent. Claims were staked, allowed to lapse, and were then restaked by others. During this period a small amount of hand mining was done on a left-limit bench of Tozimoran Creek 2,000 feet downstream from Ash Creek, a headwater tributary (see fig. 3).

Since 1938, the upper tin-bearing portion of Tozimoran Creek has been held by two partners, who have carried on intermittent handmining on the bench and at various times prospected on various parts of the creek.

The total production for the creek has probably been not more than a few ounces of gold and a few hundred pounds of tin.

PROPERTY AND OWNERSHIP

Eighteen 40-acre association placer claims covering the tin-bearing area are held by partners I. W. Purkeypile, of Fairbanks, Alaska, and Martin Webories, of Tanana, Alaska. All these claims are recorded at the Fort Gibbon recording office at Tanana, Alaska.

WATER SUPPLY

Tozimoran Creek contains enough water for a small placer mining operation. During low stages it is estimated that approximately 400 miner's inches of water flows through the tin-bearing area. Water measurements made by the Bureau of Mines during a high stage show a flow of 4,200 miner's inches in the vicinity of the tin deposit.

One small ditch excavated several years ago supplies water for hand-mining on the bench. This ditch is too small to furnish water for a mechanized operation.

OCCURRENCE OF DEPOSITS

The principal tin-bearing area on Tozimoran Creek is a bench 1,000 feet long and 200 feet wide on the north side of Tozimoran Valley downstream from the mouth of Ash Creek (see fig. 3). Tin, in the form of cassiterite, and gold are found in the gravels on this bench. Small amounts of tin and gold occur in the gravels of the valley floor downstream from the bench.

The hills on the south side of the valley rise steeply, but to the north they slope more gently, indicating the presence of a higher bench. This latter bench begins near the confluence of Ash and Tozimoran creeks and extends 3 miles down Tozimoran Valley.

The bedrock in the tin-bearing area of the bench and in the valley floor consists of quartz mica schist and appears to have a fairly even surface.

There are no known tin lode deposits in the district, and the exact source of the placer tin has not been determined.

CHARACTER OF DEPOSITS

The tin-bearing gravels on the bench are about 4 feet deep and are covered with muck to an average depth of 3 feet. Along the margins of the bench the muck and gravels are thawed, but back from the margins both are permanently frozen. The muck, consisting of organic matter, some fine sand, and clay is overlain by a thin mantle of moss. The gravel is fairly coarse and contains many boulders over 2 feet in diameter. Very little clay is found in the upper portions of the gravel, but near bedrock a considerable quantity is found.

The gravel in the valley floor is also overlain with moss and muck. The muck is frozen, but the underlying gravels are thawed. Along the outer rim of the valley some of the gravel is frozen, but this condition seems to exist only along the margins of the alluvium. Unlike the bench gravel, considerable clay is found in the upper portions as well as near bedrock. The size of material is comparable to that found on the bench.

On the bench cassiterite, associated with gold and the heavy minerals magnetite and limonite, is concentrated in the gravels 2 feet above bedrock, but in the valley floor these minerals are sparsely disseminated in the upper gravels and concentrated in the last 5 feet above bedrock. In no case do these minerals appear to penetrate the bedrock for more than 6 inches.

The cassiterite is 1/16 to 1-1/2 inches in diameter; however, the largest percentage is found in the smaller sizes.

SAMPLING

During the preliminary examination, two methods of sampling were used. Channel samples were cut through exposed pay sections of gravel in open cuts on the bench, and shaft holes were sunk in the gravel of the valley floor.

Channel Sampling

Nine channel samples were cut at convenient locations along the banks of the open cuts on the bench (see fig. 4). Prior to cutting samples all sloughed material was cleaned away from the face of the banks to expose virgin gravel. Small samples were panned from various depths in the gravel to determine the pay horizon. When the pay horizon had been established, the barren upper gravel was excavated and a channel was cut through the pay horizon only.

Each channel was measured after it was cut. All material cut from the channel was weighed, and a loose volume measurement was made. The entire sample was run through a rocker, from which a concentrate was recovered. Gold was extracted from the concentrate and weighed, and the remaining concentrate was weighed and analyzed for its tin content.

Table 1 is a summary of tin-concentrate analyses, and table 2 is a compilation of channel sampling data.

TABLE 1. - Summary of tin concentrate analysis from channel samples

Sample	Percent tin	Sample	Percent tin
C.S. 1	45.37	C.S. 5	27.82
2	57.13	6	51.83
3	62.26	7	60.11
4	32.29	8	15.40
		9	23.85

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TABLE 2. - Calculated tin and gold content

Sample	Depth, feet			Depth pay horizon, feet	Measured volume loose, cubic feet	Calculated volume, cubic feet	Weight of sample, pounds	Weight of tin concentrate, grams	Weight of gold, mg.
	Muck	Gravel	Bedrock						
1	1.0	4.5	0.5	3.0	4.8	4.32	529	156.2	143.18
2	3.0	4.0	.5	2.5	1.4	1.60	149	59.9	122.03
3	3.0	4.5	.5	3.1	2.2	1.86	207	196.5	214.40
4	1.0	3.5	.5	3.0	1.9	1.68	213	22.8	32.51
5	3.0	4.5	.5	3.9	3.0	2.81	348	36.9	4.68
6	4.0	5.0	.5	3.1	2.0	1.54	231	37.5	126.30
7	2.0	2.5	.5	2.0	1.3	.96	126	51.6	19.02
8	3.5	1.5	.6	2.1	2.4	1.26	265	13.0	7.55
9	1.5	1.0	.8	1.3	1.0	.78	115	16.1	2.27

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Shaft Sampling

Two shaft holes 50 feet apart on line 24, 1-1/2 miles below the bench, were sunk in a narrow portion of the valley floor. A small section of the valley floor was frozen sufficiently to permit sinking open shaft holes at this location. An attempt was made to sink two more holes in order to crosscut the valley at this point, but ground water prevented attaining a depth over 4 feet, so they were abandoned.

A small prospect boiler was used during thawing of frozen muck and gravel. The pay gravels were washed in a rocker, and the gold was extracted from the recovered concentrate. The remaining concentrate was weighed and then analyzed for tin content. Table 3 is a summary of tin concentrate analyses.

TABLE 3. - Summary of tin concentrate analyses from shaft-hole samples

<u>Hole</u>	<u>Percent tin</u>
3	52.16
4	49.02

The pay gravel was extracted in sections approximately 2 feet deep. The material from each section was measured in a volume bucket, and the size of the hole at each section was measured with a tape. In order to recover all the cassiterite, the pay gravel was washed through the rocker twice.

The logs of each shaft hole are shown in tables 4 and 5.

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TABLE 4. - Log of shaft holes, Tozimoran Creek, Alaska
Hole 3, line 24

Depth, feet	Measured volume loose, cubic feet	Calculated volume, cubic feet	Weight of tin concentrate, grams	Weight of gold, mg.	Remarks
1			0		Moss
3			0	0	Frozen muck; some sand top of gravel 5.0 ft.
6			0	0	Frozen fine gravel and sand.
10			0	0	Frozen coarse gravel; some clay schist and quartz.
11			0	0	Frozen, coarse gravel, sand, and some clay.
12	21.34	12.4	120	91.29	Frozen, coarse gravel, much clay, some sand.
13	22.42	10.8	69	46.32	Frozen, coarse gravel, much clay many small boulders.
16.2	35.40	27.0	431	323.30	Top bedrock 16.0 ft; bedrock decomposed schist.
16.5			0	0	Decomposed schist (gray color).
	79.06	50.2	620	460.91	

Depth: Moss..... 1.0
Muck..... 4.0
Gravel..... 11.0
Bedrock..... 0.5
Total 16.5

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TABLE 5. - Log of shaft holes, Tozimoran Creek, Alaska
Hole 4, line 24

Depth, feet	Measured volume loose, cubic feet	Calculated volume, cubic feet	Weight of tin concentrate, grams	Weight of gold, mg.	Remarks
1					Moss.
5.5					Frozen muck; top gravel 5.5 ft.
11.2			0	0	Frozen medium gravel and sand.
13.2	30.68	25.1	163	160.04	Frozen, coarse gravel; some sand and clay.
15.2	23.60	13.9	57	24.55	Frozen, coarse gravel, and much clay.
17.0	21.24	15.8	310	237.00	Frozen, coarse gravel; many boulders and much clay.
17.6	24.78	15.6	204	34.25	Frozen, coarse gravel; many boulders and much clay; top bedrock 17.7 ft.
18.2			0	0	
	100.3	70.4	734	455.84	

Depth: Moss..... 1.0
Muck..... 4.5
Gravel..... 12.1
Bedrock..... 0.6
Total 18.2

Attempts were made to sink shaft holes at eight other locations on upper Tozimoran Creek and its upper tributaries, but excessive ground water prevented reaching bedrock (see fig. 3). One of these shaft holes, near the mouth of Ash Creek, was sunk 12 feet before it was abandoned. Table 6 lists each shaft hole and shows the depths attained.

TABLE 6. - Depths of abandoned shafts

<u>Hole</u>	<u>Depth abandoned, feet</u>
1	4.5
2	4.0
5	4.0
6	5.0
7	6.0
8	6.5
9	4.5
10	3.5
11	3.0
12	12.0

Channel-Sample Summary

The examination indicated a tin-bearing area approximately 650 feet long and 80 feet wide, which constitutes a portion of the bench below Ash Creek. The sampled block averages 0.731 pound tin and 0.0228 ounce gold per cubic yard. Table 7 is a summary of channel-sample results.

TABLE 7. - Summary channel-sample results

<u>Sample</u>	<u>Depth mining section, feet</u>	<u>Pounds tin per cubic yard</u>	<u>Ounces gold per cubic yard</u>	<u>Depth muck section, feet</u>
C.S. 1	5.5	0.536	0.01390	1.0
2	5.0	.630	.02950	3.0
3	5.5	2.190	.05030	3.0
4	4.5	.170	.00950	1.0
5	5.5	.150	.00090	3.0
6	6.0	.400	.03300	4.0
7	3.5	1.100	.00860	2.0
8	2.5	.079	.00390	3.5
9	2.0	.190	.00140	1.5

The tin content of gravel in the valley floor below the bench was not estimated. The two shaft holes (numbers 3 and 4, at line 24) were in a narrow portion of the valley. The results of the sampling from these two holes do not indicate the presence of a paystreak. Table 8 is a summary of shaft-hole sampling results.

TABLE 8. - Summary of shaft hole sampling results

Hole	Depth mining section, feet	Pounds tin per cubic yard	Ounces gold per cubic yard	Depth muck section, feet
3	12.0	0.197	0.0031	5.0
4	13.1	.146	.0029	5.5