

**FINAL
LIMITED VAPOR INTRUSION INVESTIGATION**

**Cumberland Farms, Inc.
Store No. 1842 - Gorham, Maine**

Prepared for:

**Maine Department of Environmental Protection
Augusta, Maine**

Prepared by:



**MACTEC Engineering and Consulting, Inc.
511 Congress St.
Portland, ME 04101**

February 8, 2011

MACTEC PROJECT: 3612102157

LIMITED VAPOR INTRUSION INVESTIGATION

**Cumberland Farms, Inc.
Store No. 1842 - Gorham, Maine**

Prepared for:

**Maine Department of Environmental Protection
Augusta, Maine**

Prepared by:



**MACTEC Engineering and Consulting, Inc.
511 Congress St.
Portland, ME 04101**

February 8, 2011

MACTEC PROJECT: 3612102157

A handwritten signature in black ink, appearing to read "Charles Staples", written over a horizontal line.

**Charles Staples
Task Manager**

A handwritten signature in black ink, appearing to read "Peter Thompson", written over a horizontal line.

**Peter Thompson
Program Manager**

A handwritten signature in black ink, appearing to read "Jeffrey Pickett", written over a horizontal line.

**Jeffrey Pickett
Principal**

TABLE OF CONTENTS

LIST OF ACRONYMS	ii
1.0 INTRODUCTION	1-1
2.0 SITE BACKGROUND AND CONCEPTUAL SITE MODEL	2-1
3.0 METHODOLOGIES.....	3-1
4.0 RESULTS	4-1
4.1 Quality Assurance.....	4-1
4.2 Source Area Soil.....	4-1
4.3 Groundwater	4-2
4.4 Soil Vapor.....	4-2
5.0 CONCLUSIONS.....	5-1
6.0 REFERENCES	6-1

FIGURES

Figure 3.1 Site Features and Sample Locations

TABLES

Table 4.1 Soil Sample Analytical Results

Table 4.2 Soil Vapor Analytical Results

APPENDICES

Appendix A Boring Logs

LIST OF ACRONYMS

$\mu\text{g}/\text{M}^3$	micrograms per cubic meter
APH	Air Petroleum Hydrocarbons
AOC	Area of Concern
bgs	below ground surface
CFI	Cumberland Farms Incorporated
CSM	Conceptual Site Model
ECS	Environmental Compliance Services
GRO	Gasoline Range Organics
MACTEC	MACTEC Engineering and Consulting, Inc.
MEDEP	Maine Department of Environmental Protection
mg/kg	milligram per kilogram
PID	photoionization detector
ppm	parts per million
REC	recognized environmental concerns
Site	Cumberland Farms Gorham site
SSQAPP	Site-Specific Quality Assurance Project Plan
UST	underground storage tank
VI	Vapor Intrusion
VOC	volatile organic compounds
VPH	Volatile Petroleum Hydrocarbons

1.0 INTRODUCTION

The Maine Department of Environmental Protection (MEDEP) is evaluating the potential for vapor intrusion (VI) at gasoline stations in the State of Maine. As part of the evaluation, the MEDEP conducted investigations at a number of Cumberland Farms, Inc. (CFI) owned gasoline stations. MACTEC Engineering and Consulting, Inc. (MACTEC) was contracted to conduct this Limited VI Investigation at the CFI Gorham Station (Store No. 1842) under Contract Number 20100708-164, dated July 8, 2010, between the MEDEP and MACTEC. The purpose of the investigations was to evaluate the potential presence of residual soil and or groundwater contamination at the Site and, if present, the potential for it to result in vapor intrusion of contaminants into nearby buildings.

This Limited VI Investigation Report covers work conducted at the Cumberland Farms Gorham site (Site), located at 137 Main Street, Gorham, Maine (Store No. 1842). This report consists of:

Section 1: Introduction/Objectives

Section 2: Site Background and Conceptual Site Background

Section 3: Methodologies

Section 4: Results

Section 5: Conclusions

Section 6: References

2.0 SITE BACKGROUND AND CONCEPTUAL SITE MODEL

A conceptual site model includes an evaluation of potential source areas, potential contaminants of concern, potential migration and exposure pathways and potential receptors. The Conceptual Site Model (CSM) is based on information developed as part of a Phase I Environmental Site Assessment conducted by MACTEC (MACTEC, 2010a).

Site Setting. The general topographic relief of the Site is relatively flat. The Site elevation is approximately 194 feet above mean sea level, with the immediate Site relief remaining flat. The surrounding topography is also flat, although there is a slight downward slope from southwest to northeast, with an elevation drop of approximately 20 feet over a 500-foot distance (United States Geological Survey, 1975).

The majority of the Site is covered by pavement and grass, promoting rain water to runoff in a northeasterly direction to a town storm drain. There were no apparent low areas located on the Site that would be expected to contain standing water during wet periods. Surface water bodies were not observed or identified on, or within a quarter-mile radius of the Site. The Site is not within the 100 year flood zone (FEMA, 1981).

The Site and surrounding area are serviced by public water supply. Although the Site is mapped as being situated over a significant sand and gravel aquifer (Foster, et. Al, 2008), glaciomarine silt and clay was noted below the Site starting at approximately 16 feet below ground surface (bgs) and groundwater was not encountered. These findings are consistent with other surficial geologic information. Although saturated soils were noted at 13 feet bgs at one boring location, this water may be perched. Groundwater, when present, is expected to flow to the northeast, following the area topography (groundwater was reported at approximately five feet bgs during a 2005 underground storage tank (UST) removal, and at approximately 12 feet bgs during a 2004 UST removal (MACTEC, 2010a).

The bedrock surface beneath the Site is anticipated to be present between 20 and 45 feet bgs (bedrock was not encountered at depths up to 20 feet bgs) and is mapped as:

- Vassalboro Formation; Silurian-Ordovician slightly to non-calcareous sandstone with limited cal-silicate lenses (Osberg, et.al., 1985).

Soils at the Site were described using the surficial geologic mapping conducted by Geoffrey W. Smith 1999, and taken from the Surficial Geology of the Gorham Quadrangle, Maine from 1999 (Smith, 1999).

Site soil is mapped as:

- glaciomarine deposits - fine grained - Silt, clay, and minor amounts of gravel. Commonly clayey silt (the Presumpscot Formation). Sand is dominant in some places, but may be underlain by finer grained sediments. Locally fossiliferous. Map unit includes small areas of till and other units that are not completely covered by marine sediments.

Site Operational History. The Site has operated as a gasoline station for over 75 years. Site remediation occurred in 1981, 1996, and 2005 during tank closure activities (MACTEC, 2010a). Environmental Compliance Services, Inc. (ECS) reported in a May 2005 Site Assessment that in place Site soils sampled for remedial confirmation at thirteen feet bgs (after contaminated soils were removed) had photoionization detector (PID) headspace readings ranging from 2,050 parts per million (ppm) to 2,726 ppm. In addition, concentrations of Gasoline Range Organics (GRO) detected in samples submitted for off-site analytical analysis ranging from 44 milligrams per kilogram (mg/kg) to 3,500 mg/kg (ECS, 2005). Additionally, the MEDEP noted in Spill Report P-383-2005 concerning the May 2005 tank removal that gasoline contaminated soil remained on-site in areas under the dispenser islands, under the public roadways, and was likely under adjacent properties (MEDEP, 2005).

There are several properties with documented environmental conditions located in close proximity to the Site. Many of these properties are southwest of the Site, or the potential upgradient location (the closest former fuel station is approximately 150 feet southwest of the Site). It was unknown if releases from these properties (primarily petroleum products) have impacted the Site groundwater or vapor conditions. These releases include reported leaking USTs at gasoline stations, commercial businesses, and private residences. A former dry cleaning company was also located approximately 50 feet south of the Site on the southern side of New Portland Road (MACTEC, 2010a). It is unknown if dry cleaning solvents were discharged or spilled onto the surrounding soil and if potential contamination at this location may impact the Site groundwater or vapor conditions.

As a result of the geologic setting of the Site and information concerning past operations at the property, a conceptual model of the Site with the following considerations was developed:

- Based on previous excavations and current borings, shallow overburden consists of coarse sand and gravel to medium/coarse sand and gravel with silt. Clay is present at 16 feet bgs and extends to at least 20 feet bgs. Bedrock is anticipated to be 20 to 45 feet bgs.
- Groundwater at the Site, although not encountered, is expected to flow towards the northeast.
- Operations at the Site and vicinity included the use of gasoline products and cleaning solvents from the 1930's to the present.

Potential Source Areas and Contaminants of Concern. The Phase I (MACTEC, 2010a) identified four Recognized Environmental Conditions (RECs) at the Site that could have impacted Site media. RECs from the Site are:

1. **Contamination from historic use as a gasoline station.** The site has a long history of operating as a gasoline station, since approximately 1934. During that time various petroleum products have been stored in USTs and dispensed on-site. USTs and associated product piping constitute a risk of a leak or spill, past or future. Soil contamination remaining from prior tank removals is documented as remaining on-site, providing the potential for on-site groundwater contamination and a vapor encroachment condition.
2. **Historic use of the Site as an automotive service station.** It is unknown if petroleum products or cleaning solvents have been discharged or spilled onto the surrounding soils providing for potential contamination of the Site soil and groundwater which may result in a potential vapor encroachment condition.

Background RECs are:

1. **Former adjacent dry cleaning business.** It is unknown if dry cleaning solvents have been discharged or spilled onto the property south of the Site, resulting in the potential contamination of Site groundwater and may also result in a potential vapor encroachment condition.
2. **Several leaking USTs located in close proximity to the Site.** Leaking USTs at gasoline stations, commercial businesses, and private residences were noted as being southwest of the site, or potential upgradient location. It is unknown if discharges from these sites (primarily petroleum products) have impacted the site groundwater or vapor encroachment conditions.

Areas of Concern (AOCs). Based on the RECs MACTEC identified the following two property specific AOCs to evaluate for potential contamination.

AOC -1: Historic Gasoline USTs. Contaminated soils were reportedly present in the vicinity of the historic USTs.

AOC-2: Historic Waste Oil Tank. It is unknown if petroleum products or solvents remain in soil in the vicinity of the historic waste oil tank.

Potential Migration Pathways. Potential migration pathways at the site include:

1. Petroleum related contaminants remaining in subsurface soils from historic UST removal actions may have impacted groundwater under the Site. Volatile organic contaminants present in soil and groundwater can partition to soil vapor and may migrate to indoor air in nearby buildings or future site buildings. Pathways for entry into buildings include utility trenches and migration through the building flooring.
2. If other volatile organic compounds (VOCs) are present in Site soil and groundwater from the past use of solvents at the Site, these contaminants could also partition from the soils or groundwater and migrate as soil vapor to nearby buildings.
3. Contaminants that potentially impacted soils from a historic dry cleaner (cleaning solvents) could have leached during infiltration of precipitation into the sub-surface soils, and also into groundwater. The shallow overburden groundwater is anticipated to flow northeast from the historic dry cleaner towards the Site. Contaminants in groundwater can partition to soil vapor and migrate to indoor air in overlaying buildings.

Potential Exposure Pathways. Potential exposure routes include inhalation of contaminated soil vapor and indoor air, ingestion/dermal contact of soil, and ingestion of and dermal contact with groundwater.

Potential Receptors. Potential receptors include future site workers being exposed to soil, groundwater, and soil vapor, and customers and near-by residents that inhale indoor air if contaminated. The area is serviced by public water and although ingestion of groundwater is unlikely, it has been included as a potential future exposure route.

3.0 METHODOLOGIES

To evaluate the potential migration pathways and exposure routes identified in the CSM, a Phase II field investigation was conducted. The field work was conducted in accordance with the Site-Specific Quality Assurance Project Plan (SSQAPP) (MACTEC, 2010b).

The field program was designed to evaluate the potential for vapor intrusion as a result of residual contamination at the two identified AOCs. Sample locations are shown on Figure 3.1.

The field work consists of the following items:

- Completion of five direct push (Geoprobe) soil borings;
- Installation of five soil vapor implants; and
- Collection of one sub-slab soil vapor sample.

Prior to conducting sampling activities, MACTEC contacted Dig-Smart, of Scarborough Maine to conduct utility clearance and identify underground utilities. The purpose of the utility clearance was both to avoid drilling into utility lines, as well as to target shallow utility corridors as possible preferential pathways for vapor migration.

Prior to the commencement of field activities, a kick-off meeting was held on-Site with MACTEC, the MEDEP, and subcontractor personnel to familiarize on-Site workers with the Site's history, health and safety requirements, sampling procedures, equipment, decontamination procedures, and investigation derived waste handling.

Geoprobe Soil Sampling. Continuous soil samples were collected at five locations using direct push methods to characterize subsurface soils at potential source areas, as well as to assist in installation of soil vapor sampling points. Soil characteristics (such as soil type, moisture, color) and PID field screening results were recorded on a field data record to distinguish between source and clean soil. Boring logs are presented in Appendix A. PID screening and visual and olfactory observations were used to select boring intervals for off-site analysis. Two samples were submitted to Resource Laboratories for analysis of volatile petroleum hydrocarbons by Massachusetts Volatile Petroleum Hydrocarbon (VPH) method.

Geoprobe Microwell Installation and Groundwater Sampling. Saturated soil conditions indicative of groundwater were not encountered in the soil borings. Microwell installation and groundwater sampling therefore did not occur at the Site.

Soil Vapor Sampling Implants. Soil vapor samples were collected at five exterior locations to determine the vertical and lateral extent of soil vapor contamination and to evaluate the potential for vapor intrusion into nearby buildings. Soil vapor implants were installed in the following locations: two locations in or adjacent to the potential soil source areas at AOC-1 (SV-01 and SV-02); one location approximately 35 feet from AOC 1 (SV-03); one location within underground utility trenching using a hand screw auger (SV-04); and one in an interpreted upgradient location, on the side of the Site nearest the former dry cleaner (SV-05). With the exception of the soil vapor implant installed in the utility trenches, the implants were installed approximately eight to 10 feet below ground surface (groundwater was not encountered). Helium leak tests were conducted during sampling to evaluate the integrity of the soil vapor implant surface seals. The samples were shipped to Alpha Analytical for analyses of Air Petroleum Hydrocarbons (APH) by MA APH method. The samples were also analyzed for carbon dioxide, and oxygen. In addition, three of the samples were analyzed for chlorinated VOCs by USEPA Method TO-15.

Sub-Slab Soil Vapor Sample. One sample (SV-06) was collected from below the concrete slab of the Site building to evaluate the potential presence of contaminants in soil vapor below the Site building. The sample was shipped to Alpha Analytical for analyses of APH by MA APH method, as well as chlorinated VOCs via USEPA Method TO-15. The sample was also analyzed for carbon dioxide and oxygen.

Survey. Sampling locations were surveyed by the MEDEP using a global positioning system with sub-meter accuracy.

4.0 RESULTS

This section of the report highlights field sampling results and findings, and includes a discussion of quality assurance and quality control.

4.1 QUALITY ASSURANCE

The laboratory did not report any data quality issues. One duplicate soil vapor sample was collected using a "T" in the soil vapor tubing. Results of the duplicate were comparable to the original sample, indicating good quality control (the relative percent difference between the sample and duplicate was 11 % or less). In addition, leak tests were conducted using helium as a tracer gas. Leaks greater than one percent were not noted in the three four deeper soil vapor samples (SV-01 to SV-03 and SV-05). Leaks of approximately 8% were noted in the shallow soil vapor sample SV-05 and a leak of approximately 2.5% was noted in the sub-slab soil vapor sample SV-06). These readings indicated an acceptable seal (although Maine does not currently list an acceptable breakthrough concentration in its guidance, New York Guidance lists a breakthrough concentration of less than 10% as acceptable). Carbon dioxide measurements collected both before and after sampling were also similar, another indication that leaks within the vapor probe sample train were not significant and that data quality was acceptable.

4.2 SOURCE AREA SOIL

Shallow overburden at the Site consists of fine to coarse sand to approximately 16 feet bgs, and clay from 16 feet to greater than 20 feet bgs. A strong petroleum odor and PID readings as high as 15,000 ppm were noted at 13 feet bgs in boring SB-2. This location is in the vicinity of the historic UST and contaminated soil removal action. Although PID and olfactory indications of contamination were observed, analytical results for a soil sample collected from this location were non-detect for fuel related VOCs. Slightly elevated PID readings (160 ppm) were also noted at boring SB-3 at nine feet bgs, although olfactory evidence of contamination was not observed. Low concentrations of naphthalene and fuel range hydrocarbons were detected in a sample from this location, but detected concentrations were below any of the Remedial Action Guidelines (RAGs). Analytical results from the two soil samples are presented in Table 4.1.

4.3 GROUNDWATER

Groundwater was not encountered during the investigation. Due to the silt/clay layer noted from approximately 16 feet bgs to greater than 20 feet bgs, and the lack of water above this silt/clay layer, microwells were not installed.

4.4 SOIL VAPOR

For comparative purposes, concentrations of parameters detected in the soil vapor samples were compared to the MEDEP residential multi-contaminant chronic soil gas target values (assumes an attenuation factor of 0.02). Soil vapor results are reported on Table 4.2.

Concentrations of fuel related VOCs were detected in the sample from location SV-02, located on the north side of the historic USTs. This included concentrations of benzene at 32,000 micrograms per cubic meter ($\mu\text{g}/\text{M}^3$) compared to a residential soil vapor target value of 15.5 $\mu\text{g}/\text{M}^3$. Ethylbenzene, toluene, xylene, naphthalene, and fuel range hydrocarbons were also detected at concentrations greater than an order of magnitude above the residential soil vapor target value. The source of this vapor was not identified, but may be the result of residual soil contamination surrounding the historic UST and soil removal. It is also possible that this contamination is the result of ongoing releases at the pump station from potential line leaks, or ongoing surface spills over time. Sample SV-03 was collected approximately 35 feet northeast of sample SV-02. With the exception of some of the fuel range hydrocarbons, concentrations of target analytes detected in the sample SV-03 decreased by greater than an order of magnitude from sample SV-02. Although less than concentrations in sample SV-02, concentrations detected in sample SV-03 were above residential target values.

Concentrations of VOCs detected in sample location SV-01, located approximately 55 feet southwest of SV-02, were below the residential soil vapor target value, with the exception of the hydrocarbon range C5 to C8 aliphatics. The soil vapor sample collected closer to the Site building, sample SV-04, was collected approximately 110 feet east of SV-2 at a depth of 2-feet below grade. C5 to C8 aliphatic hydrocarbons and 1,3-butadiene were the only fuel related VOCs detected in sample SV-04 above the residential soil vapor target value. Tetrachloroethene was also detected in sample SV-04 at a concentration of 94.1 $\mu\text{g}/\text{M}^3$, which is above the residential soil vapor target

value of $20 \mu\text{g}/\text{M}^3$, but below the commercial soil vapor target value of $105 \mu\text{g}/\text{M}^3$. The source of the tetrachloroethene is not known, but may be related to the former dry cleaner located approximately 50 feet south of the Site. Individual target VOCs were not detected in the sub-slab soil vapor sample SV-06, and only low concentrations (below target values) of fuel range hydrocarbons were detected.

Benzene and 1,2-butadiene exceeded the residential soil vapor target value in upgradient soil vapor sample SV-05. The remainder of the detected VOCs in sample SV-05 were below the target values.

Oxygen and carbon dioxide concentrations were compared to the soil vapor results. Where biological activity is present in response to fuel contamination, oxygen should be depleted and carbon dioxide produced. For the two samples collected from approximately eight to 10 feet bgs with little indication of contamination (samples SV-01 and SV-05), oxygen concentrations were approximately 12% to 15%. Carbon dioxide in these two samples was approximately 5% (based on off-site analysis). For the two soil vapor samples with high fuel detections (samples SV-02 and SV-03), oxygen was not detected in the pre-sample field measurement, or in the laboratory sample. The carbon dioxide measurement for these two off-site samples (SV-02 and SV-03) were approximately 14% and 10%. This shows fairly good correlation between fuel related soil vapor contamination and low oxygen and high carbon dioxide concentrations. The exception to this was sample SV-04. This was a shallow soil vapor sample with low concentrations of fuel range compounds, but also low oxygen (2% in the off-site sample) and high carbon dioxide (17% in the off-site sample). This location also had a breakthrough of helium from the leak test of approximately 8%.

As would be expected, PID readings collected during purging of the soil vapor lines were higher in the soil vapor points with the higher concentrations of VOCs (based on off-site analysis).

5.0 CONCLUSIONS

This section describes the Site geology, groundwater, analytical results, findings, and recommendations.

Shallow overburden at the Site consists of coarse sand and gravel to medium/coarse sand and gravel with silt. Silt/clay is present at 16 feet bgs and extends to at least 20 feet bgs. Groundwater was not encountered above the clay, but was reported in historic UST removal reports to have been present at five feet bgs in 2005 and 12 feet bgs in 1996.

Low concentrations of fuel related compounds were detected in soil at the Site, and high concentrations of fuel related compounds were detected in several of the soil vapor samples. The sandy overburden is transmissive which may negate other preferential pathways for soil vapor migration; such as utility conduits. Samples were collected within the bedding for the shallow electrical conduits that ran from the pump islands to the Site building to evaluate if vapors were migrating towards the Site building along this path. This utility conduit did not show elevated vapor concentrations.

Although low concentrations (below the RAGs) of fuel related compounds were identified in soil samples from boring SB-03, a soil contamination source area was not identified during the investigation. Previous soil removal actions conducted during UST removals indicated that soil contamination was left below the roadway and below the fuel dispensers. It is possible that sample SB-02 was collected from within an area previously backfilled during the UST removal (high PID readings were noted in SB-02).

High concentrations of fuel related VOCs were detected in the soil vapor samples SV-02 and SV-03. Sample SV-02 was collected adjacent to the historic UST grave. It is possible that VOCs detected in soil vapor at this location are the result of nearby residual fuel contamination located either below Main Street, or below the fuel dispensers. It is not known if this contamination is from the historic leaking UST, or from ongoing spills/leaks in the vicinity of the fuel dispensers. Concentrations of detected VOCs diminished by greater than an order of magnitude over a distance of 35 feet from location SV-02 to SV-03. Because the actual source area was not identified, it is also possible that location SV-03 is proximal to soil contamination.

Concentrations diminish to the southeast, at location SV-01, which is approximately 55 feet from the high soil vapor concentrations detected at location SV-02. Concentrations of fuel related VOCs in soil vapor also diminish towards the Site building, with no detected concentrations of individual VOCs, and low concentrations of petroleum range compounds (below target values) in the soil vapor sample collected from below the Site building.

Results also indicate that oxygen concentrations in soil vapor at approximately 10 feet bgs appear to diminish from around 13% in locations without fuel contamination, to near 0% in areas with detected fuel contamination. Conversely, carbon dioxide concentrations at 10 feet bgs increase from approximately 5% to greater than 10% from areas with little fuel contamination to areas with high fuel contamination. Low oxygen concentrations and high carbon dioxide concentrations were noted in one sample (SV-04) where only low concentrations of fuel related VOCs were detected.

Although field and laboratory measurements of oxygen were fairly consistent, the field instrument used to measure carbon dioxide was not capable of accurately quantifying the higher concentrations present at the Site.

Based on the data collected, the site does not appear to pose a health risk from vapor intrusion, either to on-site receptors, or off-site receptors, based on radial distances to potential off-site buildings. The majority of the intervening area is covered by paved roadways. Concentrations of VOCs diminished as one moved away from the source areas, both horizontally, and vertically.

Results of this investigation indicate that high concentrations of fuel contamination are likely still present either below Main Street, or below the fuel dispensers. This soil contamination is resulting in soil vapor concentrations well above the residential soil vapor target values in the vicinity of the soil contamination. This soil vapor contamination diminishes to below target values beneath the building (160 feet from soil vapor sample SV-02 to soil vapor sample SV-06). Based on this information, the soil vapor to indoor air pathway is an incomplete pathway at the Site. In addition, due to the distance of the potential contamination to the closest off-site buildings (200 feet) the vapor intrusion pathway to off-site buildings is also unlikely to be a completed pathway.

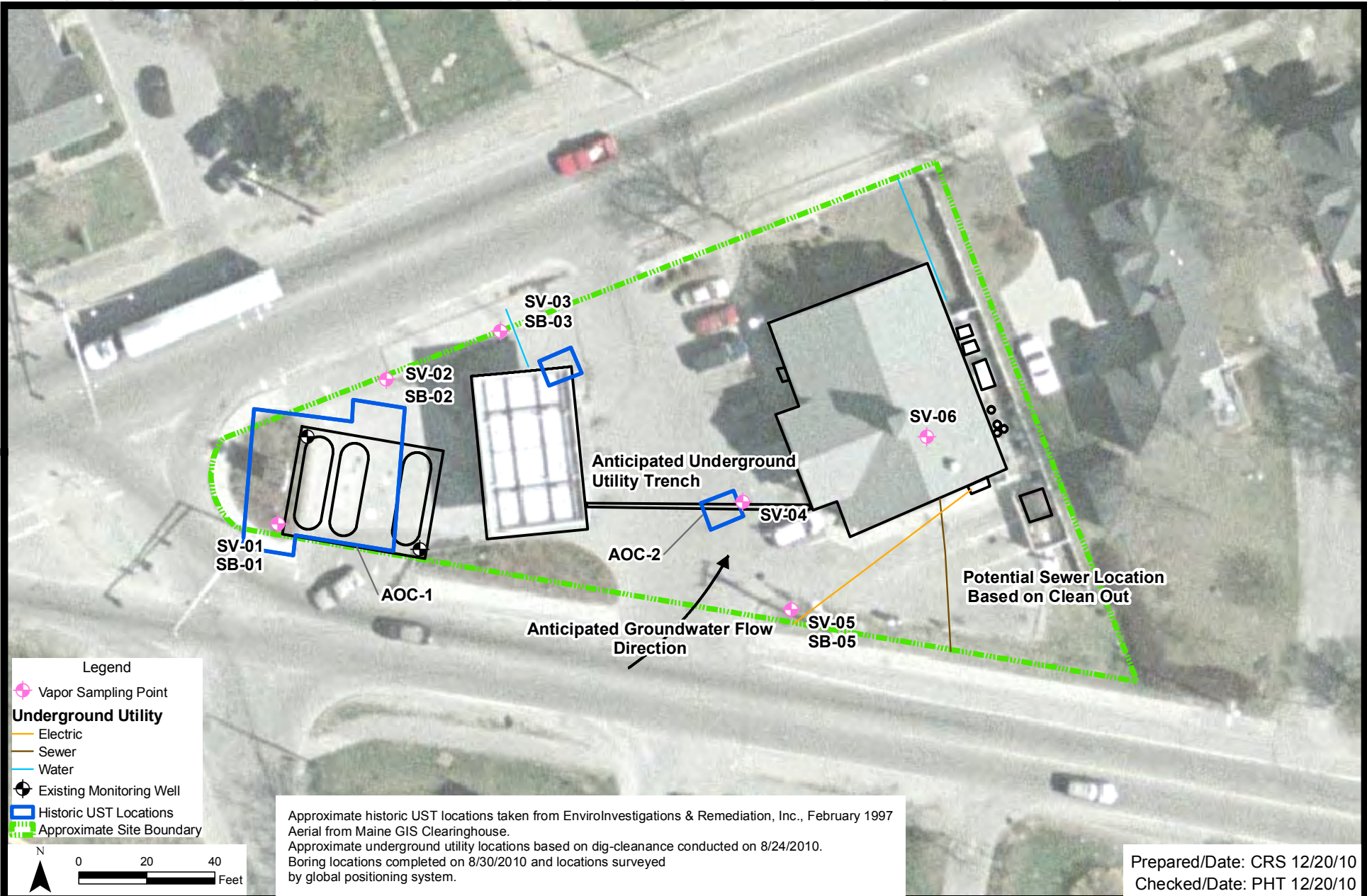
Based on historic reports, the remaining soil contamination is not easily accessible for remediation (below roadways or fuel dispensers). In addition, the soil vapor to indoor air pathway from the fuel

contamination does not appear to be a complete migration pathway. No further action is therefore recommended for the Site.

6.0 REFERENCES

- Department of Homeland Security - Federal Emergency Management Agency (FEMA), 1981, "Flood Insurance Rate Maps (FIRMs)". Washington, D.C.
<http://www.fema.gov/hazard/map/firm.shtm>. Retrieved 2010-07-12.
- ECS, 2005; Site Assessment During Underground Storage Tank Facility Closure, May 2005, At CFI #1842. Issued July 18, 2005. ECS project number 02-203484.00.00.
- Lauren E. Foster, et. al., 2008; Maine Geologic Survey Significant Sand and Gravel Aquifer for the Bangor Quadrangle; 2008.
- Maine Department of Environmental Protection, 2005; Oil and Hazardous Materials Report # P-383-2005, completed by Stephen G. Brezinski. U.S. Dated 5/16/2005.
- MACTEC, 2010a; Phase I Environmental Site Assessment - Cumberland Farms, Inc., Store # 1842, Gorham, Maine; Prepared for the Maine Department of Environmental Protection; August 2010.
- MACTEC, 2010b; Final Site-Specific Quality Assurance Project Plan - Cumberland Farms, Inc., Store # 1842, Gorham, Maine; Prepared for the Maine Department of Environmental Protection; August 2010.
- Osberg, Philip H., Hussey, Arthur M., II, and Boone, Gary M., 1985; Bedrock geologic map of Maine; Maine Geological Survey (Department of Conservation), Open-File Report 84-1, 13 p. (map, scale 1:500,000); 1985.
- Smith, Geoffrey W., 1999, Surficial geology of the Gorham quadrangle, Maine: Maine Geological Survey (Department of Conservation), Open-File Map 99-84, scale 1:24,000.
- United States Geologic Survey, 1975; 7.5 Minute Topographic Gorham Quadrangle Map; Dated, 1975.

FIGURES



Gorham Cumberland
 137 Main Street
 Gorham, Maine



Site Features and Sample Locations

Project 3612-10-2154

Figure 3.1

TABLES

TABLE 4.1
SOIL SAMPLE ANALYTICAL RESULTS
CUMBERLAND FARMS STORE NO. 1842
GORHAM SITE

Parameter	Sample Point				SB-02		SB-03		
	RAG Resident	RAG Park User	RAG Outdoor Commercial	RAG Exc. Const.	Sample Depth	Concentration	Qualifier	Concentration	Qualifier
BENZENE	17	28	86	30	13	1.3	U	1.5	U
ETHYLBENZENE	130	210	420	2,700		1.3	U	1.5	U
METHYL-TERT-BUTYL ETHER (MTBE)	780	1,300	2,600	10,000	8/30/2010	1.3	U	1.5	U
NAPHTHALENE	200	330	200	32		1.3	U	9.6	
M,P-XYLENE	6,600	10,000	10,000	7,000		2.6	U	3	U
O-XYLENE	6,600	10,000	10,000	7,000		1.3	U	1.5	U
TOLUENE	2,700	4,500	10,000	10,000		1.3	U	1.5	U
UNADJUSTED C5-C8 ALIPHATICS	1,400	2,300	10,000	10,000		26	U	95	
UNADJUSTED C9-C12 ALIPHATICS	2,600	4,400	10,000	9,800		26	U	700	
C5-C8 ALIPHATIC HYDROCARBONS	1,400	2,300	10,000	10,000		26	U	95	
C9-C10 AROMATIC HYDROCARBONS	740	1,200	5,100	5,500		26	U	370	
C9-C12 ALIPHATIC HYDROCARBONS	2,600	4,400	10,000	9,800		26	U	330	
SOLIDS-TOTAL RESIDUE (TS)	--	--	--	--		92		89	

Notes:

Depth in feet below ground surface
 Samples analyzed by Massachusetts Volatile Petroleum Hydrocarbons method
 Results in milligrams per kilogram (detections in **bold**)
 (solids in percent)
 RAG = Remedial Action Guideline
 Qualifier U = not detected above reporting limit

TABLE 4.2
SOIL VAPOR ANALYTICAL RESULTS

CUMBERLAND FARMS STORE NO. 1842
GORHAM SITE

Parameter (Laboratory Results)	Units	Sample Point Sample Type Sample Depth Sample Date Guidance	SV-01	SV-01 (duplicate)	SV-02	SV-03	SV-04	SV-05	SV-06
			SOIL GAS 10 8/30/10 15:38 Concentration Qualifier	SOIL GAS 10 8/30/10 16:15 Concentration Qualifier	SOIL GAS 12.5 8/30/10 13:21 Concentration Qualifier	SOIL GAS 9 8/30/10 14:11 Concentration Qualifier	SOIL GAS 2 8/30/10 15:01 Concentration Qualifier	SOIL GAS 8 8/30/10 15:53 Concentration Qualifier	SOIL GAS 1.5 8/30/10 11:38 Concentration Qualifier
1,3-BUTADIENE	UG/M3	4.05	2 U	2 U	4400 U	200 U	6	12	2 U
BENZENE	UG/M3	15.5	2 U	2 U	32000 D	440 D	6.4	20	2 U
ETHYLBENZENE	UG/M3	48.5	2.3	3.2	120000 D	8100 D	14	12	2 U
M,P-XYLENE	UG/M3	1000	12	16	440000 D	5000 D	40	26	4 U
METHYL-TERT-BUTYL ETHER (MTBE)	UG/M3	470	9.9	12	4400 U	200 U	6	2 U	2 U
NAPHTHALENE	UG/M3	3.6	2 U	2 U	4400 U	400 D	2.3	2 U	2 U
O-XYLENE	UG/M3	1000	6.8	8.1	120000 D	1700 D	14	11	2 U
TOLUENE	UG/M3	50000	5.4	6.7	560000 D	3800 D	30	31	2 U
C5-C8 ALIPHATIC HYDROCARBONS	UG/M3	2100	2100	2900	2900000 D	1500000 D	6500	760	200
C9-C10 AROMATIC HYDROCARBONS	UG/M3	500	70	110	200000 D	49000 D	140	110	13
C9-C12 ALIPHATIC HYDROCARBONS	UG/M3	2100	360	480	150000 D	120000 D	2100	340	110
1,1,1-TRICHLOROETHANE	UG/M3	50000	--	--	1180 U	--	18.7	1.09 U	1.09 U
1,1-DICHLOROETHANE	UG/M3	75	--	--	878 U	--	13	0.809 U	0.809 U
1,1-DICHLOROETHYLENE	UG/M3	2100	--	--	860 U	--	0.792 U	0.792 U	0.792 U
1,2-DIBROMOETHANE	UG/M3	0.205	--	--	1670 U	--	1.54 U	1.54 U	1.54 U
1,2-DICHLOROETHANE	UG/M3	4.7	--	--	878 U	--	0.809 U	0.809 U	0.809 U
CIS-1,2-DICHLOROETHENE	UG/M3	650	--	--	860 U	--	1.31	0.792 U	0.792 U
TETRACHLOROETHYLENE	UG/M3	20.5	--	--	1470 U	--	94.1	4.12	1.36 U
TRANS-1,2-DICHLOROETHENE	UG/M3	650	--	--	860 U	--	0.792 U	0.792 U	0.792 U
TRICHLOROETHYLENE	UG/M3	60	--	--	1170 U	--	5.76	1.07 U	1.07 U
VINYL CHLORIDE	UG/M3	27.5	--	--	555 U	--	0.511 U	0.511 U	0.511 U
CARBON DIOXIDE	%		5.11 D	5.69 D	13.7 D	9.73 D	16.9 D	5.38 D	1.88 D
OXYGEN GAS	%		12.4 D	12.3 D	1.63 U	1.57 U	2.34 D	12.9 D	16.8 D
Ambient Air Measurements									
CARBON DIOXIDE	%		0.046		0.040	0.045	0.040	0.040	0.084
METHANE	%				21.3	20.9	20.5	20.9	20.9
OXYGEN GAS	%		20.9						
PID SOIL GAS SCREEN	%								
SUBSURFACE PRESSURE	IN H2O		0.005 LT		0.005 LT	0.005 LT	0.005 LT	0.005 LT	0.005 LT
Pre-Sample Measurements									
CARBON DIOXIDE	%		0.6 G		0.6 G	0.6 G	0.6 G	0.6 G	0.6 G
METHANE	%		0.2		0.7	0.25	0.65	0.55	0 U
OXYGEN GAS	%		12.9		0 U	0 U	0 U	14.7	18.4
PID SOIL GAS SCREEN	%		0.0001		0.0808	0.0213	0.00041	0.00007	0 U
Post Sample Measurements									
CARBON DIOXIDE	%		0.6 G		0.6 G	0.6 G	0.6 G	0.6 G	0.6 G
METHANE	%								
OXYGEN GAS	%		13		0.1	0 U	0 U	14.9	17

Note:

Laboratory results reported from methods MADEP Air Phase Hydrocarbons and USEPA TO-15 analysis

Results as reported by the laboratory; detections in **BOLD**

-- = not analyzed

Guidance = residential multi contaminant chronic soil gas target (Table B10)

Highlighted results exceed Guidance value.

UG/M3 = micrograms per cubic meter

Qualifier

U = not reported above detection limit

D = result from dilution run

LT = less than

G = greater than

**APPENDIX A
BORING LOGS**

SOIL BORING LOG



511 Congress Street, Portland Maine 04101

Project Name: MEDEP-VI	Boring ID: SB-01/SV-01
Project Location: Gorham ME - CFD	Page No. 1
Project No.: 3612102154 Client: MEDEP	of: 1
Boring Location: SB-01	Refusal Depth: - Total Depth: 20'
Weather: 80°F	Soil Drilled: 20' Method: Direct Push
Subcontractor: EPE	P.I.D (eV): Mini Rna Protection Level: D
Driller: D. DIDONE	Date Started: 8/30/10 Date Completed: 8/30/10
Rig Type/Model: Geoprobe	Logged By: C. Staples Checked By: BAS 9/7/10
Reference Elevation: NN	Water Level: ≈ 13' Time: -
	Bore Hole ID/OD: 2"
	Casing Size: 2" ID
	Sampler: 4" / Loose
	Sampler ID/OD: 1"
	Hammer Wt/Fall: NA
	Hammer Type: NA

Sample Information					Monitoring				Sample Description and Classification	USCS Group Symbol	Remarks
Depth (feet bgs)	Sample Number	Penetration/Recovery (feet)	SPT Blows/6"	N Value	PID Field Scan	PID Headspace	Lab Tests Performed	Lab Sample ID			
0.0											
2	51	1.0 / 4.0			COI				Reddish Brown F. SAND, little C. SAND, little gravel - dry	SP	
4											
6	52	1.1 / 4.0			COI				0-0.4 - same as 51 0.4-1.1 Tan M+C SAND, Moist, uniform fill	SP	
8											
10	53	2.5 / 4.0			COI				Tan M+C SAND. trace gravel Moist	SP	
12											
14	54	3.0 / 4.0			COI				Tan M+C SAND - little to some FOM Gravel. Saturated @ 13' - water likely from watering garden above	SP	
16											
18	55	4.0 / 4.0			COI				0-0.5 same as 55 0.5-4.0 Gray clay - high plasticity	CL	
20									BOB @ 20' BGS		

NOTES: No sign contamination - No well
 - SV point SV-01 - set @ 10' bgs - sand to 4.5' - Bentonite 7.5-2.5'

SOIL VAPOR IMPLANT SAMPLING RECORD



Project Name: CFI - MEDEP VI Study	Boring ID: SV - 01
Project Location: Gorham	Page No. 1
Project No.: 3612102157 Client: MEDEP	of: 1
Boring Location: SV-01	Refusal Depth: — Total Depth: 20'
Weather: 80°F - clear	Soil Drilled: 20' Method: Direct Push
Subcontractor: EPI	P.I.D (eV): 10.8 Protection Level: D
Driller: Dave Dionne	Date Started: 8/30/10 Date Completed: 8/30/10
Rig Type/Model: Track Mounted	Logged By: CRS Checked By: BAS - 9/7/10
Reference Elevation: —	Water Level: NA Time: —
He Breakthrough %: NA	Initial He %: NA Final He %: NA

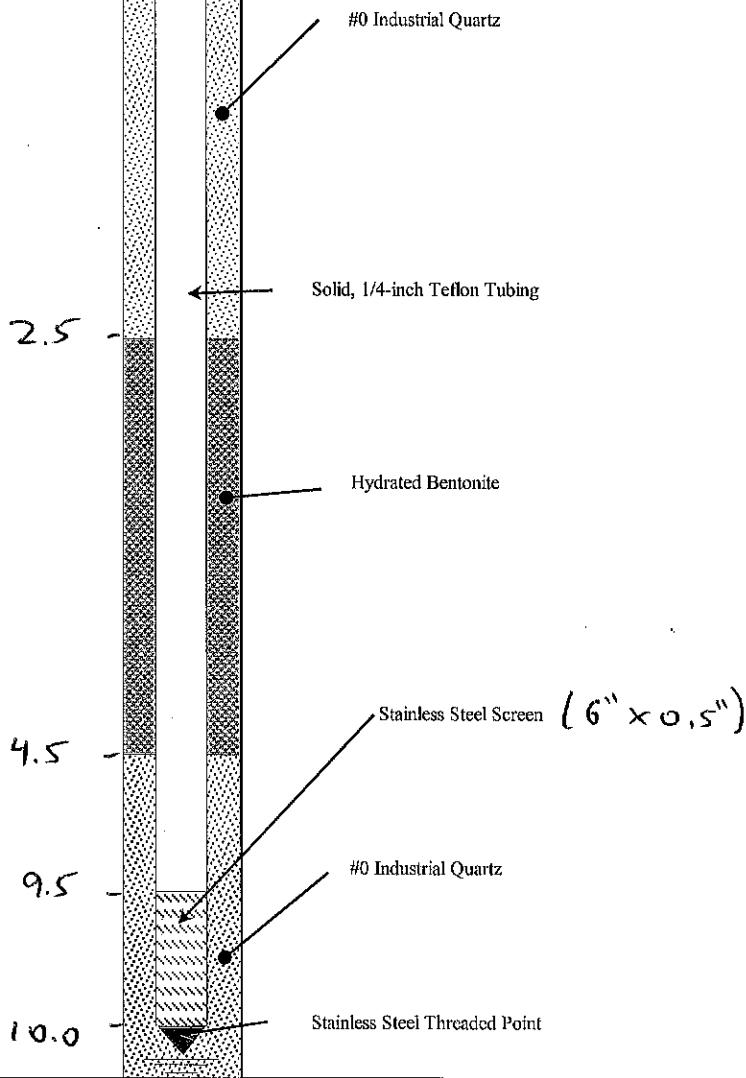
Overburden Drilling Notes:

Flush Mount

FT. BGS

Soil Vapor
Diagram

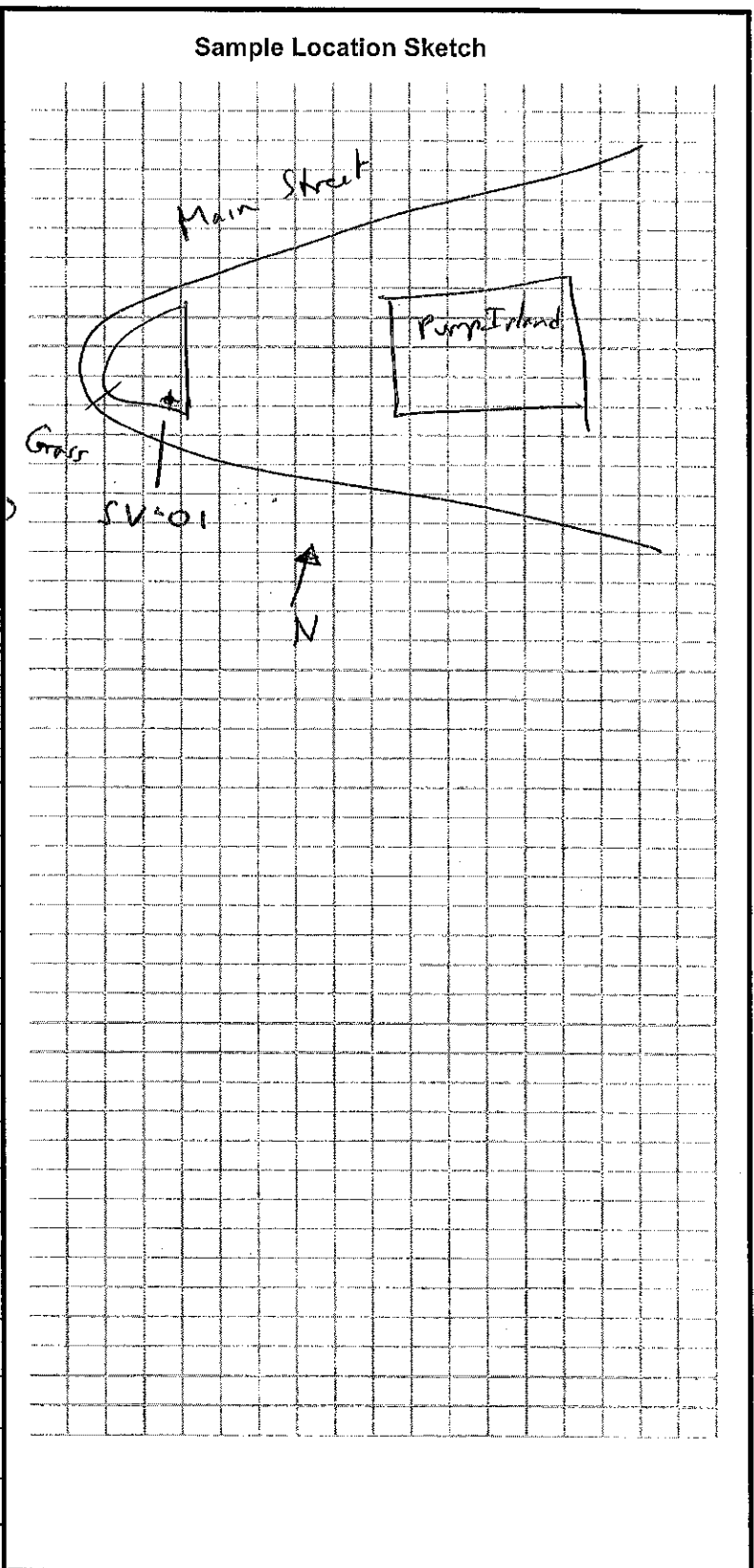
Soil Vapor Point Construction Notes:



NOTES:

Soil Gas Sampling Field Sheet
Maine DEP

Site Name:	CFI Gorham	
Town:	Gorham	
Date:	8/30/10	
Sample I.D.:	SV-01	
Sampling Purpose:	(Source) (Utility) (Migration) (Receptor) (Other)	
Sampling Personnel:	C. Staples	
Project Manager:	P. Frenette	
Collection Device:	(Summa Can) (Tedlar Bag)	
Sample Penetration Location:	(Asphalt) (Concrete) (Soil)	
Soil Type:	(Fill) (Till) (Sand & Gravel) (Glacial Marine)	
Sample Depth:	10 ft	
Depth to Water:	10e	
Suspected COCs:	(Petroleum) (Solvents)	
Cannister I.D.:	451	0422
Flow Control I.D.:	0315	0166
Flow control rate:	100 ml/min	
O ₂ Ambient:	20.9 %	
CO ₂ Ambient:	460 ppm	
subsurface pressure/vacuum	(+/- Inches of water column)	
Pre-Sample O ₂ :	12.9 %	
Pre-Sample CO ₂ :	>6000 ppm	
Pre-Sample PID:	1.0 ppm	
Pre-Sample CH ₄ :	4 (% volume, %LEL, PPM)	
Sample Initiation Time:	0509	0509
Initial Vacuum:	-30" H ₂	-35" H ₂
Sample End Time:	1538	1615
Final Vacuum:	-4" H ₂	-7" H ₂
Post Sample O ₂ :	13.0 %	
Post Sample CO ₂ :	>6000 ppm	



Notes:

SOIL BORING LOG



511 Congress Street, Portland Maine 04101

Project Name: MEPEP-VI		Boring ID: SB-02/GW2/GW02
Project Location: Gorham		Page No. 1
Project No.: 3612102154	Client: MEPEP	of: 1
Boring Location: SB-02	Refusal Depth: NA	Total Depth: 24'
Weather: Clear 75°F	Soil Drilled: 24'	Method: Direct Push
Subcontractor: EP.I	P.I.D (eV): MiniPac 3000	Protection Level: D
Driller: D. DIONNE	Date Started: 8/30/10	Date Completed: 8/30/10
Rig Type/Model: Geoprobe	Logged By: C. Staples	Checked By: BAS 9/7/10
Reference Elevation: NA	Water Level: Dry	Time: NA

Sample Information					Monitoring			Sample Description and Classification	USCS Group Symbol	Remarks
Depth (feet bgs)	Sample Number	Penetration/Recovery (feet)	SPT Blows/6"	N Value	PID Field Scan	PID Headspace	Lab Tests Performed			
0.0										
2		0.8 / 4.0				0.5	ppm		SP	0-0.8 Brown F+M SAND, trace gravel - damp. fill.
4		2.5 / 4.0				0.5	ppm		SP	0-2.5- Brown. C. SAND, trace cobble - dry - fill
6						1.5				
8		2.5 / 4.0				2.5			SP	0-2.5 - SAND - little gravel
10										
12		2.5 / 4.0				2.5			SP	0-2.5 C. SAND - Brown/tan trace cobble Damp - strong food odor
14							15,000 ppm 6,000 ppm			SB-02-13 0815
16		4.0 / 4.0				0.5			SP	0-0.2 - C. SAND.
18									CL	0.2-4.0 Gray clay. Moist, high plasticity
20										
22		4.0 / 4.0					601 ppm		CL	0-4.0 Gray clay. Moist - high plasticity
24										
										BOB @ 24'

NOTES: Set SV-02 - 4' east . 6" vapor screen from 12.0 to 12.5' bgs Sand to 5' - bentonite to 3' bgs - sand to surface.

SOIL VAPOR IMPLANT SAMPLING RECORD



511 Congress Street, Portland Maine 04101

Project Name: CFI - MEDEP VI Study		Boring ID: SV - 02
Project Location: <i>Carbam</i>		Page No. 1
Project No.: 3612102157	Client: MEDEP	of: 1
Boring Location: SV-02	Refusal Depth: —	Total Depth: 24'
Weather: 75° F Clear	Soil Drilled: 24.0'	Method: Direct Push
Subcontractor: EPI	P.I.D (eV): 10.8	Protection Level: D
Driller: Dave Dionne	Date Started: 8/30/10	Date Completed: 8/30/10
Rig Type/Model: Track Mounted	Logged By: CRS	Checked By: <i>BAK</i>
Reference Elevation: —	Water Level: <i>NA</i>	Time: —
He Breakthrough %: <i>1250 ppm (22%)</i>	Initial He %: 100	Final He %: <i>98.6</i>

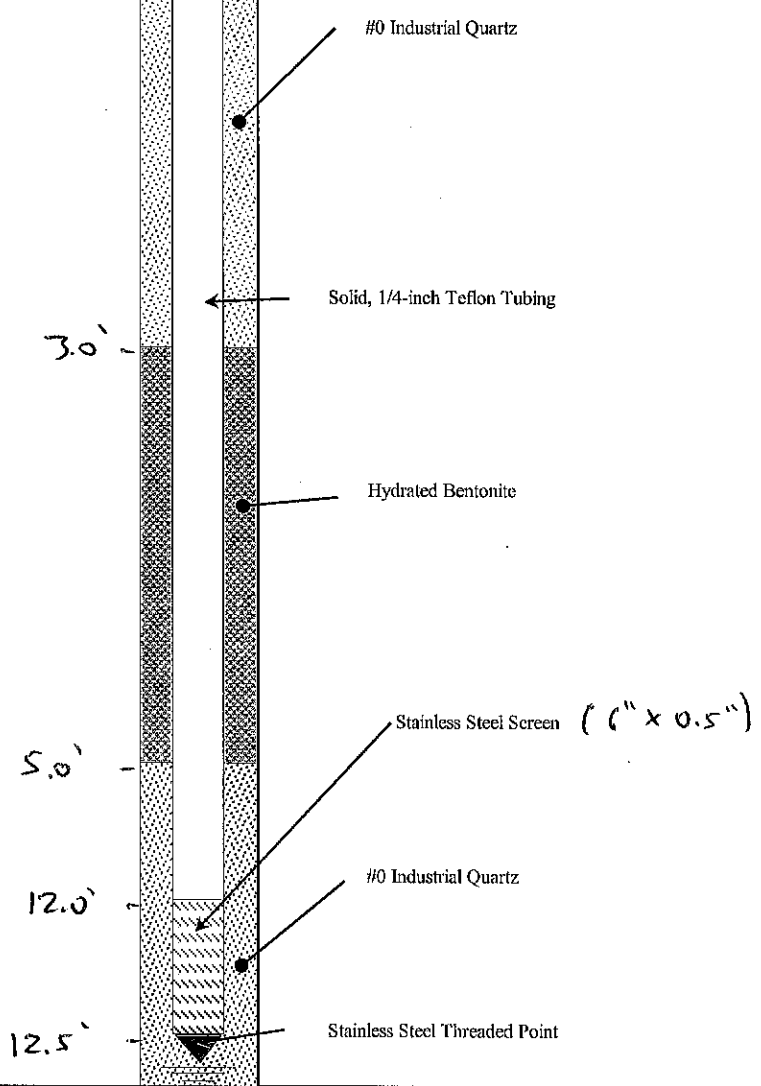
Overburden Drilling Notes:

Flush Mant

FT BGS

Soil Vapor
Diagram

Soil Vapor Point Construction Notes:



NOTES:

**WELL/PIEZOMETER CONSTRUCTION DIAGRAM
FLUSHMOUNT**

LOCATION ID:

GW-02/SB-02

Project Name: MEPER-VI
 Project Location: CF-Gorham
 Project Number: 3612102154 Task Number: 13.2
 Subcontractor: EPI Drilling Method: Direct Push
 Development Method: — Development Date: —
 Bucking Posts/Ballards: —
 Notes: elevation not surveyed (well dry)

Date Started: 8/30/10 Date Completed: 8/31/10
 Logged By: C. J. Taylor
 Checked By: BAS Checked Date: 09-07-2010

Measuring Point Information

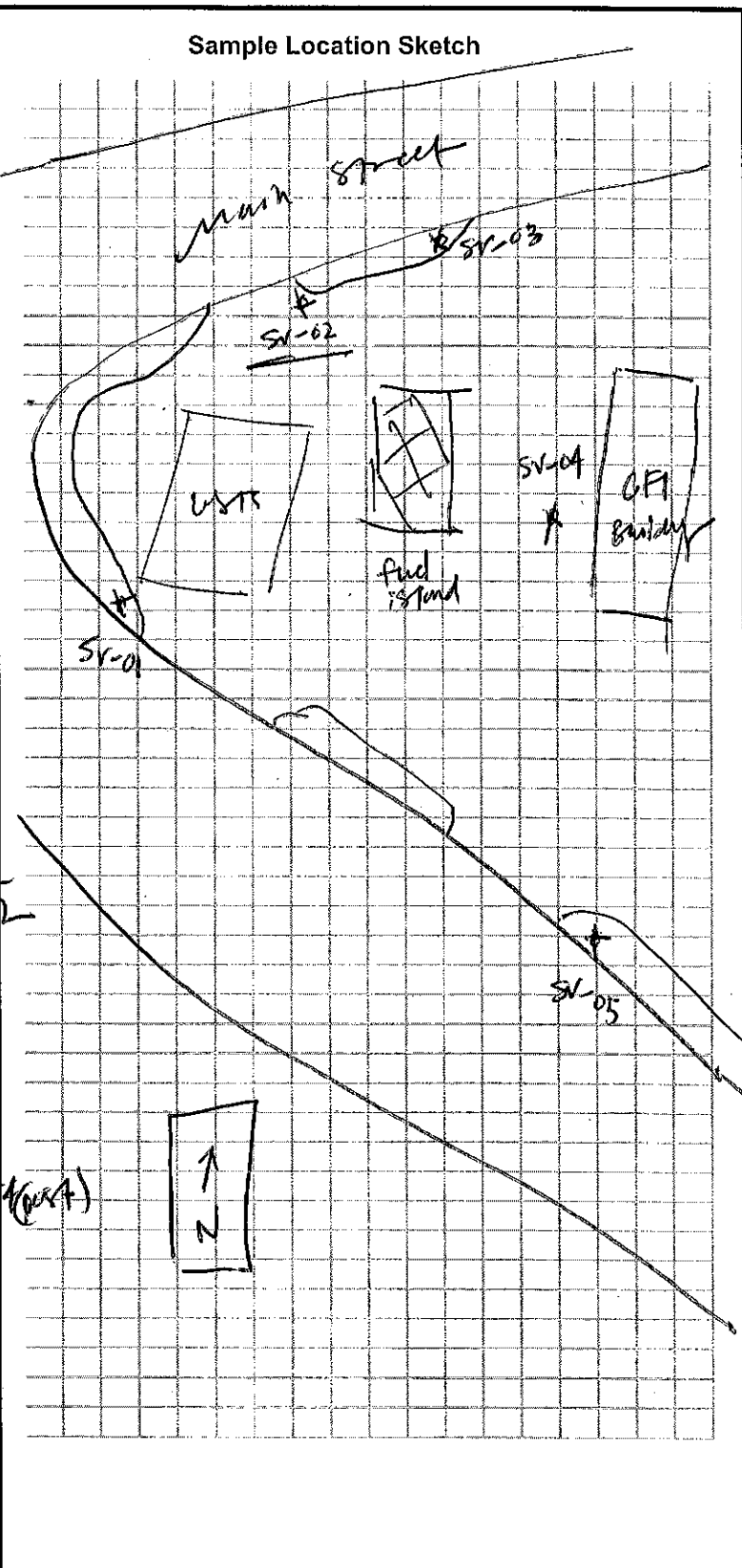
Measuring Point (MP) Type: Top Of Riser
 MP Elevation (ft): NA

Item	Depth BMP (ft)	Elevation (ft)	Description
Surface Casing Elevation	<u>-0.05</u>		
Ground Surface Elevation	<u>Flush</u>		
Riser Pipe (Top)	<u>≈ 0.2'</u>		
			Slope Away
			Surface Seal Type: <u>Concrete</u>
			Lock Identification: <u>—</u>
			Stickup Casing Diameter: <u>4"</u>
			Backfill/Grout Type: <u>Bentonite</u>
			Riser Pipe Type: <u>PVC</u>
			Riser Pipe ID: <u>1"</u>
			Borehole Diameter: <u>2"</u>
Top of Well Seal	<u>1.0</u>		Type of Seal: <u>Bentonite</u>
Top of Sand Pack	<u>4.0</u>		
Top of Screen	<u>7.0</u>		Screen Type: <u>PVC</u>
			Screen ID: <u>1"</u>
			Screen Slot Size: <u>0.01</u>
			Screen Length: <u>10'</u>
Base of Screen	<u>17.0</u>		Filter/Sand Pack Type: <u>#0</u>
End Cap	<u>17.0</u>		Sump:
Drilled Depth	<u>24'</u>		Fallback/Backfill: <u>Native</u>
Bottom of Exploration	<u>24'</u>		
Bedrock Surface	<u>N/A</u>		

NOT TO SCALE

Soil Gas Sampling Field Sheet
Maine DEP

Site Name:	CFI - Gorham (under vi)
Town:	Gorham, ME
Date:	August 30, 2010
Sample I.D.:	SV-02
Sampling Purpose	(Source) (Utility) (Mitigation) (Receptor) (Other)
Sampling Personnel:	B. Small / C. Staples
Project Manager	Peter Erpmita
Collection Device:	(Summa Can) (Tedlar Bag)
Sample Penetration Location:	(Asphalt) (Concrete) (Soil)
Soil Type:	(Fill) (Till) (Sand & Gravel) (Glacial Marine)
Sample Depth:	12.5' bgs
Depth to Water:	unknown
Suspected COCs:	(Petroleum) (Solvents)
Cannister I.D.:	6650
Flow Control I.D.:	0325
Flow control rate:	AS 0325 ~ 110ml/min
O ₂ Ambient	21.3%
CO ₂ Ambient	404 ppm
subsurface pressure/vacuum	— (+/- inches of water column)
Pre-Sample O ₂	0.0%
Pre-Sample CO ₂	> 6000 ppm
Pre-Sample PID:	808 ppm (pre) 115 (post)
Pre-Sample CH ₄ :	14 (% Volume, 1LE PPM)
Sample Initiation Time:	1255
Initial Vacuum:	-30 + "
Sample End Time:	1321
Final Vacuum:	-5"
Post Sample O ₂	0.1%
Post Sample CO ₂ :	> 6000 ppm



Conducted Helium leak test

- Notes:
- He in Bucket : 100%
 - He in sample point : 1250 ppm
 - He in Bucket after : 98.6%

checked CES

SOIL BORING LOG



511 Congress Street, Portland Maine 04101

Project Name: MEDEP- VI	Boring ID: SB-07/SV-03
Project Location: Gorham ME - CFI	Page No. 1
Project No.: 3612102154 Client: MEDEP	of: 1
Boring Location: SB-03 - by island	Refusal Depth: NA Total Depth: 20'
Weather: 85° F	Soil Drilled: 20' Method: Direct Push
Subcontractor: EPI	P.I.D (eV): Mini Ram 3000 Protection Level:
Driller: D. Dionne	Date Started: 8/30/10 Date Completed: 8/20/10
Rig Type/Model: Geopack 66 DT	Logged By: C. Styler Checked By: BAS
Reference Elevation: NA	Water Level: NA Time: —

Sample Information					Monitoring				Sample Description and Classification	USCS Group Symbol	Remarks
Depth (feet bgs)	Sample Number	Penetration/ Recovery (feet)	SPT Blows/6"	N Value	PID Field Scan	PID Headspace	Lab Tests Performed	Lab Sample ID			
0.0											
2	51	1.3 / 4.0			LOI				Dark brown FOM SAND, little M gravel Damp, loose	SP	
4											
6	52	2.8 / 4.0			LOI				Tan to brown M+C SAND, little FOM gravel - saturated 0-1.0, then dry	SP	
8											
10	53	2.8 / 4.0			160 @ 9'	40			Tan/red brown M+C SAND, some C. Gravel, loose Moist		SB-03-9 @ 1125
12						20					
14	54	2.7 / 4.0			6.0				SAME as 53 - very hard/dense	SP	
16											
18	55	4.0 / 4.0			LOI				0-0.4 - M SAND - moist 0.4 - 4.0 - Gray clay - high plasticity.		
20									BOB @ 20'		

NOTES:

Vapor point SV-03 - set @ 9' bgs - bentonite 5' to 1'
- flush mount road box.

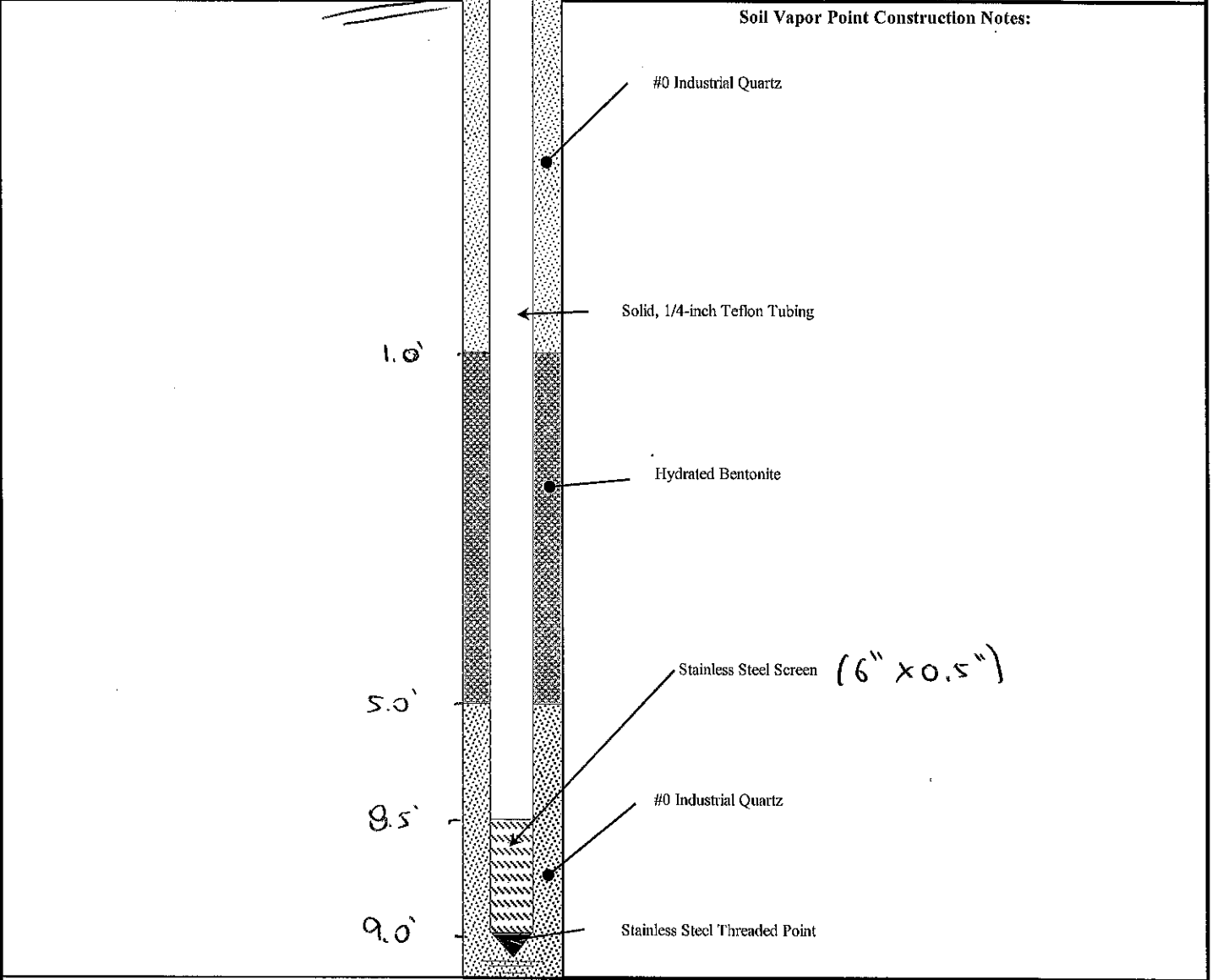
SOIL VAPOR IMPLANT SAMPLING RECORD



511 Congress Street, Portland Maine 04101

Project Name: CFI - MEDEP VI Study		Boring ID: SV-03
Project Location: <u>Gorham</u>		Page No. 1
Project No.: 3612102154	Client: MEDEP	of: 1
Boring Location: <u>SV-03</u>	Refusal Depth: -	Total Depth: <u>20'</u>
Weather: <u>85°F</u>	Soil Drilled: <u>20'</u>	Method: Direct Push
Subcontractor: EPI	P.I.D (eV): 10.8	Protection Level: D
Driller: Dave Dionne	Date Started: <u>8/30/10</u>	Date Completed: <u>8/30/10</u>
Rig Type/Model: Track Mounted	Logged By: CRS	Checked By: <u>BAS 9/7/10</u>
Reference Elevation: - <u>NA</u>	Water Level: <u>NA</u>	Time: -
He Breakthrough %: <u>1050 ppm (22%)</u>	Initial He %: <u>100</u>	Final He %: <u>97.1</u>

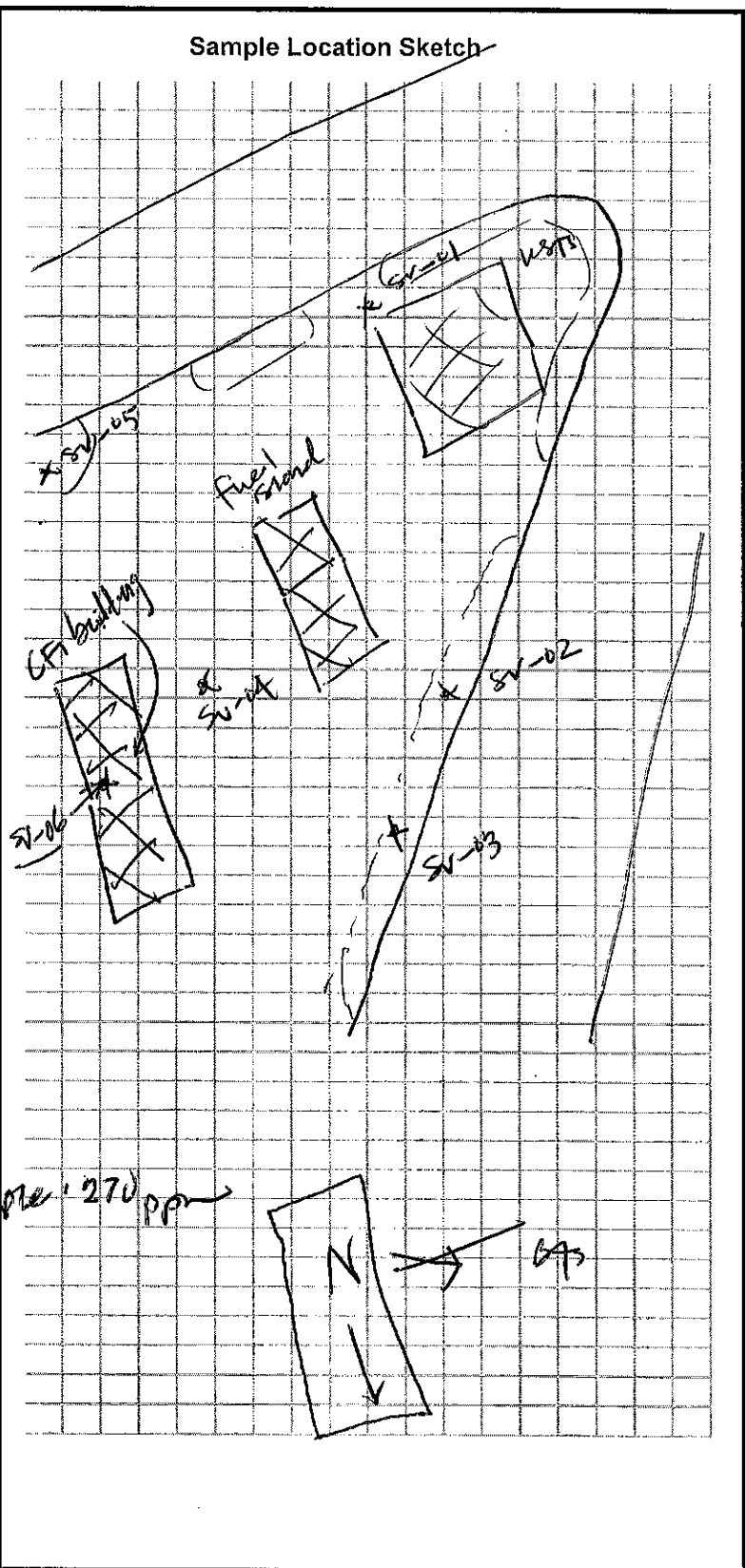
<u>BAS</u>	<u>Flush Mount</u>	Soil Vapor Diagram
	<u>FT BGS</u>	



NOTES:

**Soil Gas Sampling Field Sheet
Maine DEP**

Site Name:	UFI-gorham-(underpl)
Town:	Gorham, ME
Date:	August 30, 2010
Sample I.D.:	SV-03
Sampling Purpose	(Source) (Utility) <u>(Mitigation)</u> (Receptor) (Other)
Sampling Personnel:	B. Shaw / C. Staples
Project Manager	Peter Eremith
Collection Device:	(Summa Can) (Tedlar Bag)
Sample Penetration Location:	(Asphalt) (Concrete) <u>(Soil)</u>
Soil Type:	<u>(Fill)</u> (Till) (Sand & Gravel) (Glacial Marine)
Sample Depth:	9' bgs
Depth to Water:	unknown
Suspected COCs:	<u>(Petroleum)</u> (Solvents)
Cannister I.D.:	e178
Flow Control I.D.:	0227
Flow control rate:	-100 ml/min
O ₂ Ambient	20.9%
CO ₂ Ambient	425 ppm
subsurface pressure/vacuum	- (+/- inches of water column)
Pre-Sample O ₂	0.0%
Pre-Sample CO ₂	> 6000 ppm
Pre-Sample PID:	213 ppm; post-sample 270 ppm
Pre-Sample CH ₄ :	5 (% Volume, <u>(%LEL)</u> , PPM)
Sample Initiation Time:	1346
Initial Vacuum:	-30"
Sample End Time:	1411
Final Vacuum:	-3"
Post Sample O ₂	0.0%
Post Sample CO ₂ :	> 6000 ppm



Notes: Helium leak test water:
 - helium in bucket = 100%
 - helium detected in sample = 1050 ppm
 - helium in bucket after = 97.1%

checked CRs - 9/2/10

SOIL VAPOR IMPLANT SAMPLING RECORD



511 Congress Street, Portland Maine 04101

Project Name:	CFI - MEDEP VI Study	Boring ID:	SV - 04 SV-04
Project Location:	Yorkham, ME	Page No.	1
Project No.:	3612102154	Client:	MEDEP
		of:	1
Boring Location:	Utility trench	Refusal Depth:	NA
Weather:	85°F, sunny	Total Depth:	
Subcontractor:	EPI	Soil Drilled:	NA
Driller:	Dave Dionne	Method:	Direct Push / Handpoke
Rig Type/Model:	Track Mounted	P.I.D (eV):	10.8
Reference Elevation:	unknown	Protection Level:	D
He Breakthrough %:	2.6%	Date Started:	August 30, 2010
		Date Completed:	August 30, 2010
		Logged By:	CRS/BAS
		Checked By:	C. Stodd, 9/2/10
		Water Level:	unknown
		Time:	NA
		Initial He %:	100%
		Final He %:	—

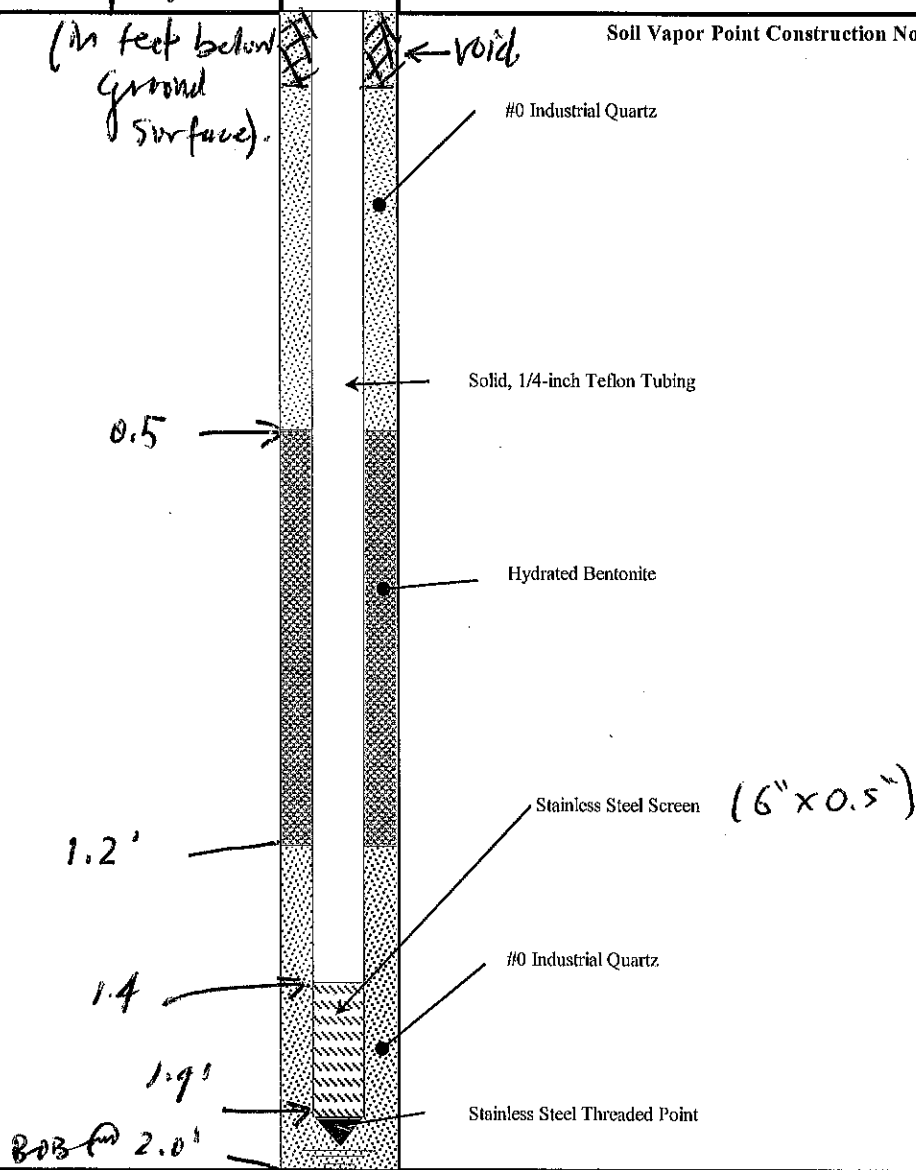
Overburden Drilling Notes:

Constructed vapor point with jackhammer and bucket auger.

Soil Vapor Diagram

Depths
(in feet below ground surface).

Soil Vapor Point Construction Notes:

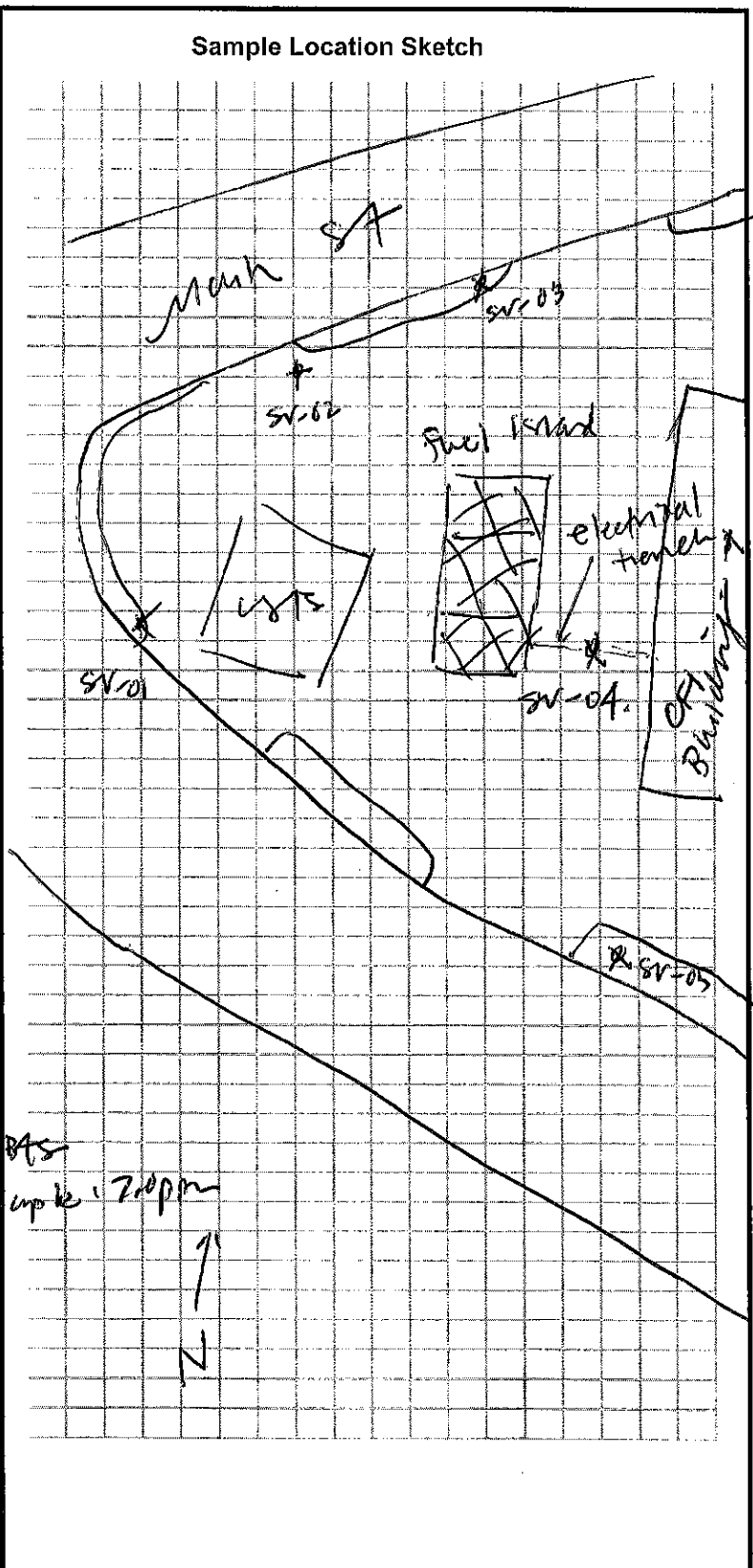


NOTES: Utility line trench; Dig Smart located electrical line @ 2.1' bgs

Checked CRS 9/2/10

Soil Gas Sampling Field Sheet
Maine DEP

Site Name:	CR-gorham, Merril
Town:	gorham, ME
Date:	August 30, 2016
Sample I.D.:	SV-04
Sampling Purpose	(Source) (Utility) (Mitigation) (Receptor) (Other)
Sampling Personnel:	By hand / C. Staples
Project Manager	Peter Tremita
Collection Device:	(Summa Can) (Tedlar Bag)
Sample Penetration Location:	(Asphalt) (Concrete) (Soil)
Soil Type:	(Fill) (Till) (Sand & Gravel) (Glacial Marine)
Sample Depth:	~ 2' bgs
Depth to Water:	unknown.
Suspected COCs:	(Petroleum) (Solvents)
Cannister I.D.:	539.
Flow Control I.D.:	0329
Flow control rate:	~ 100 ml/min
O ₂ Ambient	20.5%
CO ₂ Ambient	400 ppm
subsurface pressure/vacuum	— (± Inches of water column)
Pre-Sample O ₂	20.5% 0.0%
Pre-Sample CO ₂	400 ppm 42% bgs
Pre-Sample PID:	4.1 ppm; post sample: 2.0 ppm
Pre-Sample CH ₄ :	LEL: 13 (% Volume, %LEL PPM)
Sample Initiation Time:	1435
Initial Vacuum:	~ 30"
Sample End Time:	1501
Final Vacuum:	- 5"
Post Sample O ₂ :	0.0%
Post Sample CO ₂ :	7600 ppm



Notes: conducted helium leak test here: post reading = 11 LEL
 - helium in bucket: 100% O₂: 0.0%
 - sample port = 8.0% PID: 1.5 ppm
 - helium after sample reading: 93.8% checked CRS 9/7/16

SOIL BORING LOG



511 Congress Street, Portland Maine 04101

Project Name: MEDEA VI	Boring ID: SR-05/SV-05
Project Location: Gorham ME	Page No. 1
Project No.: 3612102154 Client: MEDEP	of: 1
Boring Location: SR-05 - backswamp	Refusal Depth: 8' Total Depth: 8'
Weather: clear - 90°F	Soil Drilled: 8' Method: Direct Push
Subcontractor: EPI	P.I.D (eV): MiniRam 3000 Protection Level: D
Driller: D. PIONNE	Date Started: 8/31/10 Date Completed: 8/31/10
Rig Type/Model: Geoprobe 66 DT	Logged By: C. Staples Checked By: BAG 9/7/10
Reference Elevation: NA	Water Level: NA Time: —
	Bore Hole ID/OD: 2"
	Casing Size: 2"
	Sampler: 2" Geoprobe
	Sampler ID/OD: 2"
	Hammer Wt/Fall: NA
	Hammer Type: NA

Sample Information					Monitoring			Sample Description and Classification	USCS Group Symbol	Remarks
Depth (feet bgs)	Sample Number	Penetration/Recovery (feet)	SPT Blows/6"	N Value	PID Field Scan	PID Headspace	Lab Tests Performed			
0.0										
2		$\frac{2.1}{4.0}$				ca1			sp	Brown F&M SAND, little F gravel dry
4										
6		$\frac{2.7}{4.0}$				ca1			sp	Redish brown Mac SAND, trace to some C. gravel, little cobble
8										
10										
12										
14										
16										
										Refused @ 8' Set Viper screen SV-01 @ 7.5' - SAND to 4' bgs bentonite - to 2' bgs Flush Mount Road box

NOTES:

SOIL VAPOR IMPLANT SAMPLING RECORD



511 Congress Street, Portland Maine 04101

Project Name: CFI - MEDEP VI Study		Boring ID: SV-05
Project Location: Gorham		Page No. 1
Project No.: 3612102154	Client: MEDEP	of: 1
Boring Location: SV-05	Refusal Depth: 8'	Total Depth: 8'
Weather: Clear 90°F	Soil Drilled: 8'	Method: Direct Push
Subcontractor: EPI	P.I.D (eV): 10.8	Protection Level: D
Driller: Dave Dionne	Date Started: 8/30/10	Date Completed: 8/30/10
Rig Type/Model: Track Mounted	Logged By: CRS	Checked By: BAS-9/7/10
Reference Elevation: NA	Water Level: NA	Time: -
He Breakthrough %: 0.0	Initial He %: 44.4	Final He %: 44.2
Bore Hole ID/OD: 2.5	Casing Size: NA	Sampler: CRS/BAS
		Sampler ID/OD: NA
		Hammer Wt/Fall: -
		Hammer Type: -

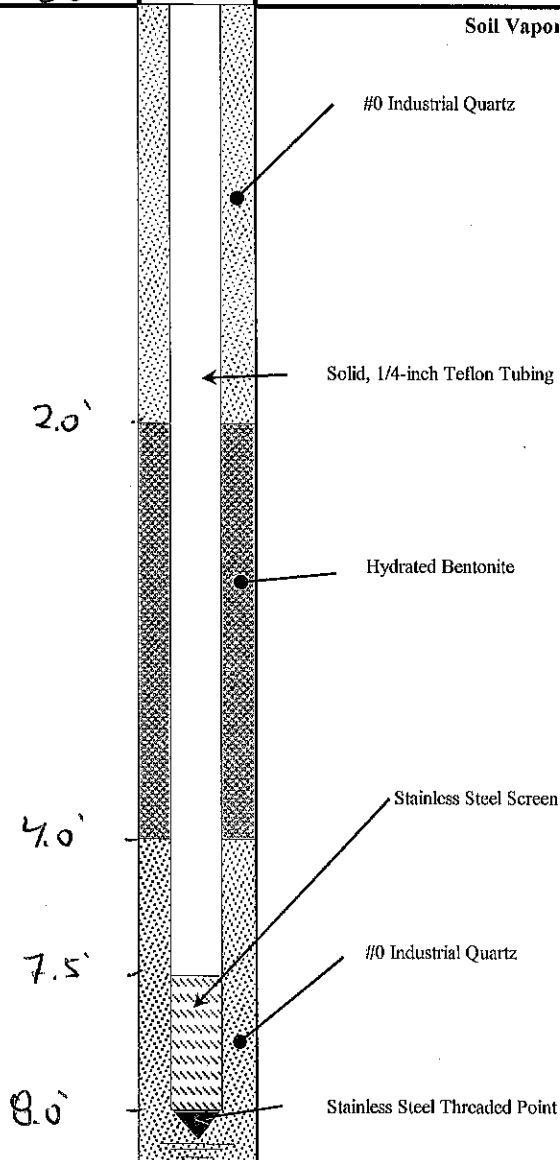
Flush Mount

FT BGS

Soil Vapor
Diagram

Overburden Drilling Notes:

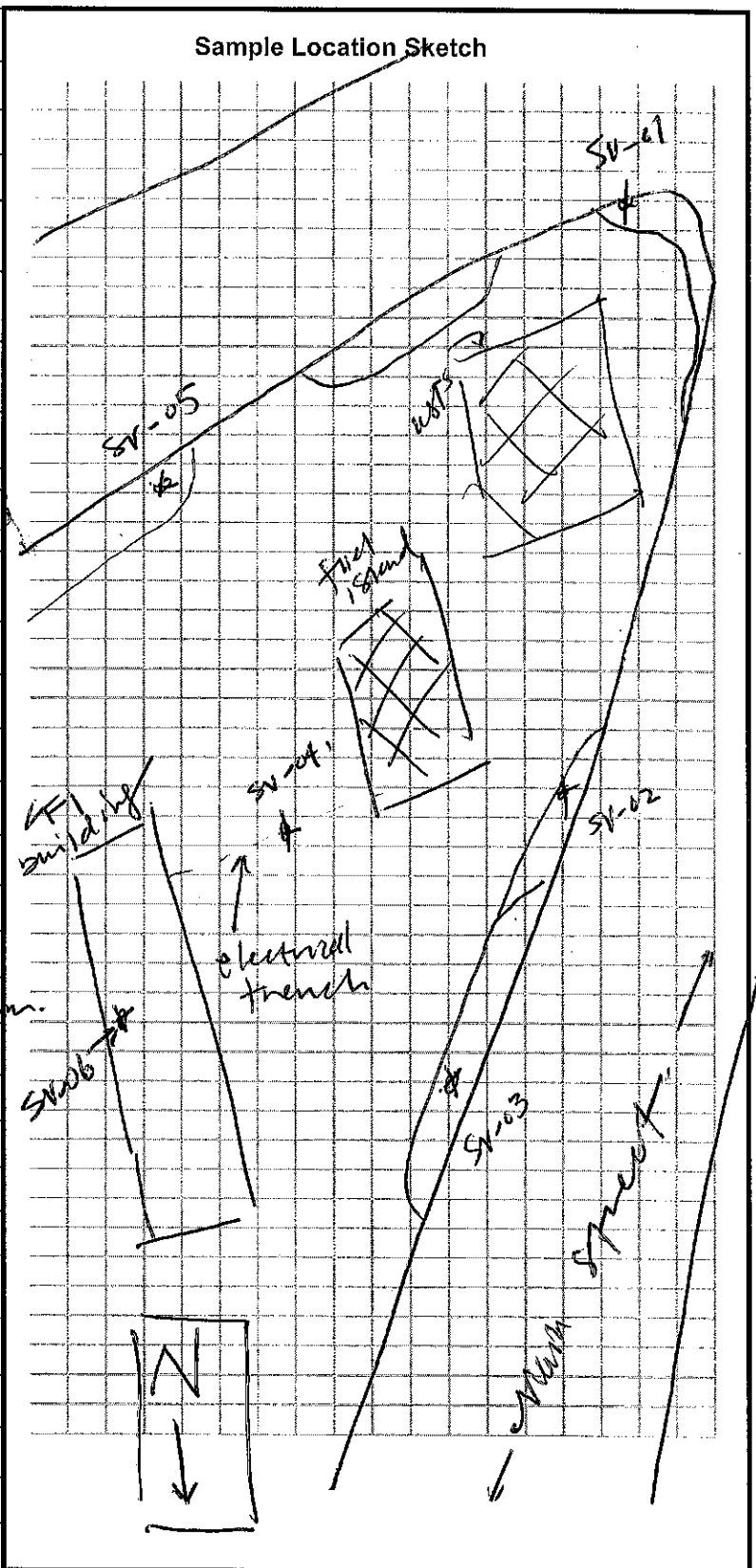
Soil Vapor Point Construction Notes:



NOTES:

**Soil Gas Sampling Field Sheet
Maine DEP**

Site Name:	CFI (under VI).
Town:	Bolton
Date:	8-30
Sample I.D.:	SV-5
Sampling Purpose:	(Source) (Utility) (Mitigation) (Receptor) (Other)
Sampling Personnel:	Stapels/Shaw
Project Manager:	Erenida
Collection Device:	(Summa Can) (Tedlar Bag)
Sample Penetration Location:	(Ashphalt) (Concrete) (Soil)
Soil Type:	(Fill) (Till) (Sand & Gravel) (Glacial Marine)
Sample Depth:	~8' bgs
Depth to Water:	unknown
Suspected COCs:	(Petroleum) (Solvents)
Cannister I.D.:	407
Flow Control I.D.:	267
Flow control rate:	~100 ml/min
O ₂ Ambient:	20.9%
CO ₂ Ambient:	0.0% ; 404 ppm
subsurface pressure/vacuum:	— (+/- inches of water column)
Pre-Sample O ₂ :	14.7%
Pre-Sample CO ₂ :	76000 ppm
Pre-Sample PID:	0.7 ; post sample 0.6
Pre-Sample CH ₄ :	LEL: 11% (% Volume, %LEL, PPM)
Sample Initiation Time:	1334
Initial Vacuum:	-29"
Sample End Time:	1553
Final Vacuum:	-5" Hg
Post Sample O ₂ :	14.9
Post Sample CO ₂ :	76000

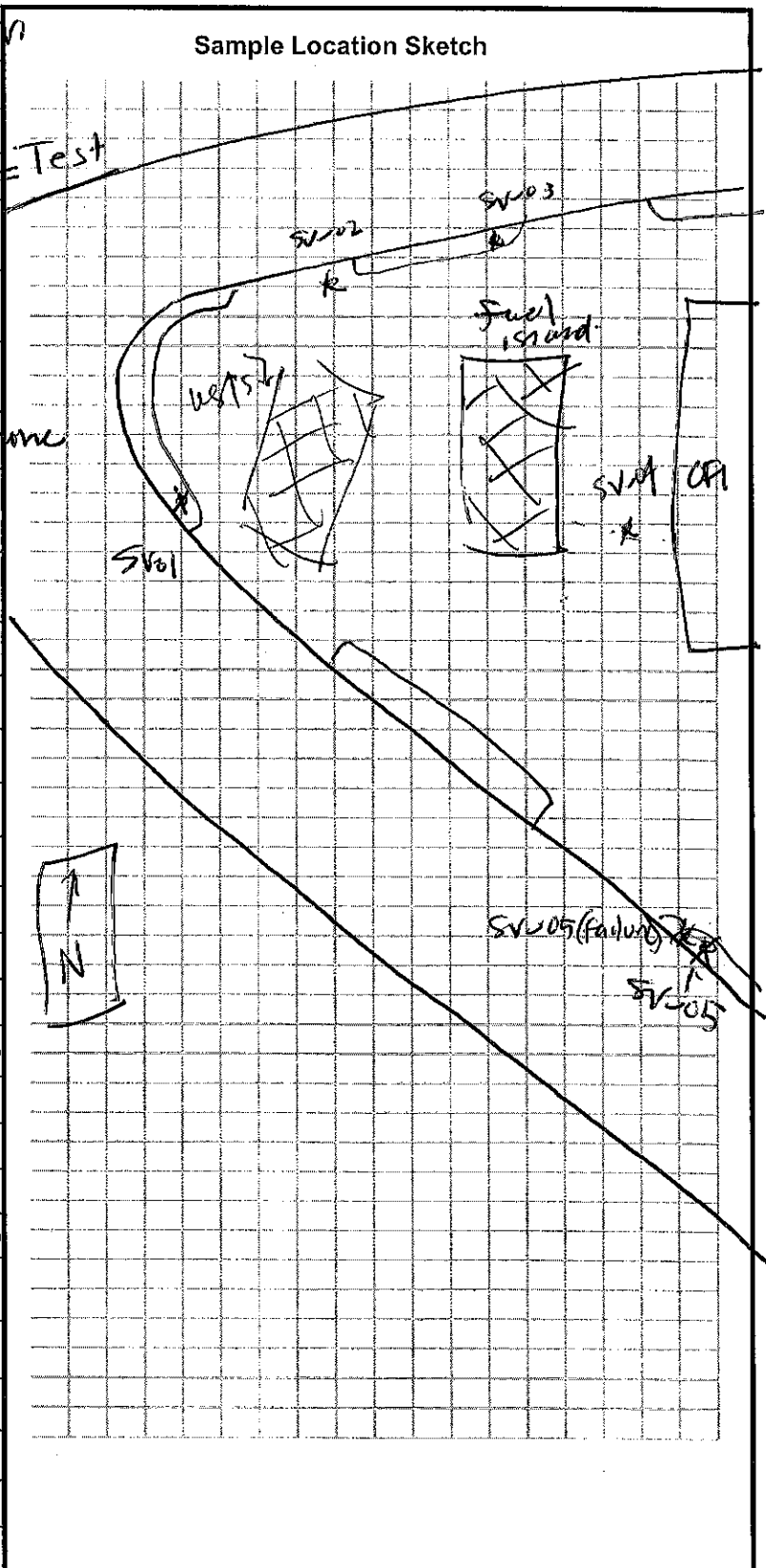


pre Helium leak test:
 Notes: - Helium in bucket = 44.9%
 - in sample point = 0.0 ppm
 - after in bucket = 44.2%

post sampling helium
 - He in bucket = 22.2%
 - He in sample = 0 ppm
 checked by CRS 9/7/10

**Soil Gas Sampling Field Sheet
Maine DEP**

Site Name:	CFI - gorham, ME DEP
Town:	gorham
Date:	August 30, 2016.
Sample I.D.:	SV-05 (failure) = Test
Sampling Purpose	(Source) (Utility) (Mitigation) (Receptor) (Other)
Sampling Personnel:	B. Shanley / C. Staples
Project Manager	Peter Premita.
Collection Device:	(Summa Can) (Tedlar Bag) none
Sample Penetration Location:	(Asphalt) (Concrete) (Soil)
Soil Type:	(Fill) (Till) (Sand & Gravel) (Glacial Marine)
Sample Depth:	2.4" wgs
Depth to Water:	unknown
Suspected COCs:	(Petroleum) (Solvents)
Cannister I.D.:	none
Flow Control I.D.:	none
Flow control rate:	~25 ml/min
O ₂ Ambient	20.9%
CO ₂ Ambient	0.0%
subsurface pressure/vacuum	— (+/- Inches of water column)
Pre-Sample O ₂	16.8%
Pre-Sample CO ₂	5800 ppm
Pre-Sample PID:	0.3 ppm
Pre-Sample CH ₄ :	(% Volume, %LEL, PPM)
Sample Initiation Time:	—
Initial Vacuum:	—
Sample End Time:	—
Final Vacuum:	—
Post Sample O ₂ :	—
Post Sample CO ₂ :	—



Helium Leak test:

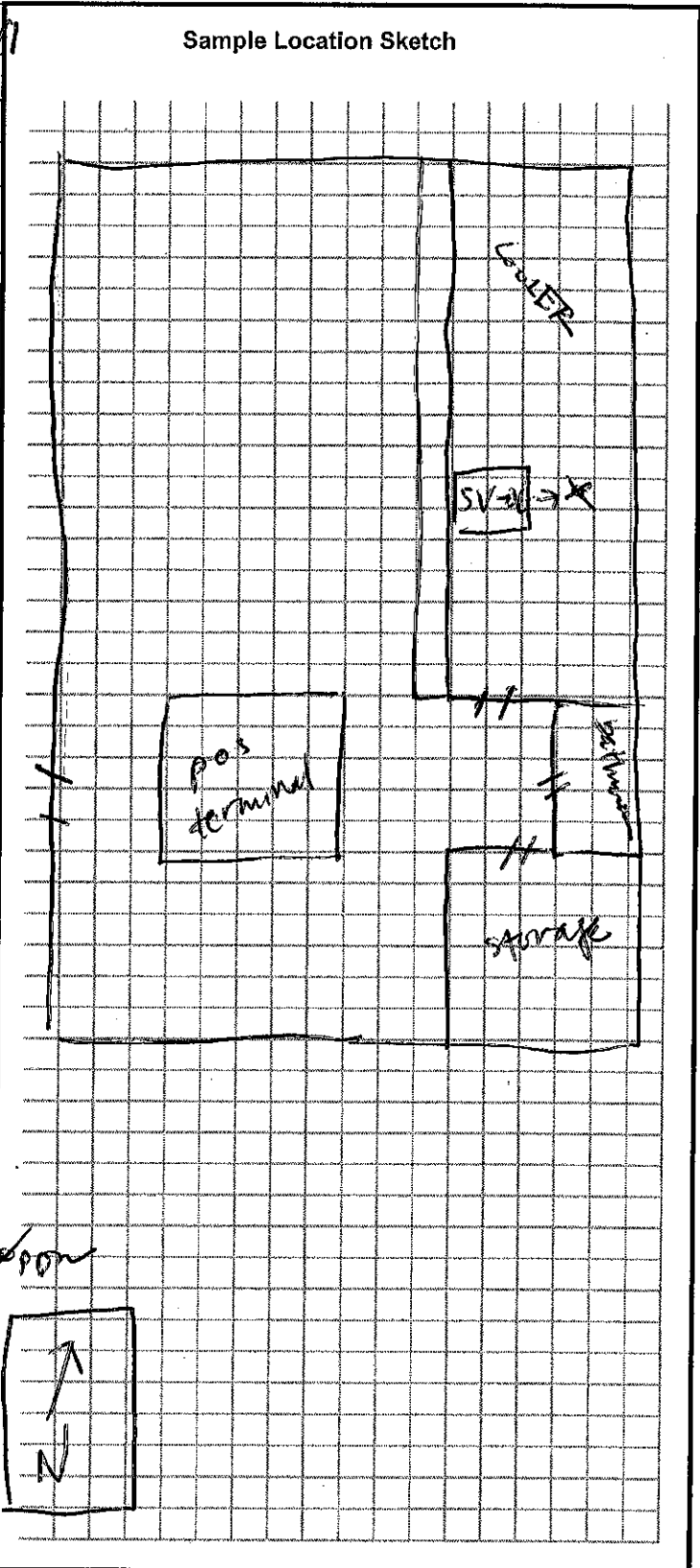
- Notes:
- Bucket He + tool 96%
 - Sample port: 7800 ppm
 - after sample = 78%

⊗ location was advanced to simulate a 'failed' Helium test
checked by CES 9/7/16

Indoor Air/Subslab Sampling Field Sheet
Maine DEP

Site Name:	CFI Gorham ME DEP VI
Town:	Gorham, Maine
Date:	August 30, 2010
Sample I.D.:	SV-06
Project Manager:	Peter. Fz
Sampling Personnel:	MACTAC: B. Shaw.
Collection Device:	(Summa Can) (Tedlar Bag)
Sample Type:	(Subslab) (Indoor Air)
Sampling Location:	cooler.
Foundation Floor Type:	(Dirt) (Concrete)
Foundation Wall Type:	(Concrete) (Block) (Stone) (Brick) (Slab on Grade)
Sump Hole:	(Yes) (No)
Penetrations in Floor:	(Sewer) (Water) (Gas) (Cracks) (Drains)
Penetrations in Wall:	(Sewer) (Water) (Gas) (Electric) (Cracks)
Suspected COCs:	(Petroleum) (Solvents)
Cannister I.D.:	487
Flow Control I.D.:	0194
Flow control rate:	100 ml/min
O ₂ Ambient:	20.9 %
CO ₂ Ambient:	842
Pre-Sample O ₂ :	18.4 %
Pre-Sample CO ₂ :	76000 ppm
Pre-Sample PID:	∅
Pre-Sample CH ₄ :	∅; post PID: down
Sample Initiation Time:	11:11
Initial Vacuum:	-30 + "
Sample End Time:	11:28
Final Vacuum:	-5 "
Post Sample O ₂ :	17.0 %
Post Sample CO ₂ :	76000 ppm

Sample Location Sketch



Notes/Observations:

Slab thickness: 4" to 5"
Sample intake depth: 8"

Initial He: 9100% / 2.06%
Bucklet/subslab
Final He: 74.4% / 8400 ppm (<2%)
checked by CER 9/7/10

FIELD INSTRUMENTATION CALIBRATION RECORD

PROJECT NAME: CFI gorham
 PROJECT NUMBER: 3612102154 -03.2
 PROJECT LOCATION: gorham, ME
 WEATHER CONDITIONS (AM): 0625, 70°F / sunny.
 WEATHER CONDITIONS (PM): 1700, 90°F, sunny hot

TASK NO: _____ DATE: 8-3-10
 MACTEC CREW: ATS
 SAMPLER NAME: Brendan Shaw
 SAMPLER SIGNATURE: _____
 CHECKED BY: CRJ DATE: 9/7/10

MULTI-PARAMETER WATER QUALITY METER

METER TYPE MODEL NO. UNIT ID NO.		AM CALIBRATION			POST CALIBRATION CHECK		
		Start Time	/End Time		Start Time	/End Time	
	Units	Standard Value	Meter Value	*Acceptance Criteria (AM)	Standard Value	Meter Value	*Acceptance Criteria (PM)
pH (4)	SU	4.0	_____	+/- 0.1 pH Units			
pH (7)	SU	7.0	_____	+/- 0.1 pH Units	7.0	_____	+/- 0.3 pH Units
pH (10)	SU	10.0	_____	+/- 0.1 pH Units			
Redox	+/- mV	240	_____	+/- 10 mV	240	_____	+/- 10 mV
Conductivity	mS/cm	1.41	_____	+/- 3% of standard	1.413	_____	+/- 5% of standard
DO (saturated)	%	100	_____	+/- 2% of standard			
DO (saturated)	mg/L ¹		_____	+/- 0.2 mg/L			+/- 0.5 mg/L of standard
DO (<0.1)	mg/L	<0.1	_____	< 0.5 mg/L			
Temperature	°C		_____				
Baro. Press.	mmHg		_____				

TURBIDITY METER		Units	Standard Value	Meter Value	Standard Value	Meter Value	*Acceptance Criteria (PM)
METER TYPE	_____						
MODEL NO.	_____						
UNIT ID NO.	_____	<0.1 Standard	NTU	<0.1	<0.1	_____	+/- 0.3 NTU of stan.
		20 Standard	NTU	20	20	_____	+/- 5% of standard
		100 Standard	NTU	100	100	_____	+/- 5% of standard
		800 Standard	NTU	800	800	_____	+/- 5% of standard

PHOTOIONIZATION DETECTOR		Background	ppmv	<0.1	20.1	<0.1	within 5 ppmv of BG
METER TYPE	<u>mini hal</u>						
MODEL NO.	<u>ppb plus</u>						
UNIT ID NO.	<u>phe</u>	Span Gas	ppmv	<u>100</u>	<u>10.5</u>	100	+/- 10% of standard


O ₂ -LEL 4 GAS METER		Methane	%	50	50	50	+/- 10% of standard
METER TYPE	_____	O ₂	%	20.9	20.9	20.9	+/- 10% of standard
MODEL NO.	_____	H ₂ S	ppmv	25	25	25	+/- 10% of standard
UNIT ID NO.	_____	CO	ppmv	50	50	50	+/- 10% of standard

OTHER METER		See Notes Below for Additional Information					
METER TYPE	_____						
MODEL NO.	_____						
UNIT ID NO.	_____						

- Equipment calibrated within the Acceptance Criteria specified for each of the parameters listed above.
 Equipment (not) calibrated within the Acceptance Criteria specified for each of the parameters listed above**.

MATERIALS RECORD		Cal. Standard Lot Number	Exp. Date
Deionized Water Source:	<u>Portland FOS</u>	pH (4)	_____
Lot#/Date Produced:	_____	pH (7)	_____
Trip Blank Source:	_____	pH (10)	_____
Sample Preservatives Source:	_____	ORP	_____
Disposable Filter Type:	<u>0.45µm cellulose</u>	Conductivity	_____
Calibration Fluids / Standard Source:		<0.1 Turb. Stan.	_____
- DO Calibration Fluid (<0.1 mg/L)	<u>Portland FOS</u>	20 Turb. Stan.	_____
- Other	_____	100 Turb. Stan.	_____
- Other	_____	800 Turb. Stan.	_____
- Other	_____	PID Span Gas	<u>9689 010479</u>
		O ₂ -LEL Span Gas	<u>5-12-15-10</u>
		Other	_____

NOTES: _____


 511 Congress Street, Portland Maine 04101

* = Unless otherwise noted, calibration procedures and acceptance criteria are in general accordance with USEPA Region 1 SOPs for Field Instrument Calibration (EQASOP-FieldCalibrat) and Low Stress Purging and Sampling (EQASOP-GW001), each dated 1/19/2010. Additional acceptance criteria obtained from instrument specific manufacturer recommendations.
 ** = If meter reading is not within acceptance criteria, clean/replace probe and re-calibrate, or use calibrated back-up meter if available. If project requirements necessitate use of the instrument, clearly document any deviations from acceptance criteria on all data sheets and log book entries.
 1 = DO Saturated standard value is calculated based on Oxygen Solubility at Indicated Pressure Chart from the USEPA Region 1 SOP for Field Instrument Calibration (EQASOP-FieldCalibrat), dated 1/19/2010.



AIR ANALYSIS

PAGE 1 OF 1

CHAIN OF CUSTODY

320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: **MACTEL Engineering**
Address: **511 Congress St
Portland, ME 04103**
Phone: **(207) 775-5401**
Fax: **(207) 772-4762**
Email: **crstaples@mactec.com**

Project Information

Project Name: **CFARMS - MEDEP VI**
Project Location: **Gorham, ME**
Project #: **3612102157**
Project Manager: **Chuck Staples**
ALPHA Quote #:

Turn-Around Time

 Standard RUSH (only confirmed if pre-approved!)

Date Due: _____ Time: _____

Date Rec'd in Lab: _____

Report Information - Data Deliverables

 FAX
 ADEx
Criteria Checker: _____
(Default based on Regulatory Criteria indicated)
Other Formats: _____
 EMAIL (standard pdf report)
 Additional Deliverables: _____
Report to: (if different than Project Manager) _____

ALPHA Job #: _____

Billing Information

 Same as Client info PO #: _____**MEDEP VI: Peter Eremitya**

Regulatory Requirements/Report Limits

State/Fed	Program	Criteria

 These samples have been previously analyzed by Alpha

Other Project Specific Requirements/Comments:

⊕ CO₂ and O₂

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection				Sample Matrix*	Sampler's Initials	Can Size	ID Can	ID - Flow Controller	TO-14A by TO-15	TO-15 CANNING/TO-15 SIM	APR	FIXED GASES	TO-14A - Ethyl Alcohol	Sample Comments (i.e. PID)
		Date	Start Time	End Time	Initial Vacuum											
	SV-01	8-30-10	1509	1530	-4	SV	BAS	2L	457	315			XXX		1.0 ppm	
	SV-01 Dup		1508	1615	-30+	SV	BAS	2L	422	166			XXX		1.0 ppm	
	SV-02		1255	1321	-30+	SV	BAS	2L	650	325			XXX		808 ppm	
	SV-03		1346	1411	-30	SV	BAS	2L	178	227			XXX		213 ppm	
	SV-04		1435	1501	-30	SV	BAS	2L	539	329	X		XXX		4.1 ppm	
	SV-05		1534	1553	-29	SV	BAS	2L	407	267	X		XXX		0.7 ppm	
	SV-06		1111	1138	-30+	SV	BAS	2L	487	194	X		XXX		0 ppm	

ANALYSIS

TO-14A by TO-15
TO-15 CANNING/TO-15 SIM
APR
FIXED GASES
TO-14A - Ethyl Alcohol

*SAMPLE MATRIX CODES

AA = Ambient Air (Indoor/Outdoor)
SV = Soil Vapor/Landfill Gas/SVE
Other = Please Specify

Container Type

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

Relinquished By:

Brandon Shew

Date/Time

9-1-10

Received By:

Date/Time: