Bureau of Mines
Report of Investigations 4719

INVESTIGATION OF MERCURY DEPOSITS, CINNABAR CREEK AREA, GEORGETOWN AND AKIAK DISTRICTS, KUSKOKWIM REGION, SOUTHWESTERN ALASKA

BY F. A. RUTLEDGE

United States Department of the Interior — November 1950

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UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary
BUREAU OF MINES
James Boyd, Director

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INVESTIGATION OF MERCURY DEPOSITS, CINNABAR CREEK AREA, GEORGETOWN AND AKIAK DISTRICTS, KUSKOKWIM REGION, SOUTHWESTERN ALASKA

by

F. A. Rutledge[1]/

CONTENTS

ILLUSTRATIONS

1/ Mining engineer, Juneau, Alaska.

INTRODUCTION AND SUMMARY

Mercury deposits were discovered in 1941 in the sedimentary rocks of the Cinnabar Creek area, near the head of the Holitna River drainage in southwestern Alaska, by Russell Schaefer and Harvey Winchell of Sleitmut, Alaska. High-grade float was found in both Canary Gulch and Cinnabar Gulch, and indications of other deposits were found in Alder and Broken Shovel Gulches. Schaefer and Winchell's exploration in 1942 and 1943 revealed placer deposits of cinnabar along Canary Gulch. During prospecting on Canary Gulch, 3,600 pounds of ore was recovered from the detrital material on the Lucky Day lode at the head of the gulch. When retorted, this ore was reported by the owners to have produced 26 flasks of quicksilver.

During the summer of 1943, Wallace M. Cady and Charles A. Hickcox, of the U. S. Geological Survey, spent 4 weeks mapping and investigating the area.2/ Bruce I. Thomas and Harold C. Pierce, mining engineers of the Bureau of Mines, examined and sampled several deposits in September 1943. Following their preliminary examination, in view of the exceptionally high-grade cinnabar present, additional investigation by the Bureau of Mines was recommended. A program of trenching, test pitting, and sampling to delimit the deposits was completed during the summer of 1947 under the direction of the author.

ACKNOWLEDGMENTS

The field investigations of the former Mining Division of the Bureau of Mines in Alaska during this period were under the general direction of R. S. Sanford, acting chief, Alaska Branch.

Chemical analyses included in this report were made at the Salt Lake City Experiment Station of the Bureau of Mines under the general supervision of S. R. Zimmerley, Chief, Salt Lake City Branch, former Metallurgical Division. Analyses were made by H. E. Peterson, metallurgist.

Acknowlegment is made also to Bruce I. Thomas and Harold C. Pierce, mining engineers of the Bureau of Mines, for the preliminary examination of the deposits. Special reference is made to the report by Wallace M. Cady and Charles A. Hickcox of the U. S. Geological Survey.

2/ Cady, Wallace M., Quicksilver Deposits in the Cinnabar Creek Area, Georgetown and Akiak Districts, Southwestern Alaska: U. S. Geol. Survey Preliminary Report, 1944, 7 pp.

Work on the project was greatly facilitated by the help of Russell Schaefer, Sleitmut, Alaska. The author is indebted to Mr. Schaefer for original sampling and sketches, past-production figures, and invaluable assistance during the project.

The data on the results of sampling the mercury placer ground along Cinnabar Gulch by the New York-Alaska Gold Dredging Corp., received through the courtesy of James K. Crowdy, Vice President and Managing Director, is also gratefully acknowledged.

LOCATION AND ACCESSIBILITY

The mercury deposits of the Cinnabar Creek area lie in the southern part of the Georgetown and Akiak districts on the divide between the drainage of the Aniak and Holitna Rivers. Both the Aniak and Holitna Rivers head in the Kilbuck Mountains of Southwestern Alaska and flow north to the Kuskokwim River.

Figure 1 is an index map of Alaska showing the location of the Holitna River area. The mineralized area is on the upper Holitna River, 85 miles by air southwest of Sleitmut, or approximately 200 miles by the water route up the Holitna River and its tributaries (fig. 2). The deposits are near longitude 158° 50' W., latitude 60° 45' N.

At ordinary stages of water during the summer, the Holitna River and its upper tributaries are navigable by small power boats to within 20 miles of the deposits. At moderately high stages of water, the tributaries can be navigated to within 1 mile of the deposits by using a poling boat and outboard motor. The upstream trip from Sleitmut to the area requires a week to 10 days, and the return trip about 4 days. The tributaries of the Holitna River are blocked by numerous beaver dams, which makes progress difficult and slow.

There are no airplane landing strips in the area. A small lake at the head of Gemuk River, within 15 miles of the deposits, is large enough for small float ships. During the examination, ski planes were landed on the divide between Beaver Creek and Gemuk River, about 2 miles northeast from Canary Gulch. If desired, a landing strip could be constructed at this location without excessive cost.

Another means of access into the area is by tractor trails. One trail leads from the head of Cinnabar Creek across the divide and down Waterboat Creek to the Aniak River, where it connects with the tractor trail up the Aniak. This route was used by the New York-Alaska Gold Dredging Corp. when they sampled the placer along Cinnabar Creek in 1943.

For the program of development by the Bureau of Mines, a D-4 tractor was taken from Nogamut, on the Holitna River, to the project area during the spring of 1947. (See fig. 2.) The trip was made on the snow before breakup,

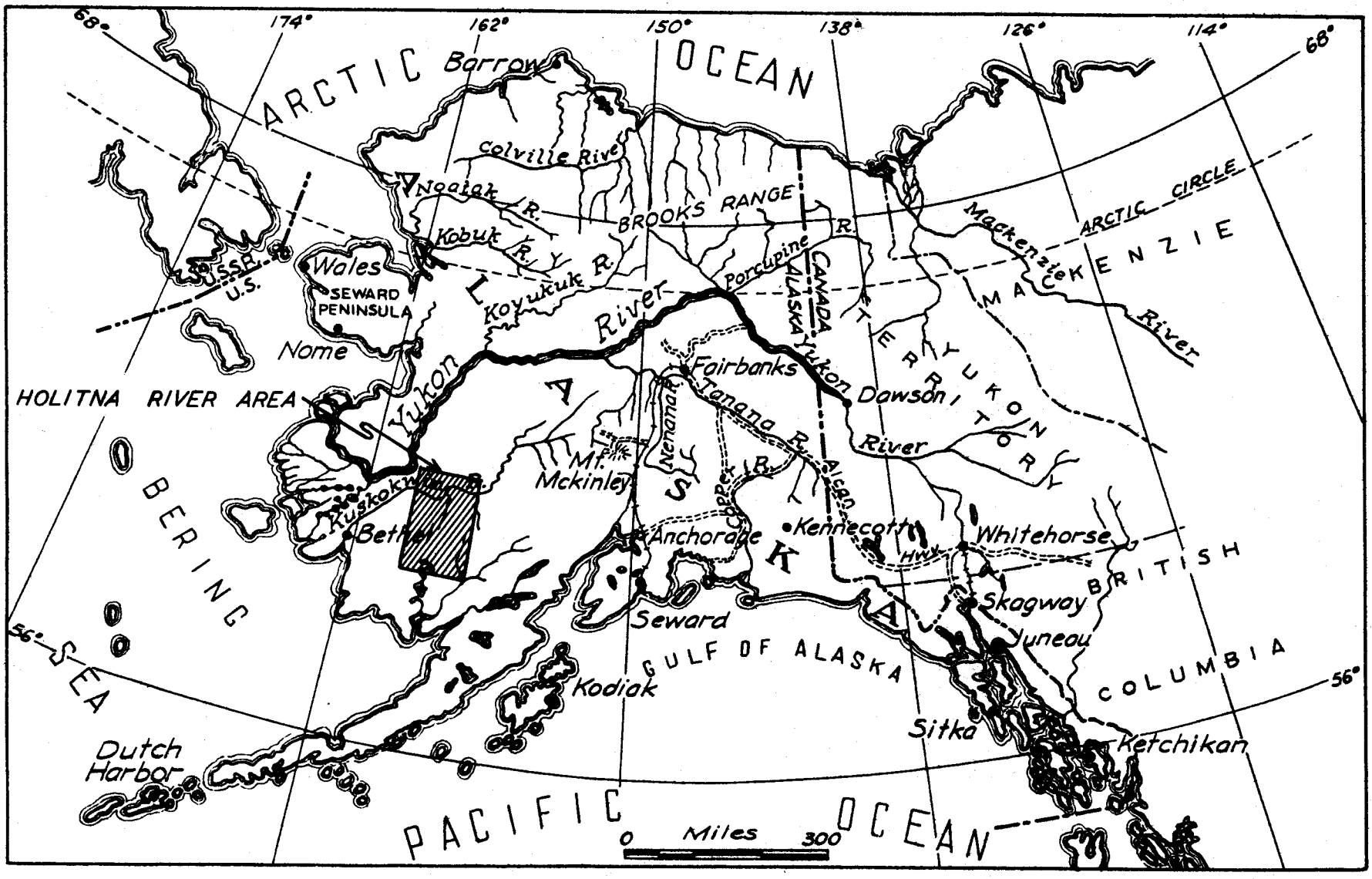


Figure 1. - Index map of Alaska.

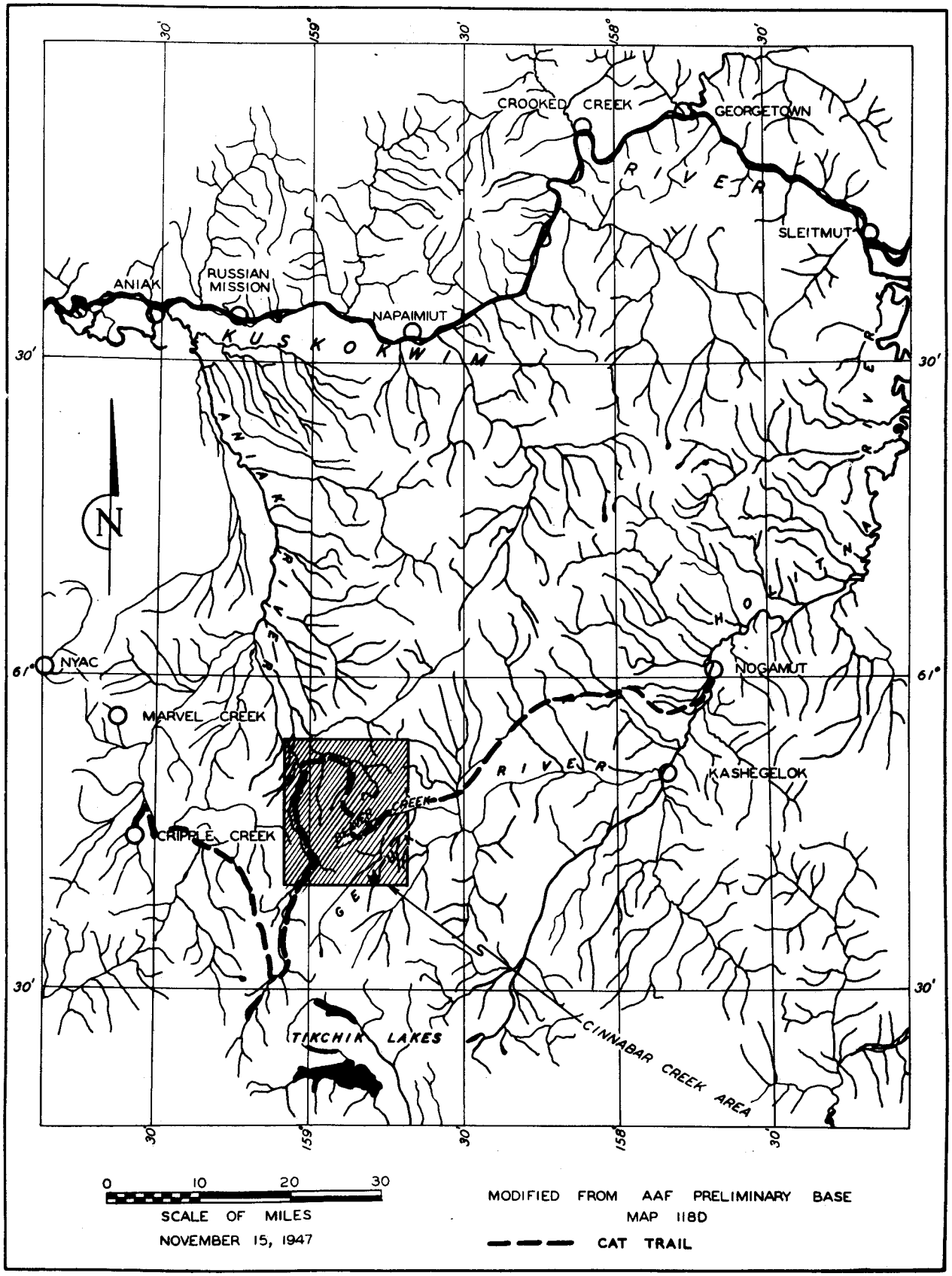


Figure 2. - Holitna River area.

and undoubtedly part of the route along the Holitna River would have been impassable during the summer months. At the close of the project, the equipment was taken to the camp of the Peandori Placer Mining Co. on Cripple Creek. The previously mentioned route made by the New York-Alaska Gold Dredging Corp. was followed to the Aniak River. Unable to cross the Aniak River at this point because of high water, it was necessary to break a new trail up the Aniak nearly to the head of the river before a crossing could be made. The route followed is shown in figure 2. If conditions had been known, it would have been possible to pick a shorter and better route across the divide at the head of Beaver Creek into the Aniak Valley.

PHYSICAL FEATURES AND CLIMATE

The area is characterized by low, moderately rolling hills, but sharp, rocky peaks are conspicuous at a few of the crests. The hills are covered with a mantle of moss, which overlies residual rock material of various thicknesses. The gulches and upper creek valleys that drain the area are above timberline but support a thick growth of alders and scrub willows. The lower valleys support a good stand of spruce.

At the north end of the area is a large butte capped by olivine basalt. Several other similarly capped hills are found in the Aniak Valley west of this area.

Spruce suitable for lumber and mine timbers can be obtained along the divide between Beaver Creek and Gemuk River, 1 to 2 miles east of the Lucky Day lode, and also along the valleys several miles below Canary Gulch. The majority of the trees are 1 to 1-1/2 feet in diameter, and the average height is about 35 feet. The trees, being close to timber line, are heavily branched and taper rapidly and are therefore poor for lumber.

Climatic records from the area are not available. The nearest recording station is at Aniak in the valley of the Kuskokwim River. Here the annual precipitation for the 6 year period ended in 1946 was 19.74 inches, including the moisture from 8 to 10 feet of snow. The mean annual temperature was 27.43° F. As the Cinnabar Creek area is about 1,300 feet higher than Aniak, it is probable that lower temperatures occur at the higher elevation. The "freeze-up" begins in September, and the "break-up" usually occurs around the middle of May.

HISTORY AND PRODUCTION

No organized party had done geological reconnaissance work in the area prior to the summer of 1943, and the upper Holitna River region was virtually unexplored as far as its mineral resources were concerned.

Russell Schaefer and Harvey Winchell of Sleitmut located and sampled the Lucky Day lode in Canary Gulch in the summer of 1941 and also located placer claims on Cinnabar Gulch, Cinnabar Run, and Cinnabar Creek. Float also was discovered in Alder Gulch and Broken Shovel Gulch.

In September 1941 Herschel Landru located the Broken Shovel lode claim on upper Broken Shovel Gulch. He also located placer claims on Cinnabar Creek below those of Schaefer and Winchell. During October of the same year, Kenneth Deleray, engineer for the Bristol Bay Mining Co., sampled the placer deposits of Cinnabar Gulch and the Lucky Day lode deposits. The local names Cinnabar Creek, Cinnabar Run, and Cinnabar Gulch designate, in order, the main creek, the main northern tributary, and its eastern tributary, as shown in figure 3.

During 1942, Schaefer recovered 2,300 pounds of cinnabar ore from detrital material from the Lucky Day lode and from it retorted 15 flasks of mercury. In the spring of 1943, the New York-Alaska Gold Dredging Corp. prospected and sampled the placer deposits on Cinnabar Gulch and Cinnabar Creek. In the summer of the same year, Schaefer recovered an additional 1,300 pounds of cinnabar ore from the residual material of the Lucky Day lode, which yielded 11 flasks of mercury. No ore was taken from the lode itself.

PROPERTY AND OWNERSHIP

The mining rights of all the claims staked in this area were held by three individuals, two of whom were partners. The following tabulation shows the original ownership of these claims and their locations:

Claims staked by Russel R. Schaefer and Harvey Winchell, partners, Sleitmut, Alaska.

Name	Location
Lode Claims	
Lucky Day Discovery	Canary Gulch
Luck Day No. 1	Canary Gulch
Redskin	Alder Gulch
Placer Claims	
Discovery	Cinnabar Gulch
No. 1 Below Discovery	Cinnabar Run
No. 2 Below Discovery	Cinnabar Run
No. 3 Below Discovery	Cinnabar Creek
No. 4 Below Discovery	Cinnabar Creek
No. 5 Below Discovery	Cinnabar Creek

Claims staked by Herschel Landru, Fairbanks, Alaska

Name	Location
Lode Claims	
Broken Shovel	Broken Shovel Gulch
Placer Claims	
No. 6 Below Discovery	Cinnabar Creek
No. 7 Below Discovery	Cinnabar Creek

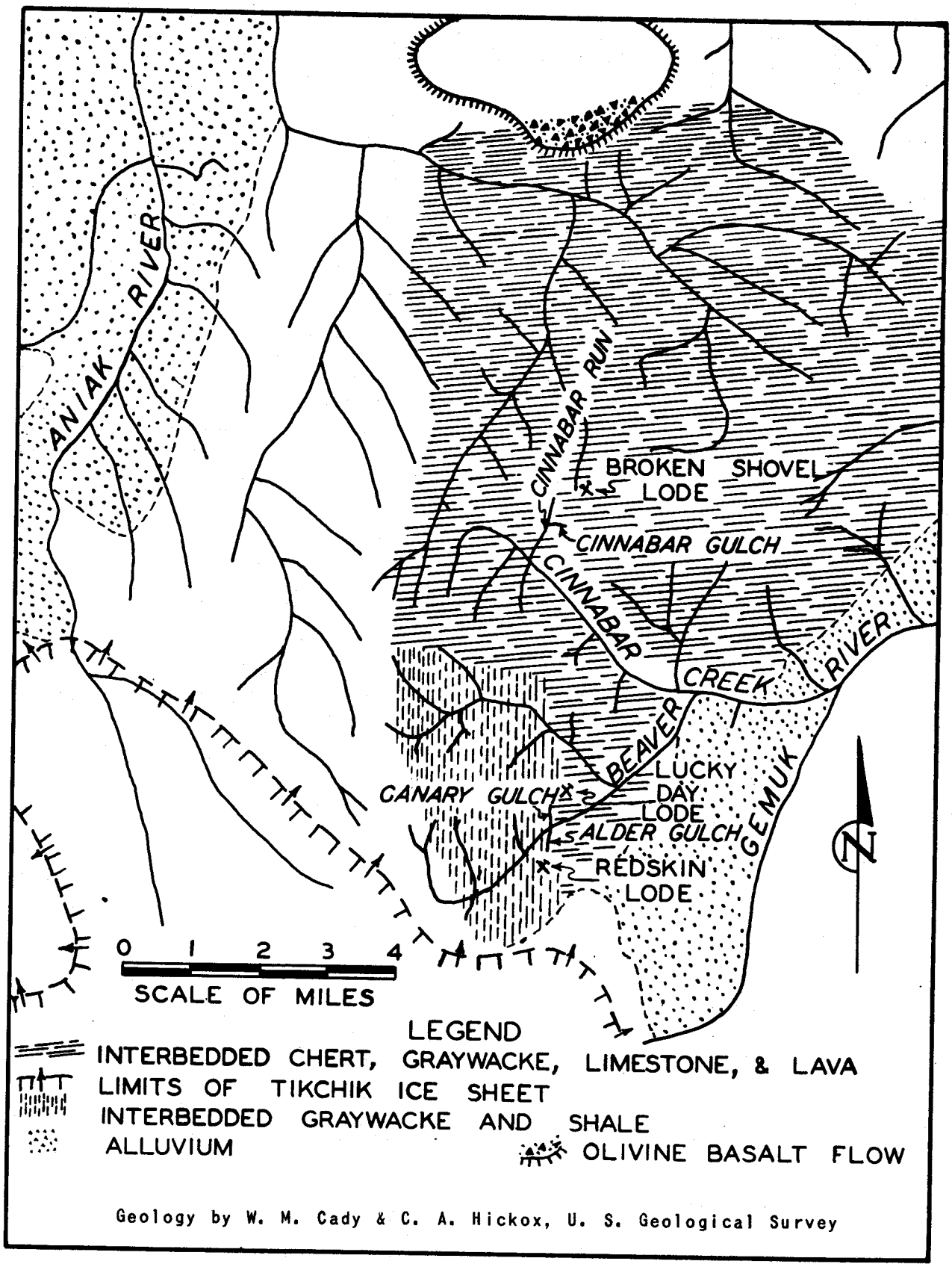


Figure 3. - Mercury deposits, Cinnabar Creek area.

All of the aforementioned claims were recorded at the office of the U. S. Commissioner at Aniak, Alaska.

GENERAL GEOLOGY

The following discussion of the geology of the area is quoted from the report by Cady3/.

> The bedrocks of the Cinnabar Creek area include a succession of interbedded graywackes, shales, argillites, and lavas. Most of these rocks are of Triassic age, but sediments of probably Cretaceous age crop out in the southwestern part of the area. Some zones in the Triassic rocks contain considerable chert, with minor limestone. The sedimentary rocks are intruded by sills probably of Tertiary age. Most of the sills and flows are of basalt, commonly porphyritic. A flow of rather coarse-grained, porphyritic, olivine basalt lies across the upturned and eroded edges of the bedded rocks in the northern part of the area.
>
> Some of the sills are hydrothermally altered to a light pearl-gray rock, which weathers yellow-brown and resembles the typical "yellow-rock porphyry" in the Sleitmut area. Some of the graywacke also appears to be altered. The altered rocks form a northward-trending belt about a mile wide and at least 6 miles long. Altered sill rock appears to be present more commonly at higher elevations immediately beneath remnants of the rolling upland surface than at lower elevations in the gulches, although this may be only because of better exposures near the hilltops.
>
> The general strike in the belt of altered sill rocks is between N. 25° W. and N., although the regional strike of the sediments is northeasterly. In the belt of altered rocks the dip in general is steeply west.
>
> Frost-broken rock fragments mantle the hills to a depth of as much as 5 feet, but the fragments are not far enough removed from their bedrock sources to interfere seriously with the tracing of geologic contacts of "yellow rock" or float ore. In the valley lowlands are deep alluvial deposits, which, according to prospectors, contain cinnabar concentrations near those places where they traverse the belt of altered sills.
>
> The topography of the hills in the vicinity of the quicksilver deposits was developed during at least two cycles of erosion; first, formation of a late mature surface and second, incisions to form youthful steep-walled gulches, leaving only remnants of the earlier surface in the rolling upland areas.

3/ See footnote 2.

DESCRIPTION OF THE DEPOSITS

Lucky Day Lode

The Lucky Day lode deposits lie along and near the head of Canary Gulch, a small tributary on the left limit of Beaver Creek (fig. 3 and 4). Mineralization is of two types. Along Canary Gulch, the quicksilver occurs as thin, sparse films of cinnabar associated with quartz and stibnite along bedding-plane faults, cross joints, and zones of brecciation in the graywacke and shale. A small amount of metallic mercury also is present.

Mineralization of this type has been traced over an area 350 feet long and 50 feet wide along the right limit of Canary Gulch. One cut 175 feet long, paralleling the gulch, was partly completed before mechanical failure of the tractor dozer precluded further development by dozer trenching. The mineralized zone was exposed by several open cuts and in one of the caved adits that was reopened. Three samples of the highest-grade showings of this area were taken by the Bureau of Mines. The location of these samples is shown in figure 4, and the results of analysis in table 1:

TABLE 1. - Analysis of samples, upper Canary Gulch

Sample	Width, feet	Mercury, percent	Antimony, percent
9.....	1.1	0.31	0.16
10.....	1.1	.18	.19
11.....	1.7	.07	.15

The results of additional sampling of this deposit by the owners in 1942 are given through the courtesy of Russell R. Schaefer. Each sample was taken over a sample length of 3 feet normal to the strike of the mineralized area. Location of the exposures sampled is designated by the letters A, B, C, E, and F in figure 4, and the results of analysis are given in table 2.

TABLE 2. - Analysis of Schaefer's and Winchell's samples, upper Canary Gulch. (See figs. 3 and 4)

Sample	Type of opening	Mercury, percent
A-1.....	Adit	Trace
A-2.....	do.	0.08
A-3.....	do.	.03
A-4.....	do.	.07
A-5.....	do.	.10
A-6.....	do.	.03
A-7.....	do.	.03

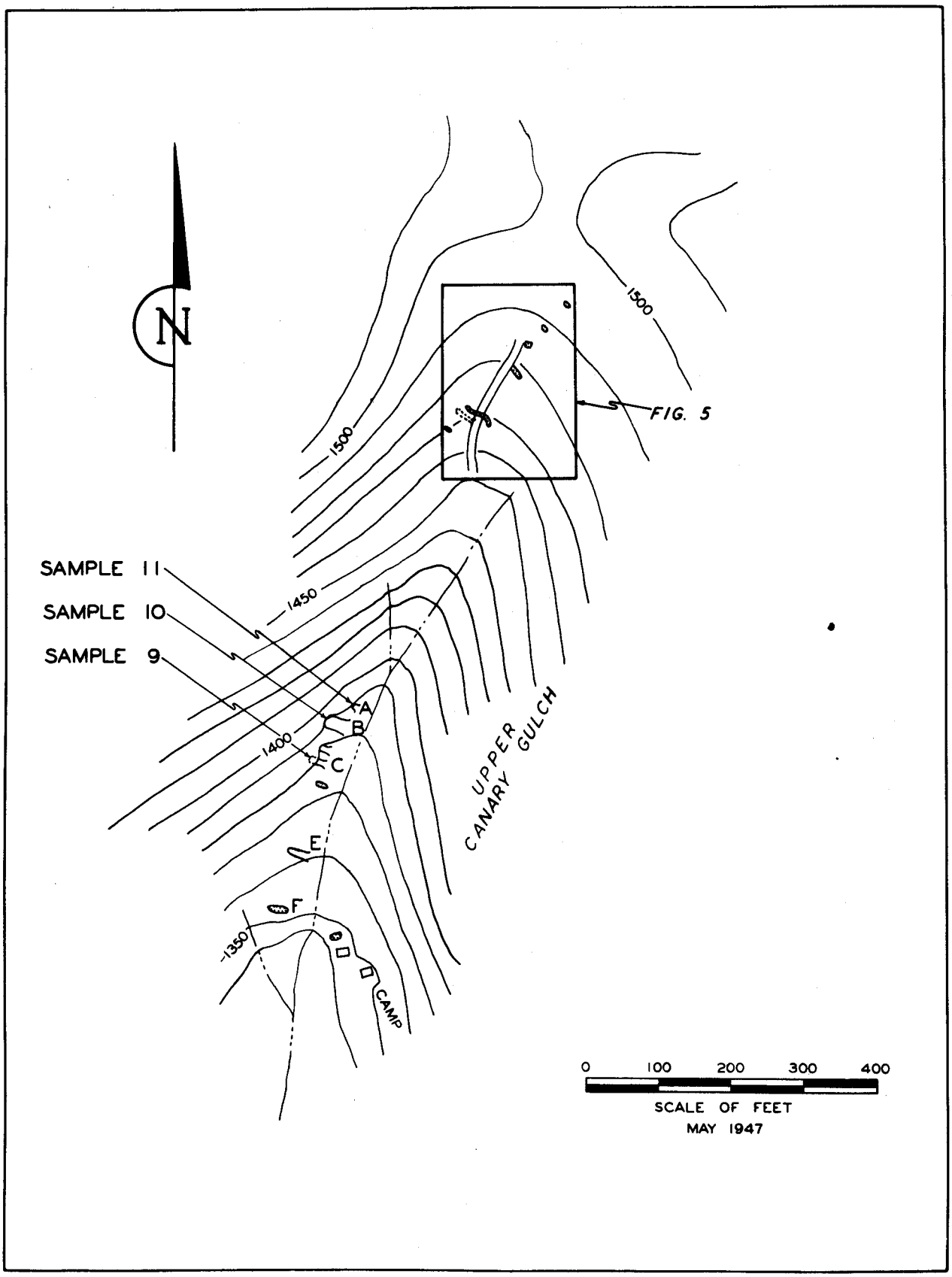
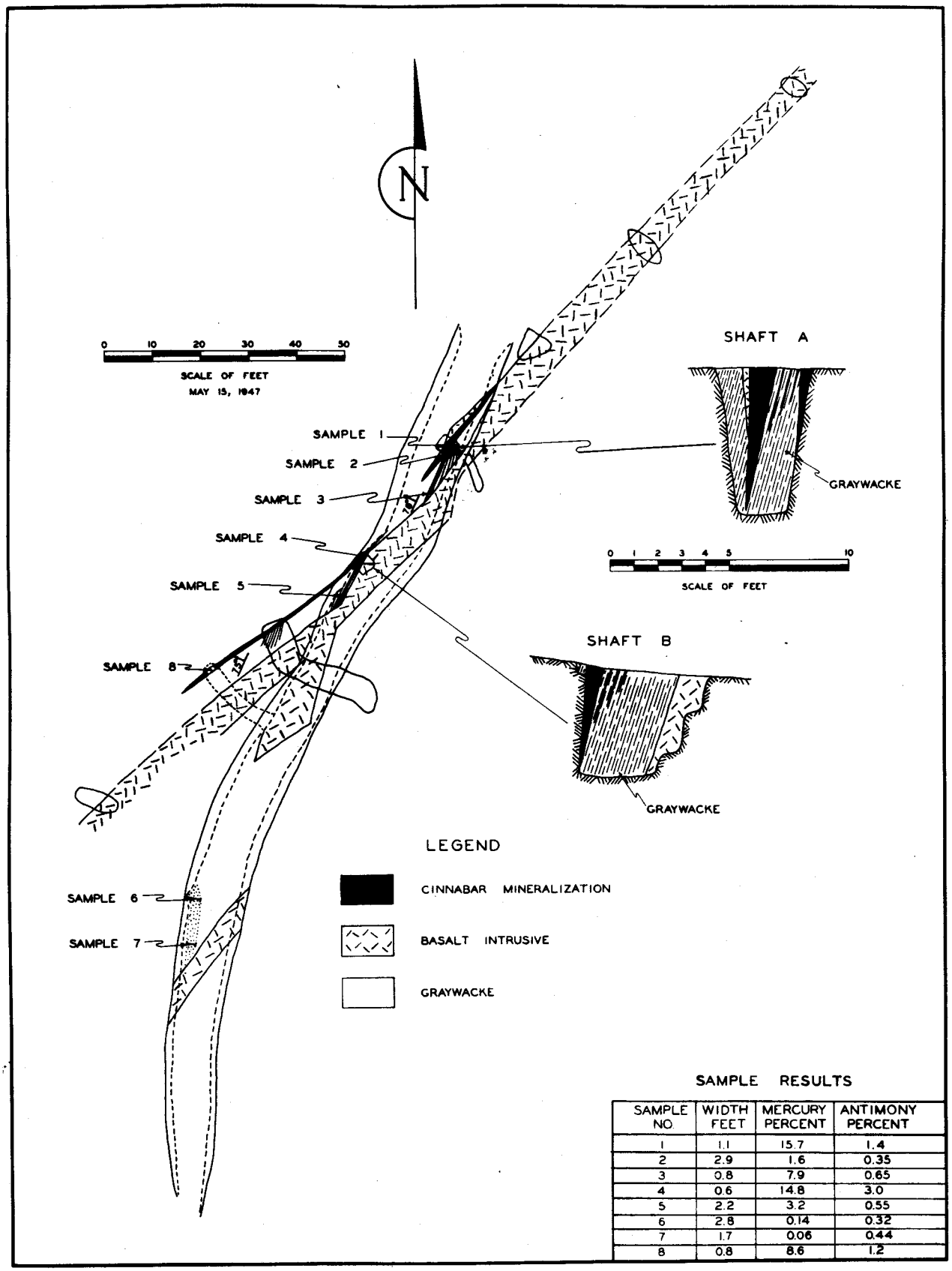


Figure 4. - Canary Gulch mercury deposits.



SAMPLE RESULTS

SAMPLE NO.	WIDTH FEET	MERCURY PERCENT	ANTIMONY PERCENT
1	1.1	15.7	1.4
2	2.9	1.6	0.35
3	0.8	7.9	0.65
4	0.6	14.8	3.0
5	2.2	3.2	0.55
6	2.8	0.14	0.32
7	1.7	0.06	0.44
8	0.8	8.6	1.2

Figure 5. - Lucky Day lode.

TABLE 2. - Analysis of Schaefer's and Winchell's samples, upper Canary Gulch. (See figs. 3 and 4) Cont'd.

Sample	Type of opening	Mercury, percent
B-1	Adit	1.33
B-2.....	do.	.15
B-3.....	do.	.04
B-4.....	do.	.05
B-5.....	do.	.04
C-1.....	do.	.02
C-2.....	do.	.01
C-3.....	do.	Trace
C-4.....	do.	Trace
C-5.....	do.	0.02
C-6.....	do.	.05
C-7.....	do.	.04
E-1.....	do.	.10
E-2.....	do.	.03
F-1.....	Pit	.55
F-2.....	do.	.12

This zone of cinnabar has been sampled over a length of 310 feet and has an average width of 11 feet.

The second type of mineral deposit is directly associated with the sill-like intrusives of basalt in the graywacke near the head of Canary Gulch. (See figs. 4 and 5.) These occurrences consist of lenticular pods of nearly massive cinnabar paralleling the intrusives and narrow offshoots of lower-grade cinnabar mineralization along bedding-plane faults between the high-grade pods and the intrusives. All of the production of quicksilver from this area has been obtained by retorting hand-sorted ore derived from these small high-grade occurrences.

High-grade ore was revealed in two of the orginal test pits in the area by Schaefer and Winchell. Part of the hand-sorted ore recovered by them was from these pits, but the main production came from open cuts along a zone of placer concentration below the deposits at the head of Canary Gulch.

A bulldozer trench was excavated along the strike of the ore zone during 1947 by the Bureau of Mines (see fig. 5). Of the six samples taken in the mineralized zone, three samples were representative of the high-grade lenticular pods of cinnabar, and the reamining three were taken across the mineralized bedding-plane faults between the lenses and the intrusive. The mineralized material consisted primarily of cinnabar, stibnite, and quartz associated

with altered graywacke and basalt. A small amount of metallic mercury is present.

Only the northeast end of the ore zone was actually delimited. The southwest end was inferred from the barren test pit 30 feet southwest of the last exposure and the lack of float in the bulldozed trench. In all cases where a mineralized zone of cinnabar was exposed in the area, a concentration of float was found on the bedrock extending downhill from the outcrop.

Two shallow shafts were sunk on the ore zone to ascertain the downward extension of the lenses. One lens measured 6 feet along the dip and the other 4.5 feet. In each case the mineral deposit pinched out along the bedding planes, as shown in the cross sections of shafts, (fig. 5).

Two samples were taken of a brecciated zone of graywacke near the south end of the trench. These samples (numbers 6 and 7) contained metallic mercury, a small amount of cinnabar, and some stibnite.

Another occurrence of interest, though not of economic consideration, is a light-gray basalt sill on the ridge a short distance northwest of the main deposit.

Redskin Lode

The Redskin lode claim (fig. 3) at the head of Alder Gulch was examined briefly during this investigation, but the mineral deposit did not warrant additional investigation. The deposit is approximately 1-1/2 miles south of the Lucky Day lode.

Mineralization at the Redskin lode is almost identical to that along Canary Gulch. The cinnabar occurs as sparse films along bedding planes, cross joints, and zones of brecciation in the graywacke and shale.

Broken Shovel Lode Claim

The Broken Shovel deposit (fig. 3) outcrops on the ridge east of Broken Shovel Gulch (fig. 6) and to the east of the claim staked by Herschel Landru along the gulch. This deposit lies in the watershed of the Aniak River 4-1/2 miles north of the Lucky Day lode.

Several shallow prospect pits were excavated by Landru in an attempt to trace the float back to its source. The main showing (marked outcrop on figure 6) is a narrow, irregular vein of quartz locally containing small lenses of stibnite and minor amounts of cinnabar. Several smaller and less persistent quartz veins are present and may have furnished a part of the placer cinnabar in Broken Shovel Gulch.

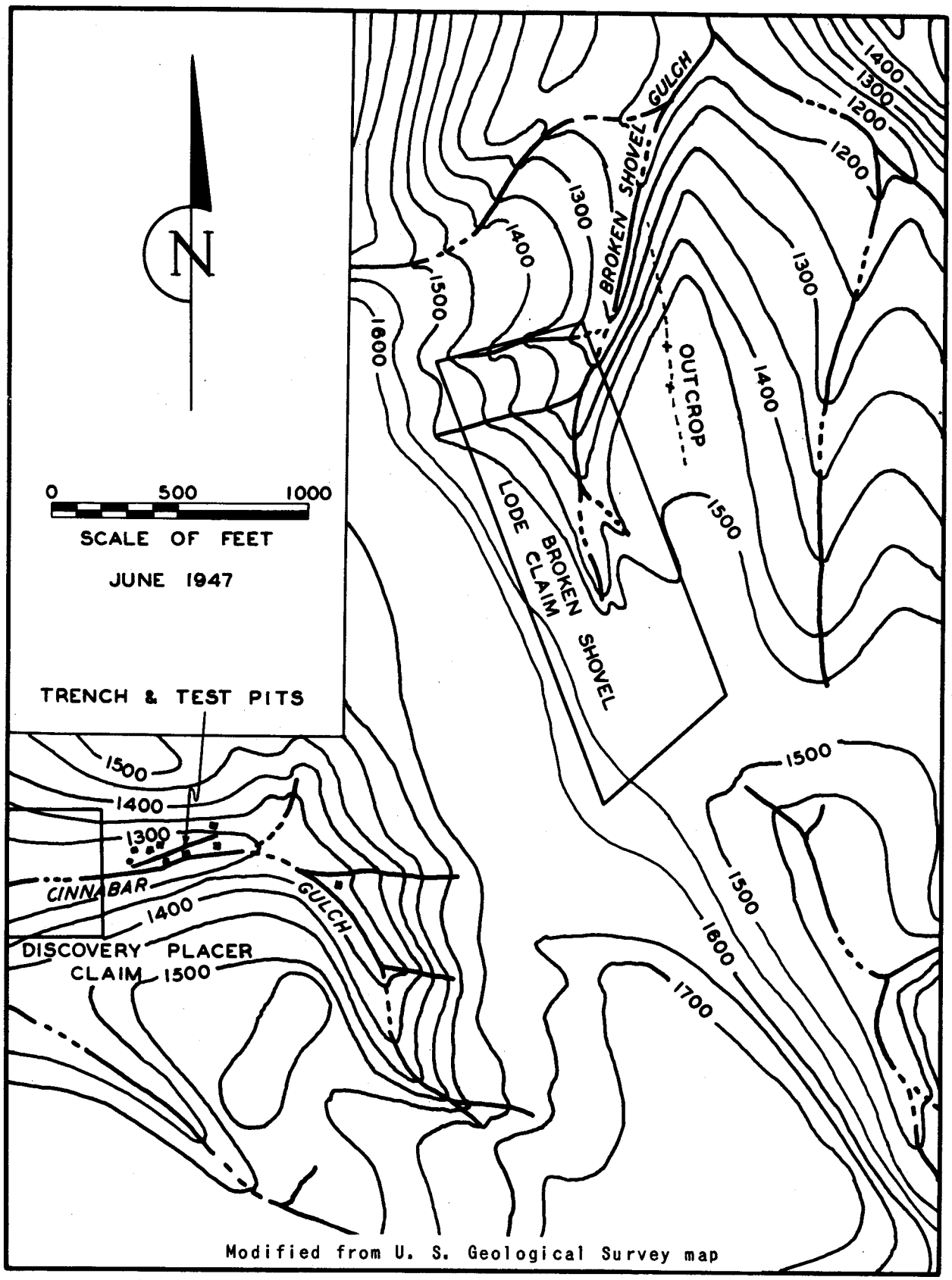
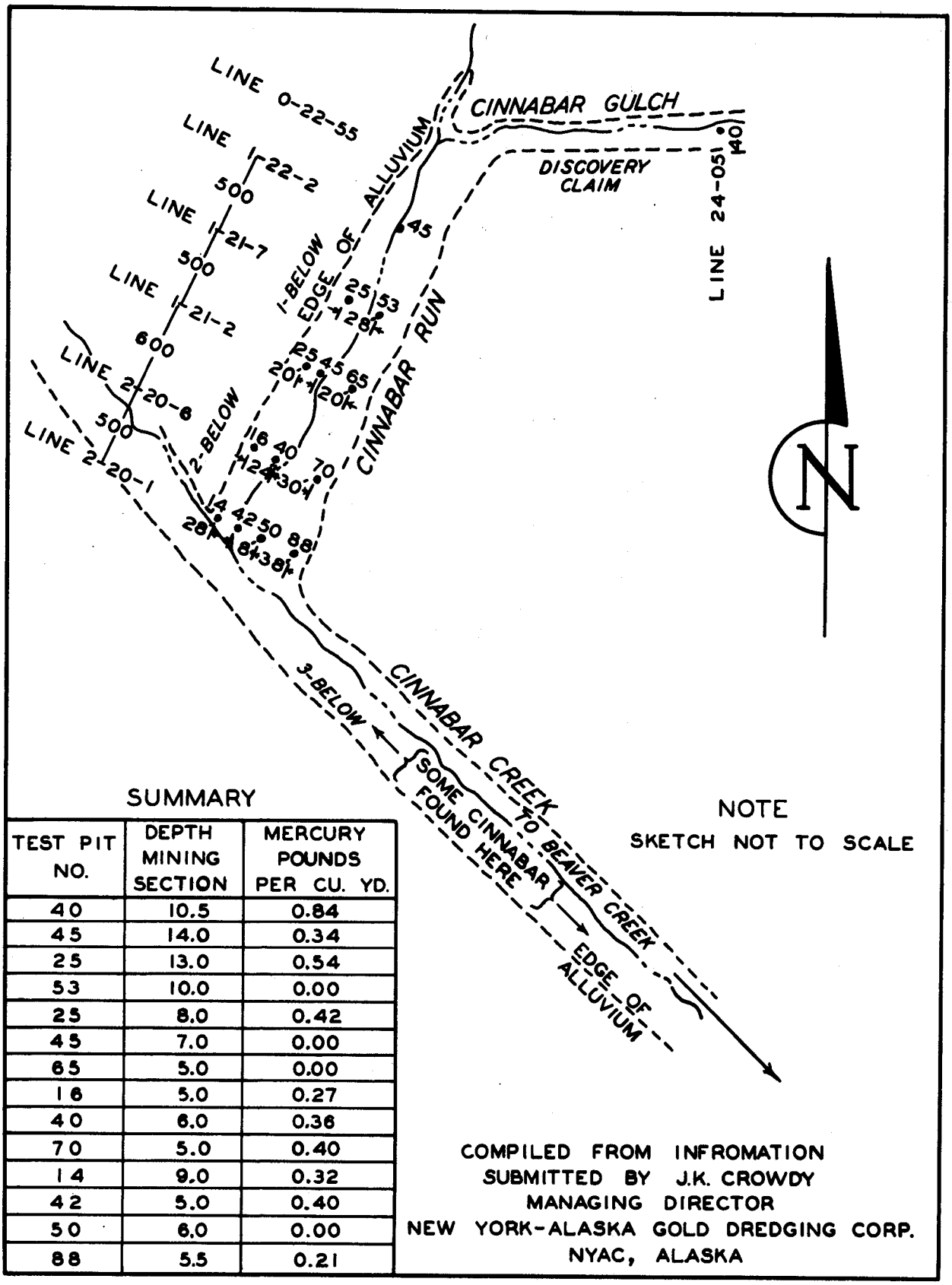


Figure 6. - Cinnabar Gulch and Broken Shovel Gulch area.



SUMMARY

TEST PIT NO.	DEPTH MINING SECTION	MERCURY POUNDS PER CU. YD.
40	10.5	0.84
45	14.0	0.34
25	13.0	0.54
53	10.0	0.00
25	8.0	0.42
45	7.0	0.00
65	5.0	0.00
16	5.0	0.27
40	6.0	0.36
70	5.0	0.40
14	9.0	0.32
42	5.0	0.40
50	6.0	0.00
88	5.5	0.21

NOTE

SKETCH NOT TO SCALE

COMPILED FROM INFROMATION
SUBMITTED BY J.K. CROWDY
MANAGING DIRECTOR
NEW YORK-ALASKA GOLD DREDGING CORP.
NYAC, ALASKA

Figure 7. - Cinnabar Creek placer area.

Cinnabar Creek Placer Area

High-grade placer cinnabar was found along Cinnabar Gulch, Cinnabar Run, and the upper portion of Cinnabar Creek below Cinnabar Run, and test pits by Schaefer and Winchell traced the cinnabar to the cluster of test pits shown in figure 6 upstream from the Discovery claim. As the pits upstream contained only a minute amount of cinnabar, and the cinnabar recovered from the pits in the area was extremely angular and showed very little signs of wear, it was supposed that the original source of the cinnabar was within this area.

A 390-foot bulldozer trench was started by the Bureau of Mines to expose the bedrock across this area and if possible locate the original source of the placer cinnabar. To accelerate excavation of the trench, a small dam was built across Cinnabar Gulch and material loosened by the bulldozer was ground sluiced from the trench. Maximum depth to bedrock was 18 feet.

No lode occurrence of cinnabar was found. Placer cinnabar was distributed on bedrock throughout the length of the trench, though the degree of concentration varied. In appearance, the grains and nuggets are similar to those found later nearer the head of the gulch. The source of the cinnabar may be the altered basalt sill crossing the head of Cinnabar Gulch and the narrow quartz stringers associated with it, like that outcropping at the Broken Shovel lode.

Cady[4]/ describes the placer deposits in the Cinnabar Creek area as follows:

> The known placer deposits in the area are in Cinnabar Gulch and in the valleys of Cinnabar Run and Cinnabar Creek. They consist of high-grade ore nuggets in alluvial material. The pay streak, which heads in Cinnaber Gulch, is regarded as probably typical of others in creek valleys not yet tested. Near the head of this pay streak the nuggets, averaging about the size of a walnut, are angular, but a claim length downstream, where Cinnabar Gulch enters the valley of Cinnabar Run, they are rather well-rounded. Thus, it is inferred that the bedrock source of the cinnabar was not far from the head of the pay streak. Remnants of a bench 40 feet above the bottom of Cinnabar Run, south of the confluence of Cinnabar Gulch and Cinnabar Run, appear to have held parts of a pay streak from which several large, well-rounded cinnabar nuggets have slumped to the rim of the present flood plain.

During 1941-42 Schaefer and Winchell sank several test pits in the valleys of Cinnabar Creek, Cinnabar Run, and Cinnabar Gulch to trace the pay streak of placer cinnabar. The results influenced the New York-Alaska Gold Dredging Corp. (Nyac) to prospect and test the ground during 1943, as shown in figure 7.

The valleys of Cinnabar Run and Cinnabar Gulch are narrow, 100 to 150 feet wide, with steep slopes. Alluvium averages about 10 feet thick and is composed of slide rock and washed gravels.

4/ See footnote 2.