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<input checked="" type="checkbox"/> Site Investigation	<input type="checkbox"/> Work Scope
<input type="checkbox"/> Corrective Action Feasibility Investigation	<input checked="" type="checkbox"/> Technical Report
<input type="checkbox"/> Corrective Action Plan	<input type="checkbox"/> PCF Reimbursement Request
<input type="checkbox"/> Corrective Action Summary Report	<input type="checkbox"/> General Correspondence
<input type="checkbox"/> Operations & Monitoring Report	

SITE INVESTIGATION REPORT

October 6, 1999

**Wilder Farm
595 US Route 2
South Hero, Vermont**

**UST Facility #NA
SMS Site #99-2603
TSEC Project # 99031**

9/12 9:27 AM '99

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Wilder Farm
SITE Investigation Report

TABLE OF CONTENTS

Section	Page No.
1.0 INTRODUCTION	1
2.0 BACKGROUND/PREVIOUS WORK	1
3.0 SCOPE OF WORK	2
4.0 SITE LOCATION AND DESCRIPTION	3
5.0 REGIONAL SURVEY	4
6.0 SUBSURFACE INVESTIGATION	4
6.1 Advancement of Soil Borings	4
6.2 Monitoring Well Installation and Construction	6
6.3 SITE Geology	6
6.4 SITE Survey	7
7.0 SOIL SAMPLING ACTIVITIES	7
7.1 Field Screening Results	7
7.2 Laboratory Results	7
8.0 GROUNDWATER SAMPLING ACTIVITIES	8
8.1 Water Table Elevation and SITE Hydrogeology	8
8.1.1 Water Table Elevation –September 3, 1999	8
8.1.2 Water Table Elevation – September 23, 1999	8
8.1.3 SITE Hydrogeology	8
8.2 Groundwater Sampling Activities	9
8.3 Groundwater Analytical Results	9
8.4 QA/QC Results	10
8.4.1 Field QA/QC	10
8.4.2 Laboratory QA/QC	10
9.0 RECEPTOR EVALUATION	10
9.1 Surface Water Receptors	10
9.2 Drinking Water Receptors	11
9.3 Other Receptors	11
10.0 CONCEPTUAL HYDROGEOLOGIC MODEL	11
11.0 CONCLUSIONS	12
12.0 RECOMMENDATIONS	13

**Wilder Farm
SITE Investigation Report**

**TABLE OF CONTENTS
(continued)**

FIGURES

- Figure 1 – SITE Location Map**
- Figure 2 – SITE Plan**
- Figure 3 – Groundwater Elevation Map**

TABLES

- Table 1 – Soil Boring Summary Table**
- Table 2 – Summary of Groundwater Elevations – September 3, 1999**
- Table 3 – Summary of Groundwater Elevations – September 23, 1999**
- Table 4 – Summary of Groundwater Quality – September 3, 1999**

APPENDICES

- Appendix A – SITE Photographs**
- Appendix B – Soil Boring and Monitoring Well Logs**

ATTACHMENTS

- Attachment 1 – VT SMS Letters**
- Attachment 2 – Laboratory Analytical Data Package**

1.0 INTRODUCTION

Twin State Environmental Corporation (TSEC) has prepared this report on behalf Wilder Farm, to present the findings of our recent SITE investigation conducted at the Wilder Farm Property (SITE). The SITE is located at 595 US Route 2, in South Hero, Grand Isle County, Vermont (see SITE Location Map, **Figure 1**, SITE Plan, **Figure 2**, and the SITE Photographs presented in **Appendix A**).

This investigation was initiated following the April 7, 1999 closure of a former 1,000 gallon capacity gasoline underground storage tank (UST) by Kent S. Koptiuch, Inc. Geo-Environmental Services (KSKGeoS™). In the UST closure report, KSKGeoS™ indicated that significant petroleum-related contamination was present within the subsurface soils surrounding the former UST. It was recommended that a Phase II subsurface investigation be completed to define the degree and extent of contaminant impact to the overburden soils and groundwater. The State of Vermont Sites Management Section (SMS), following its review of the UST Closure Report, requested that Wilder farm obtain retain the services of a qualified environmental consultant to perform the following:

- further define the degree and extent of contamination to the soil;
- if appropriate, determine if the airspace beneath the SITE and adjacent buildings has been impacted by the release using a photoionization detector (PID);
- determine the degree and extent of petroleum contamination, if any, to groundwater;
- install a sufficient number of monitoring sites to adequately define the severity of the site contamination;
- analyze groundwater samples for BTEX and MTBE;
- sample potentially at-risk groundwater supply wells;
- perform an updated sensitive receptor survey;
- determine the need for long-term treatment and/or monitoring that addresses groundwater contamination;
- actively recover any free phase product measured in the ground in excess of 1/8 inch; and,
- submit a summary report that outlines the work performed, and provides interpretations and recommendations pertinent to the SITE.

This request was made in a May 18, 1999 letter to Mr. Tad Wilder, which has been presented as **Attachment 1**. A work scope and cost estimate to perform the work included within this report was presented to Wilder Farm and the VT SMS on July 3, 1999. The work plan was approved by Mr. Chuck Schwer of the VTSMS during a meeting with Mr. Don Wilder of Wilder Farm on July 16, 1999. All field investigation activities presented within this report were conducted between August 27, 1999 and September 23, 1999.

2.0 BACKGROUND / PREVIOUS WORK

The following data has been obtained from the April 12, 1999 "Underground Storage Tank Closure Report" prepared by KSKGeoS™.

On April 7, 1999, one (1) 1,000 gasoline UST was removed from the SITE prior to the transfer of the property to a land conservation society. The UST was of unknown age, but was in place in 1976 when the Wilders bought the property. In the fall of 1998, the former UST pump island was removed. The UST has not been used under the Wilders ownership.

During removal activities, contaminated soils were encountered adjacent to the north end of the tank, at the bottom of the UST excavation, and at the overburden-bedrock interface. An end-seam failure was observed in the north end of the UST upon its removal.

Soil samples were collected from the excavation and field screened for the presence of volatile organic compounds (VOCs) using a PID. VOC concentrations obtained from soil samples collected along the tank bottom at a depth of approximately 8.5 ft below ground surface (bgs) ranged from 90 parts per million volume (ppmv) to 150 ppmv. The excavation was extended below the bottom of the former UST in an attempt to determine the vertical extent of impact to the overburden soils. The excavation was completed on top of bedrock at a depth of 16 ft bgs. VOC concentrations within the excavation were reported as follows:

Sample Depth	PID
9.5 ft bgs	130 ppmv
12 ft bgs	110 ppmv
14 ft bgs	140 ppmv
15 ft bgs	150 ppmv
16 ft bgs	16 ppmv

Note: PID employed was an 11-Nu PI-101

Following the removal of the UST and completion of the soils excavation, one (1) soil sample was collected from a depth of 14.5 ft bgs and submitted for laboratory analysis via US EPA Method 8021B for VOCs. Additionally, one (1) groundwater sample was collected from the SITE supply well and analyzed for VOCs via US EPA Method 8021B. Data returned by the laboratory indicates that the SITE supply well has not been impacted.

3.0 SCOPE OF WORK

The following activities were performed as part of this investigation, as outlined in TSEC's July 2, 1999 work scope/cost estimate:

- Preparation of a SITE specific health and safety plan that conforms to OSHA 40 CFR 1910.120.
- Clearance of SITE and vicinity for underground utilities by contacting DIG SAFE (Clearance ID# 19993503234 was obtained).
- Advancement of five (5) soil borings using Geoprobe[®] Direct Push technology in the vicinity of the former gasoline UST, product piping, and pump island. Continuous soil samples were

other is located approximately 1,600 ft to the south and west of the SITE. Lake Champlain is located approximately ½ mile south of the SITE. During the UST closure activities, KSKGeoS™ identified “surficially ponded water” adjacent to the west side of the northernmost barn. TSEC could not locate this feature during SITE activities. Due to drought conditions over the summer, there was likely insufficient water to accumulate.

At the time of SITE sampling activities, the brook bordering the SITE to the east was inspected for any evidence of petroleum contamination. There was no water flowing within the brook, and there were no seeps present on the western bank of the brook. Downstream (south) of the SITE, a small amount of water was present within the brook. However, due to a vehicle accident earlier in the year in which there was a release of petroleum to the brook, any samples collected between the SITE and Lake Champlain may not be representative of conditions originating on SITE. It is unlikely that petroleum contamination from Wilder Farm will reach the other surface water features due to their location and distance with respect to the SITE.

9.2 Drinking Water Receptors

There are two residential supply wells that are located within a 1,500 foot radius of the SITE. These wells include the SITE supply well, and a supply located on the property to the east, across US Route 2, which is owned by Mr. and Mrs. David and Barbara Carter.

A groundwater sample was collected from the SITE supply well and analyzed by STL for VOCs via US EPA Method 8021B. Before the sample was collected, the outside hose spigot was allowed to run for approximately five (5) minutes in order to draw in a representative sample from the well. The sample was collected from this tap.

Data returned from STL indicated that there were no detectable concentrations of target compounds. Additionally, the detection limits for the analysis were all well below VGES concentrations.

9.3 Other Receptors

Other potential receptors identified include the indoor air quality of the SITE residence, and the residence basement. Due to the distance and direction of the building with respect to the former UST cavity, and the subsurface materials present, contaminant impact to these receptors is not expected.

10.0 CONCEPTUAL HYDROGEOLOGICAL MODEL

The majority of the overburden materials at the SITE consist of a very dense clay and clay till. These materials reportedly overlie ashen gray to buff colored mudstone. The hydraulic conductivity (k) of the clay subsurface materials has been estimated based on several published sources, and ranges from roughly 10^{-2} ft/d to 10^{-9} ft/d.

The SITE and local area topography is relatively flat with a gentle slope to the south-southeast. Groundwater flow across the SITE likely follows the local topography and surface water drainage

The topography of the SITE and immediate vicinity slopes gently to the southeast, towards Keeler Bay of Lake Champlain. The nearest potential sensitive receptor identified during this investigation is the residential supply well, located approximately 100 ft to the east of the former UST. The well is reportedly completed in bedrock at a depth of 105 ft bgs and is constructed of 20 feet of 8-inch diameter steel casing. The well has an estimated yield of 5 gallons per minute (gpm). Roughly 50 ft east of the supply well is an unnamed intermittent brook that flows beneath Route 2 and then to the south-southeast into Keeler Bay. Surface-water drainage from the northern portion of the SITE is directed into the brook.

5.0 REGIONAL SURVEY

The SITE is situated in a mixed residential and agricultural land use area. The properties adjacent to the SITE consist of open fields to the west, the South Hero Flea Market grounds adjacent to the south, and private residences to the northeast and east. To the north, a new dairy barn facility is being constructed on a lot previously used as an agricultural field. The nearest residence is the SITE dwelling approximately 130 ft to the south-southwest of the former UST.

Other than the Wilder Farm SITE (SMS Site #99-2603) there are seven (7) facilities listed on the active hazardous waste site list with the VT SMS that have had documented releases of oil or hazardous material and are located on South Hero Island. These are the following:

SITE Name	SITE Address	SMS Site #
Midway Oil	US Route 2 – South Hero	#89-0414
A & B Beverage	US Route 2 – Grand Isle	#90-0554
Grand Isle Store	US Route 2 and Hyde Road – Grand Isle	#93-1525
Cornerstone Market	US Route 2 and VT Route 314 – South Hero	#94-1599
South Hero Grocery	328 Route 2 – South Hero	#94-1730
Chernesky Property	213 US Route 2 – Grand Isle	#96-2054
Keeler Bay Variety	US Route 2 – South Hero	#98-2434

Source: State of Vermont Sites Management Section – Second Quarter Hazardous Sites Listing – July 1999.

Based on a review of these sites, their location, and the nature of the contaminants present it does not appear as though they will have a negative impact on the Wilder Farm SITE.

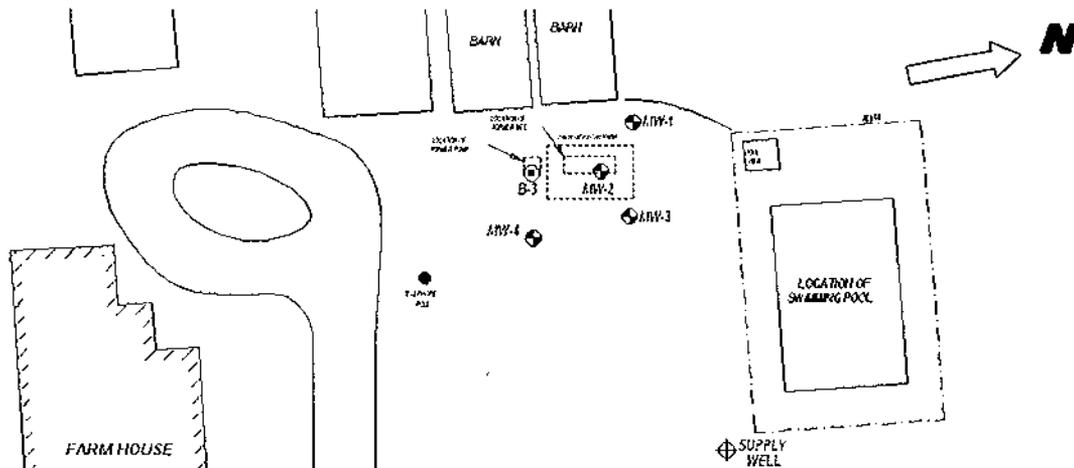
6.0 SUBSURFACE INVESTIGATION

A subsurface exploration program was developed to further assess petroleum-related contamination in the soils and groundwater on SITE. Sample locations were selected based on the results of the KSKGeoSM UST closure report, in addition to observations concerning SITE topography and area drainage patterns.

6.1 Advancement of Soil Borings

A total of five (5) soil borings were advanced by TSEC in locations indicated on **Figure 2** and as described below, using TSEC's Geoprobe[®]. Logs for these borings are presented in **Appendix B**. These borings were advanced to depths ranging from 13.0 to 16.0 ft bgs. All borings were logged,

describing soil strata conditions, and field screened for VOCs with a PID using conventional headspace techniques (described further in Section 7.1 – Field Screening Results).



Inset 2 - SITE Plan with boring locations.

The area of investigation is bordered to the east by a perennial stream that with a stream bed elevation approximately 10 ft below SITE grade. The investigation was conducted with the hypothesis that groundwater would flow from the former UST cavity towards this drainage feature. Data collected during the initial SITE Investigation supports this hypothesis.

Boring ID	Boring Location	Depth of Boring/ Depth to Water (in ft bg)
B-1/ MW-1	Advanced in an apparent upgradient direction from the former UST. Well was installed to monitor upgradient/background conditions.	Boring Depth = 13.5 ft DTW = 12.5 ft
B-2/ MW-2	Advanced in the center of the UST cavity to monitor source area concentrations.	Boring Depth = 16.0 ft DTW = 8.0 ft
B-3	Advanced at the center of the former pump island location in an attempt to determine its potential as a source for contamination.	Boring Depth = 14.0 ft ^b DTW = 11.0 ft
B-4/ MW-3	Advanced approximately 20 ft ± to the east (downgradient) of the former UST's, between the former tank and the SITE supply well.	Boring Depth = 13.0 ft DTW = 12.5 ft
B-5/ MW-4	Advanced 30 ft ± from the southeast corner of the former UST to monitor conditions downgradient of the former UST and pumps.	Boring Depth = 16.0 ft DTW = 10.5 ft

Notes: ^b - boring was backfilled with bentonite, sand, and cuttings, and finished to match existing grade.

General soil conditions encountered at the SITE consisted of a thin layer (6-inches maximum) of topsoil overlying mixed silt, clay, and sands to approximately 3.5 ft bgs. Dense silt and clay was encountered to between 5.0 and 6.0 ft bgs, with massive clay and clay till present below that. This clay was expanding to approximately 150% of its is-situ volume within the core sampler, making sample collection very difficult. Refusal, a good indicator of bedrock, was encountered below the till layer at depths ranging from 13.5 to 16.0 ft bgs. Fill materials, which consisted of mixed layers of silt, clay, sand, and gravel, were encountered during the installation of B-2/MW-2. Groundwater was encountered during drilling at depths ranging from 8.0 ft bgs (B-2/MW-2) to 12.5 ft bgs (B-1/MW-1 and B-4/MW-3).

Elevated PID readings (i.e.-PID \geq 0.1 ppmv) were encountered during the advancement of all soil borings, with the exception of B-1/MW-1. The highest levels of VOCs detected were at B-2/MW-2, which is located within the former UST cavity. A headspace analysis performed on the samples collected from this boring indicated VOCs present at concentrations ranging from <0.1 ppmv (0-4 ft bgs) to 1,210 ppmv (12-16 ft bgs). PID readings in the remaining borings ranged from <0.1 ppmv in several samples to 1,143 ppmv (B-4/MW-3; 4-7 ft bgs).

Further description of subsurface materials and contaminant distribution can be found in **Appendix B, Boring Logs**. A complete summary of all PID data obtained during drilling is presented in **Table 1, Soil Boring Summary Table**.

6.2 Monitoring Well Installation and Construction

All monitoring wells were completed by installing a 1-inch diameter schedule 40 polyvinylchloride (PVC) monitoring well with a 0.010-inch machine slotted screen. The annular space between the well screen and the borehole wall was filled by a clean sand filter pack. A 1-inch diameter PVC riser was placed above the screen, and a bentonite seal was placed around the riser to prevent surface infiltration. Wells were completed with a flush-mounted, water-tight curb box that was set in concrete, and fitted with an expansion plug to avoid surface infiltration to the aquifer.

Following installation of the new monitoring wells, each monitoring well that yielded sufficient groundwater was developed using a peristaltic pump to remove fine particulates introduced into the formation during drilling and/or installation. In addition, well development was performed to hydraulically connect the aquifer and the well, allowing for more accurate determination of *in situ* conditions (i.e. water level, aquifer parameters, and chemical constituents). Ideally, a minimum of three (3) well volumes of water should be removed from each well, until the purge water was clear. Development water was discharged directly to the ground surface.

Further details of the well installations are presented in **Appendix B--Boring Logs**.

6.3 SITE Geology

A summary of the predominant geological units encountered during drilling activities is presented in **Section 6.1**. Refusal, a good indication of bedrock, was encountered during this investigation at depths ranging from 13.5 ft to 16.0 ft bgs. For a more detailed description of geological units, see Boring Logs, **Appendix B**.

Published sources indicate that surficial geologic materials that underlie the SITE consist of marine clay and glacial till¹. Reports available concerning the bedrock underlying the SITE indicated that material present consist of the middle Ordovician age (460-485 million years old) ashen gray to buff colored argillite (mudstone) with some argillaceous limestone belonging to the Cumberland Head Argillite² formation.

¹ Doll, C.G., editor, 1970, Surficial Geologic Map of Vermont, VT Geological Survey, SGL.

² Fisher, Donald W., 1968, Geology of the Plattsburgh and Rouses Point, New York-Vermont, Quadrangles, Vermont Geol. Survey Special Bulletin No. 1.

6.4 SITE Survey

A Topcon AT-G6 auto level was used to perform a stadia survey to identify the location and relative elevations of key SITE features. The collected data was used to update the SITE Plan (Figure 2) and obtain top of PVC riser elevations necessary to calculate water table elevations.

7.0 SOIL SAMPLING ACTIVITIES

7.1 Field Screening Results

Soil samples were field screened using conventional headspace methods. A Thermo Environmental Instruments Model 580B Organic Vapor Meter with a 10.6 eV PID was employed to detect the presence of VOCs. The PID was calibrated daily to a 95 ppmv isobutylene standard, referenced to benzene.

Data collected during the field screening indicates elevated levels of VOCs within the subsurface soils. As mentioned in Section 6.1, the highest concentration of VOCs present in soil was found in the soils collected from B-2/MW-2 (1,210 ppmv), which is located within the former UST cavity. PID readings in the remaining samples ranged from <0.1 ppmv in several samples to 1,143 ppmv (B-4/ MW-3; 4-7 ft bgs). A complete summary of all PID data obtained during drilling is presented in Table 1, Soil Boring Summary Table.

7.2 Laboratory Results

No soil samples were collected for laboratory analysis during this investigation. However, during UST removal activities, one soil sample was collected from the center of the UST cavity at a depth of 14.5 ft bgs and submitted for laboratory VOC analysis via US EPA Method 8021B. The results of the soil analysis are as follows:

Parameter	Concentration (in µg/kg)	Enforcement Standard (in µg/kg ¹)
Benzene	2,300	5.0
Toluene	1,420	1,000
Ethylbenzene	502	700
Total Xylenes	1,080	10,000
Total BTEX	5,302	nc
MTBE	<220	40
1,3,5-Trimethylbenzene	248	4.0
1,2,4-Trimethylbenzene	360	5.0
Naphthalene	<550	20
PID (in ppmv)	14.0 ft	140
	15.0 ft	150

- Notes:
- Standards are Vermont Groundwater Enforcement Standard (VGES) values substituting µg/kg for µg/l, as specified by the document entitled "Agency Guidelines for Petroleum Contaminated Soils and Debris."
 - nc - Standard not established for this parameter.

This data was collected by KSKGeoS™, and was reported as an April 19, 1999 addendum to their April 12, 1999 UST Closure Report.

8.0 GROUNDWATER SAMPLING ACTIVITIES

Groundwater elevation measurements were collected on September 3, 1999 and September 23, 1999, during SITE sampling activities, and during a visit following very heavy rainfall. On September 3, 1999 TSEC collected groundwater samples from all accessible monitoring wells and from the SITE supply well for laboratory analysis via US EPA Method 8021B for VOCs. Severn Trent Laboratories of Colchester, Vermont (STL) conducted all laboratory analyses for this project. The results of the surface water sampling activities are presented in **Section 9.1**.

8.1 Water Table Elevation and SITE Hydrogeology

8.1.1 Water Table Elevation – September 3, 1999

On September 3, 1999, all four (4) groundwater monitoring wells were located and accessed for fluid level measurements and groundwater sampling activities. Depth to groundwater in the four (4) monitoring wells was measured between 10.22 ft bgs (MW-2) and 15.20 ft bgs (MW-4). Monitoring wells MW-1 and MW-3 were dry at the time of sampling activities. A full analysis of groundwater elevation data is presented in **Table 2**, Summary of Groundwater Elevations – September 3, 1999.

8.1.2 Water Table Elevation – September 23, 1999

On September 23, 1999, all four (4) groundwater monitoring wells were located and accessed for fluid level measurements following several inches of rainfall³. Depth to groundwater in the four (4) monitoring wells was measured between 8.17 ft bgs (MW-2) and 11.40 ft bgs (MW-4). Again, monitoring wells MW-1 and MW-3 were dry. In the roughly three (3) weeks between measurement events, the average SITE water table elevation rose by 3.305 ft. A full analysis of groundwater elevation data is presented in **Table 3**, Summary of Groundwater Elevations – September 23, 1999.

During both groundwater sampling episodes, the depth to groundwater in monitoring wells MW-2 and MW-4 was below the top of the well screen.

8.1.3 SITE Hydrogeology

A groundwater elevation map has been prepared from the September 3, 1999 groundwater elevation data and is presented as **Figure 3**. The groundwater flow direction could not be calculated, since only two (2) monitoring points had measurable water table elevations. However, based on the topography of the SITE, and the VOC concentration data obtained during the recent soil boring program, groundwater can be expected to flow to the east.

The majority of the groundwater encountered during the soil boring program is likely pore water bound by the marine clays and glacial till materials. These materials are massive and possess a very low effective porosity, therefore severely limiting the transport of groundwater and contaminants through the subsurface.

³ Rainfall following passing of the remnants of Hurricane Floyd

Published values of the hydraulic properties of these materials is as follows:

Published Source	Porosity (η) in percent of total volume		Hydraulic Conductivity (k) in feet per day	
	High	Low	High	Low
	Applied Hydrogeology ⁴	60%	33%	3.28×10^{-6}
Field Hydrogeology ⁵	60%	45%	3.28×10^{-2}	3.28×10^{-6}
Hydrology – An Environmental Approach ⁶	not indicated	not indicated	2.8×10^{-3}	2.8×10^{-5}

The apparent groundwater flow velocity beneath the SITE can not be calculated, since the horizontal hydraulic gradient could not be measured. However, based upon the published hydraulic conductivity (k) values presented above, we can estimate that groundwater flow and contaminant transport velocities will be very slow (1.0×10^{-2} ft/yr assuming an average k of 3.28×10^{-5} ft/d, 33% porosity and a hydraulic gradient of 0.25 ft/ft).

A graphical interpretation of the groundwater flow direction is presented on the Groundwater Contour Plan provided as **Figure 4**.

8.2 Groundwater Sampling Activities

At the time of groundwater sampling activities, only monitoring well MW-2 contained sufficient water to collect a groundwater sample. This well is located within the former UST cavity. The well was purged of three (3) well volumes prior to sampling in order to collect a representative sample from the aquifer. The water initially in the well may have become chemically altered by coming into contact with atmospheric gasses and the well casing and screen; therefore all water from the well casing and surrounding sand pack was removed prior to sampling. Purge water from the well was discharged directly to the ground surface.

8.3 Groundwater Analytical Results

Results received from STL indicate that petroleum compounds are present at elevated levels in the sample collected from MW-2.

The dissolved concentration of benzene detected in the sample was 630 micrograms per liter ($\mu\text{g/l}$). Ethylbenzene was present at 100 $\mu\text{g/l}$. MTBE was not detected in the sample collected from MW-2 above its method detection limit (MDL) of 25 $\mu\text{g/l}$.

1,3,5-Trimethylbenzene (1,3,5-TMB) was detected in the sample collected from MW-2 at a concentration of 27 $\mu\text{g/l}$. Neither 1,2,4-Trimethylbenzene (1,2,4-TMB) nor naphthalene were detected above their MDLs of 25 $\mu\text{g/l}$.

⁴ Fetter, C.W. 1994, Applied Hydrogeology – 3rd Edition. Macmillan College Publishing, New York: 691p.

⁵ Brassington, Rick, 1998, Field Hydrogeology – 2nd Edition. John Wiley, Inc. Chichester, West Sussex, England: 248p.

⁶ Watson, Ian and Burnett, Alister D., Hydrology – An Environmental Approach – 2nd Edition. CRC Press, LLC, Boca Raton, FL: 702p.

Both benzene and 1,3,5-Trimethylbenzene were detected at concentrations exceeding their respective Vermont Groundwater Enforcement Standards (VGES) in the sample collected from MW-2.

The complete laboratory analytical report from STL is summarized in **Table 4**, and is provided as **Attachment 2**.

8.4 QA/QC RESULTS

8.4.1 Field QA/QC

The Relative Percent Difference (RPD) for total aromatics (BTEX plus 1,3,5-TMB, 1,2,4-TMB, and naphthalene) in the sample collected from MW-2 and its duplicate, DUP-1 was calculated to be 6.83%.

$$\text{Equation: } RPD = \frac{(757\text{ug/l} - 707\text{ug/l})}{\left(\frac{757\text{ug/l} + 707\text{ug/l}}{2}\right)} * 100\% = \frac{50\text{ug/l}}{732\text{ug/l}} * 100\% = 6.83\%$$

The RPD for MTBE between MW-2 and DUP-1 was not calculated since MTBE was not present above the MDL of 25 µg/l in either sample. Typically, a RPD of up to 25% is considered to be an acceptable correlation between duplicate samples.

BTEX and MTBE were not detected above method detection limits in the Field Blank.

8.4.2 Laboratory QA/QC

All laboratory data was evaluated for the following parameters prior to acceptance in this report:

- analysis within holding time;
- correct sample ID's;
- acceptable detection limit multipliers;
- acceptable matrix spike (MS) and matrix spike duplicate (MSD) recoveries;
- acceptable Relative Percent Difference between MS and MSD; and,
- acceptable surrogate recoveries where applicable.

9.0 RECEPTOR EVALUATION

During field activities conducted for this project, sensitive receptors in the SITE vicinity were identified and assessed for the likelihood of impact by petroleum contamination. These included surface water receptors, groundwater supply wells, downgradient basements, breathing zones of the SITE building, and subsurface utility corridors from the on-SITE contamination.

9.1 Surface Water Receptors

Surface water features identified within a ½-mile radius of the SITE include two (2) unnamed brooks and Keeler Bay of Lake Champlain. One brook is located on the eastern portion of the SITE. The

other is located approximately 1,600 ft to the south and west of the SITE. Lake Champlain is located approximately ½ mile south of the SITE. During the UST closure activities, KSKGeoS™ identified “surficially ponded water” adjacent to the west side of the northernmost barn. TSEC could not locate this feature during SITE activities. Due to drought conditions over the summer, there was likely insufficient water to accumulate.

At the time of SITE sampling activities, the brook bordering the SITE to the east was inspected for any evidence of petroleum contamination. There was no water flowing within the brook, and there were no seeps present on the western bank of the brook. Downstream (south) of the SITE, a small amount of water was present within the brook. However, due to a vehicle accident earlier in the year in which there was a release of petroleum to the brook, any samples collected between the SITE and Lake Champlain may not be representative of conditions originating on SITE. It is unlikely that petroleum contamination from Wilder Farm will reach the other surface water features due to their location and distance with respect to the SITE.

9.2 Drinking Water Receptors

There are two residential supply wells that are located within a 1,500 foot radius of the SITE. These wells include the SITE supply well, and a supply located on the property to the east, across US Route 2, which is owned by Mr. and Mrs. David and Barbara Carter.

A groundwater sample was collected from the SITE supply well and analyzed by STL for VOCs via US EPA Method 8021B. Before the sample was collected, the outside hose spigot was allowed to run for approximately five (5) minutes in order to draw in a representative sample from the well. The sample was collected from this tap.

Data returned from STL indicated that there were no detectable concentrations of target compounds. Additionally, the detection limits for the analysis were all well below VGES concentrations.

9.3 Other Receptors

Other potential receptors identified include the indoor air quality of the SITE residence, and the residence basement. Due to the distance and direction of the building with respect to the former UST cavity, and the subsurface materials present, contaminant impact to these receptors is not expected.

10.0 CONCEPTUAL HYDROGEOLOGICAL MODEL

The majority of the overburden materials at the SITE consist of a very dense clay and clay till. These materials reportedly overlie ashen gray to buff colored mudstone. The hydraulic conductivity (k) of the clay subsurface materials has been estimated based on several published sources, and ranges from roughly 10^{-2} ft/d to 10^{-9} ft/d.

The SITE and local area topography is relatively flat with a gentle slope to the south-southeast. Groundwater flow across the SITE likely follows the local topography and surface water drainage

patterns, with flow to the east and south. Within the monitoring well network, groundwater is presumed to flow to the east towards the unnamed brook. An average horizontal hydraulic gradient could not be calculated, since only two (2) monitoring points contained sufficient fluid to obtain a measurement. Surface water flows off-SITE to the east and then south, ultimately intercepting Keeler Bay of Lake Champlain located approximately ½-mile to the south of the SITE.

Based on the presumably very low groundwater flow velocity, the contaminant of concern (V_{coc}) transport velocities can also be assumed to be very slow. The greatest potential for migration exists along man-made conduits or along naturally occurring preferential pathways.

Gasoline compounds discovered in the soil and groundwater are likely attributed the ruptured seam and small holes found in the former gasoline UST. The extent of contamination is likely limited due to the nature of the soils present; however, the downgradient extents of contamination have not been fully defined.

11.0 CONCLUSIONS

Based on the investigation conducted at this SITE, and the data obtained, TSEC provides the following conclusions regarding this SITE:

- The former UST at the SITE, a 1,000 gallon capacity steel gasoline tank of unknown age, was removed from the ground on April 7, 1999. This UST had not been used since the Wilder Family purchased the SITE in 1976.
- Five (5) soil borings were installed in the vicinity of the former gasoline UST on August 27, 1999. Four (4) of the borings were completed as permanent groundwater monitoring wells.
- PID readings in soil samples collected during the installation of soil borings and monitoring wells range from <0.1 ppmv to a maximum of 1,210 ppmv in boring B-2/MW-2 (12-16 ft bgs). Boring B-2/MW-2 was installed within the former UST cavity.
- The UST cavity, in which the materials are far more permeable than the surrounding native clays, appears to be acting as a "bathtub". Groundwater is accumulating within the cavity since the water is unable to flow into the surrounding materials.
- Groundwater samples collected on September 3, 1999 indicate that petroleum contamination is present within the monitoring well network at concentrations above the VGES.
- Benzene contamination was present above its VGES level of 5.0 µg/l in the sample collected from MW-2 (630 µg/l) and its duplicate, DUP-1 (580 µg/l).
- 1,3,5-Trimethylbenzene was detected above its VGES of 4.0 µg/l in MW-2 (27 µg/l) and DUP-1 (27 µg/l).

- No separate phase petroleum product was observed during groundwater sampling events.
- Contamination is not present within the SITE water supply well.
- The degree and extent of petroleum contamination within the subsurface has not been fully defined. However, it appears as though groundwater and dissolved phase petroleum contamination is migrating to the east, towards the SITE supply well and the unnamed brook bordering the SITE to the east.

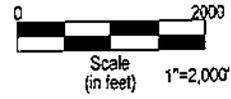
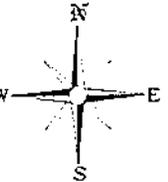
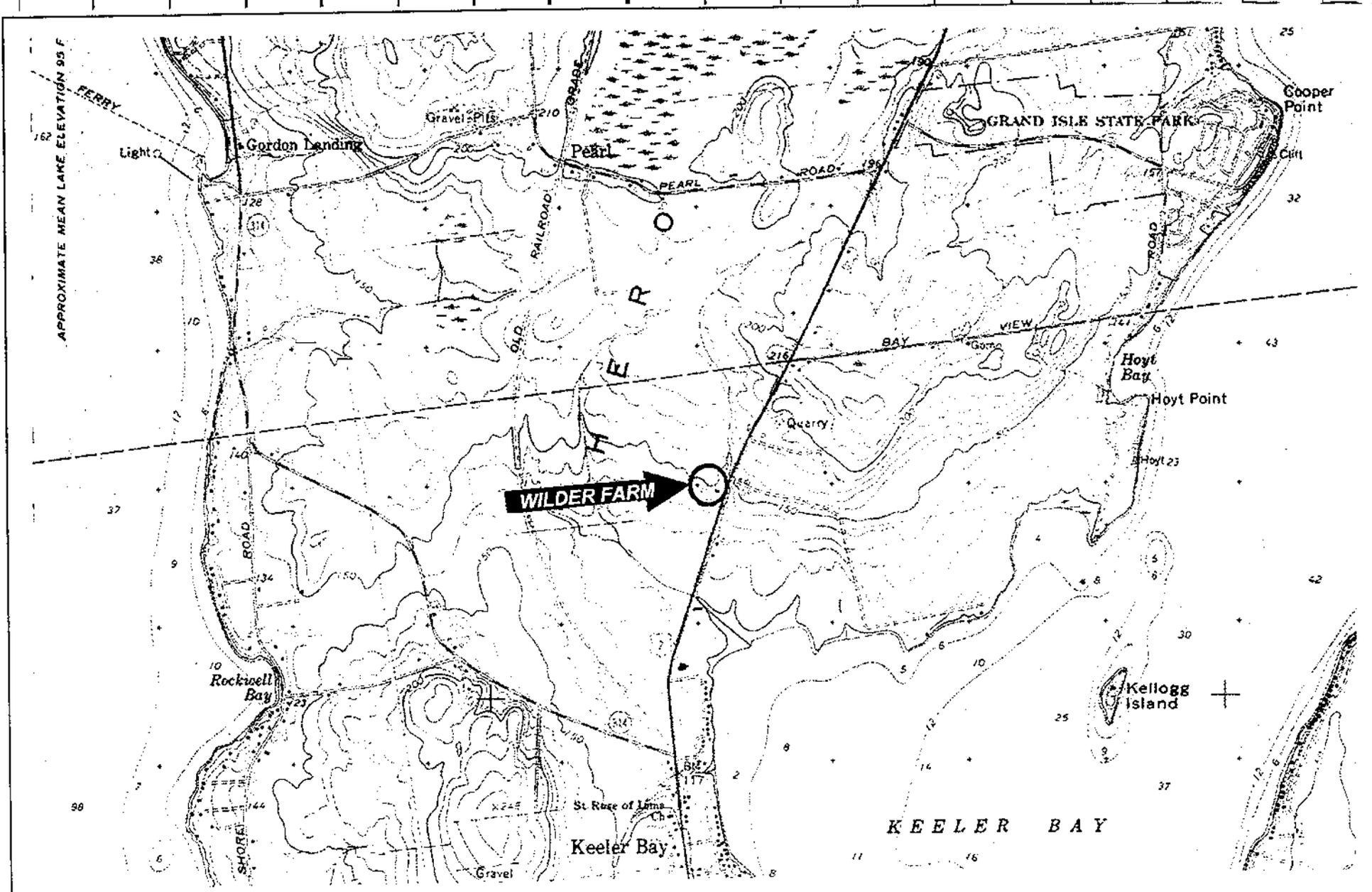
12.0 RECOMMENDATIONS

Based on the information available to date concerning this SITE and vicinity, TSEC offers the following recommendations:

- Install two (2) additional groundwater monitoring wells to the east of the former UST cavity. One (1) well should be installed at the midway point between the former UST cavity and the SITE supply well, to act as a "sentinel" well. The other well should be installed to the southeast of MW-3, and east of MW-4. These wells should provide adequate information to define the extent of the contaminant plume.
- Implement a groundwater monitoring program that will include the quarterly sampling of all SITE monitoring wells, and the SITE supply well. A quarterly groundwater monitoring program is recommended due to the proximity of the contaminant source to the SITE supply well. Monitoring well samples would be analyzed for BTEX, MTBE, Trimethylbenzene isomers, and Naphthalene via US EPA Method 8021B. The SITE supply well should be analyzed for VOCs via US EPA Method 524.2.

Following a period of one year, the sampling frequency and the monitoring wells sampled would be evaluated.

FIGURES



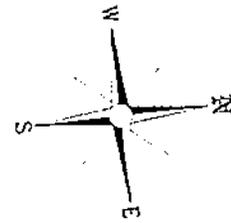
Site Location:
 Lat: 44°40'29.34" North
 Long: 73°19'13.11" West

Project No: 98031	Designed By: jpb
	Checked By: _____
	Approved By: _____
	Drawn By: jpb
	Scale: as shown
Date: 09/03/99	

TWIN STATE ENVIRONMENTAL CORP.
 34 Roosevelt Highway
 Colchester, Vermont 05446
 (802) 654-8663

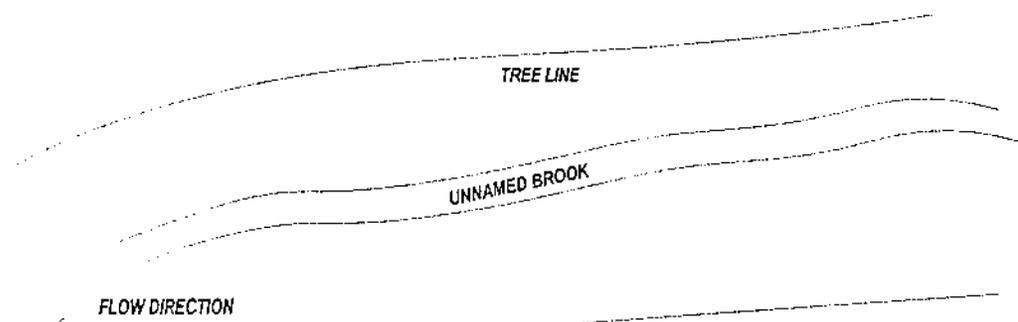
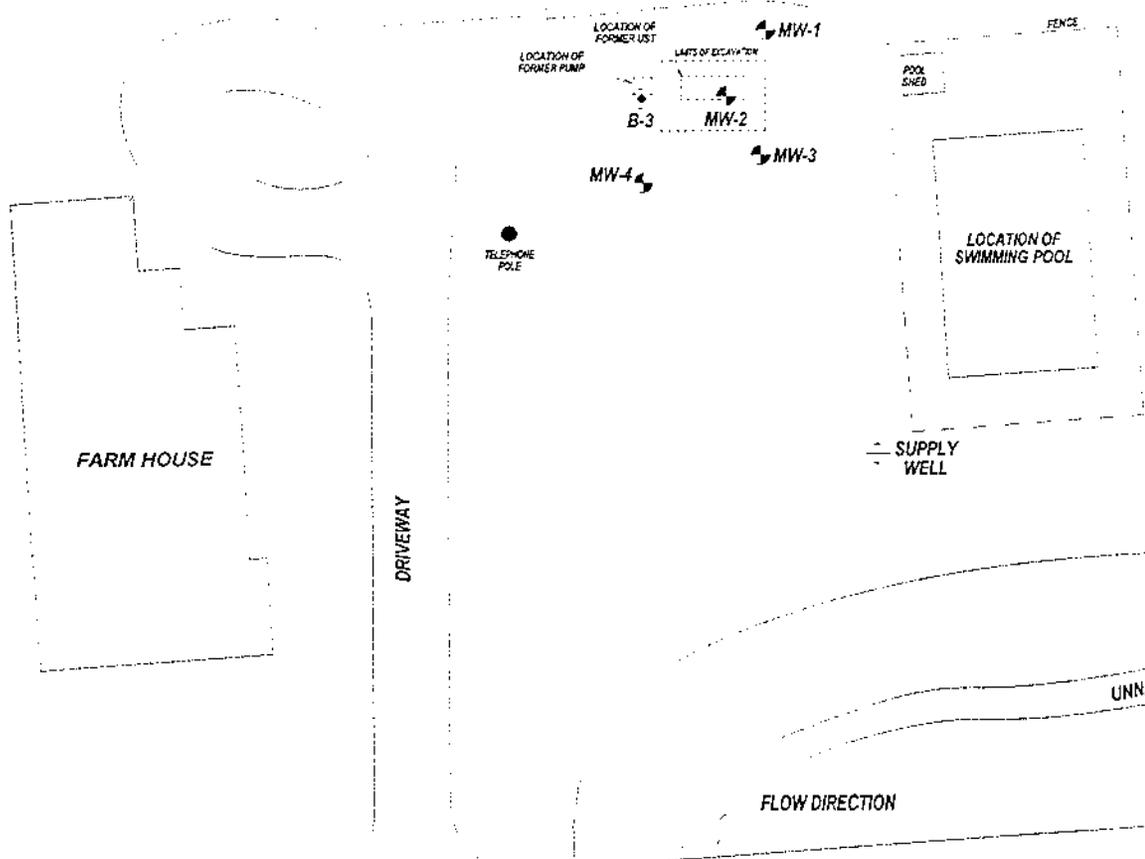
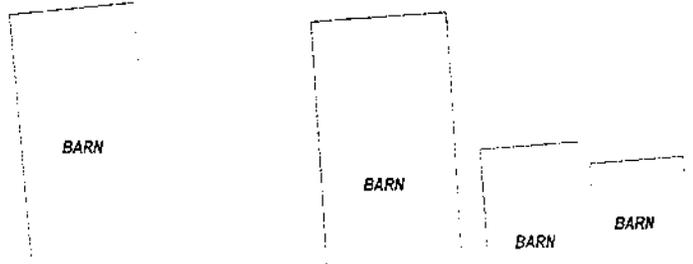
FIGURE 1
 SITE LOCATION MAP
 Wilder Farm
 South Hero, Vermont

Source: USGS 7.5 Minute Topographic Map Series
 South Hero, Vermont Quadrangle



LEGEND

-  Site Supply Well
-  Soil Boring
-  Groundwater Monitoring Well

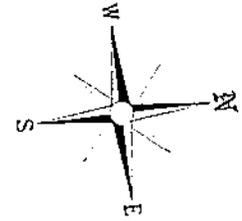


To
Plea Market
Grounds

To
Burlington

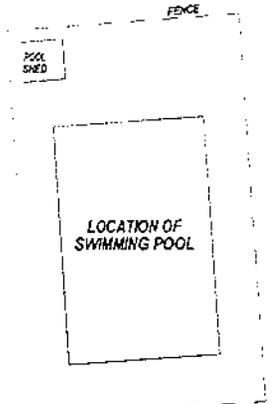
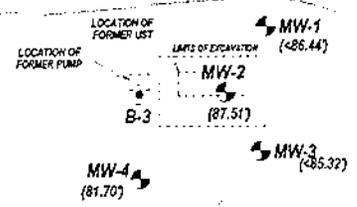
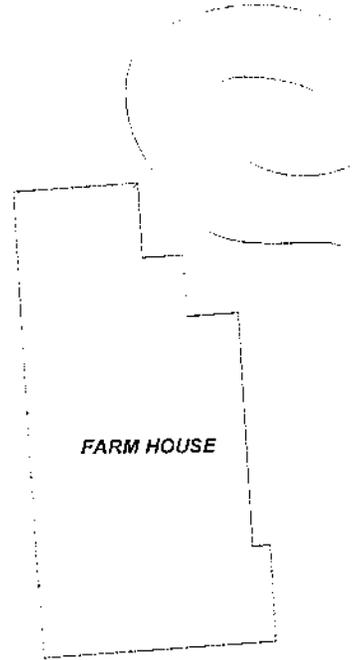
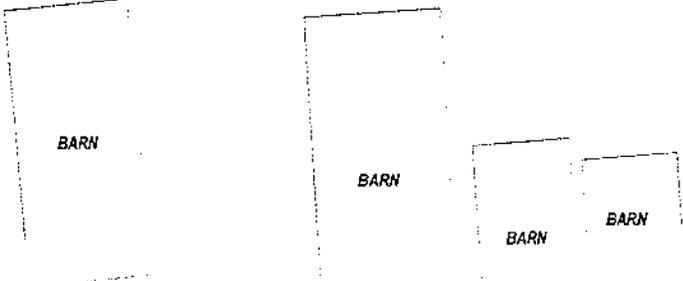
To
Grand Isle

Project # 99031	Designed by: jpb	TWIN STATE ENVIRONMENTAL CORP. 34 Roosevelt Highway Colchester, Vermont 05446 (802) 654-8663	FIGURE 2 SITE PLAN Wilder Farm South Hero, Vermont
	Checked by:		
	Approved by:		
	Drawn by: jpb		
	Scale: 1"=50'		
Date: 09/20/99			



LEGEND

-  Site Supply Well
-  Soil Boring
-  MW-2 (81.51)
Groundwater Monitoring Well with measured groundwater table elevation on September 3, 1999.



PRESUMED GROUNDWATER FLOW DIRECTION

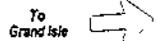


DRIVEWAY

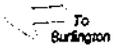
TREE LINE

UNNAMED BROOK

FLOW DIRECTION



US ROUTE 2



CULVERT

Project # 99031	Designed by: jpb	TWIN STATE ENVIRONMENTAL CORP. 34 Roosevelt Highway Colchester, Vermont 05446 (802) 654-8663	FIGURE 3 GROUNDWATER ELEVATION MAP September 3, 1999 Wilder Farm South Hero, Vermont
	Checked by: Approved by: Drawn by: jpb Scale: 1"=50' Date: 09/20/99		

TABLES

TABLE 1

WILDER FARM
SOUTH HERO, VERMONT
VT SMS SITE #99-2603

Soil Boring Summary Table

August 27, 1999

Boring Identification	Depth of Sample (ft bgs)	PID Reading (in ppmv)
B-1/ MW-1	0-4	<0.1
	4-8	<0.1
	8-12	<0.1
	12-13.5	<0.1
B-2/ MW-2	0-4	<0.1
	4-8	<0.5
	8	509
	8-12	83.1
	12-16	1,210
	16	58.6
B-3	0-4	<0.1
	4-6	83.9
	6-8	4.9
	8-10	0.6
	10-12	<0.1
	12-14	<0.1
B-4/ MW-3	0-4	<0.1
	4-7	1,143
	7-9	1,007
	9-11	1,022
	11-13	622
B-5/ MW-4	0-4	<0.1
	4-6	<0.1
	6-8	<0.1
	8-10	3.4
	10-12	0.3
	12-14	NR
	14-16	<0.1

- Notes: 1. PID readings were obtained with a Thermo-Environmental Instruments Model 580B PID calibrated to a 95 ppmv isobutylene standard referenced to benzene.
2. Conventional headspace techniques were used.

jpb:\project\99031\report tables.xls\soil boring summary

TABLE 2

WILDER FARM
SOUTH HERO, VERMONT
SMS SITE #99-2603

Summary of Water Table Elevations

September 3, 1999

Well Identification	Top of Riser Elevation	Depth to Product	Depth to Water	Depth of Well	Thickness of Water in Well	Water Table Elev.
MW-1	98.56	ND	DRY	12.12	NA	<86.44
MW-2	97.73	ND	10.22	14.60	4.38	87.51
MW-3	97.82	ND	DRY	12.50	NA	<85.32
MW-4	96.90	ND	15.20	15.22	0.02	81.70

Notes 1. Elevation data is referenced to a TBM. Units are in feet.

2. ND - not detected.

3. NA - not applicable.

4. Measurements recorded are referenced to a marking on top of PVC riser for each well.

5. Depth to fluid measurements were obtained using a Solinst Interface Probe.

jpb:\project\99031\report tables.xls\water table elevations

TABLE 3

WILDER FARM
SOUTH HERO, VERMONT
SMS SITE #99-2603

Summary of Water Table Elevations

September 23, 1999

Well Identification	Top of Riser Elevation	Depth to Product	Depth to Water	Depth of Well	Thickness of Water in Well	Water Table Elev.
MW-1	98.56	ND	DRY	12.12	NA	<86.44
MW-2	97.73	ND	6.86	14.60	7.74	90.87
MW-3	97.82	ND	DRY	12.50	NA	<85.32
MW-4	96.90	ND	12.55	15.22	2.67	84.35

- Notes 1. Elevation data is referenced to a TBM. Units are in feet.
2. ND - not detected.
3. NA - not applicable.
4. Measurements recorded are referenced to a marking on top of PVC riser for each well.
5. Depth to fluid measurements were obtained using a Solinst Interface Probe.

jpb:\project\9903\report tables.xls\water table elevations

TABLE 4

**WILDER FARM
SOUTH HERO, VERMONT
SMS SITE #99-2603**

Summary of Water Quality

September 3, 1999

Compound	Benzene	Toluene	Ethyl- benzene	Total Xylenes	Total BTEX	MTBE	1,3,5- Trimethylbenzene	1,2,4- Trimethylbenzene	Naphthalene
Sample ID	Concentration (µg/l)								
MW-1	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-2	630	<25	100	<25	730	<25	27	<25	<25
MW-3	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-4	NS	NS	NS	NS	NS	NS	NS	NS	NS
DUP-1	580	<25	100	<25	680	<25	27	<25	<25
Supply	<0.50	<0.50	<0.50	<0.50	—	<0.50	<0.50	<0.50	<0.50
Field Blank	<0.50	<0.50	<0.50	<0.50	—	<0.50	<0.50	<0.50	<0.50
VGES ⁽¹⁾	5.0	1,000	700	10,000	ne	40	4.0	5.0	20

Notes:

1. VGES -Vermont Groundwater Enforcement Standard.
2. ne -VGES not established.
3. ***Bold and Italic*** numbers indicate concentrations that exceed VGES.
4. DUP-1 - Duplicate sample of monitoring well MW-2. Collected for Quality Assurance/Quality Control.
5. All samples were analyzed for VOCs via US EPA Method 8021B.

RPD for total aromatics between MW- and DUP-1 = 6.83%
RPD for MTBE between MW- and DUP-1 = not calculated

APPENDIX A

SITE PHOTOGRAPHS

**WILDER FARM
SOUTH HERO, VERMONT
SMS SITE #99-2603**



PHOTOGRAPH 1 – Panoramic view of SITE looking southeast. Note approximate former UST layout.



PHOTOGRAPH 2 – Panoramic view of SITE looking southwest. Note location of SITE Supply well in foreground right.

APPENDIX B



34 Roosevelt Highway Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: Wilder Farm	WELL/ BORING ID: B-1/MW-1
Location: South Hero, Vermont	
TSEC Project #: 99031	

INSTALL DATE: August 27, 1999	WELL DEPTH: 12.5 ft	BORING DEPTH: 13.5 ft
TSEC REP: Jon Berntsen	DEPTH TO WATER: (during drilling) Approx. 12.0 ft	
DRILLING CO: TSEC Colchester, VT	SCREEN DIA: 1-inch	DEPTH: 2.5-12.5 ft bgs
	SCREEN TYPE/SIZE: 0.010"-slot Schedule 40 PVC	
DRILLING METHOD: Geoprobe [®]	RISER TYPE: Schedule 40 PVC	
SAMPLING METHOD: Macrocore Sampler	RISER DIA: 1-inch	DEPTH: 0.5-2.5 ft bgs
REFERENCE POINT (RP): Grade	GUARD TYPE: Flush mount road box set in concrete	
ELEVATION OF RP: Not Measured	RISER CAP: Locking expansion plug	
REMARKS: Boring was completed as Monitoring Well MW-1.		

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND	
0		0-4	<0.1	3.0 ft recovery	0.0-0.8: Silty SAND topsoil and grass. Dark brown, dry.		
1					0.8-1.0: Silty SAND topsoil with trace of gravel and grass. Dark brown, dry.		
2							1.0-2.9: SILT and very fine SAND. Light brown, dry.
3							2.9-3.0: SILT with CLAY. Brown/gray mottled. Dry.
4			4-8	<0.1	4.0 ft recovery		4.0-6.7: SILT with CLAY. Brown, dry.
5							6.7-9.0: CLAY with little sand and fine gravel. Dense, damp, brown.
6							
7							
8			8-12	<0.1	4.0 ft recovery		8.0-12.0: CLAY. Dense, brown/gray mottled, damp.
9							
10							
11							
12			12-13.5	<0.1	1.5 ft recovery		12.0-13.5: CLAY with little medium sand and fine gravel. Wet, gray, soft.
13							13.5: Weathered black limestone bedrock. Refusal
14							End of Sampling = 13.5 feet
15							End of Boring = 13.5 ft
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

GRANULAR SOILS BLOWS/FT 0-4 4-10 10-30 30-50 >50	DENSITY V.LOOSE LOOSE M.DENSE DENSE V.DENSE	COHESIVE SOILS BLOWS/FT <2 2-4 4-8 8-15 15-30 >30	DENSITY V.SOFT SOFT M.STIFF STIFF V.STIFF HARD	PROPORTIONS USED TRACE 0-10% LITTLE 10-20% SOME 20-35% AND 35-50%	NOTES: 1. See Figure __, SITE Plan, for boring locations 2. PID readings were obtained using a Thermo Environmental Instruments Model 580 B PID equipped with a 10.6eV lamp. Conventional headspace techniques were used.
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34 Roosevelt Highway Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **Wilder Farm**
Location: **South Hero, Vermont**
TSEC Project #: **99031**

WELL/
BORING ID:
B-2/MW-2

INSTALL DATE:	August 27, 1999	WELL DEPTH:	15.0 ft	BORING DEPTH:	16.0 ft
TSEC REP:	Jon Berntsen	DEPTH TO WATER: (during drilling)	Approx. 8.0 ft		
DRILLING CO:	TSEC Colchester, VT	SCREEN DIA:	1-inch	DEPTH:	5.0-15.0 ft bgs
DRILLING METHOD:	Geoprobe [®]	SCREEN TYPE/SIZE:	0.010"-slot Schedule 40 PVC		
SAMPLING METHOD:	Macrocore Sampler	RISER TYPE:	Schedule 40 PVC		
REFERENCE POINT (RP):	Grade	RISER DIA.:	1-inch	DEPTH:	0.5-5.0 ft bgs
ELEVATION OF RP:	Not Measured	GUARD TYPE:	Flush mount road box set in concrete		
REMARKS:	Boring was completed as Monitoring Well MW-2.				

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND	
0		0-4	<0.1	3.0 ft recovery	0.0-0.1: Silty SAND topsoil and grass. Dark brown, dry. 0.1-1.0: Medium and coarse SAND and GRAVEL, UST cavity fill. Dry, tan. 1.0-3.0: Silty CLAY. Loose, brown, dry.	CEMENT GROUT NATIVE BACKFILL DENTONITE SEAL SAND PACK WELL SCREEN RISER PIPE HEAD SPACE WATER LEVEL (APPROXIMATE)	
1							
2							
3							
4			4-8	<0.1	1.0 ft recovery	4.0-4.6: Medium and coarse SAND. Tan, damp. 4.6-5.0: CLAY with little sand and fine gravel. Dense, damp, brown. Gas odor.	
5							
6							
7				509			
8			8-12	83.1	1.5 ft recovery	8.0-9.2: Medium and coarse SAND. Tan, damp. (cave in?) 9.2-9.5: CLAY with trace of sand, silt and fine gravel. Dense, gray/brown mottled, wet.	
9							
10							
11							
12			12-16	1,210	2.0 ft recovery	12.0-13.5: Silt, sand, gravel, and clay fill. Loose, gray, saturated. Gas odor. 13.5-14.0: Weathered black limestone bedrock. Refusal	
13							
14				58.6			
15							
16						End of Sampling = 16.0 feet End of Boring = 16.0 ft	
17							
18							
19							
20							
21							
22							
23							
24							
25							
GRANULAR SOILS BLOWS/FT DENSITY 0-4 V.LOOSE 4-10 LOOSE 10-30 M.DENSE 30-50 DENSE >50 V.DENSE		COHESIVE SOILS BLOWS/FT DENSITY <2 V.SOFT 2-4 SOFT 4-8 M.STIFF 8-15 STIFF 15-30 V.STIFF >30 HARD		PROPORTIONS USED TRACE 0-10% LITTLE 10-20% SOME 20-35% AND 35-50%		NOTES: 1. See Figure __ SITE Plan, for boring locations 2. PID readings were obtained using a Thermo Environmental Instruments Model 580 B PID equipped with a 10.6eV lamp. Conventional headspace techniques were used.	



34 Roosevelt Highway Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

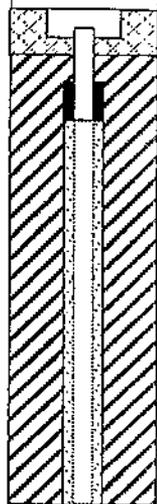
Project Name:	Wilder Farm	WELL/ BORING ID:
Location:	South Hero, Vermont	B-3
TSEC Project #:	99031	

INSTALL DATE:	August 27, 1999	WELL DEPTH:	N/A	BORING DEPTH:	14.0 ft
TSEC REP:	Jon Berntsen	DEPTH TO WATER:	(during drilling) Approx. 11.0 ft		
DRILLING CO:	TSEC Colchester, VT	SCREEN DIA:	N/A	DEPTH:	N/A
DRILLING METHOD:	Geoprobe [®]	SCREEN TYPE/SIZE:	Not Installed		
SAMPLING METHOD:	Macrocore Sampler	RISER TYPE:	Not Installed		
REFERENCE POINT (RP):	Grade	RISER DIA.:	N/A	DEPTH:	N/A
ELEVATION OF RP:	Not Measured	GUARD TYPE:	N/A		
REMARKS:	Boring was backfilled with bentonite clay, drill cuttings and clean sand.				

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND
0	N	0-4	<0.1	3.8 ft recovery	0.0-0.3: Silty SAND topsoil and grass.	CEMENT GROUT NATIVE BACKFILL BENTONITE SEAL SAND PACK WELL SCREEN RISER PIPE HEAD SPACE WATER LEVEL (APPROXIMATE)
1	O				0.3-2.6: SILT and SAND. Dry, tan, loose.	
2					2.6-3.8: SILT, SAND, and CLAY. Damp, tan, increasing density with depth.	
3	W					
4	E	4-8	83.9	4.0 ft recovery	4.0-5.3: SILT, CLAY, and little sand. Brown, soft, little water.	
5	L		4.9		5.3-8.0: CLAY. Dense, gray/brown mottled. Wet to 6.5 ft bq, damp below.	
6	L					
7						
8	I	8-10	0.6	2.0 ft recovery	8.0-10.0: CLAY. Dense, gray/brown mottled. Damp.	
9	N					
10	S	10-12	<0.1	2.0 ft recovery	10.0-11.0: CLAY. Dense, gray/brown mottled, saturated.	
11	T				11.0-12.0: CLAY. Dense, gray, saturated.	
12	A	12-14	<0.1	2.0 ft recovery	12.0-14.0: CLAY with little sand and silt. Soft, gray, saturated.	
13	L				14.0: Bedrock - Refusal	
14	L				End of Sampling = 14.0 feet End of Boring = 14.0 feet	
15	E					
16	D					
17						
18						
19						
20						
21						
22						
23						
24						
25						

GRANULAR SOILS BLOWS/FT DENSITY 0-4 V.LOOSE 4-10 LOOSE 10-30 M.DENSE 30-50 DENSE >50 V.DENSE	COHESIVE SOILS BLOWS/FT DENSITY <2 V.SOFT 2-4 SOFT 4-8 M.STIFF 8-15 STIFF 15-30 V.STIFF >30 HARD	PROPORTIONS USED TRACE 0-10% LITTLE 10-20% SOME 20-35% AND 35-50%	NOTES: 1. See Figure 2, SITE Plan, for boring locations 2. PID readings were obtained using a Thermo Environmental Instruments Model 580 B PID equipped with a 10.6eV lamp. Conventional headspace techniques were used.
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 TWIN STATE ENVIRONMENTAL 34 Roosevelt Highway Colchester, Vermont 05446 (802) 654-8663 FAX: (802) 654-8667	MONITORING WELL/SOIL BORING LOG	
	Project Name: Wilder Farm Location: South Hero, Vermont TSEC Project #: 99031	WELL/ BORING ID: B-4/MW-3
INSTALL DATE: August 27, 1999	WELL DEPTH: 13.0 ft	BORING DEPTH: 13.0 ft
TSEC REP: Jon Berntsen	DEPTH TO WATER: (during drilling) Approx. 12.5 ft	
DRILLING CO: TSEC Colchester, VT	SCREEN DIA: 1-inch	DEPTH: 3.0-13.0 ft bgs
DRILLING METHOD: Geoprobe®	SCREEN TYPE/SIZE: 0.010"-slot Schedule 40 PVC	
SAMPLING METHOD: Macrocore Sampler	RISER TYPE: Schedule 40 PVC	
REFERENCE POINT (RP): Grade	RISER DIA.: 1-inch	DEPTH: 0.5-3.0 ft bgs
ELEVATION OF RP: Not Measured	GUARD TYPE: Flush mount road box set in concrete	
REMARKS: Boring was completed as Monitoring Well MW-3.	RISER CAP: Locking expansion plug	

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND	
0		0-4	<0.1	4.0 ft recovery	0.0-2.8: SILT and CLAY. Mottled brown/gray, dry. 2.8-4.0: SILT and CLAY. Clay increasing with depth. Brown/gray mottled, dry.	 CEMENT GROUT  NATIVE BACKFILL  BENTONITE SEAL  SAND PACK  WELL SCREEN  RISER PIPE  HEAD SPACE  WATER LEVEL (APPROXIMATE)	
1							
2							
3							
4			4-7	1,143	3.0 ft recovery	4.0-7.0: CLAY. Brown, dry. Petroleum odor at bottom of core sample.	
5							
6							
7			7-9	1,007	2.0 ft recovery	7.0-9.0: CLAY with trace of sand, silt and fine gravel. Dense, gray/brown mottled, wet.	
8							
9			9-11	1,022	2.0 ft recovery	9.0-11.0: CLAY with trace of sand, silt and fine gravel. Dense, gray/brown mottled, wet.	
10							
11			11-13	662	2.0 ft recovery	11.0-13.0: CLAY with trace of sand, silt and fine gravel. Dense, gray/brown mottled, wet.	
12							
13					End of Sampling = 13.0 feet End of Boring = 13.0 ft		
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
GRANULAR SOILS BLOWS/FT DENSITY 0-4 V.LOOSE 4-10 LOOSE 10-30 M.DENSE 30-50 DENSE >50 V.DENSE		COHESIVE SOILS BLOWS/FT DENSITY <2 V.SOFT 2-4 SOFT 4-8 M.STIFF 8-15 STIFF 15-30 V.STIFF >30 HARD		PROPORTIONS USED TRACE 0-10% LITTLE 10-20% SOME 20-35% AND 35-50%	NOTES: 1. See Figure __ SITE Plan, for boring locations 2. PID readings were obtained using a Thermo Environmental Instruments Model 580 B PID equipped with a 10.6eV lamp. Conventional headspace techniques were used.		



TWIN STATE ENVIRONMENTAL

34 Roosevelt Highway Colchester, Vermont 05446
(802) 654-8663 FAX: (802) 654-8667

MONITORING WELL/SOIL BORING LOG

Project Name: **Wilder Farm**
Location: **South Hero, Vermont**
TSEC Project #: **99031**

WELL/
BORING ID:
B-5/MW-4

INSTALL DATE:	August 27, 1999	WELL DEPTH:	15.75 ft	BORING DEPTH:	16.0 ft
TSEC REP:	Jon Berntsen	DEPTH TO WATER: (during drilling)	Approx. 10.5 ft		
DRILLING CO:	TSEC Colchester, VT	SCREEN DIA:	1-inch	DEPTH:	5.75-15.75 ft bgs
DRILLING METHOD:	Geoprobe®	SCREEN TYPE/SIZE:	0.010"-slot Schedule 40 PVC		
SAMPLING METHOD:	Macrocore Sampler	RISER TYPE:	Schedule 40 PVC		
REFERENCE POINT (RP):	Grade	RISER DIA:	1-inch	DEPTH:	0.5-5.75 ft bgs
ELEVATION OF RP:	Not Measured	GUARD TYPE:	Flush mount road box set in concrete		
REMARKS:	Boring was completed as Monitoring Well MW-4.				

DEPTH IN FEET	WELL PROFILE	SAMPLE DEPTH (FT)	PID (PPMV)	BLOWS/6" AND RECOVERY	SOIL DESCRIPTION AND NOTES	LEGEND	
0		0-4	<0.1	4.0 ft recovery	0.0-2.8: SILT. Mottled gray/brown, dry		
1					2.8-4.0: SILT and CLAY. Clay increasing with depth. Brown/gray mottled, dry.		
2							
3							
4			4-6	<0.1	2.0 ft recovery		4.0-4.3: SILT and CLAY. Soft, brown, damp.
5							4.3-6.0: CLAY. Dense, damp, brown.
6			6-8	<0.1	2.0 ft recovery		4.0-6.0: CLAY. Dense, damp, brown.
7							
8			8-10	3.4	2.0 ft recovery		8.0-10.0: CLAY with trace of sand, silt and fine gravel. Dense, gray/brown mottled, damp.
9							
10			10-12	0.3	2.0 ft recovery		10.0-10.5: CLAY with trace of sand, silt and fine gravel. Dense, gray/brown mottled, damp.
11							
12			12-14	NR	No recovery		No Recovery
13							
14			14-16	<0.1	2.0 ft recovery		14.0-16.0: CLAY with trace of sand, silt and fine gravel. Soft, gray mottled, wet.
15							16.0: Refusal
16							End of Sampling = 16.0 feet End of Boring = 16.0 ft
17							
18							
19							
20							
21							
22							
23							
24							
25							
GRANULAR SOILS BLOWS/FT DENSITY 0-4 V.LOOSE 4-10 LOOSE 10-30 M.DENSE 30-50 DENSE >50 V.DENSE		COHESIVE SOILS BLOWS/FT DENSITY <2 V.SOFT 2-4 SOFT 4-8 M.STIFF 8-15 STIFF 15-30 V.STIFF >30 HARD		PROPORTIONS USED TRACE 0-10% LITTLE 10-20% SOME 20-35% AND 35-50%		NOTES: 1. See Figure __, SITE Plan, for boring locations 2. PID readings were obtained using a Thermo Environmental Instruments Model 580 B PID equipped with a 10.6eV lamp. Conventional headspace techniques were used.	

ATTACHMENT 1



State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
RELAY SERVICE FOR THE HEARING IMPAIRED
1-800-253-0191 TDD>Voice
1-800-253-0195 Voice>TDD

AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
Waste Management Division
103 South Main Street/West Office
Waterbury, Vermont 05671-0404
(802) 241-3888
FAX (802) 241-3296

May 18, 1999

Mr. Tad Wilder
Wilder Farm
595 Route 2
South Hero, Vermont 05486

RE: Petroleum Contamination at Wilder Farm
 South Hero, Vermont
 SMS Site # 99-2603

Dear Mr. Wilder:

The Sites Management Section (SMS) has received the Underground Storage Tank (UST) closure report which outlines the subsurface conditions for the above referenced site. The fieldwork was conducted by KSKGeos, Inc. on April 7, 1999. The report is dated April 12, 1999 and summarizes the degree and extent of contamination encountered. The USTs removed include:

- UST #1 - 1,000 gallon gasoline UST

During the site activities, screened soils had concentrations up to 150 parts per million (ppm) as measured by a photoionization detector (PID). The limits of soil contamination were not defined. All soil was used for backfill at the conclusion of the UST removal program. A soil sample from the limit of the excavation indicates significant petroleum contamination of the site soil.

Site soils consisted of silty clay. Groundwater was encountered seeping from the excavation sidewalls. The groundwater had a sheen.

The Wilder Farm was inspected for sensitive receptors. The possible receptors potentially affected include groundwater, basements of adjacent buildings, nearby surface water, and public or private drinking water wells. A sample of the site drinking water supply well obtained on April 7 did not contain detectable concentrations of petroleum compounds above method detection limits.

Based on the report information, the SMS has determined additional work is necessary to determine the severity of contamination. Due to possible contamination to nearby receptors, the SMS requests that Wilder Farm retain the services of a qualified environmental consultant to perform the following:

- Further define the degree and extent of contamination to the soil.
- If appropriate, determine if the airspace beneath the site and site adjacent building(s) (e.g. basements) has been impacted by the release using a PID. Wall and floor construction and susceptibility to vapor migration should be noted. PID measurements should be made in cracks and/or joints likely impacted. If the airspace has been impacted, SMS requests confirmatory sampling and laboratory analyses be performed using EPA Method TO-2.
- Determine the degree and extent of contamination, if any, to groundwater. A sufficient number of monitoring sites should be installed to adequately define the severity of site contamination. Analyze groundwater samples for BTEX and MTBE. At sites proximal to water supply sources, determine the

hydrologic relationship of the contaminated area to the water supply source. Pumping influences should be considered in the evaluation.

- Assess the potential for contaminant impact on sensitive receptors. Base this update on all available information and include basements of adjacent buildings, nearby surface water, any proximal drinking water sources, wetlands, sensitive ecologic areas, outdoor or indoor air, sewers, or utility corridors. Sample and analyze any at-risk water supplies for BTEX, TPH and MTBE compounds.
- Determine the need for long-term treatment and/or monitoring that addresses groundwater contamination.
- Actively recover any free phase petroleum product measured in the ground in excess of 1/8 inch. If this is done manually, a log must be maintained which documents the dates product is measured, the thickness of the product and the amount removed.
- Submit a summary report that outlines the work performed, as well as provides conclusions and recommendations. **As appropriate** include analytical data; a site map showing the location of any potential sensitive receptors, stockpiled soils and monitoring or sample locations; an area map; detailed well logs; and a groundwater contour map.

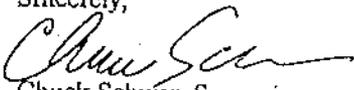
Please have your consultant submit a preliminary work plan and cost estimate or a site investigation expressway notification form within fifteen days of your receipt of this letter, so it may be approved prior to the initiation of onsite work. Enclosed please find a list of consultants who perform this type of work as well as the brochure "*Selecting Your UST Cleanup Contractor*," which will help you in choosing an environmental consultant.

Based on current information, the underground storage tanks at Wilder Farm are eligible for participation in the Petroleum Cleanup Fund (PCF). You must provide written proof to the SMS that you hold no other applicable insurance in order to receive reimbursement from the PCF. The owner or permittee must pay for the removal and/or repair of the failed tank(s), and for the initial \$250.00 of the cleanup. The fund will reimburse the tank owner or permittee for additional eligible cleanup costs of up to \$1 million. All expenditures must be pre-approved by the Agency or performed in accordance with the "*Site Investigation Guidance*" expressway program. Please refer to the enclosed guidance document titled, "*Procedures for Reimbursement from the Petroleum Cleanup Fund*" for additional information concerning the PCF.

The Secretary of the Agency of Natural Resources reserves the right to seek cost recovery of fund monies spent at the Wilder Farm site if the Secretary concludes that Wilder Farm is in significant violation of the Vermont Underground Storage Tank Regulations or the Underground Storage Tank statute (10 V.S.A., Chapter 59).

We realize this may be a lot to absorb and respond to. We are here to help make this process as effective and uncomplicated as possible. Please review the enclosed documents and call me with any questions you may have. I can be reached at (802) 241-3876.

Sincerely,



Chuck Schwer, Supervisor
Sites Management Section

Enclosures (3)

cc: South Hero Selectboard w/o enclosure
South Hero Health Officer w/o enclosure
DEC Regional Office w/o enclosure (transmitted electronically)
Kent Koptiuch, KSKGeos, Inc. w/o enclosure

CS
112603.wpd

ATTACHMENT 2

SEP 17 1999



Committed To Your Success

Severn Trent Laboratories
55 South Park Drive
Colchester VT 05446
Tel: (802) 655-1203
Fax: (802) 655-1248

Analytical Report

Twin State Environmental Corp.
34 Roosevelt Highway

Colchester, VT 05446

Attention : John Diego

Date : 09/16/99
ETR Number : 75067
Project No.: 99020
No. Samples: 4
Arrived : 09/03/99

Page 1

JOB:99031 Wilder Farm

Standard analyses were performed in accordance with Methods for Analysis of Water and Wastes, EPA-600/4/79-020, Test Methods for Evaluating Solid Waste, SW-846, or Standard Methods for the Examination of Water and Wastewater. All results are in mg/l unless otherwise noted.

Lab No./ Method No.	Sample Description/ Parameter	Result
395465 8021	Supply:09/03/99 @0925(Water) Aromatic/Halogenated VOA	C
395466 8021	Field blank:09/03/99 @0912(Water) Aromatic/Halogenated VOA	C
395467 8021	Mw-2:09/03/99 @0932(Water) Aromatic/Halogenated VOA	C
395468 8021	Dup-1:09/03/99 @0900(Water) Aromatic/Halogenated VOA	C

Comments/Notes

C = Procedure/analysis completed

< Last Page >

Submitted By :

Kristine Jusablen STL VT



The following Qualifiers may be used when reporting any Organic Parameters analyzed by Gas Chromatography (GC) or High Pressure Liquid Chromatography (HPLC). Any additional qualifiers used in the reports will be described in the case narrative. These flags are based on the EPA Contract Laboratory Program statement of work.

GC/HPLC Qualifiers

- U - Indicates compound was analyzed for but not detected above the reporting limit.
- J - Indicates an estimated value. This flag is used when the result is less than the reporting limit, but $> \frac{1}{2}$ reporting limit.
- P - This flag is used for a pesticide/Aroclor target analyte when there is greater than 25.0% difference for detected concentrations between the two analytical columns. The lower of the two values is reported on the Form I and flagged with a "P".
- C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.
- B - This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. Only the samples get a "B" flag. The method blank does not.
- D - This flag identifies all compounds identified in an analysis at a secondary dilution factor. This flag alerts data users that any discrepancies between the concentrations reported for the dilutions may be due to dilution of the sample or extract. It additionally indicates that spike recoveries may have been diluted below quantifiable levels.
- E - This flag identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument for that specific analysis. If one or more compounds have a response greater than the upper level of calibration range, the extract shall be diluted and re-analyzed.
- X,Y,Z - Laboratory defined flags. These flags must be fully described, and such description attached to the Sample Data Summary Package and the case Narrative. Begin by using "X" and go on to "Y" as necessary. These flags may also be used to combine several flags, as needed.

FORM 1
VOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

SUPPLY

Lab Name: SEVERN TRENT LABORATORIES Contract: 99020

Lab Code: INCHVT Case No.: 99020 SAS No.: SDG No.: 75067

Matrix: (soil/water) WATER Lab Sample ID: 395465

Sample wt/vol: 5.000 (g/mL) ML Lab File ID: 14SE991728-I211

Level: (low/med) MED Date Received: 03/09/99

% Moisture: not dec. _____ Date Analyzed: 09/15/99

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

1634-04-4	Methyl tert-Butyl Ether	0.50	U
71-43-2	Benzene	0.50	U
108-88-3	Toluene	0.50	U
100-41-4	Ethylbenzene	0.50	U
1330-20-7	m/p-Xylene	0.50	U
95-47-6	o-Xylene	0.50	U
108-67-8	1,3,5-Trimethylbenzene	0.50	U
95-63-6	1,2,4-Trimethylbenzene	0.50	U
91-20-3	Naphthalene	0.50	U

FORM 1
VOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

FIELDBLANK

Lab Name: SEVERN TRENT LABORATORIES Contract: 99020

Lab Code: INCHVT Case No.: 99020 SAS No.: SDG No.: 75067

Matrix: (soil/water) WATER Lab Sample ID: 395466

Sample wt/vol: 5.000 (g/mL) ML Lab File ID: 14SE991728-I221

Level: (low/med) MED Date Received: 03/09/99

% Moisture: not dec. Date Analyzed: 09/15/99

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
1634-04-4	Methyl tert-Butyl Ether	0.50	U
71-43-2	Benzene	0.50	U
108-88-3	Toluene	0.50	U
100-41-4	Ethylbenzene	0.50	U
1330-20-7	m/p-Xylene	0.50	U
95-47-6	o-Xylene	0.50	U
108-67-8	1,3,5-Trimethylbenzene	0.50	U
95-63-6	1,2,4-Trimethylbenzene	0.50	U
91-20-3	Naphthalene	0.50	U

FORM 1
VOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

MW-2

Lab Name: SEVERN TRENT LABORATORIES Contract: 99020

Lab Code: INCHVT Case No.: 99020 SAS No.: SDG No.: 75067

Matrix: (soil/water) WATER Lab Sample ID: 395467

Sample wt/vol: 5.000 (g/mL) ML Lab File ID: 14SE991728-I231

Level: (low/med) MED Date Received: 03/09/99

% Moisture: not dec. Date Analyzed: 09/15/99

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 50.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
1634-04-4	Methyl tert-Butyl Ether	25	U
71-43-2	Benzene	630	
108-88-3	Toluene	25	U
100-41-4	Ethylbenzene	100	
1330-20-7	m/p-Xylene	25	U
95-47-6	o-Xylene	25	U
108-67-8	1,3,5-Trimethylbenzene	27	
95-63-6	1,2,4-Trimethylbenzene	25	U
91-20-3	Naphthalene	25	U

FORM 1
VOLATILE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

DUP-1

Lab Name: SEVERN TRENT LABORATORIES Contract: 99020

Lab Code: INCHVT Case No.: 99020 SAS No.: SDG No.: 75067

Matrix: (soil/water) WATER Lab Sample ID: 395468

Sample wt/vol: 5.000 (g/mL) ML Lab File ID: 14SE991728-I241

Level: (low/med) MED Date Received: 03/09/99

% Moisture: not dec. _____ Date Analyzed: 09/15/99

GC Column: DB-VRX ID: 0.45 (mm) Dilution Factor: 50.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
1634-04-4-----	Methyl tert-Butyl Ether	25	U
71-43-2-----	Benzene	580	
108-88-3-----	Toluene	25	U
100-41-4-----	Ethylbenzene	100	
1330-20-7-----	m/p-Xylene	25	U
95-47-6-----	o-Xylene	25	U
108-67-8-----	1,3,5-Trimethylbenzene	27	
95-63-6-----	1,2,4-Trimethylbenzene	25	U
91-20-3-----	Naphthalene	25	U

