SHANNON & WILSON, INC.
Geotechnical Consultants
Engineering and Applied Geosciences

Over 35 Years of Excellence

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August 29, 1990

X-0316

Stephen R. Cline
Key Bank Center
100 Cushman Street
Fairbanks, Alaska 99701

RE: MONITORING REMOVAL OF UNDERGROUND FUEL STORAGE TANK, FLOOR DRAIN LEACH FIELD AND SEPTIC SYSTEM, TRACT C-2, HEALY SMALL TRACTS, HEALY, ALASKA

Dear Mr. Cline:

At your request, Shannon & Wilson personnel performed the following work at the referenced site in Healy:

- monitor the removal of an underground gasoline storage tank;
- investigate and monitor removal of suspected contamination in a floor drain leach field;
- investigate and monitor removal of suspected contamination in the septic system leach field;
- obtain a water sample from the on-site drinking water well.

Field work took place on July 25 through 28, 1990.

The site is occupied by a three-bay garage building which we understand was constructed about 1972. We understand that in the recent past it was leased for about a year to a school bus operator. We further understand that you have recently purchased this facility, and intend to convert it to a retail building by constructing an addition to the north and west sides of the building.

It is our understanding that a site assessment was performed in May 1990 by Clarke Engineering Corporation, prior to our visit to the site. Soil samples from various locations were collected and analyzed for Total Recoverable Petroleum Hydrocarbons (TRPH), by EPA Method 418.1. Sample locations, and analytical results from these soil and water samples, are

presented in Attachment 1. Samples collected from near the underground storage tank and the septic system leach field contained levels of Total Petroleum Hydrocarbons which suggested contamination might be present. In addition, we understand that oily residue was noted in the leach field for the floor drain system.

Following discussions with you, it was agreed that the most cost effective method of investigation of this potential contamination would be to excavate the suspect areas, segregate visually or obviously contaminated soil, and sample the soils remaining in place. In the case of the underground tank, it was your desire to remove this tank, and the primary purpose of our work was to screen soil and obtain samples to document the presence or absence of hydrocarbon contamination during tank removal, intended to satisfy the requirements of 40 CFR 280.72 for site assessment at closure.

Field Methods

Excavation operations were performed by a crew and equipment provided by Mr. David Evans of Evans Industries. Both visual evidence of contamination (staining) and the presence or absence of volatile compounds were used to determine the extent of excavation and as a basis for segregating suspected contaminated soil from the presumed clean soil. A Photovac "TIP" photoionization detector (PID) was used to screen soil for volatiles during excavation. A PID measures total volatile compounds present and is used as a semi-quantitative indication of hydrocarbon contamination. The PID is calibrated to an isobutylene standard, with the readings mathematically corrected to a benzene standard. During excavation, all soils suspected of containing hydrocarbons above cleanup levels contained in the June 20, 1990 draft ADEC cleanup guidelines (100 ppm Total Petroleum Hydrocarbons; and for gasoline more than 0.5 ppm benzene, and 10 ppm sum of benzene, toluene, ethylbenzene, and xylene) were stockpiled on a layer of Visqueen on site behind the building. Soil from the various excavations were segregated as removed. Those soils which were inferred to be below these levels were temporarily stockpiled for later use as backfill for the excavations.

A site plan of the area is presented in Figure 1. Soil samples were collected for headspace gas screening for total volatile compounds present as excavation progressed. Sample locations are presented in Figures 2, 3 and 4. At the maximum extent of excavation both laterally and at depth, samples for laboratory analysis were collected. Sample collection was in general accordance with Shannon & Wilson's Generic QA/QC Plan for Tank Closure Operations, a copy of which is available upon request. Samples taken for laboratory analyses were maintained

at or near 4°C and transported to Northern Testing Laboratories, Inc. The soil samples obtained for headspace screening were either warmed in the field, or returned to our office and allowed to equilibrate to room temperature. The PID was used to measure total volatile compounds present in the headspace of the sample jars. Headspace gas concentrations measured on the samples are presented in Table 1, rounded to single digit precision, along with the results of the laboratory analyses from Northern Testing Laboratories, Inc. Figures 2, 3 and 4 show the locations of both analytical samples and samples collected only for headspace screening. The laboratory analytical report for this work is provided in Attachment 2.

Underground Storage Tank Removal

A 2,000 gallon storage tank was removed from an excavation on the southwest corner of the building. Figure 2 is a sketch of the excavation, with the locations of headspace and analytical samples. The tank surface was oxidized, but no holes or punctures were observed. The tank was equipped with a suction pump type dispenser located directly above the tank. The vent, fill and pump piping all came off of the west end of the tank. The piping appeared to be tightly attached to the tank. Soils to the east of the tank appeared to be clean, however, soils at the piping, or west end of the tank gave elevated readings when screened with the PID. Therefore, this soil was removed to the containment area.

Contaminated soil, as delineated by the PID, was found and excavated to the west of the tank, from the surface to a depth of 16 feet. The excavation was terminated at the property boundary, 35 feet west of the building.

↳ does the adjacent prop. owner know?

Soil samples for headspace screening were collected periodically during excavation to monitor soil removal. After approximately 12 hours of excavating at the site, operations were halted to await analytical results. Analytical samples were collected from below each end of the tank, at the deepest part of the excavation, and at the western extension of the excavation. These five samples were analyzed by EPA Method 8020 for Purgeable Aromatics, and by EPA Method 8015 for Total Volatile Petroleum Hydrocarbons.

Floor Drain, Septic System and Groundwater

Two areas of contamination were indicated by the initial site assessment in addition to TPH reported in the groundwater. During field operations each location was excavated separately, soil conditions were monitored visually and with the PID, samples were collected, and the appropriate analyses were performed for compliance with the testing methods required in the

June 20, 1990 ADEC cleanup guidelines.

Septic System

The septic system leach field was located 20 feet to the north of the building (Figure 3). A 2-inch feeder line drained from the building into a 6 foot by 6 foot gravel-filled timber crib. It is our understanding that only a toilet and lavatory located on the second floor of the building drained to this leach field. Headspace screening of soil removed from above and adjacent to the cribbing suggested the material was "clean." Below the cribbing, the soil was stained, had a noticeable odor and had elevated values when screened with the PID. Excavation of suspected contaminated soil continued to a depth of approximately 18 feet below ground surface. The backhoe used for excavation could not reach below this depth.

Soil samples for Purgeable Aromatics (EPA Method 8020), Total Recoverable Petroleum Hydrocarbons (EPA Method 418.1) and Halogenated Volatiles (EPA Method 8010) analyses, and a sample for headspace gas screening for total volatile compounds present, were taken from the side wall at a depth of approximately 16 feet, and at the base of the excavation at 18 feet. Sample locations are presented in Figure 3, and shown in cross section in Figure 4.

Floor Drain

Three floor drains, connected within the building, drained via a 2-inch pipe to a leach field separate from the septic system (see Figure 3). The edge of the leach field was located 2 feet outside the foundation, and the top was less than a foot below the base of the foundation (see Figure 4). The leach field was constructed of concrete block arranged in a 4-foot diameter circle, which was open at the base. After the block was exposed, standing liquid was bailed into 55-gallon drums, the concrete block removed, and the visibly stained soil removed. Soil excavation continued laterally to what visually appeared to be unstained soil, and to a depth of 16 feet below ground surface. At this depth excavation was halted as it was felt that continued excavation would undermine the building foundation. Visibly stained soil had to be left in place under the building. Soil samples were collected from the four side walls and the base of the excavation, and analyzed for Total Recoverable Petroleum hydrocarbons (EPA Method 418.1). In addition, sample 316-726-14 was analyzed for Purgeable Aromatics (EPA Method 8020). Samples 316-726-10 and sample 316-726-14 were analyzed for Halogenated Volatiles (EPA Method 8010) and for total arsenic (As), cadmium (Cd), chromium (Cr), and lead (Pb).

Groundwater

Analyses of a water sample, collected during the previous work on site, revealed low levels of Total Petroleum Hydrocarbons in the well water. While on site, we resampled the well water. Samples were collected from a non-aerated tap after purging the well for approximately one hour by running water from the tap. Samples were collected in HCL-preserved 40-ml vials for analysis by EPA Method 602 for Purgeable Aromatics, and in plain baked jars for analysis by EPA Method 418.1 for Total Petroleum Hydrocarbons.

Results

Results of the laboratory analyses for soil and water samples are presented in Table 1. The complete laboratory analytical report for this work is presented in Attachment 2.

Samples collected from each end of the underground storage tank meet the ADEC soil cleanup target levels, contained in the June 20, 1990 Petroleum Contaminated Soil Cleanup Guidelines. The three analyzed samples collected from west of the tank exceeded the cleanup target levels. EPA Method 8015, which is reported as ppm total volatile petroleum hydrocarbons, quantified the petroleum hydrocarbons from these soil samples predominantly as diesel, although some gasoline was reported. We had been told that the underground storage tank in this vicinity was a gasoline storage tank. Results of the 8015 analyses suggest that either the underground storage tank at one time held diesel, which was somehow spilled, or that there was a surface diesel spill in the area, which has migrated to depth. The analyses show that soil exceeding cleanup levels is still present at sample locations 34 and 38. The extent of excavation had been based on the assumption that the hydrocarbons were gasoline, and the PID readings from the headspace samples were interpreted accordingly. Since it now appears that the primary contaminant is diesel fuel, the PID readings must be reinterpreted, and it is possible that soil exceeding cleanup levels may also be present in the vicinity of sample -37.

Excavation of the floor drain leach field has progressed as far as possible without undermining the foundation. Results of analyses show that the contaminated soil located adjacent to the north and east sides of the floor drain leach field has been removed. The sample from the west sidewall of the excavation, sample 316-726-13, had elevated levels of TRPH (7,600 ppm). We feel that the extent of contamination laterally from the sump location is limited, based on the results of the other two walls that were sampled. The sample at the base of the excavation, sample 316-726-10, also had very high levels of TRPH (25,000 ppm). We can not estimate the depth to which contamination has penetrated. Sample 316-726-14, taken from stained soil left

in place under the building foundation, has very high levels of TRPH (38,000 ppm). It also contains significant levels of ethylbenzene, toluene, and xylene. The levels of these compounds suggests that diesel fuel may be a major component of the hydrocarbons which were found at this location. No Method 8010 chlorinated compounds were detected either in the soils left in place beneath the footing (sample -14) or in the base of the excavation (sample -10). The concentrations of arsenic, cadmium, chromium and lead detected in these two samples do not appear to exceed background values which we would expect from work at other sites in the interior Alaska area.

Samples 316-728-30 and -31, collected from the base of the excavation which removed the septic leach field, did not contain TRPH above cleanup guidelines and contained no detectable BTEX. However, they did contain headspace volatiles measured with the PID, and contained measurable quantities of 1,2- dichlorobenzene, 1,3- dichlorobenzene, and 1,4- dichlorobenzene (0.7 to 3.4 ppm). 1,2- dichlorobenzene is considered a RCRA characteristic hazardous waste if the Toxicity Characteristic Leaching Procedure (TCLP) extract exceeds 0.5 ppm. If sample 316-728-31, which contained 3.4 ppm 1,2- dichlorobenzene, were subjected to the TCLP, it would not exceed the 0.5 ppm TCLP limit even if all of the 1,2- dichlorobenzene were dissolved. Therefore, the soil left in place in the excavation is not a hazardous waste, in our opinion. Dichlorobenzenes are common constituents of toilet bowl deodorizer cakes. In our opinion, this is a more likely source of the observed dichlorobenzene than is improper disposal of materials in the septic system.

During the course of excavation of the floor drain leach field, several isolated spots were unearthed which gave elevated PID readings (see the locations of Samples -32 and -33 in Figure 2). Samples collected from these areas, after removal of suspected contaminated soil, are below the ADEC soil cleanup guidelines. The 11 ppm of TVPH contained in one sample was quantified by the laboratory as diesel.

Results of analyses of water samples taken from the water well on site (located on the east wall of the building, see Figure 1) show that no BTEX was detected, but Total Petroleum Hydrocarbons were reported at 0.5 ppm. The previous sample by Clarke Engineering reported 2.8 ppm. It is our understanding from Mr. David Evans that groundwater depth in the area is about 50 feet, and that the well is thought to be about 100 feet deep.

→ direction of gradient?

Conclusions and Recommendations

Based on the work performed to date, our conclusion regarding the various areas investigated at this site are as follows:

- Underground tank - in our opinion, the area directly beneath the tank has been excavated to clean soils. However, additional excavation, followed by confirmatory analytical sampling, is recommended in the area of samples -34 and -38, and additional field screening followed by confirmation analytical sampling, is recommended in the area of sample -37.

- Septic system leach field - excavation appears to have removed hydrocarbon-contaminated soils from beneath and adjacent to the septic system leach field. Assuming that the source of the dichlorobenzenes is toilet bowl deodorizers, in our opinion no further work should be necessary at this location.

- Floor drain leach field - the currently-known extent of contaminated soil in this area is limited in lateral extent, and furthermore cannot be excavated without risk of undermining the building. The depth extent of contaminated soils is not known. Even if the building foundation were shored or underpinned, further excavation could result in loss of soil from beneath the slab inside the footing, which would then require destruction of the slab to replace the fill. We understand that this area will be covered by the concrete slab of the new addition, which will preclude any water infiltration which might cause the contaminants to migrate. We recommend that you request permission from ADEC to leave these contaminated soils in place. If it is necessary to establish the depth of contamination, an attempt at drilling and sampling a boring could be made once the excavation has been backfilled. However, auger drilling may be difficult or impossible due to the coarseness of underlying gravels.

- Isolated spots - the two isolated spots of contaminated soil identified during excavation have been excavated to clean soil, and no further remediation should be necessary in these areas.

- Groundwater - the occurrence of low levels of Total Petroleum Hydrocarbons in the well water, in our opinion, is not conclusive evidence of contamination from one of the areas investigated having reached the groundwater. Since diesel fuel

appears to be the most common contaminant in the soil samples tested, we would have expected to have found the more soluble and mobile constituents of diesel (the toluene, ethybenzene and xylene, which were not detected), rather than heavier petroleum hydrocarbons. We recommend additional sampling of the well water by both Methods 602 and 418.1 to establish a trend of data.

elevated PID during excavation

- The soil which has been excavated to date has been stockpiled on site on a visqueen liner. There are three piles. The small pile (about 25 cubic yards) contains soil from the septic leach field. The middle pile (about 170 cubic yards) contains soil from the floor drain leach field toward the back of the pile, and from the tank excavation toward the front of the pile. The largest pile (about 210 cubic yards) contains soil from the tank excavation. We recommend that these piles be kept covered to prevent infiltration until a disposal or treatment option is selected.

430 yd^3 soil

Notifications

You are reminded that in accordance with Alaska statute 18AAC75.080, "a person in charge of a facility or operation shall notify a field office of the department [of Environmental Conservation] ....for any discharge of oil to the waters ...[or] the land of the state". ADEC has interpreted this to include underground evidence of spills, such as disclosed by this study. They have stated that the responsibility for reporting rests on the owner or operator of the facility, not on the consultant performing the study. Therefore Shannon & Wilson has not, and will not, disclose the results of this study.

In addition, the federal underground storage tank (UST) regulations, 40CFR part 280.50, state that "owners and operators of UST systems must report to the implementing agency within 24 hours ... the discovery ... of released regulated substances at the UST site or in the surrounding area (such as the presence of free product or vapors in soils...)". Corrective action or additional investigation and confirmation is required to follow the discovery, within a defined time frame.

Limitations

This report presents conclusions based on a limited number of soil samples collected in conjunction with remediation of previously disclosed or suspected contamination problems. It was not the intent of our sampling program to be a comprehensive investigation of the entire

parcel. The samples collected were intended to confirm the presence or absence of hydrocarbon contamination at the locations selected. The sample locations were selected to be representative of the soils at the base of the excavation. However, levels observed may not be the greatest levels present at the site. It was not the intent of our exploration to detect other than contamination by the substances for which analyses were performed. No conclusions can be drawn on the presence or absence of other contaminants.

This report was prepared for the exclusive use of the owner and our client in the study of the current problem. If it is made available to others, it should be for information on factual data only and not as a warranty of subsurface conditions, such as those interpreted from the discussions included in this report.

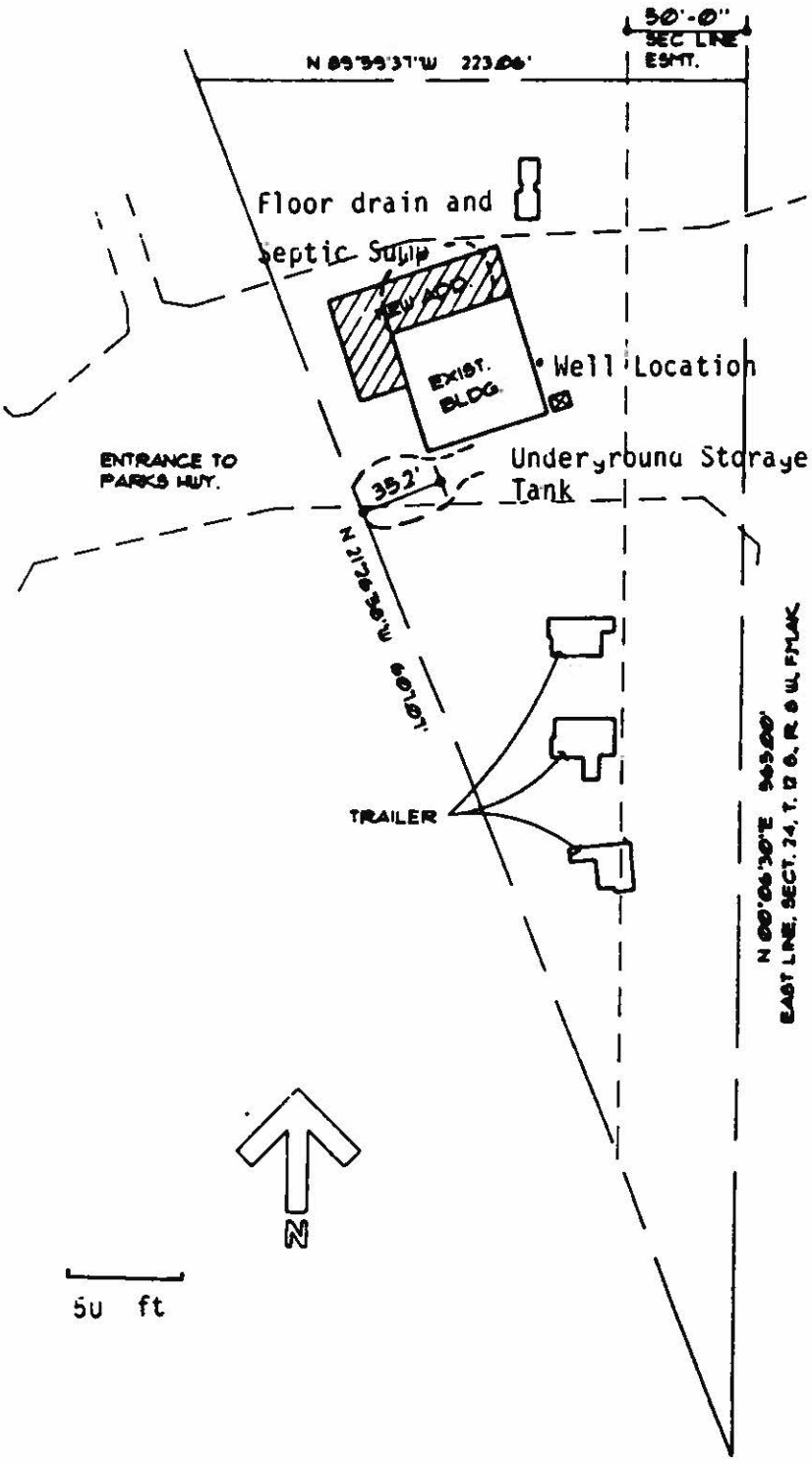
We trust that this information is sufficient for your needs at the present time. If you have any questions, or if we can be of further assistance, please call.

Sincerely,

SHANNON & WILSON, INC.

By _____
Kathyrn Lamal, Geologist

Reviewed By _____
John E. Cronin
Vice President
Waste Management/Hydrogeology



Stephen Cline
Lot C-2, Healy Small Tracts
Healy, Alaska

SITE PLAN

From plan by Design Alaska

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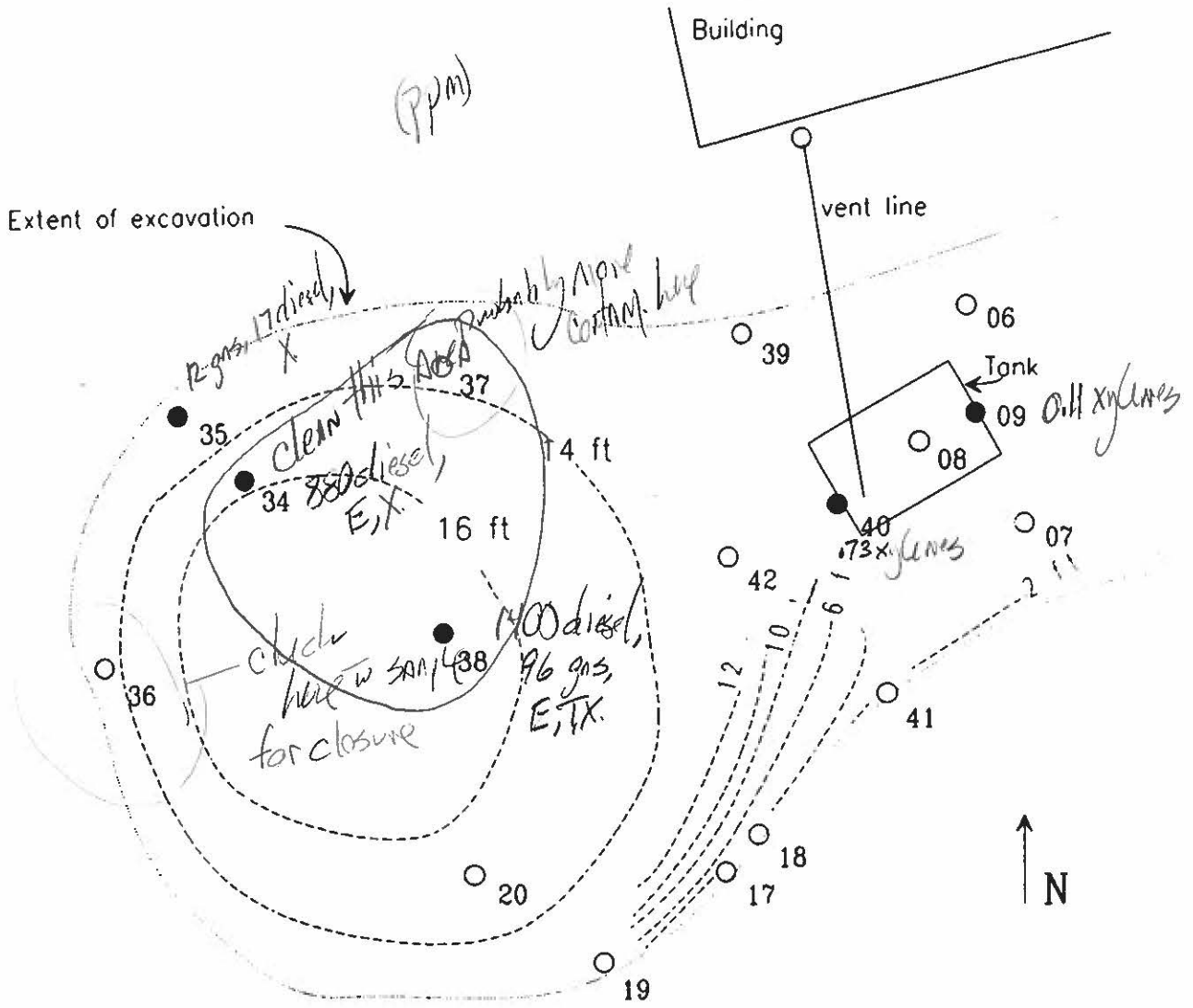
FIG. 1



Sample	PID Readings, in ppm
316-726-06	<1
-07	<1
-08	4
-09	1
316-728-34	10
-35	<1
-36	<1
-37	6
-38	8
-39	<1
-40	1
-41	<1
-42	1

Note: Contours for visualization only, not based on survey.

Legend

12 ft Excavation Contours

19 PID sample

38 PID and Analytical sample

Scale
1 in = 10 ft

Stephen Cline
Lot C-2, Healy Small Tracts
Healy, Alaska

PLAN OF STORAGE TANK REMOVAL

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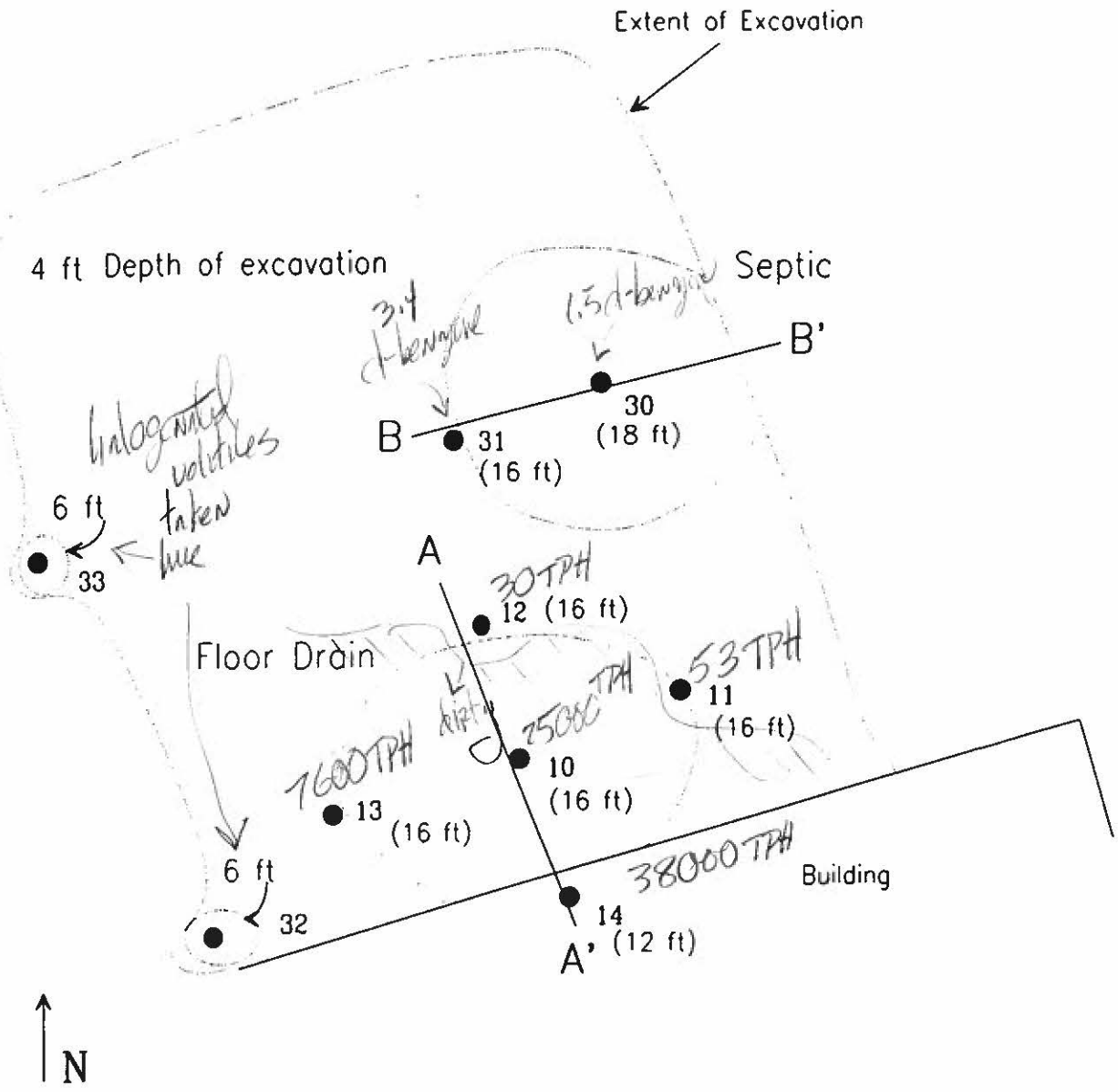
Fig. 2

(PPM)



Legend

- ● 14 (12 ft) — PID and Analytical sample, Depth of sample collection
- A——A' — Cross-section location see Figure 4
- Scale 1 in = 10 ft

Stephen Cline
Lot C-3, Healy Small Tracts
Healy, Alaska

PLAN OF FLOOR DRAIN AND SEPTIC LEACH FIELD EXCAVATIONS

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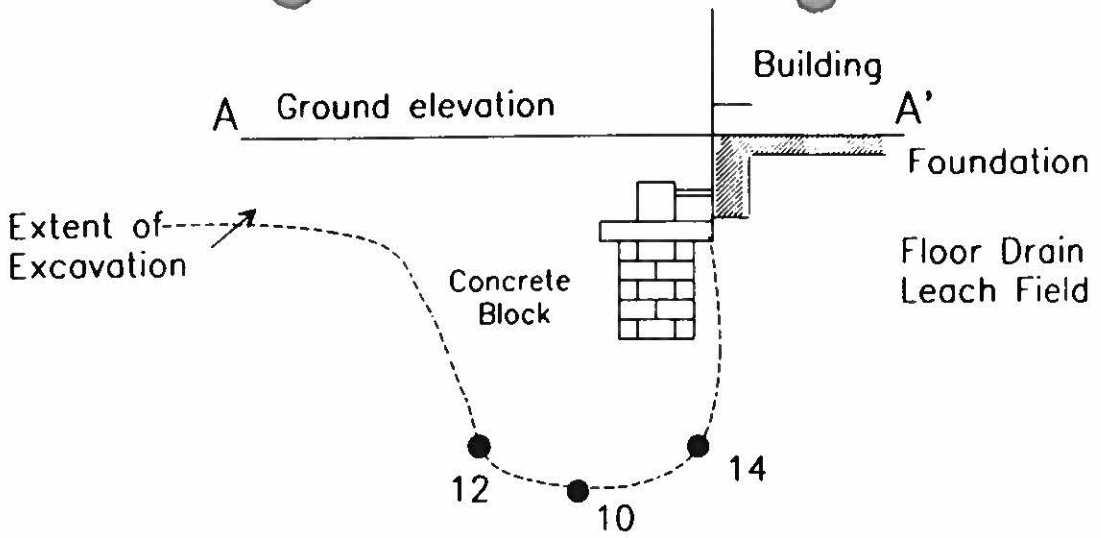
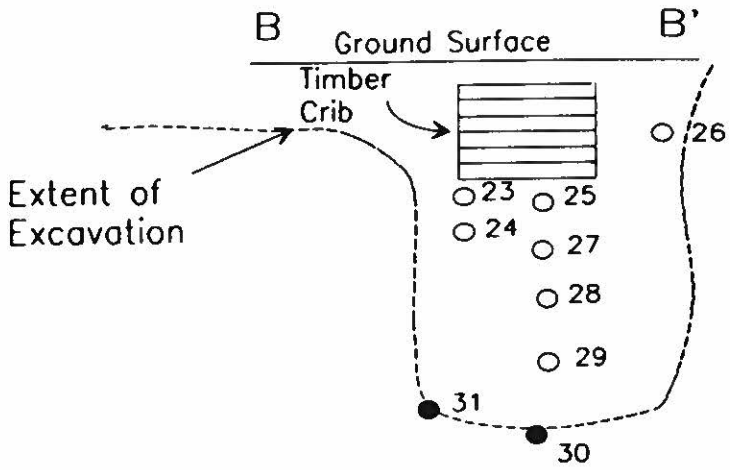
Fig. 3





Septic
Leach Field

Sample	PID Reading, in ppm
316-727-23	50
-24	20
-25	70
-26	<1
-27	100
-28	70
-29	40
-30	8
-31	20

Legend

○ 25 PID sample

● 30 PID and Analytical sample

Scale
1 in = 10 ft

Stephan Cline
Lot C-2, Healy Small Tracts
Healy, Alaska

CROSS-SECTIONAL VIEW OF FLOOR DRAIN AND SEPTIC LEACH FIELD EXCAVATIONS

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Fig. 4

TABLE 1

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Purgable Aromatics (EPA Method 8020)(a), Total Recoverable Petroleum Hydrocarbons (EPA Method 418.1), Total Volatile Petroleum Hydrocarbons (EPA Method 8015), and Headspace Gas Concentrations in Soil (all concentrations in ppm)

Sample	Headspace Gas Concentrations	Benzene	Ethyl-benzene	Toluene	Xylene	Total Recoverable Petroleum Hydrocarbons	Total Volatile Petroleum Hydrocarbons
		Septic System					
316-728-30	8	ND	ND	ND	ND	ND	_
316-728-31	20	ND	ND	ND	ND	21	_
		Floor Drain					
316-726-10	NA	-	-	-	-	25,000	_
316-726-11	NA	-	-	-	-	53	_
316-726-12	NA	-	-	-	-	30	_
316-726-13	NA	-	-	-	-	7,600	_
316-726-14	NA	ND	22	41	260	38,000	_
		Isolated Spots					
316-728-32	2	ND	ND	ND	ND	-	11, quantified as diesel
316-728-33	<1	ND	ND	ND	ND	-	ND

(a) All analytes are not listed. See laboratory reports for a complete list of analytes tested.

(-) Denotes not tested

(NA) Denotes not applicable

(ND) Denotes not detected

TABLE 1, continued

X-0316

Purgable Aromatics (EPA Method 8020)(a), Total Volatile Petroleum Hydrocarbons (EPA Method 8015) and Headspace Gas Concentrations in Soil (all concentrations in ppm)

Underground Storage Tank

Sample	Headspace Gas Concentrations	Benzene	Ethyl-benzene	Toluene	Xylene	Total Volatile Petroleum Hydrocarbons
316-726-09	1	ND	ND	ND	.11	1, quantified as diesel
316-728-34	14	ND	0.06	ND	2.30	880, quantified as diesel
316-728-35	<1	ND	ND	0.03	ND	ND
316-728-38	8	ND	0.64	1.00	8.60	96, gasoline; 1,400, diesel
316-728-40	1	ND	ND	ND	0.73	12, gasoline; 17, diesel

Purgable Aromatics (EPA Method 602)(a) and Total Recoverable Petroleum Hydrocarbons (EPA Method 418.1) in Water (all concentrations in ppm)

Sample	Benzene	Ethyl-benzene	Toluene	Xylene	1,2-Dichloro benzene	1,3-Dichloro benzene	1,4-Dichloro benzene	Total Recoverable Petroleum Hydrocarbons
316-727-15	ND	ND	ND	ND	ND	ND	ND	-
316-728-43	-	-	-	-	-	-	-	0.5

(a) All analytes are not listed. See laboratory reports for a complete list of analytes tested.

(-) Denotes not tested

(ND) Denotes not detected

TABLE 1, continued

X-0316

Halogenated Volatiles (EPA Method 8010)(a), and Total Arsenic (As), Cadmium (Cd), Chromium (Cr) and Lead (Pb) (all concentrations in ppm)

Sample	1,2-Dichloro benzene	1,3-Dichloro benzene	1,4-Dichloro benzene	Ar	Cd	Cr	Pb
		Septic System					
316-728-30	0.70	1.50	1.40	-	-	-	-
316-728-31	3.40	3.30	1.70	-	-	-	-
		Floor Drain					
316-726-10	ND	ND	ND	39.7	ND	14.3	23.8
316-726-11	-	-	-	-	-	-	-
316-726-12	-	-	-	-	-	-	-
316-726-13	-	-	-	-	-	-	-
316-726-14	ND	ND	ND	59.9	1.3	36.3	30.7
		Isolated Spots					
316-728-32	ND	ND	ND	-	-	-	-
316-728-33	ND	ND	ND	-	-	-	-

(a) All analytes are not listed. See laboratory reports for a complete list of analytes tested.

(-) Denotes not tested

(ND) Denotes not detected