

MAR 16 1994



LINCOLN

APPLIED GEOLOGY, INC.  
ENVIRONMENTAL CONSULTANTS

Mr. Chuck Schwer  
Supervisor  
Sites Management Section  
Vermont Department of  
Environmental Conservation  
103 South Main Street/West Office  
Waterbury, VT 05671-0404

March 15, 1994

RE: Letter Report - Hartford Engineering, Inc., Hartford, Vermont (Site #93-1546)

Dear Chuck:

Lincoln Applied Geology, Inc. (LAG) recently completed the Hartford Engineering, Inc. (HEI) Phase A workplan accepted by you on February 4, 1994. The location of hand-augered well AH-1 is shown on **Figure 1**. The well log is presented as **Attachment A**, and the water quality and soil extraction laboratory analytical reports are included as **Attachment B**.

On February 24, 1994 monitoring well AH-1 was installed at the location of the former single wall steel 1,000 gallon fuel oil underground storage tank (UST) as shown on **Figure 1**. Hand auger methods were used to retrieve soil samples for visual description, evaluate soil related volatile organic compounds (VOCs) with a calibrated photoionization detector (PID), and allow installation of a screened monitor well for ground water sample collection.

The AH-1 boring was located at the west end of the former UST where the greatest levels of soil contamination were detected by PID during the UST excavation on December 9, 1993. Background (BG) levels of VOCs were detected by PID in fill soils from the surface to a depth of 5.5 feet. Soil PID levels increased to 3.2 parts per million (ppm) at 7 to 7.5 feet and a faint fuel oil odor was noted. A peak PID level of 12.6 ppm and fuel oil odor was present in soils at 8.5 to 9 feet. The PID level then decreased to 0.4 ppm at 10 to 10.5 feet, and 0.6 ppm was detected at the bottom of the boring at 11 to 11.5 feet. No fuel oil odors were noted from soils below 9.5 feet. The February PID assays are considerably lower than the assays recorded during the December 1993 UST removal. A comparison of PID assays is presented in **Table 1**.

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We do attribute the decrease in PID assays to enhanced microbial activity as a result of the increased redox potentials arising from the UST excavation activities introducing a greater oxygen input to the subsurface. Certainly it is well established that microbial activity is greatly diminished during the colder winter months but such activity does not cease, especially when a crucial limiting factor such as oxygen is provided.

Soils encountered in the boring were comparable to those previously found and include sand and gravel fill to about 7 feet, beneath which are native glaciolacustrine sediments of very fine to fine sand and silt. Soils were saturated with water below a depth of 7.5 feet. No water saturation was encountered during the December, 1993 UST removal. A 2-inch PVC monitoring well, sand pack, and bentonite seal were installed in the boring. A flush mounted well box covers the well. Following well development a ground water sample was obtained for BTEX and MTBE analysis. Results of the AH-1 ground water sample analysis indicate no detectable levels of BTEX (<6 parts per billion - ppb) and MTBE (<1 ppb).

Soil samples collected from the depths of 8.5' - 9.5', 9.5' - 10', and 10.5' - 11' were analyzed in the laboratory for BTEX and MTBE constituents following simple extractions to identify "total" and "biolabile" fractions. Two soil samples from each depth interval were collected in conventional 40 ml glass VOA vials and then extracted in the laboratory. From each depth interval one soil sample was extracted using methanol and the other sample was extracted with ammonium acetate (NH<sub>4</sub>OAc). The results are included in **Attachment B** and summarized in **Table 1**. No significant concentrations of BTEX constituents were recovered by either extractant.

We designed this novel and inexpensive soil extraction procedure in conjunction with the chemical staff of MicroAssays of Vermont (MAV). Although soil samples could be "fixed" in the field by placing the soil sample into a pre-weighed vial already containing the extractant, that level of soil science has not yet been incorporated into standard practices. Known weights of the HEI soil samples were added in the MAV laboratory to 40 ml VOA vials containing the extractant solutions at an approximate 5:1 solution to soil ratio. Vials were agitated for 15 minutes, followed by a low speed centrifugation to



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provide a clear extract for purge and trap GC/MS utilizing a conventional volatiles capillary column. Due to the strength and signature of the methanol, only a single 0.5 ml aliquot could be purged while 5 ml aliquots of the  $\text{NH}_4\text{OAc}$  could be utilized. This purgeable volume difference leads to the differences in detection limits shown on the results in **Attachment B**.

The methanol extractant will provide an indication of the "total" contaminant constituents present in the sample. It will solubilize vapor phase, extract soluble phase and free phase, as well as, desorb and solubilize the adsorbed phase contaminant. The  $\text{NH}_4\text{OAc}$  extractant will provide an indication of "biolabile" contaminants or the fraction of the "total" that is readily available for leaching and/or biodegradation.

The  $\text{NH}_4\text{OAc}$  extractant utilized for the HEI analyses (1.25 N, pH 4.8) is the same as the Vermont Buffer #1 utilized by the Vermont Agricultural Testing Service located at the University of Vermont (UVM). This extractant was designed to provide an indicator of "available" cations and anions. It has also been used for heavy metals availability and is very comparable to the ammonium acetate extractant used for the Federal TCLP procedure (1.0 N, pH 5.0). We believe the convenience and low cost of these extractions performed for HEI will be very useful in future soils analyses for contaminated sites throughout the region.

The current HEI results indicate that "total" extractable contamination is very low. As seen on **Table 1** only toluene was quantifiable in the methanol extraction at levels less than 100 parts per billion (corrected for dry weight). The toluene, however, does not appear to be in a "biolabile" form as it was not detected in either the  $\text{NH}_4\text{OAc}$  extract or in the ground water sample from AH-1

We have already delineated the downgradient receptors in the area of HEI which include only the White River about 200 feet north of the site. The Wise Potato Chips warehouse and distribution facility located about 50 feet downgradient and north of the site is served by the Town of Hartford municipal water system, as are other private residences and apartments upgradient to the south of the site. No other receptors have been identified



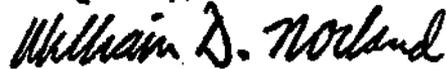
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As a result of the current ground water and soil analytical results, we recommend that: no additional ground water monitoring wells need be installed, no additional ground water samples need to be collected for laboratory analysis, and no further action be required at the HEI site. We therefore request that this site be formally closed. If you have any questions or comments, please call me or John Amadon, Project Manager, at 453-4384.

Sincerely,



William D. Norland  
Hydrogeologist

Approved by:



John F. Amadon CPSS

JFA/lr  
Enclosure  
cc: Mitchell Moore



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VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
 UNDERGROUND STORAGE TANK PROGRAM  
 TANK PULL FORM

TODAY'S DATE: December 16, 1993 INSPECTOR: William Norland, Hydrogeologist  
 DATE OF REMOVAL: December 9, 1993 BUSINESS NAME: Lincoln Applied Geology, Inc.  
 RD 1 Box 710  
 UST Removal Site Location: Hartford Engineering, Inc. Bristol, VT 05443  
 15 V.A. Cutoff Road  
 Hartford, VT

SITE DIAGRAM

Show location of all tanks and distance to permanent structures, sample points, areas of contamination and any pertinent site information. Indicate North arrow and major street names or route number.

**Monitor Well AH-1**

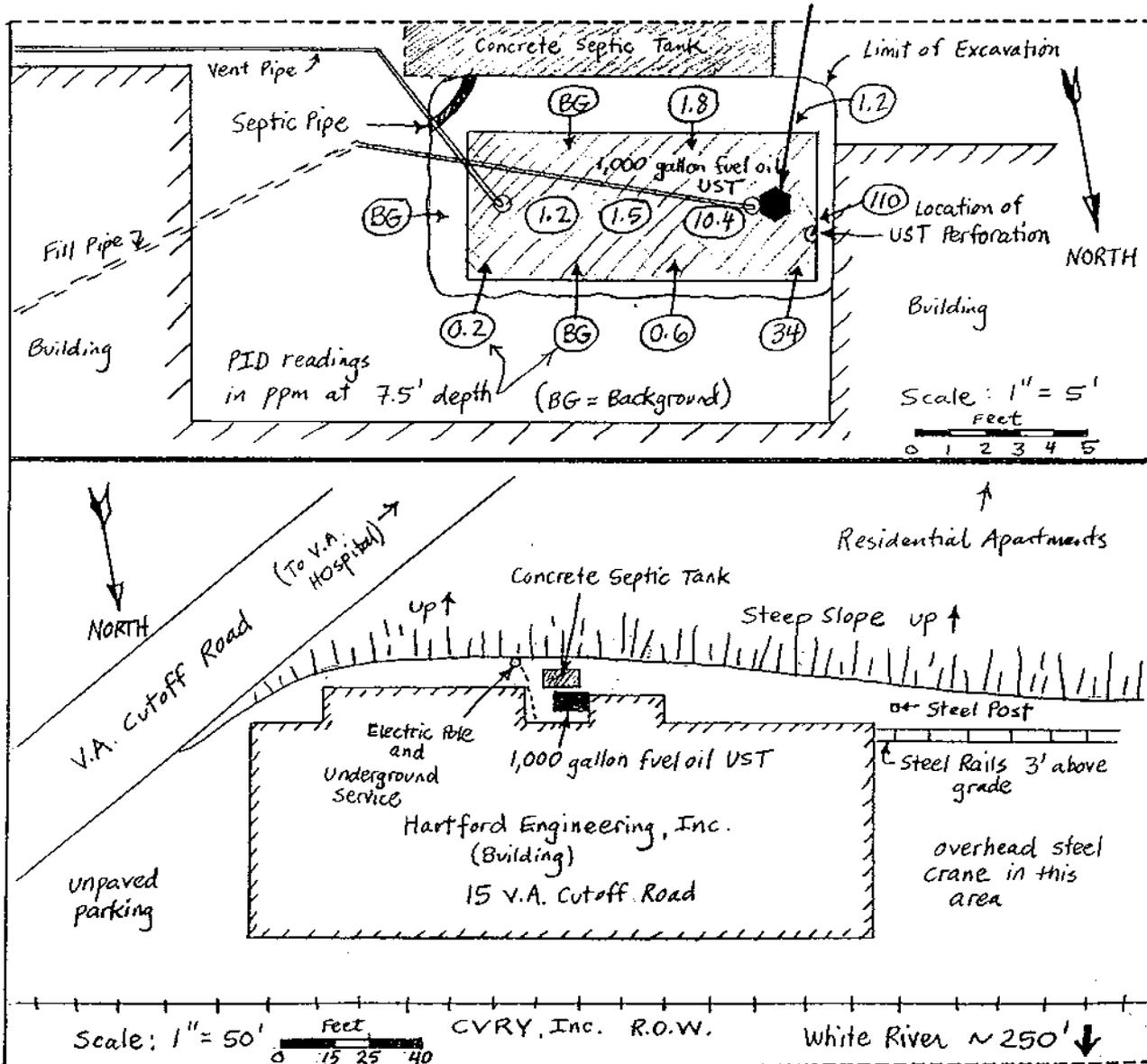


Table 1

**Hartford Engineering, Inc.**  
**(VDEC Site# 93-1546)**  
**Summary of Soils Assays**

Depth (ft)	12-20-93	2-24-94	2-24-94	2-24-94	
	PID (ppm)	PID (ppm)	NH <sub>4</sub> OAc * μg/kg	Methanol ** μg/kg	
0 - 7.5	0	0	---	---	
7.5	110 (avg. 13.4)	3.2	---	---	
8.5	20	12.6	<6	37 (<26)	
10.5	14	0.4	<7	55 (<26)	
11.5	---	0.6	<7	47 (<29)	

*AVG = 3.4*

\* NH<sub>4</sub>OAc - Ammonium Acetate (1.25N, pH 4.8) extract showed no quantifiable BTEX constituents. The lowest detection limit for an individual constituent is presented.

\*\* Methanol - Purge & Trap grade 100% methanol extracts did remove quantifiable amounts of Toluene. All remaining BTEX constituents were below the detection limits in parentheses.

**ATTACHMENT A**

**AH-1 WELL LOG**

## WELL LOG

WELL: AH-1

LOCATION: Hartford Engineering, Inc. - At former location of 1,000 gallon fuel oil UST

DRILLER: Hand augered soil boring by Lincoln Applied Geology, Inc.

HYDROGEOLOGIST: William Norland, Lincoln Applied Geology, Inc.

DATE: February 24, 1994

### Soils Description

BG = Background = 0.2 ppm

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
0'	Ice and snow, surface water from recent thaw. Frost layer >1' deep.	
2'	Wet, brown, sand and gravel fill from recent UST removal	BG
3.5 - 4'	Moist, brown, <u>silt and very fine sand</u> ; little pebbles. <u>Fill</u>	BG
5' - 5.5'	(Same as above)	BG
7' - 7.5'	Moist to wet, brown and gray, <u>very fine to fine sand</u> ; some silt. Native glacio-lacustrine sediments. Faint fuel odor.	3.2
7.5 - 8'	Wet (same as above)	1.0
8.5 - 9'	(Same as above) Fuel odor.	12.6
9' - 9.5'	Wet, brown, <u>very fine sand and silt</u> .	11.8
9.5' - 10'	(Same as above)	2.8
10' - 10.5'	(Same as above)	0.4
10.5 - 11'	(Same as above)	0.6
11' - 11.5'	(Same as above)	0.6

Water level in well after installation is 9.28' below top of casing.

### Well Construction

Bottom of Boring:	11.5'
Well Screen:	(10') 1'-11'; 0.020 slot, 2" PVC, sch. 40
Solid Riser:	(1') 0' - 1', 2" PVC, sch. 40
Sand Pack:	(10.5') 0.5' - 11'
Bentonite Seal:	(0.5') 0' - 0.5'
Backfill:	none
WellBox:	one - flush with grade.

**ATTACHMENT B**

**SOIL & GROUND WATER LABORATORY REPORTS**



## LABORATORY ANALYSIS

CLIENT NAME:	Lincoln Applied Geology	REF #:	8330
ADDRESS:	RD#1 Box 710 Bristol, VT 05443	PROJECT NO.:	not given
SAMPLE LOCATION:	Hartford Engineering	DATE OF SAMPLE:	2/24/94
SAMPLER:	Bill Norland	DATE OF RECEIPT:	2/24/94
		DATE OF ANALYSIS:	2/28,3/1,3/8/94
ATTENTION:	John Amadon/Bill Norland	DATE OF REPORT:	3/9/94

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. Soil samples were not preserved.
- 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

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## LABORATORY REPORT

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

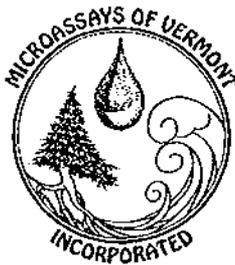
CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Hartford Engineering	REF.#:	8,330
REPORT DATE:	March 9, 1994	STATION:	AH-1
DATE SAMPLED:	February 24, 1994	TIME SAMPLED:	14:15
DATE RECEIVED:	February 24, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	February 28, 1994	SAMPLE TYPE:	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: 101%

BPQL = Below Practical Quantitation Limit (PQL).

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## LABORATORY REPORT

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

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Hartford Engineering	REF.#:	8,330
REPORT DATE:	March 9, 1994	STATION:	8.5'-9.5'
DATE SAMPLED:	February 24, 1994	TIME SAMPLED:	13:45
DATE RECEIVED:	February 24, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	March 1, 1994	SAMPLE TYPE:	Soil - 77% Dry wt.
		EXTRACTION:	Methanol

PARAMETER	PQL ( $\mu\text{g}/\text{Kg}$ )	Concentration ( $\mu\text{g}/\text{Kg}$ dry wt)
Benzene	26	BPQL
Toluene	26	37
Ethylbenzene	26	BPQL
Xylenes	78	BPQL
MTBE	26	BPQL

Surrogate % Recovery: 95%

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:	Hartford Engineering	REF.#:	8,330
REPORT DATE:	March 9, 1994	STATION:	9.5'-10.0'
DATE SAMPLED:	February 24, 1994	TIME SAMPLED:	13:50
DATE RECEIVED:	February 24, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	March 1, 1994	SAMPLE TYPE:	Soil - 76% Dry wt.
		EXTRACTION:	Methanol

PARAMETER	PQL (µg/Kg)	Concentration (µg/Kg dry wt)
Benzene	26	BPQL
Toluene	26	55
Ethylbenzene	26	BPQL
Xylenes	78	BPQL
MTBE	26	BPQL

Surrogate % Recovery: 96%

BPQL = Below Practical Quantitation Limit (PQL).

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## LABORATORY REPORT

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

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Hartford Engineering	REF.#:	8,330
REPORT DATE:	March 9, 1994	STATION:	10.5'-11.5'
DATE SAMPLED:	February 24, 1994	TIME SAMPLED:	13:55
DATE RECEIVED:	February 24, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	March 1, 1994	SAMPLE TYPE:	Soil - 70% Dry wt.
		EXTRACTION:	Methanol

PARAMETER	PQL ( $\mu\text{g}/\text{Kg}$ )	Concentration ( $\mu\text{g}/\text{Kg}$ dry wt)
Benzene	29	BPQL
Toluene	29	47
Ethylbenzene	29	BPQL
Xylenes	87	BPQL
MTBE	29	BPQL

Surrogate % Recovery: 99%

BPQL = Below Practical Quantitation Limit (PQL).



## LABORATORY REPORT

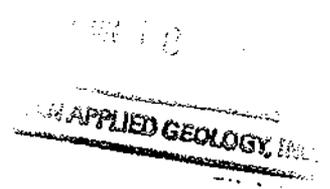
GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

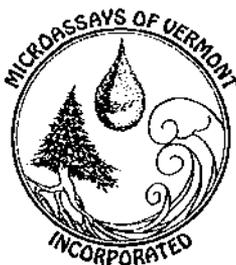
CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Hartford Engineering	REF.#:	8,330
REPORT DATE:	March 9, 1994	STATION:	9.5'-10.0'
DATE SAMPLED:	February 24, 1994	TIME SAMPLED:	13:50
DATE RECEIVED:	February 24, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	March 8, 1994	SAMPLE TYPE:	Soil - 76% Dry wt.
		EXTRACTION:	Ammonium Acetate

PARAMETER	PQL (µg/Kg)	Concentration (µg/Kg dry wt)
Benzene	7	BPQL
Toluene	7	BPQL
Ethylbenzene	7	BPQL
Xylenes	21	BPQL
MTBE	7	BPQL

Surrogate % Recovery: 100%

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:	Hartford Engineering	REF.#:	8,330
REPORT DATE:	March 9, 1994	STATION:	10.5'-11.5'
DATE SAMPLED:	February 24, 1994	TIME SAMPLED:	13:55
DATE RECEIVED:	February 24, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	March 8, 1994	SAMPLE TYPE:	Soil - 70% Dry wt.
		EXTRACTION:	Ammonium Acetate

PARAMETER	PQL ( $\mu\text{g}/\text{Kg}$ )	Concentration ( $\mu\text{g}/\text{Kg}$ dry wt)
Benzene	7	BPQL
Toluene	7	BPQL
Ethylbenzene	7	BPQL
Xylenes	21	BPQL
MTBE	7	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).

JWA

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## LABORATORY REPORT

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

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Hartford Engineering	REF.#:	8,330
REPORT DATE:	March 9, 1994	STATION:	Trip Blank
DATE SAMPLED:	February 24, 1994	TIME SAMPLED:	07:15
DATE RECEIVED:	February 24, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	February 28, 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: 102%

BPQL = Below Practical Quantitation Limit (PQL).

MAR 10 1994  
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