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

BUREAU OF MINES
JAMES BOYD, DIRECTOR

REPORT OF INVESTIGATIONS

INVESTIGATION OF KNIK VALLEY CHROMITE DEPOSITS, PALMER, ALASKA

BY

STUART BJORKLUND AND W. S. WRIGHT

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By Stuart Bjorklund[2] and W. S. Wright[2]

CONTENTS

INTRODUCTION AND SUMMARY

This paper is one of many reporting various aspects of the Bureau of Mines program initiated in August 1939 by passage of the Strategic Minerals Act, the scope of which was greatly expanded by subsequent legislation. In its program of investigation of mineral deposits, the Bureau of Mines has as its primary objective the more effective utilization of our mineral resources to the end that they make the greatest possible contribution to national security and economy.

The occurrence of chromite in the Knik Valley near Palmer, Alaska, was brought to the attention of the Bureau of Mines in September 1941 by George Johnson, of Ancho rage. At that time a preliminary investigation was made by Robert S. Sanford, an engineer of the Bureau of Mines. The area was investigated on June 4 and 5, 1943, by Henry R. Joesting and Leo H. Saarela, engineers of the Territorial Department of Mines.

In August 1942, a second chromite occurrence, the Highway deposit, in the Knik Valley, was reported to the Territorial Department of Mines by John E. Ryan of Anchorage.

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 4356."

2/ Mining engineer, Bureau of Mines, Juneau, Alaska.

The United States Geological Survey had a field party3/ in the region during August and September 1942.

The results of these investigations proved that there was a small tonnage of low-grade chromite ore in the region. Because of the large area of unexplored dunite and close proximity of the Anchorage-Palmer highway and the Alaska Railroad, the area was selected for further exploration. A Bureau of Mines exploratory project begun on September 1 was completed November 20, 1942.

LOCATION AND ACCESSIBILITY

These two chromite occurrences are at latitude 61° 27' N. and longitude 149° 11' W., at altitudes of 20 to 1,120 feet and on the south side of Knik River Valley. Knik River drains into Knik Arm, at its head, which, in turn, enters the head of Cook Inlet, one of the major waterways of Southwestern Alaska, as shown in figures 1 and 2.

The Highway claim is located at mile 31.8 of the Anchorage-Palmer Highway. The chromite outcrops in the south side of a highway cut.

The Pioneer Creek deposit is in Pioneer Gulch, about 3/4 mile south of mile 32.8 of the same highway.

The Anchorage-Palmer Highway is a well-graded, graveled road connecting the farming community of the Matanuska Valley and the city of Anchorage. This highway, together with the Alaska Railroad, which passes within 2 miles of the chromite deposits, affords ideal transportation facilities for any development or production from the area under consideration.

CLIMATE AND VEGETATION

This area, because of its northern latitude, is characterized by long winters and short summers. Climatic conditions are transitional between the semi-aridness of the interior and the extreme humidity of the coast. Weather Bureau records over a period of 5 years show temperatures ranging from 91° above to 30° below zero, or a mean annual temperature of 36°. The average annual rainfall over the same period was 18 inches, and snowfall was 44 inches.

The north and west slopes of the Chugach Mountains, on which the properties are situated, are covered with a dense growth of vegetation to an altitude of 1,250 feet. The principal timber of the area is spruce, although an abundance of small birch grows in localized areas. The underbrush consists mainly of alder and devil's club. Timber suitable for mine use can be found in the immediate vicinity of the chromite prospects.

OWNERSHIP

The mining claims covering the Pioneer Creek chromite prospects were staked July 9, 1940, by Gaylord R. Skinner, George Johnson, and O. F. Ohlson.

3/ George O. Gates, assistant geologist, and Jacob Freedman, junior geologist.

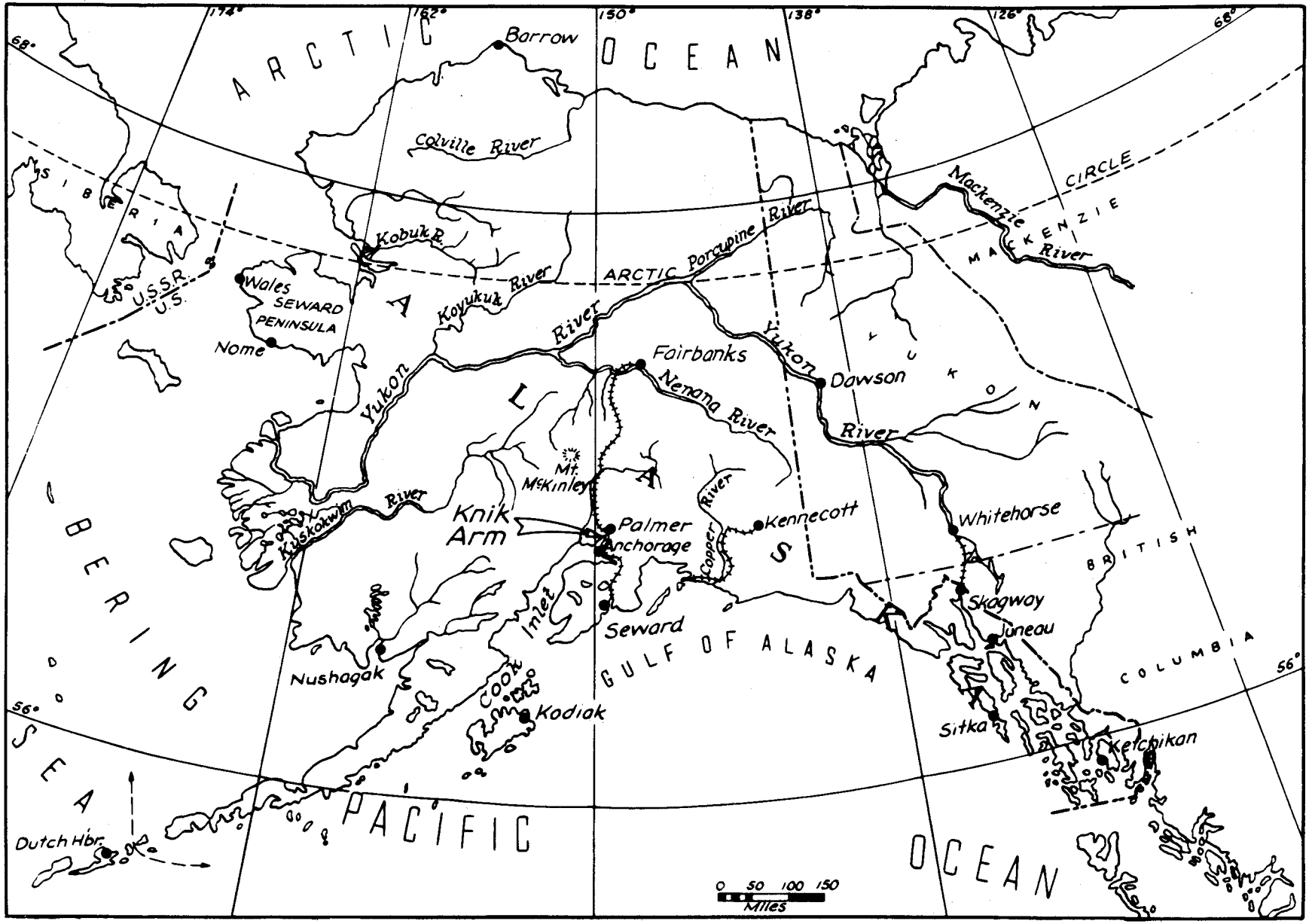


Figure 1. - Map of Alaska, showing Knik Arm area.

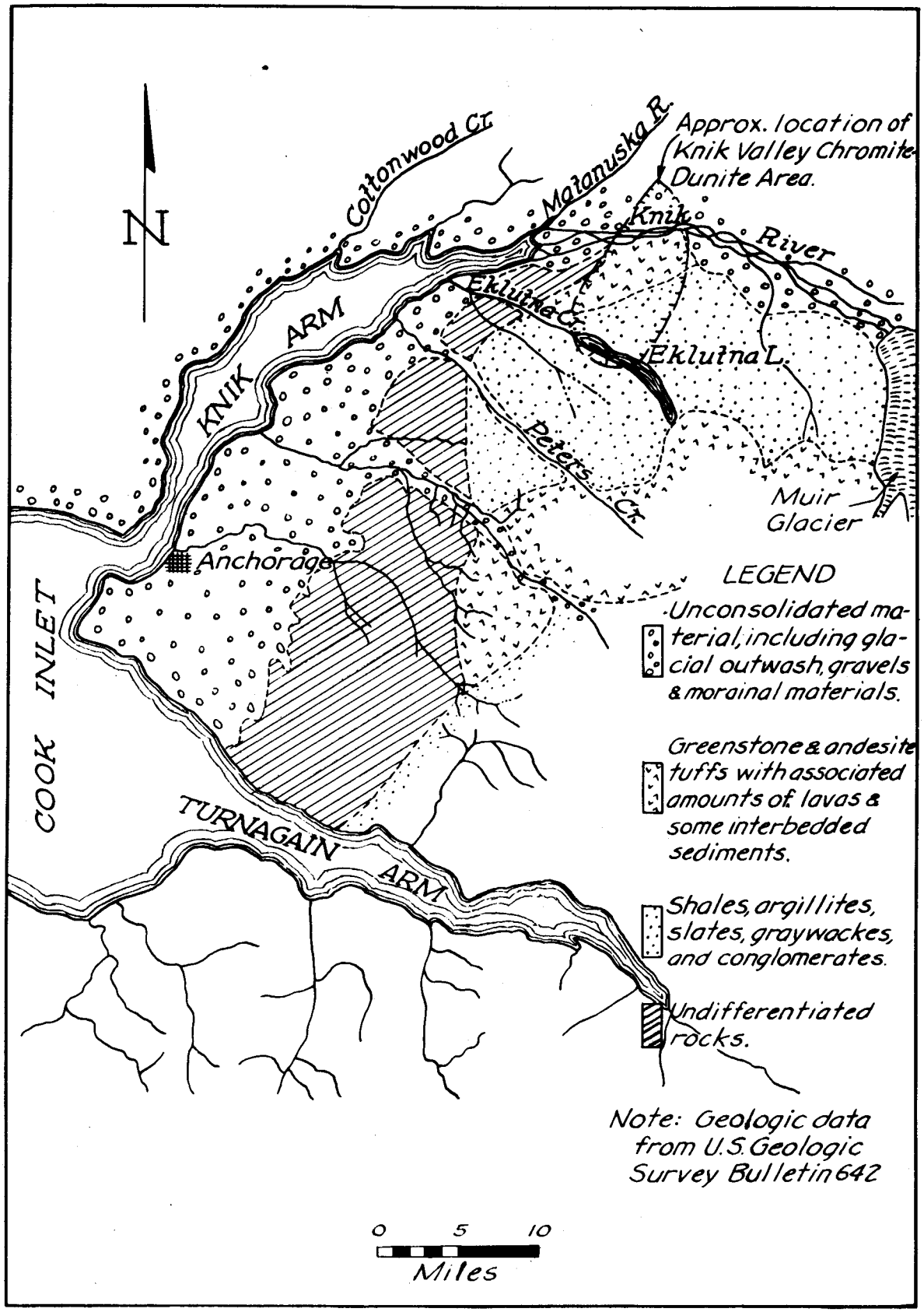


Figure 2. - Geologic sketch map, Turnagain-Knik region.

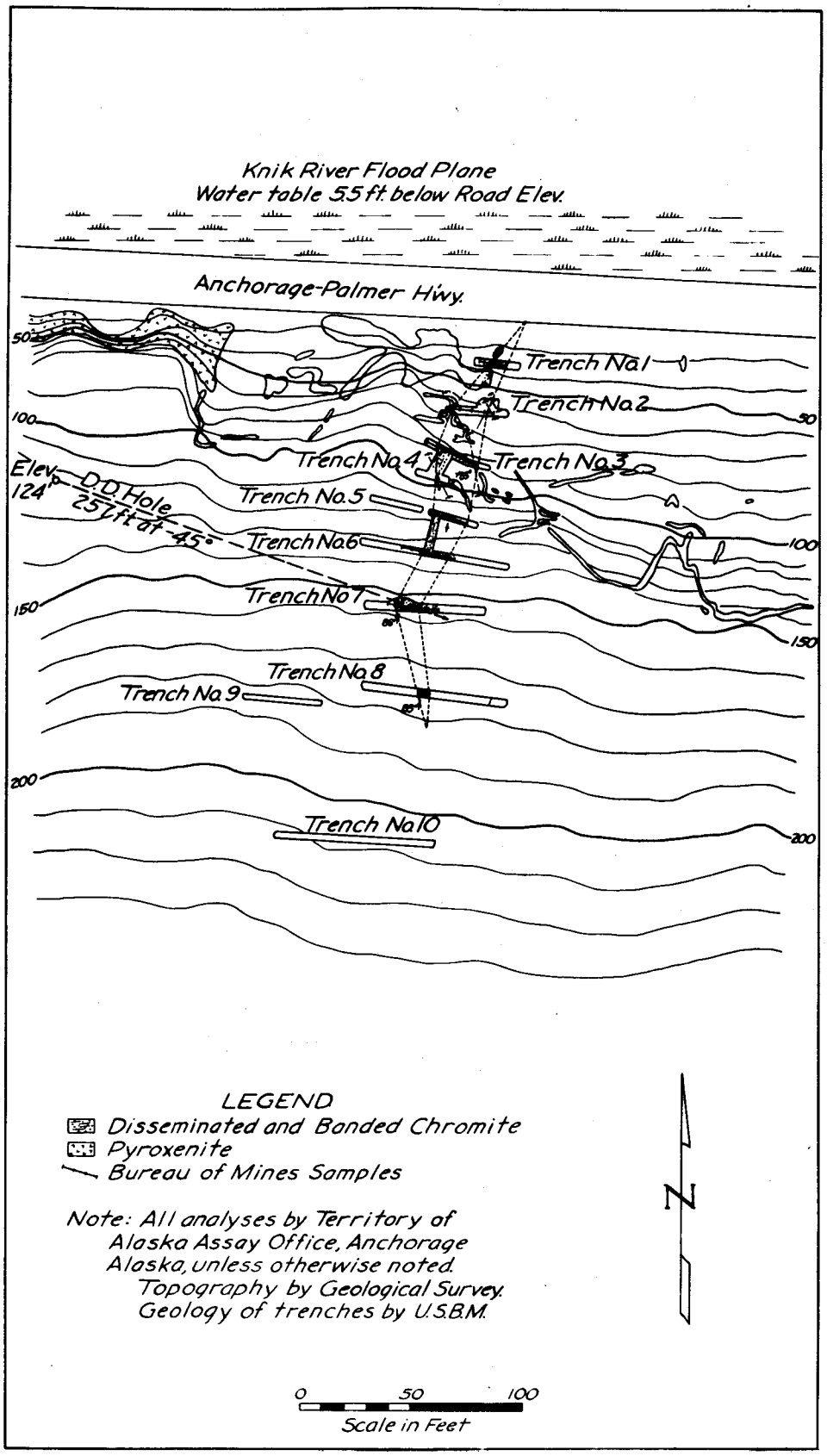
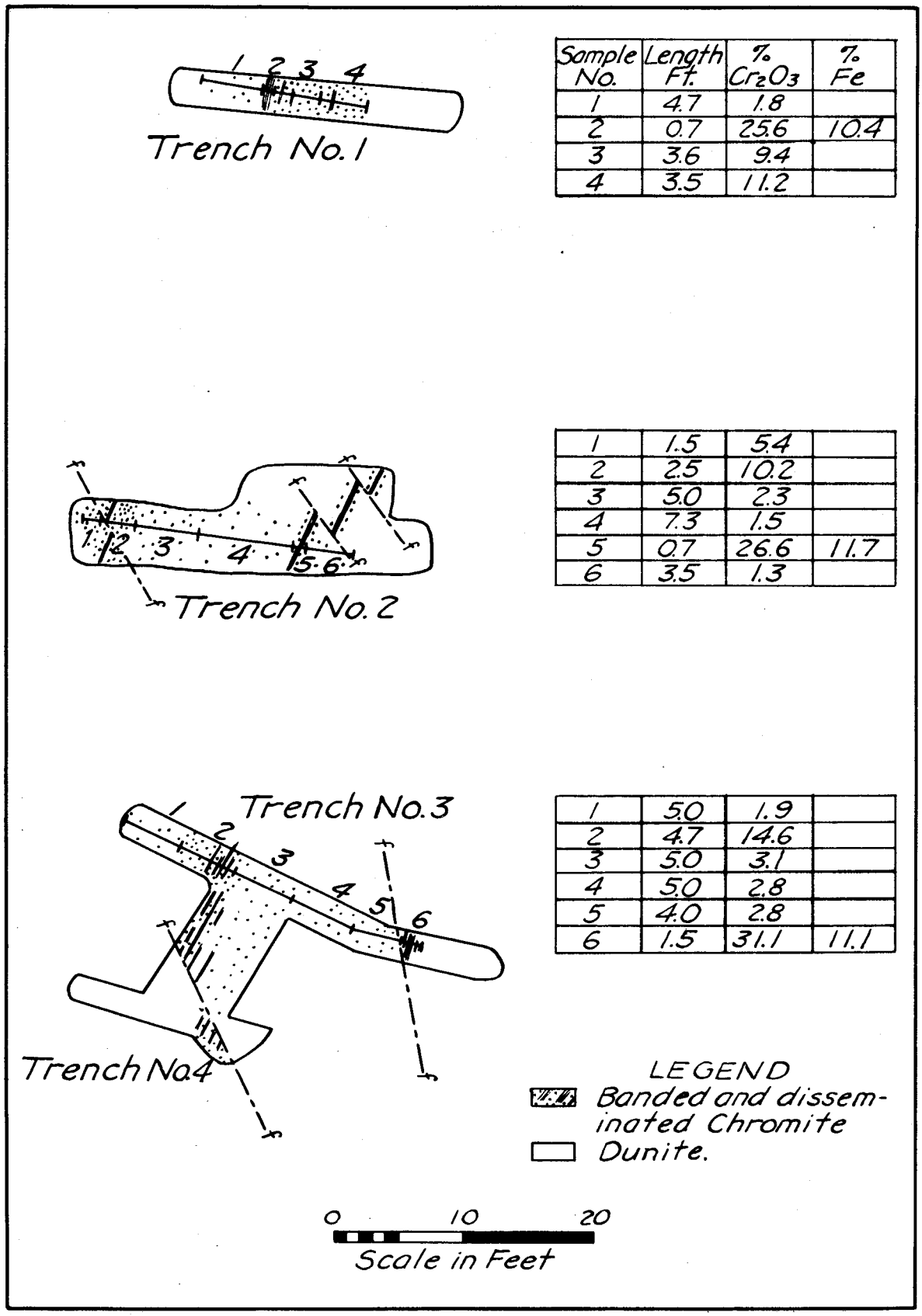


Figure 3. - Topographic map, Highway claim property.

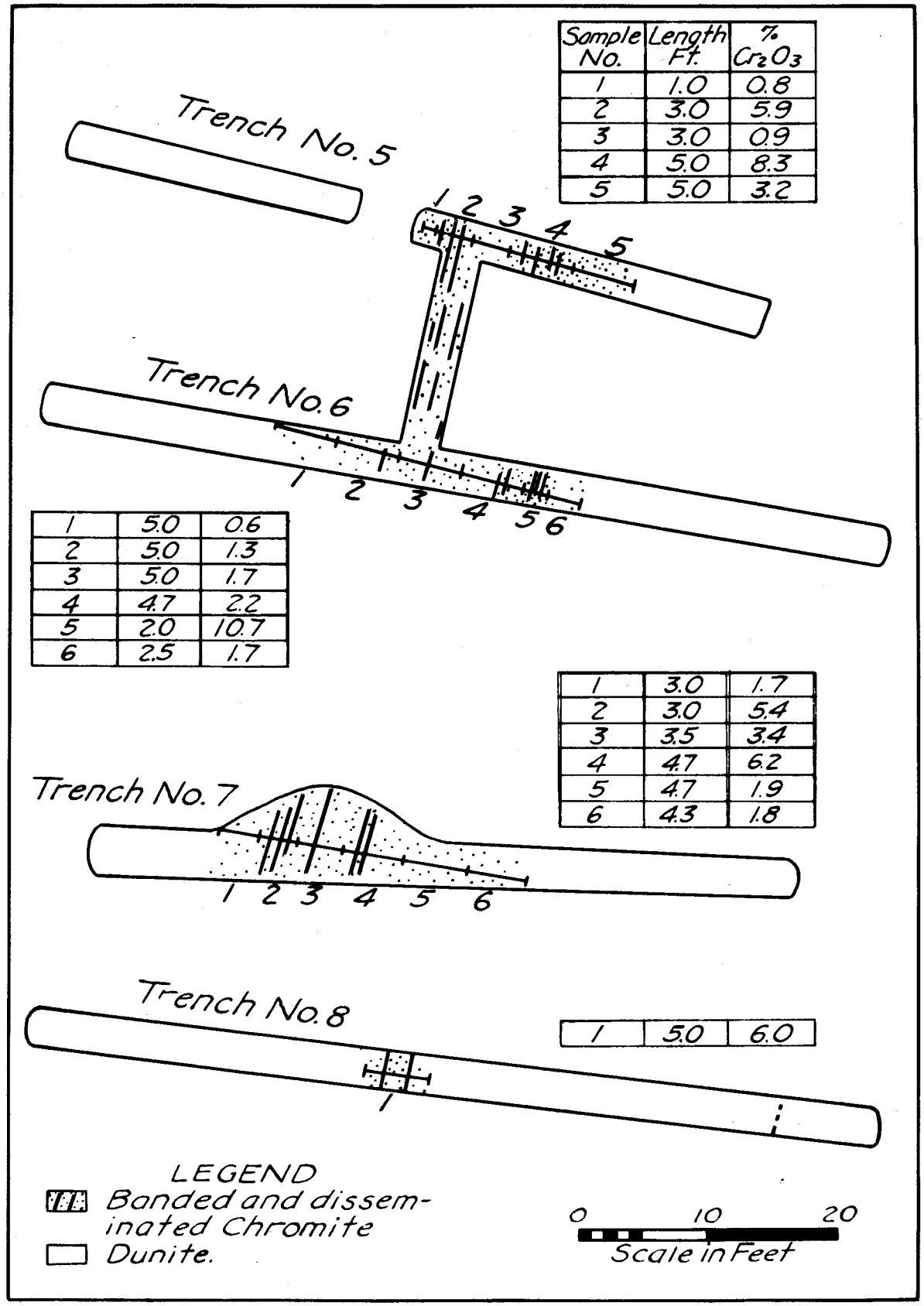


Sample No.	Length Ft.	% Cr_2O_3	% Fe
1	4.7	1.8	
2	0.7	25.6	10.4
3	3.6	9.4	
4	3.5	11.2	

1	1.5	5.4	
2	2.5	10.2	
3	5.0	2.3	
4	7.3	1.5	
5	0.7	26.6	11.7
6	3.5	1.3	

1	5.0	1.9	
2	4.7	14.6	
3	5.0	3.1	
4	5.0	2.8	
5	4.0	2.8	
6	1.5	31.1	11.1

Figure 4. - Trench sampling, Highway claim.



Sample No.	Length Ft.	% Cr_2O_3
1	1.0	0.8
2	3.0	5.9
3	3.0	0.9
4	5.0	8.3
5	5.0	3.2

1	5.0	0.6
2	5.0	1.3
3	5.0	1.7
4	4.7	2.2
5	2.0	10.7
6	2.5	1.7

1	3.0	1.7
2	3.0	5.4
3	3.5	3.4
4	4.7	6.2
5	4.7	1.9
6	4.3	1.8

1	5.0	6.0

Figure 5. - Trench sampling, Highway claim.

Information obtained in the field indicated that the property comprises three unpatented claims - the Pioneer No. 1, Pioneer No. 2, and the Big Mogul.

The Highway claim chromite prospect was filed upon by John E. Ryan and associates. During the summer of 1942, Ryan and associates filed on two additional claims adjoining the Highway No. 1 claim. All of the chromite showings occur on the Highway Claim No. 1.

Both groups of claims are within the area tentatively designated as the Eklutna Indian Reserve.

ORE DEPOSITS

The ultra-basic rocks of Knik Valley area are intrusive into a complex of volcanic and sedimentary rocks and have been altered to greenstone. The predominant intrusive is a dunite associated with bands of pyroxenite and some peridotite and olivine gabbro. The dunite occupies much of the approximately 4 by 10 mile area between the Knik River and Eklutna Creek.

The ultra-basic rocks are characterized by their high content of magnesia and iron, low silica and alumina, and almost complete lack of alkalies. Chromite is associated with rock of this type.

The dunite consists almost entirely of olivine $(Mg, Fe)_2SiO_4$, with accessory chromite grains. The outcrops weather to a reddish or terra-cotta color. On fresh dunite surfaces the rock shows a dense texture and a greenish-gray color. Chromite is seldom seen in hand specimens.

The greenish pyroxenite consists mostly of augite. It is distinguished from the dunite by a greenish-gray color on weathered surfaces. No ore bodies are known to occur in the pyroxenite.

OCCURRENCE OF DEPOSITS

Highway Claim Deposit

The chromite occurs as nearly vertical stringers and poorly defined bands within dunite. At an altitude of approximately 20 feet, one band measuring 0.7 foot and containing 25.8 percent Cr_2O_3 is present with several smaller stringers varying from 1/4 to 1 inch in width. The chromite-bearing zone at this point is 7.8 feet wide, strikes N. 17° E., and dips about 85° to the northwest. A plan of the deposit is shown on figure 3. Details of trench sampling and analyses are shown on figures 4 and 5.

The deposit has been cut by two minor fault systems. The first system strikes northwest and dips southwest. Displacements along parallel planes have resulted in "step faults." The second fault system strikes northerly. A maximum displacement of 5 feet was noted in trench 4. The majority of the displacements are only about 1 foot.

The most striking features of the deposit are the pinching and swelling of the mineralized zone and a decrease in grade at higher altitudes. In trench 3, at 85 feet, one of the faults was intersected. The main chromite band was consistent in width and grade for about 1 foot beyond this fault. At this point a vertical outcrop clearly showed the band fingering into several narrow chromite stringers separated by nearly barren dunite. The mineralized zone increases to a width of about 20 feet in trench 7, with a corresponding decrease in the grade of the ore. A decided decrease in the width of the zone between trench 7 and trench 8 was noted. This deposit could have economic significance only in the event of an appreciable increase in grade or size at depth.

One hole was diamond-drilled to test this possibility. The hole was drilled 160 feet N. 70° W. of trench 7 at an angle of minus 45°. The hole cut the projected dip of the chromite stringers appearing in trench 7 at 25 feet below sea level. Only dunite having the usual chromite content was encountered, and the hole was terminated in barren pyroxenite. Considerable difficulty was encountered in drilling because of "blocky" and caving ground. A section through the drill hole and analyses are shown on figure 6.

The deposit may extend beyond trench 1 and even north of the Anchorage-Palmer Highway, and it is not improbable that the grade also increases in this direction. The existence of ore on the north side of the highway, however, is only of academic interest, as the possibility of finding ore that would warrant development beneath the Knik River flood plane is remote.

Pioneer Creek Deposit

The occurrence of chromite on Pioneer Creek can be grouped into two poorly defined mineralized zones. The two zones are approximately 400 feet apart and are separated by Pioneer Creek. A plan of the Pioneer Creek deposit is shown on figure 7.

The northernmost of the two zones is on a steep hillside at an altitude of 900 feet. Normal faulting, with very little horizontal displacement, is present. The dunite is badly shattered, and slump has developed crevices. Strikes and dips are erratic. The general trend of the stringers and disseminated zone is N. 50° W., with dips ranging from 52° to 78° in a northeastern direction.

Trenching exposed the zone for a length of 50 feet. Few samples were taken on this zone because of the irregularity of the ore occurrence. At the southeastern limit the analysis of 5-foot sample was 13.2 percent Cr_2O_3. The zone terminated a few feet beyond the point sampled. Trenching and stripping were continued for 150 feet along the strike in an unsuccessful attempt to pick up a continuation of this zone.

The southern chromite-bearing zone of the Pioneer Creek deposit is situated on a steep hillside at an altitude of 1,150 feet. This zone is composed of a number of small pods and elliptical segregations of disseminated chromite. The general trend of the zone is due north; it extends for 82 feet and has a width of about 30 feet.

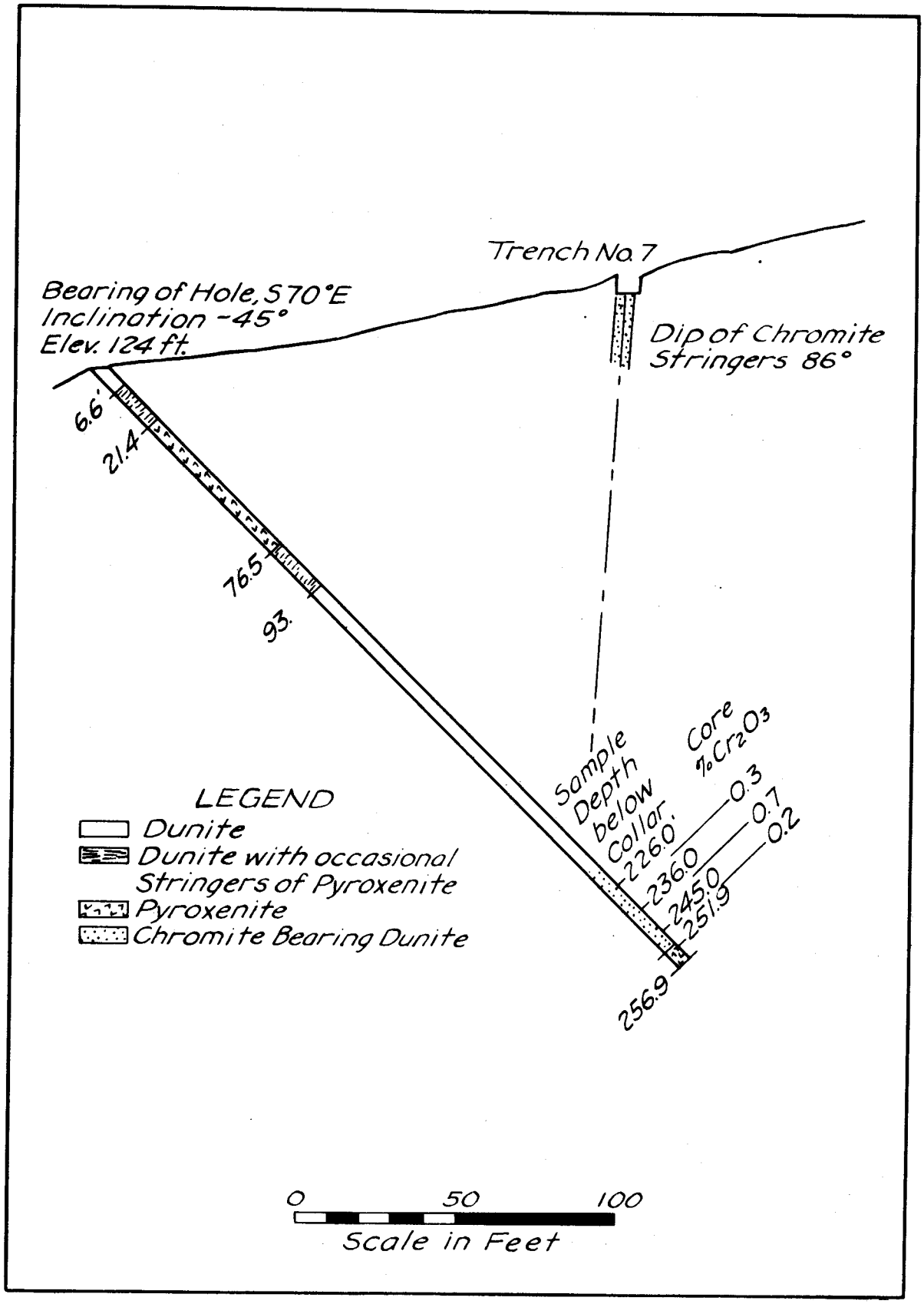


Figure 6. - Profile diamond-drill hole, Highway claim.

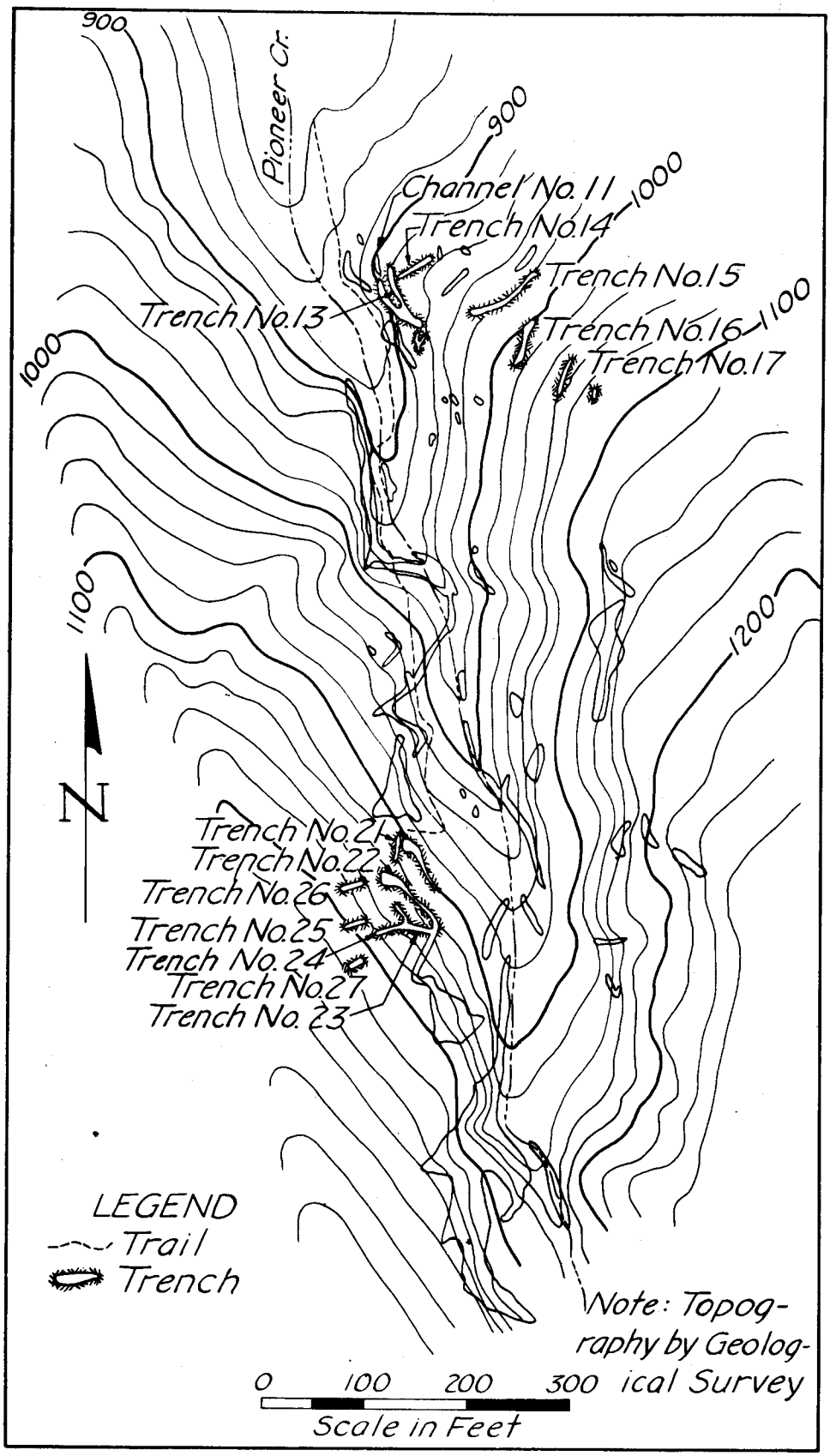


Figure 7. - Topographic map, Pioneer Creek deposit.

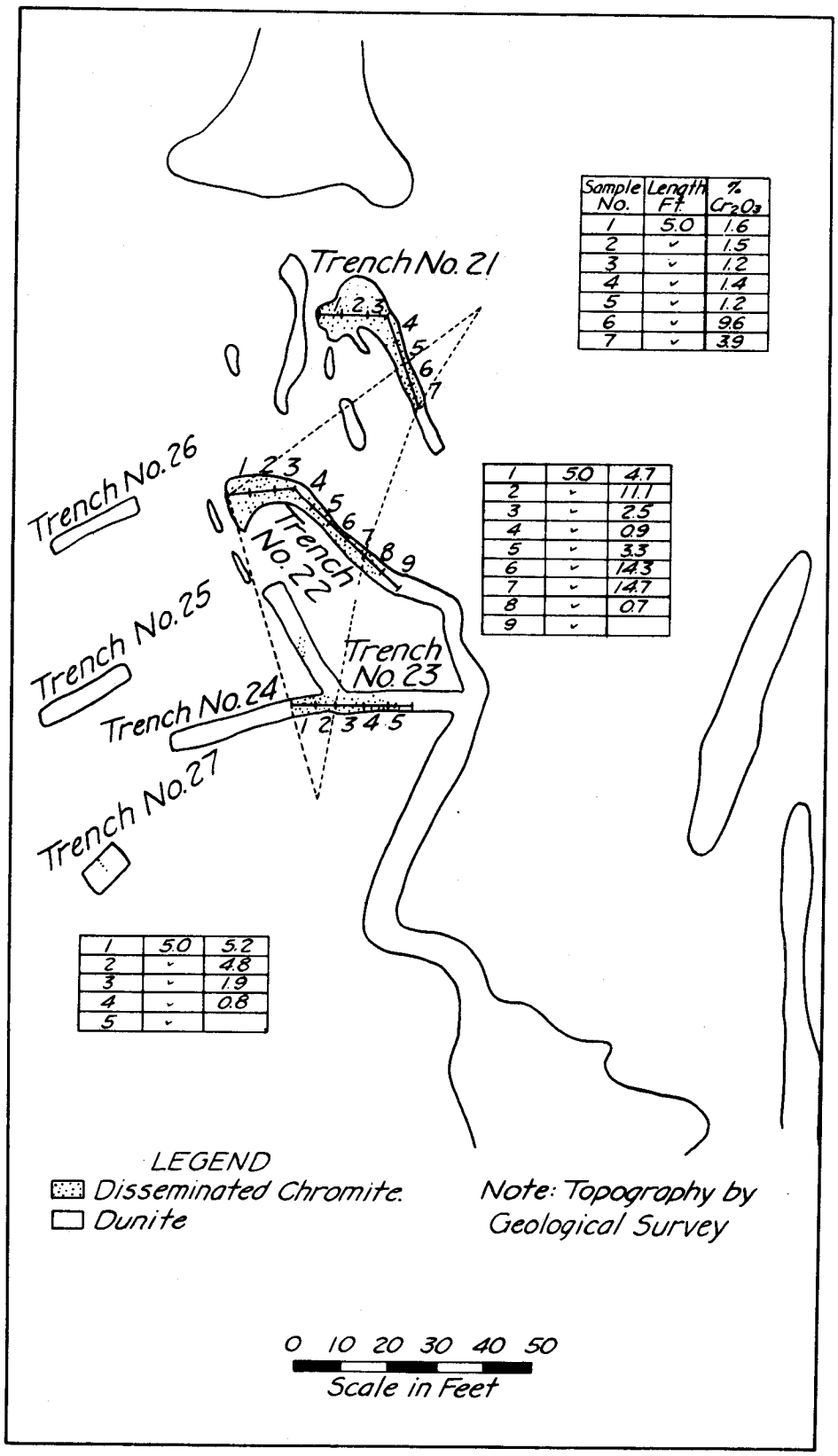


Figure 8. - Trench sampling, southern chromite-bearing zone, Pioneer Creek deposit.

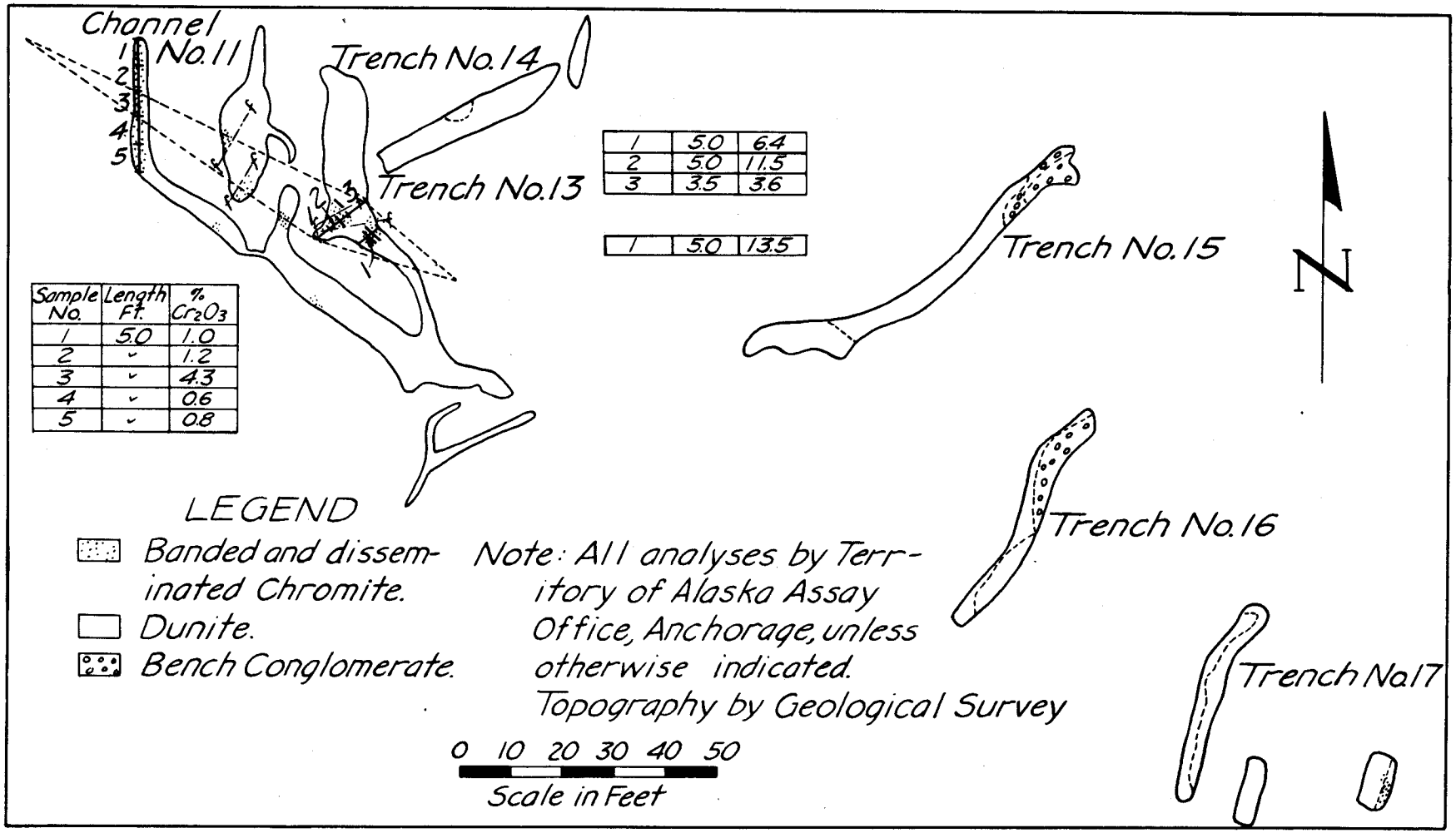


Figure 9. - Trench sampling, northern chromite-bearing zone, Pioneer Creek deposit.

The zone is bounded on the north, east, and south by outcrops of barren dunite and on the west by a thick mantle of soil and overburden. An attempt was made to determine the western limit by trenching, but after a depth of 16 feet was reached in trenches 25 and 26 excavation had to be abandoned. No chromite-bearing float was observed in the overburden. Analyses and location of trench samples on the north and south zones are shown on figures 8 and 9.

CHARACTER OF THE ORE

The term "ore," as used in this report, refers to material that, although it cannot be handled profitably at present, might be of economic importance in the future.

No massive high-grade chromite was discovered on either the Highway claim or the Pioneer Creek prospects. The highest analysis showed a Cr_2O_3 content of 31.1 percent and an iron content of 11.1 percent.

The grain size of the chromite ranges from 1 to 2.5 millimeters. Metallurgical tests on a similar ore indicate that concentration of the ore into a marketable product would not involve any difficulty.

SAMPLING AND ANALYSIS

The Highway claim deposit was trenched at intervals of approximately 25 feet along its strike. All samples taken from these trenches consisted of 2- by 4-inch grooves cut perpendicular to the strike of the ore occurrence. Whenever possible, a standard sample length of 5 feet was taken. However, when changes in grade of formation occurred along any one section, the sample lengths conformed to such changes.

It was difficult to follow a systematic trenching pattern on the Pioneer Creek deposit, and the work consisted mostly of stripping wherever the depth of the bedrock was not excessive and wherever chromite mineralization could be found. On the northern zone of the Pioneer Creek deposit, samples were taken wherever chromite occurred. In sampling the southern zone an attempt was made to obtain a cross section of the zone at three intervals. It will be noted in figures 7, 8, and 9 that the samples are not cut parallel to one another, nor are all of them cut perpendicular to the apparent strike of the zone. Considering the irregularity of the ore in this zone, this diversion from standard sampling procedures will not affect the resultant grade of the zone appreciably.

The calculated grade of the Highway-claim deposit, based upon weighted average analysis from each trench, is 5.7 percent Cr_2O_3. The weighted average of samples taken from the northern zone of the Pioneer Creek deposit shows a chromic trioxide content of 6.8 percent; the southern zone contains 6.9 percent Cr_2O_3.

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