

SITE SCREENING MEMORANDUM
PHASE II REMEDIAL INVESTIGATION
FORMER AMCHITKA ARMY AIR BASE
AMCHITKA ISLAND, ALASKA

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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**SITE SCREENING MEMORANDUM
PHASE II REMEDIAL INVESTIGATION
FORMER AMCHITKA ARMY AIR BASE
AMCHITKA ISLAND, ALASKA**

1.0 INTRODUCTION

Amchitka Island is located near the far western extent of the Aleutian Islands, approximately 1,340 miles west-southwest of Anchorage, Alaska. It is part of the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge, which is administered by the U.S. Fish and Wildlife Service (USFWS). Since World War II (WWII), Amchitka has been used by U.S. government agencies for a variety of military and research activities: from 1943 to 1950 as a forward air base for the U.S. Armed Forces; during the late 1960s and early 1970s by the U.S. Atomic Energy Commission (AEC) as a site for three underground nuclear tests; and during the late 1980s and early 1990s by the U.S. Navy (Navy), who constructed and operated a radar station on the island. Amchitka is currently uninhabited, and access is restricted to USFWS and other agency personnel and government contractors.

The Alaska District, U.S. Army Corps of Engineers (Corps) contracted the field work for the first phase of a Remedial Investigation (RI) on Amchitka Island in 1997. Based on the results of that work, a limited amount of field work was conducted during 1998 to complete the field portion of the RI. The 1997 Phase I RI addressed the majority of the identified Formerly Used Defense Sites (FUDS). The 1998 Phase II RI consisted mainly of follow-up work at sites where an environmental impact had been documented that was judged to be serious enough to warrant further investigation.

The Phase II RI field work was conducted between August 26 and September 17, 1998. This work was performed for the U.S. Army Corps of Engineers, Alaska District, under Contract No. DACA85-94-D-0009, Delivery Orders No. 0020 and 0021. A *Phase II Site Characterization Report* that is a companion to this document presents the findings of the Phase II work. The purpose of this *Site Screening Memorandum* is to document recommendations for further work (e.g. additional data collection, removal actions, etc.) or justification for no-further-action at specific sites, based on the results of the Phase II RI.

2.0 SCOPE OF THE REMEDIAL INVESTIGATION

The Remedial Investigation performed for the Corps of Engineers represents the culmination of environmental investigations and activities related to FUDS on Amchitka. The following sections provide additional detail regarding the scope of both this current investigation and the previous studies.

2.1 PRIOR ENVIRONMENTAL STUDIES

Environmental reconnaissance and sampling was first conducted on Amchitka by the USFWS in 1985. Sampling was next performed by the Corps in 1986, concurrent with a Debris Cleanup that resulted in the demolition of almost all WWII structures and above-ground physical remains. The Naval Energy and Environmental Support Activity (NEESA) conducted a Preliminary Assessment of Amchitka in 1991, and a Corps Contractor performed environmental sampling at Base Camp, Bird Cape, and Top Camp in 1992. In 1993, the USFWS compiled data collected during these studies into the *Summary of Site Contamination on Amchitka Island, Alaska*. This report, also referred to as the "USFWS Database", lists all of the sites that had been sampled for contamination (by various parties) as of 1993.

The USFWS Database provided one basis for the list of sites that were investigated by the Corps during this RI. However, not all of the sites on the Database are FUDS. Some sites are the responsibility of the Department of Energy (DOE), the Navy, or the USFWS. Another 11 are shared- or uncertain-liability sites that were studied in 1995 by Foster Wheeler Environmental Corporation for the USFWS under a Memorandum of Agreement (MOA) with the other agencies. No further work is currently planned by the USFWS for the MOA sites (although the DOE conducted followup work at one of these sites in 1998). The remaining USFWS Database sites were studied by the Corps during this RI, along with five of the sites originally included under the MOA and later incorporated into this RI by the Corps.

2.2 PHASE I RI

Prior to the 1997 field season, only two places on Amchitka were known to have relatively large areas of visibly contaminated soil. One of these was at Kirilof Point, near Base Camp, where water contaminated with diesel oil was seeping into a wetland and the Bering Sea. The other area was at Bird Cape, where 17 drums had rusted away in a small area within a wetland, releasing most of the oil they once held. These two areas were identified as the highest priority for the Phase I RI, with sampling designed to support risk assessment and possible future removal actions.

In addition to the sampling and risk assessment at Kirilof Point and Bird Cape, the Phase I work included reconnaissance or "preliminary source evaluations" of the majority of the other identified FUDS. Limited sampling was performed at locations where significant contamination

was observed. While the Phase I reconnaissance did not include sampling for laboratory analysis at many sites, it was thorough enough to identify FUDS that had evidence of significant environmental impact from chemical contamination.

The risk assessment at Kirilof Point Seeps and Bird Cape Drum Group BI05 concluded that there is no unacceptable risk to human health, and only limited risk to ecological receptors.

The Scope of Work for the Phase I RI included 183 of the 276 previously identified FUDS. Forty-nine transformer sites and 36 drum dumps were not included because it was uncertain whether any of these sites could be located. The uncertainty regarding transformers was based on the fact that no power poles remained standing, and it was unknown if the former pole locations could be found, much less which poles had formerly contained transformers. With respect to drum dumps, the uncertainty was based on the difficulty that the USFWS had in locating many of the drum dumps during their 1993 work (after the drums had been removed during the 1986 Debris Cleanup). The approach for the 1997 field work was to focus project resources on other sites that could more readily be located and that were more likely to pose an environmental concern. Eight sites with ordnance were also excluded from the Phase I RI because of the additional regulatory, technical, and logistical requirements that must be employed in addressing sites with UXO.

Sixty of the 183 Phase I RI sites could not be located with certainty during the 1997 reconnaissance activities. Evidence of contamination was found at 51 of the 123 sites that were located (about 40 percent). In addition, thirteen previously unknown sites were found during the 1997 Phase I RI, three of which had evidence of contamination. In many cases, this evidence amounted to small areas of stained soil, or faint odors noted in a test hole.

More detailed information on the results of the 1997 Phase I RI field activities is presented in Shannon & Wilson's March 1998 *Site Characterization Report, Amchitka Army Air Base, Phase I Remedial Investigation, Amchitka Island, Alaska*.

2.3 SCOPING OF THE PHASE II RI

Conclusions regarding the 1997 Phase I RI and recommendations for further action were presented in Shannon & Wilson's March 1998 *Site Screening Memorandum, Amchitka Army Air Base, Phase I Remedial Investigation, Amchitka Island, Alaska*.

During a January 22, 1998, scoping meeting between the Corps, USFWS, Alaska Department of Environmental Conservation (ADEC), and Shannon & Wilson, a scope of work was developed for the second RI field season. Because of the limited number of sites observed during the 1997 Phase I RI with evidence of significant contamination, the scope of work for the Phase II RI was not extensive. Specifically, the Phase II RI included:

- Additional sampling at two sites within the Kirilof Peninsula Tank Farm where diesel fuel has impacted small streams.

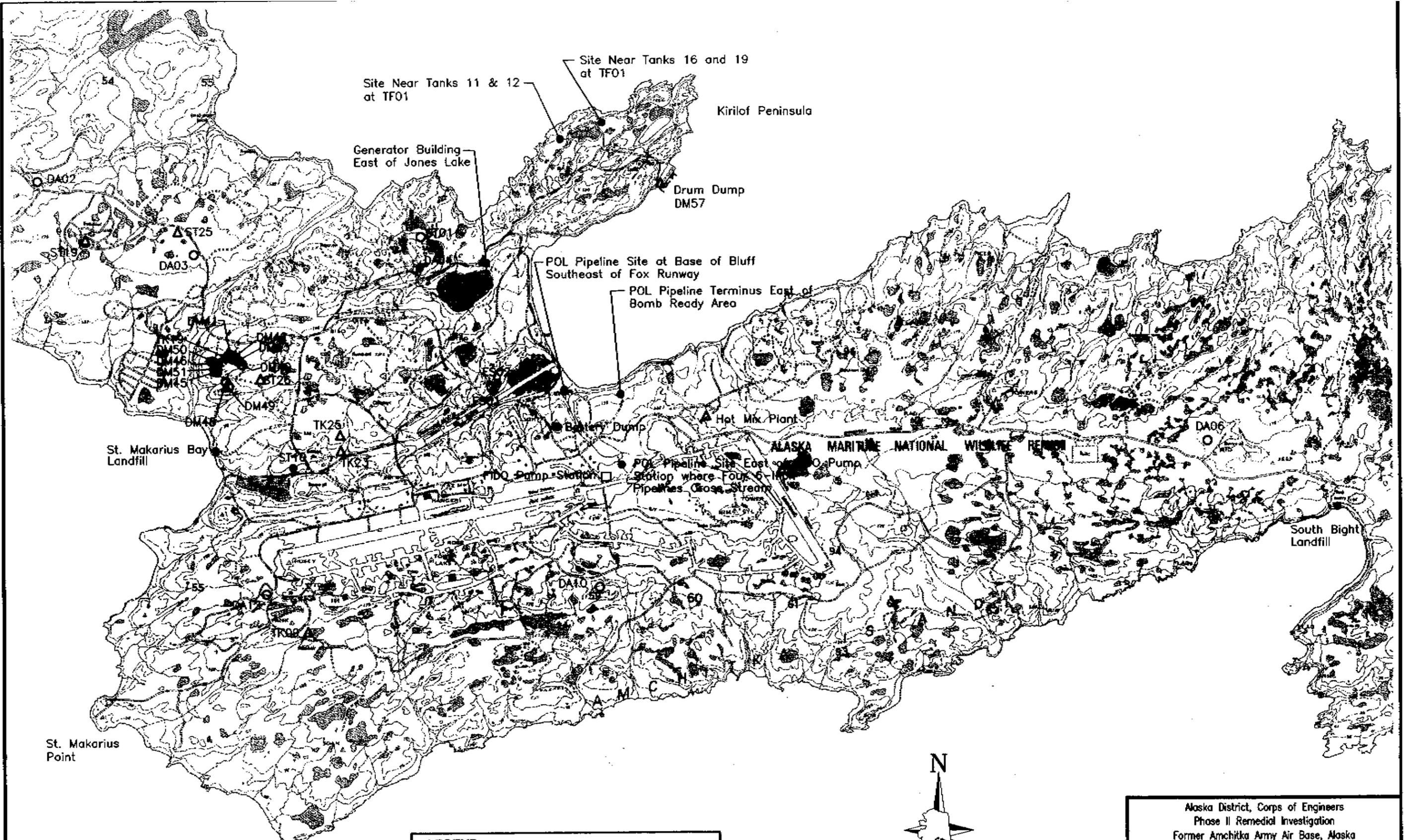
- Sampling at five sites where gasoline may be impacting streams or lakes (Fill Stands FS01 and FS02; three sites along the POL pipeline system; and a suspected generator building east of Jones Lake).
- Additional sampling of a group of WWII drum dumps above St. Makarius Bay that may be impacting streams and a wetland.
- Sampling at the WWII St. Makarius Bay Landfill where earlier sampling was inconclusive whether metals were leaching into the ocean at unacceptable concentrations.
- Sampling at a former WWII motor pool north of Clevenger Lake (Suspect Building ST10), where suspected gasoline contamination of the shallow groundwater table was observed in 1997.
- Collection and disposal of a limited quantity of fuel and oil remaining in drums from WWII.
- Investigation of nine sites with known or suspected underground tanks to determine whether they contain water, fuel, or oil, and to collect fuel or oil for recycling or disposal.

The group of sites listed above were the only FUDS at which further action was deemed necessary, based on the consensus reached by the participants at the January 22, 1998 scoping meeting. The only other action agreed to at that meeting was continued observations at the Kirilof Point Seeps to be sure that conditions are not significantly worse than those observed during 1997.

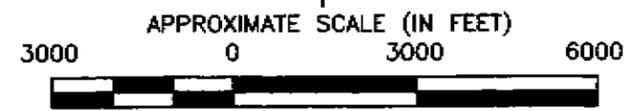
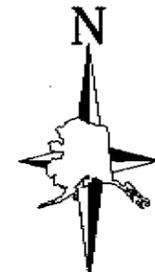
Two sites were added to this scope when they were discovered during the 1998 field work. Samples were collected at one of these sites, a former WWII landfill at the head of South Bight. The other new site was a suspected UST location.

Sampling activities during the 1998 Phase II RI focused primarily on sites where an impact to surface water was known or suspected, based on sampling or reconnaissance conducted during the 1997 Phase I RI. The goal of this sampling was to determine whether contaminants of concern were present in surface water at unacceptable levels.

Table 2-1 lists the sites that were investigated during the 1998 Phase II RI, with a description of the information about each site that resulted in its inclusion in the Phase II scope of work. This table also summarizes the sampling activities performed during 1998. The locations of the sites in the Base Camp area are shown in Figure 2-1.



LEGEND	
ST10 ●	Site Reconnoitered and Sampled
DM40 ○	Site Reconnoitered only
TK09 ▲	Tank or Drum Site Investigated and Contents (if any) Removed



Base map from the Army Map Service
Map Sheet 2023 I NE, revised in 1986.

Alaska District, Corps of Engineers Phase II Remedial Investigation Former Architka Army Air Base, Alaska	
BASE CAMP AREA SITES INVESTIGATED	
February 1999 Revision Number: 0	X-0926
SHANNON & WILSON, INC. <small>GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS</small>	FIG. 2-1

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**TABLE 2-1
SUMMARY OF PHASE II RI SAMPLING**

Site		Description of Site Conditions (based on Phase I RI)	Scope of Phase II Sampling Effort
Kirilof Peninsula Tank Farm	Tanks 11 & 12	Sheen and elevated DRO in sediment and water sample from stream adjacent to tanks that drains to the Bering Sea; stained soil and elevated headspace gas at tank settings	Four borings completed as monitoring wells in upper reach of stream valley; stream reconnaissance; water and sediment samples from stream and beach
	Tanks 16 and 19	Stained soil in vicinity of two tanks and pipeline; elevated DRO in sediment and water samples from two streams that drain the area to the Bering Sea	Eight borings between tanks, pipeline, and stained area; stream reconnaissance; insufficient sediment on beach to collect sample
POL Pipelines	Base of Bluff Southeast of Fox Runway	Small depressed area adjacent to gasoline pipeline contained apparent thin hydrocarbon layer on groundwater; nearby stream drains to Constantine Harbor	Exploration of extent of contamination around depressed area; stream reconnaissance; soil samples in source area; stream water and sediment samples near beach
	East of Bomb Ready Area	Sheen and hydrocarbon odor in stream adjacent to gasoline pipeline terminus; stream drains to Constantine Harbor	Stream reconnaissance; stream water and sediment samples in impacted area and upstream and downstream
	East of FIDO Pump Station	Sheen and hydrocarbon odor in stream below crossing of four gasoline pipelines	Stream reconnaissance; stream water and sediment samples in impacted area and two downstream locations
Fill Stands FS01 and FS02		Hydrocarbon sheen and odor in wetland near reported location of two gasoline fill stands	Reconnaissance; water and sediment samples at two locations in wetland
Drum Dumps Above St. Makarius Bay	Streams	Stained stream sediment, sheen on water, and low levels of DRO in streams draining an area with numerous former drum dumps with stained, contaminated soil	Stream reconnaissance; water and sediment samples at four additional locations
	Drum Groups	Ten drum dumps had not been previously reconnoitered in an area where several other drum dumps were found to have significant levels of localized soil contamination	Reconnaissance of new drum dumps, soil samples at five of them

Site	Description of Site Conditions (based on Phase I RI)	Scope of Phase II Sampling Effort
Generator Building East of Jones Lake.	Odor and sheen at base of suspected former UST pit near Jones Lake and stream draining to Constantine Harbor	Soil sample from UST pit; monitoring well between pit and stream; stream reconnaissance; three water and sediment samples from stream, including one near beach
Suspect Building ST10	Elevated headspace gas, hydrocarbon odors, and discoloration suggestive of gasoline in soil near former Motor Pool; Clevenger Lake is nearby	Soil sample in source area; water and sediment samples in surface water drainage and from beach of Clevenger Lake
St. Makarius Bay Landfill	Anomalously high metals concentrations in marine water at toe of bluff below WWII landfill	Six water and four sediment samples from seeps draining the bluff below the landfill, and from two adjoining tide pools
Battery Dump	Six lead-acid batteries abandoned in pond and wetland	Recover batteries for recycling; water and sediment samples from pond
South Bight Landfill (new site discovered during Phase II RI)	Oil seep into intertidal zone at head of South Bight from debris pile at base of bluff	One sediment and two water samples from toe of debris pile; one water and sediment sample from tide pool
Kirilof Point Seeps	USFWS requested observation of this site during wetter conditions	Reconnaissance only
Suspect Building ST01	Improper location was reconnoitered for this former generator building in 1997	Reconnaissance only, in accordance with procedures used during Phase I RI
1986 Disposal Areas	No surface water leachate was observed during relatively dry conditions in 1997	Reconnaissance of eight disposal areas; a surface water sample was collected from the only site with evidence of surface water flowing off site
UST Sites (various)	It was not known whether ten known or suspected USTs still contained petroleum products	Confirmation of existence of USTs; excavation to gain access if necessary, recovery of petroleum products for recycling
Drum sites (various)	Drum groups at Bird Cape and one other site still contained fuels or lubricating oil	Investigation of all known drums for presence or absence of contents; recovery of petroleum products for recycling

3.0 CONCLUSIONS AND RECOMMENDATIONS

The 1997 Phase I RI involved a combination of detailed sampling to support risk assessment at two sites (Kirilof Point Seeps and Bird Cape Drum Group BI05), less detailed sampling at a number of other sites, and preliminary source evaluation at all other known FUDS that could be found. Accordingly, the conclusions and recommendations presented in the March 1998 *Phase I RI Site Screening Memorandum* focused on general categories of sites, although the results from individual sites were examined in the process of drawing those conclusions and recommendations.

In early 1998, a consensus was reached between the Corps, USFWS, and ADEC accepting the conclusions and recommendations presented in the March 1998 *Phase I RI Site Screening Memorandum*. This included agreement on a scope of work for the 1998 Phase II RI that involved further investigation at a defined list of sites considered to have the potential for unacceptable impacts to the environment. Since the 1998 investigation targeted individual sites rather than groups of sites, the conclusions and recommendations in this memorandum are presented on a site-by-site basis, rather than discussing categories of sites as was done in the previous document.

It is acknowledged that risk management decisions are not the responsibility of the consultant; that authority ultimately lies with the regulatory agencies. However, to meet the objective of this memorandum it was necessary to propose recommendations for those risk management decisions. Each of the sites investigated during the 1998 Phase II RI is discussed in the following subsections.

3.1 KIRILOF PENINSULA TANK FARM, TANKS 11 AND 12

Tanks 11 and 12 are located in the diesel portion of the Kirilof Peninsula Tank Farm, on the northwest side of Kirilof Peninsula. These tanks are located south of, and are unrelated to, the Kirilof Point Seeps that were investigated during the 1997 Phase I RI. Evidence of hydrocarbon contamination observed in 1995 and 1997 included blackened soil, stressed vegetation, and a sheen on groundwater in holes excavated in the tank settings. The two tanks are located along the north flank of a small westward-flowing stream that drains Lake Grace to the Bering Sea (Photo 1). In 1997, a heavy sheen and strong hydrocarbon odor were noted at two locations along the stream. Samples collected at that time contained DRO at 1,830 mg/kg in the sediment, and 196 ug/L in the surface water.

During the 1998 Phase II RI, samples were collected from farther downstream and from two tide pools at the stream outlet to assess impact to the marine environment. Four soil borings completed as monitoring wells were also installed and sampled to attempt to determine the source of the contamination and its extent in the stream valley. No sediment was available on the beach for analysis; the shore consists of a rock terrace (Photo 2). The downstream extent of visible contamination was about 250 feet upstream from the edge of the beach. The three surface

water samples collected from the stream and tide pools had DRO concentrations ranging from 149 to 177 ug/L. The sediment sample collected from the stream had a DRO concentration of 41 mg/kg. None of these samples contained detectable levels of PAHs. These concentrations may reflect at least some contribution by biogenic hydrocarbons in the DRO range, because they are consistent with levels of DRO found in surface waters from elsewhere on the island at uncontaminated background sites. Similar low levels of diesel-range hydrocarbons were found in the soil and groundwater from the monitoring wells, with the exception of higher concentrations that were detected in the well immediately adjacent to the 1997 stream sample location.

Based on the 1998 investigation, it is concluded that: (1) no primary or extensive secondary source remains for continuing contaminant release, (2) contaminated soil does not appear to extend beyond the area immediately downslope of the tanks, and (3) there is no visible or supporting chemical evidence of significant levels of hydrocarbons migrating to the marine environment. No further action is recommended at this site.

3.2 KIRILOF PENINSULA TANK FARM, TANKS 16 AND 19

Tanks 16 and 19 are also located in the diesel portion of the Kirilof Peninsula Tank Farm, east of, and also unrelated to, the Kirilof Point Seeps. Evidence of hydrocarbon contamination observed in 1997 included stained soil with a strong hydrocarbon odor at the toe of a roadside bench downslope from the two tanks that may have been a roadside turnout or fill stand for fuel oil trucks. Water that was seeping from the slope near the stained soil was flowing directly into a small north-flowing stream that drains to the Bering Sea. Samples collected in 1997 from this stream and from a tributary stream that drains the vicinity of Tank 19 contained maximum DRO concentrations of 37,500 mg/kg and 445 ug/L, respectively, in sediment and surface water. Other contaminants detected in the sediment samples included low concentrations of PAHs and alkylated benzenes.

The goal of the 1998 Phase II RI work at this site was to assess the impact to the marine environment, and to attempt to determine if Tanks 19 (Photo 3), 16, or the adjacent POL pipeline (Photo 4) were the source of the contamination previously documented in the stream. Reconnaissance of the beach identified no visible evidence of contaminants reaching the marine environment. This could not be documented with laboratory analysis however because the beach and intertidal pools contained only coarse pebbles; no beach sediment samples could be collected. The stream sediment with elevated DRO concentrations appear to be limited in extent to the areas sampled in 1997; the 1998 reconnaissance identified no visible evidence of contamination in the reaches of the stream below or above the 1997 locations. Borings drilled downhill of Tanks 16 and 19 during 1998 did not reveal any clear contaminant migration pathway from either of the tanks or the pipeline trench, which are the three potential nearby sources. The shallow soil underlying the heavily stained soil at the toe of the roadside bench did not contain a highly elevated DRO concentration.

It is concluded that the contamination at the bench may have resulted from a fill stand or a short-term leak in the nearby pipeline. The contaminated areas in the streams may have resulted from contaminants originating upgradient that are migrating through the bedrock on the water table, and coming to the surface as seeps along the streams (and possibly at the toe of the bench as well). Such a migration pathway was hypothesized in the 1997 Phase I RI to explain the seemingly random distribution of DRO contamination at the adjoining Kirilof Point Seeps.

No primary source remains for continuing contaminant release, and the impacted stream water and sediment do not appear either extensive or continuous to the marine environment. No further action is recommended at this site.

3.3 POL PIPELINE AT BASE OF BLUFF SOUTHEAST OF FOX RUNWAY

This POL pipeline site is located along the gasoline pipeline between the former White Ship Dock and the aviation gasoline facilities near Baker and Charlie Runways. During the Phase I RI, a thin film of what appeared to be petroleum was found on groundwater in a shallow test hole excavated in a 3-foot by 3-foot, 4-inch deep depression about 100 feet south of the junction of two pipelines (Photo 5). An adjacent stream discharges to Constantine Harbor about 250 feet downstream of the site.

The objective of the 1998 Phase II investigation of this site was to characterize the source of the apparent contamination in the depression and to determine whether contamination was migrating to Constantine Harbor. Numerous exploratory holes were excavated around the depression to determine the extent of contamination, and two soil samples were analyzed from the source area. Surface water and sediment samples were collected from a location about 150 feet downstream of the site and approximately 70 feet inland from the beach ridge.

Reconnaissance observations suggest that petroleum contamination is primarily limited to the 3-foot by 3-foot depression. Only one exploratory hole around the perimeter of the depression had a slight petroleum odor. This petroleum product is probably gasoline that was spilled from the nearby pipeline, although no GRO or VOCs were detected in two soil samples on the downgradient edge of the depression, or in surface water and sediment samples collected near the beach from the stream. Lead was detected in the two shallow soil samples at concentrations of 64 and 112 mg/kg. This lead, which may be the result of leaded gasoline, exceeds the background concentration for lead, but is well below the EPA soil cleanup level of 400 mg/kg. The 28 mg/kg lead detected in the stream sediment near the beach is about twice background, but well below the NOAA Effects Range-Low (ER-Low) value for benthic organisms.

With a very limited source area and no adverse impact to the marine environment, no further action is recommended for this site.

3.4 POL PIPELINE TERMINUS EAST OF BOMB READY AREA

This POL pipeline site is located on a pipeline spur off the pipeline that connects the tanks in the East Bomber Road Tank Farm near Lake Carmen. The lack of a known purpose for this dead-end pipeline, combined with its proximity to the "Bomb Ready Area" shown on WWII drawings, was previously used to hypothesize that this area might have been used to fill napalm bomb casings. A stream near this location flows down a narrow ravine to Constantine Harbor, about 200 feet to the north (Photo 6). During the 1997 Phase I RI, sediment in the stream at this location exhibited a pronounced hydrocarbon odor, and a nearby pool of stagnant water in the stream had a heavy hydrocarbon sheen.

During the 1998 Phase II RI, a reconnaissance was performed of the stream from the beach at Constantine Harbor to its headwaters above the site at Lake Carmen, where WWII gasoline tanks were formerly located. Surface water and sediment samples were collected from the stream at the impacted area and both upstream and downstream from it to evaluate the possible source areas and the extent of contaminant migration. During the reconnaissance, evidence of contamination was found only in the original 1997 location, where a slight sheen was generated on the water when the stream sediment was disturbed. GRO was not detected in any sediment samples, and was detected only in the upstream surface water sample, at a concentration of 94 ug/L. This sample also contained 3.8 ug/L isopropylbenzene. Several alkylated benzenes were detected in the sediment samples, at a maximum total concentration of 4.6 mg/kg. None of these occurrences exceed applicable cleanup standards or risk-based comparison criteria. Lead in the downstream sediment sample, at 41 mg/kg, exceeded the background level and slightly exceeded the NOAA ER-Low value of 34 mg/kg, but is well below the EPA soil cleanup level.

The 1998 Phase II RI results show that the impacted area in the stream is not significantly contaminated by gasoline, nor is it extensive. The data suggest that the pipeline and tanks near Lake Carmen are a possible source of low levels of contamination. Based on the field observations and analytical results, significant impacts due to gasoline contamination are unlikely at this site. No further action is recommended.

3.5 POL PIPELINE EAST OF FIDO PUMP STATION

The pump station for the fog-dispersing gasoline flare (FIDO) system was located about 1,000 feet east of the eastern end of Baker Runway, connected by four, 6-inch pipelines to the Avgas Road Tank Farm. The four pipes cross a stream about 600 feet east of the FIDO Pump Station (Photo 7). In 1997 it was noted that one pipe is disintegrated and water was leaking from a hole on the underside of another pipe. Stream sediment below the pipes had a moderate to strong hydrocarbon odor, and when the sediment in the streambed was disturbed, a prominent hydrocarbon sheen formed on the water.

The 1998 Phase II RI investigation at this site was designed to determine the levels of contamination near, downstream, and upstream of the pipeline crossing. No evidence of contamination was found in the stream except within the 20-foot-long zone immediately

downstream of the pipeline crossing, where a slight hydrocarbon sheen was observed on the water surface. Immediately upstream (6 inches) of the pipeline crossing, small blebs of free product were released and floated to the water surface when the sediment was disturbed, resulting in a heavier sheen. Surface water and sediment samples were collected at the pipeline crossing and at 80 and 240 feet downstream. Sampling was not performed upstream of the pipeline crossing because reconnaissance revealed no evidence of upstream sources.

GRO was detected in the sediment at the pipeline crossing at 2,510 mg/kg. The water from this location contained 270 ug/L GRO and low concentrations of several alkylated benzenes, including ethylbenzene and xylenes. While these VOCs did not individually exceed ADEC groundwater cleanup levels, human-health RBCs, or EPA AWQCs, the sum of the ethylbenzene and xylenes concentrations totals 14.84 ug/L, which slightly exceeds the ADEC water quality standard of 10 ug/L for total aromatic hydrocarbons. No volatile compounds were detected in the corresponding sediment sample from below the pipeline, although the reporting limits were raised somewhat due to the presence of GRO. The 2,510 mg/kg GRO in this sample exceeds the ADEC "maximum allowable concentration" for soil of 1,400 mg/kg. No GRO or fuel-related VOCs were detected in the surface water and sediment samples collected downstream from the pipeline crossing. This is consistent with the lack of visual evidence of contamination along this part of the stream. Lead was detected in the sediment sample from the pipeline crossing at 99 mg/kg, which is about twice the NOAA Effects Range-Low criterion for lead in sediment. Lead was only slightly above the background concentration in the two downstream sediment samples, and was not detected in any of the water samples.

Based on the 1998 Phase II RI, the area of contamination is limited to a short section of the stream near the pipeline crossing, since downstream surface water and sediment samples are not contaminated by GRO, VOCs, or metals. The sediment at the pipeline exceeds the ADEC "maximum allowable concentration" for GRO in soil and the NOAA Effects Range-Low criterion for lead. The concentration of total aromatic hydrocarbons in the surface water at this location is also slightly elevated relative to the ADEC surface water criterion, but is not at a concentration expected to result in significant impacts. The analytical results and field evidence suggest that the gasoline contamination is not migrating downstream at levels of concern. No further action is recommended at this site.

3.6 FILL STANDS FS01 AND FS02

An area north of the middle of Fox Runway was searched for two fill stands during the 1997 Phase I RI, based on WWII fuel system maps that showed two fill stands in this vicinity. Although no pipelines were identified during the site reconnaissance, remnants of two wooden boxes were found that were considered to have possibly been part of the fill stand construction (Photo 8). Nearby, an area with a light hydrocarbon sheen and faint hydrocarbon odor was observed.

The goal of the 1998 Phase II RI at this site was to attempt to determine the source and extent of the hydrocarbon sheen and odor. To the east of the wood remnants, two wetland areas were

observed, each with about 2 to 5 inches of standing water. A hydrocarbon sheen was noted at two locations about 20 feet apart on the northern boundary of the western wetland. No other visible evidence of impacts was found around the borders of the wetlands during the 1998 reconnaissance. GRO was not detected in any surface water or sediment sample. No VOCs were detected in either surface water sample. Two VOCs, 1,2-dibromo-3-chloropropane (a pesticide included in the Method 8260B list of VOCs) and naphthalene, were detected in the sediment sample collected from the western wetland, at concentrations of 22 and 2.7 mg/kg, respectively. The 1,2 dibromo-3-chloropropane concentration exceeds the human health RBC of 0.46 mg/kg for this chemical, while the naphthalene concentration slightly exceeds the NOAA Effects Range-Median concentration. Lead was detected below the background concentration in the sediment samples. Metals concentrations in water samples were near or below background levels.

Based on the 1998 Phase II RI, there does not appear to be any widespread contamination associated with these possible former fill stands. Neither GRO nor elevated levels of lead are present; only 1,2-dibromo-3-chloropropane and naphthalene exceed their comparison criteria. This contamination appears to be restricted in extent at this site, and this is the only reported occurrence of this pesticide compound in the entire RI. The 1998 analytical results do not explain the hydrocarbon sheen or odor that were observed, unless a carrier oil containing naphthalene (other than gasoline) is responsible for the sheen and odor. It is considered unlikely that the sediment contamination will spread far beyond its present localized extent. No further action is recommended at this site.

3.7 ST. MAKARIUS BAY DRUM DUMPS

Eighteen drum dumps were identified in the *Phase I RI Work Plan* in an area bounded by St. Makarius Bay on the south, Infantry Road on the north, Gash Road on the east, and a prominent south-trending stream valley on the west. This area, which is described herein as the St. Makarius Bay Drum Dumps, is situated in a rolling upland to the east of a broad, unnamed stream valley that drains southward to St. Makarius Bay (Photo 9). Essentially all of the drums that were stored or disposed in this area during WWII were removed during the 1986 Debris Cleanup. Reconnaissance and sampling were conducted at eight of these former drum dumps and in the streams that drain them during the 1997 Phase I RI. Results of sampling from impacted areas within the drum dumps in 1997 revealed highly elevated DRO concentrations, as well as VOCs and elevated concentrations of some metals. During the 1997 Phase I RI, three areas along tributary streams that drain the former drum dump area were noted to have been impacted by hydrocarbons, although chemical results from farther downstream indicated relatively low levels of DRO in stream water and sediment. Nevertheless, because of the impacted areas within the drum dumps and along the streams, the remaining ten drum dumps (plus two additional dumps identified during the reconnaissance) were evaluated during the Phase II RI. Additional surface water and sediment samples were also collected from the streams that drain the area.

Of the additional drum dumps investigated during 1998, five were found to have sufficient evidence of contamination during reconnaissance to warrant sampling for chemical analyses.

The ADEC "maximum allowable concentration" was exceeded for DRO in 1998 only at Drum Dump DM43 (Photo 10), whereas in 1997 it was also exceeded at Drum Dumps DM01, DM09, DM10, and DM11. DRO concentrations as high as 160,000 mg/kg have been reported among these drum dumps (in 1997). DRO concentrations in downstream surface water and sediment have ranged from 63 to 186 ug/L and 4 to 154 mg/kg, respectively, during 1997 and 1998. However, it is unclear if these relatively low concentrations are due to site contamination or biogenic hydrocarbons, since similar levels of DRO were detected in background samples. PAHs were detected in the soil samples from three drum dumps at levels below regulatory and risk-based criteria. The highest PAH concentrations were associated with the high DRO concentration in the sample from Drum Dump DM43. No PAHs were detected in the downstream sediment or surface water samples during 1997 or 1998.

The 53,400 mg/kg GRO and 1,091 mg/kg total of associated alkylated benzenes at Drum Dump DM50 (Photo 11) represent the highest concentrations of these compounds found during the RI. The GRO concentration at DM50 exceeds the ADEC 1,400 mg/kg "maximum allowable concentration." However, neither GRO nor fuel-related volatiles were detected in any surface water or sediment samples during 1997 or 1998.

Metals in soil at the drum dumps investigated during 1998 exceeded the most stringent pathway-specific ADEC cleanup levels in only a few instances. Elevated concentrations of antimony and lead at DM45, both exceeding their cleanup levels, are attributed to the inclusion of a fragment of a lead-acid battery in the sample. Several metals were detected in the downstream sediment samples, but the only exceedances of background concentrations were lead, nickel, and zinc downstream of Drum Dump DM50 (on the northern stream) and in the farthest downstream sampling location on the southern stream. Only the lead in the southern stream, and the zinc at both locations, exceeded the NOAA Effects Range-Low values for those metals. Drum Dumps DM11, DM43, and DM50 appear to be the probable sources for these metals in stream sediment. No occurrences of metals in the downstream surface water samples exceed risk-based screening criteria, nor do they appear to correlate to elevated levels of these metals in upstream drum dump soil samples.

The surface water and sediment samples collected during 1997 and 1998 provide data on all streams that drain the St. Makarius Drum Dumps area into the wetland to the west, and eventually into St. Makarius Bay. These data show that the impact on the wetlands from the 20 or so drum dumps in this area is limited to exceedances of the Effects Range-Low criteria for only two metals.

Although the soil in some of the drum dumps exceeds ADEC cleanup standards for several compounds, it does not appear that in the 50 years since WWII that these compounds have migrated to surface water or sediment at levels of concern. ADEC maximum allowable concentrations are exceeded for GRO at Drum Dump DM50, and for DRO at DM01, DM09, DM10, DM11, and DM43. However, in each case these exceedances are based on single samples biased to represent worst-case conditions. In addition, in each case the volume of soil represented by these samples is quite limited. In no case was pooled free product observed in

association with these samples, and the downstream water and sediment samples demonstrate that no significant migration has occurred from these source areas.

No further action is recommended either for the drum dumps or the streams in this area above St. Makarius Bay.

3.8 GENERATOR BUILDING EAST OF JONES LAKE

Reconnaissance during the 1997 Phase I RI of a possible transformer site identified a previously unknown site with the remains of a possible generator building (Photo 12). The site, which is located near the northeast corner of Jones Lake, included a rectangular water-filled pit that may have once held a UST. The site is located about 70 feet upslope from a small unnamed stream that drains Jones Lake to Constantine Harbor, approximately 2,000 feet to the northeast.

The objective of the Phase II RI investigation of this site was to characterize the extent of the hydrocarbon contamination originating in the water-filled pit. Samples were collected from the soil at the base of the pit, from a boring and monitoring well installed along the probable migration path between the pit and the stream, and from water and sediment in the stream. When the stream sediment was found to be impacted, two more sediment and water samples were collected: about 50 feet farther downstream, and 20 feet upstream from the stream's outlet across the beach at Constantine Harbor.

DRO was detected in the soil sample from the pit at 8,680 to 16,000 mg/kg (based on an original sample and a triplicate sample analyzed by the independent QA laboratory, respectively). The soil samples from the boring downgradient of the pit contained a maximum of 104 mg/kg DRO; the groundwater sample contained 397 ug/L, which is well below the ADEC groundwater cleanup standard of 1,500 ug/L. The sediment sample directly downslope from the pit contained DRO at 37 mg/kg, while the sample at the beach contained 13 mg/kg of DRO. The three surface water samples contained DRO at 76 to 115 ug/L, with the concentrations increasing in a downstream direction. These DRO concentrations in sediment and surface water may reflect at least some contribution by biogenic hydrocarbons in the DRO range, because they are consistent with levels of DRO found in surface water and sediment at uncontaminated background sites. The pit sample also had low levels of four alkylated benzenes and naphthalene; none exceeded the ADEC soil cleanup levels. No VOCs were detected in the other soil, sediment, groundwater, and surface water samples.

Six PAHs were detected at low concentrations in the soil sample from the pit; 15 PAHs were detected in the sediment sample from the stream location immediately downslope from the site, at a total concentration of 1.7 mg/kg. The benzo(a)pyrene concentration in this sample slightly exceeds the human health risk-based concentration; fluorene and phenanthrene slightly exceed the NOAA Effects Range-Low values for protection of benthic organisms. In contrast, no PAHs were detected in the sediment sample from approximately 50 feet downstream, and six were detected in the sediment sample near the beach (total concentration 0.07 mg/kg). Only one PAH

(fluorene) was detected in the groundwater sample. No PAHs were detected in the surface water samples.

The levels of metals detected in soil and sediment samples fall below or only slightly above the 1997 background concentrations for the island. The metals detected in the groundwater and surface water samples are all below background levels with the exception of antimony in groundwater.

While the soil in the pit has been heavily impacted with DRO, the contamination essentially ends within 60 feet downgradient of the pit. Based on test results from the monitoring well, groundwater 60 feet downgradient of the pit is slightly impacted with DRO. The DRO appears to be migrating to the stream and has resulted in low levels of contamination in the surface water and sediment adjacent to the site. Three PAHs are the only constituents that slightly exceed risk-based cleanup criteria, and these constituents were not detected a short distance downstream. Low levels of PAHs detected near the stream outlet at Constantine Harbor do not appear to be related to the contamination at the Jones Lake Generator Site (given the presence of a "clean" sample between these two locations). In any case, they are not at a concentration likely to cause ecological impacts.

There is no reason to expect accelerated migration of contaminants beyond that which has occurred during the past 50 years. No further action is recommended at this site.

3.9 SUSPECT BUILDING ST10

Suspect Building ST10, thought to be a former WWII motor pool garage, is located about 200 feet north of the northeast corner of Clevenger Lake. During the 1997 Phase I RI, stressed vegetation was observed in a poorly drained area at the base of the sandy bluff, about 100 feet west-southwest of the former motor pool garage location (Photo 13). A 6-inch-deep hole exposed green-gray sand that had a moderate to strong hydrocarbon odor and a PID headspace reading of 40 ppm. It was speculated that the green color was the result of dye in gasoline. The objective of the Phase II RI investigation of this site was to confirm the presence or absence of hydrocarbon contamination at the location observed in 1997, and determine the potential of downstream impacts.

During the Phase II RI, a soil sample was collected from the green-gray sand. Surface water and sediment samples were collected from a drainage depression leading west from this site and from seeps on the shore of Clevenger Lake that are inferred to be the end of a combined surface/subsurface drainage path from the site.

The soil sample from the gray-green sand contained no GRO, but contained 191 mg/kg DRO and as much as 3,100 mg/kg RRO (triplicate analyses were performed). These samples also contained low concentrations of four to six PAHs and toluene. Only the DRO in the replicate sample exceeded the most stringent pathway-specific ADEC soil cleanup criterion. Arsenic

exceeded both the background concentration and the ADEC soil cleanup level; lead and zinc exceeded background but not their cleanup standards.

Surface water and sediment samples collected downstream from the site contained much lower concentrations of organic constituents. DRO was reported at 53 mg/kg in the Clevenger Lake sediment sample, and at 84 and 157 ug/L in the two surface water samples. These low levels of DRO are comparable to levels of biogenic hydrocarbons found in the 1997 Phase I RI background samples. The Clevenger Lake sediment sample also contained 0.14 mg/kg toluene. The sediment sample from the drainage trench west of the site contained a total concentration of 0.47 mg/kg of nine PAHs. No VOCs or PAHs were reported in the water samples. Similarly, the metals detected in these samples were at or below their corresponding background concentrations, with a few exceptions. Zinc concentrations were slightly elevated above background in both sediment samples, and were slightly higher than the NOAA Effects Range-Low values for zinc in sediment. The lead in the sediment sample from the drainage trench was about double background, but lower than the NOAA Effects Range-Low value and much less than the concentration reported in the green-gray sand. Metals concentrations in water were at or below background except for antimony in Clevenger Lake, and chromium and lead in the drainage depression; none of these metals exceeded surface water quality criteria.

The diesel, heavy oil, and metals contamination found in the green-gray sand appears to be localized. Slightly elevated metals levels in the downstream water samples may be related to the site, but Clevenger Lake does not appear to be significantly impacted. No further action is recommended at this site.

3.10 ST. MAKARIUS BAY LANDFILL

The St. Makarius Bay Landfill is a WWII disposal site on the bluff overlooking St. Makarius Bay that contains a variety of metal debris and ordnance. In 1993 the USFWS observed leachate on the beach at the toe of the bluff. Debris extends approximately 400 feet along the toe of the bluff, and also into the intertidal zone as a result of large slump blocks that have fallen from the bluff face (Photo 14). Elevated levels of cadmium, chromium, and lead were detected by the USFWS in a sediment sample collected in 1993 downgradient from the leachate seeps. Foster Wheeler Environmental Corporation conducted a Site Inspection of the St. Makarius Bay Landfill for the USFWS in 1995, and found elevated concentrations of chromium, nickel, arsenic, and lead in a soil sample from the base of the bluff. One tide pool surface water sample contained cadmium, copper, zinc, arsenic, lead, and mercury above the Phase I RI surface water background concentrations. Copper, lead, and zinc concentrations were significantly higher than background, at 6,400 ug/L, 1,200 ug/L, and 1,700 ug/L, respectively. The anomalously high concentrations of these metals were the primary reason that additional sampling was conducted during the 1998 Phase II RI. Based on their analytical work, Foster Wheeler concluded that organic compounds were not present at significant levels at this site.

Samples were collected in 1998 from each potentially contaminated media, including surface/groundwater seeps from the face of the bluff, groundwater seeps from the base of the

bluff, soil slumped from the bluff, water (and associated sediment) seeping through the debris on the beach, and tide pool water and sediment (Photo 15). Ordnance compounds were analyzed, but not detected, in water and sediment. Metals were the only other COPC for the 1998 Phase II RI.

It was concluded that metal debris piled on the beach and scattered in the intertidal zone has resulted in concentrations of some metals that are above both background levels and ecological risk-based screening concentrations in seep surface water and sediment, and in marine surface water and sediment. While some of this contamination may be transported via water from the landfill on top of the bluff, it appears that the majority of contamination is being transported via water filtering through the large slump block on the beach that contains a large quantity of rusted metal debris.

Ecological risk-based screening comparisons show that only copper, lead, and silver are present in surface water at concentrations that exceed both background and ecological screening concentrations. Ecological exceedances are most notable below the debris pile and in the tide pool downgradient of this pile. The finding of copper and silver at concentrations above ecological risk-based screening concentrations in a deep bedrock groundwater seep suggests that these metals may be naturally occurring in the bedrock. The location of this seep makes it more likely that it is deeper groundwater from farther inland that is discharging at the coast line, rather than water that has passed downward through the near-surface landfill debris at the top of the bluff. The 1997 Phase I RI did not characterize background concentrations of metals in the bedrock aquifer, so these occurrences at this site may not be site-related.

The water samples collected during the 1998 Phase II RI did not confirm the anomalous levels of copper, lead, and zinc reported by Foster Wheeler in 1995. This disparity suggests that the 1995 data were either the result of inadvertent incorporation of sediment into the water sample, or the collection of nearly stagnant water that had equilibrated with sediment containing very high concentrations of these metals.

Ecological risk-based screening results for the sediments suggest that copper, zinc, and lead may be present in sediments at ecologically significant concentrations, based on exceedances of NOAA Effects Range-Median values. Cadmium, mercury, nickel, and silver are less significant, exceeding only the Effects Range-Low value. However, not all of the samples that exceed the ER-L or ER-M also exceed background concentrations; thus the screening concentration exceedances may not all represent site-related contamination. Only the cadmium and zinc in the tide pool downgradient of the debris pile, and copper, lead, mercury, and nickel concentrations in the tide pool that is not downgradient of the debris pile, also exceed background concentrations.

The analytical results suggest that the majority of contamination at the St. Makarius Bay Landfill is being leached from the large metal debris slump by surface water or shallow groundwater that surfaces on the bluff face and then filters through the slump. Determination of the Simultaneously Extracted Metals/Acid Volatile Sulfides (SEM/AVS) ratio suggests that cadmium, copper, lead, mercury, nickel, and zinc are bound to the sediments, and not readily bioavailable.

The 1998 Phase II RI data demonstrate that the potential ecological impact from the St. Makarius Bay Landfill is not as great as previously feared. It was demonstrated that the highly elevated 1995 surface water results for copper, lead, and zinc were probably incorrect. Only a limited number of metals in the 1998 surface water and sediment samples exceed both background values and ecological risk-based screening concentrations. The concentrations of metals in water samples from the tide pools are probably diminished greatly in the water of the bay when the tide is up. Similarly, while copper, lead, and zinc exceeded Effects Range-Median values in tide pool sediment, the high-energy environment of the bay is unlikely to result in ecologically significant accumulation of these metals. The SEM/AVS analysis suggests that these three metals are bound and not bioavailable. Based on these conclusions, no further action is recommended at this site.

3.11 BATTERY DUMP

Six lead-acid batteries were discovered during the 1997 Phase I RI near a small pond in the Base Camp area near the head of Constantine Harbor. One battery was in the small pond, and the remaining five were in an adjacent marshy area (Photo 16). The pond is a shallow water feature with no surface water outlet, perched in a small enclosed basin about two acres in size. The primary goal of the 1998 Phase II RI was the removal for recycling of these post-WWII batteries. A sediment sample and surface water sample were collected for analysis for lead from the marshy area, about 5 feet away from the closest battery.

The sediment sample contained 65 mg/kg lead, about four times the background level. It also contained levels of lead, nickel, and zinc that exceed background and are 1.5 to 2 times greater than the NOAA Effects Range-Low values protective of benthic organisms. The chromium concentration exceeds both background and the most stringent pathway-specific ADEC cleanup level. However, besides lead, only zinc is commonly associated with lead-acid batteries, so the source of the elevated levels of the other metals is unknown.

The surface water sample contained 532 ug/L of lead, which was not detected in any of the 1997 background surface water samples. This level of lead exceeds all surface water comparison criteria, but is not unexpected considering the batteries were in contact with this water. However, the source has now been removed, and it is likely that the level of contamination diminishes rapidly with distance from the former source. No further action is recommended at this site.

3.12 SOUTH BIGHT LANDFILL

A UXO subcontractor working for Shannon & Wilson, Inc. during the 1998 field effort observed a hydrocarbon release at the beach below the South Bight Landfill. After the release was confirmed and reported to the Corps of Engineers, investigation of leachate from the debris was added to the scope of the Phase II RI. This site is on the beach below South Bight Quarry, which was previously an unexploded ordnance (UXO) demolition area. In 1993, the USFWS

noted the presence of debris dumped over the bluff face southwest of the quarry. UXO was noted mixed with the debris at the toe of the bluff in 1998. It appears that during or after the war, scrap metal and munitions were dumped over the edge of the bluff. Some of this debris is now scattered down the face of the steep bluff (Photo 17), but much of it has slumped and is piled on the beach below (Photo 18). Relatively little debris has been washed into the intertidal area compared with the conditions observed at the St. Makarius Bay Landfill. Most of the debris on the beach is found within about a 250-foot-wide stretch of beach.

The scope of the 1998 Phase II RI investigation of this site was primarily to determine the potential impact of the seep on the marine environment. Ordnance compounds were also analyzed, but not detected, in water and sediment. Two seep water samples and one seep sediment sample were collected at the toe of the bluff downslope from the largest debris pile, but above the beach gravel. A tide pool water and sediment sample were also collected downgradient of the debris pile.

No seeps were noted on the face of the bluff above the debris pile. However, water was seeping from the debris pile, possibly originating from shallow subsurface water filtering through the slump, from deeper groundwater, or a combination of both. A slight hydrocarbon sheen and black discolored soil were noted at the seeps during the initial reconnaissance of the site. The surface water and sediment below the debris pile contained 1,110 ug/L and 1,990 mg/kg DRO, respectively. Low levels of fuel-related alkylated benzenes and PAHs were also present in these samples. The 1,110 ug/L DRO in the seep water at one location does not exceed the ADEC groundwater cleanup level, although the DRO concentration in sediment exceeds the ADEC cleanup level for the migration to groundwater pathway. The absence of BTEX compounds, and the low level of PAHs, results in no exceedance of ADEC surface water criteria for total aromatic or total aqueous hydrocarbons. The only exceedances of ecological risk-based screening criteria for the organic compounds detected in the sediment were fluorene at a slightly higher concentration than the Effects Range-Low value, and a naphthalene concentration midway between the Effects Range-Low and -Median values. The tide pool sediment and water are unimpacted by organics, with the exception of the reported occurrence of 2.4 ug/L of PCE in the water sample; this concentration is well below the Ambient Water Quality Criterion. Since this compound was not reported in the sediment or seep water uphill of this tide pool, it is difficult to attribute a source to the PCE.

Concentrations of several metals exceed background concentrations in surface water and sediment samples below the debris pile. However, none of the metals that exceeded background concentrations in surface water or sediment exceeded their respective ecological risk-based screening concentrations in the tide pool downstream of the debris pile.

Although the data suggest that some organic chemicals from the seep may be released to the intertidal environment, it is unlikely that the detected concentrations would result in any significant ecological effects, especially given the volume of the receiving water in South Bight. Similarly, the concentrations of metals found in tide pool water and sediment do not appear to pose a significant risk, since those that exceed background concentrations do not exceed risk-based benchmarks. No further action is recommended for this site.

3.13 KIRILOF POINT SEEPS

A brief reconnaissance was conducted of the Kirilof Point Seeps area during the 1998 Phase II investigation to evaluate whether site conditions had changed appreciably since the 1997 investigation. A key element of this reconnaissance was to look for evidence of changes in the amount of visually obvious surface water contamination in the stream, wetland, seeps, and beach area. Such changes were considered possible because considerably greater rainfall occurred during and immediately preceding the 1998 field work than had occurred during the 1997 field investigation. This reconnaissance had also been requested by the USFWS because of their 1993 observation of "pure diesel gushing" from a "fracture"; this had not been observed during 1995 or 1997, nor was it observed in 1998. In spite of considerably more rainfall and higher surface water in 1998, there was no evidence to suggest that groundwater discharge was any greater in this area than was observed in 1997. The oil seeps were flowing at a comparable or slower rate than in 1997, and there was no visible groundwater discharge (oily or otherwise) elsewhere in the site vicinity. Thus, the observations and conclusions provided in the Phase I RI and risk assessment regarding the amount of contamination reaching the marine environment have been qualitatively substantiated during somewhat different environmental conditions.

3.14 SUSPECT BUILDING ST01

Although this site, which was supposed to have been a former generator building, was targeted for reconnaissance during the 1997 Phase I RI field work, the field team misidentified the site and investigated a nearby building site instead. Only reconnaissance was scheduled here during the 1998 Phase II RI. The correct location was found, but no evidence of visible contamination or stressed vegetation was observed. Nor was any evidence found during this reconnaissance to suggest that this location had once been occupied by a generator building. No further action is recommended for this site.

3.15 1986 DISPOSAL AREAS

Six sites used for debris disposal during the 1986 Debris Cleanup were investigated during the 1998 Phase II RI. These disposal areas, which were reconnoitered in 1997, typically contain large mounds of debris that were placed onto the ground surface (often a bedrock surface in a borrow area), covered with soil, and revegetated. The focus of the 1997 Phase I RI reconnaissance was to locate and describe each of these sites and to look for visible evidence of contamination; no evidence of contamination or of surface water leachate was identified at any of the six sites. However, since the 1997 field work was conducted during June when rainfall and surface water levels were low, further reconnaissance of the sites was planned for the 1998 Phase II RI, to look for evidence of surface water leachate during a wetter season.

All six of the disposal areas (shown in Figure 2-1) were revisited in 1998 to look for evidence of contamination and leachate. Although considerably more surface water was present than during

the 1997 site visits, there was no evidence of leachate (or other contamination) issuing from the disposal mounds, with the exception of Disposal Area DA04. Disposal Area DA04 is located in a former rock quarry northwest of Jones Lake. Vertical bedrock walls bound the southern and northern sides of the quarry. Drainage from the quarry and debris area flows toward a stream channel northwest of the disposal area (Photo 19), passes under Earle Road, and eventually into Jones Lake.

The surface water sample from the intermittent stream draining this disposal area was analyzed for a broad range of compounds. DRO was detected at 74 ug/L, which is comparable to DRO levels in background samples that are attributed to biogenic hydrocarbons rather than fuel constituents. The only other organic compound detected (besides a suspected laboratory contaminant) was the pesticide endrin aldehyde, at 0.165 ug/L. No regulatory or risk-based criteria presently exist for this compound. Only chromium and lead were present at concentrations exceeding surface water background concentrations; neither metal was detected in 1997 background surface water samples. Concentrations of both were below the ADEC surface water quality standards.

Based on the findings of both the 1997 and 1998 work, none of the 1986 Disposal Areas appear to pose a risk of contamination. Surface water was found migrating from a disposal area only at DA04. The compounds leaching from this disposal area are doing so at very low concentrations, and based on field observations over two field seasons, only during or following periods of heavy rainfall. No further action is recommended for the 1986 disposal areas.

3.16 UST SITES

During the 1997 Phase I RI, nine sites were identified that contained potential or known underground storage tanks (USTs). These sites were selected for further investigation during the 1998 Phase II RI so that any contents remaining in the USTs could be identified and removed, if possible. ADEC personnel identified an additional possible UST site near Banjo Point during the 1998 field work. This newly identified site was also investigated during the 1998 field work, for a total of ten sites.

During the 1998 Phase II RI, each of the ten sites was excavated with a backhoe or by hand, as appropriate, to confirm the presence or absence of a UST, and to obtain access to it to determine the presence and nature of contents. Only one of the three known USTs was found to contain petroleum. About 120 gallons of diesel fuel was removed from this tank and recycled. Among the seven suspected UST sites that were investigated, only one was found to be a tank, and it was empty. The UST investigations conducted during the Phase II RI resolved the status of all known or suspected WWII USTs on Amchitka. No further action is recommended at these UST sites.

The only USTs with contents known to remain on Amchitka are the two non-FUDS-eligible buried railroad tank cars at the Hot Mix Plant. These tanks are thought to have been used by the AEC and/or Navy.

3.17 DRUM SITES

Based on the results of the Phase I RI, seven drum sites were identified as locations where product was either known or suspected to be present in deteriorating drums, and therefore posing a threat of product release to the environment. The objectives of this component of the Phase II RI was to identify where product remained in drums, characterize any liquids found (visually and analytically if necessary), and to remove and recycle the product at an off-island facility. Six of the drum sites identified for further work were located at Bird Cape, and the seventh was located in Base Camp near Kirilof Wharf.

During the Phase II RI, the remaining accessible drums at Bird Cape and the site near Kirilof Wharf were investigated, and their petroleum product contents were removed and recycled. A total of about 400 gallons of diesel fuel and lubricating oil were recovered. At Bird Cape Drum Group BI05, about 8 gallons of motor oil sludge were recovered from the ground surface using absorbent spill pads. No product-containing WWII drums are known to remain on Amchitka. No further action is recommended for these drum sites.

3.18 UXO SITES

During both the 1997 and 1998 RI field efforts, an Unexploded Ordnance (UXO) Supervisor accompanied each field team conducting reconnaissance or sampling activities. The primary duty of the subcontracted UXO Supervisors was to ensure the safety of the field team members from UXO. A second duty was to achieve the Data Quality Objective (DQO) to identify the presence of UXO or ordnance and explosive waste (OEW) that might present a hazard to future workers on the island. In spite of at least three field seasons of explosive removal and demolition work on Amchitka, the UXO subcontractor noted six sites with UXO/OEW, some of them previously unknown, during the 1997 Phase I RI. During the 1998 Phase II RI, the UXO Supervisors documented several new sites, and observed changed conditions at previously identified sites. Wave action has removed hazardous ordnance at St. Makarius Bay Landfill. At Bird Cape, the opposite occurred, and three new high explosive items are now exposed (Photo 20). The presence of UXO was also confirmed on the beach at South Bight Landfill (Photo 21). Since the primary responsibility of the UXO Supervisors was to accompany environmental sampling teams, their findings cannot be construed as the results of a comprehensive search for UXO/OEW. No physical barriers or institutional controls are currently in place to limit the exposure of island visitors to UXO/OEW.

4.0 SUMMARY

The first phase of the Remedial Investigation of WWII-era FUDS on Amchitka Island, conducted during 1997, accomplished its DQOs of evaluating the risk posed by the two most visibly contaminated sites and conducting preliminary source evaluations at all other identified sites that could be found. Based on that work, a limited number of sites were identified for further evaluation, and a consensus was reached between the Corps, USFWS, and ADEC on the conclusions of the Phase I RI and the scope for the 1998 Phase II RI.

The 1998 Phase II RI met its DQOs of both characterizing the extent of contaminated media and estimating the potential risk posed by that contamination. This latter goal was accomplished by collecting samples of downstream surface water and sediment to determine whether the contamination is migrating to downstream receptors at levels of concern.

As described in this *Site Screening Memorandum*, although the source areas were found to contain some compounds in excess of applicable cleanup or risk-based screening levels, the contaminated areas were found to be limited in extent. In the downstream surface water and sediment, various compounds were reported at concentrations in excess of applicable risk-based screening criteria, but the degree of exceedance was generally not great. In most cases, sufficient data were obtained to confirm that the downstream extent of contamination was limited, resulting in limited or no impact to the ultimate receiving waters in the marine environment. No further action is recommended at these sites

Investigation of drum sites and known and suspected UST sites during the 1998 Phase II RI resulted in the removal of several hundred gallons of fuel and lubricating oil from the island for recycling. No product-containing WWII drums are known to remain on Amchitka, and the status of all the known or suspected WWII USTs on Amchitka has been resolved.

This 1998 sampling completed the investigation of all FUDS on Amchitka to the extent agreed to between the Corps, USFWS, and ADEC. It is concluded that the two phases of this Remedial Investigation, when considered together, constitute a thorough investigation of the known FUDS on Amchitka, and an adequate evaluation of the potential risk they pose to human health and the environment.



Photo 1: Tanks 11 and 12 site, standing near Tank 10 facing northeast. Tank 12 setting and wetland at center, Lake Grace at center right.



Photo 2: Tanks 11 and 12 site, beach at stream mouth, surface water samples collected from pools in intertidal area.



Photo 3: Tanks 16 and 19 site, north side of Tank 19 where three soil borings were drilled.

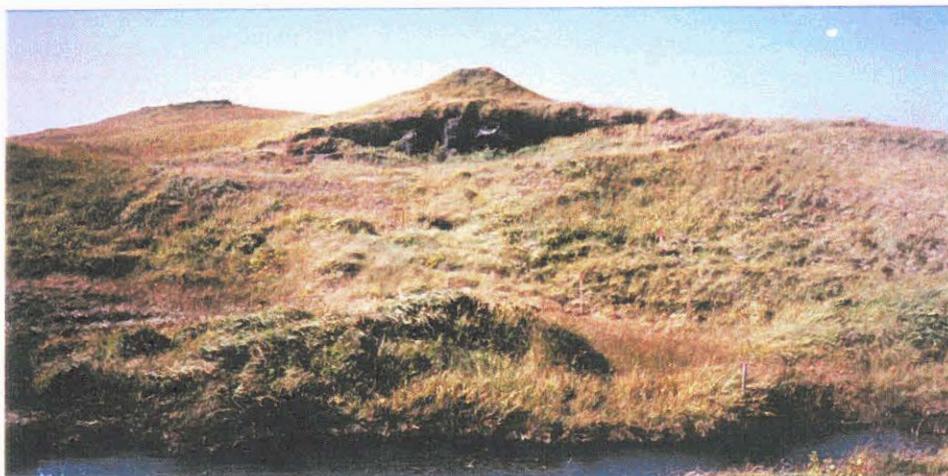


Photo 4: Tanks 16 and 19 site, facing northwest toward Tank 16 setting. Location where five soil borings were drilled, pipeline trench full of standing water in foreground



Photo 5: Setting of POL site at base of bluff southeast of Fox Runway; Constantine Harbor at upper right. Site is just right of center of photo, immediately below intersection of two pipe trenches, just hidden by bluff in foreground.



Photo 6: POL pipeline site east of Bomb Ready Area, standing at upstream sampling location facing north, view of stream channel extending toward Constantine Harbor.



Photo 7: View downstream of stream crossing of four, 6-inch pipes east of the FIDO Pump Station. Note deteriorated condition of closest pipe.



Photo 8: Fill Stands FS01 and FS02 site, view west from Nashville Runway, site overview and FS01.



Photo 9: St. Makarius Drum Dumps site, view looking south toward valley where streams draining the drum dumps converge and flow to St. Makarius Bay.



Photo 10: Drum Dump DM43, area of stressed vegetation and circular depressions. This drum dump had the highest concentration of DRO: 21,500 mg/kg.

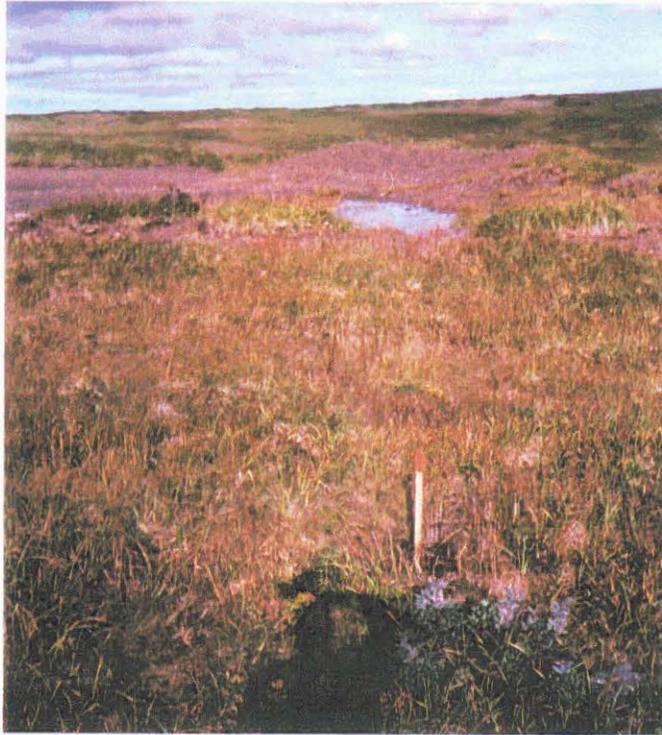


Photo 11: Drum Dump DM50, facing west. Stake in foreground was sample collection location with the highest concentration of GRO: 53,400 mg/kg.



Photo 12: Jones Lake Generator Building site, view facing east. Suspected former UST pit in foreground, concrete pad of generator building beyond. Stream in middle background, flowing to left.



Photo 13: Suspect Building ST10 site facing southwest. Building foundation in middle foreground, Clevenger Lake in background. Gray-green sand area is near center right edge of photo; surface water drainage path goes around base of bluff at upper right.



Photo 14: St. Makarius Bay Landfill site, standing on beach facing inland, debris visible on beach, sampling Station 5 on slump block in background.



Photo 15: St. Makarius Bay Landfill site, looking east along beach from west of the landfill, view of intertidal area. Slump block at left center.

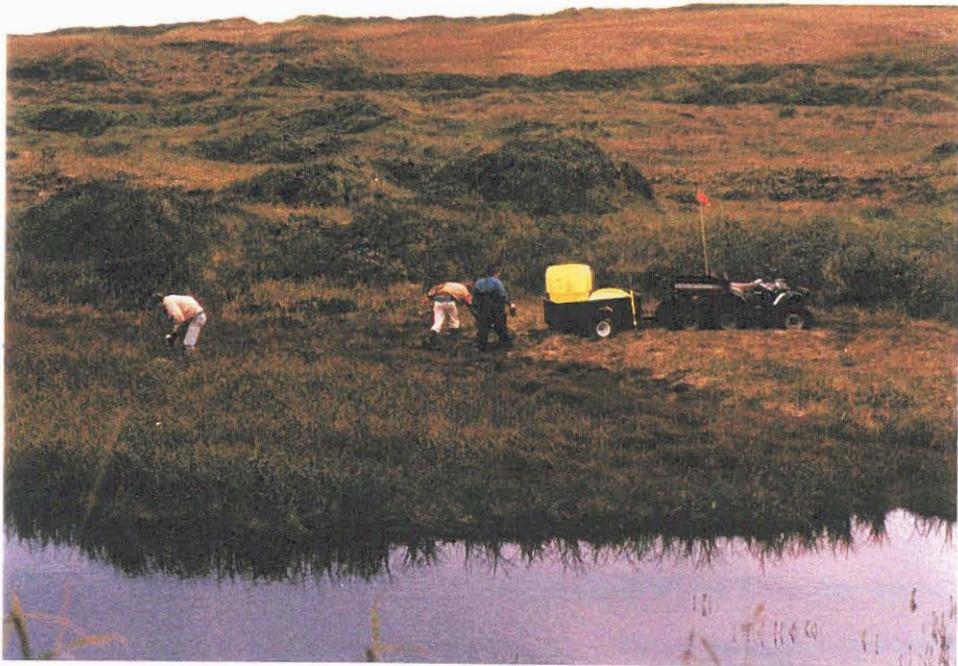


Photo 16: Battery Dump site facing northeast, removing batteries from marshy area.

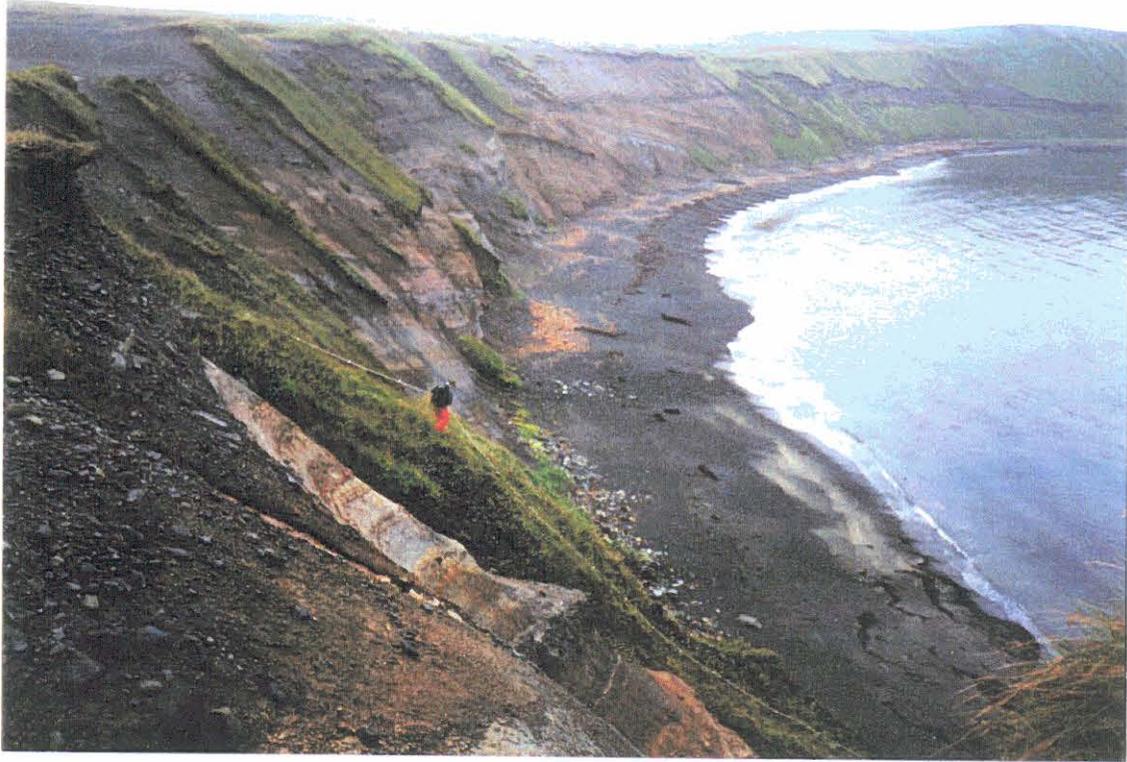


Photo 17: South Bight Landfill, view from top of bluff.



Photo 18: South Bight Landfill, beach to the east of landfill.



Photo 19: View east toward Disposal Area DA04 (in background, upper right) from stream (foreground) that runs in valley west of disposal area; sample was collected from stream.



Photo 20: Bird Cape, view west to parking area from stream north of parking area. In bottom right corner above grass is 81mm mortar that eroded from the sand bank since 1997.



Photo 21: Beach at South Bight Landfill. Close-up of M54 incendiary bomblet resting on deteriorated lead-acid battery.