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Report of Investigations 4852

DIAMOND DRILLING THE GYPSUM CAMEL PROSPECT, IYOUKEEN COVE, CHICHAGOF ISLAND, SOUTHEASTERN ALASKA

BY G. D. JERMAIN AND F. A. RUTLEDGE

United States Department of the Interior — April 1952

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UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary
BUREAU OF MINES
J. J. Forbes, Director

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DIAMOND DRILLING THE GYPSUM-CAMEL PROSPECT IYOUKEEN COVE, CHICHAGOF ISLAND, SOUTHEASTERN ALASKA

by

G. D. Jermain[1/] and F. A. Rutledge[2/]

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ILLUSTRATIONS

1/ Former chief, Mining Branch, Bureau of Mines, Juneau, Alaska
2/ Mining engineer, Bureau of Mines.

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INTRODUCTION

The Bureau of Mines investigated the Gypsum-Camel deposit on Iyoukeen Cove, Chichagof Island, Southeastern Alaska, from April 21 to August 26, 1948, as a part of the United States Department of the Interior program for developing an Alaskan construction industry. As gypsum is one of the components necessary for the manufacture of cement and one of the raw materials for plaster and plaster-board products, it is desirable to locate and develop a readily accessible deposit of gypsum in Alaska.

In 1928, B. D. Stewart[3/] of the Territorial Department of Mines surveyed the gypsum deposits at Iyoukeen Cove, and during the summer of 1946 George M. Flint, Jr., and Edward H. Cobb[4/] of the Federal Geological Survey examined and mapped the old workings at Gypsum Creek and the prospect at Iyoukeen Cove. Both the Territorial Department of Mines and the Federal Geological Survey recommended the Gypsum-Camel prospect as warranting a diamond-drilling program by the Bureau of Mines.

The Bureau of Mines project consisted of cleaning out and sampling the old underground workings and diamond drilling from the surface to ascertain the lateral extensions of the deposit.

ACKNOWLEDGMENTS

The sampling and diamond-drilling program at Iyoukeen Cove was under the direct supervision of G. D. Jermain, chief, Alaskan Branch, Mining Division of the Bureau of Mines.

Analytical determination of samples were made by H. E. Peterson, chemist, Salt Lake City Branch, Metallurgical Division, Bureau of Mines, Salt Lake City, Utah.

Acknowledgment also is made to Dave Housel of Seattle, Wash., for the use of his cabins at the prospect and a historical resume of the prospect.

LOCATION AND ACCESSIBILITY

The gypsum deposit at Iyoukeen Cove is on tidewater on a small bight facing Chatham Strait approximately 1-1/2 miles northeast of Gypsum Creek on Chichagof Island (figs. 1, 2, and 3). The area is 32 miles southwest of

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3/ Stewart, B. D., The Occurrence of Gypsum at Iyoukeen Cove, Chichagof Island, Alaska: Geol. Survey Bull. 824-E, 1931, pp. 173-181.

4/ Flint, George M., Jr., and Cobb, Edward H., Preliminary Report on the Gypsum Deposits near Iyoukeen Cove, Chichagof Island, Southeastern Alaska: Geol. Survey prelim. mimeo. rept.

Diamond-drill hole 2 was drilled 60 feet northwest of a point midway between the faces of adits 2 and 3 (fig. 5), and no gypsum was found. Bedrock was penetrated at 105 feet 8 inches, which agrees very closely with the depth of overburden expected from the slope of the old erosion surface exposed in the adits. This hole was bottomed at 166 feet 6 inches in limestone. Both adits 2 and 3 show lumps of gypsum in blue and brown clay in the face and probably have reached the western limit of the deposit, since gypsum was not found in hole 2.

Sections through the adits and diamond-drill holes are shown on figure 6.

The gypsum is mostly pure white, although in places it grades to a light bluish gray. It is usually fine-grained and translucent approaching alabaster in grade.

The location of samples taken is shown on figure 5, and analyses and descriptions are given in table 1.

TABLE 1. - Analyses of Samples, Gypsum-Camel prospect, percent

Sample No.	Description	Comb. H_2O	CO_2	CaO	MgO	SO_3	SiO_2	R_2O_3	NaCl	Free H_2O
1	Blue and brown clay with gypsum.	1.1	20.9	29.6	5.3	1.3	28.6	8.2	0.01	1.16
2	Clay with gypsum.	10.7	9.0	30.4	2.6	25.85	12.8	4.4	.01	.49
3	Gypsum.	14.9	6.4	31.9	2.2	35.0	5.6	2.0	.01	.08
4	do.	14.7	5.2	29.6	3.8	34.25	8.2	2.4	.01	.34
5	do.	11.1	12.9	33.8	3.4	26.55	8.0	2.6	.01	.37
6	Gypsum with some clay seams.	7.9	12.3	29.3	3.7	18.6	17.8	5.4	.01	.81
7	Gypsum with some gravel.	.9	24.2	33.3	5.4	3.0	21.4	6.8	.01	1.08
8	do.	3.7	20.6	33.3	3.3	8.15	19.2	6.4	.01	.71
9	do.	1.6	24.9	35.0	5.6	3.1	19.8	6.2	.01	1.05
10	Gypsum.	16.1	3.95	31.4	1.5	39.25	4.0	1.2	.01	.20
11	do.	17.7	2.70	32.5	1.0	42.2	2.4	.8	.01	.09
12	Gypsum with some clay seams.	8.4	16.7	33.1	5.5	20.15	10.2	2.8	.01	.51
13	do.	13.8	4.65	28.1	4.5	32.2	10.2	3.2	.01	.41
14	do.	11.8	8.15	28.5	5.5	28.0	11.2	2.4	.01	.66
15	Gypsum and clay.	9.8	4.75	22.1	4.5	21.1	21.6	11.2	.01	1.48
16	Gypsum with some clay seams.	15.7	2.70	29.5	2.7	37.35	7.0	2.2	.01	.34
17	do.	6.5	16.2	30.9	6.2	16.05	15.8	4.2	.01	.72
18	do.	15.0	3.60	29.8	1.1	36.2	7.4	3.2	.01	.39
19	Gypsum.	15.0	1.40	30.2	2.55	40.7	6.2	1.8	.01	.15
20	Gypsum with some clay seams.	12.7	4.70	28.0	3.55	31.3	11.9	3.9	.01	.40
21	do.	12.0	4.60	29.1	2.95	29.9	12.3	3.2	.01	.25
22	Gypsum with some gravel.	6.1	13.1	28.1	2.90	15.2	21.2	7.7	.01	.65

WORK BY BUREAU OF MINES

The Bureau of Mines program originally outlined for development of the Gypsum-Camel prospect included additional drill holes west of hole 2 along the

Juneau by air and on the airline route between Juneau and Sitka. Stops by the Alaska Coastal Airlines will be made upon request during their regular flights but are dependent on weather. Iyoukeen Cove offers no shelter to winds from the southeast, and too high a swell prohibits landings. Rates by air from Juneau to Iyoukeen Cove in 1948 were $18.00 plus 15 percent federal tax per person and 9 cents a pound for freight with a $10.000 minimum charge per stop.

The mailboat between Juneau, Sitka, and waypoints makes the trip once a week and will stop if requested. Dave Housel of Seattle Wash., and associates at one time had a short wharf at the property for unloading equipment and supplies. At present, all supplies have to be landed by small boats, and a new wharf will be required before the property can be operated.

PHYSICAL FEATURES AND CLIMATE

Chichagof Island presents all the appearance of its recent glaciation. U-shaped valleys and hanging valleys are common throughout the mountainous interior of the island. The lower flanks of the mountains and the bench lands along the valleys and the coast are deeply mantled with glacial till.

In the immediate vicinity of the gypsum prospect, the effects of a rising coast line are evidenced by the partly consolidated beach sand containing marine shells exposed above the gypsum in the old workings and the marine terrace under which the adits have been driven.

The drainage in the Gypsum-Camel area is by numerous short, parallel streams flowing southeastward into Chatham Strait (see fig. 4). The combination of heavy precipitation, dense vegetation, and poor drainage has formed numerous muskeg flats along the benches and moderate slopes.

Dense forests, mainly hemlock with spruce, cedar, and white ash, cover all but the steepest slopes. An undergrowth of devil's club, blueberry bushes, alder, and ferns is found intermixed with the timber and extends from tidewater to near the tops of the mountains.

The climate of the region is extremely mild. Since no weather records are available for Iyoukeen Cove, an average has been taken of the averages for Sitka and Juneau, Alaska, where records have been kept for over 40 years. A mean annual temperature of 42.9° F. and cool summers with mean temperatures of 51.7° to 55.9° F. show that temperature variation is small. Only 1 month - January, with 30° F. - has an average under 32° F.

Average precipitation is 85.59 inches, which includes 75.8 inches of snowfall.

HISTORY, PRODUCTION, AND OWNERSHIP

The gypsum at Iyoukeen Cove was discovered by Robert Greenwald of Hoonah, Alaska, in 1910. Greenwald, before the discovery, had been employed as a miner at the property of the Pacific Coast Gypsum Co. on Gypsum Creek and recognized the yellowish brecciated limestone outcropping along the shore as

the same formation underlying the gypsum at Gypsum Creek. The gypsum does not outcrop at Iyoukeen Cove.

Dave Housel of Seattle, Wash., now (March 1950) has the controlling interest in the property, which consists of eight placer claims: Gypsum and Gypsum 1, 2, 3, 4, 5, 6, and 7. The claims are known as the Gypsum-Camel group.

Though there has been very little production of gypsum from this deposit, the property on Gypsum Creek, 1-1/4 miles west of the area, produced approximately 500,000 tons[2/] before 1926.

MINE WORKINGS

Five adits have been driven westward into the gently sloping bench that rises steeply from the beach at the gypsum-Camel prospect (figs. 4 and 5). Two of the adits - 1 and 5 - are driven into the buff limestone breccia and limestone underlying the gypsum. Another (No. 4) was driven around the caved portion of adit 2 to open up the face of gypsum exposed in that adit. Additional development consists of three winzes from adit 3 and a short sub-level drift 30 feet below adit 3 (see figs. 5 and 6). The total of all development work is 1,060 feet.

DESCRIPTION OF DEPOSIT

The gypsum at Iyoukeen Cove is in a small synclinal basin lying unconformably on buff brecciated limestone. This brecciated limestone is exposed 200 feet south of adit 2 and 80 feet north of adit 3, making a total distance of 520 feet between exposures of the formation underlying the gypsum. However, it is probable that the north-south dimension of the deposit is less than 450 feet.

Diamond-drill hole 1 was drilled vertically 38 feet S. 15° E. of the portal of adit 3 (see fig. 5). This hole cut the following formations:

From-		To-		Formation
Ft.	in.	Ft.	in.	
0	0	1	0	Soil and glacial till.
1	0	4	6	Large boulders in beach sand, marine shells.
4	6	7	0	Large beach pebbles and beach sand.
7	0	15	8	Beach sand and marine shells, partly consolidated.
15	8	20	0	Fragments of gypsum in clay.
20	0	24	2	Gypsum.
24	2	25	0	Limestone.
25	0	27	0	Gypsum.
27	0	28	0	Limestone.
28	0	30	0	Gypsum
30	0	32	5	Limestone.
32	5	34	1	Clay and limestone.
34	1	44	0	Brecciated limestone.
44	0	44	1-1/2	Gypsum.
44	1-1/2	63	0	Brecciated limestone.

2/ Stewart, B. D., The Occurrence of Gypsum at Iyoukeen Cove, Chichagof Island, Alaska: Geol. Survey Bull. 824-E, 1931, p. 173.

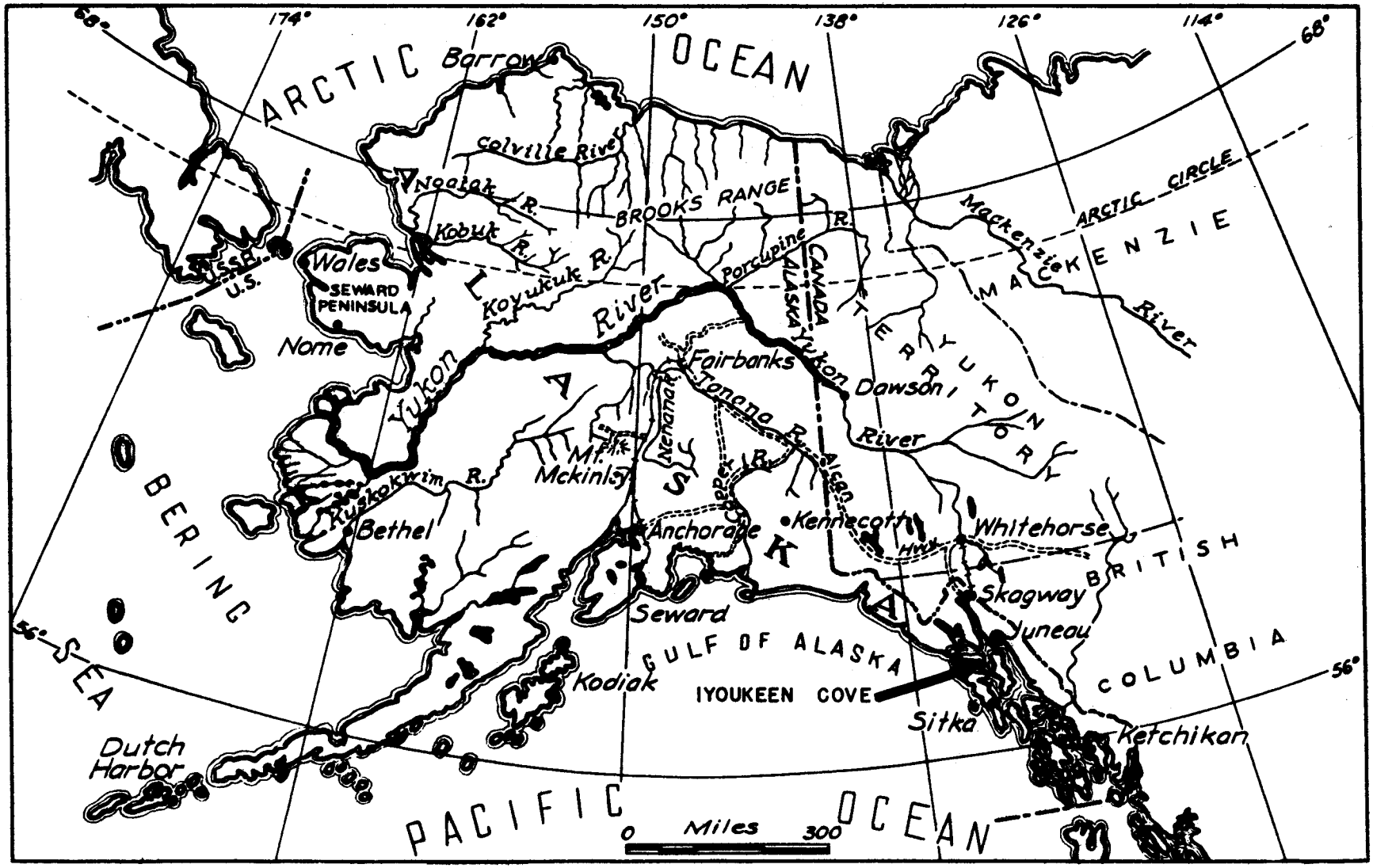

Figure 1. - Index map of Alaska.

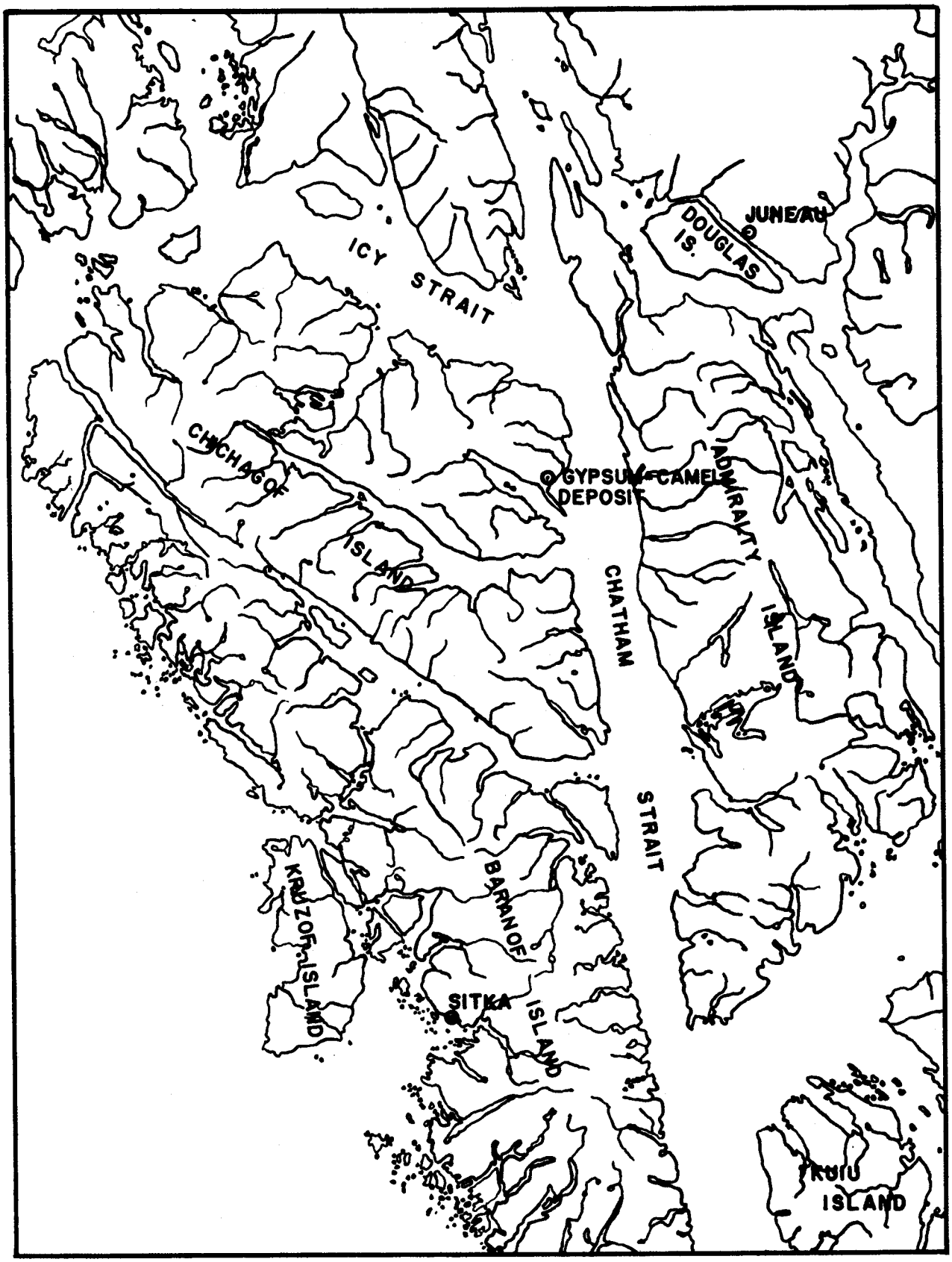

Figure 2. - Index map of Chichagof Island, Alaska.

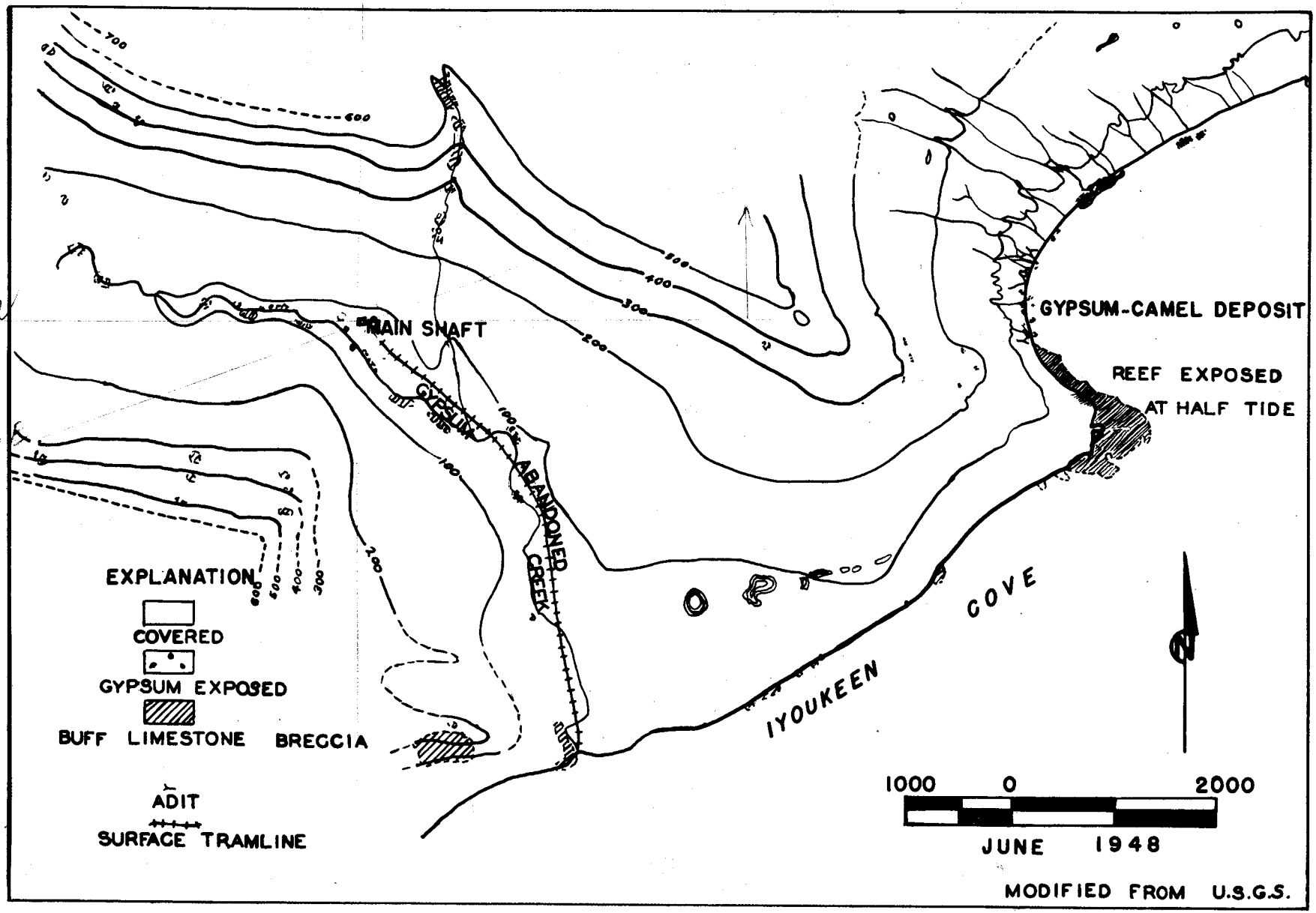

Figure 3. - Iyoukeen Cove, Chichagof Island.

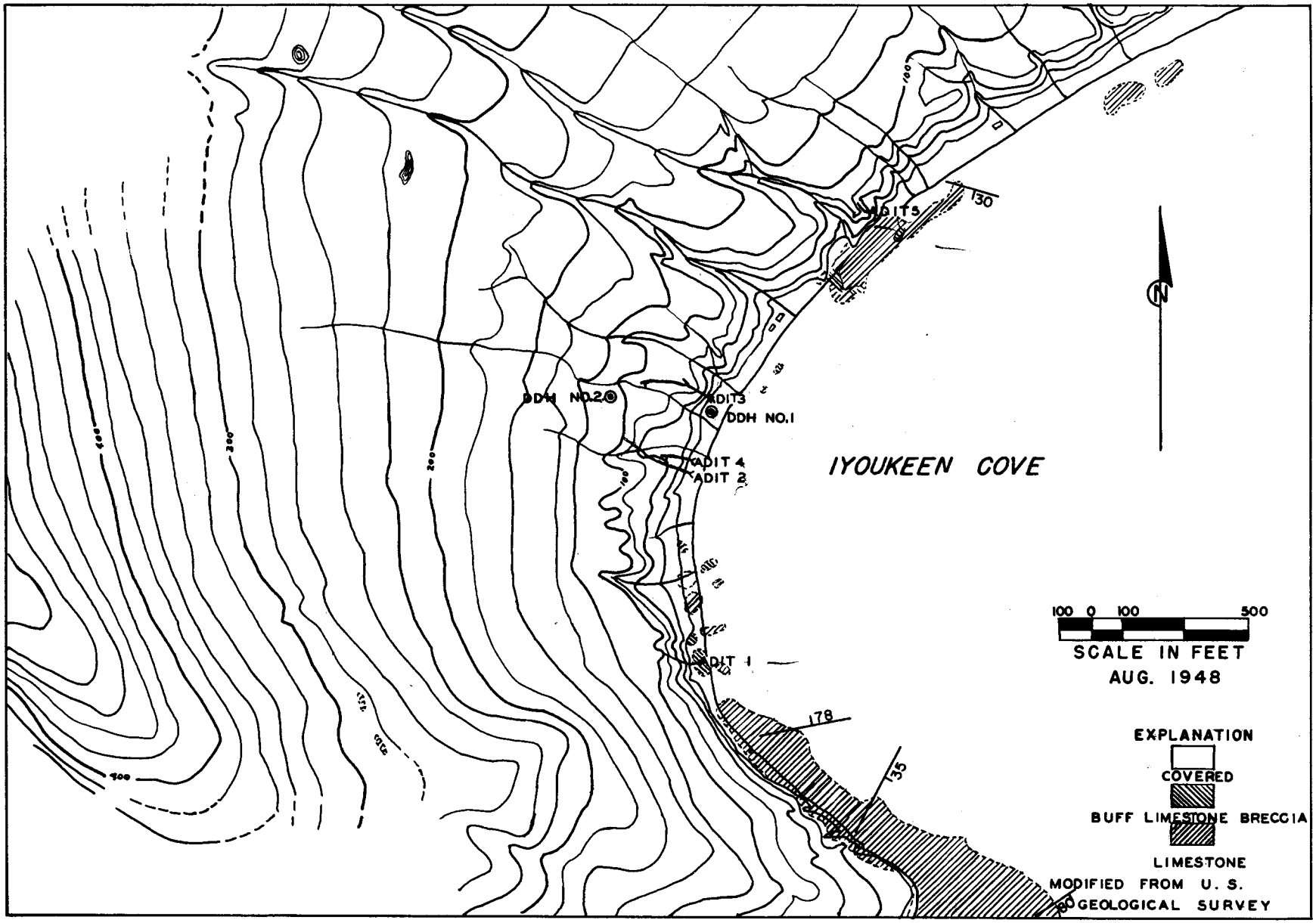

Figure 4. - Gypsum-Camel deposit, Iyoukeen Cove.

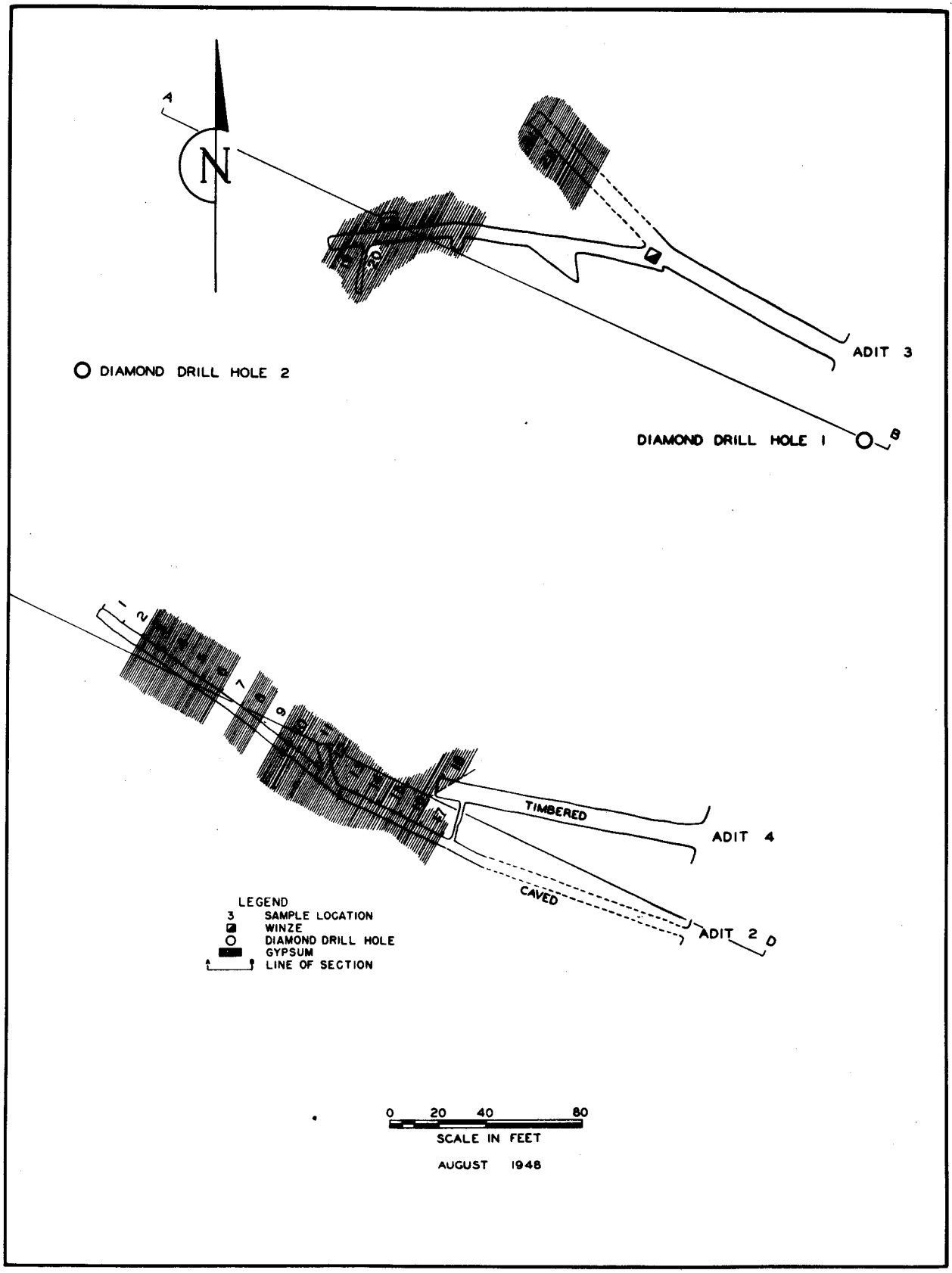

Figure 5. - Drill holes and underground workings.

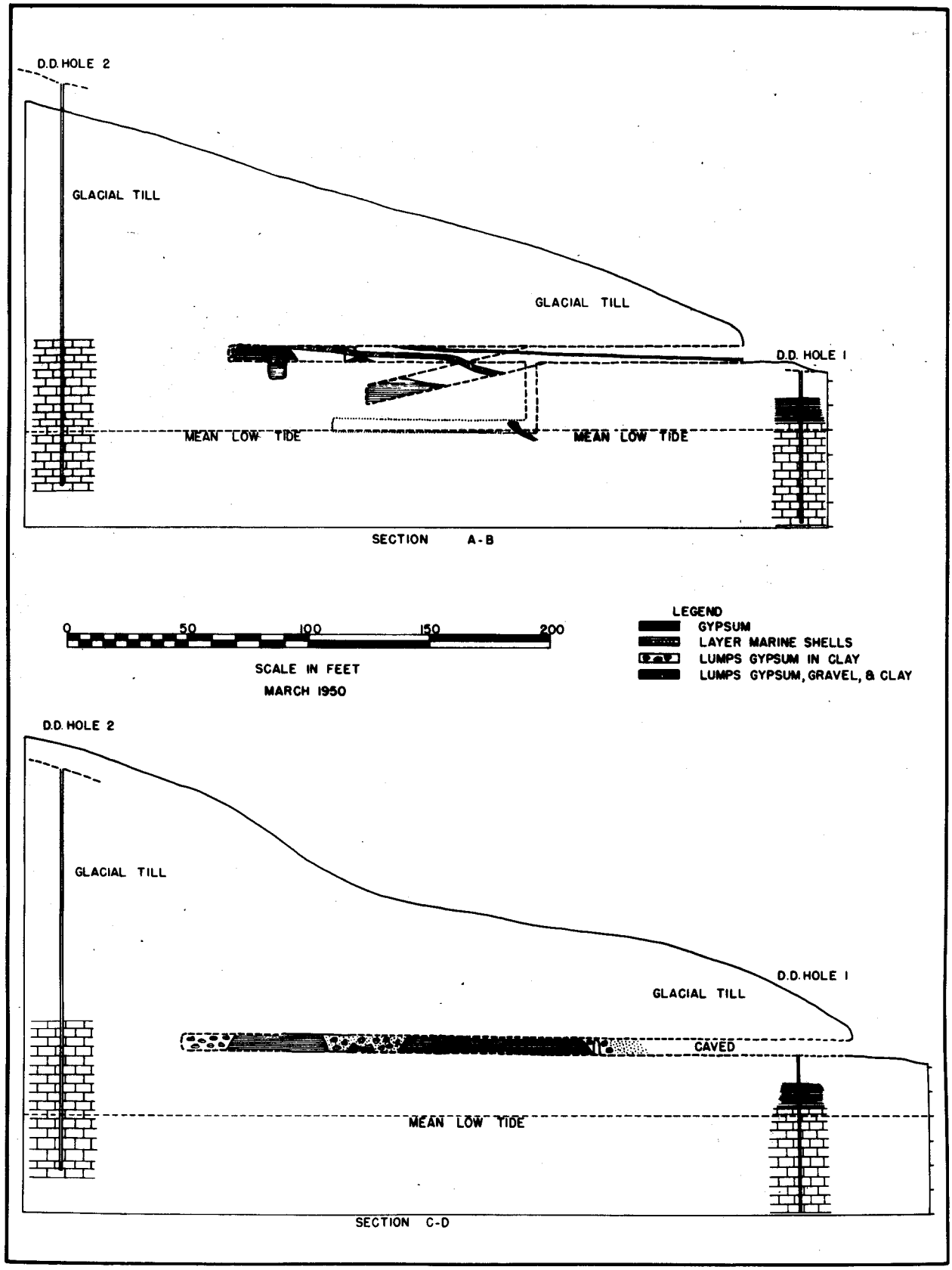

Figure 6. - Geologic sections Gypsum-Camel deposit.

axis of the synclinal basin. If gypsum had been found here, other holes would have been drilled north and south of this line to test the breadth of the deposit. When no gypsum was found in hole 2, this plan was abandoned, since it was apparent that the western boundary of the deposit was near the faces of adits 2 and 3.

The caved adits were cleaned out and samples of the gypsum taken for analysis. Attempts were made to pump out the vertical winze in adit 3 so that the gypsum reported in the bottom of the winze and along the sublevel drift could be sampled. The water was lowered 24 feet, but the pump available would not lift the water below this depth. There was still 5 feet of water in the winze and drift, and it could not be examined and sampled.

The inclined winze in adit 3 was pumped out and 11 feet 6 inches of gypsum containing numerous clay seams was exposed.

The thickness of glacial till, especially the large number of boulders in the till, caused many difficulties in putting down the drill holes. Several innovations were tried to expedite the drilling.

In drill hole 1, on the beach, shaped charges were tried as a means of clearing a way through the boulders. This was not successful because the boulders were in water-filled beach sand and the hole would slough before casing could be driven. It finally was necessary to put a shaft down 10 feet to get below this layer of glacial boulders and beach sand.

In hole 2, a much greater thickness of overburden with a large number of boulders, sand, and clay necessitated another approach. Conventional methods with sawtooth bit and chopping bits gave little progress, as the boulders fell in, which prevented driving the standpiping ahead. In addition, sand ran in and filled both hole and standpipe. The wash water necessary in using the conventional methods was an adverse factor aggravating the difficulties.

It was thought that the most feasible method would be to churn-drill through the overburden. Since no churn drill was available and to use the cathead on the drill would be both slow and difficult, it was decided to build a small churn-drill attachment to fit on the head of the diamond drill in lieu of the drill head.

A churn drill was made locally and fitted to the diamond-drill motor by removing the hydraulic head and fitting a 10-1 reduction gear in place of the bevel gear. A walking beam with frame was added; and thus, at small cost, an adequate and compact churn drill was constructed, which was very successful.

Figures 5 and 6 show the adits that penetrate the gypsum and the locations of the samples. Twenty two samples were taken.

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