

Phase (check one)	Type (check one)
<input type="checkbox"/> Initial Site Investigation <input type="checkbox"/> Corrective Action Feasibility Investigation <input type="checkbox"/> Corrective Action Plan <input type="checkbox"/> Corrective Action Summary Report <input type="checkbox"/> Operations & Monitoring Report	<input type="checkbox"/> Work Scope <input type="checkbox"/> Technical Report <input type="checkbox"/> PCF Reimbursement Request <input type="checkbox"/> General Correspondence

INITIAL SITE INVESTIGATION

CALMART GAS STATION

Calmart Gas Station
Site # 94-1621
97 Main Street (Route 5)
Lyndonville, Vermont

October 7, 1994

A Facility Owned by:

THE CALEDONIA OIL COMPANY

99 Main Street
 Lyndonville, Vermont 05851
 (802) 626-9052

Prepared by:

THE JOHNSON COMPANY, INC.

100 State Street, Suite 600
 Montpelier, Vermont 05602
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EXECUTIVE SUMMARY

A subsurface release of gasoline was discovered in the Spring of 1994 during the process of upgrading the piping system at the Calmart Gas Station at 97 Main Street in Lyndonville, Vermont. A preliminary subsurface investigation was performed by The Johnson Company during June, 1994 to assess the nature and extent of subsurface contamination resulting from the release. The preliminary investigation consisted of test pits, soil borings, groundwater monitoring well installation, groundwater level measurement, groundwater mapping and laboratory testing of soils and groundwater. These data, presented in a July 1994 report by The Johnson Company indicated that subsurface soils and groundwater had been contaminated by gasoline in the vicinity of the site, and that the indicated direction of ground water flow was toward the west.

Based upon their review of the results of the preliminary investigation, the State of Vermont Hazardous Material Management Division recommended that additional subsurface investigations be performed to more completely ascertain the extent of the contamination that was encountered.

The Johnson Company performed these additional subsurface investigations during August and September of 1994. The additional investigations consisted of performance of seven additional soil borings, installation of four additional groundwater monitoring wells, additional water level measurements and groundwater mapping, a sensitive receptor survey including PID screening of basements, screening of stockpiled soils, and laboratory testing of additional soil and groundwater samples.

The results of these additional investigations are that subsurface soils and surficial groundwater in the vicinity of, and to the west of, the fuel pump island are contaminated above enforcement standards with gasoline and that concentrations of soil and groundwater contamination extends in a westerly direction for a distance of at least 50 feet. It appears that the groundwater plume was migrating toward the west and had crossed U.S. Route 5 as of September 8, 1994.

No nearby water supplies or surface water appears to be currently at risk of contamination from this contamination.

Based upon the findings and conclusions of this additional work we recommend that remedial measures be undertaken to limit the westward migration of the groundwater plume, and to reduce the level of contamination in the vadose zone and groundwater. In the short term, additional vapor screening of nearby basements is recommended, as is additional groundwater monitoring. A pilot test of soil vapor extraction and possibly air sparging is recommended to test the viability of this method to remove contaminants from the vadose zone. A groundwater pumping and treatment system may be needed to increase the vadose zone thickness and to control plume migration. Also recommended are permeability tests in the existing monitoring wells to predict contaminant transport velocities and to evaluate the potential effectiveness of a groundwater extraction system.

within approximately 50 feet distance from monitoring well MW-7. This confirms the reported probable source as a leaking pipe knuckle located between MW-6 and MW-7.

At SB-2, the greatest reported PID measurement was in the shallow soils at a depth of 4' bgs. This may indicate that contamination in the vicinity of SB-2 was derived from vapor movement through the vadose zone rather than through groundwater transport, because groundwater transport would be anticipated to produce its greatest measurements at, or slightly below, the water table.

2.1.4 Laboratory Soils Sampling and Analysis

Soil samples were collected for laboratory analysis from all of the additional soil borings except for MW-5. All samples were chilled upon collection and were sent via Chain of Custody procedure to Scitest Inc., an analytical testing laboratory located in Randolph, Vermont. Laboratory analytical methods for the soil samples consisted of EPA method 8015 for total petroleum hydrocarbons (TPH) quantified as gasoline. The results of the laboratory testing are summarized in Table 2-2 below. A copy of the laboratory analytical report is included as Attachment 4.

Location	Reported TPH Concentration	Collection Depth
MW-6	820 ppm	9-11' bgs
MW-7	98 ppm	11-13' bgs
MW-8	17 ppm	9-11' bgs
SB-1	140 ppm	13-15' bgs
SB-2	<0.13 ppm	3-5' bgs
SB-3	0.33 ppm	9-11' bgs

The soil samples for laboratory analysis were collected from the soil horizon which produced the highest PID measurement in that boring. With one exception (SB-2), all of the soil samples were collected from beneath the water table. The highest reported soil contamination was in boring MW-6, closest to the Calmart gasoline island, and the degree of subaqueous soil contamination declined in a westward direction. The next-highest reported TPH value was in MW-7; these results are in close relative agreement with the PID headspace measurements collected during the advancement of the soil borings. The only soil sample

1.0 INTRODUCTION

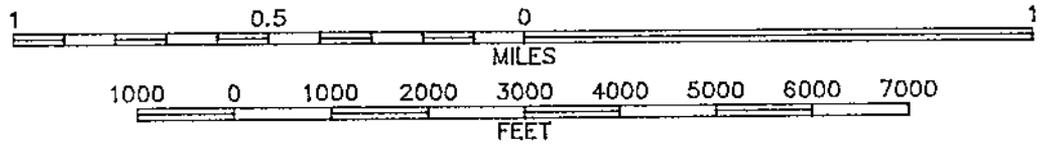
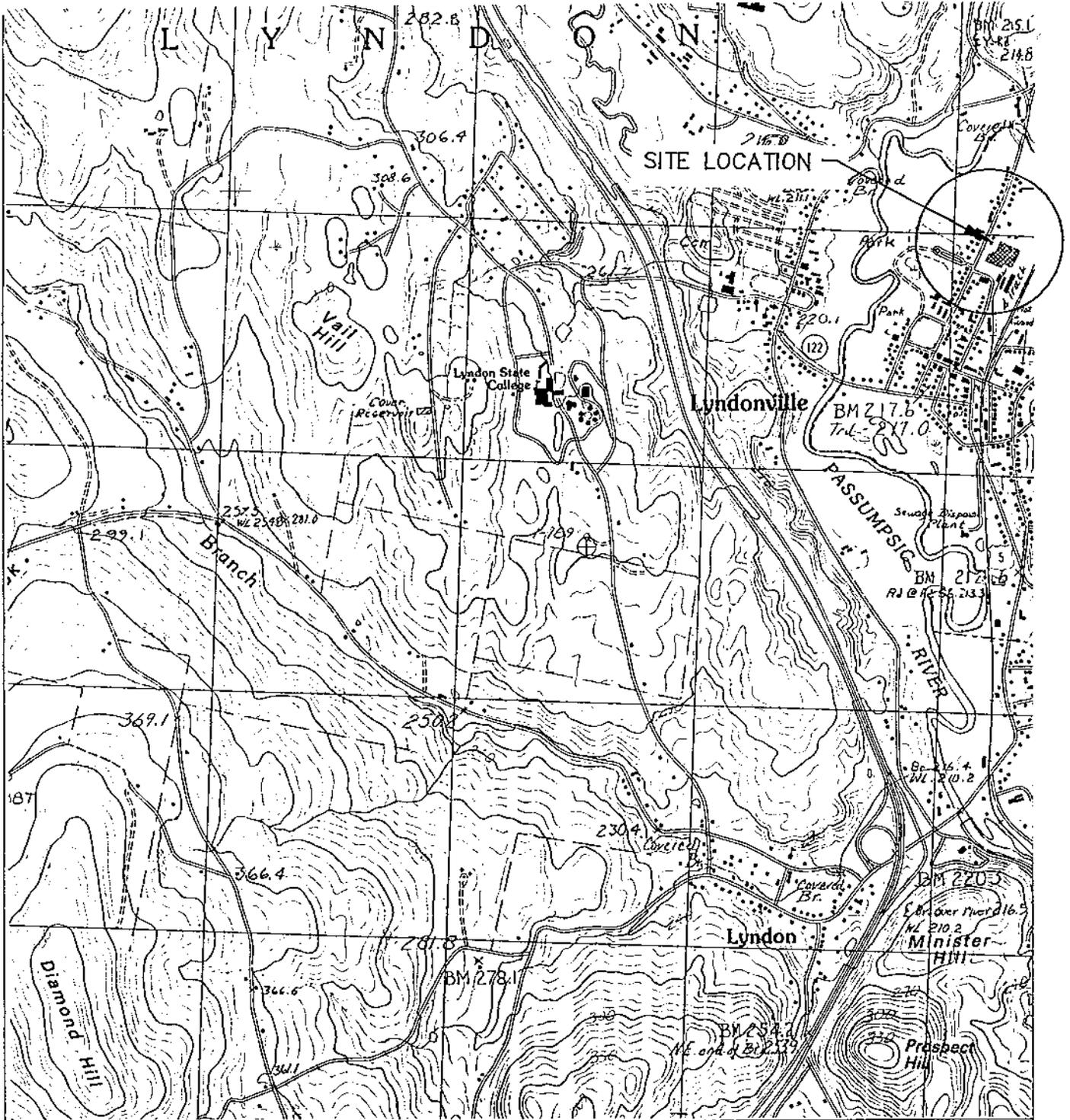
A release of gasoline was discovered in the Spring of 1994 during the process of upgrading the piping system at the Calmart Gas Station at 97 Main Street in Lyndonville, Vermont ("Calmart") (Figures 1 and 2). Subsequently, The Johnson Company examined the soils by means of four backhoe test pits and four soil borings. Four groundwater monitoring wells were also installed at Calmart during this preliminary investigation. Laboratory analytical results from soils and groundwater obtained during the preliminary site investigation indicated that significant gasoline contamination of soils and groundwater was present beneath the Calmart site (Caledonia Oil Company Report, prepared 7/12/94 by The Johnson Company).

Based upon their review of the results of the preliminary investigation, the State of Vermont, Hazardous Materials Management Division (HMMD) recommended that additional subsurface investigations be completed at Calmart. These included: additional monitoring well installation and sampling; basement screening; utility corridor investigation; and stockpiled soils field screening. These recommendations were included in an August 5, 1994 letter from HMMD to The Johnson Company, a copy of which is included as Attachment 1.

The Johnson Company submitted a workplan for additional investigations to the HMMD on August 17, 1994. The HMMD granted verbal approval for the additional investigations during August 1994, based upon the information contained in the workplan (Michael Young, HMMD, Personal Comm. on October 5, 1994). The Johnson Company has completed these additional investigations, and the results thereof, and the resulting remedial recommendations, are summarized in Section 3.0 of this report.

2.0 METHODOLOGY

The work that was performed during the additional site investigation at Calmart included: advancement of seven soil borings, field screening of recovered soils for volatile organic compounds, installation of four additional groundwater monitoring wells, collection and laboratory analysis of 6 soil samples and 8 groundwater samples, several rounds of groundwater level measurement, screening of stockpiled contaminated soils and performance of a sensitive receptor survey to identify those receptors potentially at risk from this release.



CONTOUR INTERVAL 20 FEET



BASE MAP : USGS 7.5 Minute Topographic Quadrangle: Lyndonville, VT (Provisional Edition 1986).

FIGURE 1 : Site Location Map
 Calmart Gas Station
 Lyndonville, Vermont

THE JOHNSON COMPANY, INC.
 Environmental Sciences and Engineering
 100 STATE STREET MONTPELIER, VT 05602

SOURCES

TOWN OF LYNDONVILLE, VERMONT TAX MAP.

"TOWN OF LYNDONVILLE -- SITE PLANS", PREPARED BY DUBOIS AND KING, DATED 1975.

"SITE PLAN" FROM REMEDIAL SITE EVALUATION REPORT, PREPARED BY ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., DATED 11/14/91.

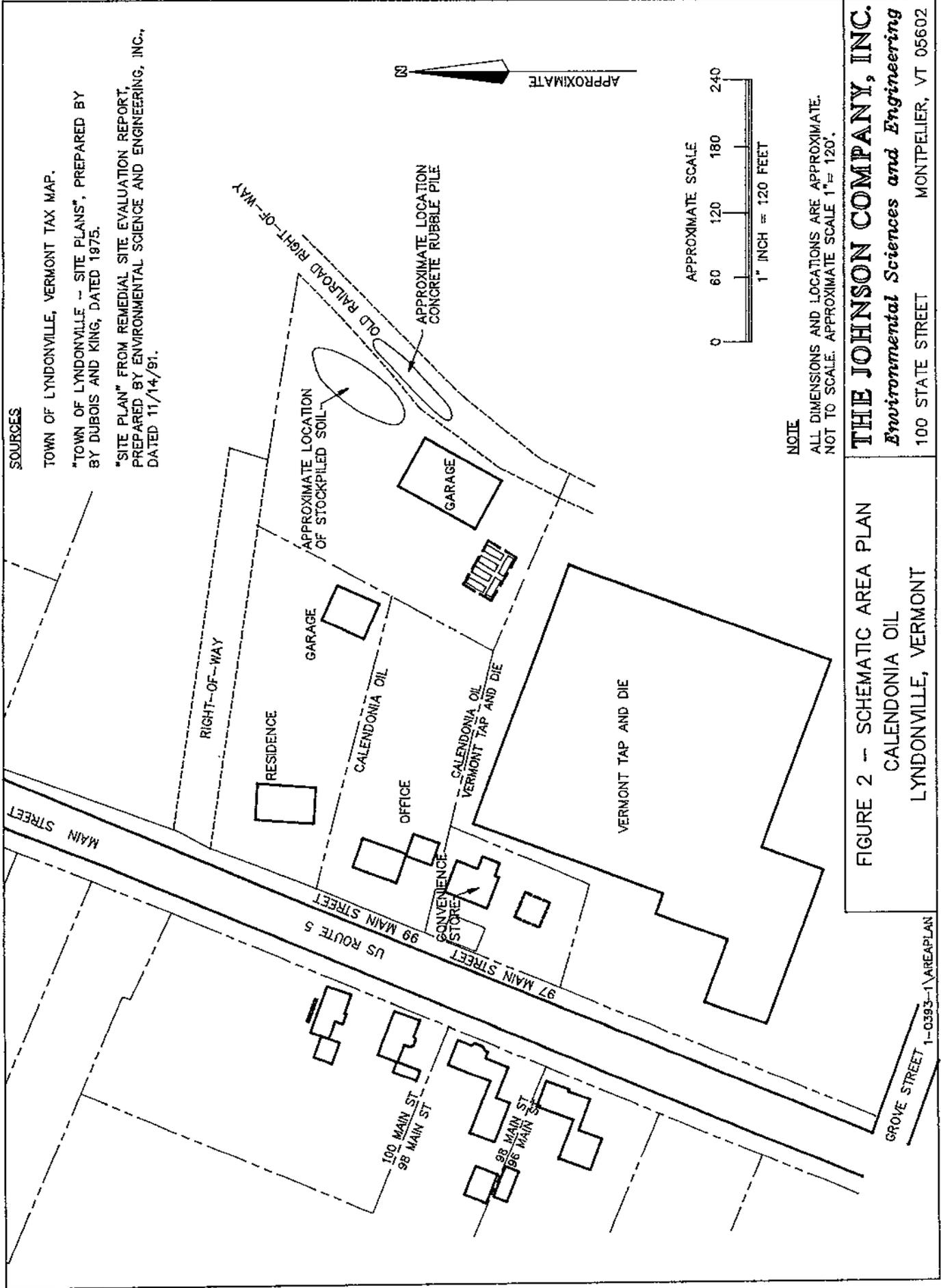


FIGURE 2 -- SCHEMATIC AREA PLAN
 CALENDONIA OIL
 LYNDONVILLE, VERMONT

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1-0393-1\AREAPLAN

2.1 SOIL BORINGS

Seven soil borings were advanced at Calmart on August 24-25, 1994 by Tristate Drilling and Boring, Inc. of West Burke, Vermont. The Johnson Company provided oversight of the soil boring work. The locations of these additional borings, as well as of the previous soil borings, are shown on the Site Plan (Figure 2 and Attachment 2). Detailed boring logs are included in Attachment 3.

The seven new soil borings are labelled as follows: SB-1, SB-2, and SB-3; and MW-5, MW-6, MW-7 and MW-8. The information gained from these additional soil borings complements the information obtained during the installation of the preliminary soil borings MW-1, MW-2, MW-3 and MW-4 and provides additional aerial coverage of the extent of contamination.

2.1.1 Subsurface Stratigraphy

In general, the additional Calmart soil borings indicate a similar stratigraphy as do the preliminary soil borings (MW-1, MW-2, MW-3 and MW-4). A shallow layer of asphalt and fill is generally underlain by a sand and gravel horizon to a depth of approximately 8-10 feet below ground surface (bgs). At approximately 8-10 feet bgs, this sand and gravel unit is underlain with a sharp horizontal contact by a silt/fine sand unit, which was penetrated but not punctured during the conduct of the soil borings. This unit is composed of alternating layers of fine sand and silt. The fine grained layers may have contained the release to the upper 15-20 feet of the unconsolidated soil profile.

In soil boring MW-7 (in U.S. Route 5 west of the filling station), the upper horizon of the silty layer was interbedded with grey fine sand. The fine sand was in turn underlain at approximately 13 feet bgs with more silt, so it is believed that the protective function of the silt is undiminished by this variation in the stratigraphy.

This stratigraphy is confirmed by numerous borings conducted by ESE at the neighboring Vermont Tap and Die Facility (ESE, "Phase II Report and Corrective Action Plan", March 31, 1994).

2.1.2 Preferential Flow Paths

Utility trenches dug into fine grained soils can result in the formation of preferential groundwater flow paths if the utility trenches are below the water table. However, these utility trenches cannot likely form preferential pathways; according to the Town of Lyndonville, the bury depths of the known subsurface utilities near Calmart place these in the unsaturated sand and gravel deposit, not in the saturated silt deposit where preferential groundwater flow could occur.

Soil borings SB-1, SB-2, SB-3, MW-6, MW-7 and MW-8 were installed to assess the extent of the release immediately downgradient of the release site, and to investigate the possibility of preferential flow of contaminated groundwater and/or vapor through the utility corridors beneath Route 5. Also, boring locations MW-2 and MW-3 are proximal to U.S. Route 5 and the known utility trenches, and previously existing data from these locations was used in determining that preferential flow paths do not exist.

2.1.3 Soil Sampling and Field Screening Methods/Results

Split spoon sampling was performed continuously during the advancement of the soil borings. A calibrated OVM 580B photoionization detector (PID) with a 10.2 eV lamp was used to perform bag headspace measurements on soils collected from the split spoon sampler during the advancement of the soil borings. The PID was calibrated to 101 ppm isobutylene gas each day before use. In the bag headspace method, a reclosable bag filled half with soil and half with air is sealed and is allowed to equalize for several minutes; then the vacuum tip of the PID is inserted into the bag so that a sample of the air in the bag is drawn into the ionization chamber. The number of molecules of volatile chemical in the chamber is estimated by the machine and this is theoretically proportional to the total number of molecules of volatile chemical in the soils. PID measurements are good relative indicators of the severity and distribution of contamination beneath the ground, but they do not convert directly to actual chemical concentrations and they do not identify which chemicals are present. Laboratory analytical tests are required to accomplish these goals, see Section 2.1.4.

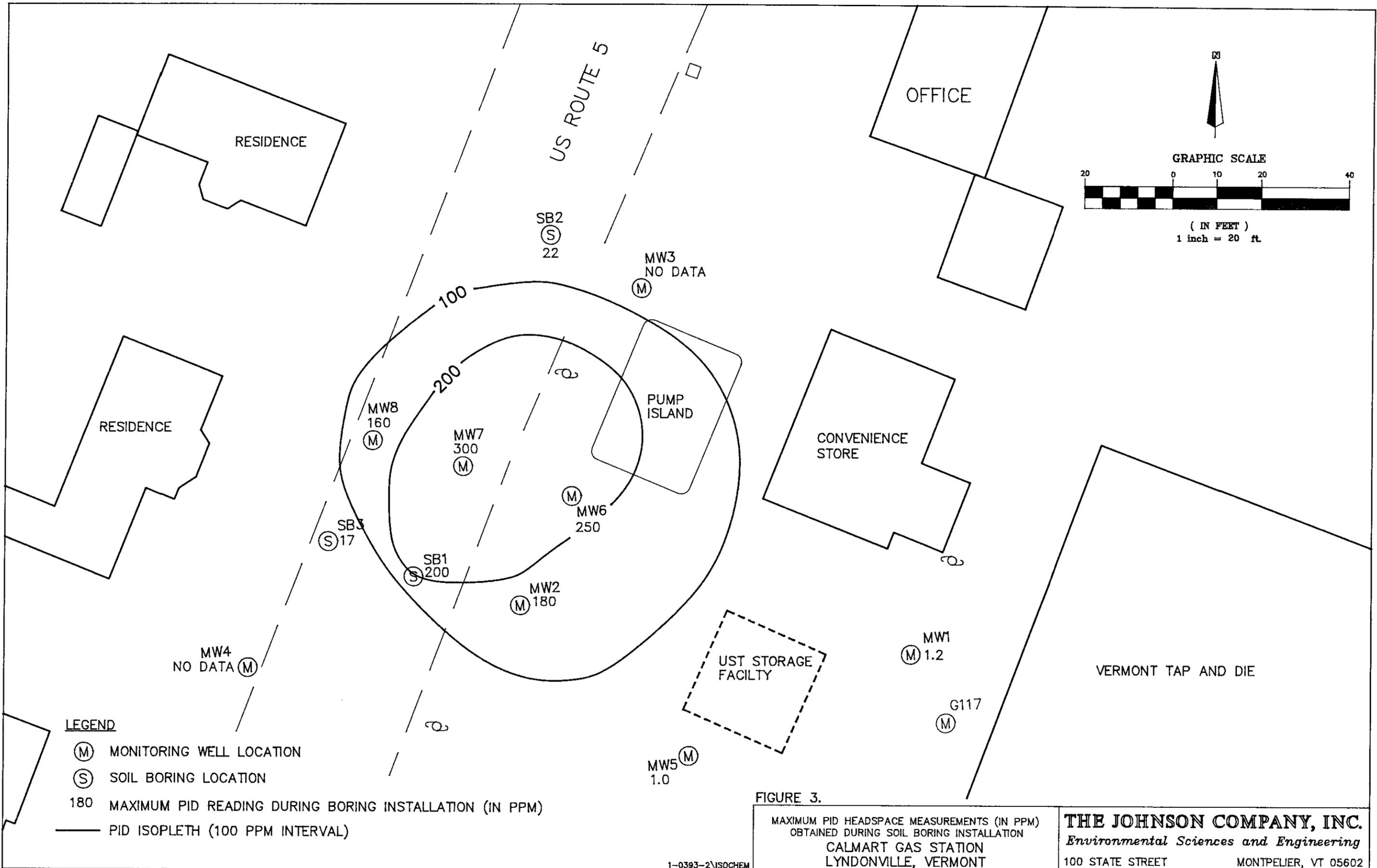
The PID measurements collected during the advancement of soil borings MW-2, MW-6, MW-7, MW-8 and SB-1 indicated the presence of significant soil contamination. The magnitude of soil contamination was generally lowest immediately below the ground surface and increased rapidly with depth, reaching approximately 200 ppm at, or slightly below the water table.

**TABLE 2-1
REPORTED MAXIMUM PID HEADSPACE MEASUREMENTS
OBTAINED DURING SOIL BORINGS - CALMART**

Location	Max. Value (ppm)	Depth
MW-1	1.2	11' bgs (5/31/94)
MW-2	180	9' bgs (5/31/94)
MW-3	----	----
MW-4	----	----
MW-5	1.0	10' bgs (8/24/94)
MW-6	250	10' bgs (8/24/94)
MW-7	300	12' bgs (8/25/94)
MW-8	160	10' bgs (8/25/94)
SB-1	200	12-14' bgs (8/25/94)
SB-2	22	4' bgs (8/25/94)
SB-3	17	10' bgs (8/25/94)

The PID measurements collected from soil borings MW-1, MW-5, SB-2 and SB-3 indicated lower, but still positive, PID measurements. Soil boring MW-5 is adjacent to the UST installation, while SB-2 and SB-3 are located in U.S. Route 5. An instrument malfunction prevented the collection of headspace measurements during the installation of soil borings MW-3 and MW-4.

Figure 3 is a map view plot of the highest PID measurement obtained in each soil boring during their installation. Contour lines of extrapolated equal PID measurements were plotted based upon the field-measured values. PID contour lines indicate a circular (in two dimensions) distribution of contamination centered on monitoring well MW-7. PID measurements from MW-6, MW-7, MW-8, and SB-1 were all over 150 ppmV. Declining trends of PID measurements are predicted in all directions outward from MW-7 as of August 24-25. The groundwater table beneath the site was generally about 8-9' bgs during the installation of the soil borings. Since most of the PID measurements which were used for the plot (except at MW-1 and MW-2) were collected from at or slightly beneath the groundwater table, they most likely represent the approximate distribution of groundwater-borne volatile contamination as of August 24-25, 1994. At that time, groundwater contamination appears to have declined rapidly in all directions to below 100 ppmV



within approximately 50 feet distance from monitoring well MW-7. This confirms the reported probable source as a leaking pipe knuckle located between MW-6 and MW-7.

At SB-2, the greatest reported PID measurement was in the shallow soils at a depth of 4' bgs. This may indicate that contamination in the vicinity of SB-2 was derived from vapor movement through the vadose zone rather than through groundwater transport, because groundwater transport would be anticipated to produce its greatest measurements at, or slightly below, the water table.

2.1.4 Laboratory Soils Sampling and Analysis

Soil samples were collected for laboratory analysis from all of the additional soil borings except for MW-5. All samples were chilled upon collection and were sent via Chain of Custody procedure to Scitest Inc., an analytical testing laboratory located in Randolph, Vermont. Laboratory analytical methods for the soil samples consisted of EPA method 8015 for total petroleum hydrocarbons (TPH) quantified as gasoline. The results of the laboratory testing are summarized in Table 2-2 below. A copy of the laboratory analytical report is included as Attachment 4.

Location	Reported TPH Concentration	Collection Depth
MW-6	820 ppm	9-11' bgs
MW-7	98 ppm	11-13' bgs
MW-8	17 ppm	9-11' bgs
SB-1	140 ppm	13-15' bgs
SB-2	<0.13 ppm	3-5' bgs
SB-3	0.33 ppm	9-11' bgs

The soil samples for laboratory analysis were collected from the soil horizon which produced the highest PID measurement in that boring. With one exception (SB-2), all of the soil samples were collected from beneath the water table. The highest reported soil contamination was in boring MW-6, closest to the Calmart gasoline island, and the degree of subaqueous soil contamination declined in a westward direction. The next-highest reported TPH value was in MW-7; these results are in close relative agreement with the PID headspace measurements collected during the advancement of the soil borings. The only soil sample

which was collected from above the water table was from boring SB-2; in this case, no laboratory TPH soil contamination was reported.

The lack of significantly elevated PID measurements at the water table at SB-2, and the lack of reportable TPH contamination at this boring, indicates that contaminant transport through groundwater in the direction of SB-2 had not occurred as of August 24, 1994. If preferential flow through utility trenches were occurring in groundwater in a northward direction, elevated PID and TPH measurements at the water table at SB-2 would be anticipated. This opinion is consistent with the known bury depths of the utilities, (approximately 5-6 feet below ground surface) and strongly suggests that north-south preferential contaminant transport through utility trenches beneath Route 5 is not occurring to any significant degree.

2.2 GROUNDWATER MONITORING WELLS

Four additional groundwater monitoring wells were installed simultaneously with the soil boring work. Groundwater monitoring wells were installed in soil borings at locations MW-5, MW-6, MW-7 and MW-8. Two inch PVC riser pipe and screens were used. Screens were 10 feet long with 0.010 inch slots. Annular sandpack was placed to a depth of at least one foot above the top of the well screen in each well. A three-foot bentonite seal was installed over the sandpack to minimize stormwater inflow potential. A locking flush mounted roadbox was installed in a cement plug to complete each well. Well construction diagrams are included in Attachment 3.

2.3 GROUNDWATER SAMPLING & ANALYSES

Groundwater samples were collected from each groundwater monitoring well at Calmart on September 8, 1994. The sampled locations included monitoring wells MW-1 through MW-8. In addition, quality control samples consisting of a field duplicate sample from MW-4, one field blank and one trip blank, were also collected. All groundwater samples were collected using the protocol established in The Johnson Company Standard Operating Procedure JCO-008.

All samples were chilled upon collection and were sent via Chain of Custody procedure to Friedman and Bruya, Inc., an analytical testing laboratory located in Seattle, Washington. There, analysis of the water samples was undertaken using EPA method 8020 for BTEX. A copy of the laboratory report is included in Attachment 4. The reported analytical values obtained during this testing are summarized in Table 2-3 below, as are the previously-obtained values for monitoring wells MW-1 through MW-4.

TABLE 2-3
LABORATORY REPORTED COMPOUNDS IN GROUNDWATER
MONITORING WELLS - CALMART

Location	Parameter	Reported 6/3/94	Conc. ($\mu\text{g/l}$) 9/8/94	VT GWES $\mu\text{g/l}$	VT HA $\mu\text{g/l}$
MW-1	Benzene	492*	1	5	=====
	Toluene	45	1	2,420	=====
	Ethylbenzene	49	1	380	=====
	Total Xylenes	<20	3	400	=====
	TPH	1,800	----	----	=====
	MTBE	73	----	----	40
	BTEX	586	6	=====	=====
MW-2	Benzene	3,150*	9,000*	5	=====
	Toluene	13,100*	1,500	2,420	=====
	Ethylbenzene	1,880*	1,100*	680	=====
	Total Xylenes	14,200*	4,400*	400	=====
	TPH	61,000	----	----	=====
	MTBE	8,480	----	----	40
	BTEX	32,690	16,000	----	=====
MW-3	Benzene	16*	<1	5	=====
	Toluene	10	<1	2,420	=====
	Ethylbenzene	3	<1	680	=====
	Total Xylenes	38	<3	400	=====
	TPH	1,200	----	----	=====
	MTBE	1,048	----	----	40
	BTEX	67	<3	----	----
MW-4 ¹	Benzene	<1	28*, 2	5	=====
	Toluene	<1	3, 1	2,420	=====
	Ethylbenzene	<1	2, 1	680	=====
	Total Xylenes	<1	5, <3	400	=====
	TPH	<	---- ²	=====	=====

**TABLE 2-3
LABORATORY REPORTED COMPOUNDS IN GROUNDWATER
MONITORING WELLS - CALMART**

Location	Parameter	Reported 6/3/94	Conc. ($\mu\text{g}/\text{l}$) 9/8/94	VT GWES $\mu\text{g}/\text{l}$	VT HA $\mu\text{g}/\text{l}$
MW-4 ¹ cont'd	MTBE	<	----	=====	40
	BTEX	<	38.5	=====	=====
MW-5	Total Xylenes	===== ³	3	400	=====
	BTEX	=====	3	=====	=====
MW-6	Benzene	=====	12,000*	5	=====
	Toluene	=====	17,000*	2,420	=====
	Ethylbenzene	=====	2,200*	680	=====
	Total Xylenes	=====	11,000*	400	=====
	BTEX	=====	42,200	=====	=====
MW-7	Benzene	=====	41,000*	5	=====
	Toluene	=====	39,000*	2,420	=====
	Ethylbenzene	=====	3,400*	680	=====
	Total Xylenes	=====	18,000*	400	=====
	BTEX	=====	101,400	=====	=====
MW-8	Benzene	=====	34,000*	5	=====
	Toluene	=====	45,000*	2,420	=====
	Ethylbenzene	=====	2,400*	680	=====
	Total Xylenes	=====	24,000*	400	=====
	BTEX	=====	105,400	=====	=====

NOTES:

* means exceedance of standards.

¹ Monitoring well MW-4 x,x results are for sample, duplicate.

² ---- means sample not collected for this parameter.

³ ===== means well not in existence on the date of collection.

GWES means State of Vermont Groundwater Enforcement Standards

HA means State of Vermont Health Advisory (only provided for compounds with out an established GWES).

The reported testing results for groundwater samples indicate that the groundwater in the vicinity of monitoring wells MW-2, MW-6, MW-7 and MW-8 are contaminated with benzene, toluene, ethylbenzene and total xylenes above enforcement standards, while the groundwater in the vicinity of monitoring well MW-4 is contaminated with these compounds at much lower concentrations. The groundwater in the vicinity of monitoring wells MW-1, MW-3 and MW-5 remained free (or nearly free) of reportable concentrations of benzene, toluene, ethylbenzene or xylenes on September 8.

The magnitude of reported groundwater contamination near monitoring wells MW-6, MW-7 and MW-8 is above Groundwater Enforcement Standards and indicates that free floating gasoline is likely resident in the nearby soils. The greatest reported concentration of BTEX compounds was in monitoring well MW-8, followed in order by monitoring wells MW-7 and MW-6. These data indicate that on September 8, the reported concentration of BTEX increased with distance from Calmart.

While caution must be used when comparing soil vs. groundwater data, the westward-increasing contaminant trend may contradict data obtained from the laboratory soil boring samples which were collected on August 24-25, 1994. The conclusion drawn from the soil sample data was that levels of contamination decreased in a westward direction (away from Calmart), along the MW-6-MW-7-MW-8 line. The soil samples from the borings were collected from beneath the water table and as such were a mixture of soil and groundwater, while the groundwater samples were unfiltered. This data indicates that the center of the contaminant plume in groundwater has migrated away from Calmart in a westerly direction across Route 5. The western edge of the groundwater contaminant plume was not identified in this investigation.

Figure 4 presents total reported BTEX concentrations by location in surficial groundwater as of September 8, 1994. Lines of presumed equal BTEX concentration were plotted based upon the reported test values. The contour lines, termed "Isopleth" lines, indicate an elliptical (in two dimensions) distribution of contamination with a major axis oriented east-west through monitoring wells MW-6, MW-7 and MW-8. The contour interval in this case is logarithmic due to the great difference in reported test values. Groundwater contamination appears to decline rapidly to the north and to the south of the line. This distribution of contamination is consistent with the predicted groundwater flow direction beneath the site, and suggests that contaminant transport from Calmart had occurred as of September 8 in a dominantly east-to-west direction beneath Route 5.

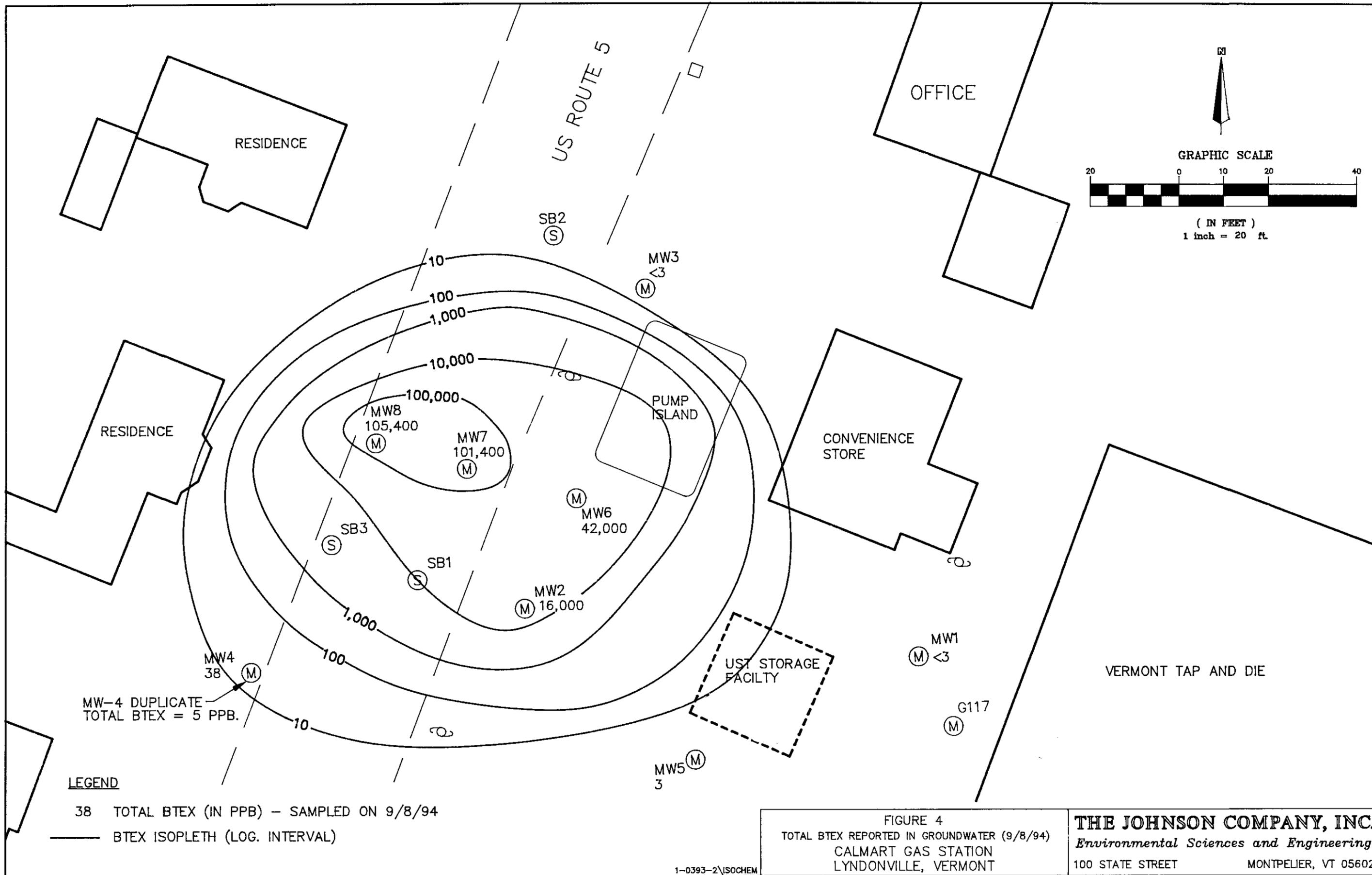


FIGURE 4
 TOTAL BTEX REPORTED IN GROUNDWATER (9/8/94)
 CALMART GAS STATION
 LYNDONVILLE, VERMONT

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
 100 STATE STREET MONTPELIER, VT 05602

2.4 GROUNDWATER CONTOUR MAP

A groundwater contour map for the Calmart site was prepared and is presented in Attachment 2. Groundwater level measurements collected on September 21, 1994 were used in the preparation of this map. The groundwater elevation to the nearest 1/100 foot was then calculated by subtracting the measured depth to groundwater from the surveyed top of casing elevation for each well. The calculated groundwater elevation in each well was plotted on the site plan, then lines of equal groundwater elevation, termed "equipotential lines" were drawn based on the well data.

The equipotential lines for September 21, 1994 indicate a sineous pattern with hydraulic head generally decreasing from west to east at a slope of about 3.6-4.4 feet per 100 feet. A hydraulic "ridge" extended in an east-west orientation through monitoring wells MW-6, MW-7 and MW-8 on that date, with a parallel "trough" to the south. The predominant direction of groundwater flow is normal to the equipotential line for uniform aquifers; an assumption of normality is made in this case. The primary direction of groundwater flow is toward the west beneath Route 5. Locally, groundwater may flow to the north or south for short distances but eventually it appears that these flow lines would be turned toward the west based upon the data collected on September 21. The groundwater surface was below the contact between the sand and gravel, and the sand and soil boring 9/94. Groundwater flow velocities on the order of 0.01-0.1 feet per day are predicted for this combination of groundwater slope and aquifer material. (Assumed porosity of .035 for fine sand, assumed hydraulic ft/ft conductivity of 0.1 feet per day for fine sand. Used Darcy equation. $V = .1\text{FPD}$ for gravel ($k + 10 \text{ FPD}$)).

2.5 SENSITIVE RECEPTOR SURVEY

A survey of the residential basements across Route 5 from Calmart that could be at risk from the release of petroleum from the Calmart gas station was conducted as part of this investigation. Three residential basements were screened on August 24-25, 1994 and again on October 7, 1994 at 96, 98, and 100 Main Street. The basements that were tested included two residential buildings and one apartment building. Basements were visited to determine whether gasoline odors were present, and in addition, instrumented screening was performed using a PID to test for the presence of volatile organic compounds that may be present below their odor threshold.

The results of the screening that was conducted on August 24-25 were that no PID measurements were recorded in any of the three basements above background levels and that no gasoline odors were detected in any of the basements. All three basements were described as being dry with no groundwater inflow as of the date of the screening.

There are no known drinking water supplies within 2,000 feet of the site. The nearest surface water is the Passumpsic River which is about 1,400 feet west of the site.

2.6 SOIL STOCKPILE SCREENING

Stockpiled soils and concrete rubble at the Caledonia Oil Company's Bulk Storage facility were field screened using the PID on September 8, 1994 by The Johnson Company. A total of seventeen locations were screened, eleven of these from the soil stockpile and six from the concrete pile.

The procedure used to screen the soils was as follows. Soil samples were collected with an auger at a depth of approximately 2 feet below the pile surface. Collected soils were tested for headspace PID measurements using the procedure outlined in Section 2.2 of this report. Concrete rubble PID measurements were collected directly from the interstitial spaces within the pile.

The results of the screening are presented on Figure 5. Soil screening measurements at the 2 foot depth ranged from 0.0 ppmV in two locations to 1.2 ppmV in three locations. All of the concrete screening results were 0.0 ppmV.

These results indicate a very low or non-existent contaminant level in the stockpiled materials, which would permit their disposal or re-use without further treatment under the "Guidelines for Handling Petroleum Contaminated Soils." We recommend that Caledonia Oil Company apply for a one time insignificant SW disposal event from the Vermont Solid Waste Division.

3.0 CONCLUSIONS AND RECOMMENDATIONS

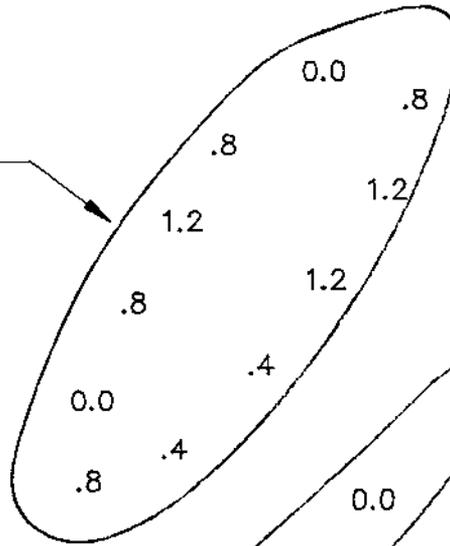
The results of the additional investigations described above are that subsurface soils and surficial groundwater in the vicinity of, and to the west of, the fuel pump island are moderately to heavily contaminated with BTEX compounds derived from gasoline above standards. In addition it was determined that high concentrations of soil and groundwater contamination extends in a westerly direction for a distance of at least 50 feet. The reported concentration of BTEX compounds in monitoring wells MW-7 and MW-8 indicates that free product may reside in the nearby soils. However, no free product or sheen was noted during the installation of these wells.



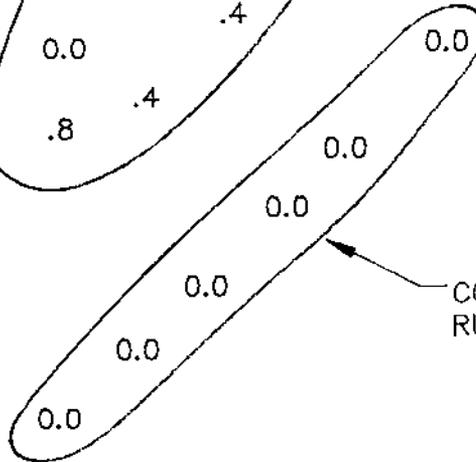
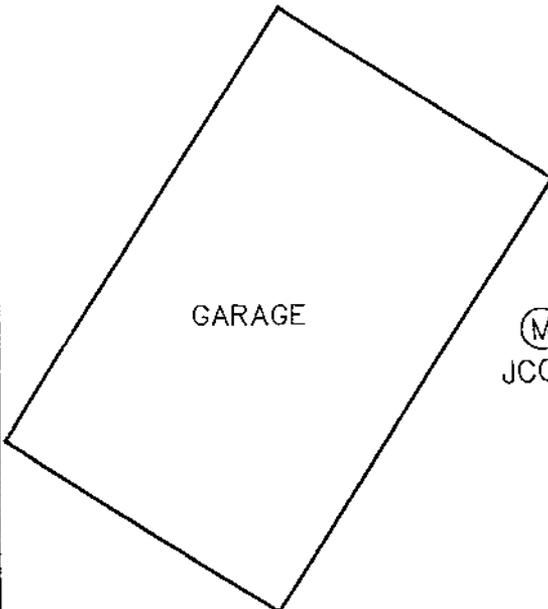
APPROX. SCALE: 1" = 30'

JCO3 (M)

STOCKPILED SOIL



CAL3 (M)



CONCRETE RUBBLE PILE

JCO2 (M)

LEGEND

0.0 PHOTO-IONIZATION DETECTOR READING IN PPM (BAG HEADSPACE SAMPLES TAKEN FROM SOIL PILE, HEADSPACE OF RUBBLE TAKEN FROM CONCRETE PILE)

(M) EXISTING MONITORING WELL LOCATION
JCO2

NOTES

ALL SOIL SAMPLES COLLECTED AT +/- 2' BELOW PILE SURFACE BY PTD OF THE JOHNSON COMPANY ON 9/8/94. HEADSPACE READINGS TAKEN BY LRH.

FIGURE 5.

PID READINGS OF SOIL PILE AND CONCRETE RUBBLE
CALENDONIA OIL COMPANY
LYNDONVILLE, VERMONT

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering
100 STATE STREET MONTPELIER, VT 05602

Based upon the contaminant distribution and groundwater flow plots prepared for this report, it appears that groundwater beneath the Calmart site flows toward the west beneath Route 5, and that the contaminant plume is migrating toward the west and had crossed U.S. Route 5 as of September 8, 1994. The full westward extent of groundwater contamination is not known because significant groundwater contamination is present at the westernmost monitoring wells at the site.

Air testing in three basements to the west of the site has not provided any evidence of vapor migration to these spaces as of October 6, 1994. No water supplies or surface water appears to be currently at risk of contamination from the observed distribution of subsurface petroleum product.

Screening of stockpiled materials at the Caledonia Oil Company property indicates that very low or non-existent contaminant levels persist and that these materials can be disposed of as common fill or else reused for benefit.

Based upon the findings and conclusions of this additional work we recommend that remedial measures be undertaken to limit the westward migration of the dissolved groundwater plume, and to reduce the level of contamination in the vadose zone and groundwater. In the short term, additional vapor screening of nearby basements is recommended, as is a pilot test of soil vapor extraction to control vadose zone concentrations of volatile contaminants. Additional groundwater samples should be collected monthly during the remedial period, utilizing EPA method 8020 for BTEX and MTBE compounds. The first round of sampling should be for EPA method 8260 compounds to determine whether any other contaminants besides gasoline are present in the groundwater beneath the site. This comprehensive round of samples should be collected during October 1994. The estimated cost of 12 months of monitoring in this manner is approximately \$12,000, assuming that 8 groundwater wells are monitored monthly for one year.

A pilot soil vapor (SVE) extraction test is recommended because it is a rapid and cost effective method to remove volatile contaminants from the vadose zone, which is about 9 feet deep at this site. The high percentage of pavement at the site will help minimize any short-circuiting of make-up air. A 36 hour pilot test is proposed to test for potential recovery airflow volumes, vapor concentrations in recovered air, and for zone of influence data.

We propose to utilize existing monitoring wells as vacuum wells for the test. The existing monitoring wells were specifically constructed for this eventually. An initial water level measurement round will be conducted to determine which of the wells have significant dry screened sections on the test date. A Rotron 1 hp single phase regenerative blower, with a no-load capacity of 100 scfm airflow will be connected using PVC pipe and Fernco flexible fittings first to those individual monitoring wells with significant dry screened sections to determine which wells produce the greatest mass recovery per unit time. If several wells produce significant airflow/vapor concentration results, then the second stage of the test will consist of vapor extraction from several monitoring wells connected together to determine whether interference effects would significantly reduce the potential for contaminant recovery via SVE. The data collected from the pilot test will be used to either design a full-scale weatherized SVE system or else to reject the concept as a remedial measure. We recommend that this test occur during the month of October 1994 to take advantage of relatively lower groundwater levels.

A SVE system will not directly address the documented groundwater contamination that has already occurred at this site. This can be addressed in one of three ways: either by air sparging in combination with SVE; by groundwater extraction and treatment to reduce westward groundwater flow velocities and to lower the groundwater table to below the 9-12 foot level; or else by SVE operations in conjunction with groundwater monitoring to minimize any additional groundwater contamination. This last option would not actively remove that groundwater contamination which had already occurred. We recommend performing permeability tests using the existing wells and the "slug test" method in order to evaluate the potential effectiveness of groundwater extraction. These "slug tests" should be performed in October, 1994 and will cost approximately \$1,500. We recommend that the Hazardous Materials Management Division consider each of these alternatives on a conceptual level, following which we will further research that alternative which appears to be the most efficient at effecting contaminant removal from beneath this site.

ATTACHMENT 1
August 4, 1994 HMMD Letter



State of Vermont

1-0393-2

AHT
DMM

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
Natural Resources Conservation Council
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
Hazardous Materials Management Division
103 South Main Street/West Office Building
Waterbury, VT 05671-0404
Phone: (802) 241-3888
Fax: (802) 241-3296

August 5, 1994

RECEIVED
AUG 12 1994
THE JOHNSON CO., INC.
MONTPELIER, VERMONT

Karl Johnson
Johnson Company
100 State Street
Montpelier, VT 05402

RE: Calmart Gas Station, 97 Main Street (Route 5), Lyndonville, (Site #94-1621)

Dear Mr. Johnson:

The Sites Management Section (SMS) has concluded its review of the initial investigation report for the Caledonia Oil Facility #343 (Calmart Gasoline Station) and Bulk Fuel Storage Facility. This review focuses on the Calmart Gasoline Station portion of the report. During this phase of the investigation four test pits were excavated, soils sampled, and four monitor wells installed and sampled. Based on the information contained in the report, the SMS has concluded the following:

- A release of petroleum has occurred at the site. The release was detected during replacement of piping.
- Petroleum contaminated soils were excavated and moved to Vail Road. The soils were subsequently removed from Vail Road and are currently polyencapsulated at the Caledonia Bulk Fuel Plant (Site # 94-1630).
- Gasoline related compounds have been detected in groundwater samples collected from monitor wells installed at the site.
- Groundwater appears to flow in an easterly direction.

During the review it was noted that Table A, on the Site Map that during excavation of test pit 3 and test pit 4, the word "pint" appears before the description of the soil encountered at that particular depth in the pit. Does this refer that a pint of free product was recovered at that depth? Also there is no description of what was found during the excavation of test pit 2.

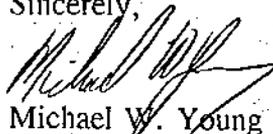
Based on the information contained in the report, the SMS will require that some additional work be performed at the site to determine the degree and extent of contamination at the site. The SMS recommends the following work be conducted:

- Installation additional monitor wells to further determine the degree of groundwater contamination.
- Screen the basement air with PID of buildings in the immediate vicinity of Calmart.
- Investigate all utility corridors (sewer, storm drains, water mains) in the vicinity of Calmart to ensure they are not acting as preferential conduits for contaminated groundwater migration.
- Collect groundwater samples from all monitor wells. Samples should be analyzed by EPA Method 8020.
- Screen stockpiled soils located at the Caledonia Oil Bulk Storage Site (Site 94-1630) and develop a monitoring schedule.

A work plan cost estimate should be developed and submitted to the SMS for review and approval prior to performing any of the aforementioned work. The SMS understands Caledonia Oil would like to perform any additional work requested at this site concurrently with the additional work to be performed at the bulk plant. The SMS will make every effort to review the workplan to accommodate Caledonia Oils request.

If you have any questions please feel free to contact me at the phone/fax number, or address identified above.

Sincerely,



Michael W. Young
Asst. Hazardous Materials Specialist
Sites Management Section

cc: Ralph Devereau, Caledonia Oil
Bob Martin, Primmer & Piper

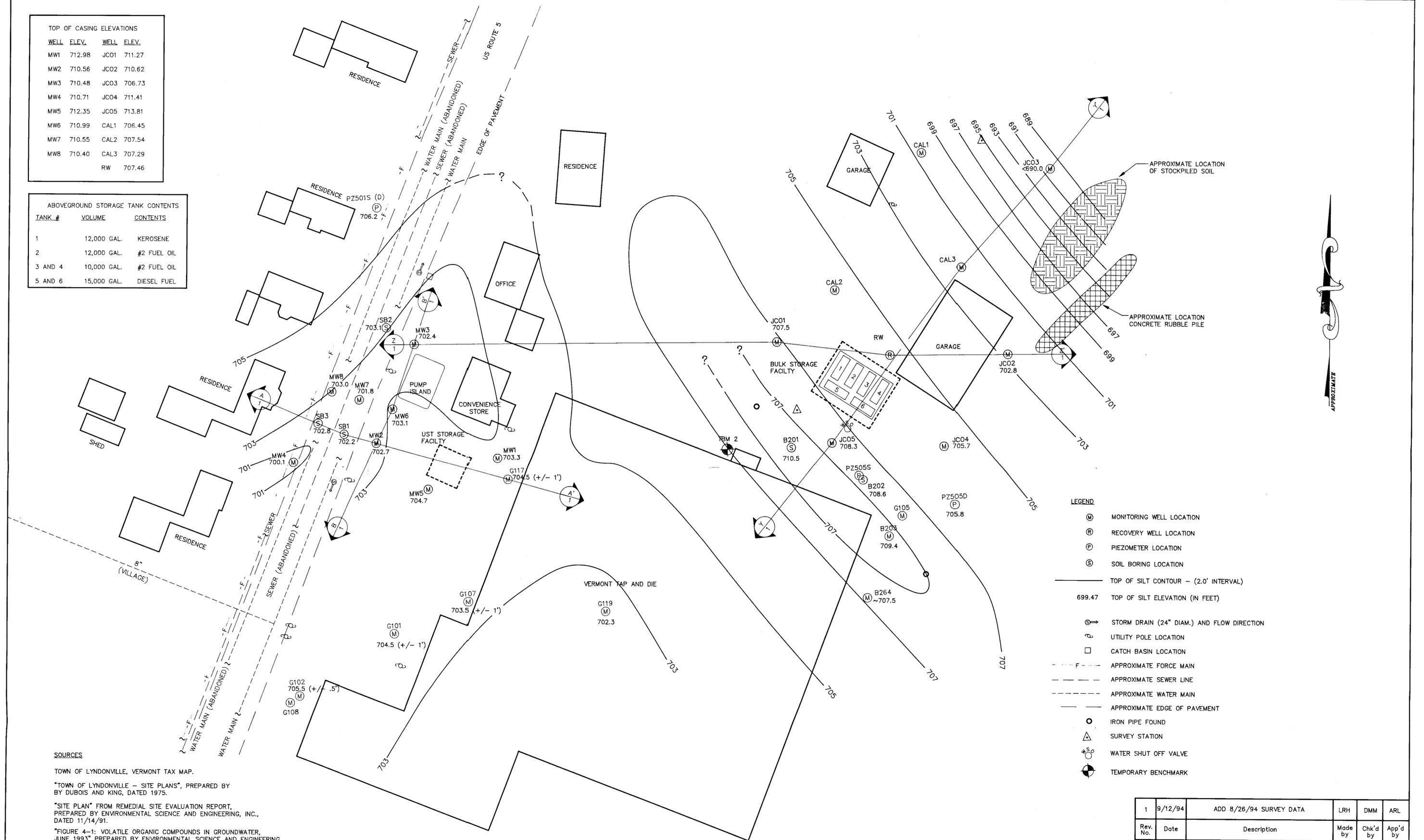
ATTACHMENT 2
Site Drawings and Cross Sections

TOP OF CASING ELEVATIONS

WELL	ELEV.	WELL	ELEV.
MW1	712.98	JCO1	711.27
MW2	710.56	JCO2	710.62
MW3	710.48	JCO3	706.73
MW4	710.71	JCO4	711.41
MW5	712.35	JCO5	713.81
MW6	710.99	CAL1	706.45
MW7	710.55	CAL2	707.54
MW8	710.40	CAL3	707.29
		RW	707.46

ABOVEGROUND STORAGE TANK CONTENTS

TANK #	VOLUME	CONTENTS
1	12,000 GAL.	KEROSENE
2	12,000 GAL.	#2 FUEL OIL
3 AND 4	10,000 GAL.	#2 FUEL OIL
5 AND 6	15,000 GAL.	DIESEL FUEL



LEGEND

- (M) MONITORING WELL LOCATION
- (R) RECOVERY WELL LOCATION
- (P) PIEZOMETER LOCATION
- (S) SOIL BORING LOCATION
- TOP OF SILT CONTOUR - (2.0' INTERVAL)
- 699.47 TOP OF SILT ELEVATION (IN FEET)
- STORM DRAIN (24" DIAM.) AND FLOW DIRECTION
- UTILITY POLE LOCATION
- CATCH BASIN LOCATION
- APPROXIMATE FORCE MAIN
- APPROXIMATE SEWER LINE
- APPROXIMATE WATER MAIN
- APPROXIMATE EDGE OF PAVEMENT
- IRON PIPE FOUND
- △ SURVEY STATION
- ⊕ WATER SHUT OFF VALVE
- ⊙ TEMPORARY BENCHMARK

SOURCES

TOWN OF LYNDONVILLE, VERMONT TAX MAP.
 "TOWN OF LYNDONVILLE - SITE PLANS", PREPARED BY DUBOIS AND KING, DATED 1975.
 "SITE PLAN" FROM REMEDIAL SITE EVALUATION REPORT, PREPARED BY ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., DATED 11/14/91.
 "FIGURE 4-1: VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER, JUNE 1993" PREPARED BY ENVIRONMENTAL SCIENCE AND ENGINEERING, INC., DATED 1/10/94.
 USGS 15' QUADRANGLE FOR LYNDONVILLE, VT (1951).
 FIELD OBSERVATIONS MADE BY THE JOHNSON COMPANY, ON 5/31/94.
 LEVEL SURVEY AND GROUNDWATER LEVEL MEASUREMENTS CONDUCTED BY THE JOHNSON COMPANY, ON 8/26/94 AND 9/21/94.
 SANBORN FIRE INSURANCE MAP, 1958.

NOTES

- 1) ALL DIMENSIONS AND LOCATIONS ARE APPROXIMATE. NOT TO SCALE. APPROXIMATE SCALE 1"= 30'.
- 2) ALL ELEVATIONS ARE BASED ON A TEMPORARY BENCHMARK, TBM 2, LOCATED ON LOCATED ON THE NORTH SIDE OF THE VERMONT TAP AND DIE BUILDING. TBM 2 IS A CHISELED SQUARE IN CORNER OF CONCRETE PAD, AT 715.90' ABOVE MEAN SEA LEVEL, BY OTHERS.
- 3) THE CALEDONIA OIL PROPERTY IS LOCATED ON THE LYNDONVILLE, VT USGS 15' QUADRANGLE (1951) AT APPROXIMATELY 72°00'00" LONG., 44°32'45" LAT.

Rev. No.	Date	Description	Made by	Chk'd by	App'd by
1	9/12/94	ADD 8/26/94 SURVEY DATA	LRH	DMM	ARL

SITE MAP
TOP OF SILT CONTOUR MAP
CALEDONIA OIL
LYNDONVILLE, VERMONT

OCT 10 1994

Sheet 2 of 4
 Scale: as shown
 Drawn by: LRH
 Chk'd by: KHJ
 Date: 6/02/94

THE JOHNSON COMPANY, INC.
Environmental Sciences and Engineering

100 STATE STREET MONTPELIER, VERMONT 05602

Job: 1-0393-1



ATTACHMENT 3

Soil Boring Logs and Well Construction Diagram

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

DRILLING LOG
WELL # MW-1

Project: Calendonia Oil
 Location: Lyndonville, VT
 Job # 1-0393-1
 Logged By: Paul Daly
 Date Drilled: 5/31/94
 Driller: Tri-State
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter: 2.0 in.
 Casing Length: 2.7 ft.
 Screen Type: Factory Slotted
 Screen Diameter: 2.0 in.
 Screen Length: 15.0 ft.
 Slot Size: .01

Total Pipe: 17.7 ft.
 Stick Up: -0.2 ft.
 Total Hole Depth: 17.8 ft.
 Well Guard Length: 1.2 ft.
 Initial Water Level: 8.4 ft.
 Surface Elevation: 713.18
 T.O.C. Elevation: 712.98

█ = Sampled Interval

Sheet 1 of 0

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					
4					
3					
2					
1					
0					
1	Well Guard			0.0 ppm	0-2': 3,6,6,6 (12" recovery) medium to coarse sand, fill.
2	Cement			0.0 ppm	
3	Bentonite			0.0 ppm	2-4': 1,3,2,3 (5" recovery) medium sand, moist.
4					
5					
6					
7				0.6 ppm	4-6': 3,2,1,2 (8" recovery) fine to medium sand with some clay.
8				1.0 ppm	
9					
10		Sand Pack		1.2 ppm	6-8': 2,1,1,2 (6" recovery) medium to coarse sand, native, saturated at 8 feet below ground surface.
11					
12					
13		Screen		.9 ppm	
14					
15				.6 ppm	8-10': 2,1,2,2 (15" recovery) 6" medium sand, 2" coarse sand lens, 6" fine sand, 1" silty clay, wet.
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

The Johnson Company, Inc.
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 100 State Street
 Montpelier, Vermont 05602

DRILLING LOG
WELL # MW-2

Project: Calendonía Oil
 Location: Lyndonville, VT
 Job # 1-0393-1
 Logged By: Paul Daly
 Date Drilled: 5/31/94
 Driller: Tri-State
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter: 2.0 in.
 Casing Length: 2.6 ft.
 Screen Type: Factory slotted
 Screen Diameter: 2.0 in.
 Screen Length: 15.0 ft.
 Slot Size: .01

Total Pipe: 17.6 ft.
 Stick Up: -0.4 ft.
 Total Hole Depth: 18.0 ft.
 Well Guard Length: 1.2 ft.
 Initial Water Level: 7.4 ft.
 Surface Elevation: 710.89
 T.O.C. Elevation: 710.56

█ = Sampled Interval

Sheet 1 of 0

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					
4					
3					
2					
1					
0					
1	Well Guard Cement Bentonite				
2					
3					
4				see descr.	
5					
6					
7		▽			
8					
9				180 ppm	
10	Sand Pack			NA	8-10': 3,3,2,3 (12" recovery) 4" very coarse sand, 4" silt, 4" clayey silt with some clay lenses. Wet at 8.2' bgs.
11				NA	
12				NA	
13	Screen			NA	
14				NA	10-12': 1,1,4,5 (12" recovery) fine silt with clay lenses, honey-light brown fine sand lense at 11.8' bgs, strong product odor.
15					
16					
17					
18					
19					12-14': (24" recovery) silt with clay lenses, mild product smell.
20					
21					
22					
23					14-16': 3,3,3,4 (24" recovery) grey clayey silt with very dense 2" clay layer at 15' bgs.
24					
25					
26					
27					16-18': 1,4,6,8 (24" recovery) silty sand, silt, clay, saturated.
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

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 Montpelier, Vermont 05602

DRILLING LOG
WELL # MW-3

Project: Calendonia Oil
 Location: Lyndonville, VT
 Job # 1-0393-1
 Logged By: Paul Daly
 Date Drilled: 5/31/94
 Driller: Tri-State
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter: 2.0 in.
 Casing Length: 1.7 ft.
 Screen Type: Factory slotted
 Screen Diameter: 2.0 in.
 Screen Length: 15.0 ft.
 Slot Size: .01

Total Pipe: 16.7 ft.
 Stick Up: -0.5 ft.
 Total Hole Depth: 17.1 ft.
 Well Guard Length: 1.2 ft.
 Initial Water Level: 8.5 ft.
 Surface Elevation: 710.91
 T.O.C. Elevation: 710.48

■ = Sampled Interval

Sheet 1 of 0

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					
4					
3					
2					
1					
0		Well Guard Cement			
1		Bentonite			
2					0-8': Drilled to 8' bgs, coarse sand, fill. 6-8' bgs: 2-3" cobbles, boney. No split spoons taken 0-8' bgs.
3					
4				NA	
5					
6					
7					
8					
9				NA	8-10': 3,6,6,6 (18" recovery) coarse and fine sand, clayey silt, saturated, petroleum odor. Took jar soil sample.
10		Sand Pack			
11				NA	10-12': 2,2,5,6 (12" recovery) saturated silt with clay lenses, 1" compact clay lens at 11.5' bgs.
12		Screen			
13				NA	12-14': 4,4,5,5 (20" recovery) dark grey silt, saturated.
14					
15				NA	3,4,4,4, (16" recovery) saturated grey silty clay with a 2" grey fine sand layer at 14.6' bgs.
16					
17				NA	Grey silty clay. Grey fine sand encountered at 18' bgs.

The Johnson Company, Inc.
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 100 State Street
 Montpelier, Vermont 05602

DRILLING LOG
 WELL # MW-4

Project: Calendonía Oil
 Location: Lyndonville, VT
 Job # 1-0393-1
 Logged By: Paul Daly
 Date Drilled: 5/31/94
 Driller: Tri-State
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter: 2.0 in.
 Casing Length: 2.5 ft.
 Screen Type: Factory slotted
 Screen Diameter: 2.0 in.
 Screen Length: 15.0 ft.
 Slot Size: .01

Total Pipe: 17.5 ft.
 Stick Up: -0.4 ft.
 Total Hole Depth: 17.9 ft.
 Well Guard Length: 1.2 ft.
 Initial Water Level: 11.0 ft.
 Surface Elevation: 711.09
 T.O.C. Elevation: 710.71

■ = Sampled Interval

Sheet 1 of 1

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					
4					
3					
2					
1					
0					
1		Well Guard			0-2' bgs: well-sorted fine sand fill (taken from auger flights). Cobbles at 3.0'.
2		Cement			
3		Bentonite			
4					
5				NA	4-6': 11,6,5,6 (8" recovery) coarse sand and gravel with 1" cobbles.
6				NA	
7				NA	
8		Sand Pack		NA	6-8': 2,2,3,2 (16" recovery) tan well-sorted fine sand coarsening to "salt and pepper" medium sand. No odor, dry.
9				NA	
10				NA	
11				NA	
12				NA	
13		Screen		NA	
14				NA	8-10': 3,4,12,7 (14" recovery) 10" "salt and pepper" medium sand, 2" compacted cobbles, 2" grey-black weathered rock. No odor, dry.
15				NA	
16					
17					
18					
19					
20					10-12': 3,4,6,6 (16" recovery) coarse tan sand, underlain by coarse "salt and pepper", grey silt with brown streaks, grey silt with clay lenses. No odor, wet. Took jar sample.
21					
22					
23					
24					
25					
26					12-14': 4,5,6,7, (19" recovery) grey silt with clay lenses, dense 2-3" layer of clay at 13.5'. No odor, saturated.
27					
28					
29					
30					
31					
32					14-15': 3,2,3,4 (14" recovery) grey silt with clay lenses. No odor, wet.
33					
34					
35					
36					
37					
38					
39					
40					

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

DRILLING LOG
 WELL # MW-5

Project: Calmart Service Station
 Location: Route 5, Lyndonville, Vt.
 Job # 1-0393-2
 Logged By: DMM
 Date Drilled: 8/24/94
 Driller: Tristate
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter: 2.0 in.
 Casing Length: 4.9 ft.
 Screen Type: PVC
 Screen Diameter: 2.0 in.
 Screen Length: 9.7 ft.
 Slot Size: 0.010"

Total Pipe: 14.8 ft.
 Stick Up: -0.37ftft.
 Total Hole Depth: 15.0 ft.
 Well Guard Length: 1.2 ft.
 Initial Water Level: 10.3 ft.
 Surface Elevation: 712.72
 T.O.C. Elevation: 712.35

█ = Sampled Interval

Sheet 1 of 1

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					
4					
3					
2					Brown dry fine sand, Fill.
1					
0		Well Guard			
		Cement			3-5', 2,4,6,16 16" recovery. Brown dry massive fine sand. Pebble in tip.
1					
2		Bentonite		0.2	5-7' 10,11,12,18 6" recovery. Brown dry poorly sorted coarse sand and gravel and subround pebbles.
3					
4				0.2	7-9' 10,7,3,3 15" recovery. Brown dry coarse sand and gravel and subround pebbles. No preferential orientation. Coarsens downward. Sharp horizontal contact. 6-15"
5				0.2	Grey saturated silt, some clay, fine sand. Horizontally laminated.
6					
7					
8				0.2	9-11' 4,4,5,5 20" recovery. 0-9" Tan saturated horizontally laminated silt and fine sand. Sharp horizontal contact (SHC). 9-11"
9		Sand Pack			Grey humid horizontally laminated (HL) clay. SHC. 11-20" Tan saturated HL silt and fine sand.
10				1.0	
11					
12		Screen		8	11-13', 4,4,4,5 18" recovery. 0-13" Grey saturated massive silt and fine sand. SHC 13-15" Grey damp HL clay. 15-18" Grey saturated massive silt and fine sand.
13					
14				0.6	
15					13-15' 2,3,4,6 19" recovery. 0-8" Grey saturated HL fine sand and silt. SHC. 8-10" Grey wet silt and clay. 10-19" Grey saturated silt and fine sand.
16					
17					

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

DRILLING LOG
WELL # MW-6

Project: Calmart Service Station
 Location: Route 5, Lyndonville, Vt.
 Job # 1-0393-2
 Logged By: DMM
 Date Drilled: 8/24/94
 Driller: Tri-state
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter: 2.0 in.
 Casing Length: 5.3 ft.
 Screen Type: PVC
 Screen Diameter: 2.0 in.
 Screen Length: 9.7 ft.
 Slot Size: 0.010

Total Pipe: 15.1 ft.
 Stick Up: -0.1 ft.
 Total Hole Depth: 15.0 ft.
 Well Guard Length: 1.2 ft.
 Initial Water Level: 9.6 ft.
 Surface Elevation: 711.09
 T.O.C. Elevation: 710.99

█ = Sampled Interval

Sheet 1 of 1

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					Brown over grey humid fine sand. Slight petroleum odor.
4					
3					
2					
1					
0	Well Guard				
	Cement				
1					
2	Bentonite			3	5-7' 11,11,9,7 2" recovery. Grey dry coarse sand and gravel and subangular pebble in tip.
3					
4				26	7-9' 7,7,4,2 12" recovery. 0-9" Dry brown massive coarse sand and gravel and subround pebbles. No preferred orientation. 9-12" Grey wet horizontally laminated (HL) silt, little clay, fine sand. SHC.
5					
6				11	
7	Sand Pack				9-11' 3,3,3,3 24" recovery. 0-22" Grey wet HL silt, some fine sand. 1/8" orange bands common. SHC. 22-24" Grey moist clay (PID 35 ppm). SHC. Strong petroleum odor. EPA 8015.
8				120	
9					
10				250	11-13' 3,5,5,5 26" recovery. 0-11" Grey saturated massive fine sand and silt. SHC. No odor. 11-13" Brown saturated HL clean fine sand. SHC. 13-21" Grey saturated massive silt and fine sand, little clay.
11					
12	Screen			95	
13					
14				40	13-15' 3,4,4,4 20" recovery. 0-10", 7 ppm, Grey saturated massive silt, some fine sand, clay. SHC. 10-11" Grey damp clay. 11-20", 25 ppm, Grey saturated massive silt, some fine sand, some clay. SHC.
15					
16					
17					

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

DRILLING LOG
WELL # MW-7

Project: Calmart Service Station
 Location: Route 5, Lyndonville, Vt.
 Job # 1-0393-2
 Logged By: DMM
 Date Drilled: 8/25/94
 Driller: Tri-state
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter: 2.0 in.
 Casing Length: 4.6 ft.
 Screen Type: PVC
 Screen Diameter: 2.0 in.
 Screen Length: 9.7 ft.
 Slot Size: 0.010

Total Pipe: 14.8 ft.
 Stick Up: -0.3 ft.
 Total Hole Depth: 15.1 ft.
 Well Guard Length: 1.2 ft.
 Initial Water Level: 8.5 ft.
 Surface Elevation: 710.87
 T.O.C. Elevation: 710.55

█ = Sampled Interval

Sheet 1 of 1

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					0-3" Asphalt. 3-6" Gravel. 6-12" Concrete. 1-2' Brown dry fine sand and angular gravel. 2-3' Tan dry fine sand some silt. Sharp horizontal contacts (SHC).
4					
3					
2					
1					
0		Well Guard			3-5' 11,10,10,11 12" recovery. Brown and grey coarse sand and rgravel and subround pebbles. Poorly sorted and no preferential orientation.
-0.3		Cement		10	
1					
2		Bentonite			5-7' 11,7,6,7 4" recovery. Same as above, pebble in tip.
3					
4				15	7-9' 5,5,6,4 10" recovery. Strong gasoline odor. Same as above.
5					
6				40	9-11' 2,2,6,5 22" rec. 0-0.5" Coarse sand. 0.5-1" Wet grey clay, SHC. 1-4" Grey sat. lam. silt, some fine sand. 4-4.5" Grey wet clay, SHC. 4.5-11" Grey sat. massive silt. 11-13" Grey wet lam. clay, SHC. 13-16" Grey sat. massive silt. 16-22" Grey wet laminated clay.
7					
8				110	
9					
10		Sand Pack		250	
11					11-13' 5,6,6,6 20" rec. Strong gasoline odor. Samples for EPA 8015. 0-10" Grey saturated fine sand little silt. Horizontal gradational contact. 10-20" Silt, some fine sand.
12		Screen		300	
13					
14				85	
15				55	13-15' 4,3,3,5, 23" rec. Petroleum odor. 0-6" Grey saturated silt, some fine sand. 6-7" Grey moist laminated clay, SHC. 7-23" Grey massive saturated silt, little fine sand, clay, a lens of grey wet fine sand at 15-17", SHC.
16					
17					

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

DRILLING LOG
 WELL # MW-8

Project: Calmart Service Station
 Location: Route 5, Lyndonville, Vt.
 Job # 1-0393-2
 Logged By: DMM
 Date Drilled: 8/25/94
 Driller: Tri-state
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter: 2.0 in.
 Casing Length: 5.1 ft.
 Screen Type: PVC
 Screen Diameter: 2.0 in.
 Screen Length: 9.8 ft.
 Slot Size: 0.010

Total Pipe: 14.9 ft.
 Stick Up: -0.34 ft.
 Total Hole Depth: 15.3 ft.
 Well Guard Length: 1.2 ft.
 Initial Water Level: 9.5 ft.
 Surface Elevation: 710.74
 T.O.C. Elevation: 710.4

■ = Sampled Interval

Sheet 1 of 1

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					0-4" Asphalt. 4"-2.5' Tan dry medium and coarse sand and subround gravel, pebbles. 2.5-3' Brown sand and gravel as above.
4					
3					
2					
1					
0					
1	Well Guard				
	Cement				
2	Bentonite			12	3-5' 7,8,11,13 12" recovery. 0-2" Tan dry coarse sand. Sharp horizontal contact (SHC). 2-12" Brown/grey dry coarse sand and gravel and subround pebbles. Poorly sorted. No preferred orientation.
3					
4				1.5	5-7' 14,13,9,9 8" recovery. Grey, dry to damp, fine and medium sand and gravel. Pebble in tip.
5					
6				22	7-9' 7,3,1,1 16" rec. 0-3" Tan dry massive fine sand. Gas odor. 3-4" Grey damp mass. fine sand, some silt, SHC. 4-9" Brown/tan, mass. fine sand. 9-16" Grey saturated horizontally laminated silt, little fine sand. SHC. 110 ppm.
7					
8	Sand Pack			135	
9					
10				160	9-11' 20" recovery. 0-2" Tan saturated massive fine sand, spoil? SHC. 2-20" Grey laminated saturated silt and fine sand. Strong gasoline odor. Samples for EPA 8015. 1/4" fine sand layer at 19".
11					
12	Screen			80	
13					
14				80	11-13' 16" recovery. 0-13" Grey saturated laminated silt, some fine sand. 13-15" Grey moist clay. 15-16" Grey sat. lam. silt, some fine sand. SHC.
15					
16					
17					

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 Environmental Sciences and Engineering
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 Montpelier, Vermont 05602

DRILLING LOG
 WELL # SB-1

Project: Calmart Service Station
 Location: Route 5, Lyndonville, Vt.
 Job # 1-0393-2
 Logged By: DMM
 Date Drilled: 8/25/94
 Driller: Tri-state
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter:
 Casing Length:
 Screen Type: Factory
 Screen Diameter:
 Screen Length:
 Slot Size: 010

Total Pipe: 0.0 ft.
 Stick Up: 0.0 ft.
 Total Hole Depth: 15.0 ft.
 Well Guard Length: 0.0 ft.
 Initial Water Level: 8.7 ft.
 Surface Elevation: 710.98
 T.O.C. Elevation: -

█ = Sampled Interval

Sheet 1 of 1

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					0-2" Asphalt. 2-12" Concrete. 1-3' Brown humid fine sand some silt, little angular gravel.
4					
3					
2					
1					
0	Cement		Cement		3-5' 6,9,18,21 12" recovery. 0-9" Tan dry massive fine sand. Sharp horizontal contact (SHC). 9-12" Brown dry poorly sorted coarse sand and gravel and subround pebbles. No preferred orientation.
1				22	
2	Backfill				5-7' 14,10,7,7 Brown dry coarse sand and gravel and subround pebbles as above.
3				45	
4					7-9' 5,5,6,5 10" recovery. Same as above, but wet in lower 3".
5				18	
6					9-11' 22" recovery. 0-19" Grey wet massive silt and fine sand. SHC. 19-22" Orange saturated massive fine sand.
7		▽		190	
8					11-13' 3,3,5,1 23" recovery. Grey saturated horizontally laminated silt, some fine sand. 1" of clay in tip. No petroleum odor.
9	Bentonite			120	
10					13-15' 2,4,5,4 22" rec. 0-3" Grey wet clay and silt. 3-5" Brown sat. massive fine sand, SHC. 5-11" Grey sat. mass. silt and fine sand. 11-17" Grey sat. fine sand and silt. Gradational upper contact. 17-22" Grey sat. silt some fine sand, clay.
11				200	
12					
13				200	
14					
15					
16					
17					

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DRILLING LOG
 WELL # SB-2

Project: Calmart Service Station
 Location: Route 5, Lyndonville, Vt.
 Job # 1-0393-2
 Logged By: DMM
 Date Drilled: 8/25/94
 Driller: Tri-state
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter:
 Casing Length:
 Screen Type: Factory
 Screen Diameter:
 Screen Length:
 Slot Size: 010

Total Pipe: 0.0 ft.
 Stick Up: 0.0 ft.
 Total Hole Depth: 11.0 ft.
 Well Guard Length: 0.0 ft.
 Initial Water Level: 7.6 ft.
 Surface Elevation: 710.70
 T.O.C. Elevation: --

■ = Sampled Interval

Sheet 1 of 1

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					
4					
3					
2					
1					
0					
0-1	Cement		Cement		
1-2	Backfill		Backfill	8.5	0-4" Asphalt. 4-12" Concrete. 1-3' Brown dry fine sand, little silt, some angular gravel (fill).
2-3	Backfill		Backfill		
3-4	Backfill		Backfill	22	3-5' 12,13,13,11 12" recovery. 0-4" Brown dry massive coarse sand. Sharp horizontal contact (SHC). 4-12" Brown dry coarse sand and gravel and subround pebbles. Poorly sorted, no preferential orientation. EPA 8015 samples.
4-5	Backfill		Backfill	14	
5-6	Backfill		Backfill		
6-7	Backfill	▽	Backfill	12	5-7' 4,6,6,7 12" recovery. Brown dry coarse sand and gravel and subround pebbles. some as above.
7-8	Backfill		Backfill		
8-9	Bentonite		Bentonite		
9-10	Bentonite		Bentonite	7	7-9' No odor. 15" recovery. 0-5" Brown dry coarse sand and gravel and subround pebbles. Wet in lower 2". SHC. 5-15" Grey saturated silt, some fine sand, clay.
10-11	Bentonite		Bentonite		
11-12					
12-13					
13-14					9-11' 3,4,5,5 24" recovery. Grey saturated horizontally laminated silt, some fine sand, little clay.
14-15					
15-16					
16-17					

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

DRILLING LOG
WELL # SB-3

Project: Calmart Service Station
 Location: Route 5, Lyndonville, Vt.
 Job # 1-0393-2
 Logged By: DMM
 Date Drilled: 8/25/94
 Driller: Tri-state
 Drill Method: Hollow Stem Auger

Casing Type: PVC
 Casing Diameter:
 Casing Length:
 Screen Type: Factory
 Screen Diameter:
 Screen Length:
 Slot Size: 010

Total Pipe: 0.0 ft.
 Stick Up: 0.0 ft.
 Total Hole Depth: 13.0 ft.
 Well Guard Length: 0.0 ft.
 Initial Water Level: 8.0 ft.
 Surface Elevation: 710.78
 T.O.C. Elevation: -

■ = Sampled Interval

Sheet 1 of 1

Depth (feet)	Well Construction	Notes	Geology	PID Reading	Description
5					
4					
3					
2					
1					
0					
0	Cement		Cement		0-0.5' Asphalt. 0.5-3' Brown dry medium and coarse sand and gravel and subround pebbles.
1				9	
2					
3	Backfill			0.5	3-5' 8,4,6,5 12" recovery. Grey and brown dry poorly sorted, coarse sand and gravel and subround pebbles. No preferred orientation.
4					
5					
6				1.6	5-7' 5,5,13,13 10" recovery. Grey dry coarse sand. Three 1/2-1" thick layers of medium sand. Sharp horizontal contacts (SHC).
7					
8		▽			7-9' 7,4,3,5 No recovery. Spoon wet to 8' bgs.
9					
10	Bentonite			17	9-11' 4,4,4,6 18" recovery. 0-10" Grey saturated laminated silt, some fine sand, clay. SHC. No petroleum odor. 10-12" Grey moist massive clay. 12-18" Grey saturated laminated silt, some fine sand, clay. SHC. Samples for EPA 8015.
11					
12				13	
13					
14					
15					
16					
17					
					11-13' 6,4,6,8 18" recovery. 0-3" Grey wet laminated silt. SHC. 3-5" Brown saturated laminated fine sand. SHC. 5-18" Grey saturated laminated silt, some fine sand, little clay.

ATTACHMENT 4

Laboratory Analytical Reports for Soil and Groundwater



P.O. Box 339
Randolph, Vermont 05060-0339
(802) 728-6313

RECEIVED

SEP 23 1994

1-0393-2
KHJ

THE JOHNSON CO., INC.
MONTPELIER, VERMONT

LABORATORY REPORT

CLIENT: Caledonia Oil
ADDRESS: 99 Main St.
Lyndonville, VT

SITE: Calmart Gas Station

LABORATORY NO: 4-2209
PROJECT NO: 78627
DATE OF SAMPLE: 8/24-25/94
DATE OF RECEIPT: 8/26/94
DATE OF REPORT: 9/20/94

RESULTS

(Results expressed in milligrams per kilogram(mg/kg)(ppm)except as noted for the trip blank)

Petroleum Hydrocarbons (TPH) Fuel Scan

SAMPLE	VOLATILES--8015 Quantified as Gasoline	% SOLID
MW-6	820	74.6
MW-7	98	75.1
SB1	140	75.7
SB2	< 0.13	96.9
MW-8	17	74.3
SB3	0.33	76.7
Trip Blank	< 0.13 (mg/L)	---

EPA method & 8015 modified, SW-846, 3rd Edition, July, 1992.
Quantification as gasoline.

cc: The Johnson Company, Inc.
100 State Street
Montpelier, VT 05602
Attn: Karl Johnson

Respectfully submitted,

SCITEST, INC.

Roderick J. Lamothe
Roderick J. Lamothe
Laboratory Director

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: October 7, 1994
 Date Received: September 13, 1994
 Project: 1-0393-2
 Date Samples Extracted: September 14, 1994
 Date Extracts Analyzed: September 15, 1994

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES
 FOR BENZENE, TOLUENE, ETHYLBENZENE AND THE XYLENES
 USING METHOD 8020**

Samples Processed Using Method 5030
 Results Reported as µg/L (ppb)

<u>Sample ID</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl- benzene</u>	<u>Total Xylenes</u>	<u>Surrogate Standard % Recovery</u>
MW-1	1	1	1	3	127%
MW-2	9,000	1,500	1,100	4,400	126%
MW-3	<1	<1	<1	<3	123%
MW-4	28	3	2	5	105%
MW-5	<1	<1	<1	3	105%
MW-6	12,000	17,000	2,200	11,000	127%
MW-7	41,000	39,000	3,400	18,000	92%
MW-8	34,000	45,000	2,400	24,000	131%
MW4-DUP	2	1	1	<3	70%
T/B	5 ^a	8 ^a	<1	8 ^a	126%
F/B	<1	<1	<1	<3	129%

* This sample was run after sample MW-8. Levels found in this sample were most likely due to carryover from sample MW-8.

FRIEDMAN & BRUYA, INC.**ENVIRONMENTAL CHEMISTS**

Date of Report: October 7, 1994
Date Received: September 13, 1994
Project: 1-0393-2
Date Samples Extracted: September 14, 1994
Date Extracts Analyzed: September 15, 1994

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES
FOR BENZENE, TOLUENE, ETHYLBENZENE AND THE XYLENES
USING METHOD 8020**

**Samples Processed Using Method 5030
Results Reported as $\mu\text{g/L}$ (ppb)
Quality Assurance**

<u>Sample ID</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl- benzene</u>	<u>Total Xylenes</u>	<u>Surrogate Standard % Recovery</u>
Blank	<1	<1	<1	<3	128%
Deionized Water (Matrix Spike) % Recovery	111%	116%	113%	106%	119%
Deionized Water (Matrix Spike Duplicate) % Recovery	116%	119%	115%	110%	118%
Spike Level	100	100	100	300	