VOLUME 1
FINAL CLEAN-UP REPORT
ICY BAY WEST CAMP #2

Icy Bay

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EXECUTIVE SUMMARY

This Final Clean-Up Report was prepared and written by Dan McNair – DMC Technologies. Mr. McNair is and environmental engineer and was recognized by ADEC as a qualified professional to perform site remediation. 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, final report compliance matrix and listing of final clean-up report requirements. The body of the report is divided into four sections including background information, pre-remediation work, release information, remediation results. References are also provided.

Work at this site commenced in 2000. Clean-up was recommended in 2001 and a site characterization was performed in 2002. Remedial work commenced 12/2002 and completed 9/2003. All work was completed under approved ADEC documentation.

Only traces of free product were encountered during remediation – none requiring engineering controls. Remediation included the excavation of 1,735 CY of contaminated soil from 16 different areas in and around camp. Contaminated soils were stockpile and then treated by system ET-20 bioaugmentation. Treatment was effective in removing over 98% of contaminants in 24 to 31 days. 226 samples were collected from the site during remediation efforts. Sample raw data is included with the report. 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.

A final camp inspection was completed in September. As of September 21, the camp was considered clean and is recommended for closure.

A draft final report was completed November 14, 2003 and was reviewed by ADEC with only minor comments. On December 15, 2003 ADEC responded to the draft final repor with the following comment:

" . . . .the November 14, 2003 "Icy bay West Camp #2 Final Clean-Up Report" from DMC Technologoes fulfills all the requirements for final reporting under ADEC AAC 75.380. No further clean-up will be required."

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FINAL CLEAN-UP REPORT COMPLIANCE MATRIX

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*** *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.

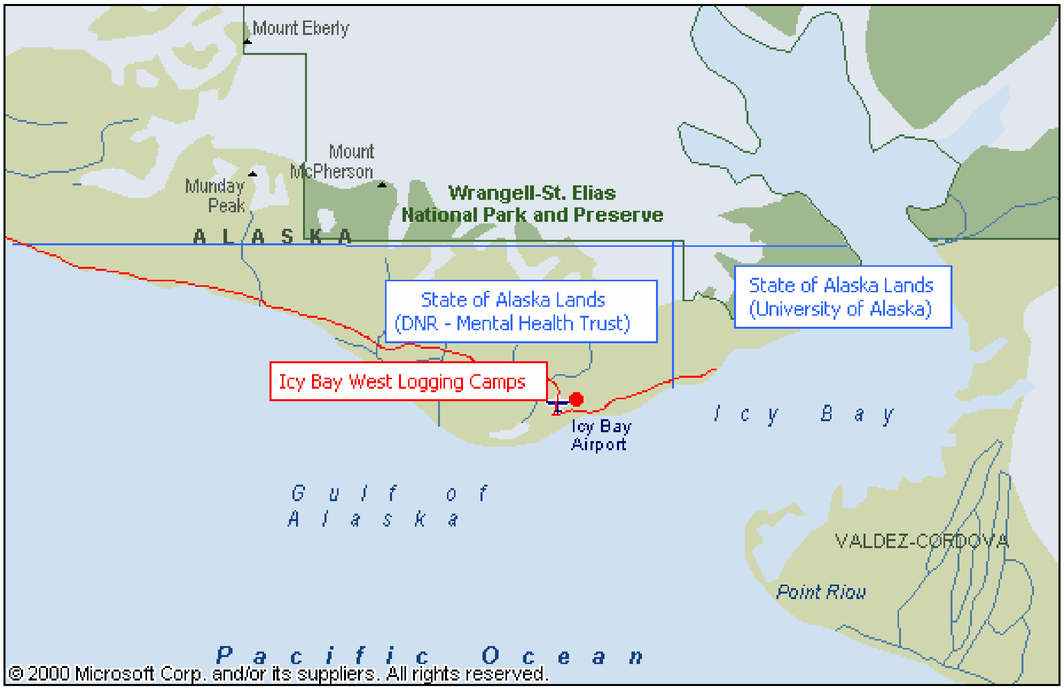


Figure 3. Location of Icy Bay West Logging Camps.

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

Logging at Icy Bay commenced in 1971 on State of Alaska Land administered by the University of Alaska. Camp #1 (a 15-75 man camp) was constructed to support logging operations and has been used by various operators including SCTD, Sullivan, CAC, Wasser-Winter Corp. and Citifor (Dobson, 2002). Camp #1 has undergone enlargements and changes as logging activities varied over the years.

West Camp #2

In early 2000, Camp #2 (a 30 to 70 man camp) was constructed immediately to the northwest and in close proximity to Camp #1. Camp #2 processes timber on State of Alaska Lands administered by the Department of Natural Resources (DNR) Mental Health Trust Land Office (TLO). Camp #2 has been used primarily by Citifor. Camp #2 is divided into three general working areas including: (1) residential and shop area with generator and equipment storage and parking areas; (2) fuel depot and (3) log sort yard and transfer facility. These sites are closely connected in a 550 ft. x 1,100 ft. area with the exception of the 1 acre fuel depot near the runway and the 11 acre log sort yard and transfer facility located 4.5 miles east of the camp. Aerial views of the two camps together and camp #2 separately are shown in the following figures.

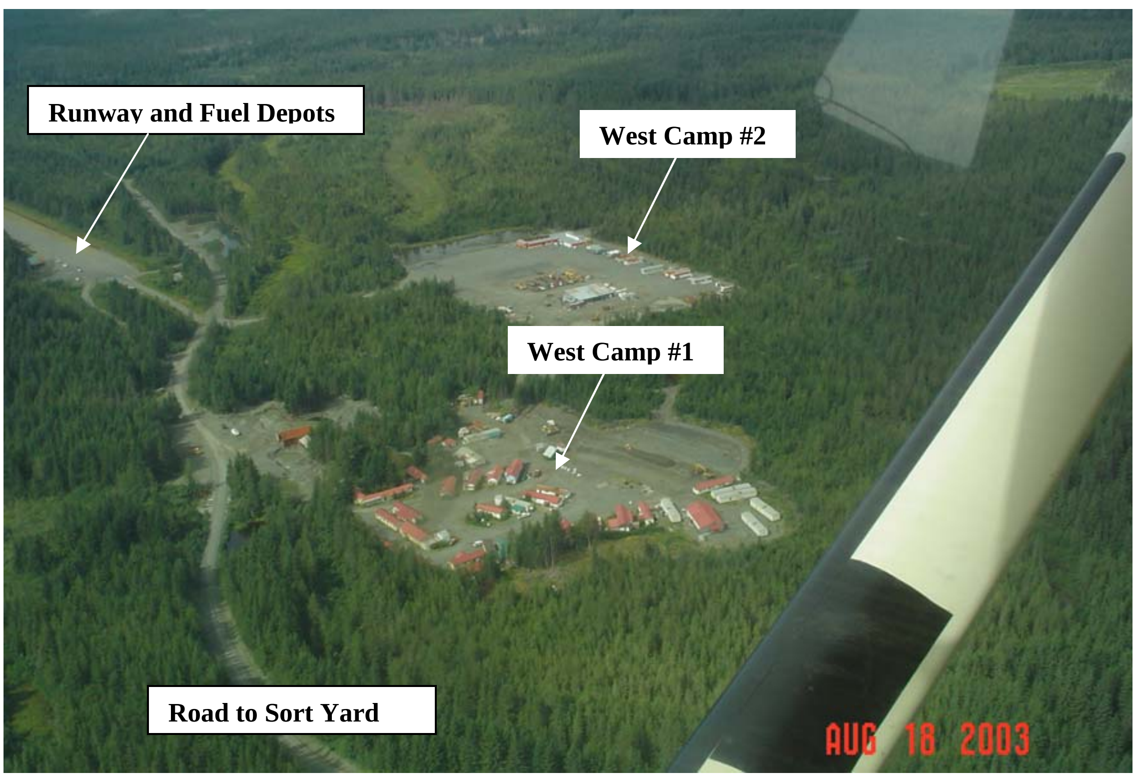


Figure 4. Icy Bay West Logging Camps #1 and #2

Figure 5. Icy Bay West Camp #2.

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 1971 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 is likely to be found at shallow depths throughout the area. From this perspective aquifers are expected to 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).

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 20% of the forest. 75% percent of the forest is Western Hemlock. The remaining 5% is Western Red Cedar, Alaskan Cedar, and Lodgepole. 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 and similar to Icy Bay is presented below:

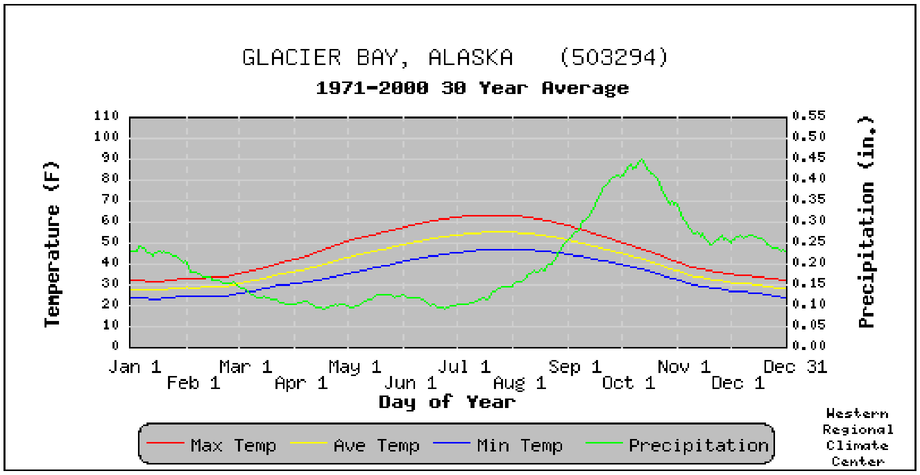


Table 3. Glacier Bay Temperature Profile

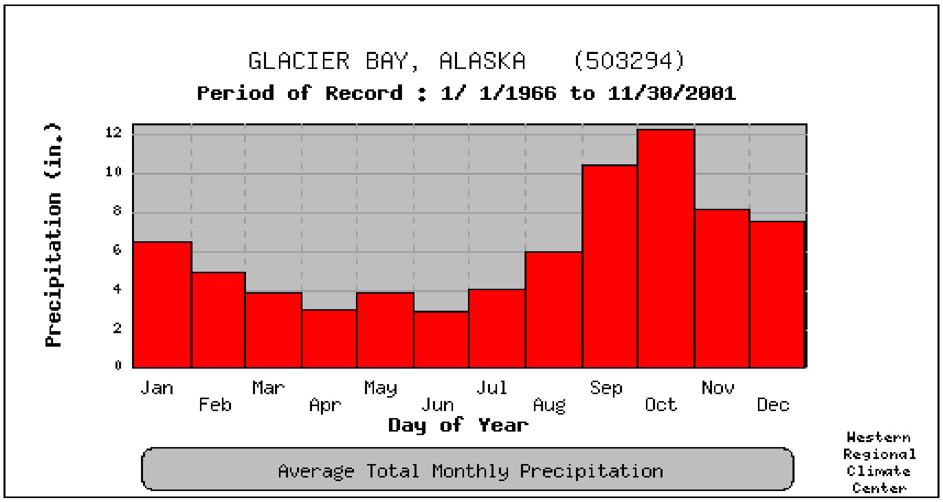


Table 4. Glacier Bay Precipitation Profile

PRE-REMEDIATION WORK

<u>Camp #2 Remediation Status</u>

The following table highlights the remediation history associated with Icy Bay West Camp #2:

Date	Activity
Mar., 2000	Camp #2 is constructed and logging activities out of the camp initiated.
May, 2001	Joint determination is reached by owners/operators that Camp #2 will undergo a comprehensive site characterization in accordance with ADEC standards to identify the extent and nature of contaminated soil or water
May, 2002	Site Characterization Work Plan approved and characterization work initiated by SEMS.
June, 2002	Site characterization work completed by SEMS.
July, 2002	Site Characterization Report submitted to ADEC.
Nov. 2002	GeoEngineers submits a Remediation Work Plan to ADEC for clean-up of Camp #2
Dec., 2002	ADEC approves the Work Plan for Camp #2 as "interim action" work to go forward until Site Characterization Plans previously submitted by SEMS are formally approved.
Dec., 2002	GeoEngineers initiates and completes interim action excavations at Camp #2 generator and equipment repair shop areas.
Jan., 2003	GeoEngineers submits a draft report of interim action excavations to Citifor, Inc. Plan is not submitted to ADEC.
Feb., 2003	ADEC approves the Site Characterization Report for Camp #2 with comment. Owners/operators agree on additional interim actions to ensure uninterrupted logging activities.
Mar., 2003	DMC Tech submits a Remedial Work Plan for Camp #2 to ADEC for approval. The plan is approved and DMC Tech performs additional interim excavations.
May, 2003	DMC Tech submits a Modified Remedial Workplan for Camp #2. Plan is approved.
June, 2003	Remediation activities commence at Camp #2 by DMC Tech.
July, 2003	Remediation activities are completed at Camp #2 by DMC Tech.
Aug., 2003	Regulatory inspection of remedial work activities is performed by ADEC.
Sep., 2003	Final camp closure activities are completed by Browning Timber.
Sep., 2003	Final camp inspection is performed by DMC Tech.
Nov., 2003	Final Clean-up Report is submitted to ADEC by DMC Tech.

Table 5. Camp #2 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 and soil in Camp #2 recommended for clean-up based on site characterization data:

Groundwater Data

#	Remediation Areas	VOC (ppb)	SVOC (ppb)	Metals w/ Limits (ppb)
A	Shop 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	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)
C	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. Water Characterization Data

Soil Data

#	Remediation Areas	Max. RRO (ppm)	Max. DRO (ppm)	Max. GRO (ppm)	Soil Estimate
1	Sawshop	16,000	8,400	NT	2-3 CY 1 ft. deep
2	Generator Tank Containment	Evaluate	Evaluate	NT	35-45 CY 6 ft. deep
3	Generator Trailers	1,400	1,000	NT	0-1 CY 1 ft. deep
4	Shop Floor Above Liner	Evaluate	Evaluate	Evaluate	157 + 150-200 CY 1 ft. deep
5	Shop Floor Below Liner	Evaluate	Evaluate	Evaluate	100-250 CY 3 ft. deep
6	Shop Middle Back Door	4,300	1,700	NT	1-2 CY 2 ft. deep
7	Shop Culvert Sections	10,000	4,000	NT	4-7 CY 3 ft. deep
8	Shop Repair Bays Exterior	4,000	3,500	Traces	17-48 CY 2 ft. deep
9	SW Corner Equipment Parking	Evaluate	Evaluate	NT	1-10 CY 1 ft. deep
10	NE Corner Equipment Parking	Evaluate	Evaluate	NT	4-14 CY 1 ft. deep
11	West Equipment Parking	Evaluate	Evaluate	NT	3-5 CY 1 ft. deep
12	South Equipment Parking	Evaluate	Evaluate	NT	0-1 CY 1 ft. deep
13	SE Corner Equipment Parking	8,100	3,100	NT	25-60 CY 1 ft. deep
14	Fuel Depot	220	9,900	16	700-950 CY 6 ft. deep
15	Sort Yard Sawyers Shack	14,000	2,600	NT	1-5 CY 2 ft. deep
16	Sort Yard Primary Log Sort Station	2,600	1,500	NT	4-10 CY 2 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

Samples were collected from 49 specific locations from 7 general areas during characterization work. 16 areas of soil contamination and 3 water areas were identified for possible remediation. Areas identified for remediation are illustrated in Figures 6, 7, and 8; which follow.

Approved Clean-up Limits for Camp #2

Water Clean-Up Limits

Constituents	Groundwater Limit (ppb)	Surface Water Limit (ppb)
Organics		
GRO	1,300	1,300
DRO	1,500	1,500
RRO	1,100	1,100
Total Aqueous Hydrocarbons	11,300	15
Total Aqueous Aromatics	9,900	10
Total Aqueous Aliphatics	1,400	5
Acetone	650	650
Benzene	5	5
bis(2)ethylhexyl-phthalate	6	6
Ethylbenzene	700	3,100
Napthalene	1,460	365
Phenol	22,000	21,000
Toluene	1,000	6,800
Xylene	10,000	10,000
Metals		
Arsenic - As	50	150
Antimony - Sb	6	14
Barium - Ba	2,000	500
Beryllium - Be	4	1
Cadmium - Cd	5	1
Chromuim – Cr Total	100	11
Copper - Cu	1,300	1,300
Lead - Pb	15	4
Mercury - Hg	2	0.05
Nickel - Ni	100	610
Selenium - Se	50	5
Silver - Ag	180	0
Thallium - Tl	2	1.7
Vanadium - V	760	190
Zinc - Zn	11,000	9,100
Methodology	***18AAC75.341 Table C***	*18AAC70.020 Table 3 aquatic life criteria for freshwater – chronic, Table 5 human health for consumption – aquatic + water,GRO/DRO/RRO = groundwater, remaining unknowns at 25% of groundwater*

Table 8. Water Clean-Up Limits

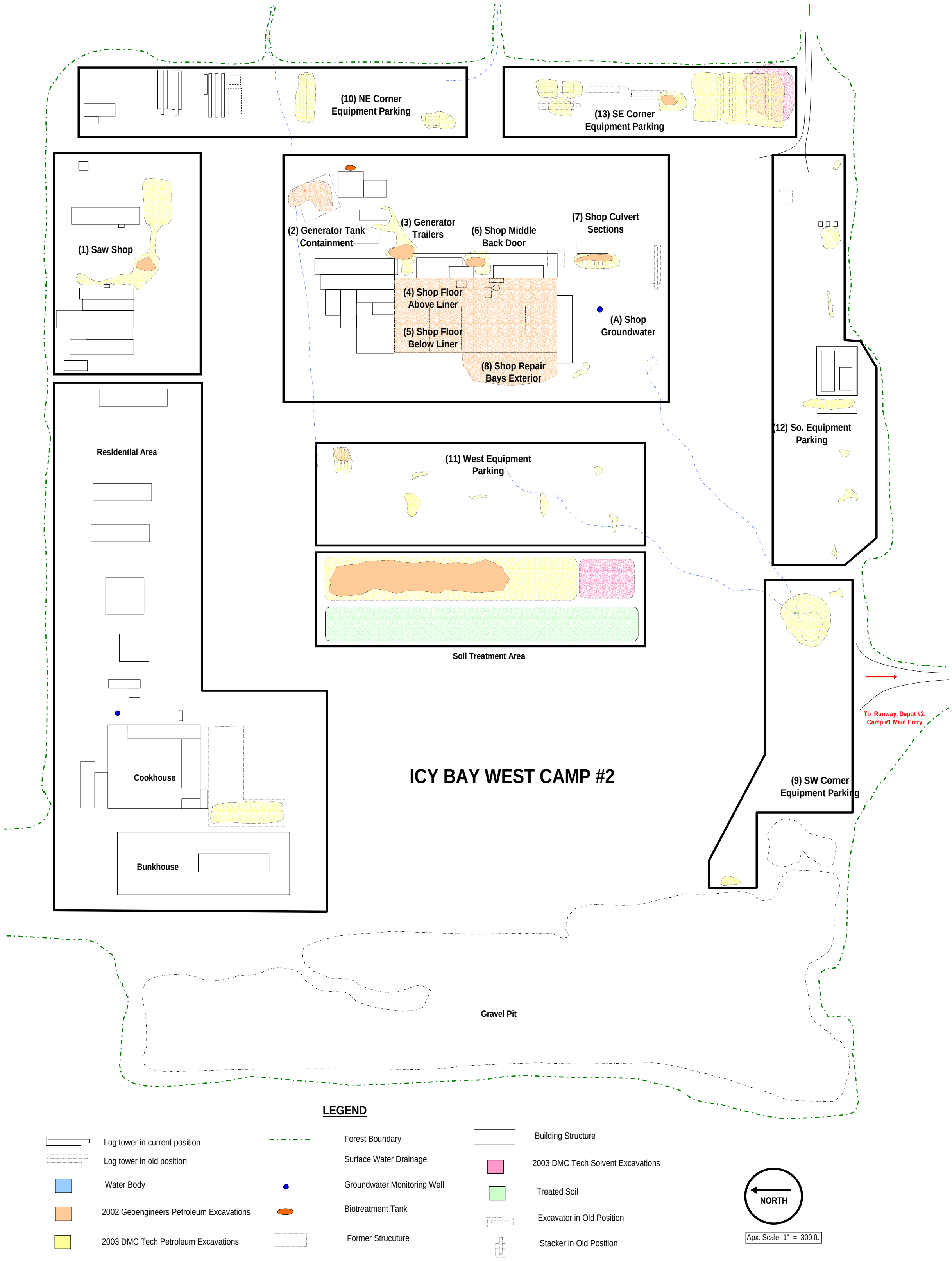
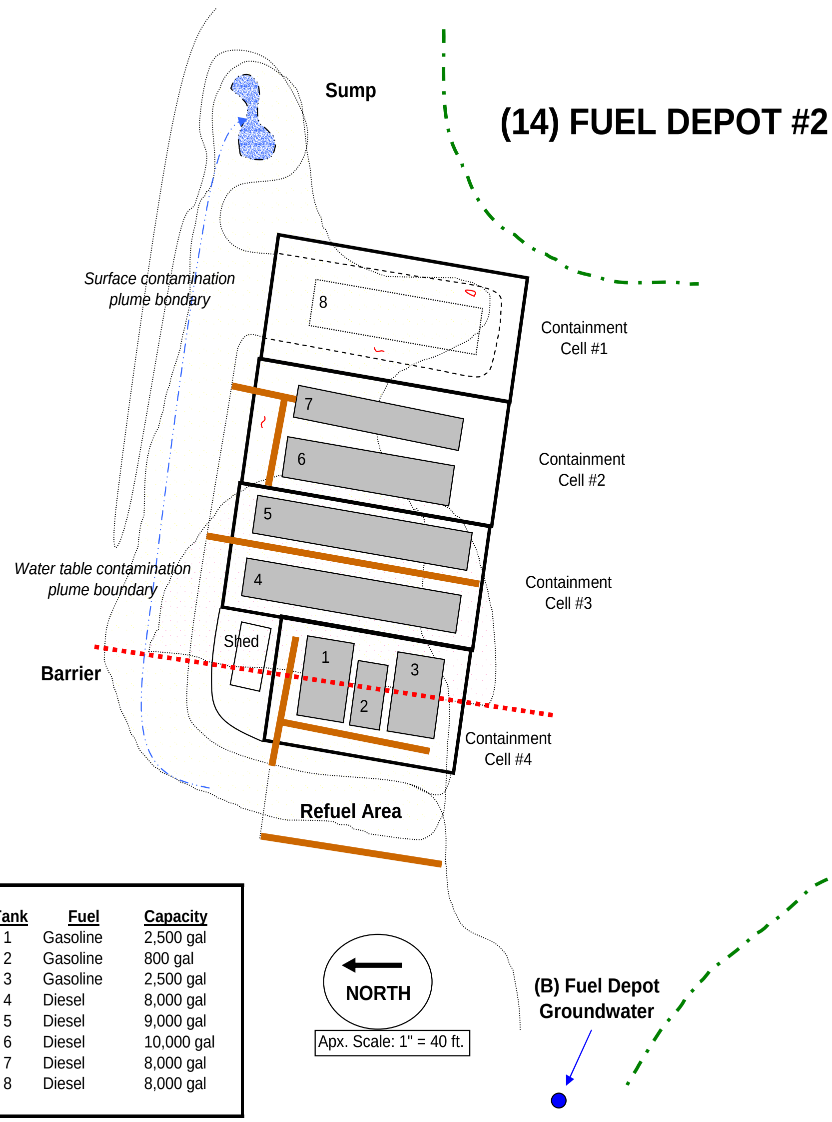


Figure 6. Camp #2 Residential and Shop Layout (2002)



Tank	Fuel	Capacity
1	Gasoline	2,500 gal
2	Gasoline	800 gal
3	Gasoline	2,500 gal
4	Diesel	8,000 gal
5	Diesel	9,000 gal
6	Diesel	10,000 gal
7	Diesel	8,000 gal
8	Diesel	8,000 gal

Figure 7. Camp #2 Fuel Depot Layout

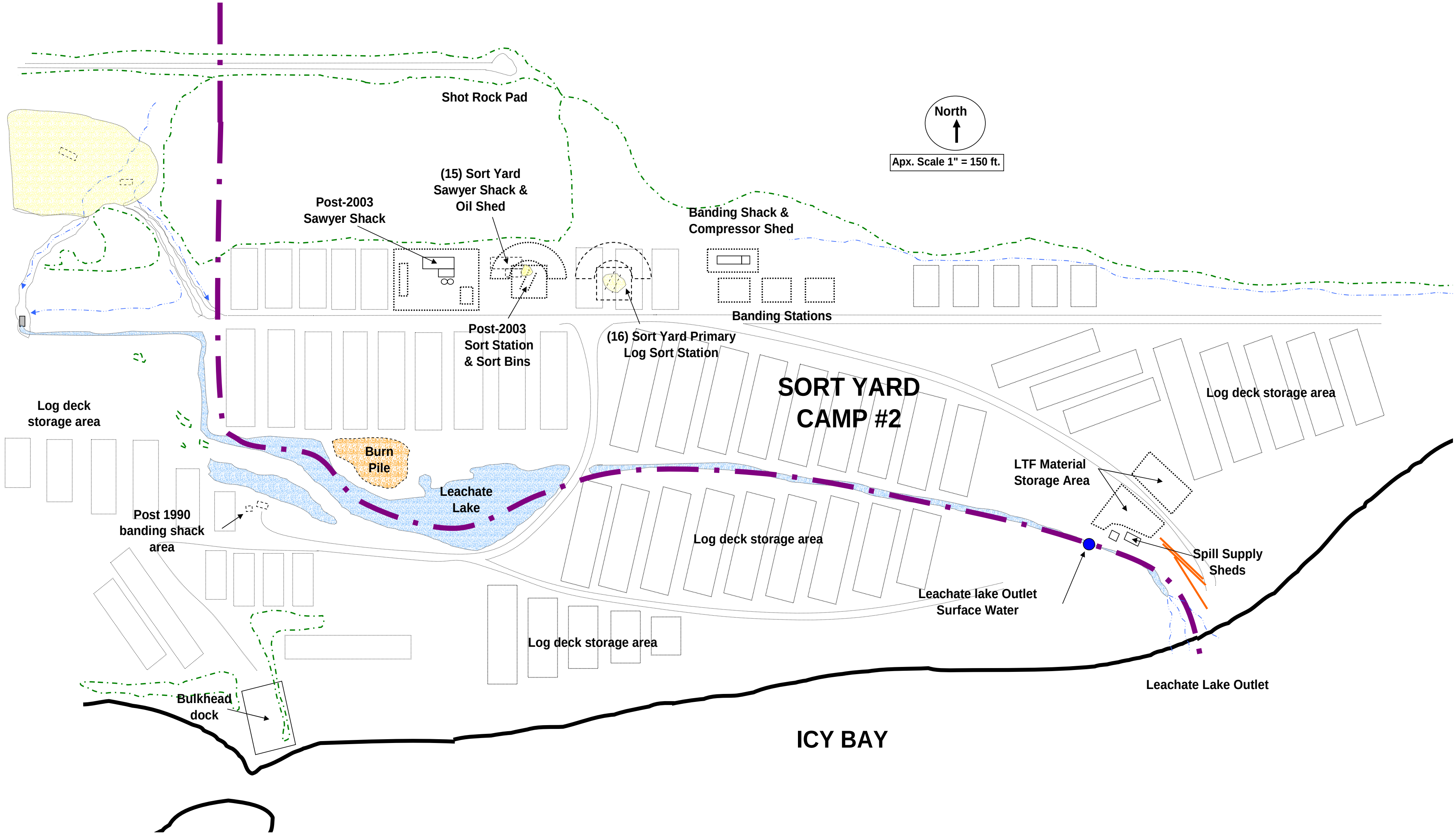


Figure 8. Camp #2 Sort Yard Layout

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 9. Contaminated Soil Clean-Up Limits

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 10. 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. <u>Additional active treatment will be necessary only if the most stringent calculated alternative cleanup levels are exceeded</u>. 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."*

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 11. Soil Limits for Organic Constituents

Interim Action Plan

An Interim Action Plan was submitted by GeoEngineers in November 2002 to perform excavations inside the shop and around the generator. The GeoEngineers Plan was approved by ADEC December 2002. Excavations were performed in December and a temporary stockpile was created west of the Shop. Clean fill and a liner were restored to the shop. The majority of the shop floor was then covered with steel plate. Remaining portions of the floor were then covered with wood.

Remedial Work Plan

DMC submitted a Remedial Work Plan for remaining Camp #2 work on March 17, 2003. The plan was approved by ADEC on March 20, 2003 with the following comments:

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.

Additional interim actions were performed by DMC Tech in March. Logging activities for 2003 commenced in January and the layout of the yard was changed to improve productivity. The Sawyers Shack, Oil Shed and Log Sort Bins were moved. Approval was granted to investigate contaminated soils in the sort yard identified in the 2002 characterization plan before they were obliterated. Additional excavations also occurred in the Fuel Depot to further delineate contamination.

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

Critical Documentation

Adherence to Approved Plans

Plans to guide the remediation of Camp #2 were prepared, submitted and approved before work in the field was performed. As necessary field changes to the plan were prepared, negotiated and approved.

Remedial Work Plans

A Remedial Work Plan was prepared and submitted by GeoEngineers on November 7, 2002 titled, “Remedial Soil Excavation and Cleanup, Browning Timber-Logging Camp #2, Icy Bay West, Alaska,”. A letter dated December 3, 2002 from the Alaska Department of Environmental Conservation (ADEC) provided approval for interim action soil removal. ADEC approval was based on review the work plan and approval of Southeast Management Services (SMS) site characterization report “5/13/02 – 6/6/02 Site Assessment: Trust Land Office’s Icy Bay West Logging Camp and Its Related Facilities, Icy Bay, Alaska,” dated July 2002. Interim action work was performed at the Icy Bay West Logging Camp #2 from December 6-10, 2002. Interim excavations were documented in a report dated January 10, 2003 and titled, “Draft Summary Report for Electric Generator and AST and Equipment Shop Remedial Excavations - Browning Timber-Logging Camp #2 Icy Bay, Alaska (GEI File No. 8779-002-00). This plan was not submitted to ADEC.

An Amended Remedial Work Plan was prepared by DMC Technologies on March 20, 2002, titled, "Amended Site Remediation Work Plan Icy Bay West Camp #2". This plan was also approved by ADEC on March 20, 2003 with comment. Interim excavation work was performed at Camp #2 by DMC Tech on March 23, 2003. The purpose of the interim excavation was the removal of contaminated soil in a sort yard location inhibiting on-going timber operations. Excavation activities were also targeted at locations not formerly excavated by GeoEngineers and at the Fuel Depot for Camp #2. The long term stockpile located inside the confines of Camp #2 formerly used by GeoEngineers was expanded to receive additional contaminated soil. The stockpile was expanded in accordance with ADEC standards with 10 mil liner and was designed to receive additional soil.

Revised Remedial Work Plan

The results of the efforts in December by GeoEngineers and in March by DMC Technologies as well as the comments on the Amended Remedial Work Plan prepared by DMC Technologies 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". This plan was submitted on 5/28/03 and was verbally approved by ADEC without comment on 5/28/03. This plan was used to guide remedial work in June and July.

Changes to Revised Remedial Work Plan

Three changes to the plan were developed during the course of remediation as noted below and included in Appendix B 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.

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.

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 Analyses

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:

(n) No Sheen

No visible sheen

(s) 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

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.

(h) 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.

(n) No Odor

No petroleum odor or only the odor of natural humus.

(s) Slight Odor

Slight petroleum odor and distinguishable from natural humus

(m) Moderate Odor

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

(h) 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 Analyses

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. 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.

RELEASE INFORMATION

Release Details

Release Contacts

Site Name & Address

Icy Bay West Logging Camp #2
Icy Bay
Yakutat, Alaska 99689

Owner/Operator/Contractor

Owner: State of Alaska
Mental Health Trust Land Office
Attn. Doug Campbell
550 West 7th Avenue, Suite 1430
P: 907-269-8656
X: 907-269-8905
dougc@dnr.state.ak.us

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

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

Date/Time of Release

In early 2000, Camp #2 was constructed at Icy Bay on State of Alaska Lands administered by the Department of Natural Resources (DNR) Mental Health Trust Land Office (TLO). Camp #2 was used primarily by Citifor, Inc. and Browning Timber Corporation. During the operation of Camp #2, beginning in 2000 and through 2003, numerous releases of petroleum product occurred. The sum of the releases over a three year period of time constitutes the subject of this report and the extent of releases.

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	1,500 CY
Diesel (DRO)	9,900 ppm	
Oil (RRO)	16,000 ppm	
Stoddard Solvent	3,500 ppm	300 CY

Table 12. 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. It is not believed that any quantifiable environmental damage has occurred from ingestion, adsorption, inhalation, direct/contact or fire/explosion of contaminated soils by any receptor. Regardless, 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

No measurable amount of pure product gasoline, diesel, oil or solvent was observed during the excavation of contaminated soil in Camp #2. Free product was not detected in soils or on the water surface of excavations. However, contamination was present as noted by field observations and measurements indicating discoloration, sheening and odor. The contamination was never present in sufficient quantity to be considered a free release of product.

Permits for Managing Free Product

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

Free Product Recovery System Used

No free product recovery system was deployed during remediation. However, spill materials were made available at the site during 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.

Potential for Release of Free Product During Recovery

From a general perspective, free product was not present in excavations and the potential for release of such products did not exist either on-site or off-site. However, excavations did occasionally uncover scrap metal, oil filters or crushed containers.

On June 12th, 2003 at 1430 hours, during routine excavation of oil-stained soils at a location approximately 100 feet south of the shop, a buried drum of hydraulic oil was uncovered approximately 24” below the ground surface in upright position. The bucket on the track hoe snagged and folded the drum as soil was being removed. Approximately 8-10 gallons of hydraulic oil spilled through the open bunghole in the drum into the excavation area below. Free oil was removed from the water surface using absorbent pads. The pads were incinerated. The residual spilled oil adsorbed to sediment was excavated and removed as part of the routine clean-up. A release notification was made to ADEC and is attached as Appendix A to this report.

A photograph of the drum is included and follows for review. Prompt clean-up and ADEC notification were made (see Appendix A to this report).

Figure 9. Excavated Drum of Hydraulic Oil

Contingency Plan to Address Free Product Releases

A contingency plan to address free product releases was not developed. However, as noted, spill prevention supplies were readily available for use.

Demonstration of Recovery of Free Product

Free product was not present and a demonstration of recovery is not required.

Free Product Disposal

Free product was not observed, collected or disposed during remediation of the Camp.

Free Product Remaining

No free product is present at the site.

REMEDIATION RESULTS

Remedial Work Summary

A summary of remedial work performed during the project is provided in the following table.

Date	Activity	Soil Excavated	Samples Collected
3/23, 6/14, 6/24	(Area 1) Sawshop	45 CY	9
12/5	(Area 2) Generator Tank Containment	3 CY	3
3/23, 6/14	(Area 3) Generator Trailers	41 CY	2
12/4	(Area 4) Shop Floor Above Liner	292 CY	6
12/5	(Area 5) Shop Floor Below Liner	145 CY	12
3/23, 6/14	(Area 6) Shop Middle Back Door	6 CY	2
3/23, 6/17	(Area 7) Shop Culvert Sections	34 CY	3
3/23	(Area 8) Shop Repair Bays Exterior	75 CY	4
6/16	(Area 9) SW Corner Equipment Parking	132 CY	23
6/17	(Area 10) NE Corner Equipment Parking	4 CY	8
6/13	(Area 11) West Equipment Parking	52 CY	15
6/12, 6/16, 6/24	(Area 12) South Equipment Parking	91 CY	19
6/17, 6/27	(Area 13) SE Corner Equipment Parking	161 CY	19
3/23, 6/17, 6/18, 6/19	(Area 14) Fuel Depot	772 CY	61
3/23	(Area 15)Sort Yard Sawyers Shack	0 CY	1
3/23	(Area 16) Sort Yard Primary Log Sort Station	0 CY	0
3/23	(Area A) Shop Groundwater	NA	0
3/23	(Area B) Depot Groundwater	NA	0
6/23	(Area C) Leachate Lake Surface Water	NA	7
6/23	Water Table Determination	NA	10
7/19	Solvent Stockpile Confirmation	NA	12
7/20	Diesel Stockpile Confirmation	NA	20
9/14	Final in-situ treatment of shop floor, west and south side oil spots, parked stacker (NW of shop) and blue log tower (NE of shop)	NA	0

Total 1,753 CY
(2,805 tons) @1.6 tons/CY

Table 13. Remedial Work Summary

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.

Soils - Area by Area Evaluation

Each of the areas identified in Table 13, 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) Sawshop

The sawshop was characterized in June of 2002. Four samples were collected along the southeast corner of the sawshop in an area where visible staining was noticed. Only one of the samples had contamination levels higher than clean-up limits (DRO-16,000 ppm, RRO-8,400 ppm), likely due to bar oil spillage. It was estimated that 2-3 CY of contaminated soil was present to a depth of 1 foot. On March 23, 2003; the Camp Manger identified the general location where this contamination had previously been observed, but which was no longer visible. Approximately 4 CY from the noted area was excavated and two confirmation samples collected indicating a clean excavation.

On June 14, 2003; the area was reinvestigated and additional staining was found at both the southeast and southwest corners, under the east entrance steps to the shop, and in the lay down area east of the southeast corner towards the nearby residential trailer. The characterization report previously noted that these areas were potentially contaminated. This remaining staining was excavated resulting in 41 CY of contaminated soil to a depth of 3 feet. Another seven confirmation samples were collected all indicating that excavation was complete. The site was backfilled in late June, 2003. Figure 10 illustrates work completed in this area.

(Area 2) Generator Tank Containment

The generator tank containment was characterized in June, 2002. During this time the containment was lined and housed a 5,000 gallon diesel fuel tank. Sorbent pads were being used to remove oil from water surfaces in the containment at the time of the original inspection. A liner tear in the northeast corner of the containment was observed. Exploratory trenched were excavated at the northwest and southeast corners and three samples were collected for analyses. No contaminants were detected. However, the area under the containment was suspect of being contaminated and it was estimated that 35-45 CY to a depth of six feet may need to be removed pending additional future investigation.

Browning Timber dismantled and removed the 5,000 gal diesel tank and containment structure in early December, 2002 to provide unobstructed access to excavate under the containment. On December 5, 2002; after removal of the tank and liner, the area immediately under the AST was inspected. There was no visual evidence that a release had occurred from under the AST. GeoEngineers optioned to not excavate significantly under the containment based on this observation. Approximately 3 CY of contaminated soils under the area above the liner tear were excavated to a depth of 1 foot and removed to the long term stockpile. Three confirmation samples were collected following the excavation all indicating the absence of contamination. Backfilling was performed immediately and a new containment structure was constructed immediately southwest of the historic location. Figure 11 illustrates work completed in this area.

(Area 3) Generator Trailers

Two trailer mounted generator serve electrical needs of the camp and are parked west of the generator containment area near the northeast corner of the equipment shop. Several small surface stains were observed in the area. A single sample from the area indicated 1,000 ppm DRO and 1,400 ppm RRO likely due to diesel spillage. Contamination was observed to be only 6” in depth and an estimate of <1 CY was made for removal.

On March 23, 2003; the Camp Manger identified the general location where this contamination had previously been observed, but which was no longer visible. Approximately 6 CY from the noted area was excavated to a depth of 2 feet and one confirmation samples collected indicating a clean excavation. On June 14, 2003; the area was re-inspected and new stains were clearly visible near the trailers and outside of the previous excavation pattern. Another 35 CY was removed to a depth of 3 feet and one additional confirmation sample collected indicating that contamination removal was effective. The area was backfilled in late June. Figure 12 identifies the layout of this area and related work as described.

(Areas 4 & 5) Shop Floor Above and Below Liner

In March, 2002 the upper foot of soil inside the shop, observed to be highly contaminated, was removed and placed in a stockpile (150 – 200 CY). A liner and clean fill was then placed in the shop. A few months later in June of 2002; oil stained soils could again be seen in numerous areas across the entire shop floor. Because of the presence of equipment and supplies and due to ongoing operations, the shop floor was not sampled. A recommendation was made to remove soils both above the liner (150 – 200 CY) about a foot deep and to remove soils below the liner (100-250 CY) about three feet deep. It was recommended that this be accomplished during remediation.

In early December, 2002; the equipment repair shop was evacuated and all materials and equipment relocated to provide unobstructed access for excavation on December 4th and 5th, 2002. As recommended, soils above the liner around the battery storage area (0.5 CY) were segregated and placed in a super sack. Soils above the liner and around the used oil burner/tank were also segregated (6CY) and placed in a separate portion of the long-term stockpile. It was assumed that these soils, rich in contaminants might need to be shipped off-site. All remaining soil covering the shop floor (12' deep) and above the liner was removed and placed in the long-term stockpile (135 CY). Six waste characterization samples of excavated materials from above the liner were then collected for analyses. Two soil samples indicated contamination exceeding clean-up limits (DRO-1,250 ppm and 6,550 ppm and RRO-2,430 ppm and 26,300 ppm).

Field screening was performed on soils under the liner to determine the extent of excavation required to achieve clean closure. SEMS had originally recommended that 150-320 CY of contaminated soil be removed from under the shop liner. Based on field measurements, approximately 145 CY of soil were removed. Twelve confirmation samples were collected from soils left in-place to validate clean up. Excavated soil was then placed in the long-term stockpile. The liner removed from the shop was brushed clean and saved for future camp use. The shop was immediately backfilled with clean soil and a manufactured sub floor with steel plates to reduce shop downtime and return the camp to operation status. Collected confirmation samples under the shop floor liner indicated that all contaminated soils had been removed. Figure 13 illustrates the equipment shop area and work performed.

(Area 6) Shop Middle Back Door

On June 5, 2002; the backside of the shop was inspected and was found to be in good order with the exception of one soil stain 10 feet beyond the outside of the middle back door. A single sample from the area indicated DRO contamination of 1,700 ppm and RRO contamination of 4,300 ppm. It was estimated that 1-2 CY of soil to a depth of 2 feet would need to be removed.

As before, on March 23, 2003; the Camp Manger identified the general location where this contamination had previously been observed, but which was no longer visible. Approximately 2 CY from the noted area was excavated to as depth of 1 foot and one confirmation sample collected indicating a clean excavation. On June 14, 2003; the area was re-inspected and other soil staining identified. An additional 4 CY was excavated to a depth of 2 feet and another confirmation sample collected. Confirmation samples indicate that all contaminated soil was removed. Figure 14 illustrates the location in question.

(Area 7) Shop Culvert Sections

In June 2002, three large "culvert" sections were observed in close proximity to the shop's southeastern corner. The culverts were actually interior steel hubs from the wheels of large equipment. Hydraulic cylinders were stockpiled in the hubs and were found to be leaking and contaminating underlying soils at the front of the "culverts". A sample was collected in front of the southern most hub and was analyzed to contain 4,000 ppm DRO and 10,000 ppm RRO likely originating with hydraulic oil from the leaking cylinders. It was estimated that 4-7 CY of soil would need to be excavated to a depth of 3 feet to remove the contamination.

In December, 2002; the cylinders in the hubs were removed and either stored inside or drained and discarded. The hubs were moved straight south into the south equipment parking area as scrap metal. As before, on March 23, 2003; the Camp Manger identified the general location where this hubs had previously been previously placed, but which was no longer clearly visible. Approximately 8 CY from the noted area was excavated to a depth of 2 feet and one confirmation sample collected indicating a clean excavation. On June 14, 2003; the area was re-inspected and additional soil staining identified. Another 26 CY of soil was excavated to a depth of 3 feet and two more confirmation samples collected. The last samples also indicated that all contaminated soil was removed. Figure 15 depicts the area where the hubs were originally located.

(Area 8) Shop Repair Bays Exterior

Characterization efforts in June included sampling excavations in front of and outside the five shop repair bays. Contaminated soils were detected in front of Bay 5 (DRO-3,500 ppm and RRO-<260ppm), Bay 4 (DRO-1,500 ppm and RRO-4,000 ppm), and Bay 3 (DRO-2,000 ppm and RRO-<260 ppm). Contamination appeared to be contributable to diesel fuel and motor oil spillage. A recommendation was made to excavate 17-48 CY to a depth of 2-3 feet from the front of the bays.

The front of the bays was re-inspected on March 23, 2003. Numerous stains were noted from the edge of the shop to a distance of about 15 feet westward from the shop in Bays #3, #4 and #5. Approximately 75 CY of soil was removed from the bays exterior to a depth of 3 feet and four samples collected all indicating that the excavation had removed contaminated soil. Figure 16 depicts the work effort at the front of the shop bays.

(Area 9) SW Corner Equipment Parking

This corner of the camp was used during part of 2001 by a logging subcontractor for both parking and maintenance. By June, 2002 the area had been abandoned and graded and no visible traces of oil staining were noted. The southeastern water line of the camp gravel pond located in SW corner of camp was inspected and traces of staining found. However, a sample collected from the area did not identify contaminants at levels of concerns – far below limits. A backhoe was not available to pursue exploratory trenching in this area. A recommendation was made to explore the area further during remediation. It was suspected that the area would require 1-10 CY of excavation to a depth of 1 foot.

On June 12, 2003; the southeastern shoreline of the gravel pit on the west side of the entrance road was inspected. One clean sample was collected from the area. Several small oil stains were identified above the shoreline within the corner. These were later removed accounting for 1 CY of excavation to 1 foot of depth. A single confirmation sample indicated that the area was clean. The area immediately east of the entrance road yet still in the SW corner was also inspected and similar staining identified and removed accounting for another 1 CY of soil to a depth of 1 foot. A sample was collected from the area for analyses and indicated that excavation had been effective in removing contamination.

On June 16, 2003; following a large rain event, run-off water with visual oil sheen was noticed flowing into the SW corner from the west parking area and sinking into soft gravel east of the entrance road. Observations the following day in the sun identified slight soil staining covering a 400 sq.ft area. Because the area appeared to be natural “sump”, core samples with depth were collected for observation. Coring and subsequent field measurements at 8 inch intervals indicated that the soil contamination was worsening with depth. The observed area was excavated to a depth of 6 feet and within the upper 1 foot of the water table. About 130 CY of contaminated soil was removed. 19 confirmation samples were collected from this excavation, including sidewalls and bottom locations, all denoting that the excavation was effective in removing contaminants. Figure 17 illustrates the excavations and samples from this area.

(Area 10) NE Corner Equipment Parking

Historical data indicated that this corner of the camp was also used by a logging subcontractor. As with the SW corner, the NW corner was abandoned and graded over by the time characterization work was performed in June, 2002. At the time, a visual inspection did not identify soil staining. A backhoe was not available to investigate the possibility of contamination with depth. A recommendation was made to further evaluate this area with trenching. Sometime before remediation, two log towers located near the southeast corner of camp were moved to the northeast corner. Plastic was placed under the towers after they were moved.

On June 17, 2003; several oil stains near parked log towers were identified. The stains were likely spillage associated with the movement of the towers. The presence of contamination in or near the area was estimated to contribute 4-14 CY of contaminated soil at a depth of 1 foot. The towers were moved forward to provide access. Less than 1 CY of soil was excavated from the northern most positioned log tower. Three samples confirmation samples collected from the area near this tower all indicated that contaminated soil had been effectively removed. The southern most positioned tower required the removal of 3 CY to eliminate contaminated soil. Five samples collected from the excavation indicated that contaminated soil removal was complete. Figure 18 illustrates the excavations and samples from this area.

(Area 11) West Equipment Parking

The west parking area located in front of the shop was used during the operation of the camp as a parking and equipment storage area. An abandoned log stacker is located on the north end of the parking area. Oil stains were visible under the abandoned stacker, which was awaiting repair. It was estimated that 3-5 CY of contaminated soil to a depth of 2 feet might need to be removed from under the stacker. The remaining parking area was not inspected or sampled. However, a recommendation was made to cut shallow trenches across the areas king for contamination that may need to be removed.

On June 13, 2003; a comprehensive soil staining survey of the entire parking area was performed. Numerous stains were identified adjacent to and around equipment parked in the area. The stacker was still found at the north end - unrepaired. Oil staining under the stacker was again noted. The stacker could not be moved at the time work was performed for fear of damaging the unit which was jacked off the ground and awaiting purchase of parts. It was noted that a liner had been placed under the stacker to prevent further leakage. Large and small stains in the main parking area were excavated and removed. Most of the stains were shallow in depth. However, several stains extended to depths of 3 feet. 52 CY of soil was excavated and 15 confirmation samples were collected from the excavations. All of the samples indicated that clean-up had been effective. Surface water run-off patterns in the area were noted to proceed southeast towards the SW corner of the camp consistent with previous observations. Figure 19 illustrates the excavations and samples from this area.

(Area 12) South Equipment Parking

During characterization efforts, the south side of camp was noted as being used for both equipment and materials storage. No oil stains were found along the south area even where trucks were being parked. The area was concluded to be clean. A recommendation was made to recheck the area and remove any visible stains thought to be less than 1 CY and less than 1 foot deep.

On June 12 and 16, 2003; the south parking area was carefully surveyed for staining. Numerous stains were observed along the length of the area from west to east associated with both equipment and materials being stored and refueling operations at a small fuel depot supporting camp. Both small and large stains were excavated resulting in the removal of 91 CY of contaminated soil. 19

confirmation samples were collected all indicating that contaminated soil had been effectively removed. One location within the south parking area stood apart from the rest. This area was located immediately south of the shop and towards the southeast corner of camp. The “culverts” or hubs formerly stored next to the south end of the shop for hydraulic cylinders had been removed to this area. One of the hubs standing upright appeared to have been used as a place to dump oil. The hub was removed and excavations under the hub performed. At a depth of 3 feet, a partially filled drum of hydraulic oil was snagged. The drum was standing upright, contained oil and was sitting on top of the underlying puncheon at the water table level. The 8-10 gallons of hydraulic oil in the drum spilled and was immediately recovered using oil adsorbent pads and booms. The site was then excavated to a depth of approximately 6 feet. The spill was reported to ADEC. Confirmation samples from the excavation indicated that contaminated soil had been effectively removed. Figure 20 illustrates the excavations and samples from this area.

(Area 13) SE Corner Equipment Parking

At the time of the characterization work in June, 2002; the southeast corner of the camp had four parked log towers and a dozer. All the equipment had plastic sheeting laid underneath, but without containment berms. A sample was collected under the front track of northern most log tower in the area and identified contamination requiring removal (DRO – 3,100 ppm, RRO – 8,800 ppm). No further investigation in the area was performed and a recommendation was made to excavate under each piece of equipment before final camp closure. It was estimated that 25-60 CY of soil might need to be removed to a depth of 1 foot. Sometime after the characterization work in the area was performed two log towers were removed to the approximate northeast corner of the camp. The remaining two towers were relocated to the area east of the shop and north of the back exit road. The parked dozer was repaired and put to use.

On June 17, 2003; the parked towers east of the shop were moved to facilitate access for investigation and remediation. Surface stains were mapped and then removed. 31 CY of petroleum contaminated soil were excavated with 7 confirmation samples collected all indicating that contaminated soils were removed as required.

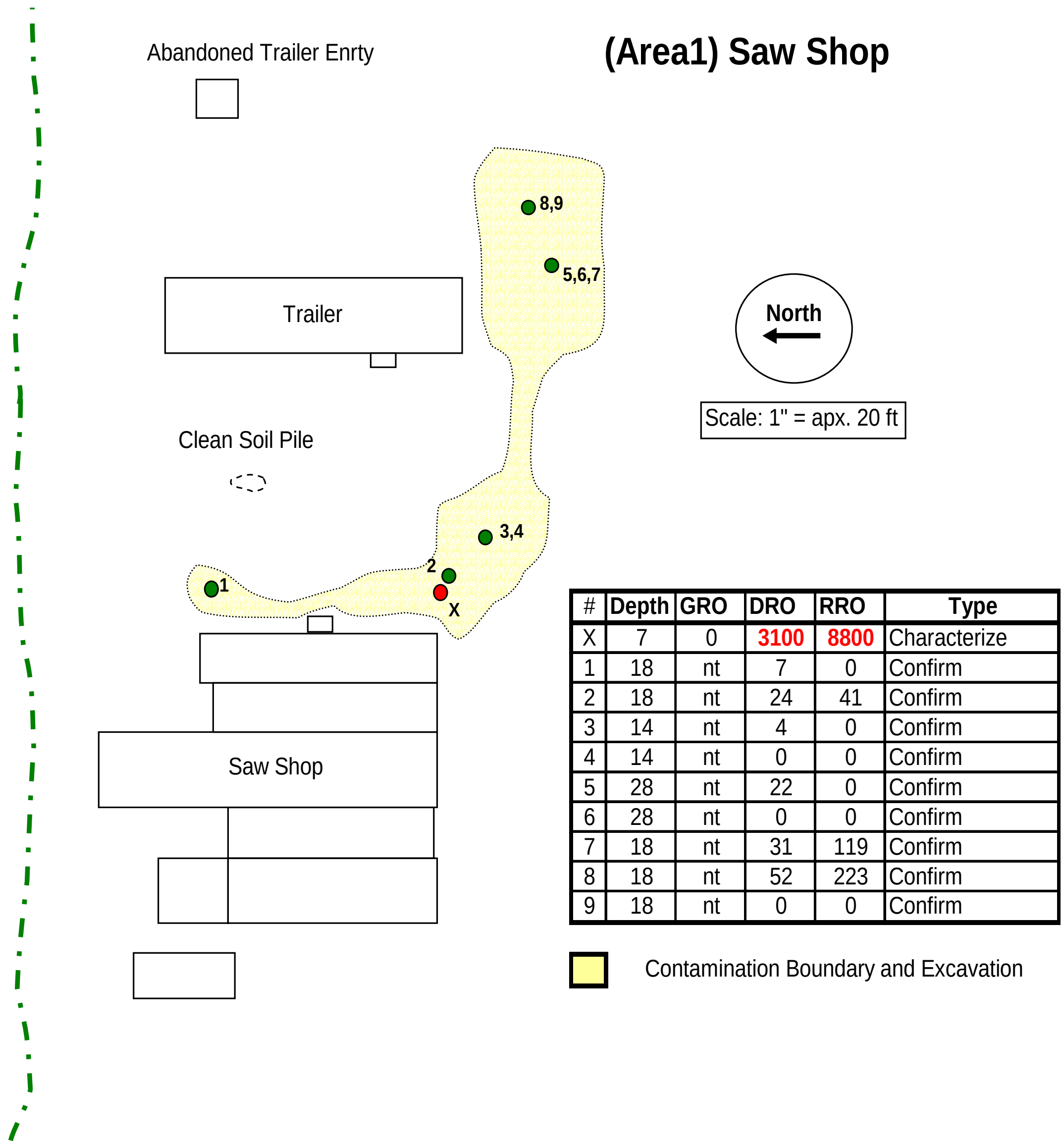
A small area north of the back exit road was observed to emit “solvent” odor. Further exploration of this area with the PID indicated a large surface spill area. The PID will typically read 3 to 5 times higher for solvent than for diesel. Gasoline will also read high on the PID, but has much different odor. Two characterization samples were collected and sent to laboratory for analyses. An investigation of camp records insued and all MSDS were reviewed. It was noted that various solvents had been purchased. The shop was thoroughly inspected and several 5-gallon cans of Stoddard Solvent was found both in use and in storage. The chemical manufacturer of the product provided a chemical footprint of the solvent that was positively traced to the characterization samples from the solvent spill site with the detection of trimethylbenzene. Since the solvent contained no chlorine, approval from ADEC was granted to excavate and treat the material. However, a separate treatment cell was required to both to store the contaminated soil and treated soil. The cell was developed and on June 27, 2003; 230 CY of soil were excavated to a depth of 9 feet (3 feet below the water table). 10 confirmation samples were collected all indicating that contaminated soil had been effectively removed. Figure 21 illustrates the excavations and samples from this area.

(Area 14) Fuel Depot

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 t 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.

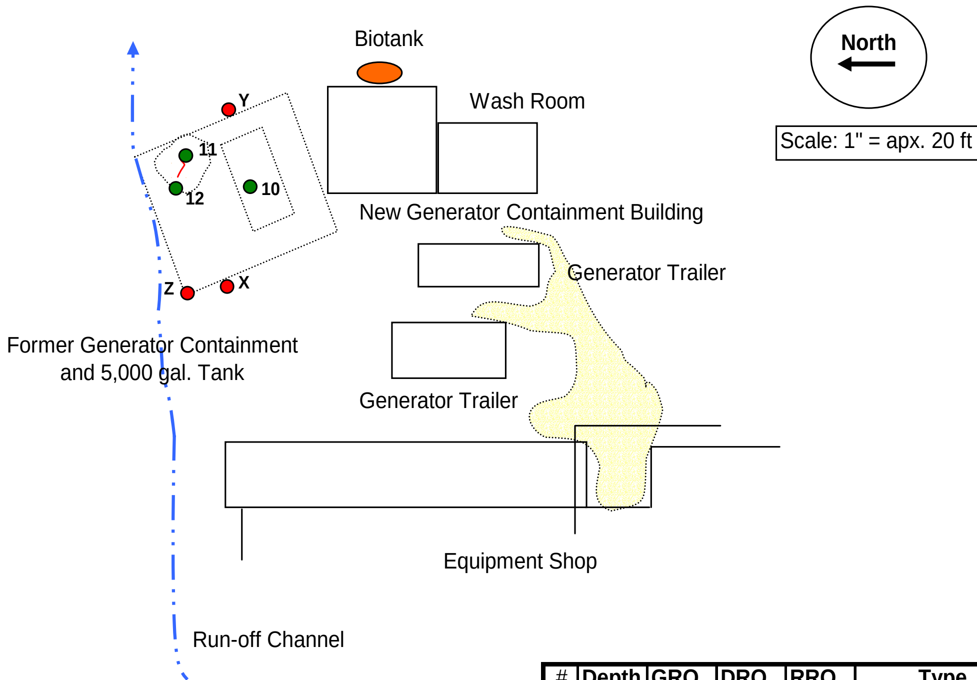
After removal of snow, the surface area immediately under the depot was inspected and PID surface measurements collected. From a surface perspective, there was no visual or PID evidence that a significant release at the surface had occurred. The only positive readings obtained, and far below response 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



#	Depth	GRO	DRO	RRO	Type
X	7	0	3100	8800	Characterize
1	18	nt	7	0	Confirm
2	18	nt	24	41	Confirm
3	14	nt	4	0	Confirm
4	14	nt	0	0	Confirm
5	28	nt	22	0	Confirm
6	28	nt	0	0	Confirm
7	18	nt	31	119	Confirm
8	18	nt	52	223	Confirm
9	18	nt	0	0	Confirm

Figure 10. Sawshop Excavation and Sampling

(Area 2) Generator
Tank Containment



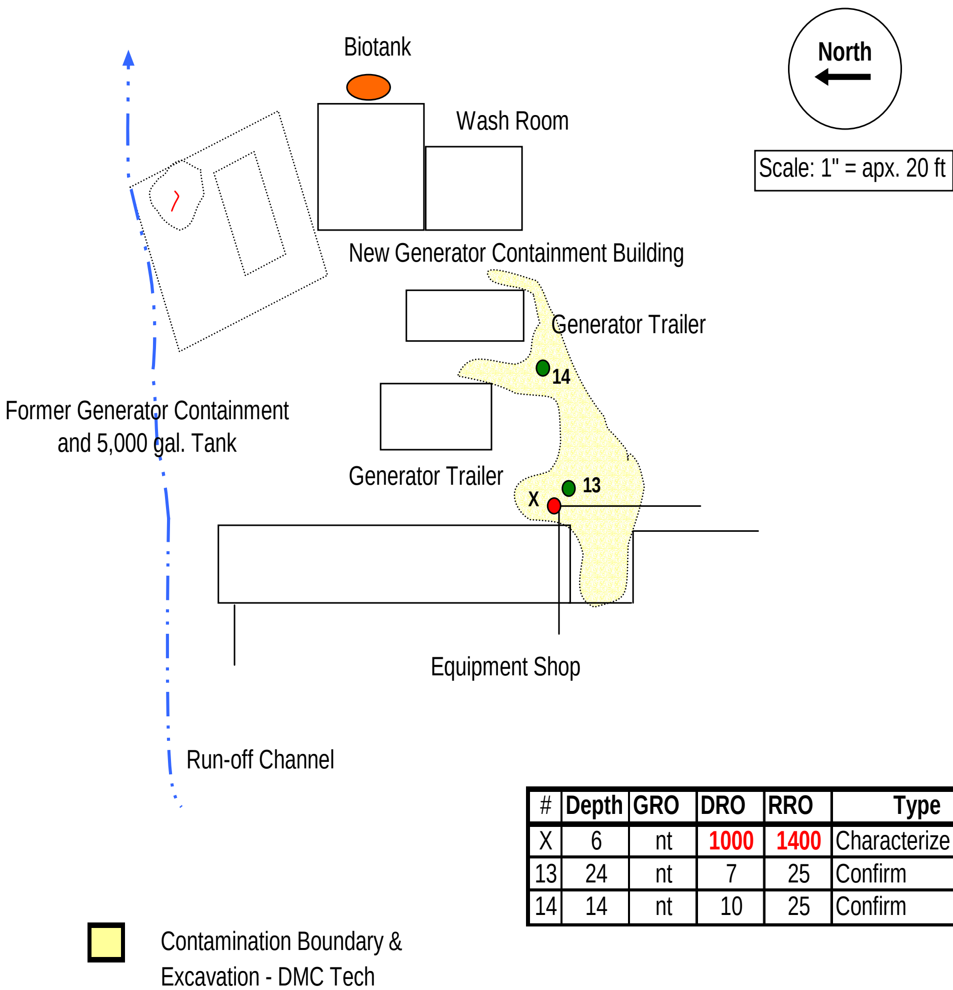
#	Depth	GRO	DRO	RRO	Type
X	78	nt	22	14	Characterize
Y	60	nt	5	10	Characterize
Z	60	nt	7	10	Characterize
10	12	nt	7	25	Confirm
11	24	nt	10	25	Confirm
12	60	nt	6	25	Confirm

Contamination Boundary & Excavation - DMC Tech

Contamination Boundary & Excavation - GeoEngineers

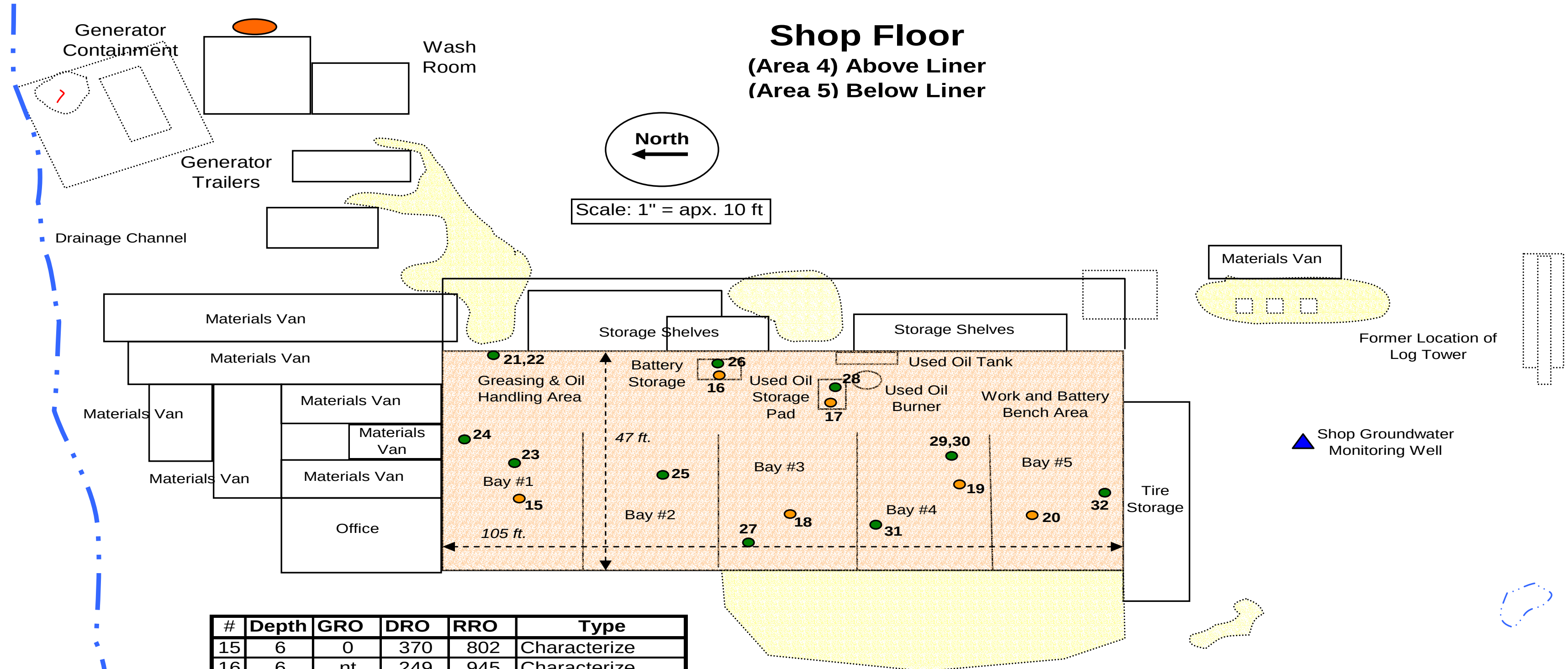
Figure 11. Generator Tank Containment Excavation and Sampling

(Area 3) Generator Trailers



#	Depth	GRO	DRO	RRO	Type
X	6	nt	1000	1400	Characterize
13	24	nt	7	25	Confirm
14	14	nt	10	25	Confirm

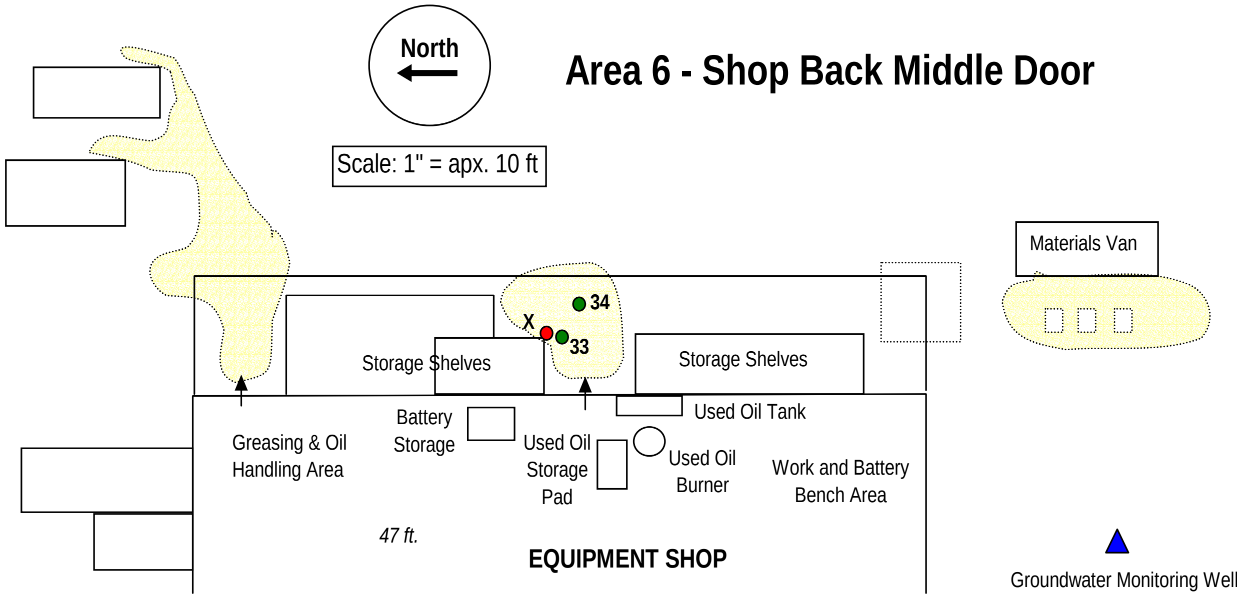
Figure 12. Generator Trailers Excavation and Sampling



#	Depth	GRO	DRO	RRO	Type
15	6	0	370	802	Characterize
16	6	nt	249	945	Characterize
17	6	nt	6550	26300	Characterize
18	6	nt	778	1580	Characterize
19	6	nt	1250	2430	Characterize
20	6	nt	15	43	Characterize
21	36	nt	8	25	Confirm
22	36	nt	8	25	Confirm
23	12	nt	8	25	Confirm
24	30	nt	4	25	Confirm
25	18	nt	6	25	Confirm
26	24	nt	11	27	Confirm
27	48	nt	6	25	Confirm
28	54	nt	4	25	Confirm
29	24	nt	4	25	Confirm
30	24	nt	4	25	Confirm
31	24	nt	10	25	Confirm
32	24	nt	8	25	Confirm

Contamination Boundary & Excavation - DMC Tech
Contamination Boundary & Excavation - GeoEngineers
Above floor liner characterization sample
below floor liner confirmation sample

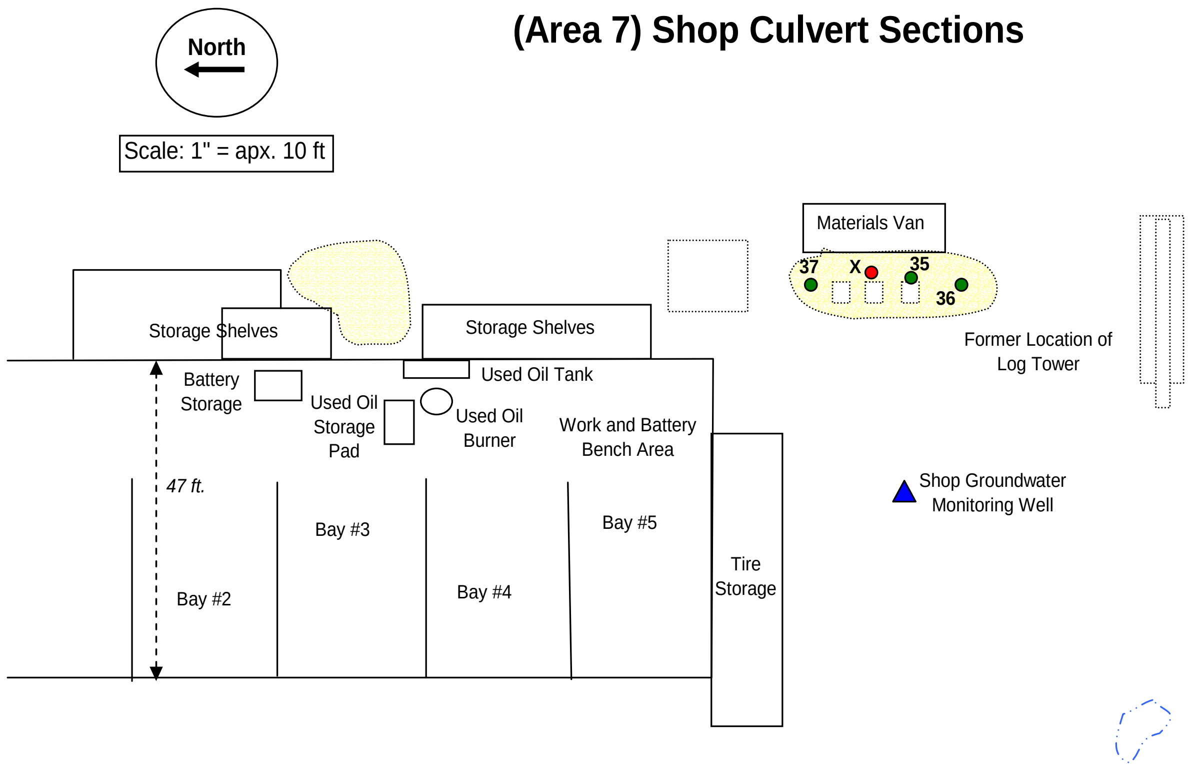
Figure 13. Shop Floor Excavation and Sampling



#	Depth	GRO	DRO	RRO	Type
X	6	nt	1700	4300	Characterize
33	24	nt	77	311	Confirm
34	16	nt	34	125	Confirm

Contamination Boundary &
Excavation - DMC Tech

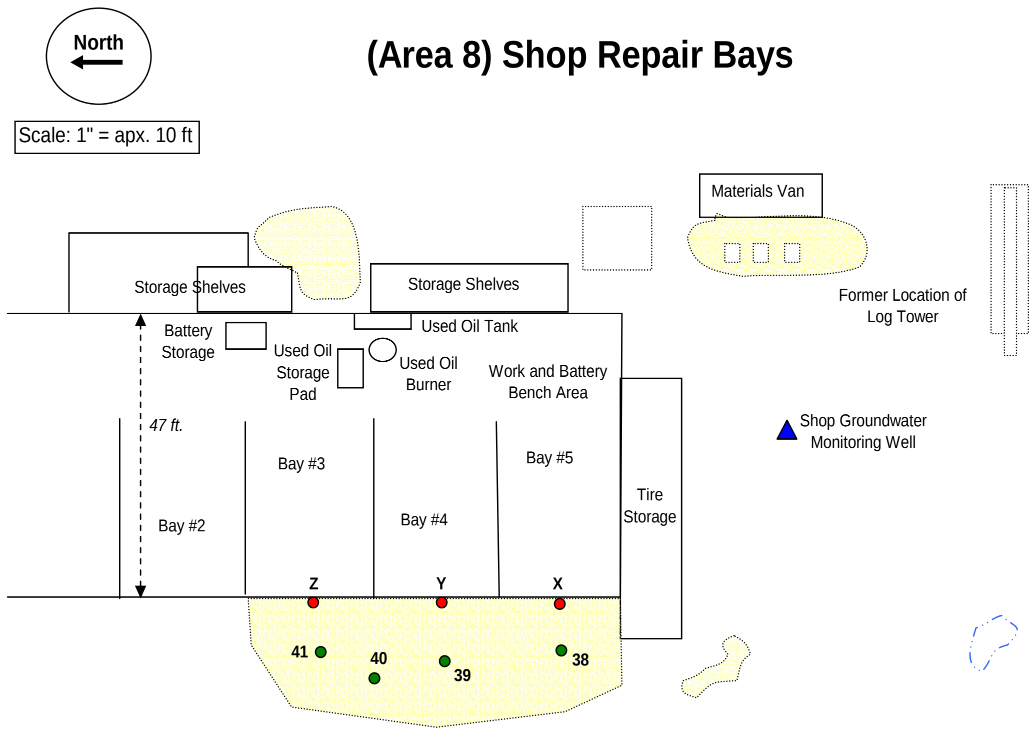
Figure 14. Shop Middle Back Door Excavation and Sampling



#	Depth	GRO	DRO	RRO	Type
X	8	nt	**4000**	**10000**	Characterize
35	24	nt	5	25	Confirm
36	18	nt	5	25	Confirm
37	18	nt	5	25	Confirm

Contamination Boundary & Excavation - DMC Tech

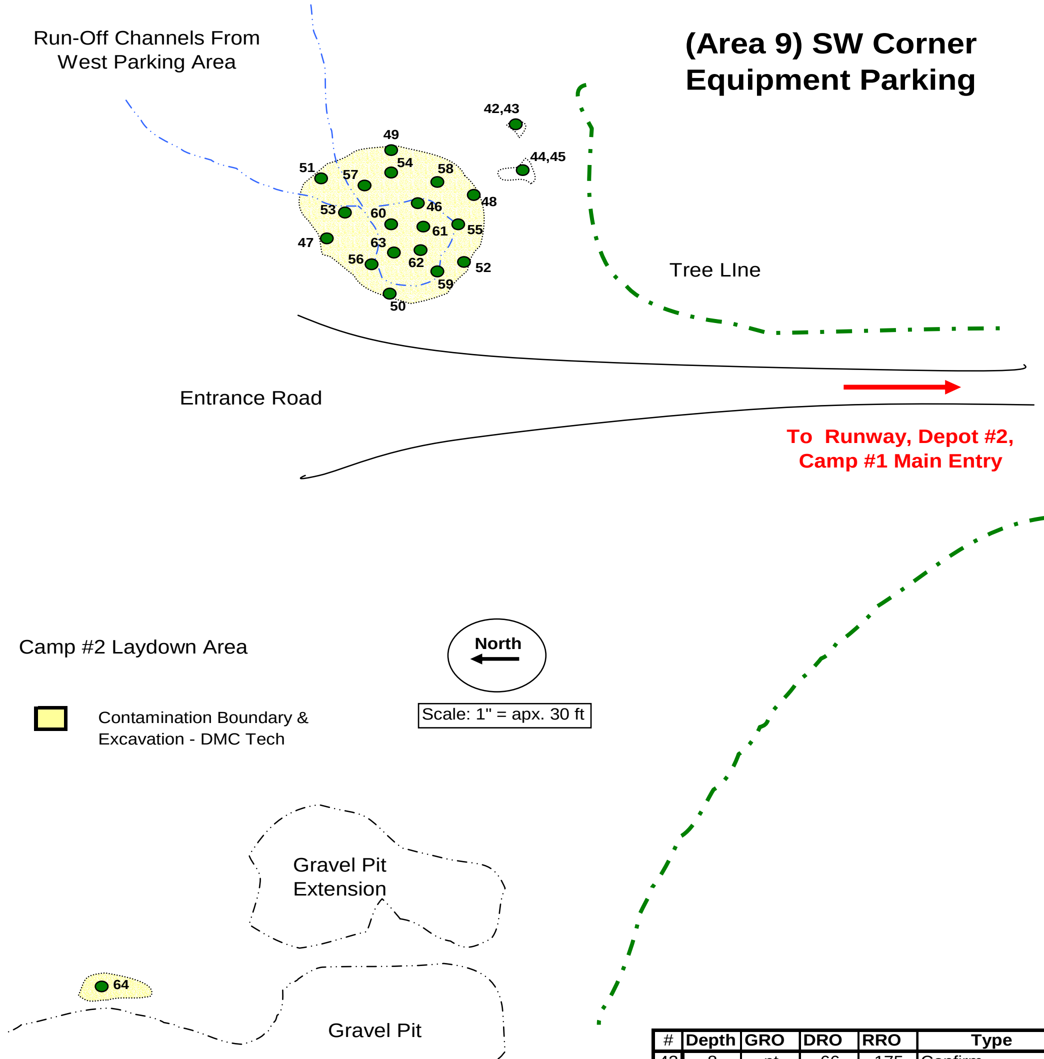
Figure 15. Shop Culvert Sections Excavation and Sampling



#	Depth	GRO	DRO	RRO	Type
X	6	nt	**3500**	260	Characterize
Y	12	nt	**1500**	4000	Characterize
Z	18	nt	**2000**	260	Characterize
38	36	nt	219	595	Confirm
39	24	nt	80	316	Confirm
40	24	nt	73	191	Confirm
41	24	nt	160	648	Confirm

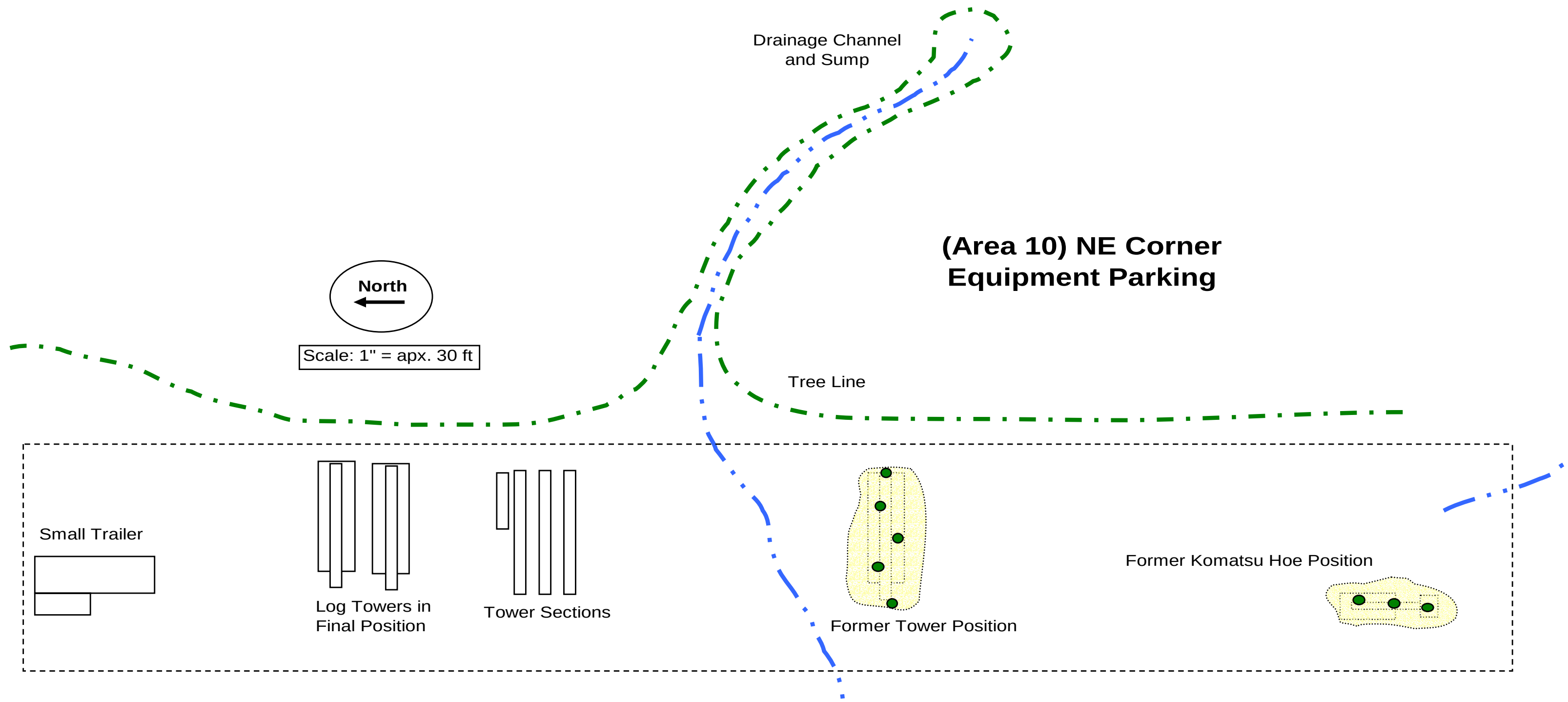
Contamination Boundary & Excavation - DMC Tech

Figure 16. Shop Repair Bays Exterior Excavation and Sampling



#	Depth	GRO	DRO	RRO	Type
42	8	nt	66	175	Confirm
43	8	nt	95	239	Confirm
44	8	nt	42	142	Confirm
45	8	nt	5	25	Confirm
46	8	nt	7	25	Confirm
47	30	nt	5	25	Confirm
48	30	nt	5	25	Confirm
49	30	nt	29	33	Confirm
50	42	nt	9	25	Confirm
51	30	nt	5	25	Confirm
52	30	nt	30	73	Confirm
53	42	nt	37	25	Confirm
54	42	nt	496	96	Confirm
55	42	nt	47	52	Confirm
56	42	nt	5	25	Confirm
57	42	nt	4	25	Confirm
58	42	nt	5	25	Confirm
59	42	nt	5	25	Confirm
60	42	nt	9	25	Confirm
61	72	nt	8	25	Confirm
62	72	nt	14	25	Confirm
63	72	nt	8	25	Confirm
64	8	nt	9	36	Confirm

Figure 17. SW Corner Equipment Parking Excavation and Sampling

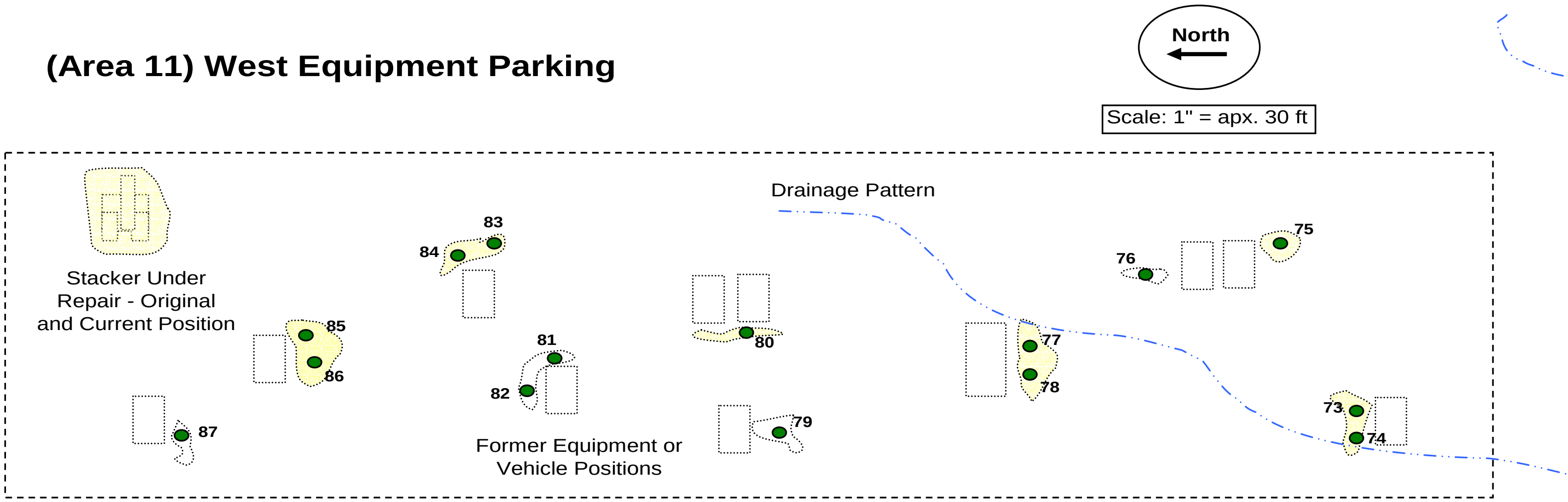


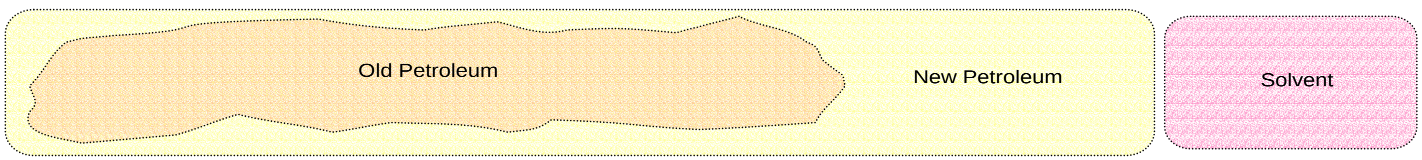
#	Depth	GRO	DRO	RRO	Type
65	24	nt	6	25	Confirm
66	24	nt	5	25	Confirm
67	36	nt	5	25	Confirm
68	42	nt	5	25	Confirm
69	48	nt	5	25	Confirm
70	48	nt	6	25	Confirm
71	48	nt	65	200	Confirm
72	48	nt	31	4230	Confirm

Contamination Boundary and Excavation

Figure 18. NE Corner Equipment Parking Excavation and Sampling

(Area 11) West Equipment Parking

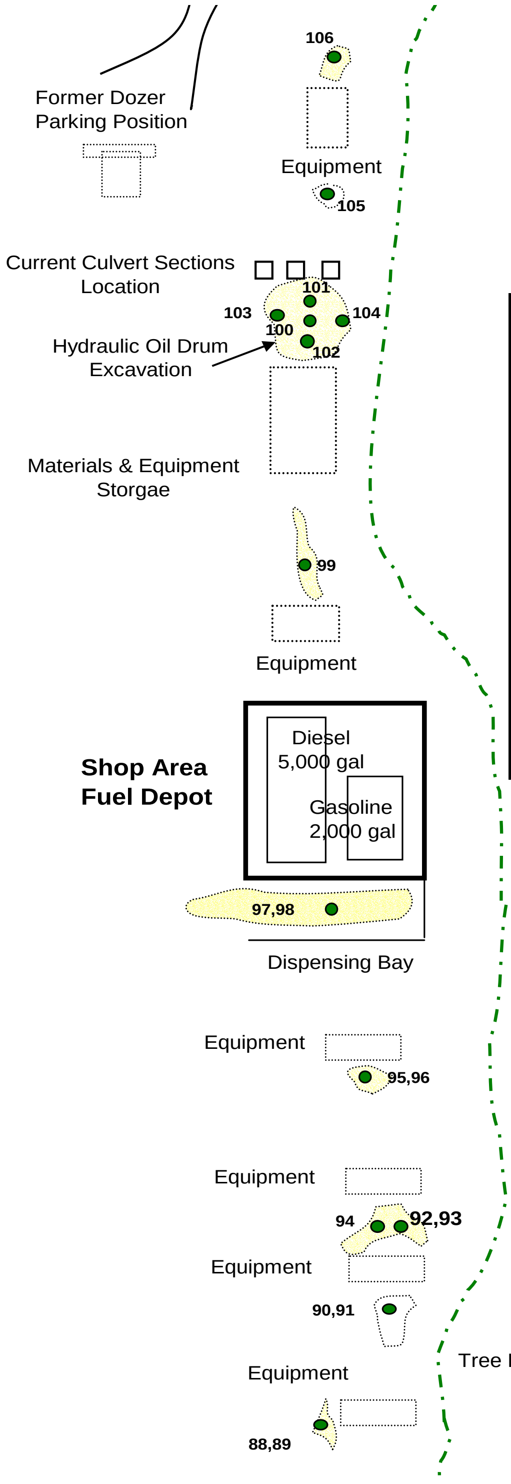




Contaminated Soil Stockpile Area

#	Depth	GRO	DRO	RRO	Type
73	14	nt	25	75	Confirm
74	8	nt	19	87	Confirm
75	6	nt	21	61	Confirm
76	6	nt	235	68	Confirm
77	4	nt	21	50	Confirm
78	6	nt	33	277	Confirm
79	8	nt	45	153	Confirm
80	8	nt	27	100	Confirm
81	16	nt	6	25	Confirm
82	18	nt	30	72	Confirm
83	6	nt	14	30	Confirm
84	8	nt	5	25	Confirm
85	8	nt	5	25	Confirm
86	8	nt	17	28	Confirm
87	16	nt	13	25	Confirm

Figure 19. West Equipment Parking Excavation and Sampling



(Area 12) So. Equipment Parking

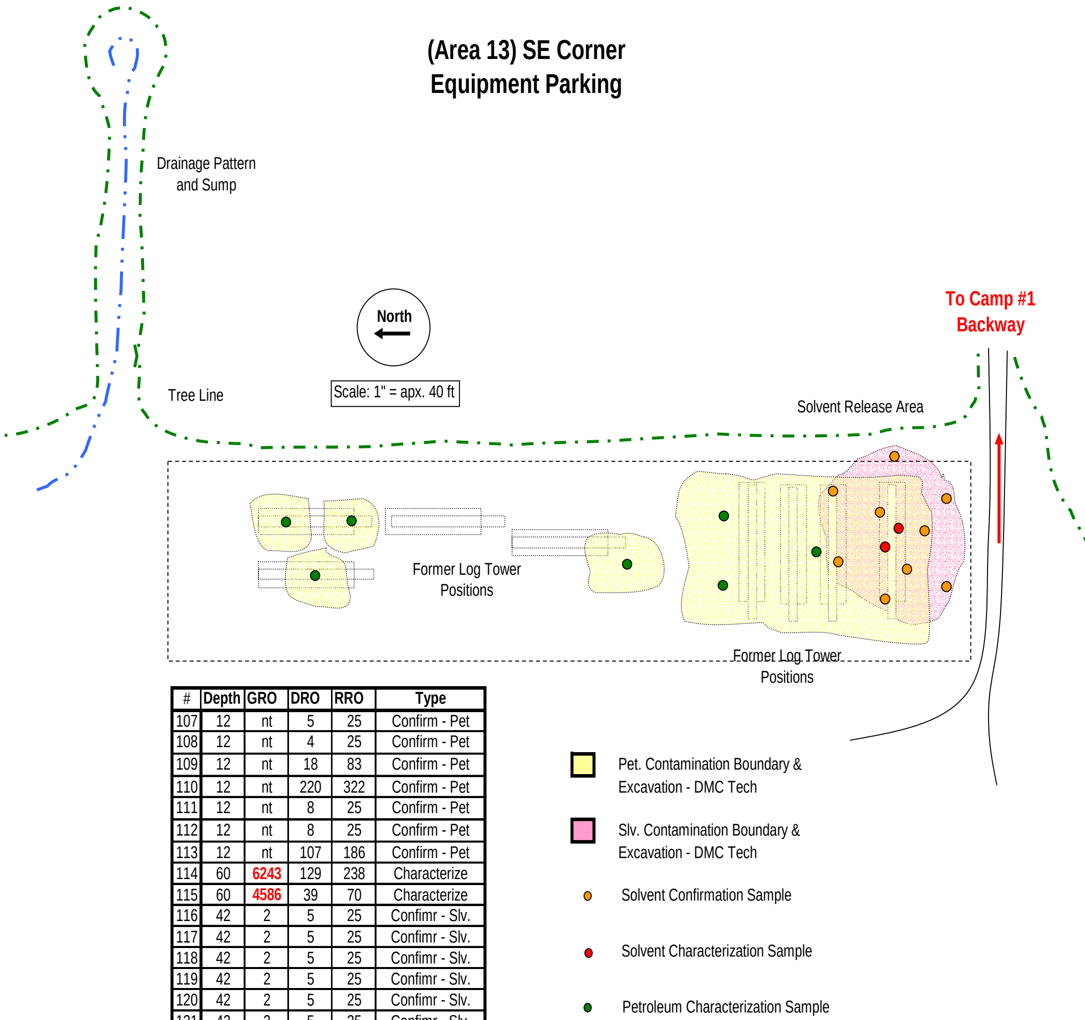
North

Scale: 1" = apx. 30 ft

#	Depth	GRO	DRO	RRO	Type
88	8	nt	117	235	Confirm
89	8	nt	5	64	Confirm
90	8	nt	29	118	Confirm
91	8	nt	47	210	Confirm
92	8	nt	5	25	Confirm
93	8	nt	34	104	Confirm
94	8	nt	36	137	Confirm
95	8	nt	36	96	Confirm
96	8	nt	84	129	Confirm
97	8	nt	58	362	Confirm
98	8	nt	5	25	Confirm
99	8	nt	169	583	Confirm
100	8	nt	10	32	Confirm
101	72	nt	42	199	Confirm
102	72	nt	28	128	Confirm
103	48	nt	6	25	Confirm
104	48	nt	18	81	Confirm
105	8	nt	16	58	Confirm
106	8	nt	65	208	Confirm

Pet. Contamination Boundary & Excavation - DMC Tech

Figure 20. South Equipment Parking Excavation and Sampling



#	Depth	GRO	DRO	RRO	Type
107	12	nt	5	25	Confirm - Pet
108	12	nt	4	25	Confirm - Pet
109	12	nt	18	83	Confirm - Pet
110	12	nt	220	322	Confirm - Pet
111	12	nt	8	25	Confirm - Pet
112	12	nt	8	25	Confirm - Pet
113	12	nt	107	186	Confirm - Pet
114	60	6243	129	238	Characterize
115	60	4586	39	70	Characterize
116	42	2	5	25	Confimr - Slv.
117	42	2	5	25	Confimr - Slv.
118	42	2	5	25	Confimr - Slv.
119	42	2	5	25	Confimr - Slv.
120	42	2	5	25	Confimr - Slv.
121	42	2	5	25	Confimr - Slv.
122	42	2	5	25	Confimr - Slv.
123	60	2	5	25	Confimr - Slv.
124	108	2	5	25	Confimr - Slv.
125	132	2	5	25	Confimr - Slv.

Figure 21. SE Corner Equipment Parking and Sampling

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:

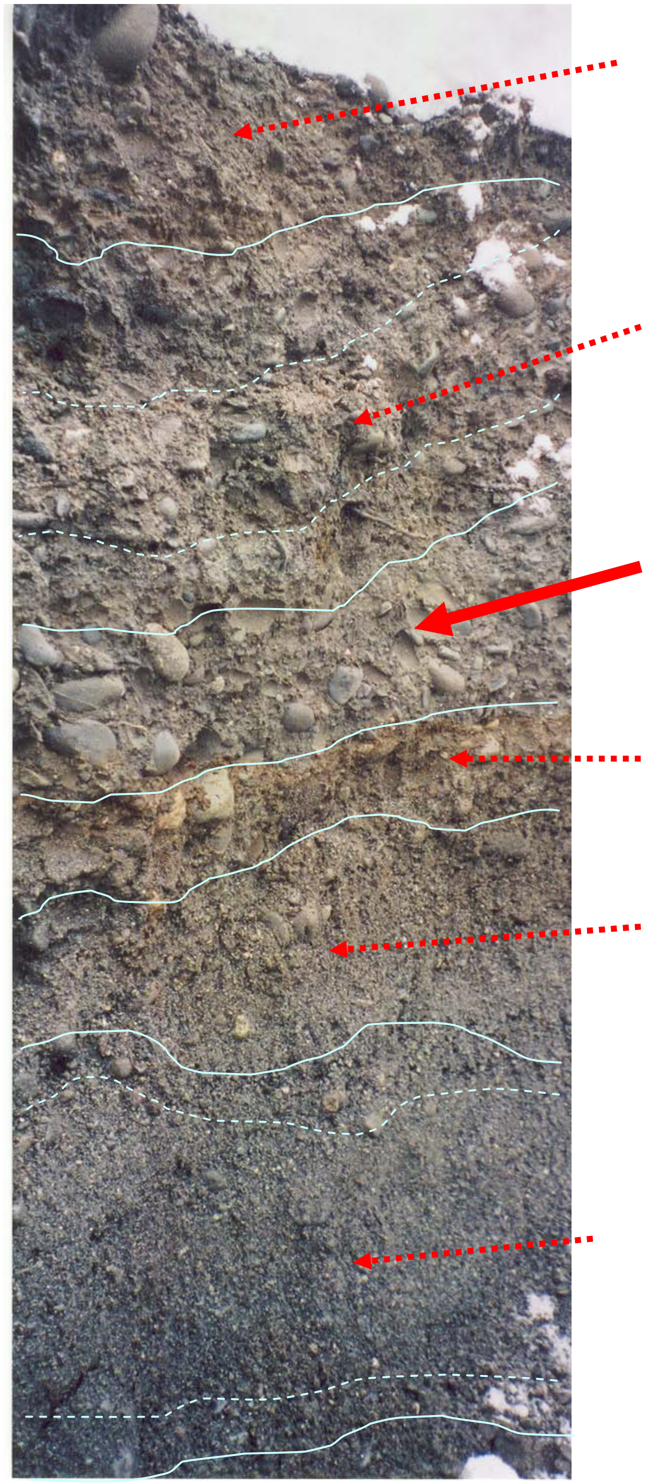


Figure 22. Typical Soil Profile Fuel Depot #2

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:

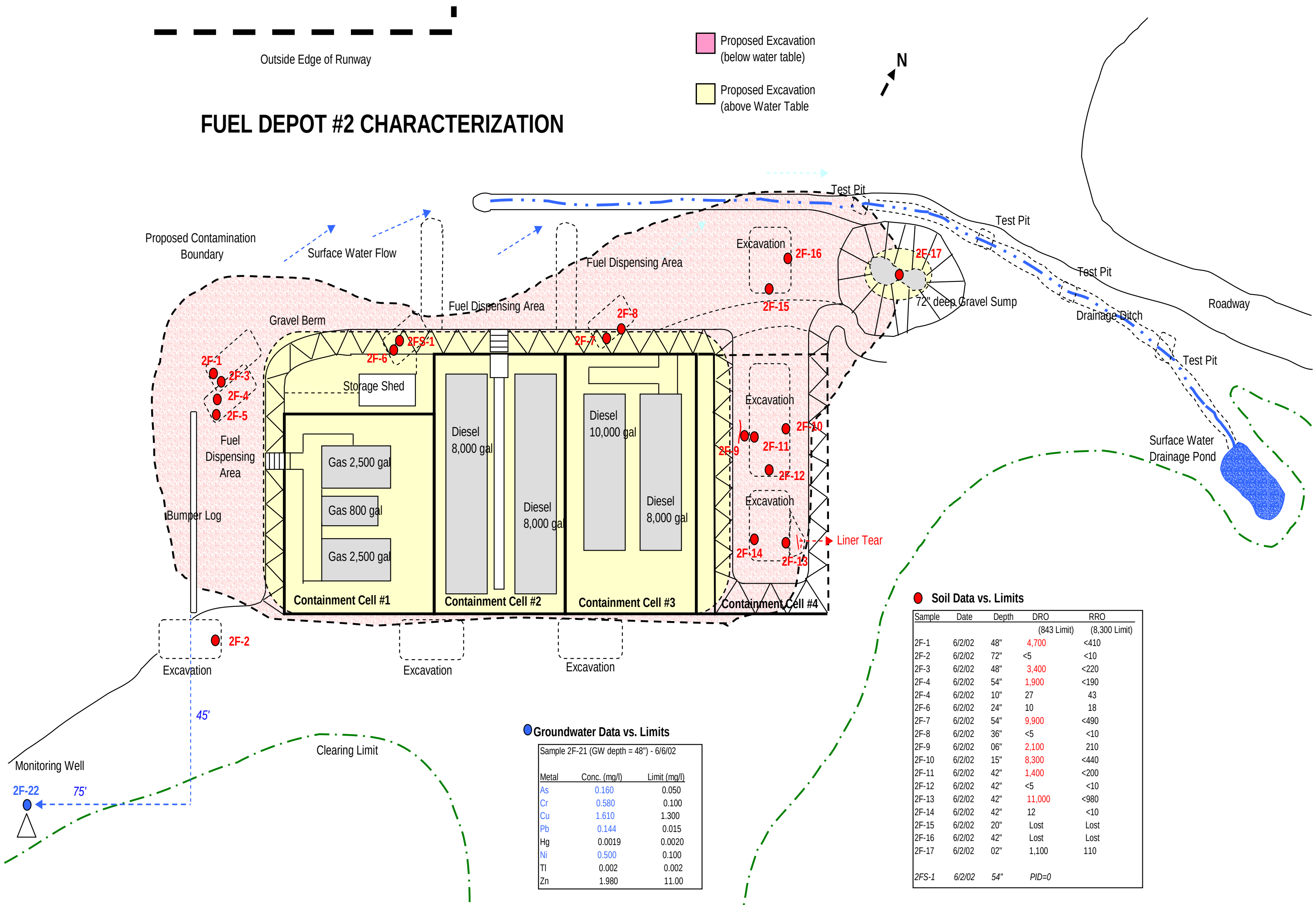
1. Light surface contamination is present only inside containment cell #4 and in refueling areas including the western bay and the area in front of the depot to the sump. Contamination is shallow (6” to 12”) and does not penetrate the cemented confining layer at 21” – 36”.

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.



Groundwater Data vs. Limits

Sample 2F-21 (GW depth = 48") - 6/6/02

Metal	Conc. (mg/l)	Limit (mg/l)
As	0.160	0.050
Cr	0.580	0.100
Cu	1.610	1.300
Pb	0.144	0.015
Hg	0.0019	0.0020
Ni	0.500	0.100
Tl	0.002	0.002
Zn	1.980	11.00

Soil Data vs. Limits

Sample	Date	Depth	DRO	RRO
			(843 Limit)	(8,300 Limit)
2F-1	6/2/02	48"	4,700	<410
2F-2	6/2/02	72"	<5	<10
2F-3	6/2/02	48"	3,400	<220
2F-4	6/2/02	54"	1,900	<190
2F-4	6/2/02	10"	27	43
2F-6	6/2/02	24"	10	18
2F-7	6/2/02	54"	9,900	<490
2F-8	6/2/02	36"	<5	<10
2F-9	6/2/02	06"	2,100	210
2F-10	6/2/02	15"	8,300	<440
2F-11	6/2/02	42"	1,400	<200
2F-12	6/2/02	42"	<5	<10
2F-13	6/2/02	42"	11,000	<980
2F-14	6/2/02	42"	12	<10
2F-15	6/2/02	20"	Lost	Lost
2F-16	6/2/02	42"	Lost	Lost
2F-17	6/2/02	02"	1,100	110
2FS-1	*6/2/02*	*54"*	*PID=0*	

Figure 23. 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:

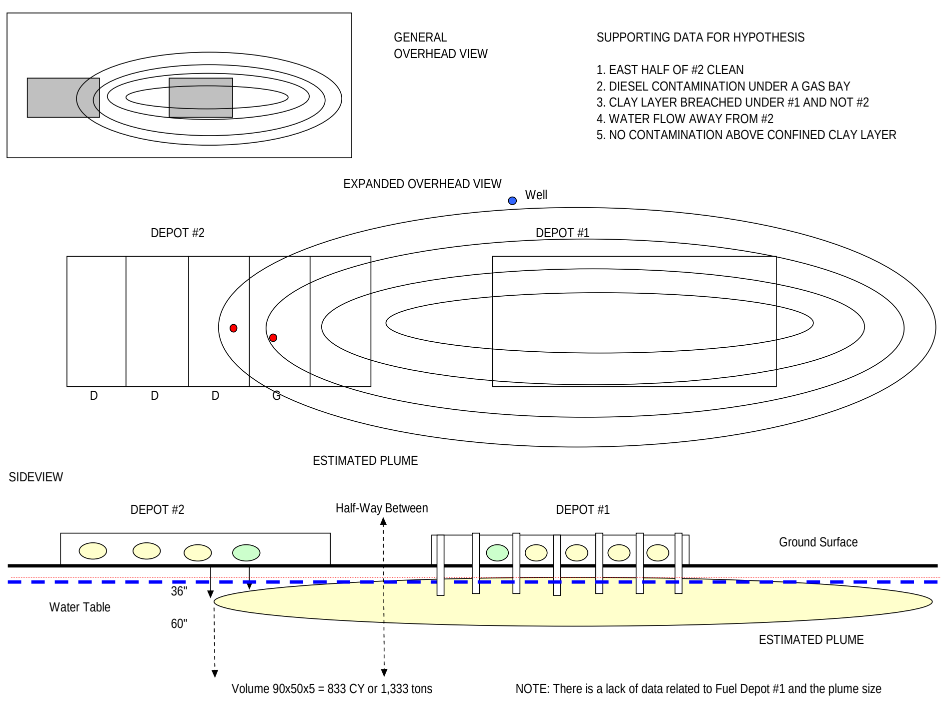


Figure 24. Revised Plume Hypothesis Depot #2

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

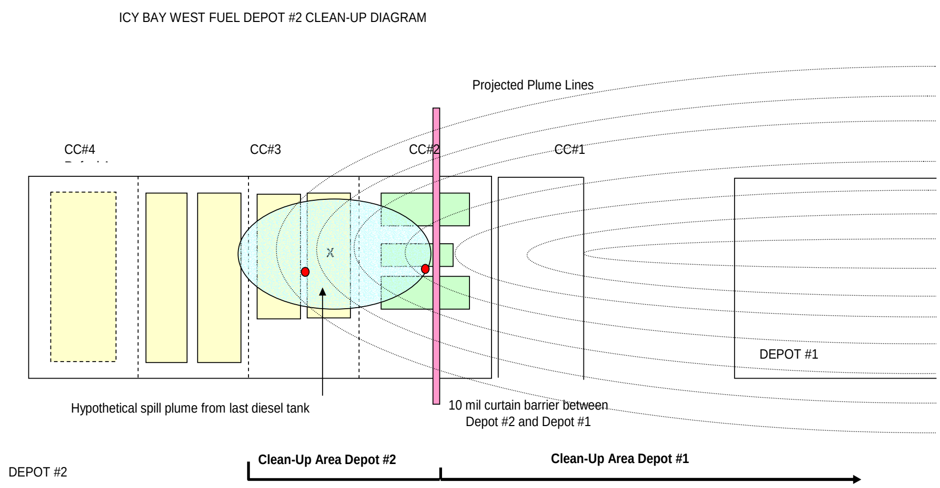
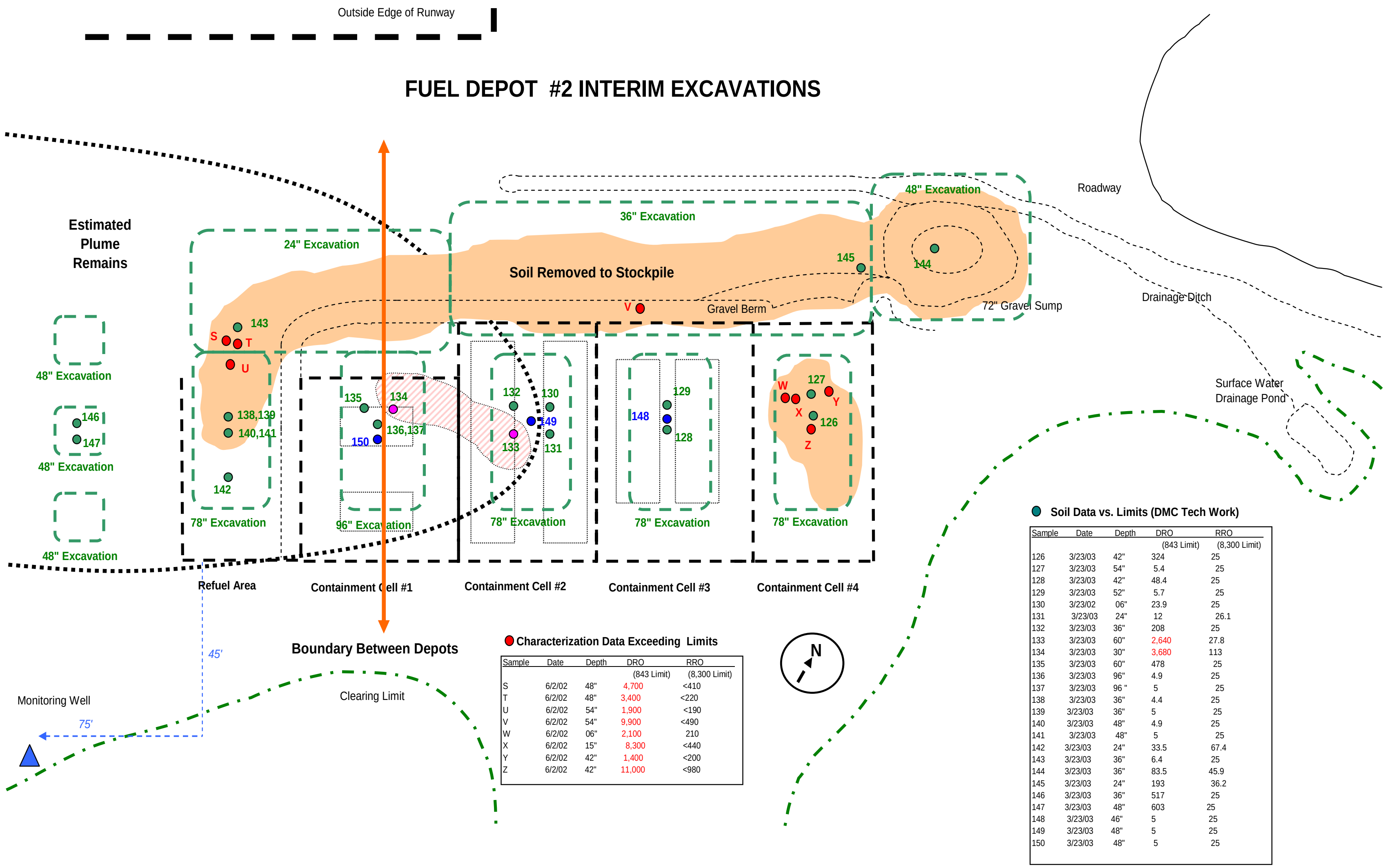


Figure 25. Estimated Boundary Line Between Depots

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



Characterization Data Exceeding Limits

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

Soil Data vs. Limits (DMC Tech Work)

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 26. Fuel Depot #2 Layout - Interim Excavations

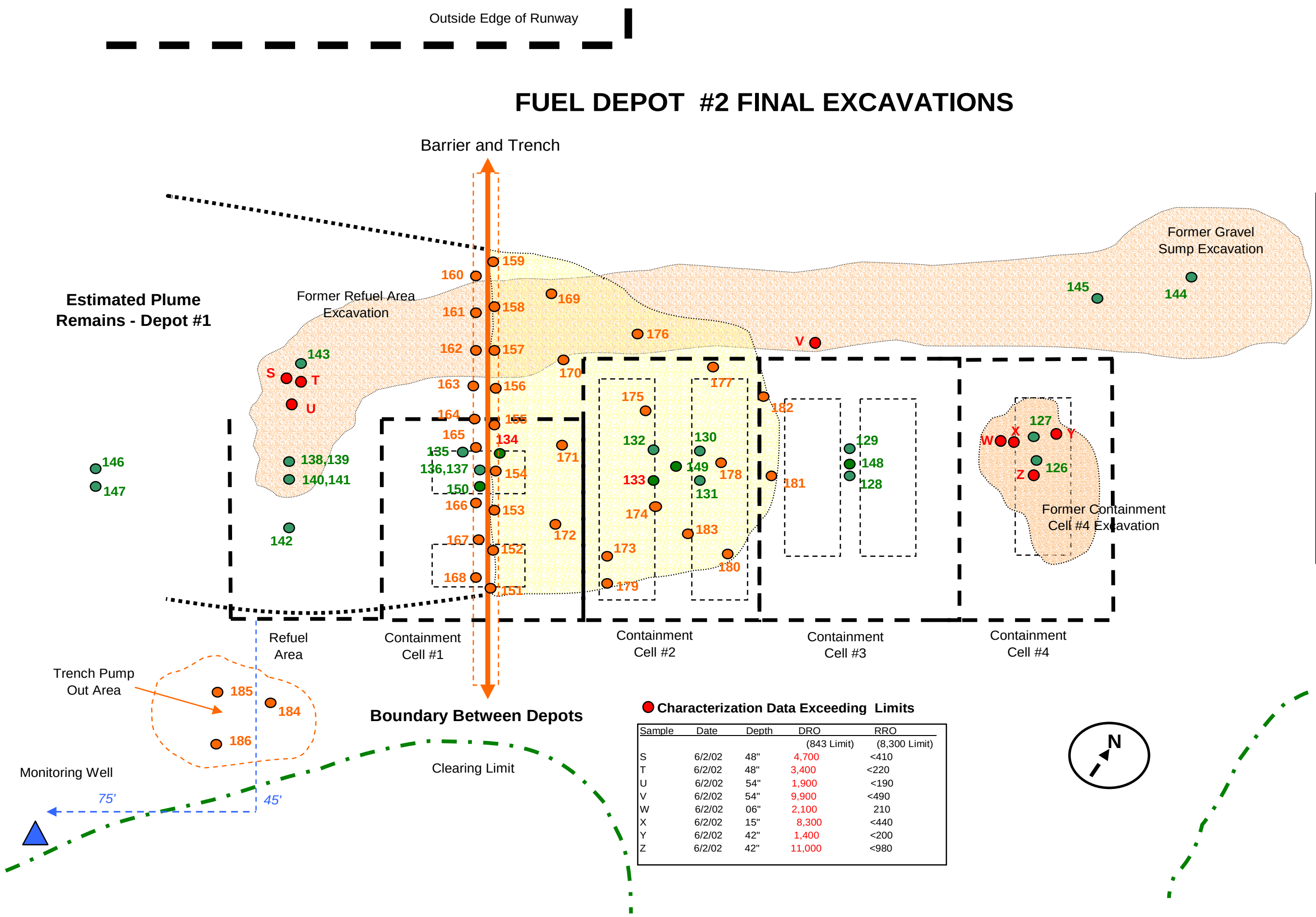
Final excavations at Fuel Depot #2 were performed June 17-19, 2003. A long trench was excavated along the previously defined boundary between the depots. The trench commenced in clean soil and progressed south to north at a depth of 84 inches, which was about 2 feet under the water table level. Samples 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 27.



Characterization Data Exceeding Limits

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

Interim Excavation Results

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

Final Excavation Results

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 27. Fuel Depot #2 Layout – Final Excavations

(Area 15) Sort Yard Sawyers Shack

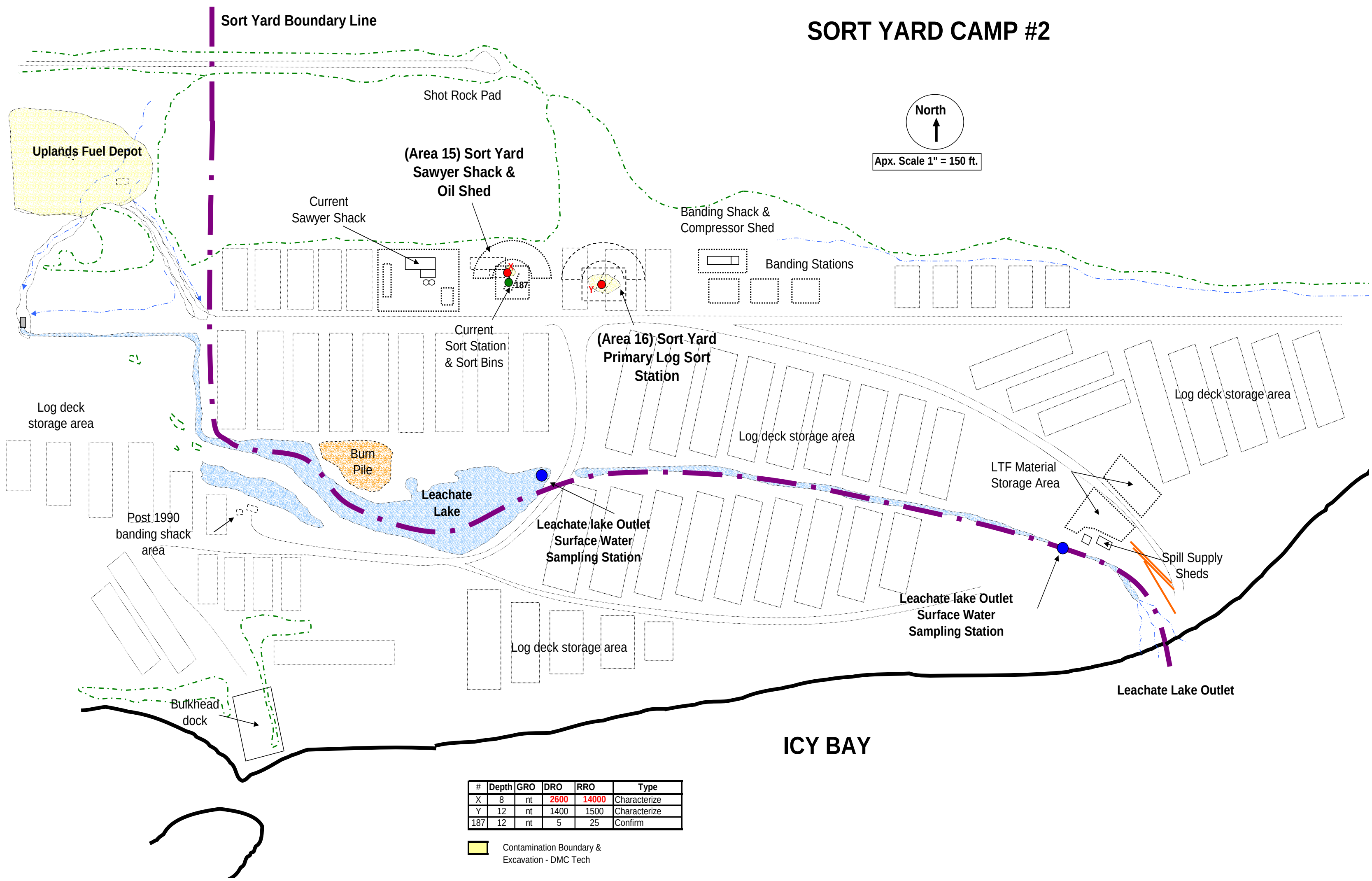
Characterization sampling in the sort yard pertaining to Camp #2 identified DRO and RRO contamination near the sawyers shack and immediately in front of the oil shed. A sample at 8" yielded a DRO concentration of 2,600 ppm and an RRO concentration of 14,000 ppm. No contamination was detected at 18" of depth. It is estimated that as much as 5 CY of material may need to be removed from the site to a depth of 2 feet.

In February, 2003; the sawyer shack and oil shed were relocated eastward to make room for renewed logging. The old log sort station was then also moved eastward and placed over the top of the former sawyer shack and oil shed location. Construction of the log sort station required the upright burial of several large logs to form abutments. Abutment logs are placed several feet in the ground and were placed through former areas suspect of contamination; however, no contamination was observed. In March, the location of former sawyer shack and oil shed was pinpointed and investigated. An excavation pit to 24" was opened and evaluated. No contamination was observed and therefore, no samples were collected. Extensive yard work and construction of the log sort station have dispersed any contamination that was formerly present.

(Area 16) Sort Yard Primary Log Sort Station

The former log sort station and 3 log bundle banding stations were inspected in June, 2002; oil was observed across the front of the stations south log sort bin where the load loader picks up logs. Similar contamination was observed in front of the east log sort bin. Removal of the stacker equipment from the bin allowed free access to inspection. Oil stained debris and soils were present throughout the tracked areas. In spite of these observations only one sample yielded sample results close to clean-up limits (DRO-1,400 ppm, RRO-2,600 ppm). Because of the proximity to the limits, clean-up was recommended. Contamination was estimated not to exceed 6" in depth and to include less than 4-10CY of material.

In February, 2003; the sawyer shack and oil shed were relocated eastward to make room for renewed logging. The log sort station was then also moved eastward and placed at the former sawyer shack and oil shed location. The abandoned log sort station area was graded and used for log bundle storage. In March, the location of former log sort station was identified and investigated. No contamination was observed and therefore, no samples were collected. Extensive yard work and yard maintenance have dispersed any contamination that was formerly present. Figure 28 identifies areas of interest related to the sort yard



#	Depth	GRO	DRO	RRO	Type
X	8	nt	2600	14000	Characterize
Y	12	nt	1400	1500	Characterize
187	12	nt	5	25	Confirm

Figure 28. Sort Yard Remediation

Residential Area

The parking area in front of the office, bunkhouse, and cookhouse complex was frequently used. A large rectangular area containing soil stains was excavated to a depth of 2 feet resulting in the placement of 27 CY into the contaminated soil stockpile. Filed measurements were used to determine effective removal since the site was not previously characterized and since the work was considered routine camp maintenance. A 10 mil reinforced liner was placed at the base of the excavation prior to backfilling. Figure 29 identifies work performed in the residential area.

Water - Area by Area Evaluation

Water Table Determination

The March, 2003 approval of the Remedial Work Plan suggested that groundwater level measurements should be collected. ADEC notes,

> *"Page 59 - Groundwater - Do not proceed with background metals sampling. The work plan states that prior to sampling five to ten exploratory pits will be excavated with a track hoe. Water level measurements will then be collected from the water table surface. If possible, a flow diagram will be prepared identifying the flow pathway of the shallow aquifer (expected to be towards the bay). Proceed with this component as planned."*

On June 12, 2003; 10 shallow excavations to the water table were created with a track hoe in various locations across the main camp area. Water was allowed to quiescence overnight. The next morning, a GPS unit was used to measure the surface of the water table in each excavation and from the water ponded in the gravel pit. Water levels were used to develop a flow net. Data indicates that groundwater under the camp flows from northeast to southwest towards surface water stream located between camp and the airport. Figure 30 illustrates the data collected.

(Area A) Shop Groundwater

Groundwater was collected from the shop well (see Figure 13) and subjected to analyses as noted in Table 6 previously presented. Concentrations of several metals including As, Be, Cr, Pb and Ni 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.

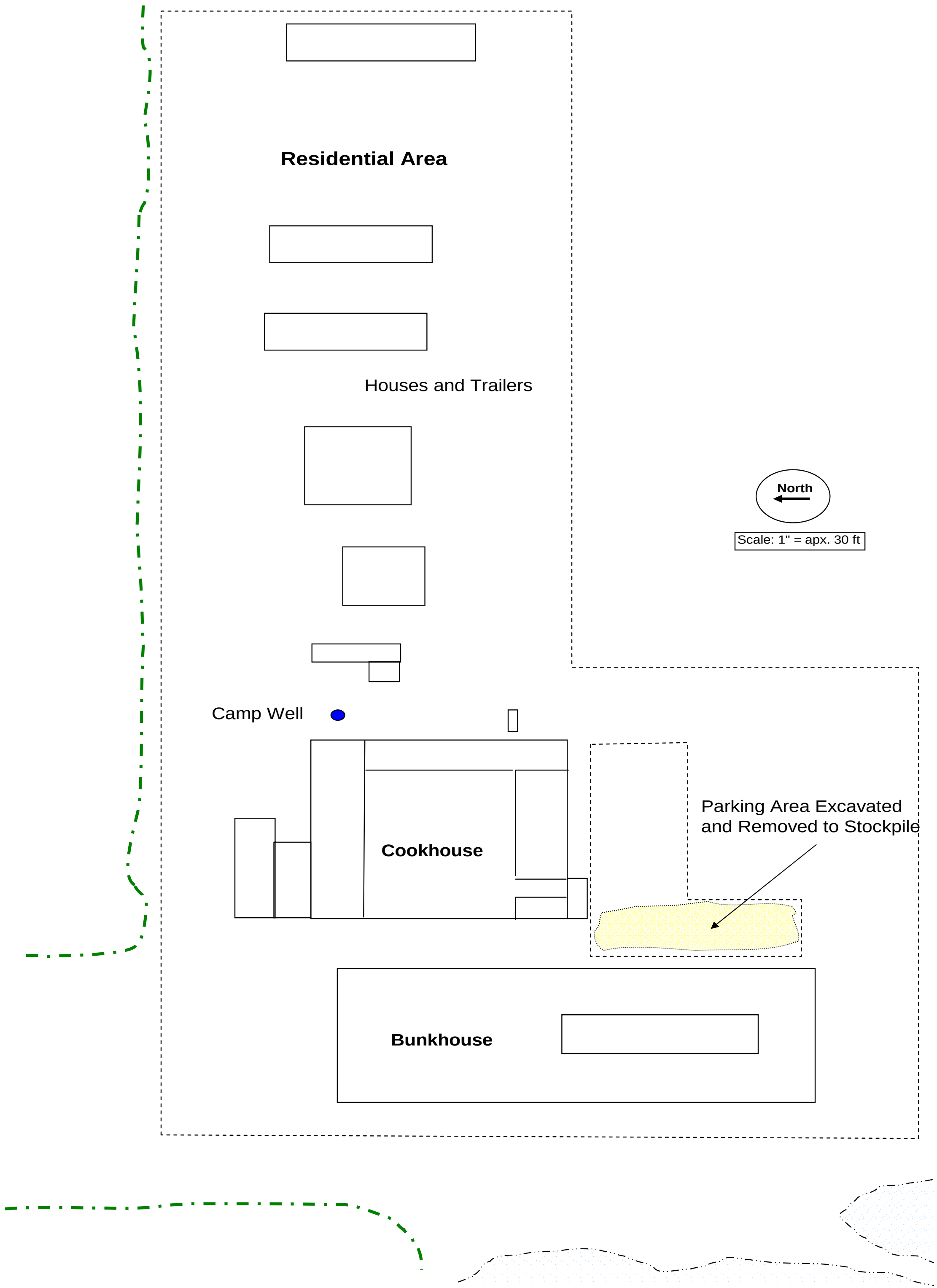


Figure 29. Residential Area Excavation

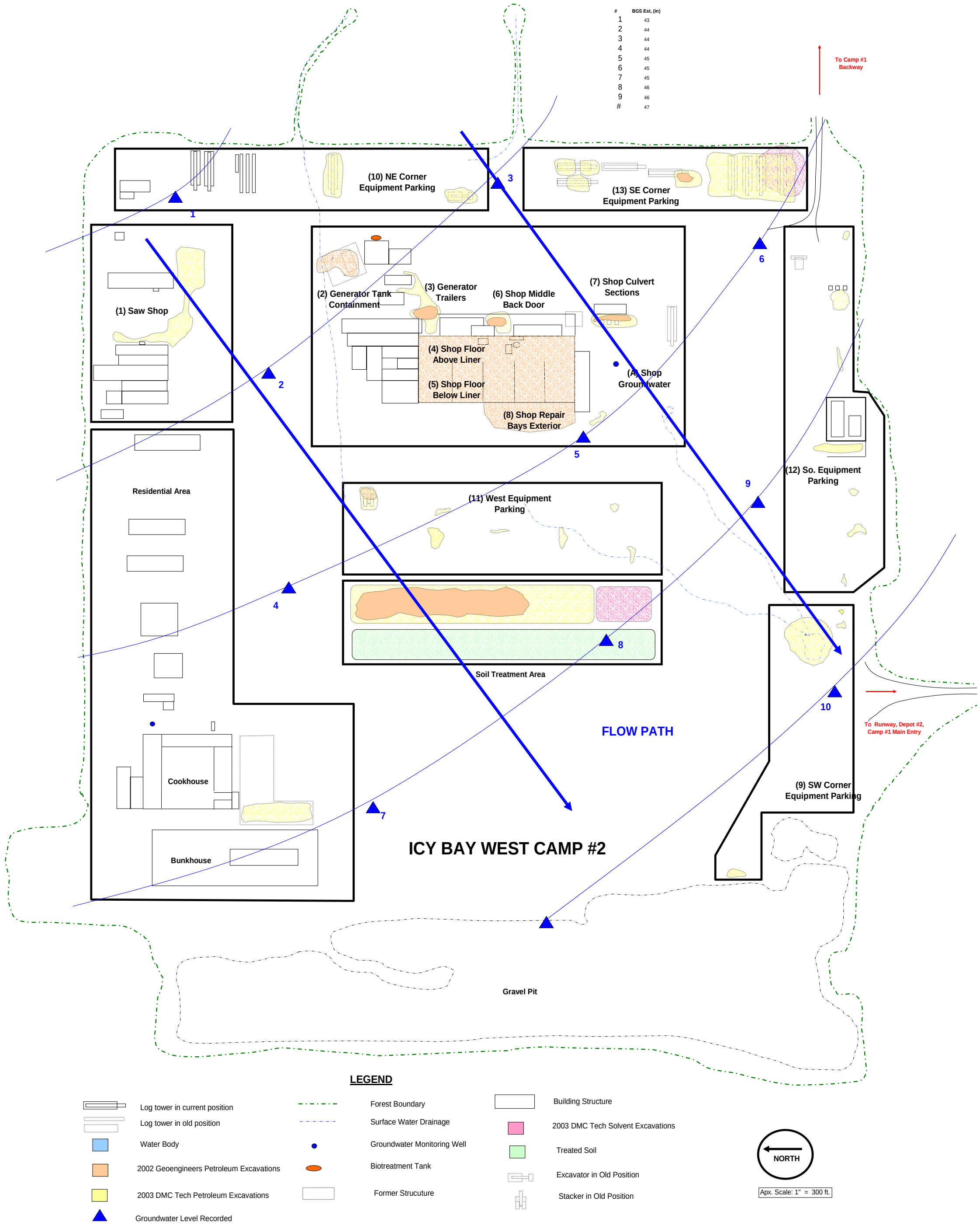


Figure 30. Camp Water Table Measurements

This fact was recognized by ADEC in the March, 2003 approval to the 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.*

(Area B) Depot Groundwater

Groundwater was collected from the fuel depot well and subjected to analyses as noted in Table 6 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. This fact was recognized by ADEC in the March, 2003 approval to the 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.*

During March excavations, three unfiltered groundwater samples were collected from groundwater at the water table level in containment cells #3, #2 and #1. Samples were analyzed for petroleum products and volatile organics. No contaminants were detected. Figure 27 identifies sample locations and data.

(Area C) Leachate Lake Surface Water

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 commented on leachate lake as follows:

> *"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 form 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.

<u>Contaminated Soil Stockpiles</u>

Petroleum Contaminated Soil Stockpile

A stockpile for contaminated soil was originally developed in March ,2002. The stockpile was located west of west equipment parking area and south of the camp cafeteria and office. 200 CY of soil from above the shop floor liner was placed on the stockpile liner and covered with 6 mil reinforced liner.

In December, 2002 a more permanent stockpile was created and the original stockpile expanded to accommodate interim action excavations performed by GeoEngineers. At this time more 10 mil reinforced liner was placed on the ground adjacent to the old stockpile. 290 CY of contaminated soil was placed on this liner from the soils above the shop liner for a second time – 135 CY, from soils under the shop liner – 145 CY, and from the generator containment area – 3 CY. 6CY of soil from inside the shop was segregated to one side of the pile and about 1 CY from the battery storage area inside the shop was placed in a supersack inside the shop. The pile was again covered with reinforced 6 mil liner.

In March 2003, the stockpile was again used to receive approximately 395 CY of material excavated from around camp (95 CY) but primarily from the fuel depot (300 CY). The original cover was pulled back as best as could be accomplished. Material excavated was added to the top of the already existing stockpile and the recovered again with reinforced 6 mil liner.

By June the stockpile was oddly shaped on haphazard liner and without an intact cover. A D-8 dozer was immediately used to groom the stockpile into a long rectangular shape with outside berms. The top of the stockpile was also flattened. During June, more material was added to the pile as remediation was completed including 416 CY excavated from areas around camp and 472 CY excavated from the fuel depot.

The total volume of petroleum contaminated soil in the stockpile waiting treatment was 1,773 CY or 2,837 tons at 1.6 tons per cubic yard.

Solvent Contaminated Soil Stockpile

An area south of the petroleum contaminated stockpile was established and used to store and treat 230 CY of solvent contaminated soil excavated from the SW corner equipment parking area. The stockpile was bermed, lined with 10 mil liner and covered with 6 mil liner.

Contaminated Stockpile Development and Maintenance

Contaminated stockpiles were covered during rain events and periodic maintenance was deployed to keep berms in-place and covers secured. During sunny weather, covers were removed to facilitate hydrocarbon removal by ultra-violet penetration.

Bioaugmentation Process

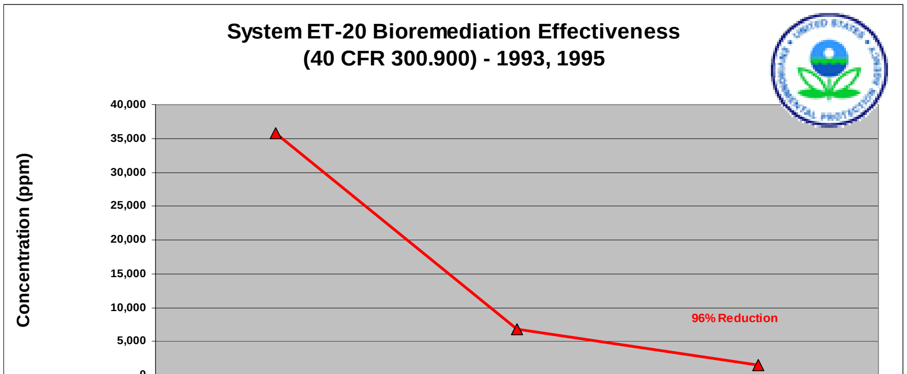
Treatment began on the surface of the contaminated stockpile in a “lift”. A lift represents a one-foot deep slice of the top of the stockpile. Bionutrient was spread by hand across the top of the pile in a concentration of one-pound per cubic yard. This concentration is apx. 3 times that needed to treat 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:



	0	7	28
Waste (ppm)	35787	6766	1450

Figure 31. EPA Bioremediation Effectiveness Testing Results

Based on estimated stockpile concentrations of 500 ppm GRO, 3,000 ppm DRO and 5,000 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. Treatment activities commenced 6/20 and ended 6/28. The first soils treated were expected to reach the clean-up limit by 7/04. The last soils were expected to be treated by 7/11. All soils should easily exhibit acceptable concentrations by 7/18 to 7/26.

Treated Soil Stockpiles

Petroleum Stockpile

A treatment cell adjacent to the contaminated stockpile was created by developing a gravel bermed rectangle and lining the inside of the rectangle with 10 mil thick liner. The adjacent location allowed for easy transfer of treated soil from the contaminated stockpile to the treatment cell.

The petroleum stockpile was treated from June 20, 2003 to July 21, 2003 for a total of 21 days before sampling occurred. 10 samples were collected along each side of the stockpile using a stainless steel coring device. The corer was inserted at an angle from the side of pile to a depth of 6 feet into the pile. This location in the pile is the mid-depth point, top to bottom, and represents the average treated material in the pile.

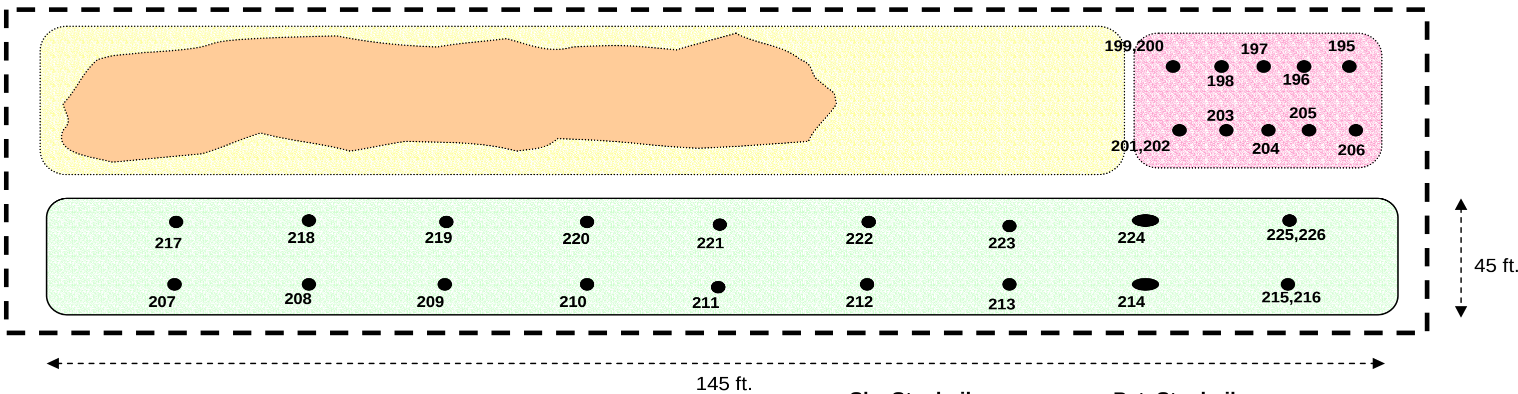
Following review of field and laboratory sampling data quality objectives, sample data was validated. Data was considered adequate. The higher of duplicate samples was removed from the data set. The data was checked for “best fit” and calculations made to determine normal or log normal distribution. The data was determined to be distributed log normally.

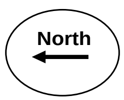
A student H-test was performed and an upper confidence limit calculated at 201 ppm DRO. This is less than the established limit of 718 ppm DRO for further treatment and below the free-release criteria of 230 ppm DRO. The pile was considered treated. Raw data was sent to ADEC for review. A student H-test was also performed and an upper confidence limit calculated at 430 ppm RRO. This is less than the established limit of 8,300 ppm DRO for further treatment or for free-release. The pile was considered treated. Raw data was sent to ADEC for review.

All of the individual samples for both DRO and RRO were less than the established treatment limit mandating no further soil treatment. Therefore no statisitical calculations were required. However, statistical data is included for review as information only.

Figure 32 illustrates sampling associated with the stockpiles.

Soil Treatment Area





Scale: 1" = apx. 30 ft

- Contaminated Stockpile - Petroleum (2003 placements)
- Contaminated Stockpile - Petroleum (2002 placements)
- Solvent contaminated and treated stockpile (2003)
- Treated Soil Stockpile

Slv. Stockpile

#	GRO	DRO	VOC
195	1	14	nd
196	1	18	nd
197	1	38	nd
198	1	36	nd
199	1	87	nd
200	1	86	nd
201	1	40	nd
202	1	39	nd
203	5.4	34	nd
204	8.2	41	nd
205	1	17	nd
206	8.9	22	nd

Composited through pile in 8" intervals

Pet. Stockpile

#	DRO	RRO
207	263	396
208	161	112
209	115	305
210	148	430
211	145	198
212	322	534
213	149	360
214	167	692
215	303	801
216	161	379
217	176	232
218	249	739
219	205	416
220	209	594
221	178	203
222	354	1090
223	184	345
224	268	266
225	157	354
226	208	561

All Mid-depth (4 ft @ C)

Figure 32. Stockpile Development and Sampling

The following table presents the information associated with the analyses of the treated soil.

CAMP #2 PETROLEUM STOCKPILE - DRO ANALYSES

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

Sample	Units	Result	Detection
DS-W-1	mg/kg	263	14.8
DS-W-2	mg/kg	161	2.95
DS-W-3	mg/kg	115	2.95
DS-W-4	mg/kg	148	2.95
DS-W-5	mg/kg	145	2.95
DS-W-6	mg/kg	322	14.8
DS-W-7	mg/kg	149	2.95
DS-W-8	mg/kg	167	14.8
DS-W-9	mg/kg	303	14.8
DS-W-9D	mg/kg	161	2.95
DS-E-1	mg/kg	176	2.95
DS-E-2	mg/kg	249	14.8
DS-E-3	mg/kg	205	14.8
DS-E-4	mg/kg	209	14.8
DS-E-5	mg/kg	178	2.95
DS-E-6	mg/kg	354	29.5
DS-E-7	mg/kg	184	2.95
DS-E-8	mg/kg	268	5.9
DS-E-9	mg/kg	157	2.95
DS-E-9D	mg/kg	206	14.8

(highlighted) Higher of duplicates eliminated

	Not Transformed		Transformed	
	x	x2	ln(x)	[ln(x)]2
1	263	69169	5.57	31.05
1	161	25921	5.08	25.82
1	115	13225	4.74	22.51
1	148	21904	5.00	24.97
1	145	21025	4.98	24.77
1	322	103684	5.77	33.35
1	149	22201	5.00	25.04
1	167	27889	5.12	26.19
1	161	25921	5.08	25.82
1	176	30976	5.17	26.73
1	249	62001	5.52	30.44
1	205	42025	5.32	28.33
1	209	43681	5.34	28.54
1	178	31684	5.18	26.85
1	354	125316	5.87	34.45
1	184	33856	5.21	27.20
1	268	71824	5.59	31.26
1	157	24649	5.06	25.57
18		796951		498.89

99.88%	**Log Normal Distribution Probability**
99.74%	Normal Distribution Probability

18	Samples	18	Samples
17	Deg. Frdm.	17	Deg. Frdm.
200.61	Mean	5.26	Mean
9.17	Detect Limit	2.22	Detect Limit
177	Median	5.18	Median
4267.31	Variance	0.09	Variance
65.32	Std. Dev.	0.30	Std. Dev.
15.40	Std. Error	0.07	Std. Error
1.74	T-test Value	1.86	H-test Value
227.40	UCL	**200.84**	**UCL**
173.82	LCL	**183.17**	**LCL**

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

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

Treatment Data

High DRO Treated	9,500
Avg. DRO Treated	4,100

95.10% **reduction in** **21 days**

Start Treatment	6/20/2003
Test Treatment	7/21/2003
Days Treated	21 days

Table 14. Petroleum Stockpile DRO Confirmation Data

The results of RRO analyses follow.

CAMP #2 PETROLEUM STOCKPILE - RRO ANALYSES

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

Sample	Units	Result	Detection
DS-W-1	mg/kg	396	18.7
DS-W-2	mg/kg	112	3.74
DS-W-3	mg/kg	305	7.48
DS-W-4	mg/kg	430	18.7
DS-W-5	mg/kg	198	3.74
DS-W-6	mg/kg	534	18.7
DS-W-7	mg/kg	360	18.7
DS-W-8	mg/kg	692	18.7
DS-W-9	mg/kg	801	18.7
DS-W-9D	mg/kg	379	18.7
DS-E-1	mg/kg	232	7.48
DS-E-2	mg/kg	739	18.7
DS-E-3	mg/kg	416	18.7
DS-E-4	mg/kg	594	18.7
DS-E-5	mg/kg	203	3.74
DS-E-6	mg/kg	1090	37.4
DS-E-7	mg/kg	345	7.48
DS-E-8	mg/kg	266	7.48
DS-E-9	mg/kg	354	7.48
DS-E-9D	mg/kg	561	18.7

(highlighted) Higher of duplicates eliminated

	Not Transformed		Transformed	
	x	x2	ln(x)	[ln(x)]2
1	396	156816	5.98	35.78
1	112	12544	4.72	22.26
1	305	93025	5.72	32.72
1	430	184900	6.06	36.77
1	198	39204	5.29	27.97
1	534	285156	6.28	39.44
1	360	129600	5.89	34.65
1	692	478864	6.54	42.77
1	379	143641	5.94	35.25
1	232	53824	5.45	29.67
1	739	546121	6.61	43.63
1	416	173056	6.03	36.37
1	594	352836	6.39	40.79
1	203	41209	5.31	28.23
1	1090	1188100	6.99	48.92
1	345	119025	5.84	34.15
1	266	70756	5.58	31.18
1	354	125316	5.87	34.45
18		4193993		634.98

96.31%	**Log Normal Distribution Probability**
95.76%	Normal Distribution Probability

18	Samples	18	Samples
17	Deg. Frdm.	17	Deg. Frdm.
424.72	Mean	5.92	Mean
14.59	Detect Limit	2.68	Detect Limit
369.5	Median	5.91	Median
55705.39	Variance	0.29	Variance
236.02	Std. Dev.	0.54	Std. Dev.
55.63	Std. Error	0.13	Std. Error
1.74	T-test Value	1.86	H-test Value
521.52	UCL	**429.82**	**UCL**
327.93	LCL	**320.08**	**LCL**

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

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

Treatment Data

High DRO Treated	12,000
Avg. DRO Treated	8,450

Start Treatment	6/20/2003
Test Treatment	7/21/2003
Days Treated	21 days

94.91% **reduction in** **21 days**

Table 15. Petroleum Stockpile DRO Confirmation Data

Solvent Stockpile

On June 27th following positive identification of Stoddard solvent from the site and ADEC change approval to manage solvents, contaminated soils were excavated and placed in a stockpile. The stockpile was located at the end of the petroleum stockpile, most of it having been previously treated and removed to the treatment cell. The stockpile was designed to be filled to depth of 3-4 feet and to also serve as the treatment cell.

The stockpile/treatment cell was created by developing a gravel bermed rectangle and lining the inside of the rectangle with 10 mil thick liner. A spare cell was also developed north of the stockpile in case additional treatment and removal was required. As with the petroleum stockpile, this location allowed for easy transfer of treated soil from the contaminated stockpile to the treatment cell.

The solvent stockpile was treated from June 27, 2003 to July 21, 2003 for a total of 24 days before sampling occurred. 5 samples were collected along each side of the stockpile using a stainless steel coring device. Composite samples were formed at each discrete location at 8 inch intervals from the top of the pile to the liner. This methodology secures representative samples of treated material in the pile.

Following 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. The data was determined to be distributed log normally.

A student H-test was performed and an upper confidence limit calculated at 3.4 ppm GRO. This is less than the established limit of 260 ppm GRO for further treatment and below the free-release criteria of 260 ppm GRO. A student H-test was also performed and an upper confidence limit calculated at 35.4 ppm DRO. This is less than the established limit of 718 ppm DRO for further treatment and below the free-release criteria of 230 ppm DRO. Volatile organic constituents were also analyzed. No detected constituent had concentrations higher than ADEC limits. The pile was considered treated. Raw data was sent to ADEC for review. Raw data was sent to ADEC for review.

All of the individual samples for both GRO and DRO were less than the established treatment limit mandating no further soil treatment. Therefore no statistical calculations were required. However, statistical data is included for review as information only.

Figure 32, presented earlier, illustrates sampling associated with the stockpiles. Tables 16 and 17 summarize statistical data from treated soils formerly containing solvent.

CAMP #2 SOLVENT STOCKPILE - GRO ANALYSES

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

Sample	Units	Result	Detection
SS-1-1	mg/kg	0	1
SS-1-2	mg/kg	0	1
SS-1-3	mg/kg	0	1
SS-1-4	mg/kg	0	1
SS-1-5	mg/kg	0	1
SS-1-5D	mg/kg	0	1
SS-1-6	mg/kg	0	1
SS-1-7	mg/kg	5	1
SS-1-8	mg/kg	8	1
SS-1-9	mg/kg	0	1
SS-1-10	mg/kg	9	1
SS-1-10D	mg/kg	9	1

(yellow)	Higher of duplicates eliminated
(grey)	NDs replaced with 1/2 LOD value

Field DQOs	Met
Lab DQOs	Met
NDs Changed	Yes (8)
High Dupes Out	Yes (2)

	Not Transformed		Transformed	
	x	x2	ln(x)	[ln(x)]2
1	0.5	0.25	-0.69	0.48
1	0.5	0.25	-0.69	0.48
1	0.5	0.25	-0.69	0.48
1	0.5	0.25	-0.69	0.48
1	0.5	0.25	-0.69	0.48
1	0.5	0.25	-0.69	0.48
1	5	25	1.61	2.59
1	8	64	2.08	4.32
1	0.5	0.25	-0.69	0.48
1	9	81	2.20	4.83
10		171.75		15.11

46.06%	Log Normal Distribution Probability
0.00%	Normal Distribution Probability

10	Samples	10	Samples
9	Deg. Frdm.	9	Deg. Frdm.
2.55	Mean	0.10	Mean
1.00	Detect Limit	0.00	Detect Limit
0.5	Median	-0.69	Median
11.86	Variance	1.67	Variance
3.44	Std. Dev.	1.29	Std. Dev.
1.09	Std. Error	0.41	Std. Error
1.74	T-test Value	1.86	H-test Value
4.44	UCL	3.35	UCL
0.66	LCL	-0.32	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	< 250 ppm
Free release as clean soil	< 250 ppm
All VOCs Detected Under Published Limits	Yes

Treatment Data

High GRO Treated	6,000
Avg. GRO Treated	3,000

Start Treatment	6/27/2003
Test Treatment	7/21/2003
Days Treated	24 days

99.89% **reduction in** **24 days**

Table 16. Solvent Stockpile GRO Confirmation Data

CAMP #2 SOLVENT STOCKPILE - DRO ANALYSES

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

Sample	Units	Result	Detection
SS-1-1	mg/kg	14	5
SS-1-2	mg/kg	18	5
SS-1-3	mg/kg	38	5
SS-1-4	mg/kg	36	5
SS-1-5	mg/kg	87	5
SS-1-5D	mg/kg	86	5
SS-1-6	mg/kg	40	5
SS-1-7	mg/kg	34	5
SS-1-8	mg/kg	41	5
SS-1-9	mg/kg	17	5
SS-1-10	mg/kg	22	5
SS-1-10D	mg/kg	21	5

	Not Transformed		Transformed	
	x	x2	ln(x)	[ln(x)]2
1	14	196	2.64	6.96
1	18	324	2.89	8.35
1	38	1444	3.64	13.23
1	36	1296	3.58	12.84
1	87	7569	4.47	19.94
1	40	1600	3.69	13.61
1	34	1156	3.53	12.44
1	41	1681	3.71	13.79
1	17	289	2.83	8.03
1	22	484	3.09	9.55
10		16039		118.75

93.44%	Log Normal Distribution Probability
78.59%	Normal Distribution Probability

Legend	
(yellow)	Higher of duplicates eliminated
(grey)	NDs replaced with 1/2 LOD value

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

10	Samples	10	Samples
9	Deg. Frdm.	9	Deg. Frdm.
34.70	Mean	3.41	Mean
5.00	Detect Limit	1.61	Detect Limit
35	Median	3.55	Median
444.23	Variance	0.30	Variance
21.08	Std. Dev.	0.55	Std. Dev.
6.67	Std. Error	0.17	Std. Error
1.74	T-test Value	1.86	H-test Value
46.30	UCL	35.35	UCL
23.10	LCL	25.66	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 GRO Treated	6,000
Avg. GRO Treated	3,000

Start Treatment	6/27/2003
Test Treatment	7/21/2003
Days Treated	24 days

98.82% reduction in 24 days

Table 17. Solvent Stockpile DRO Confirmation Data

Final Camp Closure Actions

In September Browning Timber initiated efforts to close-out Camp #2 by remediating any and all remaining contamination. The following actions were observed:

1) The camp oil burner was placed outside in a truck bed. Large quantities of waste oil and fuel were burned.

2) Three Log towers historically contributing contamination through leaking were drained of fluids (the fluids were burned), cut into pieces and disposed. The two remaining towers were placed at the northeast corner of the camp. Towers sections from scrapped equipment were also saved and stacked near the remaining two log towers. All scrap was disposed in the metal waste dump west of camp.

3) Scrap equipment in the south and west laydown areas not needed for future use was discarded. The Komatsu stacker in the southwest parking area was dismantled and discarded. The loader east of the shop was also scrapped and disposed. All scrap was disposed in the metal waste dump west of camp.

4) The entire area around the shop was graded after removing one supersack of petroleum contaminated soils. The sack was dumped onto the runway stockpile in Camp #1 and treated.

5) Spare equipment was reparked west of the shop pending off-site barging.

6) The yarder parked in the northeast corner of the west parking area was recovered and secured. To avoid damaging the yarder, the equipment was not moved.

7) The metal covering the shop floor was removed and an inspection made to ensure that no staining was present. The shop was cleaned of unwanted materials, which were disposed in the camp incinerator or metal waste dump.

Final Inspection

On September 21, 2003; DMC Tech performed a final camp inspection. The entire camp area was walked to identify any oil staining. The following minor stains were noted:

A. Small stains around generator trailers
B. Small stains on the east side of the generator containment area.
C. Small stains immediately southwest of the shop
D. Staining under the parked yarder in the northeast corner of the west parking area
E. Minor staining on the exposed shop floor under the area where the used oil furnace was operated.
F. Minor staining in front of several residences.

All of the stains were noted to be on the surface. A decision was made to rake the stains and treat them in-place. Stains were raked to 6 inches in depth. . Bionutrient was added and tilled. Finally, organisms were sprayed onto each stain. Extra effort was made to ensure that the shop floor was over-treated. Staining under the parked yarder was also treated even though access was limited. Following treating of the stains on September 21, the camp was declared clean.

No accounting of camp conditions has been made since September 21, 2003. It is recommended that the camp be regarded again after all equipment and buildings are removed as a final action. Any small stains remaining at that time will be graded, aerated and will naturally decompose. None are expected to be of sufficient depth to warrant concern.

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<u>Institutional Controls</u>

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. ASDEC notification will be required to remove and reuse the material in the piles. However, sample data suggests that removal can proceed based on calculated UCLs less than approved limits.

Remaining Residual Estimate

No residual contamination remains at the camp. All contaminated soils were removed to clean-up limits. All stockpiles were treated to approved limits.

APPENDIX A
SPILL NOTIFICATION

NOTIFICATION

To: ADEC – Bill Janes
From: Dan McNair – DMC Technologies
Date: June 16, 2003

Occurrence

Icy Bay West Camp #2 is undergoing remediation to excavate and treat soil contaminated with petroleum products such as diesel and motor oil. Remediation is being performed in accordance with an ADEC approved Remedial Work Plan.

On June 12th, 2003 at 1430 hours, during routine excavation of oil-stained soils, a buried drum of hydraulic oil was uncovered approximately 24" below the ground surface in upright position. The bucket on the track hoe snagged and folded the drum as soil was being removed. Approximately 8-10 gallons of hydraulic oil spilled through the open bunghole in the drum into the excavation area below. The spilled oil was excavated and removed as part of the routine clean-up.

Activities regarding the discovery and clean-up of the drum are noted in DMC Tech's field log book tracking remedial action work for Camp #2. Digital photographs were collected to support documentation.

Notification

This notification meets the requirements of AS 46.03.755 and AAC 75.300-307. A courtesy reporting call was made to Mike Jaines (ADEC-Juneau) at 1535 hours June 16th. Mike noted that the spill could be considered "reported" as required by regulation. Mike also asked that this letter be sent to him for review and documentation. The letter will be telefaxed by COB.

Notification was also made to Citifor, Inc. (Keith Burke and Chuck Dobson) as well as Browning Timber (Wayne Browning). The Mental Health Trust Land on-site representative (Mike Cooney) was present during the discovery and remedial processing of the buried drum. The Camp Manager recorded the occurrence in a log book.

Recommendation

No further action regarding this notification is recommended.

Response

Mike Jaynes responded to the notice on June 18, 2003 and indicated that the release was duly report and that no further action would be required.

APPENDIX B
REMEDAIL WORK PLAN CHANGES

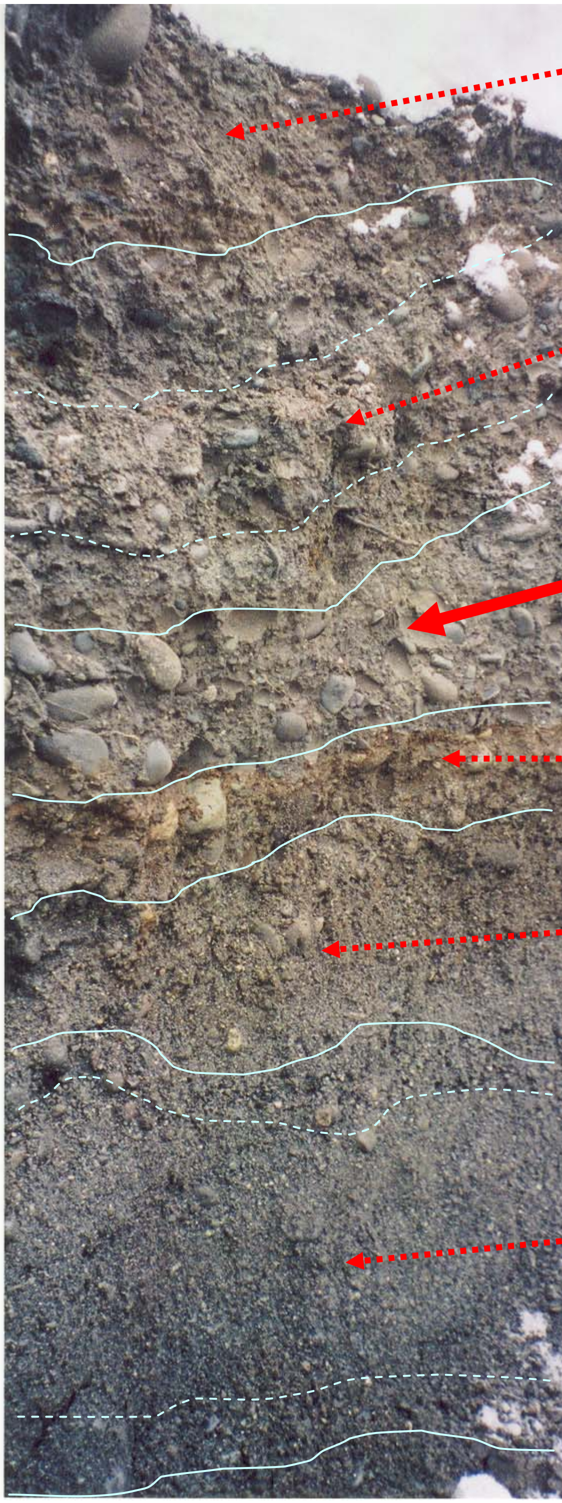
Change: IBW-001: Camp 2 - Fuel Depot Boundary Determination

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.

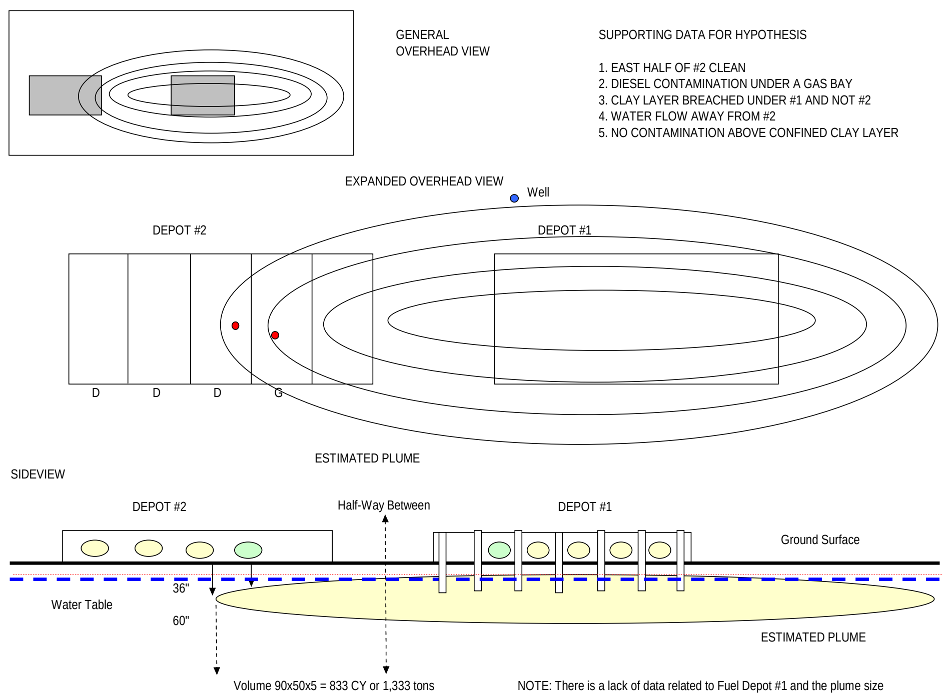
13. The confining soil layer observed under depot #2 has been breached at depot #1 both by construction of the depot through installation of the roof and by the presence of buried wastes under and around the depot.

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.

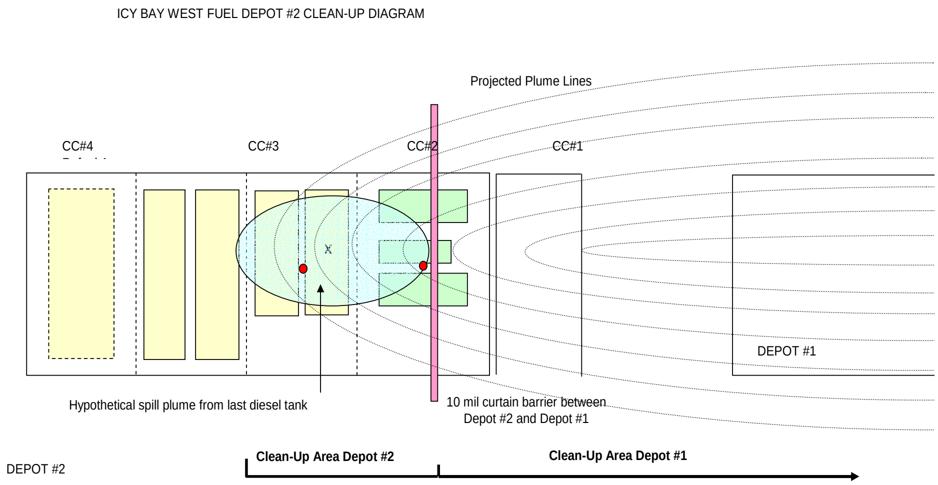
CONCLUSION

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.

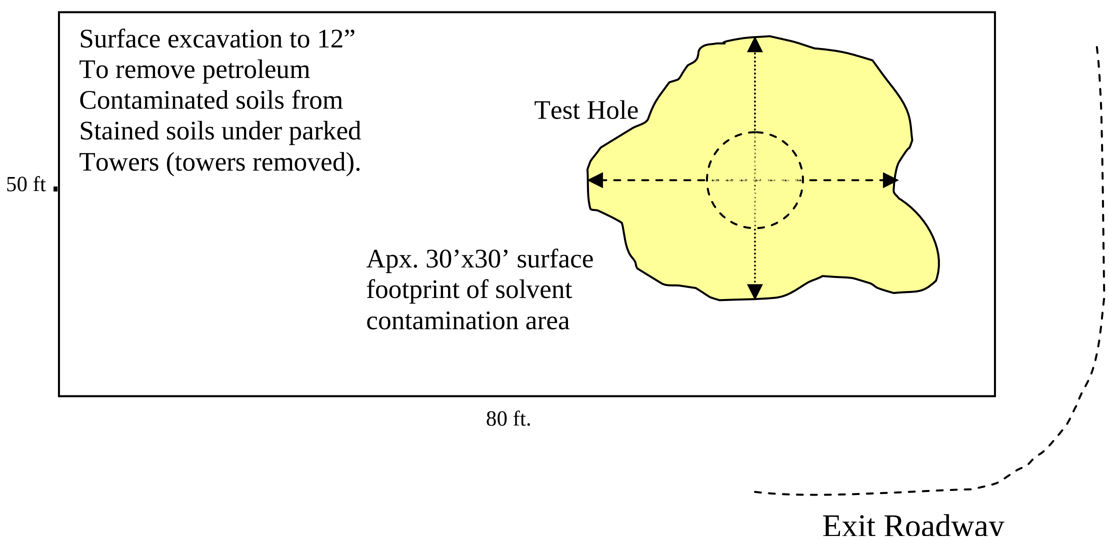
2. Complete excavation of contaminated soils under containment cells #1 and #2 of depot #2 in the spring.

Change: IBW-002: Camp 2 – Solvent Contamination

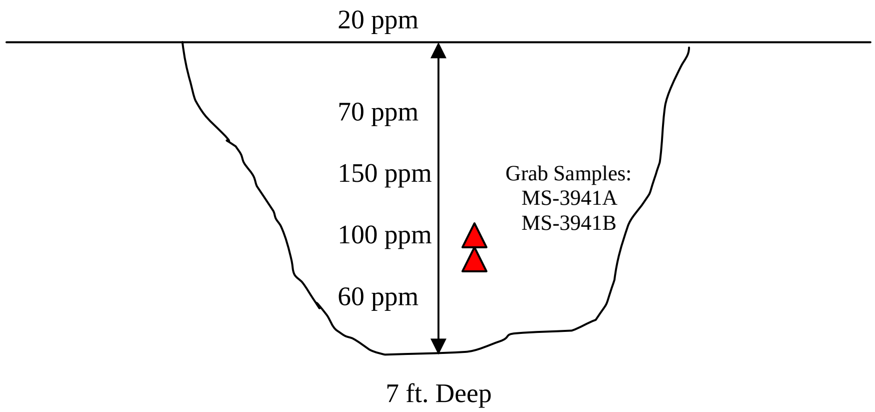
BACKGROUND INFORMATION

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

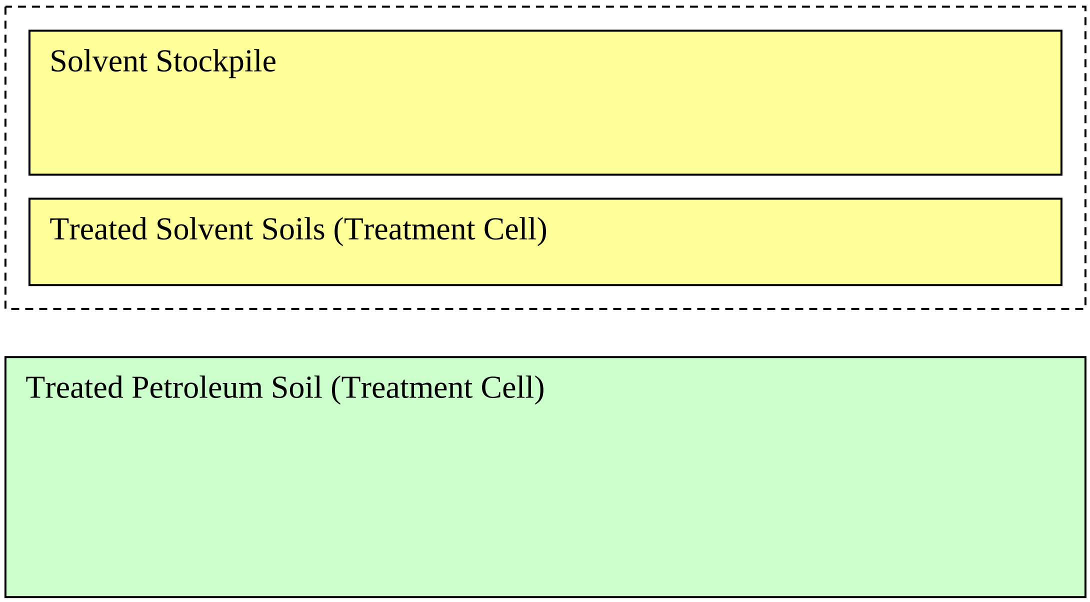
The landowners and ADEC are requested to allow treatment of the solvent contaminated soils on-site as per the following process:

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

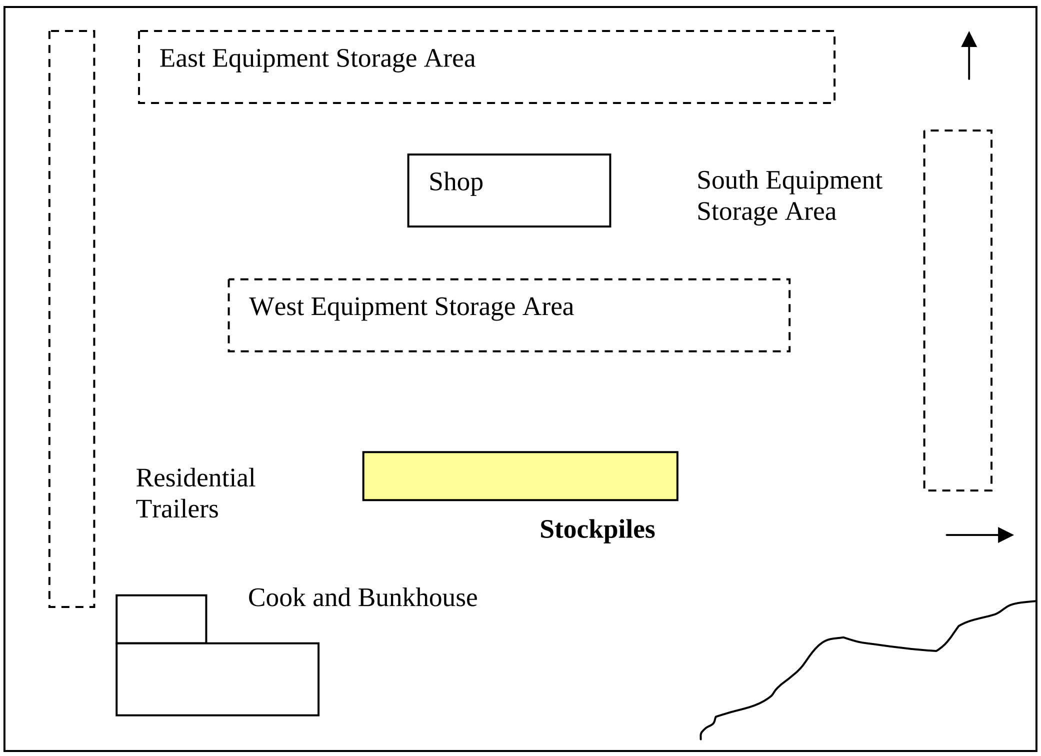
It is recommended that the emptied petroleum contaminated soil stockpile area be used to develop the new treatment cell for solvent contaminated soils. After removing the petroleum contaminated soil and treating it, the old liner will be removed and new liner placed on the ground. This will eliminate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



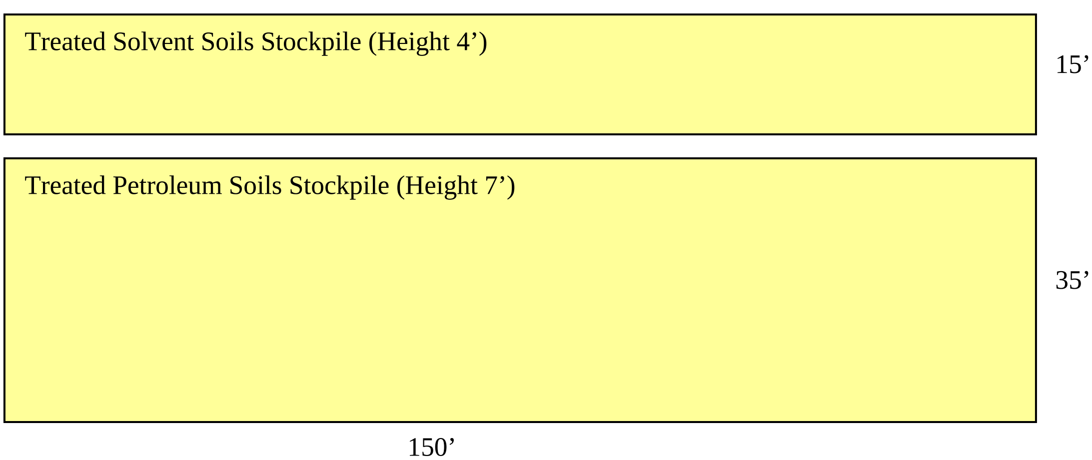
Change: IBW-003: Camp 2 – Stockpile Location

BACKGROUND INFORMATION

Treatment Cell Locations



<u>Treatment Cell Dimensions</u>



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.

APPENDIX C
SAMPLE LOG SUMMARY