VOLUME 1
REVISED FINAL CLEAN-UP REPORT
ICY BAY WEST CAMP #1

Icy Bay

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EXECUTIVE SUMMARY

This Revised Final Clean-Up Report was prepared and written by Dan McNair – DMC Technologies, Inc. and includes various revisions to text addressing public comments received from January 22, 2004 to March 19, 2004. Mr. McNair is an environmental engineer and is recognized by ADEC as a qualified professional to perform site remediation and closure. The final report is presented in three Volumes as follows:

Volume 1: Final Clean-Up Report
Volume 2: Photographic Log
Volume 3: Laboratory Data

The report is prefaced with an executive summary, compliance matrix and listing of final clean-up report requirements. The body of the report is divided into five sections including background information, pre-remediation work, clean-up limits, remediation results and release information. References are also provided.

Site History

The Icy Bay-West Camp #1 facilities have been used in connection with timber harvest activities continuously from 1968 until present. The Icy Bay-West Camp #1 facilities include camp, vehicle maintenance, road, airport, fuel storage and dispensing, log sort yard and storage, and related facilities. Until 1993, these facilities were used by several different purchasers of timber from the State of Alaska Department of Natural Resources (DNR) to support their logging activities on State of Alaska lands (including lands conveyed to Alaska pursuant to the Alaska Mental Health Enabling Act).

The facilities were used exclusively by the University's Timber Purchaser between 1993 and 1996. Beginning in 1996, the site was jointly occupied by purchasers of timber from the University of Alaska ("University"), and from the Mental Health Trust Land Office (TLO), acting by and on behalf of the Alaska Mental Health Trust Authority, in support of their timber operations. The University's timber purchaser was Wasser & Winters Company and Wasser & Winters Alaska Company ("Wasser & Winters"); the TLO's timber purchaser was Citifor, Inc. Both purchasers employed Browning Timber of Alaska, Inc. ("Browning"), and Ben A. Thomas, Inc. ("Thomas") as logging contractors to harvest the timber and conduct other operations for them.

As of late 2002, the State of Alaska's timber purchasers had harvested approximately fifty seven percent of the total volume of the timber harvested at West Icy Bay since 1968, while the University's timber purchaser had harvested approximately twenty seven percent of all such timber, and the TLO's purchaser had harvested approximately sixteen percent of all such timber. From 1996-2000,

Wasser & Winters and Citifor jointly used the Icy Bay-West Camp #1 facilities under agreements providing for such joint use.

In 2000, the TLO's purchaser Citifor moved to newly constructed separate camp and shop facilities ("Icy Bay-West Camp #2") located near Camp #1, while the University's timber purchase Wasser & Winters continued its use and occupancy of the Icy Bay-West Camp #1 camp and shop facilities. In the spring of 2000, Citifor moved to newly constructed, expanded sort yard and log storage facilities, while Wasser & Winters continued to use the original sort yard and log storage facilities. In 2000, the TLO's purchaser Citifor began to use newly constructed separate fuel storage facilities located at the airport. After 2000, both companies continued joint use of the Log Transfer facilities, the airport, the roads and other similar facilities (under agreements providing for such joint use) until the termination of Citifor's operations in 2002.

Discovery of Contamination at the Site

Incidents of contamination likely occurred at the Icy Bay-West Camp #1 facility throughout its history. Regardless, inspections of the Icy Bay-West Camp #1 facilities performed under the Forest Practices Act by the landowners and regulatory agencies documented contamination and eventually resulted in the environmental remediation of the Icy Bay-West Camp #1. Several specific events of contamination were witnessed. In April 2001, certain poor housekeeping practices involving oil sheens and antifreeze were noted by the agencies during a Forest Practices Act inspection. In September, 2001, another incident occurred during an agency visit to the Icy Bay-West Camp #1 facility in which equipment and petroleum were burned, and releases of petroleum products occurred. These events brought agency scrutiny to the site, and as a result, an extensive environmental site assessment was eventually requested and completed by Southeast Management Services on behalf of the University of Alaska.

Settlement Agreement Resolving Environmental Contamination at the West Icy Bay Camp Facility

As a result of this site characterization and a land use history completed by the University, negotiations began between the State of Alaska Department of Environmental Conservation (“DEC”), the State of Alaska Department of Law ("DOL"), DNR, TLO, the University, Wasser and Winters, Citifor, Browning, and Thomas to establish the terms of, and to allocate the cost of, the required environmental remediation of the Icy Bay-West Camp #1 facilities.

These negotiations resulted in the completion of the "Settlement Agreement Resolving Environmental Contamination At The West Icy Bay Camp Facility" ("Environmental Settlement Agreement"). Under the terms of the Environmental

Settlement Agreement, DNR was allocated approximately fifty seven percent of the total cost of such remediation, while the University and its timber purchaser were allocated approximately thirty two percent of all such cost, and the TLO (and its timber purchaser) were allocated approximately ten percent of all such cost. The Settlement Agreement also specified and defined the volumes of contaminated materials to be removed and the levels of cleanup that were required and contained mutual releases of the parties.

The Parties next negotiated a Remediation Agreement to provide for the terms of the conduct of the environmental remediation. Wasser & Winters and Citifor agreed to conduct the Environmental Remediation pursuant to the Settlement Agreement and the Remediation Agreement, in a version of the Remediation Agreement signed by them on June 2, 2003, and the University, DNR and TLO conditionally approved that agreement by a letter dated June 12, 2003 ("Conditional Approval").

Thereafter, the parties concluded a "First Amendment to Settlement Agreement Resolving Environmental Contamination at the West Icy Bay Camp Facility" (the "First Amendment to Settlement Agreement"). The First Amendment to Settlement Agreement resolved further issues that arose during the environmental remediation including the remediation of a newly discovered contaminated site (the “Camp #1 Shop Fuel Depot Site,”) involving additional amounts of remediated soils, specific guidance for cleanup and expenditures at various other sites, final settlement of cost liabilities for the remediation, and agreement concerning the location and remediation of soil treatment cells and stockpiles. The environmental remediation of the Icy Bay-West Camp #1 facilities was thus conducted pursuant to, and controlled by, the Environmental Settlement Agreement, First Amendment to Settlement Agreement, and the Remediation Agreement and its Conditional Approval. Under these agreements, Wasser & Winters was primarily responsible for conducting the environmental remediation, and its costs were partially reimbursed under the Environmental Settlement Agreement."

Environmental Remediation Activities

Witnessed events of petroleum contamination in 2001 led to the development, ADEC approval and execution of a Site Characterization Plan by Southeast Management Services. Site characterization was performed in 2002 and documented in a three volume Final Site Characterization Report prepared in 2003. A Remedial Work Plan was prepared by DMC Technologies in March 2003 and approved by ADEC in May 2003. Remedial work commenced June 2003 and was completed September 2003. All work performed was completed under approved ADEC documentation.

The remediation effort focused primarily on the excavation and treatment of oil and diesel contaminated soils. Soils were characterized as predominantly sands and gravel. Contaminated soils were excavated by track hoe and transported to stockpiles using dump trucks. All equipment and operators were provided by Wasser & Winters Company. Environmental oversight and clean-up direction, including soil/water treatment and soil treatment were provided by DMC Technologies.

Remediation included the excavation of 14,989 CY of contaminated soil from 16 (not including the sacks) different areas in and around camp. The 337 samples collected confirmed compliance with ADEC clean-up criteria in all 16 sites. Excavation data is summarized below:

SUMMARY

	Location	Excavated (CY)	Required Confirm Samples	Actual Confirm Samples	
SACK	Sacks	14	2	0	
GCS	Generator	1,102	10	39	
TWS	Truck Washdown	1,088	10	31	
OSH	Oil Shed	2,054	11	70	
SLV1	Oil Shed Solvents	408	5	7	
SSS	Saw Shop	1,700	10	82	
MCS	Maintenance Shop	1,240	10	18	
SEQP	South Equipment Parking Area	150	5	12	
BNY	Boneyard	231	5	9	
5MDT	5-Mile Ditch	14	2	2	
BHS	Bunk House	122	5	5	
SCH	School House	95	3	4	
TLO	TLO Area	326	5	7	
SLV2	TLO Solvents	22	2	2	
FDP	Fuel Depot #1	2,557	12	22	
CFD	Camp Fuel Depot	3,767	14	22	
ICN	Incinerator	100	3	5	
	Total	**14,989**	**114**	**337**	296%

Contaminated soils were placed in one of three stockpiles and then treated using DMC Technologies "System ET-20 Bioaugmentation" process. Treatment was effective in removing over 98% of contaminants in 24 to 31 days. The 100 samples collected confirmed compliance with ADEC treatment criteria in all 3 stockpiles. Treatment data is summarized below:

Stockpile	CY Treated	Confirmation Samples		Background Samples	Footprint Samples
		Required	Actual		
North	3,426	13	40	5	10
South	5,139	17	40	5	10
Runway	6,424	19	20	10	10
	14,989				

Nutrient 105% dose applied
Bacteria 517% dose applied

Analyses were performed by an ADEC approved laboratory – North Creek Analytical. No groundwater contamination was defined during characterization or reported during remediation. Groundwater was observed to be highly mineralized – typical of the Icy Bay environment.

Three contaminated sites were not cleaned up due to limited remaining cleanup funds. The sites are the upland fuel depot including the former saw shack, remote maintenance shop, and residential trailers.

Uplands Fuel Depot and Former Sawshack

The Uplands Fuel Depot is situated on a bench north of the log sort yard and provided fuel storage and dispensing for heavy equipment operations prior to 1990. The southwest corner of the depot area contains the former Saw Shack site used in the early 1990's. Gasoline and diesel contaminated soil is present at the site with depth, but there is no data suggesting that contaminants are mobile or unstable. Further action at this site is at the sole discretion of ADEC.

The First Amendment to Settlement Agreement states regarding these sites:

> "The "Uplands Fuel Depot Site (including the Former Sawshack Area)" is subject to the terms of the Settlement Agreement because it contains Environmental Contamination that was identified and discussed in the Hanna Reports. All of the Environmental Contamination present at the "Uplands Fuel Depot Site (including the Former Sawshack Area)" is excess contamination above the 8000 cubic yards identified for environmental remediation in the Settlement Agreement. The DEC indicates that this site is stable and that the excess contamination at this site is not mobile. Pursuant to the terms of the Settlement Agreement, each Party is released from liability for the "Uplands Fuel Depot Site (including the Former Sawshack Area)", pursuant to the terms of the releases contained in Paragraphs 3 and 4 of the Settlement Agreement and each Party shall have no further obligation to contribute to any further remediation of this site, or to conduct further Environmental Remediation at this site, including without limitation under that certain Lease Agreement ADL No. 105887 by and between UA and the TLO dated March 22, 1995. DEC shall not issue an order to conduct further cleanup of this site unless it first makes the findings set forth in Section 4.B. of the Settlement Agreement with respect to either such site, in compliance with Section 3 below. "TLO and DNR will continue to own and administer this site after the conclusion of the Lease Agreement ADL No. 105887 by and between UA and the TLO dated March 22, 1995.

Remote Maintenance Shop

The Remote Maintenance Shop is located 32.5 miles west of camp near Cape Yakataga and has been used since the early 1990's for emergency maintenance. Excavation of petroleum stained soils was performed in early 2003. Excavated soils were placed in a supersack and delivered to camp for storage and disposal by treatment. The shop was reinspected in 2004. Continued housekeeping of this site will be performed and the need to excavate additional soils will be evaluated when logging operations have permanently ceased.

The First Amendment to Settlement Agreement states regarding this site:

> "The Remote Maintenance Facility is located at Cape Yakataga. Environmental Remediation and Additional Remediation of the "Remote Maintenance Shop Site" is now completed and the site has been backfilled and all confirmation samples have been returned demonstrating this site is closed. Subject to Paragraphs 4.B and 15.F of the Settlement Agreement, no further Environmental Remediation or Additional Remediation is required at this site. Any remaining contamination at this site will be dealt with by the potentially responsible party."

Camp Residential Area Trailers

Fuel tanks on three of twenty-one trailers in the camp residential area were found to have leaked. Contaminated soils are situated under the trailers and within the confines of associated utility lines (power, water, etc.). Excavation of these soils will be performed when logging operations have permanently ceased and the trailers are moved.

Because of comprehensive contaminated soil excavation, including excavation with depth in and around the Equipment Shop to remove a smear band at the water table, a petition to perform no groundwater monitoring was made at this site and was approved by ADEC.

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FINAL CLEAN-UP REPORT COMPLIANCE MATRIX

The requirements noted below are derived from 18AAC 75.380:

Citation	Requirement	Plan Pgs.
380(a)	Prepared and submitted by a responsible person	
380(a)	Identifies each site undergoing clean-up	
380(b)(1)	Indicates date and time of release	
380(b)(2)	Provides latitude and longitude coordinates of release	
380(b)(3)	Provides name and address of site	
380(b)(4)	Contains contact information for owners & operators	
380(b)(5)	Identifies type and amount of hazardous chemicals released	
380(b)(6)	Describes environmental damage caused by release	
380(b)(7)***	Demonstration that free product was recovered	
380(b)(7)(A)	Technical description of free product observed or measured	
380(b)(7)(B)	Type of free product recovery system used	
380(b)(7)(C)	Release potential both on and off site during recovery	
380(b)(7)(D)	Treatment method and effectiveness for releases	
380(b)(7)(E)	Permits required and obtained for free product	
380(b)(7)(F)	Date, location and method of disposal of contaminated soil	
380(b)(7)(G)	Estimate of free product remaining	
380(b)(8)	Approved soil and groundwater clean-up levels	
380(b)(8)	Methodology for calculating clean-up levels	
380(b)(9)	Description of clean-up actions	
380(b)(9)(A)**	Demonstration of clean-up to an approved plan	
380(b)(9)(B)	Sampling methods, locations and reports for all media	
380(b)(9)(C)	Summary of lab results for final verification samples	
380(b)(9)(D)	Explanation of actions for samples exceeding limits	
380(b)(9)(E)	Management of contaminated media by approved methods	
380(b)(9)(F)	Estimate and extent of remaining residual contamination	
380(b)(9)(G)	Surface soil staining examined and removed	
380(b)(9)(H)	Permits required and obtained for contaminated media	
380(b)(9)(I)	Management of defined hazardous wastes	
380(b)(9)(J)	Other information pertinent to hazards exposure	
380(b)(10)*	Compliance with applicable institutional controls	
380(c)	Determination of final compliance	
380(c)(1)	Soil clean-up compliance determined by maximum concentrations detected compared to limits and between untreated and treated samples compared to limits	
380(c)(1)	Soil clean-up determined by approved statistical analyses to 95% UCL	
380(c)(1)(A)	Consideration for number and location of samples	
380(c)(1)(B)	Consideration for variations in concentrations from mean	
380(c)(1)(C)	Consideration for % of concentrations below MDL	
380(c)(2)	Groundwater compliance determined by maximum unfiltered samples	
380(c)(2)	Size of plume must be steady state or shrinking and concentrations of contaminants decreasing	

*** *AAC 75.325(f)(1)(B)*
** *AAC 75.360*
* *AAC 75.375*

Table 1. Final Report Compliance Matrix

FINAL CLEAN-UP REPORT REQUIREMENTS

18 AAC 75.380. Final reporting requirements and site closure.

(a) A responsible person shall submit a written final cleanup report to the department for each site undergoing cleanup under the site cleanup rules. The report must be prepared by a qualified person.

(b) The written report required by (a) of this section must contain, as applicable,

(1) the date and time of the discharge or release;

(2) the location of the discharge or release, including latitude and longitude coordinates;

(3) the name and physical address of the site, facility, or operation;

(4) the name, mailing address, and telephone number of the owner and of the operator of the site, facility, or operation;

(5) the type and amount of each hazardous substance discharged or released;

(6) a description of environmental damage caused by the discharge, release, or containment, to the extent the damage can be identified;

(7) a demonstration that the free product was recovered in compliance with 18 AAC 75.325(f)(1)(B) and that provides, at a minimum, the following information:

(A) the estimated amount, type, and thickness of free product observed or measured in wells, boreholes, and excavations;

(B) the type of free product recovery system used;

(C) whether a discharge or release has occurred or will occur at the site or offsite during the recovery operation and where the discharge or release occurred or will occur;

(D) the type of treatment applied to, and the effluent quality resulting or expected from, any substance that has been discharged or released or will be discharged or released;

(E) whether a discharge or other permit was required under local, state, or federal law and if each required permit was obtained;

(F) the date, location, and method of disposal of the recovered free product, dissolved phase product, or contaminated soil; and

(G) whether free product remains at the site, and, if so, the estimated quantity;

(8) a summary of each applicable soil and groundwater cleanup level approved under the site cleanup rules and a description of the factors used in determining each applicable cleanup level;

(9) a description of cleanup actions taken, including

(A) a demonstration that cleanup was conducted in accordance with the elements, including modifications to the elements, approved under 18 AAC 75.360;

(B) sampling reports and a description of the soil and groundwater sampling protocol and sampling locations;

(C) a summary of the laboratory reports for the final verification samples collected at the site; the laboratory or a responsible person shall keep those reports and make them available to the department upon request for at least 10 years after submission of the summary to the department;

(D) a detailed explanation of what was done if a sample exceeded the applicable required cleanup level;

(E) a demonstration that contaminated soil and groundwater were stored, treated, and disposed of in an approved manner;

(F) an estimate of the extent of any remaining residual contamination, above and below the applicable cleanup levels;

(G) a demonstration that surface soil staining was evaluated and that a cleanup of that staining was performed;

(H) whether permits were required under local, state, or federal law and if each required permit was obtained;

(I) confirmation that any hazardous waste generated was stored, treated, or disposed of in compliance with 42 U.S.C. 6901 - 6992k (Solid Waste Disposal Act, as amended by Resource Conservation Recovery Act), as amended through October 1, 1998 and adopted by reference; and

(J) other information requested by the department, as the department determines necessary to ensure protection of human health, safety, or welfare, or of the environment;

(10) a demonstration of compliance with applicable institutional control requirements under 18 AAC 75.375.

(c) The department will determine final compliance with the

(1) applicable soil cleanup levels, based on sampling results from onsite contaminated soil and from contaminated soil moved offsite for treatment or disposal, and based on the maximum concentrations detected, unless the department approves an appropriate statistical method, in which case compliance will be based on the mean soil concentration at the 95th percent upper confidence limit; approval of a statistical method will be based on

(A) the number and location of samples taken;

(B) whether large variations in hazardous substance concentrations relative to the mean concentration exist; and

(C) whether a large percentage of concentrations are below the method detection limit; and

(2) groundwater cleanup levels, based on an analysis of unfiltered groundwater samples unless a responsible person demonstrates that a filtered sample provides a more representative measure of groundwater quality; the department will determine compliance based on the maximum concentrations of a hazardous substance detected in the final confirmation samples; before closure, the size of the dissolved plume must be steady state or shrinking and concentrations of the hazardous substance must be decreasing.

(d) After reviewing the final cleanup report submitted under this section, if the department determines that

(1) a site has been adequately characterized under 18 AAC 75.335 and has achieved the applicable requirements under the site cleanup rules, the department will issue a written determination that the cleanup is complete, subject to a future department determination that the cleanup is not protective of human health, safety, or welfare, or of the environment; or

(2) the cleanup and applicable institutional controls are not protective of human health, safety, or welfare, or of the environment, the department will, as necessary to ensure protection of human health, safety, or welfare,

or of the environment, require a responsible person to conduct additional actions that meet the requirements of the site cleanup rules.

(Eff. 1/22/99, Register 149)

Authority:

AS 46.03.020	*AS 46.03.745*	*AS 46.04.070*
AS 46.03.050	*AS 46.03.755*	*AS 46.09.010*
AS 46.03.710	*AS 46.04.020*	*AS 46.09.020*
AS 46.03.740		

18 AAC 75.385. Appeals.

A person aggrieved by a final department decision under the site cleanup rules may request an adjudicatory hearing under 18 AAC 15.195 - 18 AAC 15.340.

(Eff. 1/22/99, Register 149; am 7/11/2002, Register 163)

Authority:

AS 46.03.020 *AS 46.35.090(e)*

18 AAC 75.390. Waiver or modification.

If the department determines that a waiver of modification will be protective of human health, safety, and welfare, and of the environment, the department will waive or modify the site cleanup rules based on a review of the quantity or concentration of the discharge or release, soil and groundwater conditions, surface water and topography, geology, water and land use, construction methods and materials, and any other human health or environmental factor important to the evaluation. A responsible person seeking a waiver or modification of a provision of the site cleanup rules under this section shall submit a written report to justify the request and to demonstrate that the waiver or modification is protective of human health, safety, and welfare, and of the environment. A qualified person shall prepare and sign the report submitted under this section.

(Eff. 1/22/99, Register 149)

Authority:

AS 46.03.020	*AS 46.03.745*	*AS 46.09.010*
AS 46.03.050	*AS 46.03.755*	*AS 46.09.020*
AS 46.03.710	*AS 46.04.070*	

18 AAC 75.395. Interference with cleanup prohibited.

A person may not interfere with, hinder, or obstruct the containment or cleanup of a hazardous substance conducted under this chapter. This prohibition does not apply to the United States Coast Guard or EPA.

(Eff. 1/22/99, Register 149)

Authority:

AS 46.03.020 *AS 46.04.070* *AS 46.09.020*
AS 46.04.020

18 AAC 75.396. Local control.

Subject to AS 29.35.020, AS 46.04.110, and AS 46.09.060, the requirements of 18 AAC 75.300 - 18 AAC 75.390 do not preempt local control that is as stringent as, or more stringent than, those requirements, and that is consistent with a regional master plan prepared under AS 46.04.210.

(Eff. 1/22/99, Register 149)

Authority:

AS 46.03.020 *AS 46.04.210* *AS 46.09.060*
AS 46.04.110

BACKGROUND INFORMATION

SITE LOCATION

Icy Bay

Icy Bay is located in the State of Alaska approximately 70 air miles northwest of the small community of Yakutat. The general location of Icy Bay is depicted in Figure 1 below:

Figure 1. General Location of Icy Bay in Alaska

Icy Bay is located on the Alaska mainland along the coastal margin of the Gulf of Alaska and the Wrangell-St.Elias Mountains near the foot of Mt. St. Elias. The south shore of Icy Bay is protected from the open Pacific by a long, low neck of sand, the Pt. Riou spit, which marks the last forward advance of local glaciers. At the head of the bay lie three deep fjords and the glaciers that formed them: the Tyndall, Yahtse, and Guyot. These glaciers are remnants of a general ice advance- the Little Ice Age- that began about 4,000 years ago. The Little Ice Age reached its maximum extent here about 1750, when general melting began.

A more specific view of Icy Bay is illustrated in Figure 2 below:

Figure 2. Specific Location of Icy Bay in Alaska.

The shorelines of Icy Bay were completely covered by ice just 200 years ago. Explorer Captain George Vancouver found Icy Strait choked with ice in 1794, and Icy Bay was barely an indented glacier. That glacier was more than 4000 ft. thick, up to 20 miles or more wide, and extended more than 100 miles to the St.Elias Range of mountains. By 1879 naturist John Muir found that the ice had retreated many miles up the bay. Icy Bay now stretches 40 miles inland, and varies from four to ten miles wide. Such rapid retreat of glaciers is known nowhere else on earth. Scientists have documented it, hoping to learn how glacial activity relates to climate changes.

In addition to glacial activity, other natural processes in the Icy Bay environment are extreme and impose severe constraints on commercial and private development. Primary hazards include high earthquake potential associated with the Yakataga seismic gap: active faulting; tsunamis; ground instability (onshore and off shore) associated with the high influx of glacially derived sediment: costal erosion, glacier outburst and related flooding; snow avalanches near steep terrain: severe storms: and possible large icebergs.

Figure 3 illustrates the location of State of Alaska Timber Lands at Icy Bay and the relative location of Icy Bay West Logging Camps.

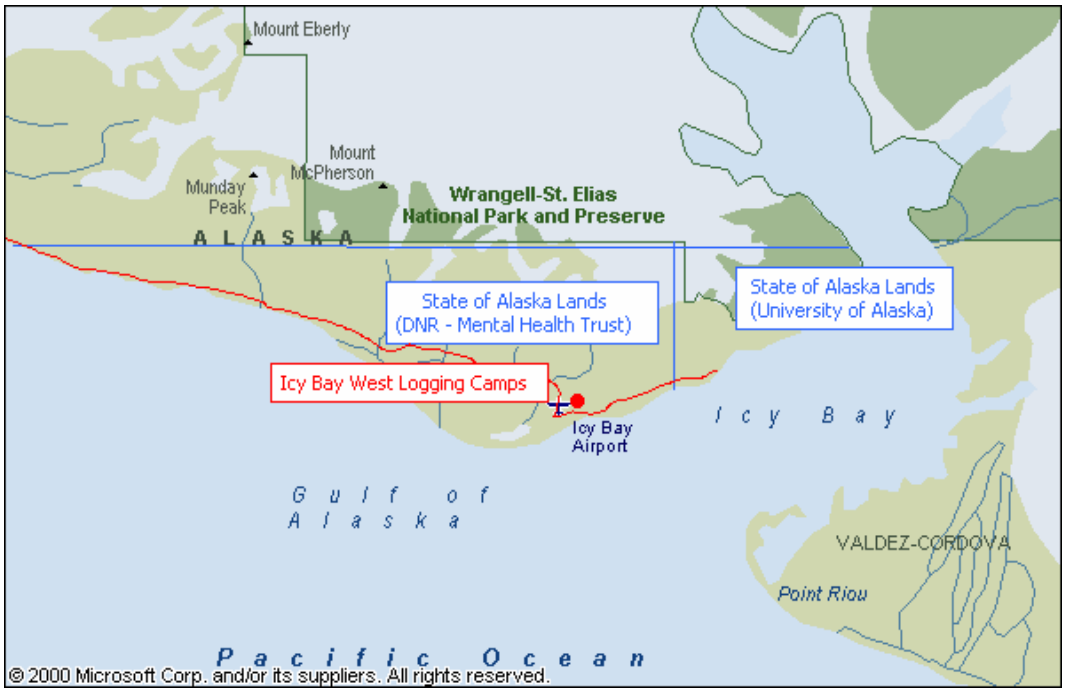


Figure 3. Location of Icy Bay West Logging Camps.

An approximate 35 mile long logging road running east and west connects the north shore of Icy Bay with Cape Yakataga at the confluence of the Yakataga River with the Gulf of Alaska. The logging road provides access to State of Alaska timber managed by either the University of Alaska or Department of Natural Resources Mental Health Trust Lands. The east end of the logging road at Icy Bay is marked by a log transfer facility (LTF) and sort yard near the beach. The far west end of the logging road at Cape Yakataga is a small remote field maintenance shop. Various logging facilities stretch along the roadway (mostly near Icy Bay) including the camp wastes incinerator, woodwaste disposal site, solid waste disposal sites, and west logging campsites (Camp #1 and Camp #2).

WEST LOGGING CAMPS

The two logging camps and adjacent facilities are situated along low-lying hills composed of gravel and sandy soils with elevations varying from 0 ft.-100 ft. and averaging about 30ft. to 50 ft. above seal level.

The two camps share a 4,000 foot long gravel airplane runway and burn camp domestic wastes in a jointly-operated incinerator. Otherwise, the camps maintain their own separate shop facilities, log sort yard areas, log transfer facilities, and fuel depots. The fuel depots for both camps are located along the southeast end of the airport runway.

West Camp #1

The Icy Bay-West Camp #1 facilities have been used in connection with timber harvest activities continuously from 1968 until present. The Icy Bay-West Camp #1 facilities include camp, vehicle maintenance, road, airport, fuel storage and dispensing, log sort yard and storage, and related facilities. Until 1993, these facilities were used by several different purchasers of timber from the State of Alaska Department of Natural Resources (DNR) to support their logging activities on State of Alaska lands (including lands conveyed to Alaska pursuant to the Alaska Mental Health Enabling Act). The facilities were used exclusively by the University's Timber Purchaser between 1993 and 1996. Beginning in 1996, the site was jointly occupied by purchasers of timber from the University of Alaska ("University"), and from the Mental Health Trust Land Office (TLO), acting by and on behalf of the Alaska Mental Health Trust Authority, in support of their timber operations. The University's timber purchaser was Wasser & Winters Company and Wasser & Winters Alaska Company ("Wasser & Winters"); the TLO's timber purchaser was Citifor, Inc. Both purchasers employed Browning Timber of Alaska, Inc. ("Browning"), and Ben A. Thomas, Inc. ("Thomas") as logging contractors to harvest the timber and conduct other operations for them. As of late 2002, the State of Alaska's timber purchasers had harvested approximately fifty seven percent of the total volume of the timber harvested at West Icy Bay since 1968, while the University's timber purchaser had harvested approximately twenty seven percent of all such timber, and the TLO's purchaser had harvested approximately sixteen percent of all such timber. From 1996-2000, Wasser & Winters and Citifor jointly used the Icy Bay-West Camp #1 facilities under agreements providing for such joint use. In 2000, the TLO's purchaser Citifor moved to newly constructed separate camp and shop facilities ("Icy Bay-West Camp #2") located near Camp #1, while the University's timber purchaser Wasser & Winters continued its use and occupancy of the Icy Bay-West Camp #1 camp and shop facilities. In the spring of 2000, Citifor moved to newly constructed, expanded sort yard and log storage facilities, while Wasser & Winters continued to use the original sort yard and log storage facilities. In 2000, the TLO's purchaser Citifor began to use newly constructed separate fuel storage facilities located at the airport. After 2000, both companies continued joint use of the Log Transfer facilities, the airport, the roads and other similar facilities (under agreements providing for such joint use) until the termination of Citifor's operations in 2002.

Camp #1 has undergone enlargements and changes as logging activities varied over the years. Camp #1 is currently divided into six general working areas including:

(1) Residential Area
(2) Shop Area with generator, oil & saw shed, parking areas and boneyard
(3) Fuel Depot
(4) Log Sort Yard with transfer facility and upland fuel depot

(5) Camp Incinerator
(6) Remote Maintenance Shop.

The residential and shop areas are closely connected in an approximate 1,000 ft. x 1,500 ft. area. The 1 acre fuel depot is located apx. 2,000 feet from the shop near the runway. The camp incinerator is located 3.5 miles east of camp. The 11 acre log sort yard and transfer facility is located 4.5 miles east of the camp. The remote maintenance shop is located 32.5 miles west of camp. Aerial views of the two camps together and camp #1 separately are shown in the following figures including a vicinity map:

West Camp #2

In early 2000, West Icy Bay Camp #2 (a 30 to 70 man camp and vehicle maintenance facility) was constructed immediately to the northwest and in close proximity to Camp #1, on lands exclusively within the control of TLO. Camp #2 was used exclusively by TLO's timber purchaser Citifor in support of its timber operations on Mental Health lands administered by the TLO until these timber operations were terminated in 2002. An extensive environmental site assessment of the Icy Bay-West Camp #2 facilities was completed by Southeast Management Services on behalf of TLO, and the Icy Bay-West Camp #2 facilities and Citifor's separate fuel storage and dispensing facilities at the airport underwent a cleanup in 2002-3, completed by DMC, that was separate from Camp #1's cleanup activity, and controlled and paid for by Citifor and/or TLO. After this remediation, the Icy Bay-West Camp #2 facilities have been occupied by a logging contractor pursuant to a separate agreement with the TLO. "

Figure 4. Icy Bay West Logging Camps #1 and #2

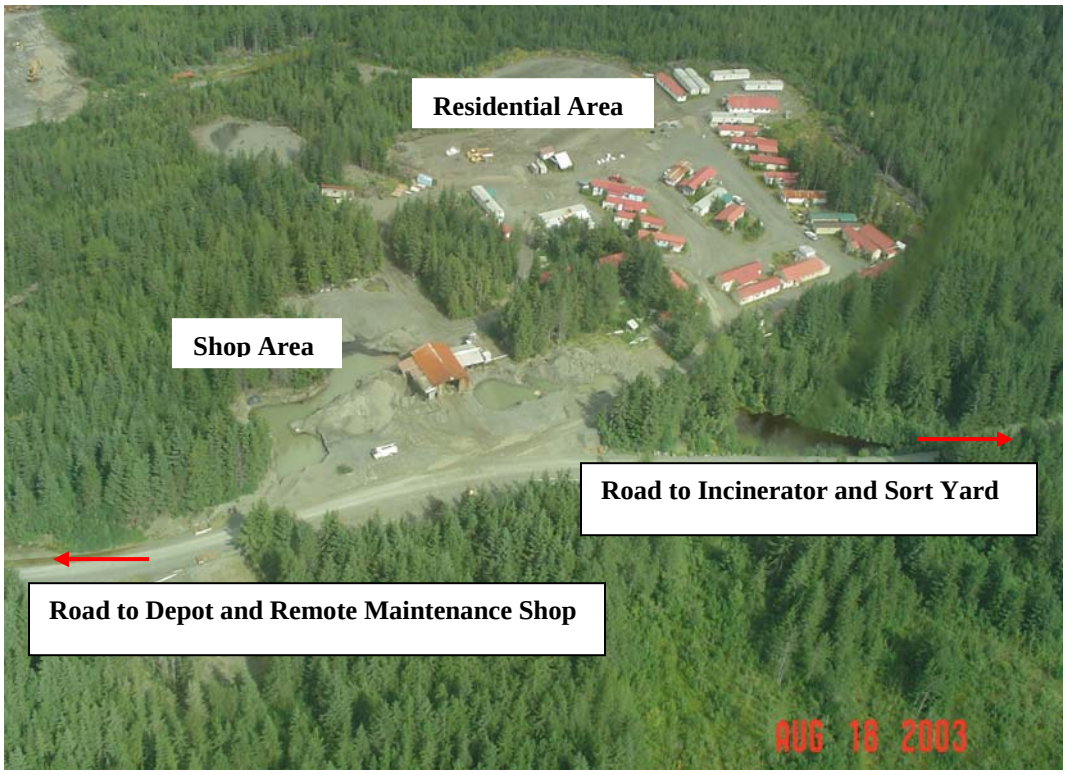


Figure 5. Icy Bay West Camp #1.

Figure 6. Icy Bay West Vicinity Map

REGIONAL HISTORY

The original settlers of the area between Cape Yakataga and Yakutat were probably Eyak speaking people from the Copper River area near current Cordova. In prehistoric times, a Tlingit village with some Eyak influence known as Nessudat was established on Tawah Creek near the Situk River. In 1780 a Russian settlement was developed near the same general area on the Ankau River called 'Novo Rossiysk" The settlement thrived until 1795 and was destroyed in 1805 by Tlingit warriors. Thereafter, the native presence in the area also diminished.

An American trading post and staging area for Mt. St. Elias climbers was developed in 1880 near current Yakutat. A native village was then re-established there in 1889. In 1904 a fish cannery was developed and operated in Yakutat. The Yakutat and Southern Railroad developed the "fish train" for the cannery, which operated until the 1960s.

Gold was discovered near cape Yakataga in the late 1880s. The population around the cape and eastward toward White River grew to several hundred individuals. By 1900 the population essentially abandoned Cape Yakataga with the discovery or more profitable claims near Nome.

In 1940 the Army Corp of Engineers began construction of a new airfield in Yakutat vital to World War II interests. Construction was completed in 1944. During this effort, the White Alice Site at Cape Yakataga was also developed and operated.

In 1957 Army activities had diminished and natural resource exploration work was in full swing. Colorado Oil and gas leased the property in Yakutat from 1957 to 1959. Oil and gas explorations took place between 1959 and the early 1970s. Two satellite exploration camps were established between Icy Bay and Cape Yakutaga, one on the Big Sandy River and the other on the White River. Timber activities at Icy Bay commenced in the late 1960's as previously noted.

SOCIAL AND ECONOMIC CONDITIONS

Original settlers in the area were Eyak and Tlingit. Today the traditional culture and language is Tlingit. The Tlingit people of Yakutat did not form their own Indian Reorganization Act council, but designated the Tlingit and Haida Central Council to act as their IRA council. The first formal village was developed in 1889.

Yakutat was incorporated as a first class city in 1948. Local government was converted to a City and Borough in 1992. A mayor and council govern the community. Icy Bay is considered within the Borough of Yakutat. The local economy is generally based on natural resource management. The following statistics are provided:

Commercial fishing and fish processing – 29.9%
Services – 20.3%
Forestry – 13.5%
Trade – 10.7%
Government – 9.5%

ENVIRONMENT

Geology, Soils, Glaciers and Streams

The land between the Mt. Saint Elias Mountains and the Gulf of Alaska is called the Yakutat Forelands. The forelands are a glacial outwash plain, sloping gently toward the ocean. The outwash plain soils are composed primarily of coarse sand and gravel. In some places, thin organic layers overlay the sand and gravel deposits. There are many drainages flowing from the mountains to the sea in and around Icy Bay including Big Sandy River, Priest River, Camp Creek, Watson Creek, Carson Creek and Jetty Creek.

The Malaspina Glacier is about 50 miles northwest of Yakutat, across Yakutat Bay towards Icy Bay. A major fault is northwest of Yakutaga, called the Yakutaga Gap. For some reason, there is the potential for earthquakes (up to a Richter Scale magnitude of 7-8) and tsunamis. There are also faults in the Mt. Saint Elias Mountains that lie generally in a northwest to southeast direction.

The development of sedimentary strata at Icy Bay has resulted from progressive glacial retreat occurring since approximately 1750. This process has played the dominant role in the development of Icy Bay hydrogeology. Historic sedimentary deposition rates varied seasonally being slowest in the winter and highest in the summer. Spatial variations in glacial sedimentation also occurred with a predominance of laminated muds being formed nearest the glacier and bioturbated sediments forming at locations furthest from the retreating headwall (Jaeger and Nittrouer, 2000).

Sedimentary materials in the vicinity of Icy Bay are highly mineralized and of Holocene age. Mineral samples collected from Icy Bay beach sands and marine terraces at Icy Bay in 1996 identified the following minerals and elemental metal compositions:

USGS Samples	Ore and Gangue Minerals	Commodity Metals
B 001 to 003	Ilmenite, magnetite, pyrite, rutile, garnet, sphene, zircon + crust	Au, Ti, Cr
B 004 to 011	Chromite, ilmenite, magnetite, pyrite, rutile, garnet, sphene, xenotime, zircon + crust	Au, Ti, Cr
B 012 to 013	Chromite, ilmenite, magnetite, pyrite, rutile, garnet, sphene, xenotime, zircon + crust	Au, Ti, Cr

Minerals Listing	Elemental Compositions
Chromite	$CaCrO^4$
Ilmenite	$FeTiO^3$
Magnetite	Fe^3O^4
Pyrite	FeS^2
Rutile	TiO^2
Garnet (General)	$\mathbf{A}^3\mathbf{B}^2(SiO^4)_3$ A = Ca, Mg, Fe, Mn; B= Al, Fe, Cr
Sphene (Titanite)	$CaTiSiO^5$
Xenotime	YPO^4
Zircon	$ZrSiO^4$
Other (General Crust Minerals)	O, Si, Al, Na, Ca, K, Fe, Mg
Other (Trace Crust Minerals)	Au, Zn, Cu, Pb, Ba, As, Be, Ni, Sn, Tl, Hg

Table 2. Mineral and Elemental Metal Composition of Icy Bay Sediments

Samples IB001 to IB011 were collected from Icy Bay beach sands. Samples IB012 and IB013 were collected within the confines of camp from raised beach Holocene marine terrace sediments (USGS, 1996). All of the samples contained visible traces of gold.

As a result of recent glaciation and geologic activity in the Holocene Period, primary near-surface sediments in the camp area now consist of marine terrace sediments and glacial till and outwash; which are composed of a mixture of sands, gravels and silts to unknown depths. Bedrock can be found at shallow depths (16 to 20 feet) throughout the area (CPG, 1952; USGS, 1982). From this perspective aquifers are expected to be shallow with fluctuating water levels corresponding to season precipitation. On-site data collected during site characterization noted groundwater levels varying between 4 feet and 10 feet (SEMS, 7/2002), (SEMS, 9/2002). Outcroppings of rock are not generally present at the site, except near the sort yard where some sedimentary rock cliffs approach the northern boundary of the yard. Outcroppings are not of sufficient quality or quantity to support quarrying for roadbase or other engineered features.

Mental Health Trust Lands has evaluated mineral and sand/gravel potential from its lands including the area surrounding Icy Bay. Sand and gravel resources are defined as moderate due to the presence of silt (Reger, 1987). Minerals from the are noted as marine sedimentary sequences typically containing Zn, Cu, Pb, Ba, and Mn. In areas of glaciation, As, Be, Hg, Ni and Sn may also be detected (Wiltze, 1988).

Decomposition of organic material in the forest produces naturally occurring organic leachate contains tannin, pinene, terpene, etc. These compounds can create a sheen often mistaken for petroleum contamination. This “woodwaste” leachate has an acidic pH that ranges from 3-5 units at points of discharge with a corresponding visual orange to brown discoloration. In areas of heavy organic decomposition, surrounding surface and groundwater can exhibit pH values of 5-6. This acidic characteristic solubilizes metals trapped minerals and releases them to the water. This mechanism is hypothesized at Icy Bay and is apparent based on surface water characteristics the high TOC concentrations in the analyzed in sediment samples. It is anticipated that this condition contributes to the presence of metals in groundwater samples at Icy Bay.

Vegetation

The Yakutat Forelands are generally vegetated in Sitka spruce and western hemlock forest with interspersed muskegs. A large portion of land in and around the area is classified as wetland. Low growing plants consisting of mosses and herbs dominate some of these wetlands while woody shrubs dominate others. The wetlands function as floodwater alteration (storage and desynchronization), nutrient cycling (removal, retention and transformation), production export, fish habitat and wildlife habitat.

Spruce constitutes about 75% of the forest. 25% percent of the forest is Western Hemlock. Traces of other trees exist. Red Alder is the most abundant broadleaf tree in the area and is common along streams, beach fringes and areas disturbed by logging. Berry bushes are numerous in the area and include Salmon Berry, Huckleberry and Bunchberry. During May and June Skunk Cabbage can be seen throughout the area.

Wildlife and Fish

Animal life in the area is varied. Sitka Blacktail Deer are often seen at lower elevations in the forest and beach fringes. Black Bears and Brown Bears (Grizzly Bears) are common. During the summer and fall months the bears are seen along the streams where they grow fat on salmon meat. During the winter, Mountain Goats can be found at the tree line. Wolves are present and play a valuable role in the ecological balance of the forest. Wolves travel, hunt and feed in packs ranging over large territories. In 2000, a wolf attacked a boy in camp at Icy Bay. Smaller mammals may also be seen including Red Fox, Otters, Mink, Porcupine, Red Squirrel, and Weasels. Marine mammals are common in the area around the Icy Bay and include harbor seals, dall porpoises, killer whales and humpback whales.

The coastline of the Gulf of Alaska is part of the main Pacific migration route for birds going north to breed in May and returning South in September. Migrating birds use the wetlands and estuaries of the forelands for resting and feeding. Numerous birds utilize the habitat in the area including passerines (warblers, robins, sparrows, pine siskins, thrushes, chickadees and juncos); shorebirds (American pipet, spotted sandpiper, greater yellowlegs, common snipe, semi-palmated plover, pectoral sandpiper, dunlin and great blue heron); waterfowl (blue-winged teal, common golden eye, common merganser, common mure, green-winged teal, mallard, northern pintail, red-breasted merganser, red necked grebe, ring-necked duck, trumpeter swan, white-fronted goose, and white winged scoter); corvids (common raven, Stellar's Jay, and black billed magpie); owls (short eared own and northern hawk owl); several varieties of gulls and bald eagles.

Pacific Salmon are the predominant anadromous species in the area. This group includes Chinook, Coho, Dog, Sockeye and Humback varieties. Anadromous fish streams are located in close proximity to and in every direction from camp. Other freshwater fish include cutthroat, rainbow and dolly varden trout. Saltwater fish are common and include halibut and varieties of cod.

There are no endangered or threatened species in the Icy Bay Camp area. The American and arctic peregrine falcons migrate through the area in the spring and fall but do not nest there. The Trumpeter Swan is on the sensitive species list.

Climate

The climate of the area is moderated by coastal proximity. The average annual temperature is 45.5 F. The coldest month is January with an average maximum temperature of 31.2 F and an average minimum temperature of 18.1 F. The warmest month is August with an average maximum temperature of 60F and an average minimum temperature of 46.6 F. The average annual precipitation is 151.25". The wettest month is October with an average monthly precipitation of 22.97" and the driest month is June with an average monthly precipitation of 7.30". The average annual snowfall is 193.5" and the record snowfall fell in 1975-1976 and was 403".The Icy Bay area has a maritime climate. Summers are generally cool and winters are the coldest in January (WRCC, 2002). Data from a weather station at Glacier Bay (2002) and similar to Icy Bay is presented below:

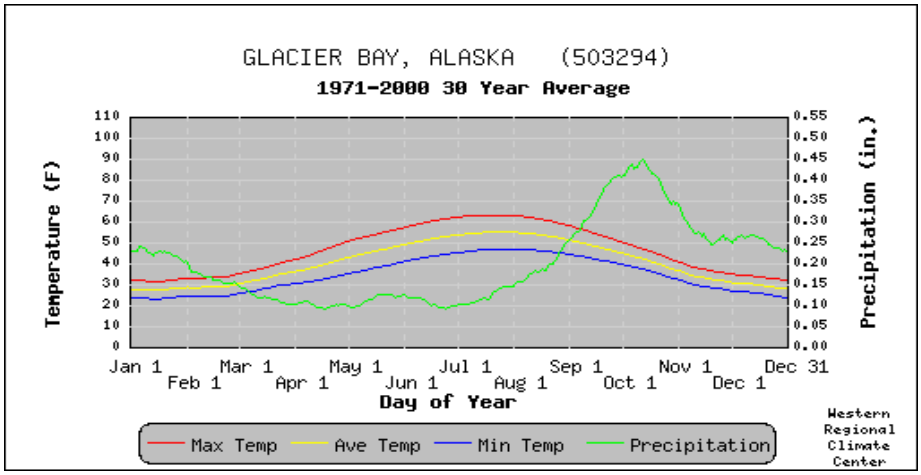


Table 3. Glacier Bay Temperature Profile

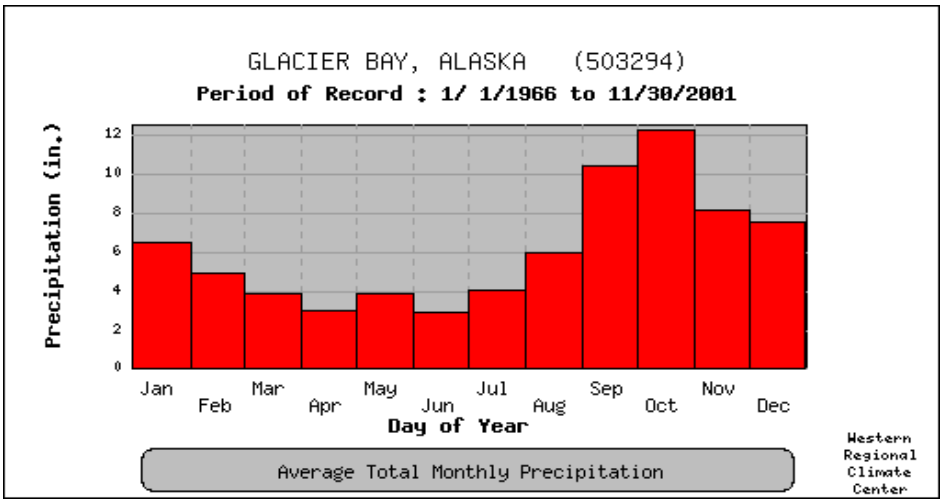


Table 4. Glacier Bay Precipitation Profile

PRE-REMEDIATION WORK

REMEDIATION STATUS

The following table highlights the remediation history associated with Icy Bay West Camp #1:

Date	Activity
1971	Initial camp construction and commencement of logging activities.
Mar. 2001	A complaint of petroleum contamination at Icy Bay West Logging Camps is made with the State of Alaska Department of Environmental Conservation.
Apr. 12, 2001	A field inspection regarding the complaint is made by the University of Alaska, Alaska Department of Fish and Game, and the State Division of Forestry. Numerous oil contaminated soil areas were discovered.
Apr. 19, 2001	Wasser & Winters Company, the Operator of Camp, ceases operations until a clean-up scenario is developed.
May, 2001	Logging operations recommence based on a joint determination by the University of Alaska Office of Land Management (Camp #1 owner) and the State of Alaska Department of Natural Resources Mental Health Trust Lands Office (Camp #2 owner) that both logging camps and facilities will undergo a comprehensive site characterization in accordance with ADEC standards to identify the extent of contaminated soil or water.
May-Oct., 2001	Camp operators initiate more stringent housekeeping to control petroleum product releases. A variety of minor clean-up activities are performed at the camp. ADEC performs various camp inspections.
Feb., 2002	Southeast Management Services (SEMS) is contracted to conduct Site Characterizations for Camp #1.
Mar. 25, 2002	SEMS submits a Site Characterization Work Plan to ADEC for approval. The report is titled, “Proposed Site Assessment: Icy Bay West Logging Camps & Their Related Facilities”.
Apr. 24, 2002	SEMS conducts coordination meeting with camp operators to solicit comments on the Site Characterization Work Plan.
May 10, 2002	ADEC approves the SEMS Site Characterization Work Plan with comments.
May 13, 2002	SEMS initiates Camp #1 site characterization work.
Jun. 6, 2002	SEMS completes Camp #1 site characterization work.
Jul., 2002	SEMS submits a Site Characterization Report for Camp #1 to ADEC and owners in four (4) volumes titled, “5/13/02 – 6/6/02 Site Assessment: Icy Bay West Logging Camp#1 and It’s Related Facilities: Volume 1 – Narrative, Volumes 2,3 – Sample Analyses Results, Volume 4 – 6/04 Soil Sample Results Along the Icy Bay-West 5-Mile Logging Road Ditchlines”.

Date	Activity
Oct. 2002	SEMS prepares "6/4/02 Soil Sample Results Along the Icy Bay-West 5-Mile Logging Road Ditchlines".
Oct. 26, 2002	A meeting with Camp #1 operators and consultants is conducted to discuss Site Characterization Reports.
Nov. 7, 2002	GeoEngineers submits a Remediation Work Plan to ADEC for clean-up of Camp #2 titled, "Work Plan: Remedial Soil Excavation and Clean-Up; Browning Timber Logging Camp #2, Icy Bay West, Alaska".
Nov. 11, 2002	DMC Technologies responds to request from Wasser & Winters to evaluate SEMS Characterization Reports and recommendations for site remediation at Camp #1.
Dec. 16, 2002	DMC Technologies meets with Wasser & Winters, Inc. and Citifor, Inc. in Longview, WA to discuss Site Characterization Results and remediation alternatives.
Feb. 3, 2003	DMC Technologies visits with ADEC (Mike Jaynes) in Juneau to discuss remedial action responsibilities at Camps #1, bioremediation technology, qualifications and pending approval of SEMS characterization work..
Feb. 14, 2003	ADEC approves Southeast Management Services Site Characterization Plan for Camp #1 with comment including approval of Method 3 clean-up calculations for RDO.
Apr. 2003	Landowners reach verbal agreement on cost shares for clean-up of Icy Bay Camp #1.
Apr. 11, 2003	DMC Tech visits with Wasser & Winters in Longview , WA to discuss remediation of Icy Bay West Camp #1.
May 12, 2003	Wasser & Winters Company authorize DMC Technologies to be remediation contractor for Camp #1 and perform excavation.
May 16, 2003	DMC Tech submits site clean-up plan for Camp #1 to ADEC for approval titled, "Site Remediation Workplan: Icy Bay West-Camp #1".
May 27, 2003	ADEC approves the submitted Remedial Work Plan with comment.
June 2, 2003	Final Remediationn Agreement developed and submitted for group approval.
June 9, 2003	SEMS consultant review of Remedial Work Plan performed with comment.
June 12, 2003	Conditional approval of remediation agreement reached.
June 13, 2003	ADEC and SEMS comments reviewed and resolved in Juneau conference at ADEC offices.
June 14, 2003	Structure demolition commences at Camp #1.
July 1, 2003	Contractual agreement signed between Wasser & Winters and DMC Tech to perform remediation.
July 13, 2003	On-site remedial work activities commence at Camp #1.
Aug., 2003	Regulatory inspection of remedial work activities is performed by ADEC.

Date	Activity
Sep. 24, 2003	On-site remedial work activities complete at Camp #1.
Jan. 12, 2004	Draft Final Clean-up Report is submitted to ADEC by DMC Tech.

Table 5. Camp #1 Remediation History

SITE CHARACTERIZATION

The Site Characterization Report was approved by ADEC on February, 2002. Clean-up limits presented in the plan were approved. The approval letter also provided comments regarding future site remediation as noted below:

1. Research should be made to distinguish if metals noted in the soils and groundwater is natural background rather than indicative of man-made contamination.

2. Cumulative risk calculations regarding compounds left on-site must be performed before final closure as required by 18AAC 75.325(g).

3. Additional characterization work is recommended during clean-up including sampling in and around formerly inaccessible areas.

The following table identifies areas with water in Camp #1 recommended for clean-up based on site characterization data presented in the SEMS Characterization Report:

Groundwater Data

#	Remediation Areas	VOC (ppb)	SVOC (ppb)	Metals w/ Limits (ppb)
A	North of Oil Shed Area (North Equipment Area) Groundwater	None	None	As – 260 ppb (50 ppb) Be – 7 ppb (4 ppb) Cr – 1,080 ppb (100 ppb) Pb – 300 ppb (15 ppb) Hg – 2.7 ppb (2 ppb) Ni – 940 ppb (100 ppb) Zn – 1,980 ppb (11,000 ppb)
B	Boneyard Groundwater	None	None	As-110 ppb (50 ppb) Be-2 ppb (4 ppb) Cr-333 ppb (100 ppb) Cu-742 ppb (1,300 ppb) Pb-90 ppb (15 ppb) Hg-1 ppb (2 ppb) Ni-230 ppb (100 ppb) Zn-513 ppb (11,000 ppb)
C	Fuel depot groundwater	Trace-2	None	As-150 ppb (50 ppb) Be-2 ppb (4 ppb) Cr-248 ppb (100 ppb) Cu-786 ppb (1,300 ppb) Pb-114 ppb (15 ppb) Hg-1 ppb (2 ppb) Ni-210 ppb (100 ppb) Zn-403 ppb (11,000 ppb)

#	Remediation Areas	VOC (ppb)	SVOC (ppb)	Metals w/ Limits (ppb)
D	Fuel depot groundwater (excavation influx)	Trace-3	None	As-160 ppb (50 ppb) Be-4 ppb (4 ppb) Cr-580 ppb (100 ppb) Cu-1,610 ppb (1,300 ppb) Pb-144 ppb (15 ppb) Hg-1.9 ppb (2 ppb) Ni-510 ppb (100 ppb) Tl-2 ppb (5 ppb) Zn-910 ppb (11,000 ppb)
E	Sort yard leachate lake outlet surface water	Trace-3 DRO- 1,800 ppb (1,500 ppb) TaqA- 42 ppb (10 ppb)	Trace-3	As-6 ppb (50 ppb) Cr-17 ppb (37 ppb) Cu-30 ppb (21 ppb) Pb-2 ppb (5 ppb) Ni-10 ppb (20 ppb) Zn-24 ppb (47 ppb)

Notes: (Red) Sample exceeding water quality standard

(Trace -#) Number of constituents detected above detection limit but less than established water quality standards

Table 6. Groundwater Characterization Data

The following table identifies areas with soil in Camp #1 recommended for clean-up based on site characterization data presented in the SEMS Characterization Report:

#	Remediation Areas	Max. RRO (ppm)	Max. DRO (ppm)	Max. GRO (ppm)	Soil Estimate
1	Bunkhouse Fuel Tank Shed Area	73	8,600	NT	5-20 CY 2 ft. deep
2	School Fuel Tank Building Area	140	9,100	NT	20-50 CY 1 ft. deep
3	TLO Trailer and Shop Area	23,000	18,000	NT	175-370 CY 3 ft. deep
4	Residential Trailers Area Including U of A (20)	39	1,200	NT	23-103 CY 1 ft. deep
5	Equipment Shop Area	9,800	7,600	Traces	220-275 CY 4 ft. deep
6	Generator Shed Area	5,200	10,000	NT	660-1,020 CY 8 ft. deep
7	Truck Washdown Area	18,000	10,000	Traces	550-650 CY 7 ft. deep
8	Oil Shed Area	18,000	6,500	Traces	475-680 CY 6 ft. deep
9	Saw Shop Area	3,300	6,600	NT	70-100 CY 2 ft. deep
10	North Equipment Storage Area	39,000	16,000	Traces	800-900 CY 4 ft. deep

#	Remediation Areas	Max. RRO (ppm)	Max. DRO (ppm)	Max. GRO (ppm)	Soil Estimate
11	Southwest Equipment Storage Area	13,000	7,300	NT	510-670 CY 5 ft. deep
12	Camp Fuel Depot Area	Unknown	Unknown	Unknown	Unknown
13	South Equipment Storage Area	21,000	7,500	NT	30-100 CY 4 ft. deep
14	Boneyard Area	6,700	3,200	NT	30-70 CY 2 ft. deep
15	5-Mile Ditchline Area (Northside & Southside)	12,000	8,900	NT	15-35 CY 1 ft. deep
16	Airport Fuel Depot	830	7,500	Traces	1,500-2,500 CY 4 ft. deep
17	Uplands Fuel Depot	120	820	Traces	200-450 10 ft. deep
18	Sort Yard Former Log Sort Station #1	260	1,300	NT	75-125 CY 1 ft. deep
19	Sort Yard Former Saw Shack	30,000	13,000	Traces	300-400 CY 3 ft. deep
20	Remote Maintenance Shop Area	9,800	5,800	NT	10-20 CY 2 ft. deep
21	Camp Incinerator Area	38,000	10,000	Traces	170-250 CY 3 ft. deep

Notes: *(Red)* *Sample exceeding soil clean-up limit*

(Evaluate) *Areas identified as requiring additional evaluation during remediation due to inaccessibility or lack of sampling during characterization*

NT *Not tested since gasoline was never managed at the site*

Table 7. Soil Characterization Data (Contaminated Sites)

Samples were collected from 221 specific locations from 26 general areas during characterization work. 21 areas of soil contamination and 5 water areas were identified for possible remediation. Appendix A provides a summary of site characterization data.

Areas subjected to excavation and remediation are illustrated in Figures 7 through 13; which follow. The listing includes the sites identified during 2002 characterization activities.

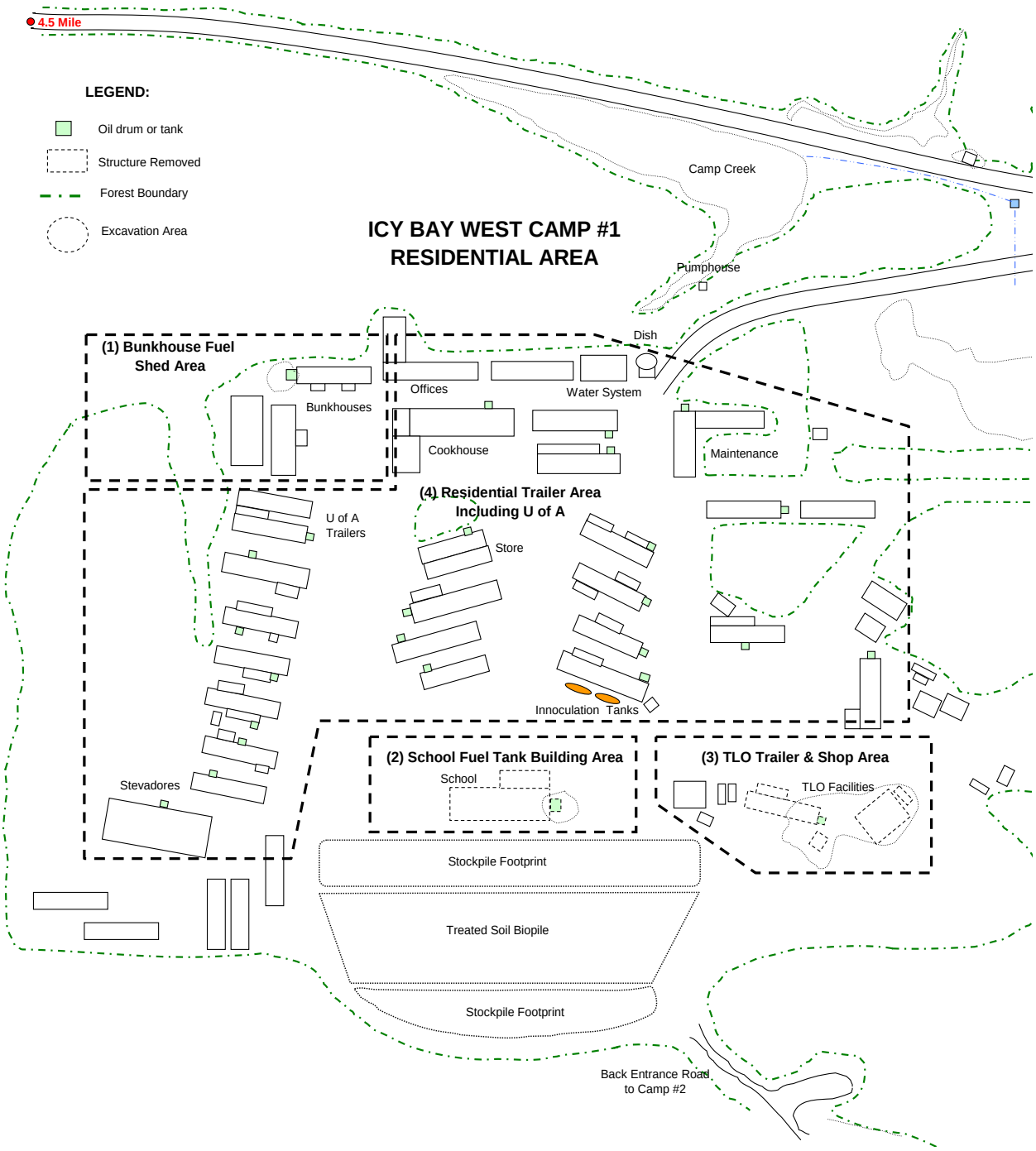


Figure 7. Camp #1 Residential Area Showing Yr-2003 Clean-Up Sites

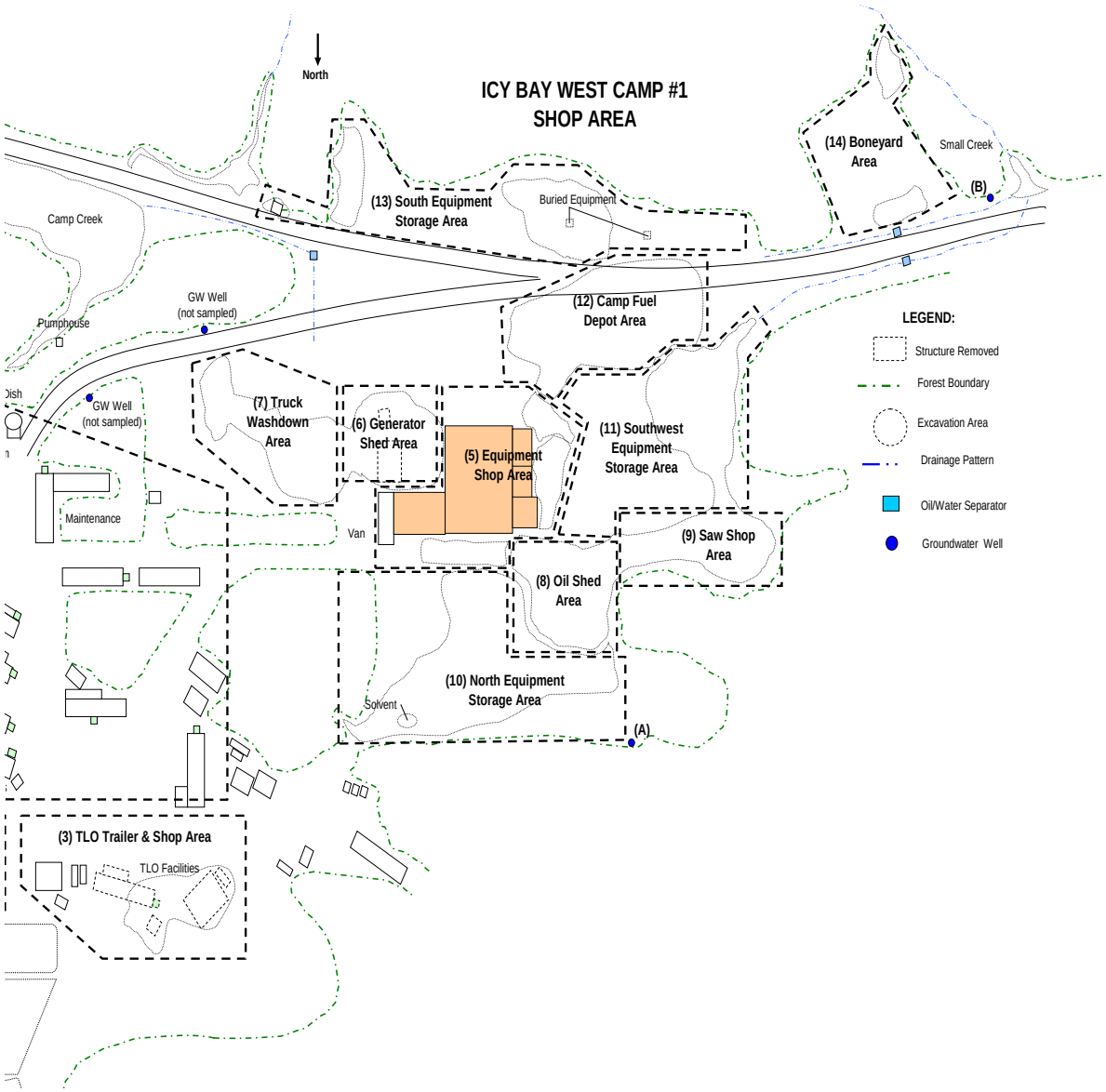


Figure 8. Camp #1 Shop Area Showing Yr-2003 Clean-Up Sites

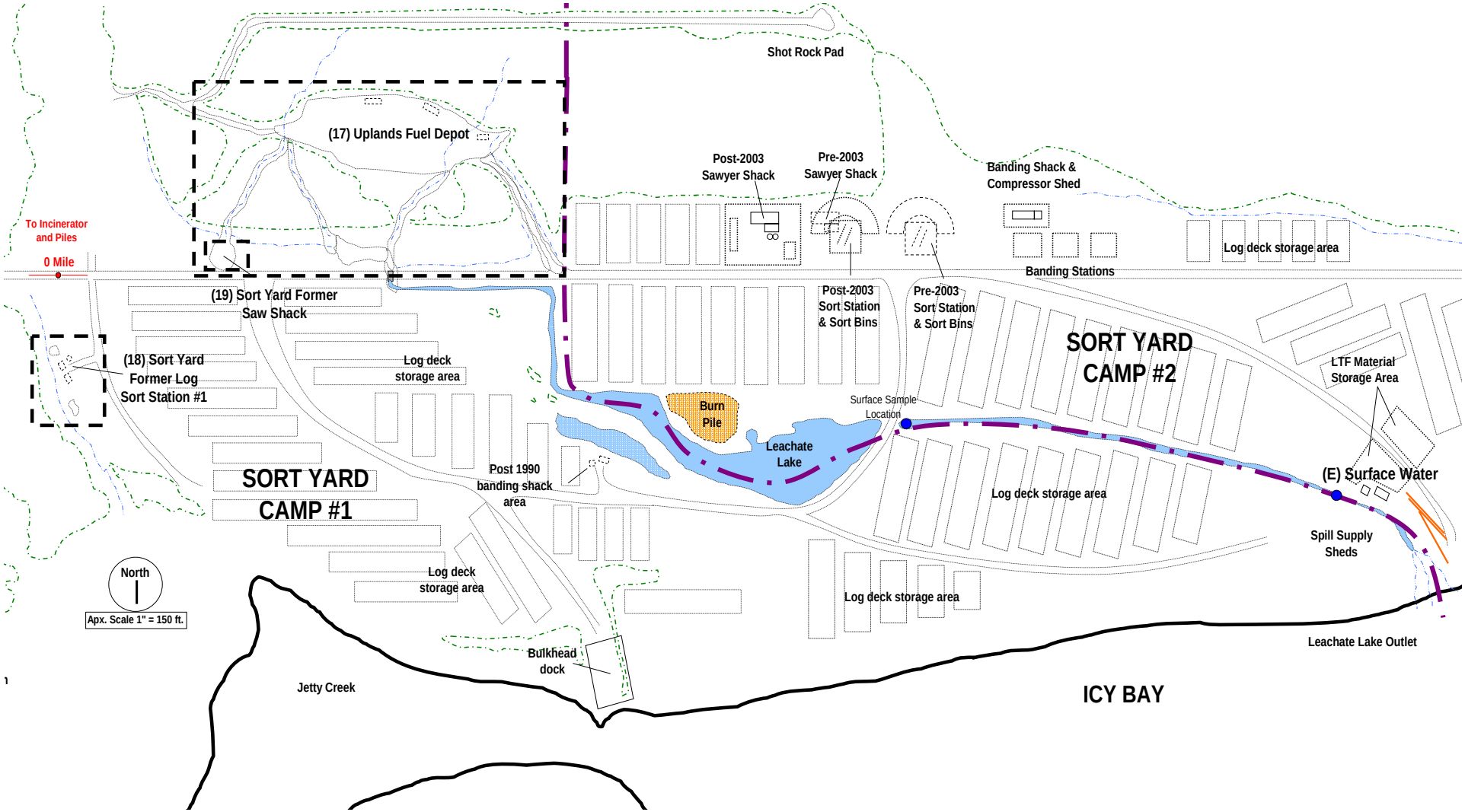


Figure 9. Camp #1 Log Sort Yard Showing Yr-2003 Evaluation Sites (Camp 2 Area Shown for Reference Only)

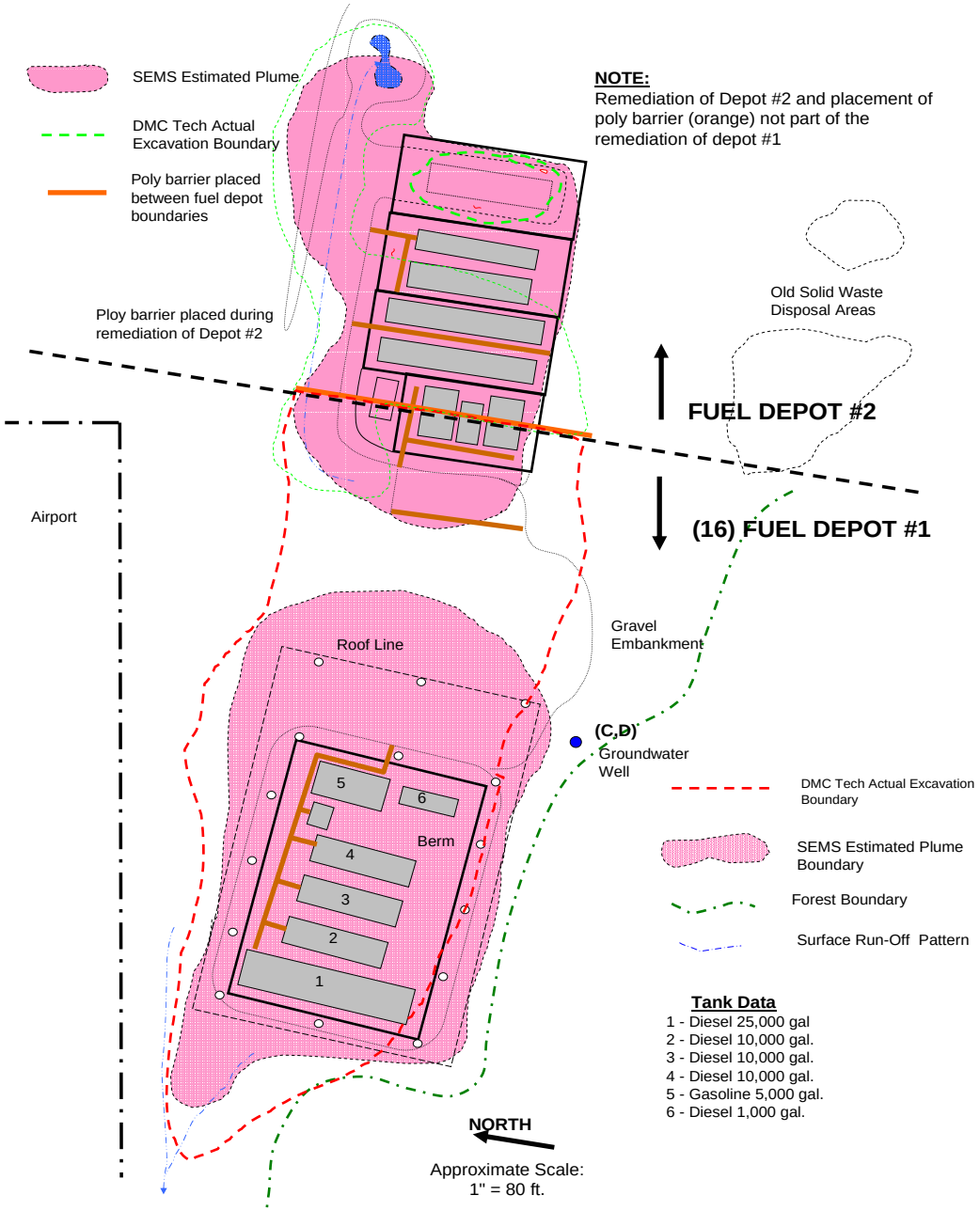


Figure 10. Fuel Depot #1 Showing Yr. 2003 Clean-Up Sites

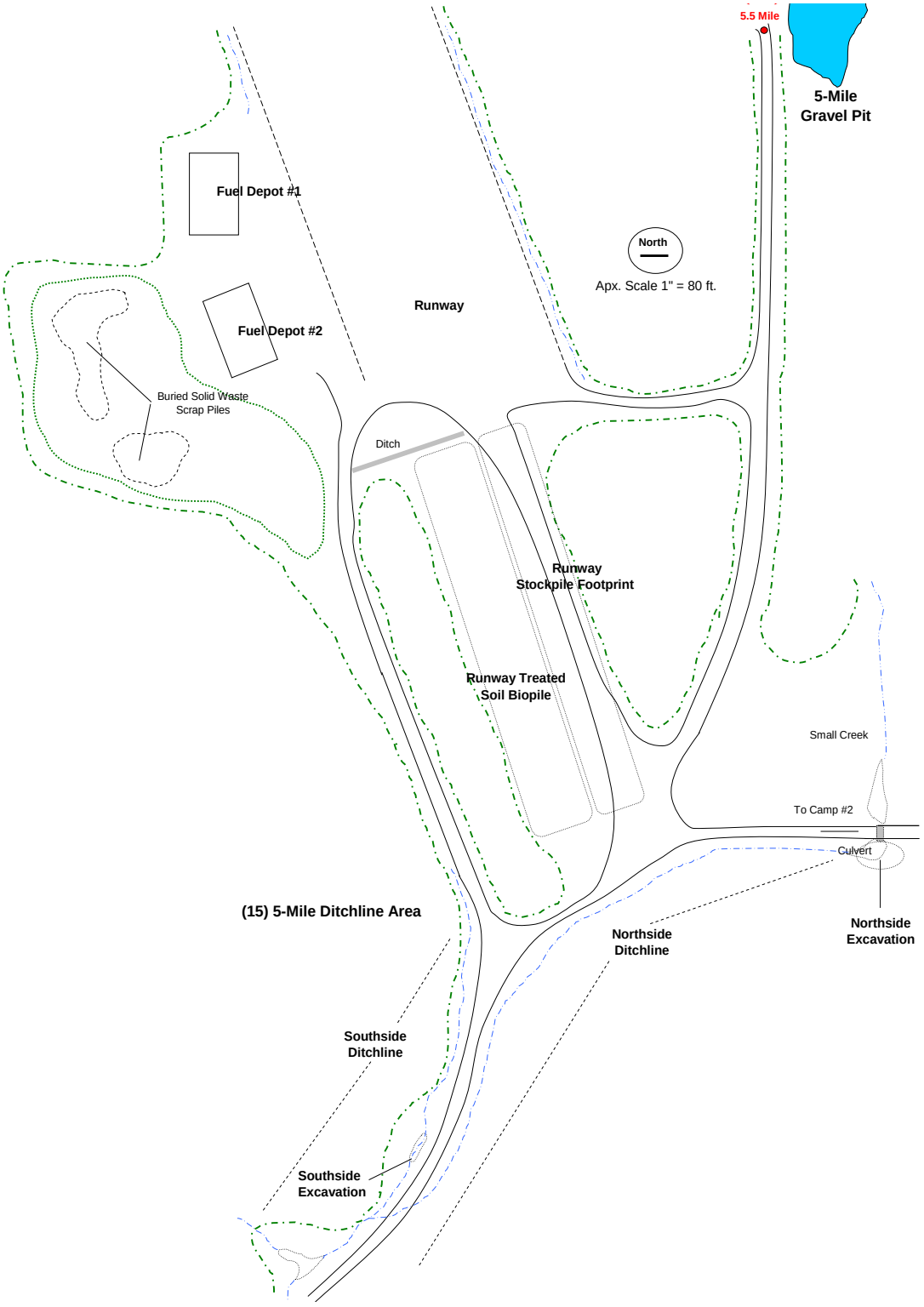


Figure 11. Runway Overview and 5-Mile Ditchline Area Showing Yr. 2003 Clean-Up Sites

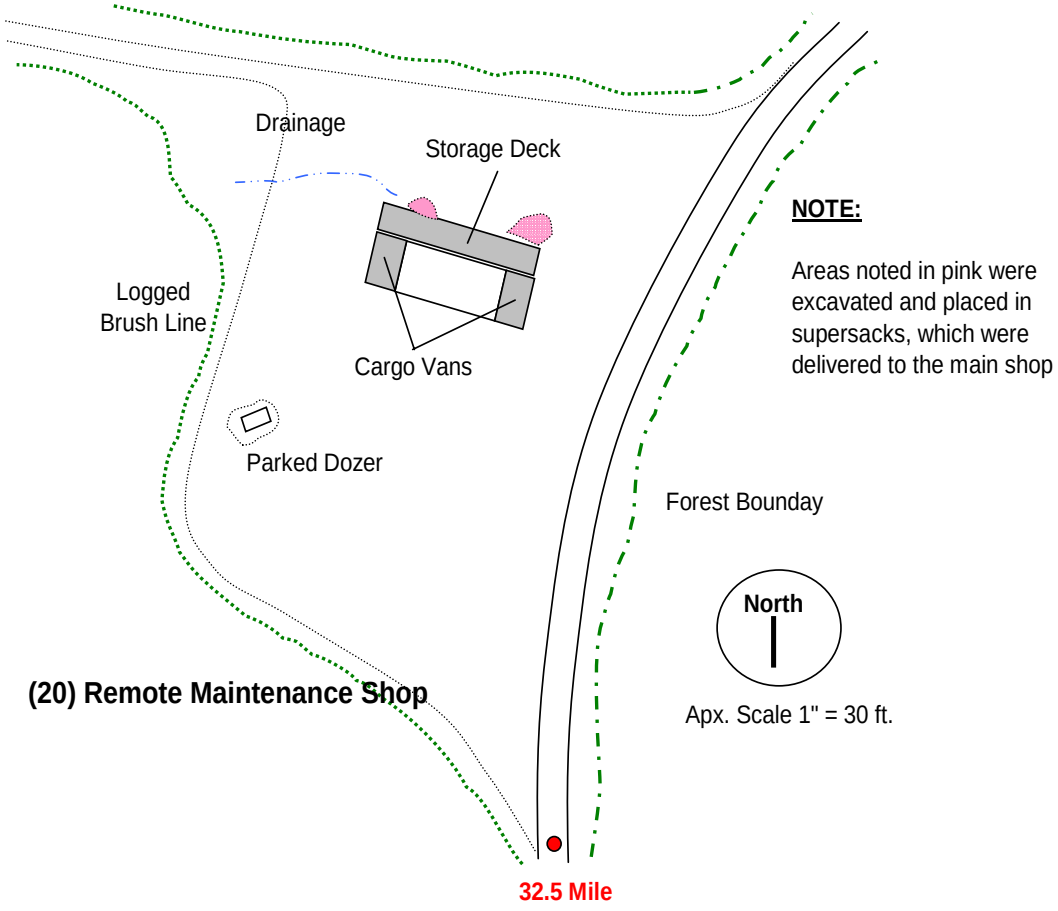


Figure 12. Remote Maintenance Shop Including Areas Excavated and Placed in Supersacks

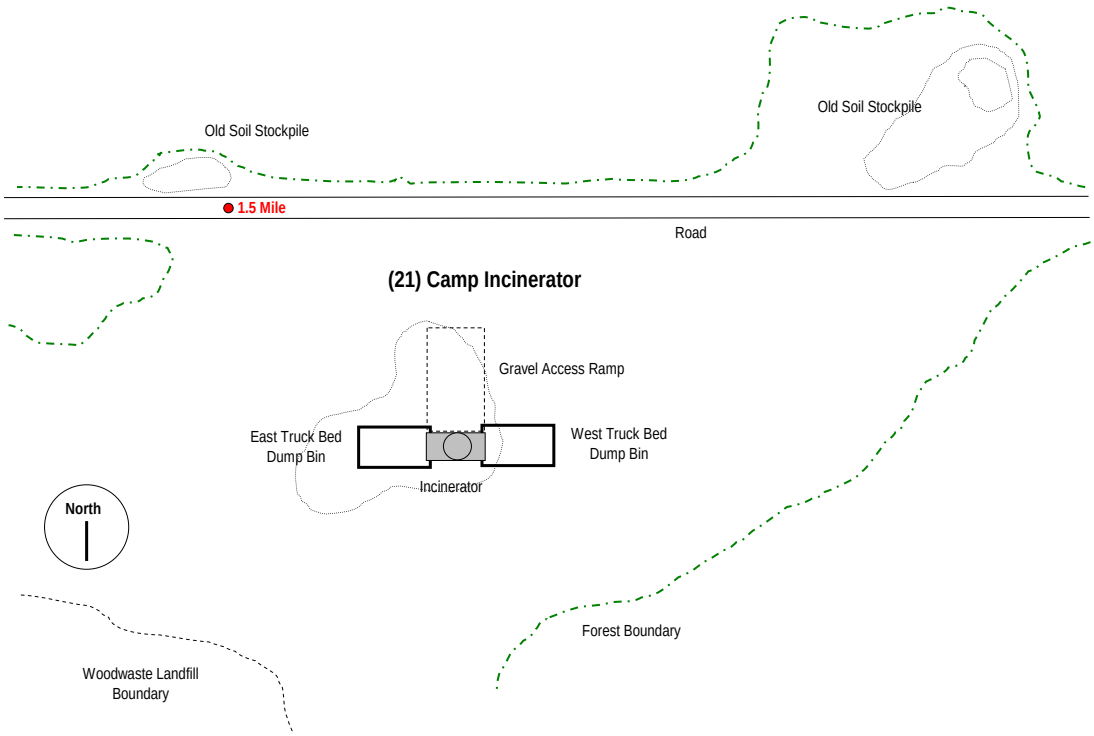


Figure 13. Camp Incinerator Showing Yr. 2003 Clean-Up Sites

REMEDIAL WORK PLAN

ADEC comments from the Remedial Work Plan for Camp #2 have applicability to Camp #1 and are noted below:

1) Background sampling will not be required to delineate the concentration of heavy metals in groundwater, surface water and undisturbed natural soils.

2) The site characterization report (information repeated in work plan – Table 10) indicates that high aromatic hydrocarbon and DRO levels suggest that oil is being discharged into leachate lake. This is likely from Camp #2 since at the time of sampling, Camp #1 was not operating. Continue to use 2SY-12 as a long-term monitoring station. Sample for total aqueous TaqH and total Aromatics (TAH), but not DRO. Use 8270C-SIM for TaqH to achieve lower detection limits (make sure your lab is approved for this method). Use 8021B for aromatics. Establish a second monitoring location near the outlet to Icy Bay. This discharge point is our main concern.

3) Do not proceed with background sampling for groundwater. Do proceed with exploratory pits (5-10) to collect water level measurements. If possible prepare a flow diagram mapping the flow pathway of the shallow aquifer.

4) Do not proceed with background metals sampling for surface water.

5) Delete references to Alaska AA methods to distinguish aliphatic and aromatic compounds.

DMC submitted the Remedial Work Plan for Camp #1 work on May 16, 2003. The plan was approved by ADEC on May 27, 2003 with the following comments:

6) Cumulative risk calculations only apply for contaminants other than petroleum mixtures (GRO, DRO, RRO) that are detected at one-tenth the clean-up level.

7) The plan implies that all PID readings are contact readings collected in the field. Consideration should be given to also collecting bagged readings.

8) Both treatment and biopiles constitute Category A soil treatment facilities. The Operations Plan chapter in the workplan is sufficient as an ADEC approved Operations Plan.

9) Statistical analyses must be performed to the 95% UCL of the statistical mean – not 90%.

The Remedial Work Plan was modified and then approved in early July subsequent to complete site remediation.

CRITICAL DOCUMENTATION

Adherence to Approved Plans

Plans to guide the remediation of Camp #1 were prepared, submitted and approved before work in the field was performed. As necessary field changes to the plan were prepared they were also negotiated and approved.

Remedial Work Plans

A Remedial Work Plan was prepared by DMC Technologies on May 16, 2003, titled, “Site Remediation Work Plan Icy Bay West Camp #1”. This plan was also

approved by ADEC on May 26, 2003 with comment. Comments on the Remedial Work Plan were incorporated into a final version of the Remedial Work Plan titled, "Site Remediation Work Plan Icy Bay West Camp #2 – Revision 1 – 5/28/03". ADEC did not require that the revised plan be reapproved prior to remediation work. Revisions were discussed verbally with ADEC without issue or concern. This plan was used to guide remedial work performed from July to September.

Project Communications

At the onset of remediation activities a process was developed to verbally discuss project status on a weekly basis. During the course of the clean-up, DMC Tech distributed sixteen (16) separate telefaxes to several stakeholders as a basis for discussion. These included ADEC, Trust Land Office, ADNR, University of Alaska, Wasser and Winters Company, and Citifor Inc. %-15 persons typically participated in the teleconferences to discuss the telefaxes. Telefaxes are listed in the following table with a summarization of topics discussed to depict the level of communication fostered during the remediation process.

Telefax	Date	Content
01	6/28/03	Revisions to plan from approval letter, remediation schedule, stockpile locations approval, building demolition required, sequence of work
02	7/15/03	MHTLO hazardous material inventory, camp disposal permit review
03	7/16/03	Depot #1 extended investigation, Upland Depot extended investigation, revised camp contaminated soil volume, order of excavation
04	7/24/03	Excavation update, treatment update, ADEC approvals, Fuel Depot #1 report, Uplands Depot report, Camp #2 bioaugmentation success, issues – treated soil limits, lack of GRO readings and dismissal of further evaluation
05	7/30/03	Excavation update, solvents, treatment update, Uplands Depot SAP, ADEC approvals, issues – smear band
06	8/7/03	Excavation update, treatment update, backfilling update, yardage estimates, clean-up order of work, ADEC approvals, issues – CY removed, groundwater monitoring
07	8/14/03	Excavation, treatment and backfilling status; groundwater monitoring, project yardage estimates, issues – excess yardage, shop floor

Telefax	Date	Content
08	8/21/03	Excavation, treatment and backfilling status; groundwater monitoring, project yardage estimates, issues – buried equipment, camp fuel depot and runway dumps discovery, UFD leave in place, budget
09	8/21/03	Airport schematic for additional stockpile location OK.
10	8/29/03	Excavation, treatment and backfilling status; groundwater monitoring and smear band removal, issues – cost overrun potential, rain, old equipment removal, trailers w/ DRO
11	9/2/03	Cost review
12	9/2/03	Excavation, treatment and backfilling status; issues – cost
13	9/11/03	Excavation, treatment and backfilling status; clean-up confirmation packages, groundwater monitoring, issues – cost. confirmation SAP and limitation in sample #s to finish extra work within budget
14	9/15/03	Added work scope to complete – incinerator, confirmation SAP; refined cost information (EAC)
15	9/20/03	Punch list for close-out
16	9/22/03	Final cost review

Table 8. Weekly Telefaxes and Teleconferences

Changes to Remedial Work Plan Related to Camp #2 Work and Effecting Camp #1

Three (3) changes to the to the plan were developed during the execution of remediation work for Camp #2 that had direct effect on the remedial work for camp #1. These changes are noted below and presented in detail in Appendix B to this report.

1) Fuel Depot Boundary Determination

Technical data collected in the field during March and early June at the camp fuel depots indicated no separation of contaminated water or soil between Fuel Depot #1 and Fuel Depot #2 as estimated in the 2002 Site Characterization Report. Based on this conclusion, a change to the Remedial Work Plan was prepared. A technical report in the form of a change request (IBW-001) was developed and submitted to ADEC on June 14, 2002 identifying an appropriate boundary between the two depots and recommending the placement of a 10 mil barrier to impede possible contamination creep from Fuel Depot #1. The requested change was approved by ADEC via telefax on June 17, 2003. Work commenced June 18.

2) Solvent Contamination

During excavations in the southeast corner of camp on June 19, 2003; solvent odor was detected. Because no solvents were reported in the characterization report, a change to the remedial work plan was prepared outlining the need to collect waste characterization samples and segregate solvent contaminated soils. A technical report in the form of a change request (IBW-002) was prepared and submitted to ADEC for approval on June 24, 2003. The report provided a detailed evaluation of camp MSDS and identified solvent products in camp (Stoddard Solvent). The results of samples tracing the contaminated soil to Stoddard Solvent product were provided. A recommendation was made to treat the solvent contaminated soil in a separate treatment area. Verbal approval of the change was provided by ADEC on June 25, 2003. Work was completed June 26, 2003.

NOTE: Stoddard Solvent is a non-chlorinated solvent containing volatile organics – particularly trimrthylbenzene.

3) Stockpile Safe Location and Soil Treatment Limits

The final disposition of treated soils was not addressed in the Remedial Plan. After consultation with ADEC, a change to the Remedial Plan in the form of a technical report was prepared requesting designation of a final safe location for treated soils and active treatment to the most stringent Method 3 clean-up limit of 718 ppm DRO and not to the Method 2 limit of 250 ppm DRO or "free release of soil" criteria. The request was submitted to ADEC June 26, 2003 and approved in writing via email on June 28, 2003.

Changes to Remedial Work Plan Directly Related to Camp #1 Work

Additional changes were also derived during the remediation work performed at Camp #1. These changes are summarized below:

(4) Telefax 0A – 7/20/03: Request for various changes as follows:

- No formal submittal of revisions to Remedial Work Plan from approval letter
- Additional investigation of Fuel Depot #1
- Additional Investigation of Upland Fuel Deport
- Placement of 11 supersacks from historic operation onto contaminated stockpile
- Placement of 13 drums of antifreeze/water/oil from historic operation onto contaminated stockpile
- Elimination of liners and covers

(5) Telefaxes 0B/0C - 7/24/03: Submittal of initial stockpile statistical analyses from Camp #2

- Presentation of the data stimulated a conversation regarding ADEC Guidance for Statistical Analyses and a probable request for a detailed sampling and analyses plan addendum to support confirmation sampling of treated soil stockpiles.

(6) Telefax 0D – 7/31/03: Request for various changes as follows:

- East Icy Bay statistical analyses as per SW-846 methodology
- Solvent management as per Camp #2 methods
- Leveling and seeding of stockpiles or backfill use
- Exemption of smear band excavation

(7) Telefax 0E – 8/7/03: Groundwater monitoring recommendation as follows:

- Water sampling from excavations after quiescence
- 5 monitoring wells constructed at smear band
- Groundwater sampling after 30 days and one round of samples only

(8) Telefax 0F – 8/8/03: Request for various changes as follows:

- Backfilling generator and truck washdown areas
- Use of Camp #2 treated stockpile soils as backfill in Camp #1
- Initial request for complete removal of smear band and no groundwater monitoring

(9) Telefax 0G – 8/23/03: Request for approval of confirmation data from Generator and Truck Washdown Areas and subsequent backfilling

(10) Telefax 0H – 9/5/03: Request for approval of confirmation data from Oil Shed and Saw Shop Areas and subsequent backfilling

(11) Telefax 0I – 9/8/03: Request for approval of confirmation data from Maintenance Shop Area and subsequent backfilling

(12) Telefax 0J – 9/12/03: Request for approval of confirmation data from Residential, South Equipment Parking Area, Boneyard and 5-Mile Ditchline and subsequent backfilling

(13) Telefax 0K – 9/12/03: Request for approval of confirmation data relative to smear band location and removal and final request for no groundwater monitoring

(14) Telefax 0L – 9/18/03: Request for approval of confirmation data from Fuel Depot #1 and subsequent backfilling

(15) Telefax 0M – 9/20/03: Request for approval of confirmation data from Camp Fuel Depot and subsequent backfilling

A summary of requests and approvals is noted in the following table. Documentation regarding each request and approval is voluminous and is not included in the Appendix to the report. The material is available upon request and has already once been distributed to interested parties.

Date	Ref.	Request	ADEC Action
6/14/03	IBW-001	Change Fuel Depot #1 boundary closer to Fuel Depot #2 and demark with poly barrier	Approved
6/24/03	IBW-002	Proceed with treatment of Stoddard Solvent by bioaugmentation in separate stockpiles	Approved
6/26/03	IBW-003	Revise soil treatment limits to lesser of Method 3 limits followed by natural attenuation	Approved
6/28/03	T01	Stockpile layout and locations south of camp #1 as permanent and environmentally safe	Approved
6/28/03	T01	Commencement and order of building demolition in Camp #1	Approved
7/15/03	T02	MHTLO and U of A hazardous material inventory and material packaging & return to Anchorage	Approved and submit inventory to landowner (*1)
7/16,20/03	T03, T0A	Additional investigation at Fuel Depot #1	Proceed and prepare detailed report (*1)
7/16,20/03	T03, T0A	Additional investigation at Uplands Fuel Depot	Submit SAP, proceed and prepare detailed report (*1)
7/20/03	T0A	Eliminate paper revision of Remedial Work Plan to address approval letter comments – discuss in teleconference	Approved
7/20/03	T0A	Dispose of 11 supersacks in contaminated stockpile	Approved

Date	Ref.	Request	ADEC Action
7/20/03	T0A	Dispose of 13 drums of liquid antifreeze/water/oil in contaminated stockpile	Approved
7/20/03	T0A	Eliminate use of bottom liners and top covers with footprint sampling requirement	Approved
7/24/03	T04	Treated soil limits confirmed at lesser of Method 3 limits w/ natural attenuation follow	Approved
7/24/03	T0B, T0C	Perform statistical analyses by EPA Methodology, lack of GRO and no further evaluation	Rejected – Submit SAP for stockpile confirmation and adhere to ADEC guidance (*1)
7/29/03	Tel-1, T-05, T-0D	Discovery and management of solvents as per Camp #2 procedures	Approved
7/30/03	T05	Allow smear band to remain under inaccessible SE Shop corner	Approved
7/31/03	T0D	Allow smear band under Oil Shed area and overburden to remain unexcavated	On hold pending further evaluation
7/31/03	T0D	Dismantle and seed old stockpiles or use them as backfill	Acceptable but deferred to landowners
8/7/03	T06	Truckload volume at 13-14 CY per truck to calculate stockpile volume	Approved but confirm with measure of stockpile
8/7/03	T06, T0E	Groundwater monitoring proposed – water sampling in open excavations, 5 wells, 30 day rest, 1 round samples	On hold pending further evaluation
8/8/03	T0F	Use Camp #2 treated stockpiles as backfill in Camp #1 excavations	Rejected by by U of A and WW
8/8/03	T0F	Request to remove all smear band and eliminate future groundwater monitoring	Acceptable pending smear band excavation and sampling

Date	Ref.	Request	ADEC Action
8/14/03	T07	Order of excavation changed to accommodate excess yardage and reduce cost	Approved
8/14/03	T07	Shop floor not to be removed and no sampling under floor necessary – no groundwater monitoring impact	Approved
8/21/03	T08	Buried equipment hulks in South Equipment Parking Area to be left in-place and not removed	Approved
8/21/03	T08	Newly discovered Camp Fuel Depot to be excavated	Approved
8/21/03	T08	Newly discovered Runway Solid Waste Dumps to remain undisturbed	Approved
8/21/03	T08	Uplands Fuel Depot not to be excavated with this project	Approved
8/21/03	T09	Airport stockpile location as FAA safe, permanent and environmentally safe	Approved
8/23/03	T0G	Generator and truck washdown areas confirmation sampling & backfilling	Approved
8/29/03	T10	Draft petition for no future groundwater monitoring	Acceptable pending evaluation and concurrence
8/29/03	T10	DRO contaminated soils around residential trailers to remain unexcavated until final camp clean-up (3 trailers)	Approved
8/29/03	T10	Remove equipment from Camp and Carlson Creeks	Approved
9/5/03	T0H	Oil shed and saw shack areas confirmation sampling and backfill	Approved
9/8/03	T0I	Shop areas confirmation sampling and backfill	Approved
9/11/03	T13	Limit confirmation sampling at Fuel Depot #1 and Camp Fuel Depot to save money	Approved
9/12/03	T0J	Residential, south equipment parking, boneyard and 5-mile ditch area confirmation sampling and backfill	Approved

Date	Ref.	Request	ADEC Action
9/18/03	T0K	Formal petition for no future groundwater monitoring	Approved
9/20/03	T0L	Fuel Depot #1 confirmation sampling and backfill	Approved
9/23/03	T0M	Camp Fuel Depot and Incinerator confirmation sampling and backfill	Approved

Table 9. Negotiated Changes to Camp #1 Remedial Work Plan

Based on the data presented in this table, four additional support documents have been added to the final report as information and are noted in the above table with a footnote (*1) and are included in Appendix C. These documents are:

- MHTLO Inventory
- Fuel Depot #1 Investigation
- Uplands Fuel Depot SAP and Investigation
- Final Stockpile Confirmation Sampling and Analyses Plan

Permits Obtained

No permits were required to perform the planned remediation – soil excavation and treatment.

Hazardous Wastes and Exposure Risk Notification

No RCRA hazardous wastes or other regulated hazardous substances with known exposure risks were used or generated during the remediation process (excavation and treatment).

FIELD SAMPLING AND ANALYSIS

Field screening methods deployed included (1) visual observations, (2) subjective odor determination, (3) water sheen evaluation and (4) photoionization detection screening.

Visual Screening

Visual screening consists of inspecting soils for petroleum contamination noted in odor and discoloration or staining. Clay and sediment fines in the soil at Icy Bay can turn gray to blue tint with prolonged contact with petroleum product. This

discoloration is distinctly different that that associated with natural gray-blue clay especially when accompanied by odor. Discoloration may also appear as dark banding near the surface of the soil with some cementation of particles. Diesel in water can also impart a distinct “shine” to uniform sands and gravels. The shine is caused by adherence of the petroleum to the surface of the media.

Sheen Screening

Water sheen screening involves placing the soil in water and observing the water surface for signs of sheen. This may facilitate detection of both volatile and non-volatile petroleum hydrocarbons. Sheen classification is as follows:

(a) No Sheen

No visible sheen

(b) Slight Sheen

Light, colorless dull sheen; spread is irregular, not rapid; Sheen dissipates rapidly. Natural organic matter in the soil may produce a slight sheen.

(c) Moderate Sheen

Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on water surface.

(d) Heavy Sheen

Heavy sheen with color/iridescence, spread is rapid; entire water surface may be covered with sheen.

Odor Screening

Subjective odor testing is important in screening potentially contaminated soils. The human olfactory system can sense the presence of petroleum product when a PID cannot detect it. Petroleum odor is distinct and not similar to the acid organic smell of natural humus common in Alaska soils. Sensing by odor is an art developed with experience, but should never be used solely as a determination measure.

(a) No Odor

No petroleum odor or only the odor of natural humus.

(b) Slight Odor

Slight petroleum odor and distinguishable from natural humus

(d) Moderate Odor

Moderate petroleum odor clearly distinguishable from natural humus. Odor can be identified as light (volatile) or heavy (oil)

(e) Heavy Odor

Distinguishable petroleum odor with easy identification of fraction as gas, diesel, oil or solvent.

Photoionization Detector (PID) Screening

PID sampling will be accomplished from a hand-held PID. The unit will collect readings from freshly excavated soil at a distance of 2" from the soil until a stable reading is obtained. The unit will be calibrated weekly and can measure vapor concentrations from 0.1 ppm to 10,000 ppm (benzene equivalent). Generally, readings of 5 ppm to 10 ppm suggest DRO concentrations exceeding 250 ppm. This is a rule of thumb and readings at sites vary depending on soil and environmental conditions. Data collected from the PID will be noted in log books. The PID can also be used in a more controlled setting to ensure that exhaust fumes or vapor space discharge immediately following excavation is not falsely considered. In this case, samples are collected and placed in sealed liner bags. The bags are delivered to a room and brought to room temperature. Approximately 200 grams of soil is then placed in a clean sealed 1-liter bag. The PID probe is inserted in the bag and reading recorded at stability.

LABORATORY SAMPLING AND ANALYSIS

Grab samples were collected and managed in accordance with accepted commercial practices and EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), Third Edition, including Final Update III (1997), adopted by reference in AAC 75. The following requirements were addressed:

- Samples will be preserved after collection in accordance with approved laboratory instructions. Alternatively, the approved laboratory will provide pre-preserved containers for sample collection.
- Representative samples will be collected based on the judgment of a qualified person.
- Sample collection will include the collection of duplicate samples at the discretion of the qualified professional and advice of the approved laboratory (apx. 10% of the total sample volume).
- Samples will be placed in approved containers with labels and seals applied.
- Labels and seals will clearly describe the sample with a unique sample #, date and time of collection, person collecting the sample, and sample description/location.
- Environmental conditions surrounding the collection of the sample will be carefully noted in a logbook.
- Samples will be shipped in a timely manner and will not exceed mandated "holding times". This will likely require packaging in ice and priority shipments to laboratories coordinated in more than 2 locations.
- A properly executed chain-of-custody form will accompany sample shipments. The chain-of-custody form will clearly identify the analytical methods to be used for the samples collected.
- Sample coolers or containers will be sealed.

North Creek Analytical has been contracted to perform analytical work and is approved by the State of Alaska (18 AAC 78.800 - 18 AAC 78.815). The contracted laboratory addressed the following requirements:

- Maintain adequate custody of samples.
- Perform all analyses in accordance with approved procedures and methods specified by the chain-of-custody form.
- Dispose of samples in accordance with applicable federal and state rules and regulations.
- Apply appropriate quality considerations to analyses including analyses of laboratory duplicates, matrix spikes, matrix spike duplicates with notation of percent recoveries as required by the laboratories approved quality assurance program.
- Report results in a timely manner with duplicate copies of analyses – one for the sample requestor and one for ADEC.

Analysis for petroleum contamination followed applicable Alaska methods for petroleum hydrocarbons referred to in Table 1 of Chapter 2 of the *Underground Storage Tanks Procedures Manual*, dated November 7, 2002. Table 1 of Chapter 2 and Appendices D and E of the *Underground Storage Tanks Procedures Manual*, dated November 7, 2002 are adopted by reference. This included:

- Method AK 101: C_6-C_{10} GRO
- Method AK 102: C_{10}-C_{25} DRO
- Method AK 103: C_{25}-C_{36} RRO

GRO - gasoline range organics: light-range petroleum products such as gasoline, with petroleum hydrocarbon compounds corresponding to an alkane range from the beginning of C_6 to the beginning of C_{10} and a boiling point range between approximately 60^o Centigrade and 170^o Centigrade;

DRO - diesel range organics: mid-range petroleum products such as diesel fuel, with petroleum hydrocarbon compounds corresponding to an alkane range from the beginning of C_{10} to the beginning of C_{25} and a boiling point range between approximately 170^o Centigrade and 400^o Centigrade;

RRO - residual range organics: heavy-range petroleum products such as lubricating oils, with petroleum hydrocarbon compounds corresponding to an alkane range from the beginning of C_{25} to the beginning of C_{36} and a boiling point range between approximately 400^o Centigrade and 500^o Centigrade.

In addition to meeting the established soil cleanup limits, assurance was provided that the site met the most stringent standards for benzene, toluene, ethylbenzene, and total xylenes as applicable. Analyses for heavy metals were also performed. These more specific analyses were completed following prescribed methods set out in EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846).

Data Validation and Verification

A qualified professional reviewed, evaluated and assessed the results of the sampling. Both the analytical laboratory and the analytical requestor performed validation and verification to ensure that the data presented was not a false positive or a false negative.

The following considerations were made relative to validation and verification:

- If there is more than one analytical method for a hazardous substance, a responsible person may select any of those methods with a practical quantitation limit less than the applicable cleanup level. If only one analytical method has a practical quantitation limit less than the applicable cleanup level, that method must be used.

- If a hazardous substance is suspected at the site because of empirical evidence or prior analysis, but is not detected or is detected at a concentration below the practical quantitation limit, and the practical quantitation limit is higher than the cleanup level for that substance, ADEC will determine the responsible

person to have attained the cleanup level, if additionally the more stringent of the following conditions is met:

(A) the practical quantitation limit is no greater than 10 times the method detection limit for all hazardous substances other than polychlorinated biphenyls where the practical quantitation limit is no greater than five times the method detection limit;

(B) the practical quantitation limit is no greater than the practical quantitation limit established in EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), Third Edition, including Final Update III (1997), adopted by reference;

Quality Assurance

Applicable commercial practices for quality assurance were applied to all sample collection and analyses as well as verification and validation of results. Quality was assured by:

- Using qualified and trained personnel (OSHA familiarity)
- Following approved procedures
- Stopping work in the event of unresolved questions
- Maintaining an accurate filing system
- Facilitating communications to avoid unnecessary delays

Project Sample Log

A summary of sample results is included as an appendix to this report. The summary and actual data submitted by the laboratory are included in Volume 2 to this report.

CLEAN-UP LIMITS

The following ADEC approved clean-up limits were developed for the site both as pertaining to clean excavations and treated soils.

SOIL LIMITS

Contaminated Soil Clean-Up Limits for Petroleum Hydrocarbon

Camp #2 Areas	GRO "Gasoline"	DRO "Diesel"	RRO "Oil"
Residential Area & Shop	260 ppm	843 ppm	8,300 ppm
Fuel Depot	260 ppm	718 ppm	8,300 ppm
Sort Yard and LTF	260 ppm	1,420 ppm	8,300 ppm
Methodology	*Method 2: Table B-2, Over 40", migration to groundwater potential*	*Method 3: custom calculation based TOC in background*	*Method 2: Table B2, Over 40", ingestion potential*

Table 10. Contaminated Soil Clean-Up Limits (From SEMS Characterization)

Contaminated Soil Treatment Limits for Petroleum Hydrocarbon

Camp #2 Areas	GRO "Gasoline"	DRO "Diesel"	RRO "Oil"
Stockpiles in Final Safe and Secure Location	260 ppm	718 ppm	8,300 ppm
Stockpiles to be Relocated or Moved (*)	260 ppm	230 ppm	8,300 ppm
Methodology	*Method 2: Table B-2, Over 40", migration to GW potential*	*Approved by ADEC in writing as noted below*	*Method 2: Table B2, Over 40", ingestion potential*

Table 11. Contaminated Soil Treatment Limits

18 AAC 75.341 identifies Method 2 soil treatment criteria in areas similar to Icy Bay where over 40 inches of precipitation occur and where potential for contaminant migration to groundwater exists. A clarification of these limits was documented in email from ADEC on 7/22/03:

> *"The default cleanup level for the contaminated soil stockpile (Camp #2) is method 2 migration to groundwater. Additional active treatment will be necessary only if the most stringent calculated alternative cleanup levels are exceeded. The stockpile may be dismantled and the soil seeded if residual concentrations are between the default cleanup level and the calculated method 3 level. Natural attenuation will continue once the treatment cell is dismantled. This same approach can be taken for camp # 1 once we know the treated soils can be placed in an environmentally safe location."*

The stockpile locations as depicted in Figures 6 and 10 are the safest locations for treated soils relative to environmental protection as agreed in July teleconferences with all parties.

Contaminated Soil Clean-Up Limits for Organic Constituents

Constituents	Contaminated Soil Clean-Up Limit (ppb)	Treated Soil Clean-Up Limit (ppb)
Organics		
Acetone	9	9
Benzene	20	20
1,2,4 trimethylbenzene	85	85
1,3,5 trimethylbenzene	23	23
bis(2)ethylhexyl-phthalate	1,100	1,100
Ethylbenzene	50	50
Isopropylbenzene	200	200
Napthalene	38	38
Phenol	60	60
Toluene	480	480
Xylene	69	69
Methodology	***18AAC75.341 Table B-1, Over 40", migration to groundwater potential***	***18AAC75.341 Table B-1, Over 40", migration to groundwater potential***

Table 12. Contaminated Soil Limits for Organic Constituents

WATER LIMITS

Water Clean-Up Limits

Constituents	Groundwater Limit (ppb)	Surface Water Limit (ppb)
Organics		
GRO	1,300	NA
DRO	1,500	NA
RRO	1,100	NA
Total Aqueous Hydrocarbons	11,300	15 (A)
Total Aqueous Aromatics	9,900	10 (A)
Total Aqueous Aliphatics	1,400	5 (A)
Acetone	650	650 (C)
Benzene	5	5 (C)
bis(2)ethylhexyl-phthalate	6	6 (C)
Ethylbenzene	700	3,100 (B)
Napthalene	1,460	365 (D)
Phenol	22,000	21,000 (B)
Toluene	1,000	6,800 (B)
Xylene	10,000	10,000 (C)
Metals		
Arsenic - As	50	150 (A)
Antimony - Sb	6	14 (B)

Constituents	Groundwater Limit (ppb)	Surface Water Limit (ppb)
Barium - Ba	2,000	500 (D)
Beryllium - Be	4	1 (D)
Cadmium - Cd	5	0.094-0.640 (A)
Chromuim – Cr Total (III)	100	24-230 (A)
Copper - Cu	1,300	2.7-29 (B)
Lead - Pb	15	0.54-11 (A)
Mercury - Hg	2	0.05 (B)
Nickel - Ni	100	16-170 (A)
Selenium - Se	50	4.6 (A)
Silver - Ag	180	0.32-37 (A)
Thallium - Tl	2	1.7 (B)
Vanadium - V	760	190 (D)
Zinc - Zn	11,000	9,100 (B)
Methodology	***18AAC75.341 Table C***	*See Notes below:*

Table 13. Contaminated Water Clean-Up Limits

Note: *(A) - 18AAC70.020 Table III: aquatic life freshwater – chronic value*
(B) - 18AAC70.020 Table V: human health for consumption (water+aquatic)
(C) -18AAC75.341 Table: Groundwater, See also 18AAC75.341 Table I – Drinking water
(D)- Remaining unknowns listed at 25% of groundwater criteria

REMEDIATION RESULTS

REMEDIATION OVERVIEW

Camp #1 remediation commenced on 7/13/03 and ended on 10/1/03. The following tables summarize excavation, treatment and confirmation sampling of defined remediation areas:

SUMMARY

	Location	Excavated (CY)	Required Confirm Samples	Actual Confirm Samples	
SACK	Sacks	14	2	0	
GCS	Generator	1,102	10	39	
TWS	Truck Washdown	1,088	10	31	
OSH	Oil Shed	2,054	11	70	
SLV1	Oil Shed Solvents	408	5	7	
SSS	Saw Shop	1,700	10	82	
MCS	Maintenance Shop	1,240	10	18	
SEQP	South Equipment Parking Area	150	5	12	
BNY	Boneyard	231	5	9	
5MDT	5-Mile Ditch	14	2	2	
BHS	Bunk House	122	5	5	
SCH	School House	95	3	4	
TLO	TLO Area	326	5	7	
SLV2	TLO Solvents	22	2	2	
FDP	Fuel Depot #1	2,557	12	22	
CFD	Camp Fuel Depot	3,767	14	22	
ICN	Incinerator	100	3	5	
	Total	**14,989**	**114**	**337**	296%

Table 14. Summary of Excavation Activities and Clean-Up Confirmation Sampling

Treatment activities are summarized below:

Stockpile	CY Treated	Confirmation Samples		Background Samples	Footprint Samples
		Required	Actual		
North	3,426	13	40	5	10
South	5,139	17	40	5	10
Runway	6,424	19	20	10	10
	14,989				

Nutrient	105% dose applied
Bacteria	517% dose applied

Table 15. Summary of Treatment Activities and Treatment Confirmation Sampling

EXCAVATION WORK

All excavations were accomplished using a large Komatsu or Cat track hoes and Volvo or Cat reticulating end dumps. Photographs of remedial work are available in Volume 3 of this report. Details regarding excavations are presented below:

Date	Day	Rain	Loads																Daily Total
			SACK	GCS	TWS	OSH	SLV1	SSS	MCS	SEQP	BNY	5MDT	BHS	SCH	TLO	SLV2	FDP	CFD	ICN	
13-Jul-03	Sun																			0
14-Jul-03	Mon																			0
15-Jul-03	Tue																			0
16-Jul-03	Wed																			0
17-Jul-03	Thu																			0
18-Jul-03	Fri		1																	1
19-Jul-03	Sat																			0
20-Jul-03	Sun	1																		0
21-Jul-03	Mon	1		25																25
22-Jul-03	Tue			32																32
23-Jul-03	Wed	1		5		14														19
24-Jul-03	Thu			13	62															75
25-Jul-03	Fri				16															16
26-Jul-03	Sat																			0
27-Jul-03	Sun	1																		0
28-Jul-03	Mon	1				57														57
29-Jul-03	Tue					45	14													59
30-Jul-03	Wed					14		57												71
31-Jul-03	Thu							68												68
1-Aug-03	Fri																			0
2-Aug-03	Sat																			0
3-Aug-03	Sun																			0
4-Aug-03	Mon																			0
5-Aug-03	Tue																			0
6-Aug-03	Wed																			0
7-Aug-03	Thu																			0
8-Aug-03	Fri																			0
9-Aug-03	Sat																			0
10-Aug-03	Sun																			0
11-Aug-03	Mon			6	2															8
12-Aug-03	Tue	1																		0
13-Aug-03	Wed	1				16														16
14-Aug-03	Thu	1				5	16													21
15-Aug-03	Fri	1																		0
16-Aug-03	Sat	1							26											26
17-Aug-03	Sun	1																		0
18-Aug-03	Mon								12											12
19-Aug-03	Tue								2											2
20-Aug-03	Wed								21	11	17									49
21-Aug-03	Thu	1							28			1								29
22-Aug-03	Fri	1																		0
23-Aug-03	Sat								2				9	7	24	2				44
24-Aug-03	Sun																			0
25-Aug-03	Mon	1																		0
26-Aug-03	Tue	1																		0
27-Aug-03	Wed	1																		0
28-Aug-03	Thu	1																		0
29-Aug-03	Fri	1																		0
30-Aug-03	Sat																			0
31-Aug-03	Sun																			0
1-Sep-03	Mon	1																		0
2-Sep-03	Tue	1															67			67
3-Sep-03	Wed	1															66			66
4-Sep-03	Thu	1															55			55
5-Sep-03	Fri	1																		0
6-Sep-03	Sat	1																		0
7-Sep-03	Sun	1																		0
8-Sep-03	Mon																	126		126
9-Sep-03	Tue	1																72		72
10-Sep-03	Wed																	66		66
11-Sep-03	Thu																	13		13
12-Sep-03	Fri																			0
13-Sep-03	Sat																			0
14-Sep-03	Sun																			0
15-Sep-03	Mon																			0
16-Sep-03	Tue																		7	7
			1	**81**	**80**	**151**	**30**	**125**	**91**	**11**	**17**	**1**	**9**	**7**	**24**	**2**	**188**	**277**	**7**	**1,102**
			14	1,102	1,088	2,054	408	1,700	1,240	150	231	14	122	95	326	22	2,557	3,767	100	
			8,000										**566**				**2,557**	**3,767**	**100**	
																			TOT	**14,989**

LOAD CONTROL

Load Calculation

Measure - DMC	5,922
Measure - UOA	5,626
Measure - WW	5,878
Measure - CTF	5,652
Average	5,770
Loads	423.0
CY/Load	**13.6**

Load Variance

17 CY/load	18,737
16 CY/load	17,634
15 CY/load	16,532
14 CY/load	15,430
13 CY/load	14,328
12 CY/load	13,226
11 CY/load	12,124

Table 16. Truck Load Counts and Volumes of Excavated Soils

Date	Day	Rain	Stockpiles (Lifts Treated)			Daily Total	Nutrient Req. (50lb Bags)	Nutrient Used (50lb Bags)	Bacteria Req. (Gal. Conct.)	Bacteria Used (Gal. Conct.)
			North	South	Runway					
15-Aug-03	Fri	1	2	2		4	21	22	214	1,000
16-Aug-03	Sat	1				0				
17-Aug-03	Sun	1				0				
18-Aug-03	Mon		2	2		4	21	22	214	1,000
19-Aug-03	Tue					0				
20-Aug-03	Wed					0				
21-Aug-03	Thu	1	2	2		4	21	22	214	1,000
22-Aug-03	Fri	1				0				
23-Aug-03	Sat			2		2	13	14	128	1,000
24-Aug-03	Sun					0				
25-Aug-03	Mon	1	2	2		4	21	22	214	1,000
26-Aug-03	Tue	1				0				
27-Aug-03	Wed	1				0				
28-Aug-03	Thu	1	2	2		4	21	22	214	1,000
29-Aug-03	Fri	1				0				
30-Aug-03	Sat			2		2	13	15	128	500
31-Aug-03	Sun					0				
1-Sep-03	Mon	1	2	2		4	21	22	214	1,000
2-Sep-03	Tue	1				0				
3-Sep-03	Wed	1				0				
4-Sep-03	Thu	1	2			2	9	10	86	500
5-Sep-03	Fri	1				0				
6-Sep-03	Sat	1				0				
7-Sep-03	Sun	1				0				
8-Sep-03	Mon					0				
9-Sep-03	Tue	1				0				
10-Sep-03	Wed					0				
11-Sep-03	Thu					0				
12-Sep-03	Fri		2			2	9	11	86	1,000
13-Sep-03	Sat					0				
14-Sep-03	Sun					0				
15-Sep-03	Mon				2	2	21	22	214	1,000
16-Sep-03	Tue				2	2	21	22	214	1,000
17-Sep-03	Wed				2	2	21	22	214	1,000
18-Sep-03	Thu				1	1	11	12	107	500
19-Sep-03	Fri				2	2	21	22	214	1,000
20-Sep-03	Sat	1			2	2	21	23	214	1,000
21-Sep-03	Sun	1			1	1	11	13	107	1,000
		Tot. Lifts	**16**	**16**	**12**	**44**	300	318	2,998	15,500
		Tot. CY	3,426	5,139	6,424	14,989		106%		517%
		Avg. CY/Lift	214	321	535	341		Overtreated		Overtreated

Table 17. Treatment Details Including Lifts and Doses

SOILS – AREA BY AREA EVALUATION

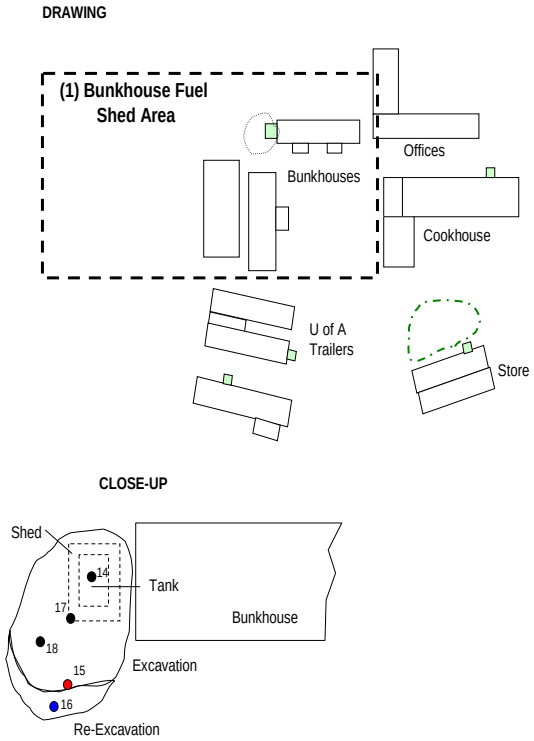
Each of the areas identified in Table 7, and pertinent ADEC comments relative to the Final Site Characterization Repot and Remedial Work Plan, have been remediated.

The following sub-sections discuss the work completed at each location. Attached figures illustrate excavated contamination areas originating from surface stains and sampling locations for confirmation of clean-up.

(Area 1) Bunkhouse Fuel Tank Shed Area

The bunkhouse fuel tank shed was characterized in June 2002. At initial inspection both filter and connection lines were noted to be unprotected (no underlying liner). Two samples indicated the presence of DRO at a concentration of 8,600 ppm. An area 15 ft. x 20 ft. to a depth of 4 ft. was estimated for clean-up.

The fuel shed and tank were removed in May allowing complete access for excavation. Excavation was performed on 8/23/03 and resulted in the removal of 122 CY of contaminated soil. Excavation completed at the water table at a depth of 6 ft. BGS. Five confirmation samples and one reconfirmation sample were collected. Figure 10 illustrates the excavation area.



DATA

Area	Map #	Sample Number	Confirmation GRO	Confirmation DRO	Confirmation RRO	Reconfirmation GRO	Reconfirmation DRO	Reconfirmation RRO
		Limits	260	843	1880			
Bunkhouse Area	14	BH001	0	113	0			
	15	BH002	0	**883**	0			
	16	BH002R				0	147	233
	17	BH003	0	6.44	0			
	18	BH004	0	78	134			

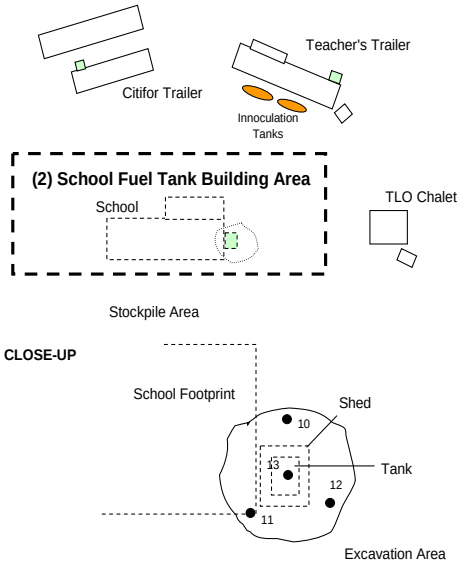
Figure 14. Bunkhouse Fuel Tank Area Excavation and Sampling

(Area 2) School Fuel Tank Building Area

The school fuel tank shed was inspected June 2002. Staining and a removal of the liner underlying the tank in the shed created suspicion of contamination. A sample collected near the tank under the liner indicated DRO concentrations of 9,300 ppm. It was estimated that and area 10 ft. x 20 ft. would need to be excavated to a depth of 6 feet to remove the contamination.

The fuel shed and tank were removed in May and the school was burned to the ground on August 5, 2003 allowing complete access for excavation. Excavation was performed on 8/23/03 and resulted in the removal of 95 CY of contaminated soil. Excavation completed at the water table at a depth of 6 ft. BGS. Four confirmation samples were collected. Figure 11 illustrates the excavation area.

DRAWING



DATA

Area	Map #	Sample Number	Confirmation			Reconfirmation		
			GRO	DRO	RRO	GRO	DRO	RRO
		Limits	260	843	1880			
School House Area	10	SH001	0	5.86	0	Not Required		
	11	SH002	0	336	0			
	12	SH003	0	6.44	0			
	13	SH004	0	201	244			

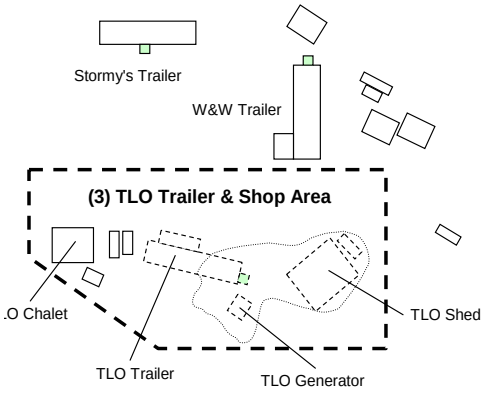
Figure 15. School Fuel Tank Building Area

(Area 3) TLO Trailer and Shop Area

The TLO area was inspected June 2002. The Chalet was found to be clean. The trailer was found to be contaminated at the fuel tank shed on the end of trailer. A fuel shed sample noted a DRO contamination of 18,000 and 6,800 ppm. The contaminated area was estimated to be 30 feet square and 10 feet deep. The TLO shop was investigated and a sample collected from under the trap door through the wooden floor on the west half indicated both DRO and RRO contamination (5,500 ppm and 23,000 ppm respectively). It was estimated that an approximate 10 foot square area to a depth of 6 foot would need to be removed.

The Trailer, Shed and Generator Shack were removed and demolished in August 2003 allowing complete access for excavation. Excavation was performed on 8/23/03 and resulted in the removal of 326 CY of contaminated soil and 22 CY of solvent contaminated soil (from the west end of the trailer – likely dumped on the ground from the shop during maintenance). The excavation appears large in size the figure since much surface soil was removed. The deepest portion of the excavation was under the garage and at the trailer corner (6 ft.) where excavation completed at the water table to a depth of 6 ft. BGS. Nine confirmation samples were collected including two samples from the area contaminated with solvents. Figure 11 illustrates the excavation area.

DRAWING



DATA

Area	Map #	Sample Number	Confirmation GRO	Confirmation DRO	Confirmation RRO	Reconfirmation GRO	Reconfirmation DRO	Reconfirmation RRO
		Limits	260	843	1880			
TLO Area	1	TLO001	0	24.8	0			
	2	TLO002	0	5.62	0			
	2	TLO002D	0	4.65	0			
	3	TLO003	0	266	0			
	4	TLO004	0	5.8	0			
	5	TLO005	0	5.5	0			
	6	TLO006	0	5.64	0			
	7	TLO007	Traces	131	979	Solvent		
	8	TLO008	0	7.09	0			
	9	TLO009	0	65	123	Not Required		

CLOSE-UP

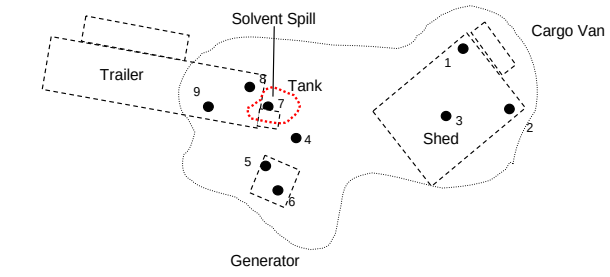


Figure 16. TLO Trailer and Shop Area

(Area 4) Residential Trailers Area Including U of A

In June, 2002 the residential area of Camp #1 was evaluated. 12 of the 20 buildings/trailers area in the area were inspected. The fuel oils systems servicing the facilities were found to be in relatively good condition with little visual contamination present in lined traps under the elevated tanks. Soil samples were collected from 6 trailers and no contamination was detected. A recommendation for future investigation was made prior to final camp closure to ensure that all trailer environments were free of contaminants. It is important that this action be taken since noted contamination was not removed.

Additional investigation was performed in July, 2003 as remediation efforts were underway with results reported in the table following the figure. Figure 13 illustrates the buildings/trailers of interest:

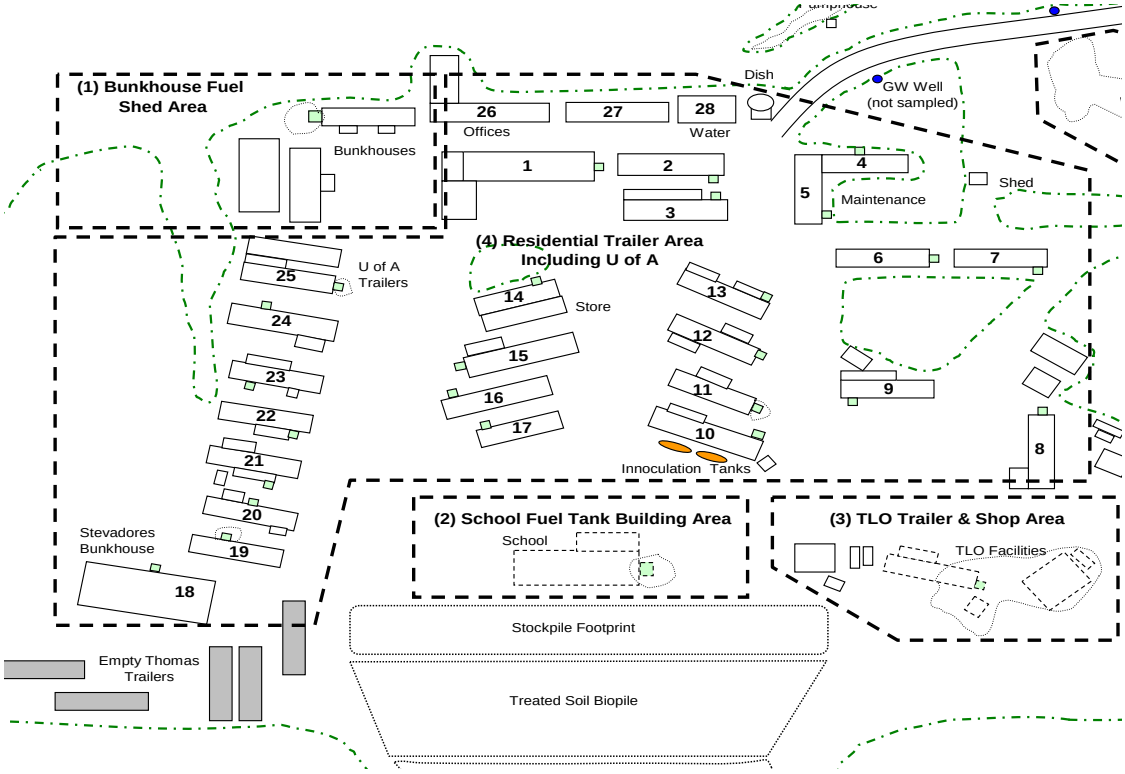


Figure 17. Residential Area Buildings and Trailers of Concern

No arrangements have yet been made with DMC Tech to participate in trailer closure.

The following table indicates concern with three trailers – #11, #19 and #25. Each of these trailers has contaminated soils to be removed when camp is closed. Trailer #25 is occupied by the University of Alaska. The presence of active buried electrical utilities and occupancy prohibited remediation of these trailers. Apx 50 CY is estimated to be required for removal from the contaminated trailers.

Map	Trailer	Fuel	Liner	Diaper	Field Data			
					Core	PID	Odor	Sheen
1	Cookhouse	2- 55 gal drums	good, no apparent leaks	Saturated w/ oil & water	9"	0	s	s
2	Bunkhouse	2- 55 gal drums	good, no apparent leaks	Dry	12"	4.5	n	n
3	Bunkhouse	2- 55 gal drums	good, no apparent leaks	Dry	9"	5.5	n	n
4	Maintenance	2- 55 gal drums	good, no apparent leaks	5" water	9"	5.2	n	n
5	Residence (abandoned)	2- 55 gal drums	good, no apparent leaks	1/2" water	12"	11	n	n
6	Residence (abandoned)	2- 55 gal drums	good, no apparent leaks	Dry	12"	2.5	s	n-s
7	Residence (abandoned)	2- 55 gal drums	good, no apparent leaks	Dry	12"	3.5	n	n
8	Residence (Winter's)	2- 55 gal drums	good, no apparent leaks	2" water	9"	3.5	n	n
9	Residence (Stormy's)	100 gal saddle	good, no apparent leaks	Dry	10"	8	n	n
10	Residence (abandoned - biotanks outside)	2- 55 gal drums	good, no apparent leaks	Dry	12"	5	n	n
11	Residence (abandoned)	2- 55 gal drums	good, no apparent leaks	Trace of water w/ sheen	21"-48"	235	h	m-h
12	Residence (abandoned)	2- 55 gal drums	good, no apparent leaks	Dry	10"	10.5	n	n
13	Residence (abandoned)	2- 55 gal drums	good, no apparent leaks	Dry	12"	3.5	n	n
14	Store	2- 55 gal drums	good, no apparent leaks	Dry	9"	8	n	n
15	Residence (Kelly's)	2- 55 gal drums	good, no apparent leaks	4" water	9"	8.5	n	n
16	Residence (abandoned)	2- 55 gal drums	good, no apparent leaks	Dry - w/ debris	9"	6	n	n
17	Residence (Citifor's)	2- 55 gal drums	good, no apparent leaks	Dry	9"	5.5	n	n
18	Bunkhouse (abandoned Stevadores)	2- 55 gal drums	good, no apparent leaks	7" water	9"	14	n	n
19	Residence (Visitor's)	2- 55 gal drums	poor, obvious leaks	1/2" water w/ sheen	15	7	m	m
20	Residence (Hired help)	2- 55 gal drums	good, no apparent leaks	Dry	10	4	n	n
21	Residence (Hired help)	2- 55 gal drums	good, E. tank drips	1/2" diesel	9"	4	n	m
22	Residence (abandoned, move to Yakataga)	2- 55 gal drums	good, no apparent leaks	Dry	12"	3.5	n	n
23	Residence (abandoned)	2- 55 gal drums	poor, probable leaks	Dry	9"	45	n	n
24	Residence (abandoned)	2- 55 gal drums	good, no apparent leaks	Dry - w/debris	12"	3.5	n	n
25	U of A Office and Residence	50 gal saddle	fair - small	4" water & full	9"	28	n	n
26	Office (used)	None	na	na	na	na	na	na
27	Office (abandoned)	None	na	na	na	na	na	na
28	Water Treatment Facility	None	na	na	na	na	na	na

Table 18. Evaluation of Residential Trailers

In addition to the three trailers requiring contaminated soil removal, 2 trailers need maintenance to prevent leakage including # 21 and #23. Trailer #22 was removed to Cape Yakataga at the conclusion of the project.

TLO Hazardous Materials

Approximately 45 gal (400 lbs) of hazardous materials (50 types of items) were collected from the TLO Trailer and Shop Area for inventorying. 17 of the 50 items were potentially regulated waste. All of the wastes were packaged and placed in the back of pick-up truck for barge shipment to Juneau as directed by the material owners. The written inventory of materials is included in Appendix C for review.

A representative for the TLO responded to the submitted inventory and directed that the materials be placed in the pick-up truck and sent to Anchorage for proper processing.

(Area 5) Equipment Shop Area

Position of Historic Buildings

The position of historic Buildings in around the shop plays a critical role in evaluating and remediating contaminated soil. The locations of old shop buildings typically map the locations of contaminated soil since the shop area is where most petroleum products were managed. Prior to discussing the remediation of areas in and around the shop, maps of historic building locations are presented for review and information. Data is presented for pre-1991, 1993 and 1995. Excavation areas during the remediation effort are noted for interest.

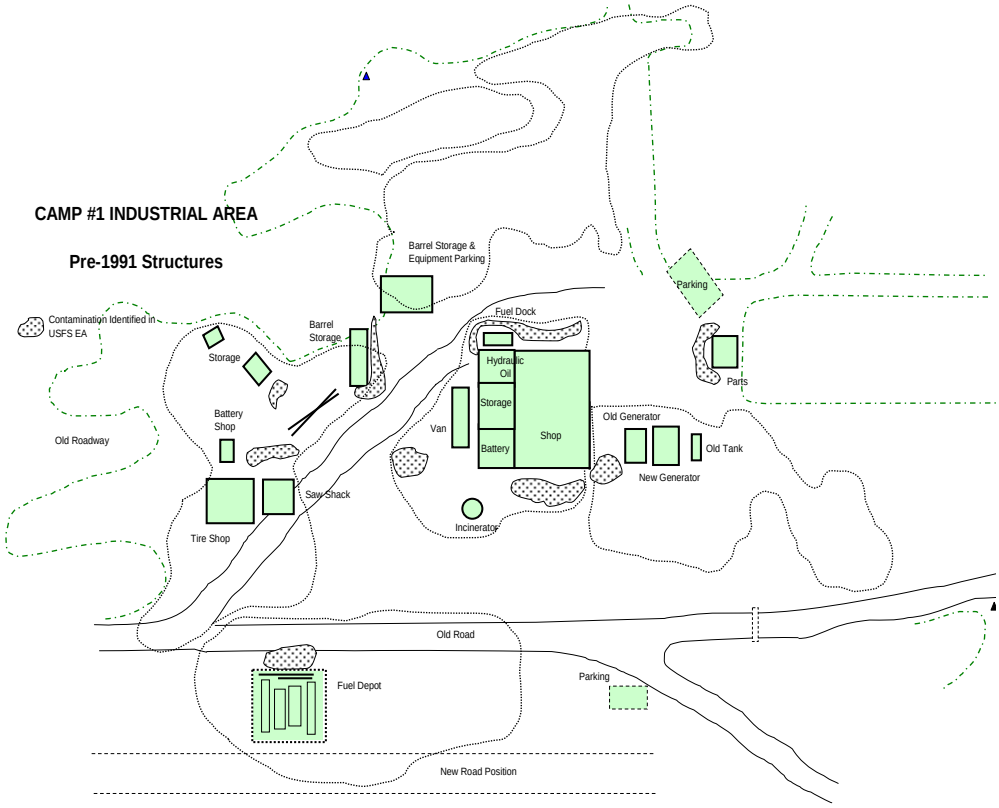


Figure 18. Original Structure Locations (Likely Prior to 1978)

Note the fuel depot south of the shop, the changes road position and the southern location of the saw shop and related buildings. Don Leishman was interviewed and confirmed the change in the road location in the early 1970s. The original road position is still visible. Also note the use of the west and north sides of the shop for oil management.

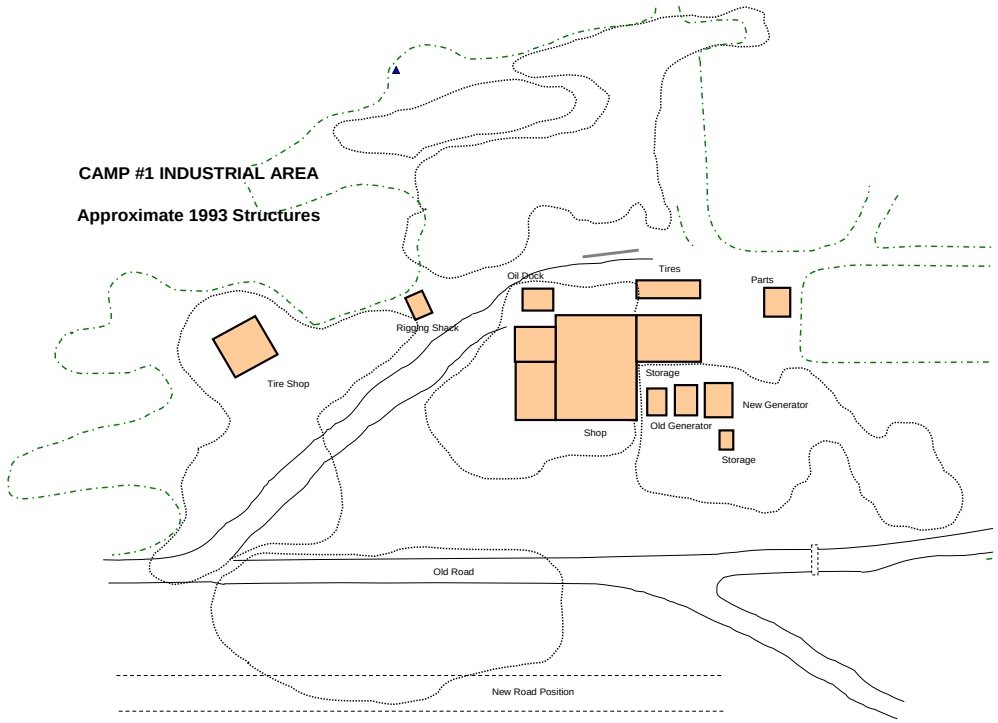


Figure 19. 1993 Structure Locations

Note the changed position of the saw shop (northward shift and listing as Tire Shop) and absence of fuel depot and incinerator from original pre-1991 positions. Some oil activities are still apparent north of the shop.

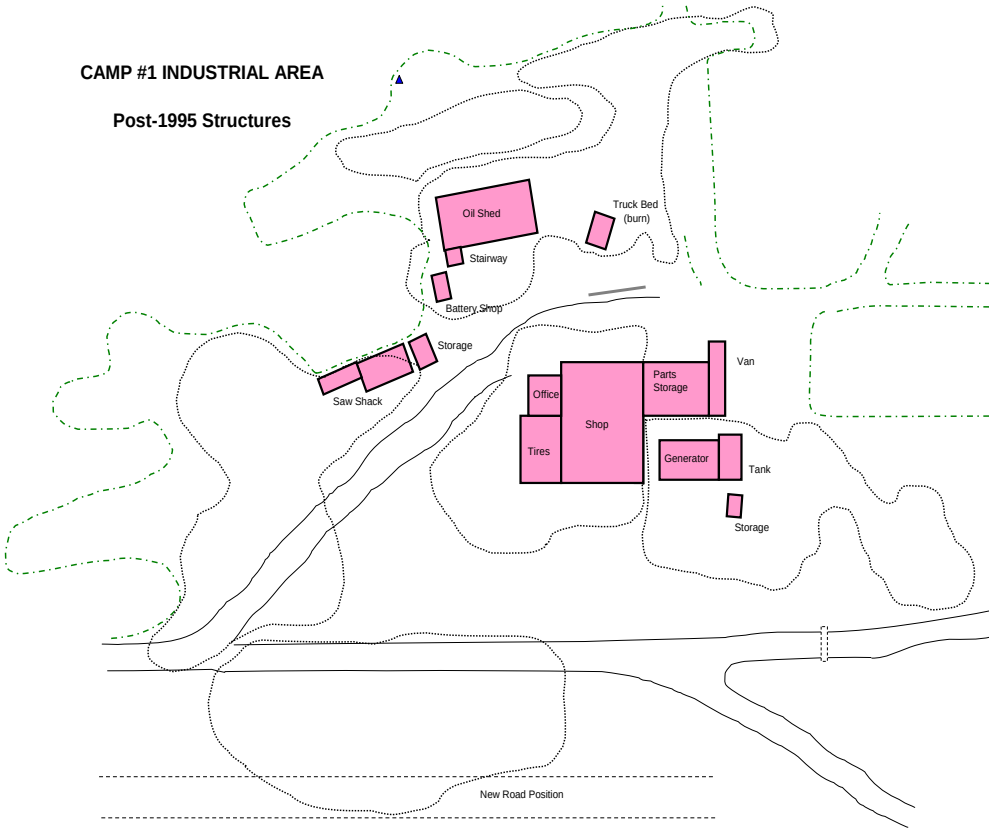


Figure 20. 1995 Structure Locations

Note the further shift north of the Saw Shop, change Tire Shop positions and the addition of the Oil Shed and other buildings. The road was shifter after 1995 to the new position noted placing the camp depot footprint on the north side of the road.

Equipment Shop Remediation Activities

Characterization of the shop area was completed in June 2002 and included the collection of 31 soil samples in and around the shop to varying depths. DRO concentrations exceeding clean-up limits were detected in 14 samples and at a maximum value of 7,600 ppm. RRO concentrations exceeding the clean-up limit were detected in 2 samples and at a maximum value of 9,800 ppm. Concentrations of GRO were not detected as evidenced by direct analyses and only traces of VOCs and SVOCs found in several samples. It was estimated that

220-275 CY of contaminated soil would need to be excavated from around the shop.

Excavations in and around the shop were performed on 8/16, 8/18-8/21 and on 8/23 resulting in the removal of 1,240 CY. The more extensive excavations followed the building footprint pattern shown. The following figure illustrates excavations in and around the shop

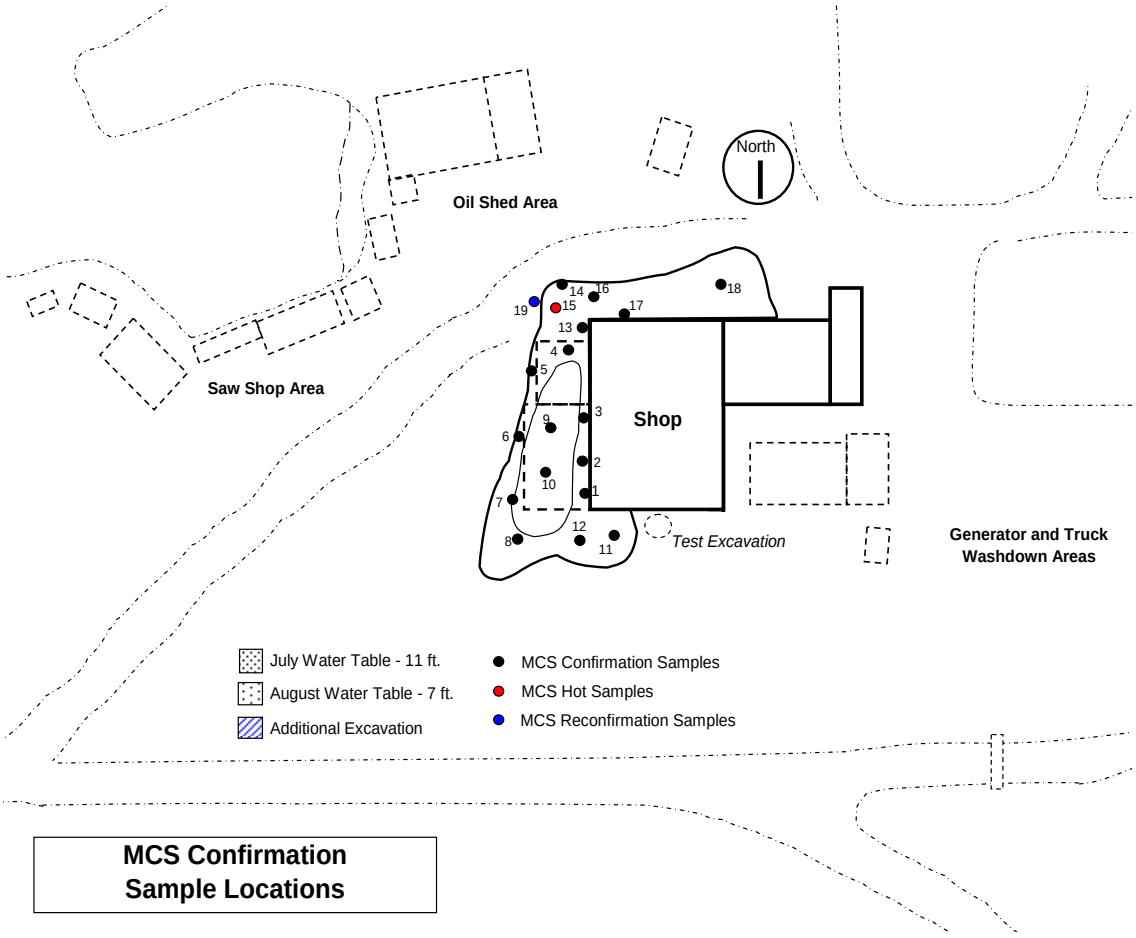


Figure 21. Shop (MCS) Excavation and Confirmation Sampling

As excavations proceeded on the north end of the shop it was apparent that soil contamination was wrapping around the northwest corner and along the west side of the shop. Although not previously characterized as an excavation area, the west side of the shop exhibited contamination and excavation proceeded along the west of the shop to the excavations at the front of the shop. Excavations reached 9 feet in depth and extended 2 feet below the water table. 1 characterization sample (west side), 18 confirmation samples and 1 reconfirmation sample were collected supporting remediation.

The pattern of excavation was consistent with pre-1991 building positions including the oil dock, lube oil trailer and camp incinerator. On August 15, a test excavation was made at the front of the shop door to the water table with ADEC present to observe. The smear band was not locatable in this excavation. Accordingly, a determination with consensus was reached to leave the shop floor in-place without disturbance (further sampling or excavation). A determination was also reached that the underlying smear band associated with the shop and the Generator Shop excavation had been adequately removed. Confirmation and reconfirmation data is presented in the following table.

Confimration Samples

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO
			Limits	na	na	na	260	843	8300
1	1	MCSD-01	Sidewall 30"	4	n-s	n-s	0.0	208.0	737.0
1	2	MCSD-02	Sidewall 36"	12	s-m	s	0.0	30.1	0.0
1	3	MCSD-03	Sidewall 24"	8	s	s	0.0	84.7	26.1
1	4	MCSD-04	Sidewall 36"	7	s	s	0.0	6.9	0.0
	4	MCSD-04D	Sidewall 36"	7	s	s	0.0	6.4	0.0
1	5	MCSD-05	Sidewall 30"	3	n-s	n-s	0.0	45.8	115.0
1	6	MCSD-06	Sidewall 48"	4	n-s	n-s	0.0	179.0	238.0
1	7	MCSD-07	Sidewall 36"	2	n-s	n-s	0.0	34.7	55.7
1	8	MCSD-08	Sidewall 42"	4	n-s	n-s	0.0	9.9	0.0
1	9	MCSD-09	Bottom 72"	5.5	n-s	n-s	0.0	99.0	144.0
1	11	MCSB-01	Bottom 72"	4	n	s	0.0	287.0	895.0
1	12	MCSB-02	Bottom 72"	3	n	s	0.0	9.6	27.7
1	13	MCSA-01	Sidewall 36"	2	n	n-s	0.0	10.9	0.0
1	14	MCSA-02	Sidewall 60"	2	n	n	0.0	110.0	373.0
1	15	MCSA-03	Bottom 72"	7	s	h	0.0	743.0	3,010.0
1	16	MCSA-04	Bottom 72"	6	n	m-h	0.0	**1,740.0**	6,690.0
1	17	MCSA-05	Bottom 48"	1.5	n	n	0.0	600.0	895.0
1	18	MCSA-06	Sidewall 60"	3	n	s	0.0	35.0	155.0
17									
			Mean				7.9	154.0	656.4
			Standard Deviation				0.0	429.3	1650.3
			Alpha (95%)				0.05	0.05	0.05
			Confidence Limit				0.0	204.1	784.5
			High Interval				0.0	358.1	1440.9
			Low Interval				0.0	-50.1	-128.1

Waste Side Characterization Sample

				PIDb	Odor	Sheen	GRO	DRO	RRO
1	10	LUBE-01	Sidewall - 36"	54	h	h	15.4	2,220.0	627.0

NOTE: Area west of the shop was not characterized by SEMS.

Reconfirmation Samples

	Map #	Former Sample #	Repeat Sample #	Depth/Location	PIDb	Odor	Sheen	DRO Prior	DRO After
				Limits	na	na	na	843	843
1	18	MCSA-04	MCSA-04R	Bottom 84"	5	n-s	n-s	**1,740**	231

NOTE: Re-excavation was performed as part of the Oil Shed work and included removal of contaminated soil associated with both MCSA-04 and MCSA-03.

Table 19. Shop (MCS) Confirmation, Characterization and Reconfirmation Sampling

Confirmation and reconfirmation data as presented was pre-approved by ADEC on 9/8/03. Sample data are also detailed on a spreadsheet presented in Appendix D to this report.

Shop Bags and Drums

12 supersacks of contaminated soil from historic camp spill clean-ups and 13 drums of antifreeze/water with traces of used oil from historic shop operations were collected from the west side of the shop under the Tire Shop awning and delivered to the contaminated stockpile for treatment on July 18, 2003.

Each sack and drum was inspected to ensure that the sack only contained petroleum contaminated soil. The Camp Manager was helpful in identifying the various types of materials in numbered sacks and drums. The sacks contained approximately 14 CY of contaminated soil.

The soils and liquid were evenly spread across the top of the stockpile prior to bionutrient and inoculants addition. After dosing the materials were tilled into the lift and effectively treated. Empty drums were returned to the shop and empty toe sacks were burned with the Icy Bay School. The following figures show the staged location of the bags and drums prior to placement on the stockpile.

Figure 22. Contaminated Soil in Supersacks Staged for Bioremediation

Figure 23. Staging Drums of Antifreeze/Oil and Water for Bioremediation

(Area 6) Generator Shed Area

The generator shed area was characterized in June 2002. 4 of the 5 soil samples collected to depths of 8 feet were contaminated with DRO concentrations exceeding clean-up limits. Maximum DRO concentration was identified at 10,000 ppm. An estimate of 660-1,020 CY of contaminated soil was suggested.

Excavation of the area commenced July 21, 2003 and continued through July 24, 2003. Additional excavation was performed August 11, 2003 to complete contaminated soil removal. The pattern of excavation was consistent with old building placement. The excavation total for the site was 1,102 CY. Excavated depths extended below the water table to as much as 14 feet. During excavation near the southeast corner of the shop a dark smear band was detected at approximately 8 feet BGS which appeared to extend under the SE corner of the shop. Excavation of the smear band under the corner of the shop was not performed to reduce risk of damage from undercutting the shop foundation. ADEC was contacted and approved leaving this small section of smear band in-place.

Traces of residual oil were detected on the water surface of the excavation after excavations were completed and considered clean. The surface of the water exhibited a bright sheen. Within 24 hours the sheen and any traces of residual oil were no longer visible. 39 confirmation samples were then collected.

The west bank of the excavation along and including the southeast corner of the shop, bottom of the excavation and a small corner of the shop were not found to be clean and new excavations were performed. The remaining smear band in the area was removed and the bottom of the pond deepened. Samples of the smear band were collected for characterization. The excavation proceeded as far under the building as prudent without risking damage the structure. 6 reconfirmation samples were collected. Results of excavation and sampling are noted the following figure and table.

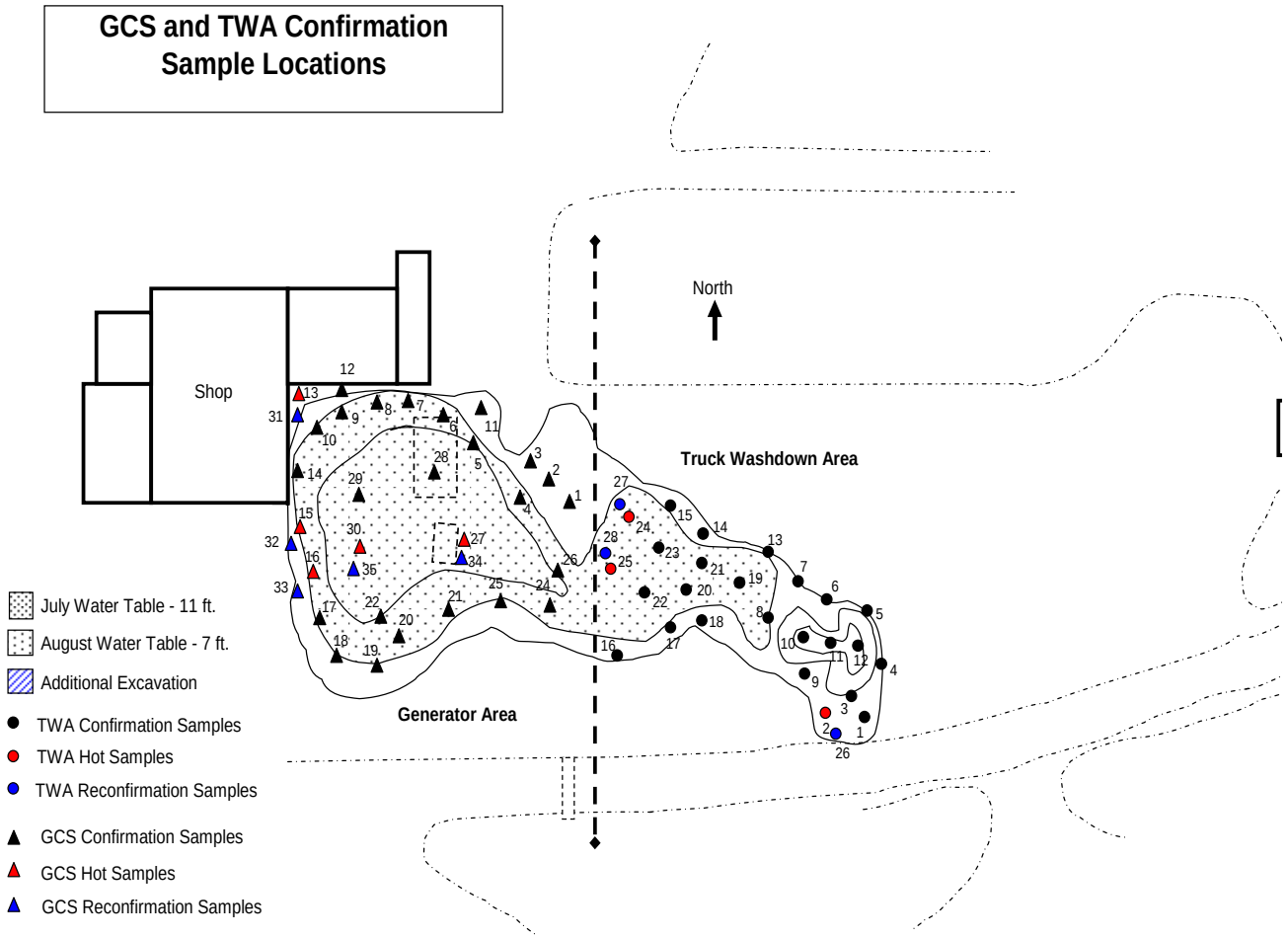


Figure 24. Generator Area (GCS) and Truck Washdown Area (TWA) Excavation and Confirmation Sampling Data

Confirmation sampling data is presented ion the following tables. This data was submitted and pre-approved by ADEC on 8/23/03.

Confirmation Data

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO	
			Limits	na	na	na	260	843	8300	
1	1	GCS001	42" bench	3.5	s	n-s	0	391	281	
1	1	GCS001D	42" bench	3.5	s	n-s	0	348	323	
1	2	GCS002	42" sidewall	3	n-s	n-s	0	456	233	
1	3	GCS003	100" sidewall	1	n	n	0	0	0	
1	4	GCS004	100" sidewall	0.5	n	n	0	0	0	
1	5	GCS005	72" sidewall	0.5	n	n	0	0	0	
1	6	GCS006	100" sidewall	0	n	n	0	0	0	
1	7	GCS007	100" sidewall	0	n-s	n-s	6.18	151	1,470	
1	8	GCS008	72" sidewall	0.5	n	n	0	0	0	
1	9	GCS009	84" sidewall	0	n	n	0	0	0	
1	10	GCS010	100" sidewall	0	n	n	0	0	0	
1	11	GCS011	42" bench	0	n	n-s	0	98.7	0	
1	12	GCS012	42" bench	0	n	n	0	0	0	
1	13	GCS013	42" bench	2	n-s	n-s	0	**1,160**	1,230	Sidewall Near SE Shop Corner
1	14	GCS014	156" sidewall	1	n-s	n	0	74.7	0	
1	15	GCS015	100" sidewall	0.5	s	n-s	0	**1,370**	0	
1	16	GCS016	90" sidewall	0.5	s	n-s	0	**1,640**	62.4	
1	16	GCS016D	90" sidewall	0.5	s	n-s	0	**1,600**	61.7	
1	17	GCS017	144" sidewall	1	n-s	n	0	0	0	
1	18	GCS018	42" bench	3	s	n-s	0	33.7	0	
1	19	GCS019	42" bench	0.5	n-s	n	0	0	0	
1	20	GCS020	42" bench	4	s	n-s	0	0	0	
1	21	GCS021	42" bench	3	s	s	0	150	93.1	
1	21	GCS021D	42" sidewall	3	s	s	0	179	143	
1	22	GCS022	156" sidewall	4	s	n-s	0	0	0	
1	23	GCS023	72" sidewall	1.5	n-s	n	0	0	0	
1	24	GCS024	120" sidewall	2	n-s	n-s	0	301	81	
1	25	GCS025	36" sidewall	2	n-s	n-s	0	573	1,350	
1	26	GCS026	42" sidewall	3	n-s	n-s	12.5	796	500	
1	27	GCS027	11 ft. bottom + 24"	6	s-m	s	27	**1,100**	2,200	Pond Bottom
1	28	GCS028	11 ft. bottom + 24"	4	s	n-s	0	14.9	0	
1	29	GCS029	11 ft. bottom + 24"	3	s	n-s	7	375	137	
1	30	GCS030	11 ft. bottom + 24"	7	s-m	s	11	**1,320**	540	
33										
			Mean				9.8	393.2	515.3	
			Standard Deviation				5.5	522.4	526.8	
			Alpha (95%)				0.05	0.05	0.05	
			Confidence Limit				1.9	178.2	179.7	
			High Interval				11.7	571.4	695.1	
			Low Interval				7.9	214.9	335.6	

Table 20. Generator Area (GCS) Confirmation Data

Pond bottom and west sidewall samples (5 sample locations and 6 samples – one was a duplicate) failing the criteria are highlighted in yellow. Additional excavations were performed in these areas. The west sidewall was removed to and slightly under the shop east foundation. The bottom of the pond was also extended in depth. Additional excavations were effective in removing remaining contaminants and new samples were collected to confirm clean closure. Reconfirmation sampling is noted in the following table. Reconfirmation

sampling data is presented ion the following tables. As previously indicated, this data was submitted and pre-approved by ADEC on 8/23/03.

Reconfirmation Data

	Map #	Former Sample #	Repeat Sample #	Depth/Location	PIDb	Odor	Sheen	DRO Prior	DRO After	
				Limits	na	na	na	843	843	
1	31	GCS013	GCS2-05	12" bench	0.1	n	n	1,160	125	Sidewall Near SE Shop Corner
1	32	GCS015	GCS2-02	72" sidewall	4	m	n	1,370	135	
1	33	GCS016	GCS2-01	72" sidewall	2.5	m	n	1,640	98	
1	33	GCS016D	GCS2-04	36" sidewall	0.1	n	s	1,600	198	
1	34	GCS027	GCS2-03	11 ft. bottom + 36"	42*	h	s-m	1,100	266	Pond Bottom
1	35	GCS030	GCS2-06	11 ft. bottom + 36"	26*	n-s	m	1,320	234	
6										
				Mean				1365.0	176.0	
				Standard Deviation				221.4	66.8	
				Alpha (95%)				0.05	0.05	
				Confidence Limit				177.2	53.5	
				High Interval				1542.2	229.5	
				Low Interval				1187.8	122.5	

Note: (*) Higher readings believed to be imparted by water in upper pond surface drawn into samples after extraction and not by surrounding soil.

Table 21. Generator Area (GCS) Reconfirmation Data

(Area 7) Truck Washdown Area

In June 2002, 23 soil samples were collected up to depths of 7 feet to characterize the Truck washdown area. 9 samples failed the DRO clean-up limit with a maximum concentration of 10,000 ppm. Only one sample failed the RRO clean-up limit with a concentration of 18,000 ppm. It was estimated that 550 to 650 CY of contaminated soil would need to be removed from the area to achieve clean-up standards.

Excavation of contaminated soils from the truck washdown area proceeded on July 24th and 25th with additional excavations on August 11th. The figure illustrating the Generator Area also identified and illustrates the Truck Washdown Area. With the exception of the parts shed, no historic buildings were noted in this area. The volume of contaminated soil removed form the area was 1,088 CY. The excavation sloped upward from the bottom of the generator shed area eastward. The east end of the excavation was as deep as 11 feet and through the water table. The northwest corner of the excavation resulted in the discovery of a small metal waste pile and a buried drum used as a sump contain oily sediments. These items were likely associated with the pre-1991 parts building near the area. The sump and surrounding soil was removed. The metals were separated form the soil and disposed in the metal waste dump. The east half of the area contained puncheon which was removed and discarded for burning at the sort yard burn pile.

Three samples from two general locations exceeded clean-up criteria. Equipment returned to the area and contamination at the west end and north wall of the excavation near the metal waste dump was extended and deepened to remove contaminants. The east end edge of the excavation near the roadway was also extended slightly into the road and deepened to remove contaminants. Approximately 28 CY were removed. Additional samples were collected to ensure that re-excavations were compliant with clean closure criteria. As previously indicated, this data was submitted and pre-approved by ADEC on 8/23/03. The following tables present data from samples collected.

Confirmation Data

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO	
			Limits	na	na	na	260	843	8300	
1	1	TWS001	Sidewall – 24”	5	n-s	s	0	39.3	195	
1	2	TWS002	Sidewall – 36”	5	s-m	s	0	**996**	885	East End Lip @ Road
1	3	TWS003	Sidewall – 36”	1	n	n	0	143	325	
1	4	TWS004	Sidewall – 36”	1.5	n-s	n	0	6.06	0	
1	5	TWS005	Sidewall – 36”	1.5	n	n	0	41.2	202	
1	6	TWS006	Sidewall – 36”	1	s	s-m	0	12.8	40.1	
1	6	TWS006D	Sidewall – 36”	1	s	s-m	0	12	30.8	
1	7	TWS007	Sidewall – 12”	1.5	n	n-s	0	640	200	
1	8	TWS008	Sidewall –24”	1.5	n	n-s	0	25	68.9	
1	9	TWS009	Sidewall –36”	1	n	n	0	89.4	197	
1	10	TWS010	Bottom – 108”	1	n	n	0	72.9	84.6	
1	11	TWS011	Bottom – 108”	1	n	n-s	0	9	0	
1	12	TWS012	Bottom – 108”	1.5	n	n-s	0	22.7	31.6	
1	13	TWS013	Sidewall – 48”	3	s	s-m	0	91	203	
1	14	TWS014	Sidewall – 36”	1	n-s	n-s	0	403	832	
1	15	TWS015	Sidewall – 36”	4.5	n	s	0	11.3	0	
1	16	TWS016	Sidewall – 48”	1.5	n-s	s	0	134	500	
1	17	TWS017	Sidewall – 48”	1	n-s	s	0	706	1,530	
1	18	TWS018	Sidewall – 24”	3	s	m-h	0	10	32.1	
1	19	TWS019	Sidewall – 60”	1.5	n-s	n	0	471	870	
1	20	TWS020	Sidewall – 60”	1.5	n-s	n	0	461	803	
1	21	TWS021	Sidewall – 60”	3	n	n-s	0	114	275	
1	21	TWS021D	Sidewall – 60”	3	n	n-s	0	72.4	228	
1	22	TWS022	Sidewall – 60”	2	n-s	n	0	375	906	
1	23	TWS023	Sidewall – 48”	1	n	n	0	15.1	28.6	
1	23	TWS023D	Sidewall – 48”	1	n	n	0	16.6	26.8	
1	24	TWS024	Bench – 78”	3	s-m	s	7.23	**1,100**	2,650	West Bench
1	25	TWS025	Bench – 84”	2	s-m	s	0	**1610**	740	
28										
			Mean				0.3	275.0	424.4	
			Standard Deviation				1.4	404.0	585.8	
			Alpha (95%)				0.05	0.05	0.05	
			Confidence Limit				0.5	149.6	217.0	
			High Interval				0.8	424.6	641.4	
			Low Interval				-0.2	125.4	207.5	

Table 22. Truck Washdown Area (TWA) Confirmation Data

The results of reconfirmation sampling are noted in the following table:

Reconfirmation Data

	Map #	Former Sample #	Repeat Sample #	Depth/Location	PIDb	Odor	Sheen	DRO Prior	DRO After
				Limits	na	na	na	843	843
1	26	TWS002	TWS2-03	Sidewall - 36"	3	m	n-s	**1,160**	112
1	27	TWS024	TWS2-02	Bench - 96"	1.5	m	n-s	**1,370**	135
1	28	TWS025	TWS2-01	Bench - 96"	0.5	s	n-s	**1,640**	266
3									
				Mean				1390.0	171.0
				Standard Deviation				240.6	83.1
				Alpha (95%)				0.05	0.05
				Confidence Limit				272.3	94.0
				High Interval				1662.3	265.0
				Low Interval				1117.7	77.0

Table 23. Truck Washdown Area (TWA) Reconfirmation Data

Following ADEC pre-approval of the confirmation data for both the generator and truck washdown areas, excavations were backfilled. Backfill material was removed from the 5-mile grave pit area north of the runway as approved by landowners. This pit is shown on a previous figure near the runway.

(Area 8) Oil Shed Area & (Area 10) North Equipment Storage Area

June 2002 characterization data indicated the presence of contamination in and around the Oil Shed as well as in the North Equipment Parking Area. Only 2 of 15 samples indicated the presence of GRO – both in and around the Small Vehicle Maintenance Shop with a maximum reading of 6,500 ppm. Supporting VOC, SVOC and Metals analyses from 4 samples resulted in the detection of trace concentrations of component constituents. 8 of 15 samples collected from the Oil Shed Area exhibited DRO concentration exceeding clean-up limits with a maximum reading of 5,500 ppm. 3 of 15 samples contained RRO concentrations exceeding clean-up limits with a maximum reading of 18,000 ppm. It was estimated that 475 to 680 CY would need to be excavated to achieve clean-up standards. 29 samples were collected from the equipment parking area surrounding the Oil Shed. No GRO was detected. 24 of 29 samples exhibited unacceptable DRO concentrations with a maximum reading of 16,000 ppm. 7 of 29 samples failed for RRO with a maximum reading of 13,000 ppm. It was estimated that the equipment storage area would require the excavation of 800-900 CY to achieve clean-up.

Excavation of the Oil Shed Area and surrounding parking areas was performed July 23, 28, 29, & 30, 2003 with repeat excavations on August 13 and 14, 2003. Re-excavations were needed to further remove contamination and included extending the west and south walls of the main excavation, removing additional soils from the bottom of the excavation, extending the depth of the excavation just north and east of the main hole and removing additional solvent contaminated soils at the bottom of the solvent excavation. A second re-excavation was performed just north of the shop at the east wall of the main excavation to further remove contaminants. Excavations were consistent with the locations of historic buildings in and around the site. A total of 2,054 CY of petroleum contaminated soil and 408 CY of solvent contaminated soil was removed the area for treatment. Excavations were as deep as 14 feet to remove contamination. Two unique aspects of the excavation effort included the presence of a highly contaminated smear band (saturated with motor oil) under the oil shed and an obvious solvent spill in the northeast corner of the parking area. Following removal of contaminated soil, confirmation/reconfirmation sampling and analyses was completed including 67 confirmation samples. Preliminary results of sampling were reviewed and approved by ADEC. Following approval, excavations were backfilled.

Smear Band

Excavations surrounding the water table identified a 6”-12” thick black band of sand & gravel saturated in motor oil. Contaminated and discolored soil also extended above and below the smear band for several feet. Free oil was visible in the interstitial spaces of the sample media and was easily released to the water creating a black slick. The following photos illustrate field observations:

Figure 25. Smear Band Excavation at the Oil Shed

Figure 26. Excavated Smear Band Material at the Oil Shed Containing Motor Oil

Figure 27. Motor Oil Released on Water Table From Smear Band Excavation

Because of the presence of the smear band at the Generator Shed excavation and again at the Oil Shed, it was determined that complete smear band removal would be necessary in order to eliminate the need for future groundwater monitoring. Accordingly, large volumes of clean overburden were removed from the area to allow access and removal of the smear band with associated underlying and overlying layers of contamination. This effort is discussed further in the groundwater section of this report.

The oil removed from the Oil Shed Area proper required special removal techniques as described in the previous "release" section of this report. Depressions and side ponds were developed over contaminated areas of the North Equipment Parking Area to capture oil. The footprints of these features were then excavated to achieve clean-up.

Solvent Contaminated Soils

On July 29, 2003 routine excavation in the northeast corner of the North Equipment Area uncovered contaminated soils with a distinct "solvent" odor. Samples of the soil were immediately collected for characterization. Previous characterization work in June 2002 did not indicate the presence of solvent but did suggest that the general area was suspect of containing petroleum contamination in general Sample characterization results indicted that the solvent waste was indeed Stoddard Solvent.

Based on a similar discovery at Camp #2, work proceeded under the assumption that the contamination was derived from a spill of Stoddard Solvent, a common solvent used in logging camps. ADEC was called on July 29, 2003 and agreement reached by teleconference to manage the soils in the same way as similar soils from Camp #2 had been managed. A separate stockpile and treatment area was prepared for the soils.

The following photo illustrates solvent contamination management activities. The segregated stockpile is shown with some contaminated soils placed in the area. Solvent contaminated soils were excavated on July 29, 2003. Confirmation samples were collected and analyzed. The west sidewall of the excavation was found to still be contaminated based on sample results. This sidewall was also littered with buried metal waste. The metal was carefully removed as additional excavations were performed. Reconfirmation samples were then collected and analyzed indicating that all contaminants had been removed. Scrap metal was loaded and delivered to the metal waste dump. A total of 408 CY of solvent contaminated soil was removed form the excavation area.

Figure 28. Separated Solvent Stockpile Excavated From Oil Shed Area

North Equipment Storage Area

This area (identified as Area 10) was excavated as part of the Oil Shed excavation and is illustrated on following figure. Equipment storage and maintenance activities performed around the oil shed were the main causes of contamination in this area.

During characterization in June 2002, an open truck bed was located northeast of the Vehicle Maintenance Shop and was used to burn shop debris. The truck bed was later abandoned and cut-up as scrap. The bed was not present during remediation work. Three exploratory trenches were excavated in this area to locate expected contamination from the truck bed used for burning. No contamination was found. Exploratory trenches were cut wide and deep with an excavator and encompassed the entire area where the former truck bed for burning had been located. Trenching is noted in the figure on the following page.

General contamination in the parking area as evidenced by both characterization sampling results and oil stains on the ground surface was excavated and removed. Typical excavations were shallow to moderate in depth and did not proceed to the water table except at the solvent contamination site. Several empty metal drums, empty metal containers and fuel filters were collected during the excavation and managed as metal waste in accordance with camp waste regulations.

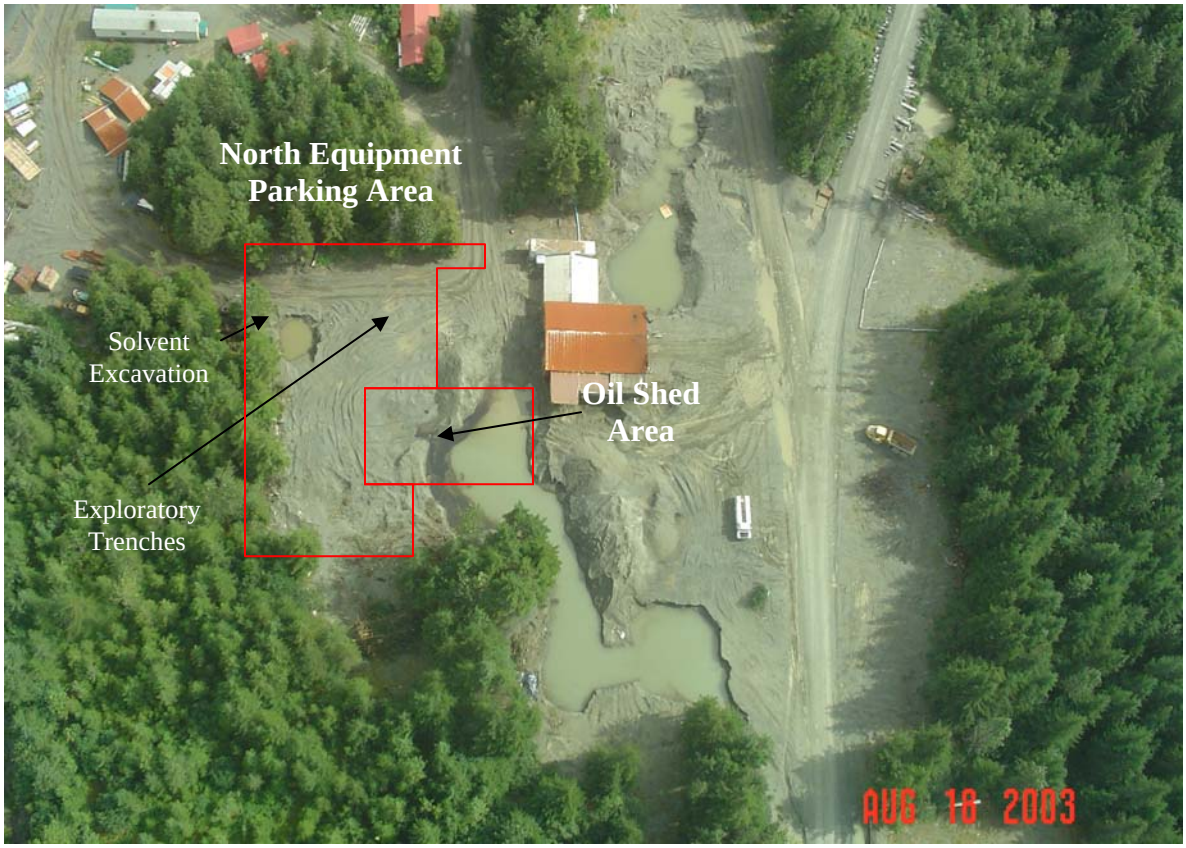


Figure 29. North Equipment Parking Area

Figure 30. Exploratory Trenching Near the Shop in North Equipment Parking Area

Adequate excavation coverage was provided to ensure that all the areas identified in the characterization report were addressed as noted below. General excavation and two sessions of re-excavation were performed to ensure all contaminated soils were removed.

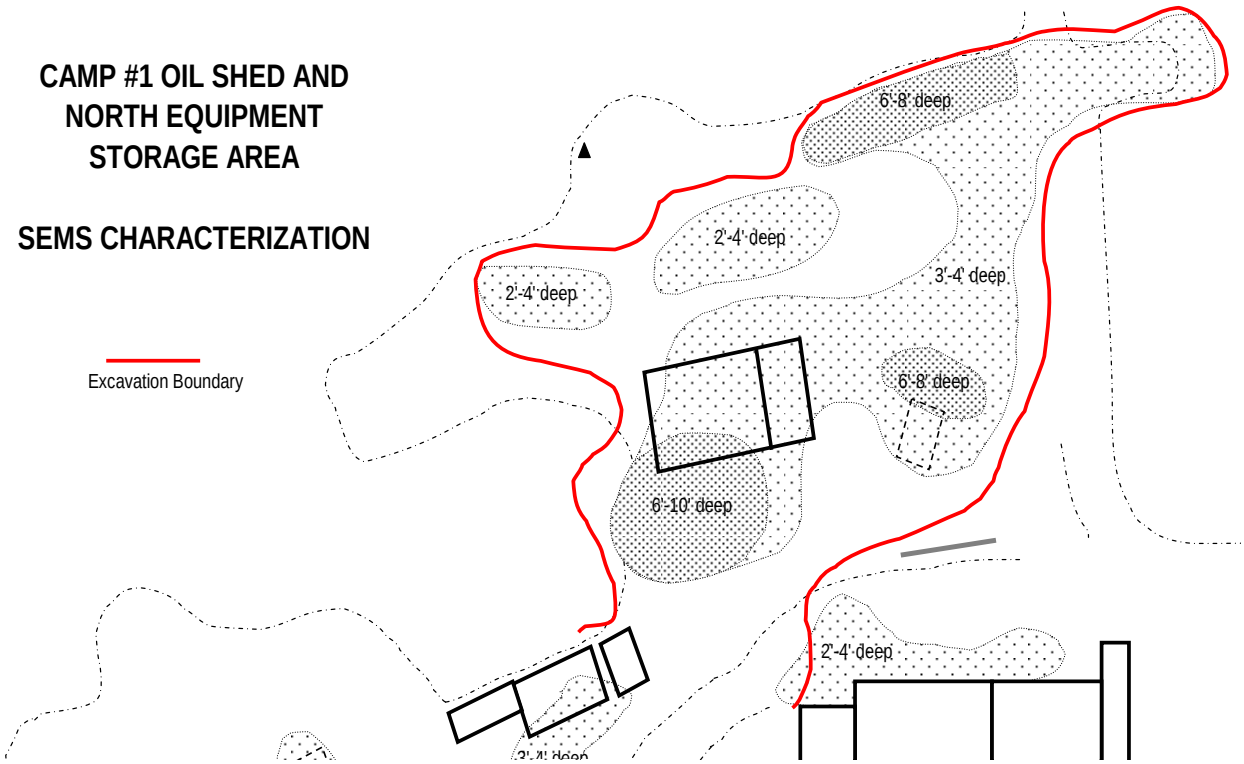


Figure 31. Excavation Boundary Associated With Oil Shed and North Equipment Parking Area Relative to Characterization

Confirmation and reconfirmation sampling data from the areas described are presented in the following figure.

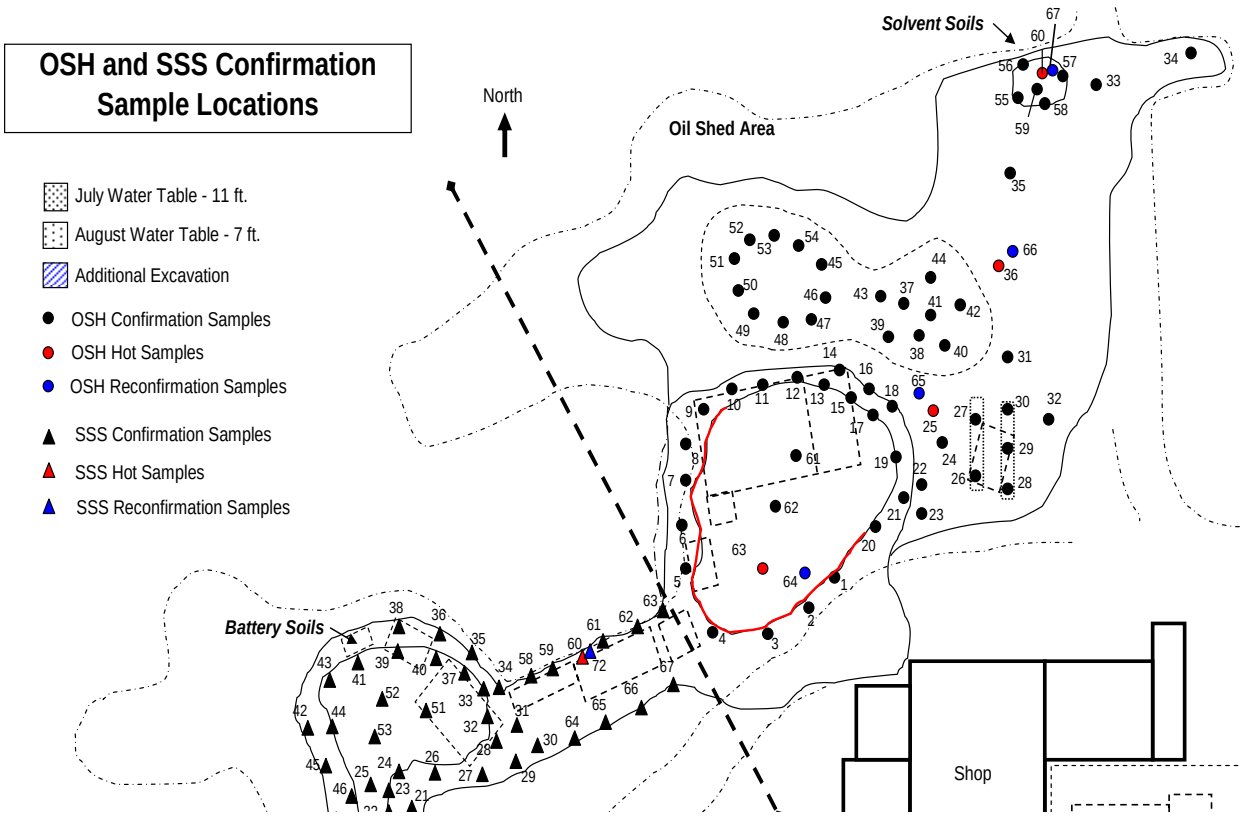


Figure 32. Oil Shed and North Equipment Storage Area Confirmation Sampling

Confirmation data associated with this figure is presented in the following tables:

CONFIRMATION SAMPLES

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO	8260B
			Limits	na	na	na	260	843	8300	na
1	1	OSH-01	Sidewall 48"	1	s	n	0.0	4.4	0.0	nt
1	2	OSH-02	Sidewall 60"	1	s	n-s	0.0	5.8	0.0	nt
1	3	OSH-03	Sidewall 72"	0	n	n	0.0	6.0	0.0	nt
1	4	OSH-04	Sidewall 84"	1	n	n	0.0	0.0	0.0	nt
1	5	OSH-05	Sidewall 72"	0	n	n-s	1.3	5.1	0.0	nt
1	6	OSH-06	Sidewall 54"	6	n	n-s	2.0	4.7	0.0	nt
1	6	OSH-06D	Sidewall 54"	6	n	n-s	0.0	6.4	0.0	nt
1	7	OSH-07	Sidewall 68"	2.5	n	n-s	3.3	11.0	25.6	nt
1	7	OSH-07D	Sidewall 68"	2.5	n	n-s	0.0	9.1	26.2	nt
1	8	OSH-08	Sidewall 120"	5.5	n-s	n	2.1	9.6	33.9	nt
1	9	OSH-09	Sidewall 108"	4.5	n	s	0.0	8.8	0.0	nt
1	10	OSH-10	Sidewall 48"	5	n-s	s	1.8	9.3	0.0	nt
1	11	OSH-11	Sidewall 60"	3.5	n	s	0.0	5.0	0.0	nt
1	11	OSH-11D	Sidewall 72"	3.5	n	s	0.0	5.7	0.0	nt
1	12	OSH-12	Sidewall 84"	3.5	n	n-s	0.0	5.1	0.0	nt
1	12	OSH-12D	Sidewall 120"	3.5	n	n-s	0.0	4.6	0.0	nt
1	13	OSH-13	Sidewall 96"	5	s	s	2.1	460.0	2,070.0	nt
1	14	OSH-14	Sidewall 24"	3	n	n	0.0	5.0	0.0	nt
1	14	OSH-14D	Sidewall 24"	3	n	n	0.0	5.8	0.0	nt
1	15	OSH-15	Sidewall 68"	2.5	n	s	0.0	5.5	0.0	nt
1	16	OSH-16	Sidewall 36"	2	n	s	0.0	7.1	0.0	nt
1	17	OSH-17	Sidewall 108"	2	n	n-s	0.0	7.3	0.0	nt
1	18	OSH-18	Sidewall 36"	12	s	s	2.5	332.0	1,160.0	nt
1	19	OSH-19	Sidewall 52"	6	n-s	s	0.0	134.0	530.0	nt
1	20	OSH-20	Sidewall 72"	2	n	n-s	0.0	12.1	35.0	nt
1	20	OSH-20D	Sidewall 84"	2	n	n-s	0.0	10.5	28.7	nt
1	21	OSH-21	Bench 60"	30	s	m-h	2.3	831.0	4,410.0	nt
1	22	OSH-22	Bench 60"	19	n	n-s	0.0	11.6	28.3	nt
1	23	OSH-23	Bench 60"	29	n	s-n	0.0	44.8	142.0	nt
1	24	OSH-24	Bench 36"	15	s	n-s	0.0	6.7	0.0	nt
1	25	OSH-25	Bench 36"	30	s-m	s	5.9	**911.0**	1,210.0	nt
1	26	OSH-26	Trench Wall 48"	29	s	n-s	0.0	8.1	0.0	nt
1	27	OSH-27	Trench Wall 60"	7.5	n	n-s	0.0	16.8	43.0	nt
1	28	OSH-28	Trench Wall 48"	22	n	n-s	0.0	19.7	43.9	nt
1	29	OSH-29	Trench Wall 72"	26	s	n-s	0.0	48.1	154.0	nt
1	30	OSH-30	Trench Wall 48"	8	s	n-s	0.0	26.0	77.8	nt
1	31	OSH-31	Bench 24"	8	s	n-s	0.0	628.0	1,850.0	nt
1	32	OSH-32	Bench 24"	16.5	n-s	n-s	0.0	11.2	0.0	nt
1	33	OSH-33	Bench 12"	10	s	n	0.0	12.7	28.5	nt
1	34	OSH-34	Bench 36"	20	n	s	3.0	636.0	1,330.0	nt
1	35	OSH-35	Bench 12"	20	s	s	0.0	139.0	125.0	nt
1	36	OSH-36	Bench 24"	33	n-s	m-h	1.9	**864.0**	3,420.0	nt
1	37	OSH-37	Depression 48"	18.5	s	s	0.0	429.0	1,760.0	nt
1	38	OSH-38	Depression 42"	29	n	m	0.0	141.0	920.0	nt
1	38	OSH-38D	Depression 51"	29	n	m	0.0	73.3	421.0	nt
1	39	OSH-39	Depression 48"	3	s	s	1.0	287.0	1,600.0	nt
1	40	OSH-40	Depression 42"	9	s	s	0.0	436.0	1,820.0	nt

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO	8260B
			Limits	na	na	na	260	843	8300	na
1	41	OSH-41	Depression 54"	7	s	s	0.0	334.0	1,200.0	nt
1	42	OSH-42	Depression 40"	7	n-s	s	0.0	85.2	858.0	nt
1	43	OSH-43	Depression 60"	8	s	s-m	3.0	472.0	1,860.0	nt
1	44	OSH-44	Depression 48"	14	s	s	0.0	515.0	2,040.0	nt
1	45	OSH-45	Depression 48"	20	s	n-s	0.0	398.0	1,210.0	nt
1	45	OSH-45D	Depression 52"	20	s	n-s	0.0	277.0	1,030.0	nt
1	46	OSH-46	Depression 52"	18	s	s	0.0	805.0	2,730.0	nt
1	46	OSH-46D	Depression 50"	18	s	s	0.0	492.0	1,810.0	nt
1	47	OSH-47	Depression 48"	15	n	s	0.0	139.0	509.0	nt
1	48	OSH-48	Depression 46"	25	n-s	n-s	0.0	177.0	554.0	nt
1	49	OSH-49	Depression 42"	5	n-s	s	0.0	69.1	293.0	nt
1	50	OSH-50	Depression 42"	6	n	s	0.0	589.0	1,880.0	nt
1	51	OSH-51	Depression 48"	3	s	n-s	0.0	518.0	2,220.0	nt
1	52	OSH-52	Depression 46"	0.9	s	n-s	0.0	104.0	304.0	nt
1	53	OSH-53	Depression 52"	3	n-s	n-s	0.0	30.4	131.0	nt
1	54	OSH-54	Sidewall 60"	2.5	n-s	s	0.0	25.0	66.7	nt
1	55	OSH-55	Sidewall 48"	3	n-s	n	0.0	0.0	0.0	0.0
1	55	OSH-55D	Sidewall 48"	3	n-s	n	0.0	0.0	0.0	0.0
1	56	OSH-56	Sidewall 72"	6.5	s	s	0.0	4.2	0.0	0.0
1	57	OSH-57	Sidewall 60"	18	n	s	0.0	0.0	0.0	0.0
1	58	OSH-58	Sidewall 60"	24	s	n-s	0.0	6.6	0.0	0.0
1	59	OSH-59	9 ft. Bottom	38	n-s	s	0.0	598.0	887.0	0.0
1	60	OSH-60	9 ft. Bottom	18	n-s	s	0.0	**1,070.0**	796.0	0.0
1	61	OSH-B3	11 ft. Bottom + 12"	21	s	s	3.7	520.0	2,390.0	nt
1	62	OSB-B2	11 ft. Bottom + 12"	18	s	s	7.3	755.0	3,570.0	nt
1	63	OSH-B1	11 ft. Bottom + 12"	31	s	s	4.0	**903.0**	4,220.0	nt
73										
			Mean				17.2	522.2	2134.9	
			Standard Deviation				30.2	300.0	1387.0	
			Alpha (95%)				0.05	0.05	0.05	
			Confidence Limit				6.9	68.8	318.2	
			High Interval				24.1	591.0	2453.1	
			Low Interval				10.3	453.4	1816.7	

Table 24. Oil Shed (OSH) and North Equipment Parking Area (OSH) Confirmation Samples

Solvent characterization and confirmation data is also presented below for information as well as reconfirmation sampling performed in the Oil Shed Area.

SOLVENT CHARACTERIZATION SAMPLES

				PIDb	Odor	Sheen	GRO	DRO	RRO	8260B
1	59	SOLVENT X	Product - Stoddard	2,000	h	h	163,000.0	350,000.0	0.0	listed
1	59	SOLVENT 1	36"	245	h	h	788.0	0.0	0.0	listed
1	59	SOLVENT 2	48"	350	h	h	1,080.0	0.0	0.0	listed

SOLVENT CONSTITUENTS (8260B)

59	Solvent X	acetone	73.4
		sec-butylbenzene	7.6
		ethylbenzene	7.85
		isopropylbenzene	7.35
		p-isopropyltoluene	8.65
		toluene	2.05
		1,2,4 trimethylbenzene	69.2
		1,3,5 trimethylbenzene	53.8
		o-xylene	8.5
		m,p-xylene	20.1

59	Solvent 1	none detected	ND

59	Solvent 2	acetone	0.918
		n-butylbenzene	0.254
		sec-butylbenzene	0.233
		ethylbenzene	0.172
		p-isopropylbenzene	0.116
		toluene	0.0747
		1,2,4 trimethylbenzene	1.08
		1,3,5 trimethylbenzene	0.898
		o-xylene	0.158
		m,p-xylene	0.447

	Map #	Former Sample #	Repeat Sample #	Depth/Location	PIDb	Odor	Sheen	DRO Prior	DRO After
				Limits	na	na	na	843	843
1	64	OSH-B1	OSH-B1R	11 ft. Bottom + 36"	2	n-s	n-s	**903**	221
1	65	OSH-25	OSH-25R	Bench 48"	3	n-s	n-s	**911**	119
1	66	OSH-36	OSH-36R	Bench 36"	3.5	s	n-s	**864**	103
1	67	OSH-60	OSH-60R	10 ft. Bottom	2	n-s	n	**1,070**	151
4									
				Mean				711.3	93.3
				Standard Deviation				108.0	24.4
				Alpha (95%)				0.05	0.05
				Confidence Limit				105.8	24.0
				High Interval				817.0	117.2
				Low Interval				605.5	69.3

Note: (*) *Smear band contamination shown in the attached map and depicted as a red line was seen leaching oil into the excavation pond. The embankment was removed in this area and additional smear band contamination removed.*

Table 25. Solvent Characterization and Reconfirmation Data From Oil Shed Area

(Area 9) Saw Shop Area & (Area 11) Southwest Equipment Storage Area

These areas were addressed as one general area during remediation of camp #1, but were characterized separately in June 2002. June 2002 characterization data indicated the presence of contamination in and around the Saw Shop as well as in the Southwest Equipment Storage Area.

Two samples from the Saw Shop were collected. One of the samples exhibited a DRO concentration of 6,600 ppm. It was estimated that 70-100 CY would soil would need to be excavated during remediation to achieve clean-up limits. 8 of 13 samples collected from the Southwest Equipment Storage Area exhibited contamination with a maximum DRO concentration of 7,300 ppm and maximum RRO concentration of 13,000 ppm. An estimate of 510-670 CY was given to support remediation of the area.

Excavation of the Saw Shop Area and SW Equipment Storage Area was performed July 30 & 31, 2003. Excavations were consistent with the locations of historic buildings formerly located in and around the site. A total of 1,700 CY of petroleum contaminated soil was removed the area for treatment. Excavations were as deep as 9 feet to remove contamination. Two unique aspects of the excavation effort included the presence of a highly contaminated smear band (saturated with hydraulic oil) under the oil shed and an apparent acid spill in the north end of the parking area. The presence of the smear band was a continuation of the smear band from the oil shed area.

Following removal of contaminated soil, confirmation/reconfirmation sampling and analyses was completed. Preliminary results of sampling were reviewed and approved by ADEC. Following approval, excavations were backfilled.

Smear Band

As with the Oil Shed Area, excavations surrounding the water table identified a 6”-12” thick black band of sand & gravel saturated in oil. The oil was much lighter than oil under the oil shed and appeared to contain some amount of pre-1972 hydraulic oil with zinc. The smear band diminished in color and intensity under the Saw Shack and the volume of oil released to the water was also observed to lesser quantities that what had been previously observed. As with the Oil Shed, contaminated and discolored soil also extended above and below the smear band for several feet. However free oil was no longer visible in the interstitial spaces of the sample media. Large volumes of over burden were removed form the area to access and remove the smear band. The shape of the plume as noted by the shape of the excavation suggested a groundwater path moving from the northeast to the southwest. The following figures illustrate information noted:

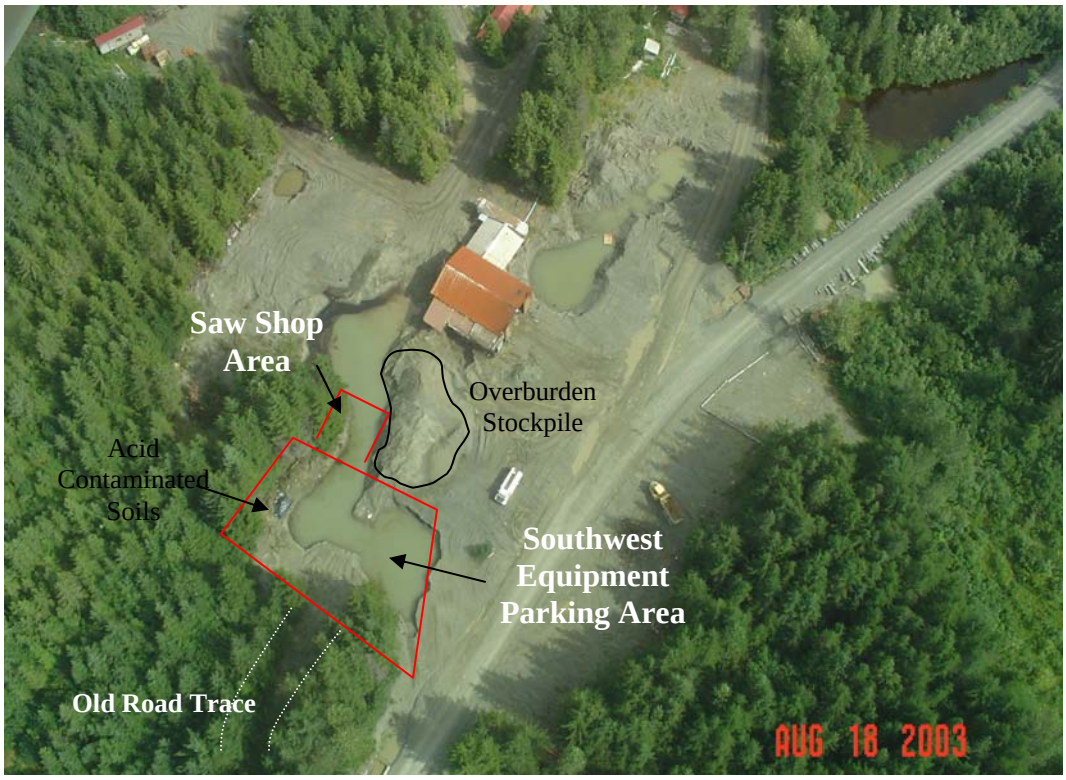


Figure 33. Location of Saw Shop and SW Equipment Parking Area

Figure 34. Saw Shop Excavation with Lighter Oil on Water Table

Figure 35. Overburden (Clean Fill) Stockpile Adjacent to Saw Shop Excavation

Figure 36. Smear Band at Saw Shop Excavation

Mapping of 82 confirmation samples collected from the Saw Shop and surrounding areas is noted below:

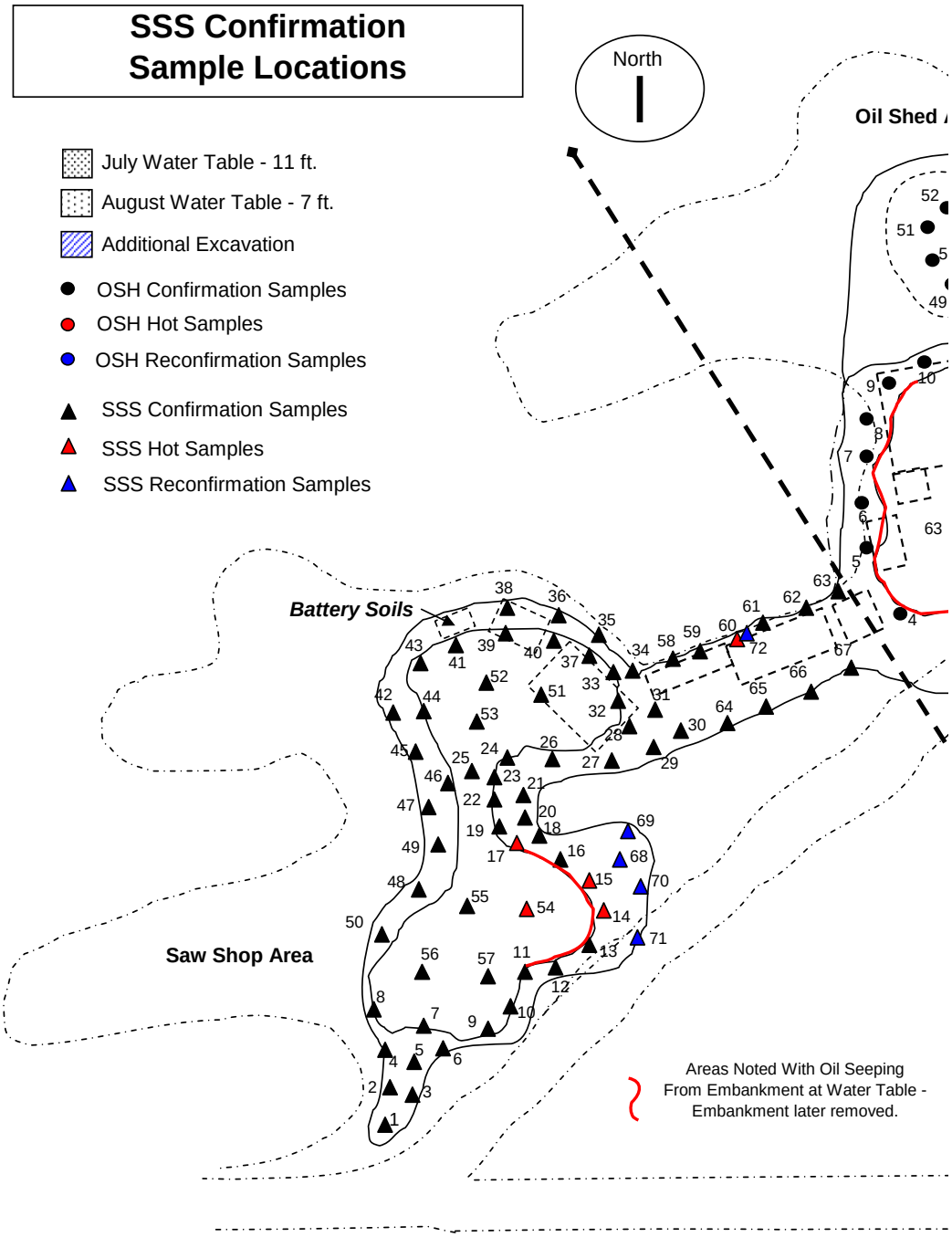


Figure 37. Saw Shop (SSS) Confirmation and Reconfirmation Sampling Locations

Acid Stained Soils

Soils with bright orange discoloration were detected at the north end of the main saw shop excavation near an area where an historic battery shop had been located. Gray/blue discoloration typical of petroleum contamination was also noted. In these circumstances the possible presence of lead from lead/acid batteries is a concern. 1-2 CY was collected and placed on a lined and covered stockpile away from other petroleum contaminated soils pending characterization analyses for lead. No evidence of batteries was found in any excavation.

The acid stained soils contained no lead and were therefore likely the result of acid spills during the filling of new batteries with no lead present. The small amount of soils collected (1-2 CY) and sequestered from the main petroleum contaminated stockpile for testing were then added back to the pile for treatment.

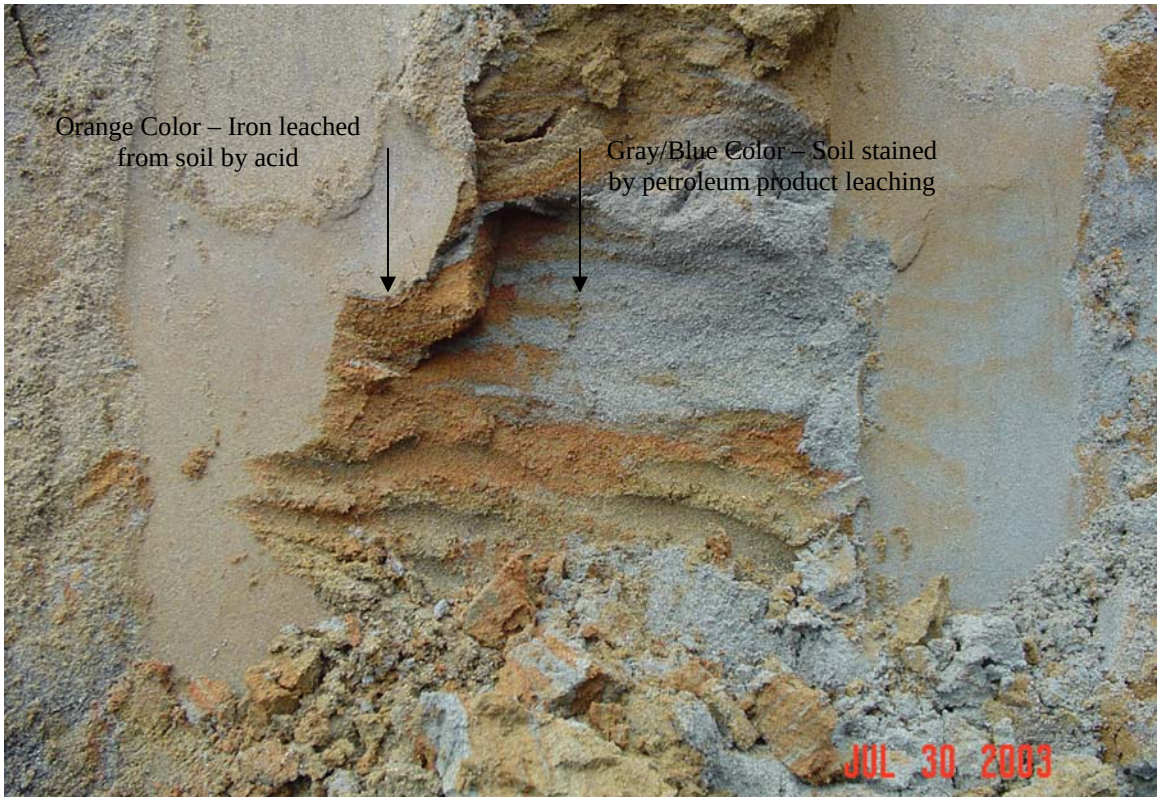


Figure 38. Acid and Petroleum Stained Soils Segregated for Testing at Saw Shop Area

Figure 39. Acid Stained Soil Stockpile Adjacent to Saw Shop Excavation

Characterization data of the acid stained soils is presented below for review:

Battery Soil Characterization

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO	RCR
			Limits	na	na	na	260	843	8300	Metals
1	1	Battery 1					0	21.1	31.4	List
1	2	Battery 2					0	36.9	59.6	List

Metals	Battery 1	Battery 2
Silver	0	0
Arsenic	3.97	3.62
Barium	26.7	22.7
Cadmium	0	0
Chromium	19.9	17.3
Iron	21400	18900
Mercury	0	0
Lead	2.32	2.12
Selenium	0	0

Table 26. Acid Stained Soil Characterization Data Identifying High Iron and Background Lead Concentrations

Having been characterized as containing only iron and petroleum contaminants the soils in the small sequestered stockpile were removed to the treatment pile.

As noted from the sample data illustrated, the bottom of the south end of the excavation and the associated eastern sidewall failed to initially remove contaminants. The north sidewall of the narrow excavation neck connecting to the oil shed excavation also required additional excavation. Following repeated excavation, reconfirmation samples were collected with results indicating that contamination had been successfully removed. Analytical results of confirmation and reconfirmation sampling are presented below.

CONFIRMATION SAMPLES

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO
			Limits	na	na	na	260	843	8300
1	1	SSS-01	Bench 24"	23	s	s-m	0.0	0.0	72.7
1	2	SSS-02	Bench 30"	9	n-s	s	0.0	84.4	232.0
1	3	SSS-03	Bench 36"	3.5	s	s-m	0.0	0.0	72.7
1	4	SSS-04	Bench 48"	5	n	n-s	0.0	0.0	232.0
1	5	SSS-05	Bench 54"	28	s-m	h	0.0	90.4	0.0
1	6	SSS-06	Bench 54"	4	n	s	0.0	148.0	0.0
1	7	SSS-07	Sidewall 54"	8.5	n-s	s	0.0	0.0	5.7
1	8	SSS-08	Sidewall 72"	9	n	s	1.5	0.0	0.0
1	9	SSS-09	Sidewall 84"	26	s-m	m	0.0	664.0	0.0
1	10	SSS-10	Sidewall 54"	5.5	n-s	n	0.0	0.0	1,680.0
1	11	SSS-11	Sidewall 96"	8	s	s-m	0.0	0.0	0.0
1	11	SSS-11D	Sidewall 96"	8	s	s-m	0.0	10.0	0.0
1	12	SSS-12	Sidewall 36"	5	n	n	0.0	0.0	0.0
1	13	SSS-13	Sidewall 36"	5.5	n	n	0.0	0.0	0.0
1	14	SSS-14	Sidewall 48"	13	s-m	n	2.8	**1,080.0**	0.0
1	15	SSS-15	Sidewall 54"	14	s-m	n-s	3.1	**2,710.0**	0.0
1	16	SSS-16	Sidewall 72"	11	n-s	n	1.8	809.0	0.0
1	17	SSS-17	Sidewall 52"	27	s-m	s	2.1	**2,500.0**	0.0
1	18	SSS-18	Sidewall 36"	9	n-s	s	0.0	0.0	0.0
1	19	SSS-19	Sidewall 72"	3.5	n-s	s	0.0	0.0	0.0
1	19	SSS-19D	Sidewall 72"	3.5	n-s	s	0.0	8.4	0.0
1	20	SSS-20	Sidewall 48"	4	n-s	s	0.0	0.0	0.0
1	21	SSS-21	Sidewall 36"	5	n-s	s	0.0	8.2	0.0
1	22	SSS-22	Sidewall 60"	14	n	n	0.0	5.7	0.0
1	23	SSS-23	Sidewall 54"	13	n	n	0.0	7.4	0.0
1	24	SSS-24	Sidewall 84"	4	n	n-s	0.0	6.2	0.0
1	25	SSS-25	Bottom 120"	2	n	n	1.7	13.3	45.0
1	26	SSS-26	Bench 60"	1	s	s-m	0.0	45.4	538.0
1	27	SSS-27	Bench 62"	4.5	n	n-s	0.0	74.9	74.2
1	28	SSS-28	Bench 50"	6	s	s-m	0.0	20.3	42.8
1	29	SSS-29	Bench 48"	4.5	n	n-s	0.0	111.0	218.0
1	30	SSS-30	Bench 36"	3	n	n-s	2.5	205.0	613.0
1	31	SSS-31	Bench 24"	0.5	n-s	s	0.0	72.9	363.0
1	31	SSS-31D	Bench 24"	0.5	n	n	0.0	90.4	393.0
1	32	SSS-32	Sidewall 84"	1.5	n	n	1.1	6.5	0.0

Continued -

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO
			Limits	**na**	**na**	**na**	**260**	**843**	**8300**
1	33	SSS-33	Sidewall 96"	2.5	n	n-s	1.0	24.6	101.0
1	34	SSS-34	Sidewall 24"	1.5	n	n	0.0	26.3	142.0
1	35	SSS-35	Bench 24"	1.5	n	n-s	0.0	4.3	0.0
1	36	SSS-36	Bench 28"	3	n	n-s	0.0	6.3	0.0
1	37	SSS-37	Sidewall 108"	3.5	n-s	s	0.0	35.3	161.0
1	38	SSS-38	Bench 36"	2	n-s	n-s	0.0	4.7	0.0
1	38	SSS-38D	Bench 36"	2	n	n-s	0.0	0.0	0.0
1	39	SSS-39	Sidewall 96"	18	n	n-s	0.0	5.2	0.0
1	40	SSS-40	Sidewall 72"	2.5	n-s	n-s	0.0	5.6	0.0
1	41	SSS-41	Sidewall 84"	2	n-s	s	0.0	4.5	0.0
1	42	SSS-42	Sidewall 38"	0.2	n-s	s	0.0	4.3	0.0
1	43	SSS-43	Sidewall 96"	2.5	n	n	0.0	94.9	155.0
1	44	SSS-44	Sidewall 70"	3	n	n-s	0.0	7.3	26.7
1	45	SSS-45	Sidewall 24"	5	n-s	s	0.0	5.3	0.0
1	45	SSS-45D	Sidewall 41"	5	n-s	s	0.0	5.9	0.0
1	46	SSS-46	Sidewall 60"	0.5	n	n-s	0.0	4.6	0.0
1	47	SSS-47	Sidewall 49"	1.5	n	n	0.0	31.6	0.0
1	48	SSS-48	Sidewall 54"	0.5	n	n	0.0	5.3	0.0
1	48	SSS-48D	Sidewall 54"	0.5	n	n	0.0	6.7	0.0
1	49	SSS-49	Sidewall 60"	2.5	n	n	2.9	4.8	0.0
1	50	SSS-50	Sidewall 108"	5	n	n	0.0	172.0	0.0
1	58	SSS-51	Sidewall 72"	3	n	n	0.0	4.5	0.0
1	59	SSS-52	Sidewall 72"	2	n	n	0.0	7.9	0.0
1	60	SSS-53	Sidewall 72"	1	s	s	0.0	**3,070.0**	6,670.0
1	61	SSS-54	Sidewall 72"	1.5	n	n-s	0.0	7.7	0.0
1	62	SSS-55	Sidewall 72"	2	n	n	0.0	6.0	0.0
1	63	SSS-56	Sidewall 72"	1.5	n-s	n-s	0.0	5.9	0.0
1	63	SSS-56D	Sidewall 72"	0.5	n	n	0.0	8.3	32.5
1	64	SSS-57	Sidewall 84"	0.5	n	n	0.0	54.1	167.0
1	65	SSS-58	Sidewall 84"	2	n	n-s	0.0	11.2	29.9
1	66	SSS-59	Sidewall 82"	3	n	n	0.0	17.4	0.0
1	67	SSS-60	Sidewall 72"	5	n	n	0.0	110.0	466.0
1	51	SSS-B7	11 ft. Bottom + 12"	12	s	s-m	0.0	255.0	800.0
1	52	SSS-B6	11 ft. Bottom + 12"	23	s	s-m	0.0	339.0	1,050.0
1	53	SSS-B5	11 ft. Bottom + 12"	18	s	s	0.0	33.4	74.8
1	54	SSS-B2	11 ft. Bottom + 12"	32	s-m	m	2.3	**2,760.0**	7,460.0
1	55	SSS-B1	11 ft. Bottom + 12"	23	s	s-m	1.9	765.0	465.0
1	56	SSS-B3	11 ft. Bottom + 12"	18	n-s	s	2.0	297.0	622.0
1	57	SSS-B4	11 ft. Bottom + 12"	13	n-s	s	0.0	265.0	40.4
74									
			Mean				**16.6**	**573.8**	**1201.4**
			Standard Deviation				**30.0**	**640.3**	**1482.1**
			Alpha (95%)				**0.05**	**0.05**	**0.05**
			Confidence Limit				**6.8**	**145.9**	**337.7**
			High Interval				**23.4**	**719.7**	**1539.1**
			Low Interval				**9.7**	**427.9**	**863.7**

Table 27. Saw Shop (SSS) and SE Equipment Storage Area (SSS) Confirmation Samples

Reconfirmation Sample results tied to re-excavations are noted on the following page:

RECONFIRMATION SAMPLING

	Map #	Former Sample #	Repeat Sample #	Depth/Location	PIDb	Odor	Sheen	DRO Prior	DRO After
				Limits	na	na	na	843	843
1	69	SSS-14	SSS-61	Sidewall 54"	2	n	n-s	**1,080**	342
1	70	SSS-15	SSS-62	Sidewall 48"	1	n	n	**2,710**	449
1	71	SSS-17	SSS-63	Sidewall 60"	1.5	n-s	n-s	**2,500**	311
1	72	SSS-53	SSS-53R	Sidewall 84"	0.5	n	n	**3,070**	358
1	68	SSS-B2	SSS-B2R	11 ft. Bottom + 36"	5.5	s	s	**2,760**	671
5									
				Mean				2424.0	426.2
				Standard Deviation				778.5	146.2
				Alpha (95%)				0.05	0.05
				Confidence Limit				682.4	128.1
				High Interval				3106.4	554.3
				Low Interval				1741.6	298.1

Note: (*) *Smear band contamination shown in the attached map and depicted as a red line was seen leaching oil into the excavation pond. The embankment was removed in this area and additional smear band contamination removed.*

Table 28. Reconfirmation Sampling Results From Saw Shop Area (SSS)

The deepest excavations were at 14 ft. BGS and approaching bedrock. At these deepest depths, large glacial rocks and boulders were occasionally encountered embedded in blue/gray glacial silt/clay. Confirmation and reconfirmation data was summarized and presented to ADEC for preliminary approval. Following preliminary approval the excavation site was cleared for backfilling, which occurred in September.

(Area 12) Camp Fuel Depot Area

This area was not identified during site characterization work in June 2002 and was discovered on August 14, 2003 at the conclusion of excavations at the Maintenance Shop, Saw Shop and South Equipment Parking Area. Following discussions with landowners and ADEC, a determination was made to proceed with remediation. Sidewalls in each of these excavations bordering the undiscovered depot were difficult to clean and exhibited DRO concentrations below but near the clean-up limits. Historic mapping indicated that a camp fuel depot had been used prior to 1990. Based on the map and the presence of DRO contaminants in adjoining excavation sites, exploratory excavations were performed and resulted in the identification of the depot site at the location noted in the figure below. Characterization samples were collected and analyzed from

five (5) samples all indicating the presence of DRO exceeding clean-up limits (3,000 ppm to 6,000 ppm DRO). Exploratory excavations successfully identified the location of the depot. Following discussions with land owners a decision was made to excavate the depot.

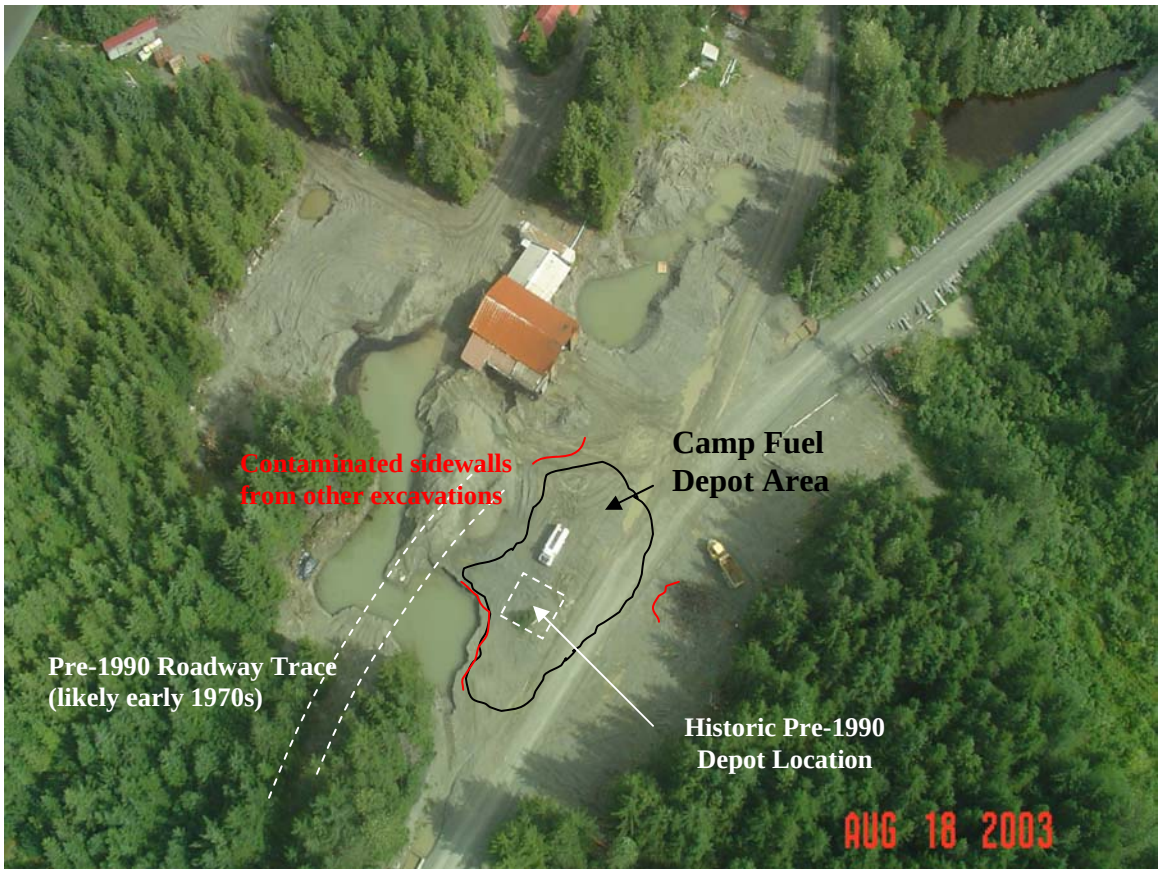


Figure 40. Camp Fuel Depot Excavation Area Location

Excavation of the camp depot was performed September 8,9,10 and 11, 2003. Excavation resulted in the removal of 3,767 CY of contaminated soil. The soil was placed in the previously approved runway stockpile for treatment. Excavation depths exceeded 12 feet. All traces of smear band at the water table were excavated and removed. Only traces of oil were noted accumulating at the water surface during excavation. Following the excavation, the water surface was observed to be clean. Prior approval was granted by ADEC to limit confirmation sampling numbers to minimum acceptable in order to preserve remediation funding. Sample results are noted following photographs of the excavation.

Figure 41. Camp Fuel Depot Excavation Looking West

Figure 42. Camp Fuel Depot Excavation Adjoining Maintenance Shop Excavation

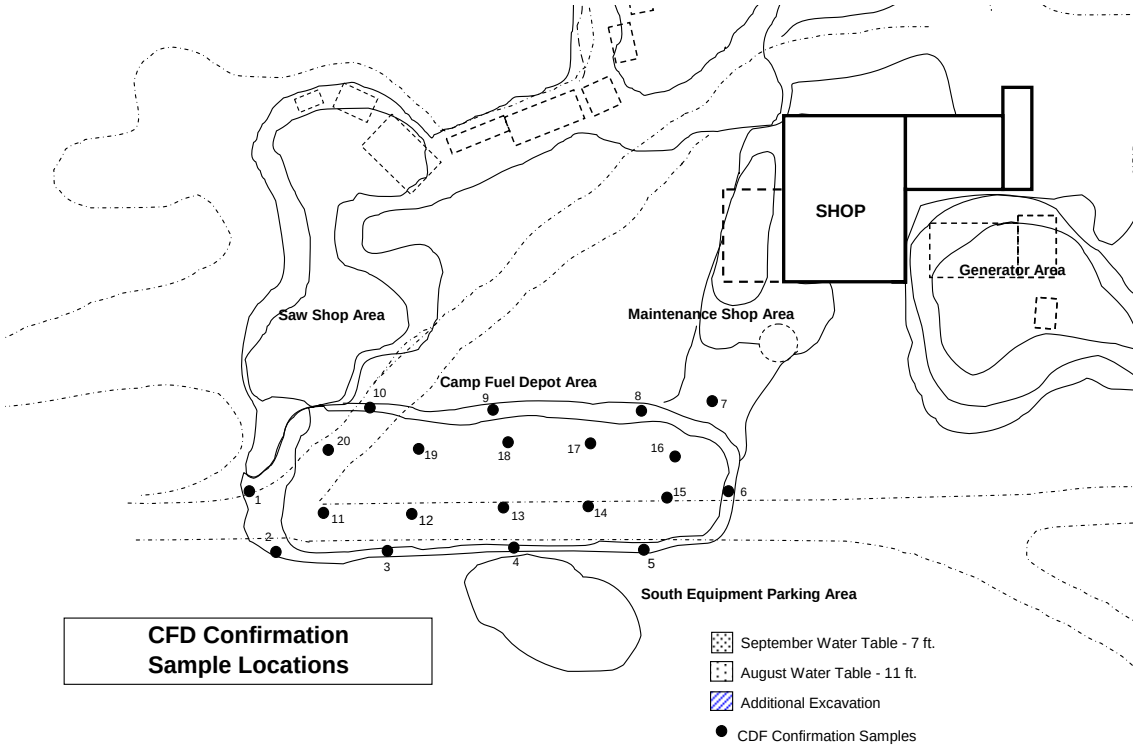


Figure 43. Camp Fuel Depot Confirmation Samples

CONFIRMATION DATA

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO
			Limits	na	na	na	260	843	8300
1	1	CFD-01	Sidewall - 48"	2.1	n-s	s	nt	0.0	0.0
1	2	CFD-02	Sidewall - 72"	6.3	s	s	nt	0.0	0.0
1	3	CFD-03	Sidewall - 84"	4,4	n-s	s	nt	0.0	0.0
1	4	CFD-04	Sidewall - 60"	3.5	n-s	s	nt	0.0	0.0
1	5	CFD-05	Sidewall - 48"	3.1	n-s	s	nt	0.0	0.0
1	5	CFD-05D	Sidewall - 84"	3.3	n-s	s	nt	0.0	0.0
1	6	CFD-06	Sidewall - 48"	1.3	n	n	nt	0.0	0.0
1	7	CFD-07	Bench - 36"	1.5	n	n	nt	0.0	0.0
1	8	CFD-08	Sidewall - 60"	0.5	n	n	nt	0.0	0.0
1	9	CFD-09	Sidewall - 72"	1.6	n	n	nt	0.0	0.0
1	10	CFD-10	Sidewall - 54"	0.5	n	n	nt	0.0	0.0
1	11	CFD-11	Bottom - WT + 2 ft.	2.1	n-s	n-s	nt	0.0	0.0
1	12	CFD-12	Bottom - WT + 2 ft.	1.8	n-s	n	nt	0.0	0.0
1	13	CFD-13	Bottom - WT + 2 ft.	5.1	s	s	nt	0.0	82.1
1	14	CFD-14	Bottom - WT + 2 ft.	6.3	s	s	nt	0.0	53.9
1	15	CFD-15	Bottom - WT + 2 ft.	4.1	s	n-s	nt	0.0	0.0
1	16	CFD-16	Bottom - WT + 2 ft.	3.4	s	s	nt	0.0	62.5
1	16	CFD-16D	Bottom - WT + 2 ft.	5.5	s	s	nt	29.6	96.7
1	17	CFD-17	Bottom - WT + 2 ft.	0.5	n	n-s	nt	0.0	0.0
1	18	CFD-18	Bottom - WT + 2 ft.	2.2	n-s	n-s	nt	0.0	30.9
1	19	CFD-19	Bottom - WT + 2 ft.	0.5	n	n	nt	0.0	0.0
1	20	CFD-20	Bottom - WT + 2 ft.	0.5	n	n	nt	0.0	0.0
22									
			Mean				na	1.3	14.8

Table 29. Confirmation Sample Results From Camp Fuel Depot

(Area 13) South Equipment Storage Area

Characterization efforts in June 2002 resulted in the collection of 15 samples from the South Equipment Storage Area. 6 of 15 samples failed for DRO contamination with a high reading of 7,500 ppm. 2 of 15 samples failed for RRO contamination with a high reading of 21,000 ppm. 30 to 100 CY of contamination was estimated for excavation to a maximum depth of 4 feet. The following figure illustrates the extent of the area in question:

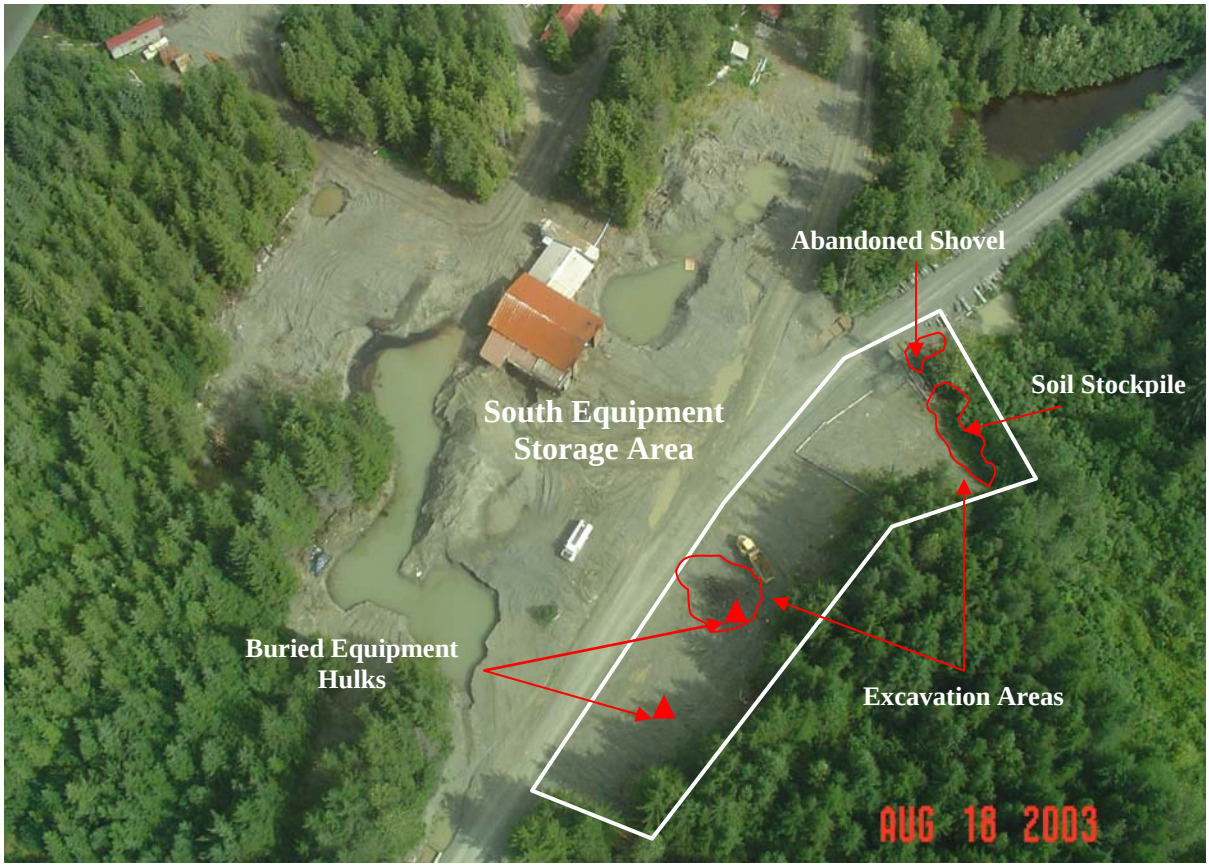


Figure 44. South Equipment Storage Area Location

The four features of the area relative to remediation include:

- Abandoned steam shovel near the periphery of Camp Creek and adjacent to the main roadway exiting camp towards the sort yard
- A long soil stockpile at the east end of the storage area covered with underbrush and placed above the boundary of Camp Creek
- A center excavation area where contaminated soils were removed and a buried piece of heavy equipment (likely a yarder)
- The west end of the storage area and a second piece of buried equipment (likely a truck).

Excavation of the area commenced and completed on August 20, 2003. 150 CY of soil was excavated and removed to the contaminated stockpile for treatment. Excavation including the removal of soil stockpiles on the east end of the site and contaminated soils under the stockpiles. Observations suggested that oily soils from the surface of the parking area were periodically graded to the east end forming the stockpiles. The abandoned shovel adjacent to Camp Creek was removed, scrapped and sent to the metal waste dump. Contaminated soils around and under the shovel were excavated.

Contaminated soils in the center of the area were also excavated. During this excavation, an abandoned yarder or shovel was uncovered. Previous employee interviews indicated that equipment burial had been authorized and performed in the area prior to 1992. ADEC was contacted and directed that the equipment be abandoned in-place without removal. According to ADEC, the equipment constituted innocuous solid waste and was not within the regulatory scope of the clean-up. No soils were removed associated with equipment burial and the equipment was left in-place with ADEC, UA, TLO and DNR concurrence. The north rim sidewall of this excavation exhibited high PID reading due to proximity to the Camp Fuel Depot, which was later excavated).

A long exploratory trench was cut parallel to the roadway and in the west end of the storage area. The trench was initially developed to ensure that the camp fuel depot was not present. During this excavation a second piece of heavy equipment was found buried. ADEC was contacted and concurred that the equipment be abandoned in place without removal. No soils were removed associated with equipment burial and the equipment was left in-place with ADEC, UA, TLO and DNR concurrence.

The results of confirmation sampling for the area are noted in the following figure.

Area	Map #	Sample Number	Confirmation			Reconfirmation		
			GRO	DRO	RRO	GRO	DRO	RRO
		Limits	260	843	1880			
South Equipment Parking Area - East End	1	SEQA001	0	16.2	62.2			
	2	SEQA002	0	87.9	135			
	2	SEQA002D	0	99.9	172			
	3	SEQA003	0	193	849			
	4	SEQA004	0	162	872			
	5	SEQA005	0	840	3850	Not Required		
South Equipment Parking Area - Center	6	SEQB001	0	462	2620			
	7	SEQB002	0	124	572			
	8	SEQB003	0	559	2010			
	9	SEQB004	0	458	2120			
	9	SEQB004D	0	278	2130			
	10	SEQB005	0	644	1130			
	10	SEQB005D	0	643	1480			
	11	SEQB006	0	8.64	0			
	12	SEQB007	0	7	0	Not Required		

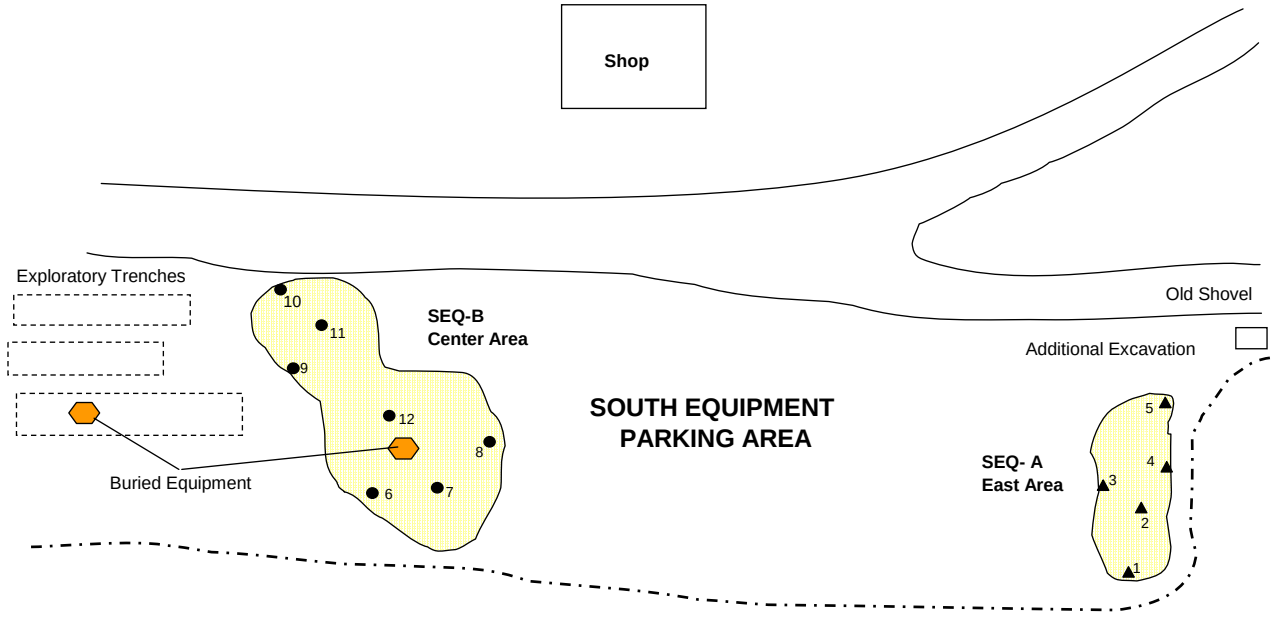


Figure 45. South Equipment Storage Area Confirmation Sample Locations.

Some re-excavation was performed after removing the old log shovel from the creek area. All contaminated soils associated with removing the shovel were excavated and placed in the stockpile.

(Area 14) Boneyard

Two of 6 samples collected from the boneyard in June 2002 exhibited DRO contamination exceeding clean-up limits with a maximum reading of 3,200 ppm. It was estimated that 30-70 CY would need to be removed during remediation.

On August 20, 2003; 231 CY of soil were excavated from the site and 9 confirmation samples collected. The majority of excavated soils were sequestered in the south end of the boneyard to a depth of 5 feet. Soils in the areas appeared to have been a combination of graded materials scraped from the boneyard surface, dumped materials from historic clean-up (liner contained) and possibly soils contaminated by periodic dumping of waste oil. The presence of clay in underlying soils inhibited migration to depth and contamination of nearby waterways. The area was thoroughly excavated.

A very small surface excavation was completed near the roadway at the north end of the boneyard. The small excavation yielded modest quantities of scrap metal that was sorted from the excavated soil, collected and shipped to the metal waste dump.

The following figure identified locations of the 9 confirmation samples collected following excavation. Photographs of the south end of the boneyard are also included.

CONFIRMATION SAMPLES

Area	Map #	Sample Number	Confirmation			Reconfirmation		
			GRO	DRO	RRO	GRO	DRO	RRO
		Limits	260	843	1880			
Boneyard - Roadside	1	BYA001	0	194	598			
	2	BYA002	0	298	941			
Boneyard - South End	3	BYB001	0	9.33	44.3			
	4	BYB002	0	16.3	38.5			
	5	BYB003	0	4.27	0			
	5	BYB003D	0	5.31	0			
	6	BYB004	0	242	926			
	7	BYB005	0	5.76	0			
	8	BYB006	0	7.92	0			
	9	BYB007	0	43.7	106			
Five-Mile Ditch - Culvert	10	5DT001	0	103	417			
Five-Mile Ditch - Roadside	11	5DT002	0	44.6	169	Not Required		

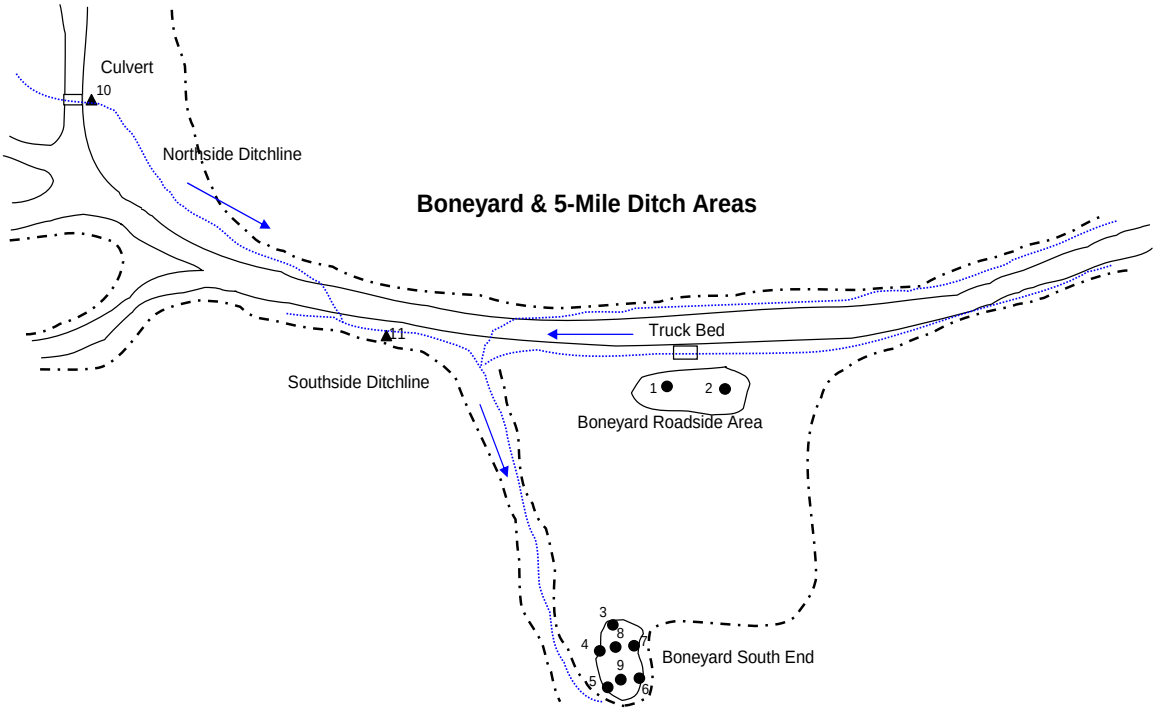


Figure 46. Boneyard and 5-Mile Ditchline Area

(Area 15) 5-Mile Ditchline: Southside and Northside

The ditchline is located at mile marker 5.0. The northside ditchline focuses on a roadside ditchline and culvert near the intersection of the roadway to Camp #2 and the Runway. The southside ditchline focuses on a segment of ditchline close to the Boneyard and a small ephemeral stream draining the ditchline complex.

On May 14, 2002 limited excavations, observed by ADEC (M. Jaynes) occurred along the southside ditchline under the assumption that a fuel spill had occurred in the area. Initial sampling indicated the presence of DRO and excavation terminated when it was determined that the volume could be more than a few

scoops from the backhoe. A small soil stockpile was left along the roadside in this area.

Six (6) characterization samples were then collected in June 2002 (3 from each ditchline area). DRO and RRO contamination was found in the southside samples at maximum values of 12,000 ppm and 8,900 ppm respectively. Only DRO was detected at the northside area at a maximum concentration of 2,300 ppm. An estimate of 15-25 on the southside and 5-10 CY on the northside ditchlines was projected with shallow excavation depths.

Ditchline flow along the roadway can vary since the topography in the area is relatively flat. Accordingly flow is influenced by weather (strong winds), grading patterns, etc.

On the northside dirtchline, the east half of the ditchline flows westward from the shop towards a convergent point near the boneyard where it often crosses the road and enters a small creek that flows south. Under circumstances noted, this flow can also continue westward towards the culvert the bridges the roadway leading to camp #2. This particular pattern is however rare. Generally, the west half of the northside ditchline flows eastward towards the same covergent point noted, where it too crosses the road near the boneyard and enters the same small creek that flows south. Observations during rain events over a 4 month period in 2003 clearly indicated that water flowed from west to east along the northside ditchline from the west culvert to the boneyard.

On the southside ditchline, the east half of the ditchline flows westward through a truck bed (water retention structure) and enters the small creek that flows south. The west half of the ditchline flows eastward and directly flows into the small creek that proceeds southward.

In most cases, ditchline flows converge near the boneyard and emptied into a small ephemeral stream the flowed south and along the west boundary of the boneyard.

On August 21, 2003; 14 CY of soil was excavated from both ditchline areas and placed in the contaminated stockpile for treatment. 8 CY were removed from the culvert crossing the roadway that leads to Camp #2. The downgradient end of the culvert (east end) was excavated to a depth of 5 feet. 6 CY were removed from the southside ditchline area. The stockpile along the southside area and additional soils in the roadside channel were removed. A single confirmation sample was collected from each area as noted in Figure X. All visual and field measured contamination was removed.

Figure 47. Boneyard Contaminated Soil

(Area 16) Airport Fuel Depot or Depot #1

Fuel Depot #1 at the airport provided fuel services to Camp #1 activities and replaced the Camp Fuel Depot likely in the 1980s. Proximity to the airport runway allowed for cargo planes containing fuel to land close to the depot and restock petroleum tanks as needed. The depot was operated for several years without a roof. In the early 1990s a roof structure was added. During the construction of the roof large poles were placed in the ground to depths of 6 feet for support. Excavations to create the holes for the poles encountered petroleum contamination. This fact indicates that contamination at the depot had been present for many years. One known spill in approximately 1992 is known to have occurred at the west end of the depot when a hose was not shut off causing several thousands gallons of fuel to spill. Some of the product migrated along the south runway ditch. The contaminant plume at the depot identified the spill.

The remediation of Fuel Depot #2 in March and June of 2003 provided valuable data relative to the presence of contamination at Fuel Depot #1. Information regarding the clean-up of Fuel Depot #2 is presented below and in Appendix B.

Fuel Depot #2 Remediation

Exploratory excavations and characterization sampling in June, 2002 identified DRO levels exceeding clean-up limits in Fuel Depot #2 at containment cell #4, the west refuel bay, and the north front of the depot (sump). The highest DRO reading was 9,900 ppm. No RRO or GRO of concern was detected. No other samples could be collected at the time because the depot was in use with tanks and containment structure inhibiting sampling. Only containment cell #4 was empty, the tank having been previously removed. Several small tears in the liner were noted within containment cell #4. It was uncertain if the tears were from routine historic activity or the removal of the tank from the cell – likely the later. Based on the data collected, it was concluded that the entire depot area to 6 feet be removed (1,367 CY). It was also estimated that the plume of contamination surrounding the depot was separate from the plume under depot #1. Figure 22 illustrates the fuel depot at the time of characterization.

Browning Timber dismantled and removed remaining fuel depot tanks and the associated containment structure in January 2003 to provide unobstructed access to excavate. No liner tears other than those previously detected by SEMS were noted. No liner breaches and associated leakage were noted during dismantling. In fact, as many as three (3) liners were present underlying the depot footprint including containment cell #4. A determination was made to collect additional data before pursuing a large excavation without gathering additional technical data.

After removal of snow, the surface area immediately under the depot was inspected and PID surface measurements collected. From a surface perspective, there was no visual or PID evidence that a significant release at the surface had occurred. The only positive readings obtained, and far below response limits, were in the center of the depot between containment cells #2 and #1. Large excavations holes were opened through the center of each containment cell and the refuel bay to provide further observations. The soil profile in each excavation pit was inspected and sampled. Approximately 500 feet of lateral trench was opened for observation. Consistently, three (3) layers of interest were identified across the depot area including surface soils containing clay from 3”-6”; a cemented layer of clay and gravel from 27” to 30”; and an orange tinted water table layer composed of sand, clay and gravel from 36” to 39”. The water table layer was clearly distinguishable by its color. Uniform coarse sand and fine gravels were detected to depth under the water table. Identification of layering provides the ability to model transport and fate mechanisms associated with diesel spills under the depot. The typical profile is noted and described below:

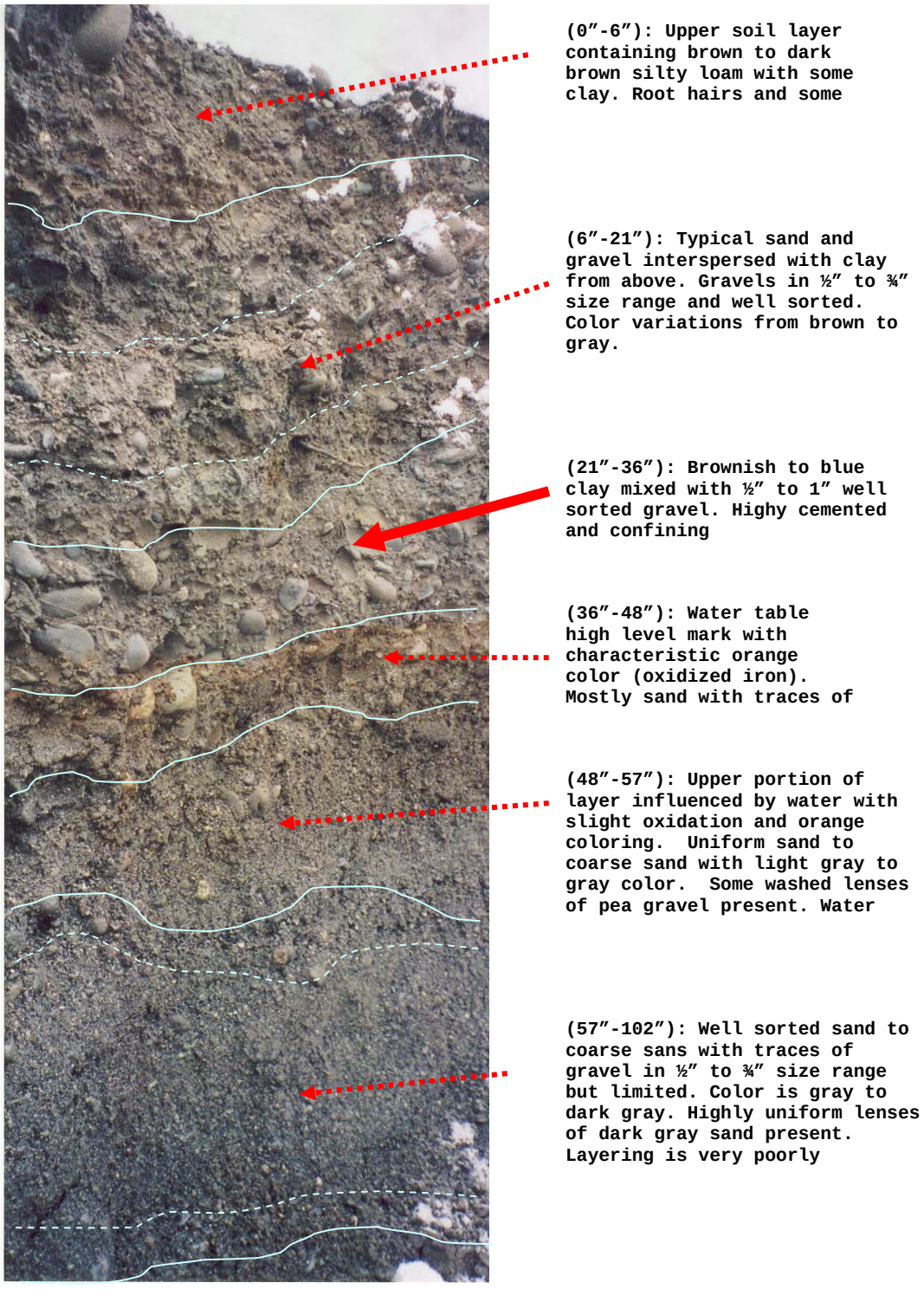


Figure 48. Typical Soil Profile Fuel Depots

Samples were collected for analysis with depth and in each excavation. A determination was made to excavate all areas containing contamination previously identified in characterization work. Approximately 300 CY of material was removed and placed in the stockpile. 23 confirmation samples were collected

after excavations were considered complete. Two samples failed confirmation. Both samples were located under the boundary between containment cell #2 and #1 at the water table. DRO readings for these 2 samples exceeded clean-up limit at levels of 2,640 ppm and 3,680 ppm respectively. Additional excavation was planned for the spring under these cells.

Three exploratory pits were excavated between depots #1 and #2 with two samples collected to define contamination with depth. All exploration pits and excavations to remove contaminated soils were refilled for safety reasons. Figure 23 illustrates the depot at the conclusion of work in March.

The following results were obtained from the additional characterization and excavation work:

1. Light surface contamination is present only inside containment cell #4 and in refueling areas including the western bay and the area in front of the depot to the sump. Contamination is shallow (6" to 12") and does not penetrate the cemented confining layer at 21" – 36".

2. The water table was observed at 42". Geologic data indicates a seasonal high water table at 36" and a low water table at 57". Based on excavations, observed groundwater flow into trenches and water table measurements; groundwater at the depots flows predominantly from west to east. This indicates flow from depot #1 towards depot #2. Variations in the flow pattern are unknown.

3. Sample results indicated DRO contamination exceeding clean-up limits only under containment cells #1 and #2 at 30" and 60" depths respectively. Interestingly, this is consistent with surface PID screening. Both samples were collected below the identified cemented layer and within the confines of the shallow water table upper limit.

4. No gasoline was detected under containment cell #1 which housed diesel tanks. The diesel in soils under the cell is therefore expected to have arrived by migration along the water table and most likely from depot #1.

5. Contaminated soil is present between depots #1 and #2 defeating the argument that each depot has its own plume.

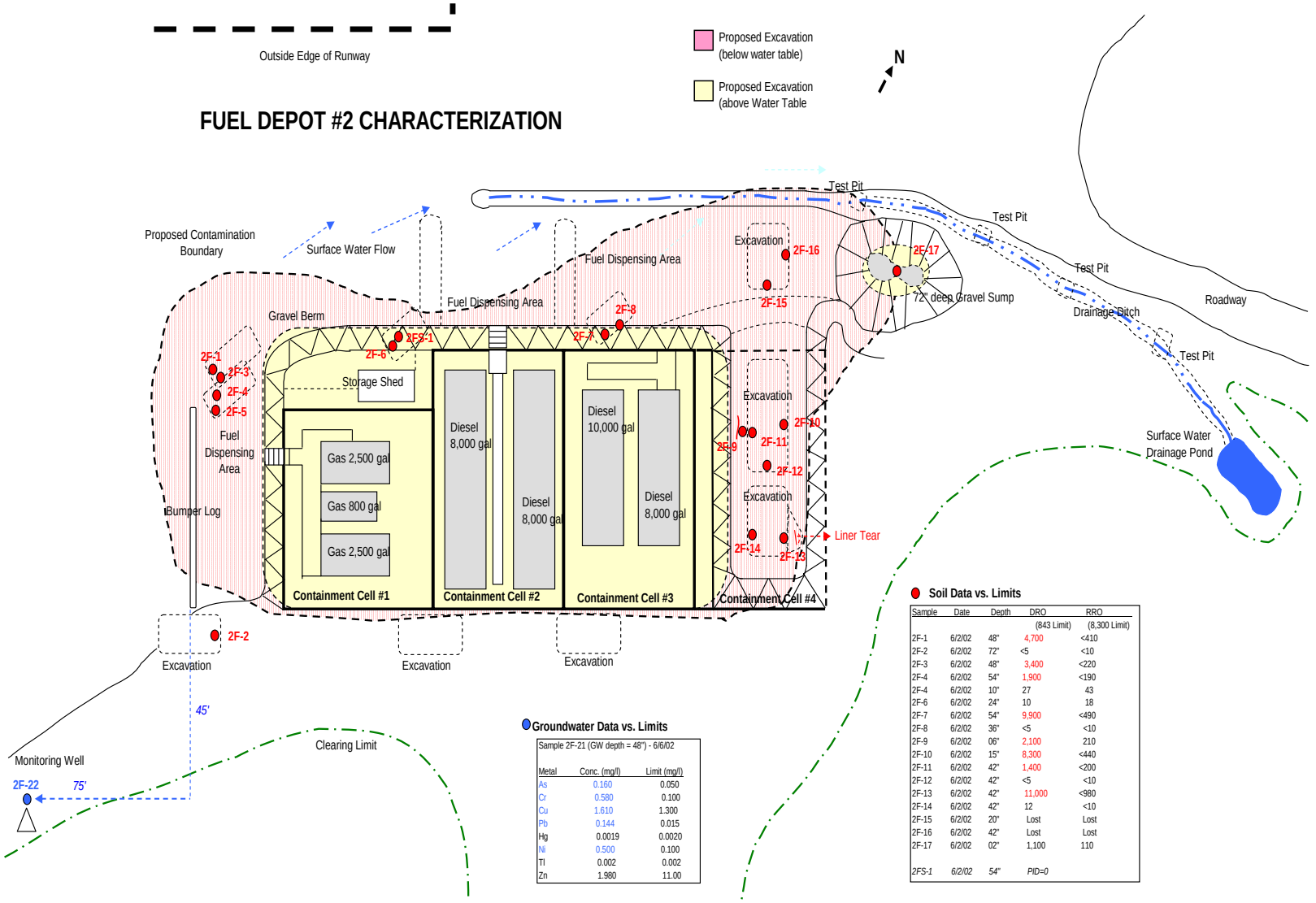


Figure 49. Fuel Depot #2 Layout - Characterization

6. The confining soil layer observed under depot #2 has been breached at depot #1 both by construction of the depot through installation of the roof and by the presence of buried wastes under and around depot #1.

7. Contaminated soils are close to the ground surface at depot #1 and then slope away from the depot. In essence, depot #1 sits on top of a mound of contaminated soil, further suggesting contaminant flow away from depot #1 towards depot #2.

Based on the March investigations, Diesel contaminated soils present under depot #2 likely originate under depot #1 and follow the movement of the water table both up and down and from west to east.

The appropriate boundary between depot #1 and depot #2 is not the halfway point between the depots. Rather, the delineation should be the most probable location where contamination from depot #2 could no longer be present. Based on data collected to date, this location is a line between depot #2 containment cells #1 and #2 as noted below:

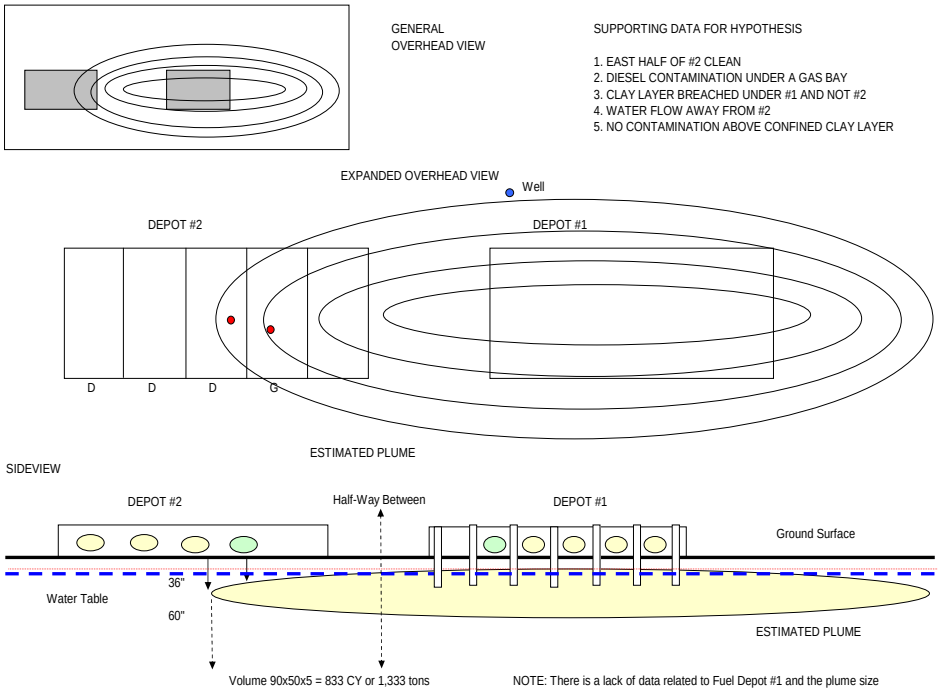


Figure 50. Revised Plume Hypothesis Fuel Depots

A detail of the estimated boundary location is noted in the figure below:

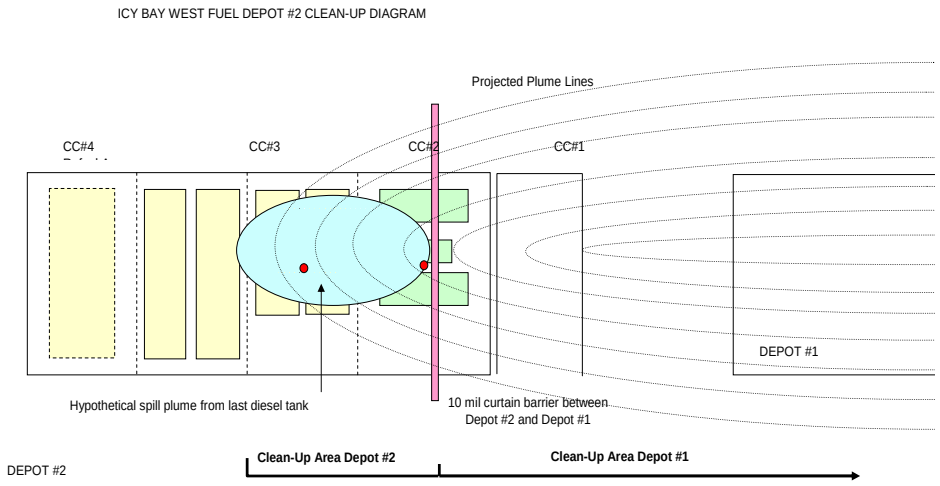
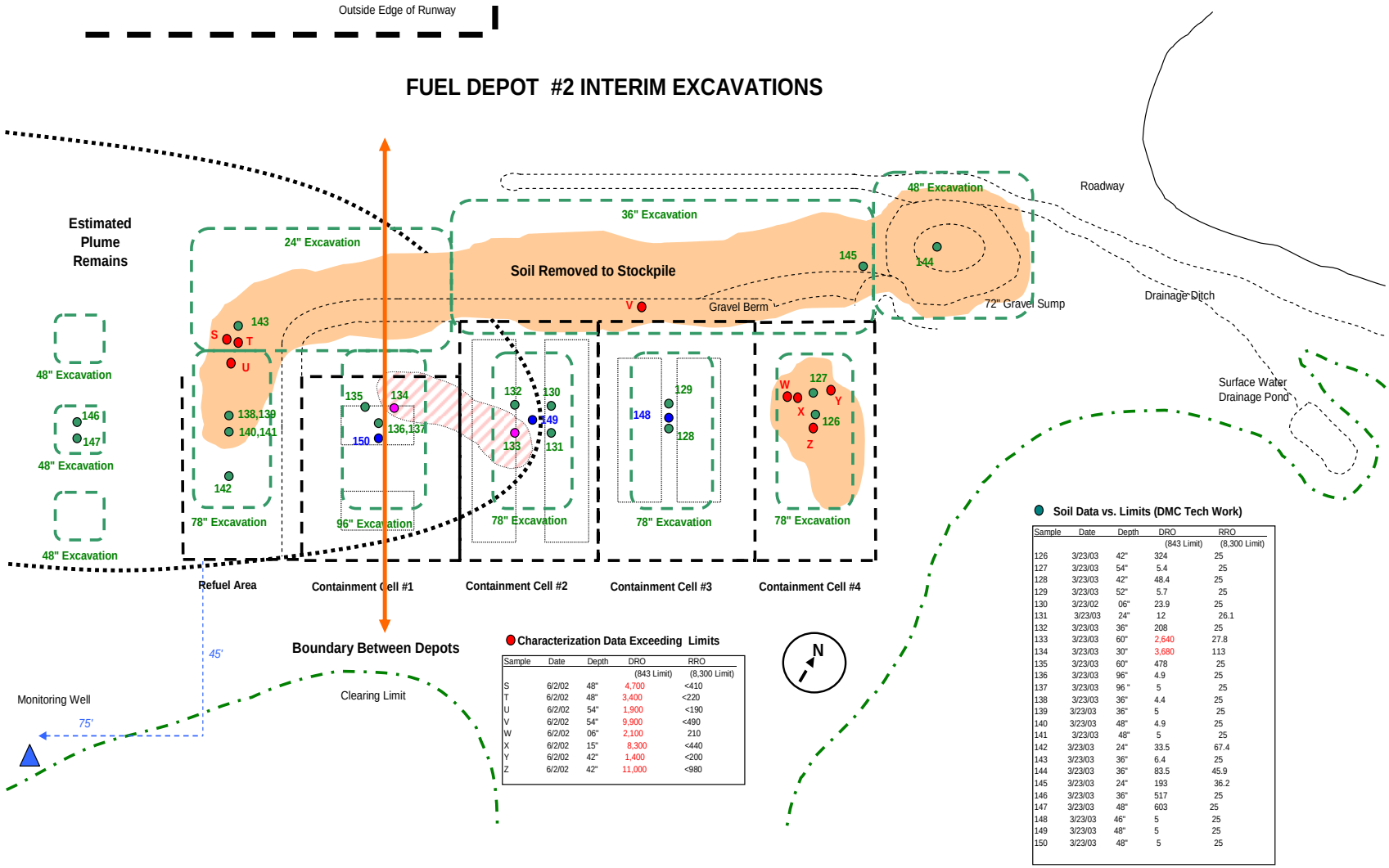


Figure 51. Estimated Boundary Line Between Depots

Based on the data collected, it was recommended to ADEC that the division line between depots be developed as a cut trench 84" deep along the proposed boundary line illustrated above. The trench will be lined with 10 mil poly curtain to inhibit groundwater flow from depot #1 towards depot #2 until remediation is complete. Additional soil excavations under depot containment cells #2, #1 and the refuel bay will then be performed to complete remediation work. Soils west of line will be remediated as part of the remediation of Depot #1. ADEC approved this proposal in June, 2003.

Figure 52 illustrates the state of efforts at depot #2 following interim excavations in March.



Sample	Date	Depth	DRO (843 Limit)	RRO (8,300 Limit)
S	6/2/02	48"	4,700	<410
T	6/2/02	48"	3,400	<220
U	6/2/02	54"	1,900	<190
V	6/2/02	54"	9,900	<490
W	6/2/02	06"	2,100	210
X	6/2/02	15"	8,300	<440
Y	6/2/02	42"	1,400	<200
Z	6/2/02	42"	11,000	<980

Sample	Date	Depth	DRO (843 Limit)	RRO (8,300 Limit)
126	3/23/03	42"	324	25
127	3/23/03	54"	5.4	25
128	3/23/03	42"	48.4	25
129	3/23/03	52"	5.7	25
130	3/23/02	06"	23.9	25
131	3/23/03	24"	12	26.1
132	3/23/03	36"	208	25
133	3/23/03	60"	2,640	27.8
134	3/23/03	30"	3,680	113
135	3/23/03	60"	478	25
136	3/23/03	96"	4.9	25
137	3/23/03	96 "	5	25
138	3/23/03	36"	4.4	25
139	3/23/03	36"	5	25
140	3/23/03	48"	4.9	25
141	3/23/03	48"	5	25
142	3/23/03	24"	33.5	67.4
143	3/23/03	36"	6.4	25
144	3/23/03	36"	83.5	45.9
145	3/23/03	24"	193	36.2
146	3/23/03	36"	517	25
147	3/23/03	48"	603	25
148	3/23/03	46"	5	25
149	3/23/03	48"	5	25
150	3/23/03	48"	5	25

Figure 52. Fuel Depot #2 Layout - Interim Excavations

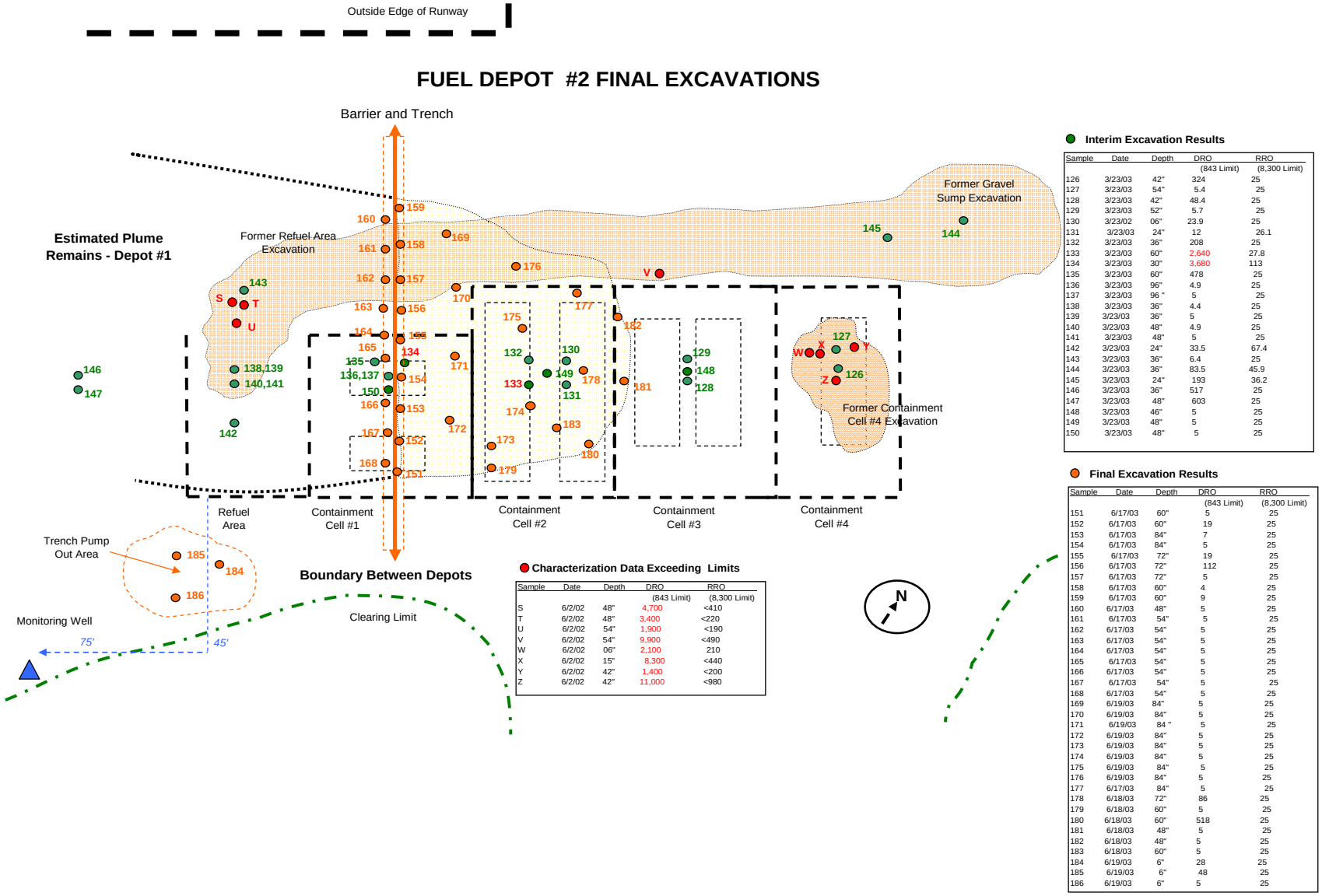
Final excavations at Fuel Depot #2 were performed June 17-19, 2003. A long trench was excavated along the previously defined boundary between the depots. The trench commenced in clean soil and progressed south to north at a depth of 84 inches, which was about 2 feet under the water table level. Samples were collected from the sidewalls and bottom of the trench as it was developed in order to accurately define the edges of the contamination plume surrounding the depot. The trench was completed when the north end reached clean soils.

After excavation and sampling, the trench was subjected to a pump test to roughly calculate aquifer transmissivity and observe groundwater flow. Water was pumped out of the south end of the trench into a natural gravel depression between depots #1 and #2 along the southern boundary of the depots. There was no concern that water was contaminated based on groundwater sampling during characterization and during March excavations. Water from the trench could not be evacuated fast enough to lower the water level significantly suggesting very high transmissivities typical of flow in alluvium; predominant water flow was observed primarily from depot #1 towards depot #2.

After testing, a 100 foot long curtain of 10 mil liner, folded in half to make a 10 foot wide piece, was placed in the trench. Rocks were used to sink the bottom of the curtain and slide it against the east wall of the trench. The trench was then carefully backfilled so that a foot of the liner protruded above the ground.

Former positions of depot #2 containment cells were then mapped and staked based on survey data collected in March. The estimated plume boundary was then staked starting at the trench and extending eastward through the refuel bay and containment cells #1 and #2. The plume boundary ended where excavations were completed in March. Excavations commenced inside the mapped area. Field measurements were carefully collected to ensure that all contamination was removed. Excavations removed 472 CY of contaminated soil and resulted in the collection of an additional 36 confirmation samples all indicating that clean-up was finally effective. After receipt of confirmation, the site was backfilled and graded.

Final work efforts associated with the depot are illustrated in Figure 53.



Sample	Date	Depth	DRO (843 Limit)	RRO (8,300 Limit)
126	3/23/03	42"	324	25
127	3/23/03	54"	5.4	25
128	3/23/03	42"	48.4	25
129	3/23/03	52"	5.7	25
130	3/23/02	06"	23.9	25
131	3/23/03	24"	12	26.1
132	3/23/03	36"	208	25
133	3/23/03	60"	2,640	27.8
134	3/23/03	30"	3,680	113
135	3/23/03	60"	478	25
136	3/23/03	96"	4.9	25
137	3/23/03	96 "	5	25
138	3/23/03	36"	4.4	25
139	3/23/03	36"	5	25
140	3/23/03	48"	4.9	25
141	3/23/03	48"	5	25
142	3/23/03	24"	33.5	67.4
143	3/23/03	36"	6.4	25
144	3/23/03	36"	83.5	45.9
145	3/23/03	24"	193	36.2
146	3/23/03	36"	517	25
147	3/23/03	48"	603	25
148	3/23/03	46"	5	25
149	3/23/03	48"	5	25
150	3/23/03	48"	5	25

Sample	Date	Depth	DRO (843 Limit)	RRO (8,300 Limit)
S	6/2/02	48"	4,700	<410
T	6/2/02	48"	3,400	<220
U	6/2/02	54"	1,900	<190
V	6/2/02	54"	9,900	<490
W	6/2/02	06"	2,100	210
X	6/2/02	15"	8,300	<440
Y	6/2/02	42"	1,400	<200
Z	6/2/02	42"	11,000	<980

Sample	Date	Depth	DRO (843 Limit)	RRO (8,300 Limit)
151	6/17/03	60"	5	25
152	6/17/03	60"	19	25
153	6/17/03	84"	7	25
154	6/17/03	84"	5	25
155	6/17/03	72"	19	25
156	6/17/03	72"	112	25
157	6/17/03	72"	5	25
158	6/17/03	60"	4	25
159	6/17/03	60"	9	25
160	6/17/03	48"	5	25
161	6/17/03	54"	5	25
162	6/17/03	54"	5	25
163	6/17/03	54"	5	25
164	6/17/03	54"	5	25
165	6/17/03	54"	5	25
166	6/17/03	54"	5	25
167	6/17/03	54"	5	25
168	6/17/03	54"	5	25
169	6/19/03	84"	5	25
170	6/19/03	84"	5	25
171	6/19/03	84 "	5	25
172	6/19/03	84"	5	25
173	6/19/03	84"	5	25
174	6/19/03	84"	5	25
175	6/19/03	84"	5	25
176	6/19/03	84"	5	25
177	6/17/03	84"	5	25
178	6/18/03	72"	86	25
179	6/18/03	60"	5	25
180	6/18/03	60"	518	25
181	6/18/03	48"	5	25
182	6/18/03	48"	5	25
183	6/18/03	60"	5	25
184	6/19/03	6"	28	25
185	6/19/03	6"	48	25
186	6/19/03	6"	5	25

Figure 53. Fuel Depot #2 Layout – Final Excavations

Remediation of Depot #1

The following figure illustrates the layouts of Fuel Depots #1 and #2 and defines the characterization effort plume estimate and actual excavation performed. As illustrated, the bounds of actual excavation cover the plume estimates from the characterization work and clearly indicate that the plume extends between the depots as suggested in DMC Tech hypothesis.

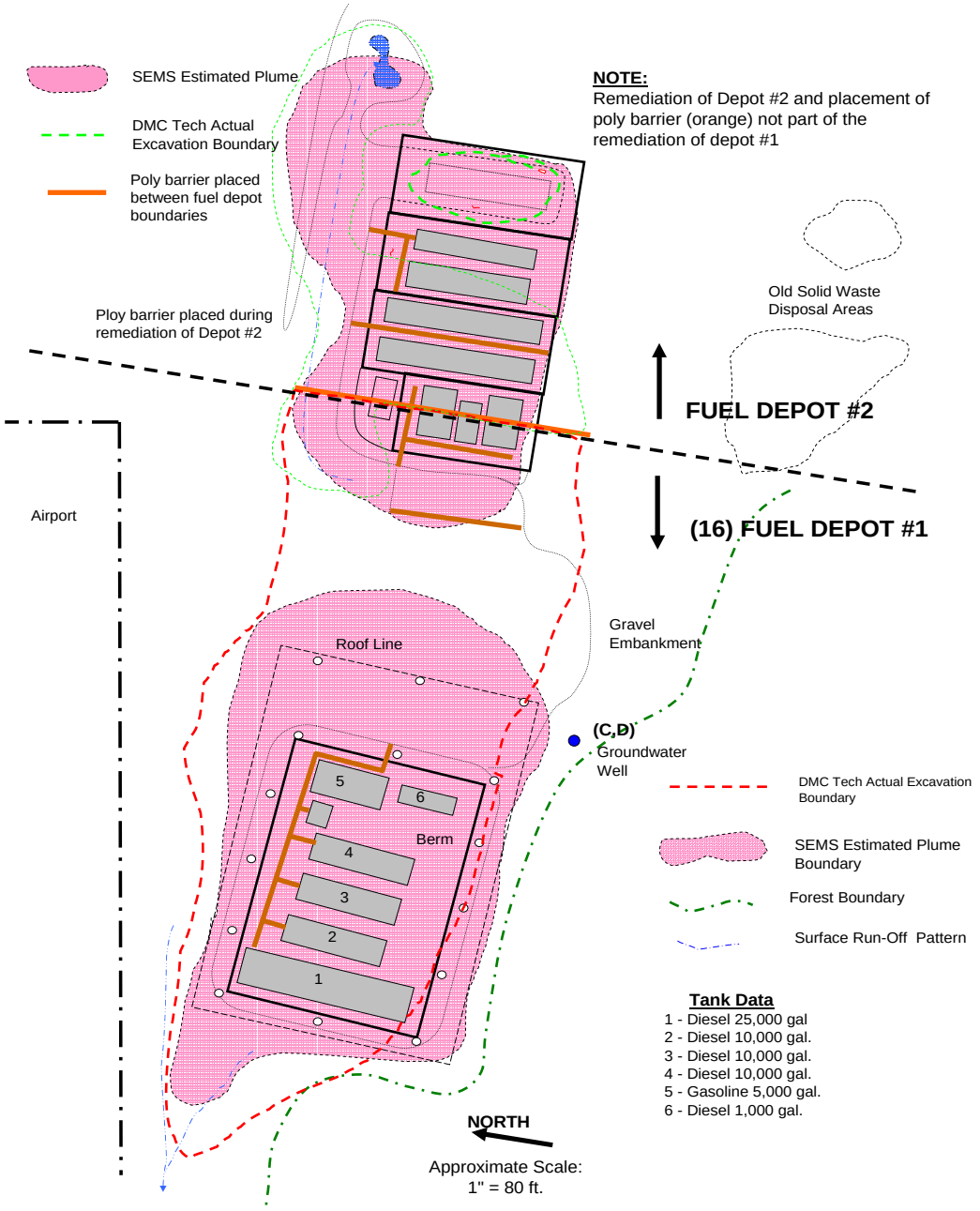


Figure 54. Fuel Depot #1 Prior to Remediation.

The original June 2002 characterization of the depot resulted in the collection of 21 soil samples to depths of 4 feet. 13 of the 21 samples breached the clean-up limit for DRO. The maximum DRO contamination observed was 7,500 ppm. Based on the data collected it was estimated that 1,500 to 2,500 CY of soil would need to be excavated.

In July, 2003; a recommendation was made to evaluate the nature of the contaminant plume at Fuel Depot #1 because of differences in the Site Characterization Report and on-site observations from the remediation of Fuel Depot #1 in March and June of 2003.

In addition to the 13 - 2002 excavations 18 new exploratory excavations were developed in mid-July 2003 as shown in the following figure. Each excavation was developed to define the contaminant plume boundary or leading edge (x-y coordinate) and contaminant plume depth through the water table (z coordinate). Excavations were mapped beginning at the 10 mil plastic barrier placed in the ground at Fuel Depot #2. Clear points where contamination ended were identified during the placement of the barrier. Conclusions drawn from the additional excavation are noted below:

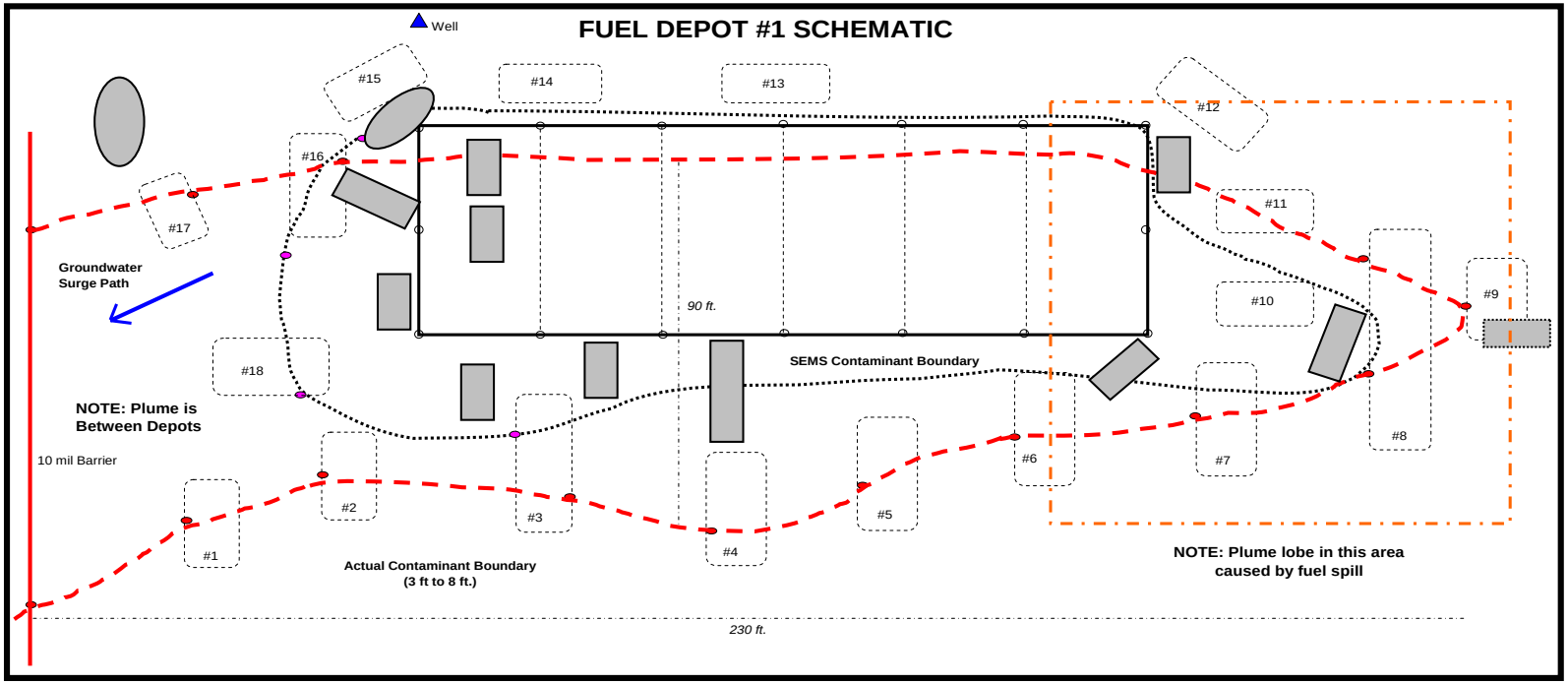
1. The plume extends from the 10 mil plastic barrier westward under Depot #1. There is no separation of plumes between depots.

2. Excavations were successful in identifying a plume boundary both laterally and with depth. The plume is expected to contain 3,833 CY of soil including soils under the structure.

3. A determination must be reached to demolish and remove the structure in order to remove contaminated soils.

4. The west end of the plume can be tied to an historical diesel spill and is clearly shown to migrate along the upper drainage channel.

Exploratory results are the subject of a special report included in Appendix C. Based on the position of the contaminate plume a determination was made to demolish the depot structure and move all tanks to a new depot location approximately 500 Yards west of the former location. Demolition was accomplished in early September making room for complete remediation including soils under the depot footprint.



VOLUME CALCULATION

230 ft long x 90 ft wide x 5 ft deep = 3,833 CY
(Note: assumes contamination from 3 ft to 8 ft deep)

Under Strucuture:
90 ft long x 60 ft. wide x 5 ft deep = 1,000 CY

Outside Strucuture:
3,833 CY - 1,000 CY = 2,833 CY

ISSUES

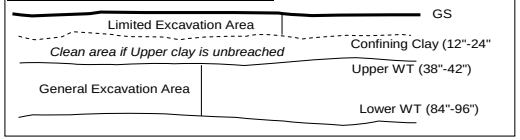
* Inaccessibility of area under the depot without moving the depot
* Operations deterence during excavation

SEMS CHARACTERIZATION DATA

1,500 TO 2,500 CY
Separate plumes between depots

Sampling 18" to 48"
Max. DRO = 7,500 ppm (10")

CONTAMINATION PROFILE WITH DEPTH



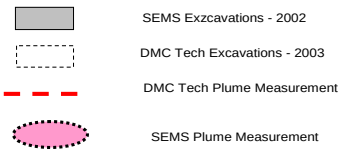
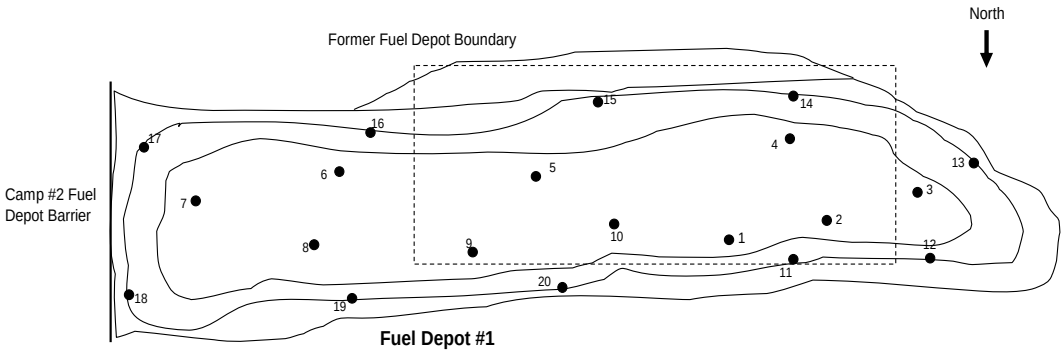


Figure 55. Fuel Depot #1 Additional Excavations

The noted figure guided remedial excavations of the depot which were performed from September 2nd to the 4th, 2003 and resulted in the removal of 2,557 CY placed in the runway stockpile near the depot. Excavations proceeded to the barrier placed during remediation of Depot #2. Due to cost constraints and upon approval from ADEC confirmation sampling was limited to 20 samples illustrated in the following figure:

FDP Confirmation Sample Locations



CONFIRMATION SAMPLES

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO
			Limits	na	na	na	260	843	8300
1	1	FDP-01	Bottom 96"	1.5	n	n	nt	0.0	0.0
1	2	FDP-02	Bottom 84"	1	n	n	nt	0.0	0.0
1	3	FDP-03	Bottom 96"	0.5	n	n	nt	0.0	0.0
1	4	FDP-04	Bottom 96"	2	n	n	nt	0.0	0.0
1	5	FDP-05	Bottom 90"	1	n	n	nt	0.0	0.0
1	6	FDP-06	Bottom 96"	0.5	n	n	nt	0.0	0.0
1	7	FDP-07	Bottom 90"	1	n	n	nt	0.0	0.0
1	8	FDP-08	Bottom 84"	1	n	n	nt	0.0	0.0
1	9	FDP-09	Bottom 96"	1.5	n	n	nt	0.0	0.0
1	9	FDP-09D	Bottom 96"	0.5	n	n	nt	0.0	0.0
1	10	FDP-10	Bottom 90"	0.1	n	n	nt	0.0	0.0
1	11	FDP-11	Sidewall 48"	0.1	n	n	nt	0.0	0.0
1	12	FDP-12	Sidewall 54"	0.1	n	n	nt	0.0	0.0
1	13	FDP-13	Sidewall 60"	0.1	n	n	nt	0.0	0.0
1	14	FDP-14	Sidewall 48"	2.5	n-s	n	nt	115.0	0.0
1	14	FDP-14D	Sidewall 48"	2	n-s	n	nt	116.0	0.0
1	15	FDP-15	Sidewall 54"	1	n	n	nt	0.0	0.0
1	16	FDP-16	Sidewall 36"	0.5	n	n	nt	0.0	0.0
1	17	FDP-17	Sidewall 24"	2	n-s	n	nt	133.0	0.0
1	18	FDP-18	Sidewall 60"	1	n	n	nt	0.0	0.0
1	19	FDP-19	Sidewall 54"	2.5	n-s	n	nt	123.0	0.0
1	20	FDP-20	Sidewall 72"	0.2	n	n	nt	0.0	0.0
22									
			Mean				na	63.3	0.0
			Standard Deviation				na	48.2	0.0
			Alpha (95%)				na	0.05	0.05
			Confidence Limit				na	20.1	0.0
			High Interval				na	83.5	0.0
			Low Interval				na	43.2	0.0

Figure 56. Depot #1 (FDP) Confirmation Sample Locations and Results

Following ADEC approval of preliminary results, the site was cleared for backfilling.

Figure 57. Fuel Depot #1 Front View Looking South Before Excavation

Figure 58. Fuel Depot #1 Looking West

(Area 17) Uplands Fuel Depot

The Icy Bay logging area was developed in 1971 consisting of a camp and log transfer facility (LTF) with bulkhead located 5 miles to the east on Icy Bay. The LTF also included development of a fuel depot. The depot was constructed on a bench approximately 20 feet above the northwest corner of the historic LTF and 1,500 feet north of the bulkhead. Because of the elevated location the site became known as the Uplands Fuel Depot.

The original LTF bulkhead was created by sinking several barges. However, by the early 1990s the bulkhead could no longer be used because of severe erosion. At this time the transfer facility was moved eastward and log transfers were made directly from the beach. The distance from the new beach landing area to the depot was significant and barge docking was also no longer possible. Because of these complications, a decision was also made to abandon the uplands depot and relocate it at camp.

For a period of approximately 20 years, the Uplands Fuel Depot dispensed diesel and gasoline for LTF operations. Fuel transfers to the depot occurred periodically by truck or pumping from storage tanks at the LTF bulkhead to the depot tanks. Tanks at the bulkhead were periodically filled by fuel delivered via barge. There were possible spills associated with fuel transfer operations.

The elevated nature of the depot provided the advantage of gravity feed refueling at the roadway located below the depot proper. It is likely that refueling activities along the roadway resulted in spills. Aerial photos from 1993 identify three (3) large tanks still present within the Uplands Fuel Depot. Sometime after 1993, the tanks were removed.

Characterization Investigations - 2002

Three exploratory excavations were made inside the Upland Fuel Depot on 6/4/02 to determine if any contaminated soils were present. The Site Characterization Report prepared by Southeast Management Services (SEMS) denotes the following:

“ Two of the three excavations had had low diesel levels of much less than 100 mg/kg. However, the middle excavation where samples 1SY-22 and 1SY-23 were taken had levels of 760 mg/kg and 820 mg/kg, which were close to the allowable clean-up criteria. This excavation went to 9.5 ft. and bright bluish-gray gravels that obviously had been leached by past oil contamination were found throughout the entire depth of the excavation. The contamination was continuing at greater depth, and the excavation hole had high levels of very aromatic gases being given off. It is roughly estimated that 200CY-450CY of contaminated soil may need to be removed from this site before it can be clean-closed.”

The characterization report also identified excavations at the western toe of the Uplands Fuel Depot along the road and about 500 feet east of Carlson Creek. This area was the former location of the Log Sort Yard Sawshack. The SEMS Characterization Report notes,

“Two shallow excavation trenches from this area encountered substantial amount of blue oil-contaminated soil. The top 2 ft. of soil had diesel levels 1,800 mg/kg to 9,400 mg/kg. Soil

levels at the base of the excavations were found to be clean. It was estimated that contaminated soil in the area would be shallow and likely limited to 100 CY – 250 CY."

ADEC approved the Characterization Report submitted. In the approval letter, ADEC noted:

"In the upland area both the Saw Shack and the Upland Fuel Depot had impacts. These impacts appear to have occurred in the early 1990s and may not be the result of current operations, but do deserve further investigation in the future."

Based on these comments, the Remedial Work Plan for Icy Bay West Camp #2 recommended additional investigations at the Uplands Fuel Depot. In correspondence from SEMS to the University of Alaska legal council outlining comments on the DMC Tech Remedial Work Plan, SEMS indicates,

"The sort yards former fuel depot has the potential of being deep and ugly".

Remedial Work Plan Investigations - 2003

In July 2003, conversations among interested parties recommended that some additional investigation be performed at the Uplands Fuel Depot to ascertain the total volume of contaminated soil present. Additional evaluation was performed by DMC Tech on July 14, 2003. The work performed included the excavation of an additional 33 trenches both within and around the Uplands Fuel Depot. Field samples were collected and evaluated for odor, sheen and PID concentration. Based on the data collected an estimate of 7,109 CY of contaminated soil was made. On July 23, 2003 a follow-up investigation was performed with both DMC Tech and Southeast Management Services personnel to review both the characterization data from 2002 and the more recent remedial work plan investigations. Consensus was reached that additional characterization data for the Uplands Fuel Depot was needed.

The following table summarizes recent investigations. The tables include descriptions of individual excavations and results of field analyses. Recommended grab sample locations for laboratory analyses are highlighted. The following figure illustrates locations of excavations. The details of the investigation are included in a special report as part of Appendix C to this report.

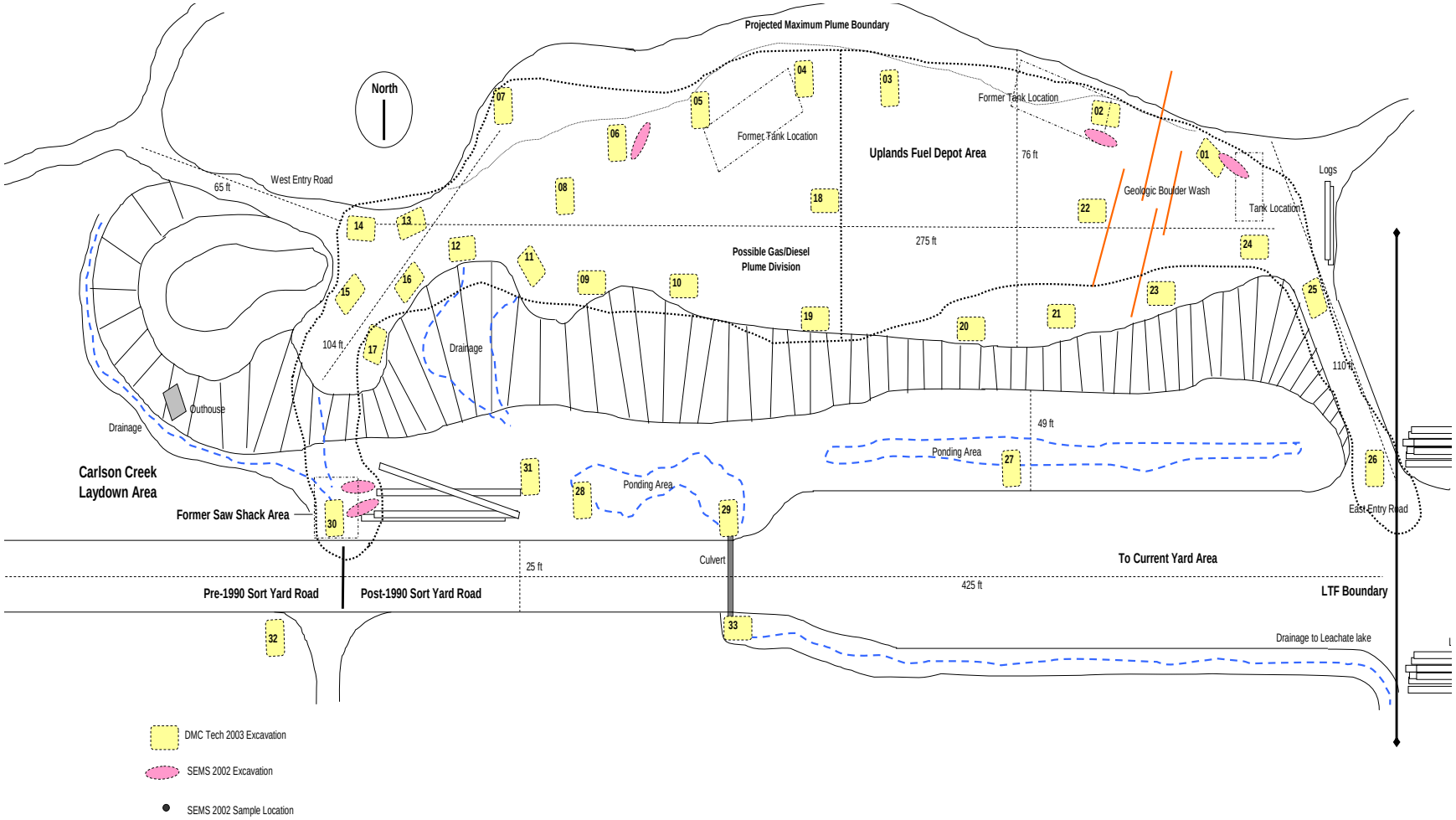


Figure 59. Uplands Fuel Depot Exploratory Excavations - 2003

During the investigation, 42 field samples were collected from 33 different excavations. Excavations varied in depth from 6 ft. to 17 ft. The majority of samples collected from the fuel depot exhibit stained soils suggesting historical contamination. These samples also exhibit high PID readings.

The following results were obtained from samples collected from 5 excavation areas:

Sample	Date	Excavation	RRO (ppm)	DRO (ppm)	GRO (ppm)
UFD-01	9/6/03	6 – 6 ft.	ND	7,160	565
UFD-02	9/6/03	11 – 9 ft.	ND	4,650	323
UFD-03	9/6/03	12 – 9 ft.	ND	3,760	234
UFD-04	9/6/03	13 – 4 ft.	ND	3,920	301
UFD-05	9/6/03	30 – 10 ft.	ND	4,960	6

Table 30. Characterization Results of Additional Uplands Depot Samples.

High concentrations of gasoline and diesel are present on the west half of the Uplands Fuel Depot where gasoline was historically stored. Traces of gasoline in excavation 30 suggest that migration has occurred and has the potential to occur.

General Observations of Additional Field Analyses

Some general observations from the work are listed below:

- Samples from the east half of the depot are likely contaminated with diesel.
- Samples from the west half of the depot are likely contaminated with both diesel and gasoline.
- The geology on the west half of the depot exhibits a buried boulder field. This portion of the depot is in the path of a large drainage cut through the upper mountains and at one time was likely a creek bed.
- The geology on the east half of the depot exhibits some layers of clay characteristic of an early ponded area.
- The east half of the depot also contains a cat push out extending southward. It is possible that this area was used for facilitating refueling from the historic bulkhead.

- The depth of contamination in several holes is characteristic of a long term leak or spill history.

- Contamination in holes at the toe of the bench may be extensions from the upper bench either by migration or by drainage from the upper bench.

- Shallow groundwater along the toe of the bench is likely from surface water run-off. Deeper groundwater is detected at apx. 12 ft. BGS.

- Contamination is present in sufficient concentrations to warrant concern.

- Historic contamination has a perceived pathway from the upper bench to the lower bench and then to leachate lake and Icy Bay. It is unknown if this occurred and not easily supported from available data. Alternatively, the soils are contaminated, but contaminants are stable and have not moved into Leachate Lake.

ADEC has made a decision to list the West Icy Bay Upland Fuel Depot as a separate and independent site on its Contaminated Sites Database. Based on characterization data, the excavation estimate for the site was revised from several hundred CYs to several thousand CYs. Additional characterization and possible clean-up of the Uplands Fuel Depot will be deferred until a later date.

Figure 60. Contaminated Soils on West Half of Uplands Depot – Test Excavation 13.

(Area 18) Sort Yard Former Log Sort Station #1 & (Area 19) Sort Yard Former Saw Shack

(Area 18) Sort Yard Former Log Sort Station #1 (Sawyer's Shack Area)

The Sort Yard Former Log Sort Station #1 (Sawyer's Shack) was characterized in June 2002. One sample exhibited a DRO concentration of 1,300 ppm, but was less than Method 3 clean-up limits. Regardless, it was recommended that the site be remediated and an estimate of 75 to 125 CY of contaminated soil was provided.

On 7/23/2003 Tom Hanna visited the site to observe remediation work. Tom was asked to identify and reinspect the location of the Sort Yard Former Log Sort Station #1. Since 2002, the site had been dismantled and abandoned. Only operations associated with Camp #2 occurring in the MHTLO portion of the Sort Yard were underway. Log decks were placed near the former location and yard traffic had obliterated any trace of contamination. Since the contamination was under the Method 3 clean-up limit and since the site was no longer visible, a decision of "no action" was reached. This determination was discussed with ADEC and teleconference concurrence provided for no action.

(Area 19) Sort Yard Former Saw Shack

The Sort Yard Former Saw Shack was used prior to 1990 and was dismantled and abandoned well before June 2002. At the time of remediation, only operations associated with Camp #2 were underway in the MHTLO portion of the Sort Yard.

In June 2002, 8 samples were collected in and around the former footprint of the saw shack. 5 of the 8 samples were contaminated with DRO at levels as high as 13,000 ppm within 3 feet of the ground surface. Observations at deeper depths indicated that contamination could be as deep as 9 feet. 2 of the 8 samples exhibited RRO concentrations exceeding clean-up limits and as high as 30,000 ppm. Based on the data collected an estimate of 300 to 400 CY was provided to support remediation.

It should be noted that the Sort Yard Fomer Saw Shack appears to be within the boundary of the Uplands Fuel Depot. A small ephemeral run-off channel exits the upper bench of the Uplands Fuel Depot and flows into the Saw Shack area. Historic contamination from the Uplands Depot could easily have migrated to this area.

Both sites in the sort yard are identified in the following figure.

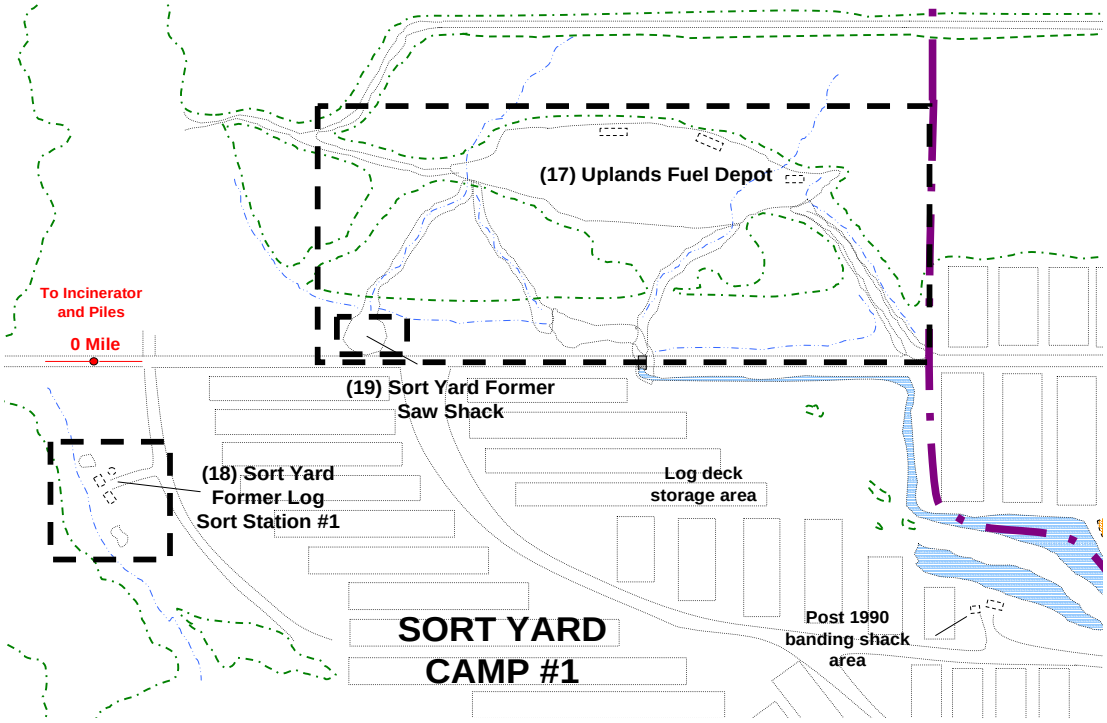


Figure 61. Locations of Sort Yard Former Log Sort Station #1 and Sort Yard Former Saw Shack

Two deep excavations have occurred in the saw shack area to the water table – one in June 2002 and one in August 2003. The June excavation proceeded to 9 feet. The August excavation was 16 feet deep. The water table was detected and 9 feet and 12 feet deep respectively. Contamination was visible throughout the depth of both excavations. It is uncertain that the operation of a saw shack could cause contamination to depths of 12 feet or more. More than likely contamination in the Saw Shack Area was influenced by both the Uplands Depot and on-site saw shack activities in the yard. Contamination in and around the shack is estimated at a volume of 300-400 CY. This contamination will be addressed with the Uplands Fuel Depot.

No excavations were performed and the site will be addressed with the Uplands Depot concerns. As mentioned, a decision was made by ADEC and land owners will remediate this site to a later date. Leaving the site unexcavated is important, if the Uplands Fuel Depot is remediated in the future as the tie between the sites will clearly be easy to identify and will allow development of a more informed theory regarding possible migration from this site to leachate lake.

Figure 62. Former Saw Shack Excavation Showing Contaminated Soil Profile and Water Table With Petroleum Product at 12 Feet BGS.

(Area 20) Remote Maintenance Shop Area

In June 2002, 8 samples were collected to a depth of 2 feet to characterize the Remote Maintenance Shop located at mile marker 32.5 west of Icy Bay. 3 samples indicated DRO contamination exceeding clean-up limits. One sample was collected under a parked and abandoned dozer. The other two were collected adjacent to the oil dock on the north side of the deck. The highest DRO reading was analyzed at 5,900 ppm under the abandoned dozer. Readings along the deck varied from 1,000 to 2,700 ppm.

In August, 2002; the abandoned dozer was moved and visible contaminated soil under the dozer and along the north of the storage bay was excavated and placed in a supersack. The sack was taken back to the shop and placed under the awning where it was later retrieved and dumped on the contaminated soil stockpile.

In September, the Remote Maintenance Shop was reinspected. No soil stains were observed in and around the Shop. The excavation of the soils in August was

considered sufficient remediation of the site. The site will be re-inspected during future final camp closure as required.

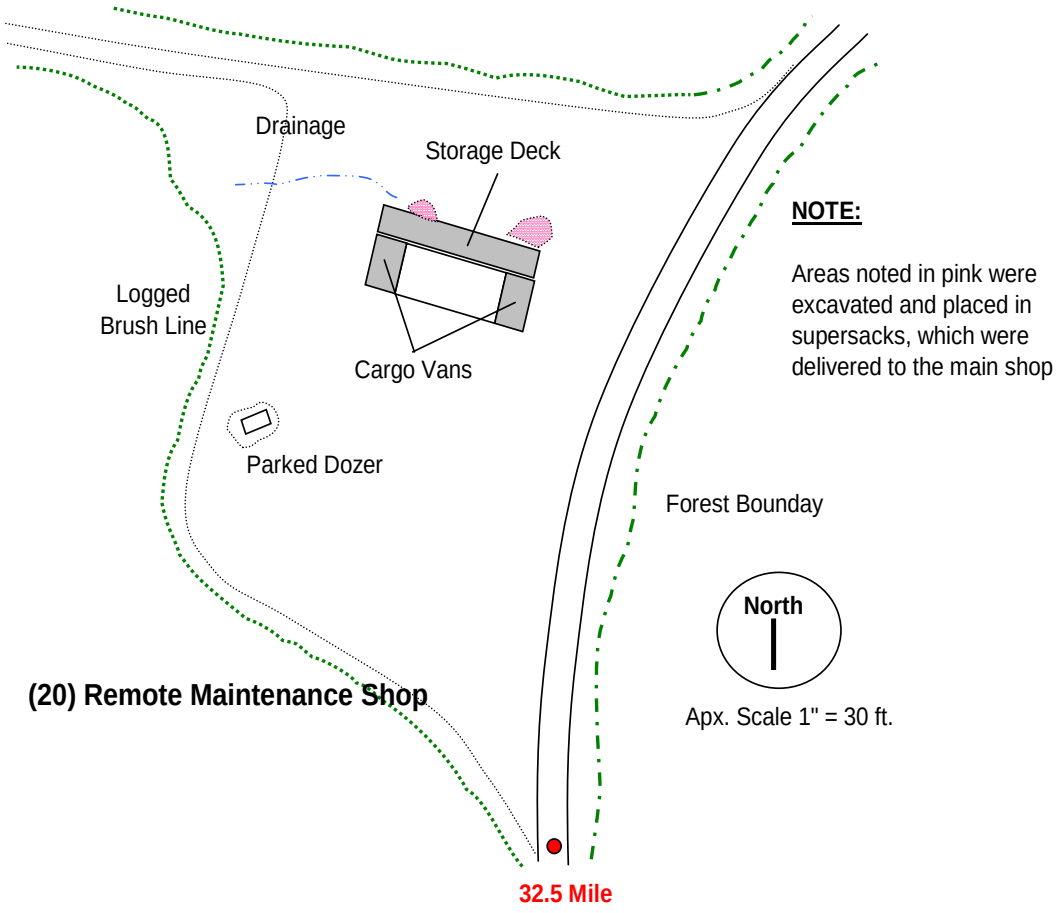
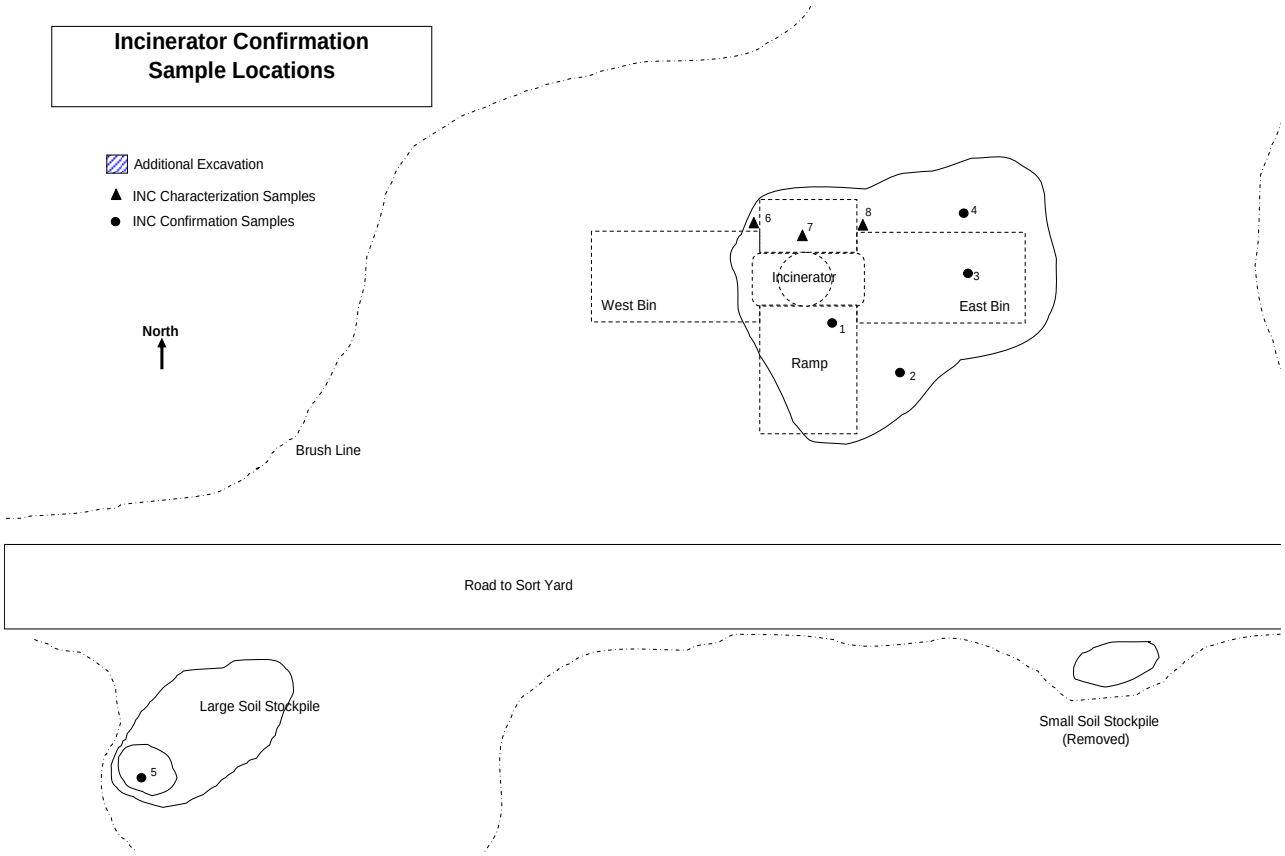


Figure 63. Remote Maintenance Shop Excavation Areas

(Area 21) Camp Incinerator Area

The Camp Incinerator is located at mile marker 1.5 approximately 3 miles east of Icy Bay on the road to the sort yard. The incinerator consists of three tanks welded in an inverted T-shape. The ends of the incinerator dump to large dump truck beds. A gravel ramp has been built so that trash can be fed into the top of the incinerator.

In June 2002, 11 samples were collected form the incinerator environment for analyses. 5 of the 11 samples failed the analyses for DRO. A single sample failed the analyses for RRO, but represented ash in the truck bed bin. It is not uncommon to find diesel or oil in the ash since the liquid is used to light the incinerator. Based on the data collected, it was estimated that 170 to 250 CY would need to be excavated form the site to complete remediation. At the time of characterization, several stockpiles across the road from the incinerator were observed. It was recommended that these piles be tested and removed. In August, 2002; the smaller of the stockpiles was bagged into a supersack and delivered to the shop. This sack was later dumped on the contaminated stockpile for treatment as previously discussed.



CONFIRMATION SAMPLES

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO
			Limits	na	na	na	260	843	8300
1	1	INC-01	Sidewall - 36"	2.1	n-s	n	nt	23.0	34.0
1	2	INC-02	Sidewall - 48"	6.3	s	n-s	nt	41.0	62.0
1	3	INC-03	Sidewall - 24"	4,4	s	n-s	nt	31.0	55.0
1	4	INC-04	Bottom - 60"	3.5	s	n-s	nt	112.0	357.0
1	5	INC-05	Bottom - 12"	3.1	n-s	n	nt	96.0	181.0
5									
			Mean				na	60.6	137.8
			Standard Deviation				na	40.5	135.4
			Alpha (95%)				0.05	0.05	0.05
			Confidence Limit				na	35.5	118.6
			High Interval				na	96.1	256.4
			Low Interval				na	25.1	19.2

RCRA METALS CHARACTERIZATION DATA

Metals	Map 6	Map 7	Map 8
Silver	0	0	0
Arsenic	4.23	4.05	4.66
Barium	28.2	23.5	26.9
Cadmium	0	0	0
Chromium	20.1	19.2	19.7
Mercury	0	0	0
Lead	2.23	2.16	2.03
Selenium	0	0	0

Note: Metals data is in ppm totals. Metals are at background levels and not at any concentration warranting TCLP analysis.

Figure 64. Incinerator Confirmation Locations and Sample Results

On September 16, 2003; 100 CY of soil was removed from the incinerator area. The majority of excavation centered on the incinerator and ash bins. The incinerator was moved prior to excavation to allow full access. During the excavation the larger of the 2 roadside stockpiles was dismantled and field tested. Only a portion of the stockpile appeared to be contaminated (bottom). These soils were excavated. The remaining soils were graded and groomed flat created a small turnout beside the road.

The following diagram and table illustrate confirmation samples collected from the area in question. Metal analyses were performed due to the presence of ash from solid waste combustion.

WATER – AREA BY AREA EVALUATION

Water Table Determination

Based on several months of observations a general model regarding vertical and horizontal movement of the water table can be provided. The following figure illustrates vertical movement of the water table at Icy Bay:

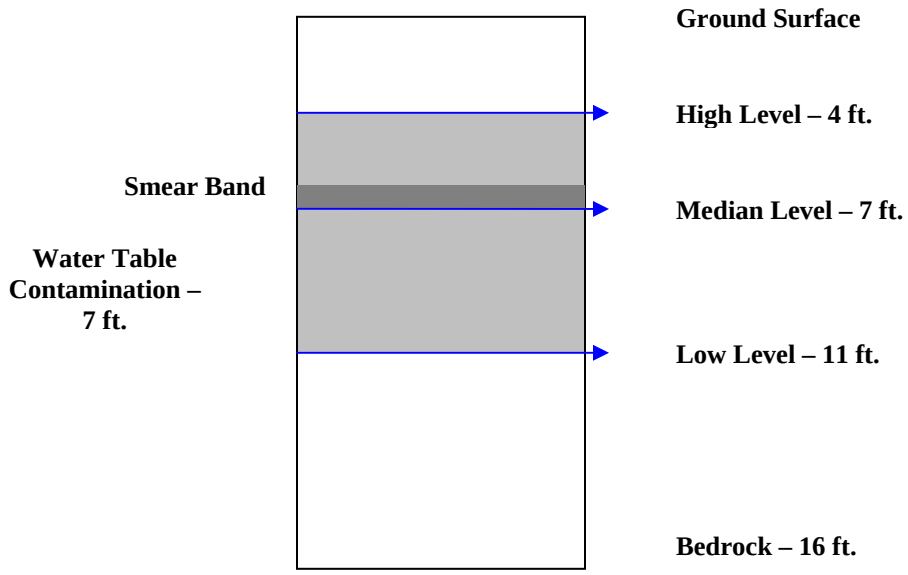


Figure 65. Water Table Vertical Profile and Fluctuation

The general gradient of the site (sloping toward the bay) including locations of stream beds (water table exit positions) coupled with the shape of excavated plumes provide some evidence of horizontal water table movement. Water typically moves from north to south with localized variations.

The following table provides an estimate of water flow in site locations of interest:

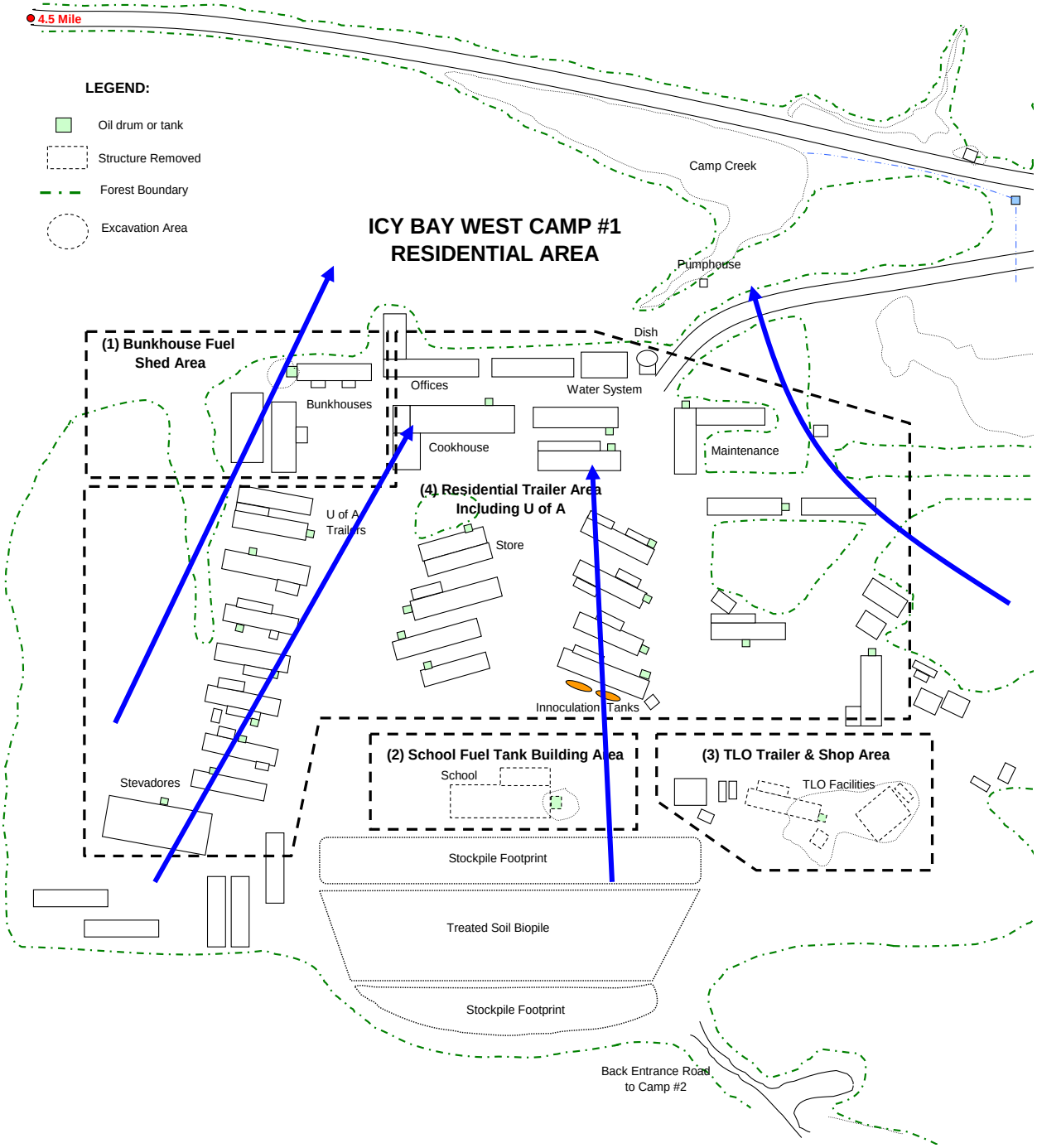


Figure 66. Hypothesized Water Table Movement - Camp

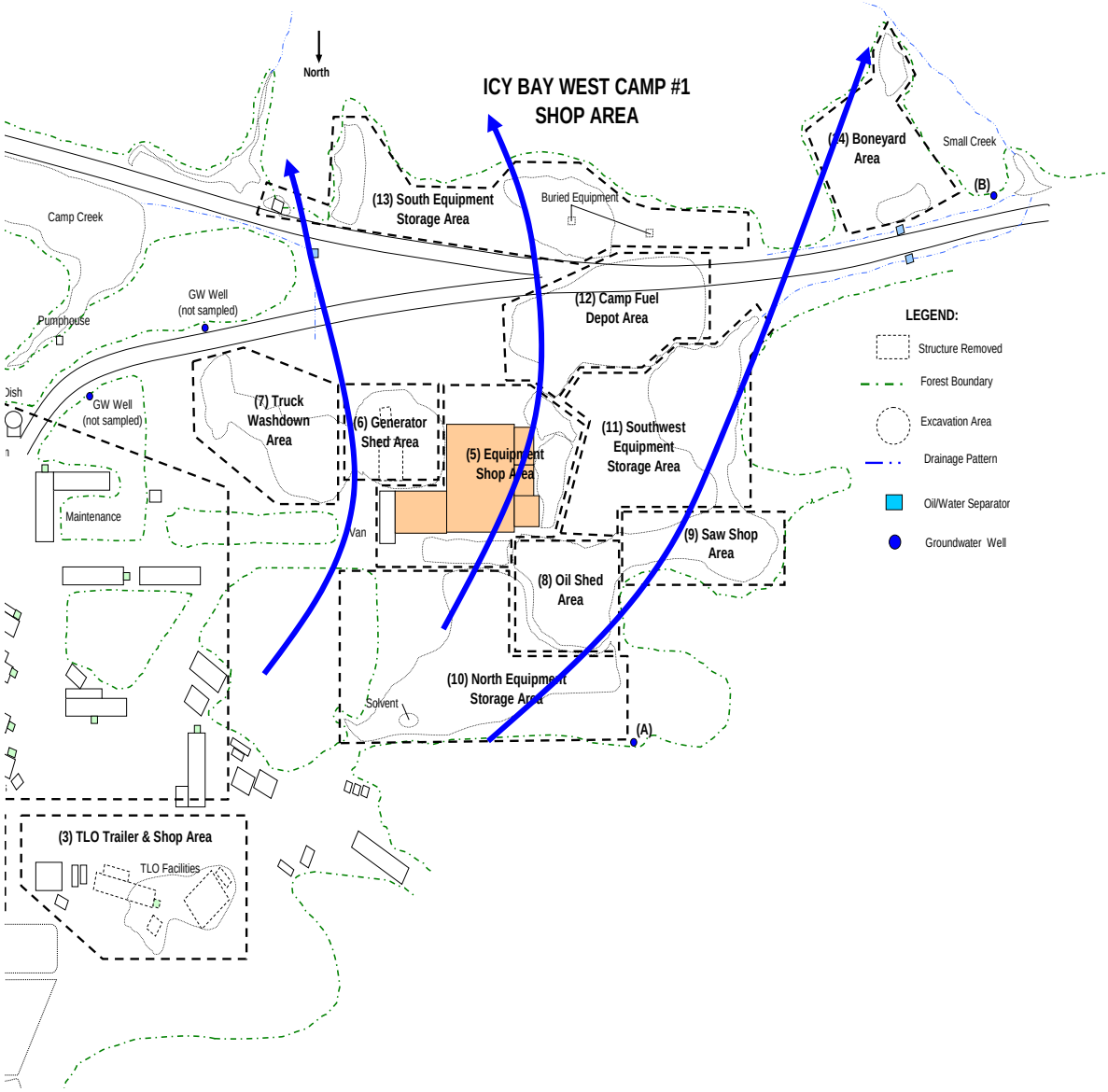


Figure 67. Hypothesized Water Table Movement - Shop

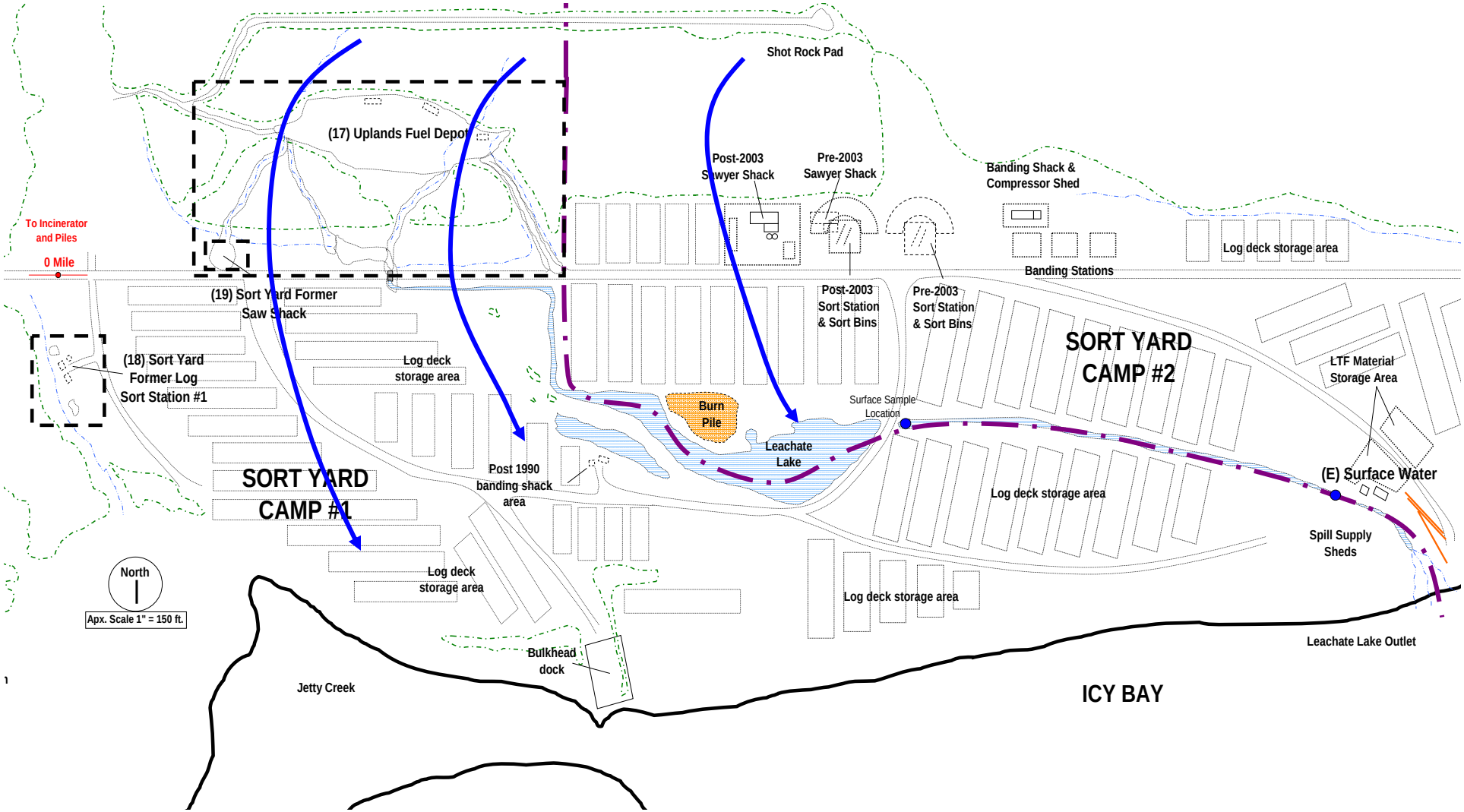


Figure 68. Hypothesized Water Table Movement - Sort Yard

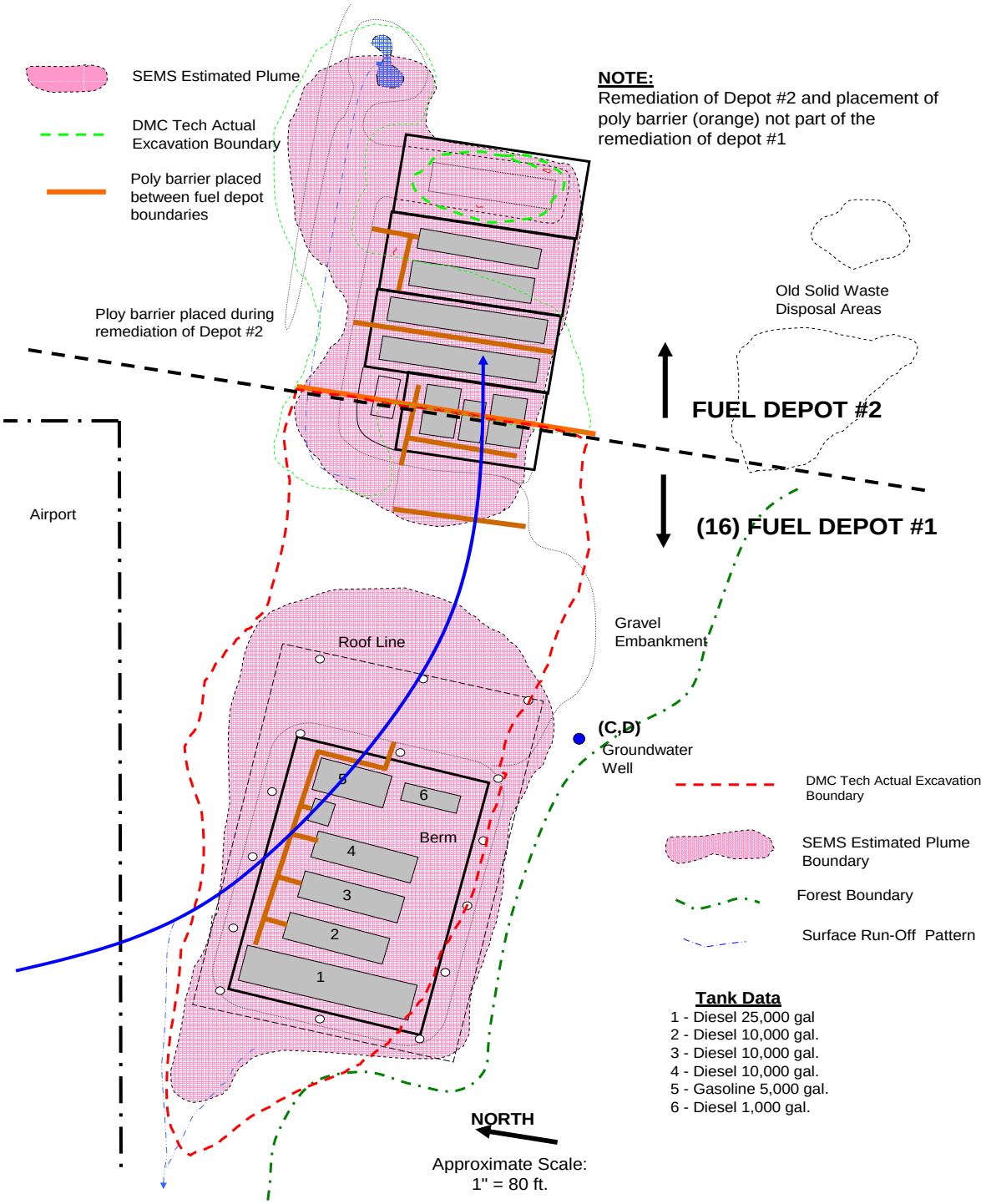


Figure 69. Hypothesized Water Table Movement – Fuel Depots

The following table identifies areas with groundwater or surface water tied to Camp #1 recommended for evaluation based on site characterization data:

Groundwater and Surface Water Data

#	Remediation Areas	VOC (ppb)	SVOC (ppb)	Metals w/ Limits (ppb)
A	North Equipment Storage Area Groundwater	None	None	As – 150 ppb (50 ppb) Be – 2 ppb (4 ppb) Cr – 248 ppb (100 ppb) Cu – 786 ppb (1,300 ppb) Pb – 114 ppb (15 ppb) Hg – 1 ppb (2 ppb) Ni – 210 ppb (100 ppb) Zn – 403 ppb (11,000 ppb)
B	Boneyard Groundwater	None	None	As-110 ppb (50 ppb) Be-2 ppb (4 ppb) Cr-333 ppb (100 ppb) Cu-742 ppb (1,300 ppb) Pb-90 ppb (15 ppb) Hg-1 ppb (2 ppb) Ni-230 ppb (100 ppb) Zn-513 ppb (11,000 ppb)
C,D	Fuel Depot Groundwater	Trace-2	None	As-160 ppb (50 ppb) Be-4 ppb (4 ppb) Cr-580 ppb (100 ppb) Cu-1,610 ppb (1,300 ppb) Pb-144 ppb (15 ppb) Hg-1.9 ppb (2 ppb) Ni-500 ppb (100 ppb) Tl-2 ppb (2 ppb) Zn-1,980 ppb (11,000 ppb)
E	Sort yard leachate lake outlet surface water – avg. 2 Samples	Trace-3 DRO- 1,800 ppb (1,500 ppb) TaqA- 42 ppb (10 ppb)	Trace-3	As-6 ppb (50 ppb) Cr-17 ppb (37 ppb) Cu-30 ppb (21 ppb) Pb-2 ppb (5 ppb) Ni-10 ppb (20 ppb) Zn-24 ppb (47 ppb)
E*	Natural leachate background near sort yard	Trace-3 DRO- 1,800 ppb (1,500 ppb) TaqA- 42 ppb (10 ppb)	Trace-3	As-6 ppb (50 ppb) Cr-17 ppb (37 ppb) Cu-30 ppb (21 ppb) Pb-2 ppb (5 ppb) Ni-10 ppb (20 ppb) Zn-24 ppb (47 ppb)

Notes: (Red) Sample exceeding water quality standard (See Clean-Up Limits Section)

(Trace -#) Number of constituents detected above detection limit but less than established water quality standards

Table 31. Water Characterization Data

Groundwater at Icy Bay is highly mineralized as discussed in the background section to this report.This fact was recognized by ADEC in the March, 2003 approval to the Camp #2 Work Plan which states:

> *"Page 17, number 2 - Background sampling will not be required to delineate the concentration of heavy metals in groundwater, surface water and undisturbed natural soils. The discussion in the work plan regarding the area hydrogeology adequately discusses the highly mineralized nature of area sediments. Moreover, Alaskan logging camps are typically contaminated with petroleum products only, although there may be limited metals contamination associated with specific source areas such as shops or incinerators.*

This comment also has applicability to Camp #1. The following areas had water samples collected for analyses either by grab sample or by pumping/bailing water from small piezometers. No groundwater samples were collected during remediation efforts. However, grab samples of surface water relative to leachate lake were collected and analyzed.

(Area A) North of Oil Shed Area – North Equipment Storage Area Groundwater

Groundwater was collected from the North Equipment Storage Area groundwater well upgradient of the shop and subjected to analyses. Concentrations of several metals including As, Cr, Pb, and Ni were found in groundwater at levels exceeding ADEC clean-up standards. However, as noted in Table 2, soils at Icy Bay are highly mineralized. This mineralization naturally disperses metals to the surrounding groundwater. More importantly, the camp does not use products containing the metals noted and could create the higher concentrations observed. Groundwater is not contaminated with heavy metals from camp operations.

(Area B) Boneyard Area Groundwater

Groundwater was collected from the Boneyard groundwater well downgradient of the shop and subjected to analyses. Concentrations of several metals including As, Cr, Cu, Pb, and Ni were found in groundwater at levels exceeding ADEC clean-up standards. However, as noted in Table 2, soils at Icy Bay are highly mineralized. This mineralization naturally disperses metals to the surrounding groundwater. More importantly, the camp does not use products containing the metals noted and could create the higher concentrations observed. Groundwater is not contaminated with heavy metals from camp operations. The lack of statistical difference between analyte concentrations in the two noted wells is also indicative of background concentrations of metals only.

(Area C and D) Fuel Depot Groundwater

Groundwater was collected from the fuel depot well both before and after development and was subjected to analyses as noted in the table previously presented. Concentrations of several metals including As, Cr, Cu, Pb, Ni and Zn were found in shop groundwater at levels exceeding ADEC clean-up standards. However, as noted in Table 2, soils at Icy Bay are highly mineralized. This mineralization naturally disperses metals to the surrounding groundwater. More importantly, the camp does not use products containing the metals noted and could create the higher concentrations observed.

(Area E) Leachate Lake Surface Water and Leachate Background

On June 5, 2002; a grab sample was collected at the discharge from leachate lake about 160 feet downstream of its outlet. The discharge flows at a rate of about 300 to 1,000 gpm. The DRO level was 1.8 ppm. There is no surface water quality standard for DRO. The groundwater standard is 1.5 ppm. The sample had more DRO than is allowed in groundwater. Traces of three volatile organics and three semivolatile organics were noted but not in concentrations exceeding water quality criteria. The total aqueous hydrocarbon level detected was 42 ppb – four times higher than established water quality criteria. The only metal found slightly higher than established criteria was copper – only slightly higher. The characterization report indicates that the presence of DRO and total aqueous hydrocarbon in the lake discharge might be attributable to leaking heavy equipment used in the yard. Follow-up sampling was recommended in the fall to determine if levels had changed or dropped.

ADEC approval of the work plan for Camp #2 commented on leachate lake as follows. The comment has applicability to Camp #1 since leachate lake is common to both sort yards:

> *"The work plan states that high aromatic hydrocarbon and DRO levels indicate that considerable oil is being discharged to leachate lake. This is likely from Camp #2 since at the time Camp #1 sort yard was not operating. Continue to use 2SY-12 as a long-term surface water monitoring station. Sample for total aqueous TAqH and total aromatics (TAH) but not DRO. Use 8270C - SIM for TAqH to achieve lower detection limits (make sure your lab is approved for this method). Use 8021B for the aromatics. Establish a second monitoring location near the outlet to Icy Bay. This discharge point is our main concern.*

Two samples were collected from leachate lake on March 23, 2003. One sample was collected at the lake near the roadway culvert. The second was collected at the terminal end of the discharge from the lake near Icy Bay. This location was closer to the bay that the location sampled during former characterization work. During the sampling, the outlet of the discharge from the lake near Icy Bay was bridged with sand from tidal action and no leachate was reaching the bay. Rather, the leachate was infiltrating into the sand along the length of the ditch. Sample results did not identify totals aqueous hydrocarbons in the surface water. It is recommended that the outlet remain bridged with sand and that equipment working in the yard be kept free of leaks in order to keep oil from entering the system and possibly reaching Icy Bay.

Samples were again repeated from the locations describe above and from a non-impacted background area where natural woodwaste leachate was present. The results of these analyses follow. During this sampling event the sand bridge at the terminal end of the discharge was breached and leachate was flowing into Icy Bay.

Sample #	Petroleum (ppm)	VOCs (ppb)	SVOCs + PNAs (ppb)	Metals (ppb)
LL0 – Lake	DRO – 12.9 RRO – 3.49	acetone – 32.6 p-isopropyltoluene – 13.4	ND	As – 6.2 Ba – 97.4 Cd – ND Cr – 8.45 Pb – 3.45 Hg – ND Se – 5.54 Ag - ND
LL1- Outlet	DRO – 12.1 RRO – 3.17	acetone – 26.3 p-isopropyltoluene – 4.18 toluene – 2.21	3,4-methylphenol – 180 phenol - 162	As – 16.3 Ba – 127 Cd – ND Cr – 35.7 Pb – 10.2 Hg – ND Se – ND Ag - ND
LLB-1 Background	DRO – 0.419 RRO - ND	ND	ND	As – ND Ba – 19.9 Cd – ND Cr – ND Pb – 1.53 Hg – ND Se – ND Ag - ND
LLB-2 Background	DRO – ND RRO - ND	ND	ND	As – ND Ba – 22.5 Cd – ND Cr – ND Pb – 1.38 Hg – ND Se – ND Ag - ND
LLB-3 Background	DRO – ND RRO - ND	toluene – 1.08	ND	As – ND Ba – 20.7 Cd – ND Cr – ND Pb – 1.47 Hg – ND Se – ND Ag - ND
LLB-4 Background	DRO – ND RRO - ND	toluene – 1.44	ND	As – ND Ba – 22.3 Cd – ND Cr – ND Pb – 1.70 Hg – ND Se – ND Ag - ND
LLB-5 Background	DRO – ND RRO - ND	toluene – 1.53	ND	As – 1.45 Ba – 21.6 Cd – ND Cr – 1.11 Pb – 1.83 Hg – ND Se – ND Ag - ND

Table 32. Leachate Lake Water Quality Data

There is only a slight impact imparted to the surface water from yard activities, which appears to be an acceleration of natural degradation products (toluenes, phenols, etc.). At the time of this sampling, sort yard activities were at a minimum and significant rainfall had impacted the lake. Based on a long term view of all the data collected it appears that traces of petroleum product are imparted to the lake but none are discharged in quantities of concern. Concentrations of organics only seem to collect when the yard is in full use and when little rain is falling.

It is recommended that the outlet be monitored frequently and that the outlet be closed to discharge. Trapping the discharge over a large natural sand bed will keep constituents on site in a degrading environment and prevent potential releases to Icy Bay.

Camp Groundwater Monitoring

Throughout the remediation process scientific observations and data was being collected and evaluated to assess the potential need for groundwater monitoring. Groundwater monitoring became an issue when a dark smear band was detected under the Generator Shop Area.

Initially, an exemption was requested to leave the band in-place near the shop structure as to avoid risking structural damage by excavating under the building floor/footings. The exemption was approved by ADEC. Later as the Oil Shed and Saw Shack were excavated, more smear band was detected. Discussions were held regarding how much of the smear band could be left in-place without excavating. At the time it was thought that only small amounts of smear band extended beyond excavations under forested peripheries. A request for exemption to leave additional smear band was tabled and groundwater monitoring discussions commenced.

As excavations preceded additional smear band was detected around the maintenance shop and at the newly discovered Camp Depot. Concern mounted that perhaps the smear band covered a very large area. Accordingly, exploratory excavations were made in and around the shop and around the edges of the major excavations. It was learned that the smear band was actually limited to the excavation areas. In fact, confidence was building that perhaps the smear band could be removed. To limit contaminated material, the smear band was sampled with depth in several locations and a contamination band was consistently observed at a thickness of 7 feet. The contamination zone commenced at the high water table at 4 feet and extended to the lower water table line at 11 ft. It was agreed that by removing the overburden of 4 feet and excavating contamination zone, any source of contamination that could potentially creat a risk would be removed. Thus, the need for groundwater monitoring would be eliminated. A determination was reached to remove the smear band in it’s entirely.

From July to September, excavations focused on complete removal of the smear band and exploratory holes to ensure that no smear band remained. After collecting data, a petition for no groundwater monitoring was made and then approved by ADEC. Data presented to ADEC follows for review:

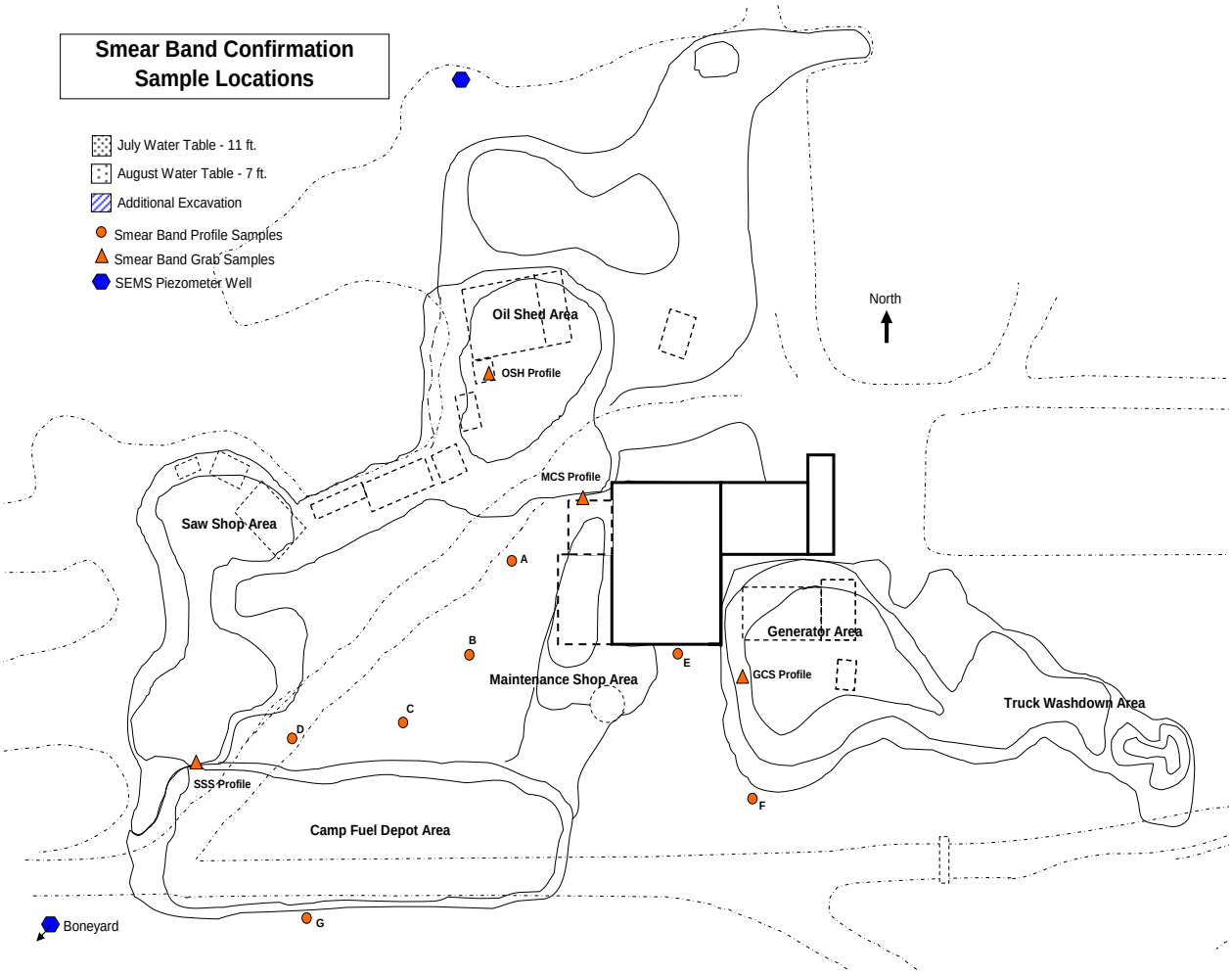


Figure 70. Smear Band Samples and Exploratory Excavations Supporting a Petition for No Groundwater Monitoring

4 smear band samples and 7 exploratory excavations are noted. Date follows. As mentioned, groundwater samples collected upgradient and downgradient of the smear band mass - still present in 2002; indicated no contamination.

	Map #	Sample #	Depth/Location	PIDb	Odor	Sheen	GRO	DRO	RRO
			Limits	**na**	**na**	**na**	**260**	**843**	**8300**
1	OSH	OSH-01P	9'	1.5	n-s	n	0.0	20.0	88.0
1		OSH-02P	9'6"	8	s-m	s	6.6	846.0	356.0
1		OSH-03P	10'	26	m	m-h	31.6	2,130.0	8,720.0
1		OSH-04P	10'6"	135	h	h	38.2	3,370.0	18,700.0
1		OSH-05P	11'	42	h	h	155.0	9,270.0	41,900.0
1		OSH-06P	11'6"	83	h	h	58.3	5,720.0	25,400.0
1		OSH-07P	12'	19	m	m-h	21.9	1,510.0	8,040.0
1		OSH-08P	12'6"	3	s-m	s-m	0.0	27.0	112.0
1	MCS	MCS-01P	9'	1	n	n	0.0	10.6	0.0
1		MCS-02P	9'6"	4.5	n-s	n-s	4.3	207.0	976.0
1		MCS-03P	10'	5	s-m	s	11.7	675.0	2,740.0
1		MCS-04P	10'6"	11.5	m-h	m-h	16.0	1,360.0	5,440.0
1		MCS-05P	11'	21	h	h	20.6	2,370.0	8,870.0
1		MCS-06P	11'6"	17	h	h	12.3	2,080.0	8,480.0
1		MCS-07P	12'	4	s-m	m	0.0	219.0	885.0
1		MCS-08P	12'6"	1	n-s	s	0.0	12.7	32.2
1	GCS	GCS-01P	9'	0	n	n	0.0	5.1	0.0
1		GCS-02P	9'6"	1	n	n	0.0	164.0	125.0
1		GCS-03P	10'	1.5	n-s	n	0.0	276.0	110.0
1		GCS-04P	10'6"	3	s-m	s	25.3	713.0	0.0
1		GCS-05P	11'	9.5	m	m	14.7	1,100.0	68.6
1		GCS-06P	11'6"	6.5	m	m	5.1	845.0	0.0
1		GCS-07P	12'	2.5	s-m	s	0.0	477.0	0.0
1		GCS-08P	12'6"	1	n-s	s	3.6	72.8	0.0
1	SSS	SSS-01P	9'	2	n	n	0.0	13.1	0.0
1		SSS-02P	9'6"	3	n	n	0.0	155.0	0.0
1		SSS-03P	10'	4.5	s	s	2.7	312.0	111.0
1		SSS-04P	10'6"	26.5	m	m	4.8	1,743.0	268.0
1		SSS-05P	11'	16	s	s	12.8	989.0	177.0
1		SSS-06P	11'6"	10	n-s	n	10.0	671.0	46.0
1		SSS-07P	12'	4.5	n	n	3.1	213.0	0.0
1		SSS-08P	12'6"	2	n	n	0.0	87.0	0.0
1	A	SBA	11'	0.5	n	n	0.0	8.4	28.3
1	B	SBB	11'	1	n	n	0.0	6.4	0.0
1	C	SBC	11'	0.5	n	n	0.0	8.5	0.0
1	D	SBD	11'	1	n	n	0.0	5.1	0.0
1	E	SBE	11'	1	n	n	0.0	10.0	0.0
1	F	SBF	11'	1	n	n	0.0	7.4	0.0
1	G	SBG	11'	2.5	s	n-s	0.0	175.0	683.0

Table 33. Smear Band and Exploratory Excavation Sample Data

The smear band described was removed as evidenced from confirmation sampling already recorded in the report. Data from exploratory excavations indicates that the smear band was limited in expanse.

CONTAMINATED SOIL STOCKPILES

Four (4) contaminated soil stockpiles were developed. Samples were collected from the footprint of the stockpiles before contaminated soils were placed in them to provide technical data regarding background concentrations of DRO and RRO. The following stockpiles were created:

- North Petroleum Stockpile
- South Petroleum Stockpile
- South Solvent Stockpile
- Runway Petroleum Stockpile

The locations of these piles are noted below. The north pile and the solvent stockpile were placed in bermed and plastic lined containments. ADEC was petitioned and approved leaving the south petroleum and runway stockpiles unlined, yet still bermed.

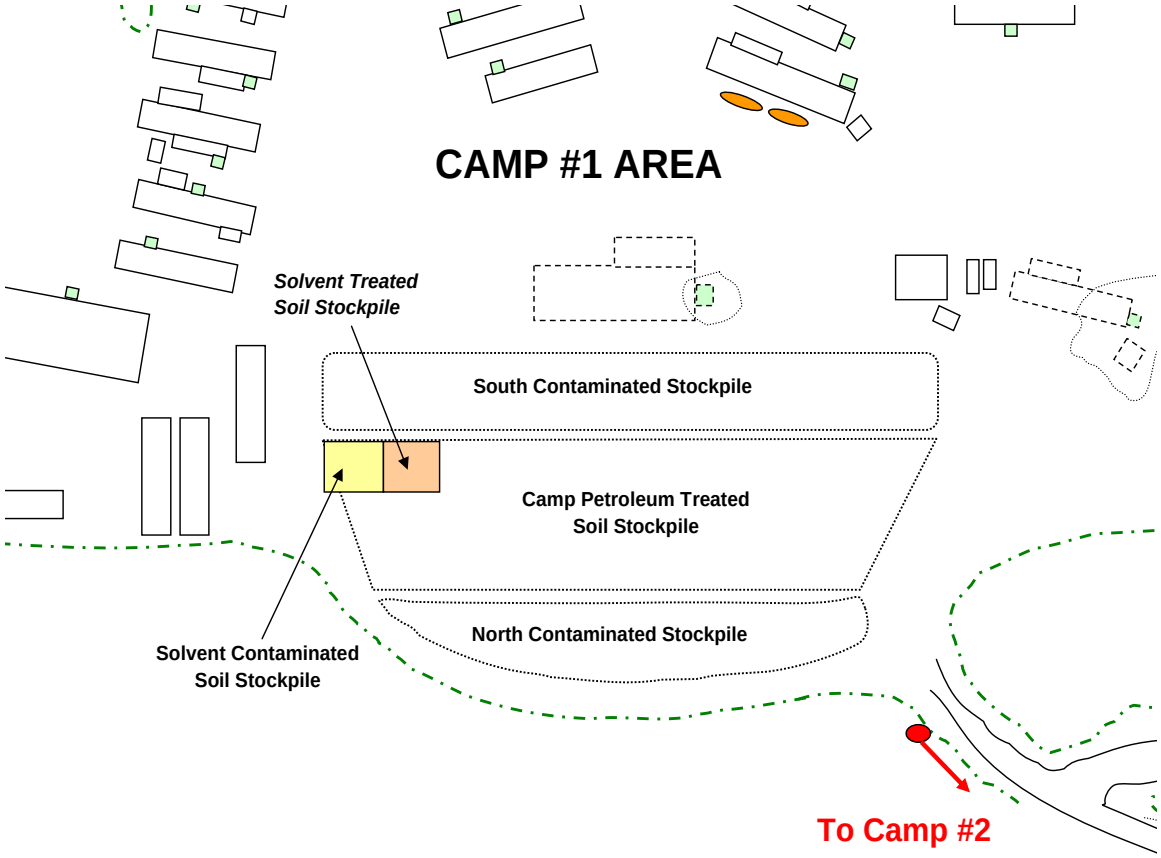


Figure 71. Stockpiles – North, South & Solvent

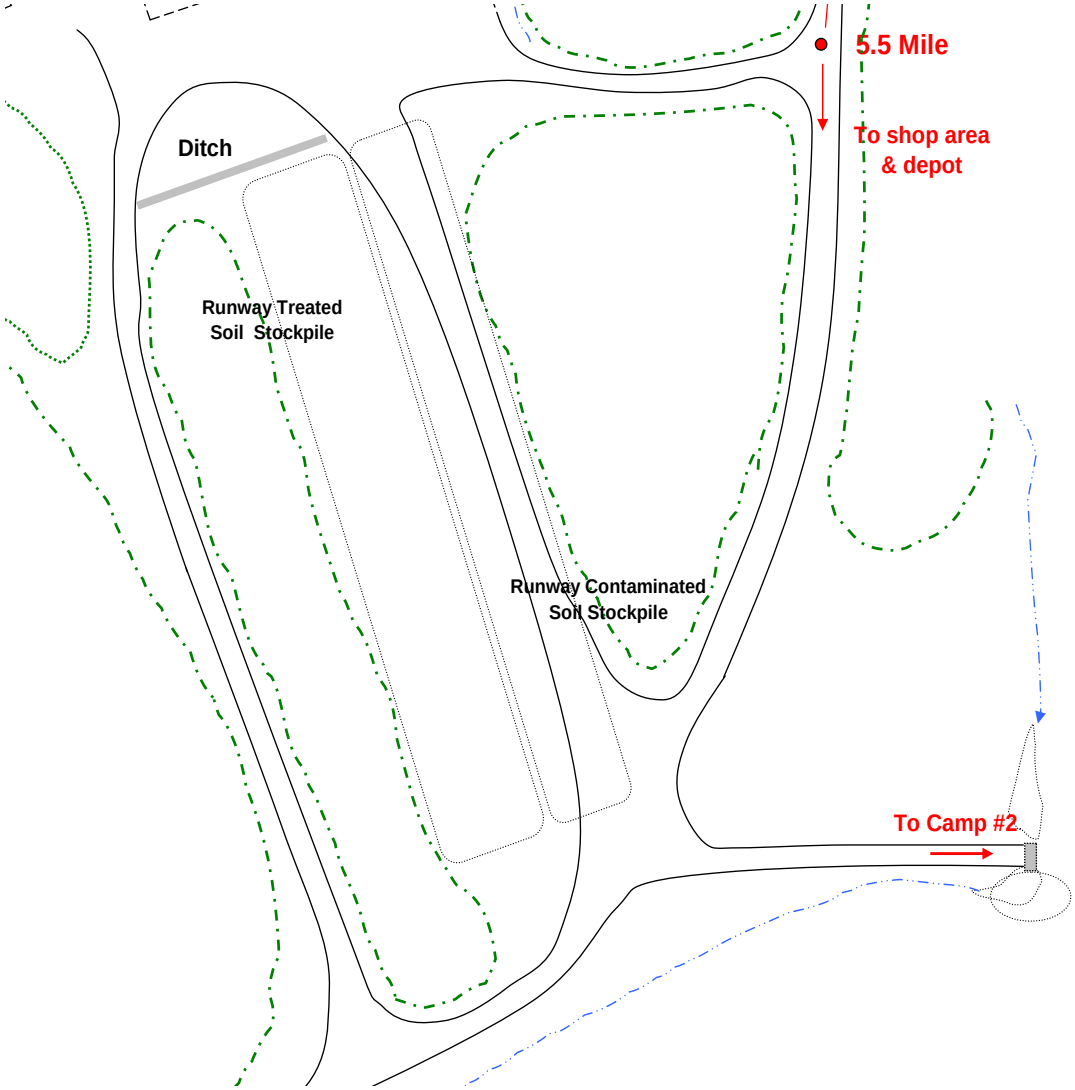


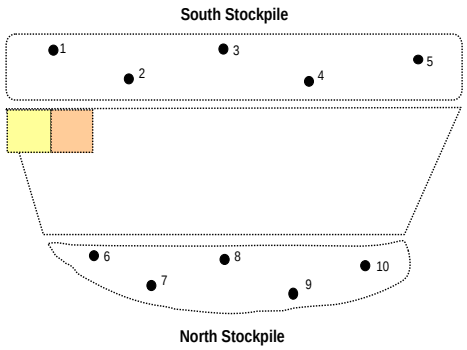
Figure 72. Stockpiles - Runway

Stockpiles were carefully managed to control run-off. Berming, ditching and grooming were periodically performed to maintain pile integrity after precipitation events. Even though the piles were unlined, no run-off from the piles entered any surface water system. Piles remained uncovered to ensure sufficient moisture to promote bioremediation was present. Three sets of sample data were collected to monitor treatment as follows:

- Samples collected before contaminated soil was placed on the ground to establish background
- Samples of treated soils
- Samples collected after contaminated stockpiles were removed to prove no leaching occurred since piles were unlined

Stockpile Background Sampling

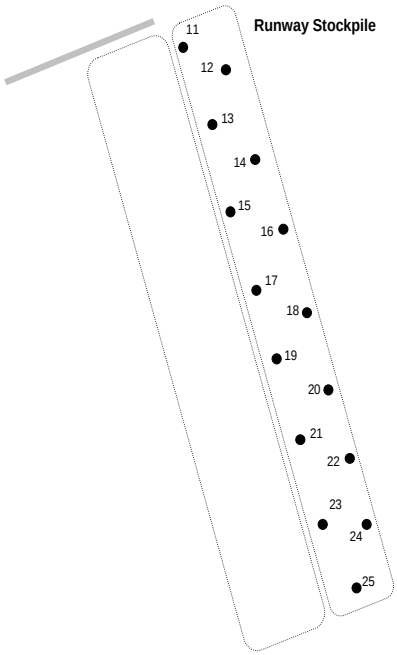
Background sample data associated with the stockpiles is noted below:



BACKGROUND (before)

Map	Sample	Odor	Sheen	PID	DRO	RRO
1	TC-A	n	n	0.5	6.66	0
2	TC-B	n	n	0.5	5.58	0
3	TC-C	n	n	0.5	9.57	63.1
4	TC-D	n	n	0.5	4.49	0
5	TC-E	n	n	0.5	5.07	0
5	TC-E-DUP	n	n	0.5	4.52	0
6	TC-F	n	n	0.5	5.93	0
7	TC-G	n	n	0.5	0	0
8	TC-H	n	n	0.5	8.02	61.7
9	TC-I	n	n	0.5	5.86	0
10	TC-J	n	n	0.5	5.14	0
10	TC-J-DUP	n	n	0.5	0	0
				Mean	5.07	10.40

All samples @ 8" depth



BACKGROUND (before)

Map	Sample	Odor	Sheen	PID	DRO	RRO
11	TC-K	n	n	0.5	6.67	0
12	TC-L	n	n	0.5	0	0
13	TC-M	n	n	0.5	8.94	0
14	TC-N	n	n	0.5	7.34	0
15	TC-O	n	n	0.5	0	0
16	TC-P	n	n	0.5	11.4	18.3
17	TC-Q	n	n	0.5	9.97	14.9
18	TC-R	n	n	0.5	6.58	0
19	TC-S	n	n	0.5	278	374
20	TC-T	n	n	0.5	0	0
21	TC-U	n	n	0.5	0	0
22	TC-V	n	n	0.5	0	0
23	TC-W	n	n	0.5	0	0
24	TC-X	n	n	0.5	0	0
25	TC-Y	n	n	0.5	6.69	0
				Mean	22.37	27.15

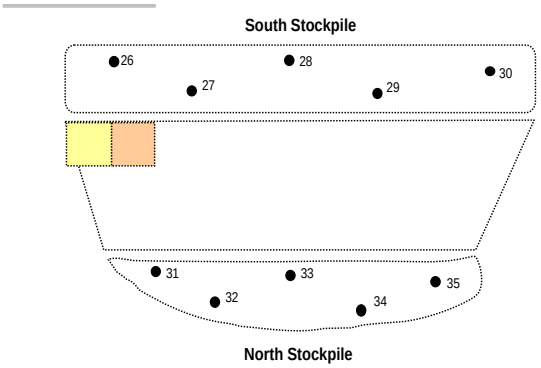
All samples @ 8" depth

Figure 73. Stockpiles Background Sampling Results

As indicated by the data, biogenics are present in background soils contributing approximately 5-10 ppm DRO and approximately 20-30 ppm RRO. The data also provides a baseline concentrations to ensure that stockpiling and treatment do not increase the concentrations of organics in the soil.

Stockpile Footprint Sampling

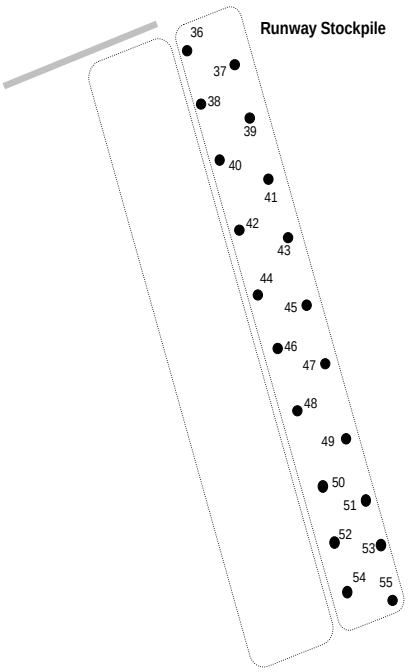
Samples were collected following treatment from under the former stockpiles (footprint of stockpiles). Footprint data is presented below and clearly indicates that no impact to the surrounding soil was created even in the absence of liners. It should be noted that the bottom of the contaminated stockpile was treated with nutrient and bacteria to ensure cleanliness.



FOOTPRINT (after)

Map	Sample	Odor	Sheen	PID	DRO	RRO
26	FT-1	n	n	0.5	0	0
27	FT-2	n	n	0.5	0	0
27	FT-2D	n	n	0.5	0	0
28	FT-3	n	n	0.5	0	0
29	FT-4	n	n	0.5	0	0
30	FT-5	n	n	0.5	0	80
31	FT-6	n	n	0.5	0	0
32	FT-7	n	n	0.5	0	0
32	FT-7D	n	n	0.5	0	0
33	FT-8	n	n	0.5	0	0
34	FT-9	n	n	0.5	0	0
35	FT-10	n	n	0.5	0	0
				Mean	0.00	6.67

All samples @ 8" depth



FOOTPRINT (after)

Map	Sample	Odor	Sheen	PID	DRO	RRO
36	FT-11	n	n	0.5	0	0
37	FT-12	n	n	0.5	0	0
38	FT-13	n	n	0.5	0	0
39	FT-14	n	n	0.5	0	0
39	FT-14D	n	n	0.5	0	0
40	FT-15	n	n	0.5	0	0
41	FT-16	n	n	0.5	0	0
42	FT-17	n	n	0.5	0	0
42	FT-17D	n	n	0.5	0	0
43	FT-18	n	n	0.5	0	0
44	FT-19	n	n	0.5	0	0
45	FT-20	n	n	0.5	0	0
46	FT-21	n	n	0.5	0	0
47	FT-22	n	n	0.5	0	0
48	FT-23	n	n	0.5	0	0
48	FT-23D	n	n	0.5	0	0
49	FT-24	n	n	0.5	0	0
50	FT-25	n	n	0.5	0	0
51	FT-26	n	n	0.5	0	0
52	FT-27	n	n	0.5	0	0
52	FT-27D	n	n	0.5	0	0
53	FT-28	n	n	0.5	0	0
54	FT-29	n	n	0.5	0	0
55	FT-30	n	n	0.5	0	0
				Mean	0	0

All samples @ 8" depth

Figure 74. Stockpiles Footprint Sampling Results

BIOAUGMENTATION PROCESS

Treatment began on the surface of the contaminated stockpile in a "lift". A lift represents a one-foot deep slice of the top of the stockpile. Bionutrient was spread by hand across the top of the pile in a concentration of one-pound per cubic yard. This concentration is apx. 3 times that needed to treat the soil. The bionutrient is specially designed for the organisms only and will not dissolve in water. After the bionutrient was added, bacteria (inoculant) was sprayed onto the pile. Approximately 1 gallon of inoculant was sprayed per 5 cubic yards of soil. This dose is apx. 5 times that needed to treat the soil. This dosing rate represents the addition of 95 trillion bacteria per cubic yard of soil. The pile was overdosed for several reasons:

1. Alaska soils lack natural nutrients and organisms to support treatment.
2. Conditions in Alaska are also colder and wetter. These facts warrant higher doses to ensure rapid and effective treatment.
3. The piles will sit over the winter undergoing natural attenuation. Higher doses will ensure that the attenuation process remains effective in treating concentrations of contaminants to lower limits.

After bionutrient and bacteria were added, the upper one-foot of the soil was vigorously tilled using a specially designed rake placed on a D-6 dozer. Following tilling, the upper foot of stockpile, or lift, was pushed into a pile on top of the stockpile using a D-8 dozer. Next, a trackhoe accessed the top of the pile and threw the pile of treated soil through the air into the adjacent treatment stockpile. The soil on the treated stockpile was then pushed with a D-8 dozer across the pile into its desired shape. This treatment process aerates and mixes the soil. As a result the soil in the treatment stockpile is thoroughly homogenized. This process continued lift by lift until the entire contaminated stockpile was treated. The treatment process ensures that there are no large variations or hot spots in contaminant concentrations.

Expected Treatment Effectiveness

System ET-20 was thoroughly tested by the EPA in 1993 (EPA Technical Bulletin B-45-1993). Petroleum products at a concentration of 35,000 ppm alkanes (GRO, DRO & RRO) and 5,000 ppm aromatics (GR0, DRO and RRO) were treated. After 7 days, contaminant concentration decreased by 60%. Greater than 95% reduction was achieved by 28 days. System ET-20 adds the bacteria and nutrients missing in Alaska soils (bioaugmentation) and secures effective treatment quickly. EPA data is presented below:

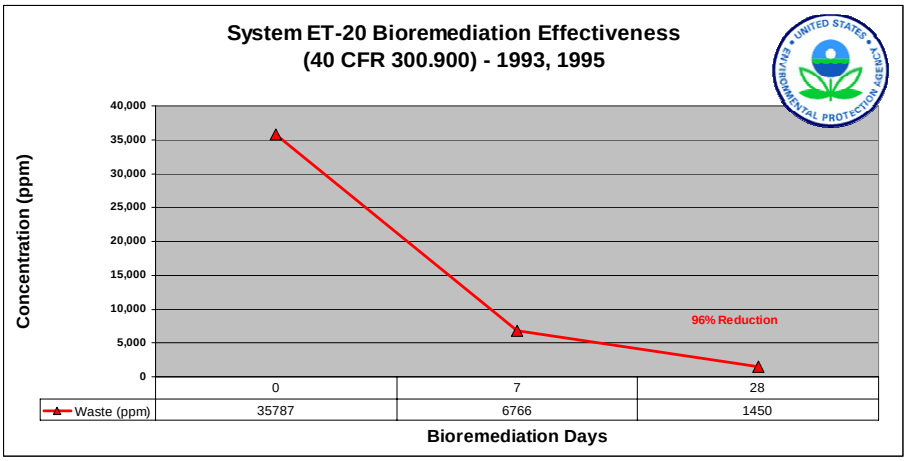


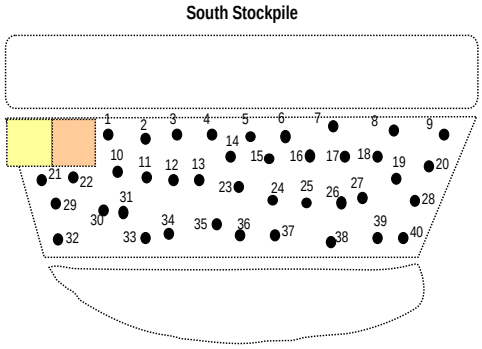
Figure 75. EPA Bioremediation Effectiveness Testing Results

Based on estimated stockpile concentrations of 100 ppm GRO, 5,000 ppm DRO and 10,000 ppm RRO; it was hypothesized that a 60% reduction in concentrations would be achieved in 7 days, and 80% reduction in 14 days and a 90% reduction in 21 days. The clean-up limit of 718 ppm DRO was expected to be achieved in apx. 14 days. Due tot lateness of the season and work in September, some delay in treatment effectiveness was expected.

TREATED SOIL STOCKPILES

Camp Petroleum Treated Soil Stockpiles

Both contaminated stockpiles were combined into a single treated soil stockpile to preserve space. The treated soil stockpile contained 8,134 CY of treated soil upon completion with an average depth of 12 feet. The stockpile was filled from 7/18 to 8/23 and samples were collected on September 25, 2003 rendering a treatment period of 56 to 68 days. No liners were present under or on the stockpile. Results of confirmation sampling follow.



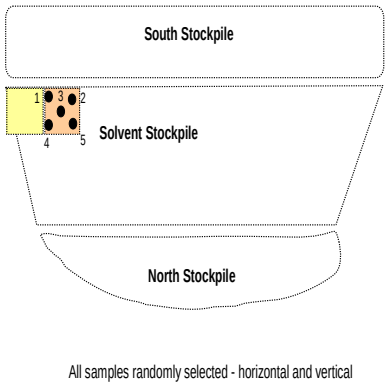
CONFIRMATION OF TREATMENT

Map	Sample	Depth (ft.)	Odor	Sheen	PID	DRO	RRO
1	1	12	s-m	s	36	133	108
2	2	10	m-h	s-m	23	754	114
2	41D	10	m-h	s-m	24	605	1330
3	3	8	s-m	s	23	333	664
4	4	2	s-m	s	32	570	965
5	5	12	s-m	s	32	415	941
6	6	11	m-h	s	32	612	356
7	7	7	s-m	s	15	354	886
8	8	1	s-m	s	26	349	581
9	9	8	n-s	s	30	30.8	807
9	42D	8	s-m	s	30	186	689
10	10	3	s-m	s	15	301	633
11	11	10	s-m	s	6	517	2260
12	12	5	s-m	s	5	441	2190
13	13	1	s-m	s	5	212	211
14	14	9	s-m	s	11	354	1430
15	15	6	s-m	s	15	217	1600
16	16	1	s-m	s	11	194	1500
17	17	11	s-m	s	10	93.2	1320
18	18	7	s-m	s	12	215	3060
19	19	2	n-s	s	14	58.4	902
20	20	12	s-m	s	3	197	465
21	21	8	s-m	s	16	105	910
22	22	5	s-m	s	12	381	2270
23	23	8	m-h	s-m	17	612	2550
24	24	6	s-m	s	25	489	763
25	25	5	s-m	s	16	349	1900
25	44D	5	s-m	s	16	362	733
26	26	10	s-m	s-m	9	649	810
27	27	6	s-m	s	3	555	779
28	28	1	s-m	s	21	329	1220
29	29	10	s-m	s	26	401	1760
30	30	9	s-m	s	8	269	1270
31	31	2	s-m	s	8	486	458
32	32	12	s-m	s	2	94.1	1850
33	33	7	s-m	s	3	455	2170
34	34	4	n-s	s	1	65.3	2210
35	35	11	s-m	s	1	529	262
36	36	8	s-m	s	8	575	466
37	37	3	s-m	s	18	206	1840
37	45D	3	s-m	s	18	300	2010
38	38	12	s-m	s	10	524	1250
39	39	8	h	s-m	12	865	2060
39	43D	8	h	s-m	12	485	2110
40	40	4	s-m	s	17	209	3540
					Mean	365.2	1293.4
					Limit	718	8300

Figure 76. Camp Stockpiles Sampling Results

Solvent Contaminated Soil Stockpiles

The stockpile contained 430 CY upon completion with an average depth of 4 feet. The contaminated stockpile was spread out to 2 feet of depth and treated by direct injection of organisms and nutrient. Soils were stockpiled beginning 7/30 and also on 8/13 and 8/23. Sampling for confirmation was performed September 25, 2003 rendering a treatment period of 34 to 56 days. No liners were present under or on the stockpile. Results of confirmation sampling follow:



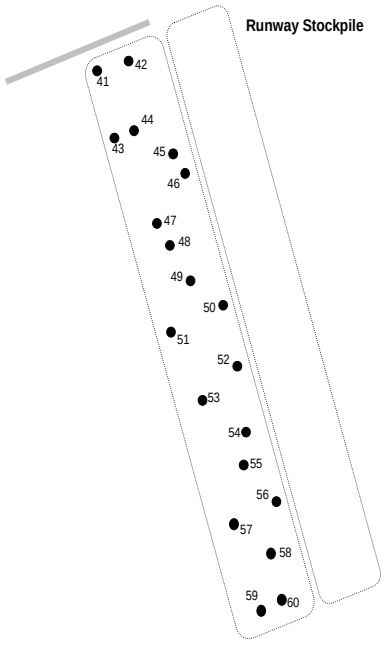
CONFIRMATION OF TREATMENT

Map	Sample	Depth	Odor	Sheen	PID	GRO	DRO	RRO	VOCs
1	SCS-001	2 ft.	s-m	s	35	0	387	NT	ND
2	SCS-002	2 ft.	m-h	s-m	11	0	65.7	NT	ND
3	SCS-003	2 ft.	s-m	s	51	0	654	NT	ND
4	SCS-004	2 ft.	s-m	s	31	0	388	NT	ND
5	SCS-005	2 ft.	m-h	s	1	0	0	NT	ND
5	SCS-005D	2 ft.	s-m	s	1	0	0	NT	ND

Figure 77. Solvent Stockpile Confirmation Results

Petroleum Contaminated Soil Stockpiles - Runway

The runway stockpile contained 6,424 CY upon completion with an average depth of 12 feet. The stockpile was filled from September 2, to September 11, 2003. Confirmation samples were collected October 1, 2003 rendering a treatment period of 19 to 29 days – relatively short. No liners were present under or on the stockpile. Results of confirmation sampling follow:



CONFIRMATION OF TREATMENT

Map	Sample	Depth (ft.)	Odor	Sheen	PID	DRO	RRO
41	RSP-01	4	s-m	s	23	237	73.3
42	RSP-02	8	m	s-m	49	708	305
43	RSP-03	9	s-m	s	36	453	116
44	RSP-04	12	s-m	s	42	571	216
45	RSP-05	10	s-m	s	37	417	117
46	RSP-06	7	s-m	s	38	489	130
47	RSP-07	9	s-m	s	33	493	142
48	RSP-08	3	s-m	s	40	568	253
49	RSP-09	5	s	s	29	287	88.4
49	RSP-9D	5	s-m	s	31	421	120
50	RSP-10	2	s-m	s	29	364	107
51	RSP-11	11	s	s	26	270	154
52	RSP-12	12	s-m	s	30	353	258
53	RSP-13	7	s-m	s	31	312	107
54	RSP-14	8	s-m	s	33	341	97.8
55	RSP-15	3	s-m	s	28	287	97.8
56	RSP-16	4	s	n-s	20	161	0
57	RSP-17	10	s	n-s	17	147	0
58	RSP-18	12	s-m	s	36	451	137
58	RSP-18D	12	s-m	s	33	342	128
59	RSP-19	5	s-m	s	34	373	134
60	RSP-20	6	s-m	s	41	546	233
					Mean	390.5	137.0
					Limit	718.0	8300.0

Figure 78. Runway Stockpile Confirmation Results

Treatment cells adjacent to contaminated stockpiles were created by developing a gravel bermed rectangle and lining the inside of the rectangle with 10 mil thick liner as an option. The adjacent location allowed for easy transfer of treated soil from the contaminated stockpile to the treatment cell.

Samples were collected in accordance with a revised and approved sampling plan using a trackhoe and stainless steel scoop. The scoop allowed for sample collection from a deep excavation without entering the excavation. All of the samples were randomly collected after establishing a grid on top the stockpile. Sample depths were also randomly chosen.

STATISTICAL ANALYSES OF CONFIRMATION DATA

Statistical analyses are performed if any of the analyses indicates a sample higher than the established clean-up limit. This is necessary to ensure that the statistical mean upper confidence limit is below the established clean-up limit. ADEC guidance was followed in performing statistical analyses including assignment of large sample lots (>20 samples) for large piles to ensure validity. Statistical analyses were not needed for any stockpile. Regardless, the analyses were performed for the larger stockpiles as a demonstration of complete compliance.

Following a review of field and laboratory sampling data quality objectives, sample data was validated. Data was considered adequate. The higher of duplicate samples was removed from the data set. The data was checked for "best fit" and calculations made to determine normal or log normal distribution. Data was determined to be distributed log normally. A student H-test was performed and upper confidence limits calculated for DRO. These upper limits were noted to be less than the established treatment limit of 718 ppm DRO for further treatment, but higher than the Method 2 criteria of 230 ppm DRO. The pile was considered treated. However, the piles will need to remain undisturbed to allow natural attenuation to proceed until the free-release criteria of 230 ppm DRO is met. A student H-test was also performed and an upper confidence limit calculated for RRO. These upper limits were noted to be less than the established clean-up limit of 8,300 ppm DRO for further treatment or for free-release. The piles were considered treated. No evaluation of individual VOC constituents was required for solvent stockpiles since the analyses performed indicated an absence of contaminants – no detect.

Stockpile	DRO 95% Upper Confidence Limit	RRO 95% Upper Confidence Limit
Camp	368 ppm	1,394 ppm
Solvent	NT	NT
Runway	352 ppm	209 ppm
	Treatment Limit = 718 ppm	Treatment Limit = 8,300 ppm

Table 34. Statistical Analyses Summary

Based on the statistical analyses, the treated stockpiles have met the most conservative approved Method 3 clean-up levels. Active treatment is no longer required. Tabular sheets derived in Microsoft Excel software follow presenting statistical data:

CAMP STOCKPILE - DRO ANALYSES

Original Data Set → **Duplicate Removed Data Set**

Sample	Units	Result	Detection
1	mg/kg	133	5
2	mg/kg	754	5
41D	mg/kg	605	5
3	mg/kg	333	5
4	mg/kg	570	5
5	mg/kg	415	5
6	mg/kg	612	5
7	mg/kg	354	5
8	mg/kg	349	5
9	mg/kg	30.8	5
42D	mg/kg	186	5
10	mg/kg	301	5
11	mg/kg	517	5
12	mg/kg	441	5
13	mg/kg	212	5
14	mg/kg	354	5
15	mg/kg	217	5
16	mg/kg	194	5
17	mg/kg	93.2	5
18	mg/kg	215	5
19	mg/kg	58.4	5
20	mg/kg	197	5
21	mg/kg	105	5
22	mg/kg	381	5
23	mg/kg	612	5
24	mg/kg	489	5
25	mg/kg	349	5
44D	mg/kg	362	5
26	mg/kg	649	5
27	mg/kg	555	5
28	mg/kg	329	5
29	mg/kg	401	5
30	mg/kg	269	5
31	mg/kg	486	5
32	mg/kg	94.1	5
33	mg/kg	455	5
34	mg/kg	65.3	5
35	mg/kg	529	5
36	mg/kg	575	5
37	mg/kg	206	5
45D	mg/kg	300	5
38	mg/kg	524	5
39	mg/kg	865	5
43D	mg/kg	485	5
40	mg/kg	209	5

	Not Transformed		Transformed	
	x	x2	ln(x)	[ln(x)]2
1	133	17689	4.89	23.92
1	605	366025	6.41	41.03
1	333	110889	5.81	33.73
1	570	324900	6.35	40.27
1	415	172225	6.03	36.34
1	612	374544	6.42	41.17
1	354	125316	5.87	34.45
1	349	121801	5.86	34.28
1	30.8	948.64	3.43	11.75
1	186	34596	5.23	27.31
1	301	90601	5.71	32.57
1	517	267289	6.25	39.04
1	441	194481	6.09	37.08
1	212	44944	5.36	28.69
1	354	125316	5.87	34.45
1	217	47089	5.38	28.94
1	194	37636	5.27	27.75
1	93.2	8686.24	4.53	20.56
1	215	46225	5.37	28.84
1	58.4	3410.56	4.07	16.54
1	197	38809	5.28	27.91
1	105	11025	4.65	21.66
1	381	145161	5.94	35.32
1	612	374544	6.42	41.17
1	489	239121	6.19	38.35
1	349	121801	5.86	34.28
1	362	131044	5.89	34.71
1	649	421201	6.48	41.93
1	555	308025	6.32	39.93
1	329	108241	5.80	33.59
1	401	160801	5.99	35.93
1	269	72361	5.59	31.30
1	486	236196	6.19	38.27
1	94.1	8854.81	4.54	20.65
1	455	207025	6.12	37.46
1	65.3	4264.09	4.18	17.46
1	529	279841	6.27	39.33
1	575	330625	6.35	40.38
1	206	42436	5.33	28.39
1	300	90000	5.70	32.53
1	524	274576	6.26	39.21
1	485	235225	6.18	38.24
1	209	43681	5.34	28.54
43		6399469.34		1395.26
	97.42%	**Log Normal Distribution Probability**		
	96.86%	Normal Distribution Probability		

Higher of duplicates eliminated
NDs replaced with 1/2 LOD value

Field DQOs	Met
Lab DQOs	Met
NDs Changed	None
High Dupes Out	Yes (2)

43	Samples	43	Samples
42	Deg. Frdm.	42	Deg. Frdm.
344.58	Mean	5.65	Mean
5.00	Detect Limit	1.61	Detect Limit
349	Median	5.86	Median
30808.21	Variance	0.51	Variance
175.52	Std. Dev.	0.71	Std. Dev.
26.77	Std. Error	0.11	Std. Error
1.74	T-test Value	1.86	H-test Value
391.15	UCL	**368.01**	**UCL**
298.00	LCL	**220.59**	**LCL**

Calculations Methodology

Ref. (a) *EPA Statistical Method - Publication SW-846, Volume II, Part III, Chapter 9*

Ref. (b) *ADEC Draft Statistical Methods for Determining the Mean Soil Concentration - 8/16/2001 (SPAR\CS\STP\02-001)*

ADEC Regulatory Limits

No additional treatment required	< 718 ppm
Free release as clean soil	< 230 ppm
All VOCs Detected Under Published Limits	Yes

Treatment Data

High DRO Treated	9,000
Avg. GRO Treated	6,000

Start Treatment	7/30/2003
Test Treatment	9/25/2003
Days Treated	53

93.87% **reduction in** **53 days**

Table 35. DRO Statistical Analyses – Camp Stockpile

CAMP STOCKPILE - RRO ANALYSES

Original Data Set → **Duplicate Removed Data Set**

Sample	Units	Result	Detection
1	mg/kg	108	5
2	mg/kg	114	5
41D	mg/kg	1330	5
3	mg/kg	664	5
4	mg/kg	965	5
5	mg/kg	941	5
6	mg/kg	356	5
7	mg/kg	886	5
8	mg/kg	581	5
9	mg/kg	807	5
42D	mg/kg	689	5
10	mg/kg	633	5
11	mg/kg	2260	5
12	mg/kg	2190	5
13	mg/kg	211	5
14	mg/kg	1430	5
15	mg/kg	1600	5
16	mg/kg	1500	5
17	mg/kg	1320	5
18	mg/kg	3060	5
19	mg/kg	902	5
20	mg/kg	465	5
21	mg/kg	910	5
22	mg/kg	2270	5
23	mg/kg	2550	5
24	mg/kg	763	5
25	mg/kg	1900	5
44D	mg/kg	733	5
26	mg/kg	810	5
27	mg/kg	779	5
28	mg/kg	1220	5
29	mg/kg	1760	5
30	mg/kg	1270	5
31	mg/kg	458	5
32	mg/kg	1850	5
33	mg/kg	2170	5
34	mg/kg	2210	5
35	mg/kg	262	5
36	mg/kg	466	5
37	mg/kg	1840	5
45D	mg/kg	2010	5
38	mg/kg	1250	5
39	mg/kg	2060	5
43D	mg/kg	2110	5
40	mg/kg	3540	5

Higher of duplicates eliminated
NDs replaced with 1/2 LOD value

		Not Transformed		Transformed	
		x	x2	ln(x)	[ln(x)]2
1		108	11664	4.68	21.92
1		114	12996	4.74	22.43
1		1330	1768900	7.19	51.74
1		664	440896	6.50	42.23
1		965	931225	6.87	47.23
1		941	885481	6.85	46.88
1		356	126736	5.87	34.51
1		886	784996	6.79	46.06
1		581	337561	6.36	40.51
1		807	651249	6.69	44.80
1		689	474721	6.54	42.71
1		633	400689	6.45	41.61
1		2260	5107600	7.72	59.65
1		2190	4796100	7.69	59.16
1		211	44521	5.35	28.64
1		1430	2044900	7.27	52.79
1		1600	2560000	7.38	54.43
1		1500	2250000	7.31	53.48
1		1320	1742400	7.19	51.63
1		3060	9363600	8.03	64.42
1		902	813604	6.80	46.30
1		465	216225	6.14	37.72
1		910	828100	6.81	46.42
1		2270	5152900	7.73	59.71
1		2550	6502500	7.84	61.53
1		763	582169	6.64	44.05
1		1900	3610000	7.55	57.00
1		733	537289	6.60	43.52
1		810	656100	6.70	44.85
1		779	606841	6.66	44.33
1		1220	1488400	7.11	50.50
1		1760	3097600	7.47	55.85
1		1270	1612900	7.15	51.08
1		458	209764	6.13	37.54
1		1850	3422500	7.52	56.59
1		2170	4708900	7.68	59.02
1		2210	4884100	7.70	59.30
1		262	68644	5.57	31.01
1		466	217156	6.14	37.75
1		1840	3385600	7.52	56.51
1		2010	4040100	7.61	57.85
1		1250	1562500	7.13	50.85
1		2060	4243600	7.63	58.22
1		2110	4452100	7.65	58.59
1		3540	12531600	8.17	66.78
45			104167427		2179.72
		94.44%	Log Normal Distribution Probability		
		94.23%	Normal Distribution Probability		

Field DQOs	Met
Lab DQOs	Met
NDs Changed	None
High Dupes Out	None

45	Samples	45	Samples
44	Deg. Frdm.	44	Deg. Frdm.
1293.40	Mean	6.91	Mean
5.00	Detect Limit	1.61	Detect Limit
1220	Median	7.11	Median
656537.88	Variance	0.65	Variance
810.27	Std. Dev.	0.81	Std. Dev.
120.79	Std. Error	0.12	Std. Error
1.74	T-test Value	1.86	H-test Value
1503.57	UCL	**1393.84**	**UCL**
1083.23	LCL	**726.10**	**LCL**

Calculations Methodology

Ref. (a) *EPA Statistical Method - Publication SW-846, Volume II, Part III, Chapter 9*

Ref. (b) *ADEC Draft Statistical Methods for Determining the Mean Soil Concentration - 8/16/2001 (SPAR\CS\STP\02-001)*

ADEC Regulatory Limits

No additional treatment required	< 8,300 ppm
Free release as clean soil	< 8,300 ppm
All VOCs Detected Under Published Limits	Yes

Treatment Data

High DRO Treated	20,000
Avg. GRO Treated	10,000

Start Treatment	7/30/2003
Test Treatment	9/25/2003
Days Treated	53

86.06% **reduction in** **53 days**

Table 36. RRO Statistical Analyses - Camp Stockpile

RUNWAY STOCKPILE - DRO ANALYSES

Original Data Set → **Duplicate Removed Data Set**

Sample	Units	Result	Detection
RSP-01	mg/kg	133	5
RSP-02	mg/kg	754	5
RSP-03	mg/kg	605	5
RSP-04	mg/kg	333	5
RSP-05	mg/kg	570	5
RSP-06	mg/kg	415	5
RSP-07	mg/kg	612	5
RSP-08	mg/kg	354	5
RSP-09	mg/kg	349	5
RSP-09D	mg/kg	30.8	5
RSP-10	mg/kg	186	5
RSP-11	mg/kg	301	5
RSP-12	mg/kg	517	5
RSP-13	mg/kg	441	5
RSP-14	mg/kg	212	5
RSP-15	mg/kg	354	5
RSP-16	mg/kg	217	5
RSP-17	mg/kg	194	5
RSP-18	mg/kg	93.2	5
RSP-18D	mg/kg	215	5
RSP-19	mg/kg	58.4	5
RSP-20	mg/kg	197	5

Higher of duplicates eliminated
NDs replaced with 1/2 LOD value

Field DQOs	Met
Lab DQOs	Met
NDs Changed	None
High Dupes Out	None

Calculations Methodology

Ref. (a) *EPA Statistical Method - Publication SW-846, Volume II, Part III, Chapter 9*

Ref. (b) *ADEC Draft Statistical Methods for Determining the Mean Soil Concentration - 8/16/2001 (SPAR\CS\STP\02-001)*

Treatment Data

High DRO Treated	9,000
Avg. GRO Treated	6,000

Start Treatment	9/2/2003
Test Treatment	10/1/2003
Days Treated	28

	Not Transformed		Transformed	
	x	x2	ln(x)	[ln(x)]2
1	133	17689	4.89	23.92
1	754	568516	6.63	43.90
1	605	366025	6.41	41.03
1	333	110889	5.81	33.73
1	570	324900	6.35	40.27
1	415	172225	6.03	36.34
1	612	374544	6.42	41.17
1	354	125316	5.87	34.45
1	349	121801	5.86	34.28
1	30.8	948.64	3.43	11.75
1	186	34596	5.23	27.31
1	301	90601	5.71	32.57
1	517	267289	6.25	39.04
1	441	194481	6.09	37.08
1	212	44944	5.36	28.69
1	354	125316	5.87	34.45
1	217	47089	5.38	28.94
1	194	37636	5.27	27.75
1	93.2	8686.24	4.53	20.56
1	215	46225	5.37	28.84
1	58.4	3410.56	4.07	16.54
1	197	38809	5.28	27.91
22		3121936.44		690.53

95.00%	**Log Normal Distribution Probability**
94.15%	Normal Distribution Probability

22	Samples	22	Samples
21	Deg. Frdm.	21	Deg. Frdm.
324.61	Mean	5.55	Mean
5.00	Detect Limit	1.61	Detect Limit
317	Median	5.76	Median
38274.91	Variance	0.63	Variance
195.64	Std. Dev.	0.79	Std. Dev.
41.71	Std. Error	0.17	Std. Error
1.74	T-test Value	1.86	H-test Value
397.19	UCL	**352.01**	**UCL**
252.03	LCL	**187.34**	**LCL**

ADEC Regulatory Limits

No additional treatment required	< 718 ppm
Free release as clean soil	< 230 ppm
All VOCs Detected Under Published Limits	Yes

94.13% **reduction in** **28 days**

Table 37. DRO Statistical Analyses – Runway Stockpile

RUNWAY STOCKPILE - RRO ANALYSES

Original Data Set → **Duplicate Removed Data Set**

Sample	Units	Result	Detection
RSP--01	mg/kg	73.3	5
RSP-02	mg/kg	305	5
RSP-03	mg/kg	116	5
RSP-04	mg/kg	216	5
RSP-05	mg/kg	117	5
RSP-06	mg/kg	130	5
RSP-07	mg/kg	142	5
RSP-08	mg/kg	253	5
RSP-08D	mg/kg	88.4	5
RSP-09	mg/kg	120	5
RSP-10	mg/kg	107	5
RSP-11	mg/kg	154	5
RSP-12	mg/kg	258	5
RSP-13	mg/kg	107	5
RSP-14	mg/kg	97.8	5
RSP-15	mg/kg	97.8	5
RSP-16	mg/kg	2.5	5
RSP-17	mg/kg	2.5	5
RSP-18	mg/kg	137	5
RSP-18D	mg/kg	128	5
RSP-19	mg/kg	134	5
RSP-20	mg/kg	233	5

	Not Transformed		Transformed	
	x	x2	ln(x)	[ln(x)]2
1	73.3	5372.89	4.29	18.44
1	305	93025	5.72	32.72
1	116	13456	4.75	22.60
1	216	46656	5.38	28.89
1	117	13689	4.76	22.68
1	130	16900	4.87	23.69
1	142	20164	4.96	24.56
1	253	64009	5.53	30.62
1	88.4	7814.56	4.48	20.09
1	120	14400	4.79	22.92
1	107	11449	4.67	21.84
1	154	23716	5.04	25.37
1	258	66564	5.55	30.84
1	107	11449	4.67	21.84
1	97.8	9564.84	4.58	21.00
1	97.8	9564.84	4.58	21.00
1	2.5	6.25	0.92	0.84
1	2.5	6.25	0.92	0.84
1	137	18769	4.92	24.21
1	128	16384	4.85	23.54
1	134	17956	4.90	23.99
1	233	54289	5.45	29.71
22		535204.63		492.23

96.17%	**Log Normal Distribution Probability**
94.20%	Normal Distribution Probability

Higher of duplicates eliminated
NDs replaced with 1/2 LOD value

Field DQOs	Met
Lab DQOs	Met
NDs Changed	None
High Dupes Out	None

22	Samples	22	Samples
21	Deg. Frdm.	21	Deg. Frdm.
137.24	Mean	4.57	Mean
5.00	Detect Limit	1.61	Detect Limit
124	Median	4.82	Median
5753.96	Variance	1.54	Variance
75.85	Std. Dev.	1.24	Std. Dev.
16.17	Std. Error	0.26	Std. Error
1.74	T-test Value	1.86	H-test Value
165.38	UCL	**209.41**	**UCL**
109.10	LCL	**44.30**	**LCL**

Calculations Methodology

Ref. (a) *EPA Statistical Method - Publication SW-846, Volume II, Part III, Chapter 9*

Ref. (b) *ADEC Draft Statistical Methods for Determining the Mean Soil Concentration - 8/16/2001 (SPAR\CS\STP\02-001)*

ADEC Regulatory Limits

No additional treatment required	< 8,300 ppm
Free release as clean soil	< 8,300 ppm
All VOCs Detected Under Published Limits	Yes

Treatment Data

High DRO Treated	20,000
Avg. GRO Treated	10,000

Start Treatment	7/30/2003
Test Treatment	9/25/2003
Days Treated	53

97.91% **reduction in** **53 days**

Table 38. RRO Statistical Analyses – Runway Stockpile

INSTITUTIONAL CONTROLS

The stockpiles in camp are located in their permanent and safe locations with no plans to remove them. No further treatment or seeding of the piles is currently planned. ADEC notification will be required to remove and reuse the material in the piles.

RELEASE INFORMATION

RELEASE DETAILS

Release Contacts

Site Name & Address

Icy Bay West Logging Camp #1
Icy Bay
Yakutat, Alaska 99689

Owner/Operator/Contractor

Owners: State of Alaska
Department of Natural Resources
Attn. Nancy Welch
550 West 7th Avenue, Suite 1400
Anchorage, AK 99501
P: 907-269-8431
X: 907-269-8918

State of Alaska
Mental Health Trust Land Office
Attn. Doug Campbell
550 West 7th Avenue, Suite 1430
Anchorage, AK 99501
P: 907-269-8656
X: 907-269-8905

Leasee: Statewide Office of Land Management
Attn. Mari Montgomery
University of Alaska
3890 University Lake Drive, Suite 103
Anchorage, AK 99508
P: 907-786-7766
X: 907-786-7733

Operators: Wasser & Winters Company
Attn. Ron Berg
66 Port Way
P.O. Box 396
Longview, WA 98632
P: 360-423-1080
X: 360-423-1084

Citifor, Inc.
Attn. Chuck Dobson
7272 Bank of America Tower
701 5th Avenue
Seattle, WA 98104
P: 206-622-3770
X: 206-622-6714

Contractor: Browning Timber Corporation
Attn. Wayne Browning
1300 East 68th
Suite 210
Anchorage, AK 99518
P: 907-562-2910
X: 907-562-2901

Date/Time of Release

Incidents of contamination likely occurred at the Icy Bay-West Camp #1 facility throughout its history. Regardless, inspections of the Icy Bay-West Camp #1 facilities performed under the Forest Practices Act by the landowners and regulatory agencies documented contamination and eventually resulted in the environmental remediation of the Icy Bay-West Camp #1. Several specific events of contamination were witnessed. In April 2001, certain poor housekeeping practices involving oil sheens and antifreeze were noted by the agencies during a Forest Practices Act inspection. In September, 2001, another incident occurred during an agency visit to the Icy Bay-West Camp #1 facility in which equipment and petroleum were burned, and releases of petroleum products occurred. These events brought agency scrutiny to the site, and as a result, an extensive environmental site assessment was eventually requested and completed by Southeast Management Services on behalf of the University of Alaska.

The Icy Bay-West Camp #1 facilities have been used in connection with timber harvest activities continuously from 1968 until present. The Icy Bay-West Camp #1 facilities include camp, vehicle maintenance, road, airport, fuel storage and dispensing, log sort yard and storage, and related facilities. Until 1993, these facilities were used by several different purchasers of timber from the State of Alaska Department of Natural Resources (DNR) to support their logging activities on State of Alaska lands (including lands conveyed to Alaska pursuant to the Alaska Mental Health Enabling Act).

The facilities were used exclusively by the University's Timber Purchaser between 1993 and 1996. Beginning in 1996, the site was jointly occupied by purchasers of timber from the University of Alaska ("University"), and from the Mental Health Trust Land Office (TLO), acting by and on behalf of the Alaska Mental Health Trust Authority, in support of their timber operations. The University's timber purchaser was Wasser & Winters Company and Wasser & Winters Alaska Company ("Wasser & Winters"); the TLO's timber purchaser was Citifor, Inc. Both purchasers employed Browning Timber of Alaska, Inc. ("Browning"), and

Ben A. Thomas, Inc. ("Thomas") as logging contractors to harvest the timber and conduct other operations for them.

As of late 2002, the State of Alaska's timber purchasers had harvested approximately fifty seven percent of the total volume of the timber harvested at West Icy Bay since 1968, while the University's timber purchaser had harvested approximately twenty seven percent of all such timber, and the TLO's purchaser had harvested approximately sixteen percent of all such timber. From 1996-2000, Wasser & Winters and Citifor jointly used the Icy Bay-West Camp #1 facilities under agreements providing for such joint use.

In 2000, the TLO's purchaser Citifor moved to newly constructed separate camp and shop facilities ("Icy Bay-West Camp #2") located near Camp #1, while the University's timber purchase Wasser & Winters continued its use and occupancy of the Icy Bay-West Camp #1 camp and shop facilities. In the spring of 2000, Citifor moved to newly constructed, expanded sort yard and log storage facilities, while Wasser & Winters continued to use the original sort yard and log storage facilities. In 2000, the TLO's purchaser Citifor began to use newly constructed separate fuel storage facilities located at the airport. After 2000, both companies continued joint use of the Log Transfer facilities, the airport, the roads and other similar facilities (under agreements providing for such joint use) until the termination of Citifor's operations in 2002.

Release Coordinates

Icy Bay is located on the Alaska mainland along the costal margin of the Gulf of Alaska and the Wrangell-St.Elias Mountains near the foot of Mt. St. Elias. The general camp is approximately 70 air miles northwest of the small community of Yakutat. The camp sort yard is located at the following coordinates:

Latitude	59°55’37”
Longitude	141°21’49”

Chemical Type and Amount of Release

The chemicals released to the environment were strictly petroleum based products including diesel, gasoline, solvent and oil (motor and hydraulic). The volume of individual products released is unknown and not possible to accurately estimate. The following table provides an estimate of contaminated media based on site characterization data:

Hazardous Substance	Maximum Contaminated Soil Concentration Observed	Estimated Volume of Contaminated Soil
Gasoline (GRO)	<100 ppm	8,788 CY
Diesel (DRO)	18,000 ppm	
Oil (RRO)	39,000 ppm	
Stoddard Solvent	3,500 ppm	300 CY

Table 39. Estimate of Release

Environmental Damage Resulting From Release

The release of petroleum products has contaminated soils in excess of established ADEC clean-up limits and thereby poses a potential risk of exposure to human health and the environment. Without removal and treatment, the contaminated soil presents a potential future risk relative to contamination of nearby groundwater and surface water and possible receptor uptake by native flora and fauna. The presence of the contaminated soil also diminishes the future use potential of the property and its inherent economic value.

FREE PRODUCT MANAGEMENT

Technical Description of Free Product

Free product was observed on the water surface of excavations in the form of motor oil, hydraulic oil and traces of diesel during the excavation of contaminated soil in Camp #1 in and around the shop. No free release of petroleum product was observed from Camp #1 excavations outside of the shop area. At these locations soil contamination was present as noted by field observations and measurements indicating discoloration, sheening and odor. However, the volume and form of contamination was not of sufficient quantity to create observable releases. The following photos depict free product from the excavations.

Figure 79. Brownish Oil on Surface of Water in Saw Shop Excavation

Figure 80. Blackish Oil on Surface of Water in Oil Shed Excavation

Permits for Managing Free Product

No permits were required to manage free product at the site.

Free Product Recovery System Used

No free product mechanical recovery system was deployed during remediation. Spill materials were made available at the site and used both during and after remediation efforts consisting of petroleum absorbent pads and booms, granular absorbent and super sacks for containment. Excavation and pumping equipment was readily available for use as needed. Generally, oil present on the water surface after excavation was removed with absorbent pads and booms. In the Oil Shed and Saw Shop excavations, larger quantities of oil on the water surface were captured by two methods:

1. Oil was rounded up with booms and pushed through a narrow channel into a small shallow pool created at the sides of excavations above already contaminated soil to be excavated to capture oil. The neck was then closed off and the small pond, including the oil, was excavated and sent to the stockpile for treatment. No more than 50 CY of waste soil were created during this removal action.

Figure 81. Oil Removal Method Using Side Pond

2. The excavator created a small depression in the ground surface above a contaminated area scheduled for excavation. Oily water was then bailed from the large excavation into the depression. The water in the depression seeped through the ground leaving a small area with the oil that was then excavated and sent to the stockpile for treatment. No more than 50 CY of waste soil were created during this removal action.

Figure 82. Oil Removal Method Using Depression.

Potential for Release of Free Product During Recovery

The point of release of free product was a 1 foot thick, darkened; smear band located at approximately 7 feet BGS near the shop area. The smear band contained sufficient free product adhered to sediments and only releasable during excavation disturbances.

No more than 55 gallons of oil was estimated to be released from all excavations and the smear band was removed. The smear band where the majority of product was sequestered that was released during excavation is noted below:

Figure 83. Smear Band Location in Excavation and Oil Releasing

From a general perspective, free product was not present in most excavations and the potential for release of such products to the environment did not exist either on-site or off-site. Excavations did occasionally uncover scrap metal, oil filters or crushed containers. These were removed from the soil and disposed as solid waste by normal camp procedure.

Contingency Plan to Address Free Product Releases

A contingency plan was put in place to address free product releases including the following protective measures:

1. Maintain an adequate and readily accessible supply of spill materials including absorbent pads and booms. Additional materials were immediately ordered when it was discovered that small quantities of free-product were being released at some Camp #1 excavations.

2. When excavating through the smear band where oil is being released into the water:

    a) Place excavating equipment on a small pad adjacent to the excavation that slopes into the excavation preventing off-site release of spilled material
    b) Tip the excavator bucket to dewater soils before placing in the truck.

    c) Place a bride of dry contaminated soil at the back of the dump truck before loading wet material at the front of the dump truck. The bridge will keep sloppy material from running out of the truck.

d) Do not over load the truck

After excavation remove all free products with absorbent pads and booms. Continue inspecting the excavation and removing free product until the water in the excavation is clear. As necessary, deploy removal actions previously described for larger quantities of free product.

Demonstration of Recovery of Free Product

Free product was successfully removed from all excavations where present as per the described methodology.

The following photographs illustrate the free-product clean-up process:

Figure 84. Booms and Pad Clean-Up at Oil Shed Area

Figure 85. Booms and Pad Clean-Up at Saw Shack Area

Clean-up of free product was very effective. Excavations were not backfilled until water was clean and petroleum-free.

Free Product Disposal

Free product was disposed by 1 of 2 methods noted below:

1. Product was absorbed onto pads and booms. The pads and booms were incinerated in the camp incinerator as per camp disposal requirements (< 200 lbs)

2. Product was mixed with other contaminated soil and placed into the contaminated soil stockpile for treatment (< 100 CY)

Free Product Remaining

No free product remains at Camp #1. The smear band containing the majority of highly contaminated soil was effectively removed. Free product released from the excavation of the smear band was clean-up prior to backfilling. All remaining contaminated soil both above and below the smear band was also removed.

APPENDIX A
SITE CHARACTERIZATION DATA SUMMARY

APPENDIX B
REMEDIAL WORK PLAN CHANGES

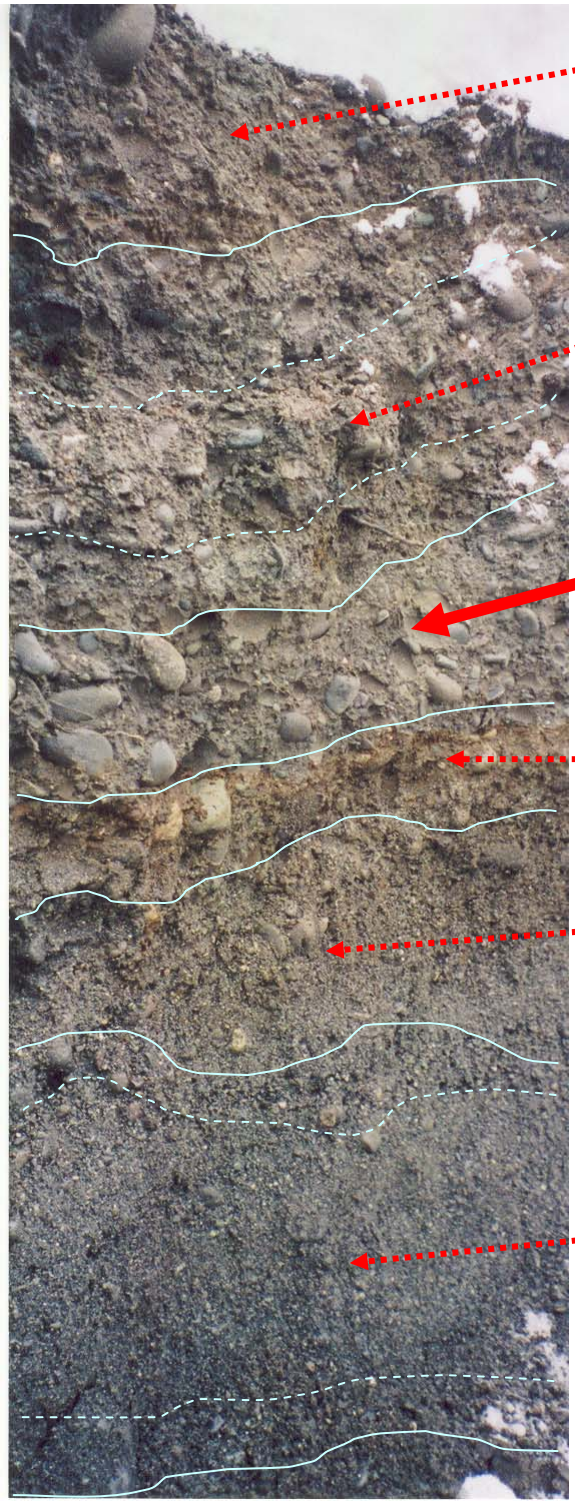
Change: IBW-001: Camp 2 - Fuel Depot Boundary Determination

BACKGROUND INFORMATION

Historic sampling by SEMS detected DRO levels exceeding clean-up limits in Fuel Depot #2: containment cell #4, refuel area and the north front of the depot (sump). No other samples could be collected at the time because the depot was in use with tanks and containment structure inhibiting sampling. Only containment cell #4 was empty. Several small tears in the liner were noted within this cell. It was uncertain if the tears were from routine historic activity or the removal of the tank from the cell – likely the later. Based on the data collected, SEMS concluded that the entire depot area to 6 feet be removed (1,367 CY). SEMS also concluded that the plume of contamination surrounding the depot was separate from the plume under depot #1.

Browning Timber dismantled and removed remaining fuel depot tanks and the associated containment structure in January 2003 to provide unobstructed access to excavate. No liner tears other than those previously detected by SEMS were noted. No liner breaches and associated leakage were noted during dismantling. In fact, as many as three (3) liners were present underlying the depot footprint. A determination was made to collect additional data before pursuing a large excavation without gathering additional data.

After removal of snow, the surface area immediately under the depot was inspected and PID surface measurements collected. From a surface perspective, there was no visual or PID evidence that a significant release at the surface had occurred. Large excavations holes were opened in each containment cell to provide further observations. The soil profile in each excavation pit was inspected and sampled. Three (3) layers of interest were identified across the depot area including surface soils containing clay from 3”-6”; a cemented layer of clay and gravel from 27” to 30”; and an orange tinted water table layer composed of sand, clay and gravel from 36” to 39”. Approximately 500 feet of lateral trench was opened for observation. The water table layer was clearly distinguishable by its color. Uniform coarse sand and fine gravels were detected to depth under the water table. Identification of layering provides the ability to model transport and fate mechanisms associated with diesel spills under the depot. The typical profile is noted and described below:



(0”-6”): Upper soil layer containing brown to dark brown silty loam with some clay. Root hairs and some

(6”-21”): Typical sand and gravel interspersed with clay from above. Gravels in ½” to ¾” size range and well sorted. Color variations from brown to gray.

(21”-36”): Brownish to blue clay mixed with ½” to 1” well sorted gravel. Highy cemented and confining

(36”-48”): Water table high level mark with characteristic orange color (oxidized iron). Mostly sand with traces of

(48”-57”): Upper portion of layer influenced by water with slight oxidation and orange coloring. Uniform sand to coarse sand with light gray to gray color. Some washed lenses of pea gravel present. Water

(57”-102”): Well sorted sand to coarse sans with traces of gravel in ½” to ¾” size range but limited. Color is gray to dark gray. Highly uniform lenses of dark gray sand present. Layering is very poorly

Typical Soil Profile Fuel Depot #2

Samples were collected for analysis with depth and in each excavation. A determination was made to excavate areas containing contamination identified by SEMS. Approximately 300 CY of material was removed and placed in the stockpile. Confirmation samples were collected after excavations were considered complete. Three exploratory pits were excavated between depots #1 and #2 to define contamination with depth. All exploration pits and excavations to remove contaminated soils were refilled for safety reasons.

The following results were obtained from the additional characterization and excavation work:

8. Light surface contamination is present only inside containment cell #4 and in refueling areas including the western bay and the area in front of the depot to the sump. Contamination is shallow (6" to 12") and does not penetrate the cemented confining layer at 21" – 36".

9. The water table was observed at 42". Geologic data indicates a seasonal high water table at 36" and a low water table at 57". Based on excavations, observed flow into trenches and water table measurements; groundwater at the depots flows predominantly from west to east. This indicates flow from depot #1 towards depot #2. Variations in the flow pattern are unknown.

10. Sample results indicated DRO contamination exceeding clean-up limits only under containment cells #1 and #2 at 30" and 60" depths respectively. Both samples were collected below the identified cemented layer and within the confines of the shallow water table upper limit.

11. No gasoline was detected under containment cell #1 which housed diesel tanks. The diesel in soils under the cell is therefore expected to have arrived by migration along the water table and most likely from depot #1.

12. Contaminated soil is present between depots #1 and #2 defeating the argument that each depot has its own plume.

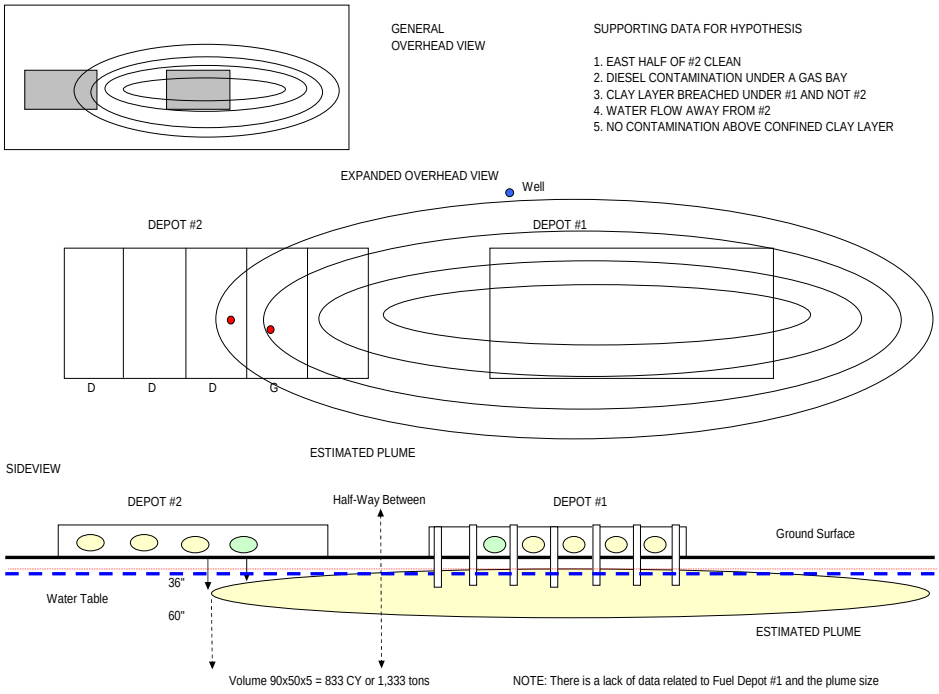
13. The confining soil layer observed under depot #2 has been breached at depot #1 both by construction of the depot through installation of the roof and by the presence of buried wastes under and around the depot.

14. Contaminated soils are close to the ground surface at depot #1 and then slope away from the depot. In essence, depot #1 sits on top of a mound of contaminated soil.

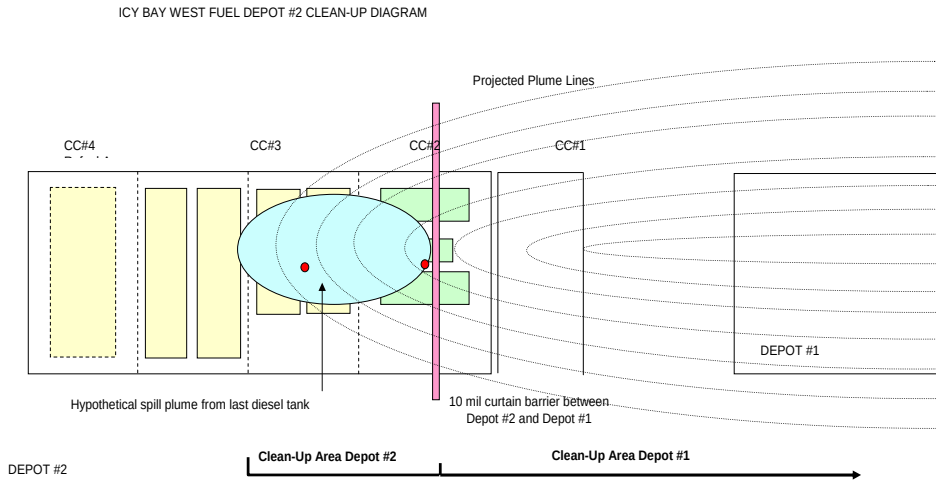
CONCLUSION

Diesel contaminated soils present under depot #2 likely originate under depot #1 and follow the movement of the water table both up and down and from west to east.

The appropriate boundary between depot #1 and depot #2 is not the halfway point between the depots. Rather, the delineation should be the most probable location where contamination from depot #2 could no longer be present. Based on data collected to date, this location is a line between depot #2 containment cells #1 and #2 as noted below:



A detail of the estimated boundary location is noted below:



REQUEST

The following requests are made:

1. Accept the proposed location of the boundary between depots #1 and #2 as illustrated.

2. Accept recommendations noted below.

RECOMMENDATIONS

1. Cut a trench to 84” along the boundary line between depots #1 and depot #2. Line the trench with 10 mil poly liner to inhibit groundwater flow from depot #1 towards depot #2 until remediation is complete.

2. Complete excavation of contaminated soils under containment cells #1 and #2 of depot #2 in the spring.

NOTE

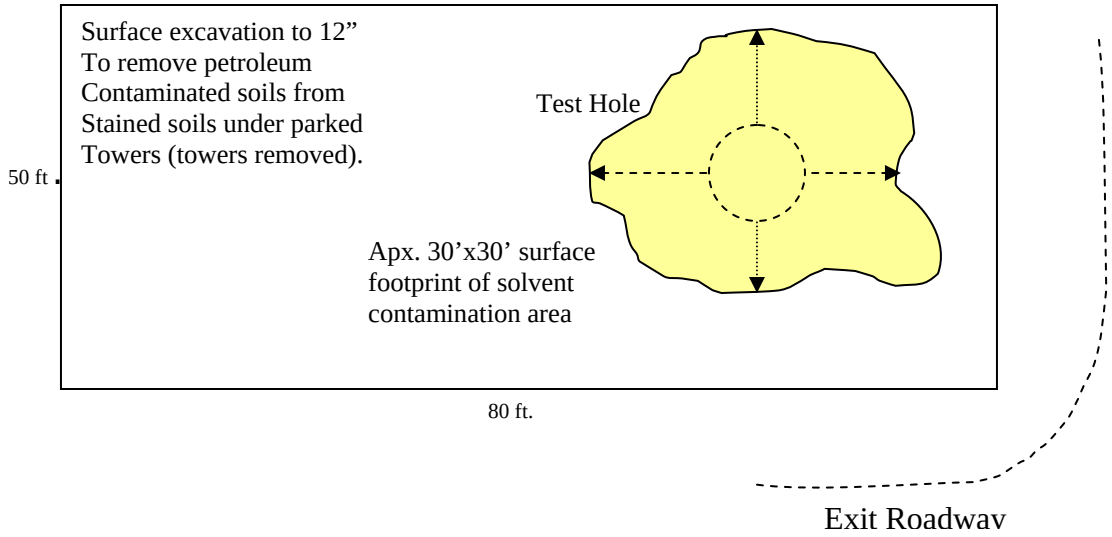
Recommendations accepted by ADEC per teleconference.

Change: IBW-002: Camp 2 – Solvent Contamination

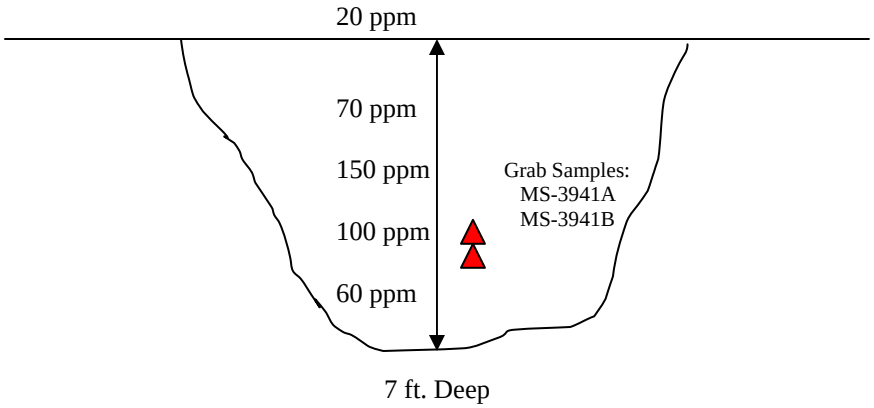
BACKGROUND INFORMATION

During the routine excavation of diesel-contaminated soils in the East Parking Area, the track hoe operator detected solvent odor. Surface soils were analyzed utilizing the PID (photoionization detector) and levels were noted between 10-20 ppm. The surface area was gridded and a carefully surveyed to map a surface plume shown as follows:

SE Corner of East Parking Area



A test hole was excavated in the center of the spill footprint to evaluate the depth of contamination with PID results as follows. A grab sample was collected at 60”.



The volume of material is estimated at 233 CY or 373 tons.

ADEC (M. Jaynes) was notified verbally of the presence of solvents on 6/18. He indicated the on-site bioremediation was an option and that he would like to understand the data when available. I agreed to call back when results were received.

Samples MS-3941A and MS-3941B were sent out for immediate analyses (EPA Methods 8260B - VOCs the solvents and Method 8270 - SVOCs to North Creek Analytical (results attached) and summarized as follows (highest values noted of two samples):

Constituent	Concentration (ppm)
DRO	129
1,2,4 trimethylbenzene	14.0
1,3,5 trimethylbenzene	4.81
ethylbenzene	5.84
sec-butylbenzene	0.531
Isopropylbenzene	0.212
n-butylbenzene	1.15
n-propylbenzene	0.274
p-xylene	9.39
o-xylene	5.23
Napthalene	0.221
p-isopropyltoluene	2.80
Toluene	0.605

The high concentration of benzene and other volatiles suggests the presence of solvent.

MSDS in camp were obtained and reviewed to determine if solvents had been purchased. Solvent 51-L (Ashland), Polar Power Diesel Fuel Treatment (FPPF), NOROX MEKP-9 (Norac) and Meltdown (FPPF) were identified. All of the sheets indicated the presence of target benzene compounds.

An inspection of the shop identified four 5-gal cans of Stoddard Solvent MS-66 1% AROM (Ashland). A MSDS was requested from the manufacturer. The MSDS provided was not useful in determining the presence of target benzene compounds. The environmental group at Ashland was contacted and a new MSDS was provided indicating the presence of "timethylbenzene" in the Stoddard Solvent used at camp. Since the same compound was detected in the soil analyses, it was concluded that the spill was likely from Stoddard Solvent MS-66 1% AROM

Having obtained analytical results, ADEC was again contacted (B. Janes) to discuss disposal options.

DISPOSAL OPTIONS

The following options for the material were discussed:

A. Packaging and Off-Site Treatment, and

B. On-Site Bioaugmentation

Because the solvent contains no chlorine, it can be bioremediated on-site. This process requires acclimation of bacteria to "solvent" and a higher dosage of organisms and nutrients. System ET-20 has been successful in bioremediating solvents not containing chlorine. The site has already been set-up to accomadate the treatment. TCLP benzene testing is not required if on-site bioremediation is performed.

The recommendation is that the solvent contaminated soil be treated on-site by bioaugmentation. ADEC (B. Janes) concurs with this recommendation.

REQUEST

The landowners and ADEC are requested to allow treatment of the solvent contaminated soils on-site as per the following process:

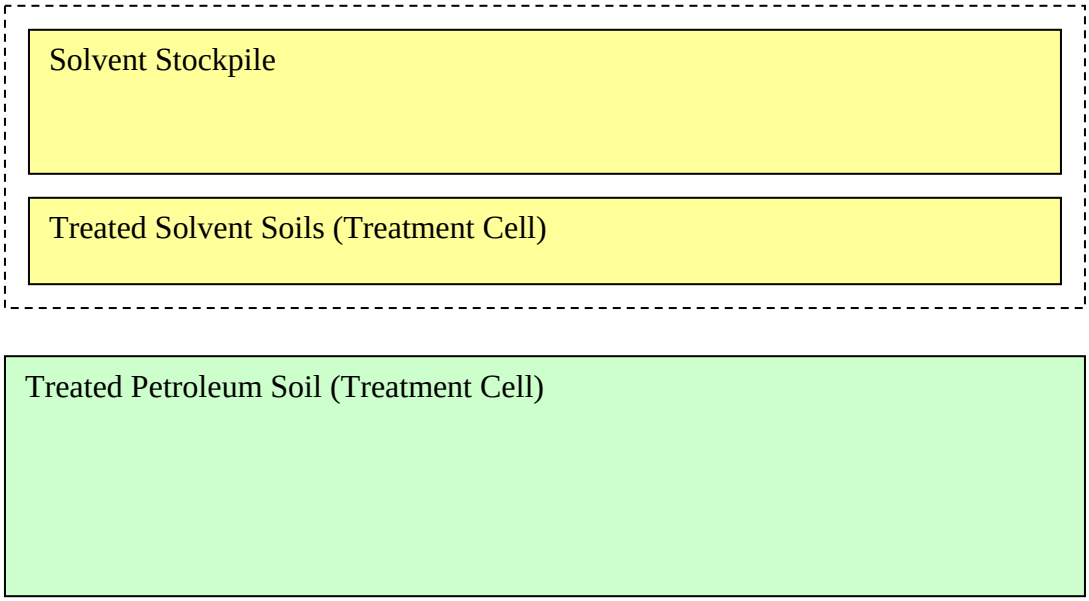
1. Acclimate the System ETR-20 organisms to a Stoddard Solvent media. This is accomplished by preparing a T-drum. A T-drum contains solvent contaminated soil mixed in water allowed to sit for several days. The water forms a dilute solution that is slowly added to the broth tank. The T-drum has already been prepared and is ready to use.
2. Culture organisms to a 1xE10 count.
3. Excavate and place the solvent contaminated soil onto a newly lined stockpile. Collect confirmation samples to determine clean-up. Confirmation samples will be analyzed for EPA Method 8260 analytes and GRO.
4. Immediately teat the soil with a 2X dose of nutrient and organisms. Thoroughly mix the organism and nutrients into the contaminated soil.
5. Place the treated soil into a 10 mil lined treatment cell. The cell is anticipated to be 10 ft. x 150 ft. x 4 ft deep (interior dimensions)
6. After placement, groom the stockpile and cover with a 6 mil liner.
7. Treatment is expected to take 3 months or longer. The cover will remain in-place so that the organisms can generate heat.
8. It may be necessary to retreat the pile with organisms and nutrients monthly. Periodic PID samples of treated soil will be collected to determine how treatment is progressing. Since the contaminated matrix is composed on benzene, PID readings will be a good measure of relative treatment success.
9. Since the contaminated soil is similar to gasoline, it is recommended that a clean-up limit and treatment limit of 260 ppm GRO be imposed. Confirmation Samples will analyzed

for EPA Method 8260 analytes and GRO when PID readings of treated soil fall below 3 ppm.

Work is planned for 6/26/03 (afternoon).

LOCATION

It is recommended that the emptied petroleum contaminated soil stockpile area be used to develop the new treatment cell for solvent contaminated soils. After removing the petroleum contaminated soil and treating it, the old liner will be removed and new liner placed on the ground. This will eliminate the need to develop more treatment area.



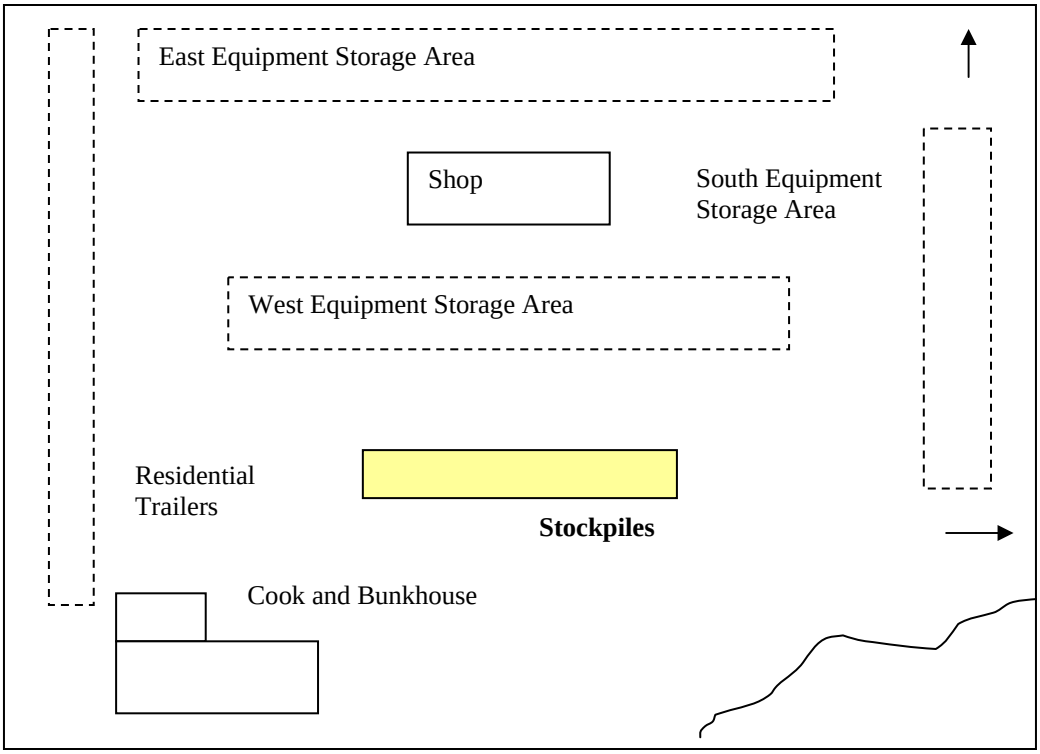
NOTE:

Recommendations accepted by ADEC as per teleconference call.

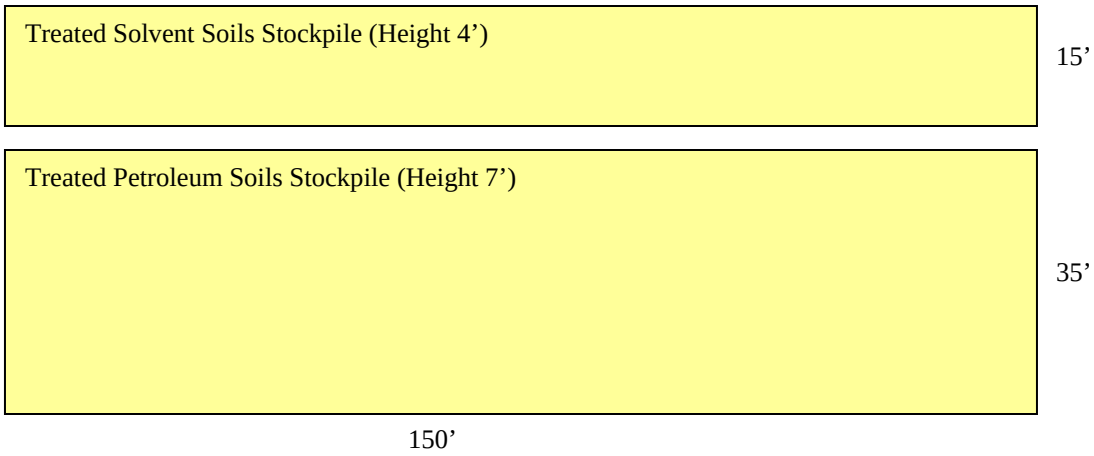
Change: IBW-003: Camp 2 – Stockpile Location

BACKGROUND INFORMATION

Treatment Cell Locations



Treatment Cell Dimensions



Clean-Up Limits

Clean-up limits for contaminated soils on-site are:

	GRO	DRO	RRO
Shop & Residential Areas	260 ppm	843 ppm	8,300 ppm
Fuel Depot	260 ppm	718 ppm	8,300 ppm
Sort Yard	260 ppm	1,420 ppm	8,300 ppm

Treated Soil Free Release

ADEC guidance for the "free release" of treated soils is 250 ppm. After soils have been treated and reach 250 ppm they can be spread out and used in any manner.

Treated soils can also be deposited in "safe" locations where there is no risk of disturbance and where reclamation might be support (caps, etc.). In these cases, the treated soils need only be treated to the most stringent clean-up limit (718 ppm).

Safest Location

The treatment cells noted above have been placed within Camp #2 Residential Area. The cells are located more than 200 ft. from any surface water body and associated fisheries. The cells are located away from any equipment storage areas and will not interfere with future operations. The cells are not located near traffic patterns or residential trailers. The current location is considered the safest location for the cells. All other outlying areas, such as gravel pits or boneyards, where the pile could be relocated are too close to surface water bodies and represent a significant expense in relocation. The landowners desire to leave the cells where currently located.

Request

ADEC is requested to support leaving the treated soils in-place in their current location. ADEC is also requested to support deeming the piles "treated" when the concentration of treated soils is less than 718 ppm rather than 250 ppm. In support of this request, it should be noted that the proposed treatment limit of 718 ppm is less than the clean-up limit in the residential area of 843 ppm.

NOTE:

Recommendation (request) accepted by ADEC as per teleconference call.

APPENDIX C
SUPPORTING DOCUMENTS

Sampling and Analyses Plan for Treated Soils

Field Investigation of the Uplands Fuel Depot

Fuel Depot #1 Investigation

MHTLO/University Trailer, Chalet & Garage Hazardous Materials Inventory

SITE REMEDIATION WORK PLAN SUPPLEMENT - ICY BAY WEST CAMP #1

SAMPLING AND ANALYSES PLAN FOR TREATED SOILS

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INTRODUCTION

This plan outlines a sampling and analyses strategy for petroleum contaminated soils treated by bioaugmentation processes at Icy Bay. The plan is written as a modification to the currently approved Remedial Work Plan.

BACKGROUND INFORMATION

Clean-Up Limits

Two types of clean-up limits for the project must be considered: (1) clean-up limits for contaminated soils and (2) clean-up limits for treated soils.

Contaminated Soil Clean-up Limits

Method 3 clean-up limits at the camp for petroleum contaminated soils were developed by SEMS, approved by ADEC and are noted below:

Area	GRO (ppm)	DRO (ppm)	RRO (ppm)
Camp #1 Residential and Shop Area	260	843	8,300
Camp #1 Fuel Depot Area	260	718	8,300
Camp #1 Sort Yard and LTF Area	260	1,420	8,300

Treated Soil Clean-up Limits

18 AAC75.341 identifies Method 2 soil clean-up criteria in areas similar to Icy Bay where over 40 inches of precipitation occur and where potential for contaminant migration to groundwater exists. These limits are typically used to determine if soil has been treated:

GRO (ppm)	260 ppm
DRO (ppm)	230 ppm
RRO (ppm)	8,300 ppm

An approved modification to this limit was approved by ADEC on 7/22/03 relative to treated soil clean-up:

"The default cleanup level for the contaminated soil stockpile is method 2 migration to groundwater. Additional active treatment will be necessary only if the most stringent calculated alternative cleanup levels are exceeded. The stockpile may be dismantled and the soil seeded if residual concentrations are between the default cleanup level and the calculated method 3 level. Natural attenuation will continue once the treatment cell is dismantled. This same approach can be taken for camp # 1 once we know the treated soils can be placed in an environmentally safe location.

On July 24, 03 (Telefax 04) the organizations participating in the clean-up of Camp #1 discussed the ADEC approval and concurred that the current north and south stockpile locations in Camp #1 are the permanent and environmentally safe location for the treated soils. On August 21, 03 (Telefax 09) the organizations participating in the clean-up of Camp #1 concurred that the current runway stockpile located near the Icy Bay airport was the permanent and environmentally safe location for the soils.

Based on these determinations, the following treated soil clean-up limit strategy has been approved:

- The default clean-up level is the method 2 migration to groundwater limit of 230 ppm
- Additional active treatment is only necessary if the most stringent calculated alternative clean-up levels (DRO-718 ppm) are exceeded.
- Stockpiles may be dismantled and soil seeded if residual concentrations of contaminants in treated soils are between 230 ppm and 718 ppm.
- Natural attenuation will continue once the treatment cell is dismantled.

Applicable ADEC Requirements

The following requirements regarding confirmation sampling must be met:

[18 AAC 75.380.(c).1] Final Reporting Requirements and Site Closure

Applicable soil clean-up levels, based on sampling results from on-site contaminated soil and from contaminated soil moved off-site for treatment or disposal, and based on the maximum concentrations detected, unless the department approves an appropriate statistical method, in which case compliance will be based on the mean soil concentration at the 95th percent upper confidence limit; approval of a statistical method will be based on:

(A) The numbers and locations of samples taken
(B) Whether large variations in hazardous substance concentrations relative to the mean concentration exist; and
(C) Whether a large percentage of concentrations are below the method detection limit; and

DMC Technologies will collect data and analyze the results to determine if the maximum concentration detected is lower than the approved clean-up limits.

Applicable ADEC Guidance

The following guidance is provided relative to confirmation sampling:

Guidance for Cleanup of Petroleum Contaminated Sites - September 2000. Page 14.

Confirmation samples must be collected to demonstrate compliance with the applicable clean-up level. The same collection and analysis methods need to ensure consistency between the samples. The minimum number of samples required depends on the volume of post-remediated excavated soil, and need to adhere to the following guidelines:

0-10 CY	*Collect a minimum of 1 sample*
11-50 CY	*Collect a minimum of 2 samples*
51-100 CY	*Collect a minimum of 3 samples*
101-500 CY	*Collect a minimum of 5 samples*
501-1000 CY	*Collect a minimum of 10 samples*
1001 – 2000 CY	*Collect a minimum of 10 samples*
2001 & Greater CY	*Collect a minimum of 10 + 1 per ea 500/CY additional*

Samples collected from the pit after excavation need to be collected from the bottom and sides in sufficient numbers to demonstrate that the clean-up was successful.

Additional Guidance is provided in:

ADEC Division of Spill Prevention and Response – Contaminated Sites and Storage Tank Programs Guidance Draft; Statistical Methods for Determining the Mean Soil Concentration, August 16, 2001; Pages 1-13 & Appendices

This manual establishes criteria on how to determine a mean soil concentration at the 95% upper confidence level (UCL) at contaminated sites for compliance with applicable soil clean-up levels using department approved statistical methods. The manual recommends the following considerations:

- *Sampling plan approval before sampling*
- *Use of supporting field screening during sampling*
- *Sampling locations must be representative of soil concentrations through the pile both horizontally and vertically*
- *Assurance of adequate spatial coverage. As a minimum 10 samples must be collected with one additional sample for each 500 CY treated in excess of 2,000 CY. It is suggested that at least 20 samples be collected to support statistical validity*
- *Evaluation and validation of sample analyses results*

- *Careful data screening and characterization to determine data distribution*
- *Proper data handling to address non-detects and outliers*
- *Selection of an appropriate statistical test to estimate the mean at the UCL with 95% confidence*

Remedial Work Plan

A Remedial Work Plan for Camp #1 including a Sampling and Analyses Plan was submitted in May, 2003 for review and approval. The following information was provided:

Remedial Work Plan – Biocell Management and Treatment Monitoring

Confirmation sampling of treated soil will be accomplished in accordance with a sampling and analyses plan approved under 18 AAC 75.360(2) to verify that the applicable clean-up levels have been met. Statistical analyses of the data will be performed. The mean of all the samples less one standard deviation (90% confidence interval) must be less than the clean-up limit for the material to be considered "treated".

Sampling and Analyses Plan

Final confirmation sampling is needed at Icy Bay West Camp #1 to meet the requirements of the site cleanup rules. This sampling and analysis plan is submitted for approval under 18 AAC 75.360. After implementation, analytical sampling results collected will be submitted to ADEC. Compliance with the site cleanup rules shall be demonstrated by the results of the analyses.

The Remedial Work Plan was approved via email on May 27, 2003 with the following comments:

"Biocell Management and Treatment Monitoring (Page 68) – The plan states that statistical analyses will be performed to determine if treatment is complete and proposes using the 90% UCL of the mean. However, 18 AAC 75.380 states that 95% of the UCL of the mean shall be used to determine final compliance. The change should also be made for Camp #2."

SAMPLING AND ANALYSES PLAN MODIFICATIONS

Existing Stockpiles

Excavated and contaminated soil is placed in unlined and bermed stockpiles. The following piles have been developed:

North and South Combined Camp Stockpiles

200 ft. long, 35 feet wide, 12 feet deep = 3,111 CY
280 ft. long, 45 feet wide, 12 feet deep = 5,600 CY

Runway Stockpile

380 ft. long, 40 feet wide, 12 feet deep = 6,755 CY

During excavation, stockpiles were intermittently used. Soil was both dumped in bulk and spread to create the piles. Materials in the piles were dozed daily to maintain pile shape. Stockpile materials are well mixed. It is estimated that average contaminant concentrations in the piles do not exceed 500 ppm GRO; 3,000 ppm DRO; 5,000 ppm RRO and are relatively homogeneous.

Piles are located in approved permanent and environmentally safe locations.

Treatment Process

Treatment begins on the surface of the contaminated stockpile in a "lift". A lift represents a one-foot deep slice of the top of the stockpile. Bionutrient is spread by hand across the top of the pile in a concentration of one-pound per cubic yard. This concentration is apx. 3 times that needed to treat the soil. The bionutrient is specially designed for the organisms only and will not dissolve in water. After the bionutrient in added, bacteria (inoculant) is sprayed onto the pile. Approximately 1 gallon of inoculant is sprayed per 5 cubic yards of soil. This dose is apx. 5 times that needed to treat the soil. This dosing rate represents the addition of 95 trillion bacteria per cubic yard of soil. The pile is being overdosed for several reasons:

1. Alaska soils lack natural nutrients and organisms to support treatment. Conditions in Alaska are also colder and wetter. These facts warrant higher doses to ensure rapid and effective treatment.

2. The piles will sit over the winter undergoing natural attenuation. Higher doses will ensure that the attenuation process remains effective in treating concentrations of contaminants to lower limits.

After bionutrient and bacteria have been added, the upper one-foot of the soil is vigorously tilled using a specially designed rake placed on a D-6 dozer. Following tilling, the upper foot of stockpile, or lift, is pushed into a pile on top of the stockpile using a D-8 dozer. Next, a trackhoe accesses the top of the pile and throws the pile of treated soil through the air onto the adjacent treatment stockpile. The soil on the treated stockpile is then pushed with a D-8 dozer across the pile into its desired shape. This treatment process aerates and mixes the soil.

The soil in the treatment stockpile is more homogenized relative to contaminant concentration than soil in the contaminated stockpile. This process continues lift by lift until the entire contaminated stockpile is treated. The treatment process ensures that there are no large variations in contaminant concentrations.

Expected Treatment Effectiveness

System ET-20 was thoroughly tested by the EPA in 1993 (EPA Technical Bulletin B-45-1993). Petroleum products at a concentration of 35,000 ppm alkanes (GRO, DRO & RRO) and 5,000 ppm aromatics (GR0, DRO and RRO) were treated. After 7 days, contaminant concentration decreased by 60%. Greater than 95% reduction was achieved by 28 days. System ET-20 adds the bacteria and nutrients missing in Alaska soils (bioaugmentation) and secures effective treatment quickly.

Based on estimated stockpile concentrations of 500 ppm GRO, 3,000 ppm DRO and 5,000 ppm RRO; it is hypothesized that a 60% reduction in concentrations will be achieved in 7 days, and 80% reduction in 14 days and a 90% reduction in 21 days. The clean-up limit of 718 ppm DRO is expected to be achieved in apx. 14 days. Treatment activities commenced 8/11. The first soils treated are expected to reach the clean-up limit by 8/25. The last soils are expected to be treated by 9/21. These soils should then exhibit acceptable concentrations by 10/5.

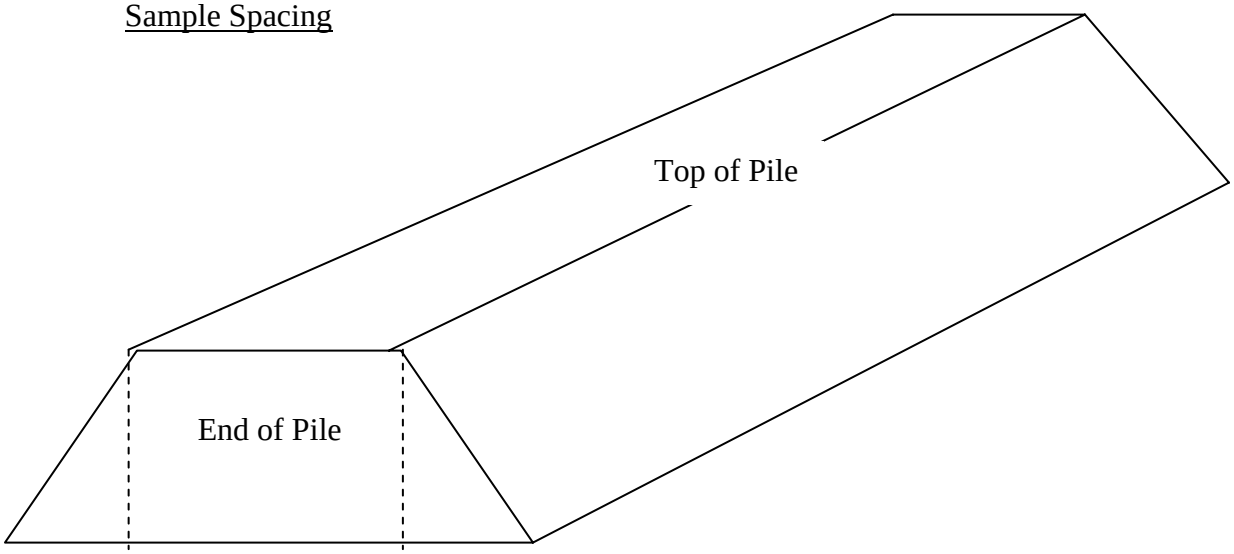
Background Sampling

Background samples have been collected under the stockpile footprints. Approximately 5-10 grab samples were collected from the upper 6 inches of the ground surface under each proposed pile location. Each of these samples will be analyzed for DRO and RRO. The purpose of the samples is to identify the presence of natural biogenics contributing to the DRO and RRO concentrations present in soils prior to stockpiling soil. No natural GRO contributions are expected. Results of background samples will be subjected to statistical analyses for determining a mean with upper and lower limits at 95% confidence.

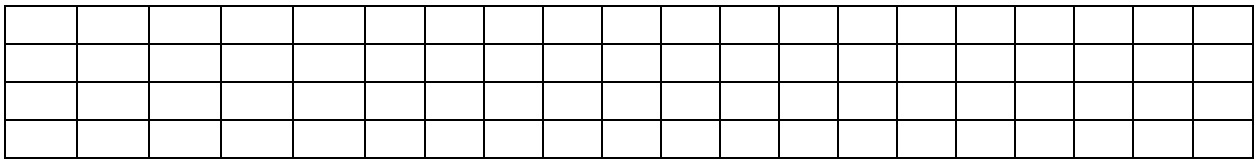
Stockpile Sampling

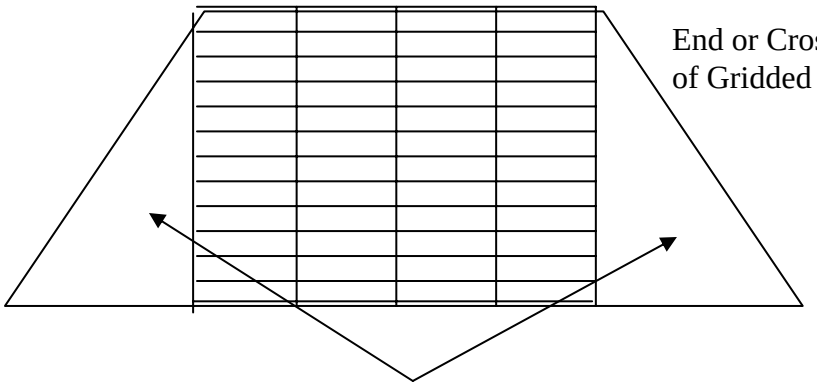
Treated stockpiles will be gridded prior to sampling. Horizontal grid spacing will be arranged in 10 ft. x 10 ft. squares. Vertical grid spacing will be arranged in 10 ft. x 1 ft. rectangles as noted in the following diagram:

Sample Spacing



Top View of Gridded Pile – 40 grids





End or Cross-Section View
of Gridded Pile – 40 grids

Triangular Sides Not
Considered in Gridding

Number of Samples

Based on ADEC guidance, the following minimum number of samples is required to verify that soils are treated:

- Treated Stockpile North – 3,111 CY = 10 samples + 3 samples = 13 samples
- Treated Stockpile South – 5,600 CY = 10 samples + 8 samples = 18 samples
- Treated Stockpile Runway – 6,755 CY = 10 samples + 10 samples = 20 samples

In consideration of statistical validity, these sample numbers will be increased to 20 samples per pile.

Sample Locations

Sample locations will be determined randomly. A method for random collection is provided in EPA SW-846 and considers both horizontal and vertical gridding in piles.In accordance with this method, each horizontal grid from the top of the pile is assigned a number. Twenty (20) numbers are randomly drawn from a hat – one for each sample number. This establishes a x,y coordinate for each sample. Vertical grid patterns are then established at 20 cross sections– one for each sample. Each vertical grid pattern is numbered and one number is then selected. This number represents the vertical or z coordinate for the sample. In this manner each sample is randomly selected and assigned an x,y,z coordinate. The following figure represents this concept in 10 ft. grids:

200 ft. long

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	30	31	32	**33**	34	35	36	**37**	38	**39**	40
41	42	**43**	44	45	46	47	**48**	49	50	**51**	**52**	53	54	**55**	56	57	58	**59**	60
61	62	63	64	**65**	66	67	68	69	**70**	71	72	73	74	**75**	76	77	78	**79**	80

40 feet wide

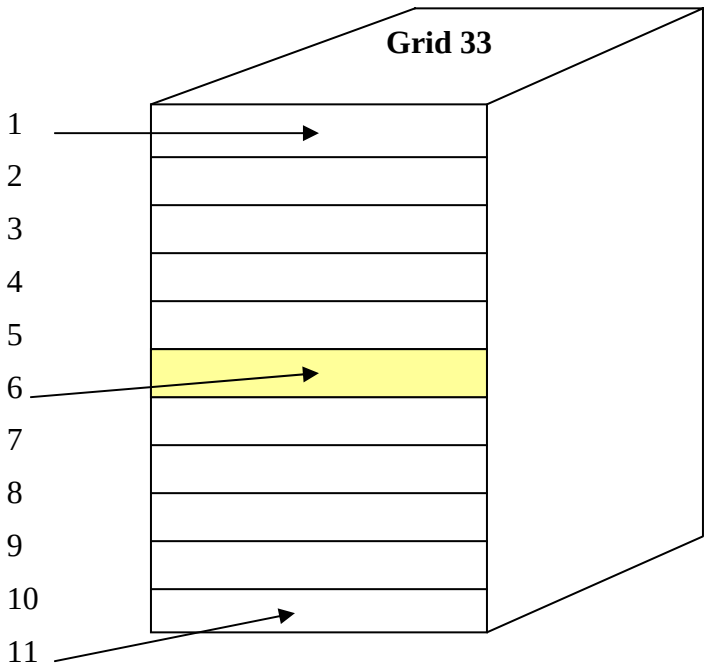
Bold depicts grids randomly selected for sampling. The grid in yellow is a grid of interest

further discussed below

20 numbers are drawn from hat with 80 numbers in it – one for each grid and one for each sample.

Select #	Grid Location	Select #	Grid Location
1	4	11	48
2	10	12	51
3	16	13	52
4	20	14	55
5	22	15	59
6	26	16	61
7	**33**	17	65
8	37	18	70
9	39	19	75
10	43	20	79

For each sample listed (in this case we are focusing on grid 33), a vertical depth needs to be selected. This is also determined randomly. For example, Sample 6 is denoted by horizontal grid location 26. A new grid is then established representing a cross section of the pile as noted below. Each section represents 1 foot depth in the pile. A random number 1-12 is drawn from a hat. That becomes the depth the sample will be collected from. In the case shown a depth of 6 foot is selected as noted in yellow**.**



This pattern of sample selection repeats itself until each of 20 samples has a depth value selected. In this case we have selected grid 33 at a depth of 6 feet.

Sample Collection Method

Samples will be collected using a track hoe and as needed a custom designed stainless steel grab bucket. The track hoe can excavate to depths from 1 to 5 feet below the pile surface. Excavations will be apx. 5 ft. square. Personnel will enter the excavation when there is no risk of sidewall sluffing or caving and collected the grab sample at the desired depth. The sample will be placed in a zip-lock plastic bag. Personnel will wear clean latex gloves for each sample collected. Samples below 5 ft. will be collected using the stainless steel tool. The tool allows for a sidewall sample to be extracted at depths from 6 feet to 12 feet without entering the excavation and risking personnel safety. Each sample will be subjected to three field tests – PID, Odor and Sheen as described in the Remedial Work Plan. Samples will then be bottled and processed for delivered to the subcontracted laboratory. A photograph of the tool follows:

Sample Analyses

Collected samples will be analyzed for DRO and RRO. GRO will not be analyzed. Confirmation sampling at excavations has noted a lack of GRO in contaminated soils. Therefore, GRO will not be analyzed.

Primary Data Analyses

Sample results will first be compared to the clean-up limit of 718 ppm DRO and 8,300 ppm RRO. If all of the samples are below these limits, no further analyses will be performed. If any sample is over the limit then the sample set will be subjected to statistical analyses.

Statistical Analyses

The following methodology will be applied to perform the statistical analyses:

1. All data from the sample set will be evaluated and validated against standard QA/QC criteria for sampling and analyses.

2. Sample set data will be carefully screened to remove false positives and false negatives (outliers). A determination will be made to utilize non-detect data as "zero" or as 50% of the limit of detection as considered appropriate by the consultant.

3. An appropriate, a statistical test to estimate the mean at the UCL with 95% confidence will be selected based on data distribution and normalization as needed.

All of the aspects of the analyses will be carefully documented and referenced. As appropriate industry standards and ADEC guidance will be considered in the analyses.

A determination will be made that a clean-up limit is achieved when the statistical mean at the 95% UCL is less than the clean-up limit.

Stockpile Footprint Samples

Stockpiles have been approved without bottom liners. The footprints of contaminated soil stockpile locations will be sampled at the conclusion of the project to demonstrate that no contaminants of concern have leached from the stockpile into underlying soils in concentrations exceeding established background levels.

Five to Ten (5-10) grab samples from the upper 6" of the ground surface will be collected under the footprints of each stockpile. Samples will be analyzed for DRO and RRO. Results of footprint samples will be subjected to statistical analyses for determining a mean. The mean concentration of the identified parameters at the appropriate UCL cannot exceed the higher of either established clean-up limits or the upper confidence limit of background samples. If the limit is exceeded, the bottom 12 inches of the pile will be treated in-place.

Summary of Samples to be Collected

The numbers noted include duplicates for QA/QC purposes and are noted as follows:

Background

South Stockpile – 6	Grab 0"-6"	Analyses for DRO/RRO
North Stockpile – 6	Grab 0"-6"	Analyses for DRO/RRO
Runway Stockpile -11	Grab 0"-6"	Analyses for DRO/RRO

Treated Stockpiles

South Stockpile – 22	Random by Grid	Analyses for DRO/RRO
North Stockpile – 22	Random by Grid	Analyses for DRO/RRO
Runway Stockpile – 22	Random by Grid	Analyses for DRO/RRO

Stockpile Footprints

South Stockpile – 6	Grab 0”-6”	Analyses for DRO/RRO
North Stockpile – 6	Grab 0”-6”	Analyses for DRO/RRO
Runway Stockpile – 11	Grab 0”-6”	Analyses for DRO/RRO

FIELD INVESTIGATION OF THE UPLANDS FUEL DEPOT

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FIELD INVESTIGATION REPORT

Introduction

The Icy Bay logging area was developed in 1971 consisting of a camp and log transfer facility (LTF) with bulkhead located 5 miles to the east on Icy Bay. The LTF also included development of a fuel depot. The depot was constructed on a bench approximately 20 feet above the northwest corner of the historic LTF and 1,500 feet north of the bulkhead. Because of the elevated location the site became known as the Uplands Fuel Depot.

The original LTF bulkhead was created by sinking several barges. However, by the early 1990s the bulkhead could no longer be used because of severe erosion. At this time the transfer facility was moved eastward and log transfers were made directly from the beach. The distance from the new beach landing area to the depot was significant and barge docking was also no longer possible. Because of these complications, a decision was also made to abandon the uplands depot and relocate it at camp.

Historic Uplands Fuel Depot Operations

For a period of approximately 20 years, the Uplands Fuel Depot dispensed diesel and gasoline for LTF operations. Fuel transfers to the depot occurred periodically by truck or pumping from storage tanks at the LTF bulkhead to the depot tanks. Tanks at the bulkhead were periodically filled by fuel delivered via barge. There were possible spills associated with fuel transfer operations.

The elevated nature of the depot provided the advantage of gravity feed refueling at the roadway located below the depot proper. It is likely that refueling activities along the roadway resulted in spills. Aerial photos from 1993 identify three (3) large tanks still present within the Uplands Fuel Depot. Sometime after 1993, the tanks were removed.

Characterization Investigations - 2002

Three exploratory excavations were made inside the Upland Fuel Depot on 6/4/02 to determine if any contaminated soils were present. The Site Characterization Report prepared by Southeast Management Services (SEMS) denotes the following:

" Two of the three excavations had had low diesel levels of much less than 100 mg/kg. However, the middle excavation where samples 1SY-22 and 1SY-23 were taken had levels of 760 mg/kg and 820 mg/kg, which were close to the allowable clean-up criteria. This excavation went to 9.5 ft. and bright bluish-gray gravels that obviously had been leached by past oil contamination were found throughout the entire depth of the excavation. The contamination was continuing at greater depth, and the excavation hole had high levels of very aromatic gases being given off. It is roughly estimated that 200CY-450CY of contaminated soil may need to be removed from this site before it can be clean-closed."

The characterization report also identified excavations at the western toe of the Uplands Fuel Depot along the road and about 500 feet east of Carlson Creek. This area was the former location of the Log Sort Yard Sawshack. The SEMS Characterization Report notes,

"Two shallow excavation trenches from this area encountered substantial amount of blue oil-contaminated soil. The top 2 ft. of soil had diesel levels 1,800 mg/kg to 9,400 mg/kg. Soil levels at the base of the excavations were found to be clean. It was estimated that contaminated soil in the area would be shallow and likely limited to 100 CY – 250 CY."

ADEC approved the Characterization Report submitted. In the approval letter, ADEC noted:

"In the upland area both the Saw Shack and the Upland Fuel Depot had impacts. These impacts appear to have occurred in the early 1990s and may not be the result of current operations, but do deserve further investigation in the future."

Based on these comments, the Remedial Work Plan for Icy Bay West Camp #2 recommended additional investigations at the Uplands Fuel Depot. In correspondence from SEMS to the University of Alaska legal council outlining comments on the DMC Tech Remedial Work Plan, SEMS indicates,

"The sort yards former fuel depot has the potential of being deep and ugly".

Remedial Work Plan Investigations - 2003

In July 2003, conversations among interested parties recommended that some additional investigation be performed at the Uplands Fuel Depot to ascertain the total volume of contaminated soil present. This was necessary to ensure that the remediation cap of 8,000 CY not be exceeded. Additional evaluation was performed by DMC Tech on July 14, 2003. The work performed included the excavation of an additional 33 trenches both within and around the Uplands Fuel Depot. Field samples were collected and evaluated for odor, sheen and PID concentration. Based on the data collected an estimate of 7,109 CY of contaminated soil was made. On July 23, 2003 a follow-up investigation was performed with both DMC Tech and Southeast Management Services personnel to review both the characterization data from 2002 and the more recent remedial work plan investigations. Consensus was reached that additional characterization data for the Uplands Fuel Depot was needed.

The following table summarizes recent investigations. The tables include descriptions of individual excavations and results of field analyses. Recommended grab sample locations for laboratory analyses are highlighted. The following figure illustrates locations of excavations.

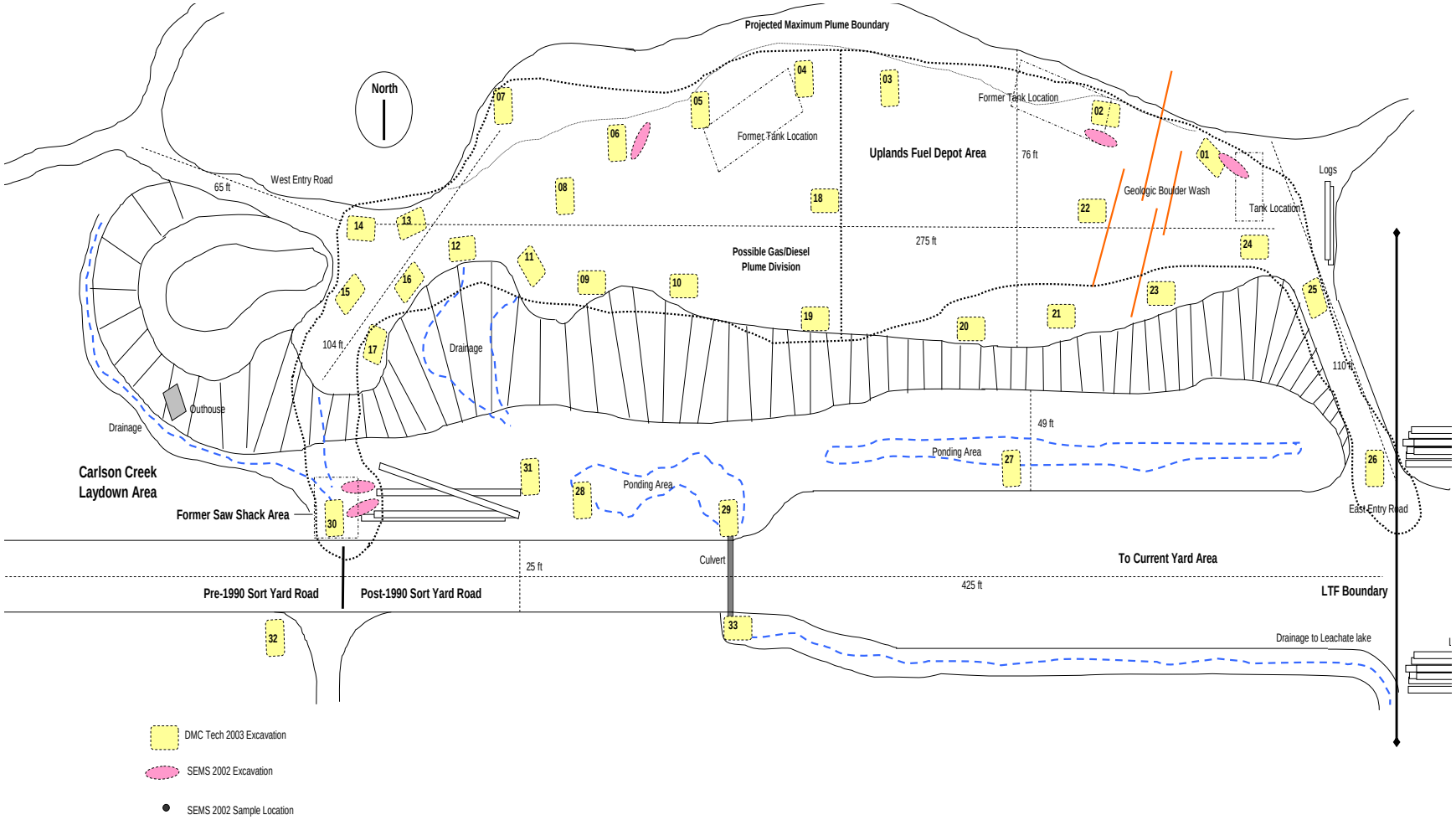

Figure 1. Uplands Fuel Depot Excvations - 2003

Excavation #1 (No Groundwater Detected)

Depth (ft)	**Material Type**	**Contact PID**	**Field Sample**	**Bagged PID**	**Odor**	**Sheen**
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	3			s	
2-3	Sand/Boulders	5			s-m	
3-4*	Sand/Boulders	5	x	5	m	s
4-5	Sand/Boulders	3			s	
5-6	Sand/Boulders	1			n-s	

1SY20 30” (3’) *DRO-63* *RRO-35*
1SY21 60” (5’) *DRO-10* *RRO-<10*

Excavation #2 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n-s	
1-2	Sand/Gravel	2			n-s	
2-3	Sand/Rocks	5			s	
3-4	Sand/Rocks	10			s	
4-5	Sand/Rocks	15			s-m	
5-6*	Sand/Gravel	20	x	5	m	s
6-7	Sand/Gravel	25			m	
7-8	Sand/Gravel	20			m	
8-9	Sand/Gravel	15			s-m	
9-10	Sand/Gravel	5			s-m	
10-11	Sand/Gravel	5			s	
11-12	Sand/Gravel	1			n-s	

1SY23 42”(4’) *GRO-17* *DRO-760* *RRO-27*
1SY22 114”(12’) *GRO-nt* *DRO-820* *RRO-28*

Excavation #3 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	2			n-s	
2-3	Sand/Gravel	5			s	
3-4	Sand/Gravel	7			s-m	
4-5	Sand/Gravel	5			s	
5-6	Sand/Gravel	3			n-s	
6-7*	Sand/Gravel	1	x	1	n-s	n

Excavation #4 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	3			n-s	
2-3	Sand/Gravel	5			s	
3-4	Sand/Gravel	10			s-m	
4-5*	Sand/Gravel	10			m	
5-6	Sand/Gravel	3			s	
6-7	Sand/Gravel	1	x	1	n-s	n-s

Excavation #5 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	2			n	
2-3	Sand/Clay	3			n-s	
3-4	Sand/Clay	5			s	
4-5	Sand/Gravel	10			s-m	
5-6	Sand/Gravel	20			m	
6-7	Sand/Gravel	10			m	
7-8	Sand/Gravel	5			s	
8-9*	Sand/Gravel	1	x	1	n-s	n

Excavation #6 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	5			s	
2-3	Sand/Gravel	10			s-m	
3-4	Sand/Gravel	20			m	
4-5	Sand/Gravel	50			m-h	
5-6**	Clay	80		100	h	m
6-7	Clay	30			m-h	
7-8*	Clay	10	x	20	m-h	s-m
8-9	Sand/Gravel	3			s	

1SY24 20” (2’) *DRO-23* *RRO-13*
1SY25 48” (4’) *DRO-10* *RRO-<10*

Excavation #7 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Clay	3			n-s	
1-2	Sand/Clay	10			s	
2-3	Sand/Clay	20			s-m	
3-4*	Sand/Gravel	10	x	6	m	s-m
4-5	Sand/Gravel	5			s-m	
5-6	Sand/Gravel	2			s	

Excavation #8 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Clay	1			n-s	
1-2	Sand/Clay	3			s	
2-3	Sand/Gravel	5			s	
3-4	Sand/Gravel	10			s-m	
4-5	Sand/Gravel	10			s-m	
5-6	Sand/Gravel	20			m	
6-7	Sand/Gravel	15			m	
7-8*	Sand/Gravel	10	x	30	s-m	s-m
8-9	Sand/Gravel	5			s	

Excavation #9 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Clay	1			n	
1-2	Sand/Gravel	5			s	
2-3	Sand/Gravel	7			s-m	
3-4	Sand/Gravel	10			m	
4-5*	Sand/Gravel	4	x	8	s	
5-6	Sand/Gravel	2			n-s	

Excavation #10 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	5			s	
2-3	Sand/Gravel	10			s-m	
3-4*	Sand/Gravel	15	x	20	m	s-m
4-5**	Sand/Gravel	10	x	20	s-m	s
5-6	Sand/Gravel	3			s	

Excavation #11 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Clay	1			n-s	
1-2	Sand/Gravel	2			s	
2-3	Sand/Gravel	5			s	
3-4	Sand/Gravel	10			s-m	
4-5	Sand/Gravel	10			m	
5-6	Sand/Gravel	20			m	
6-7	Sand/Gravel	10			m	
7-8	Sand/Rocks	7			s-m	
8-9*	Sand/Gravel	5	x	10	s-m	n-s
9-10	Sand/Gravel	2			s	

Excavation #12 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Clay	4			n-s	
2-3	Sand/Gravel	10			s	
3-4	Sand/Clay	20			s-m	
4-5	Sand/Gravel	20			m	
5-6	Sand/Gravel	30			m-h	
6-7	Sand/Rocks	40			m-h	
7-8	Sand/Rock	60			h	
8-9**	Sand/Gravel	80	x	100	h	m
9-10	Sand/Gravel	45			m-h	
10-11	Sand/Gravel	35			m	
11-12	Sand/Gravel	20			m	
12-13	Sand/Gravel	10			l-m	
13-14	Sand/Gravel	10			l	
14-15	Sand/Rock	7			s	
15-16	Sand/Rock	5			n-s	
16-17*	Sand/Rock	2	x	5	n-s	n-s

Excavation #13 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	10			s	
2-3	Sand/Gravel	15			s-m	
3-4**	Sand/Gravel	25	x	20	m	s-m
4-5*	Sand/Gravel	5	x	0.5	s-m	s
5-6	Sand/Gravel	2			n-s	

Excavation #14 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	5			s	
2-3	Sand/Gravel	10			s-m	
3-4	Sand/Gravel	15			m	
4-5**	Sand/Gravel	10	x	7	s-m	s-m
5-6*	Sand/Gravel	4	x	4	s	s

Excavation #15 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n-s	
1-2	Sand/Gravel	3			s	
2-3	Sand/Gravel	10			s-m	
3-4*	Sand/Gravel	5	x	2	s	s
4-5	Sand/Gravel	3			s	
5-6	Sand/Gravel	1			n-s	

Excavation #16 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	5			s	
2-3**	Sand/Gravel	10	x	45	m	s-m
3-4*	Sand/Gravel	5	x	2	s	s
4-5	Sand/Gravel	2			n-s	
5-6	Sand/Gravel	1			n	

Excavation #17 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	2			n-s	
2-3	Sand/Gravel	3			s	
3-4*	Sand/Gravel	5	x	1	s-m	s
4-5	Sand/Gravel	3			n-s	
5-6	Sand/Gravel	1			n	

Excavation #18 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	2			n-s	
2-3	Sand/Gravel	4			s	
3-4	Sand/Rocks	10			s-m	
4-5	Sand/Rocks	8			s-m	
5-6	Sand/Rocks	5			s	
6-7*	Sand/Rocks	3	x	1	s	n-s
7-8	Sand/Rocks	2			n-s	

Excavation #19 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			S	
1-2	Sand/Gravel	2			s	
2-3	Sand/Gravel	3			n-s	
3-4	Sand/Gravel	5			s	
4-5	Sand/Gravel	7			s-m	
5-6	Sand/Rocks	5			s	
6-7	Sand/Rocks	3			n-s	
7-8*	Sand/Rocks	1	x	2	n	n-s

Excavation #20 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	2			n	
2-3	Sand/Gravel	3			n-s	
3-4	Sand/Gravel	5			n-s	
4-5	Sand/Gravel	7			s	
5-6	Sand/Gravel	5			s	
6-7	Sand/Rocks	3			n-s	
7-8*	Sand/Boulders	2	x	1	n	n

Excavation #21 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n	
1-2	Sand/Gravel	2			n-s	
2-3	Sand/Gravel	5			n-s	
3-4	Sand/Boulders	5			n	
4-5	Sand/Boulders	2			n-s	
5-6*	Sand/Boulders	2	x	1	n	n

Excavation #22 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	2			n-s	
2-3	Sand/Gravel	4			s	
3-4	Sand/Gravel	5			s	
4-5	Sand/Gravel	10			s-m	
5-6	Sand/Gravel	10			s-m	
6-7	Sand/Gravel	15			m	
7-8	Sand/Boulders	15			m	
8-9	Sand/Boulders	10			m	
9-10	Sand/Boulders	5			s-m	
10-11*	Sand/Boulders	5	x	0.5	s	s
11-12	Sand/Boulders	3			n-s	
12-13	Sand/Boulders	2			n-s	
13-14	Sand/Boulders	2			n	
14-15	Sand/Boulders	1			n	

Excavation #23 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n-s	
1-2	Sand/Gravel	4			s	
2-3	Sand/Gravel	7			s	
3-4	Sand/Gravel	10			s-m	
4-5**	Sand/Gravel	5	x	30	s-m	s-m
5-6*	Sand/Boulders	1	x	2	S	n-s

Excavation #24 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	3			n-s	
2-3	Sand/Gravel	5			n-s	
3-4	Sand/Rocks	5			s	
4-5	Sand/Rocks	7			s	
5-6	Sand/Rocks	5			n-s	
6-7	Sand/Boulders	5			n-s	
7-8	Sand/Boulders	3			n-s	
8-9*	Sand/Boulders	1	x	1	n-s	n

Excavation #25 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	3			n	
2-3	Sand/Rocks	5			n-s	
3-4	Sand/Rocks	5			s	
4-5**	Sand/Rocks	8	x	4	s-m	s
5-6	Sand/Boulders	3			s	
6-7*	Sand/Boulders	2	x	1	n-s	n

Excavation #26 (groundwater encountered at 5 ft. and 12 ft.)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Yard Debris	2			n	
1-2	Sand/Gravel	3			n	
2-3	Sand/Gravel	5			s	
3-4	Sand/Gravel	5			s-m	
4-5**	Sand/Gravel	10	x	3	s-m	s
5-6	Sand/Rocks	15			m	
6-7	Sand/Rocks	9			s-m	
7-8*	Sand/Rocks	5	x	0.5	s	n-s
8-9	Sand/Rocks	5			s	
9-10	Sand/Rocks	3			n-s	
10-11	Sand/Boulders	2			n-s	
11-12	Sand/Boulders	1			n	

Excavation #27 (groundwater encountered at 5 ft.)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sediment	1			n	
1-2	Sand/Gravel	2			n-s	
2-3	Sand/Gravel	2			n-s	
3-4	Sand/Clay	5			s	
4-5*	Sand/Gravel	3	x	0.5	n-s	n-s
5-6	Sand/Gravel	2			n	

Excavation #28 (groundwater encountered at 4 ft.)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sediment	1			n	
1-2	Sand/Clay	1			n	
2-3	Sand/Clay	2			n	
3-4	Sand/Gravel	2			n-s	
4-5	Sand/Gravel	3	x	1	s	n-s
5-6	Sand/Gravel	2			n-s	
6-7	Sand/Gravel	1			n	
7-8	Sand/Gravel	1			n	

Excavation #29 (groundwater encountered at 4 ft.)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sediment	1			n	
1-2	Sand/Clay	2			n	
2-3	Sand/Clay	2			n-s	
3-4	Sand/Gravel	2	x	0	n-s	
4-5	Sand/Gravel	3			n-s	
5-6	Sand/Gravel	2			n-s	
6-7	Sand/Gravel	1			n	
7-8	Sand/Gravel	1			n	

Excavation #30 (groundwater encountered at 5 ft. and 12 ft.)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sediment	1			n	
1-2	Sand/Gravel	5			n-s	
2-3	Sand/Clay	10			s	
3-4	Sand/Gravel	10			s	
4-5	Sand/Gravel	10			s-m	
5-6	Sand/Gravel	10			s-m	
6-7	Sand/Gravel	15			m	
7-8**	Sand/Clay	15	x	30	m	s-m
8-9	Sand/Rocks	20			m-h	
9-10**	Sand/Gravel	25	x	40	m-h	m
10-11	Sand/Clay	50			m-h	
11-12*	Sand/Rocks	35	x	50	h	m
12-13	Sand/Gravel	30			m	
13-14	Sand/Gravel	20			m	
14-15	Sand/Gravel	15			s-m	
15-16	Sand/Rocks	10			s	

1SY2 13” (1’) DRO-4,100 RRO-<520
1SY3 12”(1’) DRO-9,400 RRO-<550
ISY4 7”(1’) DRO-800 RRO-<200

ISY5 34”(3’) DRO-28 RRO-10

Excavation #31 (groundwater encountered at 5 ft. and 12 ft.)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sediment	2			n	
1-2	Sand/Gravel	2			n-s	
2-3	Sand/Clay	2			n-s	
3-4	Sand/Gravel	3			n-s	
4-5	Sand/Gravel	5			n-s	
5-6	Sand/Gravel	5			n-s	
6-7	Sand/Gravel	5			s	
7-8	Sand/Clay	7			s	
8-9	Sand/Rocks	5			n-s	
9-10	Sand/Gravel	3			n-s	
10-11	Sand/Clay	2			n	
11-12*	Sand/Rocks	2	x	4	n	n

Excavation #32 (groundwater encountered at 5 ft.)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	1			n	
2-3	Sand/Gravel	0			n	
3-4	Sand/Rocks	1			n	
4-5	Sand/Rocks	0			n	
5-6	Sand/Rocks	1			n	

Note: Upper material representative of durapan and extremely cemented.

Excavation #33 (no groundwater encountered)

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sediment	1			n	
1-2	Sediment	1			n	
2-3	Sand/Gravel	2			n-s	
3-4	Sand/Gravel	1			n	
4-5	Sand/Gravel	1			n	
5-6	Sand/Gravel	1			n	
6-7	Sand/Rocks	0			n	
7-8	Sand/Rocks	1			n	

Legend to Tables

Field Sample

Extra Field Sample

Water Table Encountered

Chemical Analyses

Odor and Sheening Criteria

n:	none
n-s:	none to slight
s:	slight
s-m:	slight to moderate
m:	moderate

A summary of the data presented in the report follows. The data indicates that 42 field samples were collected from 33 different excavations. Excavations varied in depth from 6 ft. to 17 ft. In addition to identifying the maximum excavation depth and PID contact reading, the summary table also identifies the presence of stained soils as per visual observations (gray to blue coloring).

Excavation #	Depot Location	Max. Depth (ft.)	Visual Staining	Max. PID (ppm)	Samples Collected
1	Bench	6	Y	5	1
2	Bench	12	Y	25	1
3	Bench	7	Y	7	1
4	Bench	7	Y	10	1
5	Bench	9	Y	20	1
6	Bench	9	Y	80	2
7	Bench	6	Y	20	1
8	Bench	9	Y	20	1
9	Bench	6	Y	10	1
10	Bench	6	Y	15	2
11	Bench	10	Y	20	1
12	Bench	17	Y	80	2
13	Bench	6	Y	25	2
14	Bench	6	Y	15	2
15	Bench	6	N	10	1
16	Bench	6	Y	10	2
17	Bench	6	N	5	1
18	Bench	8	Y	10	1
19	Bench	8	N	7	1
20	Bench	8	N	7	1
21	Bench	6	N	5	1
22	Bench	15	Y	15	1
23	Bench	6	Y	10	2
24	Bench	9	Y	7	1

Excavation #	Depot Location	Max. Depth (ft.)	Visual Staining	Max. PID (ppm)	Samples Collected
25	Bench	7	Y	8	2
26	Bench	12	Y	10	2
27	Toe	6	N	5	1
28	Toe	8	N	3	1
29	Toe	8	N	3	1
30	Toe	16	Y	50	3
31	Toe	12	Y	7	1
32	Toe	6	N	1	0
33	Toe	8	N	2	0

The majority of samples in the fuel depot exhibit stained soils suggesting historical contamination. Samples identified by shading represent excavations with PID field readings exceeding 10 ppm. These samples are at risk relative to exceeding established clean-up limits and are identified for future sampling to obtain chemical concentration data.

The following results were obtained from samples collected from 5 excavation areas as noted by red dots in the upper tables.

Sample	Date	Excavation	RRO (ppm)	DRO (ppm)	GRO (ppm)
UFD-01	9/6/03	6 – 6 ft.	ND	7,160	565
UFD-02	9/6/03	11 – 9 ft.	ND	4,650	323
UFD-03	9/6/03	12 – 9 ft.	ND	3,760	234
UFD-04	9/6/03	13 – 4 ft.	ND	3,920	301
UFD-05	9/6/03	30 – 10 ft.	ND	4,960	6

High concentrations of gasoline and diesel are present on the west half of the Uplands Fuel Depot where gasoline was historically stored. Traces of gasoline in excavation 30 suggest that migration has occurred and has the potential to occur with a driving force.

General Observations of Field Analyses

Some general observations from the work are listed below:

- Samples from the east half of the depot are likely contaminated with diesel.
- Samples from the west half of the depot are likely contaminated with both diesel and gasoline.
- The geology on the west half of the depot exhibits a buried boulder field. This portion of the depot is in the path of a large drainage cut through the upper mountains and at one time was likely a creek bed.

- The geology on the east half of the depot exhibits some layers of clay characteristic of an early ponded area.

- The east half of the depot also contains a cat push out extending southward. It is possible that this area was used for facilitating refueling from the historic bulkhead.

- The depth of contamination in several holes is characteristic of a long term leak or spill history.

- Contamination in holes at the toe of the bench may be extensions from the upper bench either by migration or by drainage from the upper bench.

- Shallow groundwater along the toe of the bench is from surface water run-off. Deeper groundwater is detected at apx. 12 ft. BGS.

- Contamination is present in sufficient concentrations to warrant concern.

- Historic contamination has a pathway from the upper bench to the lower bench and then to leachate lake and Icy Bay

SAMPLING AND ANALYSES PLAN (18 AAC 75.360,355)

Sampling Scenario

The following table identifies the excavations where samples will be collected. Samples will be collected from 12 excavations considered the highest at risk for chemical contamination.

Excavation #	Depot Location	Max. Depth (ft.)	Visual Staining	Analyses	Samples Planned
2	Bench	12	Y	DRO, RRO	2
5	Bench	9	Y	GRO,DRO,RRO	1
6	Bench	9	Y	GRO, DRO, RRO	1
7	Bench	6	Y	GRO, DRO, RRO, EPA8260B, TePb	1
8	Bench	9	Y	GRO, DRO, RRO, EPA8260B, TePb	1
10	Bench	6	Y	GRO, DRO, RRO	1
11	Bench	10	Y	GRO, DRO, RRO	1
12	Bench	17	Y	GRO, DRO, RRO, EPA8260B, TePb	2
13	Bench	6	Y	GRO,DRO,RRO	1
14	Bench	6	Y	GRO,DRO,RRO	1
22	Bench	15	Y	DRO,RRO, 8260B	2
30	Toe	16	Y	GRO,DRO,RRO, 8260B, TePb	2

Note: TePb (Tetraethyl lead – leaded gasoline)

Summary:	GRO:	12
	DRO:	16
	RRO:	16
	8260B:	8
	TePb:	6

Field Screening

Field screening methods deployed include (1) visual observations, (2) subjective odor determination, (3) water sheen evaluation, (4) photoionization detection screening (Hnu DL-101) and (5) TPH measurements using test kits. Visual screening consists of inspecting soils for petroleum contamination noted in odor and discoloration or staining.

Visual

Clay in the soil at Icy Bay can turn gray to blue tint with prolonged contact with petroleum product. This discoloration is distinctly different that that associated with natural gray-blue clay especially when accompanied by odor. Discoloration may also appear as dark banding near the surface of the soil with some cementation of particles. Diesel in water can also impart a distinct “shine” to uniform sands and gravels. The shine is caused by adherence of the petroleum to the surface of the media.

Sheen

Water sheen screening involves placing the soil in water and observing the water surface for signs of sheen. This may facilitate detection of both volatile and non-volatile petroleum hydrocarbons. Sheen classification is as follows:

Key	Value	Description
N	No Sheen	No visible sheen
L	Slight Sheen	Light, colorless dull sheen; spread is irregular, not rapid; Sheen dissipates rapidly. Natural organic matter in the soil may produce a slight sheen.
M	Moderate Sheen	Moderate sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on water surface.
H	Heavy Sheen	Sheen with color/iridescence, spread is rapid; entire water surface may be covered with sheen.

Odor

Subjective odor testing is also important in screening potentially contaminated soils. The human olfactory system can sense the presence of petroleum product when a PID cannot detect it. Petroleum odor is distinct and not similar to the acid organic smell of natural humus common in Alaska soils. Sensing by odor is an art developed with experience, but should

never be used solely as a determination measure. The same scale used in sheening will apply – none, slight, moderate and heavy

PID

PID sampling will be accomplished from a hand-held PID. The unit will collect readings from freshly excavated soil at a distance of 1" from the soil for 10 seconds. The unit will be calibrated weekly and can measure vapor concentrations from 0.1 ppm to 10,000 ppm (benzene equivalent). Generally, readings of 5 ppm suggest DRO concentrations exceeding 250 ppm. This is a rule of thumb and readings at sites vary depending on soil and environmental conditions. Data collected from the PID will be noted in log books.

The PID can also be used in a more controlled setting to ensure that exhaust fumes or vapor space discharge immediately following excavation is not falsely considered. In this case, samples are collected and placed in sealed liner bags. The bags are delivered to a room and brought to room temperature. Approximately 200 grams of soil is then placed in a clean sealed 1-liter bag. The PID probe is inserted in the bag and head space reading collected.

Sampling

Characterization sampling is needed at the Uplands Fuel Depot to prepare for potential site remediation. This sampling and analysis plan is submitted for approval under 18 AAC 75.360. After implementation, analytical sampling results collected will be submitted to ADEC.

Sample Management

Samples will be collected and managed in accordance with accepted commercial practices and EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), Third Edition, including Final Update III (1997), adopted by reference. The following requirements will be addressed:

- Samples will be preserved after collection in accordance with approved laboratory instructions. Alternatively, the approved laboratory will provide pre-preserved containers for sample collection.
- Representative samples will be collected based on the judgment of a qualified person.
- Sample collection will include the collection of duplicate samples at the discretion of the qualified professional and advice of the approved laboratory (apx. 10% of the total sample volume).
- Samples will be placed in approved containers with labels and seals applied.
- Labels and seals will clearly describe the sample with a unique sample #, date and time of collection, person collecting the sample, and sample description/location.

- Environmental conditions surrounding the collection of the sample will be carefully noted in a logbook.
- Samples will be shipped in a timely manner and will not exceed mandated "holding times". This will likely require packaging in ice and priority shipments to laboratories coordinated in more than 2 locations
- A properly executed chain-of-custody form will accompany sample shipments. The chain-of-custody form will clearly identify the analytical methods to be used for the samples collected.
- Sample coolers or containers will be sealed.

Approved Analyses

Laboratory analysis under the site cleanup a laboratory will perform rules approved by the department under 18 AAC 78.800 - 18 AAC 78.815. (Eff. 1/22/99, Register 149; am 8/27/2000, Register 155; am 1/30/2003, Register 165). North Creek Analytical has been contracted to perform analytical work. North Creek is approved by the State of Alaska.

The contracted laboratory will:

- Maintain adequate custody of samples.
- Perform all analyses in accordance with approved procedures and methods specified by the chain-of-custody form.
- Dispose of samples in accordance with applicable federal and state rules and regulations.
- Apply appropriate quality considerations to analyses including analyses of laboratory duplicates, matrix spikes, matrix spike duplicates with notation of percent recoveries as required by the laboratories approved quality assurance program.
- Report results in a timely manner with duplicate copies of analyses – one for the sample requestor and one for ADEC.

Analysis for petroleum contamination must follow the applicable Alaska methods for petroleum hydrocarbons referred to in Table 1 of Chapter 2 of the *Underground Storage Tanks Procedures Manual*, dated November 7, 2002. Table 1 of Chapter 2 and Appendices D and E of the *Underground Storage Tanks Procedures Manual*, dated November 7, 2002 are adopted by reference. This includes:

- Method AK 101: C_6-C_{10} GRO
- Method AK 102: C_{10}-C_{25} DRO
- Method AK 103: C_{25}-C_{36} RRO

GRO - gasoline range organics: light-range petroleum products such as gasoline, with petroleum hydrocarbon compounds corresponding to an alkane range from the beginning of C_6 to the beginning of C_{10} and a boiling point range between approximately 60^o Centigrade and 170^o Centigrade;

DRO - diesel range organics: mid-range petroleum products such as diesel fuel, with petroleum hydrocarbon compounds corresponding to an alkane range from the beginning of C_{10} to the beginning of C_{25} and a boiling point range between approximately 170^{o} Centigrade and 400^{o} Centigrade;

RRO - residual range organics: heavy-range petroleum products such as lubricating oils, with petroleum hydrocarbon compounds corresponding to an alkane range from the beginning of C_{25} to the beginning of C_{36} and a boiling point range between approximately 400^{o} Centigrade and 500^{o} Centigrade.

Analyses required to distinguish aliphatic and aromatic hydrocarbons will use:

- AK Aliphatic and Aromatic Fraction Methods 101AA
  C_6-C_{10} Aliphatics
  C_6-C_{10} Aromatics

- AK Aliphatic and Aromatic Fraction Methods 102AA
  C_{10}-C_{25} Aliphatics
  C_{10}-C_{25} Aromatics

- AK Aliphatic and Aromatic Fraction Methods 103AA
  C_{25}-C_{36} Aliphatics
  C_{25}-C_{36} Aromatics

In addition to meeting the established soil cleanup limits, a responsible person shall ensure that the site meets the most stringent standards for benzene, toluene, ethylbenzene, and total xylenes. Analyses for heavy metals may also be required.

Analytical methods to evaluate volatile organics, semi-volatile organics and metals are set out in EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846).

Data Validation and Verification

A qualified professional will review, evaluate and assess the results of the sampling. Both the analytical laboratory and the analytical requestor will perform validation and verification to ensure that the data presented is not a false positive or a false negative.

The following considerations are applicable to validation and verification:

- If there is more than one analytical method for a hazardous substance, a responsible person may select any of those methods with a practical quantitation limit less than the applicable cleanup level. If only one analytical method has a practical quantitation limit less than the applicable cleanup level, that method must be used.

- If a hazardous substance is suspected at the site because of empirical evidence or prior analysis, but is not detected or is detected at a concentration below the practical quantitation limit, and the practical quantitation limit is higher than the cleanup level for that substance, ADEC will determine the responsible person to have attained the cleanup level, if additionally the more stringent of the following conditions is met:

(A) the practical quantitation limit is no greater than 10 times the method detection limit for all hazardous substances other than polychlorinated biphenyls where the practical quantitation limit is no greater than five times the method detection limit;

(B) the practical quantitation limit is no greater than the practical quantitation limit established in EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846), Third Edition, including Final Update III (1997), adopted by reference;

- If ADEC determines that additional action is necessary to ensure protection of human health, safety, or welfare, or of the environment, the department will require one or more of the following:

(A) use of a surrogate measure to estimate the concentration of the hazardous substance;

(B) use of a specialized sample collection or analytical method to improve the accuracy, precision, method detection limit, or practical quantitation limit for the hazardous substances at the site; or

(C) monitoring to ensure that the concentration of the hazardous substance does not exceed quantitatable levels; and

- If ADEC determines that an improved analytical method or other responsive action is necessary to ensure protection of human health, safety, or welfare, or of the environment, the department will, before site closure and if the site is in a monitoring stage, periodically consider whether improved analytical methods should be used at the site and will require the use of an improved analytical method or other responsive action.

Quality Assurance

Applicable commercial practices for quality assurance will be applied to all sample collection and analyses as well as verification and validation of results. Quality will be assured by:

- Using qualified and trained personnel (OSHA familiarity)
- Following approved procedures

- Stopping work in the event of unresolved questions
- Maintaining an accurate filing system
- Facilitating communications to avoid unnecessary delays

COST ESTIMATE

The total cost to perform the characterization work is expected to be less than $10,000.

Sampling Analyses

GRO:	12	@$100 = $1,200
DRO:	16	Included below
RRO:	16	@$100 = $1,600
8260B:	8	@$400 = $3,200
TePb:	6	@$200 = $1,200

Total - $7,200

Labor

3 persons for 4 hours to excavate and manage samples = 12 hrs @ $100/hr = $1,200
1 person for 2 hours to prepare data for presentation = 4 hrs @ $50/hr = $200

Total - $1,400

Equipment

1 trackhoe and operator for 4 hours at $250/hr = $1,000

Total - $1,000

FATE AND TRANSPORT HYPOTHESIS

The following data points are apparent in evaluating the site. This data can be used to formulate a hypothesis. The hypothesis will be refined as more data is collected:

- There is a significant volume of contaminated soil present including gasoline and diesel (apx. 7,000 CY)
- Contaminants are old but have high PID readings suggesting that natural bioremediation is progressing slowly. Chemical contamination levels will confirm this concept.
- Site PID readings are high enough to suggest high chemical concentrations of contaminants will be encountered.
- Pre-1990 gasoline fuels may contain lead and will be discerned by testing for tetraethyl lead. The lead is not expected to be higher than local background.
- Mishandling, spills, and possible leaks have acted to spread contamination to depths of 17 feet.
- Contamination on the bench is not at risk to contaminate groundwater or surface water.
- Contamination in the toe may or may not have come from the bench. There are physical drainage patterns present that could have carried material off the bench. The soil is sufficiently porous for materials to have transported from the upper to the lower bench.
- There is no evidence that contamination crosses the roadway.

Contamination at the site includes both diesel and gasoline. The contamination has migrated from the bench to the toe by surface water transport and by slow leaching of the mass from the bench to the toe. There is no longer a driving force and contaminants have not crossed the roadway. Contaminants are not at risk to migrate further than currently mapped. Natural bioremediation is progressing very slowly due to bacteria barren soils and cold temperatures.

REMEDIATION SCENARIOS

Possible Remediation scenarios for this site include the following:

Natural Attenuation

Leave the mass in place and let it bioremediate on its own. Little has happened in 20 years and so it can be expected that the rate of clean-up will be extremely slow. The attenuation argument may inherently fail and be rejected because of lack of natural treatment.

Time: 1 Year
Cost: Low
Risk: Significant

Excavate, Treat, and Replace

Excavate the mass, screen away the large rocks and treat the mass above the ground along the east side of Carlson Creek. Because of proximity to water it is recommended that bioaugmentation be pursued. The treatment will progress quickly and run to completion in one season. Treated soils could used to refill the excavation or could be left in place and the site could be recontoured.

Time: 3 months
Cost: Moderate
Risk: Low

Treat In-Place

In-situ treatment could be accomplished through a series of trenches excavated into the bench. Water would be pumped to the trenches including organisms and nutrients. Lack of a water table and gravity would allow the organisms to saturate the bench and move towards the toe. A separate trench at the toe would ensure that bench soils are treated. Without frequent saturation, the system could work slowly or fail.

Time: 1 to 5 years
Cost: Low to Moderate
Risk: Low to Moderate

Burn

The soil could be excavated and burned to remove contaminants. Burned soil could be refill the excavation or could be used elsewhere.

Time: 3-6 months
Cost: High
Risk: Low

Package and Haul Off-Site

Excavated soils can be packaged and shipped off-site.

Time: 3-6 months
Cost: High
Risk: Low to Moderate

Based on current data it is recommended that consideration be given to excavation, treatment and replacement via bioaugmentation or in-situ treatment be performed. These options are the least expensive, have acceptable risks and controllable costs.

No option can be chosen until chemical concentration data is obtained.

SCHEDULE

- Collect the data now
- Collect the data at the end of the project
- Collect the data at some other time as part of a new project

It is recommended that the 1 day effort be completed now and that the information obtained be discussed with potential opportunity to perform some remediation this fall or early in the spring.

This would allow the current subcontractor to remain mobilized at the site with an early start next year. This would save money.

FIELD INVESTIGATION OF FUEL DEPOT #1

ICY BAY WEST

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Prepared for:

Wasser and Winters Company
Citifor, Inc.
State of Alaska Department of Environmental Conservation
State of Alaska Department of Natural Resources
State of Alaska Mental Health Trust Land Office
University of Alaska – Statewide Office of Land Management

July 19, 2003

Introduction

A recommendation was made to evaluate the nature of the contaminant plume at Fuel Depot #1 because of differences in the Site Characterization Report and on-site observations from the remediation of Fuel Depot #1 in March and June of 2003.

The questions that need confirmation by additional excavation are:

1. Does a contaminant plume exist between the fuel depots?
2. What is the shape of the plume?

Excavations

In addition to the 13 - 2002 excavations 18 new exploratory excavations were developed in mid-July 2003 as shown in the attached figure. Each excavation was developed to define the contaminant plume boundary or leading edge (x-y coordinate) and contaminant plume depth through the water table (z coordinate).

Excavations were mapped beginning at the 10 mil plastic barrier placed in the ground at Fuel Depot #2. Clear points where contamination ended were identified during the placement of the barrier.

Data from the excavations is included in the attached table. No samples were collected for chemical analyses. Field measurements (odor, sheen, PID) were determined to be adequate to define boundaries.

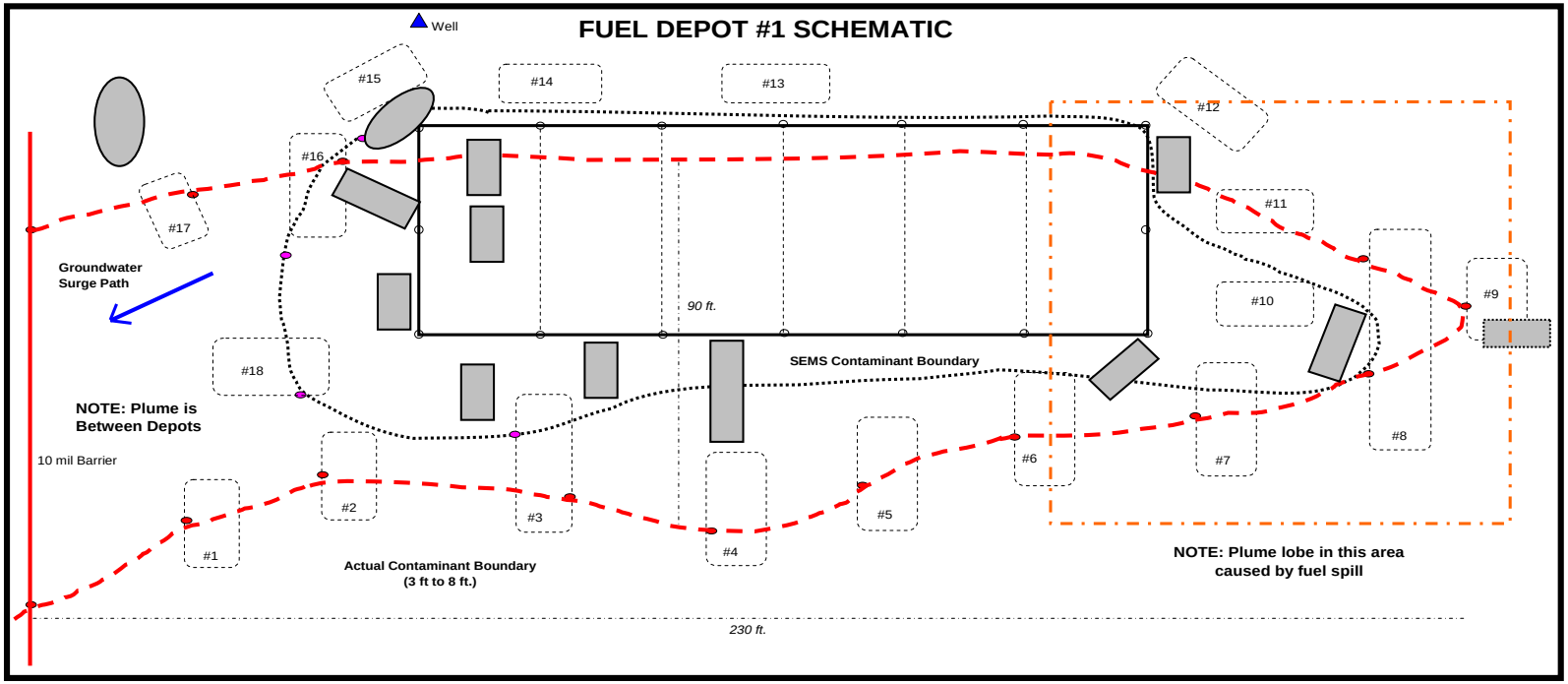
Results

5. The plume extends from the 10 mil plastic barrier westward under Depot #1. There is no separation of plumes between depots.

6. Excavations were successful in identifying a plume boundary both laterally and with depth. The plume is expected to contain 3,833 CY of soil including soils under the structure.

7. A determination must be reached to demolish and remove the structure in order to remove contaminated soils.

8. The west end of the plume can be tied to an historical diesel spill and is clearly shown to migrate along the upper drainage channel.



VOLUME CALCULATION

230 ft long x 90 ft wide x 5 ft deep = 3,833 CY
(Note: assumes contamination from 3 ft to 8 ft deep)

Under Strucuture:
90 ft long x 60 ft. wide x 5 ft deep = 1,000 CY

Outside Strucuture:
3,833 CY - 1,000 CY = 2,833 CY

ISSUES

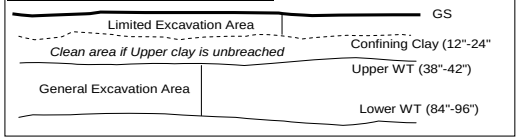
* Inaccessibility of area under the depot without moving the depot
* Operations deterence during excavation

SEMS CHARACTERIZATION DATA

1,500 TO 2,500 CY
Separate plumes between depots

Sampling 18" to 48"
Max. DRO = 7,500 ppm (10")

CONTAMINATION PROFILE WITH DEPTH



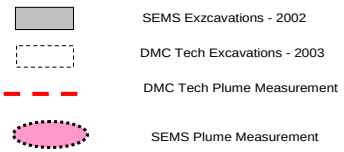


Figure. Fuel Depot #1 Additional Excavations

Excavation #1 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n-s	
1-2	Sand/Gravel	6			s	
2-3	Sand/Gravel	13			s-m	
3-4*	Sand/Gravel	22	x	35	m	s
4-5	Sand/Gravel	4			s	
5-6	Sand/Gravel	1			n-s	

Excavation #2 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n-s	
1-2	Sand/Gravel	4			s	
2-3	Sand/Gravel	12			s-m	
3-4*	Sand/Gravel	19	x	27	m	s
4-5	Sand/Gravel	3			s	
5-6	Sand/Gravel	1			n-s	

Excavation #3 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	8			s	
2-3	Sand/Gravel	21			s-m	
3-4*	Sand/Gravel	30	x	41	m	s
4-5	Sand/Gravel	5			s	
5-6	Sand/Gravel	2			n-s	

Excavation #4 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n-s	
1-2	Sand/Gravel	2			s	
2-3	Sand/Gravel	9			s-m	
3-4*	Sand/Gravel	18	x	26	m	s
4-5	Sand/Gravel	2			s	
5-6	Sand/Gravel	1			n-s	

Excavation #5 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n-s	
1-2	Sand/Gravel	5			s	
2-3	Sand/Gravel	12			s-m	
3-4*	Sand/Gravel	21	x	26	m	s
4-5	Sand/Gravel	3			s	
5-6	Sand/Gravel	1			n-s	

Excavation #6 (Water Table detected at apx. 48")

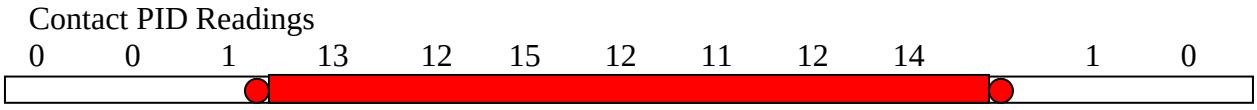
Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n-s	
1-2	Sand/Gravel	7			s	
2-3	Sand/Gravel	12			s-m	
3-4*	Sand/Gravel	18	x	21	m	s
4-5	Sand/Gravel	1			s	
5-6	Sand/Gravel	1			n-s	

Excavation #7 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	11			s	
2-3	Sand/Gravel	13			s-m	
3-4*	Sand/Gravel	22	x	28	m	s
4-5	Sand/Gravel	4			s	
5-6	Sand/Gravel	1			n-s	

Excavation #8 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	10			s	
2-3	Sand/Gravel	13			s-m	
3-4*	Sand/Gravel	19	x	22	m	s
4-5	Sand/Gravel	4			s	
5-6	Sand/Gravel	1			n-s	



Excavation #9 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	9			s	
2-3	Sand/Gravel	12			s-m	
3-4*	Sand/Gravel	20	x	25	m	s
4-5	Sand/Gravel	2			s	
5-6	Sand/Gravel	1			n-s	

Excavation #10 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	9			s	
1-2	Sand/Gravel	15			s	
2-3	Sand/Gravel	19			s-m	
3-4*	Sand/Gravel	26	x	34	m	s
4-5	Sand/Gravel	5			s	
5-6	Sand/Gravel	1			n-s	

Contact PID Readings

19 13 21 18 13 15 15

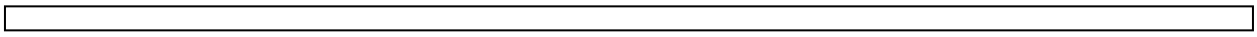
Inside Excavation

Excavation #11 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	1			n	
2-3	Sand/Gravel	2			n	
3-4*	Sand/Gravel	1			n	n
4-5	Sand/Gravel	1			n	
5-6	Sand/Gravel	1			n	

Contact PID Readings

1 1 1 1 0 1



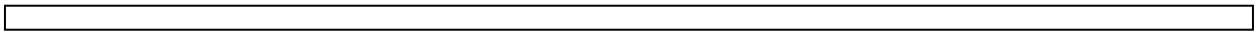
Inside Excavation

Excavation #12 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	0			n	
2-3	Sand/Gravel	1			n	
3-4*	Sand/Gravel	2			n	n
4-5	Sand/Gravel	0			n	
5-6	Sand/Gravel	1			n	

Contact PID Readings

1 0 1 1 0 1



Inside Excavation

Excavation #13 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	1			n	
2-3	Sand/Gravel	1			n	
3-4*	Sand/Gravel	1			n	n
4-5	Sand/Gravel	1			n	
5-6	Sand/Gravel	0			n	

Contact PID Readings

0 1 0 1 0 1

Inside Excavation

Excavation #14 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	0			n	
1-2	Sand/Gravel	0			n	
2-3	Sand/Gravel	1			n	
3-4*	Sand/Gravel	2			n	n
4-5	Sand/Gravel	1			n	
5-6	Sand/Gravel	1			n	

Contact PID Readings

0 0 1 1 0 0

Inside Excavation

Excavation #15 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n	
1-2	Sand/Gravel	0			n	
2-3	Sand/Gravel	1			n	
3-4*	Sand/Gravel	0			n	n
4-5	Sand/Gravel	1			n	
5-6	Sand/Gravel	0			n	

Contact PID Readings

0 0 1 1 0 0

Inside Excavation

Excavation #16 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	8			s	
2-3	Sand/Gravel	17			s-m	
3-4*	Sand/Gravel	29	x	34	m	s
4-5	Sand/Gravel	5			s	
5-6	Sand/Gravel	2			n-s	

Contact PID Readings 23 21 8 4 1 0 0

Inside Excavation Outside Excavation

Excavation #17 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	1			n-s	
1-2	Sand/Gravel	7			s	
2-3	Sand/Gravel	13			s-m	
3-4*	Sand/Gravel	19	x	24	m	s
4-5	Sand/Gravel	5			s	
5-6	Sand/Gravel	2			n-s	

Contact PID Readings 22 11 9 2 1 0 0

Inside Excavation Outside Excavation

Excavation #18 (Water Table detected at apx. 48")

Depth (ft)	Material Type	Contact PID	Field Sample	Bagged PID	Odor	Sheen
0-1	Sand/Gravel	2			n-s	
1-2	Sand/Gravel	4			s	
2-3	Sand/Gravel	22			s-m	
3-4*	Sand/Gravel	29	x	36	m	s
4-5	Sand/Gravel	5			s	
5-6	Sand/Gravel	2			n-s	

Contact PID Readings 26 22 13 8 2 1 0 0

Inside Excavation Outside Excavation

MHTLO/U of A Hazardous Materials Inventory

ICY BAY WEST

Prepared by:

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Prepared for:

Wasser and Winters Company
Citifor, Inc.
State of Alaska Department of Environmental Conservation
State of Alaska Department of Natural Resources
State of Alaska Mental Health Trust Land Office
University of Alaska – Statewide Office of Land Management

July 15, 2003

TELEFAX

From: Dan McNair – DMC Technologies

To: MHTLO – Clair Doig (907-346-4022)
ADEC – Bill Janes (907-465-5262)

Subject: Icy Bay West Camp #2 MHTLO Garage Haz Mat Inventory

Date: July 15, 2003

Pages: 6 with cover

Clair:

The MHTLO/University inventory is attached with recommended actions.

General Permit #9740-BA002 (2/10/97) for Icy Bay West has been issued for the disposal of wastes by logging camps. The permit includes provisions for the incineration of combustible solid wastes (page 4 A.2).

The permit prohibits the disposal of hazardous wastes in accordance with 40 CFR261.3, oily wastes, waste oil, transformer oil, greases, **paints**, sludges, and chemical wastes at this facility (with the exception of household wastes as excluded in 40 CFR 261.4(b) [see page 6 IV.B – also attached for reference].

All the materials inventoried are being placed in the back of the pick-up truck, which will leave for Anchorage this week. It is recommended that you check with Wayne Browning to ensure that the barge can accept the truck and materials as inventoried.

Please inform me if these actions meet your needs.

Dan McNair