Overview of Environmental and Hydrogeologic Conditions at Kotzebue, Alaska

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U.S. GEOLOGICAL SURVEY

Open-File Report 95-349

Prepared in cooperation with the

FEDERAL AVIATION ADMINISTRATION

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By Joseph M. Dorava and Joshua M. Brekken

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Anchorage, Alaska
1995

U.S. DEPARTMENT OF THE INTERIOR
BRUCE BABBITT, Secretary

U.S. GEOLOGICAL SURVEY
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CONVERSION FACTORS

Multiply	By	To obtain
millimeter (mm)	0.03937	inch
meter (m)	3.281	foot
kilometer (km)	0.6214	mile
liter (L)	0.2642	gallon
cubic meter per second (m^3/s)	35.31	cubic foot per second

In this report, temperature is reported in degrees Celsius (°C), which can be converted to degrees Fahrenheit (°F) by the following equation:

$$°F = 1.8\ (°C) + 32$$

ABBREVIATED WATER-QUALITY UNITS

Chemical concentration and water temperature are reported only in metric units. Chemical concentration in water is given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the solute mass per unit volume (liter) of water. One thousand micrograms per liter is equivalent to 1 milligram per liter.

VERTICAL DATUM

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929—A geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

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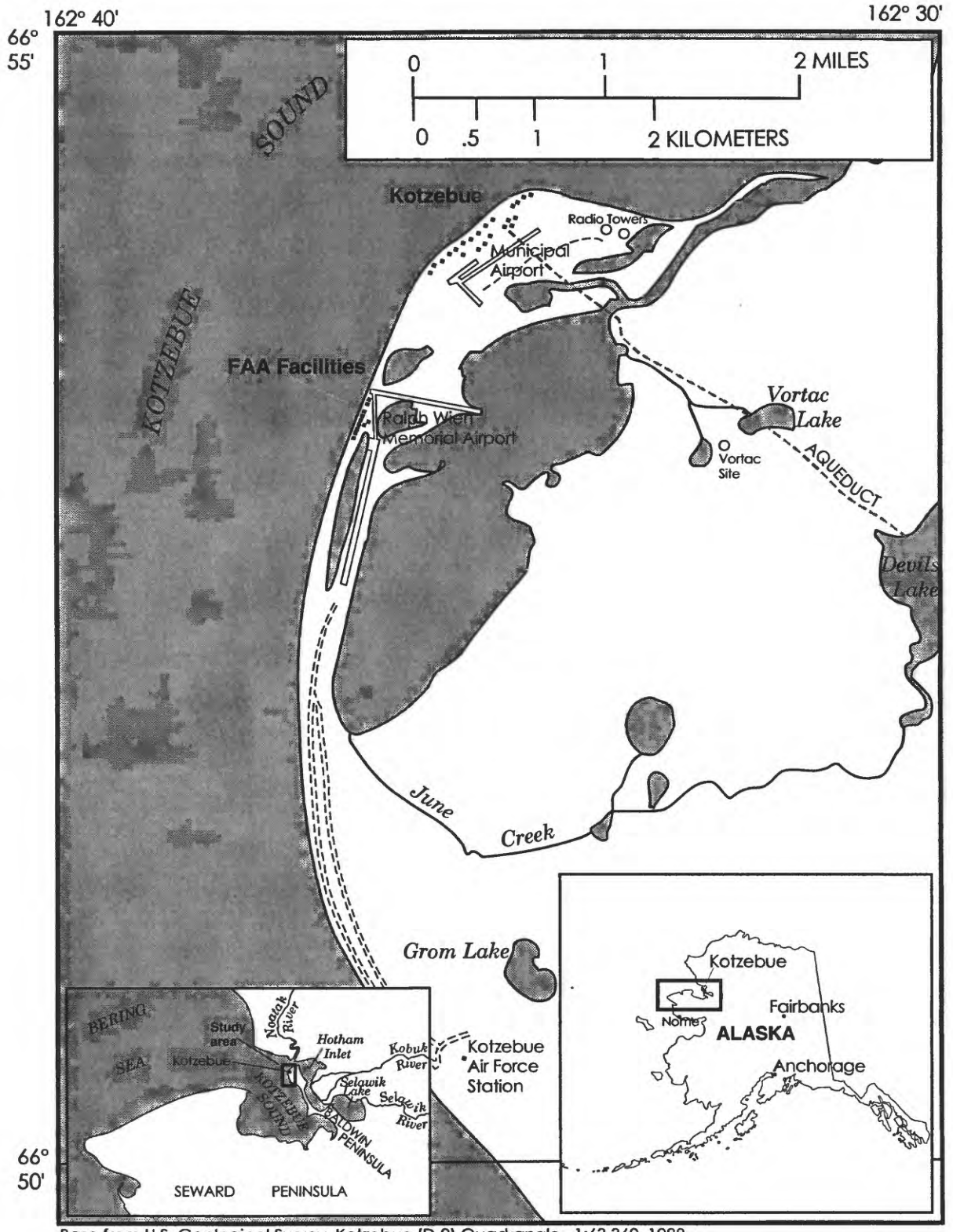
Abstract

The Federal Aviation Administration is making preliminary environmental assessments at most of its present or former facilities in Alaska. The Federal Aviation Administration facilities in Kotzebue are at the Ralph Wien Memorial Airport on the western edge of the Baldwin Peninsula, about 1.5 kilometers south of the smaller Municipal Airport. The facilities lie on a narrow spit between Kotzebue Sound on the west and an unnamed lagoon on the east. Small lakes and ponds, open wetlands, and unvegetated beaches characterize the ground cover. Kotzebue has a transitional climate; summers are short and cool and winters are long and cold. Surface water is abundant in the area and currently is being used as a public drinking-water source. Ground water is available in shallow beach deposits and within deeper thawed zones in the frozen ground but is inadequate in quantity and is poor in quality.

INTRODUCTION

The Federal Aviation Administration (FAA) owns and (or) operates airway-support and navigational facilities throughout Alaska. At many of these sites, fuels and potentially hazardous materials such as solvents, polychlorinated biphenyls, and pesticides may have been used and (or) disposed of in the past. To determine if environmentally hazardous substances have been spilled or disposed of at any of these sites, the FAA is conducting environmental studies mandated by the Comprehensive Environmental Response, Compensation, and Liability Act and the Resource Conservation and Recovery Act. To complete these more comprehensive environmental studies, the FAA requires information on the hydrology and geology of areas surrounding the facilities. This report is the product of compilation, review, and summary of existing hydrologic and geologic data by the U.S. Geological Survey (USGS), in cooperation with the FAA, and provides such information for the FAA facilities and nearby areas at Kotzebue, Alaska.



Base from U.S. Geological Survey, Kotzebue (D-2) Quadrangle, 1:63,360, 1988.

Figure 1. Location of Kotzebue, Alaska and Federal Aviation Administration Facilities.

BACKGROUND

Location

Kotzebue is in northwest coastal Alaska, at lat 66°53' N., long 162°36' W, about 1,150 km northwest of Anchorage (fig. 1). The Kotzebue FAA facilities are at an elevation of about 3 m above sea level on a narrow spit between Kotzebue Sound and an unnamed lagoon (fig. 1). The FAA facilities are about 1.5 km south of the Kotzebue Municipal Airport at the larger Ralph Wien Memorial Airport (fig. 1). Because Kotzebue Sound is extremely shallow near the village, year-round access to Kotzebue is by air only. Kotzebue is a village of about 3,000 residents and is a transportation link for many villages in northwestern Alaska.

FAA Facilities

In 1942, FAA facilities near Kotzebue were established as part of the World War II defense buildup in Alaska. As of 1994, the FAA provides air-traffic control, navigational, and communication aids to pilots from several facilities at the Ralph Wien Memorial Airport. A detailed list of the FAA facilities in Kotzebue and a list of suspected sources of contamination can be found in an environmental compliance investigation report by Ecology and Environment, Inc. (1992).

Climate

Kotzebue has a transitional climate typical of northwestern coastal Alaska (Hartman and Johnson, 1984). The climate is influenced by maritime conditions during the summer when Kotzebue Sound is free of ice and by continental conditions during other seasons. Typical conditions include pronounced diurnal and annual temperature variations, as well as low precipitation, limited cloud cover, and low humidity. From 1949 to 1987, weather records were kept at Kotzebue (Leslie, 1989). During this period, the mean annual temperature was -5.9 °C, the mean maximum July temperature was 14.9 °C, and the mean minimum February temperature was -24.9 °C. Mean annual precipitation is about 225 mm and mean annual snowfall is about 1,210 mm. Mean monthly and annual temperature, precipitation, and snowfall are summarized in table 1.

Table 1. Mean monthly and annual temperature, precipitation, and snowfall,1949 to 1987, Kotzebue, Alaska
[Modified from Leslie (1989); °C, degrees Celsius; mm, millimeter]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
						Temperature (°C)							
Mean maximum[1]	-15.1	-16.8	-12.9	-6.3	3.4	9.9	14.9	13.7	8.2	-2.2	-9.9	-15.5	-2.4
Mean minimum[2]	-22.4	-24.9	-22.3	-16.5	-4.2	3.2	8.8	8.2	2.5	-7.6	-15.9	-22.6	-9.4
Mean	-18.7	-20.9	-17.6	-11.4	-0.4	6.6	11.9	11.0	5.4	-4.9	-12.9	-19.0	-5.9
						Precipitation (mm of moisture)							Total
	10	8	8	8	8	14	37	52	40	17	13	11	226
						Snowfall (mm)							Total
	163	132	140	125	43	3	0.0	0.0	31	168	216	191	1,212

[1]Record maximum 29.4 °C, July 1958.
[2]Record minimum -46.7 °C, February 1964.

Vegetation

The vegetation in coastal areas near Kotzebue is dominated by moist tundra, which includes sedges, scattered willows, and dwarf birch (Viereck and Little, 1972). Near the FAA facilities at the airport, the typical moist tundra is dominated by many small lakes and ponds, barren beach, and open wetland areas containing mostly grasses and mosses.

PHYSIOGRAPHY AND GEOLOGY

Physiography

The northern end of Baldwin Peninsula is in the Kobuk-Selawik lowlands, an area of low relief consisting primarily of broad flood plains and lake-dotted lowlands (Wahrhaftig, 1965). The Baldwin Peninsula, separating Hotham Inlet from Kotzebue Sound, is a rolling lowland containing hills that are less than 100 m in elevation (Wahrhaftig, 1965). The lowlands are currently unglaciated; however, the Baldwin Peninsula may be the end moraine of an early glacial advance (Wahrhaftig, 1965). The Kobuk-Selawik Lowlands extend inland about 300 km east of Kotzebue and are drained primarily by the Kobuk and Selawik Rivers. These rivers along with the Noatak River, farther to the north, contribute large amounts of freshwater to Hotham Inlet and Kotzebue Sound (Cederstrom, 1961).

Geology

Bedrock is not exposed on the Baldwin Peninsula. Surficial deposits overlying bedrock near Kotzebue may be between 150 and 750 m thick; however, no detailed information is available to confirm this estimate. A well near Kotzebue that was drilled to a depth of 99 m did not encounter bedrock (J.R. Williams and D.A. Morris, U.S. Geological Survey, written commun., 1974). Bedrock in the nearby northern Yukon-Koyukuk province, which extends to the north and east of Kotzebue, consists of volcanic sedimentary and andesitic rocks of Cretaceous age (Patton, 1973). Surficial materials consist of a sequence of marine and glacial deposits that are exposed in sea cliffs along the peninsula (Cederstrom, 1961; Hopkins, 1977). Organic-rich soils near Kotzebue have a maximum active layer of about 1 m where permafrost is present (Rieger and others, 1979). Polygonal ground, which indicates shallow permafrost, is prevalent west of the runway. Because of seasonal variations in temperature and precipitation, the soils are alternately wet and dry and typically are dark-gray and mottled (Rieger and others, 1979). The predominant silt loam soils are developed on deep silty alluvium (Rieger and others, 1979).

HYDROLOGY

Although Kotzebue is in an area of low precipitation, surface water is a major component of the physical environment. Saltwater nearly surrounds Kotzebue, and many small freshwater lakes and streams dot the landscape. Additionally, three major rivers—the Noatak, Kobuk, and Selawik— drain into the sea within 100 km of Kotzebue (fig. 1). Local lakes presently are used to supply drinking water to residents; streams have been used in the past. Ground water is available above and below the permafrost; however, the local aquifers have not been developed for public drinking-water supplies because they are commonly affected by saltwater and are inadequate in quantity (J.R. Williams and D.A. Morris, U.S. Geological Survey, written commun., 1974).

Surface Water

Streamflow near Kotzebue is influenced by local temperature and precipitation. About 60 percent of the 226 mm/yr of precipitation falls during the months of June, July, and August (table 1) and causes significant increases in stream discharge. This local runoff is augmented by snowmelt runoff from the nearby Brooks Range. In general, rivers and streams in northwestern Alaska will reach their maximum flows during the spring snowmelt period and will have secondary peak flows following heavy rainfall during the summer. Many streams, including the upper tributaries and headwater reaches of the Noatak and the Kobuk Rivers, approach zero flow during the long cold winter (Childers and Kernodle, 1981, 1983).

The records of streamflow available for rivers near Kotzebue are discharge of the Noatak River during open-water periods from 1965 to 1971 (U.S. Geological Survey, 1972) and discharge for the Kobuk River for 1976-93 (U.S. Geological Survey, 1994). These data-collection sites, near the villages of Noatak and Kiana, are about 30 km north and 90 km east of Kotzebue, respectively. The quality of the Noatak and Kobuk Rivers was investigated at a reconnaissance level during 1978-80 (Childers and Kernodle, 1981, 1983). The quality of the water, indicated by the chemical analyses and macroinvertebrate communities, generally was excellent. Streamflow data from June 1965 to September 1967 are available for June Creek, which flows into the southern end of the unnamed lagoon east of Kotzebue (U.S. Geological Survey, 1968). Fluctuations in the flow of June

Creek indicate no flow during the winter and peak flow during spring snowmelt followed by intermittent storm peaks during the summer (fig. 2). June Creek was used as a drinking-water source for the Air Force Station before the development of the Grom Lake system (J.R. Williams and D.A. Morris, U.S. Geological Survey, written commun., 1974). Because this stream ceases to flow during the winter, its use as a drinking-water supply for Kotzebue would require the construction of an earthen dam near the mouth of the stream (J.R. Williams and D.A. Morris, U.S. Geological Survey, written commun., 1974).

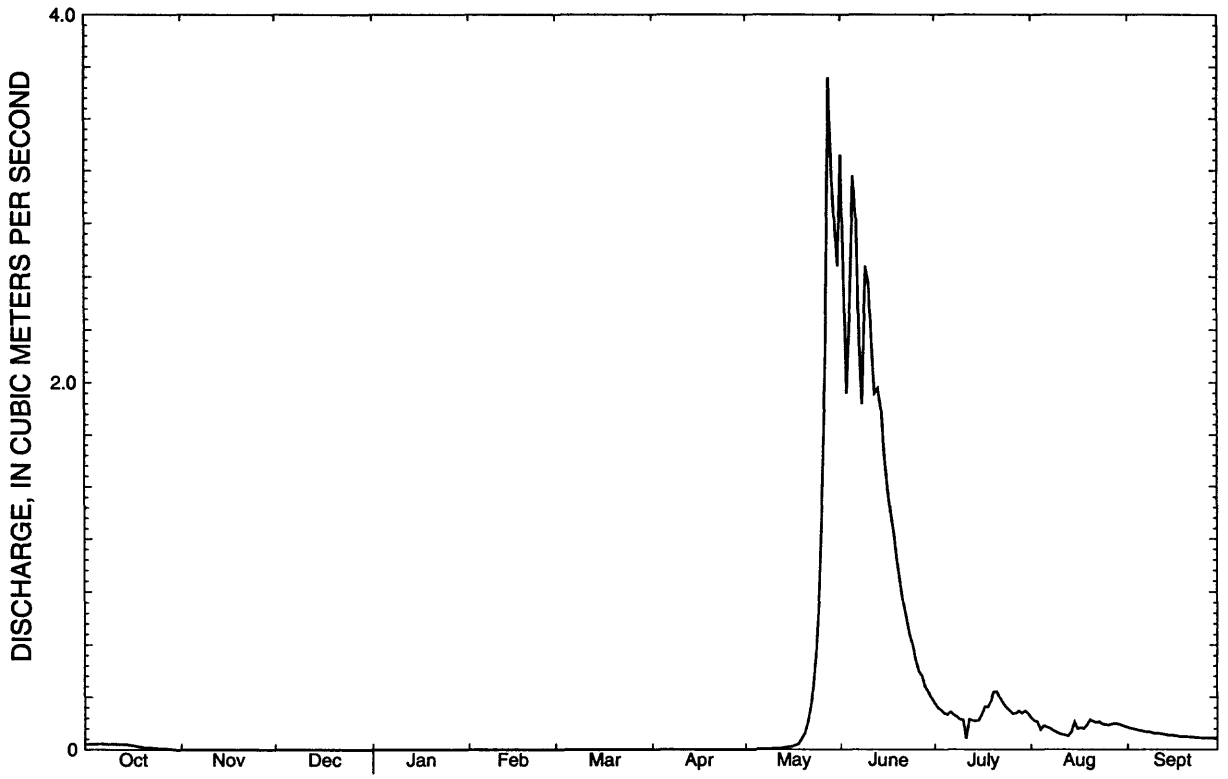


Figure 2. Daily mean discharge of June Creek near Kotzebue, water year 1967

Major rivers are far from Kotzebue and are not viable sources of drinking water. The major rivers, however, do provide spawning habitat for salmon used by the community for subsistence (Lingnau, 1992), and data from these rivers are the only source of information about the quality and quantity of the unmeasured surface-water bodies near Kotzebue.

Many small streams and lakes are present on the Baldwin Peninsula near Kotzebue. Many lakes in this area were formed by glacial activity or from surficial thawing of permafrost. Some of these lakes are shallow and probably freeze completely during the winter. Two larger lakes—Vortac Lake and Devils Lake—are used to supply Kotzebue with drinking water, and Grom Lake, about 5 km south of Kotzebue, has been used to supply drinking water to the Air Force Station near Kotzebue (fig. 1, this report; J.R. Williams and D.A. Morris, U.S. Geological Survey, written commun., 1974; University of Alaska, 1976).

Floods

Flooding of the coastal areas near Kotzebue occurred in 1963, 1965, 1982, 1986, and 1990 because of storm-driven waves; however, the flood hazard is considered low (U.S. Army Corps of Engineers, 1993). Because of the shallow water and extensive offshore sandbars, damage during past flooding has consisted mainly of local erosion of the beachfront (U.S. Army Corps of Engineers, 1993).

Kotzebue Sound has a tidal range of about 0.3 m (Federal Emergency Management Agency, 1983). Most of Kotzebue Spit has poorly drained soils that are underlain by permafrost. The result is localized shallow flooding during spring snowmelt or extensive rainfall. Kotzebue does not have a storm-drainage system (Federal Emergency Management Agency, 1983).

Ground Water

Ground-water recharge and flow on the Baldwin Peninsula are influenced by continuous permafrost that acts as a nearly impermeable barrier; however, in unfrozen areas along the coast of northwestern Alaska, ground water may be hydraulically connected to the ocean and subject to saltwater intrusion. A recharge experiment revealed that the ground water in a thin unconfined aquifer under the Kotzebue FAA facilities either froze during the winter or was confined between the seasonal frost and permafrost (J.R. Williams and D.A. Morris, U.S. Geological Survey, written commun., 1974). Ground water discharges into Kotzebue Sound to the west, the lagoon to the east, and wetlands throughout the area (Ecology and Environment, Inc., 1992). Ground water is not presently used as a drinking-water source for Kotzebue or the FAA facilities.

A test well drilled in Kotzebue during the summers of 1949 and 1950 reached water at 5 m below the ground surface (about sea level). The water contained 26,000 mg/L of chloride at a depth of 25 m below ground surface, and at depths of 80 and 83 m, ground water contained 4,680 and 5,670 mg/L of chloride, respectively (Cederstrom, 1955, 1961; table 2, appendix 1, this report). Drilling was discontinued at 99 m because the permeability was too low to produce the desired yields, and it was anticipated that the salinity would continue to increase with depth (Cederstrom, 1955; 1961). Ground water near the FAA facilities in Kotzebue occurs within surficial deposits at depths ranging from 1.5 to 6 m below ground surface; however, the quality of this water is unknown (Ecology and Environment, Inc.,1992).

Table 2. Analyses of ground-water samples from a test well, Kotzebue, Alaska

[Data from Cederstrom, 1961 and modified from Appendix 1, this report. Constituents are reported in milligrams per liter except pH. Dashes indicate no data.]

Constituent or property	Depth, 25 meters	Depth, 80 meters	Depth, 83 meters
Iron (Fe)	68	---	---
Sulfate (SO_4)	1,610	---	9
Sodium (Na) and potassium (K)	14,100	2,850	3,490
Chloride (Cl)	26,200	4,680	5,670
Total dissolved solids	45,300	---	10,600
pH	7.2	7.6	7.6

Table 3. Selected water-quality data for FAA wells near Kotzebue, Alaska

[Data from J.R. Williams and D.A. Morris, U.S. Geological Survey, written commun., 1974; modified from Appendix 2, this report. Constituents are reported in milligrams per liter except pH. Dashes indicate no data; USEPA, U.S. Environmental Protection Agency]

Constituent or property	USEPA drinking-water regulation	Shallow ground water at a depth of 5 meters	Deep ground water at a depth of 29 meters
Iron (Fe)	0.3	0.38	---
Sulfate (SO_4)	250	38	975
Fluoride (F)	2	0	---
Chloride (Cl)	250	104	21,400
Total dissolved solids	500	494	36,700
pH	6.5-8.5	7.4	7.2

Drinking-Water Sources

Surface water is the principal source of drinking water for Kotzebue, although there are a few private wells in the community (Feulner, 1973). Kotzebue and the FAA facilities obtain drinking water from Vortac Lake (fig. 1). Water from the lake is heated and pumped through an aqueduct to a water-treatment plant. Devils Lake also is used as a municipal water supply. Water is pumped from Devils Lake into Vortac Lake and then to the water-treatment plant (Ecology and Environment, Inc., 1992). The water is filtered, treated for iron, and stored in a 5.7-million-liter storage tank located adjacent to the water-treatment plant (Selkregg, 1976). Prior to 1970, June Creek was used by the Air Force Station for a drinking water supply, and after that Grom Lake was used (fig. 1; J.R. Williams and D.A. Morris, U.S. Geological Survey, written commun., 1974). The quality of water from these sources is summarized in table 4.

Table 4. Analysis of surface water from the water-treatment plant (Vortac Lake), June Creek and Devils Lake

[Modified from Appendix 3; Constituents are reported in milligrams per liter except pH. Dashes indicate no data; USEPA, U.S. Environmental Protection Agency]

Constituent or property	USEPA drinking water regulation	Water-treatment plant		June Creek	Devils Lake
		Raw water	Treated water		
Iron (Fe)	0.3	1.32	0.1	2.7	.38
Sulfate (SO_4)	250	5.4	28.2	120	2.4
Manganese (Mn)	.05	.02	0	.89	.01
Fluoride (F)	2	.22	.12	---	.09
Chloride (Cl)	250	5	11	1,100	8
Sodium (Na)	200	3.8	33	581	4.8
Total dissolved solids	500	88	60	2,312	94
pH	6.5 -8.5	7	9.5	7.1	7.63

Alternative Drinking-Water Sources

Kotzebue has at least four potential alternative sources of drinking water: (1) shallow ground water; (2) deep ground water; (3) surface water, such as streams, ponds, and lakes; and (4) brackish to salty surface water, such as the lagoon or Kotzebue Sound (J.R. Williams and D.A. Morris, U.S. Geological Survey, written commun., 1974). Shallow ground water is of a limited supply and is vulnerable to contamination. June Creek and Grom Lake provide inadequate or unreliable quantities of water during winter. The major rivers, including the Noatak, the Selawik, and the Kobuk are located too far from Kotzebue to be considered as economical sources. The brackish lagoon directly east of Kotzebue, although closer to town than Vortac and Devils Lakes, is shallow and freezes completely in winter. Lack of winter storage and brackish quality make the lagoon a poor source for drinking water. The salinity of deep ground water and Kotzebue Sound makes them unacceptable drinking-water sources without expensive treatment. Other alternatives, such as the collection of rain water or snow seem impractical because of the low levels of annual accumulation. A possible source of drinking water for future needs may be augmentation of the present surface-water supply through expanded collection, storage, and treatment facilities.

SUMMARY

Kotzebue is in northwest coastal Alaska about 1,150 km northwest of Anchorage. Kotzebue and the FAA facilities are at the northern end of Baldwin Peninsula, a rolling, lake-dotted lowland. Bedrock is at depths greater than 99 m and surficial deposits may be 750 m thick. The northern end of Baldwin Peninsula is nearly surrounded by saltwater, and surface water is a major component of the physical environment. Flood hazards are low for Kotzebue and the FAA facilities. Surface water is the main source of drinking water. Deep ground water is highly saline, and shallow ground water is of inadequate quantity. The most promising alternative for future drinking-water needs for Kotzebue may be augmentation of the present surface-water supply through expanded collection, storage, and treatment facilities.

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APPENDIX 1

Analysis of ground-water samples at Kotzebue, Alaska
(Data from Cederstrom, 1961, p. 1429)

TABLE 1. ANALYSES OF GROUND-WATER SAMPLES FROM TEST WELL AT KOTZEBUE, ALASKA
Analyses by U. S. Geological Survey

	Depth (feet)			
	82	130*	260	273
Silica	9.7	5.1	42	51
Iron	68	..	..	..
Calcium	640	..	184	41
Magnesium	1890	..	..	348
Sodium and potassium	14,100	..	2850	3490
Bicarbonate	1770	221	1200	1800
Sulfate	1610	..	..	9.0
Chloride	26,200	515	4680	5670
Dissolved solids	45,300	..	..	10,600
Hardness as $CaCO_3$	9370	130	1390	1890
Specific conductance (micromhos at 25^0 C)	63,500	2110	15,000	17,800
pH	7.2	..	7.6	7.6

* Sample of permafrost ice

APPENDIX 2

Analysis of ground- and surface-water samples at Kotzebue, Alaska
(Data from J.R. Williams and D.A. Morris, USGS, written commun., 1974, p. 17)

—Chemical analyses of shallow and deep ground water and surface water at Kotzebue
(Chemical constituents in milligrams per liter)

Owner and date of collection	Wells total depth	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue at 180°C)	Hardness as CaCO: Calcium, magnesium	Hardness as CaCO: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color	Mean temperature (°C)
SHALLOW GROUND WATER																			
ouis Ratman Store October 7, 1955	13.5	6.9	0.0	98	26	43	4.9	375	54	45	0.0	13.0	-	-	-	817	-	-	0.31
ederal Aviation Administration October 8, 1955	16.5	5.0	.38	75	24	79	7.7	323	38	104	.0	2.2	494	286	21	880	7.4	-	.00 41°F
laska Area Native Health Service Hospital Duplex March 13, 1958	30	7.9	1.7	155	44	80	6.0	446	188	115	.3	0.8	819	568	202	1,350	7.4	30	-
ureau of Indian Affairs School March 13, 1958	12	10	0.53	74	25	102	7.1	400	47	90	.1	3.0	555	287	0	966	8.0	45	0.02
laska Communications System July 10, 1967	10	4.5	.16	80	14	32	2.1	244	18.0	55	-	34	360	258	58	613	8.2	10	.04
obuk Valley Jade Company June 20, 1973	37	4.8	.12	100	18	35	2.3	318	41	71	.0	2.2	439	320	63	771	7.6	30	.02
DEEP GROUND WATER																			
.S. Geological Survey Test Well August 15, 1949	82	9.7	-	640	1,890	14,100	-	1,770	1,610	26,200	-	-	45,300	9,370	8,920	63,500	7.2	-	-
Do August 20, 1949	130*	5.1	-	-	-	-	-	221	-	515	-	-	-	130	-	2,110	-	-	-
Do August 25, 1949	260	42	-	-	-	2,850	-	1,200	-	4,680	-	-	-	1,390	-	15,000	-	-	-
Do August 29, 1949	273	51	-	184	348	3,490	-	1,800	9.0	5,670	-	-	10,600	1,890	415	17,800	-	-	-
Federal Aviation Administration September 6, 1955	95	6.3	-	375	1,560	11,600	-	1,570	975	21,400	-	-	36,700	7,350	6,060	56,800	7.2	-	-
SURFACE WATER																			
June Creek, September 3, 1960	-	7.6	0.88	9.6	0.0	2.4	0.0	22	5.0	4.0	0.1	0.0	40	24	6	59	6.7	20	0.0
June Creek, May 26, 1967	-	0.8	.56	6.8	1.0	1.8	1.6	8	11.0	2.1	.2	.7	30	18	11	36	6.2	55	-
June Creek, September 26, 1967	-	.7	.34	8.6	2.1	1.9	0.4	34	0.0	3.5	.0	1.6	36	30	2	69	7.0	30	-
748th ACWRON Grom Lake, September 8, 1969	-	.3	.48	13.0	3.5	2.8	.5	51	.0	6.0	.0	0.0	50	46	4	105	7.6	20	0.08
Grom Lake, January 11, 1972	-	.6	.85	14.0	3.2	4.5	.8	52	.0	11.0	.1	.5	61	48	5	115	7.4	30	.1
Lagoon, February 17, 1949	-	2.7	-	59	135	1,120	-	73	2,85	1,970	.2	-	3,610	702	642	-	-	-	-
Vortac Lake, April 7, 1967	-	2.5	-	30	8.5	5.1	1.6	126	0.0	7.8	.8	1.3	131	108	5	226	7.0	<50	-
Vortac Lake, June 20, 1973	-	1.7	-	20	4.6	2.4	2.1	75	5.8	5.8	.0	0.02	82	69	7	126	7.3	200	0.12
Devils Lake, September 1, 1967	-	0.0	0.02	18	1.1	2.1	0.7	60	0.0	1.4	.1	1.1	55	50	1	103	7.3	20	-

* Slush from drill cuttings in permafrost.
< Greater than.

APPENDIX 3

Analysis of surface-water samples at Kotzebue, Alaska

DeVault.

3/15/74

WATER ANALYSIS REPORT FORM

Mail Report to: ARCH HAMMETT, ADMIN. OFFICER
OFFICE OF ENVIRONMENTAL HEALTH
P. O. BOX 7-741
ANCHORAGE, AK 99510

395 SEP 2 9 RECD

NAME OR LOCATION: Kotzebue Water Treatment Plant - Raw Water

COLLECTED BY: Richard Hopkins DATE 9-1-76 HOUR: 11:20 a.m.

WATER SYSTEM

1. Well Type _____ Depth _____ Gallons per minute _____
2. Surface Water: Vortac Reservoir Temporary ☐ Permanent ☒
3. Number of Homes Served: 400
4. Treatment: ☒ Yes ☐ No New or Existing Source Existing

PURPOSE OF ANALYSIS

☐ 1. Water Approval for Building Permit. (Column 1)
☒ 2. Routine Analysis. (Column 1 & 2)
☒ 3. Special: Check Specific Items for Analysis (Columns 1,2,3)

COLUMN 1

	Analysis	Limits
Iron (Fe)	1.32	0.3
Fluoride (F)	0.22	1.5
Chloride (Cl)	5	250
Phosphate (PO_4)	0.02	.05 good 30 poor
Total Hardness	60	50 soft 300 hard
Detergents	0	0
pH	7.00	6.5 8.5
Specific Conductance	112	

COLUMN 2

	Anal.	Limit
Magnesium (Mg)	3.4	125
Calcium (Ca)	13.8	300
Turbidity	16	5
Color	58	15
Bicarbonate (HCO_3)	63	25 good 500 poor
Carbonate	0	350
Alkalinity	52	350
Total Dissolved Solids	88	500

COLUMN 3

	Analysis	Limits
Sodium (Na) #	3.8	200
Potassium (K)		
Sulfate (SO_4) #	5.4	250
Sulfite **(SO_3)		5.
Nitrate (NO_3) ##	0.30	10
Suspended Solids		
Arsenic (As)		0.(
Copper (Cu)		1.(
Cyanide (Cn)		0.(
Phenols		0.(
Zinc (Zn)		5.(
Barium (Ba)		1.(
Cadmium (Cd)		0.(
Lead Pb)		0.(
Silver (Ag)		0.(
Mercury (Hg)		0.(
Manganese (Mn) ##	0.02	0.(

Rec'd 9/17/76

COMMENTS: 9/21/76
K M Emerson
D P Herber

INSTRUCTIONS:

1. Rinse container several times in water source to be sampled.
2. Place cap on sample container firmly.
3. Place sample in carton mailer, and forward to:

Public Health Laboratory
SRO, Medical Arts Bldg.
Pouch J
Juneau, AK 99801

3/15/74

WATER ANALYSIS REPORT FORM

Mail Report to: ARCH HAMMETT, ADMIN. OFFICER
OFFICE OF ENVIRONMENTAL HEALTH
P. O. BOX 7-741
ANCHORAGE, AK 99510

387 SEP 2 9 RECD

NAME OR LOCATION: Kotzebue Water Treatment Plant - Treated Water

COLLECTED BY: Richard Hopkins DATE 9-1-76 HOUR: 11:30 a.m.

WATER SYSTEM

1. Well Type _____ Depth _____ Gallons per minute _____
2. Surface Water: Vortac Reservoir Temporary ☐ Permanent ☒
3. Number of Homes Served: 400
4. Treatment: ☒ Yes ☐ No New or Existing Source Existing

PURPOSE OF ANALYSIS

☐ 1. Water Approval for Building Permit. (Column 1)
☒ 2. Routine Analysis. (Column 1 & 2)
☒ 3. Special: Check Specific Items for Analysis (Columns 1,2,3)

COLUMN 1

	Analysis	Limits
Iron (Fe)	0.10	0.3
Fluoride (F)	0.12	1.5
Chloride (Cl)	11	250
Phosphate (PO_4)	0.02	.05 good 30 poor
Total Hardness	58	50 soft 300 hard
Detergents	0	0
pH	9.5°	6.5 8.5
Specific Conductance	212	

Recd 9/16/76

COLUMN 2

	Anal.	Limit
Magnesium (Mg)	3.7	125
Calcium (Ca)	10.2	300
Turbidity	4	5
Color	10	15
Bicarbonate (HCO_3)	62	25 good 500 poor
Carbonate	5	350
Alkalinity	60	350
Total Dissolved Solids	60	500

COLUMN 3

	Analysis	Limits
Sodium (Na) *	33.0	200
Potassium (K)		
Sulfate (SO_4) *	28.2	250
Sulfite **(SO_3)		5.
Nitrate (NO_3) **	0.41	10
Suspended Solids		
Arsenic (As)		0.(
Copper (Cu)		1.(
Cyanide (Cn)		0.(
Phenols		0.(
Zinc (Zn)		5.(
Barium (Ba)		1.(
Cadmium (Cd)		0.(
Lead Pb)		0.(
Silver (Ag)		0.(
Mercury (Hg)		0.(
Manganese (Mn) *	0.00	0.(

COMMENTS: 9/21/76
D P Gerber
K M Emerson

INSTRUCTIONS:

1. Rinse container several times in water source to be sampled.
2. Place cap on sample container firmly.
3. Place sample in carton mailer, and forward to:

Public Health Laboratory
SRO, Medical Arts Bldg.
Pouch J
AK 99801

Dr Pauls

3/15/74

WATER ANALYSIS REPORT FORM

393

SEP 2 9 RECD

Mail Report to: ARCH HAMMETT, ADMIN. OFFICER
OFFICE OF ENVIRONMENTAL HEALTH
P. O. BOX 7-741
ANCHORAGE, AK 99510

NAME OR LOCATION: Devils Lake - Kotzebue - Raw Water

COLLECTED BY: Richard Hopkins DATE 9-1-76 HOUR: 9:30 a.M.

WATER SYSTEM

1. Well Type _____ Depth _____ Gallons per minute _____
2. Surface Water: Lake Temporary [ ] Permanent [X]
3. Number of Homes Served: _____
4. Treatment: [ ] Yes [X] No New or Existing Source Existing

PURPOSE OF ANALYSIS

[ ] 1. Water Approval for Building Permit. (Column 1)
[X] 2. Routine Analysis. (Column 1 & 2)
[X] 3. Special: Check Specific Items for Analysis (Columns 1,2,3)

COLUMN 1

	Analysis	Limits
Iron (Fe)	0.38	0.3
Fluoride (F)	0.09	1.5
Chloride (Cl)	8	250
Phosphate (PO_4)	0.07	.05 good 30 poor
Total Hardness	67	50 soft 300 hard
Detergents	0	0
pH	7.63	6.5 8.5
Specific Conductance	112	

Rec'd 9/17/76

COLUMN 2

	Anal.	Limit
Magnesium (Mg)	3.2	125
Calcium (Ca)	13.8	300
Turbidity	15	5
Color	23	15
Bicarbonate (HCO_3)	32	25 good 500 poor
Carbonate	0	350
Alkalinity	26	350
Total Dissolved Solids	94	500

COLUMN 3

	Analysis	Limit
Sodium (Na) *	4.8	200
Potassium (K)		
Sulfate (SO_4) *	2.4	250
Sulfite **(SO_3)	*	5
Nitrate (NO_3) *	0.09	10
Suspended Solids		
Arsenic (As)		0.
Copper (Cu)		1.
Cyanide (Cn)		0.
Phenols		0.
Zinc (Zn)		5.
Barium (Ba)		1.
Cadmium (Cd)		0.
Lead Pb)		0.
Silver (Ag)		0.
Mercury (Hg)		0.
Manganese (Mn) *	0.01	0.

COMMENTS: 9/21/76
D P Gerber
K M Emerson

INSTRUCTIONS:

1. Rinse container several times in water source to be sampled.
2. Place cap on sample container firmly.
3. Place sample in carton mailer, and forward to:

Public Health Laboratory
SRO, Medical Arts Bldg.
Pouch J
Juneau, AK 99801

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.
P.O. BOX 4-1276 ANCHORAGE, ALASKA 99509 5633 "B" STREET
TELEPHONE (907) 278-4014

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: June Creek, Kotzebue, Alaska

DATE COLLECTED 12-7-78 TIME COLLECTED: 1000 hrs.

SAMPLED BY Steve Swingle SOURCE June Creek Water

REMARKS Temperature: 0°C ± 0.05

FOR LAB USE ONLY
RECVD.BY SJK LAB # 9415
DATE RECEIVED 12-27-78
DATE COMPLETED 1- 3-79
DATE REPORTED 1- 4-79
SIGNED Archie R. Green

	mg/l		mg/l		mg/l
[]Ag,Silver		[]P,Phosphorous		[]Cyanide	
[]Al,Aluminum		[]Pb,Lead		[]Sulfate	120
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	2312
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium		[]Si,Silicon		[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	71	[]Sr,Strontium		[]Hardness as $CaCO_3$	538
[]Cd,Cadmium		[]Ti,Titanium		[]Alkalinity as $CaCO_3$	100
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium		[]V,Vanadium		[]	
[]Cu,Copper		[]Zn,Zinc		[]	
[]Fe,Iron	2.7	[]Zr,Zirconium		[]	
[]Hg,Mercury		[]Ammonia Nitrogen-N		* * * * * * []mmhos Conductivity	3600
[]K,Potassium	26	[]Kjedahl Nitrogen-N		[]pH Units	7.1
[]Mg,Magnesium	88	[]Nitrate-N		[]Turbidity NTU	
[]Mn,Manganese	0.89	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[]T.Coliform/100ml	
[]Na,Sodium	581	[]Chloride	1100	[]	
[]Ni,Nickel		[]Fluoride		[]	