



July 1, 1998

Mr. John Schmeltzer
Sites Management Section
Vermont Department of
Environmental Conservation
103 South Main Street
Waterbury, Vermont 05676

RE: Summary Report - Hardwick House of Pizza, Hardwick, Vermont (VDEC site # 94-1602).

Dear Mr. Schmeltzer:

Lincoln Applied Geology, Inc. (LAG) has completed the work outlined in our March 31, 1998 work scope and cost estimate for the abovementioned site. In this regard, we have sampled all accessible on-site wells, conducted a photoionization detector (PID) survey of the 70 cubic yard (yd³) soil stockpile, gathered information regarding the depth and specific location of the utilities surrounding the property, and prepared this summary report. This report describes the results along with our conclusions and recommendations for the site. The results clearly show that a plume of dissolved phase gasoline contamination exists beneath the site extending beyond the array of monitor wells. These data further suggest that the plume of contamination has likely migrated off the property toward Routes 14 and 15, with the ultimate receptor being the Lamoille River. The depth to ground water adjacent to Routes 14 and 15 is similar to the noted depths of a storm sewer, a water main, and a sanitary sewer which suggests that the plume could also be migratory along these preferential pathways.

Based on these findings, we recommend that three additional ground water monitor wells be installed on and off-site on the Lanphear Sales and Services property to completely define the extent and magnitude of the downgradient dissolved phase contaminant plume. It is also recommended that quarterly monitoring and sampling be conducted to track the magnitude of contamination over time. The soil stockpile should also be monitored again in September 1998 so that it can be thinspread as soon as levels decline sufficiently.

Enclosed for your information and use in reviewing this letter are the following attachments:

Table 1,	Ground Water/Product Thickness Data;
Table 2,	Photoionization Detector (PID) Results;
Table 3,	Ground Water Quality Results;
Figure 1,	Detailed Site Map

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Figure 2,	Ground Water Elevation Contour Map for April 15, 1998
Figure 3,	Water Quality Summary Map for April 15, 1998
Figure 4,	Proposed Monitor Well Location Map
Appendix A,	Water Quality Results
Appendix B,	Cost Estimate

Ground Water Monitoring

Figure 1 shows the pertinent details of the site including the requested depth of the utilities lines beneath Route 14/15. **Figure 2** is a Ground Water Contour Map prepared from water level data collected during our April 15, 1998 monitoring and sampling round. The ground water elevation data are presented on **Table 1**. It is important to note that ground water flows to the northeast toward Route 14/15 along a relatively flat gradient of 0.006 to 0.01 feet/foot. Lanphear Sales and Service is located directly downgradient of the House of Pizza underground storage tank (UST) and dispenser island area (source area). The ultimate receptor of this contamination appears to be the Lamoille River which flows to the east of the Lanphear Sales and Service building.

Water levels and the depth of utilities beneath the site are similar, suggesting that the plume of contamination may be using one or more of the utilities as preferential conduit. However, the current array of monitor wells is not adequate enough to determine if ground water and/or contamination is migrating preferentially.

Headspace Monitoring

On April 15, 1998 a round of monitoring and sampling was completed by a representative of LAG. As a part of the site monitoring PID headspace measurements were collected from each of the six on-site monitor wells. **Table 2** present the results of the PID sampling. MW-2 was not measured with the PID because it was destroyed. Monitor well MW-3 contained a significant PID assay (180 parts per million) and all other wells, except MW-4, contained low to moderate assays. Well MW-4 did not contain any detectable concentrations of volatile petroleum compounds above background (BG). These data indicate that some significant adsorbed and vapor phase contamination is present in the area of MW-3.

Ground Water Sampling

Ground water samples were collected from all accessible monitor wells on April 15, 1998 after each well was first purged using industry accepted methods. The collected samples were taken on ice to Green Mountain Laboratories, in Montpelier, VT



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to be analyzed for benzene, toluene, ethylbenzene, and xylene (BTEX) and methyl tert butyl ether (MTBE). As previously mentioned, well MW-2 was not sampled because it was destroyed.

Results of the ground water sampling are depicted on **Figure 2**, the Water Quality Summary Map, and tabulated on **Table 3**. These data clearly show that a plume of dissolved phase contamination containing elevated concentrations of BTEX and MTBE is present in the area of monitor wells MW-3 and MW-5. The presence of these elevated concentrations in well MW-5 (the most downgradient well) indicates that the downgradient extent of the dissolved phase plume is not fully known. As previously discussed, this is problematic because the water and sewer lines are at the same approximate depth as the water table, and they may be actively redirecting ground water and/or contaminant flow.

Stockpile Monitoring

On April 15, 1998, the 70 yds³ soil stockpile located to the west of the building was monitored using a properly calibrated PID in order to assess the level of contamination remaining in the pile. Ten PID measurements were collected on an evenly spaced grid throughout the pile. The collected data presented in **Table 2** clearly show that some low level vapor and adsorbed phase contamination is still present within the pile.

Based on the fact that there is still some contamination present in the stockpile, we recommend that it be monitored again in September 1998. If PID levels decline to below 1 part per million (ppm) and there is no visual or olfactory evidence of contamination, a soil sample will be collected from the pile and analyzed for BTEX, MTBE, and total petroleum hydrocarbon (TPH). If no detectable BTEX, MTBE, and TPH is present in the pile, it will be thinspread onsite. **Appendix B** contains a cost estimate to perform the stockpile monitoring and sampling if necessary.

Conclusions and Recommendations

Data collected from the April 15, 1998 monitoring and sampling round indicate that elevated BTEX and MTBE contamination is present on-site extending from the dispenser island area to, at least, the northeast property boundary (edge of Route 14/15). The location and depth of the water and sewer lines beneath Route 14/15 may be acting as a preferential conduit, and diverting the contamination. Because of this, it is not currently possible to define the full extent of contamination due to the lack of downgradient wells. In this regard, we recommended that the following be completed



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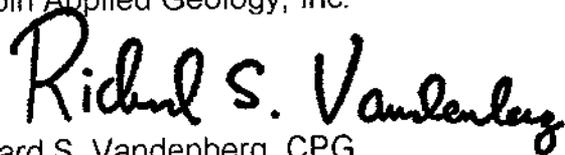
to better define the contaminant plume, and then to track the levels of contamination with time:

1. Three additional monitor wells should be installed on-site and across Route 14 and 15 in an attempt to better define the downgradient and lateral extent of the dissolved phase contaminant plume.
2. Once the new wells are installed and properly developed, initiate quarterly sampling to define the extent and magnitude of the dissolved phase contamination.
3. Because the storm sewer, is the nearest downgradient buried utility, the utility most intimately associated with the ground water system (i.e. 7 feet deep), and the utility with the most open structure (i.e. not water tight), the inlet and outlet (shown on **Figure 4**) should also be sampled when the well array is sampled.

Appendix B contains a cost estimate to complete the abovementioned recommendations including stockpile monitoring and sampling. We are prepared to initiate this work immediately upon your concurrence with these recommendations.

Please do not hesitate to call me or, Steve Revell, Senior Hydrogeologist at (800) 477-4384 if you have any questions or comments regarding this summary report.

Very Truly Yours,
Lincoln Applied Geology, Inc.



Richard S. Vandenberg, CPG
Hydrogeologist

RSV/njp
enclosure

cc: Peter Georgiadis

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Environmental Consultants

Revell Drive • Lincoln, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

Project: House of Pizza
Location: Hardwick, Vermont

Table 1
VDEC Site # 94-1602
Sheet 1 of 1

Ground Water Elevation/Product Level (feet)

Data Point	TOC	05/25/95	04/15/98				
MW-1	100.00	91.50	92.55				
MW-2	99.86	91.46					
MW-3	99.95	91.28	92.43				
MW-4	99.40	90.82	92.05				
MW-5	98.88	90.88	91.98				
MW-6	98.82	91.20	92.32				

Notes:

- 1 - Elevation datum assumed
- 2 - Reference elevation is elevation of top of PVC well casing
- Light Grey Cell = DRY
- Dark Grey Cell = Inaccessible

Photoionization Results (PID - ppm)

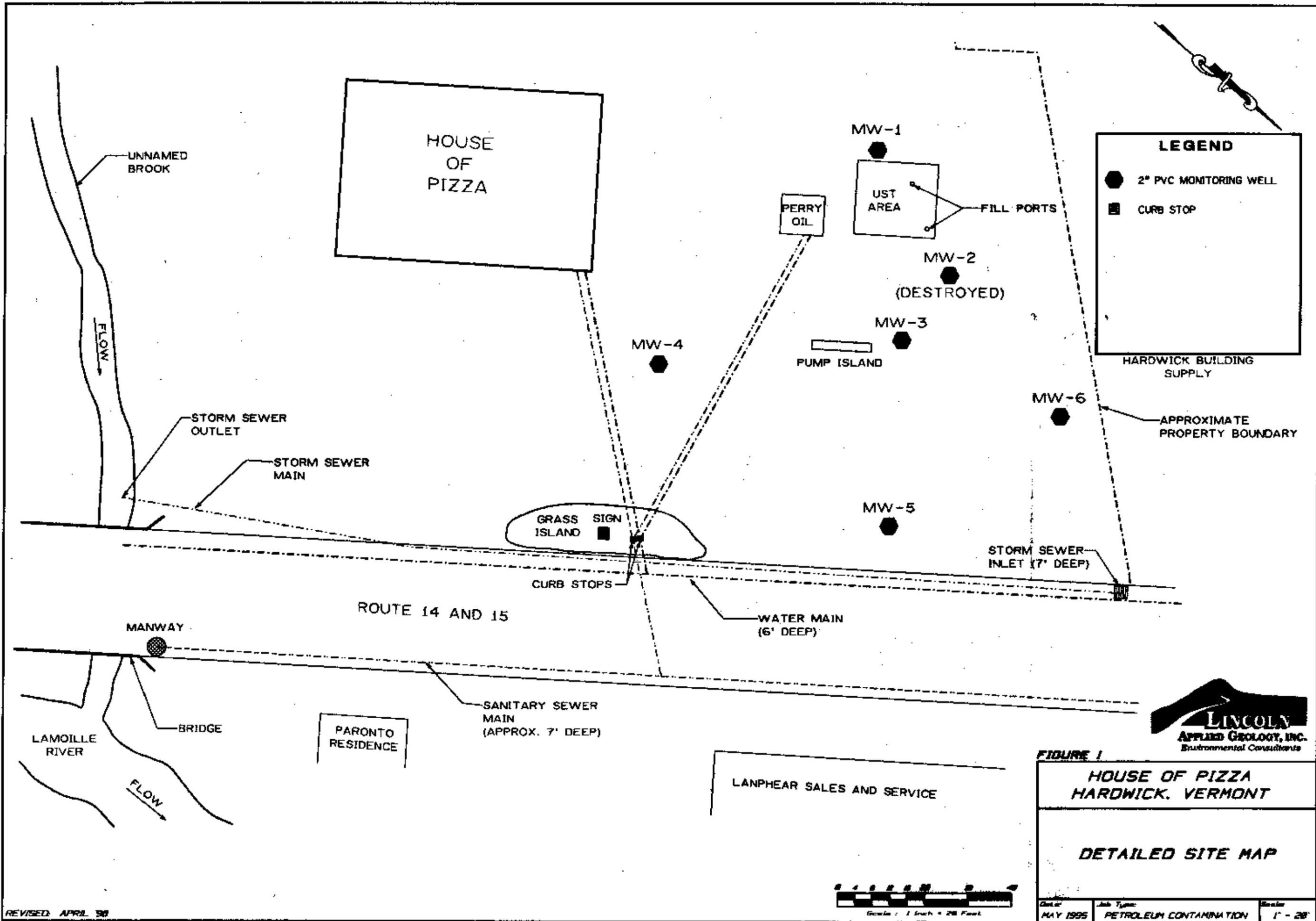
Data Point	05/25/95	06/27/95	04/15/98			
MW-1	64		6.0			
MW-2	30					
MW-3	SL		180			
MW-4	42		BG			
MW-5	162		60			
MW-6	SL		26			
SS-1			3.6			
SS-2			BG			
SS-3			1.2			
SS-4			2.2			
SS-5			BG			
SS-6			BG			
SS-7			BG			
SS-8			0.9			
SS-9			1.2			
SS-10			6.0			

Notes:
BG - Background
SL - Saturated Lamp
Light Grey Cell = DRY
Dark Grey Cell = Inaccessible
SS = Soil Samples
MW = Monitor Well

Ground Water Quality Results (ppb)

Data Point	Compound	05/25/95	04/15/98			
MW-1	Benzene	830	<1			
	Toluene	120	<1			
	Ethylbenzene	140	<1			
	Xylenes	680	<3			
	MTBE	5,000	<5			
	BTEX	1,770	<6			
MW-2	Benzene	4,400				
	Toluene	2,900				
	Ethylbenzene	66				
	Xylenes	3,000				
	MTBE	2,200				
	BTEX	10,366				
MW-3	Benzene	6,100	23,000			
	Toluene	3,200	26,000			
	Ethylbenzene	610	1,100			
	Xylenes	2,900	20,000			
	MTBE	5,500	25,000			
	BTEX	12,810	70,100			
MW-4	Benzene	120	210			
	Toluene	160	13			
	Ethylbenzene	6	<5			
	Xylenes	37	21			
	MTBE	23	420			
	BTEX	323	249			
MW-5	Benzene	5,600	4,200			
	Toluene	250	26			
	Ethylbenzene	520	72			
	Xylenes	900	48			
	MTBE	11,000	12,000			
	BTEX	7,270	4,346			
MW-6	Benzene	<25	<1			
	Toluene	<25	<1			
	Ethylbenzene	<25	<1			
	Xylenes	<75	<3			
	MTBE	<125	<5			
	BTEX	<150	<6			

NOTES:
 < - Contaminant not detected at specified detection limit



LEGEND

- 2" PVC MONITORING WELL
- CURB STOP

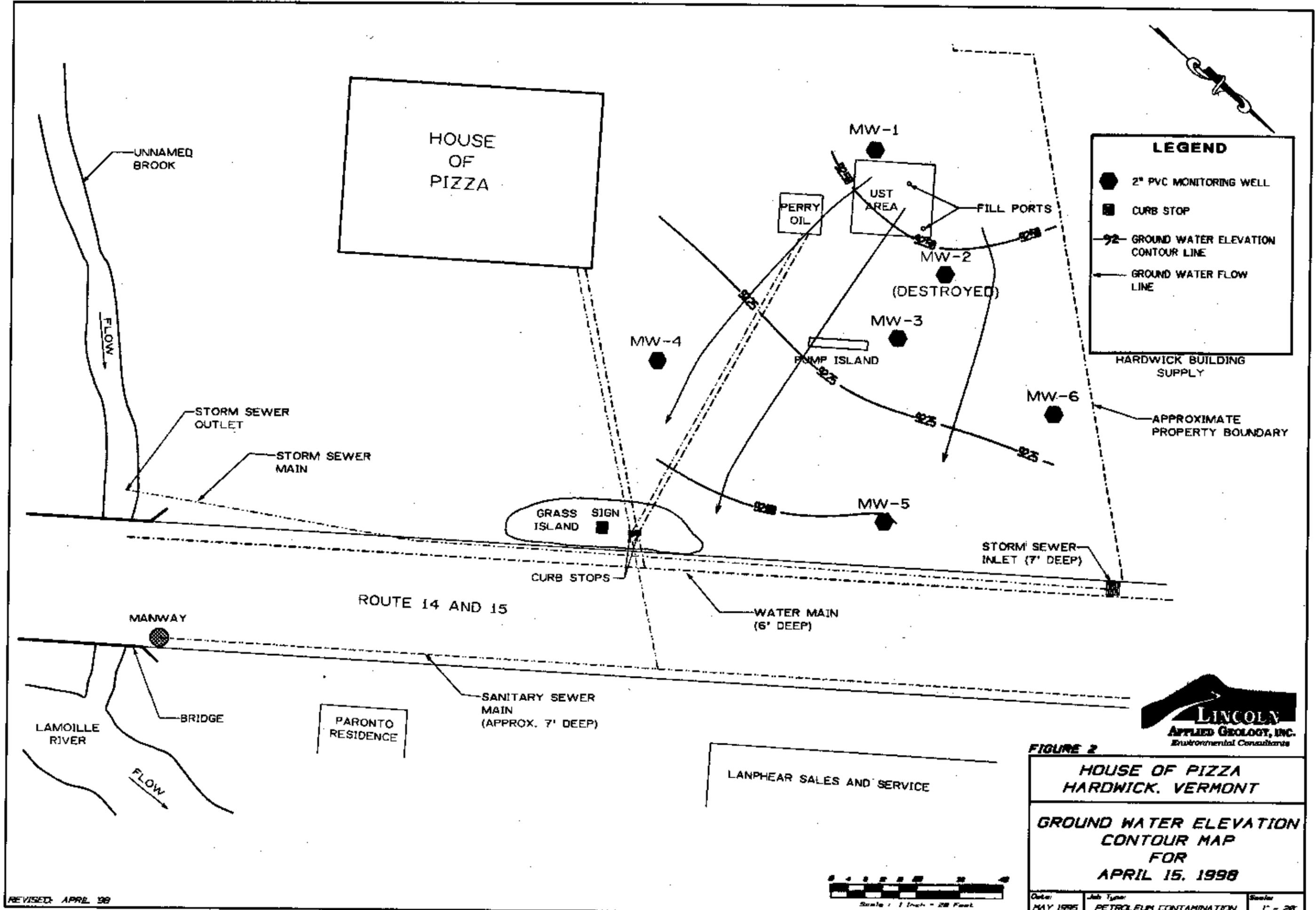
HARDWICK BUILDING SUPPLY



FIGURE 1
HOUSE OF PIZZA
HARDWICK, VERMONT
DETAILED SITE MAP



Date: MAY 1995	Job Type: PETROLEUM CONTAMINATION	Sheet: 1 - 28
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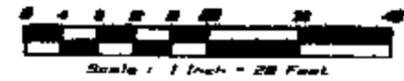
LEGEND

- 2" PVC MONITORING WELL
- CURB STOP
- GROUND WATER ELEVATION CONTOUR LINE
- GROUND WATER FLOW LINE



FIGURE 2
HOUSE OF PIZZA
HARDWICK, VERMONT
GROUND WATER ELEVATION
CONTOUR MAP
FOR
APRIL 15, 1998

Date: MAY 1995	Job Type: PETROLEUM CONTAMINATION	Scale: 1" = 20'
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SCALE: 1" = 20' (SEE NOTE ON DRAWING)

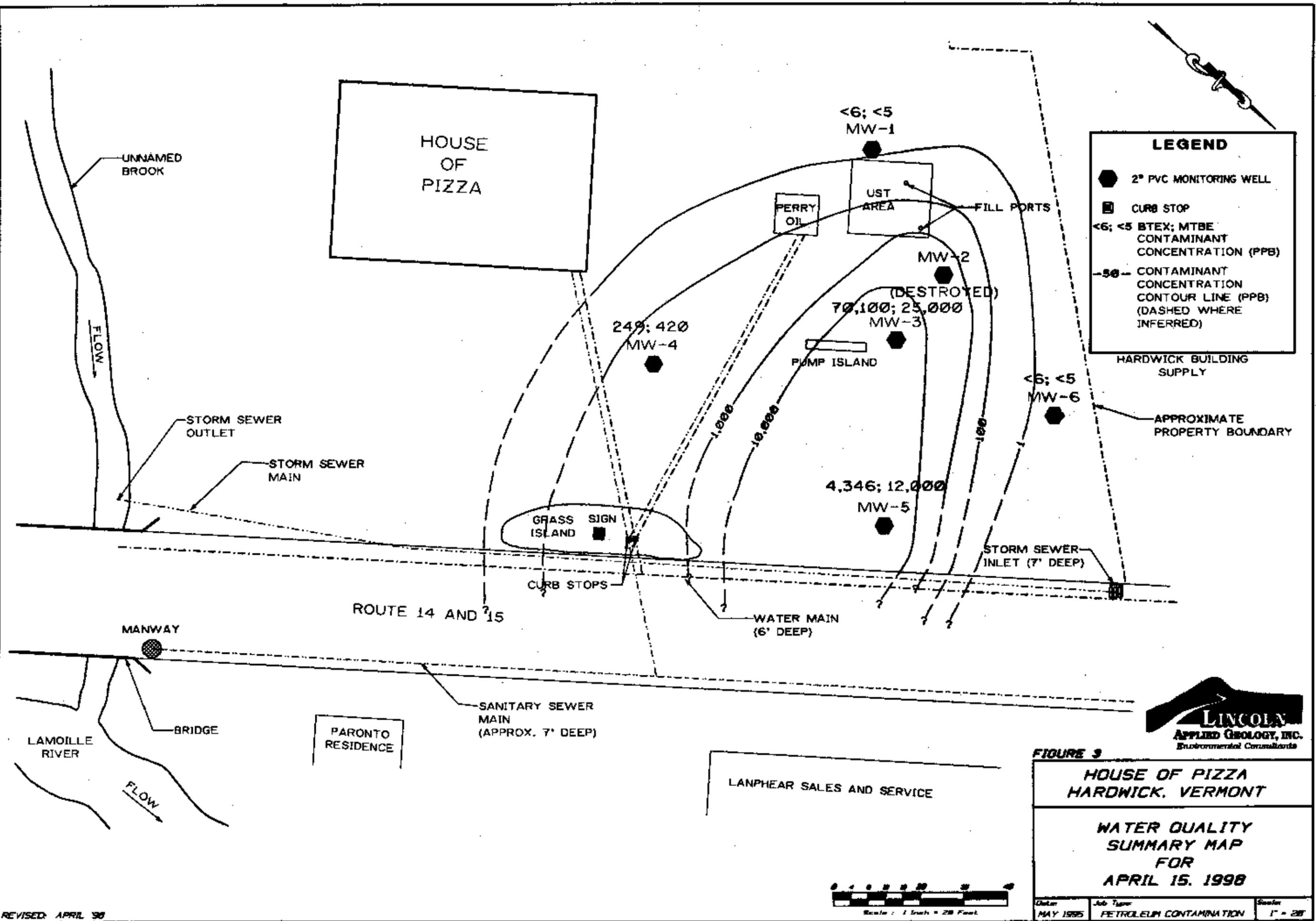
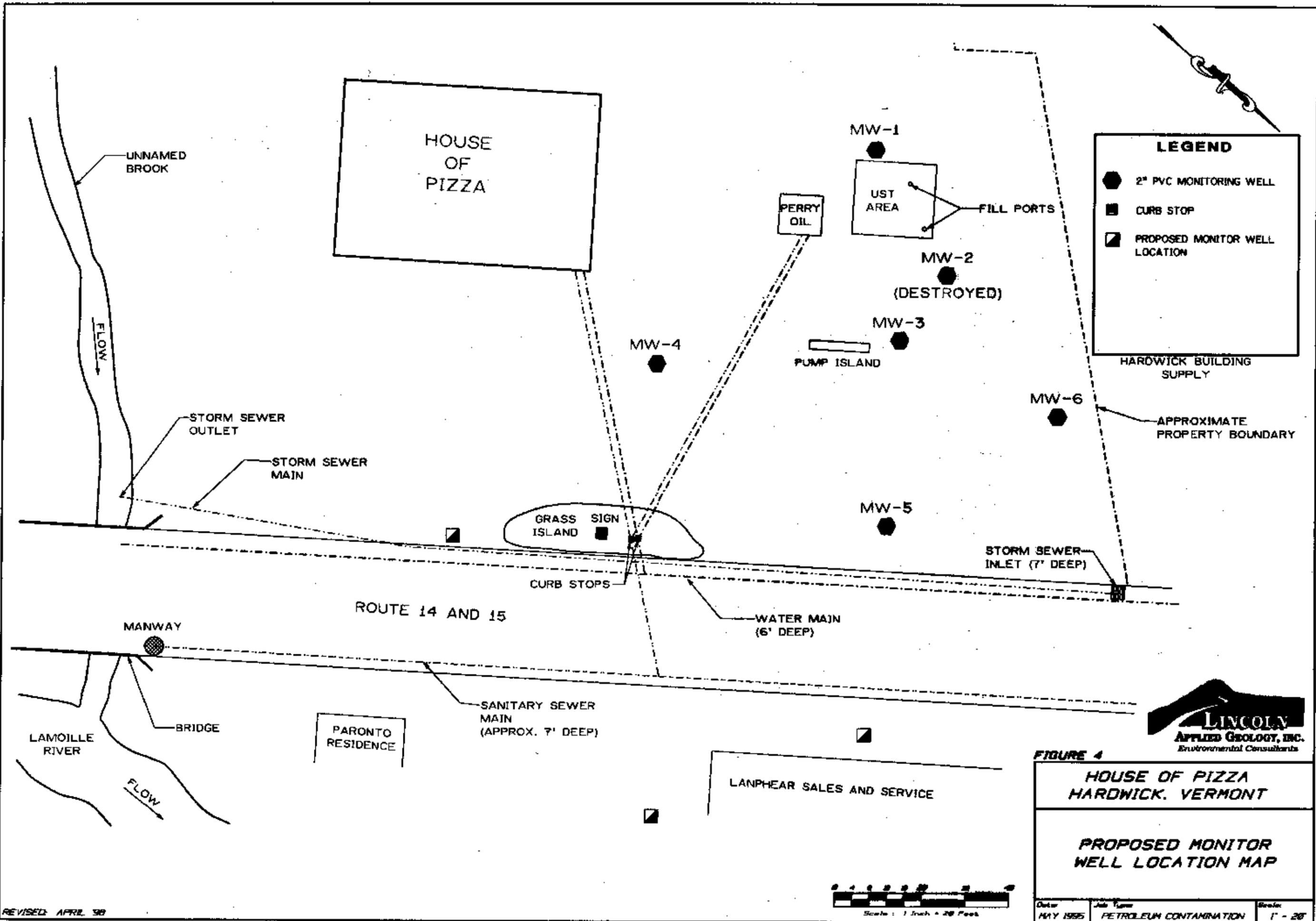


FIGURE 3
HOUSE OF PIZZA
HARDWICK, VERMONT

WATER QUALITY
SUMMARY MAP
FOR
APRIL 15, 1998

Date:	Job Title:	Scale:
MAY 1995	PETROLEUM CONTAMINATION	1" = 20'



LEGEND

- 2" PVC MONITORING WELL
- CURB STOP
- ◻ PROPOSED MONITOR WELL LOCATION



FIGURE 4
HOUSE OF PIZZA
HARDWICK, VERMONT
PROPOSED MONITOR
WELL LOCATION MAP



Appendix A

Ground Water Quality Results for April 15, 1998

GREEN MOUNTAIN LABORATORIES, INC.

RR 3, BOX 5210
Montpelier, Vermont 05602

Phone (802) 223 - 1468

APR 28 1998
Fax (802) 223 - 8688

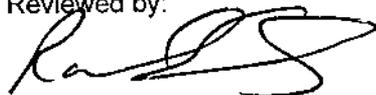
LABORATORY RESULTS

CLIENT NAME:	Lincoln Applied Geology	REFERENCE NO:	3586
ADDRESS:	RD 1 Box 710 Bristol, VT 05443	PROJECT NO:	NA
SAMPLE LOCATION:	Hose of Pizza	DATE OF SAMPLE:	04/15/98
SAMPLER:	Jeremy Revell	DATE OF RECEIPT:	04/15/98
ATTENTION:	Rick Vandenberg	DATE OF ANALYSIS:	04/23/98-04/27/98
		DATE OF REPORT:	04/27/98

Pertaining to the analyses of specimens submitted under the accompanying chain of custody form, please note the following:

- The Trip Blank was prepared by the client with reagent grade water supplied by the laboratory.
- Water samples submitted for VOC analysis were preserved with HCl.
- Specimens were processed and examined according to the procedures outlined in the specified method.
- Holding times were honored.
- Instruments were appropriately tuned and calibrations were checked with the frequencies required in the specified method.
- Blank contamination was not observed at levels interfering with the analytical results.
- Continuing Calibration standards were monitored at intervals indicated in the specified method. The resulting analytical precision and accuracy were determined to be within method QA/QC acceptance limits.
- The efficiency of analyte recovery for individual samples was monitored by the addition of surrogate analyte to all samples, standards, and blanks. Surrogate recoveries were found to be within laboratory QA/QC acceptance limits, unless noted otherwise.

Reviewed by:



Raul Sanchez
Chemical Services

GREEN MOUNTAIN
APR 28 1998
LINCOLN APPLIED GEOLOGY

GREEN MOUNTAIN LABORATORIES, INC.

Montpelier, Vermont 05602

Phone (802) 223 - 1468

Fax (802) 223 - 8688

LABORATORY RESULTS

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

GML REF. # : 3586
STATION: TRIP BLANK
ANALYSIS DATE: 04/23/98
DATE SAMPLED: 04/15/98
SAMPLE TYPE: WATER

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	1	ND
Toluene	1	ND
Ethylbenzene	1	ND
Xylenes	3	ND
MTBE	5	ND

Surrogate % Recovery: 102 %

ND = Not Detected
BPQL = Below Practical Quantitation Limits

APR 23 1998

9 1998

GREEN MOUNTAIN GEOLOGY

GREEN MOUNTAIN LABORATORIES, INC.

Montpelier, Vermont 05602

Phone (802) 223 - 1468

Fax (802) 223 - 8688

LABORATORY RESULTS

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

GML REF. # : 3586
STATION: MW-3
ANALYSIS DATE: 04/27/98
DATE SAMPLED: 04/15/98
SAMPLE TYPE: WATER

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	200	23000
Toluene	200	26000
Ethylbenzene	200	1100
Xylenes	600	20000
MTBE	1000	25000

Surrogate % Recovery: 101 %

ND = Not Detected
BPQL = Below Practical Quantitation Limits

APR 29 1998

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APR 28 1998

APR 28 1998

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Montpelier, Vermont 05602

Phone (802) 223 - 1468

Fax (802) 223 - 8688

LABORATORY RESULTS

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

GML REF. # : 3586
STATION: MW-4
ANALYSIS DATE: 04/25/98
DATE SAMPLED: 04/15/98
SAMPLE TYPE: WATER

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	5	210
Toluene	5	13
Ethylbenzene	5	ND
Xylenes	15	21
MTBE	25	420

Surrogate % Recovery: 102 %

ND = Not Detected
BPQL = Below Practical Quantitation Limits

APR 29 1998

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Montpelier, Vermont 05602

Phone (802) 223 - 1468

Fax (802) 223 - 8688

LABORATORY RESULTS

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

GML REF. #: 3586
STATION: MW-1
ANALYSIS DATE: 04/24/98
DATE SAMPLED: 04/15/98
SAMPLE TYPE: WATER

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	1	ND
Toluene	1	ND
Ethylbenzene	1	ND
Xylenes	3	ND
MTBE	5	ND

Surrogate % Recovery: 103 %

ND = Not Detected
BPQL = Below Practical Quantitation Limits

APR 28 1998

APPLIED GEOLOGY

GREEN MOUNTAIN LABORATORIES, INC.

Montpelier, Vermont 05602

Phone (802) 223 - 1468

Fax (802) 223 - 8688

LABORATORY RESULTS

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

GML REF. #: 3586
STATION: MW-6
ANALYSIS DATE: 04/24/98
DATE SAMPLED: 04/15/98
SAMPLE TYPE: WATER

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	1	ND
Toluene	1	ND
Ethylbenzene	1	ND
Xylenes	3	ND
MTBE	5	ND

Surrogate % Recovery: 101 %

ND = Not Detected
BPQL = Below Practical Quantitation Limits

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APR 29 1998

GREEN MOUNTAIN LABORATORIES, INC.

Montpelier, Vermont 05602

Phone (802) 223 - 1468

Fax (802) 223 - 8688

LABORATORY RESULTS

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

GML REF. #: 3586
STATION: MW-5
ANALYSIS DATE: 04/24/98-04/25/98
DATE SAMPLED: 04/15/98
SAMPLE TYPE: WATER

PARAMETER	PQL (µg/L)	Conc. (µg/L)
Benzene	1	4200*
Toluene	1	26
Ethylbenzene	1	72
Xylenes	3	48
MTBE	5	12000*

Surrogate % Recovery: 103 %

ND = Not Detected

BPQL = Below Practical Quantitation Limits

* Sample was reanalyzed at a higher dilution in order to bring this value within the calibration curve.

APPLIED GEOLOGY

APR 28 1998

Appendix B
Cost Estimate

**House of Pizza
Hardwick, Vermont
(VDEC Site #94-1602)**

Cost Estimate for Additional Work

A. Installation of Three Additional Wells

Subcontracted Drilling-	3	wells @	\$565.00	per well	\$	1,695.00
Hydrogeologist/Site Manager -	1	hr(s) @	\$60.00	per hour	\$	60.00
Geologist/Site Manager -	10	hr(s) @	\$45.00	per hour	\$	450.00
PID (Photoionization Detector) -	1	day(s) @	\$75.00	per day	\$	75.00
Peristaltic Pump -	1	day(s) @	\$75.00	per day	\$	75.00
LEL meter-	1	day(s) @	\$25.00	per day	\$	25.00
Mileage -	300	mile(s) @	\$0.30	per mile	\$	90.00
Subtotal						\$ 2,470.00

B. Quarterly Sampling

Hydrogeologist/Site Manager -	2	hr(s) @	\$60.00	per hour	\$	120.00
Field Technician -	8	hr(s) @	\$35.00	per hour	\$	280.00
Generator and Pump -	1	day(s) @	\$110.00	per day	\$	110.00
PID and Interface Probe -	1	day(s) @	\$75.00	per day	\$	75.00
BTEX and MTBE Samples-	12	@	\$60.00	per sample	\$	720.00
Disposable Bailer (1.5) -	9.0	@	\$8.89	each	\$	80.01
Mileage -	300.0	mile(s) @	\$0.30	per mile	\$	90.00
Subtotal						\$ 1,475.01

C. Soil Stockpile Monitoring and Sampling, if necessary

-to be done in conjunction with item B

Hydrogeologist/Site Manager -	0.25	hr(s) @	\$60.00	per hour	\$	15.00
Field Technician -	1	hr(s) @	\$35.00	per hour	\$	35.00
Subtotal						\$ 50.00

D. Quarterly Reporting

Principal/Senior Hydrogeologist -	1	hr(s) @	\$85.00	per hour	\$	85.00
Hydrogeologist/Site Manager -	4	hr(s) @	\$60.00	per hour	\$	240.00
Computer/CAD Technician -	1	hr(s) @	\$30.00	per hour	\$	30.00
Administrative Assistant -	1	hr(s) @	\$35.00	per hour	\$	35.00
Subtotal						\$ 390.00
yearly cost (x4)						\$ 1,560.00

Grand Total >>> \$ 5,555.01