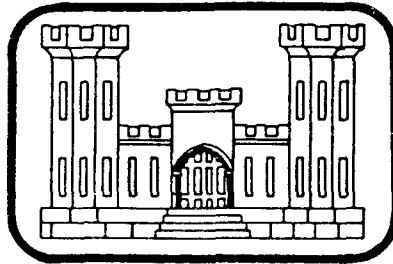


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US Army Corps
Of Engineers

Alaska District



Defense Environmental Restoration Account

City of Gambell and Northeast Cape,
St. Lawrence Island, Alaska
Contract No. DACA85-85-C-0036

**Preliminary Reconnaissance:
Surface & Subsurface Water Sampling,
Gambell, Alaska**

December 1985

URS
Corporation
Anchorage, Alaska

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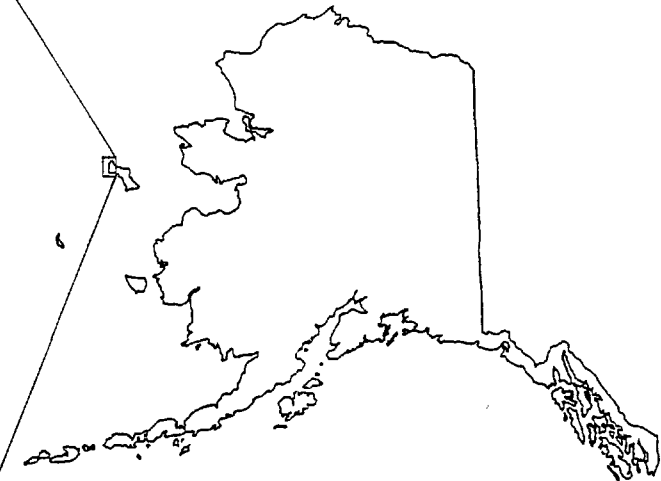
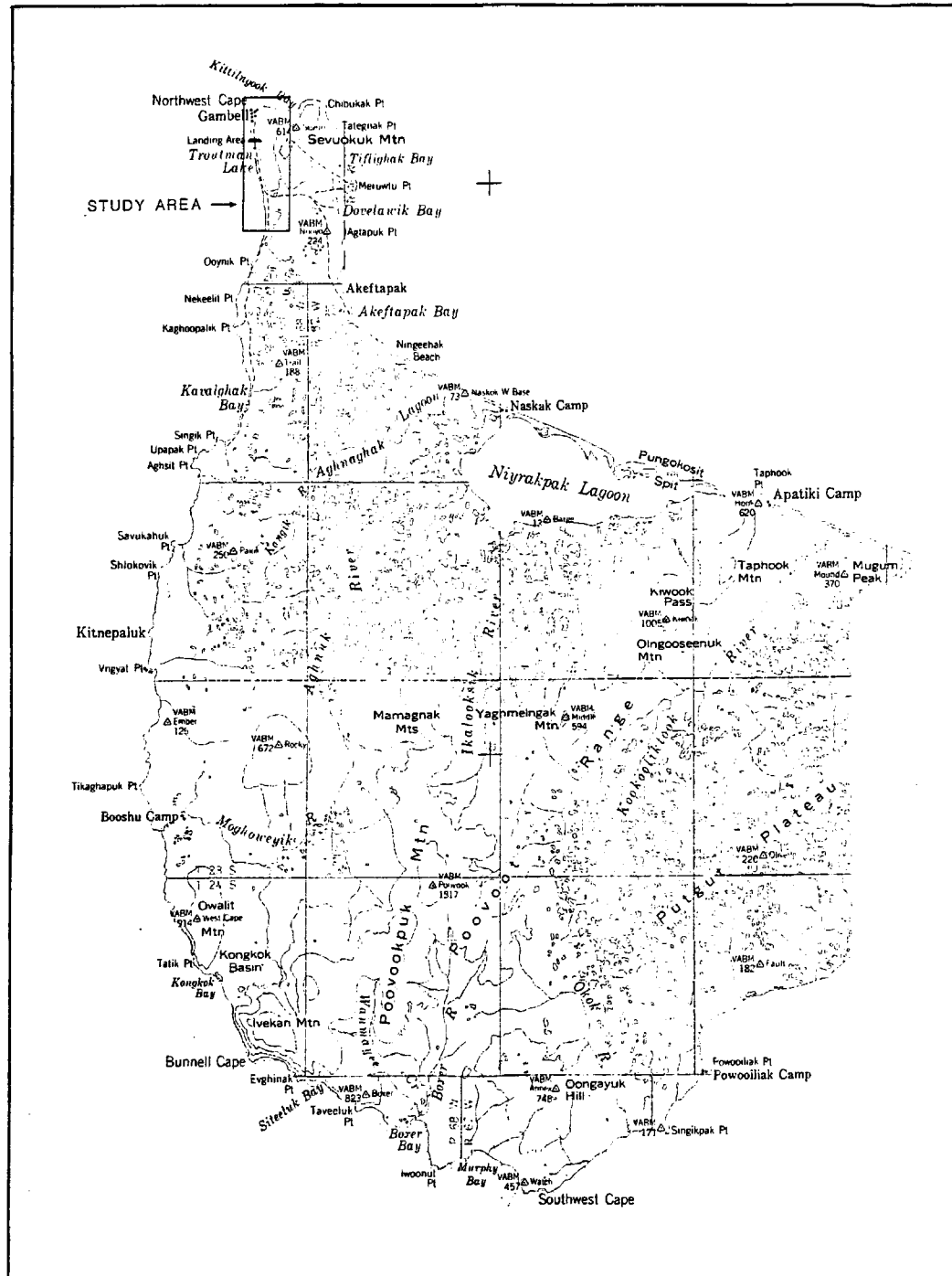
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1.0

INTRODUCTION

This document is a supplement to a three volume set previously developed by URS Corporation, Anchorage Regional Office, for the U.S. Army Corps of Engineers, Alaska District. This work is being conducted under the Defense Environmental Restoration Account, as authorized under the Department of Defense Appropriations Act of 1984 (Public Law 98-212), and implements the cleanup of former military sites in the City of Gambell and Northeast Cape, St. Lawrence Island, Alaska.

This document addresses the laboratory test results from a preliminary site reconnaissance conducted for subsurface and surface water quality in Gambell, Alaska, for the U.S. Army Corps of Engineers, Alaska District, in July of 1985. This sampling was conducted to provide preliminary information concerning potentially hazardous water contaminants which might be associated with former military activities. The location of the project area is indicated in Figure 1.



GAMBELL, ALASKA

**FIGURE 1
SITE VICINITY PLAN**

Prepared For: *RZA, INC.*
 URS Corporation By: *Geotechnical Consultants*
 Date: AUGUST 1985
 Scale: N/A

*3105 A Lakeshore Drive,
 Suite 103
 Anchorage, Alaska 99503*

2.0 Project Description

2.1 Scope of Work

URS Corporation/Anchorage was selected to provide engineering services for this project under Contract No. DACA85-85-C-0036, in accordance with the Scope of Work dated May 17, 1985. The formal Award of Contract and Notice-to-Proceed was issued on June 3, 1985. Under this contract, the Army Corps of Engineers authorized URS to obtain the following water samples in the Gambell project area:

- o EPA priority pollutants (including PCBs)-1; and
- o EPA drinking water standards-1.

In implementing its field program, URS determined that additional sampling would be possible within the constraints of the project budget.

The sampling focused upon five sites identified during the field reconnaissance as burial sites posing a risk for contamination, particularly those known to have contained electrical equipment or potentially harmful substances. The water sampling was conducted in conjunction with a subsurface exploration program utilizing soils borings and magnetometry to define burial areas and soil characteristics. In addition, water samples were obtained from the community infiltration gallery, an old village well, and two local surface water bodies, Nayvaghaq and Troutman Lakes.

A detailed discussion of geophysical and geotechnical aspects of this investigation are presented in a previously submitted report, "Geotechnical, Geophysical & Soil/Groundwater Quality Studies: Defense Environmental Restoration Program (DERP), Gambell, St. Lawrence Island, Alaska".

The sampling effort was limited to single sample analyses for the following parameters:

- o EPA drinking water standards - Sites 1 through 5, Nayvaghaq Lake, Troutman Lake, old village well, and infiltration gallery;
- o PCBs - same as above;
- o Fecal coliform - Site 4;
- o EPA priority pollutants - Sites 3 and 4.

Specific testing parameters for EPA priority pollutants, as identified by EPA's Hazardous Substance List, and EPA drinking water standards are listed in Section 3.0.

2.2 Water Sampling Strategies

Sampling site locations were selected based upon historical and local community information concerning the location of former military facilities suspected of having contained hazardous materials. Of particular concern were areas identified as having

had large electrical installations, such as power stations or radar facilities, at which PCB-contaminated materials could potentially have been buried during the original demolition of the military's sites. An additional area of concern was a former military landfill area containing 55-gallon drums of human waste.

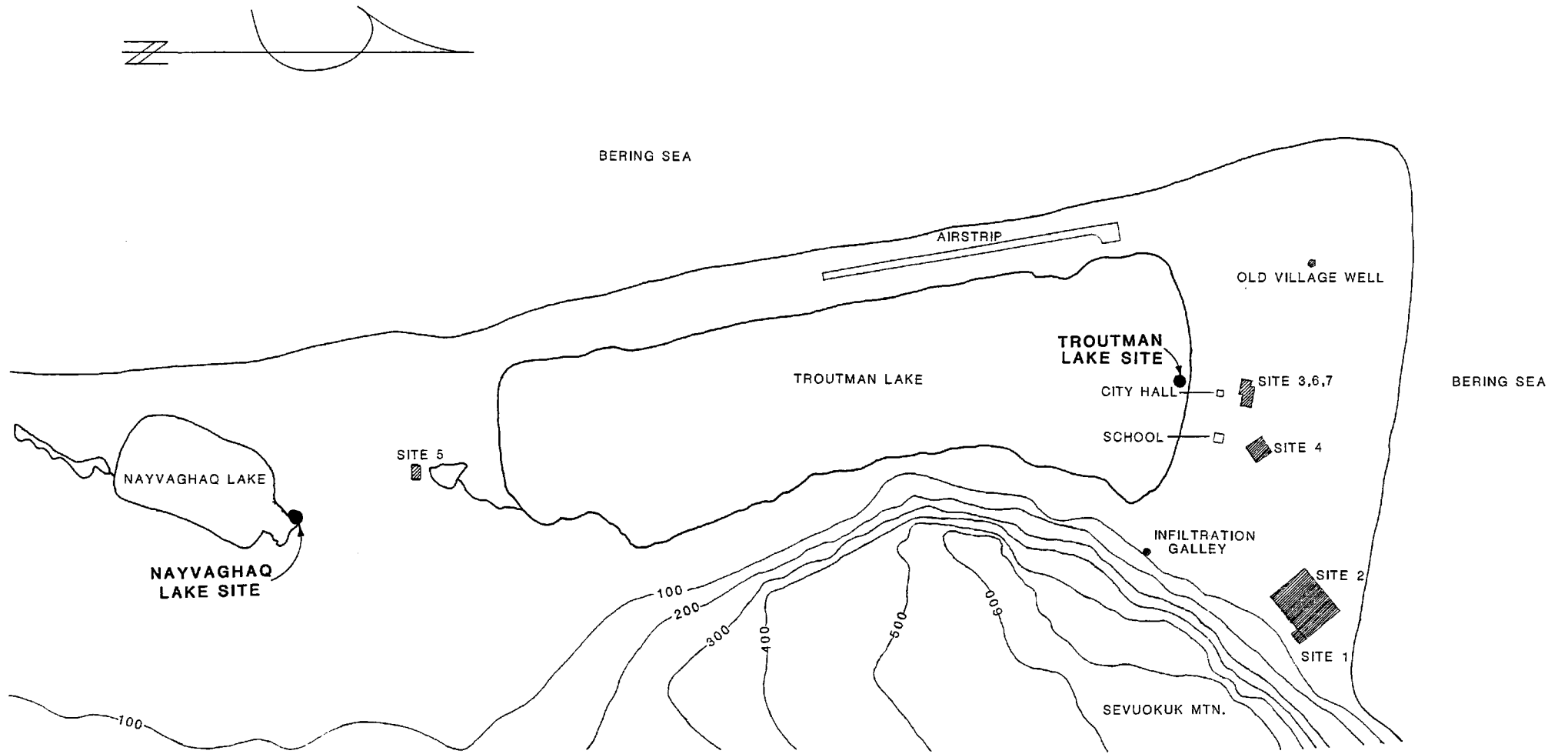
The water sampling program was coordinated with magnetometer studies and subsurface soil exploration of the sites. In those areas chosen for water sampling, ground water monitoring wells were placed in or near areas of high magnetic anomaly, which are inferred to be areas of debris concentration. Where nondescript anomalies occurred, local input from community members concerning the facilities and their location aided in well placement.

The monitoring wells consisted of 1.25 inch O.D. polyvinylchloride (PVC) threaded casing with 0.020 inch machine slot bottoming screens. Bottoming screens were placed approximately 2.5 feet into frozen material leaving a minimum of 2.5 feet of screen within thawed material. The remainder of the well was unslotted casing. This method of well placement permitted sampling of ground water nearest the freezing front, ideally the base of the active zone. In theory, any pollutant contamination within ground water having a higher specific gravity than water should, over time, migrate to the base of the active zone. Since PCB's are considered to be a possible pollution threat in Gambell, and are heavier than water, the sampling effort was designed to obtain water and soil samples from near the base of the active zone.

Water samples were obtained from the monitoring wells by using a PVC hand bailer. A total of six wells were installed. All sampling was conducted in such a manner as to reduce potential cross contamination, and in accordance with guidelines such as EPA's Characterization of Hazardous Waste Sites - A Methods Manual: Volume II, Available Sampling Methods (2nd Edition). The exteriors of all sample containers were decontaminated prior to final labelling. Each sample container was individually enclosed in a watertight membrane for shipment. As per laboratory instructions, selected samples were kept at approximately 4 degrees F during shipment to respective laboratories.

In addition to these wells, bulk water samples were also obtained at four other locations. Surface water samples were obtained at the northern portions of Troutman Lake and Nayvaghaq Lake, as shown in Figure 2. A bulk sample was obtained from the community's infiltration gallery, which provides potable water for the City of Gambell. A bulk sample was also obtained from the old village well, which is utilized by the community for a variety of nonpotable water usages.

Water samples were analyzed for broad spectrum water quality, including grease and oil contamination. Fecal coliform and EPA priority pollutants were tested for in selected samples. Water samples were collected as discrete samples, and all test results are based upon single sample analyses.



GAMBELL, ALASKA

**FIGURE 2
SAMPLING PROGRAM SITE PLAN**

Base map provided by U.S. Corps of Engineers

Prepared For *RZA, INC.*
 URS Corporation By: *Geotechnical Consultants*
 Date AUGUST 1985 *3105 A Lakeshore Drive,*
 Scale N/A *Suite 103*
Anchorage, Alaska 99503

2.3 General Sampling Area

The selected sites all have similar topographic, depositional and hydrologic characteristics, as well as a uniformity of soil types. Generally, the site areas are located within the old beach ridges on which the village of Gambell is located. These soils are characterized by rounded to subrounded grains, medium dense sands and gravels with a high permeability rate. There is little evidence of surface ponded water, except for several well established lakes, (i.e., Troutman Lake and Nayvaghaq Lake). Historical information indicates that saltwater intrusions exist throughout the spit area, as evidenced by past encroachment upon wells and Troutman Lake, limiting their potential as water sources. It is within these marine coastal sediments that the groundwater studies were conducted.

3.0 Gambell Reconnaissance Sampling

3.1 Sample Analyses

The analytical results of this preliminary field reconnaissance have been organized into three categories to simplify the tabular presentation of this data. These results are presented as:

- o Physical characteristics;
- o Biological characteristics; and
- o Chemical characteristics.

The last category, chemical characteristics, is further reduced to three areas:

- o Water quality;
- o Inorganic materials; and
- o Organic materials.

Analyses for general water quality parameters were performed by Chemical and Geological Laboratories of Alaska, Inc., based upon guidelines established by EPA and the State of Alaska's Department of Environmental Conservation (ADEC). Special analyses for PCBs and organic materials from EPA's Hazardous Substance List were performed by IT Corporation, an Army Corps of Engineers approved testing lab.

3.1.1 Data Interpretation

The data presented in this document is the result of a reconnaissance level sampling survey, and all information is the result of single sample or grab composite sample analyses. This approach, while satisfactory for a preliminary or reconnaissance level survey, provides no sensitivity for quantifying the variability inherent in sampling techniques, transport and storage of samples, and analytical protocols. Therefore, data which suggests that a parameter is above or below some standard must be interpreted with caution.

The intent of this sampling was to provide preliminary information concerning potential contaminants or parameters which may merit closer examination at the sites. This data is not intended for establishment of conclusions or recommendations concerning areal impact by former military activities; rather, this information is intended to assist in determining where additional studies may be required.

3.1.2 Physical Characteristics

Typical physical characteristics of a water source include its total solids content (TDS), odor and color. Total solids include suspended and filterable solids present in the water sample, and mainly affect the aesthetic qualities of a water source. The Alaska Department of Environmental Conservation (ADEC) treats total dissolved solids as a secondary characteristic of potable water

sources, and uses a maximum concentration of 500 mg/l as a guideline for public water supplies. Color and odor were assessed qualitatively in the field. Test results for these three parameters are shown in Table 1.

3.1.3 Biological Characteristics

Biological characteristics generally concern the availability of growth-promoting materials in a water source. The elements nitrogen and phosphorous are essential as nutrients in biological systems. Typical nitrogen compounds of interest are ammonia-N, nitrate-N, and of lesser importance nitrite-N; phosphorous is generally measured as ortho-phosphate, which is readily available for biological metabolism. Additionally, the presence of indicator organisms such as coliforms can aid in the detection of human impacts upon the water system. Nutrients were measured at all sampling sites; fecal coliform samples were only collected in Site 4. These parameters are shown in Table 2.

3.1.4 Chemical Characteristics

The discussion of chemical characteristics is based upon testing performed for detection of materials listed as EPA priority pollutants and for conformance to EPA drinking water standards. This testing includes the measurement of selected inorganic and organic species, organic content, and other water quality parameters.

A. Water Quality Parameters

Five common water quality parameters of concern include pH, conductivity, alkalinity, hardness, and chemical oxygen demand. These parameters are generally considered secondary standards which mainly affect the aesthetic qualities of drinking water, but do not directly affect public health unless significantly high concentrations occur. In practical terms, none of the sampling sites, with the exception of the infiltration gallery, are considered usable by the community for potable water usage. However, the usage of EPA drinking water standards does provide a standard against which to compare analytical parameters. The results of Gambell's water sample testing are shown in Table 3.

The hydrogen-ion concentration of a water source is important due to the rather narrow range in which most biological reactions occur and the chemical speciations which occur in given ranges. ADEC's guidelines allow a pH range of 6.5 to 8.5 for public water systems. Alkalinity is a measurement of the ability of a water source to resist, or buffer, pH change by neutralizing hydrogen ions, expressed in terms of an equivalent amount of calcium carbonate.

TABLE (1): PHYSICAL CHARACTERISTICS

CHARACTERISTIC	MAXIMUM POTABLE CONC.	SITE 1: SAMPLE 1-1	SITE 2: SAMPLE 2-1	SITE 3: SAMPLE 3-1	SITE 4: SAMPLE 4-1	SITE 4: SAMPLE 4-2	SITE 5: SAMPLE 5-1	NAYVABHAG LAKE	TROUTMAN LAKE	OLD VILLAGE WELL	INFILT. GALLERY
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
TOTAL DISSOLVED SOLIDS (TDS)	500	143	175	960	100	210	70	176	675	670	48
ODOR	#3 ODOR THRESHOLD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
COLOR	15 UNITS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND: This characteristic not detected during field investigations.

TABLE (2): BIOLOGICAL CHARACTERISTICS

CHARACTERISTIC	MAXIMUM POTABLE CONC.	SITE 1: SAMPLE 1-1	SITE 2: SAMPLE 2-1	SITE 3: SAMPLE 3-1	SITE 4: SAMPLE 4-1	SITE 4: SAMPLE 4-2	SITE 5: SAMPLE 5-1	NAYVABHAG LAKE	TROUTMAN LAKE	OLD VILLAGE WELL	INFILT. GALLERY
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
AMMONIA - N	NA	0.82	0.05	QNS	0.18	1.0	0.77	<0.05	0.05	QNS	QNS
NITRATE - N	10	2.0	<1.0	0.21	<0.10	<1.0	<1.0	<1.0	<1.0	1.4	1.2
PHOSPHOROUS (ORTHO-P)	NA	<0.01	0.16	0.063	0.063	0.08	0.01	0.01	<0.01	0.016	0.01
PHOSPHOROUS (TOTAL - P)	NA	1.2	0.65	2.6	5.8	3.1	3.4	<0.05	0.1	0.9	<0.05
FECAL COLIFORM	COLONY PER 0.1 L				0	0					

3-4

NA: Not applicable; no criteria established for potable water supplies.
 QNS: Quantity not sufficient to perform testing.

NOTE: Concentrations detected in samples are displayed to right of column; for example, 0.16 mg/l. Concentrations displayed to left of column are below detection limits of equipment used; for example, <0.01 mg/l, is limit of detection.

TABLE (3): WATER QUALITY PARAMETERS

CHARACTERISTIC	MAXIMUM POTABLE CONC.	SITE 1: SAMPLE 1-1	SITE 2: SAMPLE 2-1	SITE 3: SAMPLE 3-1	SITE 4: SAMPLE 4-1	SITE 4: SAMPLE 4-2	SITE 5: SAMPLE 5-1	INAYVAGHAR LAKE	TROUTMAN LAKE	OLD VILLAGE WELL	INFILT. GALLERY
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
pH, UNITS	6.5 TO 8.5 UNITS	5.5	6.3	7.2	7.4	7.2	6.3	6.4	6.8	6.7	6.6
CONDUCTIVITY (umhos/cm)	NA	190	280	1600	160	340	110	300	1100	1000	80
ALKALINITY (as CaCO3)	NA	6.0	13	195	36	110	18	10	12	18	12
HARDNESS (as CaCO3)	NA	142	59	409	204	208	260	43	90	159	18
CHEMICAL OXYGEN DEMAND (COD)	NA	1750	25	215	175	1570	2660	30	23	36	38

NA: Not applicable; no criteria established for potable water supplies.

QNS: Quantity not sufficient to perform testing.

NOTE: Concentrations detected in samples are displayed to right of column; for example, 0.16 mg/l. Concentrations displayed to left of column are below detection limits of equipment used; for example, <0.01 mg/l, is limit of detection.

Conductivity and hardness provide a measure of the amount of dissolved inorganic materials present in water. The chemical oxygen demand (COD) test is commonly used to measure the organic matter content of wastewaters and natural water systems, determined as an oxygen equivalence to the amount of organic material present.

B. Inorganic Materials

Primary water quality constraints include maximum concentrations for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver in potable water supplies. These parameters are of importance due to potential toxicity at high concentrations. The observed concentrations of these materials are shown in Table 4.

As defined by ADEC, secondary water standards are provided for maximum concentrations of the following inorganics: chloride, copper, iron, manganese, sodium, sulfates, and zinc. The observed concentrations of these materials, as well as aluminum, boron, calcium, magnesium, nickel, potassium, silicon, strontium, tin, vanadium, and zirconium, are shown in Table 4.

C. Organic Materials

Of particular importance in our assessment of the Gambell area is the presence of potentially harmful organic compounds which may be associated with former military operations. The field sampling program was conducted to determine the presence of oils and grease, pesticides, and EPA priority pollutants, as identified on the EPA Hazardous Substance List.

Oil and grease analyses were conducted according to EPA Method 503, using a freon extraction and spectrophotometric analysis for 7 of the 10 sampling sites. The results of this testing are indicated in Table 5.

Due to concerns that PCB-contaminated electrical equipment might have been abandoned on-site, samples from Sites 1 through 5 were analyzed for the presence of organochlorine pesticides and PCBs according to EPA Method 608. Any of the following mixtures of polychlorinated biphenyls would have been detected had they been present at or above its limit of detection:

Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268. These test results are also included in Table 5.

Testing for contaminants from EPA's Hazardous Substance List was done for samples collected in Sites 3 and 4, in which historical information suggests that the greatest contamination potential exists. These two sites are located in the closest proximity to the community, and are of the greatest concern to the residents. In order to obtain a larger range of data for defining future sampling, these samples were analyzed for

TABLE (4): INORGANIC MATERIALS

CHARACTERISTIC	POTABLE MAXIMUM CONC. mg/l	SITE 1: SAMPLE 1-1 mg/l	SITE 2: SAMPLE 2-1 mg/l	SITE 3: SAMPLE 3-1 mg/l	SITE 4: SAMPLE 4-1 mg/l	SITE 4: SAMPLE 4-2 mg/l	SITE 5: SAMPLE 5-1 mg/l	HAYVAGHAR LAKE mg/l	TROUTMAN LAKE mg/l	OLD VILLAGE WELL mg/l	INFILT. GALLERY mg/l
* PRIMARY WATER CRITERIA *	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
ARSENIC (As)	0.05	0.19	<0.05	0.09	0.15	0.11	0.21	<0.05	<0.05	<0.05	<0.05
BARIUM (Ba)	1.0	0.51	<0.05	0.14	0.43	0.42	1.3	<0.05	<0.05	<0.05	<0.05
CADMIUM (Cd)	0.01	0.011	<0.01	<0.01	<0.01	<0.01	0.025	<0.01	<0.01	<0.01	<0.01
CHROMIUM (Cr)	0.05	0.08	<0.05	<0.05	0.14	0.1	0.29	<0.05	<0.05	<0.05	<0.05
LEAD (Pb)	0.05	<0.05	<0.05	<0.05	<0.05	0.11	5.9	<0.05	<0.05	<0.05	<0.05
MERCURY (Hg)	0.002	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
SELENIUM (Se)	0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
SILVER (Ag)	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
* SECONDARY WATER CRITERIA*	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
CHLORIDE (Cl)	250	58	88	520	28	54	22	103	400	390	14
COPPER (Cu)	1.0	0.13	<0.05	0.07	0.13	0.2	6.6	<0.05	<0.05	<0.05	<0.05
IRON (Fe)	0.3	46	5.9	32	81	42	72	0.18	<0.05	4.0	0.08
MANGANESE (Mn)	0.05	29	0.07	1.3	1.5	2.5	4	<0.05	<0.05	0.17	<0.05
SODIUM (Na)	250	31	42	290	28	57	22	42	182	165	9.7
SULFATE (SO4)	250	9.5	16	210	4.5	23	5.7	11	45	45	9.5
ZINC (Zn)	5.0	0.38	0.08	0.15	0.33	0.27	4.6	<0.05	<0.05	0.85	<0.05
OTHER ELEMENTS OF INTEREST	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
ALUMINUM (Al)	NA	59	2.6	15	47	37	65	<0.05	<0.05	<0.05	<0.05
BORON (B)	NA	0.05	<0.05	0.39	0.1	0.17	0.42	<0.05	0.09	0.1	<0.05
CALCIUM (Ca)	NA	24	<0.05	65	39	42	40	3.8	0.09	26	4.4
MAGNESIUM (Mg)	NA	20	7.8	60	26	25	39	8.2	25	23	1.8
NICKEL (Ni)	NA	0.1	<0.05	<0.05	0.1	0.1	0.29	<0.05	<0.05	<0.05	<0.05
POTASSIUM (K)	NA	6.7	5.1	28	19	16	17	1.5	7.3	10	<1.0
SILICON (Si)	NA	29	7.5	27	62	39	56	<0.05	<0.05	1.5	2.7
STRONTIUM (Sr)	NA	0.23	0.09	0.59	0.34	0.44	0.39	0.06	0.19	0.2	<0.05
TIN (Sn)	NA	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
VANADIUM (V)	NA	<0.05	<0.05	<0.05	0.13	0.11	0.18	<0.05	<0.05	<0.05	<0.05
ZIRCONIUM (Zr)	NA	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

NA: Not applicable; no criteria established for potable water supplies.
 NS: Quantity not sufficient to perform testing.

NOTE: Concentrations detected in samples are displayed to right of column; for example, 0.16 mg/l. Concentrations displayed to left of column are below detection limits of equipment used; for example, <0.01 mg/l, is limit of detection.

TABLE (5): ORGANIC MATERIALS

CHARACTERISTIC	MAXIMUM POTABLE CONC.	SITE 1: SAMPLE 1-1	SITE 2: SAMPLE 2-1	SITE 3: SAMPLE 3-1	SITE 4: SAMPLE 4-1	SITE 4: SAMPLE 4-2	SITE 5: SAMPLE 5-1	NAYVAGHAQ LAKE	TROUTMAN LAKE	OLD VILLAGE WELL	INFILT. GALLERY
PETROLEUM PRODUCTS	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l	ng/l
OIL AND GREASE	NA	14	0.71	QNS	0.19	0.54	115	0.22	0.17	QNS	QNS
PESTICIDES	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
AROCLOR 1016	ND	ND	ND	ND	ND	ND	ND	*	*	*	ND
AROCLOR 1221	ND	ND	ND	ND	ND	ND	ND	*	*	*	ND
AROCLOR 1232	ND	ND	ND	ND	ND	ND	ND	*	*	*	ND
AROCLOR 1242	ND	ND	ND	ND	ND	ND	ND	*	*	*	ND
AROCLOR 1248	ND	ND	ND	ND	ND	ND	ND	*	*	*	ND
AROCLOR 1254	ND	ND	ND	ND	ND	ND	ND	*	*	*	ND
AROCLOR 1260	ND	ND	ND	ND	ND	ND	ND	*	*	*	ND
AROCLOR 1262	ND	ND	ND	ND	ND	ND	ND	*	*	*	ND
AROCLOR 1268	ND	ND	ND	ND	ND	ND	ND	*	*	*	ND

NA: Not applicable; no criteria established for potable water supplies.

QNS: Quantity not sufficient to perform testing.

*: Water samples were not tested for presence of PCBs.

volatile and semi-volatile organic contaminants using combined gas chromatography-mass spectrometry according to EPA Methods 624 and 625. These test results are included in Table 6. During this testing a number of compounds not found on the EPA hazardous substance list were also identified. These substances are listed in Table 7.

3.2 Gambell Sampling Sites

3.2.1 Site 1: Gambell Communications Facility

A. Site Description

The site is a former communications base which contained auxillary generators, oils, fuels and batteries. The abandoned operations have been removed and buried nearby. The storage batteries were reportedly destroyed and buried on-site, possibly leaking electrolite. Status of generator, fuels, oils and transformers are unknown. The antenna guy wire anchors remain visible.

This site is located at the base of Sevuokuk Mountain, north of the community (Figure 3). Surface soils are predominately poorly graded coarse sand and fine gravel, well rounded with sparse vegetative matting. The area is well drained and relatively undisturbed in recent time, as noted by the plant growth. The east side is bounded by Sevuokuk Mountain, a granitic mass rising abruptly from the spit. Local groundwater level was measured at approximately 4.2 feet below ground surface; water sample 1-1 was collected at this site.

B. Analytic Observations

In terms of physical and biological characteristics, no unusual results were observed. General water quality parameters indicated a pH of 5.5, as opposed to values of approximately 6.3 to 7.4 in the other sites. Alkalinity, as calcium carbonate, was 6 mg/l, the lowest value observed among the samples. Chemical oxygen demand (COD) is of interest in this site, having yielded a value of 1750 mg/l.

Primary and secondary water quality criteria, as indicated in Table 4, reflect some inorganic parameters of interest. Arsenic, iron, and manganese are above recommended limits for potable water systems; while no regulatory recommendations exist, aluminum also appeared elevated, at 59 mg/l. However, these values are below potentially toxic concentrations for human consumption. Oil and grease extraction yields a value of 14 mg/l, while testing for PCBs showed no detectable quantities at a detection limit of 0.1 ug/l (0.1 parts per billion). No testing was done for materials on EPA's Hazardous Substance List.

Table 6: EPA Hazardous Substance List

Volatile Compounds	Site 3	Site 4
COMPOUND =====	CONC(ug/l) =====	CONC (ug/l) =====
BENZENE	1. ND	1. ND
CARBON TETRACHLORIDE	1. ND	1. ND
CHLOROBENZENE	1. ND	1. ND
1, 2-DICHLOROETHANE	1. ND	1. ND
1, 1, 1-TRICHLOROETHANE	1. ND	1. ND
1, 1-DICHLOROETHANE	1. ND	1. ND
1, 1, 2-TRICHLOROETHANE	1. ND	1. ND
1, 1, 2, 2-TETRACHLOROETHANE	1. ND	1. ND
CHLOROETHANE	1. ND	1. ND
2-CHLOROETHYL VINYL ETHER	10. ND	10. ND
CHLOROFORM	12.	1. ND
1, 1-DICHLOROETHENE	1. ND	1. ND
TRANS-1, 2-DICHLOROETHENE	1. ND	1. ND
1, 2-DICHLOROPROPANE	1. ND	1. ND
TRANS-1, 3-DICHLOROPROPENE	1. ND	1. ND
CIS-1, 3-DICHLOROPROPENE	1. ND	1. ND
ETHYLBENZENE	1. ND	1. ND
METHYLENE CHLORIDE	1. ND	1. ND
CHLOROMETHANE	1. ND	1. ND
BROMOMETHANE	1. ND	1. ND
BROMOFORM	1. ND	1. ND
BROMODICHLOROMETHANE	3. TR	1. ND
CHLORODIBROMOMETHANE	1. ND	1. ND
TETRACHLOROETHENE	1. ND	1. ND
TOLUENE	5. TR	5. TR
TRICHLOROETHENE	1. ND	1. ND
VINYL CHLORIDE	1. ND	1. ND
ACETONE	10. ND	10. ND
2-BUTANONE	10. ND	10. ND
CARBON DISULFIDE	1. ND	1. ND
2-HEXANONE	1. ND	1. ND
4-METHYL-2-PENTANONE	1. ND	1. ND
STYRENE	1. ND	1. ND
VINYL ACETATE	1. ND	1. ND
TOTAL XYLENES	1. ND	1. ND

* CON'T

ND - THIS COMPOUND WAS NOT DETECTED; THE LIMIT OF DETECTION FOR THIS COMPOUND IS STATED TO THE LEFT OF THE ND SPECIFIER.

TR - TRACE, THIS COMPOUND WAS PRESENT, BUT WAS BELOW THE LEVEL AT WHICH THE CONCENTRATION COULD ACCURATELY BE DETERMINED. THE APPROXIMATE CONCENTRATION IS REPORTED FOR YOUR REFERENCE.

Table 6: (Con't)

Base/Neutral & Acid Compounds	Site 3	Site 4
COMPOUND =====	CONC (ug/l) =====	CONC (ug/l) =====
2, 4, 6-TRICHLOROPHENOL	1. ND	1. ND
4-CHLORO-3-METHYLPHENOL	1. ND	1. ND
2-CHLOROPHENOL	1. ND	1. ND
2, 4-DICHLOROPHENOL	1. ND	1. ND
2, 4-DIMETHYLPHENOL	1. ND	1. ND
2-NITROPHENOL	1. ND	1. ND
4-NITROPHENOL	1. ND	1. ND
2, 4-DINITROPHENOL	1. ND	1. ND
4, 6-DINITRO-2-METHYLPHENOL	1. ND	1. ND
PENTACHLOROPHENOL	1. ND	1. ND
PHENOL	1. ND	1. ND
BENZOIC ACID	1. ND	1. ND
2-METHYLPHENOL	1. ND	1. ND
4-METHYLPHENOL	1. ND	1. ND
2, 4, 5-TRICHLOROPHENOL	1. ND	1. ND
ACENAPHTHENE	1. ND	1. ND
BENZIDINE	1. ND	1. ND
1, 2, 4-TRICHLOROENZENE	1. ND	1. ND
HEXACHLOROENZENE	1. ND	1. ND
HEXACHLOROETHANE	1. ND	1. ND
BIS(2-CHLOROETHYL)ETHER	1. ND	1. ND
2-CHLORONAPHTHALENE	1. ND	1. ND
1, 2-DICHLOROENZENE	1. ND	1. ND
1, 3-DICHLOROENZENE	1. ND	1. ND
1, 4-DICHLOROENZENE	1. ND	1. ND
3, 3'-DICHLOROBENZIDINE	1. ND	1. ND
2, 4-DINITROTOLUENE	1. ND	1. ND
2, 6-DINITROTOLUENE	1. ND	1. ND
1, 2-DIPHENYLHYDRAZINE	1. ND	1. ND
FLUORANTHENE	1. ND	1. ND
4-CHLOROPHENYL PHENYL ETHER	1. ND	1. ND
4-BROMOPHENYL PHENYL ETHER	1. ND	1. ND
BIS(2-CHLOROISOPROPYL)ETHER	1. ND	1. ND
BIS(2-CHLOROETHOXY)METHANE	1. ND	1. ND
HEXACHLOROBUTADIENE	1. ND	1. ND
HEXACHLOROCYCLOPENTADIENE	1. ND	1. ND
ISOPHORONE	1. ND	1. ND
NAPHTHALENE	1. ND	1. ND
NITROENZENE	1. ND	1. ND
N-NITROSODIMETHYLAMINE	1. ND	1. ND
N-NITROSODIPHENYLAMINE	1. ND	1. ND
N-NITROSODIPROPYLAMINE	1. ND	1. ND
BIS(2-ETHYLHEXYL)PHTHALATE	6. TR	3. TR
BUTYL BENZYL PHTHALATE	1. ND	1. ND
DI-N-BUTYL PHTHALATE	1. ND	1. ND
DI-N-OCTYL PHTHALATE	1. ND	1. ND
DIETHYL PHTHALATE	1. ND	1. ND
DIMETHYL PHTHALATE	1. ND	1. ND
BENZO(A)ANTHRACENE	1. ND	1. ND
BENZO(A)PYRENE	1. ND	1. ND

Table 6: (Con't)

Base/Neutral & Acid Compounds	Site 3	Site 4
COMPOUND =====	CONC (ug/l) =====	CONC (ug/l) =====
BENZO(B)FLUORANTHENE	1. ND	1. ND
BENZO(K)FLUORANTHENE	1. ND	1. ND
CHRYSENE	1. ND	1. ND
ACENAPHTHYLENE	1. ND	1. ND
ANTHRACENE	1. ND	1. ND
BENZO(GHI)PERYLENE	1. ND	1. ND
FLUORENE	1. ND	1. ND
PHENANTHRENE	1. ND	1. ND
DIBENZO(A, H)ANTHRACENE	1. ND	1. ND
INDENO(1, 2, 3-CD)PYRENE	1. ND	1. ND
PYRENE	1. ND	1. ND
ANILINE	1. ND	1. ND
BENZYL ALCOHOL	1. ND	1. ND
4-CHLOROANILINE	1. ND	1. ND
DIBENZOFURAN	1. ND	1. ND
2-METHYLNAPHTHALENE	1. ND	1. ND
2-NITROANILINE	1. ND	1. ND
3-NITROANILINE	1. ND	1. ND
4-NITROANILINE	1. ND	1. ND

ND - THIS COMPOUND WAS NOT DETECTED; THE LIMIT OF DETECTION FOR THIS COMPOUND IS STATED TO THE LEFT OF THE ND SPECIFIER.

TR - TRACE, THIS COMPOUND WAS PRESENT, BUT WAS BELOW THE LEVEL AT WHICH THE CONCENTRATION COULD ACCURATELY BE DETERMINED. THE APPROXIMATE CONCENTRATION IS REPORTED FOR YOUR REFERENCE.

Table 7: Other Organic Compounds

Compound	Site 3 (ug/l)	Site 4 (ug/l)
Carboxylic acids	13	ND<1
Alcohol (high molecular wt)	54	ND<1
Hexadecanoic acid	ND<1	8
Total hydrocarbons	7	200
1,1,2-Trichloro-1,2,2-trifluoroethane	ND<1	300

ND - This compound was not detected; the limit of detection for this analysis is less than the amount stated in the table above.

3.2.2 Site 2: Gambell Housing/Operations Area

A. Site Description

Site 2 is adjacent to Site 1, albeit extending further south and west along Sevoukuk Mountain (Figure 3). The site is typified by undulating topography, relatively non-vegetated except for the southeastern portion. Surficial soils are characteristically well drained, rounded coarse sand and fine gravel. This site was used as a military housing and operations facilities. Abandoned metallic debris is visible throughout the site. The structures were abandoned, demolished and buried randomly on site. The current status of buried materials is unknown except for an ammunition dump along the southern portion of the site. Local groundwater level was located at approximately 6.6 feet below grade; water sample 2-1 was collected at this site.

B. Analytic Observations

Physical and biological characteristics appear to be within expected ranges. Fecal coliforms were not tested for in this site. General water quality parameters indicate a pH of 6.3, an alkalinity of 13 mg/l, as well as a hardness (as CaCO₃) of 59 mg/l. A COD value of 25 mg/l was observed, in contrast to the 1750 mg/l value obtained in the adjacent Site 1.

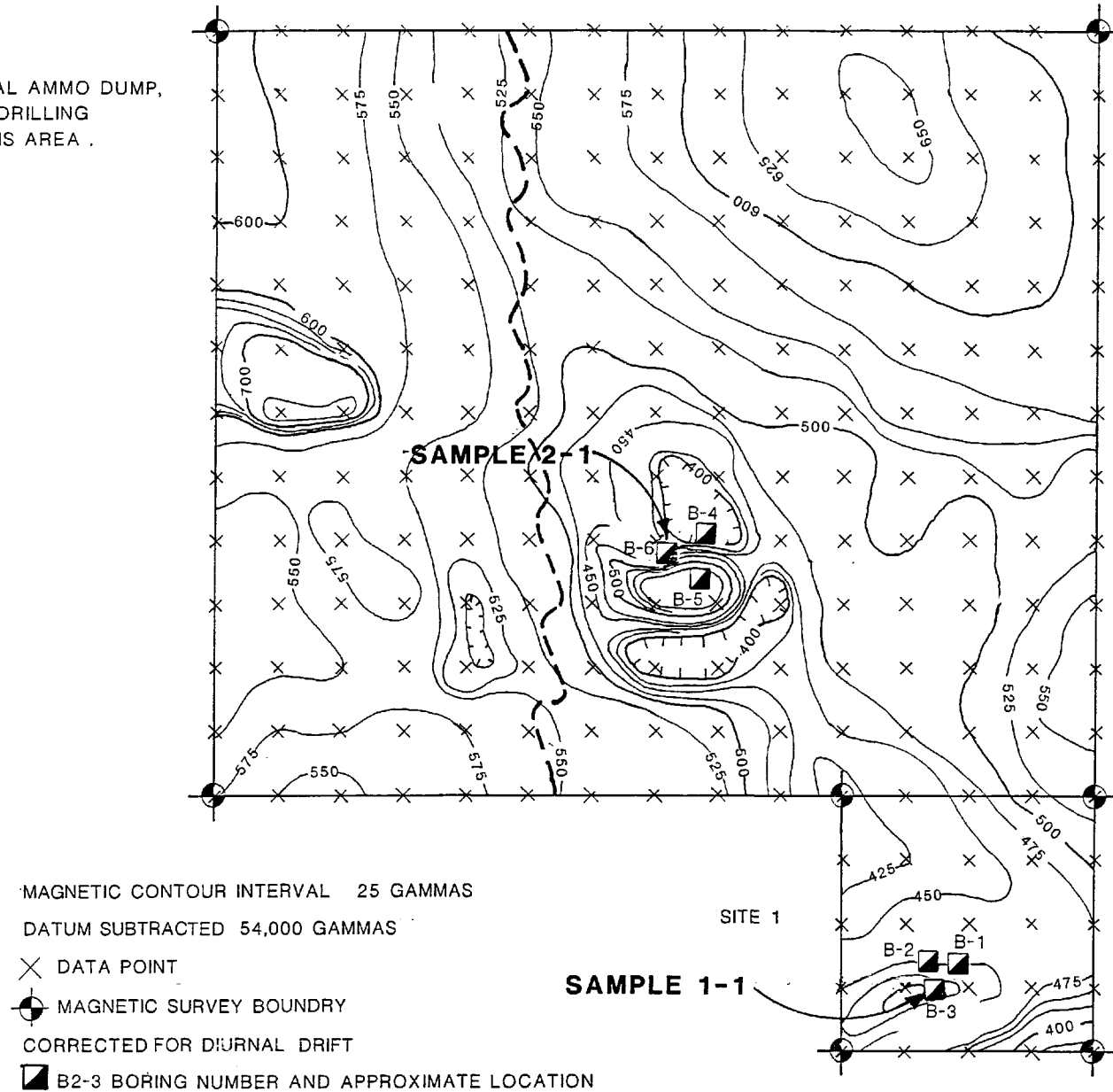
In terms of primary and secondary water quality criteria, iron and manganese are the only constituents exceeding recommended limits. Oil and grease extraction yielded 0.71 mg/l, while testing for PCBs showed no contamination at a detection limit of 0.1 ppb. No testing was done for materials on EPA's Hazardous Substance List.

3.2.3 Site 3: Military Power Facility

A. Site Description

Site 3 is actually a clustering of sites studied by the geotechnical subcontractor, located immediately north of Gambells' city hall (Figure 4). This site was the location of an abandoned power generation facility which was reportedly demolished and buried on-site. The area is currently characterized by an undulating, reworked area, traversed by underground utilities and village access trails. The site is well drained, with surficial soils predominantly medium-coarse sand/fine gravel. An abandoned concrete pad is located along the northeastern portion of the site. This area formerly housed central power generation facilities with attendant fuels, oils, and electrical distribution equipment. No surficial structures remain visible except for the concrete pad and relict coaxial cable.

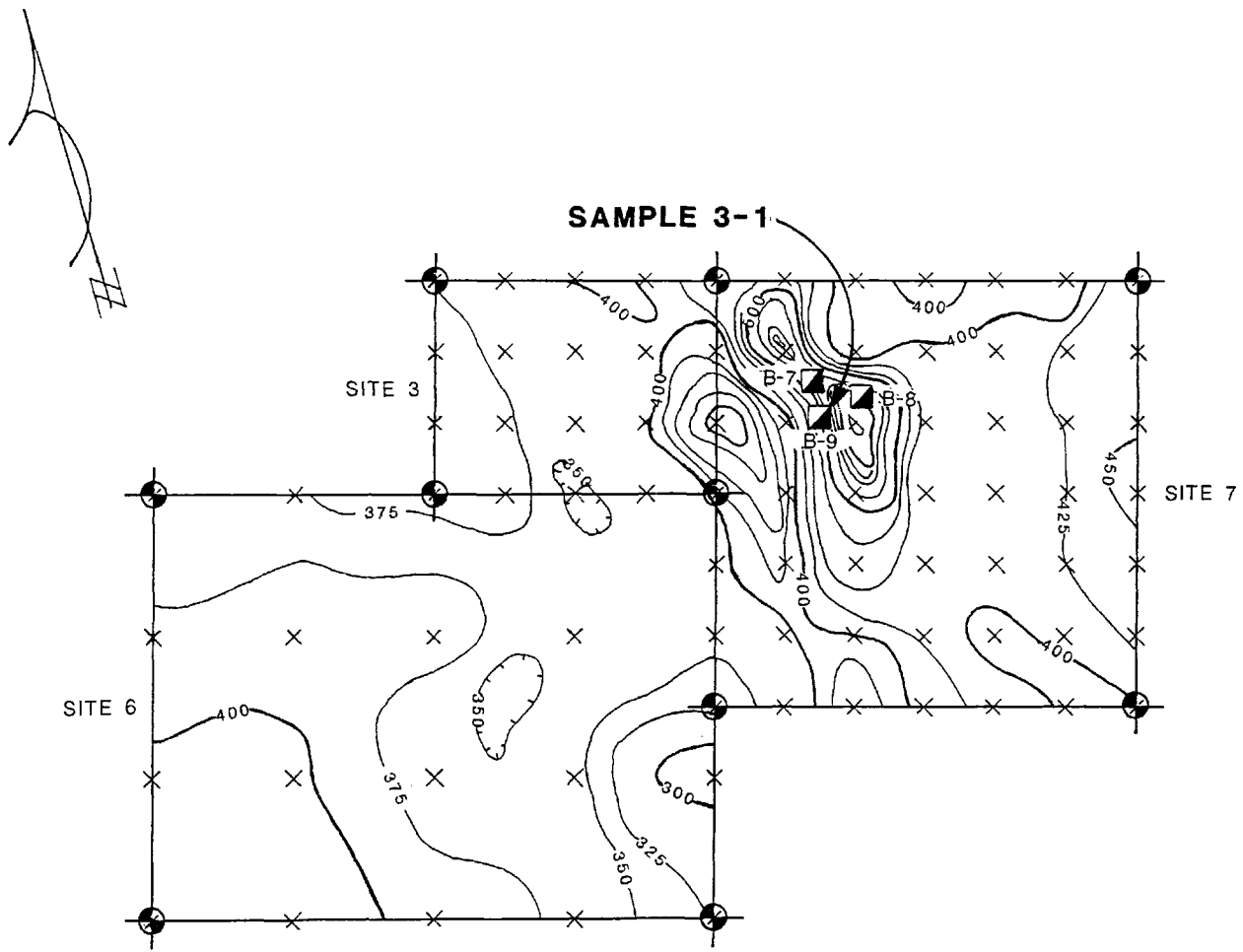
POTENTIAL AMMO DUMP,
NOT DRILLING
IN THIS AREA .



GAMBELL, ALASKA

FIGURE 3
SITE 1&2 SAMPLING LOCATIONS

Prepared For RZA, INC.
URS Corporation By: Geotechnical Consultants
Date JULY 1985 3105 A Lakeshore Drive,
Suite 103
Scale 1" = 100' Anchorage, Alaska 99503



MAGNETIC CONTOUR INTERVAL 25 GAMMAS

DATUM SUBTRACTED 54,000 GAMMAS

X DATA POINT

⊕ MAGNETIC SURVEY BOUNDRY

CORRECTED FOR DIURNAL DRIFT

▣ B-3 BORING NUMBER AND APPROXIMATE LOCATION

GAMBELL, ALASKA

FIGURE 4

SITE 3 SAMPLING LOCATION

Prepared For *RZA, INC.*
 URS Corporation By: *Geotechnical Consultants*

Date JULY 1985 *3105 A Lakeshore Drive,*
Suite 103

Scale 1" = 50' *Anchorage, Alaska 99503*

B. Analytic Observations

Physical and biological parameters did not exhibit any unusual results, with the exception of a value of 960 mg/l for total dissolved solids. Fecal coliforms were not tested for at this site. Water quality parameters indicates a pH of 7.2, an alkalinity of 195 mg/l, and a conductivity of 1600 umhos/cm. Hardness, as CaCO₃, was measured at 409 mg/l, while a COD value of 215 mg/l was obtained.

Primary and secondary water quality parameters, as shown in Table 4, suggest that arsenic, chloride, iron, manganese, and sodium exceed recommended limits; in addition, calcium, magnesium, and potassium concentrations were the highest observed among the samples. Oil and grease extraction was not performed due to sample volume limitations; however, testing for PCBs yielded no evidence of contamination at a detection limit of 0.1 ppb.

Two samples were collected from Site 3 and analyzed for compounds present on EPA's Hazardous Substance List, as shown in Table 6. One sample was tested for volatile organics, the other for base/neutral and acid compounds, using combined gas chromatography-mass spectrometry according to EPA Method 624 and 625.

Of the volatiles tested, toluene was detected at a trace concentration of 5 ug/l at Site 3, while chloroform was measured at 12 ug/l. These are common organic solvents, likely related to military activities, and are several orders of magnitude lower than regulatory limits. Bromodichloromethane, often used as a degreaser, was detected at a trace concentration of 3 ug/l. No other volatiles defined in EPA's Hazardous Substance List were detected.

Bis (2-ethylhexyl) phthalate was the only base/neutral-acid compound present at detectable concentrations, measured as a trace of 6 ug/l. This compound is relatively ubiquitous in nature, due to its use as a plasticizer and mold-release compound for plastics, and may be present due to the use of PVC casings for the monitoring wells. This compound is generally detectable in any area in which plastics are found, and poses no concern at low concentrations. None of the remaining compounds which were tested for were detected.

During this testing, a number of compounds not found on the EPA Hazardous Substance List were also identified (Table 7). Carboxylic acids and high molecular weight alcohols were detected in Site 3 at concentrations of 13 ug/l and 54 ug/l, respectively, and are likely decomposition products from a source such as a detergent. A final measurement was made for total hydrocarbon content, yielding a value of 7 ug/l.

3.2.4 Site 4: Military Landfill

A. Site Description

Site 4 was a disposal site, located immediately north of the community, for approximately 3,000 barrels of human waste and landfilled refuse resulting from military activities (Figure 5). The barrels containing human wastes were reportedly treated with lime prior to final sealing. During abandonment, these barrels were buried with a thin soil covering. Today, numerous relict barrel sections are visible throughout the area. The site is characterized by well drained coarse sand and fine gravel over a non-vegetated, undulating terrain. Due to community concern over the presence of this burial site, two monitoring wells were placed here. Water sample 4-1 was obtained from the western edge of the site, while sample 4-2 was collected in the northeast corner of the site. Local groundwater level was measured at approximately 4.5 feet below ground surface.

B. Analytic Observations

Physical and biological characteristics did not present any unusual results. Total dissolved solids were measured as 100 mg/l, and nutrients were within acceptable ranges. Due to community concerns about the reported burial of barrels of human waste in this abandoned landfill area, fecal coliforms were tested for in both samples 4-1 and 4-2; no fecal contamination was observed in either sample.

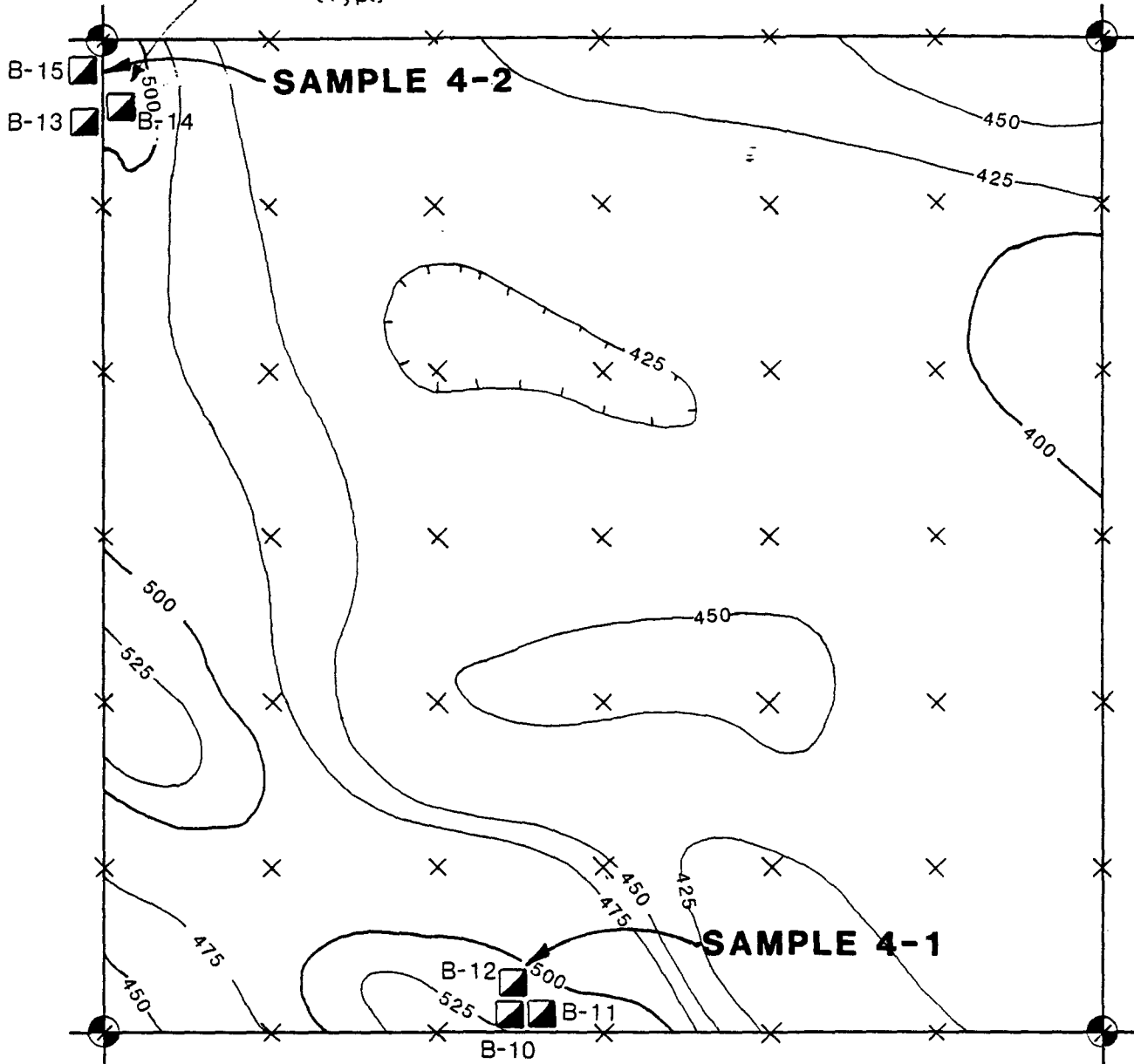
Water quality parameters yielded pH values of 7.4 and 7.2, conductivities of 160 and 340 umhos/cm, and alkalinities of 36 and 110 mg/l for samples 4-1 and 4-2 respectively. Chemical oxygen demand (COD) was of particular interest; sample 4-1 yielded a value of 175 mg/l, while sample 4-2 was measured to be 1570 mg/l.

Primary and secondary water quality parameters suggest that arsenic, chromium, lead, iron, and manganese exceed recommended limits for potable water supplies. In addition aluminum was measured at 47 mg/l and 37 mg/l for samples 4-1 and 4-2, respectively.

Oil and grease extraction yielded values of 0.19 mg/l and 0.54 mg/l, respectively, for samples 4-1 and 4-2. Testing for PCBs yielded no evidence of contamination at a detection limit of 0.1 ppb.

A total of two samples from Site 4 were analyzed for compounds present on EPA's Hazardous Substance List, as shown in Table 6. One sample was tested for volatile organics, the other for base/neutral and acid compounds, using combined gas chromatography-mass spectrometry according to EPA Method 624 and 625.

Boring number and approximate location
(Typ.)



MAGNETIC CONTOUR INTERVAL 25 GAMMAS

DATUM SUBTRACTED 54,000 GAMMAS

× DATA POINT

⊗ MAGNETIC SURVEY BOUNDRY

CORRECTED FOR DIURNAL DRIFT

GAMBELL, ALASKA

FIGURE 5
SITE 4 SAMPLING LOCATION

Prepared For *RZA, INC.*
URS Corporation By: *Geotechnical Consultants*

Date JULY 1985 *3105 A Lakeshore Drive,*
Suite 103

Scale 1" = 50' *Anchorage, Alaska 99503*

Of the volatiles tested, toluene was detected at a trace concentration of 5 ug/l at Site 4. This is a common organic solvent, and several orders of magnitude lower than regulatory limits. No other volatiles defined in EPA's Hazardous Substance List were detected.

Bis (2-ethylhexyl) phthalate was the only base/neutral-acid compound present at detectable concentrations measured as a trace of 3 ug/l. This compound is relatively ubiquitous in nature, due to its use as a plasticizer and mold-release compound for plastics, and may be present due to the use of PVC casings for the monitoring wells. This compound is generally detectable in any area in which plastics are found, and poses no concern at low concentrations. None of the remaining compounds which were tested for were detected.

During this testing, a number of compounds not found on the EPA Hazardous Substance List were also identified (Table 7). One such compound, 1,1,2-trichloro-1,2,2-trifluoroethane, is commonly known as Freon, and was measured at a concentration of 0.3 parts per million (300 ug/l). It is not considered a priority pollutant and is one of the most common degreasing compounds used today due to its relative inertness.

Carboxylic acids and high molecular weight alcohols were not detected in Site 4. Hexadecanoic acid was measured at 8 ug/l; this surfactant is one of the most common ionic detergents, found in many name brand laundry detergents.

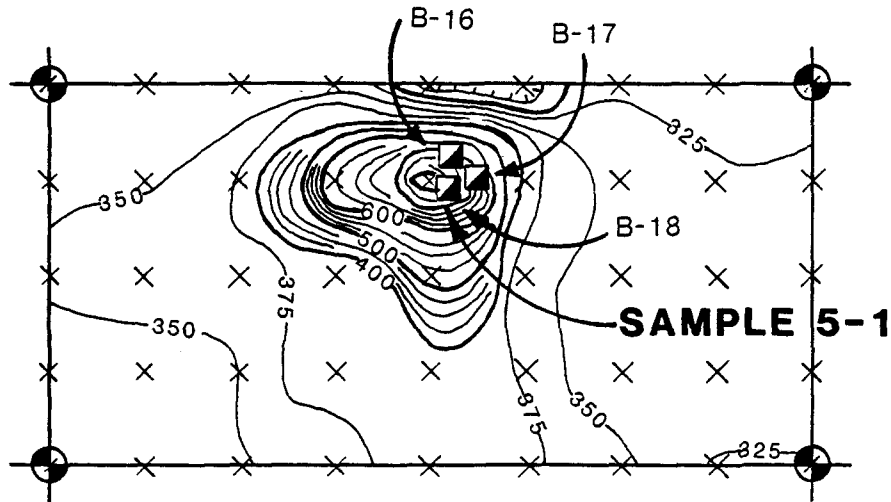
A final measurement was made for total hydrocarbon content, which yielded a value of 200 ug/l in the sample from Site 4. This is generally used to detect the presence of petroleum products, which are a complex mixture of organic compounds.

3.2.5 Site 5: Radar Power Station

A. Site Description

Site 5 is located immediately south of Troutman Lake (Figure 6) and characterized by very well drained coarse sand and gravel on a nearly level area. This site was once a radar installation for the military, and contains a number of buried towers and a former power station site. Little evidence of the installation remains; scattered surface debris and debris burial mounds are located in the area, as well as excavation scars from past military activities. During demolition of the power station, it is possible that electrical transformers were buried on-site. Water sample 5-1 was collected from a monitoring well placed near a pronounced magnetic anomaly in an area indicated by local community members as the site of the former power station. Local groundwater level was measured at approximately 3.0 feet below ground surface.

B-16: 3 1/2" SOLID FLIGHT TO 30.0'
 B-17: 6" HOLLOW STEM FOR SOIL
 B-18: 6" HOLLOW STEM FOR OBSERVATION
 WELL



MAGNETIC CONTOUR INTERVAL 25 GAMMAS

DATUM SUBTRACTED 54,000 GAMMAS

X DATA POINT

⊙ MAGNETIC SURVEY BOUNDARY

CORRECTED FOR DIURNAL DRIFT

D.E.R.P. GAMBELL, ALASKA

FIGURE 6
SITE 5 SAMPLING LOCATION

Prepared For *RZA, INC.*
 URS Corporation By: *Geotechnical Consultants*

Date JULY 1985 *3105 A Lakeshore Drive,*
Suite 103
 Scale 1" = 50' *Anchorage, Alaska 99503*

B. Analytic Observations

Physical and biological parameters reflect conditions prevalent throughout the sites, with a lower total dissolved solids value. No fecal coliform testing was conducted. General water quality parameters yielded a pH value of 6.3, conductivity of 110 umhos/cm and a hardness of 260 mg/l. Alkalinity was measured as 260 mg/l, as CaCO₃. Chemical oxygen demand (COD) was the highest observed among the samples, measuring 2660 mg/l.

Primary and secondary water quality parameters, as shown in Table 4, suggest that arsenic, barium, cadmium, chromium, iron, and manganese are sufficiently above recommended limits to bear recognition. Lead is particularly notable, measuring 5.9 mg/l, when compared to a regulatory limit of 0.05 mg/l. Similarly, a value of 6.6 mg/l for copper is of interest versus a recommended upper limit of 1.0 mg/l.

Oil and grease extraction yielded 115 mg/l, the highest value observed among the samples. Testing for PCBs yielded no detectable quantities. No sampling was done for materials from EPA's Hazardous Substance List.

3.2.6 Surface Water Bodies

A. Site Description

Two main surface bodies are present in the Gambell spit area. Troutman Lake is the larger water body, and lies adjacent to the community of Gambell. Nayvaghaq Lake is a smaller water body located south of Troutman, at which a surface disposal area lies along the northern edge.

Both lakes are considered unsuitable as a potable water due to their brackish nature. Each is heavily influenced by a complex freshwater/saltwater interface, and periodic breaching of the narrow bar separating Troutman Lake from the Bering Sea occurs during the winter. A violent winter storm in early 1985 pushed seawater across this barrier; sea ice was still visible on the lake in early July. Water was obtained from both lakes as discrete bulk samples from the upper foot of the water column.

B. Analytic Observations

Total dissolved solids in Troutman Lake were measured as 675 mg/l; Nayvaghaq Lake yielded a value of 176 mg/l. No odors or color were observed in either lake, and nutrient concentrations were low for both water sources. No testing for fecal coliforms was conducted. Measured pH's of 6.4 and 6.8, conductivities of 300 and 1100 umhos/cm, and alkalinities of 10 and 12 mg/l were obtained for Nayvaghaq and Troutman Lake, respectively. Hardness, as CaO₃, was measured at 43 mg/l and 90 mg/l. Chemical oxygen demands were low, at 23 and 36 mg/l.

In terms of primary and secondary water characteristics, no unusual parameters are apparent for Nayvaghaq Lake. Chloride concentration for Troutman Lake, 400 mg/l, is higher than the recommended limit of 250 mg/l and can be attributed to saltwater intrusion; all other parameters were below recommended water quality limits.

Oil and grease extraction yielded a value of 0.22 mg/l and 0.17 mg/l, respectively, for Nayvaghaq and Troutman Lakes. Testing for PCBs was also negative for both samples. No testing was performed for materials on EPA's Hazardous Substance List.

3.2.7 Existing Well Sites

A. Site Description

Bulk water samples were obtained from two existing well sites in the community of Gambell. The old village well is located at the western portion of the community, and was apparently installed by the military to provide water to officers housing, and later to the elementary school complex. The well is now used only for non-potable needs, due to the brackish nature of its water from saltwater intrusion into the shallow groundwater from which the well draws.

The community infiltration gallery was constructed by the Public Health Service (PHS), and is the current source of potable drinking water for the city. The gallery is located on the west slope of Sevuokuk Mountain, and intercepts runoff and shallow groundwater from the mountainside.

Samples were collected from the old village well and at the gallery's central sump, prior to its diversion to the watermain leading to the PHS pumphouse.

B. Analytic Observations

Total dissolved solids were measured at 670 mg/l at the old village well, and 48 mg/l from the infiltration gallery. Odor and color were not noted, and nutrients were similar to those observed at other sites. No testing was performed for fecal coliforms. Conductivity was high at the old village well (1000 umhos/cm) and was measured at 80 umhos/cm in the gallery. Alkalinities of 18 and 12 mg/l, hardness of 159 mg/l and 18 mg/l, and COD's of 36 mg/l and 38 mg/l were obtained for the old village well and infiltration gallery samples respectively.

Primary water quality parameters appear well within recommended limits for both sample sites. Under secondary constraints, chloride was measured at 390 mg/l for the old village well, versus a value of 14 mg/l in the gallery. Iron and manganese appear to exceed recommended limits in the old village well; all other parameters appear to be within maximum limits for both sampling sites.

Oil and grease extractions were not performed due to limitations in sample volume. Testing for PCBs yielded no detectable contamination at a limit of 0.1 ppb for either sample. No testing was done for materials on EPA's Hazardous Substance List.

4.0 Observations and Findings

4.1 Physical and Biological Characteristics

Observed results for physical parameters (TDS, odor, color) and biological factors such as nutrients do not appear to reflect any unusual characteristics. Fecal coliform testing performed in Site 4 did not show the presence of this common indicator organism for sanitary wastes.

4.2 Water Quality Parameters

Observations of interest include Site 1's pH of 5.5 and alkalinity of 6 mg/l, in an area in which batteries and carboys of acid were reported to have been buried. Conductivity values in Site 3, Troutman Lake, and the old village well likely reflect the intrusion of saltwater. Chemical oxygen demand (COD) for sites 1, 4, and 5 are particularly interesting when compared to other sample results, and suggest additional investigation during future sampling.

4.3 Inorganic Materials

Testing performed for primary water quality parameters suggest that the following materials may exceed recommended limits:

- o Arsenic - Sites 1, 4, and 5;
- o Barium - Site 5;
- o Cadmium - Site 5;
- o Chromium - Sites 4 and 5;
- o Lead - Site 5.

Due to general national concerns about such heavy metals, additional testing may be warranted to verify the concentrations of these materials.

Secondary water quality parameters exceeding recommended limits include:

- o Copper - Site 5;
- o Iron - Sites 1, 3, 4 and 5;
- o Manganese - Sites 1, 3, 4 and 5;
- o Chloride - Site 3, Troutman Lake and the old village well;
- o Sodium - Site 3.

Other elements of interest, while not specifically regulated, include aluminum at Sites 1, 3, 4 and 5.

4.4 Organic Materials

Oil and grease testing is of particular interest for Site 1 (14 mg/l) and Site 5 (115 mg/l), suggesting the likely past release of fuels and oils in these locations.

Test results for PCB contamination are encouraging, having detected no presence of these materials; however, these results are not conclusive. Due to continuing community and agency concerns about these materials, additional sampling efforts will be required under an EPA-approved sampling plan.

Testing for materials on EPA's Hazardous Substance List, performed at Sites 3 and 4, yielded trace concentrations in the parts-per-billion (ug/l) range for solvents (toluene, chloroform), degreasers (bromodichloromethane, 1,1,2-trichloro-1,2,2trifluoroethane), and a plasticizer (Bis (2-ethylhexyl) phthalate). Other organic compounds detected, but not included in EPA's Hazardous Substance List, include an ionic detergent (hexadecanoic acid) and natural decomposition products (carboxylic acids and high molecular weight alcohols).