Ground Water
of Vermont
A Division of Marin Environmental, Inc.

21 June 1996

Ms. Marjory Brooks
P.O. Box 236
Glover, VT 05839

Re: Initial Site Investigation Report
Former Brooks Property

Dear Ms. Brooks,

Please find enclosed a copy of the above-referenced document. I have forwarded a copy of the report to the Vermont Department of Environmental Conservation.

We have appreciated the opportunity to assist you with your environmental needs. Please give me a call if you have any questions or comments on this report.

Sincerely,

Ron Miller
Hydrogeologist and Regional Manager

cc. Chuck Schwer, VT DEC

One Mill Street, Box C-5 • Burlington, VT 05401 • (802) 860-6065 • Fax (802) 860-6076

OK - w/ recommendations
left message for
Ron Miller approving
them. 7/15/96 (TW)

Jun 26 10 05 AM '96

INITIAL SITE INVESTIGATION REPORT
of the
FORMER BROOKS PROPERTY

Glover, Vermont

(VT DEC SITE #96-1981)

21 June 1996

Prepared for:

Marjory Brooks
P.O Box 236
Glover, VT 05839
Phone: 802-525-3612

Prepared by:

Ground Water of Vermont
1 Mill Street, Box C-5
Burlington, VT 05401

Contact: Ron Miller
Phone: 802-860-6065

GWV Project #V96-029
GWV Document #96029R02.SAM

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EXECUTIVE SUMMARY

Ground Water of Vermont (GWV) has conducted an initial site investigation around a former residential heating-oil underground storage tank (UST) at the former Brooks Property on Dexter Mountain Road in Glover, Vermont. Field investigations following removal of the UST included the installation of three soil borings / monitoring wells, field screening of subsurface soils for the presence of volatile organic compounds (VOCs), sampling and analysis of ground water from the monitoring wells and the on-site supply well, and a site survey for the purposes of identifying and assessing potential risks to environmental and human health.

GWV's conclusions are summarized as follows:

1. Heating oil released from a 1,000-gallon single-walled steel UST has impacted underlying soil and ground water. The UST and approximately five cubic yards of grossly contaminated soils were removed from the ground on 5 April 1996. No evidence of additional and/or ongoing sources of contamination have been identified.

2. Soil-screening results from three soil borings performed at the site on 8 April 1996 suggest that most of the contaminated soils were removed during the UST closure.

3. The residual ground-water contamination at the site appears to be limited both in degree and extent. Analytical results from ground-water samples collected from three monitoring wells at the site and from the on-site residential supply well suggest that contaminant concentrations in ground water at the site do not exceed Vermont Groundwater Enforcement Standards for petroleum compounds, and that the area of ground-water contamination is limited to the immediate vicinity of the former UST location.

4. Nearby sensitive receptors include a shallow on-site supply well, three off-site residential supply wells, the basement of the on-site residence, a nearby sewer line, and the Barton River and an unnamed tributary. Given the limited degree and extent of soil and ground-water contamination and the fact that the UST and all grossly contaminated soils have been removed, however, the residual subsurface contamination at the site does not appear to pose a significant threat to any of these sensitive receptors.

5. Surficial materials at the site comprise approximately 10 feet of fine sand and silt directly overlying bedrock. On 22 April 1996, the water table was found to be about six feet below ground surface, and exhibited a west-northwest trending gradient of about 12.5%. Ground-water flow velocities are expected to be between 0.075 and 1.2 feet per day.

On the basis of the results of this investigation and the conclusions stated above, GWV does not recommend further ground-water monitoring at this site.

The off-site soil stockpile, however, should be monitored twice annually to confirm that the petroleum concentrations are declining and to verify that the integrity of the soil stockpile cover is being maintained. After PID readings in the stockpiled soils have declined to below detection limits (1 ppm), two core samples should be collected from the pile and submitted for laboratory analysis of VOCs and TPH. When analytical results confirm that the petroleum in the soils has completely degraded, GWV will recommend that the VT DEC consider the site for Sites-Management-Activity-Completed designation.

1.0 INTRODUCTION

This report details the results of an initial site investigation conducted at the former Brooks Property (now the Couture residence), located on Dexter Mountain Road in the center of Glover, Vermont (Figure 1). This report has been prepared by Ground Water of Vermont (GWV) for the estate executor, Marjory Brooks. The site investigation was initiated with Vermont Department of Environmental Conservation (VT DEC) approval under the state's "expressway" notification process following the discovery of subsurface petroleum contamination during the removal of a 1,000-gallon residential heating-oil underground storage tank (UST) on 5 April 1996.

1.1 Site Location and Physical Setting

The site is located near the southeast corner of the intersection between Route 16 and Dexter Mountain Road in the center of the town of Glover (see Site Location Map, Figure 1 in Appendix A). The town center is zoned for mixed residential and commercial development and lies along both the east and west banks of the Barton River, within its relatively narrow, north-south trending river valley. Surface drainage and presumed ground-water flow in the area follow the topographic slope toward the Barton River.

Drinking water at the site and all surrounding properties is supplied by private wells, some of which are shallow, dug wells. The on-site supply well is a dug well, and is located in the residence basement about 40 feet upgradient from the former UST. A mobile home located about 80 feet to the north and across Dexter Hill Road is the nearest building to the site. Its supply well is located about 65 feet directly north and cross-gradient from the former UST. Two other residential supply wells are located in the general downgradient direction from the site — one about 350 feet to the north-northwest and one about 900 feet to the west-northwest (see Site Map, Figure 2 in Appendix A).

The site and all buildings in the vicinity are served by a municipal sewer system.

Native surficial materials in the vicinity of the site are mapped as recent alluvial sands and gravels (Stewart and MacClintock, 1970). The Barton River Formation comprises bedrock in the area, consisting of interbedded siliceous limestone and chlorite phyllite of lower Devonian age (Doll, 1961). Bedrock outcrops occur near the site, where overburden thicknesses appear to be 11 feet or less.

1.2 Site History

The site is now owned and occupied by Peter and Alice Couture, who purchased it in April 1996 from the estate of Preston A. Wheeler. Marjory Brooks, the daughter of Mr. Wheeler, was the executor of his estate.

Mr. Wheeler purchased the approximately one-acre parcel in 1963. According to Ms. Brooks, it may have been part of a former farm, as there were chicken coops on site when it

was purchased. Mr. Wheeler built the residence in 1964, at which time he installed a 1,000-gallon, single-walled-steel UST for storage of heating oil for on-site space heating.

The UST was removed on 5 April 1996 by Fred's Plumbing and Heating and Gosselin's Excavating, both of Derby, Vermont. A GWV field geologist performed an UST closure assessment on the day of removal, and submitted a report, dated 12 April 1996, to Ms. Brooks and the VT DEC.

The UST was found to be in poor condition upon removal, with extensive surface rust and pitting, and at least 15 holes ranging up to 1/4-inch in diameter. All of the observed holes were below the water table, which was approximately six feet below ground surface (bgs) in the tank excavation. Petroleum odors, stained soils and sheens on the water table were observed throughout the excavation. The UST piping, however, appeared to be in good condition. About 30 gallons of residual heating oil and tank bottoms were removed from the UST and stored on-site in a 55-gallon drum for subsequent disposal. After receiving approval from Ted Unkles of the VT DEC, approximately five cubic yards of grossly contaminated soils were removed from the excavation and transported to a gravel pit in Derby, Vermont for treatment by polyencapsulation.

GWV initiated a site investigation in accordance with the VT DEC "expressway" process after receiving approval on 5 April 1996 from Ms. Brooks and Ted Unkles of the VT DEC.

1.3 Objectives and Scope of Work

The objectives of this initial site investigation were to:

- Evaluate the degree and extent of petroleum contamination in soil and ground water;
- Qualitatively assess the risks to environmental and public health via relevant sensitive receptors and potential contaminant migration pathways; and
- Identify potentially appropriate monitoring and/or remedial actions based on the site conditions.

To accomplish these purposes, GWV has:

- Reviewed existing historical site data.
- Supervised the installation of three soil borings / monitoring wells (MW-1, 2 and 3), and determined the local ground-water flow direction, gradient and approximate velocity.
- Screened subsurface soils from the well borings for VOC content using a PID.
- Collected and submitted ground-water samples from the on-site monitoring wells and from the shallow on-site supply well for laboratory analysis of VOCs and total petroleum hydrocarbons (TPH).
- Identified sensitive receptors in the area, and assessed the risk posed by the contamination to these potential receptors.
- Evaluated the need for treatment and/or a long-term monitoring plan for the site.
- Prepared this summary report, which details the work performed, qualitatively assesses risks, provides conclusions and offers recommendations for further action.

2.0 INVESTIGATIVE PROCEDURES AND RESULTS

2.1 Soil Boring / Monitoring Well Installation

On 8 April 1996, GWV supervised the installation of three soil borings / monitoring wells (MW-1, MW-2 and MW-3) at the site. MW-1 was placed about 14 feet north of the former UST location in the presumed oblique downgradient direction, toward Dexter Hill Road and along the sewer line running from the residence to the shoulder of the road. MW-2 was located 30 feet from the former UST location in the presumed downgradient direction. MW-3 was placed within the former UST location itself. Well locations are shown on Figure 2 in Appendix A. The monitoring wells were installed by Green Mountain Boring of East Barre, Vermont using hollow-stem-auger methods.

Soil samples were collected periodically from each boring using a two-foot-long by two-inch inner-diameter split spoon advanced in front of the auger bit with a 140-pound impact hammer. Recovery was poor, generally less than 50 percent. The split-spoon samples obtained were screened for the presence of VOCs with a photoionization detector (PID) and logged for lithology by a GWV field geologist. All downhole drilling and sampling equipment was decontaminated during use as appropriate. The PID soil-screening results are discussed in Section 2.2.

The soils encountered in each boring generally consisted of poorly sorted brown sand and gravel to a depth of 6 to 9 feet bgs, followed by a layer of fine brown sand and silt as much as 4 feet thick. Auger refusal, presumably on bedrock, was encountered in each boring at between 9.5 and 11 feet bgs.

Ground water was encountered in each of the borings at about six feet bgs. Two-inch PVC monitoring wells with between 6.0 and 9.0 feet of 0.010-inch slots were installed inside the auger flights in each boring. The tops of the screen sections were placed within two to three feet of ground surface in order to accommodate seasonal ground-water level fluctuations. Sections of unslotted PVC risers were added to bring the tops of the well casings to approximately 0.5 feet bgs. Clean silica #1 filter sand was placed in the borehole annulus around each well to nominally one foot above the slotted interval as the auger flights were backed out. A bentonite pellet seal at least one-foot thick was installed above the sand pack and the remainder of the annular space was filled with native material. Each completed monitoring well was protected by a flush-mounted steel roadbox cemented into place. Each well casing was topped with a compression cap. Monitoring-well construction details are included on the soil-boring and well-construction logs in Appendix B.

All four wells were manually developed by bailer immediately following installation. None contained any free-phase product at that time. All three wells produced moderately well and cleaned up relatively quickly. Development water was discharged directly to the ground surface in the vicinity of each well.

2.2 Soil-Screening Results

PID field-screening results of soil samples collected from the three soil borings indicate that little residual soil contamination remains at the site. With the exception of one reading of 38.4 parts per million (ppm) in a sample collected from near the water table in MW-1, all samples had PID readings of less than 5 ppm, which is below the VT DEC PID-based guideline value for fuel-oil contaminated soils of 10 ppm. PID screening results are included on the boring logs in Appendix B.

The GWV field geologist screened soil samples from each soil boring for the presence of volatile organic compounds (VOCs) using a Thermo Environmental Model 580B portable photoionization detector (PID). The PID was calibrated with an isobutylene standard gas to a benzene reference.

2.3 Determination of Ground-Water Flow Direction and Gradient

Ground water in the unconfined surficial aquifer directly beneath the site appears to be flowing in an west-northwesterly direction, as originally presumed. The average gradient of the local ground-water table on 22 April 1996 was about 12.5 percent. Average flow velocities in the ground water are estimated to be in the range of 0.075 - 1.2 feet per day. Water-level measurements and elevation calculations for 22 April 1996 are presented in Table 1. The ground-water contour map in Figure 3 was prepared using this data.

Fluid levels were measured in the three monitoring wells on 22 April 1996. The depth to water varied from 4.65 feet (MW-1) to 5.30 feet (MW-2) below top-of-casing. No free-phase petroleum or sheens were observed in any of the wells. Static water-table elevations were computed for each monitoring well by subtracting the measured depth-to-water readings from the surveyed top-of-casing elevations, which are relative to an arbitrary 100.00-foot datum.

The fine sands and silts comprising the shallow aquifer at the site typically exhibit effective porosities of about 0.35 to 0.5 and hydraulic conductivities of about 0.3 to 3.3 feet per day (Fetter, 1994). Assuming Darcian flow, these estimated ranges of porosity and conductivity combine with the calculated ground-water gradient of 12.5 percent to yield an estimated range of ground-water flow velocity in the surficial aquifer of between 0.075 and 1.2 feet per day.

2.4 Ground-Water Sampling and Analysis

Ground-water analytical results suggest that residual ground-water contamination at the site is limited both in degree and extent. None of the ground-water samples collected from the on-site monitoring wells exceeded any Vermont Groundwater Enforcement Standards (VGESs) for petroleum compounds.[1] The highest contaminant concentrations were not detected in the well in the former UST location, but rather were in the obliquely down-

[1] Vermont has established Groundwater Enforcement Standards (VGESs) for four fuel-oil VOCs, as follows: benzene - 5 ppb; toluene - 2,420 ppb; ethylbenzene - 680 ppb; and xylenes - 400 ppb. No Vermont or Federal ground-water standard has been established for TPH.

gradient well MW-1. This result suggests that the excavation of all grossly contaminated soils from the former UST location has effectively reduced residual ground-water contaminant concentrations in the source area. Analytical results are summarized in Table 2. A contaminant distribution map of total VOCs and TPH is presented as Figure 4. Laboratory report forms are included in Appendix C.

Contaminant concentrations in the MW-1 sample were as follows: xylenes - 61.9 parts per billion (ppb), ethyl benzene - 24 ppb, benzene and toluene - trace levels (less than 5 ppb), and TPH - 22 parts per million (ppm). The sample from MW-3, which is located at the former UST location, contained 13.5 ppb of xylenes, 2.0 ppb of ethylbenzene, a trace (less than 1 ppb) of toluene, and 1.71 ppm TPH. The downgradient monitoring well (MW-2) and on-site supply well samples were non-detect for all analytes.

Ground-water samples were collected from monitoring wells MW-1, 2 and 3 and from the site residence supply well on 22 April 1996. Each monitoring well was purged and then sampled using the dedicated bailer and dropline left hanging inside the well casing following development. The water-supply well was sampled directly, also with a disposable bailer. Trip blank and duplicate samples were collected to ensure that adequate quality assurance/quality control (QA/QC) standards were maintained. All field procedures were conducted in accordance with GWV standard protocols. Purge water was discharged directly to the ground in the vicinity of each well.

The ground-water samples were submitted to Endyne, Inc. of Williston, Vermont where they were analyzed for the presence of VOCs by EPA Method 8020 and for total petroleum hydrocarbons (TPH) by modified EPA Method 8100. Analytical results from the QA/QC samples indicate that adequate QA/QC was maintained during sample collection and analysis; no VOCs were detected in the trip-blank, and analytical results for the both the 8020 and 8100 duplicates fell within about twenty percent of the original sample results.

3.0 SENSITIVE RECEPTOR SURVEY AND RISK ASSESSMENT

GWV conducted a survey to identify sensitive receptors near the former UST location that could potentially be impacted. The following sensitive receptors were identified:

1. On-site supply wells are used to provide all drinking water in the area surrounding the former Brooks Property. Four residential supply wells were identified in the vicinity of the former UST. The on-site residence dug supply well is located in the basement of the house, about 30 feet upgradient of the former UST. The next nearest well, which serves the mobile home on the other side of Dexter Mountain road, is located approximately 65 feet north and cross-gradient of the former UST location. The remaining identified residential supply wells are located approximately 350 north-northwest and 900 feet west-northwest, respectively, of the former UST.

2. The on-site residence has a basement, whose nearest wall is located approximately 20 feet from the former UST location. The mobile home across Dexter Mountain Road does not have a basement.

3. The nearest surface-water bodies are a small tributary to the Barton River, located 200 feet north of and parallel to Dexter Hill Road, and the Barton River itself. One or both of these bodies presumably represents the surface discharge point of ground water that flows past the site.

4. A municipal sewer pipe connecting the sewer main to the on-site residence is located approximately 10 feet south, and downgradient of, the former UST location.

GWV assessed the risks that the subsurface contamination poses to these receptors, and has concluded that the residual contamination at the site does not pose a significant threat to any known sensitive receptors. This conclusion was based on the following:

- The only known contaminant source and all grossly contaminated soils have been removed from the ground;
- None of the ground-water samples from the monitoring wells exceeded VGESs or Vermont drinking-water standards;[2]
- No contaminants were detected in the on-site supply well;
- No odors or seeps were identified in the basement of the on-site residence, and PID readings of ambient air in the basement ranged from 0.0 ppm to 0.2 ppm — levels that are well within the range of background readings in a damp environment;
- No contaminants were detected in the monitoring well located 30 feet and directly downgradient from the former UST, and the nearest supply wells in the downgradient direction are 350 feet and 900 feet away, respectively.

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[2] The Vermont Department of Health has established drinking-water standards for several fuel-oil VOCs. These standards differ from the VGESs for several compounds, and are as follows: benzene- 5 ppb; toluene- 1,000 ppb; ethylbenzene- 700 ppb; and xylenes- 10,000 ppb. No State or Federal drinking-water standard exists for TPH.

4.0 CONCLUSIONS

Based on the results of the site investigation described above, Ground Water of Vermont concludes the following.

1. Heating oil released from a 1,000-gallon single-walled steel UST has impacted underlying soil and ground water. The UST and approximately five cubic yards of grossly contaminated soils were removed from the ground on 5 April 1996. No evidence of additional and/or ongoing sources of contamination have been identified.

2. Soil-screening results from three soil borings performed at the site on 8 April 1996 suggest that most of the contaminated soils were removed during the UST closure.

3. The residual ground-water contamination at the site appears to be limited both in degree and extent. Analytical results from ground-water samples collected from three monitoring wells at the site and from the on-site residential supply well suggest that contaminant concentrations in ground water at the site do not exceed Vermont Groundwater Enforcement Standards for petroleum compounds, and that the area of ground-water contamination is limited to the immediate vicinity of the former UST location.

4. Nearby sensitive receptors identified during the investigation include a shallow on-site supply well, three off-site residential supply wells, the basement of the on-site residence, a nearby sewer line, an unnamed tributary to the Barton River and the Barton River itself. Given the limited degree and extent of soil and ground-water contamination and the fact that the UST and all grossly contaminated soils have been removed, however, the residual subsurface contamination at the site does not appear to pose a significant threat to any of these sensitive receptors.

5. Surficial materials at the site comprise approximately 10 feet of fine sand and silt directly overlying bedrock. On 22 April 1996, the water table was found to be about six feet below ground surface, and exhibited a west-northwest trending gradient of about 12.5%. Ground-water flow velocities are expected to be between 0.075 and 1.2 feet per day.

5.0 RECOMMENDATIONS

On the basis of the results of this investigation and the conclusions stated above, Ground Water of Vermont recommends the following:

1. Given that no petroleum compounds were detected at levels above Vermont Groundwater Enforcement Standards in any ground-water samples from the installed monitoring wells and that the only identified potential contaminant source has been removed from the ground, GWV does not recommend further ground-water monitoring at this site.

2. The off-site soil stockpile should be monitored twice annually to confirm that the petroleum concentrations are declining and to verify that the integrity of the soil stockpile cover is being maintained. After PID readings in the stockpiled soils have declined to below detection limits (1 ppm), two core samples should be collected from the pile and submitted for laboratory analysis of VOCs and TPH. When analytical results confirm that the petroleum in the soils has completed degraded, GWV will recommend that the VT DEC consider the site for Sites-Management Activity Completed designation.

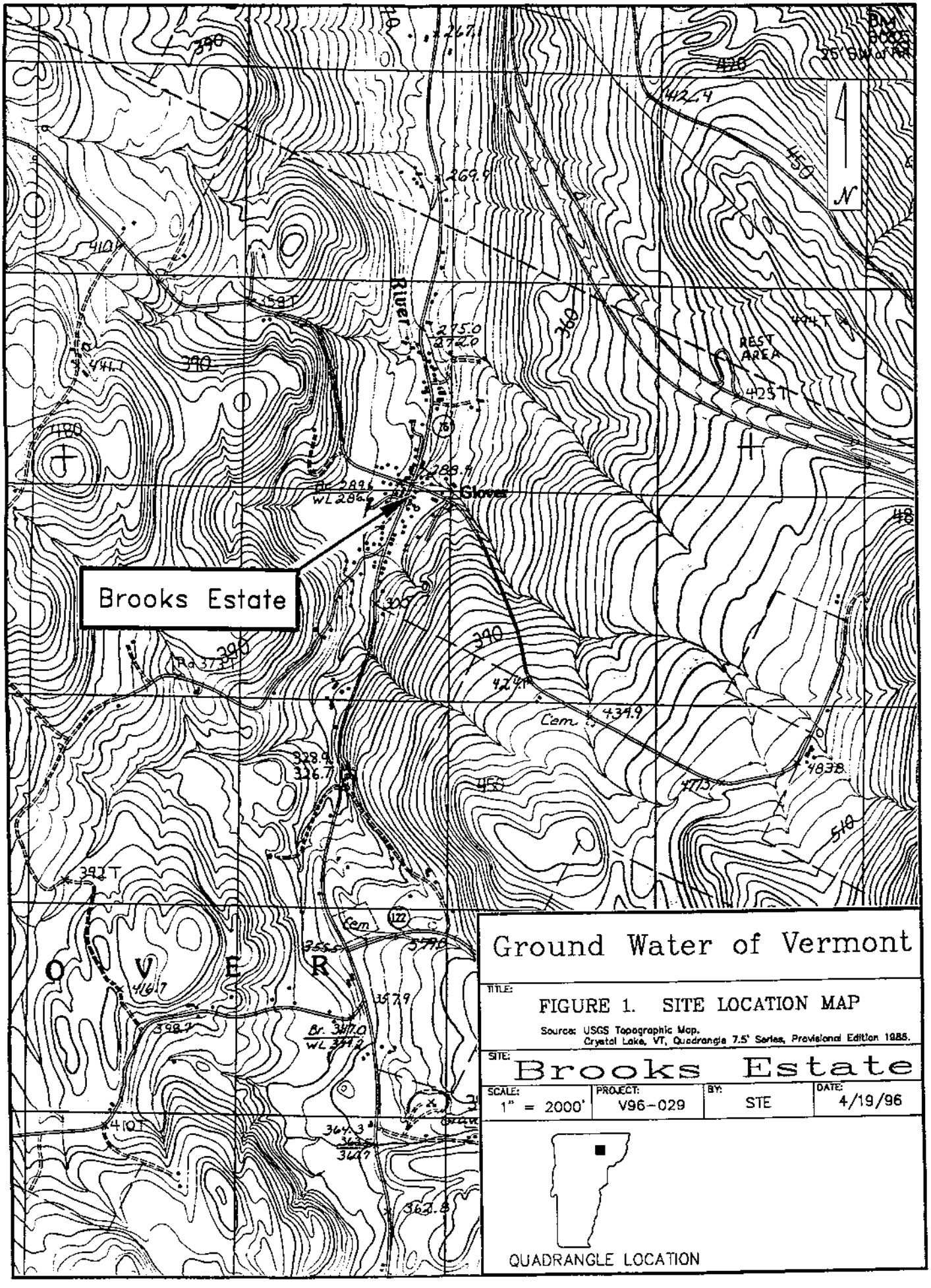
6.0 REFERENCES

Doll, C.G. and others, 1961. *Geologic Map of Vermont*, Office of the State Geologist.

Domenico, P.A., and Schwartz, F.W., 1990. *Physical and Chemical Hydrogeology*, John Wiley and Sons, New York, 824 p.

Fetter, C.W., 1994. *Applied Hydrogeology, 3rd Ed.*, Prentice Hall, Englewood Cliffs, New Jersey, 691 p.

Stewart, D.P. and MacClintock, P., *1970. Surficial Geologic Map of Vermont,* Office of the State Geologist.



Ground Water of Vermont

TITLE:

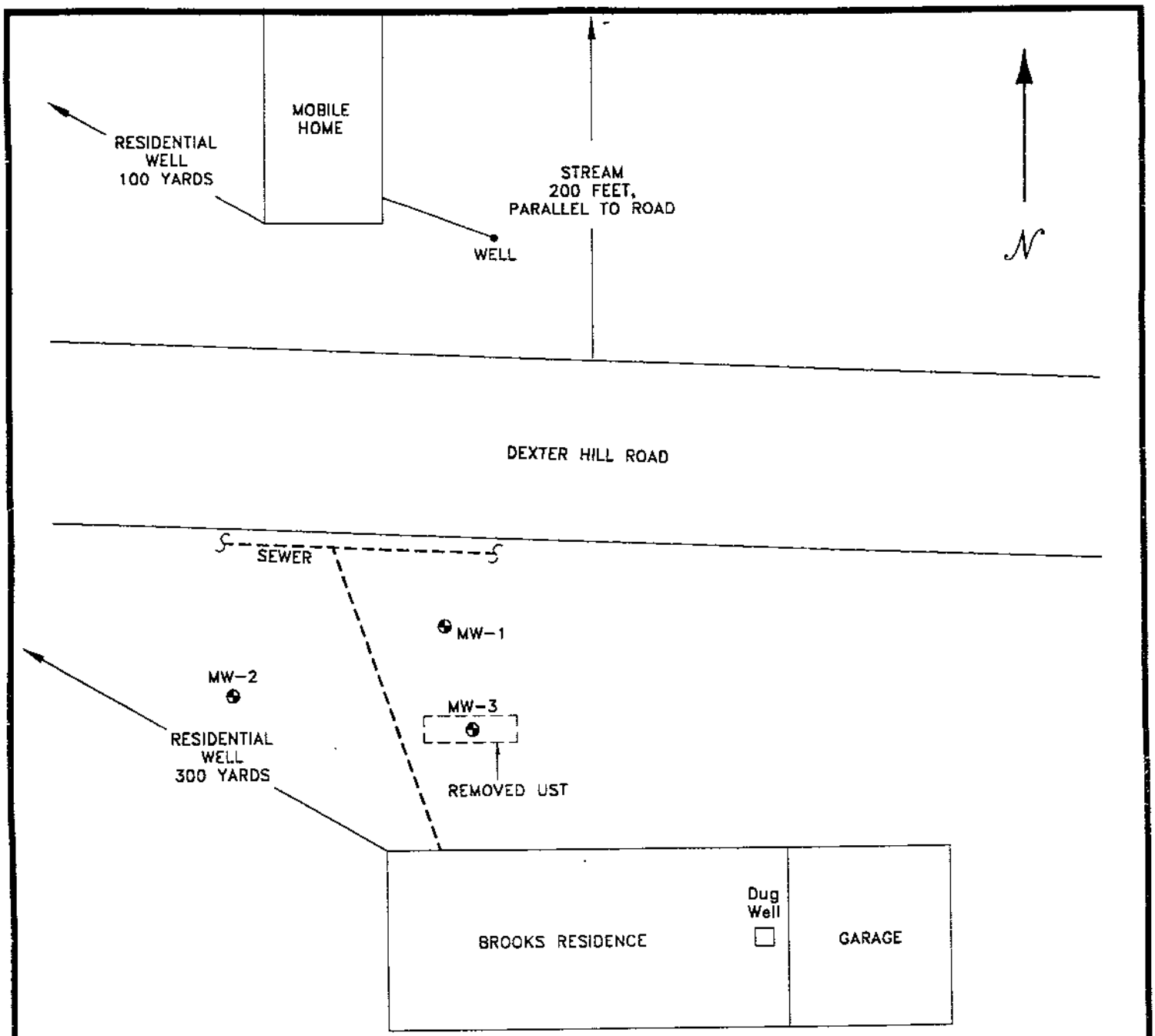
FIGURE 1. SITE LOCATION MAP

Source: USGS Topographic Map.
Crystal Lake, VT, Quadrangle 7.5' Series, Provisional Edition 1988.

SITE: **Brooks Estate**

SCALE:	PROJECT:	BY:	DATE:
1" = 2000'	V96-029	STE	4/19/96

QUADRANGLE LOCATION



0 20'

SCALE

ALL LOCATIONS ARE APPROXIMATE

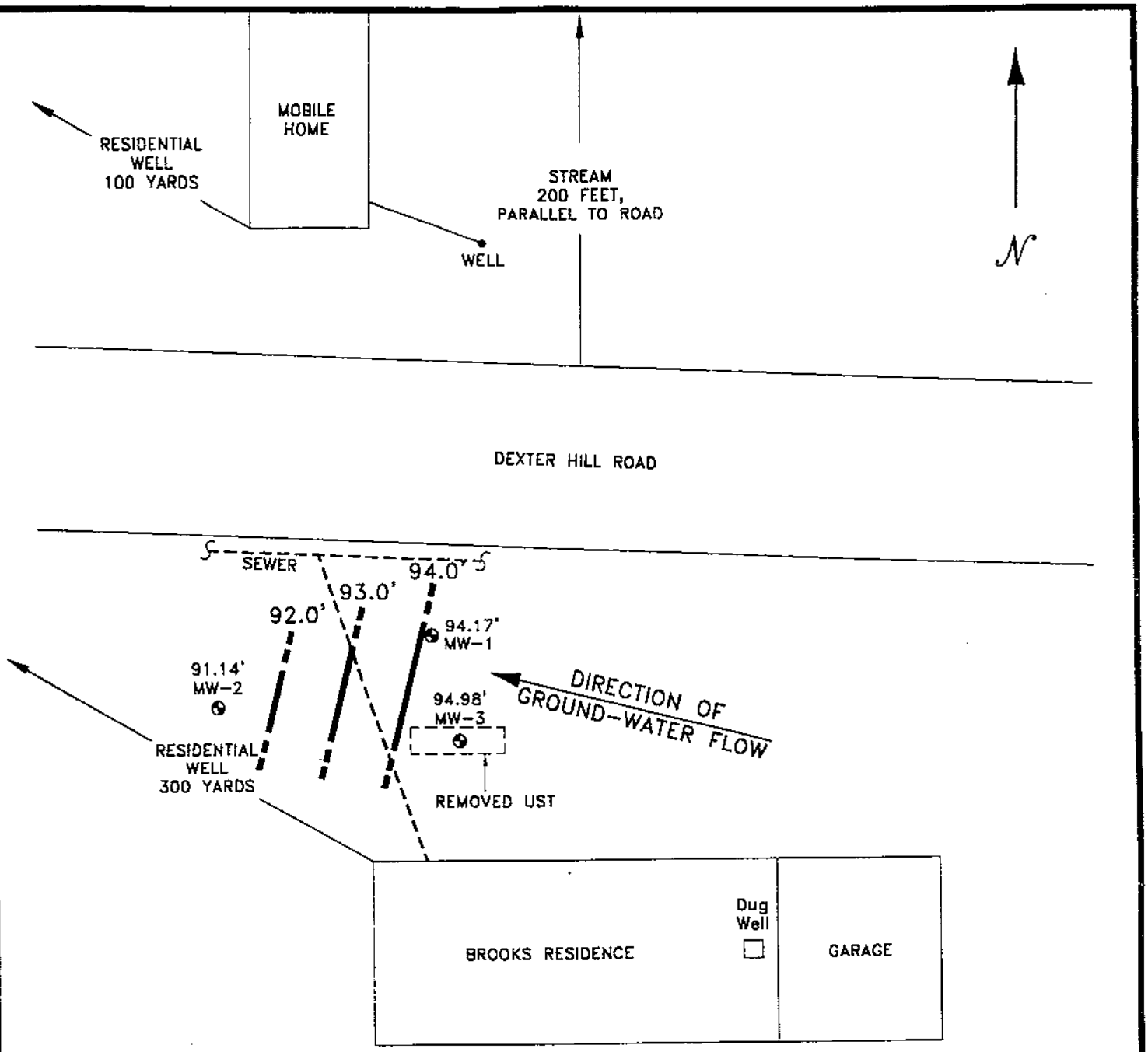
Ground Water of Vermont
1 Mill St., Box C-5
Burlington, VT 05401
(802) 860-6065

BROOKS ESTATE
GLOVER, VT

FIGURE 2.
SITE MAP
WITH MONITORING WELLS

LEGEND:
MONITORING WELL

DRAWN BY: STE	DATE: APR 1996
APPROVED BY: RM	FILE No.: 96029



0 20'

SCALE

ALL LOCATIONS ARE APPROXIMATE

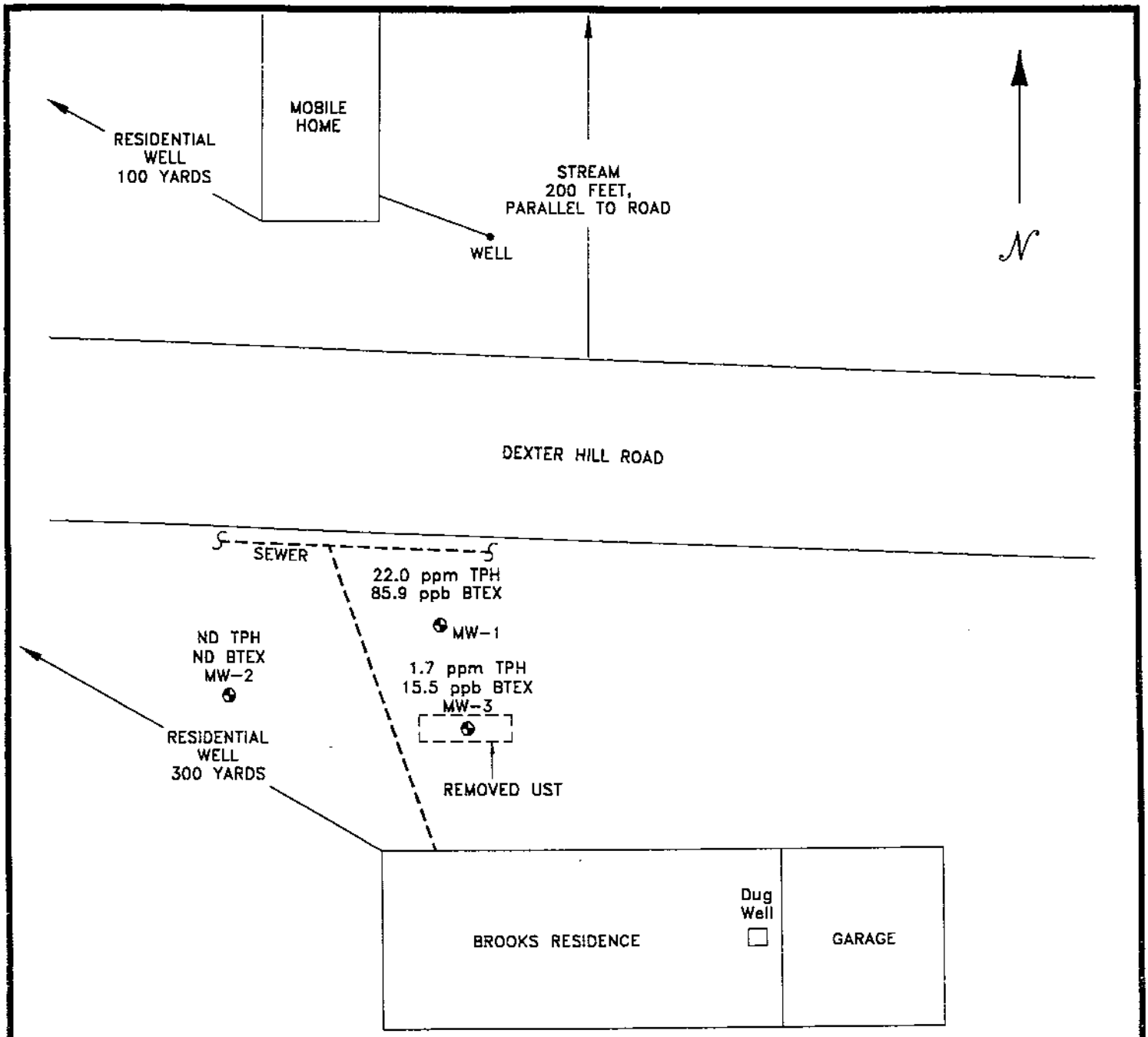
Ground Water of Vermont
1 Mill St., Box C-5
Burlington, VT 05401
(802) 860-6065

BROOKS ESTATE
GLOVER, VT

FIGURE 3.
GROUND-WATER CONTOUR MAP
MONITORING DATE: 22 APRIL 1996

LEGEND:
⊕ MONITORING WELL
— GROUND-WATER CONTOUR

DRAWN BY: STE	DATE: APR 1996
APPROVED BY: RM	FILE No.: 96029



0 20'

SCALE

ALL LOCATIONS ARE APPROXIMATE

Ground Water of Vermont
1 Mill St., Box C-5
Burlington, VT 05401
(802) 860-6065

BROOKS ESTATE
GLOVER, VT

FIGURE 4.
CONTAMINANT DISTRIBUTION MAP
MONITORING DATE: 22 APRIL 1996

LEGEND:
MONITORING WELL
ND NOT DETECTED

DRAWN BY: STE	DATE: APR 1996
APPROVED BY: RM	FILE No.: 96029

TABLE 1. GROUND-WATER ELEVATION CALCULATIONS

Brooks Estate
Glover, Vermont

Monitoring Date: 22 April 1996

Well I.D.	Top of Casing Elevation	Depth to Water	Ground Water Table Elevation
MW-1	98.82	4.65	94.17
MW-2	96.44	5.30	91.14
MW-3	100.00	5.02	94.98

TABLE 2. Ground-Water Sample Analytical Results
Brooks Estate
Glover, Vermont

Sampling Date: 22 April 1996

COMPOUND	SAMPLE LOCATION						VGES
	MW-1	MW-2	MW-3	Dup. (MW-3)	Brooks Supply Well	Trip Blank	
Benzene	**TBQ <5**	ND <1	ND <1	ND <1	ND <1	ND <1	5
Toluene	**TBQ <5**	ND <1	**TBQ <1**	**1.3**	ND <1	ND <1	2,420
Ethylbenzene	**24.0**	ND <1	**2.0**	**2.3**	ND <1	ND <1	680
Xylenes	**61.9**	ND <1	**13.5**	**15.2**	ND <1	ND <1	400
MTBE	ND <5	ND <1	ND <1	ND <1	ND <1	ND <1	40
Total VOCs	**85.9**	ND	**15.5**	**18.8**	ND	ND	--
TPH**	**22.0**	ND	**1.71**	**1.58**	ND	NS	--

Notes:

Results in parts per billion (ppb) unless otherwise noted.
ND = Nondetect at indicated detection limit.
TBQ = Trace below quantitation limit indicated.
NS = Not sampled.
** Total petroleum hydrocarbon results in parts per million (ppm).
VGES = Vermont Groundwater Enforcement Standards
(Vermont Health Advisory levels for BTEX and MTBE).

Ground Water of Vermont

FIELD SUPERVISOR Brian Starer
CONTRACTOR Green Mountain Borings
DRILLERS Jamie, Harold

JOB LOCATION Brook residence
DATE 4/8/96

DRILLING METHOD hollow stem auger
BORING DIAMETER 4¼"

AND 40 – 50%
SOME 10 – 40%
TRACE 0 – 10%

BORING LOCATION sketch on back or on site plan with measurements

BORING # MW-1

TOTAL DEPTH 10.5'

DEPTH	SAMPLES	SAMPLE NUMBER	BLOWS PER 6" 0/6	6/12	12/18	18/24	REC.	SAMPLE DESCRIPTION	STRAT CHG	PID Readings in Parts per (ppm) GENERAL DESCRIPTION	WELL DETAIL	DEPTH
			3	6	7	12	1.0	poorly sorted brown sand and gravel w/trace of topsoil		0.4 ppm		
			18	18	15	34	1.5'	medium to fine brown sand		0.8ppm		
			15	40/4"								
5'			15	16	15	13	14"	poorly sorted sand and gravel with some cobbles		0.4 ppm 4.0 ppm water table		5'
			14	14	24	30/3	1.0			38.4 ppm - weathered fuel oil odor sheen on H_2O		
			60/6"				6"	fine brown sand and silt ↓		damp		
10'								refusal		refusal		10'
15'												15'
20'												20'
25'												25'
30'												30'
35'												35'
40'												40'

WELL DETAIL: riser, screen, sand

MATERIALS USED	SIZE/TYPE	QUANTITY
WELL SCREEN	2"/PVC	8'
SLOT SIZE	0.10/PVC	8'
RISER PIPE	2"/PVC	2'
GRADED SAND	#1	2.5 bags
PELLET BENTONITE	3/8"	1/4 bag
GRANULAR BENTONITE		

MATERIALS USED	SIZE/TYPE	QUANTITY
GROUT	yes	
BACKFILL	no	
WATER USED	no	
STEAM CLEANER	yes	

Ground Water of Vermont

FIELD SUPERVISOR Brian Starer
CONTRACTOR Green Mountain Boring
DRILLERS Jamie, Harold

JOB LOCATION Brook residence
DATE 4/8/96

DRILLING METHOD hollow stem auger
BORING DIAMETER 4 1/4"

AND 40 – 50%
SOME 10 – 40%
TRACE 0 – 10%

BORING LOCATION sketch on back or on site plan with measurements
BORING # MW-2
TOTAL DEPTH 9'

DEPTH	SAMPLES	SAMPLE NUMBER	BLOWS PER 6" 0/6	6/12	12/18	18/24	REC.	SAMPLE DESCRIPTION	STRAT CHG	PID Readings in Parts per million (ppm) GENERAL DESCRIPTION	WELL DETAIL	DEPTH
			5	12	23	30/3"	1.0	Poorly sorted brown sand and gravel with cobbles		0.0 ppm	riser, 6" ø, screen, sand	
			40	30/1.4			0					
5'				10	15	12				4.6 ppm		5'
			15				1.5			water table		
				15	14	13		fine brown sand and silt				
			15				1.2			0.9 ppm		
10'								refusal		damp, refusal		10'
15'												15'
20'												20'
25'												25'
30'												30'
35'												35
40'												40

MATERIALS USED	SIZE/TYPE	QUANTITY
WELL SCREEN	2"/PVC	6'
SLOT SIZE	0.10/PVC	6'
RISER PIPE	2"/PVC	2'
GRADED SAND	#1	1 bag
PELLET BENTONITE	3/8"	1/4 bag
GRANULAR BENTONITE		

MATERIALS USED	SIZE/TYPE	QUANTITY
GROUT	yes	
BACKFILL	no	
WATER USED	no	
STEAM CLEANER	yes	

Ground Water of Vermont

FIELD SUPERVISOR Brian Starer
CONTRACTOR Green Mountain Borings
DRILLERS Jamie, Harold

JOB LOCATION Brook residence
DATE 4/8/96

DRILLING METHOD hollow stem auger
BORING DIAMETER 4¼"

AND 40 – 50%
SOME 10 – 40%
TRACE 0 – 10%

BORING LOCATION sketch on back or on site plan with measurements

BORING # MW-3 (tank excavation)
TOTAL DEPTH 11'

DEPTH	SAMPLES	SAMPLE NUMBER	BLOWS PER 6" 0/6	6/12	12/18	18/24	REC.	SAMPLE DESCRIPTION	STRAT CHG	PID Readings in Parts per Million (ppm) GENERAL DESCRIPTION	WELL DETAIL	DEPTH
								poorly sorted sand and gravel (excavation backfill)		tank excavation		
5'			37	14	2	3	4"			0.4 ppm		5'
			1	2	5	2	6"			4.8 ppm ~ water table, odor weathered fuel		
			1	5	30	39	2"			2.1 ppm		
10'								fine brown sand and silt				10'
								refusal		refusal		
15'												15'
20'												20'
25'												25'
30'												30'
35'												35
40'												40

MATERIALS USED	SIZE/TYPE	QUANTITY
WELL SCREEN	2"/PVC	9'
SLOT SIZE	0.10	9'
RISER PIPE	2"/PVC	2'
GRADED SAND	#1	2 bags
PELLET BENTONITE	3/8"	¼ bag
GRANULAR BENTONITE		

MATERIALS USED	SIZE/TYPE	QUANTITY
GROUT – yes		
BACKFILL – no		
WATER USED – no		
STEAM CLEANER – yes		

ENDYNE, INC.

Laboratory Services

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

REPORT OF LABORATORY ANALYSIS

CLIENT: GroundWater of Vermont
PROJECT NAME: Brooks Residence
REPORT DATE: April 25, 1996
DATE SAMPLED: April 22, 1996

PROJECT CODE: GWVT1506
REF.#: 87,960 - 87,965

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

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LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Brooks Residence
REPORT DATE: April 25, 1996
DATE SAMPLED: April 22, 1996
DATE RECEIVED: April 23, 1996
DATE ANALYZED: April 24, 1996

PROJECT CODE: GWVT1506
REF.#: 87,960
STATION: Trip Blank
TIME SAMPLED: 7:15
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	ND
Xylenes	1	ND
MTBE	1	ND

Bromobenzene Surrogate Recovery: 99%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

ENDYNE, INC.

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LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Brooks Residence
REPORT DATE: April 25, 1996
DATE SAMPLED: April 22, 1996
DATE RECEIVED: April 23, 1996
DATE ANALYZED: April 24, 1996

PROJECT CODE: GWVT1506
REF.#: 87,961
STATION: Duplicate
TIME SAMPLED: Not Indicated
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	2.3
Toluene	1	1.3
Xylenes	1	15.2
MTBE	1	ND

Bromobenzene Surrogate Recovery: 94%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

NOTES:
1 None detected

ENDYNE, INC.

Laboratory Services

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LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Brooks Residence
REPORT DATE: April 25, 1996
DATE SAMPLED: April 22, 1996
DATE RECEIVED: April 23, 1996
DATE ANALYZED: April 24, 1996

PROJECT CODE: GWVT1506
REF.#: 87,962
STATION: MW-1
TIME SAMPLED: 7:30
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	5	TBQ[2]
Chlorobenzene	5	ND[3]
1,2-Dichlorobenzene	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
Ethylbenzene	5	24.0
Toluene	5	TBQ
Xylenes	5	61.9
MTBE	5	ND

Bromobenzene Surrogate Recovery: 116%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

NOTES:

1 Detection limit raised due to high levels of contaminants. Sample run at a 20% dilution.

2 Trace below quantitation limit

3 None detected

ENDYNE, INC.

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LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Brooks Residence
REPORT DATE: April 25, 1996
DATE SAMPLED: April 22, 1996
DATE RECEIVED: April 23, 1996
DATE ANALYZED: April 24, 1996

PROJECT CODE: GWVT1506
REF.#: 87,963
STATION: MW-2
TIME SAMPLED: 7:45
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	ND
Xylenes	1	ND
MTBE	1	ND

Bromobenzene Surrogate Recovery: 107%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

ENDYNE, INC.

Laboratory Services

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LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Brooks Residence
REPORT DATE: April 25, 1996
DATE SAMPLED: April 22, 1996
DATE RECEIVED: April 23, 1996
DATE ANALYZED: April 24, 1996

PROJECT CODE: GWVT1506
REF.#: 87,964
STATION: MW-3
TIME SAMPLED: 8:00
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	2.0
Toluene	1	TBQ[2]
Xylenes	1	13.5
MTBE	1	ND

Bromobenzene Surrogate Recovery: 94%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >10

NOTES:

1 None detected

2 Trace below quantitation limit

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LABORATORY REPORT

EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: GroundWater of Vermont
PROJECT NAME: Brooks Residence
REPORT DATE: April 25, 1996
DATE SAMPLED: April 22, 1996
DATE RECEIVED: April 23, 1996
DATE ANALYZED: April 24, 1996

PROJECT CODE: GWVT1506
REF.#: 87,965
STATION: Brooks Supply Well
TIME SAMPLED: 8:10
SAMPLER: Brian Starer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	ND
Xylenes	1	ND
MTBE	1	ND

Bromobenzene Surrogate Recovery: 98%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 None detected

ENDYNE, INC.

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Williston, Vermont 05495
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EPA METHOD 8020 LABORATORY REPORT

MATRIX SPIKE AND DUPLICATE LABORATORY CONTROL DATA

CLIENT: GroundWater of Vermont
PROJECT NAME: Brooks Residence
REPORT DATE: April 25, 1996
DATE SAMPLED: April 22, 1996
DATE RECEIVED: April 23, 1996
DATE ANALYZED: April 24, 1996

PROJECT CODE: GWVT1506
REF.#: 87,965
STATION: Brooks Supply Well
TIME SAMPLED: 8:10
SAMPLER: Brian Starer

Parameter	Sample(ug/L)	Spike(ug/L)	Dup1(ug/L)	Dup2(ug/L)	Avg % Rec
Benzene	ND[1]	10	9.2	9.1	91%
Toluene	ND	10	9.9	9.7	98%
Ethylbenzene	ND	10	10.4	10.2	103%
Xylenes	ND	30	30.2	29.9	100%

NOTES:
1 None detected

GroundWater of Vermont

The Chace Mill, One Mill Street, Box C-5, Burlington, Vermont, 05401
(802)-860-6065 (802)-860-6076 Fax

CHAIN OF CUSTODY RECORD

87,960–87,970

LABORATORY

ANALYSIS STATUS:
_____ RUSH (2-DAY)
_____ PRIORITY (4-DAY)
_X_ BEST AVAILABLE TIME

PROJECT NUMBER: 96-029
PROJECT NAME: Brooks Residence
PROJECT LOCATION: Glover, VT
PROJECT MANAGER: Ben Miller
COLLECTED BY: B. Stryker
DATE: 4/22/96

GWVT1506

PAGE ___ OF ___

SAMPLE ID	DATE	TIME	SAMPLE MATRIX	TYPE OF CONTAINER	# CONT.	PRESRVD	METALS - PLEASE LIST: MA ( ) EP-TOX ( ) (8)	OIL & GREASE: IR ( ) GRAV. ( )	VOLATILE ORGANICS: 624 ( ) 601 ( ) 602 ( ) 8010 ( ) 8015 ( ) 8020 & MTBE (X)	EXTRACTABLES: ACIDS ( ) PESTS ( ) B-N ( ) PCBs ( ) 608.0000 ( )	TSS ( ) TDS ( ) SPEC COND ( )	BACTERIA: SPC ( ) TOT COLI ( ) FEC COLI ( )	CYANIDE: AMEN ( ) TOT ( )	CL ( ) F ( ) SO4 ( )	NO3 ( ) NO2 ( ) NH3 ( )	TCLP: METALS ( ) VOLATILES ( ) PESTICIDES ( ) SEMIVOLATILES ( ) HERBICIDES ( )	OTHER: EPA 8100	OTHER:	REMARKS
Trip Blank	4/22	715P	W	VOA + ~~250ml glass~~	2	I/A			X								X		87,960
Duplicate		-		VOA + 250ml glass	2				X								X		87,961
mw-1		730P		VOA + 250 ml glass	3				X								X		87,962
mw-2		745P							X								X		87,963
mw-3		800P							X								X		87,964
Brooks supply well		810P							X								X		87,965

MATRIX
W = AQUEOUS
S = SOLIDS

PRESERVATIVE
I = ICED
A = ACIDIFIED (VOA 1:1 HCl 4 drops; 250 ml 1:1 HCl 25 drops)
B = BASE
N = SODIUM BISULFATE

RELINQUISHED BY	DATE	TIME	RECEIVED BY
	4/23/96		
	4-23-96	12:40	

GroundWater of Vermont

The Chace Mill, One Mill Street, Box C-5, Burlington, Vermont, 05401
(802)-860-6065 (802)-860-6076 Fax

CHAIN OF CUSTODY RECORD

LABORATORY

ANALYSIS STATUS:
_____ RUSH (2-DAY)
_____ PRIORITY (4-DAY)
_____ BEST AVAILABLE TIME

PROJECT NUMBER: V96-029
PROJECT NAME: Brooks Residence
PROJECT LOCATION: Glover, VT
PROJECT MANAGER: Bar Miller
COLLECTED BY: B. Stryer
DATE: 4/22/96

ANALYSIS REQUESTED

SAMPLE ID	DATE	TIME	SAMPLE MATRIX	TYPE OF CONTAINER	# CONT.	PRESRVD	METALS - PLEASE LIST: NA ( ) EP-TOX ( ) (6)	OIL & GREASE: IR ( ) GRAV. ( )	VOLATILE ORGANICS: 624 ( ) 601 ( ) 602 ( ) 8010 ( ) 8015 ( ) 8020 & MTBE (X)	EXTRACTABLES: ACIDS ( ) B-N ( ) PCBs ( ) PESTS ( ) 608/8080	TSS ( ) TDS ( ) pH ( ) SPEC COND ( )	BACTERIA: SPC ( ) TOT COLI ( ) FEC COLI ( )	CYANIDE: AMEN ( ) TOT ( )	CL ( ) F ( ) SO4 ( )	NO3 ( ) NO2 ( ) NH3 ( )	TCLP: METALS ( ) VOLATILES ( ) PESTICIDES ( ) SEMIVOLATILES ( ) HERBICIDES ( )	OTHER: EPA 8100	OTHER:	REMARKS
Trip Blank	4/22	715P	W	VOA + ~~250ml glass~~	2	I/A			X								X		
Duplicate		-		VOA + 250ml glass	2				X								X		
mw-1		730P		VOA + 250 ml glass	3				X								X		
mw-2		745P							X								X		
mw-3		800P							X								X		
Brooks supply well	↓	810P	↓	↓	↓	↓			X								X		

MATRIX
W = AQUEOUS
S = SOLIDS

PRESERVATIVE
I = ICED
A = ACIDIFIED (VOA 1:1 HCl 4 drops; 250ml 1:1 HCl 25 drops)
B = BASE
N = SODIUM BISULFATE

RELINQUISHED BY	DATE	TIME	RECEIVED BY
[signature]	4/22/96		[signature]

ENDYNE, INC.

Laboratory Services

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(802) 879-4333
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: GroundWater of Vermont
PROJECT NAME: Brooks Residence
DATE REPORTED: April 26, 1996
DATE SAMPLED: April 22, 1996

PROJECT CODE: GWVT1507
REF. #: 87,966 - 87,970

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody record.

Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced methods and within the specified holding times.

All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced methods.

Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy were 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.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures

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LABORATORY REPORT

TOTAL PETROLEUM HYDROCARBONS (TPH) BY MODIFIED EPA METHOD 8100

DATE: April 26, 1996
CLIENT: GroundWater of Vermont
PROJECT: Brooks Residence
PROJECT CODE: GWVT1507
COLLECTED BY: B. Starer
DATE SAMPLED: April 22, 1996
DATE RECEIVED: April 23, 1996

Reference #	Sample ID	Concentration(mg/L)[1]
87,966	Duplicate	1.58
87,967	MW-1; 7:30 p.m.	22.0
87,968	MW-2; 7:45 p.m.	ND[2]
87,969	MW-3; 8:00 p.m.	1.71
87,970	Brooks Supply Well; 8:10 p.m.	ND

Notes:

1 Method detection limit is 1.0 mg/L.
2 None Detected

GroundWater of Vermont

The Chace Mill, One Mill Street, Box C-5, Burlington, Vermont, 05401
(802)-860-6065 (802)-860-6076 Fax

CHAIN OF CUSTODY RECORD

PAGE ___ OF ___

LABORATORY

ANALYSIS STATUS:
_____ RUSH (2-DAY)
_____ PRIORITY (4-DAY)
__x__ BEST AVAILABLE TIME

PROJECT NUMBER: V96-029
PROJECT NAME: Brooks Residence
PROJECT LOCATION: Glover, VT
PROJECT MANAGER: Ben Miller
COLLECTED BY: B. Stone
DATE: 4/22/96

GWVT1507

ANALYSIS REQUESTED

SAMPLE ID	DATE	TIME	SAMPLE MATRIX	TYPE OF CONTAINER	# CONT.	PRESRVD	VOLATILE ORGANICS: 624 ( ) 601 ( ) 602 ( ) 8010 ( ) 8015 ( ) 8020 & MTBE (X)	EXTRACTABLES: ACIDS ( ) B/N ( ) PCBs ( ) PESTS ( ) 608/8080	OTHER: EPA 8100	REMARKS
Trip Blank	4/22	715P	W	VOA + 250ml glass	2	HA	X		X	
Duplicate		-		VOA + 250ml glass	2		X		X	87,966
mw-1		730P		VOA + 250 ml glass	3		X		X	87,967
mw-2		745P					X		X	87,968
mw-3		800P					X		X	87,969
Brooks supply well		810P					X		X	87,970

METALS - PLEASE LIST: MA ( ) SB-TOX ( ) (6)
OIL & GREASE: IR ( ) GRAV. ( )
TSS ( ) TDS ( ) pH ( ) SPEC COND ( )
BACTERIA: SPC ( ) TDT COLI ( ) FEC COLI ( )
CYANIDE: AMEN ( ) TOT ( )
CL ( ) F ( ) SO4 ( )
NO3 ( ) NO2 ( ) NH3 ( )
TCLP: METALS ( ) VOLATILES ( ) PESTICIDES SEMIVOLATILES ( ) HERBICIDES ( )
OTHER

MATRIX
W = AQUEOUS
S = SOLIDS

PRESERVATIVE
I = ICED
A = ACIDIFIED (VOA 1:1 HCl 4 drops; 250 ml 1:1 HCl 25 drops)
B = BASE
N = SODIUM BISULFATE

RELINQUISHED BY	DATE	TIME	RECEIVED BY
	4/22/96		