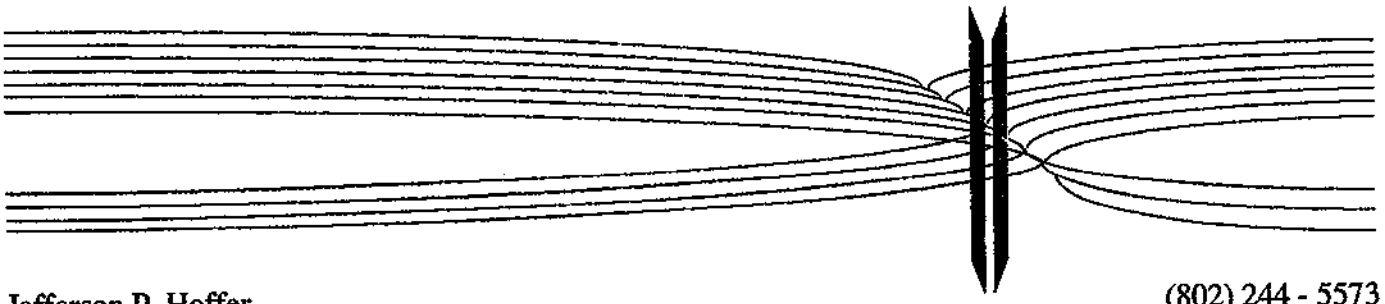
REPORT ON HYDROGEOLOGIC INVESTIGATION MARTIN'S GENERAL STORE MOBIL HIGHGATE SPRINGS, VERMONT

SEPTEMBER 1993



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REPORT ON HYDROGEOLOGIC INVESTIGATION, MARTIN'S GENERAL STORE MOBIL, HIGHGATE SPRINGS, VERMONT

SEPTEMBER 1993

Prepared For:

S.B. Collins, Inc.
St. Albans, Vermont

Prepared By:

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1.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A hydrogeologic investigation was performed at the Martin's General Store Mobil, Highgate Springs, Vermont. A 4000-gallon underground gasoline storage tank was excavated at the site on April 8, 1993. Corrosion holes were found in the tank, organic vapors were detected in surrounding soils, and sheens were observed on groundwater in the excavation pit. Groundwater monitoring wells were installed and sampled in order to define site hydrogeologic conditions and the extent of contamination.

Groundwater at the site occurs at a depth of three to five feet in low-permeability silts and clays. Groundwater flows eastward from the tank location toward a drainageway on the perimeter of the site. Groundwater flow rates are estimated to be in the range of 0.2 to 7 feet/year. Groundwater sampling has defined a plume of dissolved gasoline constituents downgradient from the source area.

Potential receptors include the drainageway on the eastern boundary of the site, and nearby domestic wells. No petroleum odors or sheens have been detected in surface water in the drainageway. The closest water wells include the Store's well, located on the southern end of the building, and the Dexter well, located approximately 200 feet north of the tank location. During two rounds of testing, no gasoline constituents have been detected in these wells. Based on the existing data, the risks to these potential receptors appears low.

Quarterly groundwater monitoring should be initiated. In addition, the downgradient extent of contamination should be determined by installing monitoring wells between MW-103 and the drainageway. A staff gauge should be installed in the drainageway directly downgradient of the site. The elevation of the surface water at this location can be incorporated into site groundwater elevation maps. A surface-water sample should be collected at this location during future sampling events.

It is recommended that samples be collected from all wells and sampling locations during the first two quarterly sampling events. Results from these sampling efforts and additional well installations should then be evaluated to determine future groundwater sampling frequencies and sampling points.

2.0 BACKGROUND AND SITE DESCRIPTION

2.1 Background

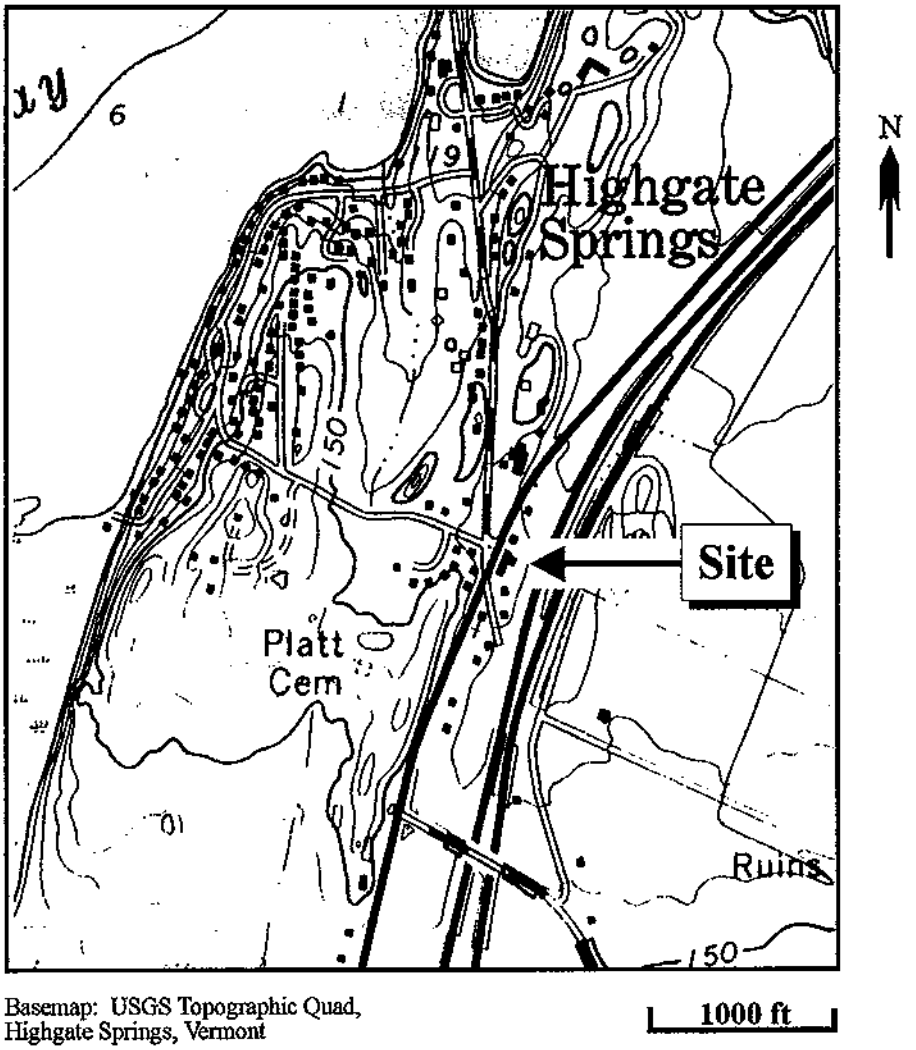
Figure 1 shows the location of the Martin's General Store Mobil in Highgate Springs, Vermont. The Store building includes the Highgate Springs Post Office and the residence of the Store owner. Three 4000-gallon underground storage tanks were installed at the site in 1984, aligned in an east-west manner just north of the Store. In the Spring of 1993, water was detected in the special-grade gasoline pump and in the special-grade tank at the site. The special-grade tank, which was the northernmost of the three tanks, was excavated and removed on April 8, 1993. Corrosion holes were found in the tank, organic vapors were detected in surrounding soils, and sheens were observed on groundwater in the excavation pit. During excavation of the tank, a lack of sand bedding was noticed alongside and under the tank. Portions of the tank were in direct contact with various fill materials including ashes and clay soils, which may have accelerated the corrosion of the tank. A letter report describing the tank pull is included in Appendix A.

A scope of work was developed to define the site hydrogeology and to evaluate the extent of contamination at the site. This scope of work was submitted to the Sites Management Section (SMS) of the Department of Environmental Conservation for their review and comment. A copy of the scope of work and comment letter from the SMS is included in Appendix A.

2.2 Site Description

Highgate Springs is located on the eastern shore of Lake Champlain, a few miles south of the Canadian border. The site is situated between I-89 and Route 7, and is approximately 2000 feet west of Lake Champlain. Elevation at the site is approximately 130 feet above mean sea level, about 35 feet above the mean lake elevation of 95 feet. The surface topography at the site grades gently from Route 7 toward the drainageway separating the site from I-89. Figure 2 is a site vicinity map.

The nearest surface water feature is the drainageway located on the eastern boundary of the site, just west of the southbound lane of I-89. This drainageway conveys surface water runoff and shallow groundwater northeastward. The predominance of wetland-type vegetation, as well as the presence of water within the drainageway during the summer indicates that the drainageway is a shallow groundwater discharge zone.



Basemap: USGS Topographic Quad,
Highgate Springs, Vermont

FIGURE 1
Site location map,
Martin's General Store Mobil, Highgate Springs, Vermont.

The Surficial Geologic Map of Vermont (Stewart and MacClintock, 1970) shows the predominant surficial material in the area is marine clay. Bedrock exposures are also mapped in the vicinity. According to the Franklin County Soil Survey (USDA, 1976), soils in the vicinity are Massena stony loams and Binghamville silt loams. Both of these soil types are poorly drained and exhibit a high water table.

According to Chevalier's Well Drilling, based in Highgate Springs, the chief source of water supply in the vicinity is the bedrock aquifer, which is primarily shale near the shore of Lake Champlain, with some limestone toward the east near I-89. The Centennial Geologic Map of Vermont (Doll and others, 1961) shows the site as being underlain by the Beldens member of the Chipman formation, an interbedded dolomite and limestone.

Two bedrock water-supply wells are located in the immediate vicinity. One is owned by the Store and is located on the south end of the building, approximately 150 feet from the tank locations. The Store owner is unaware of well-construction details. The well is reportedly located a few feet from the southern end of the building and is buried. Due to sulfur and other hardness problems, the water system includes a water softener, a filter, and a chlorinator. A tap which bypasses the treatment devices is located in a backroom of the Store.

Three residences are located north of the site along Route 7. All three residences are served by a well located in front of the residence immediately north of the site (owned by Ralph Dexter) as shown on Figure 2. A log for this well was on file with Chevalier Drilling Company and contains the following;

> *6-inch well completed July 1958;*
> *Depth 110 ft, length of casing 61' 8 1/2";*
> *rock at 38 feet, caves in upper formation of rock,*
> *well cased and cemented to 61' 8 1/2";*
> *yields 9 gals per min. at bottom, static level at ground level*

The Dexter well is approximately 200 feet from the tanks at the Store.

3.0 FIELD INVESTIGATIONS

3.1 Monitoring Well Installation

Four groundwater monitoring wells were installed at the site on June 12, 1993. These wells are numbered MW-101, MW-102, MW-103, and MW-104. Five leak-detection monitoring wells existed at the site prior to this investigation and are numbered MW-1, MW-2, etc. Well locations are shown on Figure 3.

Boreholes were advanced using hollow-stem augers. Split-spoon samples were collected from the following depth intervals; 2.5 to 4.5 feet, 5 to 7 feet, and 10 to 12 feet. Split-spoon soil samples and cuttings returned on the auger flights were visually examined and described in the field. Soil samples were collected from the split-spoons and placed into glass jars for headspace analysis using a photo-ionization detector (PID). The PID was also used to monitor for organic vapors emanating from the borehole and augers during the drilling process. Soil descriptions and headspace readings are summarized on the well logs in Appendix B. The soils encountered during drilling were generally silt loams and clayey silts. Non-native fill materials were present in MW-101 to a depth of six feet, and in MW-5 to a depth of 5 feet. PID headspace readings (ppm) for the split-spoon samples are tabulated below.

Depth Interval (ft)	MW-101	MW-102	MW-103	MW-104
2.5-4.5	10	0	0	30
5-7	150	0	0	130
10-12	0	0	No Reading	5

Boreholes were advanced to total depths of 13 feet. Monitoring wells were constructed with 2-inch PVC screens and riser. Each well was constructed with a 10-foot factory-slotted screen (10-slot) and three feet of flush-thread riser. The well screens were backfilled with a sandpack extended to one foot above the top of the screen. A 0.5-foot layer of bentonite pellets was placed on top of the sandpack. The remaining annular space was backfilled with sand. Each well was completed flush with the surface. Well construction details are summarized on the logs in Appendix B.

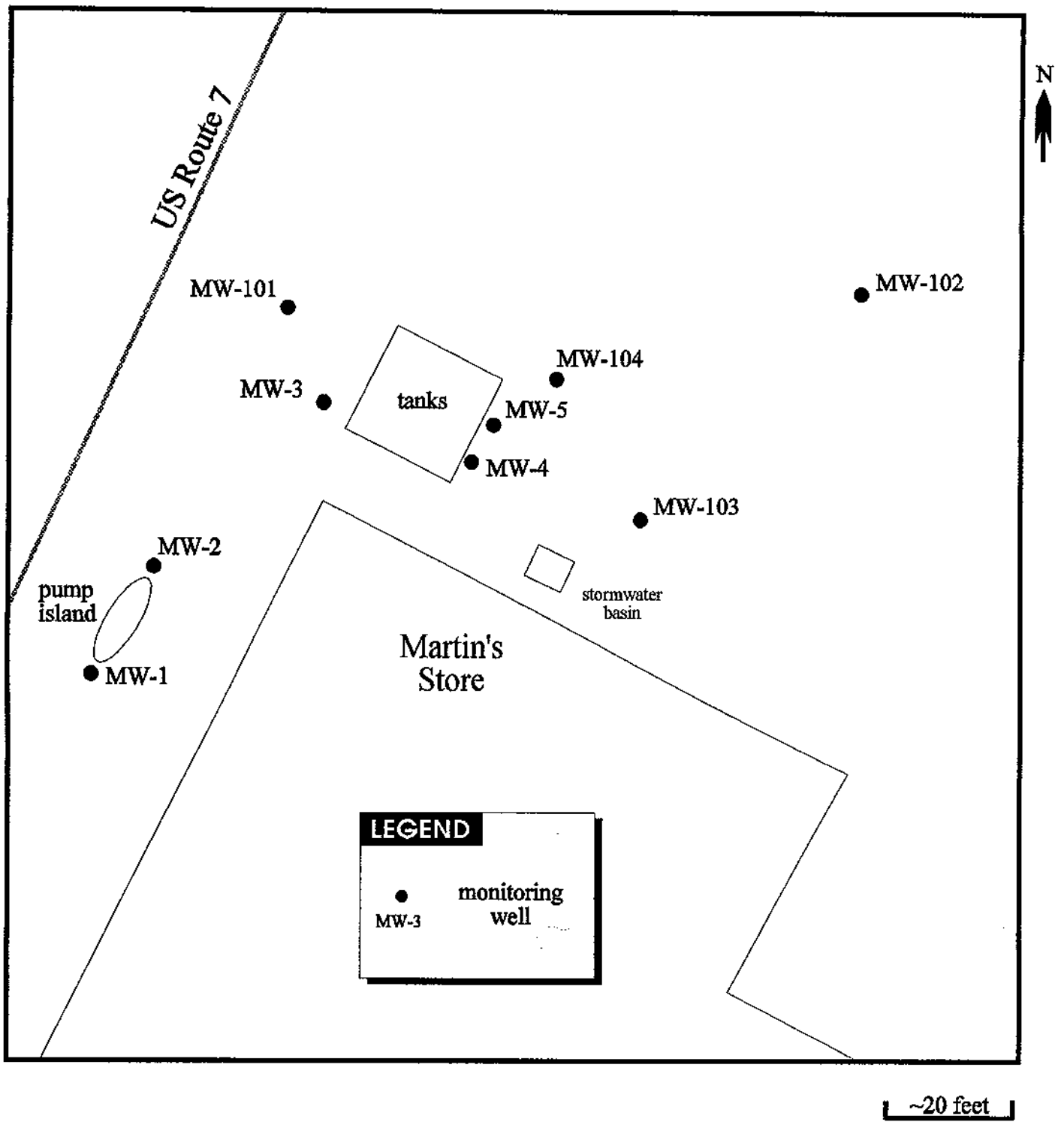


FIGURE 3
Site map showing monitoring well locations,
Martin's General Store Mobil, Highgate Springs, Vermont.

The wells were developed by bailing on June 16, 1993. Due to the low permeability of the material tapped by the monitoring wells, recovery rates were low. After the wells were bailed dry, water-level recovery measurements were taken. The recovery data were analyzed using the Bouwer and Rice slug test method (Bouwer, 1989) in order to estimate the following hydraulic conductivity values (analysis worksheets in Appendix C).

Well	K (cm/sec)	K(ft/day)
MW-101	7.6×10^{-6}	2.2×10^{-2}
MW-102	2.3×10^{-5}	6.5×10^{-2}
MW-103	9.5×10^{-6}	2.7×10^{-2}
MW-104	2.5×10^{-5}	7.1×10^{-2}

Water levels in the monitoring wells were measured on three occasions. Monitoring well elevations were obtained relative to an elevation of 100.00 feet assigned to a benchmark (top of iron pipe in concrete on west side of Route 7 by light post). Table 1 presents depths-to-water and relative elevations.

3.2 Groundwater Sampling and Analysis

The newly-installed monitoring wells and MW-5 were sampled on June 18, 1993. Prior to sampling, water levels in all site monitoring wells were measured. No free product was encountered in any of the wells. The wells were purged until dry using a PVC bailer. Volumes purged are noted on the groundwater sampling data sheet in Appendix D. Upon water-level recovery, groundwater samples were retrieved using a Teflon™ bailer equipped with a bottom-emptying stop cock to minimize sample agitation. Samples were transferred from the Teflon™ bailer to 40 mL vials supplied by Endyne, Inc., and were preserved with hydrochloric acid. Samples were labeled and placed in a cooler with ice. Sampling equipment was decontaminated between wells using an Alconox™ scrub/tap water rinse/methanol rinse/distilled water rinse. All purge waters generated during the sampling were contained in a 55-gallon drum at the site.

TABLE 1

Groundwater elevation measurements, Martin's General Store Mobil, Highgate Springs, Vermont.

DEPTH TO WATER (feet below TOC)			
WELL ID	6/16/93	6/18/93	8/17/93
MW-1	3.20	3.22	3.61
MW-2	3.39	3.16	3.47
MW-3	3.74	3.70	4.07
MW-4	3.60	3.71	4.08
MW-5	3.53	3.61	3.92
MW-101	2.99	3.11	3.39
MW-102	4.34	4.85	6.12
MW-103	5.37	5.32	5.99
MW-104	3.01	3.17	3.35

ELEVATION* (feet)				
WELL ID	Elev. of TOC	6/16/93	6/18/93	8/17/93
MW-1	100.41	97.21	97.19	96.80
MW-2	100.29	96.90	97.13	96.82
MW-3	99.58	95.84	95.88	95.51
MW-4	99.39	95.79	95.68	95.31
MW-5	99.27	95.74	95.66	95.35
MW-101	99.44	96.45	96.33	96.05
MW-102	97.36	93.02	92.51	91.24
MW-103	98.11	92.74	92.79	92.12
MW-104	98.58	95.57	95.41	95.23

* Benchmark is top of iron pipe in concrete on west side of Route 7 by light post (elev. = 100.00 ft)

Sampling proceeded from "clean" to dirty" based on previous sampling results and proximity to the tanks. Quality assurance/quality control samples included a trip blank supplied by the laboratory, a field/equipment blank, and a blind duplicate. The duplicate sample was collected at MW-5 and was labeled MW-100 on the chain-of-custody. A field/equipment blank was collected in the vicinity of MW-5 by pouring distilled water through the Teflon™ sampling bailer to gauge the effectiveness of the decontamination procedure and possible sample exposure to airborne contaminants.

Samples were also collected from the Dexter and Store wells. The Store sample was collected from a faucet in the backroom of the Store which bypasses the water treatment devices.

The sampling event was documented on a groundwater sampling data sheet and a laboratory-supplied chain-of-custody form (Appendix D). Samples were delivered to Endyne and analyzed for BTEX and MTBE using EPA Method 602. Analytical results are included in Appendix D and are summarized on Table 2, which includes results from groundwater sampling performed by S.B. Collins personnel on May 3, 1993.

3.3 PID Survey

A PID survey was performed at the site on June 16, 1993 to monitor for the presence of organic vapors in monitoring wells and the basements of the Store building. All PID measurements taken during the well installation effort and the PID survey are included in Appendix D. No vapors were detected in the basements or in a stormwater basin just north of the Store.

In conjunction with the PID survey, the perimeter of the drainageway was traversed to look for visible signs of contamination. The drainageway is overgrown with dense, wetland-type vegetation. No seeps were discovered along the bank of the drainageway. No petroleum odors or sheens were found.

TABLE 2

Groundwater sampling results, Martin's General Store Mobil, Highgate Springs, Vermont.

May 3, 1993 Results in µg/L						
WELL ID	Benzene	Toluene	Ethylbenzene	Xylenes	Total BTEX	MTBE
MW-3	2,140	3,500	127	3,950	9,717	8,020
MW-5	1,140	2,530	228	3,760	7,658	1,020
Martin's Store Well	<1	<1	<1	<1	<4	<5
Dexter Well	<1	<1	<1	<1	<4	<5

June 18, 1993 Results in µg/L						
WELL ID	Benzene	Toluene	Ethylbenzene	Xylenes	Total BTEX	MTBE
MW-5	7,200/7,330	32,000/31,200	3,740/3,600	23,600/22,700	66,670	3,530/3,650
MW-101	9.9	30.3	11.8	137	189	15.8
MW-102	<1	<1	<1	<1	<4	<5
MW-103	27.6	<10	<10	16.2	44	17,000
MW-104	1,040	715	140	3,470	5365	8,950
Martin's Store Well	<1	<1	<1	<1	<4	<5
Dexter Well	<1	<1	<1	<1	<4	<5
Trip Blank	<1	<1	<1	<1	<4	<5
Field Blank	<1	4.6	<1	5.5	10.1	<5

Aqueous Solubility - mg/L (1)	*1,780*	*515*	*152*	*162 -198*		*43,000*
Aqueous Solubility - mg/L (2)	*67*	*107*	*7*	*17*	*199*	*966*

NOTES:

<1 = less than a detection limit of 1

3,740/3,600 = results for sample and blind duplicate

(1) pure compound solubilities as reported in Mihelcic (1990)

(2) derived from mixing experiment using super unleaded gasoline, Kramer and Hayes (1987)

4.0 DISCUSSION OF RESULTS

4.1 Site Hydrogeology

The site is underlain by unconsolidated silts and clays. Groundwater occurs at a depth of three to five feet across the site. Groundwater elevations are contoured on Figures 4 through 6, and indicate a eastward direction of groundwater flow. This flow direction is consistent with surface topography and the presence of a shallow groundwater discharge zone (drainageway) east of the site. The gradient is relatively flat in the vicinity of the tanks (0.007 ft/ft) and steepens in the downgradient direction (0.1 ft/ft). The average gradient across the site is about 0.05 ft/ft.

Analysis of water-level recovery rates of site monitoring wells indicates a hydraulic conductivity mean of 4×10^{-5} cm/sec (4.0×10^{-2} ft/day). A measure of the groundwater flow rate at the site can be estimated using the equation;

$$V = \frac{K\, dh}{n_e\, dl}$$

where,

V = average linear velocity,
K = hydraulic conductivity,
n_e = effective porosity,
dh/dl = hydraulic gradient.

Using the geometric mean of hydraulic conductivity estimates (4.0×10^{-2} ft/day), a gradient range of 0.007 to 0.1 ft/ft, and an estimated effective porosity range of 0.2 to 0.5, the calculated groundwater flow rate is 0.2 to 7 feet/year.

4.2 Source and Distribution of Contamination

Corrosion holes found in a 4000-gallon gasoline tank excavated from the site suggest this tank was the source of contamination at the site. The backfill of the removed tank was primarily sand, although the sand was noticeably absent in places under and alongside the tank. Soils immediately outside of the tank excavation included various fill materials which were somewhat compact, and a mottled sandy clay.

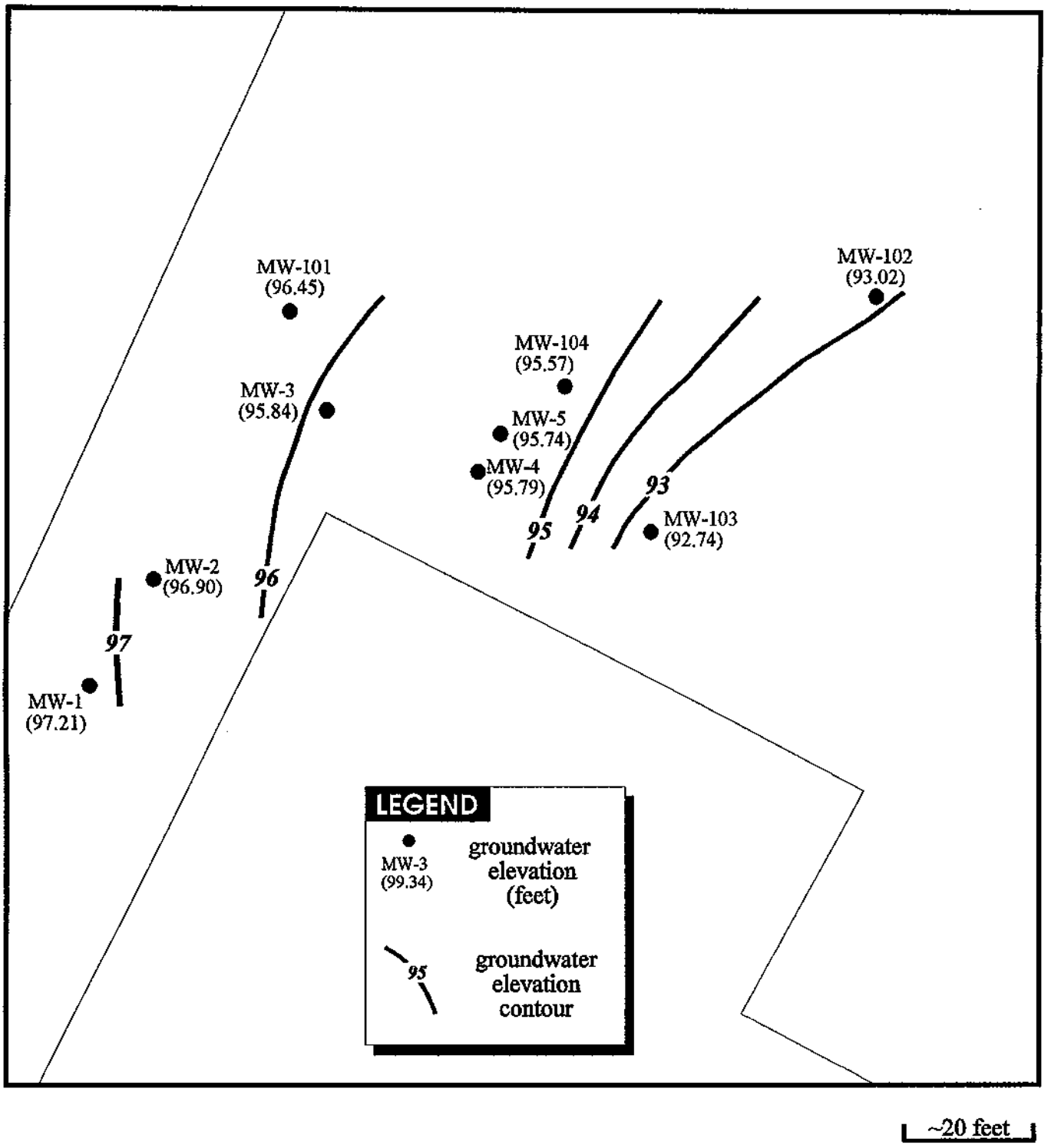


FIGURE 4
Groundwater elevations for June 16, 1993,
Martin's General Store Mobil, Highgate Springs, Vermont.

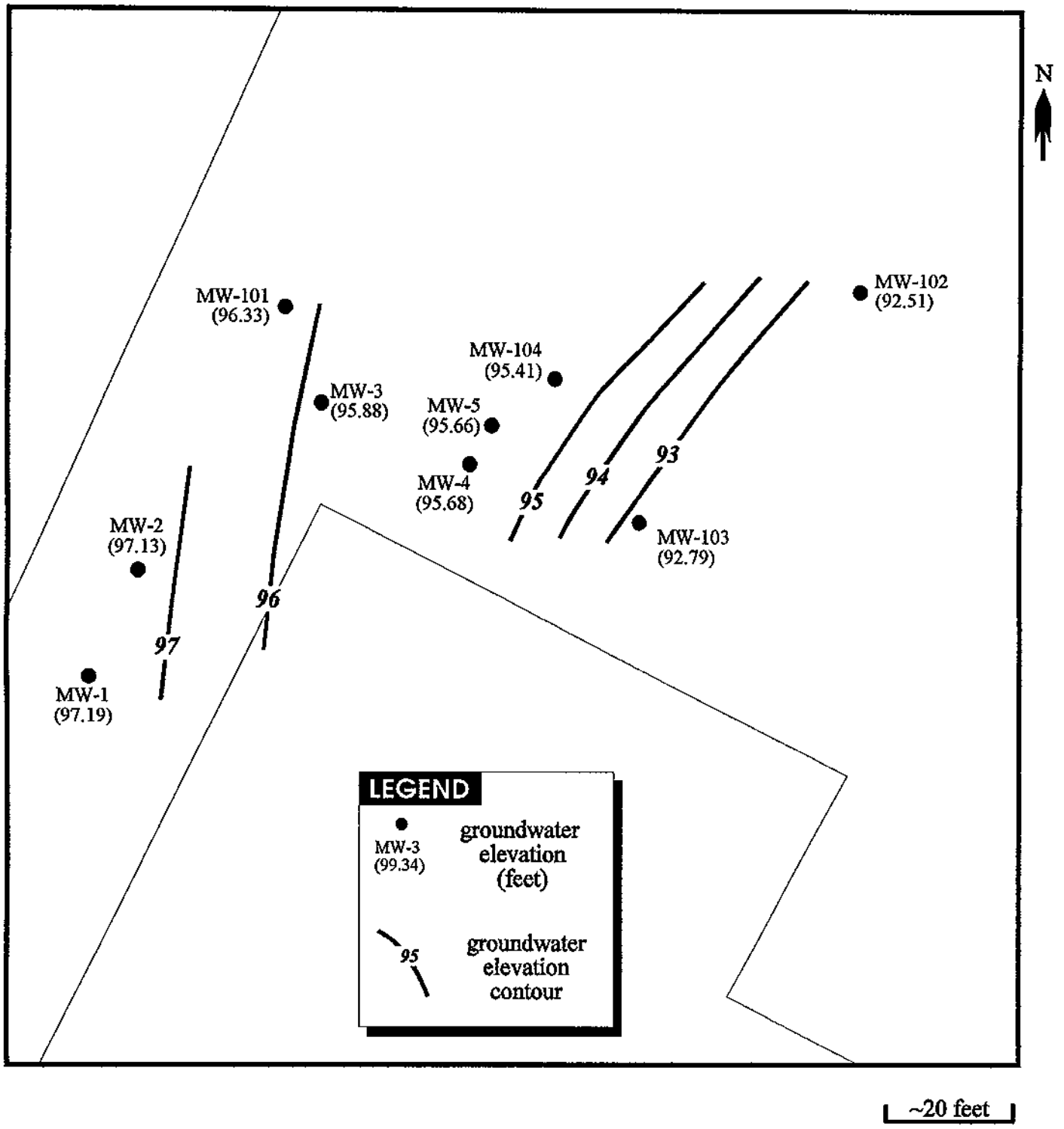


FIGURE 5
Groundwater elevations for June 18, 1993,
Martin's General Store Mobil, Highgate Springs, Vermont.

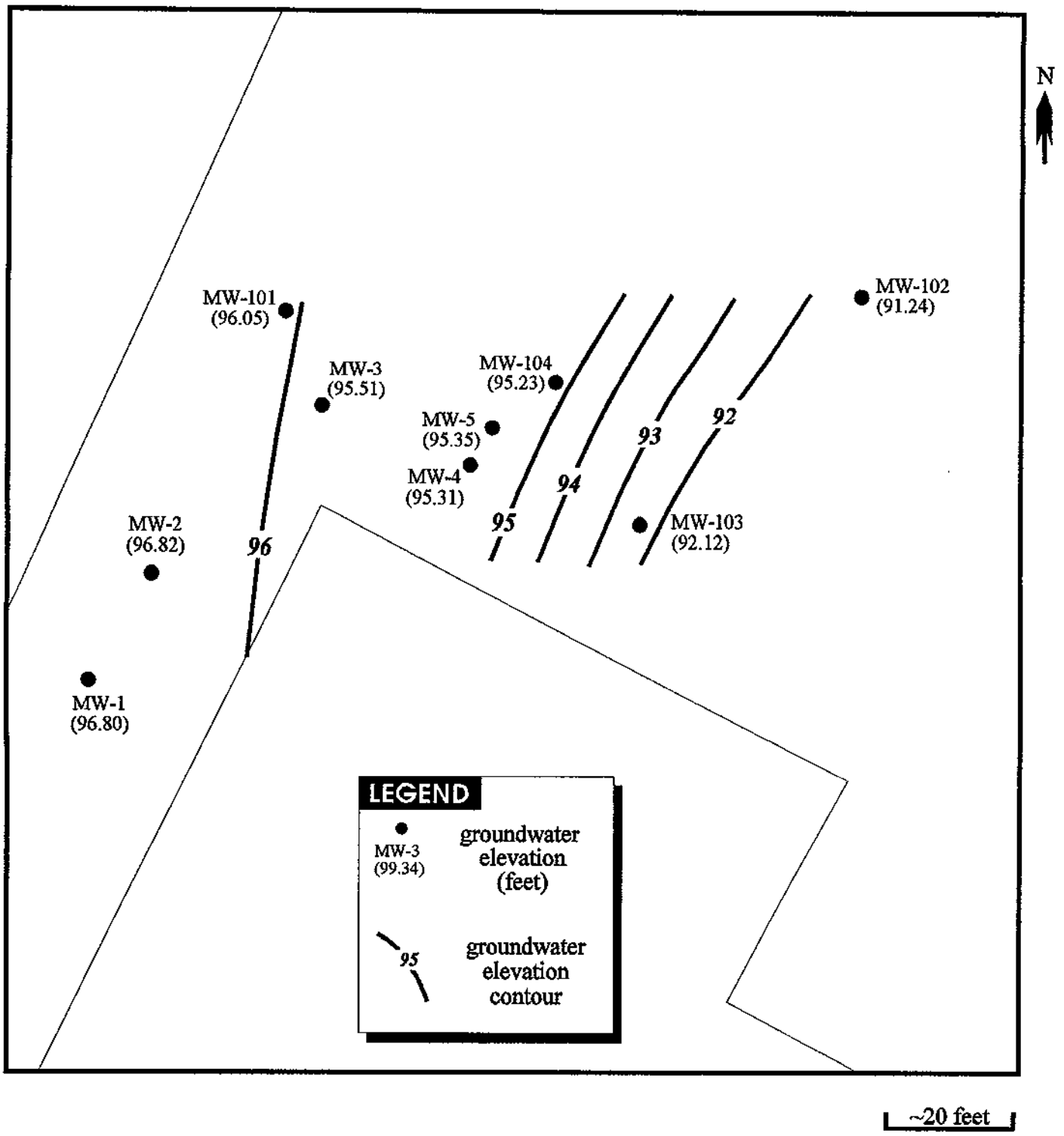


FIGURE 6
Groundwater elevations for August 17, 1993,
Martin's General Store Mobil, Highgate Springs, Vermont.

No free product has been detected in monitoring wells at the site. No vapors were detected in the basement of the Store nor in a storm sewer located just north of the building. Based on the low permeability of the site soils, and the shallow depth to groundwater, there does not appear to be a vapor-accumulation problem at the site. The primary pathway for contaminant transport at the site is advection and dispersion in groundwater.

The distribution of dissolved BTEX constituents and MTBE in site groundwater is illustrated on Figures 7 through 12. The data define a plume originating from the tank location extending eastward along the hydraulic gradient. The highest BTEX concentrations are present in MW-5, which is located immediately downgradient of the tanks, and was completed in the backfill materials. The highest MTBE concentration was detected in MW-103. Relative solubilities for BTEX components and MTBE are included on Table 2. MTBE is more soluble (and mobile) than BTEX components, and this is reflected in the MTBE plume configuration. Contaminants detected in MW-101 suggest upgradient dispersion has occurred.

4.3 Potential Receptors

Potential receptors include the surface-water drainageway on the eastern perimeter of the site, and bedrock water supplies. No vapors were detected in the basement of the Store nor in a storm sewer located just north of the building. Based on the low permeability of the site soils, and the shallow depth to groundwater, there does not appear to be a vapor-accumulation problem at the site. No petroleum odors or sheens were noted in the drainageway directly downgradient from the site. Since contamination was detected in MW-103, which is the furthest downgradient well, the downgradient extent of the plume is unknown. As a result, it is not known whether dissolved contaminants may have reached the drainageway, or will likely do so in the future.

The Dexter and Store wells are located north and south, respectively, of the eastward-flowing contaminant plume. The Dexter well (and presumably the Store well) is completed in the underlying carbonate bedrock. According to the log, the depth to bedrock at the Dexter well is 38 feet. The casing is cemented 60 feet into bedrock and the static water level is ground surface. The presence of sulfur in both the Store and Dexter wells suggests the water tapped by these wells is fairly mineralized, which may indicate a relatively long residence time or flow path for waters entering these wells.

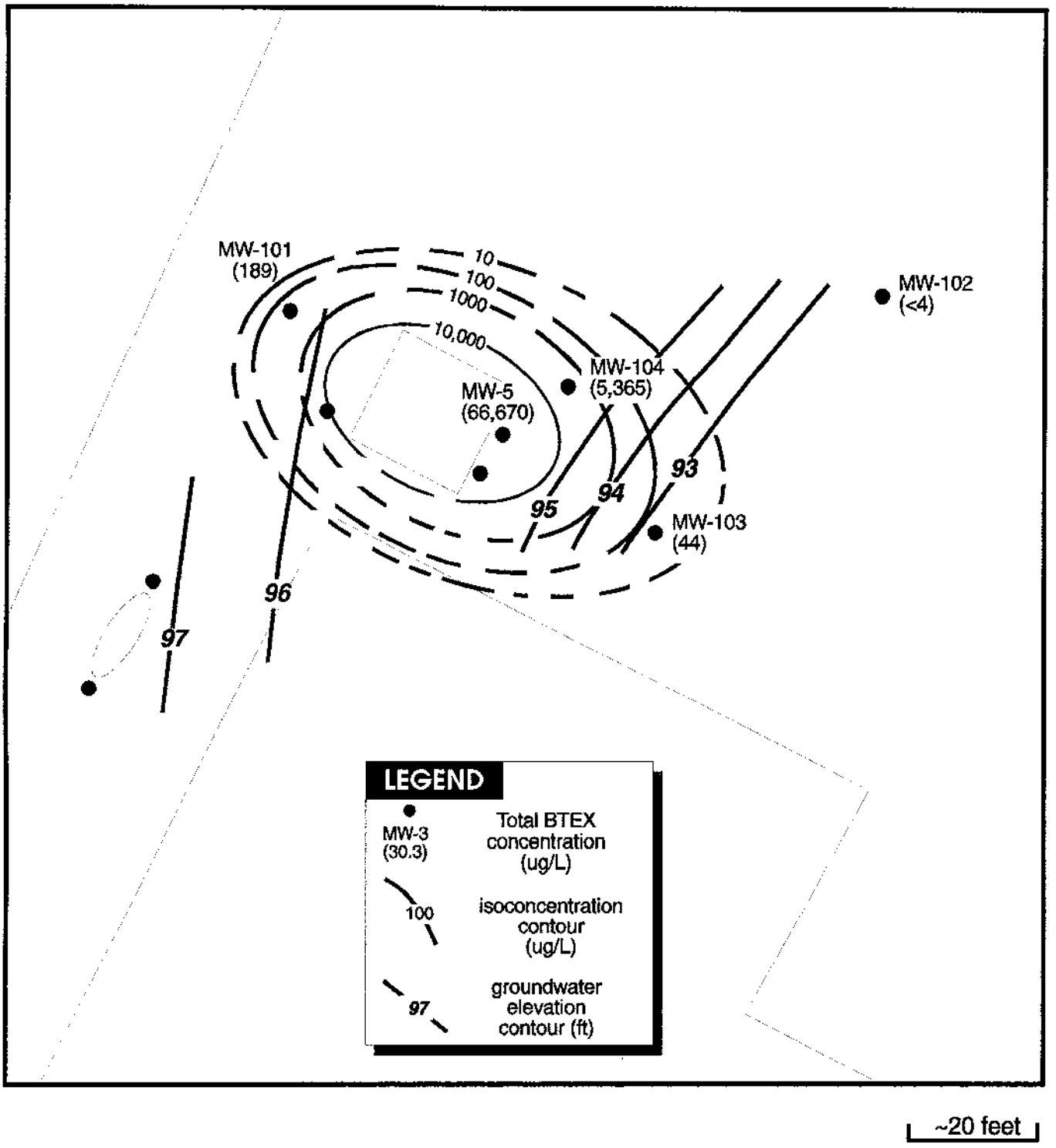


FIGURE 7
Total BTEX isoconcentration map with groundwater elevations, June 18, 1993, Martin' s General Store Mobil, Highgate Springs, Vermont.

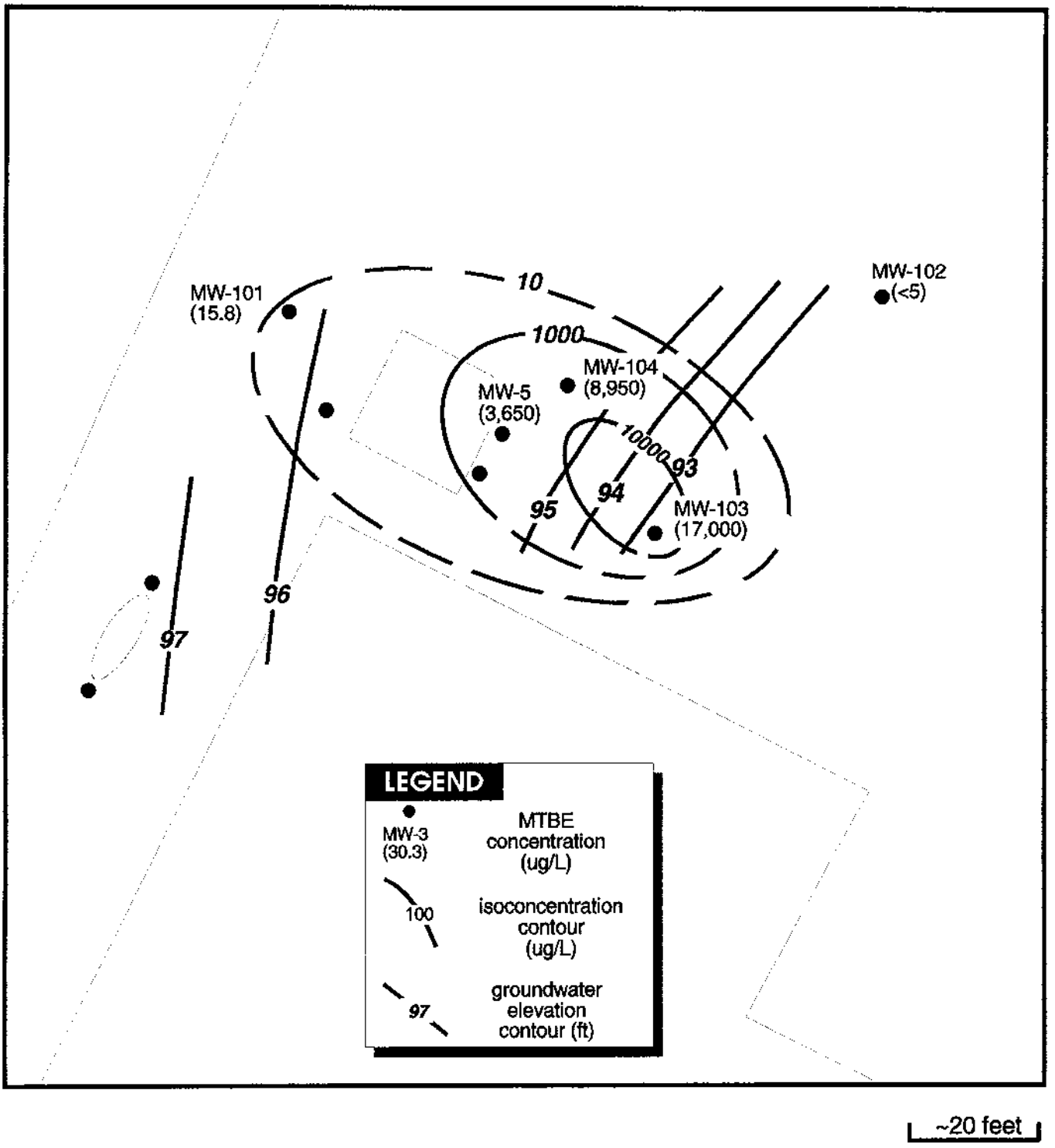


FIGURE 8
MTBE isoconcentration map and groundwater contours, June 18, 1993,
Martin' s General Store Mobil, Highgate Springs, Vermont.

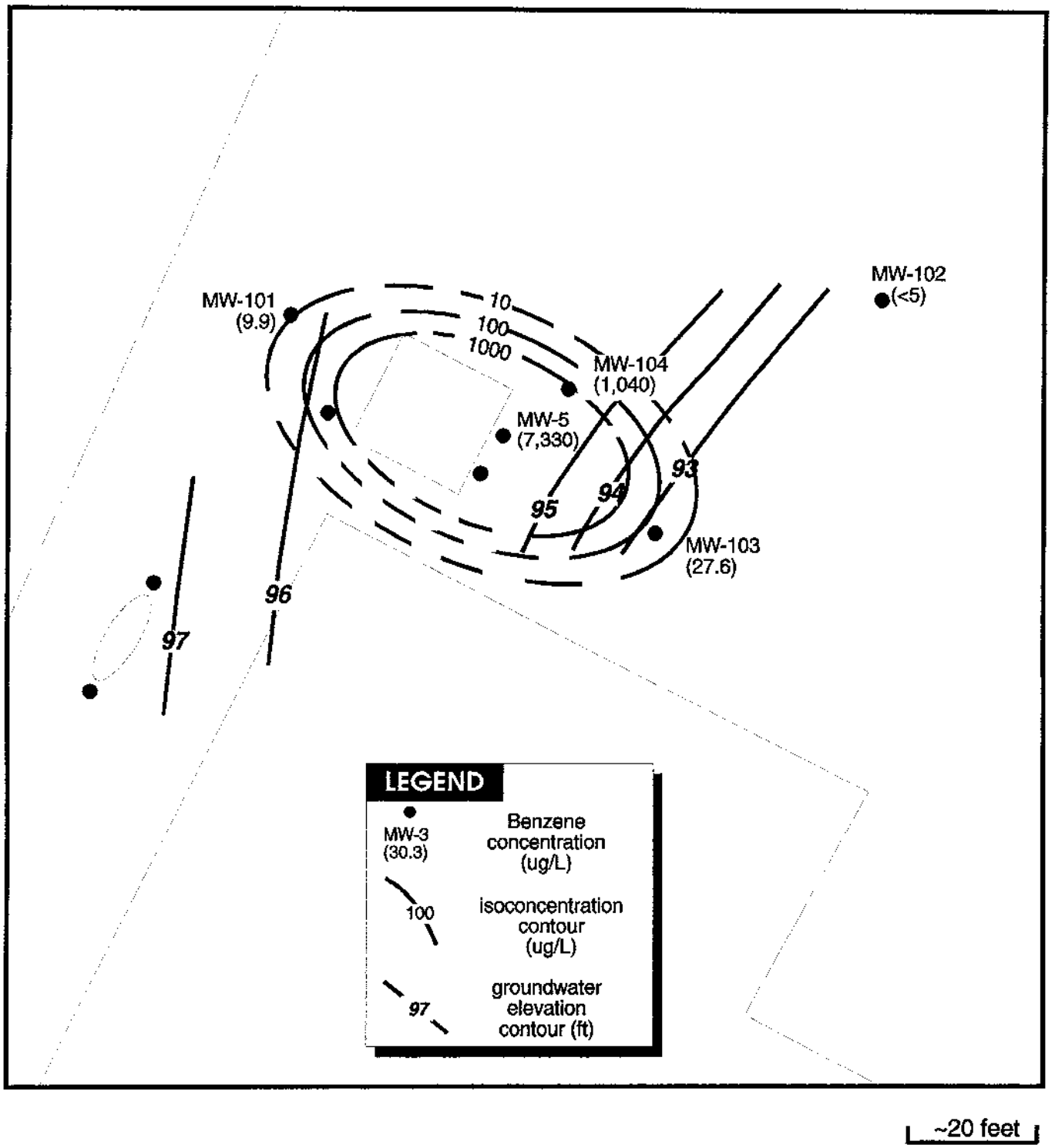


FIGURE 9
Benzene isoconcentration map and groundwater contours, June 18, 1993,
Martin' s General Store Mobil, Highgate Springs, Vermont.

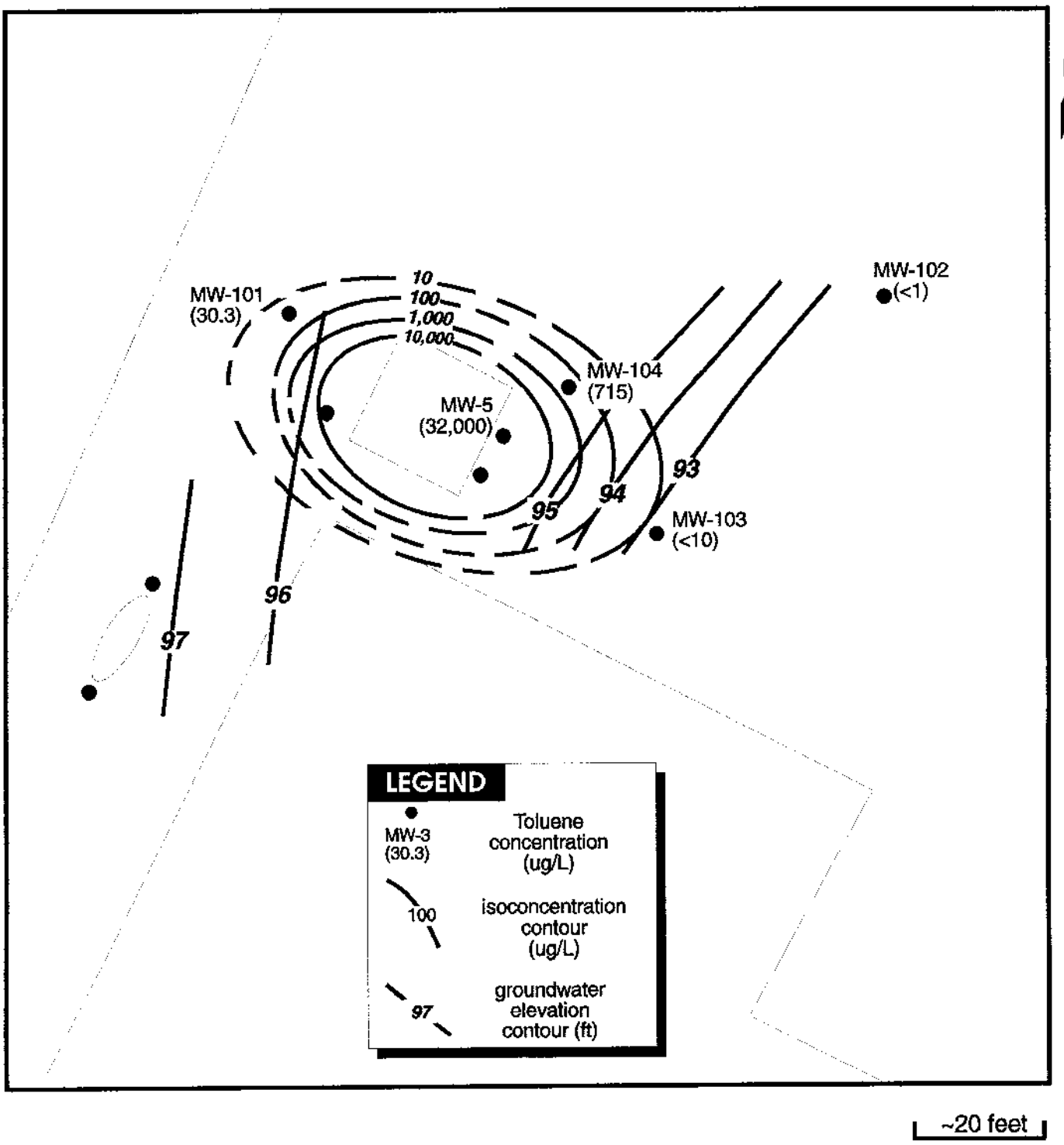


FIGURE 10
Toluene isoconcentration map and groundwater contours, June 18, 1993, Martin' s General Store Mobil, Highgate Springs, Vermont.

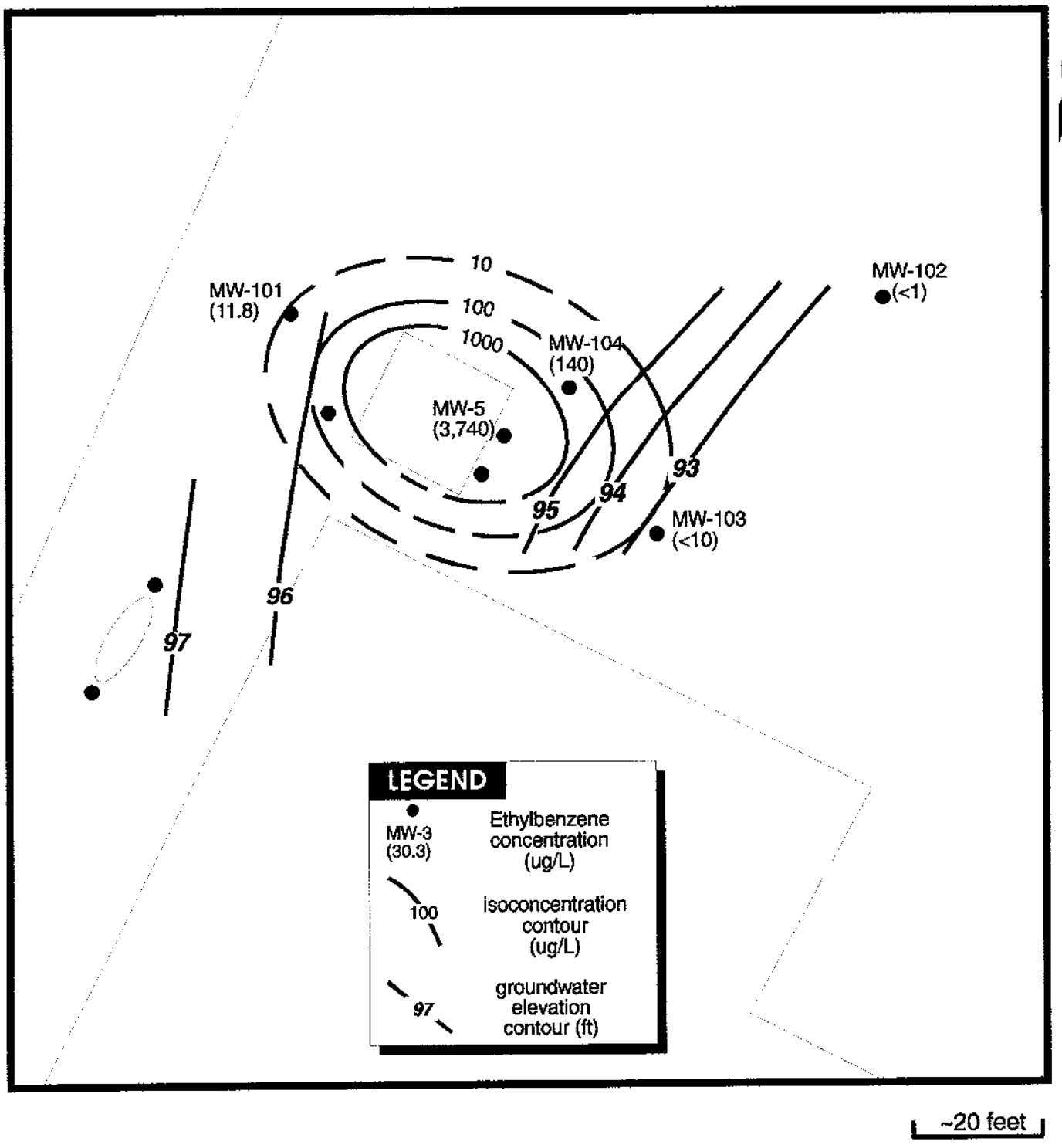


FIGURE 11
Ethylbenzene isoconcentration map and groundwater contours, June 18, 1993, Martin' s General Store Mobil, Highgate Springs, Vermont.

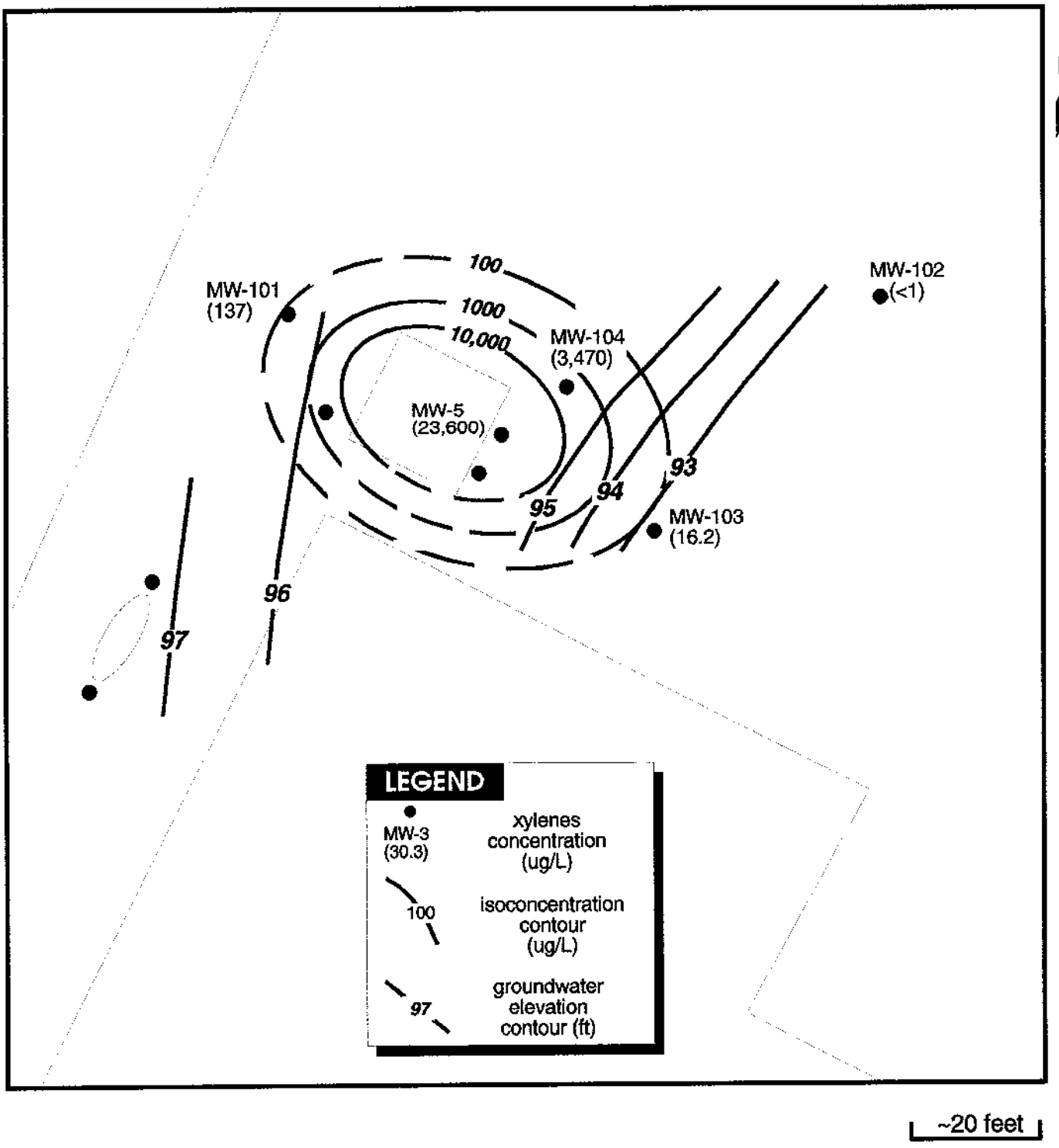


FIGURE 12
Xylenes isoconcentration map and groundwater contours, June 18, 1993, Martin' s General Store Mobil, Highgate Springs, Vermont.

Based on the existing data, the presence of contaminants in the shallow groundwater at the site does not appear to pose a threat to these water supplies.

4.4 Conclusions and Recommendations

A release of gasoline from a 4000-gallon tank at the Martin's Store has impacted soil and shallow groundwater in the vicinity. The tank and surrounding soils were removed on April 8, 1993. Groundwater at the site flows eastward from the source area toward a drainageway on the perimeter of the site. Site groundwater flow rates are estimated at 0.2 to 7 feet/year. Groundwater sampling has defined a eastward-flowing contaminant plume of dissolved MTBE and BTEX constituents. The highest concentrations occur directly downgradient of the former tank.

Based on the distribution of contamination presented in this report, the risk of contamination adversely impacting potential receptors appears to be low. The potential of contamination reaching the drainageway could be more accurately assessed if the downgradient extent of the plume was known. Monitoring wells should be installed between MW-103 and the drainageway to define the donwgradient extent of contamination. In addition, a staff gauge should be installed in the drainageway directly downgradient of the site. The elevation of the surface water at this location can be incorporated into site groundwater elevation maps. A surface-water sample should be collected at this location during future sampling event.

A quarterly groundwater sampling program should be initiated. It is recommended that samples be collected from all wells and sampling locations during the first two quarterly sampling events. Results from these sampling efforts and additional well installations should then be evaluated to determine future groundwater sampling frequencies and sampling points.

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USDA, 1976, *Soil Survey of Franklin, Vermont,* U.S. Department of Agriculture, Soil Conservation Service, Vermont Agricultural Experiment Station, and Vermont Agency of Environmental Conservation.

APPENDIX A

Relevant Correspondence

State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
Hazardous Materials Management Division
103 South Main Street / West Building
Waterbury, VT 05671-0404
802-244-8702
FAX 802-244-5141

May 17, 1993

Mr. Carl Ruprecht
S.B. Collins, Inc.
54 Lower Welden St.
P.O. Box 671
St. Albans, VT 05478

RE: Work Plan submitted for investigation at Martin's General Store in Highgate Springs (Site #92-1372)

Dear Mr. Ruprecht:

The Sites Management Section (SMS) has received the tank pull forms regarding the removal of a 4,000 gallon gasoline UST from the above referenced site. The tank was pitted with holes, sheens were observed on the groundwater which was encountered at approximately 5 ft bgs, and PID readings of the soil were as high as 300 ppm. Based on these observations, the SMS has concluded that additional work at this site will be necessary.

The SMS has also received the Work Plan for a subsurface investigation at the site submitted by Mr. Jeff Hoffer, Consulting Hydrogeologist. After reviewing this Work Plan, we have the following comments:

- The proposed monitoring well locations should be revised to more clearly define the degree of contamination around the former tank area. Review the attached map for our suggestions, which include relocating MW-1 on the same side of the street as the site, moving MW-5 closer to the tank location, and eliminating MW-2.

- A receptor assessment should be included in the investigation to define the potential of the contamination to adversely affect any sensitive receptors. Adjacent basements should be field screened with a PID, and other sensitive environments investigated.

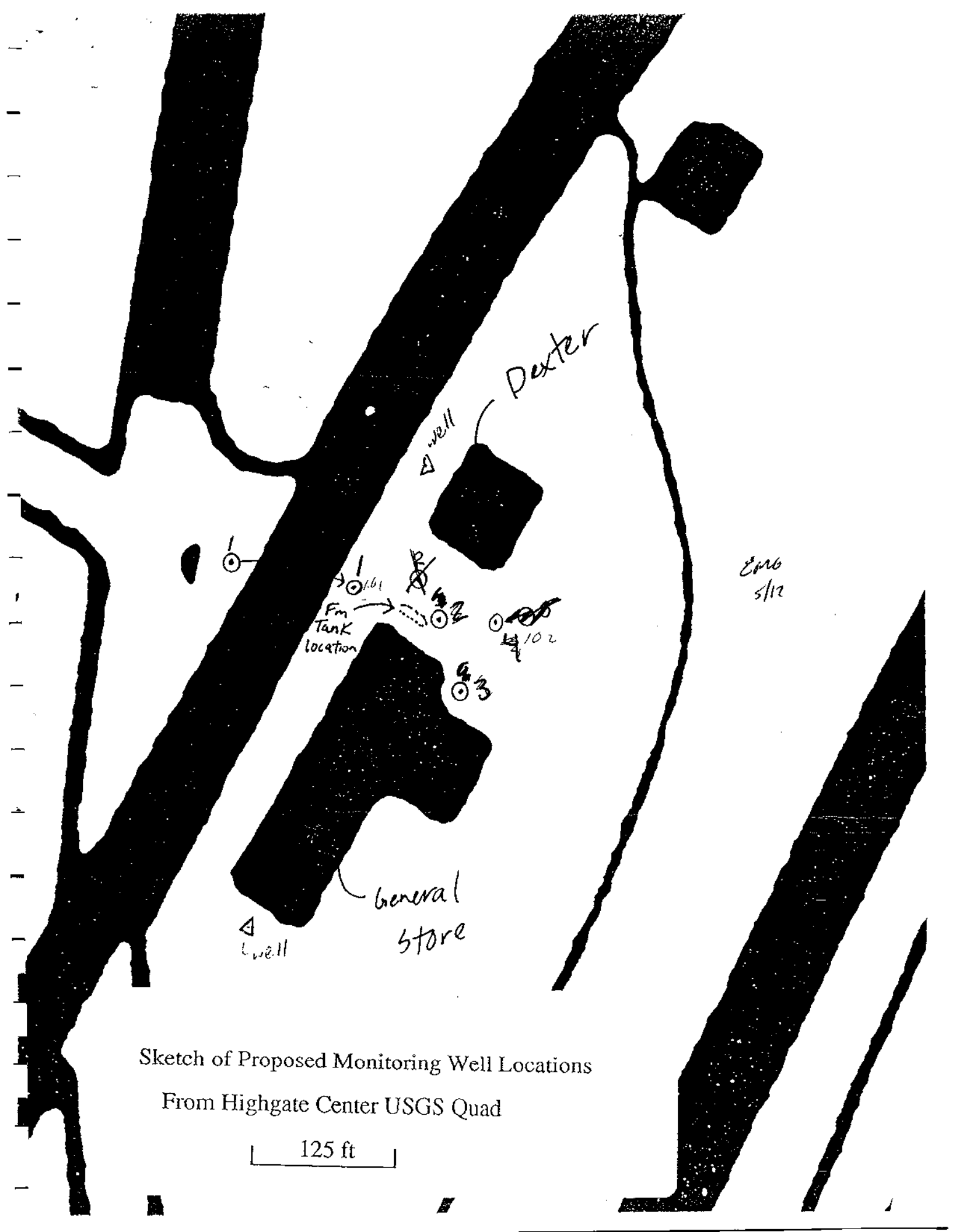
With the above additions, the SMS approves of the Work Plan as submitted, and feels that the scope of work will adequately address our concerns at this site for the necessary phase I investigation. Please have your consultant begin work as soon as possible. In addition, have your consultant notify me when the drilling has been scheduled so that I can be onsite during that time. If there are any questions or concerns, please feel free to call.

Sincerely,

E. Matt Germon

E. Matt Germon, Environmental Engineer
Sites Management Section

cc: Mr. Jeff Hoffer, Consulting Hydrogeologist
mg/1372first.approve



Sketch of Proposed Monitoring Well Locations

From Highgate Center USGS Quad

125 ft

April 20, 1993

Mr. Carl Ruprecht, UST Manager
S.B. Collins, Inc.
54 Lower Welden Street
St. Albans, Vermont 05478

Re: Scope of Work, Martin's General Store Mobil,
Highgate Springs, VT

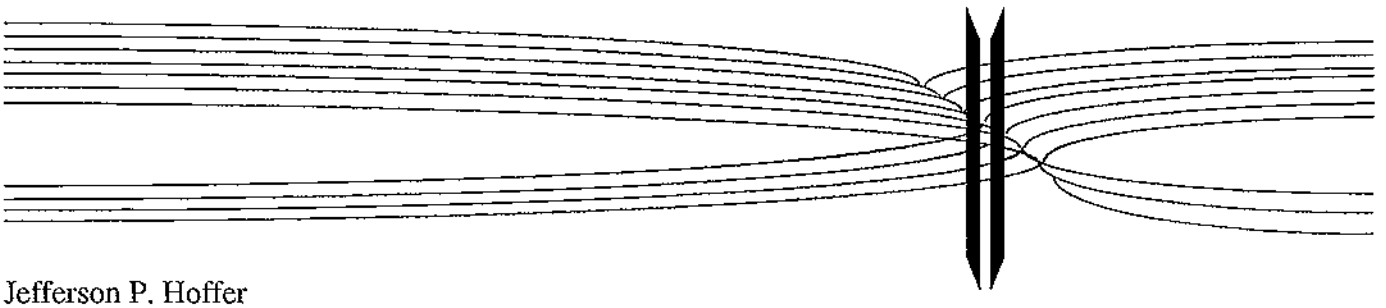
Dear Carl;

I'm pleased to present the following scope of work for a hydrogeologic site assessment at the Martin's General Store Mobil, Highgate Springs, Vermont. This work is prompted by a potential release of gasoline from a 4000-gallon UST. The tank was removed on April 8, 1993, and corrosion holes were visible. Soils removed from underneath and alongside the tank showed evidence of contamination. Additional background information is summarized in my letter dated April 9, 1993. The following scope of work has been developed to define site hydrogeologic conditions, investigate the nature and extent of contamination at the site, evaluate potential impacts on public health and the environment, and to decide whether or not remedial efforts are necessary.

All work will be performed in accordance with Vermont's Underground Storage Tank Regulations and guidance documents published by the Hazardous Materials Management Division.

SCOPE OF WORK

- General site characterization. A general site assessment will be performed by reviewing available information such as USGS topographic maps, SCS maps, geologic and hydrologic reports, and the Water Supply Division's water well inventory database. This information, along with a "windshield survey" of the area surrounding the site, will be used to summarize hydrogeologic conditions and land-use patterns in the region.



Jefferson P. Hoffer
P.O. Box 428, Waterbury, Vermont 05676 (802) 244 - 5573

A site map will be prepared using a 1:5000 orthophoto as a base. The map will be used to show pertinent local features such as residences, well locations, surface water features, etc. A field reconnaissance of the drainageway just east of the site will be performed to look for visible signs of contamination.

- Groundwater monitoring well installation. Five soil borings/monitoring wells are proposed. Tentative locations are presented on the enclosed sketch-map, and are based on expected groundwater flow directions. Well #1 is sited in the assumed upgradient direction. Well #2 is situated between the former tank and the Dexter well. Well #3 is located immediately downgradient from the former tank. Wells #4 and #5 are located to detect downgradient migration of potential contaminants.

  Boreholes will be advanced using hollow-stem augers. Split-spoon samples will be collected every five feet. Split-spoon samples and cuttings returned on the auger flights will be visually inspected and described according to USDA classifications.

  Soil samples from the downgradient wells will be collected and field-screened using a PID to qualitatively assess soil contamination. Sampling will be accomplished by taking continuous split-spoon samples from below the surface to the water table. Soil samples will be collected from the split spoons and placed into glass jars and sealed with aluminum foil, in preparation for field screening with the PID.

  Boreholes will be advanced approximately 5 feet below the water table (depth to groundwater at the site is estimated to be between 5 and 10 feet). Wells will be constructed with 10 feet of 2-inch factory-slotted (10 or 20-slot), flush-thread, PVC well screen. The well screen will be positioned so that approximately 5 feet of screen is below the water table. Flush-thread PVC riser will be extended from the screen to the ground surface. The well screens will be backfilled with an appropriately sized, commercially-sorted sand. Geologic and monitoring well construction logs will be prepared to document the stratigraphy and well construction details.

  After well installation, the wells will be developed by either bailing or pumping. All development waters will be collected and placed into 55-gallon drums at the site.

  During the well drilling and installation activities, a PID will be utilized to monitor for the presence of organic vapors. The vapor monitoring will be used to detect zones of contamination, and also to monitor worker air-space for health and safety concerns.

- Groundwater sampling. One round of groundwater sampling will be performed. Samples will be collected from the five monitoring wells, and two domestic wells (Dexter and General Store well). The monitoring wells will be purged of three well volumes (or until dryness) by bailing or pumping. Samples will be collected using a teflon bailer. All sampling equipment will be decontaminated between sampling points with an alconox scrub/tap water rinse/methanol rinse/deionized water rinse. Quality assurance/quality control samples will include a trip blank, a field/equipment blank, and a blind duplicate. The trip blank will be provided by the laboratory and will be transported to the site, handled the same as other samples, and

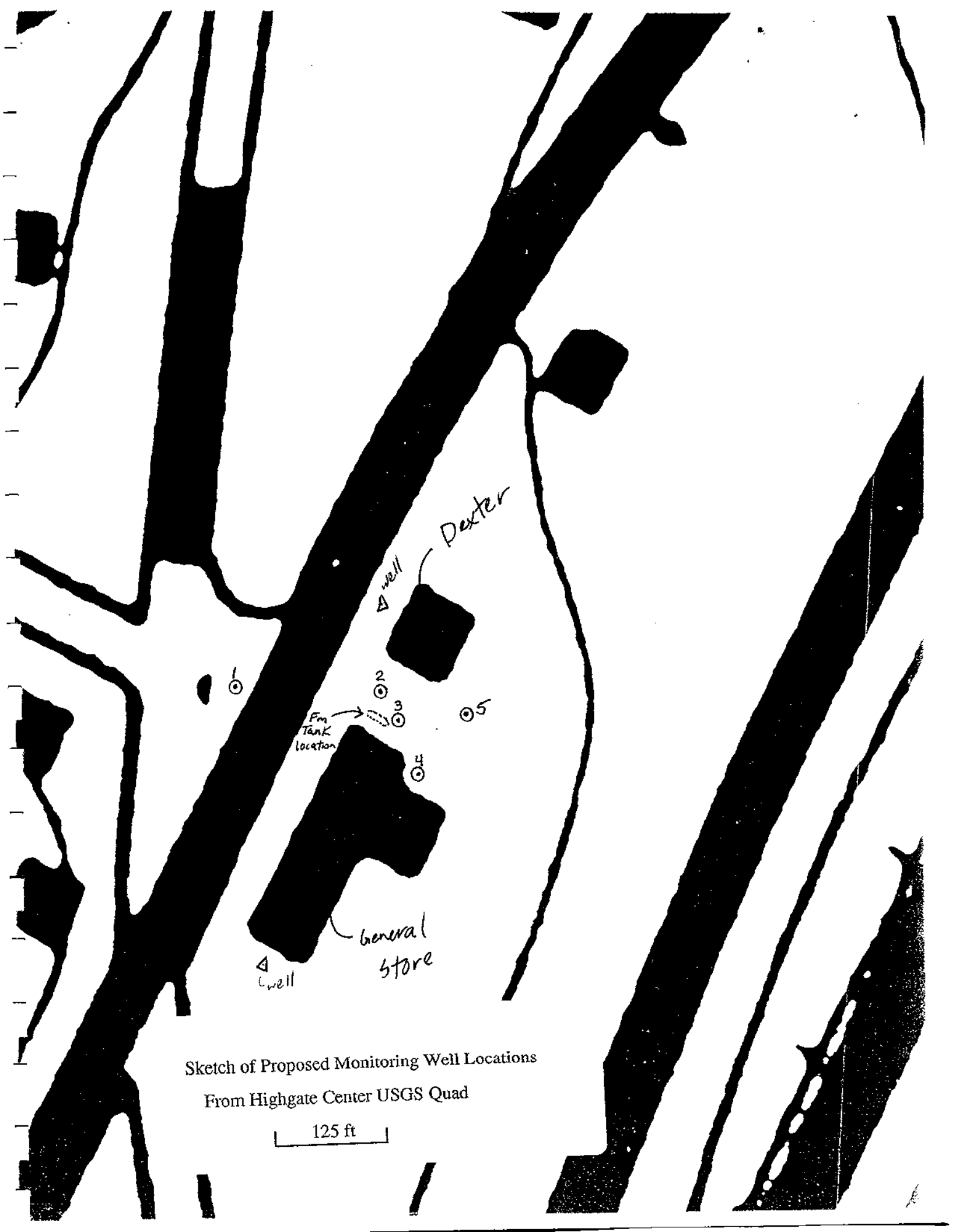
returned to the laboratory for analysis. The field/equipment blank will be prepared by pouring deionized water through the teflon sampling bailer, to determine the effectiveness of the decontamination procedure and possible sample exposure to airborne contaminants. Samples from the domestic wells will be sampled at the taps.

The samples will be properly labeled and placed into a cooler with ice. The samples will be transported to Endyne, Inc., and analyzed by EPA Method 602 for BTEX and MTBE. A laboratory chain-of-custody form will be utilized to document the sampling event.

- Water-level survey. Elevations of the monitoring wells and the Dexter well will be surveyed to allow conversion of water-level measurements into relative elevations. Two water-level surveys will be performed at the site. The initial survey will occur a few days after the installation/development of the monitoring wells. A second round of water-level measurements will be taken at the time of groundwater sampling. Water levels will be measured in the five monitoring wells and the Dexter well (the General Store well is inaccessible). Water-table elevation maps will be prepared for each of the water-level surveys.

- Report preparation. All information collected during the investigation will be incorporated into a report. The report will describe the environmental setting, and the nature and extent of contamination found at the site. The report will include logs, tables, vicinity and site maps, contour maps, cross-sections, and other figures, as appropriate. The report will also provide recommendations concerning subsequent investigations or remediation efforts which may be deemed necessary at the site.

- Health & Safety. A Health & Safety Plan will be prepared for the site.



Sketch of Proposed Monitoring Well Locations

From Highgate Center USGS Quad

125 ft

April 13, 1993

Carl Ruprecht
UST Manager
S.B. Collins, Inc.
54 Lower Welden Street
P.O. Box 671
St. Albans, VT 05478

Re: Martin's General Store Mobil, Highgate Springs

Dear Carl:

The purpose of this letter is to summarize my observations during the removal of a 4000-gallon UST at Martin's General Store Mobil, Highgate Springs, Vermont, on Thursday, April 8, 1993. Enclosed are two rough maps which illustrate some of the observations discussed below. I also took a number of photographs during the day and will forward the photographs to you as soon as possible.

It is my understanding that water had been detected at the pump and in the tank of the special-grade gasoline, indicating potential holes in the tank. The removal of the tank was necessary to assess whether or not the tank was leaking. The tank was one of three tanks buried on the north side of the store. The tanks are aligned lengthwise in an approximate east-west manner. The northern most tank was used for special-grade gasoline storage.

When I arrived at the site at 9:00 AM, S.B. Collins personnel had excavated down to the top of the tank and were preparing to pump gasoline from the tank into a tanker. After the gasoline was pumped into the tanker, the water from the bottom of the tank was pumped into 55-gallon drums.

Soils along the northern side and two ends were then excavated so that the tank could be removed and inspected. Groundwater was encountered on the eastern end of the tank at a depth below grade of approximately five to six. The water appeared to enter the excavation from the sand backfill surrounding the tanks. Although no free product was visible, the gray wet sand from which the water discharged had a slight odor of "weathered" gasoline and/or a "septic" odor. Water was also encountered along the north side of the tank at a depth of approximately seven or eight feet. As the tank was being lifted out of the hole, more water entered the excavation from beneath the tank. A black, tar-like substance was visible on the water surface, along with a sheen. The tar-like substance and sheen were removed from the excavation using sorbent pads.

Jefferson P. Hoffer
P.O. Box 428, Waterbury, Vermont 05676 (802) 244 - 5573

Inspection of the tank after its removal revealed a number of small corrosion holes. Although the tank was reportedly less than 10 years old and generally appeared to be in good condition, soil and/or groundwater conditions evidently allowed significant corrosion to occur. A "water line" was visible on the tank indicating that the bottom one-third of the tank was under water for at least a portion of time.

After removal of the tank, additional soils were removed from the base and sides of the excavation. The backfill surrounding the buried tanks consisted of a medium-grained sand, although it was noticeably absent in places under and alongside the removed tank. Soils outside of the tank backfill consisted of four to five feet of various fill materials including ash, bricks, large rock fragments, and other materials. Underlying the fill and the tank backfill materials was a sandy clay. Although the clay was mottled throughout, there was no noticeable inflow of water from the clay during excavation. Apparently, shallow groundwater accumulates within the tank backfill (sand) and is perched on the underlying low permeability sandy clay.

Soils were screened for contamination using an HNU (10.2 eV bulb). Prior to its use, the HNU was calibrated and checked with an isobutylene standard. Headspace readings were taken by placing soil in pint-size ziplock bags (half full), shaking the sample, and then inserting the HNU tip to record the vapor concentration. Grab samples were taken throughout the day as soil was removed from the excavation. HNu readings were generally above 20 ppm with a maximum range of 200 to 300 ppm. All of the soils removed from the excavation were stockpiled on site.

Surface topography at the site slopes toward the east. A drainage ditch is located behind the store, paralleling the southbound lane of I-89. This drainage ditch conveys surface-water runoff and shallow groundwater flow to the northeast. As a result, shallow groundwater flow in the vicinity of the general store is probably eastward toward this drainage ditch.

Two nearby bedrock water-supply wells are located in the immediate vicinity. One is owned by the store and is located on the south end of the store. The store owner (who lives in the same building as the store) was unaware of well-construction details but said that the well has sulfur. The store's water system includes a water softener, a filter, and a chlorinator. There is a tap located in a backroom that bypasses the treatment devices.

Another well is located in front of the residence (owned by Ralph Dexter) immediately north of the store. This well also serves two small residences further north along Route 7. A well log was retrieved from Chevalier Drilling Company and indicates the following;

> *6-inch well completed July 1958;*
> *Depth 110 ft, length of casing 61' 8 1/2";*
> *rock at 38 feet, caves in upper formation of rock,*
> *well cased and cemented to 61' 8 1/2";*
> *yields 9 gals per min. at bottom, static level at ground level*

Although the hydrogeologic setting does not indicate an immediate threat to these wells, it would be prudent to obtain water samples from both of these wells and test for BTEX and MTBE. The store well should be sampled at the tap which bypasses the treatment devices.

In accordance with Vermont UST regulations, a site assessment should be performed at the site as soon as possible. I will prepare a scope of work for a site investigation and send it to you within a week. In the meantime, if you have any questions, please give me a call.

Sincerely,

Jefferson P. Hoffer
Consulting Hydrogeologist

APPENDIX B
Monitoring Well Logs

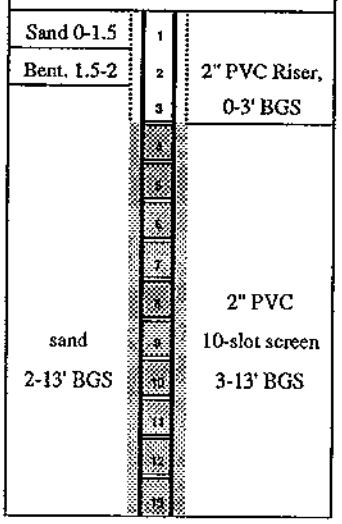
SOIL BORING/MONITORING WELL CONSTRUCTION LOG

Well/Boring ID: MW-101

Project Name: S.B. Collins/Highgate Spgs	WELL CONSTRUCTION
Project Number: 04-02	Screen Type/Interval: 2" PVC, 10-slot from 3-13' BGS
Driller: S.B. Collins	Sandpack Type/Interval: f/c sand, 2-13' BGS
Drilling Method: 3.25" ID HSA	Riser Type/Interval: 2" PVC from 0-3' BGS
Geologist: J. Hoffer	Seal Type/Interval: bentonite pellets, 1.5-2' BGS
Sampling Method: 2" split spoon	Measuring Point/Stickup: top of PVC Casing, flushmount
Date/Time Started: 6/12/93, 0850	Water Level/Date/Time: 2.99 feet BTOC, 6/16/93
Date/Time Completed: 6/12/93, 1100	Elevation of Top of PVC: 99.44 feet (benchmark = 100.00 ft)
Weather: 70 degrees, sunny	
Surface Conditions: pavement	

Sample Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID* Reading (ppm)
2.5-4.5	2.0	Olive-brown and grayish brown CLAYEY SILT, dry massive, sticky and plastic when wet, high dry strength mottled throughout (common/distinct)	10
5 - 7	2.0	Grayish-brown CLAYEY SILT, dry, mottled throughout (common/prominent)	150
10 - 12	2.0	Olive-brown CLAYEY SILT, as above but moist in places	0

Well Construction



GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0-2.5' pavement and sub-base material

2.5-13 CLAYEY SILT, mottled throughout

saturated below 7'

NOTES:

* Peak Headspace Reading

BGS - Below Ground Surface, BTOC - Below Top of Casing, f/c - fine to coarse, m/c - medium to coarse.

SOIL BORING/MONITORING WELL CONSTRUCTION LOG

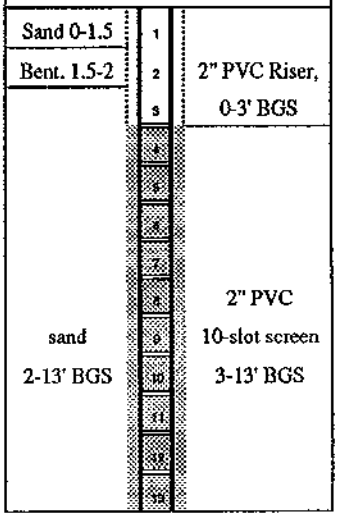
Well/Boring ID: MW-102

Project Name: S.B. Collins/Highgate Spgs	WELL CONSTRUCTION
Project Number: 04-02	Screen Type/Interval: 2" PVC, 10-slot from 3-13' BGS
Driller: S.B. Collins	Sandpack Type/Interval: f/c sand, 2-13' BGS
Drilling Method: 3.25" ID HSA	Riser Type/Interval: 2" PVC from 0-3' BGS
Geologist: J. Hoffer	Seal Type/Interval: bentonite pellets, 1.5-2' BGS
Sampling Method: 2" split spoon	Measuring Point/Stickup: top of PVC Casing, flushmount
Date/Time Started: 6/12/93, 1125	Water Level/Date/Time: 4.34 feet BTOC, 6/16/93
Date/Time Completed: 6/12/93, 1210	Elevation of Top of PVC: 97.36 feet (benchmark = 100.00 ft)
Weather: 70 degrees, sunny	
Surface Conditions: loose gravel/grass	

Sample Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID* Reading (ppm)
2.5-4.5	0.5	Brown SILT LOAM, dry	0
5 - 7	1.0	Gray SILT LOAM, moist, sl. sticky when wet	0
10 - 12	2.0	Olive-Brown CLAYEY SILT, wet, sticky and plastic mottled throughout (many/prominent)	0

Cuttings turned wet at about 8 feet

Well Construction



GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0 - 8' SILT LOAM

8 - 13' CLAYEY SILT, saturated below 8'

NOTES:

* Peak Headspace Reading

BGS - Below Ground Surface, BTOC - Below Top of Casing, f/c - fine to coarse, m/c - medium to coarse.

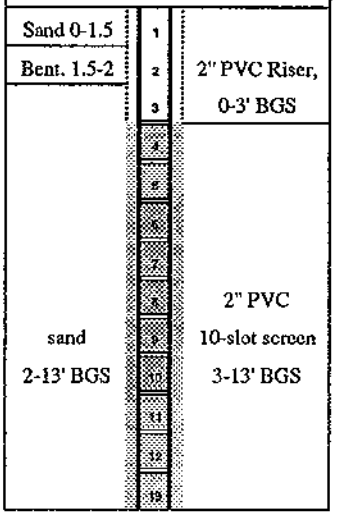
SOIL BORING/MONITORING WELL CONSTRUCTION LOG

Well/Boring ID: MW-103

Project Name: S.B. Collins/Highgate Spgs	WELL CONSTRUCTION
Project Number: 04-02	Screen Type/Interval: 2" PVC, 10-slot from 3-13' BGS
Driller: S.B. Collins	Sandpack Type/Interval: f/c sand, 2-13' BGS
Drilling Method: 3.25" ID HSA	Riser Type/Interval: 2" PVC from 0-3' BGS
Geologist: J. Hoffer	Seal Type/Interval: bentonite pellets, 1.5-2' BGS
Sampling Method: 2" split spoon	Measuring Point/Stickup: top of PVC Casing, flushmount
Date/Time Started: 6/12/93, 1210	Water Level/Date/Time: 5.37 feet BTOC, 6/16/93
Date/Time Completed: 6/12/93, 1300	Elevation of Top of PVC: 98.11 feet (benchmark = 100.00 ft)
Weather: 70 degrees, sunny	
Surface Conditions: loose gravel	

Sample Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID* Reading (ppm)
2.5-4.5	1.0	0.5' of brown sand and angular gravel with clay (FILL), dry 0.5' of silt loam with some fine gravel (FILL), dry	0
5 - 7	1.0	0.5' of moist sandy clay with rubble and wood (FILL) 0.5' of dark grayish brown SILT LOAM, moist	0
10 - 12	NR	No Recovery - but spoon wet	NR

Well Construction



GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0 - 6' FILL, dry

6-13' SILT LOAM and CLAYEY SILT as evidenced by cuttings

NOTES:

* Peak Headspace Reading

BGS - Below Ground Surface, BTOC - Below Top of Casing, f/c - fine to coarse, NR = No Reading

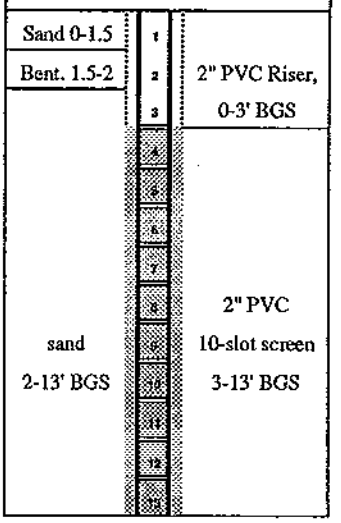
SOIL BORING/MONITORING WELL CONSTRUCTION LOG

Well/Boring ID: MW-104

Project Name: S.B. Collins/Highgate Spgs	**WELL CONSTRUCTION**
Project Number: 04-02	Screen Type/Interval: 2" PVC, 10-slot from 3-13' BGS
Driller: S.B. Collins	Sandpack Type/Interval: f/c sand, 2-13' BGS
Drilling Method: 3.25" ID HSA	Riser Type/Interval: 2" PVC from 0-3' BGS
Geologist: J. Hoffer	Seal Type/Interval: bentonite pellets, 1.5-2' BGS
Sampling Method: 2" split spoon	Measuring Point/Stickup: top of PVC Casing, flushmount
Date/Time Started: 6/12/93, 1330	Water Level/Date/Time: 3.01 feet BTOC, 6/16/93
Date/Time Completed: 6/12/93, 1445	Elevation of Top of PVC: 98.58 feet (benchmark = 100.00 ft)
Weather: 70 degrees, sunny	
Surface Conditions: loose gravel	

Sample Depth (feet)	Sample Recovery (feet)	Sample Description (color, texture, etc.)	PID* Reading (ppm)
2.5-4.5	0.1	Gray-brown sandy clay (FILL)	30
5 - 7	0.2	Gray-brown CLAYEY SILT	130
10 - 12	1.0	Olive-brown CLAYEY SILT, moist, mottled (common/prom.)	5

Well Construction



GENERALIZED GEOLOGIC LOG and OTHER OBSERVATIONS

0 - 5' sandy clay (FILL)

5 - 13' CLAYEY SILT

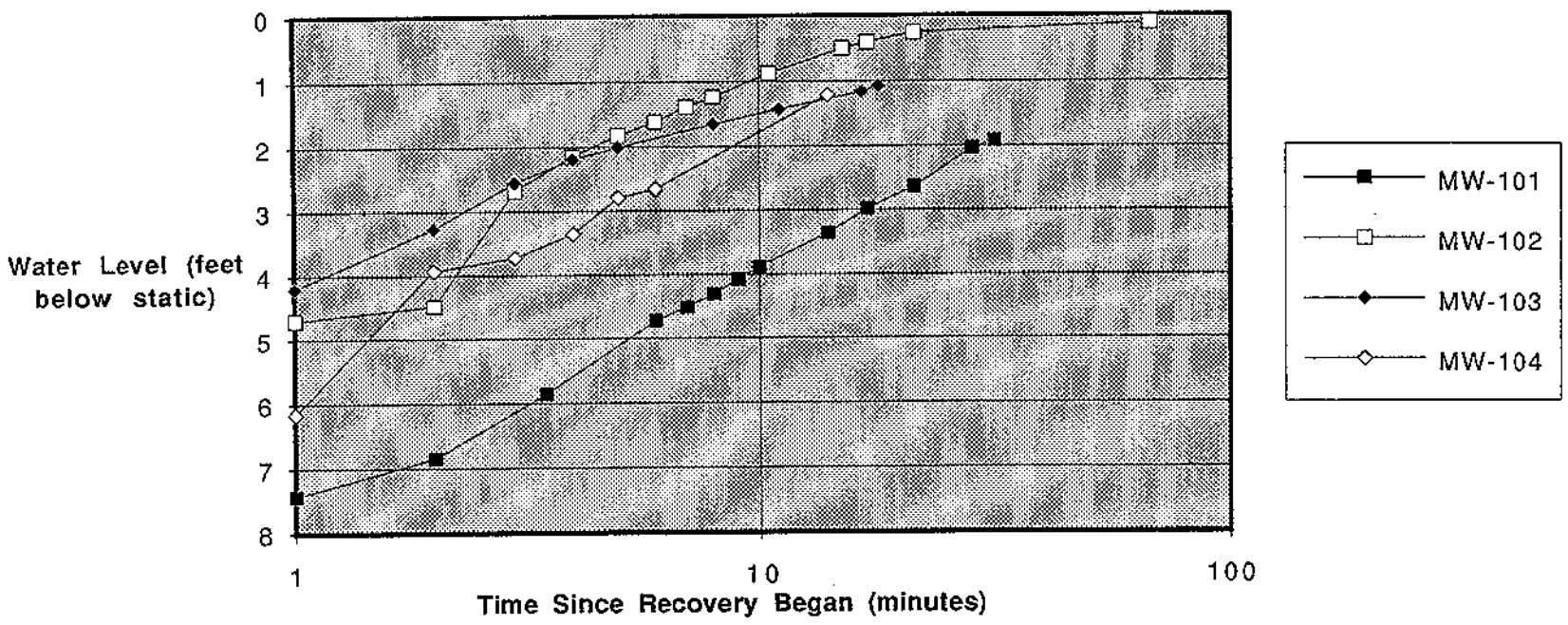
NOTES:

* Peak Headspace Reading

BGS - Below Ground Surface, BTOC - Below Top of Casing, f/c - fine to coarse, m/c - medium to coarse.

APPENDIX C
Recovery Data and Analysis

Slug Test Data, Martin's Mobil, Highgate Springs, Vermont



BOUWER & RICE Analysis Worksheet

$$K = \frac{rc * rc}{2Le} * \ln\left(\frac{Re}{rw}\right) * \frac{1}{t} \ln\left(\frac{Yo}{Yt}\right)$$

$$\ln(Re/rw) = \left\{\frac{1.1}{\ln(Lw/rw)} + \frac{A+B \ln[(H-lw)/rw]}{Le/rw}\right\}^{-1}$$

rc = radius of well casing
Re = effective radial distance over which head is dissipated
rw = radius of sandpack
Le = length of sandpack
Lw = distance between bottom of well and water table
H = saturated thickness of aquifer (35 feet)

WELL	rc (feet)	Le (feet)	rw (feet)	H (feet)	A#	B#	ln (Re/rw)	1/t ln (Yo/Yt)	K (ft/min)	k (ft/day)	K (cm/sec)
MW-101	0.083	10.01	0.333	10.01	2.5	0.4	2.15	2.0E-02	1.5E-05	2.2E-02	7.6E-06
MW-102	0.083	8.66	0.333	8.66	2.5	0.4	2.00	5.6E-02	4.5E-05	6.5E-02	2.3E-05
MW-103	0.083	7.63	0.333	7.63	2.5	0.4	1.86	2.2E-02	1.9E-05	2.7E-02	9.5E-06
MW-104	0.083	9.99	0.333	9.99	2.5	0.4	2.15	6.6E-02	4.9E-05	7.1E-02	2.5E-05
									Arithmetic Mean	4.6E-02	1.6E-05
									Geometic Mean	4.0E-02	1.4E-05

Values for A and B from Figure 2, Bouwer (1989)

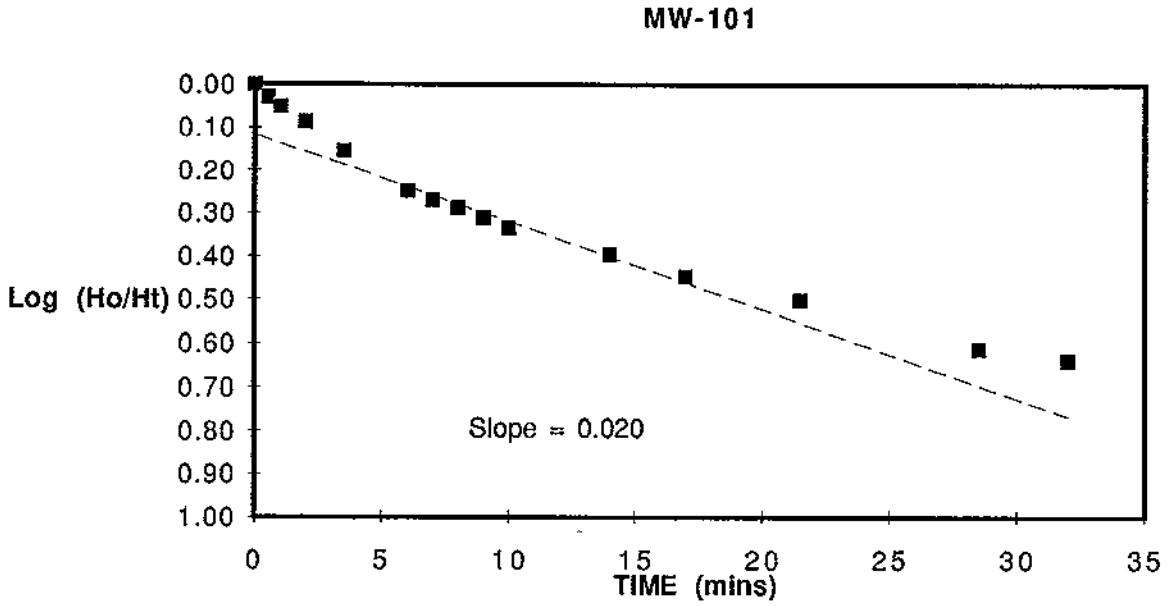
BOUWER & RICE Analysis Worksheet
Page 2

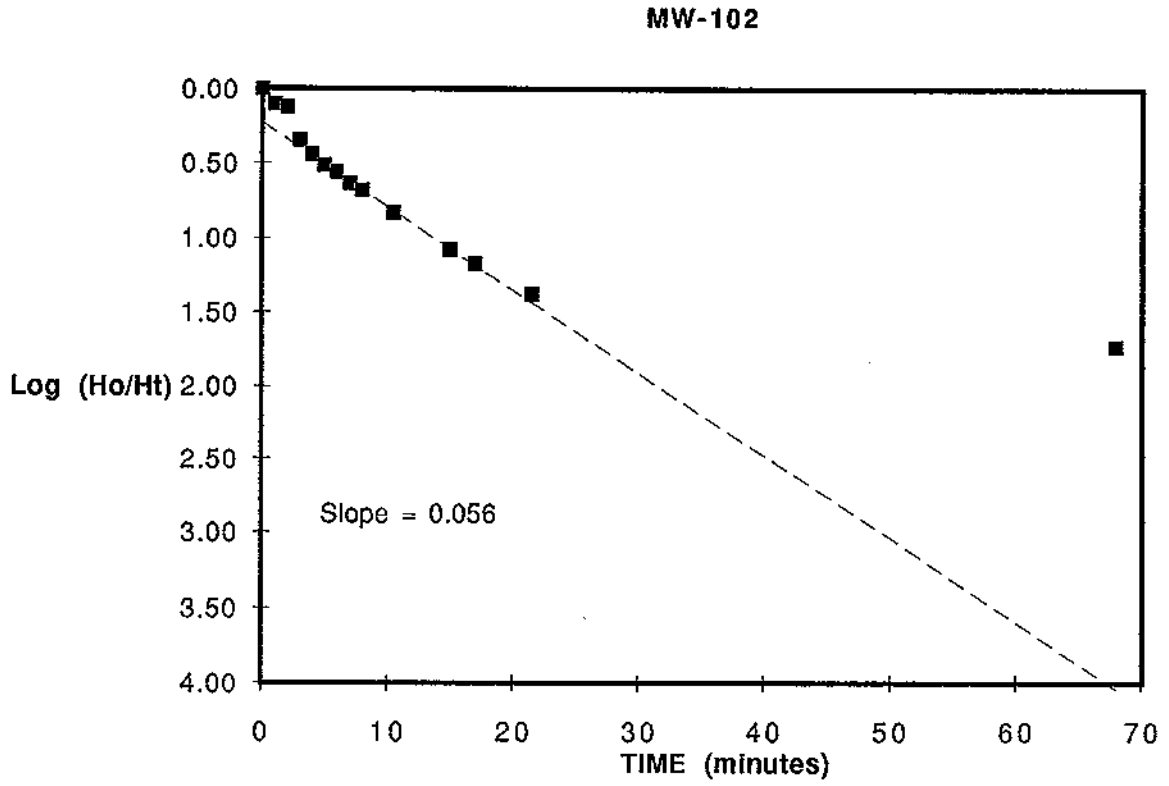
$$\ln(Re/rw) = \left\{ \frac{1.1}{\ln (Lw/rw)} + \frac{A+B \ln [(H-lw)/rw]}{Le/rw} \right\} -1$$

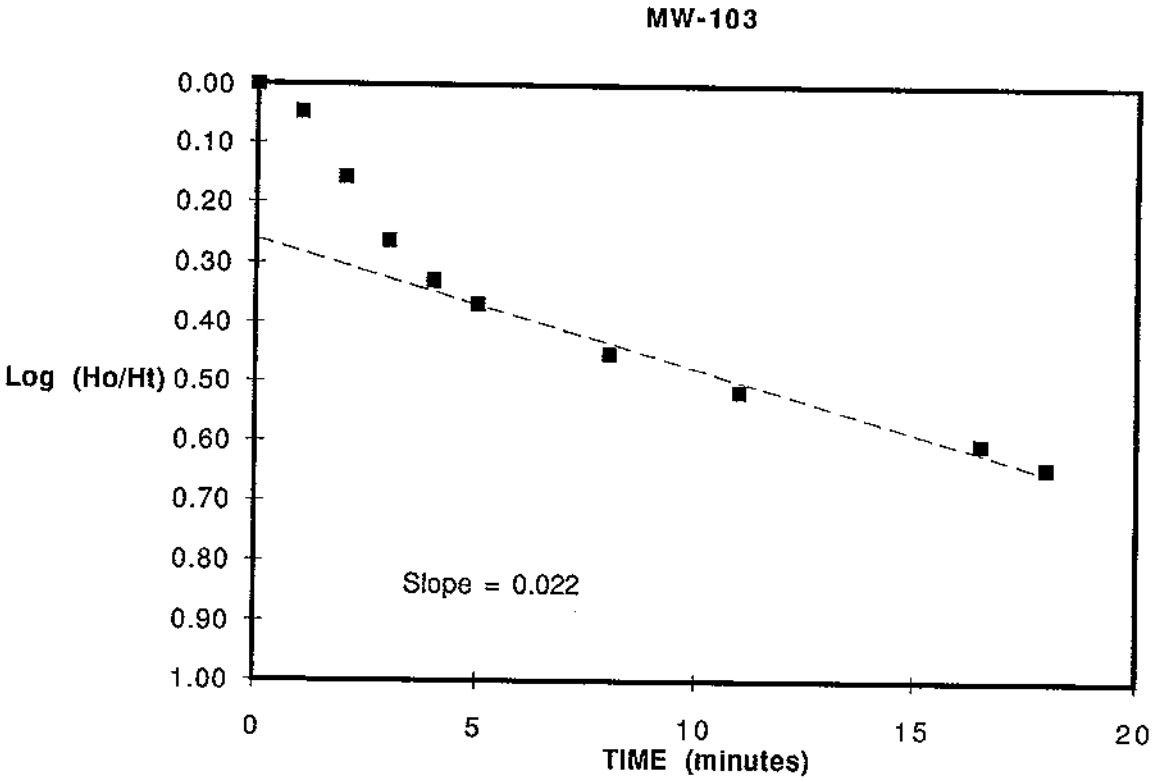
(C) (D)

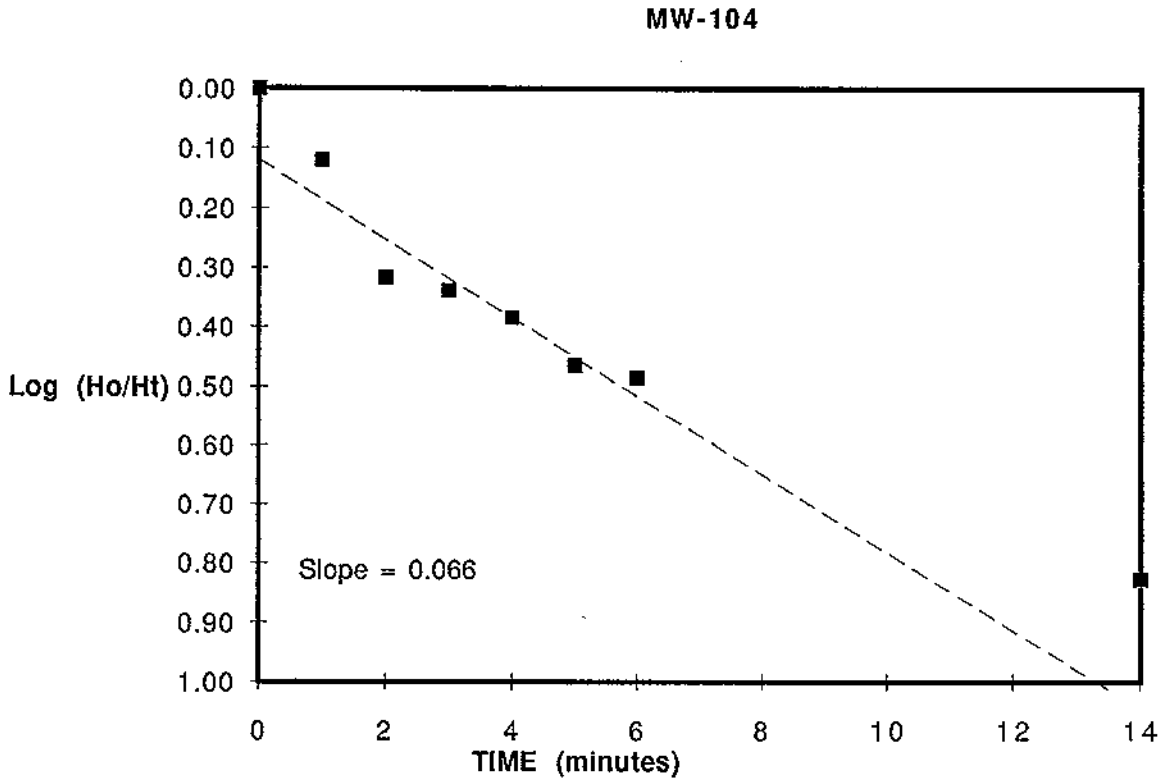
Re = effective radial distance over which head is dissipated
rw = radius of sandpack
Le = length of sandpack
Lw = distance between bottom of well and water table
H = saturated thickness of aquifer (35 feet)

WELL	Lw (feet)	C	D	ln (Re/rw) *1/(C+D)*	ln Re (feet)	Re (feet)
MW-101	10.01	0.323	0.141	2.15	1.056	2.6
MW-102	8.66	0.338	0.164	2.00	0.897	1.9
MW-103	7.63	0.351	0.186	1.86	0.761	3.3
MW-104	9.99	0.324	0.141	2.15	1.054	2.4


MW-101
Log (Ho/Ht)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
0
5
10
15
20
25
30
35
TIME (mins)
Slope = 0.020


MW-102
Log (Ho/Ht)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
Slope = 0.056
0
10
20
30
40
50
60
70
TIME (minutes)


MW-103
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
Log (Ho/Ht)
Slope = 0.022
0
5
10
15
20
TIME (minutes)

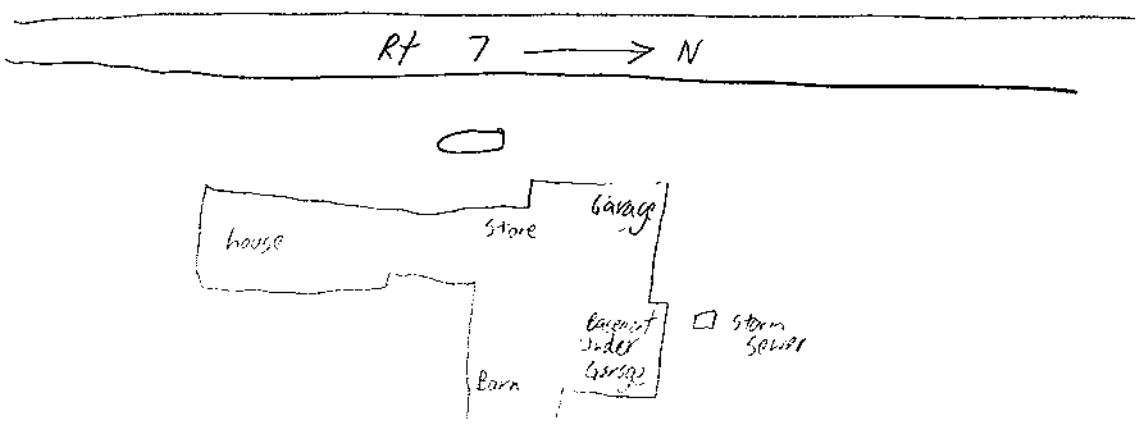

MW-104
Log (Ho/Ht)
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
Slope = 0.066
0
2
4
6
8
10
12
14
TIME (minutes)

APPENDIX D
PID Readings and Analytical Results

AIR MONITORING FORM

Project: SB Collins / Martin's Store Instrument: HNU with 10.2 eV bulb
Site: Highgate Springs, Vt. Calibration Gas: 60 ppm Isobutylene

DATE	TIME	LOCATION	READING
6/16/93	0900	Calibrated HNU	
		Storm Sewer	0
		Basement under back garage - dirt floor	0
		Basement under barn	0
		Basement under store + front garage	0
		Peak Headspace of Wells	
		MW-1	40
		MW-2	40
		MW-3	1
		MW-4	0
		MW-5	50
		MW-101	10
		MW-102	0
		MW-103	0
		MW-104	12



AIR MONITORING FORM

Project: SB Collins / Martin's Store Instrument: HNU w/ 10.2 eV bulb
Site: Highgate Springs, Vt. Calibration Gas: 60 ppm Isobutylene

DATE	TIME	LOCATION	READING (ppm)
6/12/93	0830	Calibrated HNU	
	0850	MW-101 Cuttings from 1.5 ft	0
		Cuttings from 4 ft	1-2
		Cuttings from 6 ft	5
		Cuttings from 8 ft	20
		↓ Top of Augers at 10 ft	30-40
		MW-101 Borehole when setting sandpack	3-4
		MW-102 Cuttings from 2.5 ft	0
		Top of Augers at 5 ft	0-1
		↓ Top of Augers at 10 ft	0
		MW-103 Top of Augers at 5 ft	0
		Cuttings from 5 ft	0
		Spoon Sample 5-7 ft	0
		Cuttings from 9 ft	0
		↓ Borehole at 12 ft	0
		MW-104 Top of Augers at 2.5 ft	5-10
		Tip of Spoon Sample 2.5-4.5	5
		Top of Auger at 5 ft	5-10
		Tip of Spoon Sample 5-7 ft	0-1
		Cuttings from 10 ft	0-1
		↓ Top of Auger at 10 ft	5-7
		MW-104 Tip of Spoon Sample 10-12 ft	1-5
		MW-104 Top of borehole after pulling augers	100

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CHAIN-OF-CUSTODY RECORD

006514

Project Name: MARTINS STORE Site Location: HIGHGATE SPRINGS	Reporting Address: SBCollins Inc	Billing Address: SAME
Endyne Project Number: SBMR1533	Company: CARL IMPACHT Contact Name/Phone #: 527-0116	Sampler Name: SAME Phone #:

Lab #	Sample Location	Matrix	GRAB	COMP	Date/Time	Sample Containers No.	Sample Containers Type/Size	Field Results/Remarks	Analysis Required	Sample Preservation	Rush
4537-15	EAST TANK MW #1				5/3 2:15			MTBE/BTEX	↑	HCL	
	"				"						
4538-16	WEST TANK MW #2				5/3 2:20						
	"				"						
4539-17	STORE WATER				5/3 2:30						
	"				"						
4540-18	NEIGHBORS WATER				5/3 6:40					NONE	
	"				"						
			NEED RESULTS BY 5/14/93								

Relinquished by: Signature	Received by: Signature	Date/Time 5/4/93 10:45am
Relinquished by: Signature	Received by: Signature	Date/Time

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):										

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins
PROJECT NAME: Martins Store
REPORT DATE: May 17, 1993
DATE SAMPLED: May 3, 1993
DATE RECEIVED: May 4, 1993
ANALYSIS DATE: May 10, 1993

PROJECT CODE: SBMR1533
REF.#: 45,295
STATION: East Tank [redacted] MW-5
TIME SAMPLED: 2:15
SAMPLER: C. Ruprecht

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	10	1,140.
Toluene	10	2,530.
Ethylbenzene	10	228.
Xylenes	10	3,760.
MTBE	50	1,020.

Bromobenzene Surrogate Recovery: 91%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >25

NOTES:

1 Detection limit raised due to high levels of contaminants. Sample run at 10% dilution.

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins
PROJECT NAME: Martins Store
REPORT DATE: May 17, 1993
DATE SAMPLED: May 3, 1993
DATE RECEIVED: May 4, 1993
ANALYSIS DATE: May 10, 1993

PROJECT CODE: SBMR1533
REF.#: 45,296
STATION: West Tank [redacted] MW #3
TIME SAMPLED: 2:20
SAMPLER: C. Ruprecht

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	20	2,140.
Toluene	20	3,500.
Ethylbenzene	20	127.
Xylenes	20	3,950.
MTBE	100	8,020.

Bromobenzene Surrogate Recovery: 97%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 20

NOTES:

1 Detection limit raised due to high levels of contaminants. Sample run at 5% dilution.

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins
PROJECT NAME: Martins Store
REPORT DATE: May 17, 1993
DATE SAMPLED: May 3, 1993
DATE RECEIVED: May 4, 1993
ANALYSIS DATE: May 11, 1993

PROJECT CODE: SBMR1533
REF.#: 45,297
STATION: Store Water (Martin's)
TIME SAMPLED: 2:30
SAMPLER: C. Ruprecht

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Toluene	1	ND
Ethylbenzene	1	ND
Xylenes	1	ND
MTBE	5	ND

Bromobenzene Surrogate Recovery: 99%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins
PROJECT NAME: Martins Store
REPORT DATE: May 17, 1993
DATE SAMPLED: May 3, 1993
DATE RECEIVED: May 4, 1993
ANALYSIS DATE: May 11, 1993

PROJECT CODE: SBMR1533
REF.#: 45,298
STATION: Neighbors Water (Dexter)
TIME SAMPLED: 6:40
SAMPLER: C. Ruprecht

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Toluene	1	ND
Ethylbenzene	1	ND
Xylenes	1	ND
MTBE	5	ND

Bromobenzene Surrogate Recovery: 107%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 None detected

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EPA METHOD 602 LABORATORY REPORT

MATRIX SPIKE AND DUPLICATE LABORATORY CONTROL DATA

CLIENT: S.B. Collins
PROJECT NAME: Martins Store
REPORT DATE: May 17, 1993
DATE SAMPLED: May 3, 1993
DATE RECEIVED: May 4, 1993
ANALYSIS DATE: May 11, 1993

PROJECT CODE: SBMR1533
REF.#: 45,297
STATION: Store Water
TIME SAMPLED: 2:30
SAMPLER: C. Ruprecht

Parameter	Sample(ug/L)	Spike(ug/L)	Dup1(ug/L)	Dup2(ug/L)	Avg % Rec
Benzene	0	10	11.5	12.3	119%
Toluene	0	10	11.4	12.2	118%
Ethylbenzene	0	10	11.4	12.3	119%
Xylenes	0	30	29.7	32.9	104%

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007626

CHAIN-OF-CUSTODY RECORD

Project Name: Martin General Store Mobil Site Location: Highgate Springs	Reporting Address: S. B. Collins, Inc.	Billing Address: S. B. Collins, Inc.
Endyne Project Number: SBMR1001	Company: S. B. Collins, Inc. Contact Name/Phone #: Carl Ruprecht 527-0116 524-3605	Sampler Name: Jeffrey P. Hoffer Phone #: 244-5573

Lab #	Sample Location	Matrix	GRAB	COMP	Date/Time	Sample Containers No.	Sample Containers Type/Size	Field Results/Remarks	Analysis Required	Sample Preservation	Rush
4MR2	MW-102	GW	X		6/18/93 0930	2	40mL		19	HCl	
4MR3	MW-103				0942						
4MR4	MW-101				0955						
4MR5	MW-104				1007						
4MR6	MW-100				1018						
4MR7	MW-5				1030						
4MR8	Dexter Well				0915						
4MR9	Martin Well	↓	↓		0900						
4MR10	FB-1	W			1201			(Field/Equipment Blank)			
4MR11	TB-1	W			0830	↓	↓	(Trip Blank)	↓	↓	

Relinquished by: Signature J. P. Hoffer	Received by: Signature M Kelly	Date/Time 6/18/93 1336
Relinquished by: Signature	Received by: Signature	Date/Time 6/18/93 1:36 pm

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 + MTBE (602)	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):										

GROUNDWATER SAMPLING DATA SHEET

PROJECT LOCATION: Martin's Store, Highgate Spgs, Vt
DATE: 6/18/93

SAMPLE METHOD: PVC Bailer/Teflon Bailer w/ stopcock
SAMPLERS: Jeff Hoffer

WELL ID	DEPTH TO WATER (ft)	TOTAL DEPTH (ft)	WATER COLUMN (ft)	Gals/Foot (2" = 0.163) (4" = 0.653) (6" = 1.469)	3 Well Volumes (gals)	Total Purged (gals)	Sample Time	Sample Type	Chain-of-Custody Number	Chain-of-Custody Time	Remarks
MW-102	4.85	13.0	8.15	1.33	4.0	3.0(dry)	0932	Sample	MW-102	0930	
MW-103	5.32	13.0	7.68	1.25	3.75	2.75(dry)	0946	Sample	MW-103	0942	
MW-101	3.11	13.0	9.89	1.61	4.83	2.5(dry)	1010	Sample	MW-101	0955	
MW-104	3.17	13.0	9.83	1.60	4.8	3.0(dry)	1020	Sample	MW-104	1007	
MW-5	3.61	13.0	9.39	1.53	4.59	2.0(dry)	1030	Duplicate	MW-100	1018	(1)
MW-5	↓	↓	↓	↓	↓	↓	↓	Sample	MW-5	1030	
Martin's	—	—	—	—	—	—	1109	Sample	Martin's	0900	(2)
Dexter	—	—	—	—	—	—	0950	Sample	Dexter	0915	
TB-1							0800	Trip	TB-1	0800	
FB-1							1050	Field	FB-1	1209	

* REMARKS (1) MW-5 Purge Water grayer + silttier than other wells, slight "old gas" odor.
(2) Sampled at tap in backroom which bypasses treatment

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,787
STATION: MW-5
TIME SAMPLED: 10:30
SAMPLER: J. Hoffer

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	100	7,330.
Toluene	100	32,000.
Ethylbenzene	100	3,740.
Xylenes	100	23,600.
MTBE	500	3,530.

Bromobenzene Surrogate Recovery: 92%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >25

NOTES:

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

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,786
STATION: MW-100
TIME SAMPLED: 10:18
SAMPLER: J. Hoffer

dupe of MW-5

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	100	7,200.
Toluene	100	31,200.
Ethylbenzene	100	3,600.
Xylenes	100	22,700.
MTBE	500	3,650.

Bromobenzene Surrogate Recovery: 89%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >25

NOTES:

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

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,784
STATION: MW-101
TIME SAMPLED: 9:55
SAMPLER: J. Hoffer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	9.9
Toluene	1	30.3
Ethylbenzene	1	11.8
Xylenes	1	137.
MTBE	5	15.8

Bromobenzene Surrogate Recovery: 80%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >25

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,782
STATION: MW-102
TIME SAMPLED: 9:30
SAMPLER: J. Hoffer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Toluene	1	ND
Ethylbenzene	1	ND
Xylenes	1	ND
MTBE	5	ND

Bromobenzene Surrogate Recovery: 93%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,783
STATION: MW-103
TIME SAMPLED: 9:42
SAMPLER: J. Hoffer

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)	
Benzene	10	27.6	50
Toluene	10	ND[2]	10
Ethylbenzene	10	ND	70
Xylenes	10	16.2	10,000
MTBE	50	17,000.	

Bromobenzene Surrogate Recovery: 100%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 Detection limit raised due to high levels of contaminants. Sample run at 10% dilution.

2 None detected

ENDYNE, INC.

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,785
STATION: MW-104
TIME SAMPLED: 10:07
SAMPLER: J. Hoffer

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	10	1,040.
Toluene	10	715.
Ethylbenzene	10	140.
Xylenes	10	3,470.
MTBE	50	8,950.

Bromobenzene Surrogate Recovery: 93%

NUMBER OF UNIDENTIFIED PEAKS FOUND: >25

NOTES:

1 Detection limit raised due to high levels of contaminants. Sample run at 10% dilution.

ENDYNE, INC.

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,788
STATION: Dexter Well
TIME SAMPLED: 9:15
SAMPLER: J. Hoffer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Toluene	1	ND
Ethylbenzene	1	ND
Xylenes	1	ND
MTBE	5	ND

Bromobenzene Surrogate Recovery: 95%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,789
STATION: Martin Well
TIME SAMPLED: 9:00
SAMPLER: J. Hoffer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Toluene	1	ND
Ethylbenzene	1	ND
Xylenes	1	ND
MTBE	5	ND

Bromobenzene Surrogate Recovery: 96%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

ENDYNE, INC.

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,790
STATION: FB-1
TIME SAMPLED: 12:09
SAMPLER: J. Hoffer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Toluene	1	4.6
Ethylbenzene	1	ND
Xylenes	1	5.5
MTBE	5	ND

Bromobenzene Surrogate Recovery: 97%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

ENDYNE, INC.

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LABORATORY REPORT

GC METHOD--BTEX (BENZENE, TOLUENE, ETHYLBENZENE,XYLENES)

CLIENT: S.B. Collins, Inc.
PROJECT NAME: Martins General Store Mobil
REPORT DATE: July 6, 1993
DATE SAMPLED: June 18, 1993
DATE RECEIVED: June 18, 1993
ANALYSIS DATE: June 30, 1993

PROJECT CODE: SBMR1001
REF.#: 47,791
STATION: TB-1
TIME SAMPLED: 8:00
SAMPLER: J. Hoffer

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Toluene	1	ND
Ethylbenzene	1	ND
Xylenes	1	ND
MTBE	5	ND

Bromobenzene Surrogate Recovery: 93%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected