Mining Claim	Type	County	Book No.	Page No.
No. Nine	Unpatented	Okanogan	132	K
Copper Queen ?	Unpatented	Okanogan	132	K
Crystal Springs ?	Unpatented	Okanogan	501	5
Polaris	Unpatented	Okanogan	470	H
Sherry B	Unpatented	Okanogan	276	14
Ruth	Unpatented	Okanogan	278	14
Okel E	Unpatented	Okanogan	279	14
Joy	Unpatented	Okanogan	277	14
Mary Lou	Unpatented	Okanogan	274	14
Gardenbaum	Unpatented	Okanogan	275	14

Mining claims held under option for lease from Rion Inc.:

Mining Claim	Type	County	Book No.	Page No.
Aztec	Unpatented	Okanogan	306	0
Iron King	Unpatented	Okanogan	37	4
Iron Horse	Unpatented	Okanogan	38	4
Iron Axe	Unpatented	Okanogan	479	15
Iron Ring	Unpatented	Okanogan	480	15

3. PHYSICAL DESCRIPTION:

The Buckhorn Mountain iron ore deposits are in the Meyer's Creek Mining District in northeastern Okanogan County, Washington (see Figure 1). That part of the mineralized area that may have economic importance is in Sections 13 and 24, Township 40N, Range 30E, W.M.. The deposit is 24 miles northwesterly by road from Curlew, Washington and can be reached from Curlew by a good county road leading west from Curlew and paralleling the Kettle River to Torodo, where a second-class county road extends to Nicholson Creek. Turning northwestward, the property is reached by continuing over a U. S. Forest Service Road.

The Meyer's Creek Mining District was the scene of considerable prospecting between 1890 and 1900. Hundreds of short adits, winzes and open cuts, in

addition to several long adits, were driven in the district in the search for gold and copper. During 1911, the Grandby Consolidated Mining, Smelting & Power Company drilled five drill holes to explore a portion of the Buckhorn Region for copper and gold. During 1919 - 1920, approximately 2,000 tons of magnetic ore was shipped from the Roosevelt Mine to the Northwest Magnesite Company at Chewelah, Washington. Between 1937 and 1944, approximately 35,000 tons of magnetite ore was mined from Buckhorn. The Northwest Magnesite Company and shipbuilding firms at Tacoma, Washington purchased the high-grade ore for refractories manufacture and for ship ballast. An additional tonnage was later mined and shipped to Keokuk Electro Metals Company.

GENERAL GEOLOGY

The Buckhorn Mountain iron deposits are in a zone of intense contact metamorphism near a contact between sedimentary rocks of Paleozoic age and intrusive igneous rocks of late Mesozoic age. The sedimentary rocks in this area are chiefly limestones and quartzites which appear to form the east limb of a northeastward trending anticline; striking approximately North 10° E. to North 65° E. and dip to the east or southeast. The intrusive igneous rocks are hornblende syenites, which occupy an area of about 4 square miles on the north and east sides of Buckhorn Mountain and are also exposed in several small areas to the south. These intrusives apparently are associated with the great batholith that crops out over large areas in northern Washington and southern British Columbia.

The zone of contact metamorphism is from 1,500 - 3,000 feet wide. The iron deposits are typical of the contact metamorphic type iron ore deposits from which large tonnages are presently being mined on Vancouver and Texada Island, British Columbia.

Ore has been mined from three separate pits on the Neutral Claim from ore bodies that outcrop at the surface. The largest of these is Pit No. 1, the horizontal dimensions of which are approximately 260' x 50'. Magnetite ore is

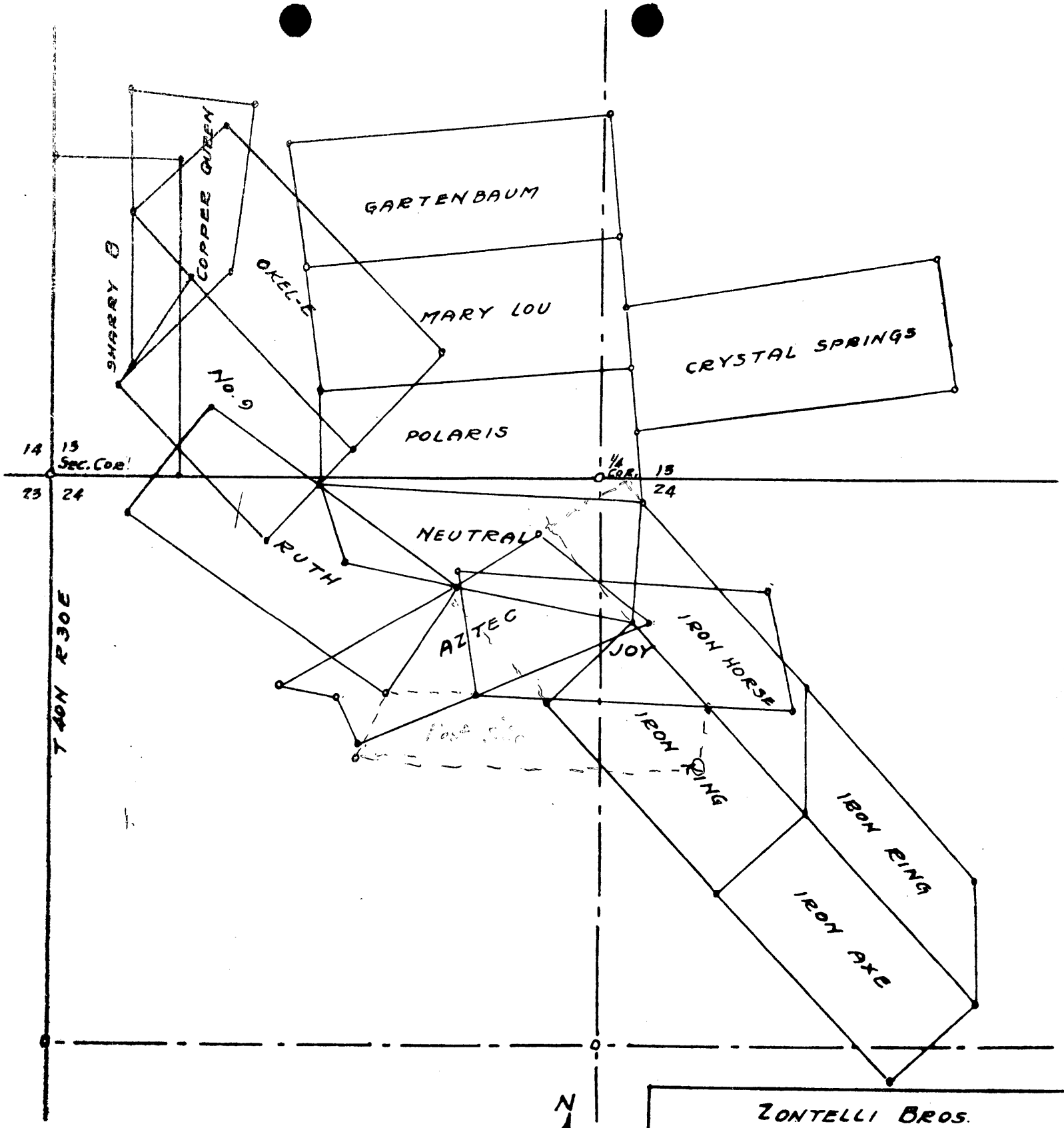
also exposed in Pit No. 2 and No. 3 with each of these pits being sampled extensively with the sample results indicated on the Plan Map, "Exhibit A". Approximately 35,000 tons of iron ore had been shipped from this deposit to Vancouver, Washington during World II for ship ballast with the material shipped assaying 60+% iron. In addition, several thousand tons have been shipped over a period of years to Northwest Magnesite for use as flux and also to Keokuk Electro Metals, Inc. for use in their electric furnace operations.

Recent aerial magnetic work performed by the Washington Bureau of Mines has indicated a large magnetic anomaly over this area which indicated a potential ore body much larger than indicated by the present workings.

This property has also been investigated by the U. S. Bureau of Mines, who have published a report of investigation entitled, "Iron Deposits of Buckhorn Mountain, Meyers Creek Mining District, Okanogan County, Washington", under R. I. 4051, by Zoldok, Cole and Dougherty. The work by the Bureau of Mines included the drilling of 7 diamond drill holes varying from 142 - 957' in depth, all of which were drilled from the surface. These holes, with their corresponding analyses, are included in the Zontelli Cross Sections, "Exhibit B". It is significant to note that many of the drill sections which were not analyzed for core iron due to their lower iron content, appear to have contained sufficient iron values to provide, when mixed with the higher grade ore formation, a satisfactory mill feed.

Additional work on the property included a drift approximately 415' in length driven from Pit No. 3 towards Pit No. 1 and raised to the surface a height of 150'. Samples taken along this drift and in the rise are included on both the Plan Map, "Exhibit A", and the Cross Sections, "Exhibit B".

Zontelli Brothers has recently completed a ground magnetometer survey to confirm the aerial magnetometer anomaly indicated in the work performed by the Washington Bureau of Mines. This survey confirmed the presence of a large magnetic anomaly and also showed the location of the aerial anomaly



N

ZONTELLI BROS.
IRONTON, MINN.

BUCKHORN IRON PROSPECT

OKANOGAN COUNTY, WASHINGTON

SKETCH SHOWING

MINING CLAIM LOCATIONS

SCALE - 1 IN. = 600 FT.

JAN. 1 1962

RECEIVED
Air mail
AUG 17 1962
U. S. G. S.
SPOKANE, WASH.

R. I. 4051 APRIL 1947

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

BUREAU OF MINES
R. R. SAYERS, DIRECTOR

REPORT OF INVESTIGATIONS

IRON DEPOSITS OF BUCKHORN MOUNTAIN, MEYERS CREEK MINING DISTRICT, OKANOGAN COUNTY, WASH.

BY

S. W. ZOLDOK, JOHN W. COLE, AND E. Y. DOUGHERTY

R. I. 4051,
April 1947.

REPORT OF INVESTIGATIONS

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

IRON DEPOSITS OF BUCKHORN MOUNTAIN, MYERS CREEK MINING DISTRICT OKANOGAN COUNTY, WASHINGTON[1]

By S. W. Zoldok,[2] John W. Cole,[2] and E. Y. Dougherty[3]

CONTENTS

	Page
Introduction	1
Acknowledgments	2
Location and accessibility	2
History and production	3
Physical features and climate	3
Property and ownership	3
Mine workings	4
Description of the deposits	4
General geology	4
The iron deposits	5
The ore	5
Company operations	6
Work by the Bureau of Mines	6
Drilling	6
Sampling and analyses	6
Davis tube magnetic tests on composite samples	7
Metallurgical testing	8
Drill hole logs	12

INTRODUCTION

During its wartime program of exploration for minerals essential to the national economy, the Bureau of Mines was instructed to investigate sources of raw materials used in the manufacture of iron and steel. As a part of this investigation, some work was done on the iron deposits on the Neutral and Aztec claims on Buckhorn Mountain, Okanogan County, Washington, which was designed chiefly to indicate the nature and behavior of the ore deposits below the surface exposures. Diamond drilling was started in June and completed in July 1945. Preliminary laboratory tests on iron ore from

1/ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is made: "Reprinted from Bureau of Mines Report of Investigations 4051."

2/ Mining engineer, Spokane Field Office, Albany Division, U. S. Bureau of Mines.

3/ In charge, Spokane Field Office, Albany Division, U. S. Bureau of Mines.

Buckhorn Mountain were completed during the fall and winter of 1945. This report presents the data obtained from the investigation.

ACKNOWLEDGMENTS

In its program of exploration 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. It is the policy of the Bureau to publish the facts developed by each exploratory project as soon as practicable after its conclusion. The Mining Branch, Lowell B. Moon, chief, conducts preliminary examinations, performs the actual exploratory work, and prepares the final report. The Metallurgical Branch, R. G. Knickerbocker, chief, analyzes samples and performs beneficiation tests.

The Buckhorn Mountain exploration project was a part of the activities of the Albany (Oregon) Division of the Mining Branch, S. H. Lorain, chief. The field work was supervised by P. E. Oscarson, engineer in charge of the Spokane field office. S. W. Zoldok was in direct charge of the field operations.

The chemical analyses were made at the Northwest Electrodevelopment Laboratory of the Bureau at Albany, Oreg., under the direction of Mark L. Wright, chemist.

The ore-dressing tests were under the direction of H. G. Poole at the Salt Lake City laboratories of the Bureau of Mines.

The authors wish to acknowledge the cooperation of A. E. Wilson and John Citkovich, owners of the Magnetic Mining Co., who generously contributed information and permitted the Bureau to use their camp and equipment.

LOCATION AND ACCESSIBILITY

The Buckhorn Mountain iron ore deposits are in the Myers Creek mining district in northeastern Okanogan County, Washington (fig. 1). That part of the mineralized area that may have economic importance is in sections 13 and 24, T. 40 N., R. 30 E., W.M. Exploration by the Bureau of Mines was confined to the Neutral and Aztec claims in the northern part of section 24.

The deposits are 24 miles northwesterly by road from Curlew, Wash., the nearest rail shipment point. From Curlew, a good county road paralleling the Kettle River leads to Torodo, where a second rate county road leads to Nicholson Creek. From Nicholson Creek, travel to the property is over a U. S. Forest Service road.

Curlew is on State Highway 4-A and on the Spokane-Republic branch of the Great Northern Railway.

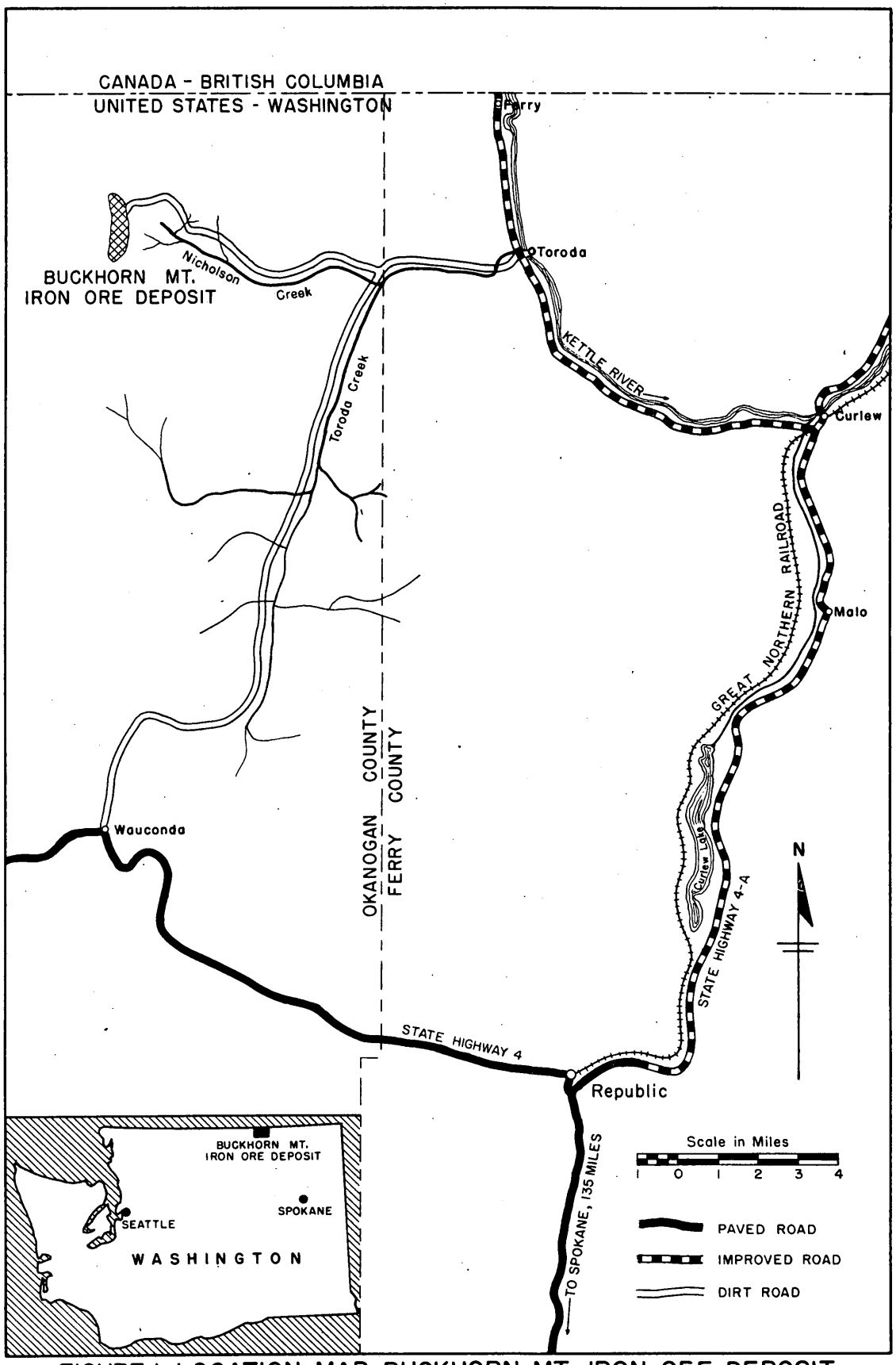


FIGURE I. LOCATION MAP-BUCKHORN MT. IRON ORE DEPOSIT

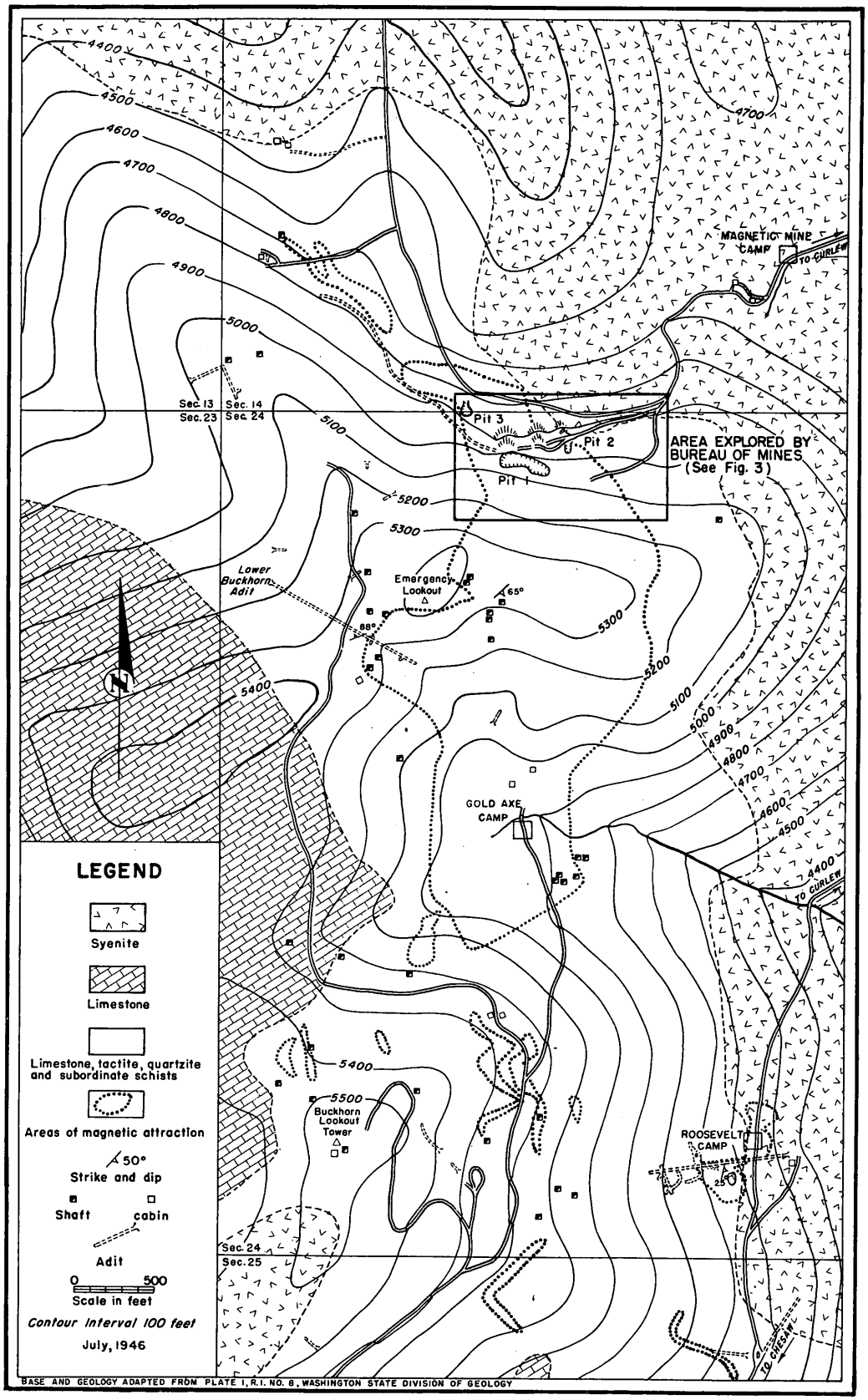


FIG. 2 GEOLOGIC MAP OF THE NORTH AND EAST SLOPES OF BUCKHORN MOUNTAIN OKANOGAN COUNTY, WASHINGTON

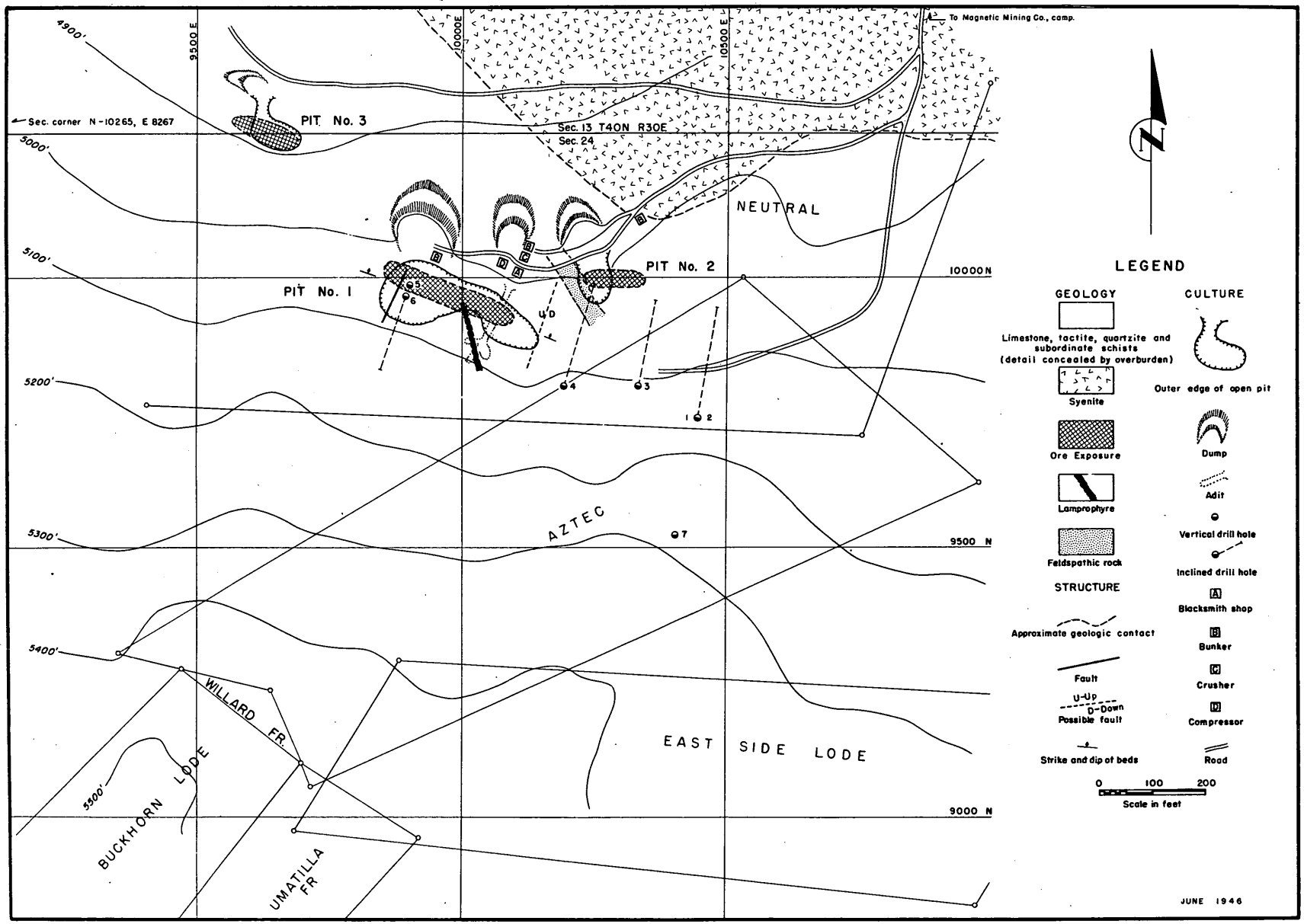


Fig.3 – PLAN OF BUCKHORN MOUNTAIN IRON DEPOSITS – OKANOGAN COUNTY, WASHINGTON,
Showing location of Bureau of Mines drill holes.

HISTORY AND PRODUCTION

The Myers Creek mining district was the scene of considerable prospecting between 1890 and 1900. Hundreds of short adits, winzes, and open cuts, in addition to several long adits, were driven in the search for gold and copper. A small quantity of ore was mined. During 1911, the Granby Consolidated Mining, Smelting, & Power Co. drilled five diamond-drill holes to explore a part of the Buckhorn region for copper and gold.

During 1919-20, approximately 2,000 tons of magnetite ore was shipped from the Roosevelt mine (fig. 2) to the Northwest Magnesite Co. at Chewelah, Wash., where small proportions of ground magnetite were mixed with magnesite in the manufacture of magnesite refractories.

The most recent production was from the Neutral claim of the Magnetic Mining Co., where, between 1937 and 1944, approximately 35,550 tons of magnetite ore was mined from open pits. The Northwest Magnesite Co. and shipbuilding firms at Tacoma, Wash., purchased the ore for refractories manufacture and for ship ballast, respectively.

PHYSICAL FEATURES AND CLIMATE

The topography of the area is moderately rugged. Buckhorn Mountain, the highest peak in the vicinity, attains an altitude of 5,580 feet. The altitudes at the deposits range from 4,500 to 5,400 feet.

Timber is abundant in the region.

The area is drained by numerous small streams, which could supply enough water for extensive mining and milling operations.

The climate is mild and dry in summer. Winters are characterized by moderate to heavy snowfall and considerable subzero weather.

PROPERTY AND OWNERSHIP

A. E. Wilson and John Citkovich of Colville, Wash., are co-partners and sole owners of the Magnetic Mining Co., which holds the Neutral, Copper Queen, Polaris, Crystal Springs, and No. 9 lode-mining claims, known, collectively, as the Neutral group. The claims are not patented.

Henry T. Nelson, Curlew, Wash., W. O. Miller, Ritzville, Wash., and G. W. Bartell and Frank Woodworth of Oroville, Wash., are each owners of a one-quarter interest in the unpatented Aztec claim, which adjoins the Neutral claim on the south.

The corners of the Neutral and Aztec claims, as located by the owners, were tied by a stadia transit survey to the northwest corner of sec. 24. T. 40 N., R. 30 E., W.M. (fig. 3).

The Roosevelt property is about 1 mile southeast of the Magnetic Mining Co. workings (fig. 2). It consists of 10 unpatented claims and 2 unpatented fractions. The property is controlled by Mrs. Elise MacLean Dewar, Mrs. Joseph McCarthy, and Roger O. Oscarson, of Spokane, Wash. The Roosevelt property was not included in the exploration program of the Bureau of Mines.

MINE WORKINGS

The only accessible mine workings in the area are on the Neutral claim of the Magnetic Mining Co. and on the Roosevelt group of claims.

The most recent workings are on the Neutral claim as shown in figure 3. They consist of one large open pit (No. 1), two small open pits, an adit 85 feet long in the south face of the large pit, and a tunnel 30 feet long in the north face of the large pit. The large open pit is 300 feet long and 50 feet to 120 feet wide. It has a maximum depth of approximately 100 feet.

The Roosevelt group of claims is developed by an adit approximately 850 feet long, approximately 700 feet of accessory drifts, and one small stope.

DESCRIPTION OF THE DEPOSITS

General Geology

The areal geology of the Myers Creek district has been described by Umpleby.[4] A more specific report on the Buckhorn Mountain iron deposits has been made by Broughton.[5] The following description of the broader geologic features of the area is based chiefly upon Umpleby's and Broughton's reports.

The Buckhorn Mountain iron deposits are in a zone of intense contact metamorphism near a contact between sedimentary rocks of Paleozoic age and intrusive igneous rocks of late Mesozoic age (fig. 2). The sedimentary rocks in this area are chiefly limestones and quartzites, which appear to form the east limb of a northeastward trending anticline; they strike N. 10° E. to N. 65° E. and, except for local irregularities, dip to the east or southeast. The intrusive igneous rocks are hornblende syenites, which occupy an area of about 4 square miles on the north and east sides of Buckhorn Mountain and are also exposed in several small areas to the south. These intrusives apparently are associated with the great batholith that crops out over large areas in northern Washington and southern British Columbia.

4/ Umpleby, J. B., Geology and Ore Deposits of the Myers Creek Mining District: Bull. 5, Washington Geological Survey, Olympia, Wash., 1911.

5/ Broughton, W. A., The Buckhorn Mountain Iron Deposits of Okanogan County, Washington: Report of Investigations 8, Dept. of Conservation and Development, Olympia, Wash.

Numerous shear zones cut the metamorphosed sedimentaries near the southwestern contact of the syenites on Buckhorn Mountain. These shear zones strike between N. 65° W. and N. 75° E. Most of the northwesterly striking shear zones dip 35 to 65 degrees southwesterly; most of the northeasterly striking shear zones dip almost vertically. The zone of contact metamorphism is 1,500 to 2,500 feet wide, but the metamorphism decreases, gradually, away from the contact. Some beds, which are assumed to have been limestone, are completely altered to tactite near the contact. In places the tactite contains deposits of nearly massive magnetite or of iron sulfides, chiefly pyrrhotite, with some chalcopyrite. Smaller lenses, veinlets, and disseminated grains of the metallic minerals are irregularly distributed throughout other parts of the altered zone. Evidence obtained from diamond-drill holes indicates that the metallic minerals are most abundant near the contact and are proportionally less abundant at greater distances from the contact.

The Iron Deposits

Dip-needle surveys by Broughton[6/] indicated the presence of several areas of magnetic attraction within the zone of contact metamorphism (fig. 2). Although nearly all of the contact zone is covered with overburden, enough mining has been done to indicate that the iron-ore bodies are coarsely crystalline, lenticular masses of magnetite or iron-rich tactite near the syenite contact, and that the areas of magnetic attraction at greater distances from the contact may be caused by relatively sparse disseminations of magnetite or by deeply buried bodies of high-grade magnetite, or both. The results of diamond drilling by the Bureau and of recent magnetometer surveys by the U. S. Geological Survey suggest that the ore lenses are irregularly distributed within a zone of relatively intense mineralization that may plunge to the southwest approximately parallel with the syenite contact.

Minable bodies of iron ore have been found at only two places on Buckhorn Mountain - at the Roosevelt and Magnetic, or Neutral, mines. According to Broughton, the old stope at the Roosevelt mine is about 35 feet long by 25 feet wide by 30 feet high. The top of the ore body was about 100 feet below the surface. On the Neutral claim of the Magnetic mine, ore has been mined from small open pits on three ore bodies that crop out at the surface. The largest of these is exposed in pit 1 (fig. 3). The horizontal dimensions of this body are approximately 260 by 45 feet; the dip length is not known. Pits 2 and 3 have exposed magnetite ore whose horizontal dimensions are at least 120 feet by 30 feet. The results of diamond drilling by the Bureau of Mines indicates that if the overburden south of pit 2 were removed the outcrop of this ore body would be found to be considerably larger than the outcrop that has been exposed by the pit. Downward extensions of this (No. 2) ore body, or of similar ore lenses along the dip extension of this ore body, have been indicated by diamond drilling to exist at depths of 300 and 800 feet below the surface. Intermediate depths have not been explored.

The Ore

The metallic minerals in the ore, in decreasing order of abundance, are magnetite, pyrrhotite, pyrite, and chalcopyrite. Minor quantities of gold

6/ Refer to footnote 5.

and silver are present. In the higher-grade lenses, the magnetite forms thick, granular disseminations or massive granular aggregates intermixed with small percentages of relic metamorphic minerals and with pyrrhotite, pyrite. and chalcopyrite. In places, the pyrrhotite may form compact masses weighing several tons. Veinlets of pyrite and chalcopyrite often cut the older pyrrhotite and magnetite.

The gangue is chiefly tactite, which is composed principally of garnet with smaller quantities of epidote, zoisite, and other calc-silicate minerals. Associated with the tactite are minor quantities of quartz and secondary calcite.

COMPANY OPERATIONS

Owing to the limited demand for magnetite ore in the Northwestern States, capital expenditures on mining equipment have been kept low. Mining equipment on the property includes a crusher, a small portable compressor, one stoper, one jackhammer, three mine cars, and miscellaneous small tools. Jackbits are used in drilling.

The ore has been mined from three small open pits. The most recent production was from No. 1 pit. The ore was hand-sorted in the pit after each blast. It was then crushed to minus 2-inch before shipment. Waste and a middling product were discarded.

WORK BY THE BUREAU OF MINES

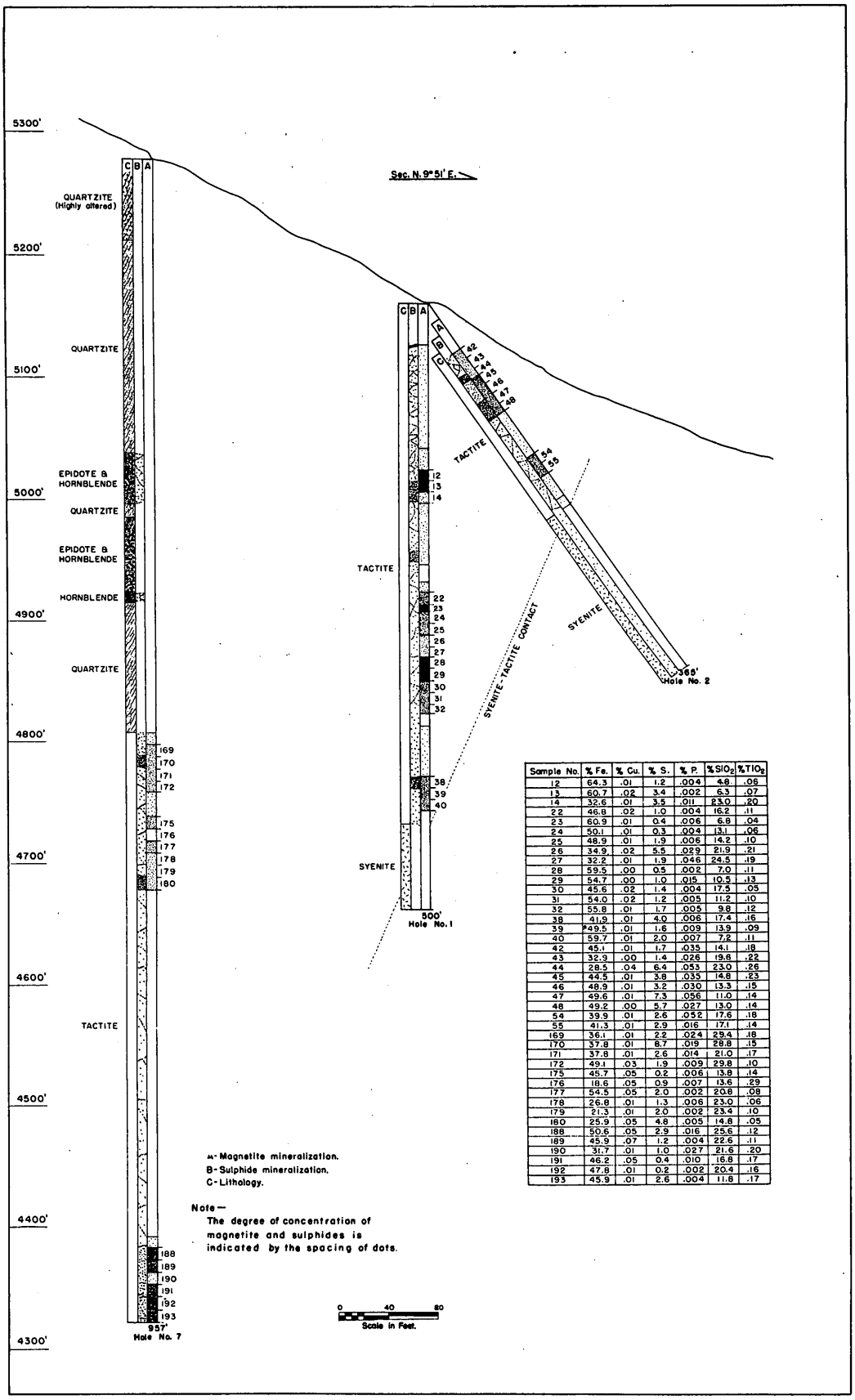
Drilling

Diamond drilling was started in June 1945; it was concluded in July 1945. Seven holes 142 to 957 feet long, were drilled from surface stations. The total footage drilled was 2,877.4; 21 feet were through overburden by driving standpipe and 2,856.4 feet were diamond-drilled. Of the total footage diamond-drilled, 3 feet were drilled with NX bits, 101.9 feet with BX bits, and 2,751.5 feet with EX bits. The average rate of advance per shift, including the time spent in moving, was 34.3 feet. Core recovery averaged 96.6 percent.

Table 1 provides the summarized data on the drill holes. The locations of the drill holes are shown on figure 3.

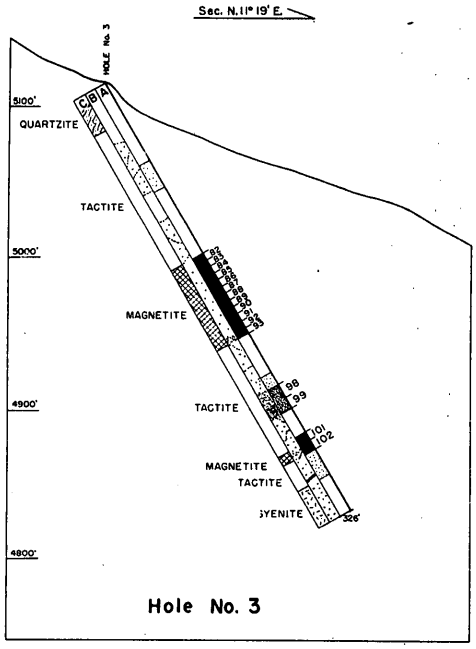
Sampling and Analyses

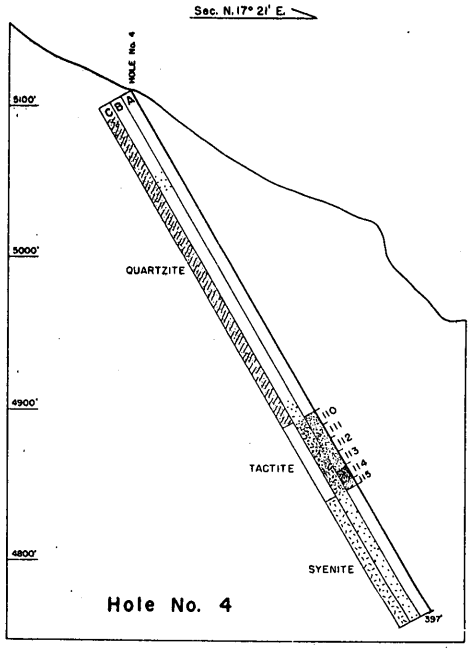
One hundred ninety-three core samples were analyzed. All that contained an appreciable quantity of magnetite were analyzed for iron, sulfur, phosphorus, silica, titania, and copper. The copper content of all samples was determined. Composite samples were assayed for gold and silver. All cores were examined under ultraviolet light but failed to show the presence of scheelite.

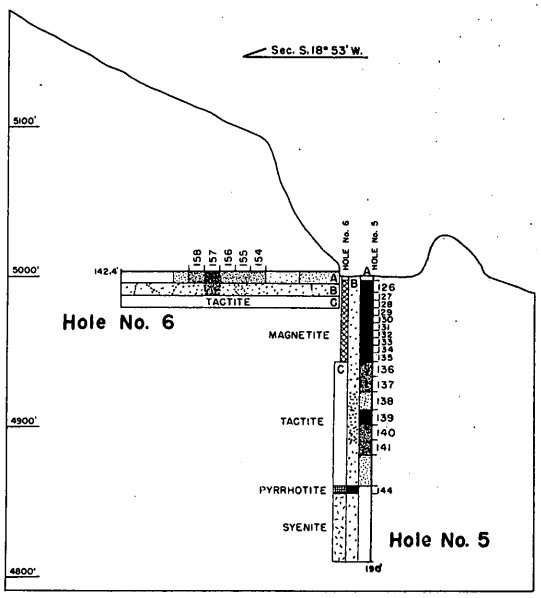


Sample No.	% Fe.	% Cu.	% S.	% P.	% SiO_2	% TiO_2
12	64.3	.01	1.2	.004	4.8	.06
13	60.7	.02	3.4	.002	6.3	.07
14	32.6	.01	3.5	.011	23.0	.20
22	46.8	.02	1.0	.004	16.2	.11
23	60.9	.01	0.4	.006	6.8	.04
24	50.1	.01	0.3	.004	13.1	.06
25	48.9	.01	1.9	.006	14.2	.10
26	34.9	.02	5.5	.029	21.9	.21
27	32.2	.01	1.9	.046	24.5	.19
28	59.5	.00	0.5	.002	7.0	.11
29	54.7	.00	1.0	.015	10.5	.13
30	45.6	.02	1.4	.004	17.5	.05
31	54.0	.02	1.2	.005	11.2	.10
32	55.8	.01	1.7	.005	9.8	.12
38	41.9	.01	4.0	.006	17.4	.16
39	*49.5	.01	1.6	.009	13.9	.09
40	59.7	.01	2.0	.007	7.2	.11
42	45.1	.01	1.7	.035	14.1	.18
43	32.9	.00	1.4	.026	19.6	.22
44	28.5	.04	6.4	.053	23.0	.26
45	44.5	.01	3.8	.035	14.8	.23
46	48.9	.01	3.2	.030	13.3	.15
47	49.6	.01	7.3	.056	11.0	.14
48	49.2	.00	5.7	.027	13.0	.14
54	39.9	.01	2.6	.052	17.6	.18
55	41.3	.01	2.9	.016	17.1	.14
169	36.1	.01	2.2	.024	29.4	.18
170	37.8	.01	8.7	.019	28.8	.15
171	37.8	.01	2.6	.014	21.0	.17
172	49.1	.03	1.9	.009	29.8	.10
175	45.7	.05	0.2	.006	13.8	.14
176	18.6	.05	0.9	.007	13.6	.29
177	54.5	.05	2.0	.002	20.8	.08
178	26.8	.01	1.3	.006	23.0	.06
179	21.3	.01	2.0	.002	23.4	.10
180	25.9	.05	4.8	.005	14.8	.05
188	50.6	.05	2.9	.016	25.6	.12
189	45.9	.07	1.2	.004	22.6	.11
190	31.7	.01	1.0	.027	21.6	.20
191	46.2	.05	0.4	.010	16.8	.17
192	47.8	.01	0.2	.002	20.4	.16
193	45.9	.01	2.6	.004	11.8	.17

FIG.4 - GRAPHIC LOGS OF DRILL HOLES 1, 2 AND 7 — BUCKHORN MOUNTAIN IRON DEPOSITS







Sample No.	% Fe.	% Cu.	% S.	% P.	% SiO_2	% TiO_2
82	66.6	.02	0.4	.001	3.4	.09
83	67.2	.02	0.5	.006	2.0	.12
84	68.3	.01	0.2	.001	1.8	.15
85	67.7	.02	0.3	.009	2.2	.07
86	63.9	.01	0.2	.007	4.5	.08
87	62.3	.01	0.2	.007	6.0	.11
88	58.1	.01	0.2	.009	8.3	.08
89	67.6	.01	0.2	.009	2.7	.15
90	68.1	.04	0.3	.011	2.2	.14
91	66.8	.01	0.3	.014	2.7	.12
92	60.0	.01	0.8	.031	6.0	.14
93	60.3	.02	1.8	.019	5.2	.16
98	42.8	.04	4.3	.029	16.3	.20
99	33.0	.02	7.1	.045	22.9	.38
101	50.0	.01	0.5	.010	12.8	.14
102	60.3	.01	1.3	.010	6.2	.10
110	30.1	Tr.	3.6	.031	24.8	.25
111	28.2	Tr.	2.4	.031	22.2	.24
112	37.8	Tr.	3.0	.031	18.2	.23
113	33.8	Tr.	5.8	.029	19.6	.18
114	47.4	Tr.	1.1	.022	15.6	.11
115	35.5	Tr.	1.7	.005	22.0	.12
126	59.3	Tr.	1.1	.046	7.0	.09
127	59.7	Tr.	1.1	.048	11.2	.17
128	60.6	.01	0.6	.041	5.8	.12
129	55.7	Tr.	0.5	.032	7.6	.12
130	61.6	Tr.	0.3	.022	5.8	.11
131	63.5	Tr.	0.3	.031	5.0	.11
132	69.3	.01	0.3	.025	4.8	.12
133	67.9	Tr.	0.4	.030	2.4	.11
134	67.0	.01	0.3	.008	3.2	.13
135	69.1	Tr.	0.2	.008	4.2	.10
136	41.1	Tr.	0.1	.008	18.4	.14
137	38.6	Tr.	0.9	.016	17.6	.20
138	21.7	.01	2.1	.036	27.4	.32
139	46.1	.01	1.5	.019	13.4	.18
140	35.3	.05	2.0	.004	17.8	.16
141	38.6	Tr.	0.9	.022	17.4	.15
144		5.20				
154	36.1	Tr.	1.7	.026	17.6	.28
155	33.4	.01	2.0	.041	25.6	.25
156	27.4	Tr.	1.5	.031	16.6	.20
157	47.8	.01	5.5	.014	12.8	.05
158	33.2	.01	1.3	.011	28.0	.05

A-Magnetite mineralization.
B-Sulphide mineralization.
C-Lithology.

0 40 80
Scale in Feet

Note —
The degree of concentration of magnetite and sulphides is indicated by the spacing of dots.
Solid black is nearly massive magnetite or nearly massive pyrrhotite

FIG.5 - GRAPHIC LOGS OF DRILL HOLES 3, 4, 5 AND 6 - BUCKHORN MOUNTAIN IRON DEPOSITS

TABLE 1. - Summarized data on drill holes

Hole	Co-ordinates	Altitude at collar, ft.	Length, ft.	Inclination	Bearing	Principal sections of iron mineralization, ft. From-	To-
1 ...	N-9740 E-10449	5160.0	500.0	-90°	-	137.2	164.4
						236.5	338.2
						389.7	418.5
2 ...	N-9740 E-10449	5160.0	365.0	-55°N	N9°51'E	45.7	107.8
						150.7	170.3
3 ...	N-9799 E-10334	5117.0	326.0	-60°N	N11°19'E	131.0	191.3
						229.6	248.0
						266.0	278.6
4 ...	N-9799 E-10193	5111.0	397.0	-60°N	N17°21'E	243.5	299.2
5 ...	N-9986 E-9901	5000.0	190.0	-90°	-	3.0	119.0
6 ...	N-9965 E-9894	5003.0	142.4	-0°	S18°53'W	48.0	98.0
7 ...	N-9521 E-10405	5278.0	957.0	-90°	-	479.8	519.0
						539.0	549.0
						559.0	599.0
						894.6	957.0

All drill cores, except those that were barren or of very low-grade material, were split for sampling and analysis. As a very high core recovery was obtained, no sludge samples were analyzed. The sampling intervals usually ranged from 5 to 10 feet in length; the shorter intervals were used where visual inspection indicated a high percentage of magnetite to be present. In a few instances where mineralization was scant, the sample interval exceeded 10 feet. This procedure was followed because there was usually sharp demarkation between the bodies of massive magnetite and the lower-grade iron-bearing tactite that surrounded them. The transition from tactite with a relatively high iron content to tactite with a low iron content was generally gradational.

Figures 4 and 5 show the graphic logs of the drill holes, the analyses of the core samples, the distribution of the magnetite and sulfide mineralization, and the lithology. Detailed logs of the drill holes, with all analyses, are provided as an appendix.

Davis Tube Magnetic Tests on Composite Samples

Davis tube magnetic tests were conducted on composited core samples of the ore intersected in drill holes 1, 2, 3, 4, 5, and 7. By recovering the magnetic iron, these tests indicated the amount of available iron (exclusive of iron combined as silicates) in the samples. Composite samples were made up for each ore section, exclusive of that in hole 6, and the section from 539 to 599 feet in hole 7. Each composite sample was analyzed separately for iron. After grinding to pass a 100-mesh screen, 10 grams of each sample were treated separately in a Davis tube, where a magnetic and a nonmagnetic fraction were produced. The location of the composited samples, the

sample length, the iron content, and the percent by weight of the magnetic fraction from each are given in table 2.

TABLE 2. - Davis tube magnetic tests

Hole	Ore Section, feet From-	Ore Section, feet To-	Sample length, feet	Weighted analysis, iron, percent	Magnetic fraction from sample, percent by weight
1 ..	137.2	164.4	27.2	51.9	67.0
	236.5	338.2	101.7	49.9	65.1
	389.7	418.5	28.8	50.7	66.9
2 ..	45.7	107.8	62.1	42.0	54.8
	150.7	170.3	19.6	40.4	49.4
3 ..	131.0	191.3	60.3	65.5	89.5
	229.6	248.0	18.4	35.9	42.7
	266.0	278.6	12.6	56.4	76.5
4 ..	243.0	299.2	56.2	33.7	37.8
5 ..	3.0	119.0	116.0	47.4	63.0
7 ..	479.8	519.0	39.2	40.4	47.7
	894.6	957.0	62.4	42.7	56.4
Averages 1/				51.6	67.1

1/ Samples from hole 6 and from 539 to 599 feet in hole 7 are not included.

All magnetic fractions were then combined and analyzed for iron, sulfur, and silica. The same procedure was followed with the nonmagnetic fractions. The chemical analyses of these combined fractions were reported as follows, in percent:

	Fe	S	SiO_2
Magnetic fraction	65.5	4.00	3.8
Nonmagnetic fraction	12.1	0.74	39.3

The average recovery in the magnetic fractions was 67.1 percent by weight of the original samples. The average iron content of the original samples was 51.6 percent (table 2). The iron content of the combined magnetic fractions was 65.5 percent. Computations based upon these results indicate that 85.2 percent of the iron in the ore samples was recovered in the magnetic concentrates by such small-scale laboratory methods. These tests, however, were conducted mainly for the purpose of obtaining an indication of the available iron in the samples after most of the nonavailable iron in the form of iron silicates had been removed.

Metallurgical Testing

A 300-pound sample for metallurgical testing was taken across a 30-foot ore exposure in the northwest end of pit 1 on the Neutral claim.

Although this ore had a somewhat higher iron content than the average ore, it was, in general, otherwise representative in character. The analysis of this ore was reported as follows:

	Percent
Iron	55.4
Manganese	0.5
Silica	7.9
Insoluble	14.0
Sulfur	1.4
Phosphorus	0.05
Copper	0.06
Nickel	Nil
Chromium	Nil
Titania	Nil
Cobalt	less than 0.01

The minerals in this sample were chiefly magnetite, pyrite, and pyrrhotite associated with a garnet, epidote, calcite, and quartz gangue. The tests performed on this ore included:

1. Sintering after crushing to pass a 1/4-inch screen, recrushing the sinter to pass a 6-mesh screen, and resintering on a downdraft sintering hearth.

2. The ore was subjected to a 30-minute hydrogen reduction at 550° C. and was given a Davis-tube wet magnetic separation.

3. Magnetic separation of the ore with a Davis tube without prior hydrogen reduction.

These tests indicate the results that may be expected from treatment of the high iron-bearing (45 percent to 55 percent Fe) tactites and the massive magnetites. Lower-grade ores would require additional concentration.

Tables 3, 4, and 5 give the results of these tests.

TABLE 3. - Metallurgical data on straight sintering test 1

Size	Product	Analyses, percent			
		Fe	S	P	SiO_2
-	Ore	55.4	1.40	0.05	7.9
-1/4 inch	Sinter	55.2	.10	.05	9.8
-6 mesh	Resinter	55.0	.05	.05	9.8

The sintering tests showed that the sulfur can be reduced by this method to a content acceptable for use in the blast furnace or other furnaces demanding an ore relatively low in sulfur, and that the silica content of the sinter is within reasonable limits.

TABLE 4. - Thirty-minute hydrogen reduction at 550° C., followed by Davis-tube wet magnetic separation

	Percentage weight	Analyses, percent						Distribution, percent
		Fe	Insol.	S	P	CaO	SiO_2	Fe
Product ground to -8 mesh:								
Calculated heads		56.1	13.3	1.23	0.031	4.28	8.21	
Magnetic	82.8	64.0	7.6	.55	.030	1.50	4.40	94.6
Nonmagnetic	17.2	17.8	40.6	4.54	.037	17.7	26.6	5.4
Product ground to -28 mesh:								
Calculated heads		56.0	12.9	1.16	.031	4.47	8.22	
Magnetic	78.7	66.4	5.4	0.36	.027	1.00	3.20	93.3
Nonmagnetic	21.3	17.6	40.4	4.15	.045	17.3	26.8	6.7
Product ground to -100 mesh:								
Calculated heads		55.7	13.8	1.33	.032	4.18	8.51	
Magnetic	75.1	69.6	2.8	.77	.019	.50	1.60	93.9
Nonmagnetic	24.9	13.6	47.2	3.04	.073	15.3	29.4	6.1
Product ground to -200 mesh:								
Calculated heads		56.1	13.6	1.38	.034	4.50	8.80	
Magnetic	74.4	70.4	2.0	.85	.015	0.30	1.5	93.4
Nonmagnetic	25.6	14.4	47.2	2.94	.090	16.7	30.0	6.6

TABLE 5. - Straight wet magnetic separation with Davis tube

	Percentage weight	Assay, percent						Distribution, percent
		Fe	Insol.	S	P	CaO	SiO_2	Fe
Product ground to -8 mesh:								
Calculated heads		54.77	16.22	1.27	0.090	2.83	8.66	
Magnetic	83.8	63.0	8.6	1.05	.038	1.0	6.4	96.4
Nonmagnetic	16.2	12.2	55.6	2.40	.047	12.3	20.4	3.6
Product ground to -28 mesh:								
Calculated heads		54.62	16.47	1.47	.042	2.68	9.85	
Magnetic	80.7	65.0	6.4	1.00	.039	.50	4.60	96.0
Nonmagnetic	19.3	11.2	58.6	3.40	.055	11.8	31.8	4.0
Product ground to -100 mesh:								
Calculated heads		56.0	16.13	1.28	.044	2.78	10.2	
Magnetic	76.3	69.8	3.0	1.00	.030	.1	3.0	95.1
Nonmagnetic	23.7	11.6	58.4	2.2	.088	11.4	33.4	4.9
Product ground to -200 mesh:								
Calculated heads		55.93	15.78	1.24	.042	3.67	9.92	
Magnetic	75.4	70.2	2.0	.95	.024	.20	2.0	94.6
Nonmagnetic	24.6	12.2	58.0	2.10	.099	14.3	34.2	5.4

Reduction by hydrogen followed by magnetic separation provided a high-iron and low-silica but fairly high-sulfur concentrate.

Straight magnetic concentration produced a high-iron, low-silica concentrate with little reduction of the sulfur content. Sintering of this concentrate, however, would reduce the sulfur content to permissible limits for furnace ore.

Results of metallurgical testing by magnetic separation of the crude ore and of ore subjected to hydrogen reduction are comparable. Iron recovery was plus 93 percent on all sizes, although grinding to finer than minus 28 mesh was indicated to be necessary for the production of 69-70 percent iron concentrate. Sulfur elimination was poor at all sizes, owing largely to the presence of the highly magnetic sulfide, pyrrhotite.

DIAMOND DRILL HOLE LOG AND ANALYSES

Hole No. 1

Location: N-9740' E-10449'
Elevation of Collar: 5160'
Bearing:
Inclination: Vertical
Depth: 500'

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
0	34.0	Barren tactite.	-	-	-	-	-	-		
34.0	40.0	Tactite, minor magnetite, sulfides	-	.05	-	-	-	-		
40.0	50.0	do	-	.08	-	-	-	-		
50.0	60.0	do	-	.02	-	-	-	-	34.0-137.2'	
60.0	69.0	do	-	.05	-	-	-	-	Tr	0.25
69.0	78.5	do	-	.02 *	-	-	-	-		
78.5	89.0	do	-	.02 *	-	-	-	-		
89.0	99.0	do	-	.02	-	-	-	-		
99.0	109.0	do	-	.02 *	-	-	-	-		
109.0	119.7	do	-	.02 *	-	-	-	-		
119.7	128.7	do	-	.02 *	-	-	-	-		
128.7	137.2	do	-	.02 *	-	-	-	-		
137.2	145.6	Magnetite	64.3	.02 *	1.2	0.004	4.8	0.06	137.2-164.4'	
145.6	154.6	do	60.7	.02	3.4	0.002	6.3	0.07	0.04	0.20
154.6	164.4	Tactite, magnetite, sulfides	32.6	.02 *	3.5	0.011	23.0	0.20		
164.4	174.0	Tactite, minor magnetite, sulfides	-	.02 *	-	-	-	-		
174.0	184.2	do	-	.02	-	-	-	-		
184.2	194.2	do	-	.02 *	-	-	-	-	164.4-236.5'	
194.2	203.7	do	-	.02	-	-	-	-	.005 *	0.05
203.7	214.2	do	-	.02 *	-	-	-	-		
214.2	228.2	Tactite, minor sulfides	-	.02 *	-	-	-	-		
228.2	236.5	do	-	.02 *	-	-	-	-		

Hole No. 1 (Continued)

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
236.5	246.5	Tactite,magnetite,sulfides	46.8	.02	1.0	0.004	16.2	0.11		
246.5	252.1	do	60.9	.02 *	0.4	0.006	6.8	0.04		
252.1	262.1	do	50.1	.02 *	0.3	0.004	13.1	0.06		
262.1	272.1	do	48.9	.02 *	1.9	0.006	14.2	0.10		
272.1	282.1	do	34.9	.02	5.5	0.029	21.9	0.21	236.5-338.2'	
282.1	290.6	do	32.2	.02 *	1.9	0.046	24.5	0.19	Tr	.05 *
290.6	300.2	do	59.5	Nil	0.5	0.002	7.0	0.11		
300.2	310.2	do	54.7	Nil	1.0	0.015	10.5	0.13		
310.2	320.2	do	45.6	.02	1.4	0.004	17.5	0.05		
320.2	330.2	do	54.0	.02	1.2	0.005	11.2	0.10		
330.2	338.2	do	55.8	.02 *	1.7	0.005	9.8	0.12		
338.2	348.3	Tactite,minor sulfides	-	.02 *	-	-	-	-		
348.3	359.9	Tactite,minor magnetite, sulfides	-	.02 *	-	-	-	-	338.2-389.7'	
359.9	369.4	do	-	.02	-	-	-	-	Tr	0.1
369.4	379.4	do	-	.02	-	-	-	-		
379.4	389.7	do	-	Nil	-	-	-	-		
389.7	399.5	Tactite,magnetite,sulfides	41.9	.02 *	4.0	0.006	17.4	0.16	389.7-418.5'	
399.5	409.5	do	49.5	.02 *	1.6	0.009	13.9	0.09	Tr	0.2
409.5	418.5	do	59.7	.02 *	2.0	0.007	7.2	0.11		
418.5	429.2	do	-	.02 *	-	-	-	-	Tr	0.1
429.2	500.0	Garnetized syenite,barren	-	-	-	-	-	-		

* Less than

Hole No. 2

Location: N-9740'- E-10449'
Elevation of collar: 5160'
Bearing: N.9° 51' E.
Inclination: -55°N.
Depth: 365'

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
0	6.0	Overburden	-	-	-	-	-	-		
6.0	45.7	Barren tactite	-	-	-	-	-	-		
45.7	55.1	Tactite, magnetite, sulfides	45.1	.02 *	1.7	0.035	14.1	0.18	45.7-72.0'	
55.1	65.4	do	32.9	Nil	1.4	0.026	19.6	0.22	.005	.05
65.4	72.0	do	28.5	.04	6.4	0.053	23.0	0.26		
72.0	80.7	do	44.5	.02 *	3.8	0.035	14.8	0.23	72.0-107.8'	
80.7	90.7	do	48.9	.02 *	3.2	0.030	13.3	0.15	0.01	0.2
90.7	100.7	do	49.5	.02 *	7.3	0.056	11.0	0.14		
100.7	107.8	do	49.2	Nil	5.7	0.027	13.0	0.14		
107.8	115.2	Tactite, minor magnetite, sulfides	-	.02*	-	-	-	-		
115.2	125.0	do	-	.02 *	-	-	-	-	107.8-150.7'	
125.0	135.0	do	-	.02 *	-	-	-	-	0.005	0.15
135.0	145.0	do	-	Nil	-	-	-	-		
145.0	150.7	do	-	.02 *	-	-	-	-		
150.7	160.3	Tactite, magnetite, sulfides	39.9	.02 *	2.6	0.052	17.6	0.18	150.7-170.3'	
160.3	170.3	do	41.3	.02 *	2.9	0.016	17.1	0.14	0.15	0.15
170.3	180.3	Tactite, minor magnetite, sulfides	-	.02	-	-	-	-	170.3-201.0'	
180.3	191.8	do	-	.02 *	-	-	-	-	0.02	0.1
191.8	201.0	do	-	.04	-	-	-	-		
201.0	211.0	Garnetized syenite, disseminated sulfides	-	.02	-	-	-	-		
211.0	221.0	do	-	.02	-	-	-	-		
221.0	231.0	do	-	Nil	-	-	-	-		

Hole No. 2 (Continued)

Interval		Formation	Analysis, Percent						Composite	
			Fe.	Cu.	S.	P.	SiO_2	TiO_2	Au-Oz.	Ag-Oz.
231.0	241.0	Garnetized syenite, disseminated sulfides	-	.02 *	-	-	-	-		
241.0	251.0	do	-	.02 *	-	-	-	-		
251.0	261.0	do	-	Nil	-	-	-	-	201.0-365.0'	
261.0	271.0	do	-	.02 *	-	-	-	-	Tr	0.05
271.0	281.2	do	-	.04	-	-	-	-		
281.2	289.3	do	-	.04	-	-	-	-		
289.3	299.4	do	-	.04	-	-	-	-		
299.4	309.5	do	-	.04	-	-	-	-		
309.5	319.5	do	-	.02	-	-	-	-		
319.5	329.5	do	-	.04	-	-	-	-		
329.5	340.0	do	-	.02	-	-	-	-		
340.0	352.5	do	-	.04	-	-	-	-		
352.5	365.0	do	-	.02	-	-	-	-		

* Less than

Hole No. 3

Location: N-9799' E-10334'
Elevation of Collar: 5117'
Bearing: N.11° 19' E.
Inclination: -60°N.
Depth: 326'

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
0	6.0	Overburden	-	-	-	-	-	-		
6.0	38.8	Calc-silicate hornfels	-	-	-	-	-	-		
38.8	50.3	Tactite with minor sulfides	-	Nil	-	-	-	-	38.8-131.0'	
50.3	60.0	do	-	Nil	-	-	-	-	.005 *	0.10
60.0	70.0	do	-	Nil	-	-	-	-		
70.0	80.0	do	-	.02 *	-	-	-	-		
80.0	99.0	Barren tactite	-	-	-	-	-	-		
99.0	109.0	Tactite with minor sulfides	-	.02 *	-	-	-	-		
109.0	120.0	do	-	.02	-	-	-	-		
120.0	131.0	do	-	.02 *	-	-	-	-		
131.0	136.0	Magnetite	66.6	.02	0.4	0.001	3.4	0.09		
136.0	141.0	do	67.2	.02	0.5	0.006	2.0	0.12		
141.0	146.0	do	68.3	.02 *	0.2	0.001	1.8	0.15		
146.0	151.0	do	67.7	.02	0.3	0.009	2.2	0.07		
151.0	156.0	do	63.9	.02 *	0.2	0.007	4.5	0.08	131.0-191.3'	
156.0	161.0	do	62.3	.02 *	0.2	0.007	6.0	0.11	.005 *	0.15
161.0	166.3	do	58.1	.02 *	0.2	0.009	8.3	0.08		
166.3	171.3	do	67.6	.02 *	0.2	0.009	2.7	0.15		
171.3	176.3	do	68.1	.04	0.3	0.011	2.2	0.14		
176.3	182.0	do	66.8	.02 *	0.3	0.014	2.7	0.12		
182.0	187.0	do	60.0	.02 *	0.8	0.031	6.0	0.14		
187.0	191.3	do	60.3	.02	1.8	0.019	5.2	0.16		
191.3	201.0	Tactite with sulfides	-	Nil	-	-	-	-	191.3-229.6'	
201.0	211.0	do	-	Nil	-	-	-	-	Tr	0.1
211.0	221.0	do	-	Nil	-	-	-	-		
221.0	229.6	do	-	.02 *	-	-	-	-		

Hole No. 3 (Continued)

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
229.6	240.1	Tactite,magnetite,sulfides	42.8	.04	4.3	0.029	16.3	0.20	229.6-248.0'	
240.1	248.0	do	33.0	.02	7.1	0.045	22.9	0.38	Tr	0.1
248.0	266.0	Tactite with sulfides	-	.02 *	-	-	-	-	Tr	0.1
266.0	272.3	Tactite,magnetite,sulfides	50.0	.02 *	0.5	0.010	12.8	0.14	266.0-278.6'	
272.3	278.6	do	60.3	.02 *	1.3	0.010	6.2	0.10	Tr	0.2
278.6	288.0	Tactite, sulfides	-	.02 *	-	-	-	-		
288.0	298.0	do	-	Nil	-	-	-	-		
298.0	308.0	Syenite with disseminated sulfides	-	Nil	-	-	-	-	278.6-326.0' Tr	0.1
308.0	318.0	do	-	Nil	-	-	-	-		
318.0	326.0	do	-	Nil	-	-	-	-		

* Less than

Hole No. 4

Location: N-9799' E-10193'
Elevation of Collar: 5111'
Bearing: N17° 21' E.
Inclination: -60°N.
Depth: 397'

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
0	6.0	Overburden	-	-	-	-	-	-		
6.0	58.3	Calc-silicate hornfels	-	-	-	-	-	-		
58.3	70.6	do	-	0.20	-	-	-	-		
70.6	231.1	do	-	-	-	-	-	-		
231.1	243.5	do	-	0.01	-	-	-	-	Tr	0.2
243.5	254.0	Tactite,magnetite,sulfides	30.1	Tr	3.6	0.031	24.8	0.25	243.5-274.0'	
254.0	264.0	do	28.2	Tr	2.4	0.031	22.2	0.24	Tr	0.1
264.0	274.0	do	37.8	Tr	3.0	0.031	18.2	0.23		
274.0	284.0	do	33.8	Tr	5.8	0.029	19.6	0.18	274.0-299.2'	
284.0	294.0	do	47.4	Tr	1.1	0.022	15.6	0.11	Tr	0.25
294.0	299.2	do	35.5	Tr	1.7	0.005	22.0	0.12		
299.2	309.0	Garnetized syenite with minor sulfides	-	Tr	-	-	-	-		
309.0	319.0	do	-	Tr	-	-	-	-		
319.0	329.0	do	-	Tr	-	-	-	-		
329.0	339.0	do	-	Tr	-	-	-	-	299.2-397.0'	
339.0	349.0	do	-	Tr	-	-	-	-	Tr	0.4
349.0	359.0	do	-	Tr	-	-	-	-		
359.0	369.0	do	-	Tr	-	-	-	-		
369.0	379.0	do	-	0.01	-	-	-	-		
379.0	389.0	do	-	Tr	-	-	-	-		
389.0	397.0	do	-	Tr	-	-	-	-		

Hole No. 5

Location: N-9986' E-9901'
Elevation of Collar: 5000'
Bearing:
Inclination: Vertical
Depth: 190'

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
0	3.0	Overburden	-	-	-	-	-	-		
3.0	10.6	Magnetite	59.3	Tr	1.1	0.046	7.0	0.09		
10.6	16.0	do	59.7	Tr	1.1	0.048	11.2	0.17		
16.0	21.0	do	60.6	0.01	0.6	0.041	5.8	0.12		
21.0	26.0	do	55.7	Tr	0.5	0.032	7.6	0.12		
26.0	31.0	do	61.6	Tr	0.3	0.022	5.8	0.11	3.0-57.0'	
31.0	36.0	do	63.5	Tr	0.3	0.031	5.0	0.11	Tr	0.15
36.0	41.0	do	69.3	0.01	0.3	0.025	4.8	0.12		
41.0	46.0	do	67.9	Tr	0.4	0.030	2.4	0.11		
46.0	51.0	do	67.0	0.01	0.3	0.008	3.2	0.13		
51.0	57.0	do	69.1	Tr	0.2	0.008	4.2	0.10		
57.0	67.0	Tactite,magnetite,sulfides	41.1	Tr	0.1	0.008	18.4	0.14		
67.0	77.0	do	38.6	Tr	0.9	0.016	17.6	0.20		
77.0	89.0	do	21.7	0.01	2.1	0.036	27.4	0.32	57.0-119.0'	
89.0	99.0	do	46.1	0.01	1.5	0.019	13.4	0.18	Tr	0.2
99.0	109.0	do	35.3	0.05	2.0	0.004	17.8	0.16		
109.0	119.0	do	38.6	Tr	0.9	0.022	17.4	0.15		
119.0	129.0	Tactite,minor magnetite, sulfides	-	0.01	-	-	-	-	119.0-139.0'	
129.0	139.0	do	-	0.01	-	-	-	-	Tr	0.05
139.0	143.4	Massive sulfides	-	5.2	-	-	-	-		
143.4	154.0	Garnetized syenite with minor sulfides	-	0.05	-	-	-	-		
154.0	164.0	do	-	0.01	-	-	-	-	139.0-190.0'	
164.0	174.0	do	-	Tr	-	-	-	-	Tr	0.1
174.0	184.0	do	-	Tr	-	-	-	-		
184.0	190.0	do	-	Tr	-	-	-	-		

Hole No. 6

Location: N-9965' E-9894'
Elevation of Collar: 5003'
Bearing: S18° 53'W.
Inclination: Horizontal
Depth: 142.4'

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
o	16.3	Tactite, minor magnetite, sulfides	-	Tr	-	-	-	-	0-48.0'	
16.3	26.3	do	-	.01	-	-	-	-	Tr	0.15
26.3	36.3	do	-	.01	-	-	-	-		
36.3	48.0	do	-	Tr	-	-	-	-		
48.0	58.0	Tactite, magnetite, sulfides	36.1	Tr	1.7	0.026	17.6	0.28		
58.0	68.0	do	33.4	.01	2.0	0.041	25.6	0.25	48.0-98.0'	
68.0	78.0	do	27.4	Tr	1.5	0.031	16.6	0.20	0.005	0.2
78.0	88.0	do	47.8	.01	5.5	0.014	12.8	0.05		
88.0	98.0	do	33.2	.01	1.3	0.011	28.0	0.05		
98.0	108.0	Tactite with minor sulfides	-	Tr	-	-	-	-	98.0-142.4'	
108.0	118.0	do	-	Tr	-	-	-	-	Tr	0.1
118.0	128.0	do	-	Tr	-	-	-	-		
128.0	142.4	do	-	Tr	-	-	-	-		

Hole No. 7

Location: N-9521' E-10405'
Elevation of Collar: 5278'
Bearing:
Inclination: Vertical
Depth: 957'

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
0	2.0	Overburden	-	-	-	-	-	-		
2.0	229.0	Calc-silicate hornfels	-	-	-	-	-	-		
229.0	239.0	Transition zone, hornfels, basic dike	-	-	-	-	-	-		
239.0	249.0	Basic (?) dike. Minor sulfides	-	.01	-	-	-	-		
249.0	259.0	do	-	.01	-	-	-	-		
259.0	269.0	do	-	.01	-	-	-	-		
269.0	282.0	do	-	.01	-	-	-	-	239.0-479.8'	
282.0	353.0	Barren zone with basic dike, calc-silicate,hornfels,tactite	-	-	-	-	-	-	Tr	0.4
353.0	361.6	Basic dike. Minor sulfides	-	.01	-	-	-	-		
361.6	469.5	Calc-silicate hornfels	-	-	-	-	-	-		
469.5	479.8	Tactite, minor sulfides	-	.05	-	-	-	-		
479.8	490.0	Tactite,magnetite,sulfides	36.1	.01	2.2	0.024	29.4	0.18		
490.0	500.0	do	37.8	.01	8.7	0.019	28.8	0.15	479.8-519.0'	
500.0	510.0	do	37.8	.01	2.6	0.014	21.0	0.17	Tr	0.2
510.0	519.0	do	49.1	.03	1.9	0.009	29.8	0.10		
519.0	529.0	Tactite,minor magnetite, sulfides	-	.05	-	-	-	-	519.0-539.0'	
529.0	539.0	do	-	.01	-	-	-	-	0.005	0.1
539.0	549.0	Tactite,magnetite,sulfides	45.7	.05	0.2	0.006	13.8	0.14		
549.0	559.0	Tactite with minor sulfides	18.6	.05	0.9	0.007	13.6	0.29		
559.0	569.0	Tactite,magnetite,sulfides	54.5	.05	2.0	0.002	20.8	0.08	539.0-599.0'	
569.0	579.0	do	26.8	.01	1.3	0.006	23.0	0.06	Tr	0.1
579.0	589.0	do	21.3	.01	2.0	0.002	23.4	0.10		
589.0	599.0	do	25.9	.05	4.8	0.005	14.8	0.05		

Hole No. 7 (Continued)

Interval		Formation	Analysis, Percent Fe.	Cu.	S.	P.	SiO_2	TiO_2	Composite Au-Oz.	Ag-Oz.
599.0	609.0	Tactite with minor sulfides	-	.15	-	-	-	-		
609.0	619.0	do	-	.10	-	-	-	-		
619.0	848.5	Barren tactite	-	-	-	-	-	-		
848.5	859.0	Tactite with minor sulfides	-	.05	-	-	-	-	599.0-894.6'	
859.0	869.0	do	-	.01	-	-	-	-	Tr	0.15
869.0	879.0	do	-	.01	-	-	-	-		
879.0	887.0	do	-	.01	-	-	-	-		
887.0	894.6	do	-	.03	-	-	-	-		
894.6	905.0	Tactite,magnetite,sulfides	50.6	.05	2.9	0.016	25.6	0.12		
905.0	915.0	do	45.9	.07	1.2	0.004	22.6	0.11		
915.0	925.0	do	31.7	.01	1.0	0.027	21.6	0.20	894.6-957.0'	
925.0	935.0	do	46.2	.05	0.4	0.010	16.8	0.17	.005	0.2
935.0	946.0	do	47.8	.01	0.2	0.002	20.4	0.16		
946.0	957.0	do	45.9	.01	2.6	0.004	11.8	0.17		