CHEMICAL DATA ACQUISITION PLAN
SITE INVENTORY UPDATE
GAMBELL, ST. LAWRENCE ISLAND, ALASKA
FINAL

Contract No. DACA85-91-D-0003

Delivery Order No. 0010

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Prepared for:

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1. INTRODUCTION

Pursuant to Contract DACA85-91-D-0003, Delivery Order No. 0010, the United States Army Corps of Engineers, Alaska District (COE) tasked Ecology and Environment, Inc. (E & E) to investigate formerly used defense sites (FUDS) at Gambell, St. Lawrence Island, Alaska, under the Defense Environmental Restoration Program (DERP) of the United States Department of Defense (DOD).

This chemical data acquisition plan (CDAP) has been prepared in accordance with all referenced United States Environmental Protection Agency (EPA) and current COE quality assurance (QA) guidance documents. It presents the policies, organization, objectives, functional activities, and specific quality assurance/quality control (QA/QC) procedures that will be employed to ensure that all technical data generated during the performance of site investigations, contamination assessments, and remedial activities are accurate, representative, and capable of withstanding judicial scrutiny. The purpose of the CDAP is to provide a plan by which the nature and extent of potential contamination attributable to the military can be determined.

This CDAP provides guidelines for the field team to conduct the entire field investigation. The investigation will consist of the following tasks:

- Geophysical surveys will be conducted in areas of suspected buried material to identify the exact location of the material or to delineate the perimeters of suspected disposal areas;

- Surface soil samples will be collected in areas of stained soils to determine the nature of potential contamination;

- Sediment samples will be collected in a mountainside drainage on Sevuokuk Mountains to determine whether there has been contaminant migration into the drainage; and

- Boreholes will be drilled and monitoring wells installed around the areas identified in the geophysical survey. Subsurface soil and groundwater samples will be collected to determine whether there has been contaminant migration from the potential sources and groundwater elevations will be recorded to determine groundwater flow direction.

Analytical results and hydrogeologic and geophysical data will be evaluated to determine whether further sampling is required and/or to assess remedial alternatives.

This CDAP provides general information about DOD activities at Gambell. Information about the cultural and natural setting of the island is presented in Section 2; data quality objectives are discussed in Section 3; the project's organization and management are outlined in Section 4; and the field program is described in Section 5; laboratory analytical procedures are outlined in Section 6; the chemical data quality management deliverables are outlined in Section 7; and references are presented in Section 8.

2. SITE DESCRIPTION/BACKGROUND INFORMATION

2.1 PHYSIOGRAPHY

St. Lawrence Island is located in the Bering Sea, southwest of Nome, Alaska, near the territorial waters of Russia. The Village of Gambell is located on the western and northern-most point of the Island. The Gambell site is located approximately 200 air miles southwest of Nome (see Figure 2-1).

Two villages are located on St. Lawrence Island, Gambell and Savoonga, that consist mainly of residential housing and community service facilities. Several seasonal hunting and fishing camps are located on the perimeter of the island. The majority of the island is wilderness, consisting of tundra-covered flatland dotted with small lakes. Barren mountains rise out of the tundra, naturally dividing the island into western, central, and eastern areas. This wilderness area provides habitat for a variety of seabirds, waterfowl, and several mammals. The soils and vegetation provide range suitable for reindeer. The island and surrounding waters are used extensively for subsistence hunting (URS 1985).

2.2 ECOLOGY

The flora and fauna of St. Lawrence Island are discussed in the following below. There are no known endangered species of plants or animals on the island (50 CFR 17).

2.2.1 Vegetation

Vegetation in the Gambell area is classified as moist or wet tundra. Gambell's vegetation is dominated by heaths, sedges, mosses, and lichen. Where microrelief provides drier sites, shrubs such as dwarf birch, willow, cranberry, and narrow leaf labrador tea are found. Although wet tundra is dominant in the low marshy/bog areas, alpine tundra can be found on the slopes and exposed ridges immediately south of the community, particularly on Sevuokuk

Mountain. There is little to no vegetation on the coarse gravels around Gambell and around Troutman Lake. All-terrain vehicles and other general community activities have denuded large areas.

2.2.2 Birds

St. Lawrence Island provides habitat for a majority of the seabird species in the northern Bering Sea. Seventeen breeding colonies of species such as auklets, murres, puffins, guillemots, gulls, and cormorants occur around the island's perimeter. Local natives report that they hunt many bird species on the island, including ducks and geese (URS 1985).

During the winter, common ravens and stray glaucous gulls occur in the vicinity of Gambell (URS 1985). The wide variety of bird populations which occur on the Island in spring attract birdwatching groups numbering up to 200 in May and June (Tobish 1992).

2.2.3 Mammals

Generally, large mammals are not abundant on St. Lawrence Island. Polar bear may be found on the island year round. Their presence on the island is relatively common when the ice pack is near shore. Some may become stranded on the island from late spring to fall when the ice pack retreats from shore. A reindeer herd, which once numbered in the thousands, has dwindled to a current population of several hundred. Pacific walrus may be found on or near portions of the island year round; however, no walrus haul-out areas exist within the project area (URS 1985).

Arctic fox are found throughout the island and are trapped by the people of Savoonga and Gambell (URS 1985).

2.2.4 Fish

St. Lawrence Island's streams and tundra ponds are dominated by blackfish, nine-spined stickleback, grayling, arctic char, and perhaps whitefish (URS 1985). All five species of Pacific salmon occur around the island, but there are no anadromous fish streams in the project area. Troutman Lake, the largest lake in northwest St. Lawrence Island, is located just south of Gambell, which is located on a gravel spit. The lake is approximately 10 feet deep, and the fishery resources have not yet been determined (Georgette 1992).

2.3 GEOLOGY

Western St. Lawrence Island is underlain by a variety of volcanic, plutonic, metamorphic, and sedimentary rocks ranging in age from middle Paleozoic to late Cenozoic. In the Gambell vicinity, the areas to the north, west, and south of Troutman Lake are Quaternary surficial deposits consisting of a thin cover of beach, bar, and alluvial deposits overlaying a wave-cut bedrock platform. In the areas northeast, east, and southeast of Troutman Lake around and including Sevuokuk Mountain, the geology is typified by Cretaceous granite rocks, specifically quartz monzonite (Patton and Csejtey 1980; Patton and Csejtey 1971).

Gambell lies on a flat sand and gravel spit created by accreting beach ridges. The spit is composed of unconsolidated, well-rounded gravels and coarse sand-sized granitic rock clasts. The community has very little relief; maximum elevation is approximately 20 feet above sea level. Sevuokuk Mountain is an eroded headland immediately east of Gambell that rises abruptly to an elevation of approximately 619 feet (URS 1985).

The surficial deposits of western St. Lawrence Island are underlain by discontinuous permafrost. In Gambell, permafrost has been encountered as shallow as 6.5 feet below ground surface (bgs), and as deep as 31.7 feet bgs (URS 1985).

2.4 HYDROLOGY

Surface Water

Freshwater resources at Gambell consist of Troutman Lake (approximately 574 acres) and Nayvaghaq Lake (approximately 93 acres). The gravelly, sandy beach soils are well drained. The terrain east of Gambell is wet tundra, with standing water. Only the highest elevations do not have extensive standing water. Rivulets are formed on steeper slopes by snowmelt runoff (URS 1985).

Groundwater

Groundwater occurs within the surficial deposits of western St. Lawrence Island. Depth to water within these deposits has been measured at 4 to 11 feet bgs throughout the vicinity of Gambell and south of Troutman Lake (URS 1986). As a consequence of the existence of discontinuous permafrost, groundwater in these unconsolidated deposits has been postulated to exist under perched, unconfined aquifer conditions (Waller 1959). Since permafrost development is discontinuous, the variance in depth to groundwater may reflect the underlying existence of permafrost as well as local topographic variations. Groundwater which occurs above permafrost is known as suprapermafrost water. As a consequence of the discontinuous permafrost, groundwater may also occur within the permafrost or beneath it (Williams 1970).

An infiltration gallery, which was developed by the Public Health Service as a potable water source on the west slope of Sevuokuk Mountain, was designed to collect shallow groundwater above relatively impermeable permafrost (see Figure 5-1) (DeChristofaro 1992). The permafrost was postulated to represent a barrier to downward migration of groundwater; however, the activity of excavation for construction of the infiltration gallery has apparently lead to melting of permafrost, deepening of the top of permafrost, and consequently, eliminating of the relatively impervious property of permafrost directly beneath the infiltration gallery. The infiltration gallery method of groundwater collection was attempted because previous attempts at locating a dependable, year-round supply of groundwater capable of supplying the needs of the entire village had been unsuccessful (URS 1986; DeChristofaro 1992).

During early 1992, efforts were made to identify a continuous source of potable groundwater for the Village of Gambell (DeChristofaro 1992). Following completion of a resistivity survey to identify depth to permafrost of surficial deposits east of Gambell, a location was selected to install test well drive points (well points) to investigate the depth to groundwater and permafrost. Three well points were installed northwest of the suspected transformer burial area at Site No. 5. Groundwater was encountered at a depth of 6 to 8 feet bgs, and permafrost was encountered 11.2 to 19.8 feet bgs between the well points (DeChristofaro 1992).

In summary, occurrence of groundwater in the vicinity of Gambell within the unconsolidated surficial deposits is dependant on the existence of permafrost and to the degree at which the permafrost retards downward migration of groundwater. Therefore, depending on the depth, density, and extent of permafrost, a perched, unconfined aquifer may exist at a shallower depth.

2.5 CLIMATE

St. Lawrence Island has a cool, moist, subarctic maritime climate with some continental influences during winter when much of the Bering Sea freezes. Winds and fog are common and precipitation is persistent, occurring approximately 300 days per year in Gambell. Precipitation is light rain, mist, or snow, with an annual total of only 10 to 15 inches. Annual snowfall is 60 to 80 inches, and it is usually distributed evenly from November to May. Winter temperatures range from -2°F (-19°C) to 10°F (-12°C). Summer temperatures average between 34°F (1°C) and 48°F (9°C). The island's most complete wind data was collected at Northeast Cape. The mean wind speed at Northeast Cape is approximately 10 knots, with winds exceeding 22 knots approximately 10% of the year. Calm weather only occurs about 10% of the year. Generally, the island has constant winds (URS 1985).

2.6 SITE HISTORY

2.6.1 Island History

Currently, St. Lawrence Island is occupied by the descendants of the original Russian Yupik Eskimos who apparently traversed the Bering Land Bridge approximately 12,000 to 14,000 years ago. The Yupiks survive in a subsistence lifestyle of hunting and fishing, as well as selling ivory or ivory carvings.

During the winter months, the permanent population of approximately 1,200 Eskimos and a small number of non-natives resides in the villages of Gambell and Savoonga. However, in the warmer months, many residents travel to the coastal hunting and fishing camps.

As a result of archaeological investigations on St. Lawrence Island during the past 50 years (e.g., Collins 1937; Giddings 1960; Ackerman 1961; Bandi 1969; Bowers 1975; Yesner 1976; Holmes and Stern 1983; and Crowell 1985), six archaeological sites and a number of burial locations are recorded within the Gambell project area. The Gambell sites include Hillside, Myowagh, Ievoghiyoq, Sevoghiyog, Seklowaghyaget, and Old Gambell, and they have been designated collectively as a National Historic Landmark (URS 1985).

The Gambell sites have been excavated by both archaeologists and local people. The sites are highly visible as large, deeply pitted midden mounds with scattered soil piles that are remnants of ongoing digging by local residents for artifacts. Sea mammal bones, wooden and bone structural members, pottery fragments, ground stone tools, and historic metal and glass fragments are scattered within and between soil piles. Military debris, consisting of rusted barrels, cable, and miscellaneous pieces of metal, also occur within the boundaries of the Myowagh, Old Gambell, and Seklowaghyaget mounds (URS 1985).

2.6.2 Land Ownership

St. Lawrence Island is jointly owned by Sivuqaq, Inc., and the Savoonga Native Corporation. The private ownership of the island by the native corporations resulted from the Alaska Native Claims Settlement Act (ANCSA) of 1971, which entitled native village corporations to select and receive specific amounts of federal land.

The non-native land on St. Lawrence Island consists of State land used for airstrips and related facilities in Gambell and Savoonga. The St. Lawrence Island native corporations are not subject to the 14(c) reconveyance provision of ANCSA, and there are no native allotments on St. Lawrence Island (URS 1985).

Between 1903 when the island was established as a Reindeer Reserve by Executive Order and 1971 when ANCSA was enacted, much occurred on St. Lawrence Island with regard to land ownership, and the military presence and use of sites on the island. In 1950, 1,700 acres and two rights-of-way near the Village of Gambell were withdrawn from the reservation for use by the Air Force (Public Land Order [PLO] 671). This land was used by the military until 1960 when PLO 2077 restored the withdrawn acreage to the reserve, revoking PLO 671 and leaving no overriding military interest in that area. Interim Conveyance 203 of June 27, 1979 conveyed unsurveyed lands of St. Lawrence Island to Sivuqaq, Inc. and the Savoonga Native Corporation. Excepted from transfer were surveyed land, easements, and land-use permits effective prior to conveyance (URS 1985).

2.6.3 Demographic Characteristics

Table 2-1 identifies the historic and projected populations of St. Lawrence Island. The ethnic makeup of the Island's population is approximately 95% native. Caucasians, Blacks, and Indians comprise the remaining 5% of the population (URS 1985).

2.6.4 Project Site History

The Gambell site has been utilized in the past by the United States Army (Army), United States Navy (Navy), and Air Force. Limited activity occurred during World War II, but the major impacts occurred in the 1950s. The Air Force operated a temporary Aircraft Control and Warning (AC&W) site at Gambell as early as 1948 to provide intelligence on Russian shipping activities; which was subsequently abandoned shortly after the Northeast Cape facility was completed. The Army operated a larger base at Gambell that reportedly supported up to several hundred men. URS Corporation, Anchorage conducted a file search and was unable to locate base plans or site information during a search of historical records (URS 1985).

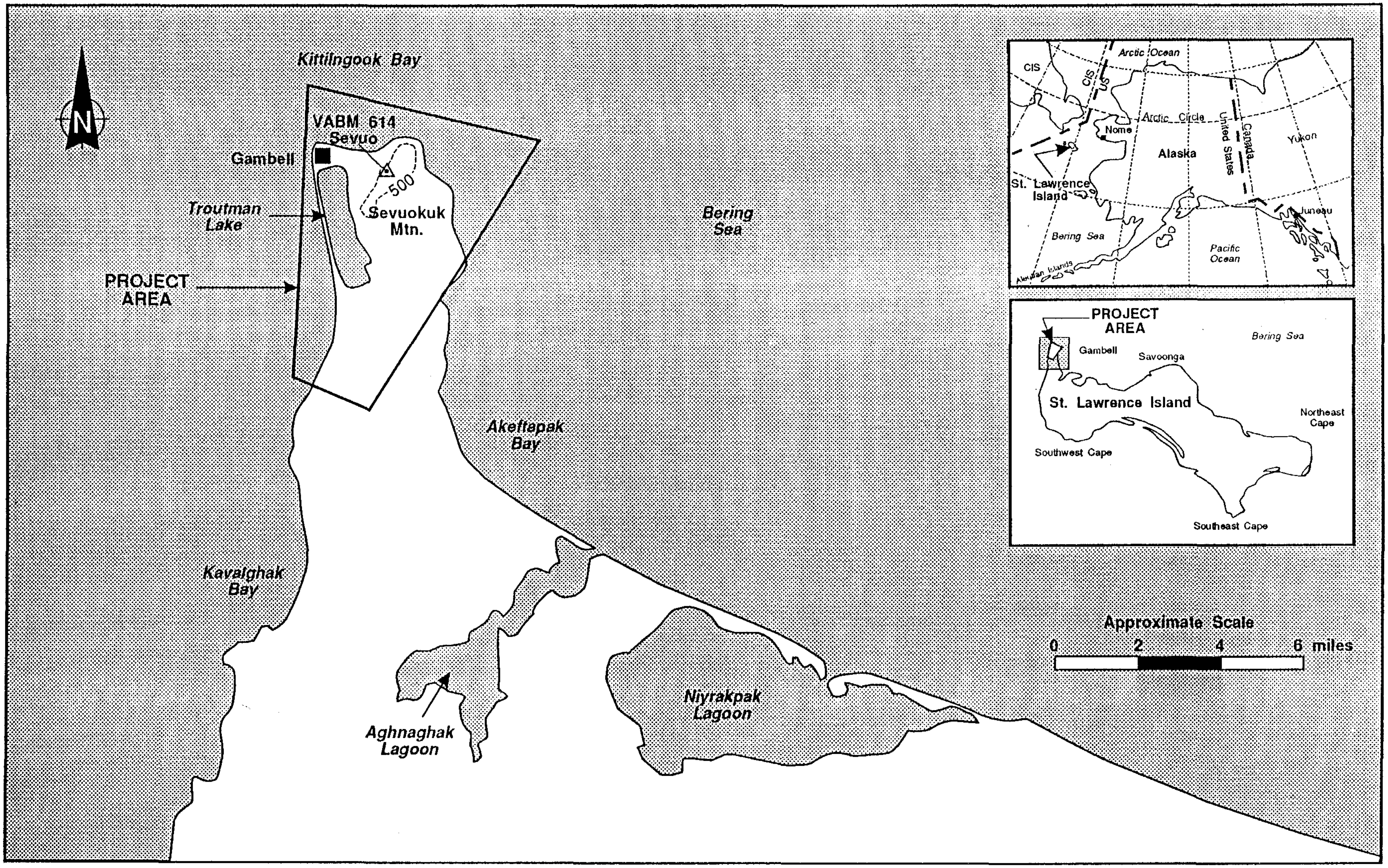
URS performed a preliminary site reconnaissance in 1985. While on site, URS collected a limited number of soil and water samples. In addition, URS inventoried materials left by the military and any potential contamination. No polychlorinated biphenyls (PCBs) were detected in the soils analyzed. Analysis of groundwater samples collected at Gambell revealed no detectable levels of PCBs; however, oil and grease were detected in many of the water samples.

TABLE 2-1

POPULATION DATA
ST. LAWRENCE ISLAND

	Date	Gambell	Savoonga	Total
Historic				
	1903	261	--	261
	1910	221	--	221
	1930	250	139	389
	1940	296	209	505
	1950	309	249	558
	1960	358	299	657
	1970	372	264	636
	1980	445	491	936
	1984	432	477	909
Projected				
	1990	461	501	962
	2000	484	527	1011

Source: URS Corporation 1985.



SOURCE: Ecology and Environment, Inc. 1992.

Figure 2-1
GAMBELL, SITE LOCATION MAP, ST. LAWRENCE ISLAND, ALASKA

KP6070-2.cdr

3. CHEMICAL DATA QUALITY OBJECTIVES

3.1 GENERAL PROJECT CONCEPTUAL MODEL

3.1.1 Contaminant Sources

Previous studies and the history of the Gambell site indicate that the primary contaminant sources are the buried equipment, debris, and drums; the solid waste dumps; chemical and petroleum, oil, and lubricant (POL) drums that were randomly discarded throughout the site; and ordnance.

3.1.2 Migration Pathways

The potential pathways for contaminant migration include groundwater, surface water, direct contact, and air. Due to the presence of buried potentially hazardous material, contaminants could migrate directly to groundwater or once sorbed onto subsurface soil could leach into groundwater. The hydraulic continuity of groundwater at each site to aquifers used as drinking water sources has not been determined. Potentially contaminated surface soils may become entrained in runoff and migrate off site. Since the potentially contaminated surface soils are accessible to the residents of Gambell, individuals would come in contact with them. Potential ACM may travel off site by wind.

3.1.3 Potential Receptors

Potential receptors include the residents of the Village of Gambell, who currently have one groundwater drinking well. In addition, if contaminated groundwater can migrate to local surface water bodies (the Bering Sea, Troutman Lake, and Nayvaghaq Lake), aquatic biota may be affected. In turn, the residents of Gambell who subsistence hunt or fish could be impacted. Children swim in Troutman Lake, which is potentially contaminated by explosive residues. Children from Gambell are also known to play near or on some of the DOD debris.

Grazing animals, specifically caribou, may be exposed to potentially contaminated materials atop Sevuokuk Mountain. Additionally, there are large populations of migratory and resident birds on the Island who may eat potentially contaminated material.

3.1.4 Contaminants of Concern

It has been determined through background research, a site reconnaissance, interviews with local residents, and previous sampling that the potential contaminants of concern, most of which are buried, include:

- Containerized POL;
- Containerized PCBs;
- Spilled or discarded POL;
- Spilled or discarded PCBs;
- Human waste (bacteriological);
- Containerized miscellaneous chemical solvents;
- Batteries and corrosives;
- Breakdown products of incompletely combusted PCBs (TCDD and TCDF);
- Leached metals in soil/sediment and water; and
- Asbestos.

The scope of previous investigations was limited; therefore, only limited analysis was performed. Based upon site history, more contaminants are suspected to be present than those previously analyzed for.

3.2 PROJECT OBJECTIVE

Since remediation of hazardous conditions is the ultimate goal of the DERP program, the project objective shall be to provide sufficient data to determine whether a hazard exists according to the guidelines of the DERP program, and to develop a remedial design, where necessary, with minimal additional investigation. Therefore, the objective of this CDAP will be to gather sufficient chemical, geophysical, and hydrological data to identify and characterize areas requiring remediation and to develop remedial alternatives.

3.3 PROJECT DATA ACQUISITION APPROACH

To accomplish the stated project objective, the following approach was adopted:

- The project area was divided into distinct sites based on selection criteria, such as previous use as a landfill, stained areas, debris, etc.;
- Only those sites with a potential for exhibiting the contaminants of concern were selected for further characterization;
- Within each site, only those matrices that have an impact on potential receptors were selected for sampling;
- Sampling points were selected, or guidance for field selection provided, based on sound characterization practices such as background comparison, site representation, postulation of possible extent of contamination, etc.;
- Analytical methods and parameters were chosen to be cost effective and provide the maximum coverage of the contaminants of concern without going beyond design needs;
- Detection limits were chosen to provide information required to determine whether cleanup levels and/or COE quality criteria have been met; and
- Field and laboratory QC measures were chosen incorporated to provide information necessary to validate analytical data.

3.4 PROJECT DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) for this project will be the method detection limits for each parameter measured. Tables 3-1 through 3-5 summarize the DQOs for each matrix. For all groundwater analytical parameters, the method detection limits will be sufficient to meet Alaska water quality criteria 18 AAC 70, Register 119.

Petroleum product cleanup levels for soil are in the Interim Guidance for non-underground storage tank contaminated soil cleanup levels dated July 1991. For this project, the matrix score cleanup level will have to be determined on a site-by-site basis. DQOs were selected to meet the most stringent (Level A) matrix score cleanup levels. These are: 100 mg/kg for diesel-range petroleum hydrocarbons (DRO), 50 mg/kg for gasoline-range petroleum hydrocarbons (GRO), 0.1 mg/kg for benzene, and 10 mg/kg for total benzene, toluene, ethylbenzene, and xylenes (BTEX). The PCB cleanup level for soil is 10 mg/kg according to TSCA, and therefore a DQO of 1 mg/kg is sufficient. (This level is approximately 10 times the method detection limit for PCBs.)

TABLE 3-1
DQO SUMMARY FORM - SOIL

1. SITE
NAME: Gambell
LOCATION: St. Lawrence Island

2. MEDIA (Circle one): [✓ SOIL] GW SW/SED AIR BIO OTHER ____

3. USE (Circle all that apply): [✓ SITE CHARAC. (H&S)] RISK ASSESS. EVAL ALTS. ENG'G DESIGN PRP DETER. MONITORING REMEDIAL ACTION OTHER ____

4. OBJECTIVE: Determine nature and extent of contamination.

5. SITE INFORMATION

AREA: 6.5 square miles
DEPTH TO GROUND WATER: approximately 4-11 feet
GROUND WATER USE: drinking water wells
SOIL TYPES: loose, well-rounded medium-coarse granitic sand and gravel
SENSITIVE RECEPTORS: children (direct contact, consumption), grazing animals (caribou)

6. DATA TYPES

A. ANALYTICAL DATA

pH
VOC
METALS
EXPLOSIVES
Ash Content
BTU
BTEX
GRO
PCB
BNA
SULFATES
Total Sulfur
Ignitability
DRO
TCLP
DIOXIN
TRPH
TOC
TOX

B. PHYSICAL DATA

MOISTURE CONTENT
ATTERBURG LIMITS
GRAIN SIZE

7. SAMPLING METHOD

BIASED GRAB

8. ANALYTICAL LEVELS

LEVEL 1 FIELD SCREENING - EQUIPMENT: HNu or OVA
LEVEL 2 FIELD ANALYSIS - EQUIPMENT: NA
LEVEL 3 NON-CLP LABORATORY - METHODS: 8260, 8270, 1311, 6000/7000, M-8015(AK101.0), M8100(AK102), 8290, 8330, 8080, C117, 9073, 9045, 375.4, D2216, ASTM-D2974-87, ASTM-D1552, 9060, ASTM-D240, 1010, 9020, 8020
LEVEL 4 CLP/RAS-METHODS: NA
LEVEL 5 NON STANDARD: NA

9. SAMPLING PROCEDURES

BACKGROUND: One representative sample for each soil type for each parameter of interest (a total of two surface soil and two subsurface soil samples are proposed).
CRITICAL (LIST): NA
PROCEDURES: NA

10. QUALITY CONTROL SAMPLES

A. FIELD

COLOCATED (VOC analysis only) - 10% QC/10% QA
REPLICATE - 10% QC/10% QA
FIELD BLANK (rinsate) - 1 per sampling equipment type
TRIP BLANK - 1 PER DAY OR: NA

B. LABORATORY

REAGENT BLANK - 1 PER ANALYSIS BATCH OR: 5%
REPLICATE - 1 PER ANALYSIS BATCH OR: 5%
MATRIX SPIKE/MATRIX SPIKE DUPLICATE - 1 PER ANALYSIS BATCH OR: 5%
OTHER:

TABLE 3-2
DQO SUMMARY FORM - GROUND WATER

1. SITE
NAME: Gambell
LOCATION: St. Lawrence Island

2. MEDIA (Circle one)	SOIL	[✓ GW]	SW/SED	AIR	BIO	OTHER ____

3. USE (Circle all that apply)	[✓ SITE CHARAC. (H&S)]	RISK ASSESS.	EVAL ALTS.	ENG'G DESIGN	PRP DETER.	MONITORING REMEDIAL ACTION	OTHER ____

4. OBJECTIVE: Determine nature and extent of contamination.

5. SITE INFORMATION

AREA: 6.5 square miles
DEPTH TO GROUND WATER: approximately 4-11 feet
GROUND WATER USE: drinking water wells
SOIL TYPES: loose, well-rounded medium-coarse granitic sand and gravel
SENSITIVE RECEPTORS: humans

6. DATA TYPES

A. ANALYTICAL DATA

pH	SULFATE	TDS
CONDUCTIVITY	PCB	TSS
VOC	METALS	BOD
BNA	BACTERIA	COD
NITRATE	GRO	DRO
AMMONIA	TRPH	EXPLO-
ALKALINITY	HARDNESS	SIVES

B. PHYSICAL DATA

7. SAMPLING METHOD

BIASED GRAB

8. ANALYTICAL LEVELS

LEVEL 1 FIELD SCREENING - EQUIPMENT: HNU or OVA
LEVEL 2 FIELD ANALYSIS - EQUIPMENT: pH, conductivity, temperature, turbidity
LEVEL 3 NON-CLP LABORATORY - METHODS: 9132, 8270, 9073, 8260, 8080, 8330, M-8015(AK101.0), M-8100(AK102), 6000/7000, 524-2, 352, 350, 375, 908, 405, 410, 160, SM908, 150, 310.1, 130.1
LEVEL 4 CLP/RAS-METHODS: NA
LEVEL 5 NON STANDARD: NA

9. SAMPLING PROCEDURES

BACKGROUND: One for groundwater matrix for each parameter Of interest
CRITICAL (LIST): NA
PROCEDURES: NA

10. QUALITY CONTROL SAMPLES

A. FIELD	B. LABORATORY
COLOCATED (VOC analysis only) - 10% QC/10% QA	REAGENT BLANK - 1 PER ANALYSIS BATCH OR: 5%
REPLICATE - 10% QC/10% QA	REPLICATE - 1 PER ANALYSIS BATCH OR: 5%
FIELD BLANK (rinsate) - 1 per sampling equipment type	MATRIX SPIKE/MATRIX SPIKE DUPLICATE - 1 PER ANALYSIS BATCH OR: 5%
TRIP BLANK - 1 PER DAY OR: per aqueous VOC sample shipment	OTHER:

TABLE 3-3
DQO SUMMARY FORM - SEDIMENT

1. SITE
NAME: Gambell
LOCATION: St. Lawrence Island

2.	MEDIA (Circle one)		SOIL	GW	SW/SED	AIR	BIO	OTHER ____
3.	USE (Circle all that apply)	SITE CHARAC. (H&S)	RISK ASSESS.	EVAL ALTS.	ENG'G DESIGN	PRP DETER.	MONITORING REMEDIAL ACTION	OTHER ____

4. OBJECTIVE: Determine nature and extent of contamination.

5. SITE INFORMATION

AREA: 6.5 square miles
DEPTH TO GROUND WATER: approximately 4-11 feet
GROUND WATER USE: drinking water wells
SOIL TYPES: loose, well-rounded medium-coarse granitic sand and gravel
SENSITIVE RECEPTORS: children (direct contact, consumption), flora, fauna (subsistence lifestyle)

6. DATA TYPES

A. ANALYTICAL DATA	B. PHYSICAL DATA
PCB	

7. SAMPLING METHOD

BIASED GRAB

8. ANALYTICAL LEVELS

LEVEL 1 FIELD SCREENING - EQUIPMENT: HNu or OVA
LEVEL 2 FIELD ANALYSIS - EQUIPMENT: NA
LEVEL 3 NON-CLP LABORATORY - METHODS: 8080
LEVEL 4 CLP/RAS-METHODS: NA
LEVEL 5 NON STANDARD: NA

9. SAMPLING PROCEDURES

BACKGROUND: One representative sediment sample for each parameter of interest
CRITICAL (LIST):
PROCEDURES:

10. QUALITY CONTROL SAMPLES

A. FIELD	B. LABORATORY
COLOCATED (VOC analysis only) - 10% QC/10% QA	REAGENT BLANK - 1 PER ANALYSIS BATCH OR: 5%
REPLICATE - 10% QC/10% QA	REPLICATE - 1 PER ANALYSIS BATCH OR: 5%
FIELD BLANK (rinsate) - 1 per sampling equipment type	MATRIX SPIKE/MATRIX SPIKE DUPLICATE - 1 PER ANALYSIS BATCH OR: 5%
TRIP BLANK - 1 PER DAY OR: NA	OTHER:

TABLE 3-4
DQO SUMMARY FORM - ASBESTOS

1. SITE
NAME: Gambell
LOCATION: St. Lawrence Island

2. MEDIA (Circle one)		SOIL	GW	SW/SED	AIR	BIO	[✓ OTHER ASBESTOS]
3. USE (Circle all that apply)	[✓ SITE CHARAC (H&S)]	RISK ASSESS.	EVAL ALTS.	ENG'G DESIGN	PRP DETER.	MONITORING REMEDIAL ACTION	OTHER ____

4. OBJECTIVE: Determine nature and extent of contamination.

5. SITE INFORMATION

AREA: 6.5 square miles
DEPTH TO GROUND WATER: approximately 4-11 feet
GROUND WATER USE: drinking water wells
SOIL TYPES: loose, well-rounded medium-coarse granitic sand and gravel
SENSITIVE RECEPTORS: flora, fauna, and humans (subsistence lifestyle)

6. DATA TYPES

A. ANALYTICAL DATA	B. PHYSICAL DATA
ASBESTOS	

7. SAMPLING METHOD

BIASED GRAB

8. ANALYTICAL LEVELS

LEVEL 1 FIELD SCREENING - EQUIPMENT: NA
LEVEL 2 FIELD ANALYSIS - EQUIPMENT: NA
LEVEL 3 NON-CLP LABORATORY - METHODS: NA
LEVEL 4 CLP/RAS-METHODS: NA
LEVEL 5 NON STANDARD: Polarized Light Microscope (PLM)

9. SAMPLING PROCEDURES

BACKGROUND: NA
CRITICAL (LIST):
PROCEDURES:

10. QUALITY CONTROL SAMPLES

A. FIELD

COLOCATED (VOC analysis only) - 10% QC
REPLICATE - 5% OR: NA
FIELD BLANK - 5% OR: NA
TRIP BLANK - 1 PER DAY OR: NA

B. LABORATORY

REAGENT BLANK - 1 PER ANALYSIS BATCH OR: NA
REPLICATE - 1 PER ANALYSIS BATCH OR: NA
MATRIX SPIKE/MATRIX SPIKE DUPLICATE - 1 PER ANALYSIS BATCH OR: NA
OTHER:

4. PROJECT ORGANIZATION AND FUNCTIONAL AREA RESPONSIBILITIES

A contractor and COE project team organization chart to implement this CDAP is presented in Figure 4-1. This organization chart will serve as a basis for discussion as to team makeup and distribution of responsibilities.

Corporate Support

The corporate support group within the project organization includes the contractor's corporate management, project director, report production, QA department, and Health and Safety department. The responsibilities here are to offer guidance, review, and support services as requested by the project manager or required by corporate policy.

Technical Project Director

The technical project director has overall responsibility for ensuring that the project meets COE objectives and quality standards. The technical project director is responsible for overall coordination and scheduling of all project activities and for communicating with COE.

Contractor's Project Manager

The contractor's project manager is responsible for the contracted scope of work. All elements of the scope must be completed on time, within budget, with high quality, and in a safe manner. The coordination of this effort is the project manager's responsibility. The contractor's project manager is also the direct link to the COE Project Manager and is responsible for keeping him or her informed at all times through required progress reports and project deliverables.

Chief Investigator

The chief investigator is the field team leader and primary report writer. The chief investigator is responsible for field team compliance with the CDAP, its procedures, and deliverables. Also, the chief investigator is responsible for documentation of all on-site activities. Should any deviations from the CDAP be deemed necessary in the field, the chief investigator must provide justification for the same to the COE project manager prior to taking such action.

Quality Assurance Officer

The QA officer is responsible for assessing the implementation of the CDAP in support of the project. The QA officer is independent of the project and does not report directly to the project manager. The QA officer conducts formal QA audits to evaluate the contractor's personnel training and implementation of project quality control protocols, and ensures that all documents produced meet COE standards.

Site Safety Officer

The responsibilities of the site safety officer include implementation of the site safety plan through safety meetings, personnel monitoring, operational monitoring, and first aid, if necessary. The site safety officer is responsible to the corporate health and safety manager regarding policy and to the chief investigator regarding field activities. The site safety officer is also responsible for maintaining the site safety logbook.

Project Chemist

The project chemist will serve as the primary QA check on field activities, ensuring samples are labeled, packaged, and shipped according to protocol. In addition, the project chemist is responsible for assessing and summarizing the accuracy, precision, and reliability of data to determine its usability, and for documenting any factors affecting data usability for the historical record.

Field Investigation Personnel

As shown in the project organization chart, it is anticipated that in order to accomplish the entire CDAP in one field season (i.e., late June to August), functional responsibilities would be divided into sampling and drilling. Individual duties would vary for the field investigation team depending on a matrix or site approach. The geologist will direct the COE drilling team, log all wells, assess geology through the use of borehole split-spoon samples, perform geophysical surveys, and prepare appropriate sections of any and all reports. The geologist will also assist the field investigation team in the subsurface soil and groundwater sampling. Surveying will be conducted by COE who will record all well placements, provide all necessary sampling grid layouts, record sample locations, and provide any other surveying called for by the CDAP or directed by the chief investigator. The field investigation team will perform all sampling procedures, decontamination of sampling equipment, material handling, and field documentation as called for in the CDAP. The report preparation related to this work will also be the responsibility of the field investigation team.

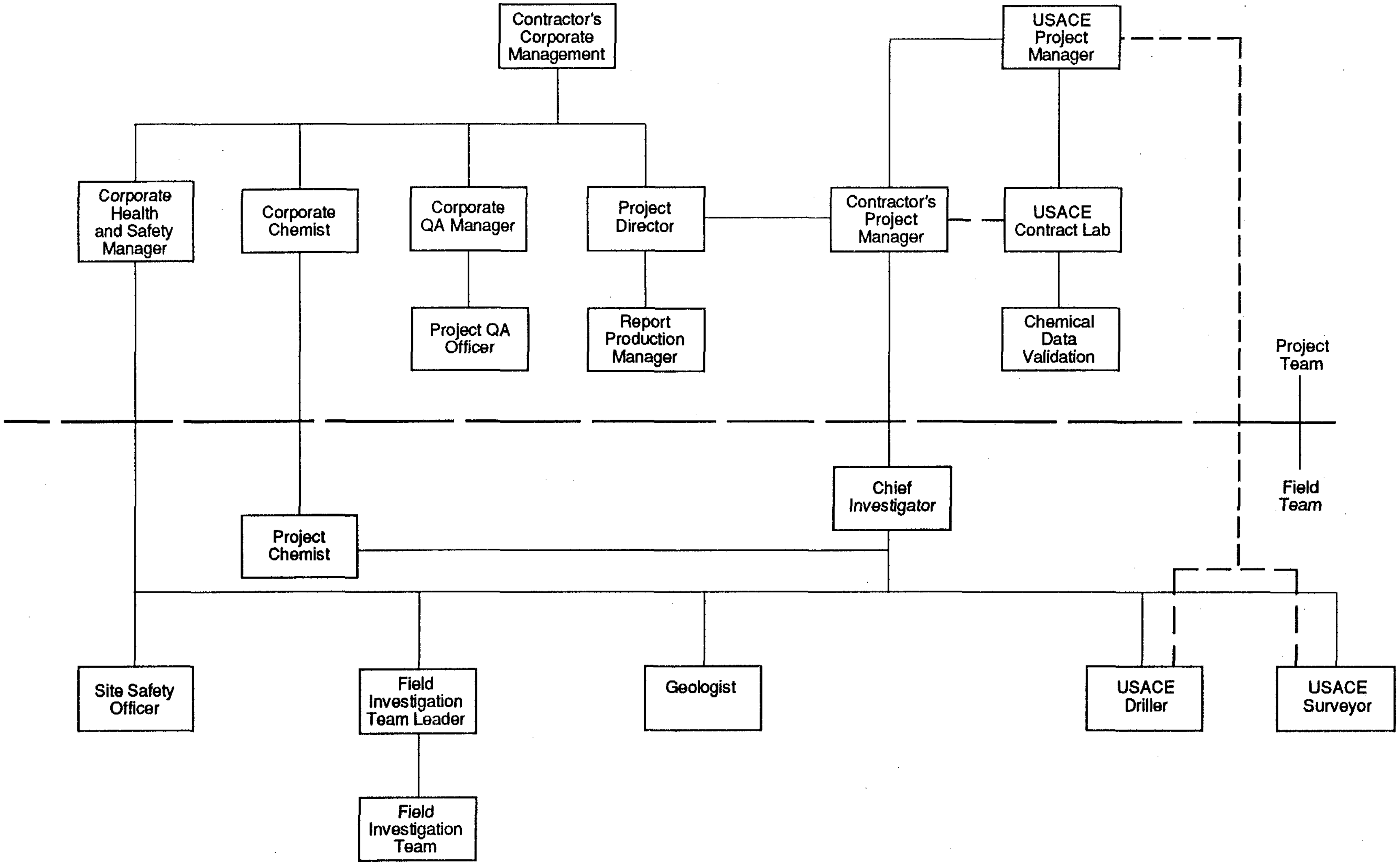


Figure 4-1
PROJECT ORGANIZATION CHART

5. FIELDWORK METHODOLOGIES/FIELD ACTIVITIES

5.1 GENERAL INFORMATION

As a result of the 1986 URS investigation, E & E's 1991 and 1992 site reconnaissance visits, and interviews with people who lived at Gambell throughout DOD occupation, 18 sites were preliminarily identified as potentially qualifying for the DERP program. Of these, 12 have been selected for the sampling program due to the possible presence of either hazardous and toxic waste (HTW) or containerized HTW. Previous reports and information supplied by COE indicate that the primary contaminants of concern are POLs, PCBs, miscellaneous chemicals (including metals, asbestos, and possibly dioxins), and persistent pathogens. URS collected a limited number of soil and water samples during their 1985 site reconnaissance. Soil samples were analyzed for PCBs only, and none were detected. Surface water and groundwater samples were analyzed for water quality parameters, PCBs, volatile organic compounds (VOC), and metals. The analytical results did not indicate any significant contamination, except for some oil and grease in most samples.

Sites were selected for sampling for this CDAP using the following criteria:

- Historical evidence of DOD occupation or use;
- Historical evidence of use or disposal of hazardous substances;
- Evidence that an area was burned; and
- Evidence of visible staining.

The field investigation has been designed to determine:

- Presence of contamination at each potential source,
- Nature of contamination, and
- Possible contaminant migration pathways.

However, determinations on the nature and extent of contamination are limited to the investigated areas. Sufficient data will be gathered to make a preliminary evaluation of remedial alternatives. The field investigation was designed in this manner to limit the need for additional sampling efforts because of the high cost of mobilizing sampling equipment and personnel to St. Lawrence Island.

Tables 5-1 and 5-2 summarize the number of samples to be collected and the analyses to be performed at Gambell.

Analytical parameters have been established according to the suspected contaminant characteristics of each site. Additional parameters, discussed in the following paragraphs and summarized in Table 5-1, were selected to provide guidance for formulating remedial alternatives. Results from these analyses will not be used to quantitatively characterize potential contamination; therefore, no discussion of remedial parameters is presented in the reports summarizing E & E 1991 and 1992 site reconnaissance visits.

Potentially contaminated areas will be screened with a flame ionization detector (FID) and observed for staining or other evidence of POL contamination (e.g. stressed vegetation). Resultant samples will be collected and analyzed for some or all of the following parameters: GRO, DRO, VOC, metals-toxicity characteristic leaching procedure (TCLP) for soil samples, and total metals for aqueous sediment samples. VOC and in some case metals analyses will be reserved for samples with high petroleum content as indicated by field screening (see Section 5.4.4.2). At sites where transformers are present or were present historically, or in areas where there is suspected used-oil contamination, samples will also be analyzed for PCBs. Ordnance burial sites will not be specifically sampled, but samples may be collected in the vicinity of the buried ordnance for explosives residues. Samples collected from burn sites will also be analyzed for dioxins and base/neutral/acid extractable (BNA) compounds. Bulk samples of building or insulation materials collected in debris areas will be tested for asbestos content. Other analyses will be performed on samples according to site-specific characteristics.

Parameters selected for remedial design purposes were based on available remediation technologies suited to the unique climate, soil characteristics, potential contamination, and remoteness of the Gambell site. Bioremediation parameters were not included since site conditions limit the feasibility of this remedial alternative. For surface and subsurface soils, the following parameters are proposed for analysis: moisture content, grain size, ash, total sulfur, total organic carbon (TOC), British thermal unit (BTU) content, ignitability, Atterburg limits, total organic halides (TOX), and aromatic volatile organics (VOCs). The following parameters are proposed for groundwater samples: alkalinity, hardness, total metals (magnesium, calcium, and total and dissolved iron). In order to provide representative analysis of soils and groundwater, approximately 10 to 20 percent of all samples will be analyzed for the remediation parameters mentioned above. This sampling frequency can be modified by the field team during the field investigation based on soil and groundwater characteristics.

5.2 PROJECT AREA SITE DESCRIPTIONS

Little evidence remains of the military installations in Gambell. Most facilities were demolished and buried in place; the materials remaining on the surface include but are not limited to, landing mat, barrels, and cables. Eighteen sites allegedly occupied by DOD have been identified in or near the Village of Gambell, except Site No. 14 which is located approximately seven miles south of Gambell (Figure 5-1).

- Site No. 1: North Beach;
- Site No. 2: Former Military Housing/Operations Site;
- Site No. 3: Former Communication Facility;
- Site No. 4: Sevuokuk Mountain;
- Site No. 5: Former Tramway Site;
- Site No. 6: Military Landfill;
- Site No. 7: Former Military Power Facility;
- Site No. 8: West Beach;
- Site No. 9: Asphalt Barrel Cache;
- Site No. 10: Sevuokuk Mountain Trail System;
- Site No. 11: Communication Cable Route;
- Site No. 12: Nayvaghaq Lake Disposal Site;
- Site No. 13: Former Radar Power Station;

- Site No. 14: Navy Plane Crash Site;
- Site No. 15: Troutman Lake Ordnance Burial Site;
- Site No. 16: Gambell Municipal Building Area;
- Site No. 17: Army Landfills; and
- Site No. 18: Former Main Camp.

Of these only 16 potentially qualify for DERP-funded cleanup or investigation. Twelve of the 16 potentially qualify for DERP-funded investigations.

The following sections describe the existing knowledge about suspected hazardous substances associated with alleged military activity at each site. In addition, the objectives and rationale are stated for the investigation of each site.

5.2.1 Site No. 1: North Beach

North Beach extends approximately 7,000 feet along the north shoreline of St. Lawrence Island, from the base of Sevuokuk Mountain to West Beach (Site No. 8) (see Figure 5-2). The apparent north to south dimension of the site varies from approximately 300 to 560 feet. North Beach includes two areas of reported buried debris associated with the former military landing areas. North Beach is largely undeveloped, except for the area immediately surrounding the Village of Gambell. Local residents often fish along the beach and ride ATVs throughout the site. In the vicinity of the Village there is a human waste landfill which is under construction, a drum dump, and a partially fenced landfill which is in use. The drum dump includes rusty aboveground tanks and household refuse (E & E 1992). A previous investigation indicated that the drum dump was possibly a military drum dump (URS 1985). During the current investigation, Mr. James stated that the Federal Aviation Administration (FAA) used this area for drum disposal (E & E 1992)

The Air Force and Army reportedly operated separate Landing Areas within Site No. 1. Each Landing Area allegedly used dead-man anchors to anchor barges off shore. There is very little surficial debris from the base of the mountain west to the Air Force Landing Area (E & E 1992).

The Air Force Landing Area is reportedly located adjacent to the beach berm, approximately 900 feet west of the 100-foot contour of Sevuokuk Mountain. (Generally, the beach berm is represented by the 10-foot contour line shown in Figure 5-2.) The Air Force Landing Area is approximately 275 feet by 80 feet. Near the northeast corner of the Air Force Landing Area, within the beach berm, is a decaying drum, black oil or tar-like material, and rust-stained gravel. In addition, there is a 5-foot by 4-foot patch of tar-stained gravel near the center of this area. An area of rust-colored gravel is visible in an ATV road that is oriented east to west and bisects the southern third of the area. Mr. James claims that there are buried drums of heavy weight oils, tars, and asphalt in Air Force Landing Area (E & E 1992).

The Army Landing Area is allegedly located immediately east of an area persistently used to beach whaling boats. Mr. James estimated that the Army Landing Area is approximately 410 feet by 340 feet, and two well established ATV roads bisect the area. The roads have sinuous patterns, and both begin near the northeast corner of the area. One road exits the area near the midpoint of the southern boundary, and the other exits the area near the midpoint of the western boundary. There are reportedly dead-man anchors, engines formerly used to run pulley systems, and a 100-foot crane buried in the Army Landing Area. A pit containing drums, landing mat, and weasel track is located in the northeast corner of the Army Landing Area near the junction of the two ATV roads (E & E 1992).

The Army Landing Area is characterized by small round gravel mounds, many of which include small metal/rust fragments from deteriorating material. Debris is scattered between the Air Force Landing Area and Army Landing Area, and it is concentrated on the beach front and near the berm (E & E 1992).

The proposed field investigation will attempt to delineate the boundaries of the landing areas with a geophysical survey and it will include the collection of surface and subsurface soil and groundwater samples. Soil borings will be drilled and monitoring wells installed within the landing areas and around the perimeter of the area. Surface soil samples will be collected in areas of stained soil. Surface and subsurface soil samples will be analyzed for POLs, BNAs, PCBs, and metals. Groundwater samples will be analyzed for POLs, VOCs, PCBs, and metals.

5.2.2 Site No. 2: Former Military Housing/Operations Area

The Former Military Housing and Operations Site includes: A Former Military Housing/Operations Burial Area, a Power Plant Burial Area, and an Ordnance Burial Site, all of which are located in the southeast portion of the site (see Figure 5-3). The Former Housing/Operations Area is approximately 365 feet by 150 feet. The Ordnance Burial Site is reportedly located at the southern end of the Former Housing/Operations Area. Mr. James estimated that the Power Plant Burial Area is approximately 110 feet by 70 feet (E & E 1992).

All facilities associated with these areas were reportedly demolished and the debris was buried at Site No. 2. The Former Housing/Operations Area included two rows of six quonset huts oriented north to south. North of the quonset huts was a mess hall and a utility building. The utility building contained showers and a day room. The remnants of an apparent fireplace and a concrete pad; pieces of burned wood, and metal debris are scattered throughout the Area. There are two locations of discolored gravel in the Former Housing/Operations Burial Area; one apparently rust-stained area is located in the northeast corner and the other 2-foot-square area is located near the center of the area and includes burned wood (E & E 1992).

The Ordnance Burial Site reportedly contains twenty-mm ammunition, 30- and 50-calibre ammunition, carbine ammunition, and hand grenades in metal and creosote-coated wooden boxes buried approximately 6 feet bgs (E & E 1992).

East of the Former Housing/Operations Area was a small power plant. The power plant and all associated machinery were reportedly buried in the Former Power Plant Burial Area. On the surface of the former Power Plant Burial Area is a large gear, and rectangular metal boxes are located in the southeast corner of the area. Part of a tiltdozer blade protrudes from the ground at the northwest corner of this area. Adjacent to the tiltdozer blade is a portion of a weasel track and rusted metal fragments. The underlying gravel is rust stained (E & E 1992).

North of the Former Housing/Operations Area is mounded gravel that reportedly covers the remains of a buried machine gun nest. Fibrous material which may potentially contain asbestos was observed in the gravel mound during the site inventory. Mr. James explained that the machine gunners would sit on this material to insulate themselves from the ground (E & E 1992).

The field investigation will attempt to identify the locations of the buried debris with a geophysical survey and include collection of surface soil, subsurface soil, and groundwater samples for analysis. Wells will be drilled within and around the perimeters of the Former

Military Housing/Operations Burial Area and the Power Plant Burial Area to determine whether contamination of soil and groundwater has occurred. No subsurface investigation will occur in the Ordnance Burial Site. Surface soil samples will be collected in areas of stained gravel. A sample of the fibrous material present near the reported machine gun nest will be collected for asbestos analysis. Although no boreholes will be drilled at the Ordnance Burial Site, all subsurface soil and groundwater samples collected in the vicinity of the site will be analyzed for nitrogen compounds and metals which could be leaching from the buried ordnance.

5.2.3 Site No. 3: Former Communication Facility

The Former Communications Facility Site is located parallel to the 100-foot contour of Sevuokuk Mountain. It extends from the southeast corner of North Beach (Site No. 1) to the north boundary of the former Tramway Site (Site No. 5) (see Figure 5-4). The site has a north-to-south dimension of 1,875 feet, and an east-to-west dimension that varies from 250 feet to 435 feet. The Site includes debris (drums and drum remnants) scattered the entire length of the Site and the area in which the communications facility was buried (E & E 1992).

The suspected Former Communications Facility Burial Area is a slightly irregular rectangular area of approximately 75 feet by 45 feet. Two Jamesway huts and a 10- to 15-kw power plant are reportedly buried in the area. The power plant probably contained auxiliary generators, transformers, oils, fuels, and batteries which may have been buried in the area. In addition, approximately twelve 5- to 10-gallon glass carboys of sulfuric acid were reportedly buried on site (URS 1986; E & E 1992).

Currently, one drum, some pipe, anchors for guy wire, and 275-gallon tank are scattered on the surface, most of which are located on the eastern half of the Burial Area. A 1.5-inch-diameter PVC well point, apparently from the URS investigation, is located near the center of the area. In contrast to the URS findings, there is no apparent staining or stressed vegetation remains in the suspected burial area (URS 1986 and E & E 1992).

The proposed field investigation will attempt to identify the locations of the buried debris and potential HTW with a geophysical survey, and it will include collection of subsurface soil and groundwater samples. The demolition and burial of generators, transformers, oils, fuels, and acids at this site poses a potential for PCB contamination, oil spillage, and acid leakage.

During the URS investigation a single surface soil grab sample was collected and analyzed only for PCBs. PCBs were not detected above a detection limit of 0.5 part per million (ppm) (URS 1986). Given the additional potential contaminants, lead and other heavy metals and sulfates may be present. The field investigation will consist of drilling a well within the suspected burial area. Subsurface soil and groundwater samples will be analyzed for POLs, metals, PCBs, and sulfates. The URS well point will not be sampled because the well is not secure.

5.2.4 Site No. 4: Sevuokuk Mountain

The Sevuokuk Mountain Site occupies an extensive area of the top and uppermost western flank of Sevuokuk Mountain. However, the remains of alleged DOD activity are concentrated in three locations: the Former Air Force Radar Station Area, the remains of two quonset huts and the surrounding area, and the area containing three transformers and miscellaneous debris (see Figure 5-4). Site No. 4 occupies an area that is approximately 4,175 feet north to south and ranges from 965 feet to 3,125 feet west to east. The Former Air Force Radar Station is an irregularly-shaped area located at the northern end of the site; the Former Quonset Hut Area is located near the middle of the site No. 4; and the transformers and miscellaneous debris are located within a stream drainage near the southwest corner of the site (E & E 1992).

Power cables were reportedly strung from the Former Military Power Facility (Site No. 7) to secondary transformers at the base of the mountain at the Tramway Site (Site No. 5), along a drainage course on the west flank of Sevuokuk Mountain, and up to a set of tertiary transformers, the quonset huts, and the Air Force Radar Station in Site No. 4. The Navy reportedly placed sonar cables along the Communications Cable Route (Site No. 11) from the Former Military Power Facility (Site No. 7) to the same drainage course and up the mountain to the radar station and several other locations. Although there is no evidence of the power cable, it is reportedly buried at the former Tramway Site (Site No. 5). Sonar cable and remnants of structures remain on the west flank of Sevuokuk Mountain below Site No. 4 (E & E 1992).

The Air Force Radar Station Area is an approximate 375-foot by 500-foot area at the north end of Sevuokuk Mountain. The Air Force Radar Station burned and its debris remain. Mr. James claims that ordnance exploded when the station burned, thereby scattering debris. There is a 30-foot-square area of stained soil near the center of the Air Force Radar Station that contains scattered rusted debris and burned timbers (E & E 1992).

Along the western edge of the mountain ridge near the middle of Site No. 4 is the 65-foot by 75-foot quonset hut area. It contains frames of two fallen quonset huts, 55-gallon drums filled with gravel used as tie-downs for the quonset huts, and one transformer. The 55-gallon drums surround the former building and the transformer sits on the ground east of the former quonset huts. Although the transformer is labeled as a dry-type transformer, its coils are coated with an oily substance. Some white friable material (potential ACM) remains in piles 20 feet north of the quonset huts.

Approximately 100 yards north northeast of the former quonset huts are guy wires, guy wire anchors, poles, and radar dish support legs. Approximately 50 yards northeast of the quonsets huts is a pile of decaying cans. Approximately 500 feet south of the quonset hut remains is an area of drums and debris. There are 55-gallon drums, barbed wire, an ammeter/voltmeter, pipes, and a transformer. There was no visible staining near the transformer. Southeast of the drum and debris area is a 10 Kilowatt generator and several drums with no visible staining on the surrounding soil (E & E 1992).

The area containing three transformers and miscellaneous debris is located at the southwest corner of Site No. 4. The area is on a ledge below the quonset hut remains on the west flank of the mountain. Three empty electrical transformer casings lie within a mountainside drainage. There was no visibly stained soil near the transformers. Northeast of the transformers are miscellaneous debris that includes rusted support structures for a quonset hut, drums, sonar cable, spools of sonar cable and wire, sheet metal, and a guy wire anchor. Debris extends eastward to the ledge below the drum and debris area (E & E 1992).

There were no indications of a previously reported oil spill at Site No. 4 (E & E 1992). During the previous investigation, a single soil grab sample was collected at a reported oil spill site and analyzed for PCBs. The sample did not contain PCBs at a concentration above the detection limit (URS 1986). During the field investigation, another attempt should be conducted to located the reported oil spill area. If it is located, surface soil samples will be collected from the apparent spill area and analyzed for metals and PCBs. During the field investigation, surface soil samples will be collected from the area of stained soil at the Former Air Force Radar Station and analyzed for TRPH, dioxins, PCBs, BNAs, and TCLP metals.

The transformer casings indicate the potential for PCB contamination. However, a single soil grab sample collected from the transformers in the mountainside drainage during the URS investigation did not contain PCBs at concentrations above the detection limit (URS 1986). Surface soil or sediment samples will be collected at each of the transformer locations to confirm the presence or absence of PCBs. A sample of the white friable material located near the quonset huts will be collected and analyzed for bulk asbestos.

5.2.5 Site No. 5: Former Tramway Site

The Former Tramway Site extends approximately 2,400 feet from the southeast corner of the Former Military Power Facility (Site No. 7) to the southwest corner of Site No. 4 (see Figure 5-5). The north to south dimension of Site No. 5 varies from approximately 125 feet to 315 feet. The Former Tramway Site includes two areas of suspected debris and potential HTW burial that are referred to as the Cable Burial Area and the Secondary Transformer Burial Area. The Cable Burial Area is approximately 100-feet by 55-feet, and the Secondary Transformer Burial Area is approximately 70 feet by 50 feet (E & E 1992).

Remnants of the steel cable, sonar cable and miscellaneous metal debris from a military tramway remain on the mountain east of the burial areas. Power cables extended from the primary transformers at the Former Military Power Facility (Site No. 7) to secondary transformers at the base of the mountain to the tertiary transformers on the mountain ridge, and reportedly continued to the quonset huts and the Air Force radar station in Site No. 4. The Navy placed sonar cables up the mountain that followed the same route, which is known as the Communications Cable Route (Site No. 11). Most of the tramway has been removed and the power cable is reportedly buried in the Cable Burial Area west of the Secondary Transformer Burial Area (URS 1986; E & E 1992). There is no visible staining in this area or in the Cable Burial Area.

Six secondary transformers are reportedly buried near the base of the mountain (see Figure 5-5). These transformers were reported to be 8 to 10 feet in height. No debris is visible on the surface, but there is a mound in the middle of the area. An ATV trail extends between the suspected burial areas (E & E 1992).

Debris is scattered on the ground between the Former Military Power Facility (Site No. 7) and the present power plant. The military reportedly buried bottles and cans of beer, whiskey, and soda pop near the power plant. Other debris in this area includes concrete, cable, miscellaneous metal objects, and drums.

The proposed field investigation will attempt to identify the locations of the buried transformers and cable with a geophysical survey, and it will include the collection of subsurface soil and groundwater samples. Buried transformers at this site pose a potential for PCB contamination. The field investigation will include drilling wells and soil borings in a direction suspected to be downgradient of the identified burial areas and within the burial area. Subsurface soil and groundwater samples will be analyzed for PCBs, GRO, DRO, and TRPH.

5.2.6 Site No. 6: Military Landfill

The Military Landfill is located north of Gambell High School. The Army reportedly buried approximately 3,000 barrels of lime-stabilized human waste in an estimated 275-foot by 135-foot area (see Figure 5-5). According to Mr. James, the Army excavated an area at this site to a depth equal to the height of a drum. Over a period of six years, the Army filled the excavation from south to north, placing drums side by side (E & E 1992). Landfilled material may have included materials generated from the Former Military Power and Former Communication Facility (Site Nos. 7 and 3, respectively) (URS 1986).

The entire landfill surface is characterized by mounded gravel. Drum tops and remnants of approximately 20 drums protrude through the gravel surface throughout the site (see Appendix A). Two drums and weasel tracks are on the surface at the east end of the site. A 1.5-inch-diameter PVC riser pipe, an apparent well point from the 1985 URS investigation, is located in the southeast quadrant of the site. No organic vapors were detected using an Organic Vapor Analyzer (OVA) in the well casing or from any of the exposed drums (E & E 1992).

Particular concern is posed by Site No. 6 due to the site's proximity to the village and the desirability of the area for future community growth (URS 1986).

The proposed field investigation at this site will attempt to delineate the areal extent of the landfill with a geophysical survey, and it will include the collection of groundwater samples. Soil borings will be drilled and monitoring wells installed around the perimeter of the site. Groundwater samples will be collected.

Two groundwater samples collected from this area during the URS investigation were analyzed for PCBs, none were present above detection limits. Samples collected during the proposed field investigation will be analyzed for a broader suite of analytes, including POLs, water quality parameters, coliform bacteria, biochemical oxygen demand (BOD), and chemical oxygen demand (COD) to determine whether any human waste or other waste type is migrating into groundwater. The URS well point will not be sampled because it is not secure.

5.2.7 Site No. 7: Former Military Power Facility

The Former Military Power Facility was allegedly buried north of the municipal building in an estimated 375-foot by 85-foot area. The primary transformers associated with the facility were reportedly buried within the 35-foot by 60-foot area in the southwest corner of the site (see Figure 5-5). An area of mounded gravel with protruding power cable, copper wire, and rusted metal is located within the Primary Transformer Burial Area (E & E 1992).

A diesel/gasoline pipeline runs south from North Beach and branches east and west near the center of the site. There are seven areas of stained gravel on the west side of the pipe junction, and there is a concrete pad near the east end of the site. Burned wood, sonar cable, and landing mat are located near the concrete pad. Some residents remember a motor pool that was adjacent to the concrete pad and an area next to the motor pool in which military personnel worked on pipes (E & E 1992).

The proposed field investigation will attempt to locate the buried remains of the facility and transformers with a geophysical survey, and it will include the collection of surface soil, subsurface soil, and groundwater samples. Buried electrical equipment, including transformers, poses a potential for PCB and POL contamination of soil and groundwater at the site. However, during the URS investigation, no PCBs were detected in either a soil grab sample from a small surface oil spill or a groundwater sample collected from a well south of the facility (URS 1986).

During the proposed investigation soil borings will be drilled and monitoring wells installed. Subsurface soil and groundwater samples will be collected to detect whether subsurface contamination exists. These samples will be analyzed for POLs, PCBs, and metals. Surface soil samples will be collected at several locations of fuel-stained gravel. These samples will be analyzed for POLs and metals.

5.2.8 Site No. 8: West Beach

The West Beach Site extends from the southwest end of North Beach to Nayvaghaq Lake along the western shore for approximately 3 miles (see Figures 5-1, 5-2, and 5-6). Near the south end of the site, adjacent to the high water mark of Nayvaghaq Lake, is a previously undocumented Army Landfill. In addition, an Ordnance Burial Site in which the military buried approximately 1 ton of ordnance is reportedly located northwest of Nayvaghaq Lake (E & E 1992).

The West Beach Site contains scattered metal debris (barrels and landing mat) and small quantities of wood and concrete. Debris are scattered along an existing runway (especially on the east side of the runway) south to the end of Troutman Lake, and west to the beach. In addition, erosion has exposed landing mat on the east side of the airstrip and road running south from the airstrip. A 25-to 30-foot-wide layer of landing mat reportedly underlies the airstrip and road south of the airstrip for approximately 4,500 feet. There is no apparent soil staining, with the exception of rust, along the beach (E & E 1992).

The Ordnance Burial Site is reportedly located approximately 225 feet east of the shoreline on West Beach. In either the fall 1956 or spring 1957, the military allegedly buried crates of live ammunition including hand grenades, 30-and 50-calibre shells, and TNT approximately 3 to 6 feet bgs. Currently, the burial site contains two pits in the northwest corner of the site and some surface debris. There is no visibly stained soil (E & E 1992).

The Army Landfill adjacent to Nayvaghaq Lake is approximately 145 feet by 145 feet. The southern boundary of the area is the high water mark of the lake. The Army reportedly dug a hole and filled it with several loads of material, but never graded the area. Currently, there is no visible debris or stained soil on the surface, but there are two 4-foot pits on the south side of the suspected landfill area (E & E 1992).

The proposed field investigation will attempt to delineate the boundaries of the landfill with a geophysical survey, and it will include drilling a well downgradient of the landfill. Subsurface soil and groundwater samples will be collected and analyzed for POLs, PCBs, and metals. The contractor will not sample, or in any way disturb, the Ordnance Burial Site with the assumption that COE will refer this problem to the Explosive Ordnance Demolition Division.

5.2.9 Site No. 9: Asphalt Barrel Cache

The Asphalt Barrel Cache is located on the east side of the airstrip. It was identified by URS as a former military site containing approximately 150 55-gallon leaking barrels of asphalt. However, Mr. James claims that the site was not used by the military and that FAA used this area as barrel cache during airstrip construction. According to Mr. James, the barrels were covered with gravel during a severe storm in fall 1990. Currently, there is little surficial evidence of the barrels except for scattered asphalt (E & E 1992).

During the E & E site inventory, several deteriorating 55-gallon drums from which a tar-like substance was leaking were observed. These drums are located an unspecified distance north of the approximate location of the Asphalt Barrel Cache. Mr. James claims that these are also the responsibility of FAA (E & E 1992).

The proposed field investigations will not include samples at this location since it is reportedly FAA's responsibility ~~and~~ NOT DOD's as discussed above.

5.2.10 Site No. 10: Sevuokuk Mountain Trail System

The Sevuokuk Mountain Trail System Site consists of unpaved trails in the tundra from atop Sevuokuk Mountain into the areas east and south of Nayvaghaq Lake (see Figure 5-1). The trail system originates at the southeast end of Troutman Lake and separates to form individual trails to the north, south, and east. Individual trails to the north include two trails that provide access to the top of Sevuokuk Mountain; the westernmost trail is known as the Army Trail, and the other trail is known as the Air Force Trail (E & E 1992). These trails are marked by approximately 157 empty 55-gallon barrels in various conditions which are located approximately 200 feet apart (see Figure 5-1). Some drums reportedly contained petroleum product that was subsequently salvaged by local residents. Several drums contained gravel, but most were empty. However, there was a tar-like substance leaking from one of the drums examined. Since not every drum was examined, other drums may contain remaining product. Landing mat and weasel track are located near the top of the mountain along the trail system (E & E 1992).

Portions of the trail system near the base of the mountain are not marked by 55-gallon barrels; however, a group of barrels was observed west of the trail system and east of Site No. 13. The drums may have accumulated in this area as a result of winds that blew the drums westward from the southern portion of the Sevuokuk Mountain Trail System (E & E 1992).

No surface samples are proposed at this site unless evidence of contamination, such as stressed vegetation, is discovered during the proposed field investigation.

5.2.11 Site No. 11: Communication Cable Route

The Communication Cable Route extends eastward approximately 2,700 feet from the Former Military Power Facility (Site No. 7) across the Tramway Site (Site No. 5) to the base of Sevuokuk Mountain (see Figure 5-1). Four sonar cables extend from the base of the mountain to a destroyed Jamesway building that served as the Navy Sonar Pick-up Station. The building is located approximately 300 feet west of the Army Trail of Site No. 10 (not shown on figures). Most of the wood from buildings remains on the ground in piles with the sonar cable. Sonar cable formerly extended east from the former Navy Sonar Pick-up Station across the tundra approximately 6 miles to Dovelawik Bay, south 35 miles to Bunnell Cape, north to the top of Sevuokuk Mountain, and then down the mountain to the Bering Sea (see Figure 5-1). Metal spools are placed at 0.25-mile intervals along each cable route. Mr. James said that the cable was used for sonar by the Navy to track Soviet submarines during the Cold War (E & E 1992).

No soil or groundwater contamination is suspected with this site, therefore no samples will be collected from the Site No. 11.

5.2.12 Site No. 12: Nayvaghaq Lake Disposal Site

The Nayvaghaq Lake Disposal Site is located south of Site No. 13 and north of Nayvaghaq Lake, on the southwest side of an ATV road which extends south from the airstrip (see Figures 5-1 and 5-6). This site includes two drum disposal areas, a North Area at the intersection of the ATV trails and a south area approximately 470 feet south (see Figure 5-6). The North Area contains approximately 120 drums, the remnants of 10 batteries, and household refuse. Drums are concentrated near the road, but some are scattered westward toward Nayvaghaq Lake. The batteries are located at the north and south ends of the North Area. A shallow pit with standing water 30 feet west of the main drum area also contains a drum. An empty rusted can labeled "ethylene glycol" was also found in this area. There is no apparent staining in the drum area other than rust (E & E 1992).

The south area includes approximately 50 drums lying immediately adjacent to the west side of the road. There are also five or six drums scattered west of the main concentration of drums. There is no visible staining of the soil except for rust (E & E 1992). During high runoff periods, Nayvaghaq Lake extends into this area. About 35% of the barrels contain garbage, with most filled to approximately one-third of capacity (URS 1986). The disposal of barrels in this area poses a potential for POL contamination. In addition, lead may be a concern due to battery disposal at the site.

The proposed field investigation in this area will attempt to determine whether there is surface and subsurface soil and groundwater contamination by drilling soil borings and installing monitoring wells around the perimeter of the disposal areas. Subsurface soil and groundwater samples will be analyzed for POL and heavy metals. Surface soil samples will be collected in the vicinity of discarded batteries and submitted for POL and metals analysis.

5.2.13 Site No. 13: Former Radar Power Station

The Former Radar Power Station was located east of the pond located south of Troutman Lake (see Figure 5-6). This site was a military radar installation and was probably the temporary AC&W site operated by the Air Force (URS 1986). The station reportedly contained two wooden quonset huts, one long wooden building, and a number of 150-foot towers that were reportedly demolished and buried on site (E & E 1992). The former locations of these structures are not known.

The potential burial area containing materials from the Former Radar Power Station is approximately 550 feet by 250 feet (E & E 1992). Electrical transformers and generators may be buried on site (URS 1986). Little evidence of the installation remains beyond scattered surface debris and gravel mounds. Wire and pieces of ceramic material are scattered across the area. Guy wire laying on the north side of the site is suspected to be attached to buried materials, and there is a concentration of pipes and other wires. A 9-foot-square area of darkened gravel containing burned wood and rusted electrical equipment is visible on the surface along the west boundary near the center of the site (E & E 1992).

The proposed field investigation will include an attempt to identify locations of buried material using a geophysical survey and the collection of surface soil, subsurface soil, and groundwater samples. The presence of electrical equipment at the site suggest the potential for POL and PCB contamination. However, neither a surface soil grab nor a contained groundwater sample collected from a well southwest of the site during the URS investigation contained PCBs above detection limits (URS 1986). Soil borings will be drilled and monitoring wells installed within the area of suspected buried material and around the perimeter of the site. Subsurface soil and groundwater samples will be analyzed for POL, VOC, PCBs, and heavy metal. Surface soil samples will be collected in the stained area and will be analyzed for POL, PCBs, and metals.

5.2.14 Site No. 14: Navy Plane Crash Site

In 1955, a Navy plane crash-landed 7 miles south of the village of Gambell (location not shown in figures). The main body of the plane remains on the tundra. Debris is largely confined to the immediate area surrounding the plane, but some is scattered as much as 100 feet away from the plane. Burned material is located near the engine area and along the interior of the fuselage. According to Mr. James, the airplane's belly gasoline tank exploded, and most fuels would have burned. There were no apparent stains or any stressed vegetation surrounding the crash site (E & E 1992).

The proposed field investigation will not include collection of samples at Site No. 14.

5.2.15 Site No. 15: Troutman Lake Ordnance Burial Site

Mr. James identified the location of a suspected ordnance burial site at the north end of Troutman Lake (see Figure 5-1). Other residents confirmed that children found unexploded ordnance while swimming in the lake (E & E 1992). After a late summer storm in 1992, children found bullets along the shores of Troutman Lake (James 1992).

COE will refer this problem to the Explosive Ordnance Demolition Division; therefore, the contractor will not sample, or in any way disturb this area.

5.2.16 Site No. 16: Gambell Municipal Building Site

The Gambell Municipal Building site consists of a 35-foot by 55-foot area of stained gravel, located immediately west of the Municipal Building (see Figure 5-7). Mr. James claims that there has been no spill at this location, but the stain becomes more pronounced after a heavy rain. Residents suspect that something is buried in the area (E & E 1992). No OVA readings above background levels were noted.

The proposed field investigation will include collection of surface soil, subsurface soil, and groundwater samples. The investigation will use a geophysical survey to identify locations of burial material. Soil borings will be drilled within and on the perimeter of the stained area and monitoring wells will be installed to determine whether there is subsurface contamination. Surface soil, subsurface soil, and groundwater samples will be analyzed for POLs and metals.

5.2.17 Site No. 17: Army Landfills

The Army Landfills are located between Site No. 7, Site No. 6, and the landing areas in Site No. 1 (see Figure 5-7). Materials in both landfills reportedly were regularly burned and covered. Landfill No. 1 is located west of Landfill No. 2 and it is approximately 240 feet by 130 feet. From 1951 to 1953 household refuse was reportedly buried to the depth of the water table, or approximately 15 feet bgs. Local residents claim that human waste, tar paper, and flat fuel containers are also buried in the landfills. The surface is characterized by mounds. Currently, debris on the surface includes drums, landing mat, and scrap metal. There was no visibly stained soil during the site inspection (E & E 1992).

Landfill No. 2 is approximately 235 feet by 245 feet and operated from 1951 to 1953. Debris on the surface was similar to the debris at Landfill No. 1. There were several buried drum tops exposed on the surface. Soil did not appear to be stained with anything except rust (E & E 1992).

The proposed field investigation will attempt to delineate the boundaries of the landfill with a geophysical survey and the collection of subsurface soil and groundwater samples. Soil borings will be drilled and monitoring wells installed within the suspected boundaries of the landfill and around the perimeters of the landfills. Subsurface soil and groundwater samples will be analyzed for POLs, PCBs, and metals.

5.2.18 Site No. 18: Former Main Camp

The Main Camp was adjacent to northeast end of Troutman Lake (see Figure 5-7). The Camp extended from the location of the current Municipal Building east to the High School. The mess hall was located where the Sivugag Incorporated building now stands. A boiler room was connected to the mess hall and there was a water pump house near the lake edge.

When it was in operation, there reportedly were ten 25,000 gallon-fuel tanks at the Main Camp. It is unknown whether the tanks were aboveground or underground or whether they were disposed of on site. Reportedly, there were also six flat fuel tanks for the boiler house and pumphouse. Gambell residents did not know whether these were buried in the area or not.

Cardboard boxes containing approximately 500 pounds of white material were found near the former pumphouse location at the edge of Troutman Lake (E & E 1992). The material has tentatively been identified as diatomaceous earth, previously used for water filtration by the Army (Waller 1959). Recent analysis of the material by ADEC indicated that minerals such as aluminum, calcium, magnesium, and sodium were present.

No samples will be collected at this site since there is no definite information about the tanks, and the white material has been analyzed and determined to be nonhazardous. However, a geophysical survey is proposed at this site to determine the presence or absence of the fuel tanks. There was no evidence of stressed vegetation nor was any stained soil observed.

5.3 GEOPHYSICAL INVESTIGATION

5.3.1 Geophysical Survey Locations

The Village of Gambell is constructed on cobble-, gravel-, and coarse sand-sided deposits which contain discontinuous permafrost (RZA 1985). The military probably encountered permafrost when excavating pits or trenches to bury debris. Disturbance of the indigenous sediments during excavation may have resulted in thaw bulbs surrounding the buried debris. Therefore, there is a potential, actually a preference for drilling soil borings and installing monitoring wells within the thaw bulbs.

Sites that contain buried waste will be surveyed with a metal detector, magnetometer, and an EM-31 to attempt to delineate the boundaries of the buried waste. The following sites will be geophysically surveyed:

- Site No. 1: North Beach Area
- Site No. 2: Former Military Housing/Operations Area
- Site No. 3: Former Communication Facility
- Site No. 5: Former Tramway Site

- Site No. 6: Military Landfill
- Site No. 7: Former Military Power Facility
- Site No. 8: West Beach
- Site No. 13: Former Radar Power Station
- Site No. 16: Gambell Municipal Building Site
- Site No. 17: Army Landfills
- Site No. 18: Former Main Camp

For each geophysical survey, survey grids will be established over and slightly beyond the estimated extent of each burial area. Each grid will be surveyed with a metal detector, an EM-31, and a magnetometer. The geophysical survey will be performed to locate buried debris, detect possible effects of buried debris on subsurface soil and groundwater quality, delineate the approximate areal extent that is underlain by buried debris, and select soil boring and monitoring well locations.

Site No. 1: North Beach

Site No. 1 includes three areas of suspected buried debris: the Air Force Landing Area, the Army Landing Area, and a drum and debris dump area (see Figure 5-2). The Air Force Landing Area and Army Landing Area will be investigated by geophysical surveys. The drum and debris dump area will not be surveyed because it is reportedly not the responsibility of the DOD.

Site No. 2: Former Military Housing/Operations Area

Site No. 2 includes suspect buried material from the Former Military Housing/Operations Burial Area, the Power Plant Burial Area, and the Ordnance Burial Site (see Figure 5-3). The Ordnance Burial Site coincides with the southern portions of the Former Military Housing/Operations Burial Area. Consequently, this area will be avoided during the geophysical surveys and subsurface investigation.

Site No. 3: Former Communication Facility

Site No. 3 reportedly includes buried generators, transformers, acids, oils, fuels, and batteries in the northern portion of the site (see Figure 5-4).

Site No. 5: Former Tramway Site

Site No. 5 reportedly includes two adjacent areas of suspected material burial at the foot of Sevuokuk Mountain (see Figure 5-5). The easternmost burial area reportedly includes transformers, and the westernmost burial area includes cables.

Site No. 6: Military Landfill

Site No. 6 reportedly includes a Military Landfill containing approximately 3,000 drums of lime-stabilized human waste and possible material from former power and communications facilities (see Figure 5-5) (E & E 1992; URS 1986). The landfill was reportedly excavated to a depth that was approximately equivalent to the height of one drum.

Site No. 7: Former Military Power Facility

Site No. 7 reportedly includes buried remnants of the Former Military Power Facility. The primary transformers are reportedly buried to the southeast of the former facility. Surface features at Site No. 7 include a concrete pad, fuel pipeline, and scattered metallic debris. These materials will have an impact on the effort to detect buried metallic debris. Interference caused by these materials will be noted during the survey.

Site No. 8: West Beach

Site No. 8 reportedly includes two areas of suspected buried debris, the Ordnance Burial Site northwest of Nayvaghaq Lake and the previously undocumented Army Landfill adjacent to the northwest portion of the shore of Nayvaghaq Lake (see Figure 5-6). The Ordnance Burial Site will not be surveyed or subject to subsurface investigation. No surface debris that could interfere with the geophysical survey debris was observed at the Army Landfill.

Site No. 13: Former Radar Power Station

Site No. 13 reportedly contains the buried remains of a Former Radar Power Station which includes metal towers, quonset hut debris, and electrical transformers (E & E 1992;

URS 1986). Metallic debris scattered on the surface of Site No. 13 may impact the effort to detect buried metallic debris. Interference caused by this debris will be noted during the survey.

Site No. 16: Gambell Municipal Building Site

Site No. 16 is suspected to contain buried debris of unknown origin (E & E 1992). Surface staining of gravel reportedly becomes more pronounced following above average rainfall, which may indicate adverse affects to area groundwater quality. No surface debris was observed at this site that would interfere with the geophysical survey.

Site No. 17: Army Landfills

Site No. 17 reportedly includes two areas of suspected debris burial denoted as Army Landfill No. 1 and No. 2 (see Figure 5-7 ~~5-6~~). During a previous investigation, permafrost was encountered at depths from 8 to 11 feet bgs in soil borings south of the landfills. Therefore, it is likely that the depth to permafrost was no greater during the time period in which the Army used these landfills for debris burial. Metallic debris scattered on the surface of Site No. 17 may have an impact on the effort to detect buried metallic debris. Whatever interference is caused by this debris will be noted during the survey.

Site No. 18: Main Camp

Site No. 18 reportedly contained tanks of various volumes. It is unknown whether they were buried or removed. The survey will be conducted to determine the presence or absence of the tanks. Possible interference to the survey includes scattered surface debris and buried utilities. Whatever interference is caused by surface debris will be noted during the survey. The contractor should obtain as-built drawings of all utility systems to determine the location of underground utility lines such as sewer, water, electric, and telephone, which were present during the 1992 site reconnaissance.

5.3.2 Geophysical Survey Methods

Geophysical surveys at Gambell will be performed using the following three instruments: metal detector, magnetometer, and electromagnetic terrain conductivity meter. The metal detector survey will be conducted using a standard portable metal detector/pipe locator. The magnetometer survey will be conducted using a Geometrics G-856AX proton precession magnetomer, which measures the earth's total magnetic field near the surface in units of gammas. The electromagnetic terrain conductivity survey will be conducted using the Geonics EM-31 DL instrument. The EM-31 measures the apparent terrain conductivity allowing quick screening for changes in conductivity potentially associated with buried debris or changes in soil conditions due to lithology, water content, permafrost or leachate plumes, if present. The EM-31 has a fixed intercoil spacing of 12.1 feet which yields an effective exploration depth of approximately 19.7 feet. Operation of the EM-31 in the horizontal dipole (shallow) mode yields an effective exploration depth of approximately 9.8 feet.

Geophysical surveys will be performed at locations of buried debris to detect potential impact to subsurface soil and groundwater quality, and to delineate the approximate areal extent of buried debris is required. In addition, geophysical surveys will help to identify the depth and lateral continuity of permafrost, and consequently in the placement of monitoring wells.

Geophysical survey efforts will require grid construction. The survey grids will consist of grid coordinates established and flagged along x and y axis on 100-foot centers (nodes) with grid stations at 25-foot intervals. Wherever possible, the x and y axes of the survey grids will be oriented east-west and north-south, respectively. Precise compass orientations will be obtained for each of the survey axis, allowing for a local magnetic declination of approximately 13° east of true north. The orientations will be indicated on the geophysical contour maps subsequently generated with the plotted field survey data. Wherever possible, a coordinate system will be consistently used at the survey grids, such that coordinates 0,0 are located in the southwest corner of each contour map. Grid nodes will be flagged and numbered as follows:

Grid X, N (or S) n_1 + yy, E (or W) n_2 + zz,

where:

X = Grid letter;

n_1 = Distance in 100-foot increments north (N) or south (S) from the origin point;

n_2 = Distance in 100-foot increments east (E) or west (W) from the origin point;

yy = Additional distance in feet north or south from the nearest previously located 100-foot increment from the grid origin; and

zz = Additional distance in feet east or west from the nearest previously located 100-foot increment from the grid origin.

Example of grid notation for a grid station on a 125 feet north and 150 feet east of origin is: Grid A, $N_1 + 25$, $E_1 + 50$.

Wooden stakes will be used to mark the proposed soil boring and monitoring well locations for reference during the subsequent drilling program. Any later adjustments of the monitoring well locations will be referenced to the survey grid coordinate system.

The apparent terrain conductivity will be measured with the EM-31 or EM-34 in the horizontal and vertical dipole modes at each survey grid node. Transmitter and receiver coil orientation will be north-south wherever possible.

Geomagnetic measurements will be recorded at each survey grid node in a north-south orientation, using the magnetometer. The response of the magnetometer is proportional to the mass of the ferrous target. All magnetometer readings obtained will be corrected for diurnal variation based on a series of background measurements collected at a designated base station that is free from manmade geophysical anomalies.

All geophysical field data will be electronically stored in the built-in memory portion of the aforementioned instruments. This data will be downloaded to a personal computer in the field as the respective data storage capacities for the instruments are reached. If a suitable power source and printer are available, this data will be plotted and then contoured using applicable software. Interpretation of the survey data and contour maps that are generated in the field may provide the basis for the adjustment of monitoring well locations if significant geophysical anomalies are identified.

5.4 SAMPLE COLLECTION AND ANALYSIS

5.4.1 Surface and Shallow Subsurface Soil

5.4.1.1 Locations

Soil samples will be collected at each site in locations of apparent stained soil and near transformers, barrels, and batteries. Surface soil samples will be collected from the following sites:

- Site No. 1: North Beach Area
- Site No. 2: Former Military Housing/Operations Area

- Site No. 4: Sevuokuk Mountain
- Site No. 7: Former Military Power Facility
- Site No. 10: Sevuokuk Mountain Trail System
- Site No. 12: Nayvaghaq Lake Disposal Site
- Site No. 13: Former Radar Power Station
- Site No. 16: Gambell Municipal Building Site

Table 5-1 summarizes the number of soil samples to be collected at each site and the analyses to be performed. Representative background surface soils samples will be collected for each soil type and analyzed for all parameters of concern. Two background soil samples are proposed (see Table 5-6).

Site No. 1: North Beach Area

To determine whether debris scattered along the beachfront has contaminated the surface soils, two surface soil samples will be collected in areas of visibly stained soil (see Figure 5-2). These samples will be analyzed for TRPH, BNA, PCBs, and TCLP metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). These analytes are representative of reported buried materials in the area.

Site No. 2: Former Military Housing/Operations Area

Due to the potential for POL contamination near the utility building and the presence of burned material, one surface soil sample will be collected from each of the two visibly stained areas and analyzed for TRPH, BNA, and TCLP metals (see Figure 5-3).

Site No. 4: Sevuokuk Mountain

Five surface soil samples will be collected at Site No. 4. One sample will be collected from each of the two transformer locations near the former quonset hut area and analyzed for PCBs. Three samples will be collected from a burned area will be collected and analyzed for TRPH, BNA, dioxins, PCBs and TCLP metals (see Figure 5-4).

Site No. 7: Former Military Power Facility

Due to the presence of fuel-stained areas in this location, two representative surface soil samples will be collected and analyzed for GRO, DRO, TRPH, and TCLP metals (see Figure 5-5). The results of these analyses will help determine the source of the staining.

Site No. 10: Sevuokuk Mountain Trail System

No surface soil samples are proposed at this site. However, it is recommended that soils beneath the barrels be inspected for stressed vegetation and, if justified, representative samples be collected and analyzed for POL-related analytes during the field investigation.

Site No. 12: Nayvaghaq Lake Disposal Site

Due to the presence of 55-gallon drums and surface debris such as batteries, three representative surface soil samples will be collected and analyzed for TRPH and TCLP metals (see Figure 5-6).

Site No. 13: Former Radar Power Station

Buried debris remains at the power station, including transformers. Two surface soil samples will be collected in the stained soil area (Figure 5-6). Samples will be analyzed for TRPH, PCBs, and TCLP metals.

Site No. 16: Gambell Municipal Building Site

The soil and gravel on the west side of the Municipal Building is visibly stained with suspected petroleum related contaminants (see Figure 5-7). Two surface soil samples will be collected from the site and analyzed for GRO, DRO, TRPH, and TCLP metals.

5.4.1.2 Sampling Methodology

Soil sampling will be conducted in accordance with EPA guidelines (EPA 1984). Surface and shallow subsurface soil samples will be collected to a maximum depth of 2 feet. Stainless steel trowels, spoons, coring devices, and mixing bowls will be utilized as sampling implements. The soil will be placed in a stainless steel bowl to be thoroughly homogenized. An aliquot of the homogenized sample will be collected from the bowl using a stainless steel spoon and placed in an 8-ounce wide-mouth glass jar with teflon-lined lids. The glass jars will then be labeled, custody sealed, covered with clear plastic tape, and placed in sealable baggies. For samples suspected to contain medium or high contaminant levels, bagged jars will be put in paint cans, which will be then filled with vermiculite. Paint cans will be closed and secured with paint can clips.

When composite sampling is required, each composite sample will consist of three aliquots oriented as a triangle and separated by a distance of approximately 5 feet. The soil aliquots will be collected to equivalent depths and contain equal volumes. The aliquots will then be homogenized by handmixing in a stainless steel mixing bowl and transferred to the sampling container.

Samples to be analyzed for VOC or GRO will not be homogenized or composited; rather select subsamples of soil, equal in volume, will be collected from each aliquot location and placed into two 2-oz. septa-lidded jars, leaving no headspace. Since most sites are located on gravel surfaces, samples collected for VOC analysis should be composed of particles less than 2 millimeters in diameter. This will facilitate reduction of headspace and preservation of sample integrity.

Sampling implements will be decontaminated prior to the collection of each sample; however, decontamination will not be required between the collection of the sample aliquots. During the collection of each surface sample, observable physical characteristics (e.g., color, physical state) of the soil material will be recorded in the field log book.

5.4.1.3 Analytical Parameters

As previously stated, the surface soil samples collected will be analyzed for some or all of the following parameters, GRO, DRO, TRPH, BNA, PCBs, dioxins, and TCLP metals (see Appendix A for a list of specific analytes for each analytical method). Table 5-3 summarizes of sample preservation procedures and holding times. Table 5-4 summarizes sample containers and volumes of soil samples required.

5.4.2 Subsurface Soil

5.4.2.1 Locations

Soil borings will drilled at sites that are suspected to contain buried debris or waste, or where surface disposal of debris may had an impact on subsurface soil (see Table 5-9). Subsurface soil will be sampled from soils excavated by borings at these sites. For each proposed soil boring, samples will be collected at depths of 2.5 feet and 5 feet bgs, and at 5-foot intervals thereafter if the boring is proposed to a depth greater than 5 feet. At a minimum, all borings will be advanced to the depth of the saturated zone. In addition, one sample is proposed for each boring from soil directly beneath the top of the saturated zone. (Drilling equipment and procedures for conducting soil borings are detailed in Appendix B.)

A total of 186 subsurface soil samples will be collected for analysis. The number of samples collected for VOC analysis may be less, depending on the results of headspace surveys of the soils sampled from borings at all sites except Site No. 5, Site No. 6, and Site No. 9 for which volatile organic contamination is not suspected. A portion of the soil volume collected for each sample at the remaining sites will be subject to soil gas headspace analysis with an organic vapor analyzer (OVA). Subsurface soil samples are proposed to be analyzed for the parameters presented in Table 5-1. However, only approximately 20 percent to 40 percent of all samples collected will be submitted for GRO and DRO analysis based on results sample headspace field screening (see Section 5.4.2.2). Soil samples with mean grain size greater than 2 mm will not be subjected to VOC analysis due to soil sample containerization methodology and tolerance of vapor headspace in sample containers for VOC analysis.

Soil borings are proposed within the boundaries of sites with suspected buried material. Although it is unconventional to recommend placement of soil borings within areas suspected to contain buried debris or containerized hazardous waste, given the uncertainty of the areal extent of the burial areas, it is necessary to locate boreholes as near to the potential source as possible. The results of the geophysical survey (section 5.3) will delineate areas to avoid, where anomalies of all instruments, especially those sensitive to ferrous material, indicate a high potential for buried material, and possibly indicate better soil boring locations. In contrast, the geophysical survey results that indicate areas of low potential for buried ferrous material and create anomalous EM-31 readings will be targeted as potential locations of impacted subsurface soil and groundwater.

Soil borings are proposed at the following eleven sites:

- Site No. 1: North Beach;
- Site No. 2: Former Military Housing/Operations Area;
- Site No. 3: Former Communications Facility;
- Site No. 5: Former Tramway Site;

- Site No. 6: Military Landfill;
- Site No. 7: Former Military Power Facility;
- Site No. 8: West Beach;
- Site No. 12: Nayvaghaq Lake Disposal Site;
- Site No. 13: Former Radar Power Station;
- Site No. 16: Gambell Municipal Building Area;
- Site No. 17: Army Landfills;

A background boring will be drilled in an undetermined location and background subsurface soil samples will be collected at the same intervals as specified above. Representative background subsurface soil samples will be collected for each soil type and will be analyzed for all the parameters of concern. Two background subsurface soil samples are proposed for collection (see Table 5-6).

Site No. 1: North Beach

Eight soil borings are proposed for the Air Force and Army Landing Areas. After a geophysical survey has indicated the approximate extent of the Air Force Landing Area and Army Landing Area, soil borings will be drilled and subsurface soil samples will be collected. Proposed soil boring locations are shown in Figure 5-2, but these locations are subject to revision pending the results of the geophysical survey.

Three borings are proposed for the Air Force Landing Area, one within the landing area and two on the perimeter. Five soil borings are proposed for the Army Landing Area, one within the landing area and four around the perimeter. Boring locations were selected on the perimeter of the landing areas to determine the direction of potential contaminant migration. The borings within the landing areas will be used to determine the nature and concentration of potential contaminants. Based upon the anticipated depth to the saturated zone in the Landing Areas (URS 1986; Waller 1959), a minimum of three subsurface soil samples per soil borings are proposed, yielding a total of 24 samples. Soil samples collected at this site will be analyzed for DRO, GRO, TRPH, VOC, PCBs, and TCLP metals (see Table 5-1). All the borings are proposed to be completed with monitoring wells.

Site No. 2: Former Military Housing/Operations Area

Soil borings are proposed for the Former Military Housing/Operations Burial Area and the Power Plant Burial Area. Proposed soil boring locations are shown in Figure 5-3, but these locations are subject to revision pending the results of the geophysical survey. Three soil borings are proposed for the perimeter of Site No. 2 to determine the nature and direction of potential contaminant migration. The borehole locations are in assumed downgradient locations. Based upon the anticipated depth to the saturated zone in the Former Military Housing/Operations Area (URS 1986, Waller 1959), a minimum of three subsurface soil samples per soil boring are proposed to be collected, yielding a total of 9 samples. Soil samples collected at this site will be analyzed for GRO, DRO, TRPH, VOC, TCLP metals, and explosives (see Table 5-1). All the borings at the Former Military Housing/Operations Area and Power Plant Burial Area are proposed to be completed with monitoring wells.

Site No. 3: Former Communications Facility

Two soil borings are proposed for the area of the Former Communications Facility, as shown in Figure 5-4, but these locations are subject to revision pending the results of the geophysical survey. One boring is proposed within the burial area to determine the nature of the potential contamination and one is proposed north of the site in an assumed downgradient location to determine the potential direction of contaminant migration. Based upon the anticipated depth to the saturated zone (URS 1986, Waller 1959), a minimum of three subsurface soil samples per soil boring will be collected for a total of 6 samples. Soil samples collected at this site will be analyzed for GRO, DRO, TRPH, VOC, PCBs, TCLP metals, sulfates, and pH (see Table 5-1). Both borings are proposed to be completed with a monitoring well.

Site No. 5: Former Tramway Site

Four soil borings are proposed for the Secondary Transformer Burial Area and the Cable Burial Area within Site No. 5. Proposed soil boring locations are shown in Figure 5-5, but these locations are subject to revision pending the results of geophysical survey. One boring is proposed within the Secondary Transformer Burial Area; one is proposed within the Cable Burial Area; two are proposed for the perimeter of these adjoining areas. The boreholes on the perimeter will aid in determining the direction of potential contaminant migration. These borehole locations are placed in assumed downgradient locations. The interior boreholes will be used to determine the nature of potential contamination. Based upon the anticipated depth to the saturated zone in this area (URS 1986, Waller 1959), a minimum of three subsurface soil samples per soil boring are proposed to be collected, yielding a total of 12 samples. Soil samples collected at this site will be analyzed for GRO, DRO, TRPH, and PCBs (see Table 5-1). Three of the borings are proposed to be completed with monitoring wells.

Site No. 6: Military Landfill

Four soil borings are proposed to be drilled around the perimeter of the Military Landfill Site to determine nature and direction of potential contaminant migration. Proposed soil boring locations are shown in Figure 5-5, but these locations are subject to revision pending the results of the geophysical survey. Based upon the anticipated depth to the saturated zone (URS 1986), a minimum of three subsurface soil samples per soil boring are proposed to be collected for a total of 12 samples only for lithology characterization. No subsurface soil samples will be collected for chemical analysis. The four borings will be completed with monitoring wells.

Site No. 7: Former Military Power Facility

Four soil borings are proposed for the Former Military Power Facility. Proposed soil boring locations are shown in Figure 5-5, but these locations are subject to revision pending the results of the geophysical survey. One boring is proposed within both burial areas to determine the nature of the potential contaminants, and three are proposed for the perimeter of the site determine the direction of potential contaminant migration. Based upon the anticipated depth to the saturated zone (URS 1986, Waller 1959), a minimum of three subsurface soil samples per soil boring are proposed to be collected, yielding a total of 12 samples. Soil samples collected at this site will be analyzed for GRO, DRO, TRPH, VOC, PCBs, and TCLP metals (see Table 5-1). All the borings are proposed to be completed with monitoring wells.

Site No. 8: West Beach

One soil boring is proposed to be drilled at the Army Landfill in Site No. 8. The proposed soil boring location is shown in Figure 5-~~5~~6, but the location is subject to revision pending the results of the geophysical survey. The proposed boring is located between the landfill and Nayvaghaq Lake to determine if potential leachate produced in the landfill is migrating towards the lake. Based upon the anticipated depth to the saturated zone in this area (URS 1986, Waller 1959), a minimum of four subsurface soil samples per soil boring are proposed to be collected. Soil samples collected at this site will be analyzed for GRO, DRO, TRPH, VOC, PCBs, and TCLP metals (see Table 5-1). The boring is proposed to be completed with a monitoring well.

Site No. 12: Nayvaghaq Lake Disposal Site

Two soil borings are proposed to be drilled at the North Disposal Area in Site No. 12. Proposed soil boring locations are shown in Figure 5-6, but these locations are subject to revision pending the results of the geophysical survey. The two borings are proposed for the perimeter of the North Disposal Area. The boreholes are sited in locations along potential contaminant migration routes to Troutman and Nayvaghaq Lakes. Based upon the anticipated depth to the saturated zone in this area (URS 1986, Waller 1959), a minimum of three subsurface soil samples per soil boring are proposed to be collected, yielding a total of 6 samples. Soil samples collected at this site will be analyzed for GRO, DRO, TRPH, VOC, and TCLP metals (see Table 5-1). Two borings are proposed to be complete with monitoring wells.

Site No. 13: Former Radar Power Station

Four soil borings are proposed for the Former Radar Power Station Area. Proposed soil boring locations are shown in Figure 5-6, but these locations are subject to revision pending the results of the geophysical survey. One boring is proposed within the burial area and three are proposed for the perimeter of the area. The interior borehole will be used to determine the nature of the potential contamination. The boreholes along the perimeter are sited in locations along the anticipated contaminant migration route to Troutman and Nayvaghaq Lakes. Based upon the anticipated depth to the saturated zone in this area (URS 1986, Waller 1959), a minimum of three subsurface soil samples per soil boring are proposed to be collected, yielding a total of 12 samples. Soil samples collected at this site will be analyzed for GRO, DRO, TRPH, VOC, PCBs, and TCLP metals (see Table 5-1). All the borings are proposed to be completed with monitoring wells.

Site No. 16: Gambell Municipal Building Site

Three soil borings are proposed for the Gambell Municipal Building Site. Proposed soil boring locations are shown in Figure 5-7, but these locations are subject to revision pending the results of the geophysical survey. One boring is proposed within the burial or stained gravel area to determine the depth and nature of the contaminant, and two are proposed for the perimeter of the area to determine the direction of contaminant migration. Based upon the anticipated depth to the saturated zone in this area (URS 1986, Waller 1959), a minimum of three subsurface soil samples per soil boring are proposed to be collected, yielding a total of nine samples. Soil samples collected at this site will be analyzed for GRO, DRO, TRPH, and TCLP metals (see Table 5-1). Two of the borings are proposed to be completed with monitoring wells.

Site No. 17: Army Landfills

Seven soil borings are proposed for both Army landfills. Proposed soil boring locations are shown in Figure 5-7, but these locations are subject to revision pending the results of the geophysical survey. Four borings are proposed for Landfill No. 1. One boring is proposed within the landfill and three around the perimeter. Three borings are proposed for Landfill No. 2. One boring is proposed within the landfill, and two around the perimeter. The boreholes sited along the perimeter of the landfills will be used to determine the direction of potential contaminant migration. The interior boreholes will provide the nature of the contamination. Based upon the anticipated depth to the saturated zone in this area (URS 1986, Waller 1959), a minimum of three subsurface soil samples per soil boring are proposed to be collected, yielding a total of 21 samples. Soil samples collected at this site will be analyzed for GRO, DRO, TRPH, VOC, PCBs, and TCLP metals (see Table 5-1). All the borings at Landfill No. 1 and Landfill No. 2 are proposed to be completed with monitoring wells.

5.4.2.2 Sampling Methodology

Soil sampling will be conducted in accordance with EPA guidelines (EPA 1984). Subsurface soil samples proposed at 2.5 feet bgs, or less, will be collected with steel hand augers equipped with stainless steel sampling buckets. Soil samples from 5 feet bgs or more will be collected using a drill rig equipped with hollow-stem augers and split-spoon samplers at Sites Nos. 1, 2, 3, 5, 6, 7, 8, 12, 13, 16, and 17. During drilling, subsurface sampling will be conducted according to standard COE and American Society for Testing and Materials (ASTM) procedures using a 2- or 3-inch split-spoon sampler. The spilt-spoon sampler will be advanced during hollow-stem auger drilling by conventional methods, including attachment of the sampler to a drill rod and standard 140- or 300-pound hammers. During sampling, blow counts will be recorded at 6-inch intervals to the total sample depth of 18 or 24 inches, depending on the length of the split-spoon. The split-spoon sampler shall be decontaminated after each sample as discussed in Section 5.7.

As samples are retrieved, they will be screened with a FID for volatile organic vapors. In addition, a set of composite soil samples will be collected from each soil boring at sites where there are suspected volatile organic contaminants, and placed in soil sample jars for each interval sampled. OVA headspace readings with and without an in-line methane filter will be recorded for each sample set (i.e. one jar of each set will be used for the reading with the in-line methane filter [methane corrected reading] and the other jar will be used for the reading without the filter). The headspace reading without the in-line filter is a total organic vapor reading, whereas, that with the in-line filter is a methane-corrected vapor reading. Therefore, for each sample, the organic vapor reading attributable to potential organic contaminants is obtained when the presence of methane is subtracted from the total organic vapor reading.

Heated headspace analysis will be performed for each sample set by half filling two 8-oz. jars with the sampled soil, quickly covering the jars with aluminum foil and applying the screw cap to tightly seal the jars. Jars will be shaken vigorously for 15 seconds and then allowed to sit for at least 10 minutes in direct sunlight if possible, or in a heated vehicle or building for headspace development. Again, jars will be shaken and lids removed. The foil seals will be quickly punctured with the OVA sampling probe to approximately one-half of the headspace depth, being careful to avoid the uptake of soil particulates. The highest meter reading for each jar will be recorded as the headspace concentration. Upon comparison of the two meter readings as detailed above, the organic vapor reading attributable to potential organic contaminants will be obtained. Only those soil samples which yield methane-corrected headspace readings greater than 10 ppm will be analyzed for VOCs. The headspace analysis methodology of subsurface soil samples is proposed to eliminate costs for VOC analysis of samples, which through organic vapor pre-screening, do not yield organic vapor contents elevated above 10 ppm.

With the exception of GRO and DRO soil samples collected will be analyzed for the parameters listed in Table 5-1. The field sampling team will use professional judgement, based on sample headspace analysis and visual observation, to select approximately 20 percent to 40 percent of all samples collected for GRO and DRO analysis. The reduction in the number of GRO and DRO analyses is based on the premise that significant degradation of these potential contaminants has occurred over the years since military occupation. Containerized samples not selected for analysis will be disposed of as investigation-derived waste (Section 5.9). Soil aliquots for VOC analysis will be containerized immediately following retrieval from the split-spoon sampler. After the lithology of the sample has been described, the remainder of the soil will be homogenized and removed from the sampler with a stainless steel spoon, placed in the appropriate sample containers, and processed for shipment as described in subsection 5.4.1.2.

All soil samples collected from soil borings in which monitoring wells will be installed will be visually classified by the Unified Soil Classifications System. The field classification will be verified by laboratory analysis of selected physical parameters, including grain-size distribution (ASTM C117 & 136) and moisture content (ASTM D 2216).

5.4.3 Groundwater Samples

The results of the geophysical survey will help to delineate the possible extent of permafrost at each site. If permafrost boundaries (i.e., "edges of discontinuous permafrost") exist beneath or immediately adjacent to any of the site, the proposed depths of monitoring wells may need to be revised. Proposed monitoring well depths are not to exceed the depth to permafrost at each site. However, if discontinuities exist in the permafrost, then the potential exists for deeper vertical migration of groundwater. Decisions on whether to install monitoring wells to greater depths will be made following review of all data collected from geophysical surveys. Currently, a total of 39 ?40 monitoring wells are proposed. Monitoring well construction, installation and development are outlined in Appendix B.

To assess the hydrologic parameters of the unconfined aquifer system at the Gambell sites, slug tests should be conducted at a minimum of one well at each site. In addition, specific capacity tests should be performed, if practical, in conjunction with development of the newly installed monitoring wells. The performance of slug test shall consist of the introduction and removal of a steel slug bar, of a known volume, into the well. Measurements of the initial water level response and subsequent water levels until equilibration to the initial water level will be recorded using a data logger pressure transducer system. The pressure transducer sonde will be placed into the well preceding the introduction of the slug bar and will remain stationary during the test (i.e., removal of the slug bar). The recovery of the groundwater to the well will be monitored continuously during the specified length of time for the test. The length of time for the tests will be decided in the field by the hydrogeologist performing the tests and based on the length of time necessary for equilibration of the water level during emplacement of the slug bar.

The specific capacity tests should consist of measuring the static (pre-pumping) water level with a calibrated water level indicator, and then pumping the well at a known discharge rate for a given length of time static and pumping water level. The difference between the static and pumping water levels is the drawdown, which is divided by the discharge to yield the specific capacity.

Quantification of the aquifer parameters using slug test results and/or specific capacities will be used to calculate values of transmissivity (T) and hydraulic conductivity (K). These parameters, in conjunction with the hydraulic gradient and flow direction, to be determined by static water level measurements in each on-site monitoring well, will be used to determine groundwater flow velocities. In addition, these results will aid in the characterization of transport potential of contaminant plumes, if present, in the unconfined aquifer system underlying the Gambell site.

5.4.3.1 Monitoring Well Locations

Groundwater samples will be collected from monitoring wells installed at those sites that contain buried debris or waste, or from sites that may pose a threat to groundwater quality as determined by the results of a geophysical survey (see Table 5-2). These sites include the following:

- Site No. 1: North Beach
- Site No. 2: Former Military Housing/Operations Area
- Site No. 3: Former Communications Facility

- Site No. 5: Former Tramway Site
- Site No. 6: Military Landfill
- Site No. 7: Former Military Power Facility
- Site No. 8: West Beach
- Site No. 12: Nayvaghaq Lake Disposal Site
- Site No. 13: Former Radar Power Station
- Site No. 16: Gambell Municipal Building Area
- Site No. 17: Army Landfills

A background monitoring well will be installed at the background soil boring location (Section 5.4.2.1) and background groundwater samples will be collected. Background groundwater samples will be analyzed for all the parameters of concern.

Site No. 1: North Beach

Eight monitoring wells are proposed to be installed at the Army Landing Area and the Air Force Landing Area in the soil borings described in subsection 5.4.3.1 for Site No. 1. Proposed locations are shown in Figure 5-2. Since the potential contaminants are suspected to be waste POLs, groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, VOC, PCBs, and total metals (see Table 5-2).

Site No. 2: Former Military Housing/Operations Area

Three monitoring wells are proposed to be installed at the Former Military Housing/Operations Burial Area and the Power Plant Burial Area in the soil borings described in subsection 5.4.3.1 for Site No. 2. Proposed locations are shown in Figure 5-3. The contaminants at this site are suspected to be petroleum or ordnance related, therefore groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, VOC, total metals, and explosives (see Table 5-2).

Site No. 3: Former Communication Facility

One monitoring well is proposed to be installed in the soil boring described in subsection 5.4.3.1 for Site No. 3. The proposed location is shown in Figure 5-4. The groundwater sample collected will be analyzed for GRO, DRO, TRPH, VOC, PCBs, total metals, sulfates and pH, since POL, PCBs from buried electrical equipment, and acids are the suspected contaminants (see Table 5-2).

Site No. 5: Former Tramway Site

Two monitoring wells are proposed to be installed in the soil borings at the Secondary Transformer Burial Area and Cable Burial Area described in subsection 5.4.3.1 for Site No. 5. The proposed locations are shown in Figure 5-5. Groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, and PCBs because there reportedly are buried transformers at this Site (see Table 5-2).

Site No. 6: Military Landfill

Four monitoring wells are proposed to be installed in the soil borings described in subsection 5.4.3.1 for Site No. 6. The proposed locations are shown in Figure 5-5. Groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, VOC, total metals, ammonia, nitrates, sulfates, TDS, TSS, coliform/fecal bacteria, BOD, and COD because the contaminants of concern originate from human water and possible POL products (see Table 5-2).

Site No. 7: Former Military Power Facility

Four monitoring wells are proposed to be installed in the soil borings at the Primary Burial Transformer Area and the Former Military Power Facility area, described in subsection 5.4.4.1 for Site No. 7. The proposed locations are shown in Figure 5-5. The contaminants of concern are POL products and PCBs from transformers. Groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, VOC, PCBs, and total metals (see Table 5-2).

Site No. 8: West Beach

One monitoring well is proposed to be installed at the Army Landfill in the soil boring described in subsection 5.4.3.1 for Site No. 8. The proposed location is shown in Figure 5-6. The contaminants at this site are suspected to be petroleum-related and may include PCBs from buried electrical equipment based on the reported contents of the Landfill. Groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, VOC, PCBs, and total metals (see Table 5-2).

Site No. 12: Nayvaghaq Lake Disposal Site

Two monitoring wells are proposed to be installed in the soil borings described in subsection 5.4.3.1 for Site No. 12. The proposed locations are shown in Figure 5-6. Since POL products and lead from batteries are the potential sources of contaminants, groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, VOC, and total metals (see Table 5-2).

Site No. 13: Former Radar Power Station

Four monitoring wells are proposed to be installed in the soil borings described in subsection 5.4.3.1 for Site No. 13. The proposed location is shown in Figure 5-6. Because POL products and PCBs from transformers are potential contaminants of concern, groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, VOC, PCBs, and total metals (see Table 5-2).

Site No. 16: Gambell Municipal Building Site

Two monitoring wells are proposed to be installed in the soil borings described in subsection 5.4.3.1 for Site No. 16. The proposed location is shown in Figure 5-7. Since petroleum-related contaminants are suspected to be present, groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, and total metals (see Table 5-2).

Site No. 17: Army Landfills

Seven monitoring wells are proposed to be installed in the soil borings described in subsection 5.4.3.1 for Site No. 17. The proposed location is shown in Figure 5-7.

Groundwater samples collected from these wells will be analyzed for GRO, DRO, TRPH, VOC, PCBs, and total metals (see Table 5-2).

5.4.3.2 Sampling Methodology

Groundwater samples will be collected in accordance with EPA guidelines (EPA 1981 and 1985). Groundwater sample collection from the monitoring wells will consist of the following four activities:

- Measurement of depth to water level and total well depth (to calculate well volume);
- Evacuation of water (purging);
- Measurement and recording of groundwater temperature, pH, turbidity and conductivity; and
- Collection of the sample (with filtering for dissolved metals samples if sample turbidity is greater than 50 NTU and no filtering for total metals samples).

Prior to sampling, static water level and total well depth will be measured with an electronic interface probe. Equipment will be decontaminated between uses to avoid cross contamination of wells.

The number of linear feet of static water (the standing water column) will be determined by calculating the difference between the static water level and the total depth of the well. The static volume will be calculated using the formula:

$$V = Tr^2(0.163)$$

Where:

V = Static volume of well in gallons.
T = Standing water column, measured in feet.
r = Inside radius of well casing in inches.
0.163 = A constant conversion factor that compensates for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and π (pi).

Before a groundwater sample is obtained, water must be purged to ensure that a representative groundwater sample is collected. A minimum of five volumes of the standing water column will be purged from each well prior to sample collection. If the well does not recover quickly enough to permit the removal of five successive volumes, the well will be pumped or bailed dry and sampled immediately following a recovery sufficient to collect a sample. Purging will be performed using decontaminated stainless steel or teflon bailers or pumps. Purge water from monitoring wells will be contained in drums. If the analytical results from groundwater samples indicate that it is not contaminated, the purge water will be applied to soil within the boundaries of the area investigated. If groundwater samples do contain contaminant concentrations above regulatory actions levels, then the drums of purge water will be labeled and stored on site in a secure area.

If free product is encountered above the water table, the product thickness must first be recorded. The well will not be purged, and a groundwater sample, including floating product will be collected. The sample will be submitted for a "hydrocarbon analysis scan" using the Alaska District COE modification of EPA Method 8015, total lead, BTEX, flashpoint and BTU. If floating free-product is not identified, a bailer or pump will be used to purge the required volume of water from the well prior to obtaining a representative water sample. Sampling personnel will take precautions against cross contamination when using one sampling apparatus for a series of samples.

Before and after each sample is collected, the apparatus will be decontaminated as specified in Section 5.7. Sample collection procedures are as follows.

- A decontaminated stainless steel or Teflon bailer or dedicated pump will be used to collect groundwater samples from monitoring wells;
- When transferring water from the sample collection device to sample containers, care will be taken to avoid agitating the sample, which promotes the loss of VOCs and increases the dissolved oxygen content;
- VOC samples will be bottled immediately upon collection (refer to Table 5-3 for other preservation methods);
- Samples from monitoring wells to be analyzed for dissolved metals (Appendix A) will be filtered in the field using a 0.45-micron filter and preserved with nitric acid prior to shipment for analysis. The filtering equipment will be decontaminated between samples to avoid cross-contamination;
- Any observable physical characteristics of the groundwater (e.g., color, sheen, odor, turbidity) will be recorded in the logbook;
- Sample temperature, pH, and specific conductivity will be measured and recorded; and

- Weather conditions at the time of sampling will be recorded (e.g., air temperature, wind direction and velocity, recent heavy rainfall, and drought conditions).

5.4.4 Sediment Samples

5.4.4.1 Locations

Sediment samples will be collected at Site No. 4, downgradient of the abandoned transformers in a surface water drainage (see Figure 5-4). A total of four sediment samples will be collected; three downgradient of the transformer and background upgradient sample within the same stream channel. Since there is potential for PCB contamination, the sediment samples will be analyzed for PCBs (see Table 5-2).

5.4.4.2 Sampling Methodology

During the collection of each sediment sample, observable physical characteristics (e.g., color, physical state, elevated organic vapor readings) of the sediment material will be recorded.

The samples will be collected using stainless steel ladles, spoons, mixing bowls, or other standard equipment. Sampling implements will be decontaminated following the procedures stated in Section 5.8 prior to the collection of each sample. Sediment samples will be collected and transferred to appropriate glass containers using a stainless steel ladle or spoon. Sediments will be homogenized by the same method described in section 5.4.2.2. for soils. A sufficient volume of sediment will be collected for subsequent analytical testing requirements.

5.4.4.3 Analytical Parameters

The sediment samples collected from Site No. 4 will be analyzed for PCBs. See Appendix A for a list of specific analytes for each analytical method. Table 5-3 is a summary of sample containers, preservation procedures and holding times. Table 5-4 summarizes the sample containers and volumes required for sediment samples.

5.4.5 Asbestos Samples

Bulk samples will be collected and analyzed for asbestos at locations determined to contain suspect asbestos containing material (ACM) during the E & E site inventory. These materials will be sampled using asbestos bulk sampling procedures outlined in Section

5.4.5.2. The number of samples collected for asbestos analysis will be determined according to the criteria in Table 5-8.

5.4.5.1 Locations

Bulk samples will be collected and analyzed for asbestos at the Former Military Housing/Operations Area (Site No. 2) and Sevuokuk Mountain (Site No. 4) that are suspected to contain ACM.

Site No. 2: Former Military Housing/Operations Area

Due to the presence of fibrous material in the vicinity of the reported machine gun nest burial area, approximately three samples will be collected to determine the presence of ACM (see Table 5-2). All samples will be submitted for bulk asbestos analysis.

Site No. 4: Sevuokuk Mountain

To determine whether fibrous debris located approximately 20 feet north of a Former Quonset Hut Area contains asbestos, at least three samples will be collected and analyzed for bulk asbestos (see Table 5-2). The number of samples collected will be determined according to the requirements in Table 5-8.

5.4.5.2 Sampling Methodology

Prior to any sampling collection activity, a visual inspection of each facility involving the following elements will be conducted:

- Identify all areas to be inspected;
- Identify types of suspected ACM present;
- Determine the category of friability by touching the suspected ACM (Categories of friability are as defined by 40 CFR, part 61, Subpart M [NESHAP] as amended November 1990 [i.e., friable, non-friable I, and non-friable II]);
- Identify homogeneous areas of suspected ACM by location (a homogeneous area is a material type that appears similar throughout the site in terms of color, texture, application, and date of installation); and

- Determine total approximate square/linear footage of each homogeneous area of suspected ACM.

A representative number of samples should be collected for each material type/homogeneous area identified. For most ACM, a minimum of 0.5 cubic inch should be collected. If the material is layered, 0.5 cubic inch of each layer should be sampled. The homogeneous material should be divided into equal sampling areas. One sample shall be collected from each of the equal areas.

Once the sample location has been selected, the following procedures will be followed to obtain a sample:

- Conduct sampling only when no unprotected persons are in the area;
- Sample while wearing Level C protection as outlined in the Health and Safety Plan;
- Use a spray bottle containing amended water (detergent and water) to adequately wet the surface of the area to be sampled;
- Use a knife or other appropriate tool to cut free a sample of the material with a minimum size of 0.5 cubic inch. Penetrate the whole thickness of the material and collect all layers, and spray the area occasionally during this process to adequately wet the whole thickness of the material in the area of the sample;
- With the tool in one hand and an open, labeled sample bag in the other hand, free the sample, allowing it to fall into the bag. See Section 5.8.3 for information on sample labels;
- Seal the individual sample bag and place inside another bag (daily sample collection bag) to prevent leakage;
- Place a piece of duct tape over the sample location and mark it with the sample ID;
- Decontaminate the sampling tools in accordance with Section 5.9 and replace the outer pair of gloves before proceeding to the next sample; and
- Place all disposables into a 6-mil plastic bag labeled as containing ACM or contaminated waste.

QC and/or duplicate samples should be obtained by taking two samples adjacent to each other. These samples are labeled and handled in the same way as ordinary samples. The laboratory should not be able to identify which samples are QC samples. One duplicate QC sample will be collected for every 10 samples, with a minimum of one for each site.

5.5 FIELD QUALITY CONTROL CHECKS

5.5.1 Field QC Samples

QC data are necessary to determine precision and accuracy and to demonstrate the absence of interference and/or contamination of glassware and reagents. Field QC samples and the frequency of analysis for this project are summarized in Table 5-6 and briefly described below.

- Trip blanks are similar to field blanks with the exception that they are not exposed to field conditions. Their analytical results give the overall level of contamination from everything except ambient field conditions. Trip blanks are prepared prior to the sampling event and shipped with the sample bottles. Trip blanks are prepared by adding organic-free water to a 40-mL VOC vial. One trip blank will be used with every batch of water samples shipped for volatile organic analysis. Each trip blank will be transported to the sampling locations, handled like a sample, and returned to the laboratory for analysis without being opened in the field.

- Field equipment/rinsate blanks are blank samples designed to demonstrate that sampling equipment has been properly prepared and cleaned before field use and that cleaning procedures between samples are sufficient to minimize cross-contamination. Rinsate blanks are prepared by passing analyte-free water over sampling equipment and analyzing the samples for all applicable parameters. If a sampling team is familiar with a particular site, its members may be able to predict which areas or samples are likely to have the highest concentration of contaminants. Unless other constraints apply, these samples should be taken last to avoid excessive contamination of sampling equipment.

- Field triplicates consist of a set of three samples collected independently at a sampling location during a single sampling event. Two of the identical samples will be sent to the project laboratory as blind duplicates. The third sample will be shipped to the QA laboratory for external quality control. Field triplicates can be sent to the laboratories so that they are indistinguishable from other analytical samples and personnel performing the analyses are not able to determine which samples are field triplicates. Field triplicates are designed to assess the consistency of the overall sampling and analytical system.

5.5.2 Field Audits

Internal audits are conducted on field activities by the regional quality assurance coordinator (RQC) or a designee. The RQC will plan and conduct internal field audits and compare field operations to the CDAP and note discrepancies or deviations. Checklists will be used to guide the auditor; however, these lists are not intended to be inclusive of all audit topics (see Appendix D). Field systems and field performance will be audited simultaneously, resulting in a comprehensive field audit. During each comprehensive field audit, a detailed review of sampling technique, decontamination procedures, sample management, documentation, field measurements, subcontractor management, and overall project management will be conducted. The auditor will be responsible for preparing a deficiency report after completion of the audit and submitting this report to the contractors and COE project managers for the audited project. The contractor's manager will be responsible for initiating corrective actions.

The RQC will perform follow-up audits as necessary to confirm the implementation of corrective actions.

5.5.3 Corrective Action

The need for corrective action will be identified by field audits as described in Section 5.5.2 and by other more direct means, such as equipment malfunction. Once the problem has been identified, prompt and appropriate action will be taken to correct the situation. After a corrective action has been implemented, its effectiveness will be verified. If the action does not resolve the problem, appropriate personnel will be assigned to investigate and effectively resolve the problem.

5.6 FIELD EQUIPMENT, CONTAINERS, AND SUPPLIES

The following discussion provides a list of the field screening instruments and procedures for calibrating these instruments.

5.6.1 Calibration Procedures and Frequency

All instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations, and criteria set forth in the applicable analytical methodology references. Operation, calibration, and maintenance will be performed by personnel properly trained in these procedures. Documentation of all routine and special maintenance and calibration information will be maintained in an appropriate logbook or reference file, and will be available on request.

Brief descriptions of calibration procedures for major field instruments follow. These instruments include a FID, a PID, a radiation alert dosimeter, and a portable digital conductance, temperature, and pH tester.

5.6.1.1 HNu Photoionizer

The HNu photoionizer can be calibrated using a static or dynamic gas generation system. A number of such systems for generating test atmospheres for various gases have been described by G.O. Nelson in Controlled Test Atmospheres, Ann Arbor Science Publishers, Ann Arbor, Michigan (1971).

The most convenient packages for calibration are the non-toxic analyzed gas mixtures available from HNu Systems in pressurized containers (Catalogue No. 101-350).

A rapid procedure for calibration involves bringing the probe and readout in close proximity to the calibration gas, cracking the valve on the tank, and checking the instrument reading. This provides a useful spot check for the instrument.

The recommended and most accurate procedure for calibration of the instrument from a pressurized container is to connect one side of a "T" to the pressurized container of calibration gas, another side of the "T" to a rotameter, and the third side of the "T" directly to the 8-inch extension of the photoionization probe. The valve of the pressurized container is cracked until a slight flow is indicated on the rotameter. The instrument draws in the volume of sample required for detection, and the flow in the rotameter indicates an excess of sample. The span potentiometer is adjusted so that the instrument is reading the exact value of the calibration gas. (If the instrument span setting is changed, the instrument should be turned back to the standby position and the electronic zero should be readjusted, if necessary.)

The calibration gas should be prepared in the same matrix (air, nitrogen, hydrogen, etc.) in which it is to be measured, otherwise an inaccurate reading may be obtained. Calibration with toxic gases should be performed in a hood since the HNu-101 is a nondestructive analyzer. The increased response that is seen in oxygen-free gases can be attributed to a reduction in the quenching of ions by oxygen (actually O_2) and is typical of any ionization detector. The quenching effect of oxygen is constant from about 10% O_2 to very high levels.

If a gas standard prepared in nitrogen is to be used for measurements in air, fill a 0.5- or 1-liter bag with the standard, then add 50 or 100 cc of pure oxygen to bring the level to 10% to 12%. Any error between this value and 20% oxygen is quite small.

If the sample to be measured is in nitrogen, standards should be prepared in nitrogen.

5.6.1.2 Organic Vapor Analyzer (OVA)

The OVA provides a continuous readout of the total concentration of organic vapors and gases by the use of a FID. The OVA should be used only by a trained operator. It does not respond to inorganic vapors.

Regular Maintenance

Procedures for regular maintenance of the OVA are as follows:

- Check particle filters daily;
- Check quad rings weekly;
- Clean burner chamber weekly;
- Check calibration daily; and
- Check pumping system daily.

OVA-128 Calibration

OVA-128 calibration is as follows:

- Remove instrument from case;
- Turn on electronics and zero instrument on X10 scale, set gas select dial to 300;
- Turn on pump and hydrogen, ignite flame, go to survey mode;
- Introduce a methane standard near 100 ppm;
- Adjust R-32 trimpot on circuit board to make meter read to standard;
- Turn off hydrogen flame and adjust meter needle to read 4 ppm;
- Switch to X1 scale and adjust R-31 trimpot to make meter read 4 ppm;

- Return to X10 scale and adjust meter needle to 40 ppm;
- Switch to X100 scale and adjust R-33 trimpot to make meter read 40 ppm.

OVA Pump System Check

The OVA pump system check is as follows:

- With pump on, hold unit upright and observe flow gauge;
- Ball level significantly below a reading of 2 is low flow;
- Clean or replace particle filters;
- Re-assemble and re-test flow;
- If flow is still low, replace pump diaphragm and valves;
- If flow is normal, plug air intake pump should slow and stop;
- If no noticeable change in pump, tighten fittings and re-test; and
- If still no change, replace pump diaphragm and valves.

5.6.1.3 Rad-Mini and Nephelometer

Rad-Mini

The Rad-mini has a scheduled preventive maintenance check performed semi-annually. There is no calibration necessary for the Rad-mini. It is only checked for proper operation and battery life.

A quick check of proper operation is performed on each unit before it is into the field. A Coleman lantern mantle or other radiation source is brought up to the unit and response is noted. If the Rad-mini reacts properly, it is then ready for use. A daily check can be performed as described above.

Nephelometer

The Series 95 Nephelometer must be calibrated before each use. Allow the instrument to warm up for approximately 2 hours. Using turbidity- free deionized water, zero the meter. Set the scale to 100, fill with a 40 NTU standard (AEPA-1 turbidity standard from Advanced Polymer Systems, Inc.), and insert into the instrument. Adjust the standardize control to give a readout of 200. Rezero the instrument and repeat these steps with the scale set at 10 and 1 using 4.0 and 0.4 NTU standards, respectively. These standards are prepared by diluting aliquots of the 40 NTU standard.

5.6.1.4 Conductance, Temperature, and pH Meter

Temperature and conductance are factory calibrated. Conductance accuracy may be checked with a solution of known conductance and recalibration can be instituted, if necessary.

All instrumentation used in field activities must be calibrated according to manufacturers' instructions. Where required, field instruments must be calibrated and recorded in the field logbook each sampling day.

Continuous sampling devices must be calibrated according to manufacturers' specifications at the time of field set-up and checked as often as necessary. Sample lines for continuous devices must be cleaned or replaced prior to each installation.

In those instances when a field instrument will not calibrate, the instrument maintenance personnel will attempt a field repair of the impaired equipment. To the extent possible or practical, backup field equipment should be available.

Do not subject the pH electrode to freezing temperatures. It is good practice to rinse the electrode in distilled water when going from one buffer to another. When not in use, the cap should be kept on the electrode. Keeping the cotton in the cap moist will keep the electrode ready to use.

5.6.1.5 Preventive Maintenance

All field instruments and equipment used for sample analysis will be maintained under service agreements with the manufacturers and will be serviced and maintained only by qualified personnel. All repairs, adjustments, and calibrations will be documented in an appropriate logbook or data sheet that will be kept on file.

A sufficient redundancy of equipment items should be maintained to allow for a reasonable level of equipment failure.

5.6.2 Sampling Equipment, Containers, and Supplies

Tables 5-4 and 5-5 specify sample container requirements by analysis and matrix. Further discussion of sampling equipment and supplies is provided in Section 5.6.1.

5.7 EQUIPMENT DECONTAMINATION

Whenever possible, disposable sampling and personal protective equipment will be used for field activities. Due the to number of samples to be collected, much of the sampling equipment used in the field will be decontaminated between uses at different sample locations. Equipment anticipated for field decontamination includes but is not limited to:

- Stainless steel trowels, spoons, and mixing bowls;
- Auger flights;
- Teflon bailers; and
- Nondisposable protective equipment.

The primary intention of field decontamination is to prevent cross contamination of samples, control the spread of contaminants to noncontaminated areas, and prevent chemical exposure to the sampling team. The decontamination area will be determined before fieldwork begins. The location will be upwind and away from suspected contaminant sources. The decontamination procedures for all stainless steel and Teflon sampling equipment will consist of a consecutive series of the following wash and rinses:

- Potable water rinse;
- Liquinox wash;
- Potable water rinse;
- Acetone rinse;
- Hexane rinse;
- Deionized water rinse; and
- Air dry.

Auger flights will be decontaminated by power wash or steam cleaning. Nondisposable protective clothing will be washed with a water and alconox solution and will be rinsed with potable water. The Health and Safety Plan presents procedures for personnel decontamination and site access control.

For asbestos sampling, decontamination of the sampling tools will take place at the sampling area. The tools and outside of the sampling bag will be decontaminated with amended water (detergent and water) and paper towels or wet wipes. All contaminated towels or wet wipes will be disposed of in a 6-mil plastic bag labeled as containing asbestos containing or contaminated waste.

5.8 SAMPLE HANDLING REQUIREMENTS

5.8.1 Container Requirements

Sample containers for the project will be supplied by either the contractor or COE in compliance with EPA guidance (Specifications and Guidance for the Preparation of Contaminant-Free Containers, April 1989). If the COE is to supply sample containers, the COE project engineer must be notified in writing of the number and type of containers needed as well as the date needed 10 days prior to container pick-up.

Container requirements vary according to the anticipated hazard class of the sample. It is anticipated that all of the samples collected for the project will be low level (less than 10 ppm contaminant concentrations suspected).

5.8.2 Preservation and Holding Times

Sample preservation and holding time requirements as outlined in EPA SW-846 are presented in Table 5-3. Holding times are established from the time of collection of the samples to extraction (as specified) and analysis.

5.8.3 Documentation

Sample documentation includes sample identification labels, sample tags, daily sampling reports, photographs, laboratory analysis requests, and permanently bound field logbooks.

Sample Documentation

Each sample will be labeled and sealed immediately after collection. To minimize handling of sample containers, labels will be filled out prior to sample collection. The sample label will be filled out using waterproof ink, will be firmly affixed to the sample containers, and protected with Mylar tape. A 10-digit alphanumeric code will be assigned to each sample as an identification number to track samples collected at the site. The sample code is broken down as follows:

Group	Digits	Time	Code Examples Completed
(1)	1-2	Calendar Year	91, 92
(2)	5-7	Identifying code	GAM (Gambell)
(3)	8-10	Sample No.	010, 110
(4)	11-12	Sample type:	Symbol
		Surface Soil	SS
		Groundwater	GW
		Sediment	SD
		Soil	SL

Example: 92 GAM 010 SD = 1992, Gambell, Sample No. 10, Sediment

The sample label also will provide the following information:

- Name of sampler;
- Date and time of collection;
- Sample number;
- Analysis required (including EPA Test Method); and
- Preservation.

Sample volume levels will be marked on each liquid sample container. Sample tags will be attached to each sample container, and will be filled out to reflect sample-specific information (see Appendix C). After the sample is collected, pertinent information such as sample identification number, date and time of sample collection, sample collection method, description of sample, and any field measurements (OVA readings, pH, conductivity, etc.), will be recorded in the field logbook, and the recorder will initial the entry.

Field Logs

Field logs are necessary to provide records of data and observations to enable participants to reconstruct events that occurred during the project and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. All daily logs will be kept in a permanently bound, waterproof notebook containing numbered pages. All entries will be made in waterproof ink, dated, and signed. No pages will be removed for any reason. The daily logs will include a site log and a task log.

The field log is the responsibility of the site team leader and will include a complete summary of the day's activity at the site.

The field log will include:

- Name of person making entry (signature);
- Names of team members on site;
- Levels of personnel protection--level of protection originally used, changes in protection, if required, and reasons for changes;
- Time spent collecting samples;
- Documentation of samples collected--including sample identification numbers, sampling location and depth numbers, sampling date and time, sampling personnel, type of sample (grab, composite, etc.), sample matrix, and number of samples collected;
- On-site measurement data, including units of measurement;
- Field observations and remarks;
- Weather conditions, wind direction, etc.;
- Monitoring equipment used (brand, model, serial number);
- Monitoring equipment calibration;
- Unusual circumstances or difficulties; and
- Initials of person recording the information.

A complete log of all conditions encountered during drilling will be maintained. This includes lithologic/hydrogeologic descriptions and notations on drilling speed, drill bit behavior, drill rig injection rates, cuttings return rates, and pull-down pressures as different materials are encountered. Major components of the log to be completed include the following.

- At 5-foot intervals or change of material, the geologist will obtain a sample of the subsurface soil split-spoon sampling. Cutting depth, date, and time will be noted;
- Description of the subsurface soil will be noted to include the following, whenever possible:
  - Soil color;
  - Soil particle size, e.g., cobbles, sand, silt, and clay (according to the Wentworth size scale);
  - Estimated percentage of cobbles, sand, silt, and/or clay;
  - Descriptive comments, e.g., degree of cementation; and
  - Moisture content.
- Depth at which groundwater is first encountered will be noted; and
- Drilling speed and rig behavior will be noted to help verify the nature of the material encountered by the drill bit.

All sample identification tags, chain-of-custody records, and other forms must be written in waterproof ink. None of these documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

No pages will be removed from logbooks for any reason. If corrections are necessary, these must be made by drawing a single line through the original entry (so that the original entry is legible) and writing the corrected entry alongside. The correction must be initialed and dated. Corrected errors may require a footnote explaining the correction.

All field documents will be supplied to the project manager at the end of the field investigation.

Photographic Log

Photographs will be taken by a member of the sampling team. Documentation of a photograph is crucial to its validity as a representation of an existing situation. The following information will be noted in the field logbook concerning photographs:

- Date, time, location where photograph was taken;
- Photographer (signature);

- Weather conditions;
- Description of photograph taken and direction photographer was facing; and
- Sequential number of the photograph and the film roll number.

After the photographs have been developed, the information recorded in the field notebook will be transferred to the back of the photographs.

The field sampling manager will be responsible for maintaining records of field activities, including field analytical measurements, sample locations, and sample identification. Data shall be entered into a permanently bound logbook while field activities are in progress. Records will be retained on file by the field sampling team manager until released to the COE for storage. A copy of all documents generated during the fieldwork will be supplied to the project manager for incorporation into the project report. Field results will be incorporated into progress reports or final reports as appropriate.

5.8.4 Analysis Request Forms/Chain-of-Custody

Laboratory analysis request forms will be furnished by the government laboratory and will be completed in accordance with COE guidelines (COE 1990). The sample analysis request forms will include the EPA method number for the analysis required.

Full chain-of-custody procedures will be initiated in the field and maintained through delivery to the contracted laboratory. The primary objective of the chain-of-custody procedures is to provide an accurate written record that can be used to trace the possession and handling of a sample from the moment of its collection through its analyses. A sample is in custody if it is:

- In someone's physical possession;
- In someone's view;
- Locked up; or
- Kept in a secured area that is restricted to authorized personnel.

The chain-of-custody record will be completed in duplicate by the field personnel designated by the sample team manager as responsible for sample shipment to the appropriate laboratory for analysis (see Appendix C, Chain-of-Custody Form). In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or analytical concerns (e.g., extraction time or sample retention period limitations, etc.), the person completing the chain-of-custody record must note these constraints in the remarks section of the custody record. The remarks section also should indicate whether the samples have been filtered or preserved. Copies of all chain-of-custody forms will be provided to the Corps of Engineers North Pacific Division Materials Laboratory (NPDML). In addition, a sample summary which identified all QA/QC duplicate samples, rinsate blanks and trip blanks, will be submitted to NPDML when sampling is completed.

Samples will be shipped to the NPDML or directly to the contract laboratory if directed by the Division Laboratory. General procedures for transfer of sample custody during sample shipment appear below:

- NPDML must be notified of the number of sample proposed for collection, sample matrices, analytical methods, required turnaround time, and dates of sampling at least 10 days prior to the initiation of sampling. The person of contact is Tim Seeman, at 503/665-4166.
- The coolers in which the samples are packed will be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving them will sign, date, and note the time on the record. This records sample custody transfer;
- Samples will be dispatched to the laboratory for analysis with a separate chain-of-custody record accompanying each shipment. Shipping containers will be sealed with custody seals for shipment to the laboratory. The method of shipment, name of courier, and other pertinent information will be entered in the remarks section of the chain-of-custody record;
- All shipments will be accompanied by the chain-of-custody record identifying their contents. The original record that accompanies the shipment will be taped to the inside of the cooler lid using chain-of-custody seals. The copy is retained by the sample team leader; and
- If sent by mail, the package is registered with return receipt requested. If sent by common carrier, a bill of lading is used. Freight bills, Postal Service receipts, and bills of lading are retained as part of the permanent documentation.

Custody seals are preprinted adhesive-backed seals with security slots designed to break if the seals are disturbed. Sample shipping containers (coolers, cardboard boxes, etc.) as appropriate are secured by placing seals on right front and left rear over the container opening. Seals will be signed and dated before use. Clear plastic tape will be placed over the seals to ensure that the seals are not accidentally broken during shipment. On receipt at the laboratory, the custodian must check and certify that seals on the shipping containers are intact by completing logbook entries. The custodian also will document the temperature of the cooler, the general condition of the sample containers, and verify that the information on the chain-of-custody agrees with the samples received. All chain-of-custody documents will be supplied by the sampling team.

5.8.5 Sample Packaging and Shipping

Samples must be packaged carefully to avoid breakage or contamination and must be shipped to the laboratory at proper temperatures. The following sample packaging requirements will be followed:

- Determine the proper shipping name and the maximum allowable net quantities per package for a passenger or cargo-only aircraft. The proper shipping name, and labeling and packaging requirements can be found in the Hazardous Material Table (49 CFR 172.1010) or in Section 4 of the IATA Dangerous Goods Regulations;
- Groups of bulk asbestos samples should be placed in a larger plastic bag, sealed and shipped in an appropriate manner to ensure that samples are not damaged;
- Enclose each sample container individually in a clear, sealable plastic bag;
- Pack ice into freezer bags, and surround samples with ice packs and remaining voids with non-combustible, absorbent packing material. Care should be taken so that the sample remains at 4°C, as excessive cold may break or damage sample bottles;
- Any remaining space in the cooler should be filled with inert packing material. Under no circumstances should material such as sawdust or sand be used; and
- Tape paperwork (chain-of-custody forms and cooler receipts) in a plastic bag on the inside of the cooler lid, seal with custody seals, label, and ship.

Shipping containers are to be custody-sealed for shipment. The container custody seal will consist of filament tape wrapped around the package at least twice and custody seals affixed in such a way that access to the container can be gained only by cutting the filament tape and breaking a seal.

Field personnel will make arrangements for transportation of samples to the contracted laboratory. When custody is relinquished to a shipper, field personnel will telephone to inform the laboratory custodian of the expected time of arrival of the sample shipment and any time constraints of sample analysis.

The following sample marking and labeling guidelines will be followed:

- Use abbreviations only where specified; and
- The words "This End Up" or "This Side Up" must be clearly printed on the top of the outer package. Upward-pointing arrows should be placed on the sides of the package. The words "Laboratory Samples" should also be printed on the top of the package.

All samples will be transported in a manner to prevent container damage or cross-contamination of the samples during shipment. Shipping and labeling procedures will be in accordance with applicable COE specifications, United States Department of Transportation (DOT) regulations, and National Enforcement Investigations Center policies (COE 1986; 49 CFR 100-199; EPA 1985).

5.9 INVESTIGATION-DERIVED WASTE

Investigation-derived waste will be containerized as necessary. Investigation-derived wastes are expected to consist of the following waste types:

- Cuttings from boreholes;
- Sample not submitted for laboratory analysis;
- Groundwater from well development and sampling activities;
- Drilling water or mud from drilling operations;
- Decontamination fluids; and
- Disposable protective clothing and supplies.

If positive PID/FID readings are detected in the drill cuttings (i.e., greater than 5 ppm), the cuttings will be containerized in DOT-approved 55-gallon drums. Otherwise, the cuttings will be stockpiled on a double layer of thickness of 6-mil plastic sheeting in close proximity to the well for storage. Depending upon the analytical results, the soil will either be disposed of at a hazardous waste landfill or the Gambell landfill.

Groundwater produced during well development and sampling activities will be treated as potentially contaminated. All potentially contaminated groundwater will be containerized in DOT-approved 55-gallon drums or equivalent and stored on site until sample analysis results are received. Depending on the results, the water will either be discharged to the ground surface, disposed of as a hazardous waste, or evaporated.

Fluids generated during decontamination will be disposed of on site unless field screening indicates the need for containerization. The solvent rinsate will be collected separately from the other solutions and held for subsequent disposal. Disposable supplies will be bagged, stored, and buried at the landfill.

5.10 PERSONAL HEALTH AND SAFETY

Personal health and safety procedures are addressed in the project Health and Safety Plan. This plan complies with and follows the requirements and guidelines in the COE Safety Manual, EM 385-1-1, 29 CFR 1910, and 29 CFR 1926. Included in the plan are descriptions of anticipated chemical and physical hazards, levels of personal protection required, health and safety monitoring requirements and action levels, personnel decontamination procedures, and emergency procedures. The drilling and sampling team is responsible for its own safety and the implementation of health and safety protocols.

Table 5-1

PROPOSED SOIL SAMPLE SUMMARY
GAMBELL, ST. LAWRENCE ISLAND, ALASKA

SITE	Surface Soil Samples		Subsurface Soil Samples[ac]	
	No. of Samples	Parameters[b]	No. of Samples	Parameters[b]
1. North Beach	2	TRPH, BNA, PCBs, TCLP metals	24	GRO, DRO, TRPH, VOC, PCBs, TCLP metals
2. Former Military Housing/Operations	2	TRPH, BNA, TCLP metals	9	GRO, DRO, TRPH, VOC, PCBs, TCLP metals, Explosives
3. Former Communication Facility	NS		6	GRO, DRO, TRPH, VOC, PCBs, TCLP metals, Sulfates, pH
4. Sevuokuk Mountain	2 3	PCBs TRPH, BNA, Dioxin, PCBs, TCLP metals	NS	
5. Former Tramway Site	NS		12	GRO, DRO, TRPH, PCBs, TCLP metals
6. Military Landfill	NS		NS	
7. Former Military Power Facility	2	GRO, DRO, TRPH, TCLP metals	12	GRO, DRO, TRPH, VOC, PCBs, TCLP metals
8. West Beach	NS		4	GRO, DRO, TRPH, VOC, PCBs, TCLP metals
9. Asphalt Barrel Cache	NS		NS	
10. Sevuokuk Mountain Trail System	NS		NS	
11. Communication Cable Route	NS		NS	
12. Nayvaghaq Lake	3	TRPH, TCLP metals	6	GRO, DRO, TRPH, VOC, TCLP metals
13. Former Radar Power Station	2	TRPH, PCBs, TCLP metals	12	GRO, DRO, TRPH, VOC, PCBs, TCLP metals
14. Navy Plane Crash Site	NS		NS	

Table 5-1

PROPOSED SOIL SAMPLE SUMMARY GAMBELL, ST. LAWRENCE ISLAND, ALASKA

SITE	Surface Soil Samples		Subsurface Soil Samples^{ac}	
	No. of Samples	Parameters^{b}	No. of Samples	Parameters^{b}
15. Troutman Lake Ordnance Burial Site	NS		NS	
16. Gambell Municipal Building Site	2	GRO, DRO, TRPH, TCLP metals	9	GRO, DRO, TRPH, TCLP metals
17. Army Landfills	NS		21	GRO, DRO, TRPH, VOC, PCBs, TCLP metals
18. Former Main Camp	NS		NS	

BNA = Base/neutral and acid extractable compounds
DRO = Diesel range organics
GRO = Gasoline range organics
NS = No samples required
Metals = Arsenic, barium, badmium, chromium, lead, mercury, selenium, silver
PCBs = Polychlorinated biphenyls
TCLP = toxicity characteristic leaching procedure
TRPH = Total recoverable petroleum hydrocarbons
VOC = Volatile organic compounds
a = Grain size analysis will be performed on all borehole samples in which monitoring wells will be installed.
b = Method numbers are presented in Table 6-1. Additinal remediatin parameters, to be performed on 10 to 20 percent of subsurface soil samples collected, presented in Tables 6-1 and 6-2.
c = Divide total number of subsurface soil samples per site by three to yield the number of proposed soil borings (Table 5-9), except for site 8. Divide total number of samples at Site 8 by four to yield the number of proposed soil borings.

Source: Ecology and Environment, Inc. 1992

Table 5-2

PROPOSED SEDIMENT, GROUNDWATER, AND ASBESTOS SAMPLE SUMMARY
GAMBELL, ST. LAWRENCE ISLAND, ALASKA

SITE	Sediment Samples		Groundwater Samples From Monitoring Wells[a]		Asbestos
	No. of Samples	Parameters[b]	No. of Samples	Parameters[b]	
1. North Beach	NS		8	GRO, DRO, TRPH, VOC, PCBs, TCLP metals[a]	
2. Former Military Housing/Operations	NS		3	GRO, DRO, TRPH, VOC, TCLP metals[a], Explosives	3
3. Former Communication Facility	NS		1	GRO, DRO, TRPH, VOC, PCBs, TCLP metals[a], Sulfates, pH	
4. Sevuokuk Mountain	3	PCBs	NS		3
5. Former Tramway Site	NS		2	GRO, DRO, TRPH, PCBs	
6. Military Landfill	NS		4	GRO, DRO, TRPH, VOC, Total Metals[a], Ammonia, Nitrates, Sulfates, TDS, TSS, Coliform/Fecal Bacteria, BOD, COD	
7. Former Military Power Facility	NS		4	GRO, DRO, TRPH, VOC, PCBs, TCLP metals[a]	
8. West Beach	NS		1	GRO, DRO, TRPH, VOC, PCBs, TCLP metals[a]	
9. Asphalt Barrel Cache	NS		NS		
10. Sevuokuk Mountain Trail System	NS		NS		
11. Communication Cable Route	NS		NS		
12. Nayvaghaq Lake	NS		2	GRO, DRO, TRPH, VOC, TCLP metals[a]	

Table 5-2

PROPOSED SEDIMENT, GROUNDWATER, AND ASBESTOS SAMPLE SUMMARY GAMBELL, ST. LAWRENCE ISLAND, ALASKA

SITE	Sediment Samples		Groundwater Samples From Monitoring Wells[a]		Asbestos
	No. of Samples	Parameters[b]	No. of Samples	Parameters[b]	
13. Former Radar Power Station	NS		4	GRO, DRO, TRPH, VOC, PCBs, TCLP metals[a]	
14. Navy plane Crash Site	NS		NS		
15. Troutman Lake Ordnance	NS		NS		
16. Gambell Municipal Building Site	NS		2	GRO, DRO, TRPH, TCLP metals[a]	
17. Army Landfills	NS		7	GRO, DRO, TRPH, VOC, PCBs, TCLP metals[a]	
18. Former Main Camp	NS		NS		

BNA = Base/neutral and acid extractable compounds
DRO = Diesel range organics
GRO = Gasoline range organics
NS = No samples required
Metals = Arsenic, barium, badmium, chromium, lead, mercury, selenium, silver
PCBs = Polychlorinated biphenyls
TCLP = toxicity characteristic leaching procedure
TDS = Total dissolved solids
TRPH = Total recoverable petroleum hydrocarbons
TSS = Total suspended solids
VOC = Volatile organic compounds
a = Grain size analysis will be performed on all borehole samples in which monitoring wells will be installed.
b = Method numbers are presented in Table 6-1. Additinal remediation parameters, to be performed on 10 to 20 percent of subsurface soil samples collected, presented in Tables 6-1 and 6-2.
c = Divide total number of subsurface soil samples per site by three to yield the number of proposed soil borings (Table 5-9), except for site 8. Divide total number of samples at Site 8 by four to yield the number of proposed soil borings.

Source: Ecology and Environment, Inc. 1992

Table 5-3

SAMPLE PRESERVATION AND HOLDING TIMES FOR SOIL AND WATER SAMPLES
GAMBELL, ST. LAWRENCE ISLAND, ALASKA

Analysis	Matrix	Preservation Method	Maximum Holding Time
Volatiles by GC/MS and GC	Soil Water	Cool to 4°C Cool to 4°C, HCL to pH < 2	14 days to analysis 14 days to analysis
PCB	Soil Water	Cool to 4°C Cool to 4°C	14 days to extraction, 40 days to analysis 7 days to extraction, 40 days to analysis
Extractable Organics	Soil Water	Cool to 4°C Cool to 4°C	14 days to extraction, 40 days to analysis 7 days to extraction, 40 days to analysis
Gasoline Range Organics	Soil Water	Cool to 4°C Cool to 4°C, HCL to pH < 2	14 days to analysis 14 days to analysis
Diesel Range Organics	Soil Water	Cool to 4°C Cool to 4°C, HCL to pH < 2	14 days to extraction, 40 days to analysis 7 days to extraction, 40 days to analysis
Dioxin	Soil	Cool to 4°C	30 days to extraction, 45 days to analysis
Explosives	Soil Water	Cool to 4°C Cool to 4°C	14 days to extraction, 40 days to analysis 7 days to extraction, 40 days to analysis
Total Residual Petroleum Hydrocarbons	Soil Water	Cool to 4°C Cool to 4°C, HCL to pH < 2	28 days to analysis 28 days to analysis
Metals	Soil Water	Cool to 4°C Cool to 4°C, HNO_3 to pH < 2	6 months (mercury - 28 days) 6 months (mercury - 28 days)
Ammonia - Nitrogen	Water	Cool to 4°C, H_2SO_4 to pH < 2	28 days
Nitrate - Nitrogen	Water	Cool to 4°C	48 hours
Sulfate	Water	Cool to 4°C	28 days
Coliform/Fecal Bacteria	Water	Cool to 4°C, 0.008% $Na_2S_2O_3$	6 hours
Total Dissolved/Suspended Solids	Water	Cool to 4°C	24 hours
Biochemical Oxygen Demand	Water	Cool to 4°C	48 hours
Chemical Oxygen Demand	Water	Cool to 4°C, H_2SO_4 to pH < 2	28 days

Table 5-3

SAMPLE PRESERVATION AND HOLDING TIMES FOR SOIL AND WATER SAMPLES GAMBELL, ST. LAWRENCE ISLAND, ALASKA

Analysis	Matrix	Preservation Method	Maximum Holding Time
Hydrocarbon Scan	Water/Free product	Cool to 4°C, HCL to $pH < 2$	28 days to analysis
BTEX	Water/Free product	Cool to 4°C, HCL to $pH < 2$	14 days to analysis
Total Lead	Water/Free product	Cool to 4°C, HNO_3 to $pH < 2$	6 months
Flashpoint	Water/Free product	---	---
BTU	Free product	---	---
Ash Content	Soil	Cool to 4°C	---
Total Sulfur	Soil	Cool to 4°C	---
Total Organic Carbon	Soil	Cool to 4°C	28 days
BTU	Soil	---	---
Ignitability	Soil	---	---
Total Organic Halides	Soil	Cool to 4°C	8 days
BTEX	Soil	Cool to 4°C	14 days
Moisture Content	Soil	---	---
Grainsize	Soil	---	---
Atterburg Limits	Soil	---	---
Magnesium	Water	Cool to 4°C, HNO_3 to $pH < 2$	6 months
Calcium	Water	Cool to 4°C, HNO_3 to $pH < 2$	6 months
Total Iron	Water	Cool to 4°C, HNO_3 to $pH < 2$	6 months
Dissolved Iron	Water	Cool to 4°C, HNO_3 to $pH < 2$	6 months
Alkalinity	Water	Cool to 4°C	14 days
Hardness	Water	Cool to 4°C, HNO_3 to $pH < 2$	6 months

Table 5-4

SAMPLE CONTAINERS AND VOLUMES FOR SOIL, SEDIMENT, AND MISCELLANEOUS SAMPLES GAMBELL, ST. LAWRENCE ISLAND, ALASKA

Type of Analysis	Type and Site of Container	Number of Containers and Sample Volume (per sample)
Purgeable (Volatile) Organics	2-oz glass jar with Teflon-lined septa cap	Two (2); fill completely, no air space
Extractable Organics	4-oz glass jar with Teflon-lined cap	One (1); fill completely
PCB	4-oz glass jar with Teflon-lined cap	One (1); fill completely
Dioxin	4-oz glass jar with Teflon-lined cap	One (1); fill completely
Gasoline Range Organics (M. 8015)	2-oz glass jar Teflon-lined septa cap	Two (2); fill completely, no air space
Diesel Range Organics	4-oz glass jar	One (1); fill completely
Method 8330 (Explosives)	4-oz glass jar foil wrapped	One (1); fill completely
Total recoverable petroleum hydrocarbons	4-oz glass jar	One (1); fill completely
Metals	8-oz glass jar with Teflon-lined cap	One (1); fill completely
Grain Size/Moisture Content	Gallon plastic bag (double)	One or more, depending on soil type
Asbestos	1-liter plastic bag	One (1); 5 in^3, minimum
Sulfate/pH	4-oz glass jar	One (1); fill completely
Ash Content	4-oz glass jar	One (1); fill completely
Total Sulfur	4-oz glass jar	One (1); fill completely
Total Organic Carbon	4-oz glass jar	One (1); fill completely
BTU/Ignitability	4-oz glass jar	One (1); fill completely
Total Organic Halides	4-oz glass jar	One (1); fill completely
Atterburg Limits	brass sleeve	One (1); fill completely

Table 5-5

Sample Containers and Volumes for Water Samples
Gambell, St. Lawrence Island, Alaska

Type of Analysis	Type and Size of Container	Number of Containers and Sample Volume (per sample)
Purgeable (Volatile) Organics	40-mL glass vials with Teflon-backed septums	Two (2)[a]; fill completely, no air space.
Extractable Organics	1-liter amber glass bottle with Teflon-lined cap	One (1)[a]; fill 7/8 full
PCB	1-liter amber glass bottle with Teflon-lined cap	One (1)[a]; fill 7/8 full
Gasoline Range Organics (M. 8015)	40 mL glass vials with Teflon-backed septums	Three (3)[a]; fill completely, no air space
Diesel Range Organics	1-liter amber glass bottle with Teflon-lined cap	One (1)[a]; fill 7/8 full
Method 8330 (Explosives)	1-liter amber glass bottle	One (1)[a]; fill 7/8 full
TRPH	1-liter amber glass bottle	one (1); fill 7/8 full
Metals	1-liter polyethylene bottle with polyethylene-lined cap	One (1); fill 7/8 full
Nitrate-Nitrogen	250-mL HDPE	One (1); fill 7/8 full
Ammonia-nitrogen	500-mL HDPE	One (1); fill 7/8 full
Sulfate	125-mL HDPE	One (1); fill 7/8 full
Coliform bacteria	125-mL HDPE, sterile	One (1); fill 7/8 full
Fecal Coliform	125-mL HDPE, sterile	One (1); fill 7/8 full
Total dissolved solids, Total suspended solids	500-mL HDPE	One (1); fill 7/8 full
Biochemical Oxygen Demand	1-liter HDPE	Two (2); fill 7/8 full
Chemical Oxygen Demand	125-mL HDPE	One (1); fill 7/8 full
pH	125-mL HDPE	One (1); fill 7/8 full
Hydrocarbon scan	1-liter amber glass bottle	One (1); fill 7/8 full
BTEX	40-mL glass vials with Teflon-backed septums	Two (2); fill 7/8 full
Flashpoint	1-liter amber glass bottle	One (1); fill 7/8 full
BTU	40-mL glass vial with Teflon-backed septums	One (1); fill completely

Table 5-5

Sample Containers and Volumes for Water Samples
Gambell, St. Lawrence Island, Alaska

Type of Analysis	Type and Size of Container	Number of Containers and Sample Volume (per sample)
Alkalinity	250-mL HDPE	One (1); fill completely
Hardness	250-mL HDPE	One (1); fill completely

[a] = One sample per twenty will be collected in triplicate for internal quality control purposes (matrix spike/matrix spike duplicate) for project and QA laboratories.

Source: EPA Documents SW-846 (3rd edition), MCAWW

Table 5-6

TOTAL NUMBER OF SAMPLES REQUIRED
GAMBELL, ST. LAWRENCE ISLAND, ALASKA[c]

Matrix	Analysis	Number of Samples Expected	Sets of Field Triplicates[b]	Background Samples	Project Trip Blanks[a]	QA Trip Blanks[a]	Total Number of Samples	Rinsate Samples
Surface Soil	GRO	4	1	2			7	1 per type of sampling equipment
	DRO	4	1	2			7	
	PCB	9	1	2			12	
	Dioxin	3	1	2			6	
	BNA	7	1	2			10	
	TCLP metals	16	2	2			20	
	TRPH	16	2	2			20	
Subsurface Soil	GRO	115	12	2			129	1 per type of sampling equipment
	DRO	115	12	2			129	
	VOC	94	10	2			106	
	PCB	94	10	2			106	
	Explosives	9	1	2			12	
	TCLP Metals	103	10	2			115	
	Sulfates	6	1	2			9	
	pH	6	1	2			9	
	TRPH	115	12	2			129	
Sediment	PCB	4	1	1			6	1 per type of sampling equipment
Groundwater	GRO	38	4	1			43	1 per type of sampling equipment
	DRO	38	4	1			43	
	VOC	34	3	1	3	1	42	
	PCB	27	3	1			31	
	Explosives	4	1	1			6	
	Total Metals	36	4	1			41	
	Sulfates	5	1	1			7	
	Ammonia	4	1	1			6	
	Nitrate	4	1	1			6	
	Coliform bacteria	4	1	1			6	
	Fecal coliform bacteria	4	1	1			6	

Table 5-6

TOTAL NUMBER OF SAMPLES REQUIRED
GAMBELL, ST. LAWRENCE ISLAND, ALASKA[c]

Matrix	Analysis	Number of Samples Expected	Sets of Field Triplicates[b]	Background Samples	Project Trip Blanks[a]	QA Trip Blanks[a]	Total Number of Samples	Rinsate Samples
Groundwater (Cont.)	pH BOD COD TRPH	1 4 4 38	1 1 1 4	1 1 1 1			3 6 6 43	1 per type of sampling equipment
Misc. Fibrous Material	Bulk Asbestos	6	1				7	None

a = One trip blank, prepared from organic-free water, will be sent with each ship of VOC samples. The total number of trip blanks is based on the number of coolers shipped throughout the duration of the project.

b = "Triplicate" refers to the collection of three sample volumes, two of which are sumbitted as field duplicates to the COE-approved project laboratory, and the third submitted to the QA laboratory for external quality control.

c = Two background samples are proposed for surface and subsurface soils to represent different soil types found at Gambell.

d = Subsurface soil samples to be submitted for analysis will total approximately 20 percent of all subsurface samples collected, based on field sample headspace screening.

BNA = Base/neutral/acid extractables
BOD = Biochemical Oxygen Demand
COD = Chemical Oxygen Demand
PCB = Polychlorinated biphenyls
TCLP = Toxic characteristic leaching procedure
TRPH = Total recoverable petroleum hydrocarbons
VOC = Volatile organic compound

Table 5-7

SAMPLING EQUIPMENT
GAMBELL, ST. LAWRENCE ISLAND, ALASKA

Matrix	Type	Construction	Use
Soil	Spoon	Stainless steel	Sampling
Soil	Trowel	Stainless steel	Sampling
Soil	Spatula	Stainless steel	Sampling
Soil	Bowl	Stainless steel	Sampling
Soil	Hand auger	Stainless steel	Sampling
Soil	Split spoon	Steel	Sampling
Sediment	Spoon	Stainless steel	Sampling
Sediment	Trowel	Stainless steel	Sampling
Groundwater	Bailer	Stainless steel or Teflon	Purging or sampling
Transformer Oil	Thieving rod	Glass	Sampling
Asbestos	Razor blade	--	Sampling
	Pocket knife	--	Sampling
	Wire cutters	--	Sampling
	Needle-nosed pliers	--	Sampling
	Hammer/chisel	--	Sampling
	Pump spray bottle	--	Sampling

Source: Ecology and Environment, Inc. 1992

Table 5-8

ASBESTOS SAMPLING
RECOMMENDED NUMBER OFSAMPLES PER HOMOGENEOUS AREA
GAMBELL, ST. LAWRENCE ISLAND, ALASKA

Suspected Homogeneous Material Type	**Quality of Homogeneous Material**	**Minimum Number of Samples to be Collected**
Surfacing Materials	≤ 1,000 square feet	3
	> 1,000 to 5,000 square feet	5
	> 5,000 square feet	7
Thermal System Insulation	All areas	3
	Patched areas	1
Miscellaneous Materials	All types	3

Source: Ecology and Environment, Inc. 1992

Table 5-9

PROPOSED SOIL BORINGS

Site No. and Name	Proposed Number of Soil Borings	Proposed Depth of Soil Borings[a] (feet)[b]
Site No. 1:		
North Beach Area		
Air Force Landing Area	3	7
Army Landing Area	5	7
Site No. 2:		
Former Military Housing and Operations Area	3	7
Site No. 3:		
Communications Facility	2	7
Site No. 5:		
Tramway Site		
Transformer Cable Burial Area	4 ✓	7
Site No. 6:		
Military Landfill	4 ✓	7
Site No. 7:		
Military Power Facility	4 ✓	7
Site No. 8:		
West Beach Area		
Army Landfill	1 ✓	11
Site No. 12:		
Nayvaghag Lake Disposal Area	2 ✓	7
Site No. 13:		
Radar Power Station	4 ✓	7
Site No. 16:		
Gambell Municipal Building	3 ✓	7
Site No. 17:		
Army Landfills		
Landfill #1	4 ✓	7
Landfill #2	3	7

Key:

42

a - Selected soil borings at each site are proposed to be completed with monitoring wells. These borings will be advanced to depths of 5-8 feet below the top of the saturated zone.

b - Below ground surface (bgs).

Source: Ecology and Environment, Inc. 1992

Table 5-10

PROPOSED MONITORING WELLS

Site No. and Name	Proposed Number of Monitoring Wells	Proposed Depth of Monitoring Wells (feet)
Site No. 1: North Beach Area		
Air Force Landing Area	3	15
Army Landing Area	5	15
Site No. 2: Former Military Housing and Operations Area	3 P 5.42.4	15
Site No. 3: Communications Facility [illegible]	~~1~~ ②	15
Site No. 5: Tramway Site Transformer Cable Burial Area	~~2~~ ③	15
Site No. 6: Military Landfill	4 ✓	12
Site No. 7: Military Power Facility	4 ✓	12
Site No. 8: West Beach Area Army Landfill	1 ✓	18
Site No. 12: Nayvaghaq Lake Disposal Area	2 ✓	12
Site No. 13: Radar Power Station	4 ✓	12
Site No. 16: Gambell Municipal Building	2 ✓	12
Site No. 17: Army Landfills		
Landfill #1	4 ✓	15
Landfill #2	3	15

Source: Ecology and Environment, Inc. 1992 3~~2~~

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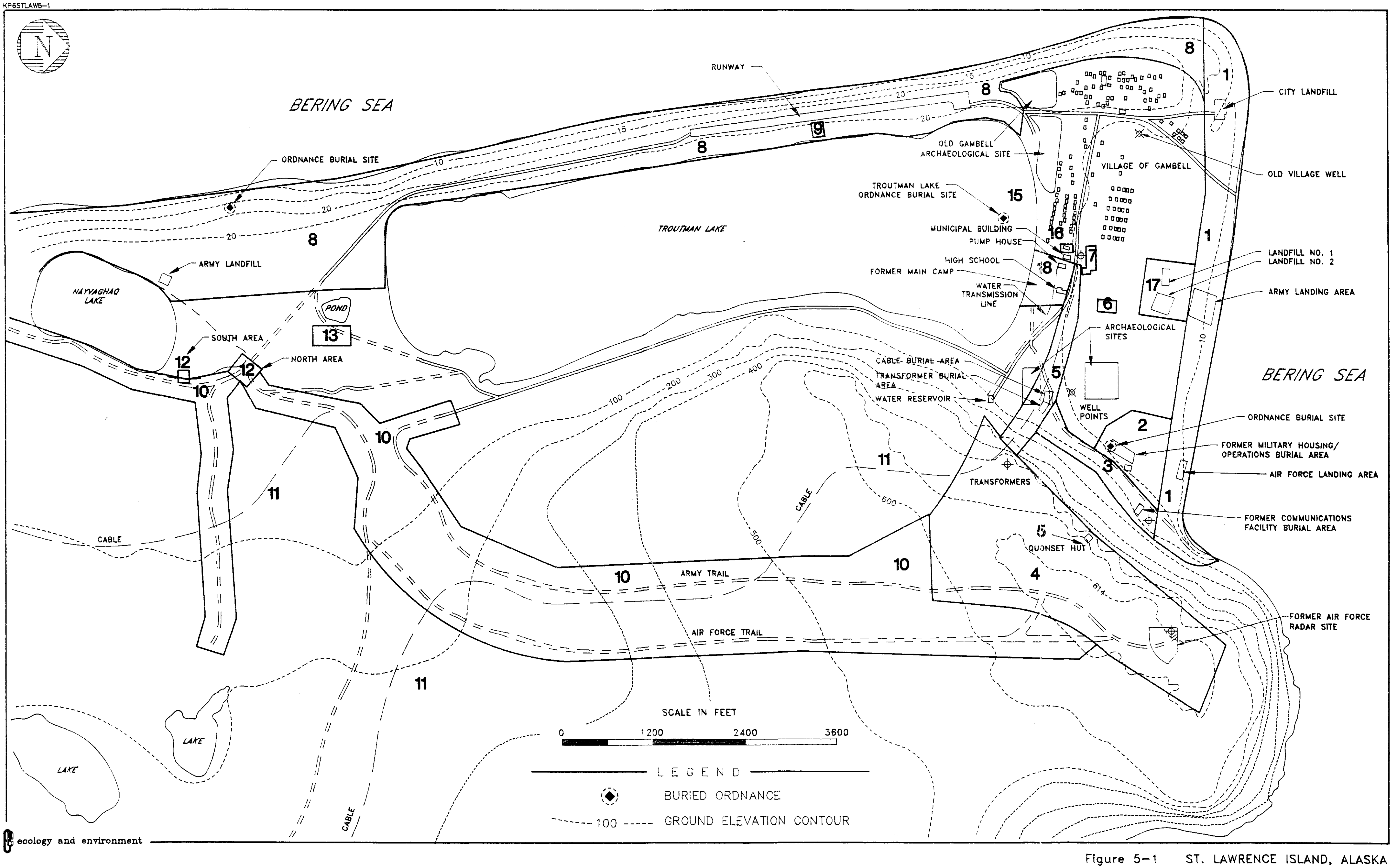

Figure 5-1 ST. LAWRENCE ISLAND, ALASKA SITE LOCATION MAP

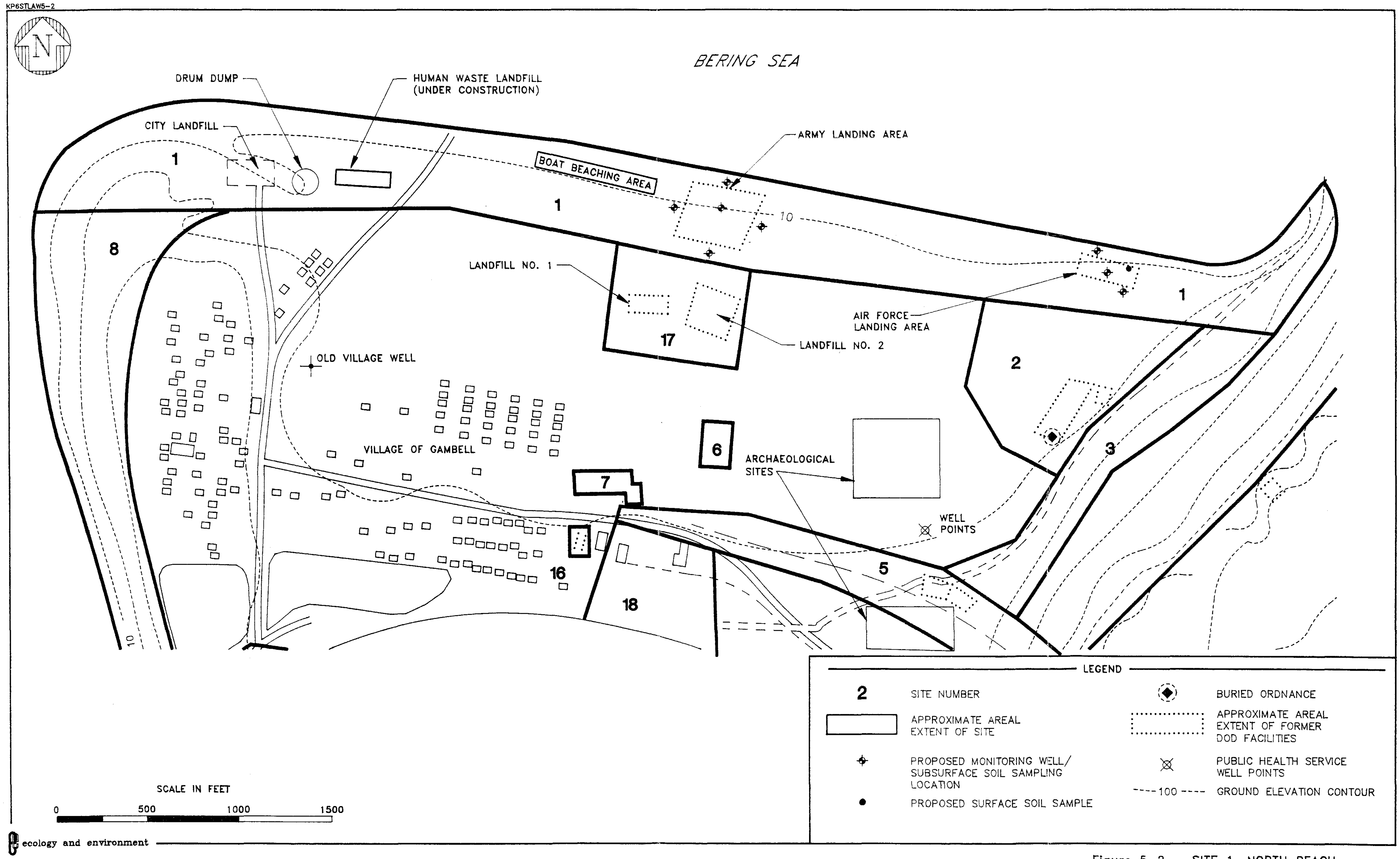

Figure 5-2 SITE 1, NORTH BEACH PROPOSED SAMPLE LOCATION MAP

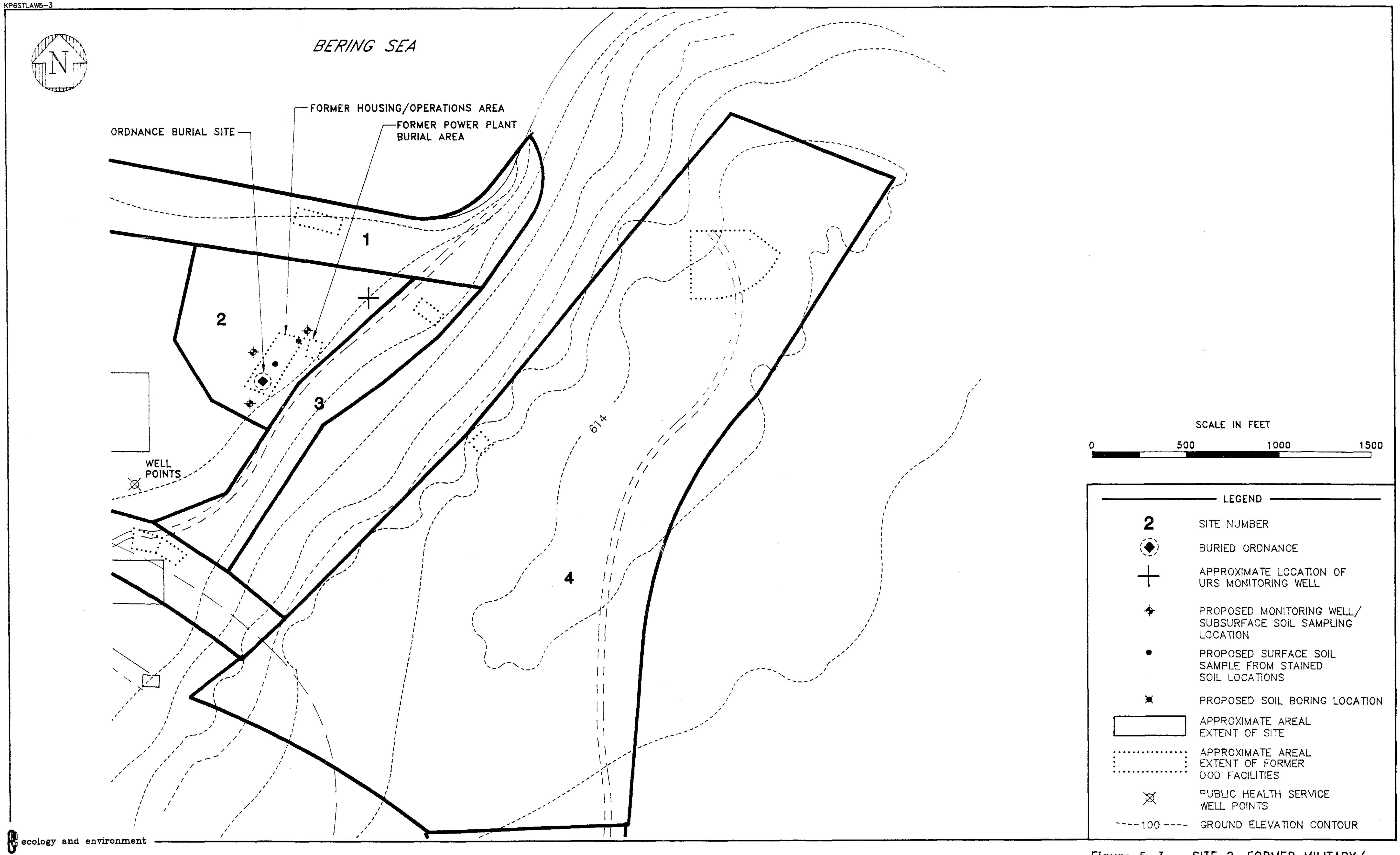

Figure 5-3 SITE 2, FORMER MILITARY/ HOUSING/OPERATIONS SITE PROPOSED SAMPLE LOCATION MAP

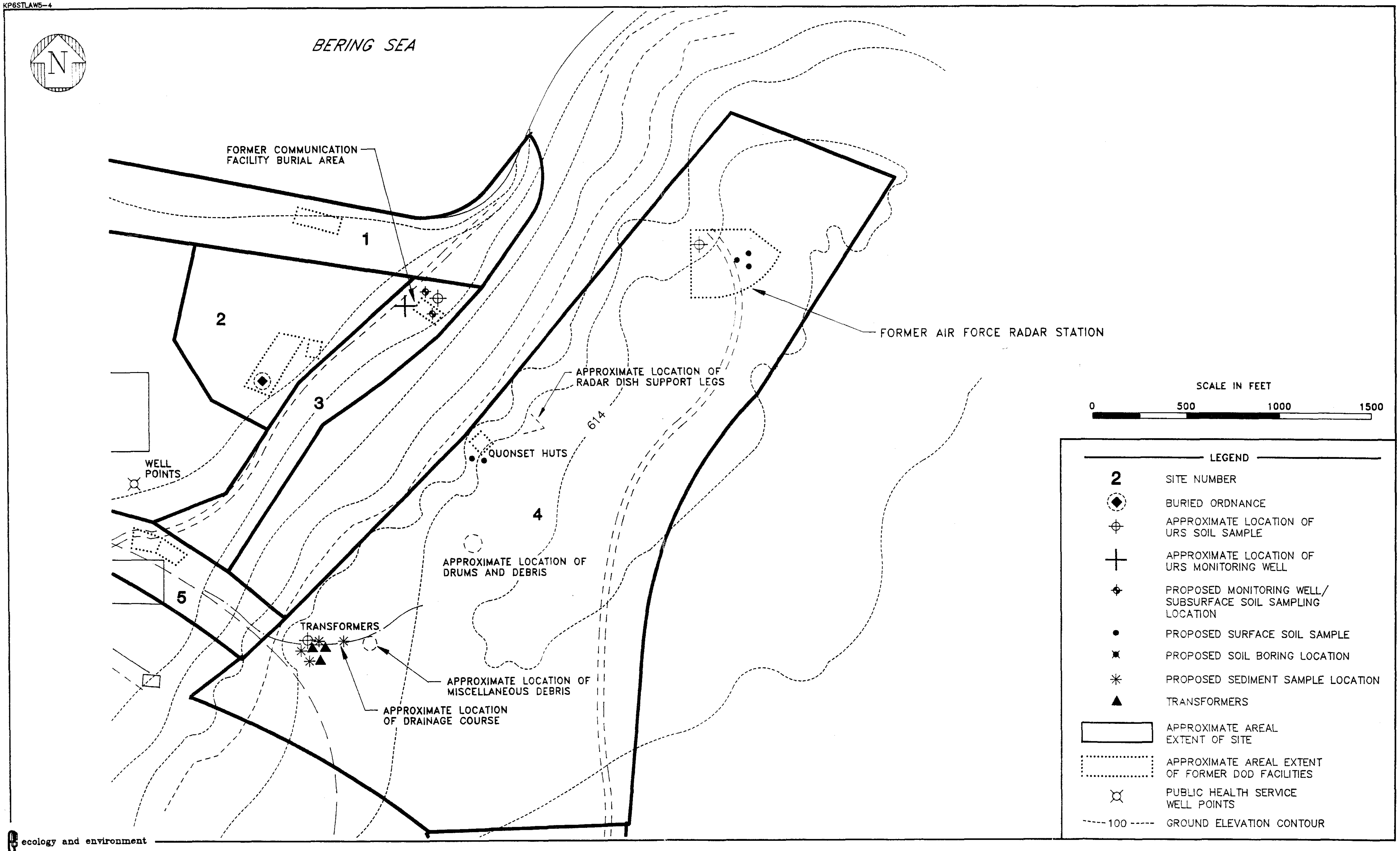

Figure 5-4 SITE 3, FORMER COMMUNICATION FACILITY AND SITE 4, SEVUOKUK MOUNTAIN PROPOSED SAMPLE LOCATION MAP

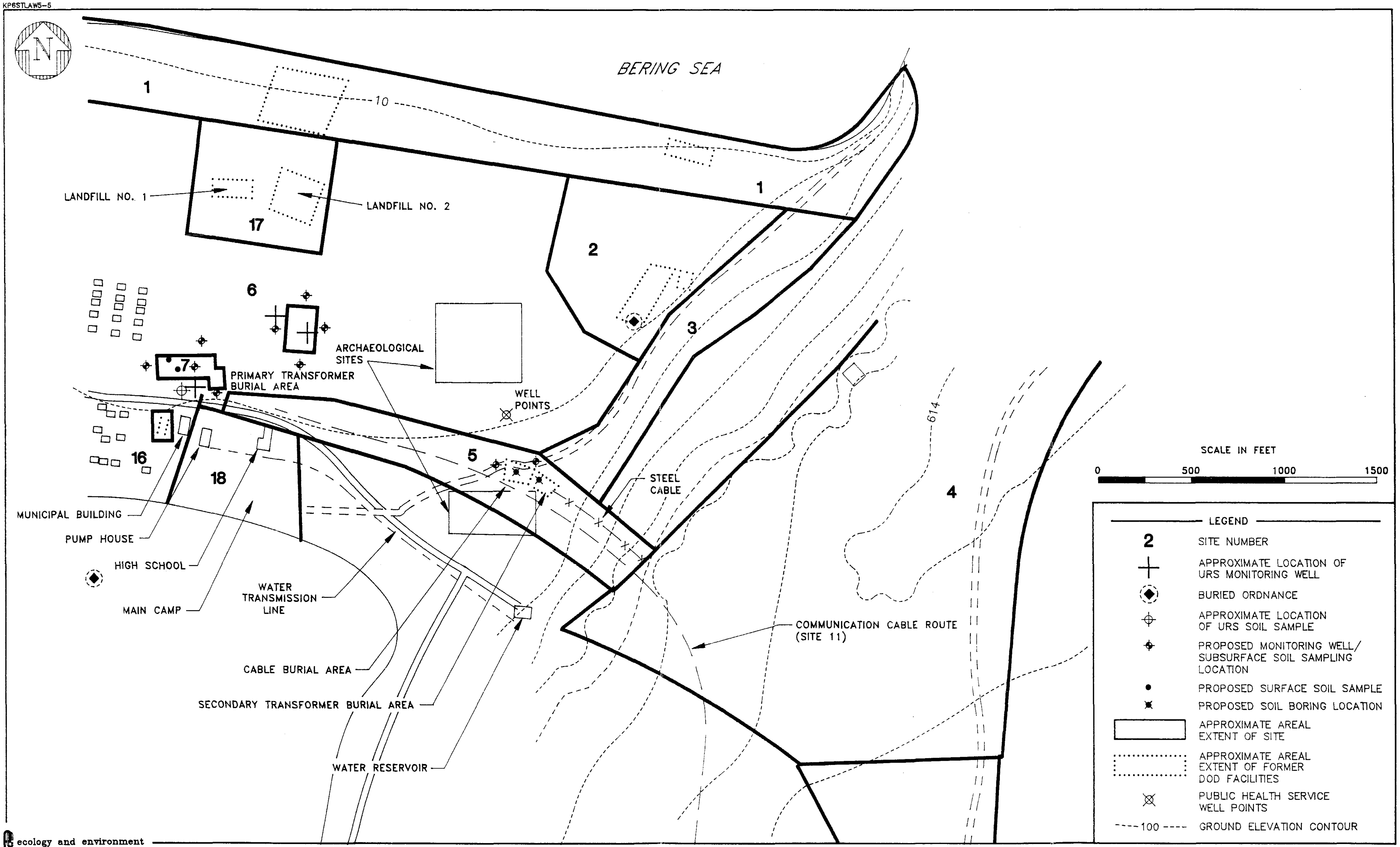

Figure 5-5 SITE 5, FORMER TRAMWAY SITE
SITE 6, MILITARY LANDFILL SITE
SITE 7, FORMER MILITARY POWER FACILITY
PROPOSED SAMPLE LOCATION MAP

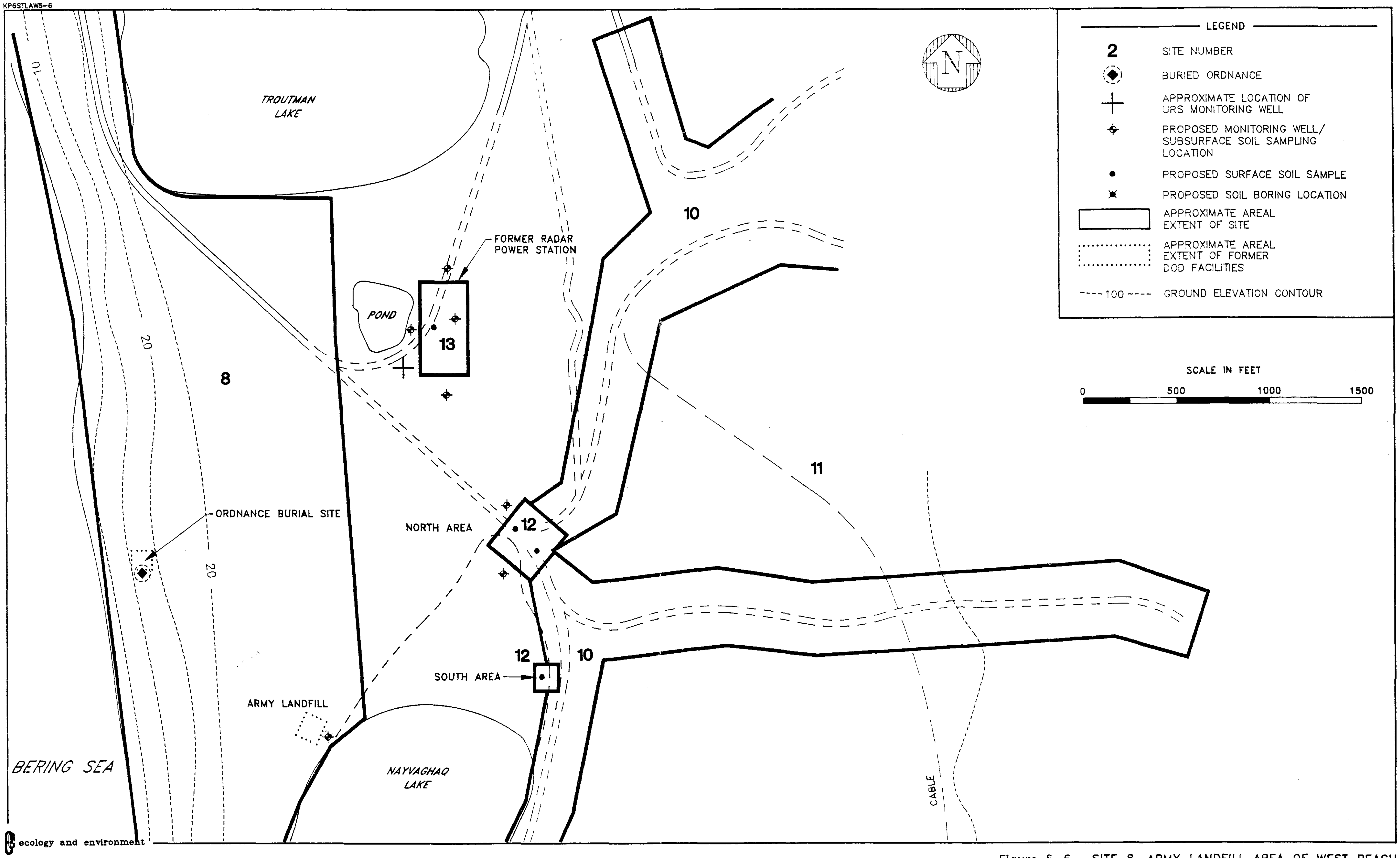

Figure 5-6 SITE 8, ARMY LANDFILL AREA OF WEST BEACH
SITE 12, NAYVAGHAQ LAKE DISPOSAL SITE
AND SITE 13, FORMER RADAR POWER STATION
PROPOSED SAMPLE LOCATION MAP

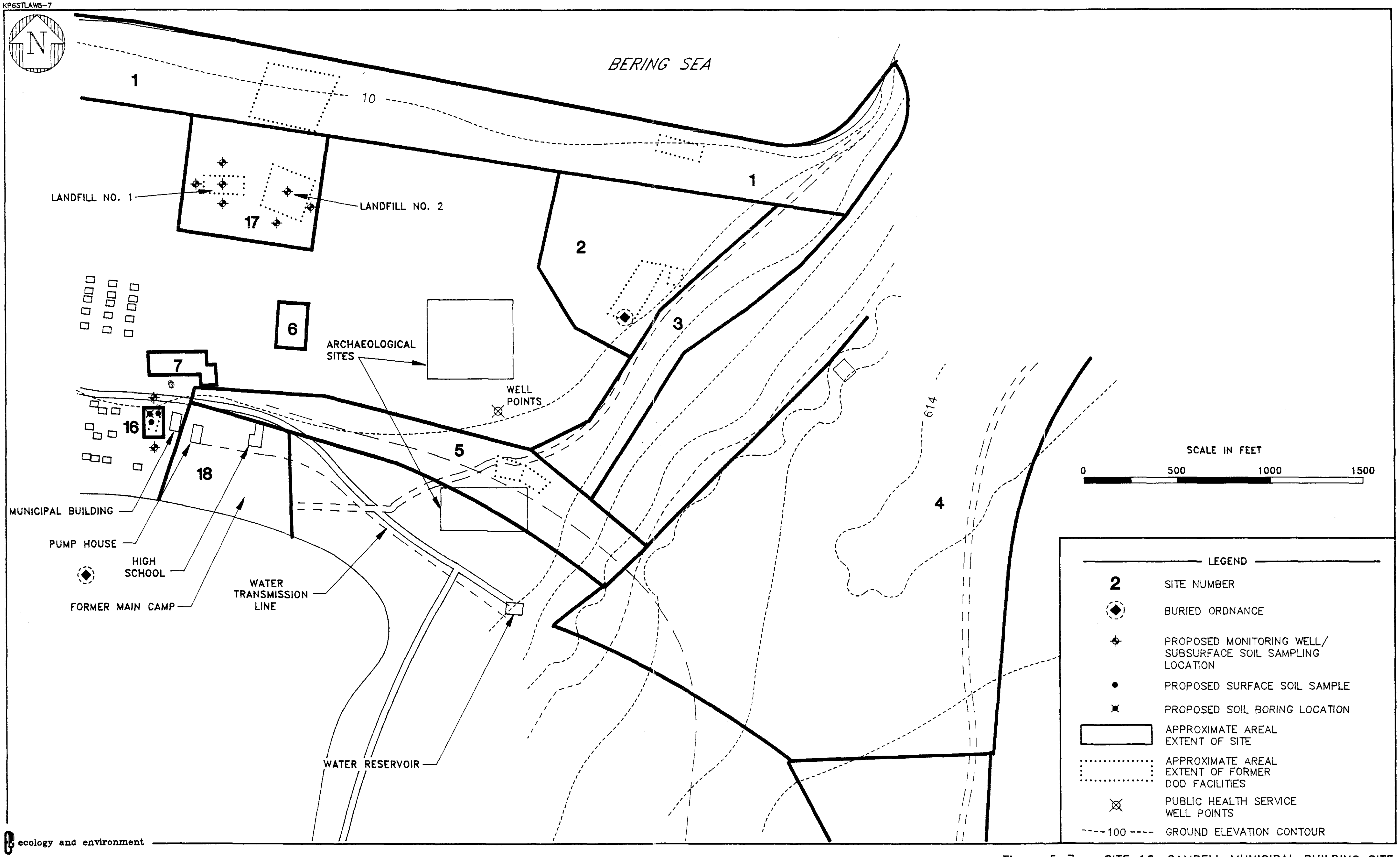

Figure 5–7 SITE 16, GAMBELL MUNICIPAL BUILDING SITE, SITE 17, ARMY LANDFILLS AND SITE 18 FORMER MAIN CAMP PROPOSED SAMPLE LOCATION MAP

6. LABORATORY ANALYTICAL PROCEDURES

6.1 LABORATORY PROCEDURES

6.1.1 Quantitative Analytical Procedures

Samples will be analyzed by laboratories that have demonstrated the ability to capably perform the required EPA- and COE-approved methodologies. Appropriate methodologies are available in the following references:

- Test Methods for Evaluating Solid Waste (EPA SW-846, November 1986);
- Methods for Chemical Analysis of Water and Wastes (EPA 600/4-79-020, March 1983);
- Standard Methods for the Examination of Water and Wastewater (APHA, AWWA, WPCF, 17th Edition, 1988); and
- Interim Method for the Determination of Asbestos in Bulk Insulation Samples (EPA, 40 CFR, part 763, 1988).
- American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA, 19103.

Table 6-2 presents a summary of the data quality assurance objectives for the methods associated with this project.

6.1.2 Sample Preparation Methods

Depending on the analytical requirements, water, soil, or sludge may be subjected to any of the following EPA SW-846 methods for sample preparation, digestion, or extraction procedures:

- Method 1311, the toxicity characteristic leaching procedure (TCLP), is employed to determine whether a waste exhibits the characteristics of

"Extraction Procedure Toxicity" (40 CFR 261.24) or may be used to simulate the leaching that a waste will undergo if disposed of in a sanitary landfill.

- Methods 3010, 3020, and 3050 outline acid digestion procedures for analyses of metals in water, soil, sediment, and waste by inductively coupled plasma (ICP) spectrophotometry and atomic absorption spectroscopy (AAS).
- Methods 3510 and 3550 outline procedures for quantitatively extracting nonvolatile compounds in water, soil, sediment, and waste samples.
- Methods 3810 and 5030 describe sample preparation and extraction of VOC and GRO by the use of headspace and purge-and-trap methods.

Sample preparation requirements used to analyze samples for parameters other than those listed above are described in SW-846 methodology.

6.1.3 Preventive Maintenance

All laboratory instruments and equipment used for sample analysis will be maintained under service agreements with the manufacturers, and will be serviced and maintained only by qualified personnel. All repairs, adjustments, and calibrations will be documented in an appropriate logbook or data sheet that will be kept on file. The instrument and field equipment maintenance logbooks will clearly document the date, the description of the problems, the corrective action taken, the result, and who performed the work.

6.1.4 Calibration Procedures and Frequency

All instruments and equipment used during analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations, as well as criteria set forth in the applicable analytical methodology references. Operation, calibration, and maintenance will be performed by personnel properly trained in these procedures. Documentation of all routine and special maintenance and calibration information will be maintained in an appropriate logbook or reference file and will be available on request.

6.2 INTERNAL QUALITY CONTROL CHECKS

QC data are necessary to determine precision and accuracy, and to demonstrate the absence of interferences and/or contamination of glassware and reagents. Laboratory-based

QC will consist of standards, replicates, spikes, and blanks. Surrogate recoveries in all organic analyses for each sample will be reported according to method requirements.

Laboratory-based QC will comprise at least 10% of each data set generated and will consist of blanks, duplicates, replicates, standards, spikes, and QC check samples. Depending on the particular method used, QC may be rigorous, but at a minimum, QC samples will be analyzed at a frequency specified in Table 6-1. Field duplicates and field blanks will be analyzed by the laboratory as samples and will not be identified to the laboratory as duplicates or blanks. Triplicate samples will be sent to the COE-appointed QA laboratory for analysis. Additional samples will be split by the laboratory and used for the laboratory duplicate, matrix spike, or matrix spike duplicate. QC records will be retained and results reported with sample data.

Laboratory Blanks

Three types of blanks, one or more of which will be utilized depending on the analysis, are described below:

- Method blanks consist of analyte-free water and are subjected to every step of the analytical procedure to determine possible contamination;
- Reagent blanks are similar to method blanks but incorporate only one of the preparation reagents in the analysis. When a method blank indicates significant contamination, one or more reagent blanks are analyzed to determine the source; and
- Calibration blanks consist of pure reagent. They are used to zero an instrument's response to establish the baseline.

Laboratory Duplicates

These samples are aliquots of a single sample that is split upon arrival at the laboratory or upon analysis. An additional volume of sample provided by the field sampling team may be required. Significant differences between laboratory duplicate samples are generally due to analytical technique, whereas significant differences in field duplicate samples may be due to a variety of reasons. Duplicate samples are used for metals analysis and most general analytical methods. Generally, organic analysis is determined using a matrix spike duplicate.

Calibration Standards

A calibration standard is prepared in the laboratory by dissolving a known amount of a pure compound in an appropriate matrix. The final concentration calculated from the known quantities is the true value of the standard. The results obtained from these standards are used to generate a standard curve and thereby quantitate the compound in the environmental sample. A minimum of three calibration standards will be used to generate a standard curve for all analyses. For organic analyses, a five-point calibration curve is usually used.

Check Standard

A check standard is prepared in the same manner as a calibration standard or may be obtained from EPA. The final concentration calculated from the known quantities is the "true" value of the standard. The important difference in a check standard is that it is <u>not</u> carried through the same process used for the environmental samples but is analyzed without digestion or extraction. A check standard result is used to validate an existing concentration calibration standard file or calibration curve. The check standard can provide information on the accuracy of the instrumental analytical method independent of various sample matrices.

Spike Sample

A spike sample is prepared by adding to an environmental sample (before extraction or digestion) a known amount of pure compound of the same type that is to be analyzed for in the environmental sample. Spikes can indicate the presence of matrix effects and interferences found in the actual samples. The spike percent recovery is taken as a measure of the accuracy of the total analytical method in the absence of matrix effects. When there is no change in volume due to the spike, it is calculated as follows:

$$\%R = \frac{100\,(O-X)}{T}$$

where: %R = percent recovery;
O = measured value of analyte;
X = measured value of analyte concentration in the sample before the spike is added; and
T = quantity of added spike.

Tolerance limits for acceptable percent recovery are established in the methodology references and presented in Table 6-2 of this document.

Internal Standard

An internal standard is prepared by adding a known amount of pure compound to the environmental extract. The compound selected is not one expected to be found in the sample, but is similar in nature to the compound of interest. Internal standards are added to the environmental sample extract or digestate just prior to analysis. (Internal standards and surrogate spikes are different compounds. The internal standard is for quantification purposes using the relative response factor; surrogate spikes indicate the percent recovery of the spike compound and, therefore, the efficiency of the methodology.)

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

To prepare matrix spikes (MS) or matrix spike duplicates (MSDs), aliquots are made in the laboratory of the same sample, and each aliquot is treated exactly the same throughout the analytical method. MS/MSD samples will be designated on chain-of-custody forms at the time of sampling to insure a minimum frequency of 5 percent. Sufficient volume of each type of sample matrix will be provided for the MS/MSD analysis (e.g., triplicate volumes for water samples). Spikes are added at approximately 10 times the method detection limit. Only project samples are to be used for MS/MSD analysis. MS/MSD samples not part of the project are not acceptable for QC purposes. The relative percent difference (RPD) between the values of the matrix spike and matrix spike duplicate, as calculated below, is taken as a measure of the precision of the analytical method.

$$\mathrm{RPD} = \frac{(D1 - D2)}{(D_1 + D_2)/2} \times 100$$

where: RPD = relative percent difference;
D_1 = First sample value; and
D_2 = second sample value (duplicate).

The tolerance limit for percent differences between laboratory duplicates should not exceed SW-846 limits for validation in homogeneous samples. Refer to Table 6-2 for criteria on percent difference. Acceptable RPDs may vary depending on actual levels.

QC Check Samples

Inorganic and organic QC check samples are available from EPA free of charge and are used as to evaluate analytical techniques employed by the analyst. Control check samples are subjected to the entire sample procedure, including extraction, digestion, etc., as appropriate for the analytical method utilized. The frequency with which control check samples are analyzed is method dependent.

6.3 PROCEDURES USED TO ASSESS DATA ACCURACY, PRECISION, AND COMPLETENESS

6.3.1 Accuracy

The accuracy of a particular analysis is measured by assessing its performance with "known" (or control) samples. These "knowns" can take the form of EPA- or NIST-traceable standards (usually spiked into a pure water matrix); laboratory-prepared solutions of target analytes in a pure water or sample matrix; or (in the case of gas chromatography [GC] or gas chromatograph/mass spectrometer [GC/MS] analysis) solutions of surrogate compounds that can be spiked into every sample and are designed to mimic the behavior of target analytes without interfering with their determination. In each case, the recovery of the analyte is measured as a percentage, correcting for analytes known to be present in the original sample if necessary (as in the case of a matrix spike analysis).

$$\text{Percent recovery } (\%R) = \frac{SSR - SR}{SA} \times 100$$

where: SSR = spike sample results;
SR = sample result; and
SA = spike added.

Note: The units for the concentrations of spikes, samples, and observed and true values vary based on the analysis. However, they are typically μg/L or mg/L for water samples and μg/kg or mg/kg for soil samples.

6.3.2 Precision

Relative to the data from a single test procedure, precision is the degree of mutual agreement among individual measurements made under prescribed conditions. An estimate of standard deviation is normally used to describe the precision of a method.

Standard Deviation Estimate

The standard deviation (S) estimate is the most widely used measure to describe the dispersion of a set of data. Normally, the mean (X) X ± S will include 68% and X ± 2S will include about 95% of the data from a study.

$$S = \frac{\sum_{i=1}^{n} (X_i - \bar{X})^2}{n-1}$$

Relative Standard Deviation

The estimate of precision of a series of replicate measurements will usually be expressed as the relative standard deviation (RSD):

$$RSD = \frac{S}{X} \times 100$$

Relative Percent Difference

Relative percent difference (RPD) is a measure of the difference between two samples assumed to be identical through dividing (splitting) an original sample. Each portion is analyzed to identify the values of the first replicate (X_1) and that of the second replicate (X_2), and the difference is divided by the mean (X) of x_1 and x_2.

$$RPD = 100 \frac{x_1 - x_2}{X}$$

6.3.3 Completeness

Completeness is for the percentage of data visible for the project. For each parameter, it is calculated as:

$$\text{Completeness} = \frac{\text{Number of successful analyses}}{\text{Number of requested analyses}} \times 100$$

The contractor's target value for completeness for all parameters is 100%. A completeness value of 95% will be considered acceptable. Incomplete results will be reported to the COE Project Officer.

6.3.4 Representativeness

Representativeness is not quantifiable. Subjective factors to be taken into account are as follows:

- The degree of homogeneity of a site;
- The degree of homogeneity of a sample taken from one point in a site; and
- The available information upon which a sampling plan is based.

To maximize representativeness of results, sampling techniques and sample locations will be carefully chosen so that they provide laboratory samples representative of the site and the specific area. Within the laboratory, precautions are taken to extract from the sample bottle an aliquot representative of the whole sample by premixing the sample.

6.3.5 Method Detection Limits

Method detection limits are determined according to procedures outlined in 40 CFR Part 136, Appendix A, for organics, or EPA Contract Laboratory Protocol (CLP) for metals. Table 6-2 presents detection limits for methods associated with this project.

6.4 CORRECTIVE ACTION

In conjunction with the QA officers, the project manager is responsible for initiating corrective action and its implementation in the field, and the laboratory manager is responsible for its implementation in the COE laboratory. It is their combined responsibility to see that all analytical and sampling procedures are followed as specified and that the data generated meet the prescribed acceptance criteria.

6.4.1 Laboratory Situations

The need for corrective action as a result of laboratory audits as described in Section 6.5 will be initiated by the laboratory QA coordinator or laboratory manager in consultation with the QA project officer. Corrective actions may include, but are not limited to:

- Reanalyzing samples if holding times permit;
- Correcting laboratory procedures;

- Recalibrating instruments using new prepared standards;
- Replacing solvents or other reagents that give unacceptable blank values;
- Providing additional training of laboratory personnel regarding correct sample preparation and analysis procedures; and
- Accepting data with an acknowledged level of uncertainty.

Whenever corrective action is deemed necessary, the laboratory manager will insure that the following steps are taken:

- The problem is defined;
- The problem is investigated and its cause is determined;
- An appropriate corrective action is determined; and
- A corrective action is implemented and its effectiveness verified.

Immediate Corrective Action

Immediate corrective action by field or laboratory personnel will be required for the following:

- Equipment or instrument malfunction;
- Standards analysis outside of QC control limits;
- Initial or continuing calibrations that indicate non-linearity of the calibration curve.

Long Term Corrective Action

Long-term corrective action refers to any quality problem that is not identified immediately, but rather after examination of field and/or laboratory QC samples, laboratory control charts, field and/or laboratory audits, and/or validation.

COE-Directed Corrective Action

Corrective actions recommended by COE will be addressed in a timely manner.

6.4.2 Documentation

The contract laboratory should maintain a documentation system to ensure that all data are compared against established QC criteria. Specific procedures for the laboratory should be documented in appropriate standard operating procedures. In general, all QC data are reviewed by the analyst and approved by the supervisor, who determines whether re-analysis is necessary and what corrective actions should be taken. All QA/QC concerns and resolutions should be documented by the contract laboratory.

6.5 DATA REDUCTION, VALIDATION, AND REPORTING

QA/QC requirements from both methodology and company protocols will be strictly adhered to during sampling and analytical work. All data generated will be reviewed by comparing and interpreting results from chromatograms (responses and stability of retention times), accuracy (percent recovery of spiked samples), and precision (reproducibility of results). All calculations and data manipulations are included in the appropriate methodology references. Control charts and calibration curves will be used to review the data and identify outlying results.

6.5.1 Data Reduction

Data reduction includes all processes that change the numerical value of the raw data. For analyses performed with linear regression, data reduction involves comparison of sample raw data to a standard curve. Sample or sample extracts are diluted, if necessary, to remain within the linear range of the curve.

To check the linearity of the calibration curve, the linear regression coefficient (r) will be calculated as given below:

$$r = \frac{N\Sigma x_i y_{i-} \Sigma x_1 y_i}{[NSx_i^2 - (\Sigma x_i)^2]^{1/2}[N\Sigma_i^2 - (\Sigma y_i)^2]^{1/2}}$$

where: x_i = sample concentration
y_i = sample response measurement

Results will be calculated using the formula: $y = mx + b$, where y is the sample response measurement (peak area or height), x is the sample concentration, m is the slope of the line, and b is the y-intercept.

For analyses performed using internal standards, results will be calculated by the formula below, which compares the peak area of a known concentration of an internal standard to the peak area of one particular analyte. The relative response factor (RRF) of the analyte will be determined by analysis of a known amount of the analyte.

$$\text{Concentration}_{\text{x}} = \frac{\text{Area}_{\text{X}} \text{ x Concentrations}}{\text{Area}_{\text{is}} \text{ x RRF}}$$

Dilution of the extract and percent moisture in soils and sediments must also be taken into account by applying appropriate correction factors to this calculation.

For analyses performed using external standards, results will be calculated using the calibration factor of the mid-level calibration standard, providing all the acceptance criteria are met. The calibration factor is calculated by dividing the nanograms of standard by the area of peak in the standard. The concentration in the sample is calculated as shown below:

$$\text{Concentration}_{\text{x}} = \frac{\text{Area}_{\text{X}} \text{ X CF X } V_{\text{F}}}{\text{sample weight or volume}}$$

Dilution of the extract and percent moisture in soils and sediments must also be taken into account by applying appropriate correction factors to this calculation. Applicable methods allow the use of a mid-level calibration standard if the initial 5-point curve is linear. If the daily calibration factor is not within 15% difference as specified in the method, a new 5-point calibration curve is determined.

Results from all types of analyses will be calculated and reported using the correct number of significant figures. The digits that are considered significant are those that are known with certainty, plus one digit whose value is in doubt. Results will be expressed so that they contain the same number of significant figures as that of the least accurately known value.

GC/MS and GC calculations are performed by the instrument's computer data system with the general exception of PCB calculations. Corrections for dry weight and extract dilution are usually performed manually. Metals calculations are performed by the instrument's computer data systems for all water samples. For soil samples, final concentrations in μg/L are manually converted to mg/kg using the sample weight and final digestion volume. For general analytical methods, calculations are performed manually with the exception of ion chromatography analysis.

6.5.2 Data Validation

All data generated will be reviewed by comparing calibration, accuracy, and precision to the QC criteria listed in the method (EPA SW-846), COE document ER1110-1-263, "Chemical Data Quality Management for Hazardous Waste Remedial Activities" and Section 6.3 of this document. Generally, the internal validation procedure for the laboratory is composed of the following steps. Each step is performed by the individual analyst, checked by the supervisor, and then checked by the laboratory project manager.

- Verify correct samples were analyzed and reported in appropriate units;
- Verify preservation holding times as specified in Table 5-3;
- Verify calibration curve is valid and checked daily;
- Verify that any analytes present in the method blanks are due to common laboratory contaminants and ensure that one blank is run every 20 samples;
- Verify that a reference sample is run every 20 samples and that percent recovery is within 20% of the known amount or as stated in the method; and
- Verify that a replicate and matrix spike, or matrix spike and spike duplicate, are run every 20 samples, and that QC criteria are in control.

All calculations and data manipulations are included in the appropriate method or internal standard operating procedures. Method-specific QA data are plotted on control charts or tabulated by the analyst. In addition, all analytical reports generated for this project will be validated by COE as an independent, third party data validator.

6.5.3 Data Reporting

The information to be included in the analytical reports consists of the following:

- A table that matches contract laboratory sample identification numbers to QA laboratory sample identification numbers will be provided. The table will identify all field QC samples and will match these QC samples with the corresponding field samples.

- A package receipt log will be provided with each data package. The package receipt log will include information regarding problems with sample packaging, chain-of-custody, and sample preservation for all shipments corresponding to the data package.

- For each analytical method run (organic and inorganic), the laboratory will report all analytes for each sample as a detected concentration or as less than the specific limits of quantitation. All samples with out-of-control spike recoveries that are attributed to matrix interferences will be reported as such. Documentation of verification of calibration curves or daily calibration checks will be provided by both the project and QA laboratories. All soil/sediment and solid waste samples shall be reported on a dry-weight basis with percent moisture also reported. In addition, dilution factors, and date of extraction (if applicable), and the date of analysis will also be provided for each sample.

- Internal QC samples will be reported as follows:

  - All analytes will be reported for each laboratory blank (method blanks and instrument blanks). All non-blank sample results will be designated as corresponding to a particular laboratory blank.

  - Surrogate spike recoveries will be reported for organic analyses when required by the method. In addition, control limits for surrogate spike results and spike concentrations will be provided. In the case of an out-of-control recovery, the sample will be re-run (and both sets of data reported) or the data will be flagged.

  - MS recoveries will be reported for all organic and inorganic analyses. All general sample results will be designated as corresponding to a particular MS sample. The report will indicate which field sample was spiked and will specify control limits for MS results for each method, for each matrix.

  - RPDs and analyte-/MS control limits will be reported for all duplicate pairs.

  - Laboratory Control Standard (LCS) results and control limits for less will be provided for the corresponding field data.

- Field QC samples will be identified and reported in the same manner as field samples. RPDs will be reported for all field duplicate pairs.

Raw data will be available for later inspection, if required, and maintained in a central job file. All records are maintained for a period of two years after the final report is issued.

Types of records to be maintained for the project include the following:

- Chain-of-custody records including: information regarding the sampler's name, date of sampling, type of sampling, location of sampling station, number and type of containers used, signature of the contractor's personnel relinquishing samples to a non-contractor personnel (e.g., Federal Express agent) with the date and time of transfer noted, signature of the contractor sample custodian receiving samples with date and time noted;

- Any discrepancy/deficiency report forms due to problems encountered during sampling, transportation, or analysis;

- Sample destruction authorization forms, containing information on the manner of final disposal of samples upon completion of analysis and an additional 60-day holding time for possible reanalysis at client request;

- Computer records on disk with magnetic tape backup of cost information, scheduling, laboratory chain-of-custody transfers, and laboratory management records;

- All laboratory notebooks including raw data readings, calibration details, QC results, etc.;

- Hard copies of data system printouts (chromatograms, mass spectra, ICP data files, etc.); and

- Tabulation of analytical results with supporting quality control information.

Table 6-1

SAMPLE ANALYTICAL PARAMETERS, METHODS, AND QA/QC REQUIREMENTS GAMBELL, ST. LAWRENCE ISLAND, ALASKA

Matrix	Analysis	Method	Description	Sample Type	QA/QC	MS/MSD
Surface Soil	BNA	EP1 8270	GC/MS	Grab	1/10	1/20
	GRO	ADEC 101.0 (M.8015)	GC/FID	Grab	1/10	1/20
	DRO	ADEC 102 (M.8100)	GC/FID	Grab	1/10	1/20
	PCB	EP1 8080	GC/ECD	Grab	1/10	1/20
	Dioxon	EP1 8290	GC/MS	Grab	1/10	1/20
	TRPH	EP1 9073	IR	Grab	1/10	1/20
	Metals	EP1 1311 (TCLP) and 6000/-7000 series	ICP/GFAA	Grab	1/10	1/20
Subsurface Soil	VOC	EP1 8260	Purge and Trap/GC/MS	Grab	1/10	1/20
	GRO	ADEC 101.0 (M.8015)	GC/FID	Grab	1/10	1/20
	DRO	ADEC 102 (M.8100)	GC/FID	Grab	1/10	1/20
	PCB	EP1 8080	GC/ECD	Grab	1/10	1/20
	Explosives	EP1 8330	HPLC	Grab	1/10	1/20
	TRPH	EP1 9073	IR	Grab	1/10	1/20
	Sulfate	EP2 375.4	Turbidimetric	Grab	1/10	1/20
	Metals	EP1 1311 and 6000/7000	ICP/GFAA	Grab	1/10	1/20
	pH	EP1 9045	Potentiometric	Grab	1/10	1/20
	Grainsize[a]	ASTM C117/136	Sieve Analysis	NA	NA	NA
	Moisture Content[a]	ASTM-D2216		NA	NA	NA
	Ash Content[a]	ASTM-D2974-87		NA	NA	NA
	Total Sulfur[a]	ASTM-D1152		NA	NA	NA
	TOC[a]	EP1 9060	Carbonaceous analyzer	Grab	1/10	1/20
	BTU[a]	ASTM-D240	Bomb calorimeter	NA	NA	NA
	Ignitability[a]	EP1 1010	Pensky-Martens Closedcup	NA	NA	NA
	TOX[a]	EP1 9020	Pyrolysis/microcoulometer	Grab	1/10	1/20
	BTEX[a]	EP1 8020	Purge and Trap/GS/MS	Grab	1/10	1/20
	Atterburg Limits[a]	ASTM-D4318	Physical property	NA	NA	NA
Sediment	PCB	EP1 8080	GC/ECD	GRAB	1/10	1/20
Groundwater	VOC	EP1 524.2	Purge and Trap/GC/MS	Grab	1/10	1/20
	GRO	ADEC 101.0 (m.8015)	GC/FID	Grab	1/10	1/20
	DRO	ADEC 102 (M.8100)	GC/FID	Grab	1/10	1/20
	PCB	EP1 8080	GC/ECD	Grab	1/10	1/20
	Explosives	EP1 8330	HPLC	Grab	1/10	1/20

Table 6-1

SAMPLE ANALYTICAL PARAMETERS, METHODS, AND QA/QC REQUIREMENTS
GAMBELL, ST. LAWRENCE ISLAND, ALASKA

Matrix	Analysis	Method	Description	Sample Type	QA/QC	MS/MSD
Groundwater (Cont.)	TRPH	EP1 9073	IR	Grab	1/10	1/20
	pH	EP2 150.1	Electrometric	Grab	1/10	1/20
	Metals[b]	EP1 6000/7000 series	ICP GFAA	Grab	1/10	1/20
	Nitrate	EP2 352.1	Colorimetric	Grab	1/10	NA
	Ammonia	EP2 350.3	Potentiometric	Grab	1/10	NA
	Sulfate	EP2 375.4	Turbidimetric	Grab	1/10	NA
	TOS	EP2 160.1	Gravimetric	Grab	1/10	NA
	TSS	EP2 160.2	Gravimetric	Grab	1/10	NA
	Coliform bacteria	EP1 9132	Membrane Filter	Grab	1/10	NA
	Fecal bacteria	SM 908	Membrane Filter	Grab	1/10	NA
	BOD	EP2 405.1	Bioassay	Grab	1/10	NA
	COD	EP2 410.2	Chemical Oxidation	Grab	1/10	NA
	Alkalinity[a]	EP2 310.1		NA	NA	NA
	Hardness[a]	EP2 130.1		NA	NA	NA
	Hydrocarbon Scan[c]	COE M.8015	GC/FID	NA	NA	NA
	Total lead[c]	EP1 6010	ICP	NA	NA	NA
	BTEX[c]	EP1 8020	Purge and Trap GC/MS	NA	NA	NA
	Flashpoint[c]	EP1 1010	Pensky-Martens Closedcup	NA	NA	NA
	BTU[c]	ASTM-D240	Bomb colorimeter	NA	NA	NA
Misc. Fibrous Material	Asbestos	EPA - Interim 40 CFR Part 763	Polarized light microscopy	Grab	NA	NA

ADEC = Alaska Department of Environmental Conservation modification of EPA SW-846 Methods 8015 (AK 101.0) and 8100 (AK 102), Draft, July 1, 1992 revision.
ASTM = American Society for Testing and Materials, Philadelphia, PA.
Bact. = Bacteria
BOD = Biochemical Oxygen Demand
BNA = Base/neutral/acid extractables
BTEX = Benzene, toelune, ethylbenzene, and total xylenes
BTU = British thermal unit
COD = Chemical Oxygen Demand
COE = Corps of Engineers modified method 8015
DRO = Diesel range organics
ECD = Electron capture detector

EP1 = EPA "Test Methods for Evaluating Solid Wastes", SW-846, November 1986.
EP2 = EPA "Methods for Chemical Analysis of Water and Wastes", (MCAWW), March 1983
FID = Flame Ionization detector
GC = Gas chromatography
GFAA = Graphite furnace atomic absorption
GRO = Gasoline range organics
HPLC = High-performance liquid chromatography
ICP = Inductively coupled plasma spectrometry
IR = Infrared analysis
MS = Mass spectrometer
MS/MSD = Matrix spike/matrix spike duplicate
PCB = Polychlorinated biphenyls
SM = American Public Health Association "Standard Methods for the Evaluatin of Water and Wastewater," 16th ed., 1985.
TCLP = Toxicity characteristic leaching procedure
TDS = Total dissolved solids
TOC = Total organic carbon
TOX = Total organic halides
TSS = Total suspended solids
VOC = Volatile organic compounds

a = Remediation parmeters
b = Includes the following remedial parameters: magnesium, calcium, total iron, and dissolved iron
c = These analyses will be performed on groundwater samples contingent on encountering free product above the water table

Table 6-2

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA
GAMBELL SITE, ST. LAWRENCE ISLAND, ALASKA

Contamination Assessment Parameter	Method	Practical Quantitation Limit	Precision (%)	Accuracy (%)	Completeness
Gasoline Range Organics (GRO)	AK 101.0 (M.8015[a])	Soil - 4 mg/kg Water - 0.1 mg/L	f	f	95
Diesel Range Organics (DRO)	AK102 (M.8100[a])	Soil - 4 mg/kg Water - 0.1 mg/L	f	f	95
VOC	8260[b]	Soil[e] Water[e]	f	f	95
BNA	8270[b]	Soil[e] Water[e]	f	f	95
PCB	8080[b]	Soil[e] Water[e]	f	f	95
Dioxin	8290[a]	Soil[e] Water[e]	f	f	95
Explosives	8330[b]	Soil[e] Water[e]	± 35	75 - 125	95
TRPH	9073	Soil - 10 mg/kg Water - 1 mg/L	± 35	60 - 120	95
Arsenic	7060[b]	Soil - 0.1 mg/kg Water - 5 µg/L	± 35 ± 20	75 - 125	95
Barium	6010[b]	Soil - 1.0 mg/kg Water - 10 µg/L	± 35 ± 20	75 - 125	95
Cadmium	7140[b]	Soil - 1.0 mg/kg Water - 10 µg/L	± 35 ± 20	75 - 125	95
Chromium	6010[b]	Soil - 1.0 mg/kg Water - 10 µg/L	± 35 ± 20	75 - 125	95
Lead	6010	Soil - 0.5 mg/kg Water - 5.0 µg/L	± 35 ± 20	75 - 125	95

Table 6-2

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA
GAMBELL SITE, ST. LAWRENCE ISLAND, ALASKA

Contamination Assessment Parameter	Method	Practical Quantitation Limit	Precision (%)	Accuracy (%)	Completeness
	7421	Soil - 0.1 mg/kg Water - 1 μg/L	± 35 ± 20	75 - 125	95
Mercury	7740^{b}	Soil - 0.1 mg/kg Water - 0.2 μg/L	± 35 ± 20	75 - 125	95
Selenium	7740^{b}	Soil - 0.5 mg/kg Water - 5 μg/L	± 35 ± 20	75 - 125	95
Silver	6010^{b}	Soil - 1.0 mg/kg Water - 10 μg/L	± 35 ± 20	75 - 125	95
Nitrate-Nitrogen	352.1^{c}	Water - 0.1 mg/L	± 20	75 - 125	95
Ammonia-Nitrogen	350.3^{c}	Water - 0.03 mg/L	± 20	75 - 125	95
Sulfate	375.4^{c}	Water - 1 mg/L	± 20	75 - 125	95
Coliform Bacteria	9132^{b}	Water - 1 colony/100 mls	± 20	75 - 125	95
Fecal Coliform Bacteria	908^{d}	Water - 1 colony/100 mls	± 20	75 - 125	95
Total Dissolved Solids	160.1^{c}	Water - 10 mg/L	± 20	75 - 125	95
Total Suspended Solids	160.2^{c}	Water - 4 mg/L	± 20	75 - 125	95
Biochemical Oxygen Demand	405.1^{c}	Water - 10 mg/L	± 50	50 - 150	95
Chemical Oxygen Demand	410.2^{c}	Water - 5 mg/L	± 20	75 - 125	95
Remediation Parameters					
Ash Content	ASTM-D2974-87	Soil - NA	NA	NA	95
Total Sulfur	ASTM-D1552	Soil - NA	NA	NA	95
Total organic carbon	9060^{b}	Soil - e	f	f	95
BTU	ASTM-D240	Soil - NA	NA	NA	95

Table 6-2

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA GAMBELL SITE, ST. LAWRENCE ISLAND, ALASKA

Contamination Assessment Parameter	Method	Practical Quantitation Limit	Precision (%)	Accuracy (%)	Completeness
Ignitability	1010[b]	Soil - e	f	f	95
Total organic halides	9020[b]	Soil - e	f	f	95
BTEX	8020[b]	Soil - NA	f	f	95
Moisture content	ASTM-D2216	Soil - NA	NA	NA	95
Grainsize	ASTM C 117/136	Soil - NA	NA	NA	95
Atterburg Limits	ASTM-D4318	Soil - NA	NA	NA	95
Magnesium	6010[b]	Water - 5 mg/L	± 20	75 - 125	95
Calcium	6010[b]	Water - 5 mg/L	± 20	75 - 125	95
Total Iron	6010[b]	Water - 0.1 mg/L	± 20	75 - 125	95
Dissolved Iron	6010[b]	Water - 0.1 mg/L	± 20	75 - 125	95
Alkalinity	310.1[c]	Water - NA	NA	NA	95
Hardness	130.1[c]	Water - 10 mg/L	NA	NA	95
Other Parameters					
Hydrocarbon scan	COE M.8015	Water/free product - 50 μg/L	f	f	95
BTEX	8020[b]	Water/free product - 10 μg/L	f	f	95
Flashpoint	1010[b]	Water/free product - NA	NA	NA	95
BTU	ASTM D240	Free product - NA	NA	NA	95

a = Alaska Department of Environmental Conservation (ADEC) modification of EPA-SW846 Methods 8015 (AK101.0) and 8100 (AK 102), Draft, July 1, 1992 revision.
b = EPA "Test Methods for Evaluating Solid Wastes," SW-846, November 1986, includes 1990 updates.
c = EPA "Methods for Chemical Analysis of Water and Wastes," MCAWW, March 1983.
d = American Public Health Association "Standard Methods for the Examination of Water and Wastewater," 1985, 16th ed.

e = Metod detection limits are specified by the corresponding SW-846 method, minimum detection limits are analyte and sample matrix specific.

f = SW-846 methods specify that accuracy and precision are determined by the sample matrix, sample introduction technique and calibration procedures used. The laboratory should establish the control limits as directed in the Quality Control section of the method used.

g = ADCOE modification of EPA-SW846 Method 8015 "proposed modified Method 8015".

ASTM = American Society for Testing and Materials, Philadelphia, PA

BNA = Base/neutral/acid extractables

DRO = Diesel Range Organics

GRO = Gasoline Range Organics

NA = Not available

PCB = Polychlorinated biphenyls

TRPH = Total recoverable petroleum hydrocarbons

VOC = Volatile organic compounds

7. CHEMICAL DATA QUALITY MANAGEMENT DELIVERABLES

7.1 DAILY FIELD QUALITY CONTROL REPORTS

The contractor's field personnel will record the events of each day's field activities on daily logs and data forms. At the end of the fieldwork portion of a project (or at least once every 30 days), copies of the daily logs and data forms will be submitted to COE as daily field QC reports.

7.2 BORING AND WELL CONSTRUCTION LOGS

The boring logs and well diagrams, prepared legibly in the field, will be submitted to COE in the draft and final reports.

7.3 DEPARTURES FROM APPROVED PLANS

Any significant problems or nonroutine occurrences identified during the investigation will be reported to COE within 48 hours of the occurrence. These reports will include any corrective actions taken and verbal or written instructions from COE for resampling or reanalysis. A discussion of additional corrective action procedures is provided in Section 5.5.3.

7.4 FINAL INVESTIGATION REPORT

A draft and final investigation report will be produced after the receipt of the analytical results and the chemical data validation reports. The report will include a site description and history, a description of the field investigation program, a presentation of the geophysical and analytical results, and a discussion of the significance of the results.

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APPENDIX A

ANALYTES

VOLATILE ORGANIC COMPOUNDS - METHOD 8260

1. Dichlorodifluormethane
2. Chloromethane
3. Vinyl Chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. 1,1-Dichloroethene
8. Methylene Chloride
9. trans-1,2-Dichloroethene
10. 1,1-Dichloroethane
11. 2,2-Dichloropropane
12. cis-1,2-Dichloroethene
13. Chloroform
14. Bromochloromethane
15. 1,1,1-Trichloroethane
16, Carbon Tetrachloride
17. 1,1-Dichloropropene
18. Benzene
19. 1,2-Dichloroethane
20. Trichloroethene
21. 1,2-Dichloropropane
22. Bromodichloromethane
23. Dibromomethane
24. Toluene
25. 1,1,2-Trichloroethane
26. Tetrachloroethene
27. 1,3-Dichloropropane
28. Dibromochloromethane
29. 1,2-Dibromomethane
30. 1-Chlorobenzene
31. Chlorobenzene
32. 1,1,1,2-Tetrachloroethane
33. Ethylbenzene
34. p-Xylene
35. m-Xylene
36. o-Xylene
37. Styrene
38. Bromoform
39. Isopropylbenzene
40. 1,1,2,2-Tetrachloroethane
41. Bromobenzene
42. 1,2,3-Trichloropropane
43. n-Propylbenzene
44. 2-Chlorotoluene
45. 1,3,5-Trimethylbenzene
46. 4-Chlorotoluene
47. tert-Butylbenzene
48. 1,2,4-Trimethylbenzene
49. sec-Butylbenzene
50. p-Isopropyltoluene
51. 1,3-Dichlorobenzene
52. 1,4-Dichlorobenzene
53. n-Butylbenzene
54. 1,2-Dichlorobenzene
55. 1,2-Dibromo-3-chloropropane
56. 1,2,4-Trichlorobenzene
57. Hexachlorobutadiene
58. Naphthalene
59. 1,2,3-Trichlorobenzene

BASE/NEUTRAL/ACID EXTRACTABLES - METHOD 8270
(SEMI-VOLATILES)

1. Phenol
2. bis(2-Chloroethyl)Ether
3. 2-Chlorophenol
4. 1,3-Dichlorobenzene
5. 1,4-Dichlorobenzene
6. Benzyl Alcohol
7. 1,2-Dichlorobenzene
8. 2-Methylphenol
9. bis(2-chloroisopropyl)Ether
10. 4-Methylphenol
11. N-Nitroso-Di-n-Propylamine
12. Hexachloroethane
13. Nitrobenzene
14. Isophorone
15. 2-Nitrophenol
16. 2,4-Dimethylphenol
17. Benzoic Acid
18. bis(2-Chloroethoxy)Methane
19. 2,4-Dichlorophenol
20. 1,2,4-Trichlorobenzene
21. Naphthalene
22. 4-Chloroaniline
23. Hexachlorobutadiene
24. 4-Chloro-3-Methylphenol
25. 2-Methylnaphthalene
26. Hexachlorocyclopentadiene
27. 2,4,6-Trichlorophenol
28. 2,4,5-Trichlorophenol
29. 2-Chloronaphthalene
30. 2-Nitroaniline
31. Dimethyl Phthalate
32. Acenaphthalene
33. 3-Nitroaniline
34. Acenaphthene
35. 2,4-Dinitrophenol
36. 4-Nitrophenol
37. Dibenzofuran
38. 2,4-Dinitrotoluene
39. 2,6-Dinitrotoluene
40. Diethylphthalate
41. Chlorophenyl-phenylether
42. Fluorene
43. 4-Nitroaniline
44. 4,6-Dinitro-2-Methylphenol
45. Nitrosodiphenylamine
46. 4-Bromophenyl-phenylether
47. Hexachlorobenzene
48. Pentachlorophenol
49. Phenanthrene
50. Anthracene
51. Di-n-Butylphthalate
52. Fluoranthene
53. Pyrene
54. Butylbenzylphthalate
55. 3,3'-Dichlorobenzidine
56. Benzo(a)Anthracene
57. bis(2-Ethylhexyl)Phthalate
58. Chrysene
59. Di-n-Octyl Phthalate
60. Benzo(b)Fluoranthene
61. Benzo(k)Fluoranthene
62. Benzo(a)Pyrene
63. Indeno(1,2,3-cd)Pyrene
64. Dibenzo(a,h)Anthracene
65. Benzo(g,h,i)Perylene

DIOXIN - METHOD 8290

1. 2,3,7,8 - TCDF
2. Total TCDF
3. 2,3,7,8 - TCDD
4. Total TCDD
5. 1,2,3,7,8 - PeCDF
6. 2,3,4,7,8 - PeCDF
7. Total PeCDF
8. 1,2,3,7,8 - PeCDD
9. Total PeCDD
10. 1,2,3,4,7,8 - HxCDF
11. 1,2,3,6,7,8 - HxCDF
12. 1,2,3,7,8,9
13. 2,3,4,6,7,8 - HxCDF
14. Total HxCDF
15. 1,2,3,4,7,8 - HxCDD
16. 1,2,3,6,7,8 - HxCDD
17. 1,2,3,7,8,9 - HxCDD
18. Total HxCDD
19. 1,2,3,4,6,7,8 - HpCDF
20. 1,2,3,4,7,8,9 - HpCDF
21. Total HpCDF
22. 1,2,3,4,6,7,8 - HpCDD
23. Total HpCDD
24. OCDF
25. OCDD

EXPLOSIVES - METHOD 8330

1. Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
2. Hexahydro-1,3,5-trinitro-1,3,5-triazine
3. 1,3,5-Trinitrobenzene
4. 1,3-Oinitrobenzene
5. Methyl-2,4,6-trinitrophenlynitramine
6. Nitrobenzene
7. 2,4,6-Trinitrotoluene
8. 4-Amino-2,6-dinitrotoluene
9. 2-Amino-4,6-dinitrotoluene
10. 2,8-Dinitrotoluene
11. 2,4-Dinitrotoluene
12. 2-Nitrotoluene
13. 4-Nitrotoluene
14. 3-Nitrotoluene

METALS - METHOD 6000/7000 SERIES

1. Arsenic
2. Barium
3. Cadmium
4. Chromium
5. Lead
6. Mercury
7. Selenium
8. Silver
9. Magnesium
10. Calcium
11. Total iron
12. Dissolved iron

GASOLINE RANGE ORGANIC COMPOUNDS - MODIFIED 8015 (AK 101.0-Draft)

DIESEL RANGE ORGANIC COMPOUNDS - MODIFIED 8100 (AK 102-Draft)

POLYCHLORINATED BIPHENYLS (PCBs) - METHOD 8080

1. Aroclor - 1016
2. Aroclor - 1221
3. Aroclor - 1232
4. Aroclor - 1242
5. Aroclor - 1248
6. Aroclor - 1254
7. Aroclor - 1260

SPECIALIZED ANALYSIS AND METHOD NUMBER

1. Ammonia-Nitrogen - EPA Method 350.3
2. Coliform bacteria - EPA Method 9132
3. Fecal bacteria - SM Method 908
4. Moisture Content - ASTM Method D2216
5. Nitrate-Nitrogen - EPA Method 352.1
6. Grain size (Sieve analysis)- ASTM Method C117, C136
7. Sulfate - EPA 375.4
8. Biochemical Oxygen Demand - EPA Method 405.11
9. Chemical Oxygen Demand - EPA Method 410.1
10. Hydrocarbon Scan - COE Method 8015
11. Flashpoint - EPA Method 1010
12. BTU - ASTM D240
13. Ash - ASTM-D2974-87
14. Total sulfur - ASTM-D1552
15. Total organic carbon - EPA Method 9060
16. Atterburg limits - ASTM-D4318
17. Total organic halides - EPA Method 9020
18. Alkalinity - EPA Method 310.1
19. Hardness - EPA Method 130.1

VOLATILE ORGANIC COMPOUNDS (BTEX - 8020)

1. Benzene
2. Chlorobenzene
3. 1,2-Dichlorobenzene
4. 1,3-Dichlorobenzene
5. 1,4-Dichlorobenzene
6. Ethylbenzene
7. Toluene
8. Total xylenes

APPENDIX B

SUBSURFACE EXPLORATION EQUIPMENT AND PROCEDURES

DRILLING EQUIPMENT AND MATERIALS

DRILLING RIG

Drilling and well installation will be accomplished using a Mobile B-50 or B-60 series drilling rig equipped with hollow-stem augers. The rig must be capable of drilling to a depth of 30 feet. The selection of this type of rig for the project is based on current USACE capability and rig availability.

DRILLING TECHNIQUES AND MATERIALS

Drilling will be conducted using 3 3/8-inch to 6-inch inside diameter (ID) hollow-stem augers as appropriate for well installation and soil sampling. The smaller diameter hollow-stem auger will probably speed up the drilling process while minimizing drilling-derived waste. Conventional hollow-stem auger drilling and sampling techniques will be utilized in the investigation.

The use of drilling fluids is not permitted. Potable water is the only approved additive, and only in amounts determined by the drilling foreman to be necessary for hole stabilization. Grease- or oil-based lubricants used to prevent binding on the drill rod or auger joints are not permitted. Solidified, edible vegetable oil may be used in place of petroleum-based products. Sorbent pads must be available. Drill rigs must be off site for refueling. All drilling activities and methods must be sufficient to positively prohibit the introduction of contaminants from one water-bearing stratum to another via the well bore. Borings are not expected to exceed 10 feet below the water table.

Drilling water must be fresh and free of contaminants. The drilling water will be obtained from a source of known quality. A sample of drilling water will be collected and analyzed for the same parameters as the groundwater to verify that the water was free contaminant free.

DRILLING PROCEDURES

INITIAL ACTIVITIES

Prior to mobilization of the drilling rig on site, the rig and all associated equipment will be thoroughly cleaned to remove oil, grease, tar, mud, and other potential contaminants. This cleaning process will consist of steam cleaning followed by the appropriate decontamination procedures outlined.

The site safety officer will conduct a brief site safety and project orientation meeting upon arrival at the site. This meeting is a requirement for all site personnel, and each person will be required to sign the project briefing form prior to the initiation of site activities.

An area will be designated as a decontamination area. A decontamination fluid collection system will be constructed, as necessary, for decontamination of all reusable drilling, sampling, and personnel equipment. The drillers will be responsible for providing a means to collect contaminated solvent, wash water, designated drilling spoils, and related materials. This collection system may involve the use of a decontamination trailer, wash tubs, plastic sheeting, tanks, storage racks, or other suitable materials.

The source of drilling and decontamination water will be potable water. A sample of this water will be collected and analyzed for the same parameters as the soil and groundwater samples.

DRILLING OPERATIONS

Storage of Equipment and Materials

Well casing, screens, and sampling devices shall be stored in a manner that prevents direct contact with surface soils, potentially contaminated working surfaces and equipment, and precipitation. It is imperative that well casing and screens remain clean and straight prior to well installation. Sampling devices that have been decontaminated must be wrapped in plastic sheeting or aluminum foil for storage unless required for immediate use.

Stratigraphic Logging

In order to characterize subsurface soil types, a complete log of all conditions encountered during drilling will be maintained. This includes regolithic/hydrogeologic descriptions and notations on drilling speed, drill bit behavior, and cuttings return rates as different materials are encountered. Major components of the log to be completed consist of the following:

- Date and time of drilling;
- Reference point for all depth measurements;
- Depth of each change of stratum;
- Thickness of each stratum;

- Identification of soil type according to the Unified Soil Classification System (ASTM-2487) or standard rock nomenclature, as necessary;
- Depth interval at which each sampling was performed;
- Location of weathered zones;
- Nominal hole diameters and depth at which hole diameter changes;
- Total depth of hole; and
- Depth at which groundwater is first encountered.

Borehole Abandonment

All boreholes not completed as monitoring wells shall be abandoned in a manner that prevents hydraulic communication between water-bearing zones within the borehole. A bentonite or bentonite-grout seal will be placed from the bottom of the borehole to at least 5 feet above the water table or permafrost immediately after the decision to abandon the hole is made. Dry bentonite will be placed in lifts of 2 feet, tamped to destroy bridges, and hydrated if there is insufficient water for hydration in the borehole. The remainder of the borehole will be backfilled with bentonite and sand. Bentonite and sand will be placed in the borehole such that sand is opposite the subsurface sand and gravel layers, and bentonite is opposite silt or clay layers. Bentonite pellets, chips, or bentonite grout may be substituted if necessary.

WELL INSTALLATION

INSTALLATION RECORDS

The well installation program outlined below has been developed to provide flexibility for the field team during construction as determined by the subsurface conditions at the site. Construction criteria for the monitoring wells will be based on hydrologic data collected during field screening and geologic information derived from drilling operations.

The construction of monitoring wells shall be in accordance with standard practice at all times. It should be noted that the well construction is subject to change as subsurface conditions warrant and as determined by the contractor representative in consultation with USACE. Typical well construction is represented in Figure B-1.

WELL CASING AND SCREEN MATERIALS

Previous studies indicate the unconfined groundwater aquifer most likely has a high transmissivity potential. Each well has been designed for such conditions. Screen lengths will be installed to account for seasonal fluctuations and long-term trends for the piezometer water level.

Well Casing (Riser)

The casing riser will consist of a 2-inch ID Schedule 40, polyvinyl chloride (PVC) (ASTM-D 1785) casing with flush-threaded joints. Schedule 80 should be used if installation will occur in subfreezing conditions. Each joint will be fitted with a viton O-ring to seal each connection. No adhesives, glues, grease, or other agents will be used on the threads.

Well Screen

The well screen will consist of a 2-inch PVC with continuous wrap design. Prepacked screens may be substituted if slot size matches site conditions. Slot openings will be 0.010 inches (No. 10 slot screen) retaining 100% of U.S. No. 40-60 sand. Slot opening may be modified as conditions warrant. The total screen length will be designed to accommodate seasonal fluctuations in the piezometric water level. The screen will be fitted with a PVC bottom cap to prevent formation materials from entering the well.

ARTIFICIAL SAND PACK

The annular sand pack will consist of a U.S. No. 40-60 clean silica sand. The sand pack will be installed by tremie pipe using several lifts and allowing each lift to settle. After the final lift has been poured, the well will be bailed to assure a uniform packing around the annulus. A final cap of No. 40-60 or greater sand will be added to prevent the annular bentonite seal material from migrating to the sand pack. The sand pack will be accurately measured with the tremie pipe prior to the bentonite seal.

BENTONITE SEAL

The bentonite seal will consist of a No. 8 grind (or equivalent) sodium bentonite installed as a slurry or dry as conditions warrant. If the bentonite is added dry, a calculated volume of clean water will be added and a time period allotted for maximum hydration. The seal thickness will be at least 2 feet.

GROUT MIXTURE

The remaining annulus will be filled with solids bentonite or volclay grout as conditions dictate. The bentonite slurry will consist of an admixture of powdered bentonite with the recommended volume of water to achieve an optimal seal. The slurry must contain at least 20% solids by weight and have a density of 9.4 pounds per gallon or greater. Prior to any development activities, the annular seal will be allowed a minimum of 48 hours curing time. All admixtures will be in accordance with appropriate EPA and state regulations. Grout must be placed by tremie or pressure displace method.

SURFACE PROTECTIVE CASING

The surface protective casing will be fitted over the well casing and grouted into place. A minimum 3-foot square, 6-inch thick gravel pad, sloped away from the well shall be constructed around the well casing at the final ground level. Three steel posts will be equally spaced around the well and embedded in the gravel pad to serve as guards. The steel protective casing will be painted with permanent, high-visibility paint.

WELL CONSTRUCTION LOGS

In addition to the stratigraphic log, information collected, details of the well construction will be recorded for each well. Information provided in the logs shall include but not be limited to:

- Depth of static water level;
- Depth of well;
- Description of well casing and screen;
- Type and depth interval of filter pack;
- Location and thickness of bentonite seal;
- Depth of grouting;

- Description of surface protective casing and dedicated monitoring devices, if installed; and

- Date(s) of completion.

WELL DEVELOPMENT

Well development shall be conducted in a manner that meets or exceeds the requirements set forth by EPA (1986). Each well shall be developed with a surge block and bailer, or hand-operated positive displacement pump (e.g., Brainard-Kilman hand pump or equivalent) until the evacuated water is clear and free of suspended solids.

Development activities shall continue for a period of up to four hours unless turbidity monitoring indicates that well development is complete. The wells will be developed after turbidity levels fall below 5 NTU or stabilize over an extended period of pumping or bailing. Longer well development periods may be required for low yielding wells or wells showing turbidity problems. Turbidity levels shall be monitored using a turbidity meter (NTU or JTU).

Field measurements of temperature, Ph, and conductivity will also be made at regular intervals during development to check for recovery of drilling water. The long-term stabilization of these water quality parameters, compared to the initial drilling water quality, will ensure that the drilling water has been purged from the vicinity of the well.

A mechanical surging method will be used to develop wells to minimize the generation of liquid waste. The method involves forcing water into and out of the well screen by moving a surge block up and down in the casing. The reason for development is to break down bridges in the filter pack or material surrounding the filter pack, to remove fine-grained materials, and to establish a hydraulic connection between the well and aquifer that is equivalent to that within the aquifer. Development of the well should begin near the top of the screen and progress downward to prevent the tool from becoming sand-locked. Fine-grained material should be removed from the well with a bailer periodically during development.

During surging, flat tabular mica grains may clog the outer surface of the screen by aligning themselves perpendicular to the direction of water flow. To minimize mica clogging, wells will be developed gently with short surging strokes rather than long, hard strokes. Development should continue until little or no sand can be pulled into the well. Development can generally be accelerated if the amount of sediment in the screen is kept at a minimum.

In accordance with USACE guidelines, a 1-liter sample of water will be collected in a clear glass jar at the completion of well development of each well. These samples will be labeled and photographed with a 35 mm color slide film. The photograph will provide a back-lit close-up view that shows the clarity of the water. All slides will be submitted as part of the well log record.

WELL AND MONUMENT LOCATIONS AND ELEVATION

Coordinates and elevations shall be established by the Government for each monitoring well. Horizontal coordinates also will be established by the Government for each soil boring not completed as a monitoring well. The coordinates shall be to the closest 1 foot and referenced to the State Plane Coordinate System. If the State Plane Coordinate System is not readily available, an existing grid system shall be used. A frost-proof bench marker (control monument) will be used in or on each well. Elevations of the closest 0.01 foot will be provided for the survey marker and the top of the casing at each well. The measurement for the casing elevation will be taken from a reference point on the north lip of the inner well casing (uncapped). These elevations will be reference to the National Geodetic Vertical Datum, if readily available, otherwise, the existing local vertical datum will be used. The permanent control monuments will be set no closer than 5,000 feet to each other. Coordinates and elevations to third order (1:5,000 accuracies or better) will be established to the closest 0.01 foot for each monument. The location, identification, coordinates, and elevations of the wells and monuments shall be plotted on a topographic base map. The tabulation will consist of the designated number of the well monument, the X and Y coordinated, and all required elevations. These items shall be submitted to the contractor representative 30 days prior to submission of the Draft Project Report.

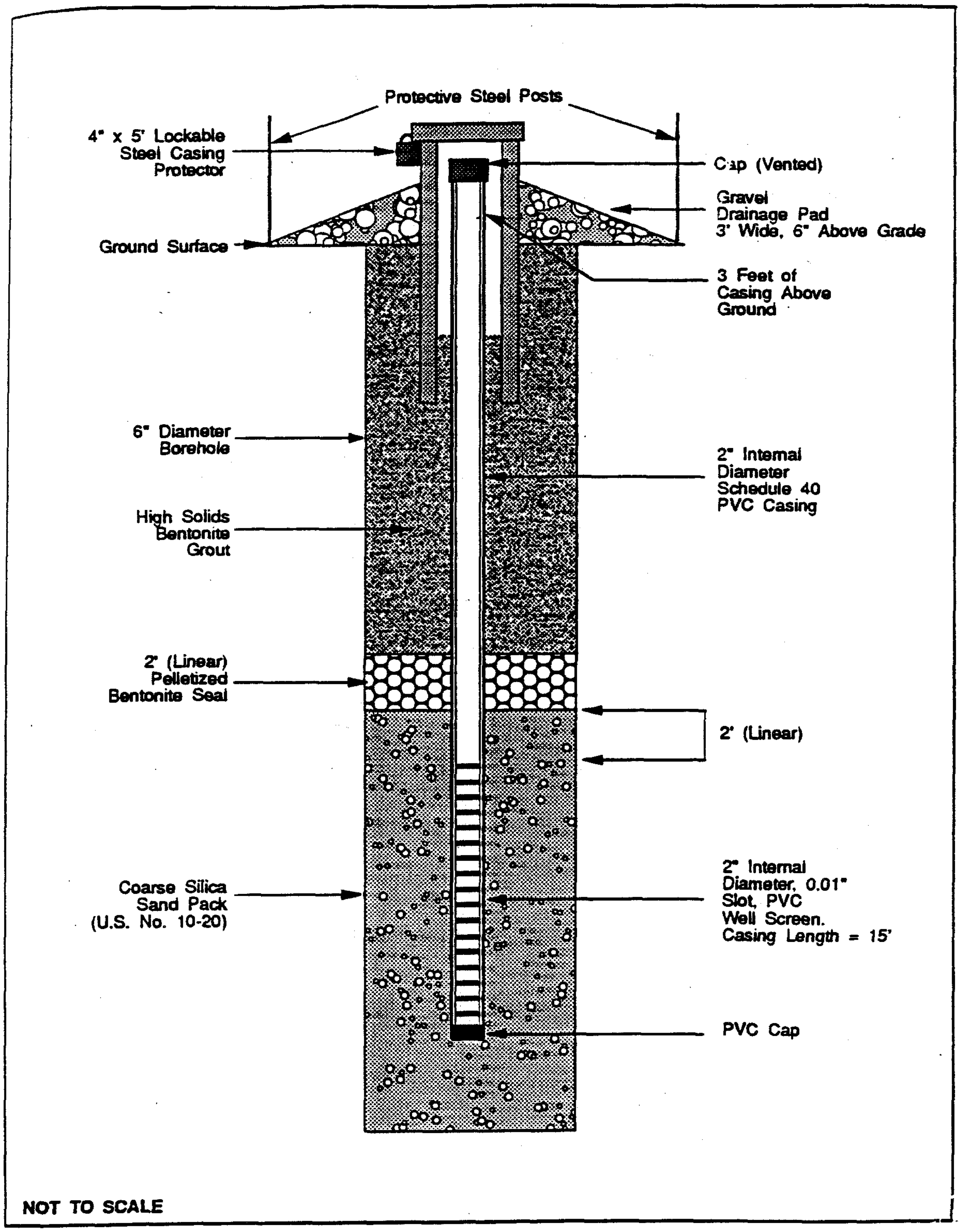
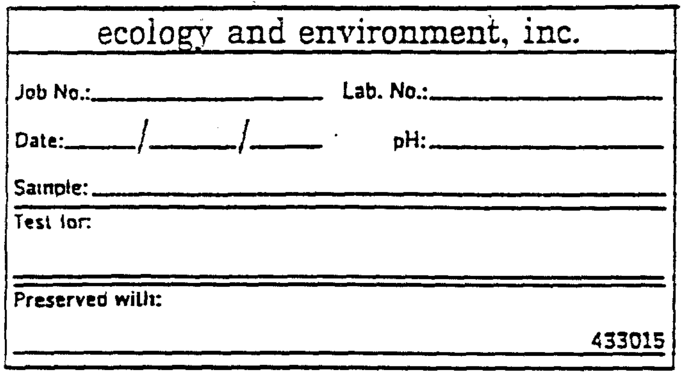


Figure B-1
Typical Well Construction

APPENDIX C

SAMPLE LABELS AND CHAIN-OF-CUSTODY FORMS



ecology and environment, inc.

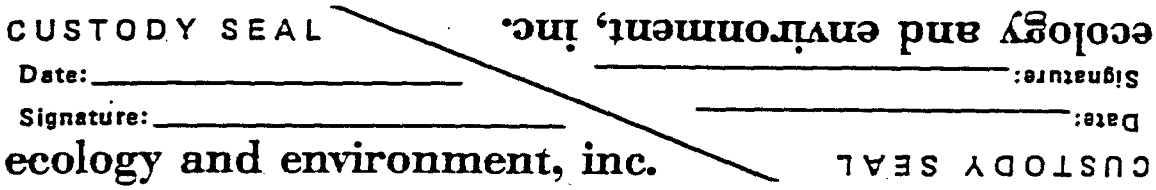
Job No.:________	Lab. No.:________
Date:____/____/____	pH:________

Sample:________

Test for:

Preserved with:

433015



CUSTODY SEAL

Date:________

Signature:________

ecology and environment, inc.

ecology and environment, inc.
Signature:________
Date:________
CUSTODY SEAL

ecology and environment, inc.
368 PLEASANTVIEW DRIVE, LANCASTER, NEW YORK 14086, TEL. 716/684-8060
International Specialists in the Environment

CHAIN-OF-CUSTODY RECORD

Page ____ of ____.

Project No.:
Project Name:
Project Manager:
Samplers: (Signatures)
Field Team Leader:

STATION NUMBER	DATE	TIME	SAMPLE TYPE			SAMPLE INFORMATION	STATION LOCATION	NUMBER OF CONTAINERS							REMARKS
			COMP	GRAB	AIR	EXPECTED COMPOUNDS (Concentration)*									

Relinquished By: (Signature)	Date/Time:	Received By: (Signature)	Relinquished By: (Signature)	Date/Time:	Received By: (Signature)	Ship Via:
Relinquished By: (Signature)	Date/Time:	Received By: (Signature)	Relinquished By: (Signature)	Date/Time:	Received By: (Signature)	BL/Airbill Number:
Relinquished By: (Signature)	Date/Time:	Received For Laboratory By: (Signature)	Relinquished By: (Signature)	Date/Time:	Received For Laboratory By: (Signature)	Date:

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files
*See CONCENTRATION RANGE on back of form.

234056

CUSTODY FORM

APPENDIX D
FIELD AUDIT CHECKLIST

ecology and environment, inc.

FIELD AUDIT CHECKLIST

PROJECT NAME: ____________ **PROJECT NUMBER:** ____________

LOCATION: ____________

____

____

E & E PERSONNEL: ____________

PRESAMPLING PROCEDURES

1. Are routine/special sampling requirements discussed and documented in the logbook? ______

   Comments: ____________

   ____

   ____

2. Are personnel assigned as:

   a. Sample custodian (Name) ____________

   b. Team leader (Name) ____________

   c. Sampler (Name) ____________

   c. Sampler (Name) ____________

   d. H & S (Name) ____________

3. Does the team member responsible for the following activities know how to complete them:

   a. Sample documentation and inventory ______

   b. Decontamination procedures ______

   c. Photodocumentation ______

   d. Chain-of-custody ______

   e. Sample packaging and shipping ______

   f. Site generated wastes ______

   Comments: ____________

   ____

   ____

   ____

4. Are past problems reviewed, discussed, and solutions identified and document in the logbook? ______

   Comments: ____________

   ____

   ____

5. Are site safety concerns covered during the meeting? __________ Comments: ____________________

SAMPLING PROCEDURES AND DOCUMENTATION

1. Is a copy of the workplan/sampling plan available so the team members understand the procedures required for sampling and sample collection? __________ Comments: ____________________

2. Do team members know what to do if procedures can not be used as identified in the sampling plan?

__________ Comments: ____________________

3. Have changes in the sampling procedures been noted in the logbook? __________ Comments: __________

4. Does the team have the necessary equipment for collecting appropriate samples? __________ Comments:

5. Does the team record appropriate information at the time that the sample is collected? (i.e., sample interval, sample type, composite or grab sample, etc.) __________ Comments: ____________________

6. Are sample jars kept clean during transfoer of sample material? __________ Comments: __________

7. Are samples preserved as indicated in the sampling plan? __________ Comments: ____________________

8. Are there any visible signs of contamination evident on the sampling equipment? ________ Comments:

CHAIN-OF-CUSTODY

1. Are samples kept in a controlled area (i.e., in a locked location or with a team member) at all times?
________ Comments:

2. Is all of the sample information (sample type, date, time, etc.) noted on the chain-of-custody?
________ Comments:

3. Have all samplers signed the chain-of-custody form? ________ Comments:

4. Is the Federal Express air bill number listed on the chain-of-custody form? ________ Comments:

5. Has a separate team member been assigned to cross check the sample inventory and the chain-of-custody prior to shipment? ________ Comments:

6. Is the cross check procedure noted in the logbook? ________ Comments:

7. Are sample numbers and Federal Express bill numbers listed in the sample log or the site logbook?
________ Comments:

8. Were the labels, logbooks, and chain-of-custody form cross checked? ________ Comments:

QUALITY CONTROL SAMPLES

1. What QC samples are required (as per sampling plan)? ________ Comments: ________________

2. What frequency must QC samples be collected? ________________

3. Are trip blanks being used? ________ Comments: ________________

4. Which laboratory provided trip blanks? ________________

5. Are appropirate materials used to generate QC samples? ________ Comments: ________________

SITE GENERATED WASTES

1. What level of protective clothing is required? ________________

2. What equipment is available on site? ________________

3. Is the equipment calibrated daily and in accordance with appropriate procedures? ________
Comments: ________________

4. Are calibration data recorded in appropriate logbooks? ________ Comments: ________________

5. Is data collected according to specific procedures and recorded in the site logbook? ________
Comments: ________________

SAMPLE PACKAGING AND SHIPPING

1. Describe sample packaging procedures ________________

2. Is packaging done at the end of the day, or as samples are collected? ____________

3. Was an inventory conducted for chain-of-custody, logbook, and sample containers? ______

Comments: ____________

4. Are samples packed on ice? ______ **Comments:** ____________

5. Is the proper information being entered on the Federal Express form for billing purposes (i.e., project number and cost code)? ______ **Comments:** ____________

PERSONNEL MANAGEMENT

1. Is the team leader noting the time that each team member arrives and departs the site in the logbook?

______ **Comments:** ____________

2. Do the weekly time reports reflect the on-site time only? ______ **Comments:** ____________

FIELD AUDITOR: ____________

DATE OF AUDIT: ____________

FIELD TEAM LEADER: ____________

Revised 11-90

U. S. ARMY ENGINEER DIVISION HUNTSVILLE — CORPS OF ENGINEERS

DESIGN REVIEW COMMENTS

PROJECT DERP FUDS ST LAWRENCE ISL GAMBELL SITE FINAL #5-202

☐ SITE DEV & GEO
☐ ENVIR PROT&UTIL
☐ ARCHITECTURAL
☐ STRUCTURAL
☐ MECHANICAL
☐ MFG TECHNOLOGY
☐ ELECTRICAL
☐ INST&CONTROLS
☒ SAFETY
☐ ADV TECH
☐ ESTIMATING
☐ SPECIFICATIONS
☐ SYSTEMS ENG
☐ VALUE ENG
☐ OTHER

REVIEW TYPE FINAL
DATE 28 MAY 93
NAME JAMES FERRIS/54583

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		After reading the Inventory Report, the Site Health and Safety Plan (SHSP), and the Chemical Data Acquisition Plan (CDAP), the following is submitted:	Please note that the plan which was provided to you was for your information and was a final plan. The plan was not for review which had already been done.
1.		There are 3 known OEW burial locations at this site: Site 2 - the former military housing/operations site; Site 8 - West Beach; and Site 15 - Troutman Lake Ordnance burial site.	Yes, there are three places on the site where there is suspected OEW.
2.		Re the SHSP, page 4-3, para 4.3 - This para states "All areas of known ordnance locations will be avoided." Yet, in the CDAP, Tables 5-9 and 5-10, soil borings and monitoring wells are proposed in these areas.	The person who made these review comment should also look at the locations of the borings in relationship to the OEW as shown on Figure 5-3 (CDAP page 5-78) for area 2 and Figure 5-6 (CDAP page 5-81) for area 8.
3.		This site has a minimum of 3 OEW locations; the others just have not been located yet. To assure the safe accomplishment of the sampling investigation and site characterization, I recommend all intrusive activities on the Gambell Site be preceded with a magnetometer survey of the sampling location. For intrusive activities, such as soil borings and monitoring well installation, a magnetometer with a down-hole capability should be used at every 2-foot level. This should preclude the sampling equipment/drill from contacted smaller UXO items that would not be detectable beyond 2-foot. This down-hole magnetometer operation should be conducted by UXO personnel, especially since sampling will be done in Sites 2 and 8, known ordnance areas. The UXO personnel will also provide UXO site safety expertise, something which I assume the SSO does not have. UXO Safety should be presented as site-specific training by UXO personnel.	Please keep in mind that the local EOD team has been to this site at least once and maybe twice looking for OEW that the local residents think they saw military people burying 30 years ago. Nothing has ever been found and there is no physical evidence of OEW on the site. The reviewer should also note the following areas of the CDAP: Figure 5-3 page 5-78 Figure 5-6 page 5-81 para. 5.3.1 page 5-19 2nd para. para. 5.3.1 page 5-20 site No. 2 Para. 5.3.1 page 5-21 Site No. 8 Para. 5.4.2.1 page 5-28 3rd para. Para. 5.4.2.1 Page 5-30 site No. 2 Para. 5.4.2.1 page 5-31 site NO. 8 No boring are being taken in suspected OEW areas.

ACTION CODES:
A - ACCEPTED/CONCUR
D - ACTION DEFERRED
W - WITHDRAWN
N - NON-CONCUR
VE - VE POTENTIAL/VEP ATTACHED

CEHND FORM 7 (Revised)
15 Apr 89

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
HUNTSVILLE DIVISION, CORPS OF ENGINEERS
P.O. BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

REPLY TO
ATTENTION OF

S: 13 August 1993

CEHND-PM-OT (415-10f) 13 July 1993

MEMORANDUM FOR Commander, U.S. Army Engineer District, Alaska
ATTN: CENPA-EN-EE-II (Mr. Blaisdell), P.O. Box 898, Anchorage, AK 99506-0898

SUBJECT: Defense Environment Restoration Program-Formerly Used Defense Site (DERP-FUDS), Final Chemical Data Acquisition Plan (CDAP), Including Site Health and Safety Plan (SHSP) and Draft Inventory Report, Gambell, St Lawrence Island, Alaska, PN F10AK06904

1. Enclosed are comments on the subject projects. Request you provide annotation of these comments NLT 13 August 1993.

2. The POC is Mr. C. Robert Britton (Program Manager), DSN 645-5482 or commercial (205) 955-5482.

FOR THE DIRECTOR OF PROGRAMS
AND PROJECT MANAGEMENT:

Lawson S. Lee

Encl

LAWSON S. LEE, P.E.
Chief, Ordnance and Technical
Programs Division

U. S. ARMY ENGINEER DIVISION HUNTSVILLE CORPS OF ENGINEERS

DESIGN REVIEW COMMENTS

PROJECT DERP FUDS ST LAWRENCE ISL GAMBELL SITE FINAL #5-202

☐ SITE DEV & GEO
☐ ENVIR PROT&UTIL
☐ ARCHITECTURAL
☐ STRUCTURAL
☐ MECHANICAL
☐ MFG TECHNOLOGY
☐ ELECTRICAL
☐ INST&CONTROLS
☒ SAFETY
☐ ADV TECH
☐ ESTIMATING
☐ SPECIFICATIONS
☐ SYSTEMS ENG
☐ VALUE ENG
☐ OTHER

REVIEW TYPE FINAL
DATE 28 MAY 93
NAME JAMES FERRIS/54583

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		After reading the Inventory Report, the Site Health and Safety Plan (SHSP), and the Chemical Data Acquisition Plan (CDAP), the following is submitted:	
1.		There are 3 known OEW burial locations at this site: Site 2 - the former military housing/operations site; Site 8 - West Beach; and Site 15 - Troutman Lake Ordnance burial site.	
2.		Re the SHSP, page 4-3, para 4.3 - This para states "All areas of known ordnance locations will be avoided." Yet, in the CDAP, Tables 5-9 and 5-10, soil borings and monitoring wells are proposed in these areas.	
3.		This site has a minimum of 3 OEW locations; the others just have not been located yet. To assure the safe accomplishment of the sampling investigation and site characterization, I recommend all intrusive activities on the Gambell Site be preceded with a magnetometer survey of the sampling location. For intrusive activities, such as soil borings and monitoring well installation, a magnetometer with a down-hole capability should be used at every 2-foot level. This should preclude the sampling equipment/drill from contacted smaller UXO items that would not be detectable beyond 2-foot. This down-hole magnetometer operation should be conducted by UXO personnel, especially since sampling will be done in Sites 2 and 8, known ordnance areas. The UXO personnel will also provide UXO site safety expertise, something which I assume the SSO does not have. UXO Safety should be presented as site-specific training by UXO personnel.	

ACTION CODES:
A - ACCEPTED/CONCUR
D - ACTION DEFERRED
W - WITHDRAWN
N - NON-CONCUR
VE - VE POTENTIAL/VEP ATTACHED

CEHND FORM 7 (Revised)
15 Apr 89

PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
HUNTSVILLE DIVISION, CORPS OF ENGINEERS
P.O. BOX 1600
HUNTSVILLE, ALABAMA 35807-4301

REPLY TO
ATTENTION OF

S: 13 August 1993

CEHND-PM-OT (415-10f)   13 July 1993

MEMORANDUM FOR Commander, U.S. Army Engineer District, Alaska
ATTN: CENPA-EN-EE-II (Mr. Blaisdell), P.O. Box
898, Anchorage, AK 99506-0898

SUBJECT: Defense Environment Restoration Program-Formerly Used Defense Site (DERP-FUDS), Final Chemical Data Acquisition Plan (CDAP), Including Site Health and Safety Plan (SHSP) and Draft Inventory Report, Gambell, St Lawrence Island, Alaska, PN F10AK06904

1. Enclosed are comments on the subject projects. Request you provide annotation of these comments NLT 13 August 1993.

2. The POC is Mr. C. Robert Britton (Program Manager), DSN 645-5482 or commercial (205) 955-5482.

FOR THE DIRECTOR OF PROGRAMS
AND PROJECT MANAGEMENT:

Lawson S. Lee

Encl

LAWSON S. LEE, P.E.
Chief, Ordnance and Technical
Programs Division

U. S. ARMY ENGINEER DIVISION HUNTSVILLE | CORPS OF ENGINEERS

DESIGN REVIEW COMMENTS

PROJECT DERP FUDS ST LAWRENCE ISL GAMBELL SITE FINAL #5-202

☐ SITE DEV & GEO
☐ ENVIR PROT&UTIL
☐ ARCHITECTURAL
☐ STRUCTURAL
☐ MECHANICAL
☐ MFG TECHNOLOGY
☐ ELECTRICAL
☐ INST&CONTROLS
☒ SAFETY
☐ ADV TECH
☐ ESTIMATING
☐ SPECIFICATIONS
☐ SYSTEMS ENG
☐ VALUE ENG
☐ OTHER

REVIEW TYPE FINAL
DATE 28 MAY 93
NAME JAMES FERRIS/54583

ITEM	DRAWING NO. OR REFERENCE	COMMENT	ACTION
		After reading the Inventory Report, the Site Health and Safety Plan (SHSP), and the Chemical Data Acquisition Plan (CDAP), the following is submitted:	
1.		There are 3 known OEW burial locations at this site: Site 2 - the former military housing/operations site; Site 8 - West Beach; and Site 15 - Troutman Lake Ordnance burial site.	
2.		Re the SHSP, page 4-3, para 4.3 - This para states "All areas of known ordnance locations will be avoided." Yet, in the CDAP, Tables 5-9 and 5-10, soil borings and monitoring wells are proposed in these areas.	
3.		This site has a minimum of 3 OEW locations; the others just have not been located yet. To assure the safe accomplishment of the sampling investigation and site characterization, I recommend all intrusive activities on the Gambell Site be preceded with a magnetometer survey of the sampling location. For intrusive activities, such as soil borings and monitoring well installation, a magnetometer with a down-hole capability should be used at every 2-foot level. This should preclude the sampling equipment/drill from contacted smaller UXO items that would not be detectable beyond 2-foot. This down-hole magnetometer operation should be conducted by UXO personnel, especially since sampling will be done in Sites 2 and 8, known ordnance areas. The UXO personnel will also provide UXO site safety expertise, something which I assume the SSO does not have. UXO Safety should be presented as site-specific training by UXO personnel.	

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