

OF  
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*At the head*

A GROUND-WATER SUPPLY AT KAKE, ALASKA

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This report gives results of a drilling project carried out by the Alaska Public Works <sup>Department of the</sup> and the Alaska Department of Health. The Ground-Water Branch, U. S. Geological Survey was ~~asked to cooperate~~ in the investigation as part of its overall program of appraising the ground-water resources of Alaska. ~~The program is under the general supervision of A. N. Sawyer, Chief of the Ground-Water Branch.~~

Kake is a small Indian village, located in southeast Alaska, about 100 miles south of Juneau, on Kupreanof Island. The island is approximately 30 miles wide and 45 miles long. The village is near the northwest end of the island and fronts on Keku Strait to the southwest.

The Alaska Department of Health drilled the well at Kake to <sup>whether</sup> determine if ground water was available in sufficient quantity and of good quality for public use. No previous subsurface exploration had been done in the area.

The village extends along a narrow bench that is about 20 feet above sea level. The land surface rises immediately behind (north-east) the village to a broad, relatively flat area about 100 feet above the village. A small stream, which is the source of the present water supply of the village, bisects the <sup>flat</sup> area and <sup>discharge</sup> empties into Keku

*Open-file reports not given data  
in form of a well log and  
correlative etc.*

*the village*  
strait just north of Uman. The only road in the area extends  
southwest of the village, along the beach, to a cove.

Except for the road and the village area, the land is covered  
with a dense, *almost impenetrable* forest.

The rocks exposed at Uman consist of a thin surficial layer  
of marine sediments (disparate masses of shell fragments are *commonly*  
found in foundation excavations on the beach) overlying consolidated  
rock. The consolidated rock crops out along the shore and along the  
hill behind the village. The rocks are classified (Bullington, A. P.,  
and Chapin, Theodore, 1927, Geology and mineral deposits of south-  
western Alaska U. S. Geol. Survey Bull. 800, p. 106) as consisting  
of "volcanic volcanics, including trachite with a limestone matrix  
and lava flows locally interbedded with sediments." Oederstrom  
(Oederstrom, S. J., 1950, Summary of *geological development* in  
Alaska, 1950, *U.S.* Geol. Survey Circ. 100, p. 10) states that the rocks  
exposed along the beach at Uman are largely crystalline limestone,  
*and the* ~~the~~ underlying rocks "predominantly gneiss and associated units."  
The beds were observed to dip about 15° to the northeast.

The present water supply for the village is derived from springs  
and a well, ground-up steam. This supply is dependent upon the  
heavy precipitation which is characteristic of southwest Alaska. No  
precipitation records are kept at Uman, but Sitka and Petersburg,  
which lie 50 miles west and east, respectively, each have about 100  
inches per year.

A cable-tool drilling rig was ~~barged into Lake and a drilling site selected~~ <sup>transported by barge</sup> ~~The site chosen~~ <sup>drilling site selected located</sup> was within the village to eliminate the expense of clearing a trail into the forest to a more favorable site. The cost of a pipeline ~~from~~ <sup>what might have been</sup> and a power line to the well, if the well were successful, were also major considerations in locating the site.

The well site (about 30 feet above sea level) is slightly up the slope of the hill at the north end of the village. The shore line (strand line) is about 180 feet from the site and about 25 feet below it. Much difficulty was encountered in starting the drill hole because large, flat-faced rocks caused the hole to veer from the perpendicular. The surface casing had to be restarted and the hole blasted out many times to insure a reasonably straight hole. Many sticks of dynamite were used to help start the hole and to maintain it plumb throughout the drilling. An 8-inch hole <sup>with 8-inch</sup> (with casing) was attempted at first but because of the above difficulties the driller was unable to make up a long string of heavy tools. Hence, the driller advised reducing the diameter of the hole to 6 inches, thus enabling him to string a longer and heavier drill stem. ~~Subsequently~~ <sup>consequently</sup>, the heavier string of tools permitted easier drilling and progress and the hole was resumed. The hole was cased to 34.2 feet and the casing later cemented in.

The driller's <sup>the logs</sup> log (page 4) indicates that fractures were encountered from 38 to 54 feet and from 68 to 88 feet. Water was:



*enter the well*  
~~into the well through these fractures in increasing volume as~~  
each fracture was encountered. At 90 feet a <sup>7</sup> *34-hour* pumping test of  
~~24 hours duration~~ indicated a yield of 15 gallons per minute  
with about 77 feet of drawdown. The static water level is  
about  $6\frac{1}{2}$  feet below <sup>the</sup> land surface, nearly 24 feet above sea level.  
It was decided to complete the well at the 90-foot depth because  
the bottom of the well was then about 60 feet below sea level and *it*  
*was desired not to go any deeper below sea level*  
The danger of intersecting a fracture that extended outward into *than*  
salt water was considered possible. The quantity of water ob- *necessary,*  
tained appeared to be sufficient for the demands of the new school  
and the proposed Health Center.

The water was analysed <sup>3</sup> and found to be moderately hard *and to contain a*  
*moderate amount*  
*but to be otherwise of good quality* <sup>1</sup> *impurities*  
(see page 5), <sup>1</sup> The chloride content is low, but the well should  
be judiciously pumped to prevent sustained overdraft and possible  
salt-water encroachment.

ALASKA DEPARTMENT OF HEALTH

Log on well No. 2 at Kake, Alaska. Date Sept. 28,  
 1956. Driller Geo. H. Ramsey  
 Driller's helper Olson H. Ramsey. Water level 8 feet  
 from top of casing. Casing 1 1/4" feet above ground.

FINAL WELL LOG

	Depth of Formation
From <u>0</u> feet to <u>2</u> feet <u>Top Soil</u>	<u>2</u>
From <u>2</u> feet to <u>6</u> feet <u>Rock</u>	<u>4</u>
From <u>6</u> feet to <u>8</u> feet <u>Rock</u>	<u>2</u>
From <u>8</u> feet to <u>38</u> feet <u>Rock. Fractures laying on 20 degrees.</u>	<u>30</u>
From <u>38</u> feet to <u>54</u> feet <u>Rock. Fractures. Cravices.</u>	<u>16</u>
From <u>54</u> feet to <u>68</u> feet <u>Rock</u>	<u>14</u>
From <u>68</u> feet to <u>83</u> feet <u>Rock. Cravices</u>	<u>15</u>
From <u>83</u> feet to <u>88</u> feet <u>Rock. Cravices</u>	<u>5</u>
From <u>    </u> feet to <u>    </u> feet <u>    </u>	<u>    </u>

With 6 inch casing. 14 1/2" feet of casing in ground. Casing 1 1/4" feet above ground. Well finished at 90 feet with no inches no feet of no slot screen. Output of well 15 GPM with 77 foot drawdown.

Remarks: Had to shoot well every 5 ft to keep hole straight from 10' to 38'

Well started to make water at 36' to 88'

Run a 24 hr pump test. Water cleared up in 18 hrs.

NO SALT WATER. Water very good tasting.

CHEMICAL ANALYSIS OF WELL WATER AT KAKE  
*U.S. Geological Survey*  
 Analyzed by ~~Quality of Water Branch~~, Palmer, Alaska

*Chemical*

CONSTITUENTS IN PARTS PER MILLION (ppm)

Dates Collected

? 10/9/56 ?

	9-6-56 on completion of drilling	109 near end of 24-hour pumping test
	SiO <sub>2</sub>	11
Fe	<del>0.00</del>	<del>0.00</del>
Ca	37	37
Mg	5.7	6.8
Na	6.2	8.3
K	2.1	1.8
CO <sub>3</sub>	0	0
HCO <sub>3</sub>	144	150
SO <sub>4</sub>	4.8	7.0
Cl	4.0	4.0
F	<del>0.0</del>	-
NO <sub>3</sub>	<del>0.2</del>	<del>0.2</del>
Mn	-	<del>0.45</del>
Sum	150	142
ph	8.1	8.1
Hardness as CaCO <sub>3</sub>	120	116
Specific Conductance at 25° C (microhms)	263	348