Report of

Subsurface Investigation at the

Morristown Town Garage

Site #93-1402

Morristown, Vermont

August 1993

Prepared for:

Town of Morristown
Box 748
Morrisville, Vermont 05661

Prepared by:

THE JOHNSON COMPANY, INC.
5 State Street
Montpelier, Vermont 05602
(802) 229-4600

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering

August 12, 1993

Bill Moulton, Road Commissioner
Town Of Morristown
Box 748
Morrisville, Vt. 05661

Re: Report of Subsurface Investigation at the Morristown Town Garage, Site #93-1402
JCO No. 1-1356-1

Dear Mr. Moulton:

We are pleased to present the following Report to the Town of Morristown. We have prepared this document pursuant to our July 8, 1993 contract with the Town of Morristown. We have completed the investigation into a release of diesel fuel from an underground storage tank at the Town Garage.

Work required for this project included: a background investigation, a health and safety plan, monitoring well installation, groundwater sampling and analysis, and this final report. We have sent a copy of this document to the State of Vermont's Sites Management Section. This should satisfy their requests to you in their June 29, 1993 letter.

Based upon the information collected during this investigation, the groundwater has not been measurably contaminated due to the diesel release at the town garage. In addition, the nearby water supply wells have not been impacted by petroleum contamination from the release.

We appreciate the opportunity to perform this work for you. If you have any questions regarding this Document, please do not hesitate to call.

Sincerely,

THE JOHNSON COMPANY, INC.

By: _____
Donald M. Maynard, C.G., MS
Project Geologist

cc: Richard Spiese, SMS

G:\users\dmm\moville.rpt Reviewed by JRB

Civil/Environmental Engineering Hydrogeology Water Supply & Wastewater Disposal Hazardous Waste Remediation Hydrology Contaminant Fate Analysis Soil & Water Science Geology & Geophysics Rivers and Dams Solid Waste Permitting
5 State Street Montpelier, VT 05602 ■ (802) 229-4600 Fax: (802) 229-5876

EXECUTIVE SUMMARY

A petroleum release, probably diesel fuel, was identified at the Morristown Town Garage during removal of two underground storage tanks (USTs). The release was documented by Marc Coleman of the Vermont Hazardous Materials Management Division (HMMD) during his June 4, 1993 site assessment for UST removal. Volatile organic compound vapors in the soil were measured by Mr. Coleman at a concentration of 30 parts per million (ppm) using a photoionization detector.

The HMMD issued a request for a subsurface investigation to the Town of Morrisville in a June 29, 1993 letter. The Johnson Company was retained on July 14, 1993 to perform the investigation. The Johnson Company Investigation Proposal was approved by the HMMD in a July 16, 1993 letter. The subsurface investigation included; collection of background data, a site inspection, installation of three groundwater monitoring wells, measurement of surficial and bedrock aquifer water elevations, and collection and analysis of water samples.

The background data revealed that the surficial aquifer is primarily composed of gravel and sand, with a laterally discontinuous silt/clay horizon at depth. High concentrations of sodium, nitrates, and other contaminants have been recorded in nearby bedrock water supplies for several years. There are three water supply wells in use within 1,000 feet of the presumed petroleum release location. There are also three additional water supply wells in the vicinity which are no longer used due to sodium contamination.

On July 21 and 22, 1993 three surficial aquifer monitoring wells were installed in the vicinity of the presumed release location. On July 27, 1993 the monitoring wells and the three nearest water supply wells were sampled by The Johnson Company, Inc. The water samples were analyzed using EPA method 8240 by the Vermont State Laboratory in Waterbury, Vermont. No volatile organic compounds were detected in any of the samples.

Discussions with Morristown Town employees revealed that approximately 2.5 gallons of diesel fuel was spilled into the excavation during the UST removal. This diesel fuel was allegedly lodged in the piping between the tank and the service pump, which was not purged prior to removal. A visual inspection of the unearthed UST revealed that the condition of the tank was good, with no visible leaks or penetrations.

All available evidence indicates that the petroleum release was of insufficient quantity to impact the groundwater, surface water, potential atmospheric or sensitive environmental receptors. The Johnson Company recommends that no further investigation or remediation of the site is necessary.

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1.0 INTRODUCTION

This document was prepared in response to a June 29, 1993 letter from the State of Vermont Hazardous Materials Management Division (HMMD) to the Town of Morristown. That letter requested an investigation of diesel contamination discovered during the removal of some underground storage tanks (USTs) at the Morristown Town Garage (Appendix A). This document presents the results of: a background investigation, a site visit including monitoring well installation, and groundwater sampling and analysis. In addition this report includes the conclusions and interpretation of the data collected during the investigation of the Morristown Town Garage Site (the Site).

2.0 HISTORICAL PERSPECTIVE

The information provided in this section is based on interviews with neighbors and Morristown employees, and on data collected during the background investigation as outlined below. The Site is located on Cochran Road, about one half mile southwest of the Morrisville Airport (see Figure 1).

The Site is near the western wall of the Ryder Brook Valley, which extends in a north-south direction from Stowe to Morrisville. The area is primarily wooded, with rural and residential usage as well. A bedrock quarry abuts the southern edge of the Site. There is a commercial automobile repair garage located approximately 1,500 feet north of the Site on Cochran Road. A 52 site mobile home park (Pinecrest Mobile Home Park, owned by Everett Rowell) lies directly across Cochran Road from the Site. In addition there are three residences within 1,000 feet of the Site.

There are 27 private water supply wells within one half mile of the Site. There are over 150 private water supply wells within 2 miles of the Site. The majority of these wells are completed in bedrock. Approximately 8,000 feet northwest of the Site there are three overburden public water supply wells serving 160 people of the Morristown Water and Light District (WSID #5160). The Pinecrest Mobile Home Park is served by a bedrock water supply well approximately 300 feet from the presumed petroleum release location (WSID #5162). The nearest residence north of the Site, owned by Barry Small, is served by a private bedrock water supply well. The Small well is located approximately 500 feet northeast of the presumed release location. The two nearest residences east of the site, and the town garage itself are served by a single bedrock water supply well. This well (well #3 on Attachment #1) is located approximately 900 feet northwest of the presumed release location.

FIGURE 1 - SITE LOCATION MAP
MORRISTOWN TOWN GARAGE
MORRISTOWN, VERMONT

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
MONTPELIER, VERMONT

The Pinecrest Mobile Home Park bedrock well has been demonstrated to have unacceptably high concentrations (greater than 20 parts per million) of sodium. Water samples from this well have been collected and sampled for sodium on numerous occasions by the Vermont Department of Health. The water supply is currently under a "boil water" notice from the Department of Health. The drillers yield of the well is 55 gallons per minute (gpm). The radius of influence of the well was calculated by Ronald Parker of the State of Vermont on June 1, 1987 to be 294 feet based on the rate of infiltration and average daily demand.

Three water supply wells have been abandoned due to excessively salty water. These wells include Morristown wells #1 and #2, and the Blanchette/Desmore well (see Attachment #1 for locations). Well completion information and drillers logs are provided in Table 1.

Table 1
Well Completion and Driller's Logs Summary

Well Name/ Year Drilled	Top of Casing Elevation (Rel.feet)	Static Water Elevation (Rel.feet)	Total Depth (feet)	Total Casing (feet)	Yield (gpm)	Geology
Pinecrest/ 1972	787.4	755.6	124.5	8	55	0-1' Soil 1-124.5' Dark Grey Rock 5 gpm @ 51.5' 50 gpm @ 120.5'
Morristown #1/ 1977	782.3	748.7	273	57	12	0-53' Sand and Gravel 53-273' Rock
Desmore --	778.8	747.9	--	--	--	--
Morristown #4/ 1983 Unknown Location	--	--	123	90	--	0-14' Sand 14-63' Clay 63-87' Sand 87-123' Rock
Morristown #2/ 1985	786.8	756.0	247	65.75	50+	0-47' Sand and Gravel 47-54' Clay 54-247' Grey Shale
Morristown #3/ 1986	Est.842	Est. 740 Pumping	597	46	7	0-2' Soil 2-30' Sand and Gravel
Small #465/ 1990	--	--	348	89	0.75	0-36' Sand 36-49' Hardpan 49-64' Sand and Gravel 64-348 Grey Shale

-- Indicates that data was unavailable or not measured.

There are three buildings on the Site. These include a conical sand storage shed, a salt storage shed, and the Town Garage. The Town Garage was constructed in 1977. The other buildings were constructed later. Prior to construction, the Site was used for gravel extraction by the Town of Morristown. No evidence of any commercial or industrial use prior to the gravel extraction was discovered during the background investigation.

The Johnson Company has identified four underground storage tank (UST) locations at the Site. All four tanks have been removed. Rosco Demar, Morristown employee, stated that there are no more USTs at the Site. All of the USTs were installed during, or shortly after, construction of the garage in 1977. There were a 1,000 gallon and a 5,000 gallon gasoline UST, one 8,000 gallon diesel UST, and one 500 gallon waste oil UST (see Attachment #1 for approximate locations). The 1,000 gallon gasoline UST and the waste oil UST were removed on June 25, 1990 under the supervision of Patricia Goyene of the HMMD. These tanks were reported to be in good condition, and no contamination was observed. The remaining tanks were removed on June 3, 1993 under the supervision of Marc Coleman of the HMMD. Mr. Coleman's memorandum describing the removal is included in Appendix A. The diesel tank had already been removed prior to Mr. Coleman's arrival on-site. No VOC vapors were detected in the soils at 15 feet below ground surface. Soil headspace analysis by photo-ionization detector (PID) indicated volatile organic compound (VOC) vapors of 30 ppm concentration at 16 feet below ground surface. A diesel odor in the soils was also noted at 16 feet. The tanks had some surface rust, but no visual evidence of holes or leaks. Rosco Demar, Morristown employee, was present during the diesel tank removal. The diesel tank was equipped with a check valve at the tank. Mr. Demar stated that a release of 2-2.5 gallons of diesel from the piping occurred during removal. This statement was confirmed by a second Morristown employee.

A water sample was collected from the James Huard residence (who uses the Pinecrest Mobile Home Park well) on June 29, 1993. The sample was analyzed using EPA method 8240 for VOCs by the State of Vermont. No VOC concentrations were observed above the detection limits.

The garage is built on a concrete slab. The garage contains three floor drains, all of which are connected to an oil/sand trap, and then to a separate leachfield 225 feet south of the building. A separate sanitary septic system and leachfield is located 120 feet south of the building (see Attachment #1).

The Site is located near the contact between the Hazens Notch and Ottauquechee Formations. Bedrock observed in nearby outcrops is typically a black or grey carbonaceous phyllite or schist with beds and veins of quartzite. The bedding and schistocity is vertical and strike 45-55° (magnetic) northeast. The bedrock

surface topography observed in outcrops is a series of ridges striking generally 35° northeast. The northwestern limb of each ridge dips steeply at 45-50%. The southeastern slope of each ridge dips approximately 25%. Numerous vertical joints strike 35°, and are coincident with 4-5' high vertical cliffs in the bedrock surface.

Directly overlying the bedrock is a sand and gravel deposit which was observed in exposures and in water supply well logs. These sands and gravels were probably deposited as outwash near the ice margin during the retreat of the Wisconsin Glaciation. These sands and gravels can be expected to be thickest and less well sorted in bedrock surface "valleys" where melt-water was concentrated. These materials can provide an excellent pathway for contaminant transport.

Silt and clay deposits were observed in several driller's logs above the sands and gravels. The silt and clays are not laterally continuous, and some driller's logs record sand and gravel from the ground surface all the way to bedrock. These fine grained sediments were probably deposited in a post-glacial lake, and may correlate with 80 foot thick clay deposits in the Stowe Valley. Post-glacial lakes have been documented with water levels at 1,175, 1,025, and 925 feet above sea level. Areas where the silt/clay horizon are missing may be due to post-depositional erosion, or to non-deposition over bedrock highs which acted as islands in the lake. Because the silt/clay layer has "holes" in it, it may not serve as an effective barrier against contaminant transport into the bedrock aquifer. Locally, the silt/clay horizon may cause a perched water table.

Sand and gravel deposits near the ground surface are typically horizontally laminated and well sorted. They are probably river (fluvial) deposits. Grain sizes can be expected to vary considerably over short distances. Preferential contaminant migration pathways may occur in relict stream channel deposits.

3.0 METHODOLOGY AND ACCOMPLISHMENTS OF INVESTIGATION

Listed below are brief descriptions of specific tasks which were necessary for the subsurface hydrogeologic investigation. These tasks included:

- Background Investigation
- Health and Safety Plan
- Site Investigation/Site Visit
- Final Report

3.1 BACKGROUND INVESTIGATION

The background investigation included a records search for any data regarding the history and present operation of the site, including the following:

- Results of previous investigations including the Department of Water Resources Files for community water supply well WSID #5162 for the Pinecrest Trailer Park.
- Drillers logs of nearby water supply wells collected from the Department of Water Quality and by personal communication with Stuart Roe of H. A. Manosh.
- Municipal information on subsurface pipes and disposal fields including design plans for the Morristown Town Garage prepared by Charles Nelson, PE.
- Hazardous Materials Management Division (HMMD) files including:

  A June 4, 1993 tank pull site assessment by Marc Coleman
  A June 26, 1990 tank pull assessment by Patricia Goyene
  Analytical Results of a Pinecrest Trailer Park water supply sample collected on June 25, 1993.
  Results of the Site Prioritization System Ranking
- "The Surficial Geology and Pleistocene History of Vermont" by Stewart and MacClintock
- Provisional Soil Conservation Service soils maps for Washington County
- 1986 Provisional 7.5 minute United States Geological Service topographic maps for Sterling Mountain and Morrisville quadrangles.
- Vermont Mapping Program 1976 orthophotos and 1974 high altitude stereo photographs.
- 1887, 1892, 1897, 1903, 1909, 1922, 1928, and 1955 Sanborn Fire Insurance maps

A site location map was prepared using available USGS topographic maps (Figure 1).

3.2 HEALTH AND SAFETY PLAN

A site specific health and safety plan (HASP) was prepared. The HASP complied with the requirements of OSHA regulations 29CFR1910.120. The HASP included:

- a site description
- a list of personnel designated to carry out the site activities, including a site health and safety officer
- a site map and preliminary on-site control measures

- a list of tasks and hazard evaluation for each task
- a recommended list of personal protective equipment
- an on-site work plan
- communication procedures
- decontamination procedures
- site operating procedures
- environmental monitoring
- emergency procedures

Site work was performed according to the HASP.

3.3 SITE INVESTIGATION

A Site Investigation was performed on July 21 and 22, 1993. The Site Investigation was performed in accordance with the July 8, 1993 "Proposal for Subsurface Investigation at the Morristown Town Garage" as approved by the Hazardous Materials Management Division in a July 16, 1993 letter to the Town of Morristown (Appendix A). One significant alteration from the proposal due to unforeseen circumstances was performed after approval was given by Richard Spiese of the HMMD and by the Town of Morristown's representative, Rosco Demar. This alteration was the elimination of the deep monitoring well installation due to heaving sands and to the presence of a confining layer.

During the site investigation, the potential receptors of atmospheric contamination were identified and evaluated. This included measurement of volatile organic compound (VOCs) in the cellars of the nearby Blanchette and Desmore residences with a photoionization detector (PID). Measurements with the PID were also performed during soil sampling and well installation. No VOCs were detected in the cellars. Soil headspace analysis measurements did not detect any VOCs above 1.2 ppm.

Monitoring well and bedrock well locations and elevations were surveyed using an Autolevel, a Brunton, and a cloth tape. A Site Sketch was prepared using Autocad and is included as Attachment #1.

No sensitive environments such as wetlands were identified as potential receptors of the petroleum contamination. The petroleum contamination has not had any effect on surface water based upon field observations and probable migration pathways.

3.3.1 *Monitoring Wells*

Three groundwater monitoring wells were installed at the Site. The wells were installed within 40 feet of the presumed release location (where VOCs were detected in soils by Marc Coleman) on the North, South, and East sides of the area excavated for UST removal. One well (MW-1) was installed upgradient of the assumed contamination source. The second well (MW-2) was installed downgradient of the presumed source. Heaving sands were encountered in MW-2, and it was necessary to flush the annulus with water prior to completion. The water used for pumping and flushing was taken from the Town Garage. A third well (MW-3) was installed cross-gradient to the presumed source, between the UST removal excavation and the Pinecrest Trailer Park water supply well. All the wells were constructed with a 5 foot long factory slotted screen. All the wells were provided with a locking cap and flush mounted well guard. The three wells described above were screened in the upper portion of the surficial aquifer, so that the observed groundwater level corresponds approximately with the center of the well screen. The fourth proposed well was not drilled due to the danger of penetrating a confining layer, and to the difficulties imposed by heaving sands on sampling and completion.

Based on water level measurements in three un-used bedrock wells, and in the surficial aquifer monitoring wells, the vertical hydraulic gradient is downwards (see Attachment 1). This indicates that the groundwater is flowing into the bedrock from the soil, at least on a seasonal basis.

The horizontal direction and gradient (slope) of groundwater flow was calculated using water level measurements in the monitoring wells collected on July 23 and 27, 1993. The surficial aquifer is almost flat, with a 0.004 to 0.007 ft/ft horizontal hydraulic gradient toward the Northeast (see Attachment #1). The bedrock aquifer has a 0.04 ft/ft gradient toward the Southwest. The well locations and elevations were surveyed by The Johnson Company using an Autolevel, compass, and tape.

3.3.2 *Groundwater Sampling and Analysis*

Water quality samples were collected from three nearby water supply wells and from the three monitoring wells. The Johnson Company collected the samples and transported them to the State of Vermont laboratory for analysis. All sampling was performed in accordance with the US EPA "RCRA Groundwater Monitoring Technical Enforcement Guidance Document".

The water supplies which were sampled included the Pinecrest Trailer Park well, the Town Garage well #3, and the Small well. The samples were analyzed by the State of Vermont for volatile organic compounds (VOCs) using EPA method 8240. No detectable concentrations of any VOCs were observed in either the bedrock or the surficial aquifer.

4.0 RESULTS, CONCLUSIONS, AND INTERPRETATION

Based on interviews with Morristown employees and on HMMD reports, the petroleum release was limited in volume and aerial extent. No evidence of groundwater contamination from petroleum products was detected either in the surficial or in the bedrock aquifers.

The calculated maximum travel time from the south end of the diesel UST to the downgradient well MW-2 is about five months (see Appendix A for Darcy flow velocity analysis). If a petroleum release occurred on June 3, 1993 during tank removal, it may not reach the monitoring well until the end of October. The Johnson Company recommends that an additional water quality sample be collected from MW-2 during November 1993. If the EPA method 8020 analysis of this sample does not detect any VOCs, then the site should qualify for closure under the Vermont regulations.

Appendix A

Background Information

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, Vermont 05671-0404
(802) 244-8702
FAX: (802) 244-5141

June 29, 1993

Bill Moulton
Town of Morristown
Box 748
Morisville, Vt 05661

RE: Petroleum contamination at the Morristown Town Garage
(Site #93-93-1402)

Dear Bill Moultan:

The Sites Management Section (SMS) has reviewed the tank pull form and accompanying letter from Marc Coleman from the Management and Prevention Section of the State dated June 4, 1993 regarding the removal of two underground storage tanks (USTs) from the above referenced site. The 5,000 gallon gasoline and 8,000 gallon diesel tanks were removed on June 3-4, 1993.

Upon excavation, soil at depths of sixteen feet measured 30 ppm using a photoionization detector. A distinct diesel smell was noticed at this depth. Further subsurface soil vapor samples were unobtainable. Neither groundwater nor free product was found to be present. All excavated soil was backfilled due to the unidentified source of contaminant mass. The DEC currently awaits sampling results from the mobile park community well approximately 300 feet downslope of the site. The DEC Water Supply Division has a boil order on the water from this well.

Based on the above information, the SMS has determined that some additional work is necessary at the site in order to determine the severity of contamination present. Therefore, the SMS is requesting that the Town of Morristown retain the services of a qualified environmental consultant to perform the following:

1. Further define the degree and extent of contamination to the soil. This may be accomplished by obtaining soil borings, digging test pits, or performing a soil gas survey.

2. Determine the degree and extent of contamination, if any, to groundwater. If soil is found to contain evidence of contamination at the water table, then a sufficient number of monitoring wells should be installed in locations which will adequately define the severity of

1-1356-1

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, Vermont 05671-0404
(802) 244-8702
FAX: (802) 244-5141

July 16, 1993

Bill Moulton
Town of Morristown
Box 748
Morrisville, VT 05661

RE: Petroleum contamination at the Morristown Town Garage
(Site #93-1402)

Dear Bill Moulton:

The Sites Management Section (SMS) has reviewed the workplan for subsurface investigation proposed by Donald Maynard of The Johnson Company, Inc. on July 13, 1993. With acceptance of the third methodology of investigation described in the workplan, i.e. the monitoring well installations, the SMS approves the proposed workplan.

Please keep the SMS informed of work scheduled to be performed at the site, as well as forwarding sampling and analytical results as they become available. If you have any questions, please feel free to call.

Sincerely,

Chuck Schwer, Supervisor
Sites Management Section

cc: Donald Maynard, The Johnson Company, Inc.

M E M O R A N D U M

TO: Chuck Schwer, SMS Coordinator
Sites Management Section

FROM: Marc Coleman, Environmental Technician B
Management and Prevention Section

DATE: June 4, 1993

SUBJECT: Contamination/release discovered during the site assessment at the Morristown Town Garage Morristown, Vermont. Facility ID # 8883230

On June 3, 1993 I was on site at the Morristown garage to conduct a site assessment for the state.

I arrived on site at 1:00 pm. The temperature was in the 70s, cloud cover was 40% overcast winds were 5-10 mph out of the south.

I over saw the removal of a 5,000 gallon gasoline UST and examined the excavation pit left by the removal of a 8,000 gallon diesel tank. Soils were screened with an H-nu photoionizer. Vapor levels were N-D for the soils around and below the gasoline UST. Two test pits were dug in the excavation pit. The first labeled #1 on the site map was to a depth of 15 feet and all soils were N-D. The second, #2, was N-D to a depth of 15 feet and increased to 30 ppm at 16 feet with a distinct diesel smell. We were unable to dig any deeper than 16 feet.

Soil was a sandy silt to 15 feet. At 15+ feet a gravel bed was encountered. Within the gravel there was gray staining and the heavy diesel odors.

There are three homes on lots adjacent to the town garage property. The apparent ground water flow should not allow migrating product to impact these homes. The water for these houses is a spring located upslope 1000ft from the excavation pit. Across the road and 300 feet downslope there is a mobile park with a community well which supplies 52 homes. Because this well is in the apparent downslope direction of the excavation pit I requested T.S.S. sample this well to determine if there has been any impact. Marc Roy will sample on 6-4-93. Be advised that water quality has a boil order on the water from this well. No one in the park should be drinking the water.

Because of the depth of the contamination the town agreed to conduct split spoon sampling to try and define the extent of the contamination. This will need to be coordinated through Bill Moulton 888-6369. He is acting as the Town contact person.

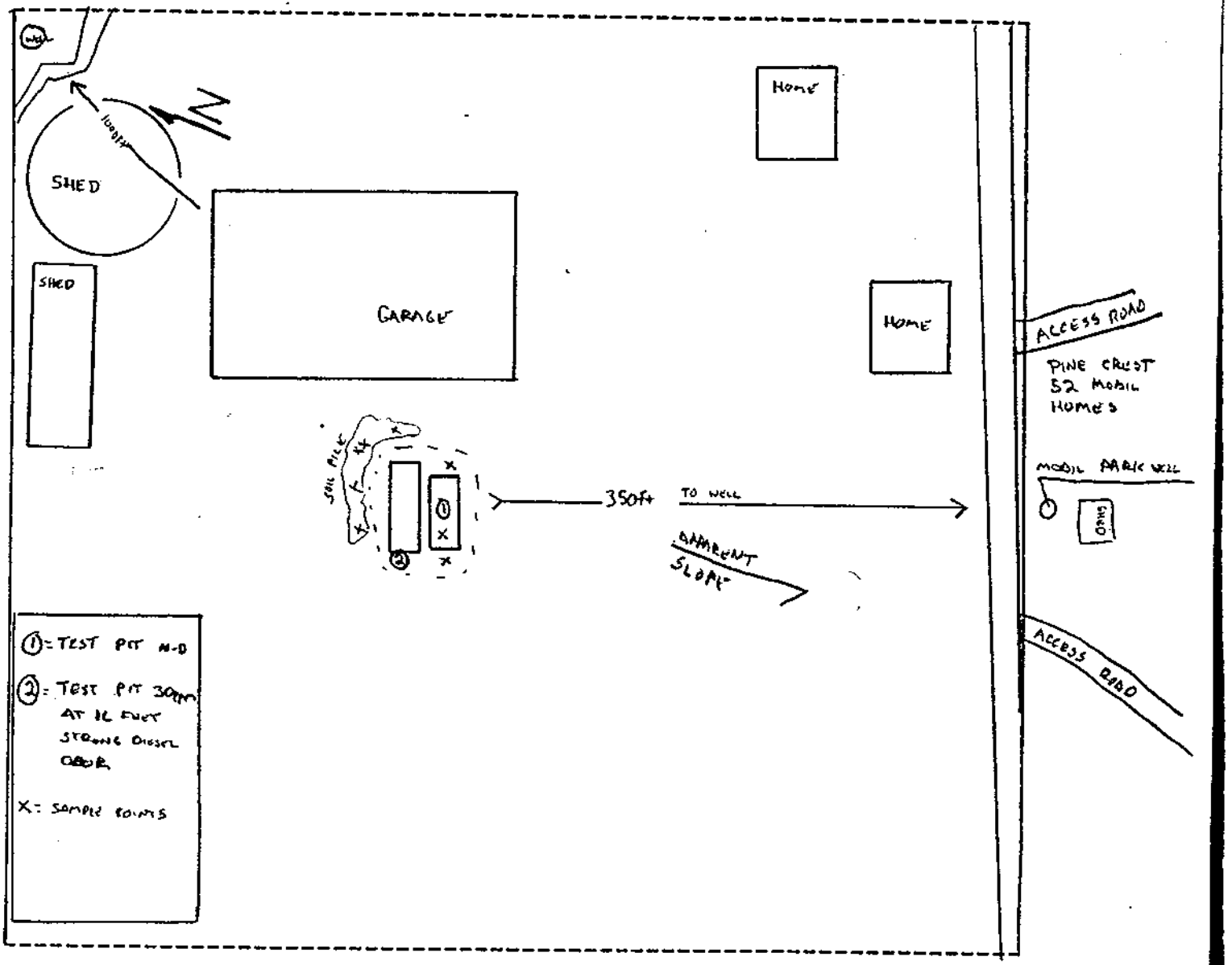
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
UNDERGROUND STORAGE TANK PROGRAM
TANK PULL FORM

TODAY'S DATE: 6-3-93 INSPECTOR: M COLEMAN

DATE OF REMOVAL: 6-3,4-93 BUSINESS NAME: MORRISTOW GARAGE

SITE DIAGRAM

Show location of all tanks and distance to permanent structures, sample points, areas of contamination and any pertinent site information. Indicate North arrow and major street names or route number.



THE JOHNSON CO., INC.
5 State Street
MONTPELIER, VERMONT 05602
(802) 229-4600

JOB Middlebury Town Garage
SHEET NO. _____ OF _____
CALCULATED BY DM DATE 8/12/93
CHECKED BY GRH DATE 8/12/93
SCALE _____

1-1356-1

Travel TIME Calcs.

VOCs Detected in Soils @ 16' on 6/4/93
Water Sampled in MW2 on 6/27/93
GW ~ 31' BGS
Soils 16-31' mostly Coarse Sands AND GRAVEL
Assumed K = 15 FPD
(Bouwer RANGE 15-300 FPD)
Assumed Porosity ϕ = 25% (Bouwer-Rainy 10-35%)
Slope i° = 0.004 FT/FT
Max. Distance - S end Diesel Tank TO MW2 = 35'

$$\text{saturated } V = \frac{K i^\circ}{\phi} = \frac{15 \times .004}{.25} = 0.24 \text{ FPD}$$

Maximum Saturated Travel time = 146 Days

UNSATURATED TRAVEL TIME - INFILTRATION
MAXIMUM DISTANCE = 15' Vertical Feet
Slope i° = 1
Dry soils per soil samples - ASSUME 1% moisture BY VOLUME
ϕ_E = EFFECTIVE POROSITY = 0.01 *
ASSUMED $K_{unsaturated}$ = 1 FPD

$$\text{unsaturated } V = \frac{K_u i^\circ}{\phi_E} = \frac{1 \times 1}{.01} = 100 \text{ FPD}$$

∴ UNSATURATED TRAVEL TIME IS NEGLIGABLE

Appendix B

Well Completion Reports and Geological Logs

The Johnson Company, Inc.
Environmental Sciences and Engineering
5 State Street
Montpelier, Vermont 05602

DRILLING LOG
WELL # MW-1

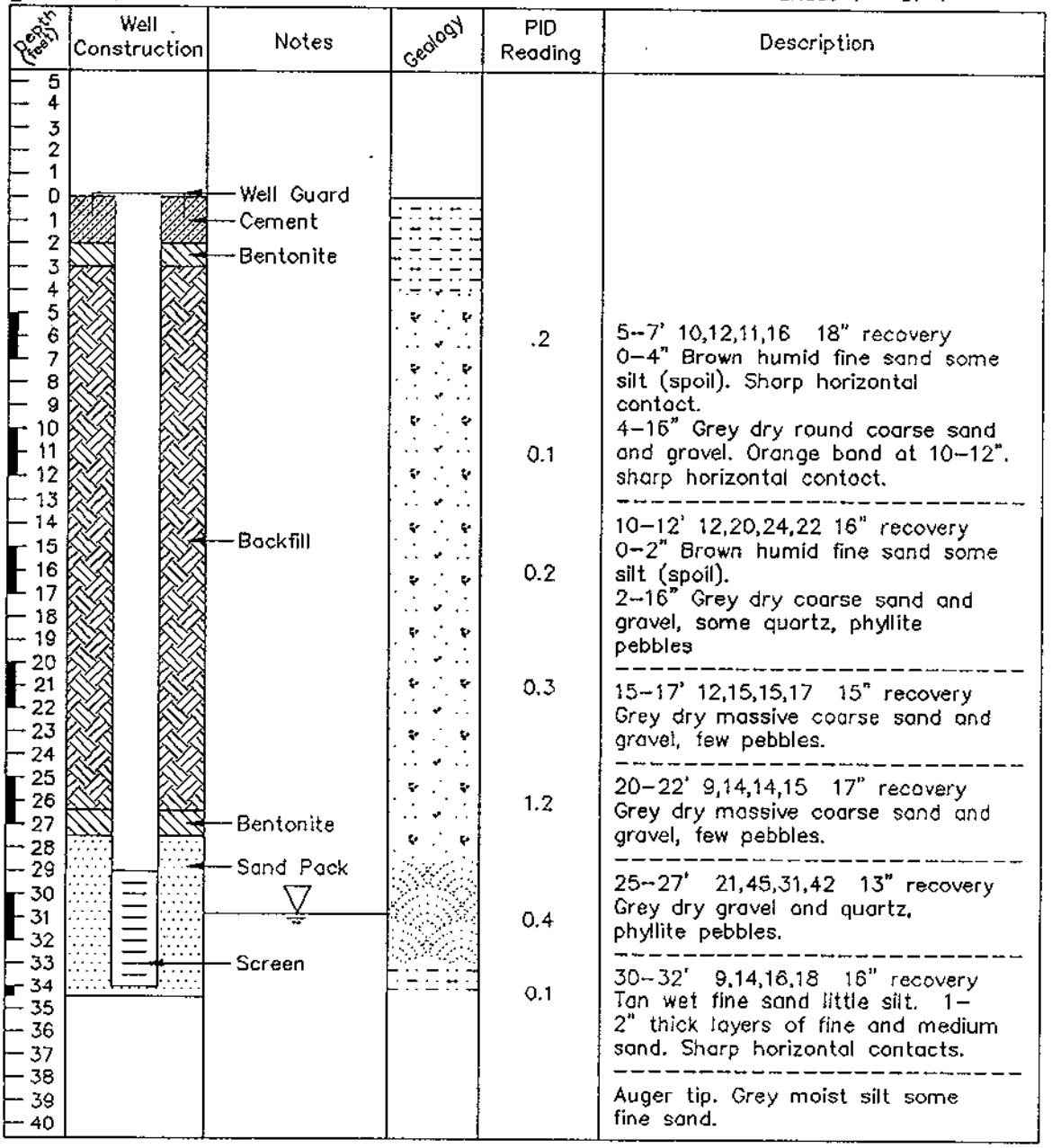
Project: Morristown Town Garage
Location: Morristown, Vermont
Job # 1-1356-1
Logged By: D. M. Maynard
Date Drilled: 7/21/93
Driller: Green Mountain Boring
Drill Method: Hollow Stem Auger

Casing Type: PVC
Casing Diameter: 2.0 in.
Casing Length: 28.8 ft.
Screen Type: Factory
Screen Diameter: 2.0 in.
Screen Length: 5.0 ft.
Slot Size: 0.010"

Total Pipe: 33.8 ft.
Stick Up: -0.2 ft.
Total Hole Depth: 34.0 ft.
Well Guard Length: 1.0 ft.
Initial Water Level: 30.8 ft.
Surface Elevation: 779.9
T.O.C. Elevation: 779.7

▌ = Sampled Interval

Sheet 1 of 1



The Johnson Company, Inc.
Environmental Sciences and Engineering
5 State Street
Montpelier, Vermont 05602

DRILLING LOG
WELL # MW-2

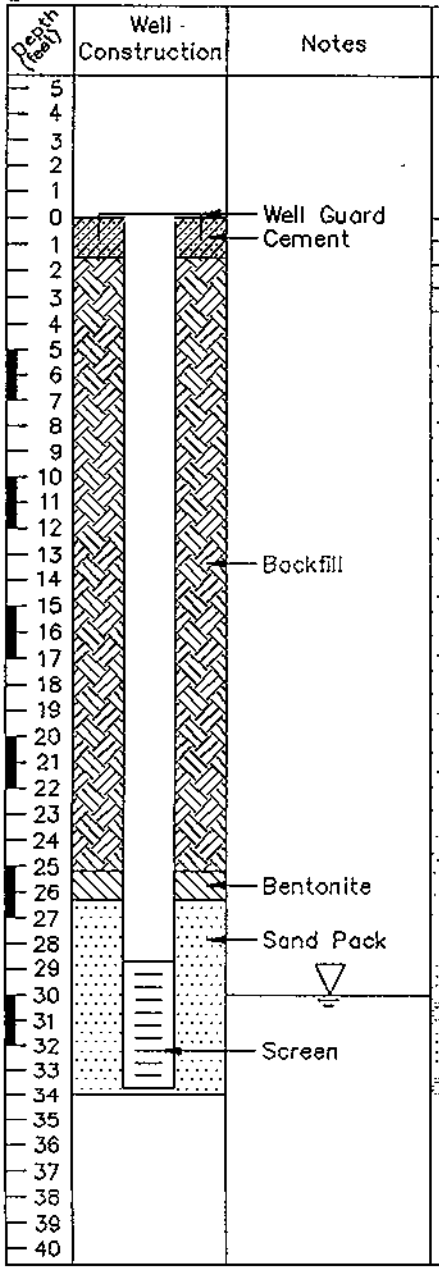
Project: Morristown Town Garage
Location: Morristown, Vermont
Job # 1-1356-1
Logged By: D.M. Maynard
Date Drilled: 7/21/93
Driller: Green Mountain Boring
Drill Method: Hollow stem auger

Casing Type: PVC
Casing Diameter: 2.0 in.
Casing Length: 27.5 ft.
Screen Type: Factory
Screen Diameter: 2.0 in.
Screen Length: 5.0 ft.
Slot Size: 0.010"

Total Pipe: 33.5 ft.
Stick Up: -0.2 ft.
Total Hole Depth: 33.7 ft.
Well Guard Length: 1.0 ft.
Initial Water Level: 30.0 ft.
Surface Elevation: 780.18
T.O.C. Elevation: 779.98

▌ = Sampled Interval

Sheet 1 of 1



PID Reading	Description
0.5	5-7' 7,7,9,9 18" recovery 0-3" brown humid fine sand some gravel, little silt (Spoil). 3-18" Grey dry gravel and coarse sand and subround garnite, phyllite, quartz, pebbles.
0.4	10-12' 13,13,17,23 16" recovery Grey dry gravel and coarse sand and pebbles. Massive.
0.9	15-17' 9,5,15,9 10" recovery 0-2" Brown humid fine sand little silt, gravel (spoil). 2-8" grey dry pebbles and gravel, trace fine, medium, coarse sand. 8-10" Brown dry medium and fine sand and subround gravel.
0.4	
0.6	20-22' 44,45,27,22 18" recovery 0-4" Brown humid fine sand little silt, gravel (spoil). 4-18" Grey dry pebbles and coarse sand and gravel.
1.0	25-27' 15,23,33,36 18" recovery 0-2" Spoil, as above. 2-8" Grey dry massive medium and coarse sand. Orange horizontal laminations 6-8". Sharp contacts. 8-18" Tan dry medium sand, some coarse sand, fine sand, gravel.
	30-32' 12,14,16,21 21" recovery Orange and grey wet horizontally laminated fine sand.

The Johnson Company, Inc.
Environmental Sciences and Engineering
5 State Street
Montpelier, Vermont 05602

DRILLING LOG
WELL # MW-3

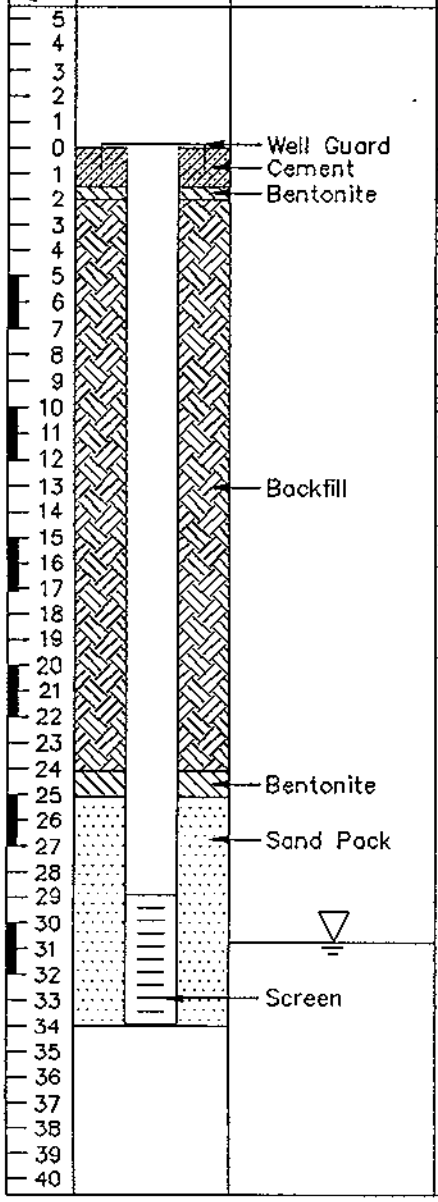
Project: Morristown Town Garage
Location: Morristown, Vermont
Job # 1-1356-1
Logged By: D. M. Maynard
Date Drilled: 7/22/93
Driller: Green Mountain Boring
Drill Method: Hollow Stem Auger

Casing Type: PVC
Casing Diameter: 2.0 in.
Casing Length: 28.5 ft.
Screen Type: Factory
Screen Diameter: 2.0 in.
Screen Length: 5.0 ft.
Slot Size: 0.010"

Total Pipe: 33.5 ft.
Stick Up: -0.4 ft.
Total Hole Depth: 33.9 ft.
Well Guard Length: 1.0 ft.
Initial Water Level: 30.8 ft.
Surface Elevation: 779.89
T.O.C. Elevation: 779.49

▌ = Sampled Interval

Sheet 1 of 1



PID Reading	Description
	5-7' 11,10,14,15 16" recovery 0-11" Tan humid fine sand. 11-13" Brown humid fine sand little silt. 1/8" grey balls of silt. 13-16" Tan humid fine sand. Horizontal brown laminations.
0.4	10-12' 7,8,9,10 17" recovery 0-2" Brown dry fine sand some silt, pebbles (spoil). 2-4" Tan dry fine laminated sand 4-17" Grey dry massive coarse sand some gravel grading down to medium sand.
0.4	15-17' 5,10,13,17 17" recovery 0-3" Brown dry fine sand some gravel, pebbles, little silt. 3-5" Brown dry fine and medium sand. sharp horizontal laminations and contacts.
0.8	5-9" grey dry medium sand some coarse sand, gravel. 1/4" faint horizontal bands. Lower 1" orange.
0.8	9-17" Grey massive gravel and coarse sand. No preferental orientation. Sharp horizontal contact.
1.2	20-22' 12,16,18,19 17" recovery Grey dry massive sub-round gravel and coarse sand. Quartz, phyllite, garnite. No orientation or sorting.
0.9	25-27' 16,17,23,30 14" recovery Grey dry massive subangular gravel and coarse sand. No preferental orientation. Greenstone rock jammed in tip.
	30-32' 27,26,25,32 16" recovery Grey massive pebbles and gravel, trace sand. Quartz, phylite, greenstone.

576

3/16/72

State of Vermont
DEPARTMENT OF WATER RESOURCES

Form WR-5

078

WELL COMPLETION REPORT

(This report must be completed and submitted to the Department of Water Resources, State Office Building, Montpelier, Vermont 05602, no later than 60 days after completion of well.)

Do not fill in
443155
723729

WELL OWNER Pinecrest Mobile Home Park (Name) — Morrisville, Vt. (Mailing Address)

WELL DRILLER H.A. Manosh Corp. (Name) — Morrisville, Vt. (Mailing Address)

PROPOSED USE OR USES (Check):

☐ Domestic ☐ Agricultural ☒ Business Establishment ☐ Municipal ☐ Industrial
☐ Other (Specify use)

CASTING DETAILS (Inside)	YIELD TEST	WATER LEVEL (From land surface) (if possible)	SCREEN DETAILS
Length: 8 Feet	☐ Bailed or ☐ Pumped or ☒ Compressed Air — Hours: — GPM:	Static: Feet	Make:
Diameter: 6 Inches		During Yield Test: Feet	Material:
Kind: Steel		DRILLING EQUIPMENT	Slot Size
Weight: 19.45 lbs/p/ft		☐ Cable Tool ☐ Rotary ☒ Air Percussion	Length: Ft.
☒ New ☐ Used	Yield: 55 GPM	☐ Other (specify)	Diameter: in.

TOTAL DEPTH OF WELL 125 FEET — TOWN WELL IS LOCATED IN: Morrisville, Vt.
(Make sketch of well location on reverse side of sheet

WELL LOG

Depth From Ground Surface	Give description of formations penetrated, such as: peat, silt, sand, gravel, clay, hard pan, shale, limestone, granite, etc. Include size of gravel (diameter) and sand (fine, medium, coarse) color of material, structure (loose, packed, cemented, hard). For example: 0 ft. to 27 ft. fine, packed, yellow sand; 27 ft. to 134 ft. gray granite.
0 ft. to 24 ft.	Dark gray bedrock - medium hard
24 ft. to 125 ft.	No Change
ft. to ft.	
ft. to ft.	
ft. to ft.	

YIELD TEST DATA IN G.P.M.
If yield was tested at different depth during drilling List Below

ft.	G.P.M.

TOWN OF

WELL OWNER Pine Crest TRAILER PARK — MORRISVILLE
Name — Mailing Address

WELL DRILLER Pete — 576
Name — Mailing Address

PROPOSED USE OR USES (Check):
☐ Domestic ☐ Agriculture ☒ Business Establishment ☐ Municipal ☐ Industrial
☐ Other (specify use):

CASING DETAILS (Inside)	YIELD TEST	WATER LEVEL (From land surface if possible)
1 well cap	☐ Bailed or ☐ Pumped or ☒ Compressed Air	Static: 30 Feet
Length: 8' Add. 3' Feet	Hours: 55 GPM	During Yield Test: Feet
Diameter: 6 Inches		DRILLING EQUIPMENT
Kind: Steel		☐ Cable Tool
Weight: 19.45 lbs./p/ft.		☐ Rotary
☒ New ☐ Used	Yield: 55 GPM	☒ Air Percussion
		☐ Other (specify)

TOTAL DEPTH OF WELL 124'6" 71.00 FEET — TOWN WELL IS LOCATED IN: (Make sketch of well location on reverse side of sheet)

— WELL LOG —

Depth From Ground Surface	Give description of formations penetrated, such as: peat, silt, sand, gravel, clay, hardpan, shale, limestone, granite, etc. Include size of gravel (diameter) and sand (fine, medium, coarse) color of material, structure (loose, packed, cemented, hard). For example; 0 ft. to 27 ft. fine, packed, yellow sand; 27 ft. to 134 ft. gray granite.
0 ft. to 1 ft.	Top Soil
1 ft. to 24½ ft.	DARK GRAY Med HARD
24½ ft. to 49½ ft.	" " " "
49½ ft. to 51½ ft.	
51½ ft. to 99½ ft.	5 GAL MIN AT 51½"

99½ & 124½

DATE WELL STARTED MARCH 15 — DATE WELL COMPLETED MARCH 16

Bits Used # 98390 — Footage 117'6" — Daily Footage 124'6"
Swed # ~~7 7/8"~~
— —
— —
8" Bit 7 —

5 6 GAL MIN AT 120' & 120'

DRILLERS HOURS — HELPERS HOURS

-1/21/71

697

WELL NO. / TAG NO.
08-11-10-15-90
(For Driller's Use)

This report must be completed and submitted to the Department of Environmental Conservation 103 South Main Street (10N), Waterbury, VT 05676 no later than 60 days after completion of the well.

State of Vermont
Dept. of Environmental Conservation
103 South Main Street (10N)
Waterbury, Vt. 05676

WELL COMPLETION REPORT

DEC 31 1990
Location map attached to WCR 461

DEPARTMENT USE ONLY
E.C. 465 U.S.G.S. ____
Field Location ☐ Map area 3269
Latitude ____ ° ' " Elev. ____
Longitude ____ ° ' " Topo. ____
Scale: 62,500 ☐, 25,000 ☐, 24,000 ☐
Data in Town Files ☐ ____

1 WELL OWNER Brenda Cleveland, P.O. Box 272, Morrisville, VT 05661
Name — Permanent Mailing Address
OR
WELL PURCHASER (BARRY SMALL)
Name — Permanent Mailing Address

2. LOCATION OF WELL: TOWN Morristown SUBDIVISION ____ LOT NO. ____

3 DATE WELL WAS COMPLETED 10-15-90

4. PROPOSED USE OF WELL: ☑ Domestic, ☐ Other ____

5. REASON FOR DRILLING WELL: ☑ New Supply, ☐ Replace Existing Supply, ☐ Deepen Existing Well, ☐ Test or Exploration, ☐ Provide Additional Supply, ☐ Other ____

6. DRILLING EQUIPMENT: ☐ Cable Tool, ☑ Rotary with A-P, ☐ Other ____

7 TYPE OF WELL: ☑ Open Hole in Bedrock, ☐ Open End Casing, ☐ Screened or Slotted, ☐ Other ____

8. TOTAL DEPTH OF WELL: 348 feet below land surface.

9. CASING FINISH: ☑ Above ground, Finished, ☐ Above ground, Unfinished, ☐ Buried, ☐ In Pit, ☐ Removed, ☐ None used, ☐ Other ____

10. CASING DETAILS: Total length 89 ft Length below L S 87 ft Dia. 6 in. Material steel Wt. 19 lb./ft

11. LINER OR INNER CASING DETAILS: Length used ____ ft Diameter ____ in. Material ____ Weight ____ lb./ft

12. METHOD OF SEALING CASING TO BEDROCK: ☑ Drive Shoe, ☐ Grout - type ____, Drilled ____ in hole ____ ft in Bedrock ☐ Other ____

13. SCREEN DETAILS: Make and Type ____, Material ____, Length ____ ft, Diameter ____ in. Slot Size ____, Depth to top of screen in feet below land surface ____ ft, Gravel pack if used, Gravel Size or Type ____

14. YIELD TEST: ☐ Bailed, ☐ Pumped, ☑ Compressed Air, for 1 Hours at 3/4 Gallons per minute
Measured by ☑ Bucket, ☐ Orifice pipe, ☐ Weir, ☐ Meter ☐ Permanent Airline installed

15 STATIC WATER LEVEL: ____ feet below land surface, Date or Time measured ____, Overflows at ____ G P M

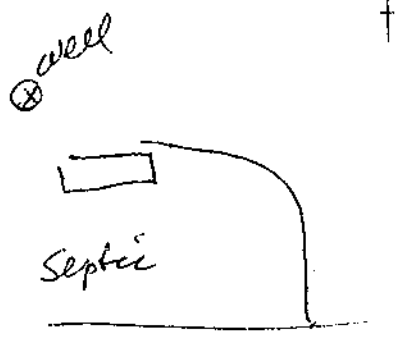
16. WATER ANALYSIS: Has the water been analyzed? ☐ Yes ☑ No. If Yes, Where ____

17. SPECIAL NOTES: ____

18. WELL LOG

Depth from Land Surface: Feet	Feet	Water Bearing	Formation Description	Sketch
Ground Surface	36		Sand	
36	49		Hardpan	
49	64		Sand + gravel	
64	84		Gray + brown soft shale	
84	87		Grdy	
87	348	✓	Grdy with Qtz	

19. SITE MAP
Show permanent structure such as buildings, septic tanks, and/or other land marks and indicate not less than two distances to the well. Indicate local street name and subdivision lot number



20. TESTED YIELD
If the yield was tested at different depths during drilling, list below.

Feet	Gallons Per Minute

WELL DRILLED BY: H. A. Manosh
DOING BUSINESS AS: H. A Manosh Corp. (Company or Business Name)
REPORT FILED BY: Dennis L Ballard (Authorized Signature)
DATE OF REPORT 10/30/90 WELL DRILLERS LIC NO. 8

WELL NUMBER
5974
(For Driller's Use)

This report must be completed and submitted to the Department of Water Resources and Environmental Engineering, State Office Building, Montpelier, Vermont 05602, no later than 60 days after completion of the well.

State of Vermont
DEPARTMENT OF WATER RESOURCES
AND ENVIRONMENTAL ENGINEERING

WELL COMPLETION REPORT

DEC 30 1986

Location map attached to WCR 312

WATER RESOURCE USE ONLY
W.R. 320 U.S.G.S. _____
Field Location ☐ Map area 3269
Latitude _____ ° ' " Elev. _____
Longitude _____ ° ' " Topo. _____
Scale: 62,500 ☐, 25,000 ☐, 24,000 ☐
Data in Town Files ☐

1. WELL OWNER Town of Morristown (Name) c/o Town Clerk Morristown Vt (Permanent Mailing Address)
OR
WELL PURCHASER _____ (Name) _____ (Permanent Mailing Address)
2. LOCATION OF WELL: TOWN Morristown SUBDIVISION _____ LOT NO. _____
3. DATE WELL WAS COMPLETED 01/09/86
4. PROPOSED USE OF WELL: ☐ Domestic, ☒ Other Municipal
5. REASON FOR DRILLING WELL: ☐ New Supply, ☒ Replace Existing Supply, ☐ Deepen Existing Well, ☐ Test or Exploration, ☐ Provide Additional Supply, ☐ Other _____
6. DRILLING EQUIPMENT: ☐ Cable Tool, ☒ Rotary with A-P, ☐ Other _____
7. TYPE OF WELL: ☒ Open Hole in Bedrock, ☐ Open End Casing, ☐ Screened or Slotted, ☐ Other _____
8. TOTAL DEPTH OF WELL: 597 feet below land surface
9. CASING FINISH: ☒ Above ground, Finished, ☐ Above ground, Unfinished, ☐ Buried, ☐ In Pit, ☐ Removed, ☐ None used, ☐ Other _____
10. CASING DETAILS: Total length 416 ft. Length below LS 44 ft. Dia 6 in. Material Steel wt _____ lb./ft.
11. LINER OR INNER CASING DETAILS. Length used _____ ft. Diameter _____ in. Material _____ Weight _____ lb./ft.
12. METHOD OF SEALING CASING TO BEDROCK: ☒ Drive Shoe, ☐ Grout - type _____, Drilled ___ in hole ___ ft. in Bedrock ☐ Other _____
13. SCREEN DETAILS: Make and Type _____, Material _____, Length _____ ft., Diameter _____ in., Slot Size _____, Depth to top of screen in feet below land surface _____ ft., Gravel packed? Gravel Size or Type _____
14. YIELD TEST: ☐ Bailed, ☐ Pumped, ☒ Compressed Air, for 1 hours at 7 gallons per minute
Measured by ☒ Bucket, ☐ [illegible], ☐ Weir, ☐ Meter ☐ Permanent Airline installed
15. STATIC WATER LEVEL: _____ feet below land surface, Date or Time measured _____, Overflows at _____ G.P.M.
16. WATER ANALYSIS: Has the water been analyzed? ☐ Yes ☒ No, If Yes, Where _____
17. SPECIAL NOTES: _____
18. WELL LOG

Depth from Land Surface Feet	Depth from Land Surface Feet	Water Bearing	Formation Description	Sketch
Ground Surface	2		Wood dirt	
2	14		Sand	
14	30		Sand & Gravel	
30	247		Gray Shale	
247	497		Gray Shale	
497	597		Gray Shale	

19. SITE MAP
Show permanent structure such as buildings, septic tanks, and/or other installations and indicate not less than two distances to the well. Indicate road, street name and subdivision lot number. N

20. TESTED YIELD
If the yield was tested at different depths during drilling, list below.

Feet	Gallons Per Minute

WELL DRILLED BY: H A Monash
DOING BUSINESS AS: H A Monash Corp.
REPORT FILED BY _____
DATE OF REPORT 12/29/86 WELL DRILLERS LIC NO. _____

WELL NUMBER
5883
(For Driller's Use)

This report must be completed and submitted to the Department of Water Resources and Environmental Engineering, State Office Building, Montpelier, Vermont 05602, no later than 60 days after completion of the well.

State of Vermont
DEPARTMENT OF WATER RESOURCES
AND ENVIRONMENTAL ENGINEERING
WELL COMPLETION REPORT

WATER RESOURCE USE ONLY
W.R. 299 U.S.G.S.
Field Location ☐ Map area 3267
Latitude ° ' " Elev.
Longitude ° ' " Topo.
Scale: 62,500 ☐, 25,000 ☐, 24,000 ☐
Location map attached to WCR 311 Data in Town Files ☐

1. WELL OWNER Town of Morristown (Name) c/o Town Clerk, Morristown Vt (Permanent Mailing Address) 05661
OR
WELL PURCHASER (Name) (Permanent Mailing Address)

2. LOCATION OF WELL: TOWN Morristown SUBDIVISION LOT NO.

3. DATE WELL WAS COMPLETED 09/25/85

4. PROPOSED USE OF WELL: ☒ Domestic, ☐ Other

5. REASON FOR DRILLING WELL: ☒ New Supply, ☐ Replace Existing Supply, ☐ Deepen Existing Well, ☐ Test or Exploration, ☐ Provide Additional Supply, ☐ Other

6. DRILLING EQUIPMENT: ☐ Cable Tool, ☒ Rotary with A-P, ☐ Other

7. TYPE OF WELL: ☒ Open Hole in Bedrock, ☐ Open End Casing, ☐ Screened or Slotted, ☐ Other

8. TOTAL DEPTH OF WELL: 247 ' feet below land surface

9. CASING FINISH: ☒ Above ground, Finished, ☐ Above ground, Unfinished, ☐ Buried, ☐ In Pit, ☐ Removed, ☐ None used, ☐ Other

10. CASING DETAILS: Total length 65' 8" ft Length below L S 63 ft Dia 6 in Material Steel Wt lb./ft

11. LINER OR INNER CASING DETAILS: Length used ft Diameter in Material Weight lb./ft.

12. METHOD OF SEALING CASING TO BEDROCK: ☒ Drive Shoe, ☐ Grout - type , Drilled in hole ft in Bedrock
☐ Other

13. SCREEN DETAILS: Make and Type , Material , Length ft , Diameter in.,
Slot Size , Depth to top of screen in feet below land surface ft , Gravel pack if used: Gravel Size or Type

14. YIELD TEST: ☐ Bailed, ☐ Pumped, ☒ Compressed Air, for 1 hours at 50 + Gallons per minute
Measured by ☐ Bucket, ☐ Orifice pipe, ☐ Weir, ☐ Meter ☐ Permanent Airline installed

15. STATIC WATER LEVEL: feet below land surface, Date or Time measured , Overflows at G P M

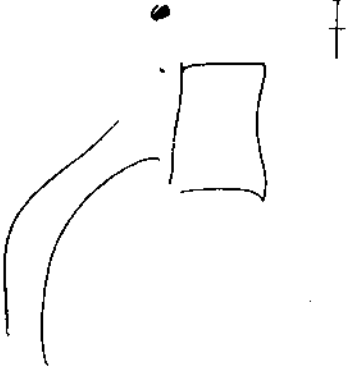
16. WATER ANALYSIS: Has the water been analyzed? ☐ Yes ☒ No, If Yes, Where

17. SPECIAL NOTES:

18. WELL LOG

Depth from Land Surface Feet	Depth from Land Surface Feet	Water Bearing	Formation Description	Sketch
Ground Surface	47		Sand & Gravel	
47	54		Clay	
54	235		Grey Shale	

19. SITE MAP
Show permanent structure such as buildings, septic tanks, and/or other land marks and indicate not less than two distances to the well. Indicate local street name and subdivision lot number.



20. TESTED YIELD
If the yield was tested at different depths during drilling, list below

Feet	Gallons Per Minute

WELL DRILLED BY: H H Manosh
DOING BUSINESS AS: H H Manosh Well
(Company or Business Name)
REPORT FILED BY:
(Authorized Agent)
DATE OF REPORT WELL DRILLERS LIC NO

Appendix C

Analytical Results

8/04/93 Department of Environmental Conservation Laboratory
Method 8240 - Volatile Organics in Water GJD

Lab Id: 3178 Report To: DON MAYNARD Phone: 229-4600 Date Collected: 7/27/93
Location: MW-1 Program: 41 1402 Chain of Custody? Yes

Notes: JOHNSON CO.- MORRISTOWN TOWN GARAGE

Date Analyzed: 7/28/93 Over hold? No Dilution factor: 1

Parameter	Units are ug/l PQL	Result	Remark Code	Rel % Diff.	Spiked Dups ?	Percent Recovery
Vinyl chloride	10	N.D.				
Chloromethane	10	N.D.				
Bromomethane	10	N.D.				
Chloroethane	10	N.D.				
Trichlorofluoromethane	10	N.D.				
Acetone	100	N.D.				
1,1-Dichloroethene	5	N.D.				
Carbon disulfide	100	N.D.				
Methylene chloride	5	N.D.				
Methyl-t-butylether (MTBE)	10	N.D.				
1,2-Dichloroethene	5	N.D.				
1,1-Dichloroethane	5	N.D.				
Vinyl acetate	50	N.D.				
2-Butanone	100	N.D.				
Chloroform	5	N.D.				
1,1,1-Trichloroethane	5	N.D.				
Carbon tetrachloride	5	N.D.				
Benzene	5	N.D.				
1,2-Dichloroethane	5	N.D.				
Trichloroethene	5	N.D.				
1,2-Dichloropropane	5	N.D.				
Bromodichloromethane	5	N.D.				
4-Methyl-2-pentanone	50	N.D.				
cis-1,2-Dichloropropene	5	N.D.				
Toluene	5	N.D.				
trans-1,3-Dichloropropene	5	N.D.				
1,1,2-Trichloroethane	5	N.D.				
2-Hexanone	50	N.D.				
Tetrachloroethene	5	N.D.				
Dibromochloromethane	5	N.D.				
Chlorobenzene	5	N.D.				
Ethylbenzene	5	N.D.				
Xylenes	5	N.D.				
Styrene	5	N.D.				
Bromoform	5	N.D.				
1,1,2,2-Tetrachloroethane	5	N.D.				
Total Volatile Hydrocarbons	100	N.D.				

Surrogate Percent Recoveries (S=Surrogate recovery out of range)

1,2-Dichloroethane-D4. 110% D8-Toluene . . . . . 100% 4-Bromofluorobenzene . 106%

Notes: Capillary column used with EPA approval.

Remarks: E=Estimated Value J=Value may be in Error O=Value outside Standard Curve

8/04/93 Department of Environmental Conservation Laboratory
Method 8240 - Volatile Organics in Water GJD

Lab Id: 3179 Report To: DON MAYNARD Phone: 229-4600 Date Collected: 7/27/93
Location: MW-2 Program: 41 1402 Chain of Custody? Yes

Notes: JOHNSON CO.- MORRISTOWN TOWN GARAGE

Date Analyzed: 7/28/93 Over hold? No Dilution factor: 1

Parameter	Units are ug/l PQL	Result	Remark Code	Rel % Diff.	Spiked Dups ?	Percent Recovery
Vinyl chloride	10	N.D.				
Chloromethane	10	N.D.				
Bromomethane	10	N.D.				
Chloroethane	10	N.D.				
Trichlorofluoromethane	10	N.D.				
Acetone	100	N.D.				
1,1-Dichloroethene	5	N.D.				
Carbon disulfide	100	N.D.				
Methylene chloride	5	N.D.				
Methyl-t-butylether (MTBE)	10	N.D.				
1,2-Dichloroethene	5	N.D.				
1,1-Dichloroethane	5	N.D.				
Vinyl acetate	50	N.D.				
2-Butanone	100	N.D.				
Chloroform	5	N.D.				
1,1,1-Trichloroethane	5	N.D.				
Carbon tetrachloride	5	N.D.				
Benzene	5	N.D.				
1,2-Dichloroethane	5	N.D.				
Trichloroethene	5	N.D.				
1,2-Dichloropropane	5	N.D.				
Bromodichloromethane	5	N.D.				
4-Methyl-2-pentanone	50	N.D.				
cis-1,2-Dichloropropene	5	N.D.				
Toluene	5	N.D.				
trans-1,3-Dichloropropene	5	N.D.				
1,1,2-Trichloroethane	5	N.D.				
2-Hexanone	50	N.D.				
Tetrachloroethene	5	N.D.				
Dibromochloromethane	5	N.D.				
Chlorobenzene	5	N.D.				
Ethylbenzene	5	N.D.				
Xylenes	5	N.D.				
Styrene	5	N.D.				
Bromoform	5	N.D.				
1,1,2,2-Tetrachloroethane	5	N.D.				
Total Volatile Hydrocarbons	100	N.D.				

Surrogate Percent Recoveries (S=Surrogate recovery out of range)

1,2-Dichloroethane-D4. 112% D8-Toluene . . . . . 98% 4-Bromofluorobenzene . 106%

Notes: Capillary column used with EPA approval.

Remarks: E=Estimated Value J=Value may be in Error O=Value outside Standard Curve

8/04/93 Department of Environmental Conservation Laboratory
Method 8240 - Volatile Organics in Water GJD

Lab Id: 3180 Report To: DON MAYNARD Phone: 229-4600 Date Collected: 7/27/93
Location: MW-3 Program: 41 1402 Chain of Custody? Yes

Notes: JOHNSON CO.- MORRISTOWN TOWN GARAGE

Date Analyzed: 7/28/93 Over hold? No Dilution factor: 1

Parameter	Units are ug/l PQL	Result	Remark Code	Rel % Diff.	Spiked Dups ?	Percent Recovery
Vinyl chloride	10	N.D.				
Chloromethane	10	N.D.				
Bromomethane	10	N.D.				
Chloroethane	10	N.D.				
Trichlorofluoromethane	10	N.D.				
Acetone	100	N.D.				
1,1-Dichloroethene	5	N.D.				
Carbon disulfide	100	N.D.				
Methylene chloride	5	N.D.				
Methyl-t-butylether (MTBE)	10	N.D.				
1,2-Dichloroethene	5	N.D.				
1,1-Dichloroethane	5	N.D.				
Vinyl acetate	50	N.D.				
2-Butanone	100	N.D.				
Chloroform	5	N.D.				
1,1,1-Trichloroethane	5	N.D.				
Carbon tetrachloride	5	N.D.				
Benzene	5	N.D.				
1,2-Dichloroethane	5	N.D.				
Trichloroethene	5	N.D.				
1,2-Dichloropropane	5	N.D.				
Bromodichloromethane	5	N.D.				
4-Methyl-2-pentanone	50	N.D.				
cis-1,2-Dichloropropene	5	N.D.				
Toluene	5	N.D.				
trans-1,3-Dichloropropene	5	N.D.				
1,1,2-Trichloroethane	5	N.D.				
2-Hexanone	50	N.D.				
Tetrachloroethene	5	N.D.				
Dibromochloromethane	5	N.D.				
Chlorobenzene	5	N.D.				
Ethylbenzene	5	N.D.				
Xylenes	5	N.D.				
Styrene	5	N.D.				
Bromoform	5	N.D.				
1,1,2,2-Tetrachloroethane	5	N.D.				
Total Volatile Hydrocarbons	100	N.D.				

Surrogate Percent Recoveries (S=Surrogate recovery out of range)

1,2-Dichloroethane-D4. 110% D8-Toluene . . . . . 98% 4-Bromofluorobenzene . 106%

Notes: Capillary column used with EPA approval.

Remarks: E=Estimated Value J=Value may be in Error O=Value outside Standard Curve

8/04/93 Department of Environmental Conservation Laboratory
Method 8240 - Volatile Organics in Water GJD

Lab Id: 3181 Report To: DON MAYNARD Phone: 229-4600 Date Collected: 7/27/93
Location: TP-WELL TRAILER PARK Program: 41 1402 Chain of Custody? Yes
PINE CREST
Notes: JOHNSON CO.- MORRISTOWN TOWN GARAGE

Date Analyzed: 7/28/93 Over hold? No Dilution factor: 1

Parameter	Units are ug/l PQL	Result	Remark Code	Rel % Diff.	Spiked Dups ?	Percent Recovery
Vinyl chloride	10	N.D.				
Chloromethane	10	N.D.				
Bromomethane	10	N.D.				
Chloroethane	10	N.D.				
Trichlorofluoromethane	10	N.D.				
Acetone	100	N.D.				
1,1-Dichloroethene	5	N.D.				
Carbon disulfide	100	N.D.				
Methylene chloride	5	N.D.				
Methyl-t-butylether (MTBE)	10	N.D.				
1,2-Dichloroethene	5	N.D.				
1,1-Dichloroethane	5	N.D.				
Vinyl acetate	50	N.D.				
2-Butanone	100	N.D.				
Chloroform	5	N.D.				
1,1,1-Trichloroethane	5	N.D.				
Carbon tetrachloride	5	N.D.				
Benzene	5	N.D.				
1,2-Dichloroethane	5	N.D.				
Trichloroethene	5	N.D.				
1,2-Dichloropropane	5	N.D.				
Bromodichloromethane	5	N.D.				
4-Methyl-2-pentanone	50	N.D.				
cis-1,2-Dichloropropene	5	N.D.				
Toluene	5	N.D.				
trans-1,3-Dichloropropene	5	N.D.				
1,1,2-Trichloroethane	5	N.D.				
2-Hexanone	50	N.D.				
Tetrachloroethene	5	N.D.				
Dibromochloromethane	5	N.D.				
Chlorobenzene	5	N.D.				
Ethylbenzene	5	N.D.				
Xylenes	5	N.D.				
Styrene	5	N.D.				
Bromoform	5	N.D.				
1,1,2,2-Tetrachloroethane	5	N.D.				
Total Volatile Hydrocarbons	100	N.D.				

Surrogate Percent Recoveries (S=Surrogate recovery out of range)

1,2-Dichloroethane-D4. 108% D8-Toluene . . . . . 98% 4-Bromofluorobenzene . 106%

Notes: Capillary column used with EPA approval.

Remarks: E=Estimated Value J=Value may be in Error O=Value outside Standard Curve

8/04/93 Department of Environmental Conservation Laboratory
Method 8240 - Volatile Organics in Water GJD

Lab Id: 3182 Report To: DON MAYNARD Phone: 229-4600 Date Collected: 7/27/93
Location: BS-WELL SMALL WATER WELL Program: 41 1402 Chain of Custody? Yes

Notes: JOHNSON CO.- MORRISTOWN TOWN GARAGE

Date Analyzed: 7/28/93 Over hold? No Dilution factor: 1

Parameter	Units are ug/l PQL	Result	Remark Code	Rel % Diff.	Spiked Dups ?	Percent Recovery
Vinyl chloride	10	N.D.				
Chloromethane	10	N.D.				
Bromomethane	10	N.D.				
Chloroethane	10	N.D.				
Trichlorofluoromethane	10	N.D.				
Acetone	100	N.D.				
1,1-Dichloroethene	5	N.D.				
Carbon disulfide	100	N.D.				
Methylene chloride	5	N.D.				
Methyl-t-butylether (MTBE)	10	N.D.				
1,2-Dichloroethene	5	N.D.				
1,1-Dichloroethane	5	N.D.				
Vinyl acetate	50	N.D.				
2-Butanone	100	N.D.				
Chloroform	5	N.D.				
1,1,1-Trichloroethane	5	N.D.				
Carbon tetrachloride	5	N.D.				
Benzene	5	N.D.				
1,2-Dichloroethane	5	N.D.				
Trichloroethene	5	N.D.				
1,2-Dichloropropane	5	N.D.				
Bromodichloromethane	5	N.D.				
4-Methyl-2-pentanone	50	N.D.				
cis-1,2-Dichloropropene	5	N.D.				
Toluene	5	N.D.				
trans-1,3-Dichloropropene	5	N.D.				
1,1,2-Trichloroethane	5	N.D.				
2-Hexanone	50	N.D.				
Tetrachloroethene	5	N.D.				
Dibromochloromethane	5	N.D.				
Chlorobenzene	5	N.D.				
Ethylbenzene	5	N.D.				
Xylenes	5	N.D.				
Styrene	5	N.D.				
Bromoform	5	N.D.				
1,1,2,2-Tetrachloroethane	5	N.D.				
Total Volatile Hydrocarbons	100	N.D.				

Surrogate Percent Recoveries (S=Surrogate recovery out of range)

1,2-Dichloroethane-D4. 110% D8-Toluene . . . . . 98% 4-Bromofluorobenzene . 106%

Notes: Capillary column used with EPA approval.

Remarks: E=Estimated Value J=Value may be in Error O=Value outside Standard Curve

8/04/93 Department of Environmental Conservation Laboratory
Method 8240 - Volatile Organics in Water GJD

Lab Id: 3183 Report To: DON MAYNARD Phone: 229-4600 Date Collected: 7/27/93
Location: GARAGE MORRISTOWN WELL #3 Program: 41 1402 Chain of Custody? Yes
Notes: JOHNSON CO.- MORRISTOWN TOWN GARAGE

Date Analyzed: 7/28/93 Over hold? No Dilution factor: 1

Parameter	Units are ug/l PQL	Result	Remark Code	Rel % Diff.	Spiked Dups ?	Percent Recovery
Vinyl chloride	10	N.D.				
Chloromethane	10	N.D.				
Bromomethane	10	N.D.				
Chloroethane	10	N.D.				
Trichlorofluoromethane	10	N.D.				
Acetone	100	N.D.				
1,1-Dichloroethene	5	N.D.				
Carbon disulfide	100	N.D.				
Methylene chloride	5	N.D.				
Methyl-t-butylether (MTBE)	10	N.D.				
1,2-Dichloroethene	5	N.D.				
1,1-Dichloroethane	5	N.D.				
Vinyl acetate	50	N.D.				
2-Butanone	100	N.D.				
Chloroform	5	N.D.				
1,1,1-Trichloroethane	5	N.D.				
Carbon tetrachloride	5	N.D.				
Benzene	5	N.D.				
1,2-Dichloroethane	5	N.D.				
Trichloroethene	5	N.D.				
1,2-Dichloropropane	5	N.D.				
Bromodichloromethane	5	N.D.				
4-Methyl-2-pentanone	50	N.D.				
cis-1,2-Dichloropropene	5	N.D.				
Toluene	5	N.D.				
trans-1,3-Dichloropropene	5	N.D.				
1,1,2-Trichloroethane	5	N.D.				
2-Hexanone	50	N.D.				
Tetrachloroethene	5	N.D.				
Dibromochloromethane	5	N.D.				
Chlorobenzene	5	N.D.				
Ethylbenzene	5	N.D.				
Xylenes	5	N.D.				
Styrene	5	N.D.				
Bromoform	5	N.D.				
1,1,2,2-Tetrachloroethane	5	N.D.				
Total Volatile Hydrocarbons	100	N.D.				

Surrogate Percent Recoveries (S=Surrogate recovery out of range)

1,2-Dichloroethane-D4. 108% D8-Toluene . . . . . 98% 4-Bromofluorobenzene . 106%

Notes: Capillary column used with EPA approval.

Remarks: E=Estimated Value J=Value may be in Error O=Value outside Standard Curve

1.1356-1

8/04/93 Department of Environmental Conservation Laboratory
Method 8240 - Volatile Organics in Water GJD

Lab Id: 3177 Report To: DON MAYNARD Phone: 229-4600 Date Collected: 7/27/93
Location: TRIP BLANK Program: 41 1402 Chain of Custody? Yes

Notes: JOHNSON CO.- MORRISTOWN TOWN GARAGE

Date Analyzed: 7/28/93 Over hold? No Dilution factor: 1

Parameter	Units are ug/l PQL	Result	Remark Code	Rel % Diff.	Spiked Dups ?	Percent Recovery
Vinyl chloride	10	N.D.				
Chloromethane	10	N.D.				
Bromomethane	10	N.D.				
Chloroethane	10	N.D.				
Trichlorofluoromethane	10	N.D.				
Acetone	100	N.D.				
1,1-Dichloroethene	5	N.D.				
Carbon disulfide	100	N.D.				
Methylene chloride	5	N.D.				
Methyl-t-butylether (MTBE)	10	N.D.				
1,2-Dichloroethene	5	N.D.				
1,1-Dichloroethane	5	N.D.				
Vinyl acetate	50	N.D.				
2-Butanone	100	N.D.				
Chloroform	5	N.D.				
1,1,1-Trichloroethane	5	N.D.				
Carbon tetrachloride	5	N.D.				
Benzene	5	N.D.				
1,2-Dichloroethane	5	N.D.				
Trichloroethene	5	N.D.				
1,2-Dichloropropane	5	N.D.				
Bromodichloromethane	5	N.D.				
4-Methyl-2-pentanone	50	N.D.				
cis-1,2-Dichloropropene	5	N.D.				
Toluene	5	N.D.				
trans-1,3-Dichloropropene	5	N.D.				
1,1,2-Trichloroethane	5	N.D.				
2-Hexanone	50	N.D.				
Tetrachloroethene	5	N.D.				
Dibromochloromethane	5	N.D.				
Chlorobenzene	5	N.D.				
Ethylbenzene	5	N.D.				
Xylenes	5	N.D.				
Styrene	5	N.D.				
Bromoform	5	N.D.				
1,1,2,2-Tetrachloroethane	5	N.D.				
Total Volatile Hydrocarbons	100	N.D.				

Surrogate Percent Recoveries (S=Surrogate recovery out of range)

1,2-Dichloroethane-D4. 102% D8-Toluene . . . . . 96% 4-Bromofluorobenzene . 106%

Notes: Capillary column used with EPA approval.

Remarks: E=Estimated Value J=Value may be in Error O=Value outside Standard Curve

Submitted by: W.DAVEY Phone: 229-4600 Date Collected: 7/27/93
Lab Report to: DON MAYNARD Custody: Y Date Submitted: 7/27/93
Program #: 41 Activity code: Date Required: 8/24/93

Notes: JOHNSON CO.- MORRISTOWN TOWN GARAGE

**** Tests Requested ****

W8240

Lab Id	Location	Lab Id	Location
3177	TRIP BLANK	3178	MW-1
3179	MW-2	3180	MW-3
3181	TP-WELL	3182	BS-WELL
3183	GARAGE		

CHAIN OF CUSTODY RECORD

№ 1056

Client/Project Name	Project Location
	VT
Project No.	**Field Logbook No.**
Sampler: (*Signature*)	**Chain of Custody Tape No.**

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample							REMARKS

Relinquished by: (*Signature*)	Date	Time	Received by: (*Signature*)	Date	Time
Relinquished by: (*Signature*)	**Date**	**Time**	**Received by: (*Signature*)**	**Date**	**Time**
Relinquished by: (*Signature*)	**Date**	**Time**	**Received for Laboratory: (*Signature*)**	**Date**	**Time**
Sample Disposal Method:	**Disposed of by: (*Signature*)**			**Date**	**Time**

SAMPLE COLLECTOR

5 State Street
Montpelier, VT 05602
(802) 229-4600
Fax: (802) 229-5876

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering

ANALYTICAL LABORATORY

1974-3-84

WHITE - To accompany sample to the lab and returned to the Johnson Co. YELLOW - Lab copy PINK - Transporter copy ORANGE - Sampler copy

JUL 08 1993

/93

Department of Environmental Conservation Laboratory
Method 8240 - Volatile Organics in Water

GJD

Id: 2230 Report To: M/ROY Phone: 241-3888 Date Collected: 6/25/93
cation: HUART Program: 41 1402 Chain of Custody? No

otes: SITE MANAGER IS UA. GIVE RESULTS TO CHUCK SCHWER. SITE #931402

ite Analyzed: 6/29/93 Over hold? No Dilution factor: 1

Parameter	Units are ug/l PQL	Result	Remark Code	Rel % Diff.	Spiked Dups ?	Percent Recovery
Vinyl chloride	10	N.D.				
Chloromethane	10	N.D.				
Bromomethane	10	N.D.				
Chloroethane	10	N.D.				
Trichlorofluoromethane	10	N.D.				
Acetone	100	N.D.				
1,1-Dichloroethene	5	N.D.				
Carbon disulfide	100	N.D.				
Methylene chloride	5	N.D.				
Methyl-t-butylether (MTBE)	10	N.D.				
1,2-Dichloroethene	5	N.D.				
1,1-Dichloroethane	5	N.D.				
Vinyl acetate	50	N.D.				
2-Butanone	100	N.D.				
Chloroform	5	N.D.				
1,1,1-Trichloroethane	5	N.D.				
Carbon tetrachloride	5	N.D.				
Benzene	5	N.D.				
1,2-Dichloroethane	5	N.D.				
Trichloroethene	5	N.D.				
1,2-Dichloropropane	5	N.D.				
Bromodichloromethane	5	N.D.				
4-Methyl-2-pentanone	50	N.D.				
cis-1,2-Dichloropropene	5	N.D.				
Toluene	5	N.D.				
trans-1,3-Dichloropropene	5	N.D.				
1,1,2-Trichloroethane	5	N.D.				
2-Hexanone	50	N.D.				
Tetrachloroethene	5	N.D.				
Dibromochloromethane	5	N.D.				
Chlorobenzene	5	N.D.				
Ethylbenzene	5	N.D.				
Xylenes	5	N.D.				
Styrene	5	N.D.				
Bromoform	5	N.D.				
1,1,2,2-Tetrachloroethane	5	N.D.				
Total Volatile Hydrocarbons	100	N.D.				

urrogate Percent Recoveries (S=Surrogate recovery out of range)

1,2-Dichloroethane-D4. 98% D8-Toluene . . . . . 108% 4-Bromofluorobenzene . 106%

Notes: Capillary column used with EPA approval.

emarks: E=Estimated Value J=Value may be in Error O=Value outside Standard Curve

PRODUCTION WELL #3
LOCATED 500' N20W
USED BY GARAGE, DESMORE AND BLANCHETTE.
PUMPING WATER LEVEL 102.5 (BELOW TOC).
ESTIMATED GROUNDWATER ELEV. 740'

BARRY SMALL
WELL ~250' NNE

PRODUCTION WELL #2
(UNUSED) (W)
WATER LEVEL 756.0

PROPERTY OF
SMALL

SMALL

DESMORE

POWER
POLE #14A

TOE OF SLOPE

SAND SHED

EDGE OF BLACKTOP/ASPHALT

ROCK

SALT SHED

WOOD SHED

TOWN GARAGE

PRODUCTION WELL #1
(UNUSED)
(W)
WATER LEVEL 748.7

BEDROCK AQUIFER GROUNDWATER FLOW DIRECTION

SEPTIC TANK

OIL/SAND SEPARATOR

MW-2 W/L 748.85 (W)

500 GAL. USED OIL

TBM
780.3
GS AT CORNER

8000 GAL. DIESEL TANK

PUMPS

5000 GAL. GAS TANK

MW-3 (W) W/L 748.73

MW-1 W/L 748.82 (W)

1000 GAL. GAS TANK

SEWAGE LEACH FIELDS

ROCK

EDGE OF BLACKTOP/ASPHALT

SURFICIAL AQUIFER GROUNDWATER FLOW DIRECTION

FLOOR DRAIN LEACH FIELDS

TOE OF SLOPE

POWER
POLE

LOWE WELL (UNUSED)
WATER LEVEL 747.9 (W)

DESMORE

BLANCHETTE

PROPERTY OF
DESMORE

PROPERTY OF
BLANCHETTE

LANDS OF
PINECREST

COCHRAN ROAD (TOWN HIGHWAY #54)

PINECREST MOBILE HOME PARK
WATER SUPPLY WELL
(W)
TOC ELEV. 787.4
PUMPING WATER LEVEL < 700.0

MAGNETIC

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

LEGEND

- PROPERTY LINE
- SURFICIAL AQUIFER GROUNDWATER ELEVATION (CONTOUR INTERVAL = 0.1')
- BEDROCK AQUIFER GROUNDWATER ELEVATION (CONTOUR INTERVAL= 1.0')
- APPROX. LOCATIONS OF FORMER UNDERGROUND STORAGE TANKS (ALL REMOVED FROM SITE)
- EDGE OF BLACKTOP/ASPHALT
- TOE OF SLOPE
- WELL ID (W) — WELL LOCATION

NOTES

ALL WATER LEVEL ELEVATIONS MEASURED ON 7/22/93.

Rev. No.	Date	Description	Made by	Chk'd by	App'd by

SITE INVESTIGATION
MORRISTOWN TOWN GARAGE
MORRISTOWN, VERMONT

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
5 STATE STREET
MONTPELIER, VERMONT 05602

AUG 19 1993

Sheet 1 of 1
Scale: 1"= 30'
Drawn by LRH
Chk'd by DMM
Date 7/26/93
Job 1-1356-1

1-1356-1\MTGARAGE