



May 19, 1994

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Mr. Charles B. Schwer
Petroleum Sites Coordinator
Vermont Department of
Environmental Conservation
103 South Main Street
Waterbury, Vermont 05676

RE: Summary of Environmental Work completed at Porter Medical Center,
Middlebury, Vermont (VDEC Site #93-1522).

Dear Mr. Schwer:

Lincoln Applied Geology, Inc. (LAG) completed the tasks recommended in our December 28, 1993 work plan which was approved by you. These tasks include the following:

1. Installation of 3 additional ground water monitor wells. Two bedrock wells and one shallow overburden well to verify the presence of ground waters above bedrock.
2. Development and sampling of all on-site wells for BTEX, MTBE, and TPH.

Results of this work indicate that ground water beneath the site has not been significantly impacted by the fuel oil contamination observed in December 1993 during the underground storage tank (UST) removal activities. Furthermore, the ground water and soils in the vicinity of the former UST, which were impacted by fuel oil, remain the only documented receptors of this contamination. The contaminated soils were removed from the excavation and the minimal accumulations of free floating fuel oil are being effectively reduced via a Soak Ease adsorbent bailer installed in MW-1. To date approximately 0.5 gallons of product has been recovered and free floating fuel oil has not been detected during our monitoring rounds since January 17, 1994. Because the source of the contamination was removed and there is no significant contamination extending beyond the former UST area, LAG recommends that semi-annual ground water quality sampling be conducted to verify the low to non-detectable ground water concentrations that have been detected. It should commence in June and continue for one year. We also recommend that this coming fall the stockpiled soils that were removed from the former UST area be re-evaluated by PID with appropriate sampling to determine their

Mr. Charles B. Schwer
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ultimate disposition. If concentrations detected in the ground waters remain below Vermont Enforcement Standards, LAG will not recommend further subsurface work and will only recommend a treatment plan for the stockpiled soils based on our PID assays and analytical results.

In the forthcoming summer, Porter Medical Center has planned to build an additional wing over the location of the former UST area (**Figure 2**). The soils in the vicinity of the former tanks will be excavated down to bedrock during this process. LAG recommends overseeing the excavation of soils in order to appropriately segregate the clean soils from any additional contaminated soils that may be encountered. LAG will be prepared to install vapor extraction pipes within the subgrade materials if vapor impacts to the new wing are deemed a potential. If vapor impacts do occur a vapor extraction system could be readily installed utilizing these pipes. Costs to complete this work are attached in **Appendix C**.

Three additional monitor wells were installed on March 21, 1994. Two bedrock wells (MW-2 and MW-3) and one overburden well (MW-4) were installed at VDEC approved locations in order to intercept any contamination migrating in the downgradient direction. MW-1 was installed during the tank removal activities.

Locations of the wells are depicted on **Figure 2**. MW-4 was installed within overburden materials above bedrock to verify the presence or lack of ground waters above bedrock, because the depth to bedrock across the site is relatively shallow. Borings were started with 4.25-inch hollow stem augers and advanced to the bedrock surface. Upon intercepting the bedrock surface in MW's 2 and 3, a 3^{7/8}-inch hammer bit was utilized to extend the boring as an open hole until water bearing fractures were intercepted. Monitor wells were constructed within the open holes in bedrock. **Appendix A** contains the geologic logs along with monitor well construction details.

The overburden materials consist of fine brown silts and light grey clays. A white to light grey limestone bedrock was encountered below the overburden. The bedrock and overburden samples were screened with a PID for volatile organic compounds (VOC's). PID assay results can also be found on each attached geologic log although no significant vapors or positive PID assays were recorded.

Two inch PVC ground water monitor wells were constructed and installed within each boring, after sufficient fractured bedrock was penetrated. Each



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RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

well was packed with clean No. 1 sand to above the screen and a sufficient bentonite seal was installed above the sand pack. Each well was then appropriately developed until the discharge was clear and free of sediment. PID assay results of the overburden and bedrock samples obtained during drilling indicate that no VOC's were detected.

Water level data was utilized along with stadia survey information for each well to generate **Figure 3**, a Ground Water Contour Map. Ground water flows to the northeast. Based on the topography of the area, ground water would be expected to flow more easterly toward Otter Creek. We do believe that MW-2, MW-3, and MW-4 are appropriately located to intercept potential contaminant migration from the former tank excavation. Wells MW-2 and MW-3 are completed at different depths, thus the different vertical upward pressures exerted on each of the wells probably caused different water levels which in turn may have skewed the resulting ground water contour map. **Table 1** contains water elevation data obtained from each of the monitor wells. Waters were detected in MW-4 during the sampling round, but were probably seasonal melt waters. MW-1 has not contained measurable thicknesses of fuel oil since January 17, 1994. Soak Ease adsorbent bailers have collected approximately 0.5 gallons of product to date. Soak Ease bailers continue to be utilized in MW-1 and are exchanged when fully saturated. **Chart 1** shows the water level trend for MW-1, which shows that water elevations have continued to increase throughout the spring.

Each well was appropriately sampled for BTEX, MTBE, and TPH analysis utilizing gas chromatography techniques. The wells were purged using industry accepted methods and samples were collected and placed in 40 milliliter bottles. The collected samples were placed on ice and brought to MicroAssays of Vermont in Montpelier along with proper chain-of-custody forms and a trip blank.

Water quality results indicate that the bedrock aquifer is minimally impacted with xylenes and toluene but not benzene. MW-2 and MW-3 contained 11 parts per billion (ppb) and 6 ppb BTEX, respectively. No MTBE, above quantification limits, was detected in any of the water samples as would be expected with fuel oils. **Table 2** contains tabulated headspace PID data from each well and **Table 3** contains summarized ground water chemistry results. Copies of formal laboratory can be found in **Appendix B**. **Figure 4** shows the spatial distribution of the BTEX constituents detected which show that there is no impact to the ground waters on the site in excess of Vermont's Ground Water Enforcement Standards (GWES).



Mr. Charles B. Schwer

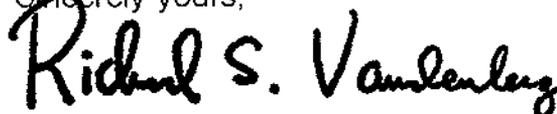
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Concentrations of soluble BTEX are low to non-existent in the ground waters beneath the site. Product has not been detected in MW-1 since January 17, 1994, although, Soak Ease adsorbent bailers continue to be utilized and are replaced as they become saturated. The trace accumulation of fuel oil indicates that the product is localized in the area of MW-1. As a result of these findings, LAG recommends that semi-annual monitoring (2 rounds) be conducted for one year to verify the low to non-existent impact into the ground waters beneath the site. LAG also recommends commencing the semi-annual ground water monitoring and sampling in June. The stockpiled soils will be assayed in October and a treat and/or monitor plan will be developed. Monitoring and sampling will be followed by semi-annual reporting. LAG will work directly with Porter Medical Center to arrange to monitor soils removed during excavation for the new wing. LAG will also be prepared to install lateral vapor extraction wells in the subgrade of the new wing. A cost estimate for the continued work is attached as **Appendix C**.

If you have any questions, comments or concerns with regard to this matter, please do not hesitate to call me or John Amadon, LAG project manager, at 453-4384.

Sincerely yours,



Richard S. Vandenberg
Hydrogeologist

RV/smd

Enclosures

cc: Dave Begins, Porter Medical Center



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Ground Water Elevation/Product Level (feet)

Data Point	TOC	12-13-93	12-21-93	12-28-93	1-10-94	1-17-94	1-27-94
MW-1	100.01	90.00	90.05	90.09	90.08	89.88	
MW-2	94.52						
MW-3	96.32						
MW-4	96.78						

NOTES:

- 1 - Elevation datum assumed
- 2 - Reference elevation is elevation of top of PVC well casing
- * - Water entering at top of casing

Ground Water Elevation/Product Level (feet)

Data Point	TOC	2-1-94	2-7-94	2-14-94	3-2-94	3-7-94	3-21-94
MW-1	100.01	90.13	89.60	89.46	90.04	89.84	89.77
MW-2	94.52						
MW-3	96.32						
MW-4	96.78						

NOTES:

- 1 - Elevation datum assumed
- 2 - Reference elevation is elevation of top of PVC well casing
- * - Water entering at top of casing

Project: Porter Medical Center
Location: Middlebury, Vermont

Table 1
Job Number: 93-1522
Sheet 3 of 3

Ground Water Elevation/Product Level (feet)

Data Point	TOC	3-29-94	4-12-94			
MW-1	100.01	90.31	90.61			
MW-2	94.52	85.47	89.82			
MW-3	96.32	91.99	91.47			
MW-4	96.78	92.38	92.02			

NOTES:

- 1 - Elevation datum assumed
- 2 - Reference elevation is elevation of top of PVC well casing
- * - Water entering at top of casing

Project: Porter Medical Center
Location: Middlebury, Vermont

Table 2
Job Number: 93-1522
Sheet 1 of 2

Photoionization Results (PID - ppm)

Data Point	12-13-93	12-21-93	12-28-93	1-10-93	1-17-94	1-27-94	2-1-94
MW-1	2.2	0.8	1.6	1.0	0.2	0.4	5.8
MW-2							
MW-3							
MW-4							

NOTES:

BG - Background

SL - Saturated Lamp

* - PID measurements taken with system off

Photoionization Results (PID - ppm)

Data Point	2-7-94	2-14-94	3-2-94	3-7-94	3-21-94	3-29-94	4-12-94
MW-1	2.4	2.6	2.2	4.2	12	0.4	2.8
MW-2						3.0	2.0
MW-3						0.4	1.0
MW-4						3.2	1.4

NOTES:

BG - Background

SL - Saturated Lamp

* - PID measurements taken with system off

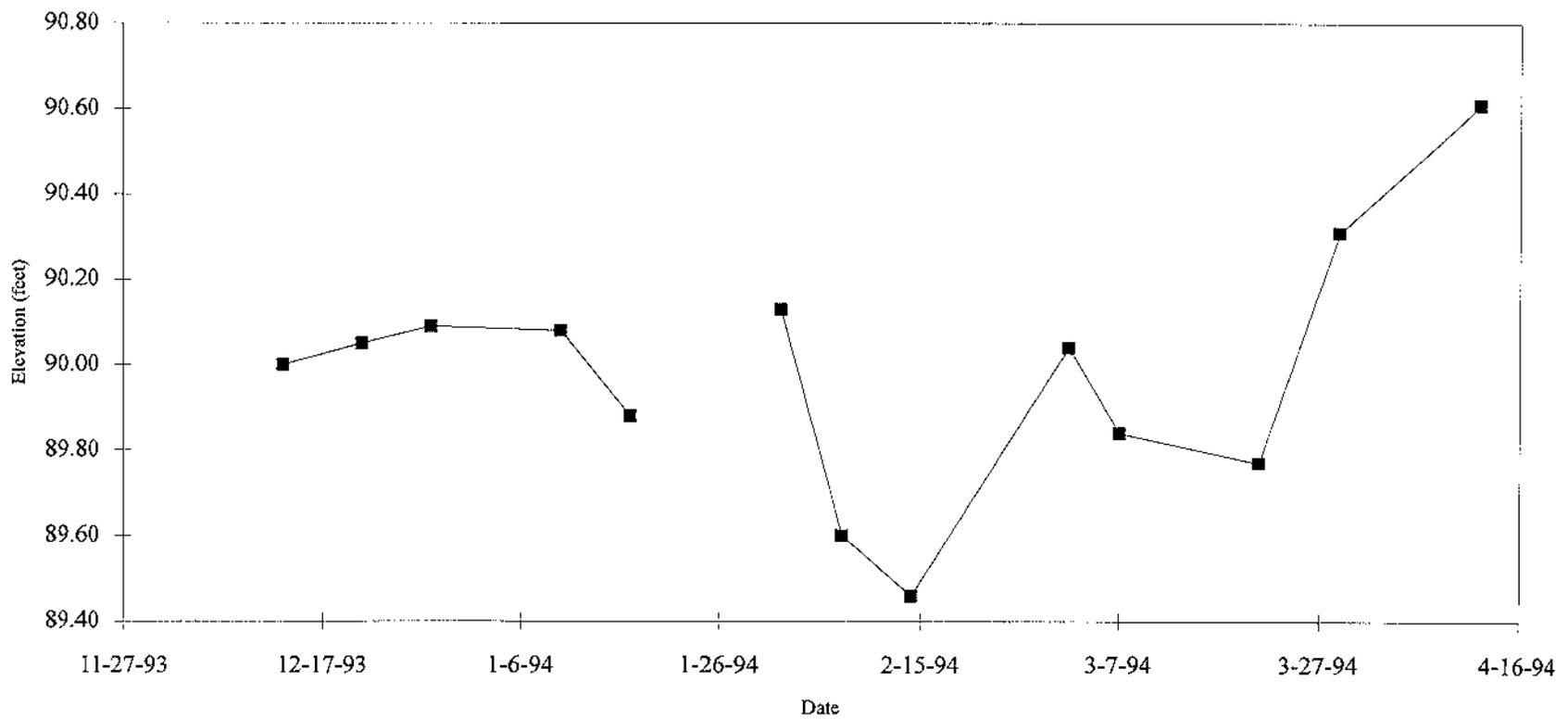
Ground Water Quality Results (ppb)

Data Point	3-29-94					
MW-1	<30	<5				
MW-2	11	<1				
MW-3	6	<1				
MW-4	26	<1				

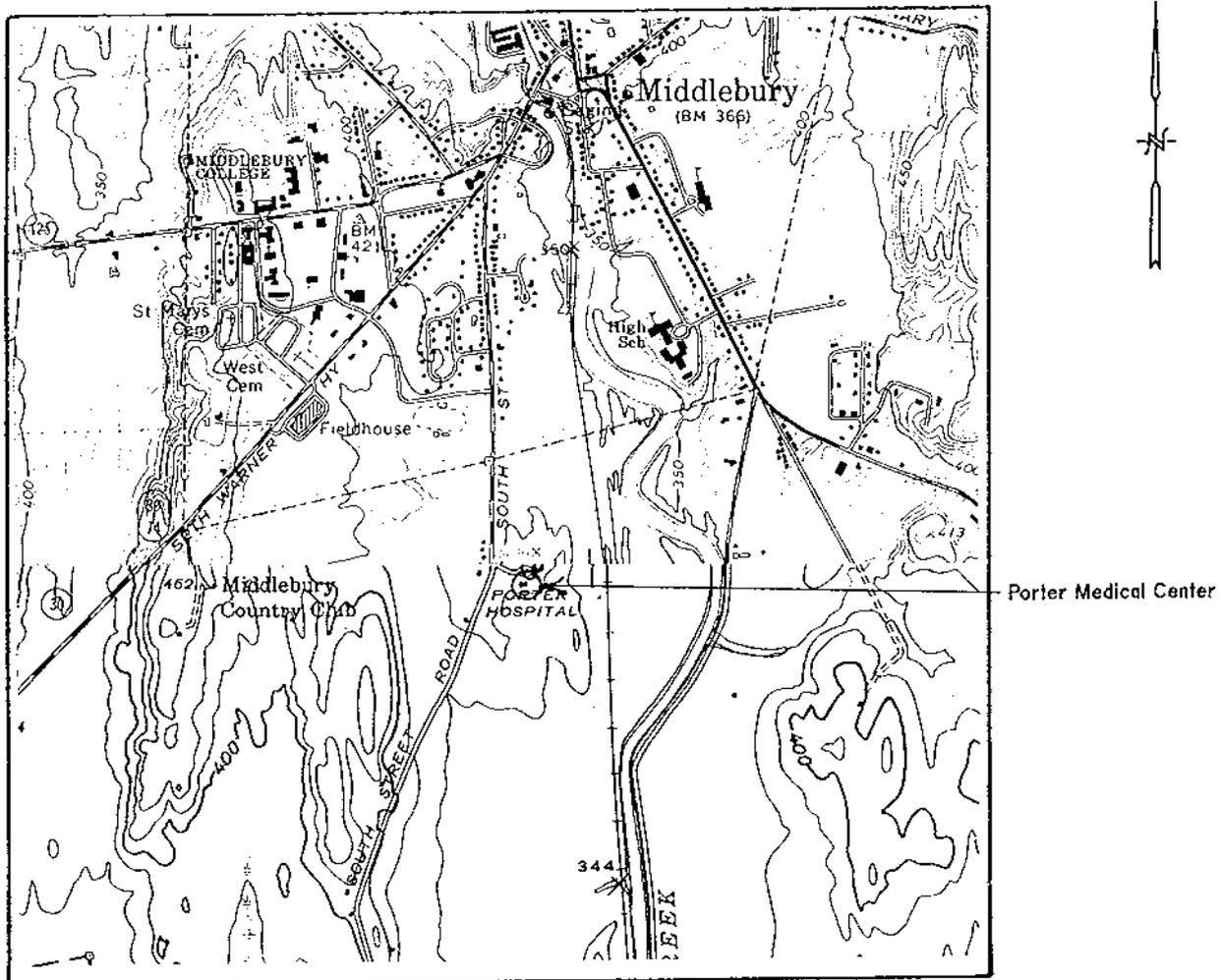
NOTES:
MTBE in upper right corner of cell
BTEX in lower left corner of cell
< - Contaminant not detected at specified detection limit

Porter Medical Center
Middlebury, Vermont
VDEC Site # 93-1522

MW-1 Water level Trend vs. Date



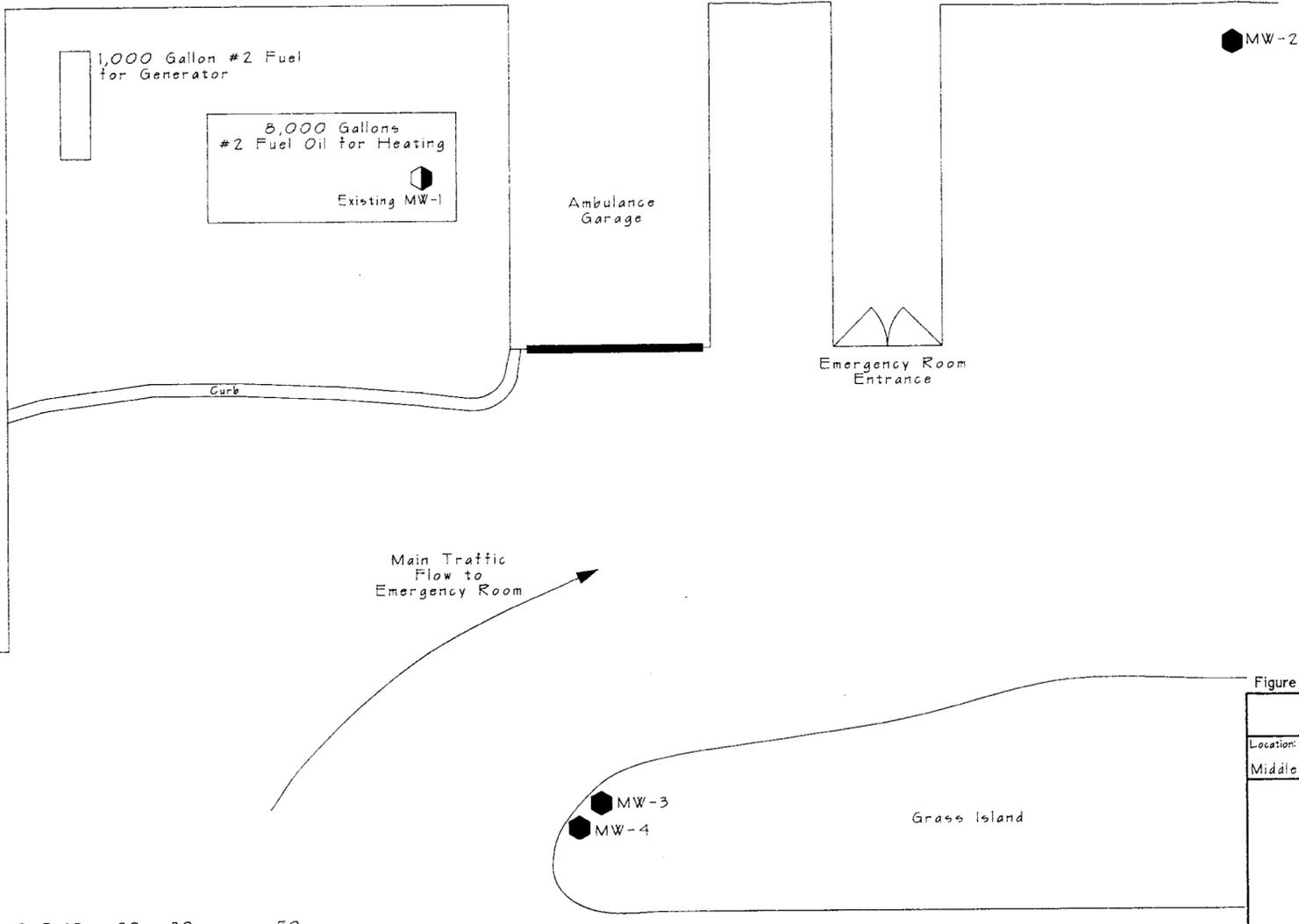
Porter Medical Center GENERAL LOCATION MAP



Source: U.S.G.S. 7.5 min.
Topo Series
Middlebury and
Cornwall VT. Quads

Scale: 1" = 2000'

Porter Hospital



LEGEND

-  Existing Monitoring Well
-  2" PVC Monitoring Well

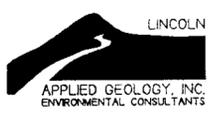
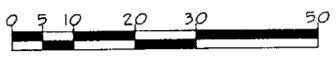
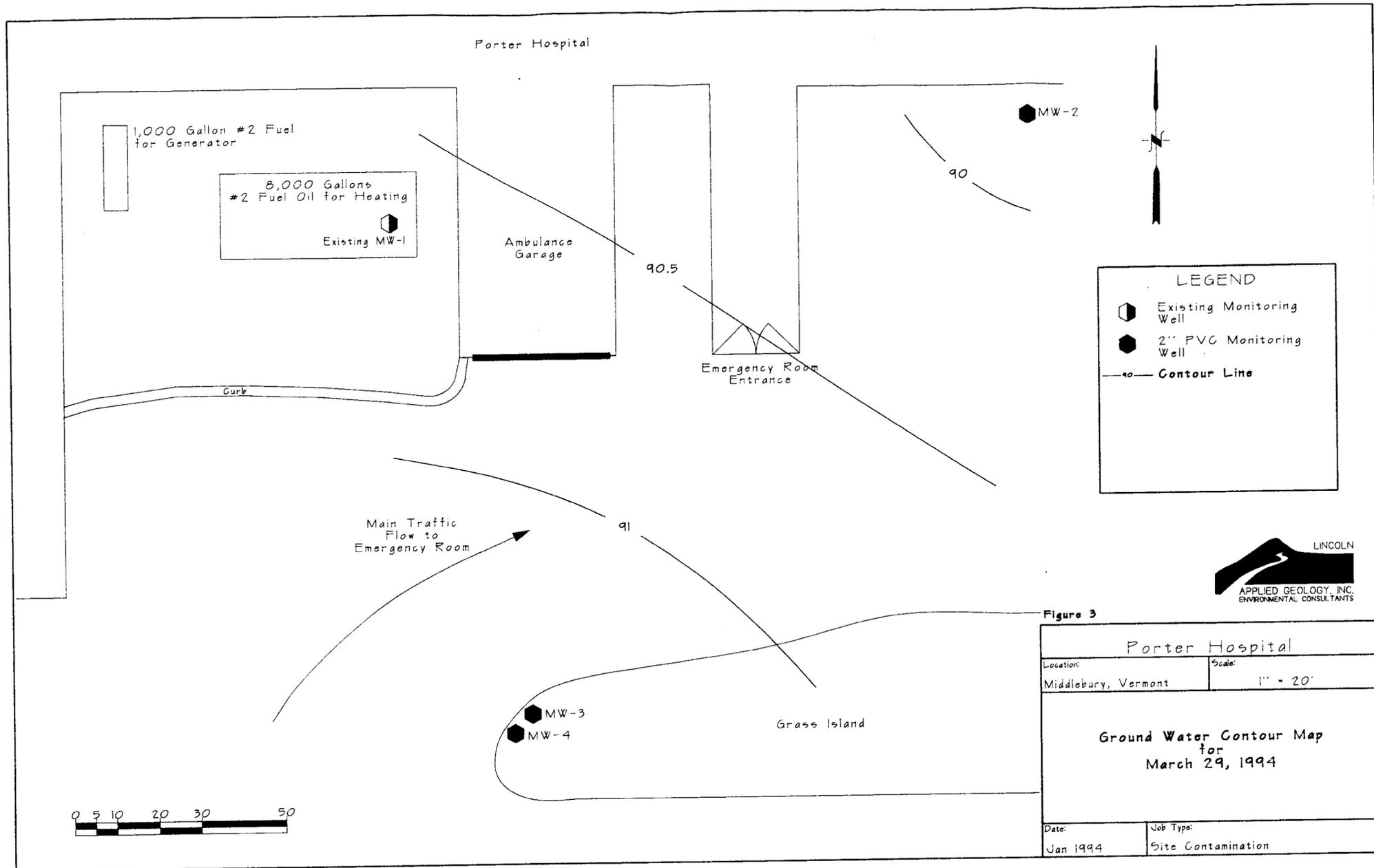


Figure 2

Porter Hospital	
Location:	Scale:
Middlebury, Vermont	1" = 20'
DETAILED SITE MAP	
Date:	Job Type:
Jan 1994	Site Contamination





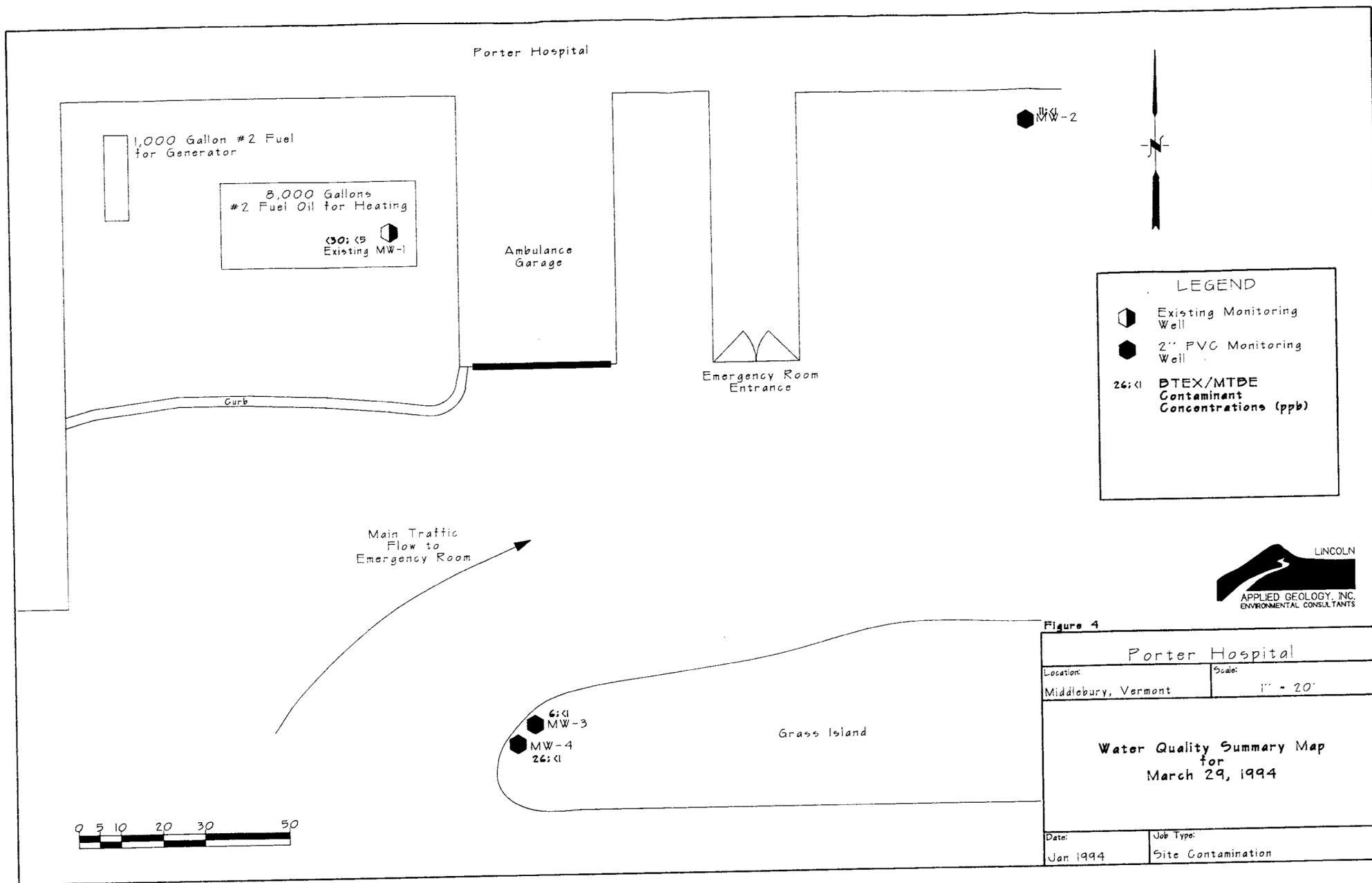


Figure 4

Porter Hospital	
Location:	Scale:
Middlebury, Vermont	1" = 20'
Water Quality Summary Map for March 29, 1994	
Date:	Job Type:
Jan 1994	Site Contamination

Appendix A

Geologic Logs

GEOLOGIC LOG

WELL: MW-2
LOCATION: Porter Medical Center
DRILLER: Tri-State Drilling and Boring, Inc.
HYDROGEOLOGIST: R. S. Vandenberg, Lincoln Applied Geology, Inc.
DATE: March 21, 1994

Soils Description:

BG = Background

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
0 - 2.5'	Asphalt, cobbles and fine brown silt and sand (moist).	BG
2.5 - 28.3'	Limestone, white to light grey.	BG

Well Construction:

Bottom of Boring: 28.3'
Bottom of Well: 28.3'
Well Screen: 3.3' to 28.3'
Solid Riser: 0 to 3.3'
Sand Pack: 3.0' to 28.3'
Bentonite Seal: 2.0' to 3.0'
Backfill: None
Well Box: Flush bolt down

GEOLOGIC LOG

WELL: MW-3
LOCATION: Porter Medical Center
DRILLER: Tri-State Drilling and Boring, Inc.
HYDROGEOLOGIST: R. S. Vandenberg, Lincoln Applied Geology, Inc.
DATE: March 21, 1994

Soils Description:

BG = Background

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
0 - 3.5'	Silt, brown, moist	BG
3.5' - 5.8'	Silt, brown and gravel, fine; some sand, medium to coarse.	BG
5.5' - 14.8'	Limestone, white to light grey; fracture noted at 13.8' (little water)	BG

Well Construction:

Bottom of Boring: 14.8'
Bottom of Well: 14.8'
Well Screen: 6.8' to 14.8'
Solid Riser: 0 to 6.8'
Sand Pack: 6' to 14.8'
Bentonite Seal: 5' to 6'
Backfill: 0 to 5'
Well Box: Flush bolt down

GEOLOGIC LOG

WELL: MW-4
LOCATION: Porter Medical Center
DRILLER: Tri-State Drilling and Boring, Inc.
HYDROGEOLOGIST: R. S. Vandenberg, Lincoln Applied Geology, Inc.
DATE: March 21, 1994

Soils Description:

BG = Background

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
0 - 8'	Silt, brown and some gravel, fine; some sand medium to coarse. (sample saturated at 6-8')	No Sample

Well Construction:

Bottom of Boring: 8'
Bottom of Well: 8'
Well Screen: 3' to 8'
Solid Riser: 0 to 3'
Sand Pack: 2' to 8'
Bentonite Seal: 1' to 8'
Backfill: None
Well Box: Flush bolt down.

Appendix B
Ground Water Chemistry Results
From March 29, 1994



LABORATORY ANALYSIS

CLIENT NAME:	Lincoln Applied Geology	REF #:	8576
ADDRESS:	RD# 1 Box 710 Bristol, VT 05443	PROJECT NO.:	not given
SAMPLE LOCATION:	Porter Medical Center	DATE OF SAMPLE:	3/29/94
SAMPLER:	James Robideau	DATE OF RECEIPT:	3/29/94
		DATE OF ANALYSIS:	4/8,4/9/94
ATTENTION:	John Amadon/Rick Vandenberg	DATE OF REPORT:	4/13/94

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

- 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 inferred efficiency of analyte recovery for individual samples was monitored by the addition of surrogate analytes to all samples, standards, and blanks. Surrogate recoveries were found to be within laboratory QA/QC acceptance limits, unless noted otherwise.

Reviewed by:

Brendan McMahon, Ph.D.
Director, Chemical Services



LABORATORY REPORT

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

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Porter Medical Center	REF.#:	8,576
REPORT DATE:	April 13, 1994	STATION:	MW-1
DATE SAMPLED:	March 29, 1994	TIME SAMPLED:	11:25
DATE RECEIVED:	March 29, 1994	SAMPLER:	James Robideau
ANALYSIS DATE:	April 9, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	5*	BPQL*
Toluene	5	BPQL
Ethylbenzene	5	BPQL
Xylenes	15	BPQL
MTBE	5	BPQL

Surrogate % Recovery: 97%

BPQL = Below Practical Quantitation Limit (PQL).

* Note: The elevated concentration of high boiling point compounds prevented analysis at higher concentration.



LABORATORY REPORT

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

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Porter Medical Center	REF.#:	8,576
REPORT DATE:	April 13, 1994	STATION:	MW-2
DATE SAMPLED:	March 29, 1994	TIME SAMPLED:	11:20
DATE RECEIVED:	March 29, 1994	SAMPLER:	James Robideau
ANALYSIS DATE:	April 8, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL ($\mu\text{g/L}$)	Concentration ($\mu\text{g/L}$)
Benzene	1	BPQL
Toluene	1	4
Ethylbenzene	1	BPQL
Xylenes	3	5
MTBE	1	BPQL

Surrogate % Recovery: 97%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

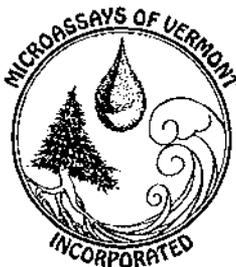
GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Porter Medical Center	REF.#:	8,576
REPORT DATE:	April 13, 1994	STATION:	MW-3
DATE SAMPLED:	March 29, 1994	TIME SAMPLED:	11:05
DATE RECEIVED:	March 29, 1994	SAMPLER:	James Robideau
ANALYSIS DATE:	April 8, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL ($\mu\text{g/L}$)	Concentration ($\mu\text{g/L}$)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	1
Xylenes	3	3
MTBE	1	BPQL

Surrogate % Recovery: 97%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

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

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Porter Medical Center	REF.#:	8,576
REPORT DATE:	April 13, 1994	STATION:	MW-4
DATE SAMPLED:	March 29, 1994	TIME SAMPLED:	11:15
DATE RECEIVED:	March 29, 1994	SAMPLER:	James Robideau
ANALYSIS DATE:	April 8, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL ($\mu\text{g/L}$)	Concentration ($\mu\text{g/L}$)
Benzene	1	BPQL
Toluene	1	3
Ethylbenzene	1	BPQL
Xylenes	3	21
MTBE	1	BPQL

Surrogate % Recovery: 97%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

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

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Porter Medical Center	REF.#:	8,576
REPORT DATE:	April 13, 1994	STATION:	Trip Blank
DATE SAMPLED:	March 29, 1994	TIME SAMPLED:	08:00
DATE RECEIVED:	March 29, 1994	SAMPLER:	James Robideau
ANALYSIS DATE:	April 8, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL ($\mu\text{g/L}$)	Concentration ($\mu\text{g/L}$)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 97%

BPQL = Below Practical Quantitation Limit (PQL).

Appendix C
Cost Estimate for Continued
Monitoring and Sampling

**Porter Medical Center
Middlebury, VT
(VDEC Site #93-1522)
Cost Estimate for Additional Work
May, 1994**

A. Semi-Annual Monitoring and Sampling

Technician -	8.0	hr(s) @	\$30.00 per hour	\$	240.00
PID and Interface Probe -	1.0	day(s) @	\$100.00 per day	\$	100.00
BTEX and MTBE samples -	5.0	@	\$62.00 each	\$	310.00
Sampling materials -	4.0	@	\$6.73 each	\$	26.92
Mileage -	50.0	mile(s) @	\$0.30 per mile	\$	15.00
Pump and Generator -	1.0	day(s) @	\$110.00 per day	\$	110.00

Subtotal A (Cost per sampling event) \$ 801.92

B. Semi-Annual Reporting

Senior Hydrogeologist -	1.0	hr(s) @	\$75.00 per hour	\$	75.00
Project Manager -	3.0	hr(s) @	\$50.00 per hour	\$	150.00
Hydrogeologist -	5.0	hr(s) @	\$45.00 per hour	\$	225.00
Computer Technician -	4.0	hr(s) @	\$30.00 per hour	\$	120.00
Administrative Assistant -	4.0	hr(s) @	\$30.00 per hour	\$	120.00

Subtotal B (per report) \$ 690.00

Total for Monitoring and Sampling >>> \$ 1,491.92

C. PID Assays of Additional Soils to be Removed and Vent Well Installation

Hydrogeologist	8.0	hr(s) @	\$45.00 per hour	\$	360.00
Technician	8.0	hr(s) @	\$30.00 per hour	\$	240.00
PID and Interface Probe -	1.0	day(s) @	\$100.00 per day	\$	100.00
Mileage -	50.0	mile(s) @	\$0.30 per mile	\$	15.00
Well Materials -			\$500.00	\$	500.00

Total for Soil Monitoring (Cost per day)>>> \$ 1,215.00



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