



JAN 21 2000

January 19, 2000

Mr. Chuck Schwer
Sites Management Section
VTDEC WMD
103 South Main St./ West Bldg.
Waterbury, VT 05671-0404

RE: Investigation of Subsurface Petroleum Contamination, Burlington Country Club, Burlington,
Vermont (VTDEC Site #99-2623)

Dear Mr. Schwer:

Enclosed please find a copy of the report on the initial site investigation conducted at the above referenced site. Mr. Fred Martell of the Burlington Country Club requested that a copy be forwarded to you for your review.

Based on the results of this site investigation, Griffin is recommending that a confirmatory round of groundwater sampling be conducted at the site in the Spring of 2000.

Please do not hesitate to call, if you have any questions or comments.

Sincerely,

A handwritten signature in black ink that reads "Beth Stopford". The signature is written in a cursive, flowing style.

Beth Stopford
Environmental Engineer

Enc.

cc: GI #7944551

**INITIAL INVESTIGATION OF
SUBSURFACE PETROLEUM CONTAMINATION
AT THE BURLINGTON COUNTRY CLUB
MAINTENANCE GARAGE**

January 7, 2000

Site Location:

**Burlington Country Club
568 South Prospect Street
Burlington, VT**

**VTDEC SITE #99-2623
GI Project # 7944551**

Prepared For:

**Mr. Fred Martell
Burlington Country Club
568 South Prospect Street
Burlington, VT 05401**

Prepared By:



P.O. Box 943 / 20 Commerce Street Williston, VT 05495 (802) 865-4288



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I. INTRODUCTION

This report summarizes the initial investigation of suspected subsurface petroleum contamination at the Burlington Country Club Maintenance Garage, located on South Prospect Street in Burlington, VT (see the Site Location Map in Appendix A). This investigation was conducted by Griffin International, Inc. (Griffin) for the Burlington Country Club (BCC), to address petroleum contamination detected during an underground storage tank (UST) closure inspection in April 1999. The Vermont Department of Environmental Conservation (VTDEC) requested that this work be completed in a letter to Mr. Fred Martell of the BCC, from Mr. Chuck Schwer of the VTDEC, dated June 24, 1999. The UST and associated piping was owned by the BCC, and the BCC is the responsible party for contamination detected at the site (VTDEC Site #99-2623).

Work conducted at the site included the installation of four groundwater monitoring wells, and the collection and laboratory analysis of groundwater samples from these monitoring wells. In addition, a sensitive receptor risk assessment was conducted to determine the risk that subsurface petroleum contamination at the site may pose to potentially sensitive receptors identified in the site vicinity. Work has been conducted in accordance with Griffin's *Work Plan and Cost Estimate for Subsurface Investigation at Burlington Country Club* dated July 8, 1999. The Work Plan was approved by Mr. Fred Martell in a telephone conversation with Griffin on July 14, 1999, and by Mr. Chuck Schwer of the VTDEC in a letter dated September 14, 1999.

II. SITE BACKGROUND

A. Site History

Subsurface petroleum contamination was detected in soil at the Burlington Country Club maintenance garage during the closure of (1) 1,000-gallon gasoline UST. Tank closure activities were conducted on April 30, 1999. Details of the closure inspection are outlined in the Underground Storage Tank Permanent Closure Form, which was submitted to the VTDEC on May 17, 1999 by Griffin [1]. Adsorbed petroleum contamination was detected in soil samples collected from the tank excavation, as measured with a photoionization detector (PID). Concentrations of volatile organic compounds (VOCs) measured with the PID in the vicinity of the 1,000-gallon gasoline UST exceeded Soil Guideline Thresholds set by the Waste Management Division of the VTDEC (as per *Agency Guidelines for Contaminated Soils and Debris* [August, 1996]). The VTDEC standard for soils contaminated with gasoline is 20 ppm when measured with a PID. PID readings taken during UST closure activities ranged from 8.5 to 230 ppm. The maximum readings were obtained at depths of approximately 5.7 feet below ground surface.



In compliance with a request from the VTDEC that additional work be conducted at this site in order to determine the degree and extent of petroleum contamination, BCC retained the services of Griffin.

B. Site Description

The BCC is located in a residential area on the southeastern border of the City of Burlington, VT (see Site Location Map in Appendix A). The former 1,000-gallon gasoline UST was located approximately 40 feet southeast of the maintenance garage. Other buildings on the BCC property are located more than 500 feet from the maintenance garage. The area surrounding the site is a golf course, surrounded by open and wooded land. An unnamed stream is located approximately 500 feet west of the maintenance garage. Lake Champlain is located approximately one mile west of the site.

C. Site Geologic Setting

According to the Surficial Geologic Map of Vermont [2], the site is underlain by till or pebbly marine sand. Soils encountered during monitoring well installation consisted primarily of sands, silty sands, and some clay. Bedrock at the site is mapped as either Winooski Dolomite or Monkton Quartzite [3].

Based on review of the USGS topographic map [4], groundwater in the vicinity of the BCC would be expected to flow to the southwest toward Lake Champlain following topographic contours. However, visual observation of site topography and areas of exposed bedrock indicate that shallow groundwater beneath the site would likely flow to the southeast.

III. INVESTIGATIVE PROCEDURES

A. Monitoring Well Installation

On October 27, 1999, four monitoring wells were installed by Adams Engineering of Underhill, Vermont using a Minirig vibratory drilling rig. Drilling and well construction were directly supervised by a Griffin engineer. Soil samples were collected continuously from each boring. Each soil sample was screened for volatile organic compounds (VOCs) using an HNu Model HW-101 PID equipped with a 10.2 eV bulb. Soils were screened using the Griffin Jar/Polyethylene Bag Headspace Screening Protocol, which conforms to state and industry standards. Contaminant concentrations and soil characteristics were recorded in detailed boring logs by the supervising Griffin engineer (see the Well Logs in Appendix B).



*why not
in source
?*

The monitoring wells (MW1, MW2, MW3, and MW4) were installed to help better define groundwater flow direction and gradient and the degree and extent of suspected petroleum contamination at the site. MW1 was installed to the east of the presumed source area (e.g. the former 1,000-gallon gasoline UST) in a presumed crossgradient direction. MW2 and MW3 were installed southeast of the presumed source area, in a presumed downgradient direction. MW4 was installed to the north of the former gasoline UST system, in a presumed upgradient direction.

The monitoring wells were constructed of 1.5-inch diameter Schedule 40 PVC riser and 0.010-inch factory slotted, well screen. The length of the riser and the screened section of pipe varied depending on the depth of the well. The annulus between the well screen and the borehole was filled with a sand pack to just above the well screen. A bentonite seal was placed above the sand pack. To complete the construction of each well, a road box was set in concrete at grade level. In addition, locking well caps were placed on the monitoring wells. Specific well construction details are displayed in the detailed well logs included in Appendix B.

MW1

The boring for MW1 was advanced to 5.5 feet below grade. Soils from the boring from MW1 consisted of silty sand from 0.5 to 5 feet below grade. Silt and clay was observed between 5 and 5.5 feet below grade. Bedrock refusal was met at 5.5 feet below grade. Soil samples collected for PID screening had a maximum reading of 4 ppm, measured in soils collected between 0.5 and 5 feet below grade.

Shallow groundwater was encountered at approximately 5.5 feet below grade, at the point where bedrock refusal was met. The screened section of the well was installed from 5.5 to 2.5 feet below the ground surface.

MW2

The boring for MW2 was advanced to 3.5 feet below grade. Soils from the boring consisted of dark brown organic silt from grade to 0.5 feet below grade. Soils between 0.5 and 2.5 feet below grade consisted of moist, olive gray silt and clay with sandy brown layers. Sandy silt was encountered between 2.5 and 3.5 feet below grade. Bedrock refusal was met at 3.5 feet below grade. Soil samples for PID screening had a maximum reading of 7.0 ppm at 2.5 to 3.5 feet below grade.

Shallow groundwater was encountered at approximately 3.5 feet below grade, at the point where bedrock refusal was met. The screened section of the well was installed from 3.5 to 1.5 feet below the ground surface.



MW3

The boring for MW3 was advanced to 5 feet below grade. Soils from the boring consisted of dark brown organic silt from grade to 0.5 feet below grade. Moist olive gray silt and clay was observed between 0.5 and 1.5 feet below grade. Soils from 1.5 to 5 feet below grade consisted of light brown, moist to wet sandy silt. Soil samples collected for PID screening had a maximum reading of 8.2 ppm, measured in soils collected between grade and 0.5 feet below grade.

Shallow groundwater was encountered at approximately 5 feet below grade, at the point where bedrock refusal was met. The screened section of the well was installed from 5 to 2 feet below the ground surface.

MW4

The boring for MW4 was advanced to 5.5 feet below grade. Soils from the boring consisted of well graded sand from grade to 0.7 foot below grade. Moist brown silt with sand was observed between 0.7 and 1.5 feet below grade. Soils between 1.5 and 2.25 feet below grade consisted of moist olive gray silt and clay. Moist brown well graded sand and silt was observed between 2.25 and 5 feet below grade. Moist olive gray silt and clay was observed 5 and 5.5 feet below grade. No elevated VOC concentrations were detected in the soil samples collected from this boring.

Shallow groundwater was encountered at approximately 5.5 feet below grade, at the point where bedrock refusal was met. The screened section of the well was installed from 5.5 to 0.5 feet below the ground surface. A 2-inch diameter PVC casing was placed around the top section of the screen, from approximately 1 to 0.5 feet below grade. The space between the screen and casing was sealed with bentonite, as well as the annulus between the casing and the walls of the soil boring.

B. Determination of Groundwater Flow Direction and Gradient

Water table elevation measurements were collected from the four monitoring wells (MW1, MW2, MW3, MW4) on November 5, 1999 using a Keck interface probe. The depth to water measurements from the monitoring wells were subtracted from the top of casing elevations, which were determined relative to an arbitrary datum of 100 feet at the top of the casing for MW4, to determine the water table elevation at each of the wells. Groundwater level data are recorded in Appendix C. No free phase petroleum product was observed in any of the monitoring wells gauged on November 5, 1999.

As displayed in the groundwater contour map included in Appendix A, the groundwater flow direction for November 5, 1999 appears to flow to the south-southeast (following site



topography) at a hydraulic gradient of approximately 6%. Under the groundwater flow regime described, MW1 is located crossgradient of the expected source area (i.e. the former gasoline UST system), MW2 is located downgradient of the presumed source area, MW3 is located downgradient to crossgradient of the expected source area, and MW4 is located upgradient of the presumed source area.

C. Groundwater Sample Collection and Analysis

Groundwater samples were collected from MW1, MW2, MW3, and MW4 immediately following well gauging on November 5, 1999. Samples were analyzed for the presence of VOCs per EPA Method 8021B. Results of the laboratory analyses are summarized in Appendix D. Laboratory report forms are presented in Appendix E.

Concentrations of targeted petroleum constituents were detected in all of the monitoring wells. Concentrations of 1,2,4-trimethylbenzene exceeded Vermont Groundwater Enforcement Standards (VGESs) in each of the sampled monitoring wells. Concentrations of 1,3,5-trimethylbenzene exceeded VGES in three of the four monitoring wells sampled.

The highest contaminant concentrations were observed in MW4, located upgradient of the former 1,000-gallon gasoline UST, and MW2, located downgradient of the former gasoline UST system. Lower contaminant concentrations were measured in the crossgradient monitoring wells (MW1 and MW3).

All samples were collected according to Griffin's groundwater sampling protocol, which complies with industry and state standards. Results from the analyses of the trip blank and duplicate samples indicate that adequate quality assurance and control (QA/QC) were maintained during sample collection and analysis.

? dup. is 2x higher than sample!

D. Sensitive Receptor Risk Assessment

A receptor risk assessment was conducted to identify known and potential receptors of contamination detected at BCC. A visual survey was conducted during monitoring well installation. Based on these observations, a determination of the potential risk to identified receptors was made based on proximity to the expected source area (i.e., the former gasoline/diesel UST system), groundwater flow direction, and contaminant concentration levels in groundwater.



Water Supplies

All of the buildings at the BCC and surrounding residences are reportedly serviced by the City of Burlington municipal water and sewer [5]. The closest water supply well to the site is a 300 foot deep bedrock well located approximately ¼ mile northeast of the maintenance garage [5]. There do not appear to be any water supplies significantly at risk of impact from petroleum contamination originating from the former gasoline UST, based on the distance to known water supplies and the low levels of petroleum contamination detected in groundwater in the vicinity of the BCC maintenance garage.

Buildings in the Vicinity

The maintenance garage is located approximately 40 feet northwest, and upgradient, of the former gasoline UST system. The garage is of steel-framed construction on a concrete slab. Environmental risk to the building is considered minimal, given that the garage does not have a basement, which would allow the potential accumulation of petroleum vapors, and that it is serviced by a municipal water supply. The area where the former gasoline UST was located, as well as the area immediately to the south of the maintenance garage are paved, reducing the potential for exposure to the petroleum compounds through dermal contact with soils or inhalation of vapors.

Surface Water

The nearest surface water to the maintenance garage is an unnamed stream located approximately 500 feet to the west. The brook drains south and west, eventually discharging into Lake Champlain. No other surface waters are located in the vicinity of the maintenance garage. Petroleum constituents detected in groundwater in the area of the maintenance garage are not likely to impact the brook due to the low concentrations of contamination detected and the separation distance between the brook and the former gasoline UST system. In addition, groundwater flow is to the south-southeast, placing the brook in a crossgradient direction of the source area at the BCC maintenance garage.

IV. CONCLUSIONS

Based on the initial site investigation of petroleum contamination at the BCC, the following conclusions are offered:

1. There has been an apparent release of gasoline in the subsurface at the subject site.



2. Four shallow monitoring wells were installed at the site on October 27, 1999, to evaluate the degree and extent of subsurface petroleum contamination detected during the closure inspection of one gasoline UST in April 1999.
3. VOC readings of soils collected during the UST removal in April 1999 indicate that adsorbed petroleum compounds exist in the soils in the vicinity of the former gasoline UST. The highest VOC concentrations were measured at a depth of 5.7 feet below grade, and were measured primarily in soils directly beneath the former gasoline UST. The petroleum-contaminated soils at the BCC maintenance garage are paved over, and are not readily accessible, reducing risk to potential receptors. With the source UST closed, it is expected that adsorbed petroleum compound concentrations will decrease over time with the progressive action of natural mitigative processes including biodegradation, volatilization, and diffusion.
4. Water table elevation data collected on November 5, 1999 indicate that groundwater in the overburden aquifer beneath the site flows to the south-southwest at a hydraulic gradient of approximately 6%.
5. The groundwater samples collected for laboratory analysis from the four on-site monitoring wells, on November 5, 1999, were contaminated with select petroleum related compounds at concentrations exceeding VGESs.
6. The downgradient extent of the contaminant plume has not been defined with the current well array, however, contaminant concentrations in the furthest downgradient monitoring well are relatively low.
7. No free product was present in the on-site wells during sampling on November 5, 1999.
8. Receptors in the vicinity of the site which have been identified as being at potential risk of impact from subsurface petroleum contamination are the BCC maintenance garage and a nearby stream. Risk to the building is considered minimal at this time, given that it is serviced by municipal water and sewer, is constructed on a concrete slab foundation, and is located upgradient of the former gasoline UST system. Risk to the nearby stream is considered minimal given its distance from the source area and location in a crossgradient direction.
9. With the apparent source removed (i.e., the former gasoline UST system), and barring the identification of an additional source, it is expected that, over time, the natural processes of dilution, dispersion, and biodegradation will reduce dissolved contaminant concentrations present in groundwater beneath the BCC site.



V. RECOMMENDATION

Based upon the above conclusions, Griffin presents the following recommendations:

1. Since select compounds were detected at concentrations exceeding their respective VGES, a confirmatory round of groundwater elevations and samples should be collected from the four monitoring wells during the Spring of 2000. Following review of data from this second round of groundwater sampling and analysis, recommendations regarding future activities at the site will be made.

VI. REFERENCES

1. Griffin International Inc., May 17, 1999. UST Closure Letter Report from Erik Sandblom to Susan Thayer (VTDEC) re: UST Permanent Closure Inspection at Burlington Country Club, Burlington, VT.
2. Doll, Charles G., ed., 1970, *Surficial Geologic Map of Vermont*, State of Vermont.
3. Doll, Charles G., ed., 1961, *Centennial Geologic Map of Vermont*, State of Vermont.
4. USGS 7.5 Minute Topographic Quadrangle Map. 1948, photo-revised 1987. Burlington, Vermont.
5. Griffin International, Inc., September 28, 1994. *Report on the Investigation of Subsurface Petroleum Contamination at the Burlington Country Club, Burlington, VT.*



APPENDIX A

Maps



Job #: 7944551



Burlington Country Club

568 South Prospect Street, Burlington, VT

Site Location Map

Date:
1/5/2000

Source: USGS Topographic Map, Burlington, VT
Quadrangle. Photorevised 1987.

Scale:
1:24,000



EDGE OF WOODS

500 GAL. PROPANE TANK

**BURLINGTON
COUNTRY
CLUB
MAINTENANCE FACILITY**

GRAVEL DRIVE
MW4

APPROXIMATE LOCATION
OF FORMER 500 GALLON
WASTE OIL UST
REMOVED MAY, 1994

EXISTING 1,000 GALLON
GASOLINE AST

PAVED AREA

FORMER 1,000 GAL
GASOLINE UST
REMOVED 4/30/99

MW1

VENT PIPE
EXTEND PAVED AREA

WOODED AREA

MW3

MW2

LEGEND



UNDERGROUND STORAGE TANK



MONITORING WELL

JOB #: 7944551

*SITE SURVEYED BY GRIFFIN INTERNATIONAL INC. 10/26/99



BURLINGTON COUNTRY CLUB

BURLINGTON, VERMONT

SITE MAP

DATE: 12/08/99

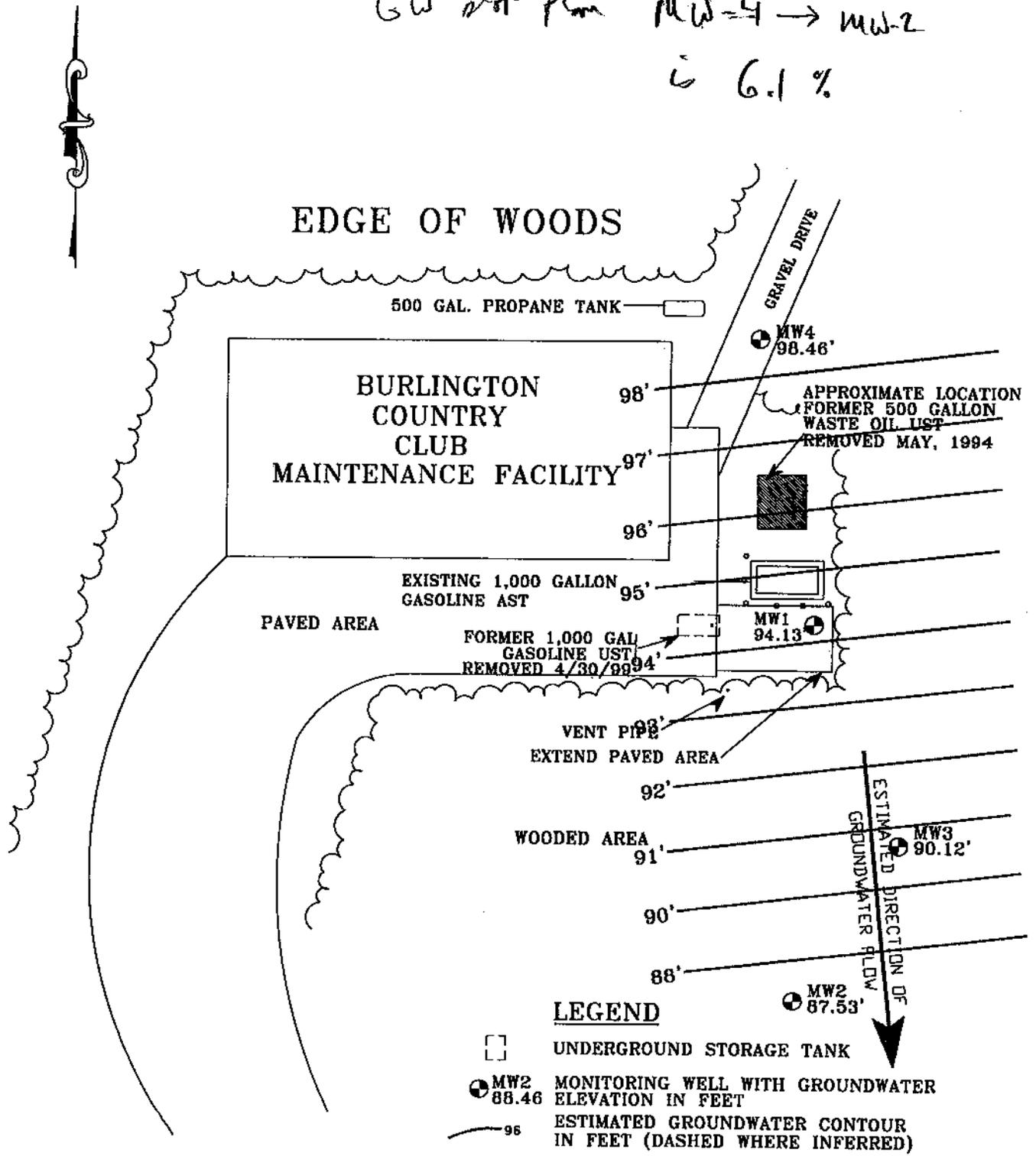
DWG.#: 2

SCALE: 1"=40'

DRN.:SB

APP.:ES

GW slope from MW-4 → MW-2
is 6.1%



JOB #: 7944551

*SITE SURVEYED BY GRIFFIN INTERNATIONAL INC. 10/26/99



BURLINGTON COUNTRY CLUB

BURLINGTON, VERMONT

GROUNDWATER CONTOUR MAP

MEASUREMENT DATE: 11/5/99

DATE: 12/08/99

DWG.#: 2

SCALE: 1"=40'

DRN.:SB

APP.:ES



EDGE OF WOODS

500 GAL. PROPANE TANK

BURLINGTON
COUNTRY
CLUB
MAINTENANCE FACILITY

GRAVEL DRIVE

MW4
189.

APPROXIMATE LOCATION
FORMER 500 GALLON
WASTE OIL UST
REMOVED MAY, 1994

EXISTING 1,000 GALLON
GASOLINE AST

PAVED AREA

FORMER 1,000 GAL
GASOLINE UST
REMOVED 4/30/99

MW1
32.1

VENT PIPE
EXTEND PAVED AREA

WOODED AREA

MW3
27.2

MW2
99.3

LEGEND

[] UNDERGROUND STORAGE TANK

MW2 MONITORING WELL WITH TOTAL
99.3 TARGETED VOCs (METHOD B021B) IN ppb

JOB #: 7944551

*SITE SURVEYED BY GRIFFIN INTERNATIONAL INC. 10/26/99



BURLINGTON COUNTRY CLUB

BURLINGTON, VERMONT

CONTAMINANT CONCENTRATION MAP

SAMPLE DATE: 11/5/99

DATE: 12/08/99

DWG.#: 2

SCALE: 1"=40'

DRN.:SB

APP.:ES



APPENDIX B

Well Logs

BORING LOG AND WELL CONSTRUCTION DIAGRAM

Well No: MW-1



BURLINGTON COUNTRY CLUB
BURLINGTON, VT

Griffin Project #: 7944551	Date Installed: 10/27/1999	
Drilled by: Griffin International	Drilling Method: Vibratory Direct Push	
Driller: Gerry Adams	Boring Diameter: 2.75"	
Supervised by: EES	Development Method: Peristaltic Pump	
Logged by: EES	Screened Length: 10 Ft.	

Letter Symbol

Graphic Symbol

Grade = 0	Well Construction	Pen/Rec ("	Interval ("	Soil Characteristics		
		Blow Count	PID (ppm)			
0.25	[Road Box]		0 - 0.5	Asphalt Surface		
0.50				Pavement		
0.75	[Bentonite Seal]		0.5 - 5.0	Silty sand. Moist to wet, brown and light brown.	SM	[Graphic Symbol]
1.00	[Drill Cuttings]		4.0			
1.25	[Water Level]					
1.50						
1.75						
2.00						
2.25						
2.50						
2.75						
3.00	[Water Level]					
3.25	3.03 feet					
3.50	11/05/1999					
3.75						
4.00						
4.25						
4.50						
4.75						
5.00			5.0 - 5.5	Silt and clay. Moist, olive gray, with petroleum odor.	ML-CL	[Graphic Symbol]
5.25			3.0			
5.50	[Water Level]		5.5	extent of boring. Bedrock refusal.		
5.75						
6.00						
6.25						
6.50						
6.75						
7.00						
7.25						
7.50						
7.75						
8.00						
8.25						
8.50						
8.75						
9.00						
9.25						
9.50						
9.75						
10.00						

Legend

- Road Box with Bolt Down Cover, Set in Cement.
- Existing Surface.
- Bentonite Seal Placed in Annulus.
- Grade #1 Silica Sand Pack Placed in Annulus.
- Drill Cuttings Placed in Annulus.
- Locking Plug.
- 1.5" ID, Schedule 40 PVC Riser.
- 1.5" ID, Schedule 40 PVC, 0.010"-Slotted Well Screen
- Plug Point
- ▼ Approximate Water Level During Drilling
- ▽ Static Water Level

NA - Not Available due to PID Malfunction

BORING LOG AND WELL CONSTRUCTION DIAGRAM

Well No: MW-2



BURLINGTON COUNTRY CLUB
BURLINGTON, VT

Griffin Project #: 7944551	Date Installed: 10/27/1999	
Drilled by: Griffin International	Drilling Method: Vibratory Direct Push	
Driller: Gerry Adams	Boring Diameter.: 2.75"	
Supervised by: EES	Development Method: Peristaltic Pump	
Logged by: EES	Screened Length: 10 Ft.	

Letter Symbol

Graphic Symbol

	Well Construction	Pen/Rec ("")	Interval (')	Soil Characteristics		
Grade = 0		Blow Count	PID (ppm)	Asphalt Surface		
0.25			0 - 0.5	Dark brown organic silt	OL	
0.50			2.6			
0.75				0.5 - 2.5	Silt and clay. Moist, olive gray with sandy brown layers.	ML-CL
1.00				1.8		
1.25				2.5 - 3.5	Sandy silt. Moist to wet, light brown and red, trace of gravel.	ML
1.50				7.0		
1.75				3.5	Extent of boring	
2.00						
2.25						
2.50						
2.75						
3.00						
3.25						
3.50						
3.75						
4.00						
4.25						
4.50						
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7.75						
8.00						
8.25						
8.50						
8.75						
9.00						
9.25						
9.50						
9.75						
10.00						

Legend

<ul style="list-style-type: none"> Road Box with Bolt Down Cover, Set in Cement. Existing Surface. Bentonite Seal Placed in Annulus. Grade #1 Silica Sand Pack Placed in Annulus. Drill Cuttings Placed in Annulus. 	<ul style="list-style-type: none"> Locking Plug. 1.5" ID, Schedule 40 PVC Riser. 1.5" ID, Schedule 40 PVC, 0.010"-Slotted Well Screen Plug Point Approximate Water Level During Drilling Static Water Level
---	---

NA - Not Available due to PID Malfunction

BORING LOG AND WELL CONSTRUCTION DIAGRAM

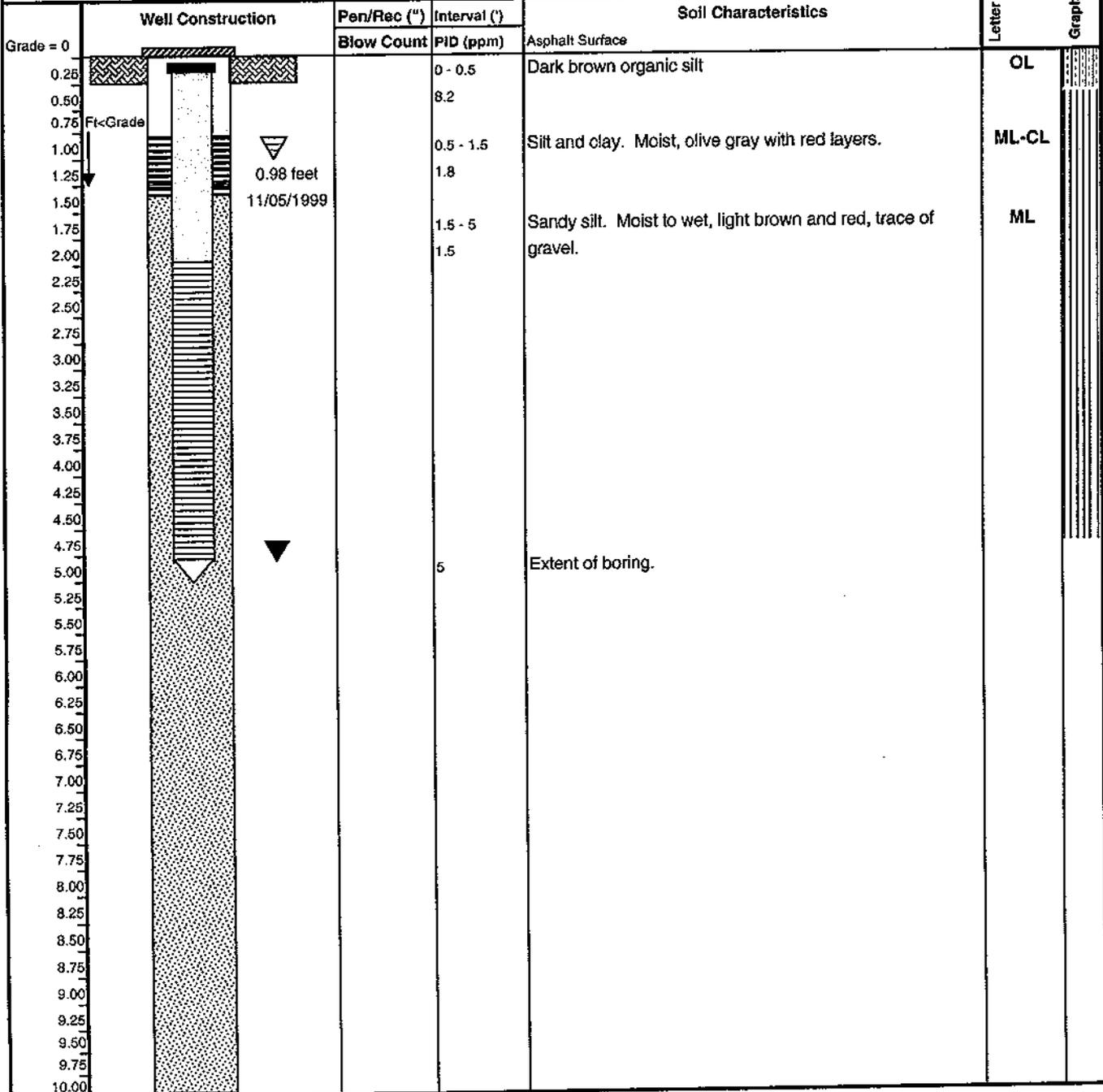
Well No: MW-3



BURLINGTON COUNTRY CLUB
BURLINGTON, VT

Griffin Project #: 7944551	Date Installed: 10/27/1999
Drilled by: Griffin International	Drilling Method: Vibratory Direct Push
Driller: Gerry Adams	Boring Diameter.: 2.75"
Supervised by: EES	Development Method: Peristaltic Pump
Logged by: EES	Screened Length: 10 Ft.

Letter Symbol
Graphic Symbol



Legend

- Road Box with Bolt Down Cover, Set in Cement.
- Existing Surface.
- Bentonite Seal Placed in Annulus.
- Grade #1 Silica Sand Pack Placed in Annulus.
- Drill Cuttings Placed in Annulus.
- Locking Plug.
- 1.5" ID, Schedule 40 PVC Riser.
- 1.5" ID, Schedule 40 PVC, 0.010" Slotted Well Screen.
- Plug Point
- Approximate Water Level During Drilling
- Static Water Level

NA - Not Available due to PID Malfunction

BORING LOG AND WELL CONSTRUCTION DIAGRAM

Well No: MW-4



BURLINGTON COUNTRY CLUB
BURLINGTON, VT

Griffin Project #: 7944551	Date Installed: 10/27/1999
Drilled by: Griffin International	Drilling Method: Vibratory Direct Push
Driller: Gerry Adams	Boring Diameter: 2.75"
Supervised by: EES	Development Method: Peristaltic Pump
Logged by: EES	Screened Length: 10 Ft.

Letter Symbol
Graphic Symbol

	Well Construction	Pen/Rec (")	Interval (')	Soil Characteristics	
		Blow Count	PID (ppm)	Asphalt Surface	
Grade = 0					
0.25			0 - 0.7	Well graded sand. Moist, light brown.	
0.50			0		SW
0.75			0.7 - 1.5	Silt with sand. Moist, brown, with pieces of wood.	ML
1.00			0		
1.25			1.5 - 2.25	Silt and clay. Moist, olive gray, with trace of gravel.	ML-CL
1.50	1.54 feet		0		
1.75	11/05/1999		2.25 - 5	Well graded sand with silt. Moist, brown, with trace of gravel.	SW-SM
2.00			0		
2.25			5.0 - 5.5	Silt and clay with sand. Moist, olive gray layers.	ML-CL
2.50			0		
2.75			5.5	extent of boring. Bedrock refusal.	
3.00					
3.25					
3.50					
3.75					
4.00					
4.25					
4.50					
4.75					
5.00					
5.25					
5.50					
5.75					
6.00					
6.25					
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7.00					
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7.50					
7.75					
8.00					
8.25					
8.50					
8.75					
9.00					
9.25					
9.50					
9.75					
10.00					

Legend

- Road Box with Bolt Down Cover, Set in Cement.
- Existing Surface.
- Bentonite Seal Placed in Annulus.
- Grade #1 Silica Sand Pack Placed in Annulus.
- Drill Cuttings Placed in Annulus.
- Locking Plug.
- 1.5" ID, Schedule 40 PVC Riser.
- 1.5" ID, Schedule 40 PVC, 0.010" Slotted Well Screen
- Plug Point
- Approximate Water Level During Drilling
- Static Water Level

NA - Not Available due to PID Malfunction



APPENDIX C

Liquid Level Monitoring Data

Liquid Level Monitoring Data

Measurement Date: November 5, 1999

Well I.D.	Well Depth btoc	Top of Casing Elevation	Depth To Product btoc	Depth To Water btoc	Product Thickness	Specific Gravity Of Product	Water Equivalent	Corrected Depth To Water	Corrected Water Table Elevation
MW1	5.1	97.16	-	3.03	-	-	-	-	94.13
MW2	3.2	88.80	-	1.27	-	-	-	-	87.53
MW3	4.0	91.10	-	0.98	-	-	-	-	90.12
MW4	4.8	100.00	-	1.54	-	-	-	-	98.46

All Values Reported in Feet

btoc - Below Top of Casing

nm - not measured

Site surveyed by Griffin International, Inc. on 10/26/99

Elevations determined relative to top of casing of MW4, which was arbitrarily set at 100'



APPENDIX D

Groundwater Quality Summary Data

Groundwater Quality Summary Data

Sample Date: November 5, 1999

PARAMETER	MW1	MW2	MW3	MW4	VGES
Benzene	TBQ(1)	2.0	2.2	4.6	5
Toluene	11.0	24.6	24.7	48.6	1,000
Ethylbenzene	2.0	6.5	6.4	13.8	700
Xylenes	11.9	37.8	37.0	75.3	10,000
Total BTEX	24.9	70.9	70.3	142.	-
1,3,5 Trimethyl Benzene	1.6	5.2	5.4	10.1	4
1,2,4 Trimethyl Benzene	5.6	18.9	17.9	33.1	5
Napthalene	TBQ(1)	4.3	3.9	3.4	20
MTBE	ND(10)	ND(10)	ND(10)	ND(10)	40
Total Targeted VOCs	32.1	99.3	97.5	189.	-
TPH (mg/L)	NT	NT	NT	NT	-

TBQ(): Trace below quantitation limit (quantitation limit)

ND(): Not detected (detection limit)

NT: Not tested

All values in ug/L (ppb) unless noted

Analysis by EPA Method 8021B, except for TPH by EPA Method 8015 DRO

VGES = Vermont Groundwater Enforcement Standards (Vermont Groundwater Protection Rule and Strategy, 11/15/97)

Quality Assurance and Control Samples

Sample Date: November 5, 1999

PARAMETER	Trip Blank	Duplicate (MW-1)	VGES
Benzene	ND(1)	2.0	5
Toluene	ND(1)	21.2	1,000
Ethylbenzene	ND(1)	4.4	700
Xylenes	ND(1)	25.0	10,000
Total BTEX	ND	52.6	
1,3,5 Trimethyl Benzene	ND(1)	2.7	4
1,2,4 Trimethyl Benzene	ND(1)	10.3	5
Napthalene	ND(1)	1.3	20
MTBE	ND(10)	ND(10)	40
Total Targeted VOCs	ND	66.9	
TPH (mg/L)	NT	NT	-

Analysis by EPA Method 8021B, except for TPH by EPA Method 8015 DRO

All values in ug/L (ppb) unless noted

NT = not tested

ND() = None detected (detection limit)

TBQ() = Trace below quantitation (detection limit)

VGES = Vermont Groundwater Enforcement Standards (Vermont Groundwater Protection Rule and Strategy, 11/15/97)



APPENDIX E
Laboratory Analysis Reports



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: Griffin International

ORDER ID: 4827

PROJECT NAME: Burlington CC/#7944551

REF.#: 147,063 - 147,068

REPORT DATE: November 19, 1999

DATE SAMPLED: November 5, 1999

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

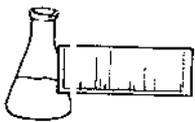
Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.

Laboratory Director

enclosures



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

EPA METHOD 8021B--PURGEABLE AROMATICS

CLIENT: Griffin International

DATE RECEIVED: November 8, 1999

PROJECT NAME: Burlington CC/#7944551

REPORT DATE: November 19, 1999

CLIENT PROJ. #: 7944551

ORDER ID: 4827

Ref. #:	147,063	147,064	147,065	147,066	147,067
Site:	Trip Blank	MW-4	MW-1	Duplicate	MW-3
Date Sampled:	11/5/99	11/5/99	11/5/99	11/5/99	11/5/99
Time Sampled:	8:17	9:50	9:58	9:58	10:07
Sampler:	JR	JR	JR	JR	JR
Date Analyzed:	11/17/99	11/17/99	11/19/99	11/19/99	11/17/99
UIP Count:	0	>10	>10	>10	>10
Dil. Factor (%):	100	100	100	100	100
Surr % Rec. (%):	88	84	103	94	108
Parameter	Conc. (ug/L)				
MTBE	<10	<10	<10	<10	<10
Benzene	<1	4.6	TBQ <1	2.0	2.2
Toluene	<1	48.6	11.0	21.2	24.7
Ethylbenzene	<1	13.8	2.0	4.4	6.4
Xylenes	<1	75.3	11.9	25.0	37.0
1,3,5 Trimethyl Benzene	<1	10.1	1.6	2.7	5.4
1,2,4 Trimethyl Benzene	<1	33.1	5.6	10.3	17.9
Naphthalene	<1	3.4	TBQ <1	1.3	3.9

Ref. #:	147,068				
Site:	MW-2				
Date Sampled:	11/5/99				
Time Sampled:	10:13				
Sampler:	JR				
Date Analyzed:	11/17/99				
UIP Count:	>10				
Dil. Factor (%):	100				
Surr % Rec. (%):	86				
Parameter	Conc. (ug/L)				
MTBE	<10				
Benzene	2.0				
Toluene	24.6				
Ethylbenzene	6.5				
Xylenes	37.8				
1,3,5 Trimethyl Benzene	5.2				
1,2,4 Trimethyl Benzene	18.9				
Naphthalene	4.3				

Note: UIP = Unidentified Peaks TBQ = Trace Below Quantitation NI = Not Indicated

JOB# 7944551

CHAIN-OF-CUSTODY RECORD

10 kg

34477

Project Name: BURLINGTON COUNTRY CLUB Site Location: BURLINGTON VT.	Reporting Address: GRIFFIN	Billing Address: GRIFFIN
Endyne Project Number: 4827	Company: GRIFFIN BS Contact Name/Phone #:	Sampler Name: J. ROCKLIN Phone #:

Lab #	Sample Location	Matrix	G R A B	C O M P	Date/Time	Sample Containers		Field Results/Remarks	Analysis Required	Sample Preservation	Rush
						No.	Type/Size				
147063	TRIP BLANK	H ₂ O	✓		11-5-99 0817	2	40ml		8021B	HCL	
147064	MW-4	↓	↓		950	↓	↓				
147065	MW-1	↓	↓		958	↓	↓				
147066	DUPLICATE MW-1	↓	↓		958	↓	↓				
147067	MW-3	↓	↓		1007	↓	↓				
147068	MW-2	↓	↓		1013	↓	↓				

Relinquished by: Signature <i>[Signature]</i>	Received by: Signature <i>[Signature]</i>	Date/Time 10-8-99 11:10
Relinquished by: Signature <i>[Signature]</i>	Received by: Signature <i>[Signature]</i>	Date/Time 11-8-99 11:10

New York State Project: Yes No Requested Analyses

1	pH	6	TKN	11	Total Solids	16	Metals (Specify)	21	EPA 624	26	EPA 8270 B/N or Acid
2	Chloride	7	Total P	12	TSS	17	Coliform (Specify)	22	EPA 625 B/N or A	27	EPA 8010/8020
3	Ammonia N	8	Total Diss. P	13	TDS	18	COD	23	EPA 418.1	28	EPA 8080 Pest/PCB
4	Nitrite N	9	BOD ₅	14	Turbidity	19	BTEX	24	EPA 608 Pest/PCB		
5	Nitrate N	10	Alkalinity	15	Conductivity	20	EPA 601/602	25	EPA 8240		
29	TCLP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify):										