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PORT HEIDEN RRS
ALASKA

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 04

UNITED STATES AIR FORCE
611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

FINAL
PRELIMINARY ASSESSMENT/SITE INSPECTION
PORT HEIDEN RADIO RELAY STATION
PORT HEIDEN, ALASKA

MARCH 1996

FINAL
PRELIMINARY ASSESSMENT/SITE INSPECTION
PORT HEIDEN RADIO RELAY STATION
CONTRACT NO. DACA85-93-D-0013
DELIVERY ORDER NO. 0020

Prepared for

United States Air Force
611th Air Support Group
611th Civil Engineer Squadron
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Project 55210-020 000 Task 8

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ACRONYMS

AAC	Alaskan Air Command
AC&W	Aircraft Control & Warning
ADEC	Alaska Department of Environmental Conservation
AFB	Air Force Base
AOC	area of concern
AT&T	American Telephone & Telegraph
bgs	below ground surface
BLM	Bureau of Land Management
BTEX	benzene, toluene, ethylbenzene, and xylenes
611 CES	611th Civil Engineer Squadron
CERCLA	Comprehensive Environmental, Restoration, Compensation and Liability Act
C&G	Chemical and Geological Laboratory
COE	U S Army Corps of Engineers
cy	cubic yards
DERP	Defense Environmental Restoration Program
DEW	Distant Early Warning
DOD	Department of Defense
DRO	diesel-range organics
FAA	Federal Aviation Administration
FID	flame ionization detector
GRO	gasoline-range organics
HVOCs	halogenated volatile organic compounds
IRP	Installation Restoration Program
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MAP	Management Action Plan
MSRU	mobile soil remediation unit

NCP	National Contingency Plan
ND	not detected
NFRAP	No Further Response Action Planned
NPDL	North Pacific Division Laboratory
NWES	Northwest EnviroServices, Inc
PA/SI	preliminary assessment/site inspection
PCBs	polychlorinated biphenyls
PID	photoionization detector
POL	petroleum, oil, and lubricants
ppb	parts per billion
ppm	parts per million
QA	quality assurance
QAR	quality assurance report
QC	quality control
RCA	Radio Corporation of America
RRS	Radio Relay Station
TPH	total petroleum hydrocarbons
UC&AI	Underwater Construction & Associates, Inc
USAF	U S Air Force
USEPA	U S Environmental Protection Agency
UST	underground storage tank
WACS	White Alice Communications Sites
WWII	World War II

SUMMARY

A Preliminary Assessment/Site Inspection (PA/SI) was conducted for the U S Air Force (USAF) by EMCON Alaska, Inc (EMCON), at the former Radio Relay Station (RRS), Port Heiden, Alaska The RRS was located on the north side of the Alaska Peninsula approximately 400 air miles from Anchorage In previous EMCON reports, RRSs were known as WACS (White Alice Communication Sites) Interviews, regulatory file reviews, aerial photograph reviews, and a site inspection were conducted to determine the potential environmental liabilities at the site The site inspection included both field screening with a photoionization detector (PID) and soil sampling for diesel-range organics (DRO), gasoline-range organics (GRO), and total petroleum hydrocarbons (TPH)

From 1981 to 1992, the USAF, U S Army Corps of Engineers (COE), and contractors to the COE have conducted site restoration and remediation at the RRS Soil cleanup concentrations for soil contaminants were designated to be 5,000 parts per million (ppm) TPH in remote areas of the Port Heiden site, 100 ppm TPH at sites near populated areas (e g , AOC06), and 25 ppm for polychlorinated biphenyls (PCBs)

The USAF has divided the RRS into one installation restoration program (IRP) site and eight areas of concern (AOCs) A summary of findings and recommendations for each site are described below

IRP site OT001 (composite building and associated White Alice Arrays) From 1981 to 1990, contaminated soil and hazardous materials were removed from OT001 PCB- and TPH-impacted soil were excavated and remediated, or landfilled. In 1990, asbestos was removed from the composite building and landfilled at AOC07 (Landfill A) Confirmation sample analytical results indicate that TPH- and PCB-impacted soil above the cleanup levels of 5,000 ppm and 25 ppm respectively, have been removed from the site No further action is recommended at site OT001

AOC01 (black lagoon) Southwest of OT001 is a petroleum waste area named the black lagoon Petroleum wastes were piped from the composite building and discharged to this area Soil sample analytical results indicate that there are approximately 4,000 cubic yards (cy) of TPH-impacted soil above the 5,000 ppm cleanup level Analytical results of EP TOX metals were not detected (ND) and PCBs were detected below the cleanup level of 25 ppm Remediation of this soil is recommended to meet the TPH cleanup level

AOC02 (gray lagoon) Results from samples collected in 1990 and 1995 indicated TPH concentrations above the 5,000 ppm cleanup level The impacted area contains approximately 100 to 150 cy of impacted soil above the cleanup level TPH and DRO analytical results have been detected up to 15,000 ppm and 9,250 ppm, respectively Remedial action is recommended for AOC02

AOC03 (heliport) This area may have been used for fuel storage to re-fuel helicopters Three trenches for soil sampling were dug in areas of the heliport with sparse vegetation PID readings and field observations did not detect the presence of petroleum or other contaminants No further action is recommended for this AOC

AOC04 (septic tank and outfall) The septic tank was removed in 1990 In 1995, a soil sample was collected from the septic outfall area and analyzed for DRO, GRO, TPH, and benzene, toluene, ethylbenzene, and xylenes (BTEX) Analytical results were detected at DRO - 164 ppm, GRO - 10 ppm, TPH - 212 ppm, and BTEX - ND The DRO concentration was due entirely to biogenic material eluting in the diesel range No further action is recommended related to the septic outfall area Additional investigation is recommended in the former septic tank vicinity

AOC05 (fuel pipeline) The fuel pipeline extended from the composite building to the petroleum, oil, and lubricants (POL) tanks about 4 miles southwest of the composite building The pipeline from the POL tanks to the airport was transferred to Reeve Aleutian Airways The pipeline between the airport and the former composite building has been dismantled The pipeline corridor has not been evaluated for potentially impacted areas A site inspection and soil sampling are recommended along the pipeline corridor

AOC06 (POL tank farm) The tanks were removed and landfilled in 1990 From 1990 to 1992, approximately 10,000 tons of soil was removed and remediated from AOC06 The impacted soil was thermally remediated and backfilled into the excavation Confirmation samples collected at the limits of the excavation indicated that there were TPH analytical results from the northwest part of the excavation above the 100 ppm cleanup level for this site Free product was also observed in the bottom of the excavation During a 1995 SI, approximately 15 to 20 feet of the shoreline appeared to have eroded since the excavation work was completed Additional investigation is recommended for AOC06, however, the eroding shoreline may prevent additional work

AOC07 (Landfill A) Landfill A is located east of the former composite building The landfill contains various scrap metal and debris from the composite building and an asbestos cell within the landfill Part of the landfill cap contains a 6-inch lift of petroleum-impacted soil below 5,000 ppm TPH and less than 10 ppm PCBs The cap is intact and the vegetation has taken hold No erosion problems were observed It is recommended that an asbestos sign be posted at the landfill and a closure report be submitted to the Alaska Department of Environmental Conservation (ADEC)

AOC 08 N-E?

AOC08 (Landfill B) Landfill B is located about ½ mile south of the airport The landfill is well vegetated and there is no evidence of breaches to the cap The landfill contains various scrap metal and other debris from Port Heiden It is recommended that a landfill closure report be filed with ADEC

1 INTRODUCTION

EMCON was retained by the COE, Alaska District, under Contract No DACA85-93-D-0013, Indefinite Delivery Architect-Engineer Contract for Investigations and Remediation for the U S Army Corps of Engineers Hazardous, Toxic, and Radiological Waste Program, Various Locations, Alaska Delivery Order No 0020 authorized EMCON to conduct PA/SI activities in areas of former and existing facilities related to the former USAF WACS at Port Heiden, Alaska This site is now referred to as the Port Heiden RRS

1.1 Objectives

The objectives of this Delivery Order are to review previous remediation and restoration documentation related to the Port Heiden RRS, conduct a site inspection, compile all documentation into a PA/SI report, and develop a Management Action Plan (MAP) The MAP is a comprehensive and consolidated plan that summarizes the status of an installation's environmental program and provides long-range strategies and schedules for environmental restoration-related compliance efforts The MAP for this site is being developed under separate cover

Based on the findings of this report and the MAP, this site will be considered for inclusion in the USAF IRP The IRP is a Department of Defense (DOD) program that identifies, assesses, and remediates environmental contamination at military sites The program is the DOD's response to the Comprehensive Environmental Response, Compensation , and Liability Act (CERCLA), which requires that all federal agencies fully comply with its procedural and substantive requirements

The objectives of the IRP are

- Identify past hazardous waste disposal and spill sites
- Assess threat to human health and the environment
- Develop remedial action consistent with the National Contingency Plan (NCP) (40 CFR Part 300)

1.2 RRS Background

From 1950 through 1959, 18 Aircraft Control and Warning (AC&W) and 12 Distant Early Warning (DEW) line radar stations were constructed throughout Alaska These numbers include an Aleutian segment of DEW line stations consisting of the main station at Cold Bay, and auxiliary stations at Port Heiden, Port Moller, Cape Sarichef, Driftwood Bay, and Nikolski

The USAF Alaskan Air Command (AAC) commissioned American Telephone & Telegraph (AT&T) to develop a reliable communications system for all of Alaska (including the Aleutian Islands) that would "tie into" the DEW line and AC&W radar systems AT&T developed a tropospheric scatter system "which bounced radio signals off the troposphere" (Cloe and Monaghan, 1984) Western Electric Company was commissioned to begin construction of the system in 1955 and completed it in the early 1960s In 1969, the sites were designated as RRS

The communications system was managed by the USAF until January 1971 when management responsibilities were transferred to Radio Corporation of America (RCA) which later formed RCA Alascom RCA Alascom operated the sites until they were replaced by satellite communications in 1981 No longer in use, the sites were returned to the AAC for disposal The Aleutian segment of RRS was operational in 1961 and deactivated by 1978

1.3 Site Location and History

The site is located on the north side of the Alaska Peninsula approximately 400 air miles southwest of Anchorage The population of Port Heiden is approximately 126 people The population of Meshik is approximately 10 (CH2M Hill, 1994) Due to soil erosion and surface subsidence, many Meshik residents have moved to Port Heiden The USAF property consists of the RRS and a former POL tank farm (Figure 1) The RRS was initially constructed as a DEW line station within the boundaries of Fort Morrow, an Army Air Corps Base during World War II (WWII) The RRS (Figure 2) consisted of a composite building with dormitories, office space, storage space, garage, standby power generation equipment, four billboard antennas and feed horns (White Alice arrays), heliport, septic system, and waste POL collection pits (referred to as the black lagoon) (CH2M Hill, 1994)

A POL tank farm was located approximately 4 miles southwest of the RRS site in the village of Meshik The POL distribution system consisted of two large aboveground tanks, a pumphouse, and piping Fuel was distributed through piping from the tank farm pumphouse to the RRS The tanks were refueled by barge through piping located along the beach which extended to the tanks

Documentation concerning site-specific activities during operation of the Port Heiden RRS does not appear to exist However, documentation is available related to site restoration, demolition, and environmental assessment activities that occurred between 1981 and January 1994

1.4 Potential Contaminant Sources

The following is a list of general site activities which may have been conducted at the Port Heiden RRS (CH2M Hill, 1994) and the potential contaminants associated with them

- Using and storing petroleum products and antifreeze (both ethylene glycol and methanol)
- Purifying water with calcium hypochlorite
- Degreasing mechanical equipment with the use of halogenated solvents (trichloroethene and trichloroethane) and petroleum distillate solvents
- Generating power with batteries (lead acid, nickel cadmium, and lithium) and associated electrolytes (ammonium chloride and sulfuric acid)
- Regulating electrical current with transformers, capacitors, and switches (some of which contained PCBs)
- Removing mineral buildup in boilers with desiccating compounds (ammonium bicarbonate)
- Maintaining buildings and equipment with the use of paints and paint thinners
- Clearing vegetation at the petroleum tank farm and aircraft runway, and in the general vicinity of the facility with herbicides (2,4-D and 2,4,5-T)
- Controlling mosquitoes, rodents, and preserving wood with the use of pesticides (DDT, Chlordane, Lindane, Dieldrin, Parathion, and Warfarin)
- Road repairing and paving with asphalt products
- Providing fire protection in areas exposed to heat sources with the use of asbestos pipe insulation, wallboard, and shingles
- Preventing freezing of liquids with the use of heat recovery and circulation systems (which may have contained antifreeze or PCBs)

- Road oiling and dust suppression with the use of recycled oils (which may have contained PCBs and solvents)

1.5 Geology and Hydrology

The site is located on the north side of the Alaska Peninsula on the coastal plain of Bristol Bay The Alaska Peninsula is composed mainly of volcanic rocks, volcaniclastic sedimentary rocks and occasional plutons Aniakchak Crater is located approximately 20 miles east of the site The most recent ash producing eruption from Aniakchak took place in 1931, reportedly "depositing ash and some pumice stones as large as a golf ball " Mt Veniaminof is located approximately 60 miles southwest of the site, but is not known to produce large ash eruptions

Lateral and terminal glacial moraines throughout the area are evidence of glaciers that advanced over the site and receded approximately 10,000 years ago The RRS was constructed on a glacial moraine approximately 140 feet above sea level Site soils are composed of glacial till There is a clay layer of unknown thickness that starts approximately 12 feet below ground surface (bgs) Groundwater is approximately 20 to 35 feet bgs in the RRS vicinity and may recharge local surface water sources (CH2M Hill, 1994)

Ponds, lakes, and wetlands abound in vicinity of the site Approximately 3/4 of a mile north of the site is a tributary of Reindeer Creek Wetlands that contain lakes and ponds begin approximately 3/4 of a mile to the southwest and approximately 1 5 miles west-southwest of the site The wetlands may drain into local creeks that flow westerly into Bristol Bay or through groundwater movement into Bristol Bay

The POL tanks located in Meshik were placed on beach sand and creek fluvial deposits The shoreline is eroding in the vicinity of Meshik and reportedly the seawall near the former POL tank farm has been breached Subsidence has also occurred in Old Meshik village and many of the residents have moved closer to the airport Depth to groundwater is approximately 7 5 feet bgs in the vicinity of the former tanks

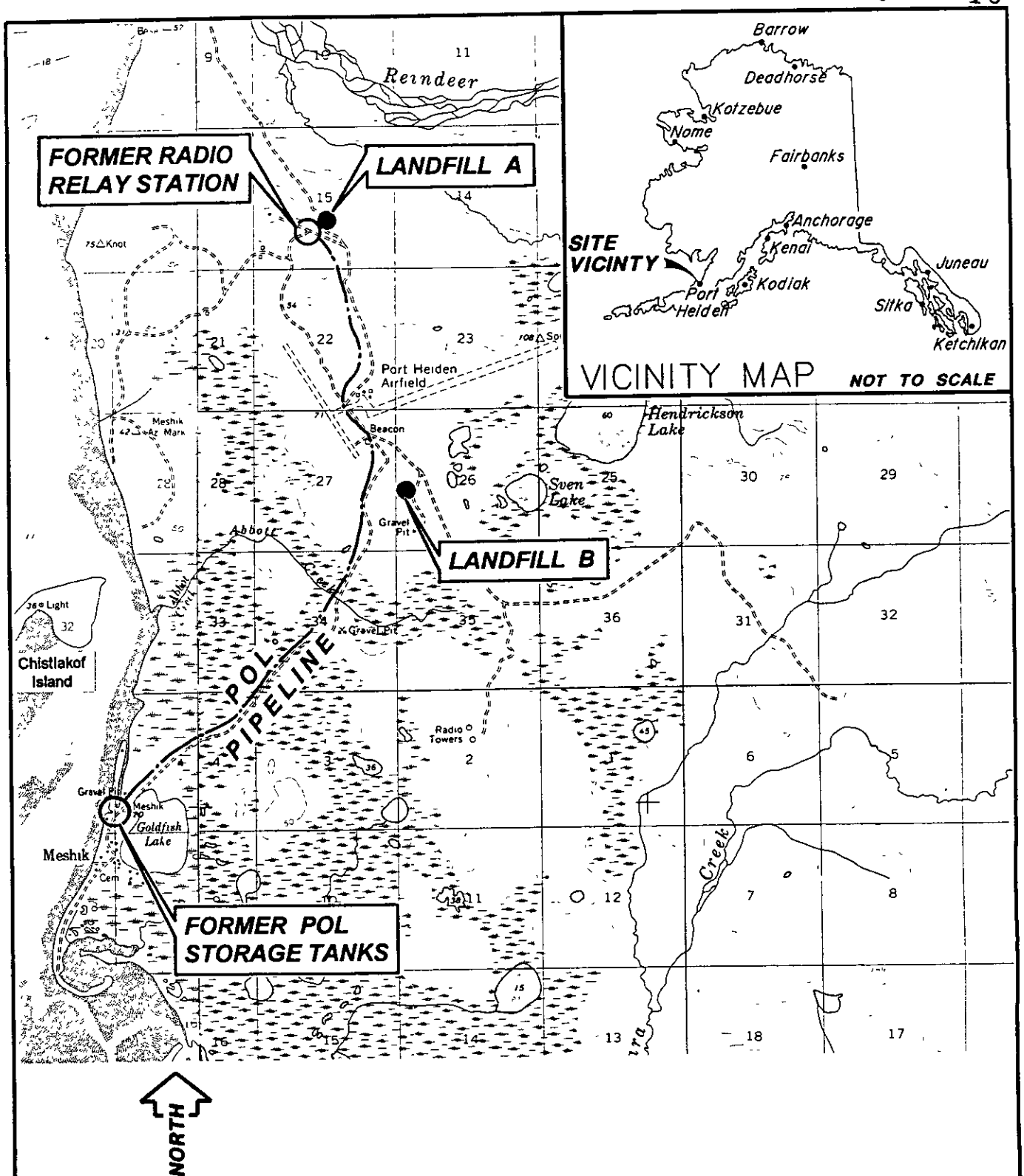
1.6 Biology

The following excerpt is from the preliminary assessment prepared by CH2M Hill for the USEPA (CH2M Hill, 1994) Greater detail regarding the biology of the site, including caribou migration routes and subsistence harvesting of the aquatic and terrestrial species, are also detailed in the PA

> The WACS site is on a coastal plain adjacent to a large shallow bay and contains several different habitats the beach, low shrub, and ericaceous tundra, and the low

wet and bog types The area is considered good wildlife habitat, and is used seasonally by caribou, waterfowl, brown bear, seabirds, and marine mammals Bears use the area as a function of available food sources Predators, including red fox, wolves, wolverine, river otter, mink, least weasel, ermine and occasionally, lynx and Arctic fox, inhabit the area Herbivores in the area include muskrat, beaver, lemmings, porcupines, and Arctic ground squirrel

The terrestrial environment of the northern side of the Alaska Peninsula is very diverse Habitats include the open, low-shrub, and ericaceous tundra found on the tops and windward sides of the small hills, ridges, and exposed sites This habitat type is dominated by heaths and includes crowberry, bearberry, lichens, dwarf willows, and mosses Additional species include low-bush cranberry, yarrow, fireweed, grasses, and sedges The leeward sides of the hills and protected areas support the same species, however, growth is taller and lusher, and includes additional species such as sedges, alder, willows, cow parsnip, grasses, dewberry, monkshood, dwarf birch, devils club, and others On some protected leeward slopes, alder and willow shrubs form a continuous canopy and reach heights of about 6 feet



SOURCE:
U.S.G.S. QUAD. MAPS CHIGNIK (D-2) AND CHIGNIK (D-3), ALASKA 1963.

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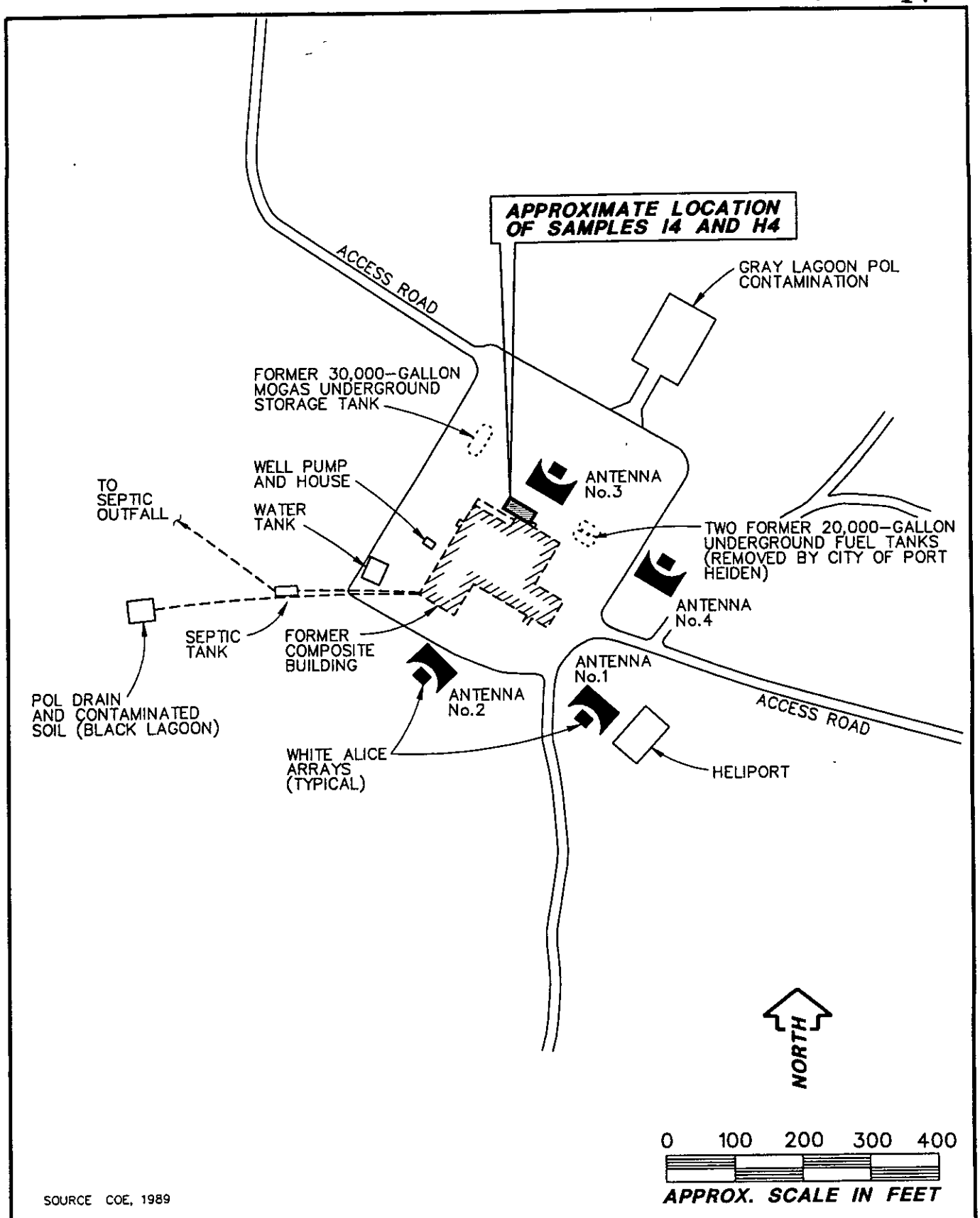
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

DATE FEB. 1996
DWN. CDS95035SVM
CKD. J.B.
REV.
PROJECT No. 55210-020.00T15

PORT HEIDEN
RADIO RELAY STATION
Port Heiden, Alaska

SITE LOCATION MAP

FIGURE 1



SOURCE COE, 1989

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DATE MARCH 1996
DWN. CDS9602F2
CKD. G.D.
REV.
PROJECT No. 55210-20.00T8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

SITE MAP

FIGURE 2

2 REMEDIATION AND RESTORATION ACTIVITIES

Remediation and restoration activities have occurred in four phases at the Port Heiden RRS

1) From 1981 through 1986, the USAF 5099th Civil Engineering and Operations Squadron (5099th) removed hazardous materials and performed PCB-impacted soil removal

2) In 1986, 1987, and 1988, the COE conducted site investigations and prepared bid documents for the demolition and restoration of the site

3) From 1990 to 1992, contractors demolished the site, and removed hazardous wastes and PCB- and petroleum-impacted soil

4) The current phase includes a site inspection, with the 1995 soil sample analytical results, preparation of this report, which summarizes past activities, and preparation of the MAP

This section provides details of past activities at the site and recommends future actions The USAF designated one IRP site and eight AOCs

IRP	OT001	Former composite building OT001
AOCs	AOC01	Black lagoon
	AOC02	Gray lagoon
	AOC03	Heliport AOC03
	AOC04	Septic tank and outfall SS004
	AOC05	Fuel pipeline
	AOC06	POL tank farm
	AOC07	Landfill A
	AOC08	Landfill B

Each IRP and AOC area is presented in sections that include a description of the site, previous investigation results, findings, conclusions, and recommendations

2.1 OT001: Former Composite Building, White Alice Arrays, Diamond Area, Burial Site-1, and 20,000-Gallon Fuel USTs

IRP Site OT001 is comprised of the former composite building, four former White Alice Arrays Burial Site I (BS I), and former underground storage tank (UST) locations around the former composite building The composite building was constructed of reinforced concrete slabs and contained offices, dormitories, storage space, and a garage The White Alice Arrays consisted of feed horns and billboard antennas, labeled 1 through 4

2.1.1 U.S. Air Force, 1981 through 1986

In 1981, the USAF removed pipe insulation, scrap metal, wood, water and fish-oil based paints, and 20 empty POL barrels from the RRS, and landfilled these materials at BS I, northwest of the composite building (Figure 3) More than 100 empty POL barrels were buried at landfills designated BS II-VIII, however, the locations of the burial sites are unknown Assorted oil-based paints, PCB-contaminated transformers, capacitors, unknown fluids, waste oil barrels, 14 boxes of calcium hypochlorite, and toluene liquid were removed by the 5099th (currently known as the 611th Civil Engineer Squadron [611 CES]) for shipment to Elmendorf Air Force Base (AFB), but no records of final disposal are available

In 1984, the 5099th shipped transformer oil containing PCBs, 372 drums of PCB-impacted soil, 5 waste oil drums, herbicides (Esteron 2,4-D), and approximately 6 drums of solvents and cleaning compounds from the RRS Final disposition of the chemicals is unknown

In 1985 and 1986, the 5099th shipped 54 drums and 395 drums, respectively, of PCB-impacted soil to Elmendorf AFB There is no record of final disposal

Actions taken by the 5099th at Port Heiden in 1985 were recorded in two three-ring binders located in the archives of the 5099th These two binders contained maps of areas that were excavated, results from two field instruments that were used to monitor the progress of the removal action, and daily reports One instrument was referred to as the "McGraw Edison Machine" The other instrument was not identified The work began on July 21, 1985, and was completed for the year on December 21, 1985

A figure found in the 5099th archives showed areas where PCB-impacted soil had been removed, and the number of drums of impacted soil removed from those areas (Figure 3) Three hundred and twenty drums of PCB-impacted soil were removed from an area on the southeast side of Antenna No 2 (Figure 3) Fifty-seven drums of PCB-contaminated soil were removed from an area which had been excavated to a depth of 3 feet, near a doorway on the southeast corner of the composite building (Figure 3) Thirty-three drums of PCB-impacted soil were removed from an area on the west side of Antenna No 3 (Figure 3)

These drums do not represent the total amount of soil removed or the only areas where soil was removed by the 5099th "PCB Negative" is written outside of the north and west walls of the composite building

Northwest of the composite building is an area labeled "Dump Debris from Building Non Hazardous " This is the BS I site referred to in paragraph two of this section

The 5099th wrote daily reports that stated that samples were sent to "town" for analysis and results were received from "town" for confirmation that the remaining excavation soils were "clean" of PCBs A December 7, 1985, entry reads "Willy and Bradburn arrive from AKN to start things going, all holes came up clean and no more PCB can be found (load things up)" (Alaska Cleanup Effort, 1985)

2.1.2 Corps of Engineers Investigations - 1986, 1987, and 1988

In 1986, soil samples were collected throughout the Port Heiden area including the RRS Selected samples were tested for PCBs, metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), semivolatile compounds, and halogenated volatile organic compounds (HVOCs) At the composite building, results indicated the presence of PCBs up to 15 ppm in the vicinity of the auto shop, and HVOCs (trichlorofluoromethane) up to 84 2 parts per billion (ppb) outside the generator room

During 1987 and 1988, 80 soil samples were collected on the north end of the composite building and analyzed for PCBs (Aroclor 1260) Analytical results varied from less than 0 2 milligrams per kilogram (mg/kg) (none detected) to 190 mg/kg PCB-impacted soil was found along the entire northern wall of the composite building The highest concentrations were found generally at the east edge of the concrete slab in front of the large garage doors (Figure 4) These analytical results were presented in the 1989 *Defense Environmental Restoration Program, Debris Cleanup and Site Restoration, Master Site Plan, Port Heiden, Alaska* (COE, 1989) The north end of the composite building was the focus for soil excavation and removal during the 1990 investigation and restoration activities

2.1.3 Defense Environmental Restoration Program Cleanup - 1990

In 1989, Underwater Construction & Associates, Inc (UC&AI), was contracted to perform demolition, restoration, and remediation activities in 13 areas of Port Heiden Areas included Fort Morrow, Federal Aviation Administration (FAA) areas, the RRS and related POL tanks at Meshik The work was consolidated into one Defense Environmental Restoration Program (DERP) contract due to the difficulty in determining the areas utilized by different users (e g , USAF, FAA, U S Army)

UC&AI subcontracted Northwest EnviroServices, Inc (NWES), to conduct sampling and field laboratory activities at the site This section details the field work, findings, and analytical results related to the former composite building at Port Heiden

2.1.4 Regulatory Framework for PCB and POL Removal at the Composite Building - 1990 and 1991

Prior to site restoration activities in 1990, cleanup levels for the composite building were established as 100 mg/kg for TPH and 25 mg/kg for PCBs Under ADEC permits, impacted soil with TPH concentrations between 100 mg/kg and 5,000 mg/kg, with PCB concentrations less than 10 mg/kg, were placed in two landfills Landfill A near the composite building and Landfill B near the airport After the 1990 field season, there was a greater volume of impacted soil than the landfills were permitted to contain The COE submitted a risk assessment to ADEC in 1991 ADEC approved the risk assessment, which included the following three recommendations

- Soils with TPH concentrations in excess of 5,000 mg/kg should be remediated by incineration, preferably at high temperature High temperature units have distinct advantages for destruction of long chain (C-30+) hydrocarbons The level of 5,000 mg/kg was the original cleanup target level The risk evaluation substantiates this level as not posing excessive risk to human health and the environment

- Soils in those areas nearest the village with TPH concentrations in excess of 100 mg/kg should be remediated by incineration The level of 100 mg/kg is a cleanup level proposed by ADEC This level would virtually eliminate any risk to human health

- The soils should be replaced, fertilized, and seeded with grasses after remediation This would act as a cap over the remaining contaminated soils Capping the remaining soils is similar to landfilling With the major source of contamination removed, the clay layer between the contamination and groundwater, and a vegetated cap, the remaining TPH in the soil would become unavailable This would allow natural processes to degrade the contamination

ADEC sent a letter of approval to the COE on June 20, 1991, which stated "This letter approves of the work proposed in the Final Risk Analysis with a remote site specific cleanup level of 5,000 mg/kg for TPH " The risk assessment and ADEC approval letter are included in Appendix A

2.1.5 Composite Building PCB-Impacted Soil Removal

According to COE bid documents, PCBs had been detected above the cleanup level on the north side of the composite building In 1990, NWES surveyed a grid in the area north of the composite building Each square of the grid covered 144 square feet of surface area The north-south axis of the grid was identified with the numbers "1" through "9", and paralleled the west wall of the composite building The east-west axis of the grid was identified with the letters "A" through "R", and paralleled the north wall of the composite building Grid points were designated "A1" through "R9" Samples were collected at each of the grid points for field screening and confirmational purposes Some samples were collected outside the boundaries of the grid and final confirmation samples were collected between grid points (NWES, 1990)

The composite building excavations conducted within the grid were partitioned into four zones

- Zone I - an approximately 40-foot by 40-foot area in front of the generator room door
- Zone II - approximately 90-foot by 50-foot area in front of and partially to the west side of the concrete slab in the garage area
- Zone IIIa - approximately 15-foot by 25-foot area against the west side of the north corner of the building
- Zone IIIb - approximately 12-foot by 15-foot area, bounded on the south by the east end of the concrete apron in front of the garage, to the west by part of the building, and on two sides by Zone II

These zones were determined based on concentrations of PCBs and types of contaminants Soil in Zones IIIa and IIIb had the highest PCB concentrations, and the grid spacing in those zones was modified to 6-foot intervals Zone II had TPH concentrations apparently resulting from parked vehicles dripping motor oil onto the pad, and Zone I potentially had diesel fuel contamination from the generators

Samples were generally composed of soil collected from 1 to 6 inches bgs at each grid point If field or confirmation laboratory analysis indicated that the soil concentration was above the target cleanup level, approximately 6 inches bgs of soil was removed in those areas and another sample from 1 to 6 inches bgs (6 to 12 inches below the original ground surface) was tested The highest PCB concentrations were 1,500 mg/kg from grid location CB6, near the original ground surface, and 1,700 mg/kg from "very dark soil shoveled onto concrete slab" (the origin of this shoveled soil is unknown)

Excavation work progressed in this fashion until field laboratory PCB concentrations were below 10 mg/kg Confirmation samples were then collected and sent to Chemical and Geological Laboratory (C&G) in Anchorage, Alaska, and to the North Pacific Division Laboratory (NPDL) of the COE in Troutdale, Oregon When the confirmation sample results exceeded the cleanup level, more soil was removed from that sample vicinity until all laboratory analyzed concentrations were below the 25 mg/kg cleanup level Final confirmation analytical results are presented in Table 1 and sample locations and PCB results are shown on Figure 5

PCB-impacted soil was found in a diamond-shaped area approximately 88 feet northwest of the northwest corner of the composite building Field laboratory results are presented in Appendix B Originally, soil from this location was collected as a representative background sample, however, PCBs were detected in the sample and additional sampling and excavation work was conducted Confirmation samples 23C, 24C, and 25C were collected from this area Laboratory analysis for PCBs showed concentrations of less than 1 mg/kg (ND) for sample 23C, 2 2 mg/kg for sample 24C, and less than 1 mg/kg (ND) for sample 25C Figure 6 presents field grid point locations and the analytical results for the final confirmation samples Field laboratory results from the diamond area are presented in Appendix B

Approximately 170 cy of PCB-impacted soil removed from the RRS and from an FAA site were sent to APTUS Environmental Services in Kansas and incinerated (CH2M Hill, 1994) The exact amount of soil removed only from the RRS was not estimated

2.1.6 Composite Building POL-Impacted Soil Removal

Surface soil with TPH concentrations above 5,000 mg/kg on the north side of the composite building was removed in 1-foot thick intervals and then retested by UC&AI laboratory and NWES The goal in 1990 was to achieve TPH concentrations below 100 ppm throughout the grid area This cleanup goal was not achieved In 1991, ADEC agreed to a 5,000 mg/kg TPH cleanup concentration Figure 7 presents the final analytical results Table 1 lists TPH results for the confirmation samples collected in 1990 All field laboratory and confirmation TPH results are shown in Appendix B Soil with TPH concentrations below 5,000 ppm and having PCB concentrations below 10 ppm was placed into the soil caps of Landfills A and B (Figure 1) Soil with analytical results above 5,000 ppm TPH and PCB concentrations below 25 ppm was stockpiled on site for remediation

Table 1
Confirmation Soil Samples
Composite Building, IRP Site OT001

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Comments/ Description	Recommendations
900829006F	1908	1 C	8/31/90	0 3	2 6NP, 91CG		Zone 1	No further action
900829010F	1912	2 C	8/30/90	ND	42NP 2CG		Zone 1	No further action
900929009F	2399	2 C	9/30/90			19	Zone 1	No further action
900829014F	1916	3 C	8/30/90	ND	58NP, 29CG		Zone 2	No further action
900929010F	2400	3 C	9/30/90			9 4	Zone 2	No further action
900829020F	1922	4 C	8/31/90	1 8	5 1NP, 1 65CG		Zone 2	No further action
900929011F	2401	4 C	9/30/90			9 2	Zone 2	No further action
900829015F	1917	5 C	8/31/90	0 67	3 8NP, 1 29CG		Zone 2	No further action
900929012F	2402	5 C	9/30/90			12	Zone 2	No further action
900829016F	1918	6 C	8/31/90	0 31	14NP, 19CG		Zone 2	No further action
900909013F	2403	6 C	9/30/90			55	Zone 2	No further action
900829017F	1919	7 C	8/31/90	ND	24NP, 12CG		Zone 2	No further action
900929014F	2404	7 C	9/30/90			35	Zone 2	No further action
900829018F	1920	8 C	8/31/90	1 4	7 6NP 3 1CG		Zone 2	No further action
900929015F	2405	8 C	9/30/90			11	Zone 2	No further action
900829019F	1921	9 C	8/31/90	0 84	3 4NP, 2 09CG		Zone 2	No further action
900929016F	2406	9 C					Zone 2	No further action
900920005F	2194	10 C	9/21/90	ND	-		Zone 1	No further action
900829007F	1909	11 C	8/31/90	2 1(2 3)	10NP, 4 43 CG		Zone 1	No further action
900929018F	2408	11 C	9/30/90			31	Zone 1	No further action
900829022F	1924	12 C	8/31/90	0 24	0 35NP, 16 CG		Zone 1	No further action
900829009F	1911	13 C	8/30/90	ND	8 6NP, 2 3CG		North of Zone 1	No further action
900829021F	1923	14 C	8/31/90	2 5	6 7NP, 3 39CG		Southeast of Zone 2	No further action
900829004F	1906	15 C	8/30/90	0 93	3 6NP, 1 06CG		Zone 3A	No further action
900829003F	1905	16 C	8/30/90	ND	29NP, 02CG		Zone 3A	No further action
900829002F	1904	17 C	8/30/90	ND	0 4NP, 021CG		Zone 3A	No further action
900829005F	1907	18 C	8/31/90	ND	52NP, 16CG		Zone 3A	No further action
900829001F	1903	19 C	8/30/90	0 64	1 3NP, 29CG		Zone 3A	No further action
900829011F	1913	20 C	8/30/90	ND	52NP, 17CG		Zone 1	No further action
900829012F	1914	21 C	8/30/90	ND	32NP, 14CG		Zone 3B	No further action
900829013F	1915	22 C	8/30/90	ND	ND (CG)		Zone 3B	No further action
900829023F	1925	25C	8/30/90	ND	1 0NP, 27CG		Diamond Area	No further action
900829024F	1926	24C	8/31/90	2 2	27CG		Diamond Area	No further action
900829025F	1927	23C	8/31/90	ND	9 9NP, 14CG		Diamond Area	No further action

Overall IRP site recommendation No further action recommended for PCBs or TPH-impacted soil

NOTE 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates results
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological (CG) Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons
NPDL - USACE North Pacific Division Laboratory
ND - not detected at or above method reporting limit

2.1.7 Quality Assurance Report Summary for 1990 Analytical Results

On February 19, 1991, NPDL completed a Quality Assurance Report (QAR) for the 1990 POL and PCB analytical results The following summary compares the results of the field laboratory and the quality assurance (QA) and quality control (QC) laboratories

> 1 SUMMARY The field QC (off-site project laboratory Chemical and Geological Laboratory of Alaska) and QA data (from ARDL, Inc of Illinois) of PCBs agree The total recoverable petroleum hydrocarbon (TRPH [sic]) data between field and QA laboratories did not agree The field laboratory found TRPH in all samples at approximately 10 mg/kg or above No polynuclear aromatic hydrocarbons (PAH) were submitted to the QA laboratory The QC laboratory's data were not evaluated due to lack of internal QC submitted Recommend resubmission of QC data with internal QC, including laboratory blanks, units and methods used, date of analysis, details of duplicate analysis, matrix spike (MS) and matrix spike duplicate (MSD) recoveries and surrogate recoveries where applicable The TRPH data of the QC laboratory were missing, therefore, data comparisons were only between the field and QA laboratories No data comparisons were made for metals, volatiles, polynuclear aromatic hydrocarbons (PAH) or flashpoints between any of the three laboratories (Department of the Army, 1991)

The QAR also stated the following regarding TPH values generated by the field laboratory, "All data disagree, probably due, in part, to the field laboratory's laboratory blanks The laboratory blanks submitted via fax on 7 and 8 Feb 91 were heavily contaminated with TPH The TPH found in the field samples were below the project required clean-up limits but did not seriously hamper the clean-up effort "

2.1.8 30,000-Gallon MOGAS UST, 20,000-Gallon USTs, and 600-Gallon UST

Bid documents and previous USAF as-builts show a 30,000-gallon MOGAS UST northwest of the composite building UC&AI conducted a search for the UST by digging 8 feet bgs in the approximate vicinity shown on the as-builts, but was unable to locate a tank In a "Memorandum for the Record," dated August 6, 1990, Ronald J Pfulm with the COE stated that "the missing 30,000-gallon UST has been found on city property The city removed the tank prior to the start of this contract " A tank of the appropriate proportions was found in the vicinity of the POL storage tanks in Meshik There was not proof (i e , a resident witness) to verify that it was the UST from the composite building Therefore, it is unknown if a tank remains in place at that location

A 600-gallon UST, registered with ADEC, at the composite building had been removed by persons unknown before the project started The tank was found empty and aboveground It was placed at the UC&AI base of operations A post-closure notice was sent to ADEC by Lawrence Wilkinson of NWES (Facility ID# 0-002126) The tank closure date was May 1, 1990 The tank was inspected and showed no signs of leakage or holes The tank's former location is unknown

Two 20,000-gallon diesel USTs were shown on bid documents to be located to the northeast of the composite building This location is approximately halfway between the gray lagoon and the composite building UC&AI was contracted to remove these USTs, but when UC&AI arrived at the site, the 20,000-gallon USTs had been removed, and the excavation was open with water in the bottom The tanks were on site

2.1.9 Drum Removal Activities

During the site cleanup in 1990, an estimated 20,000 drums were inspected, crushed, and placed into a landfill An estimated 4,200 drums contained residual fluids These fluids were tested for hazardous constituents and transported off site for disposal, as required Water from the cleaning operation was cycled through an oil/water separator and disposed of in accordance with ADEC guidelines (CH2M Hill, 1994) Final disposal information is not available

2.1.10 Site Inspection, October 1995

An SI was conducted at the Port Heiden RRS in October 1995 (Photograph 1, Appendix C) Soil was excavated from the 1990 I4 and H4 grid locations Field analytical results from 1990 indicated that TPH-impacted soil above the 5,000 ppm cleanup concentration may remain in this vicinity Soil was removed to approximately 6 feet bgs PID readings of soil removed from the trench and from the soil at the trench limits were ND There was no odor or visible impact to the soil No samples were submitted for laboratory analysis and the excavated soil was returned to the trench

2.1.11 Conclusions and Recommendations

No further action is recommended at OT001 Analytical results indicate that POL and PCB soil concentrations above the cleanup levels have been removed The USTs have been removed Table 1 presents the confirmation analytical results and recommendations for IRP site OT001

2.2 AOC01: Black Lagoon

POL wastes were poured into a floor drain in the garage at the composite building, piped downslope, and discharged into a bermed ponding area, named the black lagoon (Figure 2) This area was investigated in 1987, 1988, and 1990

2.2.1 The Black Lagoon Investigations - 1987 and 1988

In preparation of the DERP cleanup in 1987 and 1988, the COE collected and analyzed soil samples from the black lagoon (Figure 8) The black lagoon area consisted of an approximately 25-foot by 25-foot ponding area with an overflow outlet which drained to the west into an approximately 43-foot by 30-foot bermed area (COE, 1989) The 1989 bid document diagrams show POL staining which extends to the northwest from the west end of the overflow pond in a semi-cone shape

In 1987, four samples were collected from the black lagoon area two from each of the ponds and two from the distressed vegetation area soils The samples were analyzed for PCBs by U S Environmental Protection Agency (USEPA) Method 8080, volatile organics by USEPA Method 8240, semivolatile organics by USEPA Method 8270, and flashpoint Sample locations are shown on figures in Appendix D

In 1988, 16 samples were collected and tested for volatile organics by USEPA Method 8020 and selected samples were analyzed for EP TOX metals by USEPA Method 1310 The samples were collected along three lines that converged approximately 50 feet west of the northwest corner of the overflow pond All three lines were north of the holding ponds Sample number 95 was the only sample collected within the primary holding pond and none were collected from within the secondary or overflow pond Only two of the samples had detectable levels of volatile organics None of the samples contained detectable levels of EP TOX metals Sample locations and analytical results are shown on Figure 8

2.2.2 Black Lagoon (POL Drain, POL Outfall) - 1990

During the 1990 DERP cleanup, surface samples were collected and four trenches were excavated in the black lagoon area to delineate the extent of impacted soil (Figure 9) Soil samples were analyzed and cross sections drawn (Figures 10, 11, 12, and 13) Approximately 89 samples were analyzed for TPH Twenty-two of those samples were also analyzed for PCBs

2.2.3 Analytical Results, Conclusions, and Recommendations

Table 2 lists the 1990 analytical results from the black lagoon Analytical results varied from ND to 67,000 mg/kg TPH Samples analyzed for PCBs were ND The extent of impacted soil with greater than 5,000 mg/kg TPH was estimated in each trench Impacted soil with greater than 5,000 mg/kg TPH was found locally at the surface and to a depth of 12 feet Approximately 4,000 cy of impacted soil with TPH concentrations above 5,000 mg/kg remain in the black lagoon vicinity

Remediation alternatives can be evaluated and coordinated with other environmental actions at the RRS Since the soil is impacted with used oil, thermal remediation may be the most appropriate method

2.3 AOC02: Gray Lagoon

The gray lagoon is approximately 70 feet by 100 feet It is 250 feet north of the composite building and has sparse vegetation The use of this area is unknown

2.3.1 Gray Lagoon and Former UST Area, RRS Site

Exploratory trenching was conducted north of the composite building near Antenna No 3, in the vicinity of the former 20,000-gallon USTs excavation, and into the gray lagoon (Figure 14)

The trenches were extended to approximately 6 feet bgs and samples were collected from locations that appeared to have the greatest impact (Larry Wilkinson, Philip Environmental, personal communication) An underground cable ran from the gray lagoon to the composite building This cable, or disturbed soils around it, apparently acted as a conductor for product transport In general, there is a trend of relatively high concentrations of TPH in samples collected along that corridor (4,700 mg/kg, 390 mg/kg, 8,600 mg/kg, 6,900 mg/kg, 1,700 mg/kg, and 4,900 mg/kg from south to north) It was not ascertained whether the contaminant migrated along the cable from the gray lagoon, the former 20,000-gallon USTs, or from the composite building The gray lagoon may have been used as a POL storage area, or perhaps a tank was located there

4 29

Table 2
Black Lagoon TPH and PCBs
1990 Analytical Results

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Depth (feet)	Field Laboratory TPH Results (ppm)	Field Laboratory PCB Results (ppm)
900708006F	1042	FG1	7/9/90	0 5	13,000	--
900708007F	1043	FG1 5	7/9/90	1	31,000	--
900708008F	1044	FG2	7/9/90	1	34,000	ND (ND)
900708009F	1045	FG2 5	7/9/90	1	6,900	--
900708010F	1046	FG3	7/9/90	1	140	--
900708011F	1047	FG3 5	7/9/90	1	300 (270)	ND
900708012F	1048	F3 5	7/9/90	1	26,000	ND
900708013F	1049	EF3 5	7/9/90	1	37,000	ND
900708014F	1050	E3 5	7/9/90	1	28,000	--
900815006F	1706	J2	7/9/90	1 5	13,000	ND
900815007F	1707	K4	8/15/90	1 5	12,000	ND
900815008F	1708	L2	8/16/90	1	10	--
900815009F	1709	L2	8/16/90	0 5	20	--
900815010F	1710	J2	8/16/90	0 5	320	--
900815011F	1711	J2	8/16/90	1	35,000	--
900815012F	1712	I1	8/16/90	1	360	--
900815013F	1713	I1	8/16/90	0 5	170	--
900815014F	1714	E10	8/16/90	0 5	20	--
900815015F	1715	E10	8/16/90	1 5	16	--
900815016F	1716	C8	8/16/90	0 5	11	--
900815017F	1717	C8	8/16/90	1	ND	--
900815018F	1718	E4	8/16/90	1	20,000	--
900815019F	1719	E4	8/16/90	0 5	49,000	--
900815020F	1720	M6	8/16/90	0 5	120	--
900815021F	1721	M6	8/16/90	1	720	--
900815022F	1722	A8	8/16/90	0 5	129	--
900815023F	1723	A8	8/16/90	1	6	--
900815024F	1724	E8	8/16/90	0 5	530	--
900815025F	1725	E8	8/16/90	1	170	--
900815026F	1726	G8	8/16/90	0 5	580 (520)	--
900815027F	1727	G8	8/16/90	1	280	--
900815028F	1728	C2	8/16/90	0 5	40	--

Table 2 (Continued)
Black Lagoon TPH and PCBs
1990 Analytical Results

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Depth (feet)	Field Laboratory TPH Results (ppm)	Field Laboratory PCB Results (ppm)
900815029F	1729	C2	8/16/90	1	ND	--
900815030F	1730	E6	8/16/90	0 5	4,400	--
900815031F	1731	E6	8/16/90	1	880	--
900815032F	1732	I8	8/16/90	0 5	70 (90)	--
900815033F	1733	I8	8/16/90	1	53	--
900825034F	1734	K8	8/16/90	1	100	--
900815035f	1735	K8	8/16/90	0 5	270	--
900815036F	1736	K4	8/16/90	0 5	18,000	--
900821001F	1814	I5	8/21/90	8	14	ND
900821002F	1815	G1	8/21/90	12	10,000 (10,000)	ND
900821003F	1816	C1	8/21/90	5	8,300 (8,700)	ND
900821004F	1817	D1	8/22/90	12	5 400 MS	ND
900821005F	1818	G7	8/21/90	5	20	ND
900821006F	1819	G6	8/21/90	12	2,600	ND
900815007F	1820	G5	8/21/90	10	3,900	ND
900821008F	1821	G1	8/21/90	8	6,200	ND
900821009F	1822	Z1	8/21/90	GRAB	9,600	--
900821010F	1823	Z2	8/21/90	GRAB	6,200	--
900821011F	1824	Z3	8/21/90	GRAB	3,700	--
900821012F	1825	Z4	8/21/90	GRAB	5,300	--
900821013F	1826	Z5	8/21/90	GRAB	34,000	--
900821014F	1827	Z6	8/22/90	GRAB	4,200 (2,400)	--
900821015F	1828	Z7	8/21/90	GRAB	5,400	--
900821016F	1829	Z8	8/21/90	GRAB	950	--
900821017F	1830	Z9	8/21/90	GRAB	35	--
900821018F	1831	Z10	8/21/90	GRAB	30	--
900821019F	1832	Z11	8/21/90	GRAB	640	--
900821020F	1833	Z12	8/21/90	GRAB	290	--
900822001F	1839	UNK	8/22/90	UNK	53,000	--
900822001F	1840	UNK	8/22/90	UNK	67,000	--
900822003F	1841	UNK	8/22/90	UNK	3,600	--
900822004F	1842	UNK	8/22/90	UNK	55,000	--
900822005F	1843	UNK	UNK	UNK	8,100 (6,100)	--

Table 2 (Continued)
Black Lagoon TPH and PCBs
1990 Analytical Results

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Depth (feet)	Field Laboratory TPH Results (ppm)	Field Laboratory PCB Results (ppm)
900822006F	1844	UNK	8/22/90	UNK	42,000	--
900823001F	1851	O10	8/27/90	10	32	ND
900823002F	1852	O10	8/27/90	8	24	ND
900823003F	1853	O10	8/27/90	8 5	31	ND
900823004F	1854	M10	8/27/90	8	2,100	--
900823005F	1855	D10	8/27/90	8	36	--
900823006F	1856	F10	8/27/90	5	43	--
900823007F	1857	L10	8/27/90	0 5	1,500	ND
900823008F	1858	J10	8/27/90	3 to 4	38	ND
900823009F	1859	J10	8/27/90	6	32	ND
900823010F	1860	H10	8/27/90	3 to 6	36	ND
900823011F	1861	G10	8/27/90	3 to 5	47	--
900823012F	1862	B10	8/27/90	5	49	ND
900823013F	1863	B10	8/27/90	1 5	48	ND
900913001F	2057	UNK	9/14/90	7	52	--
900913002F	2058	UNK	9/14/90	8	22	--
900913003F	2059	UNK	9/14/90	8 5	40	--
900913004F	2060	UNK	9/14/90	8	40	--
900913005F	2061	UNK	9/14/90	10	1,200	--
900913006F	2062	UNK	9/14/90	6 to 8	1,300	--
900913007F	2063	UNK	9/14/90	8	29	--
900913008F	2064	UNK	9/14/90	14	40	--
900913009F	2065	UNK	9/14/90	14	94	--
900913010F	2066	UNK	9/14/90	14	190	--
900913011F	2067	UNK	9/14/90	20	31	--

NOTES * numbers in parentheses are duplicate analytical results
TPH - total petroleum hydrocarbons
PCB - polychlorinated biphenyls
ppm - parts per million
ND - none detected
UNK - unknown
-- not analyzed

Field laboratory TPH results for samples collected from the gray lagoon varied from 5,700 mg/kg to 8,600 mg/kg TPH Samples collected from the other trenches varied from 8 9 mg/kg up to 8,600 mg/kg TPH Soil removed from the trenches was used to backfill them, except for about 3 cy of soil in the vicinity of the former 20,000-gallon UST excavation (Ed Erickson, NWES, personal communication) Figure 14 shows the field sample locations and laboratory TPH analytical results Table 3 presents the field laboratory data Soil from trenches T and S may have been removed during excavation of TPH soil in the composite building area after this exploratory trenching, as discussed in Section 2 1 6 Impacted soil from the other trenches was not removed

2.3.2 Gray Lagoon Site Inspection 1995

A supplementary site inspection of the gray lagoon was conducted by EMCON in October 1995 Four trenches were excavated and soil samples were collected and analyzed to delineate the approximate limits of impact in the gray lagoon area Exploratory trenching was accomplished using a tracked backhoe and the soil was field screened using a Thermo-Environmental Model 580B® PID Soil samples were selected based on PID readings and/or field observations

Figure 15 shows the relative location of the trenches (marked 1 through 4), soil sample locations with analytical results, and a cross section through trenches 1 and 2 A visibly impacted zone was observed from approximately 1 to 5 feet bgs in Trench 1 The soil was stained a greenish gray color and there was a petroleum-like odor Samples GL-1 and GL-2 were collected to delineate the vertical extent of impacted soil Sample GL-3 was collected from the visibly impacted zone to approximate the highest contaminant concentrations

Samples were submitted to Columbia Analytical Services, Inc , Anchorage, Alaska, for analysis by USEPA Methods 418 1 for TPH, 8015 Modified for GRO, 8100 Modified for DRO, and 8020 for aromatic petroleum hydrocarbons (BTEX)

Table 3
Field Laboratory 1990 Analytical Results
Composite Building to the Gray Lagoon

Sample Identification	Laboratory Identification	Trench *	Date	Depth (feet)	Field Laboratory TPH Results (ppm)
900914001F	2068	A	9/15/90	6'	110
900914002F	2069	A	9/15/90	5'	45
900914003F	2070	A	9/15/90	4'	280
900914004F	2071	A	9/15/90	4'	100
900914005F	2072	A	9/15/90	4'	8 9
900914006F	2073	A	9/15/90	4'	10
900914007F	2074	A	9/15/90	4'	8 9
900914008F	2075	A	9/15/90	4'	4,100
90914009F	2076	A	9/15/90	4'	23
900915001F	2100	B	9/15/90	GRAB	4,600 (5,000)
900915002F	2101	B	9/15/90	GRAB	1,200
900915003F	2102	B	9/15/90	GRAB	34
900915004F	2103	B	9/15/90	GRAB	44
900915005F	2104	C	9/15/90	GRAB	79
900915006F	2105	C	9/15/90	GRAB	8 8
900915007F	2106	C	9/15/90	GRAB	18
900915008F	2107	C	9/15/90	GRAB	8 8
900915009F	2108	A	9/15/90	GRAB	31
900915010F	2109	D	9/15/90	GRAB	390
900915011F	2110	E	9/15/90	GRAB	36
900915012F	2111	E	9/15/90	GRAB	28
900915013F	2112	D	9/16/90	GRAB	42
900915014F	2113	D	9/16/90	GRAB	30
900915015F	2114	A	9/16/90	GRAB	16
900915016F	2115	A	9/16/90	GRAB	26
900915017F	2116	F	9/16/90	GRAB	8,600
900915018F	2117	A	9/16/90	GRAB	29
900915019F	2118	F	9/16/90	GRAB	200
900915020F	2119	A	9/16/90	GRAB	35
900915021F	2120	G	9/16/90	GRAB	35
900915022F	2121	A	9/16/90	GRAB	29

Table 3 (Continued)
Field Laboratory 1990 Analytical Results
Composite Building to the Gray Lagoon

Sample Identification	Laboratory Identification	Trench *	Date	Depth (feet)	Field Laboratory TPH Results (ppm)
900915023F	2122	D	9/16/90	GRAB	30
900915024F	2123	R	9/16/90	GRAB	19
900915025F	2124	A	9/16/90	GRAB	1,300
900915026F	2125	R	9/16/90	GRAB	46
900915027F	2126	T	9/16/90	GRAB	4,100
900915028F	2127	A	9/16/90	GRAB	210
900915029F	2128	H	9/16/90	GRAB	20
900915030F	2129	H	9/16/90	GRAB	27
900915031F	2130	H	9/16/90	GRAB	6,900
900915032F	2131	I	9/16/90	GRAB	24
900915033F	2132	I	9/16/90	GRAB	24
900915034F	2133	R	9/16/90	GRAB	29
900915035F	2134	G	9/16/90	GRAB	43
900915036F	2135	E	9/16/90	GRAB	23
900915037F	2136	A	9/16/90	GRAB	36
900915038F	2137	R	9/16/90	GRAB	30
900915039F	2138	C	9/16/90	GRAB	72
900915040F	2139		9/16/90	GRAB	4,100
900915041F	2140	R	9/16/90	GRAB	35
900915042F	2141	R	9/16/90	GRAB	26
900915043F	2142	R	9/16/90	GRAB	30
900915044F	2143	R	9/16/90	GRAB	180
900915045F	2144	R	9/16/90	GRAB	3,300
900915046F	2145	S	9/16/90	GRAB	170
900915047F	2146	S	9/16/90	GRAB	1,900
900915048F	2147	S	9/16/90	GRAB	1,100
900915049F	2148	S	9/16/90	GRAB	900
900915050F	2149	S	9/16/90	GRAB	4 600
900915051F	2150	U	9/16/90	GRAB	1,200
900915052F	2151	U	9/16/90	GRAB	710
900915053F	2152	U	9/16/90	GRAB	630
900915054F	2153	U	9/16/90	GRAB	860
900915055F	2154	V	9/16/90	GRAB	110
900915056F	2155	V	9/16/90	GRAB	280

Table 3 (Continued)
Field Laboratory 1990 Analytical Results
Composite Building to the Gray Lagoon

Sample Identification	Laboratory Identification	Trench *	Date	Depth (feet)	Field Laboratory TPH Results (ppm)
900915057F	2156	V	9/16/90	GRAB	41
900915058F	2157	O	9/16/90	GRAB	29
900915059F	2158	O	9/16/90	GRAB	30
900915060F	2159	P	9/16/90	GRAB	31
900915061F	2160	P	9/16/90	GRAB	24
900915062F	2161	P	9/16/90	GRAB	41
900915063F	2162	P	9/16/90	GRAB	36
900915064F	2163	P	9/17/90	GRAB	36
900915065F	2164	Q	9/17/90	GRAB	1,700
900915066F	2165	Q	9/16/90	GRAB	92
900915067F	2166	Q	9/16/90	GRAB	69
900915068F	2167	Q	9/17/90	GRAB	93
900915069F	2168	Q	9/17/90	GRAB	67
900915070F	2169	Q	9/16/90	GRAB	50
900916001F	2170	T	9/16/90	GRAB	130
900916002F	2171	T	9/16/90	GRAB	90
900916003F	2172	T	9/17/90	GRAB	110
900916004F	2173	T	9/17/90	GRAB	72
900916005F	2174	T	9/17/90	GRAB	220
900916006F	2175	J	9/17/90	GRAB	1,700
900916007F	2176	K	9/17/90	GRAB	4,900
900916008F	2177	M	9/17/90	GRAB	6,300
900916009F	2178	L	9/17/90	GRAB	7,100
900916010F	2179	L	9/17/90	GRAB	5,700
900916011F	2180	N	9/16/90	GRAB	8,600

NOTES
Numbers in parentheses are duplicate analytical results
* - The column labeled Trench was originated by EMCON and used to identify the location of individual sample points
ppm - parts per million
TPH - total petroleum hydrocarbons

2.3.3 Analytical Results

Analytical results for samples GL-1 and GL-2 are below the 5,000 ppm TPH cleanup level Sample GL-3 contains TPH, DRO, and GRO concentrations of 15,000 ppm, 9,250 ppm, and 930 ppm, respectively Xylenes were detected in sample GL-1, all other BTEX analyses were ND (Table 4)

All analyses were performed consistent with generally accepted analytical principles and practices

2.3.4 Conclusions and Recommendations

Field observations and analytical results indicate that there is approximately 100 to 150 cy of impacted subsurface soil above the 5,000 ppm cleanup level still in place at AOC02 Most of the contamination is within the diesel range

Remedial action is recommended since concentrations are above the cleanup level Remedial design should consider the type of contaminant present and be coordinated with other remedial actions at Port Heiden Table 4 summarizes the analytical results and recommendations for AOC02

2.4 AOC03: Heliport

The heliport is an area where petroleum may have been stored for fueling helicopters As part of the supplementary site inspection in October 1995, three trenches were excavated in the Heliport area Review of previous work at the RRS did not indicate previous investigations at the heliport The trenches were dug in areas of the heliport with sparse vegetation to an approximate depth of 4 feet bgs Excavated soil and the trench walls and floor were field screened with a PID Field screening and field observations (visual and odor) did not detect the presence of impacted soil in any of the trenches The excavated soil was backfilled into the trenches No samples were collected

No further action is recommended related to the heliport area.

Table 4
AOC02 Analytical Results and Recommendations
Gray Lagoon

Sample Number	Depth (feet)	Matrix	TPH 418.1 (ppm)	DRO 8100M (ppm)	GRO 8015M (ppm)	Volatile aromatic compounds USEPA Method 8020				Remarks	Recommendations
						Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)		
GL-1	7	Soil	130	117	ND	ND	ND	ND	14	Collected below the visibly impacted zone	No further action
GL-2	1 5	Soil	ND	ND	ND	ND	ND	ND	ND	Collected below the visibly impacted zone	No further action
GL-3	8 5	Soil	15,000	9,250	930	ND	ND	ND	ND	Collected in the visibly impacted zone	Remedial action

NOTE Overall AOC Recommendations Remedial action is recommended
TPH - total petroleum hydrocarbons
DRO - diesel-range organics
GRO - gasoline-range organics
ppm - parts per million
ND - non-detect
AOC - area of concern

2.5 AOC04: Septic Tank and Outfall

The septic tank piping went from the composite building approximately 200 feet west into the septic tank Piping from the septic tank branched off to the northwest, continued under a manmade dirt ridge for approximately 250 feet, and turned west into an outfall area (Figure 16) The septic tank was removed during the 1990 DERP activities The piping was left in place As part of the 1995 SI, the outfall area was investigated to determine if POL waste may have been discharged through the septic system

During the 1995 site inspection, the location of the outfall area was approximated using COE site maps There was a depression approximately 20 feet in diameter in the tundra at the estimated location, however, there was no piping or other evidence to indicate that this was the correct location A hole was excavated to a depth of approximately 4 feet bgs PID field screening did not indicate the presence of petroleum hydrocarbons The soil consisted of an upper organic layer underlain by sandy soil which had a greenish tint A sample named "septic" was collected from the greenish soil at about 4 feet bgs

2.5.1 Analytical Results and Recommendations

The septic sample was analyzed for TPH, DRO, GRO, and BTEX TPH, DRO, and GRO were detected at 212 ppm, 164 ppm, and 10 ppm respectively However, the laboratory report stated that the sample did not contain any diesel, that the reported concentration was due to biogenic material eluting in the diesel range BTEX was ND

No further action is recommended at the septic outfall area The presence of biogenic material indicates that the reported analytical concentrations are due to natural organic material and not related to petroleum products Soil sampling is recommended in the former septic tank location Table 5 presents the analytical results and recommendations for AOC04

2.6 AOC05: POL Pipeline

AOC05 consists of a two-inch fuel pipeline approximately 6 25 miles in length extending from the POL tanks to the composite building Ownership of the pipeline between the POL tanks and the airport was transferred to Reeve Aleutian Airways in 1990 Portions of the pipeline were removed from between the airport and the composite building during the 1990 DERP

Table 5
AOC04 Analytical Results and Recommendations
Septic Tank and Outfall

Sample Number	Depth (feet)	Matrix	TPH 418.1 (ppm)	DRO 8100M (ppm)	GRO 8015M (ppm)	Volatile aromatic compounds USEPA Method 8020				Remarks	Recommendations
						Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)		
Septic	4	Soil	212	164*	10	ND	ND	ND	ND	Soil has a greenish tint	No further action

NOTE
Overall AOC Recommendations Remedial action is not recommended at the outfall A site inspection is recommended at the septic tank
* Sample contains no diesel Analytical results are due to biogenic material eluting in the diesel range
TPH - total petroleum hydrocarbons
DRO - diesel-range organics
GRO - gasoline-range organics
ppm - parts per million
ND - non-detect
AOC - area of concern

The pipeline corridor has not been evaluated for potential petroleum impact Evaluation of the pipeline corridor is recommended along its entire length However, if spills are found between the POL tanks and the airport, it may be difficult to determine the responsible party

2.7 AOC06: POL Tank Farm

The POL tank area contained two aboveground 250,000-gallon fuel storage tanks, a fuel pumphouse, and fuel distribution pipes Contaminant source areas were initially designated as Spills 21, 22, and 23 in Area 13 of the Port Heiden site Spills 21 and 22 consisted of the tank ring sands below the former aboveground fuel storage tanks and the fill and native soils surrounding the former tank rings Spill 23 was contiguous to Spills 21 and 22, and consisted of a former fuel pumphouse and supply line connected to the aboveground storage tanks Eventually all three spill areas overlapped and soil removal became one large excavation The entire area was eventually designated Spill 22

In 1986, samples were collected throughout the Port Heiden area including the POL tank area One sample was collected from the POL tank area and was analyzed for EP TOX metals, none were detected

Three site investigations were conducted at Area 13 between 1990 and 1992 by UC&AI Field sampling and analysis was conducted by NWES Analysis of soil samples collected during the initial investigations revealed petroleum hydrocarbon impact in the sand and clay below the Area 13 tank rings Excavation of the tank ring sands and surrounding soil was initiated in the fall of 1991 by UC&AI, to remove and treat impacted soils in an on-site mobile soil remediation unit (MSRU) operated by VECO Environmental Excavation and soil treatment activities were completed in July 1992 Field activities and analytical results for 1990 through 1992 are discussed below

2.7.1 1990 Activities

In the fall of 1990, UC&AI removed the concrete tank rings and excavated the tank ring sand pads from the former aboveground storage tanks at Area 13 Some of the excavated material was reported to be solid and asphalt-like This material was removed in chunks and disposed of in Landfill B Concrete debris was salvaged and removed from the site The excavated tank pad sands were field screened by NWES and segregated by UC&AI into two stockpiles of "greater than" and "less than" 5,000 mg/kg TPH The excavated soil characterized as "greater than" 5,000 mg/kg TPH was placed in reinforced bags for later disposal Approximately 578 cy of excavated soil was classified as "less than" 5,000 mg/kg, and was initially stockpiled on the south side of the east-west runway After the tank ring sands had been removed, much of the remaining soil was reported to be POL-

impacted Due to remaining impacted soil and the probability of further excavation in the area, the "less than" 5,000 mg/kg TPH soil was placed back into the original tank rings excavation to avoid leaving the excavation open over the winter

2.7.2 1991 Activities

Between October and November of 1991, UC&AI excavated additional petroleum-impacted soils from the tank rings and surrounding area Prior to excavation, a perimeter measuring 72 feet by 180 feet was surveyed around the area and subdivided into a 6-foot by 6-foot grid system Excavation of impacted soil was based on the results of a flame ionization detector (FID) field screening instrument and on-site soil sample analysis Excavated soils were treated on site in the MSRU operated by VECO Environmental At the end of the 1991 project, the excavation had been advanced to depths of 2 to 3 feet bgs, and approximately 800 tons of impacted soil had been removed and treated

Soil samples were collected from the excavation at depths between 0 and 60 inches bgs and analyzed on site in the NWES field laboratory Samples were analyzed for TPH by USEPA Method 418 1 The highest TPH concentrations ranged from 95 mg/kg to 16,000 mg/kg and were detected in samples collected from 6 to 12 inches bgs in the vicinity of the fuel pumphouse TPH concentrations in soil samples collected from the rest of the excavation ranged from 0 to 6,100 mg/kg, with the highest concentrations detected in samples from 30 inches bgs Additional samples were collected from the soil that was excavated from the area in 1990 TPH concentrations detected in these samples ranged from 2,000 mg/kg to 25,000 mg/kg Confirmation samples were not collected from the walls and bottom of the excavation in 1991, because the limits of impacted soil were not found

2.7.3 1992 Activities

UC&AI resumed excavation of the tank rings and surrounding soils in May 1992 and continued through July 1992 Excavation activities proceeded as described for the 1991 activities, with NWES providing field screening and on-site laboratory analysis of soil samples The excavation was advanced in all directions until the limits of petroleum-impacted soil were found, or to within 10 feet of the ocean-side bluff on the western perimeter of the excavation While trying to reach the limits of contamination, the northwestern perimeter was extended towards the fuel pumphouse and fuel supply line, as seen in Figure 17. The bottom of the excavation was advanced to approximately 6 5 feet bgs at the edges, and to approximately 7 5 feet bgs at two areas in the center At 7 5 feet bgs, NWES reported encountering "pure diesel fuel floating on the water table " By the end of excavation activities in July 1992, approximately 10,000 tons of soil had been excavated from the area and treated on site in the MSRU

Soil samples were collected from the excavation perimeter and bottom, to guide excavation activities and confirm when the limits of petroleum impact were found Soil samples were analyzed for TPH in the NWES on-site field laboratory TPH concentrations ranged from less than 25 mg/kg to 79,800 mg/kg, with the highest concentrations detected in soil samples collected at approximately 6 feet bgs in the vicinity of the pumphouse Pre-confirmatory soil samples were collected from the excavation perimeter and bottom prior to final excavation activities, and analyzed for TPH in the on-site laboratory Based on those analytical results, additional soil was removed in the northwestern portion of the excavation, and in the bottom of the excavation

Following final excavation activities, 13 confirmation soil samples were collected from the bottom and sides of the excavation (Figure 17) In addition to being analyzed on site for TPH, these samples were sent to the project and QA laboratories to be analyzed for TPH by USEPA Method 418 1, GRO by USEPA Method 8015, and for BTEX by USEPA Method 8020 Confirmation soil sample off-site laboratory analytical results are summarized in Table 6 Three of the eleven analyzed confirmation samples had TPH concentrations greater than 100 mg/kg One sample collected from the northwest excavation bottom had a TPH concentration of 1940 mg/kg, a GRO concentration of 3890 mg/kg, and a BTEX concentration of 3 6 mg/kg. A second sample, collected from the north wall of the excavation, had a TPH concentration of 260 mg/kg and a GRO concentration of 67 9 mg/kg The third sample was collected from the southeast excavation bottom and had a TPH concentration of 924 mg/kg and a GRO concentration of 695 mg/kg In addition to the soil sampling and analysis, one free-product sample was collected from the bottom of the excavation This sample was sent to the project laboratory for analysis for volatile organic hydrocarbons by USEPA Method 8240 The detected analyte concentrations were toluene at 21 3 mg/kg, ethylbenzene at 190 mg/kg, and total xylenes at 1320 mg/kg

During the excavation project, water was encountered seeping from the western wall of the excavation and at a different location where the excavation was suspected to have extended down into the groundwater table Two water samples were collected from a seep in the western side wall These samples were sent to the project laboratory for analysis and had TPH concentrations less than 1 milligram per liter (mg/L)

2.7.4 Soil Treatment - 1990, 1991, 1992

Soils excavated in 1990, 1991, and 1992 were treated on site in the MSRU operated by VECO Environmental Soil samples were collected from the MSRU post-treatment stockpiles to confirm destruction of petroleum contaminants and treatment of soils to the required cleanup levels Initial post-treatment TPH concentrations in 1991 and early in 1992 ranged from 10 mg/kg to 1,020 mg/kg Target cleanup levels were described to be 100 mg/kg to 5,000 mg/kg TPH in the NWES 1991 Standard Operating Procedure #2

Table 6
POL Tanks Excavation Confirmation Samples 1992 Analytical Results

Sample No	COC	Sample Date	Spill No.	Elevation (ft/*)	Depth (ft/bgs)	FID mg/kg	NWES 418.1 mg/kg	C&G 418 1 mg/kg	GRO 8015 mg/kg	BTEX 8020 mg/kg	Remarks	Recommendations
920701-002	90	7/1/92	22	98	3	-	< 25	15 1	ND (10)	ND (0 03)	South wall of excavation	No Further Action
920701-006	90	7/1/92	22	94 5	6 5	-	< 25	11 8	ND (10)	ND (0 04)	East wall of excavation	No Further Action
920705-001	98	7/5/92	22	94 5	6 5	-	53	74 3	32 2	ND (0 04)	Southeast excavation bottom	No Further Action
920705-002	98	7/5/92	22	94 5	6 5	-	< 25	< 25	ND (10)	ND (0 04)	Southwest excavation bottom	No Further Action
920705-003	98	7/5/92	22	94 5	6 5	-	924	30 6	695	ND (0 04)	Southeast excavation bottom	No Further Action
920705-004	98	7/5/92	22	94 5	7 5	-	< 25	< 25	11 1	ND (0 04)	South of center of excavation bottom	No Further Action
920705-005	98	7/5/92	22	94 5	7 5	-	46 4	27 8	19 7	ND (0 04)	South of center of excavation bottom	No Further Action
920705-006	98	7/5/92	22	94 5	6 5	-	< 25	26 8	ND (10)	ND (0 04)	North of center of excavation bottom	No Further Action
920705-007	98	7/5/92	22	94 5	6 5	-	< 25	119	ND (10)	ND (0 04)	West excavation bottom	No Further Action
920705-008	98	7/5/92	22	94 5	6 5	-	< 25	< 25	ND (10)	ND (0 04)	Northeast excavation bottom	No Further Action
920705-009	98	7/5/92	22	94 5	6 5	-	< 25	< 25	10 2	ND (0 04)	North excavation bottom	No Further Action
920705-010D	98	7/5/92	22	94 5	6 5	-	1,940	1,730	3,890	3 6	Northwest excavation bottom	Subsurface Investigation
920705-011D	98	7/5/92	22	94 5	6 5	-	4,000	1,310	4,460	12 6	Duplicate of 920705010	Subsurface Investigation
920705-012	98	7/5/92	22	94 5	4 5	-	42 2	260	67 9	ND (0 04)	North wall of excavation	Subsurface Investigation

Notes * Elevation measurements above sea level, as documented in NWES field notes Based on BLM benchmark PLO2374, local surface elevation approximately 101 feet
Overall AOC Recommendations Subsurface investigation if feasible with eroding shoreline

COC - chain of custody
ft/* - elevation relative to a local datum
ft/bgs feet below ground surface
mg/kg - milligrams per kilogram
FID - flame ionization detector
C &G - Chemical and Geological Laboratory
NWES Northwest EnviroService
(0 04) method reporting limit

Review of the available NWES analytical data indicates that contaminated post-treatment soils were treated repeatedly until cleanup levels of less than 100 mg/kg TPH were achieved Treated soil was used as backfill in the excavations Additional soil from the Port Heiden borrow pit was used to restore the area to grade

2.7.5 1995 Site Inspection

No contamination was observed during the 1995 SI Approximately 15 to 20 feet of the shoreline at AOC06 has eroded away A spring exits from the base of a shoreline bluff No odor or visible impact was observed A possible ordnance remnant was found on the beach No soil or water samples were collected

2.7.6 Conclusions and Recommendations

Confirmation sample analytical results indicate TPH concentrations above 100 ppm remain at the POL tank area Free product was also observed in the bottom of the excavation These sources were not removed prior to backfilling Further subsurface investigation may be warranted, however, the shoreline is being eroded away, and logistically this may not be feasible Table 6 presents the confirmation sample results and AOC recommendations Figure 17 shows that sample locations

2.8 AOC07: Landfill A

Landfill A was filled with non-toxic demolition debris from the RRS, POL tanks, FAA site, and the Fort Morrow area ADEC issued solid waste disposal permit 8721-BA012 for Landfill A (Figure 1) Landfill A is approximately 300 feet east of the RRS composite building (Photograph 2, Appendix C) Asbestos from the RRS and Fort Morrow buildings were placed into an asbestos cell within Landfill A POL-impacted soil with less than 5,000 mg/kg TPH, and with PCB concentrations less than 10 mg/kg was placed in 6-inch lifts within the landfill cap Appendix D shows very rough as-builts of Landfill A The landfill was seeded after the cap was in place

Field activities during the 1995 SI included the visual inspection of Landfill A to determine the status of the landfill cap The cap appeared to be intact and well vegetated, with no apparent erosion However, no sign board or marker was located which identified Landfill A or indicated the presence of buried asbestos material

2.8.1 Conclusions and Recommendations

The landfill cap is intact, and there does not appear to be any threat of potential breaching It is recommended that closure documentation be submitted to ADEC, and an asbestos sign be posted

2.9 AOC08: Landfill B

Landfill B was filled with non-toxic demolition debris from the RRS, POL tanks, FAA site, and the Fort Morrow area ADEC issued solid waste disposal permit 87211-BA013 for Landfill B (Figure 1) Landfill B is approximately ½ mile south of the west end of the runway (Photograph 3, Appendix C) POL-impacted soil with less than 5,000 mg/kg TPH, and with PCB concentrations less than 10 mg/kg were placed in 6-inch lifts within the landfill cap Appendix D shows very rough as-builts of Landfill B The landfill was seeded after the cap was in place

Field activities during the 1995 SI included the visual inspection of Landfill B to determine the status of the landfill cap The cap appeared to be intact and well vegetated, with no apparent erosion

2.9.1 Conclusions and Recommendations

The landfill cap is intact and there is no apparent threat of breaching It is recommended that closure documentation be submitted to ADEC in order to comply with state regulations

2.10 Summary of Conclusions and Recommendations

Conclusions and recommendations regarding the Port Heiden site are based on the following negotiated cleanup levels 5,000 ppm TPH, 25 ppm PCBs, and the 100 ppm TPH at the POL tank area (AOC06)

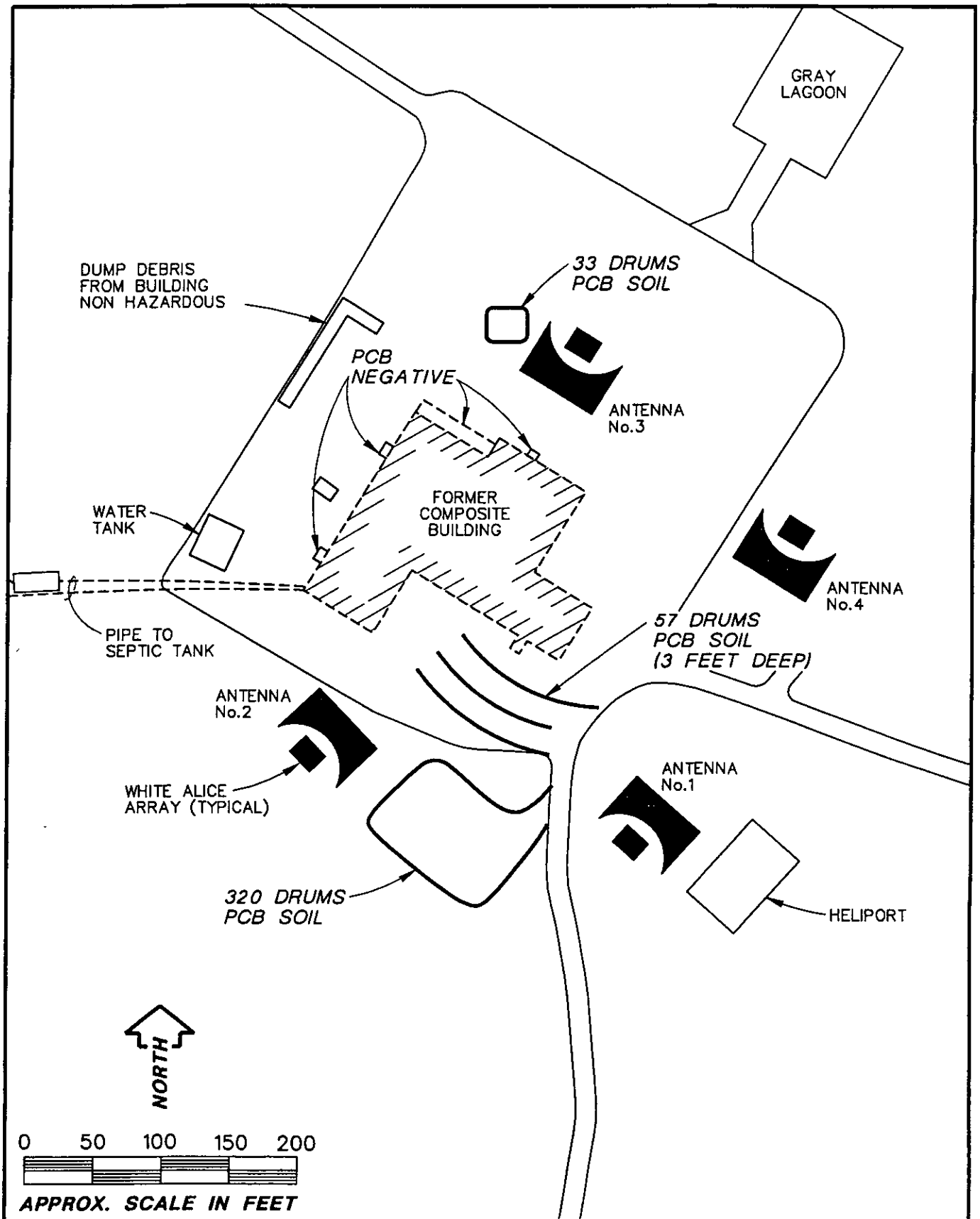
After review of previous investigations and the 1995 SI, recommendations were made for (1) No further response action planned (NFRAP), (2) remedial action, or (3) additional site characterization Table 7 presents a summary for the IRP site and AOCs with proposed recommendations

NFRAP is proposed for two of the sites Remedial action is proposed for two of the sites Three sites are recommended for additional site characterization, and filing of closure reports is recommended for Landfills A and B

TABLE 7
SUMMARY OF RECOMMENDATIONS

IRP Site/AOC Designation	IRP Site/AOC Name	Comments	Recommendations
OT001	Composite Building and White Alice Arrays	TPH concentrations below 5,000 ppm PCB concentrations below 25 ppm	NFRAP
AOC01	Black Lagoon	Approximately 4,000 cubic yards of impacted soil above 5,000 ppm TPH	Remedial action
AOC02	Gray Lagoon	Approximately 100 to 150 cubic yards of impacted soil above 5,000 ppm TPH	Remedial action
AOC03	Heliport	Field screening of trenches did not detect impacted soil	NFRAP
AOC04	Septic Tank and Outfall	The septic outfall sample had TPH, DRO, GRO, and BTEX analyses below cleanup levels and the analytical results were due to biogenic interference	NFRAP the septic outfall, further investigation at the former septic tank location
AOC05	Fuel Pipeline	The POL pipeline corridor is unevaluated The pipeline between the POL tanks and the airport has been transferred to Reeve Aleutian Airways	Additional Site Characterization
AOC06	POL Tank Area	Confirmation samples in the northwest corner of the former excavation were above cleanup levels and free product was observed in the bottom of the excavation The shoreline is eroding away	Additional site characterization if possible with the eroding bank
AOC07	Landfill A	The landfill cap is in good condition but a closure report has not been submitted to ADEC	Submit closure report
AOC08	Landfill B	The landfill cap is in good condition but a closure report has not been submitted to ADEC	Submit closure report

IRP - Installation Restoration Program
AOC - Area of Concern
BTEX - benzene, toluene, ethylbenzene, and xylenes
PCBs - Polychlorinated Biphenyls
POL - petroleum, oil, and lubricants
DRO - diesel-range organics
RRO - residual-range organics
ADEC - Alaska Department of Environmental Conservation
NFRAP - No further Response Action Planned



611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

DATE MARCH 1996
DWN. CDS9602F3
CKD. G.D.
REV.
PROJECT No. 55210-020.00T8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

PCB SOIL REMOVAL AREAS
5099th. CIVIL ENGINEERS OPERATIONS SQUADRON, 1985

FIGURE 3

13C ND(8 6)8/30

ZONE 1

ZONE 2

4C 1 8(5 1)8/31

10C ND 9/21

6C 0 31(0 14)8/31

8C 1 4(7 6)8/31

5C 0 67(3 8)8/31

3C ND(0 58)8/30

7C ND(0.24)8/31

2C ND(0 42)8/30

9C 0 84(3 4)8/31

11C 2 1(10)8/31

1C 0 3(2 6)8/31

20C ND(0 52)8/30

22C ND(ND)8/30

21C ND(0 32)8/30

14C 2 5(6 7)8/31

17C ND(0 4)8/30

18C ND(0.52)8/31

CONCRETE PAD

15C 0 93(3 6)8/30

16C ND(0 29)8/30

ZONE 3B

ZONE 3A

19C 0 64(1 3)8/30

12C 0 24(0 35)8/31

FORMER COMPOSITE BUILDING

EXPLANATION

- 12C — SAMPLE LOCATION w/ IDENTIFICATION
- 0 24(0 35)8/31 — SAMPLE DATE
- ANALYTICAL RESULTS FROM QA LAB
- PCBs (POLYCHLORINATED BIBHENYLS) RESULTS FROM FIELD
- ND — NON-DETECTED
- NA — NOT AVAILABLE

NORTH

0 10 20 30 40

APPROX. SCALE IN FEET

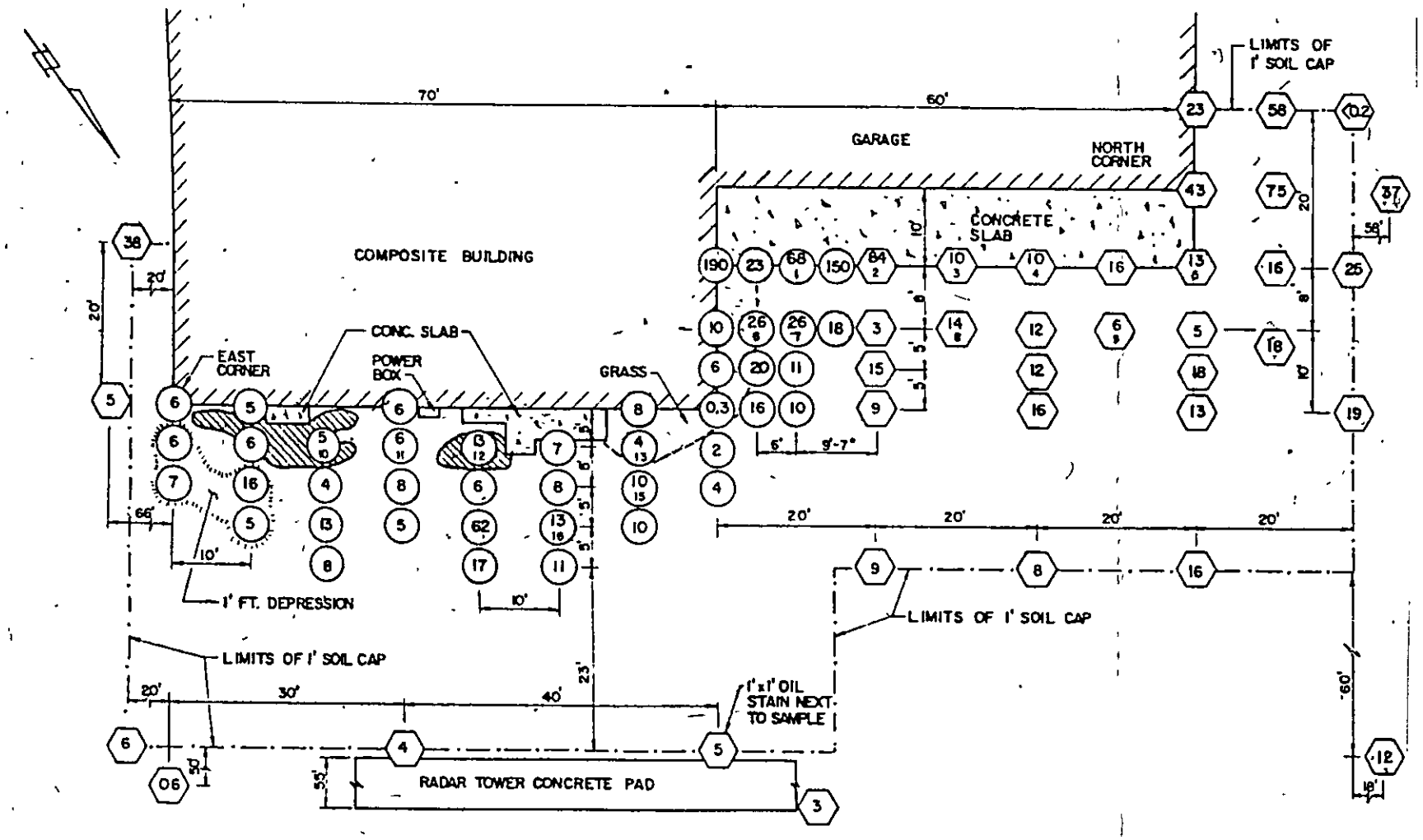
FIGURE 5

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

1990 SOIL SAMPLE LOCATIONS PCB RESULTS FORMER COMPOSITE BUILDING

DATE FEB. 1996
DWN. CDS9602PCB
CKD. G.D.
REV. MARCH 1996
PROJECT No. 55210-020.00TB

611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA



LEGEND

- 1987 SOIL SAMPLE; SURFACE SAMPLE TO 6" DEPTH — Y = PCB IN PPM (AROCLOR 1260)
- 1988 SOIL SAMPLE; SURFACE SAMPLE TO 6" DEPTH — Y = PCB IN PPM (AROCLOR 1260)
- SEE NOTE No.
- EXISTING BUILDING
- CONCRETE
- LIMITS OF 1' SOIL CAP
- VISIBLE POL STAIN
- GRASS

NOTES

1. 1988 SAMPLE AT SAME LOCATION 46 PPM.
2. SPLIT QA (134 PPM)/QC (12 AND 84 PPM) SAMPLE.
3. SUBSURFACE SAMPLES: <0.2 PPM AT 11 TO 27 INCHES DEPTH.
4. DUPLICATE QA (12 PPM)/QC (7 AND 10 PPM) SAMPLE.
5. SUBSURFACE SAMPLES: <0.2 PPM AT 11 TO 26 INCHES DEPTH.
6. SPLIT QA (50 PPM)/QC (29 AND 26 PPM) SAMPLE: SUBSURFACE SAMPLES 0.2 PPM AT 2 TO 22 INCHES DEPTH.
7. 1988 SAMPLE IN SAME LOCATION 22 PPM.
8. DUPLICATE QA (12 PPM)/QC (13 AND 14 PPM) SAMPLE.
9. SPLIT QA (8 PPM)/QC (6 AND <0.2 PPM) SAMPLE.
10. SUBSURFACE SAMPLES: 8 PPM AT 2 TO 12 INCHES, AND SPLIT QA (2PPM)/QC (3 AND 2 PPM) SAMPLE AT 14 TO 22 INCHES DEPTH. SUBSURFACE SAMPLE AT 2 TO 12 INCHES ALSO SHOWED TRICHLOROETHENE AT 46 PPB; NO OTHER VOLATILES DETECTED.
11. SPLIT QA (7 PPM)/QC (6 AND 6 PPM) SAMPLE.
12. SUBSURFACE SAMPLES: 5 PPM AT 2 TO 12 INCHES, AND 2 PPM AT 12 TO 22 INCHES DEPTH. CLAY AT 12 INCHES. SUBSURFACE SAMPLE AT 2 TO 12 INCHES ALSO SHOWED TRICHLOROETHENE AT 14 PPB; NO OTHER VOLATILES DETECTED.
13. SUBSURFACE SAMPLES: DUPLICATE QA (2 PPM)/QC (1 AND 0.5 PPM) SAMPLE AT 2 TO 12 INCHES DEPTH, AND 0.2 PPM AT 12 TO 22 INCHES DEPTH. CLAY AT 12 INCHES. SUBSURFACE SAMPLE AT 2 TO 12 INCHES SHOWED TRICHLOROETHENE AT 160 PPB, NO OTHER VOLATILES DETECTED.
14. SPLIT QA (10 PPM)/QC (10 AND 5 PPM) SAMPLE.
15. SUBSURFACE SAMPLES: 3 PPM AT 6 TO 18 INCHES, 2 PPM AT 18 TO 28 INCHES.

SOURCE: 1989 DEFENSE ENVIRONMENTAL RESTORATION PROGRAM, DEBRIS CLEANUP AND SITE RESTORATION, MASTER SITE PLAN, PORT HEIDEN, ALASKA.

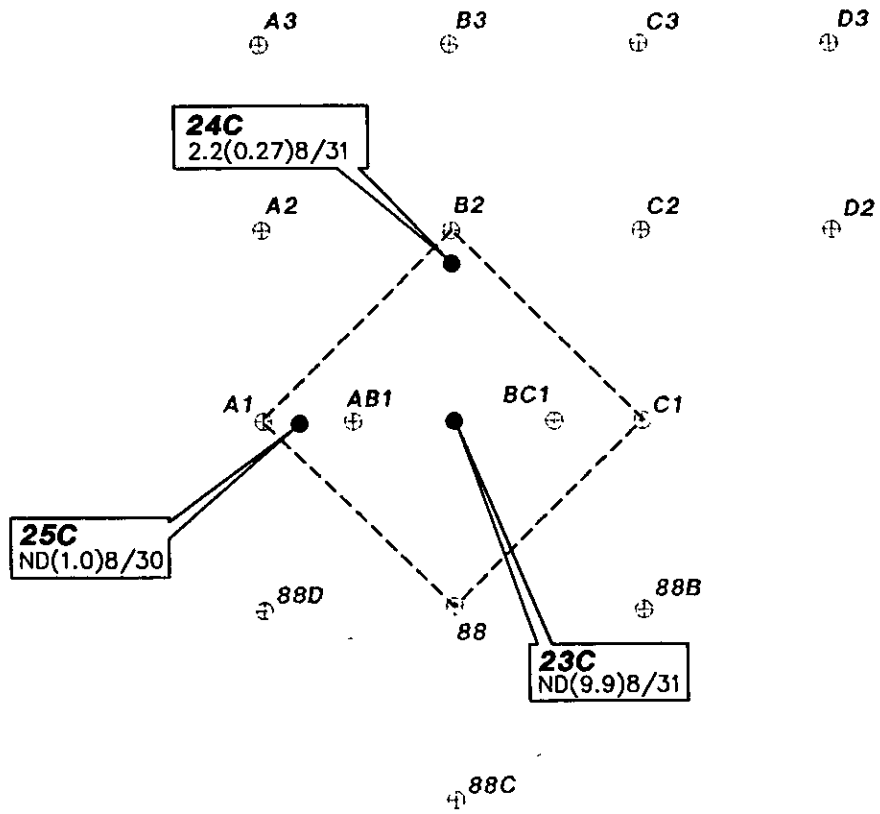
FIGURE 4

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

1987 AND 1988 PCB SAMPLE LOCATIONS AND ANALYTICAL RESULTS

DATE MARCH 1996
DWN.
CKD. G.D.
REV.
PROJECT No. 55210-020.0078

611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA



DIAMOND AREA LOCATION MAP NTS

EXPLANATION

25C ●	CONFIRMATION SOIL SAMPLE LOCATION	ND	NON-DETECTED
88C ⊕	FIELD LAB SAMPLE LOCATION		
ND(1.0)8/30	SAMPLE DATE		
	ANALYTICAL RESULTS FROM QA LAB		
	PCBs RESULTS FROM FIELD		

NORTH

0 3 6 9 12

APPROX. SCALE IN FEET

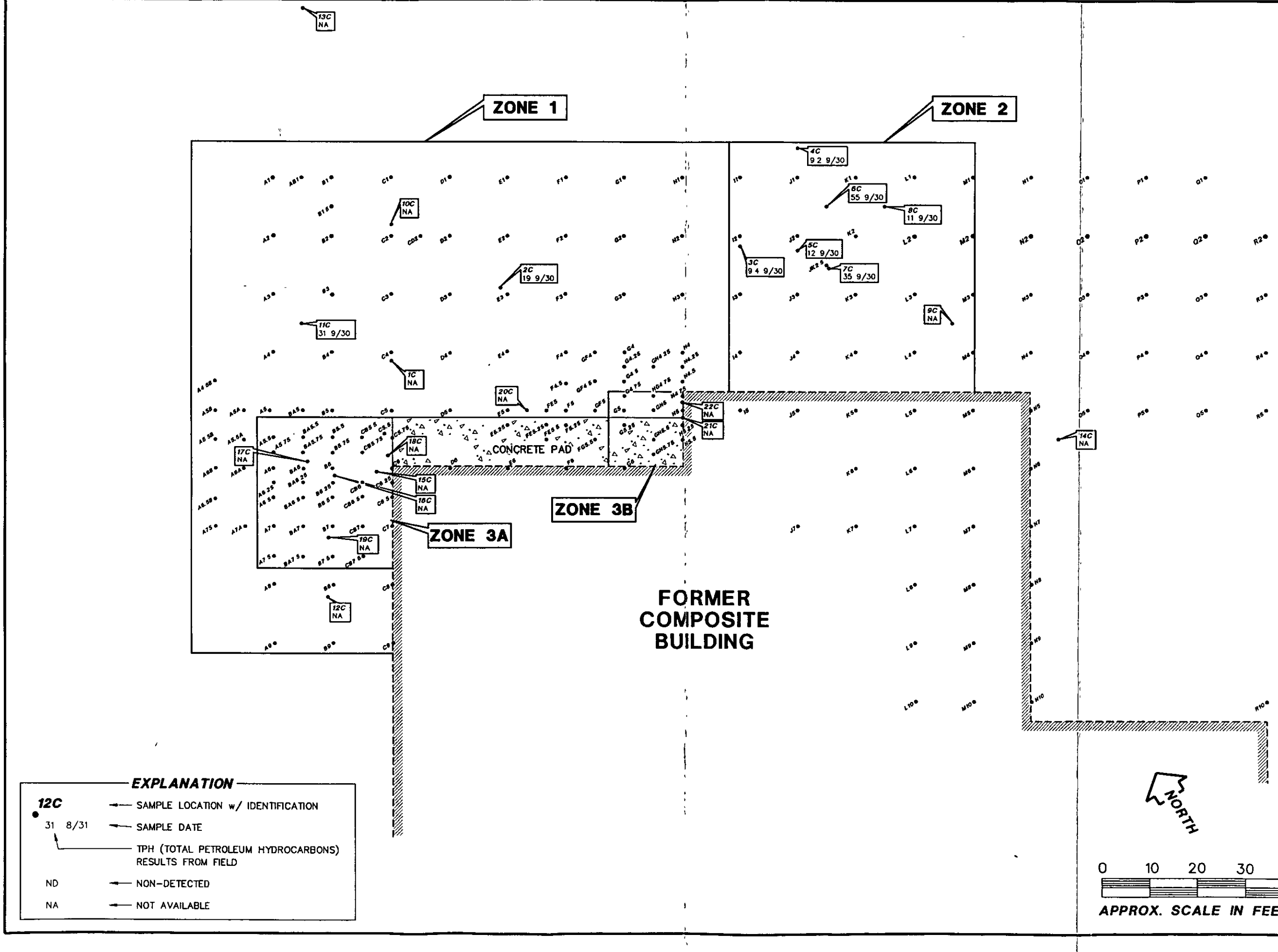
611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

DATE FEB. 1996
DWN. CDS9602EX
CKD. G.D.
REV. MARCH 1996
PROJECT No. 55210-020.00T8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

1990 DIAMOND AREA PCB RESULTS

FIGURE **6**



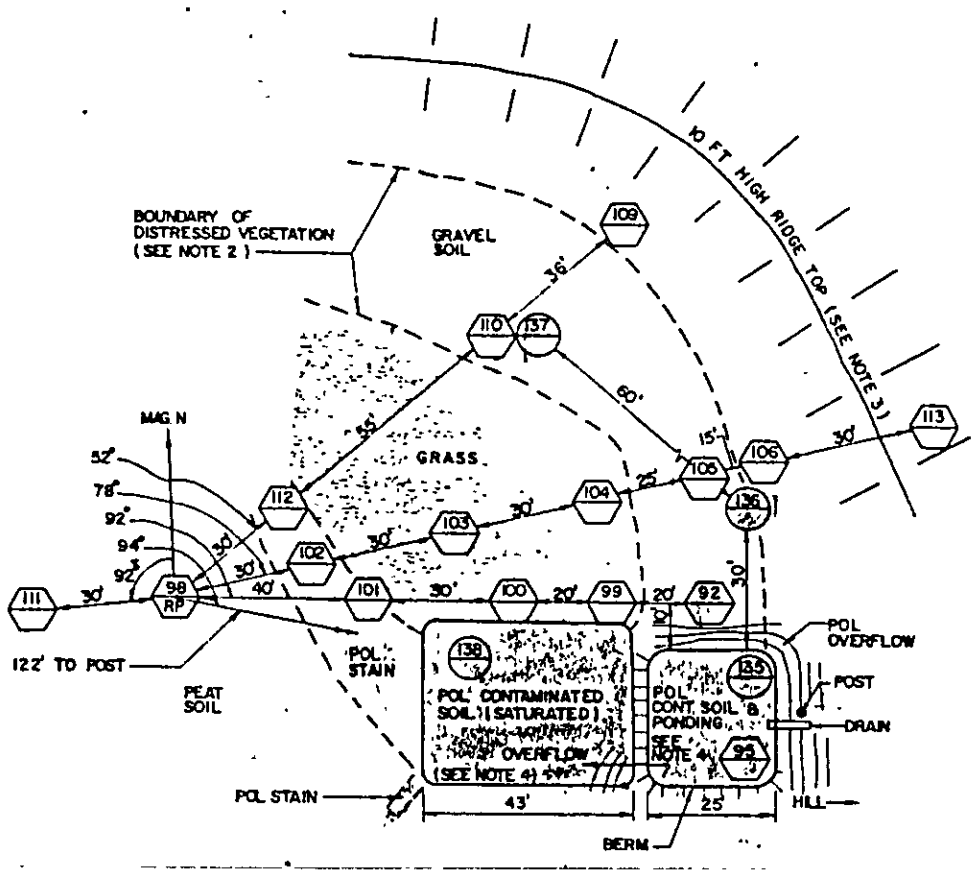
PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

1990 SOIL SAMPLE LOCATIONS TPH RESULTS FORMER COMPOSITE BUILDING

FIGURE 7

DATE FEB. 1996
DWN. CDS9602TPH
CKD. G.D.
REV. MARCH 1996
PROJECT No. 55210-020.00TB

611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA



LEGEND

(X) 1987 SOIL SAMPLE; X = SAMPLE I.D. No.

(X) 1988 SOIL SAMPLE; X = SAMPLE I.D. No.

SOURCE: 1989 DEFENSE ENVIRONMENTAL RESTORATION PROGRAM, DEBRIS CLEANUP AND SITE RESTORATION, MASTER SITE PLAN, PORT HEIDEN, ALASKA.

NOTES

1. IDENTIFY POL CONTAMINATION, EXCAVATE AND DISPOSE OF CONTAMINATED SOIL ACCORDING TO REQUIREMENTS OF 01610.
2. AREA OF DISTRESSED VEGETATION APPEARS TO HAVE BEEN BULLDOZED TO FORM RIDGE AND DOES NOT APPEAR TO HAVE POL STAINS EXCEPT NEAR SAMPLE 92. SAMPLES 136 AND 137 DO HAVE PETROLEUM HYDROCARBONS AND WILL REQUIRE EXCAVATION. DEPTH OF CONTAMINATION IS UNKNOWN, BUT IS BELIEVED TO REQUIRE EXCAVATION TO AT LEAST 2 FT. DEPTH. AREA OF CONTAMINATION BEYOND SAMPLE 137 IS ALSO UNKNOWN AND WILL REQUIRE TESTING TO DETERMINE EXTENT OF EXCAVATION REQUIRED.
3. RIDGE IS MANMADE AND PROBABLY COVERS SEWAGE DISCHARGE PIPES.
4. BERMED AREAS CONTAIN SOILS SATURATED WITH PETROLEUM. DEPTH OF CONTAMINATION IS UNKNOWN BUT MAY EXTEND TO THE WATER TABLE, WHICH IS UNKNOWN AT THIS LOCATION. LOCAL WELLS AT PORT HEIDEN REACH WATER AT A DEPTH OF 5 TO 10 FT.
5. TEST RESULTS: 1987 SAMPLES WERE TESTED FOR PCBs (8080), VOLATILE ORGANICS (8240), SEMIVOLATILE ORGANICS (8270), AND FLASHPOINT. IN 1988, ALL SAMPLES WERE TESTED FOR VOLATILE ORGANICS (8020), AND SAMPLES 92, 93, 94, 95, 110, 112, AND 113 WERE TESTED FOR EP TOX METALS (1310). WHERE NO RESULTS ARE NOT SHOWN, CONTAMINANTS WERE NOT DETECTED.

SAMPLE 92

SURFACE:
STAINS
TOLUENE 0.7 PPM
ETHYLBENZENE 0.8 PPM

1 FT. DEPTH:
FUEL ODORS, STAINS
BENZENE 1.3 PPM
TOLUENE 2.8 PPM
ETHYLBENZENE 7.5 PPM
TOTAL XYLENES 10.3 PPM

2 FT. DEPTH:
FUEL ODORS, STAINS
NO VOLATILE TESTS RUN

SAMPLE 95

1 FT. DEPTH:
FUEL ODORS, STAINS
BENZENE 1.3 PPM
TOLUENE 2.8 PPM
ETHYLBENZENE 7.5 PPM
TOTAL XYLENES 10.3 PPM

2 FT. DEPTH:
FUEL ODORS, STAINS
NO VOLATILE TESTS RUN

SAMPLE 135

BNA FRACTION = LINK HYDROCARBONS 1400 PPM
FLASHPOINT >212 DEG. F.

SAMPLE 136

BIS (2-ETHYLHEXYL) PHALATE 3 PPM
BNA FRACTION = LINK HYDROCARBONS 517 PPM
FLASHPOINT 75 DEG. F.

SAMPLE 137

CARBON DISULFIDE 5 PPB
TRICHLOROETHENE 8 PPB
TOLUENE 10 PPB
PBC .85 PPM
BNA FRACTION = LINK HYDROCARBONS 510 PPM
FLASHPOINT 78 DEG. F.

SAMPLE 138

BNA FRACTION = LINK HYDROCARBONS 2700 PPM
FLASHPOINT 79 DEG. F.

FIGURE 8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

1987 AND 1988 BLACK LAGOON SAMPLE LOCATIONS AND ANALYTICAL RESULTS

DATE MARCH 1996
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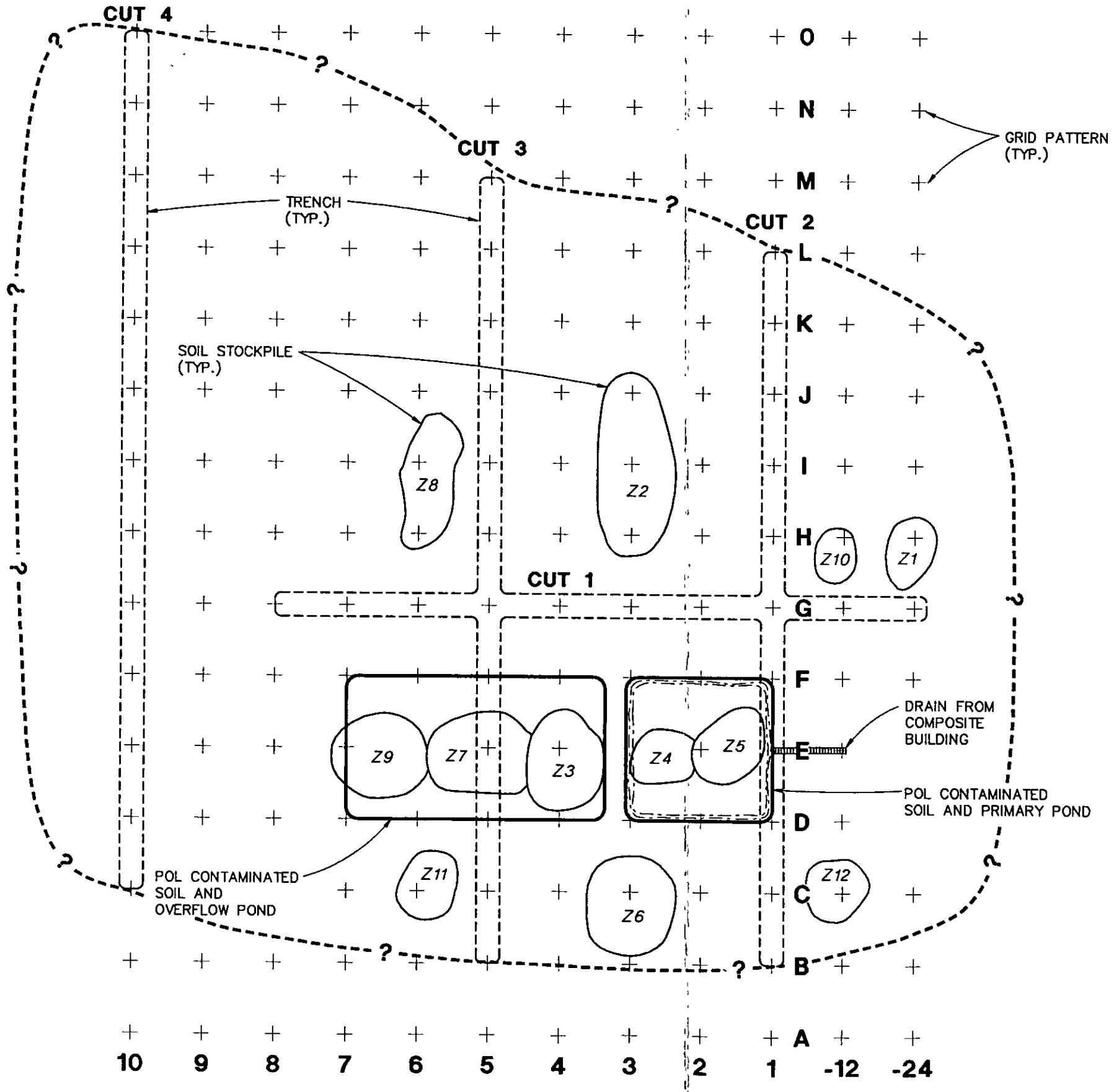
PROJECT No. 55210-020.0078

611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

DEPARTMENT OF THE AIR FORCE



EXPLANATION

Z11 — SOIL STOCKPILE

? — APPROXIMATE LIMIT OF AREA WITH TPH LEVELS ESTIMATED AT GREATER THAN 5,000 ppm

NORTH

0 10 20 30 40

APPROX. SCALE IN FEET

FIGURE 9

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

BLACK LAGOON GRID AND TRENCH DETAIL

DATE MARCH 1996
DWN. CDS9602CUT
CKD. G.D.
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PROJECT No. 55210-020.00T8

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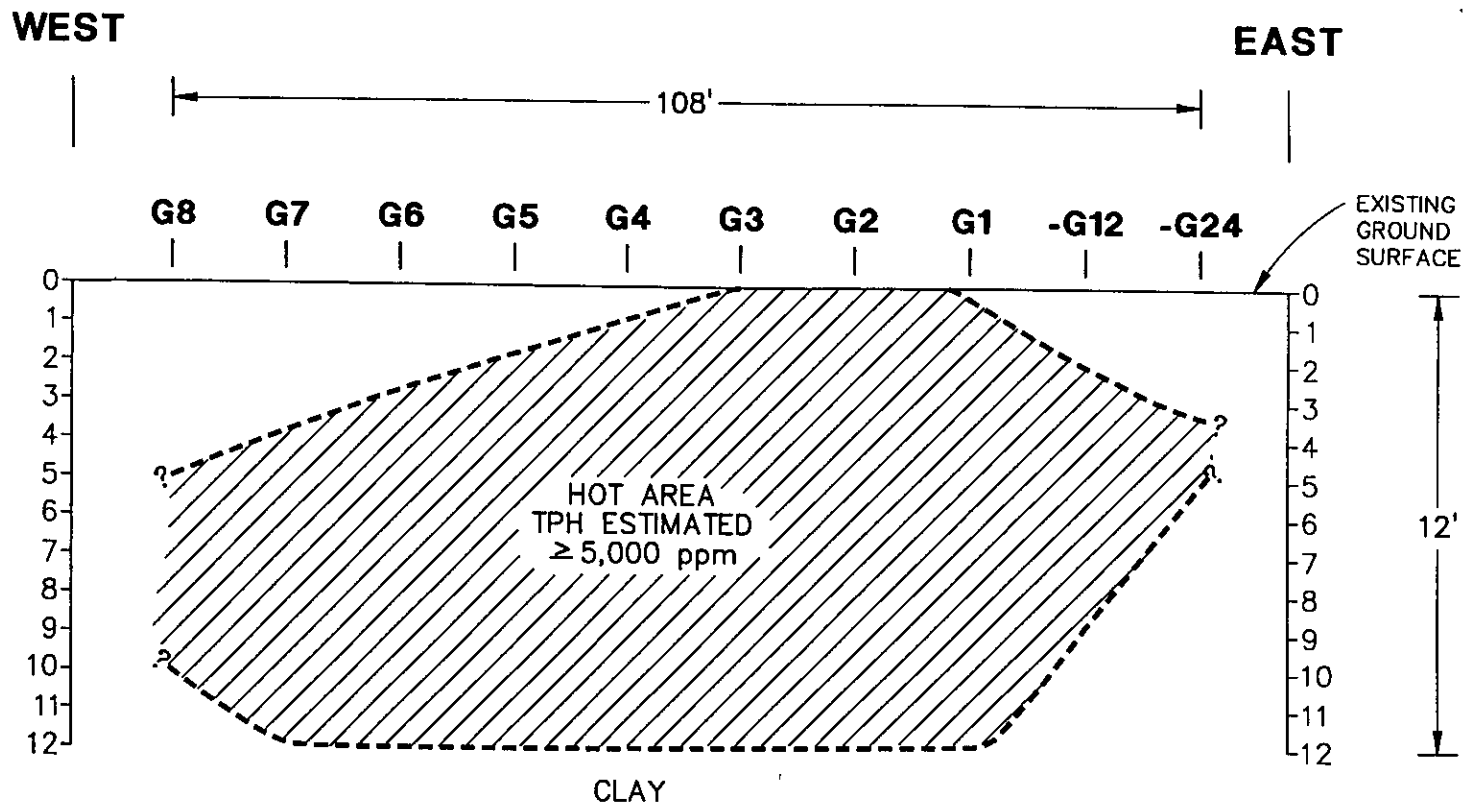
ELMENDORF AFB, ALASKA



HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=5'

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ELMENDORF AFB, ALASKA

DATE MARCH 1996
DWN. CDS9602CT1
CKD. G.D.
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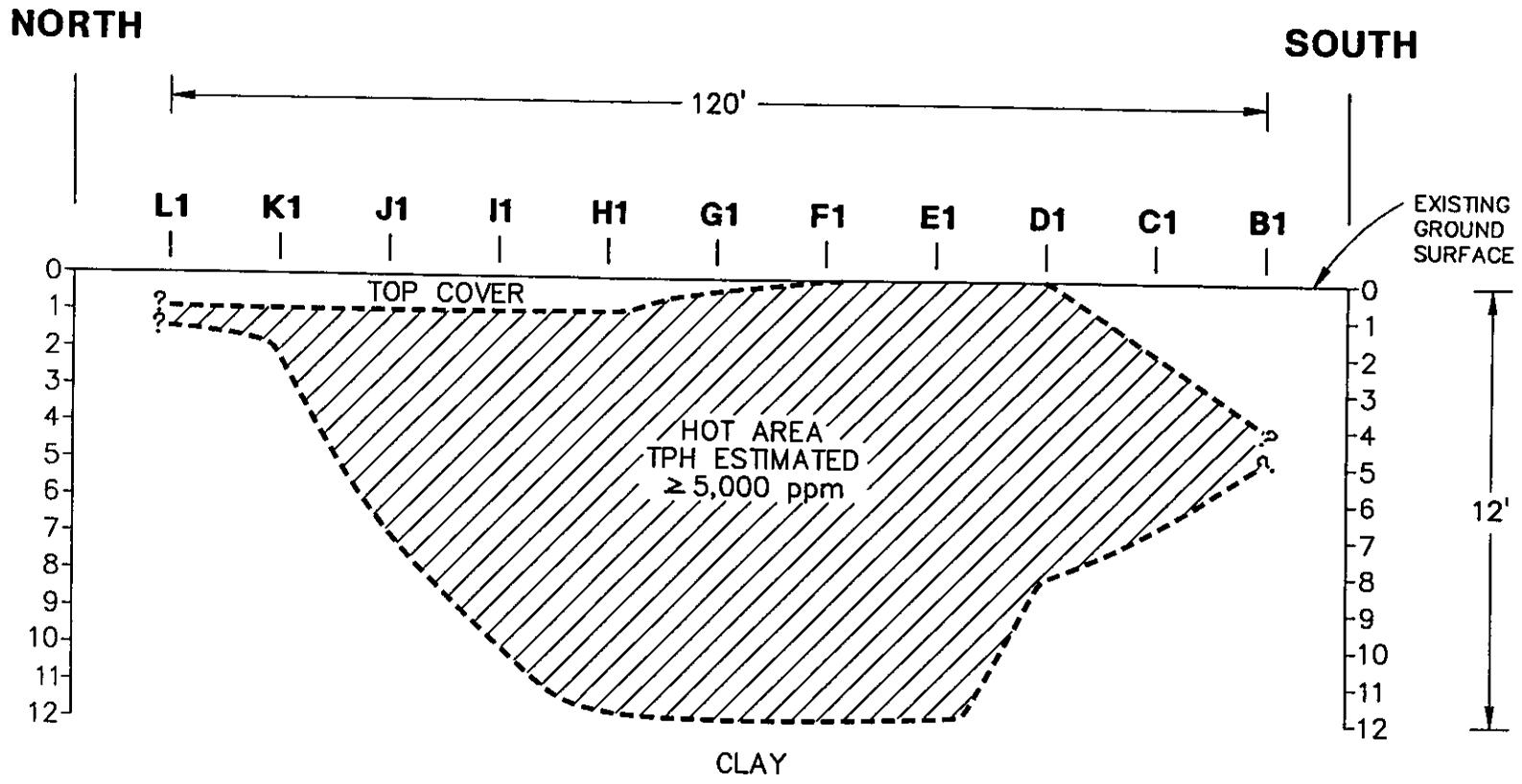
PROJECT No. 55210-20.00T8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

BLACK LAGOON CUT 1
CROSS SECTION

FIGURE
10



HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=5'

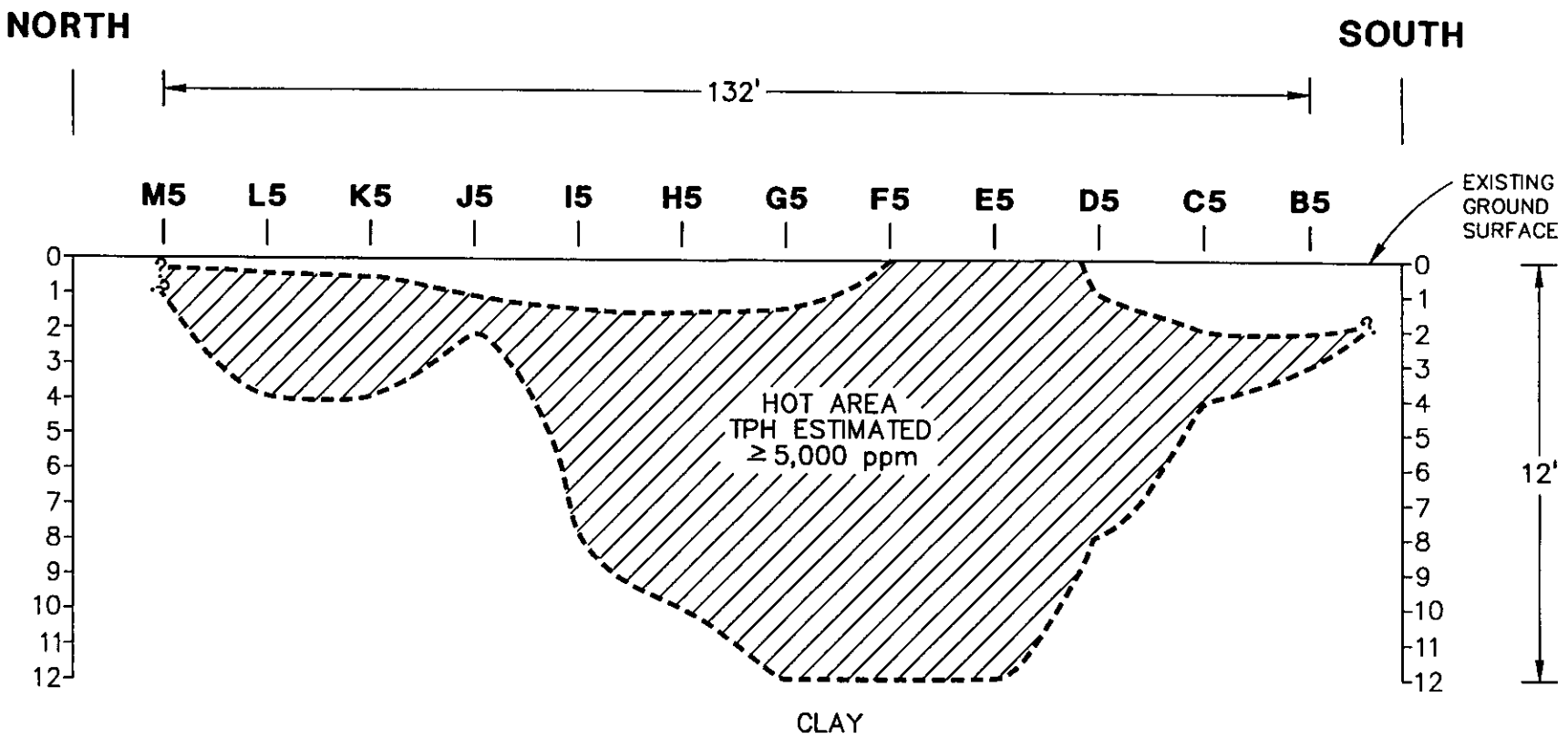
611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

DATE MARCH 1996
DWN. CDS9602CT2
CKD. G.D.
REV.
PROJECT No. 55210-20.00T8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

BLACK LAGOON CUT 2
CROSS SECTION

FIGURE
11



HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=5'

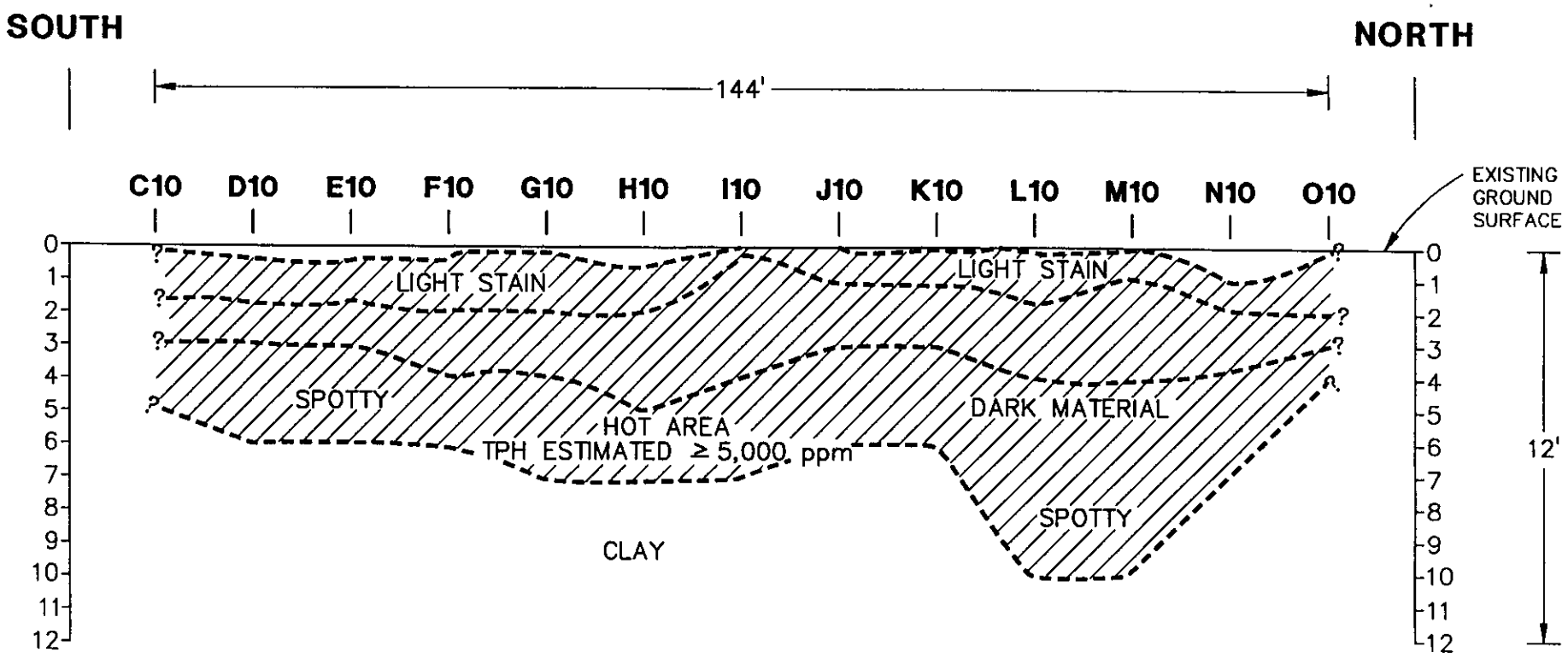
611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

DATE MARCH 1996
DWN. CDS9602CT3
CKD. G.D.
REV.
PROJECT No. 55210-20.00T8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

BLACK LAGOON CUT 3 CROSS SECTION

FIGURE 12



HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=5'

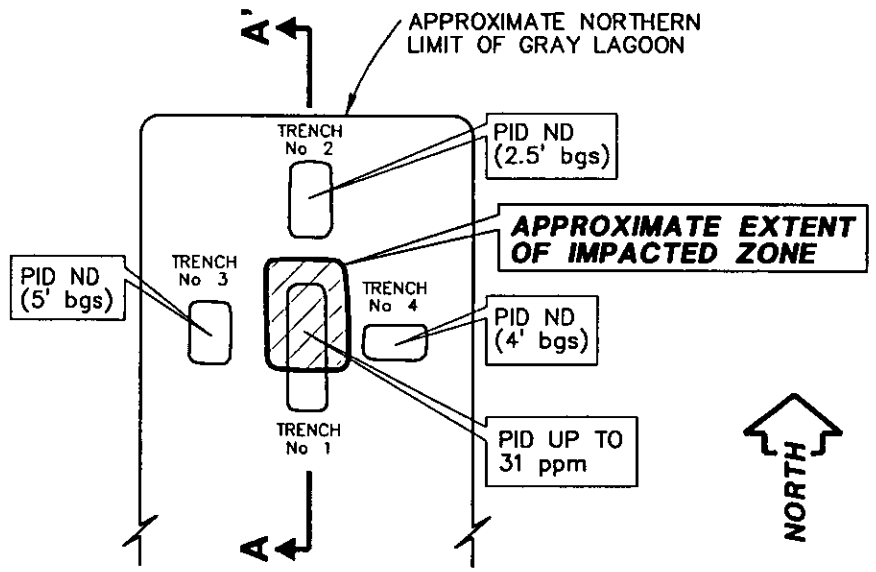
611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

DATE MARCH 1996
DWN. CDS9602CT4
CKD. G.D.
REV.
PROJECT No. 55210-20.00T8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

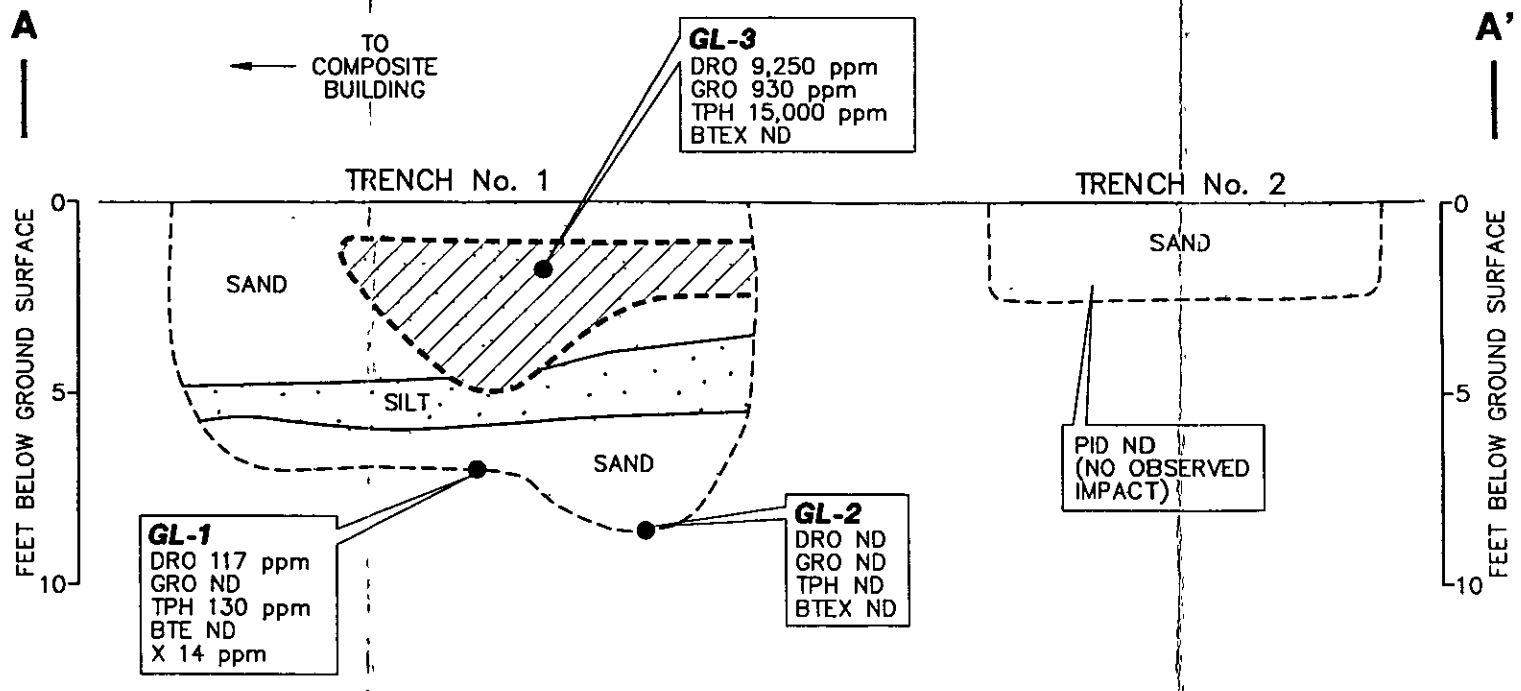
BLACK LAGOON CUT 4 CROSS SECTION

FIGURE 13



PLAN VIEW

APPROXIMATE SCALE: 1"-50'



CROSS-SECTION A-A'

APPROXIMATE SCALE:
HORIZONTAL: 1"=10'
VERTICAL: 1"=5'
VERTICAL EXAGGERATION 2X

EXPLANATION

GL-1	SOIL SAMPLE LOCATION
(4' bgs)	SAMPLE DEPTH (BELOW GROUND SURFACE)
▨	VISIBLY IMPACTED ZONE, PETROLEUM–LIKE ODOR
DRO	DIESEL–RANGE ORGANICS
GRO	GASOLINE–RANGE ORGANICS
TPH	TOTAL PETROLEUM HYDROCARBONS
BTEX	BENZENE, TOLUENE, ETHYLBENZENE AND XYLENES
PID	PHOTOIONIZATION DETECTOR
ND	NOT DETECTED

FIGURE **15**

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

GRAY LAGOON SITE DETAIL

DATE MARCH 1996
DWN. CDS9602GLS
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REV. ____
PROJECT No. 55210–020.007B

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611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

EXPLANATION

5,700 / 7,100 L — COMPOSITE BUILDING TRENCHES WITH TPH ANALYTICAL RESULTS

TRENCH IDENTIFICATION LETTER

APPROXIMATE LOCATION OF PCB DIAMOND AREA (SEE FIGURE 5)

FORMER COMPOSITE BUILDING

20,000-GALLON DIESEL USTs EXCAVATION AREA (FILLED)

ANTENNA No. 3

ANTENNA No. 4

WHITE ALICE ARRAY (TYPICAL)

ACCESS ROAD

GRAY LAGOON

APPROX. SCALE IN FEET

0 25 50 75 100

NORTH

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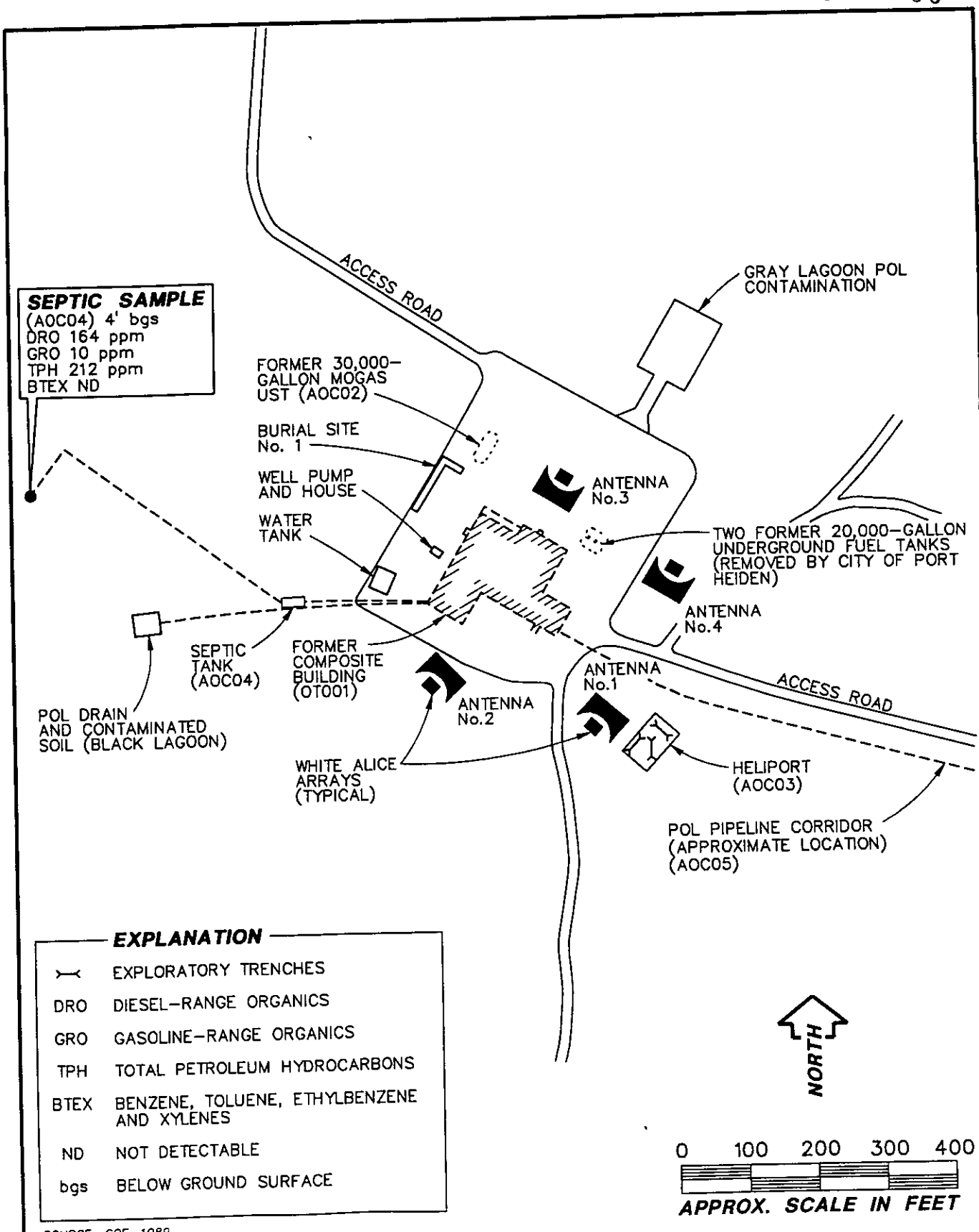
ELMENDORF AFB, ALASKA

DATE MARCH 1996
DWN. CDS9602F14
CKD. G.D.
REV.
PROJECT No. 55210-020.00T8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

COMPOSITE BUILDING EXPLORATORY TRENCHES

FIGURE 14



SOURCE COE, 1989

611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

DATE MARCH 1996
DWN. CDS9602SM
CKD. G.D.
REV.
PROJECT No. 55210-20.00T8

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

HELIPORT EXPLORATORY TRENCHES AND SEPTIC TANK OUTFALL SAMPLE

FIGURE 16

N O P Q R S T U V W X Y Z A B C D E F G H I J K L M

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

GRID PATTERN IDENTIFICATION

O2
920705-010D
TPH 1,940 NWES
TPH 1,730 C & G
920705-011D
TPH 4,000 NWES
TPH 1,310 C & G

C1
920705-012
TPH 42.2 NWES
TPH 260 C & G

A4
920705-009
TPH <25 NWES
TPH <25 C & G

K7
920705-008
TPH <25 NWES
TPH <25 C & G

920S26-019
FREE PRODUCT

APPROXIMATE LIMITS OF EXCAVATION

S12
920705-007
TPH <25 NWES
TPH 119 C & G

E12
920705-006
TPH <25 NWES
TPH 26.8 C & G

M16
920701-006
TPH <25 NWES
TPH 11.8 C & G

Y19
920705-005
TPH 46.4 NWES
TPH 27.8 C & G

E19
920705-004
TPH <25 NWES
TPH <25 C & G

K19
920705-003
TPH 924 NWES
TPH 30.6 C & G

H24
920705-001
TPH 53.0 NWES
TPH 74.3 C & G

A27
920705-002
TPH <25 NWES
TPH <25 C & G

D29
920701-002
TPH <25 NWES
TPH 15.1 C & G

EXCAVATION

- ⊕ — SOIL SAMPLE LOCATION
- ▲ — FREE PRODUCT SAMPLE LOCATION
- Y19 — GRID LOCATION
- 920705-005 — SAMPLE IDENTIFICATION No.
- TOTAL PETROLEUM HYDROCARONS
- TPH CONCENTRATIONS (ppm)
- NORTHWEST ENVIROMENTAL SERVICES FIELD LABORATORY RESULTS
- TPH 25 NWES / TPH 27.8 C & G — CHEMICAL AND GEOLOGICAL LABORATORY

NORTH

TO FORMER WHITE ALICE COMMUNICATIONS SITE

BEACH

PUMP HOUSE

POL PIPING

FORMER POL STORAGE TANKS

POL TANK EXCAVATION

OLD MESHIK VILLAGE

POL TANK LOCATION NTS

NORTH

0 10 20 30 40

APPROX. SCALE IN FEET

FIGURE 17

PORT HEIDEN RADIO RELAY STATION
Port Heiden, Alaska

POL TANK EXCAVATION

DATE MARCH 1996
DWN. CDS9602F17
CKD. G.D.
REV.
PROJECT No. 55210-020.0078

611TH AIR SUPPORT GROUP
611TH CIVIL ENGINEER SQUADRON
ELMENDORF AFB, ALASKA

3 INTERVIEWS

EMCON conducted interviews with people familiar with the remediation and demolition activities at the RRS site The primary objective of the interviews was to determine what activities took place, with regard to assessment and removal of contaminants

Mike Hostetter, Engineer and Equipment Operator Foreman, 611 CES

Mike Hostetter was interviewed via telephone He participated in the removal of PCB-contaminated soil at the site in approximately 1984 or 1985 According to Hostetter, 611 CES set up a grid and collected samples for analysis using a field gas chromatogram Excavated soil was placed into drums Soil samples from the drums were sent to a USAF laboratory in Texas He recalled that they generally dug down 2 to 3 feet bgs and in some locations down to 6 feet bgs He recalled that they removed soil in the vicinity of the transformer room and thought they had removed all the contaminated soil Wind created problems at times, blowing surface soil that was contaminated onto what may have been "clean" soil

Lawrence Robert "Bob" Willey, Engineer and Equipment Operator Foreman, 611 CES

Mr Willey stated that he did not remember the details very well but that there should be a file on the site activities in the 611 CES archives

Tom McKee, VECO

During a telephone interview, Mr McKee said that VECO ran a soil burning unit at the site in 1991 NWES ran a field analytical laboratory to test the soil before and after it was run through the soil burner to verify that TPH concentrations were below the cleanup level He recalled that NWES removed hazardous waste from the site He believed that 500 mg/kg was the limit for diesel-contaminated soil, and 5,000 mg/kg was the cleanup limit for TPH

Larry Wilkinson, Manager of Philip Environmental, Inc. (formerly Northwest EnviroServices, Inc.)

Mr Wilkinson was interviewed in person He stated that in 1990 NWES performed hazardous waste identification and removal from Fort Morrow and the RRS Approximately 19,000 drums were removed from the surface of a 3 square mile area, steam cleaned, and landfilled on site Approximately 4,400 drums had oil, gas, or rainwater in them, 2 drums contained chlorinated solvents, and at least 1 had PCB-oil

PCB-contaminated soil was removed from the vicinity of the RRS composite building to a depth of approximately 3 feet bgs Soil was placed into super sacks and into approximately 150 wooden boxes for shipment The cleanup level was 25 mg/kg for PCBs

In the vicinity of the RRS, two areas of contaminated soil remained the black lagoon and the gray lagoon Approximately 20,000 cy of contaminated soil remain in place at the black lagoon In 1990, they trenched down 18 feet bgs before the contamination ended and the subsurface had been reworked and was not in its original stratigraphy Impacted soil was encountered at 4 to 5 feet bgs to approximately 18 feet bgs Impacted soil concentrations were highest in the center and decreased in all directions radially above, below, and around all sides The gray lagoon area was saturated with POLs from the surface to a depth of approximately 12 feet bgs Vegetation was visibly stressed at the gray lagoon

In 1991, two diesel storage tanks and their concrete foundation(s) were removed in the vicinity of the Native village of Meshik near the coastline Some soil was removed and then returned to the excavation In 1992, soil was removed until groundwater was encountered Free product was visible on the groundwater Approximately 10 feet of soil was left intact between the excavation and the ocean to confine the contamination Excavated soil was processed through an on-site thermal remediation unit and replaced in the excavation A storm has since breached the sea wall in the vicinity of the tanks and may have exposed contaminants to the ocean

Allan Boggs, Independent Environmental Consultant

Allan Boggs collected many of the soil samples in the vicinity of the RRS during 1990 Soil was removed from the PCB-impacted areas in 6-inch lifts For example, soil was collected from 1 to 6 inches bgs, if the PCB concentration was above the cleanup level, the top 6 inches of soil were removed and the soil in that location was again sampled from 1 to 6 inches below the new surface In areas where TPH concentrations were above the target cleanup level, soil was removed in approximately 1-foot lifts and then retested until the cleanup level was achieved

Alascom

In several telephone interviews, Alascom stated they had only general history of the RRS and no detailed information about the Port Heiden site

4 FILE REVIEWS

Alaska Department of Environmental Conservation

The contaminated sites, solid waste, and UST files of ADEC were reviewed. EMCON found the following documentation:

- A UST post-closure notice for a 600-gallon tank at the RRS
- Letters regarding landfill permits for Landfills A and B
- A copy of the 1991 COE Risk Assessment and an ADEC letter of approval

611th Civil Engineer Squadron Archives

Two 3-ring binders were reviewed, which documented the removal of PCB-contaminated soil from the Port Heiden RRS in 1985 According to the reviewed documents, grids were established and composite samples collected from each grid area around the composite building and near the south antenna where PCBs were detected in 1984 The daily log mentions removal of PCB-contaminated soil and the use of field test kits to determine the amount of contamination There is no report or dated figure showing the final disposition of the contaminated soil removed or the final results of PCB confirmation samples from the remaining soil within the excavations An undated figure shows some excavation areas and the number of drums of impacted soil removed

A 3-ring binder labeled "ACE 1986" (ACE is the abbreviation for Alaska Cleanup Effort) contained a page of dates and accomplishments that took place at the site in 1985 A November 15, 1985, entry reads " received lab results from ANA labs, the holes are clean and will be backfilled " For the date December 13, 1985, the entry reads " holes have been backfilled "

Kurt Eilo, U.S. Environmental Protection Agency

In a telephone conversation with Mr Eilo from the USEPA Region 10, Anchorage office, he stated that they would not have received any information (for their files) from ADEC as they did not oversee investigations that took place at the RRS They directed EMCON to review ADEC files instead

U.S. Army Corps of Engineers Files

Files from the COE contained workplans, volumes of raw data, and daily reports of activities that occurred during the three DERP work seasons The majority of this report was based on those files

The COE provided EMCON with a copy of the PA conducted by CH2M Hill in 1994 The PA summarized the environmental cleanup and demolition work that has occurred at the site after 1981 and the remaining impacted areas The report states that three areas remain impacted 1) the tank rings and pipeline at Meshik, 2) the black lagoon at the RRS, and 3) the gray lagoon at the RRS

5 AERIAL PHOTOGRAPH REVIEW

Aerial photographs were obtained from Aeromap and the Bureau of Land Management (BLM). Aeromap did not have photographs of the Port Heiden RRS during its years of operation, however, the BLM did.

Flight 3A, June 19, 1985, No. 14, Aeromap

The composite building and antennas are all in place The black lagoon is a visibly black stained area The gray lagoon is visible as well Northwest of the composite building is an "L" shaped backfilled area This corresponds to an area delineated as a dump on the 5099th Civil Engineering and Operations Squadron figure, as stated in Section 2 1 of this report

Flight 1, September 20, 1968, Roll 12, No. 108, Bureau of Land Management

This photograph was taken while the site was in use Drums appear to be stored in the far northwest corner of the site, and there appears to be stained soil near Antenna No 2

BIBLIOGRAPHY

Alaska Cleanup Effort, Port Heiden 1985 Two three-ring notebooks contains daily reports and figures indicating where PCB-impacted soil was removed Located in 611th Civil Engineer Squadron archives

CH2M Hill 1994 Preliminary Assessment Port Heiden, Alaska Prepared for the U S Environmental Protection Agency 1994

Cloe, J H , and Monaghan, M F 1984 Top Cover For America The Air Force in Alaska 1920-1983

Alaska District Corps of Engineers 1989 Defense Environmental Restoration Program Debris Cleanup and Site Restoration, Port Heiden, Alaska, Master Site Plan

Department of the Army 1991 Chemical Quality Assurance Report, Port Heiden/Port Moller Cleanup Prepared by the North Pacific Division Materials Laboratory, Corps of Engineers Comparison of the 1990 field laboratory results with the project laboratory and quality assurance laboratory results

Inspectors Quality Assurance Reports 1990 through 1992 From Army Corps of Engineers, Alaska District, Construction Office at Fort Richardson, Alaska

Lamoreaux, Bill H 1989 ADEC letter to Harlan E Moore, U S Army Corps of Engineers, extending the solid waste permit for Site A at Port Heiden to December 31, 1992

Northwest EnviroServices, Inc 1990 Field laboratory test results, Port Heiden, Alaska

Northwest EnviroServices, Inc 1991 DERP Field Laboratory Report, Port Heiden, Alaska

Northwest EnviroService, Inc 1992 Field Laboratory Report on Soil Remediation Activities for the Defense Environmental Restoration Program (DERP), at Port Heiden, Alaska

Nuss, David A 1986 Letter from Lt Col Nuss to Robert J Clark of the Bristol Bay Area Health Corporation The letter states that the USAF has removed industrial chemicals and PCB contaminated soil The PCB-contaminated soil was shipped to the continental United States

Roberts, Jennifer L 1991 ADEC letter to Louis R Plyont, Corps of Engineers, stating acceptance of the Port Heiden formerly used Defense Site Risk Analysis

Underwater Construction and Associates, Inc 1990-1992 Daily Quality Control Inspection Reports from Army Corps of Engineers, Alaska District, Construction office at Fort Richardson, Alaska

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices No other warranty, express or implied, is made These services were performed consistent with our agreement with our client This report is solely for the use and information of our client unless otherwise noted Any reliance on this report by a third party is at such party's sole risk

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report

APPENDIX A

RISK ASSESSMENT AND ADEC APPROVAL LETTER

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION

SOUTHCENTRAL REGIONAL OFFICE
3601 C STREET, SUITE 1334
ANCHORAGE, ALASKA 99503

(907) 563-6529

CERTIFIED MAIL
RETURN RECEIPT
REQUESTED

June 20, 1991

Louis R. Pylant
Lieutenant Colonel, Corps of Engineers
Environmental Restoration and Civil Works Section
U.S. Army Engineer District, Alaska
P.O. Box 898
Anchorage, Alaska 99506-0898

Dear Colonel Pylant:

Re: Port Heiden Formerly Used Defense Site Risk Analysis
Dated June 19, 1991

The department has reviewed the Final Risk Analysis for Alternative Cleanup Levels at Port Heiden, Alaska, submitted by your department on June 19, 1991. The risk analysis adequately addresses the concerns generated by utilizing a cleanup level of 5,000 parts per million total petroleum hydrocarbon (TPH) for remote areas of the Port Heiden Formerly Used Defense site (FUDS) cleanup. This 5,000 parts per million does not include benzene, ethylbenzene, toluene, and total xylene? It is my understanding that the petroleum contamination at this area is old weathered fuels in which the BTEX components have volatilized off and are no longer an issue. This letter approves of the work proposed in the Final Risk Analysis with a remote site specific cleanup level of 5,000 parts per million for TPH.

If you have an questions or need further information please contact me.

Sincerely,

Jennifer L. Roberts
Federal Facility Coordinator

JLR:RS
cc: Max Schwenne, ADEC SCRO
Ron Godden, ADEC SCRO
Eileen Olsen, ADEC WDO

RISK ASSESSMENT

DEFENSE ENVIRONMENTAL RESTORATION PROGRAM
PORT HEIDEN, ALASKA

Alaska District
U.S. Army Corps of Engineers

June 1991

RISK ASSESSMENT

DEFENSE ENVIRONMENTAL RESTORATION PROGRAM
PORT HEIDEN, ALASKA

I. BACKGROUND

Work to demolish and clean up an abandoned White Alice military communications site at Port Heiden under the Defense Environmental Restoration Program (DERP) began in 1990 and is still in progress. The DERP project at Port Heiden consists of removing debris and abandoned buildings; cleaning up soils contaminated with petroleum, oil, and lubricants (POL) and asphalt; and restoring the site. An environmental assessment (EA) was written in 1987 for the removal of 333 buildings, several large fuel tanks, about 8,000 55-gallon drums, various scrap metal and debris, 500 cubic yards (yd^3) of POL-contaminated soil, and soil contaminated with polychlorinated biphenyls. The public review process was completed, and State and Federal permits were issued by the regulatory agencies. The Solid Waste Landfill Permit issued by the Alaska Department of Environmental Conservation (ADEC) stipulated that some soils saturated with POL could be landfilled at the approved on-site locations. The term "saturated" has been defined as 5,000 milligrams total petroleum hydrocarbons (TPH) in one kilogram of soil (5,000 mg/kg or 5,000 ppm).

During the process of restoring the site, the Alaska District determined that additional soil contaminated with POL's should be remediated. The permitted landfills were only large enough for the amount of material initially estimated to require disposal; therefore, not enough space remains for the additional contaminated soils. The ADEC has established interim guidelines which propose cleanup levels of 100 mg/kg. Solid waste landfill permits will not be issued for the disposal of POL-contaminated soils.

An EA was distributed for public review on April 16, 1991, for the remediation of the additional contaminated soil. The quantity is estimated to be between 18,000 and 20,000 yd^3. This estimate relies upon limited data; the quantity of contaminated soil at the 100 mg/kg level may be significantly higher. The soil would be remediated by burning it in a low-temperature incinerator (700 to 1,500 $^{\circ}F$) at the site.

II. PURPOSE AND NEED FOR RISK EVALUATION

The cleanup level of 100 mg/kg TPH proposed by the ADEC encompasses the entire State of Alaska, including the most susceptible areas and resources. The purpose of this document is

to describe the hazards present in the contaminated soil at Port Heiden and to present relevant information on physical, chemical, and toxicological properties; likely release of contaminants; fate and transport mechanisms; potential exposure pathways; and potential receptors. A qualitative discussion of potential health and environmental risks and cleanup concentrations concludes the evaluation.

III. WASTE CHARACTERIZATION

Soil samples were taken from numerous locations throughout the Port Heiden area, including the airport and the White Alice facility. The tests included total petroleum hydrocarbon (TPH), volatile organics, chlorinated hydrocarbons, metals (EP Toxicity), and polychlorinated biphenyls (PCB). The PCB-contaminated soils were removed under a previous contract. The tests indicated that the contamination consists mainly of weathered diesel and asphalts. No volatile organics or chlorinated hydrocarbons were detected. Soil samples were taken at areas where contamination was expected (e.g., under tanks, near barrel dumps, in surface-stained soil) from the surface down to 12 feet below the surface. Concentrations of TPH above 60,000 mg/kg were detected.

Gas chronograph analyses determined that the contamination is diesel fuel and some asphalts (refer to Appendix). The diesel fuel is probably diesel No. 2, probably blended with some diesel No. 1 to assure it would flow properly in winter. These fuels contain normal and branched-chain alkanes (paraffins), cycloalkanes (naphthenes), aromatics, and mixed aromatic cycloalkanes. Normal alkanes usually predominate, resulting in a clean-burning diesel fuel with a relatively high ignition quality. No. 1 diesel normally contains less than 0.02 percent benzene and very low levels of three- to seven-ring polycyclic aromatic hydrocarbons. No. 2 diesel contains some distillate and may have up to 5 percent three- to seven-ring polycyclic aromatic hydrocarbons.

Asphalt is a mixture of bitumen and mineral matter, usually sand. Bitumen is a viscous substance that can be liquid, semisolid, or solid. It is soluble in carbon disulfide and consists essentially of hydrocarbons and their derivatives. Bitumen is obtained from the distillation of suitable crude oils by treatment of the residues (occasionally the heaviest fraction).

IV. FATE AND TRANSPORT OF CONTAMINANTS

Research efforts were conducted by Fleischer et al. (1986) to determine the environmental fate of petroleum products. The study centered on 13 compounds because of their use in petroleum

products, their tendency to be released to the subsurface environment, and their potential toxicity. These compounds are listed in table 1.

The environmental fates of the organic compounds were examined by conducting computer simulations using an unsaturated zone environmental fate model. The results of the model are presented in table 2. Based on these results, the evaluated organic compounds can be divided into four groups: (1) those that preferentially adsorb onto soil particles; (2) those that volatilize rapidly; (3) those that pose an immediate threat to ground water supplies; and 4) those for which no one migration pathway dominates. Table 3 lists the percentage of each compound that takes each pathway, according to the computer model results.

The compounds in the diesel fuel that volatilize in air have probably already done so, as it has been at least 20 years since the diesel was spilled. The fractions of concern are mainly those from the multiple pathways group, such as ethylbenzene; phenol, which may dissolve in ground water; and to a lesser extent, those that primarily cling to soil particles.

Environmental Factors Influencing Transport

The environmental conditions that influence the mobility of contaminants are discussed in the following paragraphs. The contaminants appear to be located within the unsaturated soil layer (the layer above ground water). The natural transport mechanism for the contaminants in the project area will be infiltration of ground water or surface water from the soil.

TABLE 1.--*Common constituents of petroleum products*

Gasoline and fuel oils	Heavy oils and waste oils
Benzene	Benzo(a)Anthracene
Ethylbenzene	Benzo(a)Pyrene
(n) Heptane	Naphthalene
Pentane	Phenanthrene
(n) Hexane	
1-Pentene	
(o) Xylene	
Toluene	
Phenol	

TABLE 2.--*Relative environmental partitioning of petroleum constituents based on results of a computer model (SESOIL)*

Petroleum compound	Adsorption onto soil particles (%)	Volatilization (%)	Soluble Portion in ground water and soil moisture (%)
Benzene	3	62	35
Ethylbenzene	21	59	20
(n)Heptane	0.1	99.8	0.1
(n)Hexane	0.1	99.8	0.1
(n)Pentane	0.1	99.8	0.1
Benzo(a)Anthracene	100	0	0
Benzo(a)Pyrene	100	0	0
Naphthalene	61	8	31
Phenanthrene	88	2	10
1-Pentene	0.1	99.8	0.1
Phenol	9	0.01	91
Toluene	3	77	20
(o)Xylene	15	54	31

TABLE 3.--*Petroleum compounds grouped by migration pathway*

Adsorb to soil particles	Volatilize in air	Dissolve in ground water	Multiple pathways
Benzo(a)Pyrene	(n)Hexane	Phenol	Benzene
Phenanthrene	(n)Heptane		Ethylbenzene
Benzo(a)Anthracene	(n)Pentene		Naphthalene
	1-Pentene		Toluene
			(o)Xylene

Port Heiden has a moderate polar maritime climate, characterized by high winds, mild temperatures, cloud cover, and frequent precipitation. Temperatures average between 34 and 54 °F in summer and from 13 to 31 °F in winter, with extremes of 11 and 74 °F. The area receives an average of 43 inches of precipitation each year, including 98 inches of snow.

Soils around Port Heiden are primarily of volcanic origin and very rich in nutrients. Soil depths range from shallow at higher

elevations to deep and organic in lower, wet areas. Upland soils are composed of volcanic ash interspersed with rocks, rubble, or cinders, and are typically silty or sandy, wet, and susceptible to wind erosion on exposed sites. The soils deepen with decreasing elevation and are characterized as ash types having a loamy texture and high organic content. Rich peat-type soils composed of sedge peat and sphagnum, with lenses of volcanic ash, are found on poorly drained sites along rivers and valley bottoms and in depressions on morainal hills. Some mineral soils contain gel-like clays that become fluid with sudden stress and may harden after disturbance.

Contaminants detected within the unsaturated zone above ground water were not detected in ground water or surface water samples. Exploratory digging near the White Alice site indicates that the depth of contamination is 12 feet. This is one of the largest contaminated areas located on ground that provides relief from the surrounding area. The test pit indicated a layer of clay between the lower limit of the contaminated soil and ground water, which is about 35 feet below the ground surface.

Mobility of the POL contaminates by percolation to the ground water will depend on the solubility and organic carbon partition coefficients of the compounds (with consideration of the adsorption effects to surrounding materials); the volume and rate of percolating water from precipitation; and the rate of percolation through underlying materials.

In general, water is the primary solvent in soil. However, bulk hydrocarbons released during spills, leaks, and ruptures of tanks and pipes may enter the soil as the primary solvent in localized situations. When a spill occurs, the bulk hydrocarbon will migrate downward in unsaturated zone soil due to gravity and capillary forces. As a mass of bulk hydrocarbon migrates beyond a unit mass of unsaturated soil, a small amount of the total hydrocarbon mass will remain attached to the soil particles. This is refereed to as "residual saturation." If the migrating mass of bulk hydrocarbon is small relative to the soil surface area, the mass of bulk hydrocarbon eventually will be exhausted as it is converted to residual saturation. When the conversion is complete, downward migration ceases.

Percolating water, in unsaturated zone soil containing residual saturation, can initiate the downward migration of hydrocarbon. This is expected to continue until the hydrocarbon is fixed and/or adsorbed by soil particles, encounters an impermeable bed, or reaches ground water. Fixation reactions will remove an element from migrating water and immobilize it, either within the structure of a mineral or at the mineral surface. Adsorption is an accumulation of an element at the surface of soil particles, with a decrease in the concentration of the dissolved element in water.

If an organic chemical (in this instance, the weathered diesel) is extensively adsorbed by soil particles, it will not leach through the soil profile. If it remains at the soil surface, environmental and human health effects may arise due to the increased concentration of chemical in the zone of plant growth, possibly contaminating a food supply. If the chemical is weakly adsorbed, it may leach through the soil profile and reach ground water and surface waters. Recent research has shown that a number of organic chemicals (PAH, toluene, etc) bind onto dissolved organic macromolecules such as humic acid, fulvic acid, or organic matter. In most soil-water systems, these macromolecules are not mobile, and they tend to be extensively adsorbed onto soil surfaces. The high organic content of the soils in the Port Heiden area has tended to bind POL organic chemicals, as indicated by the rather shallow migration at the test pit. The adsorption also affects other transport and transformation reactions, such as volatilization, photolysis, hydrolysis, and biodegradation.

Volatilization of the lighter components of the diesel spilled or leaked on the soil at Port Heiden began with the initial spill. The relatively nonporous surface soil (high organic, fine volcanic ash) allowed the lighter carbon chains (C_{10} and lighter) with lower vapor pressures to enter the atmosphere. The volatilization was also aided by the almost constant winds on the Alaska Peninsula. Table 2 shows the percentages of the given chemical compounds of the diesel that have been volatilized.

The concentrations of chemicals can be degraded further through organic chemical reactions in soil. In general, five organic chemical reactions are known to occur in soil systems: hydrolysis, substitution, elimination, oxidation, and reduction.

In addition to the abiotic reactions, many organic chemicals can be degraded by biotic reactions. Biotic reactions are those that involve biota; in soil systems, these include plants, animals, insects, and microorganisms. Although plants, animals, and insects can degrade many organic chemicals, they do not play a significant role in degrading organic chemicals in soil. Microorganisms play a major role in degrading organic chemicals in soil. The biodegradation of an organic chemical is the modification or decomposition of the chemical by soil microorganisms, ultimately producing microbial cells, carbon dioxide, and water. It is most important to recognize that microorganisms possess numerous enzymes within their cells which are responsible for the biodegradation of organic chemicals.

The biodegradation rate of an organic chemical generally depends on the following:

a. The presence of soil organisms capable of degrading the chemical.

b. The number of organisms present in the soil system.

c. Soil temperature. As the temperature increases, the microbiological activity increases.

d. Adequate moisture in the soil to support microorganisms' metabolic processes.

e. The presence of the essential elements.

f. The concentration of the organic chemical.

V. EXPOSURE PATHWAYS

Land Use

The Port Heiden area, as outlined in the Bristol Bay Regional Management Plan (1985), is to be managed primarily for fish and wildlife habitat and harvest, recreation, and future oil and gas exploration and development. The project area, which includes the White Alice site and the village of Meshik, was selected for conveyance to the Meshik Village Council and the Bristol Bay Native Corporation.

Current land use in the area is determined by the limited local road system and the location of usable structures. The road system provides transportation routes for hunting and fishing, berry picking, and other subsistence and recreational activities. The airport is important to the Meshik village economy, as it is the only transportation link outside the community.

The population of Meshik is currently fewer than 100 permanent residents, of which the majority are Alaska Native (Eskimo). The village, located about 5 miles south of the airport and 6 miles from the White Alice facility, is connected to the local road system.

Some hunting by hunters other than Meshik village residents occurs at the project site. A portion of the Alaska Peninsula caribou heard passes through the Port Heiden area during the spring and fall migrations. These animals could come in contact with the contaminated areas. Other mammalian species with the potential for contact with the contaminated areas include brown bear, fox, wolves, weasels, microtines, and arctic ground squirrels.

Potential Exposure Pathways and Receptors

Wildlife could become exposed by ingesting contaminated soil while grazing, ingesting contaminated forage, drinking rain water and meltwater in temporary pools, and to some extent, inhaling

the contaminants. No contamination was found in any of the waterway systems, including lakes, streams, and ground water. The exposure route to aquatic resources is minimal, as is the potential for exposure by predators (including humans) from the water. The potential exposure pathways for the Port Heiden area are presented in table 4.

Soil exposure and inhalation are probably not significant exposure pathways. Inhalation of the compounds would mainly occur from windblown soil particles to which the chemical compounds are attached. The moist, heavy air in the region and the dense vegetative growth reduce the amount of airborne particulate matter, thus decreasing the potential for exposure. Soil exposure is also at a minimum. The surface area of the contaminated soil is extremely small compared to the surrounding area. Skin contact by humans is probably rare; there would be no reason for anyone to touch the contaminated soil. The contaminated areas are far removed from the village; children would not play on the chemical compounds. Soil ingestion by wildlife is feasible and is considered as a potential exposure mode.

Hunting and subsistence use of the land are the likely paths for human exposure, while hunting and grazing are the likely paths for wildlife exposure.

TABLE 4.--*Potential exposure pathways for contaminants from the Port Heiden site*

Pathway	Intermediate receptor	Exposure mode	Receptor
Hunting	Game species	Ingestion	Humans, predators
Berry picking		Ingestion	Humans, wildlife
Soil exposure		Ingestion, dermal	Humans, wildlife
Air		Inhalation	Humans, wildlife

VI. CARCINOGENIC RISK AND TOXICITY ASSESSMENT

General

Since diesel fuel is composed of a complex mixture of hydrocarbons, there are few methods for the environmental analysis of "diesel fuel" as an entity, but many methods for the analysis of its component hydrocarbons. As stated previously, preliminary analysis of the soils at Port Heiden indicated that the contamination was weathered diesel and some asphalt. Subsequent sampling was done for TPH to determine the 5,000 µg/kg concentrations for landfill. Additional testing for the chemical components of the contaminated soil was not necessary at that time.

The chemical compositions of diesel No. 1, kerosene, and fuel oil No.1 are essentially equivalent. Diesel No. 2 is approximately equivalent to fuel oil No. 2. Data on carcinogenic and toxic effects for the like compounds will be discussed. Ingestion is the major exposure pathway discussed in this section. The rationale for this is discussed in the previous section, Exposure Pathways.

Diesel Fuels

Toxic Effects - Animals. The oral LD_{50} (lethal dose which kills 50 percent of the animals tested) for rats using kerosene (JP-5) was >60 milliliters/kilogram of body weight of animal (ml/kg bw). The LD_{50} for another brand of kerosene was 28 ml/kg bw in rabbits and 20 ml/kg bw in guinea pigs, while 28 ml/kg bw killed 4 of 15 rats.

The oral LD_{50} of diesel fuel (unspecified) in rats was 7.5 grams/kg bw. The oral LD_{50}'s of No. 2 home heating oil in three tests with rats were 12.0, 15.7, and 17.5 grams/kg bw.

Groups of male and female mice were administered 250-2,000 mg/kg bw marine diesel fuel in acetone or 4,000 mg/kg bw diesel fuel by dermal application on 5 days per week for 13 weeks; no treatment-related deaths occurred. An increased severity of mild chronic active dermatitis at the site of application was observed in the high-dose group.

Toxic Effects - Humans. There have been no tests performed on humans, and little information exists on human ingestion of diesel fuels. A young woman who claimed to have ingested a large amount of diesel fuel (1.5 liters) in a suicide attempt developed toxic lung disease over the next few days, with fever, dry cough, and basal opacities on chest X-ray. The condition resolved over the following 4 months.

From absorption of the chemical through the skin, a man who cleaned his hands and arms with diesel fuel over several weeks developed renal failure after about 3 months.

Carcinogenicity Evaluation. There is inadequate evidence that diesel fuel or fuel oils cause cancer in humans. There is limited evidence that marine diesel fuel and No. 2 fuel oil cause cancer in experimental animals. Marine diesel fuel is possibly carcinogenic to humans. Distilled fuels (kerosene, diesel Nos. 1 and 2, and fuel oil Nos. 1 and 2) are not classifiable as to their carcinogenicity to humans. These evaluations were established by the International Agency for Research on Cancer of the World Health Organization.

Heavy or Residual Fuel Oils

Although these oils differ from asphalt, they are both manufactured from distillation residues from refinery processing. Residual fuel oils are complex mixtures of relatively high-molecular-weight compounds. Residual fuels tend to exhibit greater concentrations of condensed aromatics than do the lighter fuels.

Toxic Effects. Little toxicological study has been done using residual fuel oils. One study indicated there were no adverse effects in sheep fed about 100 grams of bunker fuel per day for up to 10 days.

Carcinogenicity Evaluation. There is sufficient evidence that residual fuel oils cause cancer in experimental animals. Residual fuel oils are possibly carcinogenic to humans.

VII. HUMAN HEALTH RISKS FOR PETROLEUM HYDROCARBON CHEMICAL COMPOUNDS

In most cases, the information in this section is drawn from the Public Health Statement in the Agency for Toxic Substances and Disease registry's (ATSDR) toxicological profile for the chemical. The lowest exposure concentrations that may be associated with adverse effects, or minimum risk levels (MRL's), are included in the summaries. MRL's as used in ATSDR toxicological profiles are estimates of exposure levels posing minimum risk to humans. Exposure to concentrations below the MRL are not expected to result in adverse non-carcinogenic health effects. MRL's include adjustments to reflect human variability and, where appropriate, the uncertainty of extrapolating from laboratory animal data to humans. The MRL can be used as a benchmark to which the levels humans may encounter in this environment can be compared.

Petroleum Hydrocarbon Toxicology

The petroleum hydrocarbon constituents can be divided into five major groups: aromatics (including benzene, ethylbenzene, toluene, and xylene); polycyclic aromatic hydrocarbons (PAH's); alkanes; alkenes; and cycloalkanes.

Benzene

Benzene has a long history of industrial use, most notably as a solvent and as a starting material for the synthesis of other chemicals.

Benzene is readily absorbed by inhalation and ingestion but is relatively poorly absorbed through the skin. Since benzene is quite volatile, inhalation is the most likely route of exposure.

Benzene is toxic to the blood-forming organs and the immune system. Excessive exposure (inhalation of concentrations of 10 to 100 ppm) can result in anemia, a weakened immune system, and headaches. Occupational exposure to benzene may also be associated with spontaneous abortions and miscarriages (supported by limited animal data) and certain developmental abnormalities such as low birth weight, delayed bone formation, and bone marrow toxicity. Benzene is regarded as a human carcinogen based on numerous studies documenting excess leukemia mortality among occupationally exposed workers.

Ethylbenzene

Ethylbenzene is an organic chemical which occurs naturally in coal tars and petroleum. It is also found in manmade products such as paints, inks, and insecticides. Gasoline contains approximately 2 percent ethylbenzene by weight. Ethylbenzene is readily absorbed into the body following inhalation, or eating or drinking contaminated food or water. Ethylbenzene as a liquid can be absorbed by the skin, but vapors are not as readily absorbed. Humans exposed to levels of ethylbenzene as low as 460 ppm in the air for short periods have complained of eye and throat irritation.

The MRL of 0.29 ppm of ethylbenzene in air was derived from long-term exposure studies in animals. At concentrations higher than the MRL, effects observed included birth defects in rats and biochemical changes in the brains of rabbits. Exposure of mice to concentrations greater the 1,200 ppm resulted in death.

Toluene

Toluene is used as a solvent in the production of a variety of products and as a constituent in the formulation of automotive and aviation fuels. Toluene can affect the body if it is

inhaled, contacts the eyes or skin, or is swallowed. It may also enter the body through the skin. Toluene may cause irritation of the eyes, respiratory tract, and skin; fatigue; weakness; confusion; headache; dizziness; and drowsiness. These symptoms have been reported in association with occupational exposure to airborne concentrations of toluene ranging from 50 ppm (189 milligrams per cubic meter [mg/m^3]) to 1,500 ppm (5,660 mg/m^3). These symptoms generally increase in severity with increases in toluene concentration.

The MRL for short-term exposure to toluene in air is 1.0 ppm. The MRL for long-term exposure to toluene in air is 0.3 ppm (1.1 mg/m^3). The MRL for oral exposure to toluene is 460 for short-term and 84 ppm for long-term exposure.

Xylene

Xylenes are natural components of coal tar and petroleum. Most xylenes used commercially are manmade. There are three isomers of xylene (ortho-, meta-, and para-xylene) which can occur as a mixture and are referred to here as xylenes. Xylenes are used in solvent mixtures and cleaning agents and as an ingredient in airplane fuel and gasoline. Exposure to xylene may occur by breathing xylene fumes or eating or drinking xylene-contaminated food or water. Xylene is rapidly absorbed following inhalation or ingestion. Short-term exposure of humans to high levels of xylene (100-299 ppm) causes irritation of the skin, eyes, nose, and throat; increased reaction time to a visual stimulus; impaired memory; stomach discomfort; and possible changes in the liver and kidneys. Long-term exposure of laboratory animals to xylene in air (12,800 ppm) resulted in changes in the cardiovascular system, changes in liver weights, and hearing loss.

No studies were located regarding the long-term effects of inhalation or ingestion of xylene by humans. Xylene may be fatal if large enough concentrations are inhaled or ingested. Ingestion of 5,000 ppm of xylene in food by laboratory rats resulted in impaired visual function. Decreased body weight and increased numbers of defects in unborn rats were observed at higher concentrations. MRL's have not been derived for the oral or inhalation exposure routes.

Polynuclear Aromatic Hydrocarbons (PAH's)

Polynuclear aromatic hydrocarbons (PAH's) are absorbed by inhalation and ingestion, and to a small degree through the skin. They are usually transported in the environment in association with particulates. In air, they are constituents of smoke from incomplete combustion (including automobile exhaust) and may be absorbed to dust particles. In water, they also tend to adhere to particulates, since they are quite insoluble.

Based on the available information, PAH's do not appear acutely toxic; however, some are regarded as human and animal carcinogens which can cause cancerous lesions at the point of body contact: in the lungs if inhaled, in the gastrointestinal tract if ingested, and on the skin in the event of chronic skin exposure. There is limited evidence suggesting that PAH's may exhibit reproductive and developmental toxicity as well.

There is relatively little information on the aquatic toxicity of PAH's. The compounds appear to be toxic to marine life at concentrations as low as 300 micrograms/liter. They are carcinogenic to fish as well as to animals and man. An increased incidence of tumors has been observed in some species of fish exposed to sediments containing elevated concentrations of PAH's. Bio-concentration appears to be significant only for PAH's having four or more rings.

Aliphatic Petroleum Hydrocarbons (Alkanes: C-8 to C-13)

Aliphatic petroleum hydrocarbons (PHC's) is a term used to refer to a mixture of long-chain hydrocarbon compounds derived from petroleum which are often components of petroleum products. In general, aliphatic PHC's with five or more carbons produce narcosis and central nervous system disturbances and can irritate the lungs at high airborne concentrations. The straight-chain aliphatic PHC's appear to be more toxic than their branched-chain isomers. The most toxic aliphatic is n-hexane?

Ingestion of n-hexane may cause nausea, vertigo, bronchial and general intestinal irritation, and central nervous system effects. Unconsciousness can result from central nervous system depression. After exposure to 800 ppm for 15 minutes, n-hexane has been shown to irritate the eyes and mucous membranes, and skin contact can cause irritation and dryness. Chronic exposure to n-hexane vapors may result in damage to the peripheral nervous system and symptoms such as numbness in the fingers and toes. If exposure continues, paralysis characterized by impaired walking and grasping may result. Concentrations of n-hexane associated with nerve damage have not been firmly documented.

VIII. RISK COMPARISON

This section normally compares the risk of everyday activities and cancer rates for the general population with the risk potential from the contamination at the project site. Unless the project area is very contaminated, the risk of a motor vehicle accident or the risk of cancer from smoking is considerably higher. Since there are no statistics on risks for total petroleum hydrocarbons, not to mention weathered diesel fuel, and since no data exist on concentrations of chemical components of

the hydrocarbons in the project area, no risk numbers will be compared.

IX. CONCLUSIONS AND RECOMMENDATIONS

Introduction

Preliminary chemical sampling of the soil at the Port Heiden DERP site indicated that approximately 20,000 yd³ of TPH-contaminated soil remains on the site. This quantity is based on field surveys, limited test data, and some assumptions. The soil samples were taken from areas likely to have high concentrations of contamination: under and around fuel tanks, near barrel dumps, in surface-stained soils, etc. Surface and ground water samples taken at the immediate vicinity as well as downhill from the contaminated soils indicated that the migration of the contamination has been minimal. The fuel spills occurred at least 20 years ago, yet samples at depth indicate that vertical migration has also been minor. The ground water table is about 20 feet below the ground surface. It appears very unlikely that any contaminants would reach ground water, even if no further action were taken to remediate the TPH-contaminated soils. This is probably due to several factors: (1) the relatively small amount of fuel which was spilled or leaked; (2) a relatively high organic carbon content in the soil from vegetation and volcanic ash; and (3) a distinct subsurface clay layer observed in sampling.

The degradation of the fuel began with its release. The lighter components have volatilized. Both biotic and abiotic reactions continue the degradation. Adsorption by soil particles and binding to dissolved organic macromolecules have limited much of the chemical compounds' migration.

Risk to Wildlife

The contaminated soil is relatively shallow. The depth of saturation probably averages between 1 and 2 feet. The contaminated surface area covers about 20,000 to 40,000 square yards, or 4 to 8 acres. Migratory mammal species such as caribou would be little affected by contaminated soils. The project area is in their migratory route, which they pass through in a few days. Concentrations of 100 grams of bunker fuel for 10 consecutive days showed no adverse effects on sheep. Although sheep and caribou may have different tolerances, a caribou would have to eat 16 kilograms of soil of the highest concentration of TPH found at the site per day for 10 days to equal a concentration of bunker fuel which had no effect on the sheep.

Smaller mammals with a modest home range may be adversely affected by the higher concentrations of contaminated soil. Oral

LD_{50}'s for rats using heating oil were 12.0, 15.7 and 17.5 grams/kg bw. These concentrations are not physically obtainable for the animals at the project site, since the weathered diesel has lost much of its potency. A small mammal weighing 1 kilogram would have to eat at least 2 kilograms of the most contaminated soil to equal 12.0 grams/kg bw of No. 2 fuel oil. However, adverse effects could occur. LD_{50}'s kill half the animals tested within a short period (96 hours). Concentrations much lower could cause chronic effects leading to death. These small mammals are prey for all the predatory mammals and the larger predatory birds of the area. The maximum no-effect concentration for these small mammals is not known. Greatly decreasing the TPH concentration in the soils, as is being proposed, would definitely insure no acute effects to small mammals and would substantially decrease the probability of chronic effects.

Risk to Humans

The effects of the contaminated soils on the human population are negligible at this time. The contaminated areas are far removed from any population centers; the site gets occasional visitors for subsistence or recreational purposes. Children would be the most susceptible group to hazardous or contaminated soils. If they were allowed to play in the contaminated soils, adverse effects could occur. It is reasonable to believe that supervised children would not be allowed to play continuously on the TPH-contaminated soils. Since the contaminated areas are more than 3 miles from the village, children would not be expected to wander there inadvertently. Physical (skin) contact with the contaminated soils is highly unlikely for any age group. Studies have shown that dermal contact with diesel fuel can have adverse effects, but these effects occurred with prolonged contact with the contaminant.

Ingestion of food containing diesel fuel from the contaminated soil could occur with the taking of game or berries which have been exposed to the contaminants. The higher the concentration in the soil, the higher the probability of ingesting contaminants. Caribou is the major game species hunted in the project area. Since the caribou only migrate through the area, they probably do not accumulate high enough concentrations of the contaminants to be a significant human health hazard. Resident animals, such as hares and ptarmigan, would be considered a higher risk if eaten.

Recommendations

Based on the foregoing conclusions, the Alaska District makes the following recommendations:

1. Soils with TPH concentrations in excess of 5,000 mg/kg should be remediated by incineration, preferably at high

temperature. High temperature units have distinct advantages for destruction of long chain (C-30+) hydrocarbons. The 5,000 mg/kg was the concentration in the original cleanup level. The risk evaluation substantiates this level as not being excessively harmful to human health and the environment.

2. Soils with TPH concentrations in excess of 100 mg/kg should be remediated by incineration in those areas nearest the village. These areas are delineated in the plans located in the appendix. The 100 mg/kg is a cleanup level proposed by the Alaska Department of Environmental Conservation. This level would virtually eliminate any risk to human health.

3. The soils should be replaced, fertilized, and seeded with grasses after remediation. This would act as a cap over the remaining contaminated soils. Capping the remaining soils is similar to landfilling. With the major source of contamination removed, the clay layer between the contamination and ground water, and a vegetated cap, the remaining TPH soil becomes unavailable. This would allow natural processes to degrade the contamination.

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APPENDIX

Gas Chromatograph Analysis and Site Map

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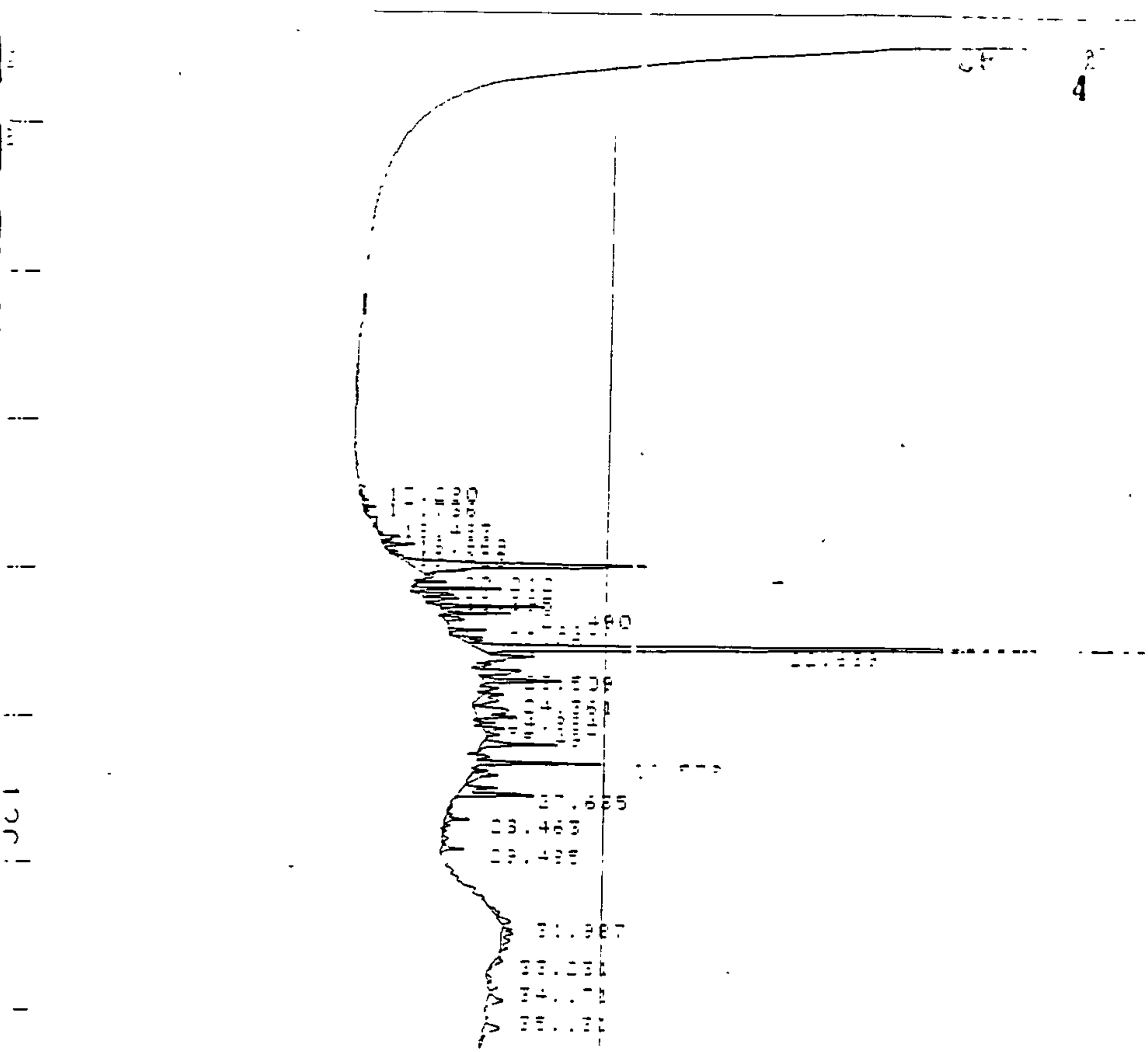

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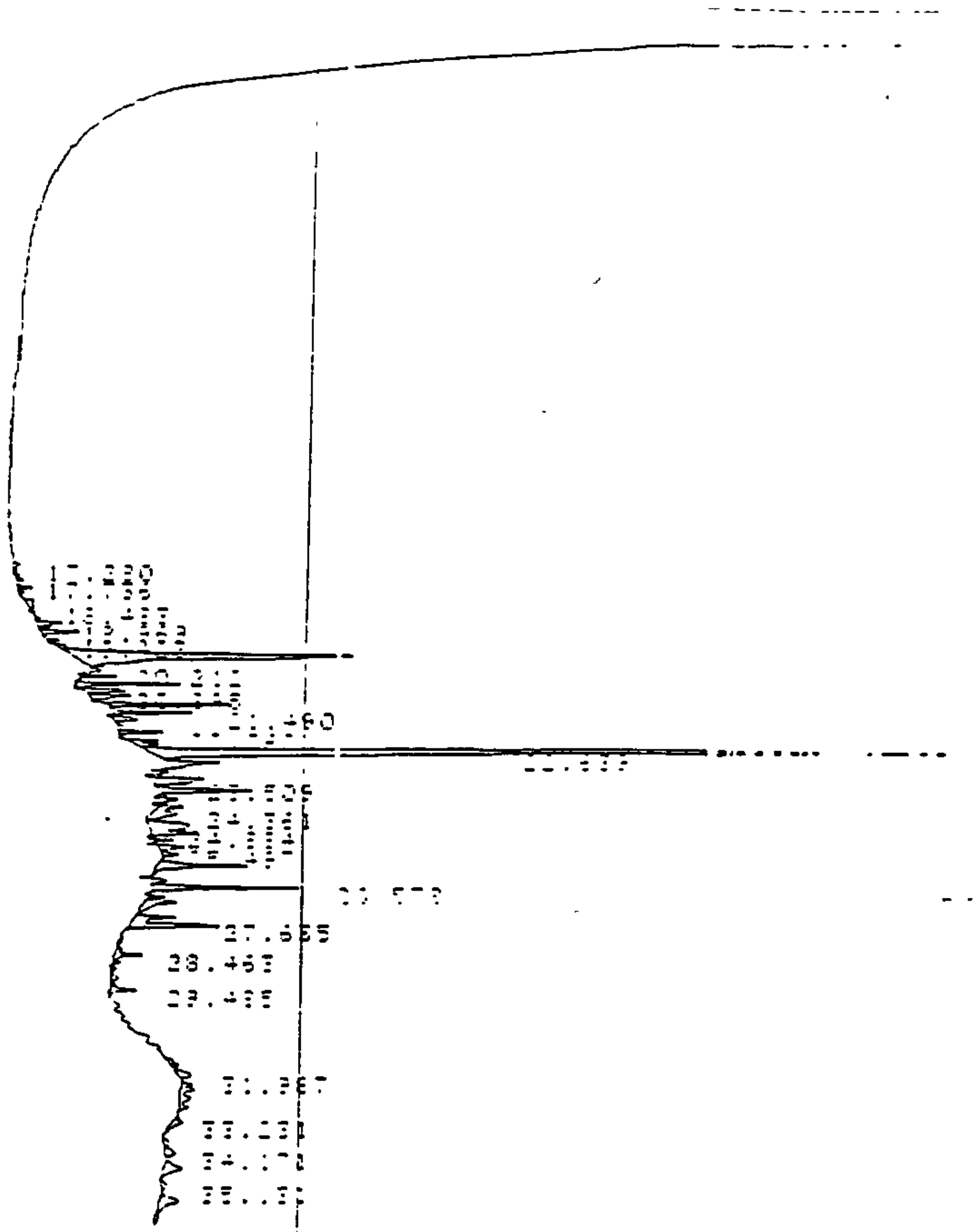
CHANNEL NO: 2 SAMPLE: [illegible] METHOD: [illegible]

PEAK NO	PEAK NAME	RESULT ()	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE
1		0.00	17.736		143	[illegible]
2	DIESEL	[illegible]	22.000	0.000	[illegible]	[illegible]
3		0.00	31.987		919	[illegible]
4		0.00	33.230		1017	[illegible]
5		0.00	[illegible]		[illegible]	[illegible]
6	D-26 SURGT	[illegible]	34.171	[illegible]	[illegible]	[illegible]
7		0.00	[illegible]		[illegible]	[illegible]
8		0.00	[illegible]		[illegible]	[illegible]
9		0.00	[illegible]		1142	[illegible]
TOTALS		[illegible]		[illegible]	[illegible]	

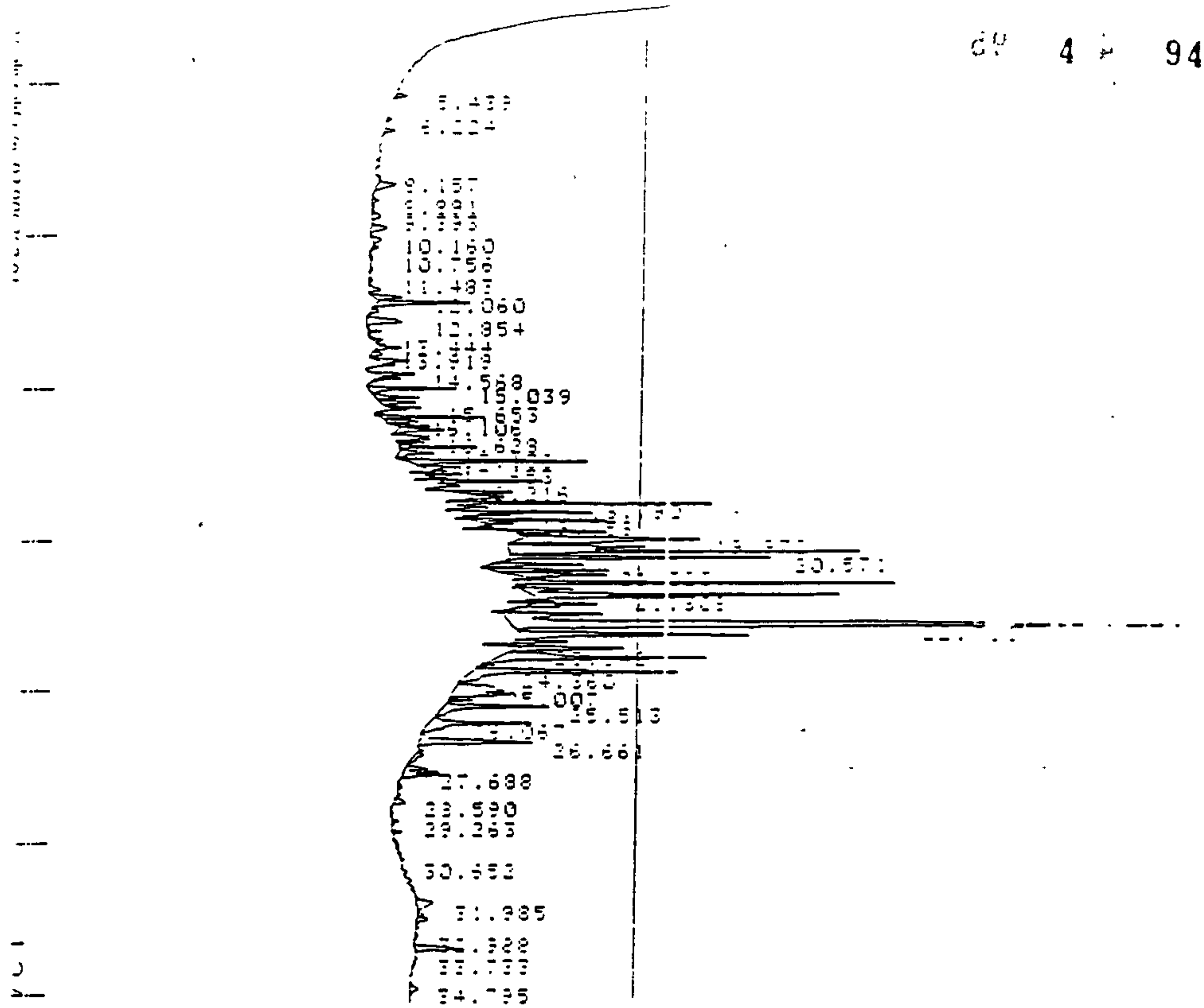
4 93



TITLE: DIESEL GAS CALIBRATED 14:45 27 SEP 93

CHANNEL NO: 2 SAMPLE: 90.3893-2 METHOD: 8015MOD

PEAK NO	PEAK NAME	RESULT NG/UL	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE
1		0.00	17.736		149	8.
2	DIESEL	960.89	22.000	0.000	65814	
3		0.00	31.987		819	
4		0.00	32.330		1017	
5		0.00	33.231		328	
6	C-26 SURGT	4.51	34.171	0.231		
7		0.00	34.639			
8		0.00	35.131		279	
9		0.00	35.565		1142	
TOTALS:		965.40		0.231	71.42	



TITLE: DIESEL GHS CALIBRATED 14:02 [illegible]

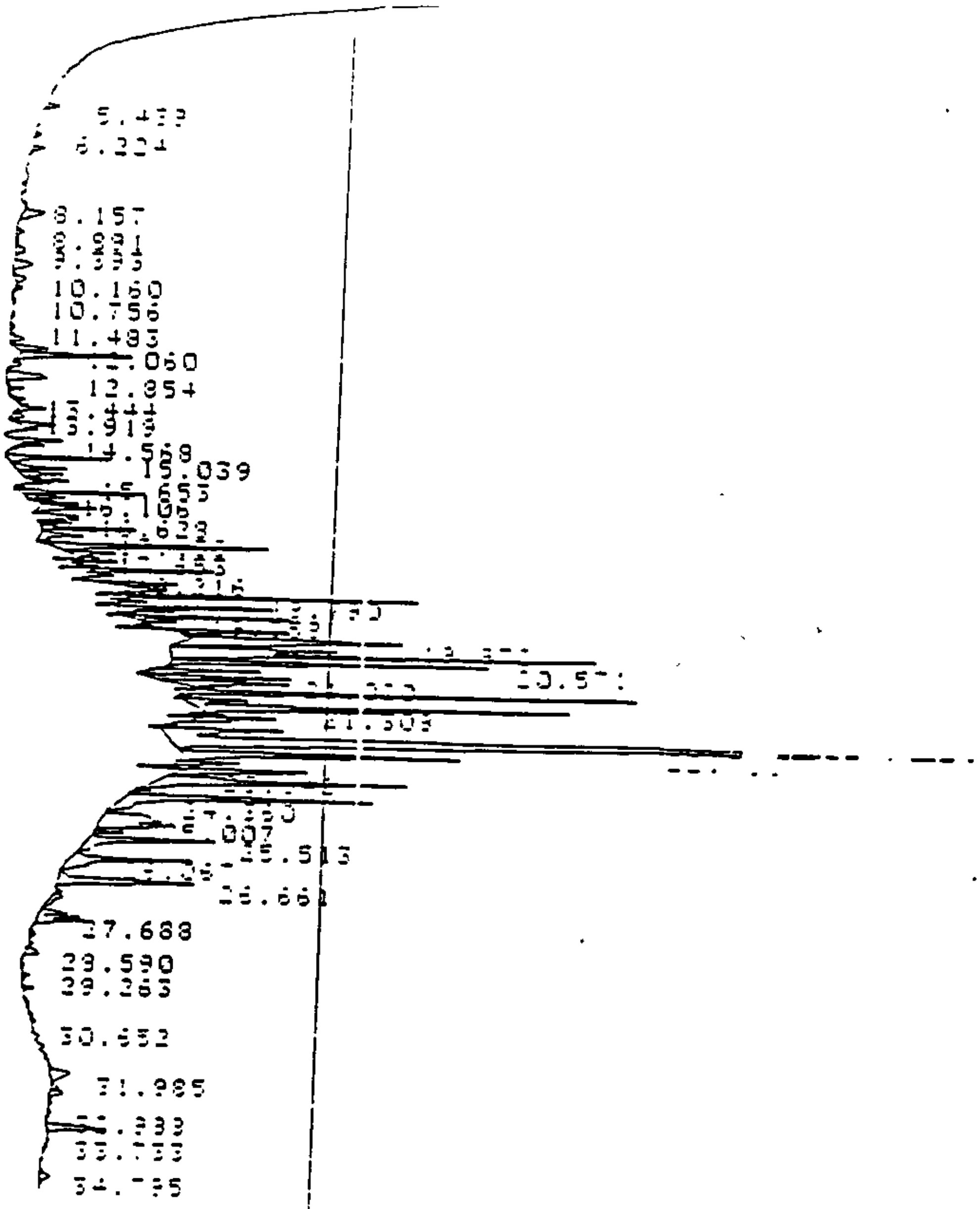
CHANNEL NO: 1 SAMPLE: 90.3893-1 METHOD: [illegible]

PEAK NO	PEAK NAME	RESULT NG/UL	TIME (MIN)	TIME OFFSET	AREA COUNTS	[illegible]	[illegible]
1	GASOLINE	[illegible]	[illegible].000	[illegible]	[illegible]	[illegible]	
2	DIESEL	4044.[illegible]	[illegible].000	[illegible]	[illegible]	[illegible]	
3		0.00	30.65[illegible]		540	[illegible]	[illegible]
4		0.00	31.985		[illegible]	[illegible]	[illegible]
5		0.00	32.446		[illegible]	[illegible]	[illegible]
6		0.00	32.98[illegible]		19[illegible]	[illegible]	[illegible]
7		0.00	33.464		[illegible]	[illegible]	[illegible]
8	C-25 SURGT	2.03	33.73[illegible]	-0.207	[illegible]	[illegible]	[illegible]
9		0.00	34.795		[illegible]	[illegible]	[illegible]

TOTALS: 4313.65 -0.207 265400

DETECTED PKS: 37 REJECTED PKS: 2

4 95



TITLE: DIESEL/GAS CALIBRATED   14:02   [illegible] SEP [illegible]

CHANNEL NO: 2   SAMPLE: 90.3893-1   METHOD: [illegible]

PEAK NO	PEAK NAME	RESULT NG/UL	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE	W1/2 (SEC)
1	GASOLINE	257.[illegible]	[illegible].000	0.000	[illegible]	[illegible]	[illegible]
2	DIESEL	[illegible]044.[illegible]	[illegible].000	0.000	241[illegible]	[illegible]	
3		0.00	30.652			[illegible]	
4		0.00	31.995		540	[illegible]	[illegible]
5		0.00	32.446		15[illegible]	[illegible]	[illegible]
6		0.00	32.989		950	[illegible]	14.[illegible]
7		0.00	33.464		193	[illegible]	
8	C-26 SURGT	2.03	33.733	-0.207	24[illegible]	[illegible]	[illegible]
9		0.00	34.795		[illegible]	[illegible]	[illegible]

TOTALS: 4313.65   -0.207   265400

DETECTED PKS: [illegible]   REJECTED PKS: 2

DIESEL		22.000	0.000	[illegible]		
		30.099		545		
		30.625		2735		
		30.957		736		
		32.397		2977		
I-26 SURGT	106.3960	33.845	-0.095	4831		
		34.396		2144		
		35.035		761		

TOTALS: -0.095 566343

DETECTED PKS: 31 REJECTED PKS: 3

AMT STD: 1.00000

NOISE: 2.4 OFFSET: 126

ERRORS:
FACTOR NOT UPDATED

NOTES:
5890 DB-5 35°10MIN,10°/MIN 250° HOLD
FID RANGE 3 ATTN 2

ESCALC
TITLE: DIESEL/GAS CALIBRATED 9:35 27 SEP

CHANNEL NO: 3 SAMPLE: STD METHOD: 8015MOD

PEAK NO	PEAK NAME	RESULT NG/UL	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE
1	GASOLINE	1420.00	9.000	0.000	265440	[illegible]
2	DIESEL	1663.00	22.000	0.000	286730	[illegible]
		0.00	30.099		545	[illegible]
		0.00	30.625		2735	[illegible]
		0.00	30.957		736	[illegible]
		0.00	32.397		2977	[illegible]
	I-26 SURGT	12.98	33.845	-0.095	4831	[illegible]
		0.00	34.396		2144	[illegible]
		0.00	35.035		761	[illegible]

TOTALS: 3095.98 -0.095 566343

DETECTED PKS: 31 REJECTED PKS: 3

DIVISOR: 1.00000 MULTIPLIER: 1.00000

NOISE: 2.4 OFFSET: 126

NOTES:
5890 DB-5 35°10MIN,10°/MIN 250° HOLD
FID RANGE 3 ATTN 2

2 DIESEL ST 998.00 22.000 0.000 296730

4 97

3			30.099		545	
4			30.625		2735	
5			30.957		736	
6			32.397		2377	
7	C-26 SURGT	205.9960	33.845	-0.095	4831	
8			34.396		2144	
9			35.035		761	

TOTALS: -0.095 566343

DETECTED PKS: 31 REJECTED PKS: 3

AMT STD: 1.00000

NOISE: 2.4 OFFSET: 126

ERRORS:
FACTOR NOT UPDATED

NOTES:
5890 DB-5 35°10MIN,10°/MIN 250° HOLD
FID RANGE 8 ATTN 2

RECALC
TITLE: DIESEL/GAS CALIBRATED 8:35 27 SEP

CHANNEL NO: 2 SAMPLE: STD METHOD: 8015MOD

PEAK NO	PEAK NAME	RESULT NG/UL	TIME (MIN)	TIME OFFSET	AREA COUNTS	SEP CODE
1	GASOLINE	1420.00	9.000	0.000	265440	
2	DIESEL	1663.00	22.000	0.000	296730	
3		0.00	30.099		545	
4		0.00	30.625		2735	
5		0.00	30.957		736	
6		0.00	32.397		2977	
7	C-26 SURGT	12.98	33.845	-0.095	4831	BB
8		0.00	34.396		2144	B
9		0.00	35.035		751	B

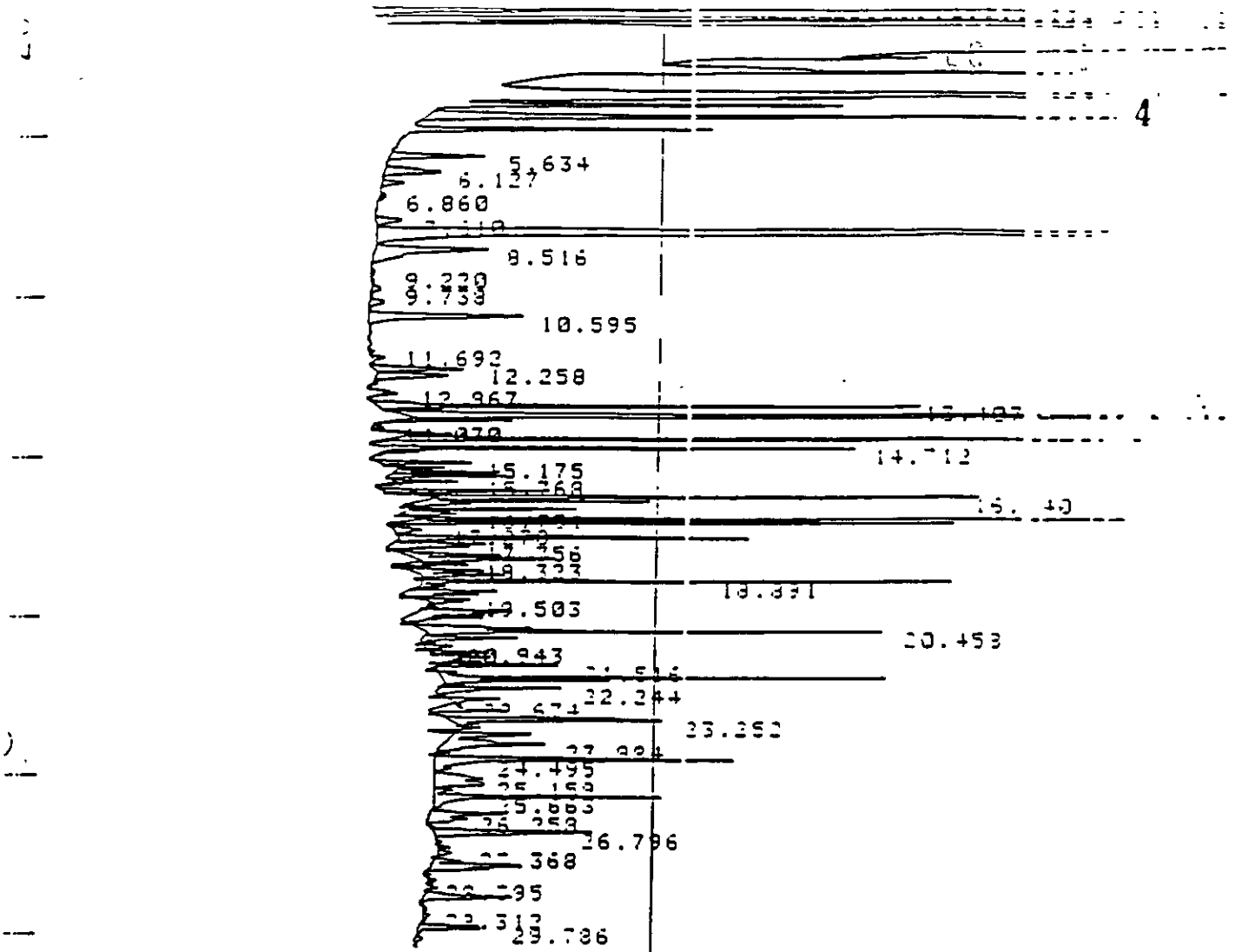
TOTALS: 3035.98 -0.095 566343

DETECTED PKS: 31 REJECTED PKS: 3

DIVISOR: 1.00000 MULTIPLIER: 1.00000

NOISE: 2.4 OFFSET: 126

NOTES:
5890 DB-5 35°10MIN,10°/MIN 250° HOLD
FID RANGE 8 ATTN 2



TITLE: DIESEL GAS CALIBRATED 10:15 27 SEP 90

CHANNEL NO: 2 SAMPLE: STD METHOD: 8015MOD

PEAK NO	PEAK NAME	RESULT NG/UL	TIME (MIN)	TIME OFFSET	APEA COUNTS	ET CO
1	GASOLINE	1329.54	9.000	0.000	248531	G
2	DIESEL	1730.27	22.000	0.000	298223	D
3		0.00	30.032		532	B
TOTALS:		3059.81			547241	

DETECTED PKS: 78 REJECTED PKS: 3

DIVISOR: 1.00000 MULTIPLIER: 1.00000

NOISE: 14.6 OFFSET: 44

SAVED FILE: STD007

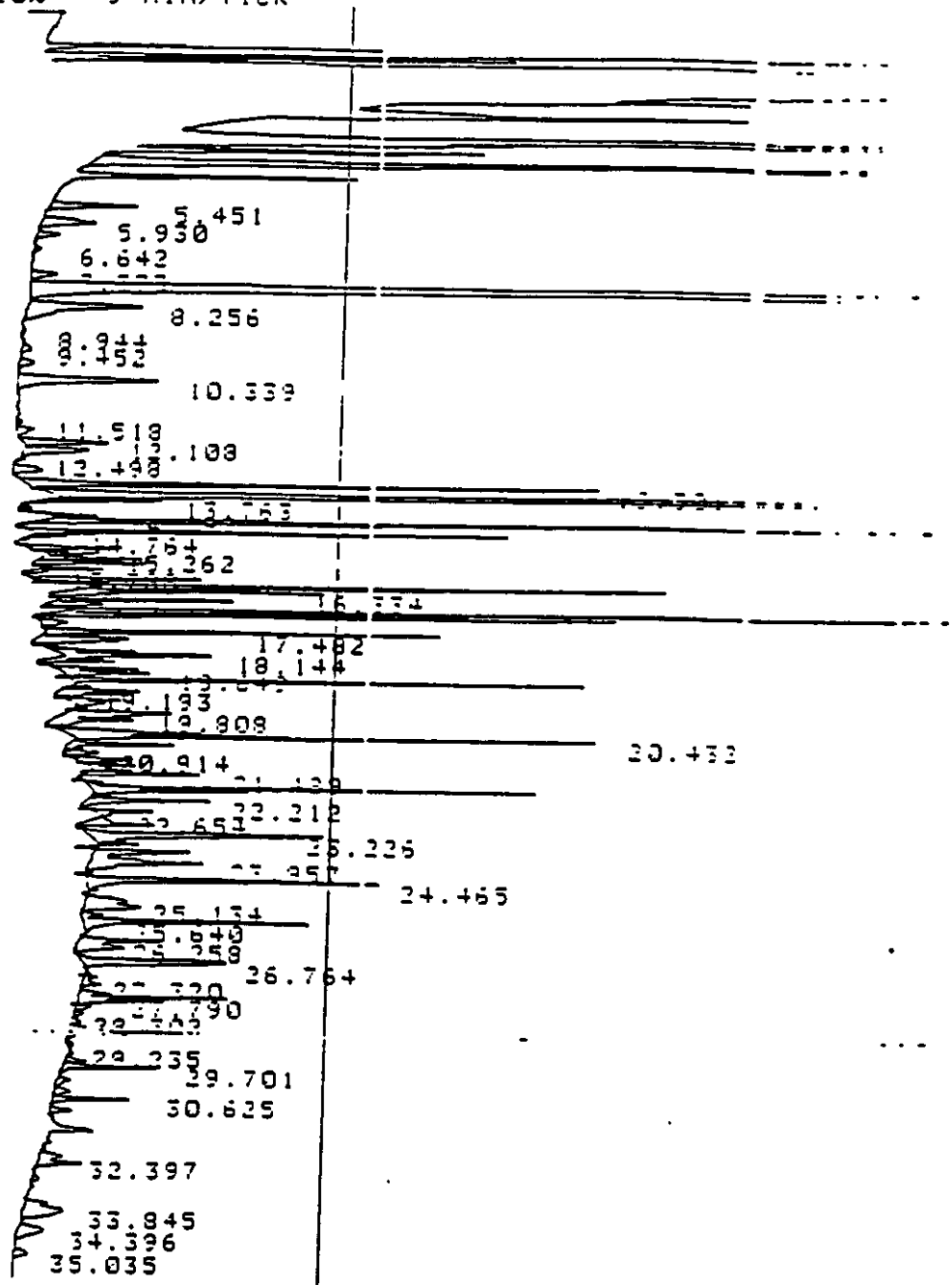
NOTES:
5890 DB-5 35°10MIN,10°/MIN 250° HOLD
FID RANGE 8 ATTN 2

Spot
75% Gas 1776 ppm
83% Diesel 2079 ppm

4 99 MOD 8015 27-09-27

calibrated 5820

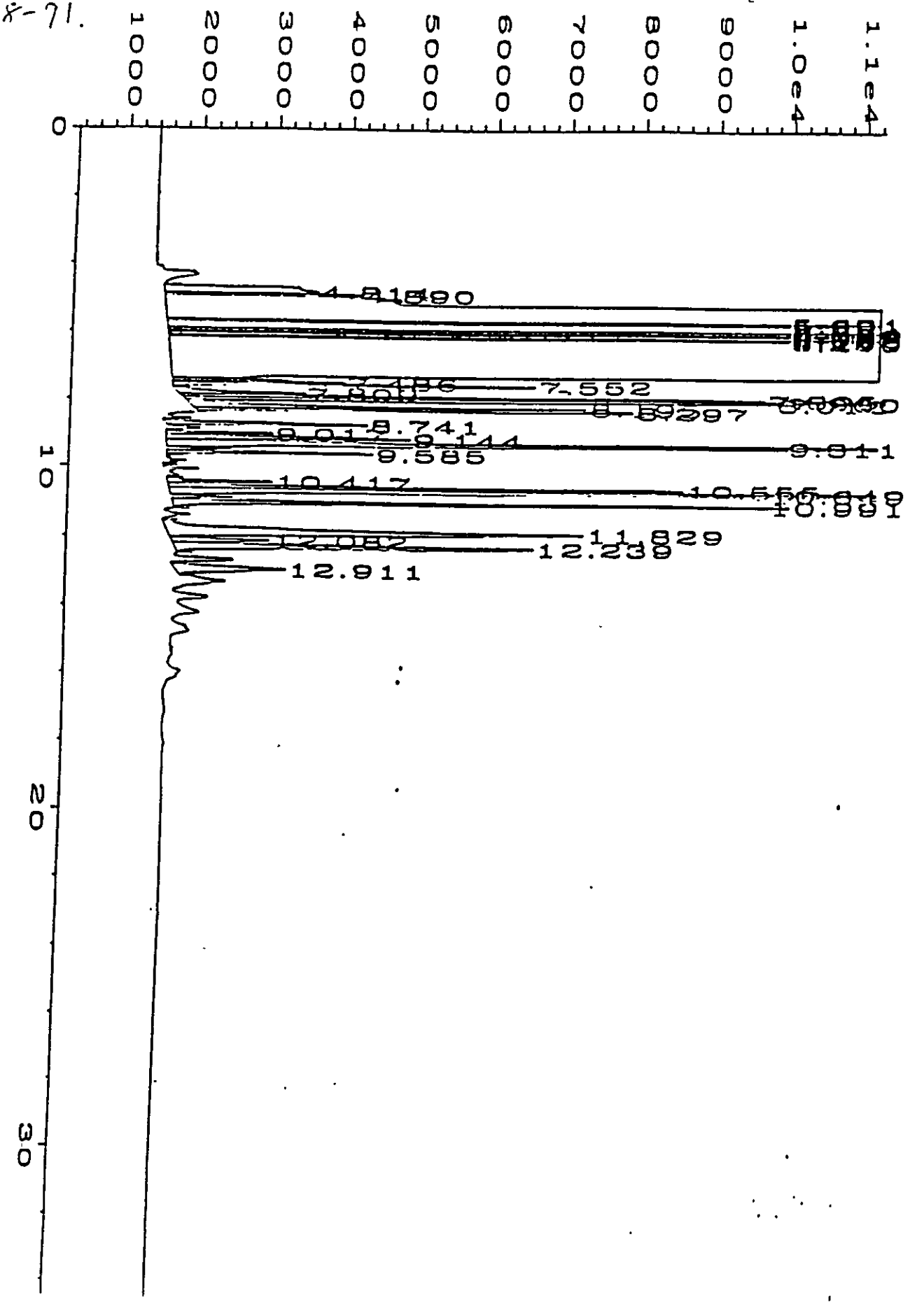
CHART SPEED 0.5 CM/MIN
ATTEN: 3 ZERO: 20% 5 MIN/TICK



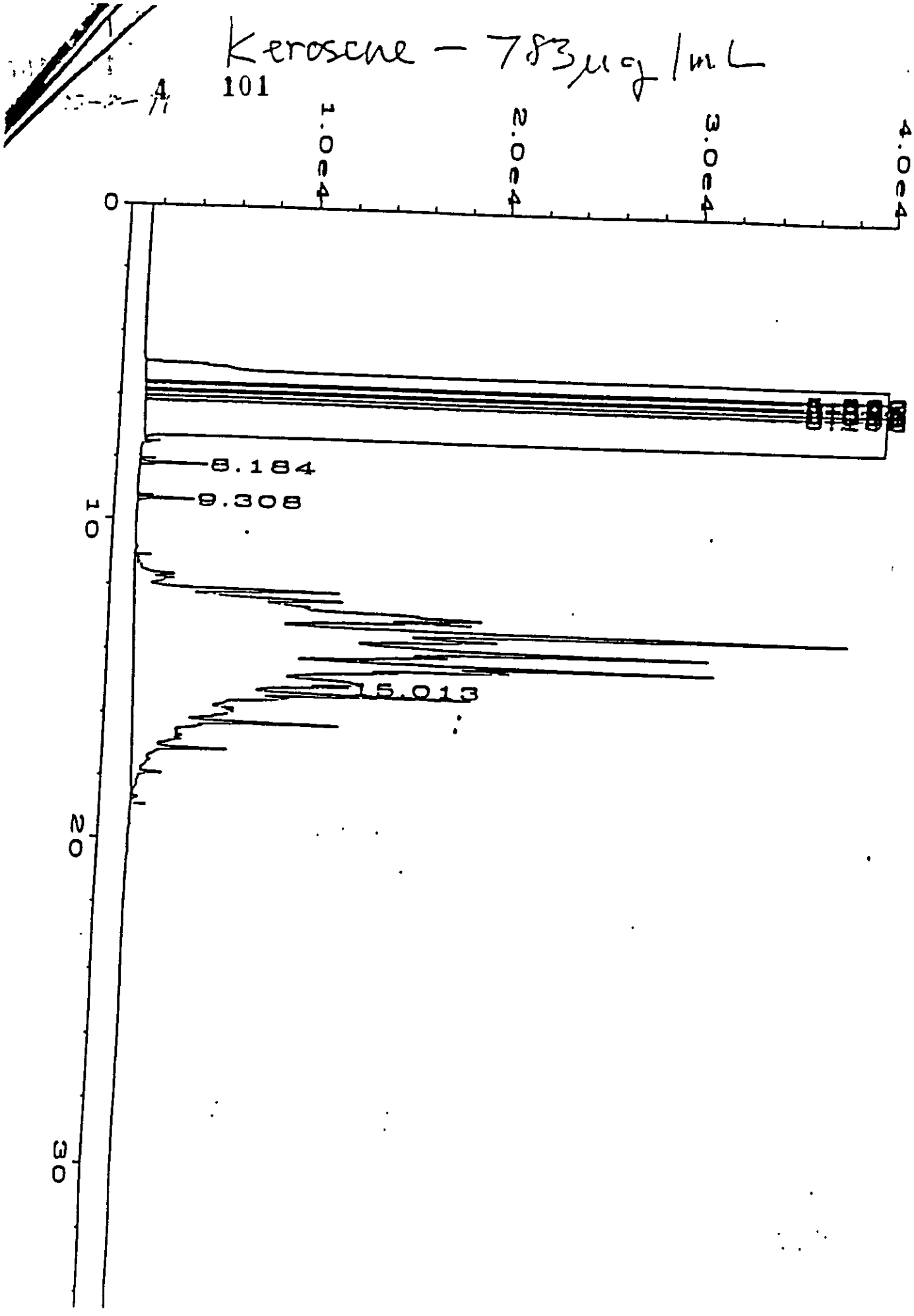
RECALC
TITLE: DIESEL/GMS CALIBRATED 8:35 27 SEP -2
CHANNEL NO: 2 SAMPLE: STD METHOD: 8015M2D

8-91 G95-230 mg/mL 4 · 100

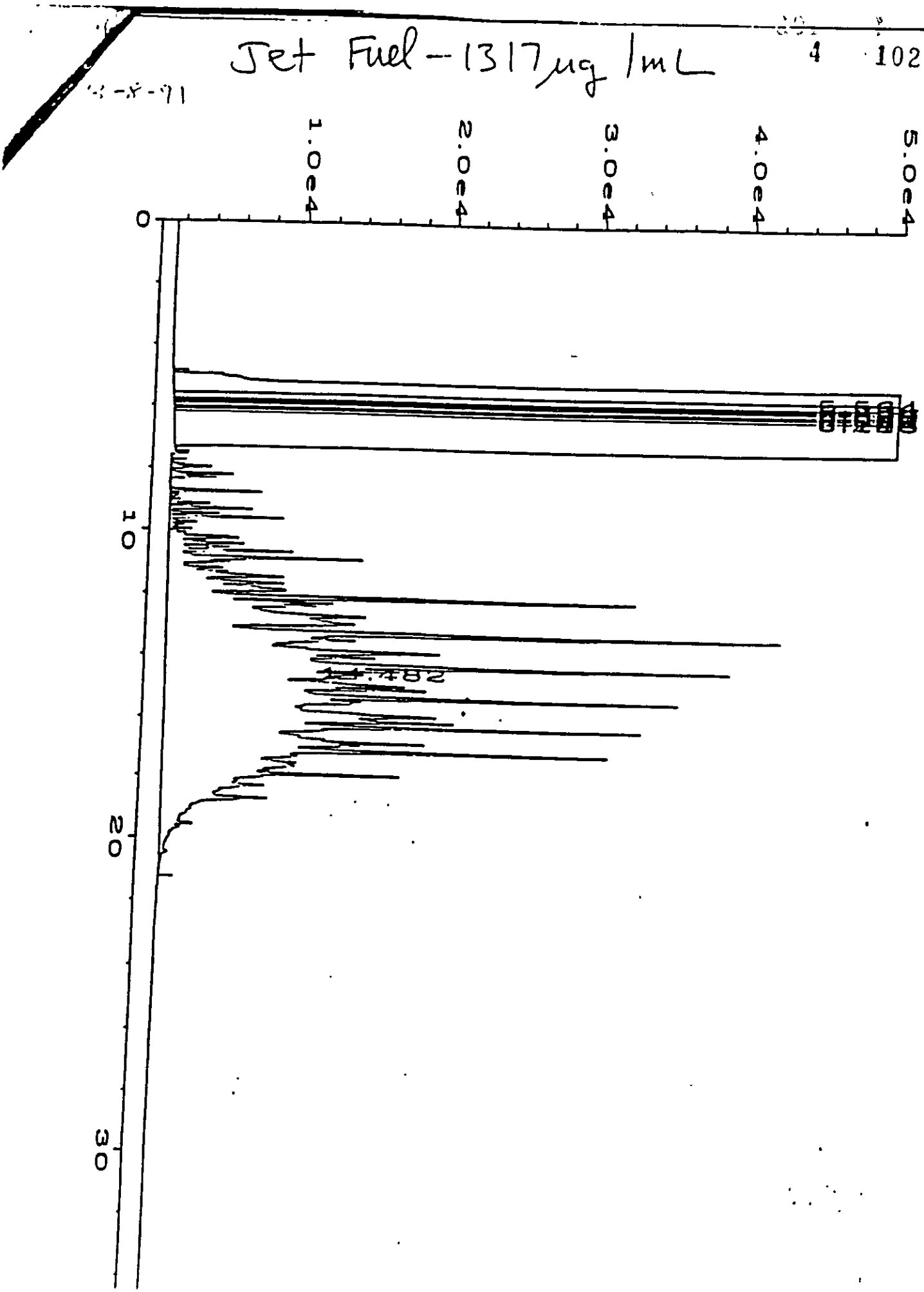
8-91.

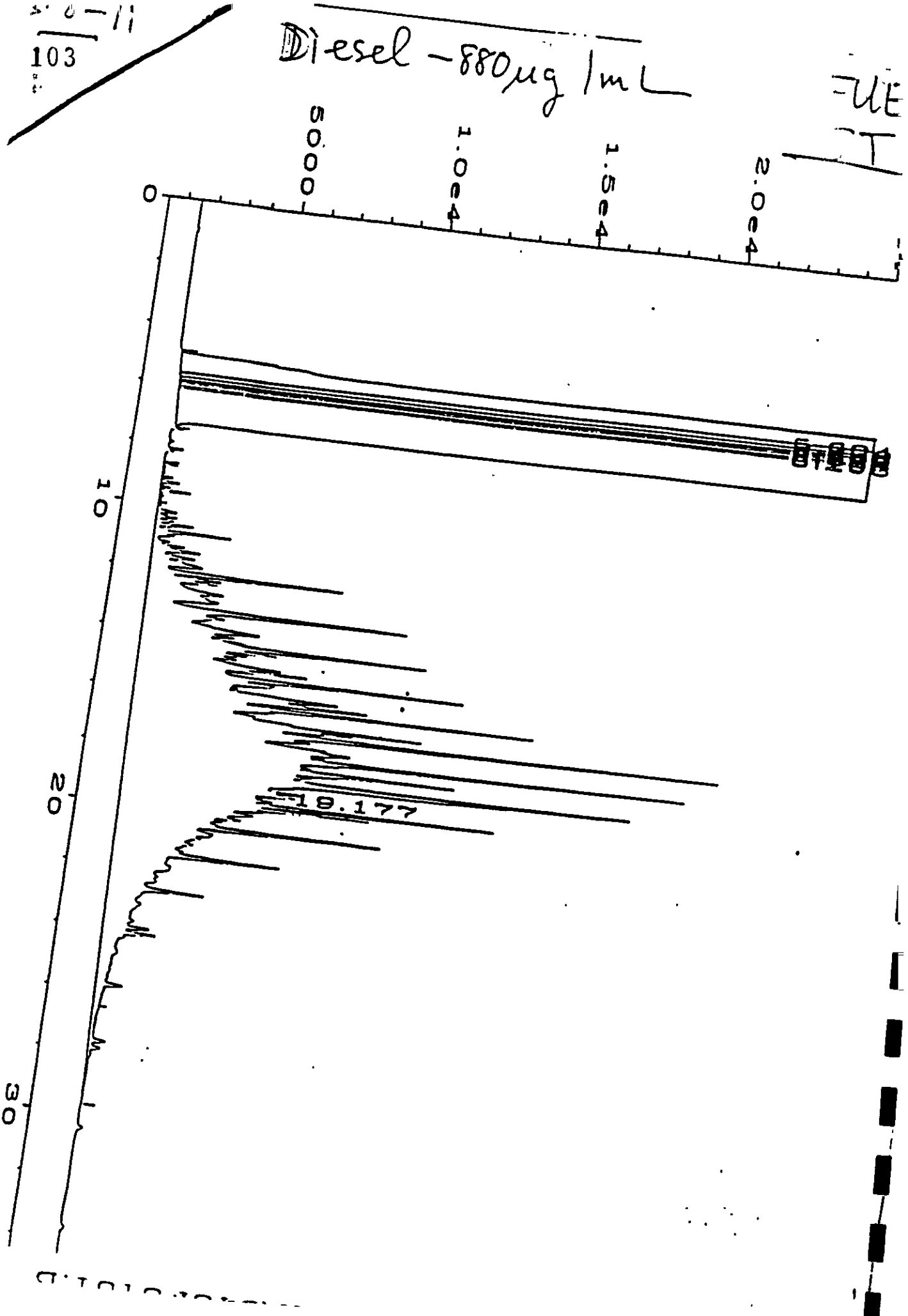


Kerosene – 783 µg/mL



Jet Fuel – 1317 µg/mL




Diesel – 880µg/mL
5.000
1.0e4
1.5e4
2.0e4
0
10
20
30
19.177

APPENDIX B

1990 COMPOSITE BUILDING ANALYTICAL RESULTS

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
Confirmation Samples								
900829006F	1908	01 C	8/31/90	0 3	2 6NP, 91CG			
900829010F	1912	02 C	8/30/90	ND	42NP, 2CG			
900929009F	2399	02 C	9/30/90			19		1-6" depth
900829014F	1916	03 C	8/30/90	ND	.58NP, 29CG			
900929010F	2400	03 C	9/30/90			9.4		1-6" depth
900829020F	1922	04 C	8/31/90	1 8	5.1NP; 1.65CG			
900929011F	2401	04 C	9/30/90			9 2		1-6" depth
900829015F	1917	05 C	8/31/90	0 67	3 8NP, 1.29CG			
900929012F	2402	05 C	9/30/90			12		12' N from W garage door E edge
900829016F	1918	06 C	8/31/90	0 31	.14NP; 19CG			
900909013F	2403	06 C	9/30/90			55		40' of N.E. corner of composite Building W. edge of tank excavation
900829017F	1919	07 C	8/31/90	ND	24NP, 12CG			
900929014F	2404	07 C	9/30/90			35		3' W of N W corner of comp bldg
900829018F	1920	08 C	8/31/90	1 4	7 6NP, 3 1CG			
900929015F	2405	08 C	9/30/90			11		Soil confirmation sample from composite building Zone II
900829019F	1921	09 C	8/31/90	0 84	3 5NP; 2 09CG			Re-excavation of 10C after recieving results from NPDL
900929016F	2406	09 C						Outer area of grid Composite Building excavation site
900829008F	1910	10 C	8/31/90	2 8(3 0)	21NP; 7.07CG			
900920001F	2190	10 C	9/21/90	ND				
900920002F	2191	10 C	9/21/90	ND				1-6" depth

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 105

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900920003F	2192	10 C	9/21/90	ND				
90092004F	2193	10 C	9/21/90	ND				
900920005F	2194	10 C	9/21/90	ND				
900829007F	1909	11 C	8/31/90	2.1(2 3)	10NP, 4 43 CG			
900929018F	2408	11 C	9/30/90			31		
900829022F	1924	12 C	8/31/90	0.24	0 35NP, .16 CG			6" soil sample
900829009F	1911	13 C	8/30/90	1 1	8.6NP, 2 3CG			6" soil sample sent to Chem Geo
900829021F	1923	14 C	8/31/90	2.5	6 7NP; 3 39CG			Composite of 1st 6"
900829004F	1906	15 C	8/30/90	0 93	3 6NP, 1 06CG			Re-excavation of 10C after recieving results from NPDL
900829003F	1905	16 C	8/30/90	ND	.29NP, ND(CG)			
900829002F	1904	17 C	8/30/90	ND	0 4NP; .021CG			
900829005F	1907	18 C	8/31/90	ND	.52NP, 16CG			
900829001F	1903	19 C	8/30/90	0 64	1.3NP; .29CG			
900829011F	1913	20 C	8/30/90	ND	52NP, .17CG			
900829012F	1914	21 C	8/30/90	ND	32NP, .14CG			
900829019F	1915	22 C	8/30/90	ND	ND (CG)			
Grid Line "A" Samples								
900717001F	1120	A1	7/18/90	2 10	-	120(160)	-	6" soil sample
900817024F	1761	A 1	8/18/90	ND				
900717002F	1121	A 2	7/18/90	ND (1.0)	-	110(120)	-	6" soil sample
900717003F	1122	A 3	7/18/90	1 30	-	160 00	-	
900717004F	1123	A 4	7/18/90	2 80	-	240 00	-	Composite of 1st 6"
900717005F	1124	A 5	7/18/90	4 20	-	140(130)	-	6" soil sA mple
900801016F	1401	A 5	8/2/90	1 20				

NOTES: 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates

0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm

PCB - polychlorinated biphenyls

ppm - parts per million

TPH - total petroleum hydrocarbons

4 106

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900801018F	1402	A 5	8/2/90	ND		65.00		1-6" depth
900807020F	1523	A 5	8/8/90	ND	0 12			
900717006F	1125	A 6	7/18/90	6 2(7 7)	-	170.00	-	1-6" depth
900807061	1564	A 6	8/9/90	ND				1-6" depth
900817031F	1768	A 6	8/20/90	ND				
900817039F	1776	A 6 25	8/20/90	ND				
900801025F	1410	A 6 5	8/3/90	2 80		37 00		1' depth
900806001F	1494	A 6 5	8/6/90	15.00	14 80			
900807040F	1543	A 6.5	8/8/90	ND				6" soil sample
900807043F	1546	A 6 5	8/9/90	12 00				6" soil sample
900717007F	1126	A 7	7/18/90	8 50	-	250 00	-	
900731004F	1383	A 7	7/31/90	1 50		10.00		
900807034FD	1537	A 7	8/8/90	ND	4.28			
900717008F	1127	A 8	7/18/90	4 60	-	170.00	-	1' depth
900717009F	1128	A 9	7/18/90	3 70	-	130(140)	-	6" soil sample
900804008F	1424	A4.5B	8/4/90	3 70				
900807021F	1524	A5.5	8/8/90	ND		32 00		
900807048F	1551	A5 5	8/9/90	1 60				Confirmation sample
900817030F	1767	A5.75	8/20/90	ND				
900807044FD	1547	A7.5	8/9/90	4.60				
900801004F	1389	A5.5A	8/2/90	3 50		300 00		1' depth
900801003F	1388	A5 5A	8/2/90	13 00				
900804004F	1420	A5.5B	8/4/90	9.20				
900807023F	1526	A5 5B	8/8/90	11.00		1,600.00		
900801015F	1400		8/2/90	7 00		1,300 00		
900801014F	1399	A5A	8/2/90	32 00				

NOTES: 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates

0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm

PCB - polychlorinated biphenyls

ppm - parts per million

TPH - total petroleum hydrocarbons

4 107

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900804005F	1421	A5B	8/4/90	5.40				1' depth
900807062F	1565	A5B	8/9/90	75 00				
900804003F	1419	A6.5B	8/4/90	3.30				1-6" depth
900807041F	1544	A6 5B	8/9/90	2 40		200.00		1-6"
900801018F	1403	A6A	8/2/90	6 00				Composite of 1st 6"
900801019F	1404	A6A	8/3/90	2 40		160 00		Composite of 1st 6"
900804001F	1417	A6B	8/4/90	6.40				Composite of 1st 6"
900807024F	1527	A6B	8/8/90	4 80		220 00		6" soil sample
900801009F	1394	A7A	8/2/90	5.60				1-6" depth
900801010F	1395	A7A	8/2/90	ND		73.00		
900807033FD	1536	A7A	8/8/90	ND				
900804006F	1422	A7B	8/4/90	3 50				6" soil sample
900807031FD	1534	A7B	8/8/90	2 50		95 00		1-6"
900813004F	1677	AB1	8/13/90	7.00				
Grid Line "B" Samples								
900717010F	1129	B 1	7/18/90	5.50	-	310.00	-	6" soil sample
900817022F	1759	B 1	8/18/90	ND				1-6" depth
900813006F	1679	B 1.5	8/13/90	21 00				1-6" depth
900717011F	1130	B 2	7/19/90	ND(ND)	-	140 00	-	1-6"
900817026F	1763	B 2	8/18/90	ND				
900804044F	1460	B 2	8/6/90			110 00		1-6"
900717012F	1131	B 3	7/19/90	3 20		370 00		1' depth
900804045F	1461	B 3	8/6/90			68.00		

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 108

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900924002F	2260	B 3	9/25/90			19		Soil from zone 2 at composite building (parking lot)
900717013F	1132	B 4	7/19/90	2 90		200 00		1-6" depth
900924003F	2261	B 4	9/25/90			14		Soil from zone 2 at composite building (parking lot)
900717014F	1133	B 5	7/19/90	2 10		250.00		6" soil sample
900801007F	1392	B 5	8/2/90	ND				
900801008F	1393	B 5	8/2/90	ND		110 00		1-6" depth
900807057FD	1560	B 5	8/9/90	ND				
900924004F	2262	B 5	9/25/90			39		Soil from zone 2 at composite building (parking lot)
900727004F	1328	B 5 5	7/28/90	34.00				6" soil sample
900731002F	1381	B 5 5	7/31/90	1 40				
900807042F	1545	B 5.5	8/9/90	ND				
900810025F	1645	B 5 75	8/10/90	1 60				
900817038F	1775	B 5 75	8/20/90	ND				
900720027F	1195	B 6	7/25/90	480 00	728.00		347 00	
900807032F	1535	B 6	8/8/90	1.20				
900817032F	1769	B 6	8/23/90	ND				1-6"
900924005F	2263	B 6	9/25/90			12		Soil from zone 2 at composite building (parking lot)
900817034F	1771	B 6.25	8/20/90	ND				
900727008F	1332	B 6.5	7/28/90	27 00				–
900731003F	1382	B 6.5	7/31/90	9.90				6" soil sample
900807054F	1557	B 6.5	8/8/90	ND	ND			1-6" depth

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates

0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm

PCB - polychlorinated biphenyls

ppm - parts per million

TPH - total petroleum hydrocarbons

4 105

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900720026F	1194	B 7	7/25/90	20 00				
900801020F	1405	B 7	8/3/90	5 30				
900801021F	1406	B 7	8/3/90	1 70		39 00		Confirmation sample
900807029F	1532	B 7	8/8/90	7 10				1-6" depth
900924006F	2264	B 7	9/25/90			10		Soil from zone 2 at composite building (parking lot)
900727011F	1335	B 7.5	7/28/90	3.30				6" soil sample
900807035FD	1538	B 7.5	8/8/90	1.90				Confirmation sample
900720025F	1193	B 8	7/25/90	12 00		260.00		
900717015F	1134	B 9	7/19/90	12 00		550.00		
9000801026F	1411	BA5	8/3/90	ND				
900801027F	1412	BA5	8/3/90	ND		89.00		6" soil sample
900807051FD	1554	BA5	8/9/90	1 50				
900727003F	1327	BA5.5	7/28/90	6 90				
900804007F	1423	BA5 5	8/4/90	1 80				Confirmation sample
900807022F	1525	BA5.5	8/8/90	ND				6" soil sample
900810029F	1649	BA5 75	8/11/90	7 00				
900817027F	1764	BA5 75	8/18/90	ND				1-6" depth
900727001F	1325	BA6	7/28/90	71 00				
900807027F	1530	BA6	8/8/90	ND				
900817028F	1765	BA6	8/18/90	ND				
900813003F	1676	BA6.25	8/13/90	2.40				Composite of 1st 6"
900817040F	1777	BA6.25	8/20/90	ND				6" soil sample
900727007F	1331	BA6.5	7/28/90	14 00				
900807025F	1528	BA6.5	8/8/90	ND				6" soil sample

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0.35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 110

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900727014F	1338	BA7	7/28/90	8.60				1-6" depth
900801012F	1397	BA7	8/2/90	3.50		120.00		1-6" depth
900801011F	1396	BA7	8/2/90	12.00				
900807037F	1540	BA7	8/9/90	4.30				1-6" depth
900727012F	1336	BA7 5	7/28/90	2 50				
900807028FD	1531	BA7 5	8/8/90	2 00				
900810028F	1648	BBA6	8/11/90	24 00				6" soil sample
900810024F	1644	BBA6 25	8/10/90	ND				
900813005F	1678	BC1	8/13/90	5.90				6" soil sample
Grid Line "C" Samples								
900717016F	1135	C 1	7/19/90	5 2(5.3)	7 75	230.00	ND(10)	
900817025F	1762	C 1	8/18/90	ND				
900804046F	1462	C 1	8/6/90			99 00		
900717017F	1136	C 2	7/19/90	1.80		130 00		
900804050F	1466	C 2	8/6/90			120.00		
900924007F	2265	C 2	9/25/90			18		Soil from zone 2 at composite building (parking lot)
900720001F	1168	C 3	7/22/90	2 10		200 00		6" soil sample
900804049F	1465	C 3	8/6/90			73.00		1-6" depth
900924008F	2266	C 3	9/25/90			30		Soil from zone 2 at composite building (parking lot)
900720020F	1188	C 4	7/23/90	ND		140.00		1-6" depth

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 111

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900804048F	1464	C 4	8/6/90			45 00		
900924009F	2267	C 4	9/25/90			15		Soil from zone 2 at composite building (parking lot)
900801005F	1390	C 5	8/2/90	ND				1' depth
90080106F	1391	C 5	8/2/90	ND		36.00		6" soil sample
900807056FD	1559	C 5	8/8/90	ND	0 62			1-6" depth
900924010F	2268	C 5	9/27/90	ND		45		Soil from zone 2 at composite building (parking lot)
900727005F	1329	C 5 5	7/28/90	1.10		140.00		Re-excavation of 10C after recieving results from NPDL
900807058FD	1561	C 5 5	8/8/90	ND	0 68			1-6" depth
900810030F	1650	C 5 75	8/11/90	ND				6" soil sample
900817035F	1772	C 5.75	8/20/90	ND				1-6"
900807030FD	1533	C 6	8/8/90	ND				
900817036F	1773	C 6	8/20/90	ND				
900924011F	2269	C 6	9/25/90			17		Soil from zone 2 at composite building (parking lot)
900810026F	1646	C 6 25	8/10/90	1 10				
900817041F	1778	C 6.25	8/20/90	ND				6" soil sample sent to Chem Geo
900727010F	1334	C 6 5	7/28/90	ND		130.00		6" soil sample
90080755FD	1558	C 6 5	8/9/90	ND				
900720024F	1192	C 7	7/25/90	2.10		250 00		6" soil sample
900801013F	1398	C 7	8/2/90	ND		33.00		6" soil sample
900924012F	2270	C 7	9/25/90			98		Soil from zone 2 at composite building (parking lot)
900720023F	1191	C 8	7/25/90	3 80		290.00		

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates

0 35 NP, .16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm

PCB - polychlorinated biphenyls

ppm - parts per million

TPH - total petroleum hydrocarbons

4 112

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900717018F	1137	C 9	7/20/90	8 70		520 00		Composite of 1st 6"
900801001F	1386	CB5.5	8/2/90	ND				
900801002F	1387	CB5 5	8/2/90	ND		33 00		
90080726F	1529	CB5 5	8/8/90	ND				1-6" depth
900807039FD	1542	CB5.5	8/9/90	ND				1-6" depth
900810022F	1642	CB5 75	8/10/90	9 80				1' depth
900817029F	1766	CB5 75	8/18/90	2 7				1-6" depth
900727002F	1326	CB6	7/28/90	1500(1600)		6,000 00		
900807038F	1541	CB6	8/9/90	130.00				6" soil sample
900817037F	1774	CB6	8/20/90	ND				Composite Bldg surface stain, between drums in lower left corner
900810027F	1647	CB6 25	8/11/90	ND				6" soil sample sent to Chem Geo
900817033F	1770	CB6 25	8/20/90	ND				Composite Bldg surface soil stain, upper right cleanup corner
900807053FD	1556	CB6 4	8/9/90	2.90				
900727009F	1333	CB6 5	7/28/90	ND		820 00		
900727006F	1330	CB7	7/28/90	ND				6" soil sample
900801022F	1407	CB7	8/3/90	ND				
900807052FD	1555	CB7	8/8/90	1 10	4.15			Sent to Chem & Geo
900727013F	1337	CB7 5	7/28/90	2 40				Sent to Chem & Geo
900807036FD	1539	CB7.5	8/9/90	2 30				Confirmation sample
900806002F	1495	CD2	8/6/90	6 10	7.98			

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

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113

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
Grid Line "D" Samples								
900717019F	1138	D 1	7/20/90	4.90		320.00		Composite of 1st 6"
900804047F	1463	D 1	8/6/90			130 00		1-6" depth
900717020F	1139	D 2	7/20/90	3.90		330 00		6" soil sample
900729006F	1369	D 2	7/31/90	ND		46 00		
900804051F	1467	D 2	8/6/90			67 00		
900924013F	2271	D 2	9/25/90			160		Soil from zone 2 at composite building (parking lot)
900928002F	2311	D 2	9/28/90			71		Composite Building area
900720002F	1169	D 3	7/22/90	ND		180 00		
900804052F	1468	D 3	8/6/90			600.00		1-6" depth
900924014F	2272	D 3	9/25/90			21		Soil from zone 2 at composite building (parking lot)
900804052F	1468	D 3	8/6/90			600 00		1-6" depth
900720019F	1187	D 4	7/23/90	ND		550.00		1-6" depth
900804053F	1469	D 4	8/6/90			390 00		
900924015F	2273	D 4	9/25/90			12		Soil from zone 2 at composite building (parking lot)
900720018F	1186	D 5	7/23/90	ND		660 00		1' depth
900924016F	2274	D 5	9/25/90			19		Soil from zone 2 at composite building (parking lot)
900924017F	2275	D 6	9/25/90			17		Soil from zone 2 at composite building (parking lot)

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates

0.35 NP, .16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm

PCB - polychlorinated biphenyls

ppm - parts per million

TPH - total petroleum hydrocarbons

4 114

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
Grid Line "E" Samples								
900717021F	1140	E 1	7/20/90	3.2(3 5)		320 00		
900804054F	1470	E 1	8/6/90			210.00		
900717022F	1141	E 2	7/20/90	2 90		330 00		6" soil sample
900729004F	1367	E 2	7/31/90	ND		50 00		
900804055F	1471	E 2	8/6/90			290 00		
900924018F	2276	E 2	9/25/90			74		Soil from zone 2 at composite building (parking lot)
900720003F	1170	E 3	7/22/90	ND		140.00		
900804056F	1472	E 3	8/6/90			200.00		
900924019F	2277	E 3	9/25/90			190		Soil from zone 2 at composite building (parking lot)
900928001F	2310	E 3	9/28/90			12		Composite Building area.
900720013F	1181	E 4	7/22/90	ND		200 00		1-6"
900804057F	1473	E 4	8/6/90			200.00		
900924020F	2278	E 4	9/25/90			57		Soil from zone 2 at composite building (parking lot)
900720014F	1182	E 5	7/22/90	ND		400.00		Diamond shaped area on other side of road around composite building
900817060F	1797	E 5	8/23/90	ND				1-6"
900924021F	2279	E 5	9/25/90			59		Soil from zone 2 at composite building (parking lot)
900817061F	1798	E 5 25	8/23/90	ND				1-6"
900924022F	2280	E 6	9/25/90			27		Soil from zone 2 at composite building (parking lot)

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 115

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900807013F	1516	EF5 5	8/8/90	4.70				1-6" depth
900807016FD	1519	EF5 5						Next to flag marking soiled area at Composite Building excavation
Grid Line "F" Samples								
900717023F	1142	F 1	7/20/90	3 60		190.00		Composite of 1st 6"
900729005	1368	F 1	7/31/90	ND		86 00		6" soil sample
900717024F	1143	F 2	7/20/90	ND	6 54	220 00	655 00	
900804058F	1474	F 2	8/6/90			40 00		1-6" depth
900924023F	2281	F 2	9/25/90			270		Soil from zone 2 at composite building (parking lot)
900929002F	2392	F 2	9/29/90			55		
900720004F	1171	F 3	7/22/90	1.30		380.00		
900804059F	1475	F 3	8/6/90			150 00		
900924024F	2282	F 3	9/25/90			33		Soil from zone 2 at composite building (parking lot)
900928003F	2312	F 3	9/28/90			16		
900720028F	1180	F 4	7/22/90	ND		140 00		1-6" depth
900729003	1366	F 4	7/31/90	ND		62 00		
900804060F	1476	F 4	8/6/90			160 00		
900924025F	2283	F 4	9/25/90			84		Soil from zone 2 at composite building (parking lot)
900928004F	2313	F 4	9/28/90			12		
900810004F	1624	F 4.5	8/10/90	ND				
900720015F	1183	F 5	7/23/90	ND		200 00		

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 116

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900817046F	1783	F 5	8/20/90	ND				
900924026F	2284	F 5	9/25/90			150		Soil from zone 2 at composite building (parking lot)
900928005F	2314	F 5	9/28/90			19		
900817050F	1787	F 5.25	8/20/90	ND				1-6" depth
900924027F	2285	F 6	9/25/90			20		Soil from zone 2 at composite building (parking lot)
900928006F	2315	F 6	9/28/90			14		
900817042F	1779	FE5	8/20/90	ND				
900817051F	1788	FE5 25	8/20/90	1 2				
900807012	1515	FG5 5	8/8/90	83 00				1-6" depth
900810007F	1627	FG5 5	8/10/90	120.00				1' depth
900810023F	1643	FG5.5	8/10/90	ND				1-6" depth
900807060F	1563	field 1	8/9/90	19 00				6" soil sample
900807059F	1562	field 2	8/9/90	ND				
Grid Line "G" Samples								
900717025F	1144	G 1	7/20/90	ND		210 00		
900804061F	1477	G 1	8/6/90			1,200 00		1-6" depth
900717026F	1145	G 2	7/20/90	ND (ND)		130.00		6" soil sample
900924028F	2286	G 2	9/25/90			4200		Soil from zone 2 at composite building (parking lot)
900928007F	2316	G 2	9/28/90			2800		
900720005F	1172	G 3	7/22/90	1.60	2.02	190 00	171.00	
900804062F	1478	G 3	8/6/90			200 00		6" soil sample

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, .16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 117

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900924029F	2287	G 3	9/25/90			200		Soil from zone 2 at composite building (parking lot)
900928008F	2317	G 3	9/28/90			190		
900720012F	1179	G 4	7/22/90	ND		260 00		1-6"
900817059F	1796	G 4	8/23/90	ND				6" soil sample
900804063F	1479	G 4	8/6/90			57 00		6" soil sample sent to Chem Geo
900928009F	2318	G 4	9/28/90			67		
9008100002F	1622	G 4.25	8/10/90	ND				
900817058F	1795	G 4.25	8/20/90	ND				
900817049F	1786	G 4 5	8/20/90	ND				1-6" depth
900810003F	1623	G 4 75	8/10/90	6 00				Composite of 1st 6"
900817044F	1781	G 4 75	8/20/90	ND				
900720016F	1184	G 5	7/22/90	ND	2.85	270 00	329 00	1-6" depth
900817054F	1791	G 5	8/20/90	ND				
900928010F	2319	G 5	9/28/90			80		
900817052F	1789	G 5 25	8/20/90	ND				1-6"
900928011F	2320	G 6	9/28/90			28		
900810005F	1625	GF4	8/10/90	ND				1-6"depth
900810009F	1629	GF4.5	8/10/90	ND				
900810008F	1628	GF5	8/10/90	17 00				Edge of excavation
900807014F	1517	GH5.5	8/8/90	ND				
900807017FD	1520	GH5.5						Composite sample from 6 road sites

NOTES 5 2 (5.3) - Numbers in ( ) are field laboratory duplicates

0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm

PCB - polychlorinated biphenyls

ppm - parts per million

TPH - total petroleum hydrocarbons

4 118

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
Grid Line "H" Samples								
9007170027	1146	H 1	7/20/90	ND(1 0)		170 00		6" soil sample Sent to chem geo, no results listed
900729008F	1371	H 1	7/31/90	1.80		5,200.00		
900717028F	1147	H 2	7/20/90	ND(1 0)		250 00		1-6"
900729010F	1373	H 2	7/31/90	1.10		110.00		Re-excavation of 10C after recieving results from NPDL
900928012F	2321	H 2	9/28/90			25		
900720006F	1173	H 3	7/22/90	ND		180 00		
900804064F	1480	H 3	8/6/90			85 00		
900928013F	2322	H 3	9/28/90			41		
900720011F	1178	H 4	7/22/90	ND		180 00		
90029015F	1378	H 4	7/31/90	ND		28,000 00		
900817043F	1780	H 4	8/20/90	ND				
90080465F	1481	H 4	8/6/90			43 00		1-6" depth
900928014F	2323	H 4	9/28/90	ND		14		
900817048F	1785	H 4 25	8/20/90	ND				
900817045F	1782	H 4 5	8/20/90	ND				1-6"
900817047F	1784	H 4.75	8/20/90	ND				
900720017F	1185	H 5	7/22/90	1 10		130.00		Re-excavation of 10C after recieving results from NPDL
900817056F	1793	H 5	8/20/90	ND				1-6" depth
900928015F	2324	H 5	9/28/90	0.60		230		
900817053F	1790	H 5.25	8/20/90	ND				
900807015F	1518	H 5.5	8/8/90	5 10				Outer area of grid

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates

0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm

PCB - polychlorinated biphenyls

ppm - parts per million

TPH - total petroleum hydrocarbons

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TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900807063FD	1566	H 5 5						Dark banding in area IIIa
900810001F	1621	HG4 25	8/10/90	1 10				Confirmation sample
900810010F	1630	HG4 75	8/10/90	ND				
900810006F	1626	HG5	8/10/90	ND				
900817057F	1794	HG5	8/20/90	ND				
900817055F	1792	HG5.75	8/20/90	ND				
Grid Line "I" Samples								
900717029F	1148	I 1	7/20/90	3 20		1,400 00		1-6" depth
900804066F	1482	I 1	8/6/90			560.00		
900928016F	2325	I 2	9/28/90			28		
900720007F	1174	I 3	7/22/90	2 10		1,500 00		6" soil sample
900804068F	1484	I 3	8/6/90			39 00		
900928017F	2326	I 3	9/28/90			90		
900720010F	1177	I 4	7/22/90	ND		320 00		1-6" depth
900804073F	1489	I 4	8/6/90			84.00		1-6" depth
900928018F	2327	I 5	9/28/90			60		
Grid Line "J" Samples								
900717031F	1150	J 1	7/20/90	4 1(2 9)		1,800.00		6" soil sample
900928019F	2328	J 1	9/28/90			16		
900729007F	1370	J 1	7/31/90	ND		310 00		
900717032F	1151	J 2	7/20/90	1.80		1,600.00		Confirmation sample
900729009F	1372	J 2	7/31/90	ND		280 00		
900928020F	2329	J 2	9/28/90			23		
990720008F	1175	J 3	7/22/90	ND		580.00		
900804070F	1486	J 3	8/6/90			39.00		

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 120

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900928021F	2330	J 3	9/28/90			280		
900720009F	1176	J 4	7/22/90	3 10		940 00		1-6" depth
900729011F	1374	J 4	7/31/90	ND		300 00		6" soil sample
900804069F	1485	J 4	8/6/90			44.00		1-6" depth
900928022F	2331	J 4	9/28/90			1400		
900928023F	2332	J 5	9/28/90			180		
900928024F	2333	J 7	9/28/90			120		
90080711F	1514	JK2.5	8/8/90	ND				
900807019FD	1522	JK2.5						Dark banding in area IIIa
Grid Line "K" Samples								
900717033F	1152	K 1	7/20/90	ND		930 00		
900804067F	1483	K 1	8/6/90			560.00		
900928025F	2334	K 1	9/28/90			360		
900717034F	1153	K 2	7/20/90	ND		1,700 00		
900928026F	2335	K 2	9/28/90			38		
900717035F	1154	K 3	7/20/90	1.30		28,000 00		
900804071F	1487	K 3	8/6/90			56 00		
900928027F	2336	K 3	9/28/90			26		
900717036F	1155	K 4	7/20/90	2 90 (2 7)		1,300 00		6" soil sample
900804072F	1488	K 4	8/6/90			71.00		
900928028F	2337	K 4	9/28/90			140		
9009028029F	2338	K 5	9/28/90			930		
900928030F	2339	K 6	9/28/90			940		
900928031F	2340	K 7	9/29/90			2900		
900929001F	2391	K 7	9/29/90			2100		

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 121

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
Grid Line "L" Samples								
900717037F	1156	L 1	7/20/90	2 10		3,700 00		6" soil sample
900928032F	2341	L 1	9/28/90			550		
900928041F	2350	L 10	9/28/90			60		
900717038F	1157	L 2	7/20/90	1.30		1,200 00		
900729013F	1376	L 2	7/31/90	ND		480 00		
900928033F	2342	L 2	9/28/90			3500		
900171039F	1158	L 3	7/21/90	2 30		33,000.00		
900804074F	1490	L 3	8/6/90			670 00		
900928034F	2343	L 3	9/28/90			150		
900717040F	1159	L 4	7/21/90	8 0(8 0)	5.73	39,000.00	47,400.00	1' depth
900729014F	1377	L 4	7/31/90	10 00		28,000.00		
900804075F	1491	L 4	8/6/90			3,000 00		
900928035F	2344	L 4	9/28/90			1700		
900928036F	2345	L 5	9/28/90			620		
900928037F	2346	L 6	9/28/90			58		
900928038F	2347	L 7	9/28/90			350		
900928039F	2348	L 8	9/28/90			290		
900928040F	2349	L 9	9/28/90			95		
900729012F	1375	L1A	7/31/94	4.10		610 00		1-6" depth
Grid Line "M" Samples								
900928042F	2351	M 1	9/28/90			110		
900928043F	2352	M 2	9/28/90			1100		
900928044F	2353	M 3	9/28/90			280		
900804076F	1492	M 4	8/6/90			4,500 00		1-6" depth

NOTES 5 2 (5.3) - Numbers in ( ) are field laboratory duplicates

0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm

PCB - polychlorinated biphenyls

ppm - parts per million

TPH - total petroleum hydrocarbons

4 122

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
900928045F	2354	M 4	9/28/90			56		
900928046F	2355	M 5	9/28/90			36		
900804077F	1493	M 6	8/6/90			4,000.00		
900928047F	2356	M 6	9/28/90			26		
900928048F	2357	M 7	9/28/90			43		
900928049F	2358	M 8	9/28/90			44		
900928050F	2359	M 9	9/28/90			15		
900928051F	2360	M10	9/28/90			63		
Grid Line "N" Samples								
900928057F	2366	N 1	9/28/90			230		
900928058F	2367	N 2	9/28/90			31		
900928059F	2368	N 3	9/28/90			33		
900928060F	2369	N 4	9/28/90			52		
900928061F	2370	N 5	9/28/90			410		
900928062F	2371	N 6	9/28/90			96		
900928063F	2372	N 7	9/28/90			34		
900928064F	2373	N 8	9/28/90			26		
900928065F	2374	N 9	9/28/90			15		
900928066F	2375	N10	9/28/90			32		
Grid Line "O" Samples								
900928052F	2361	O 1	9/28/90			28		
900928053F	2362	O 2	9/28/90			150		
900928054F	2363	O 3	9/28/90			180		
90028055F	2364	O 4	9/28/90			35		
900928056F	2365	O 5	9/28/90			50		

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates
0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was 16 ppm
PCB - polychlorinated biphenyls
ppm - parts per million
TPH - total petroleum hydrocarbons

4 1-23

TABLE B-1
1990 PCB AND TPH ANALYTICAL RESULTS
NORTH SIDE OF THE COMPOSITE BUILDING

Sample Identification Number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Remarks
Grid Line "P" Samples								
900928067F	2376	P1	9/28/90			19		
900928068F	2377	P2	9/28/90			38		
900928069F	2378	P3	9/28/90			73		
900928070F	2379	P4	9/28/90			41		
900928071F	2380	P5	9/28/90			30		
Grid Line "Q" Samples								
900928077F	2386	Q1	9/29/90			47		
900928078F	2387	Q2	9/29/90			16		
900928079F	2388	Q3	9/29/90			20		
900928080F	2389	Q4	9/29/90			62		
900928081F	2390	Q5	9/29/90			33		
Grid Line "R" Samples								
900928073F	2382	R2	9/28/90			22		
900928074F	2383	R3	9/29/90			22		
900928075F	2384	R4	9/29/90			41		
900928076F	2385	R5	9/29/90			43		
900928072F	2381	R10	9/28/90			24		

NOTES 5 2 (5 3) - Numbers in ( ) are field laboratory duplicates

0 35 NP, 16 CG - Indicates that NPDL's sample analytical result was 0 35 ppm and Chemical Geological Laboratory's result was .16 ppm

PCB - polychlorinated biphenyls

ppm - parts per million

TPH - total petroleum hydrocarbons

4 124

TABLE B-2
1990 SOIL ANALYTICAL RESULTS OF SAMPLES COLLECTED APPROXIMATELY 88 FEET NORTHWEST OF THE COMPOSITE BUILDING, PORT HEIDEN RADIO RELAY STATION, ALASKA

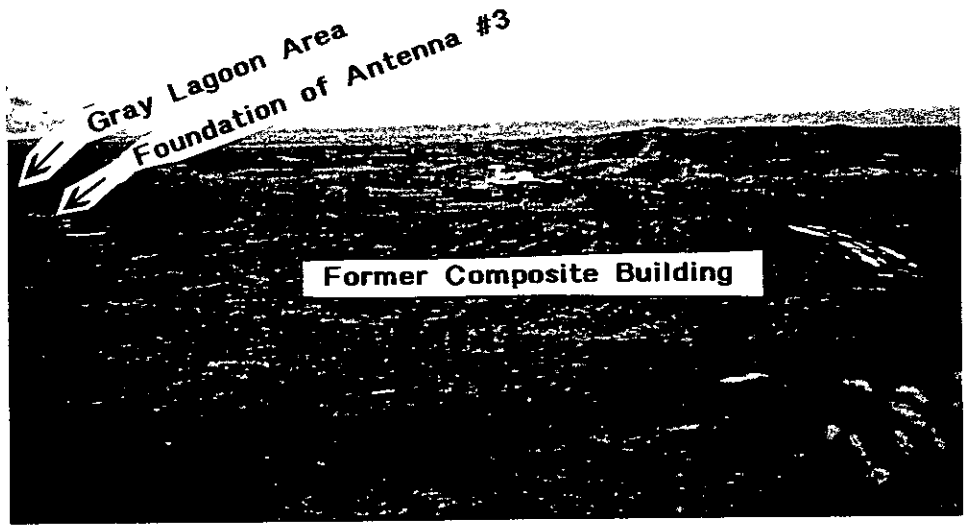
Sample Identification number	Field Laboratory Number	Grid Number	Date	Field Laboratory PCB Results (ppm)	Confirmation Laboratory PCB Results (ppm)	Field Laboratory TPH Results (ppm)	Confirmation Laboratory TPH Results (ppm)	Comments/Description
900808001F	1567	88	8/9/90	1.50				
900808002F	1568	88A	8/9/90	320 00				6" soil sample
900808003F	1569	88B	8/9/90	5.30				1-6" depth
900808004F	1570	88C	8/9/90	11 00				6" soil sample
900808005F	1571	88D	8/9/90	8.40				Composite of 1st 6"
900808006F	1572	88E	8/9/90	2 00		140 00		6" soil sample
900808007F	1573	88F	8/9/90	2 00		170 00		6" soil sample
900808008F	1574	88G	8/9/90	3 80		350 00		1' depth
900808009F	1575	88H	8/9/90	ND		960 00		1-6"
900808010F	1576	88I?	8/9/90	9 50		240 00		1-6" depth
900810011F	1631	C1	8/10/90	4 10				
900810012F	1632	A3	8/10/90	ND		60 00		
900810013F	1633	C2	8/10/90	ND				
900810014F	1634	D2	8/10/90	6 70				
900810015F	1635	A1	8/10/90	3 80		150 00		1-6" depth
900810016F	1636	B3	8/10/90	ND				1-6" depth
900810017F	1637	D3	8/10/90	7 00				Composite of 1st 6"
900810018F	1638	B2	8/10/90	1.10				
900810019F	1639	A2	8/10/90	1 40		64 00		Confirmation sample
900810020F	1640	C3	8/10/90	ND				1-6"depth
900810021F	1641	B1	8/10/90	300 00		49 00		1-6" depth
900813007F	1680	88 5	8/13/90	440 00				
900817023F	1760	88	8/18/90	ND				
900829023F	1925	25C	8/30/90	ND	1 0NP; .27CG			1-6" depth
900829024F	1926	24C	8/31/90	2 2	27CG			Confirmation sample
900829025F	1927	23C	8/31/90	ND	9 9NP, .14CG			

CG - Chemical and Geological Laboratory
NP - North Pacific Division Laboratory
ND - not detected at or above method reporting limit
TPH - total petroleum hydrocarbons
PCB - Polychlorinated biphenyls
ppm - parts per million

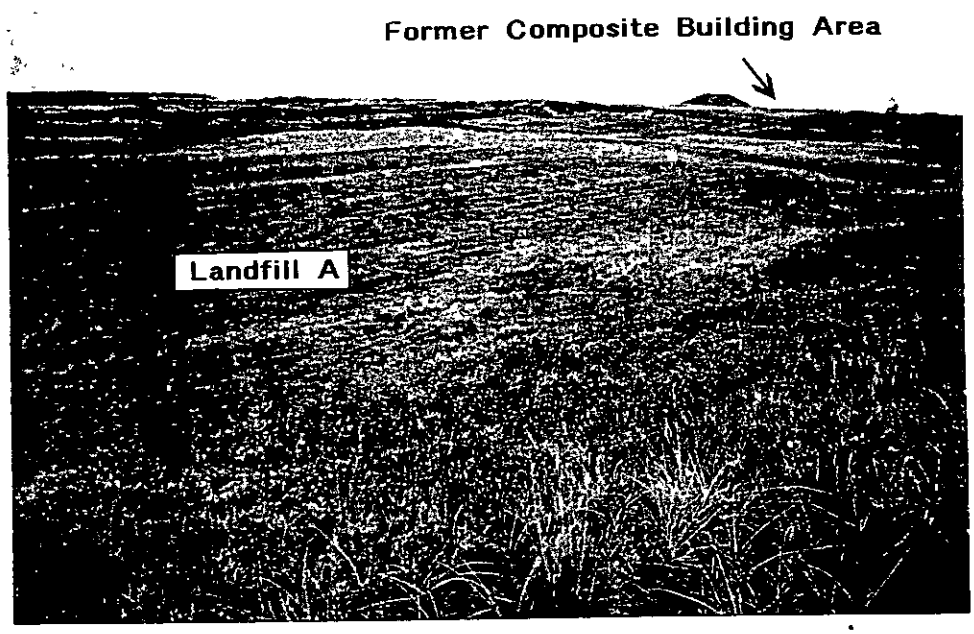
APPENDIX C

PHOTOGRAPH LOG

PHOTOGRAPHIC LOG
PORT HEIDEN RADIO RELAY STATION

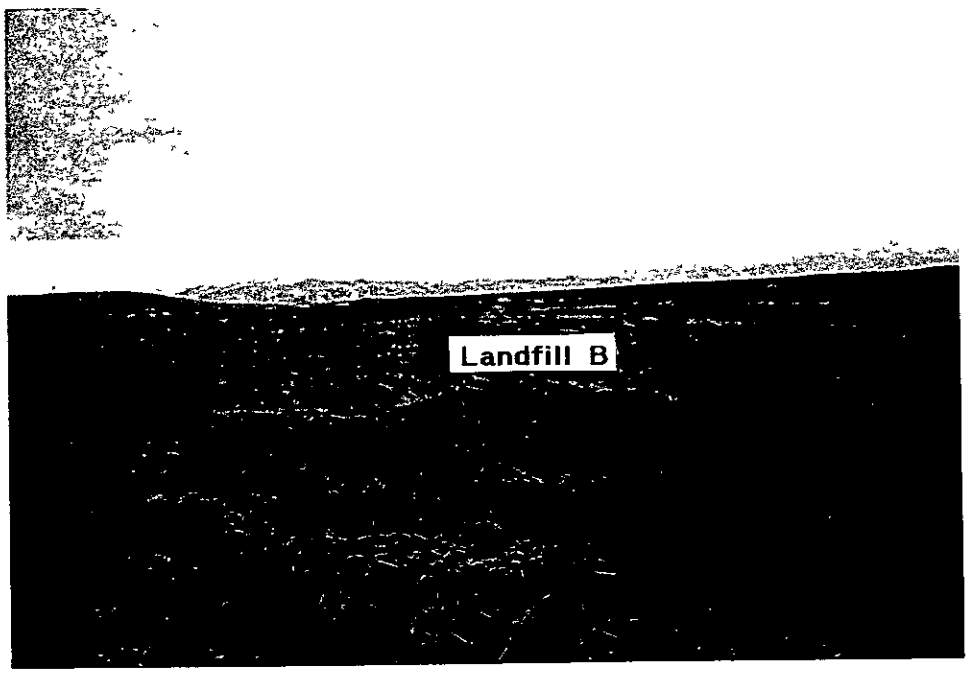


Photograph #1
Former Composite Building Area



Photograph #2
Landfill A Soil Cap

PHOTOGRAPHIC LOG (Continued)
PORT HEIDEN RADIO RELAY STATION



Photograph #3
Landfill B Soil Cap

APPENDIX D

LANDFILL AS-BUILTS

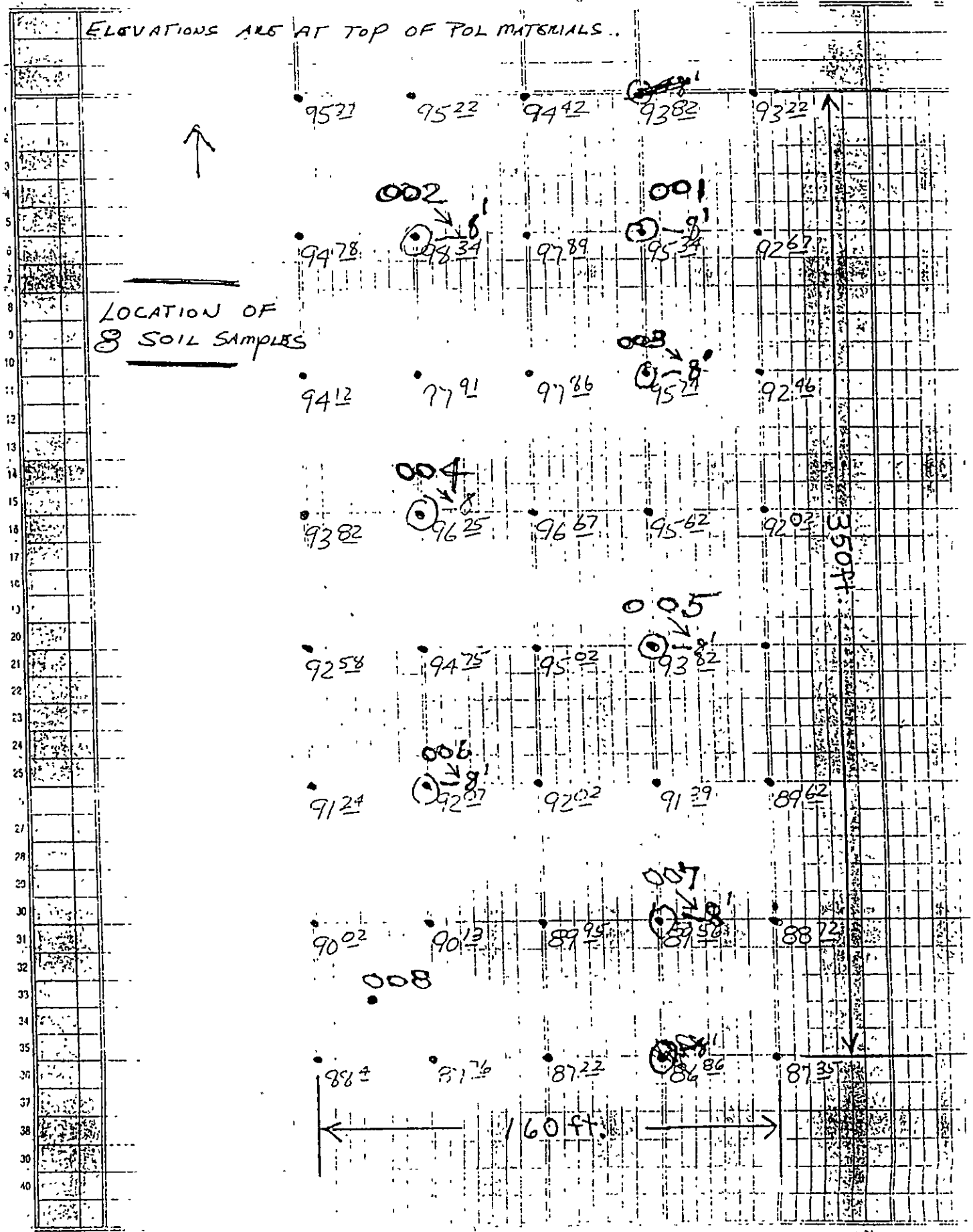
TBM = ELEVATION 100

GRID STAKES/GRADE STAKES SET AT 40' X 50' GRIDS.

	Initials
Prepared By	
Approved By	

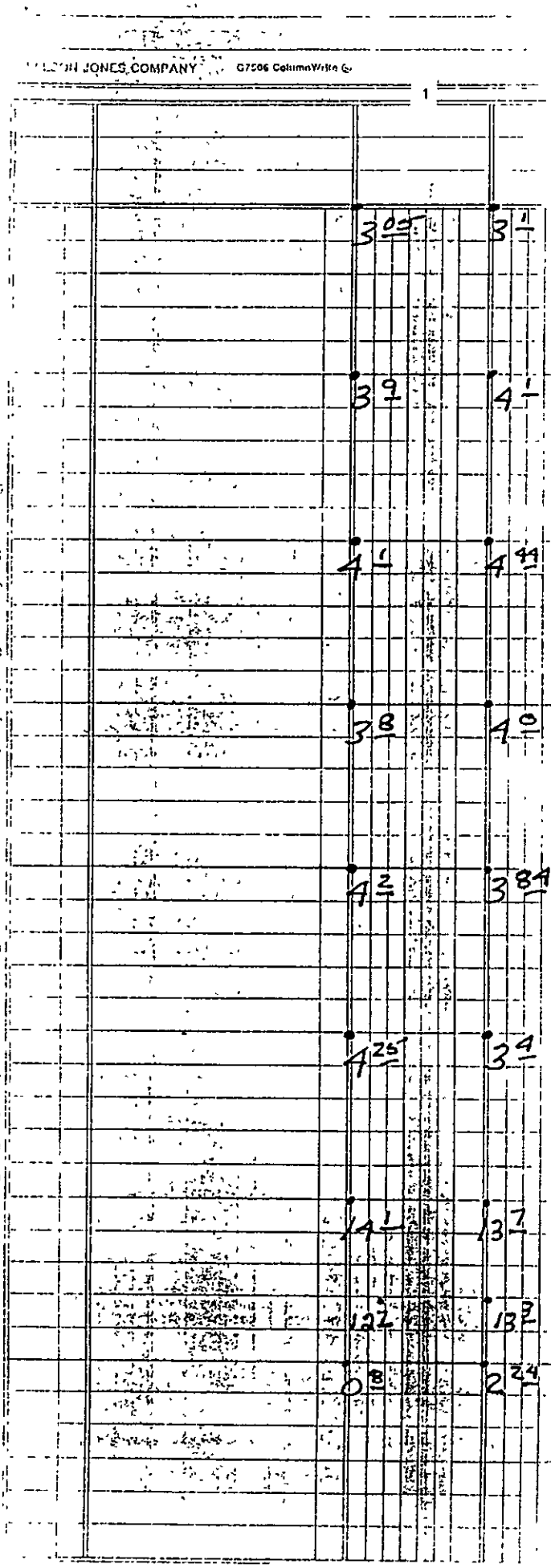
WILSON JOINT

ELEVATIONS ARE AT TOP OF TOL MATERIALS.



4 130

"LANDFILL "A" - ASBUILT OF PIT COVER



3 45 3 0 3 85

3 4 2 82 4 0

3 95 3 45 4 0

4 3 2 7 4 3

4 2 3 1 4 7

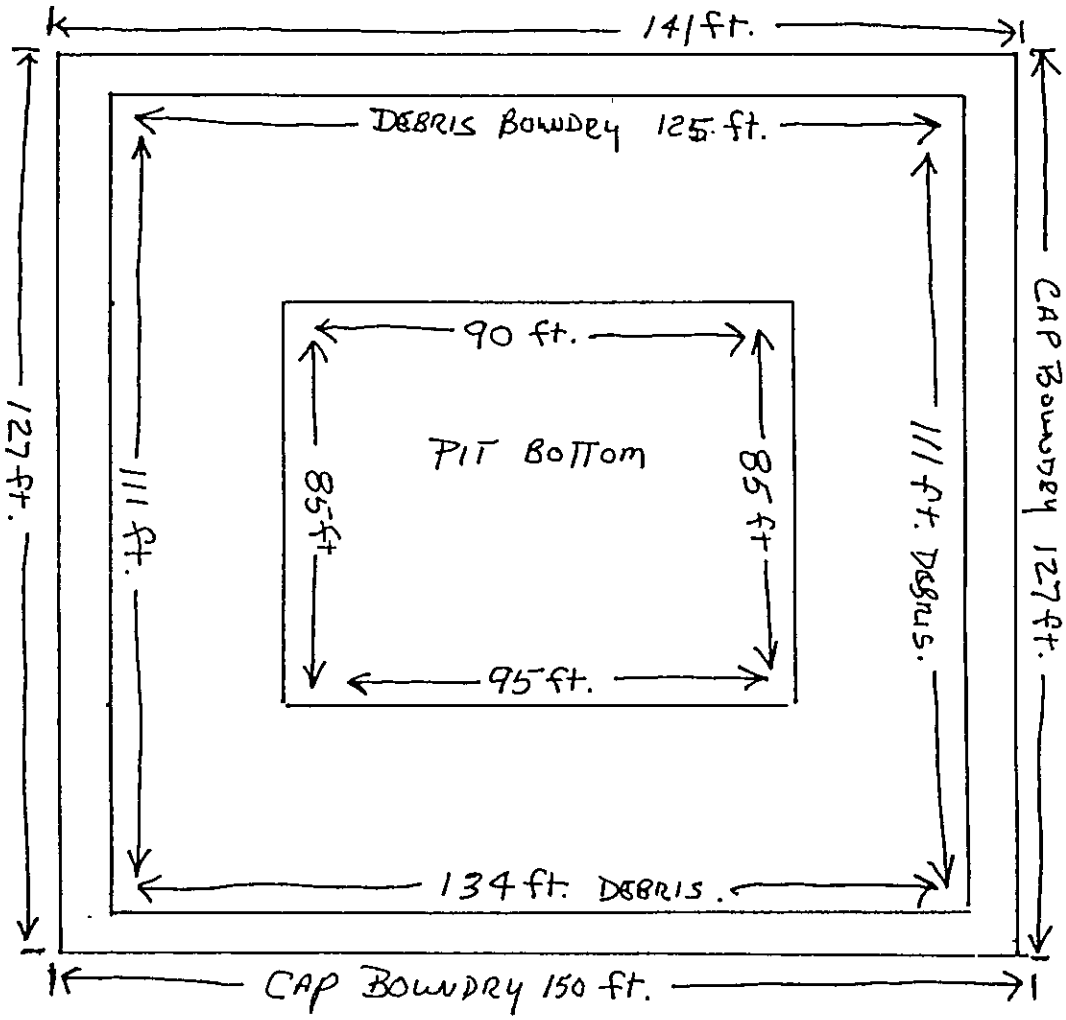
3 7 3 1 4 0

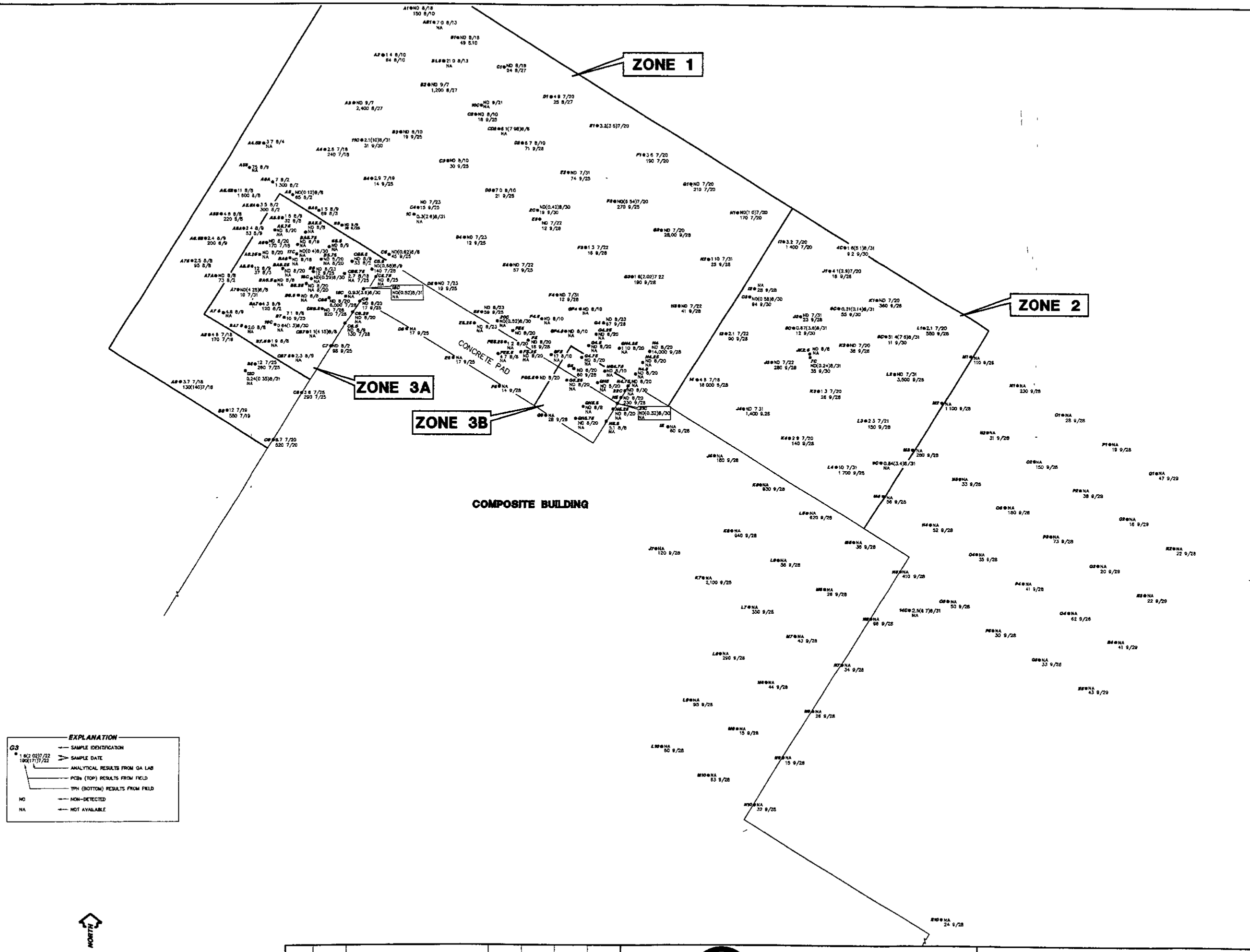
14 5 13 3 13 5

14 5 11 6 11 5

2 78 1 44 1 05

LANDFILL, "B" DIMENSIONS





EXPLANATION

- G3 — SAMPLE IDENTIFICATION
- 1.6@.02(7/22 / 1.90@.17(7/22 — SAMPLE DATE
- ANALYTICAL RESULTS FROM QA LAB
- PCBs (TOP) RESULTS FROM FIELD
- TPH (BOTTOM) RESULTS FROM FIELD
- ND — NON-DETECTED
- NA — NOT AVAILABLE

NORTH

0 5 10 15 20

APPROX. SCALE IN FEET

REV	DATE	DESCRIPTION	DWN BY	DES BY	CHK BY	APP BY

DATE OF ISSUE JULY 1995 — DWN BY CDS9405SS — DES BY — CHK BY G D — APP BY G D

EMCON Alaska, Inc.
201 E. 56th Ave. Suite 300 Anchorage, Ak. 99518
(907) 562-3452 Fax (907) 563-2814

WHITE ALICE COMMUNICATIONS SITE
Port Heiden, Alaska

SOIL SAMPLE LOCATIONS PCB AND TPH RESULTS COMPOSITE BUILDING

FIGURE 4

PROJECT NO 5210-020 00T3

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE