Overview of Environmental and Hydrogeologic Conditions at Cold Bay, Alaska

By Wendy A. Rice and Eppie V. Hogan

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U.S. DEPARTMENT OF THE INTERIOR
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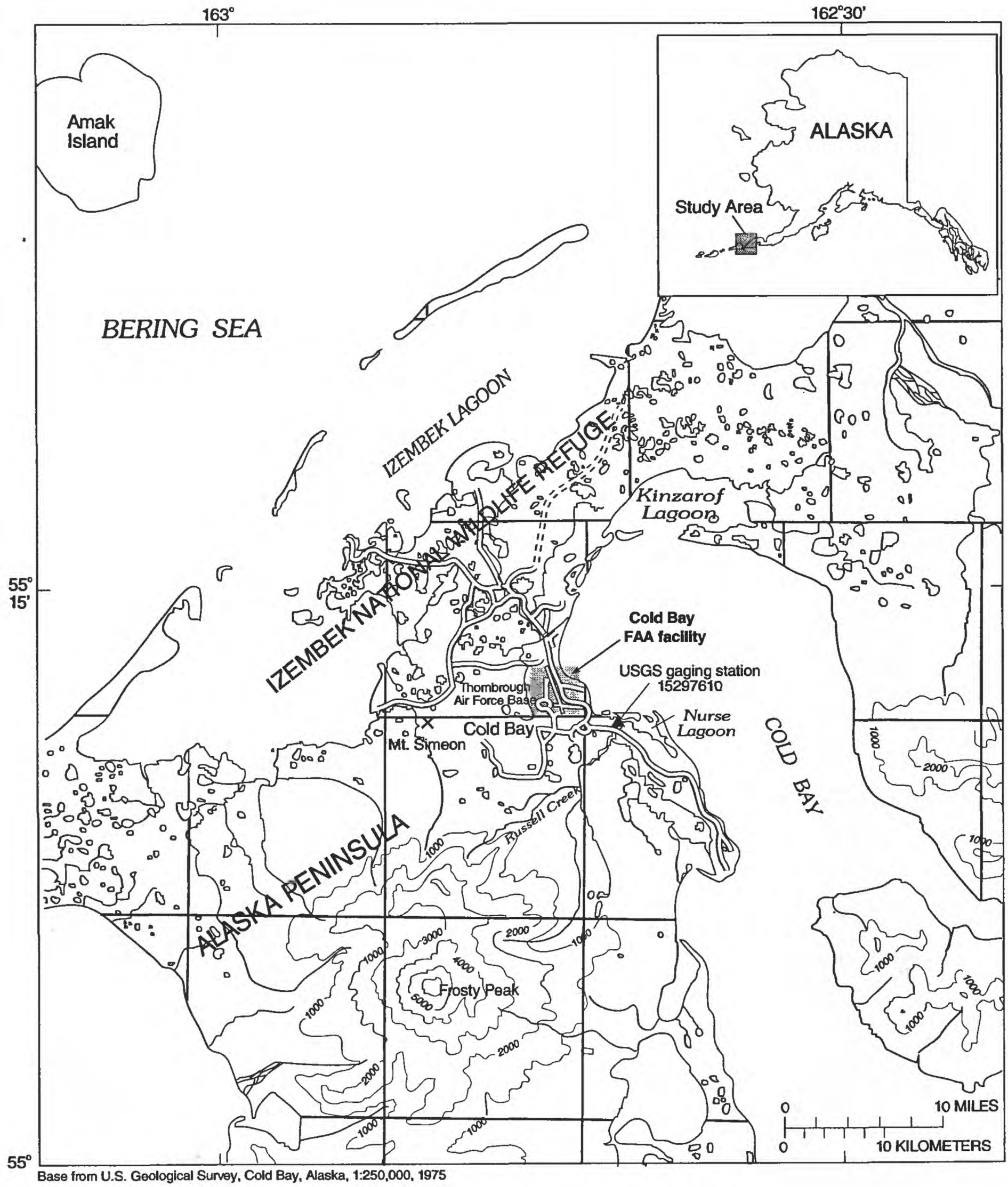
ABSTRACT

Cold Bay is near the southern tip of the Alaska Peninsula and has a maritime climate with mild winters and cool summers that affect the hydrology of the area. The city of Cold Bay and the Federal Aviation Administration facility obtain their drinking water from unconfined ground-water sources. Ground-water contamination and possible flooding of local communities may affect the quality of drinking water. The Federal Aviation Administration owns or operates airway support facilities at Cold Bay. The Federal Aviation Administration needs information on environmental and hydrogeologic conditions when evaluating options for environmental compliance and possible remediation at these facilities. This report describes the climate, vegetation, geology, ground-water and surface-water hydrology, and flood potential of the Cold Bay area.

INTRODUCTION

The Federal Aviation Administration (FAA) owns and (or) operates airway support and navigational facilities throughout Alaska. At many of these facilities, fuels and potentially hazardous materials such as solvents, polychlorinated biphenyls (PCB's), and pesticides may have been used and (or) disposed of. To determine if environmentally hazardous materials have been spilled or disposed at the facilities, 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, 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, describes general hydrogeologic and other environmental conditions near Cold Bay, Alaska.



Base from U.S. Geological Survey, Cold Bay, Alaska, 1:250,000, 1975

Figure 1. Location of Cold Bay, Alaska and the Federal Aviation Administration facility.

BACKGROUND

Location

The FAA facility at Cold Bay is on the Alaska Peninsula at approximate lat 55 °12' N. and long 162°41' W. (fig. 1). Cold Bay is in the northern part of the Izembek National Wildlife Refuge, about 1, 000 km southwest of Anchorage and 300 km northeast of Unalaska. Cold Bay has a topography similar to the nearby Aleutian Islands. The topography is characterized by a rolling, treeless tundra that contains several lakes. The City of Cold Bay is on the northwestern shore of Cold Bay, an embayment of the Pacific Ocean. The embayment is about 14 km across at its widest point and protrudes inland about 40 km. The dominant physical feature near Cold Bay is Frosty Peak, a 1,920-meter-high volcanic mountain that is due south of the city.

History and Socioeconomics

The Cold Bay area remained largely undeveloped until the onset of World War II. The Japanese occupation of the outer Aleutian Islands spurred the construction of a series of strategic American bases, including Fort Randall, a large base built on the shores of Cold Bay in 1942 (Environmental Services Ltd., 1982). Since then, the population of Cold Bay has risen and fallen, depending largely on the airport's utilization (Environmental Services Ltd., 1982).

In 1960, the population of Cold Bay was 86; in 1970 it was 261; in 1980 it was 226; and in 1993 the population was 154 (Environmental Services Ltd., 1982; U.S. Army Corps of Engineers, 1993). About 10 percent of the people are American Indian, Eskimo, or Aleut, about 84 percent are Caucasian, about 4 percent are African-American or Asian/Pacific Islander, and 2 percent are of other ethnic origin (Environmental Services Ltd., 1982).

The population of Cold Bay is transient and depends largely on the airport and government for employment. The city is in advantageous proximity to many Bering Sea resources and dramatic changes in the economic base of the community could result from the development of oil and gas resources on the outer continental shelf and (or) the fishing industry. If oil and gas development occurs, underwater pipelines from the nearby St. George Basin and the Northern Aleutian Shelf might terminate in Cold Bay (Braham and others, 1981; Sallenger and Dingler, 1979). In this event, a port facility would be needed to transfer the oil and gas to waiting tankers. The additional development of fisheries in the Cold Bay area also may enhance the economic base of the city.

FAA Facilities

The Cold Bay FAA facility consists of an 87-hectare installation in the city of Cold Bay (fig. 1). The facility was constructed in 1958-59 as an extension of the military's Distant Early Warning (DEW) line into the Aleutian Islands. Detailed lists of FAA facilities and potential sources of environmental contamination can be found in an Environmental Compliance Investigation Report (ECIR) by Ecology and Environment, Inc., (1992).

PHYSICAL SETTING

Climate

Cold Bay lies in the maritime climate zone (Hartman and Johnson, 1984). Climatic conditions are influenced by the Bering Sea and the North Pacific and are characterized by small temperature variations, high humidity, heavy precipitation, and frequent foggy periods. Cold Bay has one of the highest percentages of cloud cover in the United States. Cyclonic storms with high winds, low ceilings, and poor visibility occur frequently. Mountains rise more than 1,800 m, about 15 km south-southwest of Cold Bay. These mountains provide protection from approaching southwesterly and southeasterly winds and precipitation. The mean annual temperature for 1950-87 for Cold Bay is 3.4 °C. Mean monthly temperatures range from an August mean maximum of 13.1 °C to a February mean minimum of -5.2 °C (Leslie, 1989; table 1). Mean annual precipitation is about 910 mm with most rainfall occurring in October and November. Mean annual snowfall is about 1,600 mm.

Table 1. Mean monthly temperature, precipitation, and snowfall, 1950 to 1987, Cold Bay, Alaska.

[Modified from Leslie (1989); °C, degree Celsius]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
						Temperature (°C)							
Mean maximum[1]	0.5	0.1	1.3	3.2	6.8	10.1	12.7	13.1	11.1	6.8	3.8	1.3	5.9
Mean minimum[2]	-4.5	-5.2	-4.1	-2.1	1.5	4.8	7.6	8.4	6.2	1.6	-1.1	-3.5	0.8
Mean	-2.0	-2.5	-1.4	.6	4.2	7.5	10.2	10.8	8.6	4.3	1.3	-1.1	3.4
						Precipitation (millimeters of moisture)							
	68.8	58.4	55.9	48.3	61.0	54.1	63.5	94.2	103	113	110	80.3	910
						Snowfall (millimeters)							
	287	297	279	158	48.3	.00	.00	.00	.00	81.3	183	259	1,600

[1]Record maximum, 25.0°C, July 1960.
[2]Record minimum, -25.0°C, March 1971.

Vegetation

The Cold Bay FAA facility is located within a wet tundra ecosystem consisting principally of coastal heath shrub and alder thickets (Viereck and Little, 1972). Wetlands are found in the Izembek National Wildlife Refuge and along the shores of Nurse Lagoon (fig. 1). Typical wetland vegetation includes cotton grass, willow, bur reed, pond weed, and a variety of sedges and grasses. The shoreline near the FAA facility consists of exposed tidal flats and expanses of rocky beach. Beds of eelgrass cover about 70 percent of the local tidal flats.

Geology

Most of the landscape in the Cold Bay area was formed in the last 1 to 2 million years as a result of volcanism and glaciation (McLean, 1979). The distribution of volcanic rocks and surficial deposits are indicated on geologic maps of the area by Wilson and others (1992).

Volcanic rocks of Quaternary age are mainly of andesite, dacite, and basalt composition and occur as volcanic breccia and lahar, and debris-flow deposits (Wilson and others, 1992). These rocks are confined to the area around Frosty Peak (fig. 1) and are not exposed near the FAA facility. Most of the volcanic rocks in the area were formed by volcanic activity on Amak Island, Frosty Peak, Mount Simeon, (fig. 1) and Mount Dutton (Waldron, 1961; Wood and Kienle, 1990). Ash and basalt deposits are assumed to have been deposited by activity on Amak Island and Frosty Peak (Waldron, 1961). The Amak volcano has been active as recently as 1796; the Cold Bay volcanic center is extinct (Wood and Kienle, 1990). Volcanic rocks of Quaternary age overlie basalt flows of Tertiary age from Mount Simeon. These crystalline basalt flows dip towards the southwest toward Frosty Peak and are rarely exposed because of glacial drift cover. The absolute age of the Mount Simeon basalt flows is unknown (Waldron 1961). Mount Dutton, which is about 25 km west of Cold Bay, has no historic eruptive activity; however, in 1984-85 and in 1988, swarms of earthquake occurred beneath the volcano (Wood and Kienle, 1990).

Surficial deposits are of glacial, volcanic, and coastal origin (Wilson and others, 1992). Moraines and other glacial deposits cover most of the lowland near Cold Bay. These deposits are exposed in nearby bluffs and consist of mixed sand and gravel. A terminal moraine near the FAA facility forms an arcuate ridge complex around the northern perimeter of Cold Bay. Rock fragments within the glacial deposits are mostly volcanic (Waldron, 1961). The thickness of glacial drift is unknown. Fine volcanic ash was deposited on exposed glacial deposits as evidenced by several layers of dark reddish-brown and black coarse-grained ash that are as much as 13 cm thick (Waldron, 1961). Coastal deposits are composed of interlayered marine and alluvial deposits with grain sizes ranging from mud to boulders. Wave erosion on the Pacific shores of Cold Bay has resulted in the formation of spits and bars. Both Kinzarof Lagoon, at the head of Cold Bay, and Nurse Lagoon, southeast of the FAA facility, were formed by the deposition of sand spits (Waldron, 1961). No permafrost exists in the area of Cold Bay (Ferrians, 1965).

The lithology of sediments from a 41-meter-deep well drilled at the FAA facility in September 1963 indicates that the following deposits are present in the subsurface: muck to a depth of 1.2 m; thawed muck, gravel, and sand to a depth of 2.1 m; clay, gravel, and rocks to 25 m; clay, gravel, sand, and water to 33 m; hard pan and clay to 34 m; and gravel, clay, sand, and water to 41 m below land surface (appendix 1).

Earthquakes

Cold Bay lies within the circum-Pacific seismic belt that rims the north Pacific Ocean. The area is traversed by the Aleutian Trough and many smaller faults. In recent years, several earthquakes with Richter magnitudes greater than 7 have been recorded along these fault systems (Brower and others, 1977; Stephens and others, 1986).

HYDROLOGY

Ground Water

In the Cold Bay area, ground water generally exists under unconfined conditions within the sand and gravel lenses associated with till (appendix 1). In the underlying volcanic bedrock, ground water could possibly be obtained from secondary openings such as fractures and joints (Jones and others, 1978). However, no data are available to support this hypothesis. Ground water is recharged by infiltration of rainfall and snowmelt. It is assumed to flow from south to north along the slopes of Frosty Peak, discharging into Cold Bay and (or) the Izembek Lagoon.

At least 10 wells have been drilled near the Cold Bay FAA facility, and another 4 wells were drilled along Russell Creek (appendix 1; CH2M Hill, 1977). The wells drilled near the facility range in depth from 17 to 39 m below land surface. Ground water was reached at depths ranging from 2 to 26 m below land surface (appendix 1). In a 38-meter-deep well at the facility, ground water was reached at a depth of 19 m below land surface. After 2 hours of pumping at a rate of 0.9 L/s, drawdown in this well was 8.8 m (appendix 1). Recovery-time data are not available. The four wells drilled near Russell Creek ranged in depth from 25 to 31 m below land surface (appendix 1; CH2M Hill, 1977). Water was reached at depths ranging from 7 to 15 m below land surface. The largest recorded yields from wells near Cold Bay were between 6.0 and 8.2 L/s (CH2M Hill, 1977; U.S. Army Corps of Engineers, 1979).

Surface Water

There are no large rivers near the city of Cold Bay. The nearest stream of significant size is Russell Creek, about 4 km to the southwest. Russell Creek originates on the slopes of Frosty Peak, generally flows from southwest to northeast, and drains into Cold Bay. The creek is about 20 km long and has a gradient averaging 180 m/km near its head and 120 m/km near its mouth. Russell Creek drains an area of about 65 km^2 upstream from the USGS streamflow-gaging station 15297610, Russell Creek near Cold Bay (fig. 1), where a record of discharge was collected from 1981 to 1986. The flow of Russell Creek varies seasonally. The lowest flows occur during March and April when mean flow is about 3.5 m^3/s (table 2, this report; U.S. Geological Survey, 1987). Because of increased snowmelt and rainfall, the highest flows in Russell Creek occur from July to December. Mean flow during this period ranges from 8.8 to 11.4 m^3/s (table 2, this report; U.S. Geological Survey, 1987). Mean annual runoff near Cold Bay averages 0.1 $(m^3/s)/km^2$ (U.S. Geological Survey, 1987).

Table 2. Mean monthly flow at streamflow-gaging station 15297610 Russell Creek near Cold Bay, water years 1981–86

[Values in cubic meters per second]

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Mean	9.1	9.6	8.9	5.9	4.9	3.5	3.5	5.7	7.6	9.9	8.8	11.4
Maximum	14.6	15.0	15.5	9.0	7.7	4.3	5.8	8.5	9.3	15.0	10.9	14.8
Minimum	6.7	7.3	4.8	2.9	2.8	2.1	2.3	3.9	6.3	7.4	7.5	6.2

Small glacial lakes, typically less than 0.5 km^2 in size, cover the landscape near the FAA facility and surrounding lowlands of Cold Bay. The lakes generally are shallow and typically freeze for 2 to 3 months beginning in mid-January (Selkregg, 1976).

Tides

A two-layered estuarine-circulation system is common in the coastal areas of the Alaska Peninsula. This phenomenon is seasonal and begins during the spring thaw with an increase in freshwater discharge. The fresh water flows seaward along the surface and is replaced by saline water that intrudes at greater depths. During the fall and winter, storms and reduced runoff combine to thoroughly mix the layers and destroy the system. Tidal fluctuations also may contribute to the mixing and circulation of fresh and salt water. The diurnal tide range in Cold Bay averages 2.2 m and is the difference in height between mean higher high water and lower low water in a single day (Brower and others, 1977). The maximum predicted tide at Cold Bay is 3.4 m above mean sea level. The minimum predicted tide is -0.7 m below mean sea level (Brower and others, 1977).

Flooding

Cold Bay has a low flood-hazard rating; however, it is subject to some degree of flooding from storm-surge or tsunami waves (U.S. Army Corps of Engineers, 1993). Tsunami waves commonly are generated by seismic activity and are capable of traveling great distances across water striking shore areas with destructive effect. Storm-surge waves also can affect low-lying coastal areas, but have less potential to travel inland because of their reduced wave velocity. Brower and others (1977) describe return periods for maximum significant wave heights for coastal areas in Alaska. A 100-year-wave more than 20 m high is possible at Cold Bay (table 3).

Table 3. Annual maximum waves for selected return periods near Cold Bay

Return period (years)	Maximum significant wave (meters)
5	13.0
10	14.5
25	17.5
50	19.5
100	22.0

Overbank flooding of stream channels on the lower Alaska Peninsula may occur during the months from July to October and is primarily the result of intense rainfall augmented by melting snow. Overbank flooding also may result from the rapid melting of snow and ice during volcanic eruptions (Selkregg, 1976; Jones and Fahl, 1994). On October 22, 1981, rainfall runoff caused a maximum stream discharge of 170 m^3/s at the USGS streamflow-gaging station 15297610, Russell Creek near Cold Bay (Jones and Fahl, 1994). Flooding, however, was not reported in the Cold Bay area at this time.

DRINKING WATER

Present Drinking-Water Sources

Ground water is the principal drinking-water source for Cold Bay and typically is found in unconsolidated deposits at depths between 2 and 26 m below land surface. The aquifer is unconfined and shallow, and thus it is vulnerable to contamination. Drinking water for Cold Bay is obtained from two wells equipped with submersible pumps and is stored in four holding tanks. Two tanks hold 56,700 L of water that is chlorinated and distributed by pipe to residents, and the remaining two tanks hold 94,500 L of water that is held in reserve for fire fighting (Environmental Services Ltd., 1982). Average daily water use in Cold Bay ranges from 76,000 to 113,600 L/d (Environmental Services Ltd, 1982).

In general, the quality of ground water on the lower Alaska Peninsula and in the Aleutian Islands is good (Selkregg, 1976). Most ground-water samples contained total dissolved solids of less than 200 mg/L. Although some ground water may be corrosive to metals, most water is acceptable for domestic, agricultural, and industrial uses. Existing data indicate that most inorganic constituents of sampled ground-water sources satisfy the Class A regulations of the Alaska Department of Environmental Conservation (ADEC) and the U.S. Environmental Protection Agency (USEPA) (appendix 2; U.S. Army Corps of Engineers, 1979; Salvato, 1992; CH2M Hill, 1977). The quality of water from wells drilled near Russell Creek was reported to be excellent (appendix 2; CH2M Hill, 1977; table 4, this report).

Table 4. Selected chemical analyses of water from wells near Cold Bay, Alaska

Constituent	Concentration, in milligrams per liter	Constituent	Concentration, in milligrams per liter
Dissolved solids, total	90	Nitrate	<.8
Alkalinity, as $CaCO_3$	18	Fluoride	<3.2
Chloride	<2.9	Suspended solids, total	<5
Iron	<.1		

Alternative Drinking-Water Sources

Drinking-water alternatives for the FAA facility and the city of Cold Bay include Russell Creek and many small lakes. During the 1950's and 1960's, personnel stationed at the Thornbrough U.S. Air Force Base (fig. 1) used a small lake as a drinking-water source (Feulner, 1966). Chemical analyses of the lake indicated that concentrations of major ions and water properties were within current ADEC and USEPA drinking-water regulations (appendix 2; Feulner, 1966). The quality and quantity of the water in other lakes near Cold Bay are unknown.

The flow in Russell Creek represents an abundant source of drinking water for the area. During months of low discharge in March and April, mean flow of Russell Creek is about 3.5 m^3/s (table 2; U.S. Geological Survey, 1987), which is greater than the estimated water use of the city. Major ions, nutrients, dissolved metals, and other water properties in Russell Creek are within current ADEC and USEPA drinking-water regulations (table 5; appendix 2; U.S. Geological Survey, 1983).

Table 5. Selected chemical analyses of water from Russell Creek near Cold Bay, Alaska, water year 1982

{Concentration in milligrams per liter, unless otherwise noted. µS/cm at 25 °C, microsiemen per centimeter at 25 °C; µg/L, microgram per liter]

Constituent or property	Concentration	Constituent or property	Concentration
Specific conductance (µS/cm at 25°C)	32–62	Sulfate (SO_4)	< 5.0
pH (units)	6.1–7.5	Chloride (Cl)	5.4–11
Temperature (°C)	2.0–7.5	Fluoride (Fl)	< 0.1
Hardness as $CaCO_3$ (Ca, Mg)	9–15	Silica (SiO_2)	9.7–20
Sodium (Na)	4.0–7.2	Fecal coliform (colonies/100mL)	<1
Potassium (K)	0.6–1.0	Iron, total (Fe) (µg/L)	220–870
Bicarbonate (HCO_3)	7–10	Iron, dissolved (Fe) (µg/L)	15–110
Carbonate (CO_3)	0.0		

SUMMARY

Cold Bay's population is transient and depends on the local airport and government jobs for employment. Ground water is the principal drinking-water source and typically is found in unconsolidated deposits at depths ranging from 2 to 26 m below land surface. Water in the unconfined aquifer is currently of acceptable drinking-water quality but because it is shallow, it may be vulnerable to contamination. Russell Creek and many small lakes and ponds represent alternative drinking-water sources.

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APPENDIX 1

Well logs for the Cold Bay area

MEMORANDUM FOR RECORD

Date 1/28/92 Time 11 Am

Call (from)(to): Art Hern
Visit (from)(to): Name(s) and Title(s)

Of: FAA AK office
Headquarters, Agency or Organization

Phone ☐ FTS _____ ☒ NonFTS 271-5340

Received by: G. Solin

Type of data requested				Format of data supplied	Date completed	Charge
SW	GW	QW SW	QW GW			

Dist Chief		
Assoc Chief		
Admin Officer		
Pur Agent		
ChProj & Repts		
Reports		
Chief Hyd Rec		
Computer		
SW Spec		
GW Spec		
QW Spec		
Hwy Proj		
Library		
S Officer		
T Officer		
ASDO		
FSDO		
JSDO		
NAWDEX		

MESSAGE Wanted depth to ground water at Cold Bay and expected range of water. They are doing some improvements from 200' out from threshold runway 14 to 2400' out from threshold and are concerned about GW levels. On Nov. 25 1991 they were working in that area and hit water at 9 ft blw LSD (elev. of hole, ~ 13 ft). Will the water get any higher is the question.

Gordy has helped him in the past at King Salmon. He/FAA are putting/repairing some navigation/landing lights and do not want the piles to get wet, so he wants to place them correctly.

He said a couple of small streams are in the area.

FURTHER ACTION NECESSARY

See back for well info at Cold Bay from village file 12

District Office 11-86

Location		well depth	Depth to water
55° 13' 35"	162° 44' 00"	FAA well #1	665
55° 13' 00"	162° 43' 20"	CAA well #1	70'
N. shore range			127' 42
FAA #1, nr storage warehouse			79' 35
Bldg 603, #2			115'
Fire storage			125' 62'
Back of Reeve Air			110' 41'
			106' 38'
			57' 30'
Phillips Petrol. #1 } drilled by Kraxberger,			50' 6'
" " #2 } for water wells to support oil well drilling near Cold Bay?			60' 38'
MARS facility, only well in GWSI, drilled by COE in 1988 by USAF			125' 88'

MARS facility, 4.2' NW of Cold Bay

DATE STARTED 2 Dec 1976
DATE COMP.
GEOLOGIST David A. Lawrence
ELEV. 21 ± 0.5 MSL
TOTAL DEPTH 132'

DRILL HOLE LOG

Job No. K1335.AC

CONTRACTOR HW Drilling Inc.
DRILLER Ted Dunham
TYPE DRILL RIG BE 22W Cable
SIZE OF HOLE 8"
DEPTH TO WATER

PROJECT Cold Bay Alaska HOLE No. 1 SHEET 1 OF 3

DEPTH	GRAPHIC LOG	(1)	(2)	CLASSIFICATION AND DESCRIPTION
				(1) Bagged sample, (2) Mechanical analysis
0-16				Course sand and gravel, gravel to 2", 5% gravel, subangular sand, clean, moderately loose
16-20				Clayey sand, crs sand, subangular, slightly sticky clay, dark brown
20-21				Gravel and cobbles, hard drilling
21-23		@21'		Coarse sand and gravel, subangular, slightly cemented, very few fines
23-27		@23'		Fine to coarse sand w/ gravel, 20% crs Sd and grvl, slightly cemented, reddish tinge to boiled water, angular cuttings @ 26-27', scattered rounded pebbles and gravel, subangular gravel to 3"
27-28		@27'		Sand and gravel, coarse sand, small gravel, subangular more loose than 23-27, gray
28-37		@33'		Sand and gravel, angular, cemented, hard drilling, gray, 50% crs sand
37-38		@37'		Coarse sand and 1" gravel, subrounded gravel to subangular, coarse angular sand, weathered orange color, not cemented like 28-37, 50% Sand, 5% fine sand
38-40				Sand and gravel, angular, cemented, hard drilling gray, 50% crs sand
40-40.1				Gray clay, slightly sticky w/ gravel
40.1-41				Sand and gravel, subangular to subrounded, slightly cemented, hard drilling
41-42		@41'		Sand, medium to coarse, gray, angular to subangular, loose
42-44.5				Sand and gravel, gray, subang to subrd, loose, 70% fine to coarse gravel, grvl to 2", making water, boiled and drove from 44 to 44.5
44.5-50.4		@45.2'		Cemented gravel, hard, gray, predom. rock chips, 2% subrd grvl, static W.L. @ 15' below ground surface, bailer test 20 gpm @ 47.2'

DATE STARTED 7 Dec 1976
DATE COMP. 6 Dec 1976
GEOLOGIST D. A. Lawrence
ELEV. 21 ± 2.5 MSL
TOTAL DEPTH 122'

DRILL HOLE LOG

Job No. K10355.06

CONTRACTOR M-J Drilling, I
DRILLER Ted Durham
TYPE DRILL RIG Failing 3000
SIZE OF HOLE 8"
DEPTH TO WATER

PROJECT Gold Run, Alaska HOLE No. 1 SHEET 2 OF

DEPTH	GRAPHIC LOG	(1)	(2)	CLASSIFICATION AND DESCRIPTION
				(1) Bagged sample (2) Mechanical analysis
50.4-52.7				Sand and gravel, cemented, very hard drilling, all chips, scattered 1/4" - 1/2" subrounded gravel, gray
52.7-53				Sand, coarse, angular, gray, very loose, heaving
53-55		53-56'		Sand and gravel, gray, loose, subrd to subang, fine to crs sand, gravel to 2", 40% gravel, making water
55-56				Sand and gravel, loose, brownish gray, subrd, crs sand & gravel, 40% gravel to 1"
56-66		56-61'		Sand, medium to coarse, brown, loose, subang to subrd, 50% crs sand, 10% pea gravel easy drilling
66-69		61-63'		Gravel w/ sand, gravel to 2", vy soft, weathered easily broken, 60% grvl, 40% fine to crs sand, angular white grvl, gray-brown sand
69-73		69-73'		Sand, coarse, 40% medium to fine, scattered 1/4" gravel, angular, brown, loose
73-78		73-78'		Sand, medium, very well sorted, brown, angular loose
78-79.5		78-79.5		Sand, coarse, angular, gray, loose
79.5-82				Sand, coarse, dense, trace clay on one gravel, angular, driving and drilling, white milky water w/ cuttings
82-85.5				Sand, coarse, w/ clay binder, slightly sticky, angular scattered grvl to 1/4", loose, bailing & driving
85.5-88				Medium coarse sand w/ 10% gravel to 1", dense drilling and driving
88-90.5		88-90.5'		Medium to coarse sand w/ gravel to 3", 5% gravel, loose, bailing and driving, dark gray sand, subang sand & gravel, fine sd 90-90.5
90.5-92				Fine to crs sand w/ grvl to 1/4", 5% grvl, angular, dark gray, dense, imbiprint clay binder
92-94				Boulder, basalt, hard drilling

DATE STARTED 2 Dec 1975
DATE COMP. 6 Dec 1975
GEOLOGIST David A. Lindroth
ELEV. 2125.5 MSL
TOTAL DEPTH 122'

DRILL HOLE LOG

Job No. K10355.A6

CONTRACTOR M-W Drilling Co.
DRILLER Ted Dunham
TYPE DRILL RIG Reed Cable
SIZE OF HOLE 8"
DEPTH TO WATER

PROJECT Coal Road Project HOLE No. 1 SHEET 3 OF 3

DEPTH	GRAPHIC LOG	CLASSIFICATION AND DESCRIPTION
94-98		Sand, medium, gray, heaved into casing, rock chips, angular, mixed sample due to heaving
98-102		Rock chips, boulders or dense sand, very slow drilling, angular fine to medium sand

DATE STARTED 7 Dec 1976
DATE COMP. 12 Dec 1976
GEOLOGIST J. [illegible]
ELEV. 1622 MSL
TOTAL DEPTH 84

DRILL HOLE LOG

Trib No. K1G355.A6

CONTRACTOR [illegible]
DRILLER [illegible]
TYPE DRILL RIG [illegible]
SIZE OF HOLE 6"
DEPTH TO WATER

PROJECT Cold Bay, Alaska HOLE No. 2 SHEET 1 OF

DEPTH	GRAPHIC LOG	CLASSIFICATION AND DESCRIPTION
	(1)	(1) Sampled interval (sample bagged)
0-20	10'-15'	Sandy gravel w/ silt, rounded pebbles to 3", hole making good water at 15', material same, well graded; gravel content decreasing slightly @ 20'; gravel @ 22' rounded to 1½", material dense 16'-22', loose below 22'
20-62	25'-27'	Gravelly sand w/ silt, dark brown, sand more poorly graded than above, medium to coarse gravel rounded to 1½", Silt indicated by very muddy condition of boiling water; denser at 24.5'; hard @ 30'+, loose @ 45'+, very dense @ 42'+
	50'-52'	
62-74	71'-73'	Silty sand w/ gravel, silt increase & mid to loose brown
74-75		Gravelly sand w/ silt, loose, ~3' heave in casing, rounded pebbles to 2"
75-83	80'-82'	Silty Sand, dense, no heave, sand well graded
83-84	83'-84'	Silty gravelly sand, very dense, gravel broken due to compaction, probably to less than 1", sand well graded

DRILL HOLE LOG

DATE STARTED 19 Dec 197[illegible]
DATE COMP. 22 Dec 197[illegible]
GEOLOGIST [illegible]
ELEV. 21 ± 0.5' MSL
TOTAL DEPTH 82'

T.[illegible] K1355.AS

CONTRACTOR [illegible]
DRILLER [illegible]
TYPE DRILL RIG [illegible]
SIZE OF HOLE 8"
DEPTH TO WATER

PROJECT [illegible] HOLE No. 3 SHEET 1 OF

DEPTH	GRAPHIC LOG	CLASSIFICATION AND DESCRIPTION
0-6		Gravel and sand w/ cobbles, dry
6-17		Sand and gravel, brownish, dry
17-22		Silty sand and gravel, wet
22-39		Sand and gravel, making water, rusty color to water, semi-loose, have to drill it up
39-52		Silty sand and gravel, drilling
52-56		Heaving sand, very little gravel, silty, making wat[illegible]
56-81		Sand and some small gravel, not heaving (clean) getting more gravel after 57', real sandy after 7[illegible]
81-82		Large gravel and sand
82-		Cemented sand and gravel, silty

DRILL HOLE LOG

DATE STARTED 1 Jan 1977
DATE COMP. 4 Jan 1977
GEOLOGIST (based on driller)
ELEV. 1929.5'
TOTAL DEPTH 87'

Job No K10355.A6

CONTRACTOR [illegible] Drilling
DRILLER [illegible]
TYPE DRILL RIG [illegible]
SIZE OF HOLE [illegible]
DEPTH TO WATER

PROJECT [illegible], Alaska HOLE No. 4 SHEET 1 OF

DEPTH	GRAPHIC LOG	CLASSIFICATION AND DESCRIPTION
0-1		Gravelly overburden
1-13		Sand and gravel, silty, making water, brownish color, drilling
13-16		Sand and gravel, semi-loose, not maintaining static level for sand pumping, silty, brown
16-21		Loose sand and gravel, clean - not maintaining static level while sand pumping bailing
21-35		Cemented sand and gravel, drilling, formation is clean, holding 7' static level while drilling, some brown silt, static level raising & falling
35-46		Heaving sand, small gravel, very silty, drilling open hole with water mit
46-62		Heaving sand and small gravel, clean, making water, can't hold down with water on it, aquifer quite heaving at 57'
62-78		Cemented sand (small gravel), very silty, drilling open hole
78-79		Layer of rock-like harder sandstone
79-86		Silty sand and small gravel - drilling
86-87		Heaving sand, silty, drilling with full hole of water
87-89		Cemented sand and small gravel, very hard

9–185
(October 1950)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

WELL SCHEDULE

Date 9/20/63, 19____ Field No. _____

Record by M Office No. _____

Source of data Driller Log

1: *Location:* State Alaska County _____

Map _____

____ ¼ ____ ¼ sec. ____ T ____ N S R ____ E W

2. *Owner:* Fed Address Cold Bay

Tenant BLM 603 #2 Address _____

Driller Lynn Address _____

3. *Topography* _____

4. *Elevation* _____ ft. above / below _____

5. *Type:* Dug, ~~drilled~~, driven, bored, jetted C 19 61

6. *Depth:* Rept. ~~135~~ 119 ft. Meas. _____ ft.

7. *Casing:* Diam. 8 in., to _____ in., Type _____

Depth ~~135~~ 160 ft., Finish 20 feet Everdur

8. *Chief Aquifer* _____ From _____ ft. to _____ ft.

Others _____

9. *Water level* 41 ft. rept. / meas. _____ 19____ above / below _____

_____ which is _____ ft. above / below surface

10. *Pump:* Type _____ Capacity _____ G. M. _____

Power: Kind _____ Horsepower _____

11. *Yield:* Flow _____ G. M., Pump _____ G. M., Meas., Rept. Est. _____

Drawdown _____ ft. after _____ hours pumping _____ G. M.

12. *Use:* Dom., Stock, PS., RR., Ind., Irr., Obs. _____

Adequacy, permanence _____

13. *Quality* _____ Temp _____ °F.

Taste, odor, color _____ Sample Yes / No _____

Unfit for _____

14. *Remarks:* (Log, Analyses, etc.) _____

_____

_____

U. S. GOVERNMENT PRINTING OFFICE 16—62891-1

9–185
(October 1950)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

WELL SCHEDULE

Date 9/2-0/63, 19____ Field No. _____

Record by VM Office No. _____

Source of data FAA INFO

1: *Location:* State Alaska County _____

Map _____

____ ¼ ____ ¼ sec. ____ T ____ N S R ____ E W

2. *Owner:* FAA Address Cold BAY

Tenant #1, NEAR STORAGE YARD Address Houses

Driller _____ Address _____

3. *Topography* _____

4. *Elevation* _____ ft. above below BEFORE 58

5. *Type:* Dug, (drilled), driven, bored, jetted ____ 19____

6. *Depth:* Rept. 125 ft. Meas. _____ ft.

7. *Casing:* Diam. 8 in., to _____ in., Type _____

Depth 125 ft., Finish _____

8. *Chief Aquifer* _____ From _____ ft. to _____ ft.

Others _____

9. *Water level* 62 ft. rept. meas. _____ 19____ above below _____

_____ which is _____ ft. above below surface

10. *Pump:* Type _____ Capacity _____ G. M. _____

Power: Kind _____ Horsepower _____

11. *Yield:* Flow _____ G. M., Pump _____ G. M., Meas., Rept. Est. _____

Drawdown 29 ft. after 2 hours pumping 15 G. M.

12. *Use:* Dom., Stock, PS., RR., Ind., Irr., Obs. _____

Adequacy, permanence _____

13. *Quality* _____ Temp _____ °F.

Taste, odor, color _____ Sample Yes No _____

Unfit for _____

14. *Remarks:* (Log, Analyses, etc.) _____

_____

_____

U. S. GOVERNMENT PRINTING OFFICE 16—62891-1

APPENDIX 2

Water-quality data for the Cold Bay area

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	TIME	RECORD NUMBER	LOCAL IDENT-I-FIER	MEDIUM CODE	SITE	STREAM WIDTH (FT) (00004)	SAMPLE LOC-ATION, CROSS SECTION (FT FM L BANK) (00009)	TEMPER-ATURE WATER (DEG C) (00010)	TEMPER-ATURE AIR (DEG C) (00020)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
JAN										
08...	1000	98201306	RUSSELL C NR COLD BAY AK	9	SW	72.0	--	--	--	758
08...	1001	98201307	RUSSELL C NR COLD BAY AK	9	SW	--	8.00	0.0	--	--
08...	1002	98201308	RUSSELL C NR COLD BAY AK	9	SW	--	12.0	0.0	--	--
08...	1003	98201309	RUSSELL C NR COLD BAY AK	9	SW	--	18.0	0.0	--	--
MAR										
19...	1420	98201310	RUSSELL C NR COLD BAY AK	9	SW	73.0	--	3.5	--	--
APR										
29...	0915	98201311	RUSSELL C NR COLD BAY AK	9	SW	60.0	--	0.5	--	--
JUN										
03...	1830	98201312	RUSSELL C NR COLD BAY AK	9	SW	--	--	5.5	--	--
04...	0940	98201313	RUSSELL C NR COLD BAY AK	9	SW	74.0	--	3.5	--	--
AUG										
11...	1000	98201314	RUSSELL C NR COLD BAY AK	9	SW	--	--	6.5	10.0	763
SEP										
16...	0930	98201315	RUSSELL C NR COLD BAY AK	9	SW	76.0	--	6.0	9.0	748

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	AGENCY COLLECTING SAMPLE (CODE NUMBER) (00027)	AGENCY ANALYZING SAMPLE (CODE NUMBER) (00028)	DISCHARGE, INST. CUBIC FEET PER SECOND (00061)	GAGE HEIGHT (FEET) (00065)	TURBIDITY (NTU) (00076)	SPECIFIC CONDUCTANCE (US/CM) (00095)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	PH WATER WHOLE LAB (STANDARD UNITS) (00403)	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	NITROGEN, TOTAL (MG/L AS N) (00600)
JAN												
08...	80020	80020	73	--	0.40	--	--	--	--	7.8	18	0.28
08...	1028	1028	--	--	--	62	14.8	101	7.0	--	--	--
08...	1028	1028	--	--	--	57	15.2	104	7.0	--	--	--
08...	1028	1028	--	--	--	58	15.7	107	7.0	--	--	--
MAR												
19...	1028	1028	252	--	--	46	13.3	--	6.7	--	--	--
APR												
29...	1028	1028	102	5.83	--	32	--	--	--	--	--	--
JUN												
03...	1028	1028	353	6.82	--	44	--	--	6.6	--	--	--
04...	1028	1028	474	7.11	1.1	45	--	--	6.7	6.9	--	0.70
AUG												
11...	1028	1028	265	6.55	--	39	11.5	93	6.9	--	--	--
SEP												
16...	80020	80020	405	6.83	1.4	35	12.3	101	6.4	7.7	--	0.70

1

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	NITRO-GEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N) (00607)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	NITRO-GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N) (00624)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)
JAN											
08...	0.15	0.11	0.160	0.130	0.27	0.01	0.28	<0.090	<0.090	0.020	0.030
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
MAR											
19...	--	--	--	--	--	--	--	--	--	--	--
APR											
29...	--	--	--	--	--	--	--	--	--	--	--
JUN											
03...	--	--	--	--	--	--	--	--	--	--	--
04...	0.65	0.17	0.130	0.050	0.30	0.40	0.70	<0.100	<0.100	<0.010	<0.010
AUG											
11...	--	--	--	--	--	--	--	--	--	--	--
SEP											
16...	0.70	--	--	<0.060	0.40	0.30	0.70	<0.100	--	<0.010	0.030

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM AD-SORP-TION RATIO (00931)	SODIUM PERCENT (00932)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
JAN											
08...	1.5	0.2	15	4.1	1.2	7.2	0.8	49	1.0	11	<5.0
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
MAR											
19...	--	--	--	--	--	--	--	--	--	--	--
APR											
29...	--	--	--	--	--	--	--	--	--	--	--
JUN											
03...	--	--	--	--	--	--	--	--	--	--	--
04...	--	0.1	9	2.3	0.71	4.0	0.6	48	0.50	6.0	<5.0
AUG											
11...	--	--	--	--	--	--	--	--	--	--	--
SEP											
16...	1.5	0.1	10	2.8	0.70	4.0	0.6	45	0.60	5.4	<5.0

1

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	ARSENIC SUS-PENDED TOTAL (UG/L AS AS) (01001)	ARSENIC TOTAL (UG/L AS AS) (01002)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BARIUM, SUS-PENDED RECOV-ERABLE (UG/L AS BA) (01006)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA) (01007)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD) (01027)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)
JAN											
08...	0.10	20	<1	--	2	<100	--	<100	<1.0	<1	<10
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
MAR											
19...	--	--	--	--	--	--	--	--	--	--	--
APR											
29...	--	--	--	--	--	--	--	--	--	--	--
JUN											
03...	--	--	--	--	--	--	--	--	--	--	--
04...	<0.10	9.7	1	0	1	6	400	400	<1.0	<1	<10
AUG											
11...	--	--	--	--	--	--	--	--	--	--	--
SEP											
16...	<0.10	12	1	0	1	5	100	100	<1.0	<1	<10

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COBALT, TOTAL RECOVERABLE (UG/L AS CO) (01037)	COPPER, DISSOLVED (UG/L AS CU) (01040)	COPPER, SUSPENDED RECOVERABLE (UG/L AS CU) (01041)	COPPER, TOTAL RECOVERABLE (UG/L AS CU) (01042)	IRON, SUSPENDED RECOVERABLE (UG/L AS FE) (01044)	IRON, TOTAL RECOVERABLE (UG/L AS FE) (01045)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	LEAD, TOTAL RECOVERABLE (UG/L AS PB) (01051)
JAN											
08...	<10	<1	1	2	9	11	840	870	30	<1	2
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
MAR											
19...	--	--	--	--	--	--	--	--	--	--	--
APR											
29...	--	--	--	--	--	--	--	--	--	--	--
JUN											
03...	--	--	--	--	--	--	--	--	--	--	--
04...	<10	<1	2	<1	--	11	250	260	15	<1	3
AUG											
11...	--	--	--	--	--	--	--	--	--	--	--
SEP											
16...	<10	2	<1	5	0	3	110	220	110	<1	<1

1

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	MANGANESE, SUSPENDED RECOV. (UG/L AS MN) (01054)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN) (01055)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI) (01067)	SILVER, DISSOLVED (UG/L AS AG) (01075)	SILVER, TOTAL RECOVERABLE (UG/L AS AG) (01077)	ZINC, DISSOLVED (UG/L AS ZN) (01090)	ZINC, SUSPENDED RECOVERABLE (UG/L AS ZN) (01091)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN) (01092)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)
JAN											
08...	0	10	10	<1	<1	<1.0	<1	10	50	60	<1
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
MAR											
19...	--	--	--	--	--	--	--	--	--	--	--
APR											
29...	--	--	--	--	--	--	--	--	--	--	--
JUN											
03...	--	--	--	--	--	--	--	--	--	--	--
04...	20	20	4	<1	3	<1.0	<1	28	2	30	<1
AUG											
11...	--	--	--	--	--	--	--	--	--	--	--
SEP											
16...	2	10	8	1	<1	<1.0	<1	13	0	10	<1

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	SELE-NIUM, TOTAL (UG/L AS SE) (01147)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	NITRO-GEN, AMMONIA TOTAL (MG/L AS NH4) (71845)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4) (71846)	PHOS-PHORUS TOTAL (MG/L AS PO4) (71886)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MERCURY SUS-MPENDED RECOV-ERABLE (UG/L AS HG) (71895)
JAN											
08...	<1	--	--	51	10.1	0.07	0.17	0.21	0.06	<0.1	--
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
08...	--	--	--	--	--	--	--	--	--	--	--
MAR											
19...	--	<1	K3	--	--	--	--	--	--	--	--
APR											
29...	--	--	--	--	--	--	--	--	--	--	--
JUN											
03...	--	--	--	--	--	--	--	--	--	--	--
04...	<1	<1	180	30	37.5	0.04	0.06	0.17	--	<0.1	--
AUG											
11...	--	--	--	--	--	--	--	--	--	--	--
SEP											
16...	<1	K8	110	29	31.1	0.04	--	--	--	0.5	0

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1981 TO SEPTEMBER 1982

DATE	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG) (71900)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	DRAIN-AGE AREA (SQ. MI.) (81024)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	HARD-NESS NONCARB WH WAT TOT LAB MG/L AS CACO3 (95902)	ALKA-LINITY, CARBON-ATE IT-FLD (MG/L - CAC03) (99430)	BICAR-BONATE IT-FLD (MG/L AS HCO3) (99440)	CAR-BONATE IT-FLD (MG/L AS CO3) (99445)
JAN											
08...	0.10	3.6	2	0.39	25.0	70	15	0	--	--	--
08...	--	3.6	--	--	25.0	--	--	--	--	--	--
08...	--	3.6	--	--	25.0	--	--	--	--	--	--
MAR											
19...	--	3.6	--	--	25.0	--	--	--	--	--	--
APR											
29...	--	3.6	3	0.83	25.0	--	--	--	--	--	--
JUN											
03...	--	3.6	8	7.6	25.0	--	--	--	--	--	--
04...	<0.10	3.6	--	--	25.0	45	10	0	6.0	7.0	0
AUG											
11...	--	3.6	--	--	25.0	--	--	--	8.0	10	0
SEP											
16...	0.10	3.6	27	30	25.0	46	9.0	1	7.0	9.0	0

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RECORD NUMBER	LOCAL IDENT-I-FIER	MEDIUM CODE	SITE	STREAM WIDTH (FT) (00004)	SAMPLE LOC-ATION, CROSS SECTION (FT FM L BANK) (00009)	TEMPER-ATURE WATER (DEG C) (00010)	TEMPER-ATURE AIR (DEG C) (00020)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
OCT										
26...	1530	98301028	RUSSELL C NR COLD BAY AK	9	SW	69.0	--	--	4.0	769
26...	1531	98301029	RUSSELL C NR COLD BAY AK	9	SW	--	6.00	2.5	--	769
26...	1532	98301030	RUSSELL C NR COLD BAY AK	9	SW	--	16.0	2.5	--	769
26...	1533	98301031	RUSSELL C NR COLD BAY AK	9	SW	--	26.0	2.5	--	769
26...	1534	98301032	RUSSELL C NR COLD BAY AK	9	SW	--	36.0	2.5	--	769
26...	1535	98301033	RUSSELL C NR COLD BAY AK	9	SW	--	47.0	2.5	--	769
DEC										
13...	1614	98301034	RUSSELL C NR COLD BAY AK	9	SW	63.5	--	--	--	--
13...	1615	98301035	RUSSELL C NR COLD BAY AK	9	SW	--	1.50	2.0	--	--
13...	1616	98301036	RUSSELL C NR COLD BAY AK	9	SW	--	9.50	2.0	--	--
13...	1617	98301037	RUSSELL C NR COLD BAY AK	9	SW	--	19.5	2.0	--	--
13...	1618	98301038	RUSSELL C NR COLD BAY AK	9	SW	--	29.5	2.0	--	--
13...	1619	98301039	RUSSELL C NR COLD BAY AK	9	SW	--	39.5	2.0	--	--
JAN										
28...	1120	98301040	RUSSELL C NR COLD BAY AK	9	SW	45.5	--	--	4.0	745
28...	1121	98301041	RUSSELL C NR COLD BAY AK	9	SW	--	7.50	0.0	--	745
28...	1122	98301042	RUSSELL C NR COLD BAY AK	9	SW	--	10.0	0.0	--	745
28...	1123	98301043	RUSSELL C NR COLD BAY AK	9	SW	--	19.5	0.0	--	745
MAR										
29...	1415	98301044	RUSSELL C NR COLD BAY AK	9	SW	52.0	--	--	3.0	750
29...	1416	98301045	RUSSELL C NR COLD BAY AK	9	SW	--	42.0	4.0	--	750
29...	1417	98301046	RUSSELL C NR COLD BAY AK	9	SW	--	35.0	4.0	--	750
29...	1418	98301047	RUSSELL C NR COLD BAY AK	9	SW	--	28.0	4.0	--	750
29...	1419	98301048	RUSSELL C NR COLD BAY AK	9	SW	--	22.0	4.0	--	750
29...	1420	98301049	RUSSELL C NR COLD BAY AK	9	SW	--	12.0	4.0	--	750
30...	1040	98301050	RUSSELL C NR COLD BAY AK	9	SW	49.0	--	--	--	--

JUN										
02...	1030	98301051RUSSELL C NR COLD BAY AK	9	SW	--	--	4.5	--	--
AUG										
12...	1100	98301052RUSSELL C NR COLD BAY AK	9	SW	51.0	--	--	--	770
12...	1101	98301053RUSSELL C NR COLD BAY AK	9	SW	--	22.0	7.5	--	770
12...	1102	98301054RUSSELL C NR COLD BAY AK	9	SW	--	31.0	7.5	--	770
12...	1103	98301055RUSSELL C NR COLD BAY AK	9	SW	--	38.0	7.5	--	--
SEP										
13...	1409	98301056RUSSELL C NR COLD BAY AK	9	SW	50.0	--	--	--	--
13...	1410	98301057RUSSELL C NR COLD BAY AK	9	SW	--	19.0	6.0	--	--
13...	1412	98301058RUSSELL C NR COLD BAY AK	9	SW	--	29.5	6.0	--	--
13...	1414	98301059RUSSELL C NR COLD BAY AK	9	SW	--	38.5	6.0	--	--

15297610 - RUSSELL C NR COLD BAY AK

WATER-QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	AGENCY COLLECTING SAMPLE (CODE NUMBER) (00027)	AGENCY ANALYZING SAMPLE (CODE NUMBER) (00028)	DISCHARGE, INST. CUBIC FEET PER SECOND (00061)	SPECIFIC CONDUCTANCE (US/CM) (00095)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	DRAINAGE AREA (SQ. MI.) (81024)
OCT											
26...	1028	80020	174	--	--	--	--	3.6	3	1.4	25.0
26...	1028	80020	--	46	13.8	100	7.2	3.6	--	--	25.0
26...	1028	80020	--	46	13.8	100	7.2	3.6	--	--	25.0
26...	1028	80020	--	46	13.8	100	7.2	3.6	--	--	25.0
26...	1028	80020	--	46	13.8	100	7.2	3.6	--	--	25.0
26...	1028	80020	--	46	13.8	100	7.2	3.6	--	--	25.0
DEC											
13...	1028	80020	162	--	--	--	--	3.6	5	2.2	25.0
13...	1028	80020	--	40	--	--	6.1	3.6	--	--	25.0
13...	1028	80020	--	40	--	--	6.5	3.6	--	--	25.0
13...	1028	80020	--	40	--	--	6.5	3.6	--	--	25.0
13...	1028	80020	--	40	--	--	6.6	3.6	--	--	25.0
13...	1028	80020	--	40	--	--	6.7	3.6	--	--	25.0
JAN											
28...	1028	80020	114	--	--	--	--	3.6	5	1.5	25.0
28...	1028	80020	--	30	15.6	109	7.5	3.6	--	--	25.0
28...	1028	80020	--	--	14.5	102	7.5	3.6	--	--	25.0
28...	1028	80020	--	31	15.3	107	7.4	3.6	--	--	25.0
MAR											
29...	1028	80020	111	--	--	--	--	3.6	2	0.60	25.0
29...	1028	80020	--	48	13.3	103	7.2	3.6	--	--	25.0
29...	1028	80020	--	48	13.3	103	7.2	3.6	--	--	25.0
29...	1028	80020	--	48	13.3	103	7.2	3.6	--	--	25.0
29...	1028	80020	--	48	13.3	103	7.2	3.6	--	--	25.0
29...	1028	80020	--	48	13.3	103	7.1	3.6	--	--	25.0
30...	1028	80020	110	--	--	--	--	3.6	1	0.30	25.0

JUN											
02...	1028	80020	195	50	--	--	7.0	3.6	9	4.7	25.0
AUG											
12...	1028	80020	170	--	--	--	--	3.6	94	43	25.0
12...	1028	80020	--	26	12.8	105	7.1	3.6	--	--	25.0
12...	1028	80020	--	26	13.1	108	7.0	3.6	--	--	25.0
12...	1028	80020	--	27	--	--	--	3.6	--	--	25.0
SEP											
13...	1028	80020	167	--	--	--	--	3.6	19	8.6	25.0
13...	1028	80020	--	37	--	--	6.7	3.6	--	--	25.0
13...	1028	80020	--	38	--	--	6.8	3.6	--	--	25.0
13...	1028	80020	--	38	--	--	6.8	3.6	--	--	25.0

RUSSELL CREEK HATCHERY
WATER QUALITY
PUMPING WELL #3
(FOR DOMESTIC USE)

Parameter	Chemical & Geological Labs	Associated Labs of Alaska	CH2M HILL	Proposed ADEC Stds.
Alkalinity, mg/l as $CaCO_3$	24	--	18	--
Aluminum, µg/l	<10	1	0.2 ?	--
Ammonia, µg/l	<10	<10	40	--
Arsenic, µg/l	<10	--	<5	50
Cadmium, µg/l	<0.5	0.34	<10	10
Chloride, mg/l	--	<2.9	13	100
Chromium, µg/l	<2	Very Low Level	<20	50
Color, Pt-Co units	<5	<10	1	15
Copper, µg/l	<2	1	--	1[2]
Fluoride, mg/l	0.22	0.10	0.32	2.4
Hydrogen Sulfide, µg/l	<10	--	--	--
Iron, mg/l	0.01	<0.1	<0.1	0.3
Iron bacteria	--	None Seen	--	--
Lead, µg/l	<10	1	<50	50
Magnesium, mg/l	2.1	18	0.81	--
Manganese, µg/l	<1	0.4	<50	50
Mercury, µg/l	<10	Very Low Level	<2	2
Nitrate, mg/l	0.8	0.05	0.038[1]	10
Nitrite, mg/l	--	--	--	--
Potassium, mg/l	1.5	<39	1.8	--
Silver, µg/l	<3	0.22	<50	50
Sulfate, mg/l	2	2	1.8	250
Sulfite, mg/l	--	--	--	--
Total Dissolved Solids, mg/l	78	92.5	87	500[2]
Total Suspended Solids, mg/l	<0.1	1.5	5	--
Turbidity, FTU	0.1	<5	1.4	1
Zinc, µg/l	<3	1.8	<20	500

[1]Nitrate + Nitrate

[2]PHS recommended limit

Lake used by U.S. Air Force

ACS
1929th Comm. Gp. ACS
Cold Bay, Alaska

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Analyses by Geological Survey, United States Department of the Interior
(parts per million)

9-268 q

Laboratory Number	6150					
Date of collection	Sept. 5, 1964					
Silica (SiO_2)	29					
Iron (Fe) (dis)	0.02					
Iron (Fe) (total)	0.09					
Manganese (Mn)	0.0					
Calcium (Ca)	20					
Magnesium (Mg)	11					
Sodium (Na)	21					
Potassium (K)	0.3					
Bicarbonate (HCO_3)	128					
Carbonate (CO_3)	0					
Sulfate (SO_4)	6.2					
Chloride (Cl)	18					
Fluoride (F)	0.0					
Nitrate (NO_3)	1.7					
Carbon Dioxide (CO_2)	5.1					
Dissolved solids						
Calculated	170					
Residue on evaporation at 180°C	98					
Hardness as $CaCO_3$	—					
Noncarbonate hardness as $CaCO_3$	105					
Alkalinity as $CaCO_3$						
Specific conductance (micromhos at 25°C)	255					
pH	7.6					
Color	5					

[illegible] Station, 1929th Comm. Gp. ACS, Cold Bay, Alaska. Pt. Coll.: (Lake?) Coll.: M. R. Clark.

24027