IMMEDIATE RESPONSE ACTION PLAN

New Bedford High School Substantial Release Migration / Critical Exposure Pathway
230 Hathaway Boulevard
New Bedford, Massachusetts
Release Tracking Number 4-22409

Prepared for:

City of New Bedford
133 William Street
New Bedford, Massachusetts 02740

Prepared by:

TRC Environmental Corporation
Wannalancit Mills
650 Suffolk Street
Lowell, Massachusetts 01854
(978) 970-5600

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1.0 INTRODUCTION

TRC Environmental Corporation (TRC) has prepared this Immediate Response Action (IRA) Plan for submittal to the Massachusetts Department of Environmental Protection (MassDEP) on behalf of the City of New Bedford, Massachusetts (the City) through the City's Department of Environmental Stewardship and in accordance with the Massachusetts Contingency Plan (MCP; 310 CMR 40.0000). The IRA Plan addresses a Condition of Substantial Release Migration (SRM) at the New Bedford High School (NBHS) campus in New Bedford, Massachusetts, as defined under 310 CMR 40.0006 of the MCP. MassDEP assigned Release Tracking Number (RTN) 4-22409 to the Site. The NBHS campus is part of the larger Parker Street Waste Site (PSWS) that is tracked by MassDEP under RTN 4-15685. The location of the Site is shown in Figure 1.

TRC collected groundwater and aqueous samples near where groundwater appears to seep into the basement of the NBHS Building. Analytical results for these samples suggest the potential for chlorinated volatile organic compounds (VOCs) to be present in indoor air in the building. Following release reporting to MassDEP (described herein), TRC conducted indoor air sampling on an expedited basis from several locations within the building near the groundwater seep and in other areas of the building, including classrooms.

TRC detected chlorinated VOCs in the school's indoor air, and TRC's preliminary risk assessment of these data indicated that there is no significant risk to the health of building occupants based on criteria established by MassDEP. The risk assessment was performed using methods consistent with those used to evaluate indoor air elsewhere at the site. While the investigation and evaluations are ongoing, initial results suggest the potential for some of the VOCs in indoor air to originate from groundwater beneath the building, while others might be associated with other sources, such as cleaning products (interior) and vehicle exhaust (ambient).

Despite the finding of no significant risk, the presence of detectable concentrations of VOCs in indoor air necessitates further investigation and may require remedial action. TRC continued its investigation during the February school vacation period by sampling groundwater from 16 monitoring wells, 10 storm water sewer manholes, and 5 sanitary sewer manholes and by sampling sub-floor slab soil gas at 11 locations in the building (concentrating on classroom locations). TRC also conducted an inventory of chemicals used in the Mechanical Room, initiated an inventory of first floor drains and cracks in the A- and B-Blocks to identify where sealing may be warranted to mitigate potential vapor migration to the building, and evaluated building ventilation system performance.

TRC will continue its investigation of the VOCs detected in the high school's indoor air during the April school vacation period as described herein.

The remaining sections of this report include Section 2 (Description of the Release, Site Conditions, and Surrounding Receptors), Section 3 (IRA Objectives and IRA Plan), Section 4 (Description of Immediate Response Actions Undertaken to Date), Section 5 (Reason Why an Immediate Response Action is Required), Section 6 (Future Activities and Proposed Schedule for the Immediate Response Action), Section 7 (Remediation Waste Management Statement), Section

8 (Environmental Monitoring Plan), Section 9 (Federal, State, and Local Permits), Section 10 (Seal and Signature of the Licensed Site Professional), Section 11 (Other Relevant Information), and Section 12 (References).

This IRA Plan also includes the following appendices: Appendix A (Imminent Hazard Screening Evaluation), Appendix B (Excerpt of Building Plans), Appendix C (Laboratory Data Reports), Appendix D (Copy of Environmental Fact Sheet – February 2010), Appendix E (Groundwater Monitoring Well Installation Logs), Appendix F (Groundwater Monitoring Sampling Logs), Appendix G (Temporary Soil Gas Sampling Method), Appendix H (Drain and Crack Screening Information), and Appendix I (Notification Letters to City of New Bedford Mayor and Board of Health)

1.1 Licensed Site Professional

The Licensed Site Professional (LSP) overseeing this IRA Plan is:

David M. Sullivan
LSP License Number: 1488
TRC Environmental Corporation
650 Suffolk Street, Lowell, Massachusetts 01854
(978) 656-3565 (Office)

1.2 Person Assuming Responsibility for the IRA

The party undertaking this IRA is:

The City of New Bedford, Massachusetts
133 William Street, New Bedford, MA 02740
Contact: Mr. Scott Alfonse
(508) 991-6188

2.0 DESCRIPTION OF THE RELEASE, SITE CONDITIONS AND SURROUNDING RECEPTORS

2.1 Description of the Release

Based on the data collection and evaluations described herein, TRC has prepared the following current description of the release condition.

Seep Impacts in the Mechanical Room. Chlorinated Volatile Organic Compounds (VOCs) were detected in aqueous samples from two seep locations in the Mechanical Room at the NBHS building. The seeps have been sampled on three occasions for VOCs on December 2, 2009, January 7, 2010, and January 30, 2010. As described herein, some of the VOC constituents were detected at concentrations greater than MCP Method 1 GW-2 groundwater cleanup standards. TRC proposes further evaluation of this observation in this IRA Plan and potential mitigation measures.

Subsequent sampling of indoor air in the Mechanical Room confirmed that VOCs detected in the seeps were also present in the indoor air. The detection of chlorinated solvents in groundwater, seep water, and indoor air in the vicinity of the Mechanical Room defines a CEP[1] at the NBHS building.

Groundwater Impacts and Potential Infiltration to the Sanitary Sewer. As described herein, groundwater samples collected in January and February 2010 revealed concentrations of chlorinated VOCs in monitoring well MW-7, located in front of the NBHS building near the flagpole, above their respective GW-2 groundwater cleanup standards. Chlorinated VOCs have also been detected in the two sanitary sewer manholes (SS-MH-3 and SS-MH-4) located downgradient from MW-7 at the southern end of the NBHS campus. The lateral extent of groundwater impacts observed in MW-7 has not yet been characterized. TRC proposes further data collection and evaluation of this observation in this IRA Plan.

A comparison of groundwater elevation contours to sewer line elevation data indicates that the sanitary sewer line intersects the groundwater table in the vicinity of sample SS-MH-3. Both of the manholes where chlorinated VOCs have been detected are located downgradient from the point where the water table intersects the sewer line.

VOC Detections in Indoor Air in NBHS A-Block. Detectable concentrations of benzene, other petroleum-related compounds and chlorinated solvents were noted in an indoor air sample in classroom A-3-112 from A-Block. Subsurface VOC impacts have not been found in the vicinity of this room and no link has been found between the concentrations in the indoor air of the classroom and the VOC impacts, if any, in the subsurface environment in this location. TRC proposes further evaluation of this observation in this IRA Plan.

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[1] Section 40.0006 of the MCP defines a Critical Exposure Pathway (CEP) as a route by which subsurface contamination results in measurable concentrations of indoor air contamination in a school or residence.

2.2 Sequence of Events Leading to Identification of the Reporting Condition

The following bullets outline the sequence of events that led to the reporting of the SRM release condition:

- **Aqueous Seep Sampling.** On December 2, 2009, TRC collected aqueous samples from four locations (BRM-S-1 through BRM-S-3 and FIP-S-1) where water had pooled on the floor of the Mechanical Room of the NBHS building (see Figure 2). The pooled water appeared to have seeped into the Mechanical Room through cracks and seams in the concrete floor of the Mechanical Room. Based on elevation data collected by TRC, the elevation of the groundwater table may be periodically higher than the elevation of the lower floor surfaces of the Mechanical Room, and the seepage may be associated with groundwater. The aqueous samples were analyzed for VOCs, extractable petroleum hydrocarbons (EPH), polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and total and dissolved metals. The results of the analyses indicated the presence of chlorinated VOCs in seep sample BRM-S-3 (vinyl chloride [VC], cis-1,2-dichloroethylene [cis-1,2-DCE] and trans-1,2-dichloroethylene [trans-1,2-DCE]), C19-C36 aliphatic hydrocarbons in sample BRM-S-1, and metals (arsenic, barium and/or zinc) in all four of the seep samples. The concentration of VC in sample BRM-S-3 (2.1 ug/L) was greater than the MCP GW-2 groundwater cleanup standard of 2 ug/L (see Table 1).

- **Follow-up Aqueous Seep Sampling.** To verify the detection of VC, TRC re-sampled the seep water on January 7, 2010 for VOCs. Chlorinated VOCs were detected in samples from two of the seep locations: BRM-S-3 (chlorobenzene, 1,3-dichlorobenzene [1,3-DCB], 1,4-dichlorobenzene [1,4-DCB], cis-1,2-DCE, trans-1,2-DCE, trichloroethylene [TCE] and VC) and FIP-S-1(cis-1,2-DCE and trans-1,2-DCE). The concentrations detected during the January 7, 2010 sampling were higher than those detected in samples collected on December 2, 2009 (see Table 1). In sample BRM-S-3, the concentrations of cis-1,2-DCE and VC were greater than the corresponding MCP GW-2 groundwater cleanup standards.

- **Initial Groundwater Monitoring for VOCs.** On January 6 and 7, 2010, TRC collected groundwater samples from monitoring wells MW-4, MW-5, MW-6, and MW-7 constructed on the NBHS campus in 2008 (see Figure 2). Monitoring wells MW-4, MW-5, and MW-6 are located inside the NBHS building. MW-7 is located near the flagpole near the front entrance to the NBHS building. The samples collected from these four monitoring wells were submitted to Con-Test Analytical Laboratory (Con-Test) in East Longmeadow, Massachusetts for analysis of VOCs. Groundwater samples were collected by TRC consistent with United States Environmental Protection Agency (EPA) Region 1 low-flow sampling procedures. Well installation logs are provided in Appendix E. Groundwater sampling logs are provided in Appendix F.

  Chlorinated VOCs were detected in two of the monitoring well samples. cis-1,2-DCE was detected at a concentration of 3.7 ug/L (4.1 ug/L in its duplicate) in monitoring well

MW-5, located inside the NBHS building near the Mechanical Room. Concentrations of tetrachloroethylene (PCE) (63 ug/L) and vinyl chloride (3.4 ug/L) were detected in sample MW-7 above their respective MCP Method 1 GW-2 groundwater cleanup standards (see Table 2).

- **Imminent Hazard Evaluation.** TRC next evaluated whether the VOC concentrations in the seep were associated with an Imminent Hazard (IH) Condition based on fate and transport modeling of seep water VOC concentrations to indoor air concentrations and subsequent risk and hazard estimation. TRC modeled the potential air concentrations in the Mechanical Room where the seeps were located, and utilized the modeled indoor air concentrations to evaluate if an IH condition was present. TRC calculated concentrations of chlorinated VOCs in the air using the equation in the EPA's *Risk Management Program Guidance for Offsite Consequence Analysis* (EPA, 2009) to calculate evaporation rates of water and VOCs as functions of air velocity over the puddled seep water to estimate the mass balance for all detected compounds. The risk evaluation based on the modeled indoor air concentrations (see Appendix A) concluded that an IH condition was not present.

  TRC also collected indoor air data in the field using a photoionization detector (PID) and TCE- and VC-specific Draeger tubes, neither of which indicated the presence of measurable VOC impacts in the breathing zone in the Mechanical Room where the seep water was present. The Draeger Tube field screening activity included TCE tubes, with a measuring range from 2 to 50 parts per million by volume (ppmv) and VC tubes, with a measuring range from 0.5 to 5 ppmv. Twenty-one locations were sampled, including one location several inches above seep BRM-S-3. The lower end of these ranges is adequate to determine that an IH condition is not present.

- **Initial Evaluation of Building Structure and Drainage.** In parallel with the above evaluations and sampling, TRC evaluated building structural features that might influence fate and transport in the groundwater beneath the NBHS building. The structural evaluation revealed an extensive underdrain system through the building, directing groundwater to the storm sewer during high water events. The underdrain system, storm sewer, and sanitary sewer systems are illustrated in plan view in the NBHS engineering plan provided in Appendix B. The plan in Appendix B indicates that the storm and sanitary sewers run in proximity to monitoring well MW-7 installed in the flagpole island on the west side (front) of the NBHS building.

- **Discussions with the City.** On January 28, 2010 at approximately 3:30 PM, TRC advised the City's Department of Environmental Stewardship that the seep and impacted water and the underdrain system represented two potential SRM conditions as defined in 310 CMR 40.0006:

  - Releases to the groundwater that have migrated or are expected to migrate more than 200 feet per year; and

- Releases to the groundwater or to the vadose zone that have resulted or are within one year likely to result in the discharge of vapors into school buildings or occupied residential dwellings.

Either of these conditions constitute a 72-hour regulatory reporting obligation to the MassDEP in accordance with 310 CMR 40.0313(5). Release reporting is discussed in Section 2.3.

2.3 Release Reporting

The SRM conditions described above were reported to the MassDEP by TRC via telephone in conjunction with the City's Department of Environmental Stewardship on January 29, 2010 at approximately 11:05 AM. MassDEP orally approved the IRAs at the Site, and assigned RTN 4-22409.

The orally-approved IRA consisted of the following:

- Monitoring of indoor air locations, including the Mechanical Room, for VOCs with expedited analysis. Recognizing that indoor air in the Mechanical Room may reflect materials stored in this area, MassDEP suggested that an inventory of chemicals stored at the NBHS building, relocation of indoor chemical sources, and ventilation of the Mechanical Room would be appropriate prior to re-sampling in this area
- Re-sampling of seeps in the Mechanical Room; and
- Sealing of the floor seep.

2.4 Site Conditions

The NBHS campus in New Bedford, Massachusetts occupies approximately 35.4 acres. The NBHS campus is located on the north side of Parker Street between Hathaway Boulevard on the west and Liberty Street on the east, as indicated on Figure 1. NBHS is compromised of a single 529,192 square foot building (with a footprint of 233,903 square feet) surrounded by paved parking areas, lawn and landscaped areas for recreational use, and paved tennis courts. Approximately 48-percent of the NBHS campus is covered by impervious surfaces (e.g., pavement or building).

The NBHS building was constructed in approximately 1969/1970 on land that was previously occupied by wetlands and an area of the Parker Street Waste Site. The building construction includes a network of 6-inch polyvinyl chloride (PVC) sub-slab underdrains (see the diagram provided in Appendix B). The underdrains are connected to the storm sewer system, which discharges to the City's system. The storm drains and sanitary sewer lines are shown in Figure 2.

2.5 Surrounding Receptors

The surrounding receptors are discussed in terms of the three release areas discussed in the previous Section 2.1 (Description of the Release).

2.5.1 Seep Impacts in the Mechanical Room

The BRM-S-3 seep lies within the Mechanical Room of the NBHS building. Chlorinated solvents have been detected in indoor air within this room, but they have not been detected in samples collected from adjacent areas (see Figure 2 for sample locations).

Access to the area of the seep is secure, but adults can pass through the area while performing maintenance duties inside the Mechanical Room. In theory, students and staff could be exposed to vapors migrating from the Mechanical Room via the school's ventilation system. The HVAC systems in the Mechanical Room service the B-Block, and create a negative pressure condition in the Mechanical Room, caused by leaks in the HVAC system. However, investigations to date have not identified significant chlorinated solvent concentrations elsewhere in B-Block.

Potential receptors therefore, appear to be limited to maintenance workers, including building engineers and custodial staff.

2.5.2 Groundwater Impacts and Potential Infiltration to the Sanitary Sewer

Groundwater at the MW-7 location is at a depth of approximately 8 feet below ground surface and is not accessible to students or staff passing over the area. There are no private wells in the vicinity of the NBHS campus (a private water supply is located on Summit Street in an upgradient location from the NBHS campus, on the west side of the Keith Middle School wetland, approximately 850 feet from monitoring well MW-7). The sanitary sewer is located on the NBHS campus, but is only accessed through covered manholes and is not accessible to students or staff. The sanitary sewer system receives flow from the NBHS storm sewer system at the southern end of the campus along Parker Street, and then connects to the City sewer system, terminating at the City Publically Owned Treatment Works (POTW).

Potential receptors of the VOC impacts observed in MW-7 and the sanitary sewer system include maintenance workers at the NBHS building and POTW workers. VOCs associated with groundwater at the MW-7 could also impact indoor air through vapor intrusion in the vicinity of an occupied structure.

2.5.3 Indoor Air Detections in the A-Block

Detectable concentrations of benzene, other petroleum-related compounds and chlorinated solvents were detected in Classroom A-3-112 located within the NBHS building. Students, staff and maintenance workers have direct access to A-Block classroom areas.

3.0 IRA OBJECTIVES AND IRA PLAN

The objectives and planned activities are under this IRA are summarized below:

3.1 IRA Objectives

IRAs will address possible SRM conditions at the NBHS building. The specific objectives of this IRA Plan are:

1. Characterization of groundwater, seep water, soil vapor, and indoor air to determine if vapor migration has occurred;

2. Characterization of VOCs in groundwater, storm sewer lines, and sanitary sewer lines to determine if any VOC migration from groundwater to storm or sanitary sewer infrastructure has occurred; and

3. Implementation of mitigation measures in the NBHS building.

3.2 IRA Plan

Work performed under this IRA will include:

- Characterization of indoor air;
- Additional characterization of subslab soil vapors;
- Additional characterization of groundwater from new and existing monitoring wells located in and around the NBHS building;
- Additional evaluation of the storm sewer system on the NBHS campus;
- Additional evaluation of the sanitary sewer system on the NBHS campus;
- Additional evaluation of the air handling systems, foundation cracks, floor drains, sink drains and other annular spaces;
- Evaluation of the CEP and implementation of CEP mitigation measures, where warranted;
- Removal of interior sources to evaluate potential contributions to indoor air readings if appropriate; and
- Sealing of drains and cracks, if appropriate.

4.0 DESCRIPTION OF IMMEDIATE RESPONSE ACTIONS UNDERTAKEN TO DATE

Following the reporting of the release condition to MassDEP on Friday, January 29, 2010, TRC undertook investigations of indoor air, subslab soil vapors, groundwater, aqueous seeps, storm sewer infrastructure, and sanitary sewer infrastructure to evaluate the SRM and the nature and extent of impacts at NBHS. Sample locations are shown on Figure 2. Analytical laboratory reports associated with the sampling are provided in Appendix C. For completeness, this section also includes other activities collateral to the IRA activities (e.g., Fact Sheet preparation).

4.1 Indoor Air Sampling

On Saturday and Sunday, January 30 and 31, 2010, TRC collected five (5) indoor air samples for VOCs via EPA Method TO-15. Samples were collected over a 24-hour period using evacuated stainless steel canisters. Since the sampling took place over the weekend, the NBHS HVAC system was not in operation. The samples were collected from the following bottom floor interior locations at NBHS, illustrated on Figure 2:

- Mechanical Room (Room B-114) – Sample designation TRC-IA-1
- Classroom (Room B-116) – Sample designation TRC-IA-2
- Honors Dining Room (Room B-109) – Sample designation TRC-IA-3
- Cafeteria Storage Room – Sample designation TRC-IA-4
- Classroom (A-3-112) – Sample designation TRC-IA-5

The samples were submitted to Alpha for analysis by EPA Method TO-15. VOCs were detected in indoor air based on the samples collected by TRC. The results of the indoor air sample analyses are summarized in Table 3. The analytical results, summarized in Table 3, are compared to threshold screening levels[2] (MassDEP, 2009). Sample TRC-IA-1 (Mechanical Room) had concentrations of benzene, TCE, and VC exceeding the screening thresholds. Sample TRC-IA-5 (Classroom A-3-112) had concentrations of benzene and VC exceeding the screening thresholds. Concentrations of VOCs in the remaining three samples did not exceed screening thresholds.

Note that at the direction of MassDEP, the indoor air sample in the Mechanical Room was collected at the soonest possible time after the SRM condition was reported to MassDEP on January 29, 2010. This did not allow for an inventory of products stored in the Mechanical Room that may contribute to VOC concentrations measured in sample TRC-IA-1 prior to collecting the indoor air sample.

On February 3, 2010, TRC personnel conducted an initial inventory of chemical products stored at the NBHS building focused on the Mechanical Room and associated nearby locations (e.g., boiler room, engineers' offices, etc). TRC also compiled available Material Safety Data Sheet (MSDS) information. Where the chemical makeup of commercial products was not clearly

[2] The MassDEP has established indoor air screening levels to indicate that additional characterization is appropriate at a site. The screening levels are set at Hazard Index (HI) of 0.2 and excess lifetime cancer risk (ELCR) equal to 1E-06. A site-specific evaluation is recommended in situations where these screening levels are exceeded.

marked, TRC referred to an appropriate MSDS for the product. Benzene and chlorinated solvent content was noted in a number of products.

4.2 Indoor Air Risk Evaluation

TRC evaluated the indoor air results by performing site-specific risk and hazard calculations for each room where an indoor air sample had been collected assuming a chronic worker scenario (8 hours of exposure per day, 250 days per year for 27 years) (Appendix A). The calculations indicated that risks or hazards are less than the MCP Risk Limits of an Excess Lifetime Cancer Risk (ELCR) of 1×10^{-5} and a Hazard Index (HI) of 1 for each room evaluated. The protocol is consistent with that conducted for the neighboring Keith Middle School long-term monitoring for VOCs and PCBs. The highest risk and hazard were associated with Classroom A-3-112 with an ELCR of 2×10^{-6} (primarily due to benzene) and a HI of 0.2 (primarily due to 1,2,4-trimethylbenzene). An ELCR of 1×10^{-6} (primarily due to benzene) and a HI of 0.05 (primarily due to cis-1,2-DCE) was estimated based on the indoor air data collected in the Mechanical Room. The evaluation indicates that, based on the sampling conducted in January 2010, there is no IH condition or chronic risk/hazard above MCP risk limits associated with current indoor air exposures.

4.3 Fact Sheet

TRC prepared a Fact Sheet, which the City published on February 5, 2010. The Fact Sheet provided a description of the investigations completed to date, answered the question "Is it safe for people to occupy the high school?", described the next steps in response actions, and identified where additional information could be obtained from the City. A copy of the Fact Sheet is provided in Appendix D.

4.4 Field Survey of Potential Vapor Migration Pathways

Following confirmation of the CEP on February 2, 2010, TRC identified a range of possible vapor migration pathways and potential CEP mitigation measures. The following potential pathways were identified:

- Groundwater seepage through floor cracks;
- Vapor intrusion through floor cracks;
- Vapor migration through and around drains; and
- Migration of VOCs via the HVAC system at the NBHS building.

On February 11, 2010, TRC personnel screened annular spaces in and around drains and floor cracks throughout the first floor of the NBHS building using a ppb RAE low-level PID. TRC also measured floor drain dimensions and determined that all floor drain lines are 3-inches in diameter. The survey identified two floor cracks, 45 drains, two sumps (the elevator shaft and dish room hatch) and one instance of pipes emerging from the floor (Fry-o-Lator). TRC noted several instances where VOC readings at the drain or crack exceeded background concentrations. However, this information is not sufficient to identify any of the drains or cracks as migration

pathways for subslab vapors. An inventory of the cracks and drains examined on this date is provided in Appendix H.

4.5 Sampling of Storm Drains

On February 3, 2010, TRC field personnel collected aqueous samples for VOC analysis from ten storm drain manholes at the NBHS campus. The selected manholes are in-line or downstream of potential inflows from the NBHS underdrain system. The samples were collected from the following manhole locations at NBHS illustrated on Figure 2 which were selected to indicate whether the underdrains beneath the NBHS campus had directed impacted groundwater into the storm sewer via the footing drains:

- HS-D-1
- HS-D-2
- HS-D-3
- HS-D-4
- HS-D-5
- HS-D-6
- HS-D-7
- HS-D-8
- HS-D-9
- HS-ST-1

The aqueous samples were collected using a peristaltic pump. New dedicated tubing was used for each sample to prevent cross-contamination. The samples were submitted to Con-Test for analysis of VOCs.

The results of the storm drain manhole aqueous sample analysis are summarized in Table 4. The analytical results indicate that detectable concentrations of VOCs were not present in any of the storm sewer manholes located proximate to the underdrains or the footing drains of the NBHS building. VOCs were detected in the sample collected from the one manhole that serves both the storm sewer system and the sanitary sewer system at the NBHS campus. This manhole is shown in Figure 2 as HS-D-5. Chloroform, cis-1,2-DCE, and 1,1,1-trichloroethane were reported for the aqueous sample collected from this manhole.

4.6 Sampling of the Sanitary Sewer

During the February school vacation on February 17, 2010, TRC collected aqueous samples from the NBHS sanitary sewer system. The five selected sanitary sewer manholes are in-line/downstream of potential inflows from the NBHS building. The samples were collected from the following manhole locations on the NBHS campus illustrated on Figure 2, and were selected to identify the potential source of the concentrations of chlorinated solvents observed in the February 3, 2010 sample collected from the combined sanitary/storm manhole (HS-D-5):

- LS-MH-1

- SS-MH-1
- SS-MH-2
- SS-MH-3
- SS-MH-4

Samples were collected using a peristaltic pump. New, dedicated tubing was used for each sample to prevent cross-contamination. The samples were submitted to Con-Test for analysis of VOCs. The results of the sanitary sewer manhole aqueous sample analysis, summarized in Table 5, indicate that detectable concentrations of VOCs were present in four of the five sanitary sewer manholes. However, chlorinated solvents cis-1,2-DCE and trans-1,2-DCE were detected only in the two sanitary sewer manholes (SS-MH-3 and SS-MH-4). Sanitary sewer sample SS-MH-3 was collected immediately upstream from the combined sewer manhole (where sample HS-D-5 was collected on February 3, 2010). Sanitary sewer sample SS-MH-4 was collected from the combined sewer manhole to verify results previously obtained from the combined sewer manhole.

A comparison of groundwater elevation contours (shown in Figure 3) to sewer line elevation data indicates that the vitrified clay sanitary sewer line intersects the groundwater table in the vicinity of MH-3. Both of the manholes where chlorinated solvent impacts have been detected are located downgradient from the point where the water table intersects the vitrified clay sewer line, and downgradient of monitoring well MW-7.

4.7 HVAC, Air Flow, and Pressure Evaluations

On February 11, 2010, a TRC Certified Industrial Hygienist (CIH) with expertise in HVAC systems and indoor air evaluations visited the NBHS building. Field data were collected with pressure differential instrumentation, a velometer for air flow measurements, and smoke testing for visual evaluation of air flow directions. Pressure differentials were collected relative to the Mechanical Room and adjacent areas. Pressure differentials were measured in inches water column. Flow measurements were also taken in open doorways, drains and other possible pathways.

TRC noted that the Mechanical Room is under strong negative pressure relative to adjacent halls and rooms when all air handling equipment is operating. With the air handling units (AHUs) off, the pressure is less negative. The primary sources of this negative pressure are operating fans and air handling equipment in the room. A secondary source of negative pressure is the chimney effect induced by the former incinerator stack. Smoke testing of the AHUs, the condensate drains, floor drains, doorways and cracks in the seep area showed that there was a strong negative pressure and air was drawn into the intake side of the AHUs. TRC is continuing to evaluate this information.

4.8 Installation and Sampling of New Monitoring Wells and Sampling of Existing Monitoring Wells

On February 15, 2010 (during the February school vacation), TRC installed nine additional monitoring wells around the perimeter of A- and C-Blocks at the NBHS building. TRC developed these wells and collected samples for VOC analysis in accordance with EPA Region 1 low-flow sampling techniques. Concurrently, TRC also sampled all existing TRC wells on the NBHS campus, also by low-flow procedures. The wells were sampled from February 17 through February 19, 2010. A total of 16 wells were sampled. The wells sampled are identified below and their locations are illustrated on Figure 2.

- Existing Wells:
  - MW-4
  - MW-5
  - MW-6
  - MW-7
  - MW-8A
  - MW-HH-13
  - MW-HRC-33
- Newly Installed Wells:
  - MW-11
  - MW-12
  - MW-13
  - MW-14
  - MW-15
  - MW-16
  - MW-17
  - MW-18
  - MW-19

The groundwater samples were submitted to Alpha for analysis of VOCs. The results of these analyses are summarized in Table 2. Well installation logs are provided in Appendix E. Groundwater sampling logs are provided in Appendix F.

Chlorinated compounds were detected in monitoring wells MW-5 and MW-7, at concentrations similar to the previous sample round. VOCs were not detected in any of the newly installed monitoring wells.

4.9 Resampling of Mechanical Room Seep Water

On January 30, 2010, following the collection of indoor air samples at NBHS, TRC re-sampled the four seep locations and analyzed the samples for VOCs. Chlorinated solvent compounds

were again observed in BRM-S-3 and FIP-S-1; however none of the measured concentrations exceeded MCP Method 1 GW-2 groundwater cleanup standards. These results are summarized in Table 1.

4.10 Monitoring Well Elevation Survey and Groundwater Elevation Gauging

The newly installed wells were surveyed by Land Planning, Incorporated (Land Planning) of Hanson, Massachusetts on February 17, 2010. TRC gauged the new and previously existing monitoring wells prior to collection of groundwater samples. Groundwater elevation data are provided in Table 6. Unless noted otherwise in Table 6, the monitoring wells were all gauged on February 17, 2010. TRC prepared a revised interpreted groundwater contour map, which is illustrated in Figure 3.

4.11 Temporary Subslab Soil Gas Sampling Points

On February 15, 2010 during the February school vacation, TRC collected soil vapor samples from temporary sample points installed at 11 locations throughout A-, C-, and D-Blocks of the NBHS building. Samples were collected using evacuated stainless steel canisters. The samples were collected from the following bottom floor interior locations at NBHS, illustrated on Figure 2, and were designed to provide screening information regarding potential subslab vapor impacts in the vicinity of A-, C- and D-Blocks:

- Classroom A-4-115 – Sample designation TVP-1
- Classroom A-4-105 – Sample designation TVP-2
- Classroom A-3-115 – Sample designation TVP-3
- Classroom A-3-112 – Sample designation TVP-4
- Classroom A-3-105 – Sample designation TVP-5
- Classroom A-2-115 – Sample designation TVP-6
- Classroom A-2-105 – Sample designation TVP-7
- Classroom A-1-115 – Sample designation TVP-8
- Classroom A-1-105 – Sample designation TVP-9 (plus field duplicate)
- Room D-105 (Wood Shop) – Sample designation TVP-10
- Room D-116 (Auto Shop) – Sample designation TVP-11

The 11 temporary soil vapor sample points were installed using a hammer drill with a 5/8" bit. The method employed by TRC to collect the soil vapor samples is described in Appendix G.

TRC planned to install a temporary subslab soil gas sampling point in the Mechanical Room, but due to the uncertainty of subslab utilities, particularly electrical lines, a temporary point was not installed during this mobilization. As discussed below, a permanent soil vapor point was later installed in the Mechanical Room.

The results of the subslab soil gas analysis are summarized in Table 7. The analytical results show detectable concentrations of various VOCs in all 11 sampling locations. The soil vapor results are compared to a screening level threshold equal to 10-times the Indoor Air Threshold

Values (MassDEP, 2008), consistent with guidance provided by MassDEP (2009). These screening level thresholds were exceeded in samples collected from four locations: TVP-1 (acetone, benzene, TCE, and isopropyl benzene), TVP-3 (benzene and TCE), TVP-10 (4-methyl 2-pentanone), and TVP-11 (acetone and PCE). TVP-1 and TVP-3 are located in A-Block. TVP-10 is located in the wood shop and TVP-11 is located in the auto shop. TRC is evaluating potential follow-up sampling for additional characterization, if appropriate.

4.12 Permanent Soil Gas Sampling Points

On February 19, 2010 during the February school vacation, following receipt of the temporary soil gas sample point results, TRC selected eight (8) locations for the installation of permanent soil gas sampling points. Seven of the eight locations were previously used as temporary soil vapor sample locations. The eighth location is in the Mechanical Room, not sampled previously. The permanent points were installed in the following locations illustrated on Figure 2:

- Classroom A-4-115 – Sample designation PVP-1
- Classroom A-3-115 – Sample designation PVP-2
- Classroom A-3-112 – Sample designation PVP-3
- Classroom A-2-115 – Sample designation PVP-4
- Classroom A-1-105 – Sample designation PVP-5
- Room D-105 (Wood Shop) – Sample designation PVP-6
- Room D-116 (Auto Shop) – Sample designation PVP-7

As noted above, TRC installed a permanent subslab soil gas sampling point in the Mechanical Room after surveying the area by ground penetrating radar (GPR). When a clear location was identified, TRC installed permanent subslab soil gas point PVP-8 in the Mechanical Room. Sampling of the permanent points is tentatively scheduled for April 2010 during the school vacation week. Figure 4 provides construction diagrams for the permanent soil gas sampling point installations. The results of the sampling of the permanent subslab soil gas points will be provided in subsequent regulatory submittals.

4.13 Development of Seep Mitigation Alternatives

During the February school vacation, TRC invited several specialty contractors to the NBHS Mechanical Room to view the standing water in the Mechanical Room. TRC will solicit seep mitigation bids from several specialty vendors. A remedy for the seepage into the Mechanical Room has not yet been selected.

4.14 Camera Inspection of Drain Lines.

The City's Department of Public Infrastructure (DPI) recently conducted a camera inspection of the sewer lines. The recording of the inspection will be provided to TRC for review and interpretation. The results of this review will be reported in future regulatory submittals.

5.0 REASON FOR IMMEDIATE RESPONSE ACTIONS

TRC advised the City's Department of Environmental Stewardship that the seep and impacted water and the underdrain system represented two potential SRM conditions as defined in 310 CMR 40.0006:

- Releases to the groundwater that have migrated or are expected to migrate more than 200 feet per year; and
- Releases to the groundwater or to the vadose zone that have resulted or are within one year likely to result in the discharge of vapors into school buildings or occupied residential dwellings.

Either of these conditions constitute a 72-hour regulatory reporting obligation to the MassDEP in accordance with 310 CMR 40.0313(5), which was duly reported to MassDEP.

Under the MCP, a 72-hour notice condition constitutes a time-critical condition. Under 310 CMR 40.0411 (General Provisions for Immediate Response Actions), Subpart (1):

> *Immediate Response Actions shall assess release, threat of release and/or site conditions and, where appropriate, contain, isolate, remove or secure a release or threat of release of oil and/or hazardous material in order to:*
>
> *(a) abate, prevent or eliminate an Imminent Hazard to health, safety, public welfare or the environment; and/or*
> *(b) respond to other time-critical release, threat of release and/or site conditions.*

In addition, the detection of chlorinated VOCs in groundwater (MW-5), seep water (BRM-S-3), and indoor air (TRC-IA-1) in the vicinity of the Mechanical Room defines a type of CEP under the MCP at NBHS. Section 40.0006 of the MCP defines a CEP as a route by which subsurface contamination results in measurable concentrations of indoor air contamination in a school or residence.

Regarding CEPs, the MCP presumes that IRAs are required to prevent, eliminate and/or mitigate a CEP, which may be rebutted based on a preponderance of the evidence that the CEP does not present an IH, either at present or for the time period that is likely to be required for the implementation and/or completion of Comprehensive Response Actions; it is not feasible to eliminate the CEP(s); and in cases where it is not feasible to eliminate the CEP(s), it is not feasible to mitigate the CEP(s).

6.0 FUTURE ACTIVITIES AND PROPOSED SCHEDULE FOR THE IMMEDIATE RESPONSE ACTION

Activities to be completed under this IRA include: additional soil vapor and indoor air sampling, additional groundwater investigations, and the implementation of CEP mitigation measures, as well as relocation of indoor chemical sources, sealing of the floor seep, ventilation and sampling of the indoor air space, as necessary.

6.1 Future Investigation Activities Under This IRA

Future investigations under this IRA Plan are expected to include the following:

- **Indoor air.** Additional indoor air sampling is anticipated following completion of the subslab and groundwater investigations associated with vapor intrusion. The next indoor air sampling event is expected to include re-sampling locations in the Mechanical Room and A-Block and collection of samples from new locations in the A-, B- and D-Blocks.

- **Subslab soil vapors.** Additional subslab vapor sampling is required because several of the previous samples exceed MassDEP recommended screening levels. In addition, a soil vapor sample will be collected for the Mechanical Room because sample collection at this location was not feasible during the temporary soil vapor sampling event due to utility obstructions. The upcoming sampling event is expected to consist of sampling at each of the eight permanent soil vapor sampling points.

- **Groundwater**. Future groundwater investigation activities will include the installation of additional monitoring wells to delineate the extent of VOCs in groundwater in the vicinity of monitoring wells MW-5 and MW-7.

- **Seep water in the basement**. Additional sampling of seep water is not anticipated at this time.

- **Storm sewer and sanitary sewer systems.** Additional sampling of the storm and sanitary sewer systems is not anticipated at this time. However, TRC will continue to evaluate the influence of, or impact on, the sewer systems.

6.2 CEP Mitigation Measures

TRC will investigate if the concentrations of VOCs in indoor are related to a release to soil or groundwater. CEP mitigation measures may be necessary to reduce or eliminate intrusion of chlorinated solvent vapors into the Mechanical Room. Additionally, TRC will investigate the presence of benzene and chlorinated VOCs in an air sample from an A-Block classroom (A-3-112).

Possible CEP mitigation measures to be performed under this IRA include the following:

- **Seepage mitigation.** The location of the seeps inside the building in proximity to air handling equipment creates a condition whereby vaporization of VOCs from the standing water could enter into the ventilation system and migrate throughout the NBHS building. TRC has solicited seep mitigation bids from several specialty vendors (see Section 3.14). A remedy has not yet been selected.

- **Crack sealing in areas unaffected by groundwater seepage.** Several floor cracks were identified during the survey performed on February 11, 2010 (see Appendix H). Silicone sealant is proposed to seal these cracks and prevent future migration of subslab vapors.

- **Mitigation of intrusion through and around floor drains.** Floor drains in the building are constructed with traps which typically hold standing water sufficient to prevent vapor migration through the drain system into the building. The traps in floor drains, which are not frequently used, could potentially dry out over time. To prevent vapors from migrating into the building through these dry traps, drain plugs will be deployed in drains that are not used frequently. TRC has determined that all floor drain lines are three inches in diameter.

- **Mitigation of intrusion through infrequently used sinks.** Drain plugs are an option, but periodic running of the tap will also be effective as a management control.

- **Mitigation through Routine Operation of the HVAC System.** Operation of the HVAC system introduces from 0 to 100 percent fresh air (varying with temperature) during routine operation. TRC will also evaluate the possibility of making adjustments to the system.

- **Over-pressurization/reduced negative pressures.** TRC is evaluating options for neutralizing the negative pressure condition inside the Mechanical Room and thereby minimizing the possibility that vapors inside the mechanical room would enter the air space from the subsurface.

6.3 Implementation Schedule

The anticipated schedule for these IRAs is as follows:

- **April 2010 School Vacation.** Soil vapor sampling, monitoring well installation and sampling, and indoor air sampling. Possibly implementation of initial CEP mitigation measures.

- **June – July 2010**. Continued implementation of CEP mitigation measures, if appropriate.

- **August - December 2010**. Post-CEP mitigation indoor air sampling.

7.0 REMEDIATION WASTE MANAGEMENT STATEMENT

During well development and purging activities in February 2010, 2½ 55-gallon drums with well development water and purge water were generated. These drums are currently staged on Site awaiting disposal (anticipated to occur in late March/early April 2010).

There have been no other remediation wastes generated under this IRA.

8.0 ENVIRONMENTAL MONITORING PLAN

This IRA Plan does not anticipate any environmental monitoring activities other than those associated with characterization of the release at this disposal site.

This IRA Plan is comprised of assessment activities in various media. Past and future environmental assessment activities associated with the IRA are discussed herein.

9.0 FEDERAL, STATE & LOCAL PERMITS

There are no known Federal, State, or local permit requirements associated with the IRAs anticipated under this IRA Plan.

Massachusetts Dig-Safe® was notified at least 72 hours prior to commencing the drilling activities related to monitoring well installation and soil vapor well installation as described in this IRA Plan. The applicable Dig-Safe® are as follows:

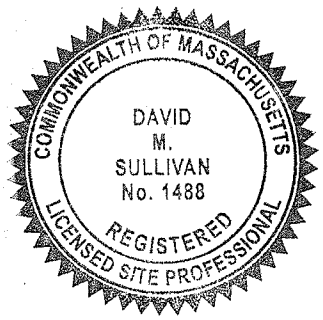
- 2010-070-1683
- 2010-070-1687

10.0 SEAL AND SIGNATURE OF THE LICENSED SITE PROFESSIONAL

Pursuant to 310 CMR 40.0424(1)(i), this IRA Plan was prepared by:

David M. Sullivan, LSP, CHMM
TRC Environmental Corporation
Licensed Site Professional No. 1488

3/22/2010
Date



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11.0 OTHER RELEVANT INFORMATION

11.1 Public Involvement

As required by 310 CMR 40.1403(3)(b), the Mayor and the Board of Health for the City of New Bedford have been notified of the IRA activities undertaken to mitigate a CEP. Copies of the notification letters sent to the Mayor and Board of Health are provided in Appendix I.

Additional notification will be provided to NBHS administrators and, if necessary, to students and staff of NBHS as required by 310 CMR 40.1403(11).

This site is part of a larger site that is involved in a proactive public communication process. As such, the status of IRA activities will be discussed periodically in public meetings and fact sheets such as the one provided in Appendix D, will be prepared as needed.

12.0 REFERENCES

EPA, 2009 — Risk Management Program Guidance for Offsite Consequence Analysis, United States Environmental Protection Agency, Office of Solid Waste and Emergency Response, EPA 550-B-99-009, March 2009

MassGIS, 2008. — Massachusetts Geographic Information System (MassGIS), On-line MassDEP Priority Resource Map. Accessed July 28, 2008. http://maps.massgis.state.ma.us/21e/viewer.htm

MassDEP, 2008. — Risk Management Criteria - MassDEP Indoor Air Threshold Values for the Evaluation of a Vapor Intrusion Pathway, Attachment C, updated June 26, 2008.

MassDEP, 2009. — Indoor Air Guidance. June 2009 Draft – For Discussion Purposes Only.

TRC, 2008. — *Data Summary Report, New Bedford High School, New Bedford, Massachusetts.* Prepared for: City of New Bedford Department of Environmental Stewardship. Prepared by: TRC Environmental Corporation. December 2008.

TABLES

Table 1
Summary of Analytical Results for Aqueous Seep Samples -- December 2009 and January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:		BRM-S-1			BRM-S-2			BRM-S-3				FIP-S-1		
		Sample Date:		12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	1/30/2010 Field Dup	12/2/2009	1/7/2010	1/30/2010
		GW-2	GW-3													
VOCs																
(ug/L)	Acetone	50,000	50,000	50 U	50 U	5.0 U	50 U	50 U	5.0 U	50 U	50 U	5.0 U	5.0 U	50 U	50 U	5.0 U
	tert-Amyl Methyl Ether (TAME)	NS	NS	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U
	Benzene	2,000	10,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromobenzene	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromochloromethane	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromodichloromethane	6	50,000	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U
	Bromoform	700	50,000	5.0 U	10 U	1.0 U	5.0 U	10 U	1.0 U	5.0 U	10 U	1.0 U	1.0 U	5.0 U	10 U	1.0 U
	Bromomethane	7	800	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	5.0 U
	2-Butanone (MEK)	50,000	50,000	20 U	20 U	10 U	20 U	20 U	10 U	20 U	20 U	10 U	10 U	20 U	20 U	10 U
	n-Butylbenzene	7,000[1]	50,000[1]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	sec-Butylbenzene	7,000[1]	50,000[1]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butylbenzene	7,000[1]	50,000[1]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butyl Ethyl Ether (TBEE)	NS	NS	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U
	Carbon Disulfide	NS	NS	3.0 U	5.0 U	1.0 U	3.0 U	5.0 U	1.0 U	3.0 U	5.0 U	1.0 U	1.0 U	3.0 U	5.0 U	1.0 U
	Carbon Tetrachloride	2	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorobenzene	200	1,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**9.5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorodibromomethane	20	50,000	0.50 U	10 U	1.0 U	0.50 U	10 U	1.0 U	0.50 U	10 U	1.0 U	1.0 U	0.50 U	10 U	1.0 U
	Chloroethane	NS	NS	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	Chloroform	50	20,000	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	Chloromethane	NS	NS	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	2-Chlorotoluene	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	4-Chlorotoluene	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	5.0 U	10 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U	10 U	5.0 U
	1,2-Dibromoethane (EDB)	2	50,000	0.50 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.0 U	0.50 U	0.50 U	1.0 U
	Dibromomethane	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichlorobenzene	2,000	2,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichlorobenzene	2,000	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1.6**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,4-Dichlorobenzene	200	8,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**6.8**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Dichlorodifluoromethane (Freon 12)	NS	NS	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	1,1-Dichloroethane	1,000	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichloroethane	5	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloroethylene	80	30,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-Dichloroethylene	100	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**54**	**180**	**24**	**23**	1.0 U	**5.6**	**7.2**
	trans-1,2-Dichloroethylene	90	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**14**	**57**	**8.2**	**8.1**	1.0 U	**1.0**	**1.4**
	1,2-Dichloropropane	3	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichloropropane	NS	NS	0.50 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.0 U	0.50 U	0.50 U	1.0 U
	2,2-Dichloropropane	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloropropene	NS	NS	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	cis-1,3-Dichloropropene	10[2]	200[2]	0.50 U	5.0 U	0.50 U	0.50 U	5.0 U	0.50 U	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	5.0 U	0.50 U
	trans-1,3-Dichloropropene	10[2]	200[2]	0.50 U	5.0 U	0.50 U	0.50 U	5.0 U	0.50 U	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	5.0 U	0.50 U
	Diethyl Ether	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Diisopropyl Ether (DIPE)	NS	NS	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U
	1,4-Dioxane	6,000	50,000	50 U	50 U	100 U	50 U	50 U	100 U	50 U	50 U	100 U	100 U	50 U	50 U	100 U
	Ethylbenzene	20,000	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Hexachlorobutadiene	1	3,000	1.0 U	1.0 U	0.50 U	1.0 U	1.0 U	0.50 U	1.0 U	1.0 U	0.50 U	0.50 U	1.0 U	1.0 U	0.50 U
	2-Hexanone (MBK)	NS	NS	10 U	10 U	1.0 U	10 U	10 U	1.0 U	10 U	10 U	1.0 U	1.0 U	10 U	10 U	1.0 U
	Isopropylbenzene (Cumene)	7,000[1]	50,000[1]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	p-Isopropyltoluene (p-Cymene)	7,000[1]	50,000[1]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Methyl tert-Butyl Ether (MTBE)	50,000	50,000	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U
	Methylene Chloride	10,000	50,000	5.0 U	5.0 U	1.0 U	5.0 U	5.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U
	4-Methyl-2-pentanone (MIBK)	50,000	50,000	10 U	10 U	5.0 U	10 U	10 U	5.0 U	10 U	10 U	5.0 U	5.0 U	10 U	10 U	5.0 U
	Naphthalene	1,000	20,000	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U
	n-Propylbenzene	7,000[1]	50,000[1]	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Styrene	100	6,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,1,2-Tetrachloroethane	10	50,000	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U
	1,1,2,2-Tetrachloroethane	9	50,000	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U

Table 1
Summary of Analytical Results for Aqueous Seep Samples -- December 2009 and January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:		BRM-S-1			BRM-S-2			BRM-S-3				FIP-S-1		
		Sample Date:		12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	1/30/2010 Field Dup	12/2/2009	1/7/2010	1/30/2010
		GW-2	GW-3													
	Tetrachloroethylene	50	30,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Tetrahydrofuran	NS	NS	10 U	10 U	5.0 U	10 U	10 U	5.0 U	10 U	10 U	5.0 U	5.0 U	10 U	10 U	5.0 U
	Toluene	50,000	40,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2,3-Trichlorobenzene	NS	NS	5.0 U	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U
	1,2,4-Trichlorobenzene	2,000	50,000	5.0 U	1.0 U	2.0 U	5.0 U	1.0 U	2.0 U	5.0 U	1.0 U	2.0 U	2.0 U	5.0 U	1.0 U	2.0 U
	1,1,1-Trichloroethane	4,000	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,2-Trichloroethane	900	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Trichloroethylene	30	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**6.0**	**1.2**	**1.3**	1.0 U	1.0 U	1.0 U
	Trichlorofluoromethane (Freon 11)	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,3-Trichloropropane	NS	NS	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	1,2,4-Trimethylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3,5-Trimethylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Vinyl Chloride	2	50,000	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	**2.1**	**34**	**1.4**	**1.3**	2.0 U	2.0 U	**1.3**
	m+p Xylene	9,000	5,000	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	o-Xylene	9,000	5,000	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U
EPH																
(ug/L)	C9-C18 Aliphatics	5,000	50,000	150 U	NA	NA	150 U	NA	NA	150 U	NA	NA	NA	150 U	NA	NA
	C19-C36 Aliphatics	NS	50,000	**190**	NA	NA	150 U	NA	NA	150 U	NA	NA	NA	150 U	NA	NA
	C11-C22 Aromatics	50,000	5,000	100 U	NA	NA	100 U	NA	NA	100 U	NA	NA	NA	100 U	NA	NA
	Acenaphthene	NS	6,000	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Acenaphthylene	10,000	40	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Anthracene	NS	30	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(a)anthracene	NS	1,000	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(a)pyrene	NS	500	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(b)fluoranthene	NS	400	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(g,h,i)perylene	NS	20	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(k)fluoranthene	NS	100	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Chrysene	NS	70	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Dibenz(a,h)anthracene	NS	40	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Fluoranthene	NS	200	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Fluorene	NS	40	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Indeno(1,2,3-cd)pyrene	NS	100	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	2-Methylnaphthalene	2,000	20,000	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Naphthalene	1,000	20,000	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Phenanthrene	NS	10,000	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Pyrene	NS	20	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
PAHs																
(ug/L)	Acenaphthene	NS	6,000	0.30 U	NA	NA	0.30 U	NA	NA	0.30 U	NA	NA	NA	0.30 U	NA	NA
	Acenaphthylene	10,000	40	0.30 U	NA	NA	0.30 U	NA	NA	0.30 U	NA	NA	NA	0.30 U	NA	NA
	Anthracene	NS	30	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	Benzo(a)anthracene	NS	1,000	0.050 U	NA	NA	0.050 U	NA	NA	0.050 U	NA	NA	NA	0.050 U	NA	NA
	Benzo(a)pyrene	NS	500	0.10 U	NA	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.10 U	NA	NA
	Benzo(b)fluoranthene	NS	400	0.050 U	NA	NA	0.050 U	NA	NA	0.050 U	NA	NA	NA	0.050 U	NA	NA
	Benzo(g,h,i)perylene	NS	20	0.50 U	NA	NA	0.50 U	NA	NA	0.50 U	NA	NA	NA	0.50 U	NA	NA
	Benzo(k)fluoranthene	NS	100	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	Chrysene	NS	70	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	Dibenz(a,h)anthracene	NS	40	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	Fluoranthene	NS	200	0.50 U	NA	NA	0.50 U	NA	NA	0.50 U	NA	NA	NA	0.50 U	NA	NA
	Fluorene	NS	40	1.0 U	NA	NA	1.0 U	NA	NA	1.0 U	NA	NA	NA	1.0 U	NA	NA
	Indeno(1,2,3-cd)pyrene	NS	100	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	2-Methylnaphthalene	2,000	20,000	1.0 U	NA	NA	1.0 U	NA	NA	1.0 U	NA	NA	NA	1.0 U	NA	NA
	Naphthalene	1,000	20,000	1.0 U	NA	NA	1.0 U	NA	NA	1.0 U	NA	NA	NA	1.0 U	NA	NA
	Phenanthrene	NS	10,000	0.050 U	NA	NA	0.050 U	NA	NA	0.050 U	NA	NA	NA	0.050 U	NA	NA
	Pyrene	NS	20	1.0 U	NA	NA	1.0 U	NA	NA	1.0 U	NA	NA	NA	1.0 U	NA	NA
PCBs																
(ug/L)	Aroclor 1016	5	10	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1221	5	10	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA

Table 1
Summary of Analytical Results for Aqueous Seep Samples -- December 2009 and January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:		BRM-S-1			BRM-S-2			BRM-S-3				FIP-S-1		
		Sample Date:		12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	1/30/2010 Field Dup	12/2/2009	1/7/2010	1/30/2010
		GW-2	GW-3													
	Aroclor 1232	5	10	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1242	5	10	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1248	5	10	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1254	5	10	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1260	5	10	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Total PCB Amount	5	10	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
Metals, total																
(ug/L)	Antimony	NS	8,000	40 U	NA	NA	40 U	NA	NA	40 U	NA	NA	NA	40 U	NA	NA
	Arsenic	NS	900	**9.2**	NA	NA	**11**	NA	NA	**10**	NA	NA	NA	**5.8**	NA	NA
	Barium	NS	50,000	**98**	NA	NA	**76**	NA	NA	**140**	NA	NA	NA	50 U	NA	NA
	Beryllium	NS	200	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Cadmium	NS	4	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Chromium	NS	300	5.0 U	NA	NA	5.0 U	NA	NA	5.0 U	NA	NA	NA	5.0 U	NA	NA
	Lead	NS	10	7.5 U	NA	NA	7.5 U	NA	NA	**220**	NA	NA	NA	7.5 U	NA	NA
	Mercury	NS	20	0.10 U	NA	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.10 U	NA	NA
	Nickel	NS	200	5.0 U	NA	NA	5.0 U	NA	NA	5.0 U	NA	NA	NA	5.0 U	NA	NA
	Selenium	NS	100	25 U	NA	NA	25 U	NA	NA	25 U	NA	NA	NA	25 U	NA	NA
	Silver	NS	7	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Thallium	NS	3,000	30 U	NA	NA	30 U	NA	NA	30 U	NA	NA	NA	30 U	NA	NA
	Vanadium	NS	4,000	25 U	NA	NA	25 U	NA	NA	25 U	NA	NA	NA	25 U	NA	NA
	Zinc	NS	900	**260**	NA	NA	**51**	NA	NA	**150**	NA	NA	NA	**21**	NA	NA
Metals, dissolved																
(ug/L)	Antimony	NS	8,000	40 U	NA	NA	40 U	NA	NA	40 U	NA	NA	NA	40 U	NA	NA
	Arsenic	NS	900	**6.5**	NA	NA	**8.9**	NA	NA	**8.4**	NA	NA	NA	**6.0**	NA	NA
	Barium	NS	50,000	**79**	NA	NA	**73**	NA	NA	**67**	NA	NA	NA	50 U	NA	NA
	Beryllium	NS	200	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Cadmium	NS	4	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Chromium	NS	300	5.0 U	NA	NA	5.0 U	NA	NA	5.0 U	NA	NA	NA	5.0 U	NA	NA
	Lead	NS	10	7.5 U	NA	NA	7.5 U	NA	NA	7.5 U	NA	NA	NA	7.5 U	NA	NA
	Mercury	NS	20	0.10 U	NA	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.10 U	NA	NA
	Nickel	NS	200	5.0 U	NA	NA	5.0 U	NA	NA	5.0 U	NA	NA	NA	5.0 U	NA	NA
	Selenium	NS	100	25 U	NA	NA	25 U	NA	NA	25 U	NA	NA	NA	25 U	NA	NA
	Silver	NS	7	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Thallium	NS	3,000	30 U	NA	NA	30 U	NA	NA	30 U	NA	NA	NA	30 U	NA	NA
	Vanadium	NS	4,000	25 U	NA	NA	25 U	NA	NA	25 U	NA	NA	NA	25 U	NA	NA
	Zinc	NS	900	**160**	NA	NA	**43**	NA	NA	**48**	NA	NA	NA	**25**	NA	NA

Notes:
ug/L - micrograms per liter.
NA - Sample not analyzed for the listed analyte.
NS - No MassDEP standards exist for this compound.
U - Compound was not detected at specified quantitation limit.
Values in **Bold** indicate the compound was detected.
Values shown in Bold and shaded type exceed one or more of the listed MassDEP Method 1 standards
VOCs - Volatile Organic Compounds.
EPH - Extractable Petroleum Hydrocarbons.
PAHs - Polynuclear Aromatic Hydrocarbons.
PCBs - Polychlorinated Biphenyls.
(1) - MassDEP Method 1 standards for C9-C10 aromatic hydrocarbons used.
(2) - MassDEP Method 1 standards for 1,3-Dichloropropene used.

Table 2
Summary of Analytical Results for Groundwater Samples -- January and February 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte		Sample ID:	MW-4		MW-5			MW-6		MW-7			MW-8A	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-HH-13	MW-HRC-33
			Sample Date:	1/6/2010	2/17/2010	1/6/2010	1/6/2010	2/17/2010	1/7/2010	2/18/2010	1/7/2010	2/17/2010	2/17/2010	2/18/2010	2/19/2010	2/18/2010	2/19/2010	2/19/2010	2/18/2010	2/19/2010	2/18/2010	2/18/2010	2/18/2010	2/18/2010	2/17/2010
		GW-2	GW-3				Field Dup						Field Dup												
VOCs (ug/L)	Acetone	50,000	50,000	50 U	5.0 U	50 U	50 U	5.0 U	50 U	5.0 U	50 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	tert-Amyl Methyl Ether (TAME)	NS	NS	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	2.0 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Benzene	2,000	10,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromobenzene	NS	NS	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Bromochloromethane	NS	NS	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Bromodichloromethane	6	50,000	5.0 U	1.0 U	5.0 U	5.0 U	1.0 U	5.0 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromoform	700	50,000	10 U	2.0 U	10 U	10 U	2.0 U	10 U	2.0 U	10 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Bromomethane	7	800	2.0 U	5.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	2-Butanone (MEK)	50,000	50,000	20 U	5.0 U	20 U	20 U	5.0 U	20 U	5.0 U	20 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	n-Butylbenzene	7,000[1]	50,000[1]	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	sec-Butylbenzene	7,000[1]	50,000[1]	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	tert-Butylbenzene	7,000[1]	50,000[1]	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	tert-Butyl Ethyl Ether (TBEE)	NS	NS	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	2.0 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Carbon Disulfide	NS	NS	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Carbon Tetrachloride	2	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorobenzene	200	1,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorodibromomethane	20	50,000	10 U	1.0 U	10 U	10 U	1.0 U	10 U	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chloroethane	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Chloroform	50	20,000	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chloromethane	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	2-Chlorotoluene	NS	NS	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	4-Chlorotoluene	NS	NS	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2-Dibromo-3-chloropropane (DBCP	NS	NS	10 U	5.0 U	10 U	10 U	5.0 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	1,2-Dibromoethane (EDB)	2	50,000	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	2.0 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Dibromomethane	NS	NS	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2-Dichlorobenzene	2,000	2,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichlorobenzene	2,000	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,4-Dichlorobenzene	200	8,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Dichlorodifluoromethane (Freon 12)	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,1-Dichloroethane	1,000	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichloroethane	5	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloroethylene	80	30,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-Dichloroethylene	100	50,000	1.0 U	1.0 U	**3.7**	**4.1**	**5.9**	1.0 U	1.0 U	**20**	**30**	**30**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-Dichloroethylene	90	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichloropropane	3	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichloropropane	NS	NS	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	2.0 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	2,2-Dichloropropane	NS	NS	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,1-Dichloropropene	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	cis-1,3-Dichloropropene	10[2]	200[2]	5.0 U	0.50 U	5.0 U	5.0 U	0.50 U	5.0 U	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	trans-1,3-Dichloropropene	10[2]	200[2]	5.0 U	0.50 U	5.0 U	5.0 U	0.50 U	5.0 U	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	Diethyl Ether	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Diisopropyl Ether (DIPE)	NS	NS	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	2.0 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,4-Dioxane	6,000	50,000	50 U	250 U	50 U	50 U	250 U	50 U	250 U	50 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U	250 U
	Ethylbenzene	20,000	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Hexachlorobutadiene	1	3,000	1.0 U	0.60 U	1.0 U	1.0 U	0.60 U	1.0 U	0.60 U	1.0 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U
	2-Hexanone (MBK)	NS	NS	10 U	5.0 U	10 U	10 U	5.0 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Isopropylbenzene (Cumene)	7,000[1]	50,000[1]	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	p-Isopropyltoluene (p-Cymene)	7,000[1]	50,000[1]	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Methyl tert-Butyl Ether (MTBE)	50,000	50,000	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Methylene Chloride	10,000	50,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	4-Methyl-2-pentanone (MIBK)	50,000	50,000	10 U	5.0 U	10 U	10 U	5.0 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Naphthalene	1,000	20,000	2.0 U	5.0 U	2.0 U	2.0 U	5.0 U	2.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	n-Propylbenzene	7,000[1]	50,000[1]	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Styrene	100	6,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,1,2-Tetrachloroethane	10	50,000	5.0 U	1.0 U	5.0 U	5.0 U	1.0 U	5.0 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,2,2-Tetrachloroethane	9	50,000	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	0.50 U	1.0 U	0.50 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Tetrachloroethylene	50	30,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**63**	**60**	**64**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Tetrahydrofuran	NS	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Toluene	50,000	40,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2,3-Trichlorobenzene	NS	NS	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	5.0 U	2.0 U	5.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,4-Trichlorobenzene	2,000	50,000	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,1,1-Trichloroethane	4,000	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,2-Trichloroethane	900	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Trichloroethylene	30	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**6.8**	**5.8**	**6.5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Trichlorofluoromethane (Freon 11)	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,3-Trichloropropane	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,4-Trimethylbenzene	7,000[1]	50,000[1]	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,3,5-Trimethylbenzene	7,000[1]	50,000[1]	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	2.0 U	1.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Table 2
Summary of Analytical Results for Groundwater Samples – January and February 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte		Sample ID:	MW-4		MW-5			MW-6		MW-7			MW-8A	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18	MW-19	MW-HH-13	MW-HRC-33
			Sample Date:	1/6/2010	2/17/2010	1/6/2010	1/6/2010	2/17/2010	1/7/2010	2/18/2010	1/7/2010	2/17/2010	2/17/2010	2/18/2010	2/19/2010	2/18/2010	2/19/2010	2/19/2010	2/18/2010	2/19/2010	2/18/2010	2/18/2010	2/18/2010	2/18/2010	2/17/2010
		GW-2	GW-3				Field Dup						Field Dup												
	Vinyl Chloride	2	50,000	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	**3.4**	**9.2**	**9.9**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	m+p Xylene	9,000	5,000	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	o-Xylene	9,000	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:
ug/L - micrograms per liter.
NS - No MassDEP standards exist for this compound.
U - Compound was not detected at specified quantitation limit.
Values in **Bold** indicate the compound was detected.
Values shown in Bold and shaded type exceed one or more of the listed MassDEP Method 1 standards.
VOCs - Volatile Organic Compounds.
(1) - MassDEP Method 1 standards for C9-C10 aromatic hydrocarbons used.
(2) - MassDEP Method 1 standards for 1,3-Dichloropropene used.

Table 3
Summary of Analytical Results for Indoor Air Samples -- January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Risk Management Criteria				Sample ID: / Sample Date:	TRC-IA-1 1/31/2010	TRC-IA-2 1/31/2010	TRC-IA-3 1/31/2010	TRC-IA-4 1/31/2010	TRC-IA-5 1/31/2010
		HI = 0.2	HI = 1.0	ELCR = 1 x 10^{-6}	ELCR = 1 x 10^{-5}		Mechanical Room B-114	Classroom B-116	Honors Dining Room B-109	Cafeteria Storage Room	Classroom A-3-112
TO-15 (ug/m3)	1,1,1-Trichloroethane	1,100	5,500	NS	NS		1.09 U	1.09 U	1.09 U	1.09 U	1.09 U
	1,1,2,2-Tetrachloroethane	19	95	0.041	0.41		1.37 U	1.37 U	1.37 U	1.37 U	1.37 U
	1,1,2-Trichloroethane	15	75	0.15	1.5		1.09 U	1.09 U	1.09 U	1.09 U	1.09 U
	1,1-Dichloroethane	100	500	NS	NS		0.809 U	0.809 U	0.809 U	0.809 U	0.809 U
	1,1-Dichloroethene	40	200	NS	NS		0.792 U	0.792 U	0.792 U	0.792 U	0.792 U
	1,2,4-Trichlorobenzene	40	200	NS	NS		1.48 U	1.48 U	1.48 U	1.48 U	1.48 U
	1,2,4-Trimethylbenzene	10[a]	50[a]	NS	NS		0.982 U	0.982 U	0.982 U	0.982 U	**3.18**
	1,2-Dibromoethane	1.8	9	0.011	0.11		1.54 U	1.54 U	1.54 U	1.54 U	1.54 U
	1,2-Dichlorobenzene	40	200	NS	NS		1.20 U	1.20 U	1.20 U	1.20 U	1.20 U
	1,2-Dichloroethane	11	55	0.09	0.9		0.809 U	0.809 U	0.809 U	0.809 U	0.809 U
	1,2-Dichloropropane	0.8	4	0.13	1.3		0.924 U	0.924 U	0.924 U	0.924 U	0.924 U
	1,3,5-Trimethybenzene	10[a]	50[a]	NS	NS		0.982 U	0.982 U	0.982 U	0.982 U	0.982 U
	1,3-Dichlorobenzene	40	200	NS	NS		1.20 U	1.20 U	1.20 U	1.20 U	1.20 U
	1,4-Dichlorobenzene	160	800	0.35	3.5		1.20 U	1.20 U	1.20 U	1.20 U	1.20 U
	1,4-Dioxane	24	120	0.59	5.9		0.720 U	0.720 U	0.720 U	0.720 U	0.720 U
	2-Butanone	1,000	5,000	NS	NS		**1.01**	0.589 U	0.589 U	0.589 U	**1.89**
	2-Hexanone	NS	NS	NS	NS		0.819 U	0.819 U	0.819 U	0.819 U	0.819 U
	Acetone	160	800	NS	NS		**3.40**	**3.57**	**29.6**	**3.68**	2.37 U
	Benzene	6	30	0.3	3		**0.983**	0.638 U	0.638 U	0.638 U	**2.55**
	Bromodichloromethane	14	70	0.14	1.4		1.34 U	1.34 U	1.34 U	1.34 U	1.34 U
	Bromoform	14	70	2.2	22		2.06 U	2.06 U	2.06 U	2.06 U	2.06 U
	Bromomethane	1	5	NS	NS		0.776 U	0.776 U	0.776 U	0.776 U	0.776 U
	Carbon disulfide	NS	NS	NS	NS		0.622 U	0.622 U	0.622 U	0.622 U	0.622 U
	Carbon tetrachloride	86	430	0.16	1.6		1.26 U	1.26 U	1.26 U	1.26 U	1.26 U
	Chlorobenzene	4	20	NS	NS		0.920 U	0.920 U	0.920 U	0.920 U	0.920 U
	Chloroethane	NS	NS	NS	NS		0.527 U	0.527 U	0.527 U	0.527 U	0.527 U
	Chloroform	130	650	0.11	1.1		0.976 U	0.976 U	0.976 U	0.976 U	0.976 U
	Chloromethane	NS	NS	NS	NS		**1.11**	**1.03**	**0.92**	**1.16**	**1.29**
	cis-1,2-Dichloroethene	7	35	NS	NS		**4.33**	**0.087**	0.079 U	0.079 U	**3.58**
	cis-1,3-Dichloropropene	4	20	0.6	6		0.907 U	0.907 U	0.907 U	0.907 U	0.907 U
	Dibromochloromethane	14	70	0.1	1		1.70 U	1.70 U	1.70 U	1.70 U	1.70 U
	Dichlorodifluoromethane	NS	NS	NS	NS		**2.00**	**2.02**	**2.08**	**2.13**	**3.36**
	Ethylbenzene	200	1,000	NS	NS		0.868 U	0.868 U	**3.06**	0.868 U	**1.80**
	Hexachlorobutadiene	0.14	0.7	0.11	1.1		2.13 U	2.13 U	2.13 U	2.13 U	2.13 U
	Methylene chloride	600	3,000	5	50		1.74 U	1.74 U	1.74 U	1.74 U	1.74 U
	4-Methyl-2-pentanone	600	3,000	NS	NS		0.819 U	0.819 U	0.819 U	0.819 U	**1.21**
	Methyl tert butyl ether	600	3,000	NS	NS		0.720 U	0.720 U	0.720 U	0.720 U	0.720 U
	p/m-Xylene	20	100	NS	NS		1.74 U	1.74 U	**9.61**	1.74 U	**7.55**
	o-Xylene	20	100	NS	NS		0.868 U	0.868 U	**2.03**	0.868 U	**2.44**
	Styrene	200	1,000	4.1	41		0.851 U	0.851 U	0.851 U	0.851 U	0.851 U

Table 3
Summary of Analytical Results for Indoor Air Samples -- January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Risk Management Criteria				Sample ID: / Sample Date:	TRC-IA-1 1/31/2010	TRC-IA-2 1/31/2010	TRC-IA-3 1/31/2010	TRC-IA-4 1/31/2010	TRC-IA-5 1/31/2010
		HI = 0.2	HI = 1.0	ELCR = 1 x 10^{-6}	ELCR = 1 x 10^{-5}		Mechanical Room B-114	Classroom B-116	Honors Dining Room B-109	Cafeteria Storage Room	Classroom A-3-112
	Tetrachloroethene	920	4,600	0.23	2.3		0.136 U	0.136 U	0.136 U	0.136 U	0.136 U
	Tetrahydrofuran	NS	NS	NS	NS		0.589 U	0.589 U	0.589 U	0.589 U	0.589 U
	Toluene	1,000	5,000	NS	NS		**1.97**	0.753 U	**4.18**	0.753 U	**13.1**
	trans-1,2-Dichloroethene	14	70	NS	NS		**2.38**	0.079 U	0.079 U	0.079 U	**1.72**
	trans-1,3-Dichloropropene	4	20	0.6	6		0.907 U	0.907 U	0.907 U	0.907 U	0.907 U
	Trichloroethene	36	180	1.4	14		**2.20**	0.107 U	0.107 U	0.107 U	**1.12**
	Trichlorofluoromethane	NS	NS	NS	NS		1.12 U	1.12 U	1.12 U	1.12 U	**4.92**
	Vinyl chloride	20	100	0.27	2.7		**0.57**	0.051 U	0.051 U	0.051 U	**0.531**
	Naphthalene	0.61	3.05	NS	NS		1.05 U	1.05 U	1.05 U	1.05 U	1.05 U
	1,1,1,2-Tetrachloroethane	NS	NS	NS	NS		1.37 U	1.37 U	1.37 U	1.37 U	1.37 U
	Isopropylbenzene	10[a]	50[a]	NS	NS		0.982 U	0.982 U	0.982 U	0.982 U	0.982 U
	1,2,3-Trichloropropane	NS	NS	NS	NS		1.20 U	1.20 U	1.20 U	1.20 U	1.20 U
	Bromobenzene	NS	NS	NS	NS		1.28 U	1.28 U	1.28 U	1.28 U	1.28 U
	Dibromomethane	NS	NS	NS	NS		1.42 U	1.42 U	1.42 U	1.42 U	1.42 U
	tert-Amyl Methyl Ether	NS	NS	NS	NS		0.835 U	0.835 U	0.835 U	0.835 U	0.835 U
	2-Chlorotoluene	NS	NS	NS	NS		1.03 U	1.03 U	1.03 U	1.03 U	1.03 U
	4-Chlorotoluene	NS	NS	NS	NS		1.03 U	1.03 U	1.03 U	1.03 U	1.03 U
	2,2-Dichloropropane	NS	NS	NS	NS		0.923 U	0.923 U	0.923 U	0.923 U	0.923 U
	1,1-Dichloropropene	NS	NS	NS	NS		0.907 U	0.907 U	0.907 U	0.907 U	0.907 U
	Diisopropyl ether	NS	NS	NS	NS		0.835 U	0.835 U	0.835 U	0.835 U	0.835 U
	tert-Butyl Ethyl Ether	NS	NS	NS	NS		0.835 U	0.835 U	0.835 U	0.835 U	0.835 U
	1,2,3-Trichlorobenzene	NS	NS	NS	NS		1.48 U	1.48 U	1.48 U	1.48 U	1.48 U
	Ethyl ether	NS	NS	NS	NS		0.606 U	0.606 U	0.606 U	0.606 U	0.606 U
	n-Butylbenzene	10[a]	50[a]	NS	NS		1.10 U	1.10 U	1.10 U	1.10 U	1.10 U
	sec-Butylbenzene	10[a]	50[a]	NS	NS		1.10 U	1.10 U	1.10 U	1.10 U	1.10 U
	tert-Butylbenzene	10[a]	50[a]	NS	NS		1.10 U	1.10 U	1.10 U	1.10 U	1.10 U
	1,2-Dibromo-3-chloropropane	NS	NS	NS	NS		1.93 U	1.93 U	1.93 U	1.93 U	1.93 U
	p-Isopropyltoluene	10[a]	50[a]	NS	NS		1.10 U	1.10 U	1.10 U	1.10 U	1.10 U
	n-Propylbenzene	10[a]	50[a]	NS	NS		0.982 U	0.982 U	0.982 U	0.982 U	0.982 U
	1,3-Dichloropropane	NS	NS	NS	NS		0.923 U	0.923 U	0.923 U	0.923 U	0.923 U

Notes:

ug/m3 - micrograms per cubic meter.

NS - No risk management criteria exist for this compound.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Values shown in Bold and shaded type exceed one or more of the listed criteria.

TO - Toxic organics.

ELCR - Excess lifetime cancer risk.

HI - Hazard index.

Risk Management Criteria - MassDEP Indoor Air Threshold Values for the Evaluation of a Vapor Intrusion Pathway, Attachment C, updated June 26, 2008.

(a) - The risk management criteria for C9-C10 aromatics used.

Table 4
Summary of Analytical Results for Storm Sewer Samples -- February 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:		HS-D-1		HS-D-2	HS-D-3	HS-D-4	HS-D-5	HS-D-6	HS-D-7	HS-D-8	HS-D-9	HS-ST-1
		Sample Date:		2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010
		GW-2	GW-3		Field Dup									
VOCs														
(ug/L)	Acetone	50,000	50,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
	tert-Amyl Methyl Ether (TAME)	NS	NS	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	Benzene	2,000	10,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromobenzene	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromochloromethane	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromodichloromethane	6	50,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Bromoform	700	50,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Bromomethane	7	800	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	2-Butanone (MEK)	50,000	50,000	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	n-Butylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	sec-Butylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butyl Ethyl Ether (TBEE)	NS	NS	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	Carbon Disulfide	NS	NS	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
	Carbon Tetrachloride	2	5,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Chlorobenzene	200	1,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorodibromomethane	20	50,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Chloroethane	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Chloroform	50	20,000	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**3.0**	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Chloromethane	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	2-Chlorotoluene	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	4-Chlorotoluene	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dibromo-3-chloropropane (DBCP	NS	NS	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	1,2-Dibromoethane (EDB)	2	50,000	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	Dibromomethane	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichlorobenzene	2,000	2,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichlorobenzene	2,000	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,4-Dichlorobenzene	200	8,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Dichlorodifluoromethane (Freon 12)	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,1-Dichloroethane	1,000	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichloroethane	5	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloroethylene	80	30,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-Dichloroethylene	100	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1.0**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,2-Dichloroethylene	90	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichloropropane	3	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichloropropane	NS	NS	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	2,2-Dichloropropane	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloropropene	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	cis-1,3-Dichloropropene	10(2)	200(2)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	trans-1,3-Dichloropropene	10(2)	200(2)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Diethyl Ether	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Diisopropyl Ether (DIPE)	NS	NS	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
	1,4-Dioxane	6,000	50,000	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U

Table 4
Summary of Analytical Results for Storm Sewer Samples -- February 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:		HS-D-1		HS-D-2	HS-D-3	HS-D-4	HS-D-5	HS-D-6	HS-D-7	HS-D-8	HS-D-9	HS-ST-1
		Sample Date:		2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010	2/3/2010
		GW-2	GW-3		Field Dup									
	Ethylbenzene	20,000	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Hexachlorobutadiene	1	3,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	2-Hexanone (MBK)	NS	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Isopropylbenzene (Cumene)	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	p-Isopropyltoluene (p-Cymene)	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Methyl tert-Butyl Ether (MTBE)	50,000	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Methylene Chloride	10,000	50,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	4-Methyl-2-pentanone (MIBK)	50,000	50,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Naphthalene	1,000	20,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	n-Propylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Styrene	100	6,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,1,2-Tetrachloroethane	10	50,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	1,1,2,2-Tetrachloroethane	9	50,000	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	Tetrachloroethylene	50	30,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Tetrahydrofuran	NS	NS	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
	Toluene	50,000	40,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2,3-Trichlorobenzene	NS	NS	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	1,2,4-Trichlorobenzene	2,000	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,1-Trichloroethane	4,000	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**3.3**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,2-Trichloroethane	900	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Trichloroethylene	30	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Trichlorofluoromethane (Freon 11)	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,3-Trichloropropane	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,4-Trimethylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3,5-Trimethylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Vinyl Chloride	2	50,000	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	m+p Xylene	9,000	5,000	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	o-Xylene	9,000	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:

ug/L - micrograms per liter.

NS - No MassDEP standards exist for this compound.

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

VOCs - Volatile Organic Compounds.

(1) - MassDEP Method 1 standards for C9-C10 aromatic hydrocarbons used.

(2) - MassDEP Method 1 standards for 1,3-Dichloropropene used.

Table 5
Summary of Analytical Results for Sanitary Sewer Samples -- February 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Sample ID: / Sample Date: / Analyte	LS-MH-1 2/17/2010	SS-MH-1 2/17/2010	SS-MH-2 2/17/2010	SS-MH-3 2/17/2010	SS-MH-4 2/17/2010	SS-MH-4 2/17/2010 Field Dup
VOCs							
(ug/L)	Acetone	**630**	500 U	50 U	50 U	50 U	50 U
	tert-Amyl Methyl Ether (TAME)	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	0.50 U
	Benzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromobenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromochloromethane	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromodichloromethane	1.0 U	10 U	5.0 U	1.0 U	**1.3**	1.0 U
	Bromoform	10 U	100 U	10 U	10 U	10 U	10 U
	Bromomethane	5.0 U	50 U	10 U	5.0 U	5.0 U	5.0 U
	2-Butanone (MEK)	20 U	200 U	20 U	20 U	20 U	20 U
	n-Butylbenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	sec-Butylbenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butylbenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butyl Ethyl Ether (TBEE)	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	0.50 U
	Carbon Disulfide	2.0 U	20 U	50 U	2.0 U	2.0 U	2.0 U
	Carbon Tetrachloride	1.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U
	Chlorobenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorodibromomethane	5.0 U	50 U	5.0 U	5.0 U	5.0 U	5.0 U
	Chloroethane	2.0 U	20 U	2.0 U	2.0 U	2.0 U	2.0 U
	Chloroform	2.0 U	20 U	**7.8**	2.0 U	**7.8**	2.0 U
	Chloromethane	2.0 U	20 U	2.0 U	2.0 U	2.0 U	2.0 U
	2-Chlorotoluene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	4-Chlorotoluene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dibromo-3-chloropropane (DBCP)	5.0 U	50 U	10 U	5.0 U	5.0 U	5.0 U
	1,2-Dibromoethane (EDB)	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	0.50 U
	Dibromomethane	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichlorobenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichlorobenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,4-Dichlorobenzene	**19**	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Dichlorodifluoromethane (Freon 12)	2.0 U	20 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,1-Dichloroethane	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichloroethane	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloroethylene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-Dichloroethylene	1.0 U	10 U	1.0 U	**3.1**	1.0 U	**2.6**
	trans-1,2-Dichloroethylene	1.0 U	10 U	1.0 U	**1.4**	1.0 U	**1.2**
	1,2-Dichloropropane	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichloropropane	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	0.50 U
	2,2-Dichloropropane	1.0 U	10 U	10 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloropropene	2.0 U	20 U	2.0 U	2.0 U	2.0 U	2.0 U

Table 5
Summary of Analytical Results for Sanitary Sewer Samples -- February 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Sample ID: / Sample Date: / Analyte	LS-MH-1 2/17/2010	SS-MH-1 2/17/2010	SS-MH-2 2/17/2010	SS-MH-3 2/17/2010	SS-MH-4 2/17/2010	SS-MH-4 2/17/2010 Field Dup
	cis-1,3-Dichloropropene	0.50 U	5.0 U	5.0 U	0.50 U	0.50 U	0.50 U
	trans-1,3-Dichloropropene	0.50 U	5.0 U	5.0 U	0.50 U	0.50 U	0.50 U
	Diethyl Ether	2.0 U	20 U	2.0 U	2.0 U	2.0 U	2.0 U
	Diisopropyl Ether (DIPE)	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	0.50 U
	1,4-Dioxane	50 U	500 U	50 U	50 U	50 U	50 U
	Ethylbenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Hexachlorobutadiene	5.0 U	50 U	1.0 U	5.0 U	5.0 U	5.0 U
	2-Hexanone (MBK)	10 U	100 U	10 U	10 U	10 U	10 U
	Isopropylbenzene (Cumene)	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	p-Isopropyltoluene (p-Cymene)	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Methyl tert-Butyl Ether (MTBE)	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Methylene Chloride	20 U	200 U	5.0 U	20 U	20 U	20 U
	4-Methyl-2-pentanone (MIBK)	10 U	100 U	10 U	10 U	10 U	10 U
	Naphthalene	5.0 U	50 U	2.0 U	5.0 U	5.0 U	5.0 U
	n-Propylbenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Styrene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,1,2-Tetrachloroethane	1.0 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U
	1,1,2,2-Tetrachloroethane	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	0.50 U
	Tetrachloroethylene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Tetrahydrofuran	10 U	100 U	10 U	10 U	10 U	10 U
	Toluene	**3.3**	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2,3-Trichlorobenzene	5.0 U	50 U	5.0 U	5.0 U	5.0 U	5.0 U
	1,2,4-Trichlorobenzene	5.0 U	50 U	1.0 U	5.0 U	5.0 U	5.0 U
	1,1,1-Trichloroethane	1.0 U	10 U	5.0 U	1.0 U	1.0 U	1.0 U
	1,1,2-Trichloroethane	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Trichloroethylene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Trichlorofluoromethane (Freon 11)	2.0 U	20 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,3-Trichloropropane	2.0 U	20 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,4-Trimethylbenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3,5-Trimethylbenzene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U
	Vinyl Chloride	2.0 U	20 U	2.0 U	2.0 U	2.0 U	2.0 U
	m+p Xylene	2.0 U	20 U	2.0 U	2.0 U	2.0 U	2.0 U
	o-Xylene	1.0 U	10 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:

ug/L - micrograms per liter.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

VOCs - Volatile Organic Compounds.

Table 6
Groundwater Elevations
New Bedford High School
New Bedford, Massachusetts

Ground/Floor Elevation	Well Location	Reference Elevation [1]	Gauging Date	Depth to Water [2]	Depth to Bottom [2]	Groundwater Elevation	Notes
84.68	MW-4	84.53	2/17/2010	1.97	11.61	82.56	
84.71	MW-5	84.55	2/17/2010	1.95	11.21	82.60	
84.74	MW-6 [3]	84.59	2/17/2010	1.54	11.12	83.05	
91.38	MW-7	91.10	2/17/2010	8.67	15.95	82.43	
89.57	MW-8A	89.35	2/17/2010	4.11	12.56	85.24	
89.59	MW-8B	89.50	NA	NA	NA	NA	Not measured (1-inch well adjacent to MW-8A)
83.97	MW-11	83.86	2/17/2010	0.29	10.65	83.57	
89.70	MW-12	89.37	2/17/2010	6.39	13.87	82.98	
84.23	MW-13	83.87	2/17/2010	0.90	10.86	82.97	
84.02	MW-14	83.64	2/17/2010	0.48	10.43	83.16	
89.47	MW-15	89.23	2/17/2010	5.94	15.10	83.29	
84.12	MW-16	83.85	2/19/2010	1.00	11.50	82.85	
89.88	MW-17	89.67	2/17/2010	6.71	15.45	82.96	
84.28	MW-18	84.09	2/17/2010	0.36	10.55	83.73	
88.76	MW-19	88.58	2/17/2010	6.26	12.83	82.32	
88.17	MW-HH-13	87.85	2/18/2010	4.35	14.00	83.50	
86.26	MW-HRC-33	86.09	2/17/2010	3.88	13.38	82.21	

NOTES:
(1) - Survey of top of PVC riser.
(2) - Measure from top of PVC riser.
(3) - Approximate riser elevation (no survey data) assumed to be 0.15-feet below floor elevation.

Table 7
Summary of Analytical Results for Soil Gas Samples -- February 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:	TVP-1	TVP-2	TVP-3	TVP-4	TVP-5	TVP-6	TVP-7	TVP-8	TVP-9		TVP-10	TVP-11
		Sample Location:	Classroom A-4-115	Classroom A-4-105	Classroom A-3-115	Classroom A-3-112	Classroom A-3-105	Classroom A-2-115	Classroom A-2-105	Classroom A-1-115	Classroom A-1-105		Wood Shop D-105	Auto Shop D-116
		Sample Date:	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010 Field Dup	2/15/2010	2/15/2010
		Screening Values*												
TO-15 (ug/m3)	1,1,1-Trichloroethane	30	10.9 U	1.09 U	2.72 U	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	**12.7**	10.9 U
	1,1,2,2-Tetrachloroethane	0.41	13.7 U	1.37 U	3.43 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	13.7 U
	1,1,2-Trichloroethane	1.5	10.9 U	1.09 U	2.72 U	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	1.09 U	10.9 U
	1,1-Dichloroethane	8	8.09 U	0.809 U	2.02 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	8.09 U
	1,1-Dichloroethene	8	7.92 U	0.792 U	1.98 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	**2.20**	7.92 U
	1,2,4-Trichlorobenzene	34	14.8 U	1.48 U	3.71 U	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U	14.8 U
	1,2,4-Trimethylbenzene	100(1)	9.82 U	**1.78**	2.46 U	0.982 U	0.982 U	0.982 U	0.982 U	0.982 U	**7.24**	**1.86**	**16.1**	9.82 U
	1,2-Dibromoethane	0.11	15.4 U	1.54 U	3.84 U	1.54 U	1.54 U	1.54 U	1.54 U	1.54 U	1.54 U	1.54 U	1.54 U	15.4 U
	1,2-Dichlorobenzene	7.2	12.0 U	1.20 U	3.00 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	12.0 U
	1,2-Dichloroethane	0.9	8.09 U	0.809 U	2.02 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	0.809 U	8.09 U
	1,2-Dichloropropane	1.3	9.24 U	0.924 U	2.31 U	0.924 U	0.924 U	0.924 U	0.924 U	0.924 U	0.924 U	0.924 U	0.924 U	9.24 U
	1,3,5-Trimethybenzene	100(1)	9.82 U	0.982 U	2.46 U	0.982 U	0.982 U	0.982 U	0.982 U	0.982 U	**1.39**	0.982 U	**3.19**	9.82 U
	1,3-Dichlorobenzene	6	12.0 U	1.20 U	3.00 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	12.0 U
	1,4-Dichlorobenzene	5	12.0 U	1.20 U	3.00 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	12.0 U
	1,4-Dioxane	5.9	7.20 U	0.720 U	1.80 U	0.720 U	0.720 U	0.720 U	0.720 U	0.720 U	0.720 U	0.720 U	0.720 U	7.20 U
	2-Butanone	120	**17.3**	**4.06**	**36.3**	**5.42**	**2.93**	**3.88**	**5.08**	**5.68**	**2.57**	**3.42**	**19.1**	5.89 U
	2-Hexanone	NS	8.19 U	0.819 U	2.05 U	0.819 U	0.819 U	0.819 U	0.819 U	0.819 U	0.819 U	0.819 U	0.819 U	8.19 U
	Acetone	910	**1,100**	**94.8**	**665**	**137**	**31.0**	**52.9**	**46.7**	**167**	**24.1**	**33.5**	**325**	**4,730**
	Benzene	23	**84.7**	**1.36**	**33.6**	**3.93**	**1.54**	**0.964**	**1.42**	**1.60**	**1.74**	**1.95**	**4.38**	6.38 U
	Bromodichloromethane	1.4	13.4 U	1.34 U	3.35 U	1.34 U	1.34 U	1.34 U	1.34 U	1.34 U	1.34 U	1.34 U	1.34 U	13.4 U
	Bromoform	22	20.6 U	2.06 U	5.16 U	2.06 U	2.06 U	2.06 U	2.06 U	2.06 U	2.06 U	2.06 U	2.06 U	20.6 U
	Bromomethane	6	7.76 U	0.776 U	1.94 U	0.776 U	0.776 U	0.776 U	0.776 U	0.776 U	0.776 U	0.776 U	0.776 U	7.76 U
	Carbon disulfide	NS	6.22 U	0.622 U	**3.04**	0.622 U	0.622 U	0.622 U	0.622 U	0.622 U	0.622 U	0.622 U	0.622 U	6.22 U
	Carbon tetrachloride	5.4	12.6 U	1.26 U	3.14 U	1.26 U	1.26 U	1.26 U	1.26 U	1.26 U	1.26 U	1.26 U	1.26 U	12.6 U
	Chlorobenzene	23	9.20 U	0.920 U	2.30 U	0.920 U	0.920 U	0.920 U	0.920 U	0.920 U	0.920 U	0.920 U	0.920 U	9.20 U
	Chloroethane	NS	5.27 U	0.527 U	**1.83**	0.527 U	0.527 U	0.527 U	0.527 U	0.527 U	0.527 U	0.527 U	**0.678**	5.27 U
	Chloroform	19	9.76 U	0.976 U	2.44 U	0.976 U	0.976 U	**2.28**	0.976 U	0.976 U	0.976 U	0.976 U	0.976 U	9.76 U
	Chloromethane	NS	4.13 U	0.413 U	**3.06**	**0.442**	0.413 U	0.413 U	0.413 U	**0.454**	0.413 U	0.413 U	**0.792**	4.13 U
	cis-1,2-Dichloroethene	8	7.92 U	0.792 U	1.98 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	7.92 U
	cis-1,3-Dichloropropene	6	9.07 U	0.907 U	2.27 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	9.07 U
	Dibromochloromethane	1	17.0 U	1.7 U	4.26 U	1.7 U	1.7 U	1.7 U	1.7 U	1.70 U	1.70 U	1.70 U	1.70 U	17.0 U
	Dichlorodifluoromethane	NS	9.88 U	**2.15**	2.47 U	**2.44**	**2.21**	**2.26**	**2.32**	**2.45**	**2.26**	**2.65**	**2.35**	9.88 U
	Ethylbenzene	74	8.68 U	0.868 U	**4.09**	0.868 U	0.868 U	0.868 U	0.868 U	0.868 U	**1.38**	**1.67**	**6.21**	8.68 U
	Hexachlorobutadiene	1.1	21.3 U	2.13 U	5.33 U	2.13 U	2.13 U	2.13 U	2.13 U	2.13 U	2.13 U	2.13 U	2.13 U	21.3 U
	Methylene chloride	50	17.4 U	1.74 U	4.34 U	1.74 U	1.74 U	1.74 U	1.74 U	1.74 U	1.74 U	1.74 U	1.74 U	17.4 U
	4-Methyl-2-pentanone	22	8.19 U	**1.31**	**9.43**	**5.19**	0.819 U	**1.44**	**2.04**	**2.83**	0.819 U	0.819 U	**24.2**	8.19 U
	Methyl tert butyl ether	390	7.20 U	0.720 U	1.80 U	0.720 U	0.720 U	0.720 U	0.720 U	0.720 U	0.720 U	0.720 U	0.720 U	7.20 U
	p/m-Xylene	200	17.4 U	**1.91**	**7.83**	**2.03**	1.74 U	1.74 U	1.74 U	1.74 U	**5.22**	**5.55**	**39.8**	**23.7**
	o-Xylene	200	8.68 U	0.868 U	2.17 U	0.868 U	0.868 U	0.868 U	0.868 U	0.868 U	**2.54**	**2.35**	**12.8**	**13.5**
	Styrene	14	8.51 U	0.851 U	**3.33**	0.851 U	0.851 U	0.851 U	0.851 U	0.851 U	0.851 U	0.851 U	0.851 U	8.51 U
	Tetrachloroethene	14	13.6 U	**1.79**	3.39 U	1.36 U	**1.48**	**10.3**	**2.90**	**2.18**	**5.17**	**4.69**	**2.20**	**39.2**
	Tetrahydrofuran	NS	5.89 U	0.589 U	1.47 U	0.589 U	0.589 U	0.589 U	0.589 U	0.589 U	0.589 U	0.589 U	**30.7**	5.89 U

Table 7
Summary of Analytical Results for Soil Gas Samples -- February 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:	TVP-1	TVP-2	TVP-3	TVP-4	TVP-5	TVP-6	TVP-7	TVP-8	TVP-9		TVP-10	TVP-11
		Sample Location:	Classroom A-4-115	Classroom A-4-105	Classroom A-3-115	Classroom A-3-112	Classroom A-3-105	Classroom A-2-115	Classroom A-2-105	Classroom A-1-115	Classroom A-1-105		Wood Shop D-105	Auto Shop D-116
		Sample Date:	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010	2/15/2010 Field Dup	2/15/2010	2/15/2010
		Screening Values*												
	Toluene	540	**21.6**	**2.57**	**21.3**	**2.97**	**1.19**	**0.764**	**0.761**	**3.67**	**3.12**	**3.92**	**17.6**	7.53 U
	trans-1,2-Dichloroethene	8	7.92 U	0.792 U	1.98 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	0.792 U	7.92 U
	trans-1,3-Dichloropropene	6	9.07 U	0.907 U	2.27 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	9.07 U
	Trichloroethene	8	**22.6**	1.07 U	**15.0**	1.07 U	1.07 U	1.07 U	1.07 U	1.07 U	1.07 U	1.07 U	1.07 U	10.7 U
	Trichlorofluoromethane	NS	11.2 U	**1.17**	2.81 U	**1.21**	1.12 U	1.12 U	1.12 U	**1.26**	1.12 U	**1.18**	**1.21**	11.2 U
	Vinyl chloride	2.7	5.11 U	0.511 U	1.28 U	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U	0.511 U	5.11 U
	Naphthalene	6.1	10.5 U	1.05 U	**3.31**	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U	**3.84**	1.05 U	**3.22**	10.5 U
	1,1,1,2-Tetrachloroethane	NS	13.7 U	1.37 U	3.43 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U	13.7 U
	Isopropylbenzene	100(1)	**198**	0.982 U	**36.0**	**7.45**	0.982 U	0.982 U	0.982 U	**39.3**	0.982 U	0.982 U	0.982 U	9.82 U
	1,2,3-Trichloropropane	NS	12.0 U	1.20 U	3.01 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U	12.0 U
	Bromobenzene	NS	12.8 U	1.28 U	3.21 U	1.28 U	1.28 U	1.28 U	1.28 U	1.28 U	1.28 U	1.28 U	1.28 U	12.8 U
	Dibromomethane	NS	14.2 U	1.42 U	3.55 U	1.42 U	1.42 U	1.42 U	1.42 U	1.42 U	1.42 U	1.42 U	1.42 U	14.2 U
	tert-Amyl Methyl Ether	NS	8.35 U	0.835 U	2.09 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	8.35 U
	2-Chlorotoluene	NS	10.3 U	1.03 U	2.59 U	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U	10.3 U
	4-Chlorotoluene	NS	10.3 U	1.03 U	2.59 U	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U	10.3 U
	2,2-Dichloropropane	NS	9.23 U	0.923 U	2.31 U	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U	9.23 U
	1,1-Dichloropropene	NS	9.07 U	0.907 U	2.27 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U	9.07 U
	Diisopropyl ether	NS	8.35 U	0.835 U	2.09 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	8.35 U
	tert-Butyl Ethyl Ether	NS	8.35 U	0.835 U	2.09 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U	8.35 U
	1,2,3-Trichlorobenzene	NS	14.8 U	1.48 U	3.71 U	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U	14.8 U
	Ethyl ether	NS	6.06 U	0.606 U	1.51 U	0.606 U	0.606 U	0.606 U	0.606 U	0.606 U	0.606 U	0.606 U	0.606 U	6.06 U
	n-Butylbenzene	100(1)	11.0 U	1.10 U	2.74 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	**1.71**	11.0 U
	sec-Butylbenzene	100(1)	11.0 U	1.10 U	2.74 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	11.0 U
	tert-Butylbenzene	100(1)	11.0 U	1.10 U	2.74 U	1.10 U	1.10 U	1.10 U	1.10 U	**3.66**	1.10 U	1.10 U	**1.91**	11.0 U
	1,2-Dibromo-3-chloropropane	NS	19.3 U	1.93 U	4.83 U	1.93 U	1.93 U	1.93 U	1.93 U	1.93 U	1.93 U	1.93 U	1.93 U	19.3 U
	p-Isopropyltoluene	100(1)	11.0 U	1.10 U	2.74 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U	11.0 U
	n-Propylbenzene	100(1)	9.82 U	0.982 U	2.46 U	0.982 U	0.982 U	0.982 U	0.982 U	0.982 U	0.982 U	0.982 U	**1.85**	9.82 U
	1,3-Dichloropropane	NS	9.23 U	0.923 U	2.31 U	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U	9.23 U

Notes:

ug/m^3 - micrograms per cubic meters.

NS - No MassDEP standards exist for this compound.

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

Values shown in Bold and shaded type exceed the screening value.

TO - Toxic organics.

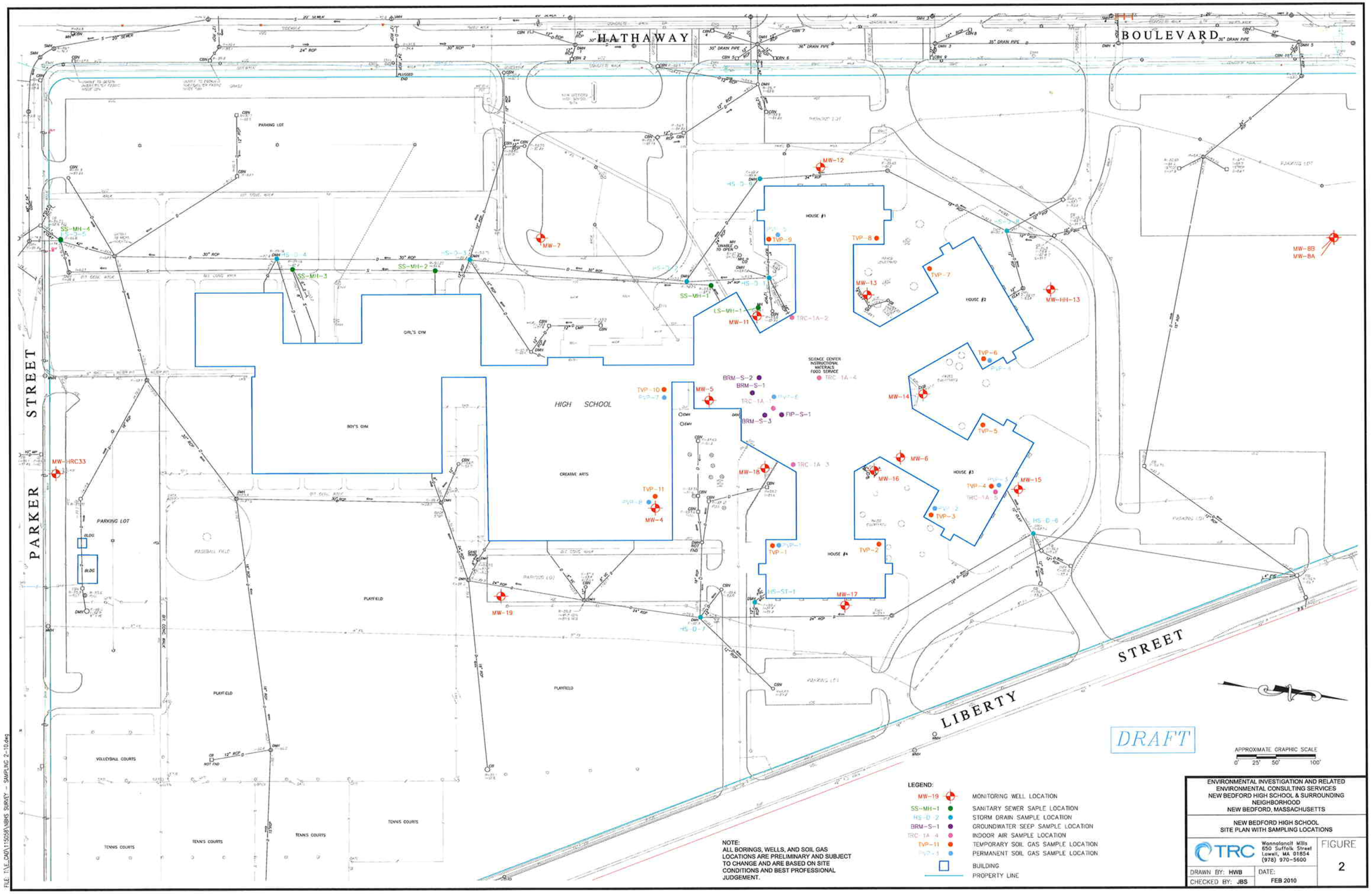
* - Soil Gas Screening Values are based on the MassDEP, Draft Indoor Air Threshold Values (IATV), June 26, 2008 and multiplied by 10, which represents a conservative soil gas to indoor air dilution attenuation factor.

(1) - IATV for C9-C10 aromatics used.

FIGURES

TRC
650 Suffolk St.
Wannalancit Mills
Lowell, MA 01854

FIGURE 1
SITE AERIAL PHOTOGRAPH
New Bedford High School
NEW BEDFORD, MASSACHUSETTS


HATHAWAY
BOULEVARD
PARKER
STREET
LIBERTY
STREET
HIGH SCHOOL
GIRL'S GYM
BOY'S GYM
CREATIVE ARTS
PARKING LOT
PLAYFIELD
VOLLEYBALL COURTS
TENNIS COURTS
HOUSE #1
HOUSE #2
HOUSE #3
HOUSE #4
SCIENCE CENTER INSTRUCTIONAL MATERIALS FOOD SERVICE
MW-12
MW-7
MW-13
MW-11
MW-5
MW-14
MW-6
MW-16
MW-18
MW-15
MW-4
MW-19
MW-17
MW-HRC33
MW-HH-13
MW-8B
MW-8A
TVP-1
TVP-2
TVP-3
TVP-4
TVP-5
TVP-6
TVP-7
TVP-8
TVP-9
TVP-10
TVP-11
SS-MH-1
SS-MH-2
SS-MH-3
SS-MH-4
LS-MH-1
HS-D-1
HS-D-2
HS-D-3
HS-D-4
HS-D-5
HS-D-6
HS-D-7
HS-ST-1
BRM-S-1
BRM-S-2
BRM-S-3
FIP-S-1
TRC-1A-1
TRC-1A-2
TRC-1A-3
TRC-1A-4
TRC-1A-5
DRAFT
APPROXIMATE GRAPHIC SCALE
0' 25' 50' 100'
LEGEND:
MW-19 MONITORING WELL LOCATION
SS-MH-1 SANITARY SEWER SAPLE LOCATION
HS-D-2 STORM DRAIN SAMPLE LOCATION
BRM-S-1 GROUNDWATER SEEP SAMPLE LOCATION
TRC-1A-4 INDOOR AIR SAMPLE LOCATION
TVP-11 TEMPORARY SOIL GAS SAMPLE LOCATION
PVP-3 PERMANENT SOIL GAS SAMPLE LOCATION
BUILDING
PROPERTY LINE
NOTE:
ALL BORINGS, WELLS, AND SOIL GAS LOCATIONS ARE PRELIMINARY AND SUBJECT TO CHANGE AND ARE BASED ON SITE CONDITIONS AND BEST PROFESSIONAL JUDGEMENT.
ENVIRONMENTAL INVESTIGATION AND RELATED ENVIRONMENTAL CONSULTING SERVICES
NEW BEDFORD HIGH SCHOOL & SURROUNDING NEIGHBORHOOD
NEW BEDFORD, MASSACHUSETTS
NEW BEDFORD HIGH SCHOOL
SITE PLAN WITH SAMPLING LOCATIONS
TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600
FIGURE
2
DRAWN BY: HWB
CHECKED BY: JBS
DATE:
FEB 2010
FILE: T:\E_CAD\115058\NBHS SURVEY - SAMPLING 2-10.dwg

APPROXIMATE GRAPHIC SCALE
0' 30' 60' 120'

ENVIRONMENTAL INVESTIGATION AND RELATED ENVIRONMENTAL CONSULTING SERVICES
NEW BEDFORD HIGH SCHOOL & SURROUNDING NEIGHBORHOOD
NEW BEDFORD, MASSACHUSETTS

NEW BEDFORD HIGH SCHOOL
GROUNDWATER CONTOURS - FEBRUARY 2010

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

FIGURE 3

DRAWN BY: HWB
DATE: FEB 18, 2010
CHECKED BY: JBS

NOTE:
ALL BORINGS, WELLS, AND SOIL GAS LOCATIONS ARE PRELIMINARY AND SUBJECT TO CHANGE AND ARE BASED ON SITE CONDITIONS AND BEST PROFESSIONAL JUDGEMENT.

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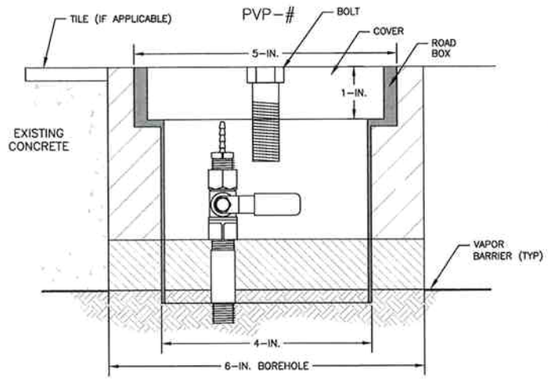
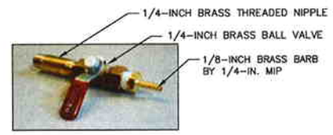


STANDARD EQUIPMENT/INSTALLATION DETAIL

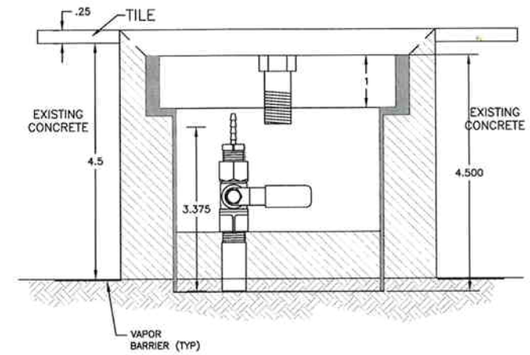


BRASS VALVE DETAIL

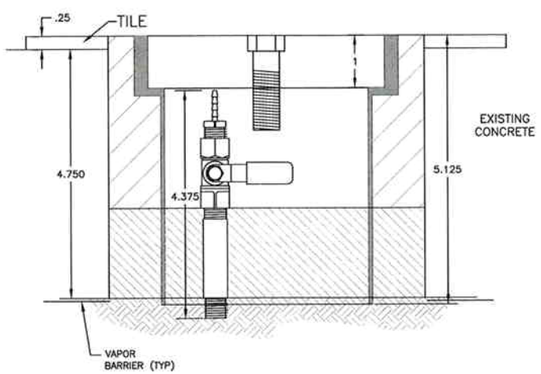
LEGEND:

- GROUT/PORTLAND CEMENT MIX
- HYDRAULIC CEMENT
- NATIVE SOIL

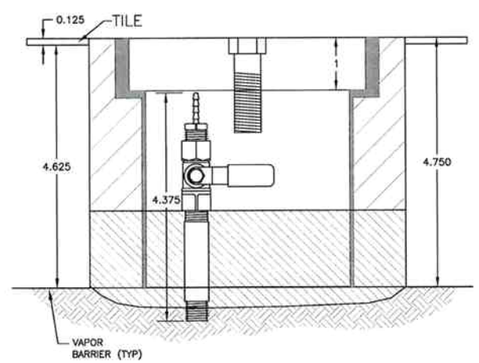
PVP-1



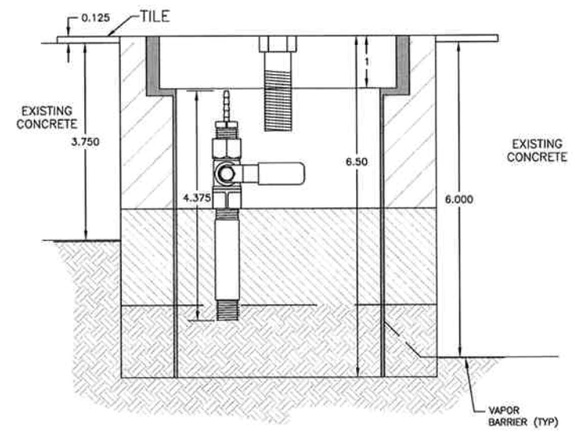
PVP-2



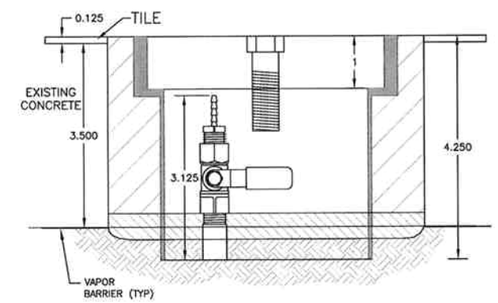
PVP-3



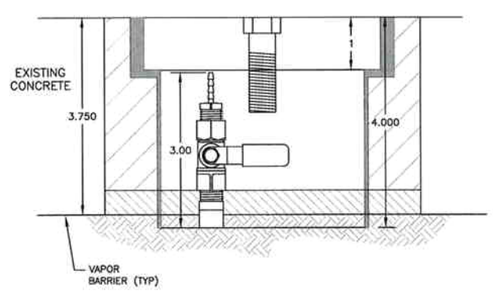
PVP-4



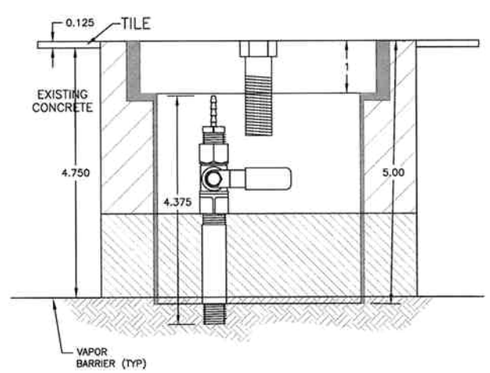
PVP-5



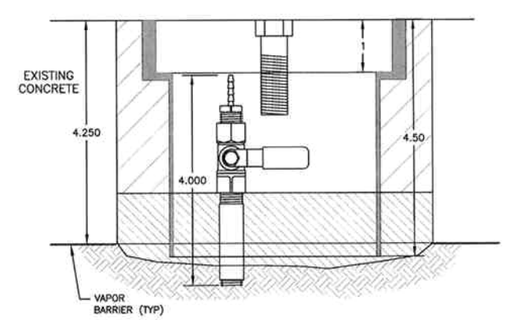
PVP-6



PVP-7



PVP-8



NOT TO SCALE
MEASUREMENTS ARE IN INCHES

NEW BEDFORD HIGH SCHOOL
NEW BEDFORD, MASSACHUSETTS

PERMANENT SOIL GAS SAMPLING POINTS
INSTALLATION DETAILS

TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

DRAWN BY: MAN
CHECKED BY: JSG
DATE: MARCH 2010

FIGURE 4

FILE: T:\E_CAD\115058\NBHS\SOIL VAPOR PNTstd.dwg

APPENDIX A

IMMINENT HAZARD SCREENING EVALUATION

IMMINENT HAZARD SCREENING EVALUATION
INDOOR AIR
NEW BEDFORD HIGH SCHOOL
NEW BEDFORD, MASSACHUSETTS

On December 2, 2009 and February 7, 2010, TRC sampled pooled water in four locations (BRM-S-1 through BRM-S-3 and FIP-S-1) in the mechanical room of the New Bedford High School (NBHS) building. The analytical results indicated the presence of chlorinated volatile organic compounds (VOCs) in two of the four samples, BRM-S-3 and FIP-S-1. A total of seven VOCs were detected including chlorobenzene, 1,3-dichlorbenzene (1,3-DCB), 1,4-dichlorobenzene (1,4-DCB), cis-1,2-dichlorotheylene (cis-1,2-DCE), trans-1,2-dichloroethylene (trans-1,2-DCE), trichloroethylene (TCE) and/or vinyl chloride (VC). In all cases, the concentrations detected during the January 7, 2010 sampling were higher than those detected in samples collected on December 2, 2009 with GW-2 exceedances noted for cis-1,2-DCE (180 ug/L compared to the GW-2 standard of 100 ug/L) and VC (34 ug/L compared to the GW-2 standard of 2 ug/L) at sample location BRM-S-3.

Because seep water VOC concentrations were trending upward and there was the potential for the release of VOCs from the standing water to impact indoor air quality in the mechanical room, TRC responded to the analytical results for the seep water samples by initiating an Imminent Hazard (IH) Evaluation on January 15, 2010 to determine whether the detected VOCs in the seep water were associated with a potential risk of harm to human health.

Fate and transport modeling was used to estimate worst-case indoor air concentrations within the mechanical room for the detected VOCs. Current receptors include only maintenance workers who might enter the mechanical room to monitor or performed repairs on the equipment housed within the room. As a conservative evaluation, workers were assumed to be exposed to VOCs in indoor air for 8 hours per day, 250 days per year for 27 years. A chronic (i.e., 27 year) exposure period has been used since it is unknown how long exposures have been occurring and the puddling of water in this area of the building has been reported as an intermittent problem since shortly after the building was constructed. Should the chronic risk estimates be associated with a condition of no significant risk, it can also be concluded that there is no IH condition associated with the exposures.

Table 2 presents the risk and hazard calculations for the current worker exposed to modeled indoor air concentrations within the mechanical room. The modeled indoor air concentrations are shown on this table, as well as the toxicity values used to estimate the Excess Lifetime Cancer Risk (ELCR) and Hazard Index (HI). Toxicity values (unit risks and reference concentrations) are the same as those used by the Massachusetts Department of Environmental Protection (MassDEP) in the development of the Massachusetts Contingency Plan (MCP) Method 1 cleanup standards. The modeled air concentrations are associated with an ELCR of 9E-09 and a HI of 5E-04, which are well below the MCP Risk Limits of an ELCR of 1E-05 and a HI of 1. Therefore, it can be concluded that the modeled air concentrations are not associated with an IH condition. In addition, it can be further concluded that chronic indoor air exposure within the mechanical room is associated with a condition of No Significant Risk for workers.

Following the seep water sampling, TRC performed an evaluation of building structural features than might influence contaminant fate and transport in the groundwater beneath the NBHS building. The structural evaluation revealed an underdrain system beneath the building, directing groundwater to the storm sewer during high water events. On January 28, 2010 at approximately 3:30 PM, TRC informed the City of New Bedford that the seep and the underdrain system represented two possible Substantial Release Migration (SRM) conditions as defined in 310 CMR 40.0006: releases to the groundwater that have migrated or are expected to migrate more than 200 feet per year, and releases to the groundwater or to the vadose zone that have resulted or are within one year likely to result in the discharge of vapors into school buildings or occupied residential dwellings. The SRM conditions were reported to the MassDEP by TRC via telephone in conjunction with the City on January 29, 2010 at approximately 11:05 AM.

As part of the Immediate Response Actions (IRAs) initiated to address the SRM conditions, indoor air sampling was conducted at the NBHS building. Over a 24-hour period from January 30 to January 31, 2010, indoor air samples were collected from five locations on the first floor of the NBHS building. The sample locations included the mechanical room (TRC-IA-1), three locations in adjacent rooms (TRC-IA-2 [classroom B-118], TRC-IA-3 [honors dining room B-119], and TRC-IA-4 [kitchen storage room]), and one location located away from the seep and designed to serve as a background location (TRC-IA-5 [classroom 3-112]). A total of 15 VOCs were detected in one or more of the five samples including 1,2,4-trimethylbenzene, 2-butanone, acetone, benzene, chloromethane, cis-1,2-DCE, dichlorodifluoromethane, ethylbenzene, 4-methyl-2-pentanone, xylene isomers, toluene, trans-1,2-DCE, TCE, trichlorofluoromethane, and VC. The highest indoor air concentrations were found in the mechanical room and classroom 3-112.

Tables 2 through 6 present the risk and hazard calculations performed for the five rooms sampled for indoor air within the NBHS building (mechanical room, classroom B-116, honors dining room B-109, kitchen storage and classroom 3-112, respectively). Because sampling was conducted in classrooms and other academic areas of the building, current receptors include not only maintenance workers but students, teachers and staff. Because students are only present for approximately four years, workers (including maintenance workers, teachers and other building staff) were evaluated as the most exposed receptors due to their possible lengthy tenure at the school. Workers were assumed to be exposed to VOCs in indoor air for 8 hours per day, 250 days per year for 27 years. Consistent with the seep water modeling evaluation, a chronic (i.e., 27 year) exposure period has been used since it is unknown how long exposures have been occurring. Should the chronic risk estimates be associated with a condition of no significant risk, it can also be concluded that there is no IH condition associated with the exposures.

Tables 2 through 6 present the measured indoor air concentrations and the toxicity values used to estimate the ELCRs and HIs for each room. Toxicity values (unit risks and reference concentrations) are identical to those used by MassDEP in the development of the MCP Method 1 cleanup standards except for 1,2,4-trimethylbenzene, chloromethane, dichlorodifluoromethane and trichlorofluoromethane. For these four compounds none of which are classified as Class A, B or C carcinogens, a reference concentration provided by EPA's Integrated Risk Information System was used for chloromethane, reference concentrations provided on EPA's Health Effects

Assessment Summary Tables were used for dichlorodifluoromethane and trichlorofluoromethane, and a provisional reference concentration provided by the EPA's Superfund Technical Support Center was used for 1,2,4-trimethylbenzene.

The calculations indicated that risks and hazards are less than the MCP Risk Limits of an ELCR of 1E-05 and a HI of 1 for all five rooms evaluated. The highest risk and hazard were associated with classroom 3-112 with an ELCR of 2E-06 (primarily due to benzene) and a HI of 0.2 (primarily due to 1,2,4-trimethylbenzene). An ELCR of 1E-06 (primarily due to benzene) and a HI of 0.05 (primarily due to cis-1,2-DCE) was estimated based on the indoor air data collected in the mechanical room. The remaining three rooms had HIs less than 0.04 and no ELCR estimated because no carcinogenic compounds were detected in the air. Therefore, it can be concluded that, based on the indoor air sampling conducted in January 2010, the measured air concentrations are not associated with an IH condition. In addition, it can be further concluded that chronic indoor air exposure is associated with a condition of No Significant Risk for workers.

Table 1
Mechanical Room Worker
Inhalation of Indoor Air Exposure Pathway
New Bedford High School - Basement Seep (Modeled Air Concentrations)
New Bedford, Massachusetts

		EPC	Estimated Dose		Toxicity Values		Risk Estimates	
	Constituent	Indoor Air Concentration µg/m3	ADEcancer (Cancer) µg/m3	ADEnon-cancer (Non-cancer) µg/m3	Unit Risk µg/m3	Chronic Noncancer Reference Concentration µg/m3	Cancer Risk (--)	Hazard Quotient (--)
108-90-7	Chlorobenzene	2.90E-03	2.6E-04	6.7E-04	NA	2.0E+01	NA	3.E-05
541-73-1	1,3-Dichlorobenzene	5.00E-04	4.4E-05	1.2E-04	NA	2.0E+02	NA	6.E-07
106-46-7	1,4-Dichlorobenzene	2.00E-03	1.8E-04	4.6E-04	6.9E-06	8.0E+02	1.E-09	6.E-07
156-59-2	cis-1,2-Dichloroethene	5.42E-02	4.8E-03	1.2E-02	NA	3.5E+01	NA	4.E-04
156-60-5	trans-1,2-Dichloroethene	1.72E-02	1.5E-03	4.0E-03	NA	7.0E+01	NA	6.E-05
79-01-6	Trichlorothene	1.80E-03	1.6E-04	4.1E-04	1.7E-06	1.8E+02	3.E-10	2.E-06
75-01-4	Vinyl chloride	1.02E-02	9.1E-04	2.3E-03	8.8E-06	1.0E+02	8.E-09	2.E-05

	Cancer Risk	Hazard Index
TOTAL:	9E-09	5E-04

Bold = Cancer Risk >1.0E-05 or Hazard Quotient > 1.0E+01

Where:

LADEcancer = IAC x EFx ED x EP/APcancer
ADEnon-cancer = IAC x EF x ED x EP / APnon-cancer
Cancer Risk = LADEcancer x UR
Hazard Quotient = ADEnon-cancer / Inhalation Reference Concentration

LADE = Life Time Average Daily Exposure
ADE = Average Daily Exposure
EPC = Exposure Point Concentration
$\mu g/m^3$ = micrograms per cubic meter

And where:

Exposure Frequency (EF) =	250	days/year (5 days a week for 50 weeks of exposure)
Exposure Duration (ED) =	8	hrs/day [1]
Exposure Period (EP) =	27	yr [1]
Unit Conversion (UC) =	0.042	days/hr
Averaging Period (APcancer) =	25550	days [1]
Averaging Period (APnon-cancer) =	9855	days [1]

[1] MADEP, 2008

Table 2
Worker/Teacher/Staff
Inhalation of Indoor Air Exposure Pathway
New Bedford High School - Mechanical Room B-114
New Bedford, Massachusetts

		EPC	Estimated Dose		Toxicity Values		Risk Estimates	
	Constituent	Indoor Air Concentration µg/m3	ADEcancer (Cancer) µg/m3	ADEnon-cancer (Non-cancer) µg/m3	Unit Risk µg/m3	Chronic Noncancer Reference Concentration µg/m3	Cancer Risk (--)	Hazard Quotient (--)
78-93-3	2-Butanone	1.01E+00	9.0E-02	2.3E-01	NA	5.0E+03	NA	5.E-05
67-64-1	Acetone	3.40E+00	3.0E-01	7.8E-01	NA	8.0E+02	NA	1.E-03
71-43-2	Benzene	9.83E-01	8.7E-02	2.3E-01	7.8E-06	3.0E+01	7.E-07	8.E-03
74-87-3	Chloromethane	1.11E+00	9.9E-02	2.6E-01	NA	9.0E+01	NA	3.E-03
156-59-2	cis-1,2-Dichloroethene	4.33E+00	3.8E-01	1.0E+00	NA	3.5E+01	NA	3.E-02
75-71-8	Dichlorodifluoromethane	2.00E+00	1.8E-01	4.6E-01	NA	2.0E+02	NA	2.E-03
108-88-3	Toluene	1.97E+00	1.7E-01	4.5E-01	NA	5.0E+03	NA	9.E-05
156-60-5	trans-1,2-Dichloroethene	2.38E+00	2.1E-01	5.5E-01	NA	7.0E+01	NA	8.E-03
79-01-6	Trichloroethene	2.20E+00	2.0E-01	5.1E-01	1.7E-06	1.8E+02	3.E-07	3.E-03
75-01-4	Vinyl chloride	5.70E-01	5.1E-02	1.3E-01	8.8E-06	1.0E+02	4.E-07	1.E-03

	Cancer Risk	Hazard Index
TOTAL:	1E-06	5E-02

Bold = Cancer Risk >1.0E-05 or Hazard Quotient > 1.0E+01

Where:

LADEcancer = IAC x EFx ED x EP/APcancer
ADEnon-cancer = IAC x EF x ED x EP / APnon-cancer
Cancer Risk = LADEcancer x UR
Hazard Quotient = ADEnon-cancer / Inhalation Reference Concentration

LADE = Life Time Average Daily Exposure
ADE = Average Daily Exposure
EPC = Exposure Point Concentration
$\mu g/m^3$ = micrograms per cubic meter

And where:

Exposure Frequency (EF) =	250	days/year (5 days a week for 26 weeks of exposure)
Exposure Duration (ED) =	8	hrs/day [1]
Exposure Period (EP) =	27	yr [1]
Unit Conversion (UC) =	0.042	days/hr
Averaging Period (APcancer) =	25550	days [1]
Averaging Period (APnon-cancer) =	9855	days [1]

[1] MADEP, 2006

Table 3
Worker/Teacher/Staff
Inhalation of Indoor Air Exposure Pathway
New Bedford High School - Classroom B-116
New Bedford, Massachusetts

		EPC	Estimated Dose		Toxicity Values		Risk Estimates	
	Constituent	Indoor Air Concentration µg/m3	ADEcancer (Cancer) µg/m3	ADEnon-cancer (Non-cancer) µg/m3	Unit Risk µg/m3	Chronic Noncancer Reference Concentration µg/m3	Cancer Risk (--)	Hazard Quotient (--)
67-64-1	Acetone	3.57E+00	3.2E-01	8.2E-01	NA	8.0E+02	NA	1.E-03
74-87-3	Chloromethane	1.03E+00	9.1E-02	2.4E-01	NA	9.0E+01	NA	3.E-03
75-71-8	Dichlorodifluoromethane	2.02E+00	1.8E-01	4.6E-01	NA	2.0E+02	NA	2.E-03
156-59-2	cis-1,2-Dichloroethene	8.70E-02	7.7E-03	2.0E-02	NA	3.5E+01	NA	6.E-04

	Cancer Risk	Hazard Index
TOTAL:	0E+00	7E-03

Bold = Cancer Risk >1.0E-05 or Hazard Quotient > 1.0E+01

Where:

LADEcancer = IAC x EFx ED x EP/APcancer
ADEnon-cancer = IAC x EF x ED x EP / APnon-cancer
Cancer Risk = LADEcancer x UR
Hazard Quotient = ADEnon-cancer / Inhalation Reference Concentration

LADE = Life Time Average Daily Exposure
ADE = Average Daily Exposure
EPC = Exposure Point Concentration
$\mu g/m^3$ = micrograms per cubic meter

And where:

Exposure Frequency (EF) =	250	days/year (5 days a week for 26 weeks of exposure)
Exposure Duration (ED) =	8	hrs/day [1]
Exposure Period (EP) =	27	yr [1]
Unit Conversion (UC) =	0.042	days/hr
Averaging Period (APcancer) =	25550	days [1]
Averaging Period (APnon-cancer) =	9855	days [1]

[1] MADEP, 2006

Table 4
Worker/Teacher/Staff
Inhalation of Indoor Air Exposure Pathway
New Bedford High School - Honors Dining B-109
New Bedford, Massachusetts

		EPC	Estimated Dose		Toxicity Values		Risk Estimates	
	Constituent	Indoor Air Concentration µg/m3	ADEcancer (Cancer) µg/m3	ADEnon-cancer (Non-cancer) µg/m3	Unit Risk µg/m3	Chronic Noncancer Reference Concentration µg/m3	Cancer Risk (--)	Hazard Quotient (--)
67-64-1	Acetone	2.96E+01	2.6E+00	6.8E+00	NA	8.0E+02	NA	9.E-03
74-87-3	Chloromethane	9.20E-01	8.2E-02	2.1E-01	NA	9.0E+01	NA	2.E-03
75-71-8	Dichlorodifluoromethane	2.08E+00	1.8E-01	4.8E-01	NA	2.0E+02	NA	2.E-03
100-41-4	Ethylbenzene	3.06E+00	2.7E-01	7.0E-01	NA	1.0E+03	NA	7.E-04
1330-20-7	Xylenes	1.16E+01	1.0E+00	2.7E+00	NA	1.0E+02	NA	3.E-02
108-88-3	Toluene	4.18E+00	**3.7E-01**	**9.6E-01**	**NA**	5.0E+03	NA	2.E-04

	Cancer Risk	Hazard Index
TOTAL:	0E+00	4E-02

Bold = Cancer Risk >1.0E-05 or Hazard Quotient > 1.0E+01

Where:

LADEcancer = IAC x EFx ED x EP/APcancer
ADEnon-cancer = IAC x EF x ED x EP / APnon-cancer
Cancer Risk = LADEcancer x UR
Hazard Quotient = ADEnon-cancer / Inhalation Reference Concentration

LADE = Life Time Average Daily Exposure
ADE = Average Daily Exposure
EPC = Exposure Point Concentration
$\mu g/m^3$ = micrograms per cubic meter

And where:

Exposure Frequency (EF) =	250	days/year (5 days a week for 26 weeks of exposure)
Exposure Duration (ED) =	8	hrs/day [1]
Exposure Period (EP) =	27	yr [1]
Unit Conversion (UC) =	0.042	days/hr
Averaging Period (APcancer) =	25550	days [1]
Averaging Period (APnon-cancer) =	9855	days [1]

[1] MADEP, 2006

Table 5
Worker/Teacher/Staff
Inhalation of Indoor Air Exposure Pathway
New Bedford High School - Kitchen Storage
New Bedford, Massachusetts

		EPC	Estimated Dose		Toxicity Values		Risk Estimates	
	Constituent	Indoor Air Concentration µg/m3	ADEcancer (Cancer) µg/m3	ADEnon-cancer (Non-cancer) µg/m3	Unit Risk µg/m3	Chronic Noncancer Reference Concentration µg/m3	Cancer Risk (--)	Hazard Quotient (--)
67-64-1	Acetone	3.68E+00	3.3E-01	8.5E-01	NA	8.0E+02	NA	1.E-03
74-87-3	Chloromethane	1.16E+00	1.0E-01	2.7E-01	NA	9.0E+01	NA	3.E-03
75-71-8	Dichlorodifluoromethane	2.13E+00	1.9E-01	4.9E-01	NA	2.0E+02	NA	2.E-03

	Cancer Risk	Hazard Index
TOTAL:	0E+00	6E-03

Bold = Cancer Risk >1.0E-05 or Hazard Quotient > 1.0E+01

Where:

LADEcancer = IAC x EFx ED x EP/APcancer
ADEnon-cancer = IAC x EF x ED x EP / APnon-cancer
Cancer Risk = LADEcancer x UR
Hazard Quotient = ADEnon-cancer / Inhalation Reference Concentration

LADE = Life Time Average Daily Exposure
ADE = Average Daily Exposure
EPC = Exposure Point Concentration
$\mu g/m^3$ = micrograms per cubic meter

And where:

Exposure Frequency (EF) =	250	days/year (5 days a week for 26 weeks of exposure)
Exposure Duration (ED) =	8	hrs/day [1]
Exposure Period (EP) =	27	yr [1]
Unit Conversion (UC) =	0.042	days/hr
Averaging Period (APcancer) =	25550	days [1]
Averaging Period (APnon-cancer) =	9855	days [1]

[1] MADEP, 2006

Table 6
Worker/Teacher/Staff
Inhalation of Indoor Air Exposure Pathway
New Bedford High School - Calssroom 3-112
New Bedford, Massachusetts

		EPC	Estimated Dose		Toxicity Values		Risk Estimates	
	Constituent	Indoor Air Concentration µg/m3	ADEcancer (Cancer) µg/m3	ADEnon-cancer (Non-cancer) µg/m3	Unit Risk µg/m3	Chronic Noncancer Reference Concentration µg/m3	Cancer Risk (--)	Hazard Quotient (--)
95-63-6	1,2,4,-Trimethylbenzene	3.18E+00	2.8E-01	7.3E-01	NA	7.0E+00	NA	1.E-01
78-93-3	2-Butanone	1.89E+00	1.7E-01	4.3E-01	NA	5.0E+03	NA	9.E-05
71-43-2	Benzene	2.55E+00	2.3E-01	5.9E-01	7.8E-06	3.0E+01	2.E-06	2.E-02
74-87-3	Chloromethane	1.29E+00	1.1E-01	3.0E-01	NA	9.0E+01	NA	3.E-03
156-59-2	cis-1,2-Dichloroethene	3.58E+00	3.2E-01	8.2E-01	NA	3.5E+01	NA	2.E-02
75-71-8	Dichlorodifluoromethane	3.36E+00	3.0E-01	7.7E-01	NA	2.0E+02	NA	4.E-03
100-41-4	Ethylbenzene	1.80E+00	1.6E-01	4.1E-01	NA	1.0E+03	NA	4.E-04
108-10-1	4-Methyl-2-pentanone	1.21E+00	1.1E-01	2.8E-01	NA	3.0E+03	NA	9.E-05
1330-20-7	Xylenes	9.99E+00	8.9E-01	2.3E+00	NA	1.0E+02	NA	2.E-02
108-88-3	Toluene	1.31E+01	1.2E+00	3.0E+00	NA	5.0E+03	NA	6.E-04
156-60-5	trans-1,2-Dichloroethene	1.72E+00	1.5E-01	4.0E-01	NA	7.0E+01	NA	6.E-03
79-01-6	Trichloroethene	1.12E+00	9.9E-02	2.6E-01	1.7E-06	1.8E+02	2.E-07	1.E-03
75-69-4	Trichlorofluoromethane	4.92E+00	4.4E-01	1.1E+00	NA	7.0E+02	NA	2.E-03
75-01-4	Vinyl chloride	5.31E-01	4.7E-02	1.2E-01	8.8E-06	1.0E+02	4.E-07	1.E-03

	Cancer Risk	Hazard Index
TOTAL:	2E-06	2E-01

Bold = Cancer Risk >1.0E-05 or Hazard Quotient > 1.0E+01

Where:

LADEcancer = IAC x EFx ED x EP/APcancer
ADEnon-cancer = IAC x EF x ED x EP / APnon-cancer
Cancer Risk = LADEcancer x UR
Hazard Quotient = ADEnon-cancer / Inhalation Reference Concentration

LADE = Life Time Average Daily Exposure
ADE = Average Daily Exposure
EPC = Exposure Point Concentration
$\mu g/m^3$ = micrograms per cubic meter

And where:

Exposure Frequency (EF) =	250	days/year (5 days a week for 26 weeks of exposure)
Exposure Duration (ED) =	8	hrs/day [1]
Exposure Period (EP) =	27	yr [1]
Unit Conversion (UC) =	0.042	days/hr
Averaging Period (APcancer) =	25550	days [1]
Averaging Period (APnon-cancer) =	9855	days [1]

[1] MADEP, 2006

MODELING RESULTS

Assumptions about Puddle

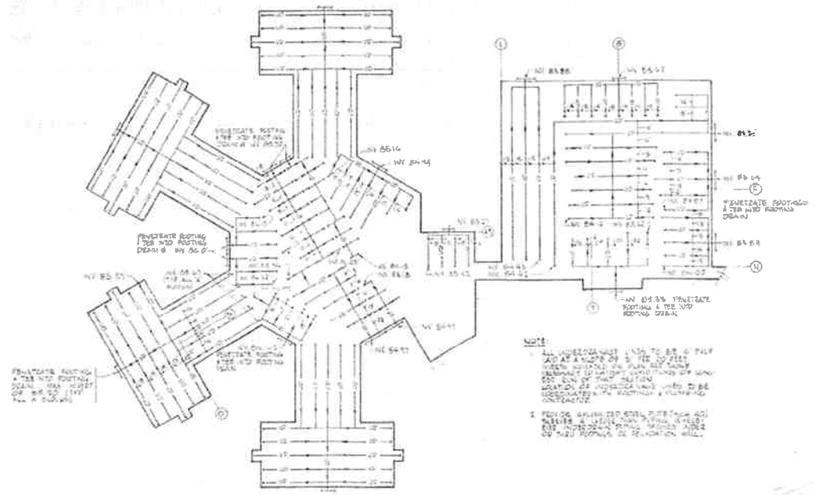
Assumed Water Temperature	70	F
	294.26	K
Area of Puddle	1530	ft^2
	142.14	m^2
Volume of Water	238	gallons
	31.816	ft^3
	0.9009	m^3
Average Water Depth	0.2495	inch
Water Density	62.305	lb/ft^3
	998.045	kg/m^3
Mass of Water	1982.30	lb
	899.17	kg
Vapor Pressure of Water	0.36292	psia
	18.768	mmHg
Molecular Weight of Water	18.0152	
Assumed Air Change Rate	0.5	hr^{-1}
Volume of Room	2713	m^3
Air Volume Flow Rate	1356.5	m^3/hr
Assumed Average Height	12	ft
	3.66	m
Room Area	742	m^2
Velocity = Volume Flow/Area	3.66	m/hr
	0.001016	m/s

Assumed Room Height over Puddle	9 ft
	2.74 m
Air Volume over Puddle	13,770 ft^3
	389.92 m^3
Dimension for Square Puddle	39.12 ft
	11.92 m
Assumed Air Exchange Rate	0.50 hr^{-1}
Volume Rate	1356.50 m^3/hr
Assumed Average Room Height	12.00 ft
	3.66 m
Room Area	741.74 m^2
Room Length if Square	27.23 m
Velocity for Square Room	13.62 m/hr
	0.00378 m/s
Water Evaporation Rate	407.56 g/hr
Assume Inflow Rate=Evap Rate	0.408 L/hr

Compound===>:	Chloro-Benzene	1,3-Dichloro-Benzene	1,4-Dichloro-Benzene	cis-1,2-Dichloro-Ethene	trans-1,2-Dichloro-Ethene	Trichloro-Ethene	Vinyl Chloride	Water	Average
Molecular Weight	112.558	147.003	147.003	96.943	96.943	131.388	62.499	18.0152	
Concentration in Water									
µg/L	9.5	1.6	6.8	180	57	6.0	34		
$gmol/m^3$	8.44E-05	1.09E-05	4.63E-05	1.86E-03	5.88E-04	4.57E-05	5.44E-04		
Henry's Law Constant, $atm\text{-}m^3/mol$	4.53E-03	3.37E-03	2.84E-03	7.36E-03	6.70E-03	1.16E-02	2.24E-02		
at Temp, C	25	25	25	25	25	25	25		
Equilibrium Partial Pressure, atm	3.82E-07	3.67E-08	1.31E-07	1.37E-05	3.94E-06	5.28E-07	1.22E-05		
Equilibrium ppb	382	37	131	13,674	3,942	528	12,179		
mmHg	2.91E-04	2.79E-05	9.97E-05	1.04E-02	3.00E-03	4.01E-04	9.26E-03	18.768	
Assumed Humidity in Room Air, %								50.000	
EPA-OCAG Evaporation Rate									
For 1 m/s wind, lb/min	1.22E-04	1.40E-05	5.00E-05	3.95E-03	1.14E-03	1.87E-04	2.62E-03	1.161	
g/hr	3.317	0.380	1.360	107.417	30.969	5.081	71.398	31586.96	
At Trial Velocity, g/hr	0.0428	0.0049	0.0176	1.3860	0.3996	0.0656	0.9212	407.5561	
Inflow Rate in Liquid, g/hr	3.88E-06	6.53E-07	2.78E-06	7.35E-05	2.33E-05	2.45E-06	1.39E-05		
Evaporation / Inflow Rate Ratio	11033.54	7507.74	6321.00	18855.63	17167.06	26756.92	66350.98		16263.14
Assume Pollutant Inflow / Air Exchange									
Concentration in Air ug/m^3	0.0029	0.0005	0.0020	0.0542	0.0172	0.0018	0.0102		
ppb	0.00074	0.00010	0.00040	0.01621	0.00513	0.00040	0.00475		

APPENDIX B

EXCERPT OF BUILDING PLANS



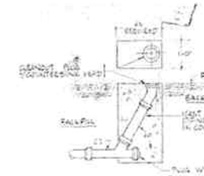
UNDERDRAINAGE PLAN
SCALE 1"=50'-0"

LEGEND

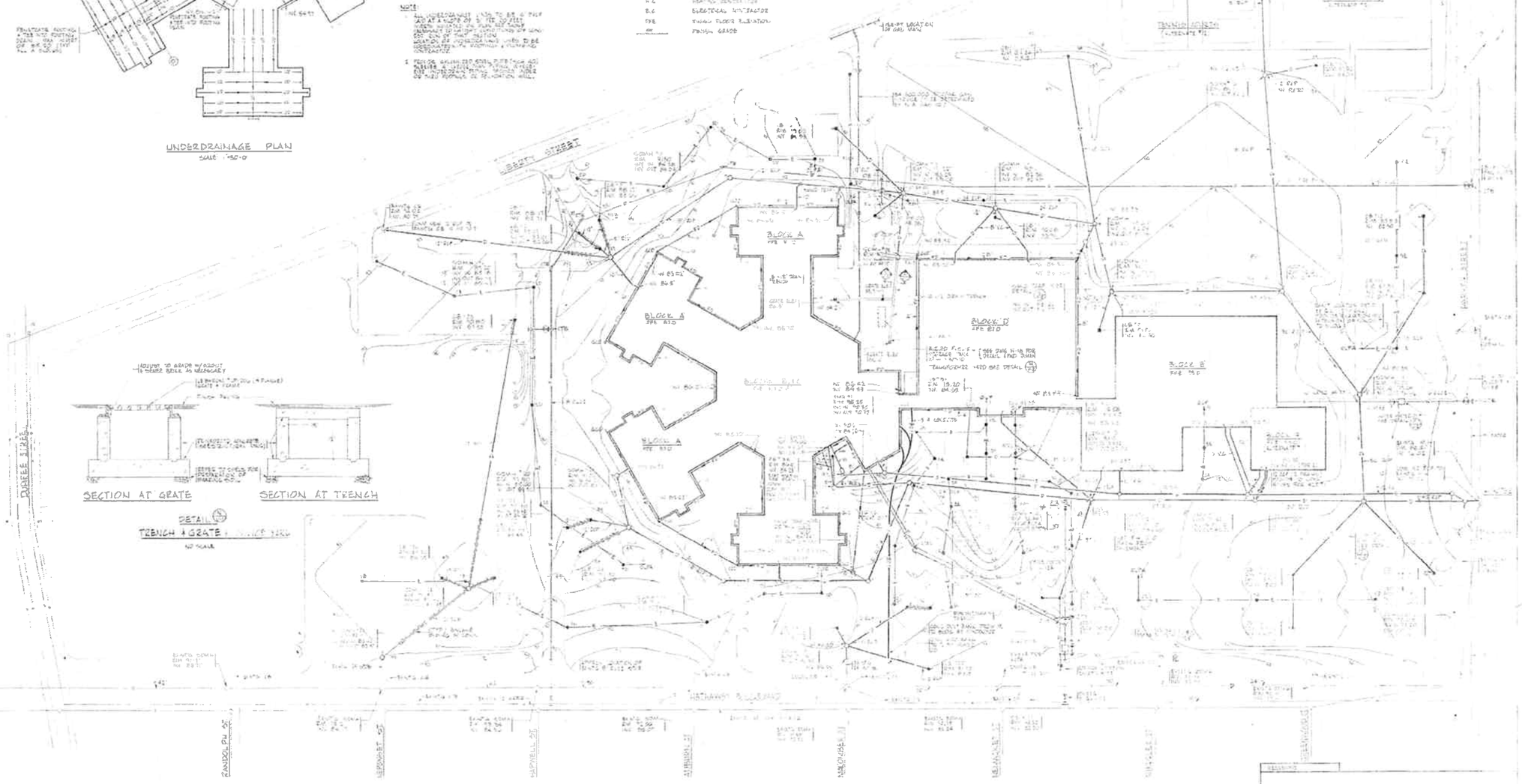
—S—	SANITARY SEWER
—D—	STORM DRAIN
—RD—	ROOFING DRAIN
—UD—	UNDER SLAB DRAIN
—W—	WATER
—F—	FIRE LINE
—CTE—	CONCRETE ELECTRICAL (ELECTRICAL)
—E—	ELECTRICAL CONDUIT TO BUILDING
	DRAIN WITH CONCRETE ENCASEMENT
—P—	PROPERTY LINE
SSMH	SANITARY MANHOLE
SDMH	STORM DRAINAGE MANHOLE
CB	CATCH BASIN
DI	DRAIN INLET
GV	GATE VALVE
HYD	HYDRANT
EL	ELEVATION
INV	INVERT ELEVATION
CB	CONCRETE BLOCK
GRD	GROUND ELEVATION
EC	ELECTRICAL CONTRACTOR
FFE	FINISH FLOOR ELEVATION
FG	FINISH GRADE

GENERAL NOTES

1. THE EXISTING UTILITIES SHOWN ARE ALL MADE ARE APPROXIMATE ONLY & MUST BE VERIFIED IN THE FIELD BY CONTRACTOR AND ENGINEER BEFORE ANY WORK IS BEGUN. NO EXTRA COST WILL BE PAID FOR ANY WORK NOT INDICATED ON THE DRAWINGS.
2. THE ELEVATION AND THE MAN AT THE COLLECTION OF PIPES & MANHOLE CONNECTIONS TO BE FIELD VERIFIED BY THE CONTRACTOR BEFORE PIPES.
3. LOCATIONS & ELEVATIONS OF ALL EXISTING UTILITIES ARE APPROXIMATE ONLY & ALL FIELD INFORMATION IS REQUIRED PRIOR TO INSTALLATION BY THE CONTRACTOR.
4. WHERE PIPING OF DIFFERENT SIZES CONNECT TO A COMMON MANHOLE, INSTALL CROWNS OF ALL PIPES AT SAME ELEVATION.
5. LOCATIONS OF WATER SERVICES ENTRY & BUILDING DRAINS AS SHOWN ON THIS PLAN ARE APPROX. VERIFY LOCATIONS PRIOR TO CONSTRUCTION.
6. NEW BEDFORD GAS CO. WILL INSTALL GAS SERVICE AT NO COST. PROVIDE UNDER THIS SECTION ALL EXCAVATION, BACKFILL & EQUIPMENT REQUIRED FOR INSTALLATION.
7. ALTERNATE #3 DOES NOT AFFECT THE WORK OF THIS SECTION.
8. PENETRATE & ROOFED DESIGNED BELOW 3'0 FEET OF ALL JOIST, JOINT & FRAME.
9. REFER TO DWG U-1.1 FOR EXACT LOCATIONS OF ALL CATCH BASINS.
10. INCLUDE IN THE WORK OF THIS SECTION THE CONSTRUCTION OF [illegible]



DETAIL 3/U1
GROUND CLEANOUT
NO SCALE



SECTION AT GRATE

SECTION AT TRENCH

DETAIL 1/U1
TRENCH & GRATE
NO SCALE

APPENDIX C

LABORATORY DATA REPORTS (ATTACHED ON DISK)

APPENDIX D

COPY OF ENVIRONMENTAL FACT SHEET – FEBRUARY 2010

ENVIRONMENTAL FACT SHEET

City of New Bedford's Investigation of Groundwater Seeps in the Basement of New Bedford High School

City of New Bedford/TRC, January 2010

The City's environmental consultant (TRC Environmental Corporation) is investigating groundwater (water located beneath the ground in spaces in the soil) which enters, or "seeps" into, the basement of New Bedford High School through small cracks in the foundation in rooms used by maintenance staff. This fact sheet describes TRC's investigation, its implications for building occupants, the next steps in the investigation, and where interested individuals can obtain more detailed information.

What are volatile organic compounds, or VOCs?
Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals. VOCs are emitted by a wide array of products numbering in the thousands. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions. Organic chemicals are widely used as ingredients in household products. Paints, varnishes, and wax all contain organic solvents, as do many cleaning, disinfecting, cosmetic, degreasing, and hobby products. Fuels are made up of organic chemicals. All of these products can release organic compounds while you are using them, and, to some degree, when they are stored.

What investigation has been completed to date?

TRC collected groundwater and basement water samples near where groundwater seeps into the basement of the high school. Analytical results for these samples suggest the potential for chlorinated volatile organic compounds (VOCs) to be present in indoor air in the building. Therefore, TRC conducted additional sampling, including indoor air sampling, on an expedited basis. On January 30th and 31st, TRC sampled indoor air from several locations within the high school near the groundwater seep and in other areas of the building, including classrooms. The results confirm the presence of chlorinated VOCs in the school. While the chlorinated VOCs detected in indoor air appear to be related to groundwater contamination, the detection of other VOCs in indoor air samples that have not been detected in groundwater is more likely associated with indoor sources such as cleaning materials or outdoor sources such as vehicle exhaust that gets entrained in the high school ventilation system. TRC's preliminary risk assessment of the indoor air concentration data indicates that there is no significant risk to the health of building occupants based on criteria established by the Massachusetts Department of Environmental Protection (MassDEP). However, the presence of detectable concentrations of VOCs in indoor air requires further investigation and possibly remedial action.

Is it safe for people to occupy the high school?

Yes, it is safe to occupy the high school, including rooms where samples were collected, based on TRC's assessment of indoor air quality data collected to date. TRC performed risk calculations using the VOC concentration data for indoor air in combination with the same procedures used to evaluate indoor air quality at the Keith Middle School. TRC concluded that there is no significant risk to the health of building occupants based on criteria established by

MassDEP. TRC's risk calculations included all of the VOCs detected in indoor air, regardless of whether they were detected in basement, or seep water. Indoor air was sampled in a manner that was intended to detect the highest concentrations that might exist in the high school by collecting samples: (1) at a time of year when migration of VOCs into the building is likely to be highest; (2) from locations near where groundwater enters the building; and (3) during the weekend when ventilation within the building is likely to be somewhat lower than it is during the week. Risks were calculated separately for each room that was sampled, based on the assumption that someone spends 8 hours per day, 5 days per week for 27 years in that one room.

What are the next steps?
TRC will continue its expedited investigation of the low level VOCs detected in the high school's indoor air and will proceed rapidly over the coming weeks. TRC's investigation will include the following elements:

- collection of additional indoor air samples in the building
- an inventory of potential interior sources of chemicals observed in the recent indoor air samples, such as routinely used/stored cleaning materials or paints;
- an evaluation of potential outdoor sources (for example, vehicle exhaust potentially entrained by the ventilation system);
- an investigation of vapor concentrations beneath the floor of the high school; and
- an investigation to determine whether these compounds are present in the groundwater beneath the high school.

The inventory of potential indoor sources was performed earlier this week, and vapor samples are scheduled to be collected from beneath the floor in the next few weeks.

TRC will evaluate subsequent rounds of indoor air concentration data in the same way and on an expedited basis. TRC is focused on characterizing the nature and extent of the VOCs identified in the indoor air samples, continuing to evaluate potential risk associated with these chemicals, and, if necessary, providing recommendations for remedial measures.

Where can I get more information?
All chemical concentration data for groundwater, seep water, and indoor air will be posted at the City's website http://www.newbedford-ma.gov/McCoy/Keithmiddleschool.html. If you have additional questions, please contact Scott Alfonse, City of New Bedford Environmental Stewardship Department, at (508) 991-6188 or email scott.alfonse@newbedford-ma.gov.

Summary of Analytical Results for Groundwater Samples -- January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:		MW-4	MW-5		MW-6	MW-7
		Sample Date:		1/6/2010	1/6/2010	1/6/2010	1/7/2010	1/7/2010
		GW-2	GW-3			Field Dup		
VOCs								
(ug/L)	Acetone	50,000	50,000	50 U	50 U	50 U	50 U	50 U
	tert-Amyl Methyl Ether (TAME)	NS	NS	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	Benzene	2,000	10,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromobenzene	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromochloromethane	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromodichloromethane	6	50,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Bromoform	700	50,000	10 U	10 U	10 U	10 U	10 U
	Bromomethane	7	800	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	2-Butanone (MEK)	50,000	50,000	20 U	20 U	20 U	20 U	20 U
	n-Butylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	sec-Butylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butyl Ethyl Ether (TBEE)	NS	NS	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	Carbon Disulfide	NS	NS	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Carbon Tetrachloride	2	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorobenzene	200	1,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorodibromomethane	20	50,000	10 U	10 U	10 U	10 U	10 U
	Chloroethane	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Chloroform	50	20,000	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Chloromethane	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	2-Chlorotoluene	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	4-Chlorotoluene	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dibromo-3-chloropropane (DBCP	NS	NS	10 U	10 U	10 U	10 U	10 U
	1,2-Dibromoethane (EDB)	2	50,000	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	Dibromomethane	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichlorobenzene	2,000	2,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichlorobenzene	2,000	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,4-Dichlorobenzene	200	8,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Dichlorodifluoromethane (Freon 12)	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,1-Dichloroethane	1,000	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichloroethane	5	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloroethylene	80	30,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-Dichloroethylene	100	50,000	1.0 U	**3.7**	**4.1**	1.0 U	**20**
	trans-1,2-Dichloroethylene	90	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichloropropane	3	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichloropropane	NS	NS	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	2,2-Dichloropropane	NS	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloropropene	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	cis-1,3-Dichloropropene	10(2)	200(2)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	trans-1,3-Dichloropropene	10(2)	200(2)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	Diethyl Ether	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

Summary of Analytical Results for Groundwater Samples -- January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:		MW-4	MW-5		MW-6	MW-7
		Sample Date:		1/6/2010	1/6/2010	1/6/2010	1/7/2010	1/7/2010
		GW-2	GW-3			Field Dup		
	Diisopropyl Ether (DIPE)	NS	NS	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	1,4-Dioxane	6,000	50,000	50 U	50 U	50 U	50 U	50 U
	Ethylbenzene	20,000	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Hexachlorobutadiene	1	3,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	2-Hexanone (MBK)	NS	NS	10 U	10 U	10 U	10 U	10 U
	Isopropylbenzene (Cumene)	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	p-Isopropyltoluene (p-Cymene)	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Methyl tert-Butyl Ether (MTBE)	50,000	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Methylene Chloride	10,000	50,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	4-Methyl-2-pentanone (MIBK)	50,000	50,000	10 U	10 U	10 U	10 U	10 U
	Naphthalene	1,000	20,000	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	n-Propylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Styrene	100	6,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,1,2-Tetrachloroethane	10	50,000	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	1,1,2,2-Tetrachloroethane	9	50,000	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
	Tetrachloroethylene	50	30,000	1.0 U	1.0 U	1.0 U	1.0 U	**63**
	Tetrahydrofuran	NS	NS	10 U	10 U	10 U	10 U	10 U
	Toluene	50,000	40,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2,3-Trichlorobenzene	NS	NS	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
	1,2,4-Trichlorobenzene	2,000	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,1-Trichloroethane	4,000	20,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,2-Trichloroethane	900	50,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Trichloroethylene	30	5,000	1.0 U	1.0 U	1.0 U	1.0 U	**6.8**
	Trichlorofluoromethane (Freon 11)	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,3-Trichloropropane	NS	NS	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,4-Trimethylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3,5-Trimethylbenzene	7,000(1)	50,000(1)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Vinyl Chloride	2	50,000	2.0 U	2.0 U	2.0 U	2.0 U	**3.4**
	m+p Xylene	9,000	5,000	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	o-Xylene	9,000	5,000	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:

ug/L - micrograms per liter.

NS - No MassDEP standards exist for this compound.

U - Compound was not detected at specified quantitation limit.

Values in **Bold** indicate the compound was detected.

Values shown in Bold and shaded type exceed one or more of the listed MassDEP Method 1 standards.

VOCs - Volatile Organic Compounds.

(1) - MassDEP Method 1 standards for C9-C10 aromatic hydrocarbons used.

(2) - MassDEP Method 1 standards for 1,3-Dichloropropene used.

Summary of Analytical Results for Indoor Air Samples -- January 2010
New Bedford High School
New Bedford, Massachusetts

	Analyte	Risk Management Criteria				Sample ID: / Sample Date:	TRC-IA-1 1/31/2010	TRC-IA-2 1/31/2010	TRC-IA-3 1/31/2010	TRC-IA-4 1/31/2010	TRC-IA-5 1/31/2010
		HI = 0.2	HI = 1.0	ELCR = 1 x 10^{-6}	ELCR = 1 x 10^{-5}						
TO-15											
(ug/m3)	1,1,1-Trichloroethane	1,100	5,500	NS	NS		1.09 U	1.09 U	1.09 U	1.09 U	1.09 U
	1,1,2,2-Tetrachloroethane	19	95	0.041	0.41		1.37 U	1.37 U	1.37 U	1.37 U	1.37 U
	1,1,2-Trichloroethane	15	75	0.15	1.5		1.09 U	1.09 U	1.09 U	1.09 U	1.09 U
	1,1-Dichloroethane	100	500	NS	NS		0.809 U	0.809 U	0.809 U	0.809 U	0.809 U
	1,1-Dichloroethene	40	200	NS	NS		0.792 U	0.792 U	0.792 U	0.792 U	0.792 U
	1,2,4-Trichlorobenzene	40	200	NS	NS		1.48 U	1.48 U	1.48 U	1.48 U	1.48 U
	1,2,4-Trimethylbenzene	10[a]	50[a]	NS	NS		0.982 U	0.982 U	0.982 U	0.982 U	**3.18**
	1,2-Dibromoethane	1.8	9	0.011	0.11		1.54 U	1.54 U	1.54 U	1.54 U	1.54 U
	1,2-Dichlorobenzene	40	200	NS	NS		1.20 U	1.20 U	1.20 U	1.20 U	1.20 U
	1,2-Dichloroethane	11	55	0.09	0.9		0.809 U	0.809 U	0.809 U	0.809 U	0.809 U
	1,2-Dichloropropane	0.8	4	0.13	1.3		0.924 U	0.924 U	0.924 U	0.924 U	0.924 U
	1,3,5-Trimethybenzene	10[a]	50[a]	NS	NS		0.982 U	0.982 U	0.982 U	0.982 U	0.982 U
	1,3-Dichlorobenzene	40	200	NS	NS		1.20 U	1.20 U	1.20 U	1.20 U	1.20 U
	1,4-Dichlorobenzene	160	800	0.35	3.5		1.20 U	1.20 U	1.20 U	1.20 U	1.20 U
	1,4-Dioxane	24	120	0.59	5.9		0.720 U	0.720 U	0.720 U	0.720 U	0.720 U
	2-Butanone	1,000	5,000	NS	NS		**1.01**	0.589 U	0.589 U	0.589 U	**1.89**
	2-Hexanone	NS	NS	NS	NS		0.819 U	0.819 U	0.819 U	0.819 U	0.819 U
	Acetone	160	800	NS	NS		**3.4**	**3.57**	**29.6**	**3.68**	2.37 U
	Benzene	6	30	0.3	3		**0.983**	0.638 U	0.638 U	0.638 U	**2.55**
	Bromodichloromethane	14	70	0.14	1.4		1.34 U	1.34 U	1.34 U	1.34 U	1.34 U
	Bromoform	14	70	2.2	22		2.06 U	2.06 U	2.06 U	2.06 U	2.06 U
	Bromomethane	1	5	NS	NS		0.776 U	0.776 U	0.776 U	0.776 U	0.776 U
	Carbon disulfide	NS	NS	NS	NS		0.622 U	0.622 U	0.622 U	0.622 U	0.622 U
	Carbon tetrachloride	86	430	0.16	1.6		1.26 U	1.26 U	1.26 U	1.26 U	1.26 U
	Chlorobenzene	4	20	NS	NS		0.920 U	0.920 U	0.920 U	0.920 U	0.920 U
	Chloroethane	NS	NS	NS	NS		0.527 U	0.527 U	0.527 U	0.527 U	0.527 U
	Chloroform	130	650	0.11	1.1		0.976 U	0.976 U	0.976 U	0.976 U	0.976 U
	Chloromethane	NS	NS	NS	NS		**1.11**	**1.03**	**0.92**	**1.16**	**1.29**
	cis-1,2-Dichloroethene	7	3.5	NS	NS		**4.33**	0.792 U	0.792 U	0.792 U	**3.54**
	cis-1,3-Dichloropropene	4	20	0.6	6		0.907 U	0.907 U	0.907 U	0.907 U	0.907 U
	Dibromochloromethane	14	70	0.1	1		1.70 U	1.70 U	1.70 U	1.70 U	1.70 U
	Dichlorodifluoromethane	NS	NS	NS	NS		**2.00**	**2.02**	**2.08**	**2.13**	**3.36**
	Ethylbenzene	200	1,000	NS	NS		0.868 U	0.868 U	**3.06**	0.868 U	**1.80**
	Hexachlorobutadiene	0.14	0.7	0.11	1.1		2.13 U	2.13 U	2.13 U	2.13 U	2.13 U
	Methylene chloride	600	3,000	5	50		1.74 U	1.74 U	1.74 U	1.74 U	1.74 U

Summary of Analytical Results for Indoor Air Samples -- January 2010
New Bedford High School
New Bedford, Massachusetts

Analyte	Risk Management Criteria HI = 0.2	HI = 1.0	ELCR = 1 x 10^{-6}	ELCR = 1 x 10^{-5}	Sample ID: TRC-IA-1 Sample Date: 1/31/2010	TRC-IA-2 1/31/2010	TRC-IA-3 1/31/2010	TRC-IA-4 1/31/2010	TRC-IA-5 1/31/2010
4-Methyl-2-pentanone	600	3,000	NS	NS	0.819 U	0.819 U	0.819 U	0.819 U	**1.21**
Methyl tert butyl ether	600	3,000	NS	NS	0.720 U	0.720 U	0.720 U	0.720 U	0.720 U
p/m-Xylene	20	100	NS	NS	1.74 U	1.74 U	**9.61**	1.74 U	**7.55**
o-Xylene	20	100	NS	NS	0.868 U	0.868 U	**2.03**	0.868 U	**2.44**
Styrene	200	1,000	4.1	41	0.851 U	0.851 U	0.851 U	0.851 U	0.851 U
Tetrachloroethene	920	4,600	0.23	2.3	1.36 U	1.36 U	1.36 U	1.36 U	1.36 U
Tetrahydrofuran	NS	NS	NS	NS	0.589 U	0.589 U	0.589 U	0.589 U	0.589 U
Toluene	1,000	5,000	NS	NS	**1.97**	0.753 U	**4.18**	0.753 U	**13.1**
trans-1,2-Dichloroethene	14	70	NS	NS	**2.30**	0.792 U	0.792 U	0.792 U	**1.72**
trans-1,3-Dichloropropene	4	20	0.6	6	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U
Trichloroethene	36	180	1.4	14	**2.20**	1.07 U	1.07 U	1.07 U	**1.12**
Trichlorofluoromethane	NS	NS	NS	NS	1.12 U	1.12 U	1.12 U	1.12 U	**4.92**
Vinyl chloride	20	100	0.27	2.7	**0.57**	0.511 U	0.511 U	0.511 U	**0.531**
Naphthalene	0.61	3.05	NS	NS	1.05 U	1.05 U	1.05 U	1.05 U	1.05 U
1,1,1,2-Tetrachloroethane	NS	NS	NS	NS	1.37 U	1.37 U	1.37 U	1.37 U	1.37 U
Isopropylbenzene	NS	NS	NS	NS	0.982 U	0.982 U	0.982 U	0.982 U	0.982 U
1,2,3-Trichloropropane	NS	NS	NS	NS	1.20 U	1.20 U	1.20 U	1.20 U	1.20 U
Bromobenzene	NS	NS	NS	NS	1.28 U	1.28 U	1.28 U	1.28 U	1.28 U
Dibromomethane	NS	NS	NS	NS	1.42 U	1.42 U	1.42 U	1.42 U	1.42 U
tert-Amyl Methyl Ether	NS	NS	NS	NS	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U
2-Chlorotoluene	NS	NS	NS	NS	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U
4-Chlorotoluene	NS	NS	NS	NS	1.03 U	1.03 U	1.03 U	1.03 U	1.03 U
2,2-Dichloropropane	NS	NS	NS	NS	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U
1,1-Dichloropropene	NS	NS	NS	NS	0.907 U	0.907 U	0.907 U	0.907 U	0.907 U
Diisopropyl ether	NS	NS	NS	NS	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U
tert-Butyl Ethyl Ether	NS	NS	NS	NS	0.835 U	0.835 U	0.835 U	0.835 U	0.835 U
1,2,3-Trichlorobenzene	NS	NS	NS	NS	1.48 U	1.48 U	1.48 U	1.48 U	1.48 U
Ethyl ether	NS	NS	NS	NS	0.606 U	0.606 U	0.606 U	0.606 U	0.606 U
n-Butylbenzene	NS	NS	NS	NS	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U
sec-Butylbenzene	NS	NS	NS	NS	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U
tert-Butylbenzene	NS	NS	NS	NS	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U
1,2-Dibromo-3-chloropropane	NS	NS	NS	NS	1.93 U	1.93 U	1.93 U	1.93 U	1.93 U
p-Isopropyltoluene	NS	NS	NS	NS	1.10 U	1.10 U	1.10 U	1.10 U	1.10 U
n-Propylbenzene	NS	NS	NS	NS	0.982 U	0.982 U	0.982 U	0.982 U	0.982 U
1,3-Dichloropropane	NS	NS	NS	NS	0.923 U	0.923 U	0.923 U	0.923 U	0.923 U

Summary of Analytical Results for Indoor Air Samples -- January 2010
New Bedford High School
New Bedford, Massachusetts

	Analyte	Risk Management Criteria				Sample ID: / Sample Date:				
		HI = 0.2	HI = 1.0	ELCR = 1 x 10^{-6}	ELCR = 1 x 10^{-5}	TRC-IA-1 1/31/2010	TRC-IA-2 1/31/2010	TRC-IA-3 1/31/2010	TRC-IA-4 1/31/2010	TRC-IA-5 1/31/2010
TO-15-SIM										
(ug/m3)	cis-1,2-Dichloroethene	7	3.5	NS	NS	**4.27**	**0.087**	0.079 U	0.079 U	**3.58**
	Tetrachloroethene	920	4,600	0.23	2.3	0.136 U	0.136 U	0.136 U	0.136 U	0.136 U
	trans-1,2-Dichloroethene	14	70	NS	NS	**2.38**	0.079 U	0.079 U	0.079 U	**1.62**
	Trichloroethene	36	180	1.4	14	**2.10**	0.107 U	0.107 U	0.107 U	**1.04**
	Vinyl chloride	20	100	0.27	2.7	**0.562**	0.051 U	0.051 U	0.051 U	**0.498**

Notes:

ug/m3 - micrograms per cubic meter.

ug/L - micrograms per liter.

NS - No risk management criteria exist for this compound.

U - Compound was not detected at specified quantitation limit.

Values in Bold indicate the compound was detected.

Values shown in Bold and shaded type exceed one or more of the listed criteria.

TO - Toxic orgaincs.

SIM - selected ion monitoring.

ELCR - Excess lifttime cancer risk.

HI - Hazard index.

Risk Management Criteria - MassDEP Indoor Air Threshold Values for the Evaluation of a Vapor Intrusion Pathway, Attachment C, updated June 26, 2008.

(b) - The rish management criteria for C5-C8 used.

Summary of Analytical Results for Basement Water Samples -- December 2009 and January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte	Sample ID:		NBHSBRM	BRM-S-1			BRM-S-2			BRM-S-3				FIP-S-1		
		Sample Date:		2/20/2009	12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	1/30/2010 Field Dup	12/2/2009	1/7/2010	1/30/2010
		GW-2	GW-3														
VOCs (ug/L)	Acetone	50,000	50,000	NA	50 U	50 U	5.0 U	50 U	50 U	5.0 U	50 U	50 U	5.0 U	5.0 U	50 U	50 U	5.0 U
	tert-Amyl Methyl Ether (TAME)	NS	NS	NA	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U
	Benzene	2,000	10,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromobenzene	NS	NS	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromochloromethane	NS	NS	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Bromodichloromethane	6	50,000	NA	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U
	Bromoform	700	50,000	NA	5.0 U	10 U	1.0 U	5.0 U	10 U	1.0 U	5.0 U	10 U	1.0 U	1.0 U	5.0 U	10 U	1.0 U
	Bromomethane	7	800	NA	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	5.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	5.0 U
	2-Butanone (MEK)	50,000	50,000	NA	20 U	20 U	10 U	20 U	20 U	10 U	20 U	20 U	10 U	10 U	20 U	20 U	10 U
	n-Butylbenzene	7,000(1)	50,000(1)	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	sec-Butylbenzene	7,000(1)	50,000(1)	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butylbenzene	7,000(1)	50,000(1)	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	tert-Butyl Ethyl Ether (TBEE)	NS	NS	NA	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U
	Carbon Disulfide	NS	NS	NA	3.0 U	5.0 U	1.0 U	3.0 U	5.0 U	1.0 U	3.0 U	5.0 U	1.0 U	1.0 U	3.0 U	5.0 U	1.0 U
	Carbon Tetrachloride	2	5,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorobenzene	200	1,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**9.5**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Chlorodibromomethane	20	50,000	NA	0.50 U	10 U	1.0 U	0.50 U	10 U	1.0 U	0.50 U	10 U	1.0 U	1.0 U	0.50 U	10 U	1.0 U
	Chloroethane	NS	NS	NA	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	Chloroform	50	20,000	NA	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	Chloromethane	NS	NS	NA	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	2-Chlorotoluene	NS	NS	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	4-Chlorotoluene	NS	NS	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dibromo-3-chloropropane (DBCP)	NS	NS	NA	5.0 U	10 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U	10 U	5.0 U
	1,2-Dibromoethane (EDB)	2	50,000	NA	0.50 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.0 U	0.50 U	0.50 U	1.0 U
	Dibromomethane	NS	NS	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichlorobenzene	2,000	2,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichlorobenzene	2,000	50,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**1.6**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,4-Dichlorobenzene	200	8,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**6.8**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Dichlorodifluoromethane (Freon 12)	NS	NS	NA	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	1,1-Dichloroethane	1,000	20,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2-Dichloroethane	5	20,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloroethylene	80	30,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	cis-1,2-Dichloroethylene	100	50,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**54**	**180**	**24**	**23**	1.0 U	**5.6**	**7.2**
	trans-1,2-Dichloroethylene	90	50,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**14**	**57**	**8.2**	**8.1**	1.0 U	**1.0**	**1.4**
	1,2-Dichloropropane	3	50,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3-Dichloropropane	NS	NS	NA	0.50 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.0 U	0.50 U	0.50 U	1.0 U
	2,2-Dichloropropane	NS	NS	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1-Dichloropropene	NS	NS	NA	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	cis-1,3-Dichloropropene	10(2)	200(2)	NA	0.50 U	5.0 U	0.50 U	0.50 U	5.0 U	0.50 U	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	5.0 U	0.50 U
	trans-1,3-Dichloropropene	10(2)	200(2)	NA	0.50 U	5.0 U	0.50 U	0.50 U	5.0 U	0.50 U	0.50 U	5.0 U	0.50 U	0.50 U	0.50 U	5.0 U	0.50 U
	Diethyl Ether	NS	NS	NA	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	Diisopropyl Ether (DIPE)	NS	NS	NA	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U
	1,4-Dioxane	6,000	50,000	NA	50 U	50 U	100 U	50 U	50 U	100 U	50 U	50 U	100 U	100 U	50 U	50 U	100 U
	Ethylbenzene	20,000	5,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Hexachlorobutadiene	1	3,000	NA	1.0 U	1.0 U	0.50 U	1.0 U	1.0 U	0.50 U	1.0 U	1.0 U	0.50 U	0.50 U	1.0 U	1.0 U	0.50 U
	2-Hexanone (MBK)	NS	NS	NA	10 U	10 U	1.0 U	10 U	10 U	1.0 U	10 U	10 U	1.0 U	1.0 U	10 U	10 U	1.0 U
	Isopropylbenzene (Cumene)	7,000(1)	50,000(1)	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	p-Isopropyltoluene (p-Cymene)	7,000(1)	50,000(1)	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Methyl tert-Butyl Ether (MTBE)	50,000	50,000	NA	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U
	Methylene Chloride	10,000	50,000	NA	5.0 U	5.0 U	1.0 U	5.0 U	5.0 U	1.0 U	5.0 U	5.0 U	1.0 U	1.0 U	5.0 U	5.0 U	1.0 U
	4-Methyl-2-pentanone (MIBK)	50,000	50,000	NA	10 U	10 U	5.0 U	10 U	10 U	5.0 U	10 U	10 U	5.0 U	5.0 U	10 U	10 U	5.0 U
	Naphthalene	1,000	20,000	NA	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	5.0 U	5.0 U	5.0 U	2.0 U	5.0 U
	n-Propylbenzene	7,000(1)	50,000(1)	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Styrene	100	6,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,1,2-Tetrachloroethane	10	50,000	NA	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	1.0 U	5.0 U	1.0 U	1.0 U	1.0 U	5.0 U	1.0 U
	1,1,2,2-Tetrachloroethane	9	50,000	NA	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	0.50 U	0.50 U	2.0 U	2.0 U	0.50 U	0.50 U	2.0 U
	Tetrachloroethylene	50	30,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

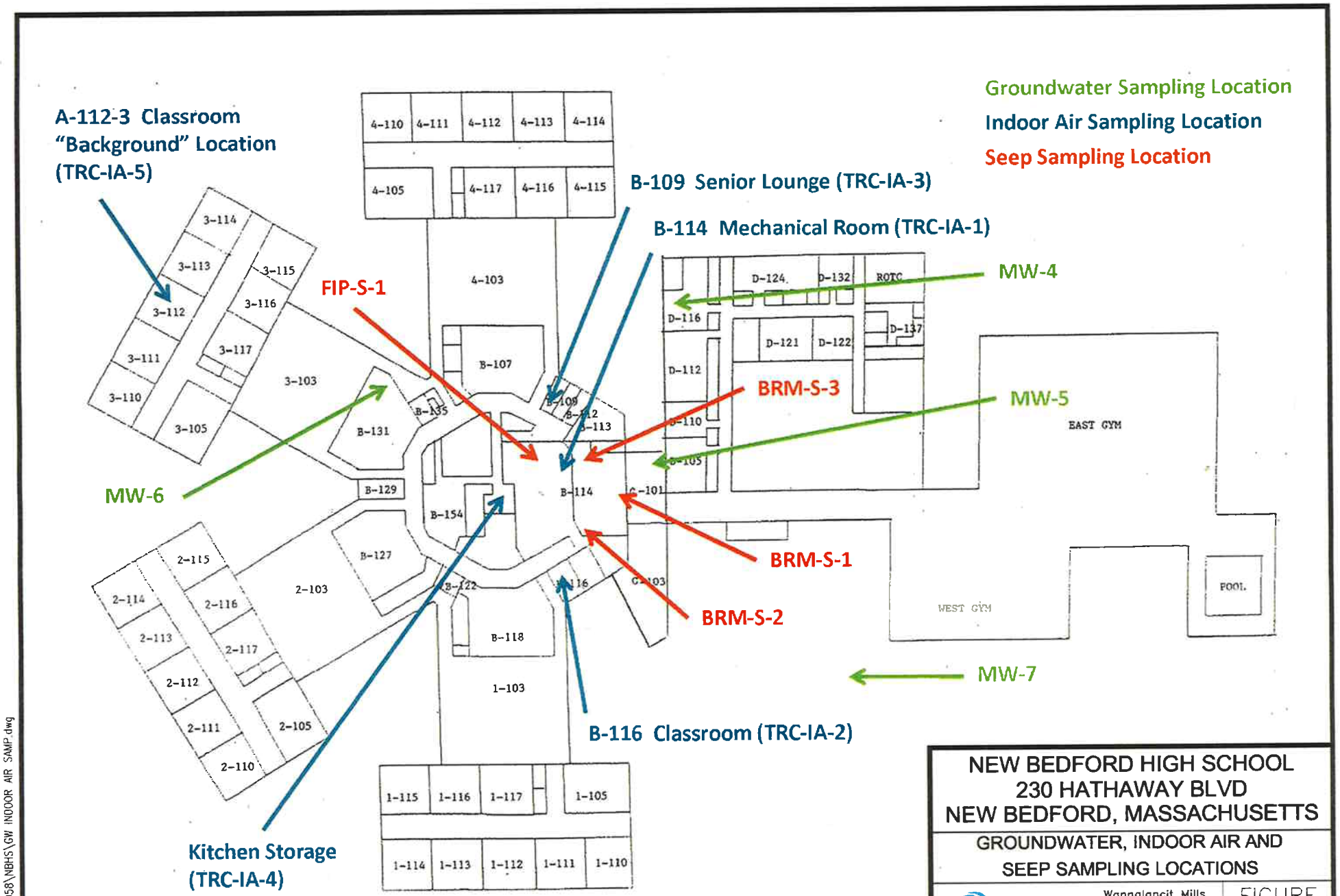
Summary of Analytical Results for Basement Water Samples -- December 2009 and January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte		Sample ID:	NBHSBRM	BRM-S-1			BRM-S-2			BRM-S-3				FIP-S-1		
			Sample Date:	2/20/2009	12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	1/30/2010 Field Dup	12/2/2009	1/7/2010	1/30/2010
		GW-2	GW-3														
	Tetrahydrofuran	NS	NS	NA	10 U	10 U	5.0 U	10 U	10 U	5.0 U	10 U	10 U	5.0 U	5.0 U	10 U	10 U	5.0 U
	Toluene	50,000	40,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,2,3-Trichlorobenzene	NS	NS	NA	5.0 U	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	5.0 U	5.0 U	2.0 U	2.0 U	5.0 U	5.0 U	2.0 U
	1,2,4-Trichlorobenzene	2,000	50,000	NA	5.0 U	1.0 U	2.0 U	5.0 U	1.0 U	2.0 U	5.0 U	1.0 U	2.0 U	2.0 U	5.0 U	1.0 U	2.0 U
	1,1,1-Trichloroethane	4,000	20,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,1,2-Trichloroethane	900	50,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Trichloroethylene	30	5,000	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**6.0**	**1.2**	**1.3**	1.0 U	1.0 U	1.0 U
	Trichlorofluoromethane (Freon 11)	NS	NS	NA	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	1,2,3-Trichloropropane	NS	NS	NA	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U
	1,2,4-Trimethylbenzene	7,000[1]	50,000[1]	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	1,3,5-Trimethylbenzene	7,000[1]	50,000[1]	NA	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	Vinyl Chloride	2	50,000	NA	2.0 U	2.0 U	1.0 U	2.0 U	2.0 U	1.0 U	**2.1**	**34**	**1.4**	**1.3**	2.0 U	2.0 U	**1.3**
	m+p Xylene	9,000	5,000	NA	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	o-Xylene	9,000	5,000	NA	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.0 U	1.0 U	1.0 U	2.0 U
EPH (ug/L)	C9-C18 Aliphatics	5,000	50,000	NA	150 U	NA	NA	150 U	NA	NA	150 U	NA	NA	NA	150 U	NA	NA
	C19-C36 Aliphatics	NS	50,000	NA	**190**	NA	NA	150 U	NA	NA	150 U	NA	NA	NA	150 U	NA	NA
	C11-C22 Aromatics	50,000	5,000	NA	100 U	NA	NA	100 U	NA	NA	100 U	NA	NA	NA	100 U	NA	NA
	Acenaphthene	NS	6,000	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Acenaphthylene	10,000	40	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Anthracene	NS	30	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(a)anthracene	NS	1,000	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(a)pyrene	NS	500	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(b)fluoranthene	NS	400	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(g,h,i)perylene	NS	20	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Benzo(k)fluoranthene	NS	100	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Chrysene	NS	70	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Dibenz(a,h)anthracene	NS	40	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Fluoranthene	NS	200	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Fluorene	NS	40	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Indeno(1,2,3-cd)pyrene	NS	100	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	2-Methylnaphthalene	2,000	20,000	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Naphthalene	1,000	20,000	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Phenanthrene	NS	10,000	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
	Pyrene	NS	20	NA	2.0 U	NA	NA	2.0 U	NA	NA	2.0 U	NA	NA	NA	2.0 U	NA	NA
PAHs (ug/L)	Acenaphthene	NS	6,000	NA	0.30 U	NA	NA	0.30 U	NA	NA	0.30 U	NA	NA	NA	0.30 U	NA	NA
	Acenaphthylene	10,000	40	NA	0.30 U	NA	NA	0.30 U	NA	NA	0.30 U	NA	NA	NA	0.30 U	NA	NA
	Anthracene	NS	30	NA	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	Benzo(a)anthracene	NS	1,000	NA	0.050 U	NA	NA	0.050 U	NA	NA	0.050 U	NA	NA	NA	0.050 U	NA	NA
	Benzo(a)pyrene	NS	500	NA	0.10 U	NA	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.10 U	NA	NA
	Benzo(b)fluoranthene	NS	400	NA	0.050 U	NA	NA	0.050 U	NA	NA	0.050 U	NA	NA	NA	0.050 U	NA	NA
	Benzo(g,h,i)perylene	NS	20	NA	0.50 U	NA	NA	0.50 U	NA	NA	0.50 U	NA	NA	NA	0.50 U	NA	NA
	Benzo(k)fluoranthene	NS	100	NA	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	Chrysene	NS	70	NA	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	Dibenz(a,h)anthracene	NS	40	NA	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	Fluoranthene	NS	200	NA	0.50 U	NA	NA	0.50 U	NA	NA	0.50 U	NA	NA	NA	0.50 U	NA	NA
	Fluorene	NS	40	NA	1.0 U	NA	NA	1.0 U	NA	NA	1.0 U	NA	NA	NA	1.0 U	NA	NA
	Indeno(1,2,3-cd)pyrene	NS	100	NA	0.20 U	NA	NA	0.20 U	NA	NA	0.20 U	NA	NA	NA	0.20 U	NA	NA
	2-Methylnaphthalene	2,000	20,000	NA	1.0 U	NA	NA	1.0 U	NA	NA	1.0 U	NA	NA	NA	1.0 U	NA	NA
	Naphthalene	1,000	20,000	NA	1.0 U	NA	NA	1.0 U	NA	NA	1.0 U	NA	NA	NA	1.0 U	NA	NA
	Phenanthrene	NS	10,000	NA	0.050 U	NA	NA	0.050 U	NA	NA	0.050 U	NA	NA	NA	0.050 U	NA	NA
	Pyrene	NS	20	NA	1.0 U	NA	NA	1.0 U	NA	NA	1.0 U	NA	NA	NA	1.0 U	NA	NA
PCBs (ug/L)	Aroclor 1016	5	10	1.0 U	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1221	5	10	1.0 U	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1232	5	10	1.0 U	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1242	5	10	1.0 U	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1248	5	10	1.0 U	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1254	5	10	1.0 U	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Aroclor 1260	5	10	1.0 U	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA
	Total PCB Amount	5	10	1.0 U	0.0500 U	NA	NA	0.0500 U	NA	NA	0.0500 U	NA	NA	NA	0.0500 U	NA	NA

Summary of Analytical Results for Basement Water Samples -- December 2009 and January 2010
New Bedford High School
New Bedford, Massachusetts

Analysis	Analyte		Sample ID:	NBHSBRM	BRM-S-1			BRM-S-2			BRM-S-3				FIP-S-1		
			Sample Date:	2/20/2009	12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	12/2/2009	1/7/2010	1/30/2010	1/30/2010 Field Dup	12/2/2009	1/7/2010	1/30/2010
		GW-2	GW-3														
Metals, dissolved																	
(ug/L)	Antimony	NS	8,000	NA	40 U	NA	NA	40 U	NA	NA	40 U	NA	NA	NA	40 U	NA	NA
	Arsenic	NS	900	NA	**6.5**	NA	NA	**8.9**	NA	NA	**8.4**	NA	NA	NA	**6.0**	NA	NA
	Barium	NS	50,000	NA	**79**	NA	NA	**73**	NA	NA	**67**	NA	NA	NA	50 U	NA	NA
	Beryllium	NS	200	NA	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Cadmium	NS	4	NA	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Chromium	NS	300	NA	5.0 U	NA	NA	5.0 U	NA	NA	5.0 U	NA	NA	NA	5.0 U	NA	NA
	Lead	NS	10	NA	7.5 U	NA	NA	7.5 U	NA	NA	7.5 U	NA	NA	NA	7.5 U	NA	NA
	Mercury	NS	20	NA	0.10 U	NA	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.10 U	NA	NA
	Nickel	NS	200	NA	5.0 U	NA	NA	5.0 U	NA	NA	5.0 U	NA	NA	NA	5.0 U	NA	NA
	Selenium	NS	100	NA	25 U	NA	NA	25 U	NA	NA	25 U	NA	NA	NA	25 U	NA	NA
	Silver	NS	7	NA	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Thallium	NS	3,000	NA	30 U	NA	NA	30 U	NA	NA	30 U	NA	NA	NA	30 U	NA	NA
	Vanadium	NS	4,000	NA	25 U	NA	NA	25 U	NA	NA	25 U	NA	NA	NA	25 U	NA	NA
	Zinc	NS	900	NA	**160**	NA	NA	**43**	NA	NA	**48**	NA	NA	NA	**25**	NA	NA
Metals, total																	
(ug/L)	Antimony	NS	8,000	40.0 U	40 U	NA	NA	40 U	NA	NA	40 U	NA	NA	NA	40 U	NA	NA
	Arsenic	NS	900	5.0 U	**9.2**	NA	NA	**11**	NA	NA	**10**	NA	NA	NA	**5.8**	NA	NA
	Barium	NS	50,000	**288**	**98**	NA	NA	**76**	NA	NA	**140**	NA	NA	NA	50 U	NA	NA
	Beryllium	NS	200	2.0 U	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Cadmium	NS	4	**3.7**	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Chromium	NS	300	**30.0**	5.0 U	NA	NA	5.0 U	NA	NA	5.0 U	NA	NA	NA	5.0 U	NA	NA
	Lead	NS	10	**50.8**	7.5 U	NA	NA	7.5 U	NA	NA	**220**	NA	NA	NA	7.5 U	NA	NA
	Mercury	NS	20	**0.36**	0.10 U	NA	NA	0.10 U	NA	NA	0.10 U	NA	NA	NA	0.10 U	NA	NA
	Nickel	NS	200	**26.0**	5.0 U	NA	NA	5.0 U	NA	NA	5.0 U	NA	NA	NA	5.0 U	NA	NA
	Selenium	NS	100	30.0 U	25 U	NA	NA	25 U	NA	NA	25 U	NA	NA	NA	25 U	NA	NA
	Silver	NS	7	3.0 U	2.5 U	NA	NA	2.5 U	NA	NA	2.5 U	NA	NA	NA	2.5 U	NA	NA
	Thallium	NS	3,000	30.0 U	30 U	NA	NA	30 U	NA	NA	30 U	NA	NA	NA	30 U	NA	NA
	Vanadium	NS	4,000	25.0 U	25 U	NA	NA	25 U	NA	NA	25 U	NA	NA	NA	25 U	NA	NA
	Zinc	NS	900	**1,870**	**260**	NA	NA	**51**	NA	NA	**150**	NA	NA	NA	**21**	NA	NA

Notes:
ug/L - micrograms per liter.
NA - Sample not analyzed for the listed analyte.
NS - No MassDEP standards exist for this compound.
U - Compound was not detected at specified quantitation limit.
Values in **Bold** indicate the compound was detected.
Values shown in Bold and shaded type exceed one or more of the listed MassDEP Method 1 standards.
VOCs - Volatile Organic Compounds.
EPH - Extractable Petroleum Hydrocarbons.
PAHs - Polynuclear Aromatic Hydrocarbons.
PCBs - Polychlorinated Biphenyls.
(1) - MassDEP Method 1 standardsfor C9-C10 aromatic hydrocarbons used.
(2) - MassDEP Method 1 standards for 1,3-Dichloropropene used.



Notes:
1. All sampling locations are approximate.
2. Drawing is not to scale.

NEW BEDFORD HIGH SCHOOL
230 HATHAWAY BLVD
NEW BEDFORD, MASSACHUSETTS

GROUNDWATER, INDOOR AIR AND SEEP SAMPLING LOCATIONS

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(978) 970-5600

FIGURE 1

DRAWN BY: HWB
CHECKED BY: JBS
DATE: FEB 2010

FILE: T:\E_CAD\115058\NBHS\GW INDOOR AIR SAMP.dwg

APPENDIX E

GROUNDWATER MONITORING WELL INSTALLATION LOGS

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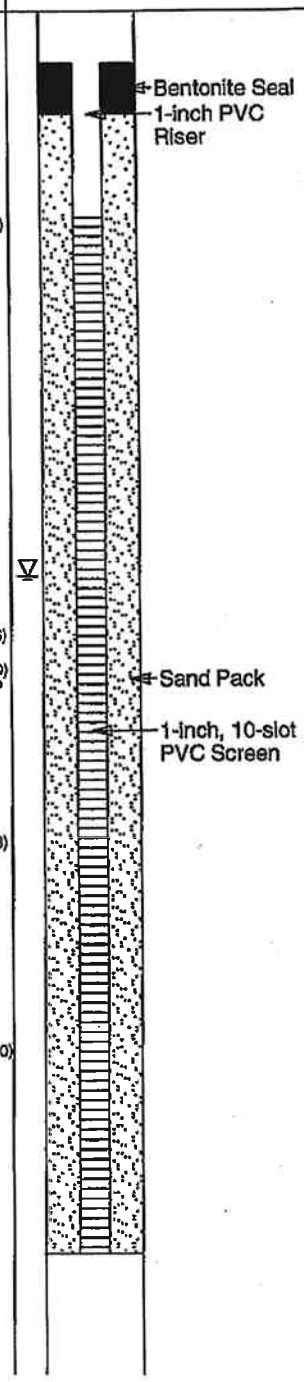
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford (NBHS)/115058
BORING/WELL NUMBER NBHS-4/MW-4
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows
DATE DRILLED 7/31/08
LOCATION NBHS - Inside garage bay of NBHS auto shop classroom.
SAMPLING METHOD 48" Macrocore
DRILLING METHOD Direct Push/5400 Truck Rig
SCREEN TYPE/SLOT NA
FILTER PACK TYPE NA
SEAL TYPE NA
DEPTH TO WATER (Approximate Feet) 5.5
TOTAL DEPTH (Feet) 12
GROUND ELEVATION (Feet) 84.68
REFERENCE ELEVATION (Feet)
NOTES Sampled for PCBs, PAHs & Metals, NBHS-4 (2) sampled for PCBs only. (Hold NBHS-4 (10))

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	TRC ID	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
		48/44"		S-1		0-4" CONCRETE	0.0	
1, 2, 3						4-44" Tan to brown fine to medium SAND, little to some coarse sand, trace fine to coarse gravel, slightly moist, no odor, no staining.		NBHS-4 (2) 0940
4, 5		48/36"		S-2		0-12" Tan to gray-brown fine to medium SAND, little coarse sand, trace fine to medium gravel, moist, no odor, no staining.	0.0	
						12-16" Dark-brown SILT, trace glass, moist, dense, no odor, no staining.		
6, 7						16-36" Gray fine to coarse SAND, little fine gravel, loose, wet, no odor, no staining.		NBHS-4 (6) 0945 NBHS-4 (D) 0845 DUP
8, 9		48/24'		S-3		0-12" Gray fine to coarse SAND, little fine gravel, loose, wet, no odor, no staining.	0.0	NBHS-4 (8) 0950
10, 11						12-24" Orange to brown fine to coarse SAND, little fine to medium gravel, wet, no odor, no staining.		NBHS-4 (10) 0955
12						End of Boring @ 12 feet		

WELL DIAGRAM



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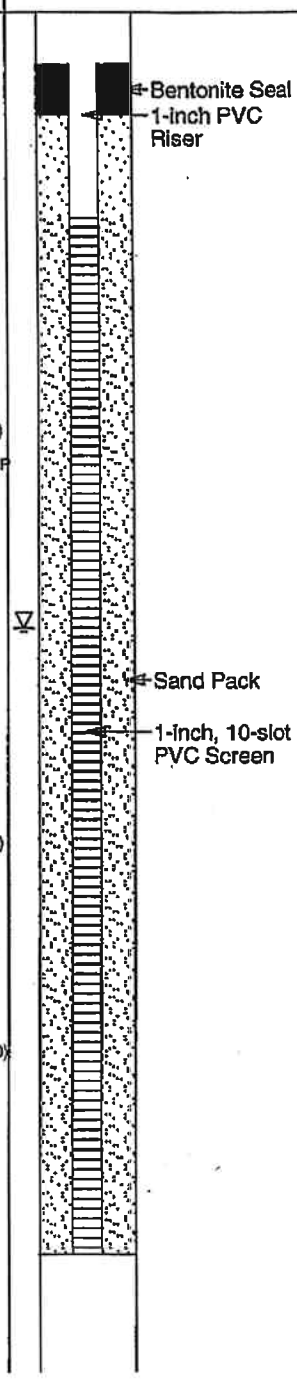
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford (NBHS)/115058
BORING/WELL NUMBER NBHS-5/MW-5
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows
DATE DRILLED 7/30/08
LOCATION NBHS - Immediately inside boiler room garage door.
SAMPLING METHOD 48" Macrocore
DRILLING METHOD Direct Push/5400 Truck Rig
NOTES Sampled for PCBs, PAHs & Metals. (Hold NBHS-5 (10))

SCREEN TYPE/SLOT NA
FILTER PACK TYPE NA
SEAL TYPE NA
DEPTH TO WATER (Approximate Feet) 6
TOTAL DEPTH (Feet) 12
GROUND ELEVATION (Feet) 84.71
REFERENCE ELEVATION (Feet)

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	TRC ID	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
		48/32"		S-1		0-4" CONCRETE (cored)	0.0	
1						4-10" Brown fine to medium SAND, little coarse sand, trace fine gravel, moist (from coring machine), no odor, no staining.		
2						10-16" Pulverized gray ROCK fragments with some fine sand.		
3						16-32" Tan fine to medium SAND, little coarse sand, trace fine to coarse gravel, moist, no odor, no staining.		
4		48/36"		S-2		0-32" Gray to brown fine to medium SAND, little to some coarse sand, trace fine gravel, mottling, moist to wet at approximately 6-feet, very dense, no odor, no staining.	0.0	NBHS-5 (4) 1440 Plus MS/DUP
5								
6								
7								
8						32-36" Gray fine SAND, some silt, wet, no odor, no staining.		
		48/24"		S-3		0-24" Gray fine SAND, some silt, pulverized gray rock fragments at approximately 10-feet, dense, wet, no odor, no staining.	0.0	NBHS-5 (8) 1450
9								
10								NBHS-5 (10) 1500
11								
12						End of Boring @ 12 feet		

WELL DIAGRAM



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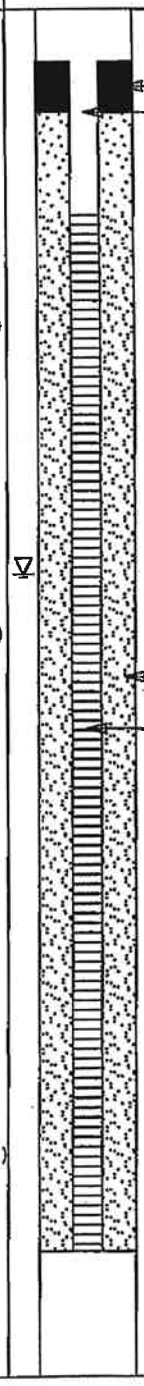
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford (NBHS)/115058
BORING/WELL NUMBER NBHS-6/MW-6
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows
DATE DRILLED 7/28/08
LOCATION NBHS - Tan house storage room (east of kitchen)
SAMPLING METHOD 48" Macrocore
DRILLING METHOD 540 M Dolly Rig
NOTES Sampled for PCBs & Metals. (Hold NBHS-6 (11))

SCREEN TYPE/SLOT NA
FILTER PACK TYPE NA
SEAL TYPE NA
DEPTH TO WATER (Approximate Feet) 5.5
TOTAL DEPTH (Feet) 12
GROUND ELEVATION (Feet) 84.74
REFERENCE ELEVATION (Feet)

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	TRC ID	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
		48/41"		S-1		0-5" CONCRETE	0.0	
1						5-11" Tan to brown sub-base fine SAND, little fine gravel, trace medium to coarse sand, slightly moist, no odor, no staining.		
						11-14" Pulverized ROCK fragments.		
2						14-41" Tan to brown fine to medium SAND, little coarse sand and fine to medium gravel mottling, moist, no odor, no staining. (gray fine sand in cutting shoe).		
3								NBHS-6 (3) 1415
4		48/36"		S-2		0-12" Tan to brown fine to medium SAND, trace coarse sand and fine gravel, moist to wet at approximately 5.5 to 6-feet, no odor, no staining.	0.0	
5						12-36" Gray fine SAND, some silt, relatively dense, wet, no odor, no staining.		
6								NBHS-6 (6) 1420
7								
8		48/NA"		S-3		Note: Liner stuck in core barrel, but appeared to be full of native gray sand. Once liner was removed the material from the bottom of the core was gray fine SAND, wet, no staining, no odor (undisturbed material collected and held for analyses from approximately 11-feet).	0.0	
9								
10								
11								NBHS-6 (11) 1425
12						End of Boring @ 12 feet		

WELL DIAGRAM



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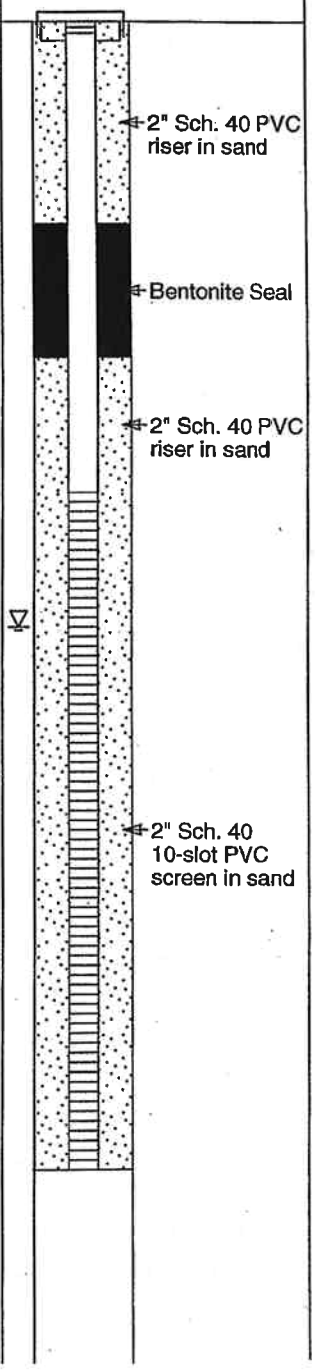
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER SB-349/MW-7
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas
DATE DRILLED 8/21/08
LOCATION Southeast corner of NBHS flagpole island
SAMPLING METHOD 60" Macrocore
DRILLING METHOD 6600 DT Truck Rig
SCREEN TYPE/SLOT Sch. 40 10-slot PVC
FILTER PACK TYPE Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 9
TOTAL DEPTH (Feet) 15
GROUND ELEVATION (Feet, NAVD 88)
REFERENCE ELEVATION (Feet, NAVD 88) NA
NOTES Sampled for PCBs, PAHs & Metals, SB-349 (1) only sampled for PCBs. (Hold SB-349 (14))

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	TRC ID	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
		60/24"		S-1		0-4" Tan to brown TOPSOIL and SILT, trace roots, dry, no odor, no staining.	0.0	
1						4-10" Dark-brown fine SAND, trace silt, glass, wood and fine gravel, dry, no odor, no staining.		SB-349 (1) 0845
2								
3						10-24" Tan fine to medium SAND, trace coal and rust coloration at approximately 4.5-feet, slightly moist, no odor, no staining.		
4								
5		60/24"		S-2		0-12" Tan fine to medium SAND, trace fine to medium gravel, moist.	0.0	
6								
7								
8						12-24" Dark-brown to rusty-brown FILL (ash, glass, slag and coal) and fine SAND, little fine gravel, wet at approximately 9-feet, no odor, no staining.		SB-349 (8) 0850 SB-349-D 0855
9								
10		60/30"		S-3		0-18" Dark-brown organic PEAT and SILT, some fibrous organic material.	0.0	
11								SB-349 (11) 0910
12								
13						18-30" Gray fine to medium SAND, trace coarse sand, wet, no odor, no staining.		
14								SB-349 (14) 0915
15						End of Boring @ 15 feet		

WELL DIAGRAM



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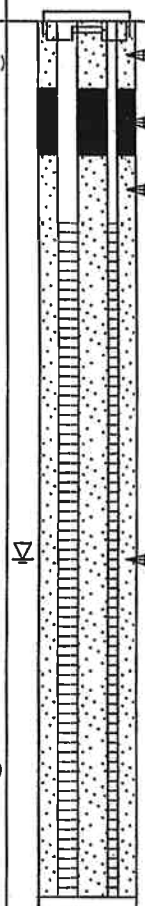
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER SB-350/MW-8A & MW-8B
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas
DATE DRILLED 8/21/08
LOCATION Northeast corner of NBHS northwest parking lot (in grass)
SAMPLING METHOD 60" Macrocore
DRILLING METHOD 6600 DT Truck Rig
NOTES Sampled for PCBs, PAHs & Metals, SB-350 (0.5) only sampled for PCBs. (Hold SB-350 (11))

SCREEN TYPE/SLOT Sch. 40 10-slot PVC
FILTER PACK TYPE Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 8
TOTAL DEPTH (Feet) 14
GROUND ELEVATION (Feet, NAVD 88)
REFERENCE ELEVATION (Feet, NAVD 88) NA

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	TRC ID	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
		60/18"		S-1		0-12" Dark-brown organic TOPSOIL and SILT, trace fine to medium sand, dry, no odor, no staining.	0.0	SB-350 (0.5) 1005
						12-18" Tan fine to medium SAND, trace coarse sand and fine gravel, cutting shoe has rusty fine to medium sand with possible ash, some glass and rubber debris in tip, moist, no odor, no staining.		
		60/30"		S-2		0-2" Rusty colored FILL (ash, glass and possible coal and cinders), some organic silt.	0.0	SB-350 (5) 1010
						2-6" Organic SILT/PEAT, moist, no odor, no staining.		
						6-18" Gray fine to coarse SAND, trace fine gravel, dense, very moist, no odor, no staining.		
						18-30" Gray to brown mottled fine to coarse SAND, trace fine gravel, wet at approximately 8 to 9-feet, no odor, no staining.		SB-350 (8) 1015
		48/18"		S-3		0-18" Gray to brown fine to coarse SAND, some fine to coarse gravel and pulverized rock, very dense (possibly till), wet.	0.0	SB-350 (11) 1020
						End of Boring @ 14 feet (refusal at 14-feet)		

WELL DIAGRAM



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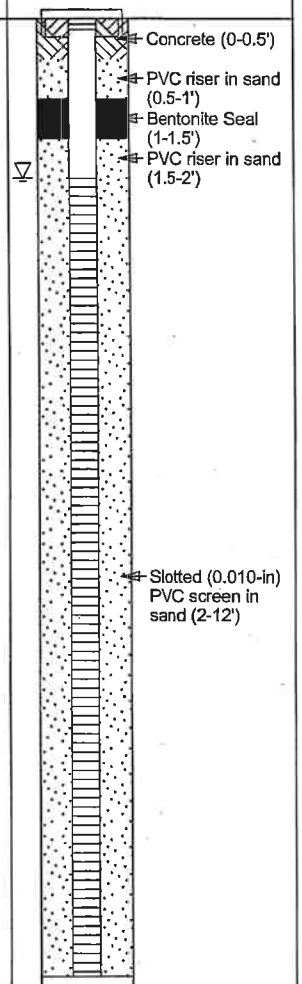
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER MW-11
TRC GEOLOGIST K. Kitchin
DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows
DATE DRILLED 2/15/10
LOCATION Adjacent to Lift Station
SAMPLING METHOD 60" Macrocore
DRILLING METHOD Direct Push/6620DT Geoprobe
NOTES No Soil samples collected.

SCREEN TYPE/SLOT 2-inch Schedule 40 Slotted (0.010-in) PVC
FILTER PACK TYPE #2 Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 2
TOTAL DEPTH (Feet) 12
GROUND ELEVATION (Feet) 83.97
REFERENCE ELEVATION (Feet) 83.86

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	60/40	MC-1		0-10" Dark brown organic SILT (TOPSOIL), trace roots and fine gravel, moist, no odor, no staining.		NA
1					10-40" Brown to grey fine to coarse SAND, some fine to coarse gravel, trace silt, wet, no odor, no staining.		
2							
3						0.0	
4							
5	NA	60/60	MC-2		0-15" Brown to grey fine to coarse SAND, some fine to coarse gravel, trace silt, wet, no odor, no staining.		NA
6							
					15-60" Grey fine SAND, dense, wet, no odor, no staining.		
7							
8						0.0	
9							
10	NA	NA	NA		End of Boring - Terminated at 10 feet Advance 3-inch casing to 12 feet to install monitoring well.		NA
11						NA	
12							

WELL DIAGRAM



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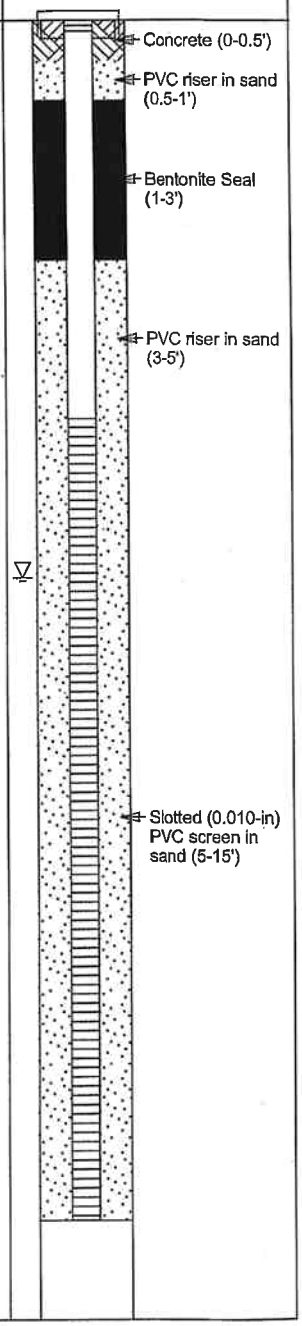
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER MW-12
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas
DATE DRILLED 2/15/10
LOCATION Off midpoint of House #1
SAMPLING METHOD 60" Macrocore
DRILLING METHOD Direct Push/6600 Truck Rig Geoprobe
NOTES No Soil samples collected.

SCREEN TYPE/SLOT 2-inch Schedule 40 Slotted (0.010-in) PVC
FILTER PACK TYPE #2 Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 7
TOTAL DEPTH (Feet) 15
GROUND ELEVATION (Feet) 89.70
REFERENCE ELEVATION (Feet) 89.37

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	60/36	MC-1		0-14" Dark brown organic TOPSOIL (silt and fine sand), trace fine gravel and roots, slightly moist, no odor, no staining.		NA
1					14-20" Tan to brown fine SAND, little to some silt, slightly moist, no odor, no staining.		
2					20-36" FILL (ash, coal, slag, glass, some silty matrix), moist, no odor, no staining.		
3						0.0	
4							
5	NA	60/12	MC-2		0-12" FILL (ash, coal, slag, glass, some silty matrix), wet. Note: Wood and silt in tip - appears that pushed and lost recovery at depth with fill collapse.		NA
6					No Recovery		
7							
8						0.0	
9							
10	NA	NA	NA		End of Boring - Terminated at 10 feet Advance 3-inch casing to 15 feet to install monitoring well.		NA
11							
12							
13						NA	
14							
15							

WELL DIAGRAM



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650 Suffolk Street
Lowell MA
Telephone: 978-970-5600
Fax: 978-453-1995

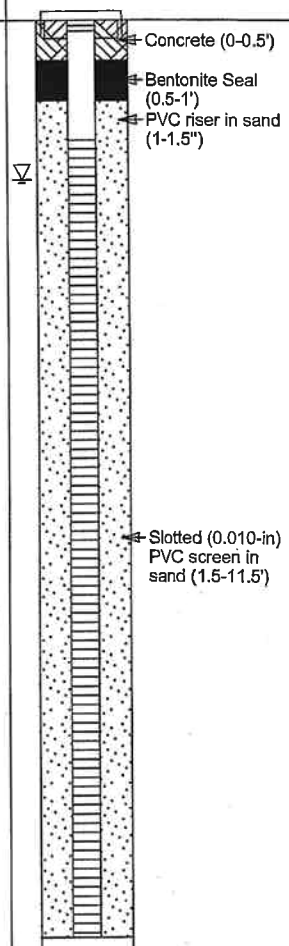
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER MW-13
TRC GEOLOGIST K. Kitchin
DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows
DATE DRILLED 2/15/10
LOCATION Within paved courtyard between House #1 & #2
SAMPLING METHOD 60" Macrocore
DRILLING METHOD Direct Push/6620DT Geoprobe
NOTES No Soil samples collected.

SCREEN TYPE/SLOT 2-inch Schedule 40 Slotted (0.010-in) PVC
FILTER PACK TYPE #2 Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 2
TOTAL DEPTH (Feet) 11.5
GROUND ELEVATION (Feet) 84.23
REFERENCE ELEVATION (Feet) 83.86

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	60/38	MC-1		0-5" Pulverized ASPHALT.		NA
1, 2, 3, 4					5-38" Brown fine to coarse SAND, trace fine to coarse gravel, wet (at 1.5-2'), no odor, no staining.	0.0	
5	NA	NA	NA		End of Boring - Terminated at 5 feet Advance 3-inch casing to 11.5 feet to install monitoring well.		NA
6, 7, 8, 9, 10, 11						NA	

WELL DIAGRAM



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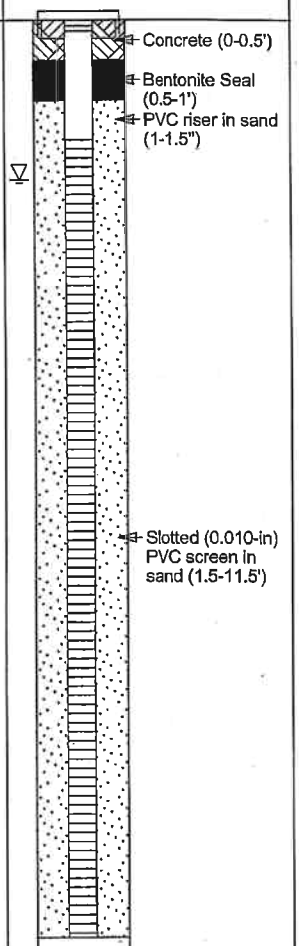
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER MW-14
TRC GEOLOGIST K. Kitchin
DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows
DATE DRILLED 2/15/10
LOCATION Within paved courtyard between House #2 & #3
SAMPLING METHOD 60" Macrocore
DRILLING METHOD Direct Push/6620DT Geoprobe
NOTES No Soil samples collected.

SCREEN TYPE/SLOT 2-inch Schedule 40 Slotted (0.010-in) PVC
FILTER PACK TYPE #2 Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 2
TOTAL DEPTH (Feet) 11.5
GROUND ELEVATION (Feet) 84.02
REFERENCE ELEVATION (Feet) 83.64

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	60/30	MC-1		0-5" Pulverized ASPHALT.		NA
1, 2, 3, 4					5-30" Brown to grey fine to coarse SAND, some fine to coarse gravel, wet (at 1.5-2'), no odor, no staining.	0.0	
5	NA	NA	NA		End of Boring - Terminated at 5 feet Advance 3-inch casing to 11.5 feet to install monitoring well.		NA
6, 7, 8, 9, 10, 11						NA	

WELL DIAGRAM



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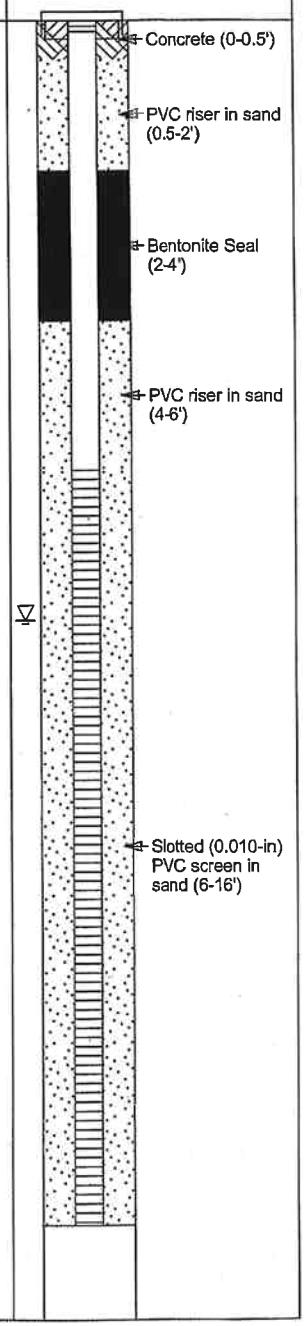
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER MW-15
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas
DATE DRILLED 2/15/10
LOCATION Off midpoint of House #3
SAMPLING METHOD 60" Macrocore
DRILLING METHOD Direct Push/6600 Truck Rig Geoprobe
NOTES No Soil samples collected.

SCREEN TYPE/SLOT 2-inch Schedule 40 Slotted (0.010-in) PVC
FILTER PACK TYPE #2 Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 8
TOTAL DEPTH (Feet) 16
GROUND ELEVATION (Feet) 89.46
REFERENCE ELEVATION (Feet) 89.23

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	60/54	MC-1		0-20" Dark brown organic TOPSOIL (silt and fine sand), trace roots and fine to medium gravel, moist, no odor, no staining.		NA
1							
2					20-21" White pulverized GRAVEL.		
					21-50" Tan brown fine SAND, little silt, slightly moist, no odor, no staining.	0.0	
3							
4					50-54" Dark brown organic SILT (PEAT), trace roots, moist, no odor, no staining.		
5	NA	60/20	MC-2		0-4" Dark red brown SILT with pulverized GRAVEL, very moist to wet, no odor, no staining.		NA
6					4-18" dark brown organic SILT (PEAT), trace roots, wet, no odor, no staining.		
7					18-20" Grey fine SAND, wet, no odor, no staining.		
8						0.0	
9							
10	NA	NA	NA		End of Boring - Terminated at 10 feet Advanced 3-inch casing to 16 feet to install monitoring well.		NA
11							
12							
13						NA	
14							
15							
16							

WELL DIAGRAM



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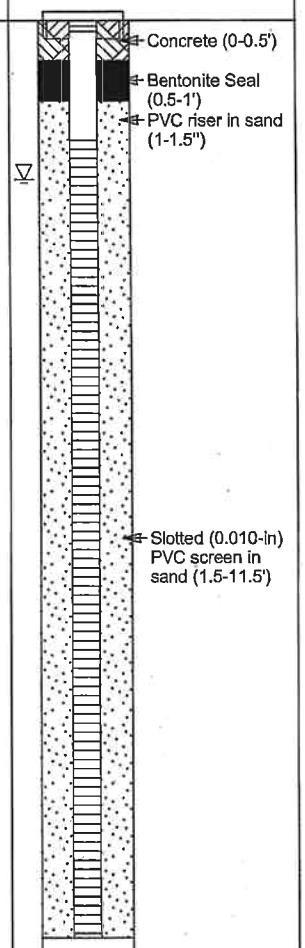
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER MW-16
TRC GEOLOGIST K. Kitchin
DRILLING CONTRACTOR/FOREMAN New England Geotech/Bill Meadows
DATE DRILLED 2/15/10
LOCATION Within paved courtyard between House #3 & #4
SAMPLING METHOD 60" Macrocore
DRILLING METHOD Direct Push/6620DT Geoprobe
NOTES No Soil samples collected.

SCREEN TYPE/SLOT 2-inch Schedule 40 Slotted (0.010-in) PVC
FILTER PACK TYPE #2 Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 2
TOTAL DEPTH (Feet) 11.5
GROUND ELEVATION (Feet) 84.12
REFERENCE ELEVATION (Feet) 83.85

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	60/40	MC-1		0-4" Pulverized ASPHALT.		NA
					4-8" Brown fine to coarse SAND, some fine to coarse gravel, moist, no odor, no staining.		
1					8-35" Brown fine to coarse SAND, some fine to coarse gravel, wet, no odor, no staining.		
2							
						0.0	
3					35-38" Pulverized GRAVEL.		
					38-40" Brown fine to coarse SAND, some fine to coarse gravel, wet, no odor, no staining.		
4							
5	NA	NA	NA		End of Boring - Terminated at 5 feet Advanced 3-inch casing to 11.5 feet to install monitoring well.		NA
6							
7							
8						NA	
9							
10							
11							

WELL DIAGRAM



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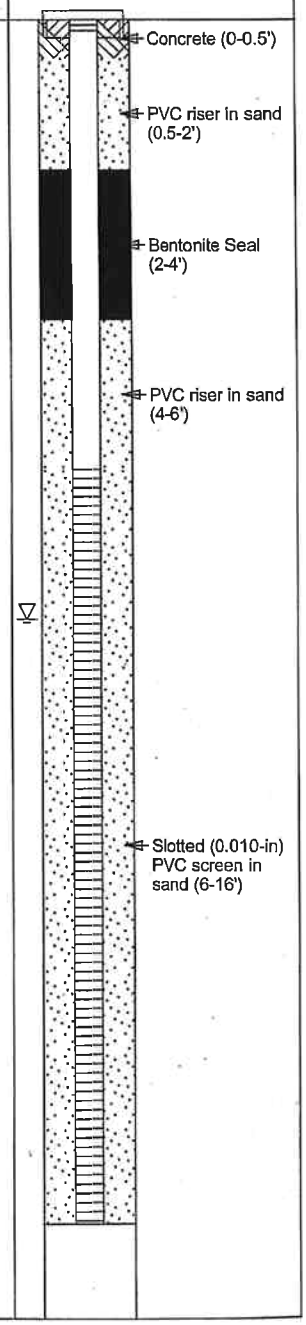
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER MW-17
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas
DATE DRILLED 2/15/10
LOCATION Off midpoint of House #4
SAMPLING METHOD 60" Macrocore
DRILLING METHOD Direct Push/6600 Truck Rig Geoprobe
NOTES No Soil samples collected.

SCREEN TYPE/SLOT 2-inch Schedule 40 Slotted (0.010-in) PVC
FILTER PACK TYPE #2 Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 8
TOTAL DEPTH (Feet) 16
GROUND ELEVATION (Feet) 89.87
REFERENCE ELEVATION (Feet) 89.66

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	60/40	MC-1		0-8" Dark brown TOPSOIL (silt and fine sand), trace fine gravel and roots, very slightly moist, no odor, no staining.		NA
1, 2, 3, 4					8-40" Tan brown fine SAND, little silt, trace medium sand, slightly moist to moist, no odor, no staining.	0.0	
5	NA	60/35	MC-2		0-5" Collapse from above.		NA
6, 7, 8, 9					5-30" Dark red-brown fine to medium SAND, little silt, trace coarse sand and fine gravel, moist to wet, no odor, no staining.	0.0	
10	NA	NA	NA		End of Boring - Terminated at 10 feet Advanced 3-inch casing to 16 feet to install monitoring well		NA
11, 12, 13, 14, 15, 16						NA	

WELL DIAGRAM



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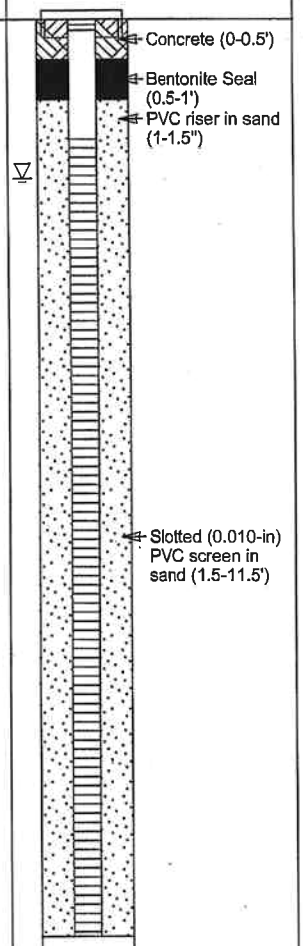
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER MW-18
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas
DATE DRILLED 2/15/10
LOCATION Parking lot off Southwest corner of playground
SAMPLING METHOD 60" Macrocore
DRILLING METHOD Direct Push/6600 Truck Rig Geoprobe
NOTES No Soil samples collected.

SCREEN TYPE/SLOT 2-inch Schedule 40 Slotted (0.010-in) PVC
FILTER PACK TYPE #2 Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 2
TOTAL DEPTH (Feet) 11.5
GROUND ELEVATION (Feet) 84.28
REFERENCE ELEVATION (Feet) 84.09

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	60/30	MC-1		0-2" ASPHALT. 2-30" Tan brown fine to medium SAND, little coarse sand, trace fine to medium gravel, moist to wet, no odor, no staining.	0.0	NA
5	NA	NA	NA		End of Boring - Terminated at 5 feet Advanced 3-inch casing to 11.5 feet to install monitoring well.	NA	NA

WELL DIAGRAM



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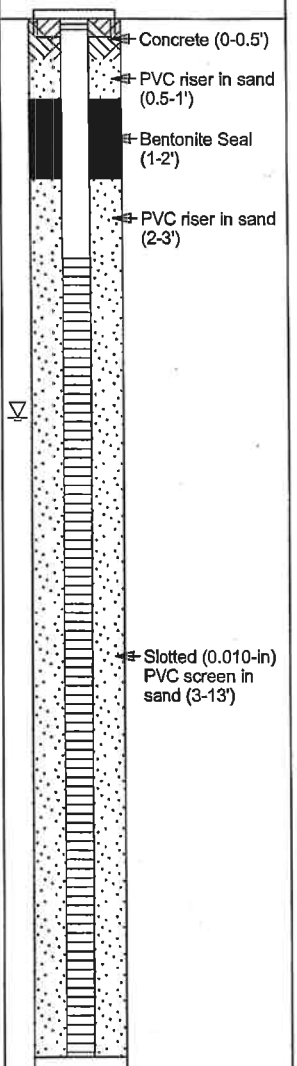
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford/115058
BORING/WELL NUMBER MW-19
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Hayes Rembijas
DATE DRILLED 2/15/10
LOCATION Southeast corner of Auditorium Parking lot
SAMPLING METHOD 60" Macrocore
DRILLING METHOD Direct Push/6600 Truck Rig Geoprobe
NOTES No Soil samples collected.

SCREEN TYPE/SLOT 2-inch Schedule 40 Slotted (0.010-in) PVC
FILTER PACK TYPE #2 Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 5
TOTAL DEPTH (Feet) 13
GROUND ELEVATION (Feet) 88.76
REFERENCE ELEVATION (Feet) 88.58

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	60/48	MC-1		0-2" ASPHALT.		NA
1					2-42" Orange to tan-brown fine SAND, little medium to coarse sand, trace fine gravel, slightly moist to moist, no odor, no staining.		
2							
3						0.0	
4					42-48" FILL (ash with glass, coal, and slag), orange to brown ash with dark brown matrix, moist to wet, no odor, no staining.		
5	NA	60/24	MC-2		0-6" FILL (ash with glass, coal, and slag), wet, no odor, no staining.		NA
					6-10" WOOD DEBRIS, wet.		
6					10-24" Dark brown organic SILT (PEAT), trace roots, moist to wet, no odor, no staining.		
7							
8						0.0	
9							
10	NA	NA	NA		End of Boring - Terminated at 10 feet Advanced 3-inch casing to 13 feet to install monitoring well.		NA
11							
12						NA	
13							

WELL DIAGRAM



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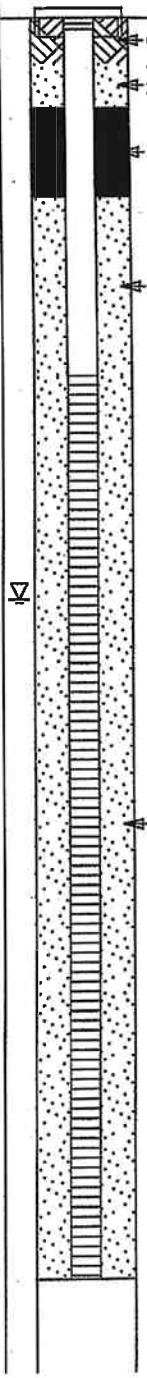
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford (NBHS)/115058
BORING/WELL NUMBER MW-HH-13
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Steve Perry
DATE DRILLED 4/3/09
LOCATION NBHS - North of House #2 (C-block)
SAMPLING METHOD 48" Macrocore
DRILLING METHOD Direct Push/6620 DT Track Rig
NOTES Samples analyzed for Dibenzofuran

SCREEN TYPE/SLOT 0.010 2-inch slotted PVC: 4-14 feet
FILTER PACK TYPE Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 6.5
TOTAL DEPTH (Feet) 14
GROUND ELEVATION (Feet, NAVD 88) 88.17
REFERENCE ELEVATION (Feet, NAVD 88) 87.85

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	TRC ID	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	48/22		S-1		12" Dark brown SILT and fine SAND, trace roots and fine gravel, moist, no odor, no staining.		HH-13(0-1) 1515
1						1" Pulverized GRAVEL.		
						9" FILL (silty matrix with ash, trace to little coal, brick, plastic and wood debris), moist, no odor, no staining.	0.0	HH-13(1-3) 1520
2								
3								
4	NA	48/20		S-2		18" Dark brown to black organic PEAT, wet, no odor, no staining.		
5								
6						2" Gray fine SAND and GRAVEL, wet, no odor, no staining.	0.0	
7								
8	NA	48/25		S-3		28" Gray fine SAND, little silt, wet, no odor, no staining.		
9								
10							0.0	
11								
12		NA		NA		No Sample Collected		
13							NA	
14						End of Boring - Terminated at 14 feet		

WELL DIAGRAM



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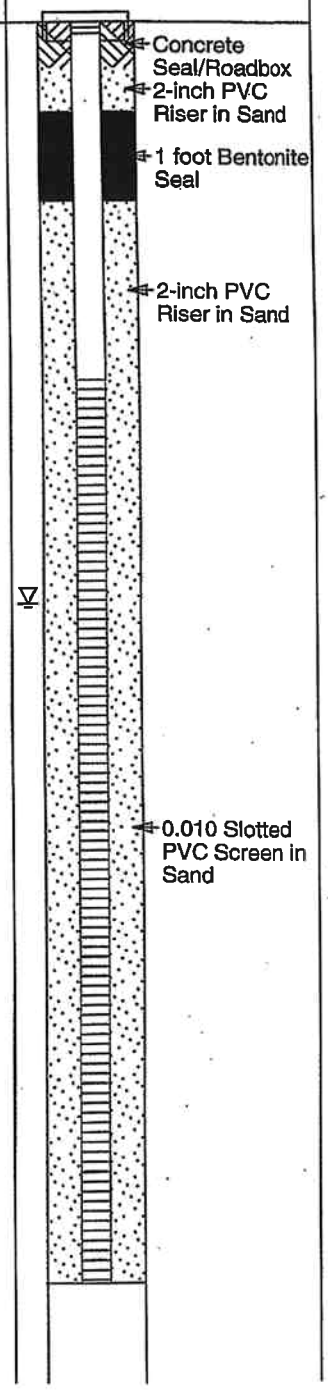
BORING/WELL CONSTRUCTION LOG

CLIENT/PROJECT NUMBER City of New Bedford (NBHS)/115058
BORING/WELL NUMBER MW-HRC-33
TRC GEOLOGIST J. Saunders
DRILLING CONTRACTOR/FOREMAN New England Geotech/Steve Perry
DATE DRILLED 4/3/09
LOCATION NBHS - HRC-33 Location/Adjacent to bus yard
SAMPLING METHOD 48" Macrocore
DRILLING METHOD Direct Push/6620 DT Track Rig
NOTES No Samples Collected

SCREEN TYPE/SLOT 0.010 2-inch slotted PVC: 4-14 feet
FILTER PACK TYPE Sand
SEAL TYPE Bentonite
DEPTH TO WATER (Approximate Feet) 6.5
TOTAL DEPTH (Feet) 14
GROUND ELEVATION (Feet, NAVD 88) 86.26
REFERENCE ELEVATION (Feet, NAVD 88) 86.09

DEPTH (ft. BGL)	BLOW COUNTS	PEN/REC (INCHES)	CORE #	TRC ID	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Testing (ppm)	SAMPLE ID/ TIME
	NA	48/18		S-1		6" Dark brown SILT and fine SAND, trace roots and fine gravel, slightly moist, no odor, no staining.		
						6" Pulverized GRAVEL.		
1						6" SILT and FILL (ash, trace brick and glass), trace fine gravel, moist, no odor, no staining.		
2							0.0	
3								
4	NA	48/26		S-2		4" Dark-tan-brown SILT, some fine sand, trace to little fine gravel, and fill (ash and brick), moist to wet, no odor, no staining.		
5						22" Dark brown organic PEAT, little root/wood debris, wet, slight organic odor, no staining.		
6							0.0	
7								NA
8	NA	48/36		S-3		8" Dark brown organic PEAT, little root/wood debris, wet, slight organic odor, very slight sheen (likely a result of organic matter breakdown), no staining.		
9						28" Gray fine SAND, little silt, trace medium sand, wet.		
10							0.0	
11								
12		NA		NA		No Sample Collected		
13							NA	
14						End of Boring - Terminated at 14 feet		

WELL DIAGRAM



APPENDIX F

GROUNDWATER MONITORING SAMPLING LOGS

TRC

Low-flow Groundwater Sampling Data Record

Project:	Project No.:	Date/Time:	Sheet
NBHS	115058	1/6/10 1130	1 of 2

TRC Personnel: K. Kitchin

Well Identification: MW-4

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present		X
Security Lock Present		X

* Stopped to discuss sample rationale w/ J. Saunders

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [ ] 2 inch [ ] 4 inch [ ] 6 inch [X] 1 in

WELL MATERIAL: [X] PVC [ ] SS [ ] ___

Well Depth 11.37 ft. [X] top of riser [ ] top of casing [ ] ___ [X] measured [ ] historical

Water Depth 1.52 ft.

Height of Water Column 9.85 ft. x [ ] .16 gal/ft (2 in.) [ ] .65 gal/ft (4 in.) [ ] 1.5 gal/ft (6 in.) [X] 0.04 gal/ft (1 in.)

Volume of Water in Well = ~0.40 gallon(s)

~1.0 Total gallons purged

[Vol. = r^2 h(0.163)]

PID SCREENING MEAS.

Background	NA
Well Mouth	NA

FIELD WATER QUALITY MEASUREMENTS

Time	1145	1148	1151	1154	1157	1200	1203	1206	1209	1212
pH (Std. Units)	5.97	5.97	5.92	5.89	5.89	5.90	5.91	5.89	5.89	5.90
Eh (millivolts)	85.4	87.7	90.3	91.9	93.9	95.9	97.8	99.9	100.1	102.5
Conduct. (µmhos/cm)	328	328	327	328	327	326	326	327	327	326
Temp. (C)	15.52	15.50	15.47	15.49	15.50	15.51	15.51	15.55	15.58	15.58
Turb. (NTU)	334	303	294	288	335	257	233	232	220	223
DO (mg/l)	2.69	2.70	2.48	2.04	2.44	2.20	1.95	1.70	1.61	1.57
Flow (ml/min)	40	40	40	40	40	40	40	40	40	40
Depth To Water (ft)	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53

Time	1215*	1230	1235	1240	1245	1248	1251	1254	1257	
pH (Std. Units)	5.91	5.89	5.90	5.90	5.90	5.90	5.90	5.91	5.91	Needed to stop purge due to beginning of clean
Eh (millivolts)	102.9	115.9	116.7	117.7	118.5	119.1	120.1	120.9	121.9	
Conduct. (µmhos/cm)	326	327	327	327	327	327	327	327	327	
Temp. (C)	15.58	15.55	15.57	15.60	15.65	15.69	15.72	15.76	15.77	
Turb. (NTU)	223	185	140	140	122	104.5	97.3	78.4	75.1	
DO (mg/l)	1.55	1.48	1.16	1.14	1.20	1.21	1.19	1.14	1.14	
Flow (ml/min)	40	40	40	40	40	40	40	40	40	
Depth To Water (ft)	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate:

Flow Rate @ 40 ml/min = ~0.01 gpm

QED Micropurge 3/4" BP w/ MP10 Controller and compressor

Famotte 20/20 Turb; YSI 600XL

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOC	N	HCl	6 ~~4~~ 40mL VOA		MW-4	
			↳ Collected extra QC volume for MS/MSD			

K:\geosci\fieldforms\lowflowrecord.ppt

Signed: [signature]

Rev: 1 Oct 2002

TRC

Low-flow Groundwater Sampling Data Record

Project:	Project No.:	Date/Time:	Sheet ~~1~~ 2 of ~~1~~ 2
NBHS	115058	9/6/00	

TRC Personnel: K. Kitchin

Well Identification: MW-4 (Cont.)

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present		X
Security Lock Present		X

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [ ] 2 inch [ ] 4 inch [ ] 6 inch [X] 1-in

WELL MATERIAL: [X] PVC [ ] SS [ ] ___

Well Depth 11.37 ft. [X] top of riser [ ] top of casing [ ] ___ [ ] measured [ ] historical

Water Depth 1.52 ft.

Height of Water Column 9.85 ft. x [ ] .16 gal/ft (2 in.) [ ] .65 gal/ft (4 in.) [ ] 1.5 gal/ft (6 in.) [X] 0.04 gal/ft (1 in.)

Volume of Water in Well = ~0.40 gallon(s)

[Vol. = r^2 h(0.163)]

___ Total gallons purged

PID SCREENING MEAS.

Background	
Well Mouth	

FIELD WATER QUALITY MEASUREMENTS

Time	1305	1308	1311	1314	1320	– SAMPLED; TURBIDITY A BIT				
pH (Std. Units)	5.90	5.90	5.90	5.90		HIGH BUT STABLE AS WELL				
Eh (millivolts)	125.1	125.4	125.8	126.2		AS OTHER PARAMETERS.				
Conduct. (µmhos/cm)	328	328	328	328						
Temp. (C)	15.87	15.85	15.80	15.82						
Turb. (NTU)	65.7	66.7	64.0	65.3						
DO (mg/l)	0.97	0.98	0.92	0.96						
Flow (ml/min)	40	40	40	40						
Depth To Water (ft)	1.53	1.53	1.53	1.53						
Time										
pH (Std. Units)	NOTE: COLLECTED POST VOC SAMPLING TURBIDITY									
Eh (millivolts)	MEASUREMENT READS = 15.1 NTUS - TURB CLEARED									
Conduct. (µmhos/cm)	VERY FAST UPON SAMPLING AFTER DETACHING									
Temp. (C)	TUBING FROM FLOW THRU CELL - FLOW THRU CELL									
Turb. (NTU)	WAS CAUSING THE EXTENDED TURBID READINGS.									
DO (mg/l)										
Flow (ml/min)										
Depth To Water (ft)										

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other: ___		

Description of Sampling Equipment and Flow Rate:

Flow Rate @ 40 ml/min = ~0.01 gpm
QED Micropurge 3/4" BP w/ MP10 Controller + Compressor; Lamotte 2020 Turb; YSI 600XL

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOC	N	HCl	6 - 40ml VOA			
			↳ Extra	QC Volume for MS/MSD		

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Signed: [signature]

Rev: 1 Oct 2002

TRC

Low-flow Groundwater Sampling Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
NBHS	~~150058~~ KMK 115058	1/6/09 0915	

TRC Personnel: K. Kitchin

Well Identification: MW-5

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	~~X~~ KMK	X
Security Lock Present	~~X~~ KMK	X

purge rate = ~~80~~ KMK 40 mL/min or 0.02 gpm

pump intake @ ~ 9.6 ft

PID SCREENING MEAS.

Background	NA
Well Mouth	NA

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: 2 inch; 4 inch; 6 inch; X 1 in

WELL MATERIAL: X PVC; SS; ___

Well Depth 10.98 ft. X top of riser; top of casing; ___ — X measured; historical

Water Depth 1.77 ft.

Height of Water Column 9.21 ft. x X 0.04 gal/ft (1 in.); .16 gal/ft (2 in.); .65 gal/ft (4 in.); 1.5 gal/ft (6 in.)

Volume of Water in Well = 0.37 gallon(s)

~~1.11~~ KMK Total gallons purged 0.57

[Vol. = r^2 h(0.163)]

FIELD WATER QUALITY MEASUREMENTS

Time	0930	0935	0940	0945	0948	0951	0954	0957	1000	1003
pH (Std. Units)	6.34	6.36	6.38	6.37	6.36	6.37	6.37	6.37	6.38	6.38
Eh (millivolts)	75.7	-28.7	-26.4	-37.9	-51.0	-56.9	-58.6	-60.8	-61.2	-62.3
Conduct. (µmhos/cm)	381	360	353	352	351	347	346	345	346	346
Temp. (C)	19.00	19.10	19.42	19.47	19.64	19.82	19.90	19.93	19.95	19.96
Turb. (NTU)	693	572	532	496	441	396	401	348	395	~~346~~ KMK 288
DO (mg/l)	1.45	0.99	1.37	1.11	0.77	0.70	0.68	0.63	0.65	0.68
Flow (ml/min)	~~80~~	~~80~~	~~80~~	~~80~~	~~80~~	~~80~~	~~80~~	~~80~~	~~80~~	~~80~~
Depth To Water (ft)	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79
Time	1006	1009	1012	1015						
pH (Std. Units)	6.38	6.38	6.38	SAMPLED; TURBIDITY HIGH BUT STABLE,						
Eh (millivolts)	-61.6	-60.8	-60.5	ALL OTHER PARAMETERS STABLE.						
Conduct. (µmhos/cm)	344	346	346							
Temp. (C)	19.97	19.98	19.98							
Turb. (NTU)	275	271	274							
DO (mg/l)	0.65	0.64	0.65							
Flow (ml/min)	~~80~~	~~80~~	~~80~~							
Depth To Water (ft)	1.79	1.79	1.79							

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other: ___		

Description of Sampling Equipment and Flow Rate:

QED 3/4" Micropurge Bladder pump

YSI 600XL

QED MP10 Controller and Compressor

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOC	N	HCl	3-40 mL Vial	1015	MW-5	
VOC	N	HCl	3-40 mL Vial	0915	MW-15	
					↳ DUP	SAMPLE.

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Rev: 1 Oct 2002

TRC

Low-flow Groundwater Sampling Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
NBHS	115058	11/7/09 1045	

TRC Personnel: K. Kitchin

Well Identification: MW-6

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present		X
Security Lock Present		X

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [ ] 2 inch [ ] 4 inch [ ] 6 inch [X] 1"

WELL MATERIAL: [X] PVC [ ] SS [ ] ___

Well Depth 10.90 ft. [X] top of riser [ ] top of casing [ ] ___ [X] measured [ ] historical

Water Depth 1.30 ft.

Height of Water Column 9.60 ft. x [ ] .16 gal/ft (2 in.) [ ] .65 gal/ft (4 in.) [ ] 1.5 gal/ft (6 in.) [X] 0.04 gal/ft (1 in.)

Volume of Water in Well = ~0.4 gallon(s)

1.2 Total gallons purged

[Vol. = r^2 h(0.163)]

PID SCREENING MEAS.

Background	NA
Well Mouth	NA

FIELD WATER QUALITY MEASUREMENTS

Time	1050	1055	1100	1103	1106	1109	1112	1115	1118	1121
pH (Std. Units)	6.34	6.31	6.30	6.28	6.28	6.28	6.27	6.27	6.26	6.26
Eh (millivolts)	-44.2	-47.7	-50.3	-54.2	-55.1	-56.8	-59.2	-60.6	-61.9	-63.1
Conduct. (µmhos/cm)	342	333	328	326	326	325	325	326	325	324
Temp. (C)	17.12	17.39	17.60	17.93	17.93	18.02	18.09	18.13	18.14	18.16
Turb. (NTU)	141	139	130	103.2	91.3	78.6	61.9	55.6	45.6	36.6
DO (mg/l)	10.02	8.68	7.67	6.50	6.47	6.25	5.92	5.77	5.60	5.30
Flow (ml/min)	70	70	70	70	70	70	70	70	70	70
Depth To Water (ft)	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32	1.32
Time	1124	1127	1130	1133	1136	1139	1145	SAMPLED		
pH (Std. Units)	6.26	6.25	6.25	6.25	6.25	6.25		PARAMETERS		STABLE
Eh (millivolts)	-64.4	-65.9	-67.1	-68.0	-68.9	-69.3		TURBIDITY SLIGHTLY		
Conduct. (µmhos/cm)	324	325	324	324	323	324		HIGH	BUT STABLE.	
Temp. (C)	18.18	18.19	18.20	18.20	18.20	18.21				
Turb. (NTU)	32.1	29.0	24.3	23.1	22.8	22.9				
DO (mg/l)	5.11	4.90	4.68	4.46	4.44	4.45				
Flow (ml/min)	70	70	70	70	70	70				
Depth To Water (ft)	1.32	1.32	1.32	1.32	1.32	1.32				

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other: ___		

Description of Sampling Equipment and Flow Rate:
QED micropurge 3/4" BP w/ MP10 controller + Compressor, Lamotte 2020, YSI 600XL
Flow Rate = 70 mL/min = ~0.02 gpm

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOC	N	HCL	2-40 mL VOA	MW-7 →	1145	

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Rev: 1 Oct 2002

TRC

Low-flow Groundwater Sampling Data Record

Project:	Project No.:	Date/Time:	Sheet 1 of 1
City of NB	115058	7/7/09 1440	

TRC Personnel: K. Kitchin / A. Weiss

Well Identification: MW-7

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present	X	

Switched YSI 600XL due to elevated DO readings.

PID SCREENING MEAS.

Background	NA
Well Mouth	NA

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch [ ] ___

WELL MATERIAL: [X] PVC [ ] SS [ ] ___

Well Depth 15.15 ft. [X] top of riser [ ] top of casing [ ] ___ [X] measured [ ] historical

Water Depth 8.30 ft.

Height of Water Column 7.65 ft. x [X] .16 gal/ft (2 in.) [ ] .65 gal/ft (4 in.) [ ] 1.5 gal/ft (6 in.) [ ] ___ gal/ft (__ in.)

Volume of Water in Well = 1.2 gallon(s)

1.3 Total gallons purged

[Vol. = r^2 h(0.163)]

FIELD WATER QUALITY MEASUREMENTS

Time	1445	#1450	1455	1458	1501	1504	1507	1510	1513	1516
pH (Std. Units)	6.32	6.54	6.29	6.25	6.20	6.20	6.19	6.18	6.18	6.18
Eh (millivolts)	53.3	44.0	53.9	55.6	60.9	62.2	64.0	65.3	67.9	69.7
Conduct. (µmhos/cm)	472	500	483	482	479	477	476	474	474	475
Temp. (C)	11.24	10.62	11.41	11.38	11.30	11.23	11.14	11.06	11.04	10.95
Turb. (NTU)	NM	20.2	17.8	15.9	13.2	11.1	10.57	10.03	9.22	6.60
DO (mg/l)	12.41	NM	NM	NM	NM	NM	NM	NM	NM	NM
Flow (ml/min)	NM	100	100	100	100	100	100	100	100	100
Depth To Water (ft)	NM	8.40	8.40	8.40	8.41	8.41	8.41	8.41	8.41	8.41
Time	1519	1522	1525	1528	1530	SAMPLED	STABILITY	REACHED		
pH (Std. Units)	6.18	6.18	6.18	6.18		FOR	PARAMETERS			
Eh (millivolts)	70.9	72.5	73.4	73.6						
Conduct. (µmhos/cm)	476	477	477	477						
Temp. (C)	10.83	10.84	10.88	10.86						
Turb. (NTU)	6.39	5.68	5.71	5.69						
DO (mg/l)	NM	NM	NM	NM						
Flow (ml/min)	100	100	100	100						
Depth To Water (ft)	8.41	8.41	8.41	8.41						

Pump Type	Purge	Sample
Peristaltic Pump	X	X
Submersible Pump		
Bladder Pump		
Other: ___		

Description of Sampling Equipment and Flow Rate: Geopump w/ poly tubing, Length = 2020. YSI 600XL

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOC	N	HCL	2-40 ml VOA	1530	MW-7	NA

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Rev: 1 Oct 2002

YSI Calibration Log

Date: 1/6/09

Instrument Number (refer to calibration logbook): 08G 101556

Has the temperature probe been checked for accuracy within the last year? Yes

Dissolved Oxygen (DO) Calibration

Time	Barometric Pressure (mm)	100% DO Calibration	Zero DO Check (mg/L)	Comments	Initials
0815	758.0	99.7	0.19		KMK

Conductivity Calibration

Time	Solution Temp	Recorded Reading (umhos/cm)	True Reading (umhos/cm)	Comments	Initials
0830	15.32	1.216	1.414	1.413 mS/cm Standard	KMK

pH Calibration

Time	pH 4	pH 7	pH 10	pH 4	Comments	Initials
0833	4.00					KMK
0835		7.01				KMK
0837			10.01			KMK
0840				4.02		KMK

Oxidation Reduction Potential (ORP) Calibration

Time	Solution Temp	Recorded Reading (mv)	True Reading (mv)	Comments	Initials
0843	15.84	251.7	240.1	240 mV Solution	KMK

Calibration Fluid ID Number (refer to calibration logbook)

Zero DO 45257616 pH 4 7278 pH 7 7268 pH 10 180370

Conductivity 7377 ORP ~~7268~~ 7279 KMK 1/4/09

revised 2/02

YSI Calibration Log

Date: 1/7/09

Instrument Number (refer to calibration logbook): SN 08G 101552

Has the temperature probe been checked for accuracy within the last year? Yes

Dissolved Oxygen (DO) Calibration

Time	Barometric Pressure (mm)	100% DO Calibration	Zero DO Check (mg/L)	Comments	Initials
0711	759.4	100.2	0.09	Long Response on Zero DO	KMK

Conductivity Calibration

Time	Solution Temp (°C)	Recorded Reading (umhos/cm)	True Reading (umhos/cm)	Comments	Initials
0729	13.39	1.428	1.415	1.413 mS/cm standard	KMK

pH Calibration

Time	pH 4	pH 7	pH 10	pH 4 KMK 7	Comments	Initials
0731	4.00				Read 4.02 Before Cal	KMK
0733		7.00			Read 7.03 Before Cal.	KMK
0735			10.01		Read 10.04 Before Cal	KMK
0737				7.00	Almost Instantaneous	KMK

Oxidation Reduction Potential (ORP) Calibration

Time	Solution Temp (°C)	Recorded Reading (mv)	True Reading (mv)	Comments	Initials
0739	13.51	239.6	240	240 mV Solution	KMK

Calibration Fluid ID Number (refer to calibration logbook)

Zero DO 45251616 pH 4 7278 pH 7 7268 pH 10 1803170
Conductivity 7377 ORP 1279

revised 2/02

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 1600 2/18/10	Sheet 1 of 1

TRC Personnel: H. Rizza + J Houlden

Well Identification: MW-HH-13

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present		X

Protective Casing Stick-up (from ground) Flush ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch [ ]

WELL MATERIAL: [X] PVC [ ] SS [ ]

Well Depth 4.35 ft. [X] top of riser [ ] top of casing [ ] measured [X] historical (well depth)

Water Depth 14 ft. 2/22/10

LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: 9.18

Static water level after pump put into well 4.40

Initial purge Rate/ Water Level (100-400 ml/min): 175 ml/min

Adjusted purge Rates/time/WL(record changes) NA

Flow rate at time of sampling: 175 ml/min

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1620	1630	1633	1636	1639	1642	1645	1648	1651	1654
Temp. (C)	10.59	9.77	9.63	9.44	9.29	9.13	8.97	8.85	8.72	8.67
Conduct. (µmhos/cm)	266	326	340	353	367	378	386	394	401	399
DO (mg/l)	1.23	0.55	0.53	0.50	0.48	0.45	0.45	0.44	0.43	0.42
pH (Std. Units)	6.27	6.39	6.43	6.46	6.49	6.51	6.54	6.54	6.57	6.56
Eh (millivolts)	72.4	-63.9	-78.8	-87.3	-95.3	-100.5	-104.0	-105.4	-108.1	-108.6
Turb. (NTU)	230	26	22	19	14	13	12	11	7.5	7.9
Flow (ml/min)	175	175	175	175	175	175	175	175	175	175
Depth To Water (ft)	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4

Time	1657									
Temp. (C)	8.60									
Conduct. (µmhos/cm)	402									
DO (mg/l)	0.42									
pH (Std. Units)	6.57									
Eh (millivolts)	-109.5									
Turb. (NTU)	7.9									
Flow (ml/min)	175									
Depth To Water (ft)	4.4									

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: Sampled w/ bladder pump, YSI MP10 w/ nitrogen, IP, Lamotte 2020 + dedicated tubing

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1700	MW-HH-13	

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Signed: H. Rizza

Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/17/10 1305	Sheet 1 of 1

TRC Personnel: H. Rizza + J. Haulden

Well Identification: MW-HRC-33

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present		X

Protective Casing Stick-up (from ground) flush ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

WELL MATERIAL: [X] PVC [ ] SS [ ]

Well Depth 14.00 ft. [✓] top of riser [ ] top of casing [ ] measured [X] historical (well depth)

Water Depth 3.99' ft.

LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: 9.00'

Static water level after pump put into well 3.99'

Initial purge Rate/ Water Level (100-400 ml/min): 50 ml/min

Adjusted purge Rates/time/WL(record changes) NA

Flow rate at time of sampling: 50 ml/min

PID SCREENING MEAS.

Background	0.0
Well Mouth	1.1

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1335	1340	1345	1350	1355	1400	1405	1410	1415	1420
Temp. (C)	7.98	7.66	7.65	7.45	7.18	7.10	6.98	6.87	6.77	6.67
Conduct. (µmhos/cm)	648	649	648	649	649	649	648	647	647	647
DO (mg/l)	3.38	2.38	1.65	1.39	1.15	1.12	1.02	0.90	0.85	0.77
pH (Std. Units)	6.82	6.81	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80
Eh (millivolts)	-6.8	-16.5	-27.2	-34.8	-41.5	-44.5	-47.9	-51.6	-53.2	-54.8
Turb. (NTU)	50	45	38	23	18	14	11	11	9.5	7.4
Flow (ml/min)	50	50	50	50	50	50	50	50	50	50
Depth To Water (ft)	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25
Time	1425	1430								
Temp. (C)	6.58	6.45								
Conduct. (µmhos/cm)	646	646								
DO (mg/l)	0.74	0.70								
pH (Std. Units)	6.79	6.79								
Eh (millivolts)	-56.9	-58.5								
Turb. (NTU)	6.1	4.6								
Flow (ml/min)	50	50								
Depth To Water (ft)	4.25	4.25								

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: sampled w/ a bladder pump, mp-10 w/ nitrogen, YSI, LaMotte 2020, IP, and dedicated tubing

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1435	MW-HRC-33	

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Signed: H Rizza

Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/17/10 1345	Sheet 1 of 1

TRC Personnel: A. Weiss + K. Kitchin

Well Identification: MW-4

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present		X
Security Lock Present		X

Microwell capped with glove as well cap will not fit in roadbox (AS 2/22/10)

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: 2 inch; 4 inch; 6 inch; X 1"

WELL MATERIAL: X PVC; SS; ___

Well Depth 11.61 ft. X top of riser; top of casing; measured; historical

Water Depth 1.97 ft.

LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: ~9'

Static water level after pump put into well 1.94

Initial purge Rate/ Water Level (100-400 ml/min): 50 ml/min (3/4" bladder pump)

Adjusted purge Rates/time/WL(record changes) none

Flow rate at time of sampling: 50

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1420	1425	1430	1435	1440	1445	1450	1455	1500	1505
Temp. (C)	16.91	16.56	16.64	16.59	16.61	16.65	16.59	16.57	16.57	16.55
Conduct. (µmhos/cm)	214	211	211	210	210	210	210	210	210	209
DO (mg/l)	2.03	1.28	1.22	1.11	1.07	1.02	0.93	0.86	0.84	0.77
pH (Std. Units)	6.11	6.10	6.10	6.08	6.08	6.07	6.06	6.07	6.07	6.07
Eh (millivolts)	128.6	135.8	137.2	140.3	142.2	143.6	143.3	143.4	143.4	143.6
Turb. (NTU)	631	722	684	562	479	396	335	303	270	240
Flow (ml/min)	50	50	50	50	50	50	50	50	50	50
Depth To Water (ft)	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94
Time	1510	1515	1520	1525	1530	1535	1540	1545	1550	1555
Temp. (C)	16.50	16.48	16.44	16.41	16.36	16.36	16.38	16.39	16.39	
Conduct. (µmhos/cm)	209	208	208	208	208	208	208	208	208	
DO (mg/l)	0.67	0.64	0.58	0.56	0.54	0.53	0.53	0.52	0.52	
pH (Std. Units)	6.08	6.07	6.07	6.06	6.06	6.06	6.06	6.06	6.06	
Eh (millivolts)	143.4	145.8	145.1	146.4	146.9	147.0	147.0	147.0	147.2	
Turb. (NTU)	237	198	164	172	137	101.5	87.2	87.3	87.1	
Flow (ml/min)	50	50	50	50	50	50	50	50	50	
Depth To Water (ft)	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	

Sampled

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: YSI 600XL, Lamotte 2020 Turbidity, QED MP10 controller w/ Nitrogen Gas Solinst Interface probe

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1555	MW-4	

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/17/10 1040	Sheet 1 of 2

TRC Personnel: K. Kitchin ; A. Weiss

Well Identification: MW-5

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present		X
Security Lock Present		X

3 well volumes = 4.17 L
Well capped with glove as cap will not fit in road box
JS 2/22/10

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

Protective Casing Stick-up (from ground) Flush ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [ ] 2 inch [ ] 4 inch [ ] 6 inch [X] 1"

WELL MATERIAL: [X] PVC [ ] SS [ ] ___

Well Depth 11.21 ft. [X] top of riser [ ] top of casing [ ] ___ [X] measured [ ] historical

Water Depth 1.95 ft. LNAPL/DNAPL Depth = NA Thickness = NA

LOW FLOW DATA

Depth of pump intake: 9.6'

Static water level after pump put into well 1.94

Initial purge Rate/ Water Level (100-400 ml/min):

Adjusted purge Rates/time/WL(record changes) none

Flow rate at time of sampling: 50 ml/min

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1110	1120	1125	1130	1135	1140	1145	1150	1155	1200
Temp. (C)	21.33	22.32	22.36	22.53	22.62	22.67	22.92	22.91	23.11	23.10
Conduct. (µmhos/cm)	246	240	240	240	241	241	241	242	242	243
DO (mg/l)	3.15	1.37	1.30	1.29	1.31	1.30	1.28	1.30	1.26	1.27
pH (Std. Units)	6.45	6.38	6.38	6.37	6.35	6.36	6.35	6.35	6.34	6.34
Eh (millivolts)	-4.6	-17.4	-18.9	-19.6	-18.7	-18.6	-17.1	-17.1	-18.8	-18.7
Turb. (NTU)	1068	1035	1022	1052	969	934	829	829	703	787
Flow (ml/min)	50	50	50	50	50	50	50	50	50	50
Depth To Water (ft)	1.97	1.99	1.99	1.97	1.97	1.97	1.97	1.97	1.97	1.97
Time	1205	1210	1215	1220	1225	1230	1235	1240	1245	1250
Temp. (C)	23.13	23.19	23.25	23.31	23.31	23.33	23.42	23.46	23.46	23.49
Conduct. (µmhos/cm)	243	243	243	243	243	243	243	243	243	243
DO (mg/l)	1.26	1.20	1.17	1.17	1.16	1.17	1.14	1.14	1.11	1.08
pH (Std. Units)	6.34	6.34	6.33	6.34	6.34	6.34	6.34	6.33	6.34	6.84
Eh (millivolts)	-18.5	-18.8	-18.3	-16.3	-17.4	-21.0	-18.7	-19.2	-17.1	-20.4
Turb. (NTU)	635	619	577	583	522	457	437	402	387	350
Flow (ml/min)	50	50	50	50	50	50	50	50	50	50
Depth To Water (ft)	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: QED Micropurge 3/4" BP, QED MP10 Controller w/ Nitrogen gas, Lamotte 2020 Turb., YSI 600XL

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1315	MW-5	

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Signed: [signature]

Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/17/10	Sheet 2 of 2

TRC Personnel: K. Kitchin; A. Weiss

Well Identification: MW-5 (cont.)

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present		X
Security Lock Present		X

well did not stabilize w/in 2 hours (turbidity)

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: 2 inch; 4 inch; 6 inch; X 1-in.

WELL MATERIAL: X PVC; SS; ___

Well Depth 11.21 ft. X top of riser; top of casing; ___ X measured; historical

Water Depth 1.95 ft.

LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: 9.6

Static water level after pump put into well

Initial purge Rate/ Water Level (100-400 ml/min): 50 ml/min (3/4" Micropurge pump)

Adjusted purge Rates/time/WL(record changes) none

Flow rate at time of sampling: 50 ml/min

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1255	1300	1305	1310	1315					
Temp. (C)	23.64	23.74	23.76	23.74						
Conduct. (µmhos/cm)	244	244	244	244						
DO (mg/l)	1.10	1.09	1.08	1.08	SAMPLED					
pH (Std. Units)	6.33	6.33	6.33	6.33						
Eh (millivolts)	-14.4	-16.9	-15.8	-17.3						
Turb. (NTU)	337	257	263	291						
Flow (ml/min)	50	50	50	50						
Depth To Water (ft)	1.97	1.97	1.97	1.97						
Time										
Temp. (C)										
Conduct. (µmhos/cm)										
DO (mg/l)										
pH (Std. Units)										
Eh (millivolts)										
Turb. (NTU)										
Flow (ml/min)										
Depth To Water (ft)										

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: see page 1 of 2

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1315	MW-5	

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/18/2010/0900	Sheet 1 of 2

TRC Personnel: A. Weiss + K. Kitchin

Well Identification: MW-6

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present		X
Security Lock Present		X

OR = Over Range
Microwell capped with slope cap. Cap won't fit in roadbox
AS 2/22/10

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: 2 inch ☐ 4 inch ☐ 6 inch ☐ X 1

WELL MATERIAL: X PVC ☐ SS ☐

Well Depth 11.12 ft. X top of riser ☐ top of casing ☐ ____ X measured ☐ historical

Water Depth 1.54 ft.

LNAPL/DNAPL Depth = NA
Thickness = NA

LOW FLOW DATA

Depth of pump intake: ~9'

Static water level after pump put into well 1.55'

Initial purge Rate/Water Level (100-400 ml/min): 50 ml/min (micropurge 3/4" pump)

Adjusted purge Rates/time/WL(record changes): none

Flow rate at time of sampling: 50 ml/min

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1000	1005	1010	1015	1020	1025	1030	1035	1040	1045
Temp. (C)	18.35	18.38	18.39	18.41	18.44	18.44	18.46	18.49	18.49	18.50
Conduct. (µmhos/cm)	428	355	315	285	258	256	243	233	232	229
DO (mg/l)	1.91	1.66	1.54	1.44	1.33	1.31	1.23	1.11	1.12	1.10
pH (Std. Units)	6.64	6.66	6.59	6.56	6.54	6.54	6.52	6.50	6.50	6.48
Eh (millivolts)	-26.7	-23.6	-25.5	-26.8	-25.4	-25.3	-24.9	-23.0	-23.0	-22.7
Turb. (NTU)	OR	OR	OR	OR	1014	988	897	845	802	754
Flow (ml/min)	50	50	50	50	50	50	50	50	50	50
Depth To Water (ft)	1.58	1.58	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Time	1050	1055	1100	1105	1110	1115	1120	1125	1130	1135
Temp. (C)	18.51	18.52	18.53	18.54	18.55	18.56	18.56	18.57	18.58	18.58
Conduct. (µmhos/cm)	225	222	221	219	218	218	218	217	217	216
DO (mg/l)	1.04	0.94	0.91	0.87	0.84	0.82	0.80	0.77	0.75	0.74
pH (Std. Units)	6.47	6.45	6.44	6.42	6.41	6.41	6.39	6.39	6.37	6.38
Eh (millivolts)	-20.0	-20.8	-19.2	-19.4	-19.9	-18.4	-15.4	-18.0	-16.2	-16.9
Turb. (NTU)	710	640	613	486	445	440	398	379	344	280
Flow (ml/min)	50	50	50	50	50	50	50	50	50	50
Depth To Water (ft)	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55

Pump Type	Purge	Sample
Peristaltic Pump	☐	☐
Submersible Pump	☐	☐
Bladder Pump	X	X
Other: ____	☐	☐

Description of Sampling Equipment and Flow Rate: YSI 600XL, Lamotte 2020, QED MP10 Controller w/ Nitrogen gas, solinst interface probe

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1205	MW-6	

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Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time:	Sheet 2 of 2

TRC Personnel: A. Weiss + K. Kitchin

Well Identification: MW-6

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present		X
Security Lock Present		X

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER ☐ 2 inch ☐ 4 inch ☐ 6 inch ☒ 1"

WELL MATERIAL ☒ PVC ☐ SS ☐

Well Depth 11.12 ft. ☒ top of riser ☐ top of casing ☐ ____ ☒ measured ☐ historical

Water Depth 1.54 ft. LNAPL/DNAPL Depth = NA Thickness = NA

LOW FLOW DATA

Depth of pump intake: ~ 9.0'

Static water level after pump put into well 1.55'

Initial purge Rate/ Water Level (100-400 ml/min): 50 ml/min

Adjusted purge Rates/time/WL(record changes) none

Flow rate at time of sampling: 50 ml/min

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1140	1145	1150	1200	1205	Sampled after purging +
Temp. (C)	18.58	18.58	18.58	18.58		no collecting data for 2 hrs
Conduct. (µmhos/cm)	216	217	216	216		Turbidity still elevated.
DO (mg/l)	0.69	0.69	0.70	0.68		
pH (Std. Units)	6.35	6.35	6.35	6.35		
Eh (millivolts)	-12.8	-13.0	-12.9	-12.6		
Turb. (NTU)	275	280	256	235		
Flow (ml/min)	50	50	50	50		
Depth To Water (ft)	1.55	1.55	1.55	1.55		
Time						
Temp. (C)						
Conduct. (µmhos/cm)						
DO (mg/l)						
pH (Std. Units)						
Eh (millivolts)						
Turb. (NTU)						
Flow (ml/min)						
Depth To Water (ft)						

Sampled

Pump Type	Purge	Sample
Peristaltic Pump	☐	☐
Submersible Pump	☐	☐
Bladder Pump	X	X
Other: ____	☐	☐

Description of Sampling Equipment and Flow Rate: See pg 1 of 2

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1205	MW-6	

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TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 1030 2/17/10	Sheet 1 of 1

TRC Personnel: H. Rizza / J. Houlden

Well Identification: MW-7

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	✓	
Concrete Collar Intact	✓	
PVC Stick-up Intact	✓	
Well Cap Present	✓	
Security Lock Present		✓

Protective Casing Stick-up (from ground) Flush ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER ✓ 2 inch ☐ 4 inch ☐ 6 inch ☐

WELL MATERIAL ✓ PVC ☐ SS ☐

Well Depth 15.95 ft. ✓ top of riser ☐ top of casing ☐ measured ✓ historical (well depth)

Water Depth 8.67 ft. LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: 12.31

Static water level after pump put into well 8.80

Initial purge Rate/ Water Level (100-400 ml/min): 75

Adjusted purge Rates/time/WL(record changes) NA

Flow rate at time of sampling: 75 ml/min

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1133	1138	1143	1148	1153	1158	1203	1208	1213	
Temp. (C)	9.45	8.95	8.23	8.07	7.84	7.81	7.80	7.72	7.80	
Conduct. (µmhos/cm)	404	407	407	408	410	411	413	415	415	
DO (mg/l)	1.63	1.40	1.38	1.33	1.33	1.25	1.22	1.22	1.19	
pH (Std. Units)	6.46	6.47	6.47	6.47	6.47	6.47	6.47	6.47	6.47	
Eh (millivolts)	116.5	110.4	105.4	98.4	90.7	85.3	83.0	80.0	79.1	
Turb. (NTU)	16	10	8	7.0	7	6.0	6.2	5.0	4.0	
Flow (ml/min)	75	75	75	75	75	75	75	75	75	
Depth To Water (ft)	9.20	9.20	9.20	9.20	9.20	9.20	9.20	9.20	9.20	
Time										
Temp. (C)										
Conduct. (µmhos/cm)										
DO (mg/l)										
pH (Std. Units)										
Eh (millivolts)										
Turb. (NTU)										
Flow (ml/min)										
Depth To Water (ft)										

+/-1 3% 10% .10 10mV

Pump Type

	Purge	Sample
Peristaltic Pump	☐	☐
Submersible Pump	☐	☐
Bladder Pump	X	X
Other:	☐	☐

Description of Sampling Equipment and Flow Rate: Sampled w/ bladder pump, mp10 w/nitrogen, TP, lanette 2020, + dedicated tubing

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1215	MW-7	
VOCs	N	HCL	2 x 40 ml	1115	~~MW-17~~	MW-71 (DUP)
					~~DUP-1~~ HCL	

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Signed: H. Rizza

Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/18/10 0850	Sheet 1 of 1

TRC Personnel: Julia Houlden + Heidi Rizza

Well Identification: MW-8A

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present		X

Protective Casing Stick-up (from ground) flush ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch [ ]

WELL MATERIAL: [X] PVC [ ] SS [ ]

Well Depth 12.50 ft. [X] top of riser [ ] top of casing [ ] measured [X] historical (well depth)

Water Depth 4.10 ft. LNAPL/DNAPL Depth = NA Thickness = NA

LOW FLOW DATA

Depth of pump intake: 8.3

Static water level after pump put into well 3.95

Initial purge Rate/ Water Level (100-400 ml/min): 30 ml/min

Adjusted purge Rates/time/WL(record changes) NA

Flow rate at time of sampling: 30 ml/min

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	~~1052~~ 0957	~~0957~~ 1002	1007	1012	1017	1022	1027	1032	1037	1042
Temp. (C)	6.19	6.27	6.33	6.47	6.90	6.99	7.19	7.33	7.46	8.04
Conduct. (µmhos/cm)	319	318	318	318	318	318	318	318	318	319
DO (mg/l)	4.82	4.57	4.18	4.04	3.90	3.73	3.55	3.41	3.28	3.24
pH (Std. Units)	6.72	6.69	6.68	6.68	6.67	6.66	6.66	6.65	6.64	6.64
Eh (millivolts)	125.7	122.7	119.0	117.2	113.1	111.3	109.0	105.6	103.5	99.7
Turb. (NTU)	60	60	53	45	40	40	35	45	28	25
Flow (ml/min)	~~50~~ 30	~~50~~ 30	30	30	30	30	30	30	30	30
Depth To Water (ft)	4.70	4.72	4.74	4.76	4.78	4.80	4.81	4.81	4.81	4.81

Time	1047	1052	1057							
Temp. (C)	8.05	7.94	7.98							
Conduct. (µmhos/cm)	319	320	319							
DO (mg/l)	3.12	3.12	3.12							
pH (Std. Units)	6.63	6.63	6.63							
Eh (millivolts)	98.1	95.6	95.2							
Turb. (NTU)	28	25	25							
Flow (ml/min)	30	30	30							
Depth To Water (ft)	4.81	4.81	4.81							

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: Water level keeps drawing down - It will not stabalize.

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1100	MW-8A	

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Signed: H Rizza

Rev: 1 Feb 2007

had
w down

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/19/2010	Sheet 1 of 2

TRC Personnel: A. Weiss

Well Identification: MW-11

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present		X

Protective Casing Stick-up (from ground) Flush ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

WELL MATERIAL: [X] PVC [ ] SS [ ]

Well Depth 10.65 ft. [X] top of riser [ ] top of casing [X] measured [ ] historical

Water Depth 0.29 ft. LNAPL/DNAPL Depth = NA Thickness = NA

LOW FLOW DATA

Depth of pump intake: ~~[illegible]~~ N5'

Static water level after pump put into well 0.19

Initial purge Rate/ Water Level (100-400 ml/min): 100

Adjusted purge Rates/time/WL(record changes) Same

Flow rate at time of sampling: 100 ml/min

PID SCREENING MEAS.

Background	1.3
Well Mouth	5.8

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	0845	0850	0855	0900	0905	0910	~~0920~~ 0915	~~0925~~ 0920	~~0930~~ 0925	~~0935~~ 0930 (AW)
Temp. (C)	9.88	9.95	10.13	10.38	10.85	10.94	11.05	11.10	11.16	11.12
Conduct. (µmhos/cm)	178	177	182	186	194	196	198	199	200	200
DO (mg/l)	1.20	0.90	0.72	0.63	0.52	0.50	0.46	0.45	0.43	0.40
pH (Std. Units)	6.44	6.42	6.41	6.41	6.42	6.42	6.43	6.43	6.43	6.43
Eh (millivolts)	-11.1	-24.6	-47.8	-60.4	-71.0	-73.7	-78.8	-81.7	-85.6	-91.0
Turb. (NTU)	103.5	107.0	131	123	98.7	72.8	63.3	56.9	54.0	42.6
Flow (ml/min)	100	100	100	100	100	100	100	100	100	100
Depth To Water (ft)	0.38	0.35	0.33	0.34	0.35	0.35	0.34	0.34	0.34	0.34
Time	0935	0940	0945	0950	0955	1000	1005	1010	1015	1020
Temp. (C)	11.13	11.16	11.22	11.25	11.34	11.30	11.32	11.33	11.36	11.34
Conduct. (µmhos/cm)	202	202	204	205	206	207	207	208	209	209
DO (mg/l)	0.41	0.40	0.39	0.38	0.37	0.36	0.35	0.34	0.34	0.34
pH (Std. Units)	6.44	6.44	6.44	6.44	6.44	6.45	6.45	6.45	6.45	6.45
Eh (millivolts)	-89.8	-91.0	-96.0	-97.9	-101.6	-104.1	-105.6	-106.0	-109.6	-110.3
Turb. (NTU)	40.0	38.5	37.5	33.0	32.3	25.5	24.0	21.1	21.3	18.4
Flow (ml/min)	100	100	100	100	100	100	100	100	100	100
Depth To Water (ft)	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34

Pump Type

	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: VSI 1000 XL, Lamotte 2020, MP10 controller w/ Nitrogen gas, Solinst interface probe

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1050	MW-11	

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Signed: Allen Weiss

Rev: 1 Feb 2007

[illegible] Note: [illegible] very high to start and come down very slowly. All other parameters stable. Waited 2 hrs and sampled.

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/19/2010	Sheet 2 of 2

TRC Personnel: A. Weiss

Well Identification: MW-11

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present		X

Protective Casing Stick-up (from ground): Flush ft.

Riser Stick-up (from ground): NA ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

WELL MATERIAL: [X] PVC [ ] SS [ ]

Well Depth: 10.65 ft. [X] top of riser [ ] top of casing [X] measured [ ] historical

Water Depth: 0.29 ft. 2/22/10 LNAPL/DNAPL Depth = NA Thickness = NA

LOW FLOW DATA

Depth of pump intake: ~5'

Static water level after pump put into well: 0.19

Initial purge Rate/ Water Level (100-400 ml/min): 100

Adjusted purge Rates/time/WL(record changes): Same

Flow rate at time of sampling: 100 ml/min

PID SCREENING MEAS.

Background	1.3
Well Mouth	5.8

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1025	1030	1035	1040	1045					
Temp. (C)	11.38	11.47	11.45	11.43	11.40					
Conduct. (µmhos/cm)	210	211	211	211	212					
DO (mg/l)	0.33	0.31	0.31	0.31	0.31					
pH (Std. Units)	6.45	6.45	6.45	6.45	6.45					
Eh (millivolts)	-112.4	-114.3	-115.4	-115.6	-116.9					
Turb. (NTU)	17.9	15.3	12.2	11.4	10.1					
Flow (ml/min)	100	100	100	100	100					
Depth To Water (ft)	0.34	0.34	0.34	0.34	0.34					
Time										
Temp. (C)										
Conduct. (µmhos/cm)										
DO (mg/l)										
pH (Std. Units)										
Eh (millivolts)										
Turb. (NTU)										
Flow (ml/min)										
Depth To Water (ft)										

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: See page 1 of 2

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1050	MW-11	

Signed:

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 4:15 2/18/2010	Sheet 1 of 1

TRC Personnel: A. Weiss + R. Kitchin

Well Identification: MW-12

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present		X

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch [ ]

WELL MATERIAL: [X] PVC [ ] SS [ ]

Well Depth 13.83 ft. [X] top of riser [ ] top of casing [X] measured [ ] historical

Water Depth 6.39 ft. LNAPL/DNAPL Depth = NA Thickness = NA

LOW FLOW DATA

Depth of pump intake: ~10'

Static water level after pump put into well 6.02

Initial purge Rate/ Water Level (100-400 ml/min): 150

Adjusted purge Rates/time/WL(record changes) None

Flow rate at time of sampling: 150

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1630	1635	1640	1645	1650	1655	1700	1705	1710	
Temp. (C)	8.67	8.60	8.53	8.37	8.27	8.19	8.15	8.16		
Conduct. (µmhos/cm)	388	388	388	385	384	383	381	382		
DO (mg/l)	2.72	1.13	1.09	1.10	1.11	1.12	1.11	1.12	sampled	
pH (Std. Units)	6.70	6.66	6.66	6.66	6.66	6.66	6.66	6.66		
Eh (millivolts)	-19.2	-24.2	-25.2	-23.1	-21.3	-21.4	-21.3	-20.4		
Turb. (NTU)	82.5	51.4	33.6	21.2	13.2	9.4	6.20	4.93		
Flow (ml/min)	150	150	150	150	150	150	150	150		
Depth To Water (ft)	6.41	6.41	6.41	6.41	6.41	6.41	6.41	6.41		
Time										
Temp. (C)										
Conduct. (µmhos/cm)										
DO (mg/l)										
pH (Std. Units)										
Eh (millivolts)										
Turb. (NTU)										
Flow (ml/min)										
Depth To Water (ft)										

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: YSI 600XL, QED MP10 controller w/ Nitrogen gas, Lamotte 2020, Solinst ~~water level meter~~ interface probe

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1710	MW-12	

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Signed: [signature]

Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford | Project No.: 115058 | Date/Time: 8/19/10 0845 | Sheet 1 of 1

TRC Personnel: Julia Houlden & H. Rizzo

Well Identification: MW-13

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present		X

Protective Casing Stick-up (from ground): Flush ft.

Riser Stick-up (from ground): NA ft.

WELL DIAMETER: X 2 inch; 4 inch; 6 inch

WELL MATERIAL: X PVC; SS

Well Depth: 10.80 ft. X top of riser; top of casing; measured; historical

Water Depth: .95 ft.

LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: 5.9

Static water level after pump put into well: .95

Initial purge Rate/ Water Level (100-400 ml/min): 50

Adjusted purge Rates/time/WL(record changes): NA

Flow rate at time of sampling: 50 ml/min

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.1

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	0905	0910	0915	0920	0925	0930	0935	0940	0945	~~0938~~ 0948
Temp. (C)	3.81	3.64	3.53	3.43	3.31	3.16	3.05	2.97	2.97	2.94
Conduct. (µmhos/cm)	573	596	579	544	487	415	418	402	395	388
DO (mg/l)	5.86	4.89	4.91	5.38	5.69	5.90	6.02	6.02	5.91	5.80
pH (Std. Units)	6.45	6.43	6.47	6.55	6.64	6.69	6.71	6.68	6.64	6.62
Eh (millivolts)	-92.1	-125.5	-139.3	-138.8	-131.2	-121.5	-113.1	-104.2	-96.0	-87.4
Turb. (NTU)	8.5	7.2	5.5	4.8	6.8	6.5	8.0	7.3	7.3	7.2
Flow (ml/min)	50	50	50	50	50	50	50	50	50	50
Depth To Water (ft)	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95

Time	0951	0954	0957
Temp. (C)	2.90	2.85	2.83
Conduct. (µmhos/cm)	385	384	383
DO (mg/l)	5.73	5.64	5.63
pH (Std. Units)	6.60	6.59	6.58
Eh (millivolts)	-83.2	-79.0	-77.5
Turb. (NTU)	7.1	7.1	7.0
Flow (ml/min)	50	50	50
Depth To Water (ft)	.95	.95	.95

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: Sampled w/ bladder pump YSI, MPTO w/ nitrogen & Lamotte 2020 + dedicated tubing

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1000	MW-13	

Signed: H. Rizzo

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/19/10 1035	Sheet 1 of 1

TRC Personnel: Julia Houlden + H. Rizza

Well Identification: MW-14

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	☒	☐
Concrete Collar Intact	☒	☐
PVC Stick-up Intact	☒	☐
Well Cap Present	☒	☐
Security Lock Present	☐	☒

Protective Casing Stick-up (from ground): Flush ft.

Riser Stick-up (from ground): NA ft.

WELL DIAMETER: ☒ 2 inch ☐ 4 inch ☐ 6 inch

WELL MATERIAL: ☒ PVC ☐ SS ☐

Well Depth: 10.43 ft. ☒ top of riser ☐ top of casing ☑ measured ☐ historical

Water Depth: 0.60 ft.

LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: 5.52

Static water level after pump put into well: ~~6.2~~ 0.62 AM

Initial purge Rate/ Water Level (100-400 ml/min): 50

Adjusted purge Rates/time/WL(record changes): NA

Flow rate at time of sampling: 50 ml/min

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.1

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1010	1015	1020	1025	1030	1135	1140	1145	1150	~~1200~~ 1155
Temp. (C)	4.45	4.36	4.14	3.80	3.54	3.40	3.32	3.25	3.18	3.09
Conduct. (µmhos/cm)	569	589	591	589	590	592	595	600	604	610
DO (mg/l)	5.68	5.29	5.18	5.24	5.32	5.33	5.30	5.25	5.21	5.15
pH (Std. Units)	6.98	6.97	6.97	6.97	6.96	6.96	6.95	6.94	6.93	6.92
Eh (millivolts)	-32.8	-67.8	-82.1	-82.1	-76.8	-72.3	-69.4	-66.1	-62.3	-59.1
Turb. (NTU)	30	26	25	23	21	23	20	19	17	13
Flow (ml/min)	50	50	50	50	50	50	50	50	50	50
Depth To Water (ft)	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Time	1200	1205	1210							
Temp. (C)	3.06	3.07	3.06							
Conduct. (µmhos/cm)	614	616	616							
DO (mg/l)	5.13	5.09	5.07							
pH (Std. Units)	6.92	6.92	6.92							
Eh (millivolts)	-57.5	-55.3	-54.7							
Turb. (NTU)	10	7	5							
Flow (ml/min)	50	50	50							
Depth To Water (ft)	6.2	6.2	6.2							

Pump Type	Purge	Sample
Peristaltic Pump	☐	☐
Submersible Pump	☐	☐
Bladder Pump	X	X
Other:	☐	☐

Description of Sampling Equipment and Flow Rate: Sampled w/ YSI, bladder pump MPTO w/ nitrogen, IP, Lanotte 2020 + dedicated tubing

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1215	MW-14	

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Signed: H. [illegible]

Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford | Project No.: 115058 | Date/Time: 2/19/2010 | Sheet 1 of 2

TRC Personnel: A. Weiss

Well Identification: MW-16

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	✓	
Concrete Collar Intact	✓	
PVC Stick-up Intact	✓	
Well Cap Present	✓	
Security Lock Present		✓

Protective Casing Stick-up (from ground): Flush ft.

Riser Stick-up (from ground): NA ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

WELL MATERIAL: [X] PVC [ ] SS [ ]

Well Depth 11.5 ft. [X] top of riser [ ] top of casing [X] measured [ ] historical

Water Depth 1.00 ft. LNAPL/DNAPL Depth = NA Thickness = NA

LOW FLOW DATA

Depth of pump intake: 6.25

Static water level after pump put into well: 1.00

Initial purge Rate/ Water Level (100-400 ml/min): 75

Adjusted purge Rates/time/WL(record changes): none

Flow rate at time of sampling: 75 ml/min

PID SCREENING MEAS.

Background	NM
Well Mouth	NM

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1125	1130	1135	1140	1145	1150	1155	1200	1205	1210
Temp. (C)	4.69	4.46	4.24	4.03	3.95	3.92	3.87	3.90	3.91	3.87
Conduct. (µmhos/cm)	381	388	398	400	481	495	527	553	556	572
DO (mg/l)	5.97	5.09	4.90	4.45	4.28	4.21	4.05	3.94	3.92	3.84
pH (Std. Units)	9.54	9.80	9.74	9.46	9.29	9.20	8.91	8.57	8.50	8.26
Eh (millivolts)	-115.0	-144.8	-144.2	-144.3	-140.9	-144.0	-143.0	-139.8	-139.3	-137.5
Turb. (NTU)	133	263	262	220	200	186	163	141	142	123
Flow (ml/min)	75	75	75	75	75	75	75	75	75	75
Depth To Water (ft)	1.14	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Time	1215	1220	1225	1230	1235	1240	1245	1250	1255	1300
Temp. (C)	3.84	3.85	3.86	3.87	3.93	3.93	3.95	3.90	3.89	3.89
Conduct. (µmhos/cm)	586	592	603	613	617	621	623	624	630	634
DO (mg/l)	3.75	3.73	3.69	3.64	3.58	3.54	3.53	3.50	3.44	3.42
pH (Std. Units)	8.03	7.96	7.84	7.72	7.62	7.57	7.55	7.50	7.43	7.39
Eh (millivolts)	-137.3	-136.6	-137.1	-136.8	-136.7	-137.7	-137.3	-137.0	-135.4	-134.7
Turb. (NTU)	105.6	106	100.5	95.4	94.2	*	*	*	*	*
Flow (ml/min)	75	75	75	75	75	75	75	75	75	75
Depth To Water (ft)	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15

*Tubidity meter battery dead. H. Rizza bringing over another. Readings temporarily [illegible]

* Go to back for rest of readings

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: YSI 600 XL, Lamotte 2020, Solinst interface probe, MP10 controller w/ Nitrogen gas.

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1330	MW-16	

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Signed: [signature]

Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford | Project No.: 115058 | Date/Time: 2/18/2010 1235 | Sheet 1 of 1

TRC Personnel: A. Weiss + K. Kitchin

Well Identification: MW-17

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present		X

Protective Casing Stick-up (from ground): NA ft.

Riser Stick-up (from ground): NA ft.

WELL DIAMETER: X 2 inch; 4 inch; 6 inch

WELL MATERIAL: X PVC; SS; ___

Well Depth 15.45 ft. X top of riser; top of casing; measured; historical

Water Depth 6.78 ft.

LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: 10'

Static water level after pump put into well: 6.44

Initial purge Rate/ Water Level (100-400 ml/min): 50 ml/min

Adjusted purge Rates/time/WL(record changes): none

Flow rate at time of sampling: 50 ml/min

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1240	1245	1250	1255	1300	1305	1308	1311	1314	1317
Temp. (C)	9.19	8.09	7.93	7.93	7.88	7.80	7.81	7.81	7.82	7.85
Conduct. (µmhos/cm)	453	442	440	440	439	436	435	433	434	433
DO (mg/l)	2.00	2.02	1.85	1.83	1.72	1.61	1.51	1.49	1.37	1.29
pH (Std. Units)	6.47	6.51	6.52	6.49	6.53	6.53	6.52	6.52	6.52	6.52
Eh (millivolts)	-104.5	-120.3	-126.3	-127.7	-133.4	-137.6	-142.8	-146.2	-150.9	-162.3
Turb. (NTU)	263	104.4	68.2	54.4	49.5	53.0	58.4	54.4	51.8	54.2
Flow (ml/min)	50	50	50	50	50	50	50	50	50	50
Depth To Water (ft)	7.40	7.15	7.10	7.10	7.05	7.05	7.05	7.05	7.05	7.05

Time	1320	1323	1326	1329	1332	1335
Temp. (C)	7.85	7.84	7.84	7.87	7.87	
Conduct. (µmhos/cm)	433	433	432	432	432	
DO (mg/l)	1.18	1.15	1.15	1.14	1.15	sampled
pH (Std. Units)	6.52	6.52	6.52	6.52	6.52	
Eh (millivolts)	-193.4	-206.8	-237.6	-237.4	-238.1	
Turb. (NTU)	44.8	43.10	45.0	44.4	46.8	
Flow (ml/min)	50	50	50	50	50	
Depth To Water (ft)	7.05	7.05	7.05	7.05	7.05	

Turbidity bit high but stable w/ other parameters.

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: YSI 1000 XL, QED MP10 w/ Nitrogen gas, Solinst interface probe, LOW-FLOW 2020

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1335		
			2x40mL	for MS		
			2x40mL	for MSD		

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Signed: [signature]

Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/18/10 1355	Sheet 1 of 1

TRC Personnel: H. Rizza & J. Houlden

Well Identification: MW-18

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	✓	
Concrete Collar Intact	✓	
PVC Stick-up Intact	✓	
Well Cap Present	✓	
Security Lock Present		✓

Protective Casing Stick-up (from ground): Flush ft.

Riser Stick-up (from ground): NA ft.

WELL DIAMETER: ✓ 2 inch / 4 inch / 6 inch

WELL MATERIAL: ✓ PVC / SS

Well Depth: 10.55 ft. ✓ top of riser / top of casing ✓ measured / historical

Water Depth: 1.24 ft. LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: 5.90

Static water level after pump put into well: 1.22

Initial purge Rate/ Water Level (100-400 ml/min): 100

Adjusted purge Rates/time/WL(record changes): NA

Flow rate at time of sampling: 100 ml/min

PID SCREENING MEAS.

Background	0.0
Well Mouth	1.0

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	1415	1418	1421	1424	~~1427~~ 1429	1434	1439	1444	1449	1454
Temp. (C)	9.37	9.22	9.09	9.03	8.86	8.37	7.86	7.62	7.40	7.11
Conduct. (µmhos/cm)	415	417	417	417	413	412	409	404	386	340
DO (mg/l)	5.65	4.85	4.67	4.53	4.34	4.26	4.18	4.05	3.80	3.10
pH (Std. Units)	7.48	7.47	7.46	7.45	7.44	7.45	7.45	7.42	7.34	7.19
Eh (millivolts)	-215.2	-217.3	-218.3	-219.9	-221.0	-222.2	-222.8	-223.3	-224.2	-225.6
Turb. (NTU)	17	22	28	30	28	28	29	26	27	19
Flow (ml/min)	100	100	100	100	100	100	100	100	100	100
Depth To Water (ft)	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36

Time	1459	1504	1509	~~1514~~ 1512	1515	1518	1521			
Temp. (C)	6.91	6.79	6.67	6.58	6.52	6.49	6.45			
Conduct. (µmhos/cm)	313	299	290	284	284	283	282			
DO (mg/l)	2.55	2.18	1.93	1.76	1.73	1.70	1.67			
pH (Std. Units)	7.09	7.04	7.00	6.97	6.96	6.96	6.95			
Eh (millivolts)	-225.5	-224.4	-224.5	-223.6	-223.1	-222.8	-222.6			
Turb. (NTU)	15	12	9.5	8.3	7.8	6.3	5			
Flow (ml/min)	100	100	100	100	100	100	100			
Depth To Water (ft)	2.36	2.36	2.36	2.36	2.36	2.36	2.36			

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: Sampled w/ bladder pump, YSI, MP10 w/ nitrogen, IP, Lamotte 2020 + dedicated tubing

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1525	MW-18	

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Signed: H. Rizza

Rev: 1 Feb 2007

TRC

Low-flow Groundwater Sampling Data Record

Project: City of New Bedford	Project No.: 115058	Date/Time: 2/18/2010	Sheet 1 of 1

TRC Personnel: Millless + K. Kitchin

Well Identification: MW-19

WELL INTEGRITY

	YES	NO
Protect. Casing Secure	X	
Concrete Collar Intact	X	
PVC Stick-up Intact	X	
Well Cap Present	X	
Security Lock Present		X

Protective Casing Stick-up (from ground) NA ft.

Riser Stick-up (from ground) NA ft.

WELL DIAMETER: [X] 2 inch [ ] 4 inch [ ] 6 inch

WELL MATERIAL: [X] PVC [ ] SS [ ]

Well Depth 12.83 ft. [X] top of riser [ ] top of casing [X] measured [ ] historical

Water Depth 6.30 ft.

LNAPL/DNAPL Depth = NA

Thickness = NA

LOW FLOW DATA

Depth of pump intake: N10'

Static water level after pump put into well ~~6.5~~ 6.01'

Initial purge Rate/ Water Level (100-400 ml/min): 75

Adjusted purge Rates/time/WL(record changes): none

Flow rate at time of sampling: 75

PID SCREENING MEAS.

Background	0.0
Well Mouth	0.0

FIELD WATER QUALITY MEASUREMENTS (record at 3-5 minute intervals)

Time	9:01	1420	1425	1430	1435		1520	1525	1530	1535
Temp. (C)	30.2	9.01	8.87	8.73	Emptied FT cell due to potential well disturbance	turbidity went up to 600 NTUs continued purging	9.93	10.32	10.14	10.33
Conduct. (µmhos/cm)	N	302	290	288			298	301	300	302
DO (mg/l)		3.87	2.65	2.47			6.40	5.61	4.07	4.34
pH (Std. Units)		6.54	6.55	6.55			6.60	6.57	6.56	6.56
Eh (millivolts)	N	-68.0	-109.5	-126.6			-124.9	-117.7	-119.6	-118.9
Turb. (NTU)		41.7	40.0	34.4			124	94	79.8	84.9
Flow (ml/min)		75	75	75			75	75	75	75
Depth To Water (ft)		6.52	6.52	6.52			6.52	6.52	6.52	6.52

Time	1540	1545							
Temp. (C)	9.69		Turbidity high but stable w/ other parameters.						
Conduct. (µmhos/cm)	297	SAMPLED							
DO (mg/l)	4.37								
pH (Std. Units)	6.52								
Eh (millivolts)	-119.1								
Turb. (NTU)	83.6								
Flow (ml/min)	75								
Depth To Water (ft)	6.52								

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump	X	X
Other:		

Description of Sampling Equipment and Flow Rate: YSI 600XL, QED MP10 controller w/ Nitrogen gas, Solinst interface probe, remote 7020

Analytical Parameter	Filtered (Y/N)	Preservation	Volume	Time Collected	Sample #	Case #
VOCs	N	HCL	2 x 40 ml	1545		

K:\geosci\fieldforms\lowflowrecord.ppt

Signed: [signature]

Rev: 1 Feb 2007

Field Instrument Calibration Log

TRC

Date: 2/17/10

Site Name: New Bedford NBHS

Water Quality Instrument Type / ID: YSI 600 XL / 650 Display 98A0904 AE

Turbidity Instrument Type / ID: Lamotte 2020 3332-2402 - US Env.

Date of Last Temperature Probe Check: 2/16/10

Dissolved Oxygen (DO)

Time	Barometric Pressure (mm Hg)	Temperature (° Celsius)	100% Saturation Calibration (On Instrument)	Actual 100% Saturation Calibration (Refer to Attachment A)	Oxygen Solubility at Indicated Pressure (mg/L) (On Instrument)	Actual Oxygen Solubility at Indicated Pressure (mg/L) (Refer to Attachment B)	Zero DO Check (mg/L)	Comments	Initials
0805	750.5	13.27	98.8	99%	10.35	10.36	0.28		HR

pH

Time	Solution Temperature (° Celsius)	pH 7	pH 4	pH 10	pH 7 Check	Comments	Initials
0810	6.30		3.99		7.02 HR		HR
0819	7.86	7.00					HR
0823	7.52			10.02			HR
0828					7.02		HR

Specific Conductance

Time	Specific Conductance Reading (umhos/cm3)	Comments	Initials
0833	1000		HR

Oxidation Reduction Potential (ORP)

Time	Solution Temperature (° Celsius)	ORP Reading (mV) (Refer to Attachment C)	Actual ORP Reading (mV) (On Instrument)	Comments	Initials
0840	10.46	250.5	250.5		HR

Turbidity

Time	Zero Standard	Standard #1 (___ NTUs)	Standard #1 (10 NTUs)	Comments	Initials
0850	0.0	—	10.0		HR

Calibration Fluid ID / Expiration Date:

Zero DO: lot# 2910520 10/2010 Specific Conductance: lot# 7342 8/5/10

pH 4: lot 7345 8/6/10 ph 7: lot 7352 8/7/10 pH 10: lot 7244, 6/22/10

ORP: lot 09K100426 10/2011

Zero Turbidity: 893180 Turbidity Std. # 1: 10 = 997123.0 Turbidity Std. #2: _____

Signed H. Rogers

L2008-213

Field Instrument Calibration Log

TRC

Date: 2/17/10

Site Name: NBHS

Water Quality Instrument Type / ID: YSI 600XL / 00D0472 AL

Turbidity Instrument Type / ID: Lamotte 2020 / 4978-1704

Date of Last Temperature Probe Check: 2/16/10

Dissolved Oxygen (DO)

Time	Barometric Pressure (mm Hg)	Temperature (° Celsius)	100% Saturation Calibration (On Instrument)	Actual 100% Saturation Calibration (Refer to Attachment A)	Oxygen Solubility at Indicated Pressure (mg/L) (On Instrument)	Actual Oxygen Solubility at Indicated Pressure (mg/L) (Refer to Attachment B)	Zero DO Check (mg/L)	Comments	Initials
0803	752.3	14.67	98.1	99.0	10.08	10.05	0.09		KMK

pH

Time	Solution Temperature (° Celsius)	pH 7	pH 4	pH 10	pH 7 Check	Comments	Initials
0808	6.25		4.00				KMK
0811	7.20	7.00					KMK
0815	7.10			10.01			KMK
0817	7.67				7.09		KMK

Specific Conductance

Time	Specific Conductance Reading (umhos/cm3)	Comments	Initials
0824	1000	Cal'd to 1000 uS/cm	KMK

Oxidation Reduction Potential (ORP)

Time	Solution Temperature (° Celsius)	ORP Reading (mV) (Refer to Attachment C)	Actual ORP Reading (mV) (On Instrument)	Comments	Initials
0847	10.10	255.1	250.4	Temp Adjustment	KMK

Turbidity

Time	Zero Standard	Standard #1 (10 NTUs)	Standard #1 (___ NTUs)	Comments	Initials
0855	0.00	9.99			KMK

Calibration Fluid ID / Expiration Date:

Zero DO: 2910520 / 10/10

Specific Conductance: 7342 / 8/5/10

pH 4: 7345 / 8/6/10

ph 7: 7352 / 8/7/10

pH 10: 7302 / 6/22/10

ORP: 09L100231 /

Zero Turbidity: 09L999924 /

Turbidity Std. # 1: 09G997430 /

Turbidity Std. #2: _____

Signed: [signature]

L2008-213

Field Instrument Calibration Log

TRC

Date: 2/18/2010

Site Name: New Bedford

Water Quality Instrument Type / ID: YSI 600XL display 01B0583 YSI: 00D0472

Turbidity Instrument Type / ID: Lamotte 2020 / 4978-1704

Date of Last Temperature Probe Check: 2/14/10

Dissolved Oxygen (DO)

Time	Barometric Pressure (mm Hg)	Temperature (° Celsius)	100% Saturation Calibration (On Instrument)	Actual 100% Saturation Calibration (Refer to Attachment A)	Oxygen Solubility at Indicated Pressure (mg/L) (On Instrument)	Actual Oxygen Solubility at Indicated Pressure (mg/L) (Refer to Attachment B)	Zero DO Check (mg/L)	Comments	Initials
0743	748.0	11.16	99%	98%	11.64	11.65	0.0	Recall →	SLW
							~~0.10~~	100% sol	
							0.06		

pH

Time	Solution Temperature (° Celsius)	pH 7	pH 4	pH 10	pH 7 Check	Comments	Initials
0745	8.34	7.00			7.06		SLW
0748	7.08		3.99				SLW
0750				9.99			SLW

Specific Conductance

Time	Specific Conductance Reading (umhos/cm3)	Comments	Initials
0753	999	1,000 µS/cm solution	SLW

Oxidation Reduction Potential (ORP)

Time	Ambient ~~Solution~~ Temperature (° Celsius)	ORP Reading (mV) (Refer to Attachment C)	Actual ORP Reading (mV) (On Instrument)	Comments	Initials
7:59	11.16	249.2	249.2	@11.16°C solution = 249.2	SLW

Turbidity

Time	Zero Standard	Standard #1 (10 NTUs)	Standard #1 (___ NTUs)	Comments	Initials
0805	0.00	9.98			KMK

Calibration Fluid ID / Expiration Date:

Zero DO: _____

Specific Conductance: 7342 / 8-5-2010

pH 4: 7345 / 8-16-2010

pH 7: 7352 / 8-7-2010

pH 10: 7244 / 6-22-2010

ORP: 09K1004246 / 10-2011

Zero Turbidity: _____

Turbidity Std. # 1: _____

Turbidity Std. #2: _____

Signed: Allison Willis

L2008-213

Field Instrument Calibration Log

TRC

Date: 2/18/10

Site Name: New Bedford NBHS

Water Quality Instrument Type / ID: YSI 600 XL / 650 Display 98A0904AE - US Env.

Turbidity Instrument Type / ID: Lamotte 2020 3332-2402 - US Env.

Date of Last Temperature Probe Check: 2/16/10

Dissolved Oxygen (DO)

Time	Barometric Pressure (mm Hg)	Temperature (° Celsius)	100% Saturation Calibration (On Instrument)	Actual 100% Saturation Calibration (Refer to Attachment A)	Oxygen Solubility at Indicated Pressure (mg/L) (On Instrument)	Actual Oxygen Solubility at Indicated Pressure (mg/L) (Refer to Attachment B)	Zero DO Check (mg/L)	Comments	Initials
0745	747.9	14.14	98.3		10.09		0.17		JH

pH

Time	Solution Temperature (° Celsius)	pH 7	pH 4	pH 10	pH 7 Check	Comments	Initials
0755	7.50	7.01	3.99	10.00	7.00		JH

Specific Conductance

Time	Specific Conductance Reading (umhos/cm3)	Comments	Initials
0810	1000		JH

Oxidation Reduction Potential (ORP)

Time	Solution Temperature (° Celsius)	ORP Reading (mV) (Refer to Attachment C)	Actual ORP Reading (mV) (On Instrument)	Comments	Initials
0813	10.55		250.5		JH

Turbidity

Time	Zero Standard	Standard #1 (____ NTUs)	Standard #1 (____ NTUs)	Comments	Initials

Calibration Fluid ID / Expiration Date:

Zero DO: lot # 2910520

Specific Conductance: lot # 7342 8/5/10

pH 4: lot 7345 8/6/10

ph 7: lot 7352 8/7/10

pH 10: lot 7244, 6/22/10

ORP: lot 09K100426 10/2011

Zero Turbidity: 893180

Turbidity Std. # 1: 10 = 997123.0

Turbidity Std. #2:

Signed

L2008-213

Field Instrument Calibration Log

TRC

Date: 2/19/2010

Site Name: NewBedford

Water Quality Instrument Type / ID: Display: 01 B0583 YSI: 00D0472

Turbidity Instrument Type / ID:

Date of Last Temperature Probe Check:

Dissolved Oxygen (DO)

Time	Barometric Pressure (mm Hg)	Temperature (° Celsius)	100% Saturation Calibration (On Instrument)	Actual 100% Saturation Calibration (Refer to Attachment A)	Oxygen Solubility at Indicated Pressure (mg/L) (On Instrument)	Actual Oxygen Solubility at Indicated Pressure (mg/L) (Refer to Attachment B)	Zero DO Check (mg/L)	Comments	Initials
800	760.23	13.68	100.3%	100%	10.19	10.27	0.25		AW

pH

Time	Solution Temperature (° Celsius)	pH 7	pH 4	pH 10	pH 7 Check	Comments	Initials
0802	11.19		3.98				AW
0805	10.82			10.00			
0808	11.27	7.06					
0812					7.00		

Specific Conductance

Time	Specific Conductance Reading (umhos/cm3)	Comments	Initials
0810	1000	1,000 µS/cm Solution	AW

Oxidation Reduction Potential (ORP)

Time	~~Solution~~ Ambient Temperature (° Celsius)	ORP Reading (mV) (Refer to Attachment C)	Actual ORP Reading (mV) (On Instrument)	Comments	Initials
0815	13.68	245.3	245.3	@14° solution is 245.3	AW

Turbidity

Time	Zero Standard	Standard #1 (10 NTUs)	Standard #1 (___ NTUs)	Comments	Initials
0820	0.0	10.00	—		HK

Calibration Fluid ID / Expiration Date:

Zero DO: 2910520 / Oct-2010 Specific Conductance: 7342 / 8-5-2010

pH 4: 7345 / 8-6-2010 ph 7: 7852 8/7/2010 pH 10: 7244 / 6-22-2010

ORP: 09K10042ce / 10-2011

Zero Turbidity: Turbidity Std. # 1: Turbidity Std. #2:

Signed Allen Alleiss

L2008-213

Field Instrument Calibration Log

TRC

Date: 2/19/10

Site Name: NBHS

Water Quality Instrument Type / ID: YSI

Turbidity Instrument Type / ID: Lamotte 2020

Date of Last Temperature Probe Check:

Dissolved Oxygen (DO)

Time	Barometric Pressure (mm Hg)	Temperature (° Celsius)	100% Saturation Calibration (On Instrument)	Actual 100% Saturation Calibration (Refer to Attachment A)	Oxygen Solubility at Indicated Pressure (mg/L) (On Instrument)	Actual Oxygen Solubility at Indicated Pressure (mg/L) (Refer to Attachment B)	Zero DO Check (mg/L)	Comments	Initials
0750	748.7	14.65	98.5		10.01		0.10		HK

pH

Time	Solution Temperature (° Celsius)	pH 7	pH 4	pH 10	pH 7 Check	Comments	Initials
0800	11.05	7.00	3.99	9.99	7.02		JH

Specific Conductance

Time	Specific Conductance Reading (umhos/cm3)	Comments	Initials
0815	1000		JH

Oxidation Reduction Potential (ORP)

Time	Solution Temperature (° Celsius)	ORP Reading (mV) (Refer to Attachment C)	Actual ORP Reading (mV) (On Instrument)	Comments	Initials
0818	14.6	245.3	245.3		JH

Turbidity

Time	Zero Standard	Standard #1 (10 NTUs)	Standard #1 (___ NTUs)	Comments	Initials
0825	0.0	9.99			HK

Calibration Fluid ID / Expiration Date:

Zero DO: _____ Specific Conductance: _____

pH 4: _____ ph 7: _____ pH 10: _____

ORP: _____

Zero Turbidity: _____ Turbidity Std. # 1: _____ Turbidity Std. #2: _____

Signed: H. Brian

L2008-213

APPENDIX G

TEMPORARY SOIL GAS SAMPLING METHOD

FINAL

Guidance for Evaluating Soil Vapor Intrusion in the State of New York

October 2006

Prepared by:

NEW YORK STATE DEPARTMENT OF HEALTH
Center for Environmental Health
Bureau of Environmental Exposure Investigation

Soil Vapor Intrusion Guidance Release History

October 2006 — Current version
February 2005 — Public comment draft

Contact Information

Comments and questions on the guidance may be sent to the following:

New York State Department of Health
Bureau of Environmental Exposure Investigation
Flanigan Square, Room 300
547 River Street
Troy, New York 12180-2216

Email: BEEI@health.state.ny.us
Telephone: 1-800-458-1158, extension 27850

New York State Departments of Health and Environmental Conservation — Web Sites on Soil Vapor Intrusion

This guidance, policy documents, training documents, fact sheets, etc. are available to the public on the following web sites:

New York State Department of Health
http://www.health.state.ny.us/environmental/indoors/vapor_intrusion

New York State Department of Environmental Conservation
http://www.dec.state.ny.us/website/der/guidance/vapor/index.html

As new information becomes available (e.g., revisions or amendments to the guidance, new fact sheets, etc.), these web sites will be updated accordingly.

Preface

This guidance has been prepared by the New York State Department of Health (NYSDOH) in consultation with the New York State Department of Environmental Conservation (NYSDEC) — collectively referred to as "the State" throughout this document. It is intended as general guidance for parties evaluating soil vapor intrusion in the State of New York. The guidance is not a regulation, rule or requirement.

The guidance describes the State's methodology for evaluating soil vapor intrusion at a site. It reflects our experience in conducting soil vapor intrusion investigations and presents a reasonable and practical approach to identifying and addressing current and potential human exposures to contaminated subsurface vapors associated with known or suspected volatile chemical contamination. The approach presented is analogous to the approach taken when investigating contamination in other environmental media (e.g., groundwater, soil, etc.) and addressing corresponding exposure concerns.

The guidance is organized into five sections:

Section 1 introduces the concept of soil vapor intrusion, associated human exposure issues, factors affecting soil vapor intrusion, factors affecting indoor air quality, and the general approach recommended to evaluating vapor intrusion;

Section 2 provides guidance on collecting appropriate and relevant data that can be used to identify current or potential human exposures;

Section 3 discusses how the investigation data are evaluated, recommends actions based on the evaluation, and presents tools that are used when determining appropriate actions to address exposures;

Section 4 provides an overview of soil vapor intrusion mitigation methods and basic recommendations pertaining to their selection for use, installation and design, post-mitigation testing, operation, maintenance and monitoring, termination of operation, and annual certification; and

Section 5 describes outreach techniques commonly used to inform the community about soil vapor intrusion issues.

The State recommends that the guidance be considered anywhere soil vapor intrusion is evaluated in the State of New York — whether the evaluation is undertaken voluntarily by a corporation, a municipality, or private citizen, or whether it is performed under one of the State's environmental remediation programs.

PLEASE NOTE:

- While soil vapor intrusion can also occur with "naturally-occurring" subsurface gases (e.g., radon, methane and hydrogen sulfide), the document discusses soil vapor intrusion in terms of environmental contamination only.
- The guidance document addresses soil vapor intrusion. However, vapor intrusion can also occur through direct volatilization of contaminants from groundwater into indoor air. This can occur when, for example, a basement slab is in contact with contaminated groundwater, contaminated groundwater enters (floods) a basement or crawl space, or contaminated groundwater enters a sump pit drainage system. In such cases, volatile

chemicals can be transferred directly from groundwater to indoor air without the intervening contamination of soil vapor. Although exposures of this nature are not discussed in this guidance, they should be addressed on a site-specific and building-specific basis.

- Throughout the guidance references are made to specific brands of field equipment. These references are for discussion purposes only and are intended to be illustrative. They should not be interpreted as endorsements by the State of any one company or their products.

ACRONYMNS and ABBREVIATIONS

ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substance and Disease Registry
BASE	Building Assessment and Survey Evaluation
BTSA	[NYSDOH] Bureau of Toxic Substance Assessment
CME	Continuing Medical Education
CSEMs	Case Studies in Environmental Medicine
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
GC	Gas Chromatograph
HEI	Health Effects Institute
HVAC	Heating, Ventilating and Air-conditioning
mcg/m^3	micrograms per cubic meter
MeCl	Methylene Chloride
MEK	Methyl Ethyl Ketone; 2-Butanone
MTBE	Methyl-*tert*-Butyl Ether
NAPL	Non-Aqueous Phase Liquid
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OVM	Organic Vapor Monitor
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene or Perchloroethylene
PID	Photoionization Detector
QA/QC	Quality Assurance/Quality Control
RIOPA	Relationship of Indoor, Outdoor, and Personal Air
SF_6	Sulfur Hexafluoride
SSD	Sub-slab Depressurization System
SIM	Selective Ion Monitoring
SMD	Sub-Membrane Depressurization
SVE	Soil Vapor Extraction
SVOCs	Semi-volatile Organic Compounds
TAL	Target Analyte List
TCA	Trichloroethane
TCDD	Tetrachlorodibenzo-*p*-Dioxin Equivalents
TCE	Trichloroethene
TCL	Target Compound List
VOCs	Volatile Organic Compounds

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Section 1: Introduction

This section introduces the concept of soil vapor intrusion, associated human exposure issues, factors affecting soil vapor intrusion, factors affecting indoor air quality, and the general approach to evaluating vapor intrusion.

1.1 Soil vapor intrusion

The phrase "soil vapor intrusion" refers to the process by which volatile chemicals migrate from a subsurface source into the indoor air of buildings. Soil vapor, also referred to as soil gas, is the air found in the pore spaces between soil particles (Figure 1.1). Primarily because of a difference between interior and exterior pressures, soil vapor can enter a building through cracks or perforations in slabs or basement floors and walls, and through openings around sump pumps or where pipes and electrical wires go through the foundation. For example, heating, ventilation or air-conditioning (HVAC) systems and/or the operation of large mechanical appliances (e.g., exhaust fans, dryers, etc.) may create a negative pressure that can draw soil vapor into the building. This intrusion is similar to how radon gas enters buildings from the subsurface.

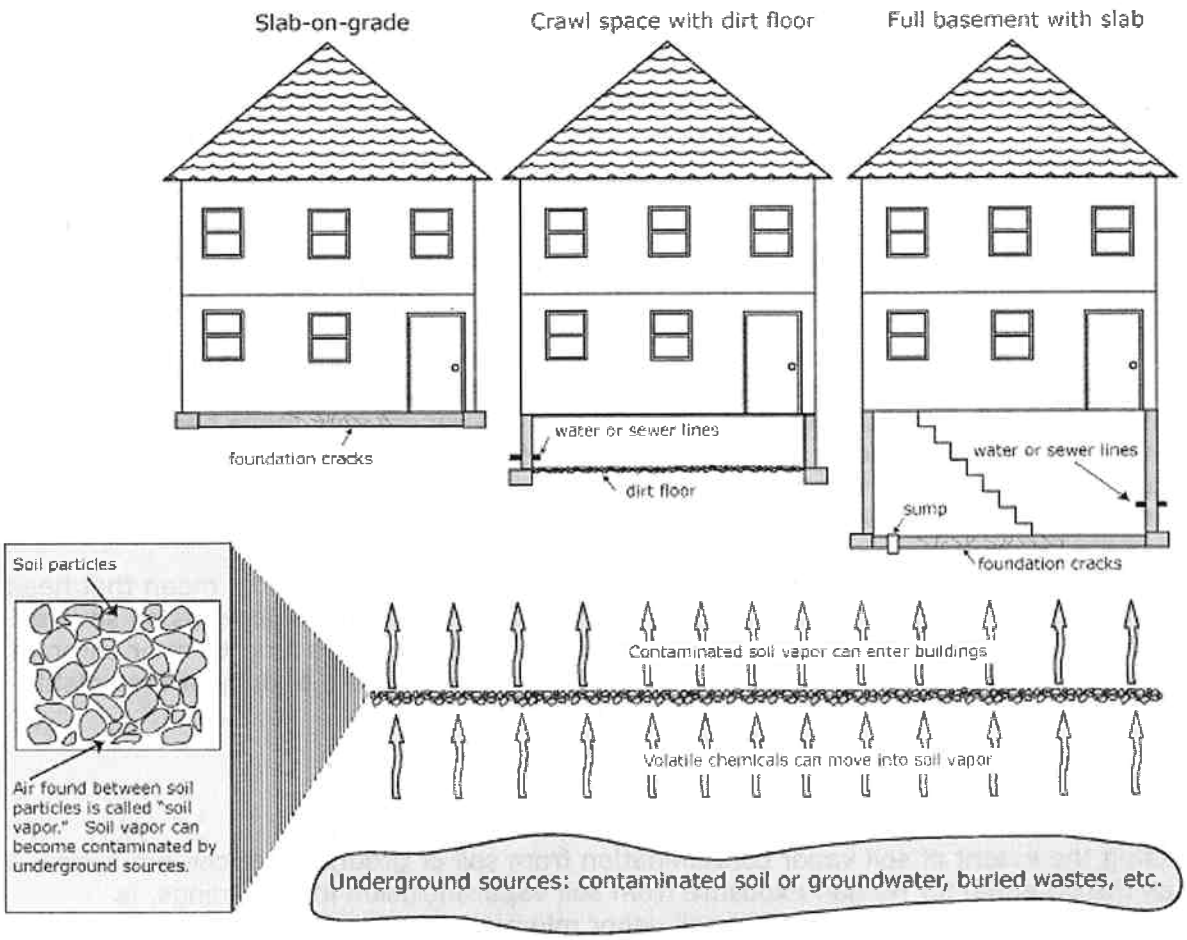

Figure 1.1
Generalized diagram of soil vapor intrusion

Soil vapor can become contaminated when chemicals evaporate from subsurface sources. Chemicals that can emit vapors are called "volatile chemicals." Volatile chemicals include volatile organic compounds (VOCs), some semi-volatile organic compounds (SVOCs), and some inorganic substances such as elemental mercury. Subsurface sources of volatile chemicals can include the following:

a. groundwater or soil that contains volatile chemicals;

b. non-aqueous phase liquid (NAPL);

c. buried wastes; and

d. underground storage tanks or drums.

If soil vapor is contaminated and enters a building, indoor air quality may be affected.

When contaminated vapors are present in the zone directly next to or under the foundation of a building, vapor intrusion is possible. Soil vapor can enter a building whether the building is old or new, or whether it is on a slab or has a crawl space or basement (Figure 1.1). However, the subsurface source of the contaminated vapor (e.g., contaminated soil or groundwater) does not need to be directly beneath a structure to contaminate the vapor immediately beneath the building's foundation (as suggested in Figure 1.1).

1.2 Soil vapor intrusion and human exposure

Humans can be exposed to contaminated soil vapor when the vapor is drawn into the building due to pressure differences [Section 1.1] and mixed with the indoor air. Inhalation is the primary route of exposure, or the manner in which the volatile chemicals, once in the indoor air, actually enter the body.

Both current and potential exposures are considered when evaluating soil vapor intrusion at sites (i.e., locations of suspected or known environmental contamination). *Current* exposures exist when vapor intrusion is documented in an occupied building. *Potential* exposures exist when volatile chemicals are present in the vapor phase beneath a building, but have not affected indoor air quality due to current site conditions. Potential exposures also exist when there is a chance that contaminated soil vapors may move beneath existing buildings not currently affected, when indoor air is affected but the building is currently unoccupied, or when there is a chance that new buildings can be built over existing subsurface vapor contamination.

Exposure to a volatile chemical due to vapor intrusion does not necessarily mean that health effects will occur. Whether or not a person experiences health effects depends on several factors, including the length of exposure (short-term or acute versus long-term or chronic), the amount of exposure (i.e., dose), the frequency of exposure, the toxicity of the volatile chemical and the individual's sensitivity to the chemical.

1.3 Factors affecting soil vapor migration and intrusion

Predicting the extent of soil vapor contamination from soil or groundwater contamination, as well as the potential for human exposure from soil vapor intrusion into buildings, is complicated by factors that can affect soil vapor migration and intrusion. For example, soil vapor contaminant plumes may not mimic groundwater contaminant plumes since different factors affect the migration pattern of each medium. In addition to the operation of HVAC systems, the operation of kitchen vents in restaurants or of elevators in office buildings may

induce pressure gradients that result in the migration of vapor-phase contaminants away from a groundwater source of vapors and toward these buildings. This is similar to when the pumping of production wells or water supply wells draws contaminated groundwater away from its natural flow path.

Factors that can affect soil vapor migration and intrusion generally fall into two categories: environmental and building factors. Examples of environmental factors are provided in Table 1.1, and examples of building factors in Table 1.2. These factors are considered when conducting an investigation of the soil vapor intrusion pathway [Section 2] and when evaluating the results [Section 3].

Table 1.1 Environmental factors that may affect soil vapor intrusion

Environmental Factor	Description
Soil conditions	Generally, dry, coarse-grained soils facilitate the migration of subsurface vapors and wet, fine-grained or highly organic soils retard migration.
Volatile chemical concentrations	The potential for vapor intrusion generally increases with increasing concentrations of volatile chemicals in groundwater or subsurface soils, as well as with the presence of NAPL.
Source location	The potential for vapor intrusion generally decreases with increasing distance between the subsurface source of vapor contamination and overlying buildings. For example, the potential for vapor intrusion associated with contaminated groundwater decreases with increasing depth to groundwater.
Groundwater conditions	Volatile chemicals dissolved in groundwater may off-gas to the vadose zone from the surface of the water table. If contaminated groundwater is overlain by clean water (upper versus lower aquifer systems or significant downward groundwater gradients), then vapor phase migration or partitioning of the volatile chemicals is unlikely. Additionally, fluctuations in the groundwater table may results in contaminant smear zones. The "smear zone" is the area of subsurface soil contamination within the range of depths where the water table fluctuates. Chemicals floating on top of the water table, such as petroleum components, can sorb onto soils within this zone as the water table fluctuates. Sorption of chemicals can influence their gaseous and aqueous phase diffusion in the subsurface, and ultimately the rate at which they migrate.
Surface confining layer	A surface confining layer (e.g., frost layer, pavement or buildings) may temporarily or permanently retard the migration of subsurface vapors to outdoor air. Confining layers can also prevent rainfall from reaching subsurface soils, creating relatively dry soils that further increase the potential for soil vapor migration.
Fractures in bedrock and/or tight clay soils	Fractures in bedrock and desiccation fractures in clay can increase the potential for vapor intrusion beyond that expected for the bulk, unfractured bedrock or clay matrix by facilitating vapor migration (in horizontal and vertical directions) and movement of contaminated groundwater along spaces between fractures.
Underground conduits	Underground conduits (e.g., sewer and utility lines, drains or tree roots, septic systems) with highly permeable bedding materials relative to native materials can serve as preferential pathways for vapor migration due to relatively low resistance to flow.
Weather conditions	Wind and barometric pressure changes and thermal differences between air and surrounding soils may induce pressure gradients that affect soil vapor intrusion.
Biodegradation processes	Depending upon environmental conditions (e.g., soil moisture, oxygen levels, pH, mineral nutrients, organic compounds, and temperature), the presence of appropriate microbial populations, and the degradability of the volatile chemical of concern, biodegradation in the subsurface may reduce the potential for vapor intrusion. For example, readily biodegradable chemicals in soil vapor may not migrate a significant distance from a source area while less degradable chemicals may travel farther.

Table 1.2 Building factors that may affect vapor intrusion

Building Factor	Description
Operation of HVAC systems, fireplaces, and mechanical equipment (e.g., clothes dryers or exhaust fans/vents)	Operation may create a pressure differential between the building or indoor air and the surrounding soil that induces or retards the migration of vapor-phase contaminants toward and into the building. Vapor intrusion can be enhanced as the air vented outside is replaced.
Heated building	When buildings are closed up and heated, a difference in temperature between the inside and outdoor air induces a stack effect, venting warm air from higher floors to the outside. Vapor intrusion can be enhanced as the air is replaced in the lower parts of the building.
Air exchange rates	The rate at which outdoor air replenishes indoor air may affect vapor migration into a building as well the indoor air quality. For example, newer construction is typically designed to limit the exchange of air with the outside environment. This may result in the accumulation of vapors within a building.
Foundation type	Earthen floors and fieldstone walls may serve as preferential pathways for vapor intrusion.
Foundation integrity	Expansion joints or cold joints, wall cracks, or block wall cavities may serve as preferential pathways for vapor intrusion.
Subsurface features that penetrate the building's foundation	Foundation perforations for subsurface features (e.g., electrical, gas, sewer or water utility pipes, sumps, and drains) may serve as a preferential pathway for vapor intrusion.

1.4 Factors affecting indoor air quality

Chemicals are a part of our everyday life. They are found in the household products we use and in items we bring into our homes. As such, chemicals are found in indoor air of homes not affected by intrusion of contaminated soil vapor. Examples of alternate sources of volatile chemicals in indoor air are given in Table 1.3. Similarly, volatile chemicals can be in the outdoor air that enters a home or place of business. Certain commercial and industrial facilities, such as gasoline stations and dry cleaners, and vehicle exhaust are examples of possible sources of volatile chemicals in outdoor air.

Commonly found concentrations of these chemicals in indoor and outdoor air are referred to as "background levels." These levels are generally determined from the results of samples collected in homes, offices and outdoor areas not known to be affected by external sources of volatile chemicals (for example, a home not known to be near a chemical spill, a hazardous waste site, a dry-cleaner, or a factory). Background sources of volatile chemicals are considered when conducting an investigation of the soil vapor intrusion pathway [Section 2] and when evaluating the results [Section 3].

Table 1.3 Alternate sources of volatile chemicals in indoor air

Source	Description
Outdoor air	Outdoor sources of pollution can affect indoor air quality due to the exchange of outdoor and indoor air in buildings through natural ventilation, mechanical ventilation or infiltration. Outdoor sources of volatile compounds include automobiles, lawn mowers, oil storage tanks, dry cleaners, gasoline stations, industrial facilities, etc.
Attached or underground garages	Volatile chemicals from sources stored in the garage (e.g., automobiles, lawn mowers, oil storage tanks, gasoline containers, etc.) can affect indoor air quality due to the exchange of air between the garage and indoor space.
Off-gassing	Volatile chemicals may off-gas from building materials (e.g., adhesives or caulk), furnishings (e.g., new carpets or furniture), recently dry-cleaned clothing, or areas (such as floors or walls) contaminated by historical use of volatile chemicals in a building. Volatile chemicals may also off-gas from contaminated groundwater that infiltrates into the basement (e.g., at a sump) or during the use of contaminated domestic well water (e.g., at a tap or in a shower).
Household products	Household products include, but are not limited to, cleaners, mothballs, cigarette smoke, paints, paint strippers and thinners, air fresheners, lubricants, glues, solvents, pesticides, fuel oil storage, and gasoline storage.
Occupant activities	For example, in non-residential settings, the use of volatile chemicals in industrial or commercial processes or in products used for building maintenance. In residential settings, the use of products containing volatile chemicals for hobbies (e.g., glues, paints, etc.) or home businesses. People working at industrial or commercial facilities where volatile chemicals are used may bring the chemicals into their home on their clothing.
Indoor emissions	These include, but are not limited to, combustion products from gas, oil and wood heating systems that are vented outside improperly, as well as emissions from industrial process equipment and operations.

1.5 General approach to evaluating soil vapor intrusion

Since no two sites are exactly alike, the approach to evaluating soil vapor intrusion is dependent upon site-specific conditions. A thorough understanding of the site, including its history of use, characteristics (e.g., geology, geography, identified environmental contamination, etc.) and potentially exposed populations, is used to develop an investigation plan. Existing information is reviewed to determine what data are available and what additional data should be collected (i.e., to guide the investigation). In addition, factors affecting soil vapor migration and intrusion [Section 1.3] and indoor air quality [Section 1.4] are also considered when both conducting an investigation [Section 2] and evaluating the results [Section 3].

This data gathering and review process should be repeated until each of the following questions can be answered:

[1] Are subsurface vapors contaminated (i.e., soil vapor as defined in Section 1.1, including vapors located immediately beneath the foundation or slab of a building)? If so, what are the nature and extent of contamination? What is/are the source(s) of the contamination?

[2] What are the current and potential exposures to contaminated subsurface vapors via soil vapor intrusion?

[3] What actions, if any, should be taken to prevent or mitigate exposures related to soil vapor intrusion and to remediate subsurface vapor contamination?

When determining what actions, if any, are appropriate to mitigate current or prevent future human exposures, all information known about a site is considered (i.e., a "whole picture" approach is taken) because each site presents its own unique set of circumstances. This information includes, but is not limited to, the following: nature and extent of contamination in all environmental media, factors affecting vapor migration and intrusion, current and future site uses, off-site land uses, presence of alternate sources of volatile chemicals, and completed or proposed remedial actions.

Actions taken to minimize or prevent exposures typically do not preclude the site from being used for a desired purpose or from being developed. If appropriate, mitigation systems can be installed at existing buildings or installed during the construction of new buildings. In many cases, installation of mitigation systems on new buildings may be a prudent, proactive action. The costs associated with installing a system at the time of a building's construction are often considerably less than the costs associated with retrofitting a system to the building after construction is completed. Furthermore, in many parts of New York State, the mitigation system would also address concerns about human exposures to radon. To learn more about radon in New York State, please refer to the Radon: Frequently Asked Questions Fact Sheet in Appendix H or visit the NYSDOH's web site at http://www.health.state.ny.us/nysdoh/radon/radonhom.htm or contact the NYSDOH's Radon Program at 1-800-458-1158.

1.6 Conceptual site model

In accordance with the NYSDEC's *Draft DER-10 Technical Guidance for Site Investigation and Remediation* (NYSDEC 2002), subsurface vapors and soil vapor intrusion should be included in an overall conceptual model for the site. As described in the NYSDEC's technical guidance, a conceptual site model should be used to develop a general understanding of the site to evaluate potential risks to public health and the environment and to assist in identifying and setting priorities for the activities to be conducted at the site. The conceptual site model also identifies potential sources of contamination, types of contaminants and affected media, release mechanisms and potential contaminant pathways, and actual/potential human and environmental receptors.

The components of a conceptual site model specific to soil vapor intrusion are provided throughout Section 1 of the guidance. The general approach for evaluating soil vapor intrusion described in Section 1.5 is analogous to the development of a conceptual site model specific to soil vapor intrusion. For additional information about the use of conceptual site models in the investigation and remediation of sites or a description of the conceptual site model process, the reader is referred to the NYSDEC's technical guidance.

1.7 Applicability of guidance

This guidance should be considered anywhere soil vapor intrusion is evaluated in the State of New York, whether the evaluation is being undertaken voluntarily by a corporation, a municipality, or private citizen, or under one of the state's environmental remediation programs.

1.7.1 Residential and non-residential settings

The guidance should be followed in residential and non-residential settings where people may be exposed involuntarily to chemicals from soil vapor intrusion.

1.7.2 Chlorinated and non-chlorinated volatile chemical sites

The guidance should be used when evaluating soil vapor intrusion at chlorinated and non-chlorinated volatile chemical sites, including petroleum hydrocarbon sites and manufactured gas plant sites. While the likelihood for exposures related to soil vapor intrusion may differ between sites due to site-specific conditions and chemical-specific properties, the extent of volatile chemical contamination and the nature of the contamination, these factors should be considered when developing the conceptual site model and implementing an investigation plan (as discussed in Sections 1.5 and 1.6). For example, if the conceptual site model suggests that soil vapor intrusion is not a concern at a petroleum hydrocarbon site due to biodegradation, the work plan might include the measurement of select bioparameters (e.g., oxygen, carbon dioxide, methane, etc.), along with the petroleum hydrocarbons, at varying depths to demonstrate bioattenuation in the vadose. The work plan might include sub-slab vapor sampling as well to demonstrate that conditions beneath nearby buildings are also resulting in bioattenuation of the petroleum hydrocarbons.

1.7.3 Current, new and past remedial sites

As discussed in the NYSDEC's Program Policy *DER-13: Strategy for Prioritizing Vapor Intrusion Evaluations at Remedial Sites in New York* (NYSDEC 2006), the soil vapor intrusion pathway will be evaluated at all completed, current and future remedial sites New York State. This soil vapor intrusion guidance document complements the NYSDEC's policy by providing recommendations on how to evaluate soil vapor intrusion. The combined goal of the policy and guidance documents is to conduct soil vapor intrusion evaluations as efficiently and effectively as possible at all remedial sites in New York.

1.8 Updates to the guidance

The investigation, evaluation, mitigation and remediation of soil vapor are evolving disciplines and this guidance document will be updated periodically, as appropriate. The history of the document's release is provided on the inside of the cover page. In addition, changes to the document are noted in Appendix A. The current version of the document supercedes previous versions. The current version of the guidance is available on the NYSDOH's web site (*http://www.health.state.ny.us/environmental/indoors/vapor_intrusion/*) or by contacting the NYSDOH's Bureau of Environmental Exposure Investigation [see Contact Information on the inside of the cover page]. Revisions or amendments to the guidance will be posted on the NYSDOH's web site.

Section 2: Investigation of the Soil Vapor Intrusion Pathway

Soil vapor is an environmental medium, like groundwater and soil, that should be characterized during the investigation of a site. This section provides guidance on collecting appropriate and relevant data that can be used to identify current or potential human exposures to contaminated subsurface vapors associated with a site. As discussed in Section 1.5, no two sites are exactly alike. Site-specific and/or building-specific conditions may warrant modifying the recommendations herein. Therefore, guidance provided in this section is presented in terms of general steps and strategies that should be applied when approaching an investigation of soil vapor intrusion.

2.1 Sites at which an investigation is appropriate

Data collected to date do not support the use of pre-determined concentrations of volatile chemicals (i.e., screening criteria) in either groundwater or soil to trigger a soil vapor intrusion investigation. Therefore, although the level of investigation may vary, the pathway should be investigated at any site with the following:

a. an existing subsurface source (e.g., on the basis of preliminary environmental sampling) or likely subsurface source (e.g., on the basis of known previous land uses) of volatile chemicals [Section 1.1]; and

b. existing buildings or the possibility that buildings may be constructed near a subsurface source of volatile chemicals.

2.2 Types of samples

The following are types of samples that are collected to investigate the soil vapor intrusion pathway:

a. subsurface vapor samples:

   1. *soil vapor* samples (i.e., soil vapor samples not beneath the foundation or slab of a building) and

   2. *sub-slab vapor* samples (i.e., soil vapor samples immediately beneath the foundation or slab of a building);

b. crawl space air samples;

c. indoor air samples; and

d. outdoor air samples.

The types of samples that should be collected depend upon the specific objective(s) of the sampling, as described below.

2.2.1 Soil vapor

Soil vapor samples are collected to determine whether this environmental medium is contaminated, characterize the nature and extent of contamination, and identify possible sources of the contamination. Our experience to date indicates soil vapor results alone typically cannot be relied upon to rule out sampling at nearby buildings. For example, concentrations of volatile chemicals in sub-slab vapor samples have been substantially higher (e.g., by a factor of 100 or more) than concentrations found in nearby soil vapor

samples (e.g., collected at 8 feet below grade near the building). This may be due to differences in factors such as soil moisture content and pressure gradients. Therefore, exposures are evaluated primarily based on sub-slab vapor, indoor air and outdoor air sampling results and soil vapor results are primarily used as a tool to guide these investigations.

Soil vapor sampling results are also used when evaluating the effectiveness of direct or indirect measures to remediate contaminated subsurface vapors. (Soil vapor extraction is an example of a direct remedial measure, and groundwater pumping and treating an indirect measure.)

2.2.2 Sub-slab vapor

Sub-slab vapor samples are collected to characterize the nature and extent of soil vapor contamination immediately beneath a building with a basement foundation and/or a slab-on-grade. Sub-slab vapor sampling results are used in conjunction with indoor air and outdoor air sampling results when evaluating the following:

a. *current* human exposures;

b. the potential for *future* human exposures (e.g., if the structural integrity of the building changes or the use of the building changes); and

c. site-specific attenuation factors (i.e., the ratio of indoor air to sub-slab vapor concentrations).

Sub-slab vapor samples are often collected after soil vapor characterization and/or other environmental sampling (e.g., soil and groundwater characterization) indicate they are warranted. Sub-slab samples are typically collected concurrently with indoor and outdoor air samples. However, outside of the heating season, sub-slab vapor samples may be collected independently depending on the sampling objective (e.g., to characterize the extent of subsurface vapor contamination outside of the heating season to develop a more comprehensive, focused investigation plan for the heating season).

2.2.3 Crawl space air

Similar to sub-slab vapor samples, crawl space air samples are collected to characterize the nature and extent of contamination immediately beneath a building with a crawl space foundation. Crawl space air sampling results are used in conjunction with indoor air and outdoor air sampling results when evaluating the following:

a. *current* human exposures; and

b. the potential for *future* human exposures (e.g., if the structural integrity of the building changes or the use of the building changes).

2.2.4 Indoor air

Indoor air samples are collected to characterize exposures to air within a building, including those with earthen floors. Indoor air sampling results are used when evaluating the following:

a. *current* human exposures;

b. the potential for *future* exposures (e.g., if a currently vacant building should become occupied); and

c. site-specific attenuation factors (e.g., the ratio of indoor air to sub-slab vapor concentrations).

Indoor air samples are often collected after subsurface vapor characterization and other environmental sampling (e.g., soil and groundwater characterization) indicate they are warranted. When indoor air samples are collected, concurrent sub-slab vapor, crawl space air (if applicable) and outdoor air samples are collected to evaluate the indoor air results appropriately. However, indoor air and outdoor air samples, without sub-slab vapor samples, may be collected when confirming the effectiveness of a mitigation system [Section 4].

In addition, site-specific situations may warrant collecting indoor air samples prior to characterizing subsurface vapors and/or without concurrent sub-slab vapor sampling to examine immediate inhalation hazards. Examples of such situations may include, but are not limited to, the following:

a. in response to a spill event to qualitatively and/or quantitatively characterize the contamination;

b. if high readings are obtained in a building when screening with field equipment (e.g., a photoionization detector (PID), an organic vapor analyzer, or an explosimeter) and the source is unknown;

c. if significant odors are present and the source needs to be characterized; or

d. if groundwater beneath the building is contaminated, the building is prone to groundwater intrusion or flooding (e.g., sump pit overflows), and subsurface vapor sampling is not feasible. In these situations, the collection of water samples from the sump may also be appropriate.

2.2.5 Outdoor air

Outdoor air samples are collected to characterize site-specific background outdoor air conditions. Outdoor air samples should be collected simultaneously with indoor air samples to evaluate the potential influence, if any, of outdoor air on the indoor air sampled. Outdoor air samples may also be collected concurrently with soil vapor samples to identify potential outdoor air interferences associated with infiltration of outdoor air into the sampling apparatus while the soil vapor was collected.

2.3 Phase of a site investigation in which to sample

There is no single phase (e.g., preliminary site characterization or remedial investigation) of a site investigation during which sampling to evaluate the soil vapor intrusion pathway is appropriate. Initiation of investigation activities for this specific purpose should be determined on a site-by-site basis. However, if exposures due to soil vapor intrusion appear likely at any point during the investigation, evaluation of this exposure pathway should not be delayed.

If the locations of likely source areas are reasonably known, sampling earlier during the investigation of a site rather than later is recommended because of the iterative nature of the sampling process [Section 2.5]. However, if current site conditions are not well-defined, then sampling after contamination in other environmental media (e.g., groundwater and soil) has been characterized may be considered. In the latter scenario, groundwater, soil and other site information may be used to guide an investigation of the soil vapor intrusion pathway, such as selecting locations for subsurface vapor samples based on likely migration pathways and source areas [Sections 2.6.1 and 2.6.2]. At a minimum, depth to groundwater and soil stratigraphy should be identified prior to collecting soil vapor samples.

Sampling may be delayed at parcels that are undeveloped or contain unoccupied buildings provided

a. characterization of the parcel is not needed to
    1. address exposures in the surrounding area;
    2. design remedial measures for subsurface vapor contamination; or
    3. monitor or confirm the effectiveness of remedial measures; and
b. measures are in place that assure that the parcel will not be developed, or buildings occupied, without addressing exposure concerns [Section 3.6].

If exposures due to soil vapor intrusion appear likely, and a delay of sampling is contemplated, the State (i.e., the NYSDEC and NYSDOH) should be informed of the contemplated delay and the rationale for the delay. Furthermore, the party contemplating the delay should consider any comments the State may have on the information provided.

2.4 Time of year in which to sample

2.4.1 Soil vapor

Soil vapor samples are collected at any time during the year. Often, sampling is completed during the summer so the results can be used as a tool when selecting buildings to be sampled during the heating season.

2.4.2 Buildings

Sub-slab vapor samples and, unless immediate sampling is appropriate, indoor air samples are typically collected during the heating season because soil vapor intrusion is more likely to occur when a building's heating system is in operation and doors and windows are closed. In New York State, heating systems are generally expected to be operating routinely from November 15th to March 31st. However, these dates are not absolute; the timeframe for sampling may vary depending on factors such as the location of the site (e.g., upstate versus downstate) and the weather conditions for a particular year.

A soil vapor intrusion investigation at a building may be conducted outside of the heating season if the concern for vapor intrusion is greater during another time of year. This may occur at certain industrial buildings, for instance, where HVAC systems are actively managed to control the ratio of recirculated indoor air to make-up air from outside the building. Information about the site and potentially affected structures, including the factors discussed in Section 1.3, should be considered in determining the timing of an investigation.

Samples may be collected at any time of year if exposures due to soil vapor intrusion appear likely. However, samples collected at times when soil vapor intrusion is not expected to have its greatest effect on indoor air quality (typically, samples collected outside of the heating season) should not be used to rule out exposures. For example, results indicating "no further action" or "monitoring required" should be verified when soil vapor intrusion is believed to be most likely to ensure these actions are protective throughout the year.

2.5 Number of sampling rounds

Investigating the soil vapor intrusion pathway usually involves more than one round of subsurface vapor, indoor air and/or outdoor air sampling, for reasons such as the following:

a. to characterize the nature and extent of subsurface vapor contamination (similar to the delineation of groundwater contamination) and to address corresponding exposure concerns;

b. to evaluate fluctuations in concentrations due to

   1. different weather conditions (e.g., seasonal effects),
   2. changes in building conditions (e.g., various operating conditions of a building's HVAC system),
   3. changes in source strength, or
   4. vapor migration or contaminant biodegradation processes (particularly when degradation products may be more toxic than the parent compounds); or

c. to confirm sampling results or the effectiveness of mitigation or remedial systems.

Overall, as discussed in Section 1.5, successive rounds of sampling should be conducted until the following questions can be answered:

a. Are subsurface vapors contaminated? If so, what are the nature and extent of contamination? What is/are the source(s) of the contamination?

b. What are the current and potential exposures to contaminated subsurface vapors?

c. What actions, if any, are appropriate to prevent or mitigate exposures and to remediate subsurface vapor contamination?

Toward this end, multiple rounds of sampling may be appropriate to characterize the nature and extent of subsurface vapor contamination such that

a. both potential and current exposures are addressed [Section 2.6];

b. measures can be designed to remediate subsurface vapor contamination, either directly (e.g., SVE system) or indirectly (e.g., soil excavation or groundwater remediation), given that monitoring and mitigation are considered temporary measures implemented to address exposures related to vapor intrusion until contaminated environmental media are remediated [Section 3.4]; and

c. the effectiveness of remedial measures can be monitored and confirmed (e.g., endpoint sampling) [Section 4.5].

2.6 Sampling locations

The general approach for selecting sampling locations as part of a soil vapor intrusion investigation is similar to the approach for the investigation of other environmental media (e.g., soil and groundwater). Sampling locations should be selected with consideration of the conceptual site model [Section 1.6]. These locations should be selected to meet the stated objectives of the sampling program. Additionally, similar to the investigation of soil and groundwater, it is typical to start at a known or suspected source and work outward. The specific approach, however, will be dependent upon site-specific and building-specific conditions.

2.6.1 Soil vapor

If available, existing environmental data (e.g., groundwater and soil data) and site background information should be used to select locations for sampling soil vapor as part of a vapor intrusion investigation. Locations will vary depending upon surface features (e.g., presence or absence of buildings, areas of pavement, or vacant lot) and subsurface characteristics (e.g., soil stratigraphy, buried structures, utility corridors, or clay lenses), as well as the specific purpose of the sampling. Therefore, a figure illustrating proposed sampling locations (with respect to both areal position and depth), actual locations sampled in the field, and relevant on-site and off-site features should be included in all sampling work plans and reports.

Examples of how locations may vary given the specific purpose of the sampling follow. They include general guidelines that should be followed when selecting soil vapor sampling locations:

a. to evaluate the **potential for current on-site or off-site exposures**, samples should be collected
    1. in the vicinity of a building's foundation [see special sampling consideration at the end of Section 2.6.1 if sampling around a building with no surrounding surface confining layer], as well as between the building's foundation and the source (if known and not located beneath the building),
    2. along the site's perimeter, and
    3. at a depth comparable to the depth of foundation footings (determined on a building-specific or site-specific basis) or at least 1 foot above the water table in areas where the groundwater table is less than 6 feet below grade;
b. to evaluate the **potential for future exposures if development** on a known or suspected contaminated area on-site or off-site is possible, representative samples should be collected
    1. in areas with either known or suspected subsurface sources of volatile chemicals, in areas where elevated readings were obtained with field equipment during previous environmental investigations, and in areas of varying concentrations of contamination in the upper groundwater,
    2. in a grid pattern across the area (at an appropriate spacing interval for the size of the area) if information is limited for the area, and
    3. at multiple depths from the suspected subsurface source, or former source, to a depth comparable to the expected depth of foundation footings;

c. to evaluate the **potential for off-site soil vapor contamination**, samples should be collected

   1. along the site's perimeter,
   2. in areas of potential subsurface sources of vapor contamination (e.g., a groundwater plume that has migrated off-site), and
   3. at a depth comparable to the depth of foundation footings (determined on a site-specific basis) or at least 1 foot above the water table in areas where the groundwater table is less than 6 feet below grade;

d. to evaluate on-site and off-site **preferential migration pathways** in areas with low permeability soils, samples should be collected

   1. along preferential soil vapor flow paths, such as sewer lines, utility corridors, trenches, pipelines, and other subsurface structures that are likely to be bedded with higher permeability materials, and
   2. at depths corresponding to these subsurface features (will depend on site-specific conditions);

e. to characterize on-site or off-site **contamination in the vadose zone**, samples should be collected

   1. in areas with either known or suspected sources of volatile chemicals, in areas where elevated readings were obtained with field equipment (e.g., PID) during previous soil and groundwater investigations, and in areas of varying concentrations of contamination in the upper groundwater regime, and
   2. at appropriate depths associated with these areas (will depend on site-specific conditions); and

f. to investigate the **influence of contaminated groundwater or soil on soil vapor** and to characterize the **vertical profile** of contamination, samples should be collected from clusters of soil vapor probes at varying depths in the vadose zone [Figure 2.2, Section 2.7.1] and preferably in conjunction with the collection of groundwater or soil samples.

Soil vapor samples collected at depths shallower than 5 feet below grade may be prone to negative bias due to infiltration of outdoor air. Therefore, samples from these depths should be collected only if appropriate (based on site-specific conditions), and sampling procedures and results should be reviewed accordingly. The depth of sampling near buildings with slab-on-grade foundations is dependent upon site-specific conditions (e.g., building surrounded by grassy or surface confining layer).

When collecting soil vapor samples around a building with no surrounding surface confining layer (e.g., pavement or sidewalk), samples should be located in native or undisturbed soils away from fill material surrounding the building (approximately 10 feet away from the building) to avoid sampling in an area that may be influenced by the building's operations. For example, operation of HVAC systems, fireplaces, or mechanical equipment (e.g., clothes dryers or exhaust fans/vents) in a building may exacerbate the infiltration of outdoor air into the vadose zone adjacent to the building. As a result, soil vapor samples collected in uncovered areas adjacent to the building may not be representative.

Investigations of soil vapor contamination should proceed outward from known or suspected subsurface sources, as appropriate, on an areal basis until the nature and extent of

subsurface vapor contamination has been characterized and human exposures have been addressed.

2.6.2 Sub-slab vapor

Existing environmental data (e.g., soil vapor, groundwater and soil data), site background information, and building construction details (e.g., basement, slab-on-grade, or multiple types of foundations, HVAC systems, etc.) should be considered when selecting buildings and locations within buildings for sub-slab vapor sampling.

At a minimum, these general guidelines should be followed when selecting buildings to sample for sub-slab vapors:

a. buildings, including residential dwellings, located above or directly adjacent to known or suspected areas of subsurface volatile chemical contamination should be sampled;

b. buildings in which screening with field equipment (e.g., PID, ppbRAE, Jerome Mercury Vapor Analyzer, etc.) suggests a completed migration pathway, such as when readings are above background and from unidentified sources or when readings show increasing gradients, should be sampled; and

c. buildings within known or suspected areas of subsurface volatile chemical contamination that are used or occupied by sensitive population groups (e.g., daycare facilities, schools, nursing homes, etc.) should be given special consideration for sampling.

Investigations of sub-slab vapor and/or indoor air contamination should proceed outward from known or suspected sources, as appropriate, on an areal basis until the nature and extent of subsurface vapor contamination has been characterized and potential and current human exposures have been addressed. In cases of widespread vapor contamination and depending upon the basis for making decisions (e.g., a "blanket mitigation" approach within a specified area of documented vapor contamination [Section 3.3.1]), a representative number of buildings from an identified study area, rather than each building, may be sampled. Prior to implementation, this type of sampling approach should be approved by State agency personnel.

Within a building, sub-slab vapor samples should be collected

a. in at least one central location away from foundation footings, and

b. from the soil or aggregate immediately below the basement slab or slab-on-grade.

The number of sub-slab vapor samples that should be collected in a building depends upon the number of slabs (e.g., multiple slabs-on-grade in a large warehouse) and foundation types (e.g., combined basement and slab-on-grade in a residence). At least one sub-slab vapor sample should be collected from each representative area.

2.6.3 Indoor air

Existing environmental data (e.g., soil vapor, groundwater and soil data), site background information, and building construction details (e.g., basement, slab-on-grade, or multiple types of foundations; number and operation of HVAC systems; elevator shafts; tunnels or other confined-space entry points; etc.) should be considered when selecting buildings and

locations within buildings for indoor air sampling. Indoor air samples are typically collected concurrently with sub-slab vapor and outdoor air samples [Section 2.2.4].

At a minimum, these general guidelines should be followed when selecting buildings to sample for indoor air:

a. where sub-slab vapor samples were collected without indoor air samples, buildings in which elevated concentrations of contaminants were measured in sub-slab vapor samples should be sampled;

b. buildings, including residential dwellings, located above or directly adjacent to known or suspected subsurface sources of volatile chemicals or known soil vapor contamination should be sampled;

c. buildings in which screening with field equipment (e.g., PID, ppbRAE, Jerome Mercury Vapor Analyzer, etc.) suggests a completed migration pathway, such as when readings are above background and from unidentified sources or when readings show increasing gradients, should be sampled; and

d. buildings within known or suspected areas of subsurface volatile chemical contamination that are used or occupied by sensitive population groups (e.g., daycare facilities, schools, nursing homes, etc.) should be given special consideration for sampling.

To characterize contaminant concentration trends and potential exposures, indoor air samples should be collected

a. from the crawl space area,

b. from the basement (where vapor infiltration is suspected, such as near sump pumps or indoor wells, or in a central location) at a height approximately three feet above the floor to represent a height at which occupants normally are seated and/or sleep,

c. from the lowest level living space (in centrally-located, high activity use areas) at a height approximately three feet above the floor to represent a height at which occupants normally are seated and/or sleep, and

d. if in a commercial setting (e.g., a strip mall), from multiple tenant spaces at a height approximately three feet above the floor to represent a height at which occupants normally are seated.

These locations are illustrated in Figure 2.1.

Investigations of indoor air contamination should proceed outward from known or suspected subsurface sources, as appropriate, on an areal basis until potential and current human exposures associated with soil vapor intrusion have been addressed. In cases of widespread vapor contamination and depending upon the basis for making decisions (e.g., a "blanket mitigation" approach within a specified area of documented vapor contamination), a representative number of buildings from an identified study area, rather than each building, may be sampled. Prior to implementation, this type of sampling approach should be approved by State agency personnel.

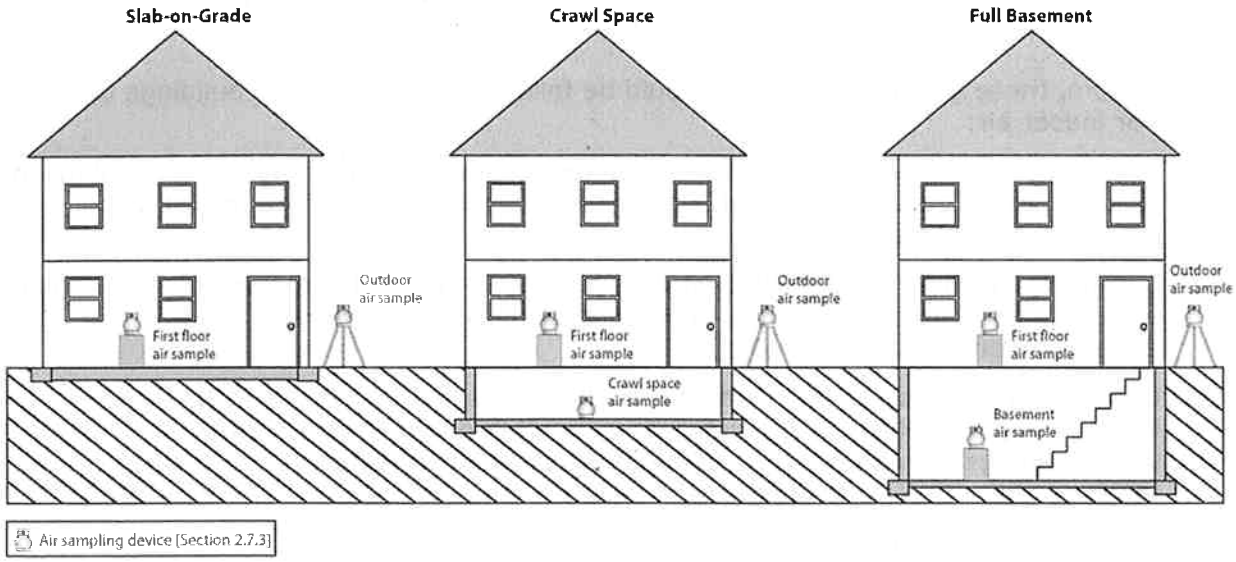

Figure 2.1
Schematic of indoor and outdoor air sampling locations

2.6.4 Outdoor air

Typically, an outdoor air sample is collected outside of each building where an indoor air sample is collected. However, if several buildings are being sampled within a localized area, representative outdoor air samples may be appropriate. For example, one outdoor air sample may be sufficient for three houses being sampled in a cul-de-sac. Outdoor air samples should be collected from a representative upwind location, away from wind obstructions (e.g., trees or bushes), and at a height above the ground to represent breathing zones (3 to 5 feet) [Figure 2.1]. A representative sample is one that is not biased toward obvious sources of volatile chemicals (e.g., automobiles, lawn mowers, oil storage tanks, gasoline stations, industrial facilities, etc.). For buildings with HVAC systems that draw outdoor air into the building, an outdoor air sample collected near the outdoor air intake may be appropriate.

2.7 Sampling protocols

The procedures recommended here may be modified depending on site-specific conditions, the sampling objectives, or emerging technologies and methodologies. Alternative sampling procedures should be described thoroughly and proposed in a work plan submitted for review by the State. The State will review and comment on the proposed procedure and consider the efficacy of the alternative sampling procedure based on the objectives of investigation. In all cases, work plans should thoroughly describe the proposed sampling procedure. Similarly, the procedures that were implemented in the field should be documented and included in the final report of the sampling results.

2.7.1 Soil vapor

Soil vapor probe installations [Figure 2.2] may be permanent, semi-permanent or temporary. In general, permanent or semi-permanent installations are preferred for data consistency reasons and to ensure outdoor air infiltration does not occur. Temporary probes should only be used if measures are taken to ensure that an adequate surface seal is created to prevent outdoor air infiltration and if tracer gas is used at every sampling location. [See Section 2.7.5 for additional information about the use of tracer gas when collecting soil vapor samples.] Soil vapor implants or probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies. The following procedures should be included in any permanent construction protocol:

a. implants should be installed using an appropriate method based on site conditions (e.g., direct push, manually driven, auger — if necessary to attain the desired depth or if sidewall smearing is a concern, etc.);

b. porous, inert backfill material (e.g., glass beads, washed #1 crushed stone, etc.) should be used to create a sampling zone 1 to 2 feet in length;

c. implants should be fitted with inert tubing (e.g., polyethylene, stainless steel, nylon, Teflon®, etc.) of the appropriate size (typically 1/8 inch to 1/4 inch diameter) and of laboratory or food grade quality to the surface;

d. soil vapor probes should be sealed above the sampling zone with a bentonite slurry for a minimum distance of 3 feet to prevent outdoor air infiltration and the remainder of the borehole backfilled with clean material;

e. for multiple probe depths, the borehole should be grouted with bentonite between probes to create discrete sampling zones or separate nested probes should be installed [Figure 2.2]; and

f. steps should be taken to minimize infiltration of water or outdoor air and to prevent accidental damage (e.g., setting a protective casing around the top of the probe tubing and grouting in place to the top of bentonite, sloping the ground surface to direct water away from the borehole like a groundwater monitoring well, etc.).

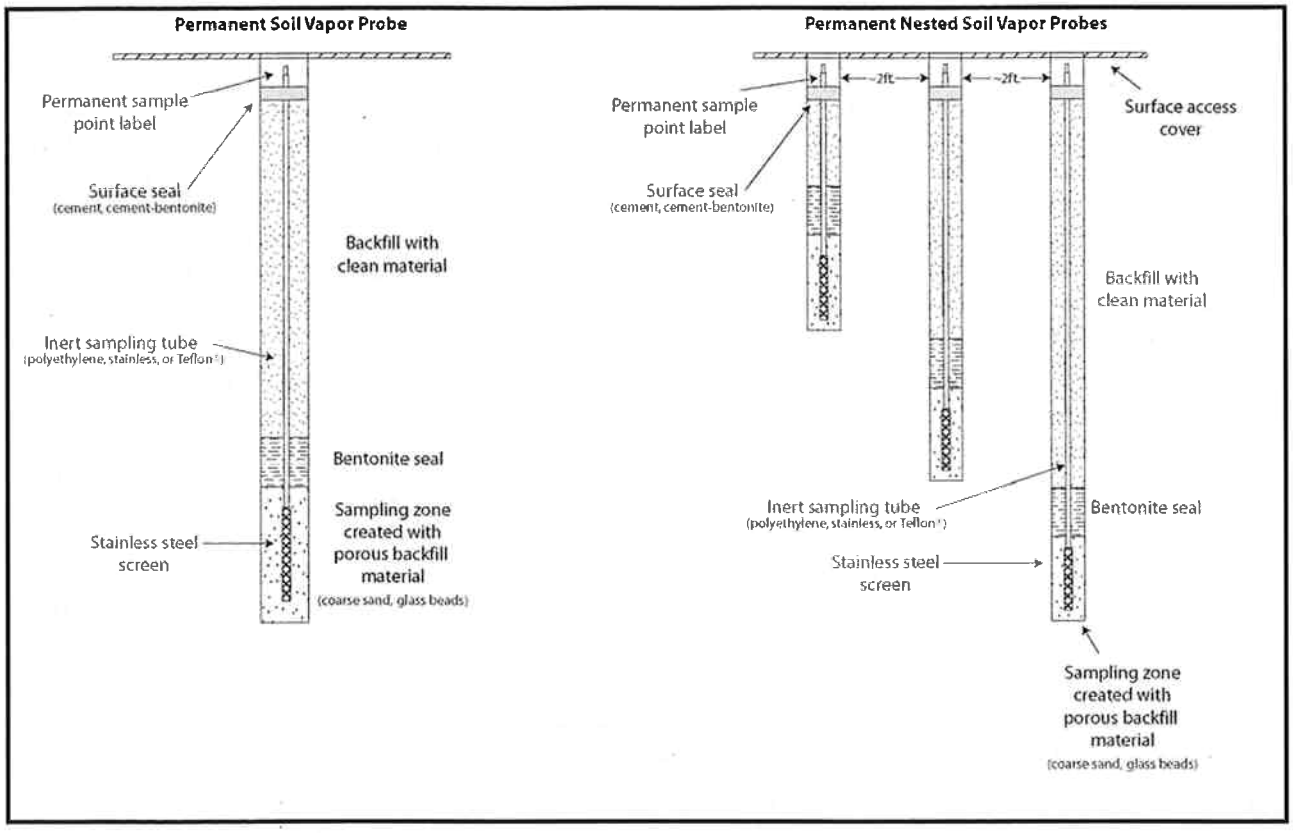

Figure 2.2

Schematics of a generic permanent soil vapor probe and permanent nested soil vapor probes

[Note: Many variations exist and may be proposed in a work plan. Proposed installations should meet the sampling objectives and requirements of the analytical methods.]

To obtain representative samples and to minimize possible discrepancies, soil vapor samples should be collected in the following manner at all locations:

a. at least 24 hours after the installation of permanent probes and shortly after the installation of temporary probes, one to three implant volumes (i.e., the volume of the sample probe and tube) should be purged prior to collecting the samples;

b. flow rates for both purging and collecting should not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling;

c. samples should be collected, using conventional sampling methods, in an appropriate container — one which

   i. meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation),

   ii. is consistent with the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and

   iii. is certified clean by the laboratory;

d. sample size depends upon the volume of that will achieve minimum reporting limits [Section 2.9]; and

e. a tracer gas (e.g., helium, butane, sulfur hexafluoride, etc.) should be used when collecting soil vapor samples to verify that adequate sampling techniques are being implemented (i.e., to verify infiltration of outdoor air is not occurring) [Section 2.7.5].

In some cases, weather conditions may present certain limitations on soil vapor sampling. For example, condensation in the sample tubing may be encountered during winter sampling due to low outdoor air temperatures. Devices, such as tube warmers, may be used to address these conditions. Anticipated limitations to the sampling should be discussed prior to the sampling event so appropriate measures can be taken to address these difficulties and produce representative and reliable data.

When soil vapor samples are collected, the following actions should be taken to document local conditions during sampling that may influence interpretation of the results:

a. if sampling near a commercial or industrial building, uses of volatile chemicals during normal operations of the facility should be identified;

b. outdoor plot sketches should be drawn that include the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor air sampling locations (if applicable), and compass orientation (north);

c. weather conditions (e.g., precipitation and outdoor temperature) should be noted for the past 24 to 48 hours; and

d. any pertinent observations should be recorded, such as odors and readings from field instrumentation.

Additional information that could be gathered to assist in the interpretation of the results includes barometric pressure, wind speed and wind direction.

The field sampling team should maintain a sample log sheet summarizing the following:

a. sample identification,

b. date and time of sample collection,

c. sampling depth,

d. identity of samplers,

e. sampling methods and devices,

f. purge volumes,

g. volume of soil vapor extracted,

h. if canisters used, the vacuum before and after samples were collected,

i. apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and

j. chain of custody protocols and records used to track samples from sampling point to analysis.

2.7.2 Sub-slab vapor

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time. Prior to installation of the sub-slab vapor probe, the building floor should be inspected and any penetrations (cracks, floor drains, utility perforations, sumps, etc.) should be noted and recorded. Probes should be installed at locations where the potential for ambient air infiltration via floor penetrations is minimal.

Sub-slab vapor probe installations [Figure 2.3] may be permanent, semi-permanent or temporary. A vacuum should not be used to remove drilling debris from the sampling port. Sub-slab implants or probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies. The following procedures should be included in any construction protocol:

a. permanent recessed probes should be constructed with brass or stainless steel tubing and fittings;

b. temporary probes should be constructed with inert tubing (e.g., polyethylene, stainless steel, nylon, Teflon®, etc.) of the appropriate size (typically 1/8 inch to 1/4 inch diameter), and of laboratory or food grade quality;

c. tubing should not extend further than 2 inches into the sub-slab material;

d. porous, inert backfill material (e.g., glass beads, washed #1 crushed stone, etc.) should be added to cover about 1 inch of the probe tip for permanent installations; and

e. the implant should be sealed to the surface with non-VOC-containing and non-shrinking products for temporary installations (e.g., permagum grout, melted beeswax, putty, etc.) or cement for permanent installations.

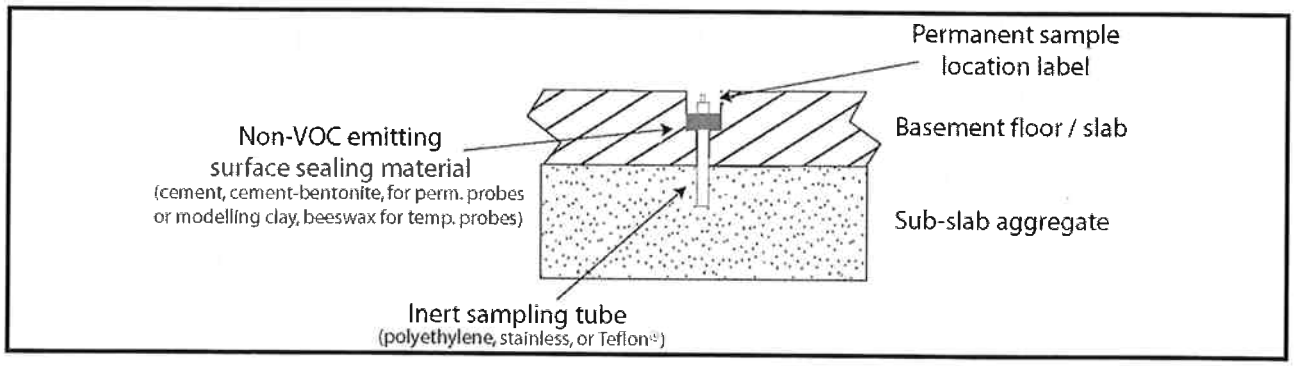

Figure 2.3

Schematic of a generic sub-slab vapor probe

[Note: Many variations exist and may be proposed in a work plan. Proposed installations should meet the sampling objectives and requirements of the analytical methods.]

To obtain representative samples that meet the data quality objectives, sub-slab vapor samples should be collected in the following manner:

a. after installation of the probes, one to three volumes (i.e., the volume of the sample probe and tube) must be purged prior to collecting the samples to ensure samples collected are representative;

b. flow rates for both purging and collecting must not exceed 0.2 liters per minute to minimize ambient air infiltration during sampling; and

c. samples should be collected, using conventional sampling methods, in an appropriate container — one which

    i. meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation),

    ii. is consistent with the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and

    iii. is certified clean by the laboratory;

d. sample size depends upon the volume of that will achieve minimum reporting limits [Section 2.9], the flow rate, and the sampling duration; and

e. ideally, samples should be collected over the same period of time as concurrent indoor and outdoor air samples.

When sub-slab vapor samples are collected, the following actions should be taken to document conditions during sampling and ultimately to aid in the interpretation of the sampling results [Section 3]:

a. historic and current storage and uses of volatile chemicals should be identified, especially if sampling within a commercial or industrial building (e.g., use of volatile chemicals in commercial or industrial processes and/or during building maintenance);

b. the use of heating or air conditioning systems during sampling should be noted;

c. floor plan sketches should be drawn that include the floor layout with sampling locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system air supply and return registers, compass orientation (north), footings that create separate foundation sections, and any other pertinent information should be completed;

d. outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations (if applicable), compass orientation (north), and paved areas;

e. weather conditions (e.g., precipitation and indoor and outdoor temperature) and ventilation conditions (e.g., heating system active and windows closed) should be reported; and

f. any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppbRAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

Additional documentation that could be gathered to assist in the interpretation of the results includes information about air flow patterns and pressure relationships obtained by using smoke tubes or other devices (especially between floor levels and between suspected

contaminant sources and other areas), the barometric pressure and photographs to accompany floor plan sketches.

The field sampling team should maintain a sample log sheet summarizing the following:

a. sample identification,
b. date and time of sample collection,
c. sampling depth,
d. identity of samplers,
e. sampling methods and devices,
f. soil vapor purge volumes,
g. volume of soil vapor extracted,
h. if canisters used, vacuum of canisters before and after samples collected,
i. apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and
j. chain of custody protocols and records used to track samples from sampling point to analysis.

2.7.3 Indoor air

[Reference: NYSDOH's *Indoor Air Sampling & Analysis Guidance (February 1, 2005)*]

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time. If possible, prior to collecting indoor samples, a pre-sampling inspection [Section 2.11.1] should be performed to evaluate the physical layout and conditions of the building being investigated, to identify conditions that may affect or interfere with the proposed sampling, and to prepare the building for sampling. This process is described in Section 2.11.1.

In general, indoor air samples should be collected in the following manner:

a. sampling duration should reflect the exposure scenario being evaluated without compromising the detection limit or sample collection flow rate (e.g., an 8 hour sample from a workplace with a single shift versus a 24 hour sample from a workplace with multiple shifts). To ensure that air is representative of the locations sampled and to avoid undue influence from sampling personnel, samples should be collected for at least 1 hour. If the goal of the sampling is to represent average concentrations over longer periods, then longer duration sampling periods may be appropriate. Typically, 24 hour samples are collected from residential settings;
b. personnel should avoid lingering in the immediate area of the sampling device while samples are being collected;
c. sample flow rates must conform to the specifications in the sample collection method and, if possible, should be consistent with the flow rates for concurrent outdoor air and sub-slab samples; and
d. samples must be collected, using conventional sampling methods, in an appropriate container — one which

i. meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation),

ii. is consistent with the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and

iii. is certified clean by the laboratory.

At sites with tetrachloroethene contamination, passive air monitors that are specifically analyzed for tetrachloroethene (i.e., "perc badges") are commonly used to collect indoor and outdoor air samples. If site characterization activities indicate that degradation products of tetrachloroethene also represent a vapor intrusion concern, perc badges may be used to indicate the likelihood of vapor intrusion (i.e., by using tetrachloroethene as a surrogate) followed, as appropriate, by more comprehensive sampling and laboratory analyses to quantify both tetrachloroethene and its degradation products. Perc badge samples ideally should be collected over a twenty-four hour period, but for no less than eight hours.

The following actions should be taken to document conditions during indoor air sampling and ultimately to aid in the interpretation of the sampling results [Section 3]:

a. historic and current uses and storage of volatile chemicals should be identified, especially if sampling within a commercial or industrial building (e.g., use of volatile chemicals in commercial or industrial processes and/or during building maintenance);

b. a product inventory survey documenting sources of volatile chemicals present in the building during the indoor air sampling that could potentially influence the sample results should be completed [Section 2.11.2];

c. the use of heating or air conditioning systems during sampling should be noted;

d. floor plan sketches should be drawn that include the floor layout with sampling locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system supply and return registers, compass orientation (north), footings that create separate foundation sections, and any other pertinent information should be completed;

e. outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations (if applicable), compass orientation (north), and paved areas;

f. weather conditions (e.g., precipitation and indoor and outdoor temperature) and ventilation conditions (e.g., heating system active and windows closed) should be reported; and

g. any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppbRAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

Additional documentation that could be gathered to assist in the interpretation of the results includes information about air flow patterns and pressure relationships obtained by using smoke tubes or other devices (especially between floor levels and between suspected contaminant sources and other areas), the barometric pressure and photographs to accompany floor plan sketches.

The field sampling team should maintain a sample log sheet summarizing the following:

a. sample identification,
b. date and time of sample collection,
c. sampling height,
d. identity of samplers,
e. sampling methods and devices,
f. depending upon the method, volume of air sampled,
g. if canisters are used, vacuum of canisters before and after samples collected, and
h. chain of custody protocols and records used to track samples from sampling point to analysis.

2.7.4 Outdoor air

Outdoor air samples should be collected simultaneously with indoor air samples to evaluate the potential influence, if any, of outdoor air on indoor air quality. They may also be collected simultaneously with soil vapor samples to identify potential outdoor air interferences associated with infiltration of outdoor air into the sampling apparatus while the soil vapor was collected. To obtain representative samples that meet the data quality objectives, outdoor air samples should be collected in a manner consistent with that for indoor air samples (described in Section 2.7.3).

The following actions should be taken to document conditions during outdoor air sampling and ultimately to aid in the interpretation of the sampling results [Section 3]:

a. outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations, the location of potential interferences (e.g., gasoline stations, factories, lawn movers, etc.), compass orientation (north), and paved areas;
b. weather conditions (e.g., precipitation and outdoor temperature) should be reported; and
c. any pertinent observations, such as odors, readings from field instrumentation, and significant activities in the vicinity (e.g., operation of heavy equipment or dry cleaners) should be recorded.

2.7.5 Tracer gas

When collecting soil vapor samples as part of a vapor intrusion evaluation, a tracer gas serves as a quality assurance/quality control measure to verify the integrity of the soil vapor probe seal. Without the use of a tracer, there is no way to verify that a soil vapor sample has not been diluted by outdoor air.

Depending on the nature of the contaminants of concern, a number of different compounds can be used as a tracer. Typically, sulfur hexafluoride (SF_6) or helium are used as tracers because they are readily available, have low toxicity, and can be monitored with portable measurement devices. Butane and propane (or other gases) could also be used as a tracer in some situations. Compounds other than those mentioned here may be appropriate, provided they meet project-specific data quality objectives. Where applicable, steps should

be taken to ensure that the gas used by the laboratory to clean the air sampling container is different from the gas used as a tracer during sampling (e.g., helium).

The protocol for using a tracer gas is straightforward: simply enrich the atmosphere in the immediate vicinity of the area where the probe intersects the ground surface with the tracer gas, and measure a vapor sample from the probe for the presence of high concentrations (> 10%) of the tracer. A cardboard box, a plastic pail, or even a garbage bag can serve to keep the tracer gas in contact with the probe during the testing. If there are concerns about infiltration of ambient air through other parts of the sampling train (such as around the fittings, not just at the probe/ground interface), then consideration should be given to ensuring that the tracer gas is in contact with the entire sampling apparatus. In these cases, field personnel may prefer to use a liquid tracer — soaking paper towels with a liquid tracer and placing the towels around the probe/ground interface, around fittings, and/or in the corner of a shroud.

There are two basic approaches to testing for the tracer gas:

1. include the tracer gas in the list of target analytes reported by the laboratory; or
2. use a portable monitoring device to analyze a sample of soil vapor for the tracer prior to and after sampling for the compounds of concern. (Note that the tracer gas samples can be collected via syringe, Tedlar® bag etc. They need not be collected in Summa® canisters or minicans.)

The advantage of the second approach is that the real time tracer sampling results can be used to confirm the integrity of the probe seals prior to formal sample collection.

Figure 2.4 depicts common methods for using tracer gas. In examples a, b and c, the tracer gas is released in the enclosure prior to initially purging the sample point. Care should be taken to avoid excessive purging prior to sample collection. Care should also be taken to prevent pressure build-up in the enclosure during introduction of the tracer gas. Inspection of the installed sample probe, specifically noting the integrity of the surface seal and the porosity of the soil in which the probe is installed, will help to determine the tracer gas setup. Figure 2.4a may be most effective at preventing tracer gas infiltration, however, it may not be appropriate in some situations depending on site-specific conditions. Figures 2.4b and 2.4c may be sufficient for probes installed in tight soils with well-constructed surface seals. Figure 2d provides an example of using a liquid tracer. In all cases, the same tracer gas application should be used for all probes at any given site.

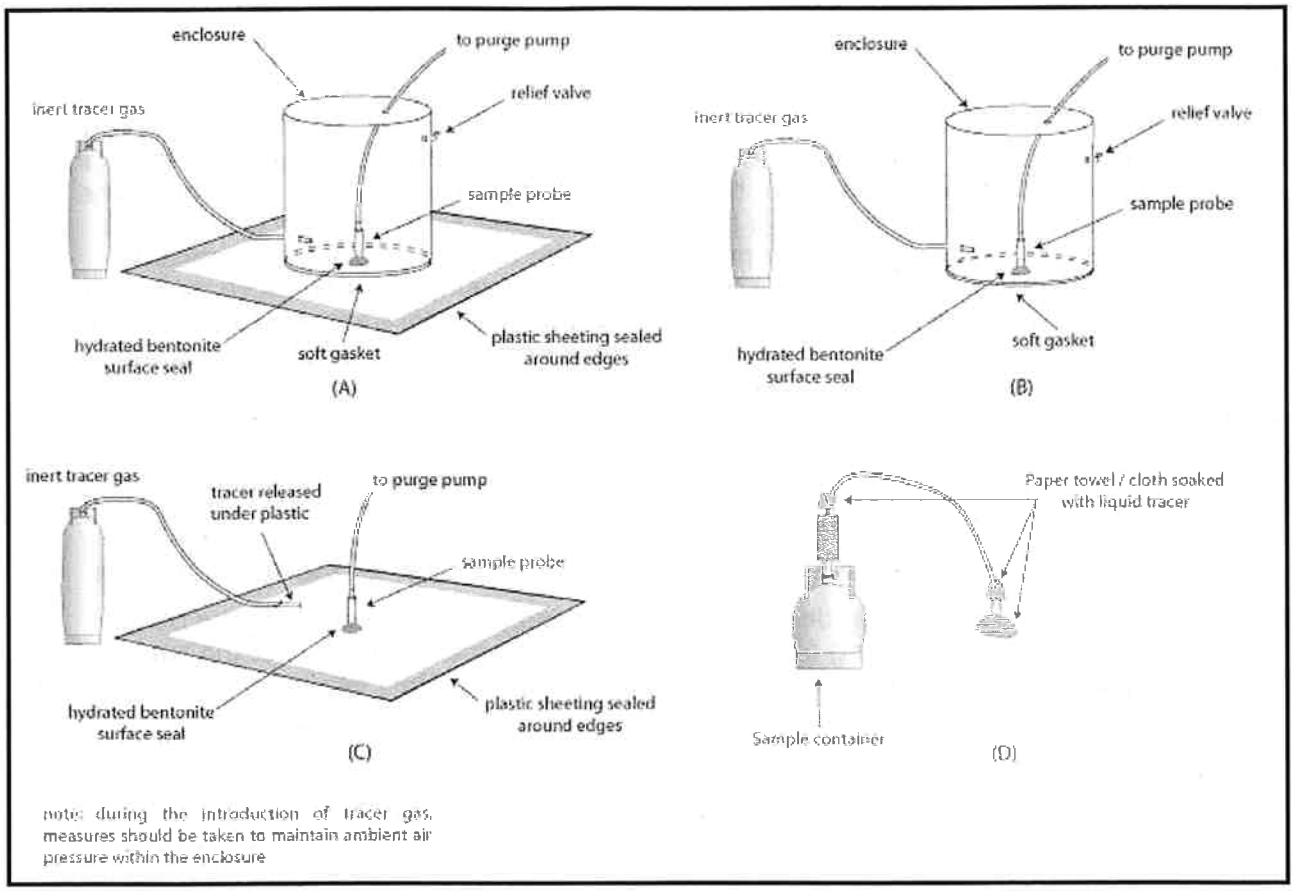

Figure 2.4
Schematics of generic tracer gas applications when collecting soil vapor samples

Because minor leakage around the probe seal should not materially affect the usability of the soil vapor sampling results, the mere presence of the tracer gas in the sample should not be a cause for alarm. Consequently, portable field monitoring devices with detection limits in the low ppm range are more than adequate for screening samples for the tracer. If high concentrations (> 10%) of tracer gas are observed in a sample, the probe seal should be enhanced to reduce the infiltration of outdoor air.

Where permanent or semi-permanent sampling probes are used, tracer gas samples should be collected at each of the sampling probes during the initial stages of a soil vapor sampling program. If the results of the initial samples indicate that the probe seals are adequate, reducing the number of locations at which tracer gas samples are employed may be considered. At a minimum, tracer gas samples should be collected with at least 10% of the soil vapor samples collected in subsequent sampling rounds. When using permanent soil vapor probes as part of a long-term monitoring program, annual testing of the probe integrity is recommended. Where temporary probes are used, tracer gas should be used at every sampling location, every time.

2.8 Quality assurance/quality control (QA/QC)

[Reference: NYSDOH's *Indoor Air Sampling & Analysis Guidance (February 1, 2005)*]

In general, appropriate QA/QC procedures should be followed during all aspects of sample collection and analysis to ensure that sampling error is minimized and high quality data are obtained. Sampling team members should avoid actions (e.g., fueling vehicles, using permanent marking pens, wearing freshly dry-cleaned clothing or personal fragrances, etc.) which can cause sample interference in the field. Portable air monitoring equipment or field instrumentation should be properly maintained, calibrated and tested to ensure validity of measurements. Air sampling equipment should be stored, transported and between samples decontaminated in a manner consistent with the best environmental consulting practices to minimize problems such as field contamination and cross-contamination. Samples should be collected using certified clean sample devices. Where applicable, steps should be taken to ensure that the gas used by the laboratory to clean the sample device is different from the gas used as a tracer during sampling (e.g., helium). Samples should meet sample holding times and temperatures, and should be delivered to the analytical laboratory as soon as possible after collection. In addition, laboratory accession procedures should be followed, including field documentation (sample collection information and locations), chain of custody, field blanks, field sample duplicates and laboratory duplicates, as appropriate.

Some methods call for collecting samples in duplicate (e.g., indoor air sampling using passive sampling devices for tetrachloroethene) to assess errors. Duplicate and/or split samples should be collected in accordance with the sampling and analytical methods being implemented.

For certain regulatory programs, a Data Usability Summary Report (DUSR) or equivalent report may be required to determine whether or not the data, as presented, meets the site or project specific criteria for data quality and data use. This requirement may dictate the level of QC and the category of data deliverable to request from the laboratory. Guidance on preparing these reports is available by contacting the NYSDEC's Division of Environmental Remediation.

New York State Public Health Law requires laboratories analyzing environmental samples collected from within New York State to have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. If ELAP certification is not currently required for an analyte (e.g., trichloroethene), the analysis should be performed by a laboratory that has ELAP certification for similar compounds in air and uses analytical methods with minimum reporting limits similar to background (e.g., tetrachloroethene via EPA Method TO-15). Questions about a laboratory's current certification status should be directed to an ELAP representative at 518-485-5570 or by email at elap@health.state.ny.us.

The work plan should state that all samples that will be used to make decisions on appropriate actions to address exposures and environmental contamination will be analyzed by an ELAP-certified laboratory. The name of the laboratory should also be provided. Similarly, the name of the laboratory that was used should be included in the report of the sampling results. For samples collected and tested in the field for screening purposes by using field testing technology, the qualifications of the field technician should be documented in the work plan.

2.9 Analytical methods

[Reference: NYSDOH's *Indoor Air Sampling & Analysis Guidance (February 1, 2005)*]

Proposed analytical procedures should be identified in work plans. Similarly, the analytical procedures that were used and corresponding reporting limits should be identified when reporting the sampling results. When selecting an appropriate analytical method, the data quality objectives should be considered. As described in Section 3, comparing sampling results for volatile chemicals with background concentrations and with indoor air/sub-slab vapor matrices are critical components of the data evaluation process. Therefore, samples should be analyzed by methods that can achieve minimum reporting limits to allow for comparison of the results with background levels and with the levels presented in the matrices [Section 3.4.2]. If there are additional data quality objectives, they should be considered also. Typically, a minimum reporting limit of 1 microgram per cubic meter (1 mcg/m^3) or less is sufficient for most analytes. Examples of commonly used analytical methods include the following:

a. EPA Method TO-15 for a wide range of VOCs (e.g., samples from evacuated canisters),

b. NYSDOH Method 311-9 for tetrachloroethene (i.e., samples from perc badges),

c. EPA Method TO-17 for VOCs (e.g., samples collected with sorbent tubes), and

d. EPA Method TO-15 for VOCs with selective ion monitoring (SIM) (e.g., to achieve minimum reporting limits lower than those achieved with Method TO-15 alone).

The laboratory should verify that they are capable of detecting the appropriate analytes and can report them at the appropriate reporting limit.

2.9.1 Subsurface vapor

Soil vapor and sub-slab vapor samples should be analyzed for a wide range of volatile chemicals during the first round of sampling (at a minimum) — unless it can be demonstrated that an abbreviated or site-specific analyte list is appropriate. This is analogous to analyzing groundwater samples for a suite of compounds (e.g., EPA's target analyte list/target compound list (TAL/TCL) chemicals) during the initial rounds of site characterization. Based on the initial sampling results, development and application of a site-specific analyte list may be considered for analysis of subsequent soil vapor and sub-slab vapor samples.

If a site-specific analyte list is developed, it should include the following:

a. volatile chemicals which have been previously detected in environmental media (e.g., soil, groundwater and air) at the site;

b. volatile chemicals which are known or demonstrated constituents of the contamination in question (e.g., petroleum products or tars from former manufactured gas plants); and

c. expected degradation products of the chemicals mentioned in a or b.

A site-specific analyte list might also include indicator compounds to assist in identifying and differentiating subsurface sources of volatile chemical contamination. The following are examples of indicator compounds that have been included in site-specific analyte lists given the nature of the contamination or type of site:

a. gasoline: benzene, toluene, ethylbenzene, xylenes, trimethylbenzene isomers, individual C-4 to C-8 aliphatics (e.g., hexane, cyclohexane, dimethylpentane, 2,2,4-trimethylpentane, etc.), and appropriate oxygenate additives (e.g., methyl-*tert*-butyl ether, ethanol, etc.);

b. middle distillate fuels (#2 fuel oil, diesel and kerosene): n-nonane, n-decane, n-undecane, n-dodecane, ethylbenzene, xylenes, trimethylbenzene isomers, tetramethylbenzene isomers, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene;

c. manufactured gas plant sites: trimethylbenzene isomers, tetramethylbenzene isomers, thiopenes, indene, indane, and naphthalene;

d. natural gas: propane, propene, butane, iso-butane, methylbutane, and n-pentane with lower levels of higher molecular weight aliphatic, olefinic, and some aromatic compounds; and

e. solvent-using industries: the solvent and its expected degradation products (e.g., tetrachloroethene, trichloroethene, dichloroethene(s), and vinyl chloride).

2.9.2 Indoor air

Indoor and outdoor air samples should be analyzed for a wide range of volatile chemicals if there are no existing data for subsurface vapors — unless it can be demonstrated that an abbreviated or site-specific analyte list is appropriate. If indoor air sampling is appropriate based on the levels of volatile chemicals in subsurface vapors, analysis of indoor air samples specifically for those volatile chemicals may be considered.

2.9.3 Outdoor air

Outdoor air samples should be analyzed in a manner consistent with corresponding indoor air samples.

2.10 Field laboratories and mobile gas chromatographs (GCs)

Use of field laboratories and mobile GCs as screening tools when collecting soil vapor samples may be considered on a site-specific basis. However, without ELAP certification, screening tools such as these are not acceptable when collecting sub-slab vapor, indoor air and outdoor air samples for the purpose of evaluating exposures related to soil vapor intrusion. ELAP certification for a particular laboratory does not indicate mobile laboratory or GC certification. Mobile laboratories and GCs have specific certification requirements through ELAP. Questions regarding a mobile laboratory's certification should be directed to the laboratory itself.

2.11 Surveys and pre-sampling building preparation

[Reference: NYSDOH's *Indoor Air Sampling & Analysis Guidance (February 1, 2005)*]

2.11.1 Pre-sampling building inspection and preparation

A pre-sampling inspection should be performed prior to each sampling event to identify and minimize conditions that may interfere with the proposed testing. The inspection should evaluate the type of structure, floor layout, air flows and physical conditions of the building(s) being studied. This information, along with information on sources of potential

indoor air contamination [Section 2.11.2], should be identified on a building inventory form. An example of a building inventory form is given in Appendix B. Items to be included in the building inventory include the following:

a. construction characteristics, including foundation cracks and utility penetrations or other openings that may serve as preferential pathways for vapor intrusion;

b. presence of an attached garage;

c. recent renovations or maintenance to the building (e.g., fresh paint, new carpet or furniture);

d. mechanical equipment that can affect pressure gradients (e.g., heating systems, clothes dryers or exhaust fans);

e. use or storage of petroleum products (e.g., fuel containers, gasoline operated equipment and unvented kerosene heaters); and

f. recent use of petroleum-based finishes or products containing volatile chemicals.

Each room on the floor of the building being tested and on lower floors, if possible, should be inspected. This is important because even products stored in another area of a building can affect the air of the room being tested.

The presence and description of odors (e.g., solvent, moldy) and portable vapor monitoring equipment readings (e.g., PIDs, ppbRAE, Jerome Mercury Vapor Analyzer, etc.) should be noted and used to help evaluate potential sources. This includes taking readings near products stored or used in the building. Where applicable, readings should be provided in units that denote the calibration gas (e.g., isobutylene-equivalent ppm, benzene-equivalent ppm, etc.).

Potential interference from products or activities releasing volatile chemicals should be controlled to the extent practicable. Removing the source from the indoor environment prior to testing is the most effective means of reducing interference. Ensuring that containers are tightly sealed may be sufficient. When testing for volatile organic compounds, containers should be tested with portable vapor monitoring equipment to determine whether compounds are leaking. The inability to eliminate potential interference may be justification for not testing, especially when testing for similar compounds at low levels. The investigator should consider the possibility that chemicals may adsorb onto porous materials and may take time to dissipate.

In some cases, the goal of the testing is to evaluate the impact from products used or stored in the building (e.g., pesticide misapplications, school renovation projects). If the goal of the testing is to determine whether products are an indoor volatile chemical contaminant source, the removing these sources does not apply.

Once interfering conditions are corrected (if applicable), ventilation may be appropriate prior to sampling to minimize residual contamination in the indoor air. If ventilation is appropriate, it should be completed 24 hours or more prior to the scheduled sampling time. Where applicable, ventilation can be accomplished by operating the building's HVAC system to maximize outside air intake. Opening windows and doors, and operating exhaust fans may also help or may be appropriate if the building has no HVAC system.

Air samples are sometimes designed to represent typical exposure in a mechanically ventilated building and the operation of HVAC systems during sampling should be noted on

the building inventory form [Appendix B]. When samples are collected, the building's HVAC system should be operating in a manner consistent with normal operating conditions when the building is occupied (e.g., schools, businesses, etc.). Unnecessary building ventilation should be avoided within 24 hours prior to and during sampling. During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time.

Depending upon the goal of the indoor air sampling, some situations may warrant deviation from the above protocol regarding building ventilation. In such cases, building conditions and sampling efforts should be understood and noted within the framework and scope of the investigation.

To avoid potential interferences and dilution effects, occupants should make a reasonable effort to avoid the following for 24 hours prior to sampling:

a. opening any windows, fireplace dampers, openings or vents;
b. operating ventilation fans unless special arrangements are made;
c. smoking in the building;
d. painting;
e. using a wood stove, fireplace or other auxiliary heating equipment (e.g., kerosene heater);
f. operating or storing automobile in an attached garage;
g. allowing containers of gasoline or oil to remain within the house or garage area, except for fuel oil tanks;
h. cleaning, waxing or polishing furniture, floors or other woodwork with petroleum- or oil-based products;
i. using air fresheners, scented candles or odor eliminators;
j. engaging in any hobbies that use materials containing volatile chemicals;
k. using cosmetics including hairspray, nail polish, nail polish removers, perfume/cologne, etc.;
l. lawn mowing, paving with asphalt, or snow blowing;
m. applying pesticides;
n. using building repair or maintenance products, such as caulk or roofing tar; and
o. bringing freshly dry-cleaned clothing or furnishings into the building.

2.11.2 Product inventory

The primary objective of the product inventory is to identify potential air sampling interference by characterizing the occurrence and use of chemicals and products throughout the building, keeping in mind the goal of the investigation and site-specific contaminants of concern. For example, it is not appropriate to provide detailed information for each individual container of like items. However, it is appropriate to indicate that "20 bottles of perfume" or "12 cans of latex paint" were present with containers in good condition. This information is used to help formulate an indoor environment profile.

An inventory should be provided for each room on the floor of the building being tested and on lower floors, if possible. This is important because even products stored in another area of a building can affect the air of the room being tested.

The presence and description of odors (e.g., solvent, moldy) and portable vapor monitoring equipment readings (e.g., PIDs, ppbRAE, Jerome Mercury Vapor Analyzer, etc.) should be noted and used to help evaluate potential sources. This includes taking readings near products stored or used in the building. Where applicable, readings should be provided in units that denote the calibration gas (e.g., isobutylene-equivalent ppm, benzene-equivalent ppm, etc.).

Products in buildings should be inventoried every time air is tested to provide an accurate assessment of the potential contribution of volatile chemicals. If available, chemical ingredients of interest (e.g., analyte list) should be recorded for each product. If the ingredients are not listed on the label, record the product's exact and full name, and the manufacturer's name, address and telephone number, if available. In some cases, material Safety Data Sheets may be useful for identifying confounding sources of volatile chemicals in air. Adequately documented photographs of the products and their labeled ingredients can supplement the inventory and facilitate recording the information.

2.12 Role of modeling

At sites where there is a potential for human exposures to subsurface contamination due to soil vapor intrusion (as described in Section 2.1), use of modeling as the sole means of evaluating potential exposures should be avoided. The limitations of modeling (e.g., exclusion of preferential migration pathways) introduce uncertainty as to whether human exposure is occurring, in absence of actual field data. Conclusions drawn from modeling should be verified with actual field data. For example, if modeling results indicate indoor air concentrations are predicted to be below applicable guidelines or levels of concern, indoor air and/or sub-slab vapor sampling would be appropriate to verify a conclusion that mitigation or other actions are not needed.

Modeling may, however, be used as a tool in the evaluation process. Examples of situations in which modeling may be used as a tool include, but are not limited to, the following:

a. to help identify potential migration pathways on the basis of site-specific conditions;
b. to estimate potential exposures when field samples cannot be collected (e.g., access to collect the samples is denied or buildings have not yet been constructed over the subsurface contamination); and
c. to identify a preferred order for sampling buildings by predicting expected indoor air concentrations within each of the buildings if there are numerous buildings overlying the subsurface contamination.

Use of any model at a site should be discussed with the agencies prior to the model's development and application. If a model is used, it should incorporate site-specific parameters (e.g., attenuation factors, soil conditions, concentrations of volatile chemicals, depth to subsurface source, characteristics of subsurface source, and foundation slab thickness) as much as possible. Furthermore, both the limitations of the model (e.g., exclusion of preferential migration pathways) and the sensitivity of the variables in the model should be understood and identified with the modeling results.

Section 3: Data Evaluation and Recommendations for Action

Section 3 describes the process by which data obtained during the investigation are evaluated. The goals of the evaluation are as follows:

a. to determine what volatile chemicals, if any, are present in the investigated media;

b. to identify the likely cause(s) of their presence; and

c. to identify completed and potential human exposures whether actions to address exposures should be taken.

Also discussed are actions typically recommended based on the evaluation. Actions to remediate the source(s) of soil vapor contamination, such as soil excavation or air-sparge/soil vapor extraction systems, are beyond the scope of this guidance and are not included.

3.1 Data quality

Before the data are evaluated, their representativeness and reliability should be verified. To assess analytical errors and the usability of the data, a qualified person should review the analytical data package and all associated QA/QC information to make sure that

a. the data package is complete;

b. holding times have been met;

c. the QC data fall within the protocol limits and specifications;

d. the data have been generated using established and agreed upon analytical protocols;

e. the raw data confirm the results provided in the data summary sheets and QC verification forms; and

f. correct data qualifiers have been used.

As discussed in Section 2.8, for sites in an environmental remediation program (e.g., State Superfund), a DUSR or equivalent report should be generated in accordance with NYSDEC guidance and should be submitted for regulatory review and approval.

If the investigation was not completed in accordance with the guidelines set forth in Section 2, additional investigation may be appropriate to either replace or complement the existing data. For example, product inventories [Section 2.11.2] filled out incompletely or incorrectly may need to be redone (and in some cases with additional air sampling) so that likely sources of volatile chemicals in the indoor air can be identified and appropriate actions to mitigate exposures can be recommended.

3.2 Overview

The results of individual soil vapor, sub-slab vapor, indoor air and outdoor air samples are not reviewed in isolation. Rather, they are evaluated with the consideration of several additional factors, which include the following:

a. the nature and extent of contamination in *all* environmental media;

b. factors that affect vapor migration and intrusion;

c. completed or proposed remedial actions;

d. sources of volatile chemicals;

e. background levels of volatile chemicals in air;

f. relevant standards, criteria and guidance values; and

g. past, current and future land uses.

These factors are described in detail in this subsection.

3.2.1 Nature and extent of contamination in all environmental media

The type of volatile chemicals present and the extent of contamination in all environmental media — including soil, groundwater, subsurface vapors, indoor air and outdoor air — is considered when evaluating the data. Trends in environmental data (e.g., groundwater monitoring results show concentrations of volatile chemicals are decreasing) are also considered. This information is used to identify possible sources of contamination and migration pathways, as well as to recommend appropriate actions to address exposures.

3.2.2 Factors that affect vapor migration and intrusion

As discussed in Section 1.3, there are numerous site-specific environmental factors [Table 1.1] and building factors [Table 1.2] that can affect soil vapor migration and intrusion. This information is used to identify possible sources of contamination and migration pathways, as well as to recommend appropriate actions to address exposures.

3.2.3 Sources of volatile chemicals

An understanding of the likely sources of the chemicals is crucial for determining appropriate actions to address exposure, as well as identifying the parties responsible for implementing the actions. Volatile chemicals that are not site-related may be present in the investigated media for reasons such as the following:

a. *subsurface vapors* — misuse, misapplication, or improper disposal of the chemicals to the subsurface, unidentified subsurface sources of vapor contamination, presence of septic systems (where products, such as cleaning agents or degreasers, may be disposed), biodegradation of natural organic matter in soil, infiltration into the subsurface from a building under positive pressure in which the chemicals are heavily used (i.e., reverse process from soil vapor intrusion), etc.;

b. *indoor air* — use and storage (current or historic) of volatile chemical-containing products, off-gassing from building materials or new furnishings, use of contaminated groundwater during private well usage, infiltration of outdoor air containing volatile chemicals, etc. [Table 1.3]; and

c. *outdoor air* — emissions from automobiles, lawn mowers, oil storage tanks, gasoline stations, dry cleaners or other commercial/industrial facilities, etc. [Table 1.3].

Site-related chemicals may also be present for these same reasons. Information about household products and their ingredients are available on web sites, such as the National Institute of Health's site at http://householdproducts.nlm.nih.gov.

3.2.4 Background levels of volatile chemicals in air

Chemicals are part of our everyday life [Section 1.4]. As such, they are found in the indoor air of buildings not affected by intrusion of contaminated soil vapor. They are also found in the outdoor air that enters a home or place of business. Commonly found concentrations of these chemicals in indoor and outdoor air are referred to as "background levels." Background levels of volatile chemicals are one of the factors considered when evaluating sampling results at a site [Section 3.3.2 – 3.3.4]. Estimates of background levels come from studies where air samples were collected in homes, offices and outdoor areas.

Several studies have been conducted, both nationally and in the State of New York, to provide information on indoor and outdoor air background levels in a variety of settings (e.g., residential or commercial buildings). Each of these studies offers useful information and has its own limitations. Each database provides statistical measures of background levels and the criteria used to select sampling locations. The criteria in some of the studies required that sampling locations not be located near known sources of volatile chemicals (for example, not near a chemical spill, hazardous waste site, dry-cleaner, or factory). The criteria may also have included checking containers of volatile chemicals in or near the building to make sure they are tightly closed or removing those products before samples are taken. Depending on the criteria for site selection and sampling conditions, statistical measures of background levels in a given study may differ from what would be expected if indoor air were sampled in randomly selected homes.

The background databases that are used for evaluating indoor and outdoor air data are introduced below. A more detailed description of each database along with statistical measures of background levels are provided in Appendix C.

a. *NYSDOH 2003: Study of Volatile Organic Chemicals in Air of Fuel Oil Heated Homes*
   Results of indoor and outdoor air samples collected from 104 single-family fuel oil heated homes throughout New York State. Samples collected in evacuated canisters and analyzed for 69 aromatic, aliphatic, and halogenated hydrocarbons, and ketones by modified EPA Method TO-15. Limitations: only fuel oil heated homes were included, homes were not randomly selected, and five boroughs of New York City were excluded.

b. *EPA 2001: Building Assessment and Survey Evaluation (BASE) Database*
   Study of measured concentrations of volatile organic compounds from 100 randomly selected public and commercial office buildings. Samples collected by evacuated canisters and/or tube methodologies. Limitations: only represents office settings, two methodologies used for sampling and analysis that are not completely overlapping and do not show agreement in results in some cases.

c. *NYSDOH 1997: Control Home Database*
   Indoor and outdoor air samples compiled from 53 residences in New York State that were considered "control Homes" with neighborhood, construction, and occupancy similar to potentially impacted homes that were being investigated at the time. Limitations: multiple methodologies for sampling and analysis, small sample size, and varying detection limits often higher than current background levels.

d. *EPA 1988: National Ambient Volatile Organic Compounds (VOCs) Data Base Update*
   Published and unpublished air data compiled by the EPA in 1988. The document includes data from studies between 1970 to 1987. The database covers more than

300 chemicals in indoor and outdoor settings. Limitations: data are compiled from numerous studies with limitations on selection or screening criteria, data are 20-35 years old, indoor air data include both residential and office spaces, sample size for some analytes is very small (less than 10). Outdoor air data include rural, suburban, urban, source dominated and remote locations.

e. *Health Effects Institute (HEI) 2005: Relationship of Indoor, Outdoor, and Personal Air (RIOPA)*

Indoor, outdoor and personal air concentrations of 18 VOCs, 10 carbonyl compounds and particulate matter (PM2.5) were measured in 100 homes in each of 3 cities between the summer of 1999 and the spring of 2001. Limitations: limited numbers of VOCs, passive organic vapor badge method is subject to sampling bias in stationary versus mobile locations, the passive organic vapor badge method is only approved for tetrachloroethene in New York State.

Among the databases, the Upper Fence (see *NOTE below) values from the NYSDOH Fuel Oil Study data may be used as initial benchmarks when evaluating residential indoor air (see Appendix C.1) and the 90th percentile values from the EPA BASE data for indoor air in office and commercial buildings (see Appendix C.2). These initial benchmark values should be considered along with the overall distribution of results in the background database to characterize sampling results from a single building or from multiple buildings in a community. The Health Effects Institute 2005 database and the older NYSDOH and EPA databases can also provide useful information on the range of concentrations found in air. The database or combination of databases that best represents site-specific conditions should be used as the basis for comparison. State agency personnel should review and have the opportunity to comment on the proposed use of other databases or subsets of data within a database for evaluating test results.

*NOTE: The Upper Fence is calculated as 1.5 times the interquartile range (difference between the 25th and 75th percentile values) above the 75th percentile value. It is a boundary estimate used to account for outliers in the data.

3.2.5 Relevant standards, criteria and guidance values

a. *Subsurface vapors*

The State of New York does not have any standards, criteria or guidance values for concentrations of volatile chemicals in subsurface vapors (either soil vapor or sub-slab vapor).

b. *Indoor and outdoor air*

The NYSDOH has developed several guidelines for chemicals in air. The development process is initiated for specific situations. For example, in New York State, particularly in New York City, dry cleaners are often located in apartment buildings. Because air in buildings mixes to some extent and the dry cleaning chemical tetrachloroethene (PCE) is volatile, it may migrate to residential apartments. When the NYSDOH became aware of this problem and how widespread it is, the NYSDOH developed an air guideline for PCE of 100 micrograms per cubic meter (mcg/m^3). In addition to PCE, the NYSDOH has developed guidelines for methylene chloride (also referred to as dichloromethane) and trichloroethene (TCE) in air, as well as dioxin and polychlorinated biphenyls (PCBs) in indoor air. Each guideline went through a peer review process, in which expert scientists outside of the NYSDOH reviewed the technical documentation that describes

the scientific basis for the guidance value. The peer reviewers provided technical comments on the data and methods used to derive the guidelines, each of which were addressed by the NYSDOH. Upon completion of the reviews and responses to comments, the guidelines were finalized.

Air guideline values derived by the NYSDOH are summarized in Table 3.1. Additional information about these guidelines is provided in the following:

- Appendix D — overview of how the NYSDOH develops air guidelines; and
- Appendix H — copies of fact sheets that discuss the air guidelines for PCE and TCE.

The purpose of a guideline is to help guide decisions about the nature of efforts to reduce exposure to the chemical. Reasonable and practical actions should be taken to reduce exposures when indoor air levels are above background, even when they are below the guideline. The urgency to complete these actions increases with indoor air levels, particularly when air levels are above the guideline, and additional actions taken if the initial actions do not sufficiently reduce levels. In all cases, the specific corrective actions to be taken depend on a case-by-case evaluation of the situation. The goal of the recommended actions is to reduce chemical levels in indoor air to as close to background as practical.

Table 3.1 Air guideline values derived by the NYSDOH

Chemical		Air Guideline Value (mcg/m^3)	Reference
methylene chloride (also referred to as dichloromethane)	MeCl	60	1
polychlorinated biphenyls	PCBs	1*	2,3
tetrachlorodibenzo-*p*-dioxin equivalents	TCDD	0.00001*	3,4
tetrachloroethene	PCE	100	5
trichloroethene	TCE	5	6,7

*The guideline is specific to indoor air.

References:

[1] NYSDOH. 1988. Letter from N. Kim to T. Allen, Division of Air, New York State Department of Environmental Conservation. November 28, 1988.
[2] NYSDOH. 1985. Binghamton State Office Building (BSOB) Re-Entry Guidelines: PCBs. Document 1330P. Albany, NY: Bureau of Toxic Substance Assessment.
[3] NYSDOH. 1988. Letter from D. Axelrod to J. Egan, New York State Office of General Services. March 8, 1988.
[4] NYSDOH. 1984. Re-Entry Guidelines. Binghamton State Office Building. Document 0549P. Albany, NY: Bureau of Toxic Substance Assessment.
[5] NYSDOH. 1997. Tetrachloroethene Ambient Air Criteria Document. Albany, NY: Bureau of Toxic Substance Assessment.
[6] NYSDOH. 2003. Letter from N. Kim to D. Desnoyers, Division of Environmental Remediation, New York State Department of Environmental Conservation. October 31, 2003. [Provided in Appendix D.]
[7] NYSDOH. 2006. Final Report: Trichloroethene (TCE) Air Criteria Document. Center for Environmental Health, Bureau of Toxic Substance Assessment. Troy, NY.

3.2.6 Completed or proposed remedial actions

The status and effectiveness of actions taken to remediate environmental contamination (e.g., soil removal, groundwater treatment, soil vapor extraction, etc.) are considered when making decisions pertaining to additional sampling and the selection of mitigation actions. For example,

a. if a comparison of pre-remediation and post-remediation subsurface vapor sampling results indicates negligible improvement in the quality of subsurface vapors,

   1. additional sampling may be appropriate to document a decreasing trend in subsurface vapor concentrations;
   2. termination of mitigation system operations may not be appropriate without additional sampling; or
   3. additional remedial actions may be appropriate to address contaminated subsurface vapors;

b. when monitoring a building is appropriate, it may be more cost-effective to install a mitigation system if subsurface contamination is wide-spread and is expected to take many years to remediate; and

c. if exposures in an on-site building will be addressed concurrently by a method selected to remediate subsurface contamination (e.g., a soil vapor extraction system), installation of a mitigation system may be redundant. However, if the remedial system is not expected to be operational in the immediate future, or if it is not expected to mitigate indoor air levels in a reasonable time frame, a mitigation system may still be appropriate. [Refer to Section 4.1 for a description of the appropriate use of concurrent techniques.]

3.2.7 Past, current and future land uses

Past, current and future land uses are considered when evaluating the investigation data and determining appropriate actions for further investigation or measures to address exposures. For example,

a. if the parcel or buildings were historically used for commercial or industrial purposes (e.g., gasoline station, automotive repair facility, electroplating facility, etc.), but are currently used for residential purposes or commercial or industrial purposes where volatile chemicals are not used in current operations, off-gassing of volatile chemicals from building materials [Table 1.3] or additional subsurface sources should be considered;

b. subsurface vapor sampling of a parcel that is undeveloped or contains unoccupied buildings may be appropriate based on the data evaluation. However, sampling may be delayed as discussed in Section 2.3;

c. air sampling of a building may be appropriate based on the data evaluation. However, provisions may be put in place to defer sampling until occupancy of the building is expected; or

d. if actions should be taken to mitigate exposures related to soil vapor intrusion should the site be developed, the appropriate mitigation method will depend upon the proposed land use — a parking lot, recreational field, single-family home, commercial building, high-rise building with underground parking, occupied or unoccupied building, etc. — since each presents a different exposure scenario.

3.3 Sampling results and recommended actions

This subsection describes the process for evaluating sampling results. It also describes actions that may be recommended based on the evaluation. The evaluation procedures and actions described may not be directly applicable to samples collected as part of an emergency response. For guidance on how to proceed in such situations, refer to Section 3.5.

3.3.1 Soil vapor

If soil vapor samples are collected from locations where there are no known sources of volatile chemicals, we do not expect the chemicals to reach detectable levels in the samples. However, concentrations of volatile chemicals in soil vapor are commonly detected. This is likely due to several factors, including infiltration of outdoor air into the subsurface (to a limited extent) and background interferences (similar to indoor and outdoor air [Section 3.2.4]).

New York State currently does not have any standards, criteria or guidance values for concentrations of compounds in soil vapor. Additionally, there are currently no databases available of background levels of volatile chemicals in soil vapor. In the absence of this information, soil vapor sampling results are reviewed "as a whole," in conjunction with the results of other environmental sampling and the site conceptual model, to identify trends and spatial variations in the data [Section 3.2.1]. To put some perspective on the data, soil vapor results might be compared to background outdoor air levels [Section 3.2.4], site-related outdoor air sampling results, or the NYSDOH's guidelines for volatile chemicals in air [Table 3.1].

These comparisons are used to

a. identify areas of relatively elevated concentrations of volatile chemicals in soil vapor;
b. select buildings for sub-slab vapor, indoor air and outdoor air sampling;
c. identify possible sources of subsurface vapor contamination;
d. monitor the progress, or verify the completion, of efforts to remediate subsurface vapor contamination (either directly or indirectly); and
e. characterize the nature and extent of subsurface vapor contamination.

When determining appropriate actions, the following should also be considered:

a. Soil vapor results may not indicate a traditional plume-like pattern of contamination (as is often described for groundwater). Rather, the nature and extent of contamination may follow a "hit and miss" pattern.

b. Our experience to date indicates soil vapor results alone typically cannot be relied upon to rule out sampling at nearby buildings. For example, concentrations of volatile chemicals in sub-slab vapor samples have been substantially higher (e.g., by a factor of 100 or more) than concentrations found in nearby soil vapor samples (e.g., collected at 8 feet below grade near the building). This may be due to differences in factors such as soil moisture content and pressure gradients. Therefore, exposures are evaluated primarily based on sub-slab vapor, indoor air and outdoor air sampling results and soil vapor results are primarily used as a tool to guide these investigations.

There are no concentrations of volatile chemicals in soil vapor that automatically trigger action or no further action. Based on the comparisons and considerations described, the following actions may be recommended:

a. *No further soil vapor sampling*

The nature and extent of subsurface vapor contamination has been adequately characterized with respect to addressing exposures and designing measures to remediate subsurface vapor contamination (either directly or indirectly).

Sub-slab vapor samples, rather than soil vapor samples, will be used to identify potential exposures and to characterize the nature and extent of subsurface vapor contamination since soil vapor results are not following a consistent pattern (i.e., hit and miss).

b. *Additional soil vapor sampling*

To characterize the nature and extent of subsurface vapor contamination if soil vapor results are following a consistent pattern (e.g., traditional plume-like pattern).

To identify possible sources of subsurface vapor contamination.

To verify sampling results that appear inconsistent with previous sampling and/or the current understanding of the site [Sections 3.2.1 and 3.2.2].

To resample locations where results may have been invalidated by short-circuiting (outdoor air infiltration), cross contamination, or other problems.

To monitor the progress, or verify the completion, of efforts to remediate subsurface vapor contamination (either directly or indirectly).

c. *Sub-slab vapor, indoor air and outdoor air sampling*

Generally, if soil vapor results are fairly consistent throughout the study area, buildings closest to the site are sampled first. The investigation then proceeds outward, as appropriate, on an areal basis until potential and current human exposures have been adequately addressed. If there is an area of relatively elevated concentrations of volatile chemicals in soil vapor (when looking at the soil vapor results as a whole), then the buildings in this area are also sampled.

d. *Address exposures related to soil vapor intrusion*

Provisions on parcels may be appropriate so that the parcel will not be developed or buildings occupied without addressing exposure concerns [Sections 2.3 and 3.6].

As discussed previously, soil vapor sampling results alone typically do not drive actions to mitigate exposures in existing buildings. Rather, they guide sampling efforts in buildings. However, a "blanket mitigation" approach may be taken provided the nature and extent of soil vapor contamination has been sufficiently characterized. A "blanket mitigation" approach is where an area is defined within which each building may be offered a mitigation system. The offer is made regardless of what actions may be appropriate based on an evaluation of air results (e.g., no further action or monitoring).

Notes:

a. The recommended actions may be modified or supported upon consideration of the factors given in Section 3.2.

b. Additional sampling may become appropriate based on the migration of subsurface contamination (e.g., contaminated groundwater or vapors) or if environmental monitoring indicates a change in chemical constituents (e.g., the production of degradation products that may be more toxic than the parent compounds).

3.3.2 Sub-slab vapor

The goals of collecting sub-slab vapor samples are to identify potential and current (when collected concurrently with indoor and outdoor air samples) exposures associated with soil vapor intrusion and to characterize the nature and extent of subsurface vapor contamination. As discussed in Sections 3.2.5 and 3.3.1, New York State currently does not have any standards, criteria or guidance values for concentrations of compounds in sub-slab vapor. Additionally, there are no databases available of background levels of volatile chemicals in subsurface vapors.

The detection of volatile chemicals in sub-slab vapor samples does not necessarily indicate soil vapor intrusion is occurring or actions should be taken to address exposures. When making these decisions, the State considers the following:

a. the sampling results — sub-slab vapor, indoor air, outdoor air, soil vapor;

b. background concentrations of volatile chemicals in indoor air;

c. the NYSDOH's guidelines for volatile chemicals in air [Table 3.1];

d. human health risks (i.e., cancer and non-cancer health effects) associated with exposure to the volatile chemical in air;

e. attenuation factors (i.e., the ratio of indoor air to sub-slab vapor concentrations),

f. the NYSDOH's decision matrices [described in Section 3.4], and

g. the factors described in Section 3.2.

Based on this evaluation, the following actions may be recommended:

a. *No further action*

   When the volatile chemical is not detected in the indoor air and sub-slab sample results are not expected to substantially affect indoor air quality.

b. *Take reasonable and practical actions to identify source(s) and reduce exposures*

   The concentration detected in the indoor air sample is likely due to indoor and/or outdoor sources rather than soil vapor intrusion given the concentration detected in the sub-slab vapor sample. Therefore, steps should be taken to identify potential source(s) and to reduce exposures accordingly (e.g., by keeping containers tightly capped or by storing volatile organic compound-containing products in places where people do not spend much time, such as a garage or outdoor shed). Resampling may be recommended to demonstrate the effectiveness of actions taken to reduce exposures.

c. *Resampling*

Resampling may also be recommended when the results are not consistent with the conceptual site model. For example, when the sub-slab vapor results of a building do not indicate a need to take action, but the sub-slab vapor results of adjacent buildings indicate a need to take actions to address exposures related to soil vapor intrusion.

Resampling may be appropriate if samples were collected outside of the heating season. As discussed in Section 2.4.2, results obtained outside of the heating season should not be used to rule out exposures related to soil vapor intrusion.

d. *Monitoring*

Monitoring, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, may be recommended to determine whether concentrations in indoor air or sub-slab vapor have changed. It is also recommended to determine what affect, if any, active soil and groundwater remediation techniques (e.g., chemical oxidation, air sparging, etc.) may be having on subsurface vapor and indoor air quality. The type and frequency of monitoring is determined on a site-specific and building-specific basis, taking into account applicable environmental data and building operating conditions.

e. *Mitigate*

Mitigation may be appropriate to minimize current or potential exposures associated with soil vapor intrusion. Mitigation methods are described in Section 4.

Notes:

a. The recommended actions may be modified or supported upon consideration of the factors given in Section 3.2.

b. Additional sampling may be appropriate based on the migration of subsurface contamination (e.g., contaminated groundwater or vapors) or if environmental monitoring indicates a change in chemical constituents (e.g., the production of degradation products that may be more toxic than the parent compounds).

c. Monitoring and mitigation measures to address exposures related to soil vapor intrusion are considered interim measures implemented until contaminated environmental media (e.g., soil, groundwater and/or soil vapor) are remediated.

d. Actions more protective of human health may be proposed. For example, such a decision may be based on a comparison of the costs associated with resampling or monitoring to the costs associated with installation and monitoring of a mitigation system.

e. Additional sampling associated with post-mitigation testing, operation, maintenance and monitoring activities, and termination of mitigation system operations is described in Section 4.

3.3.3 Indoor air

Indoor air samples are used to assess current exposures to volatile chemicals in air. The detection of volatile chemicals in indoor air samples does not necessarily indicate soil vapor intrusion is occurring or actions should be taken to address exposures. When making these decisions, the State considers the following:

a. the sampling results — sub-slab vapor, indoor air, outdoor air, soil vapor;

b. background concentrations of volatile chemicals in indoor air;

c. the NYSDOH's guidelines for volatile chemicals in air [Table 3.1];

d. human health risks (i.e., cancer and non-cancer health effects) associated with exposure to the volatile chemical in air;

e. attenuation factors (i.e., the ratio of indoor air to sub-slab vapor concentrations), and

f. the NYSDOH's decision matrices [described in Section 3.4], and

g. the factors described in Section 3.2.

When evaluating indoor air data, the results are compared to background levels of volatile chemicals in indoor air [Section 3.2.4], the NYSDOH's guidelines for volatile chemicals in air [Table 3.1], the NYSDOH's decision matrices [Section 3.4], and human health risks (i.e., cancer and non-cancer health effects) associated with exposure to the volatile chemical in air. This helps to put the results into perspective and to determine the need for action and the urgency with which actions should be taken. As discussed in Section 3.2.5, the urgency to complete reasonable and practical actions to reduce exposures increases with indoor air levels, particularly when air levels are above a guideline.

Generally, if the results are comparable to background levels, then no further action is needed to address *current* human exposures. However, additional sampling may be appropriate if

a. samples were collected at times when vapor intrusion is not expected to have its greatest effect on indoor air quality (typically, samples collected outside of the heating season). As discussed in Section 2.4, these results may not be used to rule out exposures related to soil vapor intrusion;

b. the potential for exposures related to soil vapor intrusion should be monitored based on the sub-slab vapor results [Section 3.3.2]; and/or

c. subsurface conditions change over time (e.g., due to the migration of contaminated groundwater or vapors).

If the concentrations of volatile chemicals are not consistent with background levels, then the likely cause of the exposure should be determined. Understanding the source is crucial for selecting the best method to address exposures. For example, although a volatile chemical may be detected in the sub-slab vapor sample, the results may indicate that indoor air effects are more likely to be coming from products stored in the building or from outdoor air rather than from contaminated soil vapors. Therefore, a sub-slab depressurization system to minimize exposures associated with soil vapor intrusion may not be appropriate.

As discussed in Sections 1.4 and 3.2.3, volatile chemicals may be present in the indoor air due to any one, or a combination, of the following:

a. the indoor environment itself and/or building characteristics;

b. off-gassing of volatile chemicals from contaminated water that may enter the building at the tap or shower head, or during flooding events, or contaminated water that rests in a sump or a subsurface drain;

c. outdoor sources; and/or

d. migration from the subsurface (i.e., soil vapor intrusion).

To determine the likely cause, the following assessment is completed:

a. qualitative and quantitative comparisons are made between the types and concentrations of the contaminants found in the indoor air sample(s) and those found in the outdoor air and sub-slab vapor sample;

b. qualitative and quantitative comparisons are made between indoor air results obtained in different locations of the building (e.g., different floors or rooms);

c. indoor air results are compared to the product inventory to evaluate the extent to which indoor sources are affecting indoor air quality; and

d. the indoor air quality questionnaire and building inventory form is reviewed to identify potential preferential pathways for soil vapor intrusion into the building, potential outdoor sources of volatile chemicals to the outdoor air (e.g., gasoline station or dry cleaner), and routes of air distribution within the building (e.g., HVAC system operations, airflow observations, etc.).

If a likely source or multiple sources can be identified from the available information, one or more of the following actions may be recommended given the source:

a. *Indoor source or building characteristics*

   Products containing volatile chemicals should be tightly capped. Alternatively, the products can be stored in places where people do not spend much time, such as a garage or outdoor shed. If the products are no longer needed, consideration should be given to disposing of them properly (e.g., hazardous waste cleanup days). The list of products and corresponding readings from field instrumentation provided in the product inventory [Appendix B] can help identify products that may be contributing to the levels that were detected in the indoor air.

   If exposures are assumed to be associated with off-gassing of new building materials, paint, etc., resampling may be appropriate to confirm this assumption or to confirm that actions taken to address these exposures have been effective.

b. *Off-gassing from contaminated groundwater within the building*

   Measures should be taken to prevent contaminated groundwater from entering the house (e.g., filter on private well supply, sealed sump, etc.).

c. *Outdoor source*

   No further action to address exposures related to soil vapor intrusion, unless the evaluation for soil vapor intrusion cannot be completed until outdoor interferences are addressed.

d. *Soil vapor intrusion*

Depending upon the relationship between indoor air concentrations and sub-slab vapor concentrations and the results of environmental sampling in the area, resampling, monitoring or mitigation may be recommended by the State.

1. Resampling, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, may be recommended when the results are not consistent with the conceptual site model. For example, when indoor air results are comparable or higher than the corresponding sub-slab vapor results and the results do not appear to be due to building characteristics or alternate sources (either indoor or outdoor).

2. Monitoring, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, may be recommended to determine whether concentrations in indoor air or sub-slab vapor have changed. It is also recommended to determine what affect, if any, active soil and groundwater remediation techniques (e.g., chemical oxidation, air sparging, etc.) may be having on subsurface vapor and indoor air quality. The type and frequency of monitoring is determined on a site-specific and building-specific basis, taking into account applicable environmental data and building operating conditions.

3. Methods to mitigate exposures related to soil vapor intrusion are described in Section 4.

The party responsible for implementing the recommended actions will differ depending upon several factors, including the identified source of the volatile chemicals, the environmental remediation program, and site-specific and building-specific conditions. For example, to the extent that all site data and site conditions demonstrate that soil vapor intrusion is not occurring and that the potential for soil vapor intrusion to occur is not likely, the vapor intrusion investigation would be considered complete. In general, if indoor exposures represent a concern due to indoor sources, then the State will provide guidance to the property owner and/or tenant on ways to reduce their exposure. If indoor exposures represent a concern due to outdoor sources, then the NYSDEC will decide who is responsible for further investigation and any necessary remediation. Depending upon the outdoor source, this responsibility may or may not fall upon the party conducting the soil vapor intrusion investigation.

Likely sources may not be evident given the information available. Therefore, the above recommendations cannot be made. This situation most often arises for the following reasons:

a. Interfering indoor sources are identified. However, the possibility of vapor intrusion cannot be ruled out due to the concentrations of the same volatile chemicals detected in the sub-slab vapor sample. Differentiating the contribution of each source is not possible.

b. Indoor air samples were collected without concurrent outdoor air and sub-slab vapor samples. Depending upon other information that may be available (e.g., building inventory and well-characterized subsurface vapor contamination), identifying likely sources and recommending appropriate actions may not be possible.

c. All appropriate air samples are collected. However, the indoor air quality questionnaire and building inventory forms are filled out incompletely or incorrectly. The contribution of indoor sources cannot be evaluated.

When the source(s) of volatile chemicals to indoor air cannot be identified with confidence, resampling is typically recommended with corrections made as appropriate. For example, using the three scenarios presented above:

a. resampling occurs after interferences are removed;

b. concurrent indoor air, outdoor air and sub-slab vapor samples are collected; and

c. an indoor air quality questionnaire and building inventory form is filled out completely and correctly when samples are collected.

Notes: See notes presented in Section 3.3.2.

3.3.4 Outdoor air

Outdoor air sampling results are primarily used to evaluate the extent to which outdoor air may be contributing to the levels of volatile chemicals detected in indoor air. However, people are also exposed to the outdoor air and the outdoor air results are indicative of outdoor air conditions. As such, outdoor air results are also reviewed to determine whether outdoor air conditions present a potential concern that requires further investigation.

As discussed in Sections 1.4 and 3.2.3, volatile chemicals may be present in outdoor air due to emissions from automobiles, lawn mowers, oil storage tanks, gasoline stations, and dry cleaners or other commercial and industrial facilities. To determine what extent, if any, outdoor air is affecting indoor air quality, indoor air results are compared to outdoor air results. To determine whether outdoor air conditions present a potential concern that requires further investigation, the State looks at the data set as a whole and considers the following:

a. background concentrations of volatile chemicals in outdoor air;

b. the NYSDOH's guidelines for volatile chemicals in air [Table 3.1];

c. human health risks (i.e., cancer and non-cancer health effects) associated with exposure to the volatile chemical in air; and

d. the factors described in Section 3.2.

3.4 Decision matrices

3.4.1 Overview

Decision matrices are risk management tools, developed by the NYSDOH in conjunction with other agencies, to provide guidance on a case-by-case basis about actions that should be taken to address current and potential exposures related to soil vapor intrusion. The matrices are intended to be used when evaluating the results from buildings with full slab foundations. The matrices encapsulate the data evaluation processes and actions recommended to address exposures discussed in Sections 3.3.2 and 3.3.3. The general format of a decision matrix is shown in Table 3.2.

Table 3.2 General format of a decision matrix

	Indoor Air Concentration of Volatile Chemical (mcg/m^3)		
Sub-slab Vapor Concentration of Volatile Chemical (mcg/m^3)	Concentration Range 1	Concentration Range 2	Concentration Range 3
Concentration Range 1	ACTION	ACTION	ACTION
Concentration Range 2	ACTION	ACTION	ACTION
Concentration Range 3	ACTION	ACTION	ACTION

Indoor air and sub-slab vapor concentration ranges in a matrix are selected based on a number of considerations in addition to health risks. For example, factors that are considered when selecting the ranges include, but are not limited to, the following:

a. human health risks (i.e., cancer and non-cancer health effects) associated with exposure to the volatile chemical in air;

b. the NYSDOH's guidelines for volatile chemicals in air [Table 3.1];

c. background concentrations of volatile chemicals in air [Section 3.2.4];

d. analytical capabilities currently available; and

e. attenuation factors (i.e., the ratio of indoor air to sub-slab vapor concentrations).

3.4.2 Matrices

The NYSDOH has developed two matrices, which are included at the end of Section 3.4, to use as tools in making decisions when soil vapor may be entering buildings. The first decision matrix was originally developed for TCE and the second for PCE. As summarized in Table 3.3, four chemicals have been assigned to the two matrices to date.

Table 3.3 Volatile chemicals and their decision matrices

Chemical	**Soil Vapor/Indoor Air Matrix***
Carbon tetrachloride	Matrix 1
Tetrachloroethene (PCE)	Matrix 2
1,1,1-Trichloroethane (1,1,1-TCA)	Matrix 2
Trichloroethene (TCE)	Matrix 1

*The decision matrices are available at the end of Section 3.4.

Because the matrices are risk management tools and consider a number of factors, the NYSDOH intends to assign chemicals to one of these two matrices, if possible. For example, if a chemical other than those already assigned to a matrix is identified as a chemical of concern during a soil vapor intrusion investigation, assignment of that chemical into one of the existing decision matrices will be considered by the NYSDOH. Factors that will be considered in assigning a chemical to a matrix include, but are not limited to, the following:

a. human health risks, including such factors as a chemical's ability to cause cancer, reproductive, developmental, liver, kidney, nervous system, immune system or other effects, in animals and humans and the doses that may cause those effects;

b. the data gaps in its toxicologic database;

c. background concentrations of volatile chemicals in indoor air [Section 3.2.4]; and

d. analytical capabilities currently available.

If the NYSDOH determines that the assignment of the chemical into an existing matrix is inappropriate, then the NYSDOH will either modify an existing matrix or develop a new matrix.

To use the matrices appropriately as a tool in the decision-making process, the following should be considered:

a. The matrices are generic. As such, it may be appropriate to modify a recommended action to accommodate building-specific conditions (e.g., dirt floor in basement, crawl spaces, etc.) and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, resampling may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Additionally, actions more protective of public health than those specified within the matrix may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action is usually undertaken for reasons other than public health (e.g., seeking community acceptance, reducing excessive costs, etc.).

b. Indoor air concentrations detected in samples collected from the building's basement or, if the building has a slab-on-grade foundation, from the building's lowest occupied living space should be used.

c. Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of vapor contamination, nor does it preclude remediating contaminated soil vapors or the source of soil vapor contamination.

d. When current exposures are attributed to sources other than vapor intrusion, the agencies should be provided documentation(e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix and to support assessment and follow-up by the agencies.

3.4.3 Description of recommended actions

Actions recommended in the matrix are based on the relationship between sub-slab vapor concentrations and corresponding indoor air concentrations. They are intended to address both potential and current human exposures and include the following:

a. *No further action*

When the volatile chemical is not detected in the indoor air sample and the concentration detected in the corresponding sub-slab vapor sample is not expected to substantially affect indoor air quality.

b. *Take reasonable and practical actions to identify source(s) and reduce exposures*

The concentration detected in the indoor air sample is likely due to indoor and/or outdoor sources rather than soil vapor intrusion given the concentration detected in the sub-slab vapor sample. Therefore, steps should be taken to identify potential source(s) and to reduce exposures accordingly (e.g., by keeping containers tightly capped or by storing volatile chemical-containing products in places where people do not spend much time, such as a garage or shed). Resampling may also be recommended to demonstrate the effectiveness of actions taken to reduce exposures.

d. *Monitor*

Monitoring, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, is appropriate to determine whether concentrations in the indoor air or sub-slab vapor have changed. Monitoring may also be appropriate to determine whether existing building conditions (e.g., positive pressure HVAC systems) are maintaining the desired mitigation endpoint and to determine whether changes are appropriate.

The type and frequency of monitoring is determined on a site-specific and building-specific basis, taking into account applicable environmental data and building operating conditions.

e. *Mitigate*

Mitigation is appropriate to minimize current or potential exposures associated with soil vapor intrusion. Methods to mitigate exposures related to soil vapor intrusion are described in Section 4.

f. *Monitor / Mitigate*

Monitoring or mitigation may be recommended after considering the magnitude of sub-slab vapor and indoor air concentrations along with building- and site-specific conditions.

Soil Vapor/Indoor Air Matrix 1

October 2006

	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m^3)			
SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m^3)	< 0.25	0.25 to < 1	1 to < 5.0	5.0 and above
< 5	1. No further action	2. Take reasonable and practical actions to identify source(s) and reduce exposures	3. Take reasonable and practical actions to identify source(s) and reduce exposures	4. Take reasonable and practical actions to identify source(s) and reduce exposures
5 to < 50	5. No further action	6. MONITOR	7. MONITOR	8. MITIGATE
50 to < 250	9. MONITOR	10. MONITOR / MITIGATE	11. MITIGATE	12. MITIGATE
250 and above	13. MITIGATE	14. MITIGATE	15. MITIGATE	16. MITIGATE

No further action:
Given that the compound was not detected in the indoor air sample and that the concentration detected in the sub-slab vapor sample is not expected to significantly affect indoor air quality, no additional actions are needed to address human exposures.

Take reasonable and practical actions to identify source(s) and reduce exposures:
The concentration detected in the indoor air sample is likely due to indoor and/or outdoor sources rather than soil vapor intrusion given the concentration detected in the sub-slab vapor sample. Therefore, steps should be taken to identify potential source(s) and to reduce exposures accordingly (e.g., by keeping containers tightly capped or by storing volatile organic compound-containing products in places where people do not spend much time, such as a garage or outdoor shed). Resampling may be recommended to demonstrate the effectiveness of actions taken to reduce exposures.

MONITOR:
Monitoring, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, is needed to determine whether concentrations in the indoor air or sub-slab vapor have changed. Monitoring may also be needed to determine whether existing building conditions (e.g., positive pressure heating, ventilation and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined on a site-specific and building-specific basis, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

MITIGATE:
Mitigation is needed to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system, and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building-specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

MONITOR / MITIGATE:
Monitoring or mitigation may be recommended after considering the magnitude of sub-slab vapor and indoor air concentrations along with building- and site-specific conditions.

See additional notes on page 2.

ADDITIONAL NOTES FOR MATRIX 1

This matrix summarizes the minimum actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

[1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate building-specific conditions (e.g., dirt floor in basement, crawl spaces, etc.) and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, resampling may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Additionally, actions more protective of public health than those specified within the matrix may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action is usually undertaken for reasons other than public health (e.g., seeking community acceptance, reducing excessive costs, etc.).

[2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of vapor contamination, nor does it preclude remediating contaminated soil vapors or the source of soil vapor contamination.

[3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 0.25 microgram per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples, a minimum reporting limit of 5 micrograms per cubic meter is recommended for buildings with full slab foundations, and 1 microgram per cubic meter for buildings with less than a full slab foundation.

[4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion to occur is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions may be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.

[5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.

[6] The party responsible for implementing the recommended actions will differ depending upon several factors, including the identified source of the volatile chemicals, the environmental remediation program, and site-specific and building-specific conditions. For example, to the extent that all site data and site conditions demonstrate that soil vapor intrusion is not occurring and that the potential for soil vapor intrusion to occur is not likely, the soil vapor intrusion investigation would be considered complete. In general, if indoor exposures represent a concern due to indoor sources, then the State will provide guidance to the property owner and/or tenant on ways to reduce their exposure. If indoor exposures represent a concern due to outdoor sources, then the NYSDEC will decide who is responsible for further investigation and any necessary remediation. Depending upon the outdoor source, this responsibility may or may not fall upon the party conducting the soil vapor intrusion investigation.

Soil Vapor/Indoor Air Matrix 2

October 2006

	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m^3)			
SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m^3)	< 3	3 to < 30	30 to < 100	100 and above
< 100	1. No further action	2. Take reasonable and practical actions to identify source(s) and reduce exposures	3. Take reasonable and practical actions to identify source(s) and reduce exposures	4. Take reasonable and practical actions to identify source(s) and reduce exposures
100 to < 1,000	5. MONITOR	6. MONITOR / MITIGATE	7. MITIGATE	8. MITIGATE
1,000 and above	9. MITIGATE	10. MITIGATE	11. MITIGATE	12. MITIGATE

No further action:
Given that the compound was not detected in the indoor air sample and that the concentration detected in the sub-slab vapor sample is not expected to significantly affect indoor air quality, no additional actions are needed to address human exposures.

Take reasonable and practical actions to identify source(s) and reduce exposures:
The concentration detected in the indoor air sample is likely due to indoor and/or outdoor sources rather than soil vapor intrusion given the concentration detected in the sub-slab vapor sample. Therefore, steps should be taken to identify potential source(s) and to reduce exposures accordingly (e.g., by keeping containers tightly capped or by storing volatile organic compound-containing products in places where people do not spend much time, such as a garage or outdoor shed). Resampling may be recommended to demonstrate the effectiveness of actions taken to reduce exposures.

MONITOR:
Monitoring, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, is needed to determine whether concentrations in the indoor air or sub-slab vapor have changed. Monitoring may also be needed to determine whether existing building conditions (e.g., positive pressure heating, ventilation and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined on a site-specific and building-specific basis, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

MITIGATE:
Mitigation is needed to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system, and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building-specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

MONITOR / MITIGATE:
Monitoring or mitigation may be recommended after considering the magnitude of sub-slab vapor and indoor air concentrations along with building- and site-specific conditions.

See additional notes on page 2.

ADDITIONAL NOTES FOR MATRIX 2

This matrix summarizes the minimum actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

[1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate building-specific conditions (e.g., dirt floor in basement, crawl spaces, etc.) and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, resampling may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Additionally, actions more protective of public health than those specified within the matrix may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action is usually undertaken for reasons other than public health (e.g., seeking community acceptance, reducing excessive costs, etc.).

[2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of vapor contamination, nor does it preclude remediating contaminated soil vapors or the source of soil vapor contamination.

[3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 3 micrograms per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples, a minimum reporting limit of 5 micrograms per cubic meter is recommended.

[4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion to occur is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions may be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.

[5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.

[6] The party responsible for implementing the recommended actions will differ depending upon several factors, including the identified source of the volatile chemicals, the environmental remediation program, and site-specific and building-specific conditions. For example, to the extent that all site data and site conditions demonstrate that soil vapor intrusion is not occurring and that the potential for soil vapor intrusion to occur is not likely, the soil vapor intrusion investigation would be considered complete. In general, if indoor exposures represent a concern due to indoor sources, then the State will provide guidance to the property owner and/or tenant on ways to reduce their exposure. If indoor exposures represent a concern due to outdoor sources, then the NYSDEC will decide who is responsible for further investigation and any necessary remediation. Depending upon the outdoor source, this responsibility may or may not fall upon the party conducting the soil vapor intrusion investigation.

3.5 Emergency response

The NYSDOH's staff are responsible for recommending that residents relocate in cases where there may be health risks resulting from exposure to petroleum spills. These roles and responsibilities are outlined in Environmental Health Manual Technical Reference and Procedural Items BTSA-01. Air sampling is appropriate in some cases for demonstrating that spill cleanup and engineering controls have been effective in reducing indoor air impacts and associated health risks to residents. At a minimum, air samples are collected from the basement, first floor and from outdoors. Whether sub-slab or soil gas samples will be taken is evaluated on a case-by-case basis. Air testing data are sometimes used as the basis for ending emergency relocation financial support. For additional information, please contact the NYSDOH's Bureau of Toxic Substance Assessment by calling 1-800-458-1158.

Emergency actions not related to petroleum spills are handled on a case-by-case basis.

3.6 Parcels that are undeveloped or contain unoccupied buildings

If investigation of a parcel that is undeveloped or contains unoccupied buildings is being delayed until the site is being developed or occupied, measures should be in place that assure the State that no development or occupation will occur without addressing the exposures. Institutional controls may be used for this purpose. An institutional control is any non-physical means of enforcing a restriction on the use of real property that

a. limits human or environmental exposure,

b. provides notice to potential owners, operators or members of the public, or

c. prevents actions that would interfere with the effectiveness of remedial actions or with the effectiveness and/or integrity of operation, maintenance or monitoring activities at a site.

An institutional control that is often used is an environmental easement. An environmental easement is an enforced mechanism used for property where the remedial actions leave residual contamination that makes the property suitable for some, but not all uses, or includes engineering controls that must be maintained for the easement to be effective. The purpose of the easement is to ensure that such use restrictions or engineering controls remain in place. An environmental easement

a. can only be created by the property owner (the *grantor*) through a written instrument recorded in the appropriate county recording office. It can only be granted to the State (the *grantee*) and can only be extinguished or amended by a written instrument executed by the Commissioner of the Department of Environmental Conservation and duly recorded;

b. is binding upon all subsequent owners and occupants of the property. The deed or deeds for the property (as well as any other written instruments conveying any interest in the property) must contain a prominent notice that it is subject to an environmental easement; and

c. may be enforced in perpetuity against the *grantor*, subsequent owners of the property, lessees, and any person using the property by its grantor, by the State, or by the municipality in which the property is located.

If these actions cannot be implemented, alternative measures should be in place that assure the State that the parcel will not be developed or buildings occupied without addressing the exposure concerns. For example, arrangements should be made for the town, village or city

to notify the appropriate party when new construction or tenants are proposed for the parcel (e.g., permit applications and grants) or ownership of the parcel changes.

Section 4: Soil Vapor Intrusion Mitigation

As discussed in Section 1.1, soil vapor can enter a building through cracks or perforations in slabs or basement floors and walls, and through openings around sump pumps or where pipes and electrical wires go through the foundation primarily because of a difference between interior and exterior pressures. This intrusion is similar to how radon gas enters buildings from the subsurface. Fortunately, given this similarity, well-established techniques for mitigating exposures to radon may also be used to mitigate exposures related to soil vapor intrusion.

Once it is determined that steps should to be taken to address exposures associated with soil vapor intrusion, they should be implemented with all due expediency. This section provides an overview of:

a. methods of mitigation,
b. installation and design of mitigation systems,
c. post-mitigation testing,
d. operation, maintenance and monitoring of mitigation systems,
e. termination of mitigation system operations, and
f. annual certification.

Mitigation is considered to be an interim measure to address exposures until contaminated environmental media are remediated, or until mitigation is no longer needed to address exposures related to soil vapor intrusion.

4.1 Methods of mitigation

The most effective mitigation methods involve sealing infiltration points and actively manipulating the pressure differential between the building's interior and exterior (on a continuous basis). As discussed in the following subsections, the appropriate method to use will largely depend upon the building's foundation design. Furthermore, buildings having more than one foundation design feature (e.g., a basement under one portion of the house and a crawl space beneath the remainder) may require a combination of mitigation methods. This section describes methods of mitigation that are expected to be the most reliable options under a wide range of circumstances. Occasionally, there are site-specific or building-specific conditions under which alternative methods (such as HVAC modification, sealing, room pressurization, passive ventilation systems, or vapor barriers) may be more appropriate. Such mitigation proposals may be considered on a case-by-case basis.

4.1.1 Buildings with a basement slab or slab-on-grade foundation

In conjunction with *sealing* potential subsurface vapor entry points, an active *sub-slab depressurization system* (SSD system) is the preferred mitigation method for buildings with a basement slab or slab-on-grade foundation. A SSD system uses a fan-powered vent and piping to draw vapors from the soil beneath the building's slab (i.e., essentially creating a vacuum beneath the slab) and discharge them to the atmosphere. This results in lower sub-slab air pressure relative to indoor air pressure, which prevents the infiltration of sub-slab vapors into the building.

The most common approach to achieving depressurization beneath the slab is to insert the piping through the floor slab into the crushed rock or soil underneath. However, the EPA, in their "Consumer's Guide to Radon Reduction" (EPA 402-K-03-002; revised February 2003), lists the following approaches as ways to reduce radon levels in a building, either in place of the more common sub-slab suction point method or in conjunction with that method:

a. *Drain tile suction* — Some houses have drain tiles or perforated pipe to direct water away from the foundation of the house. Suction on these tiles or pipes is often effective;

b. *Sump hole suction* — If the building has a sump pump to remove unwanted water, the sump can be capped so that it can continue to drain water and serve as the location for piping. If the sump is not used as the suction or extraction point, the associated wiring and piping should be sealed and an air-tight cover should be installed to enhance the performance of the SSD system; and

c. *Block wall suction* — If the building has hollow block foundation walls, the void network within the wall may be depressurized by drawing air from inside the wall and venting it to the outside. This method is often used in combination with sub-slab depressurization.

The depressurization approach, or combination of approaches, selected for a building should be determined on a building-specific basis due to building-specific features that may be conducive to a specific depressurization approach. For example, if the contaminants are entering the building through a block wall, block wall suction in conjunction with traditional sub-slab depressurization may be more effective at minimizing exposures related to soil vapor intrusion rather than sub-slab depressurization alone.

Although sealing is not a reliable mitigation technique on its own, it can significantly improve the effectiveness of a SSD system since it limits the flow of subsurface vapors into the building. All joints, cracks and other penetrations of slabs, floor assemblies and foundation walls below or in contact with the ground surface should be sealed with materials that prevent air leakage.

If the State concurs that a SSD system is not a practicable alternative or that exposures will be mitigated concurrently by a method selected to remediate subsurface contamination, alternative mitigation methods may be considered, such as the following:

a. *HVAC modification* — a technique where the building's HVAC system is modified to avoid depressurization of the building relative to underlying and surrounding soil (i.e., to maintain a positive pressure within the building); and

b. *Soil vapor extraction (SVE) system* — a technique used to remediate contaminated subsurface soil vapor. SVE systems use high flow rates, induced vacuum or both to collect and remove contamination, while SSD systems use a minimal flow rate to effect the minimum pressure gradient (see the EPA's technical guidance documents for recommended gradients; Section 4.2.3) needed to reverse air flow across a building's foundation. Depending upon the SVE system's design, the system may also serve to mitigate exposures. For example, the SVE system's radius of influence includes the subsurface beneath affected buildings or horizontal legs of the system will be installed beneath affected buildings. However, complications can arise if the SVE system is no longer effective at remediating contaminated vapors, exposures should still be mitigated due to residual vapor contamination.

4.1.2 Buildings with a crawl space foundation

A *soil vapor retarder* with *sub-membrane depressurization (SMD) system* is the preferred mitigation method for buildings with a crawl space foundation. A soil vapor retarder is a synthetic membrane or other comparable material that is placed on the ground in the crawl space to retard the flow of soil vapors into the building. A SMD system is similar to a SSD system. It uses a fan-powered vent and piping to draw vapors from beneath the soil vapor retarder and discharge them to the atmosphere. This results in lower air pressure beneath the membrane relative to air pressure in the crawl space, which prevents the infiltration of subsurface vapors into the building.

If the State concurs that a soil vapor retarder with a SMD system is not a practicable alternative or that exposures will be mitigated concurrently by a method selected to remediate subsurface contamination, alternative mitigation methods may be considered, such as the following:

a. *HVAC modification* — a technique where the building's HVAC system is modified to avoid depressurization of the building relative to the crawl space;

b. *Crawl space ventilation with sealing* — a technique that uses a fan to draw air out of the crawl space; and

c. *SVE system* [Section 4.1.1].

4.1.3 Buildings with dirt floor basements

Either a SSD system with a newly poured slab or a SMD system with a soil vapor retarder may be used. However, the former method is preferred.

4.1.4 Buildings with multiple foundation types

Mitigation in a building with a combination of foundations should be achieved by applying the specific methods described previously [Sections 4.1.1 through 4.1.3] to the corresponding foundation segments of the building. Special consideration should be given to the points at which different foundation types join, since additional soil vapor entry routes exist in such locations. Often, the various systems can be installed and connected to a common depressurization system and fan.

4.1.5 Undeveloped parcels

If sampling results indicate a mitigation system is recommended to address exposures in buildings that may be constructed, then a SSD system with sealing, or a SMD system with a soil vapor retarder, or a combination of these methods is recommended, as appropriate to the design of the proposed buildings.

4.1.6 Additional references

The following documents provide additional information on selecting an appropriate mitigation method:

a. *A Consumer's Guide to Radon Reduction*
EPA [EPA 402-K-03-002, revised February 2003]

This document provides assistance in selecting a qualified radon mitigation contractor to reduce the radon levels in a home, determining an appropriate radon reduction method, and maintaining a radon reduction system. It is available at the EPA's web site: http://www.epa.gov/iaq/radon/pubs/index.html; and

b. *Reducing Radon in Schools: A Team Approach*
EPA [EPA 402-R-94-008, April 1994]

This document will provide assistance in determining the best way to reduce elevated radon levels found in a school. It provides guidance on the process of confirming a radon problem, selecting the best mitigation strategy, and directing the efforts of a multidisciplinary team assembled to address elevated radon levels in a way that will contribute to the improvement of the overall indoor air quality of the school. Copies can be ordered from the EPA's Indoor Air Quality Information Clearinghouse at 1-800-438-4318.

4.2 Design and installation of mitigation systems

Once a mitigation method is selected, it should be designed and installed. The components of the design and installation of mitigation systems, the procedures for specific mitigation techniques, and references for technical guidance are provided in the following subsections.

4.2.1 General recommendations

Systems should be designed and installed by a professional engineer or environmental professional. In most areas of the state, there are contractors who have met certain requirements and are trained to identify and fix radon problems in buildings. To obtain the names of local contractors, contact the NYSDOH's Radon Program at 1-800-458-1158, extension 27556, or visit the National Radon Safety Board's web site (www.nrsb.org) or National Environmental Health Association's web site (www.neha.org).

Typically, the party responsible for remediating the site is responsible for arranging design and installation activities. If no responsible party is available, the State will arrange for the design and installation of the system. All design and installation activities should be documented and reported to the agencies. Furthermore, once a mitigation system is installed, an information package should be given to the building's owner and tenants, if applicable, to facilitate their understanding of the system's operation, maintenance and monitoring [Section 5.6].

With the exception of SVE systems, the mitigation methods introduced in Section 4.1 are not intended to remediate the source of subsurface vapors (e.g., contaminated groundwater, soil, etc.). Rather, they are designed to minimize the infiltration of subsurface vapors into a building. For consistency in implementing the techniques in residential buildings, mitigation systems should be designed and installed in accordance with the following:

a. *Standard Practice for Installing Radon Mitigation Systems in Existing Low-rise Residential Buildings* (ASTM E-2121)

American Society for Testing and Materials (ASTM) International [ASTM E-2121-03, February 10, 2003]

This document applies to existing buildings. The purpose of this document is to provide radon mitigation contractors with uniform standards that will ensure quality and effectiveness in the design, installation, and evaluation of radon mitigation systems in detached and attached residential buildings three stories or less in height. Information on how to obtain a copy of this standard is available in Appendix E; and

b. *Model Standards and Techniques for Control of Radon in New Residential Buildings* EPA [EPA 402-R-94-009, March 1994]

This document applies to new construction and contains information on how to incorporate radon reduction techniques and materials in residential construction. A copy of this document is provided in Appendix F.

4.2.2 System-specific recommendations

Basic design and installation recommendations for mitigation systems follow. These are based upon recommendations and requirements given by the EPA for mitigating exposures related to radon intrusion (for additional information see EPA's web site on radon at http://www.epa.gov/iaq/radon/pubs/index.html).

a. *Sealing* — To improve the effectiveness of depressurization and ventilation systems and to limit the flow of subsurface vapors into the building, materials that prevent air leakage should be used, such as elastomeric joint sealant (as defined in ASTM C920-87), compatible caulks, non-shrink mortar, grouts, expanding foam, "Dranjer" drain seals, or airtight gaskets. Some effective sealants may contain volatile organic compounds; in some situations, this may be a consideration in choosing an appropriate sealing material.

b. *Soil vapor retarder (membrane)* —

1. To retard the infiltration of subsurface vapors into the building and enhance the performance of a SMD system, a minimum 6 mil (or 3 mil cross-laminated) polyethylene or equivalent flexible sheeting material should be used.

2. The sheet should cover the entire floor area and be sealed at seams (with at least a 12 inch overlap) and penetrations, around the perimeter of interior piers and to the foundation walls.

3. Enough of the sheeting should be used so it will not be pulled away from the walls when the depressurization system is turned on and the sheet is drawn down.

4. If a membrane is installed in areas that may have future foot traffic (e.g., a dirt floor in a basement), consideration should be given to also installing a wearing surface such as sand or stone to protect the integrity of the membrane. Additionally, a layer of fine sand may be prudent beneath the membrane to protect it from penetrations by sharp objects in the dirt floor.

c. *Depressurization systems —*

1. The systems should be designed to avoid the creation of other health, safety, or environmental hazards to building occupants (e.g., backdrafting of natural draft combustion appliances).

2. The systems should be designed to minimize soil vapor intrusion effectively while minimizing excess energy usage, to avoid compromising moisture and temperature controls and other comfort features, and to minimize noise.

3. To evaluate the potential effectiveness of a SSD before it is installed, a diagnostic test (commonly referred to as a "communication" test) should be performed to measure the ability of a suction field and air flow to extend through the material beneath the slab. This test is commonly conducted by applying suction on a centrally located hole drilled through the concrete slab and simultaneously observing the movement of smoke downward into small holes drilled in the slab at locations separated from the central suction hole. A similar quantitative evaluation may also be performed by using a digital micromanometer or comparable instrument. Depending on test results, multiple suction points may be needed to achieve the desired effectiveness of the system.

4. Passive systems (i.e., a SSD system without a vent fan) are not as effective as active systems and their performance varies depending upon ambient temperatures and wind conditions. Therefore, active systems should be used to ensure exposures are being addressed.

5. The vent fan and discharge piping should not be located in or below a livable or occupied area of the building to avoid entry of extracted subsurface vapors into the building in the event of a fan or pipe leak.

6. To avoid entry of extracted subsurface vapors into the building, the vent pipe's exhaust should be

    i. above the eave of the roof (preferably, above the highest eave of the building at least 12 inches above the surface of the roof),

    ii. at least 10 feet above ground level,

    iii. at least 10 feet away from any opening that is less than 2 feet below the exhaust point, and

    iv. 10 feet from any adjoining or adjacent buildings, or HVAC intakes or supply registers.

7. Rain caps, if used, should be installed so as not to increase the potential for extracted subsurface vapors to enter the building.

8. To avoid accidental changes to the system that could disrupt its function, the depressurization system should be labeled clearly. An example of such labeling is shown in Figure 5.1.

9. A warning device or indicator should be installed to alert building occupants if the active system stops working properly. Examples of system failure warning devices and indicators include the following: a liquid gauge (e.g., a

manometer), a sound alarm, a light indicator, and a dial (needle display) gauge. The warning device or indicator should be placed where it can be easily heard or seen. The party installing the system should verify the warning device or indicator is working properly. Building occupants should be made aware of the warning device or indicator (what it is, where it is located, how it works, how to read/understand it, and what to do if it indicates the system is not working properly).

d. *HVAC systems* — HVAC systems should be carefully designed, installed and operated to avoid depressurization of basements and other areas in contact with the soil.

e. *Crawl space ventilation* —

1. Ventilation systems should be designed to avoid the creation of other health, safety, or environmental hazards to building occupants (e.g., backdrafting of natural draft combustion appliances).

2. Openings and cracks in floors above the crawl space that would permit conditioned air to pass into or out of the occupied spaces of the building, should be identified, closed and sealed.

f. *SVE systems designed to also mitigate exposures* —

1. The systems should be designed to avoid the creation of other health, safety, or environmental hazards to building occupants (e.g., backdrafting of natural draft combustion appliances).

2. To avoid reentry of soil vapor into the building(s), the exhaust point should be located away from the openings of buildings and HVAC air intakes. Depending upon the concentrations of volatile chemicals in subsurface vapors and the expected mass removal rate, treatment (e.g., via carbon filters) of the SVE system effluent may be appropriate to minimize outdoor air effects.

3. The SVE system's radius of influence should adequately address buildings requiring mitigation, as well as subsurface sources requiring remediation. If it does not, additional actions may be appropriate. For example, if the radius of influence does not completely extend beneath a building, a complementary air monitoring program may be appropriate to confirm that exposures are being addressed adequately while the SVE system is operating.

4.2.3 Technical guidance

To address exposures effectively in larger buildings, some of the same techniques used in residential buildings can be scaled up in size, number, or performance (e.g., adjustments in the size and air movement capacity of the vent pipe fan, or installation of multiple suction points through the slab instead of a single point). The design of the techniques may also be modified (e.g., installation of horizontal pipes beneath the building instead of a single suction point).

Detailed technical guidance on designing and installing mitigation systems in residential and non-residential buildings is provided in various documents, such as the following, released by the EPA and others:

a. References provided in ASTM's E-2121 (see Appendix E for information on how to obtain a copy) and the EPA's *Model Standards and Techniques for Control of Radon in New Residential Buildings* (Appendix F);

b. *Radon Reduction Techniques for Existing Detached Houses: Technical Guidance (Third Edition) for Active Soil Depressurization Systems*
EPA [EPA 625/R-93-011, October 1993]

This technical guidance document has been prepared to serve as a comprehensive aid in the detailed selection, design, installation, and operation of indoor radon reduction measures for existing houses based on active soil depressurization techniques. It is intended for use by radon mitigation contractors, building contractors, concerned homeowners, state and local officials and other interested persons. Copies can be ordered from the EPA's Indoor Air Quality Information Clearinghouse at 1-800-438-4318;

c. *Protecting Your Home From Radon: A Step-by-Step Manual for Radon Reduction*
Kladder *et al.*, 1993

This manual is designed to provide sufficient information to a homeowner to make many of the basic repairs that can significantly reduce radon levels in the home;

d. *Building Radon Out: A Step-by-Step Guide on How to Build Radon-Resistant Homes*
EPA [EPA 402-K-01-002, April 2001]

This fully illustrated guide contains all the information needed in one place to educate home builders about radon-resistant new construction (RRNC), including the following: basic questions and detailed answers about radon and RRNC, specific planning steps before installing a system, detailed installation instructions with helpful illustrations, tips and tricks when installing a system, marketing know-how when dealing with homebuyers, and architectural drawings. This document is available at the EPA's web site: http://www.epa.gov/iaq/radon/pubs/index.html; and

e. *Radon Prevention in the Design and Construction of Schools and Other Large Buildings*
EPA [EPA 625-R-92-016, June 1994]

It is typically easier and much less expensive to design and construct a new building with radon-resistant and/or easy-to-mitigate features, than to add these features after the building is completed and occupied. Specific guidelines on how to incorporate radon prevention features in the design and construction of schools and other large buildings are detailed in this manual. Copies can be ordered from the EPA's Indoor Air Quality Information Clearinghouse at 1-800-438-4318. This document is also available on the EPA Office of Research and Development's web site: http://www.epa.gov/ORD/NRMRL/pubs/625r92016/625r92016.htm.

4.3 Post-mitigation or confirmation testing

Once a mitigation system is installed, its effectiveness and proper installation should be confirmed. The party that installed the system should conduct post-mitigation testing and for developing a post-mitigation testing plan. Minimum objectives for post-mitigation testing associated with specific mitigation methods are provided in the following

subsections. All post-mitigation testing activities should be documented and reported to the agencies.

4.3.1 SSD systems with sealing

a. Reasonable and practical actions should be taken to identify and fix leaks. With the depressurization system operating, smoke tubes are used to check for leaks through concrete cracks, floor joints, and at the suction point. Any leaks identified should be resealed until smoke is no longer observed flowing through the opening.

b. Once a depressurization system is installed, its operation may compete with the proper venting of fireplaces, wood stoves and other combustion or vented appliances (e.g., furnaces, clothes dryers, and water heaters), resulting in the accumulation of exhaust gases in the building and the potential for carbon monoxide poisoning. Therefore, in buildings with natural draft combustion appliances, the building should be tested for backdrafting of the appliances. Backdrafting conditions should be corrected before the depressurization system is placed in operation.

c. The distance that a pressure change is induced in the sub-slab area (i.e., a pressure field extension test) should be conducted. Analogous to a communication test, this test is commonly conducted by operating the depressurization system and simultaneously observing the movement of smoke downward into small holes (e.g., 3/8 inch) drilled through the slab at sufficient locations to demonstrate that a vacuum is being created beneath the entire slab. A similar quantitative evaluation may also be performed by using a digital micromanometer or comparable instrument. If adequate depressurization is not occurring, the reason (e.g., improper fan operation) should be identified and corrected.

d. Adequate operation of the warning device or indicator should be confirmed.

e. Except as indicated below, post-mitigation indoor and outdoor air sampling should be conducted in all buildings where pre-mitigation samples were collected and in all buildings where physical data suggest possible impediments to comprehensive sub-slab communication of the depressurization system (i.e., locations with wet or dense sub-slab soils, multiple foundations and footings, minimal pressure differentials between the interior and sub-slab). Generally, indoor and outdoor air sampling locations, protocols and analytical methods should be consistent between pre-mitigation and post-mitigation sampling, where applicable. In buildings with basements, post-mitigation indoor air sampling from the basement alone (i.e., without a concurrent indoor air sample from the first floor) is recommended in most circumstances.

   Typically, post-mitigation sampling should be conducted no sooner than 30 days after installing a depressurization system. If the system is installed outside of the heating season or at the end of a season, post-mitigation air sampling may be postponed until the heating season.

   In cases of widespread mitigation due to vapor contamination and depending upon the basis of making decisions (e.g., a "blanket mitigation" approach within a specified area of documented vapor contamination [Section 3.3.1]), a representative number of buildings from an identified study area, rather than each building, may be

sampled. Prior to implementation, this type of post-mitigation sampling approach should be approved by State agency personnel.

In newly constructed buildings, a site-specific and building-specific indoor air sampling plan is recommended due to potential interferences caused by the off-gassing of volatile chemicals in new building materials (e.g., paints, carpets, furniture, etc. [Section 1.4]). In these situations, if indoor air sampling is appropriate samples should be

i. collected while the system is operational but before potentially interfering factors are brought into the building,

ii. analyzed for a targeted list of volatile chemicals based on previous environmental sampling (e.g., groundwater, soil, soil vapor, etc.), and/or

iii. collected while the system is operational but after potentially interfering factors have had an opportunity to off-gas.

If post-mitigation sampling results do not indicate a significant decrease in the concentrations of volatile chemicals previously believed to be present in the indoor air due to soil vapor intrusion, the reason (e.g., indoor or outdoor sources, improper operation of the mitigation system, etc.) should be identified and corrected as appropriate.

4.3.2 SMD systems with soil vapor retarder

a. Reasonable and practical actions should be taken to identify and fix leaks. With the depressurization system operating, smoke tubes are used to check for leaks in the membrane at seams, edge seals and at locations where the sheet was sealed around obstructions. Any leaks identified should be resealed until smoke is no longer observed flowing through the opening.

b. Backdrafting conditions should be evaluated and corrected [Section 4.3.1].

c. Adequate operation of the warning device or indicator should be confirmed.

d. Post-mitigation indoor and outdoor air testing should be conducted in buildings where pre-mitigation samples were collected [as discussed in Section 4.3.1].

4.3.3 HVAC modifications

a. Check the building for positive pressure conditions (e.g., verify a pressure controller is maintaining the desired pressure differential and/or measure the pressure differential between the sub-slab and indoor air by using field instruments).

b. Backdrafting conditions should be evaluated and corrected [Section 4.3.1].

c. Adequate operation of the warning device or indicator, if applicable, should be confirmed.

d. Post-mitigation indoor and outdoor air testing should be conducted in buildings where pre-mitigation samples were collected [Section 4.3.1].

4.3.4 Crawl space ventilation and sealing

a. Reasonable and practical actions should be taken to identify and fix leaks. With the ventilation system operating, smoke tubes are used to check for leaks in openings and cracks in floors above the crawl space that were sealed during installation of the system. Any leaks identified should be resealed until smoke is no longer observed flowing through the opening.

b. Backdrafting conditions should be evaluated and corrected [Section 4.3.1].

c. Adequate operation of the warning device or indicator, if applicable, should be confirmed.

d. Post-mitigation indoor and outdoor air testing should be conducted in buildings where pre-mitigation samples were collected [as discussed in Section 4.3.1].

4.3.5 SVE systems designed to also mitigate exposures

a. Backdrafting conditions should be evaluated and corrected [Section 4.3.1].

b. The distance that a pressure change is induced in the sub-slab area should be conducted. This may be done by operating the SVE system and simultaneously observing the movement of smoke downward into small holes (e.g., 3/8 inch) drilled through the building's slab at sufficient locations to demonstrate that a vacuum is being created beneath the entire slab.

c. Adequate operation of the warning device or indicator, if applicable, should be confirmed.

d. Post-mitigation indoor and outdoor air testing should be conducted in buildings where pre-mitigation samples were collected [Section 4.3.1].

4.4 Operation, maintenance and monitoring of mitigation systems

When mitigation systems are implemented at a site, the operation, maintenance and monitoring (OM&M) protocols for the systems should be included in a site-specific site management plan (formerly referred to as operation, maintenance and monitoring plan). The party that installed the system should conduct OM&M activities and should develop the site management plan. Recommendations for minimum OM&M activities associated with specific mitigation methods are provided in the following subsections. Also included is a discussion of non-routine maintenance. All routine and non-routine OM&M activities should be documented and reported to the agencies.

4.4.1 SSD and SMD systems

Routine maintenance should commence within 18 months after the system becomes operational, and should occur every 12 to 18 months thereafter. Based upon a demonstration of the system's reliability, the State recommends that, if a different frequency is desired, a petition describing the alternative frequency and the reasons that frequency is preferred be submitted to the State. Any comments the State may have on the petition should be considered before the frequency is altered.

During routine maintenance, the following activities (at a minimum) should be conducted:

a. a visual inspection of the complete system (e.g., vent fan, piping, warning device or indicator, labeling on systems, soil vapor retarder integrity, etc.),

b. identification and repair of leaks [Sections 4.3.1 and 4.3.2], and

c. inspection of the exhaust or discharge point to verify no air intakes have been located nearby.

As appropriate preventative maintenance (e.g., replacing vent fans), repairs and/or adjustments should be made to the system to ensure its continued effectiveness at mitigating exposures related to soil vapor intrusion. The need for preventative maintenance will depend upon the life expectancy and warranty for the specific part, as well as visual observations over time. The need for repairs and/or adjustments will depend upon the results of a specific activity compared to that obtained when system operations were initiated.

If significant changes are made to the system or when the system's performance is unacceptable, the system may need to be redesigned and restarted. Many, if not all, of the post-mitigation testing activities, as described in Sections 4.3.1 and/or 4.3, may be appropriate. The extent of such activities will primarily depend upon the reason for the changes and the documentation of sub-slab depressurization.

Generally, air monitoring is not recommended if the system has been installed properly and is maintaining a vacuum beneath the entire slab.

In addition to the routine OM&M activities described here, the building's owner and tenants are given information packages that explains the system's operation, maintenance and monitoring [Section 5.6]. Therefore, at any time during the system's operation, the building's owner or tenants may check that the system is operating properly.

4.4.2 Other mitigation systems

For other mitigation systems (e.g., HVAC modifications, crawl space ventilation, etc.), routine maintenance activities are generally comparable to post-mitigation testing activities [Section 4.3]. Activities typically include a visual inspection of the complete system, and identification and repair of leaks. System performance checks, such as air stream velocity measurements of ventilation systems, also should be performed.

As appropriate, preventative maintenance (e.g., replacing filters, cleaning lines, etc.), repairs and/or adjustments should be made to the system to ensure its continued effectiveness at mitigating exposures related to soil vapor intrusion. If significant changes are made to the system or when the system's performance is unacceptable, redesigning and restarting the system may be appropriate[Section 4.4.1].

Air monitoring, such as periodic sub-slab vapor, indoor air and outdoor air sampling, may be appropriate to determine whether existing building conditions are maintaining the desired mitigation endpoint and to determine whether changes are appropriate. The type and frequency of monitoring is determined based upon site-specific and building-specific conditions, taking into account applicable environmental data, building operating conditions, and the mitigation method employed.

4.4.3 Non-routine maintenance

Non-routine maintenance may also be appropriate during the operation of a mitigation system. Examples of such situations include the following:

a. the building's owners or occupants report that the warning device or indicator indicates the mitigation system is not operating properly;

b. the mitigation system becomes damaged; or

c. the building has undergone renovations that may reduce the effectiveness of the mitigation system.

Activities conducted during non-routine maintenance visits will vary depending upon the reason for the visit. In general, building-related activities may include examining the building for structural or HVAC system changes, or other changes that may affect the performance of the depressurization system (e.g., new combustion appliances, deterioration of the concrete slab, or significant changes to any of the building factors listed in Table 1.2). Depressurization system-related activities may include examining the operation of the warning device or indicator and the vent fan, or the extent of sub-slab depressurization. Repairs or adjustments should be made to the system as appropriate. If appropriate, the system should be redesigned and restarted [Section 4.4.1].

4.5 Termination of mitigation system operations

Mitigation systems should not be turned off, until the State receives, and has had the opportunity to comment on, a proposal to turn off mitigation systems. The party seeking to turn off the mitigation systems should consider any comments the State may have on the proposal, except in emergency situations. Systems should remain in place and operational until they are no longer needed to address current or potential exposures related to soil vapor intrusion. This determination should be based upon several factors, including the following:

a. subsurface sources (e.g., groundwater, soil, etc.) of volatile chemical contamination in subsurface vapors have been remediated based upon an evaluation of appropriate post-remedial sampling results;

b. residual contamination, if any, in subsurface vapors is not expected to affect indoor air quality significantly based upon soil vapor and/or sub-slab vapor sampling results;

c. residual contamination, if any, in subsurface vapors is not affecting indoor air quality when active mitigation systems are turned off based upon indoor air, outdoor air and sub-slab vapor sampling results at a representative number of buildings; and

d. there is no "rebound" effect for which additional mitigation efforts would be appropriate observed when the mitigation system is turned off for prolonged periods of time. This determination should be based upon indoor air, outdoor air and/or sub-slab vapor sampling from the building over a time period, determined by site-specific conditions.

Given the prevalence of radon throughout the State of New York, consideration should be given to leaving the system in place and operating to address exposures related to radon intrusion after concurrence is reached that the system is no longer needed to mitigate exposures related to soil vapor intrusion. This action should be done only with permission of the property owner and after the property owner is aware of their responsibilities in

operating, monitoring and maintaining the system for this specific purpose. If the property owner declines the offer, the system should be shut down and, if requested, removed in a timely manner.

4.6 Annual certification and notification recommendations

Mitigation systems are considered engineering controls, defined as any physical barrier or method employed to

1. actively or passively contain, stabilize, or monitor hazardous waste or petroleum,
2. restrict the movement of hazardous waste or petroleum to ensure the long-term effectiveness of remedial actions, or
3. eliminate potential exposure pathways to hazardous waste or petroleum.

Therefore, depending upon the remedial program, submission of an annual certification to the State may be required. This certification must be prepared and submitted by a professional engineer or environmental professional and affirm that the engineering controls are in place, are performing properly and remain effective. This requirement of certification remains in effect until the State provides notification, in writing, that this certification is no longer needed.

If a property owner declines a mitigation system, the party responsible for arranging the design and installation of the system should renew the offer on an annual basis, unless they demonstrate environmental conditions have changed such that a system is no longer needed.

Section 5: Community Outreach

While community outreach is an essential component of the investigation and remediation of any site, it is particularly critical when evaluating soil vapor intrusion at a site due to the following:

a. a heightened awareness by environmental professionals and the general public (both nationally and state-wide) for the importance of soil vapor intrusion;

b. the relatively complicated nature of the exposure pathway (e.g., chemicals in groundwater or soil ending up in the indoor air of buildings versus contaminated groundwater entering the house through the use of a private well);

c. the unknowns associated with the evolving science of investigating, evaluating, and mitigating exposures related to soil vapor intrusion; and

d. the relatively complicated nature of mitigating the exposure pathway (e.g., the design, installation and operation of a sub-slab depressurization system in a home versus an immediate switch from using private well water to using bottled water).

When people have been or may be exposed to contamination, providing them with accurate and timely information about those exposures is extremely important. This information should include details about the types of chemicals, the levels of exposure, and possible health effects from those exposures. In addition, information should include details about the planning and progress of the investigation and remediation efforts. Techniques commonly used to inform the community about soil vapor intrusion issues are described in this section. The type, or types, of techniques selected for a site will vary depending upon the community's needs, site-specific conditions and remedial program-specific requirements.

5.1 Site contact list

A contact list contains names, addresses and telephone numbers of individuals and organizations with interest or involvement in a site. They may be affected by or interested in the site, or have information that staff needs to make effective remedial decisions. Contact lists typically include residents near the site, elected officials, appropriate federal, state, and local government contacts, local media, organized environmental groups and the responsible party, as well as local businesses, civic and recreational groups, religious facilities, school district officials, and all staff (NYSDEC, NYSDOH, county health department, EPA, etc.) involved in the site. The checklist provided in Appendix G.1 will help to identify who should be included in a particular site's contact list.

With respect to soil vapor intrusion, the site contact list is often used to

a. send a fact sheet announcing a proposed investigation in the area, a major project decision or proposal, the project's status or progress, a public meeting or availability session, or the availability of documents in the repositories;

b. contact building owners and tenants to arrange sampling dates and times and to transmit sampling results (in written form and/or verbally); and

c. provide community members with verbal updates on the project's status or progress.

The member of the project team (defined as the NYSDEC, NYSDOH, responsible party, etc.) that develops and maintains the site contact list is determined on a site-specific and/or

program-specific basis. Development and revision of the contact list are ongoing activities throughout the site's investigation and remediation. Guidance on how to create a site contact list is provided in Appendix G.1.

5.2 Project staff contact sheet

As implied by the name, this is a summary of the contact information for staff working on the site that can be handed out to the community. Often included on the sheet are the name, title, affiliation, role or area of expertise, address, telephone number, email address, facsimile number for each staff member. The contact sheet provides the community with a quick reference on whom to call with questions, comments or concerns about the site. Project staff may also use the site contact sheet to direct inquiries to the most appropriate person. This is particularly useful when there are many agencies working on the site and many issues, such as site investigation, health studies, medical outreach, etc., being addressed.

The site contact sheet should be handed out at public meetings or availability sessions, when door-to-door visits and sampling are conducted, and in conjunction with other appropriate outreach activities. The sheet should be developed early on in the process and kept up-to-date. The member of the project team that develops and maintains the staff contact sheet is determined on a site-specific and/or program-specific basis.

5.3 Fact sheets

A fact sheet is a written summary of important information about a site. It presents information in clear and concise terms for the community. Fact sheets aid consistent distribution of information and citizens' understanding of significant issues associated with site-related activities. With respect to soil vapor intrusion, fact sheets are often used to

a. announce a proposed soil vapor intrusion investigation in the area, either as a stand-alone activity or in conjunction with the site's overall investigation;

b. summarize the results of an investigation and the anticipated next steps in the process;

c. invite the public to a meeting or availability session to discuss the proposed investigation, the results of a recently completed investigation, the anticipated next steps, etc.; and

d. provide additional information on topics associated with soil vapor intrusion, such as specific air guidelines for volatile chemicals.

The member of the project team that plans, develops and distributes the fact sheet is determined on a site-specific and/or program-specific basis. Factors to consider when designating the lead include the site's remedial program, the expected content of the fact sheet, and the relationship of various team members with the community. For example, if the community strongly distrusts the responsible party and wants to know how the state is determining that their actions are appropriate, the state should be the lead. A combination of team members may also be suitable.

All team members should be included in reviewing and finalizing the fact sheet. Once the state approves the fact sheet, it may be released to the public. Timely distribution of the fact sheet is important. Sufficient time should be allowed in the development and review

schedule to ensure that the fact sheet is distributed — *and that it is received* — before the critical activity takes place. Specific timeframes for release include the following:

a. 2 weeks prior to a public meeting or availability session, or commencement of field activities;

b. within 24 hours of receiving a specific request for an available fact sheet from the community (e.g., members of the community that did not receive a copy of the fact sheet in the mail);

c. if applicable, before a comment period begins (otherwise a 30-day comment period becomes, in reality, a 25-day comment period); and

d. if appropriate, concurrently with letters to the community explaining sampling results.

Copies of fact sheets commonly used to supplement discussions related to soil vapor intrusion are provided in Appendix H. They are also available from the NYSDOH's soil vapor intrusion web page: http://www.health.state.ny.us/environmental/indoors/vapor_intrusion/. Additional guidance on how to plan, develop and distribute fact sheets is provided in Appendix G.2.

5.4 Public gatherings

The following are several types of public gatherings where project staff can meet with the community:

a. Traditional Public Meetings: Project staff generally present information and answer questions. Citizens are encouraged to ask questions and provide comments;

b. Public Availability Sessions: The session is held in a casual setting, without a formal agenda and presentation. Staff generally conduct an availability session about a specific aspect of a site, which it publicizes ahead of time. The format promotes detailed individual or small group discussion between staff and the public. An availability session may be targeted to a specific subgroup of the overall community. For example, a session may be held where project staff meet with building owners and tenants to discuss their individual sampling results;

c. Public Forum: The forum is held in a casual setting, without a formal presentation. Typically, the format is one of "question and answer" — a panel of project staff (or, if applicable, outside experts) answer questions asked by community members in an open discussion; and

d. Other: Project staff may be invited to give presentations or to make themselves available for questions at community group meetings, such as community or neighborhood board meetings, school board meetings, etc.

If appropriate, a combination of the above may be used. The type, or combination of types, of gathering (if any) selected should be decided based on site-specific, program requirements and community-specific conditions, such as the following:

a. Is the investigation limited to on-site buildings, to a localized area of off-site buildings, or to the off-site neighborhood surrounding the site?;

b. Is the soil vapor investigation being performed as part of ongoing site investigation activities (and consequently ongoing outreach activities), or is this issue being revisited at a site where remediation was considered "complete?";

c. What type of outreach has the community favored in the past?;

d. What are the objectives of the meeting? Can one meeting type accomplish each of the objectives or are different meeting types needed on successive days (e.g., public meeting followed by an availability session)?; and

e. Who is the desired audience? Should the meeting be held in the afternoon to accommodate an elderly population and repeated in the evening for people who work during normal business hours?

The member of the project team that coordinates and implements the gathering is determined on a site-specific and/or program-specific basis. Factors to consider when designating the lead include the site's remedial program, the expected subject of the meeting, and the relationship of various team members with the community. A combination of team members may also be appropriate.

Additional guidance on how to plan and conduct a public meeting and an availability session is provided in Appendices G.3 and G.4.

5.5 Letters transmitting results

When indoor air and/or sub-slab vapor samples are collected from within or beneath a building, a letter providing the sampling results and the conclusions drawn from the data evaluation should be transmitted to the building's owner. If the building is a rental property, the transmittal letter should be sent to the tenants residing in the areas where the samples were collected and a copy to the property owner/landlord. In some cases where responsible parties are carrying out indoor air sampling, access agreements are commonly executed between such a party and the property owner. Consequently, the transmittal letter may be sent to the property owner, and where feasible by prior arrangement with the property owner and/or tenant, with a copy to the tenant.

A transmittal letter should include the following (as applicable):

a. the address of the building sampled;

b. the date samples were collected;

c. the type of samples collected (e.g., sub-slab vapor, indoor air and outdoor air);

d. indoor air sampling locations (e.g., basement, crawl space, first floor living room, etc.)

e. who collected the samples (e.g., the state, or [Consultant Name] on behalf of [Responsible Party name], etc.);

f. why samples were collected (e.g., to evaluate the potential for exposures associated with soil vapor intrusion);

g. the site name and number (usually included in the subject line);

h. the compound(s) or group of compounds of concern (e.g., trichloroethene or volatile organic compounds);

i. an overview of the sampling results (e.g., a table summarizing compounds detected in each sample and/or a figure illustrating sampling locations and corresponding results);

j. copies of the laboratory sheets for each sample collected and the completed building questionnaire/inventory;

k. a statement of the conclusions drawn and the next steps (e.g., soil vapor intrusion appears to be the likely source of volatile chemicals in your indoor air and we would like to install a sub-slab depressurization system to minimize exposures);

l. if applicable, what information should be shared with employees and/or patrons of the facility (e.g., the transmittal letter and enclosed fact sheets, a situation-specific fact sheet and cover memorandum, etc.);

m. contact information for project staff; and

n. fact sheets that supplement information provided in the letter.

The member of the project team that transmits the letter is typically the member that conducted the investigation. A representative of each member should be copied on each transmittal. For example, for investigations conducted by the state, letters are transmitted by the NYSDOH; state and local agencies, as well as a representative for the responsible party (or other non-agency project staff), should be copied. For investigations conducted by the responsible party, the responsible party should transmit letters that have been reviewed and approved by the state, and copy state and local agency representatives.

The level of detail provided in the letter will depend upon who transmits the letter. For example, letters written by the NYSDOH may recommend actions to reduce exposures to indoor sources (i.e., not site-related sources) of volatile chemicals, or address expected risks associated with an identified exposure. Letters transmitted by a responsible party generally focus on site-related contamination and their identified next steps. These letters generally refer the recipients to the state for questions regarding non-site-related compounds and health concerns. For additional guidance on the content of the transmittal letters, contact the NYSDOH's Bureau of Environmental Exposure Investigation at 1-800-458-1158, extension 27850.

Timely distribution of the transmittal letter is important. Generally, final (i.e., verified) sampling results from the laboratory are available 6 to 8 weeks after the samples are submitted. As soon as they are available, final results should be forwarded to the team member that is transmitting them. Sufficient time should be allowed in the development and review schedule to ensure that the letter is transmitted within 2 weeks after final results are available.

If there is significant community interest in the sampling results, reasonable attempts should be made to inform the building owners and tenants of their results verbally in addition to sending a transmittal letter. Other interested community members, such as residents, press and elected officials, may be given an overview of the investigation results and the conclusions drawn *after* each building owner and tenant has been notified.

5.6 Soil vapor intrusion mitigation information

Once a mitigation system (e.g., sub-slab depressurization system) is installed in a building, an information package should be given to the building's owner and tenants, if applicable, to facilitate their understanding of the system's operation, maintenance and monitoring. This package should include the following:

a. a description of the mitigation system installed and its basic operating principles;

b. how the owner or tenant can check that the system is operating properly;

c. how the system will be maintained and monitored and by whom;

d. a list of appropriate actions for the owner or tenant to take if the system's warning device or indicator (e.g., pressure gauge, alarm, etc.) indicates system degradation or failure; and

e. contact information (e.g., names, telephone numbers, etc.) if the owner or tenant has questions, comments or concerns.

The building's owner should also receive the following information:

a. any building permits required by local codes;

b. copies of contracts and warranties; and

c. a description of the proper operating procedures of any mechanical or electrical system installed, including manufacturer's operation and maintenance instructions and warranties.

Wherever possible, illustrations should be provided. For example, pictures of a manometer under normal operating conditions [Figure 5.1], as well as drawings or schematics showing the system at work [Figure 5.2].

The member of the project team who provides this information is the member who installed the mitigation system.

Figure 5.1
Manometer indicating the SSD system is operating properly.

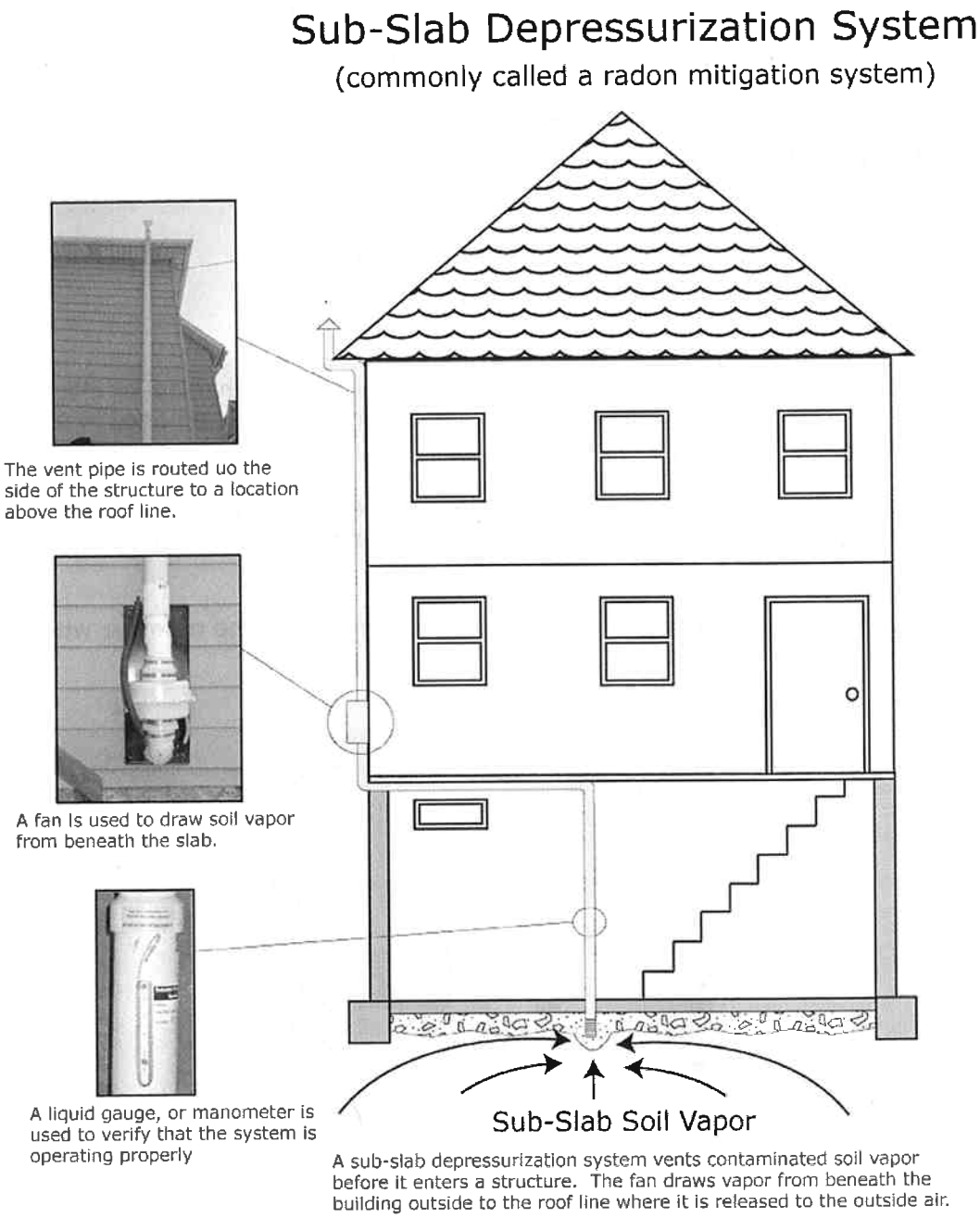

Figure 5.2
Example of an illustration showing how a SSD system works.

5.7 Toll-free "800" numbers

Toll-free information numbers provide quick, easy access for people who have questions, comments or concerns about a site. At a minimum, the NYSDOH site project manager's name and the following "800" number should be shared with the community in fact sheets and transmittal letters, at public gatherings, when samples are collected, and with other outreach techniques for their use if they have health-related questions, concerns or comments related to soil vapor intrusion at the site.

NYSDOH
Center for Environmental Health
Bureau of Environmental Exposure Investigation
Toll-free Information Line

1-800-458-1158, ext. 27850

Note: The "800" number is an *information* line — not a "*hotline*" — because callers may not receive immediate response, such as on nights or weekends.

Similarly, applicable toll-free numbers setup and maintained by other project team members should also be shared with the community whenever appropriate. Additional information on the use of toll-free "800" numbers as an outreach tool is provided in Appendix G.5.

5.8 Door-to-door visits

Door-to-door visits involve gathering or distributing site information by meeting individuals at their residences or businesses. Typically, this outreach technique is used to supplement other communication, such as telephone calls and letters. With respect to soil vapor intrusion, project staff may visit residents near a site to provide information, answer questions, or obtain permission for activities on private properties. All team members should be aware of the specifics of the door-to-door visits (e.g., who will be conducting the visits, the reason, the dates, etc.).

Additional information on conducting door-to-door visits is provided in Appendix G.6.

5.9 Document repositories

A document repository is a collection of documents and other information developed during the investigation and remediation of a site. It is located in a convenient, public facility, such as a library, so that affected and interested members of the public can easily access and review important information about the site. A repository is maintained through the site's operation and maintenance phase, or until its release from the applicable remedial program.

A site document repository helps the public review

a. documents about which the state is seeking public comment;

b. studies, reports and other information; and

c. complete versions of documents summarized in fact sheets, meeting presentations or media releases (summaries should note the locations of local repositories where the complete documents are available).

The member of the project team that establishes and maintains the document repository is determined on a site-specific and/or program-specific basis. Additional guidance on how to establish and maintain a document repository is provided in Appendix G.7.

5.10 Medical community outreach

Outreach to the medical community is an activity or combination of activities undertaken to assist local health care providers in caring for people who have concerns about site-specific environmental exposures. The goal of this type of outreach is to assist the individual provider by giving him/her much of the site-specific information related to the contaminants and to provide information about the site itself. This type of outreach is undertaken whenever the NYSDOH and/or other health agencies determine that the site-specific contaminants may be unfamiliar to the local medical community. Conversely, this outreach can be undertaken when community members express the concern that their health care providers may be unfamiliar with potential adverse health effects related to contaminants at the site.

The targeted audience for this type of outreach consists of specific groups of health care providers most likely to treat people with concerns about potential environmental exposures. Some examples of targeted groups of specialists could include any combination of the following: Family Practice, Internal Medicine, Preventive Medicine, Oncology, Neurology, Allergy, Pediatrics, Obstetrics, Dermatology and Emergency Medicine. Likewise, materials can be sent to medical and nursing schools, residency programs, and medical libraries if they are located nearby. Developing the targeted list of health-care providers is a cooperative effort between local and state departments of health, with input from the community as well.

The NYSDOH, in partnership with the Agency for Toxic Substance and Disease Registry (ATSDR) and the local health department, can conduct these activities, which could include any one or a combination of the following:

a. announcements made at public meetings that the NYSDOH Center for Environmental Health will mail out information packets to individual physicians at the request of any concerned citizen;

b. an article placed in a local newspaper, or, if applicable, in a newsletter periodically sent to residents, stating that the NYSDOH Center for Environmental Health will mail out packets to individual physicians at the request of any concerned citizen. The NYSDOH "800" number and two NYSDOH contact names would be given;

c. an article submitted to the newsletter of the local county medical society, stating that the NYSDOH and the ATSDR have information to help providers with questions about site-related contamination in the area of the site. The NYSDOH "800" number and two NYSDOH contact names would be given; and

d. materials sent to medical and nursing schools, residency programs, and medical libraries if they are located nearby.

Local and state departments of health, and ATSDR, have developed appropriate outreach materials. The information packets should contain a letter to the physician, site-specific fact sheets, brochures, and booklets about potential exposures and about the contaminants in the area of the site. As an example, here is a list of fact sheets and pamphlets that an information packet for a site with PCE and TCE as contaminants of concern might contain:

a. a letter of explanation to the provider, including the NYSDOH "800" number to call for access to more information, as well as two NYSDOH contacts with whom to speak initially;

b. a site-specific fact sheet written for the community, explaining various site-related issues;

c. a compact disc of ATSDR case studies in environmental medicine (CSEMs), with opportunities for earning many free continuing medical education (CME) credits through the Centers for Disease Control and Prevention;

d. a hard copy of both the "Trichloroethylene (TCE) Toxicity" and "Taking an Environmental Exposure History" case studies;

e. two small "quick reference guides" produced by ATSDR about evaluating environmental exposures and doing an exposure history;

f. a NYSDOH fact sheet on Trichloroethene (TCE) in indoor and outdoor air;

g. an ATSDR fact sheet on Trichloroethylene (TCE);

h. a NYSDOH fact sheet on Tetrachloroethene (PERC) in indoor and outdoor air; and

i. an ATSDR fact sheet on Tetrachloroethylene (PERC).

For additional information on this outreach tool, please contact the NYSDOH Center for Environmental Health's Outreach and Education Unit at 1-800-458-1158, extension 27530.

References

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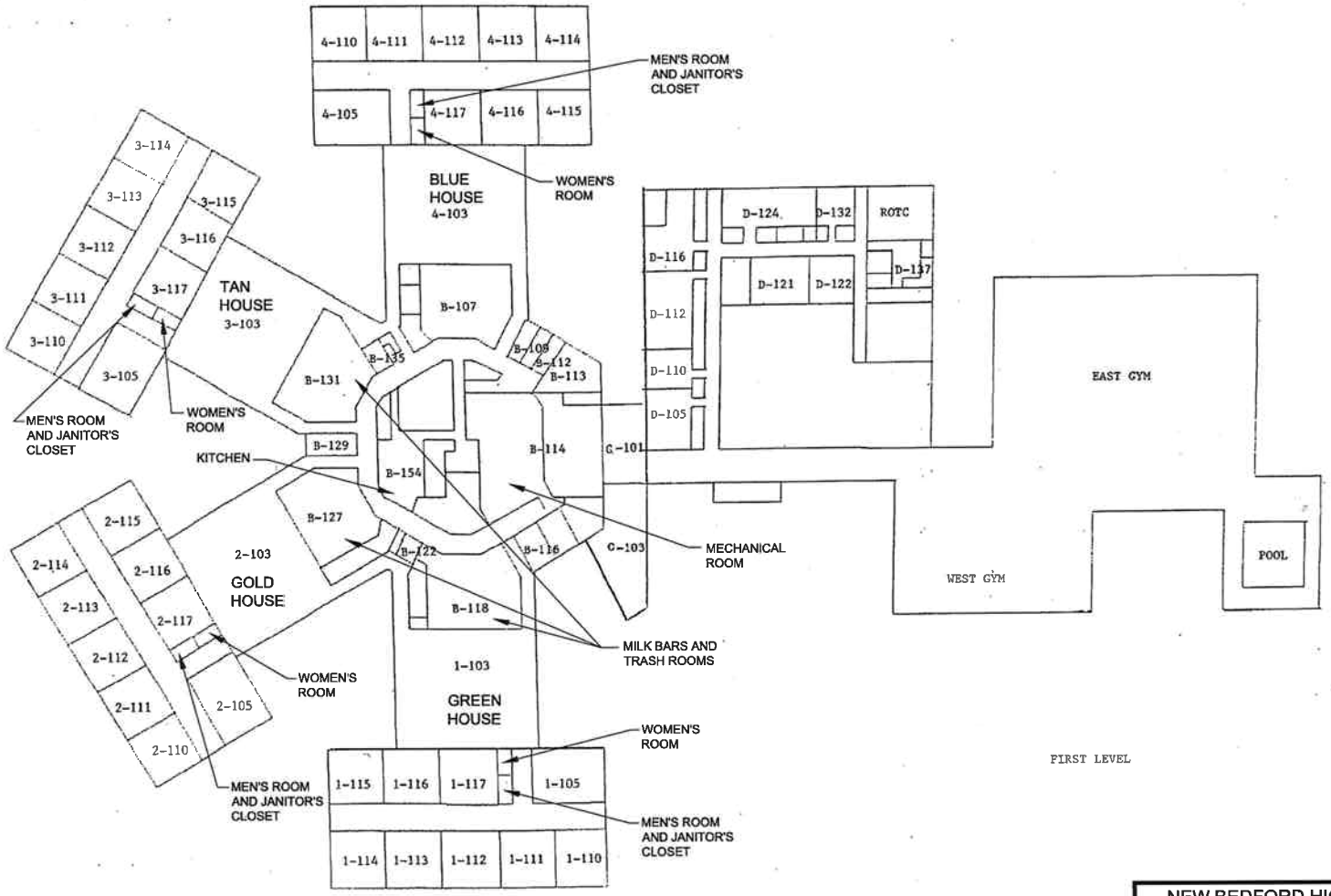
APPENDIX H

DRAIN AND CRACK SCREENING INFORMATION

Table H-1
New Bedford High School CEP Survey
Floor Crack and Drain Inventory, Blocks A and B
February 11, 2010

Room Number	Location	VOC reading (ppbv)	Background (ppbv)	Plan and Sample ID	Notes
B-114	Drain at Chiller	160	250-300	P-1, Sample 1	
B-114	Drain at Compressor	300	250-300	P-1, Sample 2	
B-114	Drain Between Tanks	230	230	P-1, Sample 3	
B-114	Drain in Pit	800	350	P-1, Sample 4	
B-114	Corner Crack in Pit	1,000	800	P-1, Sample 5	Smell of petroleum/gas fumes
B-114	Sidewall Crack in Pit	600	1,000	P-1, Sample 6	Smell of petroleum/gas fumes
B-114	Drain at Johnson Controls	180	180	P-1, Sample 7	
B-114	Drain near BRM-S-3	180	190	P-1, Sample 8	
B-114	Drain near BRM-S-1	170	170	P-1, Sample 9	
B-114	Drain at HVAC AC-2	155	170	P-1, Sample 10	
B-114	BRM-S-1 Location	180	170	P-1, Sample 11	
B-114	BRM-S-3 Location	175	180	P-1, Sample 12	
B-113A	Shower Drain	315	285	P-1, Sample 13	
B-105	Drain in Trash Room Blue House	165	165	P-18, Sample 14	
A-108-4	Drain in Mens' Room Blue House	215	110	P-5, Sample 15	Wet floor
A-109-4	Drain in Janitor's Closet Blue House	180	120	P-5, Sample 16	
A-107-4	Drain in Womens' Room Blue House	210	130	P-5, Sample 17	Wet
B-104	Drain in Milk Bar Blue House	100	100	P-18, Sample 18	
Kitchen	Drain inside Refrigerator Cage			P-17, Sample 19	Interference from snow equipment
Kitchen	Drain	440	470-550	P-17, Sample A	
Kitchen	Drain	535	470-550	P-17, Sample B	
Kitchen	Drain	800	470-550	P-17, Sample C	
Kitchen	Drain	700	470-550	P-17, Sample D	
Kitchen	Drain	700	470-550	P-17, Sample E	
Kitchen	Drain	540	470-550	P-17, Sample F	
Kitchen	Fry-O-Lator Pipes (Capped)	440	470-550	P-17, Sample G	
Kitchen	Drain	465	470-550	P-17, Sample H	
Kitchen	Drain	475	470-550	P-17, Sample I	
B-155	Drain in Food Storage by Mops	800	800	P-17, Sample 21	Possible interference from snow equipment
A-108-1	Drain in Mens' Room Green House	255	200	P-5, Sample 22	
A-109-1	Drain in Janitor's Closet Green House	1,700	1,000	P-5, Sample 23	Wet
A-107-1	Drain in Womens' Room Green House	280	265	P-5, Sample 24	
B-119	Drain in Milk Bar Green House	160	165	P-18, Sample 25	
B-120	Drain in Trash Room Green House	195	170	P-18, Sample 26	
B-122	Dish Room Drain	190	190	P-18, Sample 27	
B-122	Dish Room Hatch (22X44)	150-350	175	P-18, Sample 28	
B-125	Drain in Trash Room Gold House	190	195	P-18, Sample 29	
A-108-2	Drain in Mens' Room Gold House	1,100	300	P-5, Sample 30	
A-109-2	Drain in Janitor's Closet Gold House	410	300	P-5, Sample 31	Wet
A-107-2	Drain in Womens' Room Gold House	270	225	P-5, Sample 32	
B-126	Drain in Milk Bar Gold House	160	165	P-18, Sample 33	
B-132	Drain in Milk Bar Tan House	170	160	P-18, Sample 34	
A-108-3	Drain in Mens' Room Tan House	600	175	P-5, Sample 35	
A-107-3	Drain in Womens' Room Tan House	200	180	P-5, Sample 36	
A-109-3	Drain in Janitors' Closet Tan House	330	440	P-5, Sample 37	Wet
B-133	Drain in Trash Room Tan House	320	270	P-18, Sample 38	
B-135	Dishroom Drain	550-1,300	300	P-18, Sample 39	Wet
B-147	Utility Room Drain	940	965	P-17, Sample 40	Wet
B-147	Sink Trap, Utility Room	980	965	P-17, Sample 41	Wet
B-144	Drain in Womens' Room, Kitchen	2,200	500	P-17, Sample 42	
B-151	Elevator Door	750-1,200	750-1,200	P-1, Sample 43	Possible interference form snowblowers in hallway

All readings are observed mean, taken with a ppbRAE 3000.



NEW BEDFORD HIGH SCHOOL
230 HATHAWAY BLVD
NEW BEDFORD, MASSACHUSETTS

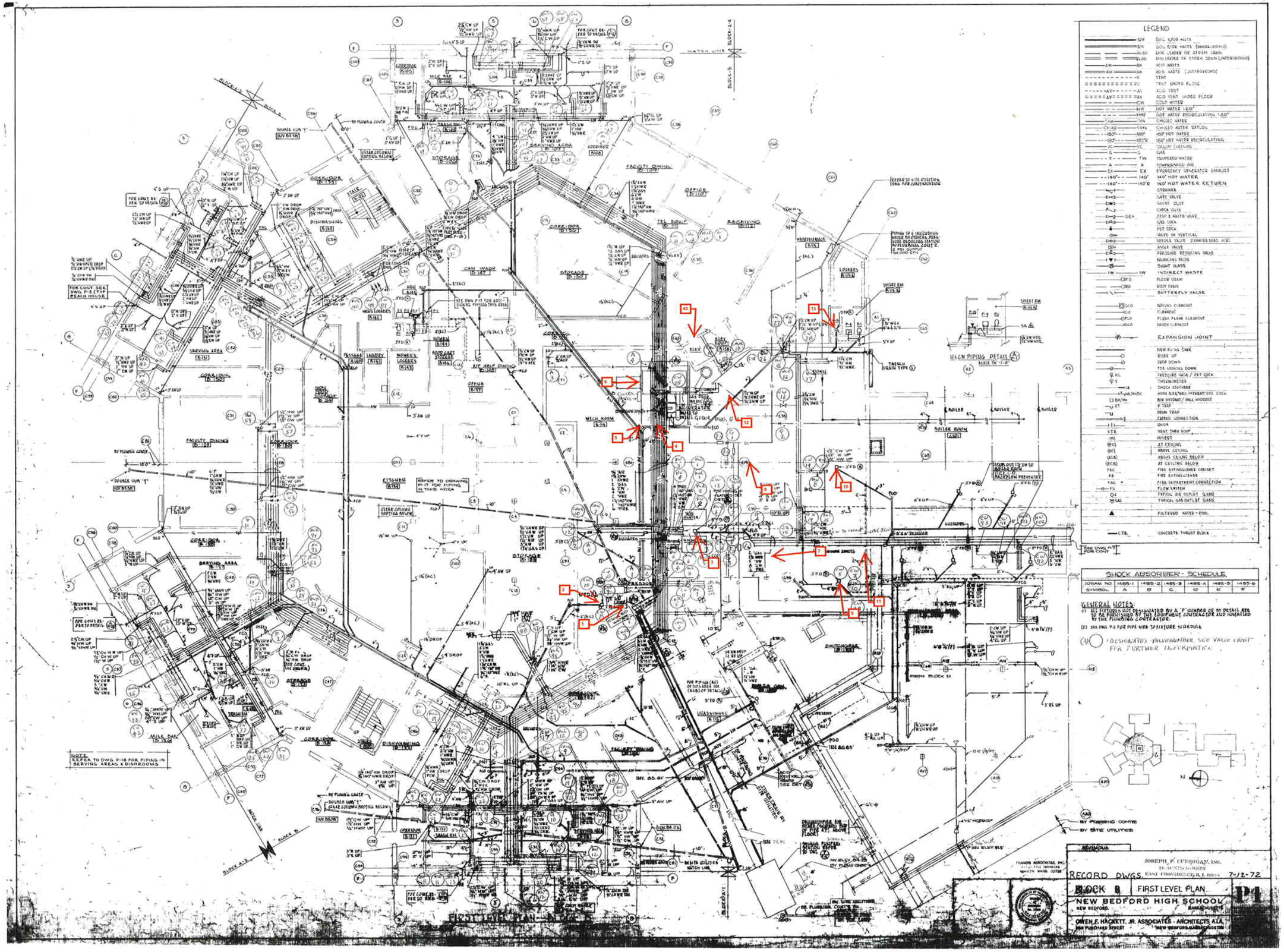
FLOOR CRACK AND DRAIN SURVEY

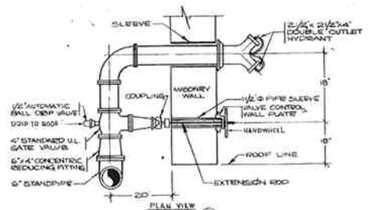
TRC
Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854
(978) 970-5600

FIGURE H-1

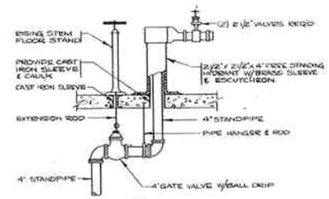
DRAWN BY: HWB
CHECKED BY: ACL
DATE: MARCH 2010

FILE: T:\E_CAD\115058\NBHS\FLOOR CRACK & DRAIN.dwg

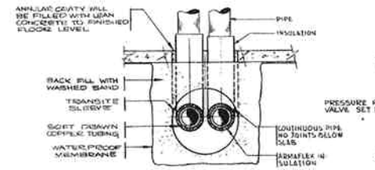

LEGEND
SHOCK ABSORBER - SCHEDULE
GENERAL NOTES:
(1) ALL FIXTURES NOT DESIGNATED BY A "P" NUMBER OR BY DETAIL ARE TO BE FURNISHED BY THE EQUIPMENT CONTRACTOR AND INSTALLED BY THE PLUMBING CONTRACTOR.
(2) SEE DWG P-2 FOR PIPE SIZE TO FIXTURE SCHEDULE
(3) DESIGNATES VALVE NUMBER SEE VALVE CHART FOR FURTHER INFORMATION
NOTE
REFER TO DWG. P-18 FOR PIPING IN SERVING AREAS & DISHROOMS
FIRST LEVEL PLAN
RECORD DWGS.
BLOCK B
FIRST LEVEL PLAN
NEW BEDFORD HIGH SCHOOL
NEW BEDFORD, MASSACHUSETTS
OWEN F. HACKETT, JR. ASSOCIATES - ARCHITECTS A.I.A.
JOSEPH P. CUDDIGAN, INC.
EAST PROVIDENCE, R.I.
7-12-72
P1



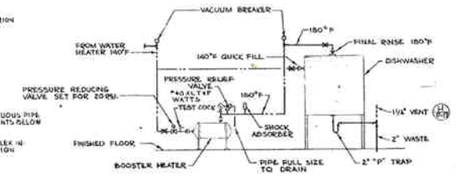
DETAIL
WALL HYDRANT PIPING
NO SCALE



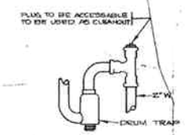
DETAIL
FREE - STANDING
ROOF HYDRANT MOUNTING
NO SCALE



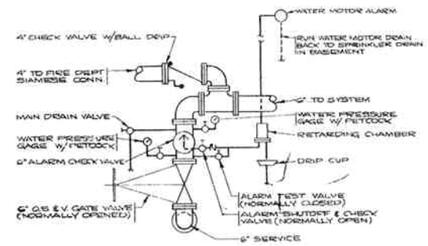
DETAIL
UNDERGROUND WATER PIPES
NO SCALE



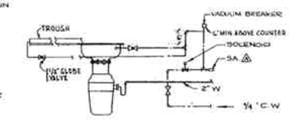
DISHWASHER PIPING DETAIL
NO SCALE



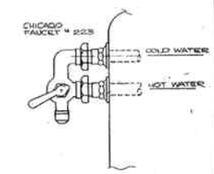
DETAIL
CLEANOUT REQUIREMENT
ISLAND SINKS
NO SCALE



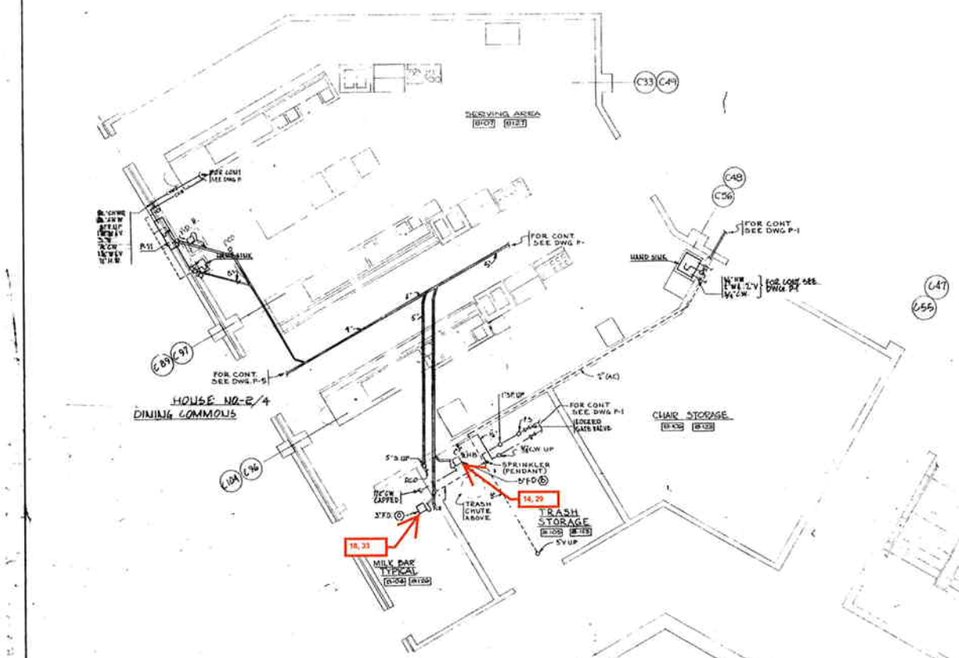
DETAIL
ALARM VALVE STATION
SCHEMATIC PIPING
NO SCALE

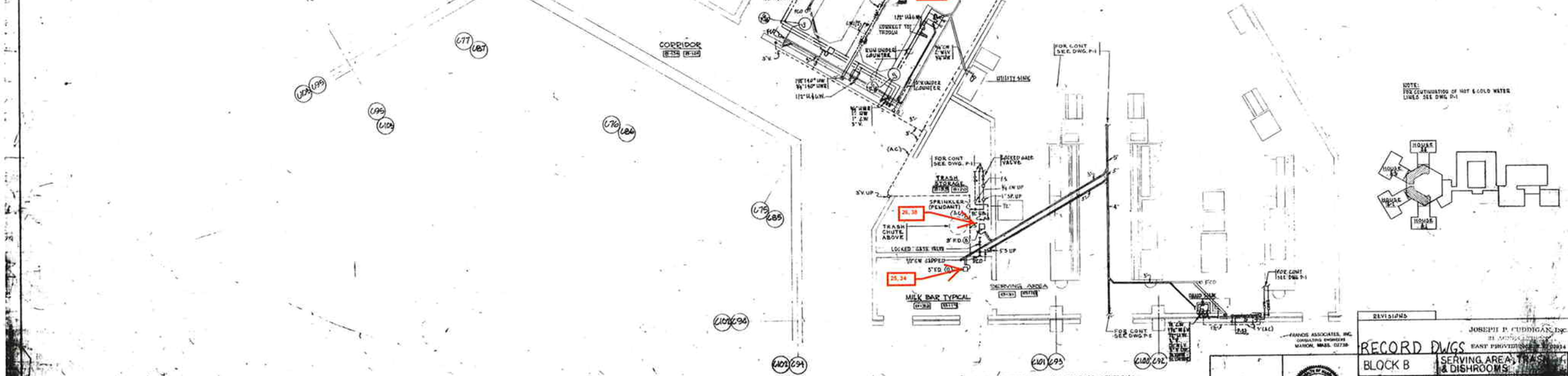


COLD WATER PIPING TO DISPOSER DETAIL
NO SCALE



DETAIL
WASH SINK FAUCET
NO SCALE





REVISIONS

JOSEPH P. CUDDIGAN, Inc.
21 MONMOUTH STREET
EAST PROVIDENCE, R.I. 02914
7-12-72

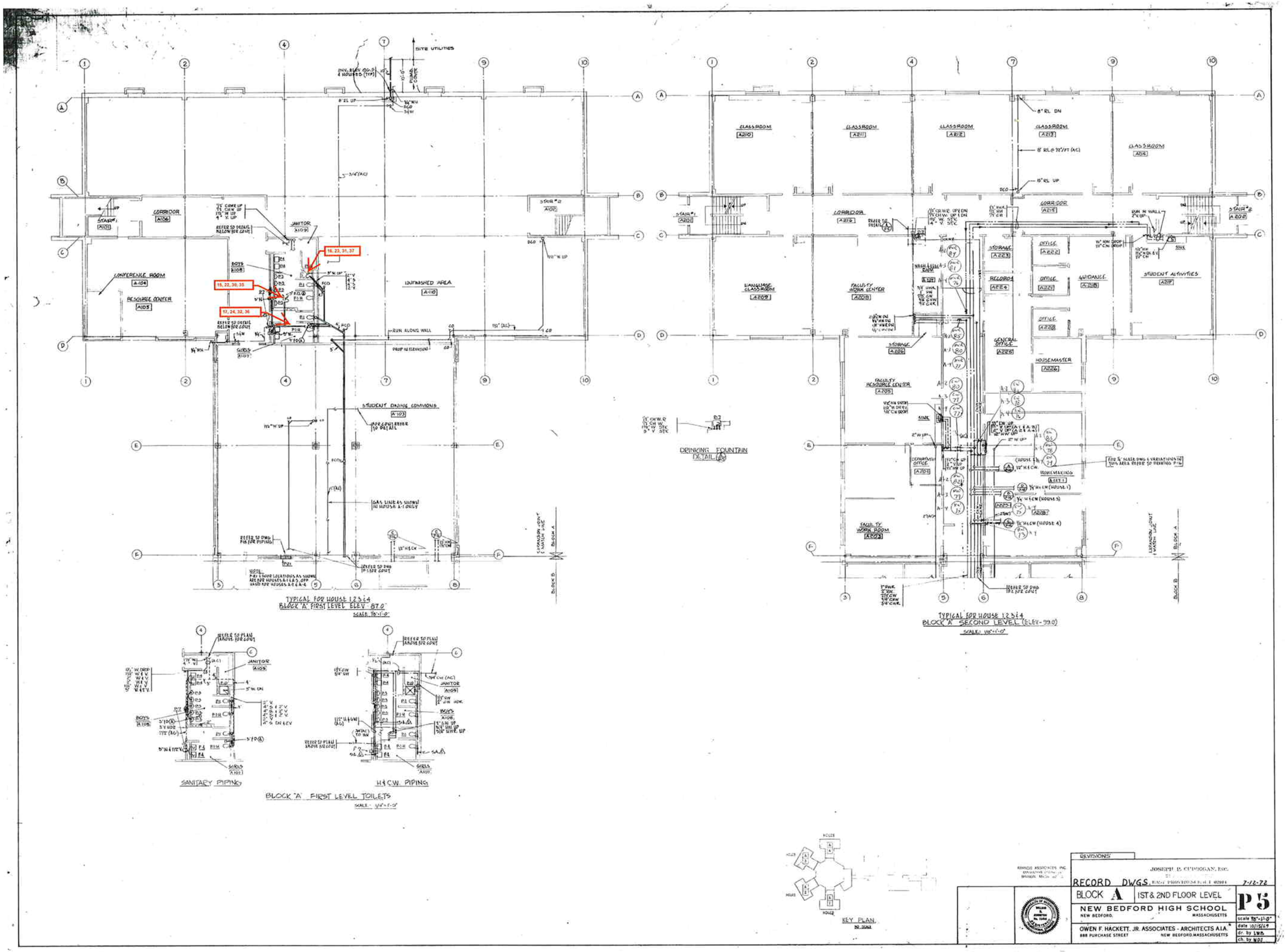
RECORD DWGS

BLOCK B — SERVING AREA, TRASH & DISHROOMS

NEW BEDFORD HIGH SCHOOL
NEW BEDFORD, MASS.

OWEN F. HACKETT, JR. ASSOCIATES - ARCHITECTS
NEW BEDFORD, MASS.

FRANOS ASSOCIATES, INC.
CONSULTING ENGINEERS
MANSFIELD, MASS. 02738



REVISIONS

JOSEPH P. CUDDIGAN, INC.

RECORD DWGS. EAST PROVIDENCE, R.I. 02914 7-12-72

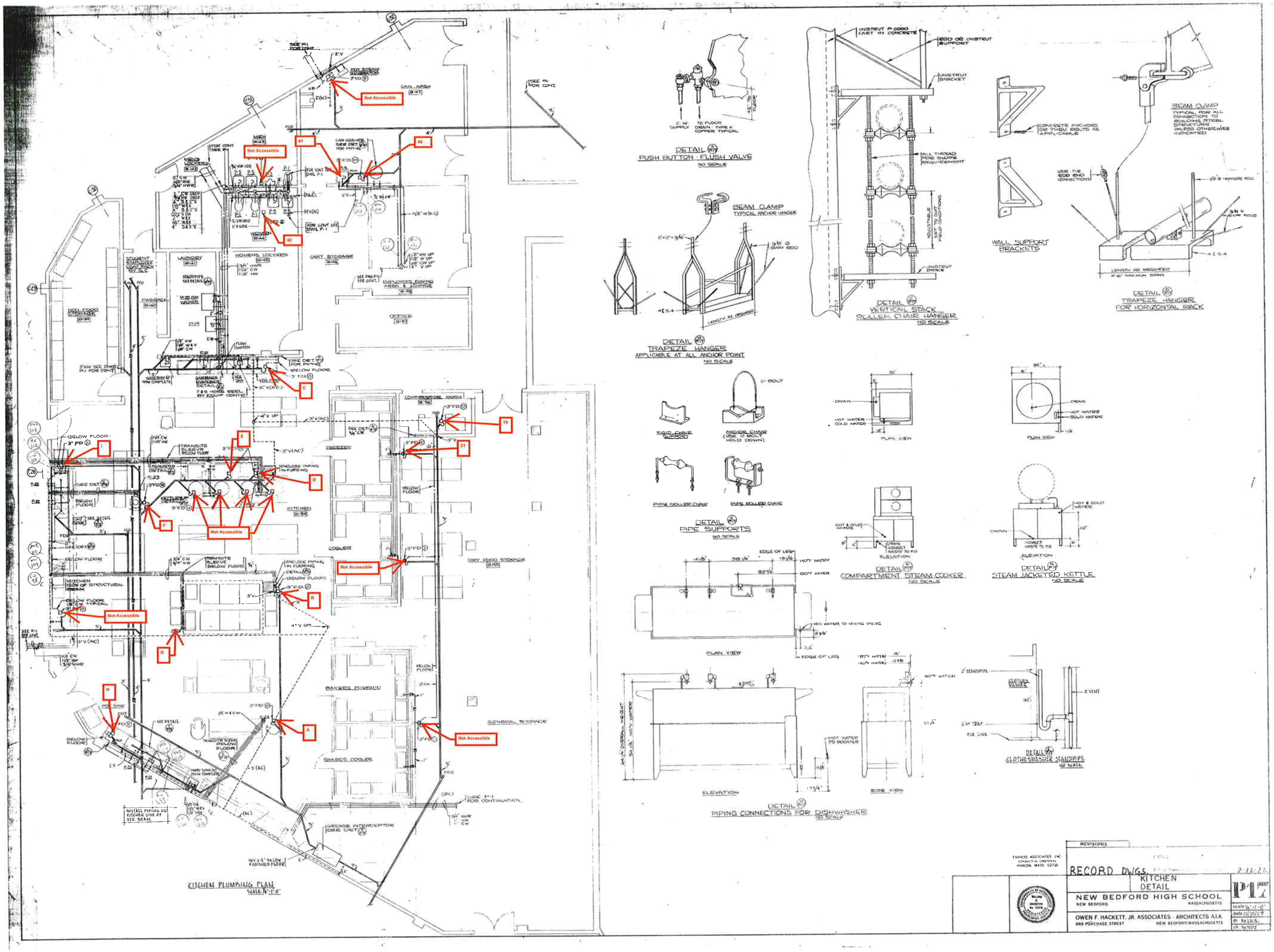
BLOCK A | 1ST & 2ND FLOOR LEVEL

NEW BEDFORD HIGH SCHOOL
NEW BEDFORD, MASSACHUSETTS

OWEN F. HACKETT, JR. ASSOCIATES - ARCHITECTS A.I.A.
888 PURCHASE STREET NEW BEDFORD, MASSACHUSETTS

P5

scale 1/8"=1'-0"
date 10/15/69
dr. by LWB
ch. by WDJ



REVISIONS

FRANCIS ASSOCIATES INC
CONSULTING ENGINEERS
MARION, MASS 02738

RECORD DWGS. 7-12-77

KITCHEN
DETAIL

NEW BEDFORD HIGH SCHOOL
NEW BEDFORD MASSACHUSETTS

OWEN F. HACKETT, JR. ASSOCIATES - ARCHITECTS A.I.A.
888 PURCHASE STREET NEW BEDFORD, MASSACHUSETTS

PT7

scale 1/4"=1'-0"
date 12/10/69
dr. by LB.B.
ch. by WDJ

APPENDIX I

NOTIFICATION LETTERS TO CITY OF NEW BEDFORD MAYOR AND BOARD OF HEALTH

Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854

978.970.5600 PHONE
978.453.1995 FAX

www.TRCsolutions.com

TRC Reference Number: 115058.0000

March 22, 2010

Marianne B. De Souza
Health Department
1213 Purchase Street
First Floor
New Bedford, MA 02740

RE: Notice of Immediate Response Action Plan – Substantial Release Migration / Critical Exposure Pathway
230 Hathaway Boulevard
New Bedford, Massachusetts
Release Tracking Number 4-22409

Ms. De Souza:

On behalf of the City of New Bedford, Massachusetts, and pursuant to 310 CMR 40.1403(3)(b) of the Massachusetts Contingency Plan (MCP), TRC Environmental Corporation (TRC) has prepared this letter to inform you of the submittal of an Immediate Response Action Plan pertaining to a Substantial Release Migration / Critical Exposure Pathway at the New Bedford High School campus in New Bedford, Massachusetts. This submittal will be made to the Massachusetts Department of Environmental Protection (MassDEP) by March 22, 2010.

A copy of this document can be obtained from Cheryl Henlin in the Department of Environmental Stewardship. If you have any questions concerning this letter please contact me at (978) 656-3565.

Sincerely,
TRC Environmental Corporation

David M. Sullivan, CHMM, LSP
Sr. Project Manager

Cc: Cheryl Henlin, New Bedford Department of Environmental Stewardship

Wannalancit Mills
650 Suffolk Street
Lowell, MA 01854

978.970.5600 PHONE
978.453.1995 FAX

www.TRCsolutions.com

TRC Reference Number: 115058.0000

March 22, 2010

Mayor Scott W. Lang
City Hall, Room 311
133 William Street
New Bedford, MA 02740

RE: Notice of Immediate Response Action Plan – Substantial Release Migration / Critical Exposure Pathway
230 Hathaway Boulevard
New Bedford, Massachusetts
Release Tracking Number 4-22409

Ms. Mayor Lang:

On behalf of the City of New Bedford, Massachusetts, and pursuant to 310 CMR 40.1403(3)(b) of the Massachusetts Contingency Plan (MCP), TRC Environmental Corporation (TRC) has prepared this letter to inform you of the submittal of an Immediate Response Action Plan pertaining to a Substantial Release Migration / Critical Exposure Pathway at the New Bedford High School campus in New Bedford, Massachusetts. This submittal will be made to the Massachusetts Department of Environmental Protection (MassDEP) by March 22, 2010.

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Sincerely,
TRC Environmental Corporation

David M. Sullivan, CHMM, LSP
Sr. Project Manager

Cc: Cheryl Henlin, New Bedford Department of Environmental Stewardship