TWIN STATE ENVIRONMENTAL CORP.
P.O. Box 719, Commercial Park, 1A Huntington Road, Richmond, VT 05477
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August 4, 1997

Mr. Chuck Schwer
State of Vermont
Sites Management Section
103 South Main Street / West Building
Waterbury, VT 05671-0404

RE: Site Investigation Activities
Burlington College - Burlington, Vermont
TSEC Project #96-099 SMS #96-2048

Dear Mr. Schwer:

This report was prepared by Twin State Environmental Corporation (TSEC) to present the findings of a limited subsurface investigation at Burlington College located at 95 North Avenue in Burlington, Vermont (SITE) (See SITE Location Map, **Figure 1**, and SITE Plan, **Figure 2**). The investigation was initiated in response to an October 7, 1996 request from the SMS to address contamination discovered during the removal of a 1,000 gallon heating oil underground storage tank (UST).

1.0 BACKGROUND

The UST was removed on August 19, 1996 upon its discovery during SITE renovations. TSEC was called in by J.A. Morrissey to provide oversight and to conduct an environmental assessment during tank removal activities. During the assessment, petroleum contaminated soils were discovered beneath the tank fill port. Volatile organic compound (VOC) concentrations as measured using a photoionization detector (PID) calibrated to an isobutylene standard ranged from non-detected to 26 parts per million volume (ppmv), with the highest readings detected beneath the UST fill port. A PID reading of 19 ppmv was measured below the tank bottom, at a depth of 6 ft below ground surface (bgs). PID readings of samples collected from the excavation sidewalls were all below equipment detection levels (<0.1 ppmv). Construction pilings in the immediate vicinity of the UST prevented further excavation below the tank bottom.

Groundwater was not encountered during the tank excavation activities, and no samples were collected for laboratory analysis of VOCs. All excavated soil was backfilled, with the exception of less than one (1) cubic yard of soil which was removed under manifest with the tank bottom materials.

On October 7, 1996, Burlington College received a letter from the VT SMS requesting that additional work be performed in order to determine the extent and severity of contamination

present. TSEC conducted a subsurface site investigation at the SITE that focused on subsurface soil in the vicinity of the former UST. This investigation, presented in an October 25, 1996 work scope and cost estimate, was approved by the SMS. Burlington College executed an Agreement with TSEC on May 7, 1997 to conduct the work.

2.0 SCOPE OF WORK

The following scope of services were performed by TSEC during this investigation:

- Three (3) Geoprobe® borings were advanced to investigate soil and groundwater contamination resulting from the former UST. Recovered soil samples were field screened using a ThermoEnvironmental Instruments Organic Vapor Meter equipped with a 10.6 eV PID lamp.

- A survey of sensitive receptors was conducted, focusing on surface water, residential basements (if present), and private drinking water wells.

- A summary report of the above-mentioned work was prepared.

3.0 SUBSURFACE EXPLORATION AND RESULTS

The subsurface exploration program implemented at this SITE was developed to gather information concerning the geology and contaminant distribution at the SITE.

3.1 Advancement of Soil Borings

Three (3) soil borings were advanced using a Geoprobe® on May 15, 1997 by TSEC in locations indicated on **Figure 2**. Boring logs are presented in **Attachment 1**. These borings were advanced to depths ranging from 16 to 20 feet below ground surface (bgs), which is at least 10 ft below the depth of peak contamination readings observed during tank removal activities. All borings were sampled continuously and logged, describing soil strata conditions, and screened for VOCs with a PID, using conventional jar headspace techniques. The PID was calibrated to an isobutylene standard prior to screening.

General soil conditions encountered at the SITE consisted generally of fine to coarse sand with gravel and some burned material. Groundwater was not encountered in any of the borings. Based on local topography and the location of Lake Champlain (<½-mile west and 200 ft ± below), it is expected that the depth to groundwater beneath the SITE is significant.
No contaminated soil was encountered during the advancement of the three (3) borings. Headspace analyses performed on the samples collected from these borings indicated no VOCs

present at a concentrations detectable by the PID (<0.1 ppmv). No separate phase product was encountered during the installation of the soil borings.

The three (3) above-mentioned borings were advanced in the following locations and are depicted on the SITE Plan, **Figure 2**.

- Soil Boring B-1 was installed east of the former UST;
- B-2 was installed south of the former UST; and,
- B-3 was installed into the west of the former UST.

Due to recent construction of a handicap access ramp and concrete landscaping columns, a soil boring could not be advanced through the former UST cavity.

3.2 SITE Geology

A summary of the predominate geological units encountered during drilling activities indicated a fine to coarse sandy fill material with some gravel and burned material. For a more detailed description of geological units and soil headspace analyses, see Boring Logs, **Attachment 1**.

4.0 RECEPTOR EVALUATION

A receptor evaluation was conducted by TSEC on May 15, 1997. Receptors identified in the immediate area include the basement of the Burlington College building, the hill slope to the west, and Lake Champlain. Interviews with several employees present indicated that there has been no impact to the basement of the building. It was not known where to access the portion of the basement adjacent to the former UST.

An investigation of the hill slope and area leading to Lake Champlain indicated that this area had not been impacted by petroleum contamination from the former UST. Based on field observations, sample screening and interviews, it has been determined that there have been no receptors impacted by the contamination present at the SITE.

5.0 SUMMARY AND CONCLUSIONS

Based on the completed scope of work, the following can be concluded:

- The source of the contamination, the 1,000 gallon heating oil UST, has been removed from the SITE. Soil that was visibly contaminated was also removed from the SITE and disposed of under manifest.

- With all buildings in the vicinity serviced by municipal water, and evidence that no petroleum contamination was found adjacent to the former tank cavity, it does not appear as though any drinking water sources have been impacted.

- Low levels of contamination were present during tank removal activities, and the subsurface materials encountered (loose sand and gravel) have very high permeability. Therefore, it can be assumed that a majority of the contamination has naturally degraded since tank removal. Additionally, there was no evidence that petroleum contamination levels were increasing with depth.

6.0 RECOMMENDATIONS

Due to the lack of contamination discovered in soil at the SITE, the significant depth to groundwater (<20 ft), the high permeability of subsurface materials, and the absence of any impacted sensitive receptors, TSEC recommends the that the SITE be designated as Sites Management Activity Completed (SMAC). This designation does not indicate that the SITE is clean, but that the impact of petroleum contamination originating from the SITE, if any, is minimal.

If you have any questions regarding the results of this investigation, please feel free to contact us.

Sincerely,
TWIN STATE ENVIRONMENTAL CORPORATION

Jon Berntsen
Geologist

cc: Mr. Mike Ireland, Burlington College

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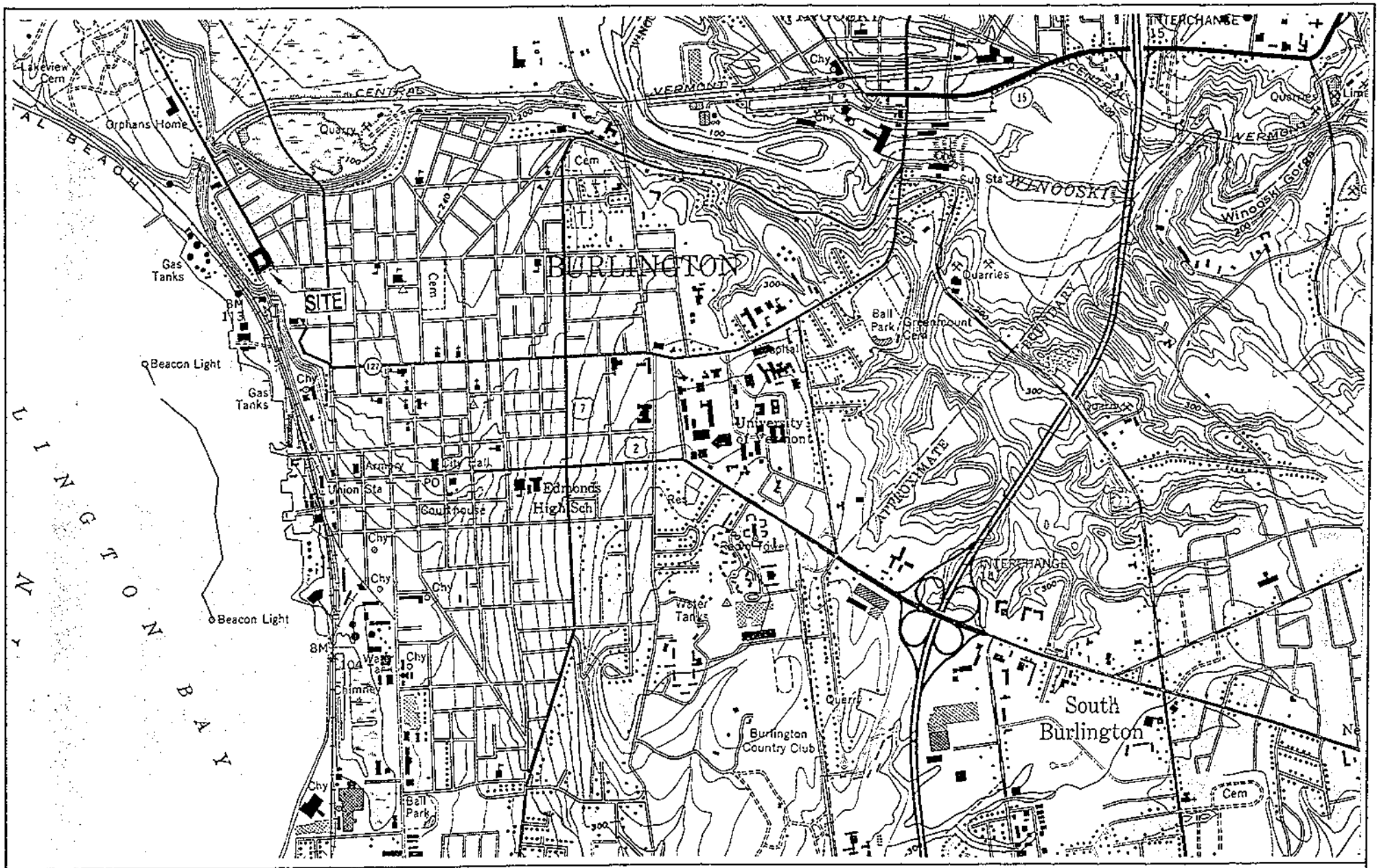
TABLES

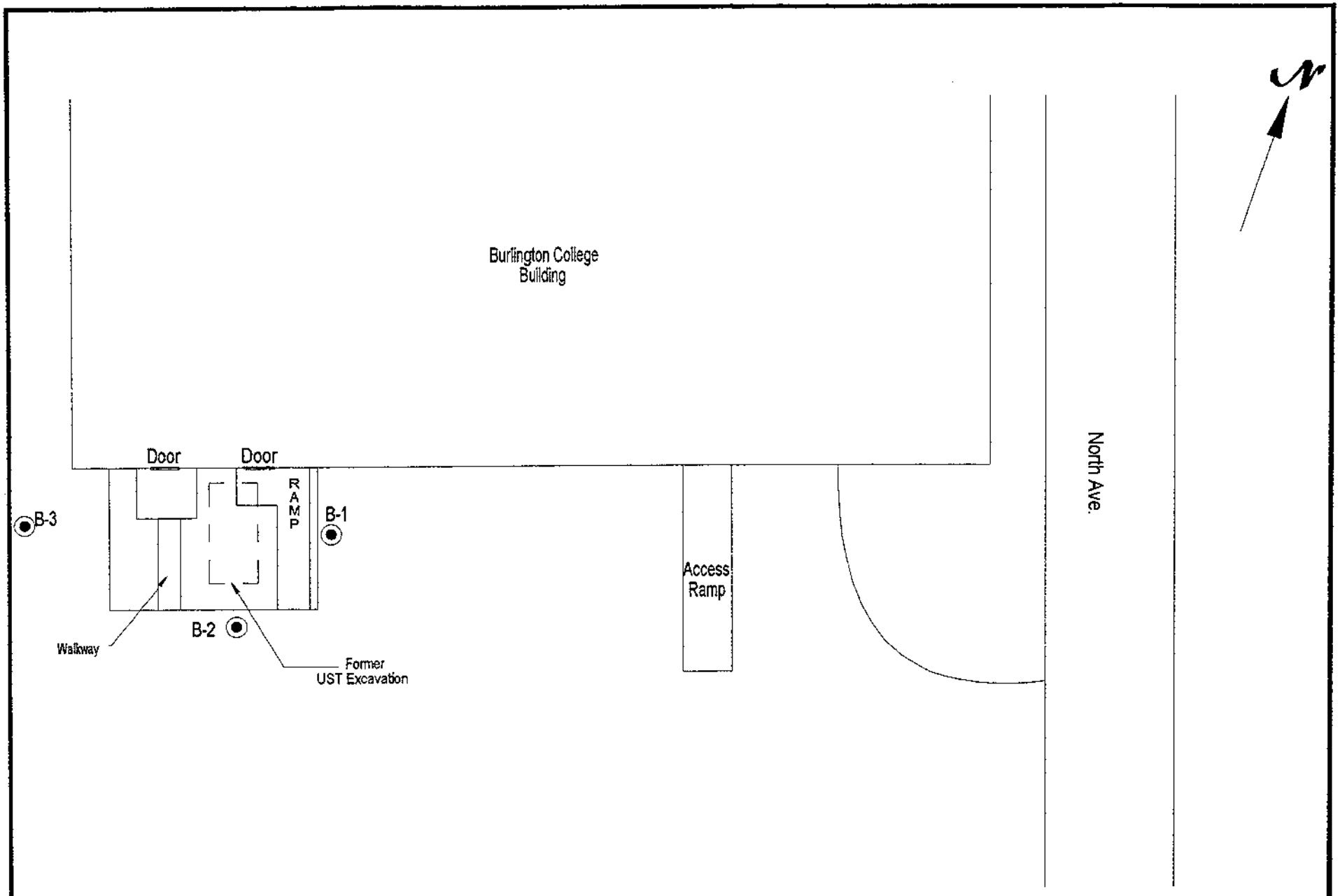


N

0 2000
Scale (in feet) 1"=2,000'

Source: USGS 7.5 Minute Topographic Series
Burlington, Vermont Quadrangle

Project No: 96-099	Designed By: jpb Checked By: Approved By: Drawn By: jpb Scale: as shown Date: 02/17/97	TWIN STATE ENVIRONMENTAL CORP. 1A Huntington Rd. P.O. Box 719 Richmond, Vermont (802) 434-3360	FIGURE 1 SITE LOCATION MAP Burlington College Burlington, Vermont



Approximate Scale
1"=20'

Project No.: 96-099	Designed By: jpb Checked By: Approved By: Drawn By: jpb Scale: 1" = 20' Date: 7/22/97	TWIN STATE ENVIRONMENTAL CORP. 1A Huntington Rd. P.O. Box 719 Richmond, Vermont 802-434-3360	FIGURE 2 SITE PLAN Burlington College Burlington, Vermont

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ATTACHMENT 1

TWIN STATE ENVIRONMENTAL CORPORATION

1A Huntington Road, P.O. Box 719 Richmond, Vermont 05477
(802) 434-3350 FAX: (802) 434-4478

MONITORING WELL/SOIL BORING LOG

WELL/BORING NO:	B-1	WELL DEPTH:	N/A	BORING DEPTH:	16.0 ft
PROJECT NAME:	Burlington College	DEPTH TO WATER:		Not encountered	
PROJECT NO:	96-099	SCREEN DIA:	N/A	DEPTH:	N/A
INSTALL DATE:	May 15, 1997	SCREEN TYPE/SIZE:	N/A		
TSEC REP:	Jon Berntsen	RISER TYPE:	N/A		
DRILLING CO:	TSEC	RISER DIA.:	N/A	DEPTH:	N/A
DRILLING METHOD:	Geoprobe®	GUARD TYPE:	N/A		
SAMPLING METHOD:	Macrocore	RISER CAP:	N/A		
REMARKS:	Boring was backfilled with bentonite and sand to grade.				

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES
0	N	0-4 ft	<1	2.5 ft recovery	0.0-0.25: Grass and organic rich topsoil. Dark brown, dry.
1	O				0.25-0.5: Coarse sand with fine gravel. Tan, dry.
2					0.5-2.0: Silty fine sand. Loose, brown.
3	W				2.0-2.5: Medium to coarse sand and fine to medium gravel. Tan, dry.
4	E	4-8 ft	<1	2.0 ft recovery	4.0-5.0: Silty fine sand mixed with layers of charcoal and ash.
5	L				5.0-6.0: Medium to coarse sand and fine to medium gravel. Tan, dry.
6	L				
7					
8	I	8-12 ft	<1	3.0 ft recovery	8.0-9.0: Fine sand with some burned material (ashes). Brown, dry.
9	N				9.0-10.5: Mediun to very coarse sand and fine to coarse gravel. Dry.
10	S				10.5-11.0: Very fine to fine sand. Tan, dry.
11	T				
12	A	12-16 ft	<1	3.5 ft recovery	12.0-12.8: Silty medium sand. Tan, damp.
13	L				12.8-15.0: Medium to coarse sand. Tan, damp.
14	L				15.0-15.5: Fine to meduim sand. Tan, damp.
15	E				
16	D				End of Boring = 16.0 ft End of Sampling = 16.0 ft
17					
18					
19					
20					
21					
22					
23					
24					
25					

LEGEND

- CEMENT GROUT
- NATIVE BACKFILL
- BENTONITE SEAL
- SAND PACK
- WELL SCREEN
- RISER PIPE
- HS HEAD SPACE
- WATER LEVEL (APPROX)

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES:

1. Boring is located east of the former UST.
2. PID readings were obtained using a Thermo Environmental Instruments Model 580 B PID equipped with a 10.6eV lamp. Conventional headspace techniques were used.

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MONITORING WELL/SOIL BORING LOG

WELL/BORING NO:	B-2	WELL DEPTH:	N/A	BORING DEPTH:	16.0 ft
PROJECT NAME:	Burlington College	DEPTH TO WATER:	Not encountered		
PROJECT NO:	96-099	SCREEN DIA:	N/A	DEPTH:	N/A
INSTALL DATE:	May 15, 1997	SCREEN TYPE/SIZE:	N/A		
TSEC REP:	Jon Berntsen	RISER TYPE:	N/A		
DRILLING CO:	TSEC	RISER DIA.:	N/A	DEPTH:	N/A
DRILLING METHOD:	Geoprobe®	GUARD TYPE:	N/A		
SAMPLING METHOD:	Macrocore	RISER CAP:	N/A		
REMARKS:	Boring was backfilled with bentonite and sand to grade, and patched with cold patch asphalt.				

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
0	N	0-4 ft	<1	2.0 ft recovery	0.0-0.5: Asphalt and gravel base.	CEMENT GROUT
1	O				0.5-1.0: Silty medium sand fill. Tan, dry.	
2					1.0-1.5: Ash layer.	NATIVE BACKFILL
3	W				1.5-2.0: Medium sand. Tan, dry.	
4	E	4-8 ft	<1	1.0 ft recovery	4.0-5.0: Medium to coarse sand and fine gravel. Tan, dry.	BENTONITE SEAL
5	L					
6	L					SAND PACK
7						
8	I	8-12 ft	<1	2.0 ft recovery	8.0-10.0: Fine to medium sand with a trace of silt. Brown, dry.	WELL SCREEN
9	N					
10	S					RISER PIPE
11	T					
12	A	12-16 ft	NR	No recovery	No sample recovered. (2 attempts)	HS HEAD SPACE
13	L					
14	L					WATER LEVEL (APPROX)
15	E					
16	D				End of Boring = 16.0 ft End of Sampling = 16.0 ft	
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS	
BLOWS/FT	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	M.DENSE
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT	DENSITY
<2	V.SOFT
2-4	SOFT
4-8	M.STIFF
8-15	STIFF
15-30	V.STIFF
>30	HARD

PROPORTIONS USED	
TRACE	0-10%
LITTLE	10-20%
SOME	20-35%
AND	35-50%

NOTES:
1. Boring is located south of the former UST.
2. PID readings were obtained using a Thermo Environmental Instruments Model 580 B PID equipped with a 10.6eV lamp. Conventional headspace techniques were used.

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MONITORING WELL/SOIL BORING LOG

WELL/BORING NO:	B-3	WELL DEPTH:	N/A	BORING DEPTH:	20.0 ft
PROJECT NAME:	Burlington College	DEPTH TO WATER:		Not encountered	
PROJECT NO:	96-099	SCREEN DIA:	N/A	DEPTH:	N/A
INSTALL DATE:	May 15, 1997	SCREEN TYPE/SIZE:	N/A		
TSEC REP:	Jon Berntsen	RISER TYPE:	N/A		
DRILLING CO:	TSEC	RISER DIA.:	N/A	DEPTH:	N/A
DRILLING METHOD:	Geoprobe®	GUARD TYPE:	N/A		
SAMPLING METHOD:	Macrocore	RISER CAP:	N/A		
REMARKS:	Boring was backfilled with bentonite and sand to grade, and patched with cold patch asphalt.				

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES
0	N	0-4 ft	<1	2.0 ft recovery	0.0-0.5: Asphalt and gravel base.
1	O				0.5-1.0: Silty medium sand fill. Tan, dry.
2					1.0-1.5: Ash layer.
3	W				1.5-2.0: Medium sand. Tan, dry.
4	E	4-8 ft	<1	2.0 ft recovery	4.0-5.0: Silty fine sand and ash material. Tan, dry.
5	L				
6	L				
7					
8	I	8-12 ft	<1	2.0 ft recovery	8.0-9.0: Silty fine to medium sand with a trace of ash. Brown, dry.
9	N				9.0-10.0: Medium to coarse sand with gravel. Tan, dry.
10	S				
11	T				
12	A	12-16 ft	<1	3.0 ft recovery	12.0-12.5: Cave in from above.
13	L				12.5-15.0: Fine sand. Tan. dry.
14	L				
15	E				
16	D	16-20 ft	<1	3.0 ft recovery	16.0-19.0: Medium to coarse sand. Tan, dry.
17					
18					
19					
20					End of Boring = 20.0 ft End of Sampling = 20.0 ft
21					
22					
23					
24					
25					

LEGEND

- CEMENT GROUT
- NATIVE BACKFILL
- BENTONITE SEAL
- SAND PACK
- WELL SCREEN
- RISER PIPE
- HS HEAD SPACE
- WATER LEVEL (APPROX)

GRANULAR SOILS		COHESIVE SOILS		PROPORTIONS USED	
BLOWS/FT	DENSITY	BLOWS/FT	DENSITY	TRACE	0-10%
0-4	V.LOOSE	<2	V.SOFT	LITTLE	10-20%
4-10	LOOSE	2-4	SOFT	SOME	20-35%
10-30	M.DENSE	4-8	M.STIFF	AND	35-50%
30-50	DENSE	8-15	STIFF		
>50	V.DENSE	15-30	V.STIFF		
		>30	HARD		

NOTES:
1. Boring is located west of the former UST.
2. PID readings were obtained using a Thermo Environmental Instruments Model 580 B PID equipped with a 10.6eV lamp. Conventional headspace techniques were used.