Overview of Environmental and Hydrogeologic Conditions near Port Heiden, Alaska

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U.S. GEOLOGICAL SURVEY

Open-File Report 95-407

Prepared in cooperation with the

FEDERAL AVIATION ADMINISTRATION

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

U.S. GEOLOGICAL SURVEY
Gordon P. Eaton, Director

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By Eppie V. Hogan

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Anchorage, Alaska
1995

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CONVERSION FACTORS, WATER-QUALITY UNITS, AND VERTICAL DATUM

Multiply	By	To obtain
millimeter (mm)	0.03937	inch
meter (m)	3.281	foot
meters per year (m/yr)	3.281	foot per year
kilometer (km)	0.6214	mile
square kilometer (km^2)	0.3861	square mile
liter per second (L/s)	15.85	gallon per minute
cubic meter per second per square kilometer ($(m^3/s)/km^2$)	91.4	cubic foot per second per square mile

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

$$°F = 1.8\ (°C) + 32$$

Chemical concentration and water temperature are given only in metric units. Chemical concentration in water is given in milligrams per liter (mg/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.

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.

Overview of Environmental and Hydrogeologic Conditions near Port Heiden, Alaska

By Eppie V. Hogan

ABSTRACT

Port Heiden is an embayment of Bristol Bay on the Alaska Peninsula about 700 kilometers southwest of Anchorage. Port Heiden Airfield is about 5 kilometers northeast of the fishing village of Meshik. The Federal Aviation Administration operates airway-support and navigational aids at the Port Heiden Airfield. They are considering environmental and hydrogeologic conditions when evaluating options for environmental compliance that may be required at the airfield. Climatic conditions near Port Heiden are affected by the Bering Sea and the North Pacific Ocean and are characterized by high humidity, heavy precipitation, and frequent cloudy periods. Vegetation consists of tundra, shrub tundra, and beach vegetation. Geologic materials in the Port Heiden area consist of volcanic ash and debris-flow deposits, till, estuarine deposits, swamp deposits, alluvial deposits, outwash deposits, and marine-terrace deposits. The Meshik River and numerous creeks, lakes, and wetlands are the freshwater bodies in the Port Heiden area. The principal aquifers near Port Heiden consist of unconsolidated sand and gravel, volcanic tuff (mostly pumice), and bedrock. Ground water is the principal drinking-water source for local residents. Alternative drinking-water supplies may be obtained from local surface-water sources or from ground water in noncontaminated areas; however, available data are inadequate to characterize the present quantity and quality of these alternative sources.

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. To determine if environmentally hazardous materials are present at the sites, the FAA is conducting environmental studies mandated under 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 sites. This report, the product of compilation, review, and summary of existing hydrologic and geologic data by the U.S. Geological Survey, in cooperation with the FAA, provides such information for the FAA facility and nearby areas at Port Heiden, Alaska.

BACKGROUND

Location

The Port Heiden Airfield is on the Alaska Peninsula at lat 56°57' N., long 158°38' W. about 700 km southwest of Anchorage and about 5 km northeast of Meshik (fig. 1). Port Heiden, an embayment of Bristol Bay, is south of the airfield (fig. 1). The dominant physical feature near Port Heiden is Aniakchak Crater, which is about 30 km to the east. The crater is an active volcanic center that last erupted in 1931.

Facility History

In March 1949, the FAA began maintaining air-navigation facilities at the Port Heiden Airfield (fig. 1). Currently, the FAA has a Remote Center Air-Ground Communications (RCAG)/Nondirectional Beacon (NDB)/Directional Measuring Equipment (DME) Facility, Visual Approach Slope Indicators (VASI), and an Automated Weather Station. Detailed lists of FAA facilities and potential sources of environmental contamination are in an environmental compliance investigation report by Ecology and Environment, Inc. (1993).

PHYSICAL SETTING

Climate

Port Heiden has a maritime climate (Hartman and Johnson, 1984). Climatic conditions are affected by the Bering Sea and the North Pacific Ocean and are characterized by small temperature variations, high humidity, heavy precipitation, and frequent cloudy periods. Cyclonic storms with high winds, fog, and poor visibility occur frequently (Hartman and Johnson, 1984). Mountainous terrain of the Aleutian Range is about 10 km east of Port Heiden and provides protection from approaching southeasterly winds and precipitation. The mean annual temperature for the periods 1927-52 and 1957-87 for Port Heiden is 2.3 °C. Mean monthly temperatures range from an August mean maximum of 14.4 °C to a February mean minimum of -8.9 °C (Leslie, 1989; table 1). Mean annual precipitation is about 395 mm, and mean annual snowfall is about 1,310 mm. Mean monthly and annual temperature, precipitation, and snowfall for Port Heiden, Alaska, are summarized in table 1.

Table 1. Mean monthly and annual temperature, precipitation, and snowfall, 1927-52 and 1957-87, Port Heiden, 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]	-1.9	-2.0	0.2	3.0	8.1	11.6	14.0	14.4	11.9	6.2	2.2	-1.0	5.6
Mean minimum[2]	-8.8	-8.9	-7.0	-3.6	1.2	4.9	7.8	8.7	5.7	0.2	-3.9	-7.2	-0.9
Mean	-5.4	-5.4	-3.5	-0.4	4.7	8.3	10.9	11.6	8.8	3.2	-0.8	-4.1	2.3
							Precipitation (millimeters of moisture)						Total
	18	13	21	17	20	28	42	56	53	61	37	29	395
							Snowfall (millimeters)						Total
	295	201	160	163	46	3	0.0	0.0	0.0	64	135	246	1,313

[1]Record maximum, 30.6 °C, July 1971.
[2]Record minimum, -32.2 °C, March 1971.

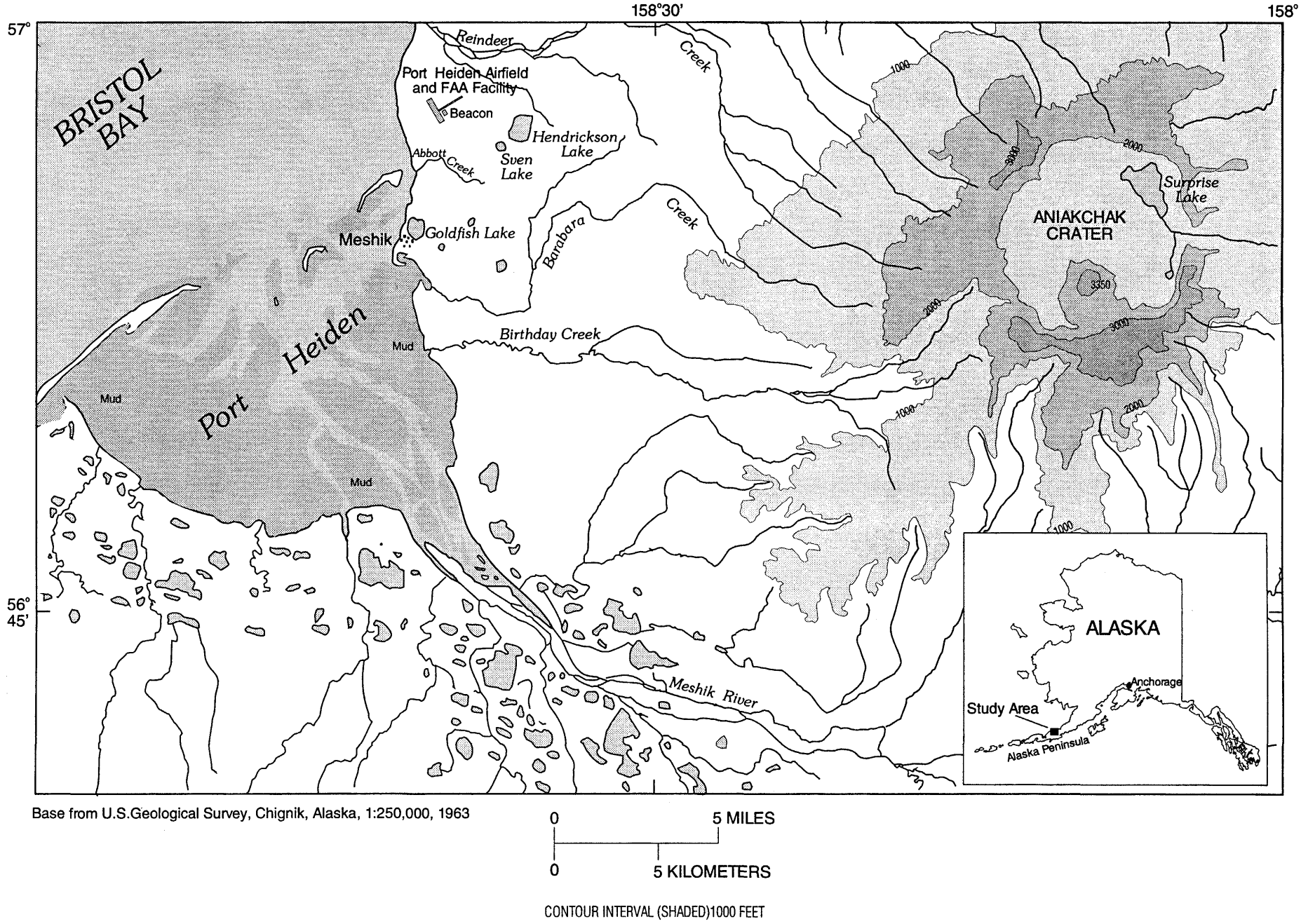

Figure 1. Location of Port Heiden, Alaska, and Federal Aviation Administration facility.

Vegetation

Vegetation in the Port Heiden area consists of tundra, shrub tundra, and beach vegetation (Viereck and Little, 1972; National Park Service, 1987). Wet-tundra vegetation grows in lowlands on poorly drained organic-rich soils and is dominated by water-tolerant plants such as sphagnum. Moist-tundra vegetation grows on terraces, subalpine slopes, and coastal lowlands and consists of heaths, shrubs, and grasses. Alpine tundra vegetation is found on exposed slopes in upland areas and on the summits of ridges and knolls and consists of scattered heaths, lichens, and mosses. Shrub tundra is found on moderately well-drained lowlands and slopes below about 300 m elevation and consists of alder, willow, and grasses. Beach vegetation is found on well-drained coastal sand dunes and consists principally of ryegrass.

GEOLOGY

Detterman and others (1981a, b) mapped the geology of the Port Heiden area. Major geologic units include volcanic deposits, till, estuarine deposits, swamp deposits, alluvial deposits, outwash deposits, and marine terrace deposits.

Volcanic deposits in the Port Heiden area consist of pumice, ash, debris-flow deposits, and ash-flow tuff of Holocene and Pleistocene age (Detterman and others, 1981a). The ash-flow tuff was deposited during the caldera-forming eruption of Aniakchak Crater about 3,400 years before present. This tuff is unsorted, poorly stratified, and composed of pumice and scoria in a matrix of fine to coarse ash and lithic fragments (Detterman and others, 1981a). The ash-fall tuff is moderately well sorted, well stratified, and consists of fine- to medium-grained dacitic ash. Near the airfield, volcanic deposits are exposed on either side of the runway, around the radio beacon, on slopes adjacent to Reindeer Creek and Aniakchak Crater, and along the eastern shoreline of Hendrickson Lake (fig. 1). Depth to volcanic deposits in other areas is not known specifically but will likely be encountered between 25 and 60 m (appendix 1).

Numerous arcuate moraine ridges are present in the Port Heiden area. Moraines consist of weathered, unsorted, and nonstratified till and have an irregular knob and kettle surface topography. Estuarine deposits found along the Bering Sea coast consist of dark-brown to black organic silt and clay. Swamp deposits are adjacent to the estuarine deposits south-southwest of the Port Heiden Airfield. These deposits form by the accumulation of sedge and sphagnum peat. A large alluvial fan, consisting mostly of well-sorted pumice, extends eastward from the base of Aniakchak Crater toward the coast. These deposits extend to about 10 km east of the airfield. Alluvial deposits also are found adjacent to Reindeer Creek (fig. 1). Outwash deposits found northwest of the airfield consist of moderately well-sorted and stratified sand, silt, and gravel that form a flat to gently sloping plain. Marine terrace deposits south of the airfield are typically about 15 m above mean high tide. These deposits consist of stratified and well-sorted sand and gravel that form level plains truncated by steep wave-cut scarps.

Soils in the Port Heiden area generally are poorly developed because of the frequent deposition of volcanic ash (Rieger and others, 1979; Howard Grey and Associates, Inc., 1982). Where soils are well developed, they are dark brown to reddish brown and typically have buried surface horizons because of repeated deposition of volcanic ash. The soil particles are mostly sand or gravel size (Howard Grey and Associates, Inc., 1982). The Port Heiden area generally is free of permafrost (Ferrians, 1965).

HYDROLOGY

Surface Water

The Meshik River and numerous creeks, lakes, and wetlands are the principal freshwater bodies in the Port Heiden area (fig. 1). The mouth of the Meshik River is about 25 km south of the Port Heiden Airfield. The river originates on the southern slopes of Aniakchak Crater and flows south and westward into Bristol Bay. A lake and several small tributaries that drain the southern flanks of the volcano feed the Meshik River. The headwaters of most other creeks in the area also originate on the slopes of the Aniakchak Crater and flow west-southwest toward Port Heiden and Bristol Bay. Birthday Creek passes the airfield about 10 km to the south; Barabara Creek passes about 8 km to the south; Abbott Creek passes less than 2 km to the south; and Reindeer Creek passes about 4 km to the north (fig. 1). Hendrickson Lake is about 0.65 km^2 in size and is about 2.5 km east of the airfield; Sven Lake has a surface areas of about 0.3 km^2 and is about 2 km to the southeast; and Goldfish Lake has a surface area of about 0.5 km^2 and is about 5.5 km to the southwest. Mean annual runoff near Port Heiden is estimated to be about 0.01 to 0.02 $(m^3/s)/km^2$ (T.P. Brabets, U.S. Geological Survey, written commun., 1995; Selkregg, 1976).

Small local streams may not be adequate sources of drinking water because of relatively low discharge, probable tidal influence, and dissolved-iron concentrations (appendix 1) that likely exceed U.S. Environmental Protection Agency (USEPA) and Alaska Department of Environmental Conservation drinking-water regulations (U.S. Environmental Protection Agency, 1995; Alaska Department of Environmental Conservation, 1995). A stream that is impounded above tidal influence could possibly supply a small local population; however, the feasibility of such an impoundment is unknown. Water samples were taken from Abbott Creek in 1981, and major ions, dissolved metals, radioactivity, and other water properties such as pH were determined. Dissolved-iron concentrations of 1.5 mg/L and manganese concentrations of 0.56 mg/L exceed current USEPA drinking-water regulations of 0.3 and 0.05 mg/L, respectively (appendix 2). Analyses of water from Goldfish Lake indicate an iron concentration of 0.8 mg/L, but other measured water properties are within current drinking-water regulations.

The tide range averages 3.7 m near Port Heiden (Brower and others, 1977). The maximum daily tide is about 4.4 m above sea level, and the minimum tide is about -1.3 m below mean sea level (Brower and others, 1977). Surface-water bodies and aquifers near the coast probably are influenced by tides.

Flooding and Erosion

According to the U.S. Army Corps of Engineers (1993), Port Heiden has a low flood-hazard rating and there is no record of flooding in the area. Beach erosion is a common phenomenon near Port Heiden (U.S. Army Corps of Engineers, 1993). Storm surges at high tide may cause beach erosion and landward migration of the beach. The rate of beach erosion near Port Heiden is estimated to be about 0.4 m/yr (appendix 1). Brower and others (1977) describe return periods for maximum significant waves for Port Heiden. A 5-year wave of 13 m is estimated for coastal areas near Port Heiden. A wave of this magnitude would not affect the Port Heiden Airfield, which is at an elevation more than 20 m. However, maximum significant waves with return periods in excess of 50 years are higher than 20 m (Brower and others, 1977).

SUMMARY

The Port Heiden Airfield is on the Alaska Peninsula about 700 km southwest of Anchorage and about 5 km northeast of the fishing village of Meshik. Climatic conditions are influenced by the Bering Sea and the North Pacific Ocean and are characterized by small temperature variations, high humidity, heavy precipitation, and frequent cloudy periods. Vegetation in the Port Heiden area consists of tundra, shrub tundra, and beach vegetation. Geologic materials in the Port Heiden area consist of volcanic ash and debris-flow deposits, till, estuarine deposits, swamp deposits, alluvial deposits, outwash deposits, and marine terrace deposits. The Meshik River and numerous creeks, lakes, and wetlands are the chief fresh surface-water bodies in the Port Heiden area. The main aquifers near Port Heiden consist of unconsolidated sand and gravel, volcanic tuff (mostly pumice), and bedrock. Ground water is the chief drinking-water source for residents in the Port Heiden area. Surface water and other ground-water sources represent alternative potable resources for the area. However, adequate data are not available to determine the present quality and quantity of these alternative drinking-water sources.

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APPENDIX 1

A 1979 memorandum from Scott Wheaton, Alaska Area Native Health Service, regarding ground-water availability and well construction near Port Heiden, Alaska

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1100

SAMPLED BY D.Lanning SOURCE Block 1 Lot 11

REMARKS High Iron and Manganese present. High Silicon indicates irreversible scaling of hot water systems may occur.

FOR LAB USE ONLY
RECVD.BY RZ LAB #3353-2
DATE RECEIVED 9-7-83
DATE COMPLETED 9-16-83
DATE REPORTED 9-16-83
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.058	[]Cyanide	
[]Al,Aluminum	<0.05	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	78
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	19	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	6.5	[]Sr,Strontium		[]Hardness as $CaCO_3$	31
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	36
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	0.69	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	100
[]K,Potassium	3.0	[]Kjedahl Nitrogen-N		[]pH Units	7.0
[]Mg,Magnesium	3.1	[]Nitrate-N	<0.1	[]Turbidity NTU	
[]Mn,Manganese	0.70	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	9.8	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1100

SAMPLED BY D.Lanning SOURCE Block 1 Lot 10

REMARKS High Iron and Manganese present. High Silicon indicates irreversible scaling of hot water systems may occur.

FOR LAB USE ONLY
RECVD.BY RZ LAB # 3353-3
DATE RECEIVED 9-7-83
DATE COMPLETED 9-16-83
DATE REPORTED 9-16-83
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.13	[]Cyanide	
[]Al,Aluminum	<0.05	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	95
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	19	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	8.5	[]Sr,Strontium		[]Hardness as $CaCO_3$	42
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	48
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	1.7	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia		[]umhos Conductivity	130
[]K,Potassium	3.8	[]Kjedahl Nitrogen-N		[]pH Units	7.4
[]Mg,Magnesium	4.4	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn,Manganese	0.25	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	13	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1120

SAMPLED BY D. Lanning SOURCE Block 1, Lot 9

REMARKS

FOR LAB USE ONLY
RECVD.BY GY LAB # 3231-1
DATE RECEIVED 8-23-83
DATE COMPLETED 8-31-83
DATE REPORTED 8-31-83
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.08	[]Cyanide	
[]Al,Aluminum	<0.05	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	95
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	17	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	11	[]Sr,Strontium		[]Hardness as $CaCO_3$	47
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	57
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	1.1	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	140
[]K,Potassium	2.4	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	4.1	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn,Manganese	0.35	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	10	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.
P.O. BOX 4-1276 ANCHORAGE, ALASKA 99509
5633 "B" STREET
TELEPHONE (907) 279-0401

ANALYTICAL REPORT

OMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

COLLECTED 7-13-79 TIME COLLECTED: ---

LED BY --- SOURCE Well 14 m south of Goldfish Lake

RKS No other Information Available - data for confined aquifer (below 45m)

FOR LAB USE ONLY
RECVD. BY DB LAB # 1003
DATE RECEIVED 7-16-79
DATE COMPLETED 7-19-79
DATE REPORTED 7-23-79
SIGNED

	mg/l		mg/l		mg/l
,Silver	<0.05	[]P,Phosphorous	7.4	[]Cyanide	
,Aluminum	3.0	[]Pb,Lead	<0.05	[]Sulfate	<1.0
,Arsenic	<0.1	[]Pt,Platinum	<0.05	[]Phenol	
,Gold	<0.01	[]Sb,Antimony	<0.05	[]Total Dissolved Solids	578
Boron	0.7	[]Se,Selenium	<0.1	[]Total Volatile Solids	
,Barium	<0.05	[]Si,Silicon	18.3	[]Suspended Solids	
,Bismuth	<0.05	[]Sn,Tin	<0.05	[]Volatile Suspended Solids	
,Calcium	1.1	[]Sr,Strontium	<0.05	[]Hardness as $CaCO_3$	20
,Cadmium	<0.05	[]Ti,Titanium	0.5	[]Alkalinity as $CaCO_3$	370
,Cobalt	<0.05	[]W,Tungsten	<0.1	[]	
,Chromium	<0.05	[]V,Vanadium	<0.05	[]	
,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
,Iron	4.3	[]Zr,Zirconium	<0.05	[]	
,Mercury	<0.1	[]Ammonia Nitrogen-N		* * * * * * []mmhos Conductivity	800
Potassium	7	[]Kjedahl Nitrogen-N		[]pH Units	8.1
Magnesium	2.1	[]Nitrate-N		[]Turbidity NTU	
Manganese	0.1	[]Nitrite-N		[]Color Units	
Molybdenum	<0.05	[]Phosphorus (Ortho)-P		[]T.Coliform/100ml	
Sodium	231	[]Chloride	90	[]	

Fort Heiden Air Force Station

#2

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	10416					
Date of collection	8/7/67					
Silica (SiO_2)	44					
Iron (Fe)	0.09					
Manganese (Mn) ... qualitative	0.2					
Carbon Dioxide (CO_2)	4.1					
Calcium (Ca)	15					
Magnesium (Mg)	5.8					
Sodium (Na)	14					
Potassium (K)	3.2					
Bicarbonate (HCO_3)	82					
Carbonate (CO_3)	0					
Sulfate (SO_4)	7.5					
Chloride (Cl)	13					
Fluoride (F)	0.4					
Nitrate (NO_3)	6.7					
Dissolved solids						
Calculated	151					
Residue on evaporation at 180°C						
Hardness as $CaCO_3$	62					
Noncarbonate hardness as $CaCO_3$	0					
Alkalinity as $CaCO_3$	67					
Specific conductance (micromhos at 25°C)	194					
pH	7.5					
Color	20					

10416-Fort Heiden Air Force Station, drilled well owned by the U. S. Air Force depth 84 feet producing intervals from [illegible] hours to 3 hours yield 20 GPM, collected at well pump appearance clear use Public supply, collected by Ale Haywood Jen water Spec.

714th ACWRON
Port Heiden

#1

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	8863					
Date of collection	3/31/66					
Silica (SiO_2)	40					
Iron (Fe)	0.52					
Manganese (Mn)	0.04					
Carbon Dioxide (CO_2)	3.3					
Calcium (Ca)	10					
Magnesium (Mg)	9.7					
Sodium (Na)	12					
Potassium (K)	1.0					
Bicarbonate (HCO_3)	82					
Carbonate (CO_3)	0					
Sulfate (SO_4)	1.9					
Chloride (Cl)	17					
Fluoride (F)	0.4					
Nitrate (NO_3)	0.2					
Dissolved solids						
Calculated	133					
Residue on evaporation at 180°C						
Hardness as $CaCO_3$	65					
Noncarbonate hardness as $CaCO_3$	--					
Alkalinity as $CaCO_3$	67					
Specific conductance (micromhos at 25°C)	198					
pH	7.6					
Color	10					

8863 - 714th ACWRON, Port Heiden, Well #1, drilled, pt. of coll. at well, water clear appearance, domestic use, 41°, coll. by Harvey, drilled 1958, depth 146'.

well (at school?)

depth 20' 8" concrete case

analysis 2/17/72

Fe 0.27 Hard. ($CaCo_3$) 106

No_3 0.4 TDS 250

CL 112 Temp. 40°F

Port Heiden (well 1.5 miles NW of Wend R/W)

analysis 5/24/67 (USAF well?)

Fe 0.3 Hard ($CaCo_3$) 64

No_3 1.5 TDS 147

CL - CA 16 mg 5.8

depth 120' 6" "open end"

Two other deep wells - unknown location

1 USAF depth 146' 1958 drilled

2 USAF depth 84' (20 gpm)

See attached water analysis sheets.

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DRINKING WATER ANALYSIS
INORGANIC, ORGANIC, PHYSICAL AND RADIOCHEMICAL CONTAMINANTS

TO BE COMPLETED BY PUBLIC WATER SUPPLIER - Public Water System & Sample Description

Identification Number	Collected By: Sheryl Carrubba PHS/ADEC
Public Water System Name: raw supply	Sample Location: near Rd culvert
Address (Street or P. O. Box): Abbot Creek possible water source development	Sample Date: 8-7-81
City: Port Heiden	State:	Zip Code:

Check the box to the left of the contaminants listed below for the analysis desired:

- ☒ Surface Water
- ☐ Ground Water
- ☐ Treated Water
- ☒ Untreated Water
- ☐ Routine Sample
- ☐ Special Purpose Sample

TO BE COMPLETED BY CERTIFIED LABORATORY

Laboratory Name: State of Alaska Dept. of Environmental Conservation	Sample Number: PTH-100-81	Station Number:
Address (Street or P. O. Box): Monitoring and Lab Operations 750 St. Ann's Ave.	Labatory Analysis Number: 81081904	
City, State and Zip Code: Douglas, AK 99824	Received By: Sandra Paddock	Date: 8-19-81

INORGANICS

	LIMIT	Mg/l
☑ Arsenic	(0.05)	ND
☐ Barium	(1.)	TR
☑ Cadmium	(0.010)	ND
☑ Chromium	(0.05)	ND
☑ Fluoride	(2.4)	TR
☑ Iron	(0.3)	1.5
☑ Lead	(0.05)	ND
☑ Manganese	(0.05)	0.56
☑ Mercury	(0.002)	ND
☑ Nitrate (as N)	(10.)	ND
☑ Selenium	(0.01)	ND
☑ Silver	(0.05)	ND
☑ Sodium	(250	13.
☐ _____		
☐ _____		

ORGANICS

	LIMIT	Mg/l
☐ Endrin	(0.0002)	
☐ Lindane	(0.004)	
☐ Methoxychlor	(0.1)	
☐ Toxaphene	(0.005)	
☐ 2,4,-D	(0.1)	
☐ 2,4,5 - TP Silvex	(0.01)	
☑ Total Trihalomethanes	(0.1)	ND
☑ Max. Trihalomethane Pot.	(0.1)	ND
☐ _____		
☐ _____		

PHYSICAL

☑ Color	(15)	60 PCU
☐ Turbidity	(1.)	NTU
☐ _____		
☐ _____		

RADIOACTIVITY

	LIMIT	pCi/l
☑ Gross Alpha*	(15)	ND
☐ Radium 226 & 228	(5)	
☐ Gross Beta	(50)	
☐ Strontium-90	(8)	
☐ Tritium	(20,000)	

*When found in excess of 5 pCi/l, analysis for Radium 226 is required.

TR - Indicates Trace Detected
ND - Indicates Not Detected
NCRD - Indicates No Confirmable Resdiue Detected

Date Analysis Completed	Signature of Laboratory Supervisor	Date Reported
11-23-81	T. A. Trull	11-24-81

18-2001(Rev. 1/81)

Casserla
Sampler
PTH - 100 - 81
Sample Number
11:15am 8/7/81
Time and Date of Collection

81081904

ADEC SAMPLE INFORMATION SHEET

1. Specify the exact sample location so there is no confusion about where the sample was collected. Provide a map or sketch, and a written description.

Abbot Creek - Near Road Culvert, RAW-supply

2. Provide the following information for all sources:

A. Physical appearance/properties of the water:

Color Clear None | Turbidity None to slight

Taste None-slight | Temperature 58°

Odor none | pH 7

B. Describe the area immediately surrounding the sample site including nearby honey buckets, oil storage areas, landfills, etc.

marsh / wetlands ~ 1/2 mile from Bay

C. The water is: ☐ Treated ☒ Untreated

D. Describe any tidal influence: ? ~~possible~~ Probable tidal influence

If samples were taken from a water treatment facility, describe the sampling points in #1 above, and indicate whether the water originated from a ground water, or surface water source.

3. For surface sources, describe the following:

A. Sample depths and distance from shore: 3" from surface ~1/2 mile from shore

B. Approximate flow rate: standing

4. For ground water sources, describe:

A. Depth of well: _____

B. Pumping rate and drawdown of well: _____

5. Comments: possible water source development.

APPENDIX 2

Water-quality data for Abbott Creek and for ground water near Port Heiden

UNITED STATES GOVERNMENT

memorandum

Alaska Area Native Health Service
Box 7-741, Anchorage, Alaska 99510

DATE: January 2, 1979

REPLY TO ATTN OF: A-EHB

SUBJECT: Port Heiden (Meshik) Well Construction

TO: John Hutchison

Attached for your review and use in water well construction and planning is a report summarizing groundwater availability at Neshik near Port Heiden, Alaska.

Scott R Wheaton

Scott Wheaton
Geologist

Attachment

cc: Valerie Kramer
Sherry Linford

OPTIONAL FORM NO. 10
(REV. 7-76)
GSA FPMR (41 CFR) 101-11.6
5010-112

PORT HEIDEN, ALASKA

GROUNDWATER AVAILABILITY AND WELL CONSTRUCTION

SUMMARY:

The United States Public Health Service proposes the construction of a potable water supply for the Port Heiden Native village of Meshik. Water availability has been discussed in earlier Public Health Service and other reports. The following summarizes available information and outlines most probable soils and groundwater conditions.

CONCLUSIONS:

1. Soils in general consist of alluvium, beach deposits, dune sands, glacial deposits, and volcanic ash deposits. Boggy areas are likely underlain by thin to thick organic silts.

2. Depth to bedrock is not known specifically but apparently is about 100 feet below the ground surface. Bedrock probably consists of layered sedimentary (shales, silty sandstone) and volcanic (breccia, sandstones, flows) rocks.

3. Discontinuous permafrost may exist in the Meshik vicinity but a thick active layer is probable. Although no permafrost is probable within the village, the most likely area for its presence is near the southeastern shore of Goldfish Lake.

4. Surface water sources include nearby shallow lakes and small streams. Analysis of water from Goldfish Lake shows a high iron content (0.8 ppm) but otherwise good quality water. Quality may deteriorate under winter ice. Ocean wave contamination of Goldfish Lake could occur during severe storms but is not likely. Streams are marginally feasible as water sources due to very low discharge, possible tidal influence, and a likely high dissolved iron content.

5. Shallow wells (16 to 20 feet) produce water for individual households and the village school. Water quality is fair to poor. Iron content apparently has a range of about 0.3 ppm to 2.5 ppm. Chloride content increases seasonally. Water production declines slightly during cold winters.

6. In the Port Heiden area deeper wells produce 20 to 25 gpm from bedrock aquifers. Well logs are not available but it is probable that the aquifers consist of shattered sedimentary or porous volcanic rock, particularly volcanic breccia or vesicular lavas. The water quality is fair with a dissolved iron content of 0.35 to 0.9 ppm. Chloride content is very low.

RECOMMENDATIONS:

1. Construction of a deep community well at Meshik is recommended. A deep well should produce greater quality and quantity water than a shallow well and would be less subject to saltwater encroachment.

2. The deep well should be drilled into bedrock to intercept a bedrock aquifer. Neither casing nor screening should be required in the rock portion of the well. Bedrock will likely be encountered above 85 feet below the ground surface but may be as deep as 200 feet. Bedrock aquifers can be anticipated between 85 and 150 feet below the surface.

3. Drilling in the surface sediments should, in general, be fairly easy. However, dense gravels and some cobbles and boulders may be encountered. In addition, wells may enter breccia - angular coarse rock fragments - in the bedrock sequence.

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1210

SAMPLED BY D. Lanning SOURCE Block 2, Lot 5

REMARKS

FOR LAB USE ONLY
RECVD.BY GY LAB # 3231-4
DATE RECEIVED 8-23-83
DATE COMPLETED 8-31-83
DATE REPORTED 8-31-83
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.15	[]Cyanide	
[]Al,Aluminum	<0.05	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	96
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	16	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	12	[]Sr,Strontium		[]Hardness as $CaCO_3$	
[]Cd,Cadmium		[]Ti,Titanium		[]Alkalinity as $CaCO_3$	60
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	0.80	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	140
[]K,Potassium	2.5	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	4.2	[]Nitrate-N		[]Turbidity NTU	
[]Mn,Manganese	0.42	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	11	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1245

SAMPLED BY D. Lanning SOURCE Block 2, Lot 1

REMARKS

FOR LAB USE ONLY
RECVD. BY GY LAB # 3231-2
DATE RECEIVED 8-23-83
DATE COMPLETED 8-31-83
DATE REPORTED 8-31-83
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.16	[]Cyanide	
[]Al, Aluminum	<0.05	[]Pb, Lead	<0.05	[]Sulfate	
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	105
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.05	[]Si, Silicon	4.4	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	16	[]Sr, Strontium		[]Hardness as $CaCO_3$	67
[]Cd, Cadmium	<0.01	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	84
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	<0.05	[]	
[]Fe, Iron	3.1	[]Zr, Zirconium		[]	
[]Hg, Mercury		[]Ammonia Nitrogen-N		* * * * * * []umhos Conductivity	170
[]K, Potassium	2.8	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg, Magnesium	5.0	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn, Manganese	0.25	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na, Sodium	11	[]Chloride		[]	
[]Ni, Nickel		[]Fluoride		[]	

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5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 12:30

SAMPLED BY D. Lanning SOURCE Block, Lot 2

REMARKS

FOR LAB USE ONLY
RECVD. BY RZ LAB # 3261-1
DATE RECEIVED 8-25-83
DATE COMPLETED 9-1-83
DATE REPORTED 9-1-83
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.33	[]Cyanide	
[]Al, Aluminum	<0.05	[]Pb, Lead	<0.05	[]Sulfate	
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	125
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.05	[]Si, Silicon	14	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	19	[]Sr, Strontium		[]Hardness as $CaCO_3$	80
[]Cd, Cadmium	<0.01	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	90
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	<0.05	[]	
[]Fe, Iron	3.2	[]Zr, Zirconium		[]	
				* * * * * *	
[]Hg, Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	150
[]K, Potassium	4.1	[]Kjedahl Nitrogen-N		[]pH Units	7.9
[]Mg, Magnesium	6.3	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn, Manganese	0.30	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na, Sodium	14	[]Chloride		[]	
[]Ni, Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1220

SAMPLED BY D. Lanning SOURCE Block 2, Lot 3

REMARKS

FOR LAB USE ONLY
RECVD.BY RZ LAB # 3261-2
DATE RECEIVED 8-25-83
DATE COMPLETED 9-1-83
DATE REPORTED 9-1-83
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.12	[]Cyanide	
[]Al,Aluminum	<0.05	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	95
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	17	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	11	[]Sr,Strontium		[]Hardness as $CaCO_3$	49
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	57
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	1.6	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	140
[]K,Potassium	3.5	[]Kjedahl Nitrogen-N		[]pH Units	7.7
[]Mg,Magnesium	4.5	[]Nitrate-N	0.33	[]Turbidity NTU	
[]Mn,Manganese	0.09	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	12	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1215

SAMPLED BY D. Lanning SOURCE Block 2, Lot 4

REMARKS

FOR LAB USE ONLY
RECVD. BY GY LAB # 3231-3
DATE RECEIVED 8-23-83
DATE COMPLETED 8-31-83
DATE REPORTED 8-31-83
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.06	[]Cyanide	
[]Al, Aluminum	<0.05	[]Pb, Lead	<0.05	[]Sulfate	
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	88
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.05	[]Si, Silicon	5.7	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	11	[]Sr, Strontium		[]Hardness as $CaCO_3$	53
[]Cd, Cadmium	<0.01	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	60
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	<0.05	[]	
[]Fe, Iron	4.2	[]Zr, Zirconium		[]	
				* * * * * *	
[]Hg, Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	140
[]K, Potassium	2.2	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg, Magnesium	4.1	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn, Manganese	0.49	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na, Sodium	10	[]Chloride		[]	
[]Ni, Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health SAMPLE LOCATION: Pt. Heiden, AK

DATE COLLECTED 5-6-83 TIME COLLECTED:

SAMPLED BY Archibald SOURCE Jim Christianson Well

REMARKS Soft water with high iron and manganese. High silicon indicates irreversible scaling of hot water systems may occur.

FOR LAB USE ONLY
RECVD.BY EY LAB #2591-1
DATE RECEIVED 6-9-83
DATE COMPLETED 6-14-83
DATE REPORTED 6-16-83
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.16	[]Cyanide	
[]Al,Aluminum	<0.05	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	95
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	21	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	11	[]Sr,Strontium		[]Hardness as $CaCO_3$	30
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	80
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	1.0	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	140
[]K,Potassium	3.2	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	4.3	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn,Manganese	0.19	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	12	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1155

SAMPLED BY D. Lanning SOURCE Block 2, Lot 6

REMARKS

FOR LAB USE ONLY
RECVD. BY RZ LAB # 3261-3
DATE RECEIVED 8-25-83
DATE COMPLETED 9-1-83
DATE REPORTED 9-1-83
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.14	[]Cyanide	
[]Al, Aluminum	<0.05	[]Pb, Lead	<0.05	[]Sulfate	
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	100
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.05	[]Si, Silicon	18	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	11	[]Sr, Strontium		[]Hardness as $CaCO_3$	49
[]Cd, Cadmium	<0.01	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	57
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	<0.05	[]	
[]Fe, Iron	1.6	[]Zr, Zirconium		[]	
				* * * * * *	
[]Hg, Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	140
[]K, Potassium	3.6	[]Kjedahl Nitrogen-N		[]pH Units	7.6
[]Mg, Magnesium	4.4	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn, Manganese	0.44	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na, Sodium	12	[]Chloride		[]	
[]Ni, Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1145

SAMPLED BY D. Lanning SOURCE Block 2, Lot 7

REMARKS

FOR LAB USE ONLY
RECVD. BY RZ LAB # 3261-4
DATE RECEIVED 8-25-83
DATE COMPLETED 9-1-83
DATE REPORTED 9-1-83
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.15	[]Cyanide	
[]Al, Aluminum	<0.05	[]Pb, Lead	<0.05	[]Sulfate	
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	95
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.05	[]Si, Silicon	18	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	9.5	[]Sr, Strontium		[]Hardness as $CaCO_3$	47
[]Cd, Cadmium	<0.01	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	50
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	<0.05	[]	
[]Fe, Iron	3.0	[]Zr, Zirconium		[]	
				* * * * * *	
[]Hg, Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	130
[]K, Potassium	3.6	[]Kjedahl Nitrogen-N		[]pH Units	7.6
[]Mg, Magnesium	4.1	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn, Manganese	0.37	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na, Sodium	11	[]Chloride		[]	
[]Ni, Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 8-18-83 TIME COLLECTED: 1130

SAMPLED BY D.Lanning SOURCE Block 2, Lot 8

REMARKS High Iron and Manganese present. High Silicon indicates irreversible scaling of hot water systems may occur.

FOR LAB USE ONLY
RECVD. BY RZ LAB # 3353-1
DATE RECEIVED 9-7-83
DATE COMPLETED 9-16-83
DATE REPORTED 9-16-83
SIGNED Stephen C. Cole

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.080	[]Cyanide	
[]Al, Aluminum	<0.05	[]Pb, Lead	<0.05	[]Sulfate	2.9
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	94
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.05	[]Si, Silicon	21	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	8.0	[]Sr, Strontium		[]Hardness as $CaCO_3$	39
[]Cd, Cadmium	<0.01	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	48
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	<0.05	[]	
[]Fe, Iron	1.2	[]Zr, Zirconium		[]	
				* * * * * *	
[]Hg, Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	120
[]K, Potassium	3.6	[]Kjedahl Nitrogen-N		[]pH Units	7.0
[]Mg, Magnesium	4.1	[]Nitrate-N	<0.1	[]Turbidity NTU	
[]Mn, Manganese	0.22	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na, Sodium	12	[]Chloride	12	[]	
[]Ni, Nickel		[]Fluoride		[]	

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TELEPHONE (907)-279-4014
274-3364

ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 12-1-82 TIME COLLECTED: —

SAMPLED BY Pete Archibald SOURCE Hud Well Lot 11 Block 1

REMARKS Iron exceeds maximum recommended level for drinking water. Silicon Aluminum levels due, in part, to Suspended Solids.

FOR LAB USE ONLY
RECVD. BY GY LAB # 1207-3
DATE RECEIVED December 9, 1982
DATE COMPLETED December 20, 198
DATE REPORTED December 20, 1982
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.17	[]Cyanide	
[]Al, Aluminum	0.65	[]Pb, Lead	<0.05	[]Sulfate	
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	70
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.5	[]Si, Silicon	26	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	7.7	[]Sr, Strontium		[]Hardness as $CaCO_3$	39
[]Cd, Cadmium	<0.01	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	43
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	0.06	[]	
[]Fe, Iron	2.1	[]Zr, Zirconium		[]	
				* * * * * *	
[]Hg, Mercury		[]Ammonia Nitrogen-N		[]mmhos Conductivity	120
[]K, Potassium	3.0	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg, Magnesium	3.9	[]Nitrate-N	0.13	[]Turbidity NTU	
[]Mn, Manganese	0.05	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[]T.Coliform/100ml	
[]Na, Sodium	12	[]Chloride		[]	
[]Ni, Nickel		[]Fluoride		[]	

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ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Services SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 12-2-82 TIME COLLECTED: ---

SAMPLED BY Steve St. Anthony SOURCE Hud Well Lot 10 Block 1

REMARKS Iron and Manganese exceeded recommended maximum levels for drinking water. Silicon and Aluminum levels due, in part, to Suspended Solids.

FOR LAB USE ONLY
RECVD.BY GY LAB # 1207-2
DATE RECEIVED December 9, 1982
DATE COMPLETED December 20, 1982
DATE REPORTED December 20, 1982
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.16	[]Cyanide	
[]Al,Aluminum	0.54	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	95
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.5	[]Si,Silicon	26	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	8.7	[]Sr,Strontium		[]Hardness as $CaCO_3$	42
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	47
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	1.2	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]mmhos Conductivity	120
[]K,Potassium	3.0	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	4.3	[]Nitrate-N	0.20	[]Turbidity NTU	
[]Mn,Manganese	0.22	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[]T.Coliform/100ml	
[]Na,Sodium	13	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

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ANCHORAGE INDUSTRIAL CENTER
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ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 12-8-82 TIME COLLECTED: ---

SAMPLED BY Dave Wahto SOURCE Hud Well Lot 9 Block 2

REMARKS Iron and Manganese exceeds maximum roommended levels for drinking water. Silicon and Aluminum levels due in parts to Suspended Solids.

FOR LAB USE ONLY
RECVD. BY GY LAB # 1207-1
DATE RECEIVED December 9, 1982
DATE COMPLETED December 20, 1982
DATE REPORTED December 20, 1982
SIGNED Daniel J. Bacon

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.16	[]Cyanide	
[]Al, Aluminum	1.1	[]Pb, Lead	<0.05	[]Sulfate	
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	75
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.5	[]Si, Silicon	27	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	8.1	[]Sr, Strontium		[]Hardness as $CaCO_3$	41
[]Cd, Cadmium	<0.01	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	40
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	<0.05	[]	
[]Fe, Iron	1.9	[]Zr, Zirconium		[]	
[]Hg, Mercury		[]Ammonia Nitrogen-N		* * * * * * []mmhos Conductivity	100
[]K, Potassium	3.8	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg, Magnesium	4.3	[]Nitrate-N	0.10	[]Turbidity NTU	
[]Mn, Manganese	0.22	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[]T.Coliform/100ml	
[]Na, Sodium	14	[]Chloride		[]	
[]Ni, Nickel		[]Fluoride		[]	

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ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 12-15-82 TIME COLLECTED:

SAMPLED BY Pete Archibald SOURCE New Well Lot 8 Block 2

REMARKS Iron and Manganese exceed recommended drinking water level Aluminum and Silicon due, in part, to Suspended Solids.

FOR LAB USE ONLY
RECVD. BY GY LAB # 1239
DATE RECEIVED December 15, 1982
DATE COMPLETED December 21, 1982
DATE REPORTED December 21, 1982
SIGNED Daniel G. Brown

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.07	[]Cyanide	
[]Al, Aluminum	0.12	[]Pb, Lead	<0.05	[]Sulfate	
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	75
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.5	[]Si, Silicon	23	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	7.7	[]Sr, Strontium		[]Hardness as $CaCO_3$	37
[]Cd, Cadmium	<0.010	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	46
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	<0.05	[]	
[]Fe, Iron	0.57	[]Zr, Zirconium		[]	
				* * * * * *	
[]Hg, Mercury		[]Ammonia Nitrogen-N		[]mmhos Conductivity	130
[]K, Potassium	3.6	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg, Magnesium	4.3	[]Nitrate-N	0.11	[]Turbidity NTU	
[]Mn, Manganese	0.18	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[]T.Coliform/100ml	
[]Na, Sodium	13	[]Chloride		[]	
[]Ni, Nickel		[]Fluoride		[]	

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ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 11-8-82 TIME COLLECTED:

SAMPLED BY Pete Archibald SOURCE Lot 8 Block 1 New HUD Site

REMARKS High Iron and Manganese content, also high Silicon indicates irreversible scaling of hot water systems may occur.

FOR LAB USE ONLY
RECVD. BY GY LAB # 935-2
DATE RECEIVED November 8, 1982
DATE COMPLETED November 12, 1982
DATE REPORTED November 12, 1982
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
[]Ag, Silver	<0.05	[]P, Phosphorous	0.32	[]Cyanide	
[]Al, Aluminum	0.29	[]Pb, Lead	<0.05	[]Sulfate	
[]As, Arsenic		[]Pt, Platinum		[]Phenol	
[]Au, Gold		[]Sb, Antimony		[]Total Dissolved Solids	120
[]B, Boron		[]Se, Selenium		[]Total Volatile Solids	
[]Ba, Barium	<0.5	[]Si, Silicon	16	[]Suspended Solids	
[]Bi, Bismuth		[]Sn, Tin		[]Volatile Suspended Solids	
[]Ca, Calcium	21	[]Sr, Strontium		[]Hardness as $CaCO_3$	67
[]Cd, Cadmium	<0.01	[]Ti, Titanium		[]Alkalinity as $CaCO_3$	76
[]Co, Cobalt		[]W, Tungsten		[]	
[]Cr, Chromium	<0.05	[]V, Vanadium		[]	
[]Cu, Copper	<0.05	[]Zn, Zinc	<0.05	[]	
[]Fe, Iron	1	[]Zr, Zirconium		[]	
				* * * * * *	
[]Hg, Mercury		[]Ammonia Nitrogen-N		[]mmhos Conductivity	170
[]K, Potassium	4.4	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg, Magnesium	3	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn, Manganese	0.21	[]Nitrite-N		[]Color Units	
[]Mo, Molybdenum		[]Phosphorus (Ortho)-P		[]T.Coliform/100ml	
[]Na, Sodium	11	[]Chloride		[]	
[]Ni, Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

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ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Port Heiden, Alaska

DATE COLLECTED 11-8-82 TIME COLLECTED:

SAMPLED BY Steve St. Anthony SOURCE Lot 10 Block 2

REMARKS High Iron content and high Silicon indicates irreversible scaling of hot water systems may occur.

FOR LAB USE ONLY
RECVD.BY GY LAB # 925-1
DATE RECEIVED November 8, 1982
DATE COMPLETED November 12, 1982
DATE REPORTED November 12, 1982
SIGNED Stephen C. Fedi

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.13	[]Cyanide	
[]Al,Aluminum	<0.05	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	85
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.5	[]Si,Silicon	17	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	7.4	[]Sr,Strontium		[]Hardness as $CaCO_3$	33
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	44
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	0.69	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]mmhos Conductivity	120
[]K,Potassium	4.4	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	3.4	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn,Manganese	<0.05	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[]T.Coliform/100ml	
[]Na,Sodium	10	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

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5633 B Street

STEVE EDE SAYS THAT THIS IS DISCOLORED DUE TO ORGANICS. 50-60 PPM. HE RECOMMENDED CHARCOAL FILTER

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health SAMPLE LOCATION: Pt. Heiden, AK

DATE COLLECTED _____ TIME COLLECTED: _____

SAMPLED BY Hendricks SOURCE Matson Well

REMARKS Soft alkaline water with high iron and manganese
Unusually high phosphorous present.

FOR LAB USE ONLY
RECVD.BY EY LAB #2591-4
DATE RECEIVED 6-9-83
DATE COMPLETED 6-14-83
DATE REPORTED 6-16-83
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	4.9	[]Cyanide	
[]Al,Aluminum	0.75	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	405
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	15	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	1.5	[]Sr,Strontium		[]Hardness as $CaCO_3$	15
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	350
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	1.0	[]Zr,Zirconium		[]	
				* * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	670
[]K,Potassium	6.9	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	2.4	[]Nitrate-N	0.42	[]Turbidity NTU	
[]Mn,Manganese	0.07	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	145	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

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5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health SAMPLE LOCATION: Pt. Heiden, AK

DATE COLLECTED _____ TIME COLLECTED: _____

SAMPLED BY Archibald SOURCE Orville Welt LND

REMARKS Slightly hard water with high iron and manganese. High silicon indicates irreversible scaling of hot water systems may occur.

FOR LAB USE ONLY
RECVD.BY EY LAB #2591-3
DATE RECEIVED 6-9-83
DATE COMPLETED 6-14-83
DATE REPORTED 6-16-83
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.54	[]Cyanide	
[]Al,Aluminum	0.68	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	110
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	24	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin	-	[]Volatile Suspended Solids	
[]Ca,Calcium	14	[]Sr,Strontium		[]Hardness as $CaCO_3$	66
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	90
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	1.5	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	170
[]K,Potassium	6.0	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	7.0	[]Nitrate-N	0.15	[]Turbidity NTU	
[]Mn,Manganese	0.64	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum	--	[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	13	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

2GW

WATER ANALYSIS

Location Port Heiden Well County
Source Depth (ft) 20 Diam (in.)
Cased to (ft) 8" concrete Date drilled Point of coll.
Owner
Treatment Use
WBF WL Yield
Temp (°F) Appear. when coll.
Collected 2-17-72 By HK
Remarks Pumice soil, no permafrost, 150' from water to sewer down grade, good drainage.

	mg/l	ap/l		mg/l	ap/l
Silica (SiO_2)	38		Bicarbonate (HCO_3)	39	0.84
Aluminum (Al)			Carbonate (CO_3)	00	0.00
Iron (Fe) (total)	0.27		MBAS	0.00	
Manganese (Mn)	0.57		Sulfate (SO_4)	2.8	0.06
Copper (Cu)	0.04		Chloride (Cl)	112	3.16
Zinc (Zn)	0.29		Fluoride (F)	0.1	0.01
Arsenic as (As)	.0 ug/l		Barium (Ba)	0	
Calcium (Ca)	23 ug/l	1.13	Lead (Pb)	2 ug/l	
Magnesium (Mg)	12	0.99	Nitrate as N Nitrate (NO_3)	0.09 0.4	0.01
Sodium (Na)	37	1.61	Cadmium (Cd)	4 ug/l	
Potassium (K)	4.8	0.12	Silver (Ag)	2 ug/l	
Selenium (Se)	3 ug/l		Chromium (Cr)	0 ug/l	
Total		3.85	Total		3.88

	mg/l		
		Specific conductance (micromhos at 25° C)	452
Dissolved solids: Calculated	250	pH	7.5
Residue on evaporation at 180°C		Color	5
Hardness as $CaCO_3$	106		
Noncarbonate	74		
Alkalinity as CaCo3	32		✓

Lab. No. Col 15321 Field No. Project State (EC)

714th ACWRON
Port Heiden

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	8863					
Date of collection	3/31/66					
Silica (SiO_2)	40					
Iron (Fe)	0.52					
Manganese (Mn)	0.04					
Carbon Dioxide (CO_2)	3.3					
Calcium (Ca)	10					
Magnesium (Mg)	9.7					
Sodium (Na)	12					
Potassium (K)	1.0					
Bicarbonate (HCO_3)	82					
Carbonate (CO_3)	0					
Sulfate (SO_4)	1.9					
Chloride (Cl)	17					
Fluoride (F)	0.4					
Nitrate (NO_3)	0.2					
Dissolved solids						
Calculated	133					
Residue on evaporation at 180°C						
Hardness as $CaCO_3$	65					
Noncarbonate hardness as $CaCO_3$	--					
Alkalinity as $CaCO_3$	67					
Specific conductance (micromhos at 25°C)	198					
pH	7.6					
Color	10					

8863 - 714th ACWRON, Port Heiden, Well #1, drilled, pt. of coll. at well, water clear appearance, domestic use, 41°, coll. by Harvey, drilled 1958, depth 146'.

24027

Palmer 1958 GPO 976283

DATE STARTED 4-14-66 CHEMIST HKH
DATE COMPLETED 4-21-66 CHECKED

Port Heiden Air Force Station

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	10416					
Date of collection	8/7/67					
Silica (SiO_2)	44					
Iron (Fe)	0.69					
Manganese (Mn)... qualitative...	0.2					
Carbon Dioxide (CO_2)	4.1					
Calcium (Ca)	15					
Magnesium (Mg)	5.8					
Sodium (Na)	14					
Potassium (K)	2.4					
Bicarbonate (HCO_3)	82					
Carbonate (CO_3)	0					
Sulfate (SO_4)	7.5					
Chloride (Cl)	13					
Fluoride (F)	0.4					
Nitrate (NO_3)	6.7					
Dissolved solids						
Calculated	151					
Residue on evaporation at 180°C						
Hardness as $CaCO_3$	62					
Noncarbonate hardness as $CaCO_3$	0					
Alkalinity as $CaCO_3$	67					
Specific conductance (micromhos at 25°C)	194					
pH	7.5					
Color	20					

10416-Port Heiden Air Force Station, drilled well owned by the U. S. Air Force depth 64 feet producing intervals from 4 hours to 3 hours yield 20 GPM, collected at well pump appearance clear use Public supply, collected by Ale Haywood June water Spec.

24027

Port Heiden
USAF
Vapor Phase

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	93	94				
Date of collection	5/4/69	5/4/69				
Silica (SiO_2)						
Iron (Fe)						
Manganese (Mn)						
Calcium (Ca)						
Magnesium (Mg)						
Sodium (Na)	4,000					
Potassium (K)						
Boron	60					
Bicarbonate (HCO_3)						
Carbonate (CO_3)						
Sulfate (SO_4)						
Chloride (Cl)						
Fluoride (F)						
Nitrate (NO_3)						
Borate (B_4O_7)	370					
Borax ($Na_2B_4O_7$)	430					
Dissolved solids						
Calculated						
Residue on evaporation at 180°C						
Hardness as $CaCO_3$						
Noncarbonate hardness as $CaCO_3$						
Alkalinity as $CaCO_3$						
Specific conductance (micromhos at 25°C)	8,500					
pH		6.5				
Color						

93 - Port Heiden (714 th AC & W Det. 5) Nitrite absent. Point of collection - Power.
94 - " " " " " " " Coll. from condensate tank.

ITT - Port Heiden

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	14568 5-3-71
Date of collection	5-3-71
Silica (SiO_2)	40
Iron (Fe)....(total)	0.37
Manganese (Mn)	0.12
Calcium (Ca)	18
Magnesium (Mg)	5.9
Sodium (Na)	15
Potassium (K)	3.3
Bicarbonate (HCO_3)	81
Carbonate (CO_3)	00
Sulfate (SO_4)	5.5
Chloride (Cl)	22
Fluoride (F)	0.3
Nitrate (NO_3)	0.2
Dissolved solids Calculated	150
Residue on evaporation at 180°C	
Hardness as $CaCO_3$	69
Noncarbonate hardness as $CaCO_3$	3
Alkalinity as $CaCO_3$	66
Specific conductance (micromhos at 25°C)	228
pH	7.5
Color	5

14568 - Port Heiden ITT Site, Well #1; collected at pumphouse, by J.M. Yerkes, murky appearance, sampling depth - 120'.

Cold Bay Det. #5
Port Heiden

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

Analyses by Geological Survey, United States Department of the Interior

9-268 q (~~parts per million~~) (milligrams per liter)

Laboratory Number	11243					
Date of collection	approx. 4-19-68					
Silica (SiO_2)	1.9					
Iron (Fe)	0.33					
Manganese (Mn)	----					
Carbon Dioxide (CO_2)	3					
Calcium (Ca)	1.2					
Magnesium (Mg)	0.0					
Sodium (Na)	0.2					
Potassium (K)	0.5					
Bicarbonate (HCO_3)	6					
Carbonate (CO_3)	0					
Sulfate (SO_4)	0.5					
Chloride (Cl)	0.0					
Fluoride (F)	0.1					
Nitrate (NO_3)	0.3					
Dissolved solids						
Calculated	8					
Residue on evaporation at 180°C						
Hardness as $CaCO_3$	3					
Noncarbonate hardness as $CaCO_3$	0					
Alkalinity as $CaCO_3$	5					
Specific conductance (micromhos at 25°C)	14					
pH	6.5					
Color	15					
11243-68-541 - Cold Bay Det. #5, Port Heiden, surface water						

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER RESOURCES DIVISION

Analyses by Geological Survey, United States Department of the Interior

9-268 q (~~parts per million~~) (milligrams per liter)

Laboratory Number	11900					
Date of collection	8-6-68					
Silica (SiO_2)						
Iron (Fe)	.72					
Manganese (Mn)						
Calcium (Ca)						
Magnesium (Mg)						
Sodium (Na)						
Potassium (K)						
Bicarbonate (HCO_3)						
Carbonate (CO_3)						
Sulfate (SO_4)						
Chloride (Cl)						
Fluoride (F)						
Nitrate (NO_3)						
Dissolved solids						
Calculated						
Residue on evaporation at 180°C						
Hardness as $CaCO_3$						
Noncarbonate hardness as $CaCO_3$						
Alkalinity as $CaCO_3$						
Specific conductance (micromhos at 25°C)	180					
pH						
Color						

11900-68-1199 - Cold Bay det. #5, Fort Holden, collected by Sgt. Robert R. Wright at discharge of well pump before treatment. Appearance clear, temperature 40°F

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Pt. Heiden, Alaska

DATE COLLECTED 5-6-83 TIME COLLECTED: ---

SAMPLED BY P.Archibald SOURCE Robt.Christianson Well

REMARKS High Iron and Manganese. High Silicon indicates irreversible scaling of hot water systems may occur.

FOR LAB USE ONLY
RECVD.BY GY LAB # 2573-1
DATE RECEIVED 6-7-83
DATE COMPLETED 6-13-83
DATE REPORTED 6-13-83
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.26	[]Cyanide	
[]Al,Aluminum	1.3	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	84
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	23	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	12	[]Sr,Strontium		[]Hardness as $CaCO_3$	57
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	60
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	3.7	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	140
[]K,Potassium	3.5	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	5.1	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn,Manganese	0.24	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	13	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Pt. Heiden, Alaska

DATE COLLECTED 5-8-83 TIME COLLECTED: —

SAMPLED BY P.Archibald SOURCE Dennis Matson Well

REMARKS

FOR LAB USE ONLY
RECVD.BY GY LAB # 2573-4
DATE RECEIVED 6-7-83
DATE COMPLETED 6-13-83
DATE REPORTED 6-13-83
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.36	[]Cyanide	
[]Al,Aluminum	<0.05	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	120
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	17	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	17	[]Sr,Strontium		[]Hardness as $CaCO_3$	67
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	110
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	0.38	[]Zr,Zirconium		[]	
				* * * * * *	
[]Hg,Mercury		[]Ammonia Nitrogen-N		[]umhos Conductivity	175
[]K,Potassium	3.2	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	5.8	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn,Manganese	0.52	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	17	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Pt. Heiden, Alaska

DATE COLLECTED 5-15-83 TIME COLLECTED: —

SAMPLED BY P.Archibald SOURCE Emil Christianson

REMARKS High Iron and Manganese. High Silicon and Aluminum indicates irreversible scaling of hot water systems may occur.

FOR LAB USE ONLY
RECVD.BY GY LAB # 2573-3
DATE RECEIVED 6-7-83
DATE COMPLETED 6-13-83
DATE REPORTED 6-13-83
SIGNED Stephen C. Ell

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.30	[]Cyanide	
[]Al,Aluminum	3.0	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	96
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	26	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	11	[]Sr,Strontium		[]Hardness as $CaCO_3$	69
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	70
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	9.2	[]Zr,Zirconium		[]	
[]Hg,Mercury		[]Ammonia Nitrogen-N		* * * * * * []umhos Conductivity	130
[]K,Potassium	4.5	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	6.2	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn,Manganese	0.37	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	13	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

CHEMICAL & GEOLOGICAL LABORATORIES OF ALASKA, INC.

TELEPHONE (907) 562-2343 ANCHORAGE INDUSTRIAL CENTER
5633 B Street

ANALYTICAL REPORT

CUSTOMER Alaska Area Native Health Service SAMPLE LOCATION: Pt. Heiden, Alaska

DATE COLLECTED 5-19-83 TIME COLLECTED: ---

SAMPLED BY P.Archibald SOURCE Alec Constantine Well

REMARKS Slightly high Iron. High Silicon indicates irreversible scaling of hot water systems may occur

FOR LAB USE ONLY
RECVD.BY GY LAB # 2573-2
DATE RECEIVED 6-7-83
DATE COMPLETED 6-13-83
DATE REPORTED 6-13-83
SIGNED Stephen C. Ede

	mg/l		mg/l		mg/l
[]Ag,Silver	<0.05	[]P,Phosphorous	0.13	[]Cyanide	
[]Al,Aluminum	0.14	[]Pb,Lead	<0.05	[]Sulfate	
[]As,Arsenic		[]Pt,Platinum		[]Phenol	
[]Au,Gold		[]Sb,Antimony		[]Total Dissolved Solids	90
[]B,Boron		[]Se,Selenium		[]Total Volatile Solids	
[]Ba,Barium	<0.05	[]Si,Silicon	21	[]Suspended Solids	
[]Bi,Bismuth		[]Sn,Tin		[]Volatile Suspended Solids	
[]Ca,Calcium	14	[]Sr,Strontium		[]Hardness as $CaCO_3$	49
[]Cd,Cadmium	<0.01	[]Ti,Titanium		[]Alkalinity as $CaCO_3$	80
[]Co,Cobalt		[]W,Tungsten		[]	
[]Cr,Chromium	<0.05	[]V,Vanadium		[]	
[]Cu,Copper	<0.05	[]Zn,Zinc	<0.05	[]	
[]Fe,Iron	0.68	[]Zr,Zirconium		[]	
[]Hg,Mercury		[]Ammonia Nitrogen-N		* * * * * * []umhos Conductivity	140
[]K,Potassium	3.6	[]Kjedahl Nitrogen-N		[]pH Units	
[]Mg,Magnesium	3.1	[]Nitrate-N	<0.10	[]Turbidity NTU	
[]Mn,Manganese	<0.05	[]Nitrite-N		[]Color Units	
[]Mo,Molybdenum		[]Phosphorus (Ortho)-P		[] .Coliform/100ml	
[]Na,Sodium	14	[]Chloride		[]	
[]Ni,Nickel		[]Fluoride		[]	

KAN.

SEP 3 REC'D

3/15/74

WATER ANALYSIS REPORT FORM Dr. Paul

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

C 154

NAME OR LOCATION: PORT HEIDEN

COLLECTED BY: R. ELMORE DATE JULY, 1974 HOUR:

WATER SYSTEM

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

PURPOSE OF ANALYSIS

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

COLUMN 1

	Analysis	Limits
Iron (Fe)	2.72	0.3
Fluoride (F)	0.79	1.5
Chloride (Cl)	98	250
Phosphate (PO_4)	0.12	.05 good 30 poor
Total Hardness	83	50 soft 300 hard
Detergents	0	0
pH	7.21	6.5 8.5
Specific Conductance	371	

Recd 8/6/74

COLUMN 2

	Anal.	Limit
Magnesium (Mg)	18	125
Calcium (Ca)	8	300
Turbidity	24	5
Color	>300	15
Bicarbonate (HCO_3)	118	25 good 500 poor
Carbonate	0	350
Alkalinity	97	350
Total Dissolved Solids	324	500

COLUMN 3

	Analysis	Limits
Sodium (Na)		200
Potassium (K)		
Sulfate (SO_4)		250
Sulfite **(SO_3)		5.0
Nitrate (NO_3)		10
Suspended Solids		
Arsenic (As)		0.01
Copper (Cu)		1.0
Cyanide (Cn)		0.01
Phenols		0.00
Zinc (Zn)		5.0
Barium (Ba)		1.0
Cadmium (Cd)		0.01
Lead Pb)		0.05
Silver (Ag)		0.05
Mercury (Hg)		0.05
Manganese (Mn)		0.05

COMMENTS: _____

INSTRUCTIONS:

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

8/9/74 [signature]

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

OCT 9

APPENDIX 3

Well logs for the Port Heiden area, Alaska

SCHOOL SITE

SOIL BORING LOG

LOCATION PORT HEIDEN DATE 4-15-79

TEST HOLE NO. 60 INSPECTOR ROBSON

STRATIFICATION DEPTH	LEGEND	GENERALIZED SOIL LOG	SAMPLE NO.	SAMPLE TYPE & REMARKS
		ICE @ 8" DEPTH.		
3		SAND, SILTY, LIGHT TAN IN COLOR (SM/GF) SOME GRAVEL ENTRAINED.		
6		SAND, SILTY, ANGULAR MED. (SM/SF)	60A	SHELBY TUBE (APPROX. 4" SLOUGH INCLUDED.)
9		AGGREGATE (PUMICE) 1/4" (GP)		
12		SILT		
15		SAND, CLEAN, SATURATED W/ 1/8" TO 1/4" (PUMICE) (SM)	60B	SPLIT SPOON
		BOH		

SAMPLE ANALYSIS

NO.	DEPTH	DESCRIPTION	GROUP	BLOWS	"N"
60A	6'	SAND, M TO C, DIRTY W/ PUMICE TO 1/2" MAX. (SM)	A		
60B	17'	SAND, CLEAN SATURATED, PUMICE ASH MIXTURE, SOFT, EASILY CRASHED. (FZ)	A	7-6" 9-6" 18-6"	16 27
		LOOSE MIXTURE (SM)			

NOTES:

THE TERM "AGGREGATE" REFER TO THE VOLCANIC BRECCIA FOUND THROUGHOUT MOST OF THE SAMPLES.

MISCELLANEOUS DATA

DEPTH OF HOLE 18 FT.

DIA. OF CASING 3 IN.

DEPTH OF GROUND WATER 3½ FT

DEPTH OF REFUSAL

WT. OF HAMMER 60 LB's

AVG. FALL OF HAMMER 30"

SCHOOL SITE

SOIL BORING LOG

LOCATION PORT HEIDEN DATE 4-15-79

TEST HOLE NO. 61 INSPECTOR ROBSON

STRATIGRAPHIC ELEVATION	DEPTH	LEGEND	GENERALIZED SOIL LOG	SAMPLE NO.	SAMPLE TYPE & REMARKS
			PEAT		
	3		SAND, CLEAN M. TO C. W/ 20% ASH CONTENT TO 1/8" AGGREGATE (SP/SM)	61A	SPLIT SPOON
	6		SAND COARSE SUBANGULAR, PUMICE 1/8" 10% FINES (SP/SF)		
	9			61B	GRAB SAMPLE
	12		SATURATED PUMICE, 1/2" SAND - 20% (GP)		
	15		SAND, SOME FINES PUMICE 1/8"-1/4"		
	18		BOH		

SAMPLE ANALYSIS

NO.	DEPTH	DESCRIPTION	GROUP	BLOWS	"N"
61A	3'	SAND CLEAN MED. TO COARSE (F2/SM)	A	6-6" 22-6" 34-6"	28 56
61B	8 1/2'	COARSE SANDY PUMICE (F2/SM)	A		56

(SEE APPENDIX FOR TEST RESULTS)

NOTES:

MISCELLANEOUS DATA

DEPTH OF HOLE 18 FT.

DIA. OF CASING 3"

DEPTH OF GROUND WATER 5 FT.

DEPTH OF REFUSAL —

WT. OF HAMMER 60 LB

AVG. FALL OF HAMMER 30"

SCHOOL STE

SOIL BORING LOG

LOCATION PORT HEIDEN DATE 4-16-79

TEST HOLE NO. 62 INSPECTOR ROBSON

ELEVATION DEPTH	LEGEND	GENERALIZED SOIL LOG	SAMPLE NO.	SAMPLE TYPE & REMARKS
		LOAM FINE, SILTY W/PEAT (MH/PT) (SOME ICE @ 1 FT. DEPTH.		
3		SAND, FINE, SUBANGULAR W/ORGANIC SILTS SOME PUMICE - 1/8" (SF)		
6			62A	SHELBY TUBE
		PUMICE 1/8"-1/4" W/10% SAND (GF)		
9				
12			62B	SPLIT SPOON
		SAND, FINE, SUBANGULAR, SOME ORGANIC SILTS. (SF)		
		BOH		

SAMPLE ANALYSIS

NO.	DEPTH	DESCRIPTION	GROUP	BLOWS	"N"
2A	6'	SAND, FINE - MED. W/SOME FINES (F2/SM)	A	11 - 6" 12 - 6" 12 - 6"	23 24
2B	11'	PUMICE (VOLCANIC TUFF) 1/8" - 1/4" IN SIZE, WHITE IN COLOR. (F2/SM)	A		

(SEE APPENDIX FOR TEST RESULTS)

NOTES:

PUMICE IS TERMED AGGREGATE DUE TO SIZE CLASSIFICATION ONLY.

MISCELLANEOUS DATA

DEPTH OF HOLE 18 FT.
DIA. OF CASING 3"
DEPTH OF GROUND WATER 6 1/2 FT.
DEPTH OF REFUSAL —
WT. OF HAMMER 60 #'s
AVG. FALL OF HAMMER 30"

SOIL BORING LOG

SCHOOL SITE

LOCATION PORT HEIDEN DATE 4-16-79

TEST HOLE NO. 63 INSPECTOR ROBSON

STRATIFICATION ELEVATION	DEPTH	LEGEND	GENERALIZED SOIL LOG	SAMPLE NO.	SAMPLE TYPE & REMARKS
			PUMICE, W/ 30% SAND, SILTY (GF/SM)		
			SAND, SILTY		
	3			63A	GRAB
	6		SAND, FINE, SUBANGULAR, SOME PUMICE WELL GRADED (SM/SW)	63B	SPLIT SPOON
	9			63C	SHELBY
	12				
	15				
	18		BOH		

SAMPLE ANALYSIS

NO.	DEPTH	DESCRIPTION	GROUP	BLOWS	"N"
63A	3 1/2'	SAND, FINE TO MEDIUM W/ PUMICE INCLUDED TROUGHOUT, (PUMICE RANGES ALL SIZES) F2/SM	A		
63B	6'		A	9-6" 10-6" 9-6"	19
63C	9'		A		19

NOTES:

VOLCANIC TUFF OR ASH CAN PULVERIZE TO .002 mm SIZE, SO SAME MATERIAL CAN ACT SIMILIAR TO A MUD SLURRY OR A SAND/GRAVEL MIX.

MISCELLANEOUS DATA

DEPTH OF HOLE 18 FT

DIA. OF CASING 3 IN.

DEPTH OF GROUND WATER 6 FT.

DEPTH OF REFUSAL —

WT. OF HAMMER 60 #'S

AVG. FALL OF HAMMER 30 IN.

SOIL BORING LOG

LOCATION PORT HEIDEN DATE 4-16-79

TEST HOLE NO. 64 INSPECTOR ROBSON

DEPTH	STRATIFICATION LEGEND	GENERALIZED SOIL LOG	SAMPLE NO.	SAMPLE TYPE & REMARKS
3		SAND, SILTY, SUBANGULAR SF		
6			64A	GRAB
9		SAND, MED, SUBANGULAR, W/ PUMICE., 1/4	64B	SHELBY
12			64C	GRAB (+1/4" PUMICE)
15		SAND L.T.M. W/ +1/4" PUMICE, CLEAN (GF)	64D	SPLIT SPOON
18		BOH		

SAMPLE ANALYSIS

NO.	DEPTH	DESCRIPTION	GROUP	BLOWS	"N"
4A	6'	SILTY SAND, FINE - MED, SATURATEDED SM F2	A		
4B	9'		A		
4C	11'		A		
4D	12'		A	16 - 6"	27
				11 - 6"	
				10 - 6"	21

NOTES:

SEE APPENDIX FOR TEST RESULTS. MATERIAL, QUITE SIMILIAR THROUGHOUT ENTIRE TEST HOLE.

MISCELLANEOUS DATA

DEPTH OF HOLE 18 FT.

DIA. OF CASING 3 IN.

DEPTH OF GROUND WATER 6 FT.

DEPTH OF REFUSAL —

WT. OF HAMMER 60 #'S

AVG. FALL OF HAMMER 30 IN.

SOIL BORING LOG

LOCATION PORT HEIDEN

DATE 4-16

TEST HOLE NO. 65

INSPECTOR ROBSON

ELEVATION	DEPTH	LEGEND	GENERALIZED SOIL LOG	SAMPLE NO.	SAMPLE TYPE & REMARKS
	3		SAND, M-C, SUBANGULAR, SILTY W/ PUMICE 1/8"-1/4"		
	6		SAND, MED. SUBANGULAR, VERY SILTY (SF/SM)	65A	SPLIT SPOON
	9			65B	SHELBY TUBE
	12		PUMICE, SANDY, WELL GRADED (SW)		
	15				
	18		BOH		

SAMPLE ANALYSIS

NO.	DEPTH	DESCRIPTION	GROUP	BLOWS	"N"
65A	6'	SILTEY SAND, W/ PUMICE MED. TO COARSE, SATURATED.	A	18-6" 22-6"	40
65B	10'	(SM/F2)	A	16-6"	38

NOTES:

- THIS TEST HOLE INDICATED A HIGHER % OF ORGANIC FINES THAN WAS FOUND IN OTHER TEST HOLES. COULD BE VOLCANIC ASH, PULVERIZED.

MISCELLANEOUS DATA

DEPTH OF HOLE 18 FT.

DIA. OF CASING 3 IN.

DEPTH OF GROUND WATER 6 1/2 F

DEPTH OF REFUSAL —

WT. OF HAMMER 60 #'s

AVG. FALL OF HAMMER 30 IN.

SOIL BORING LOG

LOCATION PORT HEIDEN

DATE 4-17-79

TEST HOLE NO. 66

INSPECTOR ROBSON

STRATIGRAPHIC ELEVATION	DEPTH	LEGEND	GENERALIZED SOIL LOG	SAMPLE NO.	SAMPLE TYPE & REMARKS
			PEAT SILTY		
	3		SAND, MED. TO COARSE, SUBANGULAR, LIGHT COLORED. SILTY		
	6		SAND, MED., SUBANGULAR W/ PUMICE 1/8" MAX. (SM/GP)	66A	GRAB
	9		BOH	66B	SPLIT SPOON

SAMPLE ANALYSIS

NO.	DEPTH	DESCRIPTION	GROUP	BLOWS	"N"
66A	6'	SAND W/ VOLCANIC ASH OF VARYING SIZE. RELATIVELY CLEAN, SATURATED, SM, F2.	A		
66B	9'		A	17-6 17-6 20-6	34 37

NOTES:

HOLE DRILLED TO VERIFY HOMOGENITY OF SOIL MATERIAL AT PATENTIAL FOUNDATION DEPTH.

MISCELLANEOUS DATA

DEPTH OF HOLE 9 FT.

DIA. OF CASING 3 IN.

DEPTH OF GROUND WATER 4 1/2'

DEPTH OF REFUSAL

WT. OF HAMMER 60 #'s

AVG. FALL OF HAMMER 30 IN.

SOIL BORING LOG

LOCATION PORT HEIDEN DATE 4-17-79

TEST HOLE NO. 67 INSPECTOR ROBSON

STRATIFICATION DEPTH	LEGEND	GENERALIZED SOIL LOG	SAMPLE NO.	SAMPLE TYPE & REMARKS
1		PEAT W/SAND		
2				
3		SAND, MED, SILT, IN ORGANIC DARK BROWN.		
4				
5		PUMICE, COARSE, SANDY (SM/SP)		
6			67A	GRAB (HAND EXCAVATED)
7		VOLCANIC DEPOSIT BLACK, CLEAN 1/8-1/4" (IGNEOUS)		
	BOH			

SAMPLE ANALYSIS

NO.	DEPTH	DESCRIPTION	GROUP	BLOWS	"N"
7A	5 1/2'	VOLCANIC ASH, BLOCK, CLEAN, ROCK SALT SIZE,	A		

NOTES:

SAMPLE AREA WAS HAND EXCAVATED IN BORROW PIT, BORDERING WEST SIDE OF PROPOSED SITE.

MISCELLANEOUS DATA

DEPTH OF HOLE 7'

DIA. OF CASING N/A

DEPTH OF GROUND WATER 6'

DEPTH OF REFUSAL —

WT. OF HAMMER N/A

AVG. FALL OF HAMMER N/A

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heiden Raymond Christenson DATE STARTED 5-3-83

DATE COMPLETED 5-[illegible]-83 DRILLER Archibald St Anthony

TOTAL DEPTH OF WELL 58' FT. CASING INSTALLED 55 4" DIAMETER 6"

GROUT Cement SCREEN SIZE 6 MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 9 HRS. PUMPED 4 @ 10 GPM DRAWDOWN to 18' FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH	FORMATION
0	SAND CLAY MIX
20'	SILTY SANDS
40'	SILTY
50'	GRAVEL
	FINE SANDS WATER
58	Bottom
	6 SLOT Screen

SOIL DATA TO 15 FT.
FEET THAWED 0-58
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE None
APPEARANCE FRESH ✓
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 10 - STATIC LEVEL
PUMPING LEVEL 50 @ 10 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 10
WILL STATIC LEVEL CHANGE WITH
TIDES NO OR FROST NO

Pump Set at 48'

DEVELOP PROCEDURE Surge Blk

ESTIMATED MAN HOURS FOR DRILLING _____ HOURS FOR TOTAL JOB _____

CREW Archibald St. Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION PORT HILDEN HUD SUBDIV. LOT 10 BLOCK 1 DATE STARTED 12-3-82

DATE COMPLETED 12-4-82 DRILLER ARCHIBALD

TOTAL DEPTH OF WELL 63 FT. CASING INSTALLED 60. DIAMETER 6"

GROUT Cement Bentonite 20 SCREEN SIZE 10 MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 17' HRS. PUMPED 8 @ 15 GPM DRAWDOWN 2' 6" FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH	FORMATION
0	
	SAND
10	
	SAND
	SILT mix
20	
	SAND
30	
	SAND
40	
	SAND Brown SILT
45	
	Gravel
60'	WATER
	Screen
63	

SOIL DATA TO 15 FT.
FEET THAWED 0-60
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE Normal
APPEARANCE FRESH Yes
AFTER ~~24~~ HOURS Same
IRON 2 ppm
CHLORIDES N H
TDS N H

PUMP TEST 17' STATIC LEVEL
PUMPING LEVEL 19' 6" @ 15 GPM
AFTER 8 HRS.

HIGHEST RECOMMENDED PUMP RATE 15
WILL STATIC LEVEL CHANGE WITH
TIDES NO OR FROST NO

DEVELOP PROCEDURE Surge 30 min

ESTIMATED MAN HOURS FOR DRILLING _____ HOURS FOR TOTAL JOB _____

CREW M. Archibald S. St Anthony

PORT HEIDEN EXPLORATORY WELL

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

PORT HEIDEN AK

LOCATION LOT 8 BLOCK 1 DATE STARTED 10-12-82

DATE COMPLETED 10-26-80 DRILLER UNKNOWN

TOTAL DEPTH OF WELL 47 FT. CASING INSTALLED 44 10' INCREMENTS DIAMETER 6"

GROUT BENTONITE CEMENT SCREEN SIZE 10 SLOT MFG. JOHNSON LENGTH 3'

STATIC WATER LEVEL 21 HRS. PUMPED 12 @ 12 GPM DRAWDOWN P 32'3" FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH	FORMATION
	SURFACE IS HUMMOCKY TUNDRA, GRASSES
0	TOP SOIL
3	
	SAND
11	
20'	10" GROUT HOLE
	SAND
30	
	SAND
40	
	44' CASING
	SANDY GRAVEL
	3' SCREEN
47	

SOIL DATA TO 15 FT.
FEET THAWED NO FROZEN MATERIAL
BOTTOM OF FROST & MATERIAL ENCOUNTERED
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE GOOD
APPEARANCE FRESH YES
AFTER 24 HOURS YES
IRON
CHLORIDES
TDS

RIG UTILIZED WAS A 22T BUCYRUS ERIE — TRACK MOUNTED.

PUMP TEST 21' STATIC LEVEL
PUMPING LEVEL 45' @ 12 GPM
AFTER 16 HRS.

HIGHEST RECOMMENDED PUMP RATE 10
WILL STATIC LEVEL CHANGE WITH TIDES NO OR FROST NO

IT IS NOTED THAT FORMATION HEAVED INTO CASING APPROXIMATELY 6' AT THE TIME WE STRUCK WATER BEARING MATERIAL.

DEVELOP PROCEDURE SURGE BLOCK

ESTIMATED MAN HOURS FOR DRILLING HOURS FOR TOTAL JOB

CREW ARCHIBALD . WHITO

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Holden HUD SUB DIV. Block 1-Lot 11 DATE STARTED _____

DATE COMPLETED 12-2-75 DRILLER N ARCHIBALD

TOTAL DEPTH OF WELL 60 FT. CASING INSTALLED 57 DIAMETER 6"

GROUT Cement Bentonite SCREEN SIZE 10 MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 15 HRS. PUMPED 4 @ 12 GPM DRAWDOWN TO 30 FT.

Log of Casing DEPTH	HOLE DIAMETER / CASING DIAMETER	FORMATION
	0	SAND
5'	5	SAND
	10	SAND
10'	15	SAND
	20	SAND & SILT
	25	SAND & SILT
	30	SAND SILT
10'	35	SAND SILT
	40	SAND SILT
	45	SAND SILT
	50	WATER
	55	GRAVEL
10'	60	GRAVEL with WATER
20'		

SOIL DATA TO 15 FT.
FEET THAWED 0 - 60
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE Good
APPEARANCE FRESH Yes
AFTER 24 HOURS _____
IRON 2 PPM
CHLORIDES _____
TDS _____

PUMP TEST 15 - STATIC LEVEL
PUMPING LEVEL 30 @ 12 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 12
WILL STATIC LEVEL CHANGE WITH
TIDES No OR FROST No

DEVELOP PROCEDURE _____

ESTIMATED MAN HOURS FOR DRILLING _____ HOURS FOR TOTAL JOB _____

CREW Archibald St Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heiden James Christenson DATE STARTED 5-5-83

DATE COMPLETED 5-6-83 DRILLER Archibald

TOTAL DEPTH OF WELL 58 FT. CASING INSTALLED 55' 4" DIAMETER 6

GROUT Cement SCREEN SIZE 6 MFG: Johnson LENGTH 3'

STATIC WATER LEVEL 10 HRS. PUMPED 4 @ 10 GPM DRAWDOWN 10 18' 5" FT.

DEPTH	HOLE DIAMETER / CASING DIAMETER	FORMATION
0		SAND CLAY mix
30		PUMICE
45		SICKY SAND
50	screen	SAND WATER

SOIL DATA TO 15 FT.
FEET THAWED 0-58
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE none
APPEARANCE FRESH ✓
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 10 - STATIC LEVEL
PUMPING LEVEL 45 @ 10 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 10
WILL STATIC LEVEL CHANGE WITH
TIDES OR FROST

Pump set at 45'

DEVELOP PROCEDURE Surge 1/2 hr

ESTIMATED MAN HOURS FOR DRILLING HOURS FOR TOTAL JOB

CREW Archibald St Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Robert Christenson DATE STARTED 5-6-83

DATE COMPLETED 5-6-83 DRILLER Archuleta St Anthony

TOTAL DEPTH OF WELL 58 FT. CASING INSTALLED 55 DIAMETER 6"

GROUT Cement SCREEN SIZE 6 MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 9 HRS. PUMPED 4 @ 10 GPM DRAWDOWN to 15' FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH	FORMATION
0	
	Sand clay mixed
40'	
	Pumice
48'	
	Sand water

SOIL DATA TO 15 FT.
FEET THAWED 0-58
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE None
APPEARANCE FRESH ✓
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 9' - STATIC LEVEL
PUMPING LEVEL 50 @ 10 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 10
WILL STATIC LEVEL CHANGE WITH
TIDES, OR FROST

Pump set at 45'

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING HOURS FOR TOTAL JOB

CREW Archuleta St Anthony

Port Helden

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Dennis Matson DATE STARTED 5-7

DATE COMPLETED 5-8 DRILLER

TOTAL DEPTH OF WELL 59'6" FT. CASING INSTALLED 57' DIAMETER 6"

GROUT Cement SCREEN SIZE 65 LOT MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 12' HRS. PUMPED 4 @ 10 GPM DRAWDOWN 10 25'6" FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH	FORMATION
0	
	SAND CLAY
30'	
	Pumice
50	
	Sand Gravel Water
60'	

3' Screen 65 LOT

SOIL DATA TO 15 FT.
FEET THAWED 0-60
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE Mild
APPEARANCE FRESH
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 12' - STATIC LEVEL
PUMPING LEVEL 50 @ 10 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 10
WILL STATIC LEVEL CHANGE WITH
TIDES NA OR FROST NA

Pump set at 50'

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING HOURS FOR TOTAL JOB

CREW Archibald St. Anthony

Fort Heldon

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION ORVIL LeLIND DATE STARTED 5-9-83

DATE COMPLETED 5-11-83 DRILLER Archibald

TOTAL DEPTH OF WELL 78 FT. CASING INSTALLED 70'4" DIAMETER 6"

GROUT Cement SCREEN SIZE 6 SLOT MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 18' HRS. PUMPED 4 @ 10 GPM DRAWDOWN 18 25' FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH	FORMATION
0	PUMICE
	SAND
2	FROST
3	CLAY
	SAND
25	MIX
48'	CLAY
	GRAVEL
	MIX
65	GRAY
	SAND
68	GRAVEL
	WATER
72'	

3' 6 SLOT SCREEN

SOIL DATA TO 15 FT.
~~FEET THAWED~~ 3'
BOTTOM OF FROST & MATERIAL
SEASONAL ~~OR PERMA FROST~~

WATER DATA FIELD TEST
TASTE
APPEARANCE FRESH ✓
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 18' STATIC LEVEL
PUMPING LEVEL ~~60~~ ↑ 25 @ 10 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 10
WILL STATIC LEVEL CHANGE WITH
TIDES NK OR FROST NK

PUMP SET AT 60'

DEVELOP PROCEDURE SURGE INC

ESTIMATED MAN HOURS FOR DRILLING HOURS FOR TOTAL JOB

CREW Archibald ST Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heiden AK Lot 8 Block 1 DATE STARTED 10 12-82

DATE COMPLETED 10-26-80 DRILLER Archibald

TOTAL DEPTH OF WELL 47 FT. CASING INSTALLED 44 10' increments DIAMETER 6"

GROUT Bentonite Cement SCREEN SIZE 10 slot MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 21 HRS. PUMPED 6 @ 12 GPM DRAWDOWN P 32'3" FT.

HOLE DIAMETER

CASING DIAMETER

DEPTH

FORMATION

SURFACE IS HUMMOCKY TUNDRA, GRASSES

0 – 3 Top soil

SAND

20' — 10" grout hole

SAND

30

SAND

40 — 44' casing

gravel with sand, SANDY — 3' Screen

47

SOIL DATA TO 15 FT.

FEET THAWED NO FROZEN MATERIAL

BOTTOM OF FROST & MATERIAL ENCOUNTERED

SEASONAL OR PERMA FROST

WATER DATA FIELD TEST

TASTE good

APPEARANCE FRESH Yes

AFTER 24 HOURS Yes

IRON

CHLORIDES

TDS

RIG UTILIZED WAS A 22T BUCYRUS ERIE — TRACK MOUNTED.

PUMP TEST 21' STATIC LEVEL

PUMPING LEVEL 45' @ 12 GPM

AFTER 6 HRS.

HIGHEST RECOMMENDED PUMP RATE 10

WILL STATIC LEVEL CHANGE WITH TIDES NO OR FROST NO

IT IS NOTED THAT FORMATION HEAVED INTO CASING APPROXIMATELY 6' AT THE TIME WE STRUCK WATER BEARING MATERIAL.

DEVELOP PROCEDURE SURGE BLOCK

ESTIMATED MAN HOURS FOR DRILLING ______ HOURS FOR TOTAL JOB ______

CREW Archibald . Whato

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heiden Emil Christenson DATE STARTED 5-12-83

DATE COMPLETED 5-16-83 DRILLER Archibald

TOTAL DEPTH OF WELL 77 FT. CASING INSTALLED 74' 6" DIAMETER 6"

GROUT Cement SCREEN SIZE 6 MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 9 HRS. PUMPED 4 @ 10 GPM DRAWDOWN 10 13' FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH		FORMATION
0		
SAND		
mix		
30 CLAY		
SAND	10	
SILT	much	
	silt	
mix		
70		
SAND		
W WATER		6 SLOT SCREEN

SOIL DATA TO 15 FT.
FEET THAWED 0-77
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE None
APPEARANCE FRESH ✓
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 9 - STATIC LEVEL
PUMPING LEVEL 65 @ 10 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 10
WILL STATIC LEVEL CHANGE WITH
TIDES OR FROST

Pump set at 65

DEVELOP PROCEDURE Surge for 1 hr

ESTIMATED MAN HOURS FOR DRILLING HOURS FOR TOTAL JOB

CREW Archibald

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Pokt Hilden Alic Constine DATE STARTED 5-17-83

DATE COMPLETED 5-19-83 DRILLER Archibald

TOTAL DEPTH OF WELL 62 FT. CASING INSTALLED 59'4" DIAMETER 6"

GROUT Cement SCREEN SIZE 10 MFG. Johnson LENGTH 5'

STATIC WATER LEVEL 9 HRS. PUMPED 4 @ 10 GPM DRAWDOWN 50 FT.

log of casing DEPTH | HOLE DIAMETER / CASING DIAMETER | FORMATION

0	SAND
20	CLAY mix
30	SILTY SAND
40	SILTY SAND
50	SILTY SAND
60	SAND WATER

SOIL DATA TO 15 FT.
FEET THAWED 0-15
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE None
APPEARANCE FRESH ✓
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 9 - STATIC LEVEL
PUMPING LEVEL 55 @ 10 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 10
WILL STATIC LEVEL CHANGE WITH
TIDES OR FROST

Pump Set at 55'

DEVELOP PROCEDURE

ESTIMATED MAN HOURS FOR DRILLING HOURS FOR TOTAL JOB

CREW Archibald

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heiden HANK MATSON WELL DATE STARTED 1 June 83

DATE COMPLETED 4 June 83 DRILLER Hendricks, Rt / CHARLES MULLER

TOTAL DEPTH OF WELL 107 FT. CASING INSTALLED 102" DIAMETER 6"

GROUT 20' SCREEN SIZE 15 MFG. Johnson LENGTH 5'

STATIC WATER LEVEL 15' HRS. PUMPED 14 @ 15 GPM DRAWDOWN 17' FT.

30 Si 90% Sa

DEPTH	HOLE DIAMETER / CASING DIAMETER	FORMATION
0-25	6" ~~0-25~~	pumist FINE BRN sand
25-35		gray sand/silt
35-43		dark gray sandy silt.
43-90		gray sandy silt
90-107		sand + gravel

SOIL DATA TO 15 FT.
FEET THAWED NO FROZEN MATERIAL
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST — same stuff just changed colors

WATER DATA FIELD TEST
TASTE IRON
APPEARANCE FRESH APPLE CIDER COLOR
AFTER 24 HOURS SAME
IRON 1.0
CHLORIDES N/A
TDS N/A

PUMP TEST 15' STATIC LEVEL
PUMPING LEVEL 17 @ 15 GPM
AFTER 14 HRS.

HIGHEST RECOMMENDED PUMP RATE
WILL STATIC LEVEL CHANGE WITH
TIDES____ OR FROST____

The hole would stay open and you could drill ahead of the pipe at 90-107.

DEVELOP PROCEDURE Bailer + pump

ESTIMATED MAN HOURS FOR DRILLING ____ HOURS FOR TOTAL JOB ____

CREW ____

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

Port Hadlen

LOCATION HUD SUBDIV Block 1-Lot 11 DATE STARTED _____

DATE COMPLETED 12-3-82 DRILLER W ARCHIBALD

TOTAL DEPTH OF WELL 60 FT. CASING INSTALLED 57 DIAMETER 6"

GROUT Cement Bentonite SCREEN SIZE 10 MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 15 HRS. PUMPED 4 @ 12 GPM DRAWDOWN TO 30 FT.

log of asing

DEPTH		HOLE DIAMETER / CASING DIAMETER FORMATION
5'	0	SAND
	5	SAND
	10	SAND
10'	15	SAND
	20	SAND & SILT
	25	SAND & SILT
	30	SAND SILT
10'	35	SAND SILT
	40	SAND SILT
	45	SAND SILT
	50	WATER
	55	GRAVEL
10'	60	GRAVEL WATER
20'		

SOIL DATA TO 15 FT.
FEET THAWED 0 - 60
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE Good
APPEARANCE FRESH Yes
AFTER 24 HOURS _____
IRON 2 PPM
CHLORIDES _____
TDS _____

PUMP TEST 15 · STATIC LEVEL
PUMPING LEVEL 30 @ 12 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 12
WILL STATIC LEVEL CHANGE WITH
TIDES no OR FROST no

DEVELOP PROCEDURE _____

ESTIMATED MAN HOURS FOR DRILLING _____ HOURS FOR TOTAL JOB _____

CREW Archibald ST Anthony

KAN. Anch

SEP 3 REC'D

3/15/74

WATER ANALYSIS REPORT FORM

Dr. Paul

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

C 154

NAME OR LOCATION: PORT HEIDEN

COLLECTED BY: R.FLMORE DATE JULY ,1974 HOUR:

WATER SYSTEM

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

PURPOSE OF ANALYSIS

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

COLUMN 1 COLUMN 2 COLUMN 3

	Analysis	Limits
Iron (Fe)	2.72	0.3
Fluoride (F)	0.79	1.5
Chloride (Cl)	98	250
Phosphate (PO_4)	0.12	.05 good 30 poor
Total Hardness	83	50 soft 300 hard
Detergents	0	0
pH	7.21	6.5 8.5
Specific Conductance	371	

Recd 8/6/74

	Anal.	Limit
Magnesium (Mg)	18	125
Calcium (Ca)	8	300
Turbidity	24	5
Color	>300	15
Bicarbonate (HCO_3)	118	25 good 500 poor
Carbonate	0	350
Alkalinity	97	350
Total Dissolved Solids	324	500

	Analysis	Limits
Sodium (Na)		200
Potassium (K)		
Sulfate (SO_4)		250
Sulfite **(SO_3)		5.0
Nitrate (NO_3)		10
Suspended Solids		
Arsenic (As)		0.01
Copper (Cu)		1.0
Cyanide (Cn)		0.01
Phenols		0.00
Zinc (Zn)		5.0
Barium (Ba)		1.0
Cadmium (Cd)		0.01
Lead Pb)		0.05
Silver (Ag)		0.05
Mercury (Hg)		0.05
Manganese (Mn)		0.05

COMMENTS:

INSTRUCTIONS:

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

8/9/74 MO Mattson

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

OCT 9

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION PORT HEIDEN HUD SUBDIV. LOT 10 Block 1 DATE STARTED 12-3-82

DATE COMPLETED 12-4-82 DRILLER ARCHIBALD

TOTAL DEPTH OF WELL 63 FT. CASING INSTALLED 60' DIAMETER 6"

GROUT Cement Bentonite 20' SCREEN SIZE 10 MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 17' HRS. PUMPED 8 @ 15 GPM DRAWDOWN 2'6" FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH	FORMATION
0	SAND
10	SAND
	SILT mix
20	SAND
30	SAND
40	SAND
45	Brown SILT
	GRAVEL
60'	WATER
	Screen
63	

SOIL DATA TO 15 FT.
FEET THAWED 0-60
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE None
APPEARANCE FRESH Clear
AFTER ~~24~~ HOURS Same
IRON 2 PPM
CHLORIDES N/A
TDS N/A

PUMP TEST 17' - STATIC LEVEL
PUMPING LEVEL 19'6" @ 15 GPM
AFTER 8 HRS.

HIGHEST RECOMMENDED PUMP RATE 15
WILL STATIC LEVEL CHANGE WITH
TIDES NO OR FROST NO

DEVELOP PROCEDURE Surge 30 min

ESTIMATED MAN HOURS FOR DRILLING _____ HOURS FOR TOTAL JOB _____

CREW M. Archibald S. St Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heiden Lot 7 Block 2 DATE STARTED Jan 14, 1993

DATE COMPLETED Jan 16, 1993 DRILLER Rick Hendricks

TOTAL DEPTH OF WELL 62' FT. CASING INSTALLED 59' DIAMETER 6"

GROUT 20 SCREEN SIZE 6 slot MFG. Johnson LENGTH 3' 7"

STATIC WATER LEVEL 19' HRS. PUMPED 4 @ 15 GPM DRAWDOWN 22'5" FT.

og. of
SING DEPTH

HOLE DIAMETER
CASING DIAMETER
FORMATION

Brown sand
to 30'
Gravel to 45'
water sand
to 65'

SOIL DATA TO 15 FT.
FEET THAWED 8" Frost
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE
APPEARANCE FRESH
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 22'5" - STATIC LEVEL
PUMPING LEVEL 22'5" @ 15 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE
WILL STATIC LEVEL CHANGE WITH
TIDES OR FROST

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING 20 HOURS FOR TOTAL JOB 30

CREW Rick Hendricks Steve St. Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Polk Heidon Lot 6 Block 2 * DATE STARTED Jan 24 1993

DATE COMPLETED Jan 26, 1993 DRILLER Rick Hendricks

TOTAL DEPTH OF WELL 64' FT. CASING INSTALLED 62 DIAMETER 6"

GROUT 20 SCREEN SIZE 6 MFG. Johnson LENGTH 3' 7"

STATIC WATER LEVEL 20'3" HRS. PUMPED 4 @ 15 GPM DRAWDOWN 22'6" FT.

Dg. of
SING DEPTH

HOLE DIAMETER
CASING DIAMETER
FORMATION

Sand to 8'
Hard pan to 10'
Silt sand to 45'
Gravel to 65'

SOIL DATA TO 15 FT.
FEET THAWED
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE
APPEARANCE FRESH
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 20'3" - STATIC LEVEL
PUMPING LEVEL 22'6" @ 15 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 30 gpm
WILL STATIC LEVEL CHANGE WITH
TIDES No OR FROST No

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING 20 HOURS FOR TOTAL JOB 30

CREW Rick Hendricks Steve St. Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heiden Block 2 Lot 5 II DATE STARTED Jan 19, 1983

DATE COMPLETED Jan 21, 1983 DRILLER Rick Hendricks

TOTAL DEPTH OF WELL 65' FT. CASING INSTALLED 62' DIAMETER 6"

GROUT 20 SCREEN SIZE 10 slot MFG. Johnson LENGTH 3' 7"

STATIC WATER LEVEL 20' HRS. PUMPED 4 @ 15 GPM DRAWDOWN 23' 8" FT.

og of
sing

DEPTH	HOLE DIAMETER / CASING DIAMETER	FORMATION
		0 to 23'
		Brown sand
		Gravel silt
		to 45'
		Sand to 65'

SOIL DATA TO 15 FT.
FEET THAWED 10" Boulders
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE fresh
APPEARANCE FRESH
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 20' - STATIC LEVEL
PUMPING LEVEL 23' 8" @ 15 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 30 gpm
WILL STATIC LEVEL CHANGE WITH
TIDES No OR FROST No

DEVELOP PROCEDURE Surge Test Pump

ESTIMATED MAN HOURS FOR DRILLING 20 hrs HOURS FOR TOTAL JOB 30 hrs

CREW Rick Hendricks Steve St. Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heidon Block 2 Lot 4 DATE STARTED Jan 28, 1983

DATE COMPLETED Jan 31, 1983 DRILLER Rich Hendricks

TOTAL DEPTH OF WELL 55' FT. CASING INSTALLED 52' DIAMETER 6"

GROUT 20 SCREEN SIZE 10 slot MFG. Johnson LENGTH 3' 6"

STATIC WATER LEVEL _____ HRS. PUMPED _____ @ _____ GPM DRAWDOWN _____ FT.

og of asing DEPTH | HOLE DIAMETER / CASING DIAMETER | FORMATION

Sand to 5'

Sand pea to 60'

Sand silt to 40'

Gravel water to 55'

SOIL DATA TO 15 FT.
FEET THAWED Frost 10"
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE _____
APPEARANCE FRESH _____
AFTER 24 HOURS _____
IRON _____
CHLORIDES _____
TDS _____

PUMP TEST 21' - STATIC LEVEL
PUMPING LEVEL 53' @ 5 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE
WILL STATIC LEVEL CHANGE WITH
TIDES no OR FROST no

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING 30 HOURS FOR TOTAL JOB 40

CREW Rich Hendricks Steve St-Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

CATION Port Heiden (14 m South of Gold Fish Lake) DATE STARTED April 28, 1979

TE COMPLETED July 22, 1979 DRILLER Anderson - Horner - Estabrook

TAL DEPTH OF WELL 162 FT. CASING INSTALLED 158' DIAMETER 6"

OUT _____ SCREEN SIZE 15 slot MFG. Johnson LENGTH 5

ATIC WATER LEVEL _____ HRS. PUMPED _____ @ _____ GPM DRAWDOWN _____ FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH		FORMATION
" Grout Pipe		0-2' Muskeg 2-5' Frozen 5-15 Sand, silt and organics 15-35 Sand and gravel-H_2O 35-45 Blue clay 45-99 very silty Black Sand 99-101 Coarse sand, angular 101-112 Fine silty sand
Confining Layer	→	112-120 Blue clay
		120-150 Soft rock and sands 150-155 Sand w/H_2O (Heaving) 155-160 Coarse sand and H_2O (Heaving) 160-165 Fine sand and H_2O (Heaving)
slot screen t at 157-162 T.O.C.		

SOIL DATA TO 15 FT.
FEET THAWED 2'
BOTTOM OF FROST & MATERIAL 5'
SEASONAL OR PERMA FROST Seasonal

WATER DATA FIELD TEST
TASTE Iron
APPEARANCE FRESH _____
AFTER 24 HOURS _____
IRON _____
CHLORIDES _____
TDS _____

PUMP TEST _____ · STATIC LEVEL
PUMPING LEVEL _____ @ _____ GPM
AFTER _____ HRS.

HIGHEST RECOMMENDED PUMP RATE
WILL STATIC LEVEL CHANGE WITH TIDES _____ OR FROST N/A

ELOP PROCEDURE Surge and test bail

IMATED MAN HOURS FOR DRILLING _____ HOURS FOR TOTAL JOB _____

W M. Anderson - H. Horner - G. Estabrook

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heiden Lot 2 Block 2 DATE STARTED Feb 4, 1983

DATE COMPLETED Feb 5, 1983 DRILLER Rick Hendricks

TOTAL DEPTH OF WELL 75' FT. CASING INSTALLED 72' DIAMETER 6

GROUT 2c SCREEN SIZE 6 Slot MFG. Johnson LENGTH 3' 7"

STATIC WATER LEVEL 26' HRS. PUMPED 4 @ 15 GPM DRAWDOWN 29' FT.

og. of
sing DEPTH | HOLE DIAMETER / CASING DIAMETER | FORMATION

Sand boulders to 15'
Sand silt to 45'
Gravel to 75' Lit water at 45'

SOIL DATA TO 15 FT.
FEET THAWED 10" frost
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE
APPEARANCE FRESH
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 26' - STATIC LEVEL
PUMPING LEVEL 29' @ 15 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE
WILL STATIC LEVEL CHANGE WITH
TIDES no OR FROST no

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING 10 HOURS FOR TOTAL JOB 15

CREW Steve St. Anthony Rick Hendricks

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heiden Block 2 Lot 1 DATE STARTED Feb 6, 1993

DATE COMPLETED Feb 7, 1993 DRILLER Steve St. Anthony

TOTAL DEPTH OF WELL 70' FT. CASING INSTALLED 67' DIAMETER 6"

GROUT 20 SCREEN SIZE 6 MFG. Johnson LENGTH 3'7"

STATIC WATER LEVEL 26' HRS. PUMPED 4 @ 15 GPM DRAWDOWN 52' FT.

log of casing

DEPTH	HOLE DIAMETER / CASING DIAMETER	FORMATION
		Sand boulders
		to 15'
		Sand silt
		to 45'
		Water gravel
		to 70'

SOIL DATA TO 15 FT.
FEET THAWED 10" Frost
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE
APPEARANCE FRESH
AFTER 24 HOURS
IRON
CHLORIDES
TDS

PUMP TEST 26' - STATIC LEVEL
PUMPING LEVEL 52' @ 15 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 5 GPM
WILL STATIC LEVEL CHANGE WITH TIDES No OR FROST No

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING 10 HOURS FOR TOTAL JOB 15

CREW Steve St. Anthony Rich Hendricks

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Heldek H.U.D. SUBDIV LT 9 B2 DATE STARTED 12-5-82

DATE COMPLETED 12 7 82 DRILLER ARCHIBALD

TOTAL DEPTH OF WELL 59 FT. CASING INSTALLED 56' 4" DIAMETER 6"

GROUT Cement Bentonite SCREEN SIZE 10 MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 16' HRS. PUMPED 12 @ 6 GPM DRAWDOWN 10 53' FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH	FORMATION
0	
	SI
	CLAY
	SAND
	MIX
53'	GRAVEL
54	
	GRAVEL W/ WATER
	10 SLOT 3' SCREEN
59	

SOIL DATA TO 15 FT.
FEET THAWED 0-59
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE None
APPEARANCE FRESH Yes
AFTER 24 HOURS
IRON 2 PPM
CHLORIDES
TDS

PUMP TEST 16' STATIC LEVEL
PUMPING LEVEL 53 @ 6 GPM
AFTER 12 HRS.

HIGHEST RECOMMENDED PUMP RATE 6
WILL STATIC LEVEL CHANGE WITH
TIDES OR FROST

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING HOURS FOR TOTAL JOB

CREW Archibald St Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION Port Hellen HUD. lot 8 Blc 2 DATE STARTED 12-8-82

DATE COMPLETED 12 9 82 DRILLER ARCHIBALD

TOTAL DEPTH OF WELL 61'6" FT. CASING INSTALLED 58'4" DIAMETER 6

GROUT Cement Bentonite SCREEN SIZE 10 MFG. Johnson LENGTH 3'

STATIC WATER LEVEL 16'10" HRS. PUMPED 4 @ 10 GPM DRAWDOWN 22'3" FT.

HOLE DIAMETER
CASING DIAMETER

DEPTH	FORMATION
	SILTY
	SAND
	TO
45'	
	SILT
	SAND
	GRAVEL mix
55'	
	COARSE GRAVEL
58'6"	WATER
10 SLOT SCREEN	
61'6"	

SOIL DATA TO 15 FT.
FEET THAWED 0-60
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE None
APPEARANCE FRESH
AFTER 24 HOURS
IRON 2 PPM
CHLORIDES
TDS

PUMP TEST 16'6" - STATIC LEVEL
PUMPING LEVEL 22'3" @ 10 GPM
AFTER 4 HRS.

HIGHEST RECOMMENDED PUMP RATE 10
WILL STATIC LEVEL CHANGE WITH
TIDES, OR FROST

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING HOURS FOR TOTAL JOB

CREW ARCHIBALD St Anthony

WELL LOG

U.S. PUBLIC HEALTH SERVICE, DIVISION OF INDIAN HEALTH

LOCATION PORT HEDEN Block 2 H.U.D SUB. DIV. LOT 10 DATE STARTED _____

DATE COMPLETED 11-1-82 DRILLER ARCHIBALD

TOTAL DEPTH OF WELL 65 FT. CASING INSTALLED 62 DIAMETER 6"

GROUT Cement Bentonite SCREEN SIZE 10 SLOT MFG. Johnson LENGTH 5'

STATIC WATER LEVEL 16 HRS. PUMPED 12 @ 15 GPM DRAWDOWN 0 22 FT.

DEPTH	HOLE DIAMETER / CASING DIAMETER	FORMATION
0		
TOP SOIL 4		
		SILTY
		GRAVEL
40		
		GRAVEL
45		SILT
		SILT
52		
62' CASING		BLUE
	SCREEN	SAND
65		WATER

WATER TO MUCH SILT CONTENT

SOIL DATA TO 15 FT.
FEET THAWED 0-15
BOTTOM OF FROST & MATERIAL
SEASONAL OR PERMA FROST

WATER DATA FIELD TEST
TASTE None
APPEARANCE FRESH Yes
AFTER 24 HOURS _____
IRON 2 PPM
CHLORIDES _____
TDS _____

PUMP TEST 16 - STATIC LEVEL
PUMPING LEVEL 24 @ 15 GPM
AFTER 12 HRS.

HIGHEST RECOMMENDED PUMP RATE 15
WILL STATIC LEVEL CHANGE WITH
TIDES _____ OR FROST _____

DEVELOP PROCEDURE Surge

ESTIMATED MAN HOURS FOR DRILLING _____ HOURS FOR TOTAL JOB _____

CREW Archibald St Anthony

APPENDIX 4

Port Heiden Well Report, a written communication from R. Ingersoll,
U.S. Public Health Service

The Port Heiden Village Council requested assistance from the U.S. Public Health Service in March 1974 to drill a deep well and develop a watering point for the community. The Indian Health Service (IHS), of the Public Health Service, acting under Public Law 86-121 (OMB 13.229) commenced drilling in May 1979. The drilling of the Port Heiden Well was done by the cable tool pecussion method with a Kirk - Hillman drill rig.

The formations drilled through were of unconsolidated rock mostly of glacial origin. Drilling through unconsolidated material was accomplished by loosening the rock fragments by the repetitive impact action of the drill bit which produces a slurry - like mixture with the water in the hole. A jet pump supplied water from nearby Goldfish Lake.

The drill log of the formations encountered and a schematic drawing is on the following pages. The drill log was determined by examining the samples coming out of the hole when bailing. At first a dart valve bailer was used, but later on a sand pump was found to be more efficient.

Two sizes of casing were used at the site, 8-inch and 6-inch. The outer 8-inch casing penetrated to a 31 foot depth to a layer of low permeability which in this case was a blue clay. However, due to heaving problems it was not penetrated properly. The outer casing's purpose is to keep the hole open for a grout seal at the completion of the well. The inside 6-inch casing closely follows the progress of the drill bit. Its purpose is to prevent caving and keep the hole open in unconsolidated materials. Many problems occurred near the end of the casing driving process. Sand heaved up into the hole several times and once as much as 35 feet. Welding and cutting pipe for casing was required frequently in the driving and bumping process. Most of this type of work was handled by Henry Horner as shown in the accompanying photographs.

An as-built was made of the well location. There is a possibility that the village may move to the north side of Goldfish Lake in a few years due to a serious beach erosion problem.

A confined aquifer was encountered at the 150 foot depth. A 5 foot 15 slot Johnson Watermark well screen was selected and installed by the pull back method. This is where the screen is set at the bottom of the casing and the casing is then pulled back to expose the screen.

After setting the screen, the outside casing was bumped out and grout was pumped into the annular space. This was the first well where we used a grout pump. It worked fairly well, but there was not enough clearance between the outside and inside casing to move the copper tubing grout line down to the bottom of the outside casing. In the future a larger outside casing will be used. A grout mix of

approximately 10 to 12 gallons of water, 5 to 10 lbs. of bentonite to one sack of type 1 portland cement. Initially a mix of 6 gallons water, one can of bentonite (3 lb. coffee can) was added to a sack of cement. However, the mix proved to be to be much too thick to be pumped through the grout pipe. All 8 bags of concrete available were used and the remaining annulus was filled with gravel as advised by myself.

Development of the well was done by a surge block assembly. Development increases permeability of the natural formation, stabilizes the sand, and corrects any damage to the formation. Surging and bailing was done for five hours.

Many problems occurred during test pumping because it was difficult to get a constant steady source of electricity. The generator on the welding unit could not supply the right voltage so the pump would stop after a short period of time. In addition, the village was having trouble with their diesel generator so it would shut off intermittantly. However, a 9 hour drawdown test was obtained running the pump at a constant 25 gallons per minute (gpm).

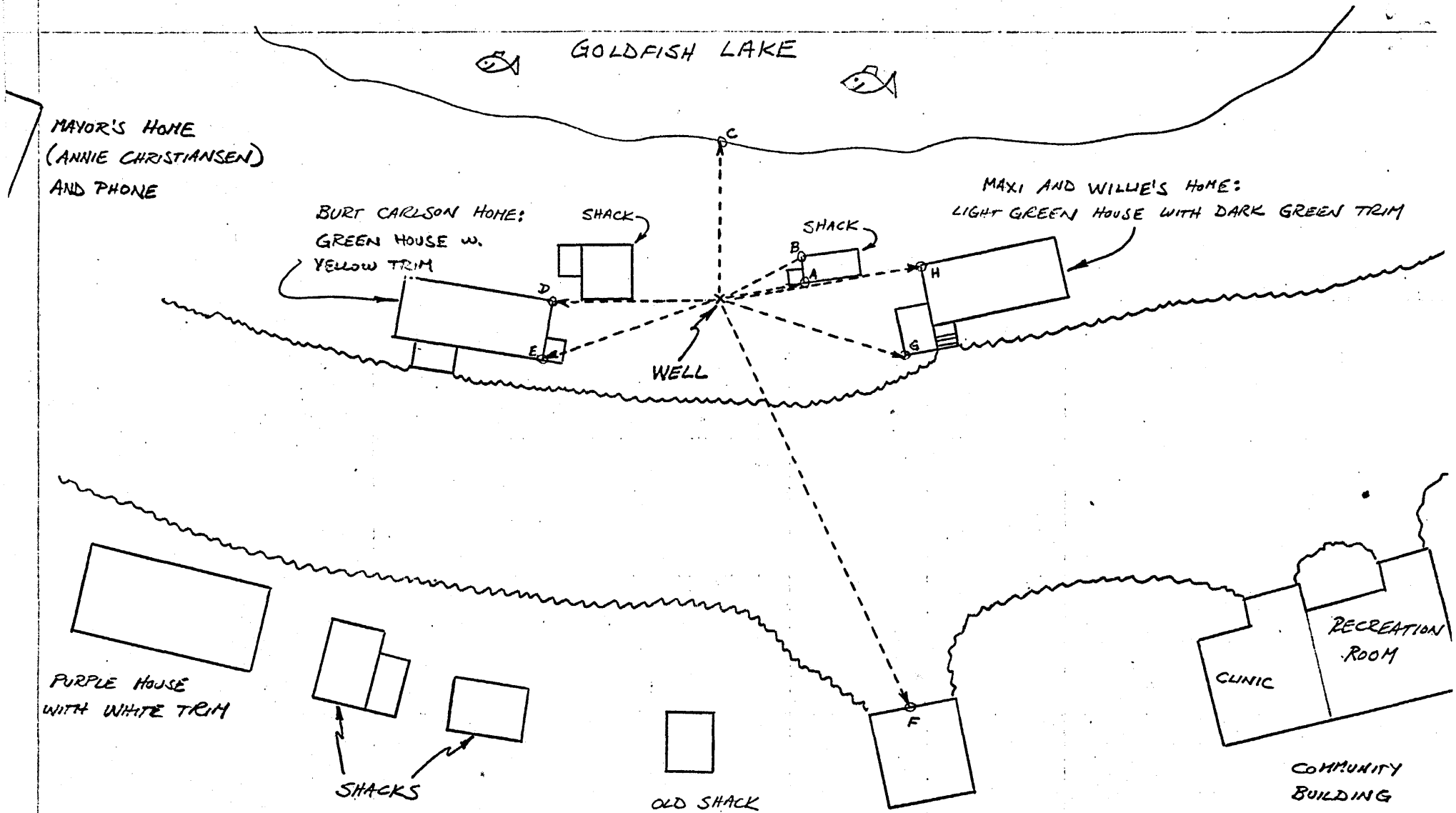
The quality of the water was visibly poor due to the high iron content. Lab tests were run on a sample and the results are on the following page. It should also be noted that a rough level was run from the high tide mark of the Bristol Bay which is approximately 1,200 feet from the well. The top of the casing was found to be 16.5 feet above the high tide mark which would mean that the static water level in the well has approximately 2 feet of head above high tide. Thus over pumping should be avoided due to the threat of salt water intrusion. The maximum transmitting capacity from a well with a 15 slot screen at the recommended entrance velocity of 0.1 ft./sec is calculated by multiplying the number of square inches of open area by a factor of 0.31 (Reference - "Groundwater and Wells", Johnson, pp. 193 and 194)

$$\text{Transmitting Capacity} = 0.31\ (30\ \text{gpm})\ (5\ \text{ft.}) = 46.5\ \text{gpm}$$

The well was test pumped at 25 gpm which is then less than the transmitting capacity of the screen.

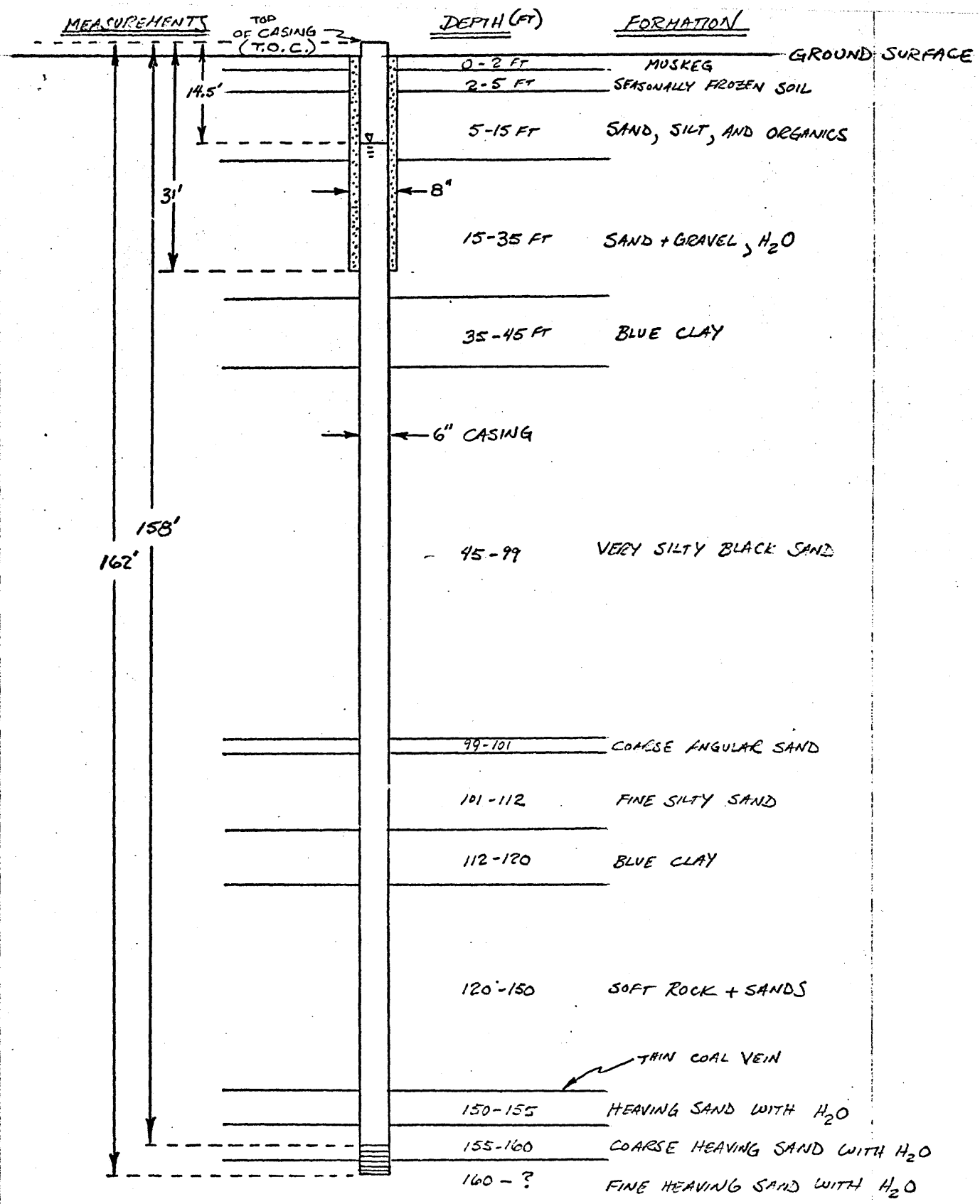
After test pumping a concentrated solution of HTH (dry chlorine) and water was poured down the well for disinfection purposes. Finally the rig was taken apart for transporting to the airport. Basically the mast was taken down and then the frame with the engine was dragged on skids to the airport.

FORT HEIDEN WELL LOCATION



DISTANCES

XA = 31'	XD = 60'	XG = 70'
XB = 32'6"	XE = 68'	XH = 73'
XC = 46'	XF ≈ 165'	



SUMMARY OF WELL INFORMATION

- DRILLING DATES - 4/28/79 TO 7/22/79
- DRILLERS — HORNER, ANDERSON, ESTABROOK
- TOTAL DEPTH 162', TOTAL LENGTH OF 6" CASING 158' 6"
- DISCONTINUOUS GROUT TO 31'
- SCREEN : SIZE - JOHNSON 15 SLOT, LENGTH - 5'
- STATIC WATER LEVEL - 14.5' FROM TOP OF CASING (T.O.C.)
- HOURS PUMPED FOR DRAWDOWN - 8 ± HOURS