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Department of Environmental Conservation

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February 6, 1997

KENT S KOPTIUCH
KENT S KOPTIUCH INC
164 OSGOOD HILL
ESSEX VERMONT 05452

RE: Initial Site Investigation, Marble's Store, Charlotte, Vermont (Site #90-0515)

Dear Mr. Koptiuch:

The Sites Management Section (SMS) has reviewed your "Initial Site Investigation" report dated January 17, 1997, for the above referenced site. This report summarizes the results of the subsurface investigation conducted in response to petroleum contamination found during the removal of one (1) gasoline underground storage tank (UST) in October 1996. The investigation included installing four (4) groundwater monitoring wells, screening split spoon soil samples with a photoionization detector, and performing a detailed sensitive receptor survey.

The SMS concurs with your conclusions that *"clear evidence of off-site migration by petroleum hydrocarbon contaminants at concentrations in excess of the Vermont Groundwater Enforcement Standards has been defined in this investigation,"* and *"the full down-gradient extent of this migration has not been determined."* The potential sensitive receptor survey did not indicate any immediate threat to human health or to the environment.

In order to better characterize the degree and extent of contamination, the SMS concurs with your recommendation to install an additional two (2) to three (3) monitoring wells. Once these wells are installed, all on-site monitoring wells, and the on-site supply well should be sampled and analyzed for benzene, toluene, ethylbenzene, xylenes, and methyl tertiary butyl ether. A summary report should be prepared which includes analytical data, detailed well logs, an area map, a groundwater contour map, conclusions, and recommendations. In addition, please submit to the SMS the name, address, and phone number of the owner of the off-site property affected by the petroleum release.

Please submit to the SMS a work plan and cost estimate or a site investigation expressway form within fifteen days of your receipt of this letter, so that it may be pre-approved prior to the initiation of on-site work. If you have any questions or comments, please feel free to call me at 802-241-3243.

Sincerely,

Matthew Moran, Site Project Manager
Sites Management Section

cc: Carl Ruprecht, S.B. Collins, Inc.
mactm/wp/900515r

Phase (check one)		Type (check one)
X	Initial Site Investigation	Work Scope
	Corrective Action Feasibility Investigation	Technical Report
	Corrective Action Plan	PCF Reimbursement Request
	Corrective Action Summary Report	General Correspondence
	Operations and Monitoring Report	

INITIAL SITE INVESTIGATION

**Marble's Store
Old Hinesburg Road
Charlotte, Vermont**

**KSKGeoS™ Project #96024
DEC Spill #: 900515
UST Facility ID #: 1065**

Prepared For:

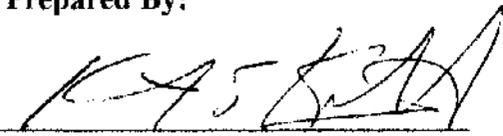
**Mr. Carl Ruprecht
S. B. Collins, Inc.
P. O. Box 671
ST. Albans, Vermont 05478**

Submitted by:

**KENT S. KOPTIUCH, Inc.
Geo-Environmental Services
164 Osgood Hill
Essex, Vermont 05452**

Prepared By:

Date: January 17, 1997



**Kent S. Koptiuch, CGWP #449
President, Principal Hydrogeologist**

KSKGeoS™

Environmental Investigations and Remedial Solutions - Call (802) 878-1620

EXECUTIVE SUMMARY
INITIAL SITE INVESTIGATION - JANUARY 17, 1996
MARBLE'S STORE, CHARLOTTE, VERMONT

KENT S. KOPTIUCH, Inc. (KSKGeoS™), under the authorization of S. B. Collins, Inc., conducted a Phase II subsurface hydrogeologic investigation of the Marble's Store property in Charlotte, Vermont. This investigation was prompted by UST closure activities conducted by KSKGeoS™ on October 24, 1996.

- KSKGeoS™ completed the installation, development, and sampling of four (4) groundwater monitoring wells. Each of the water samples were analyzed under EPA method 8020 for BTEX and MTBE (purgeable aromatics).
- Groundwater exhibits a north-northwesterly flow direction across the site. Gradient is approximately 15%. The rate of groundwater travel through the aquifer is approximately 7.36 gpd/ft².
- No separate-phase petroleum hydrocarbon products were observed during groundwater sampling activities.
- Groundwater samples from MW-2 and MW-4 yielded positive impact by benzene at concentrations in excess of the Vermont Groundwater Enforcement Standard (GES) of 5.0 µg/L. The sample from MW-3 yielded a trace below the method detection limit (MDL), however, the MDL was raised to 500 µg/L for this sample due to the high overall levels of contaminants; in all likelihood, benzene concentration in MW-3 is also in excess of the GES.
- Groundwater samples from MW-2, MW-3, and MW-4 yielded positive impact by toluene at concentrations in excess of the GES of 2,240 µg/L. The sample from MW-1 yielded 2.0 µg/L toluene.
- Groundwater samples from MW-2 and MW-3 yielded positive impact by ethylbenzene at concentrations in excess of the GES of 680 µg/L. The sample from MW-4 yielded 585 µg/L ethylbenzene.
- Groundwater samples from MW-2, MW-3, and MW-4 yielded positive impact by xylenes at concentrations in excess of the GES of 400 µg/L.
- Groundwater samples from the monitoring well network yielded no positive impact by Methyl tert butyl-ether (MTBE) at concentrations exceeding the MDL, however, the MDL was raised to levels of 1,000 µg/L or more for the samples from MW-2, MW-3, and MW-4 due to a high, overall contaminant concentration; thus this data is not definitive.
- Clear evidence of off-site migration by petroleum hydrocarbon contaminants at concentrations in excess of the Vermont Groundwater Enforcement Standards has been defined in this investigation. The full down-gradient extent of this migration has not been determined.
- No evidence has been revealed through the activities of this investigation that would indicate the migration of contaminants onto this site, from other sites in the vicinity has occurred.
- No evidence of any immediate on or off-site threat to human life, health, or safety was discerned.
- A supplemental investigation and evaluation to fully define the off-site, down-gradient extent of petroleum hydrocarbon contaminant migration is recommended prior to initiating any remedial actions and/or instituting a monitoring program.

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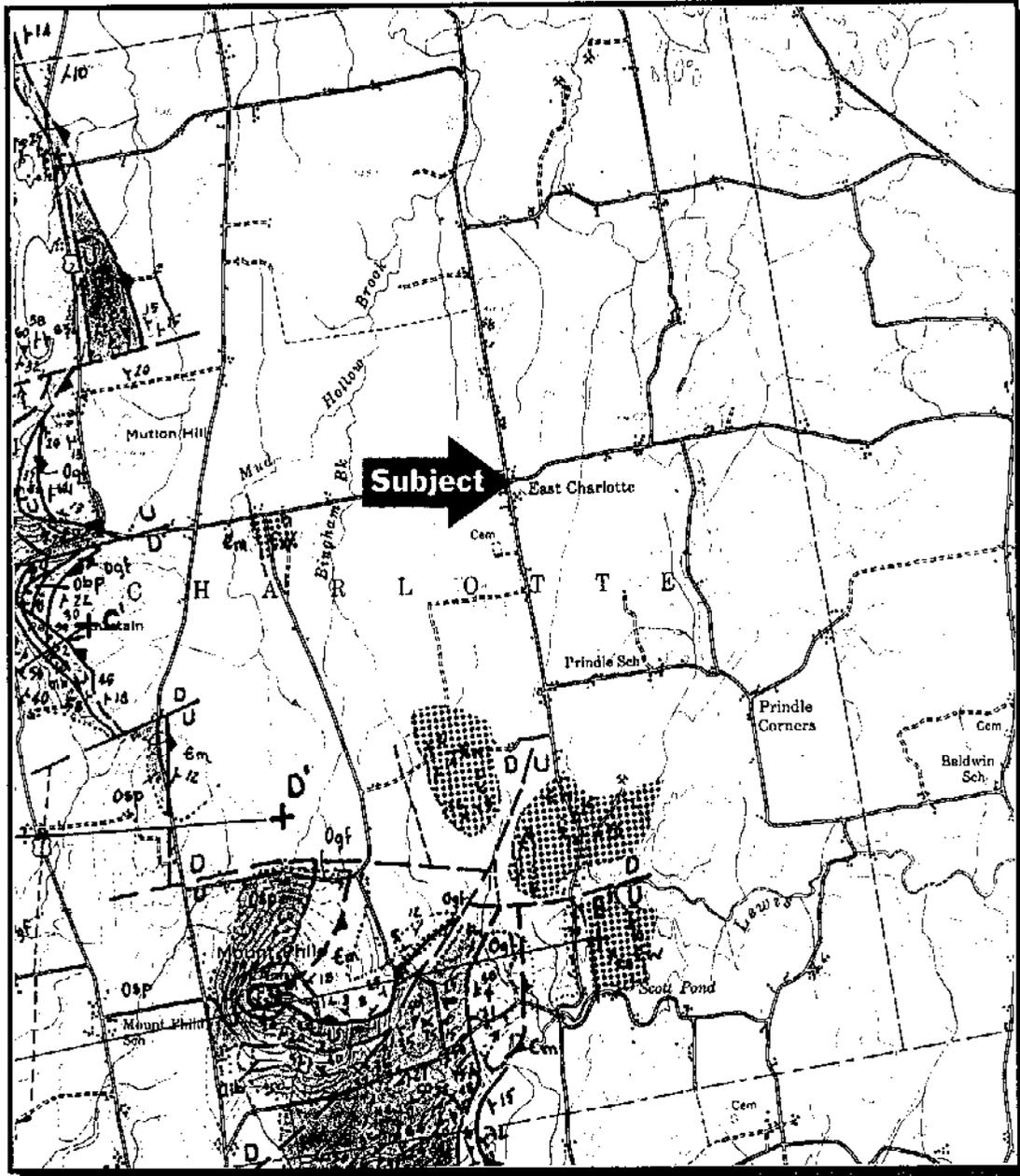
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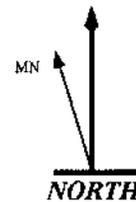
Figure 1
Site Location Map



0 1.0 2.0 3.0 4.0 Miles

SCALE: 1" = 5,208 Feet

SOURCE:
Willsboro Quadrangle, New York-Vermont 15 Minute Series (Topographic)
United States Geological Survey, Washington, D.C. 1956



KSKGeoS™

1.0 INTRODUCTION

1.1 Authorization and Site Description

On October 24, 1996, KENT S. KOPTIUCH, Inc. Geo-Environmental Services (KSKGeoS™) completed the oversight and closure by removal of one (1) underground storage tank (UST) at Marble's Store in Charlotte, Vermont. Because petroleum hydrocarbon impact to soils and groundwater was noted during closure activities, KSKGeoS™ recommended that a phase II subsurface hydrogeologic investigation be completed to better define the degree and extent of contamination. This additional investigative action was undertaken under the *Site Investigation Expressway* program.

The site is located on the south side of the intersection of the Old Hinesburg Road with Spear Street Extension in the village of East Charlotte. **Figure 1** is a Site Location Map depicting the facility's relative geographic location. The site is occupied by the Store building and retail petroleum dispensers (2).

1.2 Goals

The goals of KSKGeoS™'s investigation at this site were defined as follows:

- To assess the current environmental conditions in the overburden soils and in the unconsolidated groundwater aquifer by defining the extent and concentrations (if any) of separate-phase and/or dissolved-phase petroleum hydrocarbon product plume(s).
- To identify and evaluate impacts (if any) to potential receptors in the vicinity of the site, and
- To identify a potential remedial action program or future monitoring program suitable to address identified impacts (if any) revealed through the course of this investigation.

1.3 Scope of Work

KSKGeoS™'s scope of work on this site included the completion of the following tasks:

- Preparation of a site-specific health and safety plan (HASP) in accord with OSHA 29 CFR 1910.120.
- Field identification of potential receptors, including but not limited to: potable water supply sources, surface waterbodies and waterways, and possible preferential subsurface migratory pathways within the immediate vicinity.
- Installation and development of four (4) groundwater monitoring wells under the supervision of a qualified groundwater scientist.
- Split-barreled (split spoon) sampling of the overburden soils during monitoring well installation activities in accord with ASTM standard D1586. All samples were screened for volatile organic compounds (VOCs), using jarred head-space methodology, with an H-Nu PI-101, 10.2 electron-volt (eV) lamp, photoionization detector (PID).
- Survey of groundwater monitoring well locations and elevations. Elevational accuracy is $\pm 0.01'$; spatial accuracy is $\pm 1.0'$.
- Laboratory chemical analysis of groundwater samples from the monitoring well network for benzene, toluene, ethylbenzene, xylenes (BTEX), and methyl tert-butyl ether (MTBE) by EPA method 602.
- Data evaluation and interpretation.
- Summary report preparation including all investigative results, documentation, interpretation, and findings and recommendations.

Figure 2 is a site map showing property layout, with groundwater monitoring well locations, groundwater contours, BTEX and MTBE concentrations, and BTEX isoconcentrations on December 18, 1996.

2.0 INVESTIGATIVE METHODOLOGY

2.1 Groundwater Monitoring Well Installation

Although four (4) groundwater monitoring wells were already in existence at the site, these wells were observed to be in very poor shape during UST closure activities in October 1996; the wells were screened completely to the surface, they only extended between five (5) and seven (7) feet below grade (BG), and only one (1) of the wells was located appropriately for the purpose of actually characterizing the site's hydrogeology. In addition, three (3) of the wells were situated in locations that would necessitate their destruction when the remaining USTs on site are closed and replaced in the Spring of 1997. After discussing this information with Carl Ruprecht of S. B. Collins, Inc. (SBC), it was determined that the installation of new wells to better represent the hydrogeologic conditions at the site would be appropriate.

Boring and well installations at the site were completed on December 10, 1996. All monitoring well locations were selected by KSKGeoS™ supervising hydrogeologist Kent Koptiuch (Certified Ground Water Professional #449). Monitoring well locations were sited to best represent the overburden and groundwater conditions on a site-wide basis. Wells were installed by Tri-State Drilling and Boring, Inc. under the direct supervision of Mr. Koptiuch.

A Mobile B-57, truck-mounted drill rig, equipped with 6¾" inside diameter (ID) hollow stem augers was utilized for boring and well installations. The wells are constructed of 2" diameter, flush-threaded PVC screening and casing. Screening is factory slotted to 0.020' (an equivalent of 0.020 -feet of opening per running foot of screen). The screened interval for each well was determined by the supervising hydrogeologist to extend at least five (5) feet above and five (5) feet below the groundwater table, where possible, to allow for seasonal fluctuations.

The annulus of each borehole was then filter-packed with washed, #2 Morie sand to a depth at least one (1) foot above the top of the screened interval. A one (1) foot (or greater) hydrated bentonite seal was then set above the filter-pack. The remainder of the annular space was then backfilled with clean cuttings from each borehole. The top of each well casing was secured with a gripper-type cap. All four (4) wells were completed with flush-mounted, steel manholes set in concrete pads. Boring and well completion logs are included as ATTACHMENT A.

Well top-of-casing elevations were surveyed in on DECEMBER 18, 1996 by Mr. Koptiuch to an assumed datum of 100.00 -feet.

2.2 Soil Sampling and Field Analysis

Soil samples were secured with a two-inch (2") outside diameter split-barreled sampler (split-spoon), advanced with the aid of a 140 pound drop hammer, in conformance with ASTM Standard D1586. Sampling was conducted at five (5) -foot intervals beginning at five (5) -feet below grade (BG).

Split-spoons were decontaminated after each sample was collected with a double-rinse, liquinox-clean water solution and clean water. All samples were classified by Mr. Koptiuch using the Unified Soil Classification System.

Each sample was screened for the presence of VOCs by PID using jarred head-space methodology. The PID employed was an H-Nu PI-101 with a 10.2 eV lamp. The unit was calibrated on-site for benzene in calibration gas equivalents (CGEs) of 100% isobutylene at 70 parts per million (ppm).

2.3 Groundwater Monitoring, Sampling, and Analysis

Following the survey, on December 18, 1996, an optical interface probe, capable of determining groundwater and separate-phase hydrocarbon petroleum product presence and thickness to within 0.01',

SUMMARY TABLE 1: GROUNDWATER ELEVATIONS - October 25, 1996

WELL	GRADE	TOP-OF-CASING	SCREENED INTERVAL	DEPTH-TO-BOTTOM	DEPTH-TO-WATER	WATER ELEVATION
MW-1	101.68	101.00	92.20-98.20	9.00	1.89	99.11
MW-2	97.64	97.41	87.61-94.61	10.00	5.18	92.23
MW-3	97.41	97.21	87.41-94.41	10.00	3.30	93.91
MW-4	96.39	96.23	81.43-91.43	15.00	7.13	89.10

was utilized to profile the elevations and the VOC characteristics of the overburden aquifer within each well. Table 1 is a summary of groundwater elevations for the December 18, 1996 gauging event.

Water volumes were then calculated for each of the four (4) wells, and the equivalent of three (3) well volumes were purged, by bailing, prior to sampling. Groundwater samples were then secured from the wells in accordance with EPA method 8020 for BTEX and MTBE.

The sampling bailer was decontaminated between each well utilizing a liquinox-distilled water solution followed by a distilled water rinse. Samples were packed securely on ice and hand-delivered to Endyne, Inc. for chemical analyses on December 18, 1996.

2.4 Potential Receptor Survey

A physical survey was conducted to identify potential receptors, including surface waterbodies, potable water sources, and likely routes of subsurface conductance. In addition, a review of the following data bases was conducted:

- Well completion logs for private and public potable wells in the Town of Charlotte at the ANR DEC Water Supply Division (WSD),
- the ANR DEC Waste Management Division (WMD) Sites Management Section Hazardous Sites List, and
- the ANR DEC WMD Underground Storage Tank Program facilities list for active and closed USTs.

3.0 RESULTS

3.1 Geologic, Overburden Lithologic, Geomorphologic, and Hydrogeologic Summary

The site is located in the village of East Charlotte, Vermont in the Champlain Lowlands physiographic subdivision (Stewart and MacClintock, 1969), at approximately 400-feet above mean sea level. Topography at the site slopes with a northerly gradient of approximately 7%. Surficial drainage is to the north into the east branch of Mud Hollow Brook, approximately 400 -feet distant. Overall regional surficial drainage is to the north via the La Platte River Valley to its confluence with Shelburne Bay of Lake Champlain approximately 2.7 miles north of the site.

Surficial soils are mapped as Georgia stony loam (Allen, 1989), formed in glacial till from parent material consisting of limestone and calcareous shales. They are characterized by moderate permeability in the surface horizons, and moderately slow-to-slow permeability in the substratum.

Bedrock in the vicinity (not exposed at the site) is comprised of the lower Cambrian period Winooski Dolomite (Doll, 1961). The depth to bedrock ranges from 9 to 15 -feet BG at the site.

3.2 Specific Hydrogeological Characteristics

Groundwater beneath the site was encountered at depths ranging from 2.57 to 7.29 -feet BG on the December 18, 1996 sampling date. Groundwater flow direction is to the north-northwest across the site

FALLOW FARMLANDS

HINESBURGH ROAD

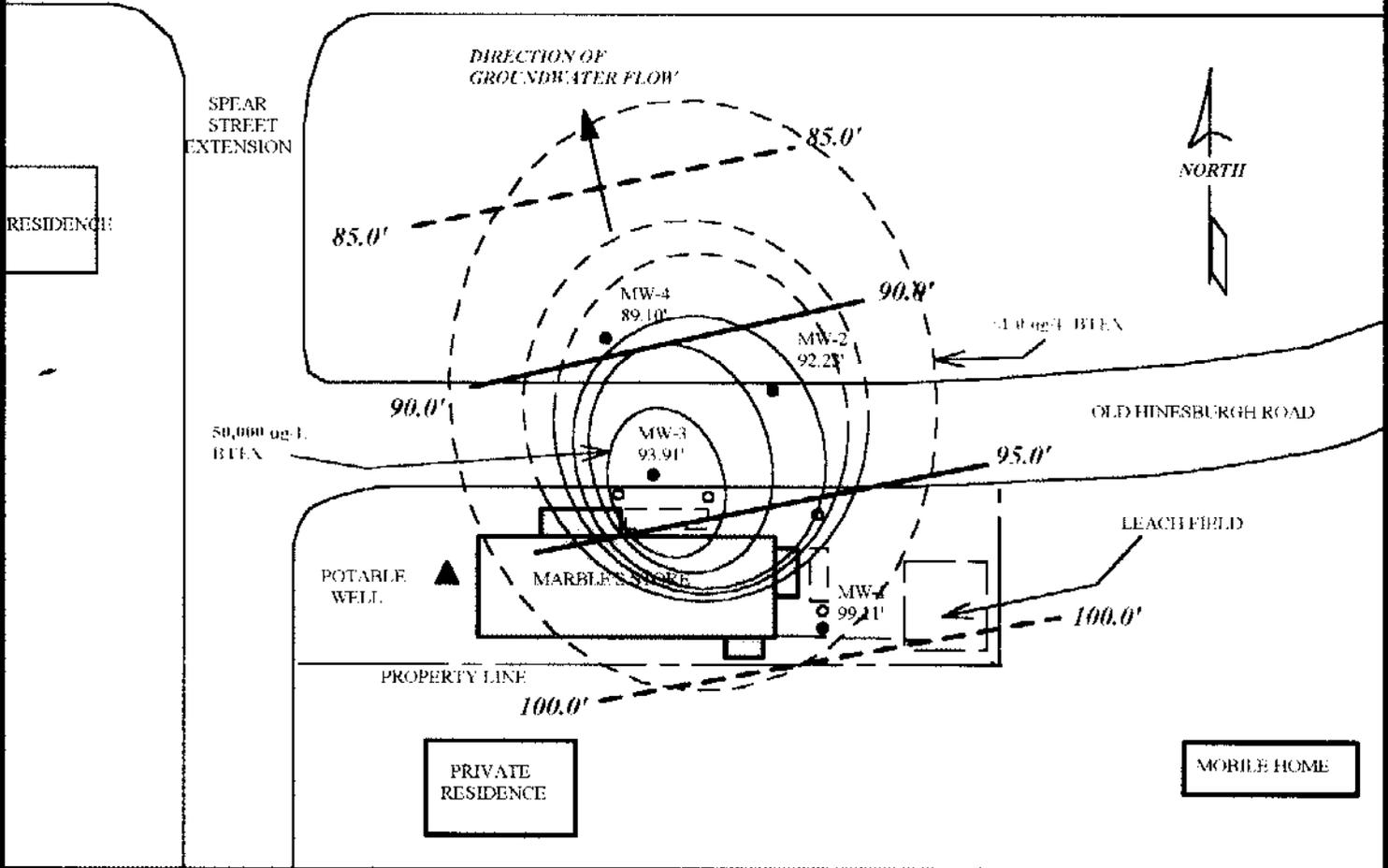


FIGURE 2

GROUNDWATER CONTOUR & BTEX ISOCON MAP

KENT S. KOPTUCH, Inc.
Geo-Environmental Services

164 Osgood Hill Road, Essex, Vermont 05452

Environmental Investigations and Remedial Solutions
Call 802-878-1620

PROJECT: MARBLE'S STORE NEW MONITORING WELL MW-1 ●
 PROJECT #: 96024
 SPILL #: 95-1877 OLD MONITORING WELL ○
 LOCATION: CHARLOTTE, VT
 SCALE: 1"=50'
 DATE: 12/18-96
 DRAWN BY: KSK
 GROUNDWATER CONTOURS IN 5.0' INTERVALS RELATIVE TO ASSUMED 100.0' DATUM

BTEX & MIBK ANALYTE CONCENTRATIONS IN ug/L (TOTAL DISSOLVED)
 BTEX ISOCONCENTRATIONS IN RED -10,000 ug/L CONTOUR INTERVAL)

WELL	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	MIBK
MW-1	17.0	2.0	1.0	1.0	10.0
MW-2	5.0	6,570.0	5,700.0	25,800.0	1,200.0
MW-3	11.0	500.0	26,800.0	4,450.0	5,000.0
MW-4	28.5	5.0	15,400.0	800.0	5,000.0

SUMMARY TABLE 2 - 12/18/96 LABORATORY CHEMICAL ANALYTICAL RESULTS						
WELL	MTBE µg/L	BENZENE µg/L	TOLUENE µg/L	ETHYLBENZENE µg/L	XYLENES µg/L	TOTAL BTEX µg/L
MW-1	<10.0	<1.0	2.0	<1.0	<1.0	2.0
MW-2	<1,000.	300.	6,570.	5,170.	25,800.	37,840.
MW-3	<5,000.	TBQ <500.	26,800.	4,450.	24,800.	>56,050.
MW-4	<5,000.	2,890.	15,400.	586.	7,770.	26,646.

with an approximate gradient of 15%. An approximate rate-of-travel (V_a) in the overburden aquifer was calculated through the application of Darcy's Law utilizing typical constants for horizontal hydraulic conductivity (K_H) and porosity (n) of the observed aquifer matrix:

$$V_a = \{[K_H (h_1 - h_2)] \div L\} \div n$$

where $(h_1 - h_2)$ is the difference in hydraulic head, and L is the distance along the flowpath for which the difference in hydraulic head is measured. When all known and assumed aquifer characteristics are entered into the above equation, the resulting rate-of-travel from MW-1 to MW-4 on December 18, 1996 is:

$$V_a = \{[10 \text{ gpd/ft}^2 (99.11' - 89.10')] \div 68'\} \div 20\% = \underline{7.36 \text{ gpd/ft}^2}$$

Table 1 is the groundwater elevation data calculated from the gauging of the monitoring well network on December 18, 1996. Figure 2 depicts Groundwater Contours of the overburden aquifer based upon this data.

3.3 Groundwater Laboratory Chemical Analytical Results

Actual laboratory chemical analytical results for all analytes are included as Attachment B of this report. Table 2 summarizes the results of these analyses. Figure 2 includes inferred dissolved-phase BTEX isoconcentrations based upon this data. Four (4) groundwater samples were secured, along with trip and field blanks for quality control purposes.

- The groundwater sample from MW-1 yielded positive VOC impact with a dissolved concentration of 2.0 micrograms per liter (µg/L) of Toluene. No other analytes were detected above the method detection limits (MDL).
- The groundwater sample secured from MW-2 yielded positive VOC impact with a total dissolved BTEX concentration of 37,840 µg/L. The dissolved benzene concentration was 300 µg/L. The dissolved toluene concentration was 6,570 µg/L. Dissolved ethylbenzene was detected at 5,170 µg/L, while the dissolved concentration of total xylenes was 25,800 µg/L. Due to the high BTEX fraction in the sample, the MDL for MTBE was raised to 1,000 µg/L; MTBE was not detected above the MDL.
- The groundwater sample secured from MW-3 yielded positive VOC impact with a total dissolved BTEX concentration of 56,050 µg/L. Dissolved benzene was not detected above the MDL of 500 µg/L. The dissolved toluene concentration was 26,800 µg/L. Dissolved ethylbenzene was detected at 4,450 µg/L, while the dissolved concentration of total xylenes was 24,800 µg/L. Due to the high BTEX fraction in the sample, the MDL for MTBE was raised to 5,000 µg/L; MTBE was not detected above the MDL.

- The groundwater sample secured from MW-4 yielded positive VOC impact with a total dissolved BTEX concentration of 26,646 µg/L. Dissolved benzene detected at 2,890 µg/L. The dissolved toluene concentration was 15,400 µg/L. Dissolved ethylbenzene was detected at 586 µg/L, while the dissolved concentration of total xylenes was 7,770 µg/L. Due to the high BTEX fraction in the sample, the MDL for MTBE was raised to 5,000 µg/L; MTBE was not detected above the MDL.
- The trip blank and field blank samples yielded no analyte concentrations above the MDL.

3.4 Potential Environmental Concerns

3.4.1 Surrounding Land Uses

Surrounding land uses were noted as follows:

- North -fallow agricultural (across Hinesburg Road),
- East -residential,
- South -residential,
- West -residential (across Spear Street Extension).

3.4.2 Site Utilities

The site is served by a private, drilled bedrock well located adjacent to the west wall of the store building. Electrical and telephone utilities consist of overhead transmission lines. Wastewater disposal for the property is handled by on site septic along the east side of the lot (see **Figure 2**).

3.4.3 Potable Water Sources - 1 Mile Radius of Site

There are at least thirty-six (36) potable water sources within a 1 -mile radius of the site. **Table 3** is a listing of these wells and their construction details. **Figure 3** is a locator map depicting the wells by registration number, and their geographic location relative to the site. The site's own potable well, located on the west side of the store building, does not appear in the WSD Well Completion files. By all appearances, it is a drilled bedrock well

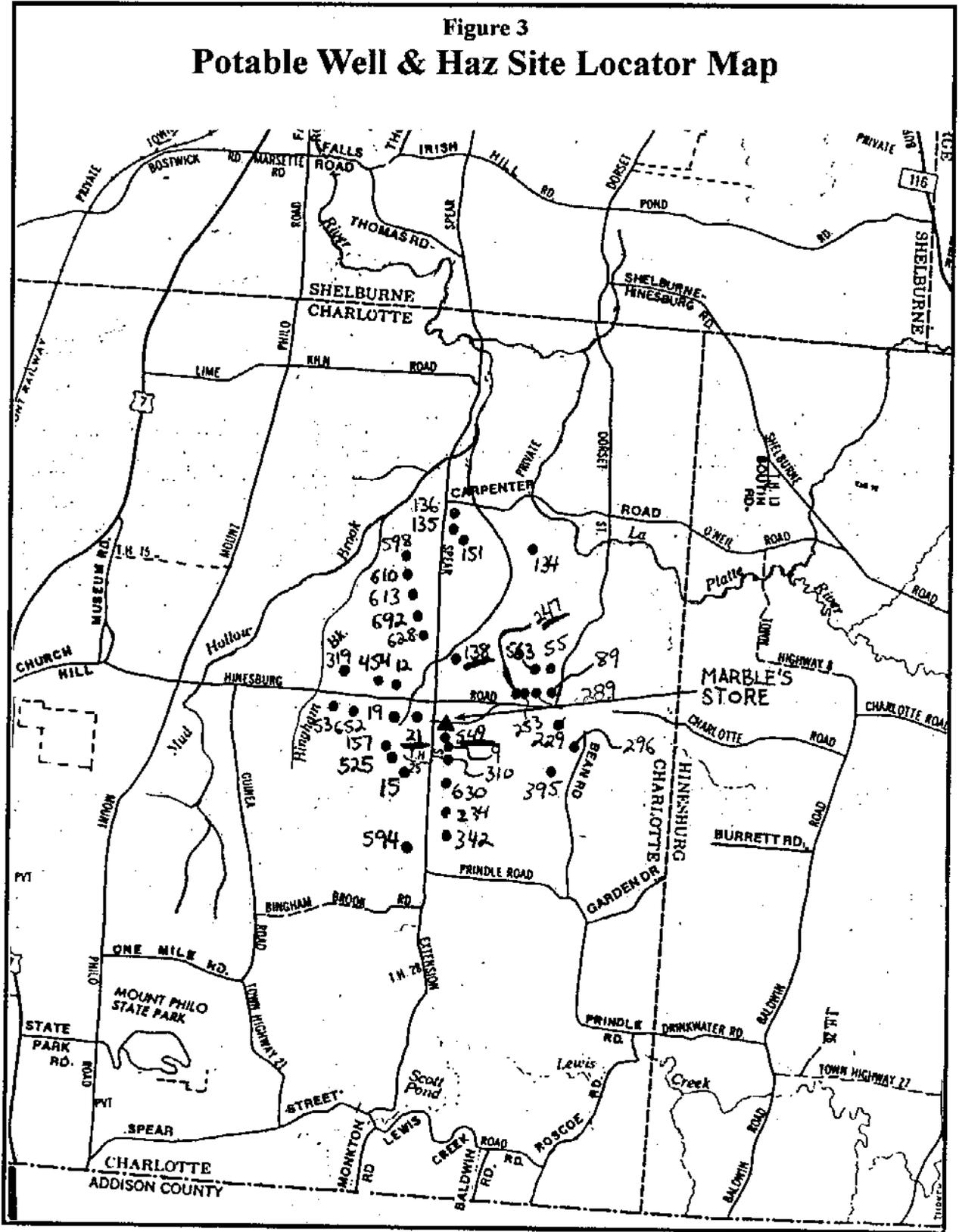
Of the thirty-six (36) wells noted above, only two (2) are located somewhat down-gradient, within the same sub-drainage basin, and within 500 -feet of the site. These wells (#21 and #138) are both drilled and set in bedrock; the potential for impact is low.

3.4.4 Hazardous Sites Review/Identification

A review of the Vermont WMD files revealed no identified hazardous waste sites within one (1) -mile of the study site (aside from the site itself):

- Marble's Store: DEC Site #900515; In May 1990, a 1,000 gallon kerosene UST owned by Mr. Robert Marble was closed in place at the site. A ½ -inch thickness of separate-phase kerosene was observed on the water table at the old MW-2 location at the time. Subsequent site inspections by SMS personnel in January 1991 and in February 1991 revealed 22 -inches and 24 -inches, respectively, of separate-phase kerosene thickness in the same well. No records of subsequent findings relative to separate-phase kerosene were noted in the project file. Nor did the project file indicate that any additional investigation, sampling, or laboratory analyses having been conducted at the site prior to the involvement of KSKGeoS™ beginning in October 1996.

Figure 3
Potable Well & Haz Site Locator Map



KSKGeoS™

SUMMARY TABLE 3 - POTABLE WATER SOURCES - 1 -MILE RADIUS								
WELL #	OWNER	YIELD (GPM)	TOTAL DEPTH	DEPTH TO BEDROCK	CASING LENGTH	STATIC LEVEL	RECORDING YEAR	NOTES
9	Carl Banner	3	320	34	?	25	1974	
12	Lewis Palmer	1.5	227	34	?	12	1974	
15	John Kendrick	2	224	4	?	40	1974	
19	Roland Leclair	40	210	?	?	18	1974	
21	Thomas Revet	1	452	20	?	12	1974	
53	Thomas Revet	4	202	22	?	0	1974	Flowing Artesian
55	Robert Rousseau	3	100	5	?	20	1974	
89	Howard Howell	2	400	25	?	50	1974	
134	Phil George	6.5	143	51	?	?	1976	
135	Lester Backus	35	154	?	?	?	1976	Set in gravel
136	Mason Huse	1	400	40	?	90	1976	
138	Bean Construction	30+	149	113	?	?	1976	
151	Dan Spadiccini	30+	124	112	?	?	1978	
157	Richard Brooks	5	300	5	?	12	1978	
234	Terry Cottillard	2.3	423	51	57	20	1981	
229	Susan Newberry	60	130	84	87	8	1981	
247	John Shecan	2	250	50	60	40	1981	
253	Thomas Bianchi	2.5	383	65	70	?	1982	
289	William Post	1.5	248	82	90	?	1983	
296	William Gregorech	1.5	249	47	60	?	1983	
310	Jonathan Fischer	3	403	21	25	27	1984	
319	Don Therrien	25	100	?	98	?	1984	Set in Gravel
342	William Blakely	2.5	352	47	55	?	1985	
395	William Gregorech	50+	155	22	32	?	1986	
454	Harvey Sharron	6	400	7	40	?	1987	
525	Peter Holmburg	10	80	?	81.25	14	1989	Set in Gravel
549	John Hancock	1.5	525	42	80	?	1989	
563	James Olson	1	500	6	20	10	1990	
594	Kaplan/Spadiccini	3	420	7	20	40	1991	
598	Jim Huntington	30	120	?	100	10	1991	Set in Gravel
610	Dan Catlin	2.5	400	79	84	?	1992	
613	Bruce Irish	50	115	?	110	20	1992	Set in Gravel
628	Robert Alsit III	1.5	440	33	42	?	1993	
630	Bruce Hella	6.5	165	52	54	37	1993	
652	Jay Vogler	6	625	212	199	?	1993	
692	Mark Sandburg	100+	221	6	20	20	1994	

4.0 FINDINGS

KENT S. KOPTIUCH, Inc. Geo-Environmental Services' phase II subsurface investigation at the Marble's Store property in Charlotte, Vermont yielded the following results and findings:

- The overburden aquifer is comprised of very fine sands with common gravels and few cobbles. Bedrock was encountered between nine (9) and fifteen (15) -feet BG during well installation activities; bedrock is mapped as the Winooski Dolomite. The groundwater table was noted at depths of 2.57 to 7.29 -feet below grade at the time of this investigation.
- Groundwater flow conditions in the overburden aquifer exhibit a north-northwesterly flow direction across the site. Gradient is approximately 15% with a rate-of-travel through the overburden aquifer of approximately 7.36 gpd/ft².
- Laboratory chemical analytical results of the groundwater samples secured from the monitoring well network yielded positive impact by benzene at concentrations in excess of the Vermont Groundwater Enforcement Standard (GES) of 5.0 µg/L in MW-2 and MW-4. It is also likely that *trace* concentrations of benzene exceeded the GES in MW-3, however, this could not be definitively ascertained because the MDL was raised to 500 µg/L.
- Laboratory chemical analytical results of the groundwater samples secured from the monitoring well network yielded positive impact by toluene at concentrations in excess of the GES of 2,240 µg/L in MW-2, MW-3, and MW-4. A low-level concentration (2.0 µg/L) was also noted in MW-1.
- Laboratory chemical analytical results of the groundwater samples secured from the monitoring well network yielded positive impact by ethylbenzene at concentrations in excess of the GES of 680 µg/L in MW-2 and MW-3. Ethylbenzene was detected at a concentration below the GES in MW-4 (585 µg/L).
- Laboratory chemical analytical results of the groundwater samples secured from the monitoring well network yielded positive impact by xylenes at concentrations in excess of the GES of 400 µg/L in MW-2, MW-3 and MW-4.
- Laboratory chemical analytical results of the groundwater samples secured from the monitoring well network yielded no detectable concentrations of MTBE, however, because the MDLs were raised to concentrations of 1,000 µg/L or more in the samples from MW-2, MW-3, and MW-4, this information is not definitive.
- It is clear from the results of this investigation that off-site migration by dissolved-phase petroleum hydrocarbon contaminants at concentrations in excess of the Vermont Groundwater Enforcement Standards has occurred.
- No evidence of any immediate on or off-site threat to human health or safety, has been discerned by the workscope defined in this investigation.
- No evidence has been revealed through the activities of this investigation that would indicate the migration of contaminants onto this site, from other sites in the vicinity has occurred.

5.0 RECOMMENDATIONS

Based upon the findings set forth in Section 4.0, KSKGeoS™ offers the following recommendations:

- A copy of this report should be forwarded to the Sites Management Section of the Vermont Agency of Natural Resources Department of Environmental Conservation at 103 South Main Street in Waterbury, Vermont.
- A supplemental investigation should be conducted to more fully define the down-gradient margin of the dissolved-phase petroleum hydrocarbon plume; this investigation should consist of at least two (2), possibly three (3) additional borings, with completion as groundwater monitoring wells. After installation and development, the new wells, along with wells MW-1 through MW-4 should be sampled and analyzed once more by EPA method 8020. The on-site potable well should also be sampled at the same time.
- After completion of this supplemental investigation, a comprehensive evaluation of this site should be completed by a qualified groundwater scientist to determine the need for additional monitoring and/or other actions.

6.0 LIMITATIONS

This report is based upon limited physical investigation of the site and vicinity, samples from a fixed number of groundwater monitoring wells and sampling points, laboratory chemical analyses, and research of materials and files available at the time of the investigation. The findings presented in this report are based only on the observations drawn during this investigation, and upon data provided by others. This report presents a description of the subsurface conditions, in the overburden lithology at each sampling and/or well location, that were prevalent at the time of KSKGeoS™ investigation.

Subsurface conditions can vary significantly over time, particularly with respect to groundwater elevations and groundwater and soil quality. Findings and recommendations presented in this document are applicable only to the facts and conditions described at the time of this investigation.

In performing its professional services, KSKGeoS™ employs the degree of care and skill exercised under similar circumstances by members of the environmental profession practicing in the same or similar locality under similar conditions. The standard of care shall be judged exclusively as of the time these services are rendered, and not according to later standards. KSKGeoS™ makes no express or implied warranty beyond its conformance to this standard.

KSKGeoS™ shall not be responsible for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed for the preparation of this document. KSKGeoS™ believes that all information contained in this document is factual, but no guarantee is made or implied.

7.0 REFERENCES

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- Department of Environmental Conservation, **Chapter 12 - Groundwater Protection Rule and Strategy**, Vermont Agency of Natural Resources, Rule #88-37, 1988.
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- Waste Management Division, **Fourth Quarter 1996 Update, Vermont Hazardous Sites List**, Vermont Agency of Natural Resources Department of Environmental Conservation, Waterbury, VT., January 6, 1997.
- Water Supply Division, **Well Completion Records - Town of Charlotte, Vermont**, Vermont Agency of Natural Resources Department of Environmental Conservation, Waterbury, VT., November 1996.
- Welby, Charles W., Bedrock Geology of The Central Champlain Valley of Vermont, Bulletin No. 14, Vermont Geological Survey, Vermont Development Department, Montpelier, VT, 1961.

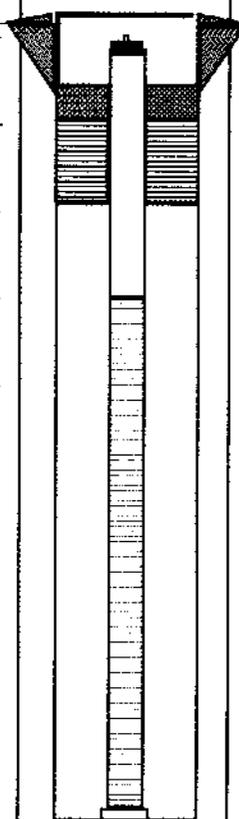
Attachment A
BORING AND WELL COMPLETION LOGS

Subsurface Hydrogeologic Investigation
Marble's Store, Charlotte, Vermont

WELL LOG: MW-1
INSTALLATION DATE: 12/10/96

	DENTONITE WELL SEAL
	CONCRETE SURFACE SEAL
	NATIVE BACKFILL
	#2 MORJE SAND PACK

DRILLING CO.: TRI-STATE DRILLING & BORING
 METHOD: 6 5/8" ID HOLLOW STEM AUGER
 GEOLOGIST: KENT KOPPIUCHI
 CASING: 2" DIAM., FLUSH-THREADED PVC
 SCREEN: 2" DIAM., FLUSH-THREADED, 0.20" SLOT PVC
 GRADE ELEVATION: 101.68'
 TOP-OF-CASING ELEVATION: 101.00'

DEPTH (ft)	CONSTRUCTION	SAMPLE #	DEPTH (ft)	BLOWSP PER 1'	RECOVERY	VOCs (ppm)	SOIL LITHOLOGY	COMMENTS
0.0		G-1	0.0' - 1.0'				#2 GRAVEL	Fill Material
1.0		G-2	1.0' - 5.0'		Grab	0.0	Wet, Brown, SILT w/many Medium Sands	
3.0								WT (2.3.5' RG)
5.0		SS-1	5.0' - 7.0'	20-3-15-24	0.8'	0.0	Saturated, Brown, Very Fine SAND w/few fine Gravels	
7.0		G-3	7.0' - 9.0'		Grab	0.0	As Above	
9.0			9.0'		Refusal		BEDROCK - End-of-Boring	Bottom Plug
10.0								
11.0								
12.0								
13.0								
14.0								
15.0								End-of-Boring

KSKGeoSPM

Subsurface Hydrogeologic Investigation
Marble's Store, Charlotte, Vermont

WELL LOG: MW-2
INSTALLATION DATE: 12/10/96

DEPTH (ft)	CONSTRUCTION	SAMPLE #	DEPTH (ft)	BLOWS PER 1/2'	RECOVERY	VOCs (ppm)	SOILS/LITHOLOGY	COMMENTS
0.0		G-1	0.0-1.0'		GRAB	0.0	ASPHALT & GRAVEL Sub-base	
1.0		G-2	1.0-2.0'		GRAB	0.0	Dry, Dark Brown, Fine SAND w/many Fine Gravels	
2.0		G-3	2.0-3.0'		GRAB	0.0	Dry, Dark Brown, Very Fine SAND w/common Fine Gravels	
3.0		G-4	3.0-5.0'		GRAB	0.0	Wet, Light Brown, Very Fine SAND w/few Cobbles	
4.0								
5.0								
6.0		SS-1	5.0-7.0'	17-24-refusal	0.7	3.0	Saturated, Olive-Brown, Very Fine SAND w/few Fine Gravels	WT @ 6.0' RG
7.0								
8.0		G-5	7.0-10.0'		GRAB	195.0	As Above	
9.0								
10.0		SS-2	10.0-12.0'	88-refusal	0.2'	280.0	Dry, Olive-Brown, Very Fine SAND w/few Fine Gravels	Bottom Plug
11.0			10.0'				BEDROCK: End-Of-Boring	
12.0								
13.0								
14.0								
15.0								

KSKGeoSM

Subsurface Hydrogeologic Investigation
Marble's Store, Charlotte, Vermont

WELL LOG: MW-3
INSTALLATION DATE: 12/10/96

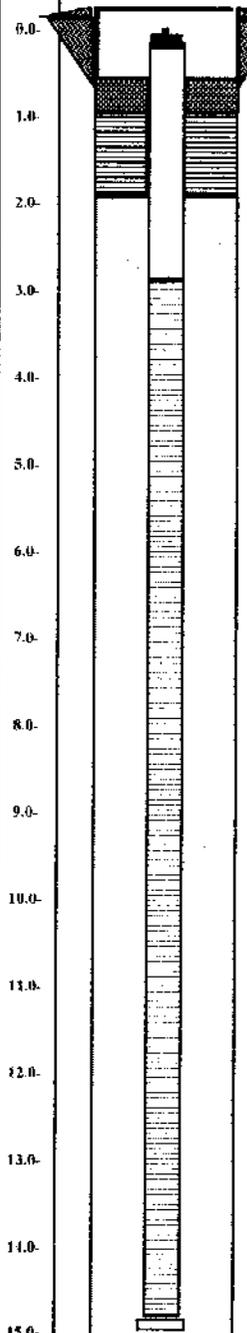
DEPTH (ft)	CONSTRUCTION	SAMPLE #	DEPTH (ft)	BLOWS PER 1/2'	RECOVERY	VOCs (ppm)	SOILS/LITHOLOGY	COMMENTS	
0.0		G-1	0.0-1.0'		GRAB	0.0	ASPHALT & GRAVEL Sub-base		
1.0									
2.0									
3.0			G-2	1.0-5.0'		GRAB	120.0	Dry, Black, Very Fine SAND w many Fine Gravels	Moistens with Depth
4.0									
5.0									
6.0			SS-1	5.0-7.0'	1-2-3-6	1.6'	300.0	Saturated, Olive-Brown, Very Fine SAND w few Fine Gravels	Orange Mottling
7.0									
8.0			G-3	7.0-10.0'		GRAB	291.0	As Above without Mottling	
9.0									
10.0			SS-2	10.0-17.0'	80-refusal	0.5'	280.0	Dry, Grey-Brown, Very Fine SAND w common Fine Gravels	Bottom Plug
11.0				10.0'				BEDROCK, End-Of-Boring	
12.0									
13.0									
14.0									
15.0									

KSKGeoSTM

Subsurface Hydrogeologic Investigation
Marble's Store, Charlotte, Vermont

WELL LOG: MW-4
INSTALLATION DATE: 12/10/96

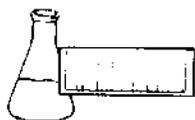
	BENTONITE WELL SEAL	DRILLING CO.:	TRI-STATE DRILLING & BORING
	CONCRETE SURFACE SEAL	METHOD:	6 5/8" HOLLOW STEM AUGER
	NATIVE BACKFILL	GEOLOGIST:	KENT KOPITZCH
	#2 MORIC SAND PACK	CASING:	2" DIAM. FLUSH-THREADED PVC
		SCREEN:	2" DIAM. FLUSH-THREADED, 0.20" SLOT PVC
		GRADE ELEVATION:	96.39'
		TOP OF CASING ELEVATION:	96.23'

DEPTH (ft)	CONSTRUCTION	SAMPLE #	DEPTH (ft)	BLOWS PER 1/2'	RECOVERY	VOCs (ppm)	SOILS/LITHOLOGY	COMMENTS	
0.0									
1.0									
2.0									
3.0			G-1	6.6-5.0'		GRAB	0.0	Dry, Light Brown, Fine SAND w/rare Fine Gravels	
4.0									
5.0									
6.0			SS-1	5.0-7.0'	1-1-2-3	1.6'	0.0	Wet, Orange-Brown, Very Fine SAND	(Fill Material?)
7.0									▼ WT @ 7.0 DG
8.0			G-2	7.0-10.0'		GRAB	57.0	Saturated, As Above	
9.0									
10.0									
11.0			SS-2	10.0-12.0'	35-50-refusal	1.0'	300.0	Saturated, Olive-Grey, Very Fine SAND w/common Fine Gravels	
12.0									
13.0			G-3	12.0-15.0'		GRAB	198.0	As Above, Dries with Depth	
14.0									
15.0		SS-3	15.0-17.0'	20-50-refusal	0.5'	50.0	Dry, Olive Grey, Very Fine SAND w/common coarse Gravels	Bottom Plug	
			15.0'				BEDROCK: End-Of-Boring		

KSKGeoSTM

Attachment B

**LABORATORY CHEMICAL ANALYTICAL RESULTS:
DECEMBER 18, 1996 GROUNDWATER SAMPLING EVENT**



ENDYNE, INC.

Laboratory Services

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

REPORT OF LABORATORY ANALYSIS

RECEIVED JAN 02 1997

CLIENT: KSK GeoS
PROJECT NAME: SBC/Charlotte
REPORT DATE: December 27, 1996
DATE SAMPLED: December 18, 1996

PROJECT CODE: KSKG2368
REF.#: 98,042 - 98,047

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



EPA METHOD 8020--PURGEABLE AROMATICS

CLIENT: KSK GeoS

DATE RECEIVED: December 18, 1996

PROJECT NAME: SBC/Charlotte

REPORT DATE: December 27, 1996

CLIENT PROJ. #: 96024

PROJECT CODE: KSKG2368

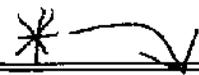
Ref. #:	98,042	98,043	98,044	98,045	98,046
Site:	Trip Blank	MW-1	MW-2	MW-3	MW-4
Date Sampled:	12/18/96	12/18/96	12/18/96	12/18/96	12/18/96
Time Sampled:	11:30	11:45	12:00	12:15	12:30
Sampler:	K. Koptiuch				
Date Analyzed:	12/24/96	12/26/96	12/26/96	12/27/96	12/27/96
UIP Count:	0	5	> 10	> 10	9
Dil. Factor (%):	100	100	1	0.2	0.2
Surr % Rec. (%):	100	101	118	103	93
Parameter	Conc. (ug/L)				
Benzene	<1	<1	300.	TBQ <500	2,890.
Chlorobenzene	<1	<1	<100	<500	<500
1,2-Dichlorobenzene	<1	<1	<100	<500	<500
1,3-Dichlorobenzene	<1	<1	<100	<500	<500
1,4-Dichlorobenzene	<1	<1	<100	<500	<500
Ethylbenzene	<1	<1	5,170.	4,450.	586.
Toluene	<1	2.0	6,570.	26,800.	15,400.
Xylenes	<1	<1	25,800.	24,800.	7,770.
MTBE	<10	<10	<1000	<5000	<5000

Ref. #:	98,047				
Site:	Field Blank				
Date Sampled:	12/18/96				
Time Sampled:	12:45				
Sampler:	K. Koptiuch				
Date Analyzed:	12/24/96				
UIP Count:	0				
Dil. Factor (%):	100				
Surr % Rec. (%):	101				
Parameter	Conc. (ug/L)				
Benzene	<1				
Chlorobenzene	<1				
1,2-Dichlorobenzene	<1				
1,3-Dichlorobenzene	<1				
1,4-Dichlorobenzene	<1				
Ethylbenzene	<1				
Toluene	<1				
Xylenes	<1				
MTBE	<10				

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

CHAIN-OF-CUSTODY RECORD

16/68



Project Name: SBC/CHARLOTTE	Reporting Address: 164 OSGOOD HILL ESSEX VT 05452	Billing Address: CARL RUPRECHT SBC COLLINS INC PO Box 671 ST ALBANS
Site Location: CHARLOTTE VT		
Endyne Project Number: KSKG2368 KSK Geos Project No. 96024	Company: KSK Geos Contact Name/Phone #: KENT KOPTIUCH	Sampler Name: KENT KOPTIUCH Phone #: 802 878 1620

Lab #	Sample Location	Matrix	G R A B	C O M P	Date/Time 12/18/96	Sample Containers		Field Results/Remarks	Analysis Required	Sample Preservation	Rush
						No.	Type/Size				
98,042	TRIP BLANK	H ₂ O	X		1130	2	40 mL VOA	FOR BTEX & MTBE	8020	HCL	
98,043	MW-1		X		1145	2					
98,044	MW-2		X		1200	2					
98,045	MW-3		X		1215	2					
98,046	MW-4		X		1230	2					
98,047	FIELD BLANK		X		1245	2					

Relinquished by: Signature <i>KPT</i>	Received by: Signature <i>M. Chambers</i>	Date/Time 12/18/96 2:30p.m.
Relinquished by: Signature	Received by: Signature	Date/Time

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 Dis-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):										