NOV 16 1993

GRIFFIN INTERNATIONAL INC

11 November 1993

Philllip and Carol Reeve
P.O. Box 477
Saxtons River, VT 05154

RE: Investigation Report, Village Mobil, Bellows Falls, VT 05154 (VT DEC Site #93-1442)

Dear Phil and Carol:

Please find enclosed a copy of the above-referenced report. Please call me if you have any questions or comments on this work.

Sincerely,

Ron Miller
Geologist

Enclosure
c. Mr Matt Moran, State of Vermont DEC

2B Dorset Lane • Williston, VT 05495 • 802-879-7708

NOV 16 1993

REPORT ON THE

INVESTIGATION OF SUBSURFACE PETROLEUM CONTAMINATION

at

VILLAGE MOBIL

Monument Square
U.S. Route 5
Bellows Falls, Vermont
(VT DEC Site #93-1442)

November 1993

Prepared for:

Phillip and Carol Reeve
P.O. Box 477
Saxtons River, VT 05154

Prepared by:

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Griffin Project # 8934408

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EXECUTIVE SUMMARY

The Village Mobil site is located on Monument Square, U.S. Route 5, in the Village of Bellows Falls, Vermont. One of the underground storage tanks used to store gasoline for retail sale on the site reportedly released approximately 1,000 gallons of mid-grade unleaded gasoline to the subsurface during June and July 1993. The leaking tank, and two other tanks that were not found to be leaking, were removed from the site in September 1993. Subsurface petroleum contamination was encountered during the tank removal.

Griffin International, Inc. (Griffin) investigated the degree and extent of contamination at the site for the owners, Phillip and Carol Reeve. The investigation consisted of the following:

- Installation of four soil boring/monitoring wells;
- Field screening of soils from the borings for volatile organic compounds (VOCs);
- Laboratory analyses (by EPA Method 602) of water samples collected from the wells; and
- Evaluation of the risk posed by contamination at the site to nearby sensitive receptors.

The results of this investigation indicate that, as of early October 1993, the bulk of the contaminant mass at the site remains in unsaturated soils directly beneath the release location. A thin confining layer has apparently retarded downward contaminant migration, but groundwater in the unconsolidated aquifer at the site has been impacted by benzene and MTBE above Vermont groundwater enforcement standards.

The water table beneath the site is located at a depth of approximately 68 feet. The unconsolidated aquifer consists of highly permeable sand and gravel of undetermined thickness. Groundwater beneath the site flows north-northeast toward the Connecticut River, which is located approximately 700 feet from the site. Contaminants appear to be migrating toward the south-southeast. The reason for the apparent difference between contaminant migration and groundwater flow directions has not yet been determined.

Although the contamination at the site does not appear to pose an immediate threat to nearby buildings, due to the depth to water and the short time since the release, the contaminants will likely continue migrating laterally, and could impact building basements and/or the Connecticut River.

Because of the potential threat to sensitive receptors, Griffin has installed and begun operation of a soil vapor extraction system to remediate the subsurface petroleum contamination at the site. Details of the remedial system are presented in a separate report.

I. INTRODUCTION

This report describes the investigation of subsurface petroleum contamination at the Village Mobil, located on Monument Square, U.S. Route 5, in the Village of Bellows Falls, Vermont. The investigation has been conducted by Griffin International, Inc. (Griffin) for the site owners, Phillip and Carol Reeve, who are acting in cooperation with the Vermont Department of Environmental Conservation.

II. SITE BACKGROUND

Site Description

The Village Mobil site is located in the Village of Bellows Falls, Vermont, on the southwest corner of the intersection of U.S. Route 5 and Vermont Route 121 (see Site Location Map, Appendix A). The site map in Appendix A shows the location of pertinent site features.

The area surrounding the site exhibits a mixture of residential and commercial uses. Private residences are located to the southeast and northwest of the site. An automotive supply store, which was reportedly formerly a gasoline station, is located immediately east of the site. An active gasoline station is located north of the site. The area immediately west of the site is a wooded embankment separating the property from the Health Center at Bellows Falls.

The site is located along a terrace in the Connecticut River valley at an elevation of about 318 feet NGVD (National Geodetic Vertical Datum). Topography at the site slopes slightly downward toward the northeast. A steep embankment rises along the west edge of the site; another steep embankment drops off steeply to the Connecticut River floodplain a few feet east of U.S. Route 5. Approximately 700 feet east of and 80 feet below the site, the Connecticut River flows toward the south.

The Surficial Geologic Map of Vermont indicates that surficial materials at the site consist of pebbly sand deposited along the shore of a glacial high-level lake that once flooded the Connecticut River Valley. Subsurface explorations at the site have principally encountered coarse-to-fine sands and gravels.

Site History

The site has reportedly been used as a gasoline service station since the 1920s. A former building was located north-northwest of the existing building.

On 6 August 1993, the site owner reported to the VT DEC an inventory loss from a 4,000 gallon underground storage tank (UST) that was being used to store mid-grade unleaded gasoline. On 9 August 1993, the tank failed a precision tightness test and was immediately taken out of service. The site owner has estimated that the release occurred during June and July 1993, and totaled approximately 1,000 gallons.

Because of the likelihood of an impact to the subsurface, Griffin submitted to the VT DEC a work plan to investigate the degree and extent of subsurface petroleum contamination in soils and groundwater at the site on 23 August 1993 . The work plan was approved on 26 August 1993.

On 7 and 8 September 1993, three gasoline underground storage tanks (USTs)--one 4,000 gallon tank and two 10,000 gallon tanks-- were removed from the property, and were replaced by two new USTs located in the same area as the two removed 10,000 gallon tanks. Soil screening during the UST removal indicated that the leak probably occurred near the north end of the 4,000-gallon tank. The other two tanks did not appear to have leaked. Soils beneath a depth of about ten feet consisted principally of highly permeable coarse-to-fine sands. Soils directly beneath the probable leak location appeared damp with gasoline from immediately beneath the tank to a depth of at least 20 feet (the maximum reach of the backhoe). Because it was not possible to remove all of the contaminated soils, only the minimum amount of contaminated soils necessary for the new tank installation were removed for off-site treatment.

On the basis of preliminary results of this investigation, Griffin sought and received VT DEC and site owner approval for a soil vapor extraction system to remediate the subsurface petroleum contamination at the site. The soil vapor extraction system was installed during September and October 1993, and began operation on 28 October 1993. Details of the remedial system installation are contained in a separate report.

III. INVESTIGATIVE PROCEDURES

Monitoring Well Installation

During the period from 15 - 17 September 1993, Technical Drilling Services of Clinton, Massachusetts installed four monitoring wells at the site under Griffin supervision. The monitoring wells were located to determine the degree and extent of the petroleum contamination in shallow groundwater at the site, and to evaluate the threat posed by the contamination to nearby sensitive receptors. Monitoring well MW1 was located in the likely upgradient direction, approximately 20 feet west of the probable leak location. Monitoring wells MW2 and MW3 were located in the likely downgradient directions, approximately sixty feet east-to-northeast of the probable leak location. Monitoring well MW4 was installed at the probable leak location. Boring logs and well construction details are presented in Appendix B.

The wells were installed with a hollow-stem-auger drill rig. Undisturbed soil cores were collected in a split-spoon sampler at five foot intervals from each borehole. Continuous split-spoon samples were collected from MW2 in the depth interval between 24 and 60 feet, and in MW1 between 44 and 50 feet. Boring logs are presented in Appendix B.

In general, the borings encountered silt and fine sand from near the surface to a depth of approximately nine feet, underlain by coarse-to-fine sand interbedded with sand and gravel to depths ranging from 42 to 46 feet, where a sharp downward-fining sequence was observed. The fining-downward sequence culminated in an approximately three-inch thick silt and clay layer at

depths that ranged from 45 to 50 feet. In the boring performed for MW4 (located at the likely leak location), soil samples were collected at five-foot intervals, and apparently missed the silt and clay layer. Samples collected during installation of a vapor point approximately three feet north of MW4 (VP5) later confirmed the presence of the three-inch thick silt and clay layer at a depth of approximately 47.5 feet in this area. In all of the wells, the silt and clay layer was underlain to the bottom of exploration by sand and gravel with some cobbles.

Griffin used a Photovac MicroTIP photoionization detector (PID) to measure volatile organic compound (VOC) concentrations in soil samples collected from the borings. The PID was calibrated with isobutylene to a benzene reference. PID readings are presented on the boring logs in Appendix B, and are summarized here. In the MW1 boring, soil headspace VOC concentrations may be summarized as follows: 0 to 26 feet: 2.8 - 6.5 parts per million (ppm); 29 to 49.5 feet: 47 - 473 ppm; 49.5 to 71 feet: 8 - 37 ppm. A sharp decrease in VOC concentrations at 49.5 feet coincided with the depth of the silt and clay confining layer in this boring. Soil headspace VOC concentrations in samples collected from the two downgradient locations (MW2 and MW3) were generally below 20 (ppm), although somewhat higher readings were detected in MW2 (31 and 74.5 ppm) immediately above the silt and clay layer, and in MW3 (37.7 ppm) immediately above the water table. Soil VOC concentrations in the MW4 boring were: 0 - 26 feet: generally higher than 2,500 ppm; 29 to 41 feet: 1200-1600 ppm; 44 to 46 feet: 600 ppm; and 49 to 71 feet: 100 - 130 ppm. As in MW1, VOC levels in this boring declined sharply below the silt and clay layer.

The monitoring wells installed at the site are constructed of two-inch diameter PVC casing and 0.010-inch slotted PVC well screen. In each well, the screened interval extends approximately five feet above and below the apparent water table. The annulus between the borehole wall and the screened section of each well contains a silica sand pack to filter fine sediments from groundwater entering the well. To prevent contaminant migration downward through the breached silt and clay layer, a five-foot-thick bentonite seal was placed in the annulus of each well across the confining layer. Each well is protected at the surface by locking well caps and flush mounted well protection casings with bolt-down covers.

After installation, the monitoring wells were developed by hand pumping with a Brainard-Kilman Model BK 1.7 hand pump.

Determination of Groundwater Gradient and Flow Direction

On 17 September 1993, the monitoring wells and other relevant site features were surveyed in azimuth and relative elevation. On 1 October 1993, a Griffin technician measured depth to water in each of the installed monitoring wells. Relative water table elevations were calculated by subtracting measured depth-to-water from surveyed top-of-casing elevations. The top-of-casing of MW1 was arbitrarily assigned an elevation of 100 feet. Water level data is presented in Appendix C.

The water table surface was estimated using the relative water level elevations in the monitoring wells. Groundwater in the area was found to be flowing generally north-

northeastward, at an average gradient of 0.8% (see Groundwater Contour and Contaminant Distribution Map, Appendix A).

Groundwater Sampling and Analyses

On 1 October 1993, water samples were collected from all four of the newly installed monitoring wells. No free-phase petroleum product was detected in any of the sampled wells. The water samples were submitted to an analytical laboratory and analyzed for volatile gasoline compounds by EPA Method 602. Laboratory reports appear in Appendix D. Results of equipment blank, trip blank and duplicate samples indicate that good quality assurance and control were maintained during sampling.

Table 1 summarizes the analytical results of these samples.

Table 1. Water Quality Summary - 10/1/93

Compound	Monitoring Well				VT Groundwater Enforcement Standard
	MW1	MW2	MW3	MW4	
Benzene	265	1,300	230	1,590	5
Toluene	239	823	168	2,060	2,420
Ethylbenzene	ND<10	ND<10	ND<10	20	680
Xylenes	ND<10	ND<10	ND<10	110	400
TOTAL BTEX	504	2,123	398	3,780	-
MTBE	ND<100	ND<100	ND<100	109	40
BTEX + MTBE	504	2,123	398	3,889	-

Notes : Sample results presented in micrograms per liter, or parts per billion (ppb)
ND<10: None Detected at Stated Detection Limit

Benzene and toluene were detected in all of the monitoring wells. Benzene levels were above Vermont groundwater enforcement standards in all of the monitoring wells. Toluene levels did not exceed Vermont groundwater enforcement standards in any of the monitoring wells. MTBE was detected in MW4 above the groundwater enforcement standard. MTBE may have been present in other wells, but the necessary sample dilution significantly raised the detection limit for this compound.

The distribution of gasoline compounds in groundwater at the site is shown in Figure 3 (Groundwater Contour and Contaminant Distribution Map). The map indicates that the contaminants have migrated toward the south-southeast. The contaminant migration path does not appear to correspond with the observed groundwater flow direction. At this time, the reason for the difference cannot be determined. Possible explanations include: changing groundwater flow direction; lateral migration of contaminants in the unsaturated zone along a southeast-dipping layer of high permeability; or incorrect sample labeling.

IV. RISK ASSESSMENT

All of the nearby buildings are reportedly served by municipal water and sewer systems. Sensitive receptors in the vicinity of the site include nearby building basements and the Connecticut River. No building basements are located within the current known contaminant plume, and the depth to groundwater suggests that the buildings immediately to the southeast of the site will not likely be impacted even if the contaminant plume continues to migrate toward the southeast. However, several residences are located approximately 100 - 300 feet east of and as much as 40 feet lower than the site. Continued contaminant migration could potentially impact these basements.

The ultimate receptor of the subsurface petroleum contamination at the site is the Connecticut River, which is located approximately 700 feet east of the site. The highly permeable nature of the sand-and gravel aquifer at the site suggests that contaminants may migrate relatively rapidly toward the river.

V. CONCLUSIONS

On the basis of the results obtained from this investigation, Griffin has reached the following conclusions:

1. A 4,000-gallon UST at the Village Mobil in Bellows Falls, Vermont reportedly released approximately 1,000 gallons of mid-grade unleaded gasoline during June and July 1993.

2. In September 1993, the leaking UST and two other USTs that did not appear to be leaking were removed from the site and replaced with two new tanks.

3. Native materials below the release location consist principally of coarse-to-fine sand interbedded with sand and gravel, with a thin silt and clay layer at depths of between approximately 45 and 50 feet.

4. The water table beneath the site is located at a depth of approximately 68 feet, in a sand and gravel aquifer of unknown thickness. When water table elevations were measured on 1 October 1993, the groundwater flow direction was toward the north-northeast.

5. The release has impacted soil immediately beneath the release location. The thin silt and clay layer has apparently retarded downward contaminant migration. Soil headspace VOC levels in samples collected from below the probable release location were generally over 2,500 ppm from near the surface to a depth of 26 feet and over 1,200 ppm from 26 to 46 feet. Below the silt and clay layer, soil VOC levels in this location ranged from 100 to 130 ppm.

6. The release has also impacted groundwater beneath the vicinity of the release location. Levels of dissolved benzene in all of the monitoring well samples collected in October 1993 were significantly above the Vermont Groundwater Enforcement Standard. Toluene was also detected in all of the monitoring wells, but at levels that did not exceed the groundwater

enforcement standard. MTBE was detected above the Vermont groundwater enforcement standard in the monitoring well located in the immediate vicinity of the release.

7. The downgradient extent of contamination has not yet been determined.

8. Contaminants have migrated preferentially toward the east-southeast, at a relatively high angle to the groundwater flow direction. The reason for this difference is not yet certain.

9. Because of the short time since the release, the deep water table, and the thin silt and clay layer underneath the site, most of the contaminant mass apparently remains in the unsaturated soils directly beneath the release location.

10. Although the residual contamination in soils and groundwater does not appear to pose a significant immediate threat, building basements along Earl Street and the Connecticut River could potentially be impacted within a few years.

VI. RECOMMENDATIONS

On the basis of the conclusions reached during this investigation, Griffin makes the following recommendations:

1. Approximately four additional monitoring wells should be installed north and east of the existing monitoring wells, to determine the downgradient extent of subsurface petroleum contamination at the site.

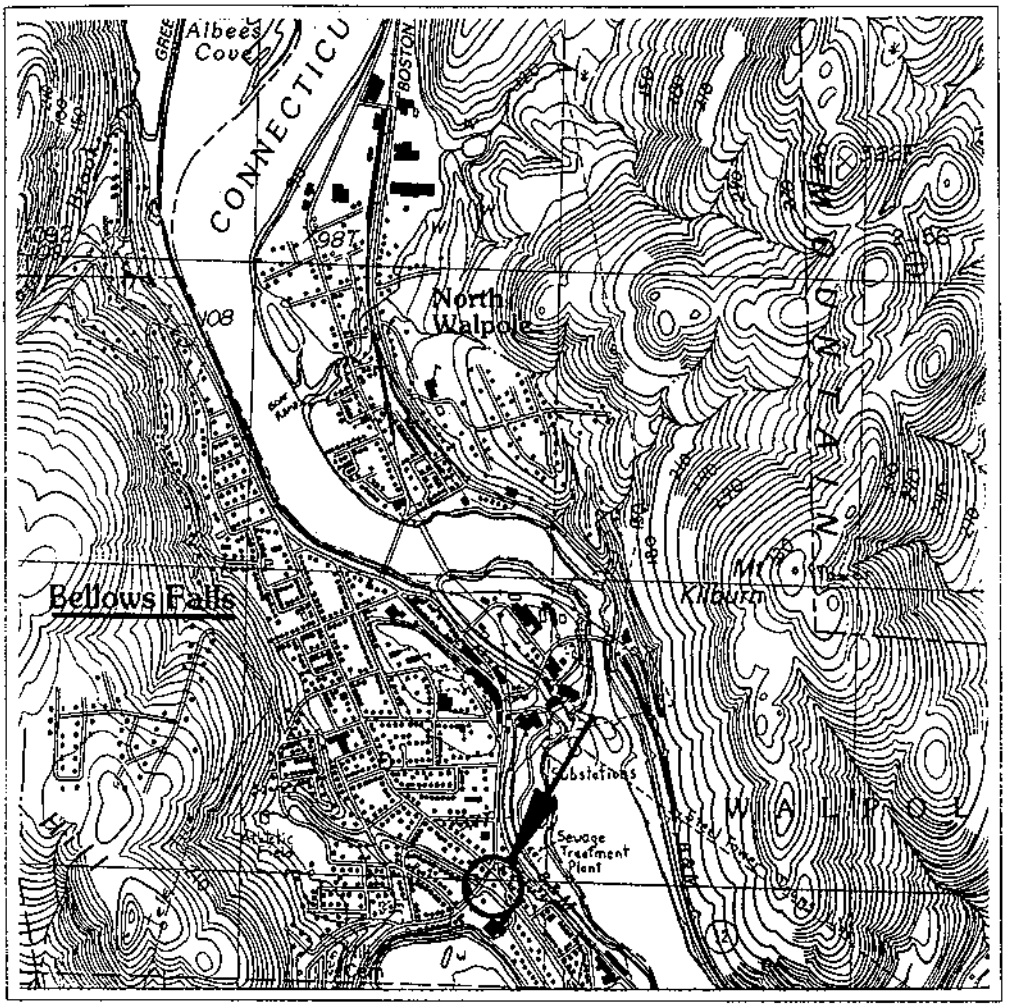
2. Operation of the soil vapor extraction system should continue, with site visits as frequent as necessary to maintain optimum system operation. It is expected that site visit frequency may be reduced to biweekly within approximately one month of system startup. Costs for biweekly site visits were included in the Corrective Action Plan monthly operations and maintenance cost estimate.

3. The on-site monitoring wells should be sampled monthly, to monitor progress of remedial efforts at the site. Costs for monthly water sample collection and analysis were also included in the Corrective Action Plan cost estimate.

4. Remedial progress reports that present system operational data and results of water quality analyses should be prepared quarterly. Preparation of these reports would represent a cost of approximately $960 per quarter ($320 per month). This cost was not included in the Corrective Action Plan cost estimate.

APPENDIX A

FIGURES



JOB #: 8934408

SOURCE: USGS

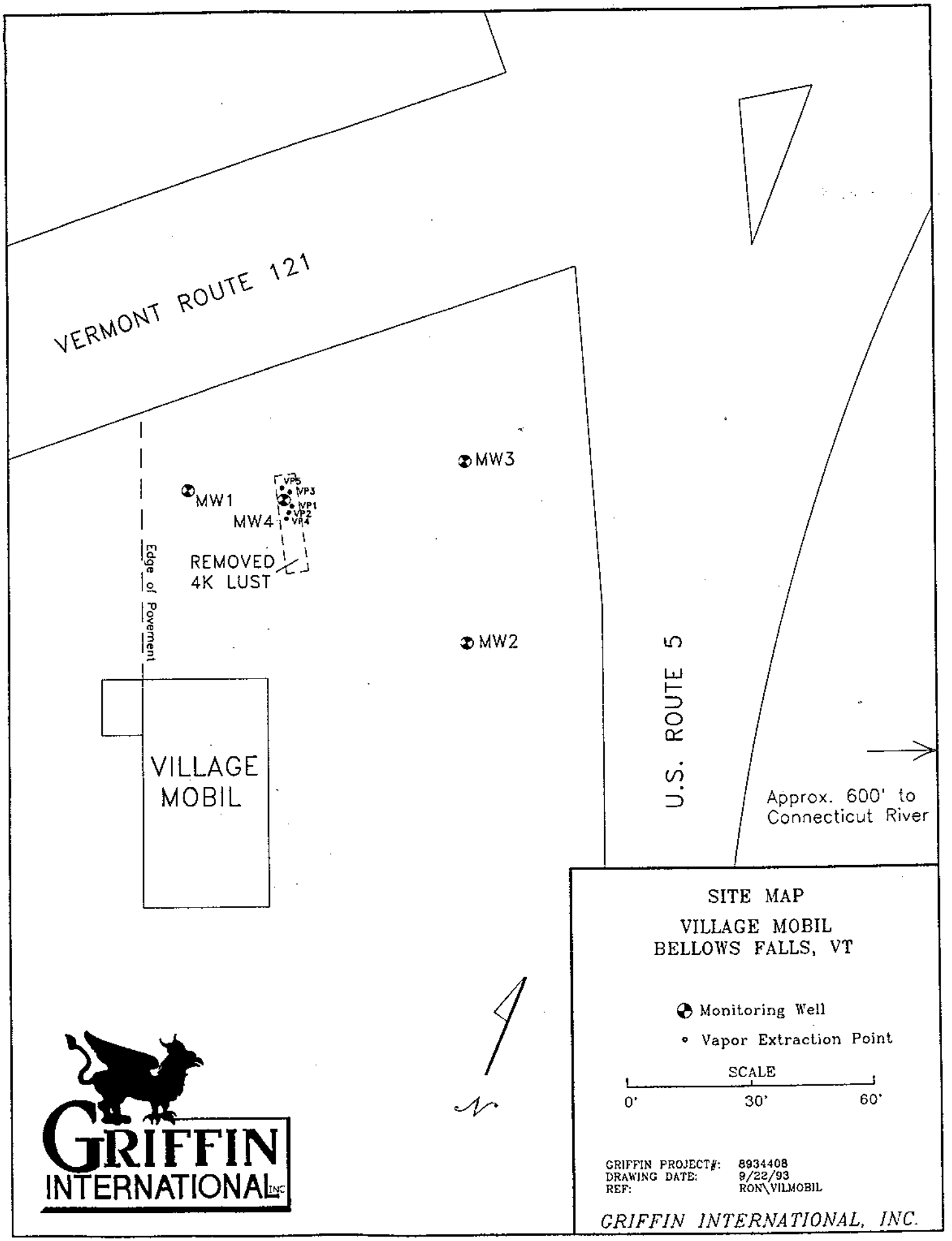
GRIFFIN INTERNATIONAL INC

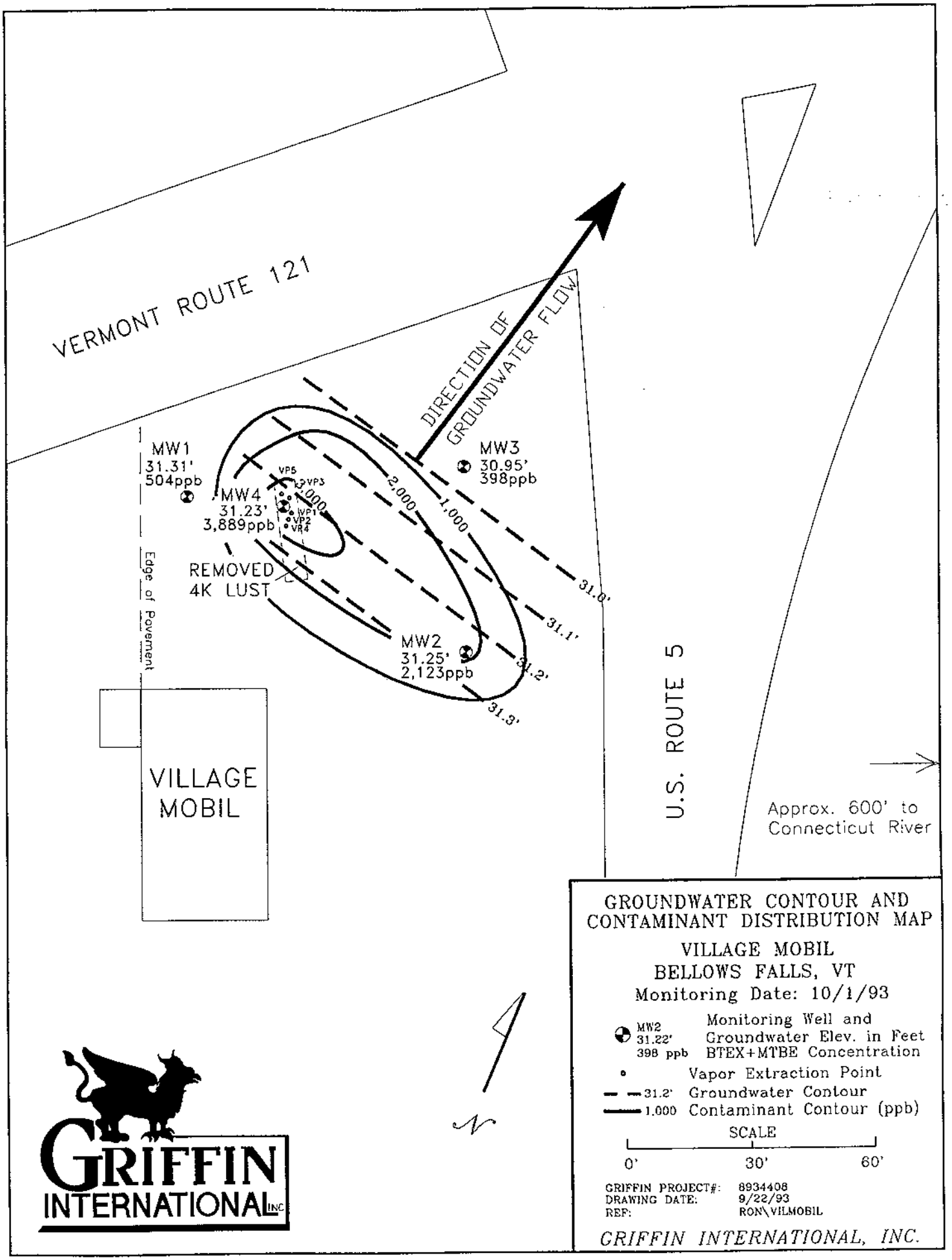
VILLAGE MOBIL

BELLOWS FALLS, VERMONT

SITE LOCATION MAP

DATE: 11/8/93	DWG.#:7	SCALE: 1:25,000	DRN.: SB	APP.: RM


VERMONT ROUTE 121
MW1
MW4
VP5
VP3
VP1
VP2
VP4
REMOVED
4K LUST
MW3
MW2
Edge of Pavement
VILLAGE
MOBIL
U.S. ROUTE 5
Approx. 600' to
Connecticut River
SITE MAP
VILLAGE MOBIL
BELLOWS FALLS, VT
Monitoring Well
Vapor Extraction Point
SCALE
0'
30'
60'
GRIFFIN PROJECT#: 8934408
DRAWING DATE: 9/22/93
REF: RON\VILMOBIL
GRIFFIN INTERNATIONAL, INC.
GRIFFIN
INTERNATIONAL INC


VERMONT ROUTE 121
DIRECTION OF GROUNDWATER FLOW
MW1
31.31'
504ppb
MW4
31.23'
3,889ppb
MW3
30.95'
398ppb
MW2
31.25'
2,123ppb
VP5
VP3
VP1
VP2
VP4
2,000
1,000
31.0'
31.1'
31.2'
31.3'
REMOVED
4K LUST
Edge of Pavement
VILLAGE
MOBIL
U.S. ROUTE 5
Approx. 600' to
Connecticut River
GROUNDWATER CONTOUR AND
CONTAMINANT DISTRIBUTION MAP
VILLAGE MOBIL
BELLOWS FALLS, VT
Monitoring Date: 10/1/93
MW2 31.22' 398 ppb
Monitoring Well and
Groundwater Elev. in Feet
BTEX+MTBE Concentration
Vapor Extraction Point
31.2' Groundwater Contour
1,000 Contaminant Contour (ppb)
SCALE
0'
30'
60'
GRIFFIN PROJECT#: 8934408
DRAWING DATE: 9/22/93
REF: RON\VILMOBIL
GRIFFIN INTERNATIONAL, INC.
GRIFFIN
INTERNATIONAL INC

APPENDIX B

WELL LOGS

APPENDIX B

WELL LOGS

WELL NUMBER MW1

PROJECT Village Mobil

LOCATION Bellows Falls, Vermont

DATE DRILLED 9/16/93 TOTAL DEPTH OF HOLE 72'

DIAMETER 6"

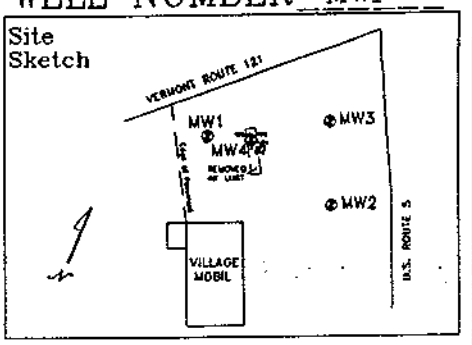
SCREEN DIA. 2" LENGTH 10' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 62' TYPE sch 40 pvc

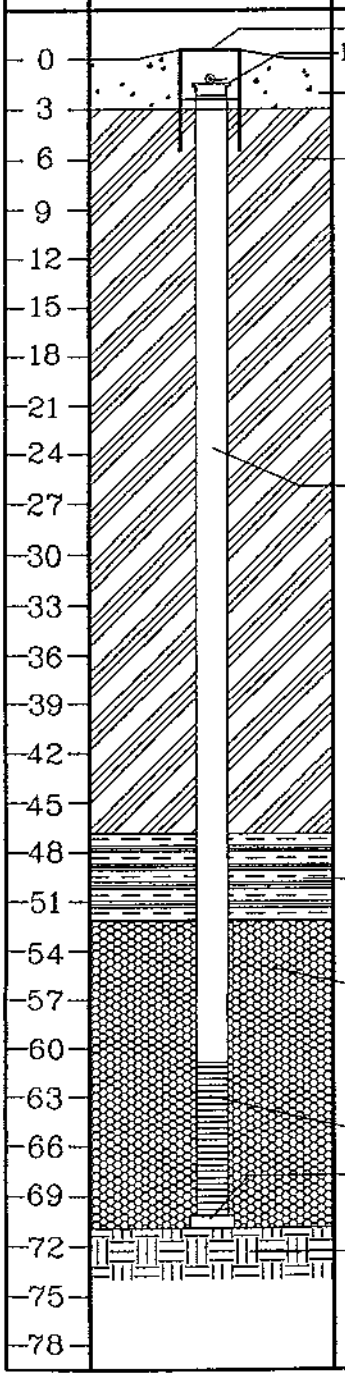
DRILLING CO. TDS DRILLING METHOD Hollow Stem

DRILLER Pete Newsham LOG BY Ron Miller

Site Sketch



GRIFFIN INTERNATIONAL, INC



DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0					0
3					3
6			4'-6', 2,2,3,4 5.1 ppm	Brown SILT & fine SAND, moist, no odor	6
9			9'-11', 9,11,10,10 2.8 ppm	Brown med/fine SAND, moist, no odor	9
12			14'-16', 8,9,8,10 6.5 ppm	Brn coarse/fine SAND, moist, no odor	12
15			19'-21', 5,7,7,8 3.1 ppm	Gray to brown coarse/fine SAND moist, no odor	15
18				Gray/brown coarse/fine SAND, moist, no odor	18
21					21
24			24'-26', 18,22,28,24	Gray/brown SAND and GRAVEL, moist, no odor	24
27		WELL RISER	29'-31', 8,8,9,9 47.4 ppm	Gray/brown coarse/fine SAND moist, no odor	27
30			34'-36', 14,11,15,10 67.2 ppm	Gray/brown coarse/fine SAND trace of gravel, moist, no odor	30
33			39'-41', 12,14,15,15 184 ppm	Gray/brown coarse/fine SAND trace of gravel, moist slight odor	33
36			44'-46', 9,10,12,10 473 ppm	Gray/brown coarse/fine SAND, moist, odor	36
39			46'-48', 11,14,16,16 73 ppm	Gray/brown med./fine SAND moist, odor	39
42			48'-50', 9,12,10,37	Med./fine SAND fining downward to fine sand, moist, slight odor	42
45			48'-49.3' 166 ppm	Green/gray SILT & CLAY, wet, no odor	45
48		BENTONITE	49.6'-50' 8.4 ppm	Gray SAND and GRAVEL, trace of cobbles	48
51			54'-56', 32,35,18,18 35.4 ppm		51
54		GRAVEL PACK	59'-61', 20,23,27,21 19.6 ppm	Gray SAND and GRAVEL, trace of cobbles, dry, no odor	54
57			64'-66', 17,17,21,17 36.8 ppm	Gray SAND and GRAVEL, trace of cobbles, moist, no odor	57
60		WELL SCREEN	69'-71', 12,13,15,15 10.4 ppm	Gray SAND and GRAVEL, trace of cobbles, wet, no odor	60
63		BOTTOM CAP		69' WATER TABLE	63
66		UNDISTURBED NATIVE SOIL		END OF EXPLORATION AT 71'	66
69					69
72					72
75					75
78					78

WELL NUMBER MW2

PROJECT Village Mobil

LOCATION Bellows Falls, Vermont

DATE DRILLED 9/15/93 TOTAL DEPTH OF HOLE 71'

DIAMETER 6"

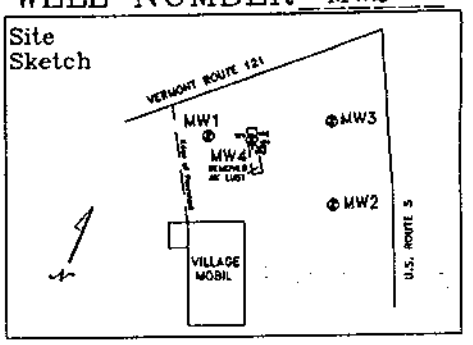
SCREEN DIA. 2" LENGTH 10' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 61' TYPE sch 40 pvc

DRILLING CO. TDS DRILLING METHOD Hollow Stem

DRILLER Pete Newsham LOG BY Ron Miller

Site Sketch



GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX			0
		LOCKING WELL CAP			
3		CONCRETE			3
6		BACKFILL	4'-6', 8,4,5,5 7.2 ppm	Brown SILT & fine SAND,moist,no odor	6
9			9'-11', 6,6,7,5 0.8 ppm	Brown fine SAND & SILT, moist to wet, no odor	9
12		WELL RISER			12
15			14'-16', 7,10,14,16 1.4 ppm	Gray to brown coarse/fine SAND trace of gravel, moist, no odor	15
18			19'-21', 13,17,12,11 1.4 ppm		18
21			24'-26', 12,8,13,11 2.2 ppm	Gray to brown SAND and GRAVEL moist, no odor	21
24			26'-28', 13,10,10,11 0.8 ppm		24
			28'-30', 13,13,16,13 0.8 ppm		
27			30'-32', 21,13,16,19 0.6 ppm	Gray to brown SAND and GRAVEL trace of cobbles, moist, no odor	27
30			32'-34', 21,16,13,15 1.6 ppm		30
33			34'-36', 13,14,17,18 2.3 ppm		33
			36'-38', 16,12,12,14 10.0 ppm		
36			38'-40', 12,7,12,17 33.6 ppm	No recovery	36
39			40'-42', 16,14,26,27		39
			42'-44', 11,12,14,13 15.7 ppm	Brown med./fine SAND, moist, no odor	
42			44'-46', 15,17,16,14 16.4 ppm	Gray/brown, med./fine SAND moist, no odor	42
45			46'-48', 13,10,12,13 74.5 ppm	Brown fine SAND, very moist, no odor	45
48			48'-50', 13,10,11,17	Green/brown CLAY & SILT, wet, no odor	48
		BENTONITE	48'-49.6' 31.0 ppm	Gray/brown, med./fine SAND moist, no odor	
51			49.6'-50' 0 ppm		51
54			50'-52', 12,12,18,23 5.0 ppm	Gray SAND & GRAVEL,moist, no odor	54
57			52'-54', 22,22,27,34 16.7 ppm	Gray SAND & GRAVEL, dry, no odor	57
60		GRAVEL PACK	54'-56', 12,27,27,22 11.2 ppm	No recovery	60
63			56'-58', 30,22,24,38 5.1 ppm	Gray/brown SAND & GRAVEL, trace of cobbles, dry, no odor	63
66		WELL SCREEN	58'-60', 29,24,26,35 5.0 ppm	Gray SAND and GRAVEL, trace of cobbles, wet, no odor	66
69		BOTTOM CAP	64'-66', 18,19,35,19 17.0 ppm	68' WATER TABLE	69
			69'-71', 10,21,33,26 6.3 ppm	END OF EXPLORATION AT 71'	
72		UNDISTURBED NATIVE SOIL			72
75					75
78					78

WELL NUMBER MW3

PROJECT Village Mobil

LOCATION Bellows Falls, Vermont

DATE DRILLED 9/16/93 TOTAL DEPTH OF HOLE 71'

DIAMETER 6"

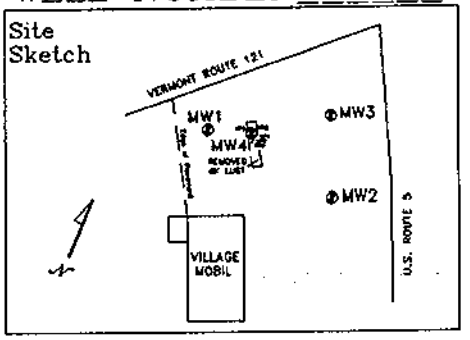
SCREEN DIA. 2" LENGTH 10' SLOT SIZE 0.010"

CASING DIA. 2" LENGTH 61' TYPE sch 40 pvc

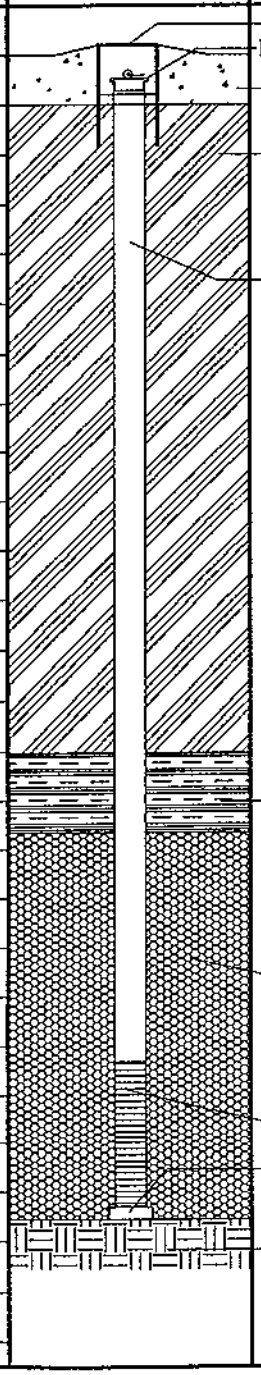
DRILLING CO. TDS DRILLING METHOD Hollow Stem

DRILLER Pete Newsham LOG BY Ron Miller

Site Sketch



GRIFFIN INTERNATIONAL, INC



DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0					0
3					3
6			4'-6', 4,4,4,4 7.6 ppm	Brown SILT & fine SAND, moist, no odor	6
9			9'-11', 6,6,8,9 8.5 ppm	Brown fine SAND & SILT, moist to very moist, no odor	9
12					12
15			14'-16', 27,20,16,13 10.3 ppm	Gray/brown coarse/fine SAND, trace of gravel, moist, no odor	15
18					18
21			19'-21', 12,15,17,20 3.4 ppm	Brown/gray coarse/fine SAND, moist, no odor	21
24			24'-26', 22,19,11,9 1.3 ppm	Brown/gray SAND & GRAVEL, moist, no odor	24
27					27
30			29'-31', 13,14,18,20 5.1 ppm	Brown/gray coarse/fine SAND & gravel, moist, no odor	30
33			34'-36', 11,13,13,13 1.8 ppm	Brown/gray coarse/fine SAND, trace of gravel, moist, no odor	33
36					36
39			39'-41', 13,13,12,11 4.9 ppm	Brown/gray coarse/fine SAND, moist, no odor	39
42					42
45		BENTONITE	44'-46', 11,9,14,14 4.9 ppm	Brown med./fine SAND fining downward to fine SAND, moist, no odor Green/gray SILT & CLAY, coarsens down to fine SAND, wet, no odor	45
48					48
51				Gray/brown coarse/fine SAND to fine SAND, wet, no odor	51
54			49'-51', 35,23,26,25 5.4 ppm		54
57		GRAVEL PACK	54'-56', 32,30,48,37 12.1 ppm	Gray SAND & GRAVEL, trace of cobbles, dry, no odor	57
60			59'-61', 73,52,33,55 10.4 ppm		60
63			64'-66', 24,18,19,18 37.7 ppm		63
66		WELL SCREEN	69'-71', 7,10,14,17 2.5 ppm	Gray coarse/fine SAND, wet, no odor	66
69		BOTTOM CAP		68' WATER TABLE END OF EXPLORATION AT 71'	69
72		UNDISTURBED NATIVE SOIL			72
75					75
78					78

PROJECT Village Mobil

LOCATION Bellows Falls, Vermont

DATE DRILLED 9/15/93 TOTAL DEPTH OF HOLE 71'

DIAMETER 6"

SCREEN DIA. 2" LENGTH 10' SLOT SIZE 0.010"

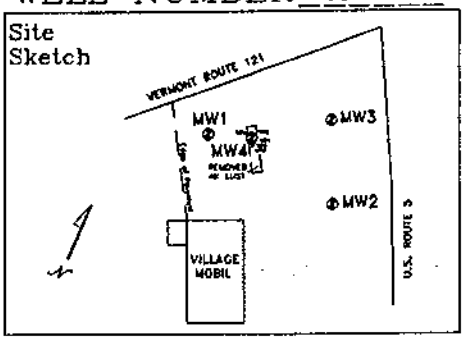
CASING DIA. 2" LENGTH 61' TYPE sch 40 pvc

DRILLING CO. TDS DRILLING METHOD Hollow Stem

DRILLER Pete Newsham LOG BY Ron Miller

WELL NUMBER MW4

Site Sketch



GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX LOCKING WELL CAP			0
3		CONCRETE			3
6		BACKFILL	4'-6', 5,4,2,2, >2500 ppm	Brown SILT & fine SAND,moist, odor	6
9			9'-11', 18,14,22,41 206 ppm	Brown/grey SAND & GRAVEL (fill),dry, odor	9
12					12
15		WELL RISER	14'-16', 16,12,12,10 >2500 ppm	Brown SILT/SAND & GRAVEL (fill) moist, strong odor	15
18			19'-21', 7,7,20,22 >2500 ppm	Brown/gray coarse/fine SAND moist, strong odor	18
21				Brown/gray SAND & GRAVEL, moist, strong odor	21
24			24'-26', 10,8,8,8, >2500 ppm	Brown/gray, coarse/fine SAND & GRAVEL, moist, strong odor	24
27			29'-31', 7,9,14,11 600 ppm ave.	Coarse/fine SAND, trace of gravel moist, odor	27
30					30
33			34'-36', 12,13,13,11 1370 ppm	Gray/brown SAND & GRAVEL, moist, odor	33
36					36
39			39'-41', 21,18,16,14 1,500 ppm ave.	Brown/gray coarse/fine SAND, moist, odor	39
42			44'-46', 7,11,11,11 550 ppm ave.	Brown/gray coarse/fine SAND, moist, odor	42
45					45
48		BENTONITE	49'-51', 38,20,32,19 130 ppm	Gray SAND & GRAVEL, trace of cobbles, dry, slight odor	48
51					51
54		GRAVEL PACK	54'-56', 34,21,31,31 102 ppm	Gray SAND & GRAVEL, trace of cobbles, slight odor	54
57			59'-61', 30,30,29,28 110 ppm	Gray SAND & GRAVEL, trace of cobbles, slight odor	57
60			64'-66', 22,16,33,18 49.0 ppm	Gray SAND & GRAVEL, trace of cobbles, dry, no odor	60
63		WELL SCREEN	69'-71', 13,16,14,11 101 ppm	Gray SAND & GRAVEL, trace of cobbles, wet, slight odor	63
66		BOTTOM CAP			66
69				68' WATER TABLE ▼	69
72		UNDISTURBED NATIVE SOIL		END OF EXPLORATION AT 71'	72
75					75
78					78

APPENDIX C

WATER LEVEL DATA

Village Mobil
Bellows Falls, Vermont

Liquid Level Data

10/1/93

Well I.D.	Well Depth	Top of Casing Elevation	Depth To Product	Depth To Water	Product Thickness	Specific Gravity Of Product	Water Equivalent	Corrected Depth To Water	Corrected Water Table Elevation
MW1	72.05	100.00	-	68.69					31.31
MW2	70.45	97.91	-	66.66					31.25
MW3	70.82	98.08	-	67.13					30.95
MW4	70.83	99.38	-	68.15					31.23

APPENDIX D

LABORATORY REPORT FORMS

ENDYNE, INC.

Laboratory Services

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

REPORT OF LABORATORY ANALYSIS

CLIENT: Griffin International
PROJECT NAME: Village Mobil
REPORT DATE: October 13, 1993
DATE SAMPLED: October 1, 1993

PROJECT CODE: GIVM1819
REF.#: 52,100 - 52,106

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated samples were preserved with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures

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ENDYNE, INC.

Laboratory Services

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

LABORATORY REPORT

EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Griffin International
PROJECT NAME: Village Mobil
REPORT DATE: October 13, 1993
DATE SAMPLED: October 1, 1993
DATE RECEIVED: October 1, 1993
ANALYSIS DATE: October 12, 1993

PROJECT CODE: GIVM1819
REF.#: 52,100
STATION: MW-1
TIME SAMPLED: 9:55
SAMPLER: J. Bernhard

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	10	265.
Chlorobenzene	10	ND[2]
1,2-Dichlorobenzene	10	ND
1,3-Dichlorobenzene	10	ND
1,4-Dichlorobenzene	10	ND
Ethylbenzene	10	ND
Toluene	10	239.
Xylenes	10	ND
MTBE	100	ND

Bromobenzene Surrogate Recovery: 108%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:

1 Detection limit raised due to high levels of contaminants. Sample run at 10% dilution.
2 None detected

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ENDYNE, INC.

Laboratory Services

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Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Griffin International
PROJECT NAME: Village Mobil
REPORT DATE: October 13, 1993
DATE SAMPLED: October 1, 1993
DATE RECEIVED: October 1, 1993
ANALYSIS DATE: October 12, 1993

PROJECT CODE: GIVM1819
REF.#: 52,101
STATION: MW-2
TIME SAMPLED: 10:25
SAMPLER: J. Bernhard

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	10	1,300.
Chlorobenzene	10	ND[2]
1,2-Dichlorobenzene	10	ND
1,3-Dichlorobenzene	10	ND
1,4-Dichlorobenzene	10	ND
Ethylbenzene	10	ND
Toluene	10	823.
Xylenes	10	ND
MTBE	100	ND

Bromobenzene Surrogate Recovery: 113%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

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

2 None detected

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ENDYNE, INC.

Laboratory Services

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Williston, Vermont 05495
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FAX 879-7103

LABORATORY REPORT

EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Griffin International
PROJECT NAME: Village Mobil
REPORT DATE: October 13, 1993
DATE SAMPLED: October 1, 1993
DATE RECEIVED: October 1, 1993
ANALYSIS DATE: October 12, 1993

PROJECT CODE: GIVM1819
REF.#: 52,102
STATION: MW-3
TIME SAMPLED: 10:50
SAMPLER: J. Bernhard

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	10	230.
Chlorobenzene	10	ND[2]
1,2-Dichlorobenzene	10	ND
1,3-Dichlorobenzene	10	ND
1,4-Dichlorobenzene	10	ND
Ethylbenzene	10	ND
Toluene	10	168.
Xylenes	10	ND
MTBE	100	ND

Bromobenzene Surrogate Recovery: 101%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

1 Detection limit raised due to high levels of contaminants. Sample run at 10% dilution.
2 None detected

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Laboratory Services

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Williston, Vermont 05495
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FAX 879-7103

LABORATORY REPORT

EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Griffin International
PROJECT NAME: Village Mobil
REPORT DATE: October 13, 1993
DATE SAMPLED: October 1, 1993
DATE RECEIVED: October 1, 1993
ANALYSIS DATE: October 12, 1993

PROJECT CODE: GIVM1819
REF.#: 52,103
STATION: MW-4
TIME SAMPLED: 11:15
SAMPLER: J. Bernhard

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	10	1,590.
Chlorobenzene	10	ND[2]
1,2-Dichlorobenzene	10	ND
1,3-Dichlorobenzene	10	ND
1,4-Dichlorobenzene	10	ND
Ethylbenzene	10	20.1
Toluene	10	2,060.
Xylenes	10	110.
MTBE	100	109.

Bromobenzene Surrogate Recovery: 107%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 1

NOTES:

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

2 None detected

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Laboratory Services

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Williston, Vermont 05495
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FAX 879-7103

LABORATORY REPORT

EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Griffin International
PROJECT NAME: Village Mobil
REPORT DATE: October 13, 1993
DATE SAMPLED: October 1, 1993
DATE RECEIVED: October 1, 1993
ANALYSIS DATE: October 12, 1993

PROJECT CODE: GIVM1819
REF.#: 52,104
STATION: Trip Blank
TIME SAMPLED: 9:30
SAMPLER: J. Bernhard

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	ND
Xylenes	1	ND
MTBE	10	ND

Bromobenzene Surrogate Recovery: 104%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

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Laboratory Services

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FAX 879-7103

LABORATORY REPORT

EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Griffin International
PROJECT NAME: Village Mobil
REPORT DATE: October 13, 1993
DATE SAMPLED: October 1, 1993
DATE RECEIVED: October 1, 1993
ANALYSIS DATE: October 12, 1993

PROJECT CODE: GIVM1819
REF.#: 52,105
STATION: Equipment Blank
TIME SAMPLED: 11:25
SAMPLER: J. Bernhard

Parameter	Detection Limit (ug/L)	Concentration (ug/L)
Benzene	1	ND[1]
Chlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
Ethylbenzene	1	ND
Toluene	1	ND
Xylenes	1	ND
MTBE	10	ND

Bromobenzene Surrogate Recovery: 99%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 0

NOTES:
1 None detected

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ENDYNE, INC.

Laboratory Services

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Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Griffin International
PROJECT NAME: Village Mobil
REPORT DATE: October 13, 1993
DATE SAMPLED: October 1, 1993
DATE RECEIVED: October 1, 1993
ANALYSIS DATE: October 12, 1993

PROJECT CODE: GIVM1819
REF.#: 52,106
STATION: Duplicate (MW-4)
TIME SAMPLED: 11:15
SAMPLER: J. Bernhard

Parameter	Detection Limit (ug/L)[1]	Concentration (ug/L)
Benzene	10	2,100.
Chlorobenzene	10	ND[2]
1,2-Dichlorobenzene	10	ND
1,3-Dichlorobenzene	10	ND
1,4-Dichlorobenzene	10	ND
Ethylbenzene	10	38.5
Toluene	10	2,690.
Xylenes	10	197.
MTBE	100	132.

Bromobenzene Surrogate Recovery: 116%

NUMBER OF UNIDENTIFIED PEAKS FOUND: 2

NOTES:

1 Detection limit raised due to high levels of contaminants. Sample run at 10% dilution.
2 None detected

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ENDYNE, INC.
32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333

CHAIN-OF-CUSTODY RECORD

008864

Project Name: Village Mobil Site Location: Bellows Falls, VT	Reporting Address: Griffin	Billing Address: Griffin
Endyne Project Number: GIVM1819	Company: Griffin Contact Name/Phone #: 879-7708	Sampler Name: J. Bernhard Phone #: same

Lab #	Sample Location	Matrix	GRAB	COMP	Date/Time 10-1-93	Sample Containers No.	Sample Containers Type/Size	Field Results/Remarks	Analysis Required	Sample Preservation	Rush
52,100	MW-1	H_2O	X		9:55	2	40ml		602	HCl	
52,101	MW-2	↓	↓		10:25	↓	↓		↓	↓	
52,102	MW-3	↓	↓		10:50	↓	↓		↓	↓	
52,103	MW-4				11:15						
52,104	Trip Blank				9:30						
52,105	Equipment Blank				11:25						
52,106	Duplicate (MW-4)				11:15						

Relinquished by: Signature J. B[illegible]	Received by: Signature [illegible] M. [illegible]	Date/Time 10/1/93 1:40
Relinquished by: Signature	Received by: Signature	Date/Time

Requested Analyses

1	pH	6	TKN	11	Total Solids	16	Metals (Specify)	21	EPA 624	26	EPA 8270 B/N or Acid
2	Chloride	7	Total P	12	TSS	17	Coliform (Specify)	22	EPA 625 B/N or A	27	EPA 8010/8020
3	Ammonia N	8	Total Diss. P	13	TDS	18	COD	23	EPA 418.1	28	EPA 8080 Pest/PCB
4	Nitrite N	9	BOD_5	14	Turbidity	19	BTEX	24	EPA 608 Pest/PCB		
5	Nitrate N	10	Alkalinity	15	Conductivity	20	EPA 601/602	25	EPA 8240		
29	TCLP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify):										

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