

LINCOLN

SEP 14 1988

APPLIED GEOLOGY, INC.

September 12, 1988

Mr. John Brabant
Waste Management Division
Dept. of Environmental Conservation
Agency of Natural Resources
103 South Main Street
Waterbury, VT 05676

Re: UVM Business School

Dear John:

Pursuant to your request I have formalized a sequence of events regarding the clean-up of the UVM Business School site. In June 1987 the University of Vermont encountered significant amounts of free petroleum product while excavating the foundation hole for the new business school. The University was issued a 1066a order which requested that the contaminated soil associated with the excavation activities be properly disposed of and that a study of the extent of contamination be performed. In June 1987 we performed a preliminary evaluation of the oil contamination problem adjacent to the excavation for the new business school. Our evaluation consisted of:

1. An initial site visit to inspect the problem area and collect available background information.
2. A site visit to conduct a backhoe test pit evaluation of the problem area and install a 30" diameter oil recovery well adjacent to the old tank pad.
3. Several site visits to monitor the presence of free product in the recovery well and in the business school excavation.

The results of this preliminary evaluation indicate that:

1. The soils in the area of the problem consist of 6 feet of medium brown sand overlying 10 feet of brown clay with interbeds of silty fine sand which directly overlie a brown to pink glacial till.,
2. All soils between a depth of 3 feet and the top of the till are contaminated with what appears to be #4 fuel oil.,
3. At 12 feet, an abandoned culvert underlain by 6" of gravel was encountered which contained 5 to 6 gallons of free oil product.,
4. Approximately 20 inches above the glacial till, the old cement slab, concrete cradle, and gravel underlayment for the old oil tank was encountered which showed evidence of oil contamination and free oil presence.,

Steve Revell, C.P.G.S.
Geologist - Hydrogeologist

RD 1, Box 710
Bristol, Vt. 05443
(802) 453-4384

5. No ground water was encountered during the excavation for the recovery well.,
6. The presence of water table was noted during a later monitoring visit indicating the presence of an intermittent perched water table associated with the top of the glacial till.,
7. The soils which were removed during the installation of the recovery well were oil contaminated and had to be stockpiled under plastic for later disposal or treatment at an off-site facility., and
8. The seeping oil could impact the drainage system for the new business school unless it was controlled.

A review of the compiled results indicated that:

1. A minimum of three monitoring wells needed to be constructed east, north, and south of the recovery well to further define the extent of oil contamination.,
2. Some type of barrier needed to be placed between the business school and the recovery well to prevent the passage of oil into the foundation drain system and to artificially raise the water level in the recovery well to enhance the ability to recover free product.
3. Some type of oil recovery system needed to be implemented to recover any free product which accumulated in the recovery well., and
4. Some means of disposal or treatment of the contaminated soil stockpiled on-site needed to be proposed and carried out before the summer/fall fair weather seasons passed.

In July 1987, the contaminated soils on-site were thinly spread at the University's Spear Street farm. This location was chosen by Lincoln Applied Geology and John Amadon. The soils were fertilized and tilled in accordance with Mr. Amadon's Land Farm protocols.

During July, August and September the recovery well was pumped dry every third to fourth week to try to enhance product flow towards the well. In mid October 1987 a barrier trench was installed. See Figure 1 for a detailed location map. The barrier trench was installed by Pizzagalli Construction, under the direction of Steven LaRosa of Lincoln Applied Geology. To avoid slumping of backfilled sands into the hole and endangering personnel, a 25 foot wide trench was dug to a depth of approximately 19 feet. The trench was dug at least two feet into the native glacial till except for the area of the tank pad. In this regard, the construction of the new Business School building made it impossible to work

around or underneath the tank pad. Therefore, the pad was scraped clean and bentonite powder was spread directly on top of and beside it to create an impermeable seal between the pad and the barrier. During excavation it was noted that product and water was flowing into the hole from the Business School and the recovery well sides of the trench. Any product remaining on the Business School side of the barrier could potentially flow into the perimeter drain at the Business School. Therefore, the sump area in the Votey Building is checked frequently for any evidence of product.

The dimensions of the completed barrier can be seen on Figure 1. The length of the front face of the barrier was determined by the extent of contamination encountered as we excavated. The front face then turned eastward on both ends. Each arm was excavated to a point where the main power lines for several buildings on campus were encountered. After discussion with Pizzagallis' representative, it was decided that the safest alternative would be to shorten the arms of the trench and leave the power lines undisturbed. A layer of bentonite powder approximately 6 to 8 inches in depth was laid in the bottom of the trench. Then 10 mil plastic was cut to size, folded in half and placed on top of the bentonite and up the Business School side of the trench. After the plastic was secured to the bank, another layer of bentonite 18 to 20 inches deep was laid on top of the plastic at the base of the trench. In this manner, the plastic barrier was securely keyed into the native till. The trench was backfilled to 1 foot below the top of the plastic with contaminated clay soils acquired while constructing the trench. This material was then compacted with the bucket of the drot and with tamping machines. Pizzagalli Construction finished backfilling and compaction of the trench with clean fill on 10-9-87. (Any contaminated soils that were not placed behind the barrier were brought to the Land Farm site on Spear Street, where it was treated as per John Amadons' land farm protocols.) After the barrier trench was installed, the recovery well was pumped to dryness twice. Each time, the water in the recovery well was allowed to equilibrate before being pumped. Equilibration time was approximately two weeks. At the end of equilibration the product thickness was 1/4".

In light of the fact that product was entering the well in significant amounts, I recommended that a more permanent automated recovery system be utilized to pump the well. I suggested that along with the automated pump, a recharge gallery (i.e. leach field) be installed upgradient of the recovery well. By utilizing this pump/re-injection method, the contaminated soils will be "washed" more effectively than by natural infiltration. By washing the soils, the flow of product towards the recovery well would be increased, thereby reducing the total time necessary for cleaning up the site. See Figure 2 for a detailed sketch of the proposed system.

In April 1988 Pizzagalli Construction installed the automated pumping system consisting of a submersible sump type pump. The pump is wired and plumbed so that:

Mr. John Brabant

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1. the pump will bring the ground water to no lower than one foot from the bottom of the well;
2. the pump will not let the ground water in the well recover more than two feet from the bottom of the well;
3. the flow rate of the pump can be controlled at grade by a gate valve;
4. the pump contains an effective foot valve to prevent back draining of pumped water into the recovery well.

The recharge gallery is constructed as follows:

1. a trench 30 ft. long by 5 ft. wide by 10 ft. deep constructed 15 feet upgradient of the recovery well;
2. one foot of 1" to 1.5" clean aggregate was laid in the bottom of the trench;
3. a closed loop of 4" PVC perforated drain pipe was placed in the trench. This loop is connected to the pump system. Also at this time two PVC monitoring wells were placed at each end of the trench. These wells are used to monitor the level of the recharge waters;
4. the pipe was covered by at least 6" of stone;
5. untreated construction paper was placed on top of the stone;
6. the remainder of the trench was backfilled with the excavated soils, and compacted.

A complete record to date of ground water level and product thickness in the recovery well and both recharge gallery wells is enclosed as Table 1. This system has been monitored frequently since its installation in April.

Monthly soil sampling at the Spear Street Land Farm was reinstated in May 1988. All soil sample results reported to date are enclosed as Appendix 1.

Due to the very dry conditions of this last spring and summer, the pump in the recovery well cycles very slowly. Therefore, to further induce product flow towards the recovery well additional water is being added on a weekly basis to the recharge gallery. The additional water is added at a rate of approximately 5 gal./min. for 8 hours. The pump system appears to be cycling more often, although the product thickness remains the same. As can be seen, the product level in the recovery well is unaffected by the additional waters being circulated through the system.

Steve Revell, C.P.G.S.
Geologist - Hydrogeologist

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Bristol, Vt. 05443
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Mr. John Brabant
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In light of this fact, I recommend that the product be removed and its recovery rate monitored closely.

If the recovered product thickness is less than 1/8" of an inch the recovery system should be shut down and the State's standard one year of quarterly monitoring be initiated. If the recovered product thickness is greater than 1/8" of an inch the system will remain operational and a product recovery scheme implemented.

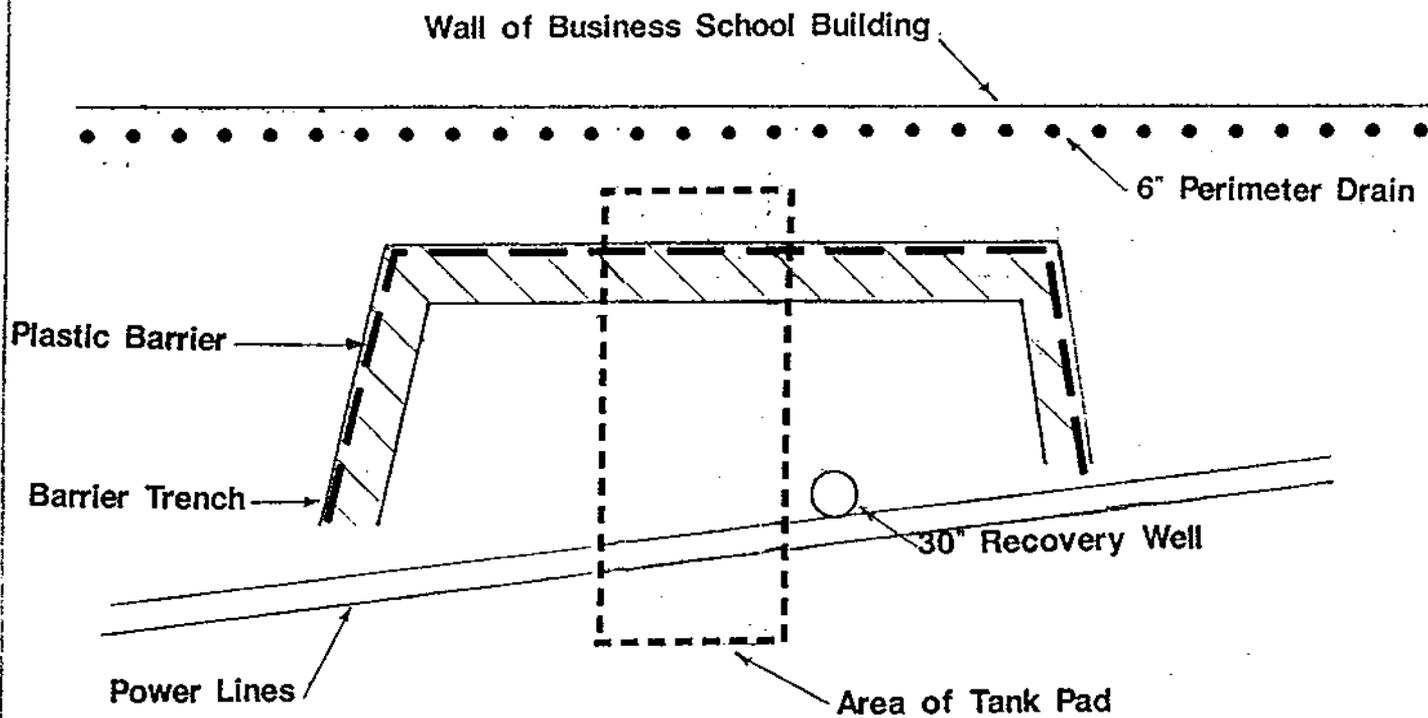
If you have any questions regarding this matter please do not hesitate to contact me at (802) 453-4384.

Sincerely,

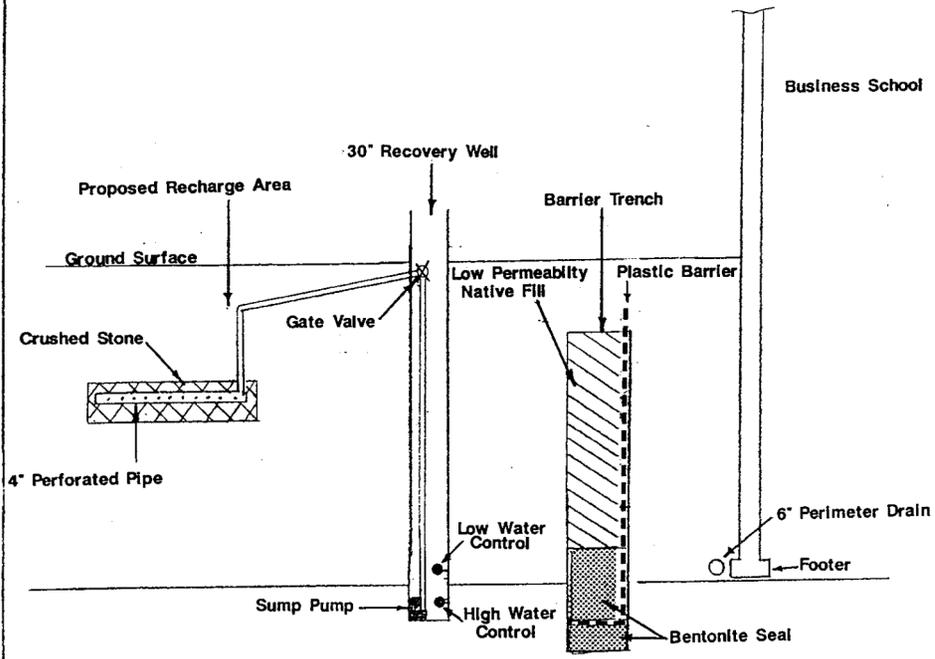


Steven LaRosa

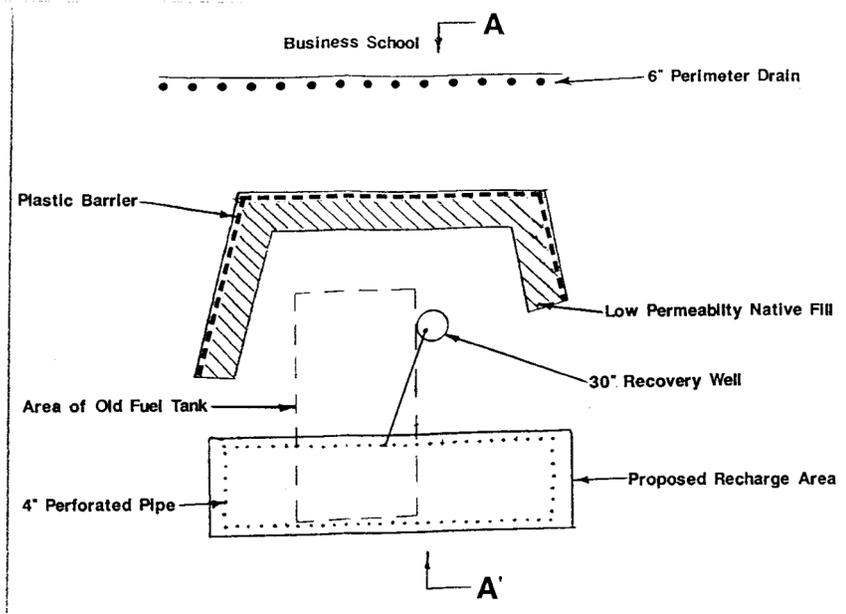
SL/mlh
Enclosures
cc: Eric Beattie, UVM.



UVM-Business School	
Scale: 1"=10'	Drawn By: S. LaRosa
Contamination Barrier	
10/27/87	No.4 Fuel Oil Spill



Detailed Section A-A'



Plan View

UVM Business School	
Scale: As Shown	Drawn By: S. LaRosa
Proposed Recharge Gallery	
Date: 3/88	Problem: No.4 Fuel Oil Spill

PROJECT UVM - Business School

JOB NO. _____

LOCATION Burlington, VT

SHEET 1 OF 1



DATA POINT	REFERENCE ELEVATION	Land Farm Soil Results (mg/kg)						
		DATE	8/87	9/87	10/87	5/88	6/88	7/88
6" Depth			3271.5	1379.0	946.0	1010.0	450.0	370.0
12" Depth			233.2	1622.0	1250.0	1220.0	700.0	410.0

Notes: 1) Elevation datum assumed.
 2) "Reference Elevation" is elevation of top of PVC well casing at each data point.

BRIGGS



400 Hingham Street, P. O. Box 369, Rockland, MA 02370-0369 ▶ (617) 871-6040

September 1, 1987

The University of Vermont
Department of Risk Management
109 South Prospect Street
Burlington, VT 05405

Attention: V. Willes

Reference: Analysis of Soil Samples for Petroleum Distillates
Briggs Sample #6155

Dear Mr. Willes:

Two samples of soils were submitted to this laboratory for analysis of petroleum distillates by soxhlet extraction/silicagel separation/gravimetric quantification. The gravimetric quantification method was opted over infrared quantification method due to the larger quantity of oil found in the soil. The results of the analysis are as follows:

Sample # T-1-S	3271.5 mg/Kg	6"	"T" = top soil
Sample #S-1-S	233.2 mg/Kg	12"	"S" = sub soil

The total infrared spectra of the T-1-S residue shows us that the oil has very little fatty residue after the chromatographic cleanup. The spectra appears to be a petroleum distillate. We can, if you desire, inject a separate aliquot into our gas chromatograph to determine what petroleum distillate boiling range is left in the extracted residue.

If you have any further questions, please call.

Sincerely yours,
BRIGGS ASSOCIATES, INC.

Andrew F. Beliveau
Laboratory Manager
AFB/ch

BRIGGS



400 Hingham Street, P. O. Box 369, Rockland, MA 02370-0369 ▶ (617) 871-6040

October 19, 1987

The University of Vermont
Department of Risk Management
109 South Prospect Street
Burlington, VT 05405

Attention: V. Willes

Reference: Analysis of Soil Samples for Petroleum Distillates
Briggs Sample #6312 A & B

Dear Mr. Willes:

Two samples of soils were submitted to this laboratory for analysis of petroleum distillates by soxhlet extraction/silicagel separation/gravimetric quantification. The gravimetric quantification method was opted over infrared quantification method due to the larger quantity of oil found in the soil. The results of the analysis are as follows:

Sample #A S-2-S	1,379 mg/Kg
Sample #B T-2-S	1,622 mg/Kg

If you have any further questions, please call.

Sincerely yours,

BRIGGS ASSOCIATES, INC.

Andrew F. Beliveau
Laboratory Manager
AFB/ch

BRIGGS



November 4, 1987 400 Hingham Street, P. O. Box 369, Rockland, MA 02370-0369 ▶ (617) 871-6040

The University of Vermont
Department of Risk Management
109 South Prospect Street
Burlington, VT 05405

Attention: V. Willes

Reference: Analysis of Soil Samples for Petroleum Distillates
Briggs Project #74324
Briggs Sample #6450

Dear Mr. Willes:

Two samples of soils were submitted to this laboratory for analysis of petroleum distillates by soxhlet extraction/silicagel separation/gravimetric quantification. The gravimetric quantification method was opted over infrared quantification method due to the larger quantity of oil found in the soil. The results of the analysis are as follows:

Sample #T-3-S	946 mg/Kg
Sample #S-3-S	1250 mg/Kg

If you have any further questions, please call.

Sincerely yours,

BRIGGS ASSOCIATES, INC.

Andrew F. Beliveau
Laboratory Manager
AFB/ch

*Sample T-3-S
is the topsoil*

*Sample S-3-S
is the subsoil*

uw

BRIGGS PROJECT NAME: UNIVERSITY OF VT
PROJECT NUMBER: 80776
SAMPLE NUMBER: 7505
SAMPLE TYPE: SOIL
SAMPLE LOCATION: AS NOTED
SAMPLE DATE: 5/3/88 RECEIVED
DATE OF REPORT: 6/6/88

RECEIVED

JUN 10 1988

Architectural &
Engineering Services

TOTAL PETROLEUM HYDROCARBONS, MG/KG

LOCATION	RESULT
7505-1/LAND FARM TOP 6"---4/26/88	1010.
7505-2/LAND FARM 6-12"---4/26/88	1220.

LABORATORY INFORMATION

BRIGGS ASSOCIATES LABORATORY
400 HINGHAM STREET
ROCKLAND, MA 02370

MANAGER: Leanne E.S. Cobb
SUPERVISOR: Stephen DiMattei

RECEIVED
JUN 10 1988
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Engineering Services

LABORATORY CERTIFICATION STATUS
Expires September 15, 1988 Mass DEQE

PRIMARY PARAMETERS AND CATEGORIES

FULL CERTIFICATION: Trace Metals, Fluoride

PROVISIONAL CERTIFICATION: Nitrate, Pesticides, Sodium,
Corrosivity, Trihalomethanes

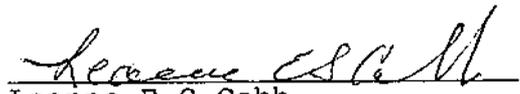
SECONDARY PARAMETERS AND CATEGORIES

FULL CERTIFICATION: Metals, PCB, Volatile Halocarbons, Volatile
Aromatics

PROVISIONAL CERTIFICATION: Nutrients, Demand, Oil and Grease,
Phenolics, Minerals

Date of Report 6/6/88

All the analyses in this report were performed in accordance with
EPA protocols using accepted QA/QC procedures.


Leanne E.S. Cobb
Laboratory Manager

LABORATORY INFORMATION

BRIGGS ASSOCIATES LABORATORY
400 HINGHAM STREET
ROCKLAND, MA 02370

MANAGER: Leanne E.S.Cobb
SUPERVISOR: Stephen DiMattei

RECEIVED

JUL 18 1988

Architectural &
Engineering Services

LABORATORY CERTIFICATION STATUS
Expires September 15, 1988 Mass DEQE

PRIMARY PARAMETERS AND CATEGORIES

FULL CERTIFICATION: Trace Metals, Fluoride

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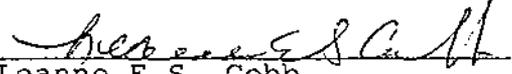
SECONDARY PARAMETERS AND CATEGORIES

FULL CERTIFICATION: Metals, PCB, Volatile Halocarbons, Volatile
Aromatics

PROVISIONAL CERTIFICATION: Nutrients, Demand, Oil and Grease,
Phenolics, Minerals

Date of Report 7/11/88

All analyses in this report were performed in accordance with EPA
protocols using accepted QA/QC procedures. The information
contained in this report is, to the best of my knowledge, accurate
and complete.


Leanne E.S. Cobb
Laboratory Manager

CLIENT NAME: UNIVERSITY OF VT
PROJECT NUMBER: 80776
SAMPLE DATE: 6/15/88
SAMPLE TYPE: SOIL
DATE RECEIVED: 6/21/88
DATE OF REPORT: 7/11/88

SAMPLE NUMBER: 7791A 7791B
SAMPLE LOCATION: TOP 6" LANDFARM 6-12" LANDFARM

TOTAL PETROLEUM
HYDROCARBONS, MG/KG 450 700

RECEIVED

JUL 18 1988

Architectural &
Engineering Services

LABORATORY INFORMATION

BRIGGS ASSOCIATES LABORATORY
400 HINGHAM STREET
ROCKLAND, MA 02370

MANAGER: Leanne E.S. Cobb
SUPERVISOR: Stephen DiMattei

RECEIVED

AUG 22 1988

Architectural &
Engineering Services

LABORATORY CERTIFICATION STATUS

Expires September 15, 1988 Mass DEQE

PRIMARY PARAMETERS AND CATEGORIES

FULL CERTIFICATION: Trace Metals, Fluoride

PROVISIONAL CERTIFICATION: Nitrate, Pesticides, Trihalomethanes,
Corrosivity Series, Sodium

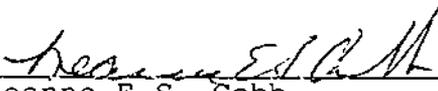
SECONDARY PARAMETERS AND CATEGORIES

FULL CERTIFICATION: Metals, Minerals, Nutrients, Demand, PCB,
Volatile Halocarbons, Volatile Aromatics

PROVISIONAL CERTIFICATION: Pesticides, Oil and Grease, Phenolics

Date of Report 8/18/88

All analyses in this report were performed in accordance with EPA protocols using accepted QA/QC procedures. The information contained in this report is, to the best of my knowledge, accurate and complete.



Leanne E.S. Cobb
Laboratory Manager

BRIGGS ASSOCIATES, INC. LABORATORY 400 HINGHAM ST.
ROCKLAND, MA 02370 (617) 871-6040

RECEIVED

AUG 22 1988

Architectural &
Engineering Services

CLIENT NAME: UNIVERSITY OF VERMONT
PROJECT NUMBER: 80776
SAMPLE TYPE: SOIL
DATE OF REPORT: 8/18/88

SAMPLE NUMBER: 7981A 7981B
SAMPLE DATE: 7/20/88 7/20/88
DATE RECEIVED: 7/28/88 7/28/88
SAMPLE LOCATION: LANDFARM TOP 6" LANDFARM TOP 12"

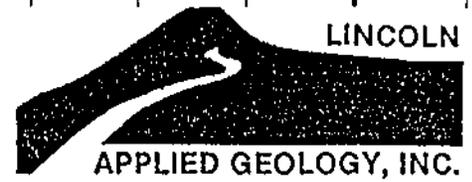
PARAMETER	RESULT	RESULT
TOTAL PETROLEUM HYDROCARBONS, MG/KG	370	410

PROJECT UVM - Business School

JOB NO. _____

LOCATION Burlington, VT

SHEET 1 OF 4



DATA POINT	REFERENCE ELEVATION	Water Table Elevation							
		DATE	6-24-87	7-8-87	8-27-87	10-12-87	10-15-87	10-19-87	10-26-87
Recovery Well	345.06		.04'	.04'	.02'	.02'	.02'	.02'	.02'
			326.02	325.48	326.63	328.79	327.91	327.49	327.93

Notes: 1) Elevation datum assumed.
 2) "Reference Elevation" is elevation of top of PVC well casing at each data point.

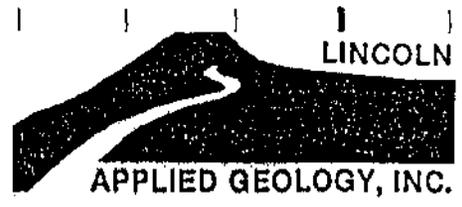
Table 1

PROJECT UVM - Business School

JOB NO. _____

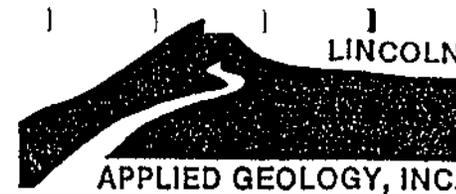
LOCATION Burlington, VT

SHEET 2 OF 4



DATA POINT	REFERENCE ELEVATION	Water Table Elevation								
		DATE	10-30-87	11-3-87	11-6-87	11-18-87	11-30-87	1-21-88	2-15-88	
Recovery Well	345.06	.02'	328.25	328.14	328.08	328.48	329.06	.04'	329.85	327.64

Notes: 1) Elevation datum assumed.
 2) "Reference Elevation" is elevation of top of PVC well casing at each data point.



DATA POINT	REFERENCE ELEVATION	Water Table Elevation							
		DATE	2-16-88	2-17-88	2-24-88	3-2-88	3-28-88	4-4-88	4-21-88
Recovery Well	345.06		327.64	Sheen 327.73	.02 328.00	.003 326.39	Sheen 327.06	326.64	.01 327.57

Notes: 1) Elevation datum assumed.
 2) "Reference Elevation" is elevation of top of PVC well casing at each data point.

PROJECT UVM - Business School

JOB NO. _____

LOCATION Burlington, VT

SHEET 4 OF 4



DATA POINT	REFERENCE ELEVATION	Water Table Elevation							
		DATE	4-25-88	5-6-88	6-10-88	6-27-88	7-8-88	8-17-88	8-26-88
Recovery Well	As of 5/88 341.80	Sheen	327.48	327.97	327.88	328.47	.02' 328.30	328.30	328.20
RG-1	341.37				336.95	DRY	DRY	DRY	DRY
RG-2	341.41				336.89	DRY	337.06	337.08	336.91

Notes: 1) Elevation datum assumed.
 2) "Reference Elevation" is elevation of top of PVC well casing at each data point.