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

BUREAU OF MINES
JAMES BOYD, DIRECTOR

REPORT OF INVESTIGATIONS

DIAMOND DRILLING AT RUSH & BROWN COPPER MINE
KASAAN BAY, PRINCE OF WALES ISLAND
SOUTHEASTERN ALASKA

BY

S. P. HOLT, J. G. SHEPARD, R. L. THORNE,
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By S. P. Holt,[2] J. G. Shepard,[3] R. L. Thorne,[4] A. W. Tolonen,[4] and E. L. Fosse[5]

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INTRODUCTION AND SUMMARY

The Rush & Brown mine has been one of the most consistent small producers of copper ore in the history of Alaskan mining. Approximately 50,000 tons of ore have been shipped to smelters from the property. Production has been made from two distinct and separate ore bodies of dissimilar types. The Shear Vein

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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 4349."

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deposit has been mined to a depth of 500 feet below the surface without a reduction in the size of the ore shoot or the grade of ore. The Magnetite ore body has been partly mined to a depth of 200 feet below the surface.

Because of the favorable production record of the Rush & Brown mine, the present need for copper, and the fact that the owners were attempting to place the mine in production, it was deemed advisable to investigate this property under the Strategic Minerals Act of 1939 as a possible source of copper.

In August 1943 the Bureau drilled four diamond-drill holes, ranging from 36 feet to 155 feet in length. The purpose of the drilling was fourfold.

1. To explore the lateral extension of the Shear Vein system.

2. To explore lateral and vertical extensions of the Magnetite ore body.

3. To explore for new ore bodies in a second shear zinc which was indicated by geologic structure.

4. To unwater the mine to the 200-foot level, by means of one of the drill holes.

Maps showing the location of the drill holes, drill-hole logs, and sample analyses accompany this report.

ACKNOWLEDGMENTS

Special mention is made of the information and assistance obtained from A. L. Howard, president of the Alaska Gold & Metals Co. Howard's report on the Rush & Brown mine and his records of the Solar Development Co., previous operators of the mine, were extremely helpful to the Bureau of Mines.

LOCATION AND ACCESSIBILITY

Figure 1 is an index map of Alaska showing the position of the Rush & Brown mine. Relationship to other mines in the district is shown on figure 2. The Rush & Brown mine is at longitude 132° 35' W. and latitude 55° 37' 30" N., near the head of Kasaan Bay, Prince of Wales Island, southeastern Alaska, about 45 miles from Ketchikan (fig. 3). It is about 1 mile from the tidewater of the Salt Chuck, a lagoonlike arm of Kasaan Bay which is navigable by barges and shallow-draft boats at high tide. A fair, nearly level trail 1 mile long leads from the Salt Chuck to the unfinished tunnel. Ore was formerly transported 2-3/4 miles by surface railroad to a deep-water harbor, known as Rush & Brown Harbor, at the head of Kasaan Bay. This railroad has completely deteriorated, except that about 2 miles of 16-pound rails remain.

A small mail boat calls once each week. This boat carries mail, freight, and passengers and is based at Ketchikan, the nearest source of supply. The regular steamship lane of the inside passage is within 25 miles of the property.

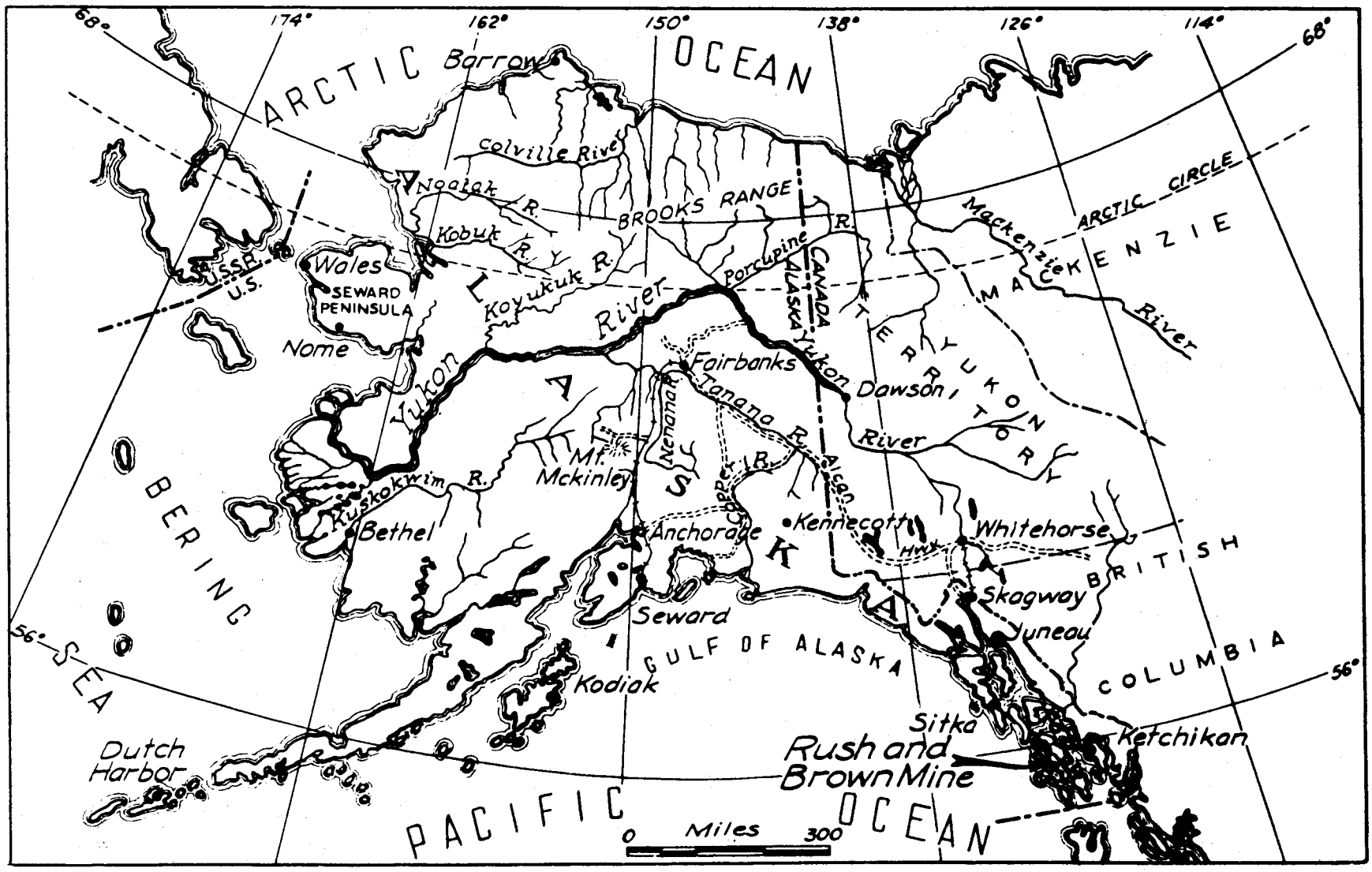


Figure 1. - Index map of Alaska showing location of Rush & Brown mine.

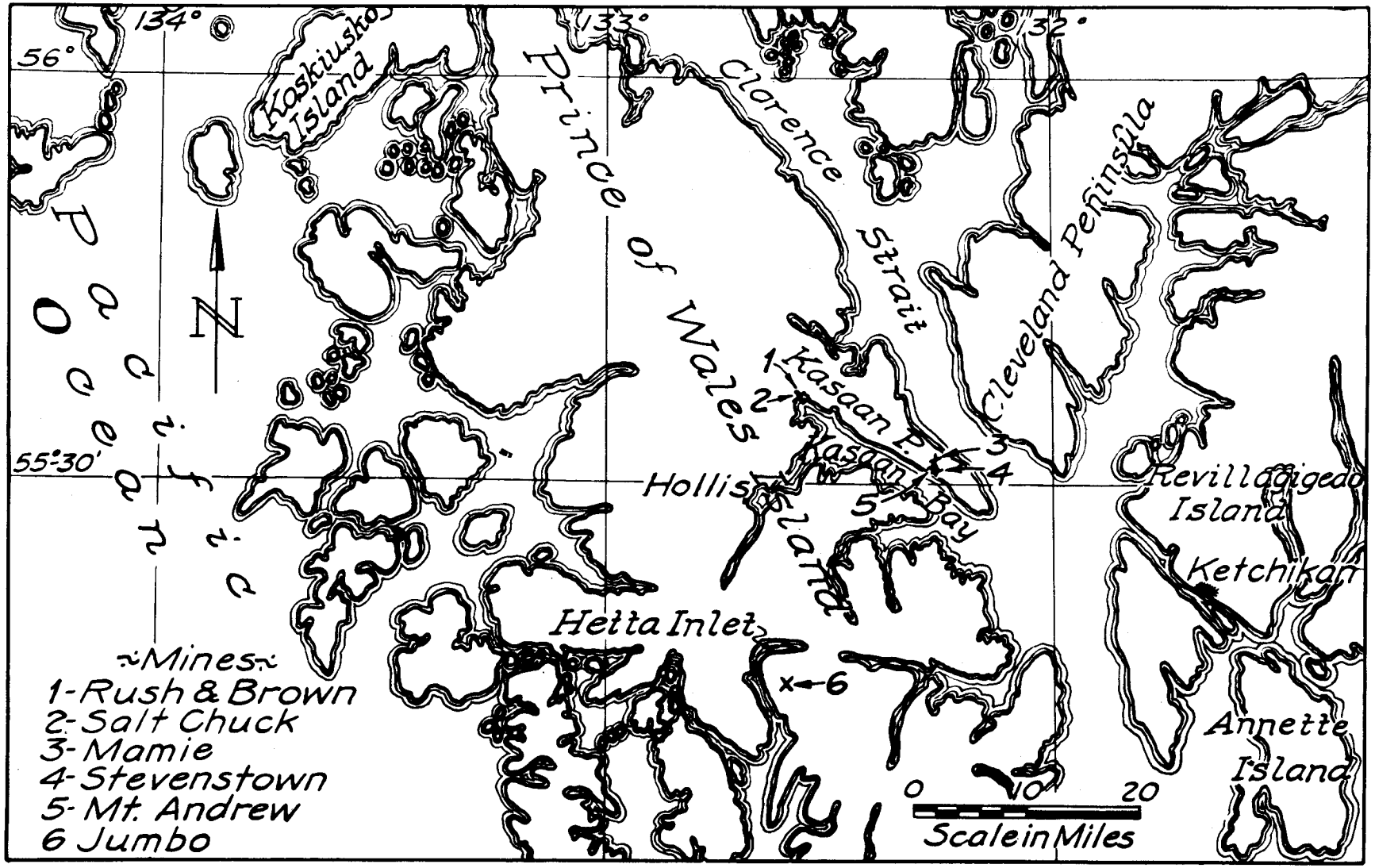


Figure 2. - Kasaan Bay and vicinity.

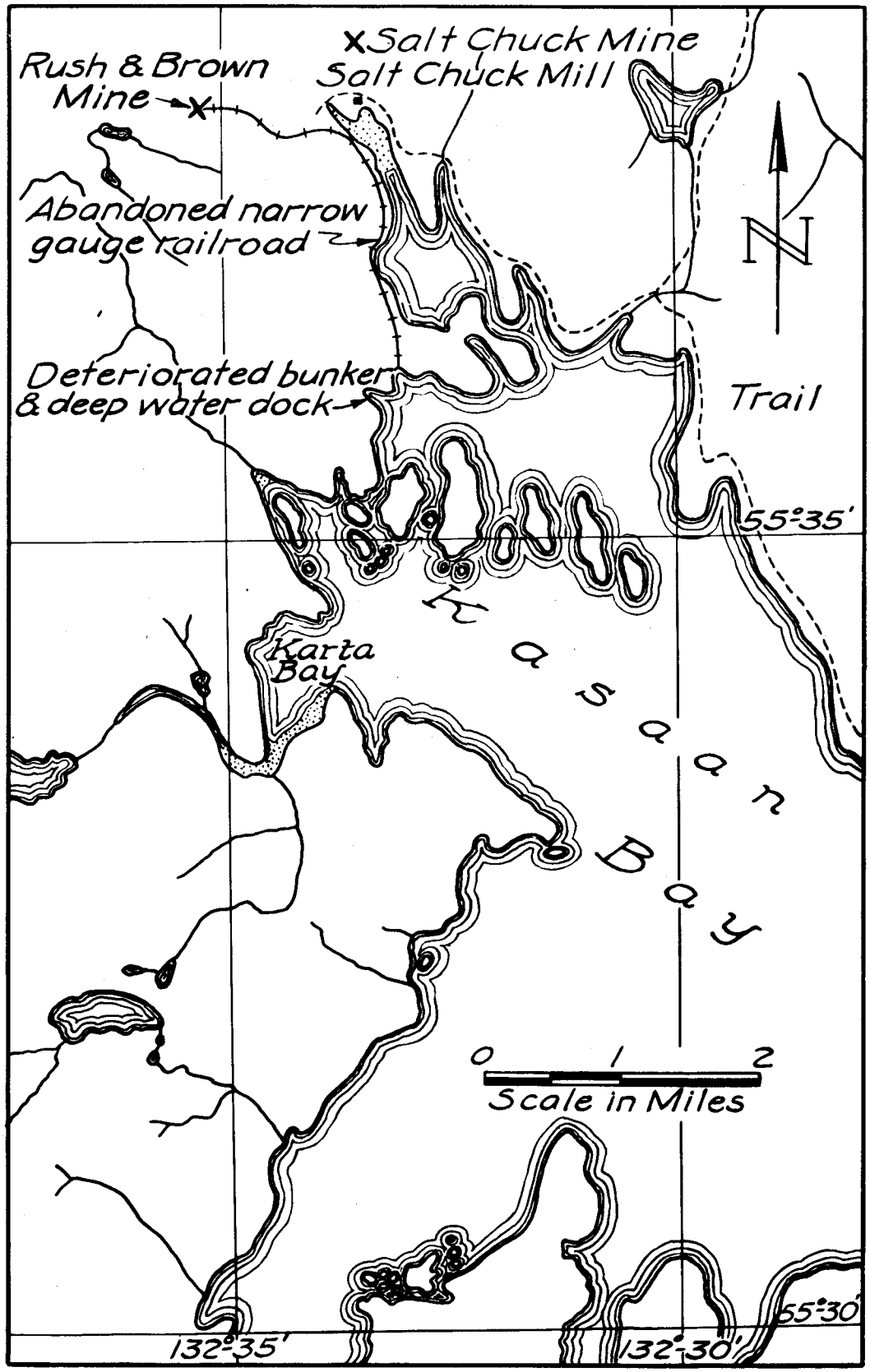


Figure 3. - Location map, Rush & Brown mine.

PHYSICAL FEATURES AND CLIMATE

The property is in a low, thickly timbered area having a dense ground cover of underbrush. Outcrops are at an altitude of about 400 feet.

Climate in the area is similar to that of Ketchikan, Alaska, winters being mild and summers cool, with about one hundred forty inches of precipitation a year. Considerable snow falls from November to March, and zero temperatures are rare. Operations may be and were carried on throughout the year without difficulty.

HISTORY AND PRODUCTION

The original location of this property was made by U. S. Rush and his partner about 1904. The Alaska Copper Co. leased it for a short time and shipped some ore to the company smelter at Copper Harbor on the west coast of Prince of Wales Island. This lease was dropped after the smelter ceased operations. The property was operated intermittently by Rush until 1926, when it passed from his ownership. The original owners did all mining by hand methods. Their operation necessitated handling the ore six times after breaking and before handsorting. From the mine bin the ore was trammed to lower bunkers at the head of a 2-3/4-mile trestled railroad leading to bunkers at the Rush & Brown Harbor, near the head of Kasaan Bay. The ore was then placed aboard ocean steamships and taken to the smelter. The owners never could accumulate enough cash reserves to modernize equipment and methods.

The following data were assembled by A. L. Howard, president and manager of the Alaska Gold & Metals Co. The Magnetite ore body produced approximately 35,000 tons of ore containing 3.25 percent copper, 0.06 ounce of gold, and 0.25 ounce of silver a ton. The owner's records show that there was shipped from the Shear Vein deposit 9,700 tons of sorted ore averaging 10.5 percent copper, 0.26 ounce of gold, and 1.60 ounce of silver a ton. The ore from both ore bodies was hand sorted.

During 1929 the Solar Development Co. optioned the property. It pumped out the workings and sampled the ore remaining in stope pillars and walls and also sampled the bottom level. An adit tunnel was then started. This tunnel, which was advanced 1,250 feet from the portal, was designed to meet the inclined shaft near the 300-foot level. The tunnel was driven to within 180 feet of its objective. The purpose of the tunnel was to provide a permanent haulageway for mine production, to provide permanent drainage above the 300-foot level, and to explore the territory along the projected route. A diamond-drill hole was drilled from the tunnel, the hole bearing northwesterly and at an angle of minus 46°. This drill hole was intended to intersect the shear zone about 300 feet east of the present workings. It was drilled 299 feet without encountering ore. The map would indicate a change in the strike of the shear zone, and the drill hole may have cut through the zone in a barren area, as it terminated in intrusive rocks.

PROPERTY AND OWNERSHIP

The property consists of four claims and two mill sites, all unpatented, the title to which is held by the Alaska Gold & Metals Co.

ORE DEPOSITS

The ore bodies lie in contact zones between diorite intrusives and greenstones. They are of two types - a contact metamorphic deposit of magnetite containing chalcopyrite and a vein type containing sulfide minerals in a tabular ore body within a shear zone.

Mineralization in both types consists of chalcopyrite with associated gold and silver. Gangue is principally metamorphosed greenstone, with associated magnetite, pyrite, quartz, calcite, garnet, and amphibole. The contact replacement deposit contains very much more magnetite than the Shear Vein deposit.

The contact metamorphic deposit, an irregular mass of magnetite enriched locally with disseminated chalcopyrite and pyrite, has been named the Magnetite ore body. This deposit is cut by numerous basic dikes and horses of country rock. About 160 feet north of the Magnetite ore body a shear zone exists, which contains a tabular sulfide ore shoot called the Shear Vein ore body. Some faulting and cross fracturing occur. The faulting, however, was not complex and was easily solved. At least one other parallel shear zone is known to exist.

Magnetite Ore Body

The contact metamorphic Magnetite ore body, having been discovered first, was the earliest to be put into production. A glory hole was started and mined to a limited depth. Numerous hard dikes and horses of country rock were encountered. Since the operators were mining by hand methods, single jack and hand steel being used, this feature, as well as the fact that copper mineralization was not uniform, made profitable mining questionable. The operators made an estimated production of 35,000 tons of ore from this deposit, containing 3.25 percent copper, 0.06 ounce of gold, and 0.25 ounce of silver a ton.

The ore body was drained to the 200-foot level by a Bureau of Mines drill hole and an examination made of the old workings at the 100-foot level. Ore was found remaining in large pillars and as a shell around the perimeter of the old glory hole.

The old workings showed that the lateral limits of the main ore body had been reached and that only small veins extended any distance into the walls. Bureau of Mines drilling confirmed the opinion that no ore extended to the west on the 300-foot level.

Shear Zone Ore Body

Upon the discovery of the Shear Vein ore body, mining was centered on this ore shoot because of its higher copper, gold, and silver content and greater regularity. A drift was driven from the 200-foot level to the Shear Vein. The shoot was developed laterally and stoped through to the surface. Some ground above the 200-foot level remains unexplored. Maps and other

information would indicate that the ore shoot was about 200 feet long, with an average width of 4 feet. The ore on the 500-foot level does not appear to have diminished either in grade or size from that mined in the stopes above.

DEVELOPMENT

Shortly after discovery of the Magnetite ore body, an open pit or glory hole was started. This method of mining was followed to a limited depth. Subsequently a 200-foot vertical shaft was sunk just outside of the ore body, and ore from the bottom of the glory hole was mined by means of short V-cuts and raises and hoisted through this shaft to the surface. The drifts and raises were not timbered and are reported to be in good condition. No maps are available of these workings, but they are known to be rather limited. No exploration was carried on outside the glory hole.

The Shear Vein deposit was developed by cross cutting 165 feet from near the shaft on the 200-foot level. After encountering the ore body, drifts were driven along the vein until the grade of ore was below the economic cut-off. An inclined winze was sunk along the dip of the Shear Vein to the 500-foot level, and levels were opened at 50-foot intervals. These levels were extended beyond the confines of the oreshoot. The greenstone walls stood well, and very little timber was used beyond an occasional stull. No serious faulting was present, and the mine made very little water. The stopes were left open and were 4 to 12 feet wide. Blocks of ore considered low grade by the owners remain in place. It is reported that in 1929 the open stopes could readily be traversed.

INVESTIGATION BY THE BUREAU OF MINES

At the time of the preliminary examination, reliable records indicated that a considerable tonnage of ore could be obtained from the Shear Vein ore body. Records of the Magnetite ore body were incomplete, but its past production suggested that marginal ore might be left in the old workings and also that a small amount of exploration was justified. The old workings were filled with water during the preliminary work.

A program of drilling was laid out by the Bureau of Mines to accomplish the following:

(1) To explore the lateral extension of the Shear Vein system for new ore shoots.

(2) To explore for lateral and vertical extensions of the Magnetite ore body.

(3) To explore for new ore bodies in a second shear zone which was indicated by the geologic structure.

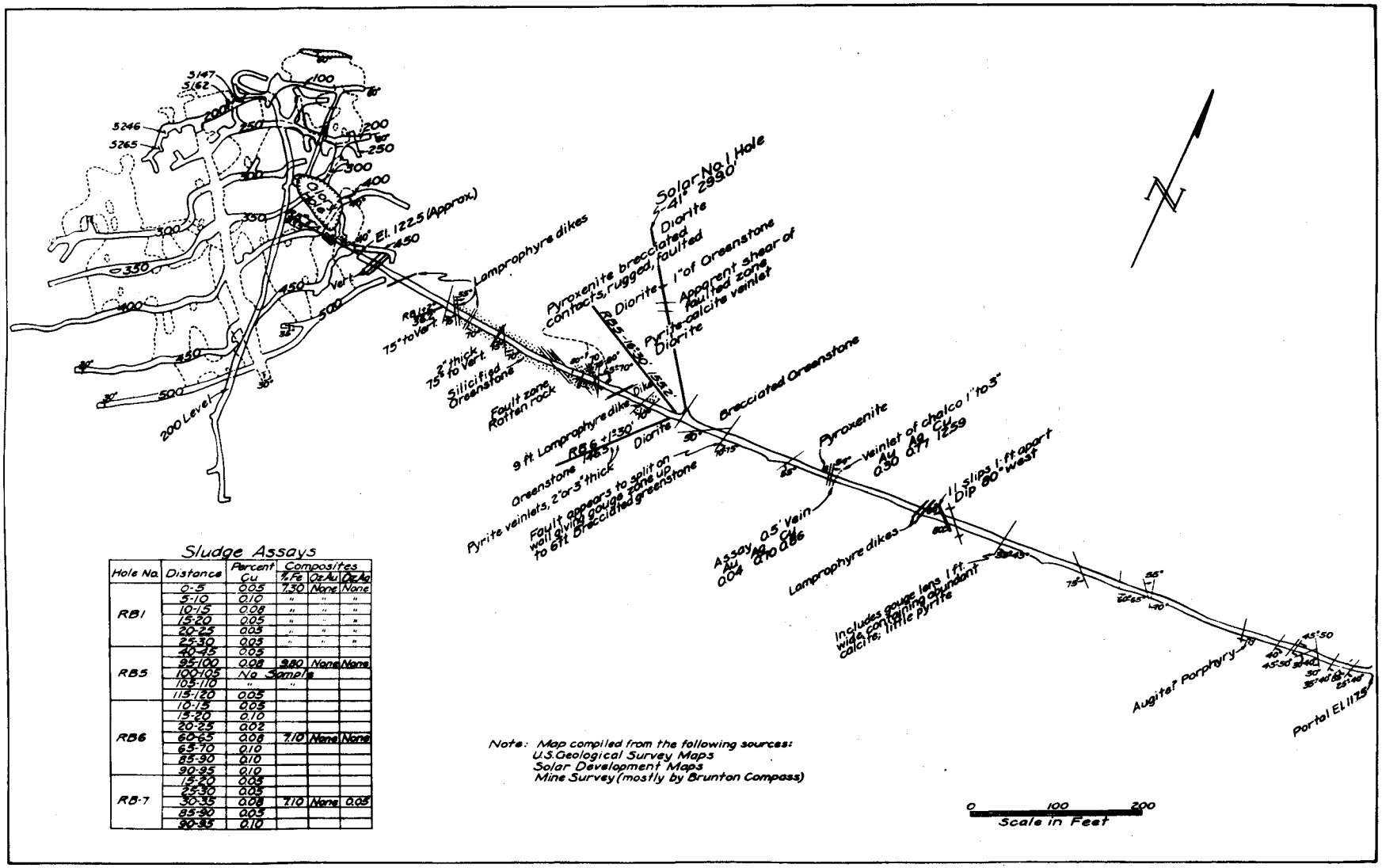
(4) To unwater the mine to the 200-foot level by means of one of the exploratory drill holes.

Four drill holes, varying from approximately 36 feet to 155 feet in length, were drilled for a total footage of 431 feet and 7 inches. No ore, or favorable indication was encountered in any of the holes.

The locations of holes drilled by the Bureau of Mines and the Solar Development Co. are shown in figure 4. A longitudinal section and assay map of the Rush & Brown mine is shown on figure 5, and the analyses are given in table 1.

TABLE 1. - Assays by Solar Development Co.

Sample No.	Vein width, feet	Cu, percent	Ounces a ton		Sample No.	Vein width, feet	Cu, percent	Ounces a ton	
			Ag	Au				Ag	Au
1		1.06	Tr.	Tr.	37	1	.64	.10	0.02
2	3	2.54	0.46	0.06	38	3	.52	.14	.02
3	2	8.48	1.40	.32	39	3.5	.90	.31	.03
4	3	4.31	.84	.06	40	3	1.06	Tr.	.03
5	2.5	1.72	.54	.04	41	2	.38	Tr.	.02
6	4	.98	.24	.02	42	2	.75	.19	.05
7	2	2.73	.55	.13	43	3.5	1.00	.19	.05
8	1.5	4.80	.94	.36	44	2.5	1.90	.48	.02
9	2.5	3.90	1.02	.26	45	2	3.74	.62	.22
10	3	1.41	.44	.06	46	2	8.08	2.44	.22
11	3	1.00	.43	.05	47	3	7.02	1.24	.26
12	5	.22	Tr.	Tr.	48	1.5	5.21	1.40	.24
13	3	6.72	1.45	.19	49	2	8.02	2.23	.17
14	2	16.24	2.80	.26	50	5	1.74	.54	.10
15	2	5.36	.97	.27	51	7	5.12	1.28	.08
16	1	5.98	1.47	.39	52	2	2.76	.80	.16
17	4	.72	.19	.05	53	3	1.70	.10	.03
18	4	2.00	.54	.06	54	2	8.41	.87	.05
19	4	4.96	.87	.05	55	3	.58	Tr.	Tr.
20	4	1.86	.52	.04	56	6	1.04	.10	.04
21	5	4.92	.65	.09	57	6	3.76	.85	.09
22	2	6.78	.66	.30	58	5	3.94	1.04	.10
23	3	.74	.20	.02	59	1.5	10.06	1.60	.10
24	2	4.15	.76	.40	60	4	4.79	1.16	.08
25	3	8.54	1.41	.21	61	4	2.00	.66	.06
26	3	2.86	.53	.37	62	2	7.16	2.00	.30
27	2	7.40	1.40	.18	63	4	5.02	.81	.09
28	4	8.26	1.56	.32	64	2.5	3.94	.73	.17
29	4	10.20	1.66	.14	65	5	3.28	.74	.22
30	4	8.81	1.46	.10	66	2	.87	.12	.04
31	2	.38	.17	.03	67	3	.14	.14	.01
32	3	.42	.14	.04	68	1	11.72	2.08	.02
33	3	.84	.17	.05	69	3	6.88	.82	.20
34	3	1.08	.18	.02	70	2.5	3.14	.52	.20
35	3	5.98	1.25	.19	71	4	3.52	.43	.05
36	2	1.15	.34	.02	72	2.5	2.20	.27	.05



Sludge Assays

Hole No.	Distance	Percent Cu	Composites %Fe	Oz. Au	Oz. Ag
RB1	0-5	0.05	7.30	None	None
	5-10	0.10	"	"	"
	10-15	0.08	"	"	"
	15-20	0.05	"	"	"
	20-25	0.05	"	"	"
	25-30	0.05	"	"	"
	40-45	0.05			
RB5	95-100	0.08	3.80	None	None
	100-105	No Sample			
	105-110	"			
	115-120	0.05			
RB6	10-15	0.05			
	15-20	0.10			
	20-25	0.02			
	60-65	0.08	7.10	None	None
	65-70	0.10			
	85-90	0.10			
	90-95	0.10			
RB-7	15-20	0.05			
	25-30	0.05			
	30-35	0.08	7.10	None	0.05
	85-90	0.05			
	90-95	0.10			

Figure 4. - Plan of Rush & Brown mine.

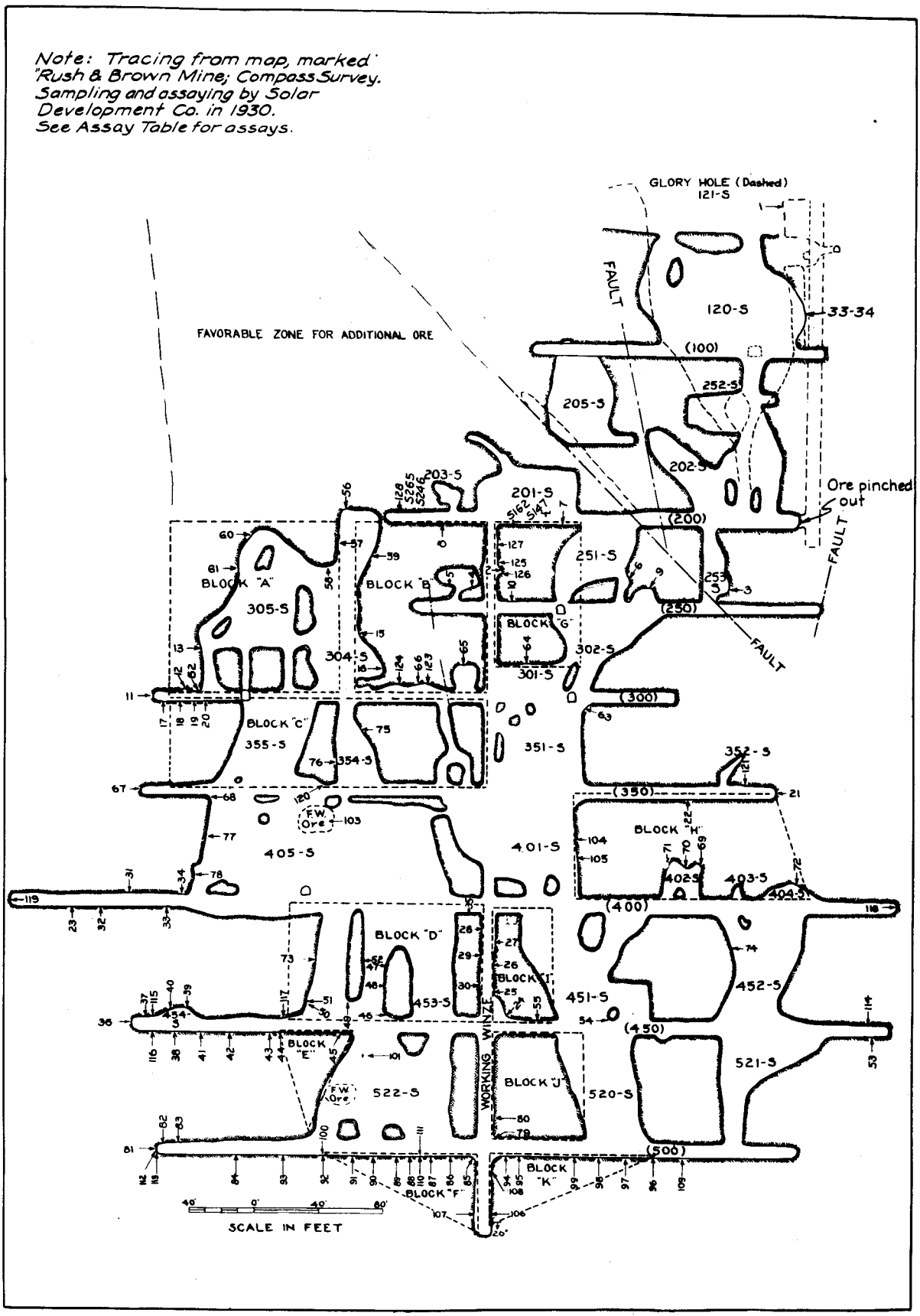


Figure 5. - Longitudinal section and assay map, Rush & Brown mine.

TABLE 1. - Assays by Solar Development Co. (Cont'd.)

Sample No.	Vein width, feet	Cu, percent	Ounces a ton		Sample No.	Vein width, feet	Cu, percent	Ounces a ton	
			Ag	Au				Ag	Au
73	1.5	7.18	1.31	0.11	105	1.5	1.32	.30	0.35
74	3	4.60	.70	.14	106	.9	13.78	1.90	.56
75	3	3.66	.77	.09	107		.36	Tr.	.02
76	1.5	9.30	1.79	.11	108	3	.34	Tr.	.01
77	3	2.91	.78	.06	109	2	.20	Tr.	Tr.
78	4	1.96	.36	.04	110	2.5	22.88	3.55	.09
79	2.5	4.10	.88	.28	111	2.5	1,78	.10	.04
80	3	9.36	1.19	.13	112	1	.37	.18	.02
81	6	.06	Tr.	Tr.	113	5	Tr.	Tr.	Tr.
82	4	.18	Tr.	Tr.	114	4	.48	.10	.01
83	4	.11	Tr.	Tr.	115	1	.36	Tr.	.01
84	4	.12	Tr.	.01	116	2	Nil.	Tr.	Tr.
85	4.5	2.56	.86	.14	117	3	Tr.	Tr.	Tr.
86	4	5.64	.96	.24	118	4	Nil.	Tr.	Tr.
87	4.5	5.50	1.14	.30	119	5	Tr.	Tr.	Tr.
88	5	11.18	1.42	.16	120	3	.67	.10	.01
89	4	4.15	.87	.25	121	3	.20	Tr.	Tr.
90	4	14.32	2.10	.18	122	4	3.77	.62	.14
91	4	7.42	1.32	.30	123	3	2.19	.40	.12
92	4	1.95	.30	.04	124	4	1.60	.30	.04
93	3	.96	.28	.02	125	3.5	1.72	.10	.04
94	2	4.60	.59	.17	126	0.5	7.36	1.66	.20
95	2.5	20.05	1.86	.12	127	4	1.64	.40	.08
96	3	5.58	.64	.14	128	4	Nil.	Tr.	Tr.
97	3.5	3.58	.54	.26					
98	2.5	6.42	.82	.08		Bureau of Mines			
99	2	5.02	.50	.16					
100	1.5	3.80	.86	.14	33-34	5.0	0.82		0.03
101	Fw	3.48	.29	.17	S147	3.0	.07		.07
102	5	2.08	.76	.04	S162	2.0	3.54		.10
103	8x6	1.86	.34	.10	S246	3.5	.49		.02
104	1.5	2.95	.46	.06	S265	3.0	.18		.02